Valley Way Drainage Environmental Assessment Study – Schedule C Environmental Study Report - FINAL

City of Niagara Falls

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Executive Summary

The Valley Way Drainage Environmental Assessment (EA) Study was initiated to thoroughly investigate the causes of the area's historic flooding issues and recommend improvements to mitigate their extent and frequency. This review was intended to guide the City's sewer separation and drainage projects to improve municipal services in the area. This study was developed based on previous study recommendations to address various flooding issues associated with the area's combined sewer system.

The study objectives involved review of the drainage areas for both the sanitary and storm service to examine the interactions between these sub-catchments. In particular, the study evaluates existing and potential storm sewer outlets for the lands south of McRae St, examines the sewer configurations and capacities at the Hydro One ROW drop shaft, investigates possible outlets for the western part of the study area, reviews possible drainage realignments, and confirms if there is sufficient downstream storm sewer capacity for the eastern part of the study area.

Alternative Concepts

Through the EA Process several alternative concepts were developed to address the flooding issues in the Valley Way area.

Short-Term Alternatives

1. **Dry Stormwater Management Pond**: A dry pond is used as temporary storage of stormwater runoff to reduce peak flow in the collection system. Flow is stored for a day or two then slowly released back to the storm sewer system. Some pollutants in the runoff settle due to gravity, thus are not released back to the system. Potential locations include F. H. Leslie Park as it contains open space and is at a low elevation within the study area, or the grassed boulevard along Valley Way.
2. **Infiltration Gallery**: An infiltration gallery is a sub-surface drain collection system, made with perforated pipes surrounded by gravel so that runoff can infiltrate back into the soil. This system could be located within the existing grassed boulevard on Valley Way to attenuate peak stormwater runoff. The depth of the trench is dependent on the infiltration rate of the native soil and the bottom should be at least one meter above the seasonally high groundwater table.
3. **Disconnect Impermeable Surfaces**: It is possible to decrease peak storm flows to the system by disconnecting any existing direct discharges to the sewer system from large, impermeable surfaces such as rooftops of commercial/industrial buildings. If it is feasible to redirect these surfaces to permeable areas without adversely affecting neighbouring properties, the length of time it takes for flow to reach the sewer will be increased. Similarly, it is preferable for parking lots to be redirected to pervious areas, though these may require more investigation as existing grading has presumably been designed to direct flow to catchbasins. Depending on topography, curb removal or strategic curb cuts may encourage infiltration instead of runoff directed to sewers.

Long-Term Alternatives

1. **Status Quo**: This option maintains the existing situation with no change to the combined sewer system. While this is conceivably an option, it does not solve any of the issues that initiated this study.
2. **Sewer Separation – Hydro Drop Shaft**: This alternative involves constructing new storm sewers that would direct storm flow to the existing Drop Shaft to the Hydro Tunnel at Stanley Avenue and Valley Way. The sanitary flow would continue to be conveyed by the Muddy Run sewer along Valley Way.

3. **Sewer Separation – Park Street Trunk Storm Sewer**: This alternative involves constructing new storm sewers that would direct storm flow to the existing storm trunk sewer on Park Street which flows east to the Niagara River. The sanitary flow would continue to be conveyed by the Muddy Run sewer along Valley Way.
4. **Sewer Separation – Muddy Run Trunk**: This option involves constructing new sanitary sewers while the existing combined Muddy Run Trunk Sewer would be used as a storm sewer. This option is complicated by the upstream combined area which also flows to the Muddy Run Trunk, thus may not be feasible.
5. **Sewer Separation** – **Hydro Drop Shaft and Park Street Combination:** This option is a combination of alternatives 2 and 3 and involves construction new storm sewers that would direct flow to the existing Drop Shaft and the Park Street Trunk Storm Sewer based on topography and capacity of both systems. The Valley Way trunk remains a combined sewer to convey the upstream combined catchment.

Preferred Design

All long-term alternatives were pre-screened to identify those that have potential for being viable options. **Table 1** provides an overview of the screening results.

Table 1: Long Term Alternative Screening Results

Alternative	Description	Screening Result	Comment
1	Status Quo	✘	Does not solve problems
2	Drop Shaft Outlet	▬	Met some criteria, possible but not best choice
3	Park Street Outlet	▬	Met some criteria, possible but not best choice
4	Combo – Drop Shaft and Park Street	✓	Best satisfied criteria
5	Muddy Run – convert to Storm Trunk/outlet	✘	Not reasonable, would not allow for separation in a reasonable time frame

Following pre-screening, all alternatives where evaluated against rigorous evaluation criteria consisting of:

- General Cost
- Phasing/Timing (Constructability)
- Maintain or Improve Sanitary Level of Service (reduce basement flooding)
- Maintain or Improve Storm Level of Service (overland flow)
- Improve Infrastructure Condition
- Resiliency

It was apparent that the preferred concept for the Valley Way area was sewer separation. Alternative 4 was determined to be the best alternative to both address the problem and be able to work within the confines and limitations of the existing infrastructure. Due to the topography of the area, the storm runoff needs to be split between the Hydro Drop Shaft to the Hydro Tunnel and the Park Street Storm Trunk Sewer. Also, the capacity of the Park Street Storm Trunk Sewer is not large enough to convey all the stormwater runoff from the Valley Way area, even if it were possible to convey it to Park Street by gravity. **Figure 1** provides an overview of the preferred design concept.

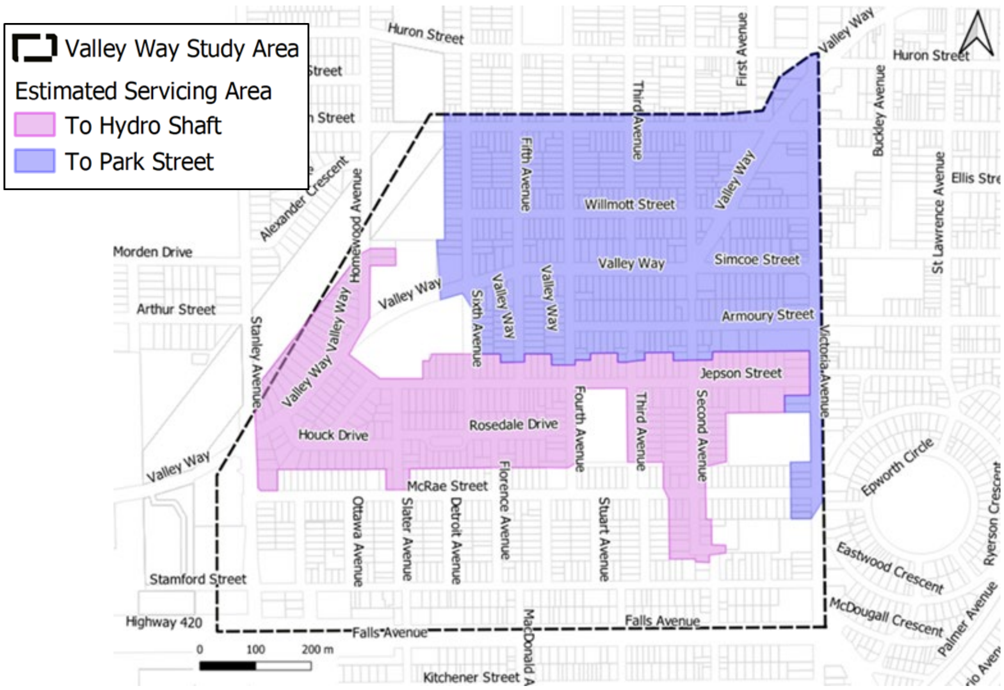

Figure 1: Preferred Alternative Design Concept

Project Cost Estimates

The estimated costs for the conceptual designs are summarized in **Table 2.**

Table 2: Estimated Cost - Conceptual Design

Item	Quantity	Units	Unit Price	Cost
SANITARY				
200mm Sanitary Sewer incl. Restoration	8294	m	$600	$4,976,412
375mm Sanitary Sewer incl. Restoration	1126	m	$700	$788,340
Sanitary Manholes	150	each	$6,000	$900,000
Additional Construction Costs (15%)	1	L.S.	$999,713	$999,713
Provisional and Allowance (10%)	1	L.S.	$766,446	$766,446
Engineering (15%)	1	L.S.	$1,264,637	$1,264,637
Contingency (15%)	1	L.S.	$1,454,332	$1,454,332
SUB-TOTAL SANITARY				**$11,149,880**
STORM				
300mm Storm Sewer incl. Restoration	960	m	$650	$624,065
375mm Storm Sewer incl. Restoration	1965	m	$700	$1,375,780
450mm Storm Sewer incl. Restoration	933	m	$725	$676,280
525mm Storm Sewer incl. Restoration	467	m	$800	$373,760
600mm Storm Sewer incl. Restoration	110	m	$1,000	$109,500
675mm Storm Sewer incl. Restoration	96	m	$1,225	$117,845

Item	Quantity	Units	Unit Price	Cost
750mm Storm Sewer incl. Restoration	198	m	$1,350	$267,570
825mm Storm Sewer incl. Restoration	183	m	$1,450	$265,785
900mm Storm Sewer incl. Restoration	468	m	$1,700	$794,750
975mm Storm Sewer incl. Restoration	423	m	$1,825	$771,245
1050mm Storm Sewer incl. Restoration	426	m	$2,000	$851,800
Storm Manholes	100	each	$8,500	$850,000
Additional Construction Costs (15%)	1	L.S.	$1,061,757	$1,061,757
Provisional and Allowance (10%)	1	L.S.	$814,014	$814,014
Engineering (15%)	1	L.S.	$1,343,123	$1,343,123
Contingency (15%)	1	L.S.	$1,544,591	$1,544,591
SUB-TOTAL STORM				**$11,841,864**
			Total	**$22,991,744**

Implementation

The preferred solution of sewer separation will proceed in a series of three phases which split up the Study Area in a logical manner, as illustrated in **Figure 2**. This potential implementation plan shows the north drainage area going first, Phase 1, followed by the south drainage area, Phase 2, though the order of these stages could be switched without causing issues. Within these Phases, the separation of the trunk sewer along Valley Way is required first (A), followed by the upstream tributary areas (B, C, D). The split between the north and south drainage areas is in the vicinity of E. F. Leslie Park and Jepson Street. The Phase 3 areas require both Phases 1 and 2 to be complete before they can advance.

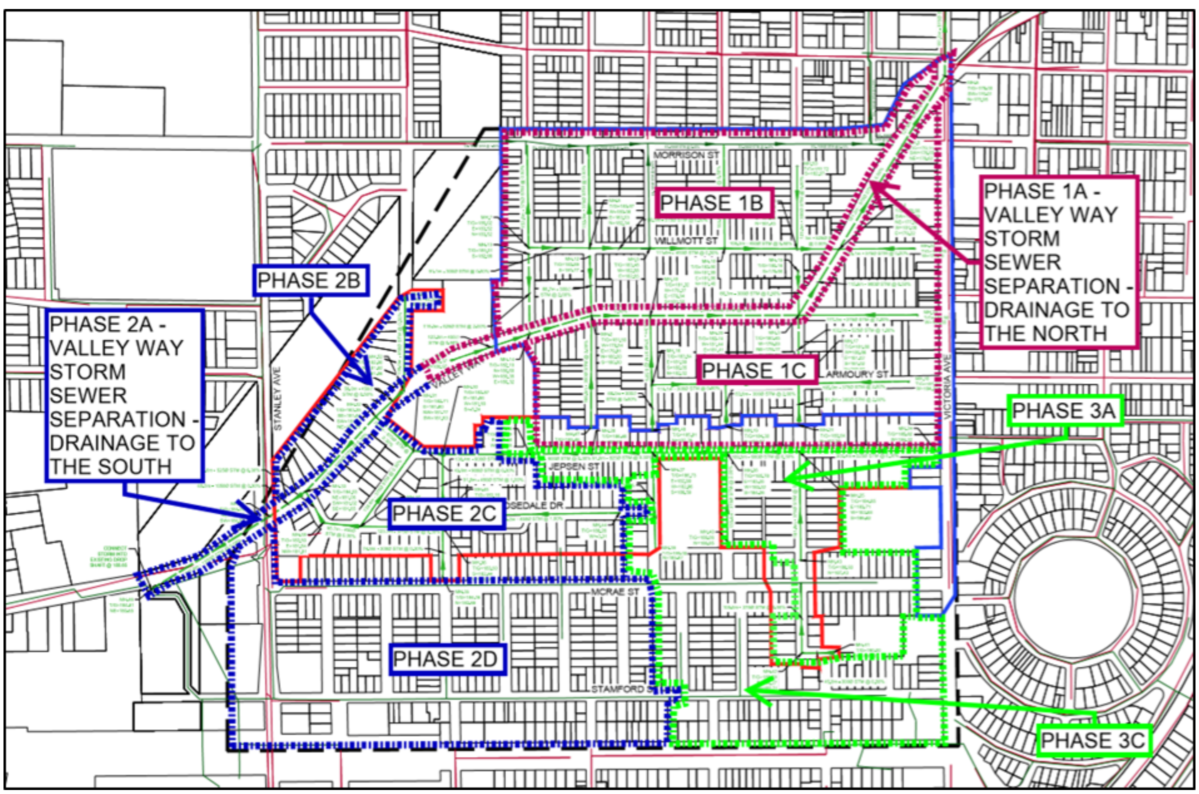

Figure 2: Implementation Plan

Permits and Approvals

During detailed design and prior to construction, permits and approvals will be required from key review agencies including:

- Ministry of the Environment, Conservation and Parks (MOECP)
- Ontario Power Generation (OPG)
- Niagara Peninsula Energy (NPE)
- Niagara Peninsula Conservation Authority (NPCA)
- Ministry of Transportation (MTO)
- Regional Municipality of Niagara (RMON)

Communications and Consultation Program

Early technical pre-consultation with key review agencies set the stage for a collaborative approach and provided the project team with preliminary input into the identification of alternative strategies. Close collaboration with key agency stakeholders such as the RMON, OPG, NPE, MOECP, and the MTO throughout all phases of the study was integral to the evaluation and decision-making process.

A variety of communication methods were utilized. The following Notices were sent out to the respective parties:

- Notice of Commencement – June 4, 2018
- Notice of Public Information Centre No.1 – March 18, 2019
- Notice of Public Information Centre No.2 (Virtual) – July 21, 2020
- Notice of Completion – April 28, 2021

Two rounds of Public Information Centres (PICs) were held at key milestones in the Class EA process. A link was also made available on the City's website for sharing project notifications and PIC materials.

All communication and correspondence were tracked throughout the study process and is provided as part of this ESR documentation. It is not anticipated that any concerns will be raised that the City cannot address during detailed design. The City will continue to proactively inform the public as this project proceeds to construction.

Recommendations

Following approval of this Municipal Class EA Study, it is recommended that the City of Niagara Falls review the recommendations herein for consideration in the wastewater budget planning process. The Valley Way area is a critical area for continued sewer separation and should be considered by the City as a key area for completion going forward.

Summary

This Municipal Class EA Environmental Study Report (ESR) has been prepared to confirm that the Valley Way Drainage Area study meets the requirements of the Environmental Assessment Act (*EAA)*. Consideration of potential impacts and recommended mitigation measures was included as part of the evaluation of the preferred solution. Public and agency notification was provided and there no comments received that cannot be adequately addressed as the project proceeds through detailed design.

List of Abbreviations

EA	Environmental Assessment
EAA	Environmental Assessment Act
ESR	Environmental Study Report
CNF	City of Niagara Falls
MOECP	Ministry of the Environment, Conservation and Parks
MTCS	Ministry of Tourism, Culture and Sport
MTO	Ministry of Transportation
NPE	Niagara Peninsula Energy
OPG	Ontario Power Generation
PIC	Public Information Centre
RMON	Regional Municipality of Niagara

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APPENDICES

1 INTRODUCTION

The Valley Way Drainage Environmental Assessment (EA) Study was initiated to thoroughly investigate the causes of the area's historic flooding issues and recommend improvements to mitigate their extent and frequency. This review was intended to guide the City's sewer separation and drainage projects to improve municipal services in the area. This study was developed based on previous study recommendations to address various flooding issues associated with the area's combined sewer system. These studies include the City of Niagara Falls' *Master Drainage Plan Update Study* (MDPUS, 2017), the City's *Pollution Control Plan Update Study* (PCPUS, 2017), and the 2016 Region of Niagara's *Master Servicing Plan Update*.

Figure 1-1 illustrates the initial Valley Way study area which is roughly bound by Stanley Avenue to the west, Victoria Ave to the east, Morrison Street to the north, and Falls Avenue to the south. The area is primarily serviced by combined sewers that flow northeast to the City's Central Pump Station, near Buttrey Street and River Road. The southern portion of the area is serviced by separate sewer systems, where storm sewers convey runoff westerly via Stamford Street to discharge at a drop shaft to the Hydro Tunnel in the Hydro One right-of-way.

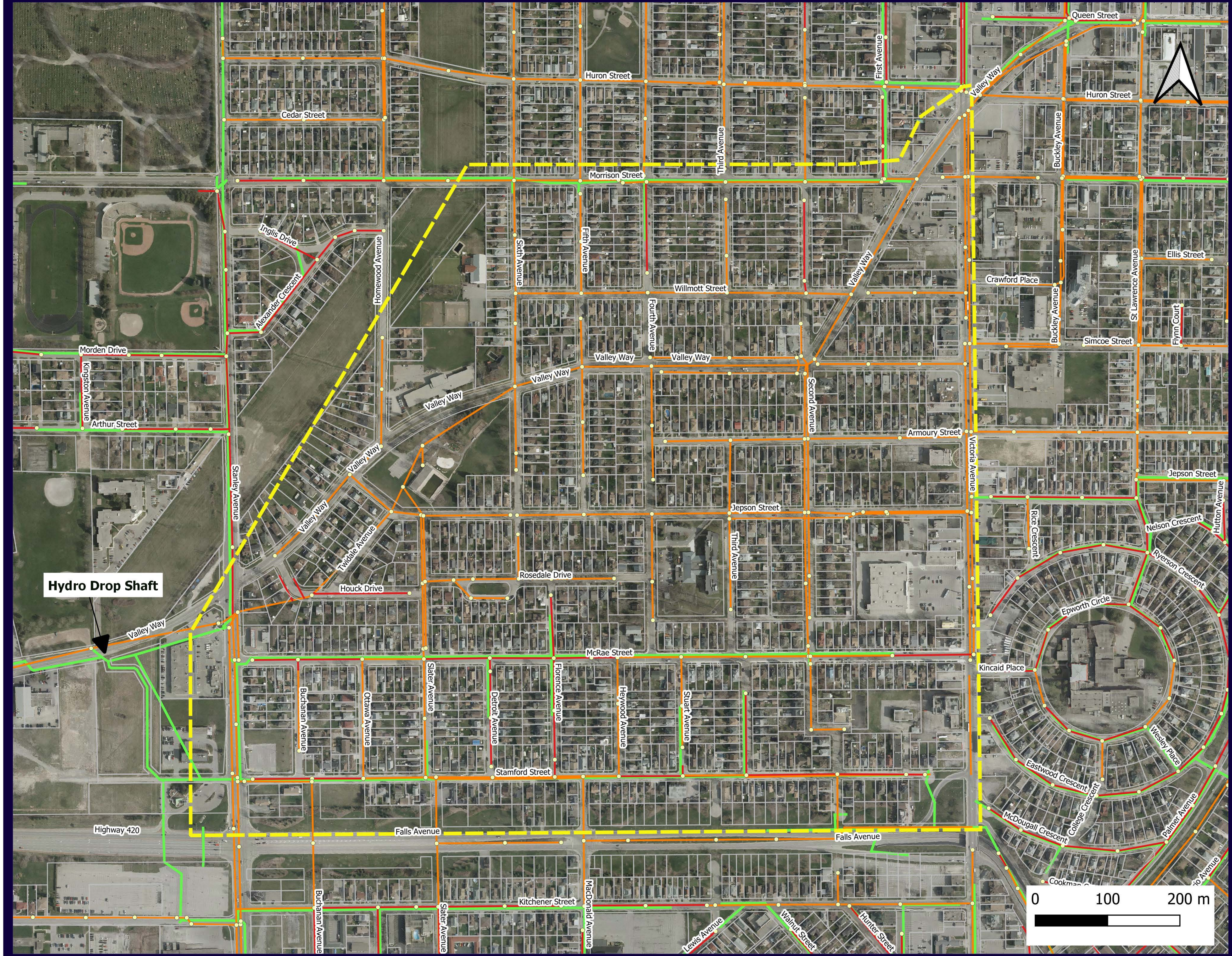
The study objectives involved review of the drainage areas for both the sanitary and storm service to examine the interactions between these sub-catchments. In particular, the study evaluates existing and potential storm sewer outlets for the lands south of McRae St, examines the sewer configurations and capacities at the Hydro One ROW drop shaft, investigates possible outlets for the western part of the study area, reviews possible drainage realignments, and confirms if there is sufficient downstream storm sewer capacity for the eastern part of the study area.

The MDPUS identified chronic flood locations associated with the combined sewer system near the intersection of Valley Way and Victoria Avenue and at the east end of Valley Way at Second Avenue. The PCPUP recommendations helped identify preliminary solutions to reduce and eliminate the number, frequency, and volumes of combined and sanitary sewer overflows (CSOs and SSOs) to the environment, and to address requirements under the MOE Procedure F-5-5. Both studies supply insight and recommendations to provide background information and help guide the Valley Way Drainage EA Study. The assessment of the various alternatives and their impacts are recorded using the framework of the Schedule C Class EA process.

1.1 Organization of Report

This Environmental Study Report for the Valley Way Drainage Area EA documents the comprehensive Class EA process and is organized into the following sections:

- **Section 1** – Introduction
- **Section 2** – Environmental Assessment Process
- **Section 3** – Problem / Opportunity
- **Section 4** – Baseline Features and Servicing Conditions
- **Section 5** – Alternative Solutions, Preferred Solution
- **Section 6** – Design Considerations
- **Section 7** – Implementation
- **Section 8** – Conclusion



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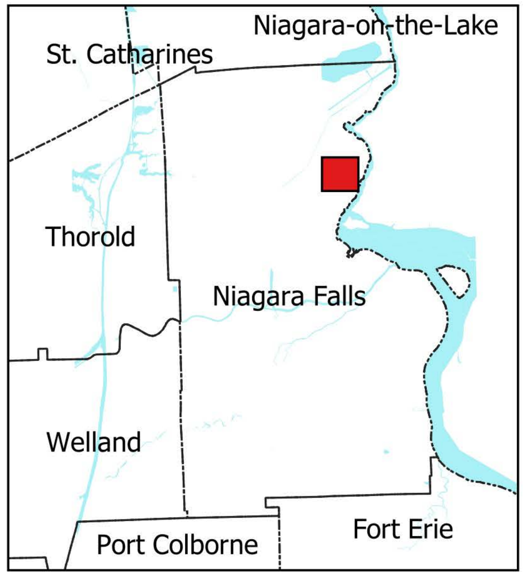
Valley Way Drainage EA Study
Environmental Study Report

Figure 1-1: Study Area

- Valley Way Study Area
- Sanitary Sewer Manhole

Sewer
- Combined
- Sanitary
- Storm Sewer



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- **Appendix A** – Class EA Process
  Detailed evaluation matrix.
- **Appendix B** – Public Consultation
  A record of communication/consultation documentation, including study contact lists, notifications, materials prepared for the Public Information Centres, and correspondence with agency stakeholders, municipal representatives, and the public throughout the process.
- **Appendix C** – Technical Documentation
  Technical discipline reports and investigations.
- **Appendix D** – Conceptual Design
  Drawings and technical details in support of the conceptual design of the preferred solution.

1.2 Public Review Period and Next Steps

This ESR meets the requirements of a Schedule C Municipal Class EA study (see Section 2). Filing of this ESR initiates the 30-day public review period starting April 28, 2021 and ending May 28, 2021. To facilitate public review of this document and accommodate COVID-19 restrictions, a full digital copy of this document is available online at:

https://niagarafalls.ca/city-hall/capital-projects/69-valley-way-drainage-area-environmental-assessment-study.cp

Access to a hard copy of the ESR is available directly from the City of Niagara Falls by request. Please contact the following directly:

Joe Colasurdo, CET
Project Manager
Municipal Works
City of Niagara Falls
4310 Queen Street, Niagara Falls, ON L2E 6X5
P: 905-356-7521 x.4359 Email: jcolasurdo@niagarafalls.ca

If you have any questions or concerns about the report, please follow the procedure below:

1. Contact the City's Project Manager to discuss your questions or concerns.
2. Arrange a meeting with the City's Project Manager if required.
3. If you have significant concerns, the City will attempt to negotiate a resolution of the issue(s). A mutually acceptable time period for this negotiation will be set. If the issue remains unresolved, you may request the Minister of the Environment and Climate Change to require the City to comply with Part II of the *Environmental Assessment Act (EAA)* before proceeding with the project. This is called a Part II Order or "bump up request". After reviewing the Part II Order request and the project documents in detail, the Minister may make one of the following decisions:
    - Deny the request, with or without conditions;
    - Refer the matter to mediation; or,
    - Require that the City comply with Part II of the *EAA* by undertaking one of the following:
        - Set out directions with respect to the Terms of Reference and preparing an Individual EA for the undertaking;

- Declare that the City has satisfied requirements for the preparation of the Class EA Study, as are specified in the order; or,
- Impose additional conditions, in addition to those set out in the Class EA Study.

Requests must be submitted in writing to the Minister of the Environment at the following address within the 30-day review period:

Minister's Office
Ministry of the Environment and Climate Change
11th Floor, Ferguson Block
77 Wellesley Street West
Toronto, ON M7A 2T5
Phone: 416-314-6790

A copy of the request must also be forwarded to the attention of the City's Project Manager at the address provided above.

If no Part II Order requests are received, the City will proceed with detailed design and construction of the proposed works as presented in this ESR.

With the exception of personal information, all comments collected will become part of the public record of the study, in accordance with the *Municipal Freedom of Information and Protection of Privacy Act*.

2 ENVIRONMENTAL ASSESSMENT PROCESS

Ontario's *Environmental Assessment Act* (EAA), passed in 1975 and proclaimed in 1976, prescribes a planning and decision-making process that examines and documents the potential environmental effects of any project before it begins. The EAA's comprehensive definition of the environment is:

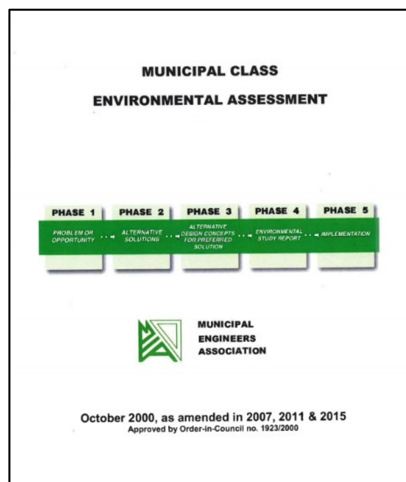
- Air, land or water
- Plant and animal life, including human life
- The social, economic and cultural conditions that influence the life of humans or a community
- Any building, structure, machine or other device or thing made by humans
- Any solid, liquid, gas, odour, heat, sound, vibration, or radiation resulting directly or indirectly from human activities
- Any part of a combination of the foregoing and the interrelationships between any two or more of them, in or of Ontario.

The EAA strives to protect, conserve, and wisely manage the environment through ensuring that planning decisions result from a rational, objective, transparent, replicable, and impartial process. The act applies to any municipality, provincial ministry or agency, or other public bodies such as conservation authorities.

There are two types of assessments, individual or streamlined. Individual assessments are for large-scale, complex projects with potential for significant environmental effects whereas streamlined assessments are used for more routine projects that have predictable and manageable environmental effects. Class Environmental Assessments fall under the streamlined process.

2.1 Class Environmental Assessment Process

The Class Environmental Assessment (Class EA) process, prepared by the Municipal Engineers Association on behalf of Ontario municipalities, was first approved by the Minister of the Environment in 1987 for routine municipal road, water, and wastewater projects. The Class EA approach outlines the procedures to be followed to satisfy requirements and streamlines the planning and approvals process for projects that are:



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

The Class EA process was revised and updated in 1993, 2000, 2007, 2011 and 2015 and includes the following five phases:

- **Phase 1: Problem or Opportunity Definition**
- **Phase 2: Identification and Evaluation of Alternative Solutions** to Determine a Preferred Solution while taking input from the public and other stakeholders into consideration.
- **Phase 3: Examination of Alternative Methods** of Implementation of the Preferred Solution while taking input from the public and other stakeholders into consideration.

- **Phase 4: Documentation of the Class EA process** in the form of an Environmental Study Report (ESR) for public review.
- **Phase 5: Implementation and Monitoring**.

Projects subject to the Class EA process are classified following four "schedules" depending on the degree of the expected impacts. **Error! Reference source not found.**-1 illustrates the Municipal Class EA planning and design process with the phases required for each schedule.

Schedule A projects are minor or emergency operational and maintenance activities and are approved without the need for further assessment. These projects are typically smaller in scale and do not have a significant environmental effect.

Schedule A+ projects are also pre-approved; however, the public is to be advised prior to the project implementation. Projects of this class do not usually have the potential for adverse environmental impacts. Typical projects that fall in this category are within existing road allowance, and utility corridors.

Schedule B projects require a screening of alternatives for their environmental impacts and Phases 1 and 2 of the planning process must be completed. The proponent is required to consult with the affected public and relevant review agencies. If outstanding issues remain after the public review period, any party may request that the Minister of the Environment and Climate Change consider a Part II Order, also known as "bumping-up" the project to a Schedule C Class EA or an Individual Environmental Assessment. Provided that no significant impacts are identified and no requests for a Part II Order to a Schedule C or Individual Environmental Assessment are received, Schedule B projects are approved and may proceed directly to implementation.

Schedule C projects must satisfy all five phases of the Class EA process. These projects have the potential for greater environmental impacts. Phase 3 involves the assessment of alternative methods of carrying out the project, as well as public consultation on the preferred conceptual design. Phase 4 normally includes the preparation of an Environmental Study Report (ESR) that is filed for public review. Provided no significant impacts are identified and no requests for Part II Order or "bump-up" to an Individual Environmental Assessment are received, Schedule C projects are then approved and may proceed directly to implementation. Construction of new facilities, expansion of existing treatment facilities, or new roads typically fall under this category.

This Valley Way study is designated as a **Schedule C** project in accordance with the requirements of the Municipal Class EA process. The Class EA process includes public and review agency consultation, evaluation of alternatives, impact assessment of proposed alternatives, and identification of measures to mitigate adverse impacts. No federal environmental assessment was triggered, as there is limited potential for adverse environmental effects within federal jurisdiction (e.g. fish and fish habitat, other aquatic species, migratory birds, federal lands, and Aboriginal peoples).

Detailed evaluation tables documenting the identification, evaluation, and selection of the preferred solution is provided in **Appendix A**. Public and agency consultation, integral to the Class EA planning process, was documented and is provided in **Appendix B**. Separate technical discipline reports are provided in **Appendix C**.

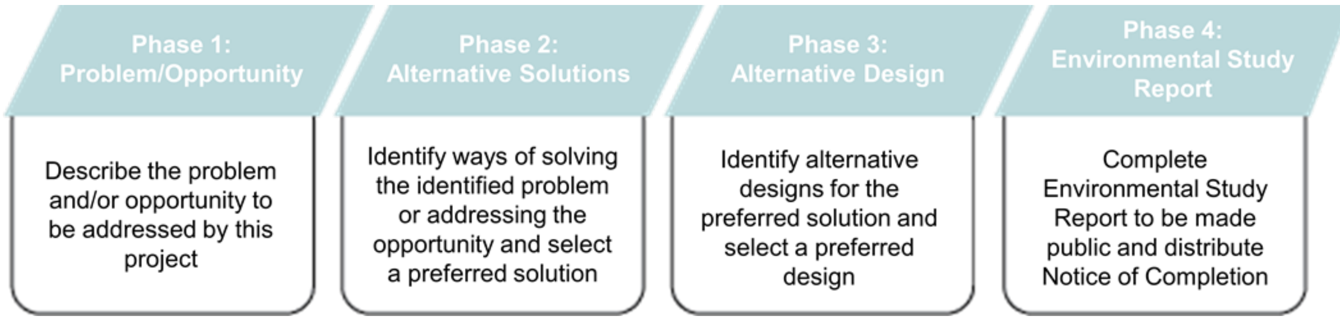


Figure 2-1: Municipal Class EA Planning and Design Process

2.2 Principles of Environmental Planning

The EAA sets a framework for a rational, objective, transparent, replicable and impartial planning process based on the following five key principles:

- **Consultation with affected parties.** Consultation with the public and government review agencies is an integral part of the planning process. Consultation allows the proponent to identify and address any concerns cooperatively before final decisions are made. Consultation should begin as early as possible in the planning process.
- **Consideration of a reasonable range of alternatives.** Alternatives include functionally different solutions, “alternatives to” the proposed undertaking and “alternative methods” of implementing the preferred solution. The “do nothing” alternative must also be considered.
- **Identification and consideration of the effects of each alternative on all aspects of the environment.** These aspects include the natural, social, cultural, technical and economic environments.
- **Systematic evaluation of alternatives in terms of their advantages and disadvantages to determine their net environmental effects.** The evaluation shall increase in the level of detail as the study moves from the evaluation of “alternatives to” to the evaluation of “alternative methods”.
- **Provision of clean and complete documentation of the planning process followed to allow “traceability” of decision-making with respect to the project.** The planning process must be documented in such a way that it may be repeated with similar results.

2.3 Public Consultation

Public consultation is an important component of the Class EA process to provide stakeholders and members of the community with objective information as well as obtain feedback on the study process, alternatives, and preliminary preferred solution. The public consultation process is intended to:

- Present clear and concise information at key stages of the study process.
- Solicit community, regulatory, and City staff input.
- Identify concerns that might arise from the undertaking.
- Undertake a comprehensive First Nations and Métis consultation to complete the Duty to Consult with Aboriginal people in Ontario.
- Consider stakeholder comments when developing the preferred solution.

A list of relevant stakeholders was compiled which included:

- Various staff on the City's Technical Steering Committee
- Ontario Power Generation
- Hydro One
- Niagara Peninsula Energy Inc.
- Regional Municipality of Niagara
- Ministry of Transportation
- Ministry of Natural Resources and Forestry
- Ministry of the Environment, Conservation and Parks
- Ministry of the Environment and Climate Change (MOECC).

The MOECC determined that no Aboriginal Treaty or Constitutional rights would be impacted by this study, thus Aboriginal consultation was not required. The project team consulted with City staff and select external stakeholders prior to the formal start of the EA process in order to solicit early input and explore the feasibility/viability of certain alternative servicing strategies.

2.3.1 Study Commencement

The formal Notice of Commencement was published and distributed to public and agency stakeholders as follows:

- Mailed to stakeholders on March 18, 2019
- Advertised in the Niagara Falls Review newspaper on March 25, 2019
- Posted on the City's project website.

The public had an opportunity to speak with the project team and view display boards to learn about the study and its potential alternative solutions through two Public Information Centres.

2.3.2 Public Information Centre No. 1

The first public consultation meeting, known as Public Information Centre No. 1, was held April 10, 2019 at the Niagara Falls Library, 4848 Victoria Avenue, from 5 – 7pm. Attendees were encouraged to submit comment forms with any feedback. **Table 2-1** summarizes the comments received from the 21 attendees who were primarily local residents who have experienced floods. Some verbally expressed concerns about future, large storms as well as desire to maintain the greenspace along Valley Way.

Table 2-1: Summary of PIC No. 1 Comments Received

No.	Correspondent	Date Received	Type	Comment	Status/Response/Action Item
1	Jerry Eldon	April 10, 2019	Written form	Concerned for the flooding experienced on property.	Homeowner was pleased to be connected to someone to inspect the property and seek a resolution.
2	Tom Hay	April 10, 2019	Written form	Experiences basement flooding in spring. Questioning if new sewer lines will be added to address flooding issues.	None

No.	Correspondent	Date Received	Type	Comment	Status/Response/Action Item
3	Wendy Madales	April 10, 2019	Written form	Backyard flooding and erosion every rains storm. Expressed desire to keep greenspace / boulevard.	
4	Arthur & Deborah Burley	April 10, 2019	Written form	Frequently running sump pump.	

2.3.3 Public Information Centre No. 2

The second public consultation meeting, known as Public Information Centre No. 2 (PIC2), was held virtually hosted on the City of Niagara Falls “Lets Talk” Platform. The materials for the virtual PIC included:

- Project Background and Objectives
- Narrated slide show
- Transcript of Narrated Slide Show
- Comment Form - .pdf fillable
- PIC #1 Materials and background
- Frequently Asked Questions

Attendees were encouraged to provide feedback either by submitting a comment form or contacting the Project Manager directly by phone or email. As PIC #2 was completed virtually, a full record of engagement was collected including email inquiries, website clicks and views, social media feedback and comment form replies.

Table 2-2 summarizes the comments received via phone call and email, additional engagement details collected from the “Let’s Talk” web platform are included in **Appendix B.**

Table 2-2: Summary of PIC No. 2 Comments Received

No.	Correspondent	Date Received	Type	Comment	Status/Response/Action Item
1	Barbara Boig	August 4, 2020	Phone call	She has experienced basement flooding in the past. She is interested in learning more about when the sewer improvements will start.	Directed to connect with Kurtis Bottrell at the City to inquire about participation in the City’s WRAP program. Informed that the work is in the preliminary phases of the improvement plan and that the whole improvement could take years pending budget approval.
2	James Duda	August 10, 2020	Phone call	He had mentioned that he had comments related to the storm drainage in the area and that he had lived there for years.	Directed to the “Let’s Talk” platform and recommended he complete a comment form.

No.	Correspondent	Date Received	Type	Comment	Status/Response/Action Item
3	Sylvana	August 10, 2020	Phone call	Has flooding concerns and has spoken to Kurtis Bottrell of the City previously.	Directed to the "Let's Talk" platform and recommended he complete a comment form. Kurtis was notified of the call and is aware of her concerns and will follow up to assess if any immediate improvements can be made to address grading and localized drainage issues.
4	Sandra Lane	August 7, 2020	Email	Has no sidewalk in front of her property currently and would like the future improvements to not add sidewalk.	Informed that sidewalk and bike lanes are typically considered during design phase of each project and that the City has specific criteria that addresses sidewalk needs. Informed that residents would be notified and provided opportunity to comment or discuss potential options when the project gets to that stage.
5	Donna Pierre	August 5, 2020	Email	Please include me in your mailing list regarding this project.	Added to mailing list.
6	Amy Proulx	August 4, 2020	Email	Please include me in your mailing list regarding this project.	Added to mailing list.

2.3.4 Study Completion

The Notice of Completion was published and distributed on April 28, 2021. The notices were made public by the following means:

- Mail-out of letters to stakeholders in the included in the Contact List
- Advertised in the Niagara Falls Review on April 28, 2021
- Posted on the City of Niagara's project website.

All materials related to the Public Consultation process are included in **Appendix B**.

3 PHASE 1 - PROBLEM / OPPORTUNITY

The first phase of the Class EA process involves defining the problem or opportunity to set the study framework. The objective for this project is described as follows:

> "That the existing sewer system capacity be improved to minimize adverse environmental and property impacts, while promoting infrastructure sustainability within the study area."

The Valley Way study area has historically been flood-prone due to its topography and limitations in the design of its combined sewer system. Most homes are directly connected to the combined sewer system which surcharges during severe wet weather, putting them at risk of sewer backups. The landscape causes surface runoff to drain to the area, exacerbating the risk of floods. Essentially, the study aims to recommend solutions that will improve system capacity and eliminate flooding concerns. This will be achieved through the following activities:

- Quantify the existing system service capacity and provide alternatives to monitor and improve it.
- Assess and plan for the elimination of combined sewers through installation of separate sanitary sewers and storm sewers.
- Verify the existing combined system's state of operation and confirm the feasibility of using it as a sanitary network.
- Identify, prevent, and eliminate combined sewer overflows and sanitary sewer overflows within the drainage areas.
- Eliminate, reduce or delay extraneous flows from entering the collection system.
- Improve operational and structural condition of the stormwater and wastewater collection system infrastructure.
- Review and recommend innovative opportunities to improve stormwater service efficiency.
- Provide a phased implementation plan for any proposed improvements.

3.1 Opportunities and Constraints

Improvements to the sewer systems in the Valley Way area will seek to reduce the peak storm flow entering the system while also reducing overland flooding and the risk of basement flooding. The possibility to implement low impact development options, also known as Green Infrastructure or landscape-based stormwater management practices, will improve the surrounding environment and contribute to infrastructure resiliency. There is opportunity to upgrade the physical condition of the infrastructure which also improves the level of service provided to customers.

There are many complexities associated with the approval of a new storm outlet by the various stakeholder groups and the associated cost of appropriately designed storm conveyance and outlet infrastructure. In addition, it is imperative to avoid moving peak flow and sewer surcharge issues to downstream areas, thus these considerations will inform all alternatives.

4 BASELINE FEATURES AND SERVICING CONDITIONS

The Valley Way Drainage area, as the name indicates, was once a valley through which ran the Old Muddy Run, a spring-fed creek which typically overflowed its banks each spring, often resulting in severe flooding. The creek originated west of Drummond Road and ended at the Niagara Gorge, creating a waterfall known as Muddy Run Falls. In 1926, the Valley Way area was developed following the path of the creek from Drummond Road to Queen Street. The creek was siphoned into a large trunk sewer and new roads paved, with no surface trace of the waterway remaining today. At that time, all homes would have been directly connected to the combined sewer system, as the majority still are today.

4.1 Existing Land Uses

To regulate the use of land, the City uses zoning Bylaws which detail the permitted uses that apply to that zone. As illustrated in **Figure 4-1**, the Valley Way study area is primarily composed of single-family homes, though it is zoned 'Multiple Residential', which in this case permits low density, grouped multiple dwellings. Other notable areas include a retirement home and E. F. Leslie community park. The eastern edge of the area along Victoria Avenue is a commercial district.

4.2 Planning and Servicing Considerations

The following presents a summary of the policies affecting land use planning and servicing requirements in the Study Area. Further details of the various policy, regulations, and guidelines reviewed for this Study are summarized in Technical Memorandum #1 (GMBP, May 10, 2018), in **Appendix C**.

4.2.1 City of Niagara's Official Plan

The "Official Plan for the City of Niagara Falls" was approved October 6, 1993 and amended to April 2019. This document outlines City objectives and policies regarding growth and development and is reviewed at least every five years. **Figure 4-2**, an extract from the 'Schedule A – Land Use' within the Plan, shows that the designated land uses for the Study Area are essentially consistent with the existing development.

4.2.2 Provincial Policy Statement

Ontario's land use planning system gives municipalities the major role in planning decisions. The Provincial Policy Statement (PPS), prepared by the Ministry of Municipal Affairs and Housing (MMAH), is the statement of the government's policies on land use planning. It applies province-wide policy direction on land use planning to promote sound infrastructure planning, environmental protection, economic development, and safe communities.

The latest PPS, issued under section 3 of the Planning Act, came into effect on May 1, 2020, replacing the previous from 2014. It provides policy direction on matters of provincial interest related to land use planning and development (MMAH, 2020). The policies of the PPS may be complemented by provincial or municipal plans and policies.

Key policies relevant to planning for wastewater (and water) services are as follows:

Policy 1.6.1

Infrastructure and public service facilities shall be provided in an efficient manner that prepares for the *impacts from a changing climate* while accommodating projected needs.

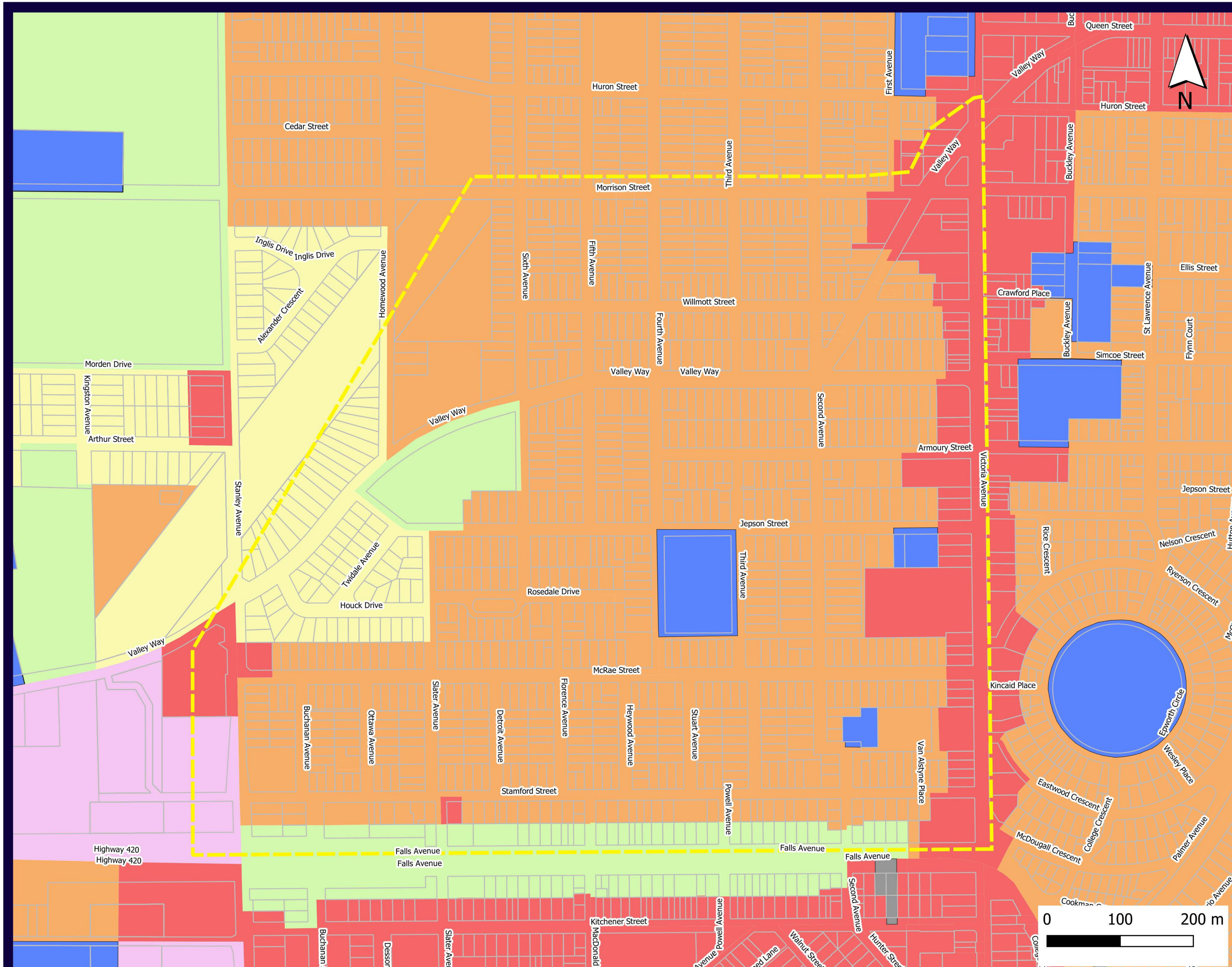


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Figure 4-1: Land Use

Valley Way Study Area

Zoning Bylaw-79-200

- COMMERCIAL
- INDUSTRIAL
- INSTITUTIONAL
- MULTIPLE RESIDENTIAL
- OPEN SPACE
- RESIDENTIAL

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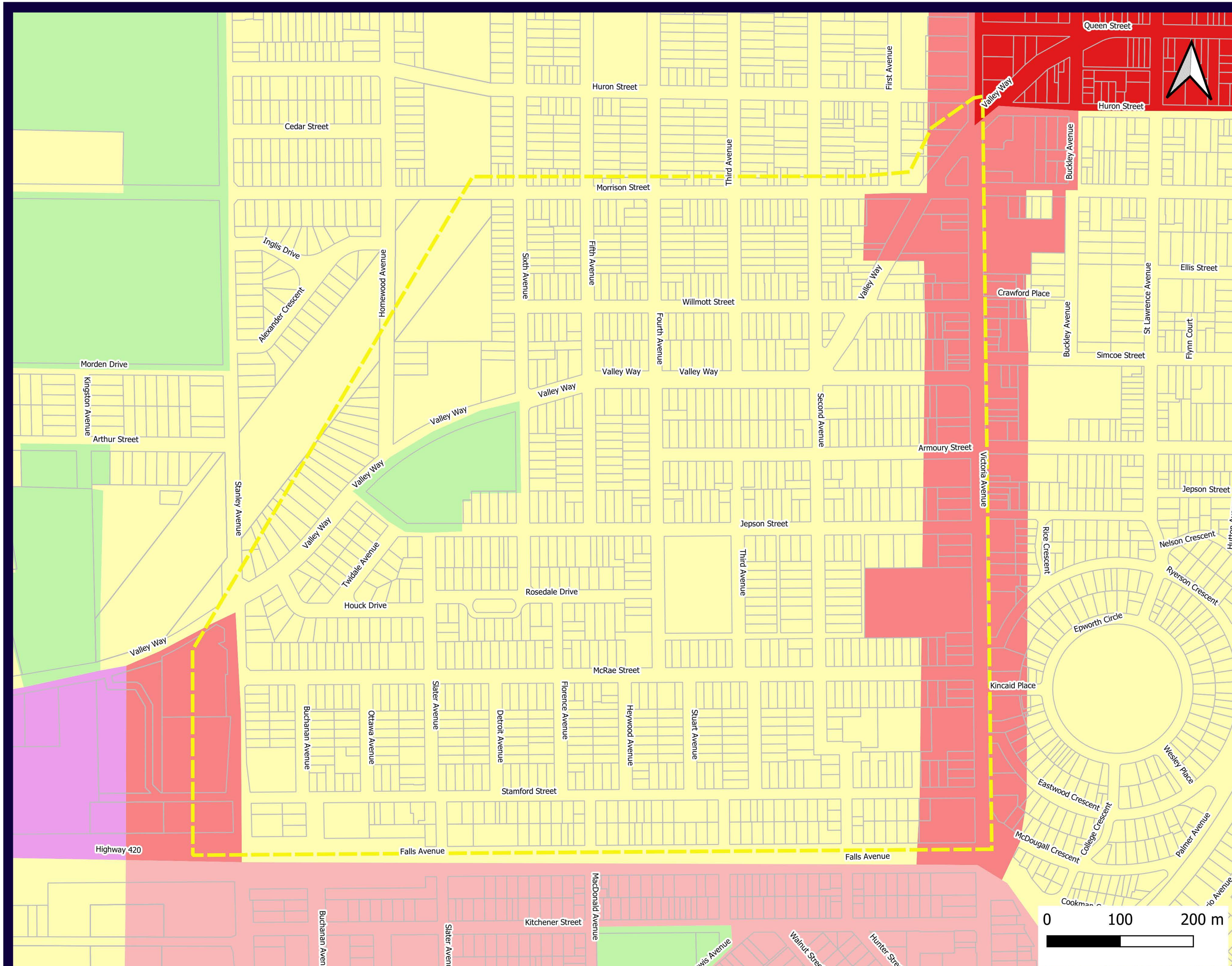

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Figure 4-2: Official Plan - Schedule A Land Use

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Planning for *infrastructure and public service facilities* shall be coordinated and integrated with land use planning so that they are:

a) Financially viable over their life cycle, which may be demonstrated through asset management planning; and,
b) Available to meet current and projected needs.

Policy 1.6.2

Planning authorities should promote *green infrastructure* to complement *infrastructure.*

Policy 1.6.3

Before consideration is given to developing new *infrastructure and public service facilities*:

a) The use of existing *infrastructure and public service facilities* should be optimized; and,
b) Opportunities for adaptive re-use should be considered, wherever feasible.

Policy 1.6.6.1

Planning for *sewage and water services* shall:

a) accommodate forecasted growth in a manner that promotes the efficient use and optimization of existing:
   1. *municipal sewage services and municipal water services*; and
   2. *private communal sewage services* and *private communal water services*, where *municipal sewage* and *water services* are not available or feasible;
b) ensure that these systems are provided in a manner that:
   1. can be sustained by the water resources upon which such services rely;
   2. prepares for the *impacts of a changing climate*;
   3. is feasible and financially viable over their lifecycle; and
   4. protects human health and safety, and the natural environment;
c) promote water conservation and water use efficiency;
d) integrate servicing and land use considerations at all stages of the planning process; and
e) be in accordance with the servicing hierarchy outlined through policies 1.6.6.2, 1.6.6.3, 1.6.6.4 and 1.6.6.5.

Policy 1.6.6.7

Planning for stormwater management shall:

a) be integrated with planning for *sewage and water services* and ensure that systems are optimized, feasible and financially viable over the long term;
b) minimize, or, where possible, prevent increases in contaminant loads;
c) minimize erosion and changes in water balance, and prepare for the *impacts of a changing climate* through the effective management of *stormwater*, including the use of *green infrastructure*;
d) mitigate risks to human health, safety, property and the environment;
e) maximize the extent and function of vegetative and pervious surfaces; and
f) promote stormwater management best practices, including stormwater attenuation and re-use, water conservation and efficiency, and low impact development.

4.3 Existing Wastewater Infrastructure

The Study Area is serviced by roughly 18km of sewers, of which about 13.8km are combined, 1.5km are sanitary, and 2.5km are storm. The separated portions, served by sanitary and storm sewers, are primarily along McRae Street and Stamford Street. These sanitary sewers are local, mainly 250mm or 300mm in diameter, and they flow to the combined system. The main trunk of the combined system runs north-east along Valley Way where the conduit increases in size to 1800mm x 1200mm and eventually discharges at the City's Central Pump Station. There is also an area around Valley Way/Second Avenue with shallow sewers that may be more prone to flooding when downstream flows are high.

The storm sewers in the southern portion of the study area convey runoff west to the Hydro One right-of-way parallel to Stanley Avenue where there is a drop shaft to the Hydro tunnel. Most of the storm sewers are 600mm to 900mm in diameter. The storm sewer along Morrison Street flows north to First Avenue, Park Street, and discharges to the Niagara River.

Figure 4-3 illustrates the existing wastewater infrastructure in the study area.

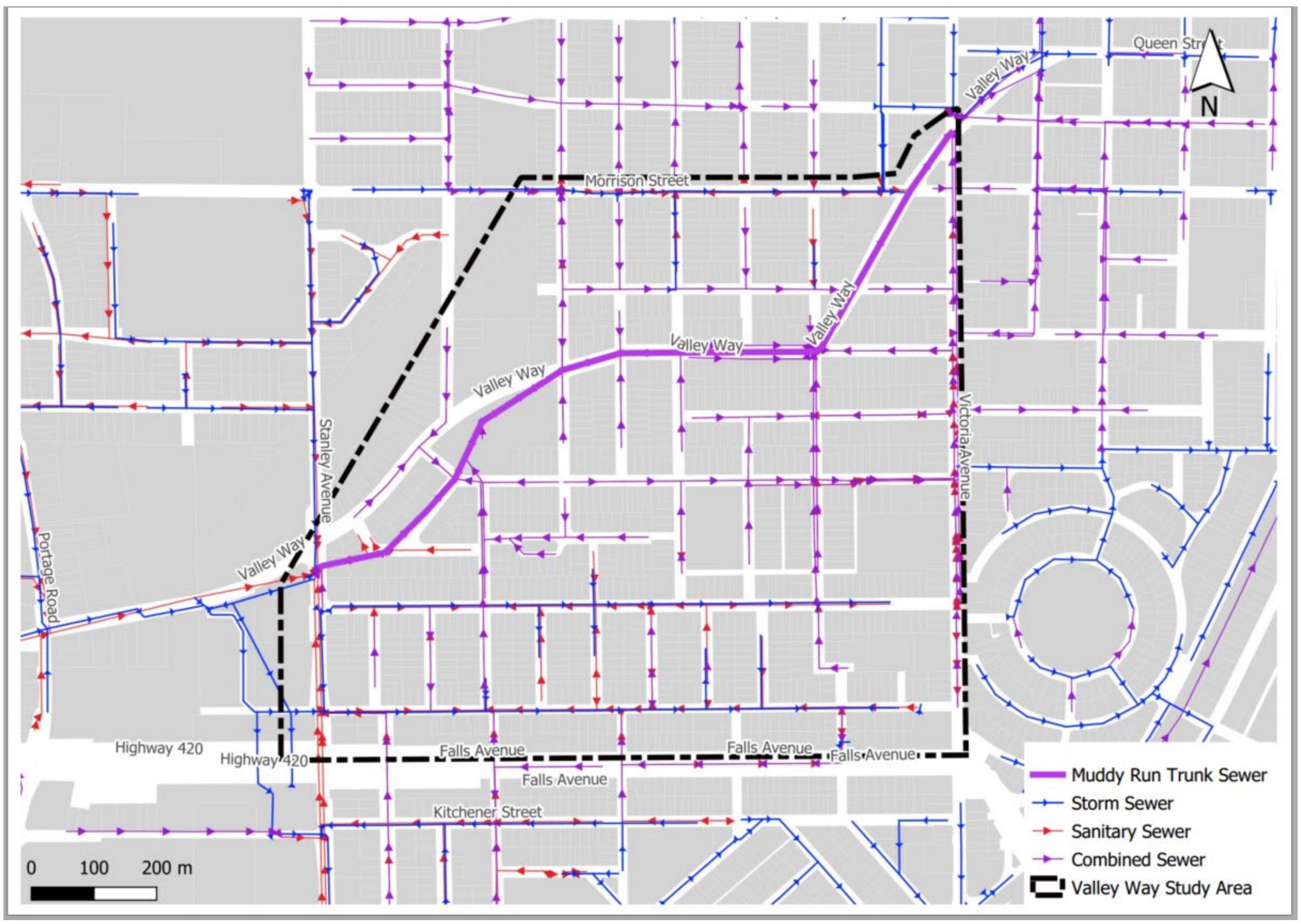

Figure 4-3: Existing Wastewater Infrastructure

4.3.1 Flow Monitoring

Flow monitoring data was collected from April 19 to August 21, 2018 to obtain an understanding of existing flow conditions in the system. The details of this study are found in Technical Memorandum #4 (October 22, 2018) in **Appendix C**. Four flow monitors were installed within combined sewers of the Study Area, as well as a rain gauge on the roof of the pool building in E. F Leslie Park. Though the Study Area is about 88 ha, the entire tributary catchment to the most downstream flow monitor is roughly 470 ha, as illustrated in **Figure 4-4**. Over half of this large upstream area is combined and flows to the Valley Way system. During the monitoring period, five rainfall events occurred with sufficient depth and intensity to generate measurable wet weather flow in the system. The dry and wet weather data was analyzed and used to calibrate the hydraulic sewer model for alternative evaluation.

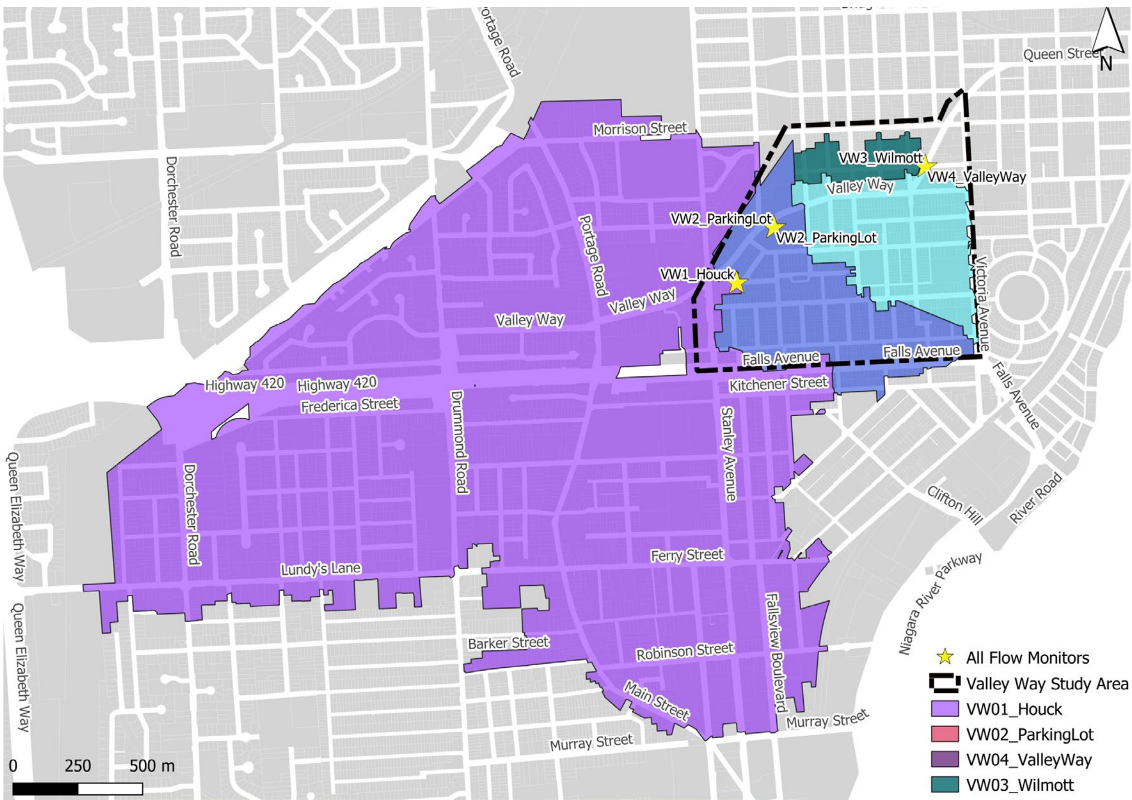

Figure 4-4: Flow Monitoring in Valley Way Study Area

4.3.2 CCTV Investigations

The original "Muddy Run" combined sewer was observed using CCTV in May 2018 to determine its physical and operational condition. PipeFlo Contracting Corp. recorded condition data for the pipe from Stanley Avenue to Bridge Street which is detailed in Technical Memorandum #4 (October 22, 2018) in **Appendix C**. Defects noted included cracks, active infiltration, and visible surface aggregate, though in general, most sections were considered in fair to good condition. A couple of segments were in poor condition with multiple locations of surface spalling, exposed reinforcing steel, and cracks. The condition assessment was considered in the development of alternative solutions.

4.3.3 Hydraulic Model

The City has an all-pipe hydraulic sewer model (InfoSWMM) used for system analysis. Dry weather flow monitoring data from 2018 was used to characterize existing system flow patterns within the Valley Way area. Then, wet weather flow monitoring data was used to calibrate the system's wet weather response using the industry standard RTK method. Reported basement flooding records provided by the City were compared with model predictions as validation. Further details of the model and calibration process are in Technical Memorandum #5 in **Appendix C**. The model was used to test the preferred alternative as discussed in Section 5.3.1.

Some field investigation work on Wilmott Street was done (November 2018) to verify a few questionable sewer inverts. Of note, several maintenance holes had poor benching and laterals in poor condition. Similarly, a variety of as-built and design drawings were consulted to verify sewer configurations throughout the process.

4.4 Existing Utilities

Various utilities present within the Conceptual Study Limit were engaged as part of this study, including the following:

- **Gas:** Enbridge Gas Distribution, Enbridge Pipelines Inc., Union Gas
- **Hydro:** Hydro One Networks, Enersource, Ontario Power Generation (OPG)
- **Cable, Telecommunications:** Rogers Cable, Bell Canada, GT Fiber 360 Networks
- **Other Pipelines:** Trans-Northern Pipelines Inc., Trans Canada Pipeline

4.5 Physical Environment

4.5.1 Topography

The topography of the Valley Way area is illustrated in **Figure 4-5**. The area slopes from highest point in the south-east corner to the lowest elevation along Valley Way to the north-east corner with roughly a 9m difference. The figure also illustrates existing buildings and properties that have reported floods in the past. There is some correlation between elevation and reported floods, with a cluster near Valley Way and Second Avenue.

Early in the project, a 3-D model of the area was also built to help visualize the topography and overland flow routes. **Figure 4-6** shows screen captures from the model (E.F. Leslie Park area and Valley Way/Second Ave) where red indicates properties that have reported flooding, green highlights City owned properties, and the blue lines denote the overland flow routes.

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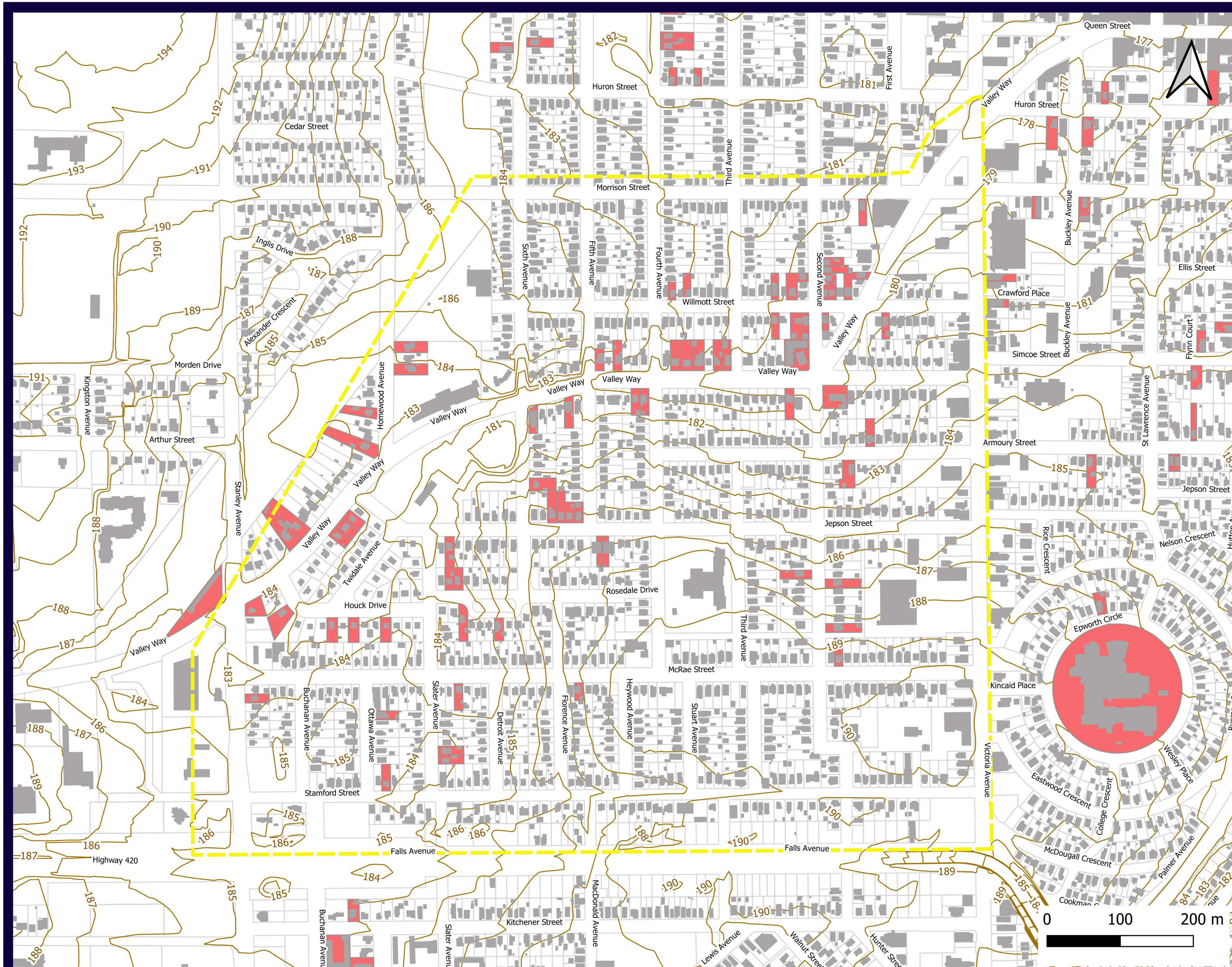
Figure 4-5: Topography



Valley Way Study Area
Contours (1m)
Reported Flood
Building

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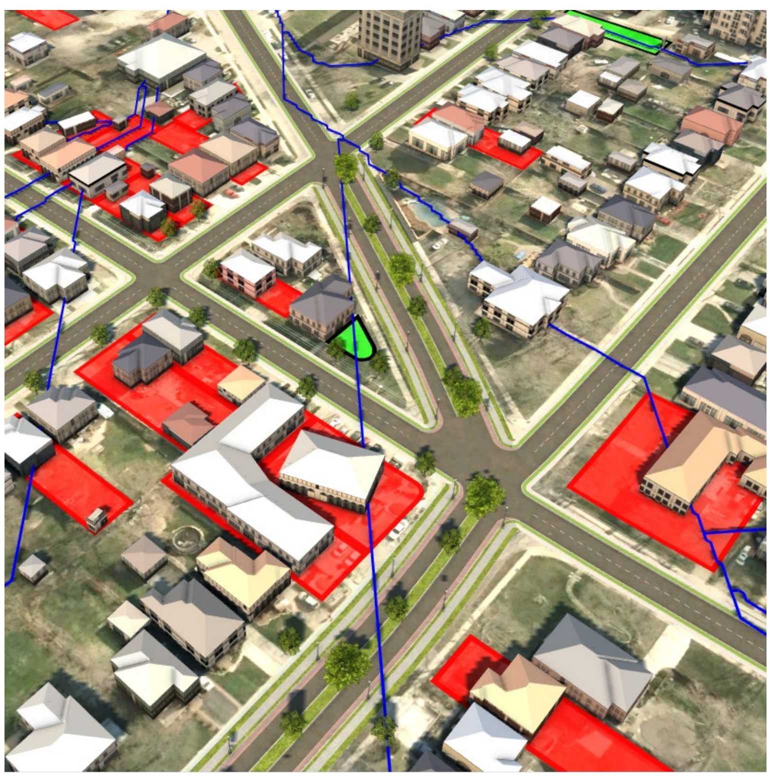


Figure 4-6: Screen Captures from 3-D Model

4.5.2 Areas of Potential Environmental Concern

The Ministry of the Environment and Climate Change (MOECC) was notified about the Valley Way study and, in response, identified the presence of a few features within the study area. Several water wells fall within the study area boundary, as well as some sites that are registered under the Hazardous Waste Information System and they are all located on private property. None of these features will be impacted by any works that may result from this study as the works will be within the public right-of-way and will not affect private property. This information is illustrated in **Figure 4-7**.

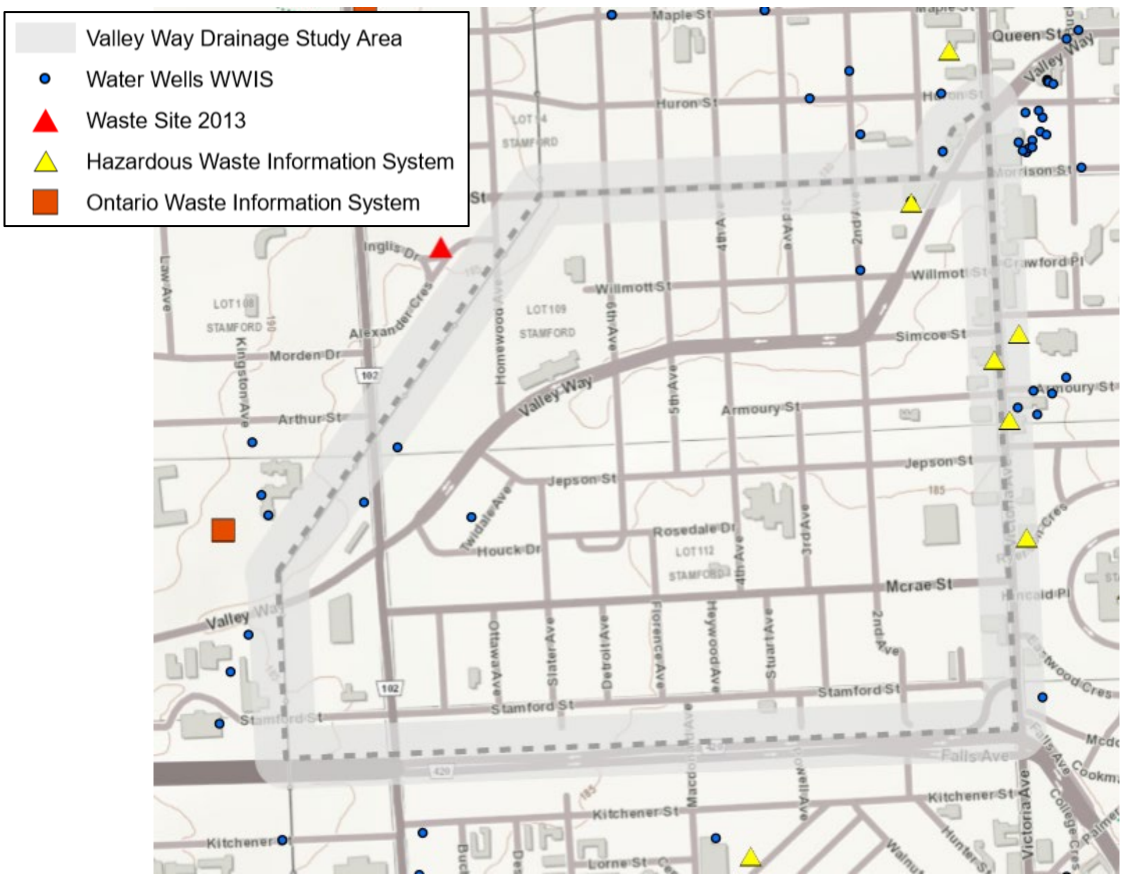


Figure 4-7: Data from MOECC

4.6 Geotechnical Analysis

A desktop geotechnical analysis was undertaken by Amec Foster Wheeler (December 2017) to establish the existing soil and rock conditions within the Study Area. The full report is included in **Appendix C**. The conclusions are based on available maps and any previous boreholes from the vicinity, thus are general in nature and may not be directly applicable for construction purposes. Specifically, the study provides information regarding:

- Anticipated subsurface soil stratigraphy
- Approximate depth to bedrock
- Expected groundwater conditions
- Preliminary bearing capacities and frost-thawing requirements for supporting soils.

Most of the surficial soils are expected to consist of glaciolacustrine nearshore and deltaic sand and silt, meaning the area was formed from sediments which were deposited in layers from glacier meltwater in a lake. Roughly 13,000 years ago, this area was beneath Lake Warren. The area comprises Lake Warren and younger pre-Iroquois stratified silty, very fine to gravely sands, and/or stratified clay, silt, and sand.

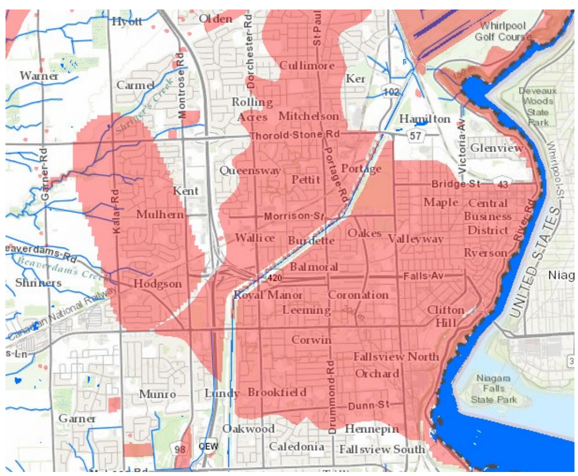
The bedrock appears to be within 3.5m or less below ground surface, which is considered shallow, therefore, may interfere with construction activities. The bedrock consists of Limestone or Shale, depending on the location.

In a previous nearby investigation, wet to saturated soil conditions were observed below a depth of 3 to 4m. It is likely that groundwater may be encountered during excavation work depending on seasonal changes and pockets of sand and silt. If excavations extend into the bedrock, groundwater problems can be found due to often highly fractured upper bedrock.

The bearing capacity within native soil materials depend on its properties and condition but are expected to be in the range of 150 - 200 kPa (SLS). Thus, it is anticipated that footings could be founded at relatively shallow depths on competent layers. A minimum soil cover of 1.2m is necessary to provide adequate frost protection.

4.7 Hydrogeology

As illustrated in **Figure 4-8**, this study area lies above a highly vulnerable aquifer (red area) that is protected under the Clean Water Act (2006). This means it could be a source of drinking water that could easily be impacted by release of pollutants above it due to its shallow water table. While the City is supplied by the municipal water system which uses the Niagara River as a source, there are some water wells in the study area.



Source: NPCA watershed explorer

http://camaps.maps.arcgis.com/apps/webappviewer/index.html?id=c7555050c8f24a7cbc829395557a7988

Figure 4-8: Highly Vulnerable Aquifer

4.8 Natural Environment / Ecology

The study area is developed and does not possess any significant environmental features such as critical habitat or Species at Risk that could be impacted by the project or future servicing alternatives.

4.9 Built/Cultural Heritage Assessment

A Heritage Overview was undertaken to identify potential cultural heritage issues or readily apparent impacts to provide guidance on the study process. Two properties within the Study Area are designated Heritage properties, the Armoury, home of the Niagara Military Museum, and the former Carnegie Library (5017 Victoria Avenue, at

Armoury Street), as shown in **Figure 4-9**. Neither property would be impacted by any proposed works in this study.

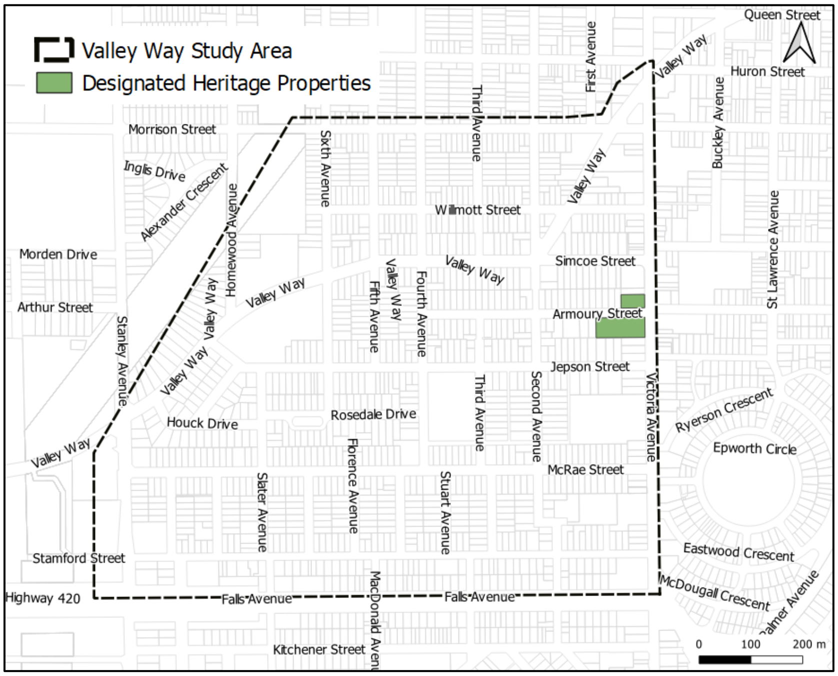


Figure 4-9: Designated Heritage Properties within Study Area

5 PHASE 2 – ALTERNATIVE SOLUTIONS

Solutions to manage the sanitary and stormwater flow in the area were organized into Short-Term and Long-Term Alternatives which also incorporate the use of *green infrastructure*, using vegetative and engineered systems to detain runoff near its source and replicate the natural water cycle to reduce peak flows, promote infiltration, and improve water quality.

5.1 Short-Term Alternatives

The Short-Term Alternatives involve Low Impact Development (LID) which is a land planning and engineering design approach to manage stormwater runoff using on-site natural features as follows:

1. **Dry Stormwater Management Pond**: A dry pond is used as temporary storage of stormwater runoff to reduce peak flow in the collection system. Flow is stored for a day or two then slowly released back to the storm sewer system. Some pollutants in the runoff settle due to gravity, thus are not released back to the system. Potential locations include F. H. Leslie Park as it contains open space and is at a low elevation within the study area, or the grassed boulevard along Valley Way. **Table 5-1** summarizes some key details of the proposed dry pond while the proposed site is illustrated in **Figure 5-1**.

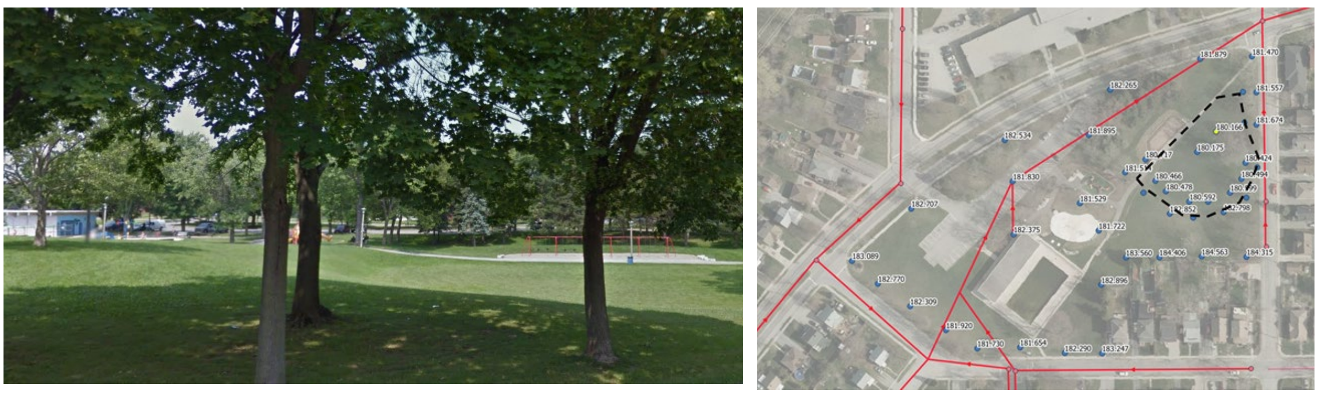


Figure 5-1: Potential Dry Pond in F.H. Leslie Park

Table 5-1: Potential Dry Pond Details

Detail	Value
Elevation of Lowest Point in Park	180.2m
Assumed Dry Pond Depth	0.5m
Approximate Storage Area	1880m^2
Approximate Storage Volume	939m^3

2. **Infiltration Gallery**: An infiltration gallery is a sub-surface drain collection system, made with perforated pipes surrounded by gravel so that runoff can infiltrate back into the soil. This system could be located within the existing grassed boulevard on Valley Way to attenuate peak stormwater runoff. The depth of the trench is dependent on the infiltration rate of the native soil and the bottom should be at least one meter above the seasonally high groundwater table. It can also be combined with a rain garden which consists of native shrubs and perennials planted to improve water quality.

3. **Disconnect Impermeable Surfaces**: It is possible to decrease peak storm flows to the system by disconnecting any existing direct discharges to the sewer system from large, impermeable surfaces such as rooftops of commercial/industrial buildings. If it is feasible to redirect these surfaces to permeable areas without adversely affecting neighbouring properties, the length of time it takes for flow to reach the sewer will be increased. Similarly, it is preferable for parking lots to be redirected to pervious areas, though these may require more investigation as existing grading has presumably been designed to direct flow to catchbasins. Depending on topography, curb removal or strategic curb cuts may encourage infiltration instead of runoff directed to sewers.

5.2 Long-Term Alternatives

A review of long-term solutions to manage sanitary and stormwater flow in the area resulted in the following design concepts:

1. **Status Quo**: This option maintains the existing situation with no change to the combined sewer system. While this is conceivably an option, it does not solve any of the issues that initiated this study.
2. **Sewer Separation – Hydro Drop Shaft**: This alternative involves constructing new storm sewers that would direct storm flow to the existing Drop Shaft to the Hydro Tunnel at Stanley Avenue and Valley Way. The sanitary flow would continue to be conveyed by the Muddy Run sewer along Valley Way.
3. **Sewer Separation – Park Street Trunk Storm Sewer**: This alternative involves constructing new storm sewers that would direct storm flow to the existing storm trunk sewer on Park Street which flows east to the Niagara River. The sanitary flow would continue to be conveyed by the Muddy Run sewer along Valley Way.
4. **Sewer Separation – Muddy Run Trunk**: This option involves constructing new sanitary sewers while the existing combined Muddy Run Trunk Sewer would be used as a storm sewer. This option is complicated by the upstream combined area which also flows to the Muddy Run Trunk, thus may not be feasible.
5. **Sewer Separation** – **Hydro Drop Shaft and Park Street Combination:** This option is a combination of alternatives 2 and 3 and involves construction new storm sewers that would direct flow to the existing Drop Shaft and the Park Street Trunk Storm Sewer based on topography and capacity of both systems. The Valley Way trunk remains a combined sewer to convey the upstream combined catchment.

5.3 Screening Evaluation

Upon further consideration of the Alternatives and consultation with the City, a few of the Alternatives were found to be less favourable. Ultimately, the City did not want to concede park land for a Dry Stormwater Management Pond, so this option was removed from consideration. Similarly, using the grassed boulevard along Valley Way for runoff infiltration was considered impractical as the soil in this area is predominantly impermeable due to high clay content, and the cost would outweigh the benefits.

Appendix A contains an evaluation matrix with the screening criteria used to assess the viability of each option and determine a preferred concept. The list of alternatives was narrowed down to a preferred design concept using the following criteria:

1. **Financial Impacts** - construction costs as well as the long-term impact to the facility's lifecycle cost. Opportunities for consolidation of municipal assets and capital funding are also considered.

2. **Phasing/Timing (Constructability)** - short-term impacts during construction including local traffic, impact to existing utilities and infrastructure, and overall duration and complexity of construction.

3. **Maintain or Improve Sanitary Level of Service (reduce basement flooding)** – impacts on the systems current and future operability. Focus on improvement to customer and technical level of service.

4. **Maintain or Improve Storm Level of Service (overland flow) –** short and long-term impacts on overland flooding, emphasis on improving or eliminating localized flooding issues.

5. **Improve Infrastructure Condition –** long-term impacts on the overall condition of the wastewater collection system, emphasis improving condition.

6. **Resiliency** – the system's ability to perform under the expected impact of climate change which involves more frequent high-intensity rainfall.

Each criterion was ranked using a Low, Medium and High (Red, Yellow, Green) judgement. Based on the criteria, the servicing alternatives were evaluated and either eliminated or carried forward for further evaluation, as summarized in **Table 5-2.**

Table 5-2. Screening of Servicing Alternatives (Long List to Preferred Concept)

Route Sub-Section	Description	Screening Result	Comment
1	Status Quo	✘	Does not solve problems
2	Drop Shaft Outlet	▬	Met some criteria, possible but not best choice
3	Park Street Outlet	▬	Met some criteria, possible but not best choice
4	Combo – Drop Shaft and Park Street	✓	Best satisfied criteria
5	Muddy Run – convert to Storm Trunk/outlet	✘	Not reasonable, would not allow for separation in a reasonable time frame

5.3.1 Selection of the Preferred Concept

Based on a detailed review of the short-list of alternatives, the evaluation key drivers of the project, project costs and subsequent consultation with project stakeholders, **Option 4 – Sewer Separation – Combo – Drop Shaft and Park Street** is recommended as the preferred alternative.

Figure 5-2 shows a conceptual layout of the preferred solution and the areas to be separated. The scope of the preferred solution addressed the problem/opportunity statement for the project and includes the following works:

- Replacement of existing combined sanitary sewers with new sanitary sewers to improve the level of service and improve the overall system condition.

