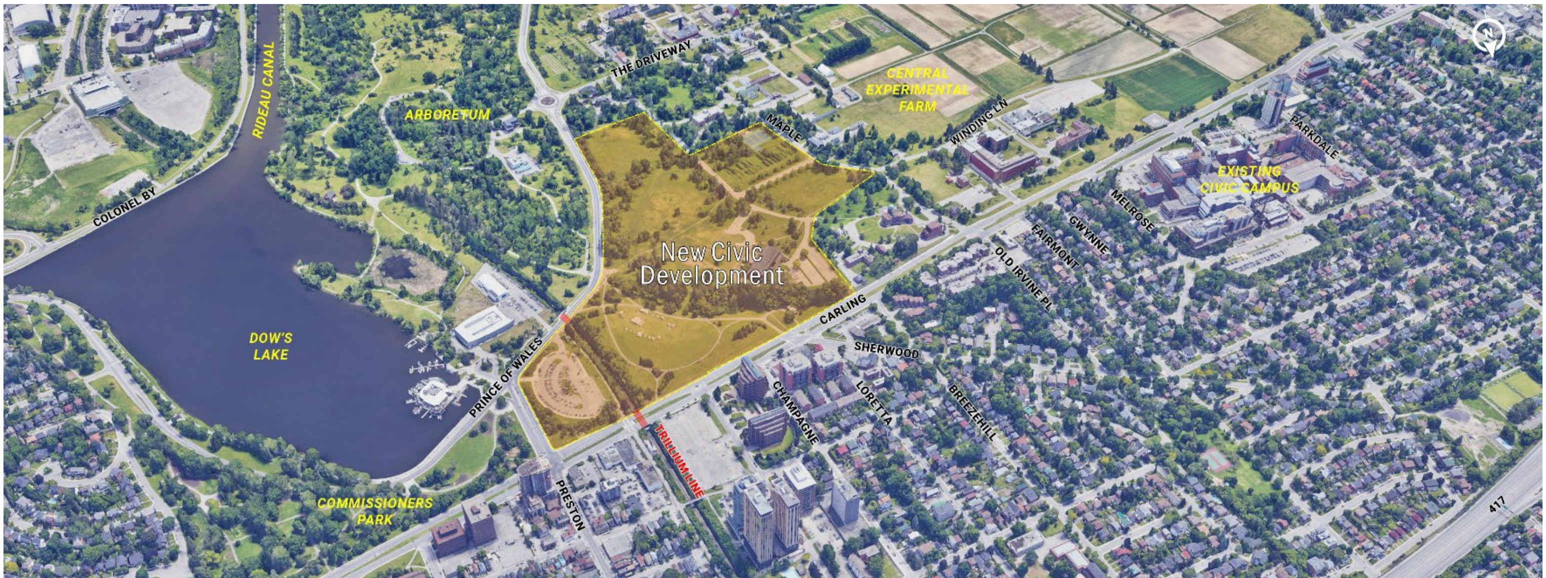


Site Servicing and Stormwater Management Report
New Campus Development for The Ottawa Hospital
Phase 3: Central Utility Plant Project
Phase 4: Main Hospital Project
Ottawa, Ontario
November 2023 (Issued for SPA & FLUDA Approval)

Prepared For:

The Ottawa Hospital

Submitted To:

City of Ottawa

Parson's Project # 477458

PARSONS

TABLE OF CONTENTS

List of Tables

List of Figures

Appendices

1.0 INTRODUCTION

The Ottawa Hospital has retained Parsons Incorporated to prepare a Site Servicing and Stormwater Management Report in support of a site plan application for the Central Utility Plant (Phase 3) and Hospital Building (Phase 4).

In June 2017, a Federal Land Use Design and Transaction Approval was granted making an approximately 20-hectare property of federal land available for a New Civic Campus of The Ottawa Hospital (**Figure 1-1**). The project is referred to as the New Campus Development (NCD) for The Ottawa Hospital. Further in 2018, the City of Ottawa passed Official Plan and Zoning By-law Amendments to bring the City of Ottawa land use planning policy documents into alignment with the federal land use decision. The amendments resulted in redesignating a portion of the Central Experimental Farm to General Urban Area and recognize the future use of the new campus within the boundary of the farm. The Preston-Carling District Secondary Plan was also amended at that time and introduced a new “Hospital Area” character area policy to specifically guide development of the hospital and its related uses. The associated Zoning By-law Amendment rezoned the lands to Major Institutional Zone and enacted holding provisions to prevent development until such time as a Master Site Plan and supporting plans and reports that addressed servicing requirements, multi-modal transportation options, cultural heritage impacts have been completed and approved by Council.

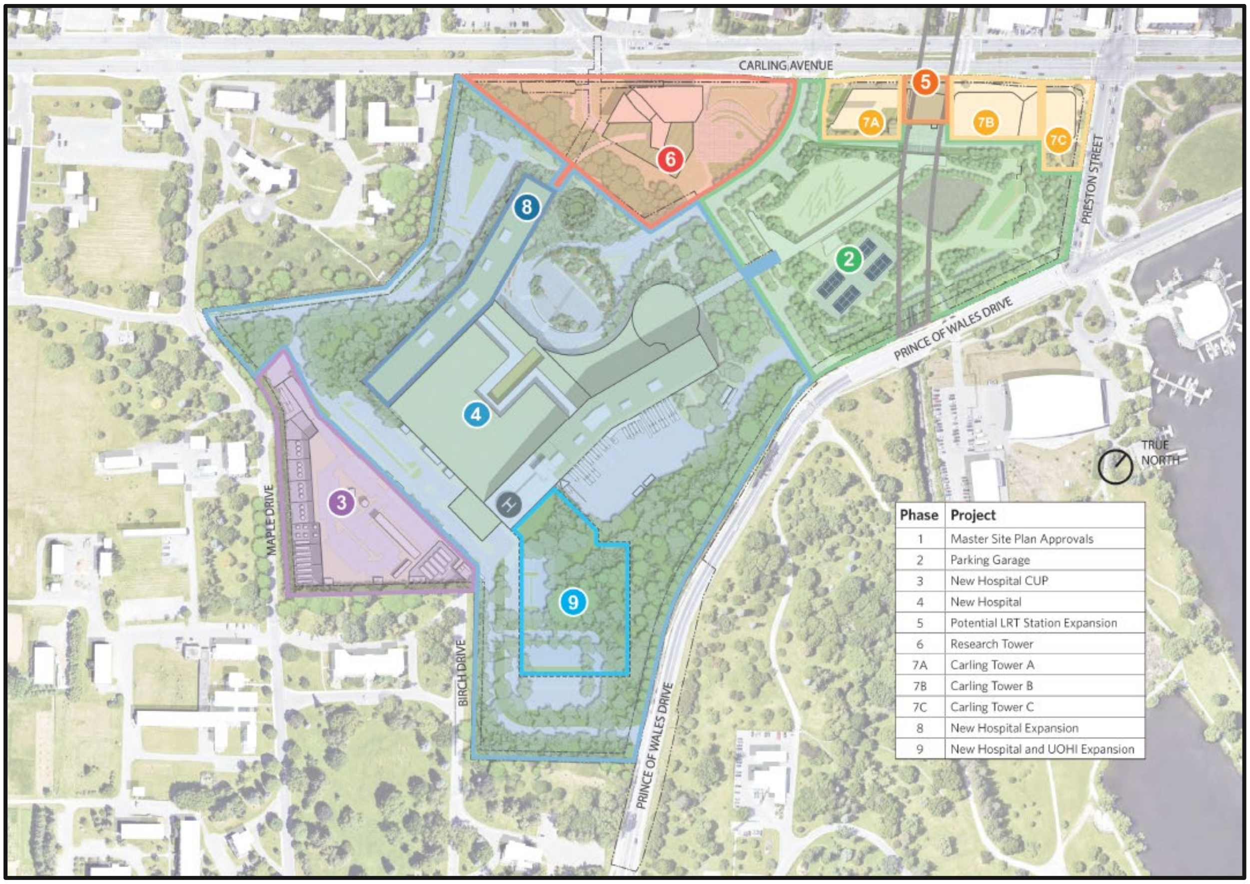
Figure 1-1: New Civic Development for the Ottawa Hospital

In May 2021, complete applications to approve a Master Site Plan and Lift the Holding Zone were submitted to the City of Ottawa as well as an application to the National Capital Commission for approval of the Master Site Plan. The applications were approved by both parties (the City of Ottawa and the National Capital Commission) in October 2021. The Master Site Plan and its supporting studies guide the future development of a new campus for The Ottawa Hospital.

The New Campus Development is to be implemented in Phases as illustrated in **Figure 1-2.** The first phase of implementation is anticipated to include widening of the Trillium LRT trench to accommodate a second LRT track that would be constructed in the future. The second phase of implementation is the parking garage structure which is still under review by the City of Ottawa and the National Capital Commission. The third phase of implementation is the Central Utility Plant which will be located in the southwest corner of the site adjacent to Maple Drive. The fourth phase of implementation is the Main Hospital Building. The remaining project phases will be completed in the future.

This Site Servicing and Stormwater Management Report has been prepared in support of a Site Plan Control Application for the Phase 3 and Phase 4 Project which includes the Central Utility Plant (Phase 3) and the Main Hospital Building (Phase 4).

Figure 1-2: New Civic Development Project Phasing



1.1 Site Description and Proposed Development

The full site is an approximately 20ha property located to the south and west of the Carling Avenue and Preston Street intersection, on two parcels that are separated by the City of Ottawa's existing O-Train line, refer to **Figure 1-1**. The larger parcel is located to the west of the O-Train line and is mostly vacant green space. The smaller parcel is located to the east of the O-Train line and hosts an asphalt parking lot.

This Site Servicing and Stormwater Management Report is for Phase 3 and Phase 4 of the site development which includes the Central Utility Plant and the Main Hospital Building. Phase 3 and Phase 4 have a combined site area of approximately 14ha. The Central Utility Plan and the Main Hospital Building are bordered by Carling Avenue and the future Research Tower (Phase 6) to the north, the Parking Garage (Phase 2) and Preston Street to the east, Prince of Wales Drive to the south, and the existing Ottawa Central Experimental Farm to the west. The development will include site accesses from proposed Road A, proposed Road B, Prince of Wales Drive, and Maple Drive. The Central Utility Plant is located within the southwest of the site and will be serviced from the main site services.

The Central Utility Plant (Phase 3) will contain electrical, heating, and cooling equipment which will provide services to the Main Hospital Building and possibly future phases of development within the site. The Central Utility Plant will be constructed prior to the construction of the Main Hospital Building to provide electricity and possibly other services to the site during the construction phase. The Central Utility Plant will be sunken into the landscape below the grade of Maple Drive. Landscaped buffers of approximately 7.5m in width will be included between the Central Utility Plant and the adjacent property line with the Ottawa Central Experimental Farm.

The first phase of the Main Hospital Building (Phase 4) includes approximately 227,000m^2 of gross floor area configured via a two-storey Pavilion, two Towers which will house the majority of the patient rooms, and a Podium flanking the main entrance. "Tower A" on the north/west portion of the site is eight (8) storeys, and "Tower B" on the south/east side of the site is twelve (12) storeys. A helipad for air ambulances transporting patients to and from the hospital will be located on the roof of Tower B. The Main Entrance to the Main Hospital Building will include welcome and registration areas, cafes, and a lightwell. The Pavilion, to be constructed using mass timber, will contain meeting and conference rooms, an auditorium, retail spaces, a cafeteria, as well as the connection to the weather-protected highline pathway providing access from the green roof of the Parking Garage (Phase 2) and the Dow's Lake LRT Station. While the majority of the parking required for the Main Hospital Building was provided as part of the Phase 2 (Parking Garage) project, the Phase 3 and Phase 4 projects include some additional surface parking for staff and large-scale emergency situations at strategic locations to the northwest of Tower A, and to the south of Tower B on the site of the future Heart Institute building. Refer to **Figure 1-3** for the location of the Central Utility Plant and Main Hospital Building.

The topography of the site is quite variable, refer to **Figure 1-4.** A wooded ridge cuts diagonally across the westerly parcel, and there are some landscape undulations to the south and west of the wooded ridge. This results in an upper western plateau that is associated with the relatively flat landscape of the Ottawa Central Experimental Farm, a middle portion that is either ridge or undulating (site of the former Sir. John Carling Building), and a lower relatively flat eastern plateau which slopes gently towards Dow's Lake. The easterly parcel is more or less flat. The eastern plateau is the location of the Parking Garage (Phase 2).

Figure 1-3: Phase 3 & Phase 4: Main Hospital Building & Central Utility Plant Site Location & Components

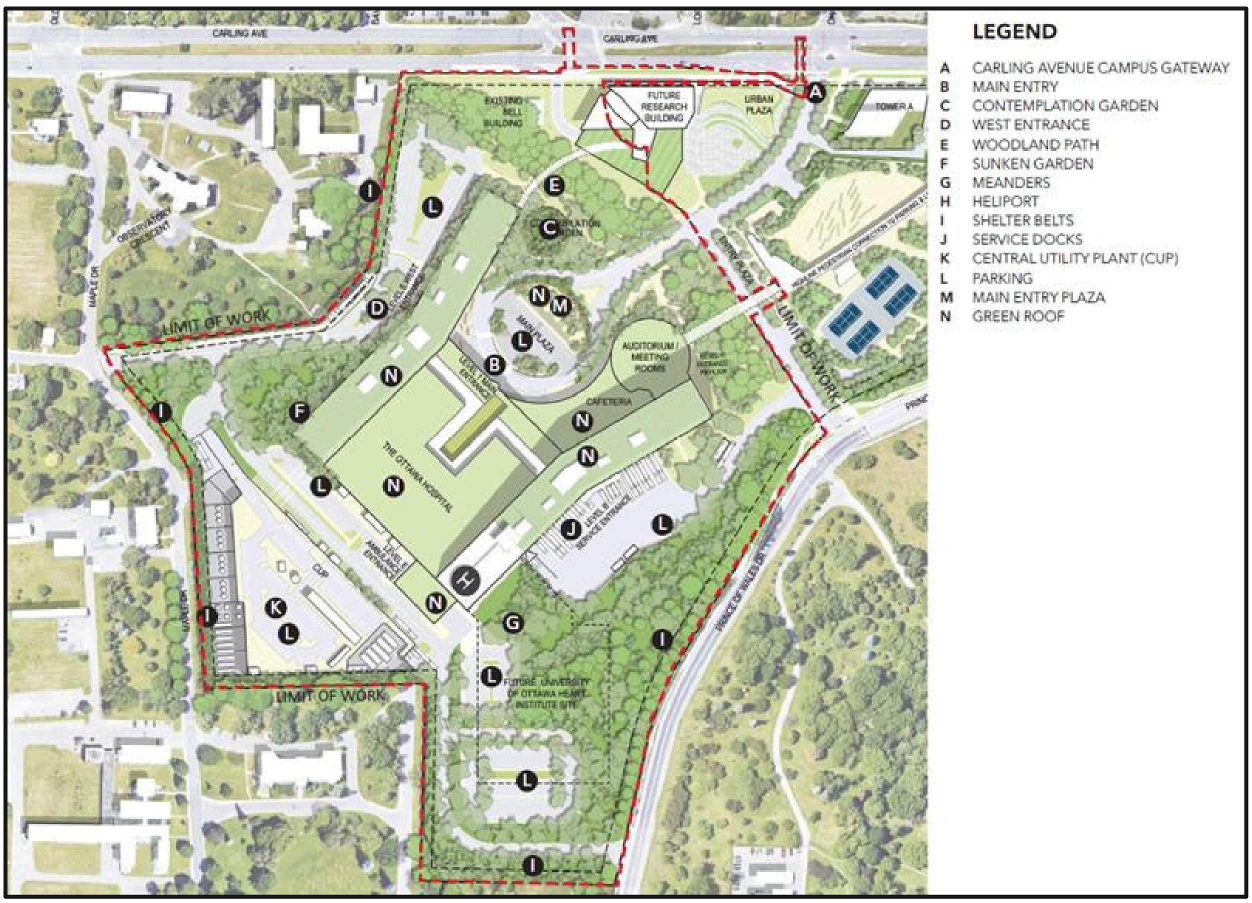
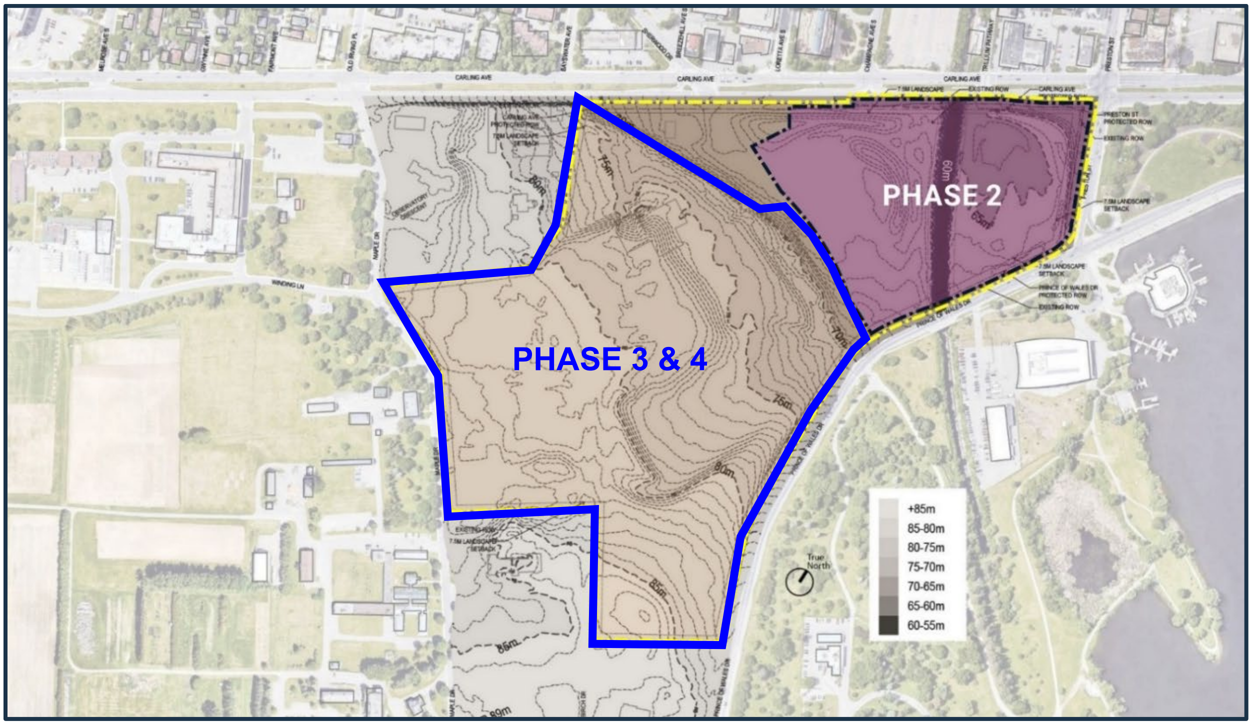


Figure 1-4: Site Topography



2.0 BACKGROUND DOCUMENTS

2.1 Design Guidelines

A list of the design guidelines referenced in the preparation of this report include the following:

- *City of Ottawa Sewer Design Guidelines 2nd Edition*, City of Ottawa, October 2012
  - *Technical Bulletin ISDTB-2012-2*, December 15, 2012
  - *Technical Bulletin ISDTB-2014-01*, City of Ottawa, February 5, 2014
  - *Technical Bulletin PIEDTB-2016-01*, City of Ottawa, September 6, 2016
  - *Technical Bulletin ISTB-2018-01*, City of Ottawa, March 21, 2018
  - *Technical Bulletin ISTB-2019-02*, City of Ottawa, July 08, 2019
  - *Technical Bulletin ISTB-2021-03*, City of Ottawa, August 18, 2021
- *City of Ottawa Design Guidelines – Water Distribution 1st Edition*, City of Ottawa, July 2010
  - *Technical Bulletin ISD-2010-2*, City of Ottawa, December 15, 2010
  - *Technical Bulletin ISDTB-2014-02*, City of Ottawa, May 27, 2014
  - *Technical Bulletin ISTB-2018-02*, City of Ottawa, March 21, 2018
  - *Technical Bulletin ISTB-2021-03*, City of Ottawa, August 18, 2021
- *Design Guidelines for Drinking Water Systems, Ministry of the Environment*, 2008
- *Design Guidelines for Sewage Works, Ministry of the Environment*, 2008
- *Stormwater Management Planning and Design Manual, Ministry of the Environment*, March 2003
- *City of Ottawa Fire Flow Study Survey Report, National Research Council Canada*, June 10, 2016
- *Water Supply for Public Fire Protection*, Fire Underwriters Survey, 2020
- *City of Ottawa Accessibility Design Standards*, City of Ottawa, 2015
  - *Technical Bulletin ISTB-2020-03*, City of Ottawa, September 24, 2020

- *City of Ottawa Standard Tender Documents*, City of Ottawa, 2023
- *Ontario Provincial Standards for Roads & Public Works*, April 2021
- *Ontario Building Code*, 2020
- *National Capital Commission Stormwater Management Manual*, Spring 2022

2.2 Mapping

A list of the mapping sources referenced in the preparation of this report includes the following:

- City of Ottawa Water Distribution System Interactive Map;
- City of Ottawa Sanitary (Sanitary, Storm, and Combined) Collection System Interactive Map;
- City of Ottawa GeoOttawa;
- City of Ottawa 1:1000 Topography Mapping;
- City of Ottawa Utility Coordinating Committee (UCC) Mapping;
- Public Service and Procurement Canada Utility Mapping; and
- Annis, O'Sullivan, Vollebekk Limited Surveys of the New Ottawa Hospital Site Civic Campus.

2.3 Background Reports and Drawings

An information request was sent to the City of Ottawa on February 6, 2020, and a response was received on March 4, 2020. A list of the background drawings and reports received has been included in Error! Reference source not found..

An information request was sent to Public Services and Procurement Canada (PSPC) and a response was received on May 20, 2020. A list of the background drawings received has been included in Error! Reference source not found.. It should be noted that a Master Servicing Study exists for the PSPC lands was received in June 2023. It should also be noted that in 2021 the operation and ownership responsibility of the private servicing was transferred to Agriculture and Agri-Food Canada (AAFC). Parsons and The Ottawa Hospital have continued to reach out to PSPC/AAFC and asked for assistance from the National Capital Commission to obtain the report. To date, the report has not been received.

2.4 Specialist Studies

The following specialist studies have been commissioned by The Ottawa Hospital and form part of the complete application for Site Plan Control Approval and Lifting of the Holding Zone for the Master Site Plan.

- Stage 1 Archaeological Assessment, prepared by Golder Associates Ltd., April 2020, or Latest Version.
- Stage 2 Archaeological Assessment, prepared by Golder Associates Ltd., July 2021, or Latest Version.
- Cultural Heritage Impact Statement, prepared by Golder Associates Ltd., July 2022, or Latest Version.
- Environmental Impact Statement and Tree Conservation Report – Master Site Plan, prepared by Parsons Inc., September 2021, or Latest Version.
- Phase One Environmental Site Assessment, The Ottawa Hospital – New Civic Campus, prepared by Golder Associates Ltd., March 2021, or Latest Version.
- Preliminary Geotechnical Review, prepared by Golder Associates Ltd., March 2021, or Latest Version.
- Environmental Noise & Vibration Assessment, prepared by Gradient Wind Engineers & Scientists, May 2021, or Latest Version.
- Design Brief and Planning Rationale – Master Site Plan, New Civic Development for The Ottawa Hospital, prepared by Parsons Inc., September 2021, or Latest Version
- Master Servicing Plan, The New Civic Development The Ottawa Hospital, prepared by Parsons Inc., July 2021, or Latest Version.
- Shadow Studies, New Civic Development for The Ottawa Hospital, prepared by HDR, August 2021, or Latest Version.

- Transportation Impact Assessment and Mobility Study, prepared by Parsons Inc., July 2021, or Latest Version.
- Pedestrian Level Wind Study, prepared by Gradient Wind Engineers & Scientists, April 2021, or Latest Version.

Reports specific to the Parking Garage were prepared subsequent to submission of the Site Plan Control Application for the Master Site Plan and further inform the application for the Site Plan Control for the Parking Garage:

- Addendum: Cultural Heritage Impact Statement for New Civic Development for the Ottawa Hospital, prepared by Golder Associates Ltd., November 2021, or Latest Version.
- Stage II Archaeological Assessment, prepared by Golder Associates Ltd., September 2021, or Latest Version.
- Phase II Environmental Site Assessment, Ottawa Hospital New Civic Campus Parkade, prepared by Golder Associates Ltd., September 2021, or Latest Version.
- Environmental Effects Analysis, Environmental Impact Assessment and Tree Conservation Report Update - Phase 2 Project: Parking Garage and Green Roof, prepared by Parsons Inc., March 2022 or Latest Version.
- Vegetation Management/Conservation Strategy and Contractor Education Program, prepared by Parsons Inc., January 2022, or Latest Version.
- Geotechnical and Hydrogeological Investigation Report, New Ottawa Hospital Development Phase 1 Parkade, prepared by Golder Associates Ltd., September 2023, or Latest Version.
- Design Brief and Planning Rationale, Phase 2: Parking Garage and Green Roof, prepared by Parsons Inc. with HDR and GBA, January 2022, or Latest Version.
- The Ottawa Hospital New Civic Development Parking Garage Schematic Design Report, prepared by HDR, September 2023, or Latest Version
- Site Servicing and Stormwater Management Report, prepared by Parsons Inc., May 2023, or Latest Version.
- Transportation Impact Assessment: Addendum #1 - Phase 2 Project: Parking Garage and Green Roof, prepared by Parsons Inc., January 2022, or Latest Version.

Reports specific to the Central Utility Plant and Main Hospital Building were prepared subsequent to submission of the Site Plan Control Application for the Master Site Plan and further inform the application for the Site Plan Control for the Central Utility Plant and Main Hospital Building.

- Cultural Heritage Impact Statement - Addendum, prepared by Golder Associates Ltd., April 2023, or Latest Version.
- Phase II Environmental Site Assessment - New Campus Development, Phase 3 and 4, Central Utility Plant and MHB, prepared by Golder Associates Ltd., September 2022, or Latest Version.
- Remedial Program for Impacted
- Environmental Effects Evaluation and Tree Conservation Report - New Campus Development, Phase 3 and 4, Central Utility Plant and MHB, prepared by Parsons Inc., November 2022, or Latest Version.
- Vegetation Management/Conservation Strategy and Contractor Education Program - Addendum, prepared by Parsons Inc., November 2022.
- Tree Removal and Mitigation Plan Memorandum, prepared by Parsons Inc., October 2022
- Geotechnical and Hydrogeological Investigation Report - New Campus Development, Main Hospital Building, prepared by WSP Canada Inc., August 2023, or Latest Version.
- Geotechnical and Hydrogeological Investigation Draft Report – Ottawa Hospital New Development, Central Utility Plant (CUP) Building, prepared by WSP Canada Inc., July 2023.
- Sewer Discharge Results Comparison Ottawa Hospital Expansion, prepared by WSP Canada Inc., April 2023 or Latest Version.

- Preliminary Groundwater Inflow Estimate Ottawa Hospital Expansion, prepared by WSP Canada Inc., February 2023 or Latest Version.
- Addendum to Environmental Noise & Vibration Assessment - New Campus Development, Phase 3 and 4, Central Utility Plant and MHB, prepared by Gradient Wind Engineers & Scientists, September 2022, or Latest Version.
- Air Quality Study - New Campus Development, Phase 3 and 4, Central Utility Plant and Main Hospital Building, prepared by Gradient Wind Engineers & Scientists, September 2022, or Latest Version.
- Stationary Noise Assessment, Phase 3 and 4, Central Utility Plant and Main Hospital Building, prepared by Gradient Wind Engineers & Scientists, September 2022, or Latest Version.
- Pedestrian Level Wind Study and Snow Drift Assessment, Phase 3 and 4, Central Utility Plant and Main Hospital Building, prepared by Gradient Wind Engineers & Scientists, October 2022, or Latest Version.
- Planning Rationale - New Campus Development, Phase 3 and 4, Central Utility Plant and MHB, prepared by Parsons Inc., November 2022, or Latest Version.
- Design Brief - New Campus Development, Phase 3 and 4, Central Utility Plant and MHB, prepared by HDR, November 30, 2022, or Latest Version.
- Site Servicing and Stormwater Management Functional Report - New Campus Development, Phase 3 and 4, Central Utility Plant and Main Hospital Building, prepared by Parsons Inc., November 2023, or Latest Version.
- Transportation Impact Assessment and Mobility Study - Addendum #2, prepared by Parsons Inc., November 2022, or Latest Version.
- Neighbourhood Traffic Management Strategy, prepared by Parsons Inc., July 2023, or Latest Version.
- Off-Site Parking Strategy, prepared by Parsons Inc., July 2023, or Latest Version.
- Transportation Monitoring Strategy, prepared by Parsons Inc., August 2023, or Latest Version.
- Transportation Demand Management Strategy, prepared by Steer, July 2023, or Latest Version.

2.5 Meetings

The following meetings were held and attended to discuss the existing public and private infrastructure in the vicinity of the NCD:

2.5.1 City of Ottawa Meeting – April 30th, 2020

- A meeting was attended with the City of Ottawa on April 30th, 2020, to discuss the existing public infrastructure in the vicinity of the NCD; and
- Prior to the meeting, the City of Ottawa circulated the potential site's evaluation, Error! Reference source not found., that was completed during the selection process in 2016. The constraints presented within the potential site's evaluation are summarized in more detail throughout the report.

2.5.2 PSPC Meeting – May 27th, 2020

- A meeting was attended with PSPC on May 27th, 2020, to discuss the existing private infrastructure in the vicinity of the NCD;
- Need to ensure that all private servicing remains functional;
- No easements were reserved during negotiations;
- Further discussion is required on how the existing lands and proposed development will be serviced;
- A Master Servicing Study was previously completed for the PSPS lands. Only a hard copy exists and due to COVID-19 restrictions, a copy of the report could not be provided;
- All private sanitary sewers on PSPC lands have sufficient capacity to accommodate existing demands;
- Further discussion is required regarding how the existing lands and proposed development will outlet to existing public sanitary infrastructure (one connection versus two connections));

- The PSPC lands are currently serviced by two public watermains - one from Carling Avenue and one from Fisher Avenue;
- A bulk meter would be required if the proposed development is to be serviced from the existing private watermain on Maple Drive;
- Servicing the proposed development from the existing private watermain on Maple Drive has associated risks;
- An existing bulk meter is located on the existing watermain at the Carling Avenue and Maple Drive intersection;
- Further discussion with the City of Ottawa would be required regarding redundancy;
- All private storm sewers on PSPC lands have sufficient capacity to accommodate existing demands;
- The storm sewer outlet for the PSPC lands discharges to Dow's Lake/Canal (maintained by Parks Canada) and is owned by PSPC;
- The storm sewer outlet has been rehabilitated; and
- The existing infrastructure might be transferred over to the Central Experimental Farm sometime in the future.

2.5.3 City of Ottawa & National Capital Commission Pre-Consultation Meeting – June 23rd, 2022

- A meeting was attended with the City of Ottawa and National Capital Commission on June 28th, 2022, to kick off Phase 3 and Phase 4: Central Utility Plant and MHB as part of The Ottawa Hospital New Campus Development.
- Between now and about spring 2023, site plan approvals for the Main Hospital Building and Central Utility Plant will be sought.
- The required plans and studies list for the Site Plan Control Application and Federal Land Use Design Approval was provided by the National Capital Commission and the City of Ottawa, Error! Reference source not found..

2.5.4 City of Ottawa & National Capital Commission Site Servicing & Stormwater Management Meeting – August 25th, 2022

- A meeting was attended with the City of Ottawa and National Capital Commission on August 25th, 2022, to provide an update on the site servicing and stormwater management design of Phase 3 and Phase 4: Central Utility Plant and Main Hospital Building as part of The Ottawa Hospital New Campus Development.

2.5.5 Approving Authority Site Servicing & Stormwater Management Meeting – March 21st, 2023

- A meeting was attended with the City of Ottawa, National Capital Commission, Parks Canada, Agriculture and Agri-Food Canada, and Public Services and Procurement Canada to review comments related to the November 2023 submission and discuss anticipated response/approach to be included in next submission.

3.0 EXISTING INFRASTRUCTURE

The existing site is not serviced by municipal (City of Ottawa) infrastructure. It should be noted that the existing property was previously owned and operated by PSPC. Existing private infrastructure (water, sanitary, and storm) is currently located within the site which is still in operation. In 2021, the operation and ownership responsibility of the private servicing was transferred to AAFC. The existing infrastructure will require relocation for the development of the Central Utility Plant (Phase 3) and the Main Hospital Building (Phase 4) Projects.

3.1 Existing Water Infrastructure

The NCD is located within the 1W and 2W2C pressure zones, south of the Lemieux Island Water Treatment Plant. The easterly parcel is located within the 1W pressure zone, and the westerly parcel is located within the 1W and 2W pressure zones.

The existing municipal watermain infrastructure within the vicinity of the NCD is as follows:

- Carling Avenue → 1067mm diameter watermain;
- Carling Avenue → 406mm diameter watermain;
- Preston Street → 152mm diameter watermain (east); and
- Preston Street → 152mm diameter watermain (west).

There is no existing municipal water infrastructure located within Prince of Wales Drive.

The existing private watermain infrastructure within the vicinity of the NCD is as follows:

- Maple Drive → 406mm diameter private watermain
- Birch Drive → 305mm diameter private watermain
- National Capital Commission Driveway → 406mm/305mm diameter private watermain

The existing municipal and private watermain infrastructure is illustrated in **Figure 3-1**.

3.2 Existing Combined Sewer Infrastructure

The NCD is located within an area of the City of Ottawa that contains a complex network of hydraulic sewer structures including the Preston-Booth Trunk (a combined sewer system).

The existing municipal combined sewer infrastructure within the vicinity of the NCD is as follows:

- Preston-Booth Trunk → 1800mm diameter combined sewer. The Preston Trunk is diverted to the Booth Street sewer at Spruce Street. The Preston Trunk north of Spruce Street was converted to a storm sewer years ago which eventually discharges to the Tailrace; and
- Preston Street → 300mm diameter combined sewer.

The existing municipal combined sewer infrastructure is illustrated in **Figure 3-2**.

3.3 Existing Sanitary Infrastructure

The NCD is located within an area of the City of Ottawa that contains a complex network of hydraulic sewer structures including the Mooney's Bay Collector (a sanitary sewer system).

The existing municipal sanitary sewer infrastructure within the vicinity of the NCD is as follows:

- Mooney's Bay Collector → 1050mm diameter sanitary sewer. The Mooney's Bay Collector is a 1050mm diameter concrete sewer that cuts through the westerly parcel (within an existing easement). This easement borders the western edge of the proposed parking garage structure; and
- Carling Avenue → 225mm/300mm diameter sanitary sewer.

The existing private sanitary sewer infrastructure within the vicinity of the NCD is as follows:

- Maple Drive → 250mm diameter private sanitary sewer
- Birch Drive → 250mm diameter private sanitary sewer
- National Capital Commission Driveway → 250mm diameter private sanitary sewer

The existing municipal and private sanitary sewer infrastructure is illustrated in **Figure 3-2.**

3.4 Existing Stormwater Infrastructure

The western parcel of the NCD is located within the most upstream point of the major tributary drainage area for the Nepean Bay Trunk and the most downstream point of a tributary area for Dows Lake. The eastern portion of the western parcel conveys runoff to the Carling Avenue storm sewers (municipal infrastructure) which discharges into the Champagne Avenue storm sewer. The Champagne Avenue storm sewer continues along Loretta Avenue, north of Gladstone Avenue. This storm sewer discharges into the Nepean Bay Trunk before ultimately discharging to the Ottawa River. The western portion of the western parcel conveys runoff through private AAFC infrastructure from the federal lands (Central Experimental Farm) towards Prince of Wales Drive and eventually to Dow's Lake.

The eastern parcel of the NCD conveys runoff into an onsite storm sewer drainage system that discharges to the Preston Trunk (combined system), located at the intersection of Carling Avenue and Preston Street.

The overland flow for the entire site flows towards Carling Avenue and is part of the Mooney's Bay major tributary drainage area.

The existing municipal storm sewer infrastructure within the vicinity of the site is as follows:

- Carling Avenue → 300mm/375mm/450mm/525mm diameter storm sewers;
- Nepean Bay Trunk → 1800mm diameter storm sewers

The existing private sanitary sewer infrastructure within the vicinity of the site is as follows:

- Maple Drive → 300mm/525mm/600mm diameter private stormwater sewer
- Birch Drive → 900mm diameter private stormwater sewer
- Dow's Lake Outfall →1350mm diameter private stormwater sewer
- Federal Land → 300mm/450mm/600mm diameter private stormwater sewer

The existing municipal and private storm sewer infrastructure is illustrated in **Figure 3-3**. Photographs of the existing Dow's Lake Outfall are shown in **Figure 3-4**, **Figure 3-5**, and **Figure 3-6**.

Figure 3-1: Existing Water Infrastructure

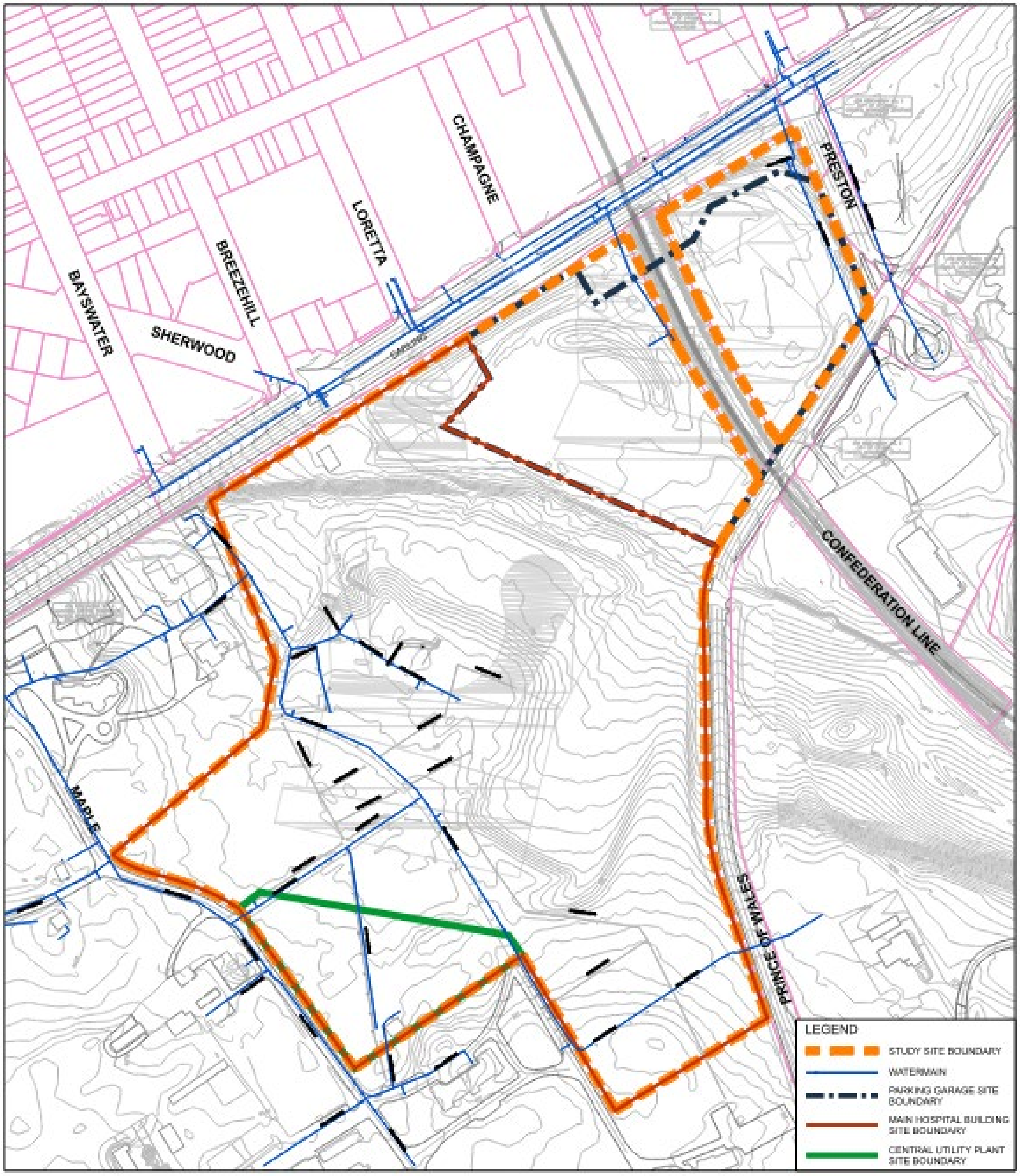


Figure 3-2: Existing Sanitary and Combined Infrastructure

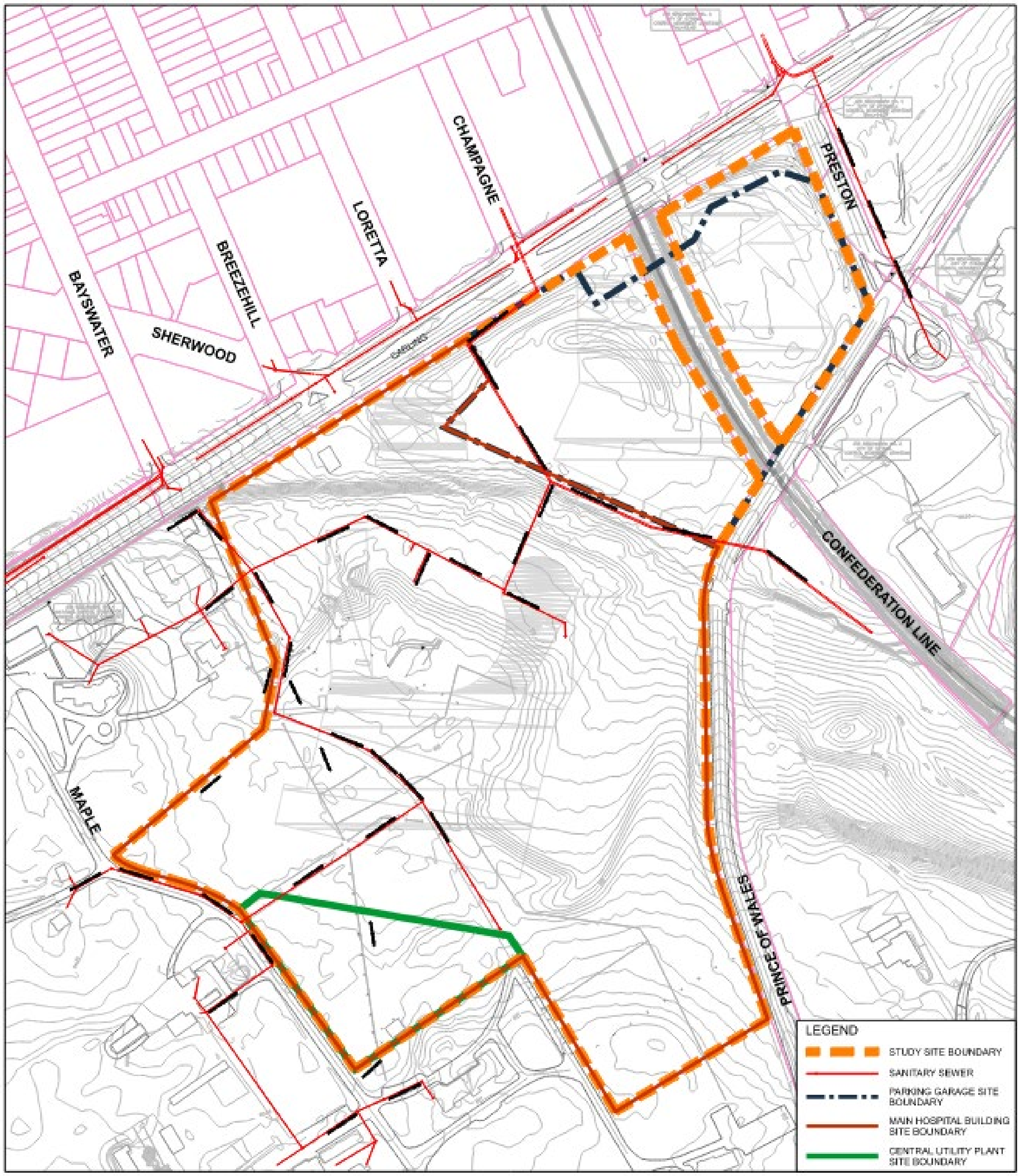


Figure 3-3: Existing Stormwater Infrastructure

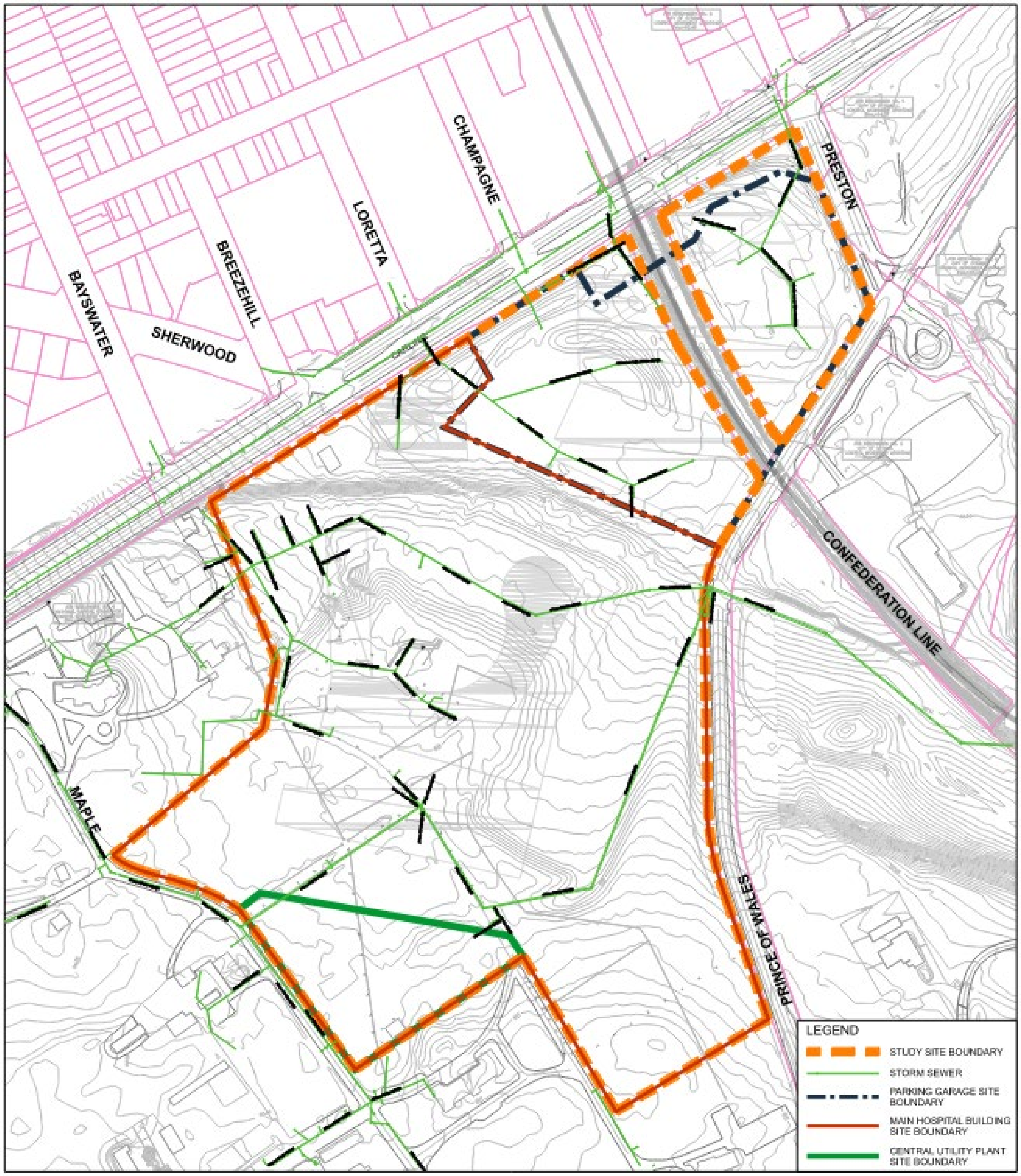


Figure 3-4: Dow's Lake Outfall – July 2022

Figure 3-5: Dow's Lake Outfall – December 2022

Figure 3-6: Dow's Lake Outfall – December 2022

4.0 CONSULTATIONS AND PERMITS

The City of Ottawa and agencies were consulted for this project. A summary of the consultations is provided below; copies of the correspondences and/or minutes are provided in Error! Reference source not found..

4.1 Consultations

4.1.1 City of Ottawa and National Capital Commission

The following studies and plans were identified by the City of Ottawa and National Capital Commission as being required for the Central Utility Plant (Phase 3) and Main Hospital Building (Phase 4) project site application.

4.1.1.1 Studies

- Design Brief and 3D Renderings;
- Response to National Capital Commission Performance Criteria;
- Planning Rationale;
- Shadow Study;
- Site Servicing and Stormwater Management Functional Report;
- Sky Illumination Study;
- Environmental Impact Assessment/Environmental Effects Evaluation and Tree Conservation Report Update;
- Wildlife Mitigation and Monitoring Plan;
- Vegetation Management Conservation Strategy and Education Program;
- Transportation Impact Assessment;
- Noise and Vibration Analysis;
- Wind Study;
- Geotechnical Report;
- Phase 3 Environmental Site Assessment;
- Cultural Heritage Impact Statement Addendum; and
- High Performance Development Standards.

4.1.1.2 Plans

- Plan of Survey
- Overall Site Plan
- Landscape Plan
- Architectural Elevations/Sections
- Site Lighting Plan
- Engineering Drawings
  - Site Servicing Plan
  - Grade Control and Drainage Plan
  - Stormwater Management Plan
  - Existing Conditions Plan
  - Excavation Plan
  - Building and Site Interfaces with Public Realm and Landscape
  - Views Analysis and Conceptual Renderings
  - Floor Plates
  - Grading and Landscape Integration
  - Exterior Material Selection and Colour Palette
  - Bird Friendly Design
- Composite Utility Plan

- Mechanical and Electrical Drawings
- Road Modification Design

4.1.1.3 Design Review Panel Requirements

- UDRP Design Package
- ACPDR Design Package

Rideau Valley Conservation Authority (RVCA)

RVCA will require enhanced water quality protection (80% Total Suspended Solids (TSS) removal), and best management practices are generally encouraged to maximize on-site quality protection. The communication with the RVCA is included in Error! Reference source not found..

Ministry of the Environment, Conservation and Parks (MECP)

An Environmental Compliance Approval (ECA) may be required as stormwater will discharge to an existing outlet to Dow's Lake. Need to determine if the existing outlet is an approved or unapproved outlet.

4.2 Permits and Approvals

The City of Ottawa and the various agencies consulted require the approvals and permits listed below. The City of Ottawa Development Servicing Study Checklist is included in Error! Reference source not found..

City of Ottawa

- Site Plan Agreement
- Road Cut Permit
- Commence Work Order
- Water Permit
- Water Data Card
- Flow Control Roof Drainage Declaration
- Tree Cutting Permit

Ontario Ministry of the Environment, Conservation and Parks

- Environmental Compliance Approval
- Permit to Take Water

National Capital Commission

- Federal Land Use and Design Approval

The following approvals have been granted by the City of Ottawa and the National Capital Commission for the New Campus Development to date, refer to Error! Reference source not found. for approval summary chart:

4.2.1 City of Ottawa

- Site Plan Agreement (D07-12-21-0159) – Master Site Plan (2021-10-27)
- Site Plan Agreement (D07-12-21-0159) – Parking Garage Delegated Authority Report (2022-09-27)

4.2.2 National Capital Commission

- FLUDA (IAMIS #19923) Master Site Plan and Amendment to the Capital Urban Lands Plan (2021-11-22)
- FLUDA (IAMIS #24020) Parking Garage Early Works #1 (2022-03-24)
- FLUDA (IAMIS #23474) Parking Garage Schematic Design (2022-06-24)
- FLUDA (IAMIS #24021) Parking Garage Early Works #2 (2022-10-08)
- FLUDA (IAMIS #24432) Remediation (2022-11-14)

5.0 EXISTING CENTRAL EXPERIMENT FARM UNDERGROUND SERVICING RELOCATIONS

Existing Agriculture and Agri Food Canada underground infrastructure on the Central Experimental Farm needs to be relocated to accommodate the New Campus Development for The Ottawa Hospital.

The Advance Works will include the relocation of the existing Agriculture and Agri Food Canada underground infrastructure (storm, sanitary, and water) and will be completed prior to the implementation of Phase 3 (Central Utility Plant) and Phase 4 (Main Hospital Building). Refer to **APPENDIX E** for the servicing relocation technical memorandum *"New Campus Development for The Ottawa Hospital Agriculture and Agri Food Canada Existing Infrastructure"*, prepared by Parsons Inc., October 2023.

6.0 GEOTECHNICAL RECOMMENDATIONS - HOSPITAL

6.1 Geotechnical and Hydrogeological Investigation

WSP Canada Inc. (formerly Golder Associates Limited) completed a geotechnical report, *Geotechnical Engineering Report – New Ottawa Hospital Development – DRAFT (August 2023)*, provided under separate cover.

The report's recommendations regarding grading, site servicing, and drainage are summarized below. Refer to the report, submitted under separate cover, for further detail.

6.1.1 Site Grading

The proposed development has a complex grading scheme which is further complicated by the existing topography.

6.1.1.1 Grade Lowering

- The development site will require grade lowering.
- Significant slopes and/or retaining walls will be required to achieve the current proposed grades.
- Additional geotechnical input will be required based on final grades and locations of the various slopes and retaining walls.
- Grade lowering below the existing groundwater table will be required to achieve the current proposed grades. Significant permanent drainage works will need to be incorporated within these areas.
- Permanent drainage work will need to be further studied during detailed design.

6.1.1.2 Grade Raising

- The development site is underlain by discontinuous fill overlying localized silty clay deposits and native glacial till and silt/sand deposits. The majority of these soils are not expected to be sensitive to typical grades raise.
- The northwest corner of the site encountered unweathered, sensitive silty clay. The extent of this clay is not known with certainty, but it seems to be located at the north end of the Tower A and Tower B. The presence of this layer is not a significant concern for moderate grade changes but significant grade raising will require additional geotechnical inputs based on final grades.
- Topsoil and fill, containing deleterious fill material, should be stripped.
- Compacted engineered fill consisting of Granular B Type I or Type II (City of Ottawa SP F-3147) can be used under hard surfaces or structures where excavations need to be brought up to grade.
- General earth fill can be used under landscaped areas where excavations need to be brought up to grade.
- Engineered fill should be placed in maximum 300mm thick lifts and compacted to at least 95% of the materials Standard Proctor Maximum Dry Density under pavements and hard surfaces or 100% of the materials Standard Proctor Maximum Dry Density under foundations and structures.
- Existing granular fill material would need to be reviewed during construction to determine re-use suitability.

6.1.2 Foundations

- The subsurface conditions at the development site are variable deposits of fill, localized deposits of silty clay, with glacial till overlying sand and gravel in some locations over shaley limestone bedrock.
- The Main Hospital Building may be designed as multiple independent structures.
- Refer to the Geotechnical Report for further discussions related to foundation types, subsurface conditions at each building section, and foundation design.

6.1.3 Excavations & Groundwater Control

6.1.3.1 Temporary Excavations

- Excavations will need to be made in a series of permanent and temporary steps, terraces, slopes, etc. Some of which will eventually be backfilled and some of which will be permanent.
- No unusual problems are anticipated with excavating the overburden using conventional hydraulic excavation equipment.
- The condition of the area around the former Sir John Carling Building should be confirmed and documented carefully to aid in construction planning of the new Main Hospital Building.
- Excavations above the groundwater and within the fill, silty sand, native silty clay, and glacial till should be stable at 1H:1V side slopes in the short term. These soils would be classified as Type 3.
- Excavation below the groundwater and within the silty and sandy soils (both fill and native) require minimum 3H:1V side slopes. These soils would be classified as Type 4. If the groundwater is lowered and maintained below the excavation, unsupported side slopes may be steepened to 1H:1V.
- Permanent drainage works will need to be incorporated since grades are expected to be below the groundwater level.
- Height of excavations (up to 12m) exceeds the height for prescriptive design under the Ontario Health and Safety Act. Deeper excavations (even if open cut) will require an engineered design in accordance with relevant regulations.
- Shoring systems can be implemented where sufficient space is not available and/or limiting the area of impact is preferred. Typical shoring includes tied back sheet pile walls or soldier pile and lagging systems.
- The shoring system required for this type of project is typically designed and constructed by a Specialist Contractor. The system needs to support the surrounding soils as well as adjacent structures, roads, utilities, etc.
- Excavations for site services can be completed by sloping excavations where space permits or vertical sides complete with fully braced steel trench boxes or shoring systems.

6.1.3.2 Groundwater Control

- Temporary lowering of the groundwater table will be required during construction.
- Significant groundwater inflow is expected during construction and careful groundwater management will be required.
- Groundwater management will need to include active dewatering from wells and well-points systems in deep excavations. Excavations just below the groundwater table may be able to be controlled by pumping from properly filtered sumps.
- Soils are sensitive to disturbance and failure to control groundwater will result in excessive soil disturbance in the base of excavations as well as potential piping, heave, and other safety concerns for temporary excavations.
- A Ministry of the Environment, Conservation and Parks Environmental Activity and Sector Registration is required for pumping that exceeds 50,000L/day but less than 400,000L/day.
- A Ministry of the Environment, Conservation and Parks Environmental Activity Permit to Take Water is required for pumping that exceeds 400,000L/day and must be supported by a Hydrogeological Report.

- A Permit to Take Water will be required for this project.
- The extents and depths of the required excavations should be reviewed in detail to determine the potential extent of groundwater drawdown as it could extend outside the site boundary.
- Permanent drainage works will be required in exterior areas where the grade is being permanently lowered below the groundwater level.
- Permanent drainage work will need to be further studied during detailed design.

6.1.4 Foundation Wall Backfill and Drainage

- Foundation and basement walls should be backfilled with non-frost susceptible sand or sand and gravel conforming to the City of Ottawa SP F-3147.
- Backfill materials should be placed in 300mm lifts and compacted to at least 95% of the materials Standard Proctor Maximum Dry Density to avoid ground settlement.
- Backfill adjacent to the wall should be placed to form a frost taper in areas where hard surfaces are adjacent to the building to reduce differential frost heaving. Frost taper should be brought up to the pavement subgrade level from 1.5m below the finished exterior grade at a slope of 3H:1V (or flatter) away from the wall. The fill should be placed in maximum 300mm thick lifts and should be compacted to at least 95% of the materials Standard Proctor Maximum Dry Density.
- Foundation wall should be wrapped in a drainage board (Miridrain or similar) and be drained by a perforated pipe subdrain in a surround of 19mm clear stone, fully wrapped in geotextile, which leads via gravity to a storm sewer of pumped from a sump pit.
- Subdrains should be provided below the basement level (perforated pipe drains place on 6m centres) since it will be below the existing groundwater table.
- Long-term flow estimates can be determined based on the final proposed basement layout and depth as part of the hydrogeological study required as part of the Permit to Take Water.

6.1.5 Site Servicing

- Excavations should be conducted in accordance with guidance provided for temporary excavations.
- Existing fill should be reviewed and approved by a qualified geotechnical engineer. It may not be found suitable.
- Engineered fill should consist of imported Granular B Type II (City of Ottawa SP F-3147) or suitable approved materials previously excavated from the site.
- Engineered fill should be placed in maximum 300mm thick lifts and compacted to at least 95% of the materials Standard Proctor Maximum Dry Density. It should extend down and away from the bottom of the bedding to the undisturbed native subgrade at a slope of 1H:1V.
- Re-use of excavated material would need to be determined based on the Phase II ESA report which is provided under separate cover.
- 150mm of Granular A (City of Ottawa SP F-3147) should be used for pipe bedding.
- A sub-bedding layer may be necessary and should consist of 300mm of compacted Granular B Type II (City of Ottawa SP F-3147).
- Bedding should extend to the spring line of the pipe and compacted to at least 95% of the materials Standard Proctor Maximum Dry Density.

6.1.6 Trench Backfill

- Trench backfill should conform with City of Ottawa SP F-2120.
- Trench backfill above the pipe cover material may consist of approved excavated material such as the existing fill (provided that it is free of organic matter and other deleterious materials) and non-clayey native soils, where the service pipes will be overlain by pavements or other hard surfacing. The fill that contains

organic matter or deleterious materials are not suitable for reuse as trench backfill and should be wasted upon excavation.
- Imported backfill, if required, should consist of compactable and inorganic earth borrow (OPSS.MUNI 206/212) or Select Subgrade Material (City of Ottawa SP F-3147).
- It is important for frost heave compatibility that the trench backfill within the frost zone (i.e., between the pavement subgrade level and 1.8m depth below pavement grade) matches the soil exposed on the trench walls.
- Trench backfill should be placed in maximum 300mm loose lifts and be uniformly compacted to at least 95% of the materials Standard Proctor Maximum Dry Density. Backfilling operations during cold weather should avoid inclusions of frozen lumps of material, snow, and ice.
- If the construction schedule allows a delay between service installation/trench backfilling and final paving should be made to allow for settlement of the trench backfill material, which will reduce the magnitude of differential movement (i.e., sagging) of pavements placed over backfilled trenches.

6.1.7 Pavement Design

6.1.7.1 Profile Grade

- No significant post-construction primary consolidation or secondary compression settlements of the subgrade soils are expected.
- Some settlement above the service trenches should be expected due to settlement of backfill. Magnitude of settlement should be within tolerable limits if compaction is conducted in accordance with the geotechnical report.

6.1.7.2 Subgrade Preparation

- Existing fill may need to be removed to accommodate the full depth of the new pavement structure.
- All deleterious material should be removed from all pavement areas.
- It should be feasible to leave the existing inorganic fill in place beneath the pavement structure. In this case, the subgrade should be proof rolled prior to the placement of new fill.
- Areas requiring grade raising to the proposed subgrade level should be filled using acceptable earth borrow (OPSS MUNI 206/221), Select Subgrade Material (OPSS MUNI 1010), or additional granular base if the grade changes are minor.
- Fill should be placed in maximum 300mm thick lifts and compacted to at least 95% of the materials Standard Proctor Maximum Dry Density.

6.1.7.3 Pavement Drainage

- Subgrade surface should be crowned or sloped to promote drainage of the roadway granular structure.
- Perforated pipes should be provided along the low sides of the roadway along the entire length.
- Geotextile should Class I nonwoven (OPSS 1860) and should have a maximum apparent opening size of 212um.
- Subdrains should be connected to the catchbasins such that the pavement structure will have positive drainage and intercept flows within the subbase.
- Subdrains should drain on existing slopes.
- Backfilling of catchbasin laterals below the subgrade should be completed using acceptable native soils or fill that match the material types expose in the lateral trench walls to reduce potential problems associated with differential frost heaving.

6.1.7.4 Granular Pavement Materials

- Granular base and subbase for new construction should consist of Granular A and Granular B Type II (SP F-3147), respectively.
- Existing fill within the project limit does not meet the requirements for Granular A or Granular B Type II and cannot be reused as general trench backfill or as subgrade material for pavements.

6.1.8 Pavement Design

6.1.8.1 Parking Areas

The pavement structure for parking areas is shown in **Table 6-1**.

Table 6-1: Recommended Pavement Structure – Parking Areas

Thickness (mm)	Material Description
50	Superpave 12.5mm Surface Course
150	S.P. F-3147 Granular A Base
400	S.P. F-3147 Granular B Type II Subbase

The asphaltic concrete should meet the requirements of City of Ottawa specification F-3106. The Performance Graded Asphalt Cement should consist of PG 58-34 for Traffic Category B.

6.1.8.2 Local Routes

The pavement structure for local and access roads, not exposed to bus or heavy truck traffic, is shown in **Table 6-2**.

Table 6-2: Recommended Pavement Structure – Local Routes

Thickness (mm)	Material Description
40	Superpave 12.5mm Surface Course
50	Superpave 19.0mm Binder Course
150	S.P. F-3147 Granular A Base
400	S.P. F-3147 Granular B Type II Subbase

The asphaltic concrete should meet the requirements of City of Ottawa specification F-3106. The Performance Graded Asphalt Cement should consist of PG 58-34 for Traffic Category B.

6.1.8.3 Collector Routes

The pavement structure for collector roads, exposed to bus or heavy truck traffic, is shown in **Table 6-3**.

Table 6-3: Recommended Pavement Structure – Collector Routes

Thickness (mm)	Material Description
50	Superpave 12.5mm FC1 Surface Course
70	Superpave 19.0mm Binder Course
150	S.P. F-3147 Granular A Base
400	S.P. F-3147 Granular B Type II Subbase

The asphaltic concrete should meet the requirements of City of Ottawa specification F-3106. The Performance Graded Asphalt Cement should consist of PG 64-34 for Traffic Category C.

6.1.8.4 Rigid Pavement

The pavement structure for rigid pavement (if required) is shown in **Table 6-4.**

Table 6-4: Recommended Pavement Structure – Rigid Pavement

Thickness (mm)	Material Description
200	Portland Cement Concrete
150	S.P. F-3147 Granular A Base
400	S.P. F-3147 Granular B Type II Subbase

The Portland cement concrete should meet the requirements of CSA A 23.1 Class C2 exposure. Concrete joint specifications and spacing should be in accordance with OPSD 552.020 and 551.010.

6.1.8.5 Pavement Structure Compaction

- Adequate compaction is essential to the continued acceptable performance of the roadway.
- Compaction should conform with OPSS 501 – Construction Specification for Compacting. Compacted densities of various materials should conform with Subsection 501.08.02 Method A.
- Granular base and subbase materials should be compacted to a least 100% of the Standard Proctor Maximum Dry Density.
- Compaction of the asphaltic concrete should conform OPSS 310 Table 10.
- Placement and compaction of all engineered fill and bedding and backfill for services should be inspected to ensure the materials confirm with the grading and compaction specifications.
- Compaction testing and sampling of the asphaltic concrete should be conducted during construction.

6.1.8.6 Joints, Tie-Ins with Existing Pavements, Pavement Resurfacing

- At intersections, the new pavement structure should be continued at least to the limits of construction of the end of the curb return.
- At these streets, the pavement should be milled back beyond the curb return an additional 300mm to a depth of 40mm to accept the surface course asphaltic concrete.
- Pavement granular and subgrade level should be tapered between new and existing pavements using 10H:1V tapers.
- Tack coat should be provided on all vertical and milled horizontal surfaces.
- Tack coat should consist of SS-1 emulsified asphalt diluted with an equal amount of water.
- Undiluted and emulsified asphalt shall conform with OPSS 1103.

6.1.9 Reuse of Existing Soils

- Native glacial till (given it has suitable water content for compaction) may be reused as backfill within service trenches provided the materials are frost compatible.
- Existing soils are likely suitable for reuse as pavement structure base/subbase materials or engineered fill.
- Heterogeneous fill and buried topsoil would not be considered suitable for reuse and pavement structure base/subbase, but portions may be used for trench backfill and grading if reviewed and approved during excavation.
- Reclaimed asphalt pavement and/or reclaimed concrete material may be used as granular material as stated in OPSS MUNI 1010 Material Specification for Aggregates – Base, Subbase, Select Subgrade and Backfill Material.
- Reclaimed asphalt pavement may be used in the asphaltic concrete mixes in accordance with OPSS MUNI 1151.

6.1.10 Corrosion and Cement Type

- Water-soluble sulphate (SO4) content in the tested samples was above 150mg/L and below 1,500mg/L.
- Concrete made with moderate sulfate resistance (S-3) type cement should be acceptable for buried concrete elements.
- Elevated potential for corrosion of exposed ferrous metal should be considered in the design of substructures.
- Corrosion protection systems of steel coating may be required but should be selected by a Structural Engineer.
- Higher chloride content should be considered on the design of substructures.

6.1.11 Additional Considerations

- Golder Associates Limited should be retained to review the final drawings and specifications prior to construction to ensure that the guidance provided within the Geotechnical Report was adequately interpreted.
- All prepared subgrade surfaces for roadways, parking areas, floor slabs, foundations, etc. should be reviewed by Golder Associates Limited to ensure they have been prepared adequately.
- Installation of piled foundations should be reviewed on a full-time basis by Golder Associates Limited.
- Placement and compaction of all engineered fill should be inspected and tested to ensure materials confirm with both the grading and compaction specifications.
- Soil samples collected as part of the Geotechnical Investigation are only maintained for three (3) months following the issuance of the report.
- Ontario Regulation 903 requires abandonment of the monitoring wells installed within the boreholes as part of the Geotechnical Investigation. However, these devices will be useful during construction and should be decommissioned as part of the construction contract.

6.2 Preliminary Groundwater Inflow Estimate

WSP Canada Inc. (formerly Golder Associates Limited) completed a geotechnical technical memorandum, "*Preliminary Groundwater Inflow Estimate – Revision 1 - Ottawa Hospital Expansion*" (February 2023), provided under separate cover.

The technical memorandum is summarized below. Refer to the technical memorandum, submitted under separate cover, for further detail.

- The groundwater inflow estimates are based on the following information:
  - A finished floor elevation of 70.36m for the Main Hospital Building.
  - A finished floor elevation of 73.54m for the Central Utility Plant.
  - Groundwater elevation measurements and hydraulic conductivity estimates described within the report titled *"Geotechnical and Hydrogeological Investigation, New Campus Development"* prepared by WSP Canada Inc. (formerly Golder Associates Limited), June 2022.
- Groundwater levels at the south end of the hospital building were found to be between 75m and 76m.
- Groundwater levels further to the north were found to be between 72m and 73m.
- It is expected that the excavation for the Main Hospital Building will be below the existing groundwater levels in predominately silty and sandy soils.
- It will be necessary to temporarily lower the groundwater table below the depth of excavation during construction.
- A simplified analytical solution was used to estimate the potential groundwater inflow into the Main Hospital Building basement excavation.

- The estimate assumed the initial groundwater level was 0.5m higher than the values measured in the monitoring wells and that they would need to be lowers to 1.0m below the finished floor elevation of the hospital basement.
- Dewatering for the excavation is estimated to be between 400,000L/day and 900,000L/day for steady state inflow.
- Dewatering for the excavation is estimated to be between 5,000,000L/day and 8,000,000L/day for initial inflow.

- Groundwater levels at the central utility plant were found to be around 76m.
- It is expected that the excavation for the central utility plant will be below the existing groundwater levels in predominately silty and sandy soils.
- It will be necessary to temporarily lower the groundwater table below the depth of excavation during construction.
- A simplified analytical solution was used to estimate the potential groundwater inflow into the central utility plant excavation.

  - The estimate assumed the initial groundwater level was 0.5m higher than the values measured in the monitoring wells and that they would need to be lowers to 1.0m below the finished floor elevation of the central utility plant.
  - Dewatering for the excavation is estimated to be around 180,000L/day for steady state inflow.
  - Dewatering for the excavation is estimated to be between 1,900,000L/day for initial inflow.

- The estimated radius of influence of the dewatering is estimated to range from around 25m and 75m for the Main Hospital Building and around 40m for the Central Utility Plant.
- The estimated radius of influence does not intersect the heritage buildings located southeast of the Central Utility Plant.
- The estimated radius of influence does intersect the heritage building located west of the Central Utility Plant.
- The amount of drawdown estimated at the heritage building located west of the Central Utility Plant is minimal.
- The slopes of the groundwater levels measured at the site were not able to be represented within the analytical model.
- The assumptions result in a potential overprediction of inflow in areas with less groundwater drawdown.
- Groundwater estimates are preliminary and include several simplified assumptions.
- A numerical model should be completed to better represent the complex geometry of the excavation, the variability in the overburden deposits, and the sloping water table.
- In areas where the grade is being permanently lowered below the groundwater level, permanent drainage works will be required. The volume of groundwater to be managed in the permanent drainage system is anticipated to be similar to the steady-state inflow amounts.
- Permanent drainage works will need to be further studied during detailed design.

6.3 Groundwater Sewer Design Recommendations

WSP Canada Inc. (formerly Golder Associates Limited) completed a sewer discharge memorandum, *"Future Ottawa Hospital Site – Sewer Discharge Results Comparison"* (April 2023), provided under separate cover.

The technical memorandum is summarized below. Refer to the technical memorandum, submitted under separate cover, for further detail.

The review included fifty-two (52) groundwater samples, excluding field duplicates, collected from the site between 2016 and 2023. Samples collected before 2023 were for other purposes than the sewer discharge compliance, therefore not all these samples included the required analytical packages for sewer discharge. Six

(6) groundwater samples were collected in April 2023 from accessible monitoring wells for comparison against sewer discharge compliance and include the analysis of total metals.

- When compared to the City of Ottawa sanitary/combined sewer discharge criteria the following is noted:
  - No exceedances of any of the analyzed parameters compared to the applicable sanitary/combined sewer discharge criteria.
- When compared to the City of Ottawa storm sewer discharge criteria the following is noted:
  - In 2023 and historically, Total Suspended Solids (TSS) were in excess of the storm sewer discharge criteria at five separate locations ranging between 20,000 to 200,000 µg/L compared to the criteria of 15,000 µg/L. TSS is a reflection of the quantity of solids in the sample and can be reduced by filtration or settlement. TSS that is marginally elevated compared to the criteria is most likely due to the method of sample collection from a monitoring well and is expected to be reduced during long term discharge from the site (i.e., from foundation drainage).
  - Concentration of manganese in several samples including the average of all results was in excess of the storm sewer discharge criteria. The average concentration of manganese was 85µg/L for samples collected in 2023 and 165µg/L for samples collected between 2016 and 2021. Both exceed the Ottawa storm discharge criteria of 50µg/L. Manganese is known to be naturally elevated regionally.
  - Copper was in excess of the storm sewer discharge criteria at only one (1) monitoring well in a groundwater sample collected in 2016 with a concentration of 177µg/L compared to the discharge criteria of 40µg/L. It is understood that the location of the monitoring well has been excavated as part of the ongoing remediation work in the former John Carling Building area. Except for this location, the concentration of total copper in groundwater was below the detection limit in all six monitoring wells sampled in 2023 and the average concentration of copper (9.2µg/L) was below the Ottawa storm sewer discharge criteria.
  - Toluene was in excess of the storm sewer discharge criteria at only one (1) monitoring well in a groundwater sample collected in 2017 with a concentration of 4.1µg/L compared to the discharge criteria of 2.0ug/L. Although present at other locations it did not exceed the criteria. The concentration of toluene in groundwater was below the detection limit in 2023 and the average concentration (0.92µg/L) was less than half of the discharge criteria.
- Groundwater quality does not appear to be an issue at the main hospital site that would prevent storm sewer discharge, subject to the following.
  - Dewatering monitoring program should be implemented during construction to monitor the groundwater quality.
  - An exemption for naturally elevated manganese would be required from the City of Ottawa to discharge to the storm sewers.

6.4 Groundwater at Proposed Retaining Walls

WSP Canada Inc. (formerly Golder Associates Limited) completed a retaining wall memorandum, "*Proposed Retaining Walls Along Road D and E*" (A 2023), provided under separate cover.

The technical memorandum states that the retaining walls will act to draw down the water table around the new roads (by providing drainage). As the site becomes developed, there will be additional drainage required (particularly around Road E and the basement of the new building) which will further draw down the groundwater levels at the site (possibly lowering the groundwater even further below the base of the wall). At this point, the retaining walls will form a component of the larger groundwater control strategy for the overall development.

7.0 GEOTECHINCAL RECOMMENDATIONS – OFFSITE ROADWAY MODIFICATIONS

WSP Canada Inc. (formerly Golder Associates Limited) completed a geotechnical investigation in support of the proposed road works surrounding the NCD site for The Ottawa Hospital. Full details of the investigation are provided in the geotechnical technical memorandum *"New Ottawa Hospital Development Phase 1, Roadway Modifications and Municipal Infrastructure Improvements Along Carling Avenue, Preston Street, and Prince of Wales Drive, Ottawa, Ontario"* (October 2022), provided under separate cover.

The technical memorandum recommendations regarding grading, site servicing, and drainage are summarized below. Refer to the technical memorandum, submitted under separate cover, for further detail.

7.1 Excavations

7.1.1 Excavation

- Excavations for municipal services will be through existing asphalt, base/subbase fill, peat/topsoil, variable heterogeneous fill, native glacial till (where present) and into bedrock in many locations.
- Excavations will likely extend below the groundwater level in some location, which was encountered at depths ranging from 1.8m to 2.6m below ground surface.

7.1.2 Overburden

- No unusual problems are anticipated in excavating the majority of the overburden materials using conventional hydraulic excavating equipment.
- Soils above the water table would be classified as a Type 3 soil. Excavations in these materials may be made with side slopes at 1 Horizontal to 1 Vertical (1H:1V).
- Silty and sandy soils (fill and native) below the water table would be classified as a Type 4 soil. Excavations in these materials would require side slopes at a minimum 3H:1V. If groundwater levels are lowered below the depth of excavation, unsupported side slopes may be steepened to 1H:1V.
- Excavation slopes could be steeper with the implementation of fully braced steel trench boxes or shoring systems if sufficient space does not exist.
- Stockpiling beside the excavation should be avoided.

7.1.3 Bedrock

- Bedrock removal is anticipated to achieve the required invert depths.
- Shallow localized bedrock excavation may potentially be carried out using mechanical excavation methos such as hoe ramming, however, more extensive rock excavation will be more economical using drill and blast techniques.
- Rockfall protection (mesh or bolts) may be required for safety at the base on the excavation.
- Rock walls should be inspected at the time of excavation.

7.1.4 Vibration Monitoring

- Caution should be exercised in carrying out bedrock removal around services and structures which may be sensitive to vibrations. Bedrock removal should be controlled to limit the peak particle velocities at all adjacent structures and services such that that risk of vibration induced damage will be mitigated.
- If blasting is chosen, a blasting plan designed by a specialist will be required, and the Contractor should be limited to only small, controlled shots.
- Vibration intensive construction activities should commence at the furthest points from sensitive receptor structures or services to assess the ground vibration attenuation characteristics and to confirm that anticipated ground vibration levels.

- Contractor is required to submit a detailed vibration monitoring plan prior to construction activities. The plan should include proposed excavation methods, vibration monitoring equipment, monitoring locations, frequency of readings, etc.

7.2 Groundwater Control

- Excavations may extend locally below the level of the groundwater.
- If excavations are below the existing groundwater levels in the predominantly silty and sandy soils, it will be necessary to temporarily lower the groundwater tables below the depth of excavation during construction.
- Soils are expected to be sensitive to disturbance. Failure to adequately control groundwater will likely results in excessive soil disturbance in the base of the excavation, as well as potentially piping, heave, and other safety concerns for temporary excavations.
- An Environmental Activity and Sector Registry (EASR) is required for pumping that exceeds 50,000L/day but is less than 400,000L./day.
- A Permit to Take Water (PTTW) is required for pumping that exceeds 400,000L/day.
- The exact excavation extent and depths should be reviewed in order to determine that potential extent of groundwater drawdown. Due to the sandy subsurface soils, it is possible that the groundwater draw down could extend outside the site boundary.

7.3 Impacts to Adjacent Structures

- Where the zone of influences of foundations or critical, movement sensitive, services are within the zone of influences of excavations, it is recommended that any temporary protection systems be designed in accordance with OPSS 539.
- Excavation support and the design of any sloped excavations will need to consider nearby structures/foundations or any existing services that are to be protected during construction.
- Vibration monitoring in conjunction with preconstruction surveys is recommended.

7.4 Site Servicing

- Excavations for site servicing shall be carried out in accordance with the guidelines outline in Section 4.2 of the Geotechnical Investigation.
- Bedding for the service pipes, maintenance holes, or valve chamber structures may be placed on undisturbed native inorganic soil or the limestone bedrock. The existing fill is potentially compressible and is generally considered unsuitable for support of service pipes and structures. Therefore, the existing fill (where present) should be sub-excavated and replaced up to the bottom of the bedding layer using engineered fill. Engineered fill, if required, should consist of either imported Granular B Type II (City of Ottawa SP F-3147) or materials previously excavated at the site (including pavement structure, inorganic sandy fill, or compactable glacial till) can potentially be re-used for this purpose. The suitability of re-using the existing fill and native soil would need to be confirmed at the time of construction by the Geotechnical Engineer. Reuse of excavated materials would also need to take into account soil quality considerations (provided under separate cover within the Phase II ESA report). Engineered fill (either imported or re-used on site) should be placed in maximum 300mm thick lifts and compacted to at least 95% of the material's SPMDD using suitable vibratory compaction equipment. The engineered fill should extend down and away from the bottom of the bedding to the undisturbed native subgrade at a slope of 1 horizontal to 1 vertical. If this cannot be achieved due to space restrictions, the geotechnical engineer should be consulted to assess potential alternatives.
- At least 150mm of Granular A (OPSS.MUNI 1010) should be used as pipe bedding for sewer and water pipes. Where unavoidable disturbance to the subgrade surface occurs during construction, it may be necessary to place a sub-bedding layer consisting of 300mm of compacted Granular B Type II (S.P. F-3147) beneath the Granular A. The bedding material should in all cases extend to the spring line of the pipe and

should be compacted to at least 95% of the material's SPMDD. The use of clear crushed stone as a bedding layer should not be permitted anywhere on this project since fine particles from the sandy backfill materials and native soils could potentially migrate into the voids in the clear crushed stone and cause loss of lateral pipe support. Where the trench will be covered with hard surfaced areas (e.g., pavements and sidewalks), the type of material placed in the frost zone (down to 1.8 m depth) should match the soil exposed on the trench walls for frost heave compatibility.

7.5 Trench Backfill

- Trench backfill shall be in accordance with City of Ottawa specification SP F-2120.
- Trench backfill above the pipe cover material may consist of approved excavated material such as the existing fill (provided that it is free of organic matter and other deleterious materials) and non-clayey native soils, where the service pipes will be overlain by pavements or other hard surfacing. The fill that contains organic matter or deleterious materials are not suitable for reuse as trench backfill and should be wasted upon excavation.
- Imported backfill, if required, should consist of compactable and inorganic earth borrow (OPSS.MUNI 206/212) or Select Subgrade Material (SP F-3147).
- Excavated bedrock may be acceptable as backfill for the lower portion of the trench, provided that the rock fill is broken/crushed to form a well-graded granular material. However, the reuse of such rock fill should be reviewed and approved by the geotechnical engineer at the time of construction once the grading of the material proposed for reuse can be determined. The rock fill should only be placed higher than at least 300mm above the pipe to minimize the potential for damage due to impact or point load. The pieces of the rock fill used as trench backfill should be limited to a maximum of 300mm in nominal size and the rock fill should be disseminated throughout (i.e., nests of large rock pieces should not be permitted).
- It is important for frost heave compatibility that the trench backfill within the frost zone (i.e., between the pavement subgrade level and 1.8m depth below pavement grade) matches the soil exposed on the trench walls. This will require some separation of materials upon excavation. If shallow services are installed within the 1.8m frost zone, frost tapers should be used, as per OPSD 803.030 and 803.031.
- Trench backfill should be placed in maximum 300mm loose lifts and be uniformly compacted to at least 95% of the material's SPMDD. Backfilling operations during cold weather should avoid inclusions of frozen lumps of material, snow, and ice.
- If the construction schedule allows a delay between service installation/trench backfilling and final paving should be made to allow for settlement of the trench backfill material, which will reduce the magnitude of differential movement (i.e., sagging) of pavements placed over backfilled trenches.

7.6 Reuse of Existing Soils

- Native glacial till (provided it has suitable water content to be compactable) may be reused as backfill within service trenched on this project, provided the materials are frost compatible.
- Native glacial till is not suitable for reuse as pavement structure base or subbase materials.
- Heterogeneous still and buried topsoil encountered on site contains organic matter and debris and is not suitable for reuse as base and subbase material.
- Reclaimed asphalt pavement and/or reclaimed concrete material may be used on this project as granular material as stated in OPSS.MUNI 1010.
- Reclaimed asphalt pavement may be used in the asphaltic concrete mixed in accordance with OPSS.MUNI 1151.

7.7 Pavement Design

7.7.1 Subgrade Preparation

- Portions of existing fill will need to be removed to accommodate the new full depth pavement structure.
- All deleterious material should be removed from all pavement areas.
- It should be feasible to leave the existing inorganic fill in place beneath the pavement structure. The subgrade should be proof rolled prior to the placement of new fill.
- Sections requiring grade raising to the proposed subgrade level should be filled using acceptable earth burrow (OPSS.MUNI 206/212), select subgrade material (OPSS.MUNI 1010) or additional granular base if grade changes are minor.
- All fill should be placed in maximum 300mm thick lifts and should be compacted to at least 95% of the material's Standard Proctor Maximum Dry Density using suitable vibratory compaction equipment.

7.7.2 Pavement Drainage

- Subgrade surface should be crowned or sloped to promote drainage of the roadway granular structure.
- Perforated pipe subdrains should be provided along the low sides of the roadway along the entire length.
- Geotextile should be Class I nonwoven in accordance with OPSS 1860 and have a maximum Apparent Opening Size of 212um.
- Subdrains should be connected to the catchbasins such that the pavement structure will be positively drained and intercept flows within the subbase.
- In some areas the existing pavement structure is deeper that the proposed pavement structure. It is important to ensure the new roadway widening does not inadvertently block drainage out of the pavement structure. Consideration should be given to: (i) deepening the proposed pavement thickness with additional granular material to match the top of the existing subgrade; and/or (ii) provide sufficient drainage at the underside of the new/widened pavement structure to ensure positive drainage between the existing and proposed pavement structure.
- Backfilling of catchbasin laterals located below subgrade level should be competed using acceptable native soils or fill which match the material types exposed on the lateral trench walls.

7.7.3 Granular Pavement Materials

- Granular base for new construction should be Granular A (S.P. F-3147).
- The existing fill within the project limits does not generally meet the requirements for Granular A or Granular B Type II.
- Existing fill material could be re-used as general trench backfill or as subbase material for pavement structures.

7.7.4 Traffic Data

- The Annual Average Daily Traffic (AADT) on Carling Avenue between Road A and Trillium LRT Corridor is 21,516 with 3% trucks.
- The AADT on Preston Street between Carling Avenue and Prince of Wales Drive is 18,515 with 2% trucks.
- The AADT on Prince of Wales Drive between Road B and NCC Driveway is 16,272 with 3% trucks.

7.7.5 Existing Pavement Structure

- Carling Avenue: the existing pavement structure consists of 130mm to 150mm of asphaltic concrete over 200mm to 460mm of concrete over a 690mm to 760mm thick combined base/subbase layer.
- Preston Street: the existing pavement structure consists of 130mm to 150mm of asphaltic concrete over 210mm to 230mm of concrete over a 630mm to 730mm thick combined base/subbase layer.

- Prince of Wales: the existing pavement structure consists of 150mm to 300mm of asphaltic concrete over 200mm to 510mm thick combined base/subbase layer.

7.7.6 Recommended Pavement Design

The flexible pavement structures are shown in **Table 7-1**.

Table 7-1: Recommended Flexible Pavement Design

Road	Thickness (mm)	Material Description
Carling Avenue (between Road A and Trillium)	50	SP 12.5mm (Traffic Level C, FC1 PG 64-34)
	100	SP 19.0mm binder course placed in two 50mm lifts
	150	S.P. F-3147 Granular A Base
	500	S.P. F-3147 Granular B Type II Subbase
Preston Street (between Carling Avenue and Prince of Wales Drive)	50	SP 12.5mm (Traffic Level C, FC1 PG 64-34)
	100	SP 19.0mm binder course placed in two 50mm lifts
	150	S.P. F-3147 Granular A Base
	400	S.P. F-3147 Granular B Type II Subbase
Prince of Wales Drive (between Road B and NCC Driveway)	50	SP 12.5mm (Traffic Level C, FC1 PG 64-34)
	100	SP 19.0mm binder course placed in two 50mm lifts
	150	S.P. F-3147 Granular A Base
	400	S.P. F-3147 Granular B Type II Subbase
Commercial Entrances	50	SP 12.5mm (Traffic Level C, FC1 PG 64-34)
	100	SP 19.0mm binder course placed in two 50mm lifts
	150	S.P. F-3147 Granular A Base
	400	S.P. F-3147 Granular B Type II Subbase

The asphaltic concrete should meet the requirements of City of Ottawa Specification F-3106. The Performance Graded Asphalt Cement should consist of PG 64-34 for Traffic Category C.

The rigid pavement structures are shown in **Table 7-2**.

Table 7-2: Recommended Rigid Pavement Design

Road	Thickness (mm)	Material Description
Carling Avenue (between Road A and Trillium)	225	Portland Cement Concrete
	150	S.P. F-3147 Granular A Base
	400	S.P. F-3147 Granular B Type II Subbase
Preston Street (between Carling Avenue and Prince of Wales Drive)	200	Portland Cement Concrete
	150	S.P. F-3147 Granular A Base
	400	S.P. F-3147 Granular B Type II Subbase
Prince of Wales Drive (between Road B and NCC Driveway)	200	Portland Cement Concrete
	150	S.P. F-3147 Granular A Base
	400	S.P. F-3147 Granular B Type II Subbase

The Portland cement concrete should meet the requirements of CSA A 23.1 Class C2 exposure. Concrete joint specifications and spacing should be in accordance with OPSD 552.020 and OPSD 551.010.

7.7.7 Pavement Structure Compaction

- Compaction shall conform with OPSS 501 Construction Specification for Compacting.
- Granular base and subbase material should be uniformly compacted to at least 100% of the Standard Proctor Maximum Dry Density using suitable vibratory compaction equipment.
- Compaction of the asphaltic concrete should be in accordance with OPSS 310 Table 10.
- Placement and compaction of engineered fill and sewer/watermain bedding and backfill should be inspected to ensure conformance.
- Compaction testing and sampling of the asphaltic concrete should be carried out.

7.7.8 Joints, Tie-ins with Existing Pavement, Pavement Resurfacing

- Pavement should be milled back beyond the curb return an additional 300mm to a depth of 40mm to accept the surface course asphaltic concrete.
- Pavement granular and subgrade level should be tapers between the new and existing pavements using a 10H:1V tapers.
- Tack coat should be provided on all vertical and milled horizontal surfaces.
- Tack coat should consist of SS-1 emulsified asphalt diluted with an equal amount of water. The undiluted and emulsified asphalt shall conform with OPSS 1103.

7.7.9 Corrosion and Cement Type

- Concrete made with type GU Portland cement is considered acceptable for buried concrete elements.
- Elevated potential for corrosion of exposed ferrous metal (steel, iron, etc.) which should be considered in the design of substructures and buried utilities.
- Corrosion protection systems or steels coating may be required but should be selected by a Structural Engineer.

8.0 GEOTECHNICAL RECOMMENDATIONS – CENTRAL UTILITY PLANT

WSP Canada Inc. (formerly Golder Associates Limited) a geotechnical investigation in support of the proposed Central Utility Plant Building for The Ottawa Hospital. Full details of the investigation are provided in the geotechnical report *"Ottawa Hospital New Development, Central Utility Plant Building"* (July 2023), provided under separate cover.

The report's recommendations regarding grading, site servicing, and drainage are summarized below. Refer to the report, submitted under separate cover, for further detail.

8.1 Site Grading

The existing ground elevations in around the proposed Central Utility Plant building are approximately 81m to 83m. The proposed building will have a basement level with a finished floor elevation (FFE) of 73.5m, meaning the building will essentially be underground relatively to the existing site grades.

8.1.1 Grade Lowering

- Grade on the north side of the Central Utility Plant will be permanently lowered to the elevation of the access road and grade on the southeast and southwest sides of the building will remain to existing conditions.
- The Central Utility Plant structure and any lowered areas (basement, roads, parking lot, slopes, walls, etc.) will be located under the existing groundwater table and will need to incorporate significant drainage works.

8.1.2 Grade Raising

- The Central Utility Plant site is underlain by glacial till and bedrock. Thus, there is no practical limits on the minor grade raises (if required) to match the existing ground around the building.

- Topsoil and fill, containing deleterious fill material, should be stripped.
- Compacted engineered fill consisting of Granular B Type I or Type II (City of Ottawa SP F-3147) can be used under hard surfaces or structures where excavations need to be brought up to grade.
- General earth fill can be used under landscaped areas where excavations need to be brought up to grade.
- Engineered fill should be placed in maximum 300mm thick lifts and compacted to at least 95% of the materials Standard Proctor Maximum Dry Density under pavements and hard surfaces or 100% of the materials Standard Proctor Maximum Dry Density under foundations and structures.
- Existing granular fill material would need to be reviewed during construction to determine re-use suitability.
- Topsoil and any excess fill materials should be stockpiled separately for re-use in landscaping applications only.

8.1.3 Frost Protection

- All exterior foundation elements and interior foundation elements in unheated areas should be provided with a minimum of 1.5m earth cover for frost protection purposes. Isolated, unheated exterior footing/pile caps adjacent to surfaces which are cleared of snow cover during winter months should be provided with a minimum of 1.8m of earth cover.
- Insulation with high density polystyrene foam could be considered as an alternative to earth cover for frost protection.

8.1.4 Foundations

- The Central Utility Plant Building will have a relatively light loaded foundation (essentially a single-storey building). Assuming typical low-rise building loads apply, it is likely that the building can be supported on shallow foundations.
- The shallow foundations of the Central Utility Plant Building will likely sit on bedrock and native soil. Refer to the Geotechnical Report for more information on shallow foundations on bedrock versus soil.
- If a slab on grade foundation is adopted for the Central Utility Plant Building, any topsoil, organic material, wet or disturbed material should be removed from the building footprint. Provision should be made for at least 200mm of City of Ottawa SP F-3147 Granular A compacted to a minimum of 100% of the SPMDD to form the base for the floor slab. Any required fill under the Granular A should consist of City of Ottawa SP F-3147 Granular Type II placed in maximum 300mm thick lifts compacted to at least 95% of the SPMDD.

8.2 Excavations & Groundwater Control

8.2.1 Temporary Excavations

- No unusual problems are anticipated with excavating the overburden using conventional hydraulic excavating equipment.
- Excavations above the groundwater and within the fill, silty sand, native silty clay, and glacial till should be stable at 1H:1V side slopes in the short term. These soils would be classified as Type 3.
- Excavation below the groundwater and within the silty and sandy soils (both fill and native) require minimum 3H:1V side slopes. These soils would be classified as Type 4. If the groundwater is lowered and maintained below the excavation, unsupported side slopes may be steepened to 1H:1V.
- Open-cut methods are expected to be feasible in most areas provided sufficient space exists to accommodate the excavations.
- Shoring systems can be implemented where sufficient space is not available and/or limiting the area of impact is preferred. Typical shoring includes tied back sheet pile walls or soldier pile and lagging systems.
- The shoring system required for this type of project is typically designed and constructed by a Specialist Contractor. The system needs to support the surrounding soils as well as adjacent structures, roads, utilities, etc.

- Excavations for site services can be completed by sloping excavations where space permits or vertical sides complete with fully braced steel trench boxes or shoring systems.
- Bedrock excavation may be required for municipal services installation. Mechanical excavation methods such as hoe ramming can be used, however drill and blast techniques should be used for more extensive excavation.
- Where significant disturbance of the rock face exists, localized rockfall protection such as scaling of loose blocks, installation of mesh, bolts, etc. may be required for the safety of workers.
- Relatively steep to near-vertical rock excavation are expected to stand unsupported however rock faces over 9-10m high should be inspected so that any safety concerns with the rock face can be addressed.

8.2.2 Overburden

- No unusual problems are anticipated in excavating the majority of the overburden materials using conventional hydraulic excavating equipment.
- Soils above the water table would be classified as a Type 3 soil. Excavations in these materials may be made with side slopes at 1 Horizontal to 1 Vertical (1H:1V).
- Silty and sandy soils (fill and native) below the water table would be classified as a Type 4 soil. Excavations in these materials would require side slopes at a minimum 3H:1V. If groundwater levels are lowered below the depth of excavation, unsupported side slopes may be steepened to 1H:1V.
- Excavation slopes could be steeper with the implementation of fully braced steel trench boxes or shoring systems if sufficient space does not exist.
- Stockpiling beside the excavation should be avoided.

8.2.3 Bedrock

- Bedrock removal is anticipated to achieve the required invert depths.
- Shallow localized bedrock excavation may potentially be carried out using mechanical excavation methos such as hoe ramming, however, more extensive rock excavation will be more economical using drill and blast techniques.
- Rockfall protection (mesh or bolts) may be required for safety at the base on the excavation.
- Rock walls should be inspected at the time of excavation.
- Contractor is required to submit a detailed vibration monitoring plan prior to construction activities. The plan should include proposed excavation methods, vibration monitoring equipment, monitoring locations, frequency of readings, etc.

8.2.4 Groundwater Control

- Temporary lowering of the groundwater table below the depth of excavation will be required during construction.
- Significant groundwater inflow is expected during construction and careful groundwater management will be required.
- Groundwater management will need to include active dewatering from wells and well-points systems in deep excavations. Excavations just below the groundwater table may be able to be controlled by pumping from properly filtered sumps.
- Soils are sensitive to disturbance and failure to control groundwater will result in excessive soil disturbance in the base of excavations as well as potential piping, heave, and other safety concerns for temporary excavations. Soil disturbance will also impact bearing resistance and settlement potential of foundations.
- The contractor is typically responsible for the design of a temporary groundwater control system and should be required to submit a detailed de-watering work plan for review given the extent of dewatering required.
- A Ministry of the Environment, Conservation and Parks Environmental Activity and Sector Registration is required for pumping that exceeds 50,000L/day but less than 400,000L/day.

- A Ministry of the Environment, Conservation and Parks Environmental Activity Permit to Take Water (PTTW) is required for pumping that exceeds 400,000L/day.
- A Permit to Take Water will likely be required for this project.
- Due to the sandy nature of the sub-surface soils, groundwater drawdown will likely extend outside the site boundary.
- A hydrogeological study will be required to support the application for a PTTW, refine estimated dewatering volumes and determine the potential extent of groundwater drawdown during construction.

8.3 Foundation Wall Backfill and Drainage

- Foundation and basement walls should be backfilled with non-frost susceptible sand or sand and gravel conforming to the City of Ottawa SP F-3147.
- Backfill materials should be placed in 300mm lifts and compacted to at least 95% of the materials Standard Proctor Maximum Dry Density to avoid ground settlement.
- Backfill adjacent to the wall should be placed to form a frost taper in areas where hard surfaces are adjacent to the building to reduce differential frost heaving. Frost taper should be brought up to the pavement subgrade level from 1.5m below the finished exterior grade at a slope of 3H:1V (or flatter) away from the wall. The fill should be placed in maximum 300mm thick lifts and should be compacted to at least 95% of the materials Standard Proctor Maximum Dry Density.
- Foundation wall should be wrapped in a drainage board (Miridrain or similar) and be drained by a perforated pipe subdrain in a surround of 19mm clear stone, fully wrapped in geotextile, which leads via gravity to a storm sewer of pumped from a sump pit.
- Subdrains should be provided below the basement level (perforated pipe drains place on 6m centres) since it will be below the existing groundwater table.
- Long-term flow estimates can be determined based on the final proposed basement layout and depth as part of the hydrogeological study required as part of the PTTW.

8.4 Site Servicing

- Excavations should be conducted in accordance with guidance provided for temporary excavations.
- Bedding for service pipes, maintenance holes, or valve chambers structures may be placed on undisturbed native inorganic soil or limestone bedrock.
- Existing fill should be reviewed and approved by a qualified geotechnical engineer. If not found to be suitable, the existing fill may require re-compaction or sub-excavation and replacement up to the bottom of the bedding layer using engineered fill.
- Engineered fill should consist of imported Granular B Type II (City of Ottawa SP F-3147) or suitable approved materials previously excavated from the site.
- Engineered fill should be placed in maximum 300mm thick lifts and compacted to at least 95% of the materials Standard Proctor Maximum Dry Density. It should extend down and away from the bottom of the bedding to the undisturbed native subgrade at a slope of 1H:1V.
- Re-use of excavated material would also need to take into account environmental considerations. Guidance should be provided by the environmental consultant.
- 150mm of Granular A (City of Ottawa SP F-3147) should be used for sewer and water pipe bedding.
- Where unavoidable disturbance to the subgrade surface occurs during construction, a sub-bedding layer may be necessary and should consist of 300mm of compacted Granular B Type II (City of Ottawa SP F-3147) beneath the Granular A.
- Bedding should extend to the spring line of the pipe and compacted to at least 95% of the materials Standard Proctor Maximum Dry Density.

8.5 Trench Backfill

- Trench backfill should conform with City of Ottawa SP F-2120.
- Trench backfill above the pipe cover material may consist of approved excavated material such as the existing fill (provided that it is free of organic matter and other deleterious materials) and non-clayey native soils, where the service pipes will be overlain by pavements or other hard surfacing. The fill that contains organic matter or deleterious materials are not suitable for reuse as trench backfill and should be wasted upon excavation.
- Imported backfill, if required, should consist of compactable and inorganic earth borrow (OPSS.MUNI 206/212) or Select Subgrade Material (City of Ottawa SP F-3147).
- Where the trench will be covered with hard surfaced areas (e.g., pavements and sidewalks), the type of material placed in the frost zone (down to 1.8 m depth) should match the soil exposed on trench wall for frost heave compatibility.
- Trench backfill should be placed in maximum 300mm loose lifts and be uniformly compacted to at least 95% of the materials Standard Proctor Maximum Dry Density. Backfilling operations during cold weather should avoid inclusions of frozen lumps of material, snow, and ice.
- If the construction schedule allows a delay between service installation/trench backfilling and final paving should be made to allow for settlement of the trench backfill material, which will reduce the magnitude of differential movement (i.e., sagging) of pavements placed over backfilled trenches.

8.6 Pavement Design

8.6.1 Profile Grade

- No significant post-construction primary consolidation or secondary compression settlements of the subgrade soils are expected.
- Some settlement above the service trenches should be expected due to settlement of backfill. Magnitude of settlement should be within tolerable limits if compaction is conducted in accordance with the geotechnical report.

8.6.2 Subgrade Preparation

- Existing fill may need to be removed to accommodate the full depth of the new pavement structure.
- All deleterious material should be removed from all pavement areas.
- It should be feasible to leave the existing inorganic fill in place beneath the pavement structure. In this case, the subgrade should be proof rolled prior to the placement of new fill.
- Areas requiring grade raising to the proposed subgrade level should be filled using acceptable earth borrow (OPSS MUNI 206/221), Select Subgrade Material (OPSS MUNI 1010), or additional granular base if the grade changes are minor.
- Fill should be placed in maximum 300mm thick lifts and compacted to at least 95% of the materials Standard Proctor Maximum Dry Density.

8.6.3 Pavement Drainage

- Subgrade surface should be crowned or sloped to promote drainage of the roadway granular structure.
- Perforated pipes should be provided along the low sides of the roadway along the entire length.
- Geotextile should Class I nonwoven (OPSS 1860) and should have a maximum apparent opening size of 212um.
- Subdrains should be connected to the catchbasins such that the pavement structure will have positive drainage and intercept flows within the subbase.
- Subdrains should not be allowed to drain on existing slopes.

- Backfilling of catchbasin laterals below the subgrade should be completed using acceptable native soils or fill that match the material types expose in the lateral trench walls to reduce potential problems associated with differential frost heaving.
- Drainage below the road immediately north of the CUP building will be required considering that the road will be built below the groundwater table. Site drainage for the CUP must be coordinated with the drainage for the main hospital.

8.6.4 Granular Pavement Materials

- Granular base and subbase for new construction should consist of Granular A and Granular B Type II (SP F-3147), respectively.
- Existing fill within the project limit would generally not meet the requirements for Granular A or Granular B Type II. However, the existing fill material could be re-used as general trench backfill or as subgrade material for pavements provided that is free of deleterious material and organic matter.

8.6.5 Pavement Design

Parking Areas

The pavement structure for parking areas is shown in **Table 8-1.**

Table 8-1: Recommended Pavement Structure – Parking Areas

Thickness (mm)	Material Description
50	Superpave 12.5mm Surface Course
150	S.P. F-3147 Granular A Base
400	S.P. F-3147 Granular B Type II Subbase

The asphaltic concrete should meet the requirements of City of Ottawa specification F-3106. The Performance Graded Asphalt Cement should consist of PG 58-34 for Traffic Category B.

Light-Use Roads (No Buses of Trucks)

The pavement structure for light use roads, not exposed to bus or heavy truck traffic, is shown in **Table 8-2**.

Table 8-2: Recommended Pavement Structure – Light-Use Roads

Thickness (mm)	Material Description
40	Superpave 12.5mm Surface Course
50	Superpave 19.0mm Binder Course
150	S.P. F-3147 Granular A Base
400	S.P. F-3147 Granular B Type II Subbase

The asphaltic concrete should meet the requirements of City of Ottawa specification F-3106. The Performance Graded Asphalt Cement should consist of PG 58-34 for Traffic Category B.

Heavy-Use Routes

The pavement structure for roads which see heavy traffic (such as buses, trucks, etc.), is shown in **Table 8-3.**

Table 8-3: Recommended Pavement Structure – Heavy-Use Routes

Thickness (mm)	Material Description
50	Superpave 12.5mm FC1 Surface Course
70	Superpave 19.0mm Binder Course
150	S.P. F-3147 Granular A Base
400	S.P. F-3147 Granular B Type II Subbase

The asphaltic concrete should meet the requirements of City of Ottawa specification F-3106. The Performance Graded Asphalt Cement should consist of PG 64-34 for Traffic Category C.

Pavement Structure Compaction

- Adequate compaction is essential to the continued acceptable performance of the roadway.
- Compaction should conform with OPSS 501 – Construction Specification for Compacting. Compacted densities of various materials should conform with Subsection 501.08.02 Method A.
- Granular base and subbase materials should be compacted to a least 100% of the Standard Proctor Maximum Dry Density.
- Compaction of the asphaltic concrete should conform OPSS 310 Table 10.
- Placement and compaction of all engineered fill and bedding and backfill for services should be inspected to ensure the materials confirm with the grading and compaction specifications.
- Compaction testing and sampling of the asphaltic concrete should be conducted during construction.

Joints, Tie-ins with Existing Pavements, Pavement Resurfacing

- At intersections, the new pavement structure should be continued at least to the limits of construction of the end of the curb return.
- At these streets, the pavement should be milled back beyond the curb return an additional 300mm to a depth of 40mm to accept the surface course asphaltic concrete.
- Pavement granular and subgrade level should be tapered between new and existing pavements using 10H:1V tapers.
- Tack coat should be provided on all vertical and milled horizontal surfaces.
- Tack coat should consist of SS-1 emulsified asphalt diluted with an equal amount of water.
- Undiluted and emulsified asphalt shall conform with OPSS 1103.

Reuse of Existing Soils

- Native glacial till, gravelly sand, silty sand and sand deposits (provided it has suitable water content for compaction) may be reused as backfill within service trenches provided the materials are frost compatible.
- Portions of the existing soils are likely suitable for reuse as pavement subgrade material, but the soil at the site is highly variable and contains numerous cobbles and boulders. Review will be required to maximize soil available for re-use.
- Reclaimed asphalt pavement and/or reclaimed concrete material may be used as granular material as stated in OPSS MUNI 1010 Material Specification for Aggregates – Base, Subbase, Select Subgrade and Backfill Material.
- Reclaimed asphalt pavement may be used in the asphaltic concrete mixes in accordance with OPSS MUNI 1151.

Corrosion and Cement Type

- Water-soluble sulphate (SO4) content in the tested samples was less than 0.1% or below 150mg/L. As such, concrete made with type GU Portland cement is considered acceptable for buried concrete elements.

- Elevated potential for corrosion of exposed ferrous metal should be considered in the design of substructures.
- Corrosion protection systems of steel coating may be required but should be selected by a Structural Engineer.

8.7 Additional Considerations

- WSP Canada Inc. should be retained to review the final drawings and specifications prior to construction to ensure that the guidance provided within the Geotechnical Report was adequately interpreted.
- Development of the CUP site will impact the development of the adjacent main hospital site (and vice-versa). The design and construction of the CUP should be coordinated with the design and construction of the main campus.
- All prepared subgrade surfaces for roadways, parking areas, floor slabs, foundations, etc. should be reviewed by WSP Canada Inc. to ensure they have been prepared adequately.
- Placement and compaction of all engineered fill should be inspected and tested to ensure materials confirm with both the grading and compaction specifications.
- Soil samples collected as part of the Geotechnical Investigation are only maintained for three (3) months following the issuance of the report.
- Ontario Regulation 903 requires abandonment of the monitoring wells installed within the boreholes as part of the Geotechnical Investigation. However, these devices will be useful during construction and should be decommissioned as part of the construction contract. Some of those devices will be useful during dewatering to monitor the progress of groundwater lowering.

9.0 WATER SERVICING

9.1 Proposed Water Servicing

A 300mm diameter watermain loop (part of Advance Works) is proposed around the Main Hospital Building that will connect to the existing 406mm diameter watermain on Carling Avenue at the Carling Avenue and Road B/Champagne Avenue South intersection and Carling Avenue and Sherwood Drive. The proposed 300mm diameter watermain loop will also connect to the proposed 300mm diameter watermain at the Road A and Road B intersection within the site.

The Main Hospital Building will be serviced with two (2) 200mm diameter water services (not part of advanced works) at the east end of Tower B, extended from the 300mm diameter watermain loop. The Central Utility Plant will be serviced with two (2) 200mm diameter water services (not part of Advance Works) extended from the 300mm diameter watermain loop located within Road E.

The Central Experimental Farm has two (2) existing 300mmd diameter watermain loops that extend onto the hospital leased land from Maple Drive. A section of both watermain loops need to be relocated to ensure adequate domestic water supply and fire flow demand. The 300mm diameter watermain relocation for the northern loop (part of Advance Works) will be within the construction easement on the Central Experimental Farmland, adjacent to the northeast property limit. The existing fire hydrant at the Maple Drive and Birch Drive intersection will be removed and relocated to ensure the fire hydrant is accessible. The proposed relocation maintains a looped configuration to ensure redundancy. The 300mm diameter watermain relocation for the southern loop (part of Advance Works) will be located on both Central Experimental Farmland and hospital leased land. A new connection to the existing watermain on Maple Drive will be made at the access road on the south side of the William Saunders Building. The proposed 300mm diameter will extend east along the access road, south along Birch Drive, and then east within the hospital leased land to Prince of Wales Drive. At Prince of Wales Drive, it will connect into the existing watermain that extends east of Prince of Wales Drive. Refer to **APPENDIX E** for the Agriculture and Agri Food Canada Existing Infrastructure technical memorandum for further details.

The design drawings, in Error! Reference source not found., show the existing and proposed water distribution network.

9.2 Design Criteria

The proposed watermain distribution system for the Central Utility Plant and Main Hospital Building has been designed in general conformance with the City of Ottawa Water Design Guideline as amended by its Technical Bulletins.

The system pressure criteria under normal and various operating conditions are listed in **Table 9-1**.

Table 9-1: Water System Pressure – Criteria

Operating Conditions	Pressure Criteria	
	kPa	psi
Average Daily Demand		
Minimum to Maximum	276-552	40-80
Desirable Range	350-480	50-70
Peak Hourly Demand		
Minimum to Maximum	276-552	40-80
Desirable Range	350-480	50-70
Maximum Daily Demand + Fire Flow		
Minimum	140	20

During the design of the Parking Garage (Phase 2), the City of Ottawa provided boundary conditions for the existing 406mm diameter watermain on Carling Avenue, as shown in **Table 9-2** and **Table 9-3**. A copy of the correspondence is included in **APPENDIX G**.

Table 9-2: Boundary Conditions - 406mm Watermain on Carling Avenue (Parking Garage)

Minimum HGL	Maximum HGL	Maximum Day + Fire Flow
107.1m	114.6m	107.8m
60psi	71psi	61psi
414KPa	487KPa	421KPa

**The associated pressures in psi and kPa are based on a ground elevation at the connection location of 64.84m.*

Table 9-3: Boundary Conditions - 406mm Watermain on Carling Avenue (Parking Garage & Hospital)

Minimum HGL	Maximum HGL	Maximum Day + Fire Flow
107.1m	114.6m	107.6m
60psi	71psi	61psi
414KPa	487KPa	419KPa

**The associated pressures in psi and kPa are based on a ground elevation at the connection location of 64.84m.*

The boundary conditions provided demonstrate that the available pressure ranges from approximately 60psi to 71psi during normal operating conditions.

Revised boundary conditions will be requested from the City of Ottawa as the design moves forward and additional accuracy is provided from the design team regarding actual demands for the Central Utility Plant and Main Hospital Building.

The fire flow will be calculated using the Fire Underwriters Survey (FUS) *(2020 Version)*.

The City of Ottawa Water Design Guideline requires that *"Service areas with a basic day demand greater than 50 m^3/day (about 50 homes) shall be connected with a minimum of two watermains, separated by an isolation valve, to avoid the creation of a vulnerable service area. Individual residential facilities with a basic day demand greater than 50 m^3/day shall be connected with a minimum of two water services, separated by an isolation valve, to avoid the creation of a vulnerable service area."* The proposed basic day demand is greater than 50 m^3/day, therefore; two water services to the Central Utility Plant and Main Hospital Building are required.

The new water services will be installed with a minimum depth of cover of 2.4m where possible. Should there be less than 2.4m cover or separation from an open structure, the pipes will be insulated in accordance with City of Ottawa Standard Drawings W22 and W23.

High pressure is not an issue on this site as the boundary conditions are below 80psi. Therefore, pressure reducing valves will not be required.

9.3 Water Calculations

9.3.1 Fire Demand

The fire flow for the Central Utility Plant, Main Hospital Building, and Pavilion were calculated using the *Fire Underwriters Survey (FUS) Water Supply for Public Fire Protection 2020*. These fire flow estimates will need to be refined as the design moves forward.

The required fire flow is determined by the following formula:

$$F = 220C\sqrt{A}$$

Where,

F = the required fire flow in litres per minute (L/min)

C = coefficient related to the type of construction

= 1.5 for **Type V** Wood Frame Construction

= 0.8 for **Type IV-A** Mass Timber Construction

= 0.9 for **Type IV-B** Mass Timber Construction

= 1.0 for **Type IV-C** Mass Timber Construction

= 1.5 for **Type IV-D** Mass Timber Construction

= 1.0 for **Type III** Ordinary Construction

= 0.8 for **Type II** Non-Combustible Construction

= 0.6 for **Type I** Fire Resistive Construction

A = total effective area is the largest floor area in square metres plus the following percentages of the total area of the other floors:

- Building classified with a Construction Coefficient from 1.0 to 1.5
  - 100% of all floor areas are considered in determining the total effective area to be used in the formula.
- Building classified with a Construction Coefficient below 1.0
  - If any vertical openings in the building are unprotected, consider the two largest adjoining floor areas plus 50% of all floors immediately above them up to the maximum of eight (8).
  - If all vertical openings and exterior vertical communications are properly protected in accordance with the National Building Code, consider only the single largest floor are plus 25% of each of the two (2) immediately adjoining floors.

- Basement floor area is excluded from the total effective area when the basement is at least 50% below grade in the building being considered.
- For open parking garages, use the area of the largest floor as the total effective area.

<u>Central Utility Plant</u>

The required fire flow is **167L/s** based on the following parameters, refer **APPENDIX H** to for detailed calculations:

- Construction Coefficient (C)
  - A construction coefficient of 0.6 was selected as the structure will have a fire rating of 2 hours.
- Floor Area (A)
  - The total effective floor area for the Central Utility Plant was assumed to be 24,000m^2 (this is approximately two (2) times the floor area).
  - The total effective floor area for the Central Utility Plant will need to be refined as the building design moves forward.
- Occupancy Factor
  - An occupancy factor of **0% (combustible)** was selected for the proposed Central Utility Plant.
- Sprinkler Factor
  - A total reduction factor of **50%** (automatic sprinklers NFPA standards, standard water supply, and full supervision) was selected for the proposed Central Utility Plant.
- Exposure Factor
  - A percentage of **0%** was selected as the separation to existing and proposed buildings is greater than 30m.

The fire flow for the Central Utility Plant will need to be reviewed and refined as the building design moves forward.

<u>Main Hospital Building</u>

The required fire flow is **250L/s** based on the following parameters, refer **APPENDIX H** to for detailed calculations:

- Construction Coefficient (C)
  - A construction coefficient of 0.6 was selected as the structure will have a fire rating of 2 hours.
- Floor Area (A)
  - The total effective floor area for the Main Hospital Building was calculated to be **61,518m^2** (this includes the largest floor and additional two (2) adjoining floors at 25%).
  - The largest floor is Level 01 at 42,266m^2 (30,266m^2 for the Main Hospital Building + 12,000m^2 assumed for the future Heart Institute).
  - The adjoining floor below is Emergency at 41,737m^2 (29,737m^2 for the Main Hospital Building + 12,000m^2 assumed for the future Heart Institute).
  - The adjoining floor above is Level 02 at 36,860m^2 (24,860m^2 for the Main Hospital Building + 12,000m^2 assumed for the future Heart Institute).
  - The total effective floor area for the Main Hospital Building will need to be refined as the building design moves forward.
- Occupancy Factor
  - An occupancy factor of **-15% (limited combustible)** was selected for the proposed Main Hospital Building.
- Sprinkler Factor
  - A total reduction factor of **50%** (automatic sprinklers NFPA standards, standard water supply, and full supervision) was selected for the proposed Main Hospital Building.
- Exposure Factor
  - A percentage of **+5%** was selected to account for the Pavilion which will be located within the Main Hospital Building but subdivided with a firewall(s).

- The Pavilion will be located within 0m to 3m from the north side and west side of the Main Hospital Building.
- The following three (3) assumptions were made:
  - The length-height factor of the exposing building (future towers) will be over 100;
  - The construction type of the exposing building (future towers) will be Type I-II[3]; and
  - The exposing building will be fully protected with an automatic sprinkler system.

The fire flow for the Main Hospital Building will need to be reviewed and refined as the building design moves forward.

<u>Pavilion</u>

The required fire flow is **250L/s** based on the following parameters, refer **APPENDIX H** to for detailed calculations:

- Construction Coefficient (C)
  - A construction coefficient of **1.5** was selected as the structure will be mass timber.
- Floor Area (A)
  - The total effective floor area for the Pavilion was calculated to be **6,825m²** (this includes 100% of all floor area)
  - The total effective floor area for the Pavilion will need to be refined as the building design moves forward.
- Occupancy Factor
  - An occupancy factor of **0% (combustible)** was selected for the proposed Pavilion.
- Sprinkler Factor
  - A total reduction factor of **50%** (automatic sprinklers NFPA standards, standard water supply, and full supervision) was selected for the proposed Pavilion.
- Exposure Factor
  - A percentage of **+5%** was selected to account for the Pavilion which will be located within the Main Hospital Building but subdivided with a firewall(s).
  - The Pavilion will be located within 0m to 3m from the north side and west side of the Main Hospital Building.
  - The following three (3) assumptions were made:
    - The length-height factor of the exposing building (future towers) will be over 100;
    - The construction type of the exposing building (future towers) will be Type I-II3; and
    - The exposing building will be fully protected with an automatic sprinkler system.

The fire flow for the Pavilion will need to be reviewed and refined as the building design moves forward.

9.3.2 Water Demand

The anticipated water demand for the Central Utility Plant, Main Hospital Building, and Parking Garage are shown in **Table 9-4**, refer to **APPENDIX H** for detailed calculations. It should be noted that the Parking Garage calculations are described within the *Site Servicing and Stormwater Management Report, New Civic Development for The Ottawa Hospital Phase 2: Parking Garage Project, May 2023,* that was prepared by Parsons.

Table 9-4: Estimated Water Demands

Building	Average Day Demand (ADD) L/s	Maximum Daily Demand (MDD) L/s	Peak Hourly Demand (PHD) L/s	Fire Flow Demand (FF) L/s	MDD + FF L/s
Main Hospital	22.82	34.22	61.60	250	285

				250(1)	285
Central Utility Plant	11.00	28.33	51.00	167	196
Parking Garage	1.14(2)	1.70(2)	3.07(2)	367(2)	369(2)

(1) Fire flow required for the Pavilion (proposed timber construction)
(2) The Parking Garage calculations are described within the Site Servicing and Stormwater Management Report, New Civic Development for The Ottawa Hospital Phase 2 Parking Garage Project, May 2023, that was prepared by Parsons.

The demands for the Central Utility Plant and Main Hospital Building will need to be revisited/revised during detail design when additional accuracy is obtained from the building design team and interior architectural floor plans.

9.4 Water Results

The pressures were determined for the average day demand (ADD), maximum daily demand (MDD), peak hourly demand (PHD), and maximum daily demand plus fire flow (MDD+FF) based on the boundary conditions provided by the City of Ottawa.

The following scenarios were modelled in WaterCAD, and the pressures are shown in **Table 9-5.**

Table 9-5: WaterCAD Pressures

Scenario	Total Demand(1) L/s	Minimum Pressure kPa	Minimum Pressure psi	Maximum Pressure kPa	Minimum Pressure psi
Scenario 1 – Average Day Demand	34.96	245(2)	36(2)	421	61
Scenario 2 – Maximum Daily Demand	64.26	243(3)	35(3)	421	61
Scenario 3 – Peak Hourly Demand	115.67	236(4)	34(4)	421	61
Scenario 4 – Fire @ East Side of Hospital (Loading Dock)	314.26	146	21	421	61
Scenario 5 – Fire @ Pavilion	314.26	191	28	421	61
Scenario 6 – Fire @ West Side of Hospital	314.26	173	25	421	61
Scenario 7 – Fire @ Future Heart Institute	314.26	120(5)	17(5)	421	61
Scenario 8 – Fire @ Back Hospital	314.26	138(5)	20(5)	421	61
Scenario 9 – Fire @ Parking Garage	397.26	184	27	421	61
Scenario 10 – Fire @ Front Hospital	314.26	191	28	421	61
Scenario 11 – Fire @ CUP	314.26	143	21	421	61

(1) Demands include Phase 2 (Parking Garage), Phase 3 (Central Utility Plant), Phase 4 (Main Hospital Building)
(2) The minimum pressure falls below 40 psi (minimum City of Ottawa requirement) due to topographic constraints. At proposed junctions adjacent to Prince of Wales Drive (J34, J-35, J-36, and J-44), at the intersection of Road D and Road E (H-6, J-7, and J-8), and at the front entrance of the Main Hospital Building (H17). In all locations, there is a significant elevation difference between Carling Avenue and the area, an approximately 17.5m increase by Prince of Wales Drive and 15m increase at the Road D and Road E intersection and front of the Main Hospital Building. These elevations are required to tie the site into Maple Drive and Prince of Wales Drive. No buildings services are proposed within this area. All other junctions within the site are above the minimum City of Ottawa requirement of 40 psi.
(3) The minimum pressure falls below 40 psi (minimum City of Ottawa requirement) due to topographic constraints. At proposed junctions adjacent to Prince of Wales Drive (J34, J-35, J-36, and J-44), at the intersection of Road D and Road E (H-6, J-7, and J-8), and at the front entrance of the Main Hospital Building (H16 and H17). In all locations, there is a significant elevation difference between Carling Avenue and the area, an approximately 17.5m increase by Prince of Wales Drive and 15m increase at the Road D and Road E intersection and front of the Main Hospital Building. These elevations are required to tie the site into Maple Drive and Prince of Wales Drive. No buildings services are proposed within this area. All other junctions within the site are above the minimum City of Ottawa requirement of 40 psi.
(4) The minimum pressure falls below 40 psi (minimum City of Ottawa requirement) due to topographic constraints. At proposed junctions adjacent to Prince of Wales Drive (H-9, J-32, J-34, J-35, J-36, and J-44), at the intersection of Road D and Road E (H-6, J-7, J-8, and J-9), and at the front of the Main Hospital Building (H16 and H17). In all locations, there is a significant elevation difference between Carling Avenue and the area, an approximately 17.5m increase by Prince of Wales Drive and 15m increase at the Road D and Road E intersection and front of the Main Hospital Building. These elevations are required to tie the site into Maple Drive and Prince of Wales

Drive. No buildings services are proposed within this area. All other junctions within the site are above the minimum City of Ottawa requirement of 40 psi.

(5) The minimum pressure falls below 20 psi (minimum City of Ottawa requirement) due to topographic constraints. At proposed junction adjacent to Prince of Wales Drive (J-35). There is a significant elevation difference between Carling Avenue and the area, an approximately 17.5m increase by Prince of Wales Drive. These elevations are required to tie the site into Prince of Wales Drive. No buildings services are proposed within this area and all proposed hydrants have a pressure greater than the minimum requirement of 20 psi.

The model results indicate that adequate domestic water supply is available for the site with the exception of the pressures falling below the City of Ottawa minimum requirement of 40psi at the proposed intersection of Road D and Road E, the front of the Main Hospital Building, and adjacent to Prince of Wales Drive during the average day demand, maximum daily demand, and peak hourly demand scenarios. The model results also indicate the pressures fall below the City of Ottawa minimum requirement of 20psi adjacent to Prince of Wales Drive during two (2) of the fire scenarios (back of the Main Hospital Building and Future Heart Institute). The pressure loss is a result of topographic constraints in the site (approximately 15m and 17.5m elevation different between these areas and Carling Avenue). None of the building services for the Central Utility Plant and Main Hospital Building are proposed in these low-pressure areas. The pressures at all proposed building services are above the City of Ottawa minimum requirement of 40psi during the average day demand, maximum daily demand, and peak hourly demand scenarios. The pressures at all proposed fire hydrants are above the City of Ottawa minimum requirement of 20psi during all fire scenarios.

The above demonstrates that the proposed 300mm diameter watermain can adequately provide the domestic flows and required fire flow to the Central Utility Plant and Main Hospital Building.

The WaterCAD output files for the model are provided in **APPENDIX H.** This model will need to be refined as the design moves froward.

9.4.2 Fire Protection

Nineteen (19) AA (blue) hydrants are proposed throughout the hospital site. The hydrant locations and the length of the hose travel are presented in **Figure 9-1**.

Hydrant 8, Hydrant 12, and Hydrant 13 are located within 75m of the east side of the Main Hospital Building. These three (3) hydrants can provide a flow contribution of **250L/s** (Hydrant 8 = 83.3L/s, Hydrant 12 = 83.3L/s, Hydrant 13 = 83.3L./s), and all have a pressure over 20psi. These three (3) hydrants can provide the estimated fire flow of 250L/s for the Main Hospital Building.

Hydrant 17 and Hydrant 18 are located within 75m of the Pavilion and Hydrant 2 is located within 150m of the Pavilion. These three (3) hydrants can provide a flow contribution of **250L/s** (Hydrant 17 = 93.5L/s, Hydrant 18 = 93.5L/s, and Hydrant 2 = 63.0L/s). These three (3) hydrants can provide the estimated fire flow of 250L/s for the Main Hospital Building.

Hydrant 4, Hydrant 7, and Hydrant 15 are located within 75m of the west side of the Main Hospital Building. These three (3) hydrants can provide a flow contribution of **250L/s** (Hydrant 4 = 83.3L/s, Hydrant 7 = 83.3L/s, Hydrant 15 = 83.3L./s), and all have a pressure over 20psi. These three (3) hydrants can provide the estimated fire flow of 250L/s for the Main Hospital Building.

Hydrant 9, Hydrant 10, and Hydrant 11 are located within 75m of the Future Heart Institute. These three (3) hydrants can provide a flow contribution of **250L/s** (Hydrant 9 = 83.3L/s, Hydrant 10 = 83.3L/s, Hydrant 11 = 83.3L./s), and all have a pressure over 20psi. These three (3) hydrants can provide the estimated fire flow of 250L/s for the Main Hospital Building.

Hydrant 3, Hydrant 11, and Hydrant 14 are located within 75m of the back of the Main Hospital Building. These three (3) hydrants can provide a flow contribution of **250L/s** (Hydrant 3 = 83.3L/s, Hydrant 11 = 83.3L/s, Hydrant 14 = 83.3L./s), and all have a pressure over 20psi. These three (3) hydrants can provide the estimated fire flow of 250L/s for the Main Hospital Building.

Hydrant 16 and Hydrant 17 are located within 75m of the front of the Main Hospital Building and Hydrant 18 is located within 150m of the front of the Main Hospital Building. These three (3) hydrants can provide a flow contribution of **250L/s** (Hydrant 16 = 93.5L/s, Hydrant 17 = 93.5L/s, and Hydrant 18 = 63.0L/s). These three (3) hydrants can provide the estimated fire flow of 250L/s for the Main Hospital Building.

Hydrant 3, Hydrant 6, and Hydrant 14 are located within 75m of the back of the Central Utility Plant. These three (3) hydrants can provide a flow contribution of **250L/s** (Hydrant 3 = 93.5L/s, Hydrant 6 = 63L/s, Hydrant 14 = 93.5L./s), and all have a pressure over 20psi. These three (3) hydrants can provide the estimated fire flow of 167L/s for the Central Utility Plant.

Hydrant 1, Hydrant 2, Hydrant 5, and Hydrant 19 are located within 75m of the Parking Garage. These four (4) hydrants can provide a flow contribution of 324L/s (Hydrant 1 = 95L/s, Hydrant 2 = 95L/s, Hydrant 5 = 95L/s, Hydrant 19 =39L/s), and all have a pressure over 20psi. Hydrant 19 cannot provide the full (95L/s due to the existing condition of the 150mm diameter municipal watermain adjacent to Preston Street. Hydrant 12 is located within 150m of the Parking Garage. This one (1) hydrant can provide a flow contribution of 63L/s. (Hydrant 12 = 63L/s) and have a pressure over 20psi. These four (4) hydrants can provide a flow contribution of **387L/s** which is above the estimated fire flow of 333L/s for the Parking Garage.

9.5 Summary and Conclusions

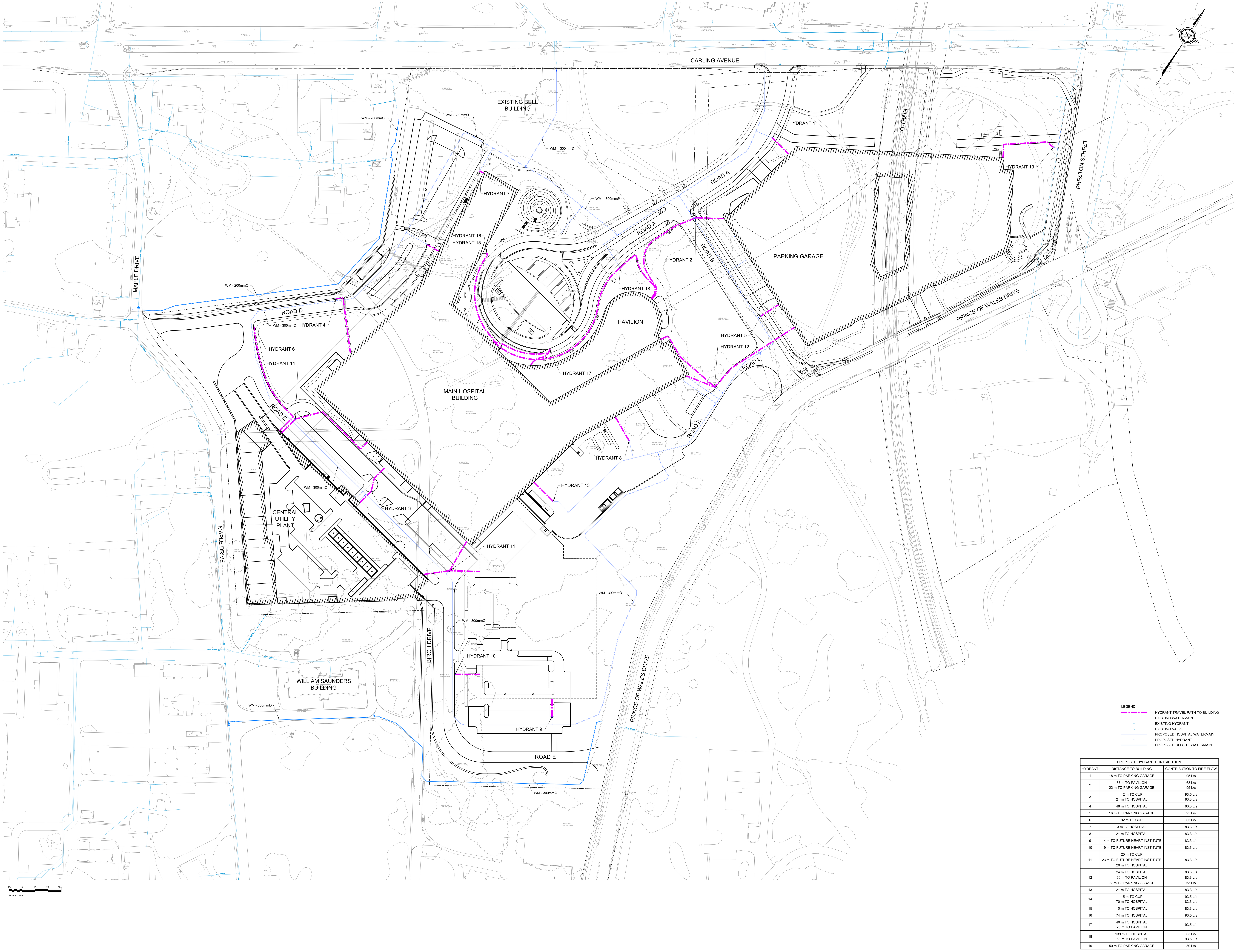
A 300mm diameter watermain loop (part of Advance Works) is proposed around the Main Hospital Building that will connect to the existing 406mm diameter watermain on Carling Avenue at the Carling Avenue and Road B intersection and Carling Avenue and Sherwood Drive. The proposed 300mm diameter watermain loop will also connect to the proposed 300mm diameter watermain at the Road A and Road B intersection.

The Central Experimental Farm has two (2) existing 300mmd diameter watermain loops that extend onto the hospital leased land from Maple Drive. A section of both watermain loops need to be relocated to ensure adequate domestic water supply and fire flow demand. The 300mm diameter watermain relocation for the northern loop (part of Advance Works) will be within the construction easement on the Central Experimental Farmland, adjacent to the northeast property limit. The existing fire hydrant at the Maple Drive and Birch Drive intersection will be removed and relocated to ensure the fire hydrant is accessible. The proposed relocation maintains a looped configuration to ensure redundancy. The 300mm diameter watermain relocation for the southern loop (part of Advance Works) will be located on both Central Experimental Farmland and hospital leased land. A new connection to the existing watermain on Maple Drive will be made at the access road on the south side of the William Saunders Building. The proposed 300mm diameter will extend east along the access road, south along Birch Drive, and then east within the hospital leased land to Prince of Wales Drive. At Prince of Wales Drive, it will connect into the existing watermain that extends east of Prince of Wales Drive.

The Main Hospital Building will be serviced with two (2) 200mm diameter water services (not part of Advance Works) at the east end of Tower B, extended from the 300mm diameter watermain loop. The Central Utility Plant will be serviced with two (2) 200mm diameter water services (not part of Advance Works) extended from the 300mm diameter watermain loop located within Road E.

The model results indicate that adequate domestic water supply is available for the site with the exception of the pressures falling below the City of Ottawa minimum requirement of 40psi at the proposed intersection of Road D and Road E, the front of the Main Hospital Building, and adjacent to Prince of Wales Drive during the average day demand, maximum daily demand, and peak hourly demand scenarios. The model results also indicate the pressures fall below the City of Ottawa minimum requirement of 20psi adjacent to Prince of Wales Drive during two (2) of the fire scenarios (back of the Main Hospital Building and Future Heart Institute). The pressure loss is a result of topographic constraints in the site (approximately 15m and 17.5m elevation different between these areas and Carling Avenue). None of the building services for the Central Utility Plant and Main Hospital Building are proposed in these low-pressure areas. The pressures at all proposed building services are above the City of Ottawa minimum requirement of 40psi during the average day demand, maximum daily demand, and peak hourly demand scenarios. The pressures at all proposed fire hydrants are above the City of Ottawa minimum requirement of 20psi during all fire scenarios.

The majority of the proposed 300 diameter watermain, excluding the building service connections and the fire hydrants, is proposed to move forward under Advance Works. The proposed watermain may need to be refined as the Advance Works design package is finalized. The proposed watermain connections and the fire hydrant locations will need to be refined as the Main Hospital Building and Central Utility Plant designs move forward. The demands for the Central Utility Plant and Main Hospital Building will need to be revisited/revised during the detail design when additional accuracy is obtained from the building design team.



LEGEND

- HYDRANT TRAVEL PATH TO BUILDING
- EXISTING WATERMAIN
- EXISTING HYDRANT
- EXISTING VALVE
- PROPOSED HOSPITAL WATERMAIN
- PROPOSED HYDRANT
- PROPOSED OFFSITE WATERMAIN

PROPOSED HYDRANT CONTRIBUTION		
HYDRANT	DISTANCE TO BUILDING	CONTRIBUTION TO FIRE FLOW
1	18 m TO PARKING GARAGE	95 L/s
2	87 m TO PAVILION 22 m TO PARKING GARAGE	63 L/s 95 L/s
3	12 m TO CUP 21 m TO HOSPITAL	93.5 L/s 83.3 L/s
4	48 m TO HOSPITAL	83.3 L/s
5	16 m TO PARKING GARAGE	95 L/s
6	92 m TO CUP	63 L/s
7	3 m TO HOSPITAL	83.3 L/s
8	21 m TO HOSPITAL	83.3 L/s
9	14 m TO FUTURE HEART INSTITUTE	83.3 L/s
10	19 m TO FUTURE HEART INSTITUTE	83.3 L/s
11	20 m TO CUP 23 m TO FUTURE HEART INSTITUTE 26 m TO HOSPITAL	83.3 L/s
12	24 m TO HOSPITAL 60 m TO PAVILION 77 m TO PARKING GARAGE	83.3 L/s 83.3 L/s 63 L/s
13	21 m TO HOSPITAL	83.3 L/s
14	15 m TO CUP 70 m TO HOSPITAL	93.5 L/s 83.3 L/s
15	10 m TO HOSPITAL	83.3 L/s
16	74 m TO HOSPITAL	93.5 L/s
17	46 m TO HOSPITAL 20 m TO PAVILION	93.5 L/s
18	139 m TO HOSPITAL 53 m TO PAVILION	63 L/s 93.5 L/s
19	50 m TO PARKING GARAGE	39 L/s

HDR

HDR Architecture Associates Inc.
300 Richmond Road, Suite 200
Ottawa, Ontario K1Z 6X6

PARSONS

THE OTTAWA HOSPITAL - CIVIC CAMPUS REDEVELOPMENT

The Ottawa Hospital | L'Hôpital d'Ottawa

Architect	HDR
Landscape Architect	HDR
Civil Engineer	Parsons
Structural Engineer	EXP
Mechanical Engineer	Smith + Andersen
Electrical Engineer	Smith + Andersen
Plumbing Engineer	Smith + Andersen
Interior Designer	HDR
Equipment Planner	Colliers
Wayfinding	
Sheet Reviewer	Author

MARK	DATE	DESCRIPTION
01	2022-11-30	ISSUED FOR SPC & FLUDA - 1ST SUBMISSION
02	2023-04-12	RE-ISSUED FOR SPC & FLUDA
03	2023-11-23	RE-ISSUED FOR SPC & FLUDTA

Project Number 10333982
Original Issue 02/21/23

PRELIMINARY
NOT FOR CONSTRUCTION

Sheet Name
HYDRANT CONTRIBUTION

Sheet Number
Figure 9-1

Project Status
STAGE 3

D07-12-22-0

10.0 SANITARY SERVICING

10.1 Proposed Sanitary Servicing

There are ten (10) sanitary service connections are assumed for the Main Hospital Building and two (2) sanitary service connections are assumed for the Central Utility Plant. The service connection(s) for the future Heart Institute will be provided in a future phase. All sanitary service connections will connect to the proposed 300mm/375mm diameter sanitary sewer that extends around the Main Hospital Building. The proposed 300mm/375mm diameter sanitary sewer will connect into the Mooney's Bay Collector at the proposed Road B and Road L intersection.