- Installation of a new stormwater sewer system with outlets to the Hydro Shaft and Park street as shown in **Figure 5-2** in order to reduce basement flooding and improve the level of service and overall condition of the system.
- Implementation of a Phased construction approach to manage costs, social and environmental impacts and maintain a reasonable level of constructability.
- Opportunity to address localized overland flooding concerns to reduce basement flooding.
- Opportunity to address directly connected properties to reduce basement flooding.

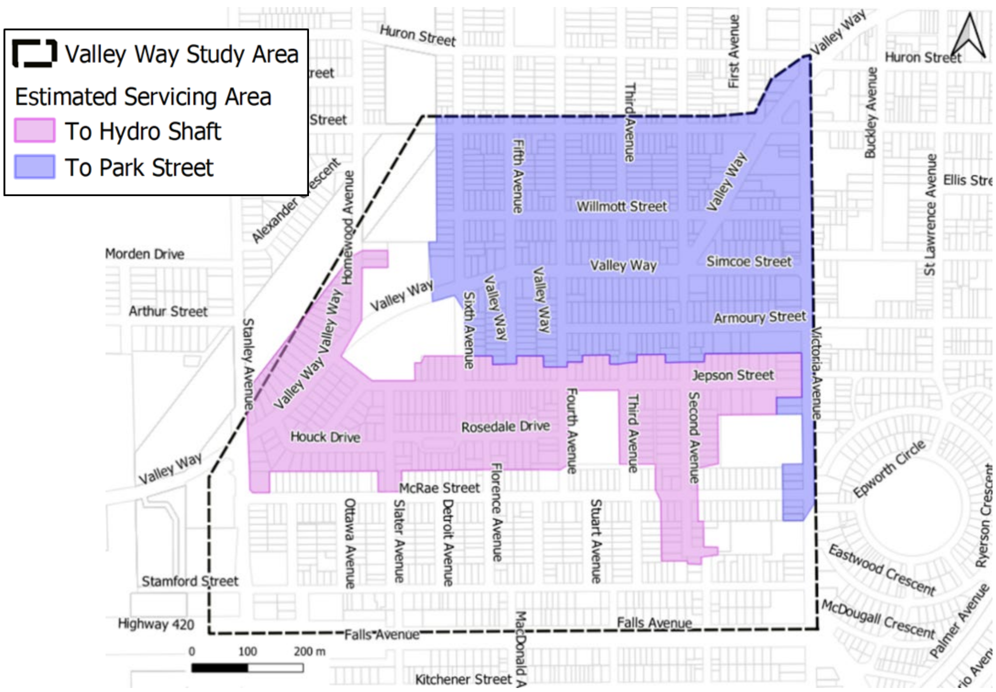


Figure 5-2: Preferred Concept – Sewer Separation

The preferred concept was tested using the City's hydraulic sewer model which demonstrated that the risk of basement flooding is reduced under this scenario. Further details are described in Technical Memorandum #5 in **Appendix C**.

Additional benefits of the recommended concept include the following:

- ✓ Opportunity for the improvement of existing road infrastructure
- ✓ Opportunity for the improvement of existing watermain infrastructure
- ✓ Opportunity to improve overall aesthetics of the area.

6 DESIGN CONSIDERATIONS

Conceptual designs for the proposed sanitary and storm sewers are complete, though there are various considerations which must be accounted for prior to detailed design. Drawings showing the design tributary areas and design flows are included in **Appendix D**.

6.1 Sanitary Sewers

The sanitary sewers were conceptually designed to be, at a minimum, as deep as the existing combined sewers. Some pipe sizes were increased beyond the needed size for capacity in order to meet minimum pipe slope criteria. The sizes should be reviewed and confirmed as part of detailed design.

The existing combined sewer has connections from each property for a private sanitary lateral which is the responsibility of the homeowner, though they are often unaware of this fact. Sewer separation will occur in the right-of-way, with sanitary laterals from the new sanitary sewer to the property line. This would be a prudent time for the City to assess the condition of laterals from the property line to each home, even though they are not under City jurisdiction. If they are in poor condition with obvious cracks or damage, they can contribute significant amounts of inflow and infiltration to the sanitary system. The City's website offers free lateral CCTV inspections on demand.

6.2 Storm Sewers

The storm sewers were designed at a minimum depth of 1.5m (for frost cover) and with minimum pipe slopes to match City design criteria. The existing combined sewer is expected to have many storm laterals from private properties which may convey flow from downspouts and/or foundation drains (weeping tiles). For existing foundation drains to drain by gravity to the new storm sewers, the sewers would need to be deeper than the basements which would be at depths greater than 1.5m. It is considered best practice for foundation drains to flow to a sump pump to be discharged to surface, though if not possible due to lack of pervious area, then pumped to the storm sewer. Similarly, it is best practice for flow from downspouts to be directed to pervious areas to infiltrate.

Based on existing knowledge of the Valley Way area, most properties appear to have suitable grading for storm flow to be discharged to grade, though this would have to be investigated for each lot as part of the separation process. The City's Weeping Tile Removal Assistance Program (WRAP) provides 100% reimbursement to a maximum of $4,000 for the disconnection of weeping tile and installation of a sump pump. Promotion of this program and coordination with the separation project will be essential.

6.3 Environmental Protective Measures for Consideration During Construction

Construction activities should include planned protective measures in order to protect the surrounding environment. The following are some of the recommended mitigation measures to be considered.

1. **Tree Protection/Removal**: an existing tree inventory and vegetation survey is recommended to be undertaken for the work area by a Certified Arborist to document existing conditions and identify impact to existing trees. A tree protection/removals plan is anticipated to be part of the design phase.

2. **Environmental Spills:** potential sources of spills including fuels and lubricants used by the contractor for construction machinery. It is recommended that a spills action plan is undertaken by the contractor to avoid accidental spills into the environment. Any environmental spills must be reported to the MECP via the Spills Action Centre.

3. **Construction Dust and Noise Control:** Construction associated with the recommended solution may result in noise, vibration, and dust in the surrounding area. The following are some of the potential dust and noise mitigation measures to be considered:
   - Use water or calcium chloride to control dust. The suitability of using calcium chlorine should be confirmed with the NPCA and the City of Niagara Falls considering proximity to the Niagara River.
   - Provide regular road sweeping to maintain public road free of mud.
   - Restrict working hours for construction, in accordance with the City of Niagara Fall's Noise Control By-law.
4. **Settlement and Vibration Monitoring:** monitoring of ground settlement and vibration within the working area is recommended to be undertaken by an experienced vendor during construction to avoid impacts to existing buildings and structure from construction activities.

6.4 Construction Costs and Funding

The estimated costs for the conceptual designs are summarized in **Table 6-1**.

Table 6-1: Conceptual Design Cost Estimate

Item	Quantity	Units	Unit Price	Cost
SANITARY				
200mm Sanitary Sewer incl. Restoration	8294	m	$600	$4,976,412
375mm Sanitary Sewer incl. Restoration	1126	m	$700	$788,340
Sanitary Manholes	150	each	$6,000	$900,000
Additional Construction Costs (15%)	1	L.S.	$999,713	$999,713
Provisional and Allowance (10%)	1	L.S.	$766,446	$766,446
Engineering (15%)	1	L.S.	$1,264,637	$1,264,637
Contingency (15%)	1	L.S.	$1,454,332	$1,454,332
SUB-TOTAL SANITARY				**$11,149,880**
STORM				
300mm Storm Sewer incl. Restoration	960	m	$650	$624,065
375mm Storm Sewer incl. Restoration	1965	m	$700	$1,375,780
450mm Storm Sewer incl. Restoration	933	m	$725	$676,280
525mm Storm Sewer incl. Restoration	467	m	$800	$373,760
600mm Storm Sewer incl. Restoration	110	m	$1,000	$109,500
675mm Storm Sewer incl. Restoration	96	m	$1,225	$117,845
750mm Storm Sewer incl. Restoration	198	m	$1,350	$267,570
825mm Storm Sewer incl. Restoration	183	m	$1,450	$265,785
900mm Storm Sewer incl. Restoration	468	m	$1,700	$794,750
975mm Storm Sewer incl. Restoration	423	m	$1,825	$771,245
1050mm Storm Sewer incl. Restoration	426	m	$2,000	$851,800
Storm Manholes	100	each	$8,500	$850,000
Additional Construction Costs (15%)	1	L.S.	$1,061,757	$1,061,757
Provisional and Allowance (10%)	1	L.S.	$814,014	$814,014
Engineering (15%)	1	L.S.	$1,343,123	$1,343,123
Contingency (15%)	1	L.S.	$1,544,591	$1,544,591
SUB-TOTAL STORM				**$11,841,864**
			Total	**$22,991,744**

7 IMPLEMENTATION

The preferred solution of sewer separation will proceed in a series of three phases which split up the Study Area in a logical manner, as illustrated in **Figure 7-1**. This potential implementation plan shows the north drainage area going first, Phase 1, followed by the south drainage area, Phase 2, though the order of these stages could be switched without causing issues. Within these Phases, the separation of the trunk sewer along Valley Way is required first (A), followed by the upstream tributary areas (B, C, D). The split between the north and south drainage areas is in the vicinity of E. F. Leslie Park and Jepson Street. The Phase 3 areas require both Phases 1 and 2 to be complete before they can advance.

The construction of these phases can be coordinated with the replacement of other aged infrastructure in each area such as watermains, roads, curbs, and sidewalks.

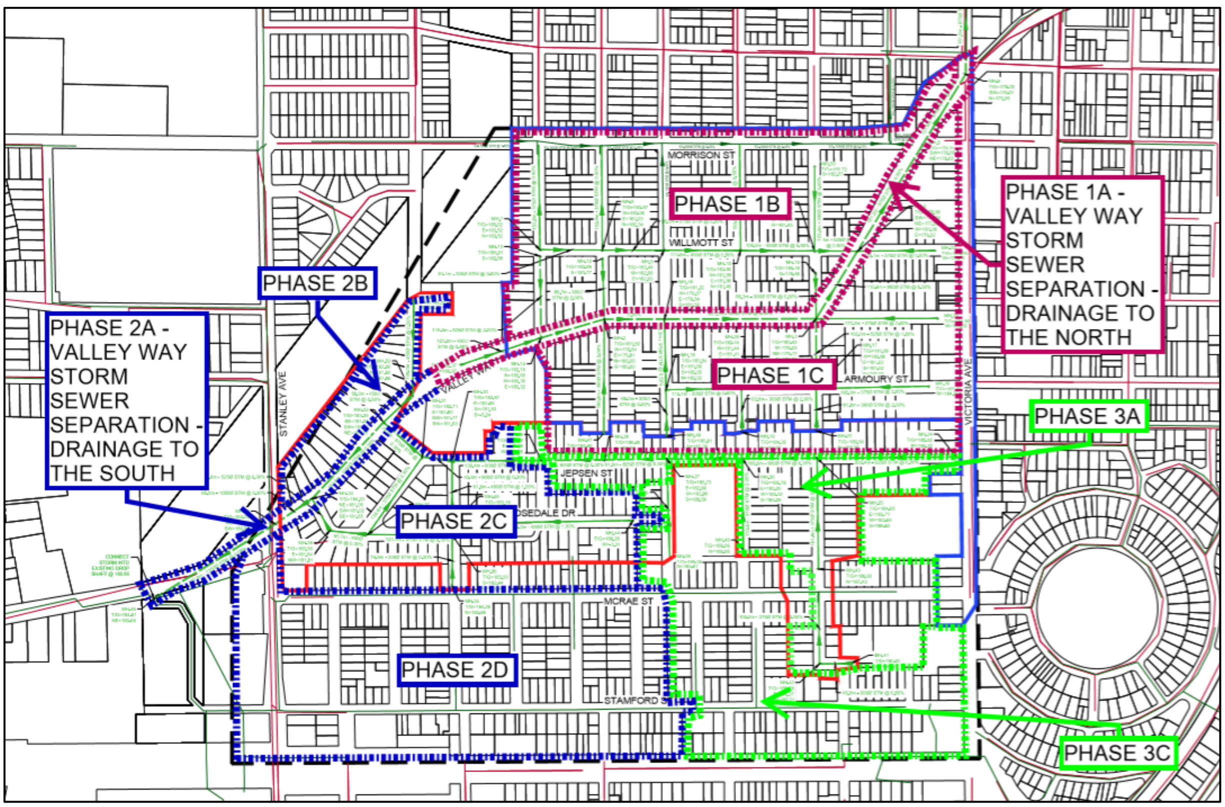


Figure 7-1: Potential Phasing for Preferred Solution

The estimated costs for each phase of the conceptual design as illustrated in **Figure 7-1** is summarized in **Table 7-1**.

Table 7-1: Conceptual Design Cost Estimate

Phase	Sanitary	Storm	Cost
1A	$ -	$2,373,582	$2,373,582
1B	$2,172,094	$1,571,878	$3,743,972
1C	$1,581,786	$2,009,487	$3,591,273
Phase 1 Total	**$3,753,880**	**$5,954,948**	**$9,708,828**
2A	$592,329	$1,637,579	$2,229,908
2B	$305,851	$142,202	$448,053
2C	$1,301,130	$2,055,431	$3,356,561
2D	$2,393,072	$ -	$2,393,072
Phase 2 Total	**$4,592,382**	**$3,835,212**	**$8,427,595**
3A	$1,473,010	$2,051,704	$3,524,715
3B	$1,330,607	$ -	$1,330,607
Phase 3 Total	**$2,803,617**	**$2,051,704**	**$4,855,322**
Total (All Phases)	**$11,149,880**	**$11,841,864**	**$22,991,744**

7.1 Permits & Approvals

During detailed design and prior to construction, permits and approvals will be required from key review agencies including:

- Ministry of the Environment, Conservation and Parks (MOECP)
- Ontario Power Generation (OPG)
- Niagara Peninsula Energy (NPE)
- Niagara Peninsula Conservation Authority (NPCA)
- Ministry of Transportation (MTO)
- Regional Municipality of Niagara (RMON)
- HydroOne Networks.

8 SUMMARY AND CONCLUSION

During this Municipal Class EA, the City of Niagara Falls and GMBP worked closely with key stakeholders to address and resolve key issues or challenges associated with evaluating alternative servicing needs for the Valley Way Drainage Area which continues to experience ongoing challenges due to infrastructure age and condition.

Based on the comprehensive review of 5 different long-term alternative concepts against a multiple bottom line evaluation process that takes into consideration environmental, social, constructability, financial, and operational factors, **Option 4 – Sewer Separation – Combo – Drop Shaft and Park Street** was identified as the recommended solution to the problem statement for this study.

The recommended solution offers the best asset value to the City from an operations, maintenance and lifecycle perspective whilst having the least overall impact to the natural and social environment.

Provided no comments or Part II orders are received during the 45-day review process, it is recommended that the City proceed with design of the new infrastructure according to the solution outlined herein.

8.1 Public Review Period and Next Steps

This Environmental Study Report (ESR) meets the requirements of a Schedule C Municipal Class EA study. Filing of this document initiates the 30-day public review period starting Wednesday, April 28, 2021 and ending Friday May 28, 2021. A copy of the Notice of Completion is provided at the beginning of this report.

APPENDIX A: CLASS ENVIRONMENTAL ASSESSMENT PROCESS

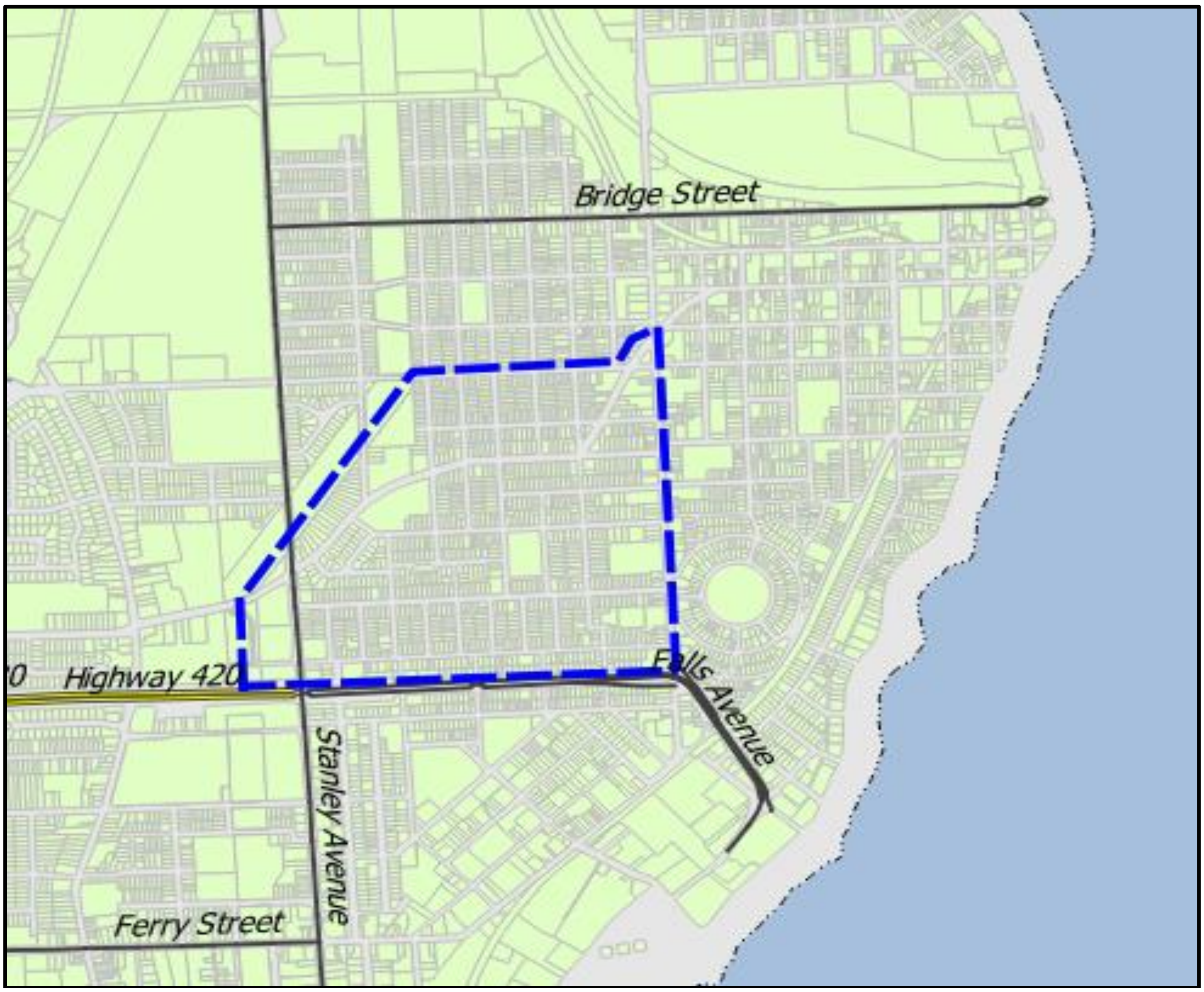
Alternative Evaluation Matrix

Alternative	Description	Reasons	General Cost	Phasing/Timing (Constructability)	Maintain or Improve Sanitary LOS (reduce basement flooding)	Maintain or Improve Storm LOS (overland flow)	Improve Infrastructure Condition	Resiliency
Status Quo	Current state of infrastructure remains. Combined sewer and shallow sanitary local sewers which convey flow to Valley Way trunk.	Does not reduce basement flooding, overflows, or improve infrastructure condition	🟢	🟢	🔴	🔴	🔴	🔴
Drop Shaft Outlet	Combined sewer separation: new storm conveyed to HydroOne drop shaft infrastructure, new sanitary sewer configuration	Continued coordination with HydroOne and OPG for construction approvals Only addresses half of the study area	🟡	🟢	🟡	🟡	🟡	🟢
Park Street Outlet	Combined sewer separation: new storm conveyed to Park St storm sewer and outlet to Niagara River, new sanitary sewer configuration	Only addresses half of the study area, due to Park Street storm sewer avaialble capacity and topography limitations	🟡	🟢	🟡	🟡	🟡	🟢
Combo - Drop Shaft/ Park St	Combo of 2 and 3, combined sewer seperation, potential new configuration, new storm system for whole area, Valley Way trunk remains combined sewer to convey upstream combined catchment	**Preferred** Provides solutions for entire study area Improves condition of storm and sanitary sewers through replacement/new design of both systems	🟡	🟢	🟢	🟢	🟢	🟢
Muddy Run Storm Sewer (not resaonable)	Combo plus complete sewer separation of the existing combined upstream catchment	Entire upstream catchment required to undergo complete sewer separation, which will require another study and complicate phasing	🔴	🔴	🟡	🟡	🟡	🔴

APPENDIX B:
PUBLIC CONSULTATION

NOTICE OF STUDY COMMENCEMENT
VALLEY WAY DRAINAGE AREA ENVIRONMENTAL ASSESSMSENT STUDY

BACKGROUND: The City of Niagara Falls is undertaking an Environmental Assessment Study for the Valley Way drainage area. The study will review current stormwater system capacity and examine the alternative solutions and conceptual designs recommended to eliminate flooding concerns for this area.



PROCESS: The Valley Way Drainage Area Environmental Assessment Study will follow the Municipal Engineers Association (MEA) Municipal Class Environmental Assessment (Oct 2000, as Amended in 2007 and 2011).

This Class EA will be filed as a Schedule C, based on the Master Drainage Study (MDPUS) recommendations; which process includes public and review agency consultation, evaluation of alternatives, impact assessment of proposed alternatives, and identification of measures to mitigate adverse impacts.

This study will also satisfy the Niagara Region Water and Wastewater Master Servicing Plan (MSP), and the Niagara Falls Master Drainage Plan (MDP) and Pollution Prevention and Control Plan (PPCP).

PUBLIC INVOLVEMENT: The City of Niagara Falls encourages the public and stakeholders to participate in this planning process. The City will be hosting a Public Information Centre (PIC) in the next few months to obtain input on the preliminary results of the study. Notification of the PIC will be advertised in the local community newspaper and notices mailed to property owners and businesses located within the immediate study area. Additional project information is located on the study's website at: **www.niagarafalls.ca/notices.**

Upon completion of the study, a Project File Report documenting the study process will be prepared and made available for public review and comment. Anyone that wishes to comment on or to be involved in this study should indicate their interest, preferably in writing to:

Danielle Anders, M.A.Sc., P.Eng
Project Manager/EA Coordinator
GM BluePlan Engineering Ltd.
410 Lewis Road, Unit 18
Stoney Creek, Ontario L8E 5Y7
Tel: 905-643-6688 ext. 6210
email: danielle.anders@gmblueplan.ca

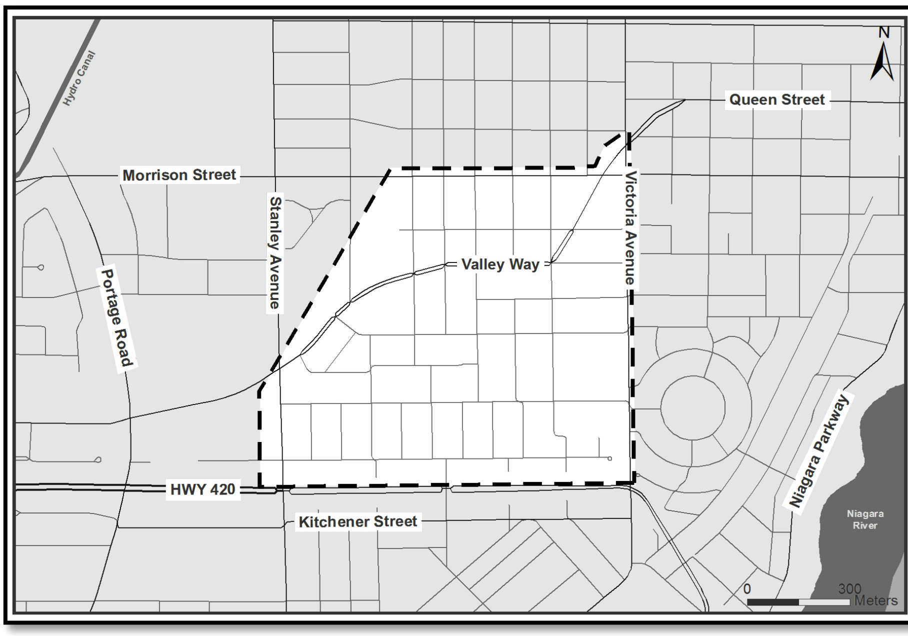
Guangli Zhang, P.Eng
Project Manager
City of Niagara Falls
4310 Queen Street
Niagara Falls, Ontario L2E 6X5
Tel: 905-356-7521 ext. 6206
email: gzhang@niagarafalls.ca

NOTICE OF STUDY COMMENCEMENT AND PUBLIC INFORMATION CENTRE #1
VALLEY WAY DRAINAGE ENVIRONMENTAL ASSESSMENT STUDY

What is the Valley Way Drainage Environmental Assessment Update Study?

The City of Niagara Falls is undertaking an Environmental Assessment Study for the Valley Way Drainage area. The study will review current sewer system capacity and examine the alternative solutions and conceptual designs recommended to eliminate flooding concerns for this area.

What is the process?



The Valley Way Drainage Environmental Assessment Study will follow the Municipal Engineers Association (MEA) Municipal Class Environmental Assessment (Oct 2000, as Amended in 2007, 2011 and 2015).

This Class EA will be filed as a Schedule C, based on the Master Drainage Study (MDPUS) recommendations. This process includes public and review agency consultation, evaluation of alternatives, impact assessment of proposed alternatives, and identification of measures to mitigate adverse impacts.

This study will also satisfy the Niagara Region Water and Wastewater Master Servicing Plan (MSP), and the Niagara Falls Pollution Prevention and Control Plan (PPCP).

How do I get involved?

The City of Niagara Falls encourages the public and stakeholders to participate in this planning process. The City will be hosting **Public Information Centre No. 1** to obtain input on the preliminary results of the study.

The Public Information Centre will be held:

Date / Time: April 10, 2019 from 5:00 p.m. to 7:00 p.m.
Location: Niagara Falls Public Library
4848 Victoria Avenue, Niagara Falls, ON L2E 4C5

If you are unable to attend, the public information material will be available on the City's website at: **www.niagarafalls.ca/notices**

Upon completion of the study, a Project File Report documenting the study process will be prepared and made available for public review and comment. Anyone that wishes to comment on or to be involved in this study should indicate their interest, preferably in writing to:

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Project Manager, EA Coordinator
GM BluePlan Engineering Ltd.
410 Lewis Road, Unit 18
Stoney Creek, ON L8E 5Y7
905-643-6688 ext. 6210
Danielle.Anders@gmblueplan.ca

Guangli Zhang, P.Eng
Project Manager
City of Niagara Falls
4310 Queen Street
Niagara Falls, ON L2E 6X5
905-356-7521 ext. 4336
gzhang@niagarafalls.ca

All comments and information received from individuals, stakeholder groups and agencies regarding this project are being collected under the authority of the "Municipal Act" to assist the City of Niagara Falls in making a decision. Under the "Municipal Act", personal information such as name, address, telephone number, and property location that may be included in a submission becomes part of the public record.

This notice was first issued March 18, 2019.

Valley Way Drainage Environmental Assessment

Public Information Centre #1

Wednesday, April 10, 2019
Niagara Falls Public Library
Victoria Avenue

NAME	ADDRESS	EMAIL	PHONE
Elizabeth Zintel	[redacted]		[redacted]
Brenda Semenyk	[redacted]		[redacted]
STUART BERRY	[redacted]		[redacted]
Rensheng Dou	[redacted]		[redacted]
Ed Ketchen	[redacted]		[redacted]
SUSAN	[redacted]		[redacted]
T. Bright	[redacted]		[redacted]
DAVID SCOTT	[redacted]	[redacted]	[redacted]
Sylvain Campbell	[redacted]	[redacted]	[redacted]
Jacques Veilleux	[redacted]		[redacted]

Valley Way Drainage Environmental Assessment

Public Information Centre #1

Wednesday, April 10, 2019
Niagara Falls Public Library
Victoria Avenue

NAME	ADDRESS	EMAIL	PHONE
Colleen Stewart	[redacted]	[redacted]	—
Ben Stewart	"	"	—
Tom Hay	[redacted]	[redacted]	[redacted]
SULAKHAN SANDHU	[redacted]	[redacted]	[redacted]
TEO PERLINGIERI	[redacted]		[redacted]
Jeff Montgomery	[redacted]	[redacted]	—
Randy McRae Kathy	[redacted]		[redacted]
Wendy Magales	[redacted]		[redacted]
TOM O'HARA	[redacted]	[redacted]	[redacted]
Craig Vandenberg	[redacted]	[redacted]	[redacted]

NiagaraFalls CANADA

Valley Way Drainage Environmental Assessment

Public Information Centre #1

Wednesday, April 10, 2019
Niagara Falls Public Library
Victoria Avenue

NAME	ADDRESS	EMAIL	PHONE
Art & Debbie Bruley	[redacted]	[redacted]	[redacted]

NiagaraFalls CANADA

Valley Way Drainage Study
Class C Environmental Assessment
Public Meeting

Thank you for taking the time to fill out this comment form. Please place it in the box provided or email it to the address below. Your input is important. Comments will become part of the public record with the exception of personal information.

1. How did you hear about this Public Information Event?

- ☐ Newspaper ad
- ☑ Personal letter or email
- ☐ Word of mouth
- ☐ Website
- ☐ Other ______

2. What was your main reason for attending the Public Information Event?

Concern for the flooding I have in my back yard, this year worse than ever before.

Global warming - weather changes.

3. Did this Public Information Event meet your information needs?

- ☑ Yes
- ☐ Somewhat
- ☐ No

Please explain: I spoke with someone who will connect me with someone to come & see my yard issues and seek a resolution.
- I am pleased to see the city being pro-active about water drainage considering global warming.

NiagaraFalls CANADA

Valley Way Drainage Study
Class C Environmental Assessment
Public Meeting

4. If you asked a question, did the representatives available answer your question sufficiently?

☑ Yes

☐ Somewhat

☐ No

Please explain: - James - very nice. Really listened & took my issue seriously & is connecting me with those who can help.

5. Other questions or comments:

If you would like to receive updates about the Valley Way Drainage Study, please provide your name and contact information:

Nam[redacted]

Affiliation:

Address: [redacted]

City/Province: [redacted] Postal Code: [redacted]

Email: [redacted]

Thank you for taking the time to fill out this comment form. For additional questions or concerns regarding this project, please contact:

Danielle Anders, M.A.Sc., P.Eng.
Project Manager, EA Coordinator
GM BluePlan Engineering Limited
410 Lewis Road, Unit 18
Stoney Creek, ON L8E 5Y7
Danielle.Anders@gmblueplan.ca

Guangli Zhang, P.Eng
Project Manager
City of Niagara Falls
4310 Queen Street
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gzhang@niagarafalls.ca

Valley Way Drainage Study
Class C Environmental Assessment
Public Meeting

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- ☐ Word of mouth
- ☐ Website
- ☐ Other ______

2. What was your main reason for attending the Public Information Event?

Learn more about the study + future sewer plans

3. Did this Public Information Event meet your information needs?

- ☑ Yes
- ☐ Somewhat
- ☐ No

Please explain: Very informative. Staff very helpful

4. If you asked a question, did the representatives available answer your question sufficiently?

- [x] Yes
- [ ] Somewhat
- [ ] No

Please explain: ______

5. Other questions or comments: I look forward to further updates.

If you would like to receive updates about the Valley Way Drainage Study, please provide your name and contact information:

Name: [redacted]

Affiliation: Home Owner

Address: [redacted]

City/Province: Niagara Falls Postal Code: [redacted]

Email: [redacted]

Thank you for taking the time to fill out this comment form. For additional questions or concerns regarding this project, please contact:

Danielle Anders, M.A.Sc., P.Eng.
Project Manager, EA Coordinator
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Valley Way Drainage Study
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1. How did you hear about this Public Information Event?

- [ ] Newspaper ad
- [x] Personal letter or email
- [ ] Word of mouth
- [ ] Website
- [ ] Other ______

2. What was your main reason for attending the Public Information Event?

My basement has flooded due to heavy rain storm. Yard saturated when it rains and in spring.

3. Did this Public Information Event meet your information needs?

- [x] Yes
- [ ] Somewhat
- [ ] No

Please explain: Good initial information.

4. If you asked a question, did the representatives available answer your question sufficiently?

- ☑ Yes
- ☐ Somewhat
- ☐ No

Please explain: ______________________________

5. Other questions or comments:

- time frame
- involve new sewer lines being added?

If you would like to receive updates about the Valley Way Drainage Study, please provide your name and contact information:

Name: [redacted]

Affiliation: [redacted]

Address: [redacted]

City/Province: [redacted] Postal Code: [redacted]

Email: [redacted]

Thank you for taking the time to fill out this comment form. For additional questions or concerns regarding this project, please contact:

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NiagaraFalls CANADA

Valley Way Drainage Study
Class C Environmental Assessment
Public Meeting

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- ☐ Newspaper ad
- ☒ Personal letter or email
- ☐ Word of mouth
- ☐ Website
- ☐ Other ______

2. What was your main reason for attending the Public Information Event?

BACKYARD FLOODING

3. Did this Public Information Event meet your information needs?

- ☒ Yes
- ☐ Somewhat
- ☐ No

Please explain: ______

Niagara Falls CANADA

Valley Way Drainage Study
Class C Environmental Assessment
Public Meeting

4. If you asked a question, did the representatives available answer your question sufficiently?

- [x] Yes
- [ ] Somewhat
- [ ] No

Please explain: address 4872 Simcoe Street - our backyard floods every rainfall + erodes the ground.

5. Other questions or comments: we are one of the lowest properties on the street. a way to drain the water quicker is needed.

* please keep Valley Way Greenspace!!

If you would like to receive updates about the Valley Way Drainage Study, please provide your name and contact information:

Name: [redacted]

Affiliation:

Address: [redacted]

City/Province: [redacted] Postal Code: [redacted]

Email:

Thank you for taking the time to fill out this comment form. For additional questions or concerns regarding this project, please contact:

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- ☐ Newspaper ad
- ☑ Personal letter or email
- ☐ Word of mouth
- ☐ Website
- ☐ Other ______

2. What was your main reason for attending the Public Information Event?

FIND OUT WHAT THE PLAN IS GOING TO BE

3. Did this Public Information Event meet your information needs?

- ☑ Yes
- ☐ Somewhat
- ☐ No

Please explain: Danielle did A GREAT JOB OF INFORMING US
LOOK FORWARD TO NEXT SESSION

4. If you asked a question, did the representatives available answer your question sufficiently?

☐ Yes

☐ Somewhat

☐ No

Please explain: ____

____

5. Other questions or comments:

____

____

____

____

If you would like to receive updates about the Valley Way Drainage Study, please provide your name and contact information:

Name: ____

Affiliation: ____

Address: ____

City/Province: ______________________ Postal Code: ______________________

Email: ____

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- ☐ Newspaper ad
- ☐ Personal letter or email
- ☐ Word of mouth
- ☐ Website
- ☑ Other Friend / Advertisment

2. What was your main reason for attending the Public Information Event?

I always like to know whats going on around my family $ I. Im always obbservent.

3. Did this Public Information Event meet your information needs?

- ☐ Yes
- ☑ Somewhat
- ☐ No

Please explain:

4. If you asked a question, did the representatives available answer your question sufficiently?

- ☐ Yes
- ☑ Somewhat
- ☐ No

Please explain: ______________________________

5. Other questions or comments:
Please just make our neighborhood Safe and fun to be in.

If you would like to receive updates about the Valley Way Drainage Study, please provide your name and contact information:

Name: [redacted]

Affiliation: Resident of Niagara Falls

Address: [redacted]

City/Province: [redacted] Postal Code: ______________

Email: ______________________________

Thank you for taking the time to fill out this comment form. For additional questions or concerns regarding this project, please contact:

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1. How did you hear about this Public Information Event?

- ☐ Newspaper ad
- ☒ Personal letter or email
- ☐ Word of mouth
- ☐ Website
- ☐ Other ______

2. What was your main reason for attending the Public Information Event?

My sump pump runs very frequently all year around. I am afraid of what may happen during a major rain storm!

3. Did this Public Information Event meet your information needs?

- ☐ Yes
- ☐ Somewhat
- ☒ No

Please explain: This project under way is just a study only.

Valley Way Drainage Study
Class C Environmental Assessment
Public Meeting

4. If you asked a question, did the representatives available answer your question sufficiently?

☒ Yes

☐ Somewhat

☐ No

Please explain: ______

5. Other questions or comments:

If you would like to receive updates about the Valley Way Drainage Study, please provide your name and contact information:

Name: [redacted]

Affiliation: ______

Address: [redacted]

City/Province: Niagara Falls Postal Code: [redacted]

Email: [redacted]

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1. How did you hear about this Public Information Event?

- ☐ Newspaper ad
- ☒ Personal letter or email
- ☐ Word of mouth
- ☐ Website
- ☐ Other __________

2. What was your main reason for attending the Public Information Event?

flooding Rosedale DR.

3. Did this Public Information Event meet your information needs?

- ☐ Yes
- ☒ Somewhat
- ☐ No

Please explain: Going to be a long time (not happy) was told that 30 years ago!

Valley Way Drainage Study
Class C Environmental Assessment
Public Meeting

4. If you asked a question, did the representatives available answer your question sufficiently?

- [x] Yes
- [ ] Somewhat
- [ ] No

Please explain: ______________________________

5. Other questions or comments:

____

If you would like to receive updates about the Valley Way Drainage Study, please provide your name and contact information:

Name: [redacted]

Affiliation: OWNER.

Address: [redacted]

City/Province: N. Falls Postal Code: [redacted]

Email: [redacted]

Thank you for taking the time to fill out this comment form. For additional questions or concerns regarding this project, please contact:

Danielle Anders, M.A.Sc., P.Eng.
Project Manager, EA Coordinator
GM BluePlan Engineering Limited
410 Lewis Road, Unit 18
Stoney Creek, ON L8E 5Y7
Danielle.Anders@gmblueplan.ca

Guangli Zhang, P.Eng
Project Manager
City of Niagara Falls
4310 Queen Street
Niagara Falls, ON L2E 6X5
gzhang@niagarafalls.ca

Niagara Falls CANADA

Valley Way Drainage Study
Class C Environmental Assessment
Public Meeting

Thank you for taking the time to fill out this comment form. Please place it in the box provided or email it to the address below. Your input is important. Comments will become part of the public record with the exception of personal information.

1. How did you hear about this Public Information Event?

- [x] Newspaper ad
- [x] Personal letter or email
- [ ] Word of mouth
- [ ] Website
- [ ] Other ______

2. What was your main reason for attending the Public Information Event?

I want to keep the boulevard (greenspace) in the middle of Valleyway

3. Did this Public Information Event meet your information needs?

- [ ] Yes
- [x] Somewhat
- [ ] No

Please explain: ______

4. If you asked a question, did the representatives available answer your question sufficiently?

☒ Yes

☐ Somewhat

☐ No

Please explain: ______________________________

5. Other questions or comments:

____

If you would like to receive updates about the Valley Way Drainage Study, please provide your name and contact information:

Name: [redacted]

Affiliation: Resident

Address: [redacted]

City/Province: Niagara Falls Postal Code: [redacted]

Email: [redacted]

Thank you for taking the time to fill out this comment form. For additional questions or concerns regarding this project, please contact:

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4310 Queen Street
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WELCOME

Valley Way Drainage Study
Class C Environmental Assessment

April 10, 2019 – 5-7 pm

Niagara Falls Library – Victoria Ave

WHY ARE WE HERE?

The purpose of this Public Information Centre (PIC) is to:

- Introduce the Valley Way Drainage Study and Schedule C Class Environmental Assessment (EA)
- Introduce the Municipal Class EA (MCEA) Process
- Provide an overview of work completed to date, including potential servicing alternatives
- Engage residents living in the Valley Way area and solicit feedback on the approach and alternatives
- Provide an opportunity for local residents and stakeholders to engage with the Project Team

GET INVOLVED!

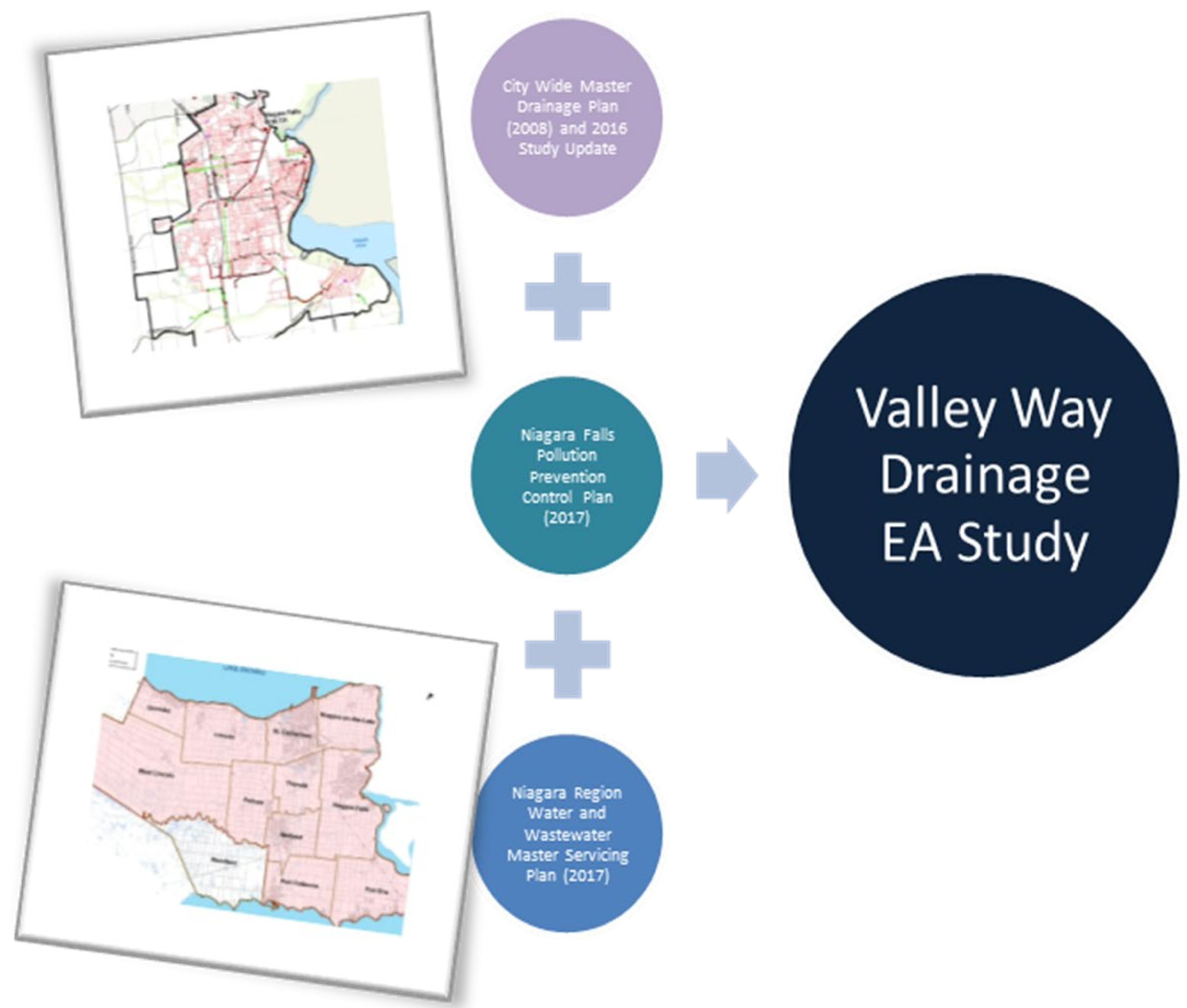
- Please sign in on the form provided
- Please fill in a comment form and leave it with us tonight
    - Need more time? Email it after the PIC to: Kristen.Farrell@gmblueplan.ca

DO YOU HAVE QUESTIONS?

Please feel free to approach anyone from the Project Team, they will be glad to answer any questions you may have.

PROJECT BACKGROUND

- The City of Niagara Falls is undertaking a Municipal Class Environmental Assessment to evaluate the sewer servicing in the area
- The need to address local flooding concerns and bottlenecks as outlined in the recommendations from the Master Drainage Plan Update Study (MDPUS), Master Servicing Plan (MSP) and Pollution Prevention Control Plan (PPC) Projects
- The preferred solution(s) must be mindful of system resiliency:
  - Basement & surface flooding
- Preferred design must recognize the risks to downstream infrastructure and lands
- Sustainable levels of service require sustainable designs that recognize hydraulic risks both within and outside of the area



PROJECT OBJECTIVES

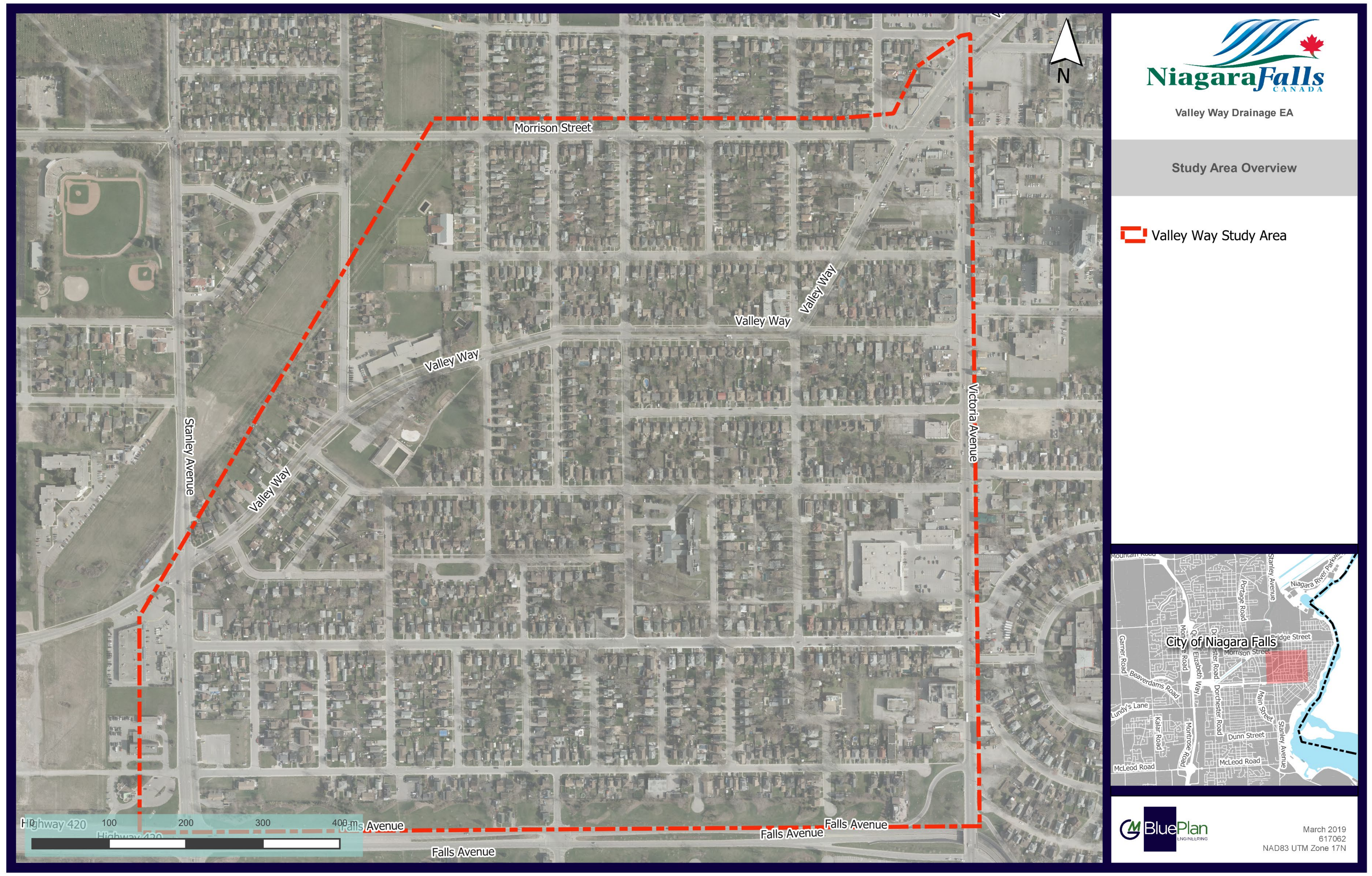
To recommend solutions to improve the system capacity and eliminate flooding concerns with aim of:

- Quantifying and verifying the existing service capacity
- Assessing and planning for the elimination of overflows
- Eliminating, reducing or delaying extraneous flows
- Improving conditions of the stormwater & wastewater collection system infrastructure
- Review and recommend innovative opportunities to address stormwater servicing limitations

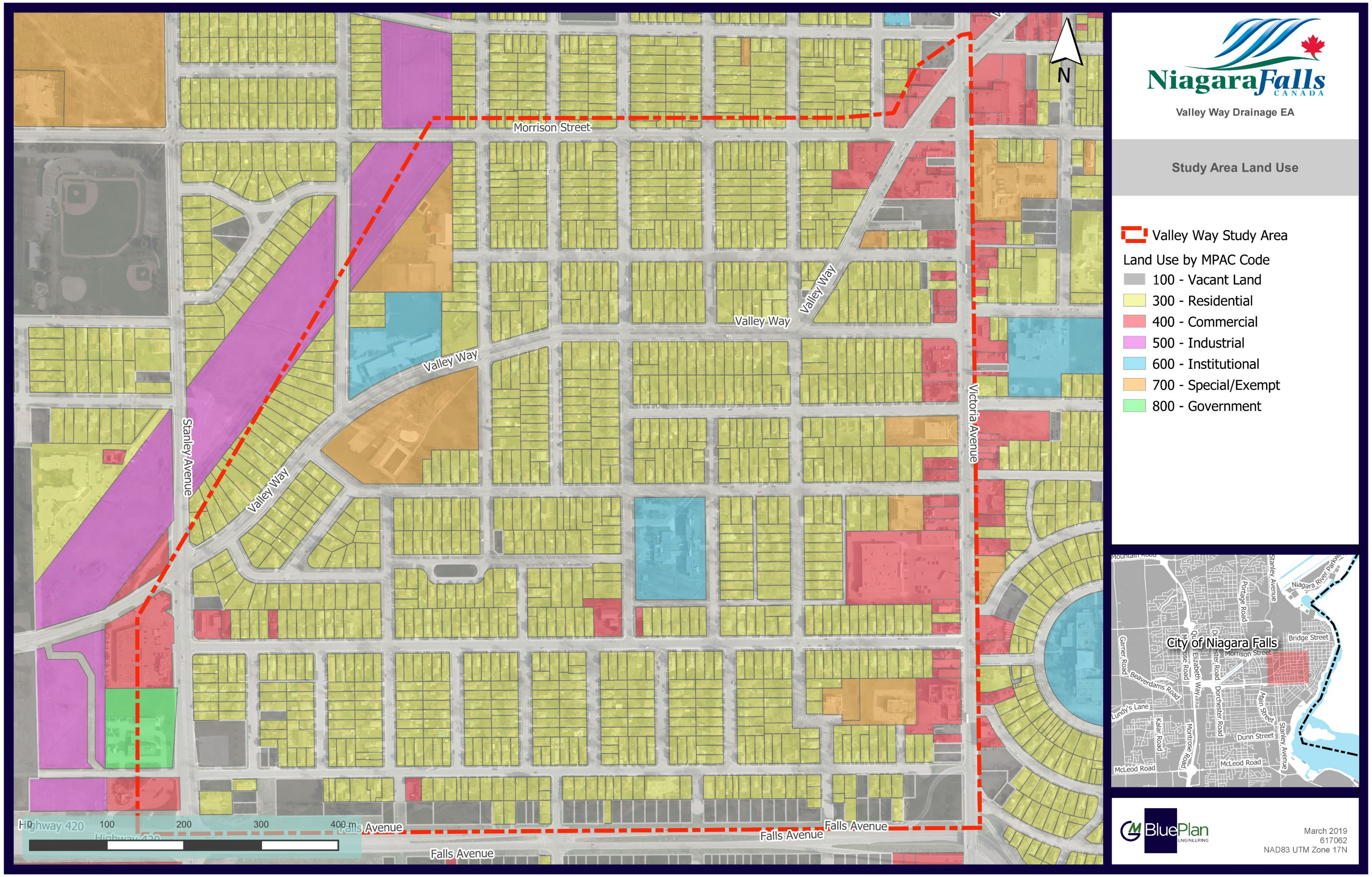
STUDY AREA OVERVIEW

The Study Area is:

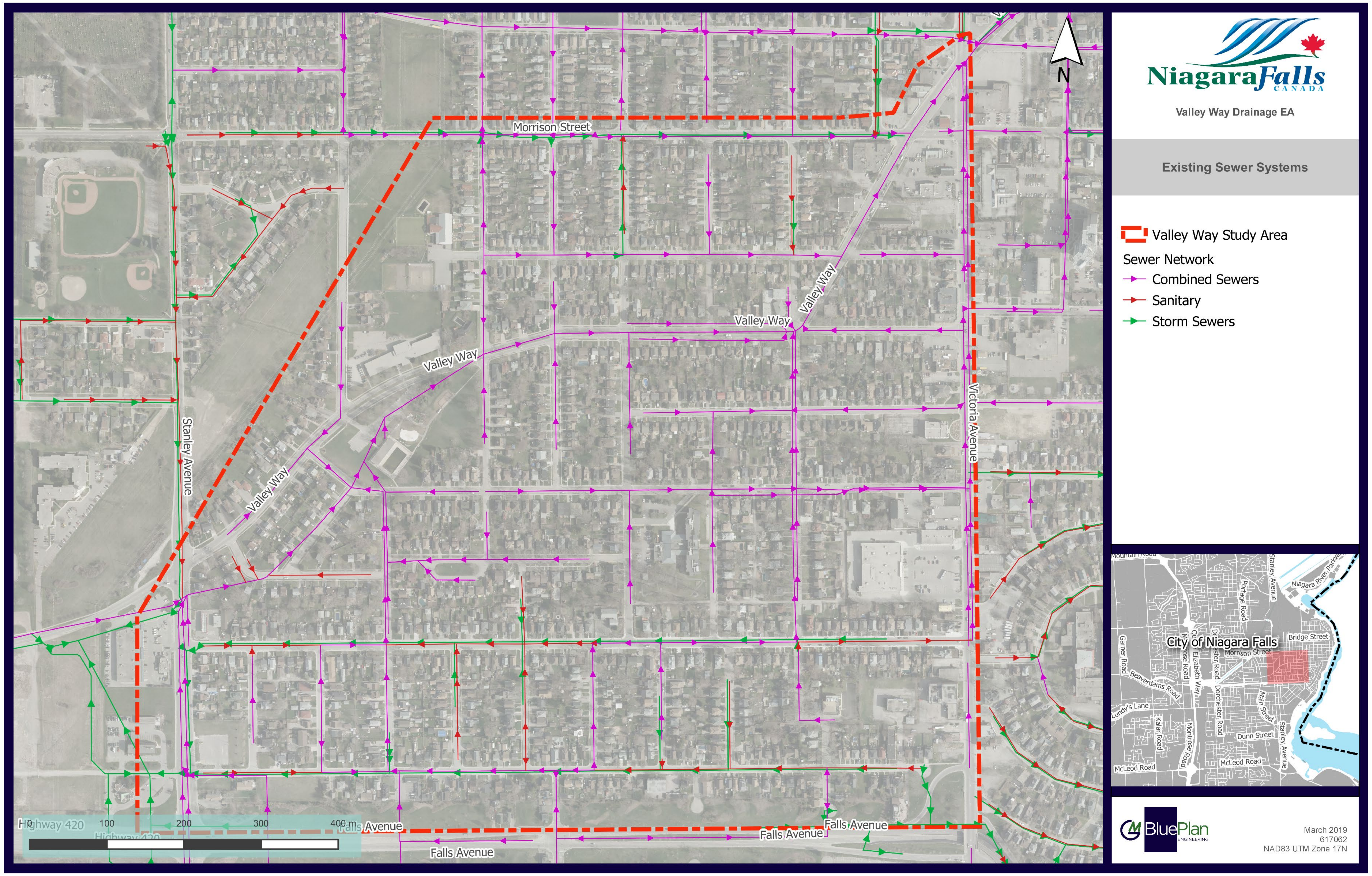
- Located in the City of Niagara Falls, within the Niagara Region
- Bound in the north by Morrison Street, south by McRae Street, east by Victoria Avenue and west by Stanley Avenue
- Comprised mainly of a combined sewer system
- The site of the old Muddy Run Creek, which was filled in around 1926



EXISTING CONDITIONS – LAND USE

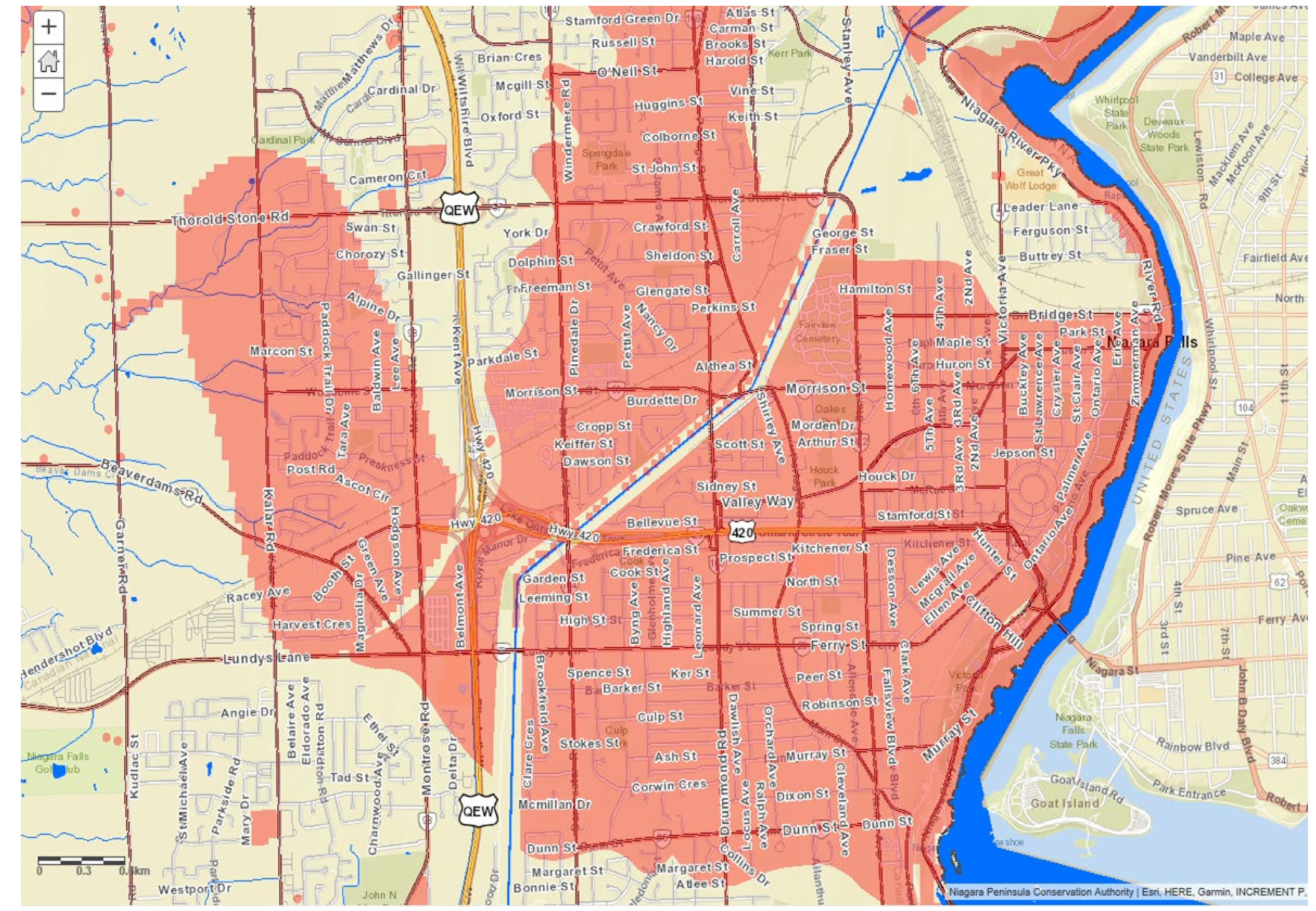


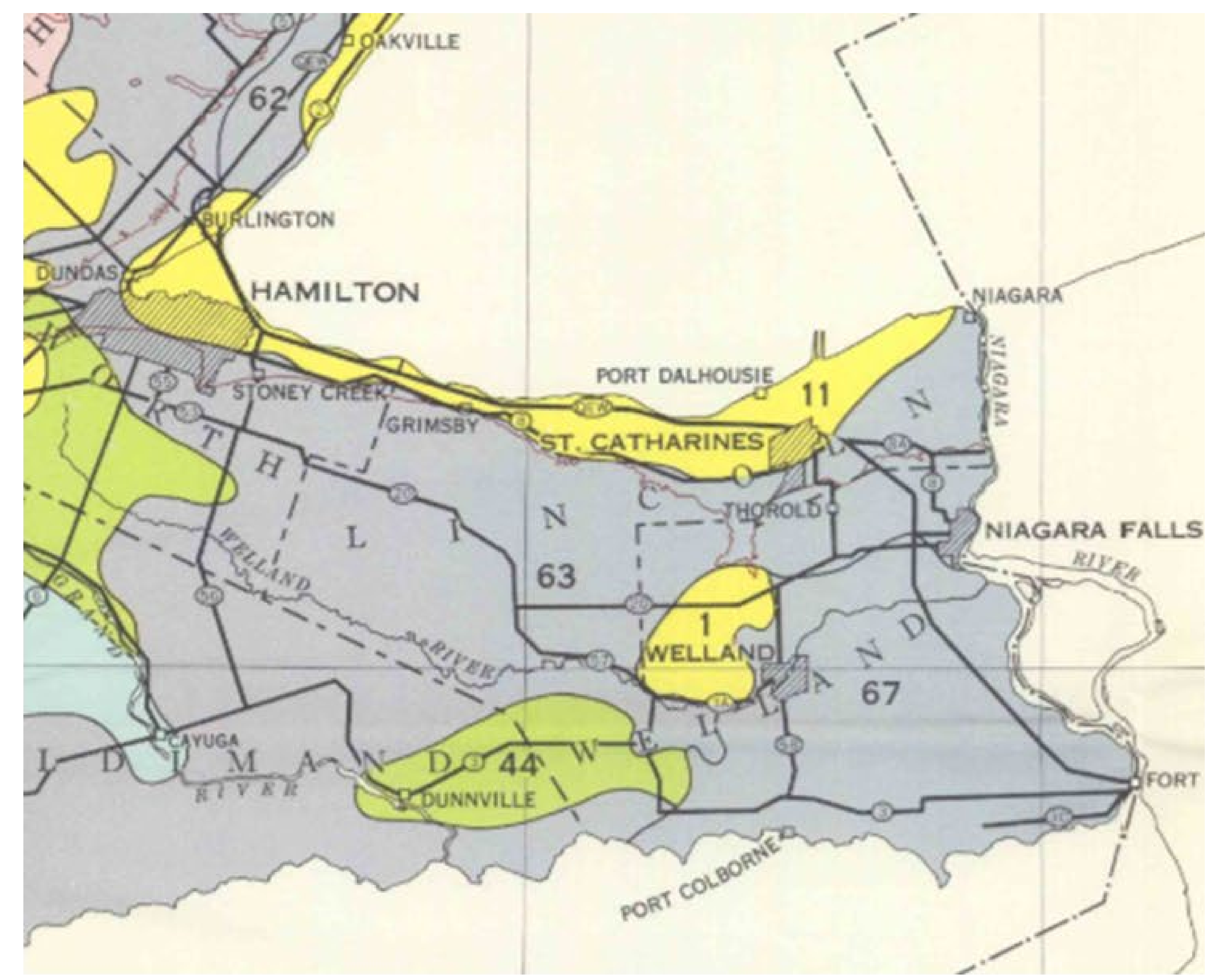
EXISTING CONDITIONS – SEWER SYSTEM



EXISTING CONDITIONS – HYDROGEOLOGY

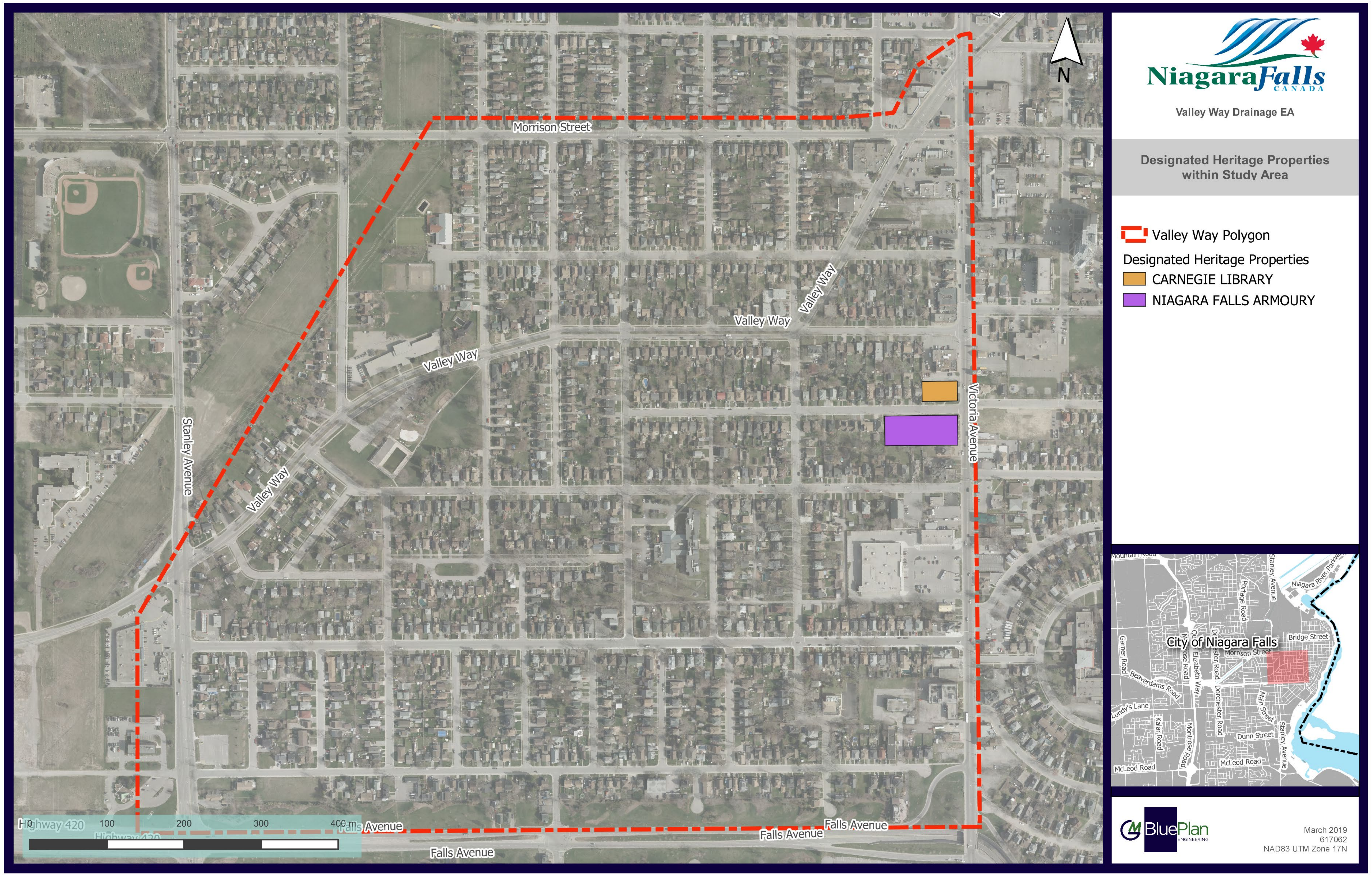
- The study area is located within a **Highly Vulnerable Aquifer** (Red)
    - This means groundwater is at a higher elevation/near the surface
- Groundwater in this area is approximately 9-12 m below the surface
- Soils in the area consist mainly of clay (Soil Group D)





DOMINANTLY VERY FINE TEXTURED SOILS FORMED ON TILL OR LACUSTRINE SEDIMENTS						
61	DUNEDIN (B.F.)	clay	hilly	good	slightly acid	moderately stony
62	LOCKPORT (G.B.P.)	clay	moderately rolling	good	slightly acid	stonefree
63	HALDIMAND (G.B.P.)	clay	undulating	imperfect	medium acid	stonefree
64	LINCOLN (D.G.G.)	clay	very gently undulating	poor	slightly acid	stonefree
	RENFREW (G.W.)	clay	undulating	imperfect	medium acid	moderately stony
65	RIDEAU (R)	clay	gently undulating	imperfect	medium acid	stonefree
66	LINCOLN (D.G.G.)	clay	very gently undulating	poor	slightly acid	stonefree
	HALDIMAND (G.B.P.)	clay	undulating	imperfect	medium acid	stonefree
67	LINCOLN (D.G.G.)	clay	very gently undulating	poor	slightly acid	stonefree
68	LINCOLN (D.G.G.)	clay	very gently undulating	poor	slightly acid	stonefree
	GRENVILLE (B.F.)	loam	moderately rolling	good	neutral	moderately stony

EXISTING CONDITIONS – BUILT & CULTURAL HERITAGE



MCEA PLANNING & DESIGN PROCESS

A Class Environmental Assessment is a decision making process that all municipalities in Ontario follow for building new infrastructure

Phase 1: Problem/Opportunity	Phase 2: Alternative Solutions	Phase 3: Alternative Design	Phase 4: Environmental Study Report
Describe the problem and/or opportunity to be addressed by this project	Identify ways of solving the identified problem or addressing the opportunity and select a preferred solution	Identify alternative designs for the preferred solution and select a preferred design	Complete Environmental Study Report to be made public and distribute Notice of Completion

All elements being reviewed are under a **Schedule C Municipal Class Environmental Assessment**

PROJECT TIMELINE

Notice of Commencement

Conduct background review & environmental inventories/field work

Develop and evaluate alternative design concepts & select preferred concept

Notice of Completion

Commence 30 day public & agency review

June 2018

April-July 2019

August-December 2019

January 2020

Ongoing Engagement & Consultation

Identify problem or opportunity statement

Identify and evaluate alternatives & preferred solution

Public Information Centre #1

Public Information Centre #2

Complete Environmental Study Report

PHASE 1: PROBLEM OR OPPORTUNITY

The problem or opportunity statement that sets the framework for this Class EA is as follows:

"That the existing sewer system capacity be improved to minimize adverse environmental and property impacts, while promoting infrastructure sustainability within the study area."

PHASE 1: PROBLEM OR OPPORTUNITY

What are the problems?

- Historically flood prone due to combined sewers and existing topography
- Old creek valley – Old Muddy Run
- Directly connected homes
- Flooding areas (from MDPUS)
    - Valley Way and Victoria Ave
    - Easterly end of Valley Way at Second Ave

What are the Opportunities?

- Reduce peak storm flow to the system
- Reduce basement flooding and overland flooding
- Improve infrastructure resiliency
- Improve infrastructure condition
- Improve level of service to customers
- Institute Low Impact Development (LID) options – Green Infrastructure solutions

PHASE 2: ALTERNATIVE SOLUTIONS

Reasonable Long-Term Alternative Solutions to address the problems and opportunities associated with the Valley Way Area include:

- **Do Nothing:** represents no change to the existing sewer system. This option maintains the combined sewer system as is.

- **Sewer Separation with storm flow to the existing storm drop shaft:** involves the construction new sewers including directing storm flow to a new trunk sewer towards the Hydro Drop Shaft located at Stanley Avenue and Valley Way.

PHASE 2: ALTERNATIVE SOLUTIONS

Reasonable Long-Term Alternative Solutions to address the problems and opportunities associated with the Valley Way Area include:

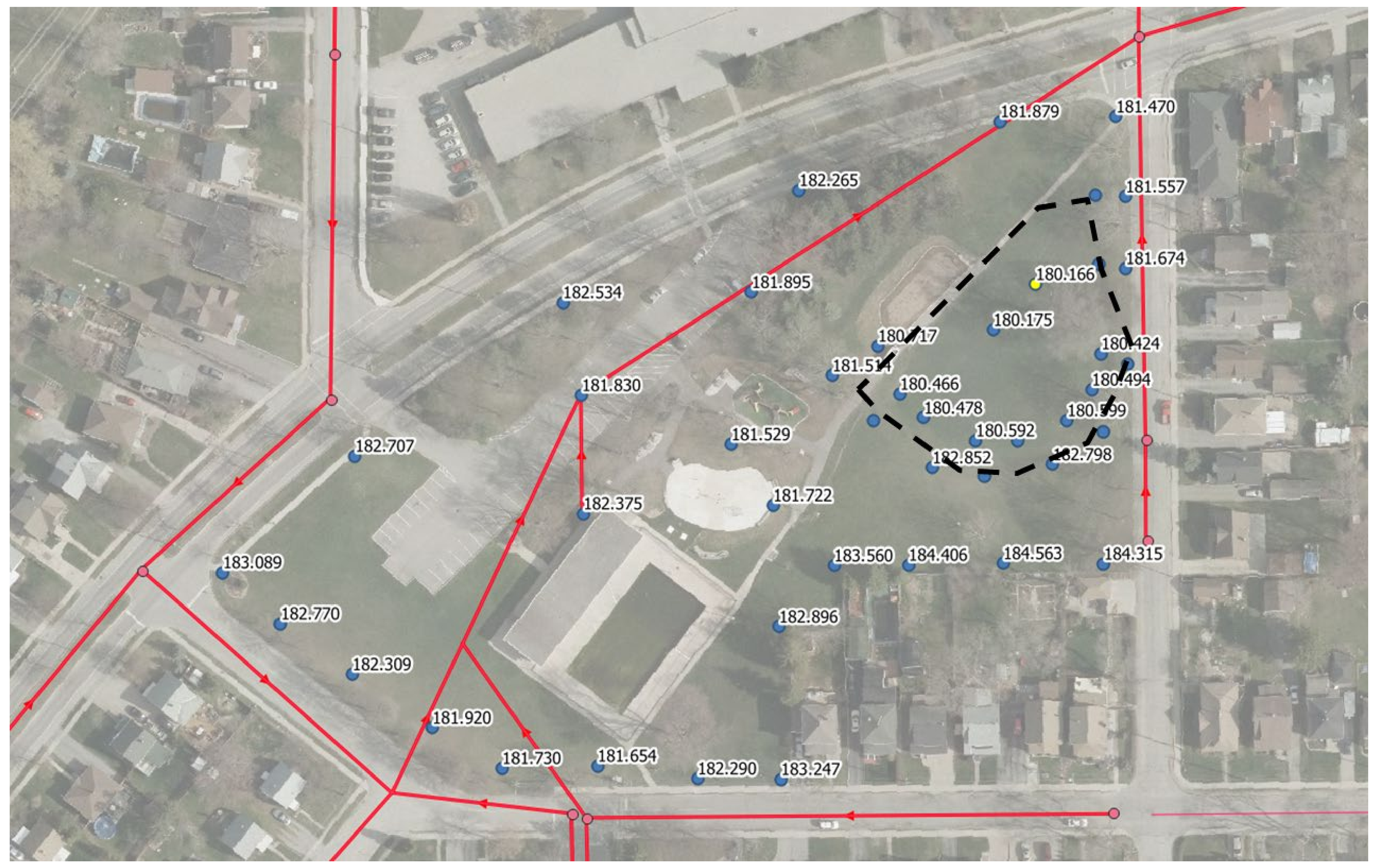
- **Sewer Separation with storm flow to the Park Avenue Trunk Storm Sewer:** involves the construction of new sewers including directing storm flow towards the Park Avenue trunk storm sewer.

- **Sewer Separation using the existing Muddy Run Trunk Sewer as a storm sewer:** involves the construction of new sewers and conversion of the existing Muddy Run to a trunk storm sewer.

INNOVATIVE OPPORTUNITIES

LOW IMPACT DEVELOPMENT (LIDS)

- Dry Storm Water Management Pond
  - Located at FH Leslie Park – lowest spot in study area
  - Reduce peak stormwater runoff
  - Temporary storage of runoff
- Infiltration Gallery
  - Located under existing grassed boulevard on Valley Way
  - Attenuate peak stormwater runoff
  - Sub-surface groundwater collection system
  - Can be combined with Rain Garden to improve quality control of stormwater



LIDS are a land planning and engineering design approach to manage stormwater runoff as part of green infrastructure. LID emphasizes conservation and use of on-site natural features to protect water quality.

NEXT STEPS

- ✓Review questions and comments following this PIC.
- ✓Evaluate and review alternatives to select the recommended (preferred) solution.
- ✓Develop and evaluate alternative design concepts for the recommended (preferred) solution.
- ✓Present our recommendations at our next PIC which is tentatively scheduled for Summer 2019

GET INVOLVED!

Your feedback is important. Please sign in and fill out a comment to leave with us tonight or provide it later to Kristen.Farrell@gmblueplan.ca

THANK YOU FOR ATTENDING!

We appreciate the time you have taken to learn more about this Study. Your feedback is important and we encourage you to stay connected!

- ✓ Fill out a comment form
- ✓ Visit the project webpage at www.niagarafalls.ca
- ✓ Contact the Project Team with additional comments or questions

Danielle Anders, M.A.Sc., P.Eng
Project Manager, EA Coordinator
GM BluePlan Engineering Ltd.
410 Lewis Road, Unit 18
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danielle.anders@gmblueplan.ca

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Project Manager
City of Niagara Falls
4310 Queen Street
Niagara Falls, ON L2E 6X5
905-356-7521 ext. 6206
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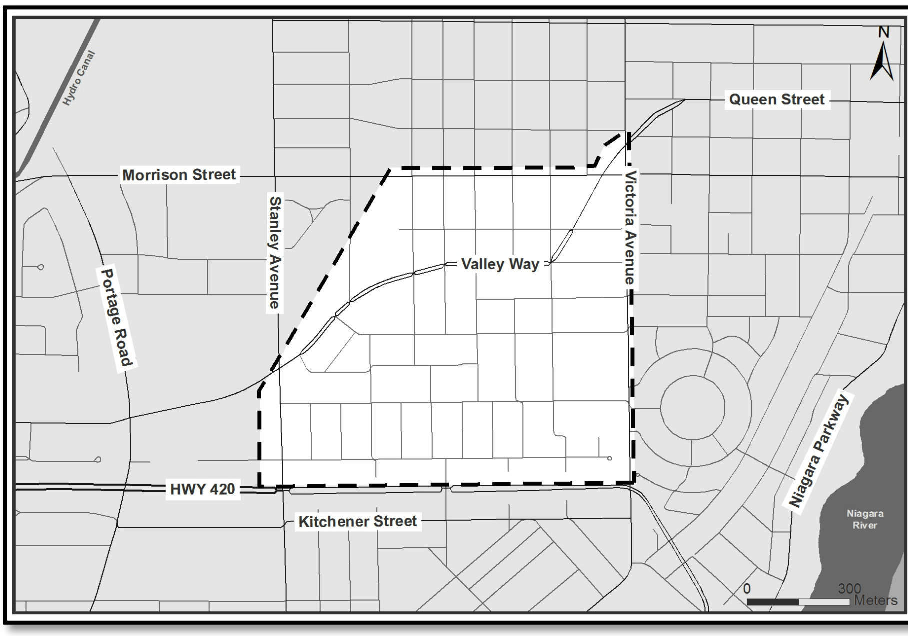
NiagaraFalls
CANADA

NOTICE OF PUBLIC INFORMATION CENTRE #2
VALLEY WAY DRAINAGE ENVIRONMENTAL ASSESSMENT STUDY

What is the Valley Way Drainage Environmental Assessment Update Study?

The City of Niagara Falls is undertaking an Environmental Assessment Study for the Valley Way Drainage area. The study will review current sewer system capacity and examine the alternative solutions and conceptual designs recommended to augment flooding concerns for this area.

What is the process?



The Valley Way Drainage Environmental Assessment Study will follow the Municipal Engineers Association (MEA) Municipal Class Environmental Assessment (Oct 2000, as Amended in 2007, 2011 and 2015).

This Class EA will be filed as a Schedule C, based on the Master Drainage Study (MDPUS) recommendations. This process includes public and review agency consultation, evaluation of alternatives, impact assessment of proposed alternatives, and identification of measures to mitigate adverse impacts.

This study will also satisfy the Niagara Region Water and Wastewater Master Servicing Plan (MSP), and the Niagara Falls Pollution Prevention and Control Plan (PPCP).

How do I get involved?

The City of Niagara Falls encourages the public and stakeholders to participate in this planning process. At our last Public Information Centre (PIC) in April 2019, we presented an overview of the work completed, including potential servicing alternatives. At our next PIC we will present the evaluation of servicing alternatives and the selection of the preferred alternative.

In response to the COVID-19 situation, this PIC will be held as a virtual PIC. All content and instructions on how to submit questions will be posted on the project webpage.

https://letstalk.niagarafalls.ca/

PIC Boards and a video walkthrough of their content will be posted on **August 7, 2020 at 3:00 PM**. This will be followed up a two-week question submission period closing **August 21, 2020**. A Frequently Asked Questions (FAQ) document will be posted after this period on **August 24, 2020 at 3:00 PM**.

If you wish to submit comments or would like to be added to the project mailing list, please contact:

Danielle Anders, M.A.Sc., P.Eng
Project Manager, EA Coordinator
GM BluePlan Engineering Ltd.
410 Lewis Road, Unit 18
Stoney Creek, ON L8E 5Y7
905-643-6688 ext. 6210
Danielle.Anders@gmblueplan.ca

Joe Colasurdo
Project Manager
City of Niagara Falls
4310 Queen Street
Niagara Falls, ON L2E 6X5
905-356-7521 ext. 4359
jcolasurdo@niagarafalls.ca

All comments and information received from individuals, stakeholder groups and agencies regarding this project are being collected under the authority of the "Municipal Act" to assist the City of Niagara Falls in making a decision. Under the "Municipal Act", personal information such as name, asddress, telephone number, and property location that may be included in a submission becomes part of the public record.

This notice was first issued July 21, 2020.

Valley Way Drainage Study
Class C Environmental Assessment
Virtual Public Information Centre #2

Thank you for taking the time to fill out this comment form. Please email it to the one of the addresses below. Your input is important. Comments will become part of the public record with the exception of personal information.

1. How did you hear about this Public Information Event?

- ☐ Newspaper ad
- ☐ Personal letter or email
- ☐ Word of mouth
- ☐ Website
- ☐ Other ____

____

2. What was your main reason for attending the Public Information Event?

____

____

____

____

____

____

3. Did this Public Information Event meet your information needs?

- ☐ Yes
- ☐ Somewhat
- ☐ No

Please explain: ____

____

4. Do you have any additional information regarding the existing conditions that you would like to share with the project team?

____

____

____

____

5. Do you have any comments/concerns regarding the preferred alternative?

____

____

____

____

6. Do you have any concerns about the potential impacts the preferred alternative may have on adjacent properties?

____

____

____

____

7. Do you have any other questions or comments regarding this study?

____

____

____

____

If you would like to receive updates about the Valley Way Drainage Study, please provide your name and contact information:

Name: ____

Affiliation: ____

Address: ____

City/Province: ______________________________ Postal Code: ___________________________

Email: ____

Thank you for taking the time to fill out this comment form. For additional questions or concerns regarding this project, please contact:

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1266 South Service Rd, Unit C31
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905-356-7521 ext. 4359
jcolasurdo@niagarafalls.ca

WELCOME

Valley Way Drainage Study
Class C Environmental Assessment

August 7, 2020

Online Virtual PIC #2

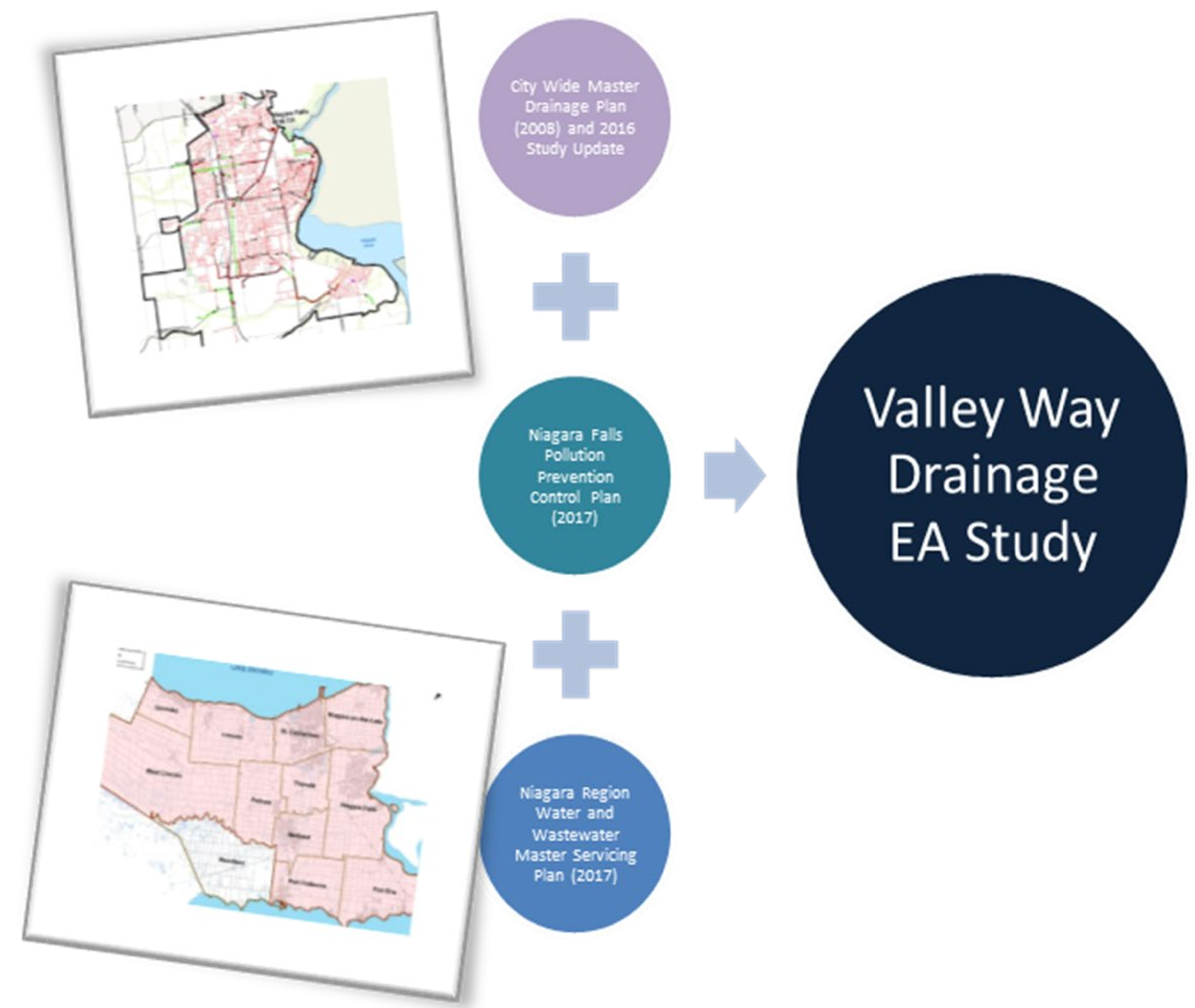
WHY ARE WE HERE?

The purpose of this Public Information Centre (PIC) is to:

- Provide background information on the Valley Way Drainage Study and Schedule C Class Environmental Assessment
- Provide information on the Municipal Class EA (MCEA) Process
- Provide an overview of work completed to date, including the evaluation of servicing alternatives and selection of the preferred alternative
- Engage residents living in the Valley Way area and solicit feedback on the approach and preferred solution
- Provide an opportunity for local residents and stakeholders to engage with the Project Team

PROJECT BACKGROUND

- The City of Niagara Falls is undertaking a Municipal Class Environmental Assessment to evaluate the sewer servicing in the area
- The need to address local flooding concerns and bottlenecks as outlined in the recommendations from the Master Drainage Plan Update Study (MDPUS), Master Servicing Plan (MSP) and Pollution Prevention Control Plan (PPC) Projects
- The preferred solution(s) must be mindful of system resiliency:
  - Basement & surface flooding
- Preferred design must recognize the risks to downstream infrastructure and lands
- Sustainable levels of service require sustainable designs that recognize hydraulic risks both within and outside of the area



PROJECT OBJECTIVES

To recommend solutions to improve the system capacity and reduce flooding concerns through the following:

- Quantify and verify the existing service capacity
- Assess and plan for the elimination of overflows
- Reduce or delay extraneous flows entering the system
- Improve conditions of the stormwater & wastewater collection system infrastructure
- Review and recommend innovative opportunities to address stormwater servicing limitations

MCEA PLANNING & DESIGN PROCESS

A Class Environmental Assessment is a decision making process that all municipalities in Ontario follow for building new infrastructure

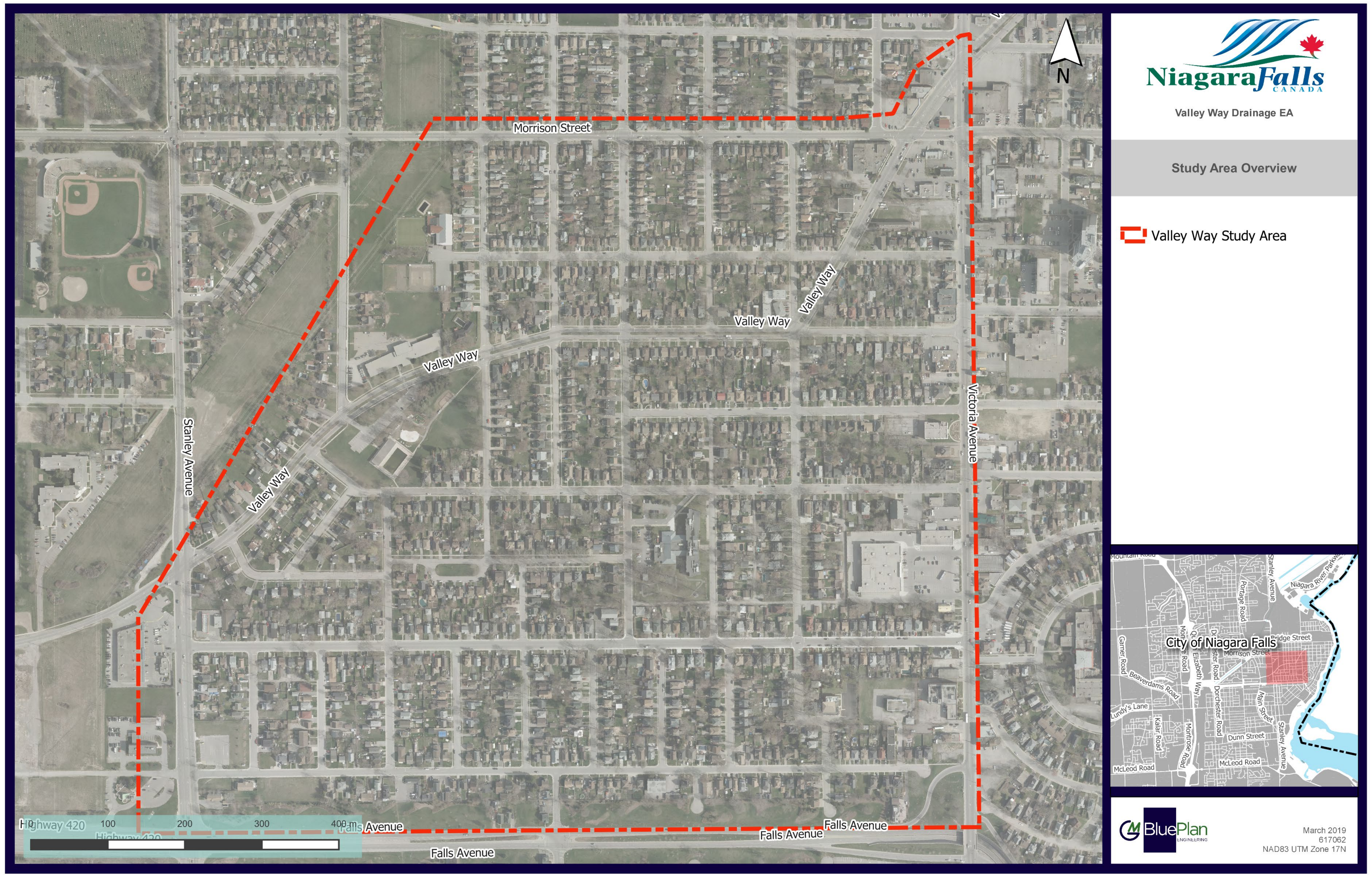
Phase 1: Problem/Opportunity	Phase 2: Alternative Solutions	Phase 3: Alternative Design	Phase 4: Environmental Study Report
Describe the problem and/or opportunity to be addressed by this project	Identify ways of solving the identified problem or addressing the opportunity and select a preferred solution	Identify alternative designs for the preferred solution and select a preferred design	Complete Environmental Study Report to be made public and distribute Notice of Completion

All elements being reviewed are under a **Schedule C Municipal Class Environmental Assessment**

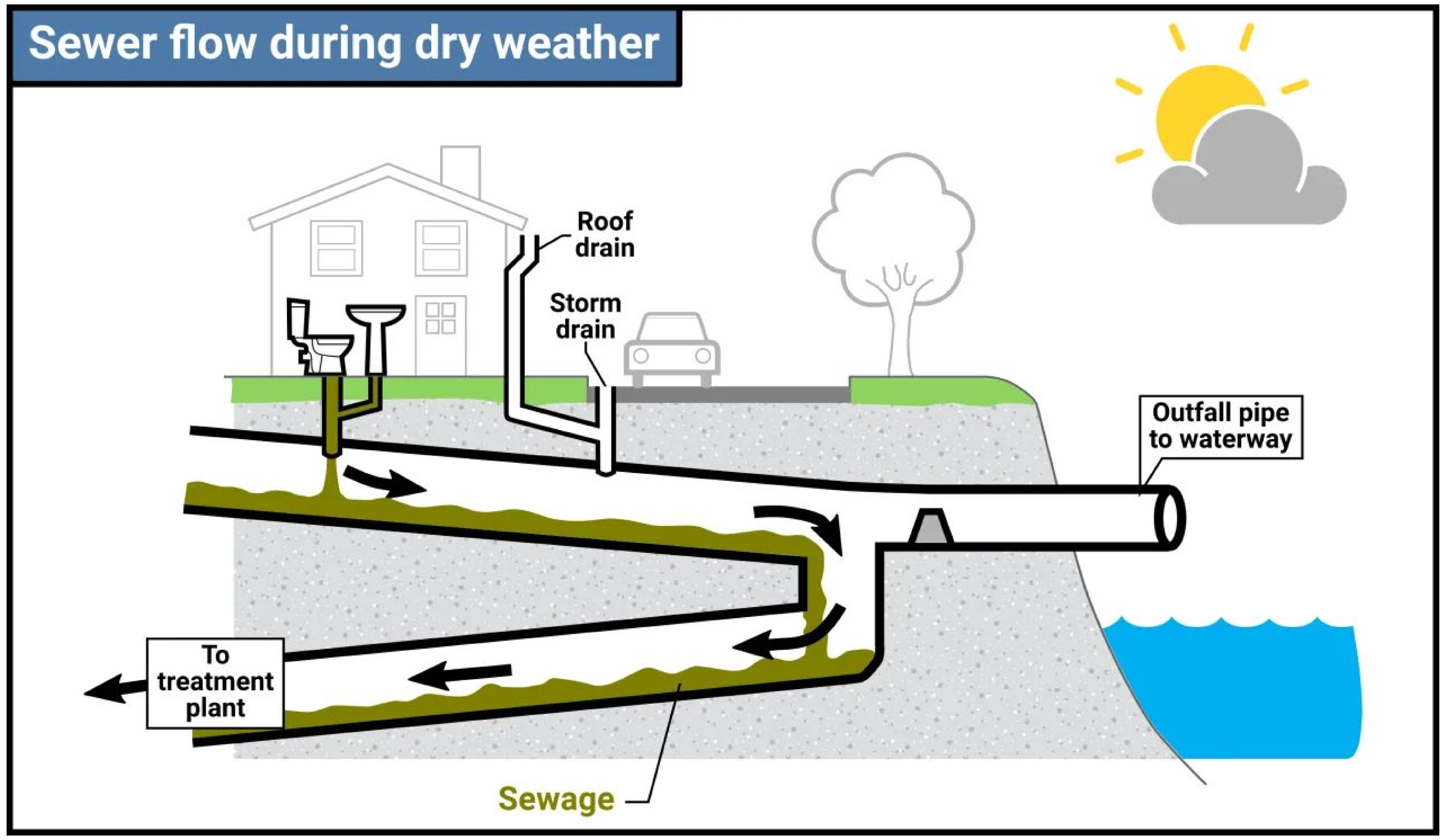
STUDY AREA OVERVIEW

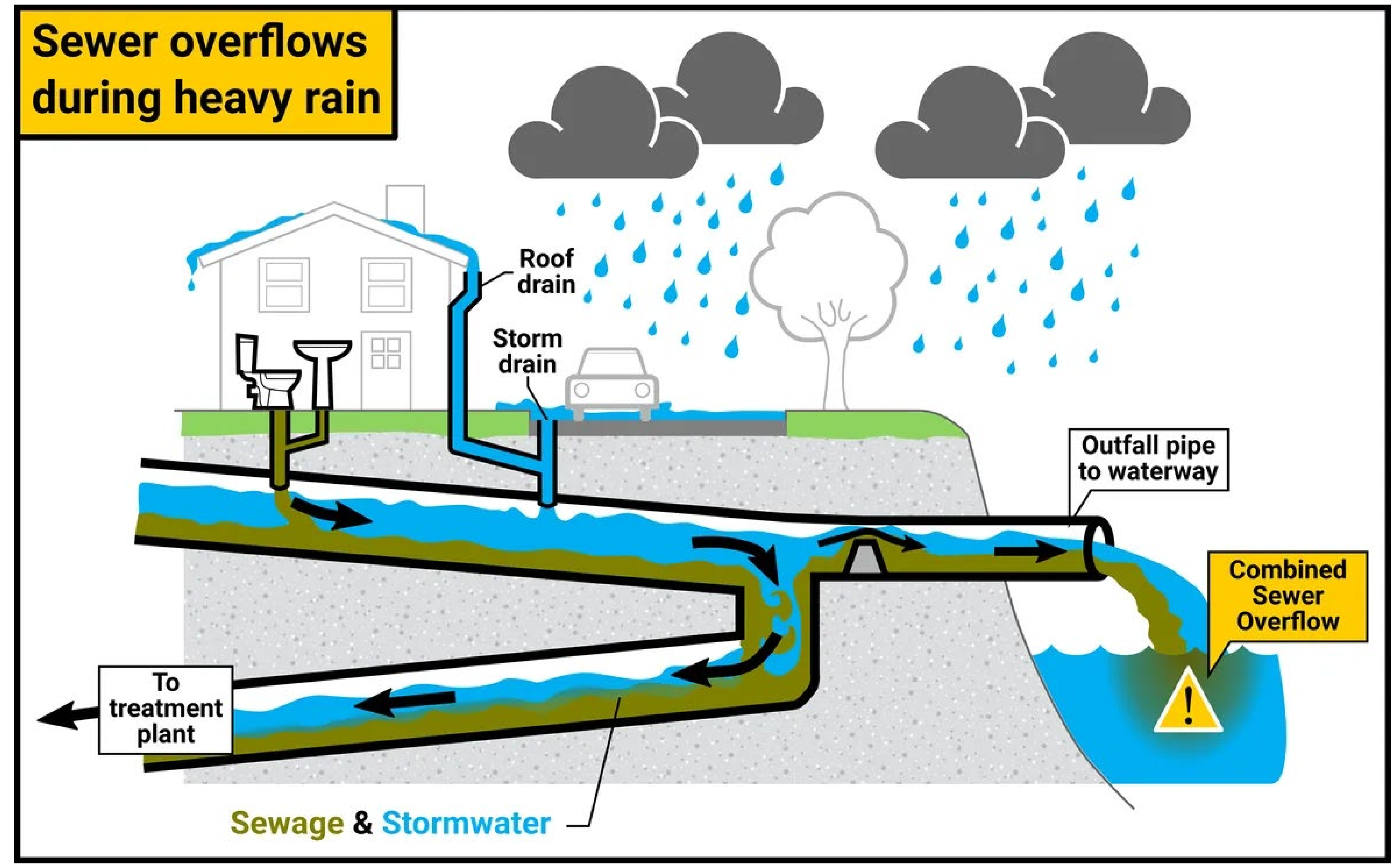
The Study Area is:

- Located in the City of Niagara Falls, within the Niagara Region
- Bound in the north by Morrison Street, south by McRae Street, east by Victoria Avenue and west by Stanley Avenue
- Comprised mainly of a **combined sewer system**
- The site of the old Muddy Run Creek, which was filled in around 1926



What is a Combined Sewer System?

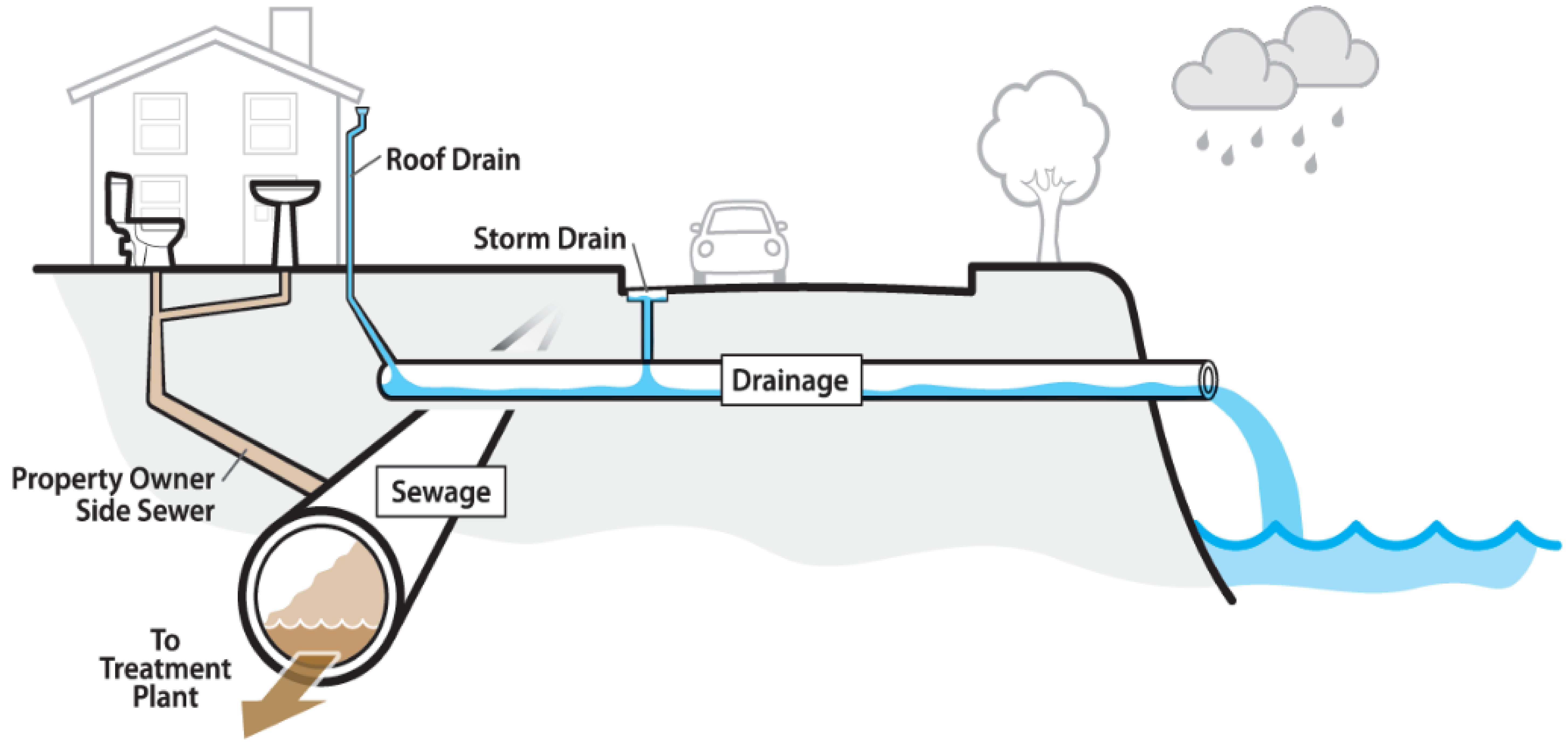




- In a combined sewer system, one pipe carries both sanitary and stormwater flow.
- During dry weather, sanitary flow is carried to the treatment plant.
- During heavy rainfall, the pipes overflow to a nearby waterway.

Images from https://ecoss.org

What is a Separate Sewer System?

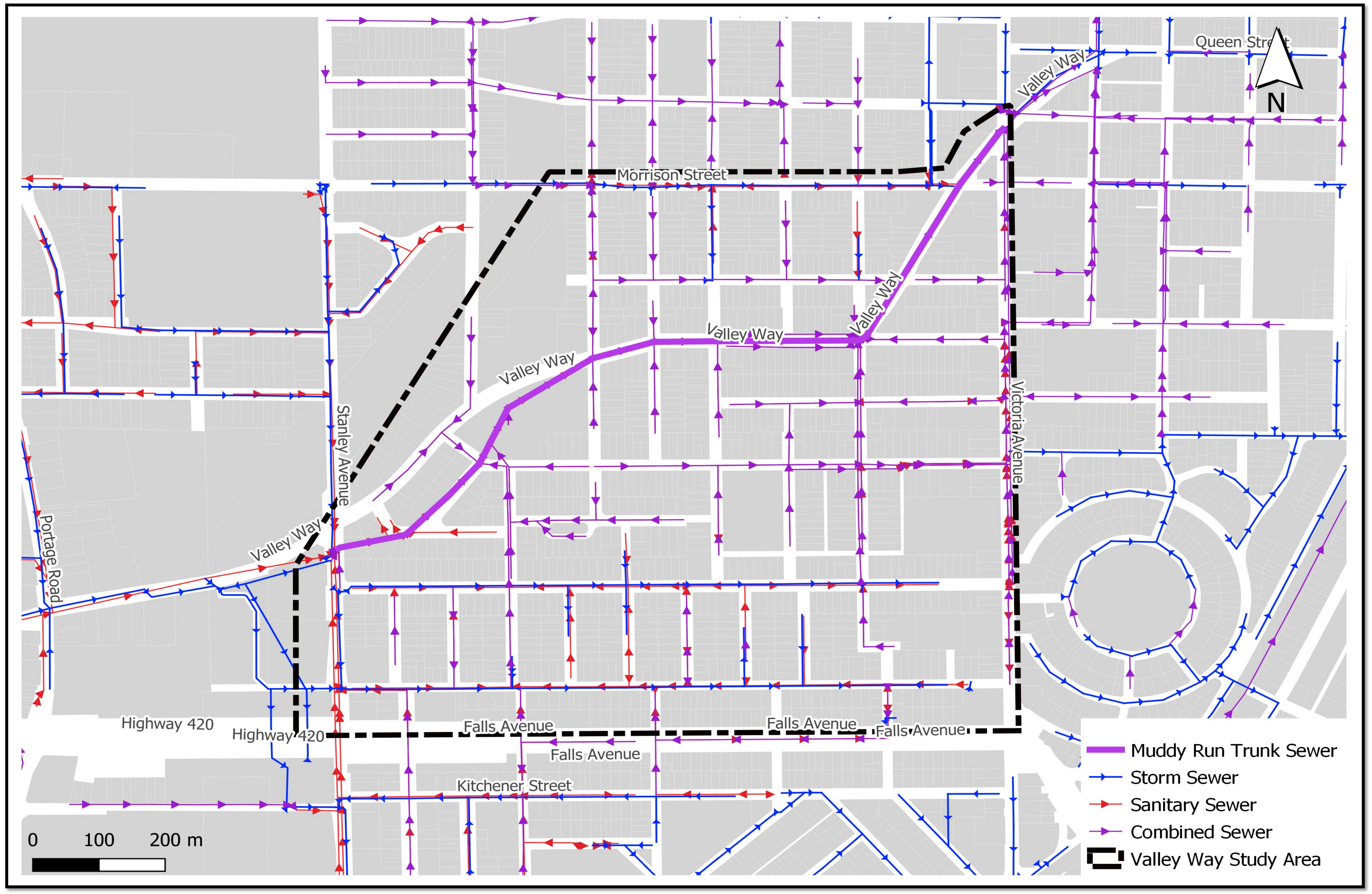


- In a separate sewer system, a sanitary sewer carries sanitary flow to the treatment plant.
- A storm sewer collects rainfall runoff and carries it to a nearby waterway.
- These sewers were built instead of combined sewer systems starting around the 1960s.

Image from https://www.seattle.gov

ALTERNATIVE 1 – DO NOTHING

- Would not reduce basement flooding, overflows or improve the condition of existing infrastructure.
- Infrastructure is in poor condition with pipes beyond their service life.
- High ground water contributes to local flooding issues (basement and surface).
- Fully developed area with mostly impermeable, poorly draining soil.

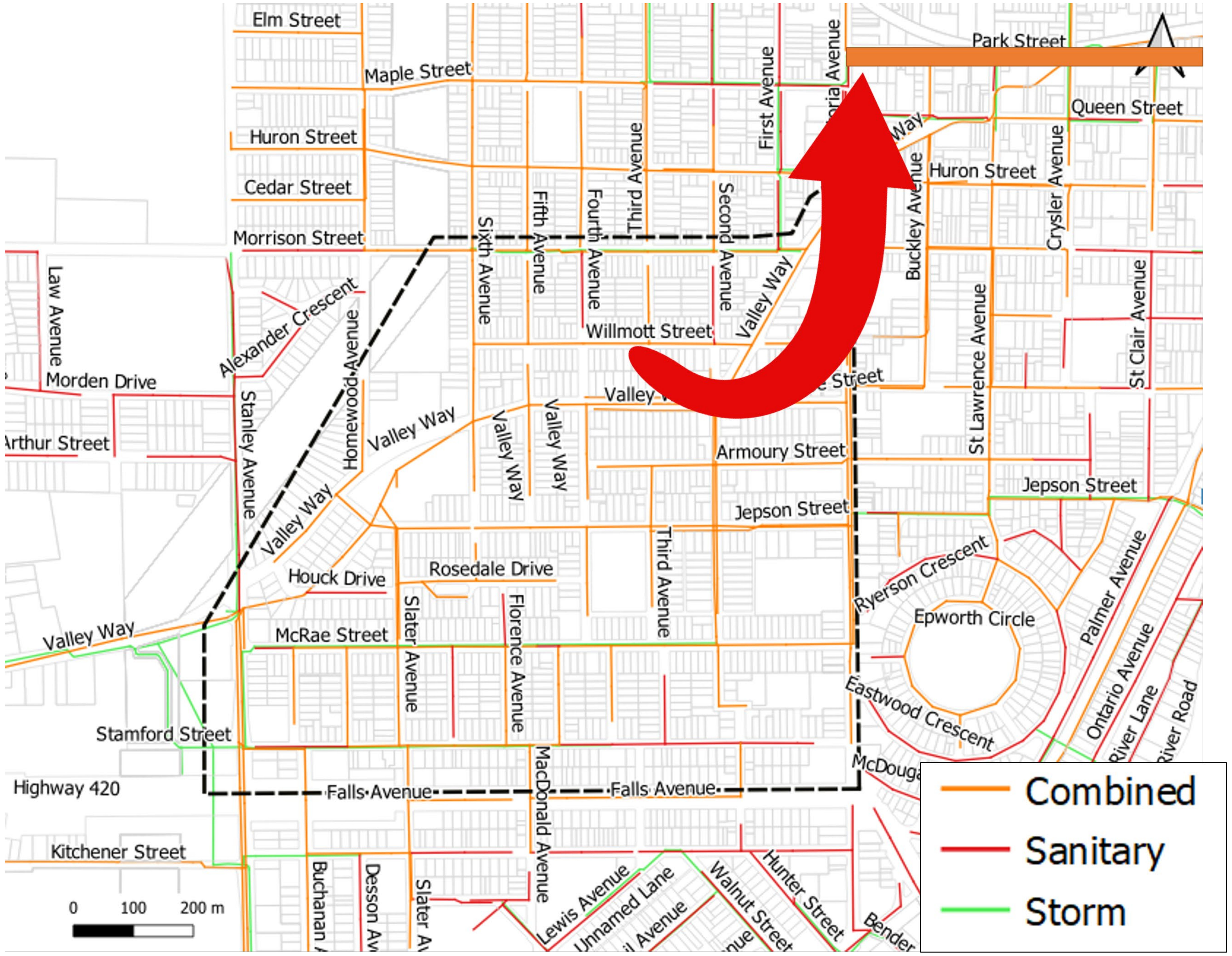


ALTERNATIVE 2 – SEWER SEPARATION – HYDRO DROP SHAFT

- **Sewer Separation with storm flow to the existing storm drop shaft:** involves the construction of new sewers including directing storm flow to a new trunk sewer towards the Hydro Drop Shaft located at Stanley Avenue and Valley Way.
- Requires continued coordination with Ontario Power Generation for construction approvals.
- Constructability a consideration
- Capacity a consideration

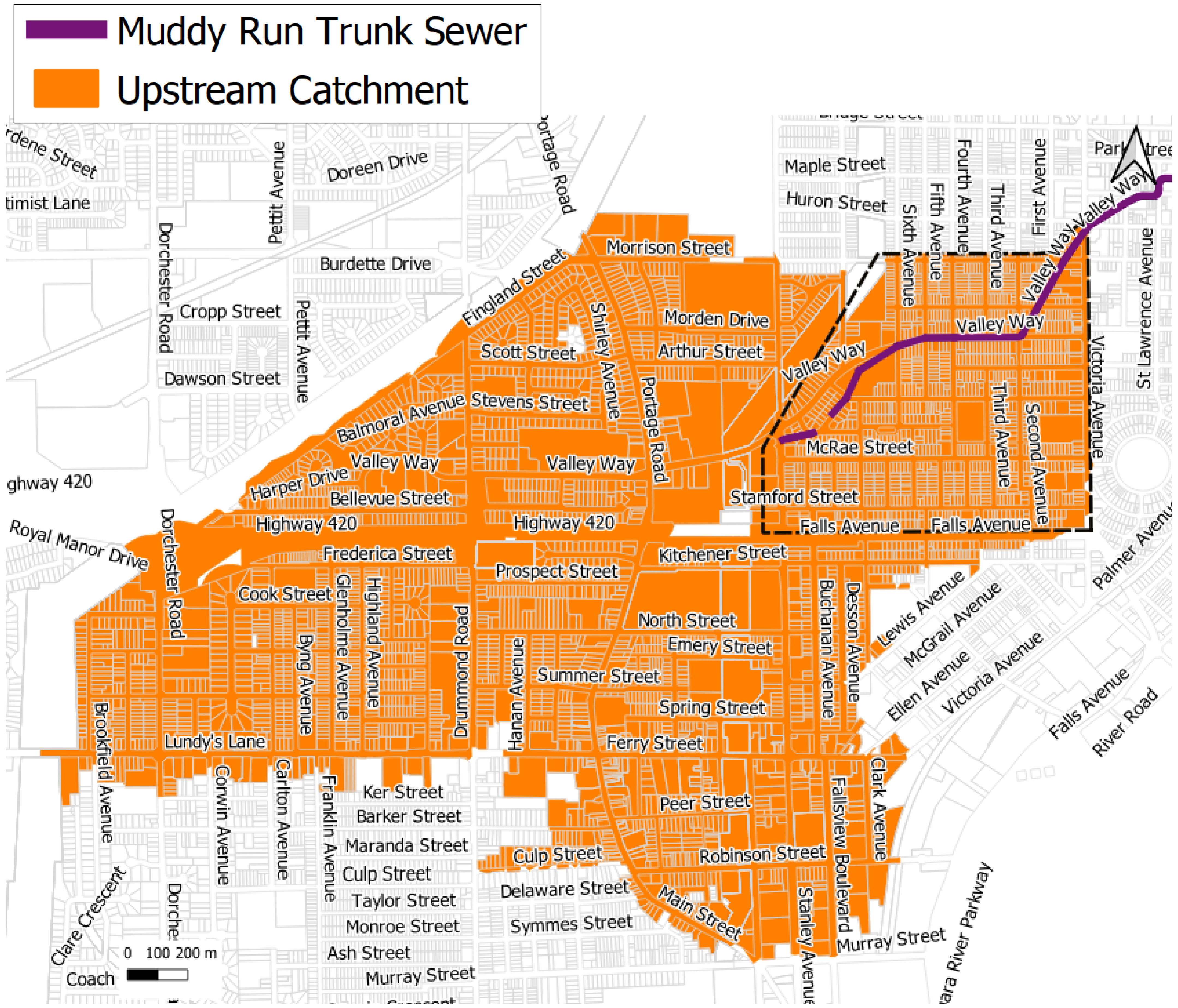
ALTERNATIVE 3 – SEWER SEPARATION – PARK STREET TRUNK STORM SEWER

- **Sewer Separation with storm flow to the Park Street Trunk Storm Sewer:** involves the construction of new sewers including directing storm flow towards the Park Street trunk storm sewer.
- Only addresses part of the study area due to capacity and topography limitations.
- Constructability a consideration
- Capacity a consideration



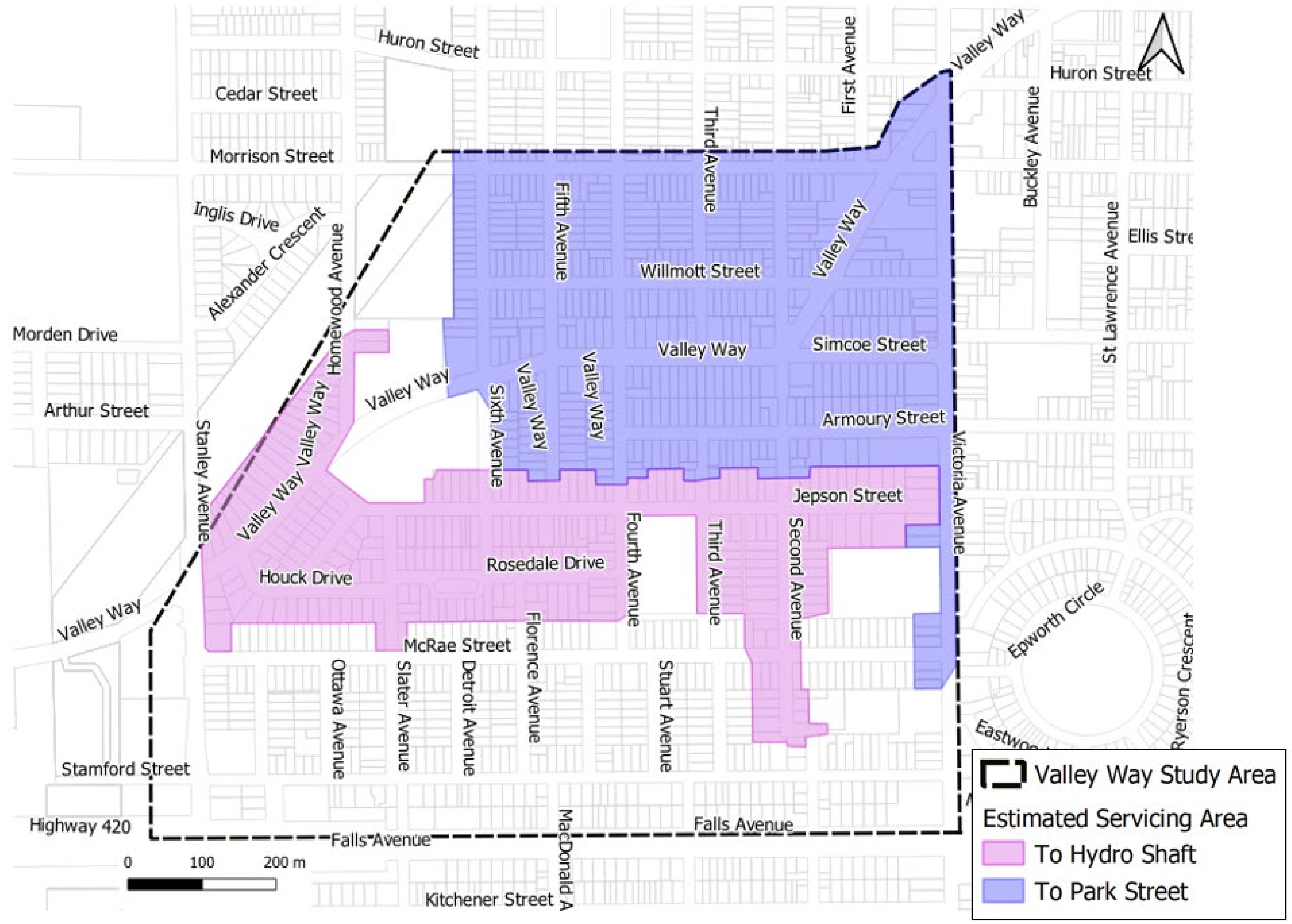
ALTERNATIVE 4 – SEWER SEPARATION – MUDDY RUN TRUNK

- **Sewer Separation using the existing Muddy Run Trunk Sewer as a storm sewer:** involves the construction of new sewers and conversion of the existing Muddy Run into a trunk storm sewer.
- Would require additional sewer separation in upstream catchment which would require additional approvals and study – timeline a consideration
- Age and condition of Muddy Run Sewer a consideration



ALTERNATIVE 5 – HYDRO DROP SHAFT & PARK STREET COMBINATION

- Based on preliminary evaluation, Alternative 5 was developed.
- This option is a combination of options 2 and 3 and involves construction of new storm sewers that would direct flow to the existing Drop Shaft and the Park Street Trunk Storm Sewer based on topography and capacity of both systems. The Valley Way trunk remains a combined sewer to convey upstream combined catchment.
- Provides a solution for the entire study area.
- Improves the condition of storm and sanitary sewers through replacement and new design of both systems.



EVALUATION CRITERIA

Environmental Impacts

- Proximity to Environmentally Sensitive Features

Social and Cultural Impacts

- Impacts to park experience
- Impacts on Heritage Properties
- Compatibility with current/planned land use and infrastructure

Evaluating the Options

With input from the public, key stakeholders and review agencies (Ministries), the project team developed criteria to evaluate the proposed alternatives.

Financial Impacts

- Construction Costs
- Maintenance Considerations

Constructability Impacts

- Ability to maintain or improve infrastructure condition and level of service
- Timing of constructability
- Resiliency of infrastructure

ALTERNATIVES EVALUATION

Alternative Routes	Cost	Environmental Impact	Social/ Cultural	Phasing/ Timing	Maintain or Improve Sanitary and Storm LOS	Improve Infrastructure Condition	Resiliency	Summary Score
1 - Do Nothing	🟢	🟢	🟡	🟢	🔴	🔴	🔴	✘
2 - Sewer Separation – Hydro Drop Shaft	🟡	🟢	🟢	🟢	🟡	🟡	🟢	▬
3 - Park Street Trunk Storm Sewer	🟡	🟢	🟢	🟢	🟡	🟡	🟢	▬
4 - Sewer Separation – Muddy Run Trunk	🔴	🟢	🔴	🔴	🟡	🟡	🔴	✘
5 - Hydro Drop Shaft & Park Street Combination	🟡	🟢	🟢	🟢	🟢	🟢	🟢	✓

Rank:

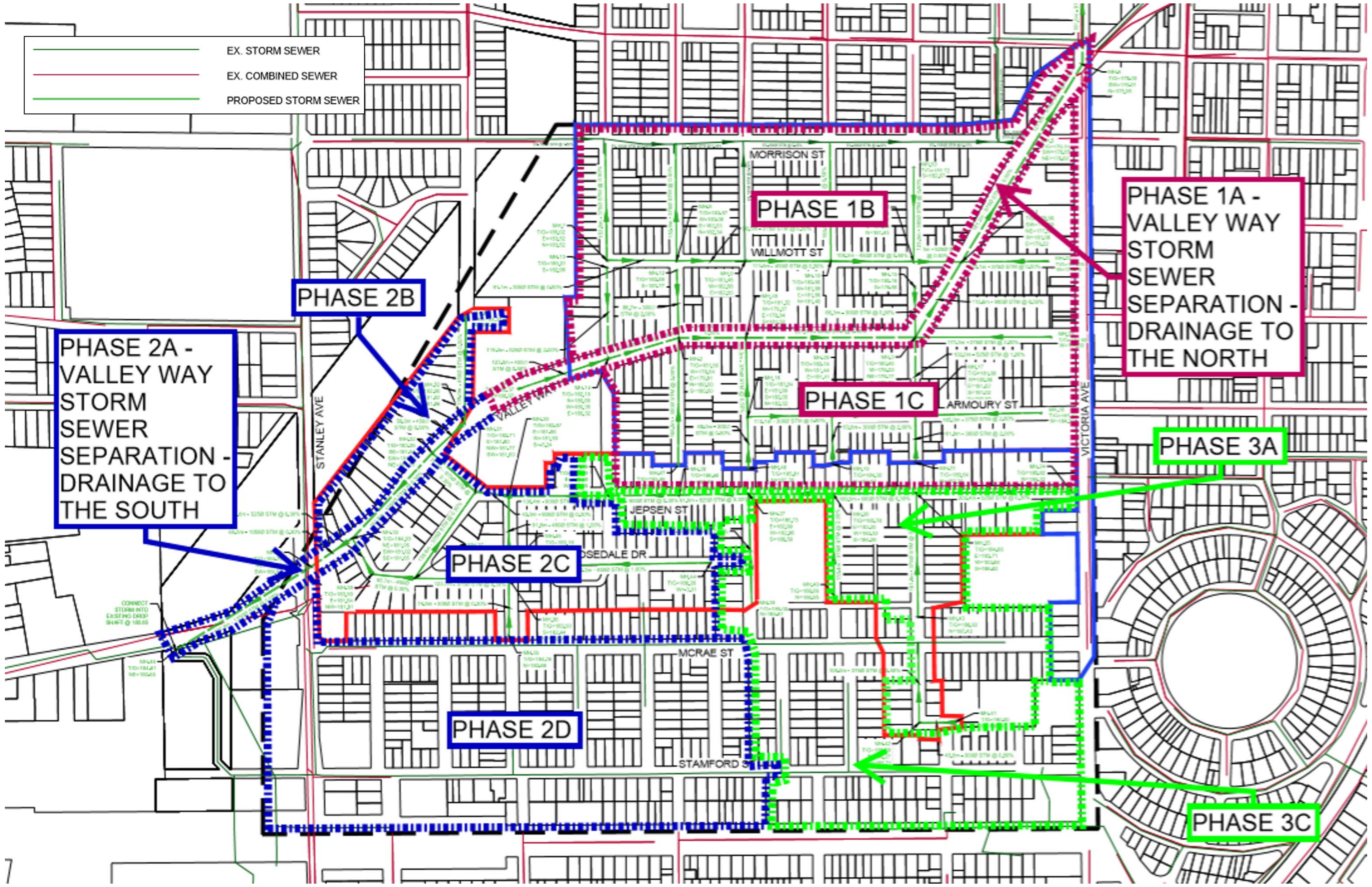
🟢 Most Preferable

🟡 Less Preferable

🔴 Least Preferable

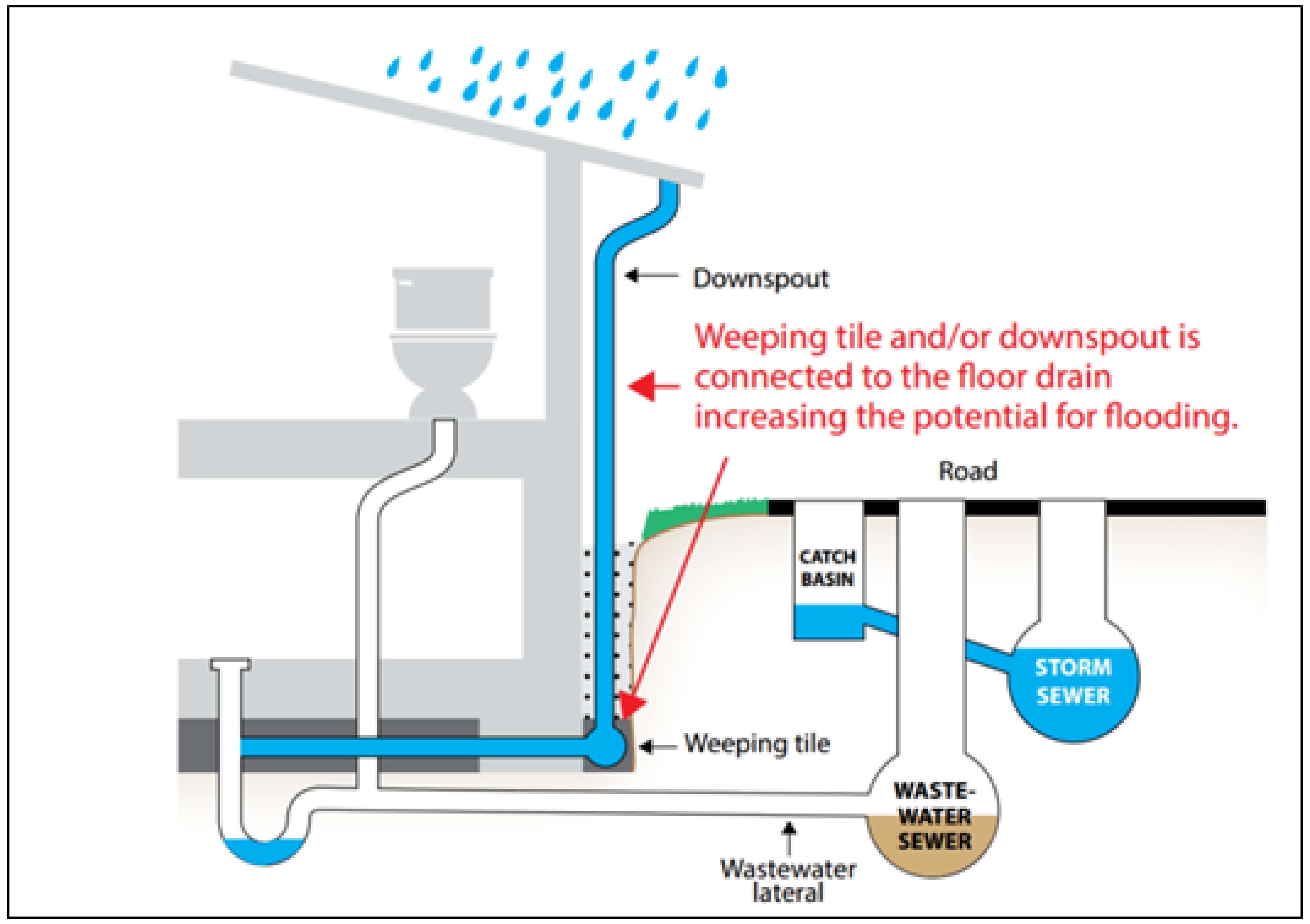
PREFERRED ALTERNATIVE

- Alternative 5 provides solutions for the entire study area
- Improves condition of sanitary and storm sewers to reduce potential for surface flooding
- Sewer separation will occur in phases. A potential scenario is illustrated here.

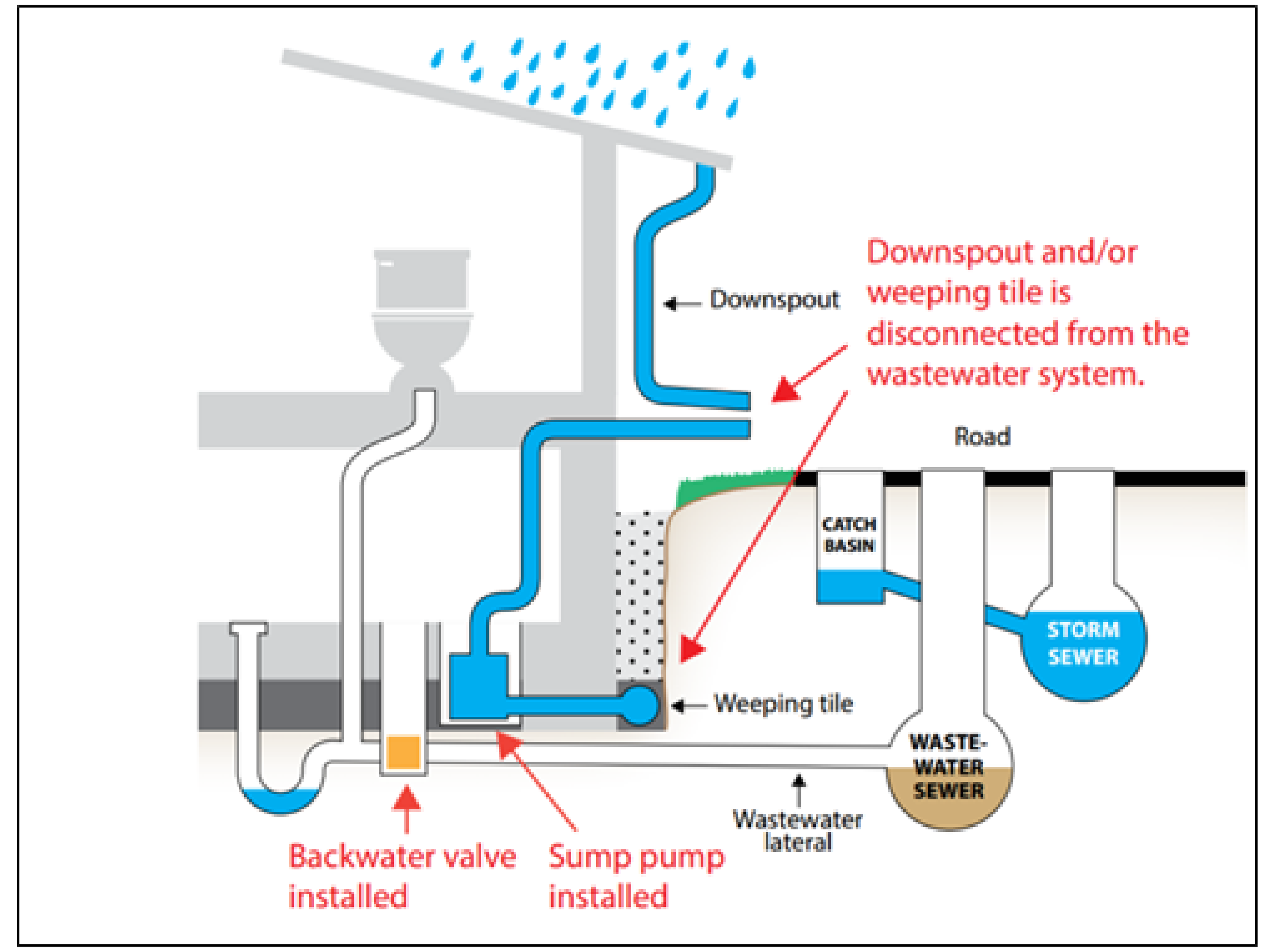


How to Reduce my Risk of Flooding?

Improper Drainage Configuration



Best Practice Configuration



As the combined system is converted to a separate system, each homeowner's drainage will need to be connected to the correct pipe system.

- Sanitary laterals will connect to a new sanitary sewer
- Foundation drains will drain to a sump pump which is directed to the ground surface or to a new storm sewer (Refer to City's Weeping-tile Removal Assistance Program (WRAP) and Bylaw No. 2010-61)
- Downspouts should discharge to the ground surface (City Bylaw No. 83-254)
- Installation of a backwater valve provides added protection against sanitary sewer backups (see WRAP details online).

Images from "A Guide to Flooding Prevention and Recovery", Halton Region

PROJECT TIMELINE

Notice of Commencement

Conduct background review & environmental inventories/field work

Develop and evaluate alternative design concepts & select preferred concept

Notice of Completion

Commence public & agency review

June 2018

April-December 2019

August 2020

September 2020

Ongoing Engagement & Consultation

Identify problem or opportunity statement

Identify and evaluate alternatives & preferred solution

Public Information Centre #1

Public Information Centre #2

Complete Environmental Study Report

NEXT STEPS

- ✓ Review questions and comments following this PIC
- ✓ Complete Environmental Study Report and commence 45-day public and agency review
- ✓ Following this study, the City will assess the timing for implementation of the preferred solution based on the budget and infrastructure planning process

GET INVOLVED!

Your feedback is important.

You have 2 weeks to submit feedback, visit www.niagarafalls.ca/notices for further details.

THANK YOU FOR ATTENDING!

- We appreciate the time you have taken to learn more about this Study. A two-week submission period is now open.
- Your feedback is important and we encourage you to stay connected!
  - By Mail – please print off the Comment Form PDF Print Version and mail to one of the addresses listed on the form
  - By Phone – please contact Joe Colasurdo at the City directly
  - By Email – complete online comment form submission

DANIELLE ANDERS, M.A.SC., P.ENG
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1266 SOUTH SERVICE ROAD, UNIT C31
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JOE COLASURDO
PROJECT MANAGER
CITY OF NIAGARA FALLS
4310 QUEEN STREET
NIAGARA FALLS, ON L2E 6X5
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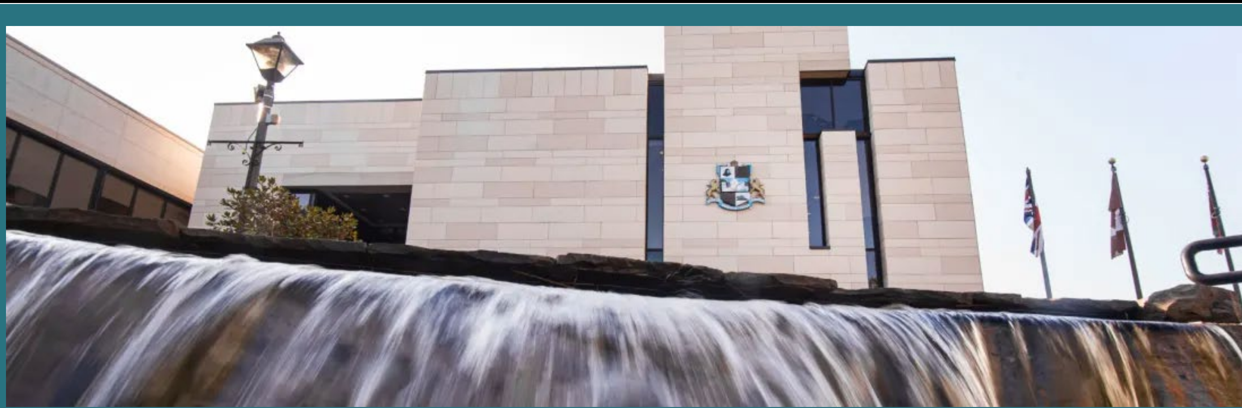

City of Niagara Falls

Valley Way Drainage Study Class C Environmental Assessment

Online Virtual PIC #2

Slide 1: Welcome – 00:0:00,00

Hello, this is the virtual PIC #2 for the Valley Way Drainage Study Class C Environmental for the City of Niagara Falls. My name is Danielle Anders and I will be narrating this slide show as a representative of GM BluePlan Engineering.

Slide 2: Why are We Here? – 00:0:18,00

The purpose of this Public Information Centre is to provide the background information of the Valley Way Drainage Study and Schedule C Class Environmental Assessment process. The information presented in this slide show will build on the information presented in Public Information Centre #1. It will provide information on the Municipal Class EA process and provide an overview of all the work completed to date, including the evaluation of servicing alternatives and selection of the preferred alternative. The purpose is to engage residents living in the Valley Way area of the City and solicit feedback on the approach and preferred alternative. We welcome all feedback and questions concerning this project. Further, is to provide an opportunity for local residents and stakeholders to engage with the Project Team as needed.

Slide 3: Project Background – 00:1:09,00

The City of Niagara Falls is undertaking a Municipal Class Environmental Assessment project for the Valley Way area to evaluate sewer servicing in this area. Currently the sewer servicing in the Valley Way area is a combined sewer system and there was a need to address local flooding concerns and bottlenecks as outlined in the recommendations of three previous studies: the Master Drainage Plan Update, Master Servicing Plan and the Pollution Prevention Control Plan projects. The City and GM BluePlan recognize that any preferred solution of this area must be mindful of the system's resiliency to basement and surface flooding as this has been an issue in the past. Any preferred design must recognize the risks to downstream infrastructure and lands. Sustainable levels of service require sustainable designs that recognize hydraulic risks both within and outside of the area.

Slide 4: Project Objectives 00:2:07,00

Five key project objectives were outlined at the beginning of the study so that all recommended solutions are designed to improve the system capacity and reduce flooding concerns in the area.

1. Quantify and verify the existing service capacity
2. Assess and plan for the elimination of overflows
3. Reduce or delay extraneous flows entering the system
4. Improve conditions of the stormwater & wastewater collection system infrastructure
5. Review and recommend innovative opportunities to address stormwater servicing limitations

As I move through the remaining slides and discuss the alternatives all five of these objectives will become clear.

Slide 5: MCEA Planning & Design Process 00:2:52,00

Slide 5 provides an overview of the MCEA Planning and Design process. A Class Environmental Assessment is a decision-making process that all municipalities in Ontario follow for building new infrastructure. The process has four phases. As the Valley Way project is a Schedule C Municipal Class Environmental Assessment all phases were completed.

Phase 1 identifies the problem or opportunity. The intention is Phase 1 is to describe the problem or opportunity to be addressed by the project.

Phase 2 is where the Project Team develops alternative solutions to addressing the problem. The key here is to identify ways of solving the identified problem or addressing the opportunity and selection of a preferred solution.

Phase 3 is alternative design. Under Phase 3, the Project Team identifies alternative designs for the preferred solution that was selected in Phase 2 and then the Project Team selects a preferred design.

Phase 4 is the completion of the Environmental Study Report. This Report includes all information and all work undertaken through Phases 1, 2 and 3 and summarizes everything into a document that is made public and distributed through a Notice of Completion.

Slide 6: Study Area Overview – 00:4:18,00

The Valley Way Study Area is located within the City of Niagara Falls, which is within the Niagara Region. As presented on the map with the red line, it is bound in the north by Morrison Street, south by McRae Street, east by Victoria Avenue and west by Stanley Avenue. The infrastructure within this study area is predominantly combined sewer system and is the site of the old Muddy Run Creek which was filled in approximately 1926. The Valley Way Street itself follows generally the path of the old Muddy Run Creek and beneath it lies a large trunk sewer called the Muddy Run Trunk which collects sanitary and stormwater from the study area.

Slide 7: What is a Combined Sewer System? – 00:5:03,00

As noted on the previous slide the Valley Way study area is comprised of mainly a combined sewer system. What is a combined sewer system? In a combined sewer system one pipe carries both sanitary and stormwater flow. During dry weather, sanitary flow is carried off to the treatment plant, generally without issue. The issue occurs during heavy rainfall when the capacity of the pipes is challenged by additional extraneous flow due to the heavy rain. Those additional flows overtake the sewer system and spill through an outfall pipe to waterways or in some cases back up into basements.

Slide 8: What is a Separate Sewer System? – 00:5:44,00

Prior to getting into discussion about the alternative solutions, I also wanted to discuss, in contrast to a combined system, what is a separate sewer system. In a separate sewer system, each street has two pipes. One that carries sanitary sewage to the treatment plant. A second pipe which collects rainfall runoff and carries it to a nearby waterway. As construction processes and procedures have changed over the years a move away from combined systems towards separate systems started around the 1960s. However, as we are aware, we have many cities with infrastructure older than 1960 and therefore combined sewer systems still exist today.

Slide 9: Alternative 1 – Do Nothing – 00:6:27,00

The next few slides will provide an overview of the alternative solutions that were put forward to address the concerns for the Valley Way area. These alternatives were presented in PIC #1 as well.

When one is completing an environmental assessment, it is common to also include, amongst other alternatives, an alternative that includes no changes to the existing system. Doing nothing in this case would not reduce flooding, basement overflows or improve the condition of the existing infrastructure. Existing infrastructure is in poor condition due to age and there are pipes in this area that are beyond their service life. High ground water in the Valley Way area contributes to local flooding issues (basement and surface) and those would not be addressed by not making any upgrades or changes to the system. This is a fully developed area existing for quite some time with almost impermeable, poorly draining soils as much of the soil in this area is clay.

Slide 10: Alternative 2 – Sewer Separation – Hydro Drop Shaft – 0:7:33,00

Alternative #2 is sewer separation with storm flow to the existing hydro drop shaft. As discussed in previous slides, the existing serviced area is comprised of a combined sewer system and alternatives for this project are looking at creating a separate sewer system. This alternative is suggesting sewer separation with storm flow going to an existing storm drop shaft which is indicated on the map by a blue dot. This involves the construction of new sewers as previously discussed including directing storm flow to a new trunk sewer towards the existing hydro drop shaft located at Stanley Avenue and Valley Way. This alternative requires continued coordination with Ontario Power Generation, as well as Hydro One, for construction approvals. However, a couple concerns or considerations for this alternative involves constructability. Getting all of the flow from this area and directing it all towards the hydro drop shaft is going to be an issue due to topography. Capacity of the hydro drop shaft is also a consideration.

Slide 11: Alternative 3 – Sewer Separation – Park Street Trunk Storm Sewer – 0:8:53,00

Alternative 3 considers sewer separation with storm flow being directed to the Park Street Trunk Storm sewer. This is an existing trunk sewer in the City. Sewer separation with storm flow to the Park Street trunk storm sewer involves construction of new sewers, including directing all storm flow towards the Park Street trunk storm sewer. This alternative only addresses part of the study area due to capacity and topography limitations. Constructability of moving all of the flow to Park Street is also a consideration as well as capacity of the Park Street sewer.

Slide 12: Alternative 4 – Sewer Separation – Muddy Run Trunk – 0:9:31,00

Alternative 4 is sewer separation utilizing the existing Muddy Run Trunk. Sewer Separation using the existing Muddy Run Trunk Sewer as a storm sewer involves the construction of new sewers on all the streets (storm and sanitary) and conversion of existing Muddy Run into a trunk storm sewer. The existing Muddy Run sewer follows the old creek alignment which essentially follows the Valley Way and is indicated in purple on the map. This would require additional sewer separation in the upstream catchment, indicated in orange on the map, which would require additional approvals and study which would critically impact the existing timeline. The age and condition of the existing Muddy Run Sewer is also a consideration, which would negatively impact this as a solution.

Slide 13: Alternative 5 – Hydro Drop Draft & Park Street Combination – 0:10:26,00

Alternative 5 considers two of the previous alternatives and combines them into one new alternative. That is utilizing the hydro drop shaft and Park Street as a combination. Based on preliminary evaluation, Alternative 5 was developed. Alternative 5 was not presented at PIC #1 as we were considering options separately at that time. This option is a combination of options 2 and 3 and involves construction of new storm sewers that would direct flow to the existing drop shaft and the Park Street trunk storm sewer based on the topography and capacity of both systems. This alternative eliminates those negative considerations in options 2 and 3 as it utilizes capacity available in both outlets as well as the topography of the system with not having to move all the water in one direction. The Valley Way Trunk remains a combined sewer to convey upstream combined catchment flow. This option provides a solution for the entire study area. It further improves the condition of storm and sanitary sewers through replacement and design of both systems.

Slide 14: Evaluation Criteria – 0:11:43,00

Since PIC #1 the study team has developed appropriate evaluation criteria to be able to determine which of the alternatives is the preferred solution. This slide represents the evaluation criteria considered.

Environmental impacts, in this case, proximity to Environmentally Sensitive Features was considered. Financial impacts, constructions costs of the alternatives as well as future maintenance considerations. Social and cultural impacts, impacts to existing park experience on the Valley Way, impacts on existing heritage properties and the compatibility of the alternatives with the current and planned land use and infrastructure. Constructability impacts, ability to maintain or improve infrastructure condition and level of service. No alternative suggested or selected should negatively impact the service the existing landowners are receiving. Timing of constructability and resiliency of infrastructure were also considered. The Project Team looked at these evaluation criteria as well as all input that was received from the public through PIC #1 and key stakeholders and review agencies, that include Ontario Power Generation, Hydro One and the Ministry of the Environment, Conservation and Parks.

Slide 15: Alternatives Evaluation – 0:13:19,00

This slide represents our alternatives evaluation considering the evaluation criteria presented on the previous slide, as well as all five alternatives. Green dots represent a most preferable option, yellow less preferable and red least preferable. As you can see, when evaluating all the alternatives and considering the summary score the alternative that comes out ahead is Alternative 5 which is a combination of utilizing the hydro drop shaft and Park Street combination.

Slide 16: Preferred Alternative – 0:13:57,00

As noted on the previous slide, through the evaluation and considerations Alternative 5 was selected and provides solutions for the entire study area. This solution improves condition of sanitary and storm sewers to reduce potential for surface flooding. And as this alternative will provide for sewer separation, the sewer separation would occur in phases with a potential scenario illustrated on this diagram.

Slide 17: How to Reduce my Risk of Flooding? – 0:14:27,00

As noted, our preferred solution includes separation of the existing combined sewer to a separated sewer. As the combined sewer is converted to a separate sewer in phases, each homeowner's drainage will need to be connected to the correct pipe system. Sanitary laterals will connect to a new sanitary sewer. Foundation drains will drain to a sump pump which is directed to the ground surface or to a new storm sewer. The City of Niagara Falls has existing programs to assist with evaluating foundation drainage and providing cost to upgrade foundation drainage around one's home. Please refer to the City's Weeping Removal Assistance Program (WRAP) and Bylaw No. 2010-61 for further information. Downspouts should discharge to the ground surface that's covered under City Bylaw No. 83-254. Installation of a backwater valve provides added protection against sanitary sewer backups. Installation of a backwater valve is covered under the City's WRAP program.

Slide 18: Project Timeline – 0:15:37,00

This project has been ongoing since June 2018 and with the completion of PIC #2 the Project Team will be completing the Environmental Study Report and posting it for public review. Anticipation of completion is September 2020.

Slide 19: Next Steps – 0:15:59,00

Following PIC #2, questions and comments will be received concerning PIC #2 materials for approximately 2 weeks. Following that, the Environmental Study Report will be completed and finalized and posted in the same location as these slides for 45 days such that the public and agencies can review and provide comments or questions as required. Once the 45-day review period is completed the EA will be finalized and following that the City will assess the timing for implementation of the preferred solution based on the budget and infrastructure planning process. The Project Team encourages all questions, concerns and comments throughout the process and prior to finalization of the EA. Your feedback is extremely important!

Slide 20: Thank You for Attending – 0:16:54,00

Thank you attending and listening to the narration of these slides. We appreciate the time you have taken to learn more about this study and as noted, a 2-week submission period is now open. Your feedback is extremely important, and we encourage you to stay connected with the project. By mail, you can print off the comment form PDF which is on the website and mail it to one of the addresses listed on the form. By phone, please feel free to contact Joe Colasurdo at the City directly. By email, you can complete the online comment form and submit that via email. Thank you for your time.

From:	Joe Colasurdo
To:	[redacted]
Cc:	Danielle Anders - GM BluePlan
Subject:	RE:
Date:	Tuesday, August 04, 2020 4:58:26 PM
Attachments:	Valley Way PIC #2 - Comment Form.pdf Valley Way PIC #2 - PIC Boards.pdf Fig 1-1 ValleyWayStudyArea.pdf Valley Way PIC#2 - Transcript.pdf

---

Hello [redacted]

Please see attached information which also be made available on the City's "Let's Talk" website page starting August 7th. Feel free to complete the attached comment form and mail it in or email it to me directly.
Thank you for your email and feel free to let me know if you have any questions.

Thank you,

Joe Colasurdo, C.E.T. | Project Manager | Municipal Works | City of Niagara Falls
4310 Queen Street | Niagara Falls, ON L2E 6X5 | (905) 356-7521 ext 4359 | Fax (289) 296-0048 |
jcolasurdo@niagarafalls.ca

From: [redacted]
Sent: Tuesday, August 04, 2020 2:01 PM
To: Joe Colasurdo <jcolasurdo@niagarafalls.ca>
Subject:

I would like to be added to the mailing list for the valleyway drainage assessment study.
Thank you
[redacted]

From: [redacted]
To: Joe Colasurdo
Subject: Re: new drainage system in downtown niagara falls
Date: Friday, August 07, 2020 4:29:18 PM

Thanks Joe
Please try your best to help me out.
I spent 100k on that duplex and want to keep the value.

Best Regards,

[redacted]

On Fri., Aug. 7, 2020, 2:55 p.m. Joe Colasurdo, <jcolasurdo@niagarafalls.ca> wrote:

> Hi [redacted],
>
> At this time I can't really promise that sidewalks will or will not be considered in that particular location. Sidewalks and bike lanes are typically considered during the design stages of each project. I believe the City does have a specific criteria that addresses sidewalk needs and I am confident that residents would be notified and provided the opportunity to comment or discuss potential options.
>
> I will also make note of your comments and try and confirm if this particular road section would even be considered for sidewalks in the future.
>
> Thank you,
>
> **Joe Colasurdo, C.E.T.** | Project Manager | Municipal Works | City of Niagara Falls
>
> 4310 Queen Street | Niagara Falls, ON L2E 6X5 | (905) 356-7521 ext 4359 | Fax (289) 296-0048 |
> jcolasurdo@niagarafalls.ca

From: [redacted]>
Sent: Friday, August 07, 2020 2:03 PM
To: Joe Colasurdo <jcolasurdo@niagarafalls.ca>
Cc: Danielle Anders - GM BluePlan <Danielle.Anders@gmblueplan.ca>
Subject: Re: new drainage system in downtown niagara falls

Hi Joe

Just wanted to ensure that no sidewalks are place in front of my property.

Can u help with this??

Best Regards,

[redacted]

On Fri., Aug. 7, 2020, 1:43 p.m. Joe Colasurdo, <jcolasurdo@niagarafalls.ca> wrote:

> Hello [redacted],
>
> Thank you for participating in the Valley Way EA PIC2. At this time we are in the preliminary stages and anticipate completing sewer design work in 2021 and/or 2022 pending budget approval. Having said that, I will be sure to include your comments regarding the potential for sidewalks and the concrete driveways. Typically when completing construction work that do affect driveways, replacement of the same material is standard practice.
>
> Hopefully this answers your questions but feel free to email should you have further questions related to the study.
>
> Thank you,

Joe Colasurdo, C.E.T. | Project Manager | Municipal Works | City of Niagara Falls

4310 Queen Street | Niagara Falls, ON L2E 6X5 | (905) 356-7521 ext 4359 | Fax (289) 296-0048 |
jcolasurdo@niagarafalls.ca

From: [redacted]>
Sent: Thursday, August 06, 2020 8:59 AM
To: Joe Colasurdo <jcolasurdo@niagarafalls.ca>
Subject: new drainage system in downtown niagara falls

Hi Joe

I own a rental property on 5066/5070 Third Ave in the center of the new drainage system. I put 2 new concrete driveways on the property so my tenants can park there. Please do not put sidewalks on the property cause if so there will not be enough room for parking for my tenants and my house value will drop in half. Also if my driveway needs to be removed for this project will you replace it same as before.

Please advise.

--

Best Regards,

[redacted]

[redacted] [redacted]

From: [redacted]
To: Danielle Anders - GM BluePlan; Joe Colasurdo
Subject: ValleyWay Drainage Environmental Assessment Study
Date: Wednesday, August 05, 2020 2:41:52 PM

Thank you for the information regarding the ValleyWay Drainage Environmental Assessment Study(Through the Notice of Public Information Centre#2 - Niagara Falls - Issued July 29th, 2020 Received on August 5th, 2020).

As invited - Please include me in your mailing list regarding the project.

[redacted]

mycity NIAGARA FALLS

NIAGARA FALLS NEWS

City Closures and Services During COVID-19

At the time of print, select services are available to the public at City Hall and the MacBain Community Centre.

Visit **niagarafalls.ca** for a list of services that require a scheduled appointment.

The Gale Centre remains open for pre-bookings only. The Niagara Falls History Museum is open. City of Niagara Falls staff remain available to assist and serve citizens online and over the phone during regular business hours. For details, please visit **niagarafalls.ca/covid19**

City Council Meetings

The next regular meeting of Council will be held electronically on **Tuesday, September 15, 2020.**

For live coverage, watch the live stream at: **niagarafalls.ca/council**

Senior Rebates

Applications available online until October 31st

Try our safe & simple contactless application process this year!

For more information visit **niagarafalls.ca**

Construction Notices & Closures

Garner Road Reconstruction

Garner Road closed from McLeod Road to Warren Woods Avenue Contract #2020-486-19

Oakes Park Improvements

Diamond #1 and the Grandstand will be closed from August 3rd to Spring 2021.

Learn more at **niagarafalls.ca/notices**

Now Recruiting Volunteer Firefighters in Niagara Falls

Interested candidates are highly encouraged to attend the information session on Thursday, September 3, 2020 from 7 p.m. to 8:30 p.m. at Station #6 (8037 Schisler Road). Advance registration is required by August 27, 2020. Learn more at **niagarafalls.ca/jobs**.

Niagara Falls Farmers Market Every Saturday 7 AM to 1 PM MacBain Centre

*Our first hour (7 AM to 8 AM) is reserved for seniors and essential workers. Thank you.

Follow **@nffarmermarket** on Instagram or on Facebook **@niagarafallsfarmermarket**

niagarafalls.ca/farmersmarket

Valley Way Area Residents & Property Owners: Virtual PIC

Local flooding and other drainage concerns have been identified in the Valley Way area as a top priority for the City. Take part in our virtual public information centre (PIC) to learn more about the issues, the preferred alternative, connect with our project team, share your concerns and ask questions.

This is the 2nd PIC in the Valley Way Drainage Study and it runs until August 21st, 2020 at **letstalk.niagarafalls.ca**

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Bid Opportunities

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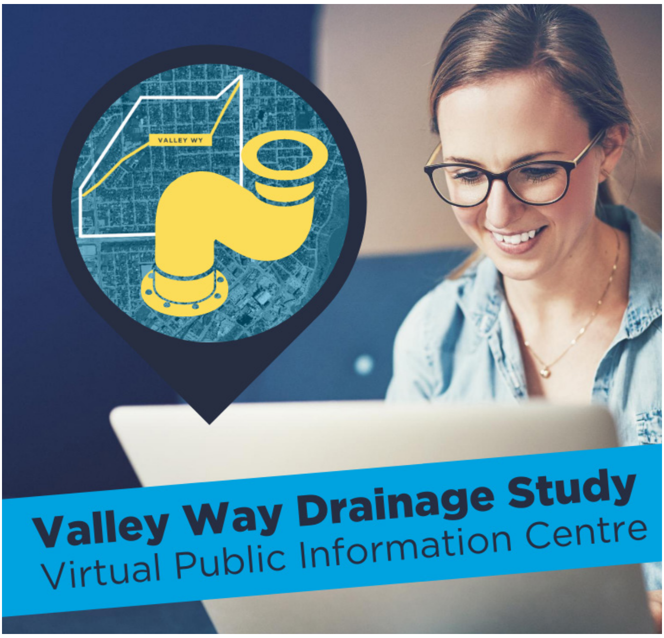

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Deadline August 21!
Valley Way Drainage Study
Virtual Public Information Centre

[City of Niagara Falls, Ontario, Canada - Government]

Let's talk drainage and flooding in the Valley Way area. Visit our virtual public information centre (PIC) to learn more, connect with our project team, share your concerns and ask questions. This is the 2nd PIC in the Valley Way Drainage Study and it runs until August 21st, 2020.

https://letstalk.niagarafalls.ca/valleyway-virtualpic

We're working with [GM BluePlan Engineering Limited]

LETSTALK.NIAGARAFALLS.CA

VWDS short promo 1

Learn More

- **Sharon Snyder** We've lived on homewood for 55 years and nothing has ever been done about ur flooding
- **Fab Thorpe Zaniol** Muddy run used to be a stream(quite fast in spring) that was the actual path of valleyway that is why there is so much flooding (back ups) in that area....
- **Virginia Hills** Cindy Haidon
- **Daniel Veysey** Ha! What till they build those houses on the old King George property. At least they will all have indoor pools, whether they want them or not
  - **Olive Royston** Daniel Veysey they are upgrading sewer system on present pumping station located on Bell Canada property On Gunning Drive first part of September. Have already inspected my house in case the heavy equipment may cause damage to my property.
  - **Maria Walsh** Olive Royston Take before pictures or they won't cover any damages cause you can't prove the damages were there before...take all foundation and basement walls...
  - **Mike Bright** Buyer beware, According to a 1910 Surveyors drawing there is an underground creek called Muddy Run that runs under Valley Way (St) from near Stanley Ave (Then known as the town line) to Vic Ave then north to the Whirl Pool.. Back 1910 ish the city (Township of Niagara) allowed the builder who was developing the 1st Ave to 6th Ave area to cover the creek over with a road with no drainage underneath. So there isn't a flood drainage system from McRea St downhill to and including Valley Way. Just

sewer lines. So all that rain water sinks to the bed rock and flows down hill to Valley Way. so even up on Jepson St you will get super saturated soil which will leak into your 110 +year old house. Been there done that ! Lived in the area for 60 +/- years 25 years on 5th between Jepson and Valley Way. So document everything Before and After with dates and witness signatures.

- **Mary Collee** Fix the roads.
- **Fab Thorpe Zaniol** Mary Collee doesnt matters it's a natural stream originally
- **Mary Collee** Fab Thorpe Zaniol Why poor money into meetings after meetings?
- **Fab Thorpe Zaniol** Mary Collee can't fight nature
- **Olwen Smith** Fab Thorpe Zaniol true... but the water pipes in the surrounding area have been replaced twice in my lifetime and yet Valleyway sits there with nothing at all being done. They need to at least replace the pipes.
- **Mary Collee** Olwen Smith Yes, why are so many meetings and so many different people involved in more meetings if it needs fixing fix it just get it done, don,t need a hoard of people sitting around wondering what and how to do it. Are they that stupid.
- **Olwen Smith** Mary Collee yes..i think they are
- **Mary Collee** Olwen Smith

- **Donna Boone** Lived quite near there when young(very long ago) .remember a flood up to my waist during a really heavy rain.
- **Eveline Theoret** What about Prospect st drainage problem we had a lake again on Saturday and my basement flooded again lived here now 41 years and nothing has been done to correct it WHY

Summary Report

01 July 2020 - 27 August 2020

Let's Talk Niagara Falls

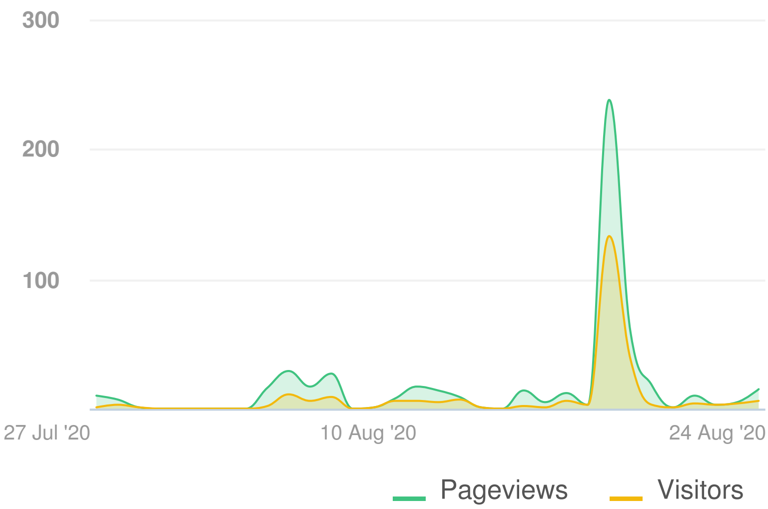
PROJECTS SELECTED: 1

Valley Way Drainage Study Class C Environmental Assessment

FULL LIST AT THE END OF THE REPORT

BANG THE TABLE engagementHQ

Visitors Summary



Highlights

TOTAL VISITS	MAX VISITORS PER DAY	NEW REGISTRATIONS
280	133	0

ENGAGED VISITORS	INFORMED VISITORS	AWARE VISITORS
3	67	239

ENGAGED

3 ENGAGED PARTICIPANTS

	Registered	Unverified	Anonymous
Contributed on Forums	0	0	0
Participated in Surveys	0	0	3
Contributed to Newsfeeds	0	0	0
Participated in Quick Polls	0	0	0
Posted on Guestbooks	0	0	0
Contributed to Stories	0	0	0
Asked Questions	0	0	0
Placed Pins on Places	0	0	0
Contributed to Ideas	0	0	0

** A single engaged participant can perform multiple actions*

	(%)
Valley Way Drainage Study ...	3 (1.3%)

** Calculated as a percentage of total visits to the Project*

INFORMED

AWARE

67 INFORMED PARTICIPANTS

	Participants
Viewed a video	12
Viewed a photo	3
Downloaded a document	32
Visited the Key Dates page	20
Visited an FAQ list Page	12
Visited Instagram Page	0
Visited Multiple Project Pages	61
Contributed to a tool (engaged)	3

** A single informed participant can perform multiple actions*

ENGAGED

INFORMED

AWARE

239 AWARE PARTICIPANTS

	Participants
Visited at least one Page	239

** Aware user could have also performed an Informed or Engaged Action*

Valley Way Drainage Study ...	239

** Total list of unique visitors to the project*

0	1	0	0	0	0	0	0
FORUM TOPICS	SURVEYS	NEWS FEEDS	QUICK POLLS	GUESTBOOKS	STORIES	Q&A'S	PLACES

4	3	3	1	1
DOCUMENTS	PHOTOS	VIDEOS	FAQS	KEY DATES

DOCUMENTS

4	Documents
32	Visitors
45	Downloads

TOP 3 DOCUMENTS BASED ON DOWNLOADS

22 Downloads	14 Downloads	6 Downloads
Presentation Boards	Map of Study Area	Comment Form

PHOTOS

3	Photos
3	Visitors
5	Views

TOP 3 PHOTOS BASED ON VIEWS

3 Views	1 Views	1 Views
Fig 2 Separate Sewer System	EZ-Flo Restrictor Plate in Catchbasin	Fig 1 Combined Sewer Operation During Heavy Rainfall

VIDEOS

3	Videos
12	Visitors
25	Views

TOP 3 VIDEOS BASED ON VIEWS

11 Views	8 Views	6 Views
Part 2 of 3: Alternatives - Danielle Anders (GM Blue Plan) walks you through the	Part 3 of 3: Alternatives Evaluation and Next Steps - Danielle Anders (GM Blue	Part 1 of 3: Introduction and Background - Danielle Anders (GM Blue Plan) walks you

TRAFFIC SOURCES OVERVIEW

REFERRER URL	Visits
m.facebook.com	118
t.co	14
l.facebook.com	11
www.facebook.com	7
www.google.com	6
instagram.com	1
mail.yahoo.com	1
us1.campaign-archive.com	1
www.101morefm.ca	1
www.bing.com	1

SELECTED PROJECTS - FULL LIST

PROJECT TITLE	AWARE	INFORMED	ENGAGED
Valley Way Drainage Study Class C Environmental Assessment	239	67	3

Survey Responses

01 July 2020 - 27 August 2020

Questions & Comments: Valley Way Drainage Study PIC #2

Let's Talk Niagara Falls

Project: Valley Way Drainage Study Class C Environmental Assessment

VISITORS
26

CONTRIBUTORS			RESPONSES		
3			3		
0 Registered	0 Unverified	3 Anonymous	0 Registered	0 Unverified	3 Anonymous

Respondent No: 1
Login: Anonymous
Email: n/a

Responded At: Aug 12, 2020 16:47:36 pm
Last Seen: Aug 12, 2020 16:47:36 pm
IP Address: n/a

Q1. **How did you hear about this Public Information Event?**

Personal letter or email

Q2. **Please describe how you heard about this event.**

not answered

Q3. **What was your main reason for attending the Public Information Event?**

To understand what is happening in my street and how it will affect my property .

Q4. **Did this Public Information Event meet your information needs?**

Yes

Q5. **Please explain**

not answered

Q6. **Do you have any additional information regarding the existing conditions that you would like to share with the project team?**

no

Q7. **Do you have any comments/concerns regarding the preferred alternative?**

No. I feel option is the best based on the videos

Q8. **Do you have any concerns about the potential impacts the preferred alternative may have on adjacent properties?**

No

Q9. **Do you have any other questions or comments regarding this study?**

It would be good to be transparent as to the cost of this work and how it might affect property taxes in the coming years (unless it is already budgeted for)

Q10. **Would you like to receive updates about the Valley Way Drainage Study?**

Yes, please email me.

Q11. **Please provide your name and affiliation (if any).**

desarmstrong75@gmail.com

Q12. **Please provide your email address.**

desarmstrong75@gmail.com

Q13. **Please provide your mailing address.**

not answered

Respondent No: 2
Login: Anonymous
Email: n/a

Responded At: Aug 16, 2020 18:05:42 pm
Last Seen: Aug 16, 2020 18:05:42 pm
IP Address: n/a

Q1. **How did you hear about this Public Information Event?**

Personal letter or email

Q2. **Please describe how you heard about this event.**

not answered

Q3. **What was your main reason for attending the Public Information Event?**

We had flooding major flooding in our basement twice. The first time was a sewer/storm issue. Back flow valve was put in. the second was a large amount of water which our insurance covered and at that time we put new weeping tile/sump pump with battery backup and fixed back flow valve. We can't handle a third time.

Q4. **Did this Public Information Event meet your information needs?**

Yes

Q5. **Please explain**

not answered

Q6. **Do you have any additional information regarding the existing conditions that you would like to share with the project team?**

I would really like to know how the new car wash is going to affect our flooding issues. It makes no sense to add even more grey water to our combined sewer/storm system. Years ago when the first casino was in place, I was concerned with where all the pee was going to go, then Gales opened and again more water and urine to the streets and now the car wash. Yes this issue needs to be fixed. Glad for the industry but it effects things.

Q7. **Do you have any comments/concerns regarding the preferred alternative?**

Number 5 looks like the best solution. My concern is ==I remember at the first meeting, there was talk of using valley way park area for a place for water to collect as there is a low area there. Is that off the table, My concern was misquitoes and too much water there as it's near a school.

Q8. **Do you have any concerns about the potential impacts the preferred alternative may have on adjacent properties?**

I don't know how it would affect adjacent properties.

Q9. **Do you have any other questions or comments regarding this study?**

Because of Covid, no money coming from the casino's. will that push back the start date of the project and by how long. are we talking months or years.

Q10. **Would you like to receive updates about the Valley Way Drainage Study?**

Yes, please send me a letter.

Q11. **Please provide your name and affiliation (if any).**

bstewart5@cogeco.ca

Q12. **Please provide your email address.** not answered

Q13. **Please provide your mailing address.**

4864 Second Avenue Niagara Falls ON L2E 4J1

Respondent No: 3
Login: Anonymous
Email: n/a

Responded At: Aug 20, 2020 19:18:38 pm
Last Seen: Aug 20, 2020 19:18:38 pm
IP Address: n/a

Q1. **How did you hear about this Public Information Event?**

Personal letter or email

Q2. **Please describe how you heard about this event.**

not answered

Q3. **What was your main reason for attending the Public Information Event?**

I live in this area of town and so it affects my prooerty

Q4. **Did this Public Information Event meet your information needs?**

Somewhat

Q5. **Please explain**

Would like to know when this would be done. My backyard is always very wet and mushy. It takes many times to flush the waste out of the toilet

Q6. **Do you have any additional information regarding the existing conditions that you would like to share with the project team?**

Just that my area is very wet

Q7. **Do you have any comments/concerns regarding the preferred alternative?**

not answered

Q8. **Do you have any concerns about the potential impacts the preferred alternative may have on adjacent properties?**

not answered

Q9. **Do you have any other questions or comments regarding this study?**

not answered

Q10. **Would you like to receive updates about the Valley Way Drainage Study?**

Yes, please email me.

Q11. **Please provide your name and affiliation (if any).**

cyndee_lu@yahoo.com

Q12. **Please provide your email address.**

cyndee_lu@yahoo.com

Q13. **Please provide your mailing address.**

not answered

APPENDIX C:
TECHNICAL DOCUMENTATION

Date:	5/10/2018	File: 617062	
To:	Guangli Zhang – City of Niagara Falls		
From:	Danielle Anders – GM BluePlan		
Project:	Valley Way Drainage Environmental Assessment		
Subject:	Technical Memorandum #1 – Existing Document Review and Summary		

TECHNICAL MEMO

1. INTRODUCTION

1.1 Project Scope

GM BluePlan (GMBP) has been retained by the City of Niagara Falls to develop a tactical plan to address localized flooding as well as sanitary and storm sewer conveyance issues in the Valley Way drainage area.

This study will review and quantify the current storm sewer capacity and recommend solutions to improve the system capacity in relation to flooding concerns through a phased implementation plan.

1.2 Memorandum Scope

This technical memorandum serves to provide an existing document review and summary of information received to-date.

This includes:

- Quality control and quality assurance of data received;
- Summary of background related information; and,
- Review of planning, policy, regulations and guidelines pertinent to the Pollution Prevention Control Plan (PPCP) process.

This memorandum is the first of several which will be prepared in support of the Valley Way Drainage Environmental Assessment (EA). The data summarized herein will be discussed with the Technical Steering Committee and form the basis of the system understanding and objectives moving forward.

2. RFP DATA COLLECTION

This section summarizes various sources used to support the baseline understanding for the Valley Way EA.

2.1 RFP Recommended Items for Review

The City of Niagara Falls (the City) recommended the review of the following wastewater and related infrastructure data:

- Existing sanitary and storm drainage area plans for the study area;
- Existing design spreadsheets;
- Existing sewer videos and CCTV inspections; and,
- Ortho imagery.

An initial review of drawings received from the City were generally compressive. Data gaps will be analyzed as a component of Valley Way EA's Technical Memorandum 2.

2.2 RFP Relevant Historic Reports

The following reports were recommended for review in the Valley Way EA's Request for Proposal. All reports were reviewed previously as part of the previous Pollution Prevention Control Plan (PPCP) project and form the baseline system understanding.