The majority of the proposed 300/375mm diameter sanitary sewer, excluding the building service connections and loading dock area, is proposed to move forward under Advance Works. The proposed sanitary sewer may need to be refined as the Advance Works design package is finalized. The proposed sanitary service connections and sanitary sewer within the loading dock area will need to be refined as the Main Hospital Building and Central Utility Plant designs move forward.

A 375mm diameter sanitary sewer will be extended from the stub provided at Road B and Road L. This stub is connected to the Mooney's Bay Collector trunk sewer within Road B. At MHSA11 this sewer will extend west (part of Advance Works) and south to service both sides of the Main Hospital Building and the Central Utility Plant.

The southern portion of Tower B of the Main Hospital Building is assumed to have one (1) 250mm diameter sanitary service connection that will connect to the proposed 300mm diameter sanitary sewer in the loading dock off of Road L (not part of Advance Works). A 375mm diameter sewer will extend west from MHSA11 and service the remainder of the Main Hospital Building and the Central Utility Plant (part of Advance Works).

The middle portion of Tower B of the Main Hospital Building is assumed to have one (1) 200mm diameter sanitary service connection that will connect to the proposed 300mm diameter sanitary sewer in the loading dock off of Road L (not part of Advance Works). A 375mm diameter sewer will extend west from MHSA11 and service the remainder of the Main Hospital Building and the Central Utility Plant (part of Advance Works).

The northern portion of Tower B of the Main Hospital Building is assumed to have one (1) 200mm diameter sanitary service connection (not part of Advance Works) that will connect to the proposed 375mm diameter sanitary sewer along the front of the hospital on the east side of Road A (part of Advance Works).

The Pavilion of the Main Hospital Building is assumed to have one (1) 150mm diameter sanitary service connection (not part of Advance Works) that will connect to the proposed 375mm diameter sanitary sewer along the front of the hospital on the east side of Road A (part of Advance Works).

The underground parking garage at the front of the Main Hospital Building, for emergency parking, is assumed to have one (1) 150mm diameter sanitary service connection (not part of Advance Works) that will connect to the proposed 375mm diameter sanitary sewer along the front of the hospital on the west side of Road A (part of Advance Works). The sanitary flows for the parking garage are considered to be negligible as the only contribution to the network is through snow melt from the parked vehicles. The internal floor drainage system for all floors and the ground floor, with the exception of the roof, are considered to be sanitary drains. A series of maintenance holes and sanitary sewers will provide the necessary drainage from the snow melt from the parked vehicles as well as any water drips from the vehicles.

The northern portion of Tower A of the Main Hospital Building is assumed to have one (1) 200mm diameter sanitary service connection (not part of Advance Works) that will connect to the proposed 375mm diameter sanitary sewer along the front of the hospital on the west side of Road A (part of Advance Works).

The middle portion of Tower A of the Main Hospital Building is assumed to have one (1) 200mm diameter sanitary service connection (not part of Advance Works) that will connect to the proposed 300mm diameter sanitary sewer on the west side of the hospital off of Road D (par of Advance Works).

The southern portion of Tower A of the Main Hospital Building is assumed to have one (1) 200mm diameter sanitary service connection (not part of Advance Works) that will connect to the proposed 300mm diameter sanitary sewer on the west side of the hospital off of Road D (part of Advance Works).

The Podium of the Main Hospital Building is assumed to have two (2) 250mm diameter sanitary service connections (not part of Advance Works) that will connect to the proposed 300mm diameter sanitary sewer in Road E on the east side of the underground tunnel between the Main Hospital Building and the Central Utility Plant (part of Advanced Works).

The Central Utility Plant is assumed to have two (2) 200mm diameter sanitary service connections (not part of Advance Works) that will connect to the proposed 300mm diameter sanitary sewer in Road E (part of Advance Works).

The future Heart Institute service connection(s) (not part of Advance Works) will connect to the proposed 300mm diameter sanitary sewer in Road E (part of Advance Works).

The eastern portion of the existing Central Experimental Farm sanitary sewer system outlets through the hospital leased lands to the Mooney's Bay Collector. Relocation of this portion of the Central Experimental Farm sanitary sewer system is required to ensure flows from the Central Experimental Farmlands continue to outlet to the Mooney's Bay Collector. A connection to the existing Central Experimental Farm sanitary sewer will be made within the hospital leased lands at the existing Birch Drive and Maple Drive intersection. A proposed 250mm diameter sanitary sewer will extend north to Road D and then east, at which point it will connect to the proposed 300mm/375mm diameter sanitary sewer for the Main Hospital Building and Central Utility Plant (part of Advance Works). Refer to **APPENDIX E** for the Agriculture and Agri Food Canada Existing Infrastructure technical memorandum for further details.

The design drawings, in Error! Reference source not found., shows the existing and proposed sanitary distribution network. These drawings will need to be refined as the design moves forward.

10.2 Design Criteria

The proposed sanitary sewer system for the Central Utility Plant and Main Hospital Building has been designed in general conformance with the *City of Ottawa Sewer Design Guidelines* as amended by its *Technical Bulletins*.

The sanitary design flow rate is the peak flow plus the peak extraneous flow. The values for the average flow, peak factor and peak extraneous flows used in the sanitary servicing calculations for the development are presented in **Table 10-1.**

Table 10-1: Sanitary Design Flow Criteria

Development Type	Average Sanitary Flow	Unit	Peak Factor	Peak Extraneous Flow
Main Hospital Building	5.40(1)	L/m2/day	1.5	0.33 L/s/gross ha
Central Utility Plant	5.0(2)	L/s	1.5	0.33 L/s/gross ha
Parking Garage	1.0(3)	L/s	1.0	0.33 L/s/gross ha
Existing Central Experimental Farm Outlet 1 @S15	-	-	-	0.299 L/s(4)
Existing Central Experimental Farm Outlet 2 @S15	-	-	-	1.202 L/s(4)

(1) Based on water records from the Ottawa Hospital Civic Campus
(2) Assumed value as the Central Utility Plant is in the feasibility design stage.

(3) Considered negligible as the only contribution is through snow melt from the parked vehicles.
(4) From Central Experimental Farm Ottawa, Ontario Master Servicing Plan Volume 2: Sanitary and Storm Systems (2008)

The sanitary sewer system is designed with a pipe roughness coefficient of 0.013.

The proposed sanitary sewer system should be installed with a minimum cover of 2.0m, where this is not possible insulation will be provided.

Based on the Master Servicing Plan, the City of Ottawa confirmed that the existing Mooney's Bay Collector has sufficient capacity to accommodate the estimated peak of **34.24L/s** for the Main Hospital Building. The City of Ottawa will need to confirm if the Mooney's Bay Collector has sufficient capacity to accommodate the revised estimated peak flow for the Main Hospital Building and Central Utility Plant. The revised estimated peak flow is presented in the section below.

10.3 Calculations and Results

Drainage Area CUP

The Central Utility Plant is assumed to have two (2) sanitary service connections (not part of Advance Works) that will connect to the proposed sanitary sewer in Road E. A total peak flow of **8.00L/s** (divided equally (4.00L/s) between the two (2) service connections) is currently assumed for the Central Utility Plant. The peak flow will need to be refined as the design of the Central Utility Plant moves into the preliminary/detail design stages.

Drainage Area 56

The underground parking garage for emergency is assumed to have one (1) sanitary service connection (not part of Advance Works) that will connect to the proposed sanitary sewer along the front of the hospital on the west side of Road A. A peak flow of **1.31L/s** was applied even though the flow is considered negligible as the only contribution to the network is through snow melt from parked vehicles.

Drainage Area 48, Drainage Area 49 & Drainage Area 50

The northern, central, and southern portions of Tower A of the Main Hospital Building are assumed to have three (3) sanitary service connections (not part of Advance Works). One (1) sanitary service connection will connect to the proposed sanitary sewer along the front of the hospital on the west side of Road A and two (2) sanitary service connections will connect to the proposed sanitary sewer on the west side of the hospital off of Road D. A peak flow of **2.97L/s, 3.50L/s,** and **7.27L/s** is estimated for the connections, respectively. It should be noted that the gross floor area for the proposed future expansion along the west side of Tower A was estimated and accounted for in the peak flow estimates but is not part of the proposed Phase 3 and Phase 4 works. The peak flows and future expansion plans will need to be refined as the design of the Main Hospital Building moves forward.

Drainage Area 51

The middle portion of Podium of the Main Hospital Building is assumed to have two (2) sanitary service connections (not part of Advance Works) that will connect to the proposed sanitary sewer in Road E on the east side of the underground tunnel between the Main Hospital Building and the Central Utility Plant. A peak flow of **10.93L/s** (divided equally (5.47L/s) between the two (2) service connections) is estimated for the connections and will need to be refined as the design of the Main Hospital Building moves forward.

Drainage Area 51

The northern, central, and southern portions of Tower B of the Main Hospital Building are assumed to have (3) sanitary service connections (not part of Advance Works). One (1) sanitary service connection will connect to the proposed sanitary sewer along the front of the hospital on the east of Road A and two (2) sanitary service connections will connect to the proposed sanitary sewer in the loading dock off of Road L. A peak flow of **2.51L/s,**

2.43L/s, and **5.43L/s** is estimated for the connections, respectively. The peak flows will need to be refined as the design of the Main Hospital Building moves forward.

<u>Drainage Area 55</u>

The Pavilion of the Main Hospital Building is assumed to have one (1) sanitary service connection (not part of Advance Works) that will connect to the proposed sanitary sewer along the front of the hospital on the east side of Road A. A peak flow of **0.88L/s** is estimated for the connection and will need to be refined as the design of the Main Hospital Building moves forward.

<u>Drainage Area HI</u>

The future Heart Institute is assumed to be serviced from the proposed sanitary sewer along Road E. A peak flow of **10.56L/s** is estimated for the connection(s) (not part of Advance Works). It should be noted that the gross floor area for the proposed future expansion was estimated but is not part of the proposed Phase 3 and Phase 4 works. The peak flow and future expansion plans will need to be refined as the design of the Main Hospital Building moves forward.

<u>Drainage Area RD, Drainage Area RE & Drainage Area LD</u>

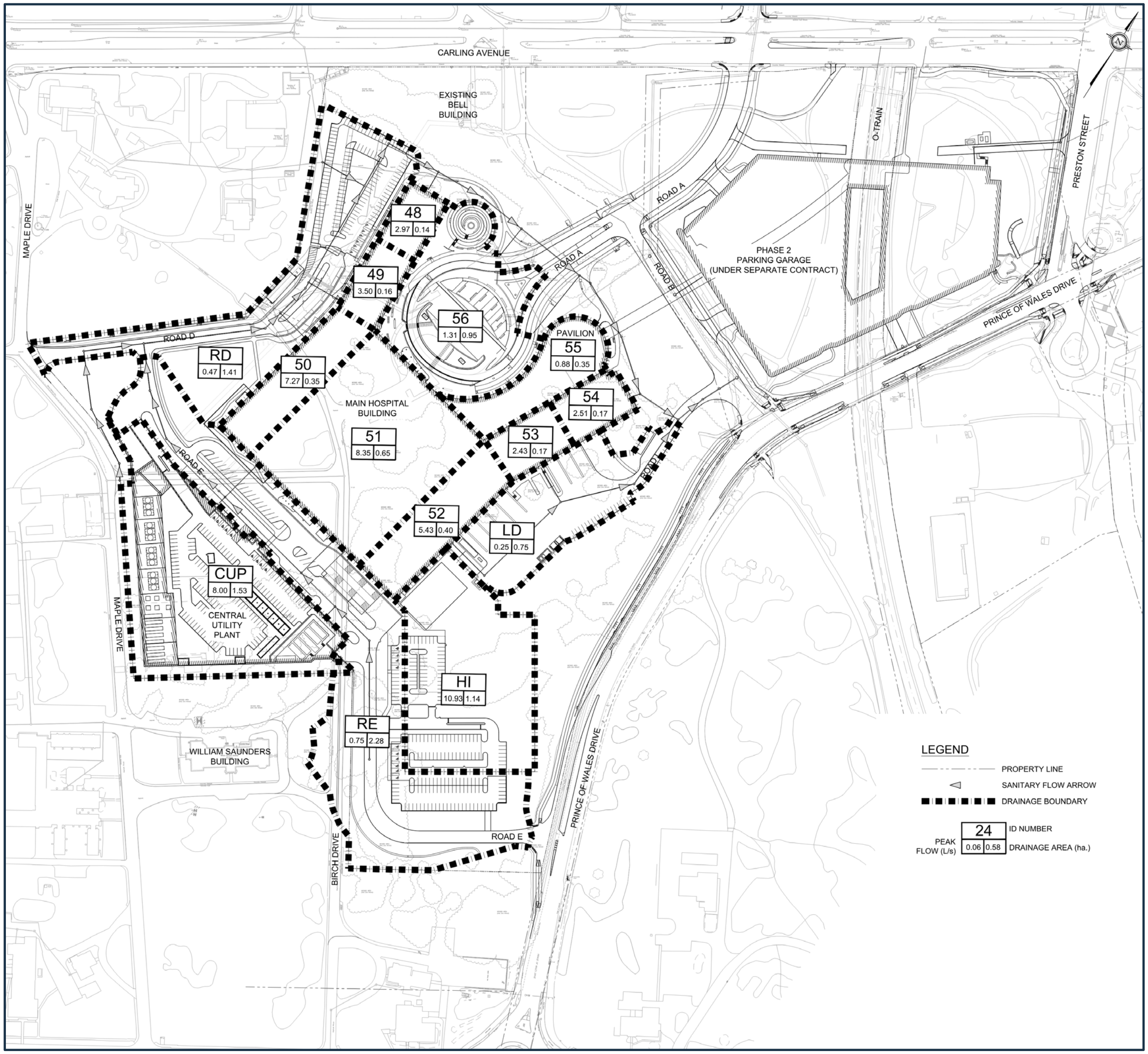
A total peak flow of **0.75L/s** has been accounted for infiltration within the Road E corridor, a total peak flow of **0.47L/s** has been accounted for infiltration within the Road D corridor, and a total peak flow of **0.25L/s** has been accounted for infiltration within the Loading Dock area.

A total peak flow of **1.50L/s** has been accounted for the Central Experimental Farmlands based on the Central Experimental Farm Master Servicing Plan Volume 2: Sanitary and Storm Systems (March 2008). It's assumed that this flow accounts for future site expansion as the report states that the drainage areas were established to account for future planned growth.

Based on the Master Servicing Plan, the City of Ottawa confirmed that the existing Mooney's Bay Collector has sufficient capacity to accommodate the estimated peak of **34.24L/s** for the Main Hospital Building. The City of Ottawa will need to confirm is the Mooney's Bay Collector has sufficient capacity to accommodate the revised estimated peak flow of **55.07L/s** for the Main Hospital Building and Central Utility Plant.

Figure 10-1 and **Figure C** in **Appendix I** shows the sanitary areas and the sewer layout with the maintenance hole locations indicated. Details including pipe lengths, sizes, materials, inverts elevations and structure types are shown on the drawings in **APPENDIX F**. The sanitary design flows and sewer pipe design spreadsheets are included in **Appendix I.**

Figure 10-1: Sanitary Drainage Areas



10.4 Summary and Conclusions

The proposed sanitary sewer system for the Main Hospital Building and the Central Utility Plant will be divided (at MHSA11) into a south and west system. There are ten (10) sanitary service connections (not part of Advanced Works) assumed for the Main Hospital Building and two (2) sanitary service connections (not part of Advanced Works) assumed for the Central Utility Plant. The service connection(s) for the future Heart Institute (not part of Advanced Works) will be provided in a future phase. The proposed 300mm/375mm sanitary sewer will connect into the Mooney's Bay Collector at the proposed Road B and Road L intersection.

The eastern portion of the existing Central Experimental Farm sanitary sewer system outlets through the hospital leased lands to the Mooney's Bay Collector. Relocation of this portion of the Central Experimental Farm sanitary sewer system is required to ensure flows from the Central Experimental Farmlands continue to outlet to the Mooney's Bay Collector. A connection to the existing Central Experimental Farm sanitary sewer will be made within the hospital leased lands at the existing Birch Drive and Maple Drive intersection. A proposed 250mm diameter sanitary sewer will extend north to Road D and then east, at which point it will connect to the proposed 300mm/375mm diameter sanitary sewer for the Main Hospital Building and Central Utility Plant.

The majority of the proposed 300/375mm diameter sanitary sewer, excluding the building service connections and loading dock area, is proposed to move forward under Advance Works. The proposed sanitary sewer may need to be refined as the Advance Works design package is finalized. The proposed sanitary service connections and sanitary sewer within the loading dock area will need to be refined as the Main Hospital Building and Central Utility Plant designs move forward. The demands for the Central Utility Plant and Main Hospital Building will need to be revisited and refined accordingly during the detail design when additional accuracy is obtained from the building design team.

11.0 STORM SERVICING AND STORMWATER MANAGEMENT

11.1 Existing Storm Servicing

The pre-development drainage areas for the entire NCD, developed as part of the Master Site Plan, were reviewed when determining the pre-development drainage area for the Central Utility Plant and the Main Hospital Building. The Central Utility Plant and the Main Hospital Building consists of drainage areas STM-01E, STM-02E, STM-03E, STM-04E, and STM-05E within the Master Site Plan. The majority of this land within the NCD drains through the Agriculture and Agri-Food Canada (AAFC) privately owned storm sewer system that outlets to Dow's Lake. The AAFC is responsible for the operation of the private servicing within the site.

The pre-development drainage areas for the Central Utility Plant and Main Hospital Building are shown in and **Figure 11-1** and **Figure A**, included in **Appendix J**, a brief description is included below. It should be noted that Drainage Areas STM-01E, STM-02E, STM-03E, STM-04E, STM-05E, STM-06E, STM-09E, and STM-11E are described within the *Site Servicing and Stormwater Management Report, New Civic Development for The Ottawa Hospital Phase 2: Parking Garage Project, May 2023,* that was prepared by Parsons for Phase 2: Parking Garage.

Drainage Area - STM-07E

Drainage area STM-07E contains an open grass area with trees and asphalt pathways. The area drains through an on-site underground storm sewer system that outlets to the Carling Avenue storm sewer system. The area is approximately 1.10ha with a runoff coefficient of 0.28.

Drainage Area - STM-08E

Drainage area STM-08E contains an open grass area with trees and asphalt pathways. The area drains through an on-site underground storm sewer system that outlets to the Carling Avenue storm sewer system. The area is approximately 1.09ha with a runoff coefficient of 0.26.

Drainage Area - STM-10E

Drainage area STM-10E contains an open grass area with trees and asphalt pathways. The area drains through an on-site underground storm sewer system that outlets to the Carling Avenue storm sewer system. The area is approximately 1.30ha with a runoff coefficient of 0.27.

Drainage Area - STM-12E

Drainage area STM-12E contains an open grass area with trees and asphalt pathways. The area drains through an on-site underground storm sewer system that outlets to the Carling Avenue storm sewer system. The area is approximately 1.34ha with a runoff coefficient of 0.30.

Drainage Area - STM-13E

Drainage area STM-13E contains an open grass area with trees, asphalt pathways, and a small utility building and sheet flows to Carling Avenue. The area is approximately 0.43ha with a runoff coefficient of 0.63.

Drainage Area - STM-14E

Drainage area STM-14E contains an open grass area with trees, asphalt pathways, and an asphalt parking lot. The area drains through an on-site underground private storm sewer system that outlets to Dow's Lake. The major system drains to Carling Avenue. The area is approximately 2.68ha with a runoff coefficient of 0.40.

Drainage Area - STM-15E

Drainage area STM-15E is adjacent to Maple Drive (east side) and contains an open grass area with trees and the existing DARA Tennis Club. The area drains through an on-site underground private storm sewer system that outlets to Dow's Lake. The major system drains to Carling Avenue. The area is approximately 2.88ha with a runoff coefficient of 0.34.

Drainage Area - STM-16E

Drainage area STM-16E is adjacent to Birch Drive (east side) and contains an open grass area with trees. The area drains through an on-site underground private storm sewer system that outlets to Dow's Lake. The major system drains to Carling Avenue. The area is approximately 3.68ha with a runoff coefficient of 0.22.

Drainage Area - STM-17E

Drainage area STM-17E is adjacent to Prince of Wales Drive and contains an open grass area with trees. This area sheet flows to Prince of Wales Drive. The area is approximately 1.46ha with a runoff coefficient of 0.27.

Drainage Area - STM-18E

Drainage area STM-18E is adjacent to Carling Avenue and contains asphalt roadways and parking areas, buildings, and open grass areas with trees. The area drains through an on-site underground private storm sewer system that outlets to Dow's Lake. The major system drains to Carling Avenue. The area is approximately 1.19ha with a runoff coefficient of 0.55.

Drainage Area - STM-19E

Drainage area STM-19E is adjacent to Maple Drive and contains asphalt roadways and parking areas, buildings, and open grass areas with trees. The area drains through an on-site underground private storm sewer system that outlets to Dow's Lake. The major system drains to Carling Avenue. The area is approximately 1.52ha with a runoff coefficient of 0.32.

Drainage Area - STM-20E

Drainage area STM-20E contains asphalt roadways and parking areas, buildings, and open grass areas with trees and the east and west sides of Maple Drive. The area drains through an on-site underground private storm sewer system that outlets to Dow's Lake. The major system drains to Carling Avenue. The area is approximately 12.77ha with a runoff coefficient of 0.44.

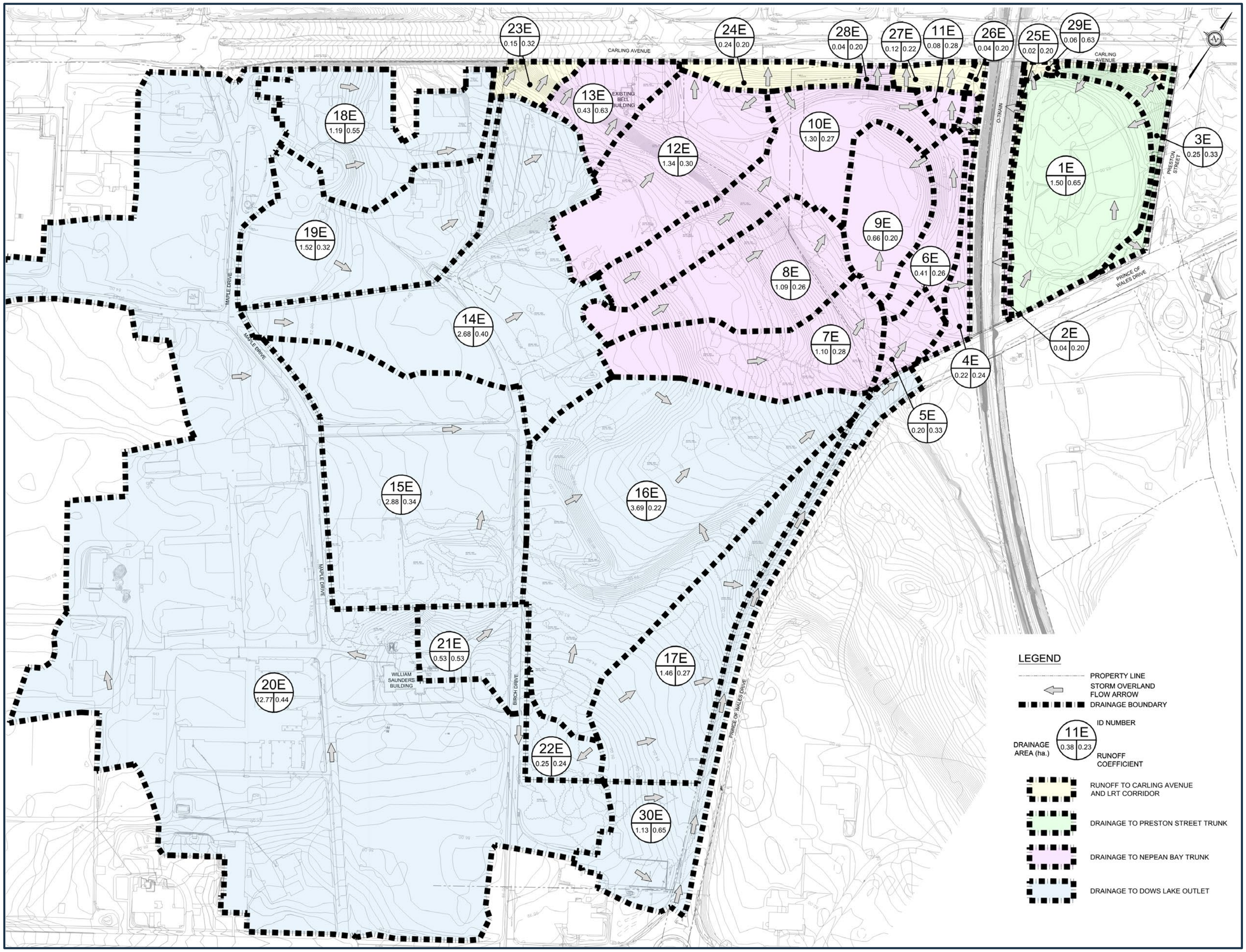
Drainage Area - STM-21E

Drainage area STM-21E is adjacent to Birch Drive and contains asphalt roadways and parking areas and open grass areas with trees. The area drains through an on-site underground private storm sewer system that outlets to Dow's Lake. The major system drains to Carling Avenue. The area is approximately 0.53ha with a runoff coefficient of 0.53.

Drainage Area - STM-22E

Drainage area STM-22E is adjacent to Birch Drive (east side) and contains an open grass area with trees. The area drains through an on-site underground private storm sewer system that outlets to Dow's Lake. The major system drains to Carling Avenue. The area is approximately 0.25ha with a runoff coefficient of 0.24.

Figure 11-1: Pre-Development Drainage Areas



A summary of the composite runoff coefficients and flows for the pre-development drainage areas are presented in **Table 11-1**.

Table 11-1: Pre-Development Runoff Summary

Drainage Area ID	Drainage Area (ha)	Runoff Coefficient 2/5 Year	Runoff Coefficient 100 Year	Minor Storm Peak Flows (L/s)	Major Storm Peak Flow (L/s)
DRAINAGE TO PRESTON TRUNK (EAST OF LRT)				2-YEAR	100-YEAR
STM01E	1.50	0.40	STM01E	128.53	605.49
STM03E	0.25	0.33	STM03E	17.94	52.12
TOTAL PRESTON TRUNK (EAST OF LRT)	1.75			146.46	657.61
DRAINAGE UNCONTROLLED TO CARLING AVENUE/LRT				2-YEAR	100-YEAR
STM13E	0.43	0.50	0.79	33.48	122.67
STM23E	0.16	0.32	0.40	10.72	31.14
STM24E	0.24	0.20	0.25	10.39	30.21
STM25E	0.02	0.20	0.25	0.98	2.84
STM26E	0.04	0.20	0.25	1.54	4.47
STM27E	0.12	0.22	0.28	5.71	16.58
STM29E	0.06	0.50	0.79	6.20	22.69
TOTAL UNCONTROLLED TO CARLING AVENUE/LRT	1.07			69.01	230.62
DRAINAGE TO NEPEAN BAY TRUNK (WEST OF LRT)				2-YEAR	100-YEAR
STM02E	0.04	0.20	0.25	1.59	4.61
STM04E	0.22	0.24	0.29	11.11	32.28
STM05E	0.20	0.33	0.41	11.22	32.44
STM06E	0.41	0.26	0.33	15.71	45.27
STM07E	1.10	0.28	0.35	38.44	110.46
STM08E	1.09	0.26	0.33	36.04	103.57
STM09E	0.66	0.20	0.25	19.09	55.02
STM10E	1.30	0.27	0.34	44.32	127.39
STM11E	0.08	0.28	0.35	4.69	13.62
STM12E	1.35	0.30	0.37	54.77	157.64
STM28E	0.04	0.20	0.25	1.82	5.29
TOTAL NEPEAN BAY TRUNK (WEST OF LRT)	6.48			238.79	682.98
DRAINAGE TO DOW'S LAKE (DOW'S LAKE OUTLET)				5-YEAR	100-YEAR
STM14E	2.68	0.40	0.50	238.03	508.65
STM15E	2.88	0.34	0.42	269.93	577.95
STM16E	3.69	0.22	0.28	183.41	391.93
STM17E	1.46	0.27	0.34	113.89	243.97
STM18E	1.19	0.50	0.68	156.15	364.37

Drainage Area ID	Drainage Area (ha)	Runoff Coefficient 2/5 Year	Runoff Coefficient 100 Year	Minor Storm Peak Flows (L/s)	Major Storm Peak Flow (L/s)
STM19E	1.52	0.32	0.39	126.57	270.89
STM20E	12.77	0.44	0.55	998.59	2129.63
STM21E	0.53	0.50	0.66	77.06	175.18
STM22E	0.25	0.24	0.30	17.53	37.55
STM30E	1.13	0.50	0.81	164.18	454.17
TOTAL DOW'S LAKE	28.10			2345.34	5154.30

11.2 Proposed Strom Servicing

The existing 300mm diameter storm sewer located on the west side of proposed Road A will be utilized to collect flows from the existing landscape areas (Drain Areas STM21B, STM46, and STM58) on an interim basis until the Research Building is constructed in a future phase. storm sewer will connect to the existing 375mm diameter storm sewer in Carling Avenue that ultimately outlets to the Nepean Bay Trunk. The flow will be released at a controlled rate into the existing system.

An oversized storm sewer (1200mm/1500mm diameter) is proposed within Road A and Road B to capture the flow within the roadway and the Parking Garage entrance(s) (Phase 2) along the west sides. Catchbasins will capture the majority of the 100-year runoff with minimal spill over. One (1) ditch inlet catchbasin is proposed to collect the landscape area (Drainage Areas STM 26B) southwest of Road B. Surface storage will be provided using an inlet control device on the catchbasin. One (1) ditch inlet catchbasin is proposed to collect the landscape area (Drainage Areas STM 26D) southwest of Road B. Surface storage will be provided using an inlet control device on the catchbasin. The controlled flows will drain to the 1200mm/1500mm diameter oversized storm sewer network. The flow will further be controlled with an inlet control device prior to discharging into the existing 900mm diameter storm sewer in Carling Avenue that ultimately outlets to the Nepean Bay Trunk.

A ditch inlet is proposed to collect the landscape area located on the east side of the Main Hospital Building (Drainage Area STM60, STM60A, STM60B, and STM60C). Surface storage will be provided using an inlet control device. The controlled flow will drain to the 1200mm/1500mm diameter oversized storm sewer network. The flow will further be controlled with an inlet control device prior to discharging into the existing 900mm diameter storm sewer in Carling Avenue that ultimately outlets to the Nepean Bay Trunk.

Three (3) storm service connections for the Central Utility Plant and ten (10) storm service connections for the Main Hospital Building are assumed. The service connection(s) for the future Heart Institute will be provided in a future phase. The proposed storm service connections (not part of advance works) will need to be refined as the design moves forward.

The Central Utility Plant is assumed to have two (2) 375mm diameter storm service connections (not part of advance works) that will connect to the proposed 900mm/1050mm diameter oversized storm sewer in Road E (part of advance works) and one (1) 200mm diameter storm service connection (not part of advance works) that will connect to the proposed 600mm diameter storm sewer located on the south side of the Central Utility Plant (not part of advance works). The 600mm diameter storm sewer will connect into the proposed 900mm/1050mm diameter oversized storm sewer in Road E. Rooftop storage or underground cistern(s) within the Central Utility Plant will be required detain to provide the required storage volumes necessary to detain the stormwater. The design of this building needs to adhere to the quantity control requirements.

The underground parking garage for emergency is assumed to have one (1) 450mm diameter storm service connection (not part of advance works) that will connect to the proposed 1350mm diameter oversized storm sewer (part of advance works) along the front of the hospital on the west side of Road A.

The northern and middle portion of Tower A of the Main Hospital Building are assumed to have two (2) 300mm diameter storm service connections (not part of advance works). One (1) 300mm diameter storm service connection will connect to the proposed 1200mm diameter oversized storm sewer along the front of the hospital on the west side of Road A/Road B and one (1) 300mm diameter storm service connection will connect to the proposed 1500mm diameter oversized storm sewer on the west side of the hospital by the parking lot (Zone 1 Parking) and Road D. Rooftop storage within the Main Hospital Building will be required to provide the required storage volumes to detain the stormwater. The design of the Main Hospital Building will need to adhere to the quantity control requirements.

The southern portion of Tower A of the Main Hospital Building is assumed to have one (1) 450mm diameter storm service connection (not part of advance works) that will connect to the proposed 1500mm diameter oversized storm sewer on the west side of the hospital by the parking lot (Zone 1 Parking) and Road D. Rooftop storage within the Main Hospital Building will be required to provide the required storage volumes to detain the stormwater. The design of the Main Hospital Building will need to adhere to the quantity control requirements.

The Podium of the Main Hospital Building is assumed to have one (1) 450mm diameter storm service connection and one 375mm diameter storm sewer connection (not part of advance works) that will connect to the proposed 750mm/900mm diameter oversized storm sewer in Road E on the east side of the underground tunnel between the Main Hospital Building and the Central Utility Plant. Rooftop storage within the Main Hospital Building will be required to provide the required storage volumes to detain the stormwater. The design of the Main Hospital Building will need to adhere to the quantity control requirements.

The southern portion of Tower B of the Main Hospital Building is assumed to have one (1) 525mm diameter storm service connection (not part of advance works) that will connect to the proposed 750mm diameter oversized storm sewer in the loading dock off of Road L. Rooftop storage within the Main Hospital Building will be required to provide the required storage volumes to detain the stormwater. The design of the Main Hospital Building will need to adhere to the quantity control requirements.

The northern and middle portion of Tower B of the Main Hospital Building are assumed to have two (2) 300mm diameter storm service connections. One (1) 300mm diameter storm service connection will connect to the proposed 1350mm diameter oversized storm sewer along the front of the hospital on the west side of Road A/Road B and one (1) 300mm storm service connection will connect to the proposed 750mm diameter oversized storm sewer in the loading dock off of Road L. Rooftop storage within the Main Hospital Building will be required to provide the required storage volumes to detain the stormwater. The design of the Main Hospital Building will need to adhere to the quantity control requirements.

The Pavilion of the Main Hospital Building is assumed to have one (1) 450mm diameter storm service connection that will connect to the proposed 1350mm diameter oversized storm sewer along the front of the hospital on the west side of Road A/Road B. Rooftop storage within the Pavilion will be required to provide the required storage volumes to detain the stormwater. The design of the Main Hospital Building will need to adhere to the quantity control requirements.

Prior to construction of the Future Heart Institute (Phase 10), servicing will be installed for the two southern parking lots (Zone 4 Parking and Zone 5B Parking). Stormwater will be captured by a series of catchbasins, catchbasin maintenance holes, 300mm diameter storm sewers (not part of advance works). The stormwater will be controlled using an inlet control device at the Zone 5B Parking Lot connection. The stormwater will be detained using underground storage in the Zone 5B Parking Lot (not part of advance works). The storm sewer network will connect to the proposed 750mm diameter storm sewer in Road E.

The main storm sewer network for the Main Hospital Building and Central Utility Plant begins at the Road E and Prince of Wales Drive intersection and wraps around the Main Hospital Building to the Road B and Prince of Wales intersection where is ultimately discharges to Dow’s Lake. Catchbasins (not part of advance works) will capture the majority of the 100-year runoff within the roads and parking lots.

The eastern portion of the existing Central Experimental Farm storm sewer system outlets through the NCD leased lands towards Price of Wales Drive. At Prince of Wales Drive, the storm sewer extends southeast and discharges to Dow's Lake. Relocation of this portion of the Central Experimental Farm storm sewer system is required to ensure flows from the Central Experimental Farm lands continue to outlet to Dow's Lake. A connection to the existing Central Experimental Farm storm sewer system will be made within the hospital leased lands at the existing Brich Drive and Maple Drive intersection. A maintenance hole structure will be installed, and a new 900mm diameter storm sewer will extend north to Road D and then east, at which point the Central Experimental Farm runoff will be combined with the NCD storm runoff (part of advance works). Another connection to the NCD storm sewer will be made to the north, east of the existing Dominion Observation Building. A new 450mm diameter storm sewer is required to make this connection (part of advance works). The stormwater will be controlled and detained using and inlet control device and underground storage (not part of advance works) in the vicinity of the Maple Drive and NCD Road D intersection and the western parking lot (Zone 1 Parking). Refer to **APPENDIX E** for the Agriculture and Agri Food Canada Existing Infrastructure technical memorandum for further details.

The design drawings, in **APPENDIX F**, shows the existing and proposed storm distribution network.

11.3 Design Criteria

The proposed storm sewer system has been designed in general conformance with the City of Ottawa Sewer Design Guidelines and its technical bulletins, plus more specific requirements from the City of Ottawa.

The design criteria from the City of Ottawa Sewer Design Guidelines and City of Ottawa staff for the site includes the following:

- The capacity of the downstream receiving system must be assessed and approved by the City of Ottawa;
- A detailed major system analysis using dynamic models must be undertaken to assess the impact of additional flow on the major system if inlet control devices are implemented;
- Proposed developments draining to an existing system that does not have stormwater treatment is subject to on-site treatment (i.e., best management practice, oil grit separators, etc.);
- Stormwater management for the portion of the site that outlets to the Nepean Bay Trunk and the Preston Trunk combined sewer shall be based on the 2-year storm event using the IDF information derived from the Meteorological Services of Canada rainfall data, taken from the MacDonald Cartier Airport, collected 1966 to 1997;
- Stormwater management for the portion of the site that outlets to Dow's Lake shall be based on the 5-year storm event using the IDF information derived from the Meteorological Services of Canada rainfall data, taken from the MacDonald Cartier Airport, collected 1966 to 1997;
- Pre-development runoff coefficient to be determined as per existing conditions but shall not exceed 0.4 when discharging to a combined City system;
- Pre-development runoff coefficient to be determined as per existing conditions but shall not exceed 0.5 when discharging to a storm City system;
- A calculated time of concentration cannot be less than 10 minutes;
- Storm flows to the Preston Trunk and Nepean Bay Trunk in excess of the 2-year storm release rate, up to and including the 100-year storm event, must be detained on site;
- Storm flows to Dow's Lake in excess of the 5-year storm release rate, up to and including the 100-year storm event, must be detained on site;
- IDF curve equations used with the Rational formula:
  - 2-year $=732.951/(Tc+6.199)^{0.810}$
  - 5-year $=998.071/(Tc+6.053)^{0.814}$
  - 100-year $= 1735.688/(Tc+6.014)^{0.820}$

- The rational method uses runoff coefficients (C) for various surfaces. The runoff coefficient for a 100-year storm event is increased by 25% in accordance with the *City of Ottawa Sewer Design Guidelines* to a maximum of 1.0. The following C values were used in within this study:
  - 5-year runoff coefficient asphalt/concrete/buildings = 0.90
  - 100-year runoff coefficient asphalt/concrete/buildings = 1.00
  - 5-year runoff coefficient grass = 0.20
  - 100-year runoff coefficient grass = 0.25
  - 5-year runoff coefficient forest = 0.40
  - 100-year runoff coefficient forest = 0.50

The design criteria from the National Capital Commission FLUDTA File (CP2299-18853) includes the following:

- Integrated best management practices for a sustainable stormwater management on site;
- Achieve improved water quality by controlling rainwater at its point of impact, managing infiltration and conveying any excess off-site by systems (such as swales, ditches and storm sewers;
- Respect the hydraulic capacity and erosion thresholds of receiving watercourses with an appropriate water quantity peak flow discharge rate;
- Seek to adhere to the following design strategies when possible:
  - Infiltration;
  - Bio-Retention/Bio-Filtration: Rainwater Harvesting (cisterns and rain barrels);
  - Water quality enhancement: oil and grit separators;
  - Detention ponds and permanent check dams in swales; and
  - Green roofs, rooftop gardens, and green walls.

The design criteria from the National Capital Commission Stormwater Management Manual - Draft, Spring 2022, includes the following:

- Water Quality – to minimize or improve surface water and groundwater quality, minimize sediment loading to surface water and groundwater, maintain or enhance the quality of drinking water sources, and maintain or enhance existing thermal watercourse regimes.
- Water Quantity – to ensure the development manages peak flows so that it does not increase risk to the environment, public safety, property, and infrastructure.
- Volume Control – to control the overall volume of stormwater runoff that leave a project site in post-development conditions and promote the adoption of love impact development approaches to stormwater management.
- Floodplain Management – to ensure that continues function of natural floodplain areas from a hydrologic and hydraulic perspective, and to guide development away from flood prone areas.
- Erosion Control – to reduce impacts of erosion on aquatic and terrestrial habitats through the appropriate implementation of stormwater management practices.
- Drainage to Federal Land – to ensure that common law and Loi sur la Qualite de l'Environnement principles are applied fairly and consistently in matters regarding the management of drainage between the National Capital Commission and neighbouring landowners.
- Water Balance – to minimize the impacts of urbanization activities on alteration of the natural hydrologic cycle and existing water balance.

11.4 Allowable Release Rate

The allowable release rates for the site were calculated using the rational method formula based on the 2-year and 5-year flow and the existing runoff coefficient that shall not exceed 0.4 when discharging to a City of Ottawa combined sewer system and 0.5 when discharging to a City of Ottawa storm sewer system.

$$Q = 2.78\ CiA$$

where

Q = Flow rate (L/s)
C = Runoff coefficient
i = Rainfall intensity (mm/hr)
A = Area (ha)

The resultant allowable release rate is **136.41L/s** to the Preston Trunk (City combined system), **238.79L/s** to the Nepean Bay Trunk (City storm system), and **2345.34L/s** to Dow's Lake (private storm system). The allowable release rates are presented in **Table 11-2**.

Table 11-2: Allowable Release Rate

Storm Event	Total Area (ha)	Runoff Coefficient 2 Year	Allowable Release Rate	Outlet
2 Year	1.75	(Table 8-1)	146.46	Preston Trunk(1)
		sanitary flow deduction 10.05L/s(1)	136.41	
2 Year	6.48	(Table 8-1)	238.79	Nepean Bay Trunk
5 Year	28.10	(Table 8-1)	2345.34	Dow's Lake

(1) Preston Trunk Outlet is only relevant to the Phase 2: Parking Garage Project. Refer to the report 'Site Servicing and Stormwater Management Report, New Civic Development for The Ottawa Hospital Phase 2: Parking Garage Project, March 2023 for additional details.

11.5 Storm Sewer Design

Calculations showing the storm sewer design are included in **Appendix J**. The storm sewer design spreadsheet is based on the Rational Method and Manning Formula and was used to calculate the design flow and required pipe sizes. Intensity Duration Frequency (IDF) Curve information for the 2-year, 5-year, and 100-year design storms were obtained from the City of Ottawa Sewer Design Guideline and used to calculate the peak flows.

Figure 11-2 and **Figure B** in **Appendix J** shows the drainage areas and the sewer layout with catch basin and maintenance hole locations indicated. Details including pipe lengths, sizes, materials, inverts elevations and structure types are shown on the drawings in **APPENDIX F.**

11.6 Stormwater Management

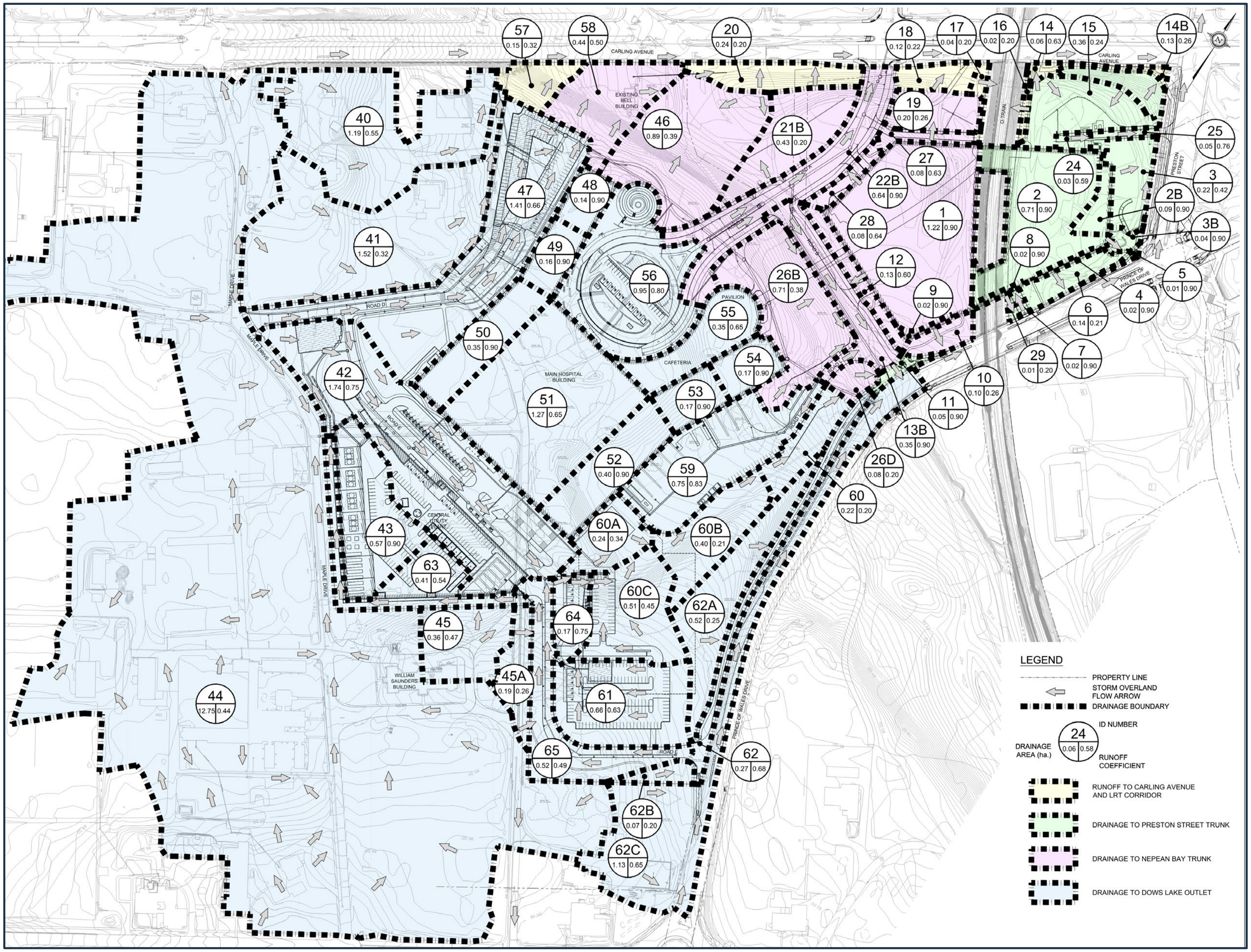
The on-site storm water management has been designed to attenuate the 2-year/5-year and 100-year post-development flow rates to the pre-development flow rate as shown in the stormwater calculations included in **Appendix J** and summarized below.

The total development area has been divided into four (4) main drainage areas, with one (1) drainage area located on the east side of the LRT corridor, one (1) drainage area located on the west side of the LRT corridor, one (1) drainage area adjacent to Carling Avenue, and one (1) drainage area to the northwest of Prince of Wales Drive, including external area from the Central Experimental Farm. The areas have then been divided into smaller site areas as shown in the **Figure 11-2** and **Figure B** in **Appendix J**. The eastern area will outlet to the Preston Street Trunk Sewer, the western area will outlet to the Carling Avenue storm sewer which ultimately outlets to the Nepean Bay Trunk Sewer, and the northwestern area will outlet to a private storm network that leads to Dow's Lake.

11.6.1 Post-Development Drainage Areas –Preston Trunk

The east post-development area will outlet to the Preston Street Trunk Sewer and will be controlled to the 2-year pre-development flow rate of **136.41L/s** or less. The Preston Trunk Outlet focuses on areas relevant to the Phase 2: Parking Garage that are under a separate contract. For additional details regarding their design please refer to the *Site Servicing and Stormwater Management Report, New Civic Development for The Ottawa Hospital Phase 2: Parking Garage Project, May 2023*, prepared by Parsons.

Figure 11-2: Post Development Drainage Areas



11.6.2 Post-Development Drainage Areas –Nepean Bay Trunk

The west post-development area will outlet to the Nepean Bay Trunk Sewer and will be controlled to the 2-year pre-development flow rate of **238.79L/s** or less.

Drainage Area - STM01

Drainage Area STM01 represents the west portion of the rooftop that will drain through uncontrolled roof drains. This flow will be directed to a cistern(s) on the west side of the LRT corridor that will be connected to the storm sewer on Road A/Road B. This area will ultimately outlet to the Nepean Bay Trunk.

The cistern(s) will be pumped at a maximum allowable flow rate of **60.0L/s.** The required storage volume of the cistern is 232m^3 and 492m^3 during the 5-year and 100-year storms, respectively. The cistern is being sized to accommodate the 100-year storm which results in a required volume of **492m^3**.

The cistern(s) will be located inside the parking garage on the west side. Four (4) 35,000-gallon cisterns are proposed that will provide a volume of **530m^3**. Therefore, the volume required for the 100-year storm can be accommodated within the cisterns. These cisterns will be pumped at a controlled rate and will have an overflow.

A permanent groundwater volume of 33,000L/day has been accounted for the western portion of the parking garage and will discharge to the cistern(s) located inside the parking garage on the west side.

Drainage Area STM01 and STM09 will also be controlled with Drainage Areas STM10, STM12, STM13B, STM19, STM22B, STM26B, STM26D, STM27, and STM28 prior to discharging into the existing 900mm diameter storm sewer on Carling Avenue, at Champagne Avenue South, that ultimately outlets to the Nepean Bay Trunk. Refer to the Drainage Area STM12 section for the release rate and storage details.

Drainage Area - STM09

This proposed garden bed located on parking level four (P4) of the parking garage that will drain through uncontrolled drains. This flow will be directed internally through the building structure and combine with the flow from Drainage Area STM01 which will be directed to the underground cistern(s). Refer to the Drainage Area STM01 section for further details.

Drainage Area – STM10

The flow from the proposed landscape area along the south side of the parking garage will be captured with landscape drains. The landscape drains will drain to the oversized 1200mm/1500mm diameter storm sewer within Road A/Road B.

Drainage Area STM10 will be controlled with Drainage Areas STM12, STM13B, STM19, STM22B, STM26B, STM26D, STM27, and STM28.

Drainage Area STM10, STM12, STM13B, STM22B, STM27, and STM28 will receive controlled flow from Drainage Area STM19, Drainage Area STM26B, and Drainage Area STM26D prior to discharging to the existing 900mm diameter storm sewer on Carling Avenue, at Champagne Avenue South, that ultimately outlets to the Nepean Bay Trunk. Refer to the Drainage Area STM12 section for the release rate and storage details.

Drainage Area – STM12

The proposed landscape area along the west side of the parking garage will sheet flow to the proposed catchbasins along Road B. The catchbasins will drain to an oversized 1200mm/1500mm diameter storm sewer within Road A/Road B. The flow will be controlled with an orifice plate with a **300mm** diameter hole (bottom) and a **100mm** diameter hole (top) prior to discharging into the existing 900mm diameter storm sewer on Carling Avenue, at Champagne Avenue South, that ultimately outlets to the Nepean Bay Trunk.

Drainage Area STM12 will be controlled with Drainage Areas STM10, STM13B, STM19, STM22B, STM26B, STM26D, STM27, and STM28 to **173.45L/s** for the 5-year and **228.12L/s** for the 100-year. The oversized

1200mm/1500mm diameter storm sewer can accommodate the 5-year and 100-year storms as well as the 100-year storm plus a 20% stress test. Refer to the PCSWMM output files with **Appendix J** for further details.

Drainage Area STM10, STM12, STM13B, STM22B, STM27, and STM28 will receive controlled flow from Drainage Area STM19, Drainage Area STM26B, and Drainage Area STM26D prior to discharging to the existing 900mm diameter storm sewer on Carling Avenue, at Champagne Avenue South, that ultimately outlets to the Nepean Bay Trunk.

<u>Drainage Area - STM13B</u>

This area represents the majority of Road B. The proposed asphalt road will drain via catchbasins that will be directed to the proposed oversized 1200mm/1500mm diameter storm sewer within Road A/Road B. The catchbasins will capture the majority of the 100-year runoff with minimal spill over to Prince of Wales and ultimately Carling Avenue (Preston Trunk Outlet).

Drainage Area STM13B will be controlled with Drainage Areas STM10, STM12, STM19, STM22B, STM26B, STM26D, STM27, and STM28.

Drainage Area STM10, STM12, STM13B, STM22B, STM27, and STM28 will receive controlled flow from Drainage Area STM19, Drainage Area STM26B, and Drainage Area STM26D prior to discharging to the existing 900mm diameter storm sewer on Carling Avenue, at Champagne Avenue South, that ultimately outlets to the Nepean Bay Trunk. Refer to the Drainage Area STM12 section for the release rate and storage details.

<u>Drainage Area – STM19</u>

This area is a proposed landscape area adjacent to the service road on the west side of the LRT corridor. A catchbasin will capture the flow and release it at a controlled rate to the proposed oversized 1200mm/1500mm diameter storm sewer within Road A/Road B.

The controlled flow from this drainage area will be **3.65L/s** for the 5-year and **3.78L/s** for the 100-year. A vortex type ICD (Hydrovex Model No. 50 VHV-1 or equivalent) is proposed in CB37 to control the flow. The required storage volume is 14m^3 and 60m^3 during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **84m^3** is required to accommodate the 100-year storm plus a 20% stress test. A surface storage volume of approximately **270m^3** is available within the landscape area. Therefore, the storage volume required for the 100-year storm plus a 20% stress test can be accommodated within the temporary dry pond.

It should be noted that this is a temporary surface storage area that will be removed when the Carling Towers are constructed. These buildings will require on-site stormwater management to attenuate the 5-year and 100-year post-development flow rates to the pre-development flow rate.

Drainage Area STM10, STM12, STM13B, STM22B, STM27, and STM28 will receive controlled flow from Drainage Area STM19, Drainage Area STM26B, and Drainage Area STM26D prior to discharging to the existing 900mm diameter storm sewer on Carling Avenue, at Champagne Avenue South, that ultimately outlets to the Nepean Bay Trunk. Refer to the Drainage Area STM12 section for the release rate and storage details.

<u>Drainage Area – STM21B</u>

This area is located west of Road A. This existing open grass area with trees will remain as existing conditions. A catchbasin will capture the flow and release it at a controlled rate to the existing storm sewer in Carling Avenue that ultimately outlets to the Nepean Bay Trunk.

The controlled flow from this drainage area will be **3.85L/s** for the 5-year and **4.10L/s** for the 100-year. A vortex type ICD (Hydrovex Model No. 50 VHV-1 or equivalent) is proposed in CB35 to control the flow. The required storage volume is 213m^3 and 662m^3 during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **889m^3** is required to accommodate the 100-year storm plus a 20% stress test. A surface storage volume of approximately **1288m^3** is available within the landscape area. Therefore, the storage volume required for the 100-year storm plus a 20% stress test can be accommodated within the temporary dry pond.

Drainage Area STM21B will be controlled with Drainage Area STM46 and Drainage Area STM58, prior to discharging to the existing storm sewer in Carling Avenue.

It should be noted that this is a temporary surface storage area that will be removed when the Research Tower is constructed. The building will require on-site storm water management to attenuate the 5-year and 100-year post-development flow rates to the pre-development flow rate.

<u>Drainage Area – STM22B</u>

This area represents Road A. The proposed asphalt road will drain via catchbasins that will be directed to the proposed oversized 1200mm/1500mm diameter storm sewer within Road A/Road B. The catchbasins will capture the majority of the 100-year runoff with minimal spill over to Carling Avenue (Nepean Bay Trunk Outlet).

Drainage Area STM22B will be controlled with Drainage Areas STM10, STM12, STM13B, STM19, STM26B, STM26D, STM27, and STM28.

Drainage Area STM10, STM12, STM13B, STM22B, STM27, and STM28 will receive controlled flow from Drainage Area STM19, Drainage Area STM26B, and Drainage Area STM26D prior to discharging to the existing 900mm diameter storm sewer on Carling Avenue, at Champagne Avenue South, that ultimately outlets to the Nepean Bay Trunk. Refer to the Drainage Area STM12 section for the release rate and storage details.

<u>Drainage Area – STM26B</u>

This existing open grass area with trees, located west of Road B, will remain as in existing conditions. A ditch inlet is proposed to capture the flow and release it at a controlled rate to the proposed oversized 1200mm/1500mm diameter storm sewer within Road A/Road B.

The controlled flow from this drainage area will be **14.03L/s** for the 5-year and **15.46L/s** for the 100-year. A vortex type ICD (Hydrovex Model No.100 VHV-1 or equivalent) is proposed in DICB2 to control the flow. The required storage volume is 48m^3 and 204m^3 during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **284m^3** is required to accommodate the 100-year storm plus a 20% stress test. A surface storage volume of approximately **299m^3** is available within the landscape area. Therefore, the storage volume required for the 100-year storm plus a 20% stress test can be accommodated.

Drainage Area STM10, STM12, STM13B, STM22B, STM27, and STM28 will receive controlled flow from Drainage Area STM19, Drainage Area STM26B, and Drainage Area STM26D prior to discharging to the existing 900mm diameter storm sewer on Carling Avenue, at Champagne Avenue South, that ultimately outlets to the Nepean Bay Trunk. Refer to the Drainage Area STM12 section for the release rate and storage details.

<u>Drainage Area – STM26D</u>

This existing open grass area with trees, located west of Road B, will remain as in existing conditions. A ditch inlet is proposed to capture the flow and release it at a controlled rate to the proposed oversized 1200mm/1500mm diameter storm sewer within Road A/Road B.

The controlled flow from this drainage area will be **3.21L/s** for the 5-year and **3.49L/s** for the 100-year. A vortex type ICD (Hydrovex Model No.50 VHV-1 or equivalent) is proposed in DICB1 to control the flow. The required storage volume is 3m^3 and 19m^3 during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **28m^3** is required to accommodate the 100-year storm plus a 20% stress test. A surface storage volume of approximately **51m^3** is available within the landscape area. Therefore, the storage volume required for the 100-year storm plus a 20% stress test can be accommodated.

Drainage Area STM10, STM12, STM13B, STM22B, STM27, and STM28 will receive controlled flow from Drainage Area STM19, Drainage Area STM26B, and Drainage Area STM26D prior to discharging to the existing 900mm diameter storm sewer on Carling Avenue, at Champagne Avenue South, that ultimately outlets to the Nepean Bay Trunk. Refer to the Drainage Area STM12 section for the release rate and storage details.

Drainage Area – STM27

The proposed service road along the north side of the parking garage, west of the LRT corridor, will be asphalt. The service road will include a catchbasin that will direct flow to the oversized 1200mm/1500mm diameter storm sewer within Road A/Road B.

Drainage Area STM27 will be controlled with Drainage Areas STM10, STM12, STM13B, STM19, STM22B, STM26B, STM26D, and STM28.

Drainage Area STM10, STM12, STM13B, STM22B, STM27, and STM28 will receive controlled flow from Drainage Area STM19, Drainage Area STM26B, and Drainage Area STM26D prior to discharging to the existing 900mm diameter storm sewer on Carling Avenue, at Champagne Avenue South, that ultimately outlets to the Nepean Bay Trunk. Refer to the Drainage Area STM12 section for the release rate and storage details.

Drainage Area – STM28

The proposed landscape area along the west side of the parking garage will sheet flow to the proposed catchbasins along Road A. The catchbasins will drain to an oversized 1200mm/1500mm diameter storm sewer within Road A/Road B.

Drainage Area STM28 will be controlled with Drainage Areas STM10, STM12, STM13B, STM19, STM22B, STM26B, STM26D, and STM27.

Drainage Area STM10, STM12, STM13B, STM22B, STM27, and STM28 will receive controlled flow from Drainage Area STM19, Drainage Area STM26B, and Drainage Area STM26D prior to discharging to the existing 900mm diameter storm sewer on Carling Avenue, at Champagne Avenue South, that ultimately outlets to the Nepean Bay Trunk. Refer to the Drainage Area STM12 section for the release rate and storage details.

Drainage Area – STM46

This area is adjacent to Carling Avenue and west of Road A. The existing tree embankments and pedestrian pathways shall remain while a small ditch is to be graded to reroute drainage to the temporary dry pond in Drainage Area STM21B.

Drainage Area STM46 will be controlled with Drainage Area STM21B and Drainage Area STM58, prior to discharging to the existing storm sewer in Carling Avenue. Refer to the Drainage Area STM21B section for the release rate and storage details.

It should be noted that this is a temporary surface storage area that will be removed when the Future Research Building is constructed. This building will require on-site stormwater management to attenuate the 5-year and 100-year post-development flow rates to the pre-development flow rate.

Drainage Area – STM58

This area is adjacent to Carling Avenue, west of the existing Bell building. The existing tree embankment is to drain to a proposed ditch that will reroute drainage to the temporary dry pond in Drainage Area STM21B.

Drainage Area STM58 will be controlled with Drainage Area STM21B and Drainage Area STM46, prior to discharging to the existing storm sewer in Carling Avenue. Refer to the Drainage Area STM21B section for the release rate and storage details.

It should be noted that this is a temporary surface storage area that will be removed when the Future Research Building is constructed. This building will require on-site stormwater management to attenuate the 5-year and 100-year post-development flow rates to the pre-development flow rate.

11.6.3 Post Development Quantity Control –Nepean Bay Trunk

The 100-year stormwater flows are controlled with the post-development 100-year flows being controlled to the pre-development 2-year flows. The 2-year pre-development flow is **238.79L/s** and the 100-year post-development flow will be controlled to **228.12L/s.** The required onsite storage is provided (surface and underground) to control to the pre-development 2-year flow. Refer to **Table 11-3** for the post development restricted and unrestricted flow and **Table 11-4** for the required and available storage volumes.

Table 11-3: Post Development Unrestricted & Restricted Flows – Nepean Bay Trunk

Drainage Area ID	Drainage Area (ha)	Runoff Coefficient 2/5 Year	Runoff Coefficient 2/5 Year	5 Year Unrestricted Flow (L/s)	5 Year Restricted Flow (L/s)	100 Year Unrestricted Flow (L/s)	100 Year Restricted Flow (L/s)
DRAINAGE TO NEPEAN BAY TRUNK (WEST OF LRT)							
STM1	1.22	0.90	1.00	348.50	176.42*	606.73	228.12
STM9	0.02	0.90	1.00	5.56		9.53	
STM10	0.10	0.26	0.32	15.11		42.14	
STM12	0.13	0.60	0.74	33.19		60.86	
STM13B	0.35	0.90	1.00	109.86		210.44	
STM19	0.20	0.26	0.33	24.94		78.44	
STM22B	0.64	0.90	1.00	183.66		315.95	
STM27	0.08	0.63	0.79	19.89		36.41	
STM28	0.08	0.64	0.80	20.27		36.77	
STM26B	0.71	0.38	0.48	77.64		240.03	
STM26D	0.08	0.20	0.25	14.53		35.37	
STM21B	0.43	0.20	0.25	138.87	3.85	490.68	4.01
STM46	0.89	0.39	0.49	165.32		477.39	
STM58	0.44	0.50	0.63	72.87		181.29	
TOTAL NEPEAN BAY TRUNK	5.37				180.27		

Table 11-4: Storage Volume Summary – Nepean Bay Trunk

Drainage Area ID	5 Year Storage Volume (m³)	100 Year Storage Volume (m³)	100 Year + 20% Stress Factor Storage Volume (m³)	Available Storage (m³)
STM1 & STM9	232	492	629	530* (Underground Cistern(s))
STM19	14	60	84	270 (Temporary Dry Pond)
STM 21B, STM46, STM58	213	662	889	1288 (Temporary Dry Pond)
STM26B	48	204	284	299 (Ponding in Ditch)
STM26D	3	19	28	51 (Ponding in Ditch)

*Building cistern(s) were sized for the 100-year storm. An overflow will be provided.

11.6.4 Post-Development Drainage Areas – Dow's Lake Outlet

The southwestern post-development area will outlet to a private storm sewer and ultimately to Dow's Lake. This will be controlled to the 5-year pre-development flow rate of 2345.34L/s or less.

Drainage Area – STM40

Drainage Area STM40 is an external drainage area located within the Ottawa Experimental Farm. It is adjacent to Carling Avenue, east of Maple Drive, and contains existing asphalt roadways and parking areas, buildings, and open grass areas with trees. This area drains through a private storm sewer system that outlets to Dow's Lake. Overland flow will remain as existing conditions and go to Carling Avenue.

Drainage Area STM40 will be controlled with Drainage Areas STM41, STM42, STM43, STM44, STM45, STM45A, STM47, STM61, STM63, STM64, and STM65 prior to discharging into the proposed oversized storm sewer system, east of Tower A, for the Main Hospital Building and Central Utility Plant that ultimately discharges to Dow's Lake. Refer to the Drainage Area STM47 section for the release rate and storage details.

Controlled flow will be received from Drainage Areas STM43, STM44, STM45, STM61, STM63, and STM64. Refer to the various Drainage Area sections for the release rate and storage details.

Drainage Area – STM41

Drainage Area STM41 is an external drainage area located within the Ottawa Experimental Farm. It is adjacent to Maple Drive and Road D and contains existing asphalt roadways and parking areas, buildings, and open grass areas with trees. Overland flow will be directed to a proposed ditch, located on Ottawa Experimental Farm property, which drains into the proposed oversized storm sewer system for the Main Hospital Building and Central Utility Plant. The proposed oversized storm sewer system will ultimately outlet to Dow's Lake.

Drainage Area STM41 will be controlled with Drainage Areas STM40, STM42, STM43, STM44, STM45, STM45A, STM47, STM61, STM63, STM64, and STM65 prior to discharging into the proposed oversized storm sewer system, east of Tower A, for the Main Hospital Building and Central Utility Plant that ultimately discharges to Dow's Lake. Refer to the Drainage Area STM47 section for the release rate and storage details.

Controlled flow will be received from Drainage Areas STM43, STM44, STM45, STM61, STM63, and STM64. Refer to the various Drainage Area sections for the release rate and storage details.

Drainage Area – STM42

This drainage area includes the western portion of Road E, the ambulance entrance and garage, parking lot for hospital staff (Zone 6A Parking), and the northern portion of the Central Utility Plant building. A network of catchbasins and catchbasin maintenance holes will capture the stormwater within the proposed oversized storm sewer system for the Main Hospital Building and Central Utility Plant. The proposed oversized storm sewer system will ultimately outlet to Dow's Lake.

The Central Utility Plant building is assumed to have two (2) service connections that tie into the proposed oversized storm sewer system for the Main Hospital Building and Central Utility Plant along Road E. It is also assumed that the northern portion of the Central Utility Plant roof will be uncontrolled and directed to these two (2) services connections.

Drainage Area STM42 will be controlled with Drainage Areas STM40, STM41, STM43, STM44, STM45, STM45A, STM47, STM61, STM63, STM64, and STM65 prior to discharging into the proposed oversized storm sewer system, east of Tower A, for the Main Hospital Building and Central Utility Plant that ultimately discharges to Dow's Lake. Refer to the Drainage Area STM47 section for the release rate and storage details.

Controlled flow will be received from Drainage Areas STM43, STM44, STM45, STM61, STM63, and STM64. Refer to the various Drainage Area sections for the release rate and storage details.

Permanent groundwater dewatering for the Central Utility Plant/Main Hospital Building is estimated to **12.73L/s**. The groundwater estimates are preliminary and include several simplified assumptions. A numerical model should be completed to better represent the complex geometry of the excavation, the variability in the overburden deposits, and the sloping water table. Based on the groundwater samples collected from the site to date and the City of Ottawa sewer discharge criteria, it is assumed that the groundwater will discharge to the proposed storm sewer system. The discharge location is assumed to be MHST158, located on Road E, and will need to be refined as the design of the Central Utility Plant/Main Hospital Building moves into the preliminary/detail stages.

Drainage Area – STM43

This area represents the southwestern portion of the Central Utility Plant. The Central Utility Plant will need to provide stormwater quantity control through rooftop storage or underground cisterns to control the released flow. The building is assumed to have one (1) service connection adjacent to Maple Drive that ties into the proposed oversized storm sewer for the Main Hospital Building and Central Utility Plant along Road E. The proposed oversized storm sewer system will ultimately outlet to Dow's Lake.

A maximum allowable release rate of **15L/s** was assigned to this drainage area. At the maximum allowable release rate, the required storage volume (rooftop or cistern(s)) is 132m^3 and 268m^3 during the 5-year and 100-year storms, respectively As per the *City of Ottawa Sewer Design Guideline*, a storage volume of **340m^3** is required to accommodate the 100-year storm plus a 20% stress test. This storage volume needs to be accounted within the building design of the Central Utility Plant.

Drainage Area – STM44

Drainage Area STM44 includes the full external drainage of the Ottawa Central Experimental Farm that is serviced by the existing Maple Drive private storm sewer network. It contains asphalt roadways and parking areas, buildings, open grass areas with trees, and Maple Drive. The existing private storm sewer within Maple Drive will connect into the proposed oversized storm sewer network for the Main Hospital Building and Central Utility Plant at the existing Maple Drive and Birch Drive intersection. The proposed oversized storm sewer system will ultimately outlet to Dow's Lake.

The controlled flow from this drainage area will be **763.88L/s** for the 5-year and **1405.28L/s** for the 100-year. A **675mm** diameter orifice and **1000mm** height weir plate is proposed in MHST155 to control the flow. The required storage volume is 651m^3 and 1686m^3 during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **2056m^3** is required accommodate the 100-year storm plus a 20% stress test. A storage volume of approximately **2100m^3** is available within the proposed off-site underground storage chamber, located on the northeast corner of the Maple Drive and Road D intersection. Therefore, the volume required for the 100-year storm plus a 20% stress test can be accommodated within the proposed off-site underground storage chamber.

Controlled flow will be received from Drainage Areas STM43, STM45, and STM63. Refer to the various Drainage Area sections for the release rate and storage details.

Drainage Area – STM45

Drainage Area STM45 is an external drainage area located within the Ottawa Experimental Farm. This area includes a portion of the existing William Saunders Building and adjacent asphalt laneway and severed portion of Birch Drive. The area is to remain as existing where stormwater flows northward. A proposed ditch, located on the hospital site, will surround the Central Utility Plant to convey the stormwater away from the building and allow ponding for storage. Stormwater will be captured by a proposed catchbasin equipped with an inlet control device that will outlet to the proposed off-site underground storage chamber, located on the northeast corner of the Maple Drive and Road D intersection. The off-site underground storage chamber will connect into the proposed oversized storm sewer network for the Main Hospital Building and Central Utility Plant at the existing Maple Drive and Birch Drive intersection. The proposed oversized storm sewer system will ultimately outlet to Dow's Lake.

Drainage Area STM45 will be controlled with STM63 prior to discharging into the proposed off-site underground storage chamber, located on the northeast corner of the Maple Drive and Road D intersection. Refer to the Drainage Area STM63 section for the release rate and storage details.

Drainage Area – STM45A

Drainage Area STM45A is an external drainage area located within the Ottawa Experimental Farm. This area is located adjacent to the proposed Road E retaining wall. This existing asphalt laneway and open grass area with trees will remain as in existing conditions.

Drainage Area STM45A will be controlled with Drainage Areas STM40, STM41, STM42, STM43, STM44, STM45, STM47, STM61, STM63, STM64, and STM65 prior to discharging into the proposed oversized storm sewer system, east of Tower A, for the Main Hospital Building and Central Utility Plant that ultimately discharges to Dow's Lake. Refer to the Drainage Area STM47 section for the release rate and storage details.

Controlled flow will be received from Drainage Areas STM43, STM44, STM45, STM61, STM63, and STM64. Refer to the various Drainage Area sections for the release rate and storage details.

Drainage Area – STM47

This area represents Road D and the most western parking lot (Zone 1 Parking). The proposed asphalt road and parking lot will drain via catchbasins that will be controlled by an inlet control device. Stormwater will be detained by an underground storage chamber and oversized 1050mm/1350mm diameter storm sewer. The proposed oversized storm sewer system will ultimately outlet to Dow's Lake.

Drainage Area STM47 will be controlled with Drainage Areas STM40, STM41, STM42, STM43, STM44, STM45, STM45A, STM61, STM63, STM64, and STM65 to **208.44L/s** for the 5-year and **524.73L/s** for the 100-year. An **800mm** rectangular orifice and **1000mm** height weir plate is proposed in MHST145 to control the flow. The required storage volume is 915m^3 and 1958m^3 during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **2681m^3** is required accommodate the 100-year storm plus a 20% stress test. A storage volume of approximately **3012m^3** is available within the underground storage chamber Therefore, the volume required for the 100-year storm plus a 20% stress test can be accommodated within the underground chamber and oversized pipe network.

Controlled flow will be received from Drainage Areas STM43, STM44, STM45, STM61, STM63, and STM64. Refer to the various Drainage Area sections for the release rate and storage details.

Drainage Area – STM48

This area represents the northern roof portion of Tower A (traditional roof) of the Main Hospital Building. The stormwater will be stored on top of the roof and controlled via roof drains. This portion of the building is assumed to have one (1) service connection that will tie into the proposed oversized storm sewer that ultimately outlets to Dow's Lake. The roof drain parameters were assumed and will need to be refined as the design moves forward. The following assumptions were made for this portion of the roof: one roof drain per 232.5m^2 of roof area, maximum flow rate of 2.28L/s per roof drain, and a maximum allowable ponding depth of 0.15m.

The controlled flow from this drainage area will be **3.19L/s** for the 5-year and **5.41L/s** for the 100-year. The required storage volume is 45m^3 and 77m^3 during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **93m^3** is required accommodate the 100-year storm plus a 20% stress test. A storage volume of approximately **193m^3** is assumed available within this portion of roof. Therefore, the volume required for the 100-year storm plus a 20% stress test can be accommodated.

Drainage Area – STM49

This area represents the central roof portion of Tower A (traditional roof) of the Main Hospital Building. The stormwater will be stored on top of the roof and controlled via roof drains. This portion of the building is assumed to have one (1) service connection that will tie into the proposed oversized storm sewer that ultimately outlets to Dow's Lake. The roof drain parameters were assumed and will need to be refined as the design moves forward. The following assumptions were made for this portion of the roof: one roof drain per 232.5m² of roof area, maximum flow rate of 2.28L/s per roof drain, and a maximum allowable ponding depth of 0.15m.

The controlled flow from this drainage area will be **4.03L/s** for the 5-year and **6.85L/s** for the 100-year. The required storage volume is 53m³ and 90m³ during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **108m³** is required accommodate the 100-year storm plus a 20% stress test. A storage volume of approximately **240m³** is assumed available within this portion of roof. Therefore, the volume required for the 100-year storm plus a 20% stress test can be accommodated.

<u>Drainage Area – STM50</u>

This area represents the southern roof portion of Tower A (traditional roof) of the Main Hospital Building. The stormwater will be stored on top of the roof and controlled via roof drains. This portion of the building is assumed to have one (1) service connection that will tie into the proposed oversized storm sewer that ultimately outlets to Dow's Lake. The roof drain parameters were assumed and will need to be refined as the design moves forward. The following assumptions were made for this portion of the roof: one roof drain per 232.5m² of roof area, maximum flow rate of 2.28L/s per roof drain, and a maximum allowable ponding depth of 0.15m.

The controlled flow from this drainage area will be **7.64L/s** for the 5-year and **12.99L/s** for the 100-year. The required storage volume is 114m³ and 194m³ during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **233m³** is required accommodate the 100-year storm plus a 20% stress test. A storage volume of approximately **506m³** is assumed available within this portion of roof. Therefore, the volume required for the 100-year storm plus a 20% stress test can be accommodated.

<u>Drainage Area – STM51</u>

This area represents the Podium roof (purple roof) of the Main Hospital Building. The stormwater will be stored within the purple roof structure and released at a controlled flow rate. This portion of the building is assumed to have two (2) service connections that will tie into the proposed oversized storm sewer that ultimately outlets to Dow's Lake. The purple roof structure was assumed, and will may need to be refined as the design moves forward.

The controlled flow (controlled via the purple roof median) from this drainage area will be **6.38L/s** for the 5-year and **33.26L/s** for the 100-year. The detention volume is 571m³, 610m³, and 629m³ during the 5-year, 100-year, and 100-year plus 20% storms, respectively.

<u>Drainage Area – STM52</u>

This area represents the southern roof portion of Tower B (traditional roof) of the Main Hospital Building. The stormwater will be stored on top of the roof and controlled via roof drains. This portion of the building is assumed to have one (1) service connection that will tie into the proposed oversized storm sewer that ultimately outlets to Dow's Lake. The roof drain parameters were assumed and will need to be refined as the design moves forward. The following assumptions were made for this portion of the roof: one roof drain per 232.5m² of roof area, maximum flow rate of 2.28L/s per roof drain, and a maximum allowable ponding depth of 0.15m.

The controlled flow from this drainage area will be **8.96L/s** for the 5-year and **15.24L/s** for the 100-year. The required storage volume is 131m³ and 223m³ during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **268m³** is required accommodate the 100-year storm plus a 20% stress test. A storage volume of approximately **596m³** is assumed available within this portion of roof. Therefore, the volume required for the 100-year storm plus a 20% stress test can be accommodated.

<u>Drainage Area – STM53</u>

This area represents the central roof portion of Tower B (traditional roof) of the Main Hospital Building. The stormwater will be stored on top of the roof and controlled via roof drains. This portion of the building is assumed to have one (1) service connection that will tie into the proposed oversized storm sewer that ultimately outlets to Dow's Lake. The roof drain parameters were assumed and will need to be refined as the design moves forward. The following assumptions were made for this portion of the roof: one roof drain per 232.5m^2 of roof area, maximum flow rate of 2.28L/s per roof drain, and a maximum allowable ponding depth of 0.15m.

The controlled flow from this drainage area will be **4.07L/s** for the 5-year and **6.91L/s** for the 100-year. The required storage volume is 57m^3 and 97m^3 during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **116m^3** is required accommodate the 100-year storm plus a 20% stress test. A storage volume of approximately **252m^3** is assumed available within this portion of roof. Therefore, the volume required for the 100-year storm plus a 20% stress test can be accommodated.

Drainage Area – STM54

This area represents the northern roof portion of Tower B (traditional roof) of the Main Hospital Building. The stormwater will be stored on top of the roof and controlled via roof drains. This portion of the building is assumed to have one (1) service connection that will tie into the proposed oversized storm sewer that ultimately outlets to Dow's Lake. The roof drain parameters were assumed and will need to be refined as the design moves forward. The following assumptions were made for this portion of the roof: one roof drain per 232.5m^2 of roof area, maximum flow rate of 2.28L/s per roof drain, and a maximum allowable ponding depth of 0.15m.

The controlled flow from this drainage area will be **4.01L/s** for the 5-year and **6.80L/s** for the 100-year. The required storage volume is 56m^3 and 95m^3 during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **114m^3** is required accommodate the 100-year storm plus a 20% stress test. A storage volume of approximately **253m^3** is assumed available within this portion of roof. Therefore, the volume required for the 100-year storm plus a 20% stress test can be accommodated.

Drainage Area – STM55

This area represents the Pavilion roof (green roof) of the Main Hospital Building. The stormwater will be stored within the purple roof structure and released at a controlled flow rate. This portion of the building is assumed to have one (1) service connection that will tie into the proposed oversized sewer that ultimately outlets to Dow's Lake. The purple roof structure was assumed, and will may need to be refined as the design moves forward.

The controlled flow (controlled via the purple roof median) from this drainage area will be **1.77L/s** for the 5-year and **9.22L/s** for the 100-year. The detention volume is 140m^3, 144m^3, and 175m^3 during the 5-year, 100-year, and 100-year plus 20% storms, respectively.

Drainage Area – STM56

This area represents the underground emergency parking garage located at the front of the Main Hospital Building. The parking structure will need to provide stormwater quantity control through rooftop storage or underground cisterns to control the released flow. The parking structure is assumed to have one (1) service connection that will tie into the proposed oversized storm sewer that ultimately outlets to Dow's Lake.

The uncontrolled flow from this drainage area will be **249.44L/s** for the 5-year and **455.79L/s** for the 100-year.

The flow will be controlled downstream of where is this drainage area outlets to the oversized storm sewer. The control flow will be **1082.53L/s** for the 5-year and **1967.23L/s** for the 100-year. An **850mm** diameter orifice and **500mm** height weir plate is proposed in MHST142 to control the flow.

Drainage Area – STM59

This area represents the loading dock of the Main Hospital Building. Stormwater will be collected through catchbasins and directed (uncontrolled) into the proposed oversized storm sewer that ultimately outlets to Dow's Lake.

The uncontrolled flow from this drainage area will be **200.62L/s** for the 5-year and **362.97L/s** for the 100-year.

Drainage Area – STM60

This area is west of Prince of Wales Drive, southwest of Road B, and adjacent to the proposed hospital loading dock. Proposed to incorporate a bioswale for quantity storage that also provides the major overland flow route for western drainage. A ditch inlet is proposed to capture the flow and release it at a controlled rate to the oversized storm sewer that ultimately outlets to Dow's Lake.

The controlled flow from this drainage areas will be **3.68L/s** for the 5-year and **4.18L/s** for the 100-year. A vortex type ICD (Hydrovex Model No.50 VHV-1 or equivalent) is proposed in MHST130 to control the flow. The required storage volume is 47m^3 and 190m^3 during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **287m^3** is required to accommodate the 100-year storm plus a 20% stress test. A surface storage volume of approximately **455m^3** is available within the landscape area. Therefore, the storage volume required for the 100-year storm plus a 20% stress test can be accommodated.

Drainage Area STM60 receives uncontrolled flow from Drainage Area STM60A, STM60B, and STM60C.

It should be noted that this is a temporary design that will be removed when the future Heart Institute is constructed. This building will require on-site stormwater management to attenuate the 5-year and 100-year post-development flow rates to the pre-development flow rate.

Drainage Area - STM60A

This area is west of Prince of Wales Drive, southwest of Road B, and adjacent to the proposed hospital loading dock. Proposed to incorporate a bioswale for quantity storage that also provides the major overland flow route for western drainage. A ditch inlet is proposed to capture the flow and release it at a controlled rate to the oversized storm sewer that ultimately outlets to Dow's Lake.

Drainage Areas STM 60, STM60A, STM60B, and STM60C will be controlled together prior to discharging to the oversized storm sewer that ultimately outlets to Dow's Lake. Refer to the Drainage Area STM60 section for the release rate and storage details.

Drainage Area - STM60B

This area is west of Prince of Wales Drive, southwest of Road B, and adjacent to the proposed hospital loading dock. Proposed to incorporate a bioswale for quantity storage that also provides the major overland flow route for western drainage. A ditch inlet is proposed to capture the flow and release it at a controlled rate to the oversized storm sewer that ultimately outlets to Dow's Lake.

Drainage Areas STM 60, STM60A, STM60B, and STM60C will be controlled together prior to discharging to the oversized storm sewer that ultimately outlets to Dow's Lake. Refer to the Drainage Area STM60 section for the release rate and storage details.

Drainage Area - STM60C

This area is west of Prince of Wales Drive, southwest of Road B, and adjacent to the proposed hospital loading dock. Proposed to incorporate a bioswale for quantity storage that also provides the major overland flow route for western drainage. A ditch inlet is proposed to capture the flow and release it at a controlled rate to the oversized storm sewer that ultimately outlets to Dow's Lake.

Drainage Areas STM 60, STM60A, STM60B, and STM60C will be controlled together prior to discharging to the oversized storm sewer that ultimately outlets to Dow's Lake. Refer to the Drainage Area STM60 section for the release rate and storage details.

Drainage Area – STM61

This area is the southern parking lot (Zone 4 Parking) adjacent to Prince of Wales Drive and southwestern portion of Road E. The proposed parking lot will drain via a network of catchbasins and catchbasin maintenance holes that will be directed (uncontrolled) to the smaller southern parking lot (Zone 5B Parking).

Drainage Area STM61 will be controlled with STM63 prior to discharging into the proposed oversized sewer that ultimately outlets to Dow's Lake. Refer to the Drainage Area STM64 section for the release rate and storage details.

Drainage Area – STM62

This area is located adjacent to Prince of Wales Drive. This existing open grass area with trees will remain as in existing conditions. The surface flow will continue to drain uncontrolled to Prince of Wales Drive and ultimately drain to Dow's Lake.

The uncontrolled flow from this drainage area will be **51.98L/s** for the 5-year and **110.81L/s** for the 100-year.

Drainage Area – STM62A

This area is located adjacent to Prince of Wales Drive. This existing open grass area with trees will remain as in existing conditions. The surface flow will continue to drain uncontrolled to Prince of Wales Drive and ultimately drain to Dow's Lake.

The uncontrolled flow from this drainage area will be **18.50L/s** for the 5-year and **94.21L/s** for the 100-year.

Drainage Area – STM62B

This area is located adjacent to Prince of Wales Drive. This existing open grass area with trees will remain as in existing conditions. The surface flow will continue to drain uncontrolled to Prince of Wales Drive and ultimately drain to Dow's Lake.

The uncontrolled flow from this drainage area will be **3.53L/s** for the 5-year and **16.74L/s** for the 100-year.

Drainage Area – STM62C

This area is located adjacent to Prince of Wales Drive. This existing open grass area with trees will remain as in existing conditions. The surface flow will continue to drain uncontrolled to Prince of Wales Drive and ultimately drain to Dow's Lake.

The uncontrolled flow from this drainage area will be **161.33L/s** for the 5-year and **330.51L/s** for the 100-year.

Drainage Area – STM 63

This area represents the southeastern portion of the Central Utility Plant. This portion of the Central Utility Plant will be directed to the proposed ditch adjacent to the south side of the Central Utility Plant. Stormwater will be captured by a proposed catchbasin equipped with an inlet control device that will outlet to the proposed off-site underground storage chamber, located on the northeast corner of the Maple Drive and Road D intersection. The off-site underground storage chamber will connect into the proposed oversized storm sewer network for the Main Hospital Building and Central Utility Plant at the existing Maple Drive and Birch Drive intersection. The proposed oversized storm sewer system will ultimately outlet to Dow's Lake.

Drainage Area STM63 will be controlled with STM45 prior to discharging into the proposed off-site underground storage chamber, located on the northeast corner of the Maple Drive and Road D intersection. Refer to the Drainage Area STM63 section for the release rate and storage details.

The controlled flow from this drainage area will be **85.97L/s** for the 5-year and **97.88L/s** for the 100-year. A vortex type ICD (Hydrovex Model No.200 VHV-1 or equivalent) is proposed in DICB4 to control the flow. The required storage volume is 16m^3 and 117m^3 during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **180m^3** is required to accommodate the 100-year storm plus a 20% stress test. A surface storage volume of **272m^3** is available within the landscape area. Therefore, the storage volume required for the 100-year storm plus a 20% stress test can be accommodated.

Drainage Area – STM64

This area represents the smaller southern parking lot (Zone 5B Parking) adjacent to the ambulance garage. and a portion of Road E. The proposed asphalt road and parking lot will drain via a network of catchbasins and catchbasin maintenance holes that will be controlled by an inlet control device. Stormwater will be detained in an underground storage chamber within the parking lot.

Drainage Area STM63 will be controlled with STM61 prior to discharging into the proposed oversized sewer that ultimately outlets to Dow's Lake.

The controlled flow from this drainage areas will be **67.57L/s** for the 5-year and **144.58L/s** for the 100-year. A **100mm** diameter orifice and **300mm** height weir plate is proposed in MHST170 to control the flow. The required storage volume is 150m³ and 224m³ during the 5-year and 100-year storms, respectively. As per the *City of Ottawa Sewer Design Guideline*, the storage volume of **268m³** is required accommodate the 100-year storm plus a 20% stress test. A storage volume of approximately **311m³** is available within the underground storage chamber**.** Therefore, the volume required for the 100-year storm plus a 20% stress test can be accommodated within the underground storage chamber.

11.6.5 Post Development Quantity Control – Dow's Lake Outlet

The 100-year stormwater flows are controlled with the post-development 100-year flows being controlled to the pre-development 5-year flows. The 5-year pre-development flow is **2533.33L/s** and the 100-year post-development flow will be controlled to **2274.43L/s.** The required storage volume of **7584m³** to control the pre-development 5-year flow is provided through surface, rooftop, and underground storage (**9334m³**). The storage volumes will need to be refined/revisited as the design moves forward. Refer to **Table 11-5** for the post development restricted and unrestricted flow and **Table 11-6** for the required and available storage volumes.

Table 11-5: Post Development Unrestricted & Restricted Flows – Dow's Lake Outlet

Drainage Area ID	Drainage Area (ha)	Runoff Coefficient 2/5 Year	Runoff Coefficient 100 Year	5 Year Unrestricted Flow (L/s)	5 Year Restricted Flow (L/s)	100 Year Unrestricted Flow (L/s)	100 Year Restricted Flow (L/s)
STM40	1.19	0.55	0.68	202.28	1230.73	454.30	2288.41
STM41	1.52	0.32	0.39	98.54		289.99	
STM42	1.74	0.75	0.93	414.83		775.44	
STM43	0.57	0.90	1.00	163.35		280.78	
STM44	12.75	0.44	0.55	1375.82		3149.20	
STM45	0.36	0.47	0.59	46.05		126.96	
STM45A	0.19	0.26	0.33	23.82		76.60	
STM47	1.41	0.66	0.83	321.24		639.57	
STM48	0.14	0.90	1.00	39.70		68.24	
STM49	0.16	0.90	1.00	47.09		81.13	
STM50	0.35	0.90	1.00	95.14		167.67	
STM51	1.27	0.65	0.81	6.38		33.26	
STM52	0.40	0.90	1.00	108.26		192.14	
STM53	0.17	0.90	1.00	49.78		85.83	
STM54	0.17	0.90	1.00	49.01		84.49	
STM55	0.35	0.65	0.81	1.77		9.22	
STM56	0.95	0.80	1.00	249.44		455.79	
STM59	0.75	0.83	1.00	200.62		362.97	
STM60	0.22	0.20	0.25	105.95		372.57	

Drainage Area ID	Drainage Area (ha)	Runoff Coefficient 2/5 Year	Runoff Coefficient 100 Year	5 Year Unrestricted Flow (L/s)	5 Year Restricted Flow (L/s)	100 Year Unrestricted Flow (L/s)	100 Year Restricted Flow (L/s)
STM60A	0.24	0.34	0.42	44.53		107.87	
STM60B	0.40	0.21	0.26	114.64		372.00	
STM60C	0.51	0.45	0.56	89.99		216.55	
STM61	0.66	0.63	0.79	142.70		292.76	
STM62	0.27	0.68	0.85	51.98		110.81	
STM62A	0.52	0.25	0.31	18.50		94.21	
STM62B	0.07	0.20	0.25	3.53		16.74	
STM62C	1.13	0.65	0.81	161.33		330.51	
STM63	0.41	0.54	0.68	140.44		308.97	
STM64	0.17	0.75	0.93	45.84		81.54	
STM65	0.52	0.49	0.62	70.36		152.53	
TOTAL	29.57			4482.91	1230.73	9076.31	2288.41

Table 11-6: Storage Volume Summary – Dow's Lake Outlet

Drainage Area ID	5 Year Storage Volume (m^3)	100 Year Storage Volume (m^3)	100 Year + 20% Stress Factor Storage Volume (m^3)	Available Storage (m^3)
STM43	132	268	340	340 (Building Cistern Storage)*
STM44	651	1686	2056	2100 (Underground Storage)
STM48	45	77	93	193 (Building Rooftop Storage)*
STM49	53	90	108	240 (Building Rooftop Storage)*
STM50	114	194	233	506 (Building Rooftop Storage)*
STM51	571	610	629	629 (Purple Rooftop Storage)*
STM52	131	233	268	596 (Building Rooftop Storage)*
STM53	57	97	116	252 (Building Rooftop Storage)*
STM54	56	95	114	253 (Building Rooftop Storage)*
STM55	140	144	175	175 (Purple Rooftop Storage)*

Drainage Area ID	5 Year Storage Volume (m³)	100 Year Storage Volume (m³)	100 Year + 20% Stress Factor Storage Volume (m³)	Available Storage (m³)
STM 60	47	190	287	455 (Ponding in Ditch)
STM45 & STM63	16	117	180	272 (Ponding in Ditch)
STM 61 & STM64	150	224	268	311 (Underground Storage)
STM40, STM41, STM42, STM43, STM44, STM45, STM45A,STM47, STM61, STM63, STM64 & STM65	915	1958	2681	3012 (Underground Storage)
TOTAL	3078	5983	7548	9334

*Storage will need to be provided within the building and will need to be refined at the design moves forward.

11.7 Stormwater Quality

Enhanced water quality protection (80% TSS removal) is required, and best management practices are generally encouraged to maximize on-site quality protection.

The quality control measures for the site will be provided through a treatment train approach; promoting sheet runoff from impervious areas (asphalt/concrete) to low impact development (LID) systems (bioswales, infiltration trenches, etc.) where possible, underground storage systems, and oil and grit separator system(s). Potential locations for LID systems are indicated on the site grading drawings but will need to be confirmed as the design moves forward into the detailed design phase. An oil and grit separator will be placed at the downstream side of the proposed 1200mm diameter storm sewer that will outlet to the Dow's Lake (not part of advance works). Additional oil and grit separators may be required throughout the site. The stormwater quality design (number of oil and grit separator units, sizing of oil and grit separator units, location(s) of oil and grit separator units, etc.) will need to be completed within the detailed design phase (not part of advance works).

Permanent groundwater dewatering will be required for the site (not part of advance works). It is currently anticipated that the groundwater will be pumped into the proposed storm sewer system which would assist with lowering the temperature of the stormwater. In addition, the site has been designed with significant tree canopy and best efforts will be provided to promote shading of impervious areas (asphalt/concrete). The lowering of groundwater and discharge locations will be studied further within the detailed design phase (not part of advance works).

Temperature mitigation for stormwater runoff off the roof of Main Hospital Building will be provided through a purple roof design. The purple roof design will be studied further within the detailed design phase (not part of advance works).

11.8 Major Overland Flow

The major overland flow route for a portion of the Ottawa Experimental Farm is towards the existing Maple Drive/Birch Drive intersection. A ditch is proposed on the west side of the Central Utility Plant to capture and direct overland flow in a northwest direction around the Central Utility Plant towards Road E. At this point, the overland flow route is directed east on Road E until the southeastern corner of the Main Hospital Building. The overland flow route is then directed to the proposed bioswale along the east side of the Main Hospital Building and adjacent to the loading dock. A berm is proposed on the east side of the loading dock to ensure overland flow is directed to the Road B/Prince of Wales Drive intersection and divert it away from the loading dock. The overland flow continues down Prince of Wales Drive and north along Preston Street towards the Plouffe Park (easterly parcel) and the LRT Corridor (westerly parcel).

Major overland flow route from the Road E and Prince of Wales Drive intersection heads northwest along Road E until it is directed into the proposed bioswale adjacent to the loading dock.

The major overland flow route for Road D starts at the Maple Drive and Road D intersection. It continues northeast along Road D until reaching the proposed parking lot (Zone 1 Parking) along the west side of the Main Hospital Building and down the existing forest embankment to Carling Avenue. The overland flow route continues east along Carling Avenue to Preston Street. At Preston Street it heads north towards Plouffe Park (easterly parcel) and the LRT Corridor (westerly parcel).

The major overland flow route for Road L and Road B heads west towards the Road B and Prince of Wales Drive intersection and then along Prince of Wales Drive. At Prince of Wales Drive it heads north along Preston Street towards the Plouffe Park (easterly parcel) and the LRT Corridor (westerly parcel).

The major overland flow route for Road A is north towards the Road A and Carling Avenue intersection. It continues along Carling Avenue to Preston Street. At Preston Street it heads north towards the Plouffe Park (easterly parcel) and the LRT Corridor (westerly parcel).

11.9 Dow’s Lake Outfall

Preliminary outlet protection calculations were completed for the existing 1200mm diameter Dow’s Lake Outfall. The design memorandum is included in **Appendix J.**

11.10 Summary and Conclusions

The proposed stormwater system will consist of controlled stormwater from the Central Utility Plant and the Main Hospital Building. The stormwater will need to be detained using rooftop storage and/or underground cistern(s) within the buildings. The design of the buildings will need to account and provide the necessary quantity control requirements. There are three (3) storm service connections for the Central Utility Plant (not part of advance works), ten (10) storm service connections for the Main Hospital Building (not part of advance works), and temporary storm services in the southern parking lots (Zone 4 Parking and Zone 5B Parking) (not part of advance works) prior to the construction of the future Heart Institute. The stormwater sewer network wraps around the Main Hospital Building and is sized to capture the for 100-year flow.

An oversized storm sewer (750mm/1350mm diameter) is proposed within Road D and Road E and along the front of the Main Hospital Building.

An oversized storm sewer (1200mm/1500mm diameter) is proposed within Road A/Road B. This will service the Phase 2 (Parking Garage) project and a small portion of the works within the Phase 3 & 4 (Central Utility Plant and Main Hospital Building) project (not part of advance works). This storm sewer will connect into the existing 900mm storm sewer at Carling Avenue and Champagne Avenue South.

Two (2) underground storage chambers are proposed in the southern interim parking lots (Zone 4 Parking and Zone 5B Parking) (not part of advance works). One (1) underground storage chamber is proposed in the western parking lot (Zone 1 Parking) (not part of advance works). One (1) underground storage chamber is proposed in the vicinity of the Maple Drive and NCD Road D intersection for stormwater runoff from the Central Experimental Farm (not part of advance works).

Five (5) surface ponding areas (within Drainage Area STM21B, STM26B, STM26D, STM60, and STM63) are proposed on the west side of Road A/Road B (not part of advance works). Two (2) temporary surface ponding areas are proposed as part of the advance works.

The stormwater flows are controlled with the post development 100-year flows being controlled to the pre-development 2-year flow for networks heading to the Preston Street Trunk and Nepean Bay Trunk and to the 5-

year flow for the private system that outlets to Dow's Lake. The external drainage from the Central Experimental Farm will be controlled to the total external 5-year flow prior to entering the proposed oversized storm sewer network for the Central Utility Plant and Main Hospital Building.

Enhanced water quality protection (80% TSS removal) is required, and best management practices are generally encouraged to maximize on-site quality protection.

The major overland flow route for the site is in the northerly direction towards Carling Avenue to Preston Street intersection where it continues north towards the Plouffe Park (easterly parcel) and the LRT Corridor (westerly parcel).

The majority of the proposed 750/1350mm diameter storm sewer, excluding the building service connections, catchbasins, and loading dock area, is proposed to move forward under Advance Works. The proposed storm sewer may need to be refined as the Advance Works design package is finalized. The proposed storm service connections, storm sewer within the loading dock area, quality control design, quantity control design, and permanent dewatering system design will need to be refined as the Main Hospital Building and Central Utility Plant designs move forward. The demands for the Central Utility Plant and Main Hospital Building will need to be revisited and refined accordingly during the detail design when additional accuracy is obtained from the building design team.

12.0 SEDIMENT AND EROSION CONTROL

To mitigate the impacts due to erosion and sedimentation during construction, erosion and sediment control measures shall be installed and maintained throughout the duration of construction. Measures shall only be removed once the construction activities are complete, and the site has stabilized.

The measures will include:

- Siltsack® shall be installed between the frame and cover of existing and new catchbasins and maintenance holes, to minimize sediments entering the storm drainage system. These shall remain in place until construction is complete;
- A mud mat shall be provided where equipment will be leaving the site;
- Cori matting shall be provided along the temporary berm;
- Light Duty Silt Fence Barriers shall be placed along the north border of the site. The barriers shall be installed and maintained according to OPSS 577 and OPSD 219.110;
- A visual inspection shall be completed daily to identify any erosion and sediment control measures that may require repair;
- Erosion and sediment control measures shall be cleaned as required; and
- Additional erosion and sediment control measures may need to be installed by the Contractor during construction as requested by the Engineer.

In addition, the oil and grit separator will accumulate sediment from the site during runoff events and will require periodic cleaning. It is recommended to be cleaned on at least a yearly basis, or as per manufacturer's recommendations.

13.0 CONCLUSION

This report outlines the proposed servicing and stormwater management design for the Main Hospital Building and Central Utility Plant within the NCD for TOH.

13.1 Water

A 300mm diameter watermain loop (part of Advance Works) is proposed around the Main Hospital Building that will connect to the existing 406mm diameter watermain on Carling Avenue at the Carling Avenue and Road B intersection and Carling Avenue and Sherwood Drive. The proposed 300mm diameter watermain loop will also connect to the proposed 300mm diameter watermain at the Road A and Road B intersection.

The Central Experimental Farm has two (2) existing 300mmd diameter watermain loops that extend onto the hospital leased land from Maple Drive. A section of both watermain loops need to be relocated to ensure adequate domestic water supply and fire flow demand. The 300mm diameter watermain relocation for the northern loop (part of Advance Works) will be within the construction easement on the Central Experimental Farmland, adjacent to the northeast property limit. The existing fire hydrant at the Maple Drive and Birch Drive intersection will be removed and relocated to ensure the fire hydrant is accessible. The proposed relocation maintains a looped configuration to ensure redundancy. The 300mm diameter watermain relocation for the southern loop (part of Advance Works) will be located on both Central Experimental Farmland and hospital leased land. A new connection to the existing watermain on Maple Drive will be made at the access road on the south side of the William Saunders Building. The proposed 300mm diameter will extend east along the access road, south along Birch Drive, and then east within the hospital leased land to Prince of Wales Drive. At Prince of Wales Drive, it will connect into the existing watermain that extends east of Prince of Wales Drive.

The Main Hospital Building will be serviced with two (2) 200mm diameter water services (not part of Advance Works) at the east end of Tower B, extended from the 300mm diameter watermain loop. The Central Utility Plant will be serviced with two (2) 200mm diameter water services (not part of Advance Works) extended from the 300mm diameter watermain loop located within Road E.

The model results indicate that adequate domestic water supply is available for the site with the exception of the pressures falling below the City of Ottawa minimum requirement of 40psi at the proposed intersection of Road D and Road E, the front of the Main Hospital Building, and adjacent to Prince of Wales Drive during the average day demand, maximum daily demand, and peak hourly demand scenarios. The model results also indicate the pressures fall below the City of Ottawa minimum requirement of 20psi adjacent to Prince of Wales Drive during two (2) of the fire scenarios (back of the Main Hospital Building and Future Heart Institute). The pressure loss is a result of topographic constraints in the site (approximately 15m and 17.5m elevation different between these areas and Carling Avenue). None of the building services for the Central Utility Plant and Main Hospital Building are proposed in these low-pressure areas. The pressures at all proposed building services are above the City of Ottawa minimum requirement of 40psi during the average day demand, maximum daily demand, and peak hourly demand scenarios. The pressures at all proposed fire hydrants are above the City of Ottawa minimum requirement of 20psi during all fire scenarios.

The majority of the proposed 300 diameter watermain, excluding the building service connections and the fire hydrants, is proposed to move forward under Advance Works. The proposed watermain may need to be refined as the Advance Works design package is finalized. The proposed watermain connections and the fire hydrant locations will need to be refined as the Main Hospital Building and Central Utility Plant designs move forward. The demands for the Central Utility Plant and Main Hospital Building will need to be revisited/revised during the detail design when additional accuracy is obtained from the building design team.

13.2 Sanitary

The proposed sanitary sewer system for the Main Hospital Building and the Central Utility Plant will be divided (at MHSA11) into a south and west system. There are ten (10) sanitary service connections (not part of Advanced Works) assumed for the Main Hospital Building and two (2) sanitary service connections (not part of Advanced Works) assumed for the Central Utility Plant. The service connection(s) for the future Heart Institute (not part of Advanced Works) will be provided in a future phase. The proposed 300mm/375mm sanitary sewer will connect into the Mooney's Bay Collector at the proposed Road B and Road L intersection.

The eastern portion of the existing Central Experimental Farm sanitary sewer system outlets through the hospital leased lands to the Mooney's Bay Collector. Relocation of this portion of the Central Experimental Farm sanitary sewer system is required to ensure flows from the Central Experimental Farmlands continue to outlet to the Mooney's Bay Collector. A connection to the existing Central Experimental Farm sanitary sewer will be made within the hospital leased lands at the existing Birch Drive and Maple Drive intersection. A proposed 250mm diameter sanitary sewer will extend north to Road D and then east, at which point it will connect to the proposed 300mm/375mm diameter sanitary sewer for the Main Hospital Building and Central Utility Plant.

The majority of the proposed 300/375mm diameter sanitary sewer, excluding the building service connections and loading dock area, is proposed to move forward under Advance Works. The proposed sanitary sewer may need to be refined as the Advance Works design package is finalized. The proposed sanitary service connections and sanitary sewer within the loading dock area will need to be refined as the Main Hospital Building and Central Utility Plant designs move forward. The demands for the Central Utility Plant and Main Hospital Building will need to be revisited and refined accordingly during the detail design when additional accuracy is obtained from the building design team.

13.3 Storm

The proposed stormwater system will consist of controlled stormwater from the Central Utility Plant and the Main Hospital Building. The stormwater will need to be detained using rooftop storage and/or underground cistern(s) within the buildings. The design of the buildings will need to account and provide the necessary quantity control requirements. There are three (3) storm service connections for the Central Utility Plant (not part of advance works), ten (10) storm service connections for the Main Hospital Building (not part of advance works), and temporary storm services in the southern parking lots (Zone 4 Parking and Zone 5B Parking) (not part of advance works) prior to the construction of the future Heart Institute. The stormwater sewer network wraps around the Main Hospital Building and is sized to capture the for 100-year flow.

An oversized storm sewer (750mm/1350mm diameter) is proposed within Road D and Road E and along the front of the Main Hospital Building.

An oversized storm sewer (1200mm/1500mm diameter) is proposed within Road A/Road B. This will service the Phase 2 (Parking Garage) project and a small portion of the works within the Phase 3 & 4 (Central Utility Plant and Main Hospital Building) project (not part of advance works). This storm sewer will connect into the existing 900mm storm sewer at Carling Avenue and Champagne Avenue South.

Two (2) underground storage chambers are proposed in the southern interim parking lots (Zone 4 Parking and Zone 5B Parking) (not part of advance works). One (1) underground storage chamber is proposed in the western parking lot (Zone 1 Parking) (not part of advance works). One (1) underground storage chamber is proposed in the vicinity of the Maple Drive and NCD Road D intersection for stormwater runoff from the Central Experimental Farm (not part of advance works).

Five (5) surface ponding areas (within Drainage Area STM21B, STM26B, STM26D, STM60, and STM63) are proposed on the west side of Road A/Road B (not part of advance works). Two (2) temporary surface ponding areas are proposed as part of the advance works.

The stormwater flows are controlled with the post development 100-year flows being controlled to the pre-development 2-year flow for networks heading to the Preston Street Trunk and Nepean Bay Trunk and to the 5-year flow for the private system that outlets to Dow's Lake. The external drainage from the Central Experimental Farm will be controlled to the total external 5-year flow prior to entering the proposed oversized storm sewer network for the Central Utility Plant and Main Hospital Building.

Enhanced water quality protection (80% TSS removal) is required, and best management practices are generally encouraged to maximize on-site quality protection.

The major overland flow route for the site is in the northerly direction towards Carling Avenue to Preston Street intersection where it continues north towards the Plouffe Park (easterly parcel) and the LRT Corridor (westerly parcel).

The majority of the proposed 750/1350mm diameter storm sewer, excluding the building service connections, catchbasins, and loading dock area, is proposed to move forward under Advance Works. The proposed storm sewer may need to be refined as the Advance Works design package is finalized. The proposed storm service connections, storm sewer within the loading dock area, quality control design, quantity control design, and permanent dewatering system design will need to be refined as the Main Hospital Building and Central Utility Plant designs move forward. The demands for the Central Utility Plant and Main Hospital Building will need to be revisited and refined accordingly during the detail design when additional accuracy is obtained from the building design team.

Prepared By:

Sarah Mitchelson, P.Eng.

Reviewed By:

Kelly Paradis, P.Eng, PMP

H:\ISO\477458\1000\DOCS\Servicing\Site Servicing - Hospital\5 - Report & Calculations\TOH - Hospital - Site Servicing and Stormwater ReportV23-SM.docx

APPENDIX A | LIST OF BACKGROUND REPORTS AND DRAWINGS

Background Reports & Drawings

City of Ottawa Information Request

An information request was sent to the City of Ottawa on February 6, 2020 and a response was received on March 4, 2020.

A list of the background drawings provided include the following:

- Carling Avenue Reconstruction & Widening from Bronson Avenue to Kirkwood Contract No. 56-28, 1956;
  - 1000p&p03.pdf
  - 1000p&p04.pdf
  - 1000p&p05.pdf
  - 1000p&p06.pdf
  - 1000p&p07.pdf
- Carling Avenue Storm and Sanitary Sewer and Convert Combined to Storm Sewer from Sherwood Drive to Champagne Street Contract No. 96C2929, 1996;
  - 2929p&p1.pdf
  - 2929p&p2.pdf
- Dow's Lake Visitor Parking Facility – Electrical, Light Standards & Irrigation Contract No. 6136, 1982;
  - 4434plan.pdf
- Mooney's Bay Sanitary Collector Sewer Phase 'A' Contract No. 65-180, 1965;
  - 6580p&p01.pdf
  - 6580p&p02.pdf
  - 6580p&p03.pdf
- Carling Avenue 42" Watermain from Loretta Avenue to East of Rochester Street Contract No. 6944, 1961;
  - 6944p&p1.pdf
- Preston Street Watermain from Carling Avenue to Dow's Lake Contract No. 3067, 1984;
  - 7232p&p.pdf
- Fire Sprinkler Systems for Buildings 76, 88, 91 & 91A Central Experimental Farm Ottawa New Water Service to Building #88 and Dry Pipe Sprinkler Connection to Building #91A Contract No. 653069, 1997;
  - 9086p&p01
- Dow's Lake Watermain Replacement Contract No. RD2800-64E, 2000;
  - 9580p&p01
- Carling Avenue Rehabilitation Watermain Irving Place/Maple Drive Contract No. ISB08-5037, 2008;
  - 14869p&p10.tif
- Central Experimental Farm Site Services Rehabilitation Phase 1A New Watermain and Storm Sewer Contract No. R.010222.002, 2008;
  - 15055p&p04.pdf
  - 15055p&p05.pdf
  - 15055p&p06.pdf
- Central Experimental Farm Site Services Rehabilitation Phase 1B Contract No. R.010223.002, 2009;
  - 15238p&p10.pdf
  - 15238plan01.pdf
  - 15238plan02.pdf
- Central Experimental Farm Site Service Reconstruction Phase 2 Contract No. R.010223.002, 2009;
  - 15395.tif
  - 15395p&p11.tif
  - 15395p&p12.tif
  - 15395p&p13.tif
  - 15395p&p14.tif

    - 15395p&p15.tif
    - 15395p&p16.tif
    - 15395p&p17.tif
    - 15395p&p20.tif
    - 15395p&p21.tif
    - 15395plan09.tif
    - 15395plan10.tif
- Loretta Avenue South Reconstruction Contract No. ISD16-5029, 2017;
    - 17416p&p20.pdf
- C.P.R Relocation Prescott Line Contract B2-Grade Separations and Approaches, 1964;
    - B12j-2.pdf
- Carling Avenue Reconstruction & Widening from Bronson Avenue to Kirkwood Avenue Contract No, 56-88, 1936;
    - B01931000-01.tif
    - B01931000-02.tif
    - B01931000-03.tif
    - B01931000-04.tif
    - B01931000-05.tif
- Proposed Conduit for Fire Cable Under CPR Tracks at Carling Avenue, 1957;
    - J-29-3.pdf
    - J-29-4.pdf
    - J-29-5.pdf
- Central Experimental Farm Site Service Reconstruction Phase 3, 2011;
    - key.pdf
    - p&pC-3.pdf
    - p&pC-4.pdf
    - p&pC-5.pdf
    - p&pC-6.pdf
    - p&pC-7.pdf
    - p&pC-8.pdf
    - p&pC-9.pdf
    - p&pC-10.pdf
    - p&pC-11.pdf
    - p&pC-12.pdf
    - p&pC-13.pdf
    - p&pC-14R.tif
    - p&pC-15R.tif
    - p&pC-16R.pdf
    - planC-2.pdf
    - planC-17R.pdf
    - planC-18R.pdf
    - planC-19R.pdf
    - planC-20R.pdf
    - planC-21R.pdf
    - planC-22R.pdf
- Water Distribution System Mapping 366-028, 2019; and
- Wastewater Collection System Mapping 366-028, 2019;

A list of the background reports provided include the following:

- City of Ottawa Report of Subsurface Investigation Carling Avenue from Sherwood Drive to Champagne Street Ottawa, Ontario prepared by John D. Patterson & Associates Limited Consulting Geotechnical & Environmental Engineers, December 15, 1995;
  - B-0298.pdf
- Transportation Department Test Laboratory Roan Plan and Borehole Log Carling Avenue from Bronson Avenue to Kirkwood Avenue, September 1992;
  - B-1772.pdf
- Geotechnical Investigation Carling Avenue Rehabilitation Kirkwood Avenue to Bronson Avenue Ottawa, Ontario prepared by Golder Associates Limited, March 17, 2007; and
  - B-2226.pdf
- Measurement of Sewage Flow from the Experimental Farm, February 1964.
  - R-0048.pdf

Public Services and Procurement Canada (PSPC) Information Request

An information request was sent to Public Services and Procurement Canada (PSPC) and a response was received on May 20, 2020.

A list of the background drawings provided include the following:

- Sir John Carling Building – Annex Storm Sewer Relining Contract No. R.083619.002, 2017;
  - C-1-Plan-Relining.pdf
- Central Experimental Farm Site Services Reconstruction Phase 2 Contract No. R010223.002, 2009
  - CEF 2C – C9.pdf
  - CEF 2C – C12.pdf
  - CEF 2C – C13.pdf
  - CEF 2C – C14.pdf
  - CEF 2C – C15.pdf
  - CEF 2C – C16.pdf
  - CEF 2C – C17.pdf
- Central Experimental Farm Site Services Reconstruction Phase 3 Contract No. R010222.002, 2011
  - CEF_3-As Builts-C-14.pdf
  - CEF_3-As Builts-C-15.pdf

APPENDIX B | CITY OF OTTAWA SITE EVALUATION AND CONSTRAINTS

		Servicing Comments											
Option	Site	Street	Storm Mains			Sanitary Mains		Water Mains					
			Sewer Size	Subwatershed	SWM Criteria	Sewer Size	Constraints	Pressure Zone	Size	Current Pressure (Psi)	Redundany for Critical Customer (Requirement)	Redundant Feeds	Additional Comments
G	CEF - Carling East (AAFC)	Carling Ave.	300mm-375mm	City Core [Rideau Valley Conservation]	1. Maintain sewer capacity for new connections to Carling Ave 2. Onsite swm to contain 1:100 year onsite (major system control)	225mm-300mm	1. Partially separated. 2. MBC sewershed, basement flooding potential. 3. Maintain pre-development sanitary sewer flows for existing sewer connections or maintain sewer capacity new connections. Assess performance in wet weather. 4. Significant concerns related to basement flooding.	2W	406mm	70-92	No?	406mm Carling Avenue, 203mm Gwynne Avenue	Depending on demands 203mm might not be sufficient to be a redundant feed
		Prince of Wales Dr.	No Storm Main		1. Depends on outlet. Need more information to comment.	No Sanitay Main	No existing SAN.	N/A	No Water Main				
		Proposed Site	Existing private sewers with outlet to Dow's Lake.		1. Note: Dow's Lake connection in existing condition is via Private sewers. No comments provided on private sewers. 2. Maintain pre-development storm sewer flows for existing sewer connections 3. Onsite swm to contain 1:100 year onsite (major system control)	1050mm Mooney's Bay Trunk Collector (North-Western Corner of Site)	1. Partially separated. 2. MBC sewershed, basement flooding potential. 3. Maintain pre-development sanitary sewer flows for existing sewer connections or maintain sewer capacity new connections. Assess performance in wet weather. 4. Significant concerns related to basement flooding.						
I	Dow's Lake Parking (NCC)	Carling Ave.	450mm	City Core East & Rideau Canal [Rideau Valley Conservation)	[Drains to Preston combined sewer, which goes to Booth Street sewer.] 1. Significant concerns due to connection to combined sewer, CSO risk, basement flooding risk 2. No increase in existing flows to combined sewer	300mm	1. Preston Street Trunk sewershed. CSO risk. Basement flooding risk. 2. Maintain pre-development sanitary sewer flows for existing sewer connections or maintain sewer capacity new connections. Assess performance in wet weather. 3. Significant concerns related to CSO and basement flooding risk.	1W	127mm	62-78		406mm Carling Avenue, Check Valve between 2W & 1W, 406mm on Preston Street	
								1W	406mm				
								1W	1067mm				
		Preston St.	No Storm Main		Depends on outlet. More information required to comment.	300mm	1. This is a private sewer. No comments provided for private sewers. 2. Preston Street Trunk sewershed. CSO risk. Basement flooding risk. 3. Maintain pre-development sanitary sewer flows for existing sewer connections or maintain sewer capacity new connections. Assess performance in wet weather. 4. Significant concerns related to CSO and basement flooding risk.	1W	152mm				
		Prince of Wales Dr.	No Storm Main		Depends on outlet. More information required to comment.	No Sanitary Main	Depends on outlet. Need more information to comment.	N/A	No Water Main				

Notes:

1. For Pinecrest Creek Criteria, please consult Planning and Growth Management Staff. Please see the "PINECREST CREEK/WESTBORO STORMWATER MANAGEMENT RETROFIT STUDY - FINAL REPORT" for more information
2. CCC refers to the Cave Creek Collector
3. MBC refers to the Mooney's Bay Collector
4. WNC refers to the West Nepean Collector
5. It is assumed that additional development criteria will apply including stormwater management criteria for most sites. The information above are preliminary comments on existing storm, sanitary, and water services only.
8. Additional comments will be required once additional details are available
9. Due to the critical nature of the proposed customer, no redundancy is a significant water servicing concern. [Column N]
11. Comments dated August 5, 2016 based on information provided (site locations and proposed connection points only)
12. Option A did not contain any information and a site location was not provided. No comment provided.
13. PSPC (PSPC) site not listed in table and proposed connections not provided. No comments provided.

APPENDIX C | CORRESPONDENCE

July 6, 2022

JOINT CITY AND NCC APPLICATION REQUIREMENTS
Phase 3 - Central Utility Plant and Phase 4 - Main Hospital Building

ENGINEERING
Civil Engineering

Reports
- Site Servicing / Stormwater Management Functional Report
- Geotechnical / Slope Stability
- Site Lighting plan/report addressing sky illumination
- Noise / Vibration Impact Analysis
    - Helicopter pad and flight path
    - Loading dock
    - Other noise generators on site (such as the Central Utility Plant?)
    - Confirm coordination with the Dominion Observatory (seismic equipment)

Plans
- Grading and Drainage / Servicing / Stormwater Management / Existing Conditions
- Erosion and Sediment Control Plan
- Composite Utility Plan

Mechanical and Electrical Engineering
- Mechanical & Electrical Drawings and Equipment details for exterior installations including access shafts, vents, etc.

Transportation Engineering
Reports
- Transportation Impact Assessment which includes:
    - Off-site Parking Strategy
    - Neighbourhood Traffic Management Study
    - Transportation Monitoring Strategy
    - Transportation Demand Management Plan
    - Present the alternatives to Maple Drive as Ambulance Access

Plans
- Roadway Modification Design Plans

DESIGN: Planning / Architecture / Landscape
Reports
- Planning Rationale, to include:
    i. Project Vision, Design Vision, and Design Principles (Urban Design, Landscape and Architecture)
    ii. Description of Functional Program Requirements, Options Analysis and Test fits.
    iii. City / Federal policy framework (such as Zoning, Official Plan, Secondary Plan, Heritage Designations (City/Federal), NCC Plans including Plan for Canada's Capital, Capital Urban Lands Plan, Federal Heritage Designations, National Historic Site Management Plan etc.)

iv. Sustainability Strategy / High Performance Design Standards
v. Consultation Reports (consultations, stakeholder meetings and summary of feedback and responses to feedback received) Stakeholder engagement documented should include Aboriginal groups, AAFC, Accessibility advocates etc
vi. Describe design response to achieve compliance with the applicable conditions of the NCC FLUA granted for the Site Master Plan that apply to the part of the site affected during this phase of development.
vii. Describe design response to achieve compliance with the NCC Project Specific Design Criteria
viii. Site and Landscape Lighting Strategy, Drawings and Specifications
ix. Public art strategy and locations
x. Exterior Material Samples and Colour Palette (Including future mock-ups)

- Design brief / 3D renderings
- Cultural Heritage Impact Statement – refer to section below
- Heritage Protection Plan – refer to section below
- Wind Study – should take into account snow drifting
- Shadow Study – take into account the Dominion Observatory Complex

Perspectives/ 3D Renderings should include:

- Views from Prince of Wales Scenic Entry – Include views toward proposed loading dock
- Views from entrance to Queen Elizabeth Drive (at Preston / Prince of Wales)
- Views from Carling Avenue both east and west of the main hospital building
- Views identified in Commemorative Integrity Statement for Central Experimental Farm
- Views from adjacent CEF heritage buildings (e.g. Dominion Observatory Complex, Saunders Building, along Commissioners Drive / and or Maple Drive)
- Include night and winter renderings for all
- Interior views from public areas of hospital (e.g., cafeteria, main lobby)

<u>Plans</u>

- Landscape plans
    - 40% canopy target plans (at 40 year maturity)
    - To include detailed landscape design and grading information site boundary interface with the Central Experimental Farm
- Site plans
- Excavation Drawings
- Drawings showing plan, elevation and cross-section views of each building
- Structural Drawings of Architecturally Exposed Components

i. Building and site interfaces with public realm and landscape (plan and cross-sections)
ii. Views analysis and conceptual renderings (Refer to views identified in Commemorative Integrity Statement for Central Experimental Farm and NCC Visual Assessment Views Analysis (2009 and 2013)
iii. Floor plates
iv. Grading / Landscape integration
v. Exterior Material Selection and Colour Palette
vi. Bird Friendly Design (CSA Standard)

- UDRP package for the formal review of the Main Hospital Building Site Plan
- Plan of Survey

<u>HERITAGE</u>

Cultural Heritage Impact Statement Requirements
Prepared by: Lesley Collins (City of Ottawa), Heather Thomson (NCC), Susan Millar (Parks Canada), Jennifer Drew (Parks Canada)

A Heritage Impact Statement (CHIS) is required to specifically address issues related to this phase of project. The CHIS will be considered jointly by both the City and the NCC in their review of the proposal. The CHIS should be prepared according to the City of Ottawa's "A Guide to Preparing Cultural Heritage Impact Statements"

This phase of the development of the new hospital campus has the greatest potential to impact the cultural heritage landscape of the Central Experimental Farm National Historic Site of Canada and adjacent heritage resources including the Rideau Canal National Historic Site of Canada and UNESCO World Heritage Site, the Federal Heritage Buildings of the Dominion Observatory Complex and other adjacent Federal Heritage Buildings.

Further to comments provided on the CHIS submitted as part of the Master Site Plan application and conditions included as part of the Master Site Plan approval, the following items should be considered and addressed as part of the CHIS:

- Landscape Plan
    - One of the conditions of Master Site Plan approval was to ensure that the CHIS addendums consider how the proposal "protects the Central Experimental Farm's rural picturesque character and value as a 'farm within the city' through its landscaping on its east, west and south borders using trees or other landscape features to reduce the impact to existing views of the CEF National Historic Site of Canada (NHSC) from the Rideau Canal NHSC and World Heritage Site (WHS), Prince of Wales Drive section of the Queen Elizabeth Driveway cultural landscape, and the William Saunders Building Recognized Federal Heritage Building"

- Transportation and Parking
    - Use of Maple Drive
        - Detailed consideration of the potential impacts that will result from the use of Maple Drive as an ambulance route should be provided. These are considered in the CHIS for the Master Site Plan but should be further detailed in the addendum. These considerations should articulate the impact of the speed and frequency of ambulance traffic on the co-located Federal Heritage Buildings, including but not limited to vibration, road maintenance requirements; and salt spray.
    - Location and visual screening of surface parking

- Consideration of impacts on the Dominion Observatory Complex
    - Detailed consideration of potential impacts including, but not limited to:
        - Potential construction impacts that could cause physical damage to the buildings
        - Isolation of the Dominion Observatory Complex from its surrounding environment in ways that would affect the access to or user/visitor experience of the site
        - Obstruction or diminishment of significant views of the Dominion Observatory dome as a landmark

        - Obstruction or impacts to views of the night sky from the Dominion Observatory dome
        - Impacts of the lighting plan as directed by Planning Committee on approval of the Master Site Plan on October 1, 2022:
            - *That Planning Committee direct staff to review site lighting for the future implementing site plan for the main hospital building. The site lighting shall be in accordance with Council approved lighting conditions, that include designing with only fixtures that meet the criteria for full cut-off (sharp cut-off) classification, as recognized by the illuminating Engineering Society of North America; and meeting minimal light spillage onto adjacent properties. That Planning Committee further direct staff to ensure that potential impacts of the site lighting on the Dominion Observatory Complex are considered through addendums to the Cultural Heritage Impact Statement, with consideration of guidelines prepared by the International Dark Sky Association and with direct/open communication with the Royal Astronomical Society of Canada.*

- Consideration of impacts to the following views
    - Views from Prince of Wales Scenic Entry – Include views toward proposed loading dock
    - Views from entrance to Queen Elizabeth Drive/Dows Lake (at Preston / Prince of Wales)
    - Views from Dows Lake to main hospital building
    - Views from Carling Avenue both east and west of the main hospital building
    - Views identified in Commemorative Integrity Statement for Central Experimental Farm
    - Views from adjacent CEF heritage buildings (e.g. Dominion Observatory Complex, Saunders Building, along Commissioners Drive / and or Maple Drive)
    - Views identified in NCC Visual Assessment Views Analysis (2009 and 2013
    - Views from/along the Rideau Canal including from Commissioner's Park, Hartwells Lockstation and Colonel By Drive (that were assessed for the Campus Master Plan and parking garage applications)

Heritage Protection Plan

- A Heritage Protection Plan is required to ensure appropriate conservation of adjacent heritage buildings during construction.
- The Protection Plan must include an evaluation of potential risks to nearby heritage buildings through the construction process and a detailed plan for protection and mitigation of these risks, including but not limited to:
    - Pre-construction building condition survey and documentation (consider baseline 3D Laser scanning of all designated buildings)
    - Vibration and crack monitoring
    - Monitoring reports
    - Implementation of physical protection for designated buildings
    - Management of construction dust, debris etc.
    - Post-construction building condition survey and documentation

<u>ENVIRONMENTAL</u>

Reports

▪ Phase 3 Environmental Site Assessment (ESA)

- Conduct any environmental site assessments required to appropriately and fully assess site conditions to guide remediation and site preparation as per federal and provincial requirements, including but not limited to Ontario Regulation 406 – On Site and Excess Soil Management. A Qualified Person (QP) as defined in O. Reg 153/04 should be engaged early on to guide environmental site assessments and to develop soil management plans.

▪ Tree Conservation Report

▪ Environmental Impact Assessment (on species at risk / significant wildlife species on the property and significant environmental features)

▪ Wildlife Mitigation and Monitoring Plan

▪ Vegetation Management / Conservation Strategy and Education Program

Phase 3 and 4 of the TOH project are subject to an Environmental Determination pursuant to the *Impact Assessment Act*, 2019 (*IAA*) prior to the initiation of any works. The Proponent is responsible for preparing an Environmental Effects Evaluation (EEE) document and completing any associated supporting studies.

1. **Format**
    a. Harmonize the federal and municipal environmental review process by producing one report that meets all requirements.
    b. Use the same format as the EEE for the Phase 2 – Parking Garage project
    c. To be confirmed once the proponent provides the proposed timeline for project approval, but, one EEE will be approved for the first approval of Phase 3 and 4, with addendums being prepared for subsequent approvals under Phase 3 and 4

2. **Guidance**
    a. Adhere to the Impact Assessment Agency of Canada guidance on Section 81-91 of the *IAA* (https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/projects-federal-lands-outside-canada/guidance-sections-81-to-91-impact-assessment-act.html

3. **Canadian Impact Assessment Registry (CIAR)**
    a. The proponent will prepare the text for the CIAR posting
    b. The NCC/PSPC will post one Notice of Intent on the CIAR
    c. The Notice of Intent should include information related to greenhouse gas (GHG) emissions and carbon sinks of the project which might include:
        i. Information on the project's estimated GHG emissions and impacts on carbon sinks and any design measures
        ii. How the project might mitigate GHG emissions or impacts on carbon sinks
        iii. See Section 8 GHG Emissions & Climate Change Considerations for more information.

The following are additional, special considerations, but is not an exhaustive list of all requirements:

4. **Trees:**

a. Review tree inventories to ensure that all expected future changes to federal and provincial Species At Risk laws and regulations are considered (e.g., Black Ash may be uplisted in January 2023).
b. Information from the NCC's document: A Living Legacy: Remarkable Trees of Canada's Capital. Impacts to remarkable trees located within the study area, and identified in the NCC document as remarkable, will be evaluated.
c. Tree Compensation
    i. Tree Compensation that continues to target a 40% tree canopy cover
d. The proponent will submit the following plans, among others:
    i. Ridge Management Plan
    ii. Landscape Plans
    iii. Updated Long Term Tree Canopy Adaptive Management Plan
    iv. Tree Canopy Cover Plan
    v. Landscape Plans
e. Bird and Bat protection measures will be implemented again which will include restrictions on tree removals during the active bird and bat seasons.
f. Continue to collaborate with Central Experimental Farm (CEF) and Arboretum staff on tree/hedge preservation efforts
    i. Document specific Old Hedge Collection and tree preservation and conservation efforts in the EEE, including any graftings and cuttings that may be used to preserve genetic material.
    ii. Document pertinent consultations with CEF and Arboretum staff
g. Butternut
    i. Confirm that there are no butternut trees located within the project footprint or area of disturbance
    ii. If the butternut is located within the project footprint or area of disturbance, address the need to conduct a Butternut Health Assessment
h. Kentucky Coffee-trees:
    i. Evaluate potential impacts to Kentucky Coffee-trees
    ii. If Kentucky Coffee-trees will be impacted by Phase 3 and 4:
        1. Consult with Arboretum staff to determine origins of the Kentucky Coffee-trees
        2. Consult with Arboretum staff to determine conservation value of the trees, depending on their origin
        3. Consult with ECCC, if necessary, to assess conservation value.

5. Targeted Wildlife Surveys:

a. As per the Environmental Impact Statement and Tree Conservation Report for the Master Site Plan (August 3, 2021), the following Species At Risk Assessments and targeted field studies are required:
    i. Acoustic Bat Surveys
    ii. Breeding Bird Surveys
    iii. Raptor Nesting Surveys
b. Identify any other surveys that may be required.
c. Ensure that all targeted wildlife surveys required for the EEE consider any recent and expected future changes to federal and provincial laws and regulations.

6. **Wetland:**
    a. Review impacts to wetlands within the Project area and zone of influence around the Project area.
    b. Follow the Federal Policy on Wetland Conservation (authorized by Environment Canada, 1991): https://publications.gc.ca/collections/Collection/CW66-116-1991E.pdf

7. **Permitting:**
    a. The EEE must include discussion on all permitting required for project implementation and facility operation, which may include, but is not limited to:
        i. Provincial Environmental Compliance Approval for stormwater discharge to the Rideau Canal.
        ii. Any Certificates of Authorisation
            1. Which may be related to incinerators, and any other hospital-specific equipment requiring authorisation.
    b. The EEE will recommend the preparation of a Regulatory Compliance Plan. This discussion will be included in the mitigation measures and will also be included in the "Future Commitments" section.

8. **Public Engagement and Communications Log:**
    a. The proponent will update the previously prepared Communications log as many comments received during Phase 2 (parking garage) of the project apply to Phase 3 and 4 of the project.
    b. All new public comments/questions/concerns raised during the Phase 3 and 4 environmental review will be addressed in the Communications log and EEE

9. **Cumulative Effects Evaluation:**
    a. The environmental effects determination must consider cumulative effects that could result from (a) Phase 3 and 4, (b) Phase 2 and (c) future phases.
    b. Evaluate how the *Vegetation Management/Conservation Strategy and Education Program* may be a tool to mitigate cumulative effects of tree and vegetation removal for all phases of the project.

10. **Gender Based Analysis + (GBA+)**
    a. Environmental effects must be considered through a GBA+ lens.
    b. The proponent can refer to this guidance to inform the process for conducting a GBA+: https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessment-act/gender-based-analysis.html
    c. Evaluate potential barriers or impacts for under-represented groups that require identification and mitigation
    d. Specific to public engagement, will disaggregated data be made available (by gender, sex, age, region, economic status, social class, ancestry, religion, household status, immigration status, literacy, internet access, ethnicity or disability)?

11. **Universal Accessible Strategy**
    a. Provide general overview and describe strategies that exceed requirements

12. **Stormwater Management**
    a. Stormwater management best practices including infiltration beds, rain gardens, bioswales and storage solutions will be incorporated into the landscape design.
    b. If storm sewer outlets will connect/interact with Dow's Lake, Parks Canada requirements may include:
        i. Discharged water quality to be better than 80% Total Suspended Solids
        ii. Monitoring for CCME Turbidity, PM parameters, and could include others.
        iii. Monitoring Plan (note: Parks Canada already requests this for new developments that discharge to the Rideau Canal)
    c. If stormwater discharge outlets to Rideau Canal, then the MECP will review for Environmental Compliance Approval (ECA)
    d. This approval can take up to 6 months to receive.Skateway – maintain integrity of the ice surfaces. Baseline temperature and salt data from 2021-22 is available – no increase in thermal load above background will be permitted (NCC).
    e. Low Impact Development – mitigating increases in runoff volume will support maintaining thermal load.
    f. Without limiting the specific items included above, proponents are to refer to the NCC's Stormwater Management Manual (Spring 2022, draft) for NCC's policy and technical requirements when reviewing stormwater management submissions.

13. **Snow Management**
    a. Temporary storage locations
    b. Operations – analyze alternatives for ice/snow melting (minimize salt use in areas that drain to the canal), mitigation of potential impacts

14. **Sustainable Development**
    a. Ensure that core sustainable design principles commitments established in the Master Site Plan including a hybrid of leading sustainability models including One Planet Living framework, LEED and the WELL building standard.
    b. Provide discussion on how Phase 3 and 4 will be a net zero carbon project.
    c. Provide discussion on LEED goals for the project and energy modelling required to meet these goals.
    d. Use the Strategic Assessment of Climate Change (SACC) to:
        i. Consider climate change in the determination of adverse environmental effects for the Phase 3 and 4 project
        ii. Make a decision about whether the carrying out of a project is likely to cause significant adverse environmental effects
        iii. The SACC can be found here: https://www.canada.ca/en/services/environment/conservation/assessments/strategic-assessments/climate-change.html or by contacting: ec.escc-sacc.ec@canada.ca.
    e. Complete a Carbon Intensity Analysis in line with Environmental and Climate Change Canada's (ECCC's) Quantification of net GHG emissions, upstream GHG emissions, and carbon sinks and GHG mitigation measures as part of the EEE. Consultation with ECCC may be required to determine approaches to reduce GHG emissions, upstream and downstream.
    f. Evaluate how energy modelling required for LEED goals align with the SACC and Carbon Intensity Analysis.Use Bird friendly design, which includes design for glazing and lighting

g. City Site Plan Control By-law provisions to enable the High Performance Development Standards will be presented to Planning Committee and ARAC on 23 June 2022 and it is anticipated this report will be forwarded to Council for approval in the near future. The applicant should follow this initiative and the HPDS because the future phases may be subject to those provisions and standards. The City will work with the applicant and Federal partners to avoid any duplications of sustainability requirements and to develop a submission that satisfies both requirements.

15. **Archaeology**

a. Though the 2021 Golder Stage 2 Archaeological Assessment concludes that no further archaeological assessment is required for the project area, should landscape disturbance extend beyond the area assessed by Golder, additional archaeological assessment may be required.

Additional NCC SPECIFIC REQUIREMENTS

<u>Committee Submission Documents</u>

- ACPDR support materials and presentation (refer to details provided previously) – Scheduling and deliverables to be coordinated with the FLUDA manager.
- BOARD meeting support materials – Scheduling and deliverables to be coordinated with the FLUDA manager.
- Include Report and Drawing list with each submission (Format YYYY-MMM-DD Name of Document)

<u>Construction</u>

- Construction Hoarding and Staging Plan
- Temporary Construction Brief and Drawings
- Temporary Construction Signage Drawings
- Temporary Service Relocation Drawings
- Operations/ Maintenance Plan
- Construction Schedule for all works

Mitchelson, Sarah [NN-CA]

From:	Eric Lalande <eric.lalande@rvca.ca>
Sent:	Thursday, September 22, 2022 2:31 PM
To:	Mitchelson, Sarah [NN-CA]
Cc:	Paradis, Kelly [NN-CA]; Sterling, Sharra [NN-CA]
Subject:	[EXTERNAL] RE: RVCA - The Ottawa Hospital - New Campus Development
Follow Up Flag:	Follow up
Flag Status:	Completed

Hi Sarah,

I don't believe the RVCA has significant concerns with the design, provided that enhanced water quality protection (80% TSS Removal) is being maintained either on-site or downstream prior to outlet.

Cheers,

Eric Lalande, MCIP, RPP
Planner, RVCA
613-692-3571 x1137

From: Sarah.Mitchelson@parsons.com <Sarah.Mitchelson@parsons.com>
Sent: Thursday, September 22, 2022 1:03 PM
To: Eric Lalande <eric.lalande@rvca.ca>
Cc: Kelly.Paradis@parsons.com; Sharra.Sterling@parsons.com
Subject: RE: RVCA - The Ottawa Hospital - New Campus Development

Hi Eric,

I wanted to follow up with the email below.

Please advise if the RVCA has any initial requirements and/or comments related to the proposed central utility plant and main hospital building as part of the new Ottawa Hospital Development.