- City of Niagara Falls Flood Relief Study (1981)
- City of Niagara Falls Evaluation of Sewage Treatment Alternatives EA (1988)
- City of Niagara Falls Sewer System Analysis and CSO Abatement Study (1996)
- Downspout Disconnection Program – Voluntary Program to Remove Extraneous Flows from Sewer System (1998)
- City of Niagara Falls and Fort Erie Weeping Tile Monitoring Program (2007)
- Niagara Falls Pollution Control Plan (2008)
- City of Niagara Falls Flow Monitoring Program (2014)
- City of Niagara Falls Master Drainage Plan Update Study (2017)
- Niagara Falls Pollution Control Plan Update Study (2017)

GMBP has created a register of all historic reports that have been received through the course of several projects, such that requests for information are not duplicated going forward. A list of all documents is attached in Appendix A.

2.3 City of Niagara Falls Council Meetings

The studies summarized below were recently completed by the City and presented to Council. Both studies will be referenced during the Valley Way EA with special emphasis on results from the City Wide Master Drainage Plan Update Study, as outlined below:

2.3.1 City Wide Master Drainage Plan Update Study, (2017)

The City Wide Master Drainage Plan Update was presented to City of Niagara Falls Council Board on April 25, 2017.

The purpose of this study was to provide guidance and assessment of the City's storm water infrastructure. The study includes a discussion for the future consideration of new policies needed in anticipation of pending changes to the legislation affecting storm water quality and quantity management.

2.3.2 Niagara Falls Pollution Control Plan Update Study, (2017)

The Niagara Falls PPCP's Executive Summary was presented to City of Niagara Falls Council Board on June 13, 2017.

The purpose of this study was to provide recommendations aimed at reducing wastewater overflow volumes and limit environmental impacts in alignment with MOECC Regulatory Procedures pertaining to wastewater treatment, and to mitigate and reduce basement flooding risks, as well as accommodate future growth.

The outcome of this study was aimed at ensuring ongoing sustainability and operability of the City's wastewater infrastructure as well as fostering an environment of continuous improvement through the use of Customer Service Levels and Key Performance Indicators.

2.4 Data Inventory

The following sources will be incorporated into Technical Memorandum 2: Data Gap. This information will indicate modelling updates required within the study area, and similar, based on sufficient local information.

- Combined Sewer Areas
- CCTV Records
- Available As-Built Drawings
- Drainage Areas Plans

3. GUIDING DOCUMENTS

The City of Niagara Falls, as with all Ontario Municipalities, must operate within the administrative, legislative and financial frameworks established by senior levels of Government. The key Provincial and Federal initiatives, which provide directives and are considered within the Master Planning process, are summarized below.

3.1 Ministry Guidelines, Regulations and Legislation

3.1.1 Provincial Policy Statement

The Provincial Policy Statement (PPS)[1] provides policy direction on matters of provincial interest related to land use planning and development. As a key element of Ontario's policy-led planning system, the Provincial Policy Statement sets the policy foundation for regulating the development and use of land. It provides for appropriate development while protecting resources of Provincial interest, public health and safety, and the quality of the natural environment.

3.1.2 Places to Grow

The Places to Grow Growth Plan for the Greater Golden Horseshoe (2006) provides a 25-year framework for implementing the Province of Ontario's vision for managing growth to 2031. The plan was prepared under the Province's Place to Grow Act (2005) and includes several guiding principles. The Growth Plan has been amended twice since its release in 2006. The first amendment was released in January 2012 and contains new policies, schedules and definitions that apply in the Simcoe sub-area. The second amendment was released in June 2013 to update and extend the Growth Plan's vision, policies and population and employment forecasts to 2041 to help communities' better plan for growth and development in a sustainable way.

3.1.3 Planning Act, R.S.O.

The **Planning Act** (1990) establishes the rules for land use planning in Ontario. It describes how land uses may be controlled in communities. Changes to the planning

[1] Provincial Policy Statement. Ontario Ministry of Municipal Affairs and Housing, 2014.

system were introduced in 2006 by the **Planning and Conservation Land Statute Law Amendment Act**. Key changes are as follows:

- Municipalities must now update their Official Plan (OP) every five years, followed by an update of the accompanying zoning by-law within three years after the new Official Plan is in effect;
- There are more opportunities for public input before local decisions are made;
- Municipalities have enhanced ability to plan for a range and mix of housing types and densities; and
- Municipalities have final say on whether designated employment lands can be converted to other uses.

3.1.4 Bill 13, Sustainable Water and Wastewater Systems Improvement and Maintenance Act, 2010

Bill 13 enacts the Sustainable Water and Wastewater Systems Improvement and Maintenance Act, 2010 and repeals the Sustainable Water and Sewage Systems Act, 2002. Key elements of Bill 13 include:

- Establishes the purpose of the Act, which includes ensuring that public ownership of water services and wastewater services is maintained;
- Identifies the Ontario Water Board as an agent of the Crown and sets out the Board's objectives, powers and duties which relate to the regulation of water and wastewater services;
- Sets out the responsibilities of Municipalities or groups of Municipalities that are designated as regulated entities by regulation; and,
- Recommends that regulated entities prepare business plans for the provision of water services or wastewater services. The plan must contain, among other things, an assessment of the full cost of providing water or wastewater services to the public and a description of how the regulated entity intends to pay this full cost (full cost accounting).

3.1.5 Infrastructure for Jobs and Prosperity Act, 2015, S.O. 2015, c. 15

The purpose of this Act is to establish principles, evidence-based, and strategic long-term infrastructure planning that supports job opportunities, economic growth and protection of the environment, and incorporate design excellence into infrastructure planning.

3.1.6 Sustainable Water and Sewage Systems Act

The Ontario Government passed the *Sustainable Water and Sewage Systems Act* in 2002; however, it is not yet in force[2]. The Act makes it mandatory for Municipalities to assess the costs of providing water and sewage services and to recover the full cost of providing these services. All designated Municipalities that provide water and sewage conveyance services must prepare a full cost report and a cost recovery plan to be approved by the Minister of the Environment. It is expected that this requirement may lead to higher water rates and give Municipalities an incentive to promote conservation[3].

3.1.7 Water Opportunities and Conservation Act

The Ontario Government passed the *Water Opportunities and Conservation Act* in 2010. The Act requires that certain Municipalities, persons and entities prepare, approve and submit to the Minister of the Environment and Climate Change (MOECC) respective sustainability plans for Municipal water services, wastewater services and stormwater services under their jurisdiction. The Minister may establish performance indicators and targets for these services. The Act also authorizes the creation of regulations requiring public agencies to prepare water conservation plans, achieve water conservation targets, and consider technologies, services and practices that promote the efficient use of water while reducing impacts on Ontario's water resources.

3.1.8 Clean Water Act

The Clean Water Act was adopted in 2006. The purpose of the Act is to protect existing and future sources of drinking water[4].

3.1.9 CCME Setting Strategic Directions for Water

The Canadian Council of Ministers of the Environment's (CCME's) 2009 vision entitled "Setting Strategic Directions for Water" provides a framework for future actions and activities related to water, such that Canadians have access to clean, safe and sufficient water to meet their needs in ways that also maintain the integrity of ecosystems.

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[2] http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_02s29_e.htm. Accessed 14 August, 2017

[3] http://www.ecolawinfo.org/WaterFAQ-WaterFinancing.aspx#watfin04. Accessed 14 August, 2017

[4] http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_06c22_e.htm. Accessed 14 August, 2017

3.1.10 MOECC Guideline F-5:

"Levels of Treatment for Municipal and Private Sewage Treatment Works Discharging to Surface Waters".

This Guideline provides guidance to Municipalities on requirements for separate sanitary, partially separated and combined sewer systems.

Two MOECC procedures relevant to the City are as follows:

1. ***Procedure F-5-1:*** "Determination of Treatment Requirements for Municipal and Private Sewage Treatment Works Discharging to Surface Waters".

   This Procedure takes the approach that all sewage treatment works shall provide secondary treatment or equivalent as the "normal" level of treatment, unless individual receiving water assessment studies indicate the need for higher levels of treatment.

   Procedure F-5-1 also contains recommendations for sewage bypass from nominally separate systems.

2. ***Procedure F-5-5:*** "Determination of Treatment Requirements for Municipal and Private Combined and Partially Separated Sewer Systems".

   Procedure F-5-5 is normally applied to partially separated and combined sewer systems. F-5-5 allows for additional Combined Sewer Overflow (CSO) controls where there is a demonstrated impact.

3.1.11 MOECC PPCP Requirements:

To meet requirements of a Pollution Prevention and Control Plan (PPCP), as outlined by the MOECC, the following should be included:

- An outline of the nature, cause and extent of pollution problems;
- Alternatives and proposed remedial measures; and,
- Recommendations for an Implementation Program.

Where the pollution problem is due to a combination of sources, discharges will be investigated and prioritized based on the relevant significance of the various discharges. In some cases, receiving water quality and pollutant transport mechanisms will be assessed in the PPCP.

To address the impact of CSOs the PPCP shall include three (3) key components:

1. **Characterization of the combined sewer system (CSS);**

   "Monitoring, modelling and other appropriate means shall be used to characterize the CSS and the response of the CSS to precipitation events. The characterization shall include the determination of the location, frequency and volume of the CSOs as well as the concentrations and mass of pollutants resulting from CSOs. Through this process the existence and severity of suspected deficiencies will be confirmed."

   Records for the CSS should include:

   - Location and physical description of CSO outfalls in the collection system, emergency overflows at pumping stations, and bypass locations at Sewage Treatment Plants;
   - Location and identification of receiving water bodies for all combined sewer outfalls;
   - Combined sewer system flow and Sewage Treatment Plant (STP) treatment capacities; present and future expected peak flow rates during dry weather and wet weather;
   - Capacity of all regulators; and,
   - Location of cross-connections.

   Operational procedures shall be developed for combined sewer systems including the following:

   - Combined sewer maintenance programs; and,
   - Regulator inspection and maintenance programs.

2. **Examination of non-structural and structural CSO control alternatives**

This examination may include:

- Source control;
- Inflow/infiltration reduction;
- Operation and maintenance improvements;
- Control structure improvements; collection system improvements; storage technologies;
- Treatment technologies; and,
- Sewer separation.

3. **Implementation plan**
    - Includes cost estimates and schedule of all practice measures to eliminate dry weather overflows and minimize wet weather overflows; and,
    - Illustrate how minimum CSO prevention and control requirements and other criteria in this Procedure are being achieved.

3.2 Conservation Authority Regulation and Policy

The legislative mandate of the Conservation Authority, as set out in Section 20 of the Conservation Authorities Act, is to establish and undertake programs designed to further the conservation, restoration, development and management of natural resources.

Conservation Authorities are local agencies that protect and manage water and other natural resources at the watershed level. These agencies have a number of responsibilities and functions in the land use planning and development process.

The study area falls predominantly within the boundaries of Niagara Peninsula Conservation Authority (NPCA) watersheds. The NPCA function as a commenting agency on development applications under the Planning Act based on regulations approved by their Board of Directors and the province. These Conservation Authorities have agreements with partnering Municipalities to provide technical services regarding matters associated with natural heritage protection, hazardous land management and water resources (e.g., stormwater management).

In addition, Conservation Authorities have the delegated responsibility from the Ministries of Natural Resources and Municipal Affairs and Housing to implement Section 3.1

(Natural Hazards) of the Provincial Policy Statement (2014), consistent with the Provincial one-window planning initiative.

NPCA also administers Regulation 155/06 and Regulation 161/06, respectively, under Section 28 of the Conservation Authorities Act. In general, these regulations prohibit the alteration of a watercourse, wetland or shoreline, and prohibit development in areas adjacent to river and stream valleys, hazardous lands and wetlands, without the prior written approval from the Conservation Authority (i.e., issuance of a Permit (permit is issued by Municipality after approval by CA).

NPCA has a Level 2 agreement with Fisheries and Oceans Canada (DFO) to review projects under Section 35 of the Fisheries Act, which deals with management and protection of fish habitats.

3.3 Region of Niagara Policies

The Region of Niagara has documents relevant to the Valley Way EA study. These documents are listed below.

3.3.1 ***The 2016 Niagara Region Water and Wastewater Master Plan Update Study*****: Established a comprehensive list of general wastewater policies.**

The Region's MSP recommended capital projects for the City of Niagara can be found in Table 1 below. These projects include improvements to regional pumping stations and forcemains to address existing wet weather capacity issues and to support growth. Further highlighted in the MSP recommendation is dedicated allowance to address and reduce existing system wet weather flows.

3.3.2 ***Bylaw 47-2008:*** **Regulations for discharges to sanitary sewer systems.**

The Region of Niagara previously regulated discharges to its sanitary sewer systems through this sewer use By-Law. This By-Law restricted stormwater from roofs (via downspouts), foundation drains or lands from watercourse and uncontaminated water discharges to the sanitary sewer system.

Table 1. Niagara MSP Summary of Niagara Falls WWTP Capital Program

Master Plan ID	Project Name	Year in Service	Municipality	Project Type	Total Component Estimated Cost
WW-D-001	Decommissioning of Queenston Wastewater Treatment Plant	2022-2031	Niagara-on-the-Lake	Treatment	$1,979,000
WW-FM-006	New Black Horse Forcemain to Niagara Falls	2022-2031	Niagara Falls	Forcemain	$9,820,000
WW-FM-008	South Side High Lift conveyance	2022-2031	Niagara Falls	Sewer	$38,039,000
WW-FM-009	Dorchester Forcemain twinning	2022-2031	Niagara Falls	Forcemain	$303,000
WW-FM-010	St. David's #1 Forcemain twinning	2022-2031	Niagara-on-the-Lake	Forcemain	$3,923,000
WW-FM-012	New Queenston Forcemain	2022-2031	Niagara-on-the-Lake	Forcemain	$11,136,000
WW-II-012	Wet weather reduction in Central Niagara Falls	2022-2031	Niagara Falls	Wet Weather Reduction	$15,000,000
WW-II-013	Wet weather reduction in South Niagara Falls	2017-2021	Niagara Falls	Wet Weather Reduction	$15,000,000
WW-SPS-025	Garner Road Sewage Pumping Station Pump Replacement – Niagara Falls	2032-2041	Niagara Falls	Pumping	$824,000
WW-SPS-026	Dorchester SPS Pump Replacement – Niagara Falls	2022-2031	Niagara Falls	Pumping	$2,414,000
WW-SPS-028	Black Horse SPS Upgrades – South Niagara Falls	2022-2031	Thorold	Pumping	$4,620,000
WW-SPS-031	St. David's #2 SPS Expansion – Niagara Falls	2022-2031	Niagara-on-the-Lake	Pumping	$3,836,000
WW-SPS-032	St. David's #1 SPS Upgrade – Niagara Falls	2022-2031	Niagara-on-the-Lake	Pumping	$1,794,000
WW-SPS-039	Queenston SPS	2022-2031	Niagara-on-the-Lake	Treatment	$2,996,000
WW-TP-002	South Niagara Falls Wastewater Treatment Plant	2022-2031	Niagara Falls		$128,186,000

3.3.3 Combined Sewer Overflow Management Action Plan (2007)

With Council approval, the CSO Action Plan recognizes the joint responsibility of the Region and the Local Area Municipalities in reducing CSOs.

The Policy promotes implementation of the "best solution" for CSO control regardless of ownership and establishes the conditions for cost sharing between the Region and the Local Area Municipalities.

The Action Plan set the following CSO management targets:

- Compliance with MOECC Procedure F-5-5 requirements by 2022.
- Reduction of infiltration and inflow (I/I) including 100% disconnection of rainwater leaders by 2008, completion of foundation drain and sump pump disconnections in high volume areas by the end of 2015, and establishment of By-laws and incentive programs by the end of 2007.

3.4 City of Niagara Falls Capital Projects

Table 2 illustrates the Sanitary Sewer Capital Projects completed within the City from 2014 to 2022 (forecast). These projects show a state of good repair of existing sanitary sewers and storm sewers. These budget**s** were obtained from the City's website.

Table 2. City of Niagara's Planned Capital Projects

	Sanitary Sewer	Storm Sewer	Water
Year(s)	**Budget**		
2014	$1,366,360	$3,249,380	$5,222,644
2015	$5,395,935	$3,563,927	$3,692,716
2016	$3,972,903	$1,782,915	$2,341,118
2017-2021	$3,049,455	$2,856,875	$3,994,049

3.5 Municipal Comprehensive Review

The Municipal Comprehensive Review (MCR) examined priorities for growth and development over the next 25 years through to 2041 in-line with the *Ontario Places to Grow* targets. This helps identify where and how growth will be accommodated within the Region.

The tables below illustrate the City's population and employment growth projections. **Error! Reference source not found.** includes overall City growth, while **Error! Reference source not found.** illustrates individual Wastewater Treatment Plant growth.

Table 3. Niagara Falls Wastewater Treatment Plant Existing and Projected Services Population by Catchment

Catchment Area	2014	2021	2026	2031	2036	2041	Growth 2014 - 41
Niagara Falls Wastewater Treatment Plant	11,912	11,893	12,187	12,659	13,122	13,248	1,336
Bender Hill Sewage Pumping Station (SPS)	510	428	444	464	725	978	468
Calaguiro Estates SPS	530	539	541	545	545	547	17
Central SPS	16,942	17,157	17,298	17,554	19,582	21,336	4,394
Dorchester Road SPS	8,118	8,278	8,504	8,799	9,154	9,650	1,533
Drummond Road SPS	174	180	189	198	200	281	107
Garner Road South West	966	2,621	2,846	3,084	3,686	4,377	3,411
Grassy Brook SPS	612	1,742	4,112	6,544	7,984	8,439	7,827
Kalar Road SPS	10,326	9,951	10,227	10,567	10,672	10,996	671
Lundy's Lane SPS	1,985	2,505	2,803	3,114	3,259	3,415	1,431

Catchment Area	2014	2021	2026	2031	2036	2041	Growth 2014 - 41
Meadowvale SPS	43	51	55	56	56	57	14
Mewburn Road SPS	634	640	659	681	687	690	56
Muddy Run SPS New	606	588	591	598	1,583	1,965	1,360
Neighbourhood of St. David's SPS	253	258	258	260	261	261	8
Oakwood Drive SPS	0	2	5	8	9	9	8
Rolling Acres SPS	1,596	1,625	1,641	1,662	1,745	1,754	159
Royal Manor SPS	523	493	503	516	521	524	1
Seneca Street SPS	951	959	967	983	1,036	1,091	140
South Side High Lift SPS	21,784	22,729	23,990	25,367	26,793	28,169	6,385
South Side Low Lift SPS	7,214	9,148	11,128	14,057	14,985	15,730	8,516
St. David's #1 SPS	979	1,297	1,721	2,173	2,651	3,142	2,163
St. David's #2 SPS	387	513	680	859	1,048	1,242	855

Table 4. Niagara Falls Wastewater Treatment Plant Existing and Projected Services Employment by Catchment

Catchment	2014	2021	2026	2031	2036	2041	Growth 2014 - 41
Niagara Falls Wastewater Treatment Plant	4,459	5,171	5,426	5,633	5,813	6,239	1,780
Bender Hill Sewage Pumping Station (SPS)	11,130	11,854	11,985	12,112	12,226	12,453	1,324

Catchment	2014	2021	2026	2031	2036	2041	Growth 2014 - 41
Calaguiro Estates SPS	0	0	0	0	0	0	0
Central SPS	8,606	9,171	9,416	9,693	9,940	10,254	1,648
Dorchester Road SPS	3,252	3,460	3,529	3,628	3,740	3,873	620
Drummond Road SPS	603	639	656	673	692	715	112
Garner Road South West	1,290	1,474	1,522	1,610	1,661	1,781	491
Grassy Brook SPS	154	163	811	1,753	2,975	4,001	3,848
Kalar Road SPS	2,033	2,266	2,324	2,389	2,462	2,548	516
Lundy's Lane SPS	838	889	912	936	963	995	157
Meadowvale SPS	27	29	29	30	31	32	5
Mewburn Road SPS	54	168	167	207	252	304	250
Muddy Run SPS New	841	942	951	974	1,002	1,033	192
Neighbourhood of St. David's SPS	0	0	0	0	0	0	0
Oakwood Drive SPS	228	284	292	317	322	356	127
Rolling Acres SPS	177	188	192	197	203	210	33
Royal Manor SPS	393	417	428	439	452	467	74
Seneca Street SPS	288	305	313	321	331	342	54
South Side High Lift SPS	4,603	5,078	5,209	5,413	5,554	5,858	1,256
South Side Low Lift SPS	4,470	4,900	4,996	5,150	5,245	5,512	1,042
St. David's #1 SPS	242	276	287	290	295	303	61
St. David's #2 SPS	106	121	126	127	129	133	27
Total	43,793	47,793	49,572	51,895	54,289	57,409	13,615

4. FLOW MONITORING DATA COLLECTION

4.1 Flow Monitoring Site Investigation

As a part of the Valley Way EA, a comprehensive flow monitoring investigation will take place. This investigation includes the installation if four (4) flow monitors within the study area. The preferred sites have been selected by GM BluePlan stuff in conjunction with AMG, who are providing support for the monitoring portion of this study.

The City's monitoring locations can be found in Table 5 and Figure 1 below. The results of this flow monitoring investigation will be discussed in a future subsequent memorandum as the study progresses.

Table 5. Flow Monitoring Investigation Site Locations

Monitor Name	Manhole ID	Monitor Pipe ID
VW1_Houck	SMH_0230	SGM_03312
VW2_ParkingLot	SMH_00737	SGM_02721
VW3_Wilmott	SMH_00189	SGM_03303
VW4_ValleyWay	SMH_00189	SGM_03317

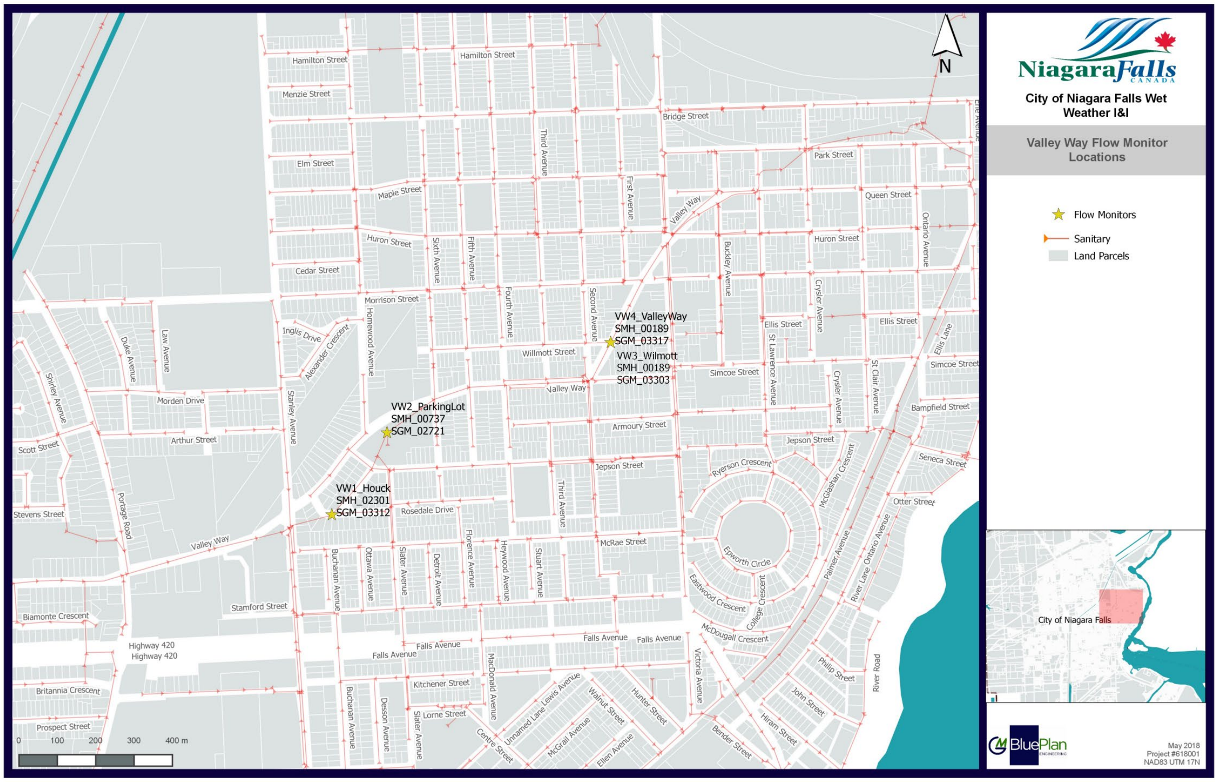


Figure 1 – Flow Monitoring Investigation Locations

5. ENVIRONMENTAL ASSESSMENT FRAMEWORK

A Master Plan is typically prepared on behalf of a Municipality, subject to approval by Council, but does not normally require approval under the Environmental Assessment Act (EAA). However, any specific project within a Master Plan must fulfill the Class Environmental Assessment (Class EA) requirements. At a minimum, Master Plans must address Phases 1 and 2 of the Class EA process.

The five phase Class EA planning process was developed by the Municipal Engineers Association (MEA), to simplify and streamline the EAA process. The five Phases are as follows:

- **Phase 1**: Problem and Opportunity Definition;
- **Phase 2**: Identification and Evaluation of Alternative Solutions to Determine a Preferred Solution;
- **Phase 3**: Examination of Alternative Methods of Implementation of the Preferred Solution;
- **Phase 4**: Documentation of the Class EA process in the form of an ESR; and,
- **Phase 5**: Implementation and Monitoring.

There are generally four approaches to undertaking Master Plans under the Class EA process. The Valley Way EA study is being undertaken to comply with Approach 1 of the Municipal Class EA Master Planning process. This approach involves the preparation of a Master Plan document at the conclusion of Phases 1 and 2 of the Class EA process, where the level of investigation, consultation, and analysis are sufficient to fulfill the requirements for Schedule A and A+ projects. In addition, Approach 1 provides the basis for future investigations for specific Schedule B and C projects.

5.1 Municipal Class Environmental Assessment Process

Ontario's EAA requires proponents to examine and document the environmental impacts and mitigation measures that could result from major projects or activities and their alternatives.

The EAA establishes the framework for a systematic, rational and replicable environmental planning process that is based on five key principles:

1. Consultation with affected parties;

2. Consideration of a reasonable range of alternatives;
3. Identification and consideration of the effects of each alternative on all aspects of the environment;
4. Systematic evaluation of alternatives in terms of their advantages and disadvantages, to determine their net environmental effects and proposed mitigation measures; and,
5. Provision of clear and complete documentation of the planning process to allow traceability of decision-making with respect to the project.

Projects subject to the Class EA process are classified into four schedules, which are outlined in the Class EA document, depending on the typical impact of similar projects.

- **Schedule A** projects are minor operation and maintenance activities. These projects are pre-approved and do not require further assessment;
- **Schedule A+** projects are similar to Schedule A undertakings; however, they require the public to be advised prior to project implementation;
- **Schedule B** projects must go through a screening process of alternatives for their environmental impacts as well as Phase 1 and Phase 2 of the Class EA planning process; and,
- **Schedule C** projects must satisfy all five phases of the Class EA process, and have the potential for more significant environmental impacts. Schedule C requires the completion of an Environmental Study Report (ESR) which is filed for public review.

- concise information to stakeholders at key stages of the study process; and,
- Solicit Community, Regulatory and City Staff input.

5.2 Public Consultation

Public consultation is an essential component of the Master Plan process, allowing the City to inform the public about the study and to solicit input from potentially interested and affected parties during the study process.

The Valley Way EA will hold two (2) separate Public Information Centre’s during the course of this undertaking, where comments can be received, reviewed and incorporated, as required, into the final Environmental Study report.

6. NEXT STEPS

The next immediate step for the Valley Way EA includes Technical Memorandum 2 which will review any data gaps with existing City data, completion of a CCTV assessment of the Muddy Run sewer and analyzing dry and wet weather data at all flow monitoring locations.

In addition to the above, initiating the Environmental Assessment process by posting a Notice of Commencement and holding Technical Steering Committee Meeting #1 will occur immediately.

APPENDIX A: DATA REGISTER

Project Number	Project	File Name	File Type	File Date	Location/Directory	Upload Date	File Description	Comments
617062	Niagara Falls Valley Way Drainage EA	Construction Drawings sewermain of adjacent streets (Plans and profiles)	Drawing	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\2017-11-01- background data\Construction Drawings\CC Eng drawings	January 2017 November 2017 January 2018 March 2018	Buckley Av, First Av, Huron Street, Maple Street, Morrison Street, Park Street, Queen Street, St. Lawrence Av, Valley Way and Victoria Av drawings	
617062	Niagara Falls Valley Way Drainage EA	Storm Drainage Plans	Drawing	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\2017-11-01- background data\Sewers\CA dwgs - Storm Drainage plans	November 2017	Morrison St, downtown area, First Av, Second Av and Bridge St	
617062	Niagara Falls Valley Way Drainage EA	Sanitary Drainage Plans	Drawing	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\2017-11-01- background data\Sewers\CB dwgs - San Drainage Plans	November 2017	Area SA-19-02, Morrison Street	
617062	Niagara Falls Valley Way Drainage EA	Sewer Map (for reference Only)	Drawing	No date	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\2017-11-01- background data\Sewers\Sewer Map (For Reference Only).pdf	November 2017	Valley Way from Morrison to St Lawrence Ave indicating sanitary and combines sewer	
617062	Niagara Falls Valley Way Drainage EA	Water (Plan 52)	Drawing	No date	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\2017-11-01- background data\Water\wa plan 52.pdf	November 2017	Valley Way Simcoe St to St Clair Av	
617062	Niagara Falls Valley Way Drainage EA	Geothecnical Desktop Study - Valley Way Drainage EA Study By: Amec Foster Wheeler	PDF Document	December 2017	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\2018-02-02 - amec report\TG173041_Vally Way Drainage_Prelim._Getechnical Desk Study_Dec. 8 2017_Final.pdf	February 2018		
617062	Niagara Falls Valley Way Drainage EA	Catch Basin Restrictor Plate 2018	Excel	N/A	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\Catch Basin Restrictor Plate 2018.xlsx	February 2018	Indicates: address, catch basin single or double, restrictor plate (Y/N) and restrictor plate descroption (square or outlet flap)	
617062	Niagara Falls Valley Way Drainage EA	Basement Flooding Valley Way	Excel	N/A	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\Requests_BasementFlooding_ValleyWy.xlsx	January 2018	Indicates: Request ID, Status, Caller, Category, location, issue, and operational area	Also saved on state of good repair
617062	Niagara Falls Valley Way Drainage EA	Overland Flooding Valley Way	Excel	N/A	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\Requests_OverlandFlooding_ValleyWy.xlsx	January 2018	Indicates: Request ID, Status, Caller, Category, location, issue, and operational area	Also saved on state of good repair
617026	Sinnicks CSO Study	Construction Drawings sewermain of adjacent streets (Plans and profiles)	Drawing	Various	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\Construction Drawings\CC Eng drawings	April 2017	Stanley Ave, Keith St, Vine Street, Coholan Street, Outfall details	
617026	Sinnicks CSO Study	CSO drawings	Drawing	Various	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\Drawings\Sinnicks CSO	September 2014 September 2016		Also saved in PPCP
617026	Sinnicks CSO Study	Project Intro	Powerpoint	No date	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\Drawings\ProjectIntro.pptx	March 2017	Process Flow Diagram and details of the different mains. Includes drawings	
617026	Sinnicks CSO Study	Flow Calculations	Excel	N/A	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\Drawings\FlowCalculations.xlsx	March 2017	Indicates: all the different pipes, the flow to mannings pipe and overflow volumes	
617026	Sinnicks CSO Study	Phytotoxicology Survey Report - General Abrasives - Niagara Falls 1990 and 1991 By: G. Vasiloff	PDF scan document	December 1993	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\general abrasives, background\phytotoxicologys00vasiuoft_bw.pdf	July 2017		
617026	Sinnicks CSO Study	Construction pictures	Pictures	N/A	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\general abrasives, background	July 2017		
617026	Sinnicks CSO Study	Survey Control Monuments	Scan documents	Various	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\Miscellaneous\Survey Control Monuments	April 2017		
617026	Sinnicks CSO Study	Reference Plans	Drawing	Various	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\Property Information\Reference Plans	April 2017	Stratford Lots 60 and 73, lot 28 plan 102	
617026	Sinnicks CSO Study	Registered Plans	Drawing	Various	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\Property Information\Registered Plans	April 2017	Stratford lot 60 plan 102 and 109	
617026	Sinnicks CSO Study	RR Railway Property	Drawing	No date	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\Property Information\RR Railway Property\20170309160127391.pdf	April 2017		
617026	Sinnicks CSO Study	Storm Drainage Plans	Drawing	Various	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\Sewers\CA Dwgs - Storm Drainage plans	April 2017	Includes details of Hawkings Creek Outfall	
617026	Sinnicks CSO Study	Sanitary Drinage Area	Drawing	Various	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\Sewers\CB Dwgs - San Drainage Plans	April 2017	Sinnicks Ave from Thorold Stone Rd to Vine St, and from Vine St to Atlas St	
617026	Sinnicks CSO Study	Tank Cleaning & Assessment - Sinnicks CSO Stanely Av and Thorold Stone Rd. By: PipeFlo and GMBP	PDF Document	July 2017	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\GM BLUEPLAN ENGINEERING LTD. REPORT.pdf	July 2017	PACP Inspection Report	
617026	Sinnicks CSO Study	Tank Cleaning & Assessment - Sinnicks CSO Stanely Av and Thorold Stone Rd. By: PipeFlo and GMBP	Video	July 2017	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\VIDEO	January 2018		There are also a few pictures Each folder has a report on each video
617017	WW System State of Good Repair	Routine Sewer Maintenance records and issues Log	PDF scan document	No date	W:\Hamilton\617000\617017 WW System State of Good Repair\Works In Progress\Received Items\isue areas and complaints listing.pdf	December 2017		
617017	WW System State of Good Repair	TV Inspection of Sewers Tender Contract	PDF Document	June 2010	W:\Hamilton\617000\617017 WW System State of Good Repair\Works In Progress\Received Items\Tender Document.pdf	December 2017		

617017	WW System State of Good Repair	TV Inspection of Sewer Tender Contract Summary	PDF Document	June 2010	W:\Hamilton\617000\617017 WW System State of Good Repair\Works In Progress\Received Items\Tender Summary.pdf	June 2010		
618008	Chippawa Flow Monitoring	Chippawa Sewer Flooding Relief Study EA - Final Recommendations MW-2010-63	PDF Document	December 2010	W:\Hamilton\618000\618008 Chippawa Flow Monitoring\MW-2010-63 - Chippawa Sewer Relief Study - Muncipal Class EA - FINAL.pdf	April 2018	Report to Council and indicates that recommendations were adopted in committee and ratified by City Council	
618008	Chippawa Flow Monitoring	Plans and Profile for Chippawa	Drawing	1950s, 1960s, 1980s	W:\Hamilton\618000\618008 Chippawa Flow Monitoring\3 Files Received\2018-02-01- Plans and profiles\Plan and profiles for chippawa flow meter alarm configuration	February 2018	Gunning Dr and Catell Dr	Also saved in Valley Way
615043	Pollution Prevention Program	Riverview Park Inline Storage at Catell Drive and Regan Drive	Drawing	November 2015	W:\Hamilton\615000\615043 Niagara Falls Pollution Prevention\RIVERVIEWPARK INLINE STORAGE IFC.pdf	November 2015	Issue for construction, tree removal and demolition plan, proposed site plan, proposed profiles, site restoration plans/details, landscaping and miscellaneous details	
615043	Pollution Prevention Program	City Strategic Priorities 2015-2018	PDF Document	No date	W:\Hamilton\615000\615043 Niagara Falls Pollution Prevention\strategic-priorities-2015-2018.pdf	April 2017		
615043	Pollution Prevention Program	Cost Sharing Agreement with NOTL for construction of gravity sewer along Stanley Av	PDF scan document	April 2004	W:\Hamilton\615000\615043 Niagara Falls Pollution Prevention\growth data\10 Planning Data\Cost Sharing Agreement-NOTL & City of NF-Gravity Sewer.pdf			
615043	Pollution Prevention Program	Niagara Falls South Side Sewershed Wet Weather Flow CSO Study By: Earth Tech	PDF scan document	January 2001	W:\Hamilton\615000\615043 Niagara Falls Pollution Prevention\growth data\10 Planning Data\Niagara Falls South Side Sewershed Wet Weather Flow CSO Study January 2001.pdf	May 2016		
615043	Pollution Prevention Program	Mewburn Road Sewage Pumping Station Feasibility Study Report By: Associated Engineering	PDF scan document	November 2012	W:\Hamilton\615000\615043 Niagara Falls Pollution Prevention\3 Planning Phase\4 Planning Data\S-70-36 Mewburn Road Sewage Pumping Station Feasibility Study Nov2012.pdf	June 2017		
615043	Pollution Prevention Program	Mewburn Road Sewage Pumping Station Capacity Assessment By: Associated Engineering	PDF scan document	February 2013	W:\Hamilton\615000\615043 Niagara Falls Pollution Prevention\3 Planning Phase\4 Planning Data\S-70-36 Mewburn Road SPS Capacity Assessment Draft February2013.pdf	June 2017		
615043	Pollution Prevention Program	2014 Consumption Report by Meter Size	Excel	N/A	W:\Hamilton\615000\615043 Niagara Falls Pollution Prevention\3 Planning Phase\4 Planning Data\Water Billing Data\2014 Consumption Report by Meter Size - Sorted by Active and Inactive.xlsx	November 2015	Includes: water work name, facility account, status, meter cycle, class code, annual usage, address, company, phone	
615043	Pollution Prevention Program	Chippawa XPSWMM Model Update and Proposed Residential Development By: CH2MHILL	PDF scan document	April 2004	W:\Hamilton\615000\615043 Niagara Falls Pollution Prevention\3 Planning Phase\4 Planning Data\20150902 fromNiagaraFalls\Chippawa XPSWMM Model Update & Proposed Residential Develpment-April 5, 2004.pdf	September 2015		
615043	Pollution Prevention Program	Niagara Region TMP - Traffic Zone Update By: IBI Group	PDF Document	November 2015	W:\Hamilton\615000\615043 Niagara Falls Pollution Prevention\3 Planning Phase\4 Planning Data\2015 Dec 10 FromNiagaraFalls - Updated TAZ\TTM TrafficZone Update 2015-11-25.pdf	January 2016		
615043	Pollution Prevention Program	Sanitary Drainage Area	Drawing	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Area 1	November 2015	Glenview, Victoria Av and Bridge St	
615043	Pollution Prevention Program	Maple Street Sewer separation, watermain replacement and road reconstruction	Layered PDF	March 2014	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Area 1\not helpful	November 2015		
615043	Pollution Prevention Program	Fallsview Tourist Core Area - Trunk sewer present and ultimate sanitary drainage areas	Drawing	October 2001	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Area 2	December 2015	Phases 2 & 3,	
615043	Pollution Prevention Program	Sanitary Drainage Area	Drawing	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Area 2	November 2015	Stramfort St and McRae St from Stanley Av to Victoria Av, main St and Seneca St and Bender St. pumping station	
615043	Pollution Prevention Program	Storm, sewer and watermain Bender Hill	Drawing	August 1980	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Area 2\Storm Sewer Drawings that may be helpful\82-CA-56.tif	October 2015		
615043	Pollution Prevention Program	Storm Drainage Plans	Drawing	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Area 2\Storm Sewer Drawings that may be helpful\82-CA-56.tif	October 2015	Bender Hill, Aalls Av, Clifton Hill, Victoria Av, Kitchener St, Walnut St, Hunter St, Union Av and propsoed drainage plan Rainbow Bridge	
615043	Pollution Prevention Program	Sanitary Drainage Area	Drawing	March 1982	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Area 2\not helpful	November 2015	Dorchester Rd & Drummon Rd Lundy's Lane to Dunn St	
615043	Pollution Prevention Program	Sanitary Drainage Area	Drawing	May 2006	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Area 3	November 2015	Sinnick Av from Thorold Stone Rd to Vine St and from Vice St to Atlas St	

615043	Pollution Prevention Program	Sanitary Drainage Area	Drawing	January 2008	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Area 3\minimal help	November 2015	Swayze Drive from Portage Rd to Stanley Av
615043	Pollution Prevention Program	Sanitary Drainage Area	Drawing	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Area 3\not helpful	November 2015	Riall-Russell-Huggins and Oakwood Dr Pumping Station
615043	Pollution Prevention Program	Trunck sewers markups	Drawing	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Layout Map	November 2015 - February 2016	
615043	Pollution Prevention Program	Combines Sewer Overflows 2012	Layered PDF	October 2014	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Other drawings that may be helpful	November 2015	
615043	Pollution Prevention Program	Sanitary Drainage Area Refrence Drawings	Excel	N/A	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Sanitary Drainage Area reference drawings.xlsx	November 2015	
615043	Pollution Prevention Program	CSO Pictures	Pictures	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CSO_Pictures	September 2015	Bellevue, Brookfield, Front St, George, Greenwood, Harte, Margaret Warden, Meadowale, Valley Way, Drummond & Dunn, Pells Creek, Sarah Street
615043	Pollution Prevention Program	Niagara Falls Pollution Control Plan - Final Screening Report By: CH2MHILL	PDF Document	June 2008	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\S-70-39 background data\NF Pollution Control Plan-Final Screening Report-CH2M Hill 2008.pdf	September 2015	
615043	Pollution Prevention Program	CSO and storage tanks overflow data	Excel	N/A	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\Storage Tanks, Overflows, P.S	September 2015	
615043	Pollution Prevention Program	Cattell Dt flood relief storage tank	Layered PDF	No date	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\Storage Tanks, Overflows, P.S	September 2015	
615043	Pollution Prevention Program	Plans and Profiles for Area 1	Drawing	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\Additional Info - Catchment review\Area 1	December 2015	Acheson, Brouhton, Buttrey, Dyson, Elgin, Ferguson, Glenview, Hickson, Leader Ln, Martin, May, Muir, River Rd, Stanton, Terrace, Victoria
615043	Pollution Prevention Program	Plans and Profiles for Area 2	Drawing	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\Additional Info - Catchment review\Area 2	December 2015	Barker West of Portage, Ferry East of Portage and Clarke Av
615043	Pollution Prevention Program	Plans and Profiles for Area 2A	Drawing	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\Additional Info - Catchment review\Area 2A	December 2015	Bender Area, Centre, Ellen, Hunter, Lewis, Magdalen, Victoria, Walnut
615043	Pollution Prevention Program	Rainbow Bride Approach	Drawing	No date	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\Additional Info - Catchment review\Area 2A\1 Bender Area	December 2017	
615043	Pollution Prevention Program	Flood Prone Areas Map	Layered PDF	August 2015	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\7 Level of Service\Niagara Falls Basement Flooding Events\Flooding\Flood Prone Areas Map-36X60.pdf	September 2015	
615043	Pollution Prevention Program	Flood pin points	Drawing	July and September 2004	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\7 Level of Service\Niagara Falls Basement Flooding Events\Flooding\Flood Prone Areas Map-36X60.pdf	September 2015	
615043	Pollution Prevention Program	2014 PCP Flow Monitoring locations	Layered PDF	October 2014	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\Flow Monitoring\New data from KS 09092015\2014 PCP Flow Monitoring Map-PLOT 36x36.pdf	September 2015	
615043	Pollution Prevention Program	Flow Monitor Install dates	World	No date	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\Flow Monitoring\New data from KS 09092015\Flow Monitor.docx	September 2015	
615043	Pollution Prevention Program	Chippawa Precipitation Report May to Augut 2015	PDF Document	September 2015	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\Flow Monitoring\Regional Precipitation Data\Chippawa Precipitation Report_May to August 2015.pdf	September 2015	
615043	Pollution Prevention Program	Kalar Precipitation Report May to Augut 2015	PDF Document	September 2015	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\Flow Monitoring\Regional Precipitation Data\Kalar Precipitation Report_May to August 2015.pdf	September 2015	
615043	Pollution Prevention Program	Sanitary sewage blockage data from 2005 to 2012	Excel	N/A	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\Sanitary Sewermain Blockage\BLOCKAGE2005-2012.xls	September 2015	Includes: blockage ID, problem, year and date

615043	Pollution Prevention Program	Sewer Maintenance List	Excel	N/A	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\Sanitary Sewermain Blockage\SEWER MAINTENANCE LIST.xls	September 2015	Includes: location ID, route, atreet number, street name, street adhead, street back, SGM_ID, sgm tye, width, problem, cleaning frequency
615043	Pollution Prevention Program	CCTV Inspection List	Excel	N/A	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\4 Condition Data\CCTV Inspection List.xlsx	September 2015	Includes: jub number, last modified, start street, catchment, start/end node, pipe diameter, pipe materials, ctv partial, strgrade, sergrade
615043	Pollution Prevention Program	3 year overflow volumes	Excel	N/A	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\3 Wastewater Facility Inventory	June 2016	Includes: year, municipality, plant, location, type, bypass date, duration, volumne, reason
615043	Pollution Prevention Program	Bypass Information Niagara Falls System incuding overflow summary	Excel	N/A	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\5 Performance capacity info\Bypass Info	November 2015	Includes: location, start time, duration, volume, date, type, reason
615043	Pollution Prevention Program	Niagara Falls Draw Down Tests	Excel	N/A	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\5 Performance capacity info\NFalls Draw Down Tests.zip	March 2016	
615043	Pollution Prevention Program	Certificate of Approval	PDF Document	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\6 C of A\ECAS	November 2015	
615043	Pollution Prevention Program	Certificate of Approval	PDF Document	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\6 C of A\ECAS	September 2015	
615043	Pollution Prevention Program	2013 Flooding claims related data	Excel	N/A	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\7 Level of Service\2013 Flooding\Data Exports	September 2015	
615043	Pollution Prevention Program	Flooding follow ups	World	N/A	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\7 Level of Service\2013 Flooding\Flooding Follow ups\Flooding Follow ups.docx	September 2015	
615043	Pollution Prevention Program	July 19 2013 flood data	Various	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\7 Level of Service\2013 Flooding\July 19 2013 Flood Data	September 2015	
615043	Pollution Prevention Program	June 28 2013 flood data	Various	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\7 Level of Service\2013 Flooding\June 28 2013 Flood data	September 2015	
615043	Pollution Prevention Program	Flooding related maps	Drawing	No date	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\7 Level of Service\2013 Flooding\Maps	September 2015	
615043	Pollution Prevention Program	Frequency of flooding study	Excel	N/A	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\7 Level of Service\Niagara Falls Basement Flooding Events\Frequency of flooding study\Frequency of flooding study.xlsx	June 2016	Includes: parcels per catchement and flooded homes per catchments
615043	Pollution Prevention Program	Flooding events	World	N/A	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\7 Level of Service\Niagara Falls Basement Flooding Events\Niagara Falls Basement Flooding Events.docx	September 2015	
615043	Pollution Prevention Program	Certificate of Approval	PDF Document	January 2002	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\9 TCA Register\MOE Certificate of Approval 5404-56FS7V re Combined Sewers.pdf	September 2015	For new sanitary sewer service connections
615043	Pollution Prevention Program	Annual CSO reduction reports	PDF Document	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Annual CSo reduction reports	May 2012 to October 2015	
615043	Pollution Prevention Program	Annual CSO reduction reports	PDF Document	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\CSO cost sharing project reports	May 2012 to October 2015	
615043	Pollution Prevention Program	Capital Budgets 2011 to 2015	PDF Document	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Capital budgets 2011-present	September 2015	
615043	Pollution Prevention Program	Storm Drainage Plans	Drawing	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\CA storm drawings	November 2015	

615043	Pollution Prevention Program	Model Data Gaps	Drawing	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\Model Data Gaps - June 15 2016	Various	Profiles and plans, manhole details
615043	Pollution Prevention Program	Central Pump Station	Drawing	January 1982	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\PCP Drawings - from Region\Central Pump Station	February 2000	
615043	Pollution Prevention Program	Inline Gate Valve	Drawing	August 1970	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\PCP Drawings - from Region\Inline Gate Valve	January 2000	
615043	Pollution Prevention Program	Low Lift PS East Inline	Drawing	September 2013	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\PCP Drawings - from Region\Low Lift PS East Inline	September 2013	
615043	Pollution Prevention Program	Park Street PS Statio Overflow	Drawing	March 1962	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\PCP Drawings - from Region\Park Street PS Station Overflow	June 2006	
615043	Pollution Prevention Program	Stanley Avenie WWTP	Drawing	August 2011	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\PCP Drawings - from Region\Stanley Avenue WWTP	Various	
615043	Pollution Prevention Program	Taro North Decommisioning	Drawing	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\PCP Drawings - from Region\Taro North Decommisioning	Various	
615043	Pollution Prevention Program	Townline Road PS	Drawing	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\PCP Drawings - from Region\Townline Road PS	Various	
615043	Pollution Prevention Program	2013 Asset Managemet Plan for the City of Niagara Falls	PDF Document	2013	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\AMP - City of Niagara Falls (Core Infrastructure).pdf	November 2015	
615043	Pollution Prevention Program	Other Reports and Studies	PDF Document	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies	Various	
615043	Pollution Prevention Program	A review of flood relief measures in Chippawa 1970 - 1989	PDF scan document	No date	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\A Review of Flood Relief Measures in Chippawa, 1970 - 1989.pdf	April 2007	
615043	Pollution Prevention Program	Chippawa - A study of weeping tile flows	PDF scan document	February 1995	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Chippawa - A Study of Weeping Tile Flows, February 1995.pdf	April 2007	
615043	Pollution Prevention Program	Chippawa Basement Flooding Analysis Final Report By: CH2MHILL	PDF Document	April 2010	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Chippawa Basement Flooding Analysis-Final Report-April 2010.pdf	May 2010	
615043	Pollution Prevention Program	Chippawa Community Remedial measures for Basement Flooding 1988 Report By: DELCAN	PDF scan document	May 1988	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Chippawa Community Remedial Measures-Basement Flooding 1988.pdf	April 2007	
615043	Pollution Prevention Program	Chippawa Community Sanitary Systems Analysis	PDF scan document	November 1991	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Chippawa Community Sanitary Systems Analysis, November 1991.pdf	April 2007	
615043	Pollution Prevention Program	Chippawa I.N.S. Astudy of weeping tile flows	PDF scan document	May 1991	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Chippawa I.N.S. - a study of weeping tile flows, may 1991.pdf	April 2007	
615043	Pollution Prevention Program	Chippawa Pollution Control Plan By: CG&S	PDF scan document	October 1996	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Chippawa Pollution Control Plan.pdf	September 2016	
615043	Pollution Prevention Program	Chippawa Pollution Control Study Final Report By: CG&S	PDF scan document	November 1998	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Chippawa Pollution Control Study-Final Report 11-1998-CG&S.pdf	April 2007	

615043	Pollution Prevention Program	Chippawa Pumping Station Upgrade and Saitary Sewage Storage Facility Schedule B - Class EA By: The Proctor & Redfern Group	PDF scan document	January 1989	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Chippawa Pumping Station Upgrade & Sanitary Sewage Storage Facility - Schedule B Class EA, January 1989.pdf	April 2007
615043	Pollution Prevention Program	Chippawa Sewer Flooding Relief Study Class EA - Environmental Screening Report By: CH2MHILL	PDF scan document	December 2010	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Chippawa Sewer Flooding Relief Study Class EA December 2010.pdf	February 2013
615043	Pollution Prevention Program	Weeping Tile Monitoring program Draft Report By: Associated Engineering	PDF scan document	February 2007	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\City of NF and Ft Erie Weeping Tile Monitoring Program 2007.pdf	July 2017
615043	Pollution Prevention Program	Engineering Design Guidelines Manual	PDF Document	No date	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\City of Niagara Falls Engineering Design Standards Manual_2012.PDF	August 2013
615043	Pollution Prevention Program	City of Niagara Falls - Flood Relief Study By: Paul Theil Associates Limited	PDF scan document	February 1981	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\City of Niagara Falls Flood Relief Study, February 1981.pdf	April 2007
615043	Pollution Prevention Program	Official Plan for the City of Niagara Falls	PDF Document	January 2015	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\City of Niagara Falls Official Plan Amended to 2015.pdf	February 2015
615043	Pollution Prevention Program	Class Environmental Assessment Evaluation of Sewage Treatment Alternatives Phase 1 Report - Identification of needs and rational By: The Proctor & Redfern Group	PDF scan document	August 1988	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Class EA-Evaluation of Sewage Treatment Alternatives-Phase 1 Report-Identification of Need & Rationale-Aug 1988.pdf	April 2007
615043	Pollution Prevention Program	Water and Wastewater Master Servicing Plan - Phase 1 Baseline By: AECOM	PDF Document	No date	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\MSP_Part3_Phase1_Baseline.pdf	September 2015
615043	Pollution Prevention Program	Technical Memorandum 1A: Niagara Falls WWTP Niagara Northeast Area Wastewater Servcing Study By: XCG Consultants Ltd.	PDF Document	November 2007	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\NEAppE.pdf	September 2015
615043	Pollution Prevention Program	Northwaste Area Wastewater Servicing Study Final Report By: XCG Consultants Ltd.	PDF Document	July 2008	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\NEAreaStudy.pdf	September 2015
615043	Pollution Prevention Program	Niagara Falls Phase 1 Sanitary System Analysis	PDF scan document	September 1992	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Niagara Falls Phase 1 Sanitary System Analysis-September 28, 1992.pdf	September 2015
615043	Pollution Prevention Program	Niagara Falls Phase 2 Santary System Analysis	PDF scan document	August 1993	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Niagara Falls Phase 2 Sanitary System Analysis-August 16, 1993.pdf	September 2015
615043	Pollution Prevention Program	Niagara Peninsula CAD Standard (NPCS) Version 2.1	PDF Document	April 2011	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Niagara Peninsula CAD Standard Version 2.1.pdf	September 2015
615043	Pollution Prevention Program	Charting a course to dlisting Niagara River (Ontario) AOC	PDF Document	Update 2012	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\NiagaraRiverOntarioAOCUpdate2012.pdf	September 2015
615043	Pollution Prevention Program	Niagara River Remedial Action Plan Stage 2 Update	PDF Document	December 2009	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\NPCA_RAP_Stage_2_Update_Full_Report-2011-09-06 (1).pdf	September 2015
615043	Pollution Prevention Program	City of Niagara Falls Sewer System Analysis and CSO Abatement Study By: CG&S	PDF scan document	February 1996	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Sewer System Analysis & CSO Abatement Study Feb 1996-City,MOE,Region-Final Report.pdf	September 2015

615043	Pollution Prevention Program	City of Niagara Falls Weeping tile (foundation drains) by-law 2010-61	PDF Document	April 2010	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\weeping-tile-by-law.pdf	September 2015	
617028	Gunning and Mears Upgrades	Gunning Drive Pumping station drawings and pump details	Drawing	October 2009	W:\Hamilton\617000\617028 Gunning and Mears Upgrades\Received Files\2017-11-06-NPC drawings	November 2017	
617028	Gunning and Mears Upgrades	Link to Bakor	World	February 2018	W:\Hamilton\617000\617028 Gunning and Mears Upgrades\Received Files\Bakor Coatings\Link to Bakor 810-21.docx	February 2018	
617028	Gunning and Mears Upgrades	Pump run times	Excel	N/A	W:\Hamilton\617000\617028 Gunning and Mears Upgrades\Received Files\Pump run times from City\Gunning and Mears.xlsx	February 2018	
617028	Gunning and Mears Upgrades	Mears Cres. Energy Bill By: Niagara Peninsula Energy	PDF scan document	December 2017	W:\Hamilton\617000\617028 Gunning and Mears Upgrades\Received Files\20171207093605710.pdf	January 2018	
617028	Gunning and Mears Upgrades	Additional Set of Drawings	Drawing	1988 and 1990	W:\Hamilton\617000\617028 Gunning and Mears Upgrades	September 2017	Surveyor's Certificate, Forcemain/drain for storage tanks, storage tanks details, pumping station details
715023	Niagara Region MSP	2016 Master Servicing Plan - Received Files	Various	Various	W:\GTA\715000\715023 Niagara Region MSP\4_Received\1_From Niagara Region\A_General_Data\A1_2012_MSP\2012_MSP_Report\Individual Sections		
715023	Niagara Region MSP	2016 Master Servicing Plan Niagara Falls Wastewater Section By: GMBP	PDF Document	June 2017	W:\GTA\715000\715023 Niagara Region MSP\6_Deliverable\MSP Final Documents\Final\Volume 4\Volume 4 - Technical Document - Wastewater - Part F - Niagara Falls V2.pdf		
617108	Bender Hill Options Alertatives	Bender Hill Drawgings	Drawing	1980	W:\Hamilton\617000\617108 Niagara Bender Hill Sanitary SPS Rehab\4 Received Files\From City of Niagara Falls	January 2018	Storm Sewer and Watermain River rd to palmer Av and drop shaft details
617108	Bender Hill Options Alertatives	Niagara Falls Tourist Core Sewage Study - Area SA 11 Final Report By: Robert Marting Engineering	PDF Document	December 2003	W:\Hamilton\617000\617108 Niagara Bender Hill Sanitary SPS Rehab\4 Received Files\NF Tourist Core Sewage Study Final Report.pdf	February 2018	
617036	Niagara Falls - Small Projects	Oldfield Estates Plans and Profile By: Upper Canad Consultants Engineers/Planners	Layered PDF	January 2016	W:\Hamilton\617000\617036 Niagara Falls - Small Projects\Survey	May 2017	
617036	Niagara Falls - Small Projects	Conceptual Design Options: Riverview Park CSO Tank Design By: CH2MHILL	PDF scan document	November 2013	W:\Hamilton\617000\617036 Niagara Falls - Small Projects\Technical Memo RE Design Concepts (7 Nov 2013).pdf	April 2017	
615043	Pollution Prevention Program	Intensification Performance January - December 2015	Drawing	March 2016	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\growth data\10 Planning Data\Yearly_2015_11x17.pdf	March 2016	

File		Location/Directory	Upload Date	Data Description	Comments
Construction Drawings & laterals	Buckley Ave	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\2017-11-01- background data\Construction Drawings\CC Eng drawings	Jan 30,2018	Buckley Ave Street view of sewer line and sewer lateral details	
	First Ave		Nov 01,2017	First Ave Street view of sewer line and sewer lateral details	Laterals are very hard to read
	Huron Street		Nov 01,2017	Huron Street view of sewer line and sewer lateral details	
	Maple Street		Nov 01,2017	Maple Street view of sewer line and sewer lateral details	
	Morrison Street		Nov 01,2017	Morrison Street view of sewer line and sewer lateral details	
	Park Street		Nov 01,2017	Park Street view of sewer line and sewer lateral details	
	Queen Street		Nov 01,2017	Queen Street view of sewer line and sewer lateral details	These are very hard to see
	St Lawrence Ave		Nov 01,2017	St Lawrence Ave Street view of sewer line and sewer lateral details	
	Valley Way		Dec 11,2017	Valley Way Street view of sewer line and sewer lateral details	
	Victoria Avenue		Nov 01,2017	Victoria Ave Street view of sewer line and sewer lateral details	
	Chippawa	3 Files Received\2018-02-01- Plans and profiles\Plan and profiles for chippawa flow meter alarm configuration	Feb 05,2018	Plans and profiles fro chippawa flow meter alarm configuration	
Field Notes	Valley Way	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\2017-12-15 - additional data\Construction Drawings\CC Eng drawings\Valley Way\Field Notes	Dec 15,2017	1990 Drawings with hand notes	
Storm Drainage Plans		W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\2017-11-01- background data\Sewers\CA dwgs - Storm Drainage plans	Nov 01,2017	Downtown and adyacent areas to Valley Way Storm Drainage	
Sanitary Drainage Plans		W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\2017-11-01- background data\Sewers\CB dwgs - San Drainage Plans	Nov 01,2017	Adyacent areas to Valley Way Sanitary Drainage	
Sewer Map		3 Files Received\2017-11-01- background data\Sewers\Sewer Map (For Reference Only).pdf	Nov 01,2017	Basic map of Valley Way adyacent area indicating storm, sanitary and combined sewer	Document says for Reference ONLY
Water Plan		W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\2017-11-01- background data\Water	Nov 01,2017	Adyacent areas to Valley Way Water Lines	Not able to save rotation

Date:	7/26/2018	File:	617062
To:	Guangli Zhang – City of Niagara Falls		
From:	Danielle Anders – GM BluePlan		
Project:	Valley Way Drainage EA Study		
Subject:	Technical Memorandum #2 – Gap Analysis		

TECHNICAL MEMO

1. INTRODUCTION

1.1 Project Scope

GM BluePlan (GMBP) has been retained by the City of Niagara Falls to develop a tactical plan to address localized flooding as well as sanitary and storm sewer conveyance issues in the Valley Way drainage area. This study is being completed as a Schedule C Class Environmental Assessment (EA) under the Municipal Environmental Assessment process.

Figure 1 provides an overview of the study area.

Figure 1: Study Area

In general, the Valley Way Drainage EA Study will serve as an action plan for the City to provide better municipal services and eliminate flooding concerns in the study area. The Drainage EA Study will guide the City's sewer separation and drainage improvement projects in the area.

1.2 Memorandum Scope

This memorandum provides a review of all relevant electronic information collected to-date. This includes identifying gaps within the data that may preclude its use in completing the project, including hydraulic system modelling, catchment delineation, option development, etc.

The data sources include:

- GIS information;
- CCTV inspection files relating to or affecting the study area;
- Plan drawings: Storm drainage, sanitary drainage, Construction drawings (sewermains of adjacent streets), water (Plan 52);
- Geotechnical desktop report;
- Flooding events (basement/overland);
- Operation and maintenance records;
- Catch basin identification; and,
- Local reporting.

2. DATA REVIEW

The first step was to review information obtained through local projects pertinent to this study. Any additional files were provided by the City in electronic format to investigate gaps between available sources.

2.1 Local Niagara Data Review

GM BluePlan recently completed projects surrounding the study area. Three previous studies specifically addressed flooding concerns in the Valley Way study area. These studies include the 2016 Niagara Master Servicing Plan, the 2016 City Wide Master Drainage Plan Study Update, and the 2017 Niagara Falls Pollution Prevention Control Plan.

These available studies, in addition to previous works completed in the Niagara area, were all collected in the local database. The comprehensive list includes several items which will be used in support of the Valley Way Drainage EA.

The available information includes:

- City of Niagara Falls Strategic Priorities List (2015-2018);
- Storm Drainage Plans/Areas;
- CSO and storage tanks overflow data;
- Infrastructure Profile Drawings;
- Sewer Maintenance List;
- 2013 Flooding Claims (and related data);
- System capacities and performance;
- Existing hydraulic model and flooding events; and,
- Final reporting and recommendations.

The information has previously been reviewed by GM BluePlan for consistency between data sets. Any additional information required for the analysis portion was requested and received from the City. This information was cross checked with the existing information for identifying gaps. A summary of the received information can be found in Appendix A. This is a comprehensive list of all Niagara Falls data GMBP has received.

2.2 City Review Process

The additional files collected from the City underwent the following definition review process:

1. Identification of the file/layer to be analyzed
    a. File Type
    b. Geometry
2. Record details contained in each specific file
    a. Field Name
    b. Field Type
        i. Name
        ii. Length
3. Verify the total number of records
4. Calculate number of records filled per field/layer
5. Assign data maturity based on the following criteria:
    - 0 to 30 % - Poor
    - >30 to 60% - Fair
    - >60 to 100% - Good

2.2.1 Maturity of City Data Received

Data results from the gap analysis were as follows:

Table 1. Maturity of City Data Received

Layer/Table	File Type	Geometry	% Filled	Maturity
Sanitary Mains Infrastructure	Shapefile	Lines	63%	Fair
Storm Main Infrastructure	Shapefile	Lines	60%	Fair
O&M Repair Requests	Excel	Data	89%	Good
Sanitary Blockages	Shapefile	Point	75%	Good
All Flooding Events	Shapefile	Point	45%	Fair

The specific analysis of each layer is presented in the following section:

Sanitary Mains Infrastructure

The sanitary layer has a total of 34 fields and 6,451 records. The majority of fields were complete. The following list displays fields with less than 10% filled only. GMBP works with the City's sanitary GIS on a regular basis and has a comprehensive understanding of the data maturity.

Table 2. Sanitary Infrastructure Data Gap

Field Name	Type Name	Length	% Filled	Maturity
Version	Integer64	11	0%	Poor
fblank	string	254	0%	Poor
oWidth	string	254	0%	Poor
pHeight	string	254	0%	Poor
rLiningTyp	string	254	0%	Poor
tESL	string	254	5%	Poor
uCondition	string	254	1%	Poor
zaProjectN	string	254	3%	Poor
zbProjectN	string	254	3%	Poor
zcNotes	string	254	4%	Poor
zeCustodia	string	254	0%	Poor

Stormwater Mains Infrastructure

This layer has a total of 44 fields and 5,559 records. The fields varied in completeness, with the following list less than 10% filled.

Table 3. Stormwater Infrastructure Data Gap

Field Name	Type Name	Length	% Filled	Maturity
Version	Integer64	18	0%	Poor
dblank	string	254	0%	Poor
fblank	string	254	0%	Poor
jPreviousI	string	254	0%	Poor
lRelinedDa	string	254	0%	Poor
oWidth	string	254	1%	Poor
pHeight	string	254	1%	Poor
rLiningTyp	string	254	0%	Poor
uCondition	string	254	2%	Poor
zaProjName	string	254	8%	Poor
zbProjNum	string	254	9%	Poor
zeCustodia	string	254	0%	Poor
ForeColor	Integer64	18	0%	Poor

Operations & Maintenance Repairs Requests

This layer has a total of 7 fields and 29 records. The majority of fields were complete, with the lowest field being 93% filled.

Operations & Maintenance Work Orders of Sanitary Mains Repairs

This layer has a total of 7 fields and 36 records. The majority of fields were complete; with only one repair date without data attached to it. Given the City's current manner of tracking maintenance work, the digital records provided only represent a fraction of the available information. GMBP has through other projects collected operations and maintenance data through speaking directly with City Staff. Any operations and maintenance details collected through those meetings that is relevant to the Valley Way EA project will be used as needed.

Sanitary Main Blockage

This layer has a total of 12 fields and 101 records. The majority of fields were complete; however the field "BUILDING_UN" had no recorded data. This data augments the other operations and maintenance data reviewed and obtained from other sources. It assists GMBP with gaining a full understanding of the sanitary system in the Valley Way Study area.

Flooding Data

This layer has a total of 17 fields and 532 records. The fields varied in completeness, with the following list showing fields that were found with less than 10% filled.

Table 4. Flood Records Data Gap

Field Name	Type Name	Length	% Filled	Maturity
FeatId2	Integer64	18	5%	Poor
Date	String	254	5%	Poor
Address	String	254	13%	Poor
WRAP	Integer64	18	0%	Poor
InsuranceC	Integer64	18	0%	Poor
Notes	String	254	6%	Poor
STREET_NO	String	20	8%	Poor
ADDRESS2	String	254	0%	Poor

Historical flooding data is a key element to identifying problem areas within the Valley Way study area.

3. CONCLUSION

In general, the electronic data received for use in the Valley Way EA project is complete and will allow GMBP to gain a good understanding of the system and its constraints within the study area. As the project progresses, GMBP may request additional data to augment the study and all new data received will be subjected to a gap analysis before it is used for modelling, or decision making.

APPENDIX A: DATA REGISTER

Project Number	Project	File Name	File Type	File Date	Location/Directory	Upload Date	File Description	Comments
617062	Niagara Falls Valley Way Drainage EA	Construction Drawings sewermain of adjacent streets (Plans and profiles)	Drawing	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\2017-11-01- background data\Construction Drawings\CC Eng drawings	January 2017 November 2017 January 2018 March 2018	Buckley Av, First Av, Huron Street, Maple Street, Morrison Street, Park Street, Queen Street, St. Lawrence Av, Valley Way and Victoria Av drawings	
617062	Niagara Falls Valley Way Drainage EA	Storm Drainage Plans	Drawing	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\2017-11-01- background data\Sewers\CA dwgs - Storm Drainage plans	November 2017	Morrison St, downtown area, First Av, Second Av and Bridge St	
617062	Niagara Falls Valley Way Drainage EA	Sanitary Drainage Plans	Drawing	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\2017-11-01- background data\Sewers\CB dwgs - San Drainage Plans	November 2017	Area SA-19-02, Morrison Street	
617062	Niagara Falls Valley Way Drainage EA	Sewer Map (for reference Only)	Drawing	No date	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\2017-11-01- background data\Sewers\Sewer Map (For Reference Only).pdf	November 2017	Valley Way from Morrison to St Lawrence Ave indicating sanitary and combines sewer	
617062	Niagara Falls Valley Way Drainage EA	Water (Plan 52)	Drawing	No date	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\2017-11-01- background data\Water\wa plan 52.pdf	November 2017	Valley Way Simcoe St to St Clair Av	
617062	Niagara Falls Valley Way Drainage EA	Geothecnical Desktop Study - Valley Way Drainage EA Study By: Amec Foster Wheeler	PDF Document	December 2017	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\2018-02-02 - amec report\TG173041_Vally Way Drainage_Prelim._Getechnical Desk Study_Dec. 8 2017_Final.pdf	February 2018		
617062	Niagara Falls Valley Way Drainage EA	Catch Basin Restrictor Plate 2018	Excel	N/A	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\Catch Basin Restrictor Plate 2018.xlsx	February 2018	Indicates: address, catch basin single or double, restrictor plate (Y/N) and restrictor plate descroption (square or outlet flap)	
617062	Niagara Falls Valley Way Drainage EA	Basement Flooding Valley Way	Excel	N/A	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\Requests_BasementFlooding_ValleyWy.xlsx	January 2018	Indicates: Request ID, Status, Caller, Category, location, issue, and operational area	Also saved on state of good repair
617062	Niagara Falls Valley Way Drainage EA	Overland Flooding Valley Way	Excel	N/A	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\Requests_OverlandFlooding_ValleyWy.xlsx	January 2018	Indicates: Request ID, Status, Caller, Category, location, issue, and operational area	Also saved on state of good repair
617026	Sinnicks CSO Study	Construction Drawings sewermain of adjacent streets (Plans and profiles)	Drawing	Various	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\Construction Drawings\CC Eng drawings	April 2017	Stanley Ave, Keith St, Vine Street, Coholan Street, Outfall details	
617026	Sinnicks CSO Study	CSO drawings	Drawing	Various	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\Drawings\Sinnicks CSO	September 2014 September 2016		Also saved in PPCP
617026	Sinnicks CSO Study	Project Intro	Powerpoint	No date	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\Drawings\ProjectIntro.pptx	March 2017	Process Flow Diagram and details of the different mains. Includes drawings	
617026	Sinnicks CSO Study	Flow Calculations	Excel	N/A	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\Drawings\FlowCalculations.xlsx	March 2017	Indicates: all the different pipes, the flow to mannings pipe and overflow volumes	
617026	Sinnicks CSO Study	Phytotoxicology Survey Report - General Abrasives - Niagara Falls 1990 and 1991 By: G. Vasiloff	PDF scan document	December 1993	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\general abrasives, background\phytotoxicologys00vasiuoft_bw.pdf	July 2017		
617026	Sinnicks CSO Study	Construction pictures	Pictures	N/A	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\general abrasives, background	July 2017		
617026	Sinnicks CSO Study	Survey Control Monuments	Scan documents	Various	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\Miscellaneous\Survey Control Monuments	April 2017		
617026	Sinnicks CSO Study	Reference Plans	Drawing	Various	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\Property Information\Reference Plans	April 2017	Stratford Lots 60 and 73, lot 28 plan 102	
617026	Sinnicks CSO Study	Registered Plans	Drawing	Various	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\Property Information\Registered Plans	April 2017	Stratford lot 60 plan 102 and 109	
617026	Sinnicks CSO Study	RR Railway Property	Drawing	No date	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\Property Information\RR Railway Property\20170309160127391.pdf	April 2017		
617026	Sinnicks CSO Study	Storm Drainage Plans	Drawing	Various	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\Sewers\CA Dwgs - Storm Drainage plans	April 2017	Includes details of Hawkings Creek Outfall	
617026	Sinnicks CSO Study	Sanitary Drinage Area	Drawing	Various	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\Sewers\CB Dwgs - San Drainage Plans	April 2017	Sinnicks Ave from Thorold Stone Rd to Vine St, and from Vine St to Atlas St	
617026	Sinnicks CSO Study	Tank Cleaning & Assessment - Sinnicks CSO Stanely Av and Thorold Stone Rd. By: PipeFlo and GMBP	PDF Document	July 2017	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\GM BLUEPLAN ENGINEERING LTD. REPORT.pdf	July 2017	PACP Inspection Report	
617026	Sinnicks CSO Study	Tank Cleaning & Assessment - Sinnicks CSO Stanely Av and Thorold Stone Rd. By: PipeFlo and GMBP	Video	July 2017	W:\Hamilton\617000\617026 Sinnicks CSO Study\3 Files Received\VIDEO	January 2018		There are also a few pictures Each folder has a report on each video
617017	WW System State of Good Repair	Routine Sewer Maintenance records and issues Log	PDF scan document	No date	W:\Hamilton\617000\617017 WW System State of Good Repair\Works In Progress\Received Items\isue areas and complaints listing.pdf	December 2017		
617017	WW System State of Good Repair	TV Inspection of Sewers Tender Contract	PDF Document	June 2010	W:\Hamilton\617000\617017 WW System State of Good Repair\Works In Progress\Received Items\Tender Document.pdf	December 2017		

617017	WW System State of Good Repair	TV Inspection of Sewer Tender Contract Summary	PDF Document	June 2010	W:\Hamilton\617000\617017 WW System State of Good Repair\Works In Progress\Received Items\Tender Summary.pdf	June 2010		
618008	Chippawa Flow Monitoring	Chippawa Sewer Flooding Relief Study EA - Final Recommendations MW-2010-63	PDF Document	December 2010	W:\Hamilton\618000\618008 Chippawa Flow Monitoring\MW-2010-63 - Chippawa Sewer Relief Study - Muncipal Class EA - FINAL.pdf	April 2018	Report to Council and indicates that recommendations were adopted in committee and ratified by City Council	
618008	Chippawa Flow Monitoring	Plans and Profile for Chippawa	Drawing	1950s, 1960s, 1980s	W:\Hamilton\618000\618008 Chippawa Flow Monitoring\3 Files Received\2018-02-01- Plans and profiles\Plan and profiles for chippawa flow meter alarm configuration	February 2018	Gunning Dr and Catell Dr	Also saved in Valley Way
615043	Pollution Prevention Program	Riverview Park Inline Storage at Catell Drive and Regan Drive	Drawing	November 2015	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\RIVERVIEWPARK_INLINE_STORAGE__IFC.pdf	November 2015	Issue for construction, tree removal and demolition plan, proposed site plan, proposed profiles, site restoration plans/details, landscaping and miscellaneous details	
615043	Pollution Prevention Program	City Strategic Priorities 2015-2018	PDF Document	No date	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\strategic-priorities-2015-2018.pdf	April 2017		
615043	Pollution Prevention Program	Cost Sharing Agreement with NOTL for construction of gravity sewer along Stanley Av	PDF scan document	April 2004	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\growth data\10 Planning Data\Cost Sharing Agreement-NOTL & City of NF-Gravity Sewer.pdf			
615043	Pollution Prevention Program	Niagara Falls South Side Sewershed Wet Weather Flow CSO Study By: Earth Tech	PDF scan document	January 2001	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\growth data\10 Planning Data\Niagara Falls South Side Sewershed Wet Weather Flow CSO Study January 2001.pdf	May 2016		
615043	Pollution Prevention Program	Mewburn Road Sewage Pumping Station Feasibility Study Report By: Associated Engineering	PDF scan document	November 2012	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\4_Planning Data\S-70-36_Mewburn_Road_Sewage_Pumping_Station_Feasibility_Study_Nov2012.pdf	June 2017		
615043	Pollution Prevention Program	Mewburn Road Sewage Pumping Station Capacity Assessment By: Associated Engineering	PDF scan document	February 2013	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\4_Planning Data\S-70-36_Mewburn_Road_SPS_Capacity_Assessment_Draft_February2013.pdf	June 2017		
615043	Pollution Prevention Program	2014 Consumption Report by Meter Size	Excel	N/A	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\4_Planning Data\Water Billing Data\2014 Consumption Report by Meter Size - Sorted by Active and Inactive.xlsx	November 2015	Includes: water work name, facility account, status, meter cycle, class code, annual usage, address, company, phone	
615043	Pollution Prevention Program	Chippawa XPSWMM Model Update and Proposed Residential Development By: CH2MHILL	PDF scan document	April 2004	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\4_Planning Data\20150902_fromNiagaraFalls\Chippawa XPSWMM Model Update & Proposed Residential Develpment-April 5, 2004.pdf	September 2015		
615043	Pollution Prevention Program	Niagara Region TMP - Traffic Zone Update By: IBI Group	PDF Document	November 2015	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\4_Planning Data\2015 Dec 10_FromNiagaraFalls - Updated TAZ\TTM_TrafficZone_Update_2015-11-25.pdf	January 2016		
615043	Pollution Prevention Program	Sanitary Drainage Area	Drawing	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Area 1	November 2015	Glenview, Victoria Av and Bridge St	
615043	Pollution Prevention Program	Maple Street Sewer separation, watermain replacement and road reconstruction	Layered PDF	March 2014	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Area 1\not helpful	November 2015		
615043	Pollution Prevention Program	Fallsview Tourist Core Area - Trunk sewer present and ultimate sanitary drainage areas	Drawing	October 2001	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Area 2	December 2015	Phases 2 & 3,	
615043	Pollution Prevention Program	Sanitary Drainage Area	Drawing	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Area 2	November 2015	Stramfort St and McRae St from Stanley Av to Victoria Av, main St and Seneca St and Bender St. pumping station	
615043	Pollution Prevention Program	Storm, sewer and watermain Bender Hill	Drawing	August 1980	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Area 2\Storm Sewer Drawings that may be helpful\82-CA-56.tif	October 2015		
615043	Pollution Prevention Program	Storm Drainage Plans	Drawing	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Area 2\Storm Sewer Drawings that may be helpful\82-CA-56.tif	October 2015	Bender Hill, Aalls Av, Clifton Hill, Victoria Av, Kitchener St, Walnut St, Hunter St, Union Av and propsoed drainage plan Rainbow Bridge	
615043	Pollution Prevention Program	Sanitary Drainage Area	Drawing	March 1982	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Area 2\not helpful	November 2015	Dorchester Rd & Drummon Rd Lundy's Lane to Dunn St	
615043	Pollution Prevention Program	Sanitary Drainage Area	Drawing	May 2006	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Area 3	November 2015	Sinnick Av from Thorold Stone Rd to Vine St and from Vice St to Atlas St	

615043	Pollution Prevention Program	Sanitary Drainage Area	Drawing	January 2008	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Area 3\minimal help	November 2015	Swayze Drive from Portage Rd to Stanley Av	
615043	Pollution Prevention Program	Sanitary Drainage Area	Drawing	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Area 3\not helpful	November 2015	Riall-Russell-Huggins and Oakwood Dr Pumping Station	
615043	Pollution Prevention Program	Trunck sewers markups	Drawing	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Layout Map	November 2015 - February 2016		
615043	Pollution Prevention Program	Combines Sewer Overflows 2012	Layered PDF	October 2014	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Other drawings that may be helpful	November 2015		
615043	Pollution Prevention Program	Sanitary Drainage Area Refrence Drawings	Excel	N/A	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CB - Drainage Area plans\Sanitary Drainage Area reference drawings.xlsx	November 2015		
615043	Pollution Prevention Program	CSO Pictures	Pictures	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\CSO Pictures	September 2015	Bellevue, Brookfield, Front St, George, Greenwood, Harte, Margaret Warden, Meadowale, Valley Way, Drummond & Dunn, Pells Creek, Sarah Street	
615043	Pollution Prevention Program	Niagara Falls Pollution Control Plan - Final Screening Report By: CH2MHILL	PDF Document	June 2008	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\S-70-39 background data\NF Pollution Control Plan-Final Screening Report-CH2M Hill 2008.pdf	September 2015		
615043	Pollution Prevention Program	CSO and storage tanks overflow data	Excel	N/A	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\Storage Tanks, Overflows, P.S	September 2015		
615043	Pollution Prevention Program	Cattell Dt flood relief storage tank	Layered PDF	No date	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\1 Wastewater System Inventory\Storage Tanks, Overflows, P.S	September 2015		
615043	Pollution Prevention Program	Plans and Profiles for Area 1	Drawing	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\Additional Info - Catchment review\Area 1	December 2015	Acheson, Brouhton, Buttrey, Dyson, Elgin, Ferguson, Glenview, Hickson, Leader Ln, Martin, May, Muir, River Rd, Stanton, Terrace, Victoria	
615043	Pollution Prevention Program	Plans and Profiles for Area 2	Drawing	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\Additional Info - Catchment review\Area 2	December 2015	Barker West of Portage, Ferry East of Portage and Clarke Av	
615043	Pollution Prevention Program	Plans and Profiles for Area 2A	Drawing	Various	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\Additional Info - Catchment review\Area 2A	December 2015	Bender Area, Centre, Ellen, Hunter, Lewis, Magdalen, Victoria, Walnut	
615043	Pollution Prevention Program	Rainbow Bride Approach	Drawing	No date	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\Additional Info - Catchment review\Area 2A\1 Bender Area	December 2017		
615043	Pollution Prevention Program	Flood Prone Areas Map	Layered PDF	August 2015	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\7 Level of Service\Niagara Falls Basement Flooding Events\Flooding\Flood Prone Areas Map-36X60.pdf	September 2015		
615043	Pollution Prevention Program	Flood pin points	Drawing	July and September 2004	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\7 Level of Service\Niagara Falls Basement Flooding Events\Flooding\Flood Prone Areas Map-36X60.pdf	September 2015		
615043	Pollution Prevention Program	2014 PCP Flow Monitoring locations	Layered PDF	October 2014	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\Flow Monitoring\New data from KS 09092015\2014 PCP Flow Monitoring Map-PLOT 36x36.pdf	September 2015		
615043	Pollution Prevention Program	Flow Monitor Install dates	World	No date	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\Flow Monitoring\New data from KS 09092015\Flow Monitor.docx	September 2015		
615043	Pollution Prevention Program	Chippawa Precipitation Report May to Augut 2015	PDF Document	September 2015	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\Flow Monitoring\Regional Precipitation Data\Chippawa Precipitation Report_May to August 2015.pdf	September 2015		
615043	Pollution Prevention Program	Kalar Precipitation Report May to Augut 2015	PDF Document	September 2015	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\Flow Monitoring\Regional Precipitation Data\Kalar Precipitation Report_May to August 2015.pdf	September 2015		
615043	Pollution Prevention Program	Sanitary sewage blockage data from 2005 to 2012	Excel	N/A	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\Sanitary Sewermain Blockage\BLOCKAGE2005-2012.xls	September 2015	Includes: blockage ID, problem, year and date	

615043	Pollution Prevention Program	Sewer Maintenance List	Excel	N/A	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\615043 Data Export\Sanitary Sewermain Blockage\SEWER MAINTENANCE LIST.xls	September 2015	Includes: location ID, route, atreet number, street name, street adhead, street back, SGM_ID, sgm tye, width, problem, cleaning frequency
615043	Pollution Prevention Program	CCTV Inspection List	Excel	N/A	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\4 Condition Data\CCTV Inspection List.xlsx	September 2015	Includes: jub number, last modified, start street, catchment, start/end node, pipe diameter, pipe materials, ctv partial, strgrade, sergrade
615043	Pollution Prevention Program	3 year overflow volumes	Excel	N/A	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\3 Wastewater Facility Inventory	June 2016	Includes: year, municipality, plant, location, type, bypass date, duration, volumne, reason
615043	Pollution Prevention Program	Bypass Information Niagara Falls System incuding overflow summary	Excel	N/A	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\5 Performance capacity info\Bypass Info	November 2015	Includes: location, start time, duration, volume, date, type, reason
615043	Pollution Prevention Program	Niagara Falls Draw Down Tests	Excel	N/A	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\5 Performance capacity info\NFalls Draw Down Tests.zip	March 2016	
615043	Pollution Prevention Program	Certificate of Approval	PDF Document	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\6 C of A\ECAS	November 2015	
615043	Pollution Prevention Program	Certificate of Approval	PDF Document	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\6 C of A\ECAS	September 2015	
615043	Pollution Prevention Program	2013 Flooding claims related data	Excel	N/A	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\7 Level of Service\2013 Flooding\Data Exports	September 2015	
615043	Pollution Prevention Program	Flooding follow ups	World	N/A	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\7 Level of Service\2013 Flooding\Flooding Follow ups\Flooding Follow ups.docx	September 2015	
615043	Pollution Prevention Program	July 19 2013 flood data	Various	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\7 Level of Service\2013 Flooding\July 19 2013 Flood Data	September 2015	
615043	Pollution Prevention Program	June 28 2013 flood data	Various	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\7 Level of Service\2013 Flooding\June 28 2013 Flood data	September 2015	
615043	Pollution Prevention Program	Flooding related maps	Drawing	No date	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\7 Level of Service\2013 Flooding\Maps	September 2015	
615043	Pollution Prevention Program	Frequency of flooding study	Excel	N/A	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\7 Level of Service\Niagara Falls Basement Flooding Events\Frequency of flooding study\Frequency of flooding study.xlsx	June 2016	Includes: parcels per catchement and flooded homes per catchments
615043	Pollution Prevention Program	Flooding events	World	N/A	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\7 Level of Service\Niagara Falls Basement Flooding Events\Niagara Falls Basement Flooding Events.docx	September 2015	
615043	Pollution Prevention Program	Certificate of Approval	PDF Document	January 2002	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\9 TCA Register\MOE Certificate of Approval 5404-56FS7V re Combined Sewers.pdf	September 2015	For new sanitary sewer service connections
615043	Pollution Prevention Program	Annual CSO reduction reports	PDF Document	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Annual CSo reduction reports	May 2012 to October 2015	
615043	Pollution Prevention Program	Annual CSO reduction reports	PDF Document	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\CSO cost sharing project reports	May 2012 to October 2015	
615043	Pollution Prevention Program	Capital Budgets 2011 to 2015	PDF Document	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Capital budgets 2011-present	September 2015	
615043	Pollution Prevention Program	Storm Drainage Plans	Drawing	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\CA storm drawings	November 2015	

615043	Pollution Prevention Program	Model Data Gaps	Drawing	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\Model Data Gaps - June 15 2016	Various	Profiles and plans, manhole details
615043	Pollution Prevention Program	Central Pump Station	Drawing	January 1982	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\PCP Drawings - from Region\Central Pump Station	February 2000	
615043	Pollution Prevention Program	Inline Gate Valve	Drawing	August 1970	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\PCP Drawings - from Region\Inline Gate Valve	January 2000	
615043	Pollution Prevention Program	Low Lift PS East Inline	Drawing	September 2013	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\PCP Drawings - from Region\Low Lift PS East Inline	September 2013	
615043	Pollution Prevention Program	Park Street PS Statio Overflow	Drawing	March 1962	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\PCP Drawings - from Region\Park Street PS Station Overflow	June 2006	
615043	Pollution Prevention Program	Stanley Avenie WWTP	Drawing	August 2011	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\PCP Drawings - from Region\Stanley Avenue WWTP	Various	
615043	Pollution Prevention Program	Taro North Decommisioning	Drawing	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\PCP Drawings - from Region\Taro North Decommisioning	Various	
615043	Pollution Prevention Program	Townline Road PS	Drawing	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\PCP Drawings - from Region\Townline Road PS	Various	
615043	Pollution Prevention Program	2013 Asset Managemet Plan for the City of Niagara Falls	PDF Document	2013	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\AMP - City of Niagara Falls (Core Infrastructure).pdf	November 2015	
615043	Pollution Prevention Program	Other Reports and Studies	PDF Document	Various	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies	Various	
615043	Pollution Prevention Program	A review of flood relief measures in Chippawa 1970 - 1989	PDF scan document	No date	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\A Review of Flood Relief Measures in Chippawa, 1970 - 1989.pdf	April 2007	
615043	Pollution Prevention Program	Chippawa - A study of weeping tile flows	PDF scan document	February 1995	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Chippawa - A Study of Weeping Tile Flows, February 1995.pdf	April 2007	
615043	Pollution Prevention Program	Chippawa Basement Flooding Analysis Final Report By: CH2MHILL	PDF Document	April 2010	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Chippawa Basement Flooding Analysis-Final Report-April 2010.pdf	May 2010	
615043	Pollution Prevention Program	Chippawa Community Remedial measures for Basement Flooding 1988 Report By: DELCAN	PDF scan document	May 1988	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Chippawa Community Remedial Measures-Basement Flooding 1988.pdf	April 2007	
615043	Pollution Prevention Program	Chippawa Community Sanitary Systems Analysis	PDF scan document	November 1991	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Chippawa Community Sanitary Systems Analysis, November 1991.pdf	April 2007	
615043	Pollution Prevention Program	Chippawa I.N.S. Astudy of weeping tile flows	PDF scan document	May 1991	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Chippawa I.N.S. - a study of weeping tile flows, may 1991.pdf	April 2007	
615043	Pollution Prevention Program	Chippawa Pollution Control Plan By: CG&S	PDF scan document	October 1996	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Chippawa Pollution Control Plan.pdf	September 2016	
615043	Pollution Prevention Program	Chippawa Pollution Control Study Final Report By: CG&S	PDF scan document	November 1998	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Chippawa Pollution Control Study-Final Report 11-1998-CG&S.pdf	April 2007	

615043	Pollution Prevention Program	Chippawa Pumping Station Upgrade and Saitary Sewage Storage Facility Schedule B - Class EA By: The Proctor & Redfern Group	PDF scan document	January 1989	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Chippawa Pumping Station Upgrade & Sanitary Sewage Storage Facility - Schedule B Class EA, January 1989.pdf	April 2007
615043	Pollution Prevention Program	Chippawa Sewer Flooding Relief Study Class EA - Environmental Screening Report By: CH2MHILL	PDF scan document	December 2010	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Chippawa Sewer Flooding Relief Study Class EA December 2010.pdf	February 2013
615043	Pollution Prevention Program	Weeping Tile Monitoring program Draft Report By: Associated Engineering	PDF scan document	February 2007	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\City of NF and Ft Erie Weeping Tile Monitoring Program 2007.pdf	July 2017
615043	Pollution Prevention Program	Engineering Design Guidelines Manual	PDF Document	No date	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\City of Niagara Falls Engineering Design Standards Manual_2012.PDF	August 2013
615043	Pollution Prevention Program	City of Niagara Falls - Flood Relief Study By: Paul Theil Associates Limited	PDF scan document	February 1981	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\City of Niagara Falls Flood Relief Study, February 1981.pdf	April 2007
615043	Pollution Prevention Program	Official Plan for the City of Niagara Falls	PDF Document	January 2015	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\City of Niagara Falls Official Plan Amended to 2015.pdf	February 2015
615043	Pollution Prevention Program	Class Environmental Assessment Evaluation of Sewage Treatment Alternatives Phase 1 Report - Identification of needs and rational By: The Proctor & Redfern Group	PDF scan document	August 1988	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Class EA-Evaluation of Sewage Treatment Alternatives-Phase 1 Report-Identification of Need & Rationale-Aug 1988.pdf	April 2007
615043	Pollution Prevention Program	Water and Wastewater Master Servicing Plan - Phase 1 Baseline By: AECOM	PDF Document	No date	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\MSP_Part3_Phase1_Baseline.pdf	September 2015
615043	Pollution Prevention Program	Technical Memorandum 1A: Niagara Falls WWTP Niagara Northeast Area Wastewater Servcing Study By: XCG Consultants Ltd.	PDF Document	November 2007	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\NEAppE.pdf	September 2015
615043	Pollution Prevention Program	Northwaste Area Wastewater Servicing Study Final Report By: XCG Consultants Ltd.	PDF Document	July 2008	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\NEAreaStudy.pdf	September 2015
615043	Pollution Prevention Program	Niagara Falls Phase 1 Sanitary System Analysis	PDF scan document	September 1992	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Niagara Falls Phase 1 Sanitary System Analysis-September 28, 1992.pdf	September 2015
615043	Pollution Prevention Program	Niagara Falls Phase 2 Santary System Analysis	PDF scan document	August 1993	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Niagara Falls Phase 2 Sanitary System Analysis-August 16, 1993.pdf	September 2015
615043	Pollution Prevention Program	Niagara Peninsula CAD Standard (NPCS) Version 2.1	PDF Document	April 2011	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Niagara Peninsula CAD Standard Version 2.1.pdf	September 2015
615043	Pollution Prevention Program	Charting a course to dlisting Niagara River (Ontario) AOC	PDF Document	Update 2012	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\NiagaraRiverOntarioAOCUpdate2012.pdf	September 2015
615043	Pollution Prevention Program	Niagara River Remedial Action Plan Stage 2 Update	PDF Document	December 2009	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\NPCA_RAP_Stage_2_Update_Full_Report-2011-09-06 (1).pdf	September 2015
615043	Pollution Prevention Program	City of Niagara Falls Sewer System Analysis and CSO Abatement Study By: CG&S	PDF scan document	February 1996	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\Sewer System Analysis & CSO Abatement Study Feb 1996-City,MOE,Region-Final Report.pdf	September 2015

615043	Pollution Prevention Program	City of Niagara Falls Weeping tile (foundation drains) by-law 2010-61	PDF Document	April 2010	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\3_Planning Phase\PHASE 3 - DATA COLLECTION AND REVIEW\11 Reports and Studies\weeping-tile-by-law.pdf	September 2015		
617028	Gunning and Mears Upgrades	Gunning Drive Pumping station drawings and pump details	Drawing	October 2009	W:\Hamilton\617000\617028 Gunning and Mears Upgrades\Received Files\2017-11-06-NPC drawings	November 2017		
617028	Gunning and Mears Upgrades	Link to Bakor	World	February 2018	W:\Hamilton\617000\617028 Gunning and Mears Upgrades\Received Files\Bakor Coatings\Link to Bakor 810-21.docx	February 2018		
617028	Gunning and Mears Upgrades	Pump run times	Excel	N/A	W:\Hamilton\617000\617028 Gunning and Mears Upgrades\Received Files\Pump run times from City\Gunning and Mears.xlsx	February 2018		
617028	Gunning and Mears Upgrades	Mears Cres. Energy Bill By: Niagara Peninsula Energy	PDF scan document	December 2017	W:\Hamilton\617000\617028 Gunning and Mears Upgrades\Received Files\20171207093605710.pdf	January 2018		
617028	Gunning and Mears Upgrades	Additional Set of Drawings	Drawing	1988 and 1990	W:\Hamilton\617000\617028 Gunning and Mears Upgrades	September 2017		Surveyor's Certificate, Forcemain/drain for storage tanks, storage tanks details, pumping station details
715023	Niagara Region MSP	2016 Master Servicing Plan - Received Files	Various	Various	W:\GTA\715000\715023 Niagara Region MSP\4_Received\1_From Niagara Region\A_General_Data\A1_2012_MSP\2012_MSP_Report\Individual Sections			
715023	Niagara Region MSP	2016 Master Servicing Plan Niagara Falls Wastewater Section By: GMBP	PDF Document	June 2017	W:\GTA\715000\715023 Niagara Region MSP\6_Deliverable\MSP Final Documents\Final\Volume 4\Volume 4 - Technical Document - Wastewater - Part F - Niagara Falls V2.pdf			
617108	Bender Hill Options Alertatives	Bender Hill Drawgings	Drawing	1980	W:\Hamilton\617000\617108 Niagara Bender Hill Sanitary SPS Rehab\4 Received Files\From City of Niagara Falls	January 2018		Storm Sewer and Watermain River rd to palmer Av and drop shaft details
617108	Bender Hill Options Alertatives	Niagara Falls Tourist Core Sewage Study - Area SA 11 Final Report By: Robert Marting Engineering	PDF Document	December 2003	W:\Hamilton\617000\617108 Niagara Bender Hill Sanitary SPS Rehab\4 Received Files\NF Tourist Core Sewage Study Final Report.pdf	February 2018		
617036	Niagara Falls - Small Projects	Oldfield Estates Plans and Profile By: Upper Canad Consultants Engineers/Planners	Layered PDF	January 2016	W:\Hamilton\617000\617036 Niagara Falls - Small Projects\Survey	May 2017		
617036	Niagara Falls - Small Projects	Conceptual Design Options: Riverview Park CSO Tank Design By: CH2MHILL	PDF scan document	November 2013	W:\Hamilton\617000\617036 Niagara Falls - Small Projects\Technical Memo RE Design Concepts (7 Nov 2013).pdf	April 2017		
615043	Pollution Prevention Program	Intensification Performance January - December 2015	Drawing	March 2016	W:\Hamilton\615000\615043_Niagara Falls Pollution Prevention\growth data\10 Planning Data\Yearly_2015_11x17.pdf	March 2016		
618008	Chippawa Alarm Monitoring	Riverview CSO tank design conceptual design optior	tech memo	November 7, 2013	W:\Hamilton\618000\618008 Chippawa Flow Monitoring\3 Files Received\2018-05-15- Riverview Tank Design Tech Memo\Technical Memo RE Design Concepts (7 Nov 2013).pdf			Seems to be the only design brief available from the City - ES

File		Location/Directory	Upload Date	Data Description	Comments
Construction Drawings & laterals	Buckley Ave	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\2017-11-01- background data\Construction Drawings\CC Eng drawings	Jan 30,2018	Buckley Ave Street view of sewer line and sewer lateral details	
	First Ave		Nov 01,2017	First Ave Street view of sewer line and sewer lateral details	Laterals are very hard to read
	Huron Street		Nov 01,2017	Huron Street view of sewer line and sewer lateral details	
	Maple Street		Nov 01,2017	Maple Street view of sewer line and sewer lateral details	
	Morrison Street		Nov 01,2017	Morrison Street view of sewer line and sewer lateral details	
	Park Street		Nov 01,2017	Park Street view of sewer line and sewer lateral details	
	Queen Street		Nov 01,2017	Queen Street view of sewer line and sewer lateral details	These are very hard to see
	St Lawrence Ave		Nov 01,2017	St Lawrence Ave Street view of sewer line and sewer lateral details	
	Valley Way		Dec 11,2017	Valley Way Street view of sewer line and sewer lateral details	
	Victoria Avenue		Nov 01,2017	Victoria Ave Street view of sewer line and sewer lateral details	
	Chippawa	3 Files Received\2018-02-01- Plans and profiles\Plan and profiles for chippawa flow meter alarm configuration	Feb 05,2018	Plans and profiles fro chippawa flow meter alarm configuration	
Field Notes	Valley Way	W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\2017-12-15 - additional data\Construction Drawings\CC Eng drawings\Valley Way\Field Notes	Dec 15,2017	1990 Drawings with hand notes	
Storm Drainage Plans		W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\2017-11-01- background data\Sewers\CA dwgs - Storm Drainage plans	Nov 01,2017	Downtown and adyacent areas to Valley Way Storm Drainage	
Sanitary Drainage Plans		W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\2017-11-01- background data\Sewers\CB dwgs - San Drainage Plans	Nov 01,2017	Adyacent areas to Valley Way Sanitary Drainage	
Sewer Map		3 Files Received\2017-11-01- background data\Sewers\Sewer Map (For Reference Only).pdf	Nov 01,2017	Basic map of Valley Way adyacent area indicating storm, sanitary and combined sewer	Document says for Reference ONLY
Water Plan		W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\3 Files Received\2017-11-01- background data\Water	Nov 01,2017	Adyacent areas to Valley Way Water Lines	Not able to save rotation

GEOTECHNICAL DESKTOP STUDY
Valley Way Drainage Environmental Assessment Study
Niagara Falls, Ontario

Submitted to:

GM BluePlan Engineering Limited
410 Lewis Road, Unit 18
Stoney Creek, ON
L8E 5Y7

Attention: Ms. Danielle Anders, M.A.Sc., P.Eng.