Regards,
Sarah

SARAH MITCHELSON, P.ENG
Municipal Engineer
1223 Michael Street North, Suite 100, Ottawa, ON K1J 7T2
sarah.mitchelson@parsons.com
Direct: +1 613.691.1609 / Mobile: +1 613.698.6705
Parsons / LinkedIn [linkedin.com] / Twitter [twitter.com] / Facebook [facebook.com] / Instagram [instagram.com]

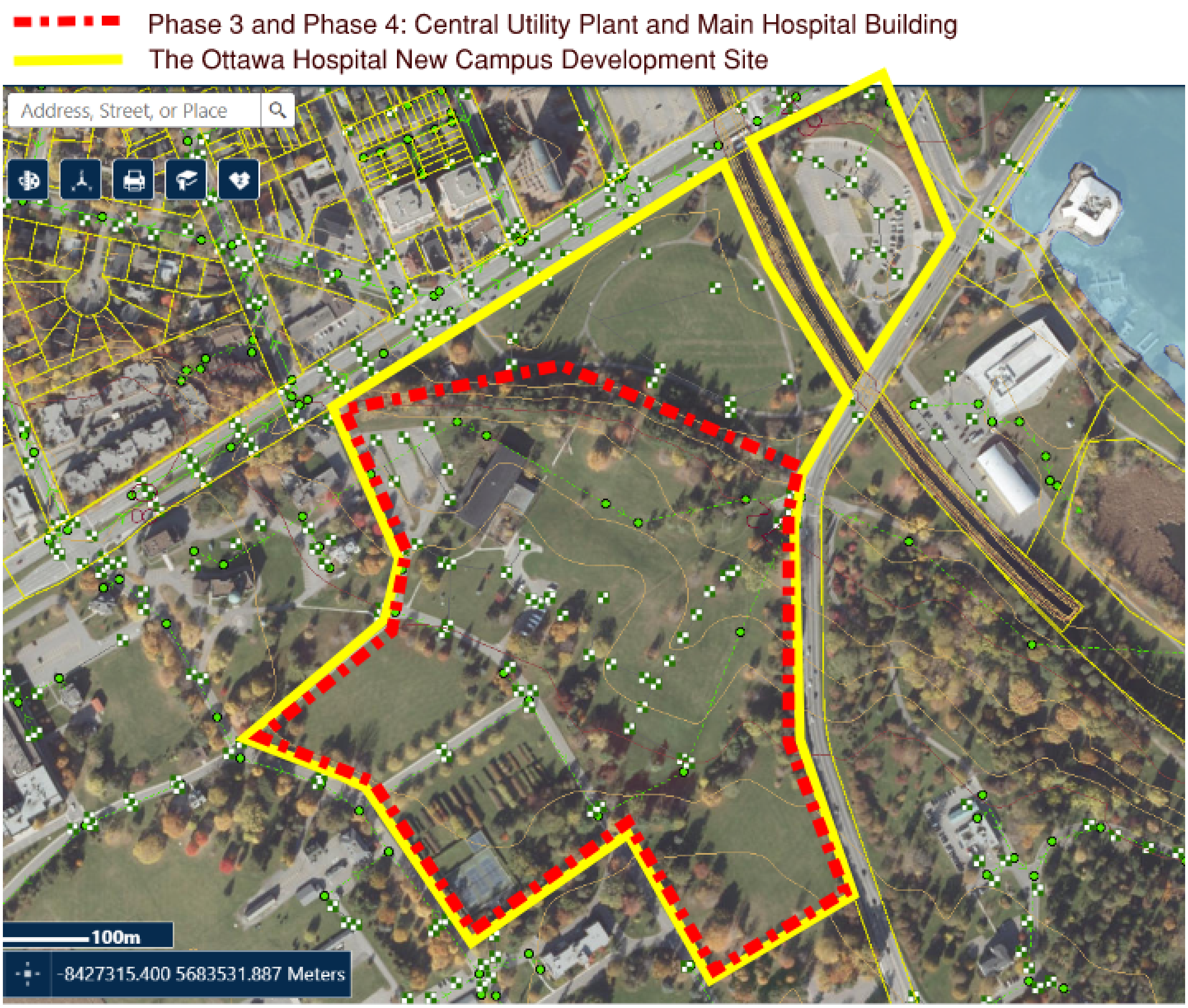
PARSONS

From: Mitchelson, Sarah [NN-CA]
Sent: Friday, July 29, 2022 7:35 AM
To: Eric Lalande <eric.lalande@rvca.ca>
Cc: Paradis, Kelly [NN-CA] <Kelly.Paradis@parsons.com>; Sterling, Sharra [NN-CA] <Sharra.Sterling@parsons.com>
Subject: RVCA - The Ottawa Hospital - New Campus Development

Hi Eric,

We would like to request any RVCA requirements and/or comments related to the proposed central utility plat and main hospital building as part of the new Ottawa Civic Hospital Development.

We are working with GBA Group towards a Site Plan Approval from the City of Ottawa, for the construction of a multi-level hospital as well as a central utility plant that will service the hospital. As you can see from the existing aerial image below, the existing development area consists of grass, parking areas, pedestrian pathways, and roadways.



Stormwater is conveyed to existing City of Ottawa infrastructure within Carling Avenue as well as private infrastructure that outlets to Dow’s Lake.

Access to the central utility plant and main hospital building will be provided from Carling Avenue, Prince of Wales, and Maple Drive. The footprint of the central utility plant is approximately 11,500m2 with a floor to height of approximately 8m and the footprint of the main hospital building is approximately 32,000m2 and consist of 14 levels.

Please advise if any further information is required and/or you have any questions/comments.

Regards,
Sarah

SARAH MITCHELSON, P.ENG
Municipal Engineer
1223 Michael Street North, Suite 100, Ottawa, ON K1J 7T2
sarah.mitchelson@parsons.com
Direct: +1 613.691.1609 / Mobile: +1 613.698.6705
Parsons / LinkedIn [linkedin.com] / Twitter [twitter.com] / Facebook [facebook.com] / Instagram [instagram.com]

PARSONS

APPENDIX D | SERVICING CHECKLIST & APPROVALS

TOH NCD Approvals

DRAFT: 2022-11-15

LEGEND

- Approval granted (grey box)
- YYYY-MM-DD (green): Date of approval
- Approval submitted and under review (white box)
- YYYY-MM-DD (grey): Expected date of approval (subject to change)
- Future application (not yet submitted) (dashed box)

Ottawa

Site Plan Agreement	Site Plan Agreement	Site Plan Agreement
Between TOH and City	Between TOH and City	Between TOH and City
Master Site Plan	**Parking Garage**	**Main Hospital Building & CUP**
2021-10-27	**DAR approved: 2022-09-27**	**2023-XX-XX**
	(Submitted October, 2021)	*(Pre-consult held June 23, 2022)*

NCC CCN

FLUDA	(IAMIS #14383)	Proponent: PSPC	**Deconstruction of the Sir John Carling Building**	**2013-01-22**	
FLUDA	(IAMIS #16638)	Proponent: PSPC, AAFC	**Landscaping Amendments for Deconstruction of the Sir John Carling Building**	**2014-12-02**	
FLUTA	(IAMIS #18853)	Proponent: PSPC, AAFC, NCC	**Land Transfer and Lease**	**2017-06-01**	Capital Realm Design Principles for TOH
FLUDA	(IAMIS #21707)	Proponent: PSPC	**Demolition of the Sir John Carling West Annex**	**2021-02-03**	
FLUA	(IAMIS #19923)	Proponent: TOH	**Master Site Plan and Amendment to the Capital Urban Lands Plan**	**2021-11-22**	NCC Performance Criteria
FLUDA	(IAMIS #24020)	Proponent: TOH	**Parking Garage – Early Works #1**	**2022-03-24**	
FLUDA	(IAMIS #23474)	Proponent: TOH	**Parking Garage – Schematic Design**	**2022-06-24**	
FLUDA	(IAMIS #24021)	Proponent: TOH	**Parking Garage – Early Works #2**	**2022-10-08**	
FLUDA	(IAMIS #24432)	Proponent: TOH (for PSPC)	**Remediation**	**2022-11-14**	
FLUDA	(IAMIS #XXXX)	Proponent: TOH	**Parking Garage – Developed Design**	**2023-04-XX**	
FLUDA	(IAMIS #XXXX)	Proponent: TOH	**Road Widening + Intersections**	**2023-XX-XX**	
FLUDA	(IAMIS #XXXX)	Proponent: TOH	**Main Hospital Building + CUP – Schematic Design**	**2023-XX-XX**	
FLUDA	(IAMIS #XXXX)	Proponent: TOH	**Main Hospital Building + CUP – Developed Design**	**2023-XX-XX**	

APPENDIX E | AAFC RELOCATIONS

PARSONS
1223 Michael Street North, Suite 100 | Ottawa, ON K1J 7T2
P: +1 613.738.4160 | F: +1 613.739.7105 | www.parsons.com

Memorandum

To: Dwight Breault (The Ottawa Hospital) Date: October 6, 2023

From: Sarah Mitchelson. P.Eng.

Subject: New Campus Development for The Ottawa Hospital
Agriculture and Agri Food Canada Existing Infrastructure

1.0 INTRODUCTION

The Ottawa Hospital has retained Parsons Incorporated to prepare a Technical Memorandum in support of the existing Agriculture and Agri Food Canada (AAFC) infrastructure on the Central Experimental Farm (CEF) land that needs to be relocated to accommodate the New Campus Development (NCD) for The Ottawa Hospital.

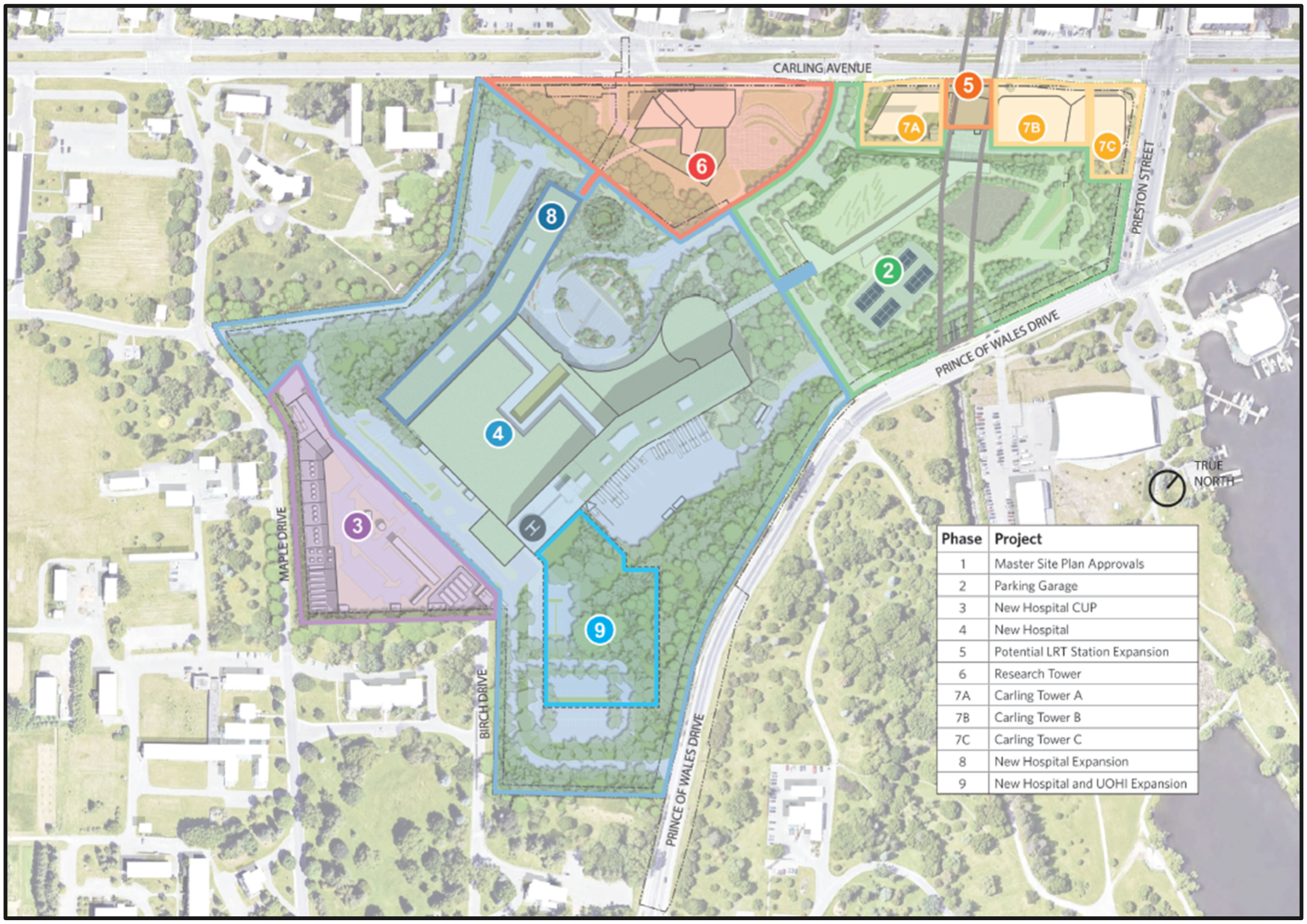
In June 2017, a Federal Land Use Design and Transaction Approval was granted making an approximately 20-hectare property of federal land available for the New Campus Development (NCD) for The Ottawa Hospital (**Figure 1-1**). Further in 2018, the City of Ottawa passed Official Plan and Zoning By-law Amendments to bring the City of Ottawa land use planning policy documents into alignment with the federal land use decision. The amendments resulted in redesignating a portion of the CEF to General Urban Area and recognize the future use of the NCD within the boundary of the farm. The Preston-Carling District Secondary Plan was also amended at that time and introduced a new "Hospital Area" character area policy to specifically guide development of the hospital and its related uses. The associated Zoning By-law Amendment rezoned the lands to Major Institutional Zone and enacted holding provisions to prevent development until such time as a Master Site Plan and supporting plans and reports that addressed servicing requirements, multi-modal transportation options, cultural heritage impacts have been completed and approved by Council.

Figure 1-1: New Civic Development for the Ottawa Hospital

In May 2021, complete applications to approve a Master Site Plan and Lift the Holding Zone were submitted to the City of Ottawa as well as an application to the National Capital Commission for approval of the Master Site Plan. The applications were approved by both parties (the City of Ottawa and the National Capital Commission) in October 2021. The Master Site Plan and its supporting studies guide the NCD for The Ottawa Hospital.

The New Campus Development is to be implemented in Phases as illustrated in **Figure 1-2.** The Advanced Works will include the relocation of the existing AAFC infrastructure and will be completed prior to the implementation of Phase 3 (Central Utility Plant) and Phase 4 (Main Hospital Building).

Figure 1-2: New Civic Development Project Phasing



2.0 BACKGROUND DOCUMENTS

2.1 Background Reports and Drawings

This memorandum should be read in conjunction with the following reports:

- Site Servicing and Stormwater Management Report New Campus Development (NCD) for the Ottawa Hospital, Phase 3: Central Utility Plan Project, Phase 4: Main Hospital Project, Ottawa, Ontario, April 2023 or Latest Version (Issued for SPA & FLUDA Approval), prepared by Parsons Inc;
- PWGSC Central Experimental Farm, Ottawa, Ontario, Master Servicing Plan, Volume 1: Water System, prepared by TSH and dated March 2008; and
- PWGSC Central Experimental Farm, Ottawa, Ontario, Master Servicing Plan, Volume 2: Sanitary and Storm Systems, prepared by TSH and dated March 2008.

2.2 Meetings

The following meetings were held and attended to discuss the existing AAFC infrastructure in the vicinity of the NCD.

Public Services and Procurement Canada (PSPC) Meeting – May 27th, 2020

- A meeting was attended with PSPC on May 27th, 2020, to discuss the existing private infrastructure in the vicinity of the NCD;
- Need to ensure that all private servicing remains functional;
- No easements were reserved during negotiations;
- Further discussion is required on how the existing lands and proposed development will be serviced;
- A Master Servicing Study was previously completed for the PSPS lands. Only a hard copy exists and due to COVID-19 restrictions, a copy of the report could not be provided;
- All private sanitary sewers on PSPC lands have sufficient capacity to accommodate existing demands;
- Further discussion is required regarding how the existing lands and proposed development will outlet to existing public sanitary infrastructure (one connection versus two connections));
- The PSPC lands are currently serviced by two public watermains - one from Carling Avenue and one from Fisher Avenue;
- A bulk meter would be required if the proposed development is to be serviced from the existing private watermain on Maple Drive;
- Servicing the proposed development from the existing private watermain on Maple Drive has associated risks;
- An existing bulk meter is located on the existing watermain at the Carling Avenue and Maple Drive intersection;
- Further discussion with the City of Ottawa would be required regarding redundancy;
- All private storm sewers on PSPC lands have sufficient capacity to accommodate existing demands;
- The storm sewer outlet for the PSPC lands discharges to Dow's Lake/Canal (maintained by Parks Canada) and is owned by PSPC;
- The storm sewer outlet has been rehabilitated; and
- The existing infrastructure might be transferred over to the Central Experimental Farm sometime in the future.

Approving Authority Site Servicing & Stormwater Management Meeting – March 21st, 2023

- A meeting was attended with the City of Ottawa, National Capital Commission, Parks Canada, Agriculture and Agri-Food Canada, and Public Services and Procurement Canada to review comments related to the November 2023 submission and discuss anticipated response/approach to be included in next submission.

3.0 WATERMAIN SYSTEM

3.1 Existing Watermain System

The CEF has two (2) existing watermain loops that extend onto NCD leased lands from Maple Drive. The first loop (northern) is a 250mm diameter watermain that extends east from Maple Drive, passing north of Building 1 (Dominion Observatory) and Building 2 (Observatory House) and south of Building 5 and 3. The watermain then travels south along what was once the frontage of Building 132 (Sir John Carling) and then it loops west along Birch Drive back to Maple Drive, refer to **Figure 3-1**.

Figure 3-1: Existing Watermain (Northern Loop)

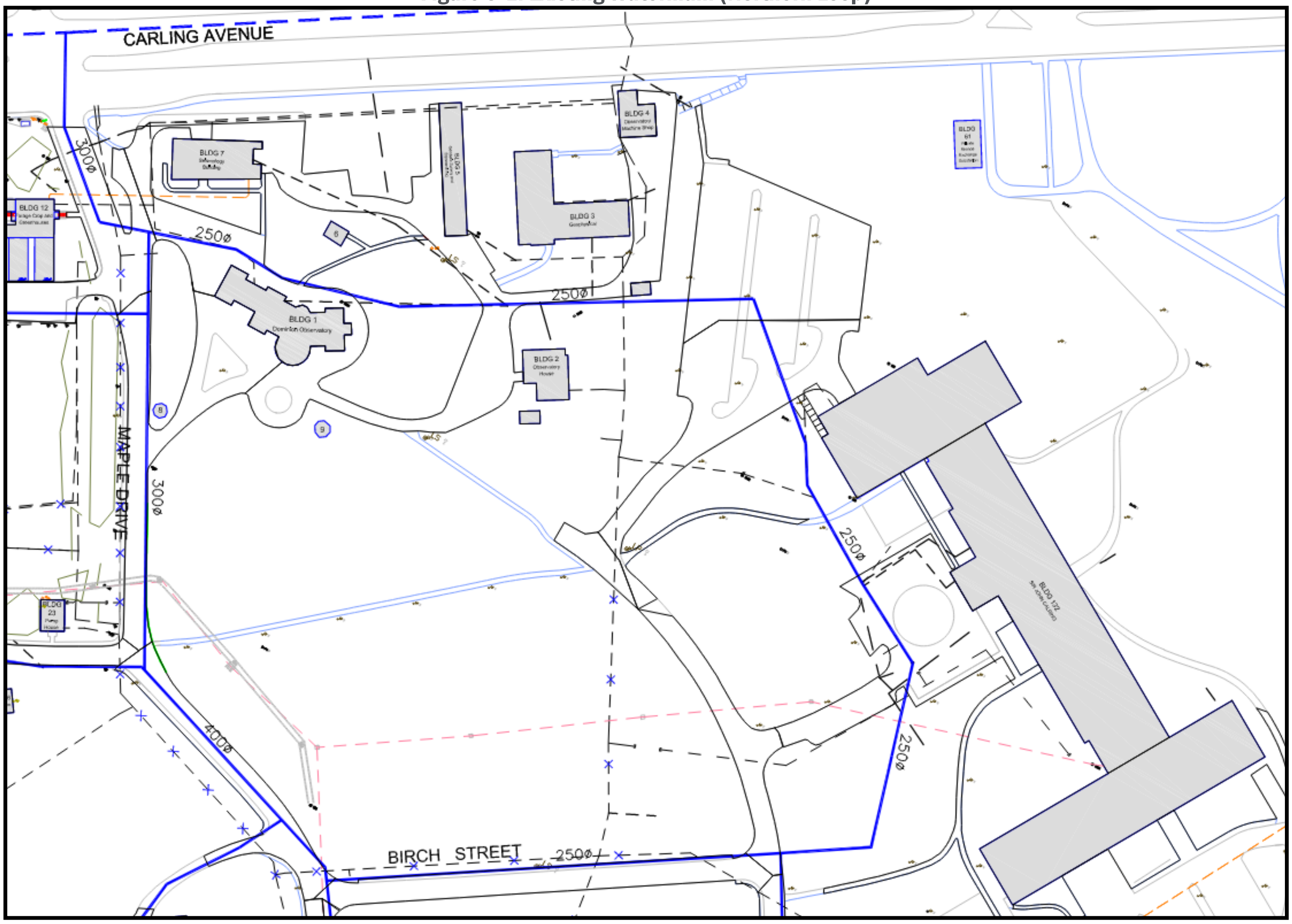


Figure 2-1 is snapshot of Figure 1, within the CEF, Master Servicing Plan, Volume 1: Water System

It understood that this existing watermain services Buildings 1 through 7, former Building 132 (Sir John Carling), and provides a connection to the second watermain loop (southern) at the directional road change of Birch Drive.

The second watermain loop (southern) begins at the directional road change of Birch Drive, this is where the road makes a ninety-degree bend and extends south towards National Capital Commission (NCC) Driveway. A 250mm diameter watermain extends south past Building 49 (William Saunders) and then is directed east. The watermain extends east through the NCD leased lands, across Prince of Wales Drive to service Building 139 and Building 72 (Agrometeorology). The watermain then extends south and loops back to Maple Drive along the NCC Driveway, servicing Building 74 (Plant Research), Building 59 (Animal Nutrition) and Building 60 (Animal Research), refer to **Figure 3-2**.

Figure 3-2: Existing Watermain (Southern Loop)

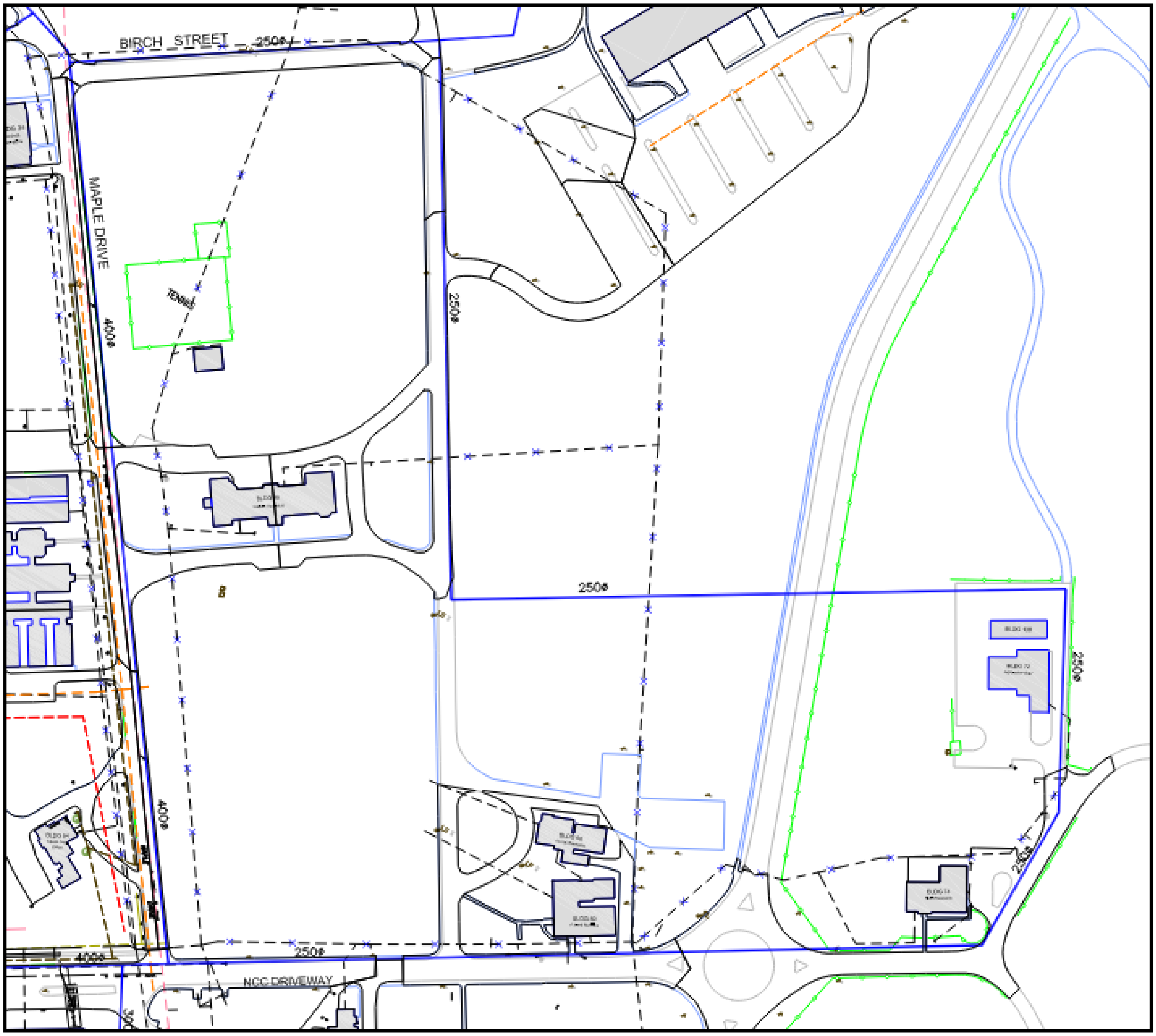


Figure 2-2 is snapshot of Figure 1, within the CEF, Master Servicing Plan, Volume 1: Water System.

It understood that this watermain services Buildings 139, 72, 74, 59, and 60, and provides a connection to the first watermain loop (northern) at the directional road change of Birch Drive.

3.2 Existing Watermain System Affected by the NCD Site

A section of both watermain loops (northern and southern) are affected by the NCD site. The existing CEF watermains affects by the NCD site are shown in **Figure 3-3** and **Figure 3-4.** Relocation of these portions of the CEF watermain system is required to ensure adequate domestic water supply and fire flow demand.

Figure 3-3: Disrupted CEF Watermain (Northern Loop)

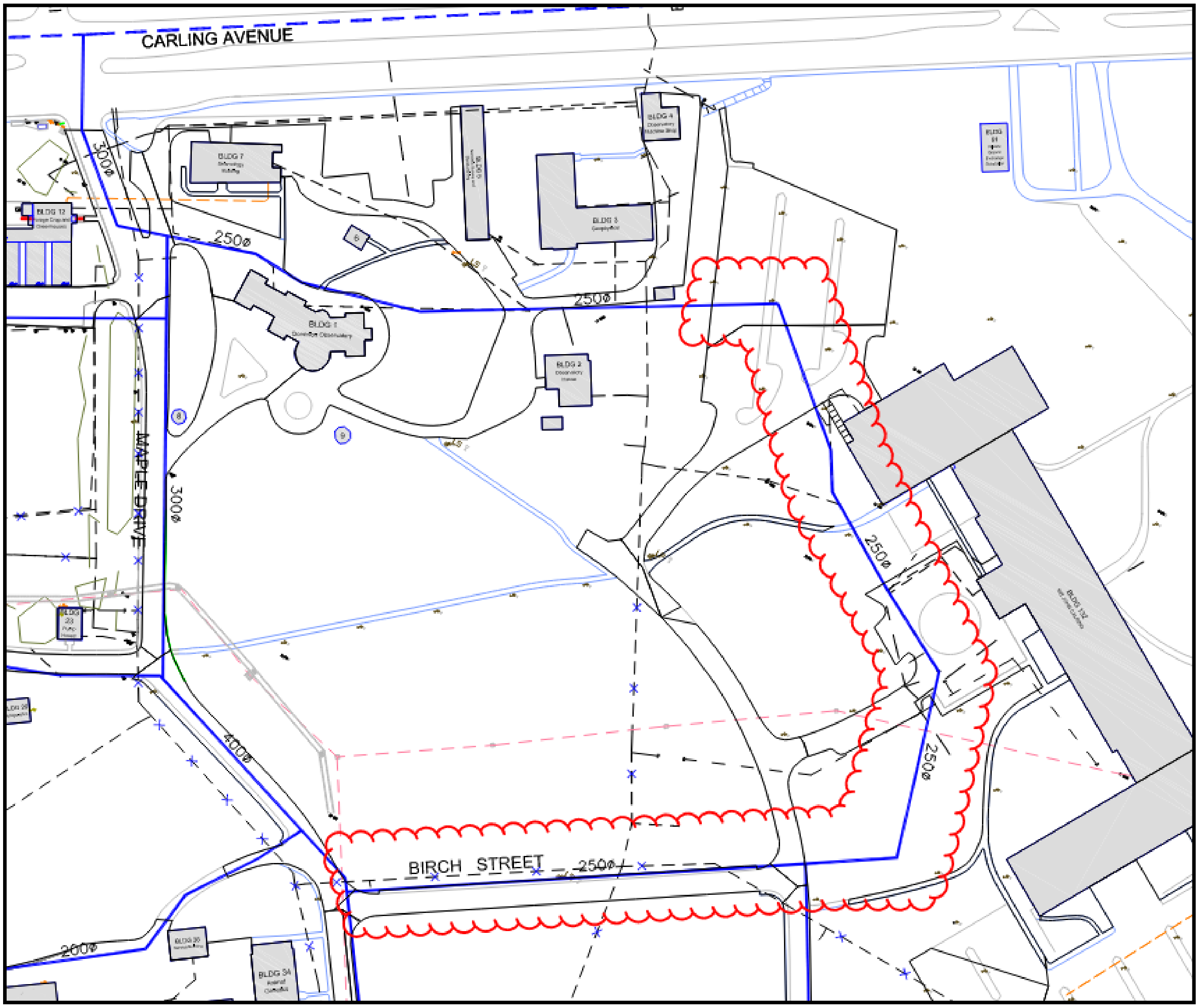


Figure 2-3 is snapshot of Figure 1, within the CEF, Master Servicing Plan, Volume 1: Water System.

Figure 3-4: Disrupted CEF Watermain (Southern Loop)

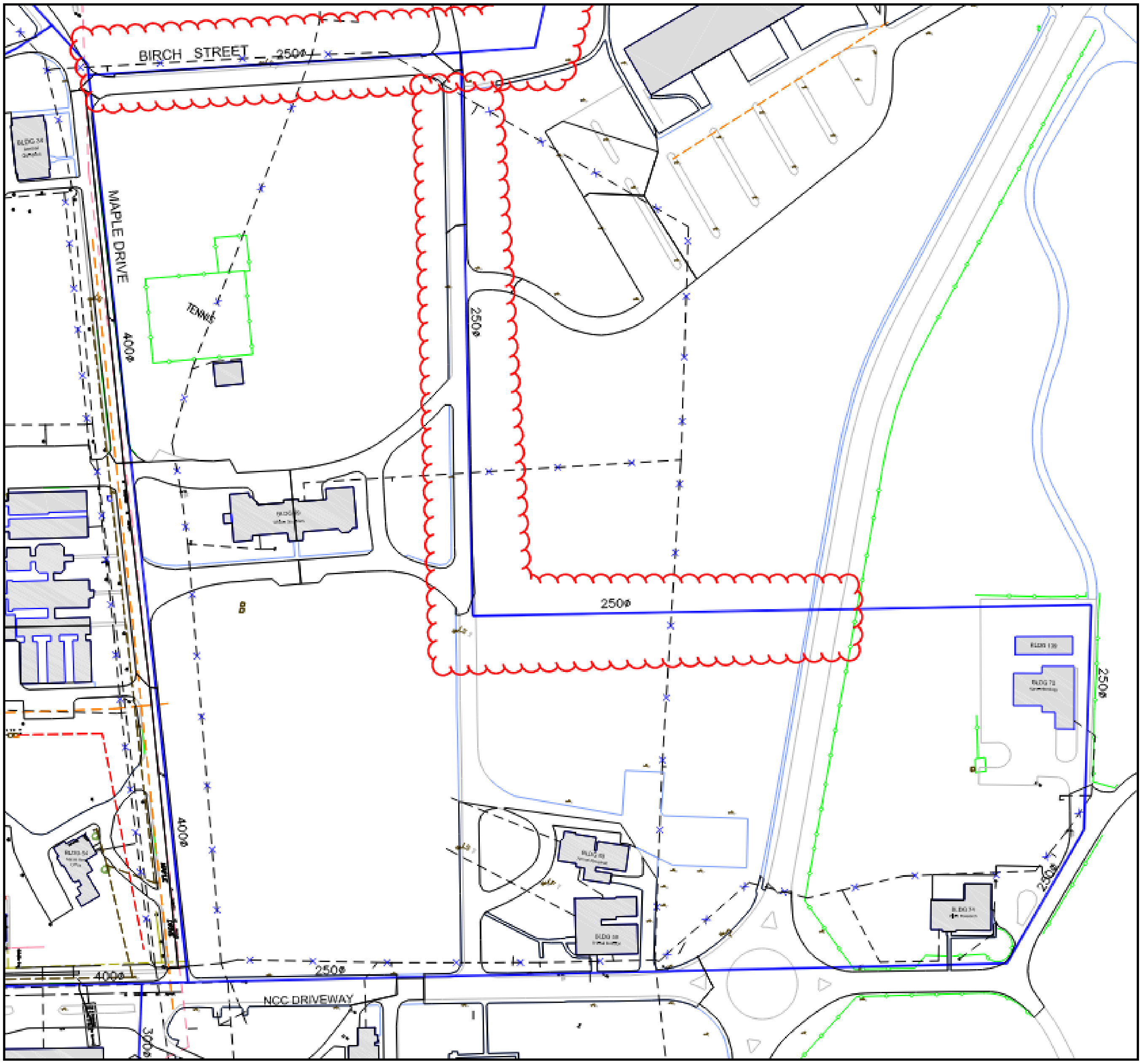
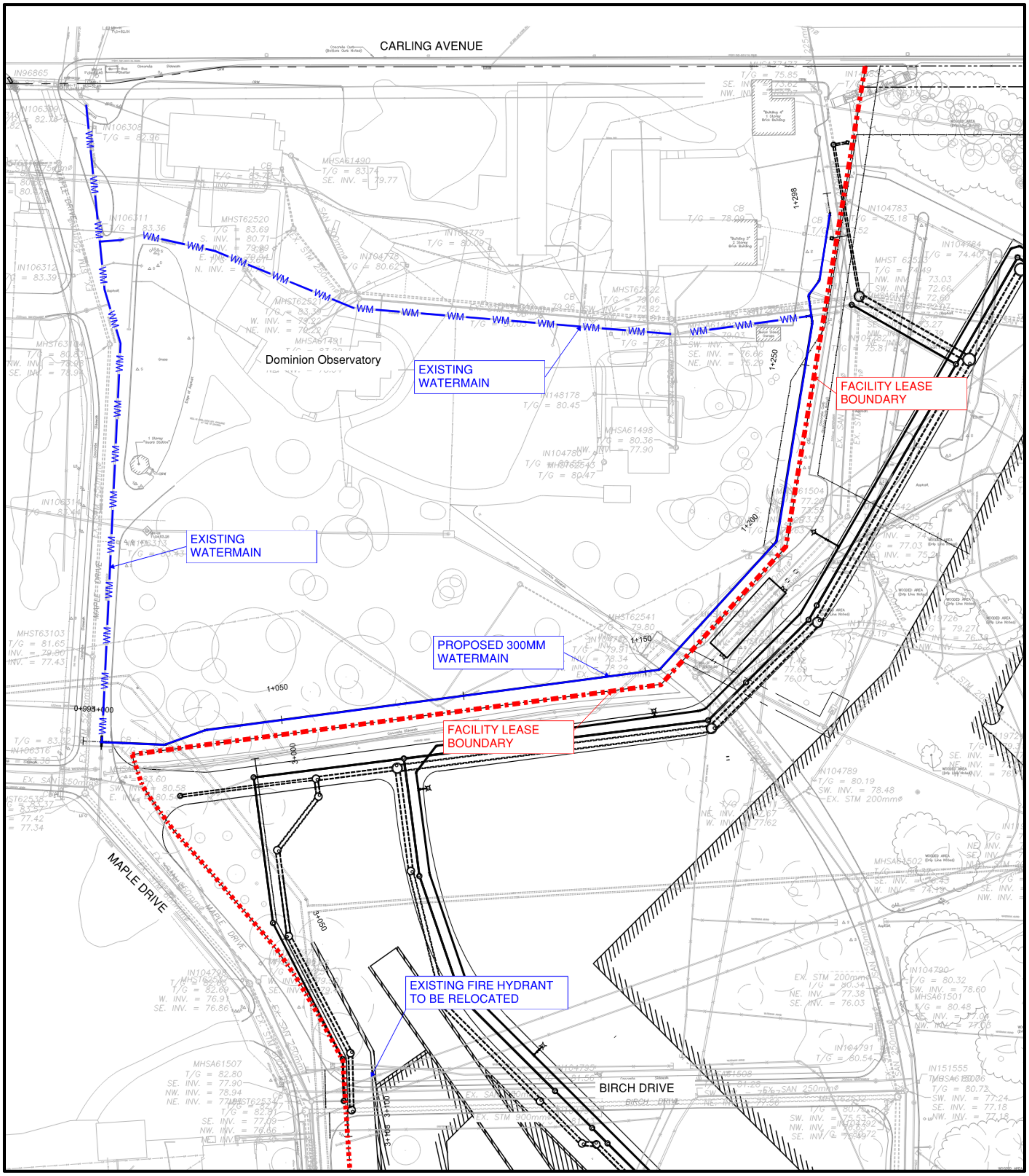


Figure 2-4 is snapshot of Figure 1, within the CEF, Master Servicing Plan, Volume 1: Water System.

3.3 Proposed Watermain System Relocation

The 300mm diameter watermain relocation for the northern loop will be within the construction easement on CEF property, adjacent to the northeast lease property limit, as shown in Figure 3-5. The existing fire hydrant located at the Maple Drive and Birch Drive intersection will be removed and relocated to ensure the fire hydrant is accessible. The proposed relocation maintains a looped configuration to ensure redundancy.

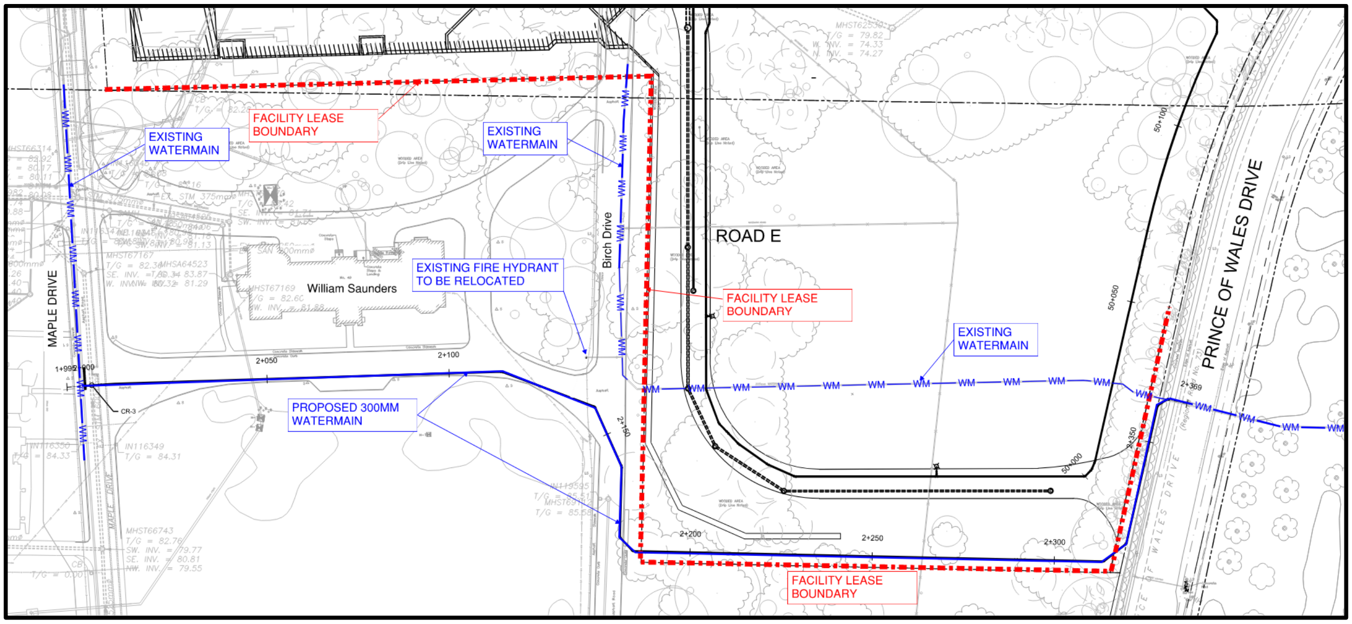
Figure 3-5: Proposed CEF Watermain Relocation (Northern Loop)



The 300mm diameter watermain relocation for the southern loop will be located on both CEF lands and NCD leased lands. A new connection to the existing watermain on Maple Drive will be made at the access road on the south side of Building 49 (William Saunders). The proposed 300mm diameter watermain will extend east along the access road, south along Birch Drive, and then east within the NCD leased lands to Price of Wales Drive. At Prince of Wales Drive, it will connect into the existing watermain that extends east of Prince of Wales Drive, refer to **Figure 3-6**

Figure 3-6. The existing fire hydrant located between Birch Drive and the William Saunders Building will be removed and relocated to ensure the fire hydrant is accessible. The proposed relocation maintains a looped configuration to ensure redundancy.

Figure 3-6: Proposed CEF Watermain Relocation (Southern Loop)



3.4 Watermain Design Criteria

The proposed watermain distribution system was designed in general conformance with the *City of Ottawa Water Design Guidelines* as amended by its *Technical Bulletins*.

The system pressure criteria under normal and various operating conditions are listed in Table 3-1.

Table 3-1: Water System Pressure – Criteria

OPERATING CONDITIONS	PRESSURE CRITERIA	
	kPa	psi
Average Daily Demand		
Minimum to Maximum	276-552	40-80
Desirable Range	350-480	50-70
Peak Hourly Demand		
Minimum to Maximum	276-552	40-80
Desirable Range	350-480	50-70
Maximum Daily Demand + Fire Flow		
Minimum	140	20

The new watermains will be installed with a minimum depth of cover of 2.4m where possible. Should there be less than 2.4m cover or separation from an open structure, the pipes will be insulated in accordance with City of Ottawa Standard Drawings W22 and W23.

High pressure is not an issue on this site as the boundary conditions are below 80psi. Therefore, pressure reducing valves will not be required.

3.5 Watermain Calculations and Results

Water demand and fire flow demand calculations were not completed as part of this analysis. A WaterCAD model of the CEF land was obtained from AAFC as part of the *CEF Master Servicing Plan Volume 1: Water System (March 2008)*. The model was updated with the proposed watermain relocations while retaining the original model's boundary conditions, water consumption demands, fire flow demands, pipe friction loss coefficient (Hazen Williams), and future site expansion.

The *CEF Master Servicing Plan Volume 1: Water Systems (March 2008)* states that one (1) new building is planned for future site expansion. The building will be located in the existing parking lot south of Building 21 (Neatby Headerhouse). The report states that the water supply and fire protection will be adequate for the future planned growth.

WaterCAD Results

Pressures were determined for the maximum daily demand, peak hourly demand, and maximum daily demand plus fire flow scenarios for three (3) different fire locations (Building 5, Building 72, and Building 74). The model output for each scenario is included with Appendix A. The results of the scenarios are summarized below.

Maximum Daily Demand & Peak Hourly Demand

The results for both the Maximum Daily Demand simulation and the Peak Hourly Demand simulation indicate the operation pressure at all junctions is between the design requirement of 276kPa and 552kPa. The pressures range from a low of 354kPa to a high of 481kPa in both simulations.

Maximum Daily Demand Plus Fire at Building 5

The results from the Fire at Building 5 and Maximum Daily Demand simulation indicate there is adequate fire coverage at Building B005 using the available fire flow of 7,500L/min. All junctions have a greater pressure than the minimum 140kPa. The pressure ranges from a low of 279 kPa to a high of 399 kPa.

Maximum Daily Demand Plus Fire at Building 72

The results from the Fire at Building 72 and Maximum Daily Demand simulation indicate there is adequate fire coverage at Building 072 using the available fire flow of 5,620L/min. All junctions have a greater pressure than the minimum 140kPa. The pressure ranges from a low of 322 kPa to a high of 451 kPa.

Maximum Daily Demand Plus Fire at Building 74

The results from the Fire at Building 74 and Maximum Daily Demand simulation indicate there is adequate fire coverage at Building 074 using the available fire flow of 9,269L/min. All junctions have a greater pressure than the minimum 140kPa. The pressure ranges from a low of 199 kPa to a high of 332 kPa.

WaterCAD Conclusion

The model results confirm there is adequate domestic water supply and fire flow demand for the proposed watermain relocations in the Central Experimental Farm.

3.6 Watermain Constructability

The watermain relocations will be constructed on both NCD leased lands and CEF lands. The northern watermain loop relocation will be constructed on CEF lands adjacent to the northwest lease property limit. This area will be accessed from the NCD leased lands. The southern watermain loop relocation will be constructed on both NCD leased lands and CEF lands. The access road on the south side of Building 49 (William Saunders) and a portion of Birch Drive (south of Building 49), both on CEF lands, will be required during construction for installation of the proposed works. The distributed CEF lands will be reinstated to existing conditions upon completion of the construction works.

4.0 SANITARY SERVICING

4.1 Existing Sanitary Sewer System

The eastern portion of the existing CEF sanitary sewer system outlets through the NCD leased lands to the existing City of Ottawa Mooney's Bay Collector (MBC). **Figure 4-1** illustrates the existing CEF sanitary sewer drainage area that outlets to the MBC.

Figure 4-1: Existing Sanitary Sewer Drainage Area

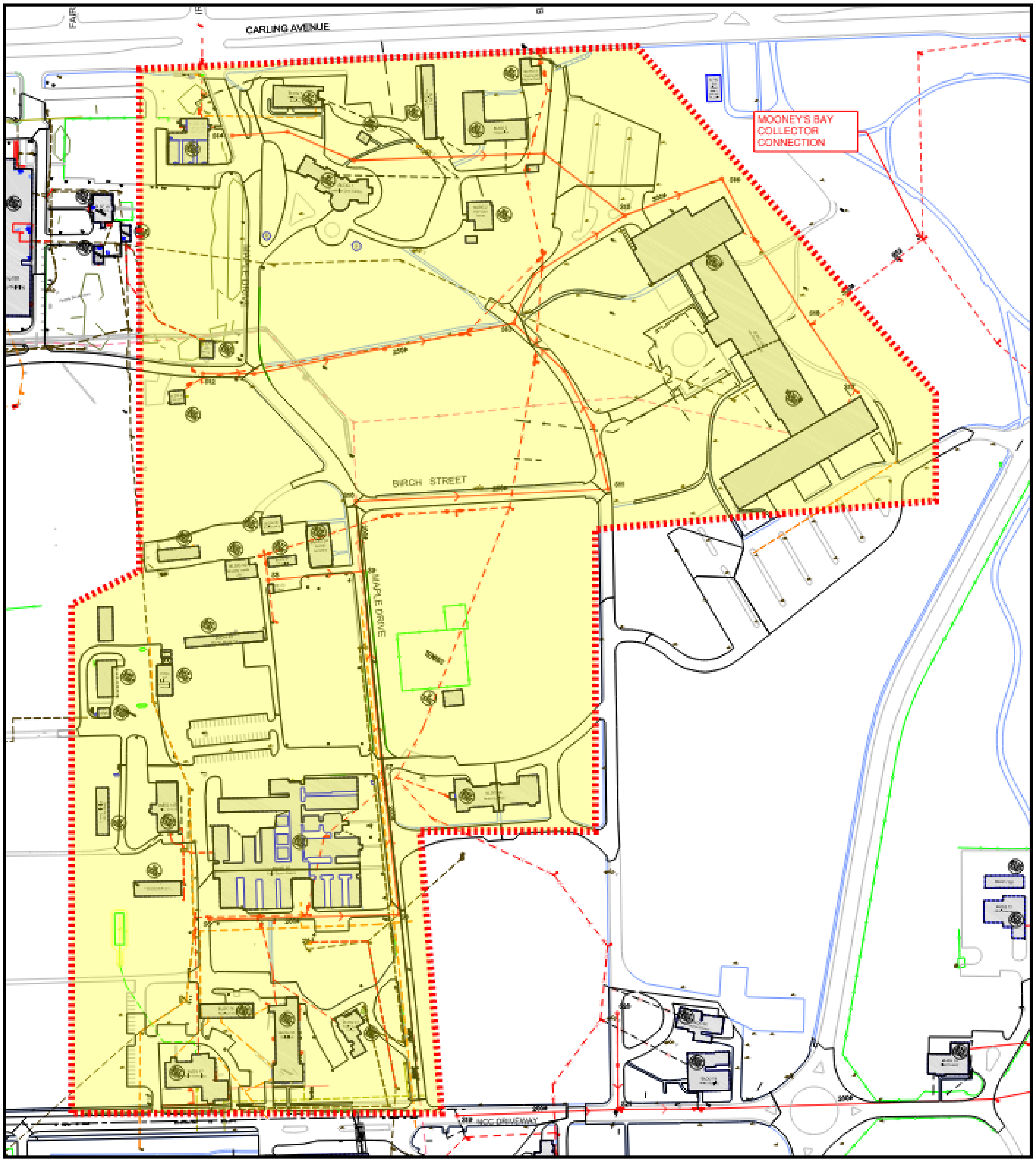


Figure 3-1 is snapshot of Figure 1, within the CEF, Master Servicing Plan, Volume 2: Sanitary and Storm Systems.

4.2 Existing Sanitary Sewers Affected by the NCD Site

The existing CEF sanitary sewers affected by the NCD site are shown in **Figure 4-2.** Relocation of this portion of the CEF sanitary sewer system is required to ensure flows from the CEF lands continue to outlet to the MBC.

Figure 4-2: Disrupted CEF Sanitary Sewers

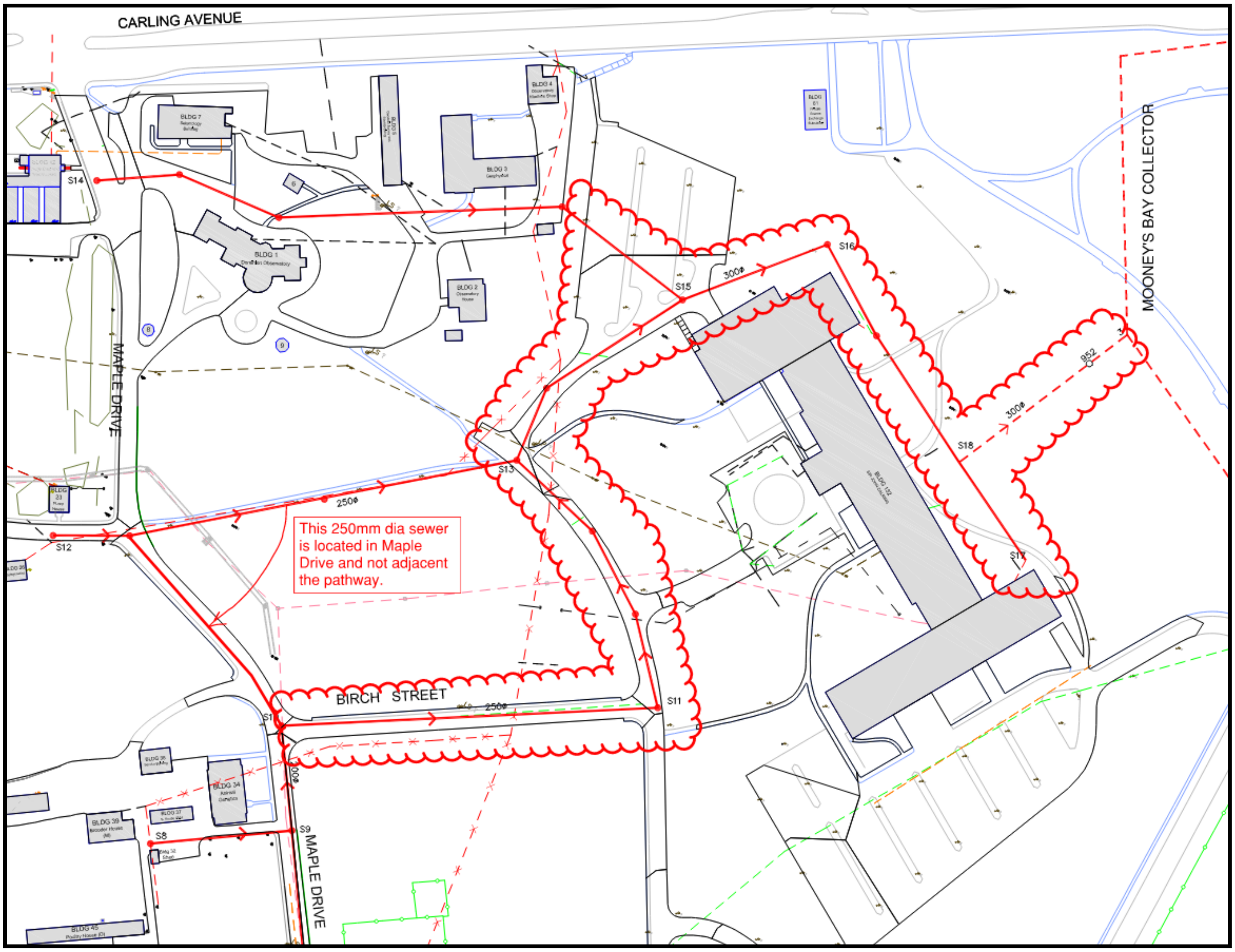


Figure 3-1 is snapshot of Figure 1, within the CEF, Master Servicing Plan, Volume 2: Sanitary and Storm Systems

4.3 Proposed Sanitary Sewer Relocation

The sanitary sewer relocation will be within the NCD leased lands as shown in **Figure 4-3** and **Figure 4-4**. A connection to the existing CEF sanitary sewer system will be made within the leased lands at the existing Birch Drive and Maple Drive intersection. A maintenance hole structure will be installed, and a new 250mm diameter sanitary sewer will extend north to Road D (within the NCD site) and then east, at which point the CEF sanitary flow will be combined with the NCD sanitary flow, refer to **Figure 4-3.** This connection will ensure continued servicing for existing Buildings on both the east and west side of Maple Drive. Another connection to the NCD sanitary sewer will be made to the north, east of the existing Dominion Observation Building, refer to **Figure 4-4.** A new 250mm diameter sanitary sewer is required to make this connection. This connection will ensure continued servicing for existing Buildings 1 though 7. The NCD sanitary sewer network will extend through the leased lands and outlet to the existing City of Ottawa MBC.

Figure 4-3: Proposed CEF Sanitary Sewer Relocation (Western)

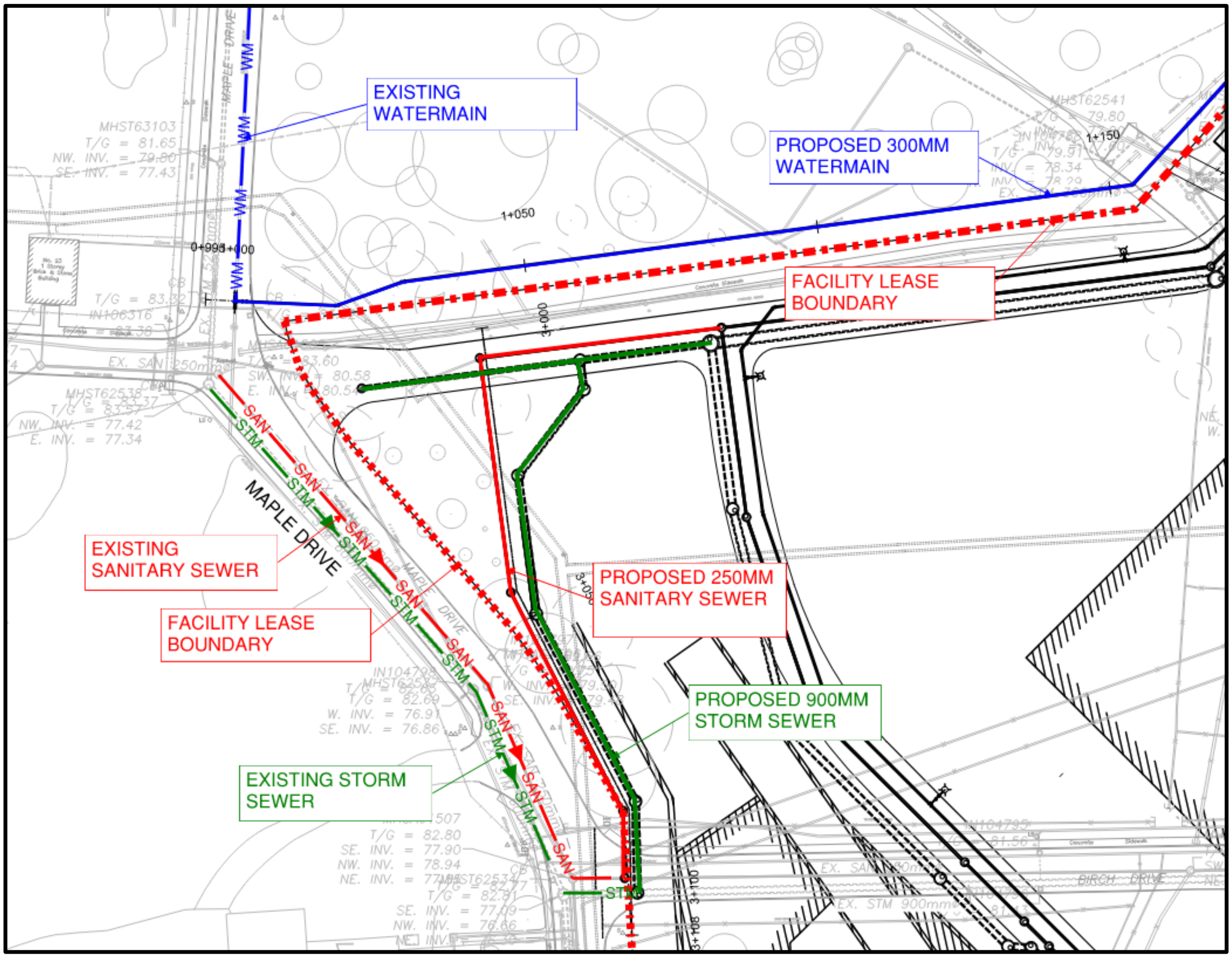
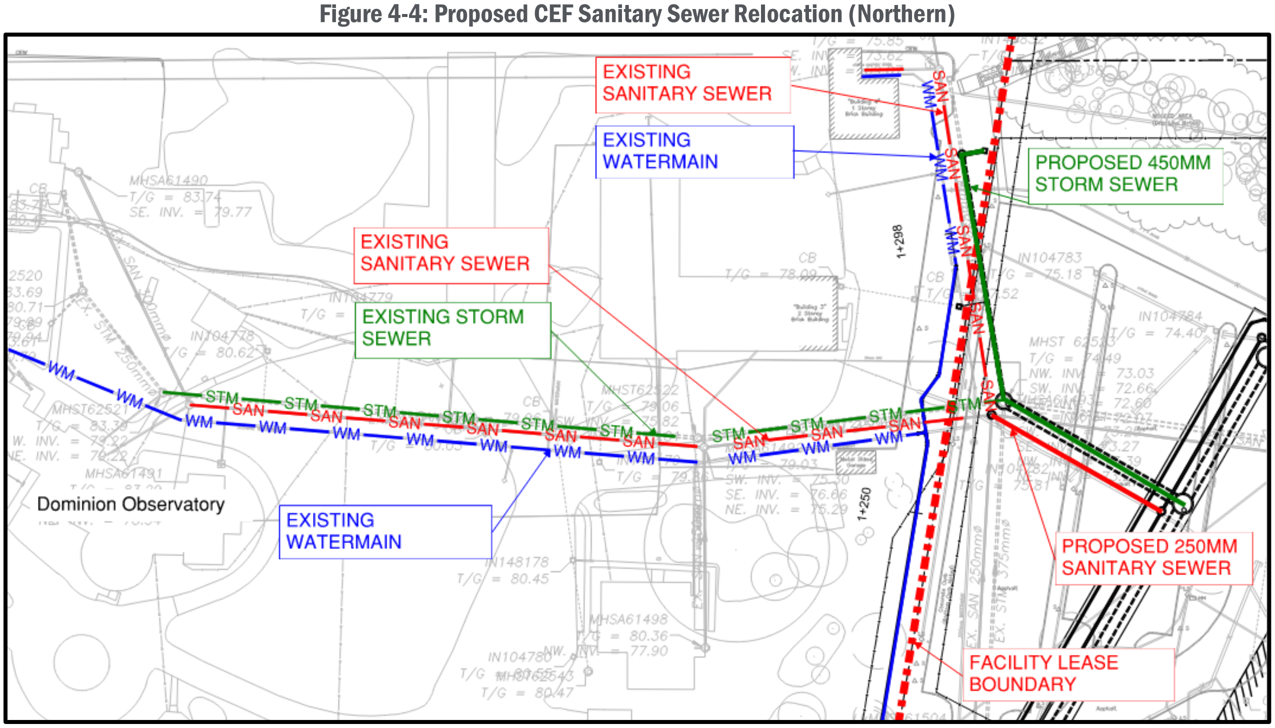


Figure 4-4: Proposed CEF Sanitary Sewer Relocation (Northern)



4.4 Sanitary Sewer Design Criteria

The proposed sanitary sewer system was designed in general conformance with the *City of Ottawa Sewer Design Guidelines* as amended by its *Technical Bulletins*.

The sanitary design flow rate is the peak flow plus the peak extraneous flow. The values for the average flow, peak factor and peak extraneous flows used in the sanitary servicing calculations for the development are presented in **Table 4-1.**

TABLE 4-1: SANITARY DESIGN FLOW CRITERIA

DEVELOPMENT TYPE	AVERAGE SANITARY FLOW	UNIT	PEAK FACTOR	PEAK EXTRANEOUS FLOW	PEAK SANITARY FLOW
Main Hospital Building	5.40(1)	L/m2/day	1.5	0.33 L/s/gross ha	
Central Utility Plant	5.0(2)	L/s	1.5	0.33 L/s/gross ha	
Parking Garage	1.0(3)	L/s	1.0	0.33 L/s/gross ha	
CEF Outlet 1@ S15	-	L/s	-	-	0.299(4)
CEF Outlet 2@ S15	-	L/s	-	-	1.202(4)

(1) Based on water records from the Ottawa Hospital Civic Campus
(2) Assumed value as the Central Utility Plant is in the feasibility design stage.
(3) Considered negligible as the only contribution is through snow melt from the parked vehicles.
(4) From Central Experimental Farm Ottawa, Ontario Master Servicing Plan Volume 2: Sanitary and Storm Systems (2008)

The sanitary sewer system is designed with a pipe roughness coefficient of 0.013.

The proposed sanitary sewer system should be installed with a minimum cover of 2.0m, where this is not possible insulation will be provided.

Based on the Master Servicing Plan, the City of Ottawa confirmed that the existing Mooney's Bay Collector has sufficient capacity to accommodate the estimated peak of **34.24L/s** for the Main Hospital Building. The City of Ottawa will need to confirm if the Mooney's Bay Collector has sufficient capacity to accommodate the revised estimated peak flow for the Main Hospital Building and Central Utility Plant. The revised estimated peak flow is presented in the section below.

4.5 Sanitary Sewer Calculations and Results

A total peak flow of **55.69L/s** is estimated for the NCD site (Main Hospital, Central Utility Plant and Parking Garage). A total peak flow of **1.50L/s** has been accounted for the CEF lands based on the *CEF Master Servicing Plan Volume 2: Sanitary and Storm Systems (March 2008)*. This results in a combined flow of **57.19L/s** within the proposed NCD sanitary sewer system that will outlet to the existing City of Ottawa MBC.

It's assumed that the **1.5L/s** taken from the *CEF Master Servicing Plan Volume 2: Sanitary and Storm Systems (March 2008)* accounts for future site expansion. The report states that the drainage areas were established to account for the future planned growth.

The City of Ottawa will need to confirm is the MBC has sufficient capacity to accommodate the revised estimated peak flow of **57.19L/s** for the Main Hospital Building and Central Utility Plant. The sanitary sewer design sheet is included in **Appendix B.**

4.6 Sanitary Sewer Constructability

The sanitary sewer relocations will be constructed within the NCD leased lands. The western sanitary sewer relocation, near the Maple Drive and NCD Road D intersection, is adjacent to the lease property limit. The CEF land between the lease property limit and the existing curb on the east side of Maple Drive, between Winding Lane and Birch Drive, will be required during construction for installation of the proposed works. The distributed CEF lands will be reinstated to existing conditions upon completion of the construction works.

5.0 STORM SEWER SERVICING

5.1 Existing Storm Sewer System

The eastern portion of the existing CEF storm sewer system outlets through the NCD leased lands towards Prince of Wales Drive. At Prince of Wales Drive, the storm sewer extends southeast and discharges to Dow's Lake. **Figure 5-1** illustrates the existing CEF storm sewer drainage area that outlets to Dow's Lake.

Figure 5-1: Existing Storm Sewer Drainage Area

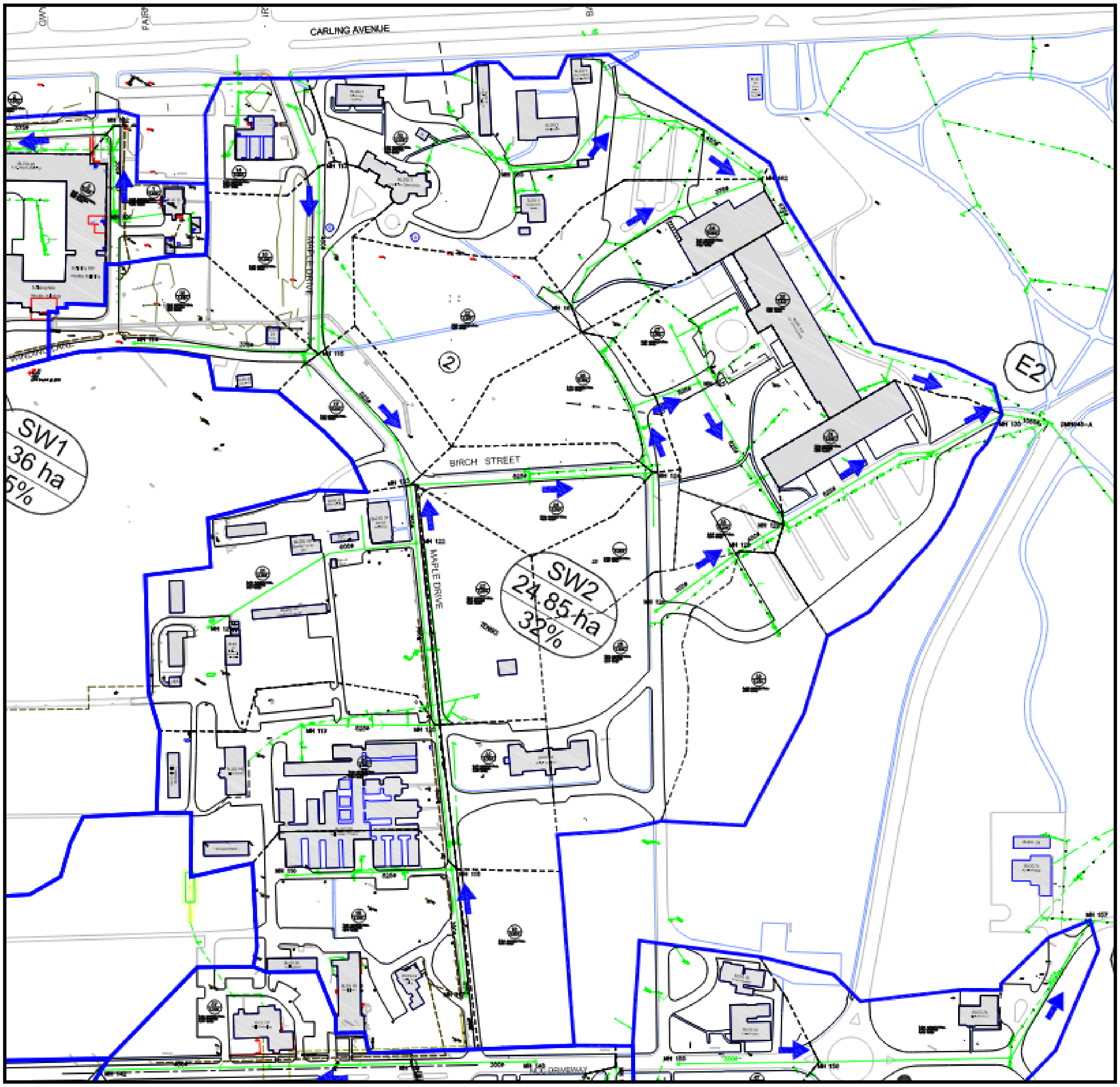


Figure 4-1 is snapshot of Figure 6, within the CEF, Master Servicing Plan, Volume 2: Sanitary and Storm Systems.

5.2 Existing Storm Sewers Affected by the NCD Site

The existing CEF storm sewers affected by the NCD site are shown in Figure 5-2. Relocation of this portion of the CEF storm sewer system is required to ensure flows from the CEF lands continue to outlet to Dow's Lake.

Figure 5-2: Disrupted CEF Storm Sewers

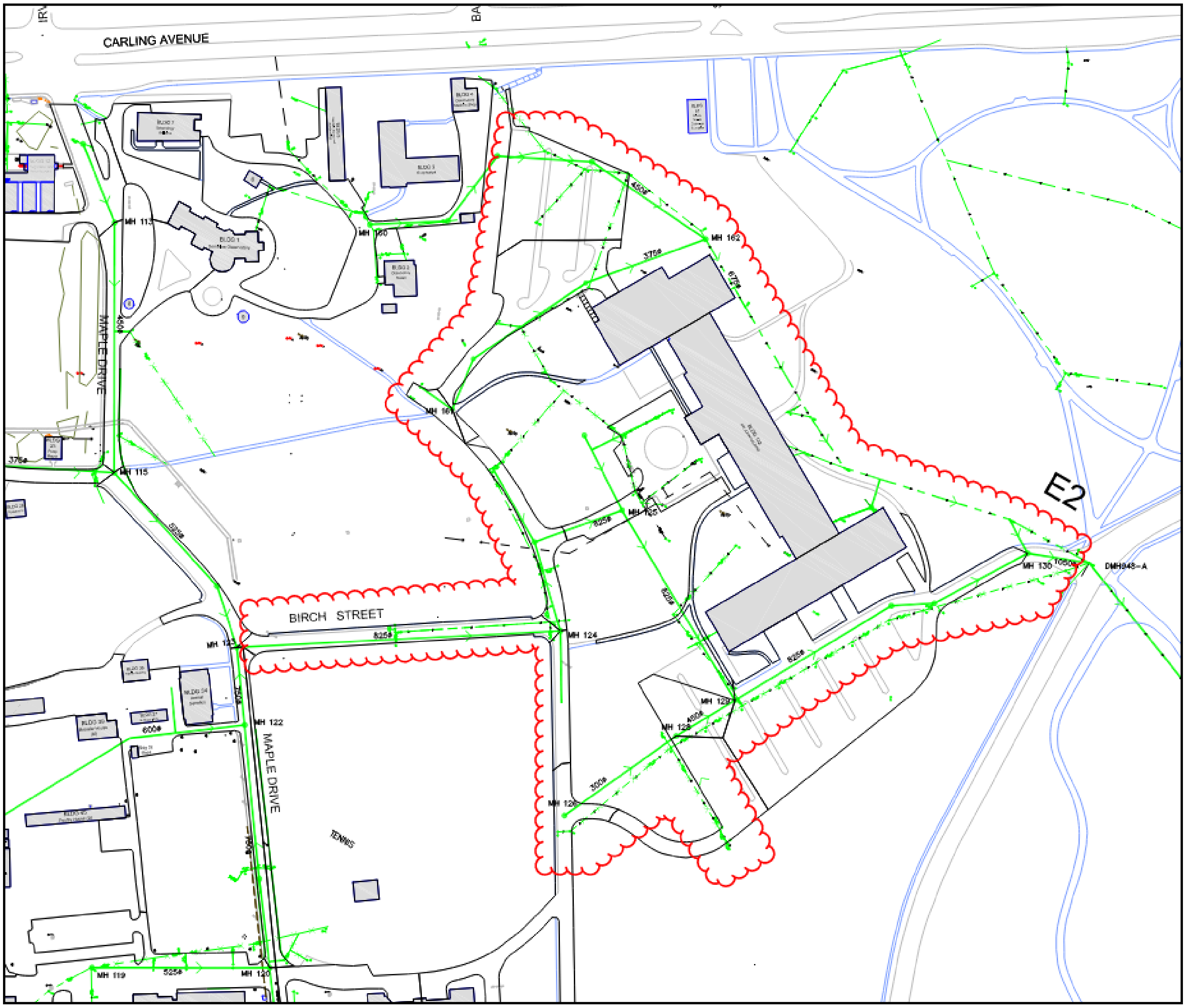


Figure 4-2 is snapshot of Figure 5, within the CEF, Master Servicing Plan, Volume 2: Sanitary and Storm Systems.

5.3 Proposed Storm Sewer Relocation

The storm sewer relocation will be within the NCD leased lands as shown in Figure 5-3 and Figure 5-4. A connection to the existing CEF storm sewer system will be made within the leased lands at the existing Birch Drive and Maple Drive intersection. A maintenance hole structure will be installed, and a new 900mm diameter storm sewer will extend north to Road D (within the NCD site) and then east, at which point the CEF storm runoff will be combined with the NCD storm runoff, refer to Figure 5-3. Another connection to the NCD storm sewer will be made to the north, east of the existing Dominion Observation Building, refer to Figure 5-4. A new 450mm diameter storm sewer is required to make this connection. The NCD storm sewer network will extend through the leased lands and outlet to the existing private outlet to Dow's Lake (owned by AAFC).

Figure 5-3: Proposed CEF Storm Sewer Relocation (Western)

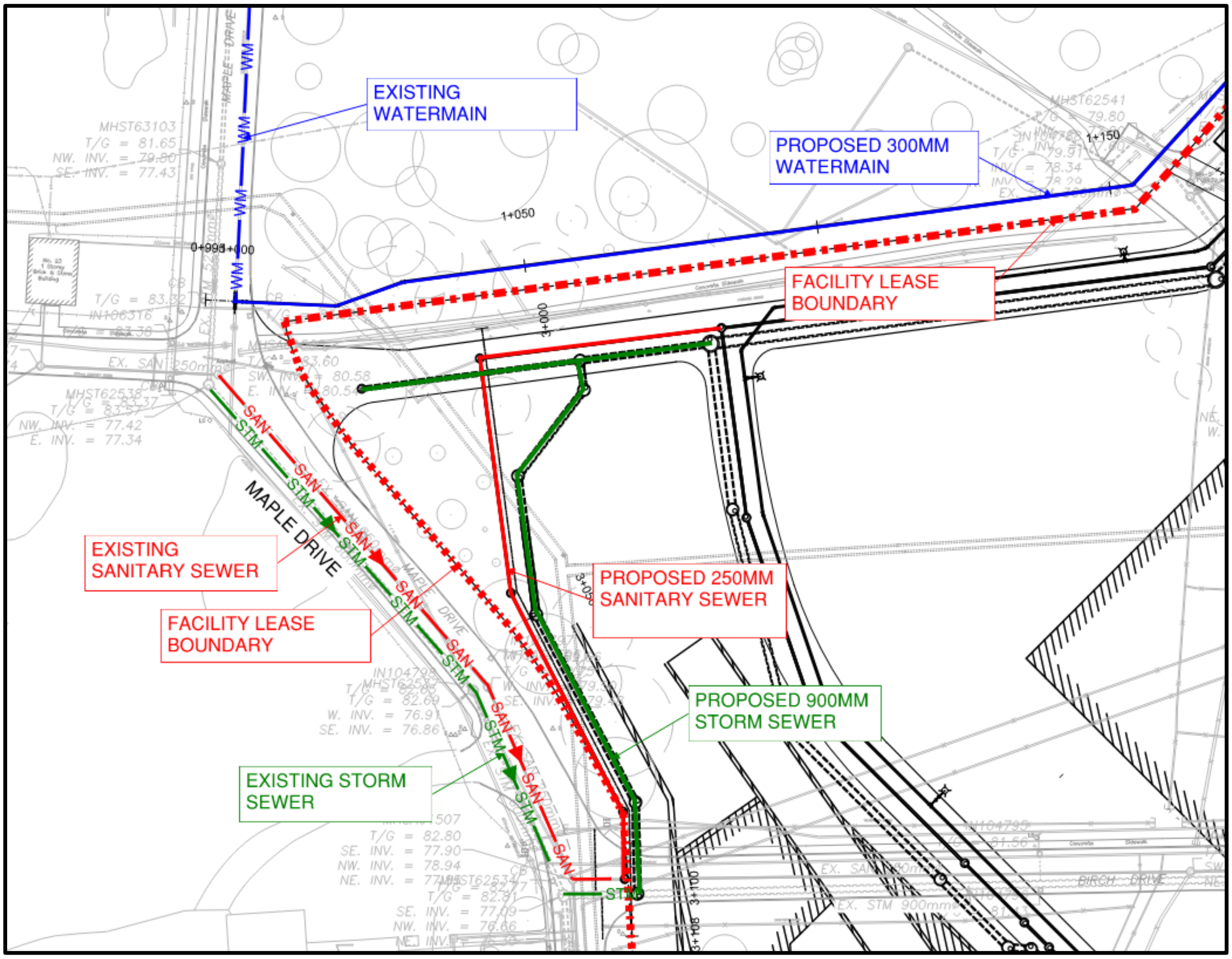
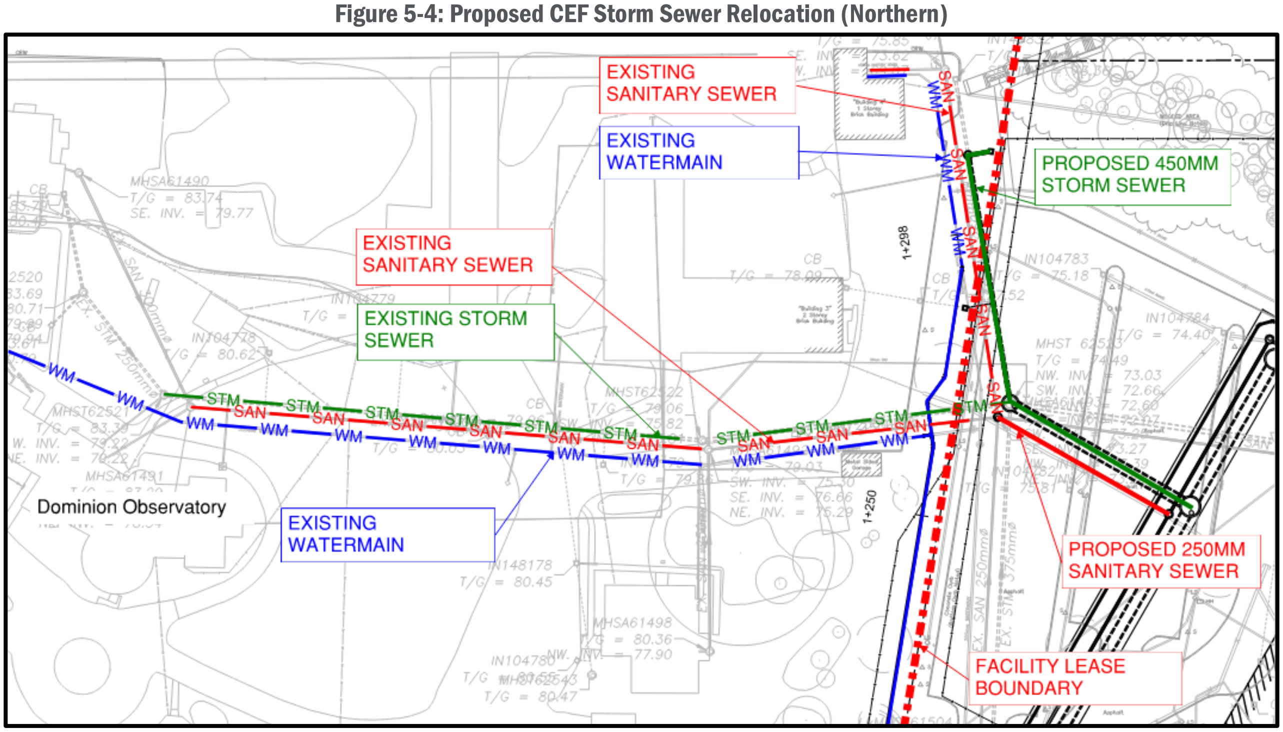


Figure 5-4: Proposed CEF Storm Sewer Relocation (Northern)



5.4 Storm Sewer Design Criteria

The proposed storm sewer system has been designed in general conformance with the City of Ottawa Sewer Design Guidelines and its technical bulletins, plus more specific requirements from the City of Ottawa.

The design criteria from the City of Ottawa Sewer Design Guidelines and City of Ottawa staff for the site includes the following:

- The capacity of the downstream receiving system (Dow's Lake Outfall) must be assessed and approved by AAFC;
- A detailed major system analysis using dynamic models must be undertaken to assess the impact of additional flow on the major system if inlet control devices are implemented;
- Proposed developments draining to an existing system that does not have stormwater treatment is subject to on-site treatment (i.e., best management practice, oil grit separators, etc.);
- Stormwater management for the portion of the site that outlets to Dow's Lake shall be based on the 5-year storm event using the IDF information derived from the Meteorological Services of Canada rainfall data, taken from the MacDonald Cartier Airport, collected 1966 to 1997;
- Pre-development runoff coefficient to be determined as per existing conditions but shall not exceed 0.4 when discharging to a combined system;
- Pre-development runoff coefficient to be determined as per existing conditions but shall not exceed 0.5 when discharging to a storm system;
- A calculated time of concentration cannot be less than 10 minutes;
- Storm flows to Dow's Lake in excess of the 5-year storm release rate, up to and including the 100-year storm event, must be detained on site;
- IDF curve equations used with the Rational formula:
  - 2-year $=732.951/(Tc+6.199)^{0.810}$
  - 5-year $=998.071/(Tc+6.053)^{0.814}$
  - 100-year $= 1735.688/(Tc+6.014)^{0.820}$
- The rational method uses runoff coefficients (C) for various surfaces. The runoff coefficient for a 100-year storm event is increased by 25% in accordance with the *City of Ottawa Sewer Design Guidelines* to a maximum of 1.0. The following C values were used in within this study:
  - 5-year runoff coefficient asphalt/concrete/buildings = 0.90
  - 100-year runoff coefficient asphalt/concrete/buildings = 1.00
  - 5-year runoff coefficient grass = 0.20
  - 100-year runoff coefficient grass = 0.25
  - 5-year runoff coefficient forest = 0.40
  - 100-year runoff coefficient forest = 0.50

The design criteria from the National Capital Commission FLUDTA File (CP2299-18853) includes the following:

- Integrated best management practices for a sustainable stormwater management on site;
- Achieve improved water quality by controlling rainwater at its point of impact, managing infiltration, and conveying any excess off-site by systems (such as swales, ditches and storm sewers;
- Respect the hydraulic capacity and erosion thresholds of receiving watercourses with an appropriate water quantity peak flow discharge rate;
- Seek to adhere to the following design strategies when possible:
  - Infiltration;
  - Bio-Retention/Bio-Filtration: Rainwater Harvesting (cisterns and rain barrels);
  - Water quality enhancement: oil and grit separators;
  - Detention ponds and permanent check dams in swales; and
  - Green roofs, rooftop gardens, and green walls.

The design criteria from the National Capital Commission Stormwater Management Manual - Draft, Spring 2022, includes the following:

- Water Quality – to minimize or improve surface water and groundwater quality, minimize sediment loading to surface water and groundwater, maintain or enhance the quality of drinking water sources, and maintain or enhance existing thermal watercourse regimes.
- Water Quantity – to ensure the development manages peak flows so that it does not increase risk to the environment, public safety, property, and infrastructure.
- Volume Control – to control the overall volume of stormwater runoff that leave a project site in post-development conditions and promote the adoption of love impact development approaches to stormwater management.
- Floodplain Management – to ensure that continues function of natural floodplain areas from a hydrologic and hydraulic perspective, and to guide development away from flood prone areas.
- Erosion Control – to reduce impacts of erosion on aquatic and terrestrial habitats through the appropriate implementation of stormwater management practices.
- Drainage to Federal Land – to ensure that common law and Loi sur la Qualite de l'Environnement principles are applied fairly and consistently in matters regarding the management of drainage between the National Capital Commission and neighbouring landowners.
- Water Balance – to minimize the impacts of urbanization activities on alteration of the natural hydrologic cycle and existing water balance.

The proposed storm sewer system should be installed with a minimum cover of 2.0m, where this is not possible insulation will be provided.

5.5 Allowable Release Rate

The allowable release rate for the Dow's Lake outfall was calculated using the rational method formula based 5-year flow and the existing runoff coefficient that shall not exceed 0.4 when discharging to a combined sewer system and 0.5 when discharging to a storm sewer system.

$$Q = 2.78\ CiA$$

where

Q = Flow rate (L/s)
C = Runoff coefficient
i = Rainfall intensity (mm/hr)
A = Area (ha)

The resultant allowable release rate is **2345.34L/s** to Dow's Lake (private storm system).

5.6 Storm Sewer Calculations and Results

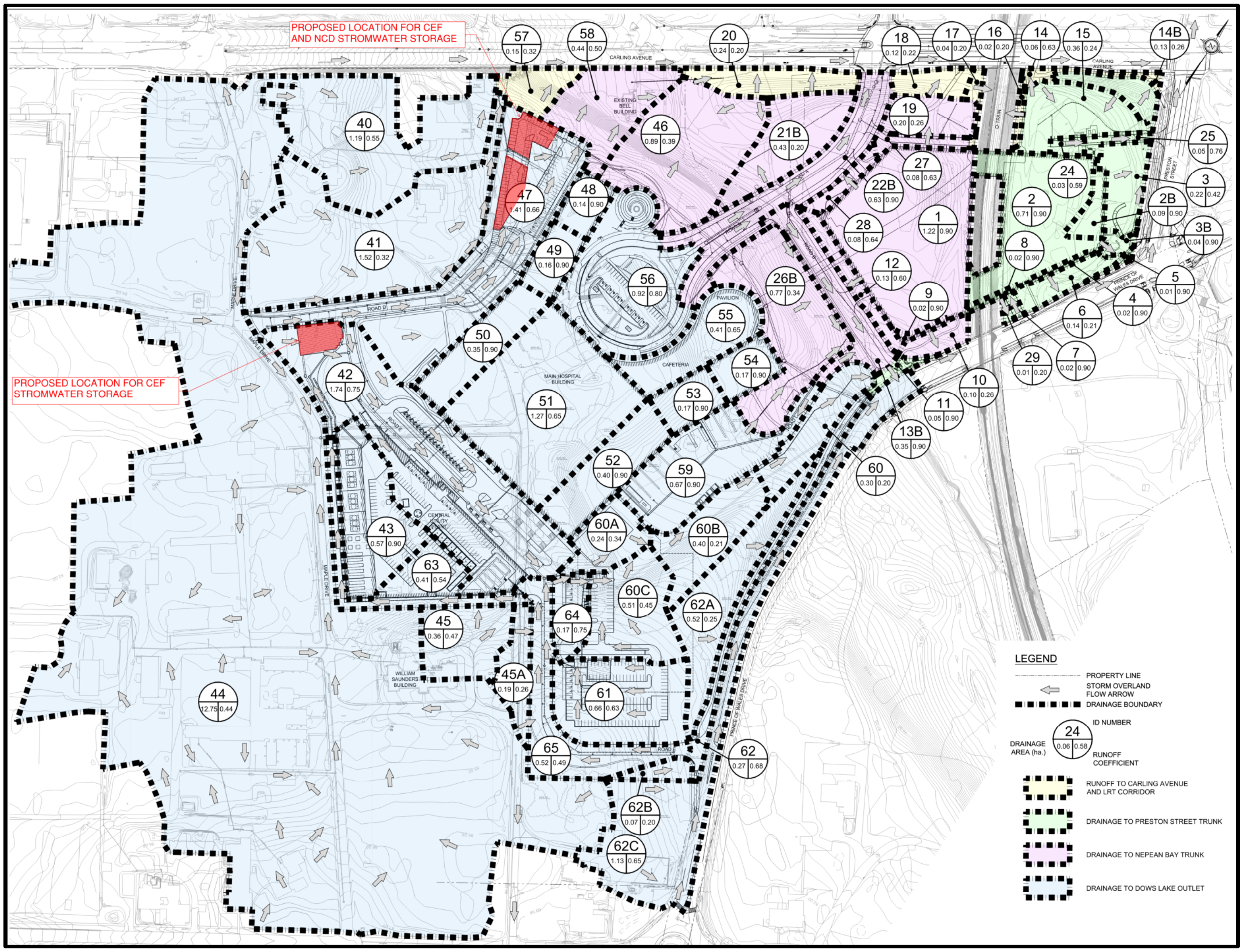
The PCSWMM model for the NCD leased lands accounts for the eastern portion of the CEF land that outlets to the existing Dow's Lake Outfall (owned by AAFC). The external drainage areas that have been accounted for are 12.75ha (Drainage Area 44), 1.19ha (Drainage Area 40), and 1.52ha (Drainage Area 41), refer to **Figure 5-5**. This aligns with the drainage area in the *CEF Master Servicing Plan Volume 2: Sanitary and Storm Systems (March 2008).*

The stormwater runoff from Drainage Area 44 (CEF land) will connect into the proposed NCD storm sewer in the vicinity of the Maple Drive and NCD Road D intersection and the second location is south of Carling Avenue and east of CEF Buildings 3&4. The stormwater runoff from Drainage Area 40 and Drainage Area 41 (CEF land) will connect into the proposed NCD storm sewer south of Carling Avenue and east of CEF Buildings 3&4. The stormwater runoff will be collected in storage tanks, located on NCD leased lands, and released at a controlled rate into the proposed NCD storm sewer and ultimately Dow's Lake. The proposed location of the storage tanks is shown in **Figure 5-5** and will be able to accommodate the 100-year storm plus 20% stress test volume.

The latest version of the PCSWMM model is included in Appendix C., it will be refined as the design is finalized.

It's assumed that the *CEF Master Servicing Plan Volume 2: Sanitary and Storm Systems (March 2008)* accounts for future site expansion. The report states that the drainage areas were established to account for the future planned growth.

Figure 5-5: Strom Sewer Drainage Areas



Stormwater Quantity

The 100-year stormwater flows are controlled with the post-development 100-year flows being controlled to the pre-development 5-year flows. The 5-year pre-development flow is 2345.34L/s and the 100-year post-development flow will be controlled to 2324.72L/s. The sizing of the storage chambers will be finalized as the design moves forward as this work will not be implemented as part of the Advance Works. All storage chambers will be located within the NCD leased lands.

The uncontrolled 100-year flow from Drainage Area 44 (CEF land) is 3148.46L/s. This flow will be released at a controlled rate of 1277.84L/s to the proposed NCD storm sewer system. The controlled rate may be refined as the PCSWMM model is finalized. The difference between the uncontrolled flow rate and the controlled flow rate will be stored in an underground tank on NCD leased lands (in the vicinity on the Maple Drive and NCD Road D intersection).

The uncontrolled 100-year flow into the proposed storage tank south of Carling Avenue and east of Drainage Area 40 and Drainage Area 41 is 2151.74L/s. This uncontrolled flow is a combination of both CEF lands (Drainage Area 40 and Drainage Area 41) and NCD leased lands. This flow will be released at a controlled rate of 586.30L/s to the proposed NCD storm sewer system. The controlled rate may be refined as the PCSWMM model is finalized. The difference between the uncontrolled flow rate and the controlled flow rate will be stored in an underground lank on NCD leased lands (south of Carling Avenue and east of CEF Buildings 3&4).

Stormwater Quality

Enhanced water quality protection (80% TSS removal) is required, and best management practices are generally encouraged to maximize on-site quality protection.

The quality control measures for the site will be provided through a treatment train approach; promoting sheet runoff from impervious areas (asphalt/concrete) to low impact development (LID) systems (bioswales, infiltration trenches, etc.), underground storage systems to promote infiltration, and ultimately an oil and grit separator system. The sizing and location of the oil and grit separator(s) will be finalized as the design moves forward. This work will not be implemented as part of the Advance Works.

Permanent Groundwater Dewatering

Permanent groundwater dewatering will be required for the site. It is currently anticipated that the groundwater will be pumped into the proposed storm sewer system which would assist with lowering the temperature of the stormwater. In addition, the site has been designed with significant tree canopy and best efforts will be provided to promote shading of impervious areas (asphalt/concrete). The lowering of groundwater and discharge locations will be finalized as the design moves forward. This work will not be implemented as part of the Advance Works.

5.7 Storm Sewer Constructability

The storm sewer relocations will be constructed on both NCD leased lands and CEF lands. The western storm sewer relocation, near the Maple Drive and NCD Road D intersection, is adjacent to the lease property limit on NCD leased lands. The CEF land between the lease property limit and the existing curb on the east side of Maple Drive, between Winding Lane and Birch Drive, will be required during construction for installation of the proposed works. The northern storm sewer relocation, south of Carling Avenue and east of CEF Buildings 3&4, is adjacent to the lease property line and located on both NCD leased lands and CEF lands. The CEF lands between Buildings 3&4 and the lease property line will be required during construction for installation of the proposed works. The distributed CEF lands will be reinstated to existing conditions upon completion of the construction works.

APPENDIX A:
WATER CALCULATIONS

Scenerio: Peak Hour

Pipe Table

Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
EX-Carling/Irving - 406mm	68	EX-Carling/Irving	EX-J125	406.4	PVC	130	4	0.03	422	413
EX-Carling/Parkdale - 406mm	159	EX-Carling/Parkdale	EX-J225	406.4	PVC	130	4	0.03	428	419
EX-FrameShed - 152mm	132	B000FRAMESHED	EX-J145	152.4	PVC	130	0	0.00	423	420
EX001 - 406mm	15	EX-J002	EX-J001	406.4	PVC	130	-2	0.02	413	413
EX002 - 406mm	60	EX-J155	EX-J002	406.4	PVC	130	-2	0.02	419	413
EX003 - 305mm	117	EX-J003	P-J200	304.8	PVC	130	0	0.00	441	424
EX004 - 152mm	30	B022 CFIA 1	EX-J053	152.4	PVC	130	-1	0.06	448	443
EX005 - 152mm	41	B020 Neatby 2	EX-J053	152.4	PVC	130	-1	0.07	431	443
EX010 - 152mm	93	B020 Neatby 3	EX-J043	152.4	PVC	130	0	0.00	431	439
EX011 - 203mm	16	B020 Neatby 4	EX-J082	203.2	PVC	130	0	0.01	413	413
EX012 - 203mm	13	EX-J082	B020 Neatby 5	203.2	PVC	130	0	0.00	413	411
EX013 - 152mm	16	B000NEWBARN	EX-J220	152.4	PVC	130	0	0.00	437	441
EX014 - 152mm	12	B018 Pesticide Lab	EX-J110	152.4	PVC	130	0	0.00	413	412
EX015 - 152mm	36	B019 Chemical Storage	EX-J082	152.4	PVC	130	0	0.00	411	413
EX020 - 152mm	49	B020 Neatby 1	EX-J224	152.4	PVC	130	-1	0.07	421	432
EX021 - 152mm	101	B022 CFIA 2	EX-J043	152.4	PVC	130	0	0.02	442	439
EX022 - 152mm	9	B023 Pumphouse	EX-J221	152.4	PVC	130	0	0.00	407	411
EX023 - 203mm	94	B049 William Saunders2	EX-J162	203.2	PVC	130	0	0.00	385	416
EX024 - 152mm	14	EX-J222	B026 Cytogenetics	152.4	PVC	130	0	0.00	408	401
EX025 - 305mm	51	EX-J125	EX-J034	304.8	PVC	130	1	0.01	413	410
EX030 - 203mm	46	B007 Seismology Building	EX-J125	203.2	PVC	130	0	0.01	409	413
EX031 - 152mm	25	B012 Forage Crop & Greenhouses	EX-J125	152.4	PVC	130	0	0.00	412	413
EX032 - 152mm	11	B034 Animal Genetics	EX-J142	152.4	PVC	130	0	0.00	414	416
EX033 - 152mm	32	B036 Service Building	EX-J231	152.4	PVC	130	0	0.00	414	415
EX034 - 305mm	84	EX-J034	EX-J115	304.8	PVC	130	1	0.01	410	445
EX035 - 152mm	9	B001 Dominion Observatory	EX-J034	152.4	PVC	130	0	0.00	409	410
EX040 - 152mm	21	EX-J231	B045 Poultry House	152.4	PVC	130	0	0.00	415	416
EX041 - 152mm	14	B048 Implement and Nursery Stock Storage	EX-J143	152.4	PVC	130	0	0.00	416	417
EX042 - 152mm	31	B050 Main Greenhouses 2	EX-J162	152.4	PVC	130	0	0.03	412	416
EX043 - 305mm	48	EX-J224	EX-J043	304.8	PVC	130	1	0.01	432	439
EX044 - 152mm	30	B054 Maple Ave. Office	EX-J161	152.4	PVC	130	0	0.00	378	381
EX045 - 152mm	21	B055 Horticulture	EX-J172	152.4	PVC	130	0	0.00	370	375
EX050 - 152mm	12	B057 Dairy Technology	EX-J171	152.4	PVC	130	0	0.01	381	382
EX051 - 152mm	10	B059 Animal Nutrition	EX-J182	152.4	PVC	130	0	0.00	398	399
EX052 - 152mm	42	B060 Heritage House	EX-J181	152.4	PVC	130	0	0.00	390	396
EX053 - 203mm	7	EX-J043	EX-J053	203.2	PVC	130	1	0.03	439	443
EX054 - 305mm	35	EX-J053	EX-J054	304.8	PVC	130	-1	0.02	443	434
EX055 - 152mm	7	B072 Agrometeorology	EX-J174	152.4	PVC	130	0	0.01	436	438
EX060 - 203mm	24	B074 Plant Research	EX-J175	203.2	PVC	130	0	0.00	421	418
EX061 - 152mm	19	B075 Cereal Greenhouse	EX-J184	152.4	PVC	130	0	0.01	380	382
EX062 - 152mm	19	B076 Cereal Cleaning	EX-J215	152.4	PVC	130	0	0.00	378	387
EX063 - 152mm	38	B077 Pottery Shed	EX-J213	152.4	PVC	130	0	0.00	417	422
EX064 - 152mm	19	B078 CHP	EX-J220	152.4	PVC	130	0	0.01	439	441
EX065 - 305mm	49	EX-J100	EX-J082	304.8	PVC	130	0	0.00	414	413
EX080 - 152mm	25	B085 Information Booth	EX-J214	152.4	PVC	130	0	0.00	354	363
EX081 - 152mm	26	B088 Main Dairy Barn	EX-J173	152.4	PVC	130	0	0.01	371	369
EX082 - 305mm	64	EX-J082	EX-J153	304.8	PVC	130	-1	0.01	413	409
EX083 - 152mm	19	EX-J204	B091 Main Piggery	152.4	PVC	130	0	0.01	444	427
EX084 - 152mm	42	EX-J204	B092 Genetics Piggery	152.4	PVC	130	0	0.00	444	446
EX085 - 152mm	29	B091 Experimental Piggery	EX-J205	152.4	PVC	130	0	0.00	427	443
EX090 - 152mm	50	B094 Engineering Research	EX-J090	152.4	PVC	130	0	0.01	407	425
EX091 - 152mm	27	B095 Large Animal Lab	EX-J090	152.4	PVC	130	0	0.00	407	425
EX092 - 152mm	10	B097 Public Works Shop	EX-J190	152.4	PVC	130	0	0.00	435	439
EX093 - 152mm	15	EX-J190	B098 Carpenter Shop	152.4	PVC	130	0	0.00	439	442
EX094 - 152mm	39	B099 Garage	EX-J191	152.4	PVC	130	0	0.01	447	431

Scenerio: Peak Hour										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
EX095 - 152mm	25	EX-Irrigation	EX-Unknown Demand Locations	152.4	PVC	130	2	0.10	455	455
EX100 - 305mm	42	EX-J100	EX-J110	304.8	PVC	130	-1	0.01	414	412
EX101 - 152mm	17	B103 Implement Shed	EX-J192	152.4	PVC	130	0	0.00	451	452
EX102 - 152mm	4	B106 Plot Bldg	EX-J211	152.4	PVC	130	0	0.00	446	446
EX103 - 152mm	6	B107 Plant Growth	EX-J202	152.4	PVC	130	0	0.00	443	444
EX104 - 152mm	6	B109 Tobacco Greenhouses	EX-J201	152.4	PVC	130	0	0.00	436	436
EX105 - 152mm	50	B110 Agronomy Service	EX-J200	152.4	PVC	130	0	0.01	442	437
EX110 - 305mm	94	EX-J110	EX-J140	304.8	PVC	130	-1	0.01	412	411
EX111 - 152mm	12	B114 Implement Repair Shop	EX-J194	152.4	PVC	130	0	0.01	432	430
EX112 - 305mm	37	EX-J112	P-J101	304.8	PVC	130	0	0.00	456	469
EX113 - 203mm	34	B004 Observatory Machine Shop	B003 Geophysical	203.2	PVC	130	0	0.00	481	480
EX114 - 305mm	2	EX-J114	EX-J112	304.8	PVC	130	0	0.00	455	456
EX115 - 305mm	25	EX-J115	EX-J114	304.8	PVC	130	0	0.00	445	455
EX120 - 102mm	31	B005 Geodetic Survey & Standardizing	EX-J115	152.4	PVC	130	-1	0.05	445	445
EX121 - 203mm	35	B002 Observatory House	EX-J114	203.2	PVC	130	0	0.00	442	455
EX122 - 152mm	169	EX-J122	B136 Mag. Lab	152.4	PVC	130	0	0.01	461	462
EX123 - 152mm	62	B136 Mag. Lab	B138 Storage Bldg	152.4	PVC	130	0	0.00	462	464
EX124 - 152mm	17	B140 Plant Growth	EX-J150	152.4	PVC	130	0	0.00	412	415
EX125 - 406mm	17	EX-J125	EX-J140	406.4	PVC	130	3	0.02	413	411
EX130 - 152mm	24	B142 Greenhouses	EX-J211	152.4	PVC	130	0	0.00	446	446
EX131 - 305mm	99	EX-J131	EX-J230	304.8	PVC	130	-1	0.01	447	412
EX132 - 152mm	180	B143 Services	EX-J210	152.4	PVC	130	0	0.01	455	452
EX133 - 305mm	41	B022 CFIA 2	EX-J131	304.8	PVC	130	0	0.01	442	447
EX134 - 203mm	39	EX-J131	B021 KWN Headerhouse	203.2	PVC	130	0	0.01	447	445
EX135 - 406mm	26	EX-J142	EX-J135	406.4	PVC	130	-2	0.02	416	417
EX140 - 406mm	120	EX-J140	P-J141	406.4	PVC	130	2	0.01	411	414
EX141 - 406mm	7	P-J141	EX-J001	406.4	PVC	130	2	0.01	414	413
EX142 - 406mm	13	EX-J152	EX-J142	406.4	PVC	130	-2	0.02	417	416
EX143 - 203mm	44	EX-J145	EX-J143	203.2	PVC	130	0	0.00	420	417
EX144 - 305mm	250	EX-J170	EX-J150	304.8	PVC	130	0	0.00	398	415
EX145 - 203mm	51	EX-J150	EX-J145	203.2	PVC	130	0	0.00	415	420
EX150 - 305mm	53	EX-J151	EX-J150	304.8	PVC	130	0	0.00	412	415
EX151 - 305mm	62	EX-J162	EX-J151	304.8	PVC	130	0	0.00	416	412
EX152 - 406mm	121	EX-J162	EX-J152	406.4	PVC	130	-2	0.01	416	417
EX153 - 406mm	90	EX-J222	EX-J153	406.4	PVC	130	0	0.00	408	409
EX154 - 305mm	152	EX-J054	EX-J100	304.8	PVC	130	-1	0.02	434	414
EX155 - 406mm	36	EX-J135	EX-J155	406.4	PVC	130	-2	0.02	417	419
EX160 - 406mm	74	EX-J160	EX-J170	406.4	PVC	130	1	0.01	415	398
EX161 - 406mm	60	EX-J165	EX-J161	406.4	PVC	130	-1	0.01	369	381
EX162 - 406mm	55	P-J206	EX-J162	406.4	PVC	130	-1	0.01	408	416
EX163 - 406mm	116	EX-J161	P-J206	406.4	PVC	130	-1	0.01	381	408
EX164 - 305mm	40	EX-J214	EX-J165	304.8	PVC	130	-2	0.03	363	369
EX165 - 305mm	79	EX-J184	EX-J165	304.8	PVC	130	0	0.00	382	369
EX170 - 406mm	55	EX-J170	EX-J171	406.4	PVC	130	1	0.01	398	382
EX171 - 406mm	29	EX-J171	EX-J172	406.4	PVC	130	1	0.01	382	375
EX172 - 406mm	39	EX-J172	EX-J173	406.4	PVC	130	1	0.01	375	369
EX173 - 406mm	53	EX-J173	EX-J165	406.4	PVC	130	1	0.01	369	369
EX174 - 305mm	63	EX-J174	EX-J003	304.8	PVC	130	0	0.00	438	441
EX175 - 305mm	143	EX-J175	EX-J174	304.8	PVC	130	0	0.00	418	438
EX180 - 406mm	101	EX-J180	EX-J160	406.4	PVC	130	1	0.01	447	415
EX181 - 305mm	19	EX-J181	EX-J182	304.8	PVC	130	0	0.00	396	399
EX182 - 305mm	125	EX-J182	EX-J175	304.8	PVC	130	0	0.00	399	418
EX183 - 406mm	990	EX-J183	EX-J192	406.4	Ductile Iron	130	5	0.04	457	452
EX184 - 305mm	106	EX-J184	EX-J181	304.8	PVC	130	0	0.00	382	396

Scenerio: Peak Hour										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
EX185 - 203mm	40	EX-J190	EX-J180	203.2	PVC	130	0	0.01	439	447
EX190 - 203mm	23	EX-J191	EX-J190	203.2	PVC	130	0	0.01	431	439
EX191 - 203mm	17	EX-J090	EX-J191	203.2	PVC	130	0	0.01	425	431
EX192 - 406mm	55	EX-J192	EX-J180	406.4	PVC	130	2	0.01	452	447
EX193 - 305mm	107	EX-Irrigation	EX-J194	304.8	PVC	130	-3	0.04	455	430
EX194 - 305mm	153	EX-J194	EX-J192	304.8	PVC	130	-3	0.04	430	452
EX195 - 305mm	58	EX-J201	EX-Irrigation	304.8	PVC	130	1	0.02	436	455
EX200 - 305mm	30	EX-J202	EX-J200	304.8	PVC	130	1	0.02	444	437
EX201 - 305mm	8	EX-J200	EX-J201	304.8	PVC	130	1	0.02	437	436
EX202 - 305mm	40	EX-J212	EX-J202	304.8	PVC	130	1	0.02	446	444
EX203 - 305mm	94	EX-J203	EX-J210	304.8	PVC	130	2	0.02	442	452
EX204 - 203mm	42	EX-J205	EX-J204	203.2	PVC	130	0	0.00	443	444
EX205 - 203mm	29	EX-J220	EX-J205	203.2	PVC	130	0	0.00	441	443
EX210 - 305mm	119	EX-J210	EX-J122	304.8	PVC	130	1	0.02	452	461
EX211 - 152mm	29	EX-J211	EX-J212	152.4	PVC	130	0	0.00	446	446
EX212 - 305mm	139	EX-J122	EX-J212	304.8	PVC	130	1	0.02	461	446
EX213 - 305mm	37	EX-J213	EX-J203	304.8	PVC	130	2	0.03	422	442
EX214 - 305mm	158	EX-J214	EX-J215	304.8	PVC	130	2	0.03	363	387
EX215 - 305mm	42	EX-J215	EX-J213	304.8	PVC	130	2	0.03	387	422
EX220 - 254mm	59	EX-J203	EX-J220	254	PVC	130	0	0.01	442	441
EX221 - 406mm	30	EX-J001	EX-J221	406.4	PVC	130	0	0.00	413	411
EX222 - 406mm	18	EX-J221	EX-J222	406.4	PVC	130	0	0.00	411	408
EX223 - 406mm	123	EX-J153	EX-J223	406.4	PVC	130	-1	0.01	409	408
EX224 - 305mm	69	EX-J223	EX-J224	304.8	PVC	130	2	0.03	408	432
EX225 - 406mm	307	EX-J225	EX-J230	406.4	PVC	130	4	0.03	419	412
EX230 - 406mm	131	EX-J230	EX-J223	406.4	PVC	130	3	0.02	412	408
EX231 - 305mm	57	EX-J231	EX-J152	304.8	PVC	130	-1	0.01	415	417
EX232 - 305mm	117	EX-J231	EX-J151	304.8	PVC	130	1	0.01	415	412
P100 - 203mm	46	B003 Geophysical	P-J101	203.2	PVC	130	0	0.00	480	469
P101 - 305mm	63	P-J101	P-J102	304.8	PVC	130	0	0.00	469	460
P102 - 305mm	10	P-J102	P-J103	304.8	PVC	130	0	0.00	460	456
P103 - 305mm	38	P-J104	P-J103	304.8	PVC	130	0	0.00	445	456
P104 - 305mm	124	P-J105	P-J104	304.8	PVC	130	0	0.00	419	445
P105 - 305mm	12	P-J106	P-J105	304.8	PVC	130	0	0.00	418	419
P106 - 305mm	17	P-J141	P-J106	304.8	PVC	130	0	0.00	414	418
P200 - 305mm	51	P-J201	P-J200	304.8	PVC	130	0	0.00	417	424
P201 - 305mm	128	P-J202	P-J201	304.8	PVC	130	0	0.00	394	417
P202 - 305mm	25	P-J203	P-J202	304.8	PVC	130	0	0.00	391	394
P203 - 305mm	17	P-J204	P-J203	304.8	PVC	130	0	0.00	391	391
P204 - 305mm	28	P-J205	P-J204	304.8	PVC	130	0	0.00	394	391
P205 - 305mm	114	P-J206	P-J205	304.8	PVC	130	0	0.00	408	394

Scenerio: Peak Hour				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
B000FRAMESHED	82.40	0	125.62	423
B000NEWBARN	81.00	0	125.62	437
B001 Dominion Observatory	83.83	0	125.62	409
B002 Observatory House	80.41	0	125.62	442
B003 Geophysical	76.54	0	125.62	480
B004 Observatory Machine Shop	76.48	0	125.62	481
B005 Geodetic Survey & Standardizing	80.15	1	125.62	445
B007 Seismology Building	83.88	0	125.62	409
B012 Forage Crop & Greenhouses	83.55	0	125.62	412
B018 Pesticide Lab	83.40	0	125.62	413
B019 Chemical Storage	83.60	0	125.62	411
B020 Neatby 1	82.60	1	125.62	421
B020 Neatby 2	81.60	1	125.62	431
B020 Neatby 3	81.60	0	125.62	431
B020 Neatby 4	83.40	0	125.62	413
B020 Neatby 5	83.60	0	125.62	411
B021 KWN Headerhouse	80.20	0	125.62	445
B022 CFIA 1	79.80	1	125.62	448
B022 CFIA 2	80.50	0	125.62	442
B023 Pumphouse	84.01	0	125.62	407
B026 Cytogenetics	84.60	0	125.62	401
B034 Animal Genetics	83.37	0	125.62	414
B036 Service Building	83.30	0	125.62	414
B045 Poultry House	83.10	0	125.62	416
B048 Implement and Nursery Stock Storage	83.10	0	125.62	416
B049 William Saunders2	86.26	0	125.62	385
B050 Main Greenhouses 2	83.50	0	125.62	412
B054 Maple Ave. Office	87.00	0	125.62	378
B055 Horticulture	87.80	0	125.62	370
B057 Dairy Technology	86.70	0	125.62	381
B059 Animal Nutrition	85.00	0	125.62	398
B060 Heritage House	85.75	0	125.62	390
B072 Agrometeorology	81.10	0	125.62	436
B074 Plant Research	82.60	0	125.62	421
B075 Cereal Greenhouse	86.75	0	125.62	380
B076 Cereal Cleaning	87.00	0	125.62	378
B077 Pottery Shed	83.00	0	125.62	417
B078 CHP	80.80	0	125.62	439
B085 Information Booth	89.50	0	125.62	354
B088 Main Dairy Barn	87.70	0	125.62	371
B091 Experimental Piggery	82.00	0	125.62	427
B091 Main Piggery	82.00	0	125.62	427
B092 Genetics Piggery	80.10	0	125.62	446
B094 Engineering Research	84.00	0	125.62	407
B095 Large Animal Lab	84.00	0	125.62	407
B097 Public Works Shop	81.20	0	125.62	435
B098 Carpenter Shop	80.50	0	125.62	442
B099 Garage	79.90	0	125.62	447
B103 Implement Shed	79.50	0	125.62	451
B106 Plot Bldg	80.10	0	125.62	446

Scenerio: Peak Hour				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
B107 Plant Growth	80.40	0	125.62	443
B109 Tobacco Greenhouses	81.10	0	125.62	436
B110 Agronomy Service	80.50	0	125.62	442
B114 Implement Repair Shop	81.50	0	125.62	432
B136 Mag. Lab	78.40	0	125.62	462
B138 Storage Bldg	78.20	0	125.62	464
B140 Plant Growth	83.50	0	125.62	412
B142 Greenhouses	80.10	0	125.62	446
B143 Services	79.10	0	125.62	455
EX-Carling/Irving	82.50	0	125.62	422
EX-Carling/Parkdale	81.90	0	125.63	428
EX-Irrigation	79.10	2	125.62	455
EX-J001	83.39	0	125.62	413
EX-J002	83.45	0	125.62	413
EX-J003	80.60	0	125.62	441
EX-J034	83.77	0	125.62	410
EX-J043	80.80	0	125.62	439
EX-J053	80.40	0	125.62	443
EX-J054	81.30	0	125.62	434
EX-J082	83.40	0	125.62	413
EX-J090	82.20	0	125.62	425
EX-J100	83.30	0	125.62	414
EX-J110	83.50	0	125.62	412
EX-J112	79.08	0	125.62	456
EX-J114	79.12	0	125.62	455
EX-J115	80.11	0	125.62	445
EX-J122	78.50	0	125.62	461
EX-J125	83.41	0	125.62	413
EX-J131	80.00	0	125.62	447
EX-J135	83.01	0	125.62	417
EX-J140	83.64	0	125.62	411
EX-J142	83.13	0	125.62	416
EX-J143	83.00	0	125.62	417
EX-J145	82.70	0	125.62	420
EX-J150	83.25	0	125.62	415
EX-J151	83.50	0	125.62	412
EX-J152	83.02	0	125.62	417
EX-J153	83.80	0	125.62	409
EX-J155	82.78	0	125.62	419
EX-J160	83.25	0	125.62	415
EX-J161	86.65	0	125.62	381
EX-J162	83.14	0	125.62	416
EX-J165	87.87	0	125.62	369
EX-J170	85.00	0	125.62	398
EX-J171	86.60	0	125.62	382
EX-J172	87.30	0	125.62	375
EX-J173	87.90	0	125.62	369
EX-J174	80.90	0	125.62	438
EX-J175	82.90	0	125.62	418
EX-J180	80.00	0	125.62	447

Scenerio: Peak Hour				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
EX-J181	85.12	0	125.62	396
EX-J182	84.87	0	125.62	399
EX-J183	78.90	0	125.63	457
EX-J184	86.62	0	125.62	382
EX-J190	80.80	0	125.62	439
EX-J191	81.60	0	125.62	431
EX-J192	79.40	0	125.62	452
EX-J194	81.70	0	125.62	430
EX-J200	81.00	0	125.62	437
EX-J201	81.10	0	125.62	436
EX-J202	80.30	0	125.62	444
EX-J203	80.50	0	125.62	442
EX-J204	80.30	0	125.62	444
EX-J205	80.40	0	125.62	443
EX-J210	79.40	0	125.62	452
EX-J211	80.10	0	125.62	446
EX-J212	80.10	0	125.62	446
EX-J213	82.50	0	125.62	422
EX-J214	88.50	0	125.62	363
EX-J215	86.10	0	125.62	387
EX-J220	80.60	0	125.62	441
EX-J221	83.66	0	125.62	411
EX-J222	83.90	0	125.62	408
EX-J223	83.90	0	125.62	408
EX-J224	81.50	0	125.62	432
EX-J225	82.80	0	125.62	419
EX-J230	83.57	0	125.62	412
EX-J231	83.25	0	125.62	415
EX-Unknown Demand Locations	79.10	2	125.62	455
P-J101	77.71	0	125.62	469
P-J102	78.62	0	125.62	460
P-J103	79.00	0	125.62	456
P-J104	80.11	0	125.62	445
P-J105	82.80	0	125.62	419
P-J106	82.87	0	125.62	418
P-J141	83.37	0	125.62	414
P-J200	82.25	0	125.62	424
P-J201	82.97	0	125.62	417
P-J202	85.40	0	125.62	394
P-J203	85.63	0	125.62	391
P-J204	85.65	0	125.62	391
P-J205	85.39	0	125.62	394
P-J206	83.93	0	125.62	408

Scenerio: Max Day										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
EX-Carling/Irving - 406mm	68	EX-Carling/Irving	EX-J125	406.4	PVC	130	3	0.02	422	413
EX-Carling/Parkdale - 406mm	159	EX-Carling/Parkdale	EX-J225	406.4	PVC	130	2	0.02	428	419
EX-FrameShed - 152mm	132	B000FRAMESHED	EX-J145	152.4	PVC	130	0	0.00	423	420
EX001 - 406mm	15	EX-J002	EX-J001	406.4	PVC	130	-1	0.01	413	413
EX002 - 406mm	60	EX-J155	EX-J002	406.4	PVC	130	-1	0.01	419	413
EX003 - 305mm	117	EX-J003	P-J200	304.8	PVC	130	0	0.00	441	425
EX004 - 152mm	30	B022 CFIA 1	EX-J053	152.4	PVC	130	-1	0.04	449	443
EX005 - 152mm	41	B020 Neatby 2	EX-J053	152.4	PVC	130	-1	0.04	431	443
EX010 - 152mm	93	B020 Neatby 3	EX-J043	152.4	PVC	130	0	0.00	431	439
EX011 - 203mm	16	B020 Neatby 4	EX-J082	203.2	PVC	130	0	0.01	413	413
EX012 - 203mm	13	EX-J082	B020 Neatby 5	203.2	PVC	130	0	0.00	413	411
EX013 - 152mm	16	B000NEWBARN	EX-J220	152.4	PVC	130	0	0.00	437	441
EX014 - 152mm	12	B018 Pesticide Lab	EX-J110	152.4	PVC	130	0	0.00	413	412
EX015 - 152mm	36	B019 Chemical Storage	EX-J082	152.4	PVC	130	0	0.00	411	413
EX020 - 152mm	49	B020 Neatby 1	EX-J224	152.4	PVC	130	-1	0.04	421	432
EX021 - 152mm	101	B022 CFIA 2	EX-J043	152.4	PVC	130	0	0.01	442	439
EX022 - 152mm	9	B023 Pumphouse	EX-J221	152.4	PVC	130	0	0.00	407	411
EX023 - 203mm	94	B049 William Saunders2	EX-J162	203.2	PVC	130	0	0.00	385	416
EX024 - 152mm	14	EX-J222	B026 Cytogenetics	152.4	PVC	130	0	0.00	408	402
EX025 - 305mm	51	EX-J125	EX-J034	304.8	PVC	130	1	0.01	413	410
EX030 - 203mm	46	B007 Seismology Building	EX-J125	203.2	PVC	130	0	0.00	409	413
EX031 - 152mm	25	B012 Forage Crop &	EX-J125	152.4	PVC	130	0	0.00	412	413
EX032 - 152mm	11	B034 Animal Genetics	EX-J142	152.4	PVC	130	0	0.00	414	416
EX033 - 152mm	32	B036 Service Building	EX-J231	152.4	PVC	130	0	0.00	414	415
EX034 - 305mm	84	EX-J034	EX-J115	304.8	PVC	130	1	0.01	410	445
EX035 - 152mm	9	B001 Dominion Observatory	EX-J034	152.4	PVC	130	0	0.00	409	410
EX040 - 152mm	21	EX-J231	B045 Poultry House	152.4	PVC	130	0	0.00	415	416
EX041 - 152mm	14	B048 Implement and Nursery	EX-J143	152.4	PVC	130	0	0.00	416	417
EX042 - 152mm	31	B050 Main Greenhouses 2	EX-J162	152.4	PVC	130	0	0.02	412	416
EX043 - 305mm	48	EX-J224	EX-J043	304.8	PVC	130	0	0.01	432	439
EX044 - 152mm	30	B054 Maple Ave. Office	EX-J161	152.4	PVC	130	0	0.00	378	381
EX045 - 152mm	21	B055 Horticulture	EX-J172	152.4	PVC	130	0	0.00	370	375
EX050 - 152mm	12	B057 Dairy Technology	EX-J171	152.4	PVC	130	0	0.01	381	382
EX051 - 152mm	10	B059 Animal Nutrition	EX-J182	152.4	PVC	130	0	0.00	398	399
EX052 - 152mm	42	B060 Heritage House	EX-J181	152.4	PVC	130	0	0.00	390	396
EX053 - 203mm	7	EX-J043	EX-J053	203.2	PVC	130	1	0.02	439	443
EX054 - 305mm	35	EX-J053	EX-J054	304.8	PVC	130	-1	0.01	443	434
EX055 - 152mm	7	B072 Agrometeorology	EX-J174	152.4	PVC	130	0	0.00	436	438
EX060 - 203mm	24	B074 Plant Research	EX-J175	203.2	PVC	130	0	0.00	421	418
EX061 - 152mm	19	B075 Cereal Greenhouse	EX-J184	152.4	PVC	130	0	0.00	380	382
EX062 - 152mm	19	B076 Cereal Cleaning	EX-J215	152.4	PVC	130	0	0.00	378	387
EX063 - 152mm	38	B077 Pottery Shed	EX-J213	152.4	PVC	130	0	0.00	417	422
EX064 - 152mm	19	B078 CHP	EX-J220	152.4	PVC	130	0	0.00	439	441
EX065 - 305mm	49	EX-J100	EX-J082	304.8	PVC	130	0	0.00	414	413
EX080 - 152mm	25	B085 Information Booth	EX-J214	152.4	PVC	130	0	0.00	354	363
EX081 - 152mm	26	B088 Main Dairy Barn	EX-J173	152.4	PVC	130	0	0.01	371	369
EX082 - 305mm	64	EX-J082	EX-J153	304.8	PVC	130	0	0.01	413	409
EX083 - 152mm	19	EX-J204	B091 Main Piggery	152.4	PVC	130	0	0.01	444	427
EX084 - 152mm	42	EX-J204	B092 Genetics Piggery	152.4	PVC	130	0	0.00	444	446
EX085 - 152mm	29	B091 Experimental Piggery	EX-J205	152.4	PVC	130	0	0.00	427	443
EX090 - 152mm	50	B094 Engineering Research	EX-J090	152.4	PVC	130	0	0.01	407	425
EX091 - 152mm	27	B095 Large Animal Lab	EX-J090	152.4	PVC	130	0	0.00	407	425
EX092 - 152mm	10	B097 Public Works Shop	EX-J190	152.4	PVC	130	0	0.00	435	439
EX093 - 152mm	15	EX-J190	B098 Carpenter Shop	152.4	PVC	130	0	0.00	439	442
EX094 - 152mm	39	B099 Garage	EX-J191	152.4	PVC	130	0	0.01	448	431

Scenerio: Max Day										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
EX095 - 152mm	25	EX-Irrigation	EX-Unknown Demand Locations	152.4	PVC	130	1	0.06	455	455
EX100 - 305mm	42	EX-J100	EX-J110	304.8	PVC	130	-1	0.01	414	412
EX101 - 152mm	17	B103 Implement Shed	EX-J192	152.4	PVC	130	0	0.00	451	452
EX102 - 152mm	4	B106 Plot Bldg	EX-J211	152.4	PVC	130	0	0.00	446	446
EX103 - 152mm	6	B107 Plant Growth	EX-J202	152.4	PVC	130	0	0.00	443	444
EX104 - 152mm	6	B109 Tobacco Greenhouses	EX-J201	152.4	PVC	130	0	0.00	436	436
EX105 - 152mm	50	B110 Agronomy Service	EX-J200	152.4	PVC	130	0	0.00	442	437
EX110 - 305mm	94	EX-J110	EX-J140	304.8	PVC	130	-1	0.01	412	411
EX111 - 152mm	12	B114 Implement Repair Shop	EX-J194	152.4	PVC	130	0	0.00	432	430
EX112 - 305mm	37	EX-J112	P-J101	304.8	PVC	130	0	0.00	456	469
EX113 - 203mm	34	B004 Observatory Machine Shop	B003 Geophysical	203.2	PVC	130	0	0.00	481	480
EX114 - 305mm	2	EX-J114	EX-J112	304.8	PVC	130	0	0.00	455	456
EX115 - 305mm	25	EX-J115	EX-J114	304.8	PVC	130	0	0.00	445	455
EX120 - 102mm	31	B005 Geodetic Survey & Standardizing	EX-J115	152.4	PVC	130	-1	0.03	445	445
EX121 - 203mm	35	B002 Observatory House	EX-J114	203.2	PVC	130	0	0.00	443	455
EX122 - 152mm	169	EX-J122	B136 Mag. Lab	152.4	PVC	130	0	0.00	461	462
EX123 - 152mm	62	B136 Mag. Lab	B138 Storage Bldg	152.4	PVC	130	0	0.00	462	464
EX124 - 152mm	17	B140 Plant Growth	EX-J150	152.4	PVC	130	0	0.00	412	415
EX125 - 406mm	17	EX-J125	EX-J140	406.4	PVC	130	2	0.01	413	411
EX130 - 152mm	24	B142 Greenhouses	EX-J211	152.4	PVC	130	0	0.00	446	446
EX131 - 305mm	99	EX-J131	EX-J230	304.8	PVC	130	0	0.00	447	412
EX132 - 152mm	180	B143 Services	EX-J210	152.4	PVC	130	0	0.01	455	452
EX133 - 305mm	41	B022 CFIA 2	EX-J131	304.8	PVC	130	0	0.00	442	447
EX134 - 203mm	39	EX-J131	B021 KWN Headerhouse	203.2	PVC	130	0	0.00	447	445
EX135 - 406mm	26	EX-J142	EX-J135	406.4	PVC	130	-1	0.01	416	417
EX140 - 406mm	120	EX-J140	P-J141	406.4	PVC	130	1	0.01	411	414
EX141 - 406mm	7	P-J141	EX-J001	406.4	PVC	130	1	0.01	414	413
EX142 - 406mm	13	EX-J152	EX-J142	406.4	PVC	130	-1	0.01	417	416
EX143 - 203mm	44	EX-J145	EX-J143	203.2	PVC	130	0	0.00	420	417
EX144 - 305mm	250	EX-J170	EX-J150	304.8	PVC	130	0	0.00	398	415
EX145 - 203mm	51	EX-J150	EX-J145	203.2	PVC	130	0	0.00	415	420
EX150 - 305mm	53	EX-J151	EX-J150	304.8	PVC	130	0	0.00	412	415
EX151 - 305mm	62	EX-J162	EX-J151	304.8	PVC	130	0	0.00	416	412
EX152 - 406mm	121	EX-J162	EX-J152	406.4	PVC	130	-1	0.01	416	417
EX153 - 406mm	90	EX-J222	EX-J153	406.4	PVC	130	0	0.00	408	409
EX154 - 305mm	152	EX-J054	EX-J100	304.8	PVC	130	-1	0.01	434	414
EX155 - 406mm	36	EX-J135	EX-J155	406.4	PVC	130	-1	0.01	417	419
EX160 - 406mm	74	EX-J160	EX-J170	406.4	PVC	130	1	0.01	415	398
EX161 - 406mm	60	EX-J165	EX-J161	406.4	PVC	130	-1	0.01	370	381
EX162 - 406mm	55	P-J206	EX-J162	406.4	PVC	130	-1	0.01	408	416
EX163 - 406mm	116	EX-J161	P-J206	406.4	PVC	130	-1	0.01	381	408
EX164 - 305mm	40	EX-J214	EX-J165	304.8	PVC	130	-1	0.02	363	370
EX165 - 305mm	79	EX-J184	EX-J165	304.8	PVC	130	0	0.00	382	370
EX170 - 406mm	55	EX-J170	EX-J171	406.4	PVC	130	1	0.01	398	382
EX171 - 406mm	29	EX-J171	EX-J172	406.4	PVC	130	1	0.01	382	375
EX172 - 406mm	39	EX-J172	EX-J173	406.4	PVC	130	1	0.01	375	369
EX173 - 406mm	53	EX-J173	EX-J165	406.4	PVC	130	1	0.00	369	370
EX174 - 305mm	63	EX-J174	EX-J003	304.8	PVC	130	0	0.00	438	441
EX175 - 305mm	143	EX-J175	EX-J174	304.8	PVC	130	0	0.00	418	438
EX180 - 406mm	101	EX-J180	EX-J160	406.4	PVC	130	1	0.01	447	415
EX181 - 305mm	19	EX-J181	EX-J182	304.8	PVC	130	0	0.00	396	399
EX182 - 305mm	125	EX-J182	EX-J175	304.8	PVC	130	0	0.00	399	418
EX183 - 406mm	990	EX-J183	EX-J192	406.4	Ductile Iron	130	3	0.02	457	452
EX184 - 305mm	106	EX-J184	EX-J181	304.8	PVC	130	0	0.00	382	396

Scenerio: Max Day										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
EX185 - 203mm	40	EX-J190	EX-J180	203.2	PVC	130	0	0.01	439	447
EX190 - 203mm	23	EX-J191	EX-J190	203.2	PVC	130	0	0.01	431	439
EX191 - 203mm	17	EX-J090	EX-J191	203.2	PVC	130	0	0.00	425	431
EX192 - 406mm	55	EX-J192	EX-J180	406.4	PVC	130	1	0.01	452	447
EX193 - 305mm	107	EX-Irrigation	EX-J194	304.8	PVC	130	-2	0.03	455	430
EX194 - 305mm	153	EX-J194	EX-J192	304.8	PVC	130	-2	0.03	430	452
EX195 - 305mm	58	EX-J201	EX-Irrigation	304.8	PVC	130	1	0.01	436	455
EX200 - 305mm	30	EX-J202	EX-J200	304.8	PVC	130	1	0.01	444	437
EX201 - 305mm	8	EX-J200	EX-J201	304.8	PVC	130	1	0.01	437	436
EX202 - 305mm	40	EX-J212	EX-J202	304.8	PVC	130	1	0.01	446	444
EX203 - 305mm	94	EX-J203	EX-J210	304.8	PVC	130	1	0.01	442	452
EX204 - 203mm	42	EX-J205	EX-J204	203.2	PVC	130	0	0.00	443	444
EX205 - 203mm	29	EX-J220	EX-J205	203.2	PVC	130	0	0.00	441	443
EX210 - 305mm	119	EX-J210	EX-J122	304.8	PVC	130	1	0.01	452	461
EX211 - 152mm	29	EX-J211	EX-J212	152.4	PVC	130	0	0.00	446	446
EX212 - 305mm	139	EX-J122	EX-J212	304.8	PVC	130	1	0.01	461	446
EX213 - 305mm	37	EX-J213	EX-J203	304.8	PVC	130	1	0.02	422	442
EX214 - 305mm	158	EX-J214	EX-J215	304.8	PVC	130	1	0.02	363	387
EX215 - 305mm	42	EX-J215	EX-J213	304.8	PVC	130	1	0.02	387	422
EX220 - 254mm	59	EX-J203	EX-J220	254	PVC	130	0	0.00	442	441
EX221 - 406mm	30	EX-J001	EX-J221	406.4	PVC	130	0	0.00	413	411
EX222 - 406mm	18	EX-J221	EX-J222	406.4	PVC	130	0	0.00	411	408
EX223 - 406mm	123	EX-J153	EX-J223	406.4	PVC	130	-1	0.01	409	408
EX224 - 305mm	69	EX-J223	EX-J224	304.8	PVC	130	1	0.02	408	432
EX225 - 406mm	307	EX-J225	EX-J230	406.4	PVC	130	2	0.02	419	412
EX230 - 406mm	131	EX-J230	EX-J223	406.4	PVC	130	2	0.01	412	408
EX231 - 305mm	57	EX-J231	EX-J152	304.8	PVC	130	0	0.01	415	417
EX232 - 305mm	117	EX-J231	EX-J151	304.8	PVC	130	0	0.01	415	412
P100 - 203mm	46	B003 Geophysical	P-J101	203.2	PVC	130	0	0.00	480	469
P101 - 305mm	63	P-J101	P-J102	304.8	PVC	130	0	0.00	469	460
P102 - 305mm	10	P-J102	P-J103	304.8	PVC	130	0	0.00	460	456
P103 - 305mm	38	P-J104	P-J103	304.8	PVC	130	0	0.00	445	456
P104 - 305mm	124	P-J105	P-J104	304.8	PVC	130	0	0.00	419	445
P105 - 305mm	12	P-J106	P-J105	304.8	PVC	130	0	0.00	418	419
P106 - 305mm	17	P-J141	P-J106	304.8	PVC	130	0	0.00	414	418
P200 - 305mm	51	P-J201	P-J200	304.8	PVC	130	0	0.00	417	425
P201 - 305mm	128	P-J202	P-J201	304.8	PVC	130	0	0.00	394	417
P202 - 305mm	25	P-J203	P-J202	304.8	PVC	130	0	0.00	391	394
P203 - 305mm	17	P-J204	P-J203	304.8	PVC	130	0	0.00	391	391
P204 - 305mm	28	P-J205	P-J204	304.8	PVC	130	0	0.00	394	391
P205 - 305mm	114	P-J206	P-J205	304.8	PVC	130	0	0.00	408	394

Scenerio: Max Day				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
B000FRAMESHED	82.40	0	125.63	423
B000NEWBARN	81.00	0	125.63	437
B001 Dominion Observatory	83.83	0	125.63	409
B002 Observatory House	80.41	0	125.63	443
B003 Geophysical	76.54	0	125.63	480
B004 Observatory Machine Shop	76.48	0	125.63	481
B005 Geodetic Survey & Standardizing	80.15	1	125.63	445
B007 Seismology Building	83.88	0	125.63	409
B012 Forage Crop & Greenhouses	83.55	0	125.63	412
B018 Pesticide Lab	83.40	0	125.63	413
B019 Chemical Storage	83.60	0	125.63	411
B020 Neatby 1	82.60	1	125.63	421
B020 Neatby 2	81.60	1	125.63	431
B020 Neatby 3	81.60	0	125.63	431
B020 Neatby 4	83.40	0	125.63	413
B020 Neatby 5	83.60	0	125.63	411
B021 KWN Headerhouse	80.20	0	125.63	445
B022 CFIA 1	79.80	1	125.63	449
B022 CFIA 2	80.50	0	125.63	442
B023 Pumphouse	84.01	0	125.63	407
B026 Cytogenetics	84.60	0	125.63	402
B034 Animal Genetics	83.37	0	125.63	414
B036 Service Building	83.30	0	125.63	414
B045 Poultry House	83.10	0	125.63	416
B048 Implement and Nursery Stock Storage	83.10	0	125.63	416
B049 William Saunders2	86.26	0	125.63	385
B050 Main Greenhouses 2	83.50	0	125.63	412
B054 Maple Ave. Office	87.00	0	125.63	378
B055 Horticulture	87.80	0	125.63	370
B057 Dairy Technology	86.70	0	125.63	381
B059 Animal Nutrition	85.00	0	125.63	398
B060 Heritage House	85.75	0	125.63	390
B072 Agrometeorology	81.10	0	125.63	436
B074 Plant Research	82.60	0	125.63	421
B075 Cereal Greenhouse	86.75	0	125.63	380
B076 Cereal Cleaning	87.00	0	125.63	378
B077 Pottery Shed	83.00	0	125.63	417
B078 CHP	80.80	0	125.63	439
B085 Information Booth	89.50	0	125.63	354
B088 Main Dairy Barn	87.70	0	125.63	371
B091 Experimental Piggery	82.00	0	125.63	427
B091 Main Piggery	82.00	0	125.63	427
B092 Genetics Piggery	80.10	0	125.63	446
B094 Engineering Research	84.00	0	125.63	407
B095 Large Animal Lab	84.00	0	125.63	407
B097 Public Works Shop	81.20	0	125.63	435
B098 Carpenter Shop	80.50	0	125.63	442
B099 Garage	79.90	0	125.63	448
B103 Implement Shed	79.50	0	125.63	451
B106 Plot Bldg	80.10	0	125.63	446

Scenerio: Max Day				
Junction Table				
Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
B107 Plant Growth	80.40	0	125.63	443
B109 Tobacco Greenhouses	81.10	0	125.63	436
B110 Agronomy Service	80.50	0	125.63	442
B114 Implement Repair Shop	81.50	0	125.63	432
B136 Mag. Lab	78.40	0	125.63	462
B138 Storage Bldg	78.20	0	125.63	464
B140 Plant Growth	83.50	0	125.63	412
B142 Greenhouses	80.10	0	125.63	446
B143 Services	79.10	0	125.63	455
EX-Carling/Irving	82.50	0	125.63	422
EX-Carling/Parkdale	81.90	0	125.63	428
EX-Irrigation	79.10	2	125.63	455
EX-J001	83.39	0	125.63	413
EX-J002	83.45	0	125.63	413
EX-J003	80.60	0	125.63	441
EX-J034	83.77	0	125.63	410
EX-J043	80.80	0	125.63	439
EX-J053	80.40	0	125.63	443
EX-J054	81.30	0	125.63	434
EX-J082	83.40	0	125.63	413
EX-J090	82.20	0	125.63	425
EX-J100	83.30	0	125.63	414
EX-J110	83.50	0	125.63	412
EX-J112	79.08	0	125.63	456
EX-J114	79.12	0	125.63	455
EX-J115	80.11	0	125.63	445
EX-J122	78.50	0	125.63	461
EX-J125	83.41	0	125.63	413
EX-J131	80.00	0	125.63	447
EX-J135	83.01	0	125.63	417
EX-J140	83.64	0	125.63	411
EX-J142	83.13	0	125.63	416
EX-J143	83.00	0	125.63	417
EX-J145	82.70	0	125.63	420
EX-J150	83.25	0	125.63	415
EX-J151	83.50	0	125.63	412
EX-J152	83.02	0	125.63	417
EX-J153	83.80	0	125.63	409
EX-J155	82.78	0	125.63	419
EX-J160	83.25	0	125.63	415
EX-J161	86.65	0	125.63	381
EX-J162	83.14	0	125.63	416
EX-J165	87.87	0	125.63	370
EX-J170	85.00	0	125.63	398
EX-J171	86.60	0	125.63	382
EX-J172	87.30	0	125.63	375
EX-J173	87.90	0	125.63	369
EX-J174	80.90	0	125.63	438
EX-J175	82.90	0	125.63	418
EX-J180	80.00	0	125.63	447