Submitted by:

Amec Foster Wheeler Environment & Infrastructure,
a Division of Amec Foster Wheeler Americas Limited
3300 Merrittville Highway, Unit 5
Thorold, Ontario
L2V 4Y6

December 2017

TG173041

TABLE OF CONTENTS

TG173041

December 8, 2017

GM BluePlan Engineering Limited
410 Lewis Road, Unit 18
Stoney Creek, ON
L8E 5Y7

Attention: Ms. Danielle Anders, M.A.Sc., P.Eng.

Re: Desktop Study of Geotechnical & Hydrogeological Conditions
Valley Way Drainage Environmental Assessment Study
Niagara Falls, Ontario

1.0 AUTHORITY

Authorization to proceed with the geotechnical investigation was received from Ms. Danielle Anders, P.Eng. of GM BluePlan Engineering Limited by means of a sub-consultant agreement dated October 23, 2017.

2.0 INTRODUCTION

Amec Foster Wheeler Environment & Infrastructure, a Division of Amec Foster Wheeler Americas Limited ('Amec Foster Wheeler') is pleased to submit a summary of the desktop study. The study area lies approximately north of Falls Avenue, west of Victoria Avenue, south of Morrison Street and south along the property boundaries of Stanley Avenue and Homewood Avenue in Niagara Falls, Ontario. A Site Location Plan is shown on **Figure 1**; attached to this study report.

It is understood that GM BluePlan Engineering Limited plan to undertake the Valley Way Drainage work within the described study area. This geotechnical desktop study includes a review of available geotechnical details to Amec Foster Wheeler to provide preliminary information on the study area and to evaluate if further investigations are required prior to initiating the project.

3.0 BACKGROUND

The study area is located within a residential area where single story houses exist. Some trees, grass areas and paved roads can be seen in and around the subject study area. The area's topography seems to be not having steep slopes or any other abnormal terrain configurations but the anticipated elevations may vary across the site within few meters (e.g., 3.0 ±).

It is understood that the purpose of this study is to provide preliminary findings based on available data/information and should not be relied on as final recommendations as it may be subject to revision and a further geotechnical site investigation. This desktop study provides preliminary information related to the study area in terms of:

- Anticipated subsurface soil stratigraphy;
- Approximate depth to bedrock;
- Expected groundwater conditions and problems;
- Preliminary bearing capacities and frost-thawing requirements for supporting soils.

4.0 METHODOLOGY

The data from drilled boreholes of previous geotechnical investigations by Amec Foster Wheeler carried out in 1982, 2000 and 2014 were reviewed. Quaternary maps, geology maps and a bedrock topography map in addition to other geotechnical information were summarized and compiled by Amec foster Wheeler (then AMEC) in 2007 for the Niagara Region. All the compiled data was used as a reference in this desktop study. The following is a list of resources relied on in the previous study and the current desktop study:

- In house data from previous geotechnical investigations (McGlone & Associates, AGRA, AMEC).

- Feenstra, B.H. 1981: Bedrock Topography of Niagara & Niagara-on-the-Lake, Southern Ontario; Ontario Geological Survey Preliminary Map P.2400, Bedrock Topography Series. Scale 1:50,000.

- Feenstra, B.H. 1972: Quaternary Geology of the Niagara Area, Southern Ontario; Ontario Division of Mines Preliminary Map P.764, Geological Series, Scale 1: 50,000

- MRD 207 – Bedrock Topography and Overburden Thickness Mapping, Southern Ontario, Ministry of Northern Development and Mines (study area only).

- MRD 128 – Surficial Geology of Southern Ontario, Ministry of Northern Development and Mines (study area only).

In addition to:

- Map 2496 "Quaternary Geology, Niagara-Welland Area, Southern Ontario", published by the Ministry of Natural Resources.
- Map P.764 "Quaternary Geology of the Niagara Area of Southern Ontario" published by the Ministry of Natural Resources – 1972.

Referring to Map 2496 "Quaternary Geology, Niagara-Welland Area, Southern Ontario" in addition to **Figure 2.A** and **Figure 2.B**, it is indicated that the majority of the surficial soils within the project area are expected to consist of glaciolacustrine nearshore and deltaic sand and silt. Referring to Map P.764 "Quaternary Geology of the Niagara Area of Southern Ontario", it can be seen that the area of the project site comprises of Lake Warren and younger pre-Iroquois stratified silty very fine to gravely sands and/or stratified clay, silt, and sand.

The other very important geological feature in this general vicinity is the Niagara Escarpment which runs generally East West some distance North of this site through which the Niagara River has cut a massive valley to the North of Niagara Falls. The Hydro Canal is also located on the North-West side of the subject study area.

In general, the bedrock elevation contours within the study area have been interpolated from well water and borehole data back in 2007 by Amec Foster Wheeler, and can be referenced in **Figure 3**. The elevation of the bedrock appears to be within 175 m

"*Geodetic*". Therefore, it is anticipated that bedrock could interfere with construction activities within the study area.

Based on our understanding of the available information, it was anticipated that the shallow bedrock consists of either Limestone or Shale depending on the construction location (refer to **Figure 4**).

5.0 SUBSURFACE CONDITIONS AND DESCRIPTIONS

Based on our experience with the geotechnical conditions and reviewing several geotechnical site investigations previously conducted by Amec Foster Wheeler and/or its predecessor companies (AMEC, AGRA, and McGlone & Associates Ltd.) for a site in the vicinity of the subject project, the following was concluded:

5.1 Anticipated Stratigraphy Based on Previous Investigations

From1982 Geotechnical Investigation:

This geotechnical investigation was for site investigated by Amec within the study area and appeared to be fairly level but some locations in its vicinity were found to be approximately 3.0 m higher. The boreholes drilled during this investigation were near Jepson Avenue in Niagara Falls, ranged from 2.0 m to 3.5 m in depth.

The obtained SPT split-spoon soil samples from the two previous investigations within the subject area have revealed the following:

- Topsoil: A thin topsoil layer was encountered at the boreholes.
- Fill material: Consisted of silt with some sand and occasional clayey areas. Silty Sand/Sandy Silt soils are expected.
- Native material: Silty Sand/Sandy Silt and Silty/Sandy Clay were found underneath the fill materials.

From 2000 Geotechnical Investigation:

A geotechnical investigation was conducted by Amec Foster Wheeler (then AGRA) within

Stanley Avenue in 2000. The gathered geotechnical information from this investigation on the subsurface conditions at the site were obtained by means of sampled boreholes. Boreholes were advanced during this investigation to confirm subsurface conditions.

The obtained SPT split-spoon soil samples from this previous investigation within the subject study area have revealed the following:

- Fill Material: Fill was encountered underlying the topsoil at boreholes extended to a depth of 1.2 m (±), and was underlain by buried topsoil to a depth of 1.8 m (±).
- Native Silty Clay: Generally, underlying the fill of topsoil at each borehole location, reddish-brown to brown Silty Clay was encountered.
- Native Silt to Silt Till: Underlying the Clayey Silt at some locations, reddish-brown Silt to Silt Till was encountered, extending to 7.0 m (±) below ground surface.
- Native Sand: Underlying the silt to Silt Till fine to medium Sand was encountered, extending to the maximum depths investigated at some of the boreholes of 8.0 m (±).

From 2014 Geotechnical Investigation:

In 2014, Amec Foster Wheeler (then, AMEC Environment & Infrastructure ('AMEC')), carried out a geotechnical investigation close to the study area on Second Avenue in Niagara Falls, Ontario. This geotechnical investigation had been carried out to provide information on the subsurface materials, groundwater conditions, and to provide geotechnical recommendations.

The obtained SPT split-spoon soil samples from the two previous investigations within the subject area have revealed the following:

- Fill: Dark brown clayey silt was encountered and extended to a depth of 0.7 m below existing grade at the site.
- Native Silty Clay/Clayey Silt: Underlying the fill, brown Silty Clay/Clayey Silt was generally encountered. This layer extended to a depth of 2.9 m (±) below existing grade.

- Native Silt: Underlying the Silty Clay/Clayey Silt, reddish brown silt was encountered. This layer extended to at least the maximum depth investigated in all of drilled boreholes.

Generally, it is anticipated that the depth, type and conditions of fill materials may vary across the study area. Either granular material, till like, boulder till or weathered bedrock are anticipated at the site. The native deposit could be brown, moist/wet to saturated, loose to compact but gets very dense near the top of bedrock stratum, if reached. It should also be noted that soft underlying silty clays/clays were encountered in some areas within the Niagara Falls area. In such cases, deep and soft clay sometimes requires a deep foundation alternative be used for heavily loaded structures.

5.2 Approximate Depth to Weathered Bedrock or Rock Stratum

The weathered rock/bedrock within the area of the subject site is expected to be roughly in the range of 3.5 m or shallower below ground surface as per geological maps and the 2000 geotechnical investigation. Bedrock was not encountered within the investigated depth of the boreholes completed during 1982 or 2014 investigation. The bedrock in the study area could consist of dolostone of the Lockport Formation. The depth and type of rock could vary across the site. It should be noted that any excavations within bedrock could be very expensive therefore, attention should be given to that aspect.

5.3 Groundwater Conditions and Potential Problems

Groundwater levels near the project site were not encountered in the 1982 geotechnical investigation. In the 2000 geotechnical investigation, wet to saturated soil conditions below a depth of between 3.0 m and 4.0 m (±) were observed. In the 2014 geotechnical investigation, all of boreholes remained dry and open upon completion of the drilling. A groundwater level of 3.6 m below existing grade was measured in a monitoring well approximately 6 week following drilling.

It is anticipated that groundwater may be encountered during excavation works and that the groundwater level may fluctuate and vary across the site depending on seasonal changes (e.g., perched water, rainfall, spring melting or drought) and sand and silt seams/pockets.

Based on the previous geotechnical investigations, it is expected that the soils in the area may range from Silty Clay to Sand.

Silty Clay to Silt Till are considered as low to moderately permeable material. Published hydraulic conductivity values for these materials range from 1×10^{-8} to 1×10^{-11} m/s (Fetter, 2001). Silty Sand/Sandy Silt/Sand are considered as a moderately to relatively highly permeable material. Published hydraulic conductivity values for these materials range from 1×10^{-5} to 1×10^{-8} m/s (Fetter, 2001). Sloughing of soils may also occur within saturated and or loose soil conditions. In areas of fill, especially within utility trenches, these materials can be highly variable and can be very permeable. Should excavations extend to or into the limestone bedrock, groundwater problems can be encountered due to the often highly fractured upper bedrock.

Where groundwater is encountered, a permit for water taking (dewatering) from the Ministry of the Environment and Climate Change (MOECC) may be required to support construction if the water takings are expected to be greater than 50,000 L/day.

5.4 Preliminary Bearing Capacity and Frost Heave

The geotechnical resistances along with the anticipated founding depth within "competent" native materials will depend on the soil condition and properties but they are expected to be in the range of 150 kPa to 200 kPa at SLS within native soils and could gradually increase with depth becoming very high at a confirmed competent bedrock surface.

It is anticipated that footings could likely to be acceptable founded at relatively shallow depths below ground surface level on competent layers to provide both sufficient bearing capacity and prevent frost-heave effects.

Bearing capacity and subgrade must be verified/inspected by an experienced geotechnical engineer during excavations and prior to pouring any foundations.

Foundations (e.g., footings) subject to freezing and thawing processes should have a minimum permanent soil cover of 1.2 m of overburden soil below existing grade to provide adequate frost protection. Otherwise, an approved equivalent insulation material may be used to reduce the quantity of soil cover required.

6.0 CLOSURE

The Geotechnical Limitations are an integral part of this desktop study report. Amec Foster Wheeler trusts that this letter adequately addresses the scope of work. If you have any questions, please do not hesitate to contact our office.

Sincerely,

Amec Foster Wheeler Environment & Infrastructure,
a Division of Amec Foster Wheeler Americas Limited.

Prepared By:

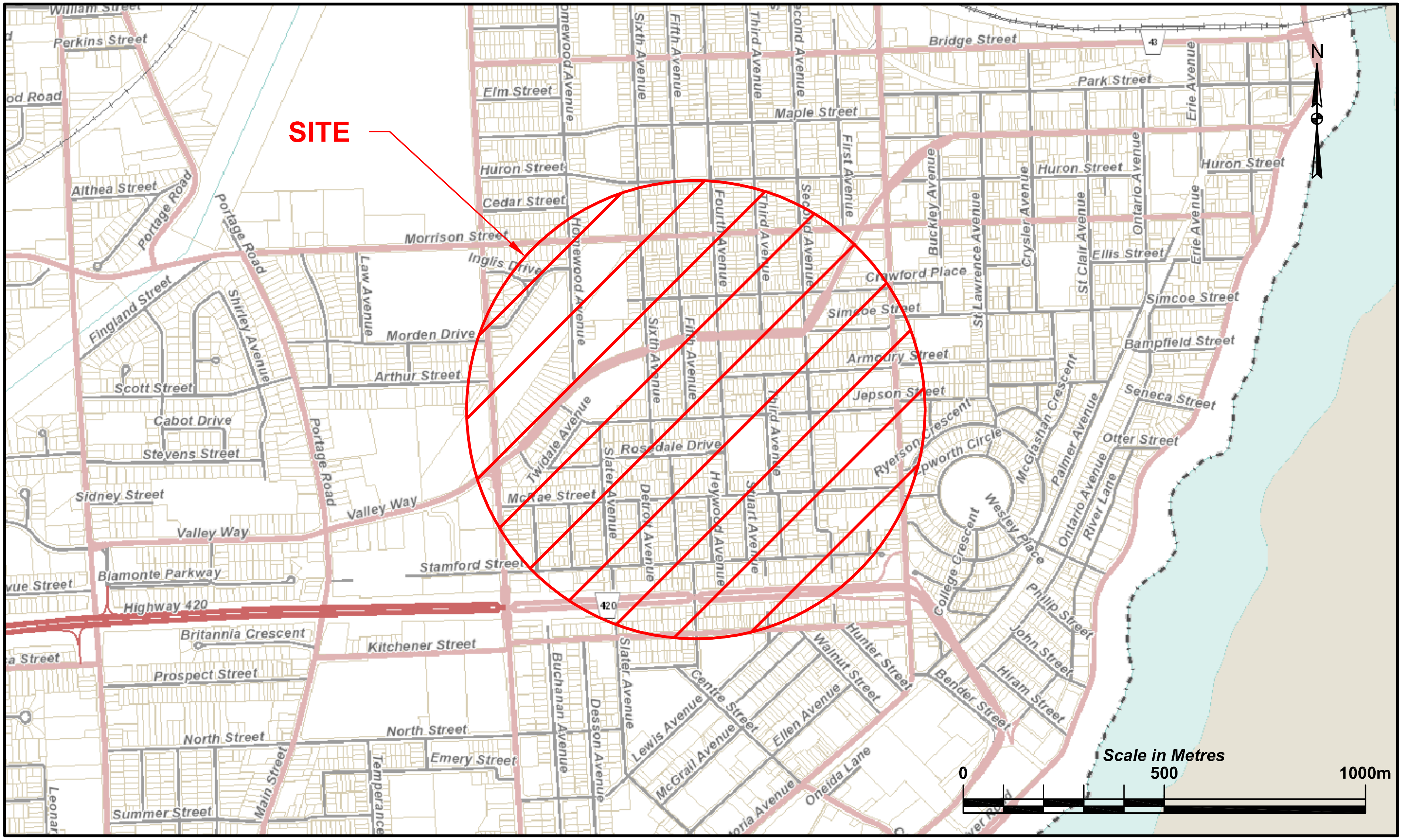
Fathi M. O. Mohamed, P.Eng.
Senior Geotechnical Engineer

Nick Schmidt, B.Sc., P. Geo.
Hydrogeologist

Reviewed By:

Mauro Cortes, P.Eng.
Senior Geotechnical Engineer

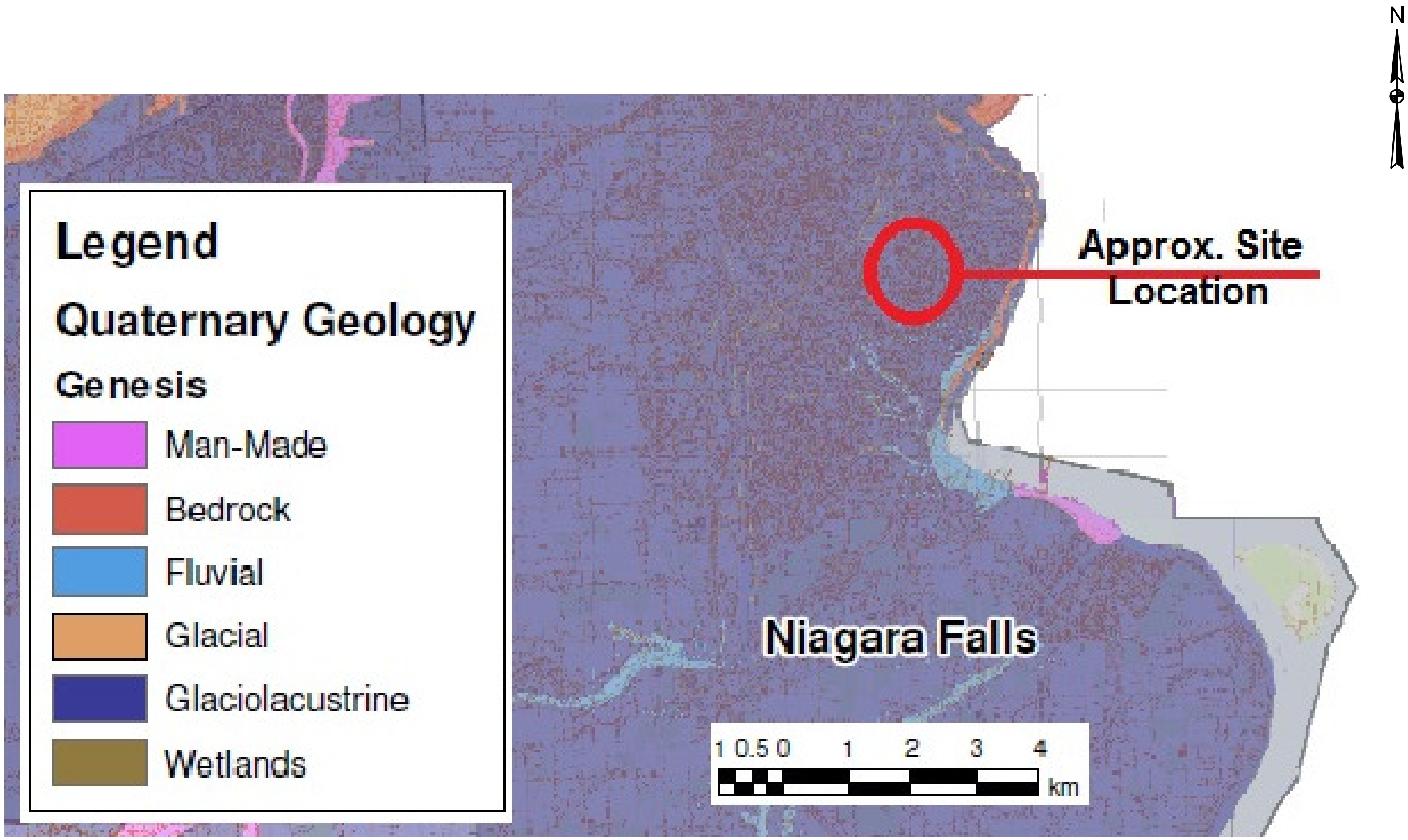
FIGURES



REFERENCE: Base plan provided by NIAGARA NAVIGATOR, https://maps-beta.niagararegion.ca/Navigator/

FOR ILLUSTRATION PURPOSES ONLY, ALL LOCATIONS APPROXIMATE.

CLIENT: GM BluePlan Engineering Ltd.	LEGEND: Site Location	DWN BY: DN	PROJECT: DESKTOP STUDY OF GEOTECHNICAL & HYDROGEOLOGICAL CONDITIONS VALLEY WAY DRAINAGE ENVIRONMENTAL ASSESSMENT STUDY NIAGARA FALLS, ONTARIO	REV. NO.: A
		CHK'D BY: MP		DATE: NOVEMBER 2017
Amec Foster Wheeler Environment & Infrastructure 3300 Merrittville Hwy, Unit 5 Thorold, Ontario		DATUM: NAD83		PROJECT NO.: TG173041
		PROJECTION: UTM Zone 17	TITLE: SITE LOCATION PLAN	NO.: FIGURE 1
		SCALE: As Shown		



REFERENCE: Base plan provided by AMEC FOSTER WHEELER, PROJECT No. TG73022.

FOR ILLUSTRATION PURPOSES ONLY, ALL LOCATIONS APPROXIMATE.

CLIENT: GM BluePlan Engineering Ltd.	LEGEND:	DWN BY: DN	PROJECT: DESKTOP STUDY OF GEOTECHNICAL & HYDROGEOLOGICAL CONDITIONS VALLEY WAY DRAINAGE ENVIRONMENTAL ASSESSMENT STUDY NIAGARA FALLS, ONTARIO	REV. NO.: A
Amec Foster Wheeler Environment & Infrastructure 3300 Merrittville Hwy, Unit 5 Thorold, Ontario amec foster wheeler		CHK'D BY: MP		DATE: NOVEMBER 2017
		DATUM: NAD83		PROJECT NO.: TG173041
		PROJECTION: UTM Zone 17	TITLE: QUATERNARY GEOLOGY - GENESIS	NO.: FIGURE 2A
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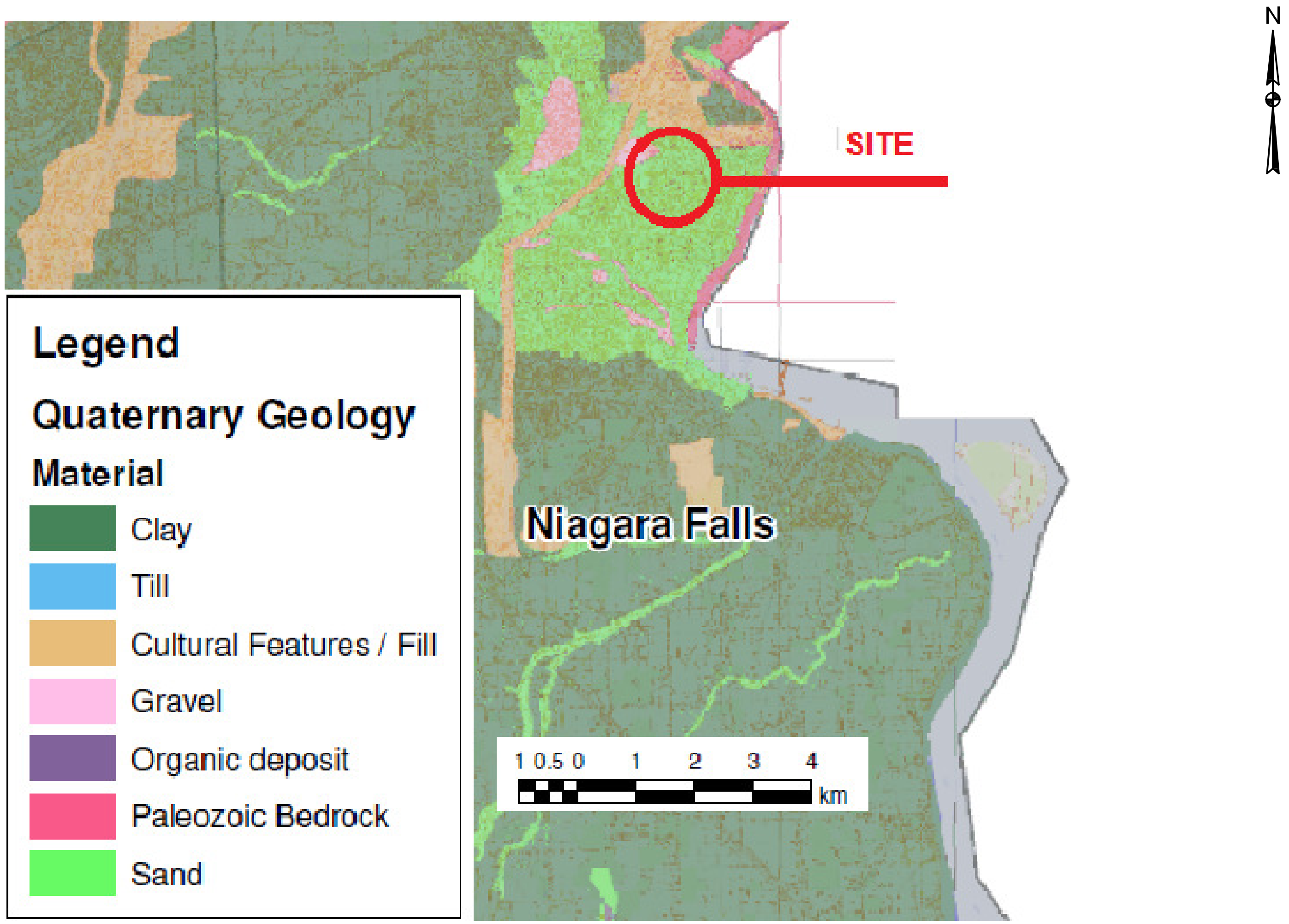

REFERENCE: Base plan provided by AMEC FOSTER WHEELER, PROJECT No. TG73022.

FOR ILLUSTRATION PURPOSES ONLY, ALL LOCATIONS APPROXIMATE.

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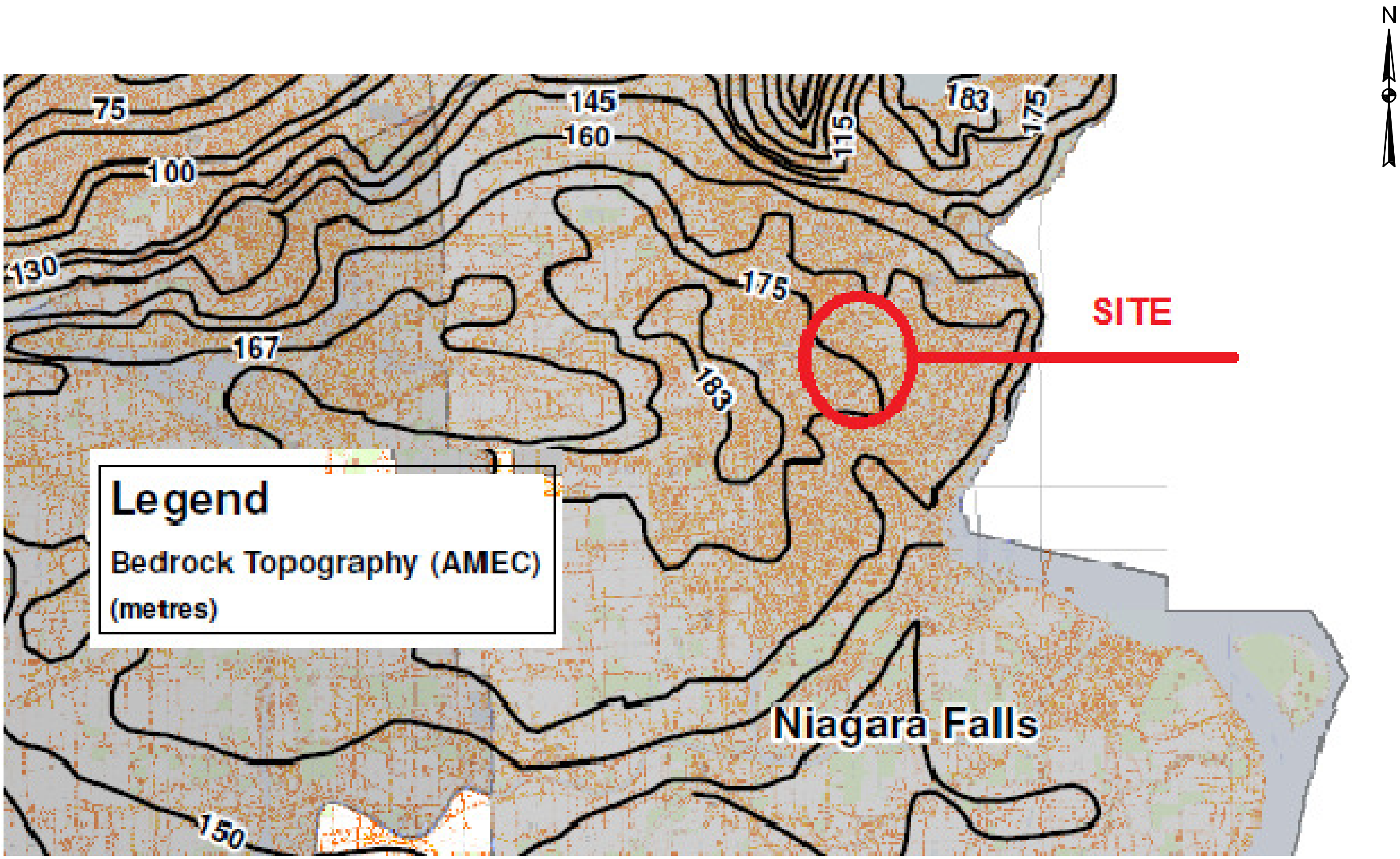
		CHK'D BY: MP		DATE: NOVEMBER 2017
Amec Foster Wheeler Environment & Infrastructure 3300 Merrittville Hwy, Unit 5 Thorold, Ontario amec foster wheeler		DATUM: NAD83		PROJECT NO.: TG173041
		PROJECTION: UTM Zone 17	TITLE: QUATERNARY GEOLOGY - MATERIAL	NO.: FIGURE 2B
		SCALE: As Shown		



REFERENCE: Base plan provided by AMEC FOSTER WHEELER, PROJECT No. TG73022.

FOR ILLUSTRATION PURPOSES ONLY, ALL LOCATIONS APPROXIMATE.

CLIENT:	GM BluePlan Engineering Ltd.
	Amec Foster Wheeler Environment & Infrastructure 3300 Merrittville Hwy, Unit 5 Thorold, Ontario amec foster wheeler
LEGEND:	
DWN BY:	DN
CHK'D BY:	MP
DATUM:	NAD83
PROJECTION:	UTM Zone 17
SCALE:	As Shown
PROJECT:	DESKTOP STUDY OF GEOTECHNICAL & HYDROGEOLOGICAL CONDITIONS VALLEY WAY DRAINAGE ENVIRONMENTAL ASSESSMENT STUDY NIAGARA FALLS, ONTARIO
TITLE:	BEDROCK TOPOGRAPHY
REV. NO.:	A
DATE:	NOVEMBER 2017
PROJECT NO.:	TG173041
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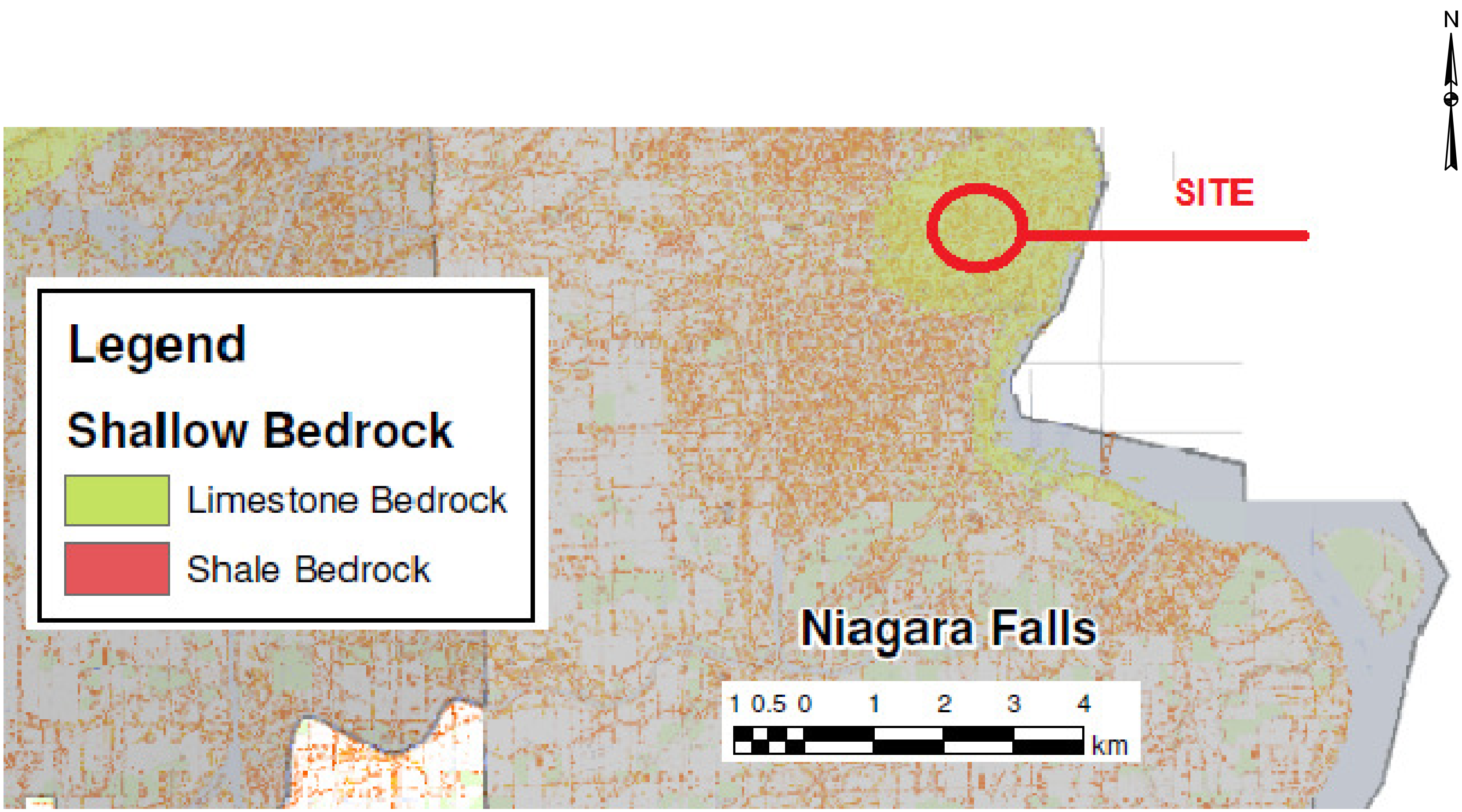


REFERENCE: Base plan provided by AMEC FOSTER WHEELER, PROJECT No. TG73022.

FOR ILLUSTRATION PURPOSES ONLY, ALL LOCATIONS APPROXIMATE.

CLIENT: GM BluePlan Engineering Ltd.	LEGEND:	DWN BY: DN	PROJECT: DESKTOP STUDY OF GEOTECHNICAL & HYDROGEOLOGICAL CONDITIONS VALLEY WAY DRAINAGE ENVIRONMENTAL ASSESSMENT STUDY NIAGARA FALLS, ONTARIO
Amec Foster Wheeler Environment & Infrastructure 3300 Merrittville Hwy, Unit 5 Thorold, Ontario		CHK'D BY: MP	REV. NO.: A
		DATUM: NAD83	DATE: NOVEMBER 2017
		PROJECTION: UTM Zone 17	TITLE: SHALLOW BEDROCK
		SCALE: As Shown	PROJECT NO.: TG173041
			NO.: FIGURE 4

STUDY REPORT LIMITATIONS

GEOTECHNICAL LIMITATIONS

The conclusions and recommendations given in this Desktop Study are based on information determined at testhole/boreholes locations of number of reviewed previous geotechnical reports nearby the study area in addition to available maps. The information contained herein in no way reflects on the environmental aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the testholes may differ from those encountered at the testhole locations described herein, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. It is recommended practice that the Geotechnical Engineer be retained during the construction to confirm that the subsurface conditions across the site do not deviate materially from those encountered in the testholes.

Since all details of the design may not be known, we recommend that we be retained during the final design stage to verify that the design is consistent with our recommendations, and that assumptions made in our analysis are valid.

The comments made in this report relating to potential construction problems and possible methods of construction are intended only for the guidance of the designer. The number of testholes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices. No other warranty is expressed or implied.

The benchmark and elevations mentioned in this report were obtained strictly for use by this office in the geotechnical design of the project. They should not be used by any other party for any other purpose. Any use which a third party makes of this study report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Amec Foster Wheeler Americas Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Date:	10/22/2018 File: 617062
To:	Guangli Zhang – City of Niagara Falls
From:	Danielle Anders – GM BluePlan, Elaine Samuel – GM BluePlan, Danielle MacKinnon – GM BluePlan
Project:	Valley Way Drainage EA Study
Subject:	Technical Memorandum #4 – Flow Monitoring & CCTV Data Review

TECHNICAL MEMO

1. INTRODUCTION

1.1 Project Scope

GM BluePlan (GMBP) has been retained by the City of Niagara Falls to develop a tactical plan to address localized flooding as well as sanitary and storm sewer conveyance issues in the Valley Way drainage area. This study is being completed as a Schedule C Class Environmental Assessment (EA) under the Municipal Environmental Assessment process. In general, the Valley Way Drainage EA Study will serve as an action plan for the City to provide better municipal services and reduce flooding concerns in the study area. In addition, this study will help guide the City's sewer separation and drainage improvement projects in the area.

1.2 Memorandum Scope

This technical memorandum provides a summary of data collected. This includes flow monitoring data collected from April 19, 2018 to August 21, 2018 and CCTV data obtained through *PipeFlo Contracting* from May 16, 2018 to May 29, 2018. The information contained in this memorandum will be used to support the hydraulic model development for the Valley Way Drainage Study area.

This information includes:

- The quality of monitored flow data;
- An assessment of the quantity and magnitude of rainfall events during the monitoring period;
- Muddy Run trunk sewer condition assessment results based on the CCTV investigations; and,
- Next steps for the Valley Way study.

1.3 Flow Monitoring Program

GMBP retained AMG Environmental Inc., as a subcontractor, to install flow monitors in the Valley Way study area to improve the understanding of local system behavior under dry and wet weather flow conditions. **Figure 1** below outlines the study area and introduces the four monitoring locations: VW1_Houck (Houck Drive and Twidale Avenue), VW2_ParkingLot (F.H. Leslie Park, north parking lot), VW3_Willmott (Willmott Street and Valley Way), and VW4_ValleyWay (Valley Way and Willmott Street).

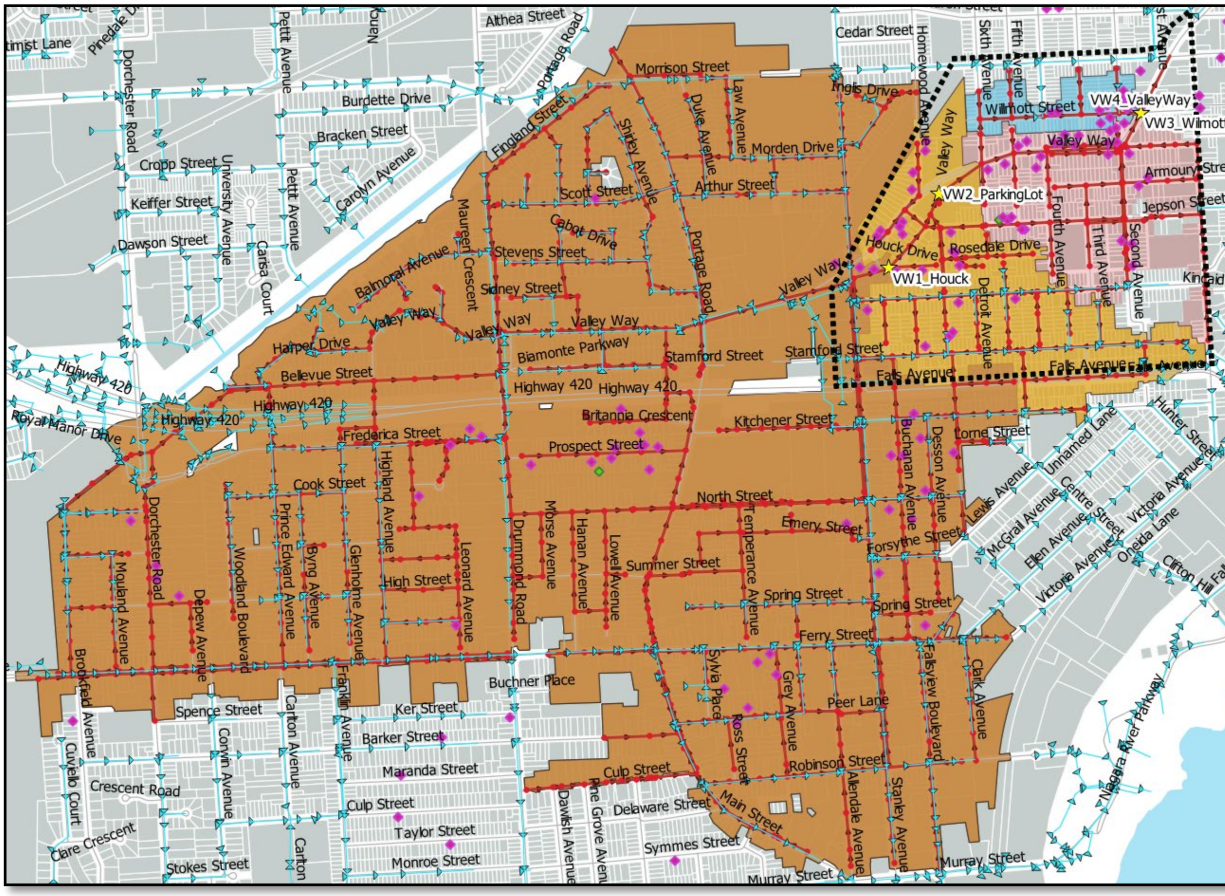


Figure 1: Valley Way Drainage Study Area

Further, **Figure 2** and **Table 1** include the descriptive monitoring locations and corresponding catchment schematic used to discretize the study area for model calibration. The flow monitoring program includes:

- One (1) rain gauge (VW_RG_1); and,
- Four (4) temporary flow monitors located on local sewers in the study area.

Figure 2. Flow Monitoring Schematic

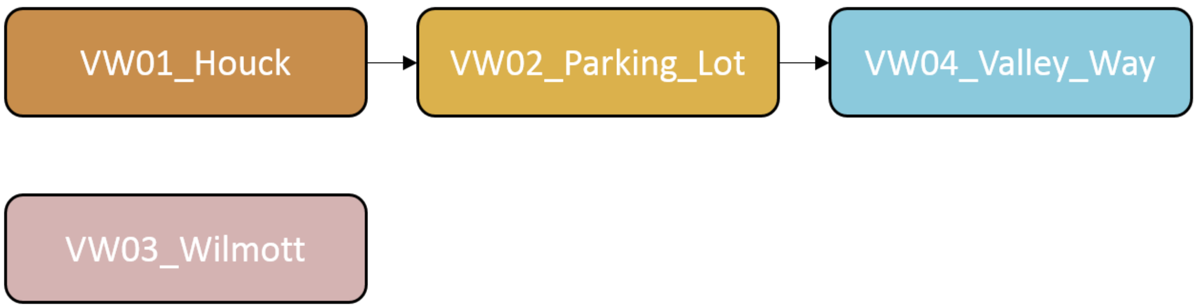


Table 1. Flow Monitoring Details

Flow Monitoring Name	Location of Flow Monitor	Manhole ID	Monitor Pipe ID	Cross Section Shape	Pipe Diameter (mm)	Catchment Area (ha)
Houck	Houck Drive and Twidale Avenue	SMH_02301	SGM_03312	Rectangular	1,475	404.8
Parking Lot	F.H. Leslie Park, North Parking lot	SMH_00737	SGM_02721	Rectangular	1,475	444.2
Willmott	Willmott Street and Valley Way	SMH_00189	SGM_03303	Circular	550	6.5
Valley Way	Valley Way and Willmott Street	SMH_00189	SGM_03317	Rectangular	1,200	470.9

2. PROGRAM REVIEW

2.1 Critical Event Summary

A "Critical Event" is a rainfall occurrence sufficient to generate measurable wet weather flow within the sewer collection system. These events are statistically largest within the study area and are used to support peak wet weather flow analysis and/or wastewater model calibration. Typically, a minimum of three (3) critical events are needed to support the peak flow analysis, with greater than five (5) events being ideal.

Each monitor reported flows into two periods, Q2 and Q3. These periods represent April 1 to June 30 and July 1 to September 30, respectively. For this program, a rainfall event was considered critical if both the peak 1-hour (mm/hr) was greater than 5 mm/hr and total depth (mm) was greater than 15 mm. As shown in **Table 2** below, Q2 recorded no critical rainfall events, while Q3 recorded five (5) separate critical events.

Table 2. Critical Event Summary Table

Critical Event No.	Start Date	End Date	Duration (hh:mm)	Peak 1-hr (mm/hr)	Total Depth (mm)	Event Return Period (year)*
CE1	7/21/2018 23:05	7/22/2018 7:00	07:55	9.5	25.3	9.5
CE2	7/24/2018 17:30	7/25/2018 1:55	08:25	13.0	21.8	13.0
CE3	8/6/2018 22:45	8/9/2018 13:25	39:58	6.5	17.8	0.2
CE4	8/17/2018 0:10	8/19/2018 0:10	30.92	12.0	35.8	0.9
CE5	8/21/2018 4:20	8/22/2018 8:50	24:17	16.50	32.3	2.3

2.2 Dry Weather Flow Summary

The following chart illustrates flow monitors at each station during periods of dry weather from April to September.

Each reporting period includes the Average Dry Weather Flow (ADWF), the Minimum Nighttime Flow (MNF), the Base Groundwater Infiltration (BGWI), Sanitary Flow, and Peak Dry Weather Flow experienced during the respective time periods. This information is illustrated in **Table 3** below, broken down into Q2 and Q3 reporting periods.

Table 3. Dry Weather Flow Summary Table

Monitoring Station	Time Period	Monitoring Dates	ADWF (L/s)	MNF (L/s)	BGWI (L/s)	Sanitary Flow (L/s)	Peak DWF (L/s)
VW01_Houck	Q2	Weekday	74.5	24.5	19.6	54.9	111.0
		Weekend	78.0	25.9	20.7	57.3	124.5
	Q3	Weekday	58.2	18.2	14.6	43.7	109.0

Monitoring Station	Time Period	Monitoring Dates	ADWF (L/s)	MNF (L/s)	BGWI (L/s)	Sanitary Flow (L/s)	Peak DWF (L/s)
		Weekend	60.8	21.4	17.12	0.04	113.3
VW02_Parking_Lot	Q2	Weekday	68.4	10.9	8.7	0.0	119.2
		Weekend	77.8	17.5	14	0.0	162.9
	Q3	Weekday	53.6	7.4	5.9	0.0	89.0
		Weekend	49.5	8.9	7.2	0.0	95.2
VW03_Wilmott	Q2	Weekday	0.8	0.5	0.4	0.1	1.0
		Weekend	1.0	0.6	0.5	0.1	1.3
	Q3	Weekday	0.8	0.5	0.4	0.1	1.1
		Weekend	1.0	0.6	0.5	0.1	1.4
VW04_Valley_Way	Q2	Weekday	64.8	45.4	36.3	0.1	92.6
		Weekend	72	44.6	35.7	0.1	138.0
	Q3	Weekday	66.7	52.7	42.2	0.1	100.1
		Weekend	69.4	54.2	43.4	0.1	122.1

2.3 Flow Monitoring Data Review

Quality Assurance and Quality Control (QA/QC) of the flow monitoring data is provided in **Appendix A** in the form of Velocity-Depth Scatterplots and Flow-Precipitation Graphs for each flow monitor from Q2 to Q3. Pipe slopes were estimated using GIS upstream and downstream manhole elevations and pipe length, which is utilized in the velocity-depth scatterplot.

2.4 Summary of Flow Monitoring Program

The Valley Way Drainage Area flow monitoring investigations recorded sufficient information with minimal data gaps during the monitoring phase. The results of the flow monitoring period include:

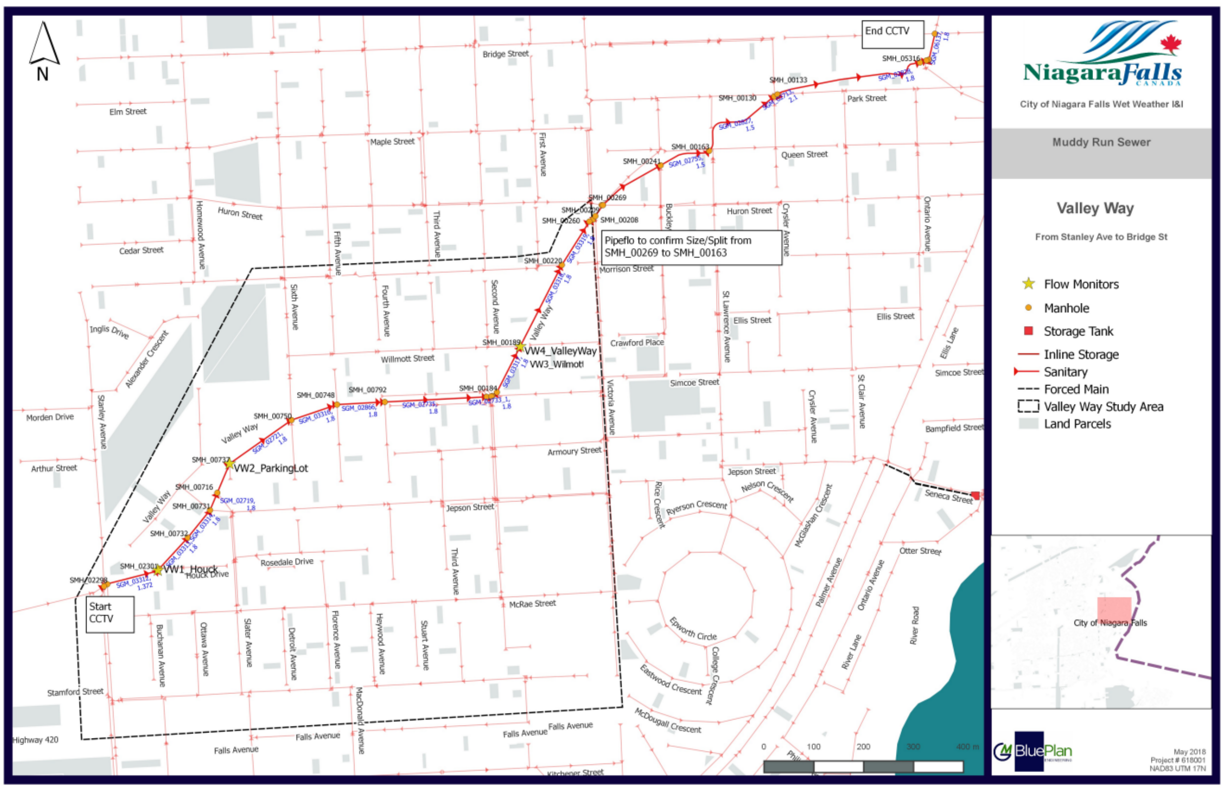
- Five (5) critical rainfall events, with peak 1-hour (mm/hr) greater than 5 mm/hr and total depth (mm) was greater than 15 mm;
- Rainfall captured reporting periods of Q2 (April to June) and Q3 (July to September);
- Q2 had no critical rainfall events and provided long term trend for dry weather flow understanding;
- Q3 had the five (5) critical events listed above and presented quality wet weather flow understanding.

The flow monitoring will be used to calibrate the Valley Way catchments in the model, which be summarized in Technical Memorandum No. 5 – *Hydraulic Model Development and Calibration*.

3. CCTV INVESTIGATIONS

GMBP reviewed CCTV data provided by *Pipeflo Contracting*. Figure 3 below shows the extent of the Muddy Run sewer that was investigated. The following observations include review of the Muddy Run Trunk Sewer captured from May 16 to May 29, 2018. Note: A GMBP staff member was on site during all CCTV investigations.

Figure 3: Muddy Run Sewer



3.1 Sewer Condition Remarks

The full CCTV report for the Muddy Run Sewer is located in **Appendix B**.

<u>SGM 03312 - Houck Drive</u>

1. At 0.0 m, surface aggregate visible.
2. At 0.4 m, circumferential crack.
3. At 0.4 m, deposits, encrustation.
4. At 9.5 m, fine deposits settled.
5. At 18.1 m, reinforcing steel is visible.
6. At 18.7 m, infiltration dripper at 12 to 2 o clock.

7. At 18.7 m, deposits; attached encrustation.
8. At 21.5 m, defective tap, break in at 9 o clock.
9. At 30.2 m, deposits; attached encrustation.
10. At 57.8 m, exposed reinforcing steel in ceiling.
11. At 64.1 m, infiltration dripper.
12. At 73.5 m, circumferential crack.
13. At 84.2 m fine root intrusion.
14. At 93.2 m, exposed reinforcing steel in ceiling.
15. At 100.4 m, infiltration dripper.
16. At 105.4 m, surface aggregate visible.

Overall, this section of sewer appears to be in fair to reasonably good condition.

SGM 03313 - Twidale Ave

1. At 1.5 m, surface aggregate visible.
2. At 8.7 m, gas line extends through the box sewer.
3. At 15.2 m, circumferential crack.
4. At 15.3 m, infiltration dripper.
5. At 28.2 m, circumferential crack.
6. At 42.7 m, circumferential crack
7. At 42.7 m, infiltration dripper.
8. At 58.3 m, circumferential crack.
9. At 58.3 m, infiltration dripper.
10. At 77.0 m, circumferential crack.
11. At 77.0 m, infiltration dripper.
12. At 86.4 m, gas line extends through the box sewer.
13. At 88.1 m, surface aggregate visible.

Generally speaking, this section of sewer is in fair to reasonably good condition.

SGM 03314 - Twidale Ave

1. At 1.5 m, surface aggregate visible.
2. At 15.9 m, infiltration dripper
3. At 17.8 m, a 19 mm diameter line extends through the box sewer.
4. At 29.9 m, infiltration dripper.
5. At 32.5 m, at 36.6 m, at 40.6 m, at 46.4 m, at 48.5 m, and at 51.3 m reinforcing steel is exposed.
6. At 53.4 m, circumferential crack.
7. At 56.0 m at joint, fine root intrusion.
8. At 57.6 m, longitudinal crack.
9. At 70.7 m, exposed reinforcing steel.
10. At 73.8 m, surface aggregate visible.

11. SMH 00731 does not exist.

Generally speaking, this section of sewer is in fair condition.

SGM 02719 - Twidale Ave

1. At 3.5 m, surface aggregate visible.
2. At 33.5 m, circumferential crack.
3. At 42.3 m, surface aggregate visible.
4. SMH 00716 does not exist.

This section of sewer appears to be in reasonably good condition.

SGM 03315 - Jepson Ave

1. At 0.0 m, surface aggregate visible.
2. At 6.7 m and at 9.0 m, exposed reinforcing steel in ceiling.
3. At 15.8 m, circumferential crack.
4. At 16.7 m, at 19.7 m exposed reinforcing steel in ceiling.
5. At 22.8 m, at 35.3 m, circumferential crack.
6. At 37.7 m, at 39.0 m, exposed reinforcing steel.
7. At 52.3 m, surface aggregate visible.

Generally speaking, this section of sewer is in fair condition.

SGM 02721 - Valley Way

1. At 0.0 m, exposed reinforcing steel.
2. At 0.0 m, surface aggregate is visible.
3. At 6.7 m, infiltration dripper.
4. At 12.2 m, circumferential crack.
5. At 15.7 m, at 19.5 m, at 25.0 m, at 35.5 m, exposed reinforcing steel in ceiling.
6. At 55.6 m, circumferential crack.
7. At 56.4 m circumferential crack.
8. At 72.7 m, infiltration dripper.
9. At 91.4 m, at 102.0 m, infiltration dripper.
10. At 118.3 m, circumferential crack.
11. At 118.7 m, exposed reinforcing steel in ceiling.
12. At 132.3 m, infiltration dripper.
13. At 142.9 m, exposed reinforcing steel in ceiling.
14. At 151.9 m, surface aggregate visible.

Generally speaking, this section of sewer is in fair condition.

SGM 03316 - Valley Way

1. At 4.3 m, at 8.4 m, exposed reinforcing steel.
2. At 10.5 m, infiltration dripper.
3. At 10.5 m, circumferential crack.
4. At 27.3 m, surface aggregate visible.
5. At 38.0 m, exposed reinforcing steel in ceiling.
6. At 40.9 m, circumferential crack.
7. At 61.7 m, at 65.1 m, exposed reinforcing steel in ceiling.
8. At 71.2 m, circumferential crack.
9. At 74.4 m, exposed reinforcing steel in ceiling.
10. At 77.4, surface aggregate visible.
11. At 84.2 m, circumferential crack.
12. At 88.8 m, surface roughness increased.
13. At 91.1 m, circumferential crack.
14. At 94.5 m, exposed reinforcing steel.
15. At 96.5 m, surface aggregate visible.

Generally speaking, this section of sewer is in fair condition.

SGM 02866 - Valley Way

1. At 0.0 m, surface aggregate visible.
2. At 4.9 m, circumferential crack.
3. At 16.7 m, infiltration dripper.
4. At 25.2 m, service connection, 90 percent blocked with calcite.
5. At 28.7 m, circumferential crack.
6. At 28.7 m, infiltration dripper.
7. At 34.4 m, infiltration dripper.
8. At 37.3 m, exposed reinforcing steel.
9. At 68.1 m, exposed reinforcing steel in wall.
10. At 91.7 m, surface aggregate visible.

Generally speaking this section of sewer is in fair to reasonably good condition.

SGM 02735 - Valley Way

1. At 3.6 m, infiltration dripper.
2. At 4.6 m, at 8.5 m, at 22.2 m, exposed reinforcing steel.
3. At 24.3 m, infiltration dripper.
4. At 45.1 m, exposed reinforcing steel.
5. At 52.3 m, infiltration dripper.
6. At 58.0 m, surface aggregate visible.
7. At 70.4 m, at 76.4 m, exposed reinforcing steel.

8. At 76.4 m, circumferential crack.
9. At 76.8 m, infiltration dripper.
10. At 79.8 m, exposed reinforcing steel.
11. At 87.3 m, infiltration dripper.
12. At 87.3 m, circumferential crack.
13. At 88.1 m, exposed reinforcing steel.
14. At 96.3 m, infiltration dripper.
15. At 97.4 m, exposed reinforcing steel.
16. At 101.7 m, longitudinal crack.
17. At 119 m, spalling in ceiling.
18. At 119.8 m longitudinal crack.
19. At 122.7 m, circumferential crack.
20. At 132.5 m, longitudinal crack.
21. At 143.6 m, infiltration dripper.
22. At 162.6 m at service connection, exposed reinforcing steel.
23. At 164.5 m, circumferential crack.
24. At 170.1 m, longitudinal crack.
25. At 185.9 m, infiltration dripper.
26. At 271.2, intruding pipe seal.
27. At 221.5 m, longitudinal crack.
28. At 230.0 m, exposed reinforcing steel.

Generally speaking, this section of sewer is in poor condition, although the concrete walls and ceilings, except as noted above, show no major spalling or deterioration.

SGM 03317 - Valley Way

1. Exposed reinforcing steel in 11 locations including at 38.9 m, above service connection not identified in contractor's report.
2. Infiltration drippers in 5 locations.
3. Surface spalling in ceiling at 98.8 m.

Generally speaking, the concrete walls and ceiling are in reasonably good condition; i.e., no major spalling or deterioration.

SGM 03318 - Valley Way

1. Surface spalling and exposed reinforcing steel throughout much of sewer ceiling.
2. Circumferential cracks in two locations and possibly a third at 128.6 m, not noted by camera operator.
3. Longitudinal cracks in two locations.
4. Surface aggregate visible in four locations.

Generally speaking, this section of sewer is in poor condition, although the walls and ceiling, except as noted above, are basically intact, i.e. there are no chunks of concrete missing from walls or ceiling and the reinforcing steel exposure is generally superficial.

SGM 03319 - Valley Way

1. Exposed reinforcing steel in six locations.
2. Surface aggregate visible in two locations.
3. Circumferential crack at 2.9 m.
4. Defective service connections at 42.3 m and at 89.9 m.
5. At the service connection at 17.0 m at 12 o clock there are two reinforcing bars completely exposed.

Except for the areas of exposed reinforcing steel the walls and ceiling of this section of sewer are in reasonably good condition.

GMBP001 - Valley Way

1. There is a 25 mm pipe extending through the sewer at 9.9 m.
2. One circumferential crack at 16.7 m.

Generally speaking, this section of sewer is in reasonably good condition.

3.2 Summary of CCTV Investigations

Overall, the CCTV of the Muddy Run Trunk Sewer reported fair to good conditions. The local study area sewers tributary to the Muddy Run Trunk Sewer is planned for CCTV investigation in year three (3) of the City's State of Good Repair (SOGR) Program, anticipated for 2020-2021.

The following segments reported poor conditions. It is recommended that the following segments be reassessed during the planned SOGR Program review:

- **SMH 00792 to SMH 00184 Valley Way:** Generally speaking, this section of sewer is in poor condition, although the concrete walls and ceilings, except as noted above, show no major spalling or deterioration.

- **SMH 00189 to SMH 00220 Valley Way:** Generally speaking, this section of sewer is not in very good condition, although the walls and ceiling, except as noted above, are basically intact, i.e. there are no chunks of concrete missing from walls or ceiling and the reinforcing steel exposure is generally superficial.

The CCTV investigations and resulting condition assessment of the sewers will be considered when developing alternative solutions under the Class EA process.

APPENDIX A: Flow Monitoring Program Results

VW01_Houck - 0: 2018

This report summarizes the flow monitoring location and specifications, in addition to the WiiFAT analysis outputs for the following reporting period:

Analysis Period: April 19, 2018 - July 31, 2018

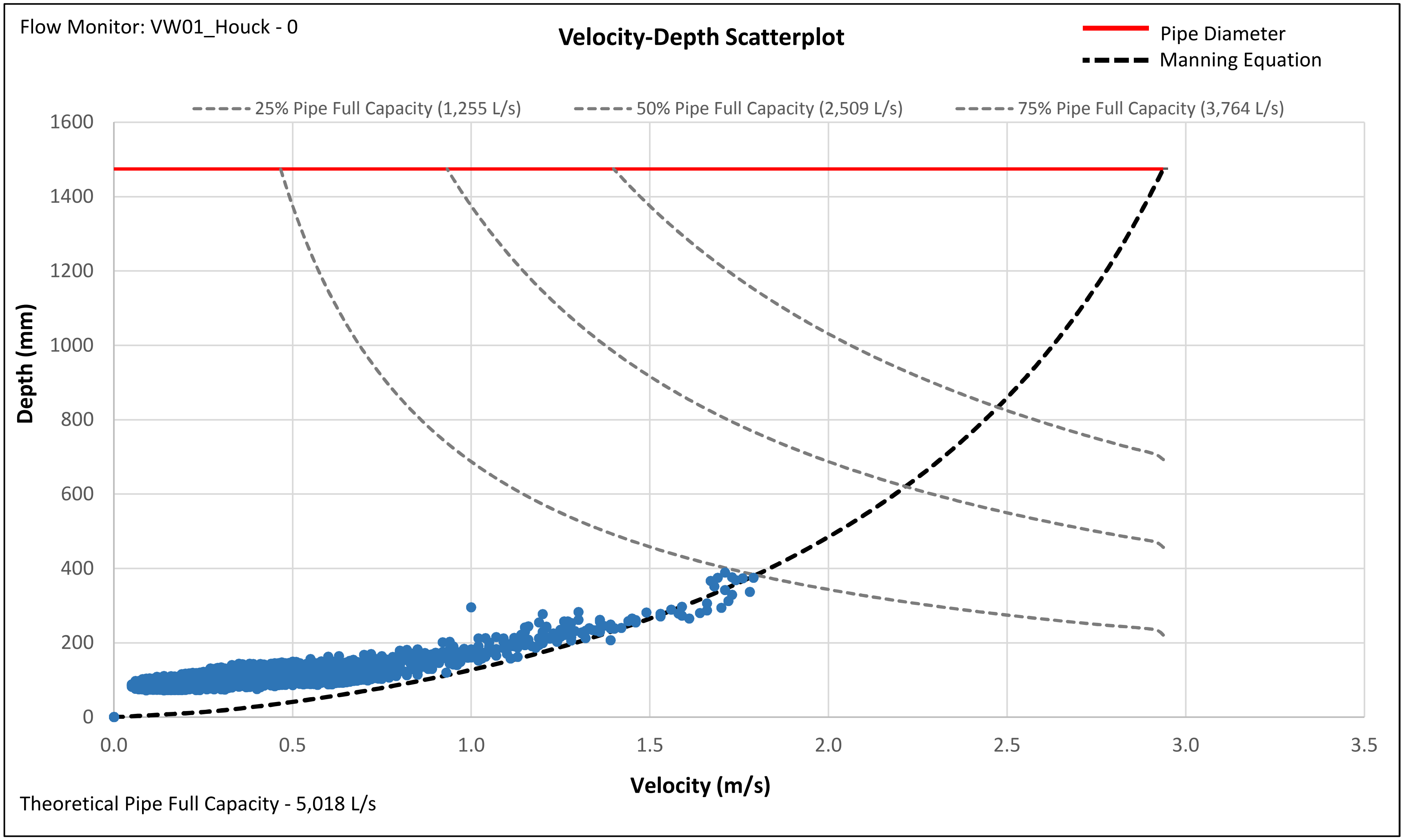
Site Location

Flow Monitor	Location	Sewer System	Manhole ID	Pipe ID
VW01_Houck	1825x1475mm inflow pipe. 5411 Houck Dr. Middle of lane.	Combined	SMH_02301	SGM_03312

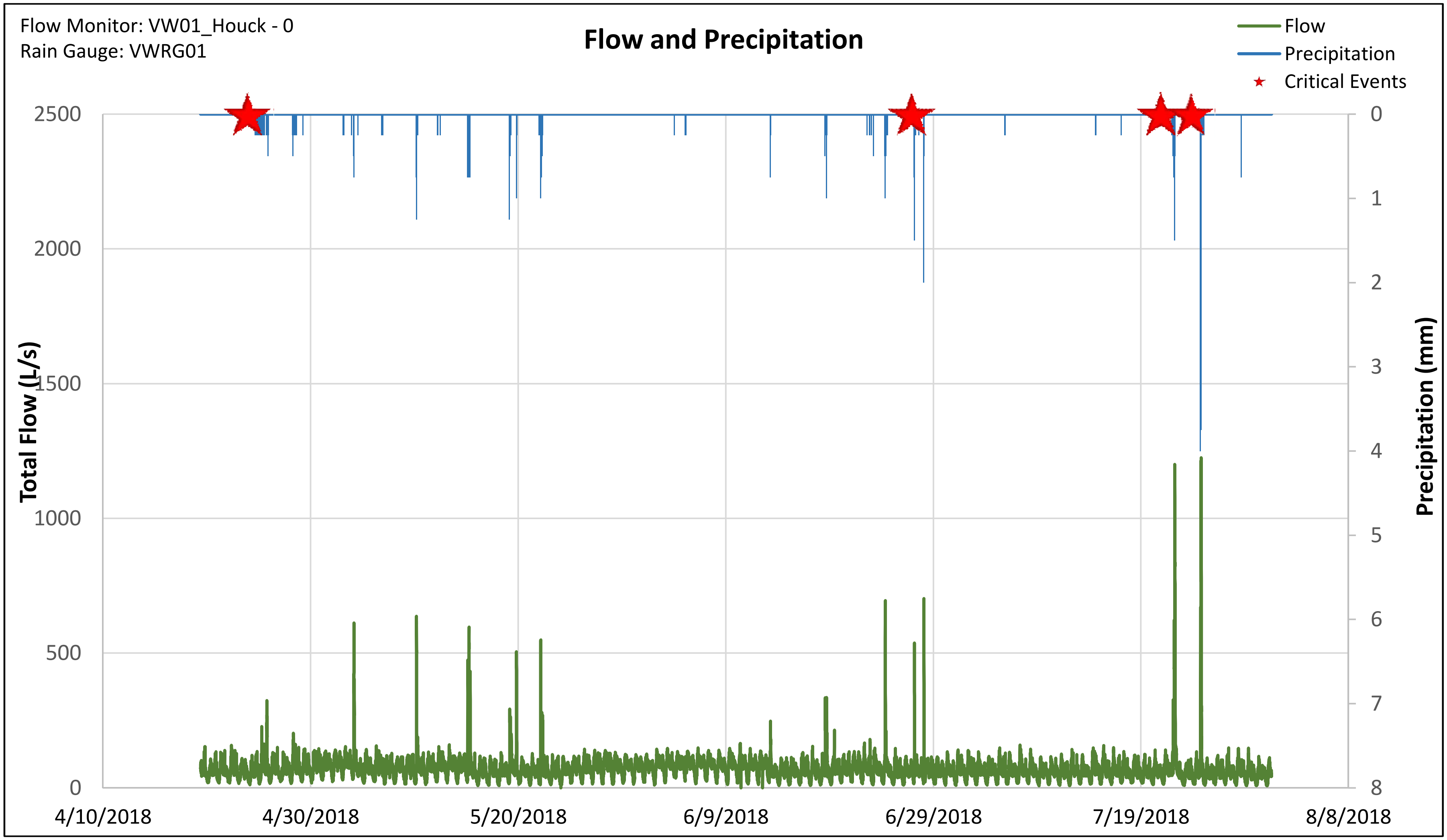
Flow Monitor Specifications

Flow Monitor	Catchment Area (ha)	Pipe Size (mm)	Pipe Length (km)	Population
VW01_Houck	404.85	1,475	0.00	0

Data QA/QC


Flow Monitor: VW01_Houck - 0
Velocity-Depth Scatterplot
Pipe Diameter
Manning Equation
25% Pipe Full Capacity (1,255 L/s)
50% Pipe Full Capacity (2,509 L/s)
75% Pipe Full Capacity (3,764 L/s)
Depth (mm)
1600
1400
1200
1000
800
600
400
200
0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
Velocity (m/s)
Theoretical Pipe Full Capacity - 5,018 L/s

Data QA/QC


Flow Monitor: VW01_Houck - 0
Rain Gauge: VWRG01
Flow and Precipitation
Flow
Precipitation
Critical Events
Total Flow (L/s)
Precipitation (mm)
2500
2000
1500
1000
500
0
0
1
2
3
4
5
6
7
8
4/10/2018
4/30/2018
5/20/2018
6/9/2018
6/29/2018
7/19/2018
8/8/2018

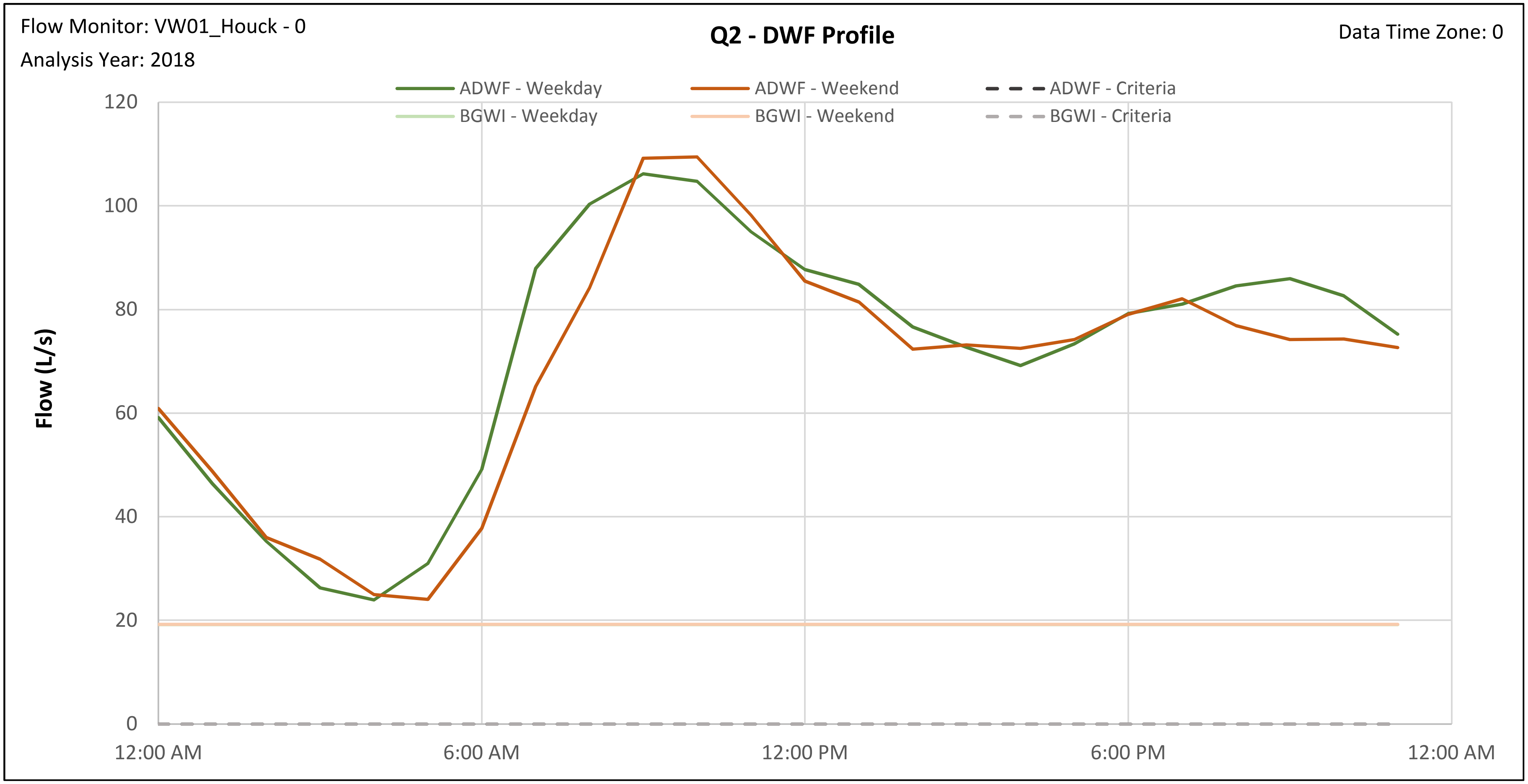
Dry Weather Flow Analysis

Flow Monitor: VW01_Houck - 0 **Analysis Year: 2018**

	Q1		Q2		Q3		Q4		
Variable	Weekday	Weekend	Weekday	Weekend	Weekday	Weekend	Weekday	Weekend	Units
ADWF			71.6	68.7	58.2	60.8			L/s
MDWF			23.9	24.0	18.2	21.4			L/s
BGWI			19.2	19.2	14.6	17.1			L/s
Unit BGWI			0.05	0.05	0.04	0.04			L/s/ha
Unit BGWI									$L/s/m^2$
Sanitary Flow			52.4	49.4	43.7	43.7			L/s
Per Capita Sanitary Flow									L/cap/day
Per Capita ADWF									L/cap/day
PDWF			106.2	109.4	109.0	113.3			L/s
BGWI/ADWF			27%	28%	25%	28%			%
Average d/D			7%	8%	6%	7%			%