Scenerio: Max Day				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
EX-J181	85.12	0	125.63	396
EX-J182	84.87	0	125.63	399
EX-J183	78.90	0	125.63	457
EX-J184	86.62	0	125.63	382
EX-J190	80.80	0	125.63	439
EX-J191	81.60	0	125.63	431
EX-J192	79.40	0	125.63	452
EX-J194	81.70	0	125.63	430
EX-J200	81.00	0	125.63	437
EX-J201	81.10	0	125.63	436
EX-J202	80.30	0	125.63	444
EX-J203	80.50	0	125.63	442
EX-J204	80.30	0	125.63	444
EX-J205	80.40	0	125.63	443
EX-J210	79.40	0	125.63	452
EX-J211	80.10	0	125.63	446
EX-J212	80.10	0	125.63	446
EX-J213	82.50	0	125.63	422
EX-J214	88.50	0	125.63	363
EX-J215	86.10	0	125.63	387
EX-J220	80.60	0	125.63	441
EX-J221	83.66	0	125.63	411
EX-J222	83.90	0	125.63	408
EX-J223	83.90	0	125.63	408
EX-J224	81.50	0	125.63	432
EX-J225	82.80	0	125.63	419
EX-J230	83.57	0	125.63	412
EX-J231	83.25	0	125.63	415
EX-Unknown Demand Locations	79.10	1	125.63	455
P-J101	77.71	0	125.63	469
P-J102	78.62	0	125.63	460
P-J103	79.00	0	125.63	456
P-J104	80.11	0	125.63	445
P-J105	82.80	0	125.63	419
P-J106	82.87	0	125.63	418
P-J141	83.37	0	125.63	414
P-J200	82.25	0	125.63	425
P-J201	82.97	0	125.63	417
P-J202	85.40	0	125.63	394
P-J203	85.63	0	125.63	391
P-J204	85.65	0	125.63	391
P-J205	85.39	0	125.63	394
P-J206	83.93	0	125.63	408

Scenerio: Fire at B005, Max Day + Fire Flow										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
EX-Carling/Irving - 406mm	68	EX-Carling/Irving	EX-J125	406.4	PVC	130	52	0.40	346	337
EX-Carling/Parkdale - 406mm	159	EX-Carling/Parkdale	EX-J225	406.4	PVC	130	39	0.30	354	345
EX-FrameShed - 152mm	132	B000FRAMESHED	EX-J145	152.4	PVC	130	0	0.00	348	345
EX001 - 406mm	15	EX-J002	EX-J001	406.4	PVC	130	37	0.29	337	337
EX002 - 406mm	60	EX-J155	EX-J002	406.4	PVC	130	37	0.29	344	337
EX003 - 305mm	117	EX-J003	P-J200	304.8	PVC	130	4	0.05	366	350
EX004 - 152mm	30	B022 CFIA 1	EX-J053	152.4	PVC	130	-1	0.04	373	367
EX005 - 152mm	41	B020 Neatby 2	EX-J053	152.4	PVC	130	-1	0.04	355	367
EX010 - 152mm	93	B020 Neatby 3	EX-J043	152.4	PVC	130	0	0.00	355	363
EX011 - 203mm	16	B020 Neatby 4	EX-J082	203.2	PVC	130	0	0.01	337	337
EX012 - 203mm	13	EX-J082	B020 Neatby 5	203.2	PVC	130	0	0.00	337	336
EX013 - 152mm	16	B000NEWBARN	EX-J220	152.4	PVC	130	0	0.00	362	366
EX014 - 152mm	12	B018 Pesticide Lab	EX-J110	152.4	PVC	130	0	0.00	337	336
EX015 - 152mm	36	B019 Chemical Storage	EX-J082	152.4	PVC	130	0	0.00	336	337
EX020 - 152mm	49	B020 Neatby 1	EX-J224	152.4	PVC	130	-1	0.04	346	356
EX021 - 152mm	101	B022 CFIA 2	EX-J043	152.4	PVC	130	3	0.19	366	363
EX022 - 152mm	9	B023 Pumphouse	EX-J221	152.4	PVC	130	0	0.00	331	335
EX023 - 203mm	94	B049 William Saunders2	EX-J162	203.2	PVC	130	0	0.00	310	341
EX024 - 152mm	14	EX-J222	B026 Cytogenetics	152.4	PVC	130	0	0.00	333	326
EX025 - 305mm	51	EX-J125	EX-J034	304.8	PVC	130	69	0.95	337	331
EX030 - 203mm	46	B007 Seismology Building	EX-J125	203.2	PVC	130	0	0.00	332	337
EX031 - 152mm	25	B012 Forage Crop &	EX-J125	152.4	PVC	130	0	0.00	336	337
EX032 - 152mm	11	B034 Animal Genetics	EX-J142	152.4	PVC	130	0	0.00	338	341
EX033 - 152mm	32	B036 Service Building	EX-J231	152.4	PVC	130	0	0.00	339	339
EX034 - 305mm	84	EX-J034	EX-J115	304.8	PVC	130	69	0.95	331	364
EX035 - 152mm	9	B001 Dominion Observatory	EX-J034	152.4	PVC	130	0	0.00	331	331
EX040 - 152mm	21	EX-J231	B045 Poultry House	152.4	PVC	130	0	0.00	339	341
EX041 - 152mm	14	B048 Implement and Nursery	EX-J143	152.4	PVC	130	0	0.00	341	342
EX042 - 152mm	31	B050 Main Greenhouses 2	EX-J162	152.4	PVC	130	0	0.02	337	341
EX043 - 305mm	48	EX-J224	EX-J043	304.8	PVC	130	6	0.08	356	363
EX044 - 152mm	30	B054 Maple Ave. Office	EX-J161	152.4	PVC	130	0	0.00	303	307
EX045 - 152mm	21	B055 Horticulture	EX-J172	152.4	PVC	130	0	0.00	295	300
EX050 - 152mm	12	B057 Dairy Technology	EX-J171	152.4	PVC	130	0	0.01	306	307
EX051 - 152mm	10	B059 Animal Nutrition	EX-J182	152.4	PVC	130	0	0.00	323	324
EX052 - 152mm	42	B060 Heritage House	EX-J181	152.4	PVC	130	0	0.00	315	322
EX053 - 203mm	7	EX-J043	EX-J053	203.2	PVC	130	10	0.30	363	367
EX054 - 305mm	35	EX-J053	EX-J054	304.8	PVC	130	8	0.11	367	358
EX055 - 152mm	7	B072 Agrometeorology	EX-J174	152.4	PVC	130	0	0.00	361	363
EX060 - 203mm	24	B074 Plant Research	EX-J175	203.2	PVC	130	0	0.00	346	343
EX061 - 152mm	19	B075 Cereal Greenhouse	EX-J184	152.4	PVC	130	0	0.00	306	307
EX062 - 152mm	19	B076 Cereal Cleaning	EX-J215	152.4	PVC	130	0	0.00	303	312
EX063 - 152mm	38	B077 Pottery Shed	EX-J213	152.4	PVC	130	0	0.00	342	347
EX064 - 152mm	19	B078 CHP	EX-J220	152.4	PVC	130	0	0.00	364	366
EX065 - 305mm	49	EX-J100	EX-J082	304.8	PVC	130	-7	0.09	338	337
EX080 - 152mm	25	B085 Information Booth	EX-J214	152.4	PVC	130	0	0.00	279	288
EX081 - 152mm	26	B088 Main Dairy Barn	EX-J173	152.4	PVC	130	0	0.01	296	294
EX082 - 305mm	64	EX-J082	EX-J153	304.8	PVC	130	-7	0.09	337	334
EX083 - 152mm	19	EX-J204	B091 Main Piggery	152.4	PVC	130	0	0.01	369	352
EX084 - 152mm	42	EX-J204	B092 Genetics Piggery	152.4	PVC	130	0	0.00	369	371
EX085 - 152mm	29	B091 Experimental Piggery	EX-J205	152.4	PVC	130	0	0.00	352	368
EX090 - 152mm	50	B094 Engineering Research	EX-J090	152.4	PVC	130	0	0.01	333	351
EX091 - 152mm	27	B095 Large Animal Lab	EX-J090	152.4	PVC	130	0	0.00	333	351
EX092 - 152mm	10	B097 Public Works Shop	EX-J190	152.4	PVC	130	0	0.00	360	364
EX093 - 152mm	15	EX-J190	B098 Carpenter Shop	152.4	PVC	130	0	0.00	364	367
EX094 - 152mm	39	B099 Garage	EX-J191	152.4	PVC	130	0	0.01	373	357

Scenerio: Fire at B005, Max Day + Fire Flow										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
EX095 - 152mm	25	EX-Irrigation	EX-Unknown Demand	152.4	PVC	130	1	0.06	381	381
EX100 - 305mm	42	EX-J100	EX-J110	304.8	PVC	130	15	0.20	338	336
EX101 - 152mm	17	B103 Implement Shed	EX-J192	152.4	PVC	130	0	0.00	377	378
EX102 - 152mm	4	B106 Plot Bldg	EX-J211	152.4	PVC	130	0	0.00	371	371
EX103 - 152mm	6	B107 Plant Growth	EX-J202	152.4	PVC	130	0	0.00	368	369
EX104 - 152mm	6	B109 Tobacco Greenhouses	EX-J201	152.4	PVC	130	0	0.00	361	361
EX105 - 152mm	50	B110 Agronomy Service	EX-J200	152.4	PVC	130	0	0.00	367	362
EX110 - 305mm	94	EX-J110	EX-J140	304.8	PVC	130	15	0.20	336	335
EX111 - 152mm	12	B114 Implement Repair Shop	EX-J194	152.4	PVC	130	0	0.00	357	356
EX112 - 305mm	37	EX-J112	P-J101	304.8	PVC	130	-56	0.77	372	387
EX113 - 203mm	34	B004 Observatory Machine	B003 Geophysical	203.2	PVC	130	0	0.00	399	398
EX114 - 305mm	2	EX-J114	EX-J112	304.8	PVC	130	69	0.94	373	372
EX115 - 305mm	25	EX-J115	EX-J114	304.8	PVC	130	69	0.94	364	373
EX120 - 102mm	31	B005 Geodetic Survey &	EX-J115	152.4	PVC	130	-1	0.03	364	364
EX121 - 203mm	35	B002 Observatory House	EX-J114	203.2	PVC	130	0	0.00	360	373
EX122 - 152mm	169	EX-J122	B136 Mag. Lab	152.4	PVC	130	0	0.00	387	388
EX123 - 152mm	62	B136 Mag. Lab	B138 Storage Bldg	152.4	PVC	130	0	0.00	388	390
EX124 - 152mm	17	B140 Plant Growth	EX-J150	152.4	PVC	130	0	0.00	337	340
EX125 - 406mm	17	EX-J125	EX-J140	406.4	PVC	130	-18	0.14	337	335
EX130 - 152mm	24	B142 Greenhouses	EX-J211	152.4	PVC	130	0	0.00	371	371
EX131 - 305mm	99	EX-J131	EX-J230	304.8	PVC	130	-4	0.05	371	336
EX132 - 152mm	180	B143 Services	EX-J210	152.4	PVC	130	0	0.01	381	378
EX133 - 305mm	41	B022 CFIA 2	EX-J131	304.8	PVC	130	-3	0.05	366	371
EX134 - 203mm	39	EX-J131	B021 KWN Headerhouse	203.2	PVC	130	0	0.00	371	369
EX135 - 406mm	26	EX-J142	EX-J135	406.4	PVC	130	37	0.29	341	342
EX140 - 406mm	120	EX-J140	P-J141	406.4	PVC	130	-3	0.02	335	337
EX141 - 406mm	7	P-J141	EX-J001	406.4	PVC	130	-59	0.45	337	337
EX142 - 406mm	13	EX-J152	EX-J142	406.4	PVC	130	37	0.29	342	341
EX143 - 203mm	44	EX-J145	EX-J143	203.2	PVC	130	0	0.00	345	342
EX144 - 305mm	250	EX-J170	EX-J150	304.8	PVC	130	13	0.17	323	340
EX145 - 203mm	51	EX-J150	EX-J145	203.2	PVC	130	0	0.00	340	345
EX150 - 305mm	53	EX-J151	EX-J150	304.8	PVC	130	-13	0.17	337	340
EX151 - 305mm	62	EX-J162	EX-J151	304.8	PVC	130	-2	0.03	341	337
EX152 - 406mm	121	EX-J162	EX-J152	406.4	PVC	130	26	0.20	341	342
EX153 - 406mm	90	EX-J222	EX-J153	406.4	PVC	130	-22	0.17	333	334
EX154 - 305mm	152	EX-J054	EX-J100	304.8	PVC	130	8	0.11	358	338
EX155 - 406mm	36	EX-J135	EX-J155	406.4	PVC	130	37	0.29	342	344
EX160 - 406mm	74	EX-J160	EX-J170	406.4	PVC	130	31	0.24	340	323
EX161 - 406mm	60	EX-J165	EX-J161	406.4	PVC	130	21	0.16	295	307
EX162 - 406mm	55	P-J206	EX-J162	406.4	PVC	130	25	0.19	333	341
EX163 - 406mm	116	EX-J161	P-J206	406.4	PVC	130	21	0.16	307	333
EX164 - 305mm	40	EX-J214	EX-J165	304.8	PVC	130	7	0.10	288	295
EX165 - 305mm	79	EX-J184	EX-J165	304.8	PVC	130	-4	0.06	307	295
EX170 - 406mm	55	EX-J170	EX-J171	406.4	PVC	130	18	0.14	323	307
EX171 - 406mm	29	EX-J171	EX-J172	406.4	PVC	130	18	0.14	307	300
EX172 - 406mm	39	EX-J172	EX-J173	406.4	PVC	130	18	0.14	300	294
EX173 - 406mm	53	EX-J173	EX-J165	406.4	PVC	130	18	0.14	294	295
EX174 - 305mm	63	EX-J174	EX-J003	304.8	PVC	130	4	0.05	363	366
EX175 - 305mm	143	EX-J175	EX-J174	304.8	PVC	130	4	0.06	343	363
EX180 - 406mm	101	EX-J180	EX-J160	406.4	PVC	130	31	0.24	372	340
EX181 - 305mm	19	EX-J181	EX-J182	304.8	PVC	130	4	0.06	322	324
EX182 - 305mm	125	EX-J182	EX-J175	304.8	PVC	130	4	0.06	324	343
EX183 - 406mm	990	EX-J183	EX-J192	406.4	Ductile Iron	130	42	0.32	386	378
EX184 - 305mm	106	EX-J184	EX-J181	304.8	PVC	130	4	0.06	307	322

Scenerio: Fire at B005, Max Day + Fire Flow										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
EX185 - 203mm	40	EX-J190	EX-J180	203.2	PVC	130	0	0.01	364	372
EX190 - 203mm	23	EX-J191	EX-J190	203.2	PVC	130	0	0.01	357	364
EX191 - 203mm	17	EX-J090	EX-J191	203.2	PVC	130	0	0.00	351	357
EX192 - 406mm	55	EX-J192	EX-J180	406.4	PVC	130	31	0.24	378	372
EX193 - 305mm	107	EX-Irrigation	EX-J194	304.8	PVC	130	-10	0.14	381	356
EX194 - 305mm	153	EX-J194	EX-J192	304.8	PVC	130	-10	0.14	356	378
EX195 - 305mm	58	EX-J201	EX-Irrigation	304.8	PVC	130	-7	0.10	361	381
EX200 - 305mm	30	EX-J202	EX-J200	304.8	PVC	130	-7	0.10	369	362
EX201 - 305mm	8	EX-J200	EX-J201	304.8	PVC	130	-7	0.10	362	361
EX202 - 305mm	40	EX-J212	EX-J202	304.8	PVC	130	-7	0.10	371	369
EX203 - 305mm	94	EX-J203	EX-J210	304.8	PVC	130	-7	0.10	367	378
EX204 - 203mm	42	EX-J205	EX-J204	203.2	PVC	130	0	0.00	368	369
EX205 - 203mm	29	EX-J220	EX-J205	203.2	PVC	130	0	0.00	366	368
EX210 - 305mm	119	EX-J210	EX-J122	304.8	PVC	130	-7	0.10	378	387
EX211 - 152mm	29	EX-J211	EX-J212	152.4	PVC	130	0	0.00	371	371
EX212 - 305mm	139	EX-J122	EX-J212	304.8	PVC	130	-7	0.10	387	371
EX213 - 305mm	37	EX-J213	EX-J203	304.8	PVC	130	-7	0.10	347	367
EX214 - 305mm	158	EX-J214	EX-J215	304.8	PVC	130	-7	0.10	288	312
EX215 - 305mm	42	EX-J215	EX-J213	304.8	PVC	130	-7	0.10	312	347
EX220 - 254mm	59	EX-J203	EX-J220	254	PVC	130	0	0.00	367	366
EX221 - 406mm	30	EX-J001	EX-J221	406.4	PVC	130	-22	0.17	337	335
EX222 - 406mm	18	EX-J221	EX-J222	406.4	PVC	130	-22	0.17	335	333
EX223 - 406mm	123	EX-J153	EX-J223	406.4	PVC	130	-29	0.22	334	333
EX224 - 305mm	69	EX-J223	EX-J224	304.8	PVC	130	7	0.09	333	356
EX225 - 406mm	307	EX-J225	EX-J230	406.4	PVC	130	39	0.30	345	336
EX230 - 406mm	131	EX-J230	EX-J223	406.4	PVC	130	36	0.27	336	333
EX231 - 305mm	57	EX-J231	EX-J152	304.8	PVC	130	11	0.15	339	342
EX232 - 305mm	117	EX-J231	EX-J151	304.8	PVC	130	-11	0.15	339	337
P100 - 203mm	46	B003 Geophysical	P-J101	203.2	PVC	130	0	0.00	398	387
P101 - 305mm	63	P-J101	P-J102	304.8	PVC	130	-56	0.77	387	380
P102 - 305mm	10	P-J102	P-J103	304.8	PVC	130	-56	0.77	380	376
P103 - 305mm	38	P-J104	P-J103	304.8	PVC	130	56	0.77	366	376
P104 - 305mm	124	P-J105	P-J104	304.8	PVC	130	56	0.77	342	366
P105 - 305mm	12	P-J106	P-J105	304.8	PVC	130	56	0.77	342	342
P106 - 305mm	17	P-J141	P-J106	304.8	PVC	130	56	0.77	337	342
P200 - 305mm	51	P-J201	P-J200	304.8	PVC	130	-4	0.05	342	350
P201 - 305mm	128	P-J202	P-J201	304.8	PVC	130	-4	0.05	319	342
P202 - 305mm	25	P-J203	P-J202	304.8	PVC	130	-4	0.05	316	319
P203 - 305mm	17	P-J204	P-J203	304.8	PVC	130	-4	0.05	316	316
P204 - 305mm	28	P-J205	P-J204	304.8	PVC	130	-4	0.05	319	316
P205 - 305mm	114	P-J206	P-J205	304.8	PVC	130	-4	0.05	333	319

Scenerio: Fire at B005, Max Day + Fire Flow				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
B000FRAMESHED	82.40	0	117.96	348
B000NEWBARN	81.00	0	117.99	362
B001 Dominion Observatory	83.83	0	117.64	331
B002 Observatory House	80.41	0	117.19	360
B003 Geophysical	76.54	0	117.24	398
B004 Observatory Machine Shop	76.48	0	117.24	399
B005 Geodetic Survey & Standardizing	80.15	1	117.32	364
B007 Seismology Building	83.88	0	117.85	332
B012 Forage Crop & Greenhouses	83.55	0	117.85	336
B018 Pesticide Lab	83.40	0	117.87	337
B019 Chemical Storage	83.60	0	117.88	336
B020 Neatby 1	82.60	1	117.91	346
B020 Neatby 2	81.60	1	117.89	355
B020 Neatby 3	81.60	0	117.90	355
B020 Neatby 4	83.40	0	117.88	337
B020 Neatby 5	83.60	0	117.88	336
B021 KWN Headerhouse	80.20	0	117.94	369
B022 CFIA 1	79.80	1	117.89	373
B022 CFIA 2	80.50	0	117.94	366
B023 Pumphouse	84.01	0	117.88	331
B026 Cytogenetics	84.60	0	117.88	326
B034 Animal Genetics	83.37	0	117.92	338
B036 Service Building	83.30	0	117.94	339
B045 Poultry House	83.10	0	117.94	341
B048 Implement and Nursery Stock Storage	83.10	0	117.96	341
B049 William Saunders2	86.26	0	117.95	310
B050 Main Greenhouses 2	83.50	0	117.95	337
B054 Maple Ave. Office	87.00	0	117.97	303
B055 Horticulture	87.80	0	117.98	295
B057 Dairy Technology	86.70	0	117.99	306
B059 Animal Nutrition	85.00	0	117.97	323
B060 Heritage House	85.75	0	117.97	315
B072 Agrometeorology	81.10	0	117.97	361
B074 Plant Research	82.60	0	117.97	346
B075 Cereal Greenhouse	86.75	0	117.97	306
B076 Cereal Cleaning	87.00	0	117.98	303
B077 Pottery Shed	83.00	0	117.99	342
B078 CHP	80.80	0	117.99	364
B085 Information Booth	89.50	0	117.98	279
B088 Main Dairy Barn	87.70	0	117.98	296
B091 Experimental Piggery	82.00	0	117.99	352
B091 Main Piggery	82.00	0	117.99	352
B092 Genetics Piggery	80.10	0	117.99	371
B094 Engineering Research	84.00	0	118.03	333
B095 Large Animal Lab	84.00	0	118.03	333
B097 Public Works Shop	81.20	0	118.03	360
B098 Carpenter Shop	80.50	0	118.03	367
B099 Garage	79.90	0	118.03	373
B103 Implement Shed	79.50	0	118.04	377
B106 Plot Bldg	80.10	0	118.01	371

Scenerio: Fire at B005, Max Day + Fire Flow				
Junction Table				
Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
B107 Plant Growth	80.40	0	118.01	368
B109 Tobacco Greenhouses	81.10	0	118.01	361
B110 Agronomy Service	80.50	0	118.01	367
B114 Implement Repair Shop	81.50	0	118.03	357
B136 Mag. Lab	78.40	0	118.00	388
B138 Storage Bldg	78.20	0	118.00	390
B140 Plant Growth	83.50	0	117.96	337
B142 Greenhouses	80.10	0	118.01	371
B143 Services	79.10	0	117.99	381
EX-Carling/Irving	82.50	0	117.90	346
EX-Carling/Parkdale	81.90	0	118.08	354
EX-Irrigation	79.10	2	118.02	381
EX-J001	83.39	0	117.87	337
EX-J002	83.45	0	117.88	337
EX-J003	80.60	0	117.96	366
EX-J034	83.77	0	117.64	331
EX-J043	80.80	0	117.90	363
EX-J053	80.40	0	117.90	367
EX-J054	81.30	0	117.89	358
EX-J082	83.40	0	117.88	337
EX-J090	82.20	0	118.03	351
EX-J100	83.30	0	117.88	338
EX-J110	83.50	0	117.87	336
EX-J112	79.08	125	117.13	372
EX-J114	79.12	0	117.19	373
EX-J115	80.11	0	117.32	364
EX-J122	78.50	0	118.00	387
EX-J125	83.41	0	117.85	337
EX-J131	80.00	0	117.94	371
EX-J135	83.01	0	117.91	342
EX-J140	83.64	0	117.85	335
EX-J142	83.13	0	117.92	341
EX-J143	83.00	0	117.96	342
EX-J145	82.70	0	117.96	345
EX-J150	83.25	0	117.96	340
EX-J151	83.50	0	117.95	337
EX-J152	83.02	0	117.93	342
EX-J153	83.80	0	117.89	334
EX-J155	82.78	0	117.90	344
EX-J160	83.25	0	118.01	340
EX-J161	86.65	0	117.97	307
EX-J162	83.14	0	117.95	341
EX-J165	87.87	0	117.97	295
EX-J170	85.00	0	117.99	323
EX-J171	86.60	0	117.99	307
EX-J172	87.30	0	117.98	300
EX-J173	87.90	0	117.98	294
EX-J174	80.90	0	117.97	363
EX-J175	82.90	0	117.97	343
EX-J180	80.00	0	118.03	372

Scenerio: Fire at B005, Max Day + Fire Flow				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
EX-J181	85.12	0	117.97	322
EX-J182	84.87	0	117.97	324
EX-J183	78.90	0	118.34	386
EX-J184	86.62	0	117.97	307
EX-J190	80.80	0	118.03	364
EX-J191	81.60	0	118.03	357
EX-J192	79.40	0	118.04	378
EX-J194	81.70	0	118.03	356
EX-J200	81.00	0	118.01	362
EX-J201	81.10	0	118.01	361
EX-J202	80.30	0	118.01	369
EX-J203	80.50	0	117.99	367
EX-J204	80.30	0	117.99	369
EX-J205	80.40	0	117.99	368
EX-J210	79.40	0	117.99	378
EX-J211	80.10	0	118.01	371
EX-J212	80.10	0	118.01	371
EX-J213	82.50	0	117.99	347
EX-J214	88.50	0	117.98	288
EX-J215	86.10	0	117.98	312
EX-J220	80.60	0	117.99	366
EX-J221	83.66	0	117.88	335
EX-J222	83.90	0	117.88	333
EX-J223	83.90	0	117.91	333
EX-J224	81.50	0	117.91	356
EX-J225	82.80	0	118.03	345
EX-J230	83.57	0	117.94	336
EX-J231	83.25	0	117.94	339
EX-Unknown Demand Locations	79.10	1	118.01	381
P-J101	77.71	0	117.24	387
P-J102	78.62	0	117.41	380
P-J103	79.00	0	117.46	376
P-J104	80.11	0	117.54	366
P-J105	82.80	0	117.79	342
P-J106	82.87	0	117.82	342
P-J141	83.37	0	117.85	337
P-J200	82.25	0	117.96	350
P-J201	82.97	0	117.96	342
P-J202	85.40	0	117.96	319
P-J203	85.63	0	117.96	316
P-J204	85.65	0	117.96	316
P-J205	85.39	0	117.96	319
P-J206	83.93	0	117.96	333

Scenerio: Fire at B072, Max Day + Fire Flow										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
EX-Carling/Irving - 406mm	68	EX-Carling/Irving	EX-J125	406.4	PVC	130	32	0.25	393	383
EX-Carling/Parkdale - 406mm	159	EX-Carling/Parkdale	EX-J225	406.4	PVC	130	26	0.20	399	390
EX-FrameShed - 152mm	132	B000FRAMESHED	EX-J145	152.4	PVC	130	0	0.00	392	389
EX001 - 406mm	15	EX-J002	EX-J001	406.4	PVC	130	-54	0.42	383	383
EX002 - 406mm	60	EX-J155	EX-J002	406.4	PVC	130	-54	0.42	389	383
EX003 - 305mm	117	EX-J003	P-J200	304.8	PVC	130	-46	0.63	402	387
EX004 - 152mm	30	B022 CFIA 1	EX-J053	152.4	PVC	130	-1	0.04	419	413
EX005 - 152mm	41	B020 Neatby 2	EX-J053	152.4	PVC	130	-1	0.04	401	413
EX010 - 152mm	93	B020 Neatby 3	EX-J043	152.4	PVC	130	0	0.00	401	409
EX011 - 203mm	16	B020 Neatby 4	EX-J082	203.2	PVC	130	0	0.01	384	384
EX012 - 203mm	13	EX-J082	B020 Neatby 5	203.2	PVC	130	0	0.00	384	382
EX013 - 152mm	16	B000NEWBARN	EX-J220	152.4	PVC	130	0	0.00	405	409
EX014 - 152mm	12	B018 Pesticide Lab	EX-J110	152.4	PVC	130	0	0.00	384	383
EX015 - 152mm	36	B019 Chemical Storage	EX-J082	152.4	PVC	130	0	0.00	382	384
EX020 - 152mm	49	B020 Neatby 1	EX-J224	152.4	PVC	130	-1	0.04	391	402
EX021 - 152mm	101	B022 CFIA 2	EX-J043	152.4	PVC	130	2	0.12	412	409
EX022 - 152mm	9	B023 Pumphouse	EX-J221	152.4	PVC	130	0	0.00	377	381
EX023 - 203mm	94	B049 William Saunders2	EX-J162	203.2	PVC	130	0	0.00	354	384
EX024 - 152mm	14	EX-J222	B026 Cytogenetics	152.4	PVC	130	0	0.00	378	372
EX025 - 305mm	51	EX-J125	EX-J034	304.8	PVC	130	7	0.09	383	380
EX030 - 203mm	46	B007 Seismology Building	EX-J125	203.2	PVC	130	0	0.00	379	383
EX031 - 152mm	25	B012 Forage Crop &	EX-J125	152.4	PVC	130	0	0.00	382	383
EX032 - 152mm	11	B034 Animal Genetics	EX-J142	152.4	PVC	130	0	0.00	383	385
EX033 - 152mm	32	B036 Service Building	EX-J231	152.4	PVC	130	0	0.00	383	383
EX034 - 305mm	84	EX-J034	EX-J115	304.8	PVC	130	7	0.09	380	416
EX035 - 152mm	9	B001 Dominion Observatory	EX-J034	152.4	PVC	130	0	0.00	379	380
EX040 - 152mm	21	EX-J231	B045 Poultry House	152.4	PVC	130	0	0.00	383	385
EX041 - 152mm	14	B048 Implement and Nursery	EX-J143	152.4	PVC	130	0	0.00	385	386
EX042 - 152mm	31	B050 Main Greenhouses 2	EX-J162	152.4	PVC	130	0	0.02	381	384
EX043 - 305mm	48	EX-J224	EX-J043	304.8	PVC	130	3	0.05	402	409
EX044 - 152mm	30	B054 Maple Ave. Office	EX-J161	152.4	PVC	130	0	0.00	346	350
EX045 - 152mm	21	B055 Horticulture	EX-J172	152.4	PVC	130	0	0.00	339	343
EX050 - 152mm	12	B057 Dairy Technology	EX-J171	152.4	PVC	130	0	0.01	349	350
EX051 - 152mm	10	B059 Animal Nutrition	EX-J182	152.4	PVC	130	0	0.00	362	363
EX052 - 152mm	42	B060 Heritage House	EX-J181	152.4	PVC	130	0	0.00	355	361
EX053 - 203mm	7	EX-J043	EX-J053	203.2	PVC	130	6	0.17	409	413
EX054 - 305mm	35	EX-J053	EX-J054	304.8	PVC	130	4	0.06	413	404
EX055 - 152mm	7	B072 Agrometeorology	EX-J174	152.4	PVC	130	0	0.00	396	397
EX060 - 203mm	24	B074 Plant Research	EX-J175	203.2	PVC	130	0	0.00	383	380
EX061 - 152mm	19	B075 Cereal Greenhouse	EX-J184	152.4	PVC	130	0	0.00	347	348
EX062 - 152mm	19	B076 Cereal Cleaning	EX-J215	152.4	PVC	130	0	0.00	346	355
EX063 - 152mm	38	B077 Pottery Shed	EX-J213	152.4	PVC	130	0	0.00	385	390
EX064 - 152mm	19	B078 CHP	EX-J220	152.4	PVC	130	0	0.00	407	409
EX065 - 305mm	49	EX-J100	EX-J082	304.8	PVC	130	4	0.05	384	384
EX080 - 152mm	25	B085 Information Booth	EX-J214	152.4	PVC	130	0	0.00	322	331
EX081 - 152mm	26	B088 Main Dairy Barn	EX-J173	152.4	PVC	130	0	0.01	339	337
EX082 - 305mm	64	EX-J082	EX-J153	304.8	PVC	130	4	0.05	384	380
EX083 - 152mm	19	EX-J204	B091 Main Piggery	152.4	PVC	130	0	0.01	412	395
EX084 - 152mm	42	EX-J204	B092 Genetics Piggery	152.4	PVC	130	0	0.00	412	414
EX085 - 152mm	29	B091 Experimental Piggery	EX-J205	152.4	PVC	130	0	0.00	395	411
EX090 - 152mm	50	B094 Engineering Research	EX-J090	152.4	PVC	130	0	0.01	376	394
EX091 - 152mm	27	B095 Large Animal Lab	EX-J090	152.4	PVC	130	0	0.00	376	394
EX092 - 152mm	10	B097 Public Works Shop	EX-J190	152.4	PVC	130	0	0.00	404	408
EX093 - 152mm	15	EX-J190	B098 Carpenter Shop	152.4	PVC	130	0	0.00	408	411
EX094 - 152mm	39	B099 Garage	EX-J191	152.4	PVC	130	0	0.01	416	400

Scenerio: Fire at B072, Max Day + Fire Flow

Pipe Table

Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
EX095 - 152mm	25	EX-Irrigation	EX-Unknown Demand	152.4	PVC	130	1	0.06	424	424
EX100 - 305mm	42	EX-J100	EX-J110	304.8	PVC	130	0	0.00	384	383
EX101 - 152mm	17	B103 Implement Shed	EX-J192	152.4	PVC	130	0	0.00	420	421
EX102 - 152mm	4	B106 Plot Bldg	EX-J211	152.4	PVC	130	0	0.00	414	414
EX103 - 152mm	6	B107 Plant Growth	EX-J202	152.4	PVC	130	0	0.00	411	412
EX104 - 152mm	6	B109 Tobacco Greenhouses	EX-J201	152.4	PVC	130	0	0.00	404	404
EX105 - 152mm	50	B110 Agronomy Service	EX-J200	152.4	PVC	130	0	0.00	410	405
EX110 - 305mm	94	EX-J110	EX-J140	304.8	PVC	130	0	0.00	383	381
EX111 - 152mm	12	B114 Implement Repair Shop	EX-J194	152.4	PVC	130	0	0.00	401	399
EX112 - 305mm	37	EX-J112	P-J101	304.8	PVC	130	6	0.09	426	439
EX113 - 203mm	34	B004 Observatory Machine	B003 Geophysical	203.2	PVC	130	0	0.00	451	451
EX114 - 305mm	2	EX-J114	EX-J112	304.8	PVC	130	6	0.09	425	426
EX115 - 305mm	25	EX-J115	EX-J114	304.8	PVC	130	6	0.09	416	425
EX120 - 102mm	31	B005 Geodetic Survey &	EX-J115	152.4	PVC	130	-1	0.03	415	416
EX121 - 203mm	35	B002 Observatory House	EX-J114	203.2	PVC	130	0	0.00	413	425
EX122 - 152mm	169	EX-J122	B136 Mag. Lab	152.4	PVC	130	0	0.00	430	431
EX123 - 152mm	62	B136 Mag. Lab	B138 Storage Bldg	152.4	PVC	130	0	0.00	431	433
EX124 - 152mm	17	B140 Plant Growth	EX-J150	152.4	PVC	130	0	0.00	381	383
EX125 - 406mm	17	EX-J125	EX-J140	406.4	PVC	130	25	0.19	383	381
EX130 - 152mm	24	B142 Greenhouses	EX-J211	152.4	PVC	130	0	0.00	414	414
EX131 - 305mm	99	EX-J131	EX-J230	304.8	PVC	130	-2	0.03	417	382
EX132 - 152mm	180	B143 Services	EX-J210	152.4	PVC	130	0	0.01	424	421
EX133 - 305mm	41	B022 CFIA 2	EX-J131	304.8	PVC	130	-2	0.03	412	417
EX134 - 203mm	39	EX-J131	B021 KWN Headerhouse	203.2	PVC	130	0	0.00	417	415
EX135 - 406mm	26	EX-J142	EX-J135	406.4	PVC	130	-54	0.42	385	386
EX140 - 406mm	120	EX-J140	P-J141	406.4	PVC	130	25	0.19	381	384
EX141 - 406mm	7	P-J141	EX-J001	406.4	PVC	130	31	0.24	384	383
EX142 - 406mm	13	EX-J152	EX-J142	406.4	PVC	130	-54	0.42	386	385
EX143 - 203mm	44	EX-J145	EX-J143	203.2	PVC	130	0	0.00	389	386
EX144 - 305mm	250	EX-J170	EX-J150	304.8	PVC	130	-1	0.01	366	383
EX145 - 203mm	51	EX-J150	EX-J145	203.2	PVC	130	0	0.00	383	389
EX150 - 305mm	53	EX-J151	EX-J150	304.8	PVC	130	1	0.01	381	383
EX151 - 305mm	62	EX-J162	EX-J151	304.8	PVC	130	-13	0.18	384	381
EX152 - 406mm	121	EX-J162	EX-J152	406.4	PVC	130	-40	0.31	384	386
EX153 - 406mm	90	EX-J222	EX-J153	406.4	PVC	130	-23	0.18	378	380
EX154 - 305mm	152	EX-J054	EX-J100	304.8	PVC	130	4	0.06	404	384
EX155 - 406mm	36	EX-J135	EX-J155	406.4	PVC	130	-54	0.42	386	389
EX160 - 406mm	74	EX-J160	EX-J170	406.4	PVC	130	31	0.24	383	366
EX161 - 406mm	60	EX-J165	EX-J161	406.4	PVC	130	-7	0.05	338	350
EX162 - 406mm	55	P-J206	EX-J162	406.4	PVC	130	-53	0.41	376	384
EX163 - 406mm	116	EX-J161	P-J206	406.4	PVC	130	-7	0.05	350	376
EX164 - 305mm	40	EX-J214	EX-J165	304.8	PVC	130	9	0.12	331	338
EX165 - 305mm	79	EX-J184	EX-J165	304.8	PVC	130	-48	0.65	348	338
EX170 - 406mm	55	EX-J170	EX-J171	406.4	PVC	130	32	0.25	366	350
EX171 - 406mm	29	EX-J171	EX-J172	406.4	PVC	130	32	0.25	350	343
EX172 - 406mm	39	EX-J172	EX-J173	406.4	PVC	130	32	0.25	343	337
EX173 - 406mm	53	EX-J173	EX-J165	406.4	PVC	130	32	0.25	337	338
EX174 - 305mm	63	EX-J174	EX-J003	304.8	PVC	130	-46	0.63	397	402
EX175 - 305mm	143	EX-J175	EX-J174	304.8	PVC	130	48	0.65	380	397
EX180 - 406mm	101	EX-J180	EX-J160	406.4	PVC	130	31	0.24	415	383
EX181 - 305mm	19	EX-J181	EX-J182	304.8	PVC	130	48	0.65	361	363
EX182 - 305mm	125	EX-J182	EX-J175	304.8	PVC	130	48	0.65	363	380
EX183 - 406mm	990	EX-J183	EX-J192	406.4	Ductile Iron	130	44	0.34	430	421
EX184 - 305mm	106	EX-J184	EX-J181	304.8	PVC	130	48	0.65	348	361

Scenerio: Fire at B072, Max Day + Fire Flow										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
EX185 - 203mm	40	EX-J190	EX-J180	203.2	PVC	130	0	0.01	408	415
EX190 - 203mm	23	EX-J191	EX-J190	203.2	PVC	130	0	0.01	400	408
EX191 - 203mm	17	EX-J090	EX-J191	203.2	PVC	130	0	0.00	394	400
EX192 - 406mm	55	EX-J192	EX-J180	406.4	PVC	130	32	0.24	421	415
EX193 - 305mm	107	EX-Irrigation	EX-J194	304.8	PVC	130	-12	0.16	424	399
EX194 - 305mm	153	EX-J194	EX-J192	304.8	PVC	130	-12	0.16	399	421
EX195 - 305mm	58	EX-J201	EX-Irrigation	304.8	PVC	130	-9	0.13	404	424
EX200 - 305mm	30	EX-J202	EX-J200	304.8	PVC	130	-9	0.13	412	405
EX201 - 305mm	8	EX-J200	EX-J201	304.8	PVC	130	-9	0.13	405	404
EX202 - 305mm	40	EX-J212	EX-J202	304.8	PVC	130	-9	0.13	414	412
EX203 - 305mm	94	EX-J203	EX-J210	304.8	PVC	130	-9	0.12	410	421
EX204 - 203mm	42	EX-J205	EX-J204	203.2	PVC	130	0	0.00	411	412
EX205 - 203mm	29	EX-J220	EX-J205	203.2	PVC	130	0	0.00	409	411
EX210 - 305mm	119	EX-J210	EX-J122	304.8	PVC	130	-9	0.12	421	430
EX211 - 152mm	29	EX-J211	EX-J212	152.4	PVC	130	0	0.00	414	414
EX212 - 305mm	139	EX-J122	EX-J212	304.8	PVC	130	-9	0.13	430	414
EX213 - 305mm	37	EX-J213	EX-J203	304.8	PVC	130	-9	0.12	390	410
EX214 - 305mm	158	EX-J214	EX-J215	304.8	PVC	130	-9	0.12	331	355
EX215 - 305mm	42	EX-J215	EX-J213	304.8	PVC	130	-9	0.12	355	390
EX220 - 254mm	59	EX-J203	EX-J220	254	PVC	130	0	0.00	410	409
EX221 - 406mm	30	EX-J001	EX-J221	406.4	PVC	130	-23	0.18	383	381
EX222 - 406mm	18	EX-J221	EX-J222	406.4	PVC	130	-23	0.18	381	378
EX223 - 406mm	123	EX-J153	EX-J223	406.4	PVC	130	-19	0.15	380	379
EX224 - 305mm	69	EX-J223	EX-J224	304.8	PVC	130	4	0.06	379	402
EX225 - 406mm	307	EX-J225	EX-J230	406.4	PVC	130	26	0.20	390	382
EX230 - 406mm	131	EX-J230	EX-J223	406.4	PVC	130	23	0.18	382	379
EX231 - 305mm	57	EX-J231	EX-J152	304.8	PVC	130	-14	0.19	383	386
EX232 - 305mm	117	EX-J231	EX-J151	304.8	PVC	130	14	0.19	383	381
P100 - 203mm	46	B003 Geophysical	P-J101	203.2	PVC	130	0	0.00	451	439
P101 - 305mm	63	P-J101	P-J102	304.8	PVC	130	6	0.08	439	430
P102 - 305mm	10	P-J102	P-J103	304.8	PVC	130	6	0.08	430	426
P103 - 305mm	38	P-J104	P-J103	304.8	PVC	130	-6	0.08	416	426
P104 - 305mm	124	P-J105	P-J104	304.8	PVC	130	-6	0.08	389	416
P105 - 305mm	12	P-J106	P-J105	304.8	PVC	130	-6	0.08	389	389
P106 - 305mm	17	P-J141	P-J106	304.8	PVC	130	-6	0.08	384	389
P200 - 305mm	51	P-J201	P-J200	304.8	PVC	130	46	0.63	381	387
P201 - 305mm	128	P-J202	P-J201	304.8	PVC	130	46	0.63	359	381
P202 - 305mm	25	P-J203	P-J202	304.8	PVC	130	46	0.63	357	359
P203 - 305mm	17	P-J204	P-J203	304.8	PVC	130	46	0.63	357	357
P204 - 305mm	28	P-J205	P-J204	304.8	PVC	130	46	0.63	360	357
P205 - 305mm	114	P-J206	P-J205	304.8	PVC	130	46	0.63	376	360

Scenerio: Fire at B072, Max Day + Fire Flow				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
B000FRAMESHED	82.40	0	122.41	392
B000NEWBARN	81.00	0	122.39	405
B001 Dominion Observatory	83.83	0	122.59	379
B002 Observatory House	80.41	0	122.58	413
B003 Geophysical	76.54	0	122.58	451
B004 Observatory Machine Shop	76.48	0	122.58	451
B005 Geodetic Survey & Standardizing	80.15	1	122.58	415
B007 Seismology Building	83.88	0	122.59	379
B012 Forage Crop & Greenhouses	83.55	0	122.59	382
B018 Pesticide Lab	83.40	0	122.59	384
B019 Chemical Storage	83.60	0	122.59	382
B020 Neatby 1	82.60	1	122.59	391
B020 Neatby 2	81.60	1	122.59	401
B020 Neatby 3	81.60	0	122.59	401
B020 Neatby 4	83.40	0	122.59	384
B020 Neatby 5	83.60	0	122.59	382
B021 KWN Headerhouse	80.20	0	122.61	415
B022 CFIA 1	79.80	1	122.59	419
B022 CFIA 2	80.50	0	122.61	412
B023 Pumphouse	84.01	0	122.57	377
B026 Cytogenetics	84.60	0	122.57	372
B034 Animal Genetics	83.37	0	122.46	383
B036 Service Building	83.30	0	122.43	383
B045 Poultry House	83.10	0	122.43	385
B048 Implement and Nursery Stock Storage	83.10	0	122.41	385
B049 William Saunders2	86.26	0	122.40	354
B050 Main Greenhouses 2	83.50	0	122.40	381
B054 Maple Ave. Office	87.00	0	122.37	346
B055 Horticulture	87.80	0	122.39	339
B057 Dairy Technology	86.70	0	122.40	349
B059 Animal Nutrition	85.00	0	121.98	362
B060 Heritage House	85.75	0	122.03	355
B072 Agrometeorology	81.10	0	121.52	396
B074 Plant Research	82.60	0	121.76	383
B075 Cereal Greenhouse	86.75	0	122.22	347
B076 Cereal Cleaning	87.00	0	122.38	346
B077 Pottery Shed	83.00	0	122.38	385
B078 CHP	80.80	0	122.39	407
B085 Information Booth	89.50	0	122.37	322
B088 Main Dairy Barn	87.70	0	122.38	339
B091 Experimental Piggery	82.00	0	122.39	395
B091 Main Piggery	82.00	0	122.39	395
B092 Genetics Piggery	80.10	0	122.39	414
B094 Engineering Research	84.00	0	122.45	376
B095 Large Animal Lab	84.00	0	122.45	376
B097 Public Works Shop	81.20	0	122.45	404
B098 Carpenter Shop	80.50	0	122.45	411
B099 Garage	79.90	0	122.45	416
B103 Implement Shed	79.50	0	122.46	420
B106 Plot Bldg	80.10	0	122.41	414

Scenerio: Fire at B072, Max Day + Fire Flow				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
B107 Plant Growth	80.40	0	122.42	411
B109 Tobacco Greenhouses	81.10	0	122.42	404
B110 Agronomy Service	80.50	0	122.42	410
B114 Implement Repair Shop	81.50	0	122.44	401
B136 Mag. Lab	78.40	0	122.40	431
B138 Storage Bldg	78.20	0	122.40	433
B140 Plant Growth	83.50	0	122.41	381
B142 Greenhouses	80.10	0	122.41	414
B143 Services	79.10	0	122.39	424
EX-Carling/Irving	82.50	0	122.61	393
EX-Carling/Parkdale	81.90	0	122.67	399
EX-Irrigation	79.10	2	122.43	424
EX-J001	83.39	0	122.57	383
EX-J002	83.45	0	122.55	383
EX-J003	80.60	0	121.62	402
EX-J034	83.77	0	122.59	380
EX-J043	80.80	0	122.59	409
EX-J053	80.40	0	122.59	413
EX-J054	81.30	0	122.59	404
EX-J082	83.40	0	122.59	384
EX-J090	82.20	0	122.45	394
EX-J100	83.30	0	122.59	384
EX-J110	83.50	0	122.59	383
EX-J112	79.08	0	122.58	426
EX-J114	79.12	0	122.58	425
EX-J115	80.11	0	122.58	416
EX-J122	78.50	0	122.40	430
EX-J125	83.41	0	122.59	383
EX-J131	80.00	0	122.61	417
EX-J135	83.01	0	122.48	386
EX-J140	83.64	0	122.59	381
EX-J142	83.13	0	122.46	385
EX-J143	83.00	0	122.41	386
EX-J145	82.70	0	122.41	389
EX-J150	83.25	0	122.41	383
EX-J151	83.50	0	122.41	381
EX-J152	83.02	0	122.44	386
EX-J153	83.80	0	122.58	380
EX-J155	82.78	0	122.51	389
EX-J160	83.25	0	122.43	383
EX-J161	86.65	0	122.37	350
EX-J162	83.14	0	122.40	384
EX-J165	87.87	0	122.36	338
EX-J170	85.00	0	122.41	366
EX-J171	86.60	0	122.40	350
EX-J172	87.30	0	122.39	343
EX-J173	87.90	0	122.38	337
EX-J174	80.90	94	121.52	397
EX-J175	82.90	0	121.76	380
EX-J180	80.00	0	122.45	415

Scenerio: Fire at B072, Max Day + Fire Flow				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
EX-J181	85.12	0	122.03	361
EX-J182	84.87	0	121.98	363
EX-J183	78.90	0	122.79	430
EX-J184	86.62	0	122.22	348
EX-J190	80.80	0	122.45	408
EX-J191	81.60	0	122.45	400
EX-J192	79.40	0	122.46	421
EX-J194	81.70	0	122.44	399
EX-J200	81.00	0	122.42	405
EX-J201	81.10	0	122.42	404
EX-J202	80.30	0	122.42	412
EX-J203	80.50	0	122.39	410
EX-J204	80.30	0	122.39	412
EX-J205	80.40	0	122.39	411
EX-J210	79.40	0	122.39	421
EX-J211	80.10	0	122.41	414
EX-J212	80.10	0	122.41	414
EX-J213	82.50	0	122.38	390
EX-J214	88.50	0	122.37	331
EX-J215	86.10	0	122.38	355
EX-J220	80.60	0	122.39	409
EX-J221	83.66	0	122.57	381
EX-J222	83.90	0	122.57	378
EX-J223	83.90	0	122.60	379
EX-J224	81.50	0	122.59	402
EX-J225	82.80	0	122.65	390
EX-J230	83.57	0	122.61	382
EX-J231	83.25	0	122.43	383
EX-Unknown Demand Locations	79.10	1	122.43	424
P-J101	77.71	0	122.58	439
P-J102	78.62	0	122.58	430
P-J103	79.00	0	122.58	426
P-J104	80.11	0	122.58	416
P-J105	82.80	0	122.57	389
P-J106	82.87	0	122.57	389
P-J141	83.37	0	122.57	384
P-J200	82.25	0	121.81	387
P-J201	82.97	0	121.90	381
P-J202	85.40	0	122.11	359
P-J203	85.63	0	122.14	357
P-J204	85.65	0	122.17	357
P-J205	85.39	0	122.21	360
P-J206	83.93	0	122.37	376

Scenerio: Fire at B074, Max Day + Fire Flow										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
EX-Carling/Irving - 406mm	68	EX-Carling/Irving	EX-J125	406.4	PVC	130	51	0.39	274	265
EX-Carling/Parkdale - 406mm	159	EX-Carling/Parkdale	EX-J225	406.4	PVC	130	41	0.31	281	272
EX-FrameShed - 152mm	132	B000FRAMESHED	EX-J145	152.4	PVC	130	0	0.00	270	267
EX001 - 406mm	15	EX-J002	EX-J001	406.4	PVC	130	-88	0.68	263	264
EX002 - 406mm	60	EX-J155	EX-J002	406.4	PVC	130	-88	0.68	269	263
EX003 - 305mm	117	EX-J003	P-J200	304.8	PVC	130	-64	0.88	273	260
EX004 - 152mm	30	B022 CFIA 1	EX-J053	152.4	PVC	130	-1	0.04	300	294
EX005 - 152mm	41	B020 Neatby 2	EX-J053	152.4	PVC	130	-1	0.04	282	294
EX010 - 152mm	93	B020 Neatby 3	EX-J043	152.4	PVC	130	0	0.00	282	290
EX011 - 203mm	16	B020 Neatby 4	EX-J082	203.2	PVC	130	0	0.01	265	265
EX012 - 203mm	13	EX-J082	B020 Neatby 5	203.2	PVC	130	0	0.00	265	263
EX013 - 152mm	16	B000NEWBARN	EX-J220	152.4	PVC	130	0	0.00	283	287
EX014 - 152mm	12	B018 Pesticide Lab	EX-J110	152.4	PVC	130	0	0.00	265	264
EX015 - 152mm	36	B019 Chemical Storage	EX-J082	152.4	PVC	130	0	0.00	263	265
EX020 - 152mm	49	B020 Neatby 1	EX-J224	152.4	PVC	130	-1	0.04	273	283
EX021 - 152mm	101	B022 CFIA 2	EX-J043	152.4	PVC	130	4	0.19	293	290
EX022 - 152mm	9	B023 Pumphouse	EX-J221	152.4	PVC	130	0	0.00	258	262
EX023 - 203mm	94	B049 William Saunders2	EX-J162	203.2	PVC	130	0	0.00	232	263
EX024 - 152mm	14	EX-J222	B026 Cytogenetics	152.4	PVC	130	0	0.00	259	252
EX025 - 305mm	51	EX-J125	EX-J034	304.8	PVC	130	11	0.15	265	261
EX030 - 203mm	46	B007 Seismology Building	EX-J125	203.2	PVC	130	0	0.00	260	265
EX031 - 152mm	25	B012 Forage Crop &	EX-J125	152.4	PVC	130	0	0.00	263	265
EX032 - 152mm	11	B034 Animal Genetics	EX-J142	152.4	PVC	130	0	0.00	262	264
EX033 - 152mm	32	B036 Service Building	EX-J231	152.4	PVC	130	0	0.00	262	262
EX034 - 305mm	84	EX-J034	EX-J115	304.8	PVC	130	11	0.15	261	297
EX035 - 152mm	9	B001 Dominion Observatory	EX-J034	152.4	PVC	130	0	0.00	260	261
EX040 - 152mm	21	EX-J231	B045 Poultry House	152.4	PVC	130	0	0.00	262	264
EX041 - 152mm	14	B048 Implement and Nursery	EX-J143	152.4	PVC	130	0	0.00	263	264
EX042 - 152mm	31	B050 Main Greenhouses 2	EX-J162	152.4	PVC	130	0	0.02	259	263
EX043 - 305mm	48	EX-J224	EX-J043	304.8	PVC	130	5	0.07	283	290
EX044 - 152mm	30	B054 Maple Ave. Office	EX-J161	152.4	PVC	130	0	0.00	224	227
EX045 - 152mm	21	B055 Horticulture	EX-J172	152.4	PVC	130	0	0.00	217	221
EX050 - 152mm	12	B057 Dairy Technology	EX-J171	152.4	PVC	130	0	0.01	228	229
EX051 - 152mm	10	B059 Animal Nutrition	EX-J182	152.4	PVC	130	0	0.00	231	232
EX052 - 152mm	42	B060 Heritage House	EX-J181	152.4	PVC	130	0	0.00	225	231
EX053 - 203mm	7	EX-J043	EX-J053	203.2	PVC	130	9	0.26	290	294
EX054 - 305mm	35	EX-J053	EX-J054	304.8	PVC	130	7	0.10	294	285
EX055 - 152mm	7	B072 Agrometeorology	EX-J174	152.4	PVC	130	0	0.00	266	268
EX060 - 203mm	24	B074 Plant Research	EX-J175	203.2	PVC	130	0	0.00	247	244
EX061 - 152mm	19	B075 Cereal Greenhouse	EX-J184	152.4	PVC	130	0	0.00	221	223
EX062 - 152mm	19	B076 Cereal Cleaning	EX-J215	152.4	PVC	130	0	0.00	224	233
EX063 - 152mm	38	B077 Pottery Shed	EX-J213	152.4	PVC	130	0	0.00	263	268
EX064 - 152mm	19	B078 CHP	EX-J220	152.4	PVC	130	0	0.00	285	287
EX065 - 305mm	49	EX-J100	EX-J082	304.8	PVC	130	6	0.09	266	265
EX080 - 152mm	25	B085 Information Booth	EX-J214	152.4	PVC	130	0	0.00	199	209
EX081 - 152mm	26	B088 Main Dairy Barn	EX-J173	152.4	PVC	130	0	0.01	217	215
EX082 - 305mm	64	EX-J082	EX-J153	304.8	PVC	130	6	0.08	265	261
EX083 - 152mm	19	EX-J204	B091 Main Piggery	152.4	PVC	130	0	0.01	290	273
EX084 - 152mm	42	EX-J204	B092 Genetics Piggery	152.4	PVC	130	0	0.00	290	292
EX085 - 152mm	29	B091 Experimental Piggery	EX-J205	152.4	PVC	130	0	0.00	273	289
EX090 - 152mm	50	B094 Engineering Research	EX-J090	152.4	PVC	130	0	0.01	255	273
EX091 - 152mm	27	B095 Large Animal Lab	EX-J090	152.4	PVC	130	0	0.00	255	273
EX092 - 152mm	10	B097 Public Works Shop	EX-J190	152.4	PVC	130	0	0.00	283	287
EX093 - 152mm	15	EX-J190	B098 Carpenter Shop	152.4	PVC	130	0	0.00	287	289
EX094 - 152mm	39	B099 Garage	EX-J191	152.4	PVC	130	0	0.01	295	279

Scenerio: Fire at B074, Max Day + Fire Flow										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
EX095 - 152mm	25	EX-Irrigation	EX-Unknown Demand	152.4	PVC	130	1	0.06	303	303
EX100 - 305mm	42	EX-J100	EX-J110	304.8	PVC	130	1	0.01	266	264
EX101 - 152mm	17	B103 Implement Shed	EX-J192	152.4	PVC	130	0	0.00	300	301
EX102 - 152mm	4	B106 Plot Bldg	EX-J211	152.4	PVC	130	0	0.00	293	293
EX103 - 152mm	6	B107 Plant Growth	EX-J202	152.4	PVC	130	0	0.00	290	291
EX104 - 152mm	6	B109 Tobacco Greenhouses	EX-J201	152.4	PVC	130	0	0.00	283	283
EX105 - 152mm	50	B110 Agronomy Service	EX-J200	152.4	PVC	130	0	0.00	289	284
EX110 - 305mm	94	EX-J110	EX-J140	304.8	PVC	130	1	0.01	264	262
EX111 - 152mm	12	B114 Implement Repair Shop	EX-J194	152.4	PVC	130	0	0.00	280	278
EX112 - 305mm	37	EX-J112	P-J101	304.8	PVC	130	10	0.14	307	320
EX113 - 203mm	34	B004 Observatory Machine	B003 Geophysical	203.2	PVC	130	0	0.00	332	332
EX114 - 305mm	2	EX-J114	EX-J112	304.8	PVC	130	10	0.14	306	307
EX115 - 305mm	25	EX-J115	EX-J114	304.8	PVC	130	10	0.14	297	306
EX120 - 102mm	31	B005 Geodetic Survey &	EX-J115	152.4	PVC	130	-1	0.03	296	297
EX121 - 203mm	35	B002 Observatory House	EX-J114	203.2	PVC	130	0	0.00	294	306
EX122 - 152mm	169	EX-J122	B136 Mag. Lab	152.4	PVC	130	0	0.00	308	309
EX123 - 152mm	62	B136 Mag. Lab	B138 Storage Bldg	152.4	PVC	130	0	0.00	309	311
EX124 - 152mm	17	B140 Plant Growth	EX-J150	152.4	PVC	130	0	0.00	259	262
EX125 - 406mm	17	EX-J125	EX-J140	406.4	PVC	130	40	0.31	265	262
EX130 - 152mm	24	B142 Greenhouses	EX-J211	152.4	PVC	130	0	0.00	293	293
EX131 - 305mm	99	EX-J131	EX-J230	304.8	PVC	130	-4	0.05	298	263
EX132 - 152mm	180	B143 Services	EX-J210	152.4	PVC	130	0	0.01	302	299
EX133 - 305mm	41	B022 CFIA 2	EX-J131	304.8	PVC	130	-4	0.05	293	298
EX134 - 203mm	39	EX-J131	B021 KWN Headerhouse	203.2	PVC	130	0	0.00	298	296
EX135 - 406mm	26	EX-J142	EX-J135	406.4	PVC	130	-88	0.68	264	266
EX140 - 406mm	120	EX-J140	P-J141	406.4	PVC	130	41	0.32	262	264
EX141 - 406mm	7	P-J141	EX-J001	406.4	PVC	130	51	0.39	264	264
EX142 - 406mm	13	EX-J152	EX-J142	406.4	PVC	130	-88	0.68	265	264
EX143 - 203mm	44	EX-J145	EX-J143	203.2	PVC	130	0	0.00	267	264
EX144 - 305mm	250	EX-J170	EX-J150	304.8	PVC	130	-2	0.03	245	262
EX145 - 203mm	51	EX-J150	EX-J145	203.2	PVC	130	0	0.00	262	267
EX150 - 305mm	53	EX-J151	EX-J150	304.8	PVC	130	2	0.03	259	262
EX151 - 305mm	62	EX-J162	EX-J151	304.8	PVC	130	-21	0.28	263	259
EX152 - 406mm	121	EX-J162	EX-J152	406.4	PVC	130	-65	0.50	263	265
EX153 - 406mm	90	EX-J222	EX-J153	406.4	PVC	130	-37	0.29	259	261
EX154 - 305mm	152	EX-J054	EX-J100	304.8	PVC	130	7	0.10	285	266
EX155 - 406mm	36	EX-J135	EX-J155	406.4	PVC	130	-88	0.68	266	269
EX160 - 406mm	74	EX-J160	EX-J170	406.4	PVC	130	52	0.40	262	245
EX161 - 406mm	60	EX-J165	EX-J161	406.4	PVC	130	-21	0.16	215	227
EX162 - 406mm	55	P-J206	EX-J162	406.4	PVC	130	-86	0.66	254	263
EX163 - 406mm	116	EX-J161	P-J206	406.4	PVC	130	-21	0.16	227	254
EX164 - 305mm	40	EX-J214	EX-J165	304.8	PVC	130	15	0.21	209	215
EX165 - 305mm	79	EX-J184	EX-J165	304.8	PVC	130	-90	1.24	223	215
EX170 - 406mm	55	EX-J170	EX-J171	406.4	PVC	130	54	0.42	245	229
EX171 - 406mm	29	EX-J171	EX-J172	406.4	PVC	130	54	0.41	229	221
EX172 - 406mm	39	EX-J172	EX-J173	406.4	PVC	130	54	0.41	221	215
EX173 - 406mm	53	EX-J173	EX-J165	406.4	PVC	130	54	0.41	215	215
EX174 - 305mm	63	EX-J174	EX-J003	304.8	PVC	130	-64	0.88	268	273
EX175 - 305mm	143	EX-J175	EX-J174	304.8	PVC	130	-64	0.88	244	268
EX180 - 406mm	101	EX-J180	EX-J160	406.4	PVC	130	52	0.40	294	262
EX181 - 305mm	19	EX-J181	EX-J182	304.8	PVC	130	90	1.24	231	232
EX182 - 305mm	125	EX-J182	EX-J175	304.8	PVC	130	90	1.24	232	244
EX183 - 406mm	990	EX-J183	EX-J192	406.4	Ductile Iron	130	71	0.54	313	301
EX184 - 305mm	106	EX-J184	EX-J181	304.8	PVC	130	90	1.24	223	231

Scenerio: Fire at B074, Max Day + Fire Flow										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
EX185 - 203mm	40	EX-J190	EX-J180	203.2	PVC	130	0	0.01	287	294
EX190 - 203mm	23	EX-J191	EX-J190	203.2	PVC	130	0	0.01	279	287
EX191 - 203mm	17	EX-J090	EX-J191	203.2	PVC	130	0	0.00	273	279
EX192 - 406mm	55	EX-J192	EX-J180	406.4	PVC	130	52	0.40	301	294
EX193 - 305mm	107	EX-Irrigation	EX-J194	304.8	PVC	130	-19	0.25	303	278
EX194 - 305mm	153	EX-J194	EX-J192	304.8	PVC	130	-19	0.26	278	301
EX195 - 305mm	58	EX-J201	EX-Irrigation	304.8	PVC	130	-16	0.22	283	303
EX200 - 305mm	30	EX-J202	EX-J200	304.8	PVC	130	-16	0.22	291	284
EX201 - 305mm	8	EX-J200	EX-J201	304.8	PVC	130	-16	0.22	284	283
EX202 - 305mm	40	EX-J212	EX-J202	304.8	PVC	130	-16	0.22	293	291
EX203 - 305mm	94	EX-J203	EX-J210	304.8	PVC	130	-16	0.21	288	299
EX204 - 203mm	42	EX-J205	EX-J204	203.2	PVC	130	0	0.00	289	290
EX205 - 203mm	29	EX-J220	EX-J205	203.2	PVC	130	0	0.00	287	289
EX210 - 305mm	119	EX-J210	EX-J122	304.8	PVC	130	-16	0.22	299	308
EX211 - 152mm	29	EX-J211	EX-J212	152.4	PVC	130	0	0.00	293	293
EX212 - 305mm	139	EX-J122	EX-J212	304.8	PVC	130	-16	0.22	308	293
EX213 - 305mm	37	EX-J213	EX-J203	304.8	PVC	130	-15	0.21	268	288
EX214 - 305mm	158	EX-J214	EX-J215	304.8	PVC	130	-15	0.21	209	233
EX215 - 305mm	42	EX-J215	EX-J213	304.8	PVC	130	-15	0.21	233	268
EX220 - 254mm	59	EX-J203	EX-J220	254	PVC	130	0	0.00	288	287
EX221 - 406mm	30	EX-J001	EX-J221	406.4	PVC	130	-37	0.29	264	262
EX222 - 406mm	18	EX-J221	EX-J222	406.4	PVC	130	-37	0.29	262	259
EX223 - 406mm	123	EX-J153	EX-J223	406.4	PVC	130	-31	0.24	261	260
EX224 - 305mm	69	EX-J223	EX-J224	304.8	PVC	130	6	0.08	260	283
EX225 - 406mm	307	EX-J225	EX-J230	406.4	PVC	130	41	0.31	272	263
EX230 - 406mm	131	EX-J230	EX-J223	406.4	PVC	130	37	0.29	263	260
EX231 - 305mm	57	EX-J231	EX-J152	304.8	PVC	130	-23	0.32	262	265
EX232 - 305mm	117	EX-J231	EX-J151	304.8	PVC	130	23	0.32	262	259
P100 - 203mm	46	B003 Geophysical	P-J101	203.2	PVC	130	0	0.00	332	320
P101 - 305mm	63	P-J101	P-J102	304.8	PVC	130	10	0.14	320	311
P102 - 305mm	10	P-J102	P-J103	304.8	PVC	130	10	0.14	311	307
P103 - 305mm	38	P-J104	P-J103	304.8	PVC	130	-10	0.14	296	307
P104 - 305mm	124	P-J105	P-J104	304.8	PVC	130	-10	0.14	270	296
P105 - 305mm	12	P-J106	P-J105	304.8	PVC	130	-10	0.14	269	270
P106 - 305mm	17	P-J141	P-J106	304.8	PVC	130	-10	0.14	264	269
P200 - 305mm	51	P-J201	P-J200	304.8	PVC	130	64	0.88	255	260
P201 - 305mm	128	P-J202	P-J201	304.8	PVC	130	64	0.88	235	255
P202 - 305mm	25	P-J203	P-J202	304.8	PVC	130	64	0.88	233	235
P203 - 305mm	17	P-J204	P-J203	304.8	PVC	130	64	0.88	233	233
P204 - 305mm	28	P-J205	P-J204	304.8	PVC	130	64	0.88	237	233
P205 - 305mm	114	P-J206	P-J205	304.8	PVC	130	64	0.88	254	237

Scenerio: Fire at B074, Max Day + Fire Flow				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
B000FRAMESHED	82.40	0	109.99	270
B000NEWBARN	81.00	0	109.92	283
B001 Dominion Observatory	83.83	0	110.43	260
B002 Observatory House	80.41	0	110.42	294
B003 Geophysical	76.54	0	110.42	332
B004 Observatory Machine Shop	76.48	0	110.42	332
B005 Geodetic Survey & Standardizing	80.15	1	110.42	296
B007 Seismology Building	83.88	0	110.44	260
B012 Forage Crop & Greenhouses	83.55	0	110.44	263
B018 Pesticide Lab	83.40	0	110.43	265
B019 Chemical Storage	83.60	0	110.43	263
B020 Neatby 1	82.60	1	110.45	273
B020 Neatby 2	81.60	1	110.44	282
B020 Neatby 3	81.60	0	110.45	282
B020 Neatby 4	83.40	0	110.43	265
B020 Neatby 5	83.60	0	110.43	263
B021 KWN Headerhouse	80.20	0	110.49	296
B022 CFIA 1	79.80	1	110.44	300
B022 CFIA 2	80.50	0	110.48	293
B023 Pumphouse	84.01	0	110.39	258
B026 Cytogenetics	84.60	0	110.40	252
B034 Animal Genetics	83.37	0	110.11	262
B036 Service Building	83.30	0	110.03	262
B045 Poultry House	83.10	0	110.03	264
B048 Implement and Nursery Stock Storage	83.10	0	109.99	263
B049 William Saunders2	86.26	0	109.97	232
B050 Main Greenhouses 2	83.50	0	109.97	259
B054 Maple Ave. Office	87.00	0	109.87	224
B055 Horticulture	87.80	0	109.93	217
B057 Dairy Technology	86.70	0	109.95	228
B059 Animal Nutrition	85.00	0	108.57	231
B060 Heritage House	85.75	0	108.76	225
B072 Agrometeorology	81.10	0	108.30	266
B074 Plant Research	82.60	0	107.86	247
B075 Cereal Greenhouse	86.75	0	109.38	221
B076 Cereal Cleaning	87.00	0	109.90	224
B077 Pottery Shed	83.00	0	109.92	263
B078 CHP	80.80	0	109.92	285
B085 Information Booth	89.50	0	109.87	199
B088 Main Dairy Barn	87.70	0	109.90	217
B091 Experimental Piggery	82.00	0	109.92	273
B091 Main Piggery	82.00	0	109.92	273
B092 Genetics Piggery	80.10	0	109.92	292
B094 Engineering Research	84.00	0	110.08	255
B095 Large Animal Lab	84.00	0	110.08	255
B097 Public Works Shop	81.20	0	110.08	283
B098 Carpenter Shop	80.50	0	110.08	289
B099 Garage	79.90	0	110.08	295
B103 Implement Shed	79.50	0	110.11	300
B106 Plot Bldg	80.10	0	110.00	293

Scenerio: Fire at B074, Max Day + Fire Flow				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
B107 Plant Growth	80.40	0	110.01	290
B109 Tobacco Greenhouses	81.10	0	110.03	283
B110 Agronomy Service	80.50	0	110.02	289
B114 Implement Repair Shop	81.50	0	110.07	280
B136 Mag. Lab	78.40	0	109.97	309
B138 Storage Bldg	78.20	0	109.97	311
B140 Plant Growth	83.50	0	109.99	259
B142 Greenhouses	80.10	0	110.00	293
B143 Services	79.10	0	109.95	302
EX-Carling/Irving	82.50	0	110.49	274
EX-Carling/Parkdale	81.90	0	110.63	281
EX-Irrigation	79.10	2	110.04	303
EX-J001	83.39	0	110.38	264
EX-J002	83.45	0	110.33	263
EX-J003	80.60	0	108.50	273
EX-J034	83.77	0	110.43	261
EX-J043	80.80	0	110.45	290
EX-J053	80.40	0	110.44	294
EX-J054	81.30	0	110.44	285
EX-J082	83.40	0	110.43	265
EX-J090	82.20	0	110.08	273
EX-J100	83.30	0	110.43	266
EX-J110	83.50	0	110.43	264
EX-J112	79.08	0	110.42	307
EX-J114	79.12	0	110.42	306
EX-J115	80.11	0	110.43	297
EX-J122	78.50	0	109.97	308
EX-J125	83.41	0	110.44	265
EX-J131	80.00	0	110.49	298
EX-J135	83.01	0	110.16	266
EX-J140	83.64	0	110.43	262
EX-J142	83.13	0	110.11	264
EX-J143	83.00	0	109.99	264
EX-J145	82.70	0	109.99	267
EX-J150	83.25	0	109.99	262
EX-J151	83.50	0	109.99	259
EX-J152	83.02	0	110.06	265
EX-J153	83.80	0	110.43	261
EX-J155	82.78	0	110.23	269
EX-J160	83.25	0	110.03	262
EX-J161	86.65	0	109.87	227
EX-J162	83.14	0	109.97	263
EX-J165	87.87	0	109.86	215
EX-J170	85.00	0	109.99	245
EX-J171	86.60	0	109.95	229
EX-J172	87.30	0	109.93	221
EX-J173	87.90	0	109.90	215
EX-J174	80.90	0	108.30	268
EX-J175	82.90	154	107.86	244
EX-J180	80.00	0	110.08	294

Scenerio: Fire at B074, Max Day + Fire Flow				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
EX-J181	85.12	0	108.76	231
EX-J182	84.87	0	108.57	232
EX-J183	78.90	0	110.91	313
EX-J184	86.62	0	109.38	223
EX-J190	80.80	0	110.08	287
EX-J191	81.60	0	110.08	279
EX-J192	79.40	0	110.11	301
EX-J194	81.70	0	110.07	278
EX-J200	81.00	0	110.02	284
EX-J201	81.10	0	110.03	283
EX-J202	80.30	0	110.01	291
EX-J203	80.50	0	109.92	288
EX-J204	80.30	0	109.92	290
EX-J205	80.40	0	109.92	289
EX-J210	79.40	0	109.95	299
EX-J211	80.10	0	110.00	293
EX-J212	80.10	0	110.00	293
EX-J213	82.50	0	109.92	268
EX-J214	88.50	0	109.87	209
EX-J215	86.10	0	109.90	233
EX-J220	80.60	0	109.92	287
EX-J221	83.66	0	110.39	262
EX-J222	83.90	0	110.40	259
EX-J223	83.90	0	110.45	260
EX-J224	81.50	0	110.45	283
EX-J225	82.80	0	110.58	272
EX-J230	83.57	0	110.49	263
EX-J231	83.25	0	110.03	262
EX-Unknown Demand Locations	79.10	1	110.04	303
P-J101	77.71	0	110.42	320
P-J102	78.62	0	110.41	311
P-J103	79.00	0	110.41	307
P-J104	80.11	0	110.40	296
P-J105	82.80	0	110.39	270
P-J106	82.87	0	110.39	269
P-J141	83.37	0	110.39	264
P-J200	82.25	0	108.84	260
P-J201	82.97	0	109.01	255
P-J202	85.40	0	109.40	235
P-J203	85.63	0	109.46	233
P-J204	85.65	0	109.51	233
P-J205	85.39	0	109.58	237
P-J206	83.93	0	109.88	254

APPENDIX B:
SANITARY CALCULATIONS

From *"CEF Master Servicing Plan Volume 1: Water System"* (March 2008)

Sanitary Sewer Design Sheet

Project Information:
Client: PWGSC
Project Number: 18-12987
Date: April 3, 2007

Design Parameters:
Manning n : 0.013
V-min = 0.60 (m/s)
V-Max = 3.00 (m/s)
Design for Full

		Daily	Units	Peaking Factor
Residential		350	L/cap.day	Harmon
Institutional		50,000	L/ha.day	1.5

AREA NUMBER	MANHOLE FROM	MANHOLE TO	INSTITUTIONAL INDIVIDUAL AREA ha	INSTITUTIONAL PEAKING FACTOR	INSTITUTIONAL PEAK FLOW L/s	DESIGN FLOW TOTAL PEAK FLOW L/s	DESIGN FLOW CUMULATIVE PEAK FLOW L/s	PROPOSED SEWER TYPE OF PIPE	LENGTH m	DIAMETER mm	INVERT FROM m	INVERT TO m	SLOPE %	CAPACITY L/s	FULL FLOW VELOCITY m/s	ACTUAL VELOCITY m/s	CAPACITY USED (%)
B21 & B20	S1	S2	0.762	1.5	0.661	0.661	0.661	PVC	85.9	200	79.000	78.150	0.99	32.626	1.039	0.413	2.0%
B22	BLDG 22	S3	0.209	1.5	0.181	0.181	0.181	PVC	43.6	200	78.418	78.280	0.32	18.452	0.587	0.188	1.0%
	S3	S4		1.5	0.000	0.000	0.181	PVC	78.7	200	78.250	78.000	0.32	18.486	0.588	0.188	1.0%
	S2	S4		1.5	0.000	0.000	0.661	PVC	37.5	200	78.120	78.000	0.32	18.554	0.591	0.278	3.6%
	S4	SMH564A	0	1.5	0.000	0.000	0.843	PVC	38.9	200	77.970	77.777	0.50	23.102	0.735	0.349	3.6%
B54, B55, B56, B57, B140, B50	S5	S6	0.892	1.5	0.774	0.774	0.774	PVC	120	200	83.300	80.900	2.00	46.384	1.476	0.554	1.7%
B49	S6	S7	0.087	1.5	0.076	0.076	0.850	PVC	90.6	200	80.870	79.960	1.00	32.871	1.046	0.447	2.6%
9	S7	S9	0.012	1.5	0.010	0.010	0.860	PVC	130	200	79.930	78.630	1.00	32.799	1.044	0.448	2.6%
B34, B36, B37, B39, B40, B45, B47, B48, B48A,	S8	S9	0.198	1.5	0.172	0.172	0.172	PVC	60.6	200	81.200	78.630	4.24	67.544	2.150	0.451	0.3%
10i	S9	S10		1.5	0.000	0.000	1.032	PVC	45	200	78.600	77.700	2.00	46.384	1.476	0.603	2.2%
11i	S10	S11		1.5	0.000	0.000	1.032	PVC	161	200	77.670	74.450	2.00	46.384	1.476	0.603	2.2%
12i	S11	S13		1.5	0.000	0.000	1.032	PVC	125	200	74.420	71.920	2.00	46.384	1.476	0.603	2.2%
B23, B26	S12	S13	0.17	1.5	0.148	0.148	0.148	PVC	201	200	80.160	71.920	4.10	66.408	2.114	0.425	0.2%
B2	S13	S15	0.026	1.5	0.023	0.023	1.202	PVC	169	200	71.890	70.560	0.79	29.096	0.926	0.456	4.1%
B1, B3, B4, B5, B6, B7, B12, B18, B19, B A	S14	S15	0.345	1.5	0.299	0.299	0.299	PVC	268	200	81.400	70.560	4.04	65.963	2.100	0.529	0.5%
	S15	S16		1.5	0.000	0.000	1.502	PVC	66	200	70.530	70.330	0.30	18.055	0.575	0.348	8.3%
B132-A	S16	S18	0.396	1.5	0.344	0.344	1.845	PVC	109	200	70.300	69.930	0.34	19.109	0.608	0.384	9.7%
B132-B	S17	S18	0.393	1.5	0.341	0.341	0.341	PVC	51	200	70.350	69.930	0.82	29.764	0.947	0.317	1.1%
	S18	SMH952	0	1.5	0.000	0.000	2.187	PVC	90	200	69.900	68.000	2.11	47.655	1.517	0.770	4.6%
						0.000											
B75, B85	S19	S21	0.092	1.5	0.080	0.080	0.080	PVC	103	200	84.520	82.460	2.00	46.384	1.476	0.276	0.2%
B59, B60	S20	S21	0.053	1.5	0.046	0.046	0.046	PVC	62	200	83.080	82.460	1.00	32.799	1.044	0.168	0.1%
19	S21	S23	0	1.5	0.000	0.000	0.126	PVC	400	200	82.430	77.230	1.30	37.396	1.190	0.273	0.3%
B72, B74, B139	S22	S23	0.113	1.5	0.098	0.098	0.098	PVC	77	200	78.000	77.230	1.00	32.799	1.044	0.232	0.3%
	S23	SMH511	0	1.5	0.000	0.000	0.224	PVC	55	200	77.200	76.650	1.00	32.799	1.044	0.298	0.7%
B95, B97, B98, B99	S24	S25	0.163	1.5	0.141	0.141	0.141	PVC	180	200	79.000	76.930	1.15	35.172	1.120	0.271	0.4%
B146	S25	S26	0.302	1.5	0.262	0.262	0.404	PVC	150	200	76.900	75.130	1.18	35.628	1.134	0.378	1.1%
B114, B143	S26	S28	0.28	1.5	0.243	0.243	0.647	PVC	98	200	75.100	73.930	1.19	35.837	1.141	0.438	1.8%
B106, B107, B108, B110, B111, B112, B113, B142	S27	S28	0.219	1.5	0.190	0.190	0.190	PVC	69	200	75.600	73.930	2.42	51.026	1.624	0.384	0.4%
B92	S28	S34	0.076	1.5	0.066	0.066	0.903	PVC	88	200	73.900	73.520	0.43	21.553	0.686	0.339	4.2%
B94	S29	S31	0.098	1.5	0.085	0.085	0.085	PVC	152	200	83.300	80.530	1.82	44.276	1.409	0.272	0.2%
B88	BLDG 88	S31	0.137	1.5	0.119	0.119	0.119	PVC	48	200	82.100	80.530	3.27	59.318	1.888	0.368	0.2%
B91A, NB, B76	S31	S33	0.138	1.5	0.120	0.120	0.324	PVC	66	200	80.500	78.030	3.74	63.450	2.020	0.527	0.5%
B91	S32	S33	0.103	1.5	0.089	0.089	0.089	PVC	50	200	79.790	78.030	3.52	61.535	1.959	0.327	0.1%
B78	S33	S34	0.103	1.5	0.089	0.089	0.503	PVC	104	200	78.000	73.520	4.31	68.073	2.167	0.634	0.7%
	S34	SMH106					1.405	Ex.	88	200	73.490	73.170	0.36	19.778	0.630	0.364	7.1%

1.202L/s + 0.299L/s = 1.5L/s

Table 2: Sanitary Sewer Computations for the Hospital

Drainage Area	From	To	Peak Flow Q (L/sec)	Sewer Data: Type of Pipe	Pipe Dia. nom. (mm)	Pipe Dia. actual (mm)	Slope* (%)	Length (m)	Capacity full (L/sec)	Velocity full (m/sec)	Velocity actual (m/sec)	Time of Flow (min)	Q(d) / Q(f)	REMARKS
Future Heart Institute	MHSA 58	MHSA 57	11.43	Transite	300	300	2.00	81.0	136.8	1.93	1.04	1.29	0.08	
	MHSA 57	MHSA 56	11.43	Transite	300	300	0.32	32.9	54.7	0.77	0.53	2.33	0.21	
Central Utility Plant	CAP	MHSA 56	3.95	Transite	200	200	1.00	7.5	32.8	1.04	0.62	0.20	0.12	
	MHSA 56	MHSA 55	15.38	Transite	300	300	0.32	32.6	54.7	0.77	0.56	3.31	0.28	
Area 51 (Podium)	CAP	MHSA 55	4.50	Transite	250	250	1.00	30.7	59.5	1.21	0.65	0.78	0.08	
	MHSA 55	MHSA 54	19.88	Transite	300	300	0.32	73.4	54.7	0.77	0.60	5.34	0.36	
Area 51 (Podium)	CAP	MHSA 54	4.50	Transite	250	250	1.00	30.9	59.5	1.21	0.65	0.79	0.08	
Central Utility Plant	CAP	MHSA 54	3.95	Transite	200	200	1.00	5.9	32.8	1.04	0.62	0.16	0.12	
	MHSA 54	MHSA 53	28.34	Transite	300	300	0.32	5.9	54.7	0.77	0.67	5.49	0.52	
	MHSA 53	MHSA 52	28.34	Transite	300	300	0.32	14.2	54.7	0.77	0.67	5.84	0.52	
	MHSA 52	MHSA 51	28.34	Transite	300	300	1.00	36.3	96.7	1.37	1.00	6.45	0.29	
	MHSA 51	MHSA 50	28.34	Transite	300	300	1.00	34.8	96.7	1.37	1.00	7.03	0.29	
	MHSA 50	MHSA 32	28.34	Transite	300	300	2.00	32.4	136.8	1.93	1.32	7.44	0.21	
	PRIVATE MHSA61507	MHSA 36	1.20	Transite	250	250	0.27	8.7	30.9	0.63	0.30	0.48	0.04	*Peak flow as per Central Experimental Farm Master Servicing Plan (2008)
	MHSA36	MHSA35	1.20	Transite	250	250	0.32	11.5	33.6	0.69	0.33	0.58	0.04	
	MHSA35	MHSA34	1.20	Transite	250	250	0.32	41.6	33.6	0.69	0.33	2.11	0.04	
	MHSA34	MHSA33	1.20	Transite	250	250	0.32	40.1	33.6	0.69	0.33	2.03	0.04	
	MHSA33	MHSA32	1.20	Transite	250	250	0.32	41.3	33.6	0.69	0.33	2.09	0.04	
	MHSA32	MHSA31	29.54	Transite	300	300	0.32	83.6	54.7	0.77	0.68	9.49	0.54	
	MHSA 31	MHSA 30	29.54	Transite	300	300	0.32	14.6	54.7	0.77	0.68	9.85	0.54	
Area 50 (Tower A)	CAP	MHSA 30	7.74	Transite	200	200	1.00	23.7	32.8	1.04	0.73	0.54	0.24	
	MHSA 30	MHSA 29	37.27	Transite	300	300	0.32	24.1	54.7	0.77	0.74	10.04	0.68	
	MHSA 29	MHSA 28	37.27	Transite	300	300	0.32	4.5	54.7	0.77	0.74	10.14	0.68	
Area 49 (Tower A)	CAP	MHSA 28	3.50	Transite	200	200	1.00	24.5	32.8	1.04	0.61	0.67	0.11	
	MHSA 28	MHSA 27	40.77	Transite	300	300	0.32	76.0	54.7	0.77	0.75	11.83	0.75	
	PRIVATE MHSA37473	MHSA 40	0.04	Transite	250	250	0.40	58.7	37.6	0.77	0.28	3.45	0.00	*Peak flow as per Central Experimental Farm Master Servicing Plan (2008)
	PRIVATE MHSA61492	MHSA40	0.26	Transite	250	250	4.22	48.3	122.2	2.49	0.92	0.87	0.00	*Peak flow as per Central Experimental Farm Master Servicing Plan (2008)
	MHSA 40	MHSA27	40.81	Transite	250	250	1.50	32.8	72.8	1.48	1.32	12.24	0.56	
	MHSA27	MHSA26	40.81	Transite	300	300	0.32	33.5	54.7	0.77	0.75	4.19	0.75	
	MHSA26	MHSA25	40.81	Transite	300	300	0.32	39.1	54.7	0.77	0.75	1.74	0.75	
Area 48 (Tower A)	CAP	MHSA 25	3.17	Transite	200	200	1.00	14.0	32.8	1.04	0.60	0.39	0.10	
	MHSA 25	MHSA 24	43.98	Transite	375	375	0.32	34.7	99.2	0.90	0.75	13.02	0.44	
	MHSA 24	MHSA 23A	43.98	Transite	375	375	0.32	27.1	99.2	0.90	0.75	13.63	0.44	
Area 56 (Lollipop Parking Garage)	CAP	MHSA 23A	1.26	Transite	150	150	2.00	24.4	21.5	1.22	0.61	0.67	0.06	
	MHSA 23A	MHSA 23	45.25	Transite	375	375	0.32	57.9	99.2	0.90	0.75	14.91	0.46	
Area 55 (Pavilion)	CAP	MHSA 23	1.05	Transite	150	150	1.00	50.5	15.2	0.86	0.46	1.84	0.07	
	MHSA 23	MHSA 22	46.30	Transite	375	375	0.32	9.0	99.2	0.90	0.75	15.11	0.47	
	MHSA 22	MHSA 21	46.30	Transite	375	375	0.32	42.2	99.2	0.90	0.75	16.04	0.47	
	MHSA 21	MHSA 20	46.30	Transite	375	375	0.32	41.1	99.2	0.90	0.75	16.95	0.47	
Area 54 (Tower B)	CAP	MHSA 20	2.51	Transite	200	200	1.00	5.3	32.8	1.04	0.56	0.16	0.08	
	MHSA 20	MHSA 11	48.81	Transite	375	375	1.00	31.3	175.3	1.59	1.14	17.41	0.28	
Area 52 (Podium/Tower B)	CAP	MHSA 14	5.96	Transite	250	250	1.00	30.5	59.5	1.21	0.69	0.74	0.10	
	MHSA 14	MHSA 13	5.96	Transite	300	300	0.32	72.4	54.7	0.77	0.45	2.69	0.11	
Area 53 (Tower B)	CAP	MHSA 13	2.43	Transite	200	200	1.00	27.3	32.8	1.04	0.55	0.82	0.07	
	MHSA 13	MHSA 12	8.39	Transite	300	300	0.32	51.6	54.7	0.77	0.48	4.48	0.15	
	MHSA 12	MHSA 11	8.39	Transite	300	300	0.32	53.1	54.7	0.77	0.48	6.32	0.15	
	MHSA 11	MHSA 10	57.19	Transite	375	375	0.32	21.9	99.2	0.90	0.81	17.86	0.58	
	MHSA 10	CAP	57.19	Transite	375	375	1.00	10.3	175.3	1.59	1.21	18.00	0.33	

Manning's n = 0.013
* Min slope for cleansing velocities is 0.32%

Design: SS
Check: SM
Date: October 2023

Project Name: New Civic Development Hospital
Parsons Project #: 477458

APPENDIX C:
STROM CALCULATIONS

PCSWMM Report

24 Hour - 5 Year Storm

Model Partial Green Roof_21092023.inp

Parsons

September 22, 2023

Table of Contents

Summary 1: Runoff quantity continuity

Name	Partial Green Roof_21092023	Partial Green Roof_21092023
Initial LID storage (mm)	0.270	0.270
Initial snow cover (mm)	n/a	n/a
Total precipitation (mm)	106.607	64.034
Outfall runon (mm)	n/a	n/a
Evaporation loss (mm)	0.000	0.000
Infiltration loss (mm)	39.495	29.853
Surface runoff (mm)	61.573	30.651
LID drainage (mm)	2.823	0.893
Snow removed (mm)	n/a	n/a
Final snow cover (mm)	n/a	n/a
Final storage (mm)	3.032	2.927
Continuity error (%)	-0.043	-0.031

Summary 2: Flow routing continuity

Name	Partial Green Roof_21092023	Partial Green Roof_21092023
Dry weather inflow (ML)	0.000	0.000
Wet weather inflow (ML)	24.119	11.814
Groundwater inflow (ML)	0.000	0.000
RDII inflow (ML)	0.000	0.000
External inflow (ML)	1.151	1.151
External outflow (ML)	25.876	12.906
Flooding loss (ML)	0.002	0.000
Evaporation loss (ML)	0.000	0.000
Exfiltration loss (ML)	0.000	0.000
Initial stored volume (ML)	0.000	0.000
Final stored volume (ML)	0.961	0.219
Continuity error (%)	-6.214	-1.235

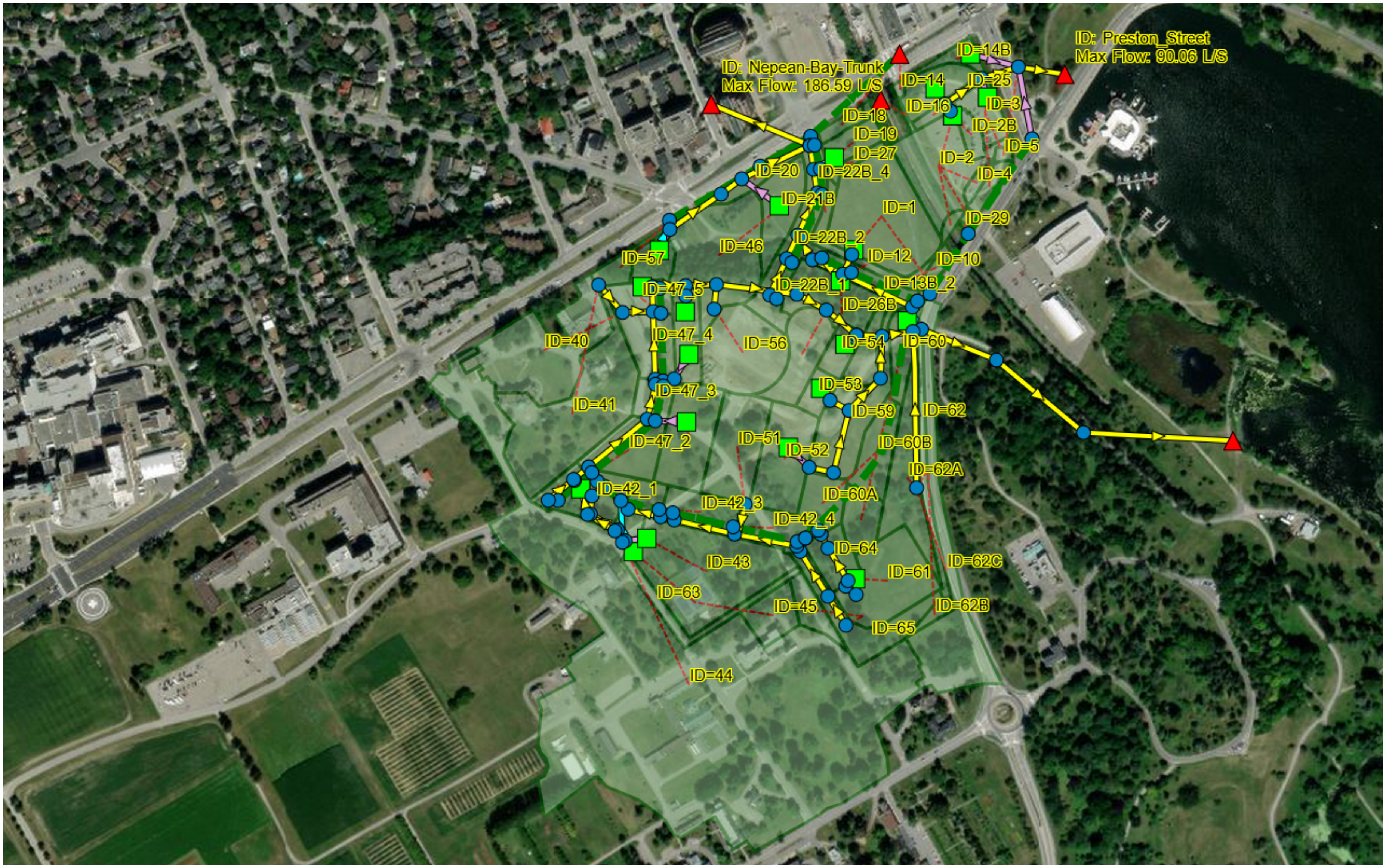


Figure 1: Extent 1

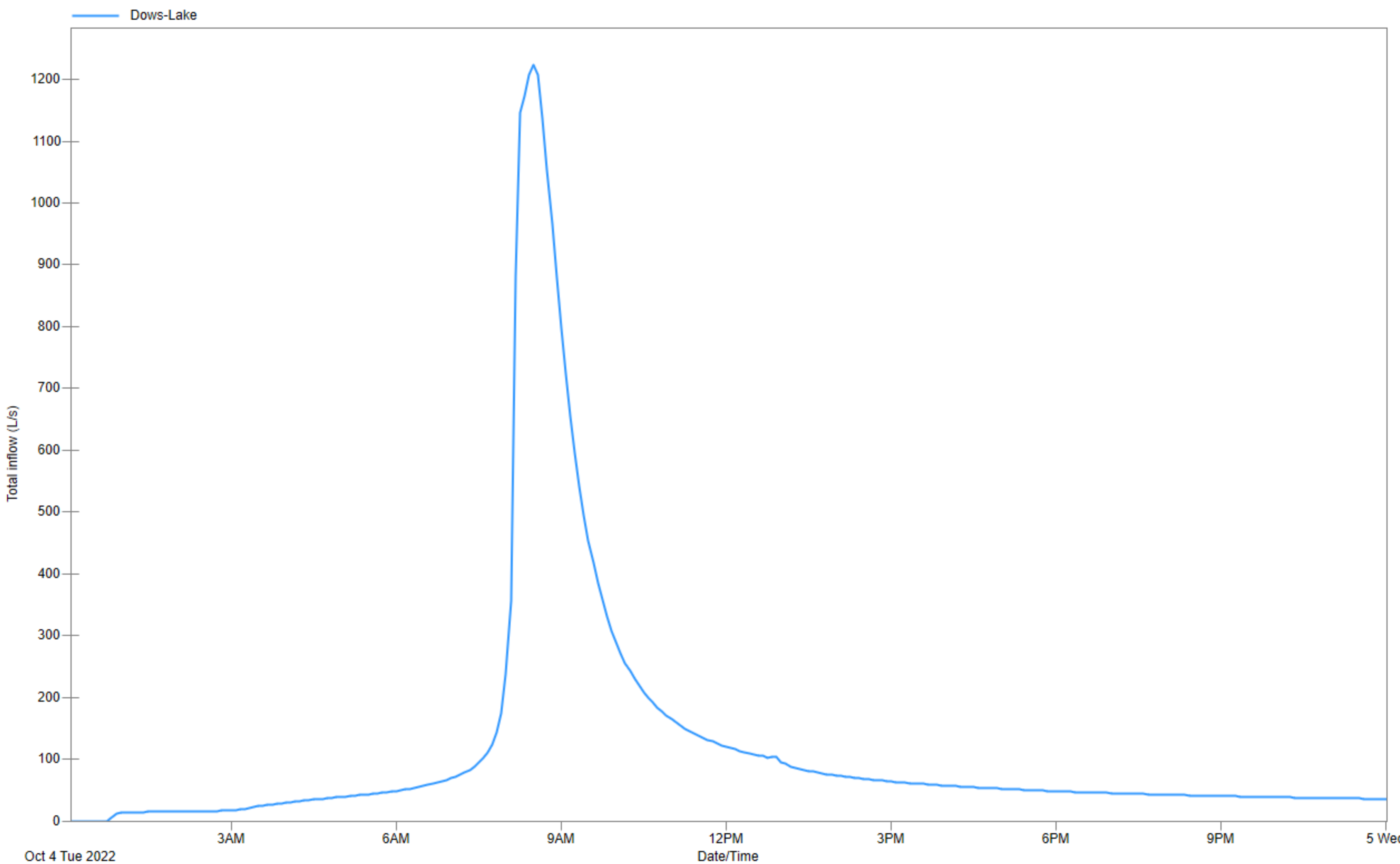


Figure 2: Dows Lake Outfall

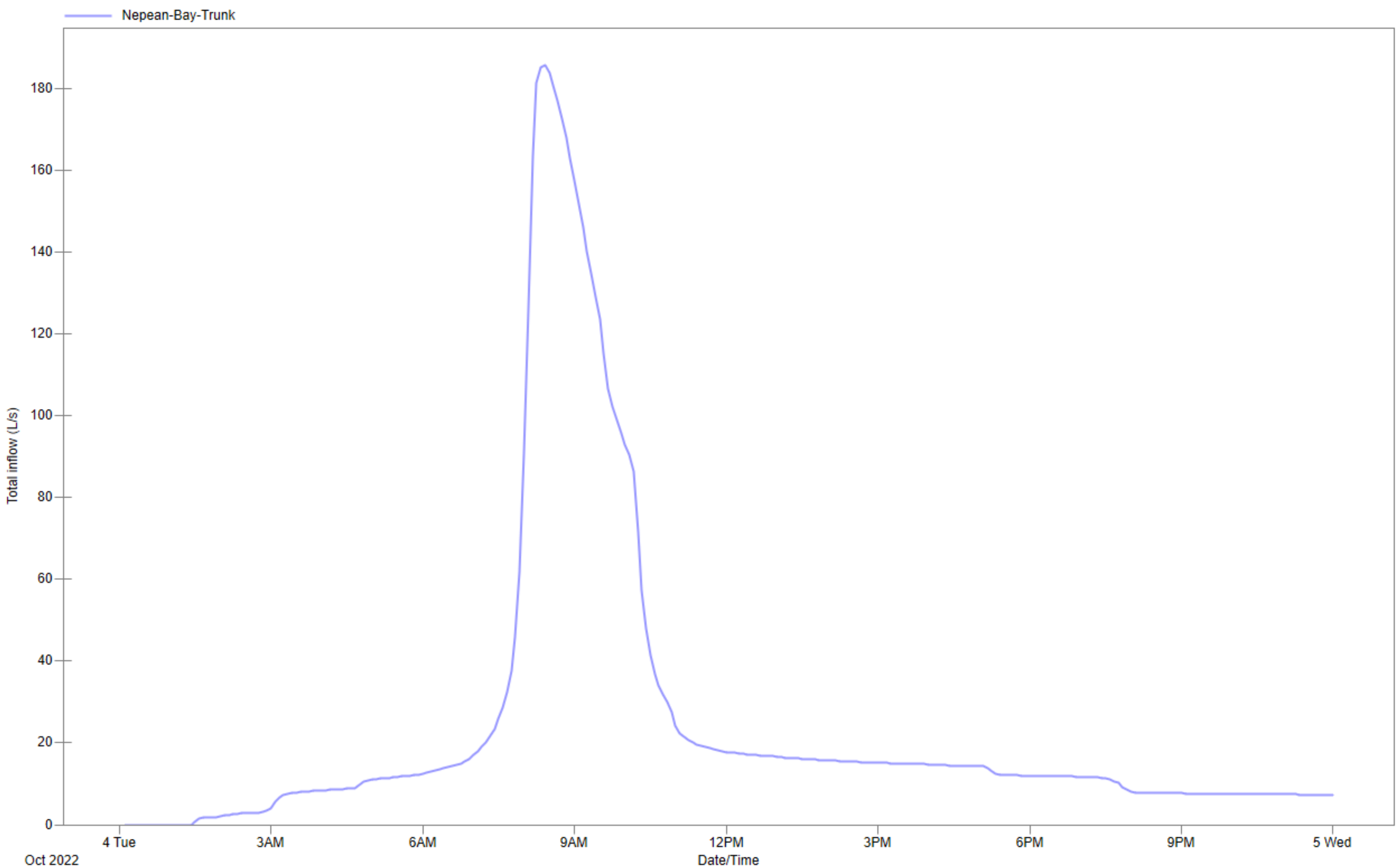


Figure 3: Nepean Bay Outfall

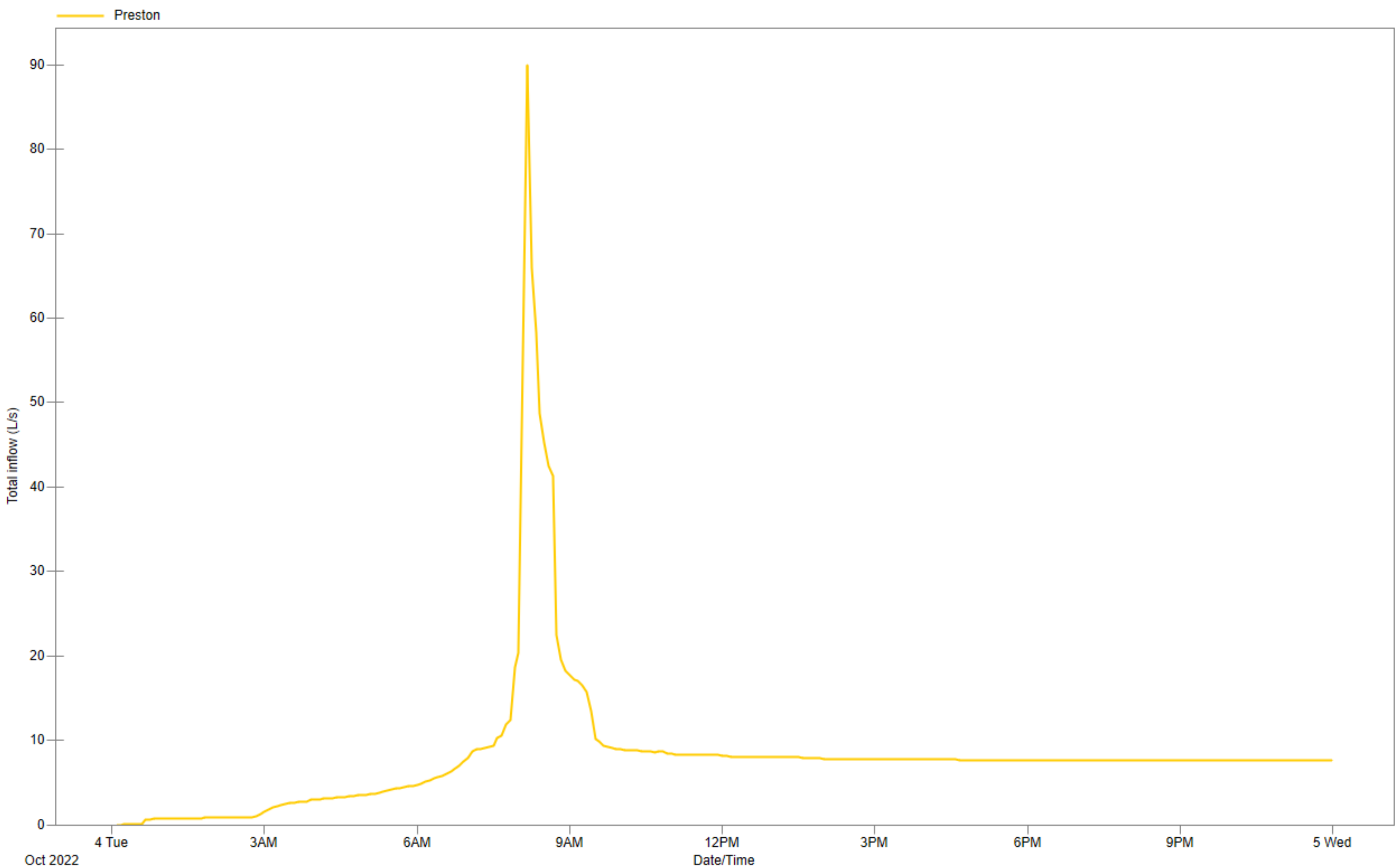


Figure 4: Preston Outfall

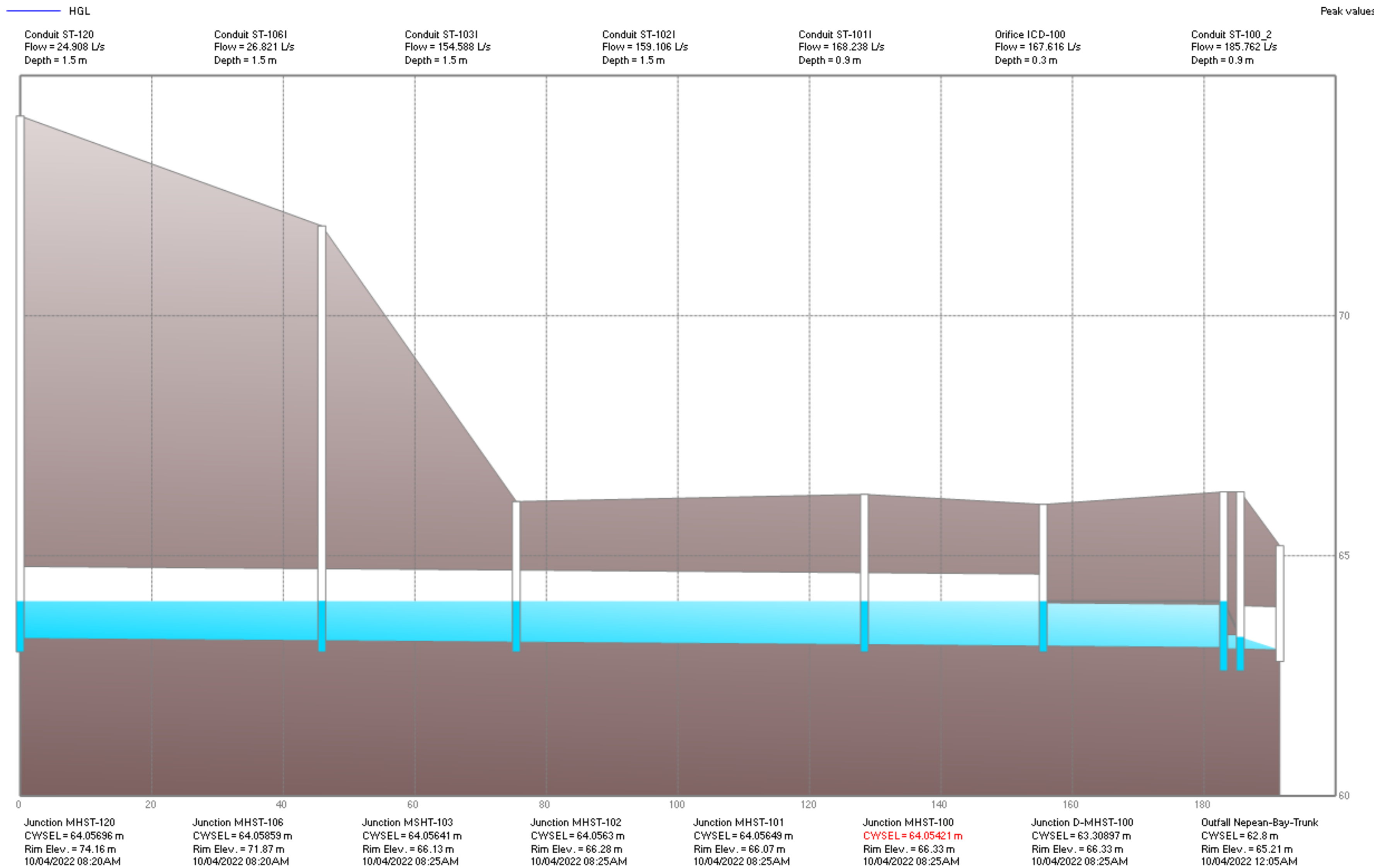


Figure 5: Road A

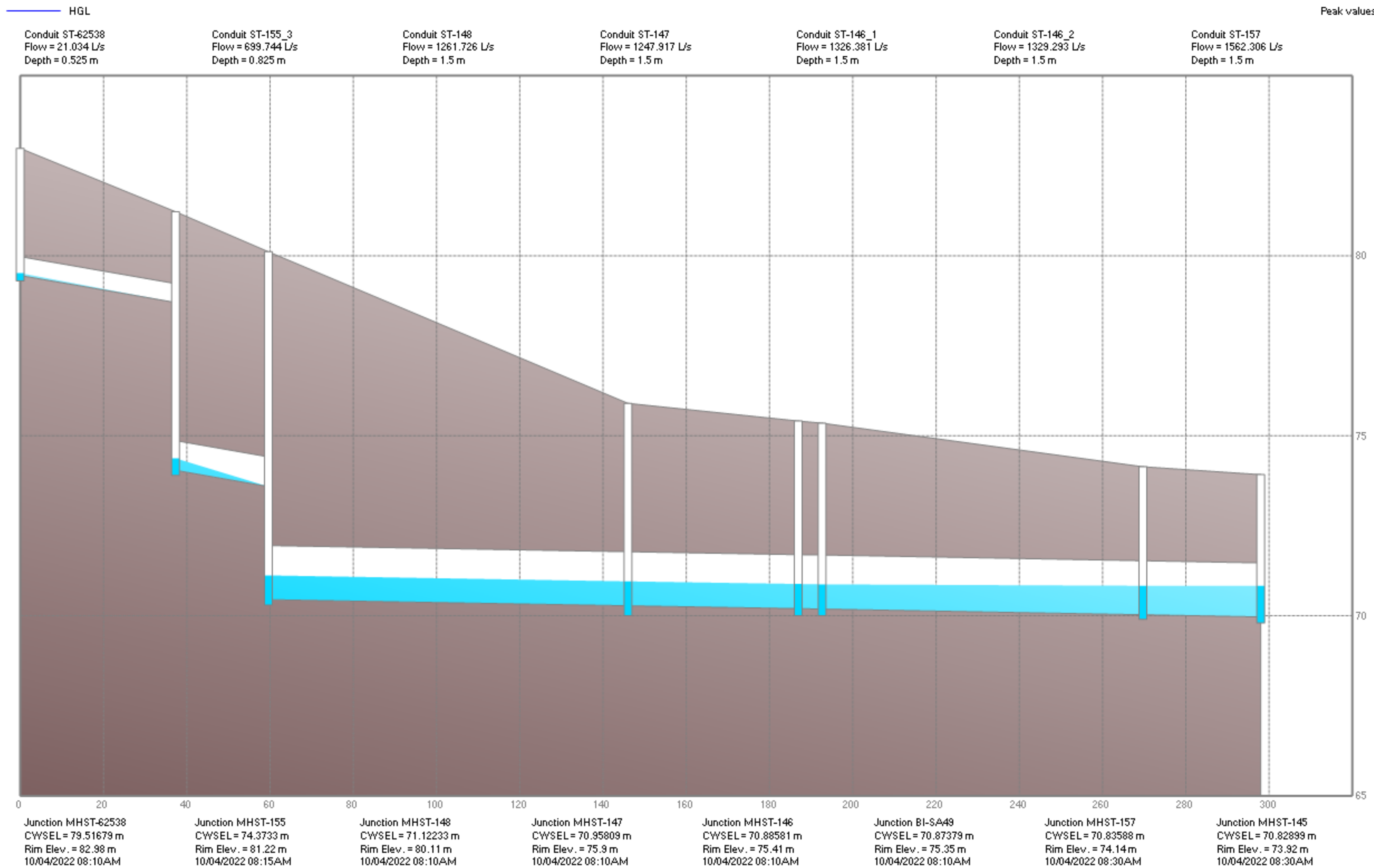


Figure 6: Road D

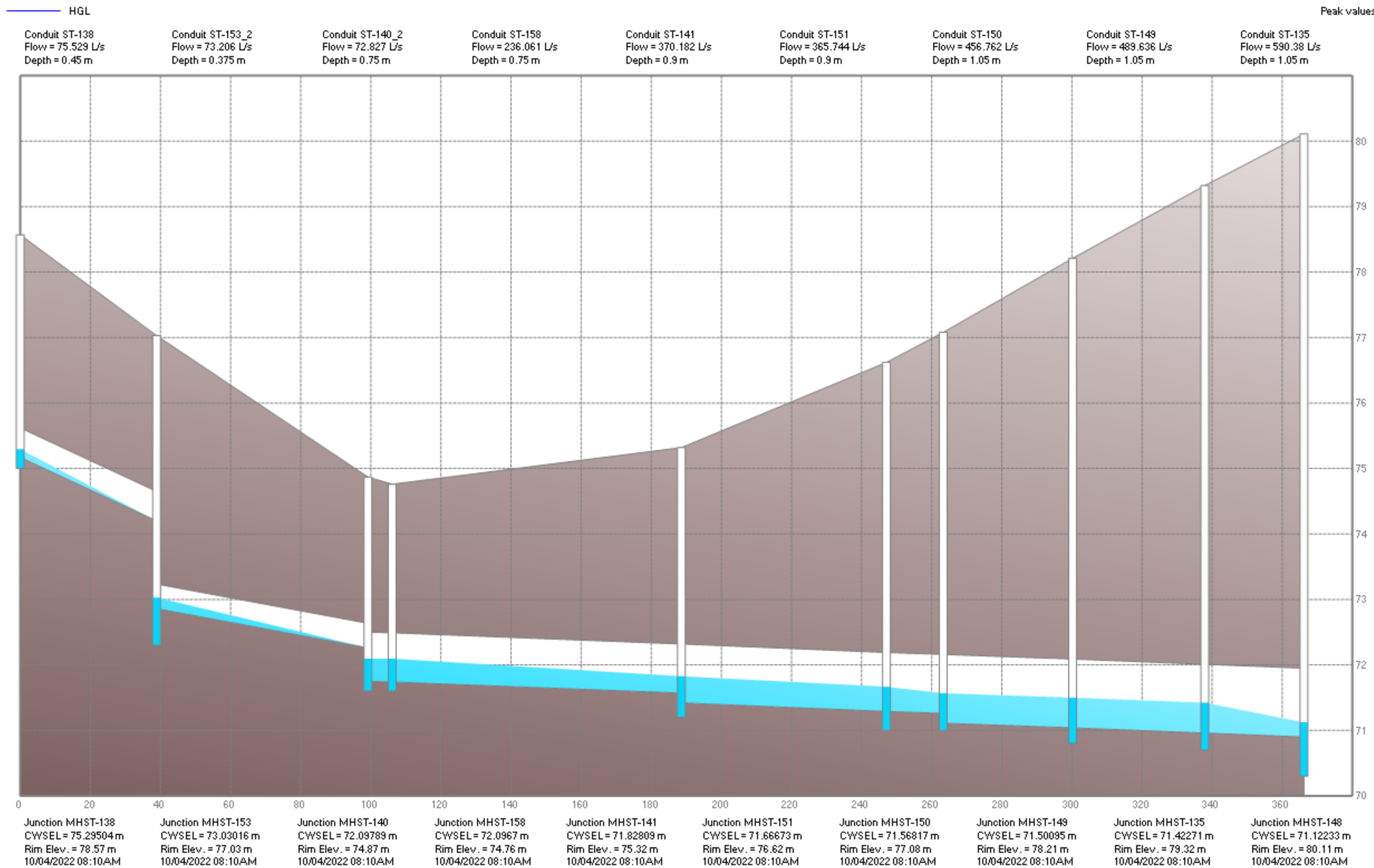


Figure 7: Road E

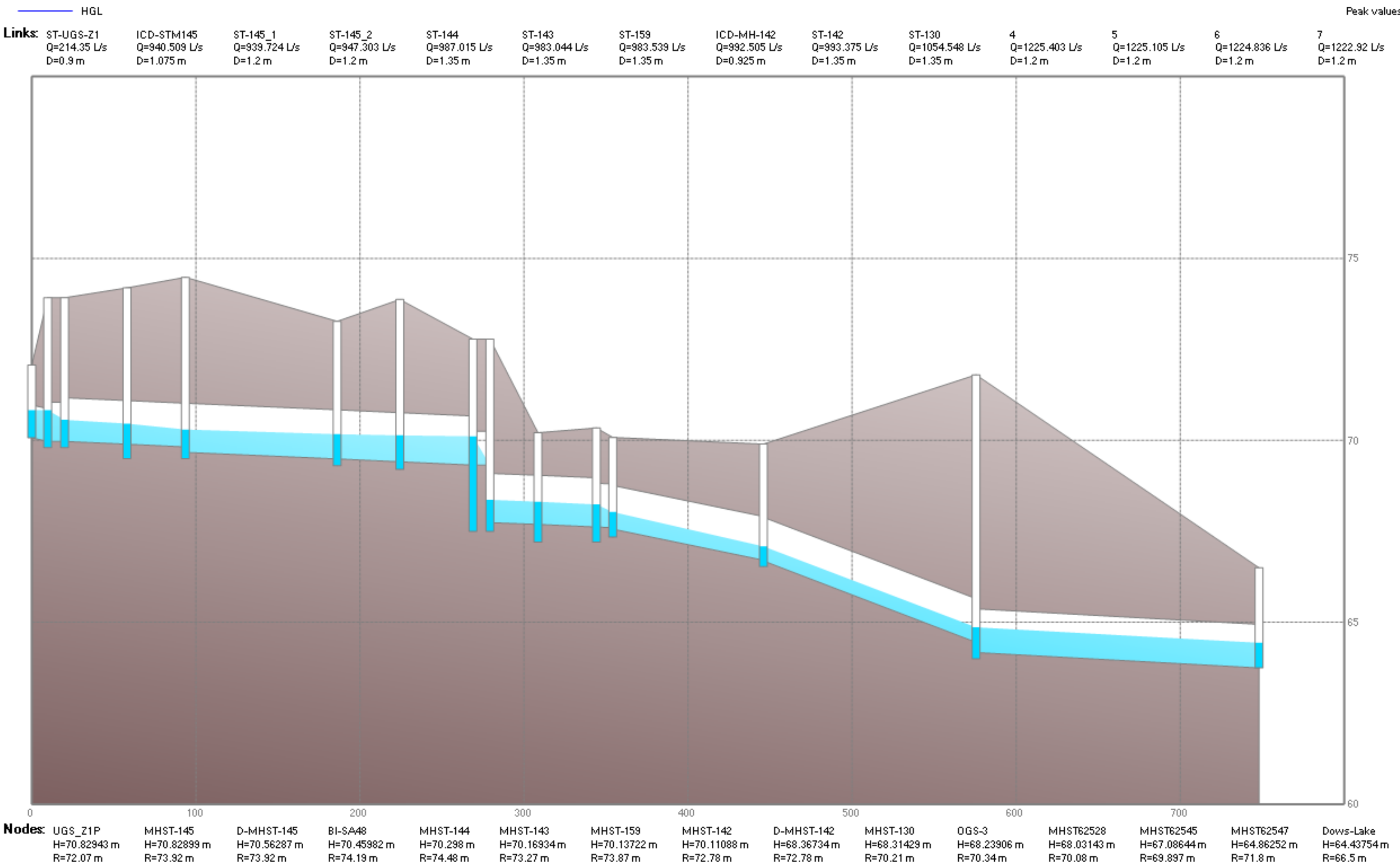


Figure 8: Road D to Outfall

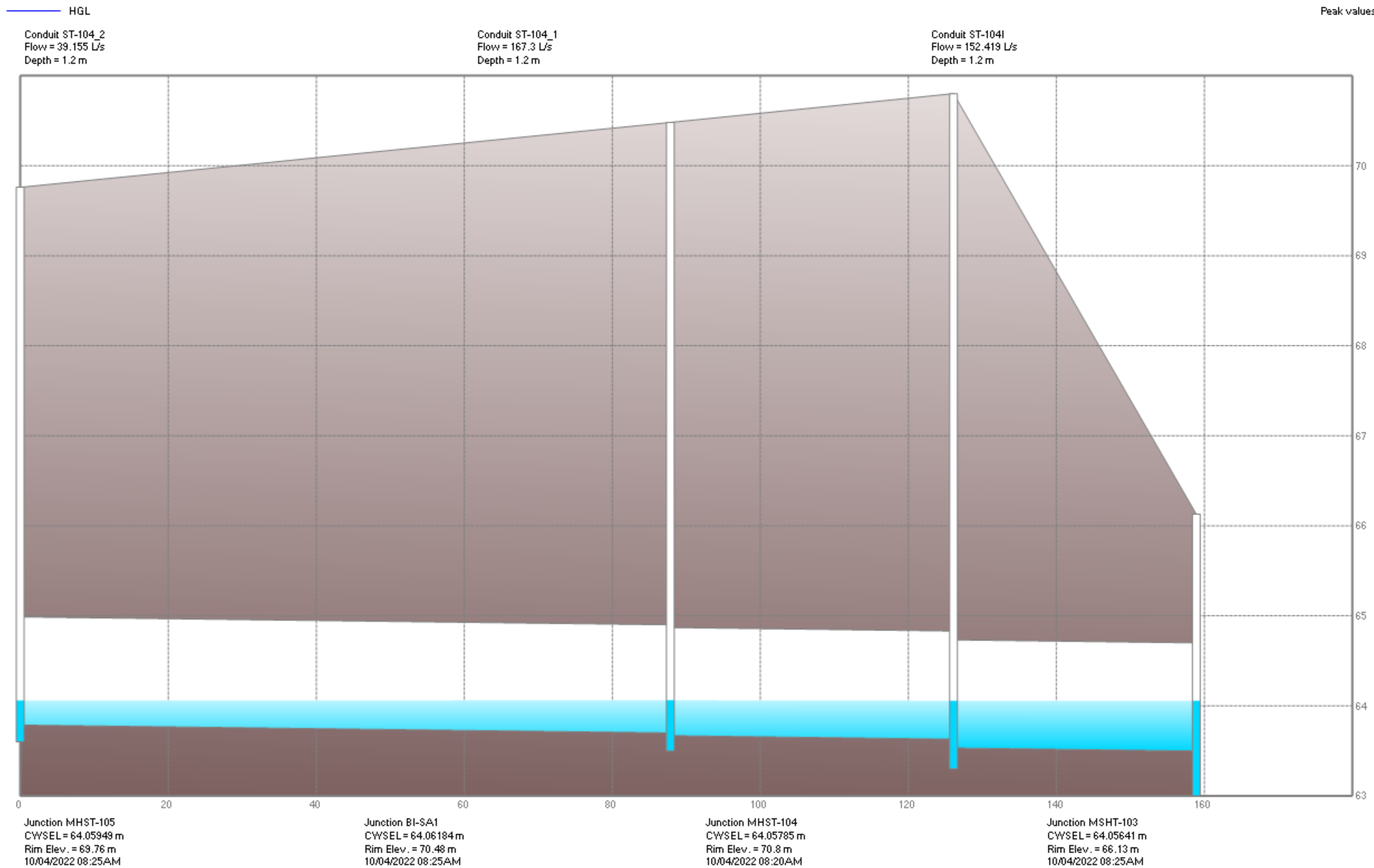


Figure 9: Road B

Table 1: Orifices

Name	Inlet Node	Outlet Node	Type	Cross-Section	Height (m)	Inlet Elev. (m)	Discharge Coeff.	Max. |Flow| (L/s)	Contributing Area (ha)	Contributing Imp. Area (ha)
ICD-100	MHST-100	D-MHST-100	SIDE	CIRCULAR	0.3	63.06	0.62	168.43	3.573	2.474
ICD11	D-MHST-155	MHST-155	SIDE	CIRCULAR	0.65	74.1	0.62	691.23	12.745	4.086
ICD-MH-142	MHST-142	D-MHST-142	SIDE	CIRCULAR	0.925	69.32	0.62	994.48	24.915	10.849
ICD-STM145	MHST-145	D-MHST-145	SIDE	CIRCULAR	1.075	69.97	0.62	943.67	23.279	9.629
ICD-STM64	MHST-170	DMHST-170	SIDE	CIRCULAR	0.15	71.96	0.62	36.85	0.826	0.539
ST-UGS4	UGS_Z4P	CBMHST-102	SIDE	CIRCULAR	0.15	73.17	0.65	29.59	0.658	0.408

Table 2: Conduits

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
1	MHST-158-S	S-60	295	0.035	74.95	68.89	TRIANGULAR	0.5	0.02055	0	0
10	CBMHST105	CBMHST103	17.6	0.013	72.4	72.13	CIRCULAR	0.3	0.01534	30.74	1.24
11	CBMHST-102	CBMHST105	43.6	0.013	73.02	72.43	CIRCULAR	0.3	0.01353	29.59	1.32
2	MHST-105-S	Wales-OLF-N03	17	0.016	69.86	68.2	IRREGULAR	0	0.09812	0	0
3	Preston	Preston_Street	10	0.013	61.03	60.9	CIRCULAR	0.3	0.013	90.06	1.74
4	OGS-3	MHST62528	10	0.013	67.62	67.6	CIRCULAR	1.2	0.002	1225.53	2.12
5	MHST62528	MHST62545	91.8	0.013	67.56	66.707	CIRCULAR	1.2	0.00929	1225.57	2.97
6	MHST62545	MHST62547	129.6	0.013	66.687	64.45	CIRCULAR	1.2	0.01726	1225.53	3.67
7	MHST62547	Dows-Lake	172.5	0.013	64.17	63.745	CIRCULAR	1.2	0.00246	1225.23	1.81
8	POW_D1	OGS-3	180	0.035	78.7	69.7	TRAPEZOIDAL	0.55	0.05006	210.79	1.27
8_1	UGS_Exp_Farm	D-MHST-155	3.1	0.013	74.12	74.1	CIRCULAR	0.825	0.00645	691.23	1.29
9	CBMHST103	UGS_Z6BP	2.6	0.013	72.1	72.07	CIRCULAR	0.375	0.01154	30.78	0.9
CA-OLF_2	Carling_OLF1	Carling_OLFN1	120.425	0.016	66.5	65.408	IRREGULAR	0	0.00907	28.49	0.46
CA-OLF_3	Carling_OLFN3	Carling_OLF	66.467	0.016	64.8	64.6	IRREGULAR	0	0.00301	43.47	0.44
CA-OLF_4	Carling_OLFN1	Carling_OLFN3	67.075	0.016	65.408	64.8	IRREGULAR	0	0.00906	58.08	0.67

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
CA-STM	IN119607	D-MHST-100	86	0.013	63.1	62.8	CIRCULAR	0.3	0.00349	18.35	0.28
ST-100_2	D-MHST-100	Nepean-Bay-Trunk	6	0.013	63.06	63.04	CIRCULAR	0.9	0.00333	186.59	1.31
ST-100-S	MHST-100-S	Carling_OLFN3	11	0.013	66.33	64.8	IRREGULAR	0	0.14046	0	0
ST-101I	MHST-101	MHST-100	27.419	0.013	63.12	63.09	CIRCULAR	0.9	0.00109	169.26	0.49
ST-101I-S	MHST-101-S	MHST-100-S	27.419	0.013	66.07	66.33	IRREGULAR	0	-0.00948	0	0
ST-102	CBMHST-101	UGS_Z4P	10	0.013	73.37	73.17	CIRCULAR	0.375	0.02	6.06	0.15
ST-102I	MHST-102	MHST-101	27.18	0.013	63.15	63.12	CIRCULAR	1.5	0.0011	161.07	0.39
ST-102I-S	MHST-102-S	MHST-101-S	27.18	0.013	66.28	66.07	IRREGULAR	0	0.00773	11.6	0.15
ST-103I	MSHT-103	MHST-102	52.936	0.013	63.203	63.15	CIRCULAR	1.5	0.001	162.67	0.46
ST-103I-S	MSHT-103-S	MHST-102-S	52.936	0.013	66.13	66.28	IRREGULAR	0	-0.00283	7.02	0.14
ST-104	CBMHST-104	CBMHST-101	15.1	0.013	74.14	73.84	CIRCULAR	0.3	0.01987	0	0
ST-104_1	BI-SA1	MHST-104	38.268	0.013	63.67	63.631	CIRCULAR	1.2	0.00102	167.44	1.02
ST-104_2	MHST-105	BI-SA1	87.842	0.013	63.788	63.7	CIRCULAR	1.2	0.001	40.72	0.3
ST-104I	MHST-104	MSHT-103	32.803	0.013	63.533	63.5	CIRCULAR	1.2	0.00101	171.06	0.99
ST-105I_1-S	BI-SA1-S	MHST-105-S	87.84	0.013	70.484	69.76	IRREGULAR	0	0.00824	52.6	0.55
ST-105I_2-S	MHST-104-S	BI-SA1-S	37.727	0.013	70.8	70.484	IRREGULAR	0	0.00838	19.87	0.29
ST-106I	MHST-106	MSHT-103	29.577	0.013	63.233	63.203	CIRCULAR	1.5	0.00101	38.74	0.09
ST-106I-S	MHST-106-S	MSHT-103-S	29.577	0.013	71.87	66.13	IRREGULAR	0	0.19783	42.93	0.93
ST-107	DMHST-170	MHST-158	13.5	0.013	71.93	71.8	CIRCULAR	0.3	0.00963	69.63	1.22
ST-108	CBMH108	CBMH109	35.7	0.013	71.56	71.49	CIRCULAR	0.6	0.00196	76.71	0.85
ST-109	CBMH109	CBMH110	20.8	0.013	71.49	71.45	CIRCULAR	0.6	0.00192	76.71	0.91
ST-110	CBMH110	MHST-135	17.9	0.013	71.45	71.41	CIRCULAR	0.6	0.00223	76.71	1.03
ST-111	CBMH111	CBMH108	15.3	0.013	71.59	71.56	CIRCULAR	0.6	0.00196	76.71	0.83
ST-120	MHST-120	MHST-106	45.853	0.013	63.278	63.233	CIRCULAR	1.5	0.00098	37	0.15
ST-120-S	MHST-120-S	MHST-106-S	45.853	0.013	74.16	71.87	IRREGULAR	0	0.05	29.83	0.88
ST-130	MHST-130	OGS-3	35.6	0.013	67.69	67.62	CIRCULAR	1.35	0.00197	1059.45	1.68
ST-131	MHST-131	MHST-130	47.9	0.013	68.16	68.11	CIRCULAR	0.825	0.00104	200.28	1.15

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-132	MHST-132	MHST-156	41.629	0.013	73.35	72.72	CIRCULAR	0.45	0.01514	97.2	1.89
ST-133	MHST-133	MHST-131	51.32	0.013	68.21	68.16	CIRCULAR	0.825	0.00097	201.84	0.94
ST-135	MHST-135	MHST-148	28.3	0.013	70.96	70.9	CIRCULAR	1.05	0.00212	609.57	1.71
ST-138	MHST-138	MHST-153	38.9	0.013	75.17	74.2	CIRCULAR	0.45	0.02494	75.97	2.11
ST-139	MHST-139	MHST-133	72.952	0.013	68.35	68.28	CIRCULAR	0.75	0.00096	27.96	0.47
ST-140_2	MHST-140	MHST-158	6.9	0.013	71.75	71.74	CIRCULAR	0.75	0.00145	74.92	0.41
ST-141	MHST-141	MHST-151	58.5	0.013	71.42	71.29	CIRCULAR	0.9	0.00222	379.98	1.4
ST-141-S	MHST-151-S	MHST-141-S	70.7	0.013	76.58	75.32	IRREGULAR	0	0.01782	156.81	0.93
ST-142	D-MHST-142	MHST-130	29.3	0.013	67.74	67.69	CIRCULAR	1.35	0.00171	995.2	1.56
ST-143	MHST-143	MHST-159	38.2	0.013	69.49	69.41	CIRCULAR	1.35	0.00209	987.21	1.34
ST-144	MHST-144	MHST-143	92.5	0.013	69.67	69.49	CIRCULAR	1.35	0.00195	988.98	1.46
ST-145_1	D-MHST-145	BI-SA48	38	0.013	69.97	69.894	CIRCULAR	1.2	0.002	943.61	1.74
ST-145_2	BI-SA48	MHST-144	35.6	0.013	69.894	69.82	CIRCULAR	1.2	0.00208	951.29	1.89
ST-146_1	MHST-146	BI-SA49	5.7	0.013	70.2	70.189	CIRCULAR	1.5	0.00193	1443.13	1.76
ST-146_1-S	MHST-146-S	BI-SA49-S	5.693	0.013	75.44	75.351	IRREGULAR	0	0.01564	65.01	0.62
ST-146_2	BI-SA49	MHST-157	77.1	0.013	70.189	70.03	CIRCULAR	1.5	0.00206	1474.83	1.83
ST-146_2-S	BI-SA49-S	MHST-157-S	77.118	0.013	75.351	74.14	IRREGULAR	0	0.01571	41.78	0.42
ST-147	MHST-147	MHST-146	40.9	0.013	70.28	70.2	CIRCULAR	1.5	0.00196	1367.51	1.68
ST-147-S	MHST-147-S	MHST-146-S	40.768	0.013	75.9	75.44	IRREGULAR	0	0.01128	69.65	0.56
ST-148	MHST-148	MHST-147	86.4	0.013	70.45	70.28	CIRCULAR	1.5	0.00197	1344.22	1.67
ST-148-S	MHST-148-S	MHST-147-S	93.313	0.013	80.11	75.9	IRREGULAR	0	0.04516	37.36	0.47
ST-149	MHST-149	MHST-135	37.7	0.013	71.04	70.96	CIRCULAR	1.05	0.00212	504.12	1.36
ST-149-S	MHST-135-S	MHST-149-S	34.9	0.013	79.32	78.21	IRREGULAR	0	0.03182	70.43	0.67
ST-150	MHST-150	MHST-149	36.9	0.013	71.11	71.04	CIRCULAR	1.05	0.0019	464.87	1.26
ST-150-S	MHST-149-S	MHST-150-S1	45	0.013	78.21	77.08	IRREGULAR	0	0.02512	108.49	0.59
ST-151	MHST-151	MHST-150	16.2	0.013	71.29	71.26	CIRCULAR	0.9	0.00185	379.99	1.54
ST-151-S	MHST-150-S1	MHST-151-S	16.1	0.013	77.08	76.58	IRREGULAR	0	0.03107	158.63	1.06

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-153_2	MHST-153	MHST-140	60.3	0.013	72.86	72.26	CIRCULAR	0.375	0.00995	74.93	1.52
ST-154	MHST-154	UGS_Exp_Farm	16	0.013	75.8	75.72	CIRCULAR	0.9	0.005	1374.49	2.58
ST-155_2-S	D-MHST-155-S	MHST-148-S	52.7	0.013	83.11	80.11	IRREGULAR	0	0.05702	6.54	0.26
ST-155_3	MHST-155	MHST-148	22.3	0.013	74.04	73.59	CIRCULAR	0.825	0.02018	699.98	3.46
ST-156	MHST-156	MHST-157	34.6	0.013	70.1	70.03	CIRCULAR	1.5	0.00202	283.85	0.56
ST-157	MHST-157	MHST-145	28.3	0.013	70.03	69.97	CIRCULAR	1.5	0.00212	1687.39	2.17
ST-157-S	MHST-157-S	MHST-145-S	28.171	0.013	74.14	73.92	IRREGULAR	0	0.00781	60.75	0.37
ST-158	MHST-158	MHST-141	82.5	0.013	71.74	71.57	CIRCULAR	0.75	0.00206	242.43	1.3
ST-158-S	MHST-141-S	MHST-158-S	75.107	0.013	75.32	74.85	IRREGULAR	0	0.00626	96.83	0.56
ST-159	MHST-159	MHST-142	44.6	0.013	69.41	69.32	CIRCULAR	1.35	0.00202	986.63	1.19
ST-62534	MHST-62534	MHST-62537	15.4	0.013	76.18	76.1	CIRCULAR	0.9	0.00519	1374.53	2.59
ST-62537	MHST-62537	MHST-154	35.9	0.013	76.04	75.86	CIRCULAR	0.9	0.00501	1372.57	2.56
ST-62538	MHST-62538	MHST-155	37.3	0.013	79.45	78.7	CIRCULAR	0.525	0.02011	21.1	1.32
ST-G107	MHST-107	OGS1	52.5	0.013	62.03	61.24	CIRCULAR	0.3	0.01505	21.69	1.14
ST-OGS1_2	OGS1	Preston	10	0.013	61.21	61.06	CIRCULAR	0.3	0.015	57.09	1.61
ST-P3	DICB3	IN119608	71.1	0.013	64.23	63.8	CIRCULAR	0.2	0.00605	14.46	0.86
ST-P46	IN119608	IN119607	30	0.013	63.5	63.2	CIRCULAR	0.2	0.01	14.46	0.98
ST-SA1	MH-SA1	BI-SA1	24.65	0.013	69.45	69.08	CIRCULAR	0.3	0.01501	60.2	1.71
ST-SA48	MH-SA48	BI-SA48	10.8	0.013	71.91	71.8	CIRCULAR	0.3	0.01019	7.72	0.82
ST-SA49	MH-SA49	BI-SA49	21	0.013	72.5	72.29	CIRCULAR	0.3	0.01	7.91	0.83
ST-SA51	MH-SA51	MHST-141	32.6	0.013	73.5	71.7	CIRCULAR	0.375	0.0553	6.07	1.35
ST-SA52	MH-SA52	MHST-139	28.6	0.013	68.86	68.57	CIRCULAR	0.525	0.01014	22.96	1.06
ST-SA53	MH-ST53	MHST-133	24.9	0.013	68.98	68.73	CIRCULAR	0.3	0.01004	8.02	0.83
ST-SA54	MH-SA54	MHST-142	2.5	0.013	70.66	70.64	CIRCULAR	0.3	0.008	7.98	0.76
ST-Sa56	MH-SA56	MHST-144	27	0.013	71.84	71.57	CIRCULAR	0.45	0.01	241.17	2.02
ST-UGS6B	UGS_Z6BP	MHST-170	10.6	0.013	72.07	71.96	CIRCULAR	0.3	0.01038	69.87	0.99
ST-UGS-Z1	UGS_Z1P	MHST-145	9.7	0.013	70.07	69.97	CIRCULAR	0.9	0.01031	1188.88	3.35

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-xx	MH-SAxx	MHST-107	10.7	0.013	62.45	62.15	CIRCULAR	0.2	0.02805	7.01	1.21
WD-OLF_3	Wales-OLF-N03	Wales-OLF-N04	81.193	0.016	68.2	66.75	IRREGULAR	0	0.01786	13.22	0.58
WD-OLF_4	Wales-OLF-N04	Wales-OLF-N05	94.991	0.016	66.75	65.5	IRREGULAR	0	0.01316	13.54	0.61

Table 3: Storages

Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)	Hours Flooded (h)	Max. Flood Rate (L/s)	Total Flood Vol. (ML)	Avg. Percent Full (%)	Max. Volume (1000 m^3)	Max. Percent Full (%)	Max. Outflow (L/s)
R-48	73	73.1	0.1	0.03	73.03	39.7	0	0	0	5	0.033	26	7.72
R-49	74	74.1	0.1	0.03	74.03	47.09	0	0	0	6	0.042	26	7.91
R-50	77	77.1	0.1	0.02	77.02	95.14	0	0	0	4	0.076	22	22.24
R-52	69	69.1	0.1	0.02	69.02	108.26	0	0	0	4	0.092	23	22.96
R-53	70	70.1	0.1	0.03	70.03	49.78	0	0	0	6	0.045	27	8.02
R-54	72	72.1	0.1	0.03	72.03	49.54	0	0	0	6	0.045	27	7.98
S-14B	61.65	63.3	1.65	1.51	63.16	23	0	0	0	1	0.001	5	18.84
S-15	62.1	63.9	1.8	1.48	63.58	30.94	0	0	0	1	0.017	16	7.16
S-19	64	66	2	1.54	65.54	24.94	0	0	0	0	0.014	5	3.65
S-21B	63.54	65.7	2.16	1.67	65.21	105.79	0	0	0	4	0.142	11	3.81
S-26B	67.33	69.62	2.29	1.96	69.29	64.06	0	0	0	2	0.052	15	8.22
S-3	62.2	64.24	2.04	1.66	63.86	63.65	0	0	0	1	0.018	22	23.89
S-58	64.93	66.95	2.02	1.96	66.89	72.87	0	0	0	1	0.038	16	14.46
S-60	67.69	69.34	1.65	1.29	68.98	102.58	0	0	0	0	0.008	3	88.2
S-63	80.3	82.16	1.86	1.65	81.95	140.44	0	0	0	1	0.03	20	61.71
SA-1	69.5	72.5	3	1.05	70.55	348.88	0	0	0	4	0.232	35	60
SA-2	62.6	65.6	3	0.97	63.57	247.05	0	0	0	18	0.292	32	7
SA-CUP	72.5	75.5	3	0.26	72.76	163.35	0	0	0	2	0.132	9	15

Table 3: Storages (continued...)

Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)	Hours Flooded (h)	Max. Flood Rate (L/s)	Total Flood Vol. (ML)	Avg. Percent Full (%)	Max. Volume (1000 m^3)	Max. Percent Full (%)	Max. Outflow (L/s)
UGS_Exp_Farm	74.12	77.12	3	0.89	75.01	1374.49	0	0	0	4	0.623	30	691.23
UGS_Z1P	70.07	72.07	2	0.76	70.83	1188.88	0	0	0	6	1.142	38	215.09
UGS_Z4P	73.17	74.39	1.22	0.41	73.58	146.15	0	0	0	7	0.109	36	32.97

Table 4: Weirs

Name	Inlet Node	Outlet Node	Type	Height (m)	Side Slope (m/m)	Inlet Elev. (m)	Discharge Coeff. (m^3/s)	Max. |Flow| (L/s)	Contributing Area (ha)	Contributing Imp. Area (ha)
ExpF-Weir	D-MHST-155	MHST-155	TRANSVERSE	1	0	76.5	1.65	0	12.745	4.086
Overflow-58	S-58	Carling_OLF1	TRANSVERSE	0.3	0	66.9	1.84	0	0.443	0.148
Overflow-60	S-60	OGS-3	TRANSVERSE	0.3	0	69.3	1.84	0	3.963	1.831
Overflow-63	S-63	MHST-149-S	TRANSVERSE	0.3	0	82.1	1.84	0	0.778	0.296
Weir3	MHST-100	D-MHST-100	TRANSVERSE	0.5	0	64.63	1.84	0	3.573	2.474
Weir4	MHST-142	D-MHST-142	TRANSVERSE	0.5	0	70.8	1.84	0	24.915	10.849
Weir5	MHST-145	D-MHST-145	TRANSVERSE	0.8	0	71.55	1.84	0	23.279	9.629
Weir8	MHST-170	DMHST-170	TRANSVERSE	0.3	0	72.6	1.84	33.24	0.826	0.539

Table 5: Outfalls

Name	Inflows	Invert Elev. (m)	Rim Elev. (m)	Type	Max. Depth (m)	Max. HGL (m)	Time Max. HGL (M/D/Y)	Max. Total Inflow (L/s)	Max. Flow (L/s)	Total Flow (ML)	Contributing Area (ha)	Contributing Imp. Area (ha)
Carling_OLF	NO	64.6	64.8	FREE	0.07	64.67	10/04/2022 08:14 AM	57.9	57.9	0.082	1.803	0.924
Dows-Lake	NO	63.745	66.5	NORMAL	0.69	64.44	10/04/2022 08:31 AM	1225.23	1225.23	10.015	29.592	13.157
LRT-Corridor	NO	56	57	FREE	0	56	10/04/2022 00:00 AM	12.24	12.24	0.006	0.059	0
Nepean-Bay-Trunk	NO	62.8	65.21	NORMAL	0	62.8	10/04/2022 00:00 AM	186.59	186.59	2.101	5.336	2.809
Preston_Street	NO	60.9	63.76	NORMAL	0.21	61.11	10/04/2022 08:10 AM	90.06	90.06	0.702	2.471	1.526

Table 6: Subcatchments

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
1	24hr-5yr	SA-1	1.216139	3	100	0.016	0.15	1.57	4.67	25	64.03	0	348.5	
10	24hr-5yr	13B_2	0.099916	3	8.07	0.016	0.15	1.57	4.67	25	64.03	50.14	15.11	
11	24hr-5yr	Wales-OLF-N03	0.045673	3	100	0.016	0.15	1.57	4.67	25	64.03	0	13.22	
12	24hr-5yr	BI-SA1-S	0.127648	5	56.48	0.016	0.15	1.57	4.67	25	64.03	23.34	33.19	
13B_1	24hr-5yr	MHST-104-S	0.13	5	100	0.016	0.15	1.57	4.67	25	64.03	0	37.52	
13B_2	24hr-5yr	BI-SA1-S	0.22	5	100	0.016	0.15	1.57	4.67	25	64.03	0	72.34	
14	24hr-5yr	Carling_OLF	0.058029	3	60.27	0.016	0.15	1.57	4.67	25	64.03	21.8	12.8	
14B	24hr-5yr	S-14B	0.1272	3	0	0.016	0.15	1.57	4.67	25	64.03	54.07	23	
15	24hr-5yr	S-15	0.364274	3	3.61	0.016	0.15	1.57	4.67	25	64.03	53.72	30.94	
16	24hr-5yr	LRT-Corridor	0.022914	3	0	0.016	0.15	1.57	4.67	25	64.03	53.66	5.04	
17	24hr-5yr	LRT-Corridor	0.036056	3	0	0.016	0.15	1.57	4.67	25	64.03	53.88	7.21	
18	24hr-5yr	Carling_OLF	0.119323	3	3.43	0.016	0.15	1.57	4.67	25	64.03	52.97	14.77	
19	24hr-5yr	S-19	0.2044	3	8.76	0.016	0.15	1.57	4.67	25	64.03	50.24	24.94	
2	24hr-5yr	SA-2	0.711441	3	100	0.016	0.15	1.57	4.67	25	64.03	0	220.56	
20	24hr-5yr	Carling_OLFN1	0.243417	8	0	0.016	0.15	1.57	4.67	25	64.03	54.19	41.11	
21B	24hr-5yr	S-21B	0.432546	10	0	0.016	0.15	1.57	4.67	25	64.03	68.57	105.79	

Table 6: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
22B_1	24hr-5yr	MHST-120-S	0.26722	5	100	0.016	0.15	1.57	4.67	25	64.03	0	76.39	
22B_2	24hr-5yr	MHST-106-S	0.06311	5	100	0.016	0.15	1.57	4.67	25	64.03	0	18.27	
22B_3	24hr-5yr	MSHT-103-S	0.13522	5	100	0.016	0.15	1.57	4.67	25	64.03	0	39.09	
22B_4	24hr-5yr	MHST-102-S	0.07311	5	100	0.016	0.15	1.57	4.67	25	64.03	0	21.16	
22B_5	24hr-5yr	MHST-101-S	0.093	5	100	0.016	0.15	1.57	4.67	25	64.03	0	26.91	
24	24hr-5yr	MHST-107	0.034783	3	55.8	0.016	0.15	1.57	4.67	25	64.03	23.99	8.08	
25	24hr-5yr	OGS1	0.046463	3	80.56	0.016	0.15	1.57	4.67	25	64.03	10.53	12.34	
26B	24hr-5yr	S-26B	0.77118	9.406	8.27	0.016	0.15	1.57	4.67	25	64.03	51.5	64.06	
27	24hr-5yr	MHST-101-S	0.076061	3	61.17	0.016	0.15	1.57	4.67	25	64.03	20.85	19.89	
28	24hr-5yr	MHST-102-S	0.076646	5	63.2	0.016	0.15	1.57	4.67	25	64.03	19.74	20.27	
29	24hr-5yr	7	0.011277	3	0	0.016	0.15	1.57	4.67	25	64.03	54.85	1.33	
2B	24hr-5yr	SA-2	0.090802	3	100	0.016	0.15	1.57	4.67	25	64.03	0	26.28	
3	24hr-5yr	S-3	0.21539	3	31.75	0.016	0.15	1.57	4.67	25	64.03	41.46	63.65	
3B	24hr-5yr	3	0.0393	3	100	0.016	0.15	1.57	4.67	25	64.03	0	11.37	
4	24hr-5yr	2	0.019571	3	100	0.016	0.15	1.57	4.67	25	64.03	0	5.66	
40	24hr-5yr	MHST-156	1.18634	6.77	47.28	0.016	0.15	1.57	4.67	25	64.03	29.6	202.28	
41	24hr-5yr	MHST-132	1.522779	3	14.99	0.016	0.15	1.57	4.67	25	64.03	49.74	98.54	
42_1	24hr-5yr	MHST-135-S	0.38897	5	75.19	0.016	0.15	1.57	4.67	25	64.03	13.37	103.86	
42_2	24hr-5yr	MHST-149-S	0.30146	5	75.19	0.016	0.15	1.57	4.67	25	64.03	13.39	79.7	
42_3	24hr-5yr	MHST-150-S1	0.59319	2	75.19	0.016	0.15	1.57	4.67	25	64.03	13.59	146.45	
42_4	24hr-5yr	MHST-141-S	0.45704	2	75.19	0.016	0.15	1.57	4.67	25	64.03	11.32	84.41	PurpleRoof
43	24hr-5yr	SA-CUP	0.56665	2	100	0.016	0.15	1.57	4.67	25	64.03	0	163.35	
44	24hr-5yr	MHST-62534	12.74513	1	32.06	0.016	0.15	1.57	4.67	25	64.03	39.85	1375.82	
45	24hr-5yr	63	0.36482	4	25.66	0.016	0.15	1.57	4.67	25	64.03	41.59	46.05	
45_A	24hr-5yr	65	0.192111	4	0	0.016	0.15	1.57	4.67	25	64.03	54.76	23.82	
46	24hr-5yr	21B	0.887972	10	21	0.016	0.15	1.57	4.67	25	64.03	43.88	112.96	
47_1	24hr-5yr	D-MHST-155-S	0.11038	3	65.86	0.016	0.15	1.57	4.67	25	64.03	18.45	27.97	

Table 6: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
47_2	24hr-5yr	MHST-148-S	0.46158	3	65.86	0.016	0.15	1.57	4.67	25	64.03	18.97	100.26	
47_3	24hr-5yr	MHST-147-S	0.19065	3	65.86	0.016	0.15	1.57	4.67	25	64.03	18.59	45.84	
47_4	24hr-5yr	MHST-146-S	0.40137	3	65.86	0.016	0.15	1.57	4.67	25	64.03	18.9	88.66	
47_5	24hr-5yr	MHST-157-S	0.25086	3	65.86	0.016	0.15	1.57	4.67	25	64.03	18.69	58.51	
48	24hr-5yr	R-48	0.137722	2	100	0.016	0.4	1.57	4.67	25	64.03	0	39.7	
49	24hr-5yr	R-49	0.16391	2	100	0.016	0.4	1.57	4.67	25	64.03	0	47.09	
5	24hr-5yr	preston	0.012005	3	100	0.016	0.15	1.57	4.67	25	64.03	0	3.47	
50	24hr-5yr	R-50	0.34548	2	100	0.016	0.4	1.57	4.67	25	64.03	0	95.14	
51	24hr-5yr	MH-SA51	1.27453	2	30	0.016	0.15	1.57	4.67	25	64.03	4.29	6.07	PurpleRoof
52	24hr-5yr	R-52	0.39976	2	100	0.016	0.4	1.57	4.67	25	64.03	0	108.26	
53	24hr-5yr	R-53	0.173497	2	100	0.016	0.4	1.57	4.67	25	64.03	0	49.78	
54	24hr-5yr	R-54	0.17264	2	100	0.016	0.4	1.57	4.67	25	64.03	0	49.54	
55	24hr-5yr	MHST-159	0.4073	2	30	0.016	0.15	1.57	4.67	25	64.03	1.89	1.79	PurpleRoof
56	24hr-5yr	MH-SA56	0.917849	2	85.76	0.016	0.15	1.57	4.67	25	64.03	7.76	241.92	
57	24hr-5yr	Carling_OLF1	0.154931	15	6.12	0.016	0.15	1.57	4.67	25	64.03	50.51	32.87	
58	24hr-5yr	S-58	0.442854	16	33.5	0.016	0.15	1.57	4.67	25	64.03	36.67	72.87	
59	24hr-5yr	MHST-133	0.668065	2	100	0.016	0.15	1.57	4.67	25	64.03	0	185.96	
6	24hr-5yr	3	0.1396	3	2.06	0.016	0.15	1.57	4.67	25	64.03	53.61	17.98	
60	24hr-5yr	S-60	0.29751	25	0	0.016	0.15	1.57	4.67	25	64.03	59.51	102.58	
60A	24hr-5yr	60B	0.243636	25	19.96	0.016	0.15	1.57	4.67	25	64.03	43.48	44.53	
60B	24hr-5yr	60	0.39679	25	0	0.016	0.15	1.57	4.67	25	64.03	72.13	114.64	
60C	24hr-5yr	60B	0.507297	25	35	0.016	0.15	1.57	4.67	25	64.03	35.66	89.99	
61	24hr-5yr	UGS_Z4P	0.65834	3	62.04	0.016	0.15	1.57	4.67	25	64.03	20.95	142.7	
62	24hr-5yr	POW_D1	0.266185	4.97	68.32	0.016	0.15	1.57	4.67	25	64.03	18.35	51.98	
62A	24hr-5yr	POW_D1	0.519395	6	0.04	0.016	0.15	1.57	4.67	25	64.03	57.6	18.5	
62B	24hr-5yr	62	0.07117	3	0	0.016	0.15	1.57	4.67	25	64.03	56.76	3.53	
62C	24hr-5yr	POW_D1	1.13365	5	58.05	0.016	0.15	1.57	4.67	25	64.03	25.03	161.33	

Table 6: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
63	24hr-5yr	S-63	0.41268	2	49.11	0.016	0.15	1.57	4.67	25	64.03	31.2	140.44	
64	24hr-5yr	UGS_Z6BP	0.16771	6	78.06	0.016	0.15	1.57	4.67	25	64.03	11.78	45.84	
65	24hr-5yr	MHST-138	0.523363	3.598	41.91	0.016	0.15	1.57	4.67	25	64.03	34.36	76.62	
7	24hr-5yr	2	0.016512	3	100	0.016	0.15	1.57	4.67	25	64.03	0	5.81	
8	24hr-5yr	2	0.01883	3	100	0.016	0.15	1.57	4.67	25	64.03	0	5.45	
9	24hr-5yr	1	0.019216	3	100	0.016	0.15	1.57	4.67	25	64.03	0	5.56	

PCSWMM Report

24 Hour - 100 Year Storm

Model Partial Green Roof_21092023.inp

Parsons

September 22, 2023

Table of Contents

Summary 1: Runoff quantity continuity

Name	Partial Green Roof_21092023	Partial Green Roof_21092023
Initial LID storage (mm)	0.270	0.270
Initial snow cover (mm)	n/a	n/a
Total precipitation (mm)	106.607	106.607
Outfall runon (mm)	n/a	n/a
Evaporation loss (mm)	0.000	0.000
Infiltration loss (mm)	39.495	39.495
Surface runoff (mm)	61.573	61.573
LID drainage (mm)	2.823	2.823
Snow removed (mm)	n/a	n/a
Final snow cover (mm)	n/a	n/a
Final storage (mm)	3.032	3.032
Continuity error (%)	-0.043	-0.043

Summary 2: Flow routing continuity

Name	Partial Green Roof_21092023	Partial Green Roof_21092023
Dry weather inflow (ML)	0.000	0.000
Wet weather inflow (ML)	24.119	24.119
Groundwater inflow (ML)	0.000	0.000
RDII inflow (ML)	0.000	0.000
External inflow (ML)	1.151	1.151
External outflow (ML)	25.876	25.876
Flooding loss (ML)	0.002	0.002
Evaporation loss (ML)	0.000	0.000
Exfiltration loss (ML)	0.000	0.000
Initial stored volume (ML)	0.000	0.000
Final stored volume (ML)	0.961	0.961
Continuity error (%)	-6.214	-6.214

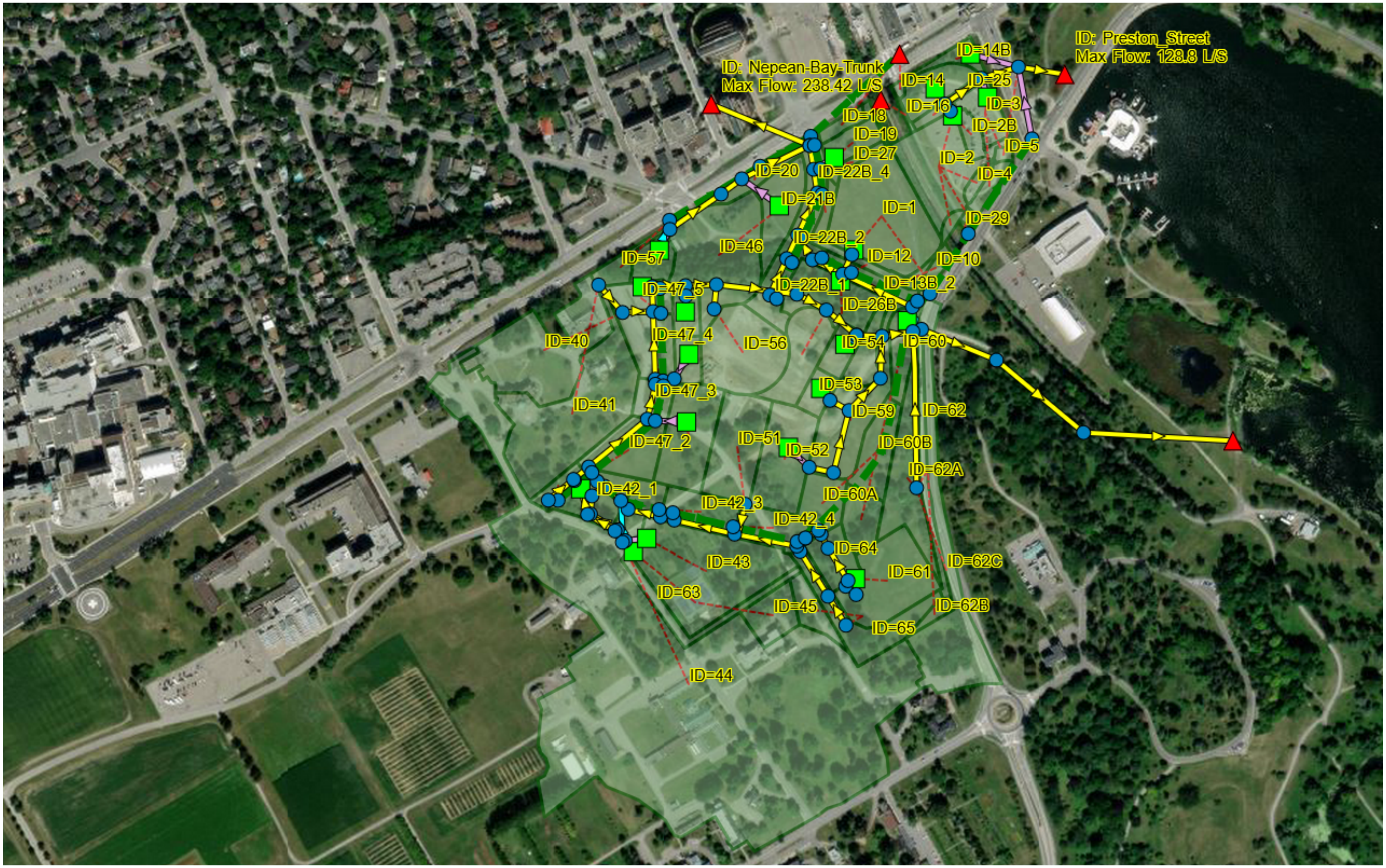


Figure 1: Extent 1

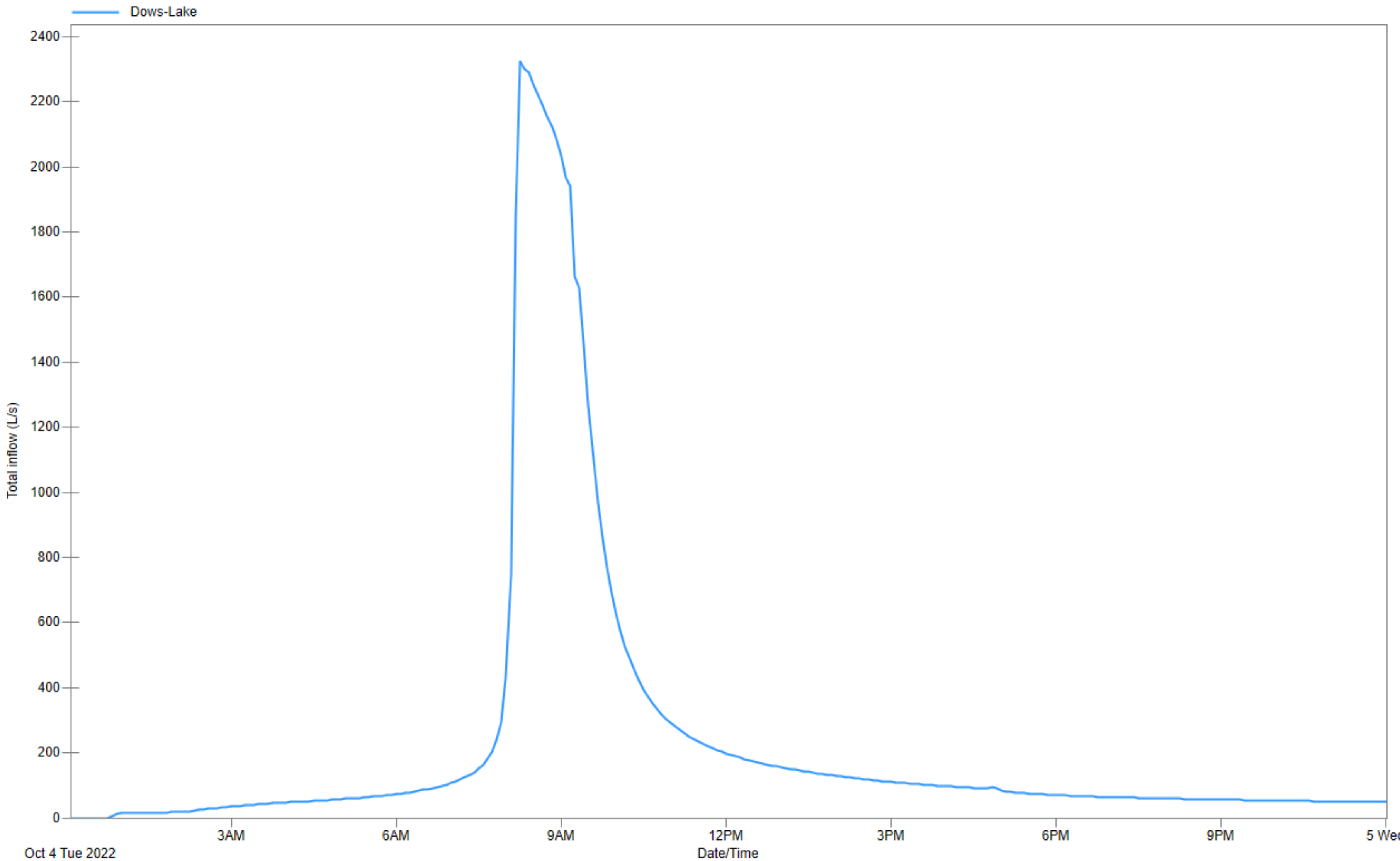


Figure 2: Dows Lake Outfall

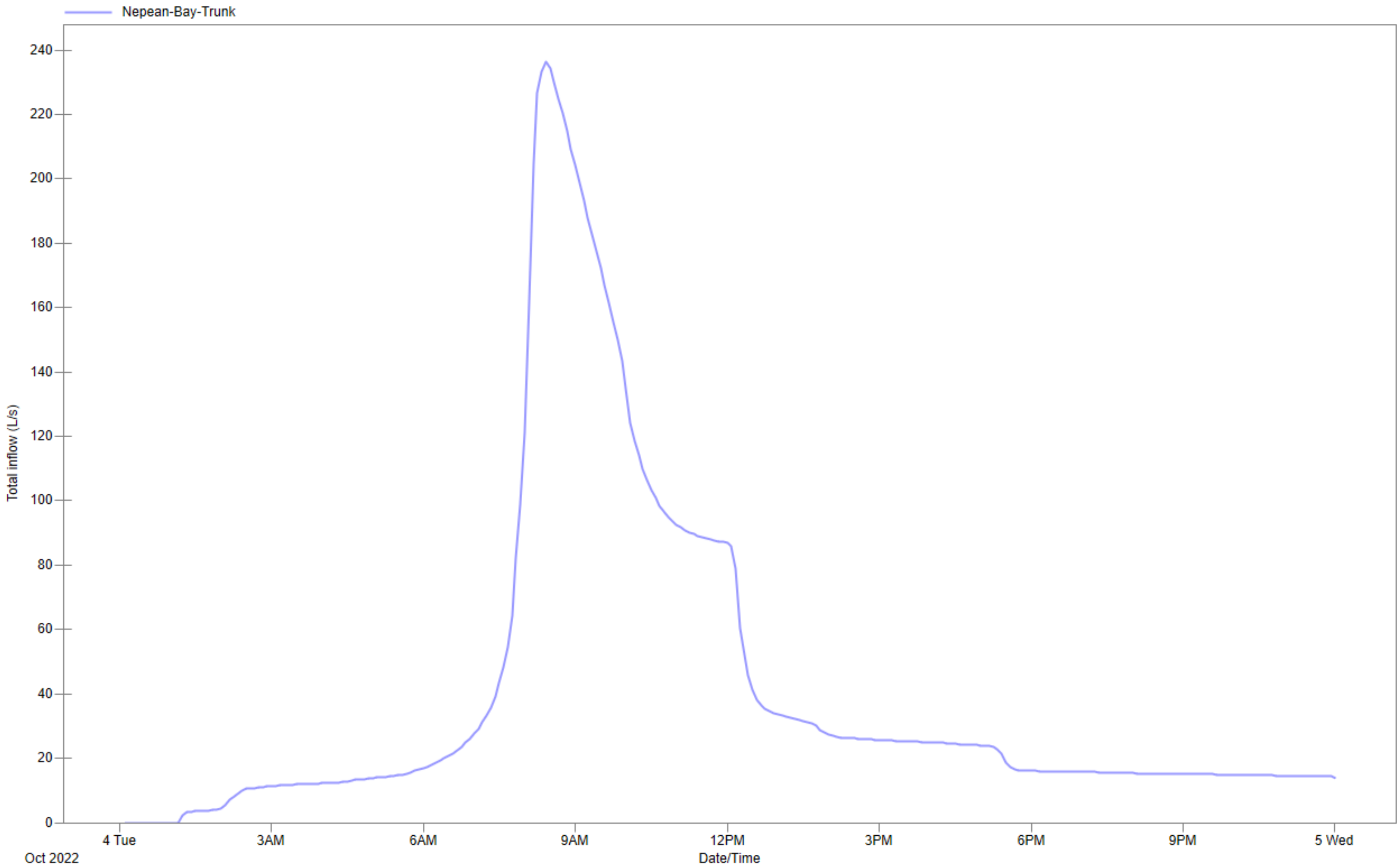


Figure 3: Nepean Bay Outfall

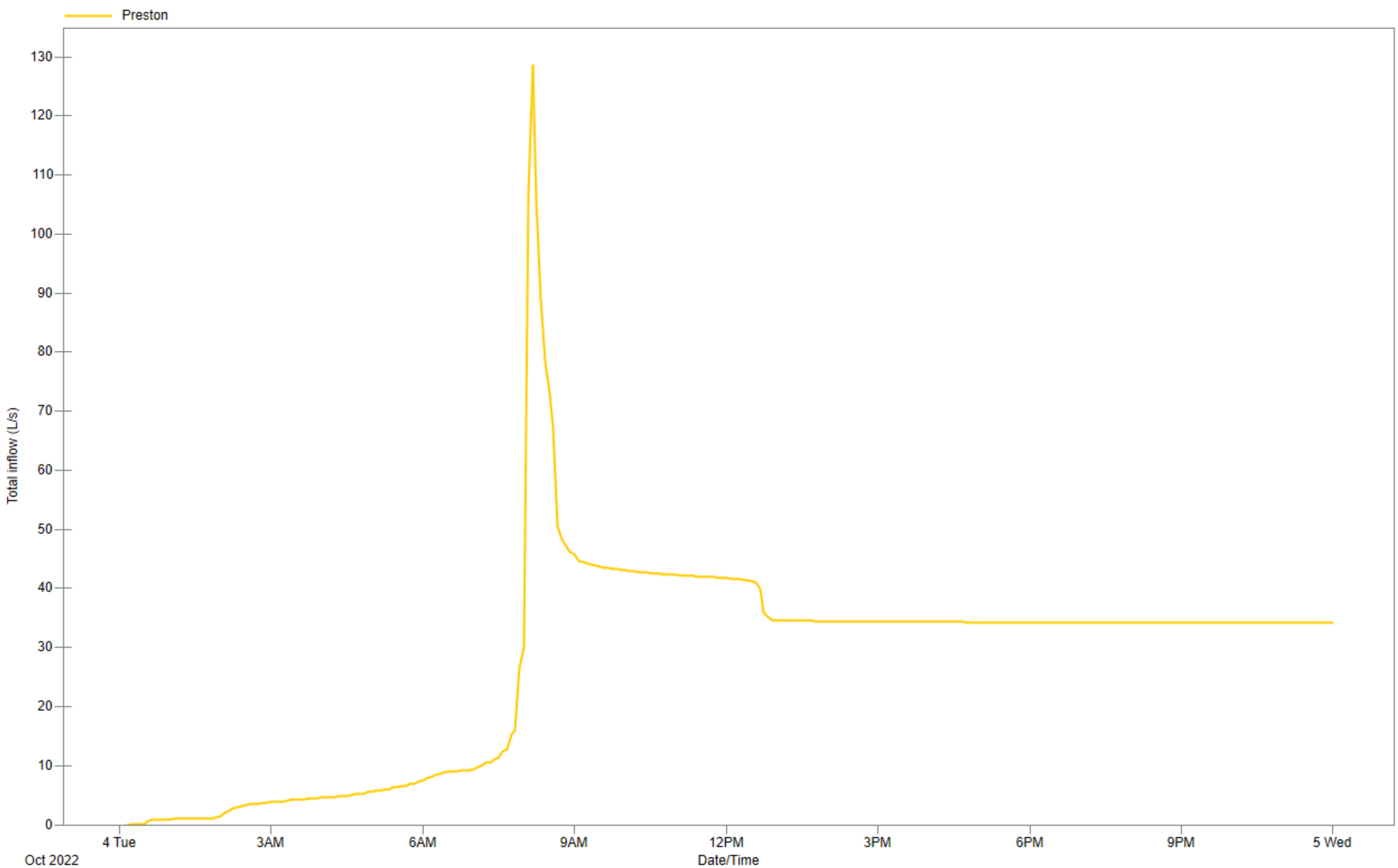


Figure 4: Preston Outfall

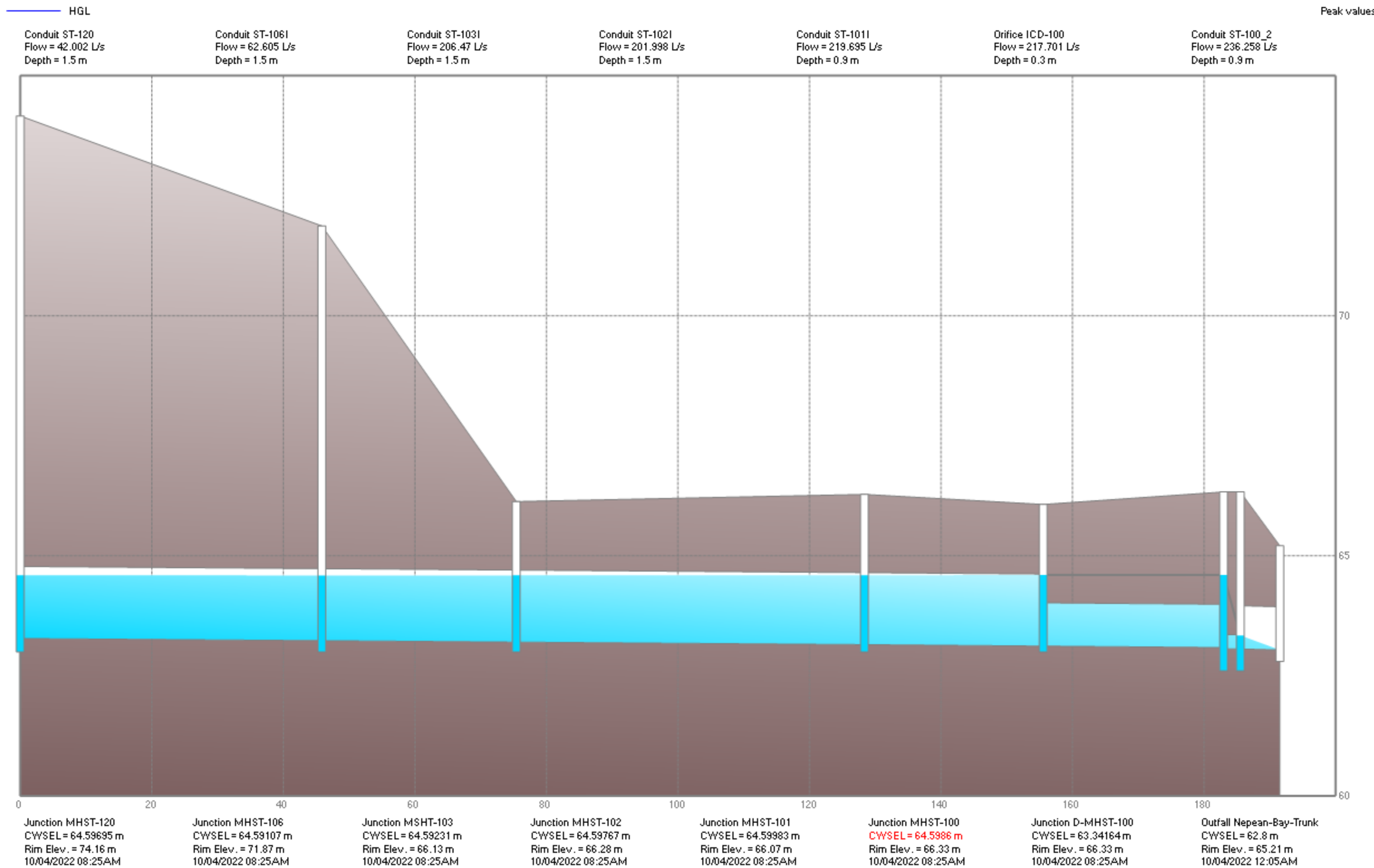


Figure 5: Road A

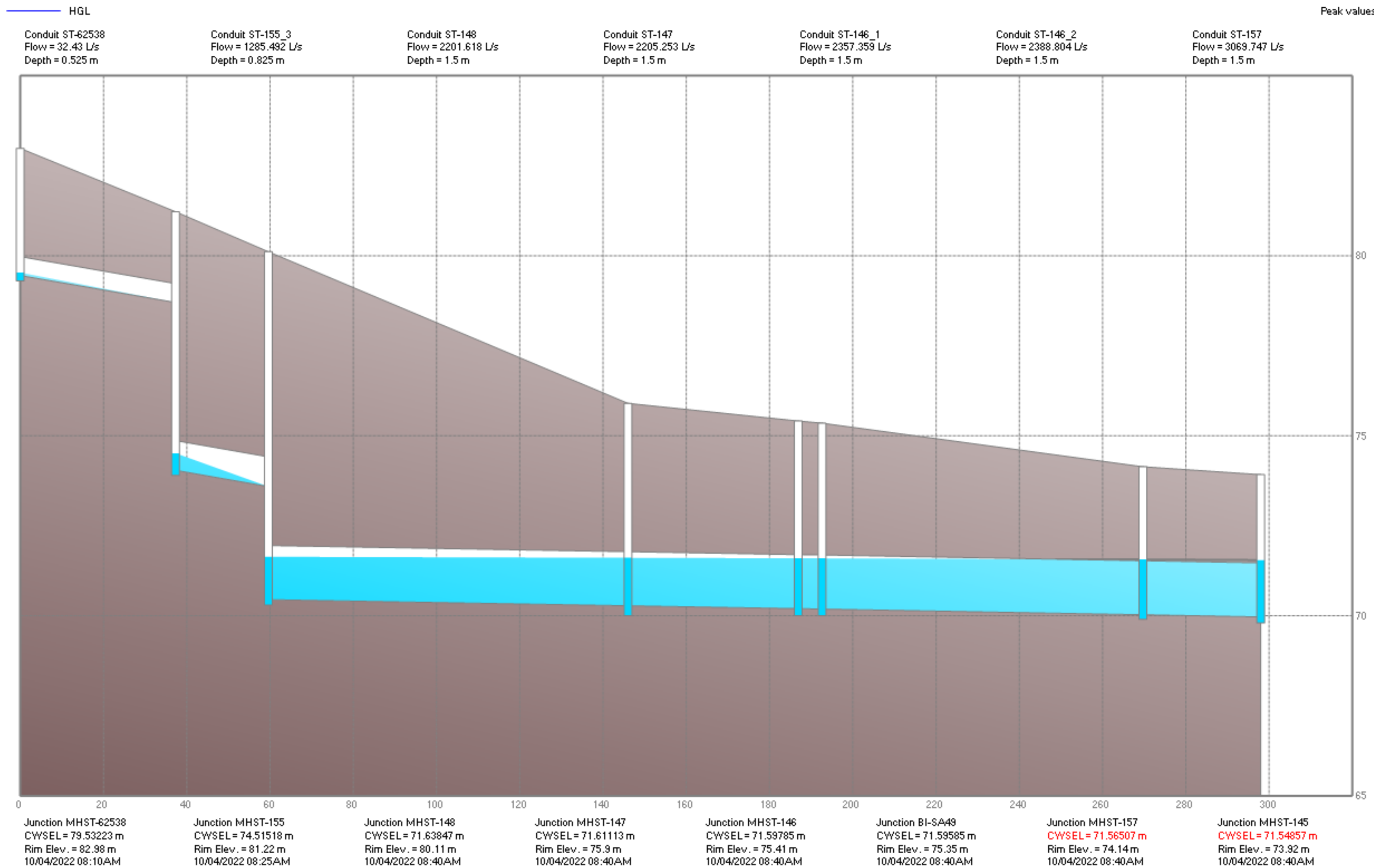


Figure 6: Road D

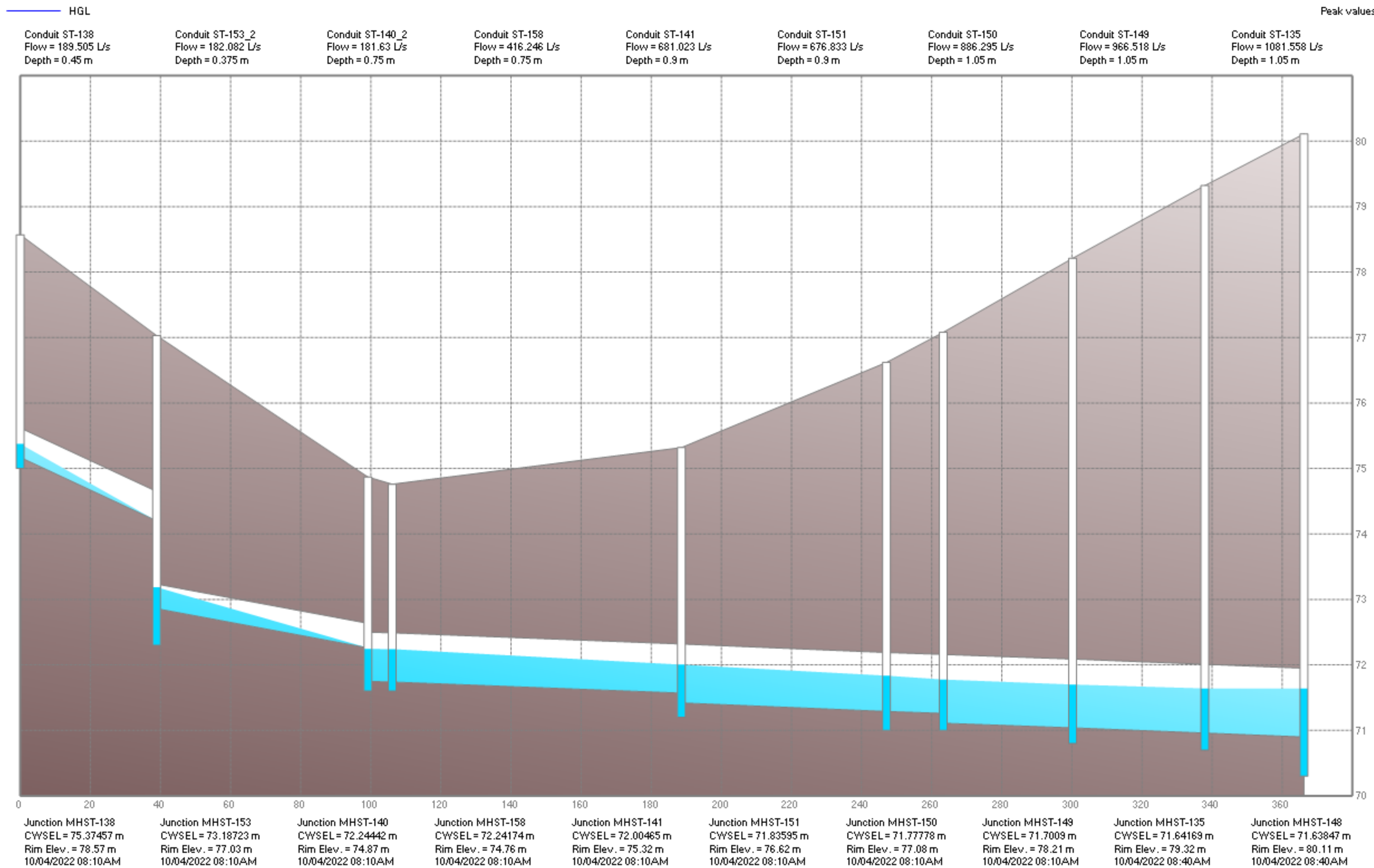


Figure 7: Road E

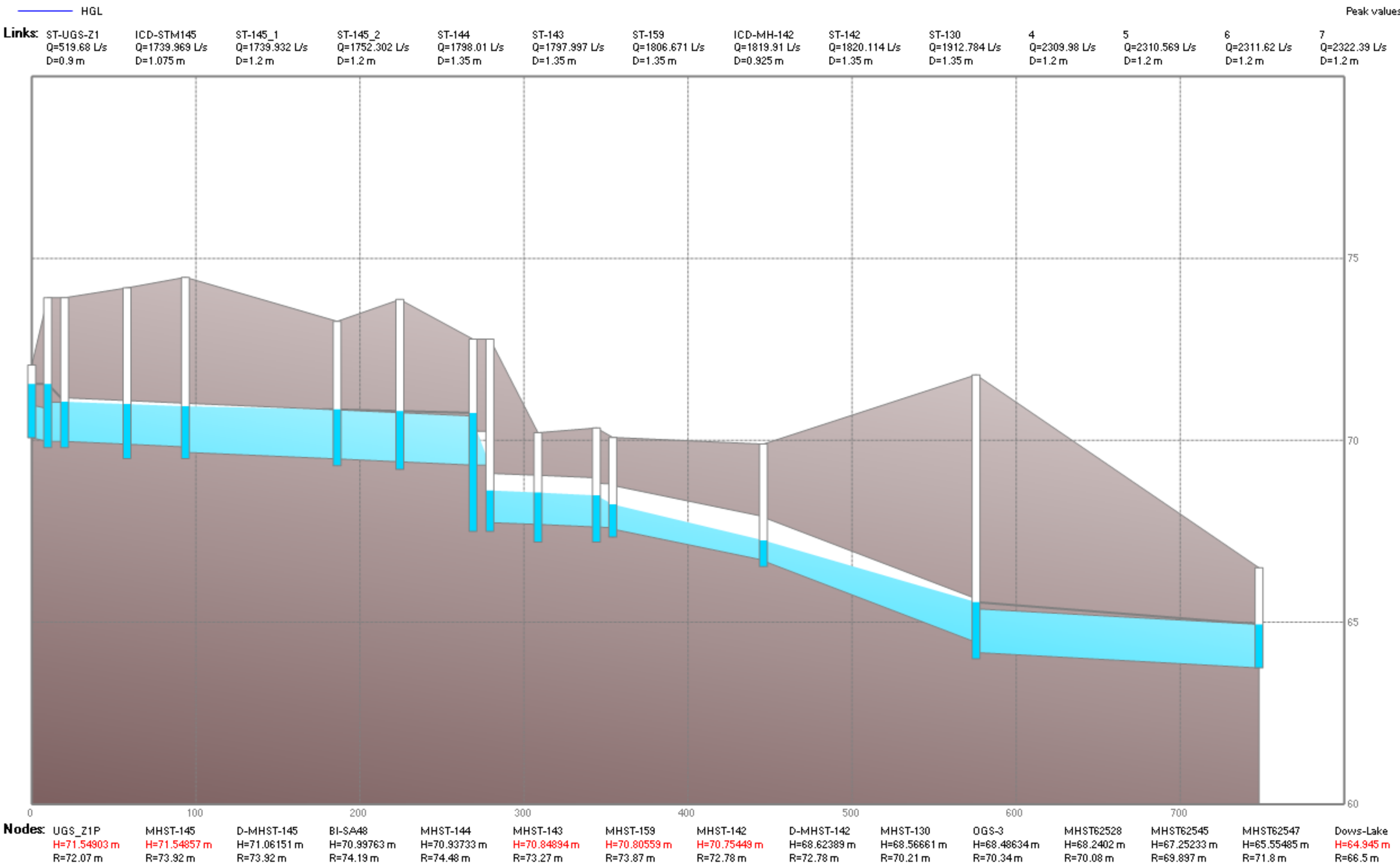


Figure 8: Road D to Outfall

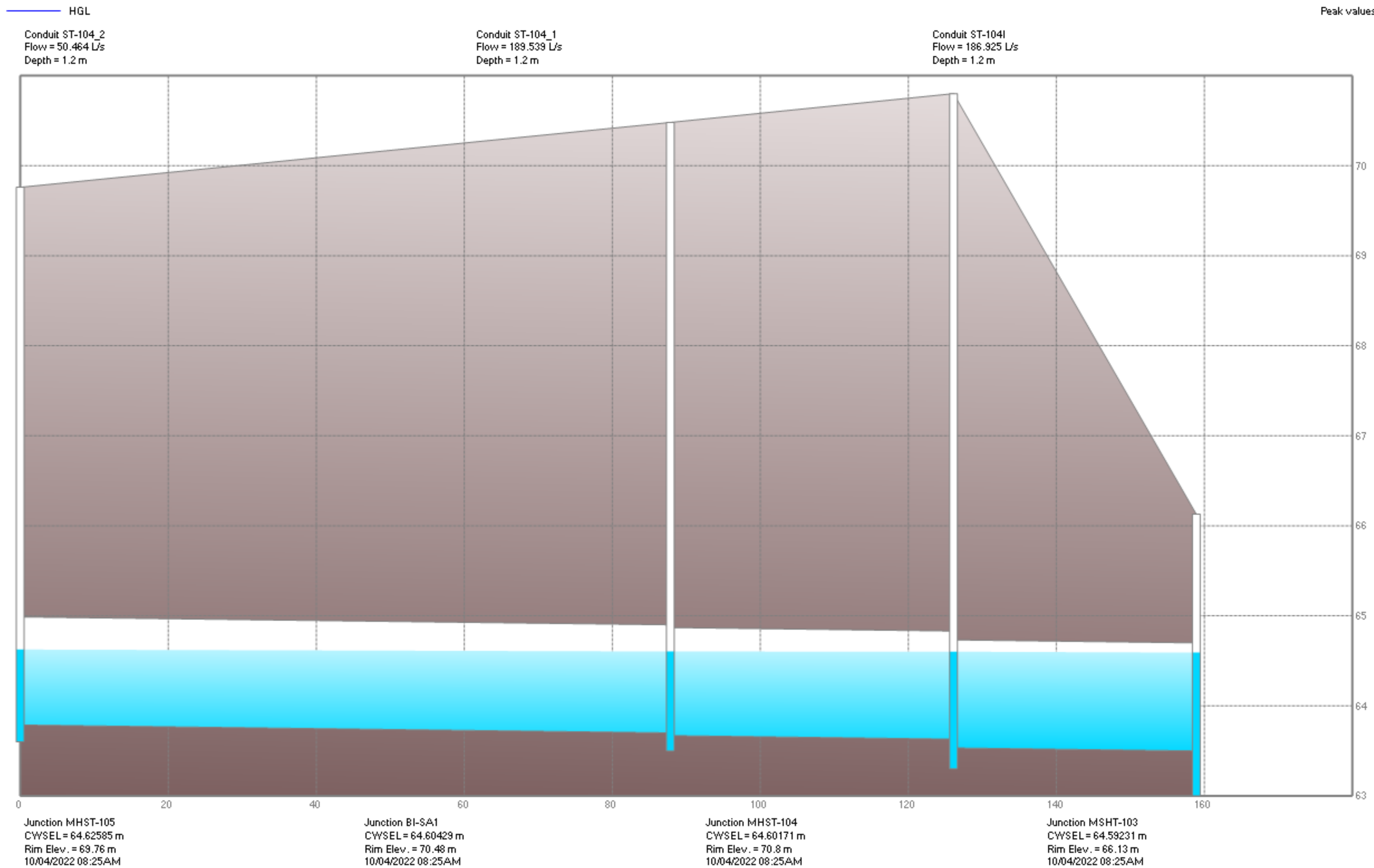


Figure 9: Road B

Table 1: Orifices

Name	Inlet Node	Outlet Node	Type	Cross-Section	Height (m)	Inlet Elev. (m)	Discharge Coeff.	Max. |Flow| (L/s)	Contributing Area (ha)	Contributing Imp. Area (ha)
ICD-100	MHST-100	D-MHST-100	SIDE	CIRCULAR	0.3	63.06	0.62	219.78	3.573	2.474
ICD11	D-MHST-155	MHST-155	SIDE	CIRCULAR	0.65	74.1	0.62	1277.84	12.745	4.086
ICD-MH-142	MHST-142	D-MHST-142	SIDE	CIRCULAR	0.925	69.32	0.62	1819.92	24.915	10.849
ICD-STM145	MHST-145	D-MHST-145	SIDE	CIRCULAR	1.075	69.97	0.62	1740.14	23.279	9.629
ICD-STM64	MHST-170	DMHST-170	SIDE	CIRCULAR	0.15	71.96	0.62	37.67	0.826	0.539
ST-UGS4	UGS_Z4P	CBMHST-102	SIDE	CIRCULAR	0.15	73.17	0.65	45.86	0.658	0.408

Table 2: Conduits

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
1	MHST-158-S	S-60	295	0.035	74.95	68.89	TRIANGULAR	0.5	0.02055	8.23	0.15
10	CBMHST105	CBMHST103	17.6	0.013	72.4	72.13	CIRCULAR	0.3	0.01534	46.02	1.24
11	CBMHST-102	CBMHST105	43.6	0.013	73.02	72.43	CIRCULAR	0.3	0.01353	45.86	1.35
2	MHST-105-S	Wales-OLF-N03	17	0.016	69.86	68.2	IRREGULAR	0	0.09812	28.54	0.55
3	Preston	Preston_Street	10	0.013	61.03	60.9	CIRCULAR	0.3	0.013	128.8	1.82
4	OGS-3	MHST62528	10	0.013	67.62	67.6	CIRCULAR	1.2	0.002	2316.13	2.69
5	MHST62528	MHST62545	91.8	0.013	67.56	66.707	CIRCULAR	1.2	0.00929	2316.4	3.49
6	MHST62545	MHST62547	129.6	0.013	66.687	64.45	CIRCULAR	1.2	0.01726	2316.2	3.86
7	MHST62547	Dows-Lake	172.5	0.013	64.17	63.745	CIRCULAR	1.2	0.00246	2324.72	2.06
8	POW_D1	OGS-3	180	0.035	78.7	69.7	TRAPEZOIDAL	0.55	0.05006	499.06	1.65
8_1	UGS_Exp_Farm	D-MHST-155	3.1	0.013	74.12	74.1	CIRCULAR	0.825	0.00645	1277.84	2.39
9	CBMHST103	UGS_Z6BP	2.6	0.013	72.1	72.07	CIRCULAR	0.375	0.01154	46.03	0.9
CA-OLF_2	Carling_OLF1	Carling_OLFN1	120.425	0.016	66.5	65.408	IRREGULAR	0	0.00907	104.35	0.61
CA-OLF_3	Carling_OLFN3	Carling_OLF	66.467	0.016	64.8	64.6	IRREGULAR	0	0.00301	174.39	0.62
CA-OLF_4	Carling_OLFN1	Carling_OLFN3	67.075	0.016	65.408	64.8	IRREGULAR	0	0.00906	190.33	0.82

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
CA-STM	IN119607	D-MHST-100	86	0.013	63.1	62.8	CIRCULAR	0.3	0.00349	18.95	0.27
ST-100_2	D-MHST-100	Nepean-Bay-Trunk	6	0.013	63.06	63.04	CIRCULAR	0.9	0.00333	238.42	1.4
ST-100-S	MHST-100-S	Carling_OLFN3	11	0.013	66.33	64.8	IRREGULAR	0	0.14046	0	0
ST-101I	MHST-101	MHST-100	27.419	0.013	63.12	63.09	CIRCULAR	0.9	0.00109	226.59	0.49
ST-101I-S	MHST-101-S	MHST-100-S	27.419	0.013	66.07	66.33	IRREGULAR	0	-0.00948	0	0
ST-102	CBMHST-101	UGS_Z4P	10	0.013	73.37	73.17	CIRCULAR	0.375	0.02	8.97	0.2
ST-102I	MHST-102	MHST-101	27.18	0.013	63.15	63.12	CIRCULAR	1.5	0.0011	220.01	0.38
ST-102I-S	MHST-102-S	MHST-101-S	27.18	0.013	66.28	66.07	IRREGULAR	0	0.00773	26.38	0.18
ST-103I	MSHT-103	MHST-102	52.936	0.013	63.203	63.15	CIRCULAR	1.5	0.001	231.44	0.44
ST-103I-S	MSHT-103-S	MHST-102-S	52.936	0.013	66.13	66.28	IRREGULAR	0	-0.00283	15.97	0.14
ST-104	CBMHST-104	CBMHST-101	15.1	0.013	74.14	73.84	CIRCULAR	0.3	0.01987	0	0
ST-104_1	BI-SA1	MHST-104	38.268	0.013	63.67	63.631	CIRCULAR	1.2	0.00102	222.54	1.04
ST-104_2	MHST-105	BI-SA1	87.842	0.013	63.788	63.7	CIRCULAR	1.2	0.001	100.47	0.29
ST-104I	MHST-104	MSHT-103	32.803	0.013	63.533	63.5	CIRCULAR	1.2	0.00101	215.76	0.97
ST-105I_1-S	BI-SA1-S	MHST-105-S	87.84	0.013	70.484	69.76	IRREGULAR	0	0.00824	96.89	0.56
ST-105I_2-S	MHST-104-S	BI-SA1-S	37.727	0.013	70.8	70.484	IRREGULAR	0	0.00838	41.25	0.37
ST-106I	MHST-106	MSHT-103	29.577	0.013	63.233	63.203	CIRCULAR	1.5	0.00101	92.63	0.15
ST-106I-S	MHST-106-S	MSHT-103-S	29.577	0.013	71.87	66.13	IRREGULAR	0	0.19783	92.79	0.92
ST-107	DMHST-170	MHST-158	13.5	0.013	71.93	71.8	CIRCULAR	0.3	0.00963	118.16	1.67
ST-108	CBMH108	CBMH109	35.7	0.013	71.56	71.49	CIRCULAR	0.6	0.00196	81.65	0.86
ST-109	CBMH109	CBMH110	20.8	0.013	71.49	71.45	CIRCULAR	0.6	0.00192	81.73	0.93
ST-110	CBMH110	MHST-135	17.9	0.013	71.45	71.41	CIRCULAR	0.6	0.00223	83.04	1.06
ST-111	CBMH111	CBMH108	15.3	0.013	71.59	71.56	CIRCULAR	0.6	0.00196	81.61	0.85
ST-120	MHST-120	MHST-106	45.853	0.013	63.278	63.233	CIRCULAR	1.5	0.00098	71.32	0.13
ST-120-S	MHST-120-S	MHST-106-S	45.853	0.013	74.16	71.87	IRREGULAR	0	0.05	68.29	1.1
ST-130	MHST-130	OGS-3	35.6	0.013	67.69	67.62	CIRCULAR	1.35	0.00197	1914.24	2.02
ST-131	MHST-131	MHST-130	47.9	0.013	68.16	68.11	CIRCULAR	0.825	0.00104	343.52	1.37

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-132	MHST-132	MHST-156	41.629	0.013	73.35	72.72	CIRCULAR	0.45	0.01514	287.06	2.47
ST-133	MHST-133	MHST-131	51.32	0.013	68.21	68.16	CIRCULAR	0.825	0.00097	352.2	1.13
ST-135	MHST-135	MHST-148	28.3	0.013	70.96	70.9	CIRCULAR	1.05	0.00212	1101.31	2.08
ST-138	MHST-138	MHST-153	38.9	0.013	75.17	74.2	CIRCULAR	0.45	0.02494	190.76	2.72
ST-139	MHST-139	MHST-133	72.952	0.013	68.35	68.28	CIRCULAR	0.75	0.00096	53.55	0.49
ST-140_2	MHST-140	MHST-158	6.9	0.013	71.75	71.74	CIRCULAR	0.75	0.00145	186.9	0.61
ST-141	MHST-141	MHST-151	58.5	0.013	71.42	71.29	CIRCULAR	0.9	0.00222	690.88	1.67
ST-141-S	MHST-151-S	MHST-141-S	70.7	0.013	76.58	75.32	IRREGULAR	0	0.01782	295.64	1.11
ST-142	D-MHST-142	MHST-130	29.3	0.013	67.74	67.69	CIRCULAR	1.35	0.00171	1820.14	1.88
ST-143	MHST-143	MHST-159	38.2	0.013	69.49	69.41	CIRCULAR	1.35	0.00209	1798.01	1.43
ST-144	MHST-144	MHST-143	92.5	0.013	69.67	69.49	CIRCULAR	1.35	0.00195	1798.07	1.6
ST-145_1	D-MHST-145	BI-SA48	38	0.013	69.97	69.894	CIRCULAR	1.2	0.002	1740.52	1.84
ST-145_2	BI-SA48	MHST-144	35.6	0.013	69.894	69.82	CIRCULAR	1.2	0.00208	1753.56	2.01
ST-146_1	MHST-146	BI-SA49	5.7	0.013	70.2	70.189	CIRCULAR	1.5	0.00193	2438.64	1.94
ST-146_1-S	MHST-146-S	BI-SA49-S	5.693	0.013	75.44	75.351	IRREGULAR	0	0.01564	184.15	0.81
ST-146_2	BI-SA49	MHST-157	77.1	0.013	70.189	70.03	CIRCULAR	1.5	0.00206	2475.51	1.95
ST-146_2-S	BI-SA49-S	MHST-157-S	77.118	0.013	75.351	74.14	IRREGULAR	0	0.01571	129.8	0.6
ST-147	MHST-147	MHST-146	40.9	0.013	70.28	70.2	CIRCULAR	1.5	0.00196	2310.54	1.83
ST-147-S	MHST-147-S	MHST-146-S	40.768	0.013	75.9	75.44	IRREGULAR	0	0.01128	176.63	0.71
ST-148	MHST-148	MHST-147	86.4	0.013	70.45	70.28	CIRCULAR	1.5	0.00197	2293.36	1.86
ST-148-S	MHST-148-S	MHST-147-S	93.313	0.013	80.11	75.9	IRREGULAR	0	0.04516	116.56	0.68
ST-149	MHST-149	MHST-135	37.7	0.013	71.04	70.96	CIRCULAR	1.05	0.00212	979.43	1.73
ST-149-S	MHST-135-S	MHST-149-S	34.9	0.013	79.32	78.21	IRREGULAR	0	0.03182	144.98	0.81
ST-150	MHST-150	MHST-149	36.9	0.013	71.11	71.04	CIRCULAR	1.05	0.0019	895.11	1.56
ST-150-S	MHST-149-S	MHST-150-S1	45	0.013	78.21	77.08	IRREGULAR	0	0.02512	239.82	0.77
ST-151	MHST-151	MHST-150	16.2	0.013	71.29	71.26	CIRCULAR	0.9	0.00185	698.77	1.88
ST-151-S	MHST-150-S1	MHST-151-S	16.1	0.013	77.08	76.58	IRREGULAR	0	0.03107	299.03	1.24

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-153_2	MHST-153	MHST-140	60.3	0.013	72.86	72.26	CIRCULAR	0.375	0.00995	186.15	1.84
ST-154	MHST-154	UGS_Exp_Farm	16	0.013	75.8	75.72	CIRCULAR	0.9	0.005	3148.46	4.95
ST-155_2-S	D-MHST-155-S	MHST-148-S	52.7	0.013	83.11	80.11	IRREGULAR	0	0.05702	20.27	0.38
ST-155_3	MHST-155	MHST-148	22.3	0.013	74.04	73.59	CIRCULAR	0.825	0.02018	1285.73	4.03
ST-156	MHST-156	MHST-157	34.6	0.013	70.1	70.03	CIRCULAR	1.5	0.00202	710.6	0.72
ST-157	MHST-157	MHST-145	28.3	0.013	70.03	69.97	CIRCULAR	1.5	0.00212	3086.49	2.64
ST-157-S	MHST-157-S	MHST-145-S	28.171	0.013	74.14	73.92	IRREGULAR	0	0.00781	157.89	0.45
ST-158	MHST-158	MHST-141	82.5	0.013	71.74	71.57	CIRCULAR	0.75	0.00206	420.5	1.47
ST-158-S	MHST-141-S	MHST-158-S	75.107	0.013	75.32	74.85	IRREGULAR	0	0.00626	174.31	0.54
ST-159	MHST-159	MHST-142	44.6	0.013	69.41	69.32	CIRCULAR	1.35	0.00202	1806.67	1.27
ST-62534	MHST-62534	MHST-62537	15.4	0.013	76.18	76.1	CIRCULAR	0.9	0.00519	3148.75	4.95
ST-62537	MHST-62537	MHST-154	35.9	0.013	76.04	75.86	CIRCULAR	0.9	0.00501	3148.43	4.95
ST-62538	MHST-62538	MHST-155	37.3	0.013	79.45	78.7	CIRCULAR	0.525	0.02011	32.44	1.5
ST-G107	MHST-107	OGS1	52.5	0.013	62.03	61.24	CIRCULAR	0.3	0.01505	30.56	1.03
ST-OGS1_2	OGS1	Preston	10	0.013	61.21	61.06	CIRCULAR	0.3	0.015	77.18	1.66
ST-P3	DICB3	IN119608	71.1	0.013	64.23	63.8	CIRCULAR	0.2	0.00605	14.94	0.87
ST-P46	IN119608	IN119607	30	0.013	63.5	63.2	CIRCULAR	0.2	0.01	14.94	0.97
ST-SA1	MH-SA1	BI-SA1	24.65	0.013	69.45	69.08	CIRCULAR	0.3	0.01501	60.11	1.71
ST-SA48	MH-SA48	BI-SA48	10.8	0.013	71.91	71.8	CIRCULAR	0.3	0.01019	13.18	0.96
ST-SA49	MH-SA49	BI-SA49	21	0.013	72.5	72.29	CIRCULAR	0.3	0.01	13.48	0.96
ST-SA51	MH-SA51	MHST-141	32.6	0.013	73.5	71.7	CIRCULAR	0.375	0.0553	33.14	2.24
ST-SA52	MH-SA52	MHST-139	28.6	0.013	68.86	68.57	CIRCULAR	0.525	0.01014	39.46	1.25
ST-SA53	MH-ST53	MHST-133	24.9	0.013	68.98	68.73	CIRCULAR	0.3	0.01004	13.65	0.97
ST-SA54	MH-SA54	MHST-142	2.5	0.013	70.66	70.64	CIRCULAR	0.3	0.008	13.58	0.89
ST-Sa56	MH-SA56	MHST-144	27	0.013	71.84	71.57	CIRCULAR	0.45	0.01	442.3	2.8
ST-UGS6B	UGS_Z6BP	MHST-170	10.6	0.013	72.07	71.96	CIRCULAR	0.3	0.01038	118.48	1.68
ST-UGS-Z1	UGS_Z1P	MHST-145	9.7	0.013	70.07	69.97	CIRCULAR	0.9	0.01031	2151.74	3.93

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-xx	MH-SAxx	MHST-107	10.7	0.013	62.45	62.15	CIRCULAR	0.2	0.02805	7.01	1.21
WD-OLF_3	Wales-OLF-N03	Wales-OLF-N04	81.193	0.016	68.2	66.75	IRREGULAR	0	0.01786	43.75	0.79
WD-OLF_4	Wales-OLF-N04	Wales-OLF-N05	94.991	0.016	66.75	65.5	IRREGULAR	0	0.01316	37.91	0.62

Table 3: Storages

Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)	Hours Flooded (h)	Max. Flood Rate (L/s)	Total Flood Vol. (ML)	Avg. Percent Full (%)	Max. Volume (1000 m³)	Max. Percent Full (%)	Max. Outflow (L/s)
R-48	73	73.1	0.1	0.04	73.04	68.24	0	0	0	8	0.057	44	13.18
R-49	74	74.1	0.1	0.04	74.04	81.13	0	0	0	10	0.072	45	13.48
R-50	77	77.1	0.1	0.04	77.04	167.61	0	0	0	6	0.13	38	38.28
R-52	69	69.1	0.1	0.04	69.04	192.14	0	0	0	7	0.158	39	39.46
R-53	70	70.1	0.1	0.05	70.05	85.83	0	0	0	10	0.077	46	13.65
R-54	72	72.1	0.1	0.05	72.05	85.41	0	0	0	10	0.077	45	13.59
S-14B	61.65	63.3	1.65	1.65	63.3	56.35	0.07	27.06	0.002	3	0.013	100	20.15
S-15	62.1	63.9	1.8	1.77	63.87	117.34	0	0	0	15	0.097	87	7.79
S-19	64	66	2	1.65	65.65	78.44	0	0	0	5	0.06	23	3.78
S-21B	63.54	65.7	2.16	1.82	65.36	372.39	0	0	0	21	0.473	37	3.99
S-26B	67.33	69.62	2.29	2.2	69.53	231.06	0	0	0	19	0.231	68	8.71
S-3	62.2	64.24	2.04	2.04	64.24	163.47	0	0	0	71	0.08	100	26.69
S-58	64.93	66.95	2.02	2.08	67.01	181.29	0	0	0	2	0.075	30	78.53
S-60	67.69	69.34	1.65	1.61	69.3	375.86	0	0	0	2	0.14	43	142.48
S-63	80.3	82.16	1.86	1.92	82.22	308.97	0	0	0	4	0.111	75	146.01
SA-1	69.5	72.5	3	2.24	71.74	607.11	0	0	0	13	0.492	75	60
SA-2	62.6	65.6	3	1.88	64.48	427.8	0	0	0	41	0.564	63	7
SA-CUP	72.5	75.5	3	0.54	73.04	280.78	0	0	0	5	0.268	18	15

Table 3: Storages (continued...)

Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)	Hours Flooded (h)	Max. Flood Rate (L/s)	Total Flood Vol. (ML)	Avg. Percent Full (%)	Max. Volume (1000 m^3)	Max. Percent Full (%)	Max. Outflow (L/s)
UGS_Exp_Farm	74.12	77.12	3	2.39	76.51	3148.46	0	0	0	8	1.674	80	1277.84
UGS_Z1P	70.07	72.07	2	1.48	71.55	2151.74	0	0	0	12	2.219	74	586.3
UGS_Z4P	73.17	74.39	1.22	0.89	74.06	297.05	0	0	0	13	0.226	75	48.4

Table 4: Weirs

Name	Inlet Node	Outlet Node	Type	Height (m)	Side Slope (m/m)	Inlet Elev. (m)	Discharge Coeff. (m^3/s)	Max. |Flow| (L/s)	Contributing Area (ha)	Contributing Imp. Area (ha)
ExpF-Weir	D-MHST-155	MHST-155	TRANSVERSE	1	0	76.5	1.65	0	12.745	4.086
Overflow-58	S-58	Carling_OLF1	TRANSVERSE	0.3	0	66.9	1.84	63.59	0.443	0.148
Overflow-60	S-60	OGS-3	TRANSVERSE	0.3	0	69.3	1.84	1.05	3.963	1.831
Overflow-63	S-63	MHST-149-S	TRANSVERSE	0.3	0	82.1	1.84	79.4	0.778	0.296
Weir3	MHST-100	D-MHST-100	TRANSVERSE	0.5	0	64.63	1.84	0	3.573	2.474
Weir4	MHST-142	D-MHST-142	TRANSVERSE	0.5	0	70.8	1.84	0	24.915	10.849
Weir5	MHST-145	D-MHST-145	TRANSVERSE	0.8	0	71.55	1.84	0	23.279	9.629
Weir8	MHST-170	DMHST-170	TRANSVERSE	0.3	0	72.6	1.84	89.03	0.826	0.539

Table 5: Outfalls

Name	Inflows	Invert Elev. (m)	Rim Elev. (m)	Type	Max. Depth (m)	Max. HGL (m)	Time Max. HGL (M/D/Y)	Max. Total Inflow (L/s)	Max. Flow (L/s)	Total Flow (ML)	Contributing Area (ha)	Contributing Imp. Area (ha)
Carling_OLF	NO	64.6	64.8	FREE	0.12	64.72	10/04/2022 08:12 AM	221.05	221.05	0.323	1.803	0.924
Dows-Lake	NO	63.745	66.5	NORMAL	1.2	64.94	10/04/2022 08:10 AM	2324.72	2324.72	19.647	29.592	13.157
LRT-Corridor	NO	56	57	FREE	0	56	10/04/2022 00:00 AM	26.54	26.54	0.021	0.059	0
Nepean-Bay-Trunk	NO	62.8	65.21	NORMAL	0	62.8	10/04/2022 00:00 AM	238.42	238.42	3.506	5.336	2.809
Preston_Street	NO	60.9	63.76	NORMAL	0.3	61.2	10/04/2022 08:05 AM	128.8	128.8	2.379	2.471	1.526

Table 6: Subcatchments

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
1	24hr-100yr	SA-1	1.216139	3	100	0.016	0.15	1.57	4.67	25	106.61	0	606.73	
10	24hr-100yr	13B_2	0.099916	3	8.07	0.016	0.15	1.57	4.67	25	106.61	66.43	42.14	
11	24hr-100yr	Wales-OLF-N03	0.045673	3	100	0.016	0.15	1.57	4.67	25	106.61	0	22.65	
12	24hr-100yr	BI-SA1-S	0.127648	5	56.48	0.016	0.15	1.57	4.67	25	106.61	31.15	60.86	
13B_1	24hr-100yr	MHST-104-S	0.13	5	100	0.016	0.15	1.57	4.67	25	106.61	0	64.44	
13B_2	24hr-100yr	BI-SA1-S	0.22	5	100	0.016	0.15	1.57	4.67	25	106.61	0	146	
14	24hr-100yr	Carling_OLF	0.058029	3	60.27	0.016	0.15	1.57	4.67	25	106.61	28.82	26.31	
14B	24hr-100yr	S-14B	0.1272	3	0	0.016	0.15	1.57	4.67	25	106.61	71.9	56.35	
15	24hr-100yr	S-15	0.364274	3	3.61	0.016	0.15	1.57	4.67	25	106.61	70.71	117.34	
16	24hr-100yr	LRT-Corridor	0.022914	3	0	0.016	0.15	1.57	4.67	25	106.61	71.61	10.35	
17	24hr-100yr	LRT-Corridor	0.036056	3	0	0.016	0.15	1.57	4.67	25	106.61	71.76	16.19	
18	24hr-100yr	Carling_OLF	0.119323	3	3.43	0.016	0.15	1.57	4.67	25	106.61	70.04	47.06	
19	24hr-100yr	S-19	0.2044	3	8.76	0.016	0.15	1.57	4.67	25	106.61	66.34	78.44	
2	24hr-100yr	SA-2	0.711441	3	100	0.016	0.15	1.57	4.67	25	106.61	0	382.55	
20	24hr-100yr	Carling_OLFN1	0.243417	8	0	0.016	0.15	1.57	4.67	25	106.61	71.99	106.47	
21B	24hr-100yr	S-21B	0.432546	10	0	0.016	0.15	1.57	4.67	25	106.61	91.78	372.39	

Table 6: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
22B_1	24hr-100yr	MHST-120-S	0.26722	5	100	0.016	0.15	1.57	4.67	25	106.61	0	132.01	
22B_2	24hr-100yr	MHST-106-S	0.06311	5	100	0.016	0.15	1.57	4.67	25	106.61	0	31.3	
22B_3	24hr-100yr	MSHT-103-S	0.13522	5	100	0.016	0.15	1.57	4.67	25	106.61	0	67.05	
22B_4	24hr-100yr	MHST-102-S	0.07311	5	100	0.016	0.15	1.57	4.67	25	106.61	0	36.26	
22B_5	24hr-100yr	MHST-101-S	0.093	5	100	0.016	0.15	1.57	4.67	25	106.61	0	46.13	
24	24hr-100yr	MHST-107	0.034783	3	55.8	0.016	0.15	1.57	4.67	25	106.61	31.85	16.27	
25	24hr-100yr	OGS1	0.046463	3	80.56	0.016	0.15	1.57	4.67	25	106.61	14	22.51	
26B	24hr-100yr	S-26B	0.77118	9.406	8.27	0.016	0.15	1.57	4.67	25	106.61	67.71	231.06	
27	24hr-100yr	MHST-101-S	0.076061	3	61.17	0.016	0.15	1.57	4.67	25	106.61	27.81	36.41	
28	24hr-100yr	MHST-102-S	0.076646	5	63.2	0.016	0.15	1.57	4.67	25	106.61	26.35	36.77	
29	24hr-100yr	7	0.011277	3	0	0.016	0.15	1.57	4.67	25	106.61	72.52	4.41	
2B	24hr-100yr	SA-2	0.090802	3	100	0.016	0.15	1.57	4.67	25	106.61	0	45.04	
3	24hr-100yr	S-3	0.21539	3	31.75	0.016	0.15	1.57	4.67	25	106.61	55.26	163.47	
3B	24hr-100yr	3	0.0393	3	100	0.016	0.15	1.57	4.67	25	106.61	0	19.49	
4	24hr-100yr	2	0.019571	3	100	0.016	0.15	1.57	4.67	25	106.61	0	9.71	
40	24hr-100yr	MHST-156	1.18634	6.77	47.28	0.016	0.15	1.57	4.67	25	106.61	38.92	454.3	
41	24hr-100yr	MHST-132	1.522779	3	14.99	0.016	0.15	1.57	4.67	25	106.61	65.74	289.99	
42_1	24hr-100yr	MHST-135-S	0.38897	5	75.19	0.016	0.15	1.57	4.67	25	106.61	17.81	188.37	
42_2	24hr-100yr	MHST-149-S	0.30146	5	75.19	0.016	0.15	1.57	4.67	25	106.61	17.82	145.77	
42_3	24hr-100yr	MHST-150-S1	0.59319	2	75.19	0.016	0.15	1.57	4.67	25	106.61	17.97	279.42	
42_4	24hr-100yr	MHST-141-S	0.45704	2	75.19	0.016	0.15	1.57	4.67	25	106.61	15.04	161.04	PurpleRoof
43	24hr-100yr	SA-CUP	0.56665	2	100	0.016	0.15	1.57	4.67	25	106.61	0	280.78	
44	24hr-100yr	MHST-62534	12.74513	1	32.06	0.016	0.15	1.57	4.67	25	106.61	52.72	3149.2	
45	24hr-100yr	63	0.36482	4	25.66	0.016	0.15	1.57	4.67	25	106.61	54.72	126.96	
45_A	24hr-100yr	65	0.192111	4	0	0.016	0.15	1.57	4.67	25	106.61	72.44	76.6	
46	24hr-100yr	21B	0.887972	10	21	0.016	0.15	1.57	4.67	25	106.61	57.81	324.92	
47_1	24hr-100yr	D-MHST-155-S	0.11038	3	65.86	0.016	0.15	1.57	4.67	25	106.61	24.54	52.8	

Table 6: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
47_2	24hr-100yr	MHST-148-S	0.46158	3	65.86	0.016	0.15	1.57	4.67	25	106.61	24.99	202.23	
47_3	24hr-100yr	MHST-147-S	0.19065	3	65.86	0.016	0.15	1.57	4.67	25	106.61	24.65	89.72	
47_4	24hr-100yr	MHST-146-S	0.40137	3	65.86	0.016	0.15	1.57	4.67	25	106.61	24.92	178.59	
47_5	24hr-100yr	MHST-157-S	0.25086	3	65.86	0.016	0.15	1.57	4.67	25	106.61	24.73	116.23	
48	24hr-100yr	R-48	0.137722	2	100	0.016	0.4	1.57	4.67	25	106.61	0	68.24	
49	24hr-100yr	R-49	0.16391	2	100	0.016	0.4	1.57	4.67	25	106.61	0	81.13	
5	24hr-100yr	preston	0.012005	3	100	0.016	0.15	1.57	4.67	25	106.61	0	5.95	
50	24hr-100yr	R-50	0.34548	2	100	0.016	0.4	1.57	4.67	25	106.61	0	167.61	
51	24hr-100yr	MH-SA51	1.27453	2	30	0.016	0.15	1.57	4.67	25	106.61	5.69	33.14	PurpleRoof
52	24hr-100yr	R-52	0.39976	2	100	0.016	0.4	1.57	4.67	25	106.61	0	192.14	
53	24hr-100yr	R-53	0.173497	2	100	0.016	0.4	1.57	4.67	25	106.61	0	85.83	
54	24hr-100yr	R-54	0.17264	2	100	0.016	0.4	1.57	4.67	25	106.61	0	85.41	
55	24hr-100yr	MHST-159	0.4073	2	30	0.016	0.15	1.57	4.67	25	106.61	2.52	10.5	PurpleRoof
56	24hr-100yr	MH-SA56	0.917849	2	85.76	0.016	0.15	1.57	4.67	25	106.61	10.28	442.3	
57	24hr-100yr	Carling_OLF1	0.154931	15	6.12	0.016	0.15	1.57	4.67	25	106.61	67.32	70.19	
58	24hr-100yr	S-58	0.442854	16	33.5	0.016	0.15	1.57	4.67	25	106.61	48.4	181.29	
59	24hr-100yr	MHST-133	0.668065	2	100	0.016	0.15	1.57	4.67	25	106.61	0	325.96	
6	24hr-100yr	3	0.1396	3	2.06	0.016	0.15	1.57	4.67	25	106.61	70.93	56.18	
60	24hr-100yr	S-60	0.29751	25	0	0.016	0.15	1.57	4.67	25	106.61	76.8	367.66	
60A	24hr-100yr	60B	0.243636	25	19.96	0.016	0.15	1.57	4.67	25	106.61	57.71	107.87	
60B	24hr-100yr	60	0.39679	25	0	0.016	0.15	1.57	4.67	25	106.61	97.32	372	
60C	24hr-100yr	60B	0.507297	25	35	0.016	0.15	1.57	4.67	25	106.61	47.15	216.55	
61	24hr-100yr	UGS_Z4P	0.65834	3	62.04	0.016	0.15	1.57	4.67	25	106.61	27.65	292.76	
62	24hr-100yr	POW_D1	0.266185	4.97	68.32	0.016	0.15	1.57	4.67	25	106.61	24.1	110.81	
62A	24hr-100yr	POW_D1	0.519395	6	0.04	0.016	0.15	1.57	4.67	25	106.61	75.78	94.21	
62B	24hr-100yr	62	0.07117	3	0	0.016	0.15	1.57	4.67	25	106.61	74.58	16.74	
62C	24hr-100yr	POW_D1	1.13365	5	58.05	0.016	0.15	1.57	4.67	25	106.61	33.47	330.51	

Table 6: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
63	24hr-100yr	S-63	0.41268	2	49.11	0.016	0.15	1.57	4.67	25	106.61	41.78	308.97	
64	24hr-100yr	UGS_Z6BP	0.16771	6	78.06	0.016	0.15	1.57	4.67	25	106.61	15.72	81.54	
65	24hr-100yr	MHST-138	0.523363	3.598	41.91	0.016	0.15	1.57	4.67	25	106.61	45.03	191.87	
7	24hr-100yr	2	0.016512	3	100	0.016	0.15	1.57	4.67	25	106.61	0	12.33	
8	24hr-100yr	2	0.01883	3	100	0.016	0.15	1.57	4.67	25	106.61	0	9.34	
9	24hr-100yr	1	0.019216	3	100	0.016	0.15	1.57	4.67	25	106.61	0	9.53	

PCSWMM Report

24 Hour - Stress Test Event

Model Partial Green Roof_21092023.inp

Parsons

September 22, 2023

Table of Contents

Summaries

Maps

Graphs

Profiles

Tables

Summary 1: Runoff quantity continuity

Name	Partial Green Roof_21092023	Partial Green Roof_21092023
Initial LID storage (mm)	0.270	0.270
Initial snow cover (mm)	n/a	n/a
Total precipitation (mm)	106.607	127.928
Outfall runon (mm)	n/a	n/a
Evaporation loss (mm)	0.000	0.000
Infiltration loss (mm)	39.495	44.053
Surface runoff (mm)	61.573	77.333
LID drainage (mm)	2.823	3.791
Snow removed (mm)	n/a	n/a
Final snow cover (mm)	n/a	n/a
Final storage (mm)	3.032	3.077
Continuity error (%)	-0.043	-0.044

Summary 2: Flow routing continuity

Name	Partial Green Roof_21092023	Partial Green Roof_21092023
Dry weather inflow (ML)	0.000	0.000
Wet weather inflow (ML)	24.119	30.386
Groundwater inflow (ML)	0.000	0.000
RDII inflow (ML)	0.000	0.000
External inflow (ML)	1.151	1.151
External outflow (ML)	25.876	31.975
Flooding loss (ML)	0.002	0.012
Evaporation loss (ML)	0.000	0.000
Exfiltration loss (ML)	0.000	0.000
Initial stored volume (ML)	0.000	0.000
Final stored volume (ML)	0.961	1.438
Continuity error (%)	-6.214	-5.989

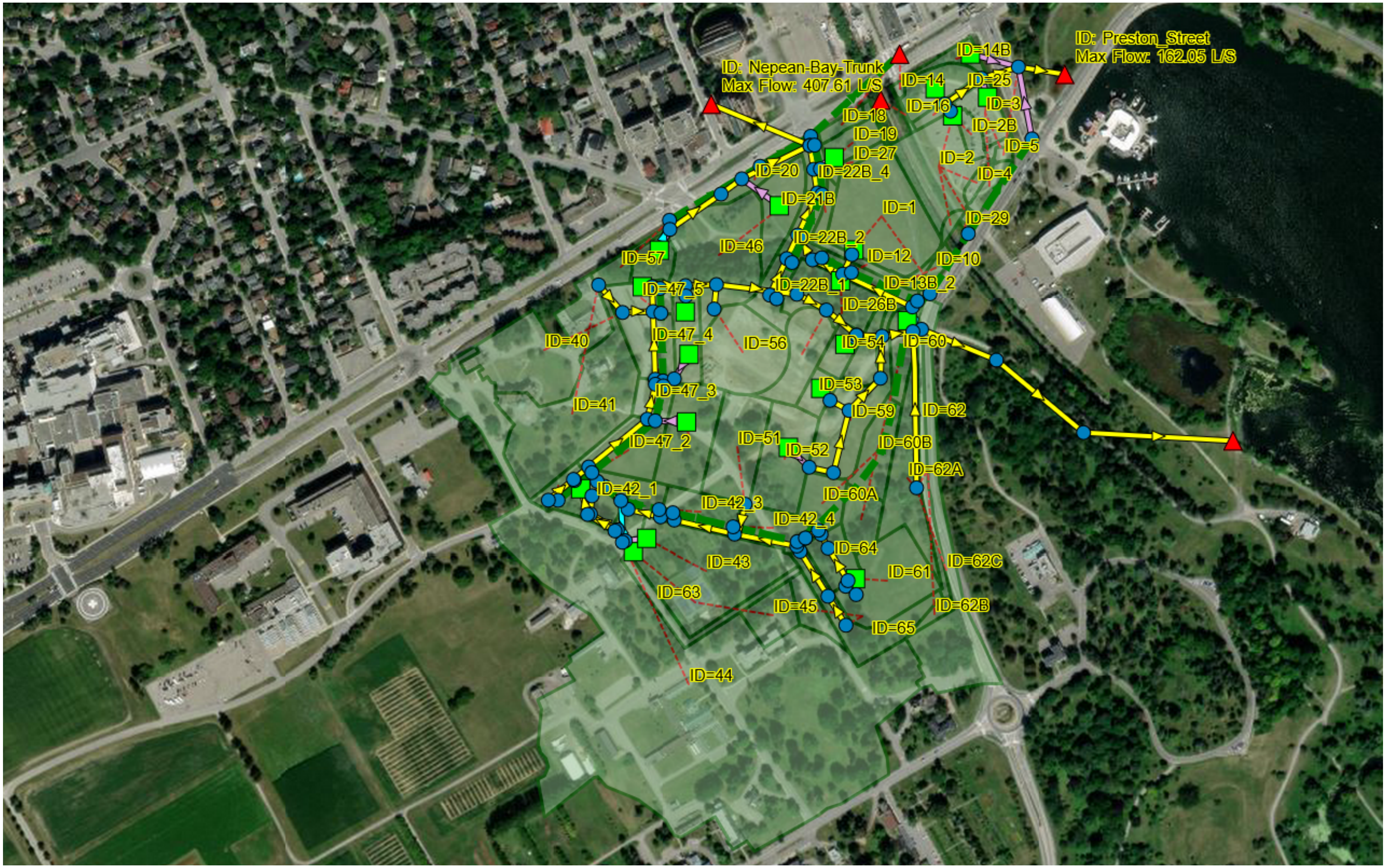


Figure 1: Extent 1

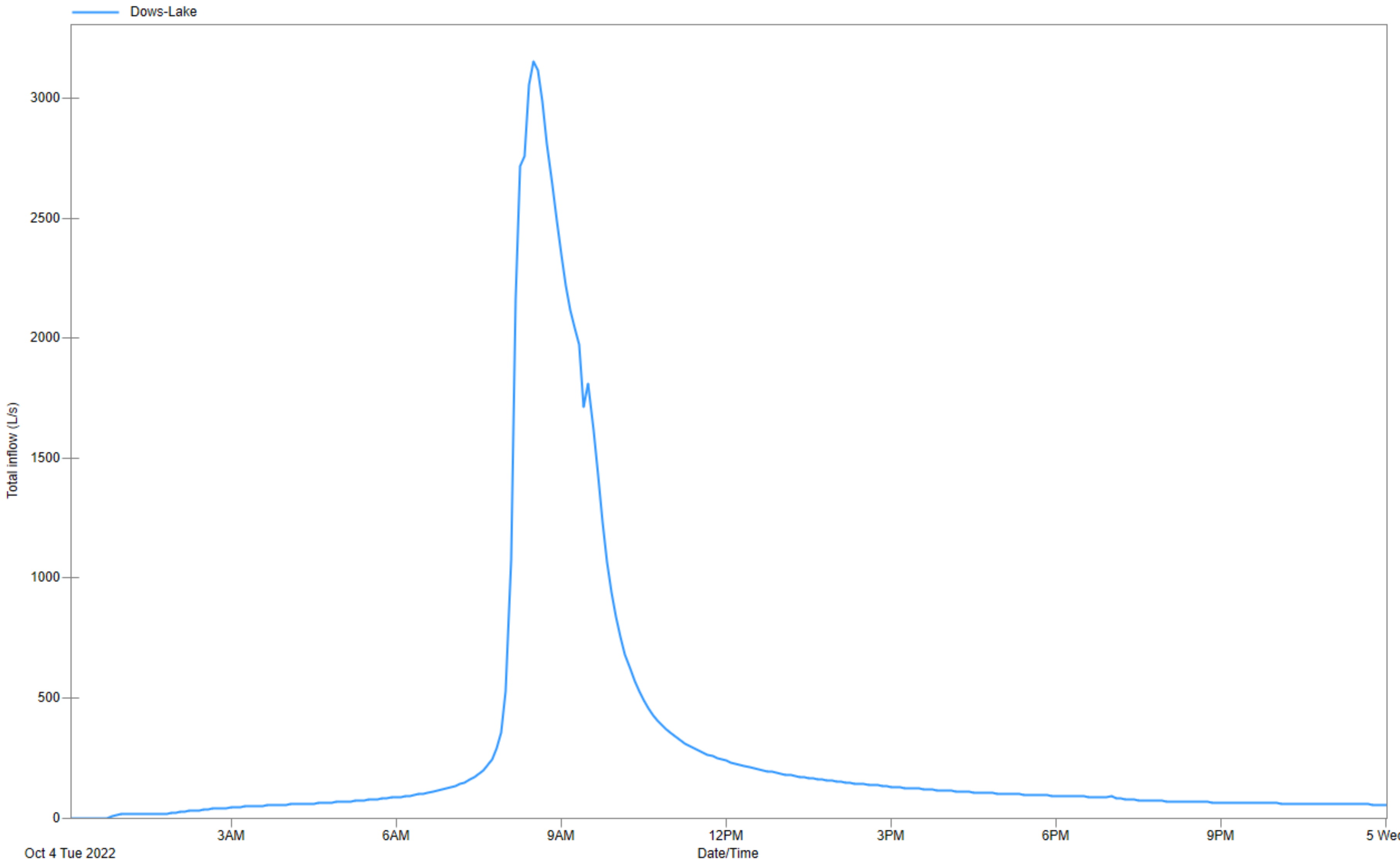


Figure 2: Dows Lake Outfall

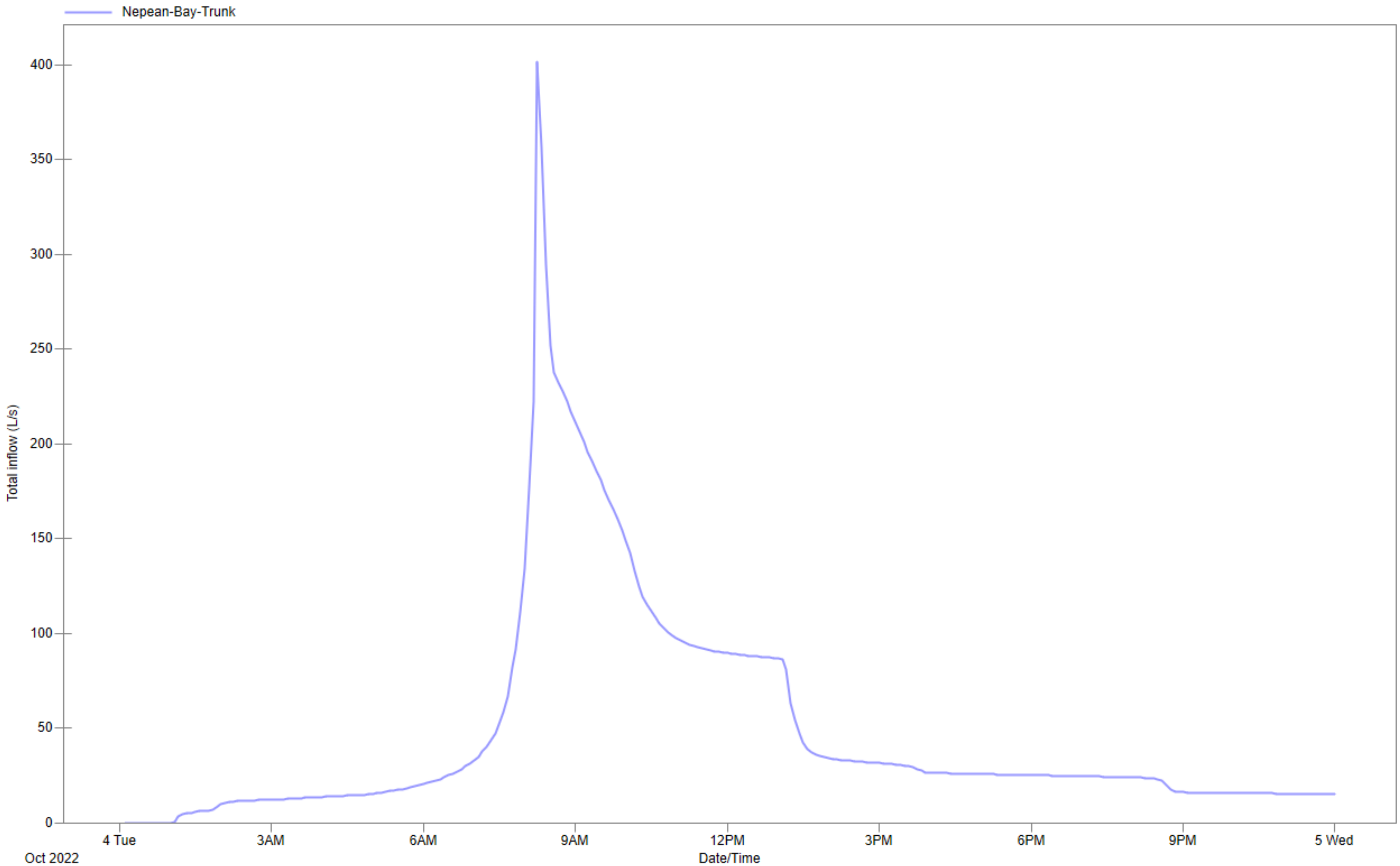


Figure 3: Nepean Bay Outfall

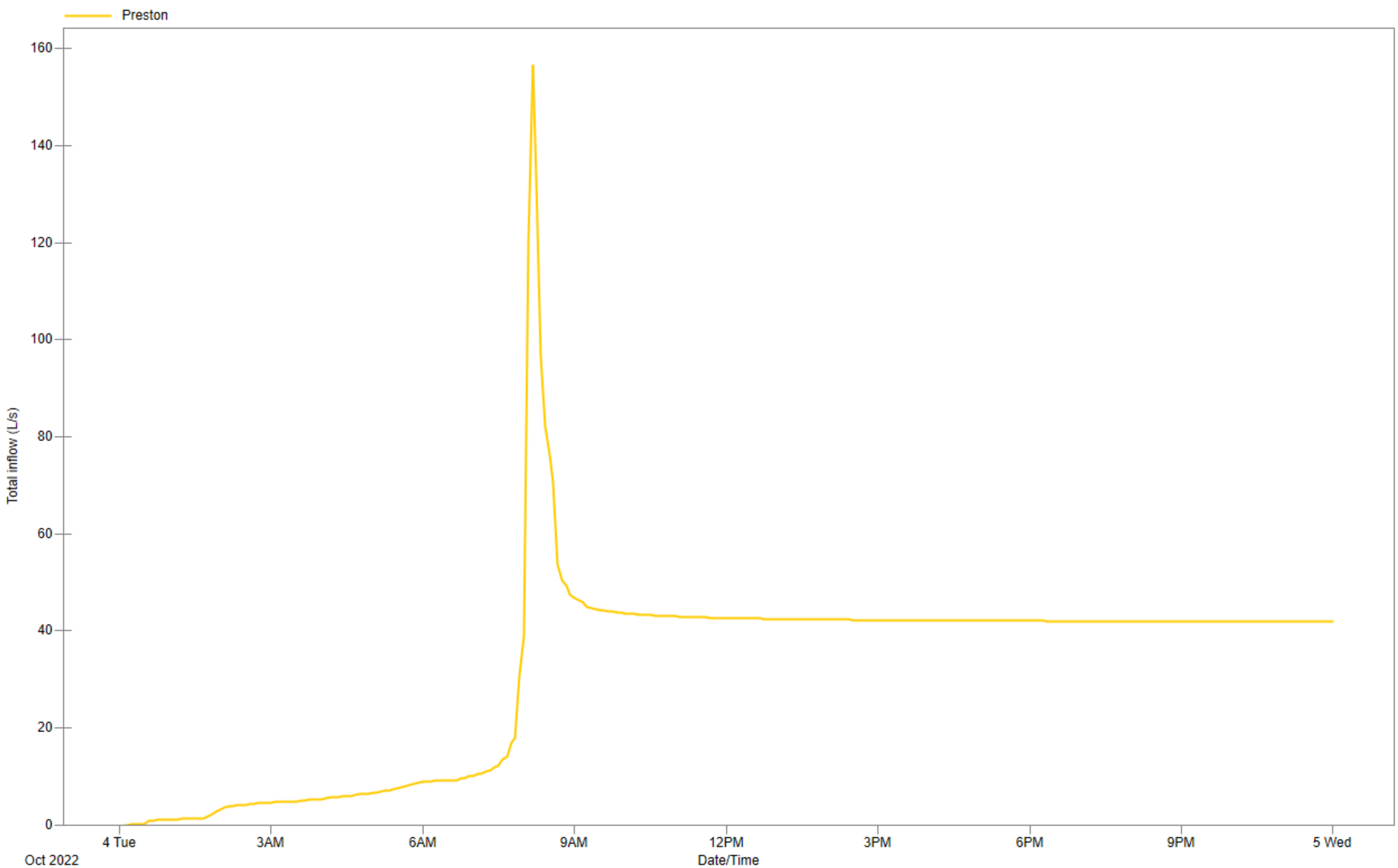


Figure 4: Preston Outfall

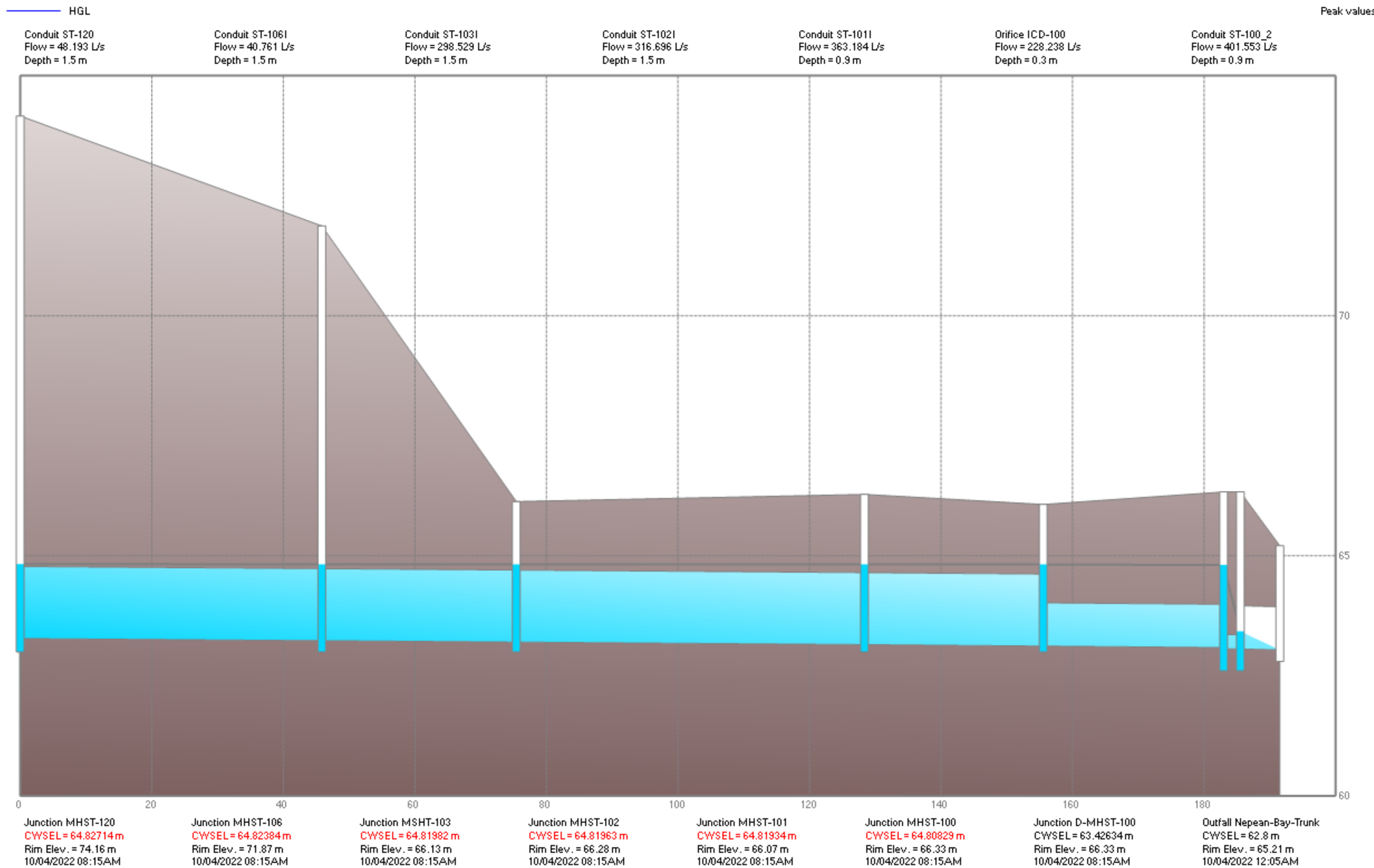


Figure 5: Road A

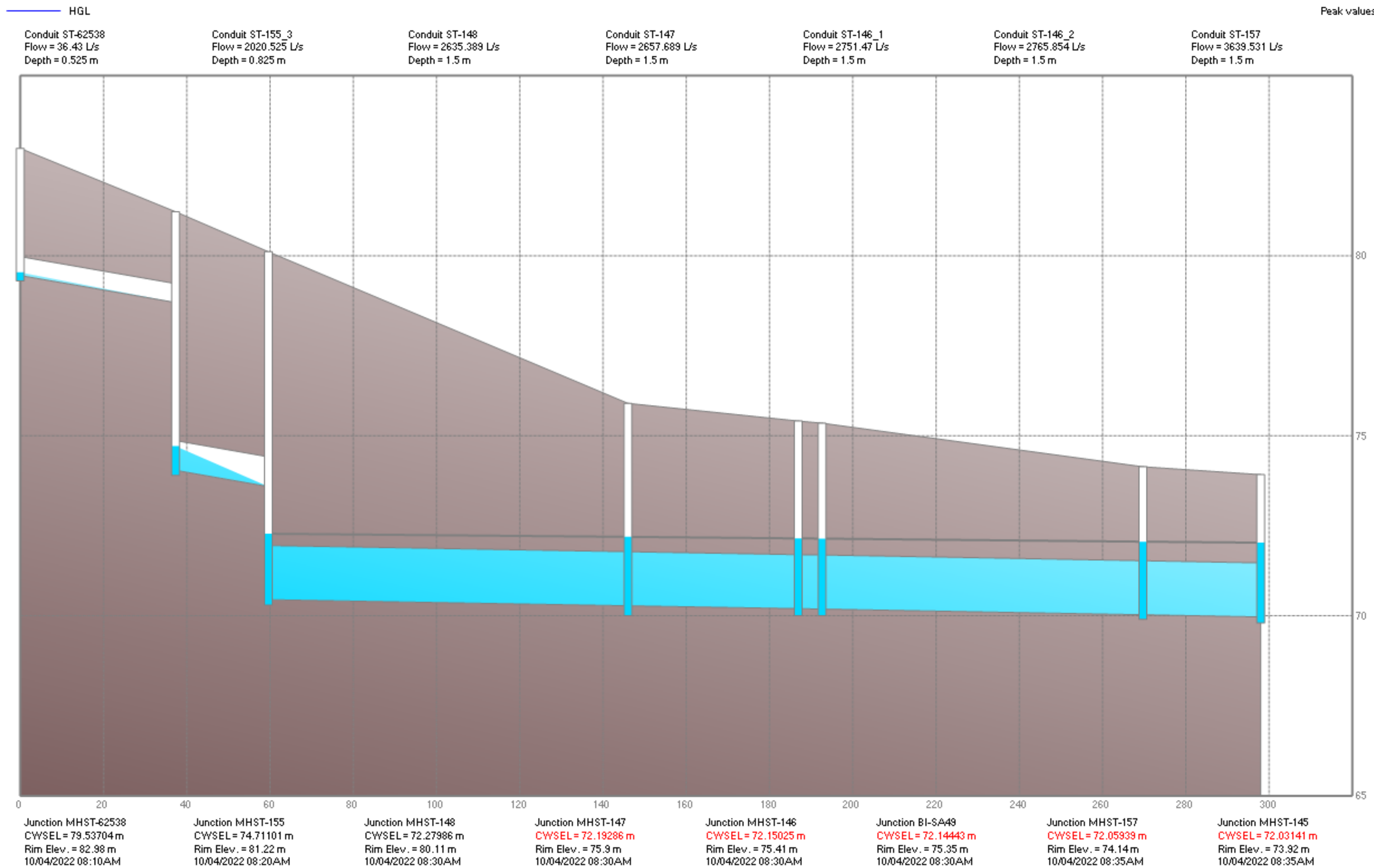


Figure 6: Road D

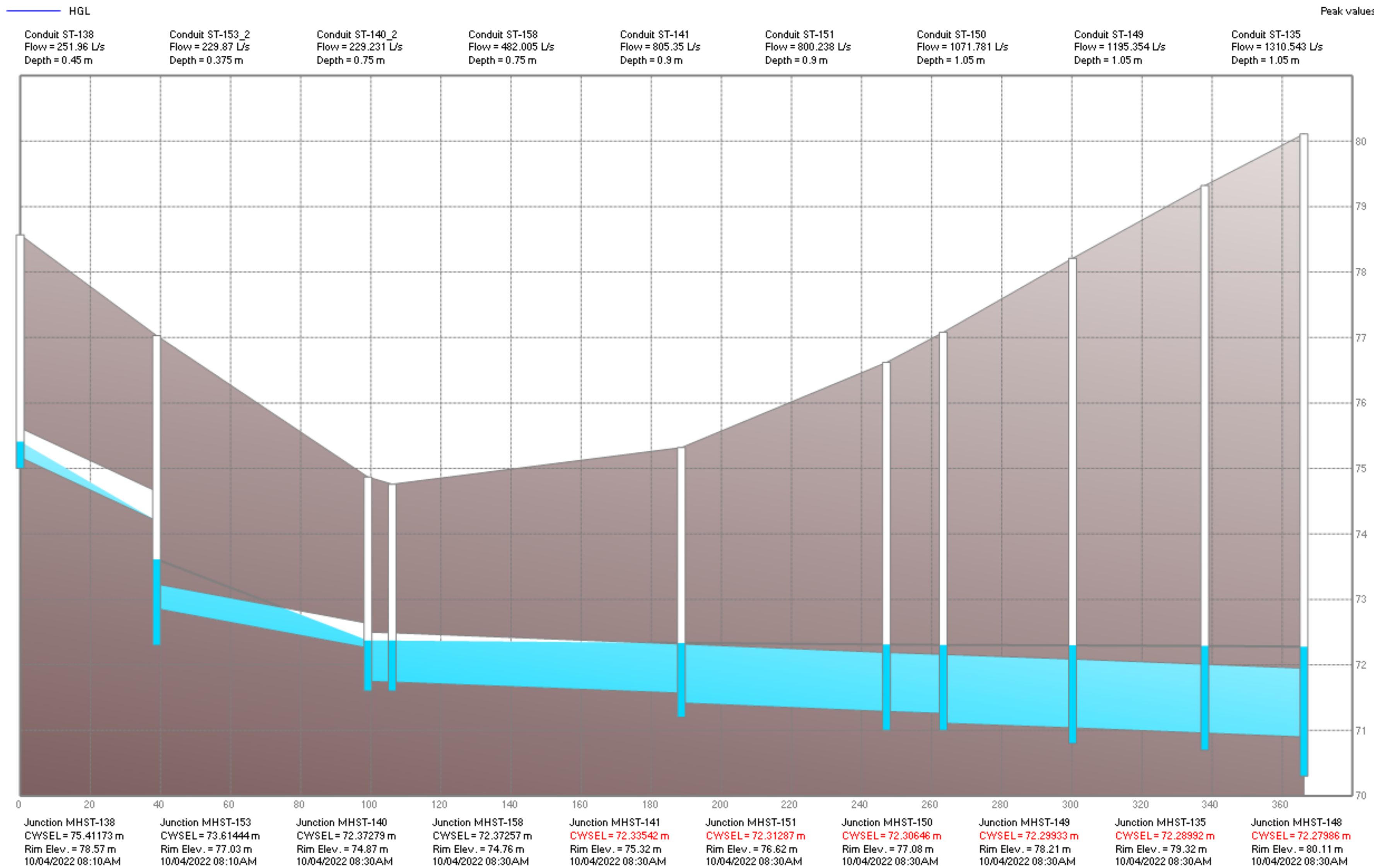


Figure 7: Road E

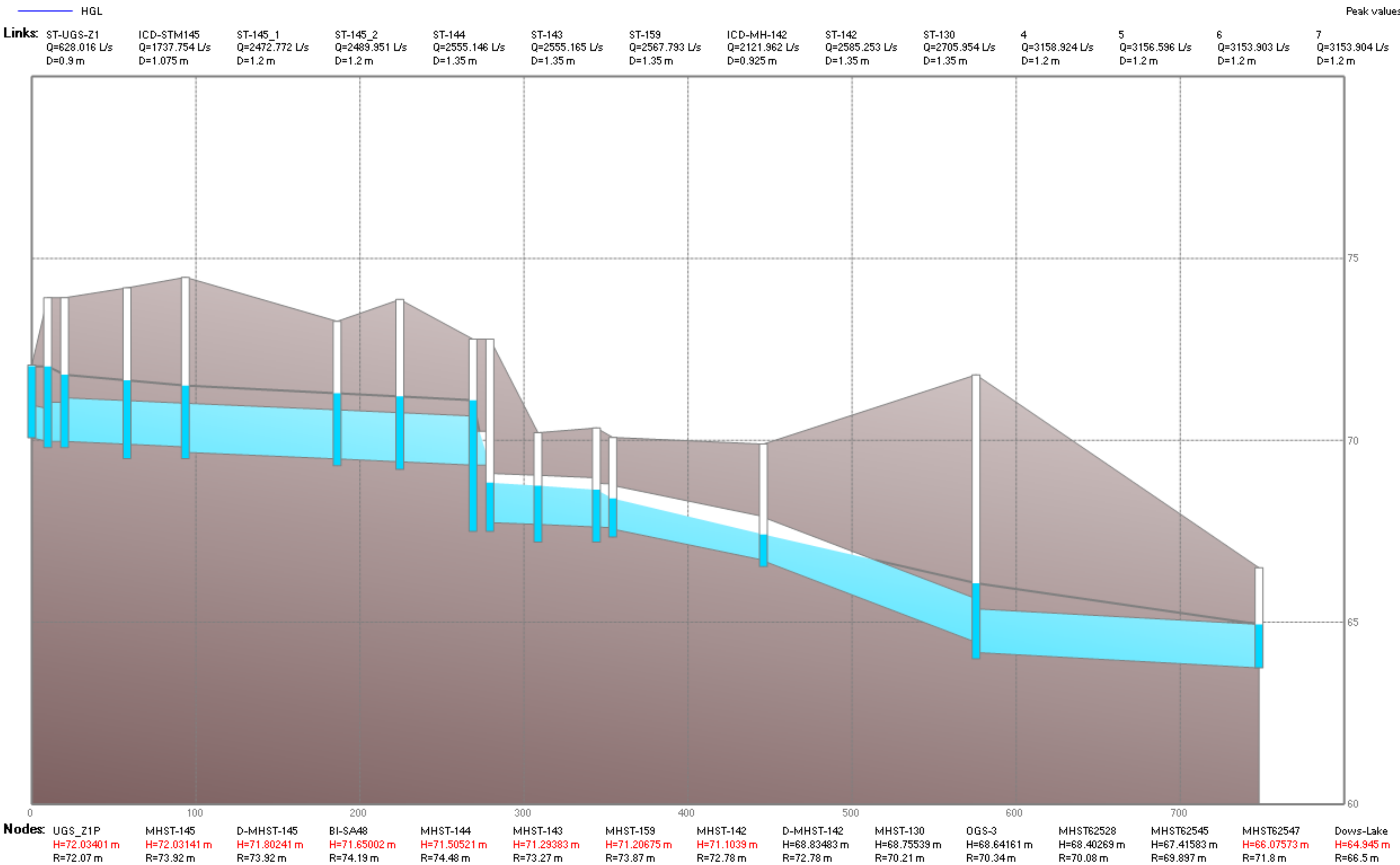


Figure 8: Road D to Outfall

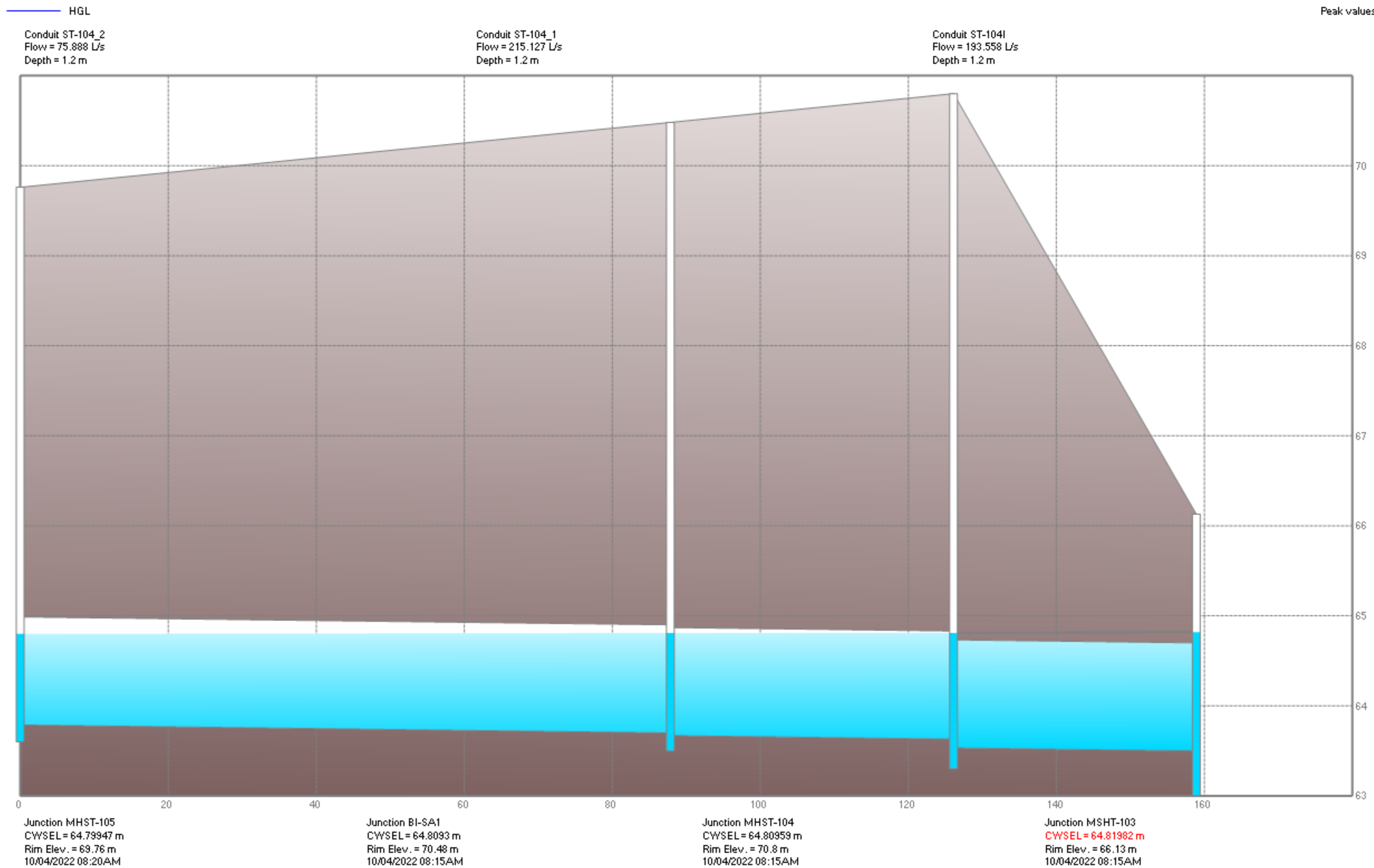


Figure 9: Road B

Table 1: Orifices

Name	Inlet Node	Outlet Node	Type	Cross-Section	Height (m)	Inlet Elev. (m)	Discharge Coeff.	Max. |Flow| (L/s)	Contributing Area (ha)	Contributing Imp. Area (ha)
ICD-100	MHST-100	D-MHST-100	SIDE	CIRCULAR	0.3	63.06	0.62	229.28	3.573	2.474
ICD11	D-MHST-155	MHST-155	SIDE	CIRCULAR	0.65	74.1	0.62	1386.83	12.745	4.086
ICD-MH-142	MHST-142	D-MHST-142	SIDE	CIRCULAR	0.925	69.32	0.62	2123.24	24.915	10.849
ICD-STM145	MHST-145	D-MHST-145	SIDE	CIRCULAR	1.075	69.97	0.62	1737.94	23.279	9.629
ICD-STM64	MHST-170	DMHST-170	SIDE	CIRCULAR	0.15	71.96	0.62	37.69	0.826	0.539
ST-UGS4	UGS_Z4P	CBMHST-102	SIDE	CIRCULAR	0.15	73.17	0.65	52.73	0.658	0.408

Table 2: Conduits

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
1	MHST-158-S	S-60	295	0.035	74.95	68.89	TRIANGULAR	0.5	0.02055	32.82	0.21
10	CBMHST105	CBMHST103	17.6	0.013	72.4	72.13	CIRCULAR	0.3	0.01534	52.75	1.24
11	CBMHST-102	CBMHST105	43.6	0.013	73.02	72.43	CIRCULAR	0.3	0.01353	52.73	1.35
2	MHST-105-S	Wales-OLF-N03	17	0.016	69.86	68.2	IRREGULAR	0	0.09812	53.91	0.67
3	Preston	Preston_Street	10	0.013	61.03	60.9	CIRCULAR	0.3	0.013	162.05	2.29
4	OGS-3	MHST62528	10	0.013	67.62	67.6	CIRCULAR	1.2	0.002	3161.36	3.14
5	MHST62528	MHST62545	91.8	0.013	67.56	66.707	CIRCULAR	1.2	0.00929	3161.6	3.72
6	MHST62545	MHST62547	129.6	0.013	66.687	64.45	CIRCULAR	1.2	0.01726	3162.02	3.91
7	MHST62547	Dows-Lake	172.5	0.013	64.17	63.745	CIRCULAR	1.2	0.00246	3162.02	2.8
8	POW_D1	OGS-3	180	0.035	78.7	69.7	TRAPEZOIDAL	0.55	0.05006	657.53	1.79
8_1	UGS_Exp_Farm	D-MHST-155	3.1	0.013	74.12	74.1	CIRCULAR	0.825	0.00645	2025.09	3.79
9	CBMHST103	UGS_Z6BP	2.6	0.013	72.1	72.07	CIRCULAR	0.375	0.01154	52.81	0.9
CA-OLF_2	Carling_OLF1	Carling_OLFN1	120.425	0.016	66.5	65.408	IRREGULAR	0	0.00907	152.64	0.67
CA-OLF_3	Carling_OLFN3	Carling_OLF	66.467	0.016	64.8	64.6	IRREGULAR	0	0.00301	244.59	0.67
CA-OLF_4	Carling_OLFN1	Carling_OLFN3	67.075	0.016	65.408	64.8	IRREGULAR	0	0.00906	263.81	0.87

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
CA-STM	IN119607	D-MHST-100	86	0.013	63.1	62.8	CIRCULAR	0.3	0.00349	20.94	0.3
ST-100_2	D-MHST-100	Nepean-Bay-Trunk	6	0.013	63.06	63.04	CIRCULAR	0.9	0.00333	407.61	1.65
ST-100-S	MHST-100-S	Carling_OLFN3	11	0.013	66.33	64.8	IRREGULAR	0	0.14046	0	0
ST-101I	MHST-101	MHST-100	27.419	0.013	63.12	63.09	CIRCULAR	0.9	0.00109	392.02	0.62
ST-101I-S	MHST-101-S	MHST-100-S	27.419	0.013	66.07	66.33	IRREGULAR	0	-0.00948	0	0
ST-102	CBMHST-101	UGS_Z4P	10	0.013	73.37	73.17	CIRCULAR	0.375	0.02	9.58	0.2
ST-102I	MHST-102	MHST-101	27.18	0.013	63.15	63.12	CIRCULAR	1.5	0.0011	344.73	0.38
ST-102I-S	MHST-102-S	MHST-101-S	27.18	0.013	66.28	66.07	IRREGULAR	0	0.00773	33.84	0.2
ST-103I	MSHT-103	MHST-102	52.936	0.013	63.203	63.15	CIRCULAR	1.5	0.001	326.29	0.44
ST-103I-S	MSHT-103-S	MHST-102-S	52.936	0.013	66.13	66.28	IRREGULAR	0	-0.00283	20.49	0.15
ST-104	CBMHST-104	CBMHST-101	15.1	0.013	74.14	73.84	CIRCULAR	0.3	0.01987	5.06	0.12
ST-104_1	BI-SA1	MHST-104	38.268	0.013	63.67	63.631	CIRCULAR	1.2	0.00102	295.21	1.04
ST-104_2	MHST-105	BI-SA1	87.842	0.013	63.788	63.7	CIRCULAR	1.2	0.001	168.65	0.24
ST-104I	MHST-104	MSHT-103	32.803	0.013	63.533	63.5	CIRCULAR	1.2	0.00101	245.57	0.94
ST-105I_1-S	BI-SA1-S	MHST-105-S	87.84	0.013	70.484	69.76	IRREGULAR	0	0.00824	116.68	0.54
ST-105I_2-S	MHST-104-S	BI-SA1-S	37.727	0.013	70.8	70.484	IRREGULAR	0	0.00838	52.06	0.4
ST-106I	MHST-106	MSHT-103	29.577	0.013	63.233	63.203	CIRCULAR	1.5	0.00101	141.92	0.13
ST-106I-S	MHST-106-S	MSHT-103-S	29.577	0.013	71.87	66.13	IRREGULAR	0	0.19783	118.52	0.9
ST-107	DMHST-170	MHST-158	13.5	0.013	71.93	71.8	CIRCULAR	0.3	0.00963	138.77	1.96
ST-108	CBMH108	CBMH109	35.7	0.013	71.56	71.49	CIRCULAR	0.6	0.00196	89.9	0.85
ST-109	CBMH109	CBMH110	20.8	0.013	71.49	71.45	CIRCULAR	0.6	0.00192	90.98	0.91
ST-110	CBMH110	MHST-135	17.9	0.013	71.45	71.41	CIRCULAR	0.6	0.00223	91.31	1.03
ST-111	CBMH111	CBMH108	15.3	0.013	71.59	71.56	CIRCULAR	0.6	0.00196	89.26	0.84
ST-120	MHST-120	MHST-106	45.853	0.013	63.278	63.233	CIRCULAR	1.5	0.00098	122.47	0.13
ST-120-S	MHST-120-S	MHST-106-S	45.853	0.013	74.16	71.87	IRREGULAR	0	0.05	88.4	1.18
ST-130	MHST-130	OGS-3	35.6	0.013	67.69	67.62	CIRCULAR	1.35	0.00197	2711.86	2.3
ST-131	MHST-131	MHST-130	47.9	0.013	68.16	68.11	CIRCULAR	0.825	0.00104	408.22	1.4

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-132	MHST-132	MHST-156	41.629	0.013	73.35	72.72	CIRCULAR	0.45	0.01514	401.23	2.55
ST-133	MHST-133	MHST-131	51.32	0.013	68.21	68.16	CIRCULAR	0.825	0.00097	417.74	1.19
ST-135	MHST-135	MHST-148	28.3	0.013	70.96	70.9	CIRCULAR	1.05	0.00212	1330.79	2.22
ST-138	MHST-138	MHST-153	38.9	0.013	75.17	74.2	CIRCULAR	0.45	0.02494	253.41	2.92
ST-139	MHST-139	MHST-133	72.952	0.013	68.35	68.28	CIRCULAR	0.75	0.00096	57.97	0.49
ST-140_2	MHST-140	MHST-158	6.9	0.013	71.75	71.74	CIRCULAR	0.75	0.00145	238.92	0.69
ST-141	MHST-141	MHST-151	58.5	0.013	71.42	71.29	CIRCULAR	0.9	0.00222	821.62	1.69
ST-141-S	MHST-151-S	MHST-141-S	70.7	0.013	76.58	75.32	IRREGULAR	0	0.01782	390.12	1.19
ST-142	D-MHST-142	MHST-130	29.3	0.013	67.74	67.69	CIRCULAR	1.35	0.00171	2589.87	2.12
ST-143	MHST-143	MHST-159	38.2	0.013	69.49	69.41	CIRCULAR	1.35	0.00209	2560.62	1.79
ST-144	MHST-144	MHST-143	92.5	0.013	69.67	69.49	CIRCULAR	1.35	0.00195	2560.61	1.79
ST-145_1	D-MHST-145	BI-SA48	38	0.013	69.97	69.894	CIRCULAR	1.2	0.002	2477.55	2.19
ST-145_2	BI-SA48	MHST-144	35.6	0.013	69.894	69.82	CIRCULAR	1.2	0.00208	2493.45	2.2
ST-146_1	MHST-146	BI-SA49	5.7	0.013	70.2	70.189	CIRCULAR	1.5	0.00193	2853.41	1.97
ST-146_1-S	MHST-146-S	BI-SA49-S	5.693	0.013	75.44	75.351	IRREGULAR	0	0.01564	246.74	0.87
ST-146_2	BI-SA49	MHST-157	77.1	0.013	70.189	70.03	CIRCULAR	1.5	0.00206	2889.67	1.99
ST-146_2-S	BI-SA49-S	MHST-157-S	77.118	0.013	75.351	74.14	IRREGULAR	0	0.01571	175.52	0.65
ST-147	MHST-147	MHST-146	40.9	0.013	70.28	70.2	CIRCULAR	1.5	0.00196	2772.61	1.85
ST-147-S	MHST-147-S	MHST-146-S	40.768	0.013	75.9	75.44	IRREGULAR	0	0.01128	226.9	0.75
ST-148	MHST-148	MHST-147	86.4	0.013	70.45	70.28	CIRCULAR	1.5	0.00197	2750.98	1.88
ST-148-S	MHST-148-S	MHST-147-S	93.313	0.013	80.11	75.9	IRREGULAR	0	0.04516	159.8	0.75
ST-149	MHST-149	MHST-135	37.7	0.013	71.04	70.96	CIRCULAR	1.05	0.00212	1214.7	1.88
ST-149-S	MHST-135-S	MHST-149-S	34.9	0.013	79.32	78.21	IRREGULAR	0	0.03182	180.46	0.86
ST-150	MHST-150	MHST-149	36.9	0.013	71.11	71.04	CIRCULAR	1.05	0.0019	1086.42	1.63
ST-150-S	MHST-149-S	MHST-150-S1	45	0.013	78.21	77.08	IRREGULAR	0	0.02512	342.79	0.89
ST-151	MHST-151	MHST-150	16.2	0.013	71.29	71.26	CIRCULAR	0.9	0.00185	830.35	1.82
ST-151-S	MHST-150-S1	MHST-151-S	16.1	0.013	77.08	76.58	IRREGULAR	0	0.03107	395.91	1.33

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-153_2	MHST-153	MHST-140	60.3	0.013	72.86	72.26	CIRCULAR	0.375	0.00995	237.97	2.19
ST-154	MHST-154	UGS_Exp_Farm	16	0.013	75.8	75.72	CIRCULAR	0.9	0.005	4128.96	6.49
ST-155_2-S	D-MHST-155-S	MHST-148-S	52.7	0.013	83.11	80.11	IRREGULAR	0	0.05702	27.55	0.44
ST-155_3	MHST-155	MHST-148	22.3	0.013	74.04	73.59	CIRCULAR	0.825	0.02018	2039.39	4.35
ST-156	MHST-156	MHST-157	34.6	0.013	70.1	70.03	CIRCULAR	1.5	0.00202	946.63	0.82
ST-157	MHST-157	MHST-145	28.3	0.013	70.03	69.97	CIRCULAR	1.5	0.00212	3690.08	2.75
ST-157-S	MHST-157-S	MHST-145-S	28.171	0.013	74.14	73.92	IRREGULAR	0	0.00781	207.54	0.48
ST-158	MHST-158	MHST-141	82.5	0.013	71.74	71.57	CIRCULAR	0.75	0.00206	488.05	1.5
ST-158-S	MHST-141-S	MHST-158-S	75.107	0.013	75.32	74.85	IRREGULAR	0	0.00626	233.86	0.56
ST-159	MHST-159	MHST-142	44.6	0.013	69.41	69.32	CIRCULAR	1.35	0.00202	2573.06	1.8
ST-62534	MHST-62534	MHST-62537	15.4	0.013	76.18	76.1	CIRCULAR	0.9	0.00519	4127.54	6.49
ST-62537	MHST-62537	MHST-154	35.9	0.013	76.04	75.86	CIRCULAR	0.9	0.00501	4128.63	6.49
ST-62538	MHST-62538	MHST-155	37.3	0.013	79.45	78.7	CIRCULAR	0.525	0.02011	36.43	1.55
ST-G107	MHST-107	OGS1	52.5	0.013	62.03	61.24	CIRCULAR	0.3	0.01505	34.35	1.05
ST-OGS1_2	OGS1	Preston	10	0.013	61.21	61.06	CIRCULAR	0.3	0.015	86.25	1.63
ST-P3	DICB3	IN119608	71.1	0.013	64.23	63.8	CIRCULAR	0.2	0.00605	15.05	0.87
ST-P46	IN119608	IN119607	30	0.013	63.5	63.2	CIRCULAR	0.2	0.01	15.59	0.97
ST-SA1	MH-SA1	BI-SA1	24.65	0.013	69.45	69.08	CIRCULAR	0.3	0.01501	60.22	1.71
ST-SA48	MH-SA48	BI-SA48	10.8	0.013	71.91	71.8	CIRCULAR	0.3	0.01019	15.84	1.02
ST-SA49	MH-SA49	BI-SA49	21	0.013	72.5	72.29	CIRCULAR	0.3	0.01	16.2	1.02
ST-SA51	MH-SA51	MHST-141	32.6	0.013	73.5	71.7	CIRCULAR	0.375	0.0553	43.87	2.43
ST-SA52	MH-SA52	MHST-139	28.6	0.013	68.86	68.57	CIRCULAR	0.525	0.01014	47.54	1.31
ST-SA53	MH-ST53	MHST-133	24.9	0.013	68.98	68.73	CIRCULAR	0.3	0.01004	16.41	1.02
ST-SA54	MH-SA54	MHST-142	2.5	0.013	70.66	70.64	CIRCULAR	0.3	0.008	16.36	0.91
ST-Sa56	MH-SA56	MHST-144	27	0.013	71.84	71.57	CIRCULAR	0.45	0.01	535.79	3.37
ST-UGS6B	UGS_Z6BP	MHST-170	10.6	0.013	72.07	71.96	CIRCULAR	0.3	0.01038	139.24	1.97
ST-UGS-Z1	UGS_Z1P	MHST-145	9.7	0.013	70.07	69.97	CIRCULAR	0.9	0.01031	2442.91	4.1

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-xx	MH-SAxx	MHST-107	10.7	0.013	62.45	62.15	CIRCULAR	0.2	0.02805	7.01	1.21
WD-OLF_3	Wales-OLF-N03	Wales-OLF-N04	81.193	0.016	68.2	66.75	IRREGULAR	0	0.01786	76.78	0.91
WD-OLF_4	Wales-OLF-N04	Wales-OLF-N05	94.991	0.016	66.75	65.5	IRREGULAR	0	0.01316	67.68	0.64

Table 3: Storages

Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)	Hours Flooded (h)	Max. Flood Rate (L/s)	Total Flood Vol. (ML)	Avg. Percent Full (%)	Max. Volume (1000 m^3)	Max. Percent Full (%)	Max. Outflow (L/s)
R-48	73	73.1	0.1	0.05	73.05	81.92	0	0	0	9	0.069	53	15.84
R-49	74	74.1	0.1	0.05	74.05	97.43	0	0	0	11	0.086	54	16.2
R-50	77	77.1	0.1	0.05	77.05	202.35	0	0	0	7	0.157	46	46.12
R-52	69	69.1	0.1	0.05	69.05	232.41	0	0	0	8	0.19	48	47.54
R-53	70	70.1	0.1	0.05	70.05	103.09	0	0	0	11	0.093	55	16.41
R-54	72	72.1	0.1	0.05	72.05	102.59	0	0	0	11	0.093	54	16.33
S-14B	61.65	63.3	1.65	1.65	63.3	70	0.17	49.85	0.012	4	0.013	100	20.15
S-15	62.1	63.9	1.8	1.8	63.9	159.41	0	0	0	70	0.112	100	7.86
S-19	64	66	2	1.7	65.7	102.32	0	0	0	8	0.084	31	3.83
S-21B	63.54	65.7	2.16	1.9	65.44	517.31	0	0	0	30	0.64	50	4.08
S-26B	67.33	69.62	2.29	2.28	69.61	316.18	0	0	0	33	0.324	95	8.85
S-3	62.2	64.24	2.04	2.04	64.24	207.93	0	0	0	71	0.08	100	26.69
S-58	64.93	66.95	2.02	2.11	67.04	230.95	0	0	0	2	0.093	38	108.54
S-60	67.69	69.34	1.65	1.7	69.39	545.99	0	0	0	3	0.198	61	243.94
S-63	80.3	82.16	1.86	1.99	82.29	390.28	0	0	0	4	0.131	88	226.21
SA-1	69.5	72.5	3	2.86	72.36	730.7	0	0	0	19	0.629	95	60
SA-2	62.6	65.6	3	2.36	64.96	514.49	0	0	0	52	0.707	79	7
SA-CUP	72.5	75.5	3	0.68	73.18	337.07	0	0	0	8	0.34	23	15

Table 3: Storages (continued...)

Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)	Hours Flooded (h)	Max. Flood Rate (L/s)	Total Flood Vol. (ML)	Avg. Percent Full (%)	Max. Volume (1000 m^3)	Max. Percent Full (%)	Max. Outflow (L/s)
UGS_Exp_Farm	74.12	77.12	3	2.97	77.09	4128.96	0	0	0	9	2.087	99	2025.09
UGS_Z1P	70.07	72.07	2	1.97	72.04	2442.91	0	0	0	14	2.952	98	644.76
UGS_Z4P	73.17	74.39	1.22	1.15	74.32	362.96	0	0	0	16	0.285	95	55.2

Table 4: Weirs

Name	Inlet Node	Outlet Node	Type	Height (m)	Side Slope (m/m)	Inlet Elev. (m)	Discharge Coeff. (m^3/s)	Max. |Flow| (L/s)	Contributing Area (ha)	Contributing Imp. Area (ha)
ExpF-Weir	D-MHST-155	MHST-155	TRANSVERSE	1	0	76.5	1.65	638.86	12.745	4.086
Overflow-58	S-58	Carling_OLF1	TRANSVERSE	0.3	0	66.9	1.84	93.49	0.443	0.148
Overflow-60	S-60	OGS-3	TRANSVERSE	0.3	0	69.3	1.84	99.92	3.963	1.831
Overflow-63	S-63	MHST-149-S	TRANSVERSE	0.3	0	82.1	1.84	158.3	0.778	0.296
Weir3	MHST-100	D-MHST-100	TRANSVERSE	0.5	0	64.63	1.84	156.79	3.573	2.474
Weir4	MHST-142	D-MHST-142	TRANSVERSE	0.5	0	70.8	1.84	466.06	24.915	10.849
Weir5	MHST-145	D-MHST-145	TRANSVERSE	0.8	0	71.55	1.84	1289.77	23.279	9.629
Weir8	MHST-170	DMHST-170	TRANSVERSE	0.3	0	72.6	1.84	114.16	0.826	0.539

Table 5: Outfalls

Name	Inflows	Invert Elev. (m)	Rim Elev. (m)	Type	Max. Depth (m)	Max. HGL (m)	Time Max. HGL (M/D/Y)	Max. Total Inflow (L/s)	Max. Flow (L/s)	Total Flow (ML)	Contributing Area (ha)	Contributing Imp. Area (ha)
Carling_OLF	NO	64.6	64.8	FREE	0.13	64.73	10/04/2022 08:12 AM	309.62	309.62	0.449	1.803	0.924
Dows-Lake	NO	63.745	66.5	NORMAL	1.2	64.94	10/04/2022 08:08 AM	3162.02	3162.02	24.585	29.592	13.157
LRT-Corridor	NO	56	57	FREE	0	56	10/04/2022 00:00 AM	32.68	32.68	0.028	0.059	0
Nepean-Bay-Trunk	NO	62.8	65.21	NORMAL	0	62.8	10/04/2022 00:00 AM	407.61	407.61	4.152	5.336	2.809
Preston_Street	NO	60.9	63.76	NORMAL	0.3	61.2	10/04/2022 08:03 AM	162.05	162.05	2.762	2.471	1.526

Table 6: Subcatchments

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
1	24hr-StressTest	SA-1	1.216139	3	100	0.016	0.15	1.57	4.67	25	127.93	0	730.32	
10	24hr-StressTest	13B_2	0.099916	3	8.07	0.016	0.15	1.57	4.67	25	127.93	74.56	53.45	
11	24hr-StressTest	Wales-OLF-N03	0.045673	3	100	0.016	0.15	1.57	4.67	25	127.93	0	27.18	
12	24hr-StressTest	BI-SA1-S	0.127648	5	56.48	0.016	0.15	1.57	4.67	25	127.93	35.03	73.75	
13B_1	24hr-StressTest	MHST-104-S	0.13	5	100	0.016	0.15	1.57	4.67	25	127.93	0	77.35	
13B_2	24hr-StressTest	BI-SA1-S	0.22	5	100	0.016	0.15	1.57	4.67	25	127.93	0	180.28	
14	24hr-StressTest	Carling_OLF	0.058029	3	60.27	0.016	0.15	1.57	4.67	25	127.93	32.32	32.49	
14B	24hr-StressTest	S-14B	0.1272	3	0	0.016	0.15	1.57	4.67	25	127.93	80.77	70	
15	24hr-StressTest	S-15	0.364274	3	3.61	0.016	0.15	1.57	4.67	25	127.93	79.13	159.41	
16	24hr-StressTest	LRT-Corridor	0.022914	3	0	0.016	0.15	1.57	4.67	25	127.93	80.51	12.72	
17	24hr-StressTest	LRT-Corridor	0.036056	3	0	0.016	0.15	1.57	4.67	25	127.93	80.65	19.97	
18	24hr-StressTest	Carling_OLF	0.119323	3	3.43	0.016	0.15	1.57	4.67	25	127.93	78.55	61	
19	24hr-StressTest	S-19	0.2044	3	8.76	0.016	0.15	1.57	4.67	25	127.93	74.36	102.32	
2	24hr-StressTest	SA-2	0.711441	3	100	0.016	0.15	1.57	4.67	25	127.93	0	460.23	
20	24hr-StressTest	Carling_OLFN1	0.243417	8	0	0.016	0.15	1.57	4.67	25	127.93	80.86	133.06	
21B	24hr-StressTest	S-21B	0.432546	10	0	0.016	0.15	1.57	4.67	25	127.93	103.28	517.31	

Table 6: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
22B_1	24hr-StressTest	MHST-120-S	0.26722	5	100	0.016	0.15	1.57	4.67	25	127.93	0	158.64	
22B_2	24hr-StressTest	MHST-106-S	0.06311	5	100	0.016	0.15	1.57	4.67	25	127.93	0	37.56	
22B_3	24hr-StressTest	MSHT-103-S	0.13522	5	100	0.016	0.15	1.57	4.67	25	127.93	0	80.47	
22B_4	24hr-StressTest	MHST-102-S	0.07311	5	100	0.016	0.15	1.57	4.67	25	127.93	0	43.52	
22B_5	24hr-StressTest	MHST-101-S	0.093	5	100	0.016	0.15	1.57	4.67	25	127.93	0	55.35	
24	24hr-StressTest	MHST-107	0.034783	3	55.8	0.016	0.15	1.57	4.67	25	127.93	35.77	19.9	
25	24hr-StressTest	OGS1	0.046463	3	80.56	0.016	0.15	1.57	4.67	25	127.93	15.72	27.21	
26B	24hr-StressTest	S-26B	0.77118	9.406	8.27	0.016	0.15	1.57	4.67	25	127.93	75.69	316.18	
27	24hr-StressTest	MHST-101-S	0.076061	3	61.17	0.016	0.15	1.57	4.67	25	127.93	31.27	44.08	
28	24hr-StressTest	MHST-102-S	0.076646	5	63.2	0.016	0.15	1.57	4.67	25	127.93	29.62	44.49	
29	24hr-StressTest	7	0.011277	3	0	0.016	0.15	1.57	4.67	25	127.93	81.33	5.73	
2B	24hr-StressTest	SA-2	0.090802	3	100	0.016	0.15	1.57	4.67	25	127.93	0	54.05	
3	24hr-StressTest	S-3	0.21539	3	31.75	0.016	0.15	1.57	4.67	25	127.93	62.03	207.93	
3B	24hr-StressTest	3	0.0393	3	100	0.016	0.15	1.57	4.67	25	127.93	0	23.39	
4	24hr-StressTest	2	0.019571	3	100	0.016	0.15	1.57	4.67	25	127.93	0	11.65	
40	24hr-StressTest	MHST-156	1.18634	6.77	47.28	0.016	0.15	1.57	4.67	25	127.93	43.5	579.63	
41	24hr-StressTest	MHST-132	1.522779	3	14.99	0.016	0.15	1.57	4.67	25	127.93	73.08	401.46	
42_1	24hr-StressTest	MHST-135-S	0.38897	5	75.19	0.016	0.15	1.57	4.67	25	127.93	20.01	227.51	
42_2	24hr-StressTest	MHST-149-S	0.30146	5	75.19	0.016	0.15	1.57	4.67	25	127.93	20.03	176.2	
42_3	24hr-StressTest	MHST-150-S1	0.59319	2	75.19	0.016	0.15	1.57	4.67	25	127.93	20.16	340.96	
42_4	24hr-StressTest	MHST-141-S	0.45704	2	75.19	0.016	0.15	1.57	4.67	25	127.93	16.89	196.02	PurpleRoof
43	24hr-StressTest	SA-CUP	0.56665	2	100	0.016	0.15	1.57	4.67	25	127.93	0	337.07	
44	24hr-StressTest	MHST-62534	12.74513	1	32.06	0.016	0.15	1.57	4.67	25	127.93	58.59	4128.53	
45	24hr-StressTest	63	0.36482	4	25.66	0.016	0.15	1.57	4.67	25	127.93	61.2	167.1	
45_A	24hr-StressTest	65	0.192111	4	0	0.016	0.15	1.57	4.67	25	127.93	81.26	99.03	
46	24hr-StressTest	21B	0.887972	10	21	0.016	0.15	1.57	4.67	25	127.93	64.72	425.85	
47_1	24hr-StressTest	D-MHST-155-S	0.11038	3	65.86	0.016	0.15	1.57	4.67	25	127.93	27.57	64.04	

Table 6: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
47_2	24hr-StressTest	MHST-148-S	0.46158	3	65.86	0.016	0.15	1.57	4.67	25	127.93	27.98	250.98	
47_3	24hr-StressTest	MHST-147-S	0.19065	3	65.86	0.016	0.15	1.57	4.67	25	127.93	27.67	109.55	
47_4	24hr-StressTest	MHST-146-S	0.40137	3	65.86	0.016	0.15	1.57	4.67	25	127.93	27.91	221.1	
47_5	24hr-StressTest	MHST-157-S	0.25086	3	65.86	0.016	0.15	1.57	4.67	25	127.93	27.74	142.61	
48	24hr-StressTest	R-48	0.137722	2	100	0.016	0.4	1.57	4.67	25	127.93	0	81.92	
49	24hr-StressTest	R-49	0.16391	2	100	0.016	0.4	1.57	4.67	25	127.93	0	97.43	
5	24hr-StressTest	preston	0.012005	3	100	0.016	0.15	1.57	4.67	25	127.93	0	7.15	
50	24hr-StressTest	R-50	0.34548	2	100	0.016	0.4	1.57	4.67	25	127.93	0	202.35	
51	24hr-StressTest	MH-SA51	1.27453	2	30	0.016	0.15	1.57	4.67	25	127.93	6.4	43.87	PurpleRoof
52	24hr-StressTest	R-52	0.39976	2	100	0.016	0.4	1.57	4.67	25	127.93	0	232.41	
53	24hr-StressTest	R-53	0.173497	2	100	0.016	0.4	1.57	4.67	25	127.93	0	103.09	
54	24hr-StressTest	R-54	0.17264	2	100	0.016	0.4	1.57	4.67	25	127.93	0	102.59	
55	24hr-StressTest	MHST-159	0.4073	2	30	0.016	0.15	1.57	4.67	25	127.93	2.84	14.1	PurpleRoof
56	24hr-StressTest	MH-SA56	0.917849	2	85.76	0.016	0.15	1.57	4.67	25	127.93	11.54	535.8	
57	24hr-StressTest	Carling_OLF1	0.154931	15	6.12	0.016	0.15	1.57	4.67	25	127.93	75.67	86.28	
58	24hr-StressTest	S-58	0.442854	16	33.5	0.016	0.15	1.57	4.67	25	127.93	54.25	230.95	
59	24hr-StressTest	MHST-133	0.668065	2	100	0.016	0.15	1.57	4.67	25	127.93	0	393	
6	24hr-StressTest	3	0.1396	3	2.06	0.016	0.15	1.57	4.67	25	127.93	79.57	72.4	
60	24hr-StressTest	S-60	0.29751	25	0	0.016	0.15	1.57	4.67	25	127.93	85.55	514.46	
60A	24hr-StressTest	60B	0.243636	25	19.96	0.016	0.15	1.57	4.67	25	127.93	64.79	134.42	
60B	24hr-StressTest	60	0.39679	25	0	0.016	0.15	1.57	4.67	25	127.93	109.64	504.94	
60C	24hr-StressTest	60B	0.507297	25	35	0.016	0.15	1.57	4.67	25	127.93	52.87	272.94	
61	24hr-StressTest	UGS_Z4P	0.65834	3	62.04	0.016	0.15	1.57	4.67	25	127.93	30.98	362.96	
62	24hr-StressTest	POW_D1	0.266185	4.97	68.32	0.016	0.15	1.57	4.67	25	127.93	26.82	142.03	
62A	24hr-StressTest	POW_D1	0.519395	6	0.04	0.016	0.15	1.57	4.67	25	127.93	84.41	138.53	
62B	24hr-StressTest	62	0.07117	3	0	0.016	0.15	1.57	4.67	25	127.93	83.24	23.96	
62C	24hr-StressTest	POW_D1	1.13365	5	58.05	0.016	0.15	1.57	4.67	25	127.93	37.15	419.23	

Table 6: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
63	24hr-StressTest	S-63	0.41268	2	49.11	0.016	0.15	1.57	4.67	25	127.93	46.93	390.28	
64	24hr-StressTest	UGS_Z6BP	0.16771	6	78.06	0.016	0.15	1.57	4.67	25	127.93	17.67	98.34	
65	24hr-StressTest	MHST-138	0.523363	3.598	41.91	0.016	0.15	1.57	4.67	25	127.93	49.99	254.68	
7	24hr-StressTest	2	0.016512	3	100	0.016	0.15	1.57	4.67	25	127.93	0	15.33	
8	24hr-StressTest	2	0.01883	3	100	0.016	0.15	1.57	4.67	25	127.93	0	11.21	
9	24hr-StressTest	1	0.019216	3	100	0.016	0.15	1.57	4.67	25	127.93	0	11.44	

APPENDIX F | DRAWINGS

APPENDIX G | BOUNDARY CONDITIONS

Mitchelson, Sarah [NN-CA]

From:	Steele, Matt <Matt.Steele@ottawa.ca>
Sent:	Tuesday, May 17, 2022 11:06 AM
To:	Mitchelson, Sarah [NN-CA]; Shillington, Jeffrey
Cc:	Paradis, Kelly [NN-CA]; Moore, Sean; Evans, Allan
Subject:	[EXTERNAL] RE: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Sarah,

All demands were applied at connection 1B – this is a more conservative approach.

If you are drawing from both 1A & 1B connections, the HGL may be slightly higher.

You can assume connection 1A will be 107.6m as well.

Matt

Matt Steele, P.Eng.
Senior Water Resources Engineer
Infrastructure and Water Services
City of Ottawa
P: 613-580-2424 Ext. 16024

From: Sarah.Mitchelson@parsons.com <Sarah.Mitchelson@parsons.com>
Sent: 2022/05/16 12:42 PM
To: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Cc: Paradis, Kelly <Kelly.Paradis@parsons.com>; Steele, Matt <Matt.Steele@ottawa.ca>; Moore, Sean <Sean.Moore@ottawa.ca>; Evans, Allan <Allan.Evans@ottawa.ca>; Pamela.Whyte@parsons.com
Subject: RE: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Jeff,

For Scenario 2, can we assume Connection 1A and 1B will be the same (107.6m)?

Regards,
Sarah

SARAH MITCHELSON, P.ENG
Municipal Engineer
1223 Michael Street North, Suite 100, Ottawa, ON K1J 7T2
sarah.mitchelson@parsons.com
Direct: +1 613.691.1609 / Mobile: +1 613.698.6705

Parsons [can01.safelinks.protection.outlook.com] / LinkedIn [can01.safelinks.protection.outlook.com] / Twitter [can01.safelinks.protection.outlook.com] / Facebook [can01.safelinks.protection.outlook.com] / Instagram [can01.safelinks.protection.outlook.com]

PARSONS

From: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Sent: Friday, May 6, 2022 10:24 AM
To: Mitchelson, Sarah [NN-CA] <Sarah.Mitchelson@parsons.com>
Cc: Paradis, Kelly [NN-CA] <Kelly.Paradis@parsons.com>; Steele, Matt <Matt.Steele@ottawa.ca>; Moore, Sean <sean.moore@ottawa.ca>; Evans, Allan <Allan.Evans@ottawa.ca>; Whyte, Pamela [NN-CA] <Pamela.Whyte@parsons.com>
Subject: [EXTERNAL] RE: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Sarah,

The 2020 FUS guidelines are to be used, subject to the modifications of Technical Bulletin ISTB-2018-02. As you can appreciate, we are still reviewing the new FUS guidelines and there will likely be further technical bulletins for clarifications. We will review your FUS calculations and advise if we have any comments.

The following are boundary conditions, HGL, for hydraulic analysis at the Ottawa Hospital Parking Garage (zone 1W) assumed to be connected to the 406 mm on Carling Avenue (see attached PDF for location).

Both Connections:

Minimum HGL = 107.1 m

Maximum HGL = 114.6 m

Scenario 1 Ottawa Parking Garage Only:

Connection 1B - Max Day + Fire Flow (367 L/s) = 107.8 m

Scenario 2 Includes Hospital Domestic Demands:

Connection 1B - Max Day + Fire Flow (367 L/s) = 107.6 m

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

Let me know if you have any questions or wish to discuss anything.

Regards,

Jeff Shillington, P.Eng.
Senior Project Manager, Development Review, South Branch
Planning, Infrastructure and Economic Development
City of Ottawa
tel: 580-2424 x 16960
email: jeff.shillington@ottawa.ca

From: Sarah.Mitchelson@parsons.com <Sarah.Mitchelson@parsons.com>
Sent: May 03, 2022 5:00 PM
To: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Cc: Paradis, Kelly <Kelly.Paradis@parsons.com>; Steele, Matt <Matt.Steele@ottawa.ca>; Moore, Sean <Sean.Moore@ottawa.ca>; Evans, Allan <Allan.Evans@ottawa.ca>; Pamela.Whyte@parsons.com
Subject: RE: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Jeff,

Is the City approving moving forward with the 2020 FUS guideline?

The demands for the parking garage are as follows:

Average Day = 1.3L/s
Max Day = 2.0L/s
Peak Hour = 3.5L/s
Fire Flow = 367L/s (based on Scenario 2 in email below)
Max Day + Fire = 369L/s

The City indicated in the last round of comments that they would like the domestic and fire demands for the parking garage and hospital provided. The demands for the hospital were previously estimated at a master plan level. These demands will be revisited and revised accordingly during detail design of the site services to align with the hospital building design.

The demands for the hospital are as follows:

Average Day = 17.8L/s
Max Day = 26.6L/s
Peak Hour = 47.8L/s
Fire Flow = 217L/s

- According to the *"City of Ottawa 2013 Water Master Plan"* prepared by Stantec Consulting Limited (September 20, 2013), the City of Ottawa's existing water supply and distribution systems can provide a fire demand level of service of 13,000L/min (217L/s) in core areas.
- This value will be used as a place holder for the time being. The previously estimated fire of 750L/s (presented in the latest version of the Master Servicing Report) will need to be adjusted to align with the 2020 FUS guideline, if the City is approving moving forward with the new guideline.

Max Day + Fire = 243.6L/s

Can we obtain boundary conditions for the following two scenario:

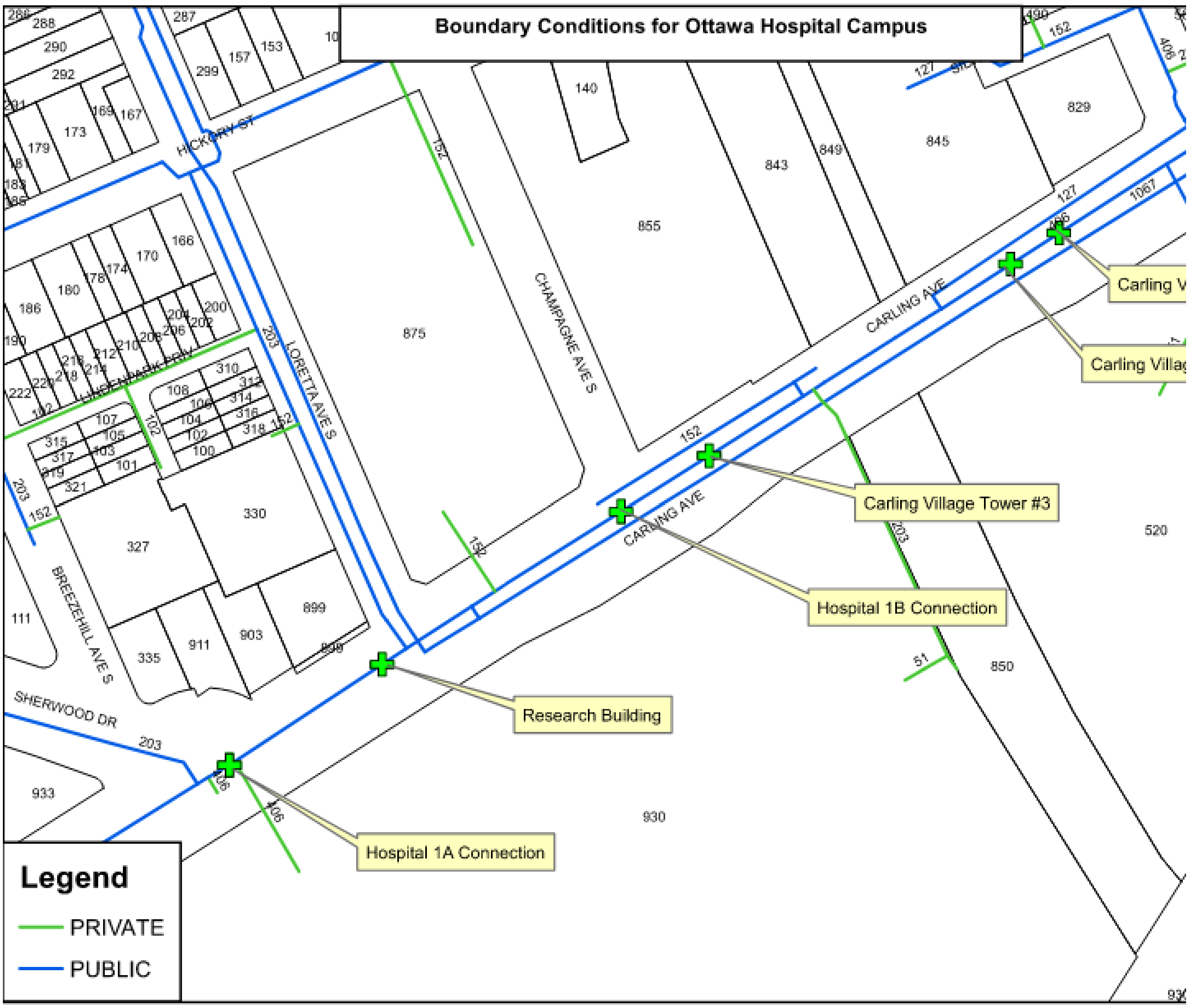
Scenario #1 – Parking Garage with 1 Connection to Carling Avenue (Hospital 1B Connection on Figure)

Average Day = 1.3L/s
Max Day = 2.0L/s
Peak Hour = 3.5L/s
Fire Flow = 367L/s
Max Day + Fire = 369L/s

Scenario #2 – Parking Garage and Hospital with 2 Connections to Carling Avenue (Hospital 1A and 1B Connections on Figure)

Average Day = 19.1L/s
Max Day = 28.6L/s
Peak Hour = 51.3L/s
Fire Flow = 367L/s
Max Day + Fire = 395.6L/s

The values for this Scenario #2 will need to be adjusted as the detail design for the hospital moves forward.



Regards,
Sarah

SARAH MITCHELSON, P.ENG
Municipal Engineer
1223 Michael Street North, Suite 100, Ottawa, ON K1J 7T2
sarah.mitchelson@parsons.com
Direct: +1 613.691.1609 / Mobile: +1 613.698.6705
Parsons [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / LinkedIn [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Twitter [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Facebook [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Instagram [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com]

From: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Sent: Monday, May 2, 2022 2:36 PM
To: Mitchelson, Sarah [NN-CA] <Sarah.Mitchelson@parsons.com>
Cc: Paradis, Kelly [NN-CA] <Kelly.Paradis@parsons.com>; Steele, Matt <Matt.Steele@ottawa.ca>; Moore, Sean <sean.moore@ottawa.ca>; Evans, Allan <Allan.Evans@ottawa.ca>; Whyte, Pamela [NN-CA] <Pamela.Whyte@parsons.com>
Subject: [EXTERNAL] RE: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Sarah,

We can provide you with boundary conditions for this, can you confirm that the other demands have not changed since your previous request for BC's?

Thanks,

Jeff

From: Sarah.Mitchelson@parsons.com <Sarah.Mitchelson@parsons.com>
Sent: April 25, 2022 11:23 AM
To: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Cc: Paradis, Kelly <Kelly.Paradis@parsons.com>; Steele, Matt <Matt.Steele@ottawa.ca>; Moore, Sean <Sean.Moore@ottawa.ca>; Evans, Allan <Allan.Evans@ottawa.ca>; Pamela.Whyte@parsons.com
Subject: RE: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Jeff,

We've started reviewing the 2020 Edition of the Water Supply for Public Fire Protection and have calculated the following (attached for reference);

- Scenario 1: Parking Garage Fire Flow (Present)

- C = 0.6 (Fire Resistive Construction – Minimum 2 Hour Fire Rating)
- A = 22,210m² (Area of the Largest Floor)
- O = 0% (Combustible)
- S = 0% (Even though levels P0 and P1 will be sprinklered, we've been conservative and applied a sprinkler factor of 0%)
- E = 0% (Once the parking garage is constructed, no buildings will be located within 30m)
- Fire Flow = 333L/s

- <u>Scenario 2: Parking Garage Fire Flow (Ultimate Build Out)</u>
  - C = 0.6 (Fire Resistive Construction – Minimum 2 Hour Fire Rating)
  - A = 22,210m² (Area of the Largest Floor)
  - O = 0% (Combustible)
  - S = 0% (Even though levels P0 and P1 will be sprinklered, we've been conservative and applied a sprinkler factor of 0%)
  - E = 8% (The Carling Towers will eventually be located within 3.1m to 10m from the north side of parking garage building face)
    - The following assumptions were applied:
      - Length-Height Factor of Exposing Building (Carling Towers) = Over 100
      - Construction Type of Exposing Building Face (Carling Towers) = Type III-IV[2] (this assumption is conservative as it most likely will be Type I or Type II)
      - Exposing Building (Carling Towers) will be fully protected with an automatic sprinkler system (based on the current planned usage mixed use (commercial/residential) these buildings will require sprinklers)
  - Fire Flow = 367L/s

We would proceed with the estimated fire flow based on the ultimate build out (Scenario 2 – 367L/s).

Once reviewed, please advise of the City's direction for moving forward. If approval is given to move forward with the 2020 Edition of the Water Supply for Public Fire Protection, we will need to obtain revised boundary conditions from the City.

Please reach out if you would like to discuss the calculations further.

Regards,
Sarah

SARAH MITCHELSON, P.ENG
Municipal Engineer
1223 Michael Street North, Suite 100, Ottawa, ON K1J 7T2
sarah.mitchelson@parsons.com
Direct: +1 613.691.1609 / Mobile: +1 613.698.6705
Parsons [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / LinkedIn [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Twitter [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Facebook [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Instagram [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com]

PARSONS

From: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Sent: Thursday, April 21, 2022 3:46 PM

To: Mitchelson, Sarah [NN-CA] <Sarah.Mitchelson@parsons.com>
Cc: Paradis, Kelly [NN-CA] <Kelly.Paradis@parsons.com>; Steele, Matt <Matt.Steele@ottawa.ca>; Moore, Sean <sean.moore@ottawa.ca>; Evans, Allan <Allan.Evans@ottawa.ca>; Whyte, Pamela [NN-CA] <Pamela.Whyte@parsons.com>
Subject: [EXTERNAL] RE: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Sarah,

Thanks for this. This does come as a bit of a surprise as we were not expecting these guidelines to be released. Quickly reviewing the new guidelines it does appear that fire flow requirements for the parking structure will be significantly reduced should no longer be an issue.

We will get back to you shortly with further direction.

Regards,

Jeff Shillington, P.Eng.
Senior Project Manager, Development Review, South Branch
Planning, Infrastructure and Economic Development
City of Ottawa
tel: 580-2424 x 16960
email: jeff.shillington@ottawa.ca

From: Sarah.Mitchelson@parsons.com <Sarah.Mitchelson@parsons.com>
Sent: April 20, 2022 9:03 PM
To: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Cc: Paradis, Kelly <Kelly.Paradis@parsons.com>; Steele, Matt <Matt.Steele@ottawa.ca>; Moore, Sean <Sean.Moore@ottawa.ca>; Evans, Allan <Allan.Evans@ottawa.ca>; Pamela.Whyte@parsons.com
Subject: RE: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Jeff,

We have been advised by the FUS that they have released the 2020 Edition of the Water Supply for Public Fire Protection (attached for your reference).

Can you please advise if the City will accept/approve the estimated fire flow for the parking garage based on this document?

We are starting to review the document and can update the calculations for the parking garage accordingly.

Regards,
Sarah

SARAH MITCHELSON, P.ENG
Municipal Engineer
1223 Michael Street North, Suite 100, Ottawa, ON K1J 7T2
sarah.mitchelson@parsons.com
Direct: +1 613.691.1609 / Mobile: +1 613.698.6705
Parsons [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / LinkedIn [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Twitter [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Facebook [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Instagram [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com]

PARSONS

From: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Sent: Wednesday, March 23, 2022 2:57 PM
To: Mitchelson, Sarah [NN-CA] <Sarah.Mitchelson@parsons.com>
Cc: Paradis, Kelly [NN-CA] <Kelly.Paradis@parsons.com>; Steele, Matt <Matt.Steele@ottawa.ca>; Moore, Sean <sean.moore@ottawa.ca>; Evans, Allan <Allan.Evans@ottawa.ca>
Subject: [EXTERNAL] RE: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Sarah,

We've met again internally to discuss the fire flow requirements for the parking garage and we've come up with the following options:

1. Provide a full engineering analysis from a fire protection engineer (signed/stamped). We do not want this analysis to rely on the 2019 Draft FUS, but provide an independent review / analysis on the fire flow needs for this structure to justify lower flows. The analysis would be submitted and reviewed by the City to determine our acceptance of it. It is our understanding that there are professionals that complete these reviews. The review may justify lower flows by taking into account other fire protection measures.
2. Reduce the 1999 FUS required flow rates by adding additional sprinkler coverage.

Should you wish to discuss the above, please do not hesitate to contact me.

Jeff Shillington, P.Eng.
Senior Project Manager, Development Review, South Branch
Planning, Infrastructure and Economic Development
City of Ottawa
tel: 580-2424 x 16960
email: jeff.shillington@ottawa.ca

From: Sarah.Mitchelson@parsons.com <Sarah.Mitchelson@parsons.com>
Sent: February 25, 2022 4:00 PM
To: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Cc: Paradis, Kelly <Kelly.Paradis@parsons.com>; Steele, Matt <Matt.Steele@ottawa.ca>; Moore, Sean <Sean.Moore@ottawa.ca>; Evans, Allan <Allan.Evans@ottawa.ca>
Subject: RE: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Jeff,

Here's the building classification information (it has been included in our responses that will be issued to the City on Monday).

The parking garage is required to be designed to Article 3.2.2.73, Group F, Division 3, Any Area, Any Height. A parking garage is classified in the Ontario Building Code as a Group F, Division 3 low hazard industrial occupancy.

We will circle back with you on Monday to discuss further.

Regards,
Sarah

SARAH MITCHELSON, P.ENG
Municipal Engineer
1223 Michael Street North, Suite 100, Ottawa, ON K1J 7T2
sarah.mitchelson@parsons.com
Direct: +1 613.691.1609 / Mobile: +1 613.698.6705
Parsons [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / LinkedIn [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Twitter [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Facebook [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Instagram [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com]

PARSONS

From: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Sent: Friday, February 25, 2022 3:48 PM
To: Mitchelson, Sarah [NN-CA] <Sarah.Mitchelson@parsons.com>
Cc: Paradis, Kelly [NN-CA] <Kelly.Paradis@parsons.com>; Steele, Matt <Matt.Steele@ottawa.ca>; Moore, Sean

<sean.moore@ottawa.ca>; Evans, Allan <Allan.Evans@ottawa.ca>
Subject: [EXTERNAL] RE: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Sarah,

Thanks for your email. We've discussed and consulted with many at the City on the 2019 draft of the FUS and at this time we can not be considering a draft format that has not been finalized and not reviewed by the City of Ottawa.

Matt provided the following:

If you recall, we requested the building classification of the building so that our Building Code Services could advise whether every floor would be required to be sprinklered as this would drop the required fire flow. It appears the designer is reluctant to reduce the fire demands for the structure.

> Please note the City of Ottawa design objective in the Water Master Plan is 13,000 L/min or 217 L/s. Even though the infrastructure around the site and proposed hydrants can deliver more than the City of Ottawa design objectives.

It was also discussed at our meeting a few weeks ago that consultation with a fire expert should be completed to verify if there could be exceptions to the FUS given that most of the building is an open air building. Has this been completed?

If you feel another meeting is required. Please let me know and we will set it up.

Regards,

Jeff Shillington, P.Eng.
Senior Project Manager, Development Review, South Branch
Planning, Infrastructure and Economic Development
City of Ottawa
tel: 580-2424 x 16960
email: jeff.shillington@ottawa.ca

From: Sarah.Mitchelson@parsons.com <Sarah.Mitchelson@parsons.com>
Sent: February 23, 2022 9:15 AM
To: Shillington, Jeffrey <jeff.shillington@ottawa.ca>; Steele, Matt <Matt.Steele@ottawa.ca>
Cc: Paradis, Kelly <Kelly.Paradis@parsons.com>
Subject: FW: TOH - 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Jeff and Matt,

We have been advised by the Fire Underwriters Survey that the proposed changes in the construction coefficient and terms of reference were update (2019 draft version) to align better with the National Building Code of Canada and Provincial Buildings.

They advised that the updated proposed within the 2019 draft version are reasonable and can be used in reviewing and determining required fire flows for new and existing buildings.

Based on the response received from the Fire Underwriters Survey, Parsons plans to apply the 2019 draft version to calculate the required fire flow for TOH Parking Garage project.

Please advise as soon as possible if the City of Ottawa will approve this approach as we have a planned submission on Monday February 28th.

Regards,
Sarah

SARAH MITCHELSON, P.ENG
Municipal Engineer
1223 Michael Street North, Suite 100, Ottawa, ON K1J 7T2
sarah.mitchelson@parsons.com
Direct: +1 613.691.1609 / Mobile: +1 613.698.6705
Parsons [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / LinkedIn [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Twitter [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Facebook [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Instagram [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com]

PARSONS

From: Michael King <michael.j.king@scm.ca>
Sent: Tuesday, February 22, 2022 3:11 PM
To: Mitchelson, Sarah [NN-CA] <Sarah.Mitchelson@parsons.com>
Cc: Fire Underwriters Survey <admin@fireunderwriters.ca>
Subject: [EXTERNAL] 2022.02.11 - Technical Query - Water Supply for Public Fire Protection in Canada Feedback

Hi Sarah,

The proposed changes in for Construction Coefficient and terms of reference was to update and align better with the National Building Code of Canada and Provincial Buildings.

The updates proposed in the 2019 draft version are reasonable and can be used in reviewing and determining Required Fire Flows for new buildings and existing buildings. FUS will have the new version released soon. FUS is actively working on reviewing final submissions received in 2021 from key stakeholders from across Canada in the engineering, fire service and insurance industry. Your contact information will be added to a list to notify once the new document is ready for release.

[can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com]

Michael King, B.Sc & Fire, C.Tech
Fire Protection Specialist
michael.j.king@scm.ca
Direct : 604- (Phone/Text/Fax)
Toll Free : 609-
4137
800-665-5661 x1471

Opta Information Intelligence – fireunderwriters.ca [fireunderwriters.ca]
[can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com]
8333 Eastlake Drive, Suite 101, Burnaby, BC V5A 4W2

From: Sarah.Mitchelson@parsons.com <Sarah.Mitchelson@parsons.com>
Sent: February-22-22 7:56 AM
To: Michael King <michael.j.king@scm.ca>
Cc: Mathew.Theiner@parsons.com; Kelly.Paradis@parsons.com
Subject: RE: Water Supply for Public Fire Protection in Canada Feedback

Hi Michael,

Just following up with your email below – do you think you will have a response early this week?

Regards,
Sarah

SARAH MITCHELSON, P.ENG
Municipal Engineer
1223 Michael Street North, Suite 100, Ottawa, ON K1J 7T2
sarah.mitchelson@parsons.com
Direct: +1 613.691.1609 / Mobile: +1 613.698.6705
Parsons [parsons.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / LinkedIn [linkedin.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Twitter [twitter.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Facebook [facebook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Instagram [instagram.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com]

[can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com]

From: Michael King <michael.j.king@scm.ca>
Sent: Tuesday, February 15, 2022 7:14 PM
To: Mitchelson, Sarah [NN-CA] <Sarah.Mitchelson@parsons.com>
Cc: Theiner, Mathew [NN-CA] <Mathew.Theiner@parsons.com>; Paradis, Kelly [NN-CA] <Kelly.Paradis@parsons.com>
Subject: [EXTERNAL] RE: Water Supply for Public Fire Protection in Canada Feedback

Received and should have a review/response by the end of the week.

[can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com]

Michael King, B.Sc & Fire, C.Tech
Fire Protection Specialist
michael.j.king@scm.ca
Direct : 604- (Phone/Text/Fax)
Toll Free : 609-
4137
800-665-5661 x1471

Opta Information Intelligence – fireunderwriters.ca [fireunderwriters.ca]
[can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com]
8333 Eastlake Drive, Suite 101, Burnaby, BC V5A 4W2

From: Sarah.Mitchelson@parsons.com <Sarah.Mitchelson@parsons.com>
Sent: February-11-22 6:14 AM
To: Michael King <michael.j.king@scm.ca>
Cc: Mathew.Theiner@parsons.com; Kelly.Paradis@parsons.com
Subject: FW: Water Supply for Public Fire Protection in Canada Feedback

CAUTION - EXTERNAL EMAIL / ATTENTION - COURRIEL EXTERNE

Hi Michael,

My colleague Mathew Theiner spoke with you earlier this week regarding our fire flow calculations for a proposed parking garage within the City of Ottawa.

Please find attached a memo outlining the fire flow calculation three (3) different ways (Fire Underwriters Survey 1999, Fire Underwriters Draft 2019, Ontario Building Code) for your review and comment.

A key difference between the Fire Underwriters Survey current version (1999) and draft version (2019) is the definition of fire resistive construction has changed from a minimum 3-hour fire resistance rating (current version) to a minimum 2-hour fire resistive rating (draft version). This change aligns with the Ontario Building Code requirements and significantly reduces fire flow calculation (can apply a construction coefficient of 0.6 (fire resistive) instead of 0.8 (non-combustible)).

Our main goal is to confirm that assumptions presented within the fire flow calculations and usage of the draft version of the Fire Underwriters Survey are reasonable.

If you could provide a response early to mid-next week it would be greatly appreciated as we are trying to obtain approval from the City of Ottawa and meet a tight project schedule.

Please reach out if any other information is required and/or you would like to discuss further.

Thanks,
Sarah

SARAH MITCHELSON, P.ENG
Municipal Engineer
1223 Michael Street North, Suite 100, Ottawa, ON K1J 7T2
sarah.mitchelson@parsons.com
Direct: +1 613.691.1609 / Mobile: +1 613.698.6705
Parsons [parsons.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / LinkedIn [linkedin.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Twitter [twitter.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Facebook [facebook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Instagram [instagram.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com]

PARSONS

From: Michael King <michael.j.king@scm.ca>
Sent: Tuesday, September 28, 2021 2:32 PM
To: Theiner, Mathew <Mathew.Theiner@parsons.com>
Cc: Michael Currie <michael.currie@scm.ca>
Subject: [EXTERNAL] RE: Water Supply for Public Fire Protection in Canada Feedback

Hi Mathew,

FUS will have the new version released as soon. FUS is actively working on reviewing final submissions received this year from key stakeholders from across Canada in the engineering, fire service and insurance industry. You contact information will be added to a list to notify once the new document is released.

[can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com]

Michael King, B.Sc & Fire, C.Tech
Fire Protection Specialist
michael.j.king@scm.ca
Direct : 604- (Phone/Text/Fax)
Toll Free : 609-
4137
800-665-5661 x1471

Opta Information Intelligence – fireunderwriters.ca [fireunderwriters.ca]
[can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com]
8333 Eastlake Drive, Suite 101, Burnaby, BC V5A 4W2

From: Theiner, Mathew <Mathew.Theiner@parsons.com>
Sent: September-28-21 9:57 AM
To: Fire Underwriters Survey <admin@fireunderwriters.ca>
Subject: Water Supply for Public Fire Protection in Canada Feedback

CAUTION - EXTERNAL EMAIL / ATTENTION - COURRIEL EXTERNE

Hi,

Any news when the 2019 version will be approved?

Mathew Theiner, P.Eng., ing. (ON, QC, AB)
Senior Municipal Engineer/Ingénieur Municipal
100-1223 Michael St North, Ottawa, ON K1J 7T2
mathew.theiner@parsons.com
P : +1 613.691.1545
Parsons [parsons.com] [can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / LinkedIn [linkedin.com]
[can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Twitter [twitter.com]
[can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Facebook [facebook.com]
[can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com] / Instagram [instagram.com]
[can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com]
[can01.safelinks.protection.outlook.com] [can01.safelinks.protection.outlook.com]

This e-mail originates from the City of Ottawa e-mail system. Any distribution, use or copying of this e-mail or the information it contains by other than the intended recipient(s) is unauthorized. Thank you.

Le présent courriel a été expédié par le système de courriels de la Ville d'Ottawa. Toute distribution, utilisation ou reproduction du courriel ou des renseignements qui s'y trouvent par une personne autre que son destinataire prévu est interdite. Je vous remercie de votre collaboration.

'
'

This e-mail originates from the City of Ottawa e-mail system. Any distribution, use or copying of this e-mail or the information it contains by other than the intended recipient(s) is unauthorized. Thank you.

Le présent courriel a été expédié par le système de courriels de la Ville d'Ottawa. Toute distribution, utilisation ou reproduction du courriel ou des renseignements qui s'y trouvent par une personne autre que son destinataire prévu est interdite. Je vous remercie de votre collaboration.

'
'

This e-mail originates from the City of Ottawa e-mail system. Any distribution, use or copying of this e-mail or the information it contains by other than the intended recipient(s) is unauthorized. Thank you.

Le présent courriel a été expédié par le système de courriels de la Ville d'Ottawa. Toute distribution, utilisation ou reproduction du courriel ou des renseignements qui s'y trouvent par une personne autre que son destinataire prévu est interdite. Je vous remercie de votre collaboration.

'
'

This e-mail originates from the City of Ottawa e-mail system. Any distribution, use or copying of this e-mail or the information it contains by other than the intended recipient(s) is unauthorized. Thank you.

Le présent courriel a été expédié par le système de courriels de la Ville d'Ottawa. Toute distribution, utilisation ou reproduction du courriel ou des renseignements qui s'y trouvent par une personne autre que son destinataire prévu est interdite. Je vous remercie de votre collaboration.

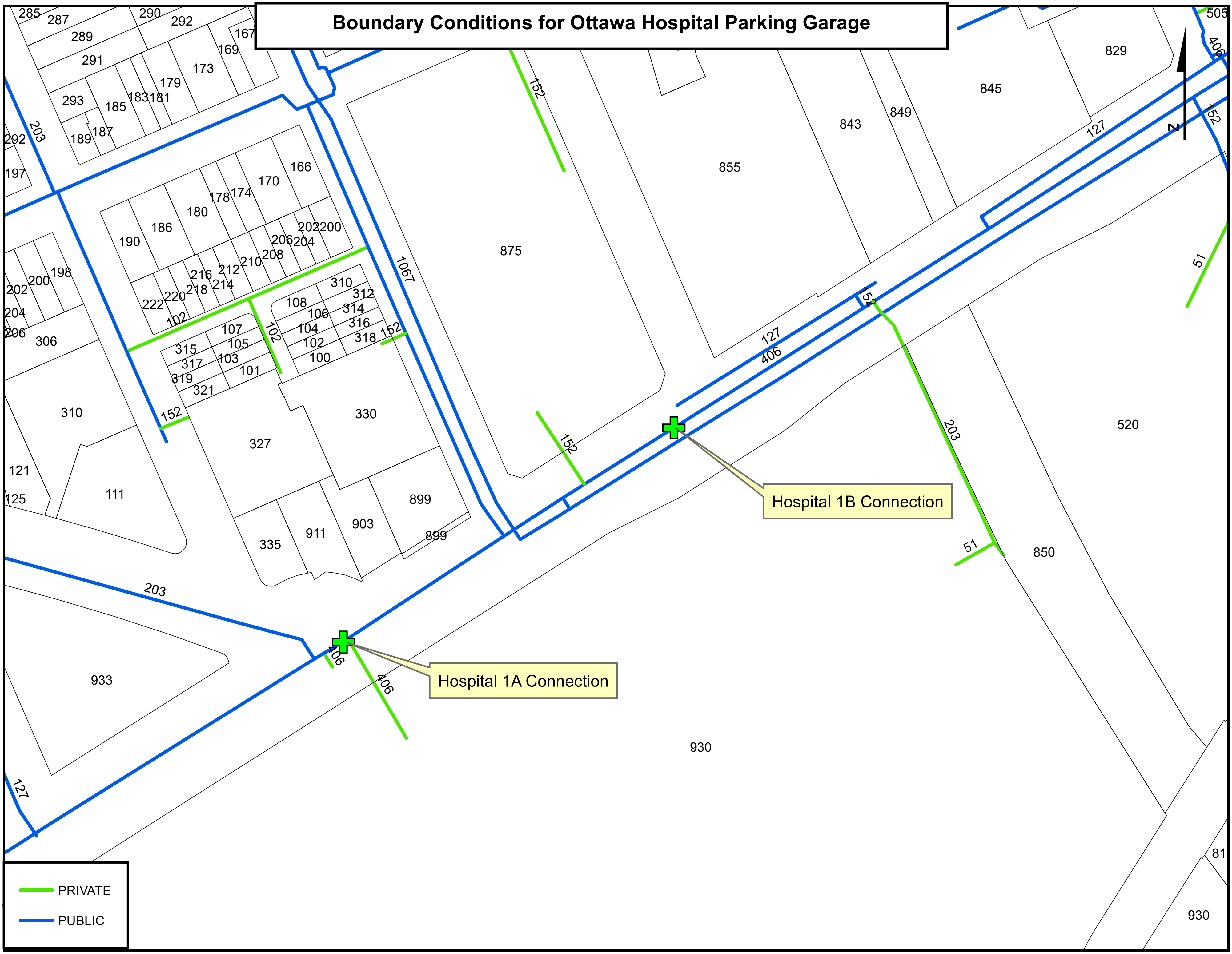
'
'

This e-mail originates from the City of Ottawa e-mail system. Any distribution, use or copying of this e-mail or the information it contains by other than the intended recipient(s) is unauthorized. Thank you.

Le présent courriel a été expédié par le système de courriels de la Ville d'Ottawa. Toute distribution, utilisation ou reproduction du courriel ou des renseignements qui s'y trouvent par une personne autre que son destinataire prévu est interdite. Je vous remercie de votre collaboration.

'

Boundary Conditions for Ottawa Hospital Parking Garage



APPENDIX H | WATER CALCULATIONS

Table 1 : Water Demand Calculations

Building	Population	Gross Floor Area (m2)	Average Daily Demand (ADD) L/s	Maximum Daily Demand (MDD) 1.5*ADD L/s	Peak Hourly Demand (PHD) 1.8*MDD L/s	Fire Flow (FF) L/s	MDD + FF L/s
Parking Garage			1.14	1.70	3.07	333	334.7
Amenity Space (Rooftop)		*19623*	*1.14*	*1.70*	*3.07*	*367*	*368.7*
Hospital			22.82	34.22	61.60	250	284.2
Fire in Main Hospital Building		*364715*	*22.82*	*34.22*	*61.60*	*250*	*284.2*
Fire in Pavilion		*364715*	*22.82*	*34.22*	*61.60*	*250*	*284.2*
Central Utility Plant*			11.00	28.33	51.00	167	195.3
Fire in Central Utility Plant		*24000*	*11.00**	*28.33**	*51.00**	*167*	*195.3*

Average Daily Demands
Based on Ottawa Design Guidelines - Water Distribution, 2010 and MOE Design Guidelines for Drinking-Water Systems, 2008

Amenity Space Flow = 5.0 L/m2/d
Existing Water Use Water Use = 2.0 m3/m2/year (Existing water usage for The Ottawa Civic Campus)

* Please note that the demands for the Central Utility Plant and the Main Hospital Building were provided by the design team during the feasibility/schematic design stage and will need to be revisited/revised during detail design. The fire flow calculations for the Central Utility Plant and the Main Hospital Building will need to be revisited/revised during detail design as the internal building designs progress.

Table 2: Fire Flow Calculations (2020 FUS)

Building	Type of Construction	Total Floor Area	Fire Flow (min. 2,000)	Adjusted (nearest 1,000)	Occupancy Factor	Reduction / Increase due to Occupancy	Fire Flow with Occupancy (min. 2,000)	Sprinklers Factor	Reduction due to Sprinklers	Exposure Factor	Increase due to Exposure	Fire Flow	Roof Contribution	Required Fire Flow Adjusted to the nearest 1000	
		m^2	L/min	L/min			L/min		L/min	%	L/min	L/min	L/min	L/min	L/s
	C	A	F		O			S		E			R	F	
Parking Structure	0.6	21,447	19,331	19,000	0%	0	19,000	0%	0	8%	1,425	20,000	0	20,000	333
Pavilion	1.5	6,825	27,262	27,000	0%	0	27,000	50%	13,500	5%	1,350	15,000	0	15,000	250
CUP	0.6	24,000	20,449	20,000	0%	0	20,000	50%	10,000	0%	0	10,000	0	10,000	167
Hospital	0.6	43,518	27,536	28,000	-15%	-4,200	23,800	50%	11,900	5%	1,190	13,000	0	13,000	217
Heart Institute	0.6	18,000	17,710	18,000	-15%	-2,700	15,300	50%	7,650	3%	383	8,000	0	8,000	133
Hospital	0.6	61,518	32,740	33,000	-15%	-4,950	28,050	50%	14,025	5%	1,403	15,000	0	15,000	250

Reference:

References

Water Supply for Public Fire Protection , 2020 by Fire Underwriters Survey (FUS) and
Ottawa Design Guidelines - Water Distribution, July 2010 and subsequent Technical Bulletins

C Type of Construction

Wood Frame (Type V)	1.5
Mass Timber (Type IV-A) - Encapsulated Mass Timber	0.8
Mass Timber (Type IV-B) - Rated Mass Timber	0.9
Mass Timber (Type IV-C) - Ordinary Mass Timber	1.0
Mass Timber (Type IV-D) - Unrated Mass Timber	1.5
Ordinary Construction (Type III also known as joisted masonry)	1.0
Non-Combustible Construction (Type II - minimum 1 hour fire resistance rating)	0.8
Fire resistive Construction (Type I - minimum 2 hour fire resistance rating)	0.6

A Total Effective Floor Area (m^2)

Buildings Classified with a Construction Coefficient from 1.0 to 1.5
100% of all Floor Areas

Buildings Classified with a Construction Coefficient below 1.0
Vertical Openings Unprotected
Two (2) Largest Adjoining Floor Areas
Additional Floors (up to eight (8)) at 50%

Vertical Openings Properly Protected
Single Largest Floor
Additional Two (2) Adjoining Floors at 25%

High One Story Building
When a building has a large single story space exceeding 3m in height, the number of storeys to be used in determining the total effective area depends upon the use being made of the building.

Subdividing Buildings (Vertical Firewalls)
Minimum two (2) hour fire resistance rating and meets National Building Code requirements.

- Up to 10% can be applied if there is severe risk of fire on the exposed side of the firewall due to hazard conditions.
- An exposure charge of up to 10% can be applied if there are unprotected openings in the firewall

Basement
Basement floor excluded when it is at least 50% below grade.

Open Parking Garages
Use the area of the largest floor.

O Occupancy

Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Burning	25%

- Table 3 provides recommended Occupancy and Contents Adjustment Factors for Example Major Occupancies from the National Building Code of Canada.
- Adjustment factors should be adjusted accordingly to the specific fore loading and situation that exists in the subject building.
- Values can be interpolated from the examples given considering fire loading and expected combustibility of contents if the subject building is not listed.
- Values can be modified by up to 10% (+/-) depending on the extent to which the fire loading is unusual for the building.
- Buildings with multiple major occupancies should use the most restrictive factor or interpolate based on the percentage of each occupancy and its associated fire loading.

Table 3 Values for Parking Garage

Group:	F
Division:	3
Description of Occupancy:	Storage Garage including Open Air Parking Garage
Occupancy and Contents:	Combustible
Adjustment Factor:	0%

Table 3 Values for Pavilion

Group:	A
Division:	2
Description of Occupancy:	Assembly Occupancies Not Elsewhere Classified in Group A
Occupancy and Contents:	Combustible
Adjustment Factor:	0%

Table 3 Values for CUP

Group:	F
Division:	3
Description of Occupancy:	Power Plant
Occupancy and Contents:	Combustible
Adjustment Factor:	0%

Table 3 Values for Hospital

Group:	B
Division:	2
Description of Occupancy:	Care and Treatment Occupancies
Occupancy and Contents:	Limited
Adjustment Factor:	-15%

S Sprinklers

	Complete Coverage	Partial Coverage
Automatic Sprinklers NFPA Standards	30%	30% * x%
Standard Water Supply	10%	10% * x%
Full Supervision	10%	10% * x%

(x%: percentage of total protected floor area)

Additional Reductions for Community Level Automatic Sprinkler Protection of Area
Buildings located within communities or subdivisions that are completely sprinkler protected may apply up to a maximum additional 25% reduction in required fire flows beyond the normal maximum of 50% reduction for sprinkler protection of an individual building.

Adjustment of Sprinkler Reductions for Community Level Oversight of Sprinkler Maintenance, Testing, and Water Supply Requirements
The reduction in required fire flow for sprinkler protection may be reduced of eliminated if:
- The community does not have a Fire Prevention Program that provides a system of ensuring that the fire sprinkler systems are inspected, tested, and maintained in accordance with NFPA 25
- The community does not maintain the pressure and flow rate requirements for fire sprinkler installations, or otherwise allows the flow rates and pressure levels that were available during sprinkler system design to significantly degrade, increasing the probability of inadequate water supply for effective sprinkler operation.

E Exposure
The maximum exposure adjustment that can be applied to a building is 75% when summing the percentages of all sides of the building.

Separation Distance (m)	Maximum Exposure Adjustment	N	E	S	W
0 to 3	25%				
3.1 to 10	20%	6m			
10.1 to 20	15%				
20.1 to 30	10%				
Greater than 30	0%		>30m		

Table 6: Exposure Adjustment Charges for Subject Building Considering Construction Type of Exposed Building Face

Distance to the Exposure (m)	Length-Height Factor of Exposing Building Face	Type V	Type III-IV[2]	Type III-IV[3]	Type I-II[2]	Type I-II[3]
0 to 3	0-20	20%	15%	5%	10%	0%
	21-40	21%	16%	6%	11%	1%
	41-60	22%	17%	7%	12%	2%
	61-80	23%	18%	8%	13%	3%
	81-100	24%	19%	9%	14%	4%
	Over 100	25%	20%	10%	15%	5%
3.1 to 10	0-20	15%	10%	3%	6%	0%
	21-40	16%	11%	4%	7%	0%
	41-60	17%	12%	5%	8%	1%
	61-80	18%	13%	6%	9%	2%
	81-100	19%	14%	7%	10%	3%
	Over 100	20%	15%	8%	11%	4%
10.1 to 20	0-20	10%	5%	0%	3%	0%
	21-40	11%	6%	1%	4%	0%
	41-60	12%	7%	2%	5%	0%
	61-80	13%	8%	3%	6%	1%
	81-100	14%	9%	4%	7%	2%
	Over 100	15%	10%	5%	8%	3%
20.1 to 30	0-20	0%	0%	0%	0%	0%
	21-40	2%	1%	0%	0%	0%
	41-60	4%	2%	0%	1%	0%
	61-80	6%	3%	1%	2%	0%
	81-100	8%	4%	2%	3%	0%
	Over 100	10%	5%	3%	4%	0%
Over 30m	All Sizes	0%	0%	0%	0%	0%

[2] with unprotected openings
[3] without unprotected openings

Automatic Sprinkler Protection in Exposed Buildings
- If the exposed building is fully protected with an automatic sprinkler system (see note Recognition of Automatic Sprinkler), the exposure adjustment charge determined from Table 6 may be reduced by up to 50% of the value determined.
Automatic Sprinkler Protection in both Subject and Exposed Buildings
- If both the subject building and the exposed building are fully protected with automatic sprinkler systems (see note Recognition of Automatic Sprinkler), no exposure adjustment charge should be applied.
Exposure Protection of Area Between Subject and Exposed Buildings
- If the exposed building is fully protected with an automatic sprinkler system (see note Recognition of Automatic Sprinkler), and the area between the buildings is protected with an exterior automatic sprinkler system, no exposure adjustment charge should be applied.
Reduction of Exposure Charge for Type V Buildings
- If the exposed building face of a Type V building has an exterior cladding assembly with a minimum 1 hour fire resistive rating, then the exposure charge may be treated as a Type III/IV building for the purposes of looking up the appropriate exposure charge in Table 6.

R Roof

Shake Roof	2,000 to 4,000 L/min	additional should be added to the fire flow
Wood Shingle	2,000 to 4,000 L/min	additional should be added to the fire flow

F Fire Flow (L/Min)
220*C*(A^0.5)

Table 3: Worst Case Residual Pressures Under Each Demand

Connection	Average Daily Demand (ADD)			Peak Hourly Demand (PHD)			Max Daily Demand (MDD) + Fire Flow		
	m	psi	kPa	m	psi	kPa	m	psi	kPa
Connection 1B (400mm on Carling Avenue at Champagne Avenue) *Parking Garage Only	42.26	60	414	49.76	71	487	42.96	61	421
Connection 1B /1A (400mm on Carling Avenue at Champagne Avenue) *Parking Garage and Hospital	42.26	60	414	49.76	71	487	42.76	61	419

Scenerio 1: Average Day (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
1 - Ex WM 400mm Carling Ave	19.39	R-1	J-E10	1000	Cast iron	130	7.25	0.01	0	436
3 - Ex WM 400mm Carling Ave	35.64	J-E10	J-E9	400	Cast iron	80	7.25	0.06	436	435
4 - Ex WM 150mm Preston St	40.2	J-E9	366028H219	150	Cast iron	40	0	0.00	435	432
5 - Ex WM 150mm Preston St	51.03	H-19	366028H219	150	Cast iron	40	0	0.00	425	432
5A - Ex WM 150mm Preston St	45.26	J-E11	366028H185	150	Cast iron	40	0	0.00	402	399
5B - Ex WM 150mm Preston St	118.76	366028H185	H-19	150	Cast iron	40	0	0.00	399	425
6 - Ex WM 400mm Carling Ave	34.14	J-E9	J-E8	400	Cast iron	80	7.25	0.06	435	432
7 - Prop WM 150mm Carling V-T #1	31.25	J-E8	J-19	150	PVC	120	0	0.00	432	421
8 - Ex WM 400mm Carling Ave	30.3	J-E8	J-E7	400	Cast iron	80	7.25	0.06	432	427
9 - Prop WM 150mm Carling V-T #2	31.07	J-E7	J-20	150	PVC	120	0	0.00	427	410
10 - Ex WM 400mm Carling Ave	86.55	J-E7	J-E6	400	Cast iron	80	7.25	0.06	427	416
11 - Ex WM 150mm Carling Ave	7.46	J-E6	J-E5	150	Cast iron	40	0	0.00	416	417
12 - Ex WM 150mm Carling Ave	90.95	J-E5	366028H030	150	Cast iron	40	0	0.00	417	412
13 - Ex WM 400mm Carling Ave	7.73	J-E6	366028H031	400	Cast iron	80	7.25	0.06	416	416
14 - Ex WM 400mm Carling Ave	29.23	366028H031	J-E4	400	Cast iron	80	7.25	0.06	416	412
15 - Prop WM 150mm Carling V-T #3	30.97	J-E4	J-21	150	PVC	120	0	0.00	412	407
16 - Ex WM 400mm Carling Ave	53.89	J-E4	J-E3	400	Cast iron	80	7.25	0.06	412	413
17 - Ex WM 400mm Carling Ave	35.1	366028H029	J-E3	400	Cast iron	80	8.31	0.07	411	413
18 - Ex WM 400mm Carling Ave	54.49	J-E2	366028H029	400	Cast iron	80	8.31	0.07	407	411
19 - Prop WM 150mm Research B	30.35	J-E2	J-22	150	PVC	120	0	0.00	407	402
20 - Ex WM 400mm Carling Ave	72.06	J-E1	J-E2	400	Cast iron	80	8.31	0.07	398	407
21 - Ex WM 400mm Carling Ave	148.67	R-2	J-E1	1000	Cast iron	130	27.72	0.04	0	398
22 - Prop WM 300mm Rd A	52.89	J-E3	J-18	300	PVC	120	15.56	0.22	413	399
23 - Prop WM 300mm Rd A	8.34	J-18	H-1	300	PVC	120	15.56	0.22	399	391
24 - Prop WM 300mm Rd A	26.24	H-1	J-17	300	PVC	120	15.56	0.22	391	380
25 - Prop WM 300mm Rd A	62.29	J-17	J-16	300	PVC	120	15.56	0.22	380	352
26 - Prop WM 300mm Rd A	21.35	J-16	J-15	300	PVC	120	-6.11	0.09	352	344
27 - Prop WM 300mm Rd B	21.58	J-16	H-2	300	PVC	120	21.67	0.31	352	351
28 - Prop WM 300mm Rd B	47.92	H-2	J-25	300	PVC	120	21.67	0.31	351	361
29 - Prop WM 150mm PG Service	16.98	J-25	J-26 (PG Service)	150	PVC	120	1.14	0.06	361	357
30 - Prop WM 300mm Rd B	42	J-25	H-5	300	PVC	120	20.53	0.29	361	364
31 - Prop WM 300mm Rd B	22.94	J-14	H-5	300	PVC	120	-20.53	0.29	369	364
32 - Prop WM 300mm Rd L	8.1	J-12	J-13	300	PVC	120	-20.53	0.29	364	366
33 - Prop WM 300mm Rd L	28.89	H-12	J-12	300	PVC	120	-20.53	0.29	360	364
34 - Prop WM 300mm Rd E	85.46	H-14	J-24	300	PVC	120	13.29	0.19	292	311
35 - Prop WM 300mm Rd E	18.08	J-9	H-14	300	PVC	120	13.29	0.19	283	292
36 - Prop WM 300mm Rd D	59.7	H-4	J-7	300	PVC	120	13.29	0.19	297	266
37 - Prop WM 300mm Rd D	14.21	J-6	H-4	300	PVC	120	13.29	0.19	305	297
38 - Prop WM 300mm Hospital	35.84	J-5	J-6	300	PVC	120	13.29	0.19	311	305
39 - Prop WM 300mm Hospital	24.29	H-15	J-5	300	PVC	120	13.29	0.19	312	311
40 - Prop WM 300mm Hospital	91.57	J-4	H-15	300	PVC	120	13.29	0.19	322	312
41 - Prop WM 300mm Hospital	10.8	H-7	J-4	300	PVC	120	13.29	0.19	323	322

Scenerio 1: Average Day (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
42 - Prop WM 300mm Hospital	43.89	J-3	H-7	300	PVC	120	13.29	0.19	323	323
43 - Prop WM 300mm Hospital	44.34	J-2	J-3	300	PVC	120	19.4	0.27	391	323
44 - Prop WM 300mm Hospital	35.61	J-1	J-2	300	PVC	120	19.4	0.27	397	391
45 - Prop WM 300mm Hospital	20.64	J-E1	J-1	300	PVC	120	19.4	0.27	398	397
46 - Prop WM 200mm CUP Service	10.04	J-27 (CUP Service)	J-24	200	PVC	120	-5.5	0.18	310	311
47 - Prop WM 300mm Hospital	12.81	J-3	J-29	300	PVC	120	6.11	0.09	323	322
48 - Prop WM 300mm Hospital	38	J-29	J-47	300	PVC	120	6.11	0.09	322	322
48B - Prop WM 300mm Hospital	35.74	J-47	J-28	300	PVC	120	5.8	0.08	322	327
49 - Prop WM 300mm Rd A	34.67	J-28	J-15	300	PVC	120	6.11	0.09	327	344
50 - Prop WM 300mm Rd E	13.31	J-7	H-6	300	PVC	120	13.29	0.19	266	265
51 - Prop WM 300mm Rd E	22.67	H-6	J-8	300	PVC	120	13.29	0.19	265	272
52 - Prop WM 300mm Rd E	34.52	J-8	J-9	300	PVC	120	13.29	0.19	272	283
53 - Prop WM 300mm Rd E	7.9	J-24	H-3	300	PVC	120	7.79	0.11	311	311
54 - Prop WM 300mm Rd E	20.35	H-3	J-10	300	PVC	120	7.79	0.11	311	312
55 - Prop WM 300mm Rd E	58.3	J-10	H-11	300	PVC	120	2.29	0.03	312	314
56 - Prop WM 300mm Rd E	5.74	H-11	J-31	300	PVC	120	2.29	0.03	314	317
57 - Prop WM 200mm CUP Service	10.93	J-30 (CUP Service)	J-10	200	PVC	120	-5.5	0.18	310	312
58 - Prop WM 300mm Rd E	90.15	J-31	H-10	300	PVC	120	2.29	0.03	317	286
59 - Prop WM 300mm Rd E	19.01	H-10	J-32	300	PVC	120	2.29	0.03	286	281
60 - Prop WM 300mm Rd E	35.95	J-32	J-33	300	PVC	120	2.29	0.03	281	289
61 - Prop WM 300mm Rd E	38.7	J-33	H-9	300	PVC	120	2.29	0.03	289	283
62 - Prop WM 300mm Rd E	26.33	H-9	J-34	300	PVC	120	2.29	0.03	283	275
63 - Prop WM 300mm Rd E	22.68	J-34	J-35	300	PVC	120	2.29	0.03	275	245
64 - Prop WM 300mm Hospital	66.23	J-35	J-44	300	PVC	120	2.29	0.03	245	258
65 - Prop WM 300mm Hospital	45.38	J-44	J-36	300	PVC	120	2.29	0.03	258	268
66 - Prop WM 300mm Hospital	61.11	J-36	J-37	300	PVC	120	2.29	0.03	268	349
67 - Prop WM 300mm Hospital	43.55	J-37	J-38	300	PVC	120	2.29	0.03	349	362
68 - Prop WM 300mm Hospital	34.59	J-38	J-40	300	PVC	120	2.29	0.03	362	351
69 - Prop WM 300mm Hospital	22.02	J-40	J-39	300	PVC	120	2.29	0.03	351	364
70 - Prop WM 300mm Loading Dock	4.94	J-42	H-13	300	PVC	120	0	0.00	365	367
71 - Prop WM 300mm Loading Dock	54.59	H-13	J-41	300	PVC	120	0	0.00	367	363
72 - Prop WM 300mm Loading Dock	10.28	J-41	H-8	300	PVC	120	0	0.00	363	365
73 - Prop WM 300mm Loading Dock	18.88	H-8	J-39	300	PVC	120	0	0.00	365	364
74 - Prop WM 300mm Loading Dock	23.4	J-39	J-43	300	PVC	120	2.29	0.03	364	365
75 - Prop WM 300mm Rd L	37.53	J-43	J-46	300	PVC	120	2.29	0.03	365	361
76 - Prop WM 300mm Hospital Service	29.22	J-46	J-45 (Hospital Service)	300	PVC	120	11.41	0.16	361	348
77 - Prop WM 300mm Rd L	5.05	J-46	J-11	300	PVC	120	-9.12	0.13	361	361
78 - Prop WM 300mm Rd L	6.03	J-11	H-12	300	PVC	120	-20.53	0.29	361	360
79 - Prop WM 300mm Hospital Service	29.77	J-11	J-23 (Hospital Service)	300	PVC	120	11.41	0.16	361	347
80 - Prop WM 300mm Rd L	17.94	J-13	J-14	300	PVC	120	-20.53	0.29	366	369
81 - Prop WM 300mm	17.05	J-28	H-18	300	PVC	120	-0.31	0.00	327	315
82 - Prop WM 150mm	15.85	H-18	H-17	150	PVC	120	-0.31	0.02	315	271

Scenerio 1: Average Day (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
83 - Prop WM 300mm	31.85	J-47	H-16	300	PVC	120	0.31	0.00	322	276
84 - Prop WM 150mm	47.38	H-16	H-17	150	PVC	120	0.31	0.02	276	271

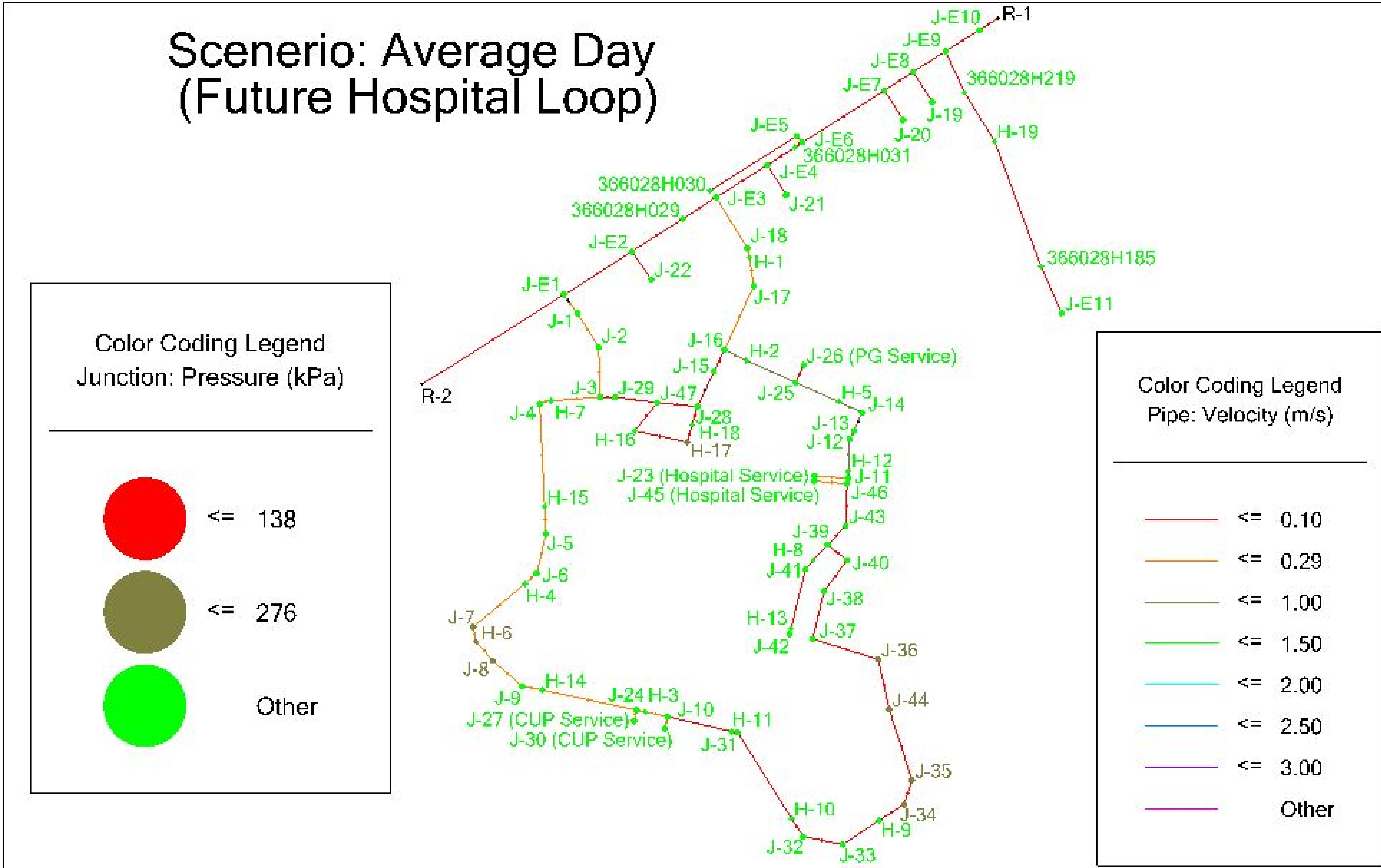
Scenerio 1: Average Day (Parking Garage with Future Hospital Loop)				
Hydrant Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
H-1	67.10	0	107.08	391
H-2	71.15	0	107.05	351
H-3	75.23	0	106.98	311
H-4	76.65	0	107.02	297
H-5	69.80	0	107.01	364
H-6	79.97	0	107.01	265
H-7	74.02	0	107.06	323
H-8	69.69	0	106.98	365
H-9	78.07	0	106.98	283
H-10	77.73	0	106.98	286
H-11	74.86	0	106.98	314
H-12	70.21	0	106.98	360
H-13	69.47	0	106.98	367
H-14	77.20	0	107.00	292
H-15	75.14	0	107.04	312
H-16	78.82	0	107.06	276
H-17	79.37	0	107.06	271
H-18	74.91	0	107.06	315
H-19	63.71	0	107.10	425
366028H029	65.10	0	107.10	411
366028H030	65.00	0	107.10	412
366028H031	64.64	0	107.10	416
366028H185	66.30	0	107.10	399
366028H219	63.00	0	107.10	432

*Minimum pressure falls below 40psi due to topographic constraints

Scenerio 1: Average Day (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-1	66.53	0	107.09	397
J-2	67.16	0	107.08	391
J-3	74.01	0	107.06	323
J-4	74.14	0	107.05	322
J-5	75.23	0	107.03	311
J-6	75.90	0	107.03	305
J-7	79.82	0	107.01	266
J-8	79.26	0	107.01	272
J-9	78.04	0	107.00	283
J-10	75.14	0	106.98	312
J-11	70.11	0	106.98	361
J-12	69.75	0	106.99	364
J-13	69.56	0	106.99	366
J-14	69.27	0	107.00	369
J-15	71.95	0	107.06	344
J-16	71.11	0	107.06	352
J-17	68.21	0	107.07	380
J-18	66.29	0	107.08	399
J-19	64.04	0	107.10	421
J-20	65.25	0	107.10	410
J-21	65.48	0	107.10	407
J-22	66.02	0	107.10	402
J-23 (Hospital Service)	71.48	11.41	106.97	347
J-24	75.18	0	106.98	311
J-25	70.16	0	107.03	361
J-26 (PG Service)	70.54	1.14	107.03	357
J-27 (CUP Service)	75.32	5.5	106.98	310
J-28	73.62	0	107.06	327
J-29	74.17	0	107.06	322
J-30 (CUP Service)	75.27	5.5	106.98	310
J-31	74.64	0	106.98	317
J-32	78.23	0	106.98	281
J-33	77.47	0	106.98	289
J-34	78.89	0	106.98	275

Scenerio 1: Average Day (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-35	81.90	0	106.98	245
J-36	79.58	0	106.98	268
J-37	71.33	0	106.98	349
J-38	70.02	0	106.98	362
J-39	69.78	0	106.98	364
J-40	71.13	0	106.98	351
J-41	69.84	0	106.98	363
J-42	69.64	0	106.98	365
J-43	69.68	0	106.98	365
J-44	80.64	0	106.98	258
J-45 (Hospital Service)	71.37	11.41	106.97	348
J-46	70.07	0	106.98	361
J-47	74.13	0	107.06	322
J-E1	66.39	0	107.10	398
J-E2	65.50	0	107.10	407
J-E3	64.89	0	107.09	413
J-E4	65.00	0	107.10	412
J-E5	64.50	0	107.10	417
J-E6	64.55	0	107.10	416
J-E7	63.50	0	107.10	427
J-E8	63.00	0	107.10	432
J-E9	62.66	0	107.10	435
J-E10	62.60	0	107.10	436
J-E11	66.00	0	107.10	402

*Minimum pressure falls below 40psi due to topographic constraints



Scenerio: Average Day
(Future Hospital Loop)
Color Coding Legend
Junction: Pressure (kPa)
<= 138
<= 276
Other
Color Coding Legend
Pipe: Velocity (m/s)
<= 0.10
<= 0.29
<= 1.00
<= 1.50
<= 2.00
<= 2.50
<= 3.00
Other
R-1
R-2
J-E10
J-E9
J-E8
J-E7
J-E6
J-E5
J-E4
J-E3
J-E2
J-E1
J-E11
366028H219
366028H031
366028H030
366028H029
366028H185
J-26 (PG Service)
J-23 (Hospital Service)
J-45 (Hospital Service)
J-27 (CUP Service)
J-30 (CUP Service)

Scenerio 2: Max Day (Parking Garage with Future Hospital Loop)

Pipe Table

Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
1 - Ex WM 400mm Carling Ave	19.39	R-1	J-E10	1000	Cast iron	130	13.25	0.02	0	436
3 - Ex WM 400mm Carling Ave	35.64	J-E10	J-E9	400	Cast iron	80	13.25	0.11	436	435
4 - Ex WM 150mm Preston St	40.2	J-E9	366028H219	150	Cast iron	40	0	0.00	435	432
5 - Ex WM 150mm Preston St	51.03	H-19	366028H219	150	Cast iron	40	0	0.00	425	432
5A - Ex WM 150mm Preston St	45.26	J-E11	366028H185	150	Cast iron	40	0	0.00	402	399
5B - Ex WM 150mm Preston St	118.76	366028H185	H-19	150	Cast iron	40	0	0.00	399	425
6 - Ex WM 400mm Carling Ave	34.14	J-E9	J-E8	400	Cast iron	80	13.25	0.11	435	432
7 - Prop WM 150mm Carling V-T #1	31.25	J-E8	J-19	150	PVC	120	0	0.00	432	421
8 - Ex WM 400mm Carling Ave	30.3	J-E8	J-E7	400	Cast iron	80	13.25	0.11	432	427
9 - Prop WM 150mm Carling V-T #2	31.07	J-E7	J-20	150	PVC	120	0	0.00	427	410
10 - Ex WM 400mm Carling Ave	86.55	J-E7	J-E6	400	Cast iron	80	13.25	0.11	427	416
11 - Ex WM 150mm Carling Ave	7.46	J-E6	J-E5	150	Cast iron	40	0	0.00	416	417
12 - Ex WM 150mm Carling Ave	90.95	J-E5	366028H030	150	Cast iron	40	0	0.00	417	412
13 - Ex WM 400mm Carling Ave	7.73	J-E6	366028H031	400	Cast iron	80	13.25	0.11	416	415
14 - Ex WM 400mm Carling Ave	29.23	366028H031	J-E4	400	Cast iron	80	13.25	0.11	415	412
15 - Prop WM 150mm Carling V-T #3	30.97	J-E4	J-21	150	PVC	120	0	0.00	412	407
16 - Ex WM 400mm Carling Ave	53.89	J-E4	J-E3	400	Cast iron	80	13.25	0.11	412	413
17 - Ex WM 400mm Carling Ave	35.1	366028H029	J-E3	400	Cast iron	80	15.2	0.12	411	413
18 - Ex WM 400mm Carling Ave	54.49	J-E2	366028H029	400	Cast iron	80	15.2	0.12	407	411
19 - Prop WM 150mm Research B	30.35	J-E2	J-22	150	PVC	120	0	0.00	407	402
20 - Ex WM 400mm Carling Ave	72.06	J-E1	J-E2	400	Cast iron	80	15.2	0.12	398	407
21 - Ex WM 400mm Carling Ave	148.67	R-2	J-E1	1000	Cast iron	130	51.01	0.06	0	398
22 - Prop WM 300mm Rd A	52.89	J-E3	J-18	300	PVC	120	28.46	0.40	413	399
23 - Prop WM 300mm Rd A	8.34	J-18	H-1	300	PVC	120	28.46	0.40	399	391
24 - Prop WM 300mm Rd A	26.24	H-1	J-17	300	PVC	120	28.46	0.40	391	380
25 - Prop WM 300mm Rd A	62.29	J-17	J-16	300	PVC	120	28.46	0.40	380	351
26 - Prop WM 300mm Rd A	21.35	J-16	J-15	300	PVC	120	-10.58	0.15	351	343
27 - Prop WM 300mm Rd B	21.58	J-16	H-2	300	PVC	120	39.03	0.55	351	350
28 - Prop WM 300mm Rd B	47.92	H-2	J-25	300	PVC	120	39.03	0.55	350	359
29 - Prop WM 150mm PG Service	16.98	J-25	J-26 (PG Service)	150	PVC	120	1.7	0.10	359	356
30 - Prop WM 300mm Rd B	42	J-25	H-5	300	PVC	120	37.33	0.53	359	362
31 - Prop WM 300mm Rd B	22.94	J-14	H-5	300	PVC	120	-37.33	0.53	367	362
32 - Prop WM 300mm Rd L	8.1	J-12	J-13	300	PVC	120	-37.33	0.53	362	364
33 - Prop WM 300mm Rd L	28.89	H-12	J-12	300	PVC	120	-37.33	0.53	357	362
34 - Prop WM 300mm Rd E	85.46	H-14	J-24	300	PVC	120	25.23	0.36	289	309
35 - Prop WM 300mm Rd E	18.08	J-9	H-14	300	PVC	120	25.23	0.36	281	289
36 - Prop WM 300mm Rd D	59.7	H-4	J-7	300	PVC	120	25.23	0.36	296	264
37 - Prop WM 300mm Rd D	14.21	J-6	H-4	300	PVC	120	25.23	0.36	303	296
38 - Prop WM 300mm Hospital	35.84	J-5	J-6	300	PVC	120	25.23	0.36	310	303
39 - Prop WM 300mm Hospital	24.29	H-15	J-5	300	PVC	120	25.23	0.36	311	310
40 - Prop WM 300mm Hospital	91.57	J-4	H-15	300	PVC	120	25.23	0.36	321	311
41 - Prop WM 300mm Hospital	10.8	H-7	J-4	300	PVC	120	25.23	0.36	322	321

Scenerio 2: Max Day (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
42 - Prop WM 300mm Hospital	43.89	J-3	H-7	300	PVC	120	25.23	0.36	323	322
43 - Prop WM 300mm Hospital	44.34	J-2	J-3	300	PVC	120	35.8	0.51	390	323
44 - Prop WM 300mm Hospital	35.61	J-1	J-2	300	PVC	120	35.8	0.51	397	390
45 - Prop WM 300mm Hospital	20.64	J-E1	J-1	300	PVC	120	35.8	0.51	398	397
46 - Prop WM 200mm CUP Service	10.04	J-27 (CUP Service)	J-24	200	PVC	120	-14.17	0.45	307	309
47 - Prop WM 300mm Hospital	12.81	J-3	J-29	300	PVC	120	10.58	0.15	323	321
48 - Prop WM 300mm Hospital	38	J-29	J-47	300	PVC	120	10.58	0.15	321	322
48B - Prop WM 300mm Hospital	35.74	J-47	J-28	300	PVC	120	10.04	0.14	322	326
49 - Prop WM 300mm Rd A	34.67	J-28	J-15	300	PVC	120	10.58	0.15	326	343
50 - Prop WM 300mm Rd E	13.31	J-7	H-6	300	PVC	120	25.23	0.36	264	263
51 - Prop WM 300mm Rd E	22.67	H-6	J-8	300	PVC	120	25.23	0.36	263	270
52 - Prop WM 300mm Rd E	34.52	J-8	J-9	300	PVC	120	25.23	0.36	270	281
53 - Prop WM 300mm Rd E	7.9	J-24	H-3	300	PVC	120	11.06	0.16	309	308
54 - Prop WM 300mm Rd E	20.35	H-3	J-10	300	PVC	120	11.06	0.16	308	309
55 - Prop WM 300mm Rd E	58.3	J-10	H-11	300	PVC	120	-3.11	0.04	309	312
56 - Prop WM 300mm Rd E	5.74	H-11	J-31	300	PVC	120	-3.11	0.04	312	314
57 - Prop WM 200mm CUP Service	10.93	J-30 (CUP Service)	J-10	200	PVC	120	-14.17	0.45	308	309
58 - Prop WM 300mm Rd E	90.15	J-31	H-10	300	PVC	120	-3.11	0.04	314	284
59 - Prop WM 300mm Rd E	19.01	H-10	J-32	300	PVC	120	-3.11	0.04	284	279
60 - Prop WM 300mm Rd E	35.95	J-32	J-33	300	PVC	120	-3.11	0.04	279	286
61 - Prop WM 300mm Rd E	38.7	J-33	H-9	300	PVC	120	-3.11	0.04	286	280
62 - Prop WM 300mm Rd E	26.33	H-9	J-34	300	PVC	120	-3.11	0.04	280	272
63 - Prop WM 300mm Rd E	22.68	J-34	J-35	300	PVC	120	-3.11	0.04	272	243
64 - Prop WM 300mm Hospital	66.23	J-35	J-44	300	PVC	120	-3.11	0.04	243	255
65 - Prop WM 300mm Hospital	45.38	J-44	J-36	300	PVC	120	-3.11	0.04	255	266
66 - Prop WM 300mm Hospital	61.11	J-36	J-37	300	PVC	120	-3.11	0.04	266	346
67 - Prop WM 300mm Hospital	43.55	J-37	J-38	300	PVC	120	-3.11	0.04	346	359
68 - Prop WM 300mm Hospital	34.59	J-38	J-40	300	PVC	120	-3.11	0.04	359	348
69 - Prop WM 300mm Hospital	22.02	J-40	J-39	300	PVC	120	-3.11	0.04	348	362
70 - Prop WM 300mm Loading Dock	4.94	J-42	H-13	300	PVC	120	0	0.00	363	365
71 - Prop WM 300mm Loading Dock	54.59	H-13	J-41	300	PVC	120	0	0.00	365	361
72 - Prop WM 300mm Loading Dock	10.28	J-41	H-8	300	PVC	120	0	0.00	361	362
73 - Prop WM 300mm Loading Dock	18.88	H-8	J-39	300	PVC	120	0	0.00	362	362
74 - Prop WM 300mm Loading Dock	23.4	J-39	J-43	300	PVC	120	-3.11	0.04	362	363
75 - Prop WM 300mm Rd L	37.53	J-43	J-46	300	PVC	120	-3.11	0.04	363	359
76 - Prop WM 300mm Hospital Service	29.22	J-46	J-45 (Hospital Service)	300	PVC	120	17.11	0.24	359	346
77 - Prop WM 300mm Rd L	5.05	J-46	J-11	300	PVC	120	-20.22	0.29	359	358
78 - Prop WM 300mm Rd L	6.03	J-11	H-12	300	PVC	120	-37.33	0.53	358	357
79 - Prop WM 300mm Hospital Service	29.77	J-11	J-23 (Hospital Service)	300	PVC	120	17.11	0.24	358	345
80 - Prop WM 300mm Rd L	17.94	J-13	J-14	300	PVC	120	-37.33	0.53	364	367
81 - Prop WM 300mm	17.05	J-28	H-18	300	PVC	120	-0.53	0.01	326	314
82 - Prop WM 150mm	15.85	H-18	H-17	150	PVC	120	-0.53	0.03	314	270

Scenerio 2: Max Day (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
83 - Prop WM 300mm	31.85	J-47	H-16	300	PVC	120	0.53	0.01	322	276
84 - Prop WM 150mm	47.38	H-16	H-17	150	PVC	120	0.53	0.03	276	270

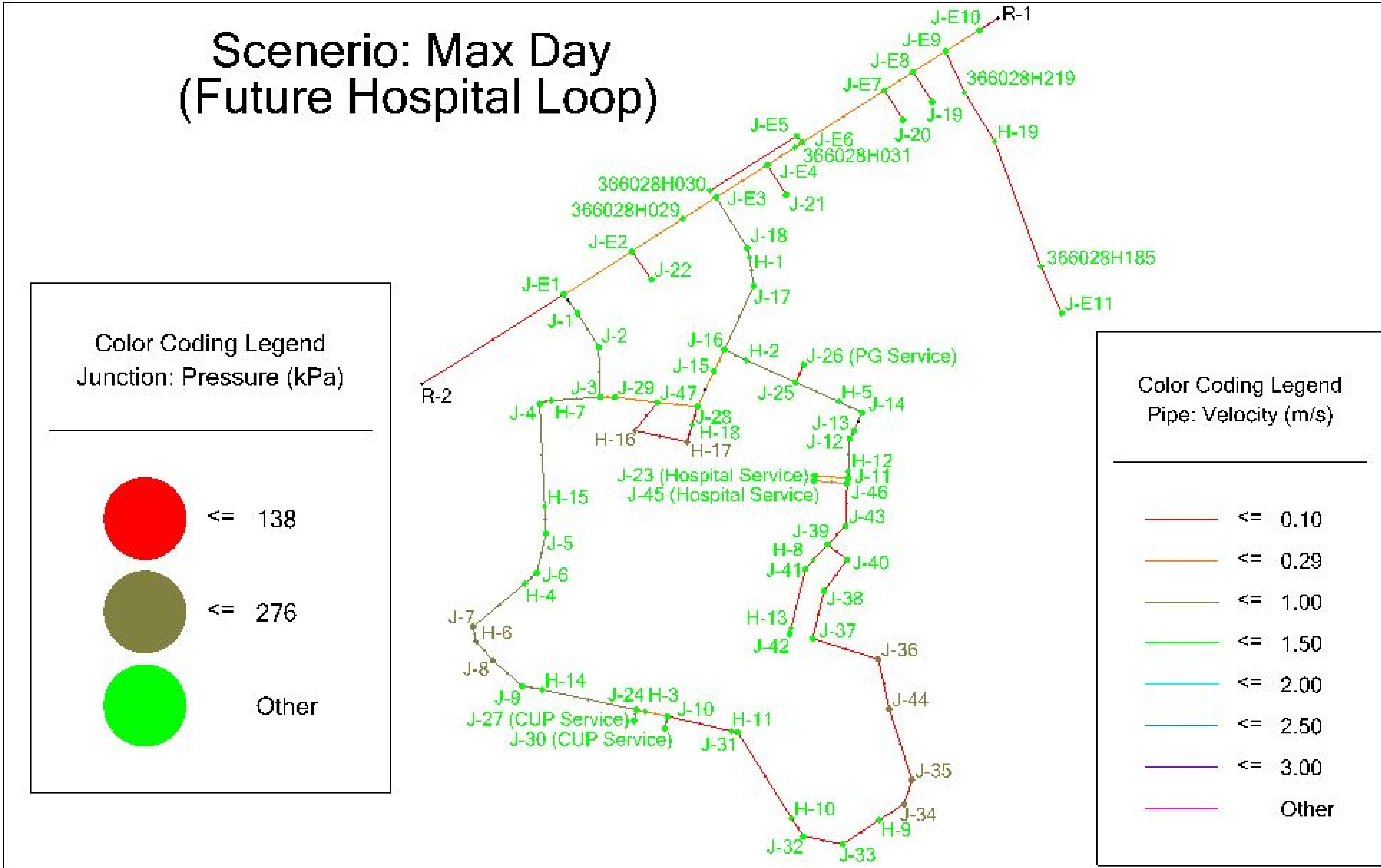
Scenerio 2: Max Day (Parking Garage with Future Hospital Loop)				
Hydrant Table				
Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
H-1	67.10	0	107.04	391
H-2	71.15	0	106.94	350
H-3	75.23	0	106.72	308
H-4	76.65	0	106.86	296
H-5	69.80	0	106.83	362
H-6	79.97	0	106.82	263
H-7	74.02	0	106.96	322
H-8	69.69	0	106.73	362
H-9	78.07	0	106.72	280
H-10	77.73	0	106.72	284
H-11	74.86	0	106.72	312
H-12	70.21	0	106.74	357
H-13	69.47	0	106.73	365
H-14	77.20	0	106.77	289
H-15	75.14	0	106.90	311
H-16	78.82	0	106.98	276
H-17	79.37	0	106.98	270
H-18	74.91	0	106.98	314
H-19	63.71	0	107.10	425
366028H029	65.10	0	107.08	411
366028H030	65.00	0	107.09	412
366028H031	64.64	0	107.09	415
366028H185	66.30	0	107.10	399
366028H219	63.00	0	107.10	432

*Minimum pressure falls below 40psi due to topographic constraints

Scenerio 2: Max Day (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-1	66.53	0	107.08	397
J-2	67.16	0	107.04	390
J-3	74.01	0	106.99	323
J-4	74.14	0	106.96	321
J-5	75.23	0	106.89	310
J-6	75.90	0	106.87	303
J-7	79.82	0	106.83	264
J-8	79.26	0	106.80	270
J-9	78.04	0	106.78	281
J-10	75.14	0	106.72	309
J-11	70.11	0	106.73	358
J-12	69.75	0	106.77	362
J-13	69.56	0	106.78	364
J-14	69.27	0	106.80	367
J-15	71.95	0	106.97	343
J-16	71.11	0	106.97	351
J-17	68.21	0	107.02	380
J-18	66.29	0	107.04	399
J-19	64.04	0	107.10	421
J-20	65.25	0	107.10	410
J-21	65.48	0	107.09	407
J-22	66.02	0	107.09	402
J-23 (Hospital Service)	71.48	17.11	106.72	345
J-24	75.18	0	106.72	309
J-25	70.16	0	106.88	359
J-26 (PG Service)	70.54	1.7	106.88	356
J-27 (CUP Service)	75.32	14.17	106.71	307
J-28	73.62	0	106.98	326
J-29	74.17	0	106.99	321
J-30 (CUP Service)	75.27	14.17	106.70	308
J-31	74.64	0	106.72	314
J-32	78.23	0	106.72	279
J-33	77.47	0	106.72	286
J-34	78.89	0	106.72	272

Scenerio 2: Max Day (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-35	81.90	0	106.72	243
J-36	79.58	0	106.73	266
J-37	71.33	0	106.73	346
J-38	70.02	0	106.73	359
J-39	69.78	0	106.73	362
J-40	71.13	0	106.73	348
J-41	69.84	0	106.73	361
J-42	69.64	0	106.73	363
J-43	69.68	0	106.73	363
J-44	80.64	0	106.72	255
J-45 (Hospital Service)	71.37	17.11	106.72	346
J-46	70.07	0	106.73	359
J-47	74.13	0	106.98	322
J-E1	66.39	0	107.10	398
J-E2	65.50	0	107.09	407
J-E3	64.89	0	107.08	413
J-E4	65.00	0	107.09	412
J-E5	64.50	0	107.09	417
J-E6	64.55	0	107.09	416
J-E7	63.50	0	107.10	427
J-E8	63.00	0	107.10	432
J-E9	62.66	0	107.10	435
J-E10	62.60	0	107.10	436
J-E11	66.00	0	107.10	402

*Minimum pressure falls below 40psi due to topographic constraints


Scenerio: Max Day
(Future Hospital Loop)
Color Coding Legend
Junction: Pressure (kPa)
<= 138
<= 276
Other
Color Coding Legend
Pipe: Velocity (m/s)
<= 0.10
<= 0.29
<= 1.00
<= 1.50
<= 2.00
<= 2.50
<= 3.00
Other
R-1
J-E10
J-E9
J-E8
J-E7
366028H219
J-19
J-20
H-19
J-E5
J-E6
366028H031
J-E4
366028H030
J-E3
J-21
366028H029
J-18
J-E2
J-22
H-1
J-E1
J-17
366028H185
J-E11
J-1
J-2
J-16
H-2
J-26 (PG Service)
J-15
R-2
J-3
J-29
J-47
J-25
H-5
J-14
J-4
H-7
J-28
J-13
H-16
H-18
J-12
H-17
H-12
J-23 (Hospital Service)
J-11
J-45 (Hospital Service)
J-46
H-15
J-43
J-39
J-5
H-8
J-40
J-41
J-6
H-4
J-38
H-13
J-7
H-6
J-37
J-42
J-36
J-8
H-14
J-24
H-3
J-44
J-9
J-10
J-27 (CUP Service)
H-11
J-30 (CUP Service)
J-31
J-35
H-10
J-34
H-9
J-32
J-33

Scenerio 3: Peak Hour (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
1 - Ex WM 400mm Carling Ave	19.39	R-1	J-E10	1000	Cast iron	130	23.86	0.03	0	436
3 - Ex WM 400mm Carling Ave	35.64	J-E10	J-E9	400	Cast iron	80	23.86	0.19	436	435
4 - Ex WM 150mm Preston St	40.2	J-E9	366028H219	150	Cast iron	40	0	0.00	435	432
5 - Ex WM 150mm Preston St	51.03	H-19	366028H219	150	Cast iron	40	0	0.00	425	432
5A - Ex WM 150mm Preston St	45.26	J-E11	366028H185	150	Cast iron	40	0	0.00	402	399
5B - Ex WM 150mm Preston St	118.76	366028H185	H-19	150	Cast iron	40	0	0.00	399	425
6 - Ex WM 400mm Carling Ave	34.14	J-E9	J-E8	400	Cast iron	80	23.86	0.19	435	432
7 - Prop WM 150mm Carling V-T #1	31.25	J-E8	J-19	150	PVC	120	0	0.00	432	421
8 - Ex WM 400mm Carling Ave	30.3	J-E8	J-E7	400	Cast iron	80	23.86	0.19	432	427
9 - Prop WM 150mm Carling V-T #2	31.07	J-E7	J-20	150	PVC	120	0	0.00	427	409
10 - Ex WM 400mm Carling Ave	86.55	J-E7	J-E6	400	Cast iron	80	23.86	0.19	427	416
11 - Ex WM 150mm Carling Ave	7.46	J-E6	J-E5	150	Cast iron	40	0	0.00	416	417
12 - Ex WM 150mm Carling Ave	90.95	J-E5	366028H030	150	Cast iron	40	0	0.00	417	412
13 - Ex WM 400mm Carling Ave	7.73	J-E6	366028H031	400	Cast iron	80	23.86	0.19	416	415
14 - Ex WM 400mm Carling Ave	29.23	366028H031	J-E4	400	Cast iron	80	23.86	0.19	415	412
15 - Prop WM 150mm Carling V-T #3	30.97	J-E4	J-21	150	PVC	120	0	0.00	412	407
16 - Ex WM 400mm Carling Ave	53.89	J-E4	J-E3	400	Cast iron	80	23.86	0.19	412	413
17 - Ex WM 400mm Carling Ave	35.1	366028H029	J-E3	400	Cast iron	80	27.37	0.22	411	413
18 - Ex WM 400mm Carling Ave	54.49	J-E2	366028H029	400	Cast iron	80	27.37	0.22	407	411
19 - Prop WM 150mm Research B	30.35	J-E2	J-22	150	PVC	120	0	0.00	407	402
20 - Ex WM 400mm Carling Ave	72.06	J-E1	J-E2	400	Cast iron	80	27.37	0.22	398	407
21 - Ex WM 400mm Carling Ave	148.67	R-2	J-E1	1000	Cast iron	130	91.81	0.12	0	398
22 - Prop WM 300mm Rd A	52.89	J-E3	J-18	300	PVC	120	51.23	0.72	413	398
23 - Prop WM 300mm Rd A	8.34	J-18	H-1	300	PVC	120	51.23	0.72	398	390
24 - Prop WM 300mm Rd A	26.24	H-1	J-17	300	PVC	120	51.23	0.72	390	378
25 - Prop WM 300mm Rd A	62.29	J-17	J-16	300	PVC	120	51.23	0.72	378	349
26 - Prop WM 300mm Rd A	21.35	J-16	J-15	300	PVC	120	-19.04	0.27	349	340
27 - Prop WM 300mm Rd B	21.58	J-16	H-2	300	PVC	120	70.27	0.99	349	347
28 - Prop WM 300mm Rd B	47.92	H-2	J-25	300	PVC	120	70.27	0.99	347	355
29 - Prop WM 150mm PG Service	16.98	J-25	J-26 (PG Service)	150	PVC	120	3.07	0.17	355	351
30 - Prop WM 300mm Rd B	42	J-25	H-5	300	PVC	120	67.2	0.95	355	357
31 - Prop WM 300mm Rd B	22.94	J-14	H-5	300	PVC	120	-67.2	0.95	362	357
32 - Prop WM 300mm Rd L	8.1	J-12	J-13	300	PVC	120	-67.2	0.95	356	358
33 - Prop WM 300mm Rd L	28.89	H-12	J-12	300	PVC	120	-67.2	0.95	350	356
34 - Prop WM 300mm Rd E	85.46	H-14	J-24	300	PVC	120	45.4	0.64	283	301
35 - Prop WM 300mm Rd E	18.08	J-9	H-14	300	PVC	120	45.4	0.64	275	283
36 - Prop WM 300mm Rd D	59.7	H-4	J-7	300	PVC	120	45.4	0.64	291	259
37 - Prop WM 300mm Rd D	14.21	J-6	H-4	300	PVC	120	45.4	0.64	299	291
38 - Prop WM 300mm Hospital	35.84	J-5	J-6	300	PVC	120	45.4	0.64	306	299
39 - Prop WM 300mm Hospital	24.29	H-15	J-5	300	PVC	120	45.4	0.64	307	306
40 - Prop WM 300mm Hospital	91.57	J-4	H-15	300	PVC	120	45.4	0.64	318	307
41 - Prop WM 300mm Hospital	10.8	H-7	J-4	300	PVC	120	45.4	0.64	320	318

Scenerio 3: Peak Hour (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
42 - Prop WM 300mm Hospital	43.89	J-3	H-7	300	PVC	120	45.4	0.64	321	320
43 - Prop WM 300mm Hospital	44.34	J-2	J-3	300	PVC	120	64.45	0.91	389	321
44 - Prop WM 300mm Hospital	35.61	J-1	J-2	300	PVC	120	64.45	0.91	396	389
45 - Prop WM 300mm Hospital	20.64	J-E1	J-1	300	PVC	120	64.45	0.91	398	396
46 - Prop WM 200mm CUP Service	10.04	J-27 (CUP Service)	J-24	200	PVC	120	-25.5	0.81	300	301
47 - Prop WM 300mm Hospital	12.81	J-3	J-29	300	PVC	120	19.04	0.27	321	319
48 - Prop WM 300mm Hospital	38	J-29	J-47	300	PVC	120	19.04	0.27	319	319
48B - Prop WM 300mm Hospital	35.74	J-47	J-28	300	PVC	120	18.08	0.26	319	324
49 - Prop WM 300mm Rd A	34.67	J-28	J-15	300	PVC	120	19.04	0.27	324	340
50 - Prop WM 300mm Rd E	13.31	J-7	H-6	300	PVC	120	45.4	0.64	259	257
51 - Prop WM 300mm Rd E	22.67	H-6	J-8	300	PVC	120	45.4	0.64	257	264
52 - Prop WM 300mm Rd E	34.52	J-8	J-9	300	PVC	120	45.4	0.64	264	275
53 - Prop WM 300mm Rd E	7.9	J-24	H-3	300	PVC	120	19.9	0.28	301	301
54 - Prop WM 300mm Rd E	20.35	H-3	J-10	300	PVC	120	19.9	0.28	301	302
55 - Prop WM 300mm Rd E	58.3	J-10	H-11	300	PVC	120	-5.6	0.08	302	305
56 - Prop WM 300mm Rd E	5.74	H-11	J-31	300	PVC	120	-5.6	0.08	305	307
57 - Prop WM 200mm CUP Service	10.93	J-30 (CUP Service)	J-10	200	PVC	120	-25.5	0.81	300	302
58 - Prop WM 300mm Rd E	90.15	J-31	H-10	300	PVC	120	-5.6	0.08	307	276
59 - Prop WM 300mm Rd E	19.01	H-10	J-32	300	PVC	120	-5.6	0.08	276	272
60 - Prop WM 300mm Rd E	35.95	J-32	J-33	300	PVC	120	-5.6	0.08	272	279
61 - Prop WM 300mm Rd E	38.7	J-33	H-9	300	PVC	120	-5.6	0.08	279	273
62 - Prop WM 300mm Rd E	26.33	H-9	J-34	300	PVC	120	-5.6	0.08	273	265
63 - Prop WM 300mm Rd E	22.68	J-34	J-35	300	PVC	120	-5.6	0.08	265	236
64 - Prop WM 300mm Hospital	66.23	J-35	J-44	300	PVC	120	-5.6	0.08	236	248
65 - Prop WM 300mm Hospital	45.38	J-44	J-36	300	PVC	120	-5.6	0.08	248	258
66 - Prop WM 300mm Hospital	61.11	J-36	J-37	300	PVC	120	-5.6	0.08	258	339
67 - Prop WM 300mm Hospital	43.55	J-37	J-38	300	PVC	120	-5.6	0.08	339	352
68 - Prop WM 300mm Hospital	34.59	J-38	J-40	300	PVC	120	-5.6	0.08	352	341
69 - Prop WM 300mm Hospital	22.02	J-40	J-39	300	PVC	120	-5.6	0.08	341	354
70 - Prop WM 300mm Loading Dock	4.94	J-42	H-13	300	PVC	120	0	0.00	356	357
71 - Prop WM 300mm Loading Dock	54.59	H-13	J-41	300	PVC	120	0	0.00	357	354
72 - Prop WM 300mm Loading Dock	10.28	J-41	H-8	300	PVC	120	0	0.00	354	355
73 - Prop WM 300mm Loading Dock	18.88	H-8	J-39	300	PVC	120	0	0.00	355	354
74 - Prop WM 300mm Loading Dock	23.4	J-39	J-43	300	PVC	120	-5.6	0.08	354	355
75 - Prop WM 300mm Rd L	37.53	J-43	J-46	300	PVC	120	-5.6	0.08	355	352
76 - Prop WM 300mm Hospital Service	29.22	J-46	J-45 (Hospital Service)	300	PVC	120	30.8	0.44	352	339
77 - Prop WM 300mm Rd L	5.05	J-46	J-11	300	PVC	120	-36.4	0.51	352	351
78 - Prop WM 300mm Rd L	6.03	J-11	H-12	300	PVC	120	-67.2	0.95	351	350
79 - Prop WM 300mm Hospital Service	29.77	J-11	J-23 (Hospital Service)	300	PVC	120	30.8	0.44	351	338
80 - Prop WM 300mm Rd L	17.94	J-13	J-14	300	PVC	120	-67.2	0.95	358	362
81 - Prop WM 300mm	17.05	J-28	H-18	300	PVC	120	-0.96	0.01	324	312
82 - Prop WM 150mm	15.85	H-18	H-17	150	PVC	120	-0.96	0.05	312	268

Scenerio 3: Peak Hour (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
83 - Prop WM 300mm	31.85	J-47	H-16	300	PVC	120	0.96	0.01	319	273
84 - Prop WM 150mm	47.38	H-16	H-17	150	PVC	120	0.96	0.05	273	268

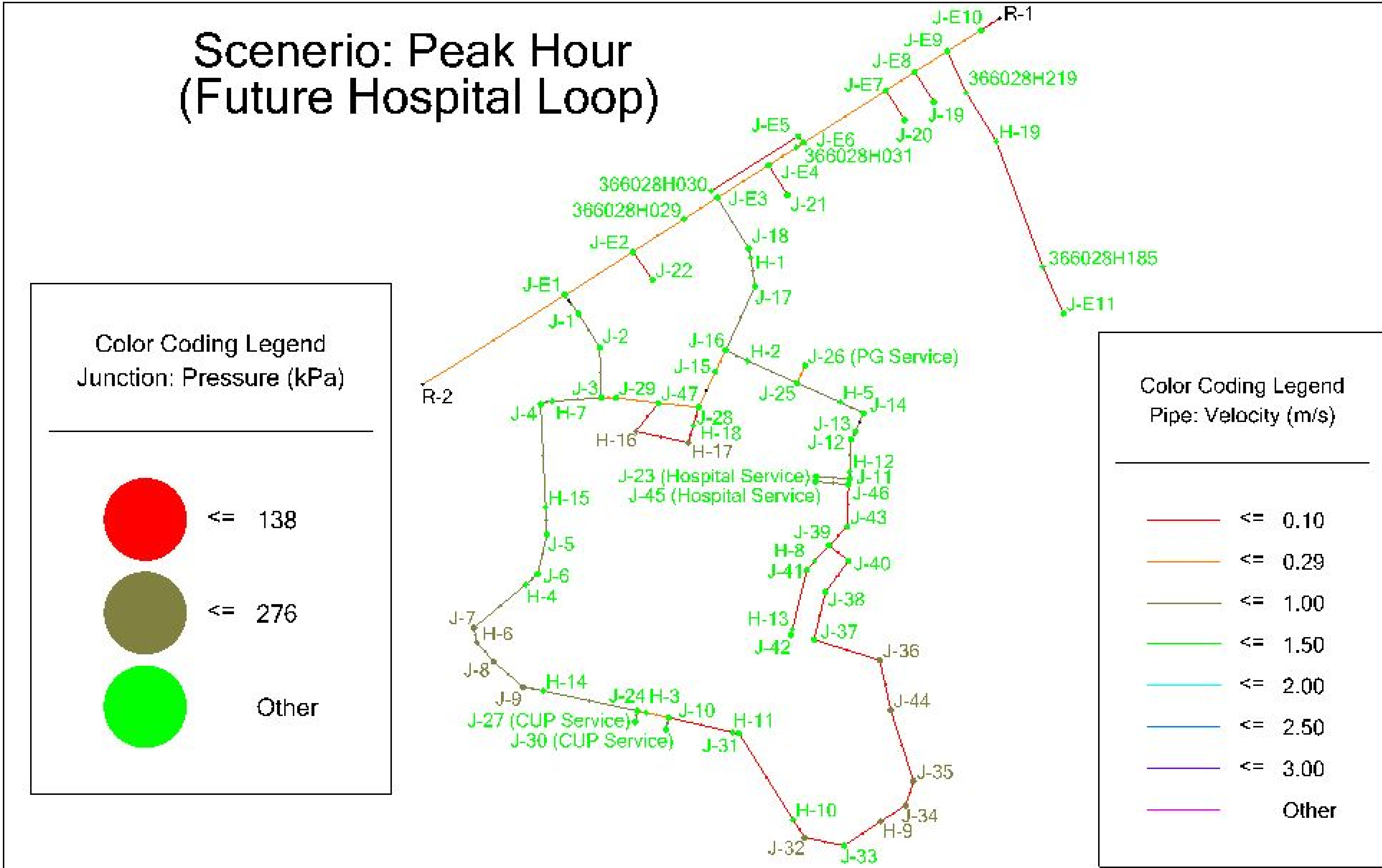
Scenerio 3: Peak Hour (Parking Garage with Future Hospital Loop)				
Hydrant Table				
Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
H-1	67.10	0	106.91	390
H-2	71.15	0	106.64	347
H-3	75.23	0	105.98	301
H-4	76.65	0	106.39	291
H-5	69.80	0	106.30	357
H-6	79.97	0	106.26	257
H-7	74.02	0	106.69	320
H-8	69.69	0	105.99	355
H-9	78.07	0	105.98	273
H-10	77.73	0	105.98	276
H-11	74.86	0	105.97	305
H-12	70.21	0	106.02	350
H-13	69.47	0	105.99	357
H-14	77.20	0	106.13	283
H-15	75.14	0	106.52	307
H-16	78.82	0	106.75	273
H-17	79.37	0	106.74	268
H-18	74.91	0	106.74	312
H-19	63.71	0	107.10	425
366028H029	65.10	0	107.06	411
366028H030	65.00	0	107.07	412
366028H031	64.64	0	107.07	415
366028H185	66.30	0	107.10	399
366028H219	63.00	0	107.10	432

*Minimum pressure falls below 40psi due to topographic constraints

Scenerio 3: Peak Hour (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-1	66.53	0	107.03	396
J-2	67.16	0	106.91	389
J-3	74.01	0	106.77	321
J-4	74.14	0	106.67	318
J-5	75.23	0	106.47	306
J-6	75.90	0	106.41	299
J-7	79.82	0	106.28	259
J-8	79.26	0	106.22	264
J-9	78.04	0	106.16	275
J-10	75.14	0	105.97	302
J-11	70.11	0	106.00	351
J-12	69.75	0	106.13	356
J-13	69.56	0	106.15	358
J-14	69.27	0	106.22	362
J-15	71.95	0	106.73	340
J-16	71.11	0	106.72	349
J-17	68.21	0	106.85	378
J-18	66.29	0	106.93	398
J-19	64.04	0	107.10	421
J-20	65.25	0	107.09	409
J-21	65.48	0	107.06	407
J-22	66.02	0	107.07	402
J-23 (Hospital Service)	71.48	30.8	105.98	338
J-24	75.18	0	105.98	301
J-25	70.16	0	106.45	355
J-26 (PG Service)	70.54	3.07	106.44	351
J-27 (CUP Service)	75.32	25.5	105.94	300
J-28	73.62	0	106.74	324
J-29	74.17	0	106.76	319
J-30 (CUP Service)	75.27	25.5	105.93	300
J-31	74.64	0	105.97	307
J-32	78.23	0	105.98	272
J-33	77.47	0	105.98	279
J-34	78.89	0	105.98	265

Scenerio 3: Peak Hour (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-35	81.90	0	105.98	236
J-36	79.58	0	105.99	258
J-37	71.33	0	105.99	339
J-38	70.02	0	105.99	352
J-39	69.78	0	105.99	354
J-40	71.13	0	105.99	341
J-41	69.84	0	105.99	354
J-42	69.64	0	105.99	356
J-43	69.68	0	105.99	355
J-44	80.64	0	105.99	248
J-45 (Hospital Service)	71.37	30.8	105.97	339
J-46	70.07	0	105.99	352
J-47	74.13	0	106.75	319
J-E1	66.39	0	107.10	398
J-E2	65.50	0	107.07	407
J-E3	64.89	0	107.04	413
J-E4	65.00	0	107.06	412
J-E5	64.50	0	107.07	417
J-E6	64.55	0	107.07	416
J-E7	63.50	0	107.09	427
J-E8	63.00	0	107.10	432
J-E9	62.66	0	107.10	435
J-E10	62.60	0	107.10	436
J-E11	66.00	0	107.10	402

*Minimum pressure falls below 40psi due to topographic constraints


Scenerio: Peak Hour
(Future Hospital Loop)
Color Coding Legend
Junction: Pressure (kPa)
<= 138
<= 276
Other
Color Coding Legend
Pipe: Velocity (m/s)
<= 0.10
<= 0.29
<= 1.00
<= 1.50
<= 2.00
<= 2.50
<= 3.00
Other
R-1
R-2
J-E10
J-E9
J-E8
J-E7
J-E6
J-E5
J-E4
J-E3
J-E2
J-E1
J-E11
366028H219
366028H031
366028H030
366028H029
366028H185
J-19
J-20
J-21
J-22
H-19
J-18
H-1
J-17
J-16
H-2
J-15
J-26 (PG Service)
J-25
H-5
J-14
J-1
J-2
J-3
J-29
J-47
J-4
H-7
J-28
H-18
H-16
H-17
J-13
J-12
H-12
J-23 (Hospital Service)
J-11
J-45 (Hospital Service)
J-46
H-15
J-43
J-39
H-8
J-40
J-41
J-5
J-6
H-4
J-38
H-13
J-37
J-7
H-6
J-42
J-36
J-8
H-14
J-9
J-24
H-3
J-10
J-27 (CUP Service)
H-11
J-30 (CUP Service)
J-31
J-44
J-35
H-10
J-34
H-9
J-32
J-33

Scenerio 4: Fire at Loading Dock, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
1 - Ex WM 400mm Carling Ave	19.39	R-1	J-E10	1000	Cast iron	130	98.84	0.13	0	436
3 - Ex WM 400mm Carling Ave	35.64	J-E10	J-E9	400	Cast iron	80	98.84	0.79	436	435
4 - Ex WM 150mm Preston St	40.2	J-E9	366028H219	150	Cast iron	40	0	0.00	435	432
5 - Ex WM 150mm Preston St	51.03	H-19	366028H219	150	Cast iron	40	0	0.00	425	432
5A - Ex WM 150mm Preston St	45.26	J-E11	366028H185	150	Cast iron	40	0	0.00	402	399
5B - Ex WM 150mm Preston St	118.76	366028H185	H-19	150	Cast iron	40	0	0.00	399	425
6 - Ex WM 400mm Carling Ave	34.14	J-E9	J-E8	400	Cast iron	80	98.84	0.79	435	432
7 - Prop WM 150mm Carling V-T #1	31.25	J-E8	J-19	150	PVC	120	0	0.00	432	421
8 - Ex WM 400mm Carling Ave	30.3	J-E8	J-E7	400	Cast iron	80	98.84	0.79	432	426
9 - Prop WM 150mm Carling V-T #2	31.07	J-E7	J-20	150	PVC	120	0	0.00	426	408
10 - Ex WM 400mm Carling Ave	86.55	J-E7	J-E6	400	Cast iron	80	98.84	0.79	426	412
11 - Ex WM 150mm Carling Ave	7.46	J-E6	J-E5	150	Cast iron	40	0	0.00	412	413
12 - Ex WM 150mm Carling Ave	90.95	J-E5	366028H030	150	Cast iron	40	0	0.00	413	408
13 - Ex WM 400mm Carling Ave	7.73	J-E6	366028H031	400	Cast iron	80	98.84	0.79	412	411
14 - Ex WM 400mm Carling Ave	29.23	366028H031	J-E4	400	Cast iron	80	98.84	0.79	411	406
15 - Prop WM 150mm Carling V-T #3	30.97	J-E4	J-21	150	PVC	120	0	0.00	406	402
16 - Ex WM 400mm Carling Ave	53.89	J-E4	J-E3	400	Cast iron	80	98.84	0.79	406	405
17 - Ex WM 400mm Carling Ave	35.1	366028H029	J-E3	400	Cast iron	80	113.39	0.90	405	405
18 - Ex WM 400mm Carling Ave	54.49	J-E2	366028H029	400	Cast iron	80	113.39	0.90	404	405
19 - Prop WM 150mm Research B	30.35	J-E2	J-22	150	PVC	120	0	0.00	404	399
20 - Ex WM 400mm Carling Ave	72.06	J-E1	J-E2	400	Cast iron	80	113.39	0.90	398	404
21 - Ex WM 400mm Carling Ave	148.67	R-2	J-E1	1000	Cast iron	130	215.42	0.27	0	398
22 - Prop WM 300mm Rd A	52.89	J-E3	J-18	300	PVC	120	212.23	3.00	405	376
23 - Prop WM 300mm Rd A	8.34	J-18	H-1	300	PVC	120	212.23	3.00	376	366
24 - Prop WM 300mm Rd A	26.24	H-1	J-17	300	PVC	120	212.23	3.00	366	347
25 - Prop WM 300mm Rd A	62.29	J-17	J-16	300	PVC	120	212.23	3.00	347	300
26 - Prop WM 300mm Rd A	21.35	J-16	J-15	300	PVC	120	0.24	0.00	300	292
27 - Prop WM 300mm Rd B	21.58	J-16	H-2	300	PVC	120	211.99	3.00	300	294
28 - Prop WM 300mm Rd B	47.92	H-2	J-25	300	PVC	120	211.99	3.00	294	289
29 - Prop WM 150mm PG Service	16.98	J-25	J-26 (PG Service)	150	PVC	120	1.7	0.10	289	286
30 - Prop WM 300mm Rd B	42	J-25	H-5	300	PVC	120	210.29	2.97	289	281
31 - Prop WM 300mm Rd B	22.94	J-14	H-5	300	PVC	120	-210.29	2.97	279	281
32 - Prop WM 300mm Rd L	8.1	J-12	J-13	300	PVC	120	-210.29	2.97	267	271
33 - Prop WM 300mm Rd L	28.89	H-12	J-12	300	PVC	120	-210.29	2.97	254	267
34 - Prop WM 300mm Rd E	85.46	H-14	J-24	300	PVC	120	102.27	1.45	213	226
35 - Prop WM 300mm Rd E	18.08	J-9	H-14	300	PVC	120	102.27	1.45	206	213
36 - Prop WM 300mm Rd D	59.7	H-4	J-7	300	PVC	120	102.27	1.45	229	194
37 - Prop WM 300mm Rd D	14.21	J-6	H-4	300	PVC	120	102.27	1.45	238	229
38 - Prop WM 300mm Hospital	35.84	J-5	J-6	300	PVC	120	102.27	1.45	247	238
39 - Prop WM 300mm Hospital	24.29	H-15	J-5	300	PVC	120	102.27	1.45	250	247
40 - Prop WM 300mm Hospital	91.57	J-4	H-15	300	PVC	120	102.27	1.45	267	250
41 - Prop WM 300mm Hospital	10.8	H-7	J-4	300	PVC	120	102.27	1.45	269	267

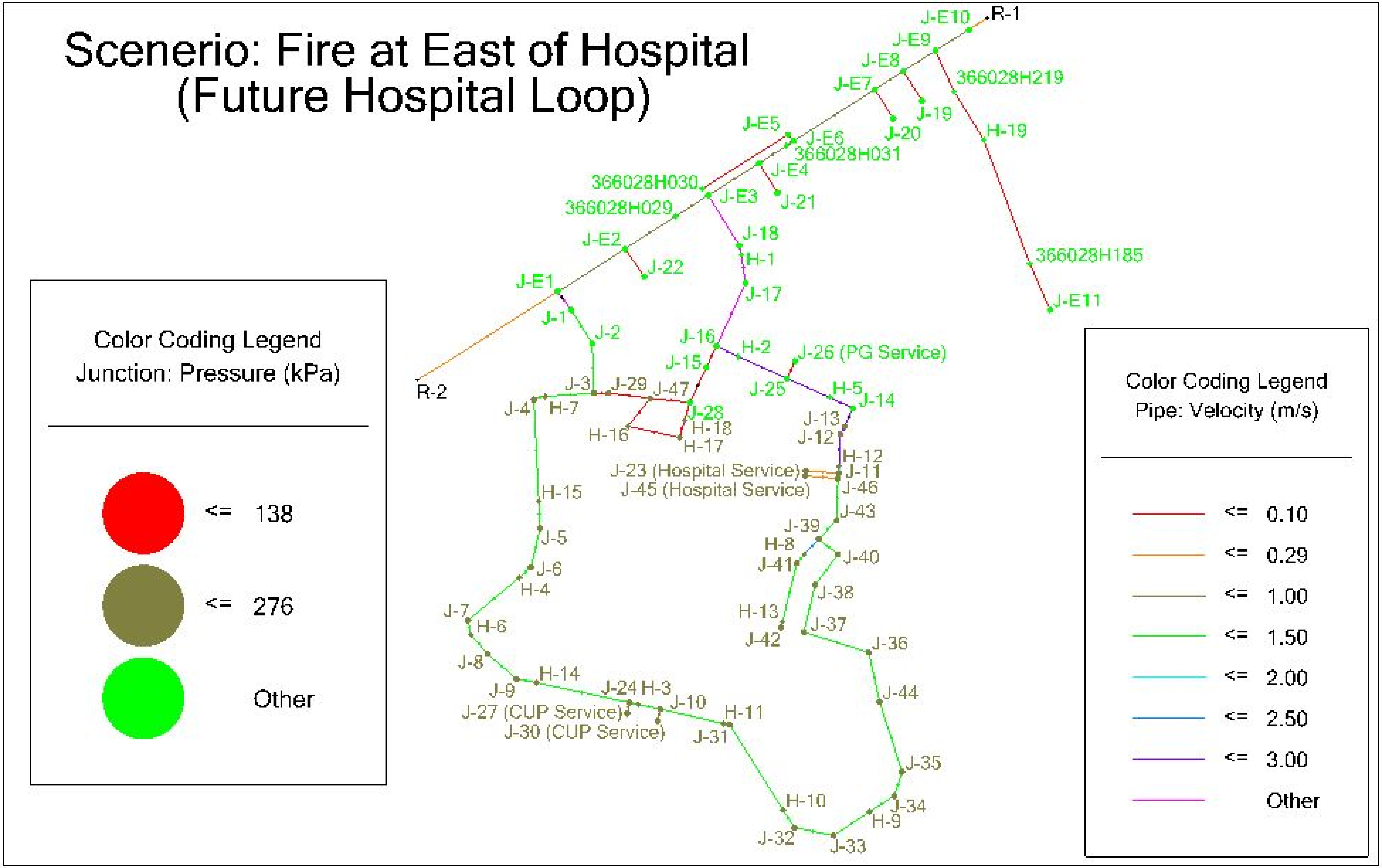
Scenerio 4: Fire at Loading Dock, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
42 - Prop WM 300mm Hospital	43.89	J-3	H-7	300	PVC	120	102.27	1.45	272	269
43 - Prop WM 300mm Hospital	44.34	J-2	J-3	300	PVC	120	102.03	1.44	342	272
44 - Prop WM 300mm Hospital	35.61	J-1	J-2	300	PVC	120	102.03	1.44	351	342
45 - Prop WM 300mm Hospital	20.64	J-E1	J-1	150	PVC	120	102.03	5.77	398	351
46 - Prop WM 200mm CUP Service	10.04	J-27 (CUP Service)	J-24	200	PVC	120	-14.17	0.45	225	226
47 - Prop WM 300mm Hospital	12.81	J-3	J-29	300	PVC	120	-0.24	0.00	272	270
48 - Prop WM 300mm Hospital	38	J-29	J-47	300	PVC	120	-0.24	0.00	270	271
48B - Prop WM 300mm Hospital	35.74	J-47	J-28	300	PVC	120	-0.08	0.00	271	276
49 - Prop WM 300mm Rd A	34.67	J-28	J-15	300	PVC	120	-0.24	0.00	276	292
50 - Prop WM 300mm Rd E	13.31	J-7	H-6	300	PVC	120	102.27	1.45	194	191
51 - Prop WM 300mm Rd E	22.67	H-6	J-8	300	PVC	120	102.27	1.45	191	197
52 - Prop WM 300mm Rd E	34.52	J-8	J-9	300	PVC	120	102.27	1.45	197	206
53 - Prop WM 300mm Rd E	7.9	J-24	H-3	300	PVC	120	88.1	1.25	226	225
54 - Prop WM 300mm Rd E	20.35	H-3	J-10	300	PVC	120	88.1	1.25	225	225
55 - Prop WM 300mm Rd E	58.3	J-10	H-11	300	PVC	120	73.93	1.05	225	225
56 - Prop WM 300mm Rd E	5.74	H-11	J-31	300	PVC	120	73.93	1.05	225	227
57 - Prop WM 200mm CUP Service	10.93	J-30 (CUP Service)	J-10	200	PVC	120	-14.17	0.45	223	225
58 - Prop WM 300mm Rd E	90.15	J-31	H-10	300	PVC	120	73.93	1.05	227	193
59 - Prop WM 300mm Rd E	19.01	H-10	J-32	300	PVC	120	73.93	1.05	193	187
60 - Prop WM 300mm Rd E	35.95	J-32	J-33	300	PVC	120	73.93	1.05	187	193
61 - Prop WM 300mm Rd E	38.7	J-33	H-9	300	PVC	120	73.93	1.05	193	186
62 - Prop WM 300mm Rd E	26.33	H-9	J-34	300	PVC	120	73.93	1.05	186	177
63 - Prop WM 300mm Rd E	22.68	J-34	J-35	300	PVC	120	73.93	1.05	177	146
64 - Prop WM 300mm Hospital	66.23	J-35	J-44	300	PVC	120	73.93	1.05	146	156
65 - Prop WM 300mm Hospital	45.38	J-44	J-36	300	PVC	120	73.93	1.05	156	164
66 - Prop WM 300mm Hospital	61.11	J-36	J-37	300	PVC	120	73.93	1.05	164	242
67 - Prop WM 300mm Hospital	43.55	J-37	J-38	300	PVC	120	73.93	1.05	242	253
68 - Prop WM 300mm Hospital	34.59	J-38	J-40	300	PVC	120	73.93	1.05	253	241
69 - Prop WM 300mm Hospital	22.02	J-40	J-39	300	PVC	120	73.93	1.05	241	253
70 - Prop WM 300mm Loading Dock	4.94	J-42	H-13	300	PVC	120	0	0.00	248	250
71 - Prop WM 300mm Loading Dock	54.59	H-13	J-41	300	PVC	120	-83.34	1.18	250	249
72 - Prop WM 300mm Loading Dock	10.28	J-41	H-8	300	PVC	120	-83.34	1.18	249	251
73 - Prop WM 300mm Loading Dock	18.88	H-8	J-39	300	PVC	120	-166.67	2.36	251	253
74 - Prop WM 300mm Loading Dock	23.4	J-39	J-43	300	PVC	120	-92.74	1.31	253	256
75 - Prop WM 300mm Rd L	37.53	J-43	J-46	300	PVC	120	-92.74	1.31	256	254
76 - Prop WM 300mm Hospital Service	29.22	J-46	J-45 (Hospital Service)	300	PVC	120	17.11	0.24	254	242
77 - Prop WM 300mm Rd L	5.05	J-46	J-11	300	PVC	120	-109.85	1.55	254	255
78 - Prop WM 300mm Rd L	6.03	J-11	H-12	300	PVC	120	-126.96	1.80	255	254
79 - Prop WM 300mm Hospital Service	29.77	J-11	J-23 (Hospital Service)	300	PVC	120	17.11	0.24	255	241
80 - Prop WM 300mm Rd L	17.94	J-13	J-14	300	PVC	120	-210.29	2.97	271	279
81 - Prop WM 300mm	17.05	J-28	H-18	300	PVC	120	0.16	0.00	276	263
82 - Prop WM 150mm	15.85	H-18	H-17	150	PVC	120	0.16	0.01	263	220

Scenerio 4: Fire at Loading Dock, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
83 - Prop WM 300mm	31.85	J-47	H-16	300	PVC	120	-0.16	0.00	271	225
84 - Prop WM 150mm	47.38	H-16	H-17	150	PVC	120	-0.16	0.01	225	220

Scenerio 4: Fire at Loading Dock, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Hydrant Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
H-1	67.10	0	104.47	366
H-2	71.15	0	101.16	294
H-3	75.23	0	98.23	225
H-4	76.65	0	100.09	229
H-5	69.80	0	98.49	281
H-6	79.97	0	99.53	191
H-7	74.02	0	101.47	269
H-8	69.69	83.33	95.32	251
H-9	78.07	0	97.05	186
H-10	77.73	0	97.46	193
H-11	74.86	0	97.86	225
H-12	70.21	83.33	94.82	241
H-13	69.47	83.34	92.73	228
H-14	77.20	0	98.94	213
H-15	75.14	0	100.67	250
H-16	78.82	0	101.81	225
H-17	79.37	0	101.81	220
H-18	74.91	0	101.81	263
H-19	63.71	0	107.10	425
366028H029	65.10	0	106.48	405
366028H030	65.00	0	106.65	408
366028H031	64.64	0	106.62	411
366028H185	66.30	0	107.10	399
366028H219	63.00	0	107.10	432

Scenerio 4: Fire at Loading Dock, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-1	66.53	0	102.43	351
J-2	67.16	0	102.15	342
J-3	74.01	0	101.81	272
J-4	74.14	0	101.38	267
J-5	75.23	0	100.48	247
J-6	75.90	0	100.21	238
J-7	79.82	0	99.63	194
J-8	79.26	0	99.35	197
J-9	78.04	0	99.08	206
J-10	75.14	0	98.11	225
J-11	70.11	0	96.12	255
J-12	69.75	0	97.04	267
J-13	69.56	0	97.28	271
J-14	69.27	0	97.81	279
J-15	71.95	0	101.81	292
J-16	71.11	0	101.81	300
J-17	68.21	0	103.68	347
J-18	66.29	0	104.72	376
J-19	64.04	0	107.10	421
J-20	65.25	0	106.98	408
J-21	65.48	0	106.51	402
J-22	66.02	0	106.75	399
J-23 (Hospital Service)	71.48	17.11	96.11	241
J-24	75.18	0	98.28	226
J-25	70.16	0	99.73	289
J-26 (PG Service)	70.54	1.7	99.72	286
J-27 (CUP Service)	75.32	14.17	98.26	225
J-28	73.62	0	101.81	276
J-29	74.17	0	101.81	270
J-30 (CUP Service)	75.27	14.17	98.10	223
J-31	74.64	0	97.84	227
J-32	78.23	0	97.37	187
J-33	77.47	0	97.21	193
J-34	78.89	0	96.94	177

Scenerio 4: Fire at Loading Dock, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-35	81.90	0	96.84	146
J-36	79.58	0	96.36	164
J-37	71.33	0	96.10	242
J-38	70.02	0	95.92	253
J-39	69.78	0	95.68	253
J-40	71.13	0	95.77	241
J-41	69.84	0	95.26	249
J-42	69.64	0	94.97	248
J-43	69.68	0	95.83	256
J-44	80.64	0	96.56	156
J-45 (Hospital Service)	71.37	17.11	96.06	242
J-46	70.07	0	96.07	254
J-47	74.13	0	101.81	271
J-E1	66.39	0	107.10	398
J-E2	65.50	0	106.75	404
J-E3	64.89	0	106.31	405
J-E4	65.00	0	106.51	406
J-E5	64.50	0	106.65	413
J-E6	64.55	0	106.65	412
J-E7	63.50	0	106.98	426
J-E8	63.00	0	107.10	432
J-E9	62.66	0	107.10	435
J-E10	62.60	0	107.10	436
J-E11	66.00	0	107.10	402


Scenerio: Fire at East of Hospital
(Future Hospital Loop)
Color Coding Legend
Junction: Pressure (kPa)
<= 138
<= 276
Other
Color Coding Legend
Pipe: Velocity (m/s)
<= 0.10
<= 0.29
<= 1.00
<= 1.50
<= 2.00
<= 2.50
<= 3.00
Other
R-1
R-2
J-E10
J-E9
J-E8
J-E7
J-E6
J-E5
J-E4
J-E3
J-E2
J-E1
J-E11
366028H219
366028H031
366028H030
366028H029
366028H185
H-19
J-19
J-20
J-21
J-22
J-18
H-1
J-17
J-16
H-2
J-15
J-26 (PG Service)
J-25
H-5
J-14
J-1
J-2
J-3
J-29
J-47
J-28
H-18
H-17
H-16
J-4
H-7
J-13
J-12
H-12
J-11
J-23 (Hospital Service)
J-45 (Hospital Service)
J-46
J-43
J-39
H-8
J-41
J-40
J-38
H-13
J-42
J-37
J-36
H-15
J-5
J-6
H-4
J-7
H-6
J-8
J-9
H-14
J-24
H-3
J-10
J-27 (CUP Service)
J-30 (CUP Service)
H-11
J-31
J-44
J-35
H-10
J-34
H-9
J-32
J-33

Scenerio 5: Fire at Pavilion, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
1 - Ex WM 400mm Carling Ave	19.39	R-1	J-E10	1000	Cast iron	130	98.27	0.13	0	436
3 - Ex WM 400mm Carling Ave	35.64	J-E10	J-E9	400	Cast iron	80	98.27	0.78	436	435
4 - Ex WM 150mm Preston St	40.2	J-E9	366028H219	150	Cast iron	40	0	0.00	435	432
5 - Ex WM 150mm Preston St	51.03	H-19	366028H219	150	Cast iron	40	0	0.00	425	432
5A - Ex WM 150mm Preston St	45.26	J-E11	366028H185	150	Cast iron	40	0	0.00	402	399
5B - Ex WM 150mm Preston St	118.76	366028H185	H-19	150	Cast iron	40	0	0.00	399	425
6 - Ex WM 400mm Carling Ave	34.14	J-E9	J-E8	400	Cast iron	80	98.27	0.78	435	432
7 - Prop WM 150mm Carling V-T #1	31.25	J-E8	J-19	150	PVC	120	0	0.00	432	421
8 - Ex WM 400mm Carling Ave	30.3	J-E8	J-E7	400	Cast iron	80	98.27	0.78	432	426
9 - Prop WM 150mm Carling V-T #2	31.07	J-E7	J-20	150	PVC	120	0	0.00	426	408
10 - Ex WM 400mm Carling Ave	86.55	J-E7	J-E6	400	Cast iron	80	98.27	0.78	426	412
11 - Ex WM 150mm Carling Ave	7.46	J-E6	J-E5	150	Cast iron	40	0	0.00	412	413
12 - Ex WM 150mm Carling Ave	90.95	J-E5	366028H030	150	Cast iron	40	0	0.00	413	408
13 - Ex WM 400mm Carling Ave	7.73	J-E6	366028H031	400	Cast iron	80	98.27	0.78	412	411
14 - Ex WM 400mm Carling Ave	29.23	366028H031	J-E4	400	Cast iron	80	98.27	0.78	411	406
15 - Prop WM 150mm Carling V-T #3	30.97	J-E4	J-21	150	PVC	120	0	0.00	406	402
16 - Ex WM 400mm Carling Ave	53.89	J-E4	J-E3	400	Cast iron	80	98.27	0.78	406	405
17 - Ex WM 400mm Carling Ave	35.1	366028H029	J-E3	400	Cast iron	80	112.74	0.90	405	405
18 - Ex WM 400mm Carling Ave	54.49	J-E2	366028H029	400	Cast iron	80	112.74	0.90	404	405
19 - Prop WM 150mm Research B	30.35	J-E2	J-22	150	PVC	120	0	0.00	404	399
20 - Ex WM 400mm Carling Ave	72.06	J-E1	J-E2	400	Cast iron	80	112.74	0.90	398	404
21 - Ex WM 400mm Carling Ave	148.67	R-2	J-E1	1000	Cast iron	130	215.99	0.28	0	398
22 - Prop WM 300mm Rd A	52.89	J-E3	J-18	300	PVC	120	211.02	2.99	405	376
23 - Prop WM 300mm Rd A	8.34	J-18	H-1	300	PVC	120	211.02	2.99	376	366
24 - Prop WM 300mm Rd A	26.24	H-1	J-17	300	PVC	120	211.02	2.99	366	347
25 - Prop WM 300mm Rd A	62.29	J-17	J-16	300	PVC	120	211.02	2.99	347	301
26 - Prop WM 300mm Rd A	21.35	J-16	J-15	300	PVC	120	107.69	1.52	301	291
27 - Prop WM 300mm Rd B	21.58	J-16	H-2	300	PVC	120	103.33	1.46	301	299
28 - Prop WM 300mm Rd B	47.92	H-2	J-25	300	PVC	120	40.33	0.57	299	308
29 - Prop WM 150mm PG Service	16.98	J-25	J-26 (PG Service)	150	PVC	120	1.7	0.10	308	304
30 - Prop WM 300mm Rd B	42	J-25	H-5	300	PVC	120	38.63	0.55	308	311
31 - Prop WM 300mm Rd B	22.94	J-14	H-5	300	PVC	120	-38.63	0.55	316	311
32 - Prop WM 300mm Rd L	8.1	J-12	J-13	300	PVC	120	-38.63	0.55	311	313
33 - Prop WM 300mm Rd L	28.89	H-12	J-12	300	PVC	120	-38.63	0.55	306	311
34 - Prop WM 300mm Rd E	85.46	H-14	J-24	300	PVC	120	23.93	0.34	238	257
35 - Prop WM 300mm Rd E	18.08	J-9	H-14	300	PVC	120	23.93	0.34	230	238
36 - Prop WM 300mm Rd D	59.7	H-4	J-7	300	PVC	120	23.93	0.34	244	213
37 - Prop WM 300mm Rd D	14.21	J-6	H-4	300	PVC	120	23.93	0.34	251	244
38 - Prop WM 300mm Hospital	35.84	J-5	J-6	300	PVC	120	23.93	0.34	258	251
39 - Prop WM 300mm Hospital	24.29	H-15	J-5	300	PVC	120	23.93	0.34	259	258
40 - Prop WM 300mm Hospital	91.57	J-4	H-15	300	PVC	120	23.93	0.34	269	259
41 - Prop WM 300mm Hospital	10.8	H-7	J-4	300	PVC	120	23.93	0.34	271	269