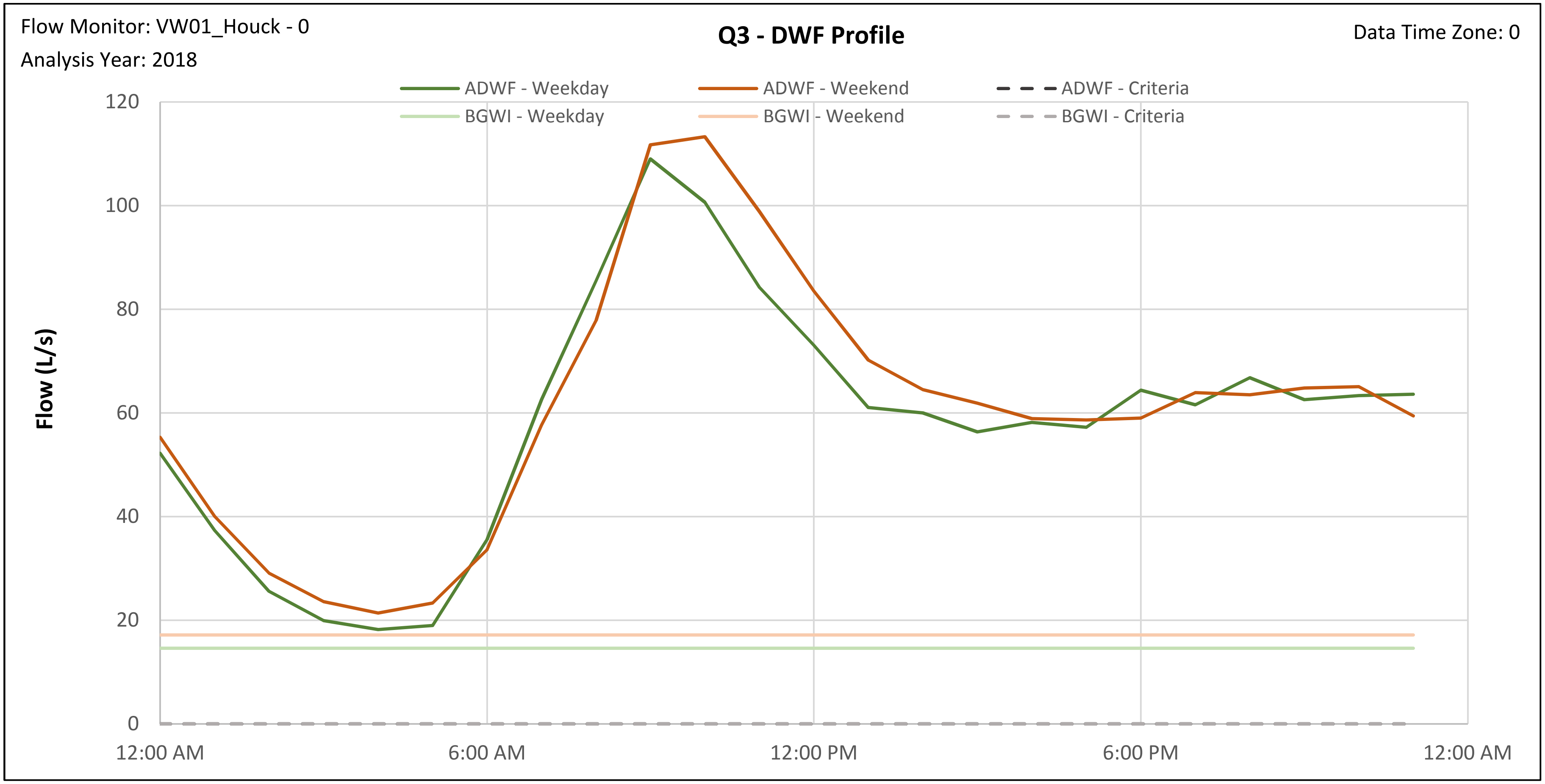
Selected Dry Weather Days

Weekday	5/29/2018	5/30/2018	5/31/2018	5/9/2018	5/14/2018
Weekend	5/26/2018	5/27/2018	6/2/2018	4/22/2018	4/21/2018



Selected Dry Weather Days

Weekday	7/3/2018	7/4/2018	7/11/2018	7/12/2018	7/13/2018
Weekend	7/1/2018	7/7/2018	7/8/2018		



VW02_Parking Lot - 0: 2018

This report summarizes the flow monitoring location and specifications, in addition to the WiiFAT analysis outputs for the following reporting period:

Analysis Period: April 19, 2018 - July 31, 2018

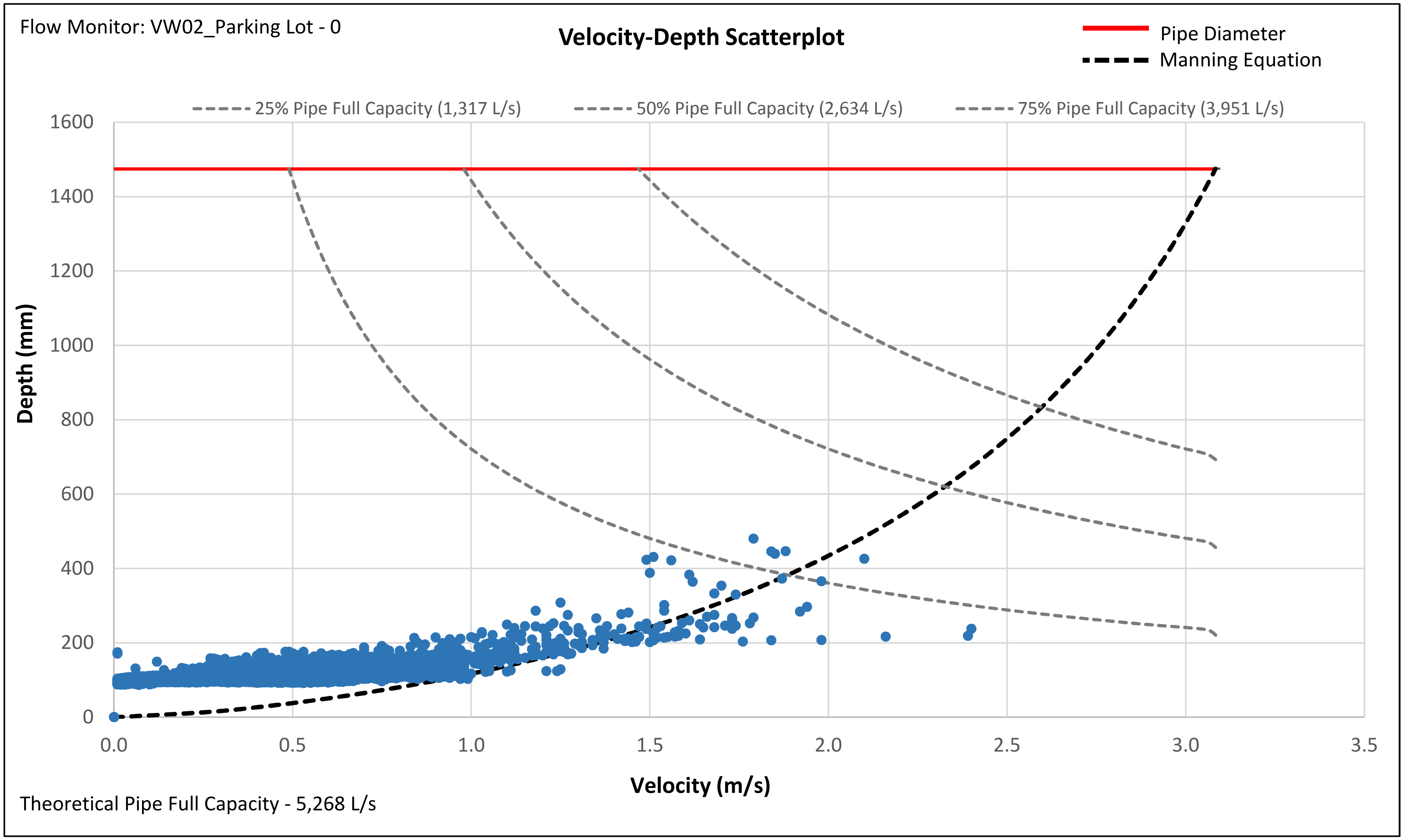
Site Location

Flow Monitor	Location	Sewer System	Manhole ID	Pipe ID
VW02_Parking Lot	1825x1475mm inflow pipe. 5272 Valley Way, F.H. Leslie Community Center parking lot.	Combined	SMH_00737	SGM_02721

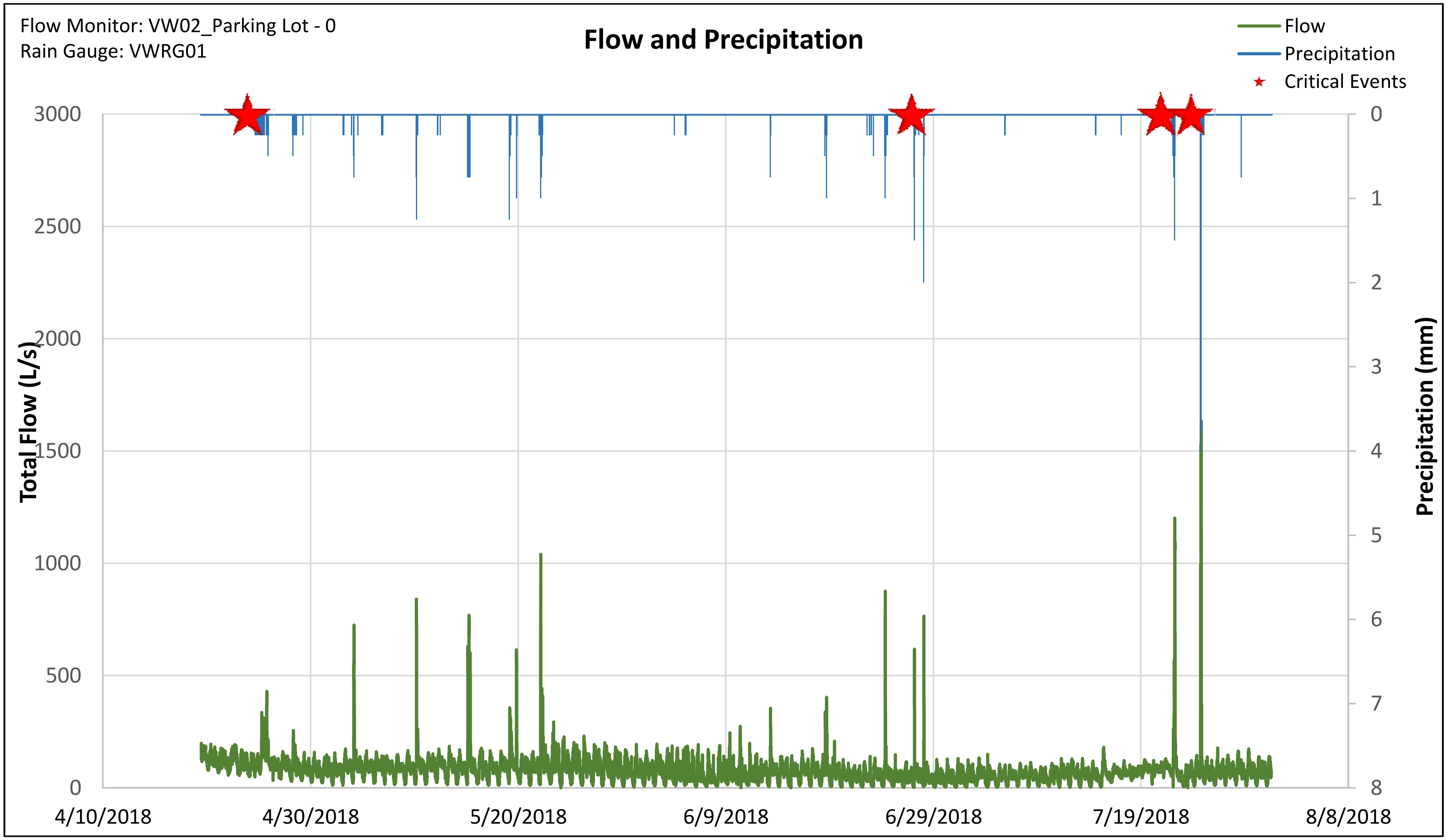
Flow Monitor Specifications

Flow Monitor	Catchment Area (ha)	Pipe Size (mm)	Pipe Length (km)	Population
VW02_Parking Lot	444.23	1,475	0.00	0

Data QA/QC


Flow Monitor: VW02_Parking Lot - 0
Velocity-Depth Scatterplot
Pipe Diameter
Manning Equation
25% Pipe Full Capacity (1,317 L/s)
50% Pipe Full Capacity (2,634 L/s)
75% Pipe Full Capacity (3,951 L/s)
Depth (mm)
1600
1400
1200
1000
800
600
400
200
0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
Velocity (m/s)
Theoretical Pipe Full Capacity - 5,268 L/s

Data QA/QC


Flow Monitor: VW02_Parking Lot - 0
Rain Gauge: VWRG01
Flow and Precipitation
Flow
Precipitation
Critical Events
Total Flow (L/s)
Precipitation (mm)
3000
2500
2000
1500
1000
500
0
1
2
3
4
5
6
7
8
4/10/2018
4/30/2018
5/20/2018
6/9/2018
6/29/2018
7/19/2018
8/8/2018

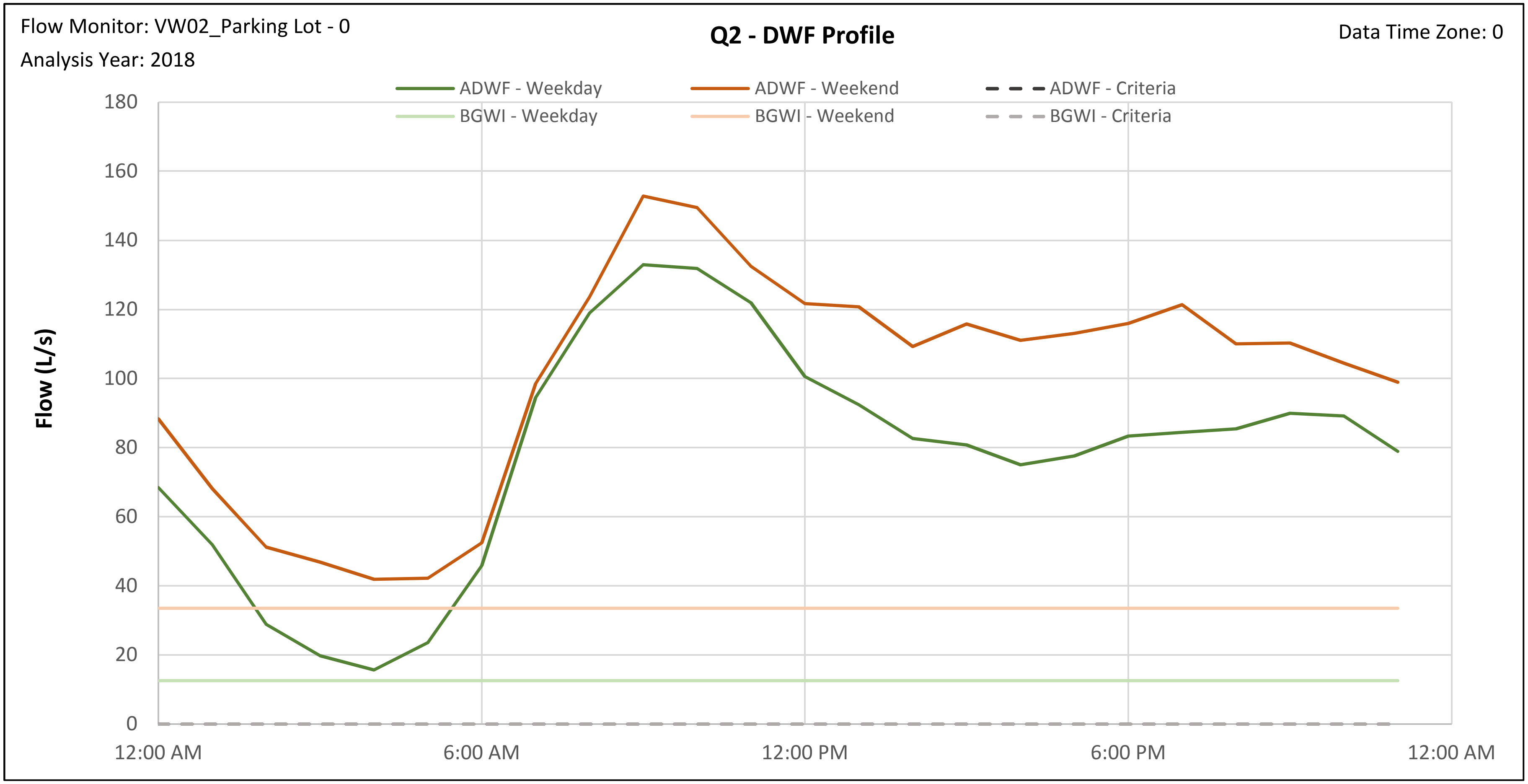
Dry Weather Flow Analysis

Flow Monitor: VW02_Parking Lot - 0 **Analysis Year: 2018**

	Q1		Q2		Q3		Q4		
Variable	**Weekday**	**Weekend**	**Weekday**	**Weekend**	**Weekday**	**Weekend**	**Weekday**	**Weekend**	**Units**
ADWF			78.1	100.0	53.6	49.5			L/s
MDWF			15.6	41.9	7.4	8.9			L/s
BGWI			12.5	33.5	5.9	7.2			L/s
Unit BGWI			0.03	0.08	0.01	0.02			L/s/ha
Unit BGWI									$L/s/m^2$
Sanitary Flow			65.6	66.5	47.7	42.3			L/s
Per Capita Sanitary Flow									L/cap/day
Per Capita ADWF									L/cap/day
PDWF			133.0	152.8	89.0	95.2			L/s
BGWI/ADWF			16%	33%	11%	14%			%
Average d/D			7%	8%	7%	7%			%

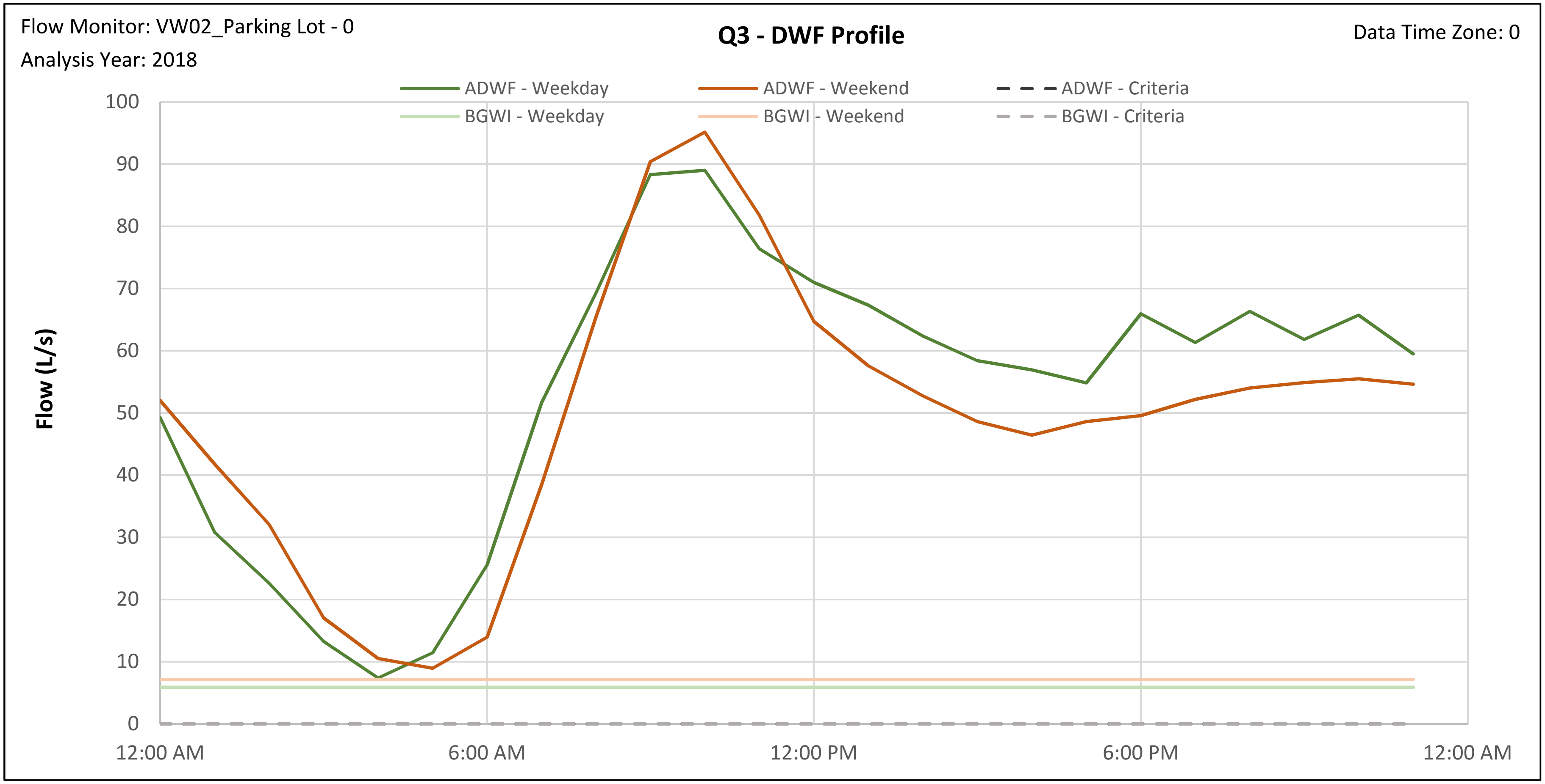
Selected Dry Weather Days

Weekday	5/21/2018	5/30/2018	5/31/2018	5/9/2018	5/14/2018
Weekend	5/26/2018	5/27/2018	6/2/2018	4/22/2018	4/21/2018



Selected Dry Weather Days

Weekday	7/3/2018	7/4/2018	7/11/2018	7/12/2018	7/13/2018
Weekend	7/1/2018	7/7/2018	7/8/2018		



VW04 Valley Way - 0: 2018

This report summarizes the flow monitoring location and specifications, in addition to the WiiFAT analysis outputs for the following reporting period:

Analysis Period: April 19, 2018 - July 31, 2018

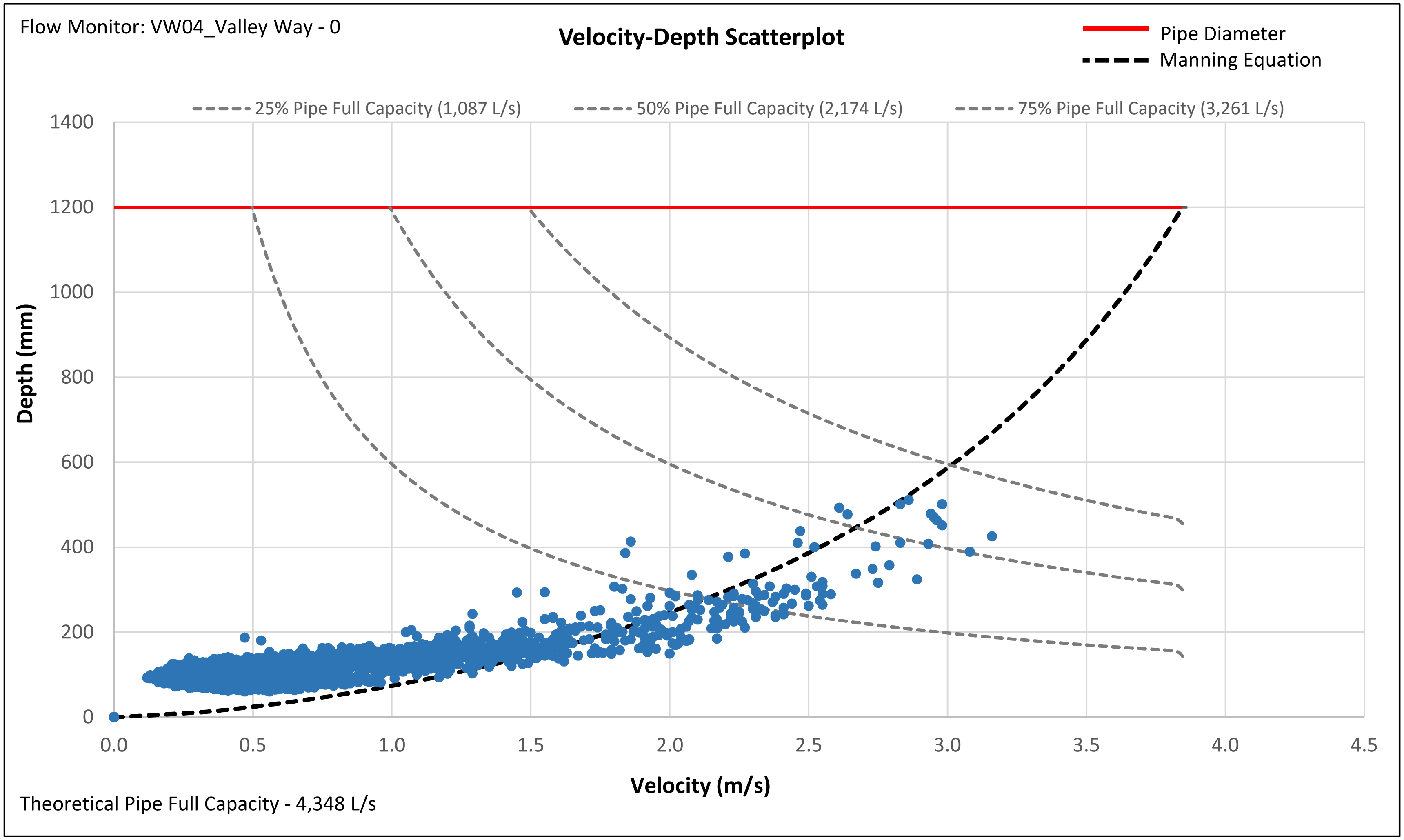
Site Location

Flow Monitor	Location	Sewer System	Manhole ID	Pipe ID
VW04_Valley Way	4904 Valley Way. Middle of lane.	Combined	SMH_00189	SGM_03317

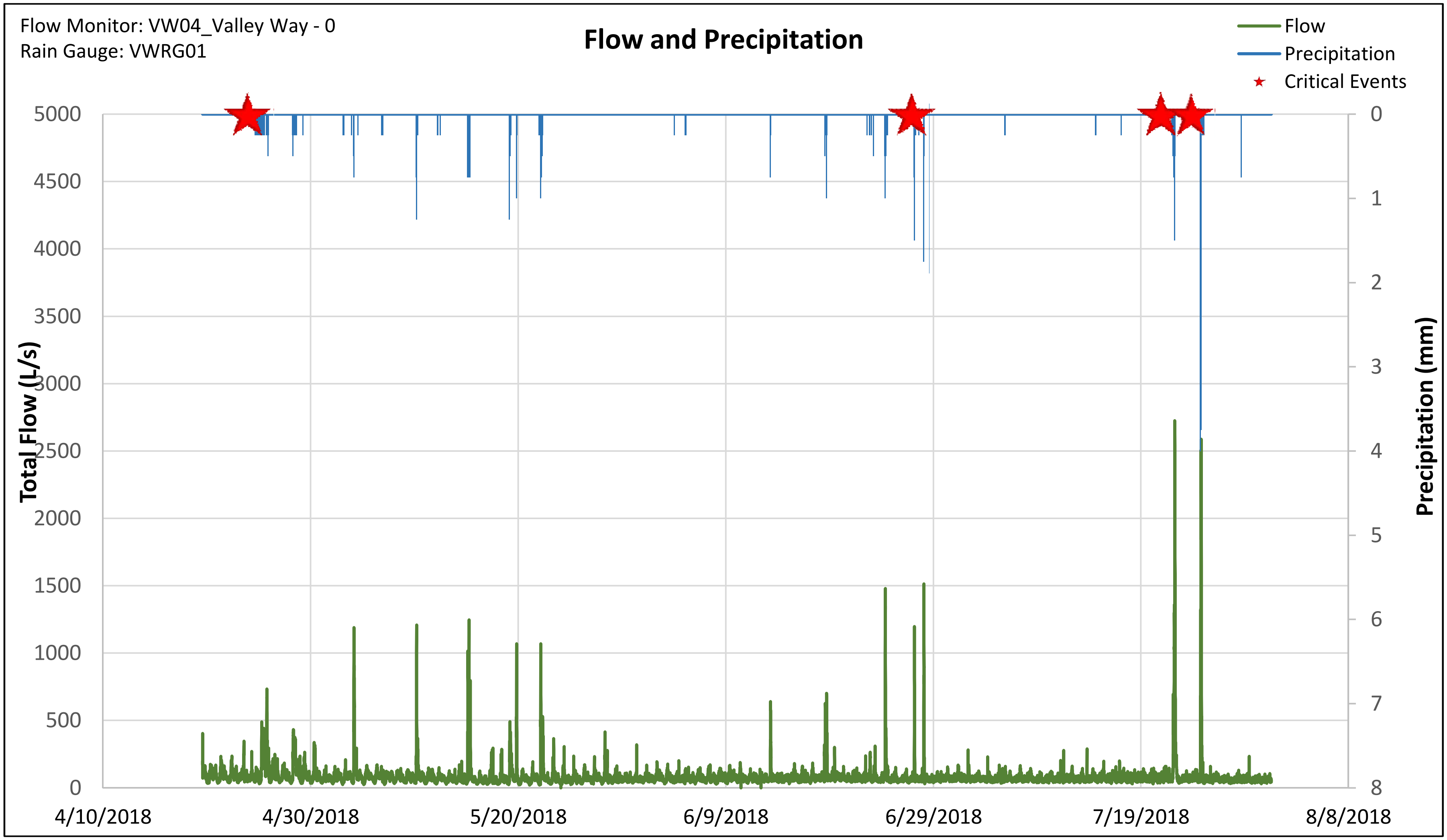
Flow Monitor Specifications

Flow Monitor	Catchment Area (ha)	Pipe Size (mm)	Pipe Length (km)	Population
VW04_Valley Way	470.93	1,200	0.00	0

Data QA/QC


Flow Monitor: VW04_Valley Way - 0
Velocity-Depth Scatterplot
Pipe Diameter
Manning Equation
25% Pipe Full Capacity (1,087 L/s)
50% Pipe Full Capacity (2,174 L/s)
75% Pipe Full Capacity (3,261 L/s)
Depth (mm)
0
200
400
600
800
1000
1200
1400
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
Velocity (m/s)
Theoretical Pipe Full Capacity - 4,348 L/s

Data QA/QC


Flow Monitor: VW04_Valley Way - 0
Rain Gauge: VWRG01
Flow and Precipitation
Flow
Precipitation
Critical Events
Total Flow (L/s)
Precipitation (mm)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1
2
3
4
5
6
7
8
4/10/2018
4/30/2018
5/20/2018
6/9/2018
6/29/2018
7/19/2018
8/8/2018

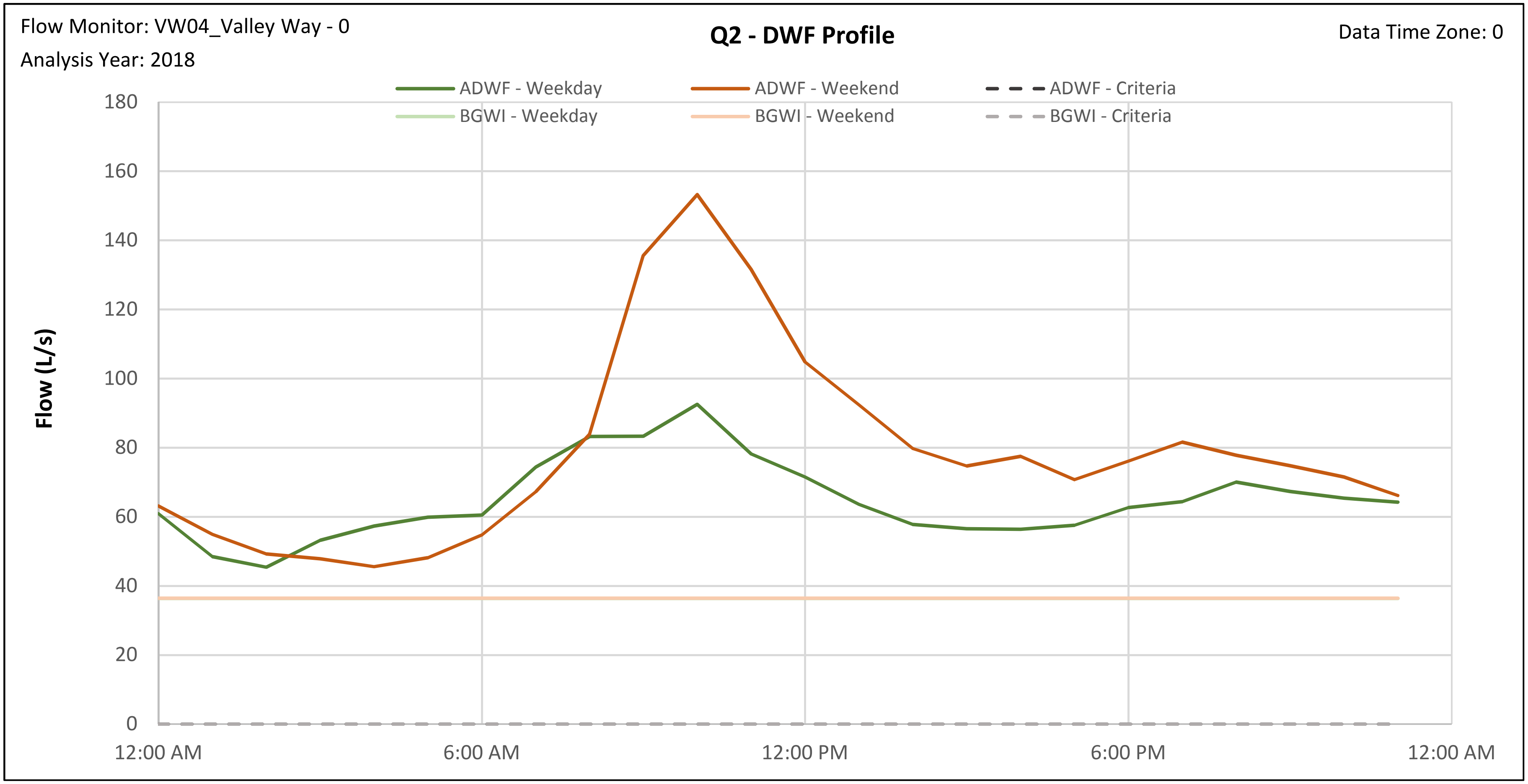
Dry Weather Flow Analysis

Flow Monitor: VW04_Valley Way - 0 **Analysis Year: 2018**

	Q1		Q2		Q3		Q4		
Variable	Weekday	Weekend	Weekday	Weekend	Weekday	Weekend	Weekday	Weekend	Units
ADWF			64.8	78.5	66.7	69.4			L/s
MDWF			45.4	45.6	52.7	54.2			L/s
BGWI			36.3	36.5	42.2	43.4			L/s
Unit BGWI			0.08	0.08	0.09	0.09			L/s/ha
Unit BGWI									$L/s/m^2$
Sanitary Flow			28.5	42.0	24.5	26.0			L/s
Per Capita Sanitary Flow									L/cap/day
Per Capita ADWF									L/cap/day
PDWF			92.6	153.3	100.1	122.1			L/s
BGWI/ADWF			56%	46%	63%	62%			%
Average d/D			9%	9%	8%	8%			%

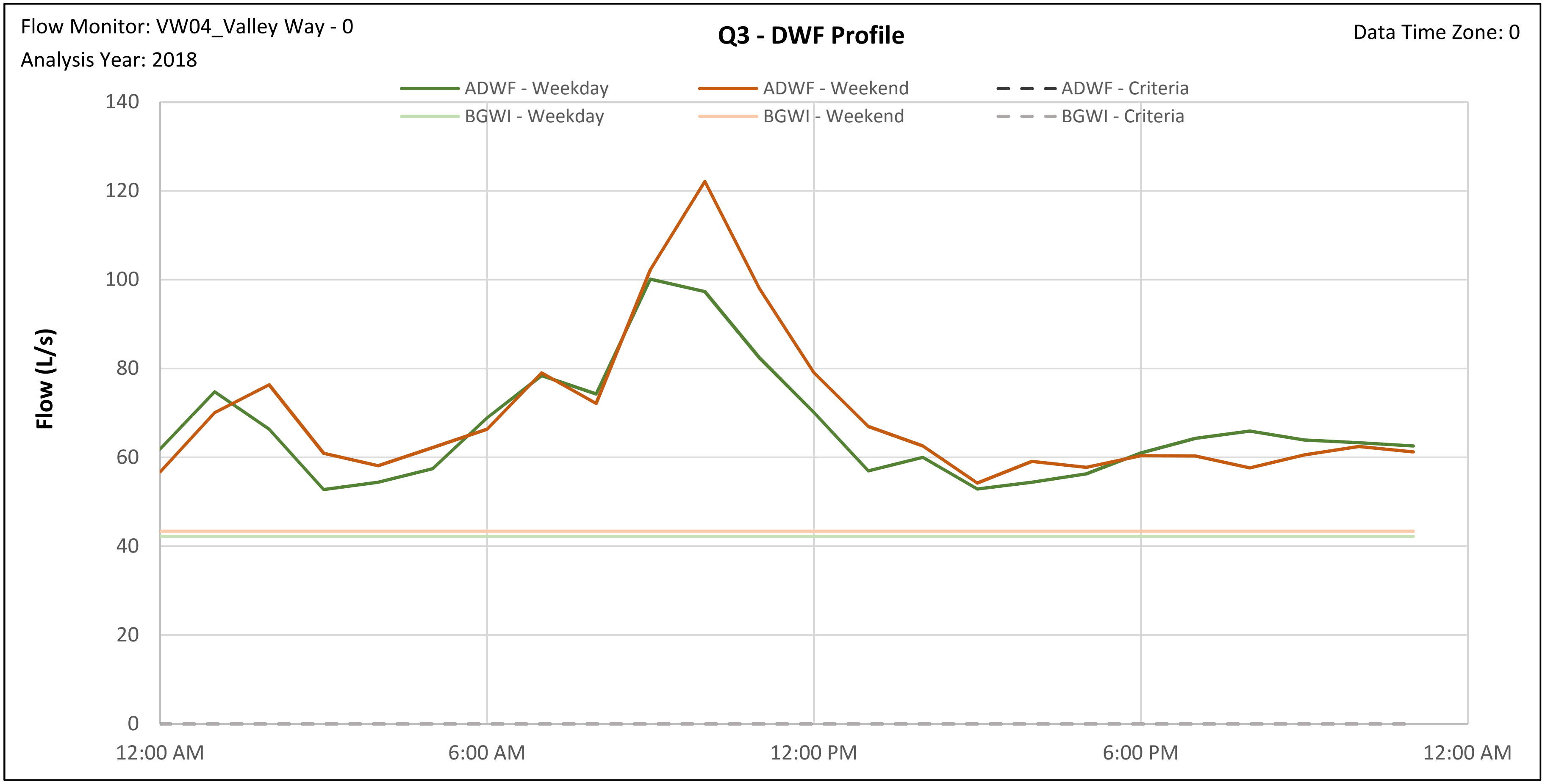
Selected Dry Weather Days

Weekday	5/29/2018	5/30/2018	5/31/2018	6/1/2018	6/12/2018
Weekend	5/26/2018	5/27/2018	6/2/2018	4/22/2018	4/21/2018



Selected Dry Weather Days

Weekday	7/3/2018	7/4/2018	7/11/2018	7/12/2018	7/13/2018
Weekend	7/1/2018	7/7/2018	7/8/2018		



VW03_Wilmott - 0: 2018

This report summarizes the flow monitoring location and specifications, in addition to the WiiFAT analysis outputs for the following reporting period:

Analysis Period: April 19, 2018 - July 31, 2018

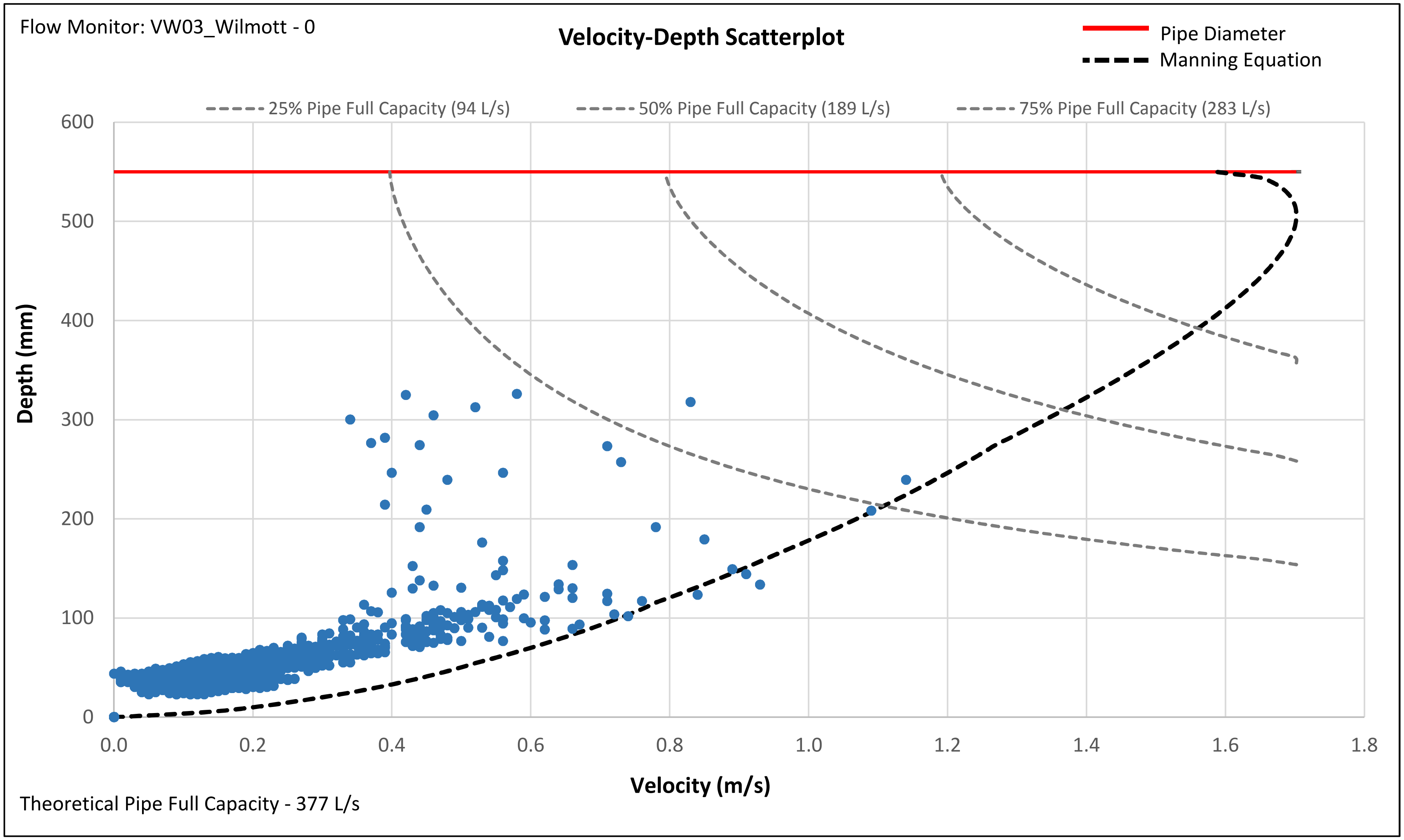
Site Location

Flow Monitor	Location	Sewer System	Manhole ID	Pipe ID
VW03_Wilmott	4904 Valley Way. Middle of road.	Combined	SMH_00189	SGM_03303

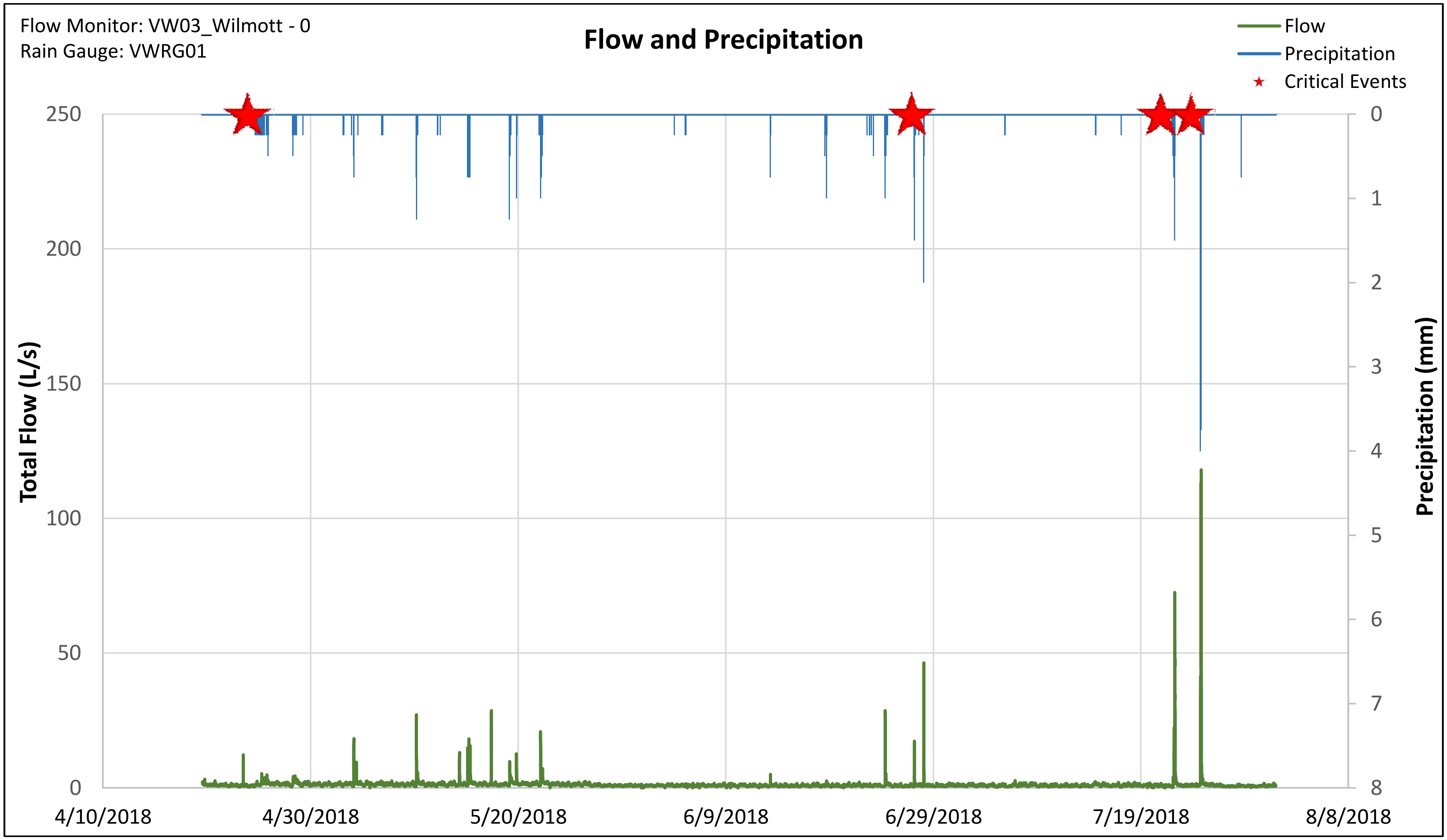
Flow Monitor Specifications

Flow Monitor	Catchment Area (ha)	Pipe Size (mm)	Pipe Length (km)	Population
VW03_Wilmott	6.53	550	0.00	0

Data QA/QC


Flow Monitor: VW03_Wilmott - 0
Velocity-Depth Scatterplot
Pipe Diameter
Manning Equation
25% Pipe Full Capacity (94 L/s)
50% Pipe Full Capacity (189 L/s)
75% Pipe Full Capacity (283 L/s)
Depth (mm)
0
100
200
300
400
500
600
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
Velocity (m/s)
Theoretical Pipe Full Capacity - 377 L/s

Data QA/QC


Flow Monitor: VW03_Wilmott - 0
Rain Gauge: VWRG01
Flow and Precipitation
Flow
Precipitation
Critical Events
Total Flow (L/s)
Precipitation (mm)
250
200
150
100
50
0
1
2
3
4
5
6
7
8
4/10/2018
4/30/2018
5/20/2018
6/9/2018
6/29/2018
7/19/2018
8/8/2018

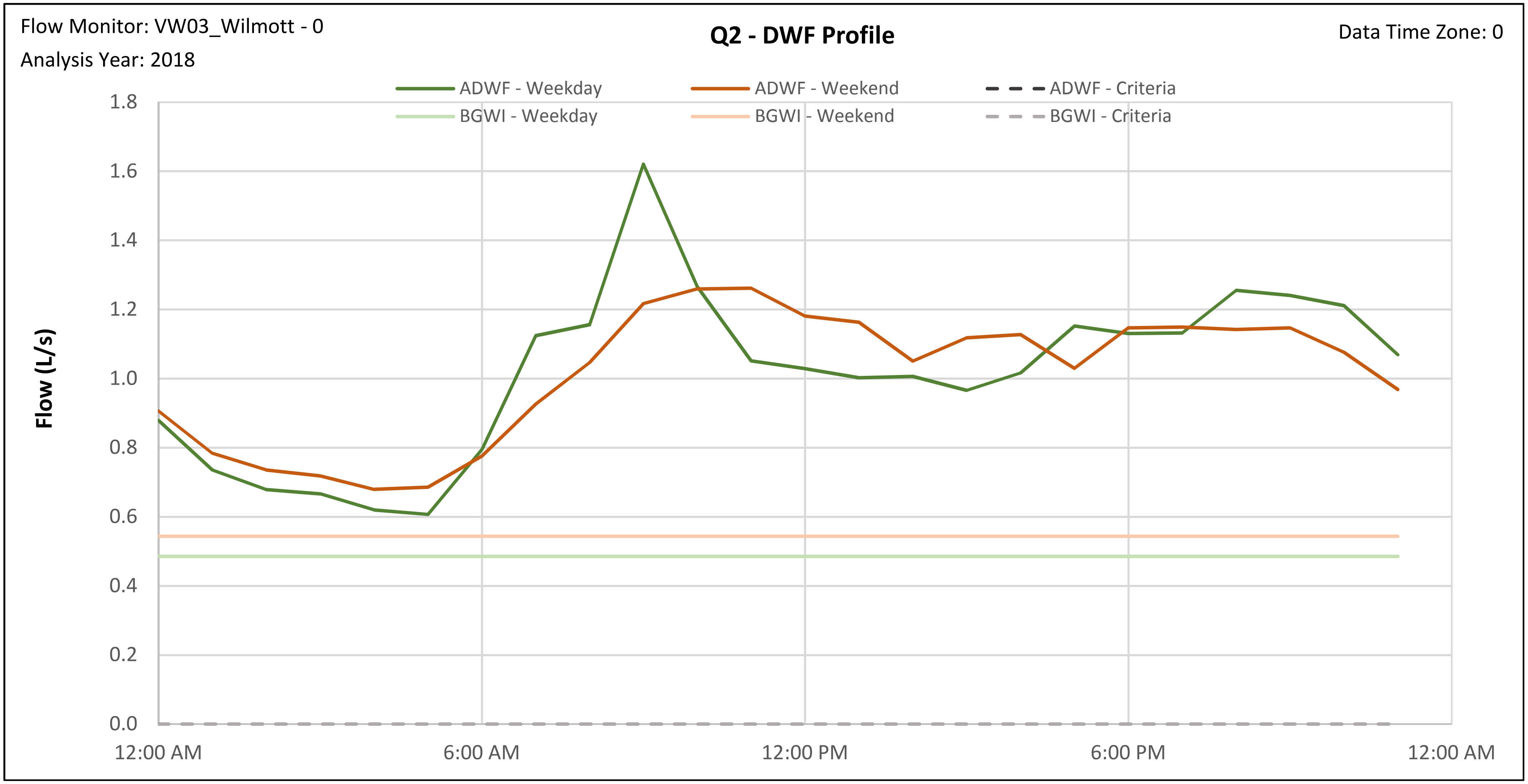
Dry Weather Flow Analysis

Flow Monitor: VW03_Wilmott - 0 **Analysis Year: 2018**

	Q1		Q2		Q3		Q4		
Variable	**Weekday**	**Weekend**	**Weekday**	**Weekend**	**Weekday**	**Weekend**	**Weekday**	**Weekend**	**Units**
ADWF			1.0	1.0	0.8	1.0			L/s
MDWF			0.6	0.7	0.5	0.5			L/s
BGWI			0.5	0.5	0.4	0.4			L/s
Unit BGWI			0.07	0.08	0.06	0.07			L/s/ha
Unit BGWI									L/s/m^2
Sanitary Flow			0.5	0.5	0.4	0.6			L/s
Per Capita Sanitary Flow									L/cap/day
Per Capita ADWF									L/cap/day
PDWF			1.6	1.3	1.1	1.4			L/s
BGWI/ADWF			48%	54%	47%	43%			%
Average d/D			8%	8%	5%	7%			%

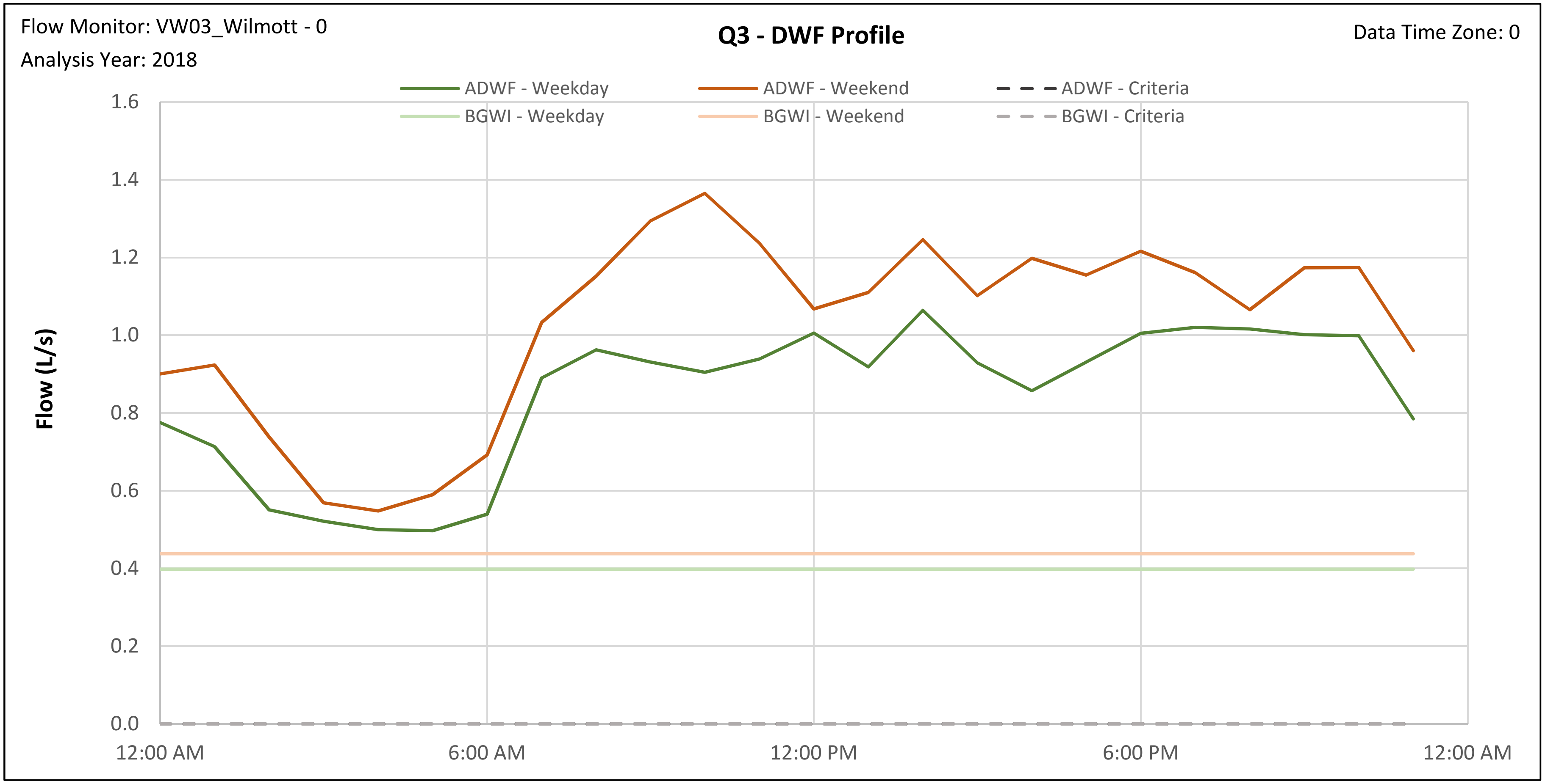
Selected Dry Weather Days

Weekday	5/29/2018	5/30/2018	5/31/2018	5/9/2018	5/14/2018
Weekend	5/26/2018	5/27/2018	6/2/2018	4/22/2018	4/21/2018



Selected Dry Weather Days

Weekday	7/3/2018	7/4/2018	7/11/2018	7/12/2018	7/13/2018
Weekend	7/1/2018	7/7/2018	7/8/2018		



APPENDIX B: CCTV Data Report

PipeFlo
Contracting Corp.

GM BLUEPLAN ENGINEERING LIMITED

GM BluePlan
ENGINEERING

#617062 : CCTV MUDDY RUN TRUNK SEWER
STANLEY AVENUE & VALLEY WAY TO BRIDGE STREET
NIAGARA FALLS, ON

INSTALLATION REPORT
5/29/2018

CUSTOMER: GM BLUEPLAN
OWNER: CITY OF NIAGARA FALLS
P/O NO: #617062- MUDDY RUN TRUNK SEWER
PROJECT: CCTV INSPECTION
CITY: NIAGARA FALLS, ONTARIO
LOCATION: STANLEY AVE TO MORRISON ST

PipeFlo Contracting Corp.

PFC JOB NO 18-0233
UPDATED: 5/29/2018
CONTACT:

PSR/ MEDIA LABEL/ WO	START MH	END MH	Street	PIPE SIZE (mm)	LENGTH (M)	MEASURED LENGTH (M)	TRAFFIC REQ'D (Y/N)	DATE OF CCTV	DATE COMPLETED	PIPE CONDITION COMMENTS	FURTHER WORK REQ'D/ REHAB RECOMMENDED
3312	SMH 02298	SMH 02301	HOUCK DR	1500	106.0	105.4	N	5/16/18	5/16/18	5/16/18 CRACKS / INFILTRATION / ENCRUSTATION / SURFACE WEAR	
3313	SMH 02301	SMH 00732	TWIDALE AVE	1500	89.0	88.1	N	5/16/18	5/16/18	5/16/18 CROSS BORE AT 8.7m / CRACKS / INFILTRATION / ENCRUSTATION / SURFACE WEAR. FLOW METER ON MH 02301	
3314	SMH 00732	SMH 00731	TWIDALE AVE	1500	74.0	73.8	N	5/16/18	5/16/18	5/16/18 CRACKS / INFILTRATION / ENCRUSTATION / SURFACE WEAR / LARGE DEBRIS	
2719	SMH 00731	SMH 00716	TWIDALE AVE	1500	42.0	42.3	N	5/16/18	5/16/18	5/16/18 CRACKS / INFILTRATION / ENCRUSTATION / SURFACE WEAR + MH 00731 DNE	
3315	SMH 00716	SMH 00737	JEPSON AVE	1500	60.0	53.0	N	5/16/18	5/16/18	5/16/18 CRACKS / INFILTRATION / ENCRUSTATION / SURFACE WEAR + MH 00716 DNE	
2721	SMH 00737	SMH 00750	VALLEY WAY	1500	153.0	152.3	N	5/16/18	5/16/18	5/16/18 CRACKS / INFILTRATION / ENCRUSTATION / SURFACE WEAR	
3316	SMH 00750	SMH 00748	VALLEY WAY	1500	97.0	96.5	N	5/23/18	5/23/18		

PSR/ MEDIA LABEL/ WO	START MH	END MH	Street	PIPE SIZE (mm)	LENGTH (M)	MEASURED LENGTH (M)	TRAFFIC REQ'D (Y/N)	DATE OF CCTV	DATE COMPLETED	PIPE CONDITION COMMENTS	FURTHER WORK REQ'D/ REHAB RECOMMENDED
2866	SMH 00748	SMH 00792	VALLEY WAY	1500 X 1800	100.0	92.0	N	5/23/18	5/23/18		
2735	SMH 00792	SMH 00184	VALLEY WAY	1500 X 1800	230.0	231.0	N	5/23/18	5/23/18		
3317	SMH 00184	SMH 00189	VALLEY WAY	1500 X 1800	100.0	101.9	N	5/23/18	5/23/18		
3318	SMH 00189	SMH 00220	VALLEY WAY	1500 X 1800	190.0	183.5	N	05/24/24	05/24/18		
3319	SMH 00220	SMH 00260	VALLEY WAY	1500 X 1800	100.0	104.0	N	05/24/24	05/24/18		
	SMH 00260	SMH 00208	VALLEY WAY	1500 X 1800						DOES NOT EXIST	
	SMH 00208	SMH 00209								DOES NOT EXIST	
XXXX	SMH 00260	SMH 00269	VALLEY WAY	1500 X 1800	140.0	38.9	N	05/24/24	05/24/18	2 X 1800mm PIPES AT MH	
XXXX1	SMH 00269	SMH 00241	VALLEY WAY	1500 X 1800	140.0	140.5	N	05/24/24	05/24/18		
2755	SMH 00241	SMH 00163	VALLEY WAY	1500 X 1800	105.0	140.1	N	05/24/24	05/24/18		
2827	SMH 00163	SMH 00130	VALLEY WAY	1500 X 1800	190.0	189.5	N	05/25/18	05/25/18		
2713	SMH 00130	SMH 00133	VALLEY WAY	1500 X 1800	3.0	2.3	N	05/25/18	05/25/18		
2828	SMH 00133	SMH 05316	VALLEY WAY	1500 X 1800	256.0	255.3	N	05/25/18	05/25/18		
6137	SMH 05216	BRIDGE ST	VALLEY WAY	1500 X 1800	46.0	46.0		05/29/18	05/29/18		LINE SPLITS INTO 2 X 1300x900
6137.A	SMH 05316	BRIDGE ST	VALLEY WAY	1500 X 1800	46.0	46.0		05/29/18	05/29/18		LINE SPLITS INTO 2 X 1300x900

PIPEFLO CONTRACTING CORP.

111 FRID STREET
HAMILTON, ONTARIO L8P 4M3
TOLL-FREE: 1-866-711-4567, TELEPHONE: 905-572-7767, FAX: 905-572-7768

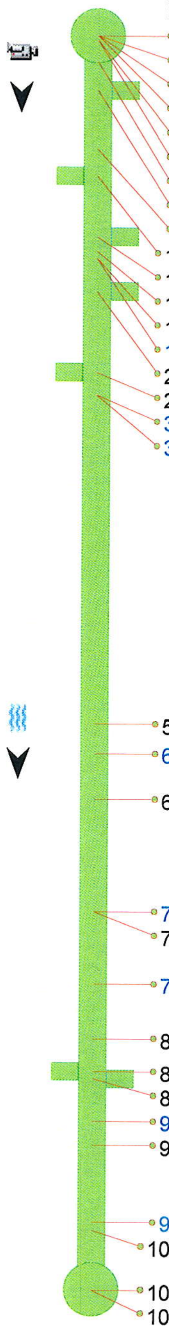
Upstream MH	Downstream MH	Size	Material	Total Length	City
SMH 02301	SMH 02298	1500	Reinforced Concrete Pipe	106	NIAGARA FALLS ONT.

Surveyor's Name	Certificate Number	Street Address	Location Details
PIPEFLOSC	U-511-12735	HOUCK DR.	AT HOUSE NUMBER 5396

Direction	Purpose	Weather	Date	Time	Length Surveyed
Upstream	Pre-Acceptance	Dry	20180516	11:37	105.4

Additional Information

CCTV SMH 02301 TO SMH 02298



Ftg.	Code	Description	Pct.	Position	Cont.	Comment
0.0	AMH	Access Point - Manhole				Starting Manhole: SMH 02298
0.0	MWL	Water Level	5			
0.0	SAV	Surface: Aggregate Visible		4 to 8	S01	
0.0	MGO	General Observation				FLOW METER IN MH
0.4	CC	Crack Circumferential		7 to 5		
0.4	DAE	Deposits Attached: Encrustation	5	7 to 5		
2.2	LR	Line - Right	45			
4.6	TBA	Tap, Break-in / Hammer: Active		8		
9.5	DSF	Deposits Settled: Fine	5	5 to 7		
11.8	TBA	Tap, Break-in / Hammer: Active		4		
16.9	TB	Tap, Break-in / Hammer		9		
18.1	SRV	Surface: Reinforcement Visible		1		
18.7	ID	Infiltration - Dripper		12 to 2		
18.7	DAE	Deposits Attached: Encrustation	5	11 to 4		
21.5	TBD	Tap, Break-in / Hammer: Defective		9		
28.3	TB	Tap, Break-in / Hammer		2		
30.2	DAE	Deposits Attached: Encrustation	5	7 to 10		
30.2	DAE	Deposits Attached: Encrustation	5	1 to 5		
57.8	SRV	Surface: Reinforcement Visible		10 to 2		
60.3	DAE	Deposits Attached: Encrustation	5	7 to 5		
64.1	ID	Infiltration - Dripper		12 to 1		
73.5	DAE	Deposits Attached: Encrustation	5	7 to 5		
73.5	CC	Crack Circumferential		10 to 2		
79.6	DAE	Deposits Attached: Encrustation	5	7 to 9		
84.2	RFJ	Roots, Fine: Joint		10		
87.0	TBA	Tap, Break-in / Hammer: Active		2		
87.6	TB	Tap, Break-in / Hammer		10		
91.2	DAE	Deposits Attached: Encrustation	5	7 to 5		
93.2	SRV	Surface: Reinforcement Visible		12 to 3		
99.7	LL	Line - Left	45			
100.4	ID	Infiltration - Dripper		10 to 2		
105.4	SAV	Surface: Aggregate Visible		3 to 9	F01	
105.4	AMH	Access Point - Manhole				SMH 02298

PipeFlo Contracting Corp.

PIPEFLO CONTRACTING CORP.
111 FRID STREET
HAMILTON, ONTARIO L8P 4M3
TOLL-FREE: 1-866-711-4567, TELEPHONE: 905-572-7767, FAX: 905-572-7768

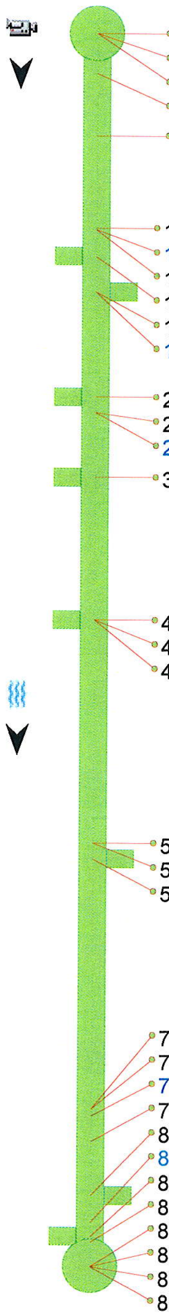
Upstream MH	Downstream MH	Size	Material	Total Length	City
SMH 00732	SMH 02301	1500	Reinforced Concrete Pipe	89	NIAGARA FALLS ONT.

Surveyor's Name	Certificate Number	Street Address	Location Details
PIPEFLOSC	U-511-12735	TWIDALE AVE	AT HOUSE NUMBER5403

Direction	Purpose	Weather	Date	Time	Length Surveyed
Upstream	Pre-Acceptance	Dry	20180516	11:07	88.1

Additional Information

CCTV SMH 00732 TO SMH 02301



Ftg.	Code	Description	Pct.	Position	Cont.	Comment
1.5	AMH	Access Point - Manhole				Starting Manhole: SMH 02301
1.5	MWL	Water Level	5			
1.5	SAV	Surface: Aggregate Visible		4 to 8	S01	
4.3	DSF	Deposits Settled: Fine	5	4 to 7	S02	
8.7	OBI	Obstacle - Object Protruding Thru Wall	5	10 to 2		UTILITIES
15.2	CC	Crack Circumferential		7 to 5		
15.3	DAE	Deposits Attached: Encrustation	5	8 to 5		
15.3	ID	Infiltration - Dripper		10 to 2		
17.2	TB	Tap, Break-in / Hammer		3		
19.7	TB	Tap, Break-in / Hammer		10		
19.7	DAE	Deposits Attached: Encrustation	5	7 to 10		
27.1	TBD	Tap, Break-in / Hammer: Defective		2		
28.2	CC	Crack Circumferential		7 to 5		
28.2	DAE	Deposits Attached: Encrustation	5	7 to 5		
32.7	TBA	Tap, Break-in / Hammer: Active		2		
42.7	TBA	Tap, Break-in / Hammer: Active		2		
42.7	CC	Crack Circumferential		7 to 5		
42.7	ID	Infiltration - Dripper		10 to 2		
58.3	CC	Crack Circumferential		7 to 5		
58.3	ID	Infiltration - Dripper		11 to 2		
59.4	TB	Tap, Break-in / Hammer		10		
77.0	CC	Crack Circumferential		7 to 5		
77.0	ID	Infiltration - Dripper		10 to 2		
77.5	DAE	Deposits Attached: Encrustation	10	2 to 5		
79.3	DSZ	Deposits Settled: Other	5	5		LARGE ROCK
83.1	TBA	Tap, Break-in / Hammer: Active		8		
85.0	LR	Line - Right	90			
86.0	TBA	Tap, Break-in / Hammer: Active		4		
86.4	OBI	Obstacle - Object Protruding Thru Wall	10	10 to 2		
88.1	SAV	Surface: Aggregate Visible		4 to 9	F01	
88.1	DSF	Deposits Settled: Fine	5	7 to 5	F02	
88.1	MGO	General Observation				FLOW METER IN MH
88.1	AMH	Access Point - Manhole				SMH 02301

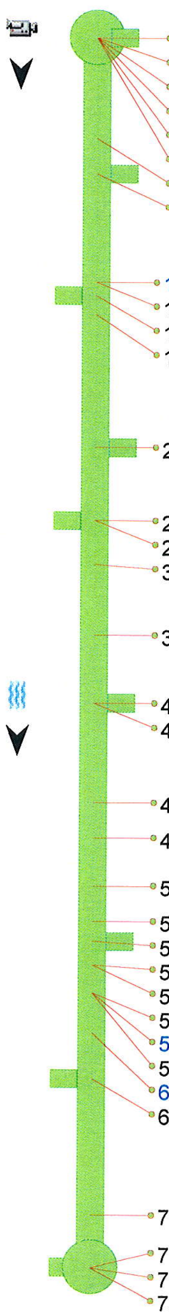
PIPEFLO CONTRACTING CORP.
111 FRID STREET
HAMILTON, ONTARIO L8P 4M3
TOLL-FREE: 1-866-711-4567, TELEPHONE: 905-572-7767, FAX: 905-572-7768

Upstream MH	Downstream MH	Size	Material	Total Length	City
SMH 00732	SMH 00731	1500	Reinforced Concrete Pipe	74	NIAGARA FALLS ONT.

Surveyor's Name	Certificate Number	Street Address	Location Details
PIPEFLOSC	U-511-12735	TWIDALE AVE	AT HOUSE NUMBER 5403

Direction	Purpose	Weather	Date	Time	Length Surveyed
Downstream	Pre-Acceptance	Dry	20180516	12:13	73.8

Additional Information
CCTV SMH 00732 TO SMH 00731



Ftg.	Code	Description	Pct.	Position	Cont.	Comment
1.5	AMH	Access Point - Manhole				Starting Manhole: SMH 00732
1.5	MWL	Water Level	5			
1.5	DAE	Deposits Attached: Encrustation	5	7 to 5		
1.5	TB	Tap, Break-in / Hammer		9		
1.5	SAV	Surface: Aggregate Visible		4 to 8	S01	
1.5	LL	Line - Left	45			
7.4	DSZ	Deposits Settled: Other	5	6		ROCKS PIECES BRANCHES
9.5	TBA	Tap, Break-in / Hammer: Active		8		
15.9	DAE	Deposits Attached: Encrustation	5	7 to 5		
15.9	ID	Infiltration - Dripper		10 to 2		
16.7	TB	Tap, Break-in / Hammer		4		
17.8	OBI	Obstacle - Object Protruding Thru Wall	5	10 to 2		
25.6	TB	Tap, Break-in / Hammer		9		
29.9	TBA	Tap, Break-in / Hammer: Active		3		
29.9	ID	Infiltration - Dripper		10 to 1		
32.5	SRV	Surface: Reinforcement Visible		1		
36.6	SRV	Surface: Reinforcement Visible		11		
40.6	TB	Tap, Break-in / Hammer		9		
40.6	SRV	Surface: Reinforcement Visible		1		
46.4	SRV	Surface: Reinforcement Visible		11		
48.5	SRV	Surface: Reinforcement Visible		1		
51.3	SRV	Surface: Reinforcement Visible		10 to 2		
53.4	CC	Crack Circumferential		8 to 5		
54.6	TBA	Tap, Break-in / Hammer: Active		9		
56.0	RFJ	Roots, Fine: Joint		11 to 1		
56.0	SRV	Surface: Reinforcement Visible		7		
57.6	CL	Crack Longitudinal		3		
57.6	DAE	Deposits Attached: Encrustation	5	2 to 4		
57.6	DSZ	Deposits Settled: Other	10	6		LARGE ROCK
60.0	DAE	Deposits Attached: Encrustation	5	8 to 5		
62.7	TB	Tap, Break-in / Hammer		3		
70.7	SRV	Surface: Reinforcement Visible		10 to 2		
73.8	TBA	Tap, Break-in / Hammer: Active		3		
73.8	SAV	Surface: Aggregate Visible		4 to 8	F01	
73.8	AMH	Access Point - Manhole				SMH 00731 DOES NOT EXIST.

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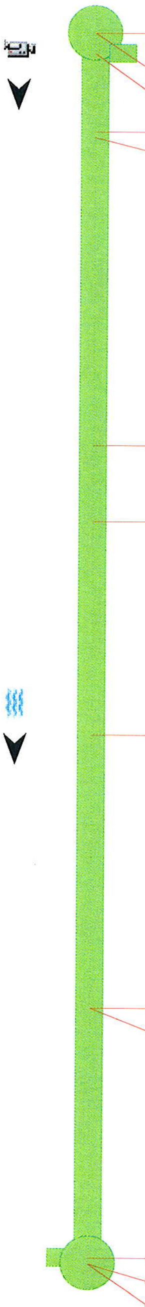
Upstream MH	Downstream MH	Size	Material	Total Length	City
SMH 00731 (MH DOES NOT EXIST)	SMH 00716	1500	Reinforced Concrete Pipe	42	NIAGARA FALLS ONT.

Surveyor's Name	Certificate Number	Street Address	Location Details
PIPEFLOSC	U-511-12735	TWIDALE AVE	AT JEPSON ST.

Direction	Purpose	Weather	Date	Time	Length Surveyed
Downstream	Pre-Acceptance	Dry	20180516	12:58	42.3

Additional Information
CCTV SMH 00731 TO SMH 00716



Ftg.	Code	Description	Pct.	Position	Cont.	Comment
0.0	AMH	Access Point - Manhole				Starting Manhole: SMH 00731 (MH DOES NOT EXIST)
0.0	MWL	Water Level	5			
0.7	TBA	Tap, Break-in / Hammer: Active		9		
3.4	SAV	Surface: Aggregate Visible		3 to 8	S01	
3.6	DAE	Deposits Attached: Encrustation	5	3 to 5		
14.2	DAE	Deposits Attached: Encrustation	5	5		
16.8	DAE	Deposits Attached: Encrustation	5	7 to 5		
24.1	DAE	Deposits Attached: Encrustation	5	7 to 5		
33.5	CC	Crack Circumferential		10 to 2		
33.5	DAE	Deposits Attached: Encrustation	5	7 to 5		
42.1	TB	Tap, Break-in / Hammer		1		
42.3	SAV	Surface: Aggregate Visible		3 to 8	F01	
42.3	AMH	Access Point - Manhole				SMH 00716 (DOES NOT EXIST)

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Upstream MH	Downstream MH	Size	Material	Total Length	City
SMH 00716 (MH DOES NOT EXIST)	SMH 00737	1500	Reinforced Concrete Pipe	60	NIAGARA FALLS ONT.

Surveyor's Name	Certificate Number	Street Address	Location Details
PIPEFLOSC	U-511-12735	JEPSON AVE	IN FH LESLIE PARK

Direction	Purpose	Weather	Date	Time	Length Surveyed
Downstream	Pre-Acceptance	Dry	20180516	13:23	53

Additional Information
CCTV SMH 00716 TO SMH 00737

Ftg.	Code	Description	Pct.	Position	Cont.	Comment
0.0	AMH	Access Point - Manhole				Starting Manhole: SMH 00716 (MH DOES NOT EXIST)
0.0	MWL	Water Level	5			
0.0	SAV	Surface: Aggregate Visible		4 to 9	S01	
5.1	DAE	Deposits Attached: Encrustation	5	7 to 5		
6.7	SRV	Surface: Reinforcement Visible		10 to 1		
9.0	SRV	Surface: Reinforcement Visible		10 to 12		
15.8	CC	Crack Circumferential		8 to 4		
15.8	DAE	Deposits Attached: Encrustation	5	7 to 5		
16.7	SRV	Surface: Reinforcement Visible		12		
19.7	SRV	Surface: Reinforcement Visible		1		
22.8	CC	Crack Circumferential		7 to 5		
22.8	DAE	Deposits Attached: Encrustation	5	7 to 5		
35.3	CC	Crack Circumferential		7 to 5		
37.7	SRV	Surface: Reinforcement Visible		10		
39.3	SRV	Surface: Reinforcement Visible		10 to 2		
41.1	TB	Tap, Break-in / Hammer		10		
41.6	TB	Tap, Break-in / Hammer		2		
44.5	DAE	Deposits Attached: Encrustation	5	7 to 2		
52.3	SAV	Surface: Aggregate Visible		4 to 8	F01	
52.3	TFA	Tap, Factory Made: Active		3		
53.0	TB	Tap, Break-in / Hammer		2		
53.0	AMH	Access Point - Manhole				SMH 00737

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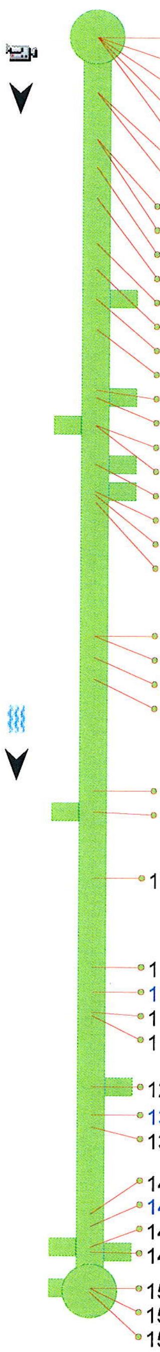
Upstream MH	Downstream MH	Size	Material	Total Length	City
SMH 00737	SMH 00750	1500	Reinforced Concrete Pipe	153	NIAGARA FALLS ONT.

Surveyor's Name	Certificate Number	Street Address	Location Details
PIPEFLOSC	U-511-12735	VALLEY WAY	IN LESLIE PARK

Direction	Purpose	Weather	Date	Time	Length Surveyed
Downstream	Pre-Acceptance	Dry	20180516	14:00	152.3

Additional Information
CCTV SMH 00727 TO SMH 00750



Ftg.	Code	Description	Pct.	Position	Cont.	Comment
0.0	AMH	Access Point - Manhole				Starting Manhole: SMH 00737
0.0	MWL	Water Level	5			
0.0	SRV	Surface: Reinforcement Visible		11 to 2		
0.0	SAV	Surface: Aggregate Visible		4 to 8	S01	
0.0	LR	Line - Right	45			
6.7	ID	Infiltration - Dripper		11		
6.7	DAE	Deposits Attached: Encrustation	5	9 to 11		
12.3	DAE	Deposits Attached: Encrustation	5	2 to 5		
12.3	CC	Crack Circumferential		10 to 4		
15.7	SRV	Surface: Reinforcement Visible		11 to 12		
19.5	SRV	Surface: Reinforcement Visible		11 to 2		
25.0	SRV	Surface: Reinforcement Visible		11 to 1		
28.1	DAE	Deposits Attached: Encrustation	5	7 to 5		
31.8	TB	Tap, Break-in / Hammer		10		
35.5	SRV	Surface: Reinforcement Visible		1		
42.9	DAE	Deposits Attached: Encrustation	5	1 to 5		
43.8	TBA	Tap, Break-in / Hammer: Active		7		
47.2	TBA	Tap, Break-in / Hammer: Active		2		
47.2	DAE	Deposits Attached: Encrustation	10	2 to 5		
51.9	TB	Tap, Break-in / Hammer		10		
55.2	TB	Tap, Break-in / Hammer		10		
55.6	CC	Crack Circumferential		12 to 5		
56.4	CC	Crack Circumferential		10 to 2		
72.7	ID	Infiltration - Dripper		10 to 2		
72.7	DAE	Deposits Attached: Encrustation	5	7 to 5		
75.3	LR	Line - Right	45			
77.9	DAE	Deposits Attached: Encrustation	5	11		
91.4	ID	Infiltration - Dripper		11 to 2		
94.0	TBA	Tap, Break-in / Hammer: Active		3		
102.0	ID	Infiltration - Dripper		11 to 2		
112.8	SRI	Surface: Roughness Increased		10 to 1		
115.8	DAE	Deposits Attached: Encrustation	5	7 to 5		
118.3	CC	Crack Circumferential		8 to 3		
118.7	SRV	Surface: Reinforcement Visible		11 to 2		
127.4	TBA	Tap, Break-in / Hammer: Active		11		
130.8	DAE	Deposits Attached: Encrustation	5	3		
132.3	ID	Infiltration - Dripper		10 to 2		
142.9	SRV	Surface: Reinforcement Visible		10 to 1		
144.4	DAE	Deposits Attached: Encrustation	5	12 to 4		
146.9	TB	Tap, Break-in / Hammer		2		
147.5	TBA	Tap, Break-in / Hammer: Active		10		
151.9	SAV	Surface: Aggregate Visible		4 to 8	F01	
151.9	TBA	Tap, Break-in / Hammer: Active		4		
152.3	AMH	Access Point - Manhole				SMH 00750

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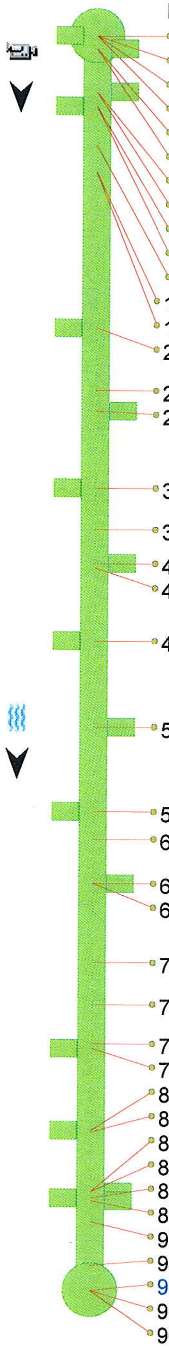
Upstream MH	Downstream MH	Size	Material	Total Length	City
SMH 00750	SMH 00748	1500	Reinforced Concrete Pipe	97	NIAGARA FALLS ONT.

Surveyor's Name	Certificate Number	Street Address	Location Details
PIPEFLOSC	U-511-12735	VALLEY WAY	SIXTH AVE.

Direction	Purpose	Weather	Date	Time	Length Surveyed
Downstream	Pre-Acceptance	Dry	20180523	07:52	96.4

Additional Information

CCTV SMH 00750 TO MH SMH 00748



Ftg.	Code	Description	Pct.	Position	Cont.	Comment
0.0	AMH	Access Point - Manhole				Starting Manhole: SMH 00750
0.0	MWL	Water Level	5			
0.0	TB	Tap, Break-in / Hammer		2		IN MH
0.0	TSA	Tap, Saddle: Active		4		IN MH
1.0	TS	Tap, Saddle		10		
1.0	LR	Line - Right	10			
4.3	TB	Tap, Break-in / Hammer		10		
4.3	SRV	Surface: Reinforcement Visible		2		
5.4	TB	Tap, Break-in / Hammer		2		
5.4	DAE	Deposits Attached: Encrustation	5	7 to 5	S01	
8.4	SRV	Surface: Reinforcement Visible		5		
10.5	ID	Infiltration - Dripper		10 to 1		
10.5	CC	Crack Circumferential		8 to 5		
22.5	TB	Tap, Break-in / Hammer		2		
27.3	SAV	Surface: Aggregate Visible		12 to 2		
28.9	TB	Tap, Break-in / Hammer		11		
34.8	TBA	Tap, Break-in / Hammer: Active		2		
38.0	SRV	Surface: Reinforcement Visible		1		
40.6	TB	Tap, Break-in / Hammer		10		
40.9	CC	Crack Circumferential		7 to 5		
46.5	TB	Tap, Break-in / Hammer		2		
53.1	TB	Tap, Break-in / Hammer		11		
59.6	TB	Tap, Break-in / Hammer		2		
61.7	SRV	Surface: Reinforcement Visible		10 to 12		
65.1	TBA	Tap, Break-in / Hammer: Active		10		
65.1	SRV	Surface: Reinforcement Visible		10 to 2		
71.2	CC	Crack Circumferential		7 to 5		
74.4	SRV	Surface: Reinforcement Visible		1		
77.4	SAV	Surface: Aggregate Visible		4 to 8	S02	
77.8	TB	Tap, Break-in / Hammer		1		
84.1	TB	Tap, Break-in / Hammer		2		
84.2	CC	Crack Circumferential		7 to 5		
88.8	TB	Tap, Break-in / Hammer		10		
88.8	SRI	Surface: Roughness Increased		10 to 1		
89.3	TB	Tap, Break-in / Hammer		2		
89.5	TB	Tap, Break-in / Hammer		11		
91.1	CC	Crack Circumferential		8 to 4		
94.5	SRV	Surface: Reinforcement Visible		1		
96.4	DAE	Deposits Attached: Encrustation	5	7 to 5	F01	
96.4	SAV	Surface: Aggregate Visible		4 to 8	F02	
96.4	AMH	Access Point - Manhole				SMH 00748

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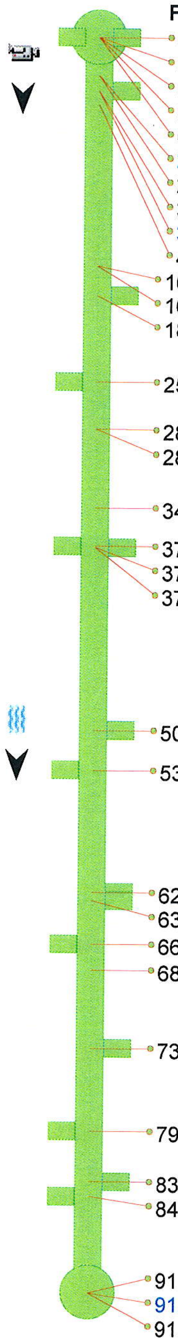
Upstream MH	Downstream MH	Size	Material	Total Length	City
SMH 00748	SMH 00792	1500	Reinforced Concrete Pipe	92	NIAGARA FALLS ONT.