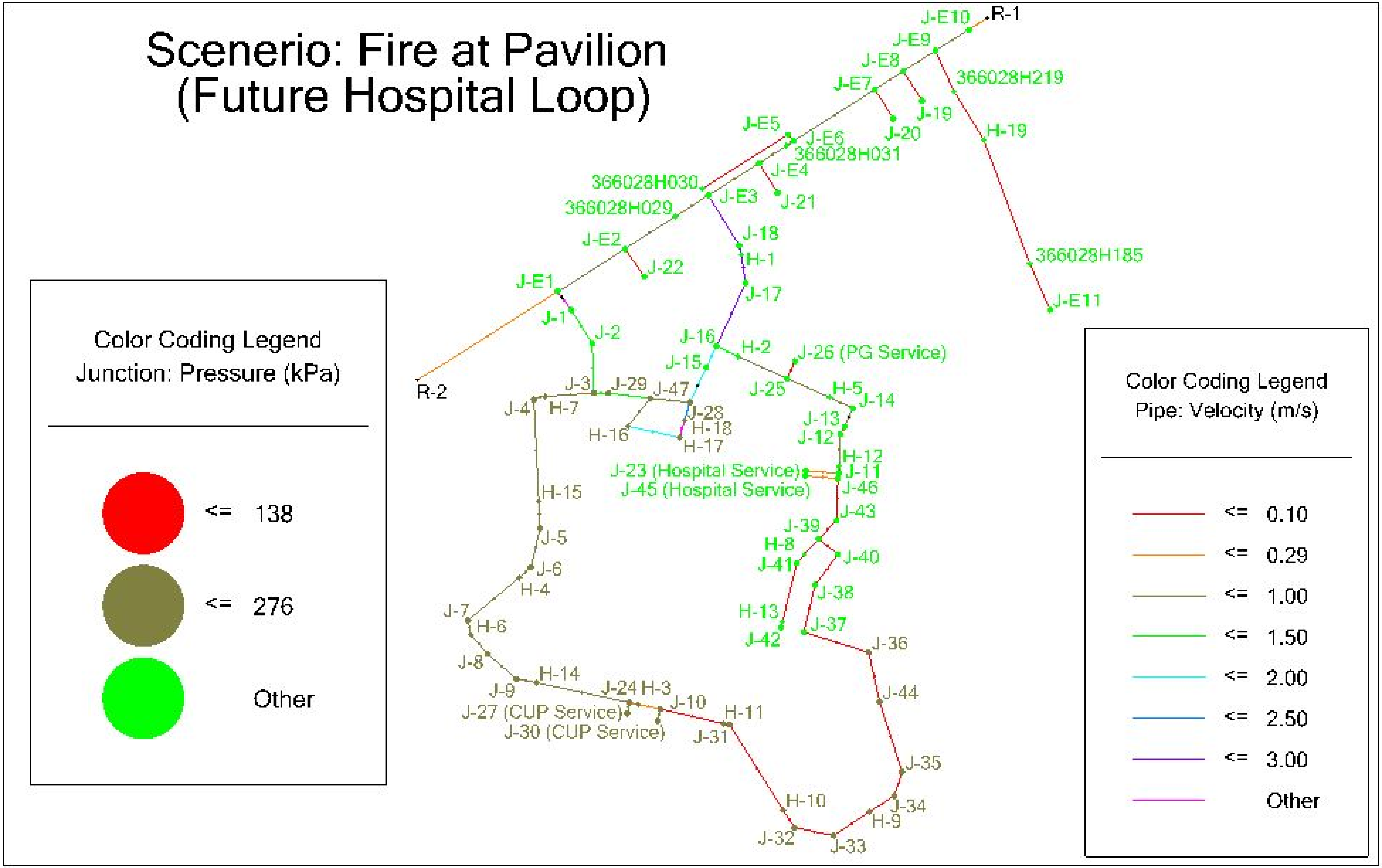
Scenerio 5: Fire at Pavilion, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
42 - Prop WM 300mm Hospital	43.89	J-3	H-7	300	PVC	120	23.93	0.34	271	271
43 - Prop WM 300mm Hospital	44.34	J-2	J-3	300	PVC	120	103.24	1.46	341	271
44 - Prop WM 300mm Hospital	35.61	J-1	J-2	300	PVC	120	103.24	1.46	350	341
45 - Prop WM 300mm Hospital	20.64	J-E1	J-1	150	PVC	120	103.24	5.84	398	350
46 - Prop WM 200mm CUP Service	10.04	J-27 (CUP Service)	J-24	200	PVC	120	-14.17	0.45	256	257
47 - Prop WM 300mm Hospital	12.81	J-3	J-29	300	PVC	120	79.31	1.12	271	269
48 - Prop WM 300mm Hospital	38	J-29	J-47	300	PVC	120	79.31	1.12	269	267
48B - Prop WM 300mm Hospital	35.74	J-47	J-28	300	PVC	120	44.59	0.63	267	272
49 - Prop WM 300mm Rd A	34.67	J-28	J-15	300	PVC	120	-107.69	1.52	272	291
50 - Prop WM 300mm Rd E	13.31	J-7	H-6	300	PVC	120	23.93	0.34	213	211
51 - Prop WM 300mm Rd E	22.67	H-6	J-8	300	PVC	120	23.93	0.34	211	218
52 - Prop WM 300mm Rd E	34.52	J-8	J-9	300	PVC	120	23.93	0.34	218	230
53 - Prop WM 300mm Rd E	7.9	J-24	H-3	300	PVC	120	9.76	0.14	257	257
54 - Prop WM 300mm Rd E	20.35	H-3	J-10	300	PVC	120	9.76	0.14	257	257
55 - Prop WM 300mm Rd E	58.3	J-10	H-11	300	PVC	120	-4.41	0.06	257	260
56 - Prop WM 300mm Rd E	5.74	H-11	J-31	300	PVC	120	-4.41	0.06	260	262
57 - Prop WM 200mm CUP Service	10.93	J-30 (CUP Service)	J-10	200	PVC	120	-14.17	0.45	256	257
58 - Prop WM 300mm Rd E	90.15	J-31	H-10	300	PVC	120	-4.41	0.06	262	232
59 - Prop WM 300mm Rd E	19.01	H-10	J-32	300	PVC	120	-4.41	0.06	232	227
60 - Prop WM 300mm Rd E	35.95	J-32	J-33	300	PVC	120	-4.41	0.06	227	235
61 - Prop WM 300mm Rd E	38.7	J-33	H-9	300	PVC	120	-4.41	0.06	235	229
62 - Prop WM 300mm Rd E	26.33	H-9	J-34	300	PVC	120	-4.41	0.06	229	221
63 - Prop WM 300mm Rd E	22.68	J-34	J-35	300	PVC	120	-4.41	0.06	221	191
64 - Prop WM 300mm Hospital	66.23	J-35	J-44	300	PVC	120	-4.41	0.06	191	204
65 - Prop WM 300mm Hospital	45.38	J-44	J-36	300	PVC	120	-4.41	0.06	204	214
66 - Prop WM 300mm Hospital	61.11	J-36	J-37	300	PVC	120	-4.41	0.06	214	295
67 - Prop WM 300mm Hospital	43.55	J-37	J-38	300	PVC	120	-4.41	0.06	295	308
68 - Prop WM 300mm Hospital	34.59	J-38	J-40	300	PVC	120	-4.41	0.06	308	297
69 - Prop WM 300mm Hospital	22.02	J-40	J-39	300	PVC	120	-4.41	0.06	297	310
70 - Prop WM 300mm Loading Dock	4.94	J-42	H-13	300	PVC	120	0	0.00	311	313
71 - Prop WM 300mm Loading Dock	54.59	H-13	J-41	300	PVC	120	0	0.00	313	309
72 - Prop WM 300mm Loading Dock	10.28	J-41	H-8	300	PVC	120	0	0.00	309	311
73 - Prop WM 300mm Loading Dock	18.88	H-8	J-39	300	PVC	120	0	0.00	311	310
74 - Prop WM 300mm Loading Dock	23.4	J-39	J-43	300	PVC	120	-4.41	0.06	310	311
75 - Prop WM 300mm Rd L	37.53	J-43	J-46	300	PVC	120	-4.41	0.06	311	307
76 - Prop WM 300mm Hospital Service	29.22	J-46	J-45 (Hospital Service)	300	PVC	120	17.11	0.24	307	294
77 - Prop WM 300mm Rd L	5.05	J-46	J-11	300	PVC	120	-21.52	0.30	307	307
78 - Prop WM 300mm Rd L	6.03	J-11	H-12	300	PVC	120	-38.63	0.55	307	306
79 - Prop WM 300mm Hospital Service	29.77	J-11	J-23 (Hospital Service)	300	PVC	120	17.11	0.24	307	293
80 - Prop WM 300mm Rd L	17.94	J-13	J-14	300	PVC	120	-38.63	0.55	313	316
81 - Prop WM 300mm	17.05	J-28	H-18	300	PVC	120	152.27	2.15	272	257
82 - Prop WM 150mm	15.85	H-18	H-17	150	PVC	120	58.77	3.33	257	201

Scenerio 5: Fire at Pavilion, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
83 - Prop WM 300mm	31.85	J-47	H-16	300	PVC	120	34.73	0.49	267	221
84 - Prop WM 150mm	47.38	H-16	H-17	150	PVC	120	34.73	1.97	221	201

Scenerio 5: Fire at Pavilion, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Hydrant Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
H-1	67.10	0	104.50	366
H-2	71.15	63	101.34	295
H-3	75.23	0	101.45	257
H-4	76.65	0	101.58	244
H-5	69.80	0	101.57	311
H-6	79.97	0	101.54	211
H-7	74.02	0	101.67	271
H-8	69.69	0	101.46	311
H-9	78.07	0	101.46	229
H-10	77.73	0	101.45	232
H-11	74.86	0	101.45	260
H-12	70.21	0	101.47	306
H-13	69.47	0	101.46	313
H-14	77.20	0	101.50	238
H-15	75.14	0	101.61	259
H-16	78.82	0	101.36	221
H-17	79.37	93.5	99.90	201
H-18	74.91	93.5	101.19	257
H-19	63.71	0	107.10	425
366028H029	65.10	0	106.49	405
366028H030	65.00	0	106.66	408
366028H031	64.64	0	106.63	411
366028H185	66.30	0	107.10	399
366028H219	63.00	0	107.10	432

Scenerio 5: Fire at Pavilion, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-1	66.53	0	102.32	350
J-2	67.16	0	102.04	341
J-3	74.01	0	101.69	271
J-4	74.14	0	101.66	269
J-5	75.23	0	101.60	258
J-6	75.90	0	101.58	251
J-7	79.82	0	101.54	213
J-8	79.26	0	101.53	218
J-9	78.04	0	101.51	230
J-10	75.14	0	101.45	257
J-11	70.11	0	101.47	307
J-12	69.75	0	101.51	311
J-13	69.56	0	101.52	313
J-14	69.27	0	101.54	316
J-15	71.95	0	101.68	291
J-16	71.11	0	101.86	301
J-17	68.21	0	103.72	347
J-18	66.29	0	104.74	376
J-19	64.04	0	107.10	421
J-20	65.25	0	106.98	408
J-21	65.48	0	106.52	402
J-22	66.02	0	106.75	399
J-23 (Hospital Service)	71.48	17.11	101.46	293
J-24	75.18	0	101.45	257
J-25	70.16	0	101.63	308
J-26 (PG Service)	70.54	1.7	101.63	304
J-27 (CUP Service)	75.32	14.17	101.44	256
J-28	73.62	0	101.39	272
J-29	74.17	0	101.63	269
J-30 (CUP Service)	75.27	14.17	101.43	256
J-31	74.64	0	101.45	262
J-32	78.23	0	101.45	227
J-33	77.47	0	101.45	235
J-34	78.89	0	101.46	221

Scenerio 5: Fire at Pavilion, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-35	81.90	0	101.46	191
J-36	79.58	0	101.46	214
J-37	71.33	0	101.46	295
J-38	70.02	0	101.46	308
J-39	69.78	0	101.46	310
J-40	71.13	0	101.46	297
J-41	69.84	0	101.46	309
J-42	69.64	0	101.46	311
J-43	69.68	0	101.46	311
J-44	80.64	0	101.46	204
J-45 (Hospital Service)	71.37	17.11	101.46	294
J-46	70.07	0	101.46	307
J-47	74.13	0	101.45	267
J-E1	66.39	0	107.10	398
J-E2	65.50	0	106.75	404
J-E3	64.89	0	106.31	405
J-E4	65.00	0	106.52	406
J-E5	64.50	0	106.66	413
J-E6	64.55	0	106.66	412
J-E7	63.50	0	106.98	426
J-E8	63.00	0	107.10	432
J-E9	62.66	0	107.10	435
J-E10	62.60	0	107.10	436
J-E11	66.00	0	107.10	402


Scenerio: Fire at Pavilion
(Future Hospital Loop)
Color Coding Legend
Junction: Pressure (kPa)
<= 138
<= 276
Other
Color Coding Legend
Pipe: Velocity (m/s)
<= 0.10
<= 0.29
<= 1.00
<= 1.50
<= 2.00
<= 2.50
<= 3.00
Other
R-1
R-2
J-E10
J-E9
J-E8
J-E7
J-E6
J-E5
J-E4
J-E3
J-E2
J-E1
J-E11
366028H219
366028H031
366028H030
366028H029
366028H185
H-19
J-19
J-20
J-21
J-22
J-18
H-1
J-17
J-16
H-2
J-15
J-26 (PG Service)
J-25
H-5
J-14
J-13
J-12
H-12
J-11
J-46
J-23 (Hospital Service)
J-45 (Hospital Service)
J-43
J-39
H-8
J-40
J-41
J-38
H-13
J-37
J-42
J-36
J-44
J-35
J-34
H-9
J-33
J-32
H-10
J-31
H-11
J-10
H-3
J-24
J-27 (CUP Service)
J-30 (CUP Service)
H-14
J-9
J-8
H-6
J-7
H-4
J-6
J-5
H-15
J-4
H-7
J-3
J-29
J-47
J-28
H-18
H-17
H-16
J-1
J-2

Scenerio 6: Fire at West Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
1 - Ex WM 400mm Carling Ave	19.39	R-1	J-E10	1000	Cast iron	130	95.29	0.12	0	436
3 - Ex WM 400mm Carling Ave	35.64	J-E10	J-E9	400	Cast iron	80	95.29	0.76	436	435
4 - Ex WM 150mm Preston St	40.2	J-E9	366028H219	150	Cast iron	40	0	0.00	435	432
5 - Ex WM 150mm Preston St	51.03	H-19	366028H219	150	Cast iron	40	0	0.00	425	432
5A - Ex WM 150mm Preston St	45.26	J-E11	366028H185	150	Cast iron	40	0	0.00	402	399
5B - Ex WM 150mm Preston St	118.76	366028H185	H-19	150	Cast iron	40	0	0.00	399	425
6 - Ex WM 400mm Carling Ave	34.14	J-E9	J-E8	400	Cast iron	80	95.29	0.76	435	432
7 - Prop WM 150mm Carling V-T #1	31.25	J-E8	J-19	150	PVC	120	0	0.00	432	421
8 - Ex WM 400mm Carling Ave	30.3	J-E8	J-E7	400	Cast iron	80	95.29	0.76	432	426
9 - Prop WM 150mm Carling V-T #2	31.07	J-E7	J-20	150	PVC	120	0	0.00	426	408
10 - Ex WM 400mm Carling Ave	86.55	J-E7	J-E6	400	Cast iron	80	95.29	0.76	426	412
11 - Ex WM 150mm Carling Ave	7.46	J-E6	J-E5	150	Cast iron	40	0	0.00	412	413
12 - Ex WM 150mm Carling Ave	90.95	J-E5	366028H030	150	Cast iron	40	0	0.00	413	408
13 - Ex WM 400mm Carling Ave	7.73	J-E6	366028H031	400	Cast iron	80	95.29	0.76	412	411
14 - Ex WM 400mm Carling Ave	29.23	366028H031	J-E4	400	Cast iron	80	95.29	0.76	411	407
15 - Prop WM 150mm Carling V-T #3	30.97	J-E4	J-21	150	PVC	120	0	0.00	407	402
16 - Ex WM 400mm Carling Ave	53.89	J-E4	J-E3	400	Cast iron	80	95.29	0.76	407	406
17 - Ex WM 400mm Carling Ave	35.1	366028H029	J-E3	400	Cast iron	80	109.32	0.87	405	406
18 - Ex WM 400mm Carling Ave	54.49	J-E2	366028H029	400	Cast iron	80	109.32	0.87	404	405
19 - Prop WM 150mm Research B	30.35	J-E2	J-22	150	PVC	120	0	0.00	404	399
20 - Ex WM 400mm Carling Ave	72.06	J-E1	J-E2	400	Cast iron	80	109.32	0.87	398	404
21 - Ex WM 400mm Carling Ave	148.67	R-2	J-E1	1000	Cast iron	130	218.97	0.28	0	398
22 - Prop WM 300mm Rd A	52.89	J-E3	J-18	300	PVC	120	204.61	2.89	406	378
23 - Prop WM 300mm Rd A	8.34	J-18	H-1	300	PVC	120	204.61	2.89	378	367
24 - Prop WM 300mm Rd A	26.24	H-1	J-17	300	PVC	120	204.61	2.89	367	349
25 - Prop WM 300mm Rd A	62.29	J-17	J-16	300	PVC	120	204.61	2.89	349	304
26 - Prop WM 300mm Rd A	21.35	J-16	J-15	300	PVC	120	104.59	1.48	304	294
27 - Prop WM 300mm Rd B	21.58	J-16	H-2	300	PVC	120	100.02	1.41	304	302
28 - Prop WM 300mm Rd B	47.92	H-2	J-25	300	PVC	120	100.02	1.41	302	308
29 - Prop WM 150mm PG Service	16.98	J-25	J-26 (PG Service)	150	PVC	120	1.7	0.10	308	304
30 - Prop WM 300mm Rd B	42	J-25	H-5	300	PVC	120	98.32	1.39	308	309
31 - Prop WM 300mm Rd B	22.94	J-14	H-5	300	PVC	120	-98.32	1.39	312	309
32 - Prop WM 300mm Rd L	8.1	J-12	J-13	300	PVC	120	-98.32	1.39	306	308
33 - Prop WM 300mm Rd L	28.89	H-12	J-12	300	PVC	120	-98.32	1.39	299	306
34 - Prop WM 300mm Rd E	85.46	H-14	J-24	300	PVC	120	-35.76	0.51	208	229
35 - Prop WM 300mm Rd E	18.08	J-9	H-14	300	PVC	120	-35.76	0.51	200	208
36 - Prop WM 300mm Rd D	59.7	H-4	J-7	300	PVC	120	-35.76	0.51	212	182
37 - Prop WM 300mm Rd D	14.21	J-6	H-4	300	PVC	120	47.57	0.67	220	212
38 - Prop WM 300mm Hospital	35.84	J-5	J-6	300	PVC	120	47.57	0.67	227	220
39 - Prop WM 300mm Hospital	24.29	H-15	J-5	300	PVC	120	47.57	0.67	228	227
40 - Prop WM 300mm Hospital	91.57	J-4	H-15	300	PVC	120	130.9	1.85	249	228
41 - Prop WM 300mm Hospital	10.8	H-7	J-4	300	PVC	120	130.9	1.85	251	249

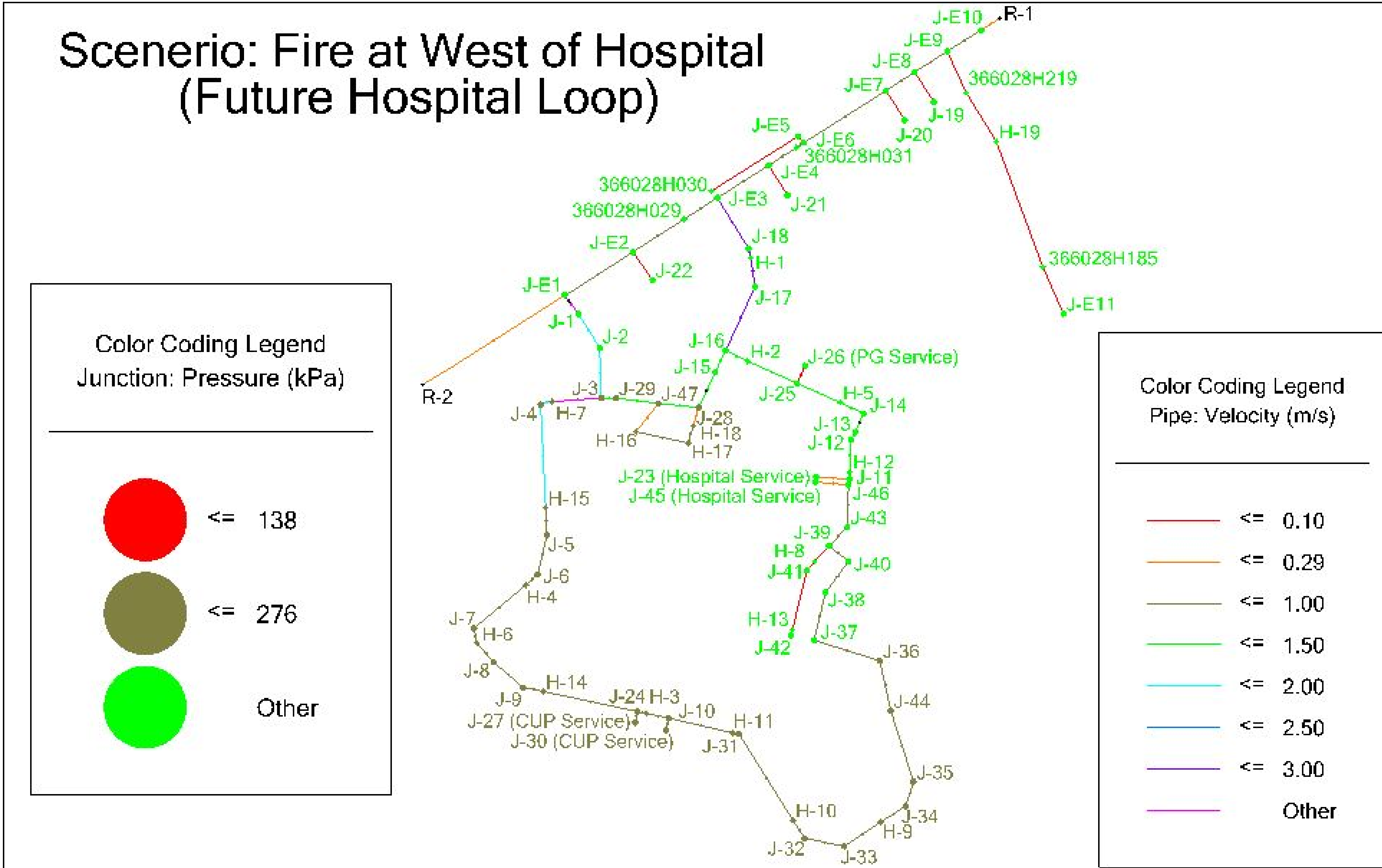
Scenerio 6: Fire at West Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
42 - Prop WM 300mm Hospital	43.89	J-3	H-7	300	PVC	120	214.24	3.03	265	251
43 - Prop WM 300mm Hospital	44.34	J-2	J-3	300	PVC	120	109.65	1.55	336	265
44 - Prop WM 300mm Hospital	35.61	J-1	J-2	300	PVC	120	109.65	1.55	345	336
45 - Prop WM 300mm Hospital	20.64	J-E1	J-1	150	PVC	120	109.65	6.21	398	345
46 - Prop WM 200mm CUP Service	10.04	J-27 (CUP Service)	J-24	200	PVC	120	-14.17	0.45	227	229
47 - Prop WM 300mm Hospital	12.81	J-3	J-29	300	PVC	120	-104.59	1.48	265	264
48 - Prop WM 300mm Hospital	38	J-29	J-47	300	PVC	120	-104.59	1.48	264	268
48B - Prop WM 300mm Hospital	35.74	J-47	J-28	300	PVC	120	-93.75	1.33	268	275
49 - Prop WM 300mm Rd A	34.67	J-28	J-15	300	PVC	120	-104.59	1.48	275	294
50 - Prop WM 300mm Rd E	13.31	J-7	H-6	300	PVC	120	-35.76	0.51	182	180
51 - Prop WM 300mm Rd E	22.67	H-6	J-8	300	PVC	120	-35.76	0.51	180	188
52 - Prop WM 300mm Rd E	34.52	J-8	J-9	300	PVC	120	-35.76	0.51	188	200
53 - Prop WM 300mm Rd E	7.9	J-24	H-3	300	PVC	120	-49.93	0.71	229	229
54 - Prop WM 300mm Rd E	20.35	H-3	J-10	300	PVC	120	-49.93	0.71	229	230
55 - Prop WM 300mm Rd E	58.3	J-10	H-11	300	PVC	120	-64.1	0.91	230	235
56 - Prop WM 300mm Rd E	5.74	H-11	J-31	300	PVC	120	-64.1	0.91	235	237
57 - Prop WM 200mm CUP Service	10.93	J-30 (CUP Service)	J-10	200	PVC	120	-14.17	0.45	229	230
58 - Prop WM 300mm Rd E	90.15	J-31	H-10	300	PVC	120	-64.1	0.91	237	210
59 - Prop WM 300mm Rd E	19.01	H-10	J-32	300	PVC	120	-64.1	0.91	210	205
60 - Prop WM 300mm Rd E	35.95	J-32	J-33	300	PVC	120	-64.1	0.91	205	214
61 - Prop WM 300mm Rd E	38.7	J-33	H-9	300	PVC	120	-64.1	0.91	214	209
62 - Prop WM 300mm Rd E	26.33	H-9	J-34	300	PVC	120	-64.1	0.91	209	202
63 - Prop WM 300mm Rd E	22.68	J-34	J-35	300	PVC	120	-64.1	0.91	202	173
64 - Prop WM 300mm Hospital	66.23	J-35	J-44	300	PVC	120	-64.1	0.91	173	188
65 - Prop WM 300mm Hospital	45.38	J-44	J-36	300	PVC	120	-64.1	0.91	188	200
66 - Prop WM 300mm Hospital	61.11	J-36	J-37	300	PVC	120	-64.1	0.91	200	282
67 - Prop WM 300mm Hospital	43.55	J-37	J-38	300	PVC	120	-64.1	0.91	282	297
68 - Prop WM 300mm Hospital	34.59	J-38	J-40	300	PVC	120	-64.1	0.91	297	287
69 - Prop WM 300mm Hospital	22.02	J-40	J-39	300	PVC	120	-64.1	0.91	287	301
70 - Prop WM 300mm Loading Dock	4.94	J-42	H-13	300	PVC	120	0	0.00	302	304
71 - Prop WM 300mm Loading Dock	54.59	H-13	J-41	300	PVC	120	0	0.00	304	300
72 - Prop WM 300mm Loading Dock	10.28	J-41	H-8	300	PVC	120	0	0.00	300	302
73 - Prop WM 300mm Loading Dock	18.88	H-8	J-39	300	PVC	120	0	0.00	302	301
74 - Prop WM 300mm Loading Dock	23.4	J-39	J-43	300	PVC	120	-64.1	0.91	301	302
75 - Prop WM 300mm Rd L	37.53	J-43	J-46	300	PVC	120	-64.1	0.91	302	300
76 - Prop WM 300mm Hospital Service	29.22	J-46	J-45 (Hospital Service)	300	PVC	120	17.11	0.24	300	287
77 - Prop WM 300mm Rd L	5.05	J-46	J-11	300	PVC	120	-81.21	1.15	300	300
78 - Prop WM 300mm Rd L	6.03	J-11	H-12	300	PVC	120	-98.32	1.39	300	299
79 - Prop WM 300mm Hospital Service	29.77	J-11	J-23 (Hospital Service)	300	PVC	120	17.11	0.24	300	286
80 - Prop WM 300mm Rd L	17.94	J-13	J-14	300	PVC	120	-98.32	1.39	308	312
81 - Prop WM 300mm	17.05	J-28	H-18	300	PVC	120	10.84	0.15	275	262
82 - Prop WM 150mm	15.85	H-18	H-17	150	PVC	120	10.84	0.61	262	218

Scenerio 6: Fire at West Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
83 - Prop WM 300mm	31.85	J-47	H-16	300	PVC	120	-10.84	0.15	268	222
84 - Prop WM 150mm	47.38	H-16	H-17	150	PVC	120	-10.84	0.61	222	218

Scenerio 6: Fire at West Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Hydrant Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
H-1	67.10	0	104.64	367
H-2	71.15	0	101.99	302
H-3	75.23	0	98.59	229
H-4	76.65	83.33	97.72	206
H-5	69.80	0	101.33	309
H-6	79.97	0	98.40	180
H-7	74.02	83.34	99.09	245
H-8	69.69	0	100.50	302
H-9	78.07	0	99.45	209
H-10	77.73	0	99.14	210
H-11	74.86	0	98.82	235
H-12	70.21	0	100.77	299
H-13	69.47	0	100.50	304
H-14	77.20	0	98.48	208
H-15	75.14	83.33	97.72	221
H-16	78.82	0	101.48	222
H-17	79.37	0	101.64	218
H-18	74.91	0	101.70	262
H-19	63.71	0	107.10	425
366028H029	65.10	0	106.52	405
366028H030	65.00	0	106.68	408
366028H031	64.64	0	106.65	411
366028H185	66.30	0	107.10	399
366028H219	63.00	0	107.10	432

Scenerio 6: Fire at West Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-1	66.53	0	101.76	345
J-2	67.16	0	101.45	336
J-3	74.01	0	101.05	265
J-4	74.14	0	99.58	249
J-5	75.23	0	98.41	227
J-6	75.90	0	98.34	220
J-7	79.82	0	98.38	182
J-8	79.26	0	98.42	188
J-9	78.04	0	98.46	200
J-10	75.14	0	98.63	230
J-11	70.11	0	100.73	300
J-12	69.75	0	100.98	306
J-13	69.56	0	101.04	308
J-14	69.27	0	101.17	312
J-15	71.95	0	101.98	294
J-16	71.11	0	102.16	304
J-17	68.21	0	103.90	349
J-18	66.29	0	104.87	378
J-19	64.04	0	107.10	421
J-20	65.25	0	106.99	408
J-21	65.48	0	106.55	402
J-22	66.02	0	106.77	399
J-23 (Hospital Service)	71.48	17.11	100.72	286
J-24	75.18	0	98.58	229
J-25	70.16	0	101.64	308
J-26 (PG Service)	70.54	1.7	101.64	304
J-27 (CUP Service)	75.32	14.17	98.56	227
J-28	73.62	0	101.70	275
J-29	74.17	0	101.16	264
J-30 (CUP Service)	75.27	14.17	98.62	229
J-31	74.64	0	98.84	237
J-32	78.23	0	99.20	205
J-33	77.47	0	99.32	214
J-34	78.89	0	99.54	202

Scenerio 6: Fire at West Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-35	81.90	0	99.61	173
J-36	79.58	0	99.98	200
J-37	71.33	0	100.18	282
J-38	70.02	0	100.32	297
J-39	69.78	0	100.50	301
J-40	71.13	0	100.43	287
J-41	69.84	0	100.50	300
J-42	69.64	0	100.50	302
J-43	69.68	0	100.58	302
J-44	80.64	0	99.83	188
J-45 (Hospital Service)	71.37	17.11	100.69	287
J-46	70.07	0	100.70	300
J-47	74.13	0	101.47	268
J-E1	66.39	0	107.10	398
J-E2	65.50	0	106.77	404
J-E3	64.89	0	106.36	406
J-E4	65.00	0	106.55	407
J-E5	64.50	0	106.68	413
J-E6	64.55	0	106.68	412
J-E7	63.50	0	106.99	426
J-E8	63.00	0	107.10	432
J-E9	62.66	0	107.10	435
J-E10	62.60	0	107.10	436
J-E11	66.00	0	107.10	402


Scenerio: Fire at West of Hospital
(Future Hospital Loop)
Color Coding Legend
Junction: Pressure (kPa)
<= 138
<= 276
Other
Color Coding Legend
Pipe: Velocity (m/s)
<= 0.10
<= 0.29
<= 1.00
<= 1.50
<= 2.00
<= 2.50
<= 3.00
Other
R-1
J-E10
J-E9
J-E8
J-E7
366028H219
J-19
J-20
H-19
J-E5
J-E6
366028H031
J-E4
366028H030
J-E3
J-21
366028H029
J-18
H-1
J-E2
J-22
J-17
366028H185
J-E11
J-E1
J-1
J-2
J-16
H-2
J-26 (PG Service)
J-15
R-2
J-3
J-29
J-47
J-25
H-5
J-14
J-4
H-7
J-28
J-13
H-16
H-18
J-12
H-17
H-12
J-23 (Hospital Service)
J-11
J-45 (Hospital Service)
J-46
H-15
J-43
J-39
J-5
H-8
J-40
J-6
J-41
H-4
J-38
J-7
H-13
H-6
J-37
J-42
J-36
J-8
H-14
J-44
J-9
J-24
H-3
J-10
J-27 (CUP Service)
H-11
J-30 (CUP Service)
J-31
J-35
H-10
J-34
H-9
J-32
J-33

Scenerio 7: Fire at Future Heart Institute, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
1 - Ex WM 400mm Carling Ave	19.39	R-1	J-E10	1000	Cast iron	130	98.06	0.12	0	436
3 - Ex WM 400mm Carling Ave	35.64	J-E10	J-E9	400	Cast iron	80	98.06	0.78	436	435
4 - Ex WM 150mm Preston St	40.2	J-E9	366028H219	150	Cast iron	40	0	0.00	435	432
5 - Ex WM 150mm Preston St	51.03	H-19	366028H219	150	Cast iron	40	0	0.00	425	432
5A - Ex WM 150mm Preston St	45.26	J-E11	366028H185	150	Cast iron	40	0	0.00	402	399
5B - Ex WM 150mm Preston St	118.76	366028H185	H-19	150	Cast iron	40	0	0.00	399	425
6 - Ex WM 400mm Carling Ave	34.14	J-E9	J-E8	400	Cast iron	80	98.06	0.78	435	432
7 - Prop WM 150mm Carling V-T #1	31.25	J-E8	J-19	150	PVC	120	0	0.00	432	421
8 - Ex WM 400mm Carling Ave	30.3	J-E8	J-E7	400	Cast iron	80	98.06	0.78	432	426
9 - Prop WM 150mm Carling V-T #2	31.07	J-E7	J-20	150	PVC	120	0	0.00	426	408
10 - Ex WM 400mm Carling Ave	86.55	J-E7	J-E6	400	Cast iron	80	98.06	0.78	426	412
11 - Ex WM 150mm Carling Ave	7.46	J-E6	J-E5	150	Cast iron	40	0	0.00	412	413
12 - Ex WM 150mm Carling Ave	90.95	J-E5	366028H030	150	Cast iron	40	0	0.00	413	408
13 - Ex WM 400mm Carling Ave	7.73	J-E6	366028H031	400	Cast iron	80	98.06	0.78	412	411
14 - Ex WM 400mm Carling Ave	29.23	366028H031	J-E4	400	Cast iron	80	98.06	0.78	411	406
15 - Prop WM 150mm Carling V-T #3	30.97	J-E4	J-21	150	PVC	120	0	0.00	406	402
16 - Ex WM 400mm Carling Ave	53.89	J-E4	J-E3	400	Cast iron	80	98.06	0.78	406	405
17 - Ex WM 400mm Carling Ave	35.1	366028H029	J-E3	400	Cast iron	80	112.5	0.90	405	405
18 - Ex WM 400mm Carling Ave	54.49	J-E2	366028H029	400	Cast iron	80	112.5	0.90	404	405
19 - Prop WM 150mm Research B	30.35	J-E2	J-22	150	PVC	120	0	0.00	404	399
20 - Ex WM 400mm Carling Ave	72.06	J-E1	J-E2	400	Cast iron	80	112.5	0.90	398	404
21 - Ex WM 400mm Carling Ave	148.67	R-2	J-E1	1000	Cast iron	130	216.2	0.28	0	398
22 - Prop WM 300mm Rd A	52.89	J-E3	J-18	300	PVC	120	210.57	2.98	405	376
23 - Prop WM 300mm Rd A	8.34	J-18	H-1	300	PVC	120	210.57	2.98	376	366
24 - Prop WM 300mm Rd A	26.24	H-1	J-17	300	PVC	120	210.57	2.98	366	348
25 - Prop WM 300mm Rd A	62.29	J-17	J-16	300	PVC	120	210.57	2.98	348	301
26 - Prop WM 300mm Rd A	21.35	J-16	J-15	300	PVC	120	45.61	0.65	301	293
27 - Prop WM 300mm Rd B	21.58	J-16	H-2	300	PVC	120	164.96	2.33	301	297
28 - Prop WM 300mm Rd B	47.92	H-2	J-25	300	PVC	120	164.96	2.33	297	298
29 - Prop WM 150mm PG Service	16.98	J-25	J-26 (PG Service)	150	PVC	120	1.7	0.10	298	294
30 - Prop WM 300mm Rd B	42	J-25	H-5	300	PVC	120	163.26	2.31	298	294
31 - Prop WM 300mm Rd B	22.94	J-14	H-5	300	PVC	120	-163.26	2.31	295	294
32 - Prop WM 300mm Rd L	8.1	J-12	J-13	300	PVC	120	-163.26	2.31	285	289
33 - Prop WM 300mm Rd L	28.89	H-12	J-12	300	PVC	120	-163.26	2.31	276	285
34 - Prop WM 300mm Rd E	85.46	H-14	J-24	300	PVC	120	149.3	2.11	183	189
35 - Prop WM 300mm Rd E	18.08	J-9	H-14	300	PVC	120	149.3	2.11	177	183
36 - Prop WM 300mm Rd D	59.7	H-4	J-7	300	PVC	120	149.3	2.11	211	171
37 - Prop WM 300mm Rd D	14.21	J-6	H-4	300	PVC	120	149.3	2.11	220	211
38 - Prop WM 300mm Hospital	35.84	J-5	J-6	300	PVC	120	149.3	2.11	232	220
39 - Prop WM 300mm Hospital	24.29	H-15	J-5	300	PVC	120	149.3	2.11	237	232
40 - Prop WM 300mm Hospital	91.57	J-4	H-15	300	PVC	120	149.3	2.11	261	237
41 - Prop WM 300mm Hospital	10.8	H-7	J-4	300	PVC	120	149.3	2.11	264	261

Scenerio 7: Fire at Future Heart Institute, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
42 - Prop WM 300mm Hospital	43.89	J-3	H-7	300	PVC	120	149.3	2.11	270	264
43 - Prop WM 300mm Hospital	44.34	J-2	J-3	300	PVC	120	103.69	1.47	341	270
44 - Prop WM 300mm Hospital	35.61	J-1	J-2	300	PVC	120	103.69	1.47	350	341
45 - Prop WM 300mm Hospital	20.64	J-E1	J-1	150	PVC	120	103.69	5.87	398	350
46 - Prop WM 200mm CUP Service	10.04	J-27 (CUP Service)	J-24	200	PVC	120	-14.17	0.45	188	189
47 - Prop WM 300mm Hospital	12.81	J-3	J-29	300	PVC	120	-45.61	0.65	270	269
48 - Prop WM 300mm Hospital	38	J-29	J-47	300	PVC	120	-45.61	0.65	269	270
48B - Prop WM 300mm Hospital	35.74	J-47	J-28	300	PVC	120	-40.88	0.58	270	276
49 - Prop WM 300mm Rd A	34.67	J-28	J-15	300	PVC	120	-45.61	0.65	276	293
50 - Prop WM 300mm Rd E	13.31	J-7	H-6	300	PVC	120	149.3	2.11	171	167
51 - Prop WM 300mm Rd E	22.67	H-6	J-8	300	PVC	120	149.3	2.11	167	171
52 - Prop WM 300mm Rd E	34.52	J-8	J-9	300	PVC	120	149.3	2.11	171	177
53 - Prop WM 300mm Rd E	7.9	J-24	H-3	300	PVC	120	135.13	1.91	189	188
54 - Prop WM 300mm Rd E	20.35	H-3	J-10	300	PVC	120	135.13	1.91	188	186
55 - Prop WM 300mm Rd E	58.3	J-10	H-11	300	PVC	120	120.96	1.71	186	183
56 - Prop WM 300mm Rd E	5.74	H-11	J-31	300	PVC	120	37.63	0.53	183	185
57 - Prop WM 200mm CUP Service	10.93	J-30 (CUP Service)	J-10	200	PVC	120	-14.17	0.45	185	186
58 - Prop WM 300mm Rd E	90.15	J-31	H-10	300	PVC	120	37.63	0.53	185	154
59 - Prop WM 300mm Rd E	19.01	H-10	J-32	300	PVC	120	-45.71	0.65	154	149
60 - Prop WM 300mm Rd E	35.95	J-32	J-33	300	PVC	120	-45.71	0.65	149	157
61 - Prop WM 300mm Rd E	38.7	J-33	H-9	300	PVC	120	-45.71	0.65	157	152
62 - Prop WM 300mm Rd E	26.33	H-9	J-34	300	PVC	120	-129.04	1.83	152	147
63 - Prop WM 300mm Rd E	22.68	J-34	J-35	300	PVC	120	-129.04	1.83	147	120
64 - Prop WM 300mm Hospital	66.23	J-35	J-44	300	PVC	120	-129.04	1.83	120	140
65 - Prop WM 300mm Hospital	45.38	J-44	J-36	300	PVC	120	-129.04	1.83	140	156
66 - Prop WM 300mm Hospital	61.11	J-36	J-37	300	PVC	120	-129.04	1.83	156	244
67 - Prop WM 300mm Hospital	43.55	J-37	J-38	300	PVC	120	-129.04	1.83	244	262
68 - Prop WM 300mm Hospital	34.59	J-38	J-40	300	PVC	120	-129.04	1.83	262	255
69 - Prop WM 300mm Hospital	22.02	J-40	J-39	300	PVC	120	-129.04	1.83	255	271
70 - Prop WM 300mm Loading Dock	4.94	J-42	H-13	300	PVC	120	0	0.00	272	274
71 - Prop WM 300mm Loading Dock	54.59	H-13	J-41	300	PVC	120	0	0.00	274	270
72 - Prop WM 300mm Loading Dock	10.28	J-41	H-8	300	PVC	120	0	0.00	270	272
73 - Prop WM 300mm Loading Dock	18.88	H-8	J-39	300	PVC	120	0	0.00	272	271
74 - Prop WM 300mm Loading Dock	23.4	J-39	J-43	300	PVC	120	-129.04	1.83	271	274
75 - Prop WM 300mm Rd L	37.53	J-43	J-46	300	PVC	120	-129.04	1.83	274	275
76 - Prop WM 300mm Hospital Service	29.22	J-46	J-45 (Hospital Service)	300	PVC	120	17.11	0.24	275	262
77 - Prop WM 300mm Rd L	5.05	J-46	J-11	300	PVC	120	-146.15	2.07	275	275
78 - Prop WM 300mm Rd L	6.03	J-11	H-12	300	PVC	120	-163.26	2.31	275	276
79 - Prop WM 300mm Hospital Service	29.77	J-11	J-23 (Hospital Service)	300	PVC	120	17.11	0.24	275	262
80 - Prop WM 300mm Rd L	17.94	J-13	J-14	300	PVC	120	-163.26	2.31	289	295
81 - Prop WM 300mm	17.05	J-28	H-18	300	PVC	120	4.72	0.07	276	263
82 - Prop WM 150mm	15.85	H-18	H-17	150	PVC	120	4.72	0.27	263	219

Scenerio 7: Fire at Future Heart Institute, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
83 - Prop WM 300mm	31.85	J-47	H-16	300	PVC	120	-4.72	0.07	270	224
84 - Prop WM 150mm	47.38	H-16	H-17	150	PVC	120	-4.72	0.27	224	219

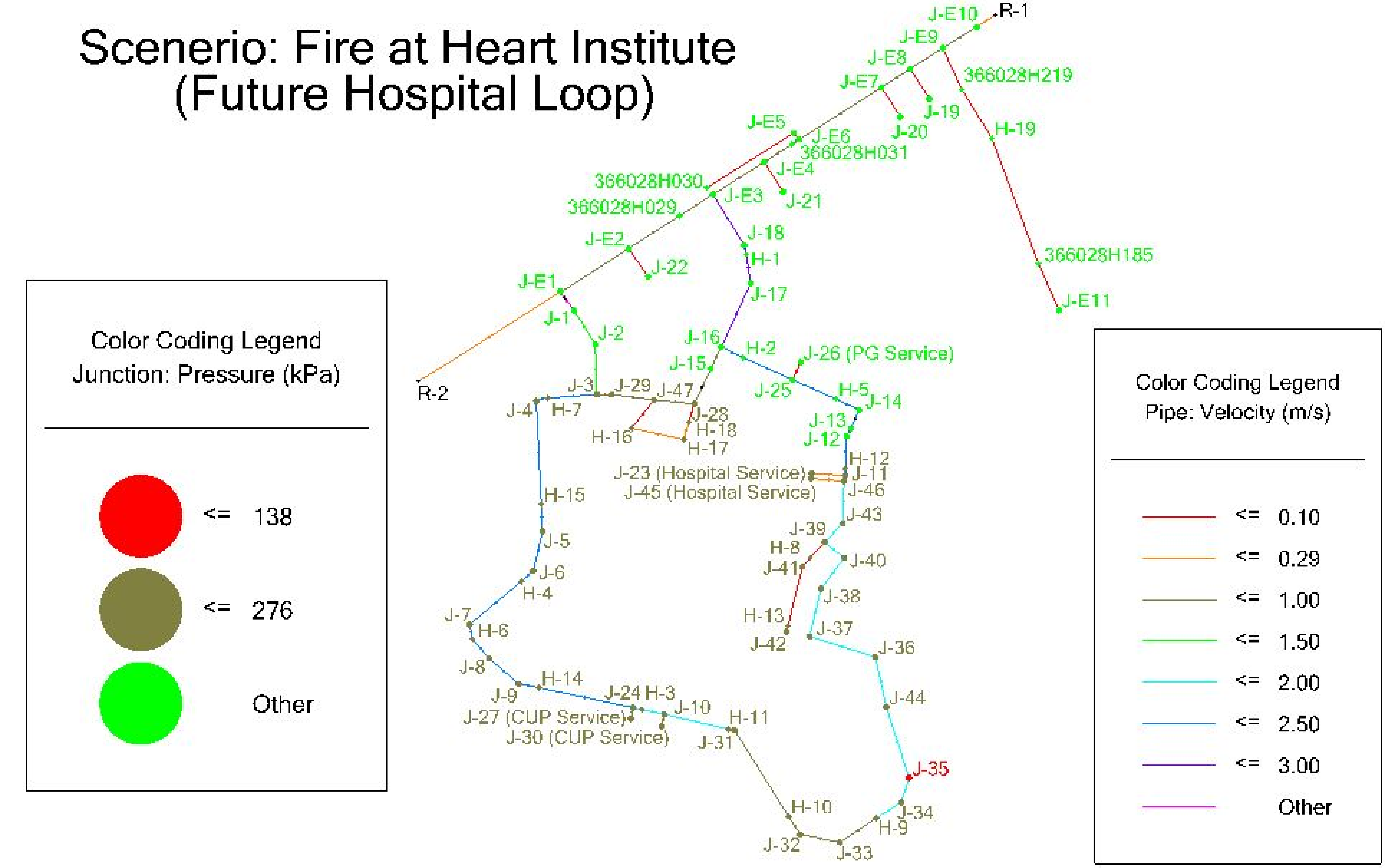
Scenerio 7: Fire at Future Heart Institute, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Hydrant Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
H-1	67.10	0	104.51	366
H-2	71.15	0	101.48	297
H-3	75.23	0	94.43	188
H-4	76.65	0	98.19	211
H-5	69.80	0	99.80	294
H-6	79.97	0	97.05	167
H-7	74.02	0	100.96	264
H-8	69.69	0	97.45	272
H-9	78.07	83.33	93.60	152
H-10	77.73	83.34	93.43	154
H-11	74.86	83.33	93.55	183
H-12	70.21	0	98.36	276
H-13	69.47	0	97.45	274
H-14	77.20	0	95.87	183
H-15	75.14	0	99.36	237
H-16	78.82	0	101.74	224
H-17	79.37	0	101.78	219
H-18	74.91	0	101.79	263
H-19	63.71	0	107.10	425
366028H029	65.10	0	106.49	405
366028H030	65.00	0	106.66	408
366028H031	64.64	0	106.63	411
366028H185	66.30	0	107.10	399
366028H219	63.00	0	107.10	432

Scenerio 7: Fire at Future Heart Institute, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-1	66.53	0	102.29	350
J-2	67.16	0	102.00	341
J-3	74.01	0	101.65	270
J-4	74.14	0	100.79	261
J-5	75.23	0	98.98	232
J-6	75.90	0	98.42	220
J-7	79.82	0	97.26	171
J-8	79.26	0	96.70	171
J-9	78.04	0	96.16	177
J-10	75.14	0	94.17	186
J-11	70.11	0	98.25	275
J-12	69.75	0	98.90	285
J-13	69.56	0	99.05	289
J-14	69.27	0	99.38	295
J-15	71.95	0	101.85	293
J-16	71.11	0	101.89	301
J-17	68.21	0	103.73	348
J-18	66.29	0	104.75	376
J-19	64.04	0	107.10	421
J-20	65.25	0	106.98	408
J-21	65.48	0	106.52	402
J-22	66.02	0	106.75	399
J-23 (Hospital Service)	71.48	17.11	98.24	262
J-24	75.18	0	94.54	189
J-25	70.16	0	100.58	298
J-26 (PG Service)	70.54	1.7	100.57	294
J-27 (CUP Service)	75.32	14.17	94.52	188
J-28	73.62	0	101.79	276
J-29	74.17	0	101.67	269
J-30 (CUP Service)	75.27	14.17	94.15	185
J-31	74.64	0	93.54	185
J-32	78.23	0	93.47	149
J-33	77.47	0	93.53	157
J-34	78.89	0	93.91	147

Scenerio 7: Fire at Future Heart Institute, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-35	81.90	0	94.18	120
J-36	79.58	0	95.52	156
J-37	71.33	0	96.25	244
J-38	70.02	0	96.77	262
J-39	69.78	0	97.45	271
J-40	71.13	0	97.18	255
J-41	69.84	0	97.45	270
J-42	69.64	0	97.45	272
J-43	69.68	0	97.73	274
J-44	80.64	0	94.98	140
J-45 (Hospital Service)	71.37	17.11	98.17	262
J-46	70.07	0	98.17	275
J-47	74.13	0	101.74	270
J-E1	66.39	0	107.10	398
J-E2	65.50	0	106.75	404
J-E3	64.89	0	106.32	405
J-E4	65.00	0	106.52	406
J-E5	64.50	0	106.66	413
J-E6	64.55	0	106.66	412
J-E7	63.50	0	106.98	426
J-E8	63.00	0	107.10	432
J-E9	62.66	0	107.10	435
J-E10	62.60	0	107.10	436
J-E11	66.00	0	107.10	402

*Minimum pressure falls below 20psi due to topographic constraints

Scenerio: Fire at Heart Institute (Future Hospital Loop)



Scenerio 8: Fire at Back of Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
1 - Ex WM 400mm Carling Ave	19.39	R-1	J-E10	1000	Cast iron	130	97.43	0.12	0	436
3 - Ex WM 400mm Carling Ave	35.64	J-E10	J-E9	400	Cast iron	80	97.43	0.78	436	435
4 - Ex WM 150mm Preston St	40.2	J-E9	366028H219	150	Cast iron	40	0	0.00	435	432
5 - Ex WM 150mm Preston St	51.03	H-19	366028H219	150	Cast iron	40	0	0.00	425	432
5A - Ex WM 150mm Preston St	45.26	J-E11	366028H185	150	Cast iron	40	0	0.00	402	399
5B - Ex WM 150mm Preston St	118.76	366028H185	H-19	150	Cast iron	40	0	0.00	399	425
6 - Ex WM 400mm Carling Ave	34.14	J-E9	J-E8	400	Cast iron	80	97.43	0.78	435	432
7 - Prop WM 150mm Carling V-T #1	31.25	J-E8	J-19	150	PVC	120	0	0.00	432	421
8 - Ex WM 400mm Carling Ave	30.3	J-E8	J-E7	400	Cast iron	80	97.43	0.78	432	426
9 - Prop WM 150mm Carling V-T #2	31.07	J-E7	J-20	150	PVC	120	0	0.00	426	408
10 - Ex WM 400mm Carling Ave	86.55	J-E7	J-E6	400	Cast iron	80	97.43	0.78	426	412
11 - Ex WM 150mm Carling Ave	7.46	J-E6	J-E5	150	Cast iron	40	0	0.00	412	413
12 - Ex WM 150mm Carling Ave	90.95	J-E5	366028H030	150	Cast iron	40	0	0.00	413	408
13 - Ex WM 400mm Carling Ave	7.73	J-E6	366028H031	400	Cast iron	80	97.43	0.78	412	411
14 - Ex WM 400mm Carling Ave	29.23	366028H031	J-E4	400	Cast iron	80	97.43	0.78	411	406
15 - Prop WM 150mm Carling V-T #3	30.97	J-E4	J-21	150	PVC	120	0	0.00	406	402
16 - Ex WM 400mm Carling Ave	53.89	J-E4	J-E3	400	Cast iron	80	97.43	0.78	406	406
17 - Ex WM 400mm Carling Ave	35.1	366028H029	J-E3	400	Cast iron	80	111.78	0.89	405	406
18 - Ex WM 400mm Carling Ave	54.49	J-E2	366028H029	400	Cast iron	80	111.78	0.89	404	405
19 - Prop WM 150mm Research B	30.35	J-E2	J-22	150	PVC	120	0	0.00	404	399
20 - Ex WM 400mm Carling Ave	72.06	J-E1	J-E2	400	Cast iron	80	111.78	0.89	398	404
21 - Ex WM 400mm Carling Ave	148.67	R-2	J-E1	1000	Cast iron	130	216.83	0.28	0	398
22 - Prop WM 300mm Rd A	52.89	J-E3	J-18	300	PVC	120	209.21	2.96	406	377
23 - Prop WM 300mm Rd A	8.34	J-18	H-1	300	PVC	120	209.21	2.96	377	366
24 - Prop WM 300mm Rd A	26.24	H-1	J-17	300	PVC	120	209.21	2.96	366	348
25 - Prop WM 300mm Rd A	62.29	J-17	J-16	300	PVC	120	209.21	2.96	348	302
26 - Prop WM 300mm Rd A	21.35	J-16	J-15	300	PVC	120	63.06	0.89	302	293
27 - Prop WM 300mm Rd B	21.58	J-16	H-2	300	PVC	120	146.16	2.07	302	298
28 - Prop WM 300mm Rd B	47.92	H-2	J-25	300	PVC	120	146.16	2.07	298	301
29 - Prop WM 150mm PG Service	16.98	J-25	J-26 (PG Service)	150	PVC	120	1.7	0.10	301	297
30 - Prop WM 300mm Rd B	42	J-25	H-5	300	PVC	120	144.46	2.04	301	298
31 - Prop WM 300mm Rd B	22.94	J-14	H-5	300	PVC	120	-144.46	2.04	300	298
32 - Prop WM 300mm Rd L	8.1	J-12	J-13	300	PVC	120	-144.46	2.04	292	295
33 - Prop WM 300mm Rd L	28.89	H-12	J-12	300	PVC	120	-144.46	2.04	283	292
34 - Prop WM 300mm Rd E	85.46	H-14	J-24	300	PVC	120	84.77	1.20	168	183
35 - Prop WM 300mm Rd E	18.08	J-9	H-14	300	PVC	120	168.1	2.38	163	168
36 - Prop WM 300mm Rd D	59.7	H-4	J-7	300	PVC	120	168.1	2.38	201	159
37 - Prop WM 300mm Rd D	14.21	J-6	H-4	300	PVC	120	168.1	2.38	211	201
38 - Prop WM 300mm Hospital	35.84	J-5	J-6	300	PVC	120	168.1	2.38	225	211
39 - Prop WM 300mm Hospital	24.29	H-15	J-5	300	PVC	120	168.1	2.38	230	225
40 - Prop WM 300mm Hospital	91.57	J-4	H-15	300	PVC	120	168.1	2.38	257	230
41 - Prop WM 300mm Hospital	10.8	H-7	J-4	300	PVC	120	168.1	2.38	261	257

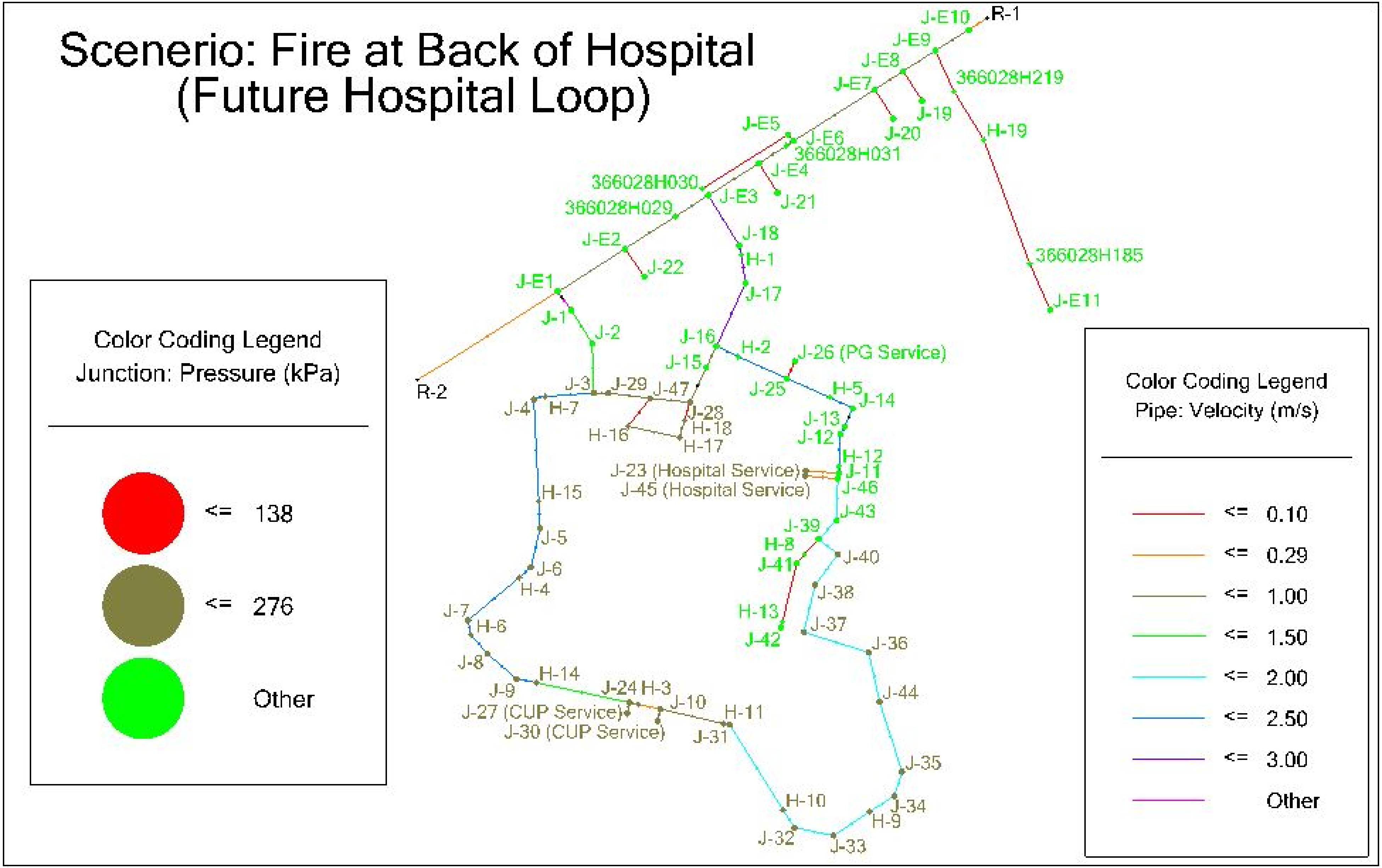
Scenerio 8: Fire at Back of Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
42 - Prop WM 300mm Hospital	43.89	J-3	H-7	300	PVC	120	168.1	2.38	269	261
43 - Prop WM 300mm Hospital	44.34	J-2	J-3	300	PVC	120	105.05	1.49	340	269
44 - Prop WM 300mm Hospital	35.61	J-1	J-2	300	PVC	120	105.05	1.49	349	340
45 - Prop WM 300mm Hospital	20.64	J-E1	J-1	150	PVC	120	105.05	5.94	398	349
46 - Prop WM 200mm CUP Service	10.04	J-27 (CUP Service)	J-24	200	PVC	120	-14.17	0.45	181	183
47 - Prop WM 300mm Hospital	12.81	J-3	J-29	300	PVC	120	-63.06	0.89	269	268
48 - Prop WM 300mm Hospital	38	J-29	J-47	300	PVC	120	-63.06	0.89	268	270
48B - Prop WM 300mm Hospital	35.74	J-47	J-28	300	PVC	120	-56.51	0.80	270	275
49 - Prop WM 300mm Rd A	34.67	J-28	J-15	300	PVC	120	-63.06	0.89	275	293
50 - Prop WM 300mm Rd E	13.31	J-7	H-6	300	PVC	120	168.1	2.38	159	155
51 - Prop WM 300mm Rd E	22.67	H-6	J-8	300	PVC	120	168.1	2.38	155	157
52 - Prop WM 300mm Rd E	34.52	J-8	J-9	300	PVC	120	168.1	2.38	157	163
53 - Prop WM 300mm Rd E	7.9	J-24	H-3	300	PVC	120	70.6	1.00	183	182
54 - Prop WM 300mm Rd E	20.35	H-3	J-10	300	PVC	120	-12.74	0.18	182	183
55 - Prop WM 300mm Rd E	58.3	J-10	H-11	300	PVC	120	-26.91	0.38	183	186
56 - Prop WM 300mm Rd E	5.74	H-11	J-31	300	PVC	120	-110.24	1.56	186	189
57 - Prop WM 200mm CUP Service	10.93	J-30 (CUP Service)	J-10	200	PVC	120	-14.17	0.45	181	183
58 - Prop WM 300mm Rd E	90.15	J-31	H-10	300	PVC	120	-110.24	1.56	189	166
59 - Prop WM 300mm Rd E	19.01	H-10	J-32	300	PVC	120	-110.24	1.56	166	163
60 - Prop WM 300mm Rd E	35.95	J-32	J-33	300	PVC	120	-110.24	1.56	163	174
61 - Prop WM 300mm Rd E	38.7	J-33	H-9	300	PVC	120	-110.24	1.56	174	171
62 - Prop WM 300mm Rd E	26.33	H-9	J-34	300	PVC	120	-110.24	1.56	171	166
63 - Prop WM 300mm Rd E	22.68	J-34	J-35	300	PVC	120	-110.24	1.56	166	138
64 - Prop WM 300mm Hospital	66.23	J-35	J-44	300	PVC	120	-110.24	1.56	138	156
65 - Prop WM 300mm Hospital	45.38	J-44	J-36	300	PVC	120	-110.24	1.56	156	171
66 - Prop WM 300mm Hospital	61.11	J-36	J-37	300	PVC	120	-110.24	1.56	171	257
67 - Prop WM 300mm Hospital	43.55	J-37	J-38	300	PVC	120	-110.24	1.56	257	273
68 - Prop WM 300mm Hospital	34.59	J-38	J-40	300	PVC	120	-110.24	1.56	273	265
69 - Prop WM 300mm Hospital	22.02	J-40	J-39	300	PVC	120	-110.24	1.56	265	281
70 - Prop WM 300mm Loading Dock	4.94	J-42	H-13	300	PVC	120	0	0.00	282	284
71 - Prop WM 300mm Loading Dock	54.59	H-13	J-41	300	PVC	120	0	0.00	284	280
72 - Prop WM 300mm Loading Dock	10.28	J-41	H-8	300	PVC	120	0	0.00	280	281
73 - Prop WM 300mm Loading Dock	18.88	H-8	J-39	300	PVC	120	0	0.00	281	281
74 - Prop WM 300mm Loading Dock	23.4	J-39	J-43	300	PVC	120	-110.24	1.56	281	284
75 - Prop WM 300mm Rd L	37.53	J-43	J-46	300	PVC	120	-110.24	1.56	284	283
76 - Prop WM 300mm Hospital Service	29.22	J-46	J-45 (Hospital Service)	300	PVC	120	17.11	0.24	283	270
77 - Prop WM 300mm Rd L	5.05	J-46	J-11	300	PVC	120	-127.35	1.80	283	283
78 - Prop WM 300mm Rd L	6.03	J-11	H-12	300	PVC	120	-144.46	2.04	283	283
79 - Prop WM 300mm Hospital Service	29.77	J-11	J-23 (Hospital Service)	300	PVC	120	17.11	0.24	283	270
80 - Prop WM 300mm Rd L	17.94	J-13	J-14	300	PVC	120	-144.46	2.04	295	300
81 - Prop WM 300mm	17.05	J-28	H-18	300	PVC	120	6.54	0.09	275	263
82 - Prop WM 150mm	15.85	H-18	H-17	150	PVC	120	6.54	0.37	263	219

Scenerio 8: Fire at Back of Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
83 - Prop WM 300mm	31.85	J-47	H-16	300	PVC	120	-6.54	0.09	270	224
84 - Prop WM 150mm	47.38	H-16	H-17	150	PVC	120	-6.54	0.37	224	219

Scenerio 8: Fire at Back of Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Hydrant Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
H-1	67.10	0	104.54	366
H-2	71.15	0	101.62	298
H-3	75.23	83.34	93.00	174
H-4	76.65	0	97.21	201
H-5	69.80	0	100.28	298
H-6	79.97	0	95.79	155
H-7	74.02	0	100.66	261
H-8	69.69	0	98.44	281
H-9	78.07	0	95.57	171
H-10	77.73	0	94.72	166
H-11	74.86	83.33	93.86	186
H-12	70.21	0	99.14	283
H-13	69.47	0	98.44	284
H-14	77.20	83.33	93.45	159
H-15	75.14	0	98.66	230
H-16	78.82	0	101.68	224
H-17	79.37	0	101.75	219
H-18	74.91	0	101.77	263
H-19	63.71	0	107.10	425
366028H029	#N/A	#N/A	#N/A	#N/A
366028H030	65.00	0	106.66	408
366028H031	64.64	0	106.64	411
366028H185	66.30	0	107.10	399
366028H219	63.00	0	107.10	432

Scenerio 8: Fire at Back of Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-1	66.53	0	102.17	349
J-2	67.16	0	101.88	340
J-3	74.01	0	101.52	269
J-4	74.14	0	100.45	257
J-5	75.23	0	98.19	225
J-6	75.90	0	97.49	211
J-7	79.82	0	96.05	159
J-8	79.26	0	95.35	157
J-9	78.04	0	94.67	163
J-10	75.14	0	93.82	183
J-11	70.11	0	99.05	283
J-12	69.75	0	99.56	292
J-13	69.56	0	99.68	295
J-14	69.27	0	99.94	300
J-15	71.95	0	101.88	293
J-16	71.11	0	101.95	302
J-17	68.21	0	103.77	348
J-18	66.29	0	104.78	377
J-19	64.04	0	107.10	421
J-20	65.25	0	106.98	408
J-21	65.48	0	106.53	402
J-22	66.02	0	106.76	399
J-23 (Hospital Service)	71.48	17.11	99.04	270
J-24	75.18	0	93.85	183
J-25	70.16	0	100.90	301
J-26 (PG Service)	70.54	1.7	100.90	297
J-27 (CUP Service)	75.32	14.17	93.84	181
J-28	73.62	0	101.77	275
J-29	74.17	0	101.56	268
J-30 (CUP Service)	75.27	14.17	93.81	181
J-31	74.64	0	93.91	189
J-32	78.23	0	94.89	163
J-33	77.47	0	95.23	174
J-34	78.89	0	95.81	166

Scenerio 8: Fire at Back of Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-35	81.90	0	96.01	138
J-36	79.58	0	97.00	171
J-37	71.33	0	97.55	257
J-38	70.02	0	97.94	273
J-39	69.78	0	98.44	281
J-40	71.13	0	98.25	265
J-41	69.84	0	98.44	280
J-42	69.64	0	98.44	282
J-43	69.68	0	98.65	284
J-44	80.64	0	96.60	156
J-45 (Hospital Service)	71.37	17.11	98.98	270
J-46	70.07	0	98.99	283
J-47	74.13	0	101.68	270
J-E1	66.39	0	107.10	398
J-E2	65.50	0	106.76	404
J-E3	64.89	0	106.33	406
J-E4	65.00	0	106.53	406
J-E5	64.50	0	106.66	413
J-E6	64.55	0	106.66	412
J-E7	63.50	0	106.98	426
J-E8	63.00	0	107.10	432
J-E9	62.66	0	107.10	435
J-E10	62.60	0	107.10	436
J-E11	66.00	0	107.10	402



Scenerio: Fire at Back of Hospital
(Future Hospital Loop)
Color Coding Legend
Junction: Pressure (kPa)
<= 138
<= 276
Other
Color Coding Legend
Pipe: Velocity (m/s)
<= 0.10
<= 0.29
<= 1.00
<= 1.50
<= 2.00
<= 2.50
<= 3.00
Other
R-1
R-2
J-E10
J-E9
J-E8
J-E7
J-E6
J-E5
J-E4
J-E3
J-E2
J-E1
J-E11
366028H219
366028H031
366028H030
366028H029
366028H185
H-19
J-19
J-20
J-21
J-22
J-18
H-1
J-17
J-16
H-2
J-15
J-26 (PG Service)
J-25
H-5
J-14
J-13
J-12
H-12
J-11
J-46
J-23 (Hospital Service)
J-45 (Hospital Service)
J-43
J-39
H-8
J-40
J-41
J-38
H-13
J-37
J-42
J-36
J-44
J-35
J-34
H-9
J-33
J-32
H-10
J-31
H-11
J-10
H-3
J-24
J-27 (CUP Service)
J-30 (CUP Service)
H-14
J-9
J-8
H-6
J-7
H-4
J-6
J-5
H-15
J-4
H-7
J-3
J-29
J-47
J-28
H-18
H-17
H-16
J-1
J-2

Scenerio 9: Fire at Parking Garage, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
1 - Ex WM 400mm Carling Ave	19.39	R-1	J-E10	1000	Cast iron	130	175.99	0.22	0	436
3 - Ex WM 400mm Carling Ave	35.64	J-E10	J-E9	400	Cast iron	80	175.99	1.40	436	435
4 - Ex WM 150mm Preston St	40.2	J-E9	366028H219	150	Cast iron	40	39	2.21	435	317
5 - Ex WM 150mm Preston St	51.03	H-19	366028H219	150	Cast iron	40	-39	2.21	164	317
5A - Ex WM 150mm Preston St	45.26	J-E11	366028H185	150	Cast iron	40	0	0.00	142	139
5B - Ex WM 150mm Preston St	118.76	366028H185	H-19	150	Cast iron	40	0	0.00	139	164
6 - Ex WM 400mm Carling Ave	34.14	J-E9	J-E8	400	Cast iron	80	136.99	1.09	435	432
7 - Prop WM 150mm Carling V-T #1	31.25	J-E8	J-19	150	PVC	120	0	0.00	432	421
8 - Ex WM 400mm Carling Ave	30.3	J-E8	J-E7	400	Cast iron	80	136.99	1.09	432	425
9 - Prop WM 150mm Carling V-T #2	31.07	J-E7	J-20	150	PVC	120	0	0.00	425	407
10 - Ex WM 400mm Carling Ave	86.55	J-E7	J-E6	400	Cast iron	80	136.99	1.09	425	408
11 - Ex WM 150mm Carling Ave	7.46	J-E6	J-E5	150	Cast iron	40	0	0.00	408	409
12 - Ex WM 150mm Carling Ave	90.95	J-E5	366028H030	150	Cast iron	40	0	0.00	409	404
13 - Ex WM 400mm Carling Ave	7.73	J-E6	366028H031	400	Cast iron	80	136.99	1.09	408	407
14 - Ex WM 400mm Carling Ave	29.23	366028H031	J-E4	400	Cast iron	80	136.99	1.09	407	401
15 - Prop WM 150mm Carling V-T #3	30.97	J-E4	J-21	150	PVC	120	0	0.00	401	397
16 - Ex WM 400mm Carling Ave	53.89	J-E4	J-E3	400	Cast iron	80	136.99	1.09	401	399
17 - Ex WM 400mm Carling Ave	35.1	366028H029	J-E3	400	Cast iron	80	157.26	1.25	400	399
18 - Ex WM 400mm Carling Ave	54.49	J-E2	366028H029	400	Cast iron	80	157.26	1.25	401	400
19 - Prop WM 150mm Research B	30.35	J-E2	J-22	150	PVC	120	0	0.00	401	396
20 - Ex WM 400mm Carling Ave	72.06	J-E1	J-E2	400	Cast iron	80	157.26	1.25	398	401
21 - Ex WM 400mm Carling Ave	148.67	R-2	J-E1	1000	Cast iron	130	275.27	0.35	0	398
22 - Prop WM 300mm Rd A	52.89	J-E3	J-18	300	PVC	120	294.25	4.16	399	357
23 - Prop WM 300mm Rd A	8.34	J-18	H-1	300	PVC	120	294.25	4.16	357	344
24 - Prop WM 300mm Rd A	26.24	H-1	J-17	300	PVC	120	199.25	2.82	344	327
25 - Prop WM 300mm Rd A	62.29	J-17	J-16	300	PVC	120	199.25	2.82	327	282
26 - Prop WM 300mm Rd A	21.35	J-16	J-15	300	PVC	120	-47.96	0.68	282	274
27 - Prop WM 300mm Rd B	21.58	J-16	H-2	300	PVC	120	247.21	3.50	282	273
28 - Prop WM 300mm Rd B	47.92	H-2	J-25	300	PVC	120	152.21	2.15	273	275
29 - Prop WM 150mm PG Service	16.98	J-25	J-26 (PG Service)	150	PVC	120	1.7	0.10	275	271
30 - Prop WM 300mm Rd B	42	J-25	H-5	300	PVC	120	150.51	2.13	275	272
31 - Prop WM 300mm Rd B	22.94	J-14	H-5	300	PVC	120	-55.51	0.79	277	272
32 - Prop WM 300mm Rd L	8.1	J-12	J-13	300	PVC	120	-55.51	0.79	271	273
33 - Prop WM 300mm Rd L	28.89	H-12	J-12	300	PVC	120	-55.51	0.79	266	271
34 - Prop WM 300mm Rd E	85.46	H-14	J-24	300	PVC	120	70.05	0.99	211	227
35 - Prop WM 300mm Rd E	18.08	J-9	H-14	300	PVC	120	70.05	0.99	203	211
36 - Prop WM 300mm Rd D	59.7	H-4	J-7	300	PVC	120	70.05	0.99	222	189
37 - Prop WM 300mm Rd D	14.21	J-6	H-4	300	PVC	120	70.05	0.99	230	222
38 - Prop WM 300mm Hospital	35.84	J-5	J-6	300	PVC	120	70.05	0.99	238	230
39 - Prop WM 300mm Hospital	24.29	H-15	J-5	300	PVC	120	70.05	0.99	239	238
40 - Prop WM 300mm Hospital	91.57	J-4	H-15	300	PVC	120	70.05	0.99	253	239
41 - Prop WM 300mm Hospital	10.8	H-7	J-4	300	PVC	120	70.05	0.99	254	253

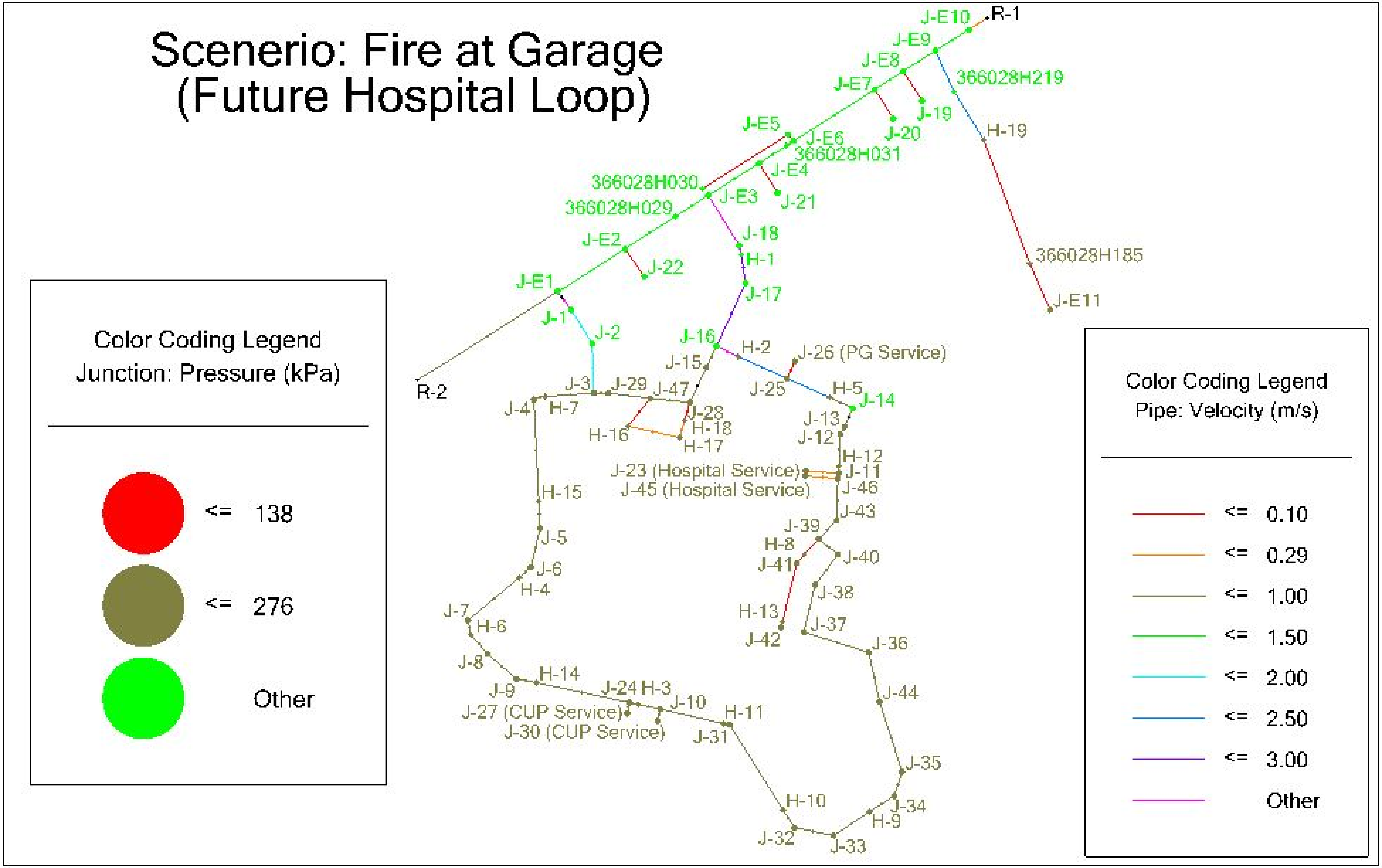
Scenerio 9: Fire at Parking Garage, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
42 - Prop WM 300mm Hospital	43.89	J-3	H-7	300	PVC	120	70.05	0.99	256	254
43 - Prop WM 300mm Hospital	44.34	J-2	J-3	300	PVC	120	118.01	1.67	327	256
44 - Prop WM 300mm Hospital	35.61	J-1	J-2	300	PVC	120	118.01	1.67	337	327
45 - Prop WM 300mm Hospital	20.64	J-E1	J-1	150	PVC	120	118.01	6.68	398	337
46 - Prop WM 200mm CUP Service	10.04	J-27 (CUP Service)	J-24	200	PVC	120	-14.17	0.45	226	227
47 - Prop WM 300mm Hospital	12.81	J-3	J-29	300	PVC	120	47.96	0.68	256	254
48 - Prop WM 300mm Hospital	38	J-29	J-47	300	PVC	120	47.96	0.68	254	254
48B - Prop WM 300mm Hospital	35.74	J-47	J-28	300	PVC	120	43	0.61	254	258
49 - Prop WM 300mm Rd A	34.67	J-28	J-15	300	PVC	120	47.96	0.68	258	274
50 - Prop WM 300mm Rd E	13.31	J-7	H-6	300	PVC	120	70.05	0.99	189	187
51 - Prop WM 300mm Rd E	22.67	H-6	J-8	300	PVC	120	70.05	0.99	187	193
52 - Prop WM 300mm Rd E	34.52	J-8	J-9	300	PVC	120	70.05	0.99	193	203
53 - Prop WM 300mm Rd E	7.9	J-24	H-3	300	PVC	120	55.88	0.79	227	227
54 - Prop WM 300mm Rd E	20.35	H-3	J-10	300	PVC	120	55.88	0.79	227	227
55 - Prop WM 300mm Rd E	58.3	J-10	H-11	300	PVC	120	41.71	0.59	227	229
56 - Prop WM 300mm Rd E	5.74	H-11	J-31	300	PVC	120	41.71	0.59	229	231
57 - Prop WM 200mm CUP Service	10.93	J-30 (CUP Service)	J-10	200	PVC	120	-14.17	0.45	226	227
58 - Prop WM 300mm Rd E	90.15	J-31	H-10	300	PVC	120	41.71	0.59	231	200
59 - Prop WM 300mm Rd E	19.01	H-10	J-32	300	PVC	120	41.71	0.59	200	194
60 - Prop WM 300mm Rd E	35.95	J-32	J-33	300	PVC	120	41.71	0.59	194	201
61 - Prop WM 300mm Rd E	38.7	J-33	H-9	300	PVC	120	41.71	0.59	201	195
62 - Prop WM 300mm Rd E	26.33	H-9	J-34	300	PVC	120	41.71	0.59	195	186
63 - Prop WM 300mm Rd E	22.68	J-34	J-35	300	PVC	120	41.71	0.59	186	157
64 - Prop WM 300mm Hospital	66.23	J-35	J-44	300	PVC	120	41.71	0.59	157	168
65 - Prop WM 300mm Hospital	45.38	J-44	J-36	300	PVC	120	41.71	0.59	168	178
66 - Prop WM 300mm Hospital	61.11	J-36	J-37	300	PVC	120	41.71	0.59	178	258
67 - Prop WM 300mm Hospital	43.55	J-37	J-38	300	PVC	120	41.71	0.59	258	270
68 - Prop WM 300mm Hospital	34.59	J-38	J-40	300	PVC	120	41.71	0.59	270	258
69 - Prop WM 300mm Hospital	22.02	J-40	J-39	300	PVC	120	41.71	0.59	258	271
70 - Prop WM 300mm Loading Dock	4.94	J-42	H-13	300	PVC	120	0	0.00	273	274
71 - Prop WM 300mm Loading Dock	54.59	H-13	J-41	300	PVC	120	0	0.00	274	271
72 - Prop WM 300mm Loading Dock	10.28	J-41	H-8	300	PVC	120	0	0.00	271	272
73 - Prop WM 300mm Loading Dock	18.88	H-8	J-39	300	PVC	120	0	0.00	272	271
74 - Prop WM 300mm Loading Dock	23.4	J-39	J-43	300	PVC	120	41.71	0.59	271	272
75 - Prop WM 300mm Rd L	37.53	J-43	J-46	300	PVC	120	41.71	0.59	272	268
76 - Prop WM 300mm Hospital Service	29.22	J-46	J-45 (Hospital Service)	300	PVC	120	17.11	0.24	268	255
77 - Prop WM 300mm Rd L	5.05	J-46	J-11	300	PVC	120	24.6	0.35	268	267
78 - Prop WM 300mm Rd L	6.03	J-11	H-12	300	PVC	120	7.49	0.11	267	266
79 - Prop WM 300mm Hospital Service	29.77	J-11	J-23 (Hospital Service)	300	PVC	120	17.11	0.24	267	254
80 - Prop WM 300mm Rd L	17.94	J-13	J-14	300	PVC	120	-55.51	0.79	273	277
81 - Prop WM 300mm	17.05	J-28	H-18	300	PVC	120	-4.97	0.07	258	246
82 - Prop WM 150mm	15.85	H-18	H-17	150	PVC	120	-4.97	0.28	246	202

Scenerio 9: Fire at Parking Garage, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
83 - Prop WM 300mm	31.85	J-47	H-16	300	PVC	120	4.97	0.07	254	208
84 - Prop WM 150mm	47.38	H-16	H-17	150	PVC	120	4.97	0.28	208	202

Scenerio 9: Fire at Parking Garage, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Hydrant Table				
Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
H-1	67.10	95	101.31	335
H-2	71.15	95	98.26	265
H-3	75.23	0	98.40	227
H-4	76.65	0	99.32	222
H-5	69.80	95	96.58	262
H-6	79.97	0	99.04	187
H-7	74.02	0	100.00	254
H-8	69.69	0	97.51	272
H-9	78.07	0	97.98	195
H-10	77.73	0	98.12	200
H-11	74.86	0	98.26	229
H-12	70.21	63	96.61	258
H-13	69.47	0	97.51	274
H-14	77.20	0	98.75	211
H-15	75.14	0	99.61	239
H-16	78.82	0	100.07	208
H-17	79.37	0	100.03	202
H-18	74.91	0	100.02	246
H-19	63.71	39	80.48	164
366028H029	65.10	0	105.96	400
366028H030	65.00	0	106.28	404
366028H031	64.64	0	106.22	407
366028H185	66.30	0	80.48	139
366028H219	63.00	0	95.37	317

Scenerio 9: Fire at Parking Garage, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-1	66.53	0	100.98	337
J-2	67.16	0	100.62	327
J-3	74.01	0	100.17	256
J-4	74.14	0	99.96	253
J-5	75.23	0	99.52	238
J-6	75.90	0	99.38	230
J-7	79.82	0	99.09	189
J-8	79.26	0	98.95	193
J-9	78.04	0	98.82	203
J-10	75.14	0	98.35	227
J-11	70.11	0	97.41	267
J-12	69.75	0	97.49	271
J-13	69.56	0	97.51	273
J-14	69.27	0	97.55	277
J-15	71.95	0	99.95	274
J-16	71.11	0	99.91	282
J-17	68.21	0	101.58	327
J-18	66.29	0	102.74	357
J-19	64.04	0	107.09	421
J-20	65.25	0	106.88	407
J-21	65.48	0	106.02	397
J-22	66.02	0	106.45	396
J-23 (Hospital Service)	71.48	17.11	97.40	254
J-24	75.18	0	98.42	227
J-25	70.16	0	98.28	275
J-26 (PG Service)	70.54	1.7	98.27	271
J-27 (CUP Service)	75.32	14.17	98.41	226
J-28	73.62	0	100.02	258
J-29	74.17	0	100.15	254
J-30 (CUP Service)	75.27	14.17	98.33	226
J-31	74.64	0	98.25	231
J-32	78.23	0	98.09	194
J-33	77.47	0	98.04	201
J-34	78.89	0	97.94	186

Scenerio 9: Fire at Parking Garage, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-35	81.90	0	97.91	157
J-36	79.58	0	97.74	178
J-37	71.33	0	97.65	258
J-38	70.02	0	97.59	270
J-39	69.78	0	97.51	271
J-40	71.13	0	97.54	258
J-41	69.84	0	97.51	271
J-42	69.64	0	97.51	273
J-43	69.68	0	97.47	272
J-44	80.64	0	97.81	168
J-45 (Hospital Service)	71.37	17.11	97.41	255
J-46	70.07	0	97.42	268
J-47	74.13	0	100.08	254
J-E1	66.39	0	107.10	398
J-E2	65.50	0	106.45	401
J-E3	64.89	0	105.65	399
J-E4	65.00	0	106.02	401
J-E5	64.50	0	106.28	409
J-E6	64.55	0	106.28	408
J-E7	63.50	0	106.88	425
J-E8	63.00	0	107.09	432
J-E9	62.66	0	107.10	435
J-E10	62.60	0	107.10	436
J-E11	66.00	0	80.48	142


Scenerio: Fire at Garage
(Future Hospital Loop)
Color Coding Legend
Junction: Pressure (kPa)
<= 138
<= 276
Other
Color Coding Legend
Pipe: Velocity (m/s)
<= 0.10
<= 0.29
<= 1.00
<= 1.50
<= 2.00
<= 2.50
<= 3.00
Other
R-1
J-E10
J-E9
J-E8
J-E7
366028H219
J-19
J-20
H-19
J-E5
J-E6
366028H031
J-E4
366028H030
J-E3
J-21
366028H029
J-18
H-1
J-E2
J-22
366028H185
J-E1
J-17
J-E11
J-1
J-2
J-16
H-2
J-26 (PG Service)
J-15
R-2
J-3
J-29
J-47
J-25
H-5
J-14
J-4
H-7
J-28
J-13
H-18
H-16
H-17
J-12
H-12
J-23 (Hospital Service)
J-11
J-45 (Hospital Service)
J-46
H-15
J-43
J-39
J-5
H-8
J-40
J-6
J-41
H-4
J-38
J-7
H-13
J-37
H-6
J-42
J-36
J-8
H-14
J-44
J-9
J-24
H-3
J-10
H-11
J-27 (CUP Service)
J-30 (CUP Service)
J-31
J-35
H-10
J-34
H-9
J-32
J-33

Scenerio 10: Fire at Front of Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
1 - Ex WM 400mm Carling Ave	19.39	R-1	J-E10	1000	Cast iron	130	96.89	0.12	0	436
3 - Ex WM 400mm Carling Ave	35.64	J-E10	J-E9	400	Cast iron	80	96.89	0.77	436	435
4 - Ex WM 150mm Preston St	40.2	J-E9	366028H219	150	Cast iron	40	0	0.00	435	432
5 - Ex WM 150mm Preston St	51.03	H-19	366028H219	150	Cast iron	40	0	0.00	425	432
5A - Ex WM 150mm Preston St	45.26	J-E11	366028H185	150	Cast iron	40	0	0.00	402	399
5B - Ex WM 150mm Preston St	118.76	366028H185	H-19	150	Cast iron	40	0	0.00	399	425
6 - Ex WM 400mm Carling Ave	34.14	J-E9	J-E8	400	Cast iron	80	96.89	0.77	435	432
7 - Prop WM 150mm Carling V-T #1	31.25	J-E8	J-19	150	PVC	120	0	0.00	432	421
8 - Ex WM 400mm Carling Ave	30.3	J-E8	J-E7	400	Cast iron	80	96.89	0.77	432	426
9 - Prop WM 150mm Carling V-T #2	31.07	J-E7	J-20	150	PVC	120	0	0.00	426	408
10 - Ex WM 400mm Carling Ave	86.55	J-E7	J-E6	400	Cast iron	80	96.89	0.77	426	412
11 - Ex WM 150mm Carling Ave	7.46	J-E6	J-E5	150	Cast iron	40	0	0.00	412	413
12 - Ex WM 150mm Carling Ave	90.95	J-E5	366028H030	150	Cast iron	40	0	0.00	413	408
13 - Ex WM 400mm Carling Ave	7.73	J-E6	366028H031	400	Cast iron	80	96.89	0.77	412	411
14 - Ex WM 400mm Carling Ave	29.23	366028H031	J-E4	400	Cast iron	80	96.89	0.77	411	406
15 - Prop WM 150mm Carling V-T #3	30.97	J-E4	J-21	150	PVC	120	0	0.00	406	402
16 - Ex WM 400mm Carling Ave	53.89	J-E4	J-E3	400	Cast iron	80	96.89	0.77	406	406
17 - Ex WM 400mm Carling Ave	35.1	366028H029	J-E3	400	Cast iron	80	111.16	0.88	405	406
18 - Ex WM 400mm Carling Ave	54.49	J-E2	366028H029	400	Cast iron	80	111.16	0.88	404	405
19 - Prop WM 150mm Research B	30.35	J-E2	J-22	150	PVC	120	0	0.00	404	399
20 - Ex WM 400mm Carling Ave	72.06	J-E1	J-E2	400	Cast iron	80	111.16	0.88	398	404
21 - Ex WM 400mm Carling Ave	148.67	R-2	J-E1	1000	Cast iron	130	217.37	0.28	0	398
22 - Prop WM 300mm Rd A	52.89	J-E3	J-18	300	PVC	120	208.05	2.94	406	377
23 - Prop WM 300mm Rd A	8.34	J-18	H-1	300	PVC	120	208.05	2.94	377	367
24 - Prop WM 300mm Rd A	26.24	H-1	J-17	300	PVC	120	208.05	2.94	367	348
25 - Prop WM 300mm Rd A	62.29	J-17	J-16	300	PVC	120	208.05	2.94	348	302
26 - Prop WM 300mm Rd A	21.35	J-16	J-15	300	PVC	120	154.12	2.18	302	291
27 - Prop WM 300mm Rd B	21.58	J-16	H-2	300	PVC	120	53.93	0.76	302	301
28 - Prop WM 300mm Rd B	47.92	H-2	J-25	300	PVC	120	53.93	0.76	301	310
29 - Prop WM 150mm PG Service	16.98	J-25	J-26 (PG Service)	150	PVC	120	1.7	0.10	310	306
30 - Prop WM 300mm Rd B	42	J-25	H-5	300	PVC	120	52.23	0.74	310	313
31 - Prop WM 300mm Rd B	22.94	J-14	H-5	300	PVC	120	-52.23	0.74	317	313
32 - Prop WM 300mm Rd L	8.1	J-12	J-13	300	PVC	120	-52.23	0.74	312	314
33 - Prop WM 300mm Rd L	28.89	H-12	J-12	300	PVC	120	-52.23	0.74	307	312
34 - Prop WM 300mm Rd E	85.46	H-14	J-24	300	PVC	120	10.33	0.15	236	256
35 - Prop WM 300mm Rd E	18.08	J-9	H-14	300	PVC	120	10.33	0.15	228	236
36 - Prop WM 300mm Rd D	59.7	H-4	J-7	300	PVC	120	10.33	0.15	242	211
37 - Prop WM 300mm Rd D	14.21	J-6	H-4	300	PVC	120	10.33	0.15	249	242
38 - Prop WM 300mm Hospital	35.84	J-5	J-6	300	PVC	120	10.33	0.15	256	249
39 - Prop WM 300mm Hospital	24.29	H-15	J-5	300	PVC	120	10.33	0.15	257	256
40 - Prop WM 300mm Hospital	91.57	J-4	H-15	300	PVC	120	10.33	0.15	267	257
41 - Prop WM 300mm Hospital	10.8	H-7	J-4	300	PVC	120	10.33	0.15	268	267

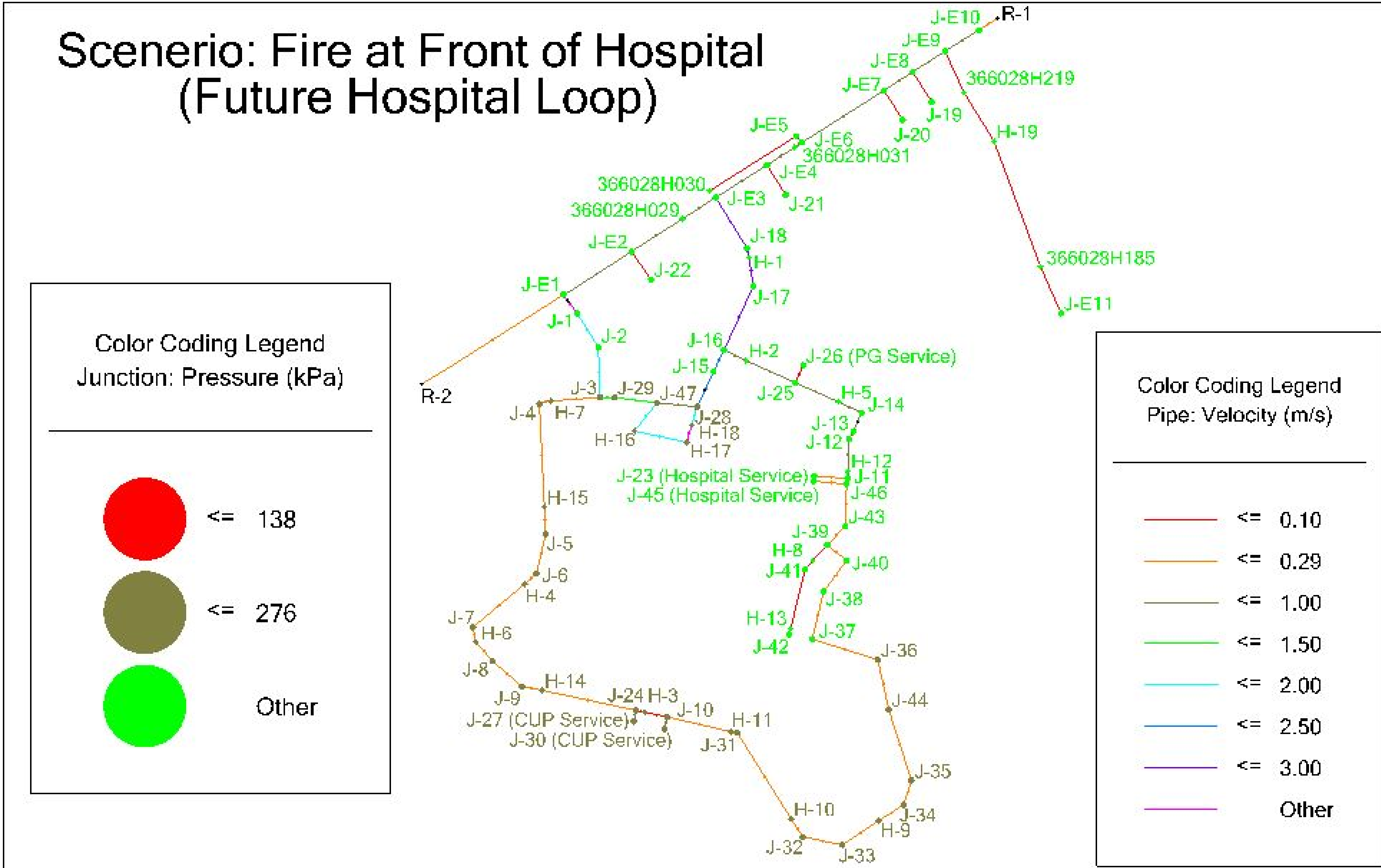
Scenerio 10: Fire at Front of Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
42 - Prop WM 300mm Hospital	43.89	J-3	H-7	300	PVC	120	10.33	0.15	268	268
43 - Prop WM 300mm Hospital	44.34	J-2	J-3	300	PVC	120	106.21	1.50	339	268
44 - Prop WM 300mm Hospital	35.61	J-1	J-2	300	PVC	120	106.21	1.50	348	339
45 - Prop WM 300mm Hospital	20.64	J-E1	J-1	150	PVC	120	106.21	6.01	398	348
46 - Prop WM 200mm CUP Service	10.04	J-27 (CUP Service)	J-24	200	PVC	120	-14.17	0.45	255	256
47 - Prop WM 300mm Hospital	12.81	J-3	J-29	300	PVC	120	95.88	1.36	268	266
48 - Prop WM 300mm Hospital	38	J-29	J-47	300	PVC	120	95.88	1.36	266	263
48B - Prop WM 300mm Hospital	35.74	J-47	J-28	300	PVC	120	-24.18	0.34	263	269
49 - Prop WM 300mm Rd A	34.67	J-28	J-15	300	PVC	120	-154.12	2.18	269	291
50 - Prop WM 300mm Rd E	13.31	J-7	H-6	300	PVC	120	10.33	0.15	211	209
51 - Prop WM 300mm Rd E	22.67	H-6	J-8	300	PVC	120	10.33	0.15	209	216
52 - Prop WM 300mm Rd E	34.52	J-8	J-9	300	PVC	120	10.33	0.15	216	228
53 - Prop WM 300mm Rd E	7.9	J-24	H-3	300	PVC	120	-3.84	0.05	256	256
54 - Prop WM 300mm Rd E	20.35	H-3	J-10	300	PVC	120	-3.84	0.05	256	257
55 - Prop WM 300mm Rd E	58.3	J-10	H-11	300	PVC	120	-18.01	0.25	257	259
56 - Prop WM 300mm Rd E	5.74	H-11	J-31	300	PVC	120	-18.01	0.25	259	262
57 - Prop WM 200mm CUP Service	10.93	J-30 (CUP Service)	J-10	200	PVC	120	-14.17	0.45	255	257
58 - Prop WM 300mm Rd E	90.15	J-31	H-10	300	PVC	120	-18.01	0.25	262	232
59 - Prop WM 300mm Rd E	19.01	H-10	J-32	300	PVC	120	-18.01	0.25	232	227
60 - Prop WM 300mm Rd E	35.95	J-32	J-33	300	PVC	120	-18.01	0.25	227	234
61 - Prop WM 300mm Rd E	38.7	J-33	H-9	300	PVC	120	-18.01	0.25	234	229
62 - Prop WM 300mm Rd E	26.33	H-9	J-34	300	PVC	120	-18.01	0.25	229	221
63 - Prop WM 300mm Rd E	22.68	J-34	J-35	300	PVC	120	-18.01	0.25	221	191
64 - Prop WM 300mm Hospital	66.23	J-35	J-44	300	PVC	120	-18.01	0.25	191	204
65 - Prop WM 300mm Hospital	45.38	J-44	J-36	300	PVC	120	-18.01	0.25	204	214
66 - Prop WM 300mm Hospital	61.11	J-36	J-37	300	PVC	120	-18.01	0.25	214	295
67 - Prop WM 300mm Hospital	43.55	J-37	J-38	300	PVC	120	-18.01	0.25	295	308
68 - Prop WM 300mm Hospital	34.59	J-38	J-40	300	PVC	120	-18.01	0.25	308	297
69 - Prop WM 300mm Hospital	22.02	J-40	J-39	300	PVC	120	-18.01	0.25	297	311
70 - Prop WM 300mm Loading Dock	4.94	J-42	H-13	300	PVC	120	0	0.00	312	314
71 - Prop WM 300mm Loading Dock	54.59	H-13	J-41	300	PVC	120	0	0.00	314	310
72 - Prop WM 300mm Loading Dock	10.28	J-41	H-8	300	PVC	120	0	0.00	310	312
73 - Prop WM 300mm Loading Dock	18.88	H-8	J-39	300	PVC	120	0	0.00	312	311
74 - Prop WM 300mm Loading Dock	23.4	J-39	J-43	300	PVC	120	-18.01	0.25	311	312
75 - Prop WM 300mm Rd L	37.53	J-43	J-46	300	PVC	120	-18.01	0.25	312	308
76 - Prop WM 300mm Hospital Service	29.22	J-46	J-45 (Hospital Service)	300	PVC	120	17.11	0.24	308	295
77 - Prop WM 300mm Rd L	5.05	J-46	J-11	300	PVC	120	-35.12	0.50	308	308
78 - Prop WM 300mm Rd L	6.03	J-11	H-12	300	PVC	120	-52.23	0.74	308	307
79 - Prop WM 300mm Hospital Service	29.77	J-11	J-23 (Hospital Service)	300	PVC	120	17.11	0.24	308	294
80 - Prop WM 300mm Rd L	17.94	J-13	J-14	300	PVC	120	-52.23	0.74	314	317
81 - Prop WM 300mm	17.05	J-28	H-18	300	PVC	120	129.94	1.84	269	255
82 - Prop WM 150mm	15.85	H-18	H-17	150	PVC	120	66.94	3.79	255	195

Scenerio 10: Fire at Front of Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	**Length (m)**	**Start Node**	**Stop Node**	**Diameter (mm)**	**Material**	**Hazen-William C**	**Flow (L/s)**	**Velocity (m/s)**	**Pressure Start (kPa)**	**Pressure Stop (kPa)**
83 - Prop WM 300mm	31.85	J-47	H-16	300	PVC	120	120.06	1.70	263	209
84 - Prop WM 150mm	47.38	H-16	H-17	150	PVC	120	26.56	1.50	209	195

Scenerio 10: Fire at Front of Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Hydrant Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
H-1	67.10	0	104.56	367
H-2	71.15	0	101.95	301
H-3	75.23	0	101.35	256
H-4	76.65	0	101.38	242
H-5	69.80	0	101.74	313
H-6	79.97	0	101.37	209
H-7	74.02	0	101.40	268
H-8	69.69	0	101.53	312
H-9	78.07	0	101.43	229
H-10	77.73	0	101.40	232
H-11	74.86	0	101.37	259
H-12	70.21	0	101.57	307
H-13	69.47	0	101.53	314
H-14	77.20	0	101.36	236
H-15	75.14	0	101.38	257
H-16	78.82	93.5	100.17	209
H-17	79.37	93.5	99.28	195
H-18	74.91	63	100.92	255
H-19	63.71	0	107.10	425
366028H029	65.10	0	106.50	405
366028H030	65.00	0	106.67	408
366028H031	64.64	0	106.64	411
366028H185	66.30	0	107.10	399
366028H219	63.00	0	107.10	432

Scenerio 10: Fire at Front of Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-1	66.53	0	102.07	348
J-2	67.16	0	101.77	339
J-3	74.01	0	101.40	268
J-4	74.14	0	101.39	267
J-5	75.23	0	101.38	256
J-6	75.90	0	101.38	249
J-7	79.82	0	101.37	211
J-8	79.26	0	101.37	216
J-9	78.04	0	101.36	228
J-10	75.14	0	101.35	257
J-11	70.11	0	101.55	308
J-12	69.75	0	101.63	312
J-13	69.56	0	101.65	314
J-14	69.27	0	101.69	317
J-15	71.95	0	101.65	291
J-16	71.11	0	102.00	302
J-17	68.21	0	103.80	348
J-18	66.29	0	104.80	377
J-19	64.04	0	107.10	421
J-20	65.25	0	106.99	408
J-21	65.48	0	106.53	402
J-22	66.02	0	106.76	399
J-23 (Hospital Service)	71.48	17.11	101.55	294
J-24	75.18	0	101.35	256
J-25	70.16	0	101.84	310
J-26 (PG Service)	70.54	1.7	101.83	306
J-27 (CUP Service)	75.32	14.17	101.34	255
J-28	73.62	0	101.07	269
J-29	74.17	0	101.31	266
J-30 (CUP Service)	75.27	14.17	101.34	255
J-31	74.64	0	101.37	262
J-32	78.23	0	101.40	227
J-33	77.47	0	101.42	234
J-34	78.89	0	101.44	221

Scenerio 10: Fire at Front of Hospital, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-35	81.90	0	101.44	191
J-36	79.58	0	101.48	214
J-37	71.33	0	101.50	295
J-38	70.02	0	101.51	308
J-39	69.78	0	101.53	311
J-40	71.13	0	101.52	297
J-41	69.84	0	101.53	310
J-42	69.64	0	101.53	312
J-43	69.68	0	101.54	312
J-44	80.64	0	101.46	204
J-45 (Hospital Service)	71.37	17.11	101.54	295
J-46	70.07	0	101.55	308
J-47	74.13	0	101.05	263
J-E1	66.39	0	107.10	398
J-E2	65.50	0	106.76	404
J-E3	64.89	0	106.34	406
J-E4	65.00	0	106.53	406
J-E5	64.50	0	106.67	413
J-E6	64.55	0	106.67	412
J-E7	63.50	0	106.99	426
J-E8	63.00	0	107.10	432
J-E9	62.66	0	107.10	435
J-E10	62.60	0	107.10	436
J-E11	66.00	0	107.10	402


Scenerio: Fire at Front of Hospital
(Future Hospital Loop)
Color Coding Legend
Junction: Pressure (kPa)
<= 138
<= 276
Other
Color Coding Legend
Pipe: Velocity (m/s)
<= 0.10
<= 0.29
<= 1.00
<= 1.50
<= 2.00
<= 2.50
<= 3.00
Other
R-1
R-2
J-E10
J-E9
J-E8
J-E7
J-E6
J-E5
J-E4
J-E3
J-E2
J-E1
J-E11
366028H219
366028H031
366028H030
366028H029
366028H185
J-19
J-20
H-19
J-21
J-18
H-1
J-17
J-22
J-1
J-2
J-16
H-2
J-26 (PG Service)
J-15
J-25
H-5
J-14
J-3
J-29
J-47
J-4
H-7
J-28
H-18
H-16
H-17
J-13
J-12
H-12
J-23 (Hospital Service)
J-11
J-45 (Hospital Service)
J-46
H-15
J-43
J-39
H-8
J-40
J-41
J-5
J-6
H-4
J-38
J-7
H-6
H-13
J-37
J-42
J-36
J-8
H-14
J-24
H-3
J-10
J-9
J-44
J-27 (CUP Service)
H-11
J-30 (CUP Service)
J-31
J-35
H-10
J-34
H-9
J-32
J-33

Scenerio 11: Fire at Central Utility Plant, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
1 - Ex WM 400mm Carling Ave	19.39	R-1	J-E10	1000	Cast iron	130	97.08	0.12	0	436
3 - Ex WM 400mm Carling Ave	35.64	J-E10	J-E9	400	Cast iron	80	97.08	0.77	436	435
4 - Ex WM 150mm Preston St	40.2	J-E9	366028H219	150	Cast iron	40	0	0.00	435	432
5 - Ex WM 150mm Preston St	51.03	H-19	366028H219	150	Cast iron	40	0	0.00	425	432
5A - Ex WM 150mm Preston St	45.26	J-E11	366028H185	150	Cast iron	40	0	0.00	402	399
5B - Ex WM 150mm Preston St	118.76	366028H185	H-19	150	Cast iron	40	0	0.00	399	425
6 - Ex WM 400mm Carling Ave	34.14	J-E9	J-E8	400	Cast iron	80	97.08	0.77	435	432
7 - Prop WM 150mm Carling V-T #1	31.25	J-E8	J-19	150	PVC	120	0	0.00	432	421
8 - Ex WM 400mm Carling Ave	30.3	J-E8	J-E7	400	Cast iron	80	97.08	0.77	432	426
9 - Prop WM 150mm Carling V-T #2	31.07	J-E7	J-20	150	PVC	120	0	0.00	426	408
10 - Ex WM 400mm Carling Ave	86.55	J-E7	J-E6	400	Cast iron	80	97.08	0.77	426	412
11 - Ex WM 150mm Carling Ave	7.46	J-E6	J-E5	150	Cast iron	40	0	0.00	412	413
12 - Ex WM 150mm Carling Ave	90.95	J-E5	366028H030	150	Cast iron	40	0	0.00	413	408
13 - Ex WM 400mm Carling Ave	7.73	J-E6	366028H031	400	Cast iron	80	97.08	0.77	412	411
14 - Ex WM 400mm Carling Ave	29.23	366028H031	J-E4	400	Cast iron	80	97.08	0.77	411	406
15 - Prop WM 150mm Carling V-T #3	30.97	J-E4	J-21	150	PVC	120	0	0.00	406	402
16 - Ex WM 400mm Carling Ave	53.89	J-E4	J-E3	400	Cast iron	80	97.08	0.77	406	406
17 - Ex WM 400mm Carling Ave	35.1	366028H029	J-E3	400	Cast iron	80	111.38	0.89	405	406
18 - Ex WM 400mm Carling Ave	54.49	J-E2	366028H029	400	Cast iron	80	111.38	0.89	404	405
19 - Prop WM 150mm Research B	30.35	J-E2	J-22	150	PVC	120	0	0.00	404	399
20 - Ex WM 400mm Carling Ave	72.06	J-E1	J-E2	400	Cast iron	80	111.38	0.89	398	404
21 - Ex WM 400mm Carling Ave	148.67	R-2	J-E1	1000	Cast iron	130	217.18	0.28	0	398
22 - Prop WM 300mm Rd A	52.89	J-E3	J-18	300	PVC	120	208.46	2.95	406	377
23 - Prop WM 300mm Rd A	8.34	J-18	H-1	300	PVC	120	208.46	2.95	377	367
24 - Prop WM 300mm Rd A	26.24	H-1	J-17	300	PVC	120	208.46	2.95	367	348
25 - Prop WM 300mm Rd A	62.29	J-17	J-16	300	PVC	120	208.46	2.95	348	302
26 - Prop WM 300mm Rd A	21.35	J-16	J-15	300	PVC	120	71.16	1.01	302	293
27 - Prop WM 300mm Rd B	21.58	J-16	H-2	300	PVC	120	137.31	1.94	302	299
28 - Prop WM 300mm Rd B	47.92	H-2	J-25	300	PVC	120	137.31	1.94	299	302
29 - Prop WM 150mm PG Service	16.98	J-25	J-26 (PG Service)	150	PVC	120	1.7	0.10	302	299
30 - Prop WM 300mm Rd B	42	J-25	H-5	300	PVC	120	135.61	1.92	302	300
31 - Prop WM 300mm Rd B	22.94	J-14	H-5	300	PVC	120	-135.61	1.92	303	300
32 - Prop WM 300mm Rd L	8.1	J-12	J-13	300	PVC	120	-135.61	1.92	295	298
33 - Prop WM 300mm Rd L	28.89	H-12	J-12	300	PVC	120	-135.61	1.92	286	295
34 - Prop WM 300mm Rd E	85.46	H-14	J-24	300	PVC	120	20.45	0.29	169	188
35 - Prop WM 300mm Rd E	18.08	J-9	H-14	300	PVC	120	113.95	1.61	162	169
36 - Prop WM 300mm Rd D	59.7	H-4	J-7	300	PVC	120	176.95	2.50	196	153
37 - Prop WM 300mm Rd D	14.21	J-6	H-4	300	PVC	120	176.95	2.50	207	196
38 - Prop WM 300mm Hospital	35.84	J-5	J-6	300	PVC	120	176.95	2.50	221	207
39 - Prop WM 300mm Hospital	24.29	H-15	J-5	300	PVC	120	176.95	2.50	227	221
40 - Prop WM 300mm Hospital	91.57	J-4	H-15	300	PVC	120	176.95	2.50	256	227
41 - Prop WM 300mm Hospital	10.8	H-7	J-4	300	PVC	120	176.95	2.50	259	256

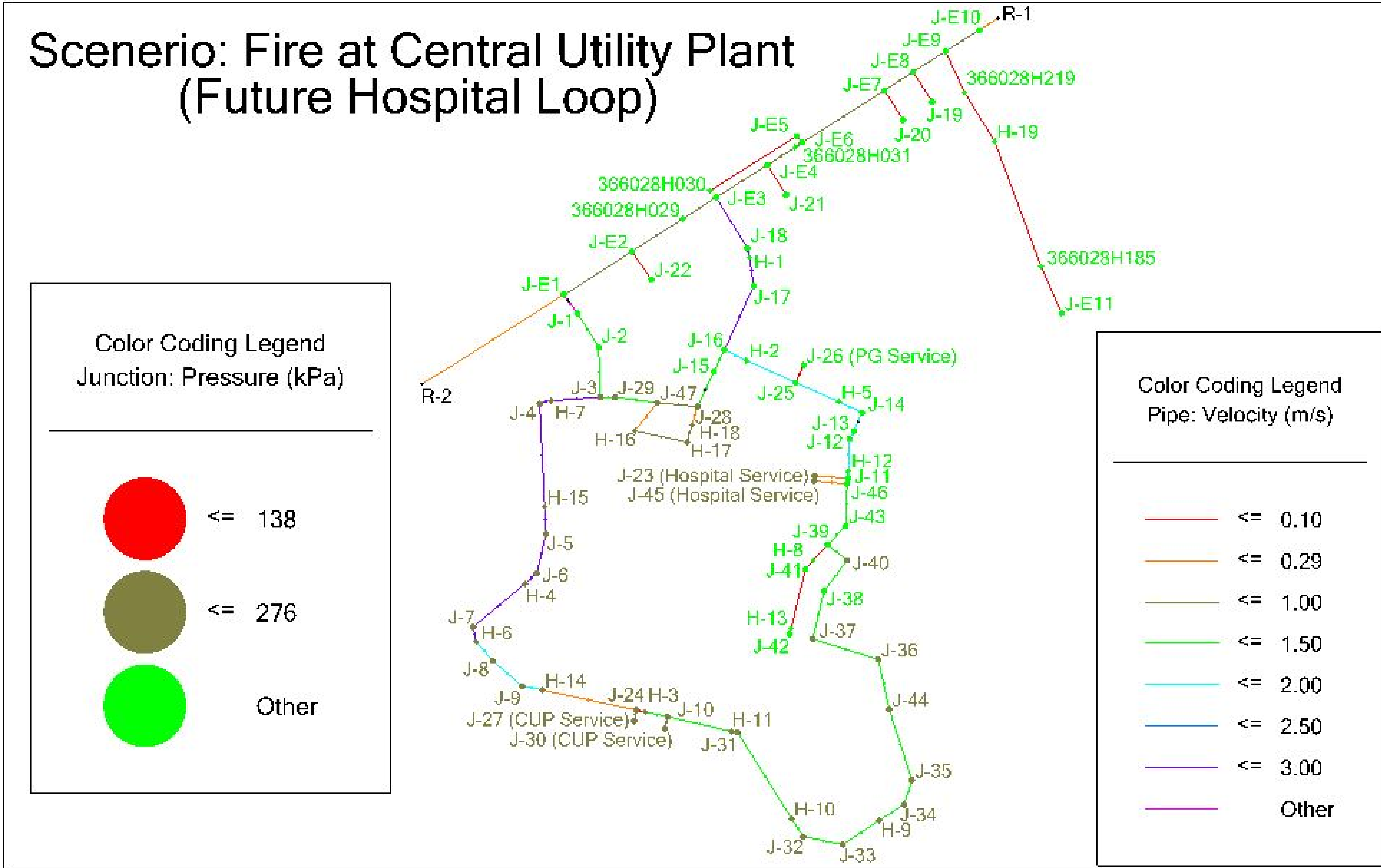
Scenerio 11: Fire at Central Utility Plant, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
42 - Prop WM 300mm Hospital	43.89	J-3	H-7	300	PVC	120	176.95	2.50	268	259
43 - Prop WM 300mm Hospital	44.34	J-2	J-3	300	PVC	120	105.8	1.50	339	268
44 - Prop WM 300mm Hospital	35.61	J-1	J-2	300	PVC	120	105.8	1.50	348	339
45 - Prop WM 300mm Hospital	20.64	J-E1	J-1	150	PVC	120	105.8	5.99	398	348
46 - Prop WM 200mm CUP Service	10.04	J-27 (CUP Service)	J-24	200	PVC	120	-14.17	0.45	187	188
47 - Prop WM 300mm Hospital	12.81	J-3	J-29	300	PVC	120	-71.16	1.01	268	267
48 - Prop WM 300mm Hospital	38	J-29	J-47	300	PVC	120	-71.16	1.01	267	269
48B - Prop WM 300mm Hospital	35.74	J-47	J-28	300	PVC	120	-63.79	0.90	269	275
49 - Prop WM 300mm Rd A	34.67	J-28	J-15	300	PVC	120	-71.16	1.01	275	293
50 - Prop WM 300mm Rd E	13.31	J-7	H-6	300	PVC	120	176.95	2.50	153	149
51 - Prop WM 300mm Rd E	22.67	H-6	J-8	300	PVC	120	113.95	1.61	149	153
52 - Prop WM 300mm Rd E	34.52	J-8	J-9	300	PVC	120	113.95	1.61	153	162
53 - Prop WM 300mm Rd E	7.9	J-24	H-3	300	PVC	120	6.28	0.09	188	188
54 - Prop WM 300mm Rd E	20.35	H-3	J-10	300	PVC	120	-87.22	1.23	188	190
55 - Prop WM 300mm Rd E	58.3	J-10	H-11	300	PVC	120	-101.39	1.43	190	197
56 - Prop WM 300mm Rd E	5.74	H-11	J-31	300	PVC	120	-101.39	1.43	197	199
57 - Prop WM 200mm CUP Service	10.93	J-30 (CUP Service)	J-10	200	PVC	120	-14.17	0.45	188	190
58 - Prop WM 300mm Rd E	90.15	J-31	H-10	300	PVC	120	-101.39	1.43	199	176
59 - Prop WM 300mm Rd E	19.01	H-10	J-32	300	PVC	120	-101.39	1.43	176	172
60 - Prop WM 300mm Rd E	35.95	J-32	J-33	300	PVC	120	-101.39	1.43	172	183
61 - Prop WM 300mm Rd E	38.7	J-33	H-9	300	PVC	120	-101.39	1.43	183	180
62 - Prop WM 300mm Rd E	26.33	H-9	J-34	300	PVC	120	-101.39	1.43	180	174
63 - Prop WM 300mm Rd E	22.68	J-34	J-35	300	PVC	120	-101.39	1.43	174	146
64 - Prop WM 300mm Hospital	66.23	J-35	J-44	300	PVC	120	-101.39	1.43	146	163
65 - Prop WM 300mm Hospital	45.38	J-44	J-36	300	PVC	120	-101.39	1.43	163	177
66 - Prop WM 300mm Hospital	61.11	J-36	J-37	300	PVC	120	-101.39	1.43	177	262
67 - Prop WM 300mm Hospital	43.55	J-37	J-38	300	PVC	120	-101.39	1.43	262	278
68 - Prop WM 300mm Hospital	34.59	J-38	J-40	300	PVC	120	-101.39	1.43	278	270
69 - Prop WM 300mm Hospital	22.02	J-40	J-39	300	PVC	120	-101.39	1.43	270	285
70 - Prop WM 300mm Loading Dock	4.94	J-42	H-13	300	PVC	120	0	0.00	286	288
71 - Prop WM 300mm Loading Dock	54.59	H-13	J-41	300	PVC	120	0	0.00	288	284
72 - Prop WM 300mm Loading Dock	10.28	J-41	H-8	300	PVC	120	0	0.00	284	286
73 - Prop WM 300mm Loading Dock	18.88	H-8	J-39	300	PVC	120	0	0.00	286	285
74 - Prop WM 300mm Loading Dock	23.4	J-39	J-43	300	PVC	120	-101.39	1.43	285	288
75 - Prop WM 300mm Rd L	37.53	J-43	J-46	300	PVC	120	-101.39	1.43	288	287
76 - Prop WM 300mm Hospital Service	29.22	J-46	J-45 (Hospital Service)	300	PVC	120	17.11	0.24	287	274
77 - Prop WM 300mm Rd L	5.05	J-46	J-11	300	PVC	120	-118.5	1.68	287	287
78 - Prop WM 300mm Rd L	6.03	J-11	H-12	300	PVC	120	-135.61	1.92	287	286
79 - Prop WM 300mm Hospital Service	29.77	J-11	J-23 (Hospital Service)	300	PVC	120	17.11	0.24	287	273
80 - Prop WM 300mm Rd L	17.94	J-13	J-14	300	PVC	120	-135.61	1.92	298	303
81 - Prop WM 300mm	17.05	J-28	H-18	300	PVC	120	7.37	0.10	275	263
82 - Prop WM 150mm	15.85	H-18	H-17	150	PVC	120	7.37	0.42	263	219

Scenerio 11: Fire at Central Utility Plant, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)										
Pipe Table										
Label	Length (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-William C	Flow (L/s)	Velocity (m/s)	Pressure Start (kPa)	Pressure Stop (kPa)
83 - Prop WM 300mm	31.85	J-47	H-16	300	PVC	120	-7.37	0.10	269	223
84 - Prop WM 150mm	47.38	H-16	H-17	150	PVC	120	-7.37	0.42	223	219

Scenerio 11: Fire at Central Utility Plant, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Hydrant Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
H-1	67.10	0	104.55	367
H-2	71.15	0	101.69	299
H-3	75.23	93.5	93.37	178
H-4	76.65	0	96.71	196
H-5	69.80	0	100.50	300
H-6	79.97	63	94.63	143
H-7	74.02	0	100.50	259
H-8	69.69	0	98.88	286
H-9	78.07	0	96.42	180
H-10	77.73	0	95.69	176
H-11	74.86	0	94.96	197
H-12	70.21	0	99.48	286
H-13	69.47	0	98.88	288
H-14	77.20	93.5	93.34	158
H-15	75.14	0	98.30	227
H-16	78.82	0	101.65	223
H-17	79.37	0	101.73	219
H-18	74.91	0	101.76	263
H-19	63.71	0	107.10	425
366028H029	65.10	0	106.50	405
366028H030	65.00	0	106.67	408
366028H031	64.64	0	106.64	411
366028H185	66.30	0	107.10	399
366028H219	63.00	0	107.10	432

Scenerio 11: Fire at Central Utility Plant, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-1	66.53	0	102.10	348
J-2	67.16	0	101.81	339
J-3	74.01	0	101.44	268
J-4	74.14	0	100.27	256
J-5	75.23	0	97.78	221
J-6	75.90	0	97.02	207
J-7	79.82	0	95.43	153
J-8	79.26	0	94.93	153
J-9	78.04	0	94.60	162
J-10	75.14	0	94.51	190
J-11	70.11	0	99.40	287
J-12	69.75	0	99.86	295
J-13	69.56	0	99.96	298
J-14	69.27	0	100.20	303
J-15	71.95	0	101.90	293
J-16	71.11	0	101.98	302
J-17	68.21	0	103.79	348
J-18	66.29	0	104.80	377
J-19	64.04	0	107.10	421
J-20	65.25	0	106.99	408
J-21	65.48	0	106.53	402
J-22	66.02	0	106.76	399
J-23 (Hospital Service)	71.48	17.11	99.39	273
J-24	75.18	0	94.40	188
J-25	70.16	0	101.05	302
J-26 (PG Service)	70.54	1.7	101.05	299
J-27 (CUP Service)	75.32	14.17	94.38	187
J-28	73.62	0	101.76	275
J-29	74.17	0	101.49	267
J-30 (CUP Service)	75.27	14.17	94.50	188
J-31	74.64	0	95.00	199
J-32	78.23	0	95.84	172
J-33	77.47	0	96.13	183
J-34	78.89	0	96.62	174

Scenerio 11: Fire at Central Utility Plant, Max Day + Fire Flow (Parking Garage with Future Hospital Loop)				
Junction Table				
Label	**Elevation (m)**	**Demand (L/s)**	**Hydraulic Grade (m)**	**Pressure (kPa)**
J-35	81.90	0	96.80	146
J-36	79.58	0	97.65	177
J-37	71.33	0	98.12	262
J-38	70.02	0	98.45	278
J-39	69.78	0	98.88	285
J-40	71.13	0	98.71	270
J-41	69.84	0	98.88	284
J-42	69.64	0	98.88	286
J-43	69.68	0	99.06	288
J-44	80.64	0	97.30	163
J-45 (Hospital Service)	71.37	17.11	99.34	274
J-46	70.07	0	99.35	287
J-47	74.13	0	101.64	269
J-E1	66.39	0	107.10	398
J-E2	65.50	0	106.76	404
J-E3	64.89	0	106.33	406
J-E4	65.00	0	106.53	406
J-E5	64.50	0	106.67	413
J-E6	64.55	0	106.67	412
J-E7	63.50	0	106.99	426
J-E8	63.00	0	107.10	432
J-E9	62.66	0	107.10	435
J-E10	62.60	0	107.10	436
J-E11	66.00	0	107.10	402


Scenerio: Fire at Central Utility Plant
(Future Hospital Loop)
R-1
J-E10
J-E9
J-E8
J-E7
366028H219
J-19
J-20
H-19
J-E5
J-E6
366028H031
J-E4
J-21
366028H030
J-E3
366028H029
J-18
H-1
J-E2
J-22
366028H185
J-E1
J-17
J-E11
J-1
J-2
J-16
H-2
J-26 (PG Service)
J-15
J-25
R-2
J-3
J-29
J-47
H-5
J-14
J-4
H-7
J-28
H-18
J-13
H-16
H-17
J-12
H-12
J-23 (Hospital Service)
J-11
J-45 (Hospital Service)
J-46
H-15
J-43
J-39
H-8
J-5
J-40
J-41
J-6
H-4
J-38
J-7
H-13
H-6
J-37
J-42
J-36
J-8
H-14
J-24
H-3
J-44
J-9
J-10
H-11
J-27 (CUP Service)
J-30 (CUP Service)
J-31
J-35
H-10
J-34
H-9
J-32
J-33
Color Coding Legend
Junction: Pressure (kPa)
<= 138
<= 276
Other
Color Coding Legend
Pipe: Velocity (m/s)
<= 0.10
<= 0.29
<= 1.00
<= 1.50
<= 2.00
<= 2.50
<= 3.00
Other

APPENDIX I | SANITARY CALCULATIONS

Table 1: Sanitary Flows for the Hospital and Central Utility Plant (Phase 3 & Phase 4)

Area	PARKING GARAGE Area (m^2)	PARKING GARAGE Peak Flow (L/s)	COMMERCIAL Area (m^2)	COMMERCIAL Average Flow L/s	COMMERCIAL Peak Factor	COMMERCIAL Peak Flow (L/s)	TOTAL Total Peak Flow (L/s)	INFILTRATION Site Area (ha)	INFILTRATION Infiltration Allowance (L/s/ha)	INFILTRATION Infiltration Flow (L/s)	Total Total Peak Flow (L/s)
Main Hospital Underground Parking Garage											
Area 56 (Parking Garage)			8000	1.0	1.0	1.00	1.00	0.95	0.33	0.31	1.31
Main Hospital Building											
Area 48 (Tower A)			25995	1.95	1.50	2.93	2.93	0.14	0.33	0.05	2.97
Area 49 (Tower A)			30590	2.30	1.50	3.44	3.44	0.16	0.33	0.05	3.50
Area 50 (Tower A)			63549	4.77	1.50	7.16	7.16	0.35	0.33	0.12	7.27
Area 51 (Podium)			72227	5.42	1.50	8.13	8.13	0.65	0.33	0.21	8.35
Area 52 (Tower B)			47063	3.53	1.50	5.30	5.30	0.40	0.33	0.13	5.43
Area 53 (Tower B)			21108	1.58	1.50	2.38	2.38	0.17	0.33	0.06	2.43
Area 54 (Tower B)			21808	1.64	1.50	2.46	2.46	0.17	0.33	0.06	2.51
Area 55 (Pavilion)			6825	0.51	1.50	0.77	0.77	0.35	0.33	0.12	0.88
Central Utility Plant											
Area CUP (Central Utility Plant)			13000	5.0	1.50	7.5	7.50	1.53	0.33	0.50	8.00
Future Heart											
Area HI (Future Heart Institute)			112500	7.0	1.50	10.6	10.56	1.14	0.33	0.38	10.93
Road E											
Area RE (Road E)								2.28	0.33	0.75	0.75
Road D											
Area RD (Road D)								1.41	0.33	0.47	0.47
Loading Dock											
Area LD (Loading Dock)								0.75	0.33	0.25	0.25
										Total - Mooney's Bay Collector	55.07

Design:	SS	Project:	The New Civic Development
Check :	SM	Location:	Ottawa, Ontario
		Project # :	477458
		Date:	November 2023
		Sheet:	1 of 1

Average Daily Demands

(Based on City of Ottawa *Sewer Design Guidelines 2012* and *MOE Water Design Guidelines*)

Average Residential Daily Flow =	280	L/p/d
Institutional Flow =	28,000	L/gross ha/d
Commercial Flow =	28,000	L/gross ha/d
Light Industrial Flow =	35,000	L/gross ha/d
Heavy Industrial Flow =	55,000	L/gross ha/d
Hotel Daily Flow =	225	L/bed/d
Office/Warehouse Daily Flow =	75	L/person/d
Office/Warehouse Daily Flow =	8.06	L/m2/day
Restaurant (Ordinary not 24 Hours) =	125	L/seat/d
Restaurant (24 Hours)	200	L/seat/d
Shopping Centres =	2,500	L/(1000m^2/d)
Amenity Area =	5	L/m2/d
Medical Office Buildings, Dental Office and Medical Clinics		
Doctors, Nurses & Medical Staff =	275	L/person/day
Office Staff =	75	L/person/day
Patients =	25	L/person/day
Hospitals - Including Laundry =	1,400	L/bed/day
Civic Hospital - Average Water Use =	5.40	L/m2/day
Nursing Homes & Rest Homes =	450	L/bed/day

Peak Factors

Commercial =	1.5	if commercial contribution > 20%, otherwise	1.0
Institutional =	1.5	if institutional contribution > 20%, otherwise	1.0
Industrial =		per Appendix 4-B.0 Graph	
Residential =	Harmon	1 + (14/(4+(Capita/1000) ^ 0.5))*0.8	
		Minimum =	2.0
		Maximum =	4.0

Infiltration Allowance

Infiltration allowance (dry)	0.05	L/s/ha
Infiltration allowance (wet))	0.28	L/s/ha
Infiltration allowance (total)	0.33	L/s/ha

* (75L/person per 9.3m2 of floor space (OBC))

Population Densities

Average Suburban Residential Dev.	60	p/ha
Single Family	3.4	p./unit
Semi-Detached	2.7	p./unit
Duplex	2.3	p./unit
Townhouse	2.7	p./unit
Apartment Average	1.8	p./unit
Bachelor	1.4	p./unit
1 Bedroom	1.4	p./unit
2 Bedrooms	2.1	p./unit
3 Bedrooms	3.1	p./unit
Hotel Room, 18 m2	1	p./unit
Restaurant, 1 m2	1	p./unit
Office	1	p/25m^2

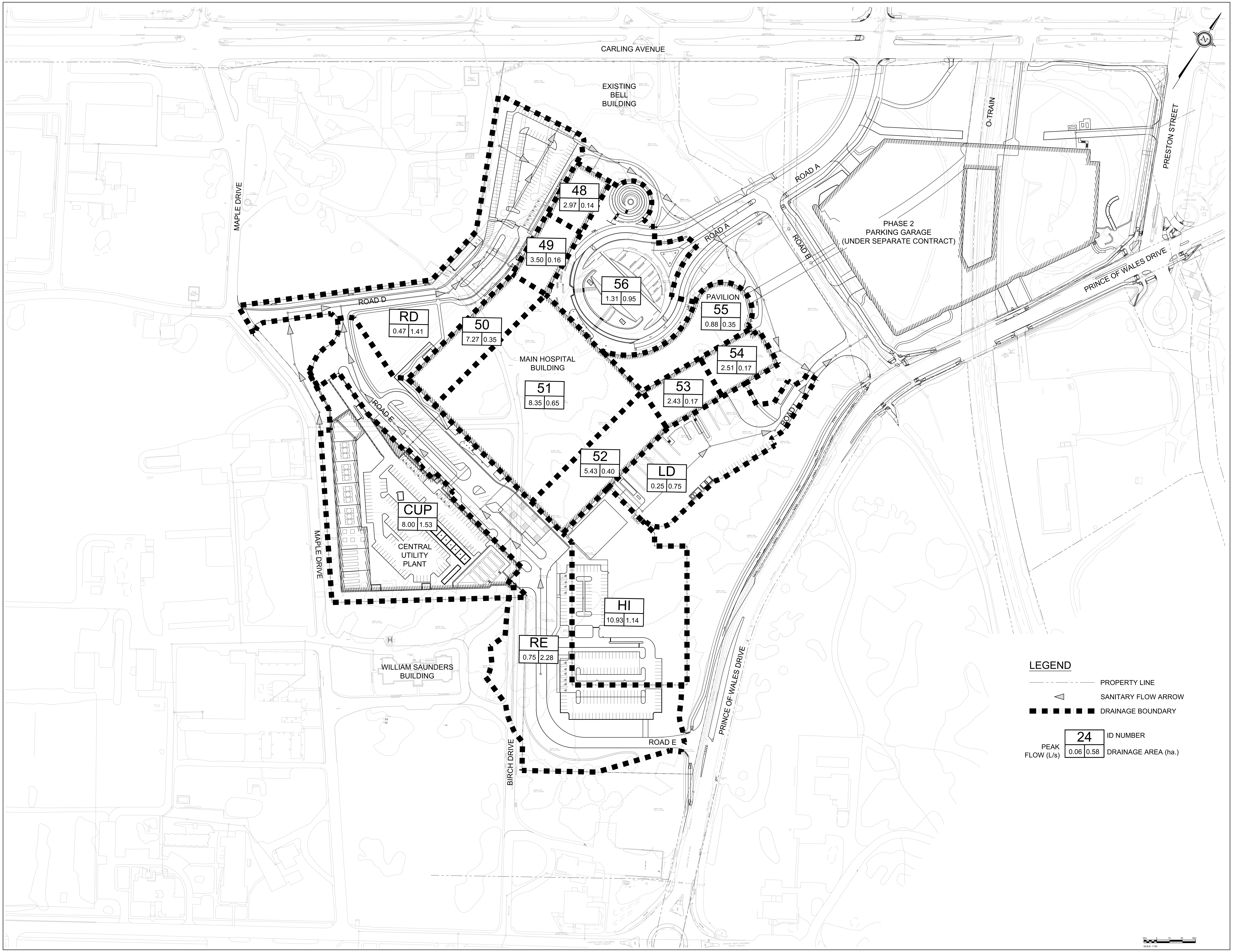
Table 2: Sanitary Sewer Computations for the Hospital and Central Utility Plant (Phase 3 & Phase 4)

Drainage Area	From	To	Peak Flow Q (L/sec)	Sewer Data: Type of Pipe	Pipe Dia. nom. (mm)	Pipe Dia. actual (mm)	Slope* (%)	Length (m)	Capacity full (L/sec)	Velocity full (m/sec)	Velocity actual (m/sec)	Time of Flow (min)	Q(d) / Q(f)	REMARKS
Area RE (Road E)			0.75											
Area HI (Future Heart Institute)	MHSA 58	MHSA 57	11.69	Transite	300	300	2.00	81.0	136.8	1.93	1.08	1.25	0.09	
	MHSA 57	MHSA 56	11.69	Transite	300	300	0.32	32.9	54.7	0.77	0.53	2.29	0.21	
Area CUP (Central Utility Plant)	CAP at CUP	MHSA 56	4.00	Transite	200	200	1.00	7.5	32.8	1.04	0.62	0.20	0.12	
	MHSA 56	MHSA 55	15.69	Transite	300	300	0.32	32.6	54.7	0.77	0.56	3.25	0.29	
Area 51 (Podium)	CAP at Hospital	MHSA 55	4.17	Transite	250	250	1.00	30.7	59.5	1.21	0.64	0.80	0.07	
	MHSA 55	MHSA 54	19.86	Transite	300	300	0.32	73.4	54.7	0.77	0.60	5.28	0.36	
Area 51 (Podium)	CAP at Hospital	MHSA 54	4.17	Transite	250	250	1.00	30.9	59.5	1.21	0.64	0.80	0.07	
Area CUP (Central Utility Plant)	CAP at CUP	MHSA 54	4.00	Transite	200	200	1.00	5.9	32.8	1.04	0.62	0.16	0.12	
	MHSA 54	MHSA 53	28.04	Transite	300	300	0.32	5.9	54.7	0.77	0.67	5.43	0.51	
	MHSA 53	MHSA 52	28.04	Transite	300	300	0.32	14.2	54.7	0.77	0.67	5.79	0.51	
	MHSA 52	MHSA 51	28.04	Transite	300	300	1.00	36.3	96.7	1.37	1.00	6.40	0.29	
	MHSA 51	MHSA 50	28.04	Transite	300	300	1.00	34.8	96.7	1.37	1.00	6.98	0.29	
	MHSA 50	MHSA 32	28.04	Transite	300	300	2.00	32.4	136.8	1.93	1.32	7.39	0.21	
	PRIVATE MHSA61507	MHSA 36	1.20	Transite	250	250	0.27	8.7	30.9	0.63	0.30	0.48	0.04	*Peak flow as per Central Experimental Farm Master Servicing Plan (2008)
	MHSA36	MHSA35	1.20	Transite	250	250	0.32	11.5	33.6	0.69	0.33	0.58	0.04	
	MHSA35	MHSA34	1.20	Transite	250	250	0.32	41.6	33.6	0.69	0.33	2.11	0.04	
	MHSA34	MHSA33	1.20	Transite	250	250	0.32	40.1	33.6	0.69	0.33	2.03	0.04	
Area RD (Road D)	MHSA33	MHSA32	1.67	Transite	250	250	0.32	41.3	33.6	0.69	0.34	2.01	0.05	
	MHSA32	MHSA31	29.70	Transite	300	300	0.32	83.6	54.7	0.77	0.68	9.44	0.54	
	MHSA 31	MHSA 30	29.70	Transite	300	300	0.32	14.6	54.7	0.77	0.68	9.80	0.54	
Area 50 (Tower A)	CAP at Hospital	MHSA 30	7.27	Transite	200	200	2.00	23.7	46.4	1.48	0.94	0.42	0.16	
	MHSA 30	MHSA 29	36.98	Transite	300	300	0.32	24.1	54.7	0.77	0.74	9.99	0.68	
	MHSA 29	MHSA 28	36.98	Transite	300	300	0.32	4.5	54.7	0.77	0.74	10.09	0.68	
Area 49 (Tower A)	CAP at Hospital	MHSA 28	3.50	Transite	200	200	2.00	24.5	46.4	1.48	0.80	0.51	0.08	
	MHSA 28	MHSA 27	40.47	Transite	300	300	0.32	76.0	54.7	0.77	0.75	11.78	0.74	
	PRIVATE MHSA37473	MHSA 40	0.04	Transite	250	250	0.40	58.7	37.6	0.77	0.28	3.45	0.00	*Peak flow as per Central Experimental Farm Master Servicing Plan (2008)
	PRIVATE MHSA61492	MHSA40	0.26	Transite	250	250	4.22	48.3	122.2	2.49	0.92	0.87	0.00	*Peak flow as per Central Experimental Farm Master Servicing Plan (2008)
	MHSA 40	MHSA27	0.30	Transite	250	250	1.50	32.7	72.8	1.48	0.55	12.77	0.00	
	MHSA27	MHSA26	40.77	Transite	300	300	0.32	33.5	54.7	0.77	0.75	4.19	0.75	
	MHSA26	MHSA25	40.77	Transite	300	300	0.32	39.1	54.7	0.77	0.75	1.74	0.75	
Area 48 (Tower A)	CAP at Hospital	MHSA 25	2.97	Transite	200	200	2.00	14.0	46.4	1.48	0.74	0.32	0.06	
	MHSA 25	MHSA 24	43.75	Transite	375	375	0.32	34.7	99.2	0.90	0.75	13.55	0.44	
	MHSA 24	MHSA 23A	43.75	Transite	375	375	0.32	34.1	99.2	0.90	0.75	14.31	0.44	
Area 56 (Lollipop Parking Garage)	CAP at Garage	MHSA 23A	1.31	Transite	150	150	2.00	24.3	21.5	1.22	0.61	0.66	0.06	
	MHSA 23A	MHSA 23	45.06	Transite	375	375	0.32	50.9	99.2	0.90	0.75	15.45	0.45	
Area 55 (Pavilion)	CAP at Pavilion	MHSA 23	0.88	Transite	150	150	2.00	50.5	21.5	1.22	0.59	1.44	0.04	
	MHSA 23	MHSA 22	45.94	Transite	375	375	0.32	9.0	99.2	0.90	0.75	15.65	0.46	
	MHSA 22	MHSA 21	45.94	Transite	375	375	0.32	42.2	99.2	0.90	0.75	16.58	0.46	
	MHSA 21	MHSA 20	45.94	Transite	375	375	0.32	41.1	99.2	0.90	0.75	17.49	0.46	
Area 54 (Tower B)	CAP at Hospital	MHSA 20	2.51	Transite	200	200	2.00	5.3	46.4	1.48	0.74	0.12	0.05	
	MHSA 20	MHSA 11	48.45	Transite	375	375	1.00	31.3	175.3	1.59	1.14	17.95	0.28	
Area 52 (Podium/Tower B)	CAP at Hospital	MHSA 14	5.43	Transite	250	250	1.00	30.5	59.5	1.21	0.68	0.75	0.09	
Area LD (Loading Dock)	MHSA 14	MHSA 13	5.68	Transite	300	300	0.32	72.4	54.7	0.77	0.44	2.74	0.10	
Area 53 (Tower B)	CAP at Hospital	MHSA 13	2.43	Transite	200	200	1.00	27.3	32.8	1.04	0.55	0.82	0.07	
	MHSA 13	MHSA 12	8.11	Transite	300	300	0.32	51.6	54.7	0.77	0.48	4.53	0.15	
	MHSA 12	MHSA 11	8.11	Transite	300	300	0.32	53.1	54.7	0.77	0.48	6.37	0.15	
	MHSA 11	MHSA 10	56.57	Transite	375	375	0.32	21.9	99.2	0.90	0.80	18.41	0.57	
	MHSA 10	CAP	56.57	Transite	375	375	1.00	10.3	175.3	1.59	1.19	18.55	0.32	

Manning's n = 0.013
* Min slope for cleansing velocities is 0.32%

Design: SS
Check: SM
Date: November 2023

Project Name: New Civic Development Hospital
Parsons Project #: 477458



HDR

HDR Architecture Associates Inc.
300 Richmond Road, Suite 200
Ottawa, Ontario K1Z 6X6

PARSONS

THE OTTAWA HOSPITAL - CIVIC CAMPUS REDEVELOPMENT

The Ottawa Hospital | L'Hôpital d'Ottawa

Architect	HDR
Landscape Architect	HDR
Civil Engineer	Parsons
Structural Engineer	EXP
Mechanical Engineer	Smith + Andersen
Electrical Engineer	Smith + Andersen
Plumbing Engineer	Smith + Andersen
Interior Designer	HDR
Equipment Planner	Colliers
Wayfinding	
Sheet Reviewer	Author

MARK	DATE	DESCRIPTION
01	2023-11-27	ISSUED FOR CONSULTATION

Project Number	10333982
Original Issue	02/21/23

PRELIMINARY
NOT FOR CONSTRUCTION

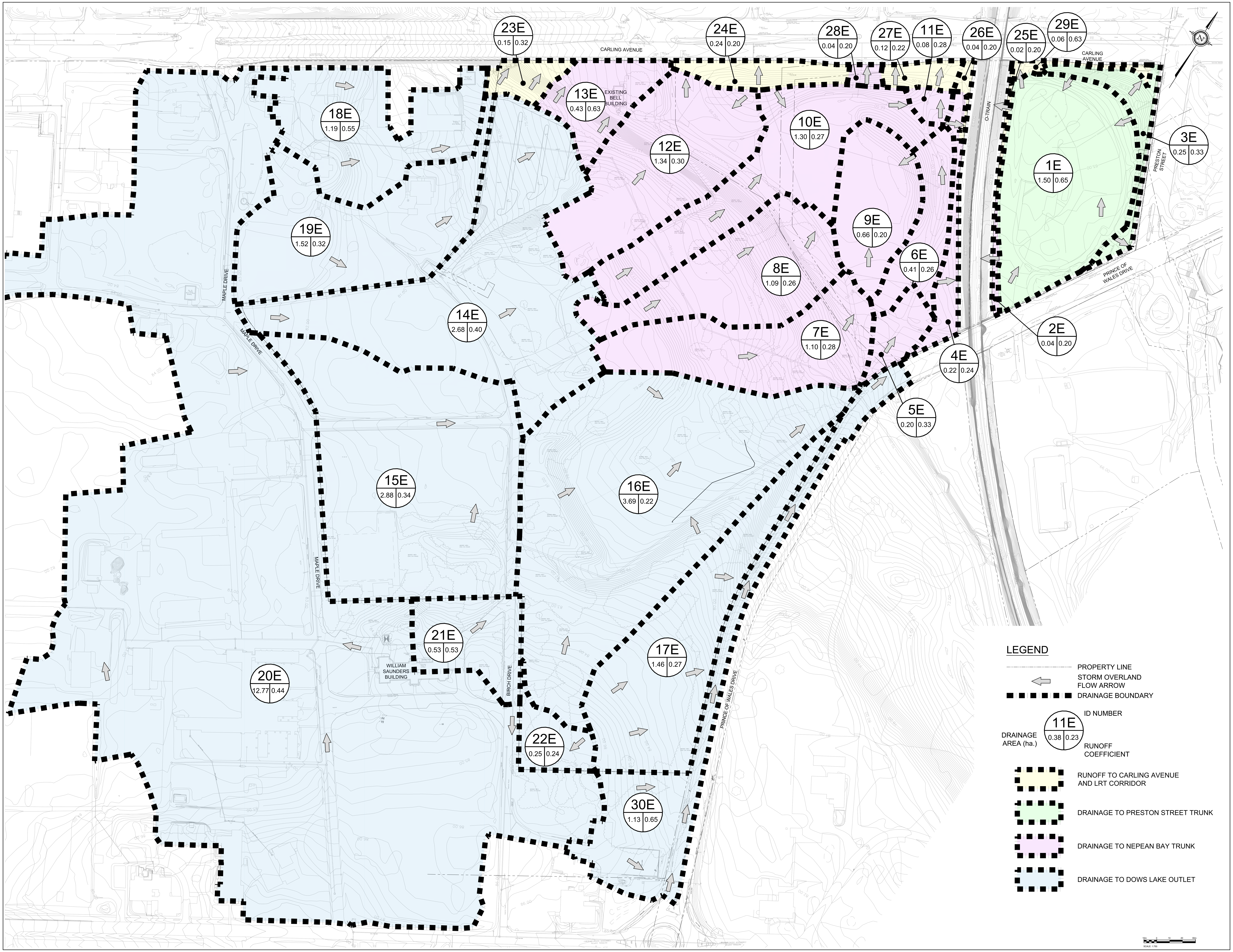
Sheet Name
SANITARY AREAS

Sheet Number
Figure C

Project Status
STAGE 3

D07-12-22-016

APPENDIX J | STORM CALCULATIONS



HDR

HDR Architecture Associates Inc.
300 Richmond Road, Suite 200
Ottawa, Ontario K1Z 6X6

PARSONS

THE OTTAWA HOSPITAL - CIVIC CAMPUS REDEVELOPMENT

The Ottawa Hospital | L'Hôpital d'Ottawa

Architect	HDR
Landscape Architect	HDR
Civil Engineer	Parsons
Structural Engineer	EXP
Mechanical Engineer	Smith + Andersen
Electrical Engineer	Smith + Andersen
Plumbing Engineer	Smith + Andersen
Interior Designer	HDR
Equipment Planner	Colliers
Wayfinding	
Sheet Reviewer	Author

MARK	DATE	DESCRIPTION
04	2022-12-02	ISSUED FOR 3A1-2
05	2023-02-24	ISSUED FOR RFP VERSION 1.0
06	2023-04-12	RE-ISSUED FOR SPC & FLUDA
07	2023-07-28	ISSUED FOR PSOS
08	2023-08-04	RE-ISSUED FOR PSOS
09	2023-09-29	ISSUED FOR REVIEW AND COSTING
10	2023-10-27	ISSUED FOR MOH 3A.3

Project Number 10333982
Original Issue 02/21/23

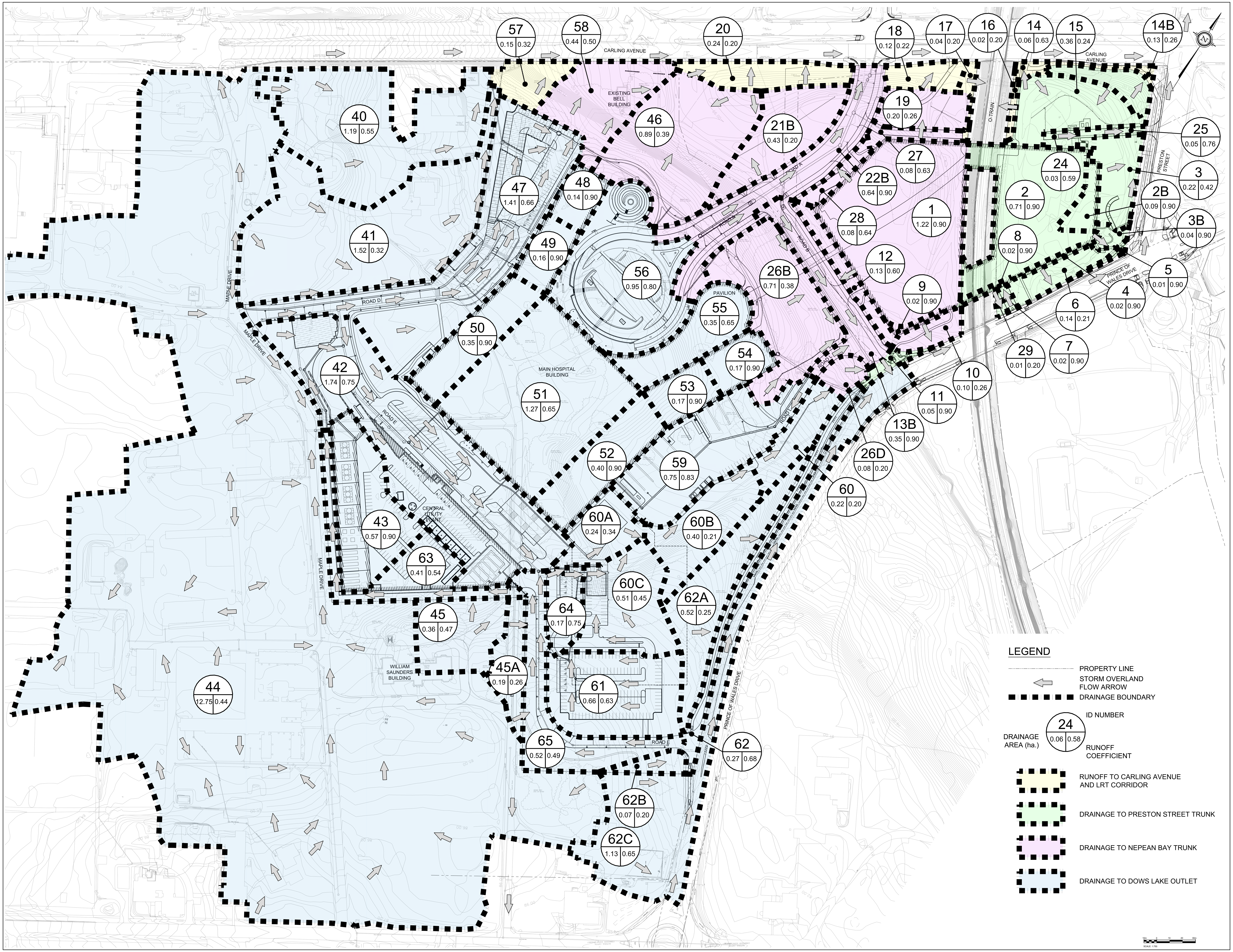
PRELIMINARY NOT FOR CONSTRUCTION

Sheet Name
PRE-DEVELOPMENT DRAINAGE AREAS

Sheet Number
Figure A

Project Status
STAGE 3

D07-12-22-0...