Surveyor's Name	Certificate Number	Street Address	Location Details
PIPEFLOSC	U-511-12735	VALLEY WAY	FIFTH AVE.

Direction	Purpose	Weather	Date	Time	Length Surveyed
Downstream	Pre-Acceptance	Dry	20180523	09:43	91.7

Additional Information
CCTV SMH 00748 TO MH SMH 00792



Ftg.	Code	Description	Pct.	Position	Cont.	Comment
0.0	AMH	Access Point - Manhole				Starting Manhole: SMH 00748
0.0	MWL	Water Level	5			
0.0	TBA	Tap, Break-in / Hammer: Active		4		IN MH
0.0	TBA	Tap, Break-in / Hammer: Active		10		
0.0	SAV	Surface: Aggregate Visible		4 to 8	S01	
2.8	LR	Line - Right	10			
2.8	DAR	Deposits Attached: Ragging	5	5		
3.9	TB	Tap, Break-in / Hammer		10		
3.9	DAE	Deposits Attached: Encrustation	5	7 to 5	S02	
4.9	CC	Crack Circumferential		7 to 5		
16.7	ID	Infiltration - Dripper		10 to 2		
16.7	CC	Crack Circumferential		7 to 4		
18.9	TB	Tap, Break-in / Hammer		11		
25.2	TBD	Tap, Break-in / Hammer: Defective		1		90 PERCENT FULL OF CALSITE AND IS ACTIVE
28.7	CC	Crack Circumferential		8 to 5		
28.7	ID	Infiltration - Dripper		1		
34.4	ID	Infiltration - Dripper		12 to 1		
37.2	TB	Tap, Break-in / Hammer		2		
37.3	TBA	Tap, Break-in / Hammer: Active		10		
37.3	SRV	Surface: Reinforcement Visible		10 to 1		
50.6	TBA	Tap, Break-in / Hammer: Active		10		
53.5	TBA	Tap, Break-in / Hammer: Active		2		
62.4	TB	Tap, Break-in / Hammer		11		
63.0	TBA	Tap, Break-in / Hammer: Active		11		
66.2	TB	Tap, Break-in / Hammer		5		
68.1	SRV	Surface: Reinforcement Visible		8		
73.8	TBA	Tap, Break-in / Hammer: Active		9		
79.9	TB	Tap, Break-in / Hammer		2		
83.6	TB	Tap, Break-in / Hammer		10		
84.7	TB	Tap, Break-in / Hammer		2		
91.7	SAV	Surface: Aggregate Visible		4 to 8	F01	
91.7	DAE	Deposits Attached: Encrustation	5	8 to 4	F02	
91.7	AMH	Access Point - Manhole				SMH 00792

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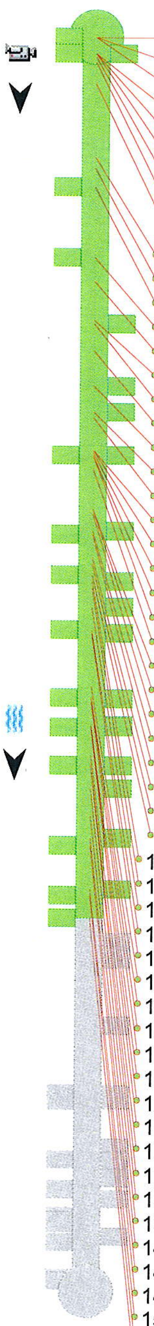
Upstream MH	Downstream MH	Size	Material	Total Length	City
SMH 00792	SMH 00184	1500	Reinforced Concrete Pipe	232	NIAGARA FALLS ONT.

Surveyor's Name	Certificate Number	Street Address	Location Details
PIPEFLOSC	U-511-12735	VALLEY WAY	FOUR AVE.

Direction	Purpose	Weather	Date	Time	Length Surveyed
Downstream	Pre-Acceptance	Dry	20180523	10:26	231.5

Additional Information
CCTV SMH 00792 TO MH SMH 00184



Ftg.	Code	Description	Pct.	Position	Cont.	Comment
0.0	AMH	Access Point - Manhole				Starting Manhole: SMH 00792
0.0	MWL	Water Level	5			
0.0	TBA	Tap, Break-in / Hammer: Active		3		
3.0	TB	Tap, Break-in / Hammer		2		
3.0	TB	Tap, Break-in / Hammer		10		
3.0	DAE	Deposits Attached: Encrustation	5	7 to 5	S01	
3.6	ID	Infiltration - Dripper		11 to 2		
4.6	SRV	Surface: Reinforcement Visible		7 to 10		
8.5	SRV	Surface: Reinforcement Visible		9 to 2		
22.2	SRV	Surface: Reinforcement Visible		1 to 3		
24.3	ID	Infiltration - Dripper		10 to 2		
27.7	TB	Tap, Break-in / Hammer		2		
40.7	TB	Tap, Break-in / Hammer		2		
45.1	SRV	Surface: Reinforcement Visible		1		
52.3	ID	Infiltration - Dripper		1		
53.0	TB	Tap, Break-in / Hammer		10		
58.0	SAV	Surface: Aggregate Visible		3		
64.5	TB	Tap, Break-in / Hammer		10		
69.3	TBB	Tap, Break-in / Hammer: Abandoned		10		
70.4	SRV	Surface: Reinforcement Visible		1		
76.4	SRV	Surface: Reinforcement Visible		10		
76.4	CC	Crack Circumferential		1 to 4		
76.8	ID	Infiltration - Dripper		1		
77.3	TB	Tap, Break-in / Hammer		2		
77.3	TB	Tap, Break-in / Hammer		10		
79.8	SRV	Surface: Reinforcement Visible		12 to 2		
87.3	ID	Infiltration - Dripper		10 to 2		
87.3	CC	Crack Circumferential		8 to 5		
88.1	SRV	Surface: Reinforcement Visible		10 to 2		
91.3	TB	Tap, Break-in / Hammer		10		
91.9	TBC	Tap, Break-in / Hammer: Capped		3		
96.3	ID	Infiltration - Dripper		11 to 2		
97.4	SRV	Surface: Reinforcement Visible		11		
99.4	TBA	Tap, Break-in / Hammer: Active		1		
100.5	TBC	Tap, Break-in / Hammer: Capped		10		
101.7	CL	Crack Longitudinal		3		
105.2	TB	Tap, Break-in / Hammer		10		
109.4	TBC	Tap, Break-in / Hammer: Capped		2		
110.0	TBC	Tap, Break-in / Hammer: Capped		10		
119.8	CL	Crack Longitudinal		3		
121.9	TBC	Tap, Break-in / Hammer: Capped		2		
122.1	TB	Tap, Break-in / Hammer		10		
122.7	CC	Crack Circumferential		8 to 4		
127.0	TB	Tap, Break-in / Hammer		7		
127.2	TFC	Tap, Factory Made: Capped		10		
127.3	TBC	Tap, Break-in / Hammer: Capped		3		
132.5	CL	Crack Longitudinal		2		
134.3	TB	Tap, Break-in / Hammer		2		
134.3	TBC	Tap, Break-in / Hammer: Capped		9		
138.6	TB	Tap, Break-in / Hammer		9		
143.6	ID	Infiltration - Dripper		1		
147.7	TB	Tap, Break-in / Hammer		10		
149.1	TB	Tap, Break-in / Hammer		2		
157.2	TB	Tap, Break-in / Hammer		9		
158.3	TB	Tap, Break-in / Hammer		2		
162.6	TB	Tap, Break-in / Hammer		1		

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Upstream MH	Downstream MH	Size	Material	Total Length	City
SMH 00792	SMH 00184	1500	Reinforced Concrete Pipe	232	NIAGARA FALLS ONT.

Surveyor's Name	Certificate Number	Street Address	Location Details
PIPEFLOSC	U-511-12735	VALLEY WAY	FOUR AVE.

Direction	Purpose	Weather	Date	Time	Length Surveyed
Downstream	Pre-Acceptance	Dry	20180523	10:26	231.5

Additional Information
CCTV SMH 00792 TO MH SMH 00184

Ftg.	Code	Description	Pct.	Position	Cont.	Comment
164.5	CC	Crack Circumferential		7 to 5		
166.9	TB	Tap, Break-in / Hammer		9		
170.1	TB	Tap, Break-in / Hammer		10		
170.1	CL	Crack Longitudinal		3		
182.3	TB	Tap, Break-in / Hammer		10		
185.9	ID	Infiltration - Dripper		10 to 2		
194.8	TB	Tap, Break-in / Hammer		2		
194.9	TB	Tap, Break-in / Hammer		10		
196.1	TB	Tap, Break-in / Hammer		10		
196.2	TB	Tap, Break-in / Hammer		2		
204.8	TB	Tap, Break-in / Hammer		10		
207.0	TBA	Tap, Break-in / Hammer: Active		5		
207.2	TBA	Tap, Break-in / Hammer: Active		7		
210.4	TB	Tap, Break-in / Hammer		10		
210.4	TBB	Tap, Break-in / Hammer: Abandoned		11		
211.0	DSZ	Deposits Settled: Other	5	6		LARGE ROCK
212.5	TB	Tap, Break-in / Hammer		2		
214.3	TBA	Tap, Break-in / Hammer: Active		9		
217.4	TBA	Tap, Break-in / Hammer: Active		3		
217.4	ISSR	Intruding Seal Material - Sealing Ring	90	10 to 8		
218.3	TBA	Tap, Break-in / Hammer: Active		3		
218.8	TB	Tap, Break-in / Hammer		1		
221.3	TB	Tap, Break-in / Hammer		11		
221.5	CL	Crack Longitudinal		3		
221.5	LL	Line - Left	90			
222.3	TB	Tap, Break-in / Hammer		2		
228.9	TB	Tap, Break-in / Hammer		2		
229.4	TBA	Tap, Break-in / Hammer: Active		1		
230.0	SRV	Surface: Reinforcement Visible		12 to 2		
231.5	DAE	Deposits Attached: Encrustation	5	7 to 4	F01	
231.5	AMH	Access Point - Manhole				SMH 00184

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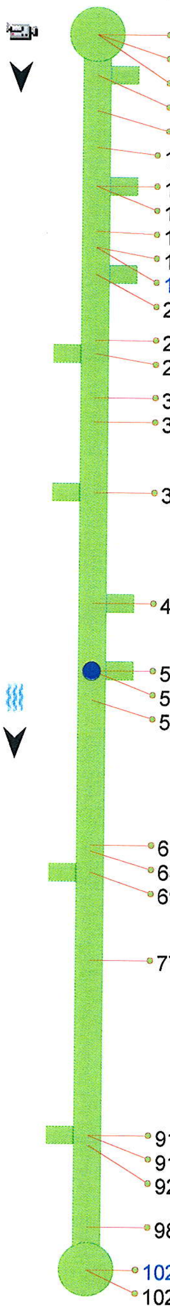
Upstream MH	Downstream MH	Size	Material	Total Length	City
SMH 00184	SMH 00189	1500	Reinforced Concrete Pipe	100	NIAGARA FALLS ONT.

Surveyor's Name	Certificate Number	Street Address	Location Details
PIPEFLOSC	U-511-12735	VALLEY WAY	AT WILLMONT ST.

Direction	Purpose	Weather	Date	Time	Length Surveyed
Downstream	Pre-Acceptance	Dry	20180523	14:12	102.3

Additional Information
CCTV SMH 00184 TO MH SMH 00189



Ftg.	Code	Description	Pct.	Position	Cont.	Comment
1.5	AMH	Access Point - Manhole				Starting Manhole: SMH 00184
1.5	MWL	Water Level	5			
1.5	SRV	Surface: Reinforcement Visible		2		
4.8	TB	Tap, Break-in / Hammer		10		
7.7	SRV	Surface: Reinforcement Visible		1 to 5		
10.7	SRV	Surface: Reinforcement Visible		1 to 5		
13.9	TBA	Tap, Break-in / Hammer: Active		11		
13.9	SRV	Surface: Reinforcement Visible		3		
17.6	SRV	Surface: Reinforcement Visible		1 to 4		
18.9	ID	Infiltration - Dripper		10 to 2		
18.9	DAE	Deposits Attached: Encrustation	5	7 to 5	S01	
21.1	TB	Tap, Break-in / Hammer		10		
26.5	SRV	Surface: Reinforcement Visible		1 to 3		
27.6	TB	Tap, Break-in / Hammer		2		
31.2	SRV	Surface: Reinforcement Visible		12 to 3		
33.2	ID	Infiltration - Dripper		10 to 2		
38.9	TB	Tap, Break-in / Hammer		1		
47.9	TB	Tap, Break-in / Hammer		10		
53.4	TB	Tap, Break-in / Hammer		11		
53.4	TB	Tap, Break-in / Hammer		12		
55.8	ID	Infiltration - Dripper		10 to 2		
67.6	ID	Infiltration - Dripper		10 to 2		
68.1	SRV	Surface: Reinforcement Visible		9 to 11		
69.8	TB	Tap, Break-in / Hammer		1		
77.0	SRV	Surface: Reinforcement Visible		9 to 1		
91.3	TB	Tap, Break-in / Hammer		2		
91.3	SRV	Surface: Reinforcement Visible		1		
92.1	ID	Infiltration - Dripper		9 to 3		
98.8	SSS	Surface: Spalling		10 to 1		
102.3	DAE	Deposits Attached: Encrustation	5	7 to 5	F01	
102.3	AMH	Access Point - Manhole				SMH 00189

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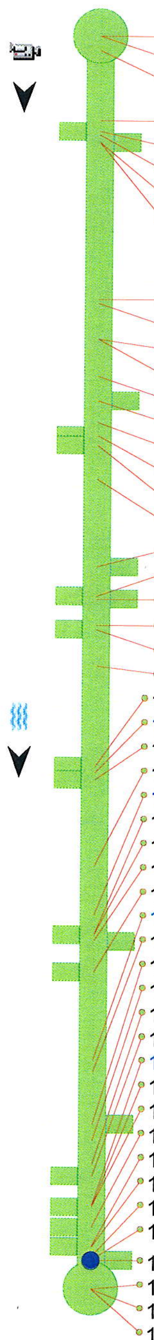
Upstream MH	Downstream MH	Size	Material	Total Length	City
SMH 00189	SMH 00220	1500	Reinforced Concrete Pipe	184	NIAGARA FALLS ONT.

Surveyor's Name	Certificate Number	Street Address	Location Details
PIPEFLOSC	U-511-12735	VALLEY WAY	AT WILLMONT ST.

Direction	Purpose	Weather	Date	Time	Length Surveyed
Downstream	Pre-Acceptance	Dry	20180524	07:30	183.4

Additional Information
CCTV SMH 00189 TO MH SMH 00220



Ftg.	Code	Description	Pct.	Position	Cont.	Comment
0.0	AMH	Access Point - Manhole				Starting Manhole: SMH 00189
0.0	MWL	Water Level	5			
2.1	CC	Crack Circumferential		7 to 5		
12.4	SAV	Surface: Aggregate Visible		5 to 7	S01	
14.0	TB	Tap, Break-in / Hammer		1		
14.5	CC	Crack Circumferential		7 to 5		
15.6	TBC	Tap, Break-in / Hammer: Capped		10		
15.6	SSS	Surface: Spalling		10 to 2	S02	
38.7	DAE	Deposits Attached: Encrustation	5	7 to 5		
39.3	SAV	Surface: Aggregate Visible		10 to 2		
44.5	SSS	Surface: Spalling		11 to 2	F02	
44.5	SAV	Surface: Aggregate Visible		10 to 1	S03	
49.9	CL	Crack Longitudinal		4		
53.5	TBA	Tap, Break-in / Hammer: Active		10		
56.7	DAE	Deposits Attached: Encrustation	5	7 to 5		
58.6	TBA	Tap, Break-in / Hammer: Active		1		
60.0	TB	Tap, Break-in / Hammer		2		
64.9	DAE	Deposits Attached: Encrustation	5	7 to 5		
77.8	TBA	Tap, Break-in / Hammer: Active		10		
82.1	TBA	Tap, Break-in / Hammer: Active		2		
82.5	TB	Tap, Break-in / Hammer		11		
86.3	DAE	Deposits Attached: Encrustation	5	7 to 5		
86.9	TB	Tap, Break-in / Hammer		1		
92.3	CL	Crack Longitudinal		3		
106.9	TB	Tap, Break-in / Hammer		2		
107.8	DAE	Deposits Attached: Encrustation	5	7 to 5		
108.8	TB	Tap, Break-in / Hammer		2		
121.4	SRV	Surface: Reinforcement Visible		10 to 2		
128.6	DAE	Deposits Attached: Encrustation	5	7 to 5		
131.6	TBA	Tap, Break-in / Hammer: Active		4		
131.6	TBD	Tap, Break-in / Hammer: Defective		2		
132.5	TB	Tap, Break-in / Hammer		10		
137.0	TB	Tap, Break-in / Hammer		2		
149.8	DAE	Deposits Attached: Encrustation	5	7 to 5		
151.6	SRV	Surface: Reinforcement Visible		10 to 2		
159.2	TB	Tap, Break-in / Hammer		11		
161.6	SRV	Surface: Reinforcement Visible		10 to 2		
165.1	SRV	Surface: Reinforcement Visible		10 to 2		
166.9	TB	Tap, Break-in / Hammer		2		
171.2	DAE	Deposits Attached: Encrustation	5	7 to 5		
171.4	TB	Tap, Break-in / Hammer		1		
171.4	SRV	Surface: Reinforcement Visible		1		
174.4	TB	Tap, Break-in / Hammer		2		
177.2	TB	Tap, Break-in / Hammer		2		
177.3	SRV	Surface: Reinforcement Visible		10 to 2		
178.7	SRV	Surface: Reinforcement Visible		10 to 2		
179.2	TB	Tap, Break-in / Hammer		9		
179.2	TB	Tap, Break-in / Hammer		12		
183.4	SAV	Surface: Aggregate Visible		4 to 7	F01	
183.4	SAV	Surface: Aggregate Visible		10 to 2	F03	
183.4	AMH	Access Point - Manhole				SMH 00220

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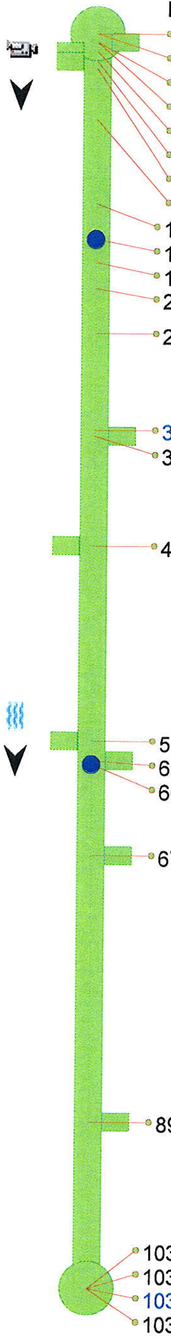
Upstream MH	Downstream MH	Size	Material	Total Length	City
SMH 00220	SMH 00260	1500	Reinforced Concrete Pipe	104	NIAGARA FALLS ONT.

Surveyor's Name	Certificate Number	Street Address	Location Details
PIPEFLOSC	U-511-12735	VALLEY WAY	AT MORRISON ST.

Direction	Purpose	Weather	Date	Time	Length Surveyed
Downstream	Pre-Acceptance	Dry	20180524	08:16	103.6

Additional Information
CCTV SMH 00220 TO MH SMH 00260



Ftg.	Code	Description	Pct.	Position	Cont.	Comment
0.0	AMH	Access Point - Manhole				Starting Manhole: SMH 00220
0.0	MWL	Water Level	5			
0.7	TBA	Tap, Break-in / Hammer: Active		8		
0.7	SAV	Surface: Aggregate Visible		3 to 9	S01	
1.5	TBC	Tap, Break-in / Hammer: Capped		3		
2.3	TB	Tap, Break-in / Hammer		1		
2.9	CC	Crack Circumferential		10 to 2		
7.1	SRV	Surface: Reinforcement Visible		10 to 2		
14.1	SRV	Surface: Reinforcement Visible		10 to 2		
17.0	TB	Tap, Break-in / Hammer		12		
18.9	SRV	Surface: Reinforcement Visible		3		
21.1	SRV	Surface: Reinforcement Visible		10 to 2		
24.8	SRV	Surface: Reinforcement Visible		10 to 2	S02	
32.8	DAE	Deposits Attached: Encrustation	5	7 to 5	S03	
33.3	TB	Tap, Break-in / Hammer		10		
42.3	TBD	Tap, Break-in / Hammer: Defective		2		
58.4	TB	Tap, Break-in / Hammer		1		
60.0	TB	Tap, Break-in / Hammer		11		
60.3	TB	Tap, Break-in / Hammer		12		
67.8	TBA	Tap, Break-in / Hammer: Active		10		
89.8	TBD	Tap, Break-in / Hammer: Defective		10		
103.6	SAV	Surface: Aggregate Visible		4 to 8	F01	
103.6	SRV	Surface: Reinforcement Visible		10 to 2	F02	
103.6	DAE	Deposits Attached: Encrustation	5	7 to 5	F03	
103.6	AMH	Access Point - Manhole				SMH 00260

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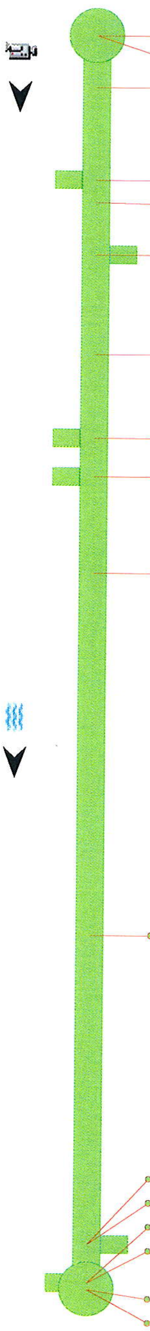
Upstream MH	Downstream MH	Size	Material	Total Length	City
SMH 00260	SMH 00269	1500	Reinforced Concrete Pipe	40	NIAGARA FALLS ONT.

Surveyor's Name	Certificate Number	Street Address	Location Details
PIPEFLOSC	U-511-12735	VALLEY WAY	AT MORRISON ST.

Direction	Purpose	Weather	Date	Time	Length Surveyed
Downstream	Pre-Acceptance	Dry	20180524	08:47	38.9

Additional Information
CCTV SMH 00260 TO MH SMH 00269



Ftg.	Code	Description	Pct.	Position	Cont.	Comment
0.0	AMH	Access Point - Manhole				Starting Manhole: SMH 00260
0.0	MWL	Water Level	5			
1.6	DAE	Deposits Attached: Encrustation	5	8 to 5	S01	
4.5	TB	Tap, Break-in / Hammer		3		
5.2	DSZ	Deposits Settled: Other	5	6		LARGE ROCK
6.8	TB	Tap, Break-in / Hammer		9		
9.9	OBP	Obstacle - External Pipe or Cable in Sewer	5	9 to 2		PIPE
12.5	TBA	Tap, Break-in / Hammer: Active		3		
13.7	TBC	Tap, Break-in / Hammer: Capped		3		
16.7	CC	Crack Circumferential		10 to 2		
27.9	LR	Line - Right	5			
37.5	TBB	Tap, Break-in / Hammer: Abandoned		9		
37.5	DAE	Deposits Attached: Encrustation	5	8 to 4	F01	
38.7	TB	Tap, Break-in / Hammer		3		
38.7	MGO	General Observation				MHS SMH 00208 AND SMH 00209 DO NOT EXIST
38.9	MGO	General Observation				TO 1500MM PIPES AT MH SMH 00269
38.9	AMH	Access Point - Manhole				

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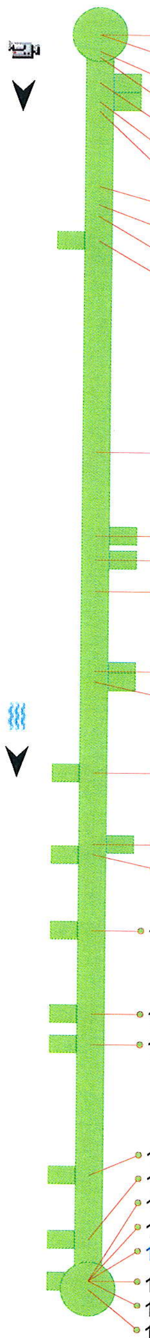
Upstream MH	Downstream MH	Size	Material	Total Length	City
SMH 00269	SMH 00241	1500	Reinforced Concrete Pipe	140	NIAGARA FALLS ONT.

Surveyor's Name	Certificate Number	Street Address	Location Details
PIPEFLOSC	U-511-12735	VALLEY WAY	AT HURON ST.

Direction	Purpose	Weather	Date	Time	Length Surveyed
Downstream	Pre-Acceptance	Dry	20180524	10:26	140.4

Additional Information

CCTV SMH 00269 TO MH SMH 00241



Ftg.	Code	Description	Pct.	Position	Cont.	Comment
0.0	AMH	Access Point - Manhole				Starting Manhole: SMH 00269
0.0	MWL	Water Level	5			
1.9	ID	Infiltration - Dripper		11 to 2		
2.6	OBP	Obstacle - External Pipe or Cable in Sewer	5	10 to 2		
5.4	TBB	Tap, Break-in / Hammer: Abandoned		10		
7.5	TB	Tap, Break-in / Hammer		11		
8.6	DAE	Deposits Attached: Encrustation	5	1 to 5		
17.0	DAE	Deposits Attached: Encrustation	5	7 to 5	S01	
19.1	SAV	Surface: Aggregate Visible		3 to 9	S02	
20.4	DSGV	Deposits Settled: Gravel	5	5 to 7	S03	
23.1	TB	Tap, Break-in / Hammer		1		
46.8	LR	Line - Right	10			
56.1	TBD	Tap, Break-in / Hammer: Defective		10		
58.8	TB	Tap, Break-in / Hammer		11		
62.3	LR	Line - Right	10			
71.2	TBB	Tap, Break-in / Hammer: Abandoned		10		
72.4	TBB	Tap, Break-in / Hammer: Abandoned		10		
82.6	TB	Tap, Break-in / Hammer		1		
90.5	TB	Tap, Break-in / Hammer		8		
91.7	TBA	Tap, Break-in / Hammer: Active		2		
100.2	TBA	Tap, Break-in / Hammer: Active		2		
109.5	TB	Tap, Break-in / Hammer		1		
112.9	TBA	Tap, Break-in / Hammer: Active		2		
127.6	TB	Tap, Break-in / Hammer		2		
134.8	TB	Tap, Break-in / Hammer		2		
139.5	TBA	Tap, Break-in / Hammer: Active		4		
139.5	SAV	Surface: Aggregate Visible		3 to 9	F02	
139.5	DAE	Deposits Attached: Encrustation	5	9 to 3	F01	
139.5	DSGV	Deposits Settled: Gravel	5	5 to 7	F03	
139.5	SRV	Surface: Reinforcement Visible		7 to 10		
140.4	AMH	Access Point - Manhole				SMH 00241

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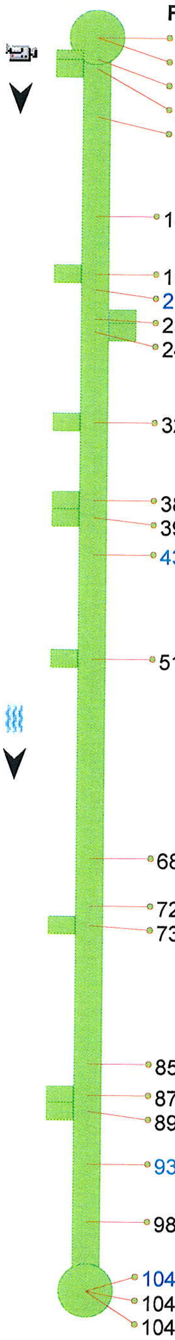
Upstream MH	Downstream MH	Size	Material	Total Length	City
SMH 00241	SMH 00163	1500	Reinforced Concrete Pipe	105	NIAGARA FALLS ONT.

Surveyor's Name	Certificate Number	Street Address	Location Details
PIPEFLOSC	U-511-12735	VALLEY WAY	AT BUCKLEY AVE

Direction	Purpose	Weather	Date	Time	Length Surveyed
Downstream	Pre-Acceptance	Dry	20180524	10:49	104.1

Additional Information
CCTV SMH 00241 TO MH SMH 00163



Ftg.	Code	Description	Pct.	Position	Cont.	Comment
0.0	AMH	Access Point - Manhole				Starting Manhole: SMH 00241
0.0	MWL	Water Level	5			
1.8	TBA	Tap, Break-in / Hammer: Active		3		
2.6	TBC	Tap, Break-in / Hammer: Capped		2		
6.6	SAV	Surface: Aggregate Visible		3 to 9	S01	
14.9	SRV	Surface: Reinforcement Visible		1		
19.7	TB	Tap, Break-in / Hammer		1		
21.0	DAE	Deposits Attached: Encrustation	5	7 to 5	S02	
23.4	TB	Tap, Break-in / Hammer		10		
24.5	TB	Tap, Break-in / Hammer		11		
32.0	TB	Tap, Break-in / Hammer		2		
38.5	TBD	Tap, Break-in / Hammer: Defective		1		
39.9	TB	Tap, Break-in / Hammer		2		
43.0	LR	Line - Right	45			
51.6	TBA	Tap, Break-in / Hammer: Active		1		
68.1	SRV	Surface: Reinforcement Visible		4		
72.1	SRV	Surface: Reinforcement Visible		10 to 2		
73.7	TB	Tap, Break-in / Hammer		1		
85.2	SRV	Surface: Reinforcement Visible		11 to 2		
87.8	TB	Tap, Break-in / Hammer		1		
89.1	TBA	Tap, Break-in / Hammer: Active		1		
93.5	LL	Line - Left	45			
98.3	ID	Infiltration - Dripper		1		
104.1	DAE	Deposits Attached: Encrustation	5	8 to 4	F02	
104.1	SAV	Surface: Aggregate Visible		3 to 9	F01	
104.1	AMH	Access Point - Manhole				SMH 00163

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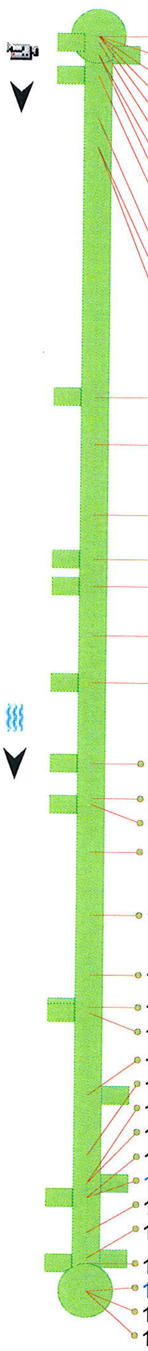
Upstream MH	Downstream MH	Size	Material	Total Length	City
SMH 00163	SMH 00130	1500	Reinforced Concrete Pipe	190	NIAGARA FALLS ONT.

Surveyor's Name	Certificate Number	Street Address	Location Details
PIPEFLOSC	U-511-12735	VALLEY WAY	AT PARK ST.

Direction	Purpose	Weather	Date	Time	Length Surveyed
Upstream	Pre-Acceptance	Dry	20180525	10:10	189.4

Additional Information
CCTV SMH 001163 TO MH SMH 00130



Ftg.	Code	Description	Pct.	Position	Cont.	Comment
0.0	AMH	Access Point - Manhole				Starting Manhole: SMH 00130
0.0	MWL	Water Level	5			
0.0	SAV	Surface: Aggregate Visible		4 to 8	S01	
0.0	CC	Crack Circumferential		1 to 5		
0.0	SAV	Surface: Aggregate Visible		12		
1.0	TBB	Tap, Break-in / Hammer: Abandoned		2		
2.8	TBA	Tap, Break-in / Hammer: Active		9		
2.8	DSGV	Deposits Settled: Gravel	5	6		
5.9	TB	Tap, Break-in / Hammer		1		
12.3	DAE	Deposits Attached: Encrustation	5	7 to 5	S02	
16.7	SAV	Surface: Aggregate Visible		2 to 10	F01	
16.7	SAV	Surface: Aggregate Visible		2 to 10	S03	
54.5	TB	Tap, Break-in / Hammer		1		
61.7	SRV	Surface: Reinforcement Visible		8 to 11		
72.3	LR	Line - Right	90			
79.0	TB	Tap, Break-in / Hammer		2		
83.1	TBA	Tap, Break-in / Hammer: Active		1		
90.5	SRV	Surface: Reinforcement Visible		7 to 9		
97.6	TB	Tap, Break-in / Hammer		2		
109.7	TB	Tap, Break-in / Hammer		2		
115.0	ID	Infiltration - Dripper		10 to 1		
115.9	TB	Tap, Break-in / Hammer		1		
123.0	ID	Infiltration - Dripper		10 to 2		
132.5	LL	Line - Left	90			
141.6	SRV	Surface: Reinforcement Visible		10 to 1		
146.5	TB	Tap, Break-in / Hammer		2		
147.4	TB	Tap, Break-in / Hammer		1		
159.8	TB	Tap, Break-in / Hammer		11		
168.8	SRV	Surface: Reinforcement Visible		11 to 2		
173.1	TB	Tap, Break-in / Hammer		11		
173.1	SRV	Surface: Reinforcement Visible		10 to 2		
175.3	TB	Tap, Break-in / Hammer		1		
175.3	LR	Line - Right	90			
180.6	OBI	Obstacle - Object Protruding Thru Wall	20	9 to 11		LARGE 90 DEGREE CAST ELBOW
184.5	TB	Tap, Break-in / Hammer		10		
185.2	TBA	Tap, Break-in / Hammer: Active		4		
189.4	DAE	Deposits Attached: Encrustation	5	8 to 4	F02	
189.4	SAV	Surface: Aggregate Visible		2 to 10	F03	
189.4	AMH	Access Point - Manhole				SMH 00163

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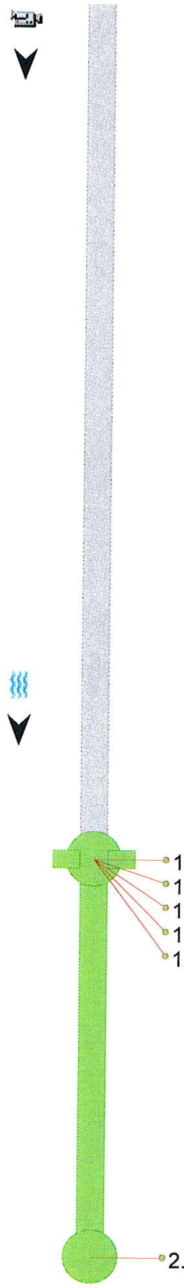
Upstream MH	Downstream MH	Size	Material	Total Length	City
SMH 00130	SMH 00133	1500	Reinforced Concrete Pipe	3	NIAGARA FALLS ONT.

Surveyor's Name	Certificate Number	Street Address	Location Details
PIPEFLOSC	U-511-12735	VALLEY WAY	AT PARK ST.

Direction	Purpose	Weather	Date	Time	Length Surveyed
Upstream	Pre-Acceptance	Dry	20180525	10:03	2.2

Additional Information
CCTV SMH 00130 TO MH SMH 00133



Ftg.	Code	Description	Pct.	Position	Cont.	Comment
1.5	AMH	Access Point - Manhole				Starting Manhole: SMH 00133
1.5	MWL	Water Level	5			
1.5	TSA	Tap, Saddle: Active		3		IN MH
1.5	TB	Tap, Break-in / Hammer		11		
1.5	SAV	Surface: Aggregate Visible		4 to 9		
2.2	AMH	Access Point - Manhole				SMH 00130

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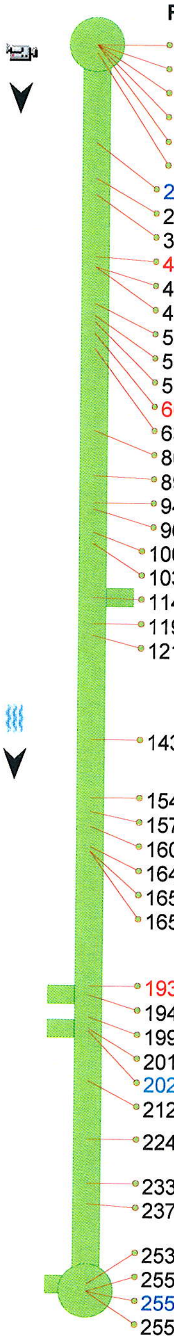
Upstream MH	Downstream MH	Size	Material	Total Length	City
SMH 00133	SMH 05316	1500	Reinforced Concrete Pipe	256	NIAGARA FALLS ONT.

Surveyor's Name	Certificate Number	Street Address	Location Details
PIPEFLOSC	U-511-12735	VALLEY WAY	AT PARK ST.

Direction	Purpose	Weather	Date	Time	Length Surveyed
Downstream	Pre-Acceptance	Dry	20180525	10:46	255.3

Additional Information

CCTV SMH 00133 TO MH SMH 05316



Ftg.	Code	Description	Pct.	Position	Cont.	Comment
1.5	AMH	Access Point - Manhole				Starting Manhole: SMH 00133
1.5	MWL	Water Level	5			
1.5	SAV	Surface: Aggregate Visible		2 to 5		
1.5	LL	Line - Left	25			
1.5	TS	Tap, Saddle		6		1500 MM PIPE BLANKED OFF
3.1	SAV	Surface: Aggregate Visible		3 to 9	S01	
21.5	DAE	Deposits Attached: Encrustation	5	7 to 5	S02	
28.8	SRV	Surface: Reinforcement Visible		8		
32.1	SAV	Surface: Aggregate Visible		11		
44.8	H	Hole in Pipe		11 to 1		AND REBAR
46.8	SAV	Surface: Aggregate Visible		12		
46.8	SRV	Surface: Reinforcement Visible		12		
54.3	MGO	General Observation				OLD ABANDON MH
56.8	RPP	Point Repair - Patch Repair		7 to 5		REPAIR AREA WITH CONCRETE
58.1	SRV	Surface: Reinforcement Visible		3 to 5		
60.4	H	Hole in Pipe		11 to 1		HAS BEEN REPAIR
63.5	SRV	Surface: Reinforcement Visible		7 to 8		
80.2	SRV	Surface: Reinforcement Visible		12		
89.3	SRV	Surface: Reinforcement Visible		2 to 5		
94.9	SRV	Surface: Reinforcement Visible		3 to 5		
96.1	SRV	Surface: Reinforcement Visible		10		
100.8	SRV	Surface: Reinforcement Visible		3 to 5		
103.1	SRV	Surface: Reinforcement Visible		3 to 5	S03	
114.2	TB	Tap, Break-in / Hammer		11		
119.6	SRV	Surface: Reinforcement Visible		10 to 1		
121.9	SRV	Surface: Reinforcement Visible		7 to 9	S04	
143.0	CL	Crack Longitudinal		8		
154.8	SRV	Surface: Reinforcement Visible		11		
157.6	CL	Crack Longitudinal		8		
160.6	SRV	Surface: Reinforcement Visible		11		
164.6	SRV	Surface: Reinforcement Visible		11		
165.6	SRV	Surface: Reinforcement Visible		6 to 8	F03	
165.6	SRV	Surface: Reinforcement Visible		4 to 5	F04	
193.1	H	Hole in Pipe		12		OLD MH COVER
194.9	TB	Tap, Break-in / Hammer		3		
199.4	RPP	Point Repair - Patch Repair		10 to 3		CONCRETE REPAIR
201.8	TB	Tap, Break-in / Hammer		4		
202.2	LR	Line - Right	30			
212.4	SRV	Surface: Reinforcement Visible		4		
224.3	SRV	Surface: Reinforcement Visible		7 to 10		
233.3	SRV	Surface: Reinforcement Visible		3 to 5		
237.5	SRV	Surface: Reinforcement Visible		8 to 9		
253.9	TB	Tap, Break-in / Hammer		2		SQUARE
255.3	SAV	Surface: Aggregate Visible		2 to 10	F01	
255.3	DAE	Deposits Attached: Encrustation	5	7 to 5	F02	
255.3	AMH	Access Point - Manhole				SMH 05316

PIPEFLO CONTRACTING CORP.

111 FRID STREET
HAMILTON, ONTARIO L8P 4M3
TOLL-FREE: 1-866-711-4567, TELEPHONE: 905-572-7767, FAX: 905-572-7768

Upstream MH	Downstream MH	Size	Material	Total Length	City
SMH 05216	BRIDGE ST.	1500	Reinforced Concrete Pipe	85	NIAGARA FALLS ONT.

Surveyor's Name	Certificate Number	Street Address	Location Details
PIPEFLOSC	U-511-12735	VALLEY WAY	AT ONTARIO AVE.

Direction	Purpose	Weather	Date	Time	Length Surveyed
Downstream	Pre-Acceptance	Dry	20180525	12:10	12.5

Additional Information
CCTV SMH 05316 TO MH BRIDGE ST.

Ftg.	Code	Description	Pct.	Position	Cont.	Comment
0.0	AMH	Access Point - Manhole				Starting Manhole: SMH 05216
0.0	MWL	Water Level	5			
0.0	SAV	Surface: Aggregate Visible		7 to 10		
0.0	SRV	Surface: Reinforcement Visible		6 to 9		
1.6	LL	Line - Left	90			
3.1	MGO	General Observation				LINE SPLITS INTO TO 1500X900MM PIPES
3.1	MGO	General Observation				LEFT PIPE
4.5	SAV	Surface: Aggregate Visible		2 to 10	S01	
4.5	SRV	Surface: Reinforcement Visible		2 to 5		
9.1	LL	Line - Left	90			
9.4	DSZ	Deposits Settled: Other	20	6		LARGE ROCKS
12.5	SAV	Surface: Aggregate Visible		2 to 9	F01	
12.5	DSZ	Deposits Settled: Other	30	4 to 9		LARGE ROCKS
12.5	MGO	General Observation				ZOOMED LAST 5 METERS TO WALL
12.5	AEP	Access Point - End of Pipe				PIPE BLANKED OFF

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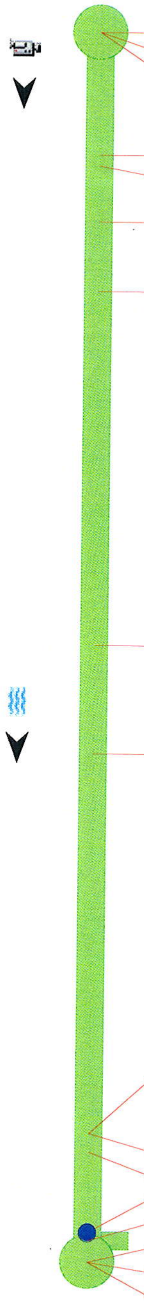
Upstream MH	Downstream MH	Size	Material	Total Length	City
SMH 05316(BURIED)	BRIDGE ST.	1500	Reinforced Concrete Pipe	48	NIAGARA FALLS ONT.

Surveyor's Name	Certificate Number	Street Address	Location Details
PIPEFLOSC	U-511-12735	PARK ST.	AT ONTARIO ST.

Direction	Purpose	Weather	Date	Time	Length Surveyed
Downstream	Pre-Acceptance	Dry	20180529	08:08	45.9

Additional Information

CCTV SMH 05316 TO BRIDGE ST.



Ftg.	Code	Description	Pct.	Position	Cont.	Comment
0.0	AMH	Access Point - Manhole				Starting Manhole: SMH 05316(BURIED)
0.0	MWL	Water Level	5			
0.0	MGO	General Observation				DOING RIGHT SIDE OF SPLIT PIPE
4.6	DAR	Deposits Attached: Ragging	10	1 to 5		
5.0	SAV	Surface: Aggregate Visible		3 to 9	S01	
7.1	SRV	Surface: Reinforcement Visible		6 to 9		
9.7	LL	Line - Left	90			
22.9	LR	Line - Right	90			
26.9	MSC	Dimension/Shape Change				SPLIT LINE COMES BACK TOGETHER HERE
41.1	MGO	General Observation				LARGE DIAMETER PIPE RUNNING FROM TOP OF PIPE TO BOTTOM OF PIPE 450MM
41.1	DAR	Deposits Attached: Ragging	10	7 to 10		
41.8	MGO	General Observation				POSSIBLE GATE VALVE
44.8	TS	Tap, Saddle		12		
45.1	TS	Tap, Saddle		11		
45.9	SAV	Surface: Aggregate Visible		3 to 9	F01	
45.9	MGO	General Observation				FLOW METER
45.9	AMH	Access Point - Manhole				BRIDGE ST.

Generated on Wednesday, 06/06/2018 at 03:28 PM by the PipeTech® TV inspection system.

Date:	2/23/2021	File:	617062
To:	Joe Colasurdo – City of Niagara Falls		
From:	Danielle Anders – GM BluePlan, Elaine Samuel - GM BluePlan		
Project:	Valley Way Drainage EA Study		
Subject:	Technical Memorandum #5 – Hydraulic Model Calibration and System Performance		

TECHNICAL MEMO

1. INTRODUCTION

1.1 Project Scope

GM BluePlan (GMBP) has been retained by the City of Niagara Falls to develop a tactical plan to address localized flooding as well as sanitary and storm sewer conveyance issues in the Valley Way drainage area. This study is being completed as a Schedule C Class Environmental Assessment (EA) under the Municipal Environmental Assessment process. The Valley Way Drainage EA Study will endeavor to serve as an action plan for the City to provide better municipal services and eliminate flooding concerns in the study area and will guide the City's sewer separation and drainage improvement projects in the area.

1.2 Memorandum Scope

The scope of this technical memorandum is to outline methodology used to update the hydraulic model for the City's wastewater system. This includes:

- Description of methodology and modelling approach;
- Inventory of input data, including all additional and supplemental data;
- List of assumptions used;
- Documentation of model verification and calibration; and
- System performance.

1.3 Model Scope

The hydraulic model was updated and calibrated using:

- The City's pre-existing hydraulic model;
- Results of the implemented flow monitoring program in the Valley Way trunk sewer;
- Targeted critical rainfall events; and
- Local field investigation verification.

1.4 Model Terminology

- Base Sanitary Flow (BSF): Is the component of dry weather sanitary flow generated by water users, i.e. "people flow".

- Groundwater Infiltration (GWI): Is the component of dry weather sanitary flow resulting from the ingress of ground water through defects, such as cracks or defective joints, in the sanitary sewer infrastructure. GWI is typically calculated as 80% of the minimum nighttime flow (MNF).
- Dry Weather Flow (DWF): Is the normal amount of flow through a sanitary sewer during periods with no rainfall or snow melt and is comprised of Base Sanitary Flow and Groundwater Infiltration.
- Average Dry Weather Flow (ADWF): The ADWF is calculated based on a selection of dry weather days, and represented as a total daily average value, and as a diurnal flow profile as illustrated by **Figure 1-1.**
- Wet Weather Flow (WWF): Is how the system performs in response to rainfall or snowmelt, and is comprised of DWF and Rainfall Derived Inflow and Infiltration (RDII), which includes:
  - Rainfall dependent inflow: Flow that enters the sanitary system from direct connections such as downspouts, combined sewers, and surface runoff.
  - Rainfall dependent infiltration: Flow due to rainfall that enters the sanitary sewer through sewer defects such as cracks or joint failures.
- Design Event / Return Period: The theoretical rainfall event used to measure likelihood of occurrence. For example, a one in five-year event means that magnitude of storm is likely to occur once every five years or has a 20% chance of occurring in any given year. Two and five-year design storms are considered industry best practices to provide adequate levels of service.

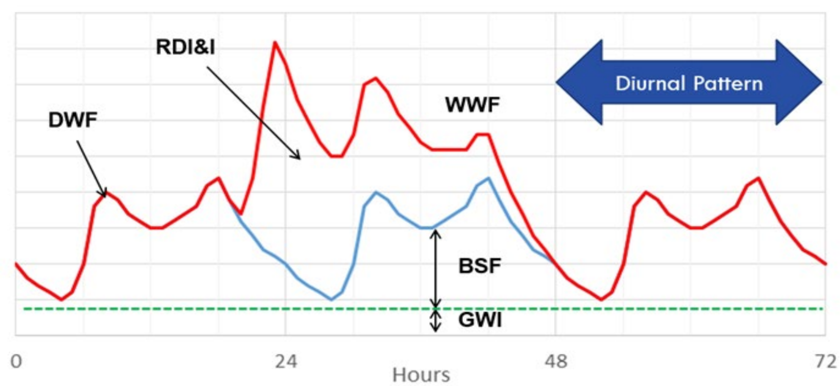


Figure 1-1. Dry and Wet Weather Flow Patterns

2. EXISTING SYSTEM

2.1 System Overview

The Niagara Falls wastewater system services the City of Niagara Falls and the Town of Niagara on the Lake. The Niagara Falls system includes an estimated existing population and employment of 87,043 and 43,793, respectively[1].

The Valley Way drainage area is located within the Central Sewage Pumping Station Wastewater Catchment which spans an estimated size of 922.1 ha. **Table 2-1** below indicates the catchment breakdown while **Figure 2-1** includes the catchment overview along with the Valley Way drainage area, estimated at approximately 88.2 ha.

Table 2-1: Wastewater Catchment Overview

Facility	Catchments	Catchment Area (ha)
Central Sewage Pumping Station (SPS)	**Central SPS** (Including Sub Catchments) Bender Hill SPS Muddy Run SPS Seneca Street SPS	922.1
	Central SPS (excluding sub catchments)	617.1
Bender Hill SPS	Bender Hill SPS	163.2
Muddy Run SPS	Muddy Run SPS	100.2
Seneca Street SPS	Seneca Street SPS	41.7

2.2 Sanitary Sewer Network

The Study Area is serviced by roughly 18km of sewers, of which about 13.8km are combined sewers, 1.5km are sanitary sewers, and 2.5km are storm sewers. The separated portions, served by sanitary and storm sewers, are primarily along McRae Street and Stamford Street. These sanitary sewers are local, mainly 250mm or 300mm in diameter, and they flow to the combined system. The main trunk of the combined system runs north-east along Valley Way where the conduit increases in size to 1800mm x 1200mm and eventually discharges at the City's Central Pump Station. There is also

[1] As indicated in the 2016 Regional Municipality of Niagara Master Servicing Plan

an area around Valley Way/Second Avenue with shallow sewers that may be more prone to flooding when downstream flows are high.

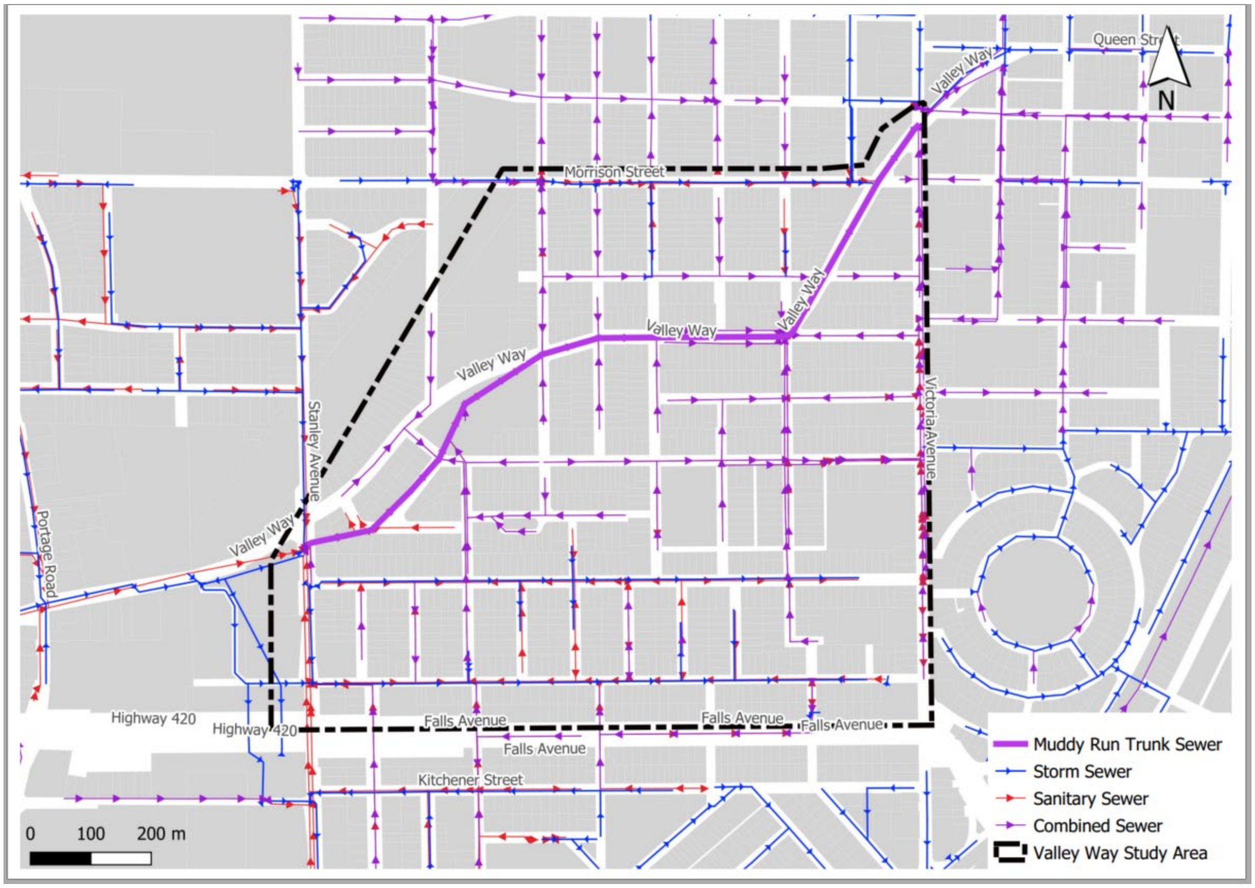


Figure 2-1. System Overview

3. MODELLING APPROACH

3.1 Data Sources

To update the City's pre-existing all-pipes model, multiple sources of data were obtained during the early process of the study. The following sources were used to update the model:

- Flow monitoring data from 2018
- Invert survey data on Wilmott St.

3.1.1 Existing Regional and City Works

The studies listed below include wastewater analysis which was reviewed by GM BluePlan staff to validate system behaviours:

- RMON's 2016 Water and Wastewater Master Servicing Plan
- City of Niagara Falls Master Drainage Plan Update Study
- City of Niagara Falls Pollution Prevention Control Plan

3.1.2 Flow Monitoring Program

A monitoring program was implemented during the initial stages of the study. The rainfall data was used during the model calibration process to further understand local events. This program was the primary source of information used to calibrate the local hydraulic model. The results of the program can be found in Technical Memorandum 4.

3.1.3 Basement Flooding History

The study area is prone to increased numbers of basement flooding, with historic flooding locations illustrated in **Figure 3-1**. These reports indicate flooding throughout the Valley Way study area. The model shows correlation of basement flooding on Jepsen St, Victoria Ave, and Valley Way.

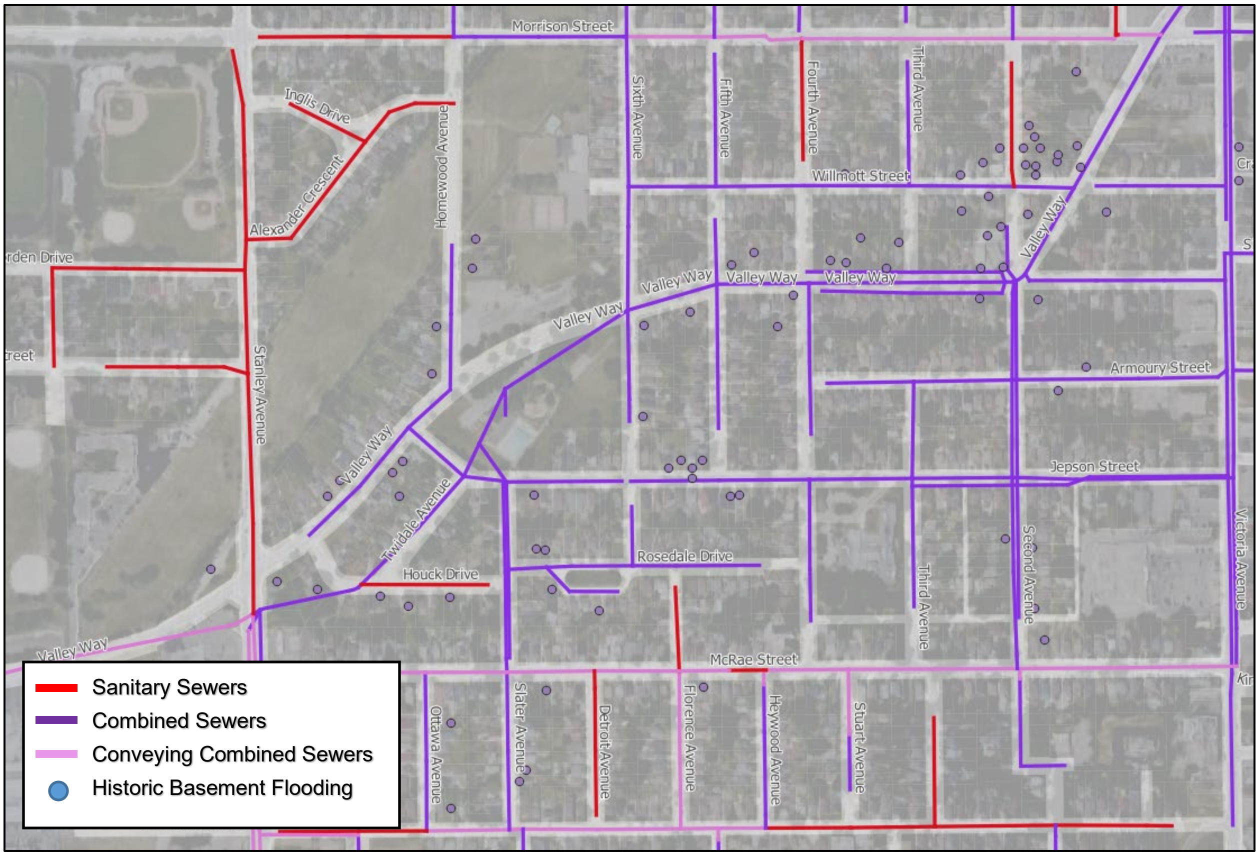


Figure 3-1: Valley Way Historic Basement Flooding Locations

4. MODEL DEVELOPMENT

4.1 Network Update

An existing City all-pipes model was provided by City staff. This model did not require geometric updates.

4.2 Sewer Catchment Delineation

Sewer catchment areas were not modified from the PPCP model.

4.3 Dry Weather Flow Methodology

Flow monitoring data was used to characterize existing system flow patterns within the Valley Way area. Basement flooding history was provided by the City and was used to validate the results of the calibrated monitoring events. If discrepancies between modelled events conflicted with prone basement flooding areas, further investigation was completed.

4.4 Wet Weather Flow Methodology

The wet weather calibration of system response to rainfall involved the determination of Rainfall Dependent Inflow and Infiltration (RDII) response in each of the monitored areas using the RTK Unit Hydrograph approach.

The unit hydrograph (RTK) method involves the fitting of three triangular unit hydrographs (slow, medium, and fast response) onto a measured RDII hydrograph from flow meter data, where:

- R is the fraction of rainfall volume entering sewer system (volume under the hydrograph);
- T is the time from the start of rainfall to the unit hydrograph's peak, in hours; and
- K is the ratio between the recession time and time to unit hydrograph peak (T).

The unit hydrograph (RTK) method is useful in the context of this project in that it allows for the identification of extraneous flow contributors based on their response times.

5. FIELD INVESTIGATIONS

Sewer geometry was updated from sewer elevations confirmed from Valley Way trunk CCTV inspection and sewer inverts collected on Wilmott St. Flow monitoring data collection was detailed in Technical Memorandum #4 and the data was used to calibrate the dry and wet weather flows in the model.

6. MODEL CALIBRATION

Model calibration was completed using the Houck, Parking Lot, Valley Way and Wilmott flow monitors. The Houck, Parking Lot and Valley Way monitors were installed in sequence and all adjustments considered upstream and downstream impacts at other monitoring points.

6.1 Dry Weather Flow Calibration

Dry weather flow calibration was achieved by multiplying the existing model loading from the PPCP model by a ratio to match the flow monitored dry weather flow.

The average dry weather flow contribution from the Valley Way study area is approximately 10 L/s and peak dry weather flow is roughly 12 L/s. Dry weather flow calibration at Houck Drive is shown in **Figure 6-1**. Peak dry weather flow was calibrated within -5% at Houck Drive FM to +15% at Valley Way FM downstream.

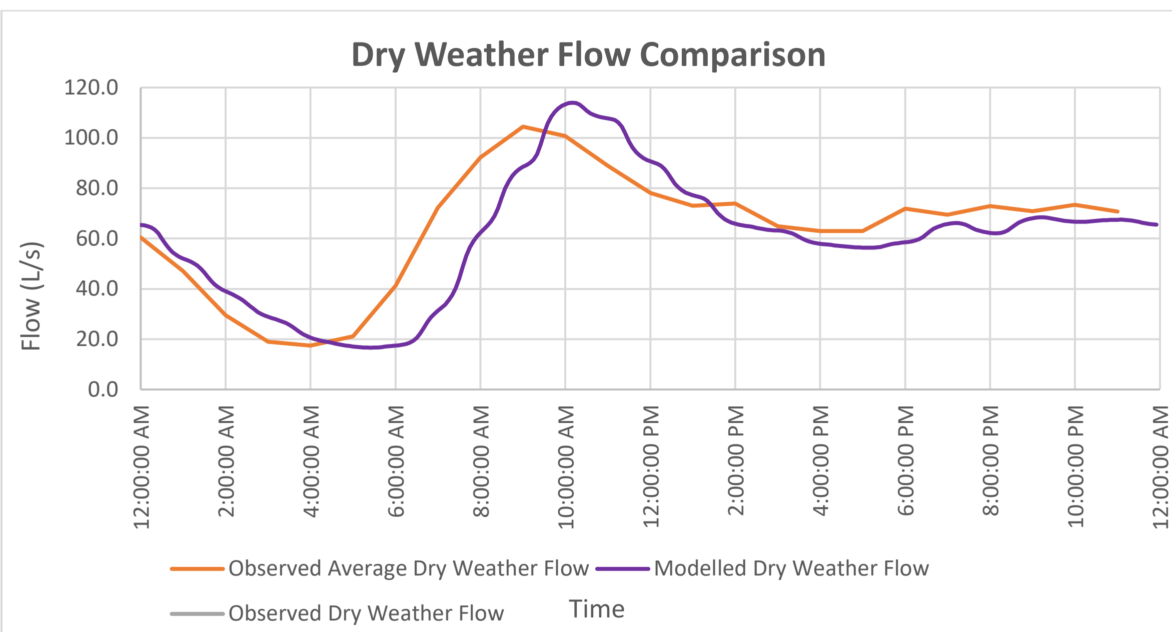


Figure 6-1. Dry Weather Flow Calibration at Houck Drive FM

Remaining dry weather flow calibration graphs are in **Appendix A**.

Challenges with dry weather flow calibration:

- The minimum night flow at the downstream Valley Way monitor was inconsistent with the two upstream monitors at Houck and the parking lot.

6.2 Wet Weather Flow Calibration

6.2.1 Calibration Events

The events used for model calibration are listed in **Table 6-1**.

Table 6-1. Wet Weather Calibration Events

Event ID	Event Date	Rain Duration (hours)	Peak 1-hr (mm/hr)	Peak 5-min (mm/hr)	Total Depth (mm)	Governing Intensity Interval	Return Period (years)
CE2	7/24/2018	8	13.0	4.0	22	2 h	0.6
CE3	8/6/2018	39	6.5	1.8	18	1 h	0.2
CE4	8/17/2018	31	12.0	2.3	36	6 h	0.9

6.2.2 RTK Factors

The RTK values used in the model are summarized in **Table 6-2.** The R values represent percentage of rainfall that enters the system. Approximately half of the area upstream of the Valley Way study area is comprised of combined sewers and the other half is separated sewers. The area between the Parking Lot FM and downstream Valley Way monitors is entirely combined sewers, which is captured by 85% of rainfall entering the system in this area (70% as inflow and 15% as medium-fast inflow/infiltration). Wilmott Street is also partially combined sewers and separated sewers in poor condition, 35% of rainfall enters the sewers on Willmott.

Table 6-2. RTK Factors

Hydrograph	R1	T1	K1	R2	T2	K2	R3	T3	K3
Houck/Parking Lot	7%	0.1	2	3%	0.5	2.2	2%	4.6	5.3
Valley Way	70%	0.04	2	15%	0.08	2.2	1%	4.0	5.3
Willmott	18%	0.04	2	12%	0.2	2.2	1%	4.0	5.3

6.2.3 Wet Weather Flow Calibration Results

Wet weather flow calibration balanced peak flows at the three monitor locations over three events in July and August. Generally, the model is conservative at the upstream end of the study area, estimating peak flows at the Houck FM location within -7% to +31% of monitored flows (peak flows ranged from 700 L/s to 1,220 L/s). Downstream at the Valley Way monitor location, the model achieved results within -20% to +10% of the observed monitor results (peak flows ranged from 1,450 L/s to 2,600 L/s). An example of wet weather flow calibration for the Valley Way FM is shown in **Figure 6-2**. Additional wet weather flow calibration graphs are in **Appendix B**.

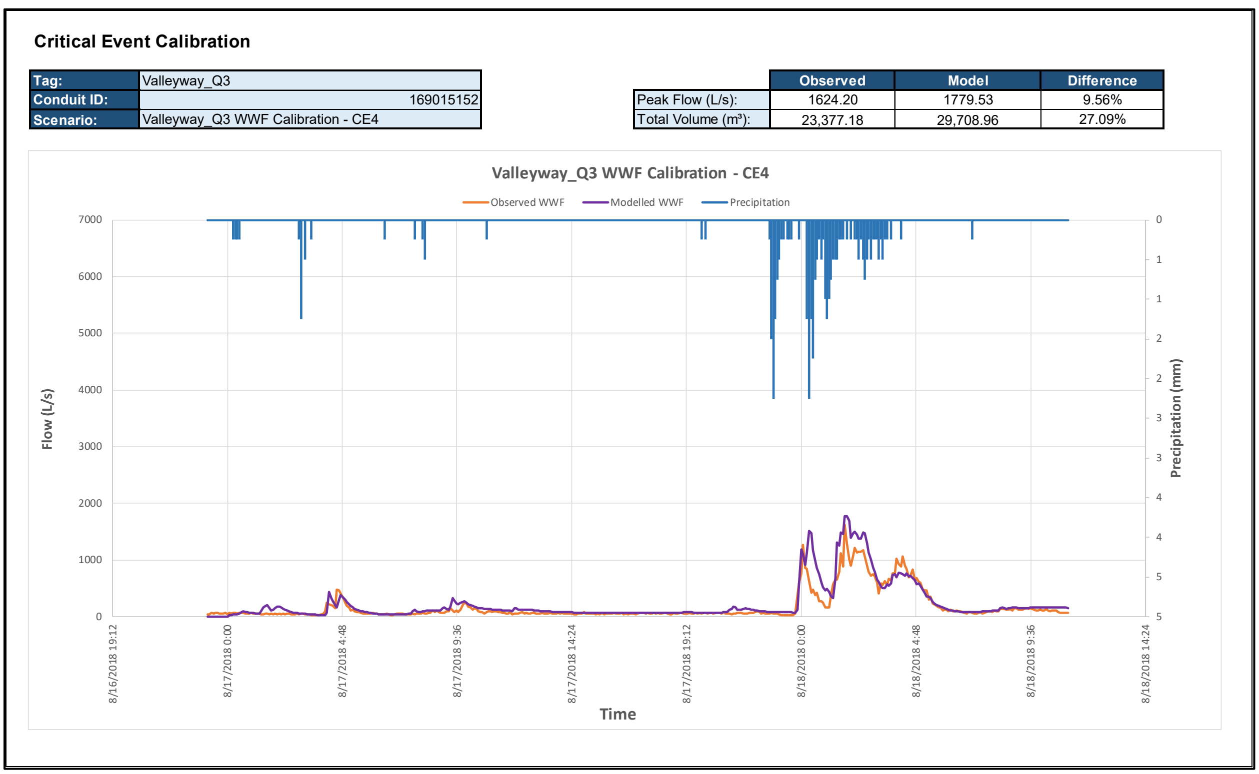


Figure 6-2. Wet Weather Flow Calibration at Valley Way FM

7. PREFERRED SOLUTION MODELLING

7.1 Model Assumptions

Sewer separation was modelled by adjusting the RTK values for the separation areas. R1 and R2 were assumed to total 8% and T1 and T2 values were adjusted from a 2-minute peak inflow time to 6-minute peak inflow time, matching upstream semi-separated conditions, to be conservative.

1) Existing system as calibrated from the 2018 flow monitoring data
2) Preferred Design with RTK representing optimal system, Cv<8%

7.2 Preferred Solution System Performance

Based on these scenarios, the preferred design concept was demonstrated to reduce the risk of basement flooding under 2 and 5-year design storms in the new sanitary system.

Table 7-1. Basement Flooding Risk Areas

Scenario	2 Year Design Storm	5 Year Design Storm
Existing System	• Armoury St • Jepsen St • 2nd Ave • 3rd Ave • 4th Ave • Victoria Ave • Simcoe St • Willmott St	• Armoury St • Jepsen St • 2nd Ave • 3rd Ave • 4th Ave • Victoria Ave • Simcoe St • Willmott St • Stamford St
Sewer Separation 8% Cv	No basement flooding risks	No basement flooding risks

The City may consider installing 250 mm sewers as the smallest local sewer size to provide an additional level of resilience to basement flooding.

8. CONCLUSION

The Valley Way area has experienced chronic flooding issues under the existing combined sewer system. The City's wastewater model which was calibrated to dry and wet weather conditions demonstrated that sewer separation should reduce the occurrence of flooding in the Valley Way area, particularly under lesser storms such as those with 2 and 5-year return periods. For greater resilience to potential flooding, the City may consider increasing the minimum pipe size to 250mm from the current 200mm design.

APPENDIX A: Dry Weather Flow Calibration

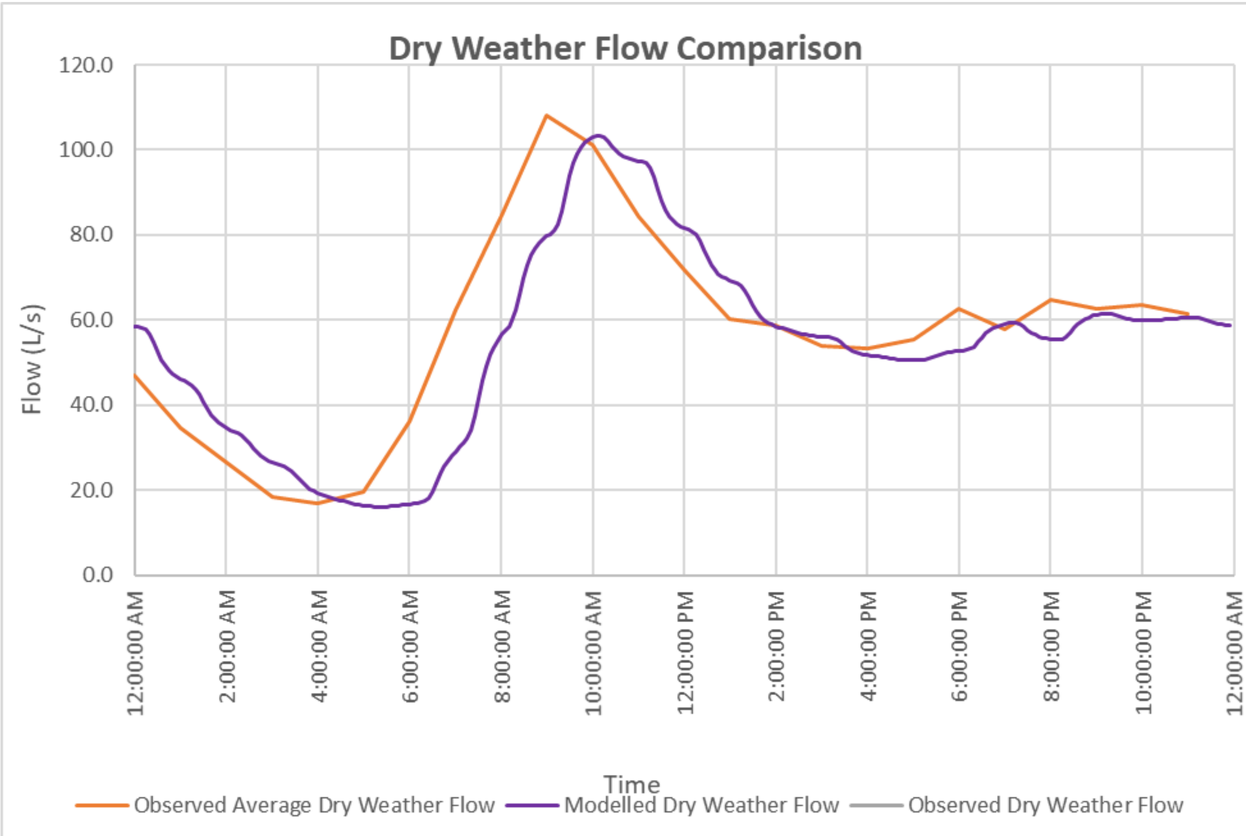


Figure 1. Houck FM DWF Calibration

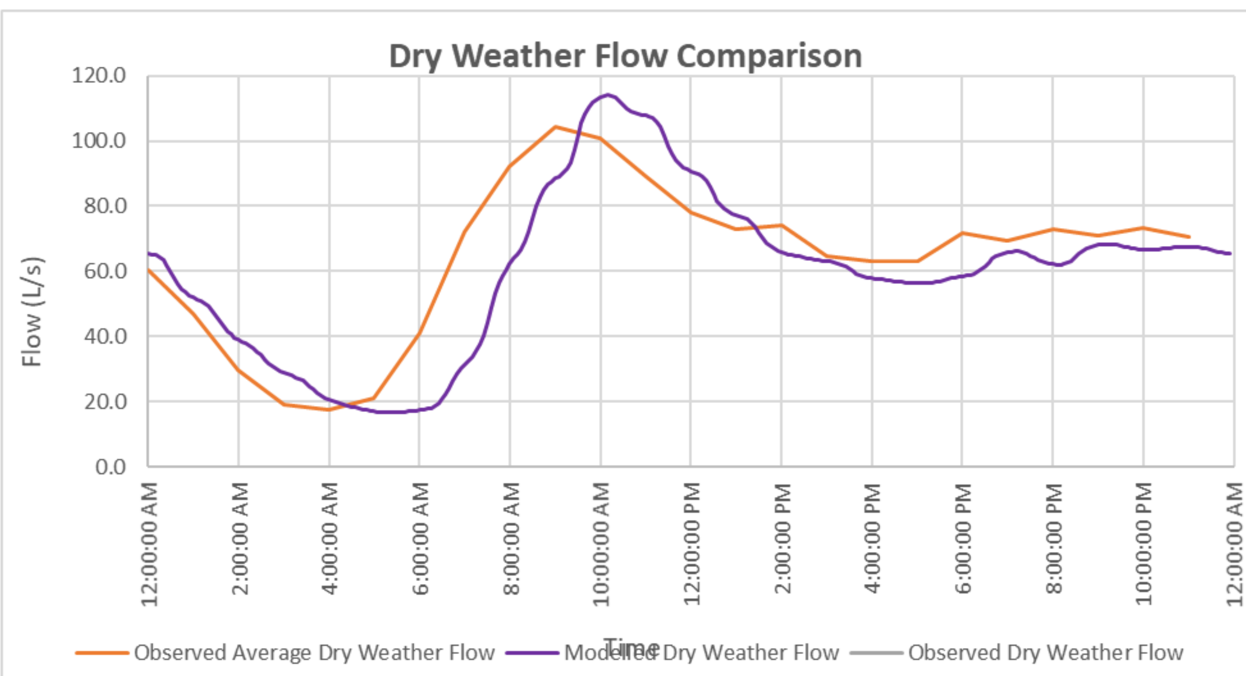


Figure 2. Parking Lot FM

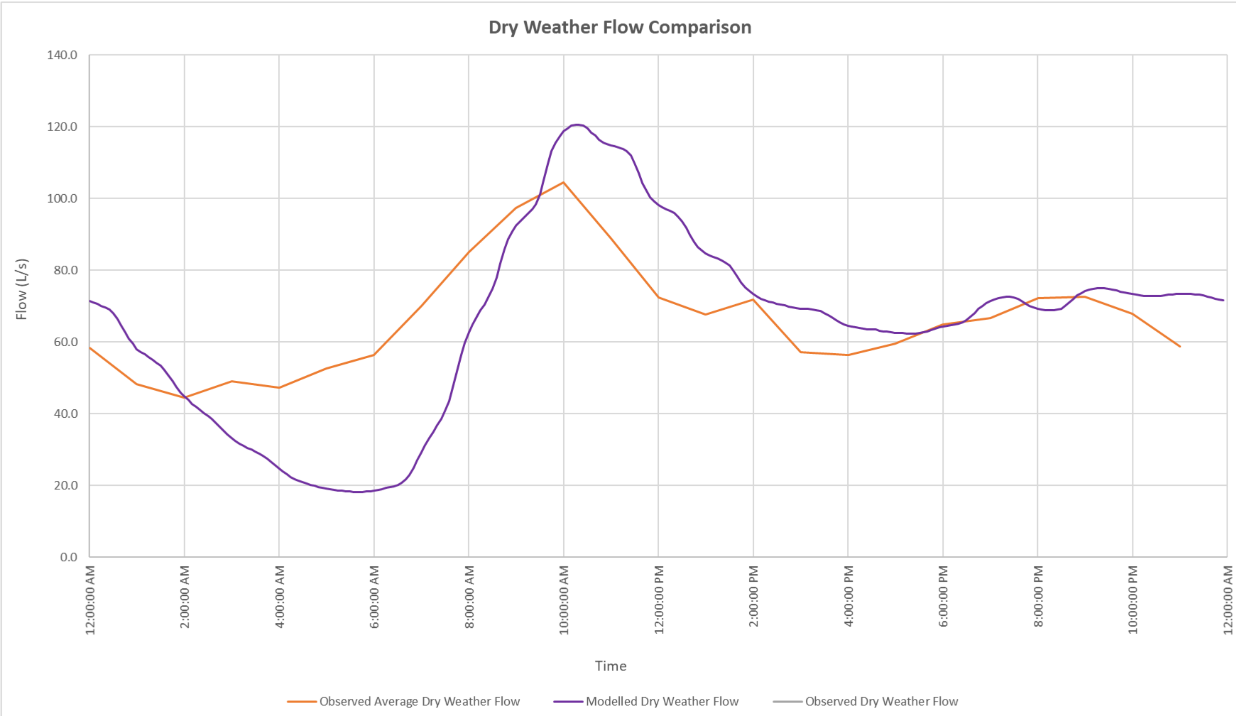


Figure 3. Valley Way FM DWF

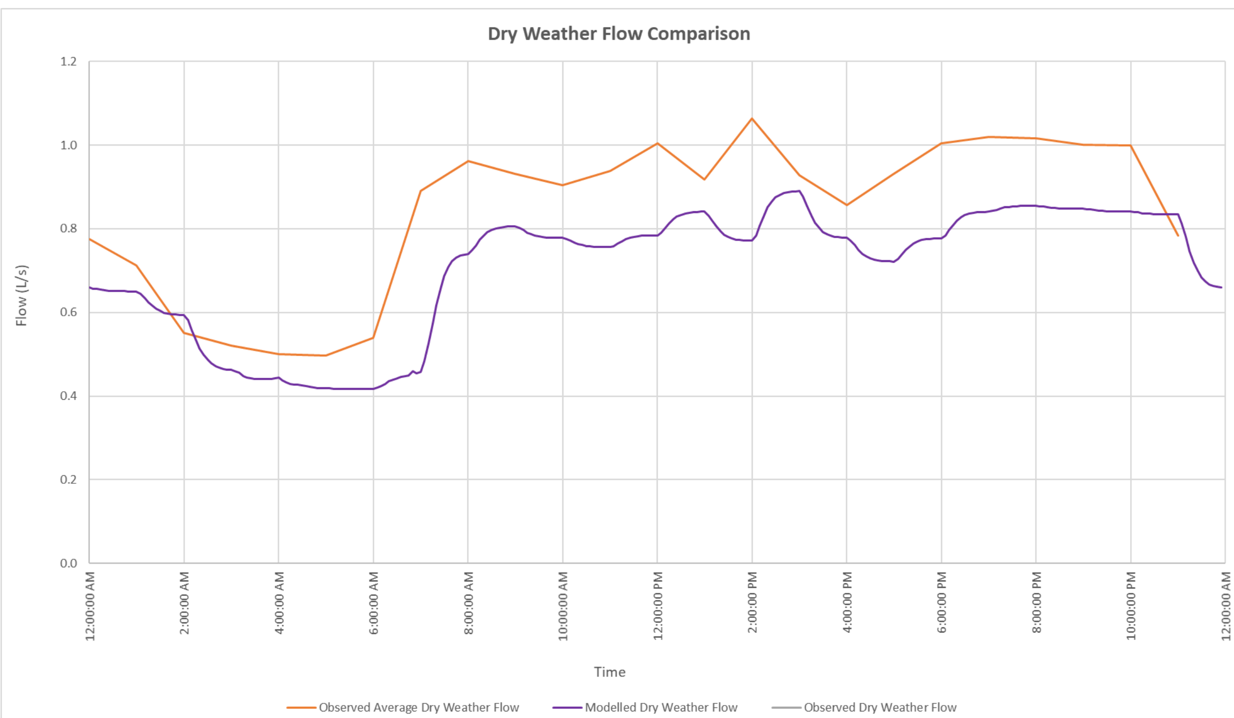


Figure 4 Willmott FM DWF

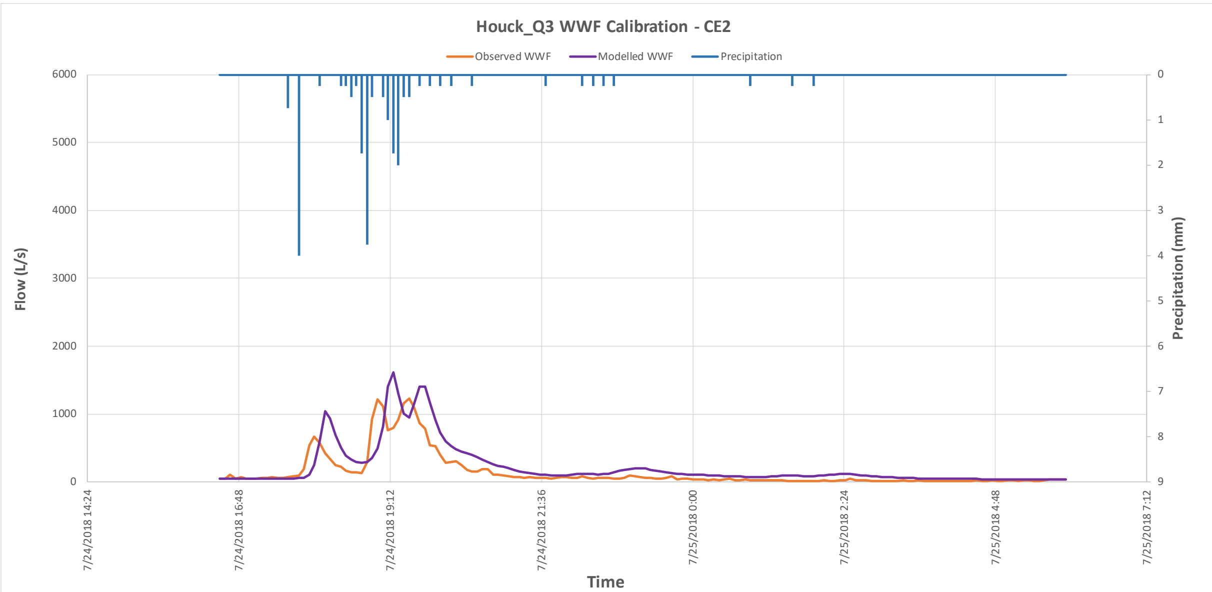
APPENDIX B: Wet Weather Flow Calibration

1. Houck Drive FM WWF

Critical Event Calibration

Tag:	Houck_Q3
Conduit ID:	169015160
Scenario:	Houck_Q3 WWF Calibration - CE2

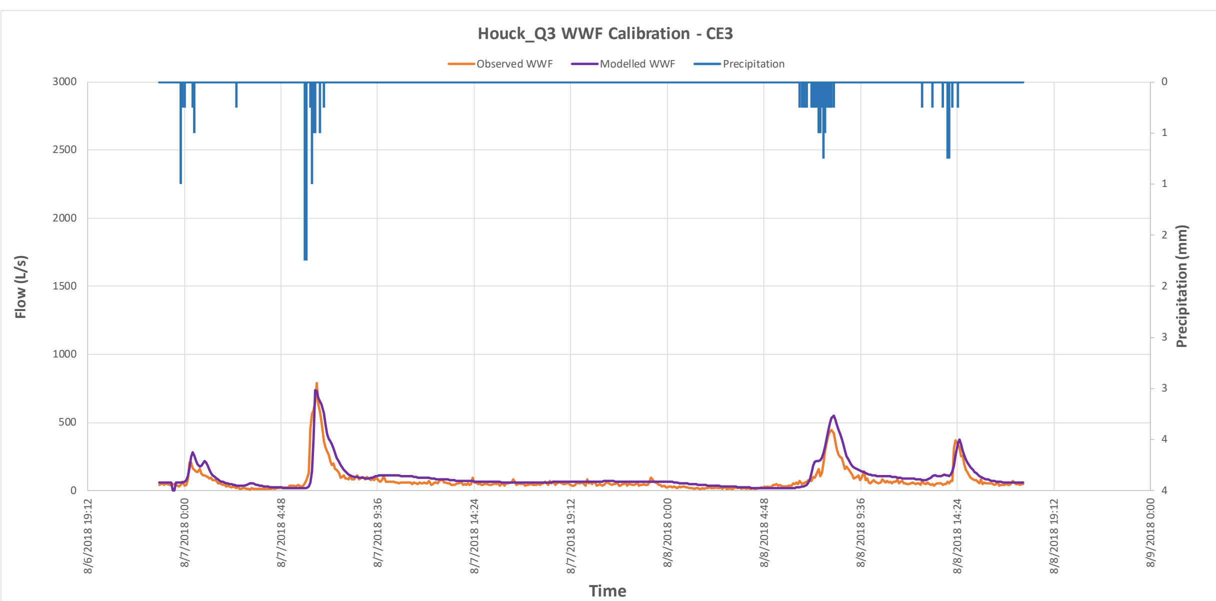
	Observed	Model	Difference
Peak Flow (L/s):	1224.93	1610.73	31.50%
Total Volume (m³):	7,039.37	10,705.64	52.08%



Critical Event Calibration

Tag:	Houck_Q3
Conduit ID:	169015160
Scenario:	Houck_Q3 WWF Calibration - CE3

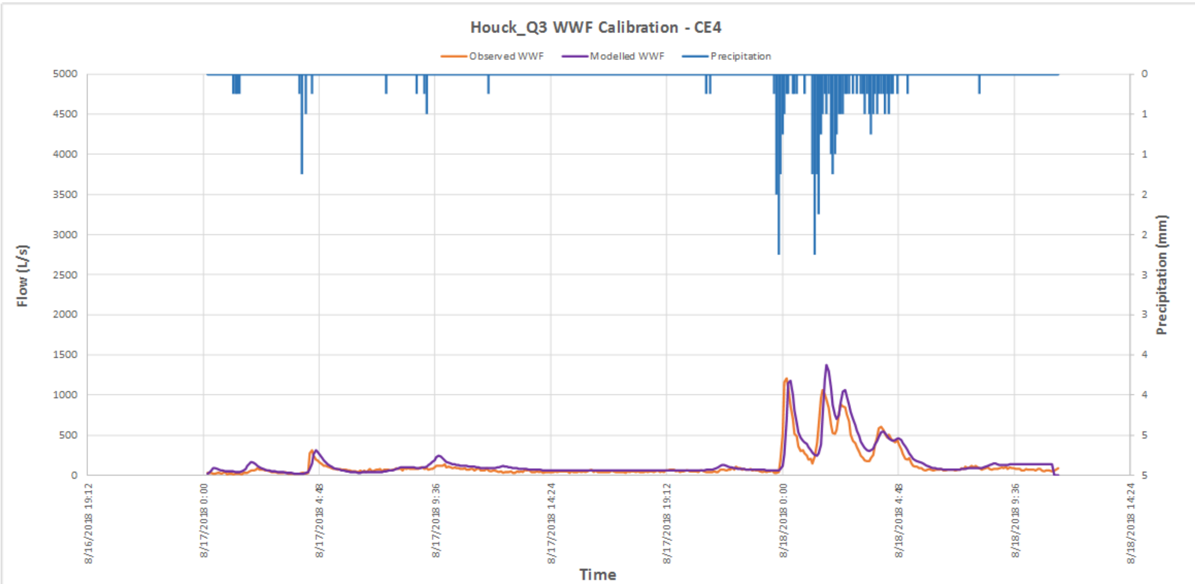
	Observed	Model	Difference
Peak Flow (L/s):	790.41	734.35	-7.09%
Total Volume (m³):	11,584.46	15,487.46	33.69%



Critical Event Calibration

Tag:	Houck_Q3
Conduit ID:	169015160
Scenario:	Houck_Q3 WWF Calibration - CE4

	Observed	Model	Difference
Peak Flow (L/s):	1205.62	1372.83	13.87%
Total Volume (m³):	16,685.53	20,533.44	23.06%

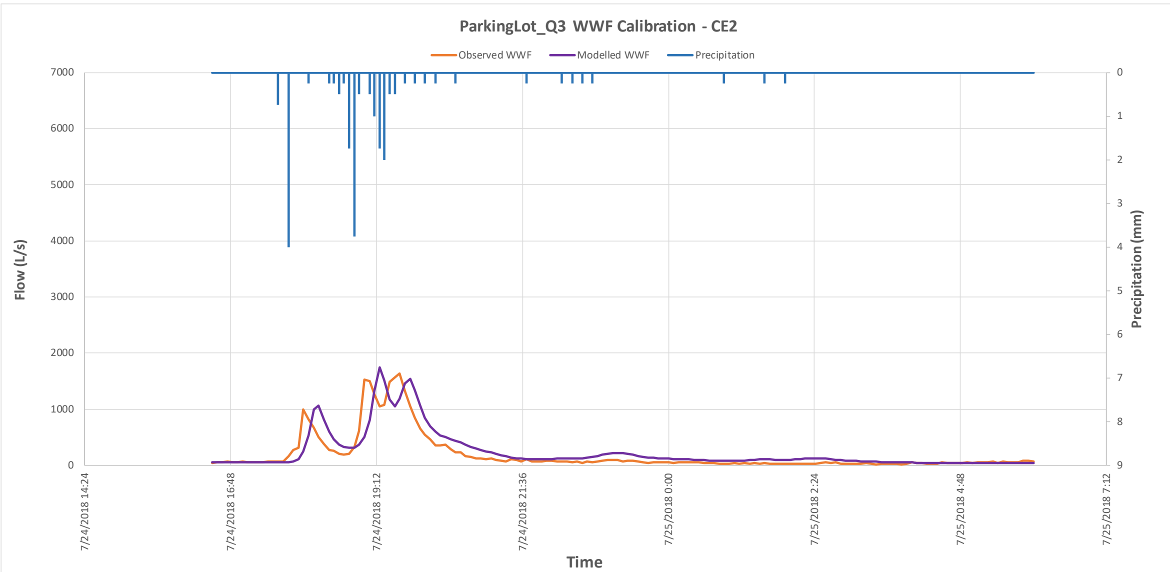


2. Parking Lot FM WWF

Critical Event Calibration

Tag:	ParkingLot_Q3
Conduit ID:	169015157
Scenario:	ParkingLot_Q3 WWF Calibration - CE2

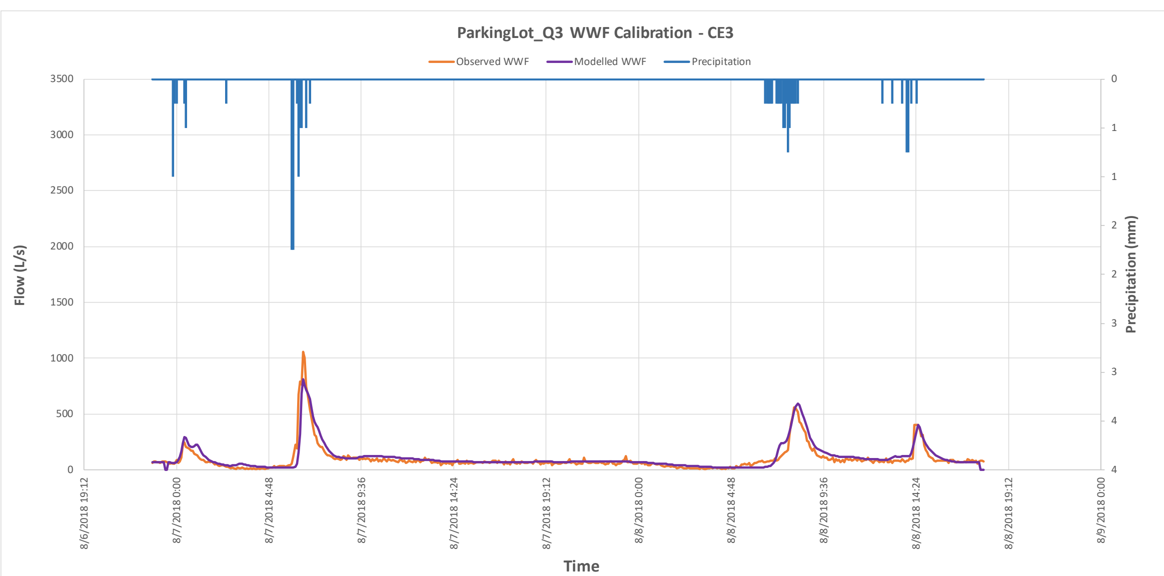
	Observed	Model	Difference
Peak Flow (L/s):	1633.64	1740.11	6.52%
Total Volume (m³):	9,402.81	11,739.91	24.86%



Critical Event Calibration

Tag:	ParkingLot_Q3
Conduit ID:	169015157
Scenario:	ParkingLot_Q3 WWF Calibration - CE3

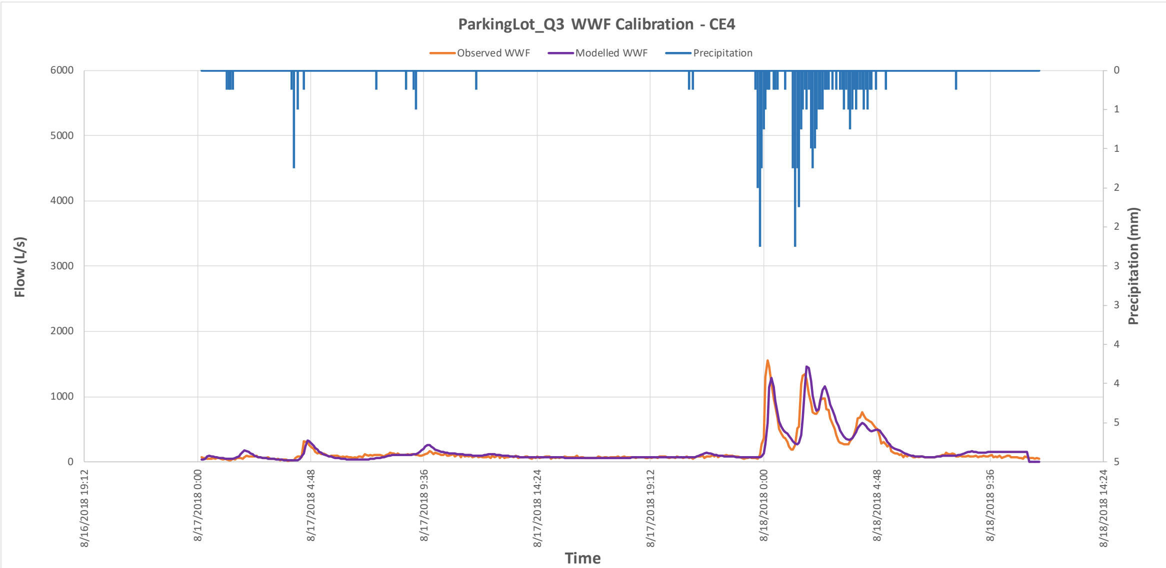
	Observed	Model	Difference
Peak Flow (L/s):	1057.85	810.42	-23.39%
Total Volume (m³):	15,139.53	17,047.39	12.60%



Critical Event Calibration

Tag:	ParkingLot_Q3
Conduit ID:	169015157
Scenario:	ParkingLot_Q3 WWF Calibration - CE4

	Observed	Model	Difference
Peak Flow (L/s):	1554.92	1459.47	-6.14%
Total Volume (m³):	21,478.45	22,510.65	4.81%

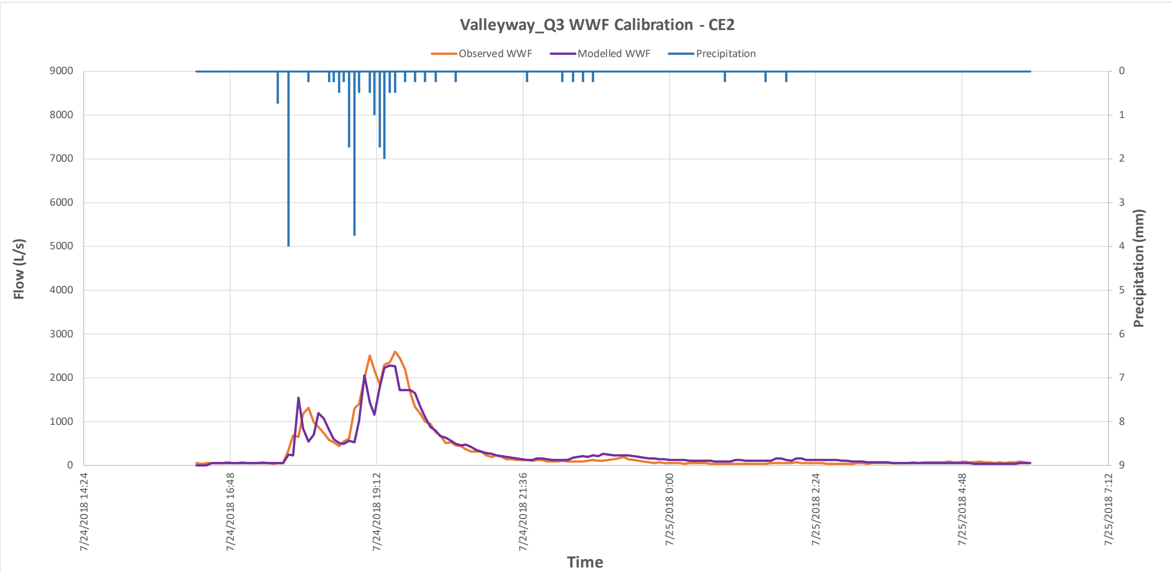


3. Valley Way FM

Critical Event Calibration

Tag:	Valleyway_Q3
Conduit ID:	169015152
Scenario:	Valleyway_Q3 WWF Calibration - CE2

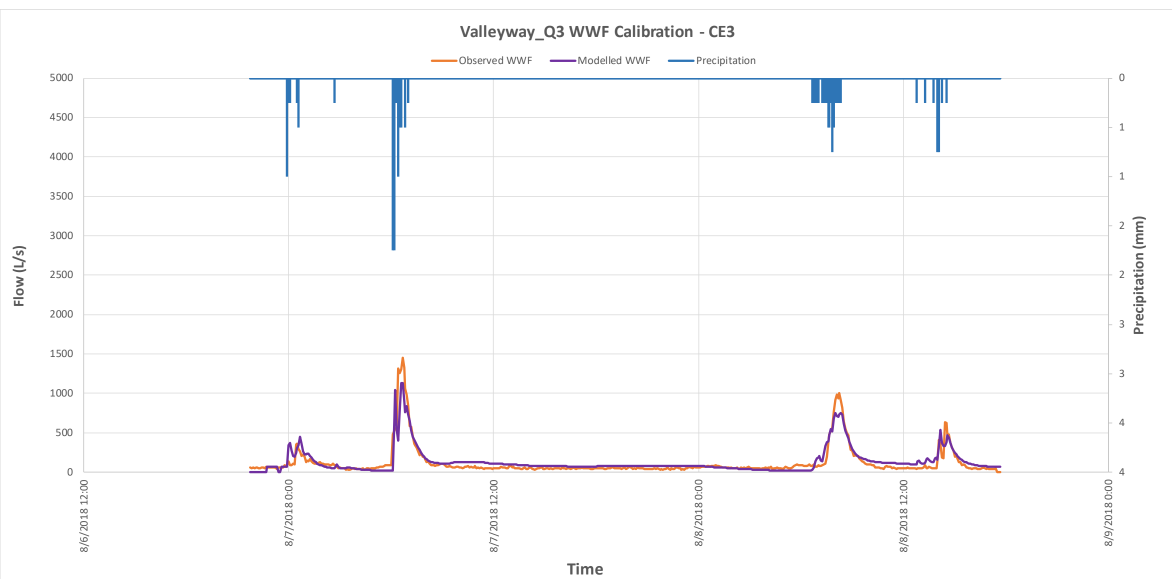
	Observed	Model	Difference
Peak Flow (L/s):	2587.75	2272.57	-12.18%
Total Volume (m³):	15,836.51	15,985.20	0.94%



Critical Event Calibration

Tag:	Valleyway_Q3
Conduit ID:	169015152
Scenario:	Valleyway_Q3 WWF Calibration - CE3

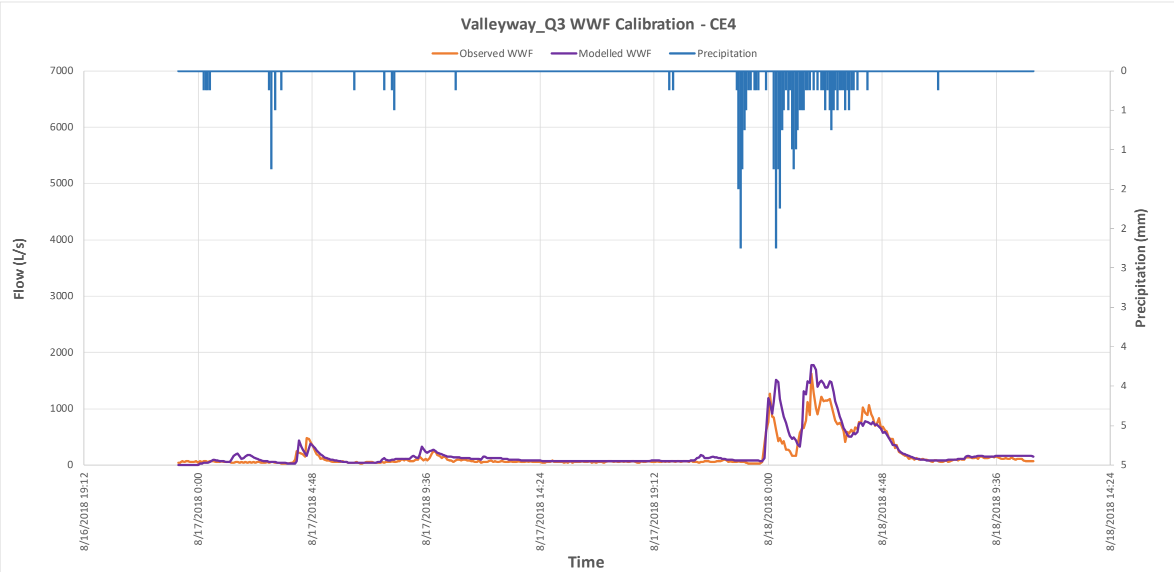
	Observed	Model	Difference
Peak Flow (L/s):	1449.59	1133.67	-21.79%
Total Volume (m³):	18,995.21	21,125.97	11.22%



Critical Event Calibration

Tag:	Valleyway_Q3
Conduit ID:	169015152
Scenario:	Valleyway_Q3 WWF Calibration - CE4

	Observed	Model	Difference
Peak Flow (L/s):	1624.20	1779.53	9.56%
Total Volume (m³):	23,377.18	29,708.96	27.09%

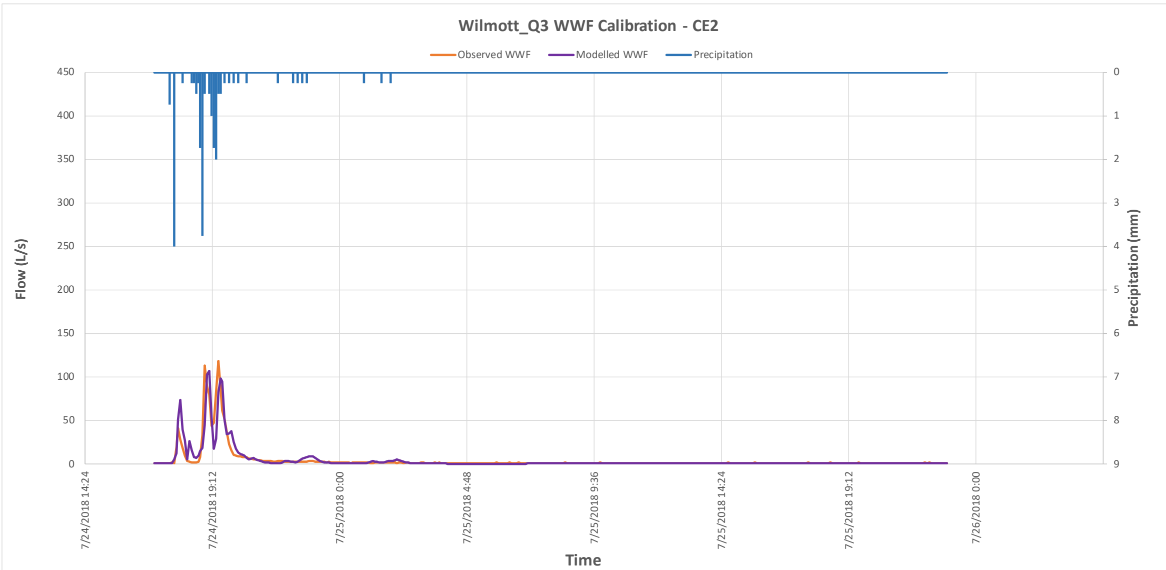


4. Willmott St FM

Critical Event Calibration

Tag:	Wilmott_Q3
Conduit ID:	169015173
Scenario:	Wilmott_Q3 WWF Calibration - CE2

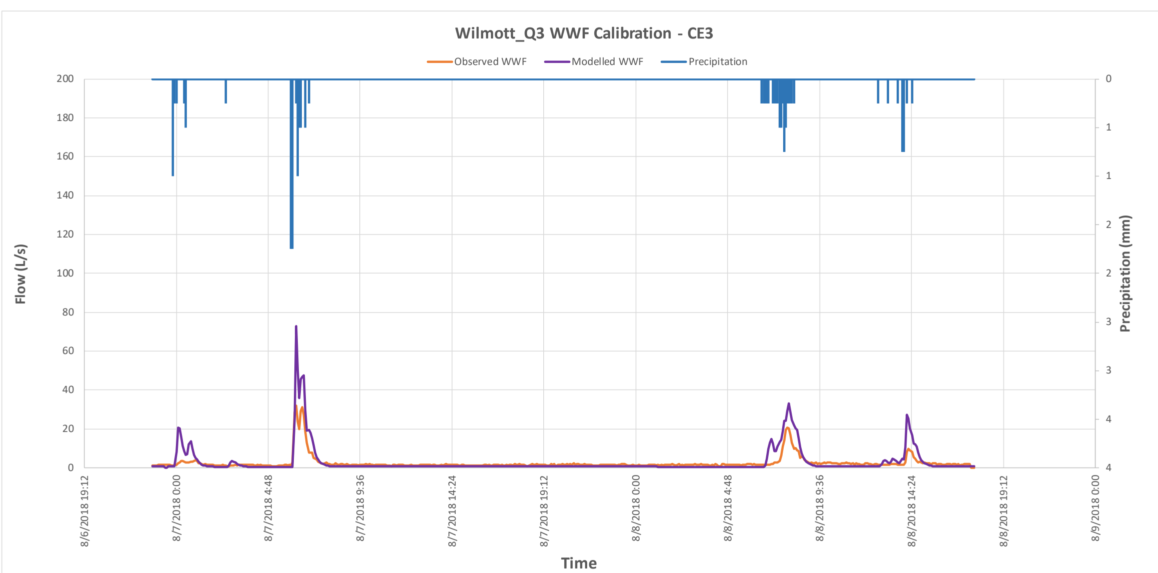
	Observed	Model	Difference
Peak Flow (L/s):	118.05	107.14	-9.25%
Total Volume (m³):	472.46	483.95	2.43%



Critical Event Calibration

Tag:	Wilmott_Q3
Conduit ID:	169015173
Scenario:	Wilmott_Q3 WWF Calibration - CE3

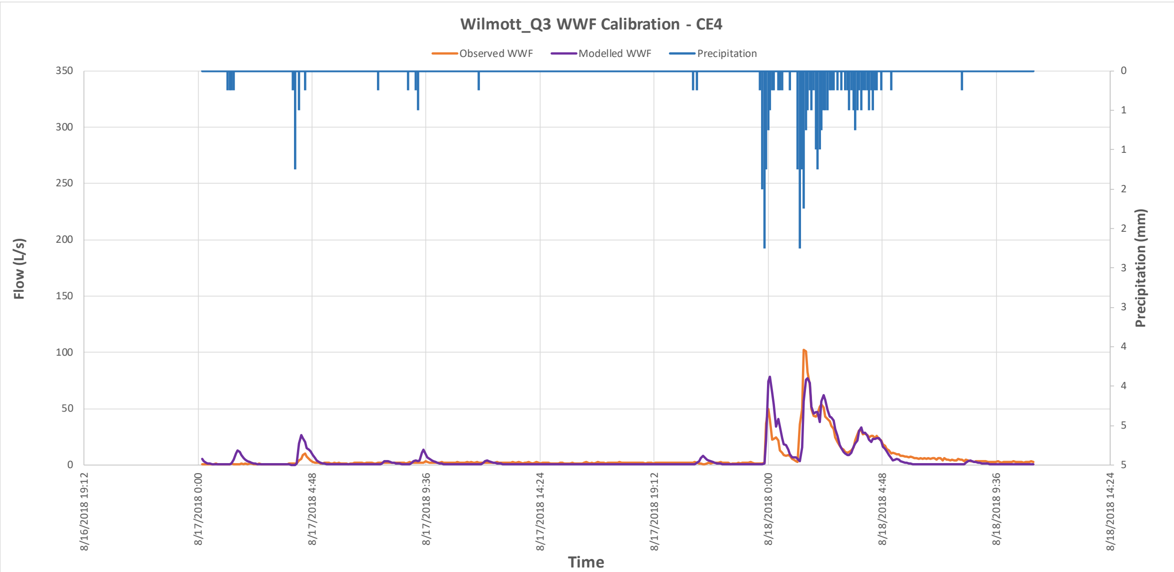
	Observed	Model	Difference
Peak Flow (L/s):	31.94	73.06	128.75%
Total Volume (m³):	391.11	469.79	20.12%



Critical Event Calibration

Tag:	Wilmott_Q3
Conduit ID:	169015173
Scenario:	Wilmott_Q3 WWF Calibration - CE4

	Observed	Model	Difference
Peak Flow (L/s):	102.61	78.17	-23.82%
Total Volume (m³):	829.11	791.98	-4.48%



APPENDIX D: CONCEPTUAL DESIGN

SANITARY SEWER DESIGN

Valley Way Environmental Assessment

City of Niagara Falls

PROJECT No: 619038
DATE: June 2, 2020
DESIGNED BY: RDJ
CHECKED BY: SJP

Densities (based on Zoning)
Institutional= 96.40 ppha
Industrial = 153.20 ppha
Commercial - Tourist = 284.20 ppha
Commercial - General = 180.40 ppha

Residential
Zone R1-R2 Density (ppha) 45.5

Q(i) = Cumm. Area (ha) * Infiltration Rate / 1000

Infiltration Rate: 0.28 L/s/ha

Peaking Factor (min 2.0, max 4.0): $F = 1 + \frac{14}{4 + \sqrt{P}}$ (P = Population/1,000)

Manning Equation: Full Cap.= (D/2/1000)^2*Pi*(D/4/1000)^0.667*(1/n)*(S/100)^0.5

D = Diameter (mm) S = Slope (%)

n = 0.013 (PVC & Concrete), 0.016 (Vitrified Clay)

Average Daily Flow= 380 L/cap/day
n = 0.013

Catchment No.	Street	From M.H.	To M.H.	RESIDENTIAL AREA AND POPULATION						INDUSTRIAL FLOW		COMMERCIAL FLOW		INSTITUTIONAL FLOW		Peak Extraneous Flow	Total Flow	Sanitary Sewer					
				Area	Population	Cumulative		Peak Factor	Peak Flow	Cumulative Area	Peak Flow	Cumulative Area	Peak Flow	Cumulative Area	Peak Flow			Distance	Diameter	Slope	Capacity (Full)	Velocity	
				(ha)		Area (ha)	Population		(m^3/s)	(ha)	(m^3/s)	(ha)	(m^3/s)	(ha)	(m^3/s)	Q(i) = (m^3/s)	(m^3/s)	(m)	(mm)	(%)	(m^3/s)	Full (m/s)	Actual (m/s)
R1	Stamford Street	MH.SS	MH. QQ	0.49	22	0.49	22.30	4.00	0.0004		0.0000		0.0000		0.0000	0.0001	0.0005	87.4	200	0.50	0.0232	0.738	0.244
R2	Heywood Avenue	MH.QQ	MH.RR	0.93	42	1.42	64.61	4.00	0.0011		0.0000		0.0000		0.0000	0.0004	0.0015	163.2	200	0.50	0.0232	0.738	0.428
R3	McRae Street	MH.Z	MH.RR	0.4	18	0.40	18.20	4.00	0.0003		0.0000		0.0000		0.0000	0.0001	0.0004	48.8	200	0.50	0.0232	0.738	0.244
R4	McRae Street	MH.RR	MH.PP	0.61	28	2.43	110.57	4.00	0.0019		0.0000		0.0000		0.0000	0.0007	0.0026	88.7	200	0.50	0.0232	0.738	0.472
R5	Florence Avenue	MH. OO	MH.PP	0.58	26	0.58	26.39	4.00	0.0005		0.0000		0.0000		0.0000	0.0002	0.0006	88.6	200	1.73	0.0431	1.372	0.316
R6	Florence Avenue	MH. YY	MH. PP	0.28	13	0.28	12.74	4.00	0.0002		0.0000		0.0000		0.0000	0.0001	0.0003	73.3	200	0.50	0.0232	0.738	0.170
R7	McRae Street	MH. PP	MH. NN	0.65	30	3.94	179.27	4.00	0.0032		0.0000		0.0000		0.0000	0.0011	0.0043	87.2	200	1.00	0.0328	1.044	0.710
R8	Stamford Street	MH. QQ	MH. OO	0.58	26	0.58	26.39	4.00	0.0005		0.0000		0.0000		0.0000	0.0002	0.0006	88.6	200	1.73	0.0431	1.372	0.316
R9	Stamford Street	MH.OO	MH.MM	0.64	29	1.22	55.51	4.00	0.0010		0.0000		0.0000		0.0000	0.0003	0.0013	86.2	200	0.50	0.0232	0.738	0.428
R10	Detroit Avenue	MH. MM	MH. NN	0.84	38	2.06	93.73	4.00	0.0016		0.0000		0.0000		0.0000	0.0006	0.0022	163.7	200	0.50	0.0232	0.738	0.472
R11	McRae Street	MH. NN	MH. LL	0.7	32	6.70	304.85	4.00	0.0054		0.0000		0.0000		0.0000	0.0019	0.0072	90.2	200	0.50	0.0232	0.738	0.657
R12	Stamford Street	MH.II	MH. Y	0.51	23	0.51	23.21	4.00	0.0004		0.0000		0.0000		0.0000	0.0001	0.0006	86.3	200	0.50	0.0232	0.738	0.244
R13	Stamford Street	MH. MM	MH. Y	0.71	32	0.71	32.31	4.00	0.0006		0.0000		0.0000		0.0000	0.0002	0.0008	92.6	200	0.50	0.0232	0.738	0.295
R14	Slater Avenue	MH. Y	MH. LL	0.84	38	2.06	93.73	4.00	0.0016		0.0000		0.0000		0.0000	0.0006	0.0022	163.9	200	0.50	0.0232	0.738	0.472
R15	Stamford Street	MH. EEEE	MH. GG	0.22	10	0.22	10.01	4.00	0.0002		0.0000		0.0000		0.0000	0.0001	0.0002	71.6	375	0.30	0.0960	0.869	0.000
R16	Buchanan Avenue	MH. GG	MH. HH	0.98	45	1.20	54.60	4.00	0.0010		0.0000		0.0000		0.0000	0.0003	0.0013	165.0	375	0.50	0.1240	1.123	0.258
R17	McRae Street	MH. KK	MH. HH	0.62	28	0.62	28.21	4.00	0.0005		0.0000		0.0000		0.0000	0.0002	0.0007	63.1	200	0.50	0.0232	0.738	0.295
R18	McRae Street	MH. HH	MH. JJ	0.68	31	2.50	113.75	4.00	0.0020		0.0000		0.0000		0.0000	0.0007	0.0027	88.8	375	0.50	0.1240	1.123	0.371

SANITARY SEWER DESIGN

Valley Way Environmental Assessment

City of Niagara Falls

PROJECT No: 619038
DATE: June 2, 2020
DESIGNED BY: RDJ
CHECKED BY: SJP

Densities (based on Zoning)

Institutional= 96.40 ppha
Industrial = 153.20 ppha
Commercial - Tourist = 284.20 ppha
Commercial - General = 180.40 ppha

Residential

Zone R1-R2 Density (ppha) 45.5

Average Daily Flow= 380 L/cap/day
n = 0.013

Q(i) = Cumm. Area (ha) * Infiltration Rate / 1000

Infiltration Rate: 0.28 L/s/ha

Peaking Factor (min 2.0, max 4.0): $F = 1 + \frac{14}{4 + \sqrt{P}}$ (P = Population/1,000)

Manning Equation: Full Cap.= (D/2/1000)^2*Pi*(D/4/1000)^0.667*(1/n)*(S/100)^0.5

D = Diameter (mm) S = Slope (%)

n = 0.013 (PVC & Concrete), 0.016 (Vitrified Clay)

Catchment No.	Street	From M.H.	To M.H.	RESIDENTIAL AREA AND POPULATION: Area	Population	Cumulative		Peak	Peak Flow	INDUSTRIAL FLOW: Cumulative Area	Peak Flow	COMMERCIAL FLOW: Cumulative Area	Peak Flow	INSTITUTIONAL FLOW: Cumulative Area	Peak Flow	Peak Extraneous Flow	Total Flow	Sanitary Sewer: Distance	Diameter	Slope	Capacity (Full)	Velocity	
R19	Stamford Street	MH. GG	MH. II	0.61	28	0.61	27.76	4.00	0.0005		0.0000		0.0000		0.0000	0.0002	0.0007	88.4	200	0.50	0.0232	0.738	0.295
R20	Ottawa Avenue	MH. II	MH. JJ	0.93	42	1.54	70.07	4.00	0.0012		0.0000		0.0000		0.0000	0.0004	0.0017	165.8	200	0.50	0.0232	0.738	0.428
R21	McRae Street	MH. JJ	MH. LL	0.65	30	4.69	213.40	4.00	0.0038		0.0000		0.0000		0.0000	0.0013	0.0051	87.2	375	0.30	0.0960	0.869	0.495
R22	Slater Avenue	MH. LL	MH. R	0.34	15	13.79	627.45	3.92	0.0108		0.0000		0.0000		0.0000	0.0039	0.0147	107.2	375	0.30	0.0960	0.869	0.626
R23	Rosedale Avenue	MH. Q	MH. U	1.07	49	1.07	48.69	4.00	0.0009		0.0000		0.0000		0.0000	0.0003	0.0012	132.0	200	0.50	0.0232	0.738	0.421
R24	6th Avenue	MH. T	MH. U	0.29	13	0.29	13.20	4.00	0.0002		0.0000		0.0000		0.0000	0.0001	0.0003	63.3	200	0.50	0.0232	0.738	0.170
R25	Rosedale Avenue	MH. U	MH. X	0.34	15	1.70	77.35	4.00	0.0014		0.0000		0.0000		0.0000	0.0005	0.0018	88.5	200	2.00	0.0464	1.477	0.724
R26	Rosedale Avenue	MH. V	MH. W	0.32	15	0.32	14.56	4.00	0.0003		0.0000		0.0000		0.0000	0.0001	0.0003	50.3	200	2.00	0.0464	1.477	0.340
R27	Rosedale Avenue	MH. W	MH. X	0.13	6	0.45	20.48	4.00	0.0004		0.0000		0.0000		0.0000	0.0001	0.0005	32.6	200	0.50	0.0232	0.738	0.244
R28	Rosedale Avenue	MH. X	MH. R	0.22	10	2.37	107.84	4.00	0.0019		0.0000		0.0000		0.0000	0.0007	0.0026	40.9	375	0.30	0.0960	0.869	0.348
R29	Slater Avenue	MH. R	MH. S	0.29	13	16.45	748.48	3.88	0.0128		0.0000		0.0000		0.0000	0.0046	0.0174	91.1	375	0.30	0.0960	0.869	0.669
R30	Jepson Street	MH. FFFF	MH. S	0.74	34	0.74	33.67	4.00	0.0006		0.0000		0.0000		0.0000	0.0002	0.0008	95.8	375	0.30	0.0960	0.869	0.200
R31	Jepson Street	MH. S	EX.. TRUNK	0.13	6	17.32	788.06	3.86	0.0134		0.0000		0.0000		0.0000	0.0048	0.0182	43.8	375	0.30	0.0960	0.869	0.678

Minimum Peak Flow velocity of 0.76 m/s

Date: June 2, 2020
Designed By: RDJ
Checked By: SJP

Project: Valley Way Environmental Assessment
File: 619038

SANITARY SEWER DESIGN

Valley Way Environmental Assessment

City of Niagara Falls

PROJECT No: 617062
DATE: June 2, 2020
DESIGNED BY: RDJ
CHECKED BY: SJP

Densities (based on Zoning)		
Institutional=	96.40	ppha
Industrial =	153.20	ppha
Commercial - Tourist =	284.20	ppha
Commercial - General =	180.40	ppha

Residential

Zone R1-R2 Density (ppha) 45.5

Average Daily Flow= 380 L/cap/day
n = 0.013

Q(i) = Cumm. Area (ha) * Infiltration Rate / 1000

Infiltration Rate: 0.28 L/s/ha

Peaking Factor (min 2.0, max 4.0): $F = 1 + \frac{14}{4 + \sqrt{P}}$ (P = Population/1,000)

Manning Equation: Full Cap.= (D/2/1000)^2*Pi*(D/4/1000)^0.667*(1/n)*(S/100)^0.5

D = Diameter (mm) S = Slope (%)

n = 0.013 (PVC & Concrete), 0.016 (Vitrified Clay)

Catchment No.	Street	From M.H.	To M.H.	RESIDENTIAL AREA AND POPULATION						INDUSTRIAL FLOW		COMMERCIAL FLOW		INSTITUTIONAL FLOW		Peak Extraneous Flow	Total Flow	Sanitary Sewer					
				Area	Population	Cumulative		Peak Factor	Peak Flow	Cumulative Area	Peak Flow	Cumulative Area	Peak Flow	Cumulative Area	Peak Flow			Distance	Diameter	Slope	Capacity (Full)	Velocity	
				(ha)		Area (ha)	Population		(m^3/s)	(ha)	(m^3/s)	(ha)	(m^3/s)	(ha)	(m^3/s)	Q(i) = (m^3/s)	(m^3/s)	(m)	(mm)	(%)	(m^3/s)	Full (m/s)	Actual (m/s)
PK1	Stamford Street	MH. FF	MH. XX	1.24	56	1.24	56.42	4.00	0.0010		0.0000		0.0000		0.0000	0.0003	0.0013	139.0	200	0.50	0.0232	0.738	0.428
PK2	2nd Avenue	MH. DDDD	MH. XX	0.14	6	0.14	6.37	4.00	0.0001		0.0000		0.0000		0.0000	0.0000	0.0002	53.8	200	0.50	0.0232	0.738	0.170
PK3	2nd Avenue	MH. WW	MH. XX	0.28	13	0.28	12.74	4.00	0.0002		0.0000		0.0000		0.0000	0.0001	0.0003	46.8	200	0.50	0.0232	0.738	0.170
PK4	Stamford Street	MH. XX	MH. UU	0.84	38	2.50	113.75	4.00	0.0020		0.0000		0.0000		0.0000	0.0007	0.0027	125.2	200	0.50	0.0232	0.738	0.502
PK5	3rd Avenue	MH.UU	MH. VV	0.92	42	3.42	155.61	4.00	0.0027		0.0000		0.0000		0.0000	0.0010	0.0037	163.7	200	0.50	0.0232	0.738	0.539
PK6	McRae Street	MH. AA	MH. VV	0.64	29	0.64	29.12	4.00	0.0005		0.0000		0.0000		0.0000	0.0002	0.0007	88.1	200	1.00	0.0328	1.044	0.345
PK7	McRae Street	MH. VV	MH. TT	0.79	36	4.85	220.68	4.00	0.0039		0.0000		0.0000		0.0000	0.0014	0.0052	88.0	200	1.32	0.0377	1.200	0.840
PK8	Stamford Street	MH. UU	MH. SS	0.57	26	0.57	25.94	4.00	0.0005		0.0000		0.0000		0.0000	0.0002	0.0006	89.2	200	0.50	0.0232	0.738	0.295
PK9	Stuart Street	MH. SS	MH. TT	0.8	36	1.37	62.34	4.00	0.0011		0.0000		0.0000		0.0000	0.0004	0.0015	163.3	200	0.50	0.0232	0.738	0.428
PK10	McRae Street	MH. TT	MH. Z	0.33	15	6.55	298.03	4.00	0.0052		0.0000		0.0000		0.0000	0.0018	0.0071	39.6	200	0.50	0.0232	0.738	0.657
PK11	4th Avenue	MH. Z	MH. DDD	0.81	37	7.36	334.88	4.00	0.0059		0.0000		0.0000	1.22	0.0005	0.0024	0.0088	199.3	200	0.50	0.0232	0.738	0.686
PK12	Jepson Street	MH. FFFF	MH. DDD	1.83	83	1.83	83.27	4.00	0.0015		0.0000		0.0000		0.0000	0.0005	0.0020	220.6	375	0.30	0.0960	0.869	0.287
PK 13	4th Avenue	MH. DDD	MH. ZZ	0.53	24	9.72	442.26	4.00	0.0078		0.0000		0.0000	1.22	0.0005	0.0031	0.0114	12.2	375	0.50	0.1240	1.123	0.707
PK 14	4th Avenue	MH. ZZ	EX. MH. M	0.39	18	10.11	460.01	3.99	0.0081		0.0000		0.0000	1.22	0.0005	0.0032	0.0118	102.0	375	0.50	0.1240	1.123	0.707

Minimum Peak Flow velocity of 0.76 m/s

Date:	June 2, 2020	Project:	Valley Way Environmental Assessment
Designed By:	RDJ		
Checked By:	SJP	File:	619038

SANITARY SEWER DESIGN

Valley Way Environmental Assessment

City of Niagara Falls

PROJECT No: 619038
DATE: June 2, 2020
DESIGNED BY: RDJ
CHECKED BY: SJP

Densities (based on Zoning)

Institutional= 96.40 ppha
Industrial = 153.20 ppha
Commercial - Tourist = 284.20 ppha
Commercial - General = 180.40 ppha

Q(i) = Cumm. Area (ha) * Infiltration Rate / 1000

Infiltration Rate: 0.28 L/s/ha

Peaking Factor (min 2.0, max 4.0): $F = 1 + \frac{14}{4 + \sqrt{P}}$ (P = Population/1,000)

Manning Equation: Full Cap.= (D/2/1000)^2*Pi*(D/4/1000)^0.667*(1/n)*(S/100)^0.5

D = Diameter (mm) S = Slope (%)

n = 0.013 (PVC & Concrete), 0.016 (Vitrified Clay)

Residential

Zone R1-R2 Density (ppha) 45.5

Average Daily Flow= 380 L/cap/day
n = 0.013

Catchment No.	Street	From M.H.	To M.H.	RESIDENTIAL AREA AND POPULATION						INDUSTRIAL FLOW		COMMERCIAL FLOW		INSTITUTIONAL FLOW		Peak Extraneous Flow	Total Flow	Sanitary Sewer					
				Area	Population	Cumulative		Peak Factor	Peak Flow	Cumulative Area	Peak Flow	Cumulative Area	Peak Flow	Cumulative Area	Peak Flow			Distance	Diameter	Slope	Capacity (Full)	Velocity	
				(ha)		Area (ha)	Population		(m^3/s)	(ha)	(m^3/s)	(ha)	(m^3/s)	(ha)	(m^3/s)	Q(i) = (m^3/s)	(m^3/s)	(m)	(mm)	(%)	(m^3/s)	Full (m/s)	Actual (m/s)
P1	2nd Avenue	MH. DD	MH. EE		0	0.00	0.00	4.00	0.0000		0.0000	0.75	0.0015		0.0000	0.0000	0.0015	45.8	200	1.80	0.0440	1.401	0.560
P2	2nd Avenue	MH. EE	MH. AA	0.57	26	0.57	25.94	4.00	0.0005		0.0000	0.75	0.0015		0.0000	0.0002	0.0021	101.9	200	1.80	0.0440	1.401	0.799
P3	Mc Crae Street	MH. CC	MH. AA	1.56	71	1.56	70.98	4.00	0.0012		0.0000		0.0000		0.0000	0.0004	0.0017	178.9	200	0.50	0.0232	0.738	0.428
P4	2nd Avenue	MH. AA	MH. GGG	1.42	65	3.55	161.53	4.00	0.0028		0.0000	0.75	0.0015		0.0000	0.0010	0.0054	198.1	200	1.80	0.0440	1.401	0.953
P5	Jepson Street	MH. DDD	MH. III	0.49	22	0.49	22.30	4.00	0.0004		0.0000		0.0000		0.0000	0.0001	0.0005	106.5	200	0.50	0.0232	0.738	0.244
P6	3rd Avenue	MH. HHH	MH. III	0.72	33	0.72	32.76	4.00	0.0006		0.0000		0.0000		0.0000	0.0002	0.0008	133.0	200	2.00	0.0464	1.477	0.487
P7	Jepson Street	MH. III	MH. GGG	0.86	39	2.07	94.19	4.00	0.0017		0.0000		0.0000		0.0000	0.0006	0.0022	107.2	200	0.50	0.0232	0.738	0.472
P8	Jepson Street	MH. FFF	MH. GGG	1.63	74	1.63	74.17	4.00	0.0013		0.0000		0.0000		0.0000	0.0005	0.0018	168.3	200	0.50	0.0232	0.738	0.450
P9	2nd Avenue	MH. GGG	MH. AAA	0.32	15	7.57	344.44	4.00	0.0061		0.0000	0.75	0.0015		0.0000	0.0021	0.0097	102.1	200	0.50	0.0232	0.738	0.701
P10	Armoury Street	MH. ZZ	MH. CCC	0.92	42	0.92	41.86	4.00	0.0007		0.0000		0.0000		0.0000	0.0003	0.0010	108.7	200	1.00	0.0328	1.044	0.418
P11	3rd Avenue	MH. BBB	MH. CCC	0.22	10	0.22	10.01	4.00	0.0002		0.0000		0.0000		0.0000	0.0001	0.0002	5.0	200	0.50	0.0232	0.738	0.170
P12	Armoury Street	MH. CCC	MH. AAA	0.74	34	1.88	85.54	4.00	0.0015		0.0000		0.0000		0.0000	0.0005	0.0020	103.9	200	0.50	0.0232	0.738	0.465
P13	Armoury Street	MH. JJJ	MH. AAA	1.29	59	1.29	58.70	4.00	0.0010		0.0000		0.0000		0.0000	0.0004	0.0014	171.3	200	0.50	0.0232	0.738	0.428
P14	2nd Avenue	MH. AAA	EX. TRUNK	0.45	20	11.19	509.15	3.97	0.0089		0.0000	0.75	0.0015		0.0000	0.0031	0.0136	102.2	200	0.50	0.0232	0.738	0.768

Minimum Peak Flow velocity of 0.76 m/s

Date:	June 2, 2020	Project:	Valley Way Environmental Assessment
Designed By:	RDJ		
Checked By:	SJP	File:	619038

SANITARY SEWER DESIGN

Valley Way Environmental Assessment

City of Niagara Falls

PROJECT No: 619038
DATE: June 2, 2020
DESIGNED BY: RDJ
CHECKED BY: SJP

Densities (based on Zoning)		
Institutional=	96.40	ppha
Industrial =	153.20	ppha
Commercial - Tourist =	284.20	ppha
Commercial - General =	180.40	ppha

Q(i) = Cumm. Area (ha) * Infiltration Rate / 1000

Infiltration Rate: 0.28 L/s/ha

Peaking Factor (min 2.0, max 4.0): $F = 1 + \frac{14}{4 + \sqrt{P}}$ (P = Population/1,000)

Manning Equation: Full Cap.= (D/2/1000)^2*Pi*(D/4/1000)^0.667*(1/n)*(S/100)^0.5

D = Diameter (mm) S = Slope (%)

n = 0.013 (PVC & Concrete), 0.016 (Vitrified Clay)

Residential

Zone R1-R2 Density (ppha) 45.5

Average Daily Flow= 380 L/cap/day

n = 0.013

Catchment No.	Street	From M.H.	To M.H.	RESIDENTIAL AREA AND POPULATION: Area (ha)	Population	Cumulative Area (ha)	Cumulative Population	Peak Factor	Peak Flow (m^3/s)	INDUSTRIAL FLOW: Cumulative Area (ha)	Peak Flow (m^3/s)	COMMERCIAL FLOW: Cumulative Area (ha)	Peak Flow (m^3/s)	INSTITUTIONAL FLOW: Cumulative Area (ha)	Peak Flow (m^3/s)	Peak Extraneous Flow Q(i) = (m^3/s)	Total Flow (m^3/s)	Sanitary Sewer: Distance (m)	Diameter (mm)	Slope (%)	Capacity (Full) (m^3/s)	Velocity Full (m/s)	Velocity Actual (m/s)
G1	6th Avenue	MH. NNN	MH. MMM	1.02	46	1.02	46.41	4.00	0.0008		0.0000		0.0000		0.0000	0.0003	0.0011	157.8	200	0.78	0.0290	0.923	0.035
G2	Morrison Street	MH. NNN	MH. PPP	0.57	26	1.59	72.35	4.00	0.0013		0.0000		0.0000		0.0000	0.0004	0.0017	92.4	200	0.72	0.0278	0.885	0.055
G3	5th Avenue	MH. OOO	MH. PPP	0.75	34	2.34	106.47	4.00	0.0019		0.0000		0.0000		0.0000	0.0007	0.0025	158.1	200	0.50	0.0232	0.738	0.080
G4	Morrison Street	MH. PPP	MH. RRR	0.42	19	2.76	125.58	4.00	0.0022		0.0000		0.0000		0.0000	0.0008	0.0030	90.5	200	0.50	0.0232	0.738	0.095
G5	4th Avenue	MH. QQQ	MH. RRR	1.07	49	3.83	174.27	4.00	0.0031		0.0000		0.0000		0.0000	0.0011	0.0041	158.2	200	0.50	0.0232	0.738	0.132
G6	Morrison Street	MH. RRR	EX. MH, K	2.07	94	5.90	268.45	4.00	0.0047		0.0000		0.0000		0.0000	0.0017	0.0064	374.7	200	0.50	0.0232	0.738	0.203

Minimum Peak Flow velocity of 0.76 m/s

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Commercial - Tourist =	284.20	ppha
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Q(i) = Cumm. Area (ha) * Infiltration Rate / 1000

Infiltration Rate: 0.28 L/s/ha

Peaking Factor (min 2.0, max 4.0): $F = 1 + \dfrac{14}{4 + \sqrt{P}}$ (P = Population/1,000)

Manning Equation: Full Cap.= (D/2/1000)^2*Pi*(D/4/1000)^0.667*(1/n)*(S/100)^0.5

D = Diameter (mm) S = Slope (%)

n = 0.013 (PVC & Concrete), 0.016 (Vitrified Clay)

Residential

Zone R1-R2 Density (ppha) 45.5

Average Daily Flow= 380 L/cap/day

n = 0.013

Catchment No.	Street	From M.H.	To M.H.	RESIDENTIAL AREA AND POPULATION						INDUSTRIAL FLOW		COMMERCIAL FLOW		INSTITUTIONAL FLOW		Peak Extraneous Flow	Total Flow	Sanitary Sewer					
				Area	Population	Cumulative		Peak Factor	Peak Flow	Cumulative Area	Peak Flow	Cumulative Area	Peak Flow	Cumulative Area	Peak Flow			Distance	Diameter	Slope	Capacity (Full)	Velocity	
				(ha)		Area (ha)	Population		(m^3/s)	(ha)	(m^3/s)	(ha)	(m^3/s)	(ha)	(m^3/s)	Q(i) = (m^3/s)	(m^3/s)	(m)	(mm)	(%)	(m^3/s)	Full (m/s)	Actual (m/s)
Y1	Wilmott Street	MH. NNN	MH. OOO	0.67	30	0.67	30.49	4.00	0.0005		0.0000		0.0000		0.0000	0.0002	0.0007	89.9	150	1.29	0.0173	0.979	0.041
Y2	Wilmott Street	MH. OOO	MH. QQQ	0.65	30	1.32	60.06	4.00	0.0011		0.0000		0.0000		0.0000	0.0004	0.0014	91.0	150	1.58	0.0191	1.081	0.081
Y3	Wilmott Street	MH. QQQ	MH. TTT	0.82	37	2.14	97.37	4.00	0.0017		0.0000		0.0000		0.0000	0.0006	0.0023	109.5	200	0.50	0.0232	0.738	0.074
Y4	3rd Avenue	MH. SSS	MH. TTT	0.79	36	0.79	35.95	4.00	0.0006		0.0000		0.0000		0.0000	0.0002	0.0009	111.8	200	0.50	0.0232	0.738	0.027
Y5	Wilmott Street	MH. TTT	MH. VVV	0.79	36	3.72	169.26	4.00	0.0030		0.0000		0.0000		0.0000	0.0010	0.0040	107.9	200	0.50	0.0232	0.738	0.128
Y6	2nd Avenue	MH. UUU	MH. VVV	0.89	40	4.61	209.76	4.00	0.0037		0.0000		0.0000		0.0000	0.0013	0.0050	124.5	200	0.50	0.0232	0.738	0.158
Y7	2nd Avenue	MH. WWW	MH. VVV	0.18	8	4.79	217.95	4.00	0.0038		0.0000		0.0000		0.0000	0.0013	0.0052	55.7	200	0.50	0.0232	0.738	0.165
Y8	Wilmott Street	MH. VVV	EX. MH. J	0.29	13	5.08	231.14	4.00	0.0041		0.0000		0.0000		0.0000	0.0014	0.0055	63.9	200	0.50	0.0232	0.738	0.175

Minimum Peak Flow velocity of 0.76 m/s

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Infiltration Rate: 0.28 L/s/ha

Peaking Factor (min 2.0, max 4.0): $F = 1 + \frac{14}{4 + \sqrt{P}}$ (P = Population/1,000)

Manning Equation: Full Cap.= (D/2/1000)^2*Pi*(D/4/1000)^0.667*(1/n)*(S/100)^0.5

D = Diameter (mm) S = Slope (%)

n = 0.013 (PVC & Concrete), 0.016 (Vitrified Clay)

Average Daily Flow= 380 L/cap/day
n = 0.013

Catchment No.	Street	From M.H.	To M.H.	RESIDENTIAL AREA AND POPULATION						INDUSTRIAL FLOW		COMMERCIAL FLOW		INSTITUTIONAL FLOW		Peak Extraneous Flow	Total Flow	Sanitary Sewer					
				Area	Population	Cumulative		Peak Factor	Peak Flow	Cumulative Area	Peak Flow	Cumulative Area	Peak Flow	Cumulative Area	Peak Flow			Distance	Diameter	Slope	Capacity (Full)	Velocity	
				(ha)		Area (ha)	Population		(m^3/s)	(ha)	(m^3/s)	(ha)	(m^3/s)	(ha)	(m^3/s)	Q(i) = (m^3/s)	(m^3/s)	(m)	(mm)	(%)	(m^3/s)	Full (m/s)	Actual (m/s)
B1	Homestead Drive	MH.XXX	MH. YYY	0.88	40	0.88	40.04	4.00	0.0007		0.0000		0.0000	1.10	0.0005	0.0006	0.0017	154.7	200	1.00	0.0328	1.044	0.055
B2	Valley Way	MH. YYY	MH. ZZZ	0.57	26	1.45	65.98	4.00	0.0012		0.0000		0.0000	1.10	0.0005	0.0007	0.0023	58.6	200	0.50	0.0232	0.738	0.074
B4	Valley Way	MH. BBBB	MH. AAAA	0.28	13	0.28	12.74	4.00	0.0002		0.0000		0.0000		0.0000	0.0001	0.0003	152.3	200	0.50	0.0232	0.738	0.010
B3	Valley Way	MH. AAAA	MH. ZZZ	1.58	72	1.86	84.63	4.00	0.0015		0.0000		0.0000	1.10	0.0005	0.0008	0.0028	152.3	200	0.50	0.0232	0.738	0.089
	Jepson Street	MH. ZZZ	EX. MH. D		0	3.31	150.61	4.00	0.0026		0.0000		0.0000	1.10	0.0005	0.0012	0.0044	76.9	200	0.50	0.0232	0.738	0.138
TQ1	Houck Drive	MH. AAAA	MH. CCCC	0.33	15	0.33	15.02	4.00	0.0003		0.0000		0.0000		0.0000	0.0001	0.0004	56.6	200	0.50	0.0232	0.738	0.011
TQ2	Houck Drive	MH. CCCC	EX. MH. B	0.33	15	0.66	30.03	4.00	0.0005		0.0000		0.0000		0.0000	0.0002	0.0007	23.1	200	0.50	0.0232	0.738	0.023

Minimum Peak Flow velocity of 0.76 m/s

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SANITARY SEWER DESIGN

Valley Way Environmental Assessment

City of Niagara Falls

PROJECT No: 617062
DATE: June 2, 2020
DESIGNED BY: RDJ
CHECKED BY: SJP

Densities (based on Zoning)

Institutional= 96.40 ppha
Industrial = 153.20 ppha
Commercial - Tourist = 284.20 ppha
Commercial - General = 180.40 ppha

Residential

Zone R1-R2 Density (ppha) 45.5

Q(i) = Cumm. Area (ha) * Infiltration Rate / 1000

Infiltration Rate: 0.28 L/s/ha

Peaking Factor (min 2.0, max 4.0): $F = 1 + \frac{14}{4 + \sqrt{P}}$ (P = Population/1,000)

Manning Equation: Full Cap.= (D/2/1000)^2*Pi*(D/4/1000)^0.667*(1/n)*(S/100)^0.5

D = Diameter (mm) S = Slope (%)

n = 0.013 (PVC & Concrete), 0.016 (Vitrified Clay)

Average Daily Flow= 380 L/cap/day
n = 0.013

Catchment No.	Street	From M.H.	To M.H.	RESIDENTIAL AREA AND POPULATION						INDUSTRIAL FLOW		COMMERCIAL FLOW		INSTITUTIONAL FLOW		Peak Extraneous Flow	Total Flow	Sanitary Sewer					
				Area	Population	Cumulative		Peak Factor	Peak Flow	Cumulative Area	Peak Flow	Cumulative Area	Peak Flow	Cumulative Area	Peak Flow			Distance	Diameter	Slope	Capacity (Full)	Velocity	
				(ha)		Area (ha)	Population		(m^3/s)	(ha)	(m^3/s)	(ha)	(m^3/s)	(ha)	(m^3/s)	Q(i) = (m^3/s)	(m^3/s)	(m)	(mm)	(%)	(m^3/s)	Full (m/s)	Actual (m/s)
O1	Houck Drive	MH. P	EX. MH. B	0.96	44	0.96	43.68	4.00	0.0008		0.0000		0.0000		0.0000	0.0003	0.0010	134.6	200	0.50	0.0232	0.738	0.362
O2	6th Avenue	MH. BB	EX. MH. G	0.5	23	0.50	22.75	4.00	0.0004		0.0000		0.0000		0.0000	0.0001	0.0005	116.4	200	0.50	0.0232	0.738	0.244
O3	5th Avenue	MH. EEE	EX. MH. H	1.07	49	1.07	48.69	4.00	0.0009		0.0000		0.0000		0.0000	0.0003	0.0012	150.4	200	2.00	0.0464	1.477	0.487
O4	6th Avenue	MH. NNN	EX. MH. G	0.67	30	0.67	30.49	4.00	0.0005		0.0000	1.15	0.0023		0.0000	0.0002	0.0031	128.0	200	2.31	0.0498	1.585	0.919
O5	5th Avenue	MH. OOO	EX. MH. H	0.27	12	0.27	12.29	4.00	0.0002		0.0000		0.0000		0.0000	0.0001	0.0003	100.8	200	2.33	0.0501	1.595	0.367
O6	Simcoe Street	MH. KKK	EX. MH. I	1.54	70	1.54	70.07	4.00	0.0012		0.0000		0.0000		0.0000	0.0004	0.0017	168.7	200	0.50	0.0232	0.738	0.428
O7	Wilmott Street	MH. LLL	EX. MH. J	0.76	35	2.30	104.65	4.00	0.0018		0.0000		0.0000		0.0000	0.0006	0.0025	113.1	200	1.20	0.0359	1.143	0.263

Minimum Peak Flow velocity of 0.76 m/s

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Chicago Storm Parameters

A = 2667

B = 20

C = 1

Intensity = $A / (t + B)^C$

$Q = CiA$ (m^3/s)

STORM SEWER DESIGN

5 Year Design

Valley Way

City of Niagara Falls

File Number: 617062

Location				Area (ha)	Runoff Coefficient	A x C	Cumulative A x C	Time of Conc. (min.)	Intensity (mm/hr)	Flow (m^3/s)	Proposed Sewer						
Drainage Area	Street	From	To								Length (m)	Pipe Size (mm)	Type of Pipe	Grade %	Capacity (m^3/s)	Full Flow Velocity (m/s)	Time of Flow (min.)
1000	2nd Avenue	MH. 41	MH. 42	0.09	0.60	0.05	0.05	10.00	88.90	0.013	45.8	300	0.013	0.50	0.071	1.01	0.76
1001	Discharge to McC	MH. 42	EX	0.39	0.60	0.23	0.29	10.76	86.71	0.069	105.0	375	0.013	0.50	0.129	1.17	1.50
123	2nd Avenue	MH. 43	MH. 25	0.94	0.40	0.38	0.38	10.00	88.90	0.093	161.9	375	0.013	0.50	0.129	1.17	2.31
122	Jepson Street	MH. 24	MH. 25	1.52	0.40	0.61	0.61	10.00	88.90	0.150	203.4	525	0.013	0.30	0.245	1.13	3.00
121	Jepson Street	MH. 25	MH. 26	0.58	0.40	0.23	1.22	13.00	80.82	0.273	109.5	600	0.013	0.30	0.349	1.24	1.48
120	3rd Avenue (Salvation Army)	MH. 40	MH. 26	0.92	0.60	0.55	0.55	10.00	88.90	0.136	133.4	375	0.013	2.00	0.258	2.33	0.95
119	Jepson Street	MH. 26	MH. 27	0.35	0.40	0.14	1.91	10.95	86.16	0.457	110.1	750	0.013	0.30	0.634	1.43	1.28
118	4th Avenue (Salvation Army)	MH. 39	MH. 27	0.87	0.60	0.52	0.52	10.00	88.90	0.129	146.1	375	0.013	2.00	0.258	2.33	1.04

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Intensity = A / (t + B)^C

Q = CiA (m^3/s)

STORM SEWER DESIGN

5 Year Design

Valley Way

City of Niagara Falls

File Number: 617062

Location				Area (ha)	Runoff Coefficient	A x C	Cumulative A x C	Time of Conc. (min.)	Intensity (mm/hr)	Flow (m^3/s)	Proposed Sewer						
Drainage Area	Street	From	To								Length (m)	Pipe Size (mm)	Type of Pipe	Grade %	Capacity (m^3/s)	Full Flow Velocity (m/s)	Time of Flow (min.)
117	Jepson Street	MH. 27	MH. 28	0.50	0.40	0.20	2.63	12.23	82.74	0.604	91.0	825	0.013	0.30	0.817	1.53	0.99
116	Jepson Street	MH. 28	MH. 29	0.58	0.40	0.23	2.86	13.22	80.27	0.638	92.3	825	0.013	0.30	0.817	1.53	1.01
115	Jepson Street	MH. 29	MH. 30	0.76	0.40	0.30	3.17	14.23	77.91	0.685	130.4	900	0.013	0.30	1.030	1.62	1.34
114	Rosedale Drive	MH. 44	MH. 45	1.60	0.40	0.64	0.64	10.00	88.90	0.158	264.2	450	0.013	1.00	0.296	1.86	2.36
113	Slater Avenue	MH. 45	MH. 30	0.21	0.40	0.08	0.72	12.36	82.41	0.166	73.0	450	0.013	0.50	0.209	1.32	0.92
112	Jepson Street	MH. 30	MH. 31	0.21	0.40	0.08	3.97	15.57	74.97	0.828	43.9	975	0.013	0.30	1.275	1.71	0.43
111	Twidale Avenue	MH. 37	MH. 31	0.50	0.40	0.20	0.20	10.00	88.90	0.049	138.6	375	0.013	0.30	0.100	0.90	2.56
110	Jepson Street	MH. 31	MH. 32	0.14	0.40	0.06	4.23	16.00	74.08	0.870	75.9	975	0.013	0.30	1.275	1.71	0.74
109	Homewood Drive	MH. 51	MH. 52	1.37	0.40	0.55	0.55	10.00	88.90	0.135	139.0	450	0.013	0.50	0.209	1.32	1.76
108	Valley Way	MH. 52	MH. 32	0.32	0.40	0.13	0.68	11.76	83.98	0.158	58.0	450	0.013	0.50	0.209	1.32	0.73

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STORM SEWER DESIGN

5 Year Design

Valley Way

City of Niagara Falls

File Number: 617062

Location				Area (ha)	Runoff Coefficient	A x C	Cumulative A x C	Time of Conc. (min.)	Intensity (mm/hr)	Flow (m^3/s)	Proposed Sewer						
Drainage Area	Street	From	To								Length (m)	Pipe Size (mm)	Type of Pipe	Grade %	Capacity (m^3/s)	Full Flow Velocity (m/s)	Time of Flow (min.)
103	Valley Way	MH. 32	MH. 33	1.01	0.40	0.40	5.31	16.74	72.59	1.071	152.6	1050	0.013	0.30	1.554	1.79	1.42
107	Slater Avenue	MH. 35	MH. 36	0.23	0.40	0.09	0.09	10.00	88.90	0.023	74.9	300	0.013	0.30	0.055	0.78	1.60
106	Houck Drive	MH. 36	MH. 37	0.52	0.40	0.21	0.30	11.60	84.39	0.070	123.7	375	0.013	0.30	0.100	0.90	2.28
105	Houck Drive	MH. 37	MH. 38	0.27	0.40	0.11	0.41	13.89	78.71	0.089	55.7	450	0.013	0.30	0.162	1.02	0.91
104	Houck Drive	MH. 38	MH. 33	0.26	0.40	0.10	0.51	14.79	76.65	0.109	53.6	525	0.013	0.30	0.245	1.13	0.79
102	Discharge to Stanley Ave	MH. 33	MH 34	0.47	0.40	0.19	6.01	18.16	69.89	1.167	65.5	1050	0.013	0.30	1.554	1.79	0.61
		MH 34	EX. MH. 46			0.00	6.01	18.77	68.80	1.148	207.8	1350	0.013	0.08	1.569	1.10	3.16
226	Valley Way Pool	MH. 1	MH. 14	1.67	0.40	0.67	0.67	10.00	88.90	0.165	123.0	450	0.013	0.50	0.209	1.32	1.56
225	6th Avenue	MH. 13	MH. 14	0.49	0.40	0.20	0.86	11.56	84.52	0.203	45.7	525	0.013	0.50	0.316	1.46	0.52
224	Valley Way	MH. 14	MH. 2	0.39	0.40	0.16	1.69	12.08	83.14	0.390	96.2	675	0.013	0.50	0.618	1.73	0.93

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5 Year Design

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Drainage Area	Street	From	To								Length (m)	Pipe Size (mm)	Type of Pipe	Grade %	Capacity (m^3/s)	Full Flow Velocity (m/s)	Time of Flow (min.)
223	5th Avenue	MH. 47	MH. 2	0.66	0.40	0.26	0.26	10.00	88.90	0.065	166.5	300	0.013	2.00	0.142	2.01	1.38
222	5th Avenue	MH. 12	MH. 2	0.25	0.40	0.10	0.10	10.00	88.90	0.025	88.7	300	0.013	2.00	0.142	2.01	0.74
221	Valley Way	MH. 2	MH. 49	0.47	0.40	0.19	2.24	11.38	84.99	0.529	88.1	750	0.013	0.50	0.818	1.85	0.79
218	4th Avenue	MH. 48	MH. 16	0.27	0.40	0.11	0.11	10.00	88.90	0.027	68.0	300	0.013	0.50	0.071	1.01	1.13
220	4th Avenue	MH. 16	MH. 49	0.31	0.40	0.12	0.23	11.13	85.68	0.055	103.3	375	0.013	0.50	0.129	1.17	1.48
219	Valley Way	MH. 49	MH. 3	1.26	0.40	0.50	2.98	12.60	81.80	0.676	221.5	900	0.013	0.50	1.330	2.09	1.77
217	Armoury Street	MH. 16	MH. 20	0.53	0.40	0.21	0.21	10.00	88.90	0.052	110.1	300	0.013	0.50	0.071	1.01	1.83
216	Armoury Street	MH. 19	MH. 20	0.14	0.40	0.06	0.06	11.83	83.80	0.013	63.6	300	0.013	2.00	0.142	2.01	0.53
215	Armoury Street	MH. 20	MH. 17	0.47	0.40	0.19	0.46	12.35	82.43	0.104	109.1	375	0.013	0.50	0.129	1.17	1.56

Chicago Storm Parameters

A = 2667

B = 20

C = 1

Intensity = A / (t + B)^C

Q = CiA (m^3/s)

STORM SEWER DESIGN

5 Year Design

Valley Way

City of Niagara Falls

File Number: 617062

Location				Area (ha)	Runoff Coefficient	A x C	Cumulative A x C	Time of Conc. (min.)	Intensity (mm/hr)	Flow (m^3/s)	Proposed Sewer						
Drainage Area	Street	From	To								Length (m)	Pipe Size (mm)	Type of Pipe	Grade %	Capacity (m^3/s)	Full Flow Velocity (m/s)	Time of Flow (min.)
214	2nd Avenue	MH. 21	MH. 17	0.17	0.40	0.07	0.07	10.00	88.90	0.017	61.8	300	0.013	2.00	0.142	2.01	0.51
213	Armoury Street	MH. 18	MH. 17	1.28	0.40	0.51	0.51	10.00	88.90	0.126	165.0	375	0.013	2.00	0.258	2.33	1.18
212	2nd Avenue	MH. 17	MH. 3	0.24	0.40	0.10	1.13	13.91	78.65	0.247	102.0	525	0.013	1.00	0.447	2.06	0.82
211	2nd Avenue	MH. 15	MH. 3	0.18	0.40	0.07	0.07	10.00	88.90	0.018	66.3	300	0.013	0.50	0.071	1.01	1.10
210	Simcoe Street	MH. 23	MH. 3	1.40	0.40	0.56	0.56	10.00	88.90	0.138	117.3	375	0.013	2.00	0.258	2.33	0.84
209	Valley Way	MH. 3	MH. 4	0.20	0.40	0.08	4.82	14.74	76.78	1.028	115.6	900	0.013	0.50	1.330	2.09	0.92
208	Willmott Street	MH. 7	MH. 8	0.39	0.40	0.16	0.16	10.00	88.90	0.039	91.1	300	0.013	0.50	0.071	1.01	1.51
207	Willmott Street	MH. 8	MH. 9	0.44	0.40	0.18	0.33	11.51	84.64	0.078	90.5	375	0.013	0.50	0.129	1.17	1.29
206	Willmott Street	MH. 9	MH. 10	0.56	0.40	0.22	0.56	12.80	81.30	0.126	111.6	450	0.013	0.50	0.209	1.32	1.41
205	Willmott Street	MH. 10	MH. 11	0.46	0.40	0.18	0.74	14.22	77.95	0.160	108.3	450	0.013	0.50	0.209	1.32	1.37

Chicago Storm Parameters

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$Q = CiA$ (m^3/s)

STORM SEWER DESIGN

5 Year Design

Valley Way

City of Niagara Falls

File Number: 617062

Location				Area (ha)	Runoff Coefficient	A x C	Cumulative A x C	Time of Conc. (min.)	Intensity (mm/hr)	Flow (m^3/s)	Proposed Sewer						
Drainage Area	Street	From	To								Length (m)	Pipe Size (mm)	Type of Pipe	Grade %	Capacity (m^3/s)	Full Flow Velocity (m/s)	Time of Flow (min.)
204	2nd Avenue	EX. MH. 53	MH. 11	0.26	0.40	0.10	0.10	10.00	88.90	0.026	123.3	300	0.013	0.50	0.071	1.01	2.04
203	Willmott Street	MH. 11	MH. 4	0.17	0.40	0.07	0.91	15.59	74.95	0.190	62.5	525	0.013	0.50	0.316	1.46	0.71
202	Willmott Street	MH. 22	MH. 4	0.74	0.40	0.30	0.30	10.00	88.90	0.073	113.1	375	0.013	0.50	0.129	1.17	1.62
201	Valley Way	MH. 4	MH. 5	1.48	0.40	0.59	6.62	15.66	74.80	1.375	181.2	975	0.013	0.50	1.647	2.21	1.37
200	Valley Way at Morrison Street	MH. 5	MH. 6	0.57	0.40	0.23	6.85	17.03	72.03	1.370	121.6	975	0.013	0.50	1.647	2.21	0.92
308	6th Avenue	MH. 7	EX	0.61	0.40	0.24	0.24	10.00	88.90	0.060	152.0	375	0.013	0.50	0.129	1.17	2.17
306	5th Avenue	MH. 8	EX	0.51	0.40	0.20	0.20	10.00	88.90	0.050	152.9	375	0.013	0.50	0.129	1.17	2.18
302	3th Avenue	MH. 10	EX	0.65	0.40	0.26	0.26	10.00	88.90	0.064	153.5	375	0.013	0.50	0.129	1.17	2.19

Date: June 2, 2020

Project: Valley Way

Chicago Storm Parameters

A = 2667

B = 20

C = 1

Intensity = $A / (t + B)^C$

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STORM SEWER DESIGN

5 Year Design

Valley Way

City of Niagara Falls

File Number: 617062

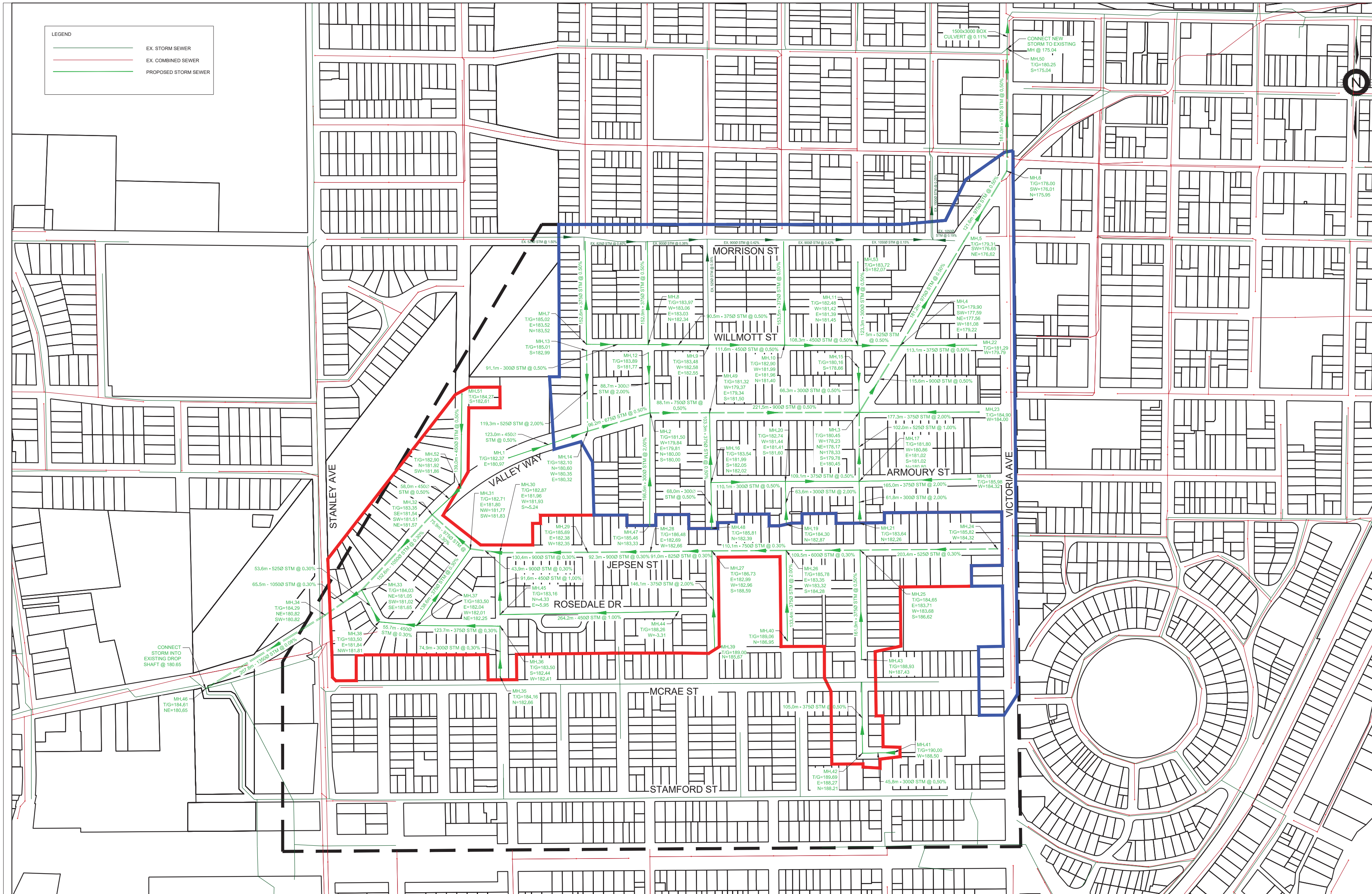
Location				Area (ha)	Runoff Coefficient	A x C	Cumulative A x C	Time of Conc. (min.)	Intensity (mm/hr)	Flow (m^3/s)	Proposed Sewer						
Drainage Area	Street	From	To								Length (m)	Pipe Size (mm)	Type of Pipe	Grade %	Capacity (m^3/s)	Full Flow Velocity (m/s)	Time of Flow (min.)

Minimum acceptable velocity = 0.75 m/s

Designed By: RDJ

Checked By:

File: 617062



0	ISSUED FOR	YYYY-MM-DD	XXX
NO.	REVISION	DATE	INIT.

NOTES/LEGEND

1 THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWER AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

2 PROPERTY LINES WERE PLOTTED USING REGISTERED PLANS AND BARS LOCATED IN THE FIELD. TO VERIFY THE ACCURACY OF THESE PROPERTY LINES, A LEGAL SURVEY SHOULD BE PERFORMED PRIOR TO CONSTRUCTION.

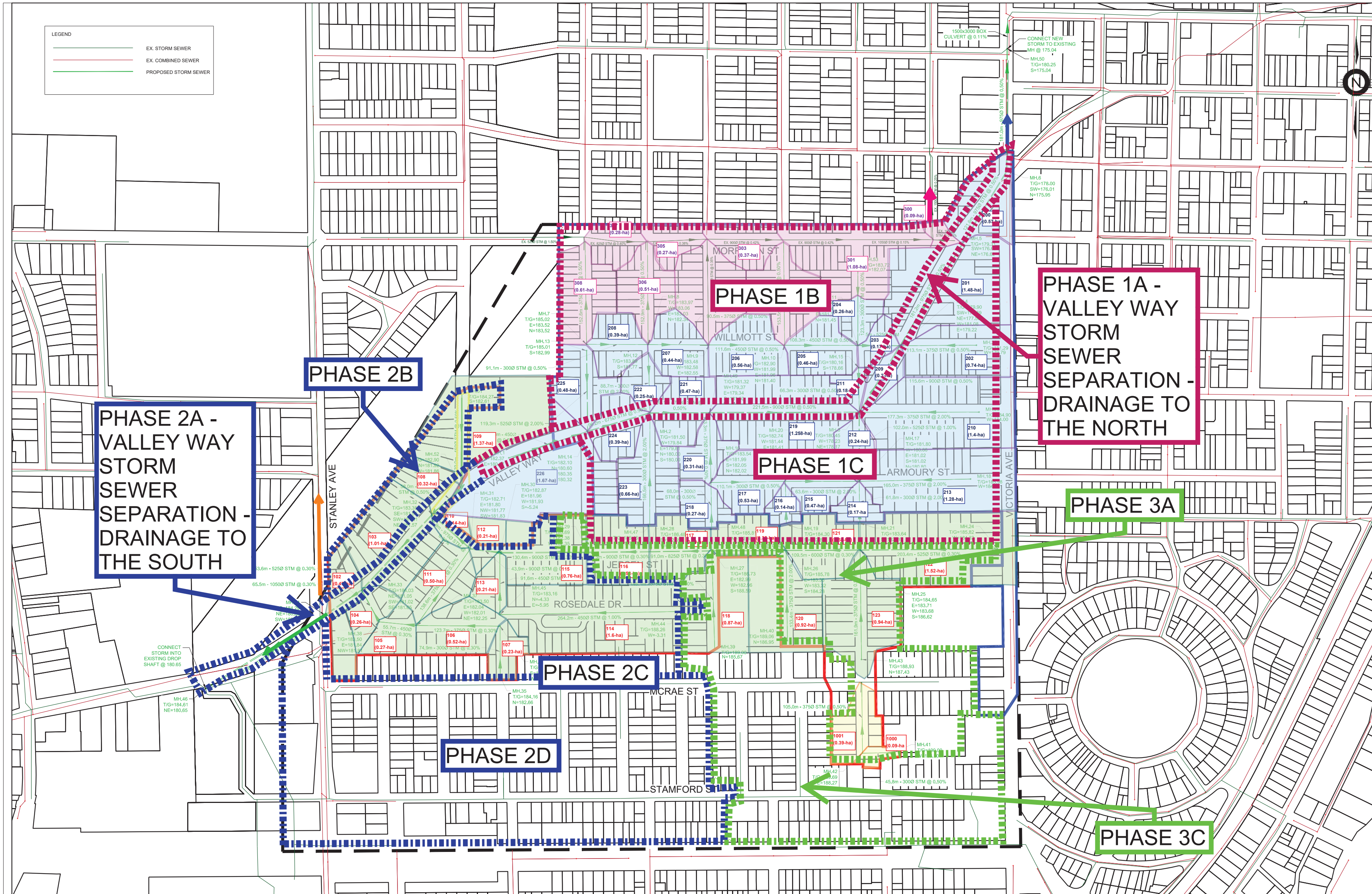
DRAFTING DJI
DESIGN DJI
CHECKED BY SJP
APPROVED BY SJP

Niagara Region PUBLIC WORKS

PROJECT / CONTRACT #
STORM PLAN
VALLEY WAY
FROM STANLEY AVE TO VICTORIA STREET
CITY OF NIAGARA FALLS

CONSULTANT FILE No. 617062
DATE 2020-04-15
SCALE Hor : 1:2000 m
Ver :
REF. No. #
DWG No. 2
REV. 0

DRAWING FILE: W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\5 Work in Progress\Drafting\617062-DESIGN.dwg PLOTTED: Jun 02, 2020 - 2:19pm PLOTTED BY: dilles



0	ISSUED FOR	YYYY-MM-DD	XXX
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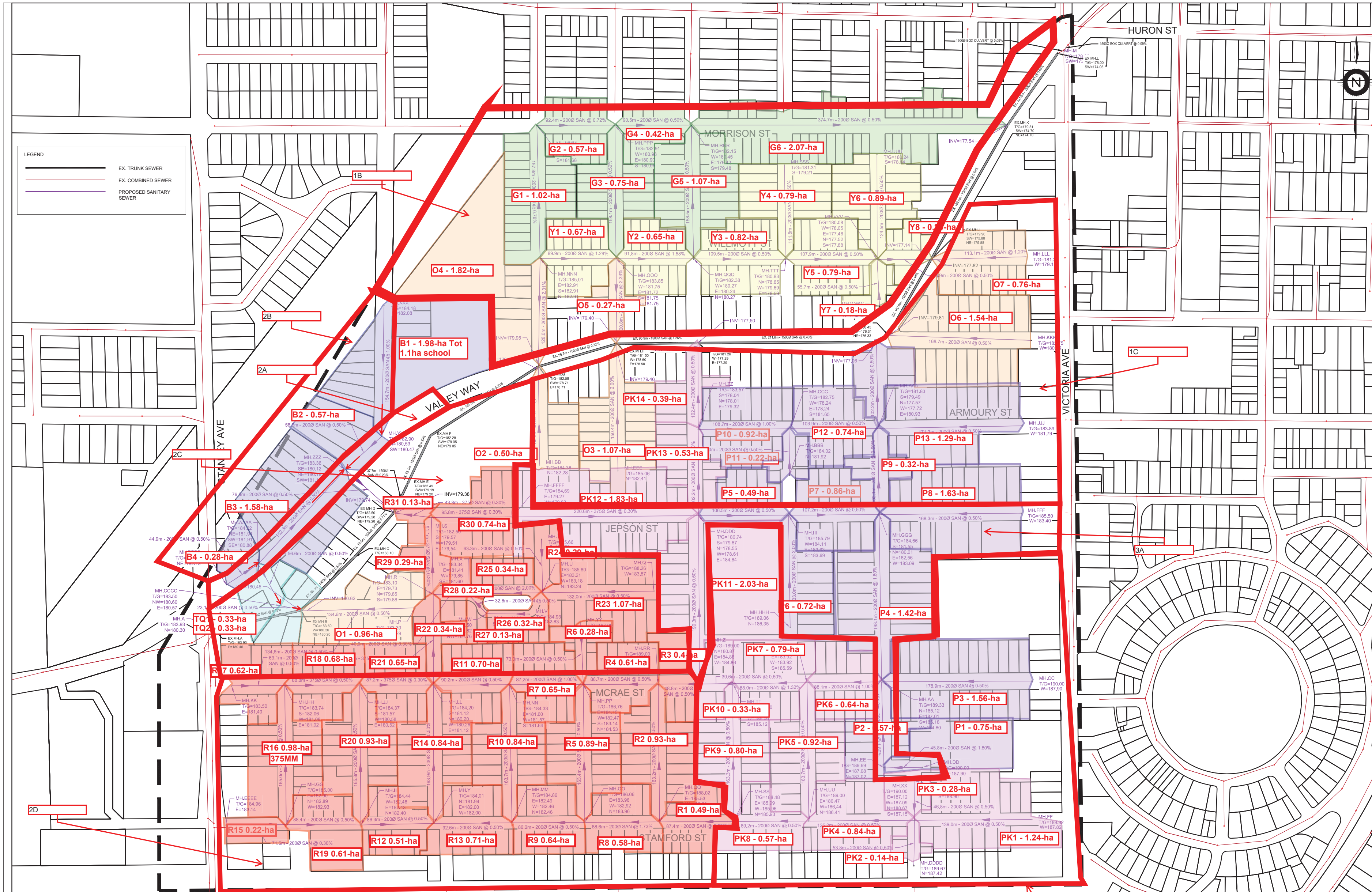
DRAFTING	DJI
DESIGN	DJI
CHECKED BY	SJP
APPROVED BY	SJP

Niagara Region
PUBLIC WORKS

PROJECT / CONTRACT #
STORM PLAN
VALLEY WAY
FROM STANLEY AVE TO VICTORIA STREET
CITY OF NIAGARA FALLS

CONSULTANT FILE No. 617062		
DATE	2020-04-15	
SCALE	Hor : 1:2000 m Ver :	
REF. No.	#	
DWG No.	2	REV. 0

DRAWING FILE: W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\5 Work in Progress\Drafting\617062-DESIGN.dwg PLOTTED: Jun 02, 2020 - 2:19pm PLOTTED BY: dilles



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NO.	REVISION	DATE	INIT.
0	ISSUED FOR	YYYY-MM-DD	XXX

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DESIGN DJI
CHECKED BY SJP
APPROVED BY SJP

Niagara Region PUBLIC WORKS

PROJECT / CONTRACT #
SANITARY PLAN
VALLEY WAY
FROM STANLEY AVE TO VICTORIA STREET
CITY OF NIAGARA FALLS

CONSULTANT FILE No. 617062
DATE 2020-04-15
SCALE Hor : 1:2000 m
Ver :
REF. No. #
DWG No. 1
REV. 0

DRAWING FILE: W:\Hamilton\617000\617062 Niagara Falls Valley Way Drainage EA\5 Work in Progress\Drafting\617062-DESIGN.dwg PLOTTED: Jun 02, 2020 - 4:31pm PLOTTED BY: dilles