HDR

HDR Architecture Associates Inc.
300 Richmond Road, Suite 200
Ottawa, Ontario K1Z 6X6

PARSONS

THE OTTAWA HOSPITAL - CIVIC CAMPUS REDEVELOPMENT

The Ottawa Hospital | L'Hôpital d'Ottawa

Architect	HDR
Landscape Architect	HDR
Civil Engineer	Parsons
Structural Engineer	EXP
Mechanical Engineer	Smith + Andersen
Electrical Engineer	Smith + Andersen
Plumbing Engineer	Smith + Andersen
Interior Designer	HDR
Equipment Planner	Colliers
Wayfinding	
Sheet Reviewer	Author

MARK	DATE	DESCRIPTION
04	2022-12-02	ISSUED FOR 3A1-2
05	2023-02-24	ISSUED FOR RFP VERSION 1.0
06	2023-04-12	RE-ISSUED FOR SPC & FLUDA
07	2023-07-28	ISSUED FOR PSOS
08	2023-08-04	RE-ISSUED FOR PSOS
09	2023-09-29	ISSUED FOR REVIEW AND COSTING
10	2023-10-27	ISSUED FOR MOH 3A.3

Project Number	10333982
Original Issue	02/21/23

PRELIMINARY
NOT FOR CONSTRUCTION

Sheet Name
POST-DEVELOPMENT DRAINAGE AREAS

Sheet Number
Figure B

Project Status
STAGE 3

D07-12-22-0...

TABLE 1 - PRE-DEVELOPMENT AVERAGE RUNOFF COEFFICIENTS

Watershed Area No.	Impervious Areas (ha)	A * $C_{ASPH/ROOF}$	Pervious Grass Areas (ha)	A * C_{GRASS}	Pervious Forest Areas (ha)	A * C_{FOREST}	Pervious Greenroof Areas (ha)	A * $C_{GREENROOF}$	Sum AC	Total Area (ha)	$C_{AVG\ (5yr)}$	$C_{AVG(100yr)}$
STM01E	0.95	0.85	0.50	0.10	0.06	0.02	0.00	0.00	0.98	1.50	0.65	0.81
STM02E	0.00	0.00	0.04	0.01	0.00	0.00	0.00	0.00	0.01	0.04	0.20	0.25
STM03E	0.02	0.02	0.14	0.03	0.09	0.04	0.00	0.00	0.08	0.25	0.33	0.41
STM04E	0.01	0.01	0.21	0.04	0.00	0.00	0.00	0.00	0.05	0.22	0.24	0.29
STM05E	0.04	0.03	0.16	0.03	0.00	0.00	0.00	0.00	0.07	0.20	0.33	0.41
STM06E	0.04	0.03	0.37	0.07	0.00	0.00	0.00	0.00	0.11	0.41	0.26	0.33
STM07E	0.05	0.05	0.80	0.16	0.25	0.10	0.00	0.00	0.31	1.10	0.28	0.35
STM08E	0.00	0.00	0.75	0.15	0.34	0.14	0.00	0.00	0.29	1.09	0.26	0.33
STM09E	0.00	0.00	0.66	0.13	0.00	0.00	0.00	0.00	0.13	0.66	0.20	0.25
STM10E	0.08	0.07	1.04	0.21	0.18	0.07	0.00	0.00	0.35	1.30	0.27	0.34
STM11E	0.01	0.01	0.07	0.01	0.00	0.00	0.00	0.00	0.02	0.08	0.28	0.35
STM12E	0.12	0.11	0.97	0.19	0.25	0.10	0.00	0.00	0.40	1.34	0.30	0.37
STM13E	0.27	0.24	0.16	0.03	0.00	0.00	0.00	0.00	0.28	0.43	0.63	0.79
STM14E	0.75	0.68	1.92	0.38	0.01	0.00	0.00	0.00	1.06	2.68	0.40	0.50
STM15E	0.50	0.45	2.11	0.42	0.27	0.11	0.00	0.00	0.98	2.88	0.34	0.42
STM16E	0.02	0.02	3.33	0.67	0.34	0.13	0.00	0.00	0.82	3.69	0.22	0.28
STM17E	0.09	0.08	1.18	0.24	0.19	0.08	0.00	0.00	0.39	1.46	0.27	0.34
STM18E	0.56	0.50	0.54	0.11	0.08	0.03	0.00	0.00	0.65	1.19	0.55	0.68
STM19E	0.23	0.21	1.21	0.24	0.08	0.03	0.00	0.00	0.48	1.52	0.32	0.39
STM20E	4.03	3.63	7.68	1.54	1.05	0.42	0.00	0.00	5.59	12.77	0.44	0.55
STM21E	0.19	0.17	0.12	0.02	0.22	0.09	0.00	0.00	0.28	0.53	0.53	0.66
STM22E	0.02	0.01	0.23	0.05	0.00	0.00	0.00	0.00	0.06	0.25	0.24	0.30
STM23E	0.01	0.01	0.08	0.02	0.06	0.03	0.00	0.00	0.05	0.15	0.32	0.40
STM24E	0.00	0.00	0.24	0.05	0.00	0.00	0.00	0.00	0.05	0.24	0.20	0.25
STM25E	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.20	0.25
STM26E	0.00	0.00	0.04	0.01	0.00	0.00	0.00	0.00	0.01	0.04	0.20	0.25
STM27E	0.00	0.00	0.12	0.02	0.00	0.00	0.00	0.00	0.03	0.12	0.22	0.28
STM28E	0.00	0.00	0.04	0.01	0.00	0.00	0.00	0.00	0.01	0.04	0.20	0.25
STM29E	0.03	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.04	0.06	0.63	0.79
STM30E	0.65	0.58	0.23	0.05	0.26	0.10	0.00	0.00	0.73	1.13	0.65	0.81
Total	**8.67**		**25.00**		**3.75**		**0.00**		**14.30**	**37.41**		

2-Year/5-Year Storm	$C_{ASPH/ROOF/CONC}$ =	0.90	C_{GRASS} =	0.20	C_{FOREST} =	0.40	$C_{GREENROOF}$ =	0.54
100-Year Storm	$C_{ASPH/ROOF/CONC}$ =	1.00	C_{GRASS} =	0.25	C_{FOREST} =	0.50	$C_{GREENROOF}$ =	0.68

TABLE 2 - ALLOWABLE RUNOFF CALCULATIONS BASED ON PRE-EXISTING CONDITIONS

Area Description	Area (ha)	Time of Conc, Tc (min)	Minor Storm				Major Storm			
				$I_{2,5}$ (mm/hr)	C_{AVG}	$Q_{ALLOWABLE}$ (L/s)		I_{100} (mm/hr)	C_{AVG}	$Q_{ALLOWABLE}$ (L/s)
STM01E	1.505	10	Storm = 2 yr	76.81	0.40	128.53	Storm = 100 yr	178.56	0.81	605.49
STM02E	0.037	10	Storm = 2 yr	76.81	0.20	1.59	Storm = 100 yr	178.56	0.25	4.61
STM03E	0.253	10	Storm = 2 yr	76.81	0.33	17.94	Storm = 100 yr	178.56	0.41	52.12
STM04E	0.221	10	Storm = 2 yr	76.81	0.24	11.11	Storm = 100 yr	178.56	0.29	32.28
STM05E	0.201	15	Storm = 2 yr	61.77	0.33	11.22	Storm = 100 yr	142.89	0.41	32.44
STM06E	0.410	20	Storm = 2 yr	52.03	0.26	15.71	Storm = 100 yr	119.95	0.33	45.27
STM07E	1.101	25	Storm = 2 yr	45.17	0.28	38.44	Storm = 100 yr	103.85	0.35	110.46
STM08E	1.091	25	Storm = 2 yr	45.17	0.26	36.04	Storm = 100 yr	103.85	0.33	103.57
STM09E	0.660	20	Storm = 2 yr	52.03	0.20	19.09	Storm = 100 yr	119.95	0.25	55.02
STM10E	1.300	25	Storm = 2 yr	45.17	0.27	44.32	Storm = 100 yr	103.85	0.34	127.39
STM11E	0.079	10	Storm = 2 yr	76.81	0.28	4.69	Storm = 100 yr	178.56	0.35	13.62
STM12E	1.341	22	Storm = 2 yr	49.02	0.30	54.77	Storm = 100 yr	112.88	0.37	157.64
STM13E	0.434	18	Storm = 2 yr	55.49	0.50	33.48	Storm = 100 yr	128.08	0.79	122.67
STM14E	2.682	16	Storm = 5 yr	80.46	0.40	238.03	Storm = 100 yr	137.55	0.50	508.65
STM15E	2.882	11	Storm = 5 yr	99.19	0.34	269.93	Storm = 100 yr	169.91	0.42	577.95
STM16E	3.687	16	Storm = 5 yr	80.46	0.22	183.41	Storm = 100 yr	137.55	0.28	391.93
STM17E	1.458	10	Storm = 5 yr	104.19	0.27	113.89	Storm = 100 yr	178.56	0.34	243.97
STM18E	1.186	12	Storm = 5 yr	94.70	0.50	156.15	Storm = 100 yr	162.13	0.68	364.37
STM19E	1.523	12	Storm = 5 yr	94.70	0.32	126.57	Storm = 100 yr	162.13	0.39	270.89
STM20E	12.770	23	Storm = 5 yr	64.29	0.44	998.59	Storm = 100 yr	109.68	0.55	2129.63
STM21E	0.532	10	Storm = 5 yr	104.19	0.50	77.06	Storm = 100 yr	178.56	0.66	175.18
STM22E	0.250	10	Storm = 5 yr	104.19	0.24	17.53	Storm = 100 yr	178.56	0.30	37.55
STM23E	0.155	10	Storm = 2 yr	76.81	0.32	10.72	Storm = 100 yr	178.56	0.40	31.14
STM24E	0.243	10	Storm = 2 yr	76.81	0.20	10.39	Storm = 100 yr	178.56	0.25	30.21
STM25E	0.023	10	Storm = 2 yr	76.81	0.20	0.98	Storm = 100 yr	178.56	0.25	2.84
STM26E	0.036	10	Storm = 2 yr	76.81	0.20	1.54	Storm = 100 yr	178.56	0.25	4.47
STM27E	0.119	10	Storm = 2 yr	76.81	0.22	5.71	Storm = 100 yr	178.56	0.28	16.58
STM28E	0.043	10	Storm = 2 yr	76.81	0.20	1.82	Storm = 100 yr	178.56	0.25	5.29
STM29E	0.058	10	Storm = 2 yr	76.81	0.50	6.20	Storm = 100 yr	178.56	0.79	22.69
STM30E	1.134	10	Storm = 5 yr	104.19	0.50	164.18	Storm = 100 yr	178.56	0.81	454.17
						$Q_{ALLOWABLE}$ (L/s) LRT & Carling =	**69.01**			
						$Q_{ALLOWABLE}$ (L/s) Nepean Bay Trunk =	**238.79**			
						$Q_{ALLOWABLE}$ (L/s) Preston Trunk =	146.46			
						$Q_{ALLOWABLE}$ (L/s) Preston Trunk (deduct additional proposed sanitary 10.05L/s) =	**136.41**			
						$Q_{ALLOWABLE}$ (L/s) Dows Lake =	**2345.34**			

Allowable Capture Rate is based on the 2-year storm at T_c=10 mins

TABLE 3 - POST DEVELOPMENT AVERAGE RUNOFF COEFFICIENTS

Watershed Area No.	Impervious Areas (ha)	A * $C_{ASPH/ROOF}$	Pervious Grass Areas (ha)	A * C_{GRASS}	Pervious Forest Areas (ha)	A * C_{FOREST}	Pervious Greenroof Areas (ha)	A * $C_{GREENROOF}$	Sum AC	Total Area (ha)	$C_{AVG\ (5yr)}$	$C_{AVG(100yr)}$
STM01	1.22	1.09	0.00	0.00	0.00	0.00	0.00	0.00	1.09	1.22	0.90	1.00
STM02	0.71	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.64	0.71	0.90	1.00
STM02B	0.09	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.09	0.90	1.00
STM03	0.07	0.06	0.15	0.03	0.00	0.00	0.00	0.00	0.09	0.22	0.42	0.53
STM03B	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.90	1.00
STM04	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.90	1.00
STM05	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.90	1.00
STM06	0.00	0.00	0.14	0.03	0.00	0.00	0.00	0.00	0.03	0.14	0.21	0.27
STM07	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.90	1.00
STM08	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.90	1.00
STM09	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.90	1.00
STM10	0.01	0.01	0.09	0.02	0.00	0.00	0.00	0.00	0.03	0.10	0.26	0.32
STM11	0.05	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.05	0.90	1.00
STM12	0.07	0.06	0.06	0.01	0.00	0.00	0.00	0.00	0.08	0.13	0.60	0.74
STM13B	0.35	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.32	0.35	0.90	1.00
STM14	0.03	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.04	0.06	0.63	0.79
STM14B	0.00	0.00	0.09	0.02	0.04	0.02	0.00	0.00	0.03	0.13	0.26	0.33
STM15	0.01	0.01	0.32	0.06	0.03	0.01	0.00	0.00	0.09	0.36	0.24	0.31
STM16	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.20	0.25
STM17	0.00	0.00	0.04	0.01	0.00	0.00	0.00	0.00	0.01	0.04	0.20	0.25
STM18	0.00	0.00	0.12	0.02	0.00	0.00	0.00	0.00	0.03	0.12	0.22	0.28
STM19	0.02	0.02	0.19	0.04	0.00	0.00	0.00	0.00	0.05	0.20	0.26	0.33
STM20	0.00	0.00	0.24	0.05	0.00	0.00	0.00	0.00	0.05	0.24	0.20	0.25
STM21B	0.00	0.00	0.43	0.09	0.00	0.00	0.00	0.00	0.09	0.43	0.20	0.25
STM22B	0.64	0.57	0.00	0.00	0.00	0.00	0.00	0.00	0.57	0.64	0.90	1.00
STM24	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.59	0.74
STM25	0.04	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.04	0.05	0.76	0.95
STM26B	0.12	0.10	0.36	0.07	0.23	0.09	0.00	0.00	0.27	0.71	0.38	0.48
STM26D	0.00	0.00	0.08	0.02	0.00	0.00	0.00	0.00	0.02	0.08	0.20	0.25
STM27	0.05	0.04	0.03	0.01	0.00	0.00	0.00	0.00	0.05	0.08	0.63	0.79
STM28	0.05	0.04	0.03	0.01	0.00	0.00	0.00	0.00	0.05	0.08	0.64	0.80
STM29	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.20	0.25
STM40	0.56	0.50	0.54	0.11	0.08	0.03	0.00	0.00	0.65	1.19	0.55	0.68
STM41	0.23	0.21	1.21	0.24	0.08	0.03	0.00	0.00	0.48	1.52	0.32	0.39
STM42	1.31	1.18	0.33	0.07	0.00	0.00	0.10	0.05	1.30	1.74	0.75	0.93
STM43	0.57	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.51	0.57	0.90	1.00
STM44	4.09	3.68	7.61	1.52	1.05	0.42	0.00	0.00	5.62	12.75	0.44	0.55
STM45	0.09	0.08	0.10	0.02	0.17	0.07	0.00	0.00	0.17	0.36	0.47	0.59
STM45A	0.00	0.00	0.13	0.03	0.06	0.02	0.00	0.00	0.05	0.19	0.26	0.33
STM46	0.19	0.17	0.50	0.10	0.20	0.08	0.00	0.00	0.35	0.89	0.39	0.49
STM47	0.93	0.84	0.48	0.10	0.00	0.00	0.00	0.00	0.94	1.41	0.66	0.83
STM48	0.14	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.14	0.90	1.00
STM49	0.16	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.16	0.90	1.00
STM50	0.35	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.35	0.90	1.00
STM51	0.38	0.34	0.00	0.00	0.00	0.00	0.89	0.48	0.83	1.27	0.65	0.81
STM52	0.40	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.40	0.90	1.00
STM53	0.17	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.17	0.90	1.00
STM54	0.17	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.17	0.90	1.00
STM55	0.11	0.10	0.00	0.00	0.00	0.00	0.25	0.13	0.23	0.35	0.65	0.81
STM56	0.82	0.73	0.13	0.03	0.00	0.00	0.00	0.00	0.76	0.95	0.80	1.00
STM57	0.01	0.01	0.08	0.02	0.06	0.03	0.00	0.00	0.05	0.15	0.32	0.40
STM58	0.15	0.13	0.14	0.03	0.16	0.06	0.00	0.00	0.22	0.44	0.50	0.63
STM59	0.68	0.61	0.07	0.01	0.00	0.00	0.00	0.00	0.63	0.75	0.83	1.00
STM60	0.00	0.00	0.22	0.04	0.00	0.00	0.00	0.00	0.04	0.22	0.20	0.25
STM60A	0.05	0.04	0.20	0.04	0.00	0.00	0.00	0.00	0.08	0.24	0.34	0.42
STM60B	0.00	0.00	0.38	0.08	0.01	0.01	0.00	0.00	0.08	0.40	0.21	0.26
STM60C	0.18	0.16	0.33	0.07	0.00	0.00	0.00	0.00	0.23	0.51	0.45	0.56
STM61	0.41	0.37	0.25	0.05	0.00	0.00	0.00	0.00	0.42	0.66	0.63	0.79
STM62	0.18	0.16	0.08	0.02	0.00	0.00	0.00	0.00	0.18	0.27	0.68	0.85
STM62A	0.00	0.00	0.40	0.08	0.12	0.05	0.00	0.00	0.13	0.52	0.25	0.31

STM62B	0.00	0.00	0.07	0.01	0.00	0.00	0.00	0.00	0.01	0.07	0.20	0.25
STM62C	0.66	0.59	0.22	0.04	0.25	0.10	0.00	0.00	0.74	1.13	0.65	0.81
STM63	0.20	0.18	0.21	0.04	0.00	0.00	0.00	0.00	0.22	0.41	0.54	0.68
STM64	0.13	0.12	0.04	0.01	0.00	0.00	0.00	0.00	0.13	0.17	0.75	0.93
STM65	0.22	0.20	0.30	0.06	0.00	0.00	0.00	0.00	0.26	0.52	0.49	0.62
Total	**17.19**		**16.47**		**2.56**				**20.46**	**37.46**		

5-year Storm $C_{ASPH/ROOF/CONC}$ = 0.90 C_{GRASS} = 0.20 C_{FOREST} = 0.40 $C_{GREENROOF}$ = 0.54

100-year Storm $C_{ASPH/ROOF/CONC}$ = 1.00 C_{GRASS} = 0.25 C_{FOREST} = 0.50 $C_{GREENROOF}$ = 0.68

STORM SEWER DESIGN SHEET

Rational Method

Q = 2.78*A*I*R
- Q = Flow (L/sec)
- A = Area (ha)
- I = Rainfall Intensity (mm/h)
- R = Ave. Runoff Coefficient

Ottawa IDF Curve - 5-y (MacDonald Cartier Airport)

$I_5 = 998.071 / (Tc + 6.053)^{0.814}$

Minimum Time of Conc. Tc = **10 min**

Manning's n = **0.013**

Drainage Area	From	To	Area* (ha)	Runoff Parameters: Runoff Coeff. R	Indiv. 2.78AR	Accum. 2.78AR	Time of Conc. (min)	Rainfall Intensity (mm/hr)	Controlled Flow* Q (L/sec)	Peak Flow Q (L/sec)	Pipe Dia. nom. (mm)	Pipe Dia. actual (mm)	Slope (%)	Length (m)	Capacity full (L/sec)	Velocity full (m/sec)	Velocity actual (m/sec)	Time of Flow (min)	Q(d) / Q(f)	REMARKS
STM58	CUP	CBMHST 111	0.44	0.50	0.62	0.62														
STM46	CUP	CBMHST 111	0.89	0.39	0.97	1.59														
STM21B	CB35	IN119606	0.43	0.20	0.24	1.83	10.00	104.19	3.85	3.85	200	203	0.18	50.8	14.52	0.45	0.32	1.89	0.27	Reduced Flow, refer to ICD 5
STM65	MHST 136	MHST 137	0.06	0.49	0.09	0.09	10.00	104.19		9.16	300	305	2.50	73.2	159.51	2.19	1.09	0.56	0.06	
STM65	MHST 137	MHST 134	0.03	0.49	0.04	0.13	10.56	101.33		13.07	375	381	2.50	22.4	289.21	2.54	1.27	0.15	0.05	
STM65	MHST 134	MHST 138	0.02	0.49	0.03	0.16	10.71	100.59		15.61	375	381	2.50	17.5	289.21	2.54	1.27	0.11	0.05	
STM65	MHST 138	MHST 153	0.03	0.49	0.04	0.20	10.82	100.05		19.83	375	381	2.50	38.9	289.21	2.54	1.34	0.26	0.07	
STM45A			0.19	0.26	0.14	0.34														
STM65	MHST 153	MHST 140	0.34	0.49	0.46	0.80	11.08	98.81		79.19	375	381	1.00	60.3	182.91	1.60	1.32	0.63	0.43	
STM65	MHST 140	MHST 158	0.04	0.49	0.06	0.86	11.71	95.95		82.21	750	762	0.20	6.9	519.40	1.14	0.73	0.10	0.16	
STM61	CB116	CBMHST 104	0.18	0.63	0.32	0.32	10.00	104.19		32.96	300	305	2.00	17.4	142.67	1.96	1.35	0.15	0.23	
STM61	CB118	CBMHST 104	0.12	0.63	0.21	0.21	10.00	104.19		21.65	300	305	2.00	16.5	142.67	1.96	1.21	0.14	0.15	
STM61	CBMHST 104	CBMHST 101	0.05	0.63	0.09	0.61	11.35	97.57		59.65	300	305	2.00	15.1	142.67	1.96	1.60	0.13	0.42	
STM61	DICB6	CBMHST 101	0.15	0.63	0.27	0.27	10.00	104.19		27.81	200	203	2.00	15.6	48.39	1.49	1.33	0.17	0.57	
STM61	CBMHST 101	CBMHST 105	0.16	0.63	0.28	1.16	12.95	90.81		105.42	375	381	2.50	10.0	289.21	2.54	1.98	0.07	0.36	
STM64	CBMHST 105	CBMHST 103	0.08	0.75	0.17	1.33	14.93	83.78		111.37	375	381	1.54	17.6	226.99	1.99	1.69	0.15	0.49	
STM64	CB115	CBMHST 103	0.04	0.75	0.09	0.09	10.00	104.19		8.89	375	381	1.00	20.1	182.91	1.60	0.80	0.21	0.05	
STM64	CBMHST 103	CHAMBER 102	0.05	0.75	0.09	1.51	16.62	78.65		118.68	375	381	1.00	2.6	182.91	1.60	1.49	0.03	0.65	
	CHAMBER 102	MHST 170				1.51	16.65	78.57		118.55	375	381	1.00	10.6	182.91	1.60	1.49	0.11	0.65	
	MHST 170	MHST 158							31.54	31.54	300	305	1.00	13.5	100.88	1.38	1.02	0.16	0.31	Reduced Flow, refer to ICD 102
																				and Weir 102
STM42	CUP	MHST 158 - MHST 141	0.30	0.75	0.63	0.63	10.00	104.19		65.42	375	381	1.00	5.5	182.91	1.60	1.25	0.06	0.36	
STM51	Hospital Area 51	MHST 158 - MHST 141	0.64	0.65	1.15	1.15	10.00	104.19		119.61	375	381	1.00	32.6	182.91	1.60	1.49	0.34	0.65	
STM42	MHST 158	MHST 141	0.35	0.75	0.72	3.36	12.44	92.86	31.54	343.26	750	762	0.20	82.5	519.40	1.14	1.07	1.21	0.66	
STM42	MHST 141	MHST 160	0.23	0.75	0.47	3.83	13.65	88.19	31.54	369.35	900	914	0.20	58.5	844.60	1.29	1.07	0.76	0.44	
STM51	Hospital Area 51	MHST 160	0.64	0.65	1.15	1.15	10.00	104.19		119.61	450	457	1.00	33.2	297.43	1.81	1.45	0.31	0.40	
STM42	MHST 160	MHST 151	0.21	0.75	0.43	5.41	14.41	85.52	31.54	494.03	900	914	0.20	4.0	844.60	1.29	1.16	0.05	0.58	
	MHST 151	MHST 150				5.41	14.46	85.35	31.54	493.11	900	914	0.20	16.2	844.60	1.29	1.16	0.21	0.58	
STM42	CUP	MHST 150 - MHST 149	0.25	0.75	0.51	0.51	10.00	104.19		53.49	375	381	1.00	2.5	182.91	1.60	1.17	0.03	0.29	
	MHST 150	MHST 149				5.92	14.67	84.64	31.54	532.75	1050	1067	0.20	36.9	1274.02	1.43	1.17	0.43	0.42	
STM42	MHST 149	MHST 135	0.15	0.75	0.31	6.24	15.10	83.24	31.54	550.62	1050	1067	0.20	37.7	1274.02	1.43	1.17	0.44	0.43	
STM43	CUP	CBMHST 111	0.57	0.90	1.42				15.00	15.00	200	203	1.00	2.2	34.22	1.06	0.88	0.03	0.44	Building Release Rate, CUP
	CBMHST 111	CBMHST 108							15.00	15.00	600	610	0.20	15.3	286.47	0.98	0.49	0.26	0.05	
	CBMHST 108	CBMHST 109							15.00	15.00	600	610	0.20	35.7	286.47	0.98	0.49	0.61	0.05	
	CBMHST 109	CBMHST 110							15.00	15.00	600	610	0.20	20.8	286.47	0.98	0.49	0.35	0.05	
STM42	CBMHST 110	MHST 135	0.21	0.75	0.44	0.44	10.00	104.19	15.00	61.08	600	610	0.20	17.9	286.47	0.98	0.67	0.30	0.21	
STM42	MHST 135	MHST 148	0.04	0.75	0.08	6.76	15.54	81.86	46.54	599.87	1050	1067	0.20	28.3	1274.02	1.43	1.20	0.33	0.47	
STM47	MHST 161	MHST 155	0.08	0.66	0.15	0.15	10.00	104.19		15.83	525	533	2.00	37.3	634.50	2.84	1.25	0.22	0.02	
STM45	LD 12	LD 11	0.36	0.47	0.48	0.48	10.00	104.19		49.91	300	305	0.50	58.8	71.33	0.98	0.94	1.00	0.70	
STM63	LD 11	LD 10	0.41	0.54	0.62	1.10	11.00	99.19		109.40	375	381	0.50	37.6	129.34	1.13	1.15	0.55	0.85	
	LD 10	LD 9				1.10	11.55	96.66		106.61	375	381	0.50	49.2	129.34	1.13	1.13	0.72	0.82	
	LD 9	DICB4				1.10	12.27	93.56		103.18	375	381	0.50	62.7	129.34	1.13	1.12	0.92	0.80	

Rational Method	
	Q = Flow (L/sec)
Q = 2.78*A*I*R	A = Area (ha)
	I = Rainfall Intensity (mm/h)
	R = Ave. Runoff Coefficient

Ottawa IDF Curve - 5-y (MacDonald Cartier Airport)

$I_5 = 998.071 / (Tc + 6.053)^{0.814}$

Minimum Time of Conc. Tc = **10 min**

Manning's n = **0.013**

Drainage Area	From	To	Area* (ha)	Runoff Parameters: Runoff Coeff. R	Indiv. 2.78AR	Accum. 2.78AR	Time of Conc. (min)	Rainfall Intensity (mm/hr)	Controlled Flow* Q (L/sec)	Peak Flow Q (L/sec)	Pipe Dia. nom. (mm)	Pipe Dia. actual (mm)	Slope (%)	Length (m)	Capacity full (L/sec)	Velocity full (m/sec)	Velocity actual (m/sec)	Time of Flow (min)	Q(d) / Q(f)	REMARKS
	DICB4	MHST 154A							85.97	85.97	300	305	2.00	15.3	142.67	1.96	1.78	0.13	0.60	Reduced Flow, refer to ICD 110
STM44	*MHST62534*	MHST 162	12.75	0.44	15.62	15.62	23.00	64.29		1004.42	*900*	*914*	*0.48*	*7.2*	*1308.45*	*1.99*	*1.95*	*0.06*	*0.77*	
	MHST 162	MHST 154A				15.62	23.06	64.18		1002.73	900	914	0.48	5.3	1308.45	1.99	1.95	0.04	0.77	
	MHST 154A	MHST 154B				15.62	23.10	64.11	**85.97**	1087.58	900	914	0.50	15.5	1335.43	2.03	2.01	0.13	0.81	
	MHST 154B	MHST 154				15.62	23.23	63.88	**85.97**	1083.96	900	914	0.50	35.9	1335.43	2.03	2.01	0.29	0.81	
	MHST 154	CHAMBER 103				15.62	23.52	63.37	**85.97**	1075.99	900	914	0.50	16.0	1335.43	2.03	2.01	0.13	0.81	
	CHAMBER 103	MHST 155				15.62	23.65	63.14	**85.97**	1072.46	900	914	0.50	3.1	1335.43	2.03	2.01	0.03	0.80	
STM47	MHST 155	MHST 148	0.04	0.66	0.07	0.22	10.22	103.04	763.88	786.46	900	914	1.00	22.3	1888.58	2.88	2.36	0.13	0.42	Reduced Flow, refer to ICD 103
																				and Weir 103
STM47	MHST 148	MHST 147	0.45	0.66	0.83	7.81	15.87	80.85	**810.42**	1441.73	1500	1524	0.20	86.4	3297.98	1.81	1.50	0.80	0.44	
STM50	Hospital Area 50	MHST 147 - MHST 146	0.35	0.90	0.86				7.64	7.64	450	457	2.00	20.5	420.63	2.56	1.13	0.13	0.02	Building Release Rate, Area 50
STM47	MHST 147	MHST 146	0.17	0.66	0.32	8.13	16.67	78.53	**818.06**	1456.28	1500	1524	0.20	40.9	3297.98	1.81	1.50	0.38	0.44	
STM49	Hospital Area 49	MHST 147 - MHST 146	0.16	0.90	0.41				4.03	4.03	300	305	2.00	21.0	142.67	1.96	0.90	0.18	0.03	Building Release Rate, Area 49
STM47	MHST 146	MHST 157	0.43	0.66	0.79	8.92	17.05	77.47	**822.09**	1513.02	1500	1524	0.20	82.8	3297.98	1.81	1.52	0.76	0.46	
STM41	DICB7	MHST 132	0.76	0.32	0.67	0.67	12.00	94.70		63.29	375	381	1.00	3.8	182.91	1.60	1.24	0.04	0.35	
STM41	MHST 132	MHST 156	0.76	0.32	0.67	1.34	12.04	94.53		126.35	450	457	1.50	41.9	364.28	2.22	1.71	0.31	0.35	
STM40	MHST 156	MHST 157	1.19	0.55	1.80	3.13	12.35	93.23		292.22	1500	1524	0.20	34.5	3297.98	1.81	1.01	0.32	0.09	
STM47	MHST 157	MHST 145	0.24	0.66	0.44	12.49	17.81	75.46	**822.09**	1764.89	1500	1524	0.20	82.8	3297.98	1.81	1.59	0.76	0.54	
	CHAMBER 104	MHST 145							1036.99	1036.99	900	914	1.00	8.4	1888.58	2.88	2.53	0.05	0.55	Reduced Flow, refer to ICD 104
																				and Weir 104
STM48	Hospital Area 48	MHST 147 - MHST 146	0.14	0.90	0.34				3.19	3.19	300	305	2.00	10.8	142.67	1.96	0.86	0.09	0.02	Building Release Rate, Area 48
	MHST 145	MHST 144							**1040.18**	1040.18	1200	1219	0.20	73.6	1818.95	1.56	1.39	0.79	0.57	
STM56	Hospital Area 56	MHST 144 - MHST 143	0.95	0.80	2.11	2.11	10.00	104.19		220.10	450	457	2.00	21.5	420.63	2.56	2.23	0.14	0.52	
STM55	Hospital Area 55	MHST 144 - MHST 143	0.35	0.65	0.64	0.64	10.00	104.19		66.31	450	457	2.00	47.6	420.63	2.56	1.64	0.31	0.16	
	MHST 144	MHST 143				2.75	10.52	101.52	**1040.18**	1319.25	1350	1372	0.20	92.5	2490.16	1.69	1.47	0.91	0.53	
	MHST 143	MHST 159				2.75	11.43	97.20	**1040.18**	1307.37	1350	1372	0.20	38.2	2490.16	1.69	1.47	0.38	0.53	
	MHST 159	MHST 142				2.75	11.81	95.51	**1040.18**	1302.73	1350	1372	0.20	44.6	2490.16	1.69	1.47	0.44	0.52	
STM54	Hospital Area 54	MHST 142	0.17	0.90	0.43				4.01	4.01	300	305	2.00	2.5	142.67	1.96	0.90	0.02	0.03	Building Release Rate, Area 54
	MHST 142	MHST 130							1082.53	1082.53	1200	1219	0.20	29.3	1818.95	1.56	1.42	0.31	0.60	Reduced Flow, refer to ICD 105
																				and Weir 105
STM52	Hospital Area 52	MHST 139	0.40	0.90	1.00				8.96	8.96	525	533	1.50	28.6	549.49	2.46	1.08	0.19	0.02	Building Release Rate, Area 52
STM59	MHST 139	MHST 133	0.55	0.83	1.28	1.28	10.00	104.19	**8.96**	142.70	750	762	0.10	72.9	367.27	0.81	0.64	1.51	0.39	
STM53	Hospital Area 53	MHST 133	0.17	0.90	0.43				4.07	4.07	300	305	1.00	24.9	100.88	1.38	0.66	0.30	0.04	Building Release Rate, Area 53
STM59	MHST 133	MHST 131	0.20	0.83	0.46	1.75	11.51	96.84	**13.03**	182.08	825	838	0.10	51.4	473.55	0.86	0.68	1.00	0.38	
	MHST 131	MHST 130				1.75	12.51	92.57	**13.03**	174.63	825	838	0.10	47.9	473.55	0.86	0.67	0.93	0.37	
STM60A			0.24	0.34	0.23	0.23														
STM60C			0.51	0.45	0.63	0.86														
STM60B			0.40	0.21	0.23	1.09														
STM60	LD 14	LD 41	0.22	0.20	0.12	1.21	10.00	104.19		125.78	450	457	0.50	12.4	210.32	1.28	1.17	0.16	0.60	
	LD 41	LD 42				1.21	10.16	103.36		124.77	450	457	0.30	42.2	162.91	0.99	0.97	0.71	0.77	
	LD 42	DICB8				1.21	10.87	99.81		120.50	450	457	0.30	16.7	162.91	0.99	0.96	0.28	0.74	
	DICB8	MHST 130 - OGS 3				1.21	11.15	98.49	3.68	3.68	250	254	0.50	71.1	43.87	0.87	0.47	1.37	0.08	Reduced Flow, refer to ICD 113
	MHST 130	OGS 3				2.95	13.44	88.96	**1099.24**	1361.94	1200	1219	0.20	32.7	1818.95	1.56	1.51	0.35	0.75	
	OGS 3	MHST62528				2.95	13.79	87.68	**1099.24**	1358.16	1200	1219	0.20	13.0	1818.95	1.56	1.51	0.14	0.75	

Rational Method	
	Q = Flow (L/sec)
Q = 2.78*A*I*R	A = Area (ha)
	I = Rainfall Intensity (mm/h)
	R = Ave. Runoff Coefficient

Ottawa IDF Curve - 5-y (MacDonald Cartier Airport)

$I_5 = 998.071 / (Tc + 6.053)^{0.814}$

Minimum Time of Conc. Tc = **10 min**

Manning's n = **0.013**

Drainage Area	From	To	Area* (ha)	Runoff Parameters: Runoff Coeff. R	Indiv. 2.78AR	Accum. 2.78AR	Time of Conc. (min)	Rainfall Intensity (mm/hr)	Controlled Flow* Q (L/sec)	Peak Flow Q (L/sec)	Pipe Dia. nom. (mm)	Pipe Dia. actual (mm)	Slope (%)	Length (m)	Capacity full (L/sec)	Velocity full (m/sec)	Velocity actual (m/sec)	Time of Flow (min)	Q(d) / Q(f)	REMARKS
	MHST62528	MHST62545				2.95	13.93	87.18	**1099.24**	1356.68	1200	1219	0.93	91.9	3922.36	3.36	2.59	0.46	0.35	
	MHST62545	MHST62547				2.95	14.39	85.58	**1099.24**	1351.95	1200	1219	1.73	129.6	5349.69	4.58	3.21	0.47	0.25	
	MHST62547	Dow's Lake				2.95	14.86	84.01	**1099.24**	1347.32	1200	1219	0.23	172.6	1929.29	1.65	1.59	1.74	0.70	
STM26B	LD 13	LD 39	0.35	0.38	0.37	0.37	10.00	104.19		39.00	300	305	0.30	22.4	55.26	0.76	0.73	0.49	0.71	
	LD 39	LD 40				0.37	10.49	101.67		38.06	300	305	0.30	10.4	55.26	0.76	0.72	0.23	0.69	
	LD 40	LD 15				0.37	10.72	100.54		37.63	300	305	0.30	7.8	55.26	0.76	0.72	0.17	0.68	
	LD 15	LD 16				0.37	10.89	99.72		37.32	300	305	20.75	8.0	459.54	6.30	3.40	0.02	0.08	
	LD 16	LD 17				0.37	10.91	99.62		37.29	300	305	0.30	12.3	55.26	0.76	0.71	0.27	0.67	
	LD 17	LD 18				0.37	11.18	98.35		36.81	300	305	0.30	12.9	55.26	0.76	0.71	0.28	0.67	
	LD 18	DICB 2				0.37	11.46	97.07		36.33	300	305	0.33	4.7	57.95	0.79	0.73	0.10	0.63	
	DICB 2	MHST 105 - MHST 104				0.37	11.56	96.62	**14.03**	**14.03**	200	203	2.00	6.4	48.39	1.49	1.09	0.07	0.29	Reduced Flow, refer to ICD 7
STM26D	DICB 1	MHST 105	0.08	0.20	0.04	0.04	10.00	104.19	**3.21**	**3.21**	200	203	2.00	7.6	48.39	1.49	0.79	0.08	0.07	Reduced Flow, refer to ICD 112
STM22B	MHST 120	MHST 106	0.64	0.90	1.60	1.60	10.00	104.19		166.37	1500	1524	0.10	46.0	2332.02	1.28	0.68	0.60	0.07	

Design:	S. Sterling	**Project:**	The Ottawa Hospital Civic Campus Redevelopment
Check:	S. Mitchelson	**Project #:**	477458 & 478340
Date:	Nov 2023	**Client:**	

1223 Michael Street North, Suite 100 | Ottawa, ON K1J 7T2
P: +1 613.738.4160 | F: +1 613.739.7105 | www.parsons.com

Memorandum

To: Pam Whyte	Date: November 2023
From: Sarah Mitchelson, P.Eng.	Phone: 613.698.6705
Subject: Dow's Lake Outfall	

1.0 Existing Stormwater Infrastructure

The western portion of the western parcel of the New Civic Development is located within the tributary area for Dows Lake. Stormwater runoff is conveyed through private Agriculture and Agri-Food Canada infrastructure from the federal lands (Central Experimental Farm) towards Prince of Wales Drive and eventually to Dow's Lake.

The existing municipal and private storm sewer infrastructure is illustrated in **Figure 2**. Photographs of the existing Dow's Lake Outfall are shown in **Figure 3**, **Figure 4**, and **Figure 5.**

2.0 Sewer Outlet Protection

The most commonly used measure for sewer outlet protection, particularly for sewers 1500mm or smaller, is a riprap apron. They are constructed of riprap or grouted riprap at a variable slope for a distance that is often related to the outlet pipe diameter. These aprons do not dissipate significant energy except through increased roughness for a short distance. However, they spread the flow and help transition to natural drainage paths or to sheet flow in areas where no natural drainage path exists. An example schematic of a riprap apron taken from the Federal Highway Administration in Hydraulic Engineering Circular No. 14 (HEC-14) is shown in **Figure 1.**

Figure 1: Schematic Protective Apron at Outlet

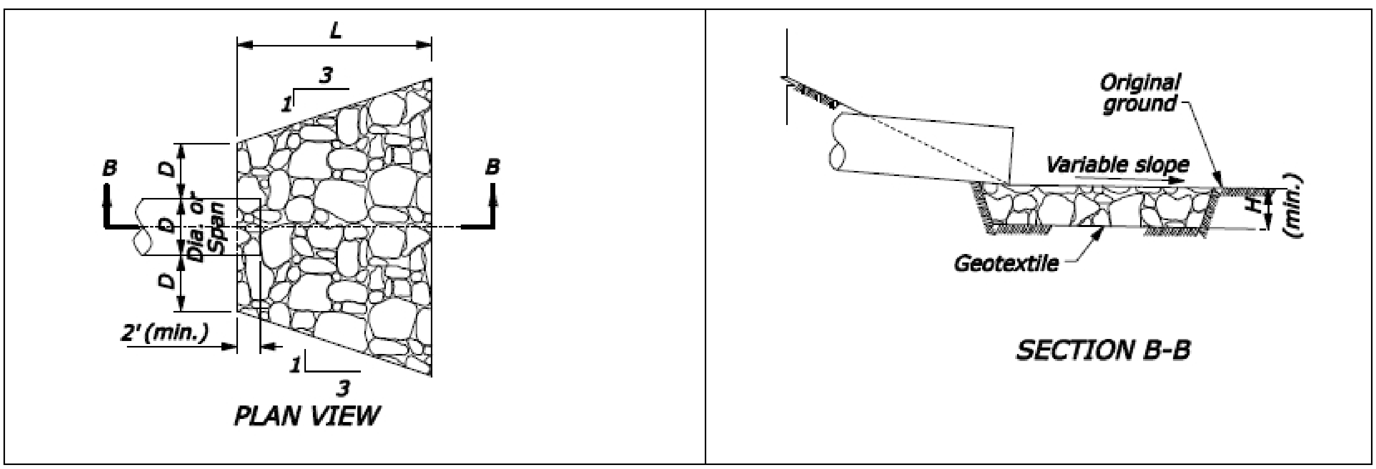


Figure 2: Existing Stormwater Infrastructure

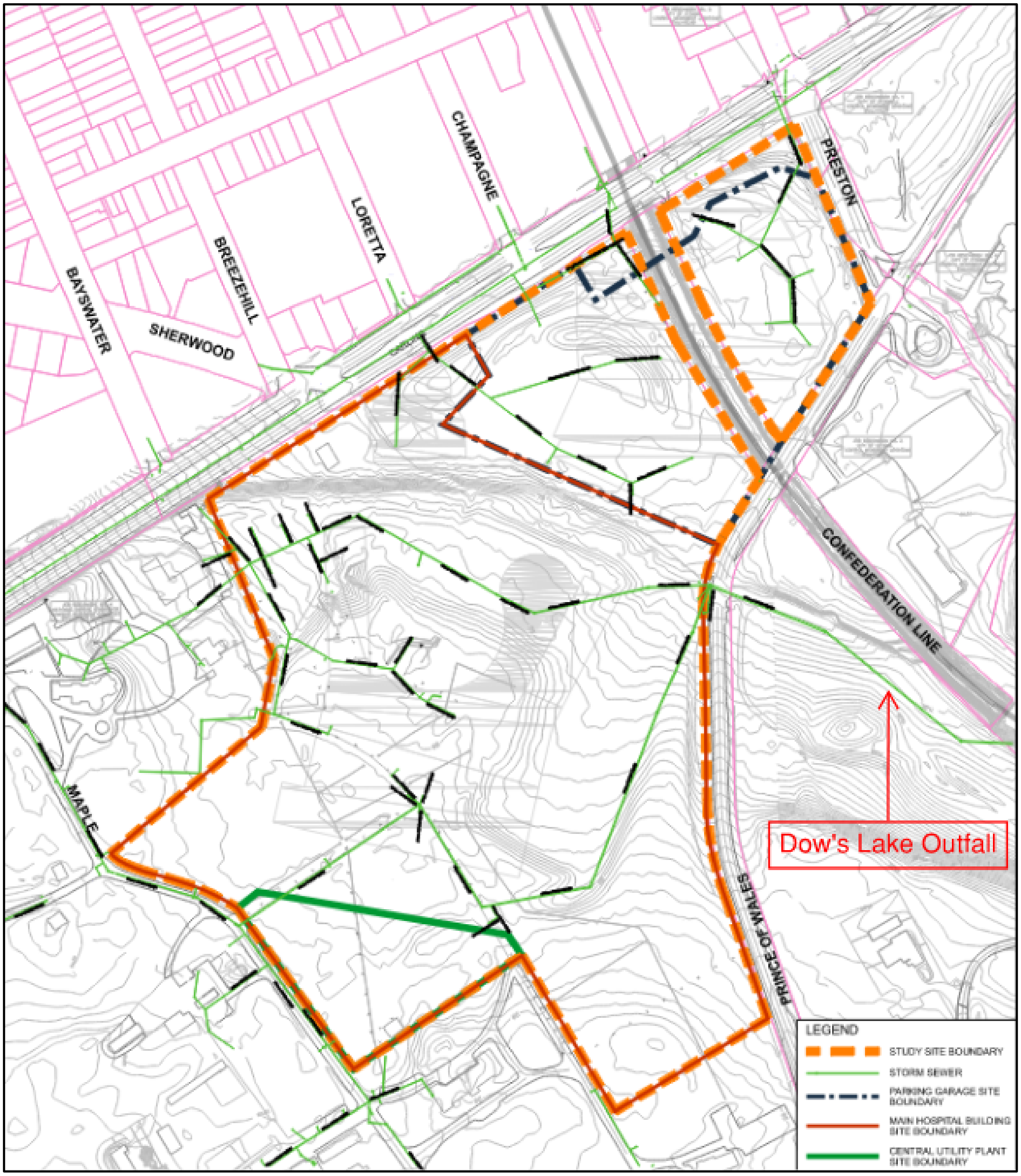


Figure 3: Dow's Lake Outfall – July 2022

Figure 4: Dow's Lake Outfall – December 2022

Figure 5: Dow's Lake Outfall – December 2022

The key design elements of the riprap apron are the riprap size and the dimensions of the apron (length, width, and depth). There are several methods for design, including one developed by the Federal Highway Administration in Hydraulic Engineering Circular No. 14 (HEC-14). It estimates the average riprap size based on the outlet size, outlet discharge and tailwater level.

3.0 Dow's Lake Outlet Protection

The following parameters were used to calculate the apron dimensions to protect the existing Dow's Lake Outlet:

- Outlet Diameter (D)= 1200mm
- Outlet Discharge (Q) = 2.27m^3/s (100-year storm event based on ultimate hospital buildout)
- Outlet Tailwater (TW)= 0.4 X D = 0.48m

The calculations are as follows:

- *Step 1 – Calculate D_{50}*

  $D_{50} = 0.2D(Q/(\sqrt{g}D^{2.5}))^{4/3}(D/TW)$ – Equation 10.4 from HEC-14

  D_{50} = 213mm

- *Step 2 – Determine Rip Rap Class from Table 10.1*

  Table 10.1 – Example Riprap Classes and Apron Dimensions

Class	D_{50}(mm)	D_{50}(in)	Apron Length	Apron Depth
1	125	4	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

  Reference: Federal Highway Administration in Hydraulic Engineering Circular No. 14 (HEC-14)

  Riprap R-50 (D_{50} = 250mm) is required in accordance with Ontario Provincial Standard Specification (OPSS) 1004.

- Step 3 – Estimate Apron Dimensions from Table 10.1 for Riprap Class 3

  Riprap Length (L) = 5D =5 x 1.2m = 6m

  Riprap Depth (H) = $2.4D_{50}$ = 2.4 x 250mm = 500mm

  Riprap Width (W1) = 3D = 3 x 1.2m = 3.6m

  Riprap Width (W2) = 3D + (2/3)L = 3 x 1.2m + (2/3) x 6m = 7.6m

In summary, a riprap apron should be installed to protect the existing Dow's Lake Outlet. The riprap apron should have a minimum length of 6m, depth of 500m, width of 3.6m at the outlet, and width of

7.6m at the end of the apron. The riprap material should be in accordance with OPSS 1004 – Material Specifications for Aggregates – Miscellaneous.

PCSWMM Report

24 Hour - 2 Year Storm

Model Partial Green Roof_November-2023.inp

Parsons

November 24, 2023

Table of Contents

Summary 1: Runoff quantity continuity

Name	Partial Green Roof_November-2023
Initial LID storage (mm)	0.247
Initial snow cover (mm)	n/a
Total precipitation (mm)	48.408
Outfall runon (mm)	n/a
Evaporation loss (mm)	0.000
Infiltration loss (mm)	24.928
Surface runoff (mm)	20.825
LID drainage (mm)	0.268
Snow removed (mm)	n/a
Final snow cover (mm)	n/a
Final storage (mm)	2.645
Continuity error (%)	-0.025

Summary 2: Flow routing continuity

Name	Partial Green Roof_November-2023
Dry weather inflow (ML)	0.000
Wet weather inflow (ML)	7.899
Groundwater inflow (ML)	0.000
RDII inflow (ML)	0.000
External inflow (ML)	1.151
External outflow (ML)	9.059
Flooding loss (ML)	0.000
Evaporation loss (ML)	0.000
Exfiltration loss (ML)	0.000
Initial stored volume (ML)	0.000
Final stored volume (ML)	0.166
Continuity error (%)	-1.926

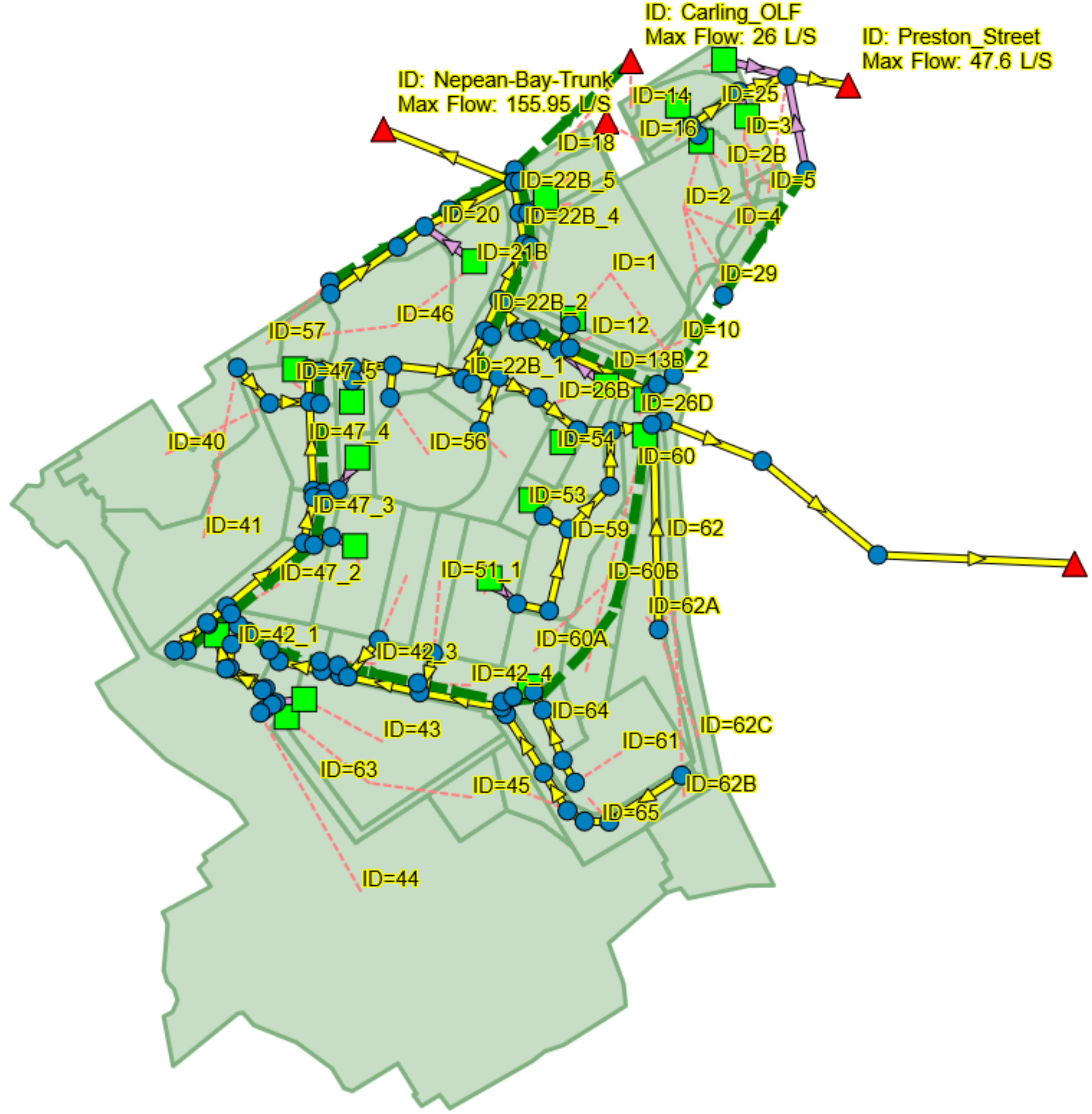


Figure 1: Extent 1

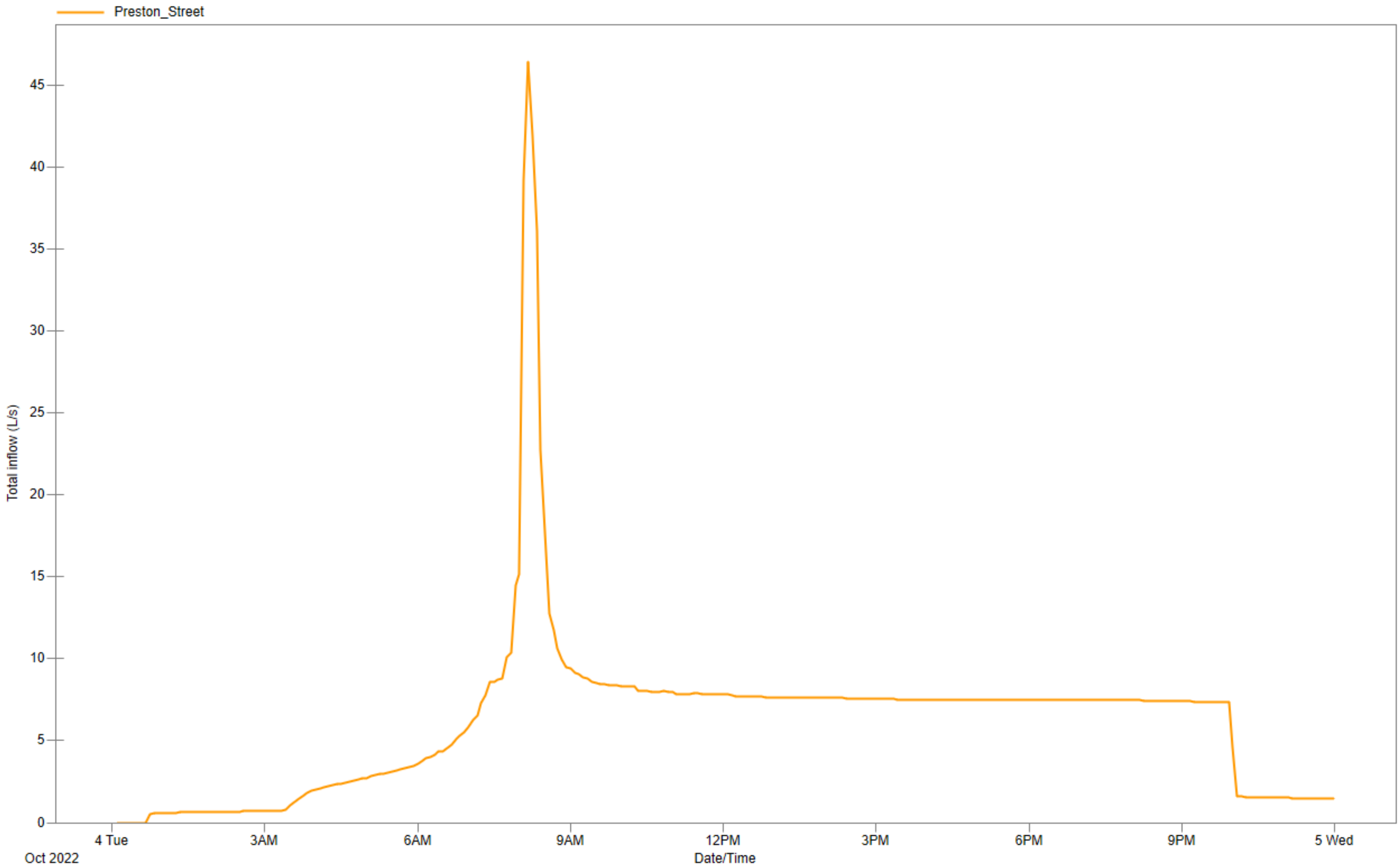


Figure 2: Preston Outfall

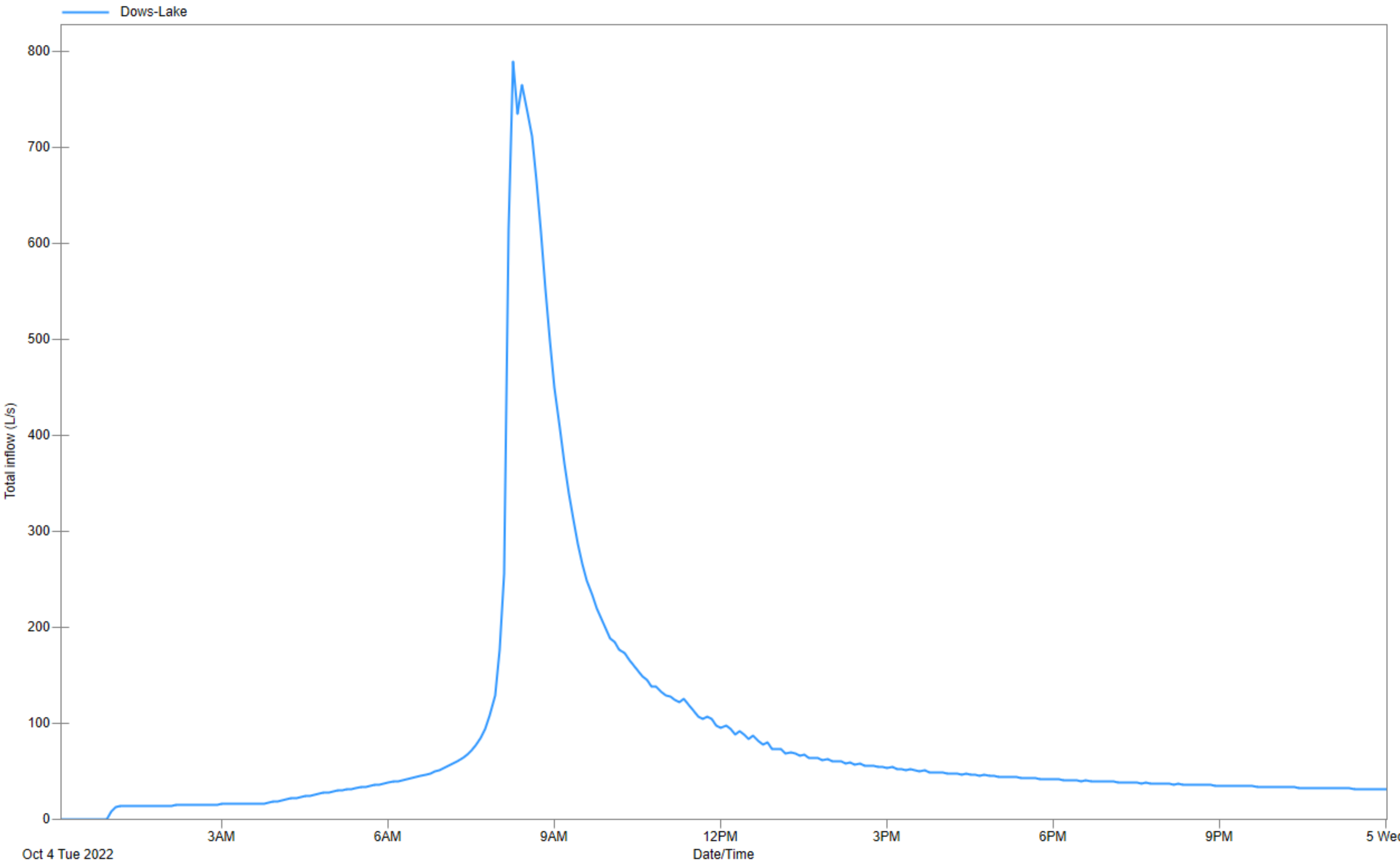


Figure 3: Dows Lake Outfall

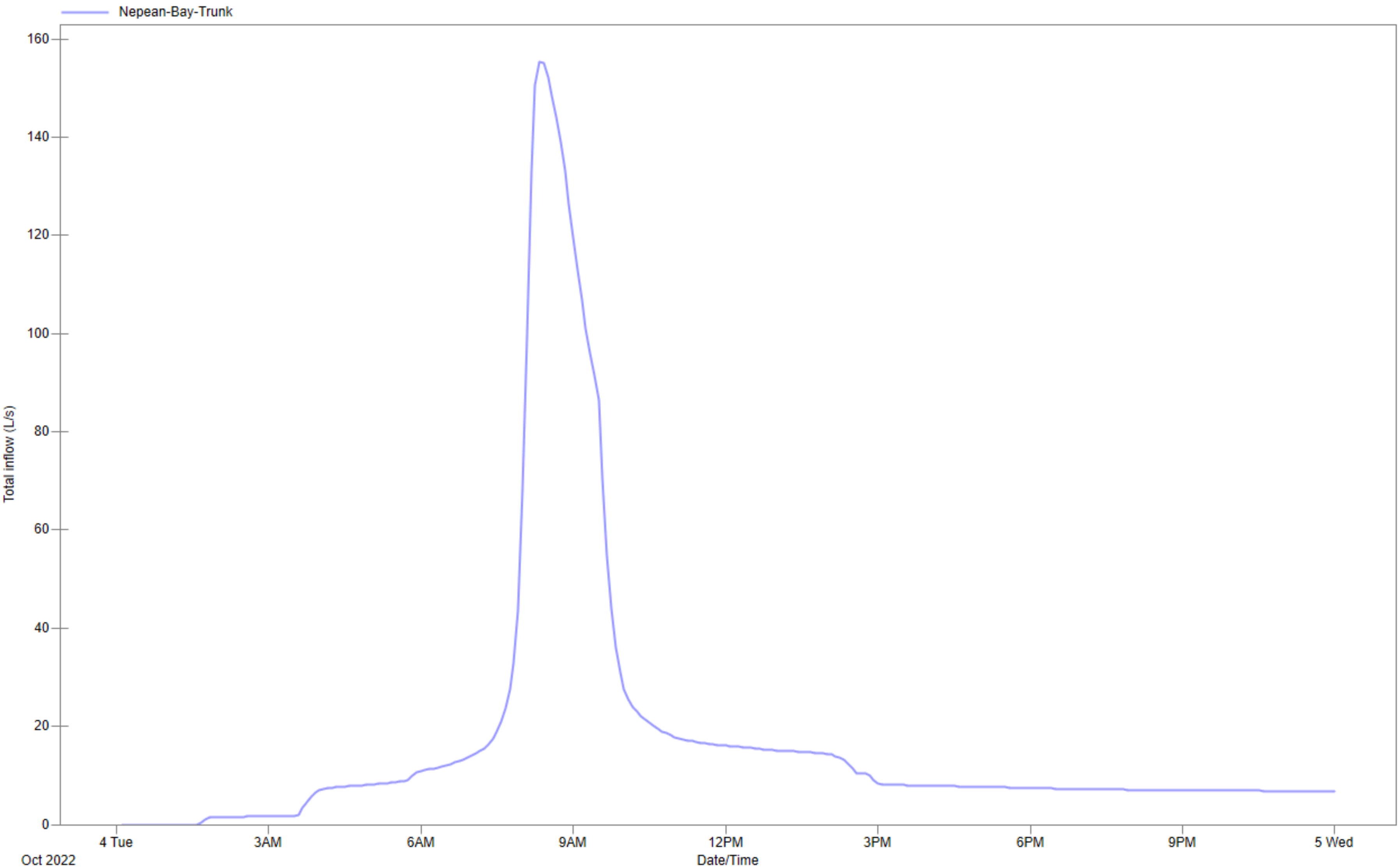


Figure 4: Nepean Bay Outfall

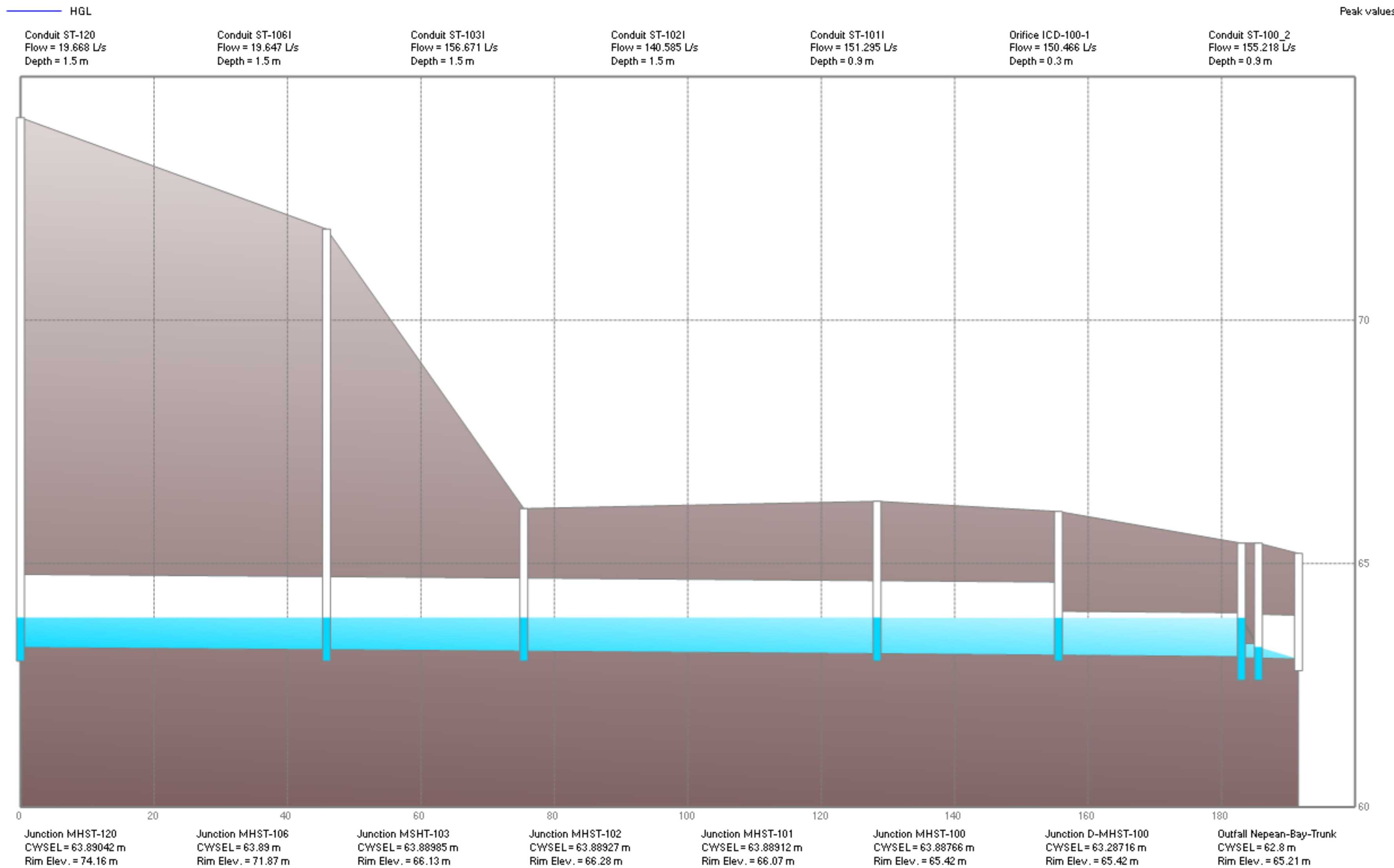


Figure 5: Road A

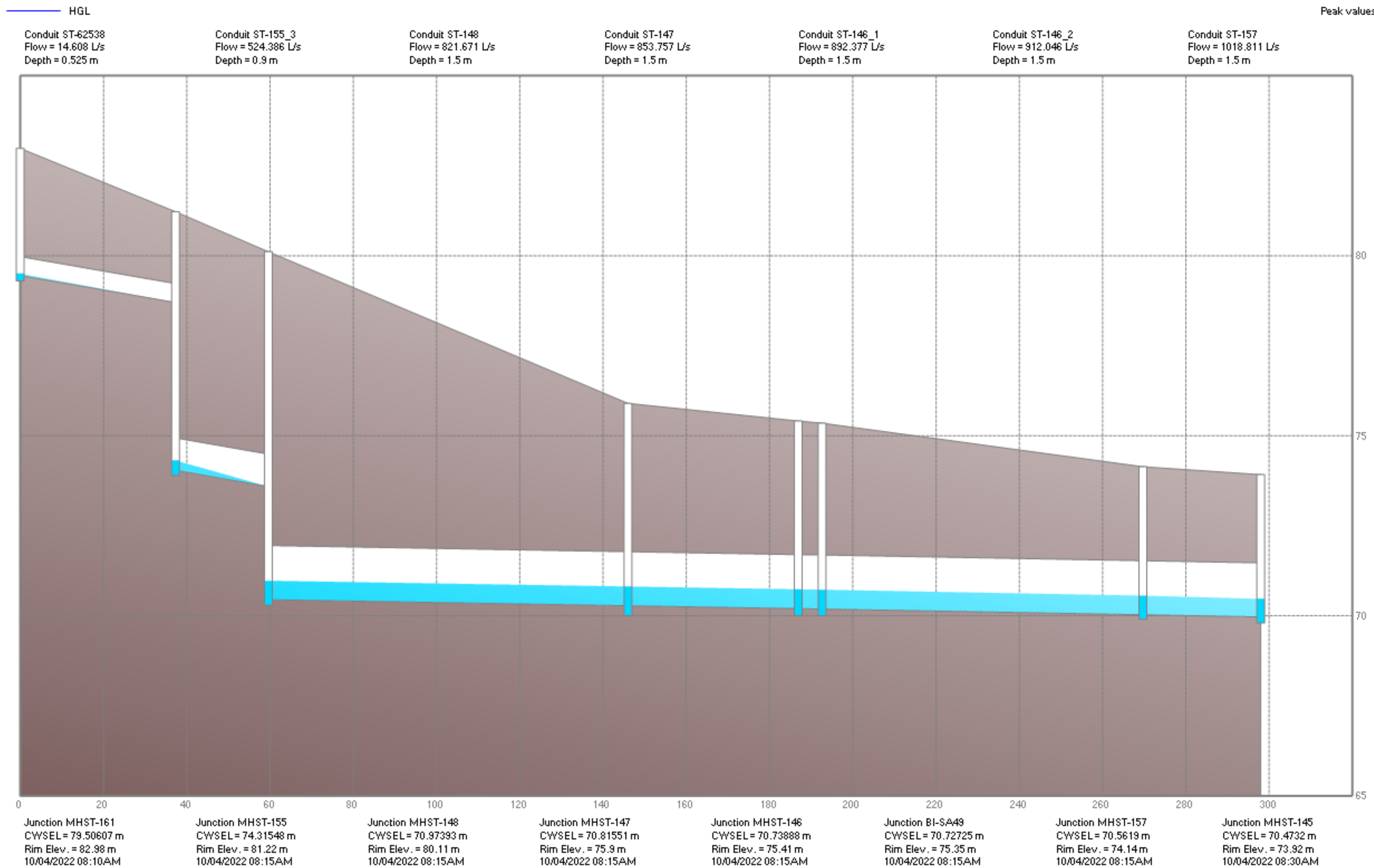


Figure 6: Road D

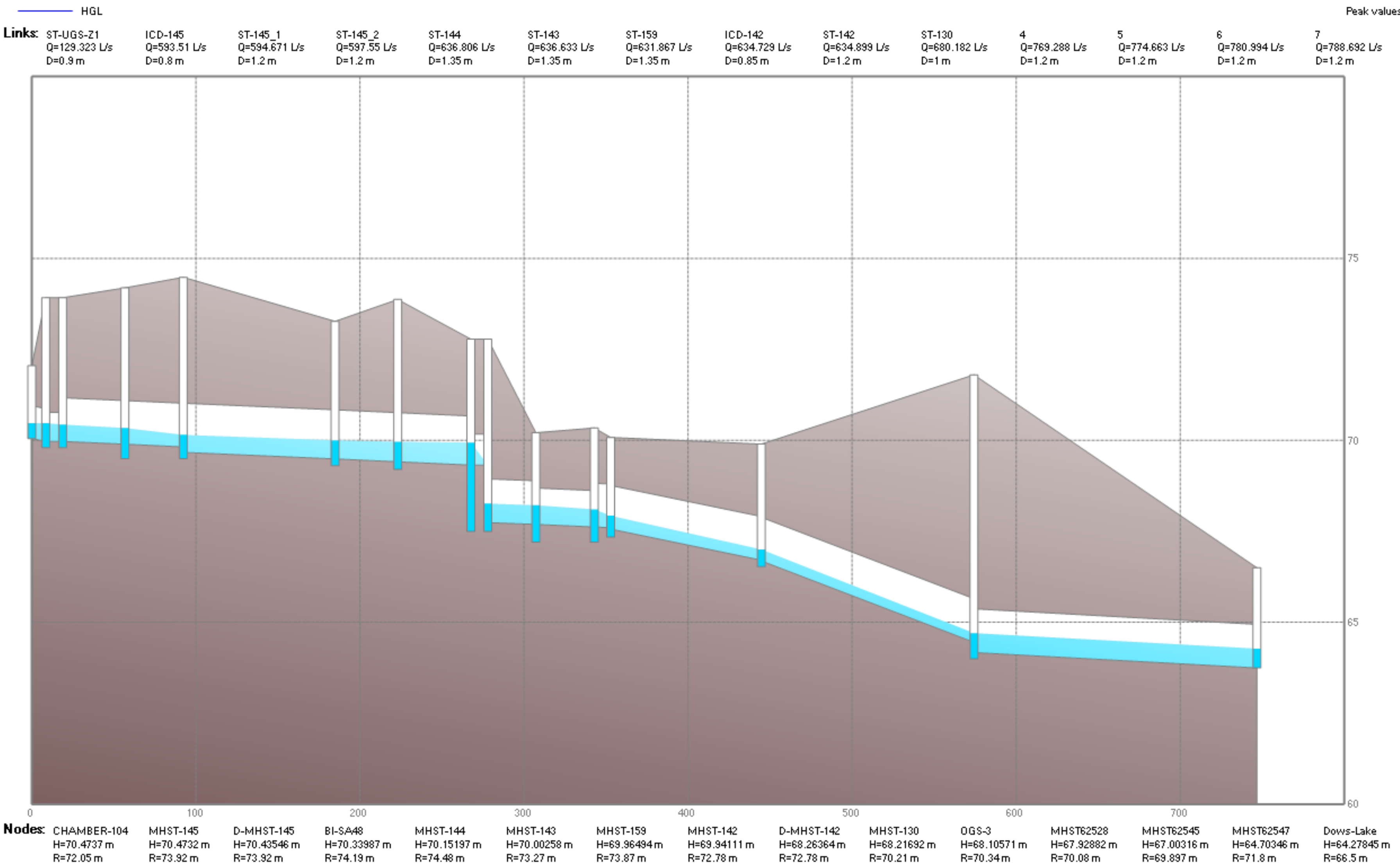


Figure 7: Road D to Outfall

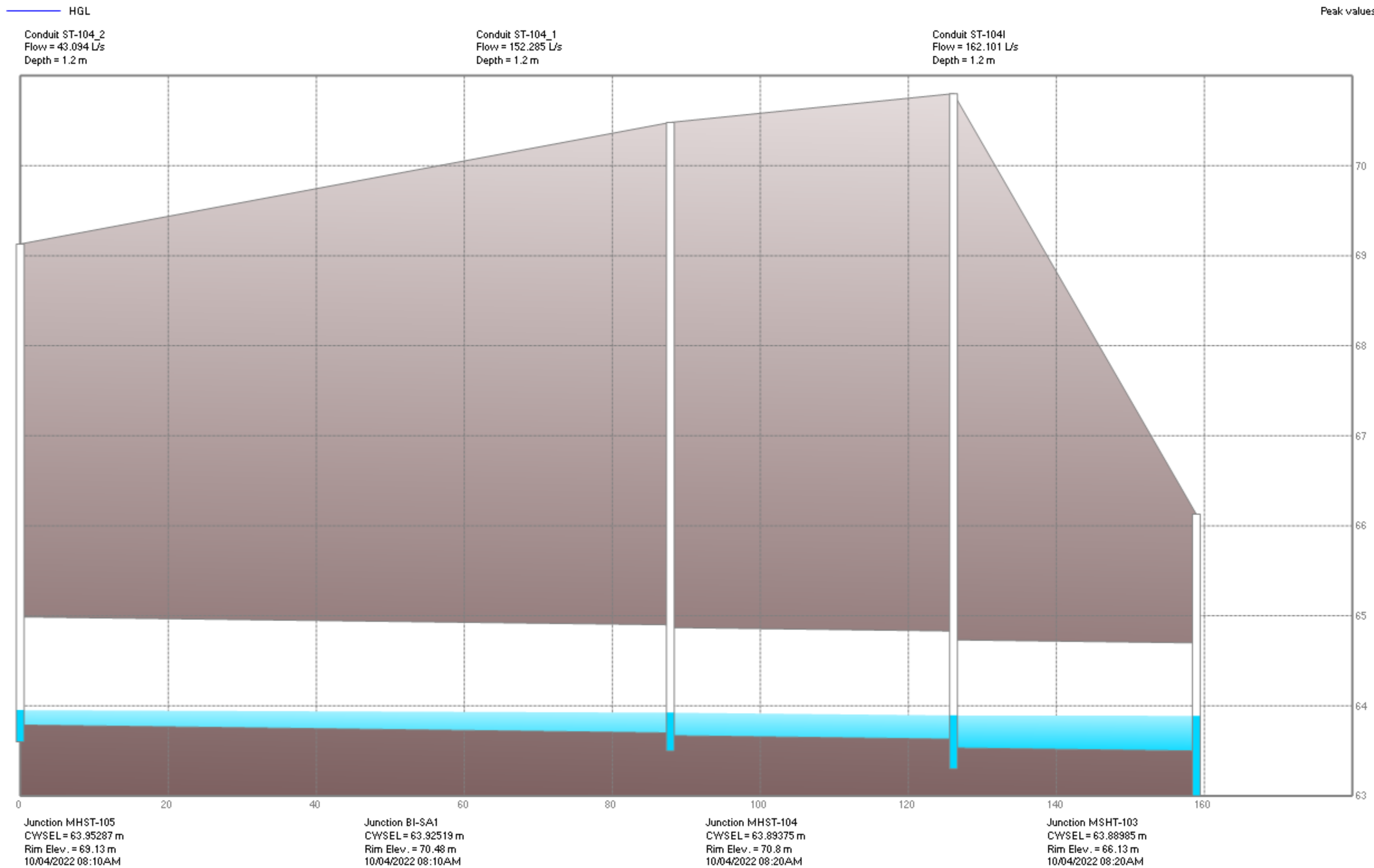


Figure 8: Road B

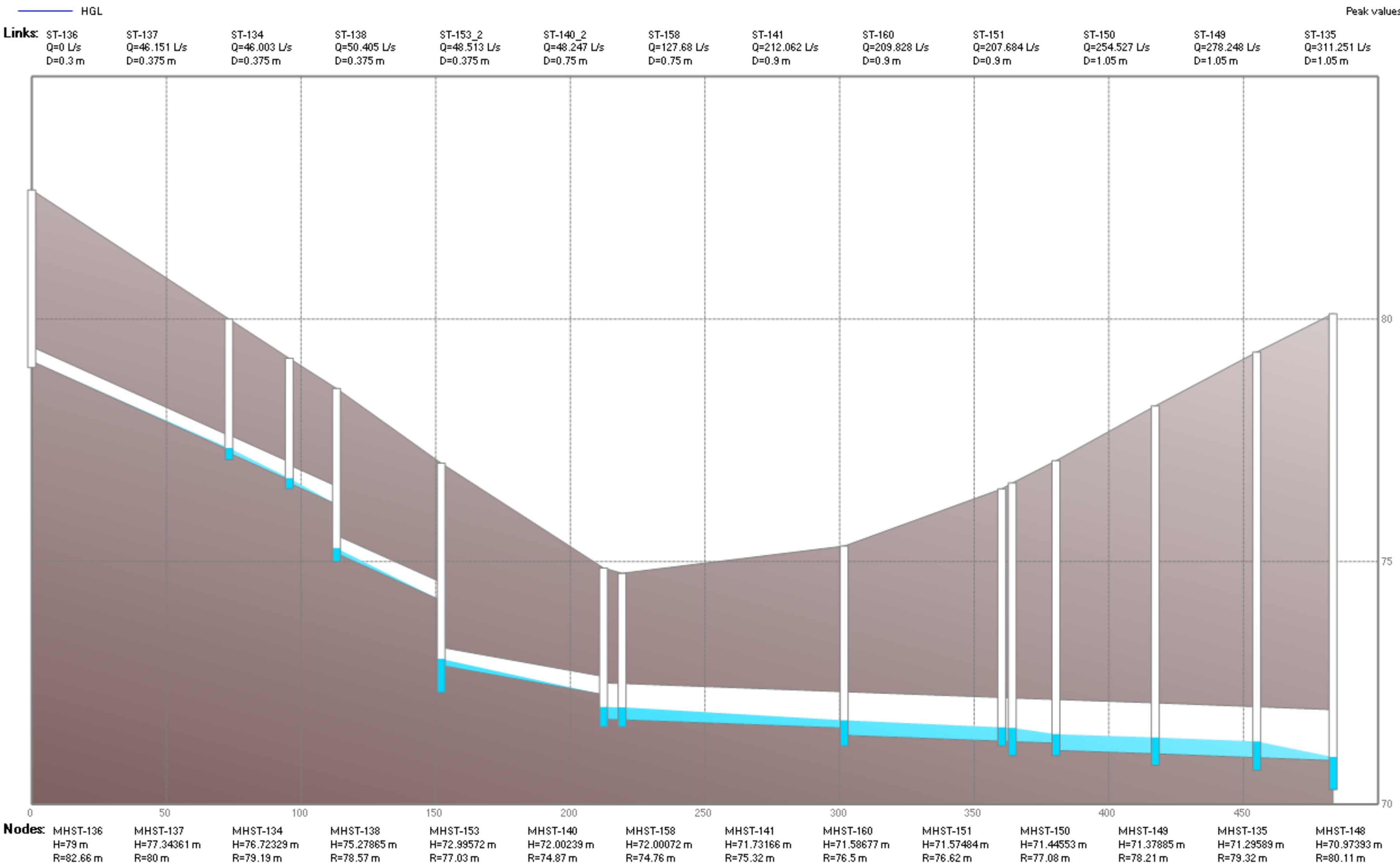


Figure 9: Road E

Table 1: Orifices

Name	Inlet Node	Outlet Node	Type	Cross-Section	Height (m)	Inlet Elev. (m)	Discharge Coeff.	Max. |Flow| (L/s)	Contributing Area (ha)	Contributing Imp. Area (ha)
ICD-100-1	MHST-100	D-MHST-100	SIDE	CIRCULAR	0.3	63.06	0.62	150.95	3.641	2.579
ICD-100-2	MHST-100	D-MHST-100	SIDE	CIRCULAR	0.1	63.85	0.62	1.32	3.641	2.579
ICD-142	MHST-142	D-MHST-142	SIDE	CIRCULAR	0.85	69.32	0.62	634.73	24.887	10.859
ICD-145	MHST-145	D-MHST-145	SIDE	RECT_CLOSED	0.8	69.97	0.62	596.44	23.279	9.629
ICD-155	D-MHST-155	MHST-155	SIDE	CIRCULAR	0.675	74.1	0.62	521.62	13.523	4.382
ICD-170	MHST-170	DMHST-170	SIDE	CIRCULAR	0.1	71.96	0.62	14.85	0.826	0.539

Table 2: Conduits

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
1	MHST-158-S	S-60	295	0.035	74.95	69.04	TRAPEZOIDAL	0.5	0.02004	0	0
10	CBMHST105	CBMHST103	17.6	0.013	72.4	72.13	CIRCULAR	0.375	0.01534	91.24	1.84
2	MHST-105-S	Wales-OLF-N03	17	0.016	68.69	68.2	IRREGULAR	0	0.02884	3.91	0.53
3	Preston	Preston_Street	10	0.013	61.03	60.9	CIRCULAR	0.3	0.013	47.6	1.5
4	OGS-3	MHST62528	10	0.013	67.62	67.6	CIRCULAR	1.2	0.002	793.85	1.84
5	MHST62528	MHST62545	91.8	0.013	67.56	66.707	CIRCULAR	1.2	0.00929	794.3	2.64
6	MHST62545	MHST62547	129.6	0.013	66.687	64.45	CIRCULAR	1.2	0.01726	793.72	3.29
7	MHST62547	Dows-Lake	172.5	0.013	64.17	63.745	CIRCULAR	1.2	0.00246	794.43	1.63
8	POW_D1	OGS-3	180	0.035	78.7	69.7	TRAPEZOIDAL	0.55	0.05006	131.72	1.09
8_1	CHAMBER-103	D-MHST-155	3.1	0.013	74.12	74.1	CIRCULAR	0.9	0.00645	521.62	1.04
9	CBMHST103	CHAMBER-102	2.6	0.013	72.1	72.07	CIRCULAR	0.375	0.01154	90.4	1.8
CA-OLF_2	Carling_OLF1	Carling_OLFN1	120.425	0.016	66.5	65.408	IRREGULAR	0	0.00907	8.78	0.41
CA-OLF_3	Carling_OLFN3	Carling_OLF	66.467	0.016	64.8	64.6	IRREGULAR	0	0.00301	17.84	0.35
CA-OLF_4	Carling_OLFN1	Carling_OLFN3	67.075	0.016	65.408	64.8	IRREGULAR	0	0.00906	12.33	0.27
CA-STM	IN119607	D-MHST-100	86	0.013	63.1	62.8	CIRCULAR	0.3	0.00349	5.76	0.11

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-100_2	D-MHST-100	Nepean-Bay-Trunk	6	0.013	63.06	63.04	CIRCULAR	0.9	0.00333	155.95	1.24
ST-100-S	MHST-100-S	Carling_OLFN3	11	0.013	65.42	64.8	IRREGULAR	0	0.05645	16.57	0.38
ST-101I	MHST-101	MHST-100	27.419	0.013	63.12	63.09	CIRCULAR	0.9	0.00109	153.36	0.5
ST-101I-S	MHST-101-S	MHST-100-S	27.419	0.013	66.07	65.42	IRREGULAR	0	0.02371	16.78	0.6
ST-102	CBMHST-101	CBMHST105	48	0.013	73.63	72.43	CIRCULAR	0.375	0.02501	91.25	2.25
ST-102I	MHST-102	MHST-101	27.18	0.013	63.15	63.12	CIRCULAR	1.5	0.0011	146.15	0.39
ST-102I-S	MHST-102-S	MHST-101-S	27.18	0.013	66.28	66.07	IRREGULAR	0	0.00773	6.36	0.22
ST-103I	MSHT-103	MHST-102	52.936	0.013	63.203	63.15	CIRCULAR	1.5	0.001	165.95	0.48
ST-103I-S	MSHT-103-S	MHST-102-S	52.936	0.013	66.13	66.28	IRREGULAR	0	-0.00283	3.85	0.13
ST-104	CBMHST-104	CBMHST-101	15.1	0.013	74.14	73.84	CIRCULAR	0.375	0.01987	91.61	2.08
ST-104_1	BI-SA1	MHST-104	38.268	0.013	63.67	63.631	CIRCULAR	1.2	0.00102	155.69	1.02
ST-104_2	MHST-105	BI-SA1	87.842	0.013	63.788	63.7	CIRCULAR	1.2	0.001	44.67	0.37
ST-104I	MHST-104	MSHT-103	32.803	0.013	63.533	63.5	CIRCULAR	1.2	0.00101	164.39	1.03
ST-105I_1-S	BI-SA1-S	MHST-105-S	87.84	0.013	70.15	68.64	IRREGULAR	0	0.01719	40.55	0.56
ST-105I_2-S	MHST-104-S	BI-SA1-S	37.727	0.013	70.8	70.15	IRREGULAR	0	0.01723	14.04	0.35
ST-106I	MHST-106	MSHT-103	29.577	0.013	63.233	63.203	CIRCULAR	1.5	0.00101	21.09	0.1
ST-106I-S	MHST-106-S	MSHT-103-S	29.577	0.013	71.87	66.13	IRREGULAR	0	0.19783	27.21	0.93
ST-107	DMHST-170	MHST-158	13.5	0.013	71.93	71.8	CIRCULAR	0.3	0.00963	14.85	0.98
ST-108	CBMH108	CBMH109	35.7	0.013	71.56	71.49	CIRCULAR	0.6	0.00196	15.02	0.52
ST-109	CBMH109	CBMH110	20.8	0.013	71.49	71.45	CIRCULAR	0.6	0.00192	15	0.53
ST-110	CBMH110	MHST-135	17.9	0.013	71.45	71.41	CIRCULAR	0.6	0.00223	15	0.63
ST-111	CBMH111	CBMH108	15.3	0.013	71.59	71.56	CIRCULAR	0.6	0.00196	15.08	0.53
ST-120	MHST-120	MHST-106	45.853	0.013	63.278	63.233	CIRCULAR	1.5	0.00098	22.04	0.15
ST-120-S	MHST-120-S	MHST-106-S	45.853	0.013	74.16	71.87	IRREGULAR	0	0.05	17.97	0.77
ST-130	MHST-130	OGS-3	35.6	0.013	67.69	67.62	CIRCULAR	1	0.00197	691.51	1.74
ST-131	MHST-131	MHST-130	47.9	0.013	68.12	68.07	CIRCULAR	0.825	0.00104	137.46	1.02
ST-132	MHST-132	MHST-156	41.86	0.013	73.25	72.62	CIRCULAR	0.45	0.01505	53.54	1.59

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-133	MHST-133	MHST-131	51.37	0.013	68.17	68.12	CIRCULAR	0.825	0.00097	138.51	0.82
ST-134	MHST-134	MHST-138	17.5	0.013	76.62	76.18	CIRCULAR	0.375	0.02515	46.22	1.87
ST-135	MHST-135	MHST-148	28.3	0.013	70.96	70.9	CIRCULAR	1.05	0.00212	333.18	1.42
ST-136	MHST-136	MHST-137	73.2	0.013	79.13	77.3	CIRCULAR	0.3	0.02501	0	0
ST-137	MHST-137	MHST-134	22.4	0.013	77.24	76.68	CIRCULAR	0.375	0.02501	46.24	1.86
ST-138	MHST-138	MHST-153	38.9	0.013	75.17	74.2	CIRCULAR	0.375	0.02494	51.24	1.91
ST-139	MHST-139	MHST-133	72.94	0.013	68.32	68.25	CIRCULAR	0.75	0.00096	12.3	0.35
ST-140_2	MHST-140	MHST-158	6.9	0.013	71.75	71.74	CIRCULAR	0.75	0.00145	50.44	0.43
ST-141	MHST-141	MHST-160	58.5	0.013	71.42	71.3	CIRCULAR	0.9	0.00205	222.26	1.17
ST-141-S	MHST-151-S	MHST-141-S	70.7	0.013	76.58	75.32	IRREGULAR	0	0.01782	104.91	0.83
ST-142	D-MHST-142	MHST-130	29.3	0.013	67.74	67.69	CIRCULAR	1.2	0.00171	634.9	1.36
ST-143	MHST-143	MHST-159	38.2	0.013	69.49	69.41	CIRCULAR	1.35	0.00209	637.23	1.25
ST-144	MHST-144	MHST-143	92.5	0.013	69.67	69.49	CIRCULAR	1.35	0.00195	645.13	1.37
ST-145_1	D-MHST-145	BI-SA48	38	0.013	69.97	69.894	CIRCULAR	1.2	0.002	596.15	1.51
ST-145_2	BI-SA48	MHST-144	35.6	0.013	69.894	69.82	CIRCULAR	1.2	0.00208	598.38	1.64
ST-146_1	MHST-146	BI-SA49	5.7	0.013	70.2	70.189	CIRCULAR	1.5	0.00193	947.94	1.58
ST-146_1-S	MHST-146-S	BI-SA49-S	5.693	0.013	75.44	75.351	IRREGULAR	0	0.01564	27.34	0.5
ST-146_2	BI-SA49	MHST-157	77.1	0.013	70.189	70.03	CIRCULAR	1.5	0.00206	961.38	1.63
ST-146_2-S	BI-SA49-S	MHST-157-S	77.118	0.013	75.351	74.14	IRREGULAR	0	0.01571	15.8	0.29
ST-147	MHST-147	MHST-146	40.9	0.013	70.28	70.2	CIRCULAR	1.5	0.00196	905.8	1.52
ST-147-S	MHST-147-S	MHST-146-S	40.768	0.013	75.9	75.44	IRREGULAR	0	0.01128	27.86	0.44
ST-148	MHST-148	MHST-147	86.4	0.013	70.45	70.28	CIRCULAR	1.5	0.00197	885.99	1.5
ST-148-S	MHST-148-S	MHST-147-S	93.313	0.013	80.11	75.9	IRREGULAR	0	0.04516	17.37	0.41
ST-149	MHST-149	MHST-135	37.7	0.013	71.04	70.96	CIRCULAR	1.05	0.00212	295.09	1.2
ST-149-S	MHST-135-S	MHST-149-S	34.9	0.013	79.32	78.21	IRREGULAR	0	0.03182	41.19	0.61
ST-150	MHST-150	MHST-149	36.9	0.013	71.11	71.04	CIRCULAR	1.05	0.0019	266.6	1.09
ST-150-S	MHST-149-S	MHST-150-S1	45	0.013	78.21	77.08	IRREGULAR	0	0.02512	59.94	0.47

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-151	MHST-151	MHST-150	16.2	0.013	71.29	71.26	CIRCULAR	0.9	0.00185	222.43	1.31
ST-151-S	MHST-150-S1	MHST-151-S	16.1	0.013	77.08	76.58	IRREGULAR	0	0.03107	106.17	0.96
ST-153_2	MHST-153	MHST-140	60.3	0.013	72.86	72.26	CIRCULAR	0.375	0.00995	50.58	1.37
ST-154	MHST-154	CHAMBER-103	16	0.013	75.8	75.72	CIRCULAR	0.9	0.005	959.11	2.22
ST-154A	MHST-154A	MHST-154B	15.51	0.013	76.18	76.1	CIRCULAR	0.9	0.00516	959.54	2.25
ST-154B	MHST-154B	MHST-154	35.9	0.013	76.04	75.86	CIRCULAR	0.9	0.00501	958.36	2.23
ST-155_2-S	D-MHST-155-S	MHST-148-S	52.7	0.013	83.11	80.11	IRREGULAR	0	0.05702	2.54	0.22
ST-155_3	MHST-155	MHST-148	22.3	0.013	74.04	73.59	CIRCULAR	0.9	0.02018	528.42	3.18
ST-156	MHST-156	MHST-157	35.51	0.013	70.1	70.03	CIRCULAR	1.5	0.00197	170.43	0.51
ST-157	MHST-157	MHST-145	28.3	0.013	70.03	69.97	CIRCULAR	1.5	0.00212	1068.65	1.89
ST-157-S	MHST-157-S	MHST-145-S	28.171	0.013	74.14	73.92	IRREGULAR	0	0.00781	30.71	0.34
ST-158	MHST-158	MHST-141	82.5	0.013	71.74	71.57	CIRCULAR	0.75	0.00206	138.94	1.1
ST-158-S	MHST-141-S	MHST-158-S	75.107	0.013	75.32	74.85	IRREGULAR	0	0.00626	67.35	0.54
ST-159	MHST-159	MHST-142	44.6	0.013	69.41	69.32	CIRCULAR	1.35	0.00202	631.98	1.09
ST-160	MHST-160	MHST-151	3.95	0.013	71.3	71.29	CIRCULAR	0.9	0.00253	222.2	1.23
ST-162	CBMHST-162	MHST-154A	5.35	0.013	76.27	76.24	CIRCULAR	0.9	0.00561	889.57	2.28
ST-62534	MHST-62534	CBMHST-162	7.16	0.013	76.3	76.27	CIRCULAR	0.9	0.00419	889.89	3.37
ST-62538	MHST-161	MHST-155	37.3	0.013	79.45	78.7	CIRCULAR	0.525	0.02011	14.69	1.18
ST-G107	MHST-107	OGS1	52.5	0.013	62.03	61.24	CIRCULAR	0.3	0.01505	15.83	1.09
ST-OGS1_2	OGS1	Preston	10	0.013	61.21	61.06	CIRCULAR	0.3	0.015	44.25	1.55
ST-P3	DICB3	IN119608	71.1	0.013	64.23	63.8	CIRCULAR	0.2	0.00605	0	0
ST-P46	IN119608	IN119607	30	0.013	63.5	63.2	CIRCULAR	0.2	0.01	0	0
ST-SA1	MH-SA1	BI-SA1	24.65	0.013	69.45	69.08	CIRCULAR	0.3	0.01501	60.3	1.7
ST-SA48	MH-SA48	BI-SA48	10.8	0.013	72	71.78	CIRCULAR	0.3	0.02037	2.38	0.74
ST-SA49	MH-SA49	BI-SA49	21	0.013	72.8	72.38	CIRCULAR	0.3	0.02	3.01	0.79
ST-SA50	MH-SA50	MHST-147	20.47	0.013	73.15	72.74	CIRCULAR	0.45	0.02003	5.69	0.9
ST-SA51-1	MH-SA51-1	MHST-141	32.56	0.013	73.5	73.17	CIRCULAR	0.375	0.01014	0.74	0.39

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-SA51-2	MH-SA51-2	MHST-160	33.2	0.013	73.5	73.17	CIRCULAR	0.45	0.00994	0.74	0.38
ST-SA52	MH-SA52	MHST-139	28.6	0.013	68.92	68.49	CIRCULAR	0.525	0.01504	6.66	0.84
ST-SA53	MH-ST53	MHST-133	24.9	0.013	69.04	68.79	CIRCULAR	0.3	0.01004	3.03	0.62
ST-SA54	MH-SA54	MHST-142	2.45	0.013	71.38	71.33	CIRCULAR	0.3	0.02041	2.99	0.8
ST-SA55	MH-SA55	MHST-143	47.61	0.013	72.5	71.55	CIRCULAR	0.45	0.01996	0.41	0.43
ST-Sa56	MH-SA56	MHST-144	21.47	0.013	72.5	72.07	CIRCULAR	0.45	0.02003	171.93	2.44
ST-UGS6B	CHAMBER-102	MHST-170	10.6	0.013	72.07	71.96	CIRCULAR	0.375	0.01038	66.7	0.77
ST-UGS-Z1	CHAMBER-104	MHST-145	8.42	0.013	70.05	69.97	CIRCULAR	0.9	0.0095	618.66	2.93
ST-xx	MH-SAxx	MHST-107	10.7	0.013	62.45	62.15	CIRCULAR	0.2	0.02805	7.01	1.21
WD-OLF_3	Wales-OLF-N03	Wales-OLF-N04	81.193	0.016	68.2	66.75	IRREGULAR	0	0.01786	3.34	0.56
WD-OLF_4	Wales-OLF-N04	Wales-OLF-N05	94.991	0.016	66.75	65.5	IRREGULAR	0	0.01316	1.6	0.53

Table 3: Storages

Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)	Hours Flooded (h)	Max. Flood Rate (L/s)	Total Flood Vol. (ML)	Avg. Percent Full (%)	Max. Volume (1000 m³)	Max. Percent Full (%)	Max. Outflow (L/s)
CHAMBER-102	72.07	73.32	1.25	0.41	72.48	145.9	0	0	0	7	0.104	33	66.7
CHAMBER-103	74.12	77.12	3	0.65	74.77	959.11	0	0	0	3	0.456	22	521.62
CHAMBER-104	70.05	72.05	2	0.43	70.48	618.66	0	0	0	4	0.638	21	129.47
R-48	73	73.15	0.15	0.03	73.03	29.15	0	0	0	7	0.034	17	2.38
R-49	74	74.15	0.15	0.02	74.02	34.51	0	0	0	6	0.04	16	3.01
R-50	77	77.15	0.15	0.02	77.02	68.5	0	0	0	6	0.085	17	5.69
R-52	69	69.15	0.15	0.02	69.02	77.55	0	0	0	6	0.097	16	6.66
R-53	70	70.15	0.15	0.02	70.02	36.44	0	0	0	6	0.042	17	3.03
R-54	72	72.15	0.15	0.02	72.02	35.89	0	0	0	6	0.042	16	2.99
S-14B	61.65	63.3	1.65	0.89	62.54	6.64	0	0	0	1	0	2	3.78

Table 3: Storages (continued...)

Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)	Hours Flooded (h)	Max. Flood Rate (L/s)	Total Flood Vol. (ML)	Avg. Percent Full (%)	Max. Volume (1000 m³)	Max. Percent Full (%)	Max. Outflow (L/s)
S-15	62.1	63.9	1.8	0.68	62.78	7.99	0	0	0	0	0.001	1	4.74
S-19	64	66	2	1.24	65.24	7.93	0	0	0	0	0.002	1	3.23
S-21B	63.54	65.7	2.16	1.63	65.17	50.87	0	0	0	1	0.071	5	3.76
S-26B	67.33	69.7	2.37	1.6	68.93	33.18	0	0	0	0	0.01	3	12.92
S-26D	67.66	69.31	1.65	0.44	68.1	4.23	0	0	0	0	0	0	1.95
S-3	62.2	64.24	2.04	1.26	63.46	30.38	0	0	0	0	0.003	4	20.96
S-60	67.84	70.25	2.41	1.35	69.19	34.9	0	0	0	0	0.011	2	3.38
S-63	78.2	82.42	4.22	2.18	80.38	81.72	0	0	0	0	0.001	1	70.94
SA-1	69.5	72.5	3	0.66	70.16	253.5	0	0	0	2	0.146	22	60
SA-2	62.6	65.6	3	0.67	63.27	180.82	0	0	0	10	0.201	22	7
SA-CUP	72.5	75.5	3	0.17	72.67	119.97	0	0	0	1	0.086	6	15

Table 4: Weirs

Name	Inlet Node	Outlet Node	Type	Height (m)	Side Slope (m/m)	Inlet Elev. (m)	Discharge Coeff. (m³/s)	Max. |Flow| (L/s)	Contributing Area (ha)	Contributing Imp. Area (ha)
Weir-142	MHST-142	D-MHST-142	TRANSVERSE	0.5	0	70.5	1.65	0	24.887	10.859
Weir-145	MHST-145	D-MHST-145	TRANSVERSE	1	0	71.25	1.65	0	23.279	9.629
Weir-155	D-MHST-155	MHST-155	TRANSVERSE	1	0	76.45	1.65	0	13.523	4.382
Weir-170	MHST-170	DMHST-170	TRANSVERSE	0.3	0	72.6	1.65	0	0.826	0.539

Table 5: Outfalls

Name	Inflows	Invert Elev. (m)	Rim Elev. (m)	Type	Max. Depth (m)	Max. HGL (m)	Time Max. HGL (M/D/Y)	Max. Total Inflow (L/s)	Max. Flow (L/s)	Total Flow (ML)	Contributing Area (ha)	Contributing Imp. Area (ha)
Carling_OLF	NO	64.6	64.8	FREE	0.05	64.65	10/04/2022 08:12 AM	26	26	0.044	1.367	0.782
Dows-Lake	NO	63.745	66.5	NORMAL	0.54	64.28	10/04/2022 08:14 AM	794.43	794.43	6.991	29.569	13.18
LRT-Corridor	NO	56	57	FREE	0	56	10/04/2022 00:00 AM	4.53	4.53	0.001	0.059	0
Nepean-Bay-Trunk	NO	62.8	65.21	NORMAL	0	62.8	10/04/2022 00:00 AM	155.95	155.95	1.492	5.404	2.914
Preston_Street	NO	60.9	63.76	NORMAL	0.14	61.04	10/04/2022 08:10 AM	47.6	47.6	0.53	2.471	1.526

Table 6: Subcatchments

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
1	24hr-2yr	SA-1	1.216139	3	100	0.016	0.15	1.57	4.67	25	48.41	0	253.12	
10	24hr-2yr	13B_2	0.099916	3	8.07	0.016	0.15	1.57	4.67	25	48.41	42.81	4.72	
11	24hr-2yr	MHST-105-S	0.045673	3	100	0.016	0.15	1.57	4.67	25	48.41	0	9.74	
12	24hr-2yr	BI-SA1-S	0.127648	5	56.48	0.016	0.15	1.57	4.67	25	48.41	19.91	20.83	
13B_1	24hr-2yr	MHST-104-S	0.13	5	100	0.016	0.15	1.57	4.67	25	48.41	0	27.58	
13B_2	24hr-2yr	BI-SA1-S	0.22	5	100	0.016	0.15	1.57	4.67	25	48.41	0	48.28	
14	24hr-2yr	Carling_OLF	0.058029	3	60.27	0.016	0.15	1.57	4.67	25	48.41	18.58	8.03	
14B	24hr-2yr	S-14B	0.1272	3	0	0.016	0.15	1.57	4.67	25	48.41	46.21	6.64	
15	24hr-2yr	S-15	0.364274	3	3.61	0.016	0.15	1.57	4.67	25	48.41	45.48	7.99	
16	24hr-2yr	LRT-Corridor	0.022914	3	0	0.016	0.15	1.57	4.67	25	48.41	45.79	2.13	
17	24hr-2yr	LRT-Corridor	0.036056	3	0	0.016	0.15	1.57	4.67	25	48.41	46.03	2.39	
18	24hr-2yr	Carling_OLF	0.119323	3	3.43	0.016	0.15	1.57	4.67	25	48.41	45.16	3.82	
19	24hr-2yr	S-19	0.2044	3	8.76	0.016	0.15	1.57	4.67	25	48.41	42.77	7.93	
2	24hr-2yr	SA-2	0.711441	3	100	0.016	0.15	1.57	4.67	25	48.41	0	161.24	
20	24hr-2yr	Carling_OLFN1	0.243417	8	0	0.016	0.15	1.57	4.67	25	48.41	46.32	11.07	
21B	24hr-2yr	S-21B	0.432546	10	0	0.016	0.15	1.57	4.67	25	48.41	60.94	50.87	

Table 6: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
22B_1	24hr-2yr	MHST-120-S	0.269974	5	100	0.016	0.15	1.57	4.67	25	48.41	0	56.37	
22B_2	24hr-2yr	MHST-106-S	0.06376	5	100	0.016	0.15	1.57	4.67	25	48.41	0	13.6	
22B_3	24hr-2yr	MSHT-103-S	0.136614	5	100	0.016	0.15	1.57	4.67	25	48.41	0	29.07	
22B_4	24hr-2yr	MHST-102-S	0.073863	5	100	0.016	0.15	1.57	4.67	25	48.41	0	15.76	
22B_5	24hr-2yr	MHST-101-S	0.093958	5	100	0.016	0.15	1.57	4.67	25	48.41	0	20.03	
24	24hr-2yr	MHST-107	0.034783	3	55.8	0.016	0.15	1.57	4.67	25	48.41	20.51	4.77	
25	24hr-2yr	OGS1	0.046463	3	80.56	0.016	0.15	1.57	4.67	25	48.41	9	8.36	
26B	24hr-2yr	S-26B	0.707526	9.406	16.46	0.016	0.15	1.57	4.67	25	48.41	39.44	33.18	
26D	24hr-2yr	S-26D	0.079723	25	0	0.016	0.15	1.57	4.67	25	48.41	46.2	4.23	
27	24hr-2yr	MHST-101-S	0.076061	3	61.17	0.016	0.15	1.57	4.67	25	48.41	17.79	12.54	
28	24hr-2yr	MHST-102-S	0.076646	5	63.2	0.016	0.15	1.57	4.67	25	48.41	16.84	13.08	
29	24hr-2yr	7	0.011277	3	0	0.016	0.15	1.57	4.67	25	48.41	46.76	0.29	
2B	24hr-2yr	SA-2	0.090802	3	100	0.016	0.15	1.57	4.67	25	48.41	0	19.37	
3	24hr-2yr	S-3	0.21539	3	31.75	0.016	0.15	1.57	4.67	25	48.41	35.43	30.38	
3B	24hr-2yr	3	0.0393	3	100	0.016	0.15	1.57	4.67	25	48.41	0	8.38	
4	24hr-2yr	2	0.019571	3	100	0.016	0.15	1.57	4.67	25	48.41	0	4.18	
40	24hr-2yr	MHST-156	1.18634	6.77	47.28	0.016	0.15	1.57	4.67	25	48.41	24.96	126.58	
41	24hr-2yr	MHST-132	1.522779	3	14.99	0.016	0.15	1.57	4.67	25	48.41	40.73	54.13	
42_1	24hr-2yr	MHST-135-S	0.38897	5	75.19	0.016	0.15	1.57	4.67	25	48.41	11.42	68.72	
42_2	24hr-2yr	MHST-149-S	0.30146	5	75.19	0.016	0.15	1.57	4.67	25	48.41	11.45	52.63	
42_3	24hr-2yr	MHST-150-S1	0.59319	2	75.19	0.016	0.15	1.57	4.67	25	48.41	11.59	98.09	
42_4	24hr-2yr	MHST-141-S	0.45704	2	75.19	0.016	0.15	1.57	4.67	25	48.41	9.73	54.94	PurpleRoof
43	24hr-2yr	SA-CUP	0.56665	2	100	0.016	0.15	1.57	4.67	25	48.41	0	119.97	
44	24hr-2yr	MHST-62534	12.74513	1	32.06	0.016	0.15	1.57	4.67	25	48.41	32.56	890.04	
45	24hr-2yr	63	0.36482	4	25.66	0.016	0.15	1.57	4.67	25	48.41	35.14	23.52	
45_A	24hr-2yr	MHST-138	0.192111	4	0	0.016	0.15	1.57	4.67	25	48.41	46.71	5.27	
46	24hr-2yr	21B	0.887972	10	21	0.016	0.15	1.57	4.67	25	48.41	41.08	76.72	

Table 6: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
47_1	24hr-2yr	D-MHST-155-S	0.11038	3	65.86	0.016	0.15	1.57	4.67	25	48.41	15.77	17.55	
47_2	24hr-2yr	MHST-148-S	0.46158	3	65.86	0.016	0.15	1.57	4.67	25	48.41	16.09	66.34	
47_3	24hr-2yr	MHST-147-S	0.19065	3	65.86	0.016	0.15	1.57	4.67	25	48.41	15.88	29.06	
47_4	24hr-2yr	MHST-146-S	0.40137	3	65.86	0.016	0.15	1.57	4.67	25	48.41	16.05	58.29	
47_5	24hr-2yr	MHST-157-S	0.25086	3	65.86	0.016	0.15	1.57	4.67	25	48.41	15.94	37.56	
48	24hr-2yr	R-48	0.137722	2	100	0.016	0.4	1.57	4.67	25	48.41	0	29.15	
49	24hr-2yr	R-49	0.16391	2	100	0.016	0.4	1.57	4.67	25	48.41	0	34.51	
5	24hr-2yr	preston	0.012005	3	100	0.016	0.15	1.57	4.67	25	48.41	0	2.56	
50	24hr-2yr	R-50	0.34548	2	100	0.016	0.4	1.57	4.67	25	48.41	0	68.5	
51_1	24hr-2yr	MH-SA51-1	0.637265	2	30	0.016	0.15	1.57	4.67	25	48.41	4.88	0.74	PurpleRoof
51_2	24hr-2yr	MH-SA51-2	0.637265	2	30	0.016	0.15	1.57	4.67	25	48.41	4.88	0.74	PurpleRoof
52	24hr-2yr	R-52	0.39976	2	100	0.016	0.4	1.57	4.67	25	48.41	0	77.55	
53	24hr-2yr	R-53	0.173497	2	100	0.016	0.4	1.57	4.67	25	48.41	0	36.44	
54	24hr-2yr	R-54	0.17076	2	100	0.016	0.4	1.57	4.67	25	48.41	0	35.89	
55	24hr-2yr	MH-SA55	0.353278	2	30	0.016	0.15	1.57	4.67	25	48.41	4.86	0.41	PurpleRoof
56	24hr-2yr	MH-SA56	0.945966	2	86.18	0.016	0.15	1.57	4.67	25	48.41	6.43	172.24	
57	24hr-2yr	Carling_OLF1	0.154931	15	6.12	0.016	0.15	1.57	4.67	25	48.41	43.14	12.75	
58	24hr-2yr	46	0.442854	16	33.5	0.016	0.15	1.57	4.67	25	48.41	31.2	37.8	
59	24hr-2yr	MHST-133	0.753001	2	90.56	0.016	0.15	1.57	4.67	25	48.41	4.38	139.66	
6	24hr-2yr	3	0.1396	3	2.06	0.016	0.15	1.57	4.67	25	48.41	45.73	4.43	
60	24hr-2yr	S-60	0.217787	25	0	0.016	0.15	1.57	4.67	25	48.41	51.7	34.9	
60A	24hr-2yr	60B	0.243636	25	19.96	0.016	0.15	1.57	4.67	25	48.41	37.16	18.07	
60B	24hr-2yr	60	0.39679	25	0	0.016	0.15	1.57	4.67	25	48.41	62.18	42.54	
60C	24hr-2yr	60B	0.507297	25	35	0.016	0.15	1.57	4.67	25	48.41	30.4	46.22	
61	24hr-2yr	CBMHST-104	0.65834	3	62.04	0.016	0.15	1.57	4.67	25	48.41	17.82	91.77	
62	24hr-2yr	POW_D1	0.266185	4.97	68.32	0.016	0.15	1.57	4.67	25	48.41	15.16	34.56	
62A	24hr-2yr	POW_D1	0.519395	6	0.04	0.016	0.15	1.57	4.67	25	48.41	47.72	3.19	

Table 6: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
62B	24hr-2yr	62	0.07117	3	0	0.016	0.15	1.57	4.67	25	48.41	47.53	0.63	
62C	24hr-2yr	POW_D1	1.13365	5	58.05	0.016	0.15	1.57	4.67	25	48.41	20.17	108.07	
63	24hr-2yr	S-63	0.41268	2	49.11	0.016	0.15	1.57	4.67	25	48.41	26.53	81.72	
64	24hr-2yr	CHAMBER-102	0.16771	6	78.06	0.016	0.15	1.57	4.67	25	48.41	10.06	31.09	
65	24hr-2yr	MHST-137	0.523363	3.598	41.91	0.016	0.15	1.57	4.67	25	48.41	27.81	46.53	
7	24hr-2yr	2	0.016512	3	100	0.016	0.15	1.57	4.67	25	48.41	0	3.66	
8	24hr-2yr	2	0.01883	3	100	0.016	0.15	1.57	4.67	25	48.41	0	4.02	
9	24hr-2yr	1	0.019216	3	100	0.016	0.15	1.57	4.67	25	48.41	0	4.1	

PCSWMM Report

24 Hour - 5 Year Storm

Model Partial Green Roof_November-2023.inp

Parsons

November 24, 2023

Table of Contents

Summary 1: Runoff quantity continuity

Name	Partial Green Roof_November-2023
Initial LID storage (mm)	0.247
Initial snow cover (mm)	n/a
Total precipitation (mm)	64.034
Outfall runon (mm)	n/a
Evaporation loss (mm)	0.000
Infiltration loss (mm)	29.966
Surface runoff (mm)	30.711
LID drainage (mm)	0.885
Snow removed (mm)	n/a
Final snow cover (mm)	n/a
Final storage (mm)	2.739
Continuity error (%)	-0.032

Summary 2: Flow routing continuity

Name	Partial Green Roof_November-2023
Dry weather inflow (ML)	0.000
Wet weather inflow (ML)	11.833
Groundwater inflow (ML)	0.000
RDII inflow (ML)	0.000
External inflow (ML)	1.151
External outflow (ML)	12.855
Flooding loss (ML)	0.000
Evaporation loss (ML)	0.000
Exfiltration loss (ML)	0.000
Initial stored volume (ML)	0.000
Final stored volume (ML)	0.290
Continuity error (%)	-1.239

Figure 1: Extent 1

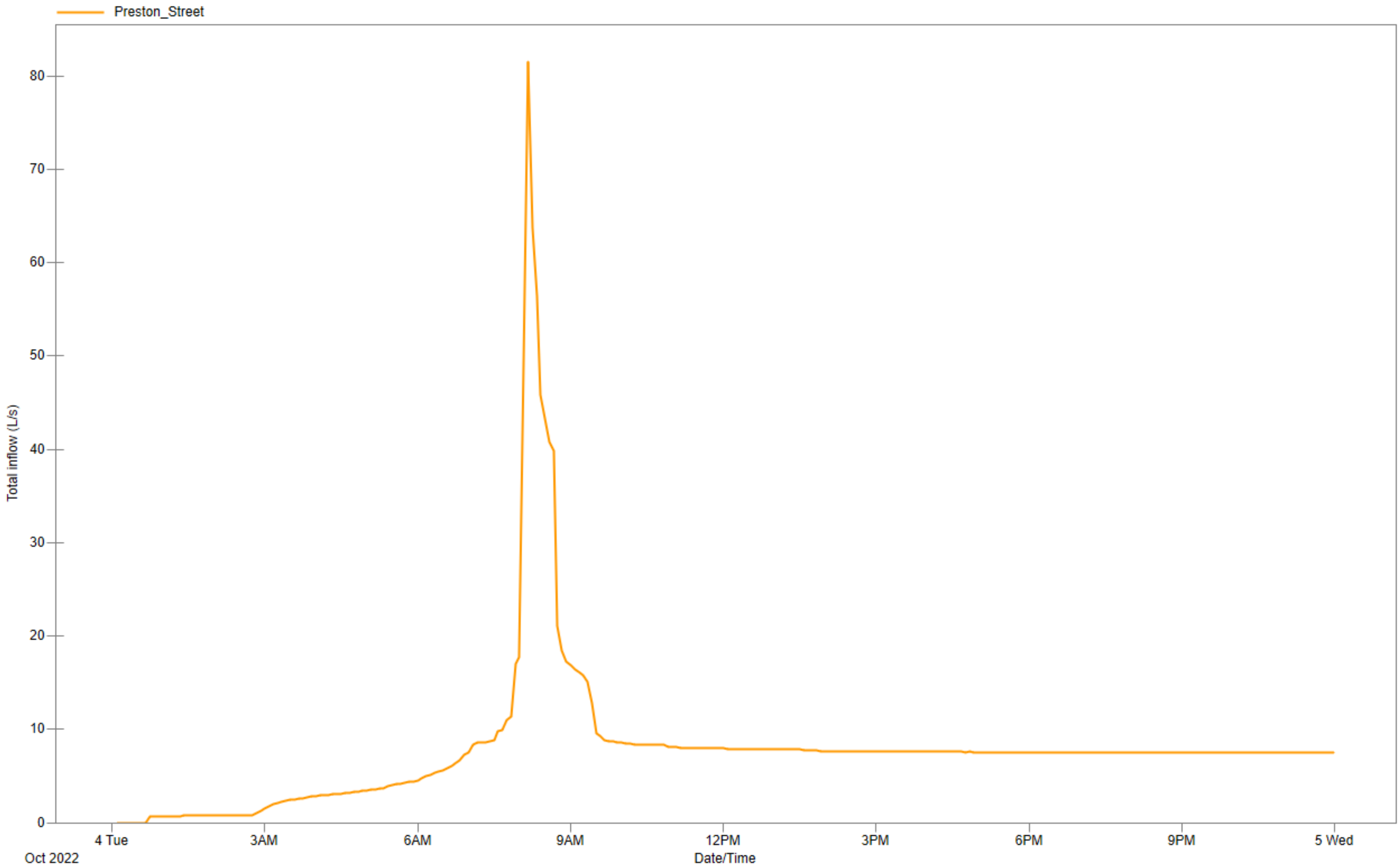


Figure 2: Preston Outfall

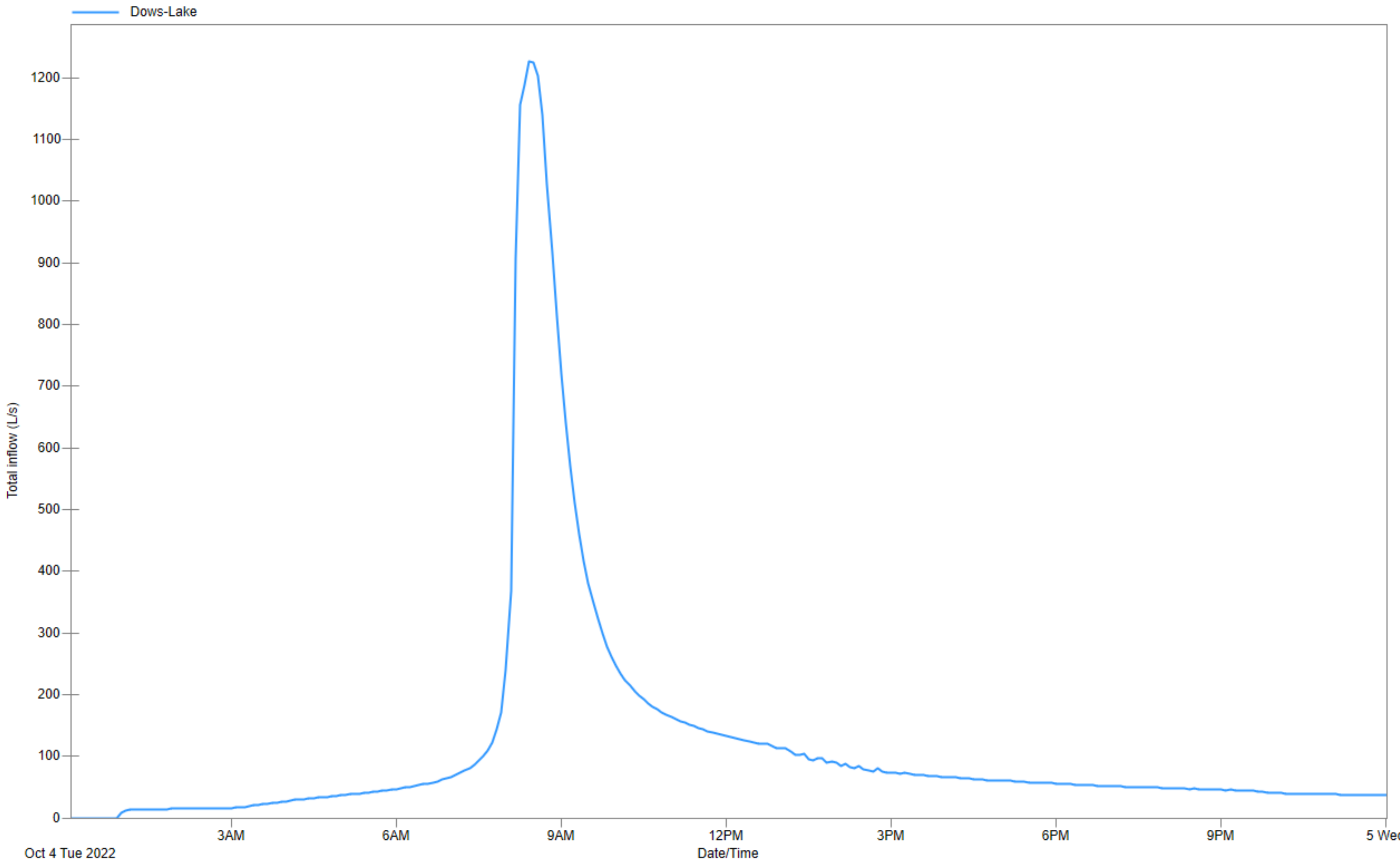


Figure 3: Dows Lake Outfall

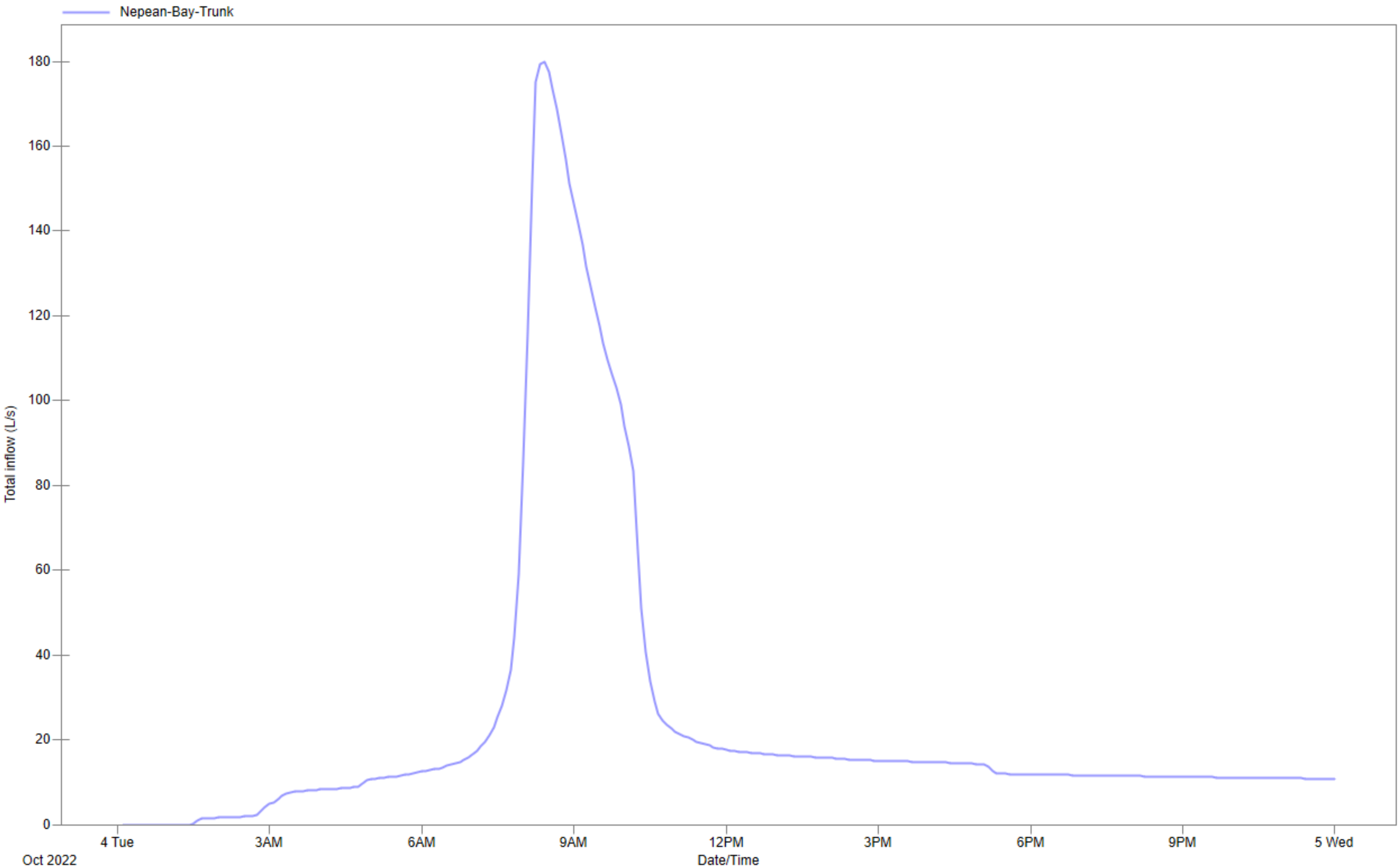


Figure 4: Nepean Bay Outfall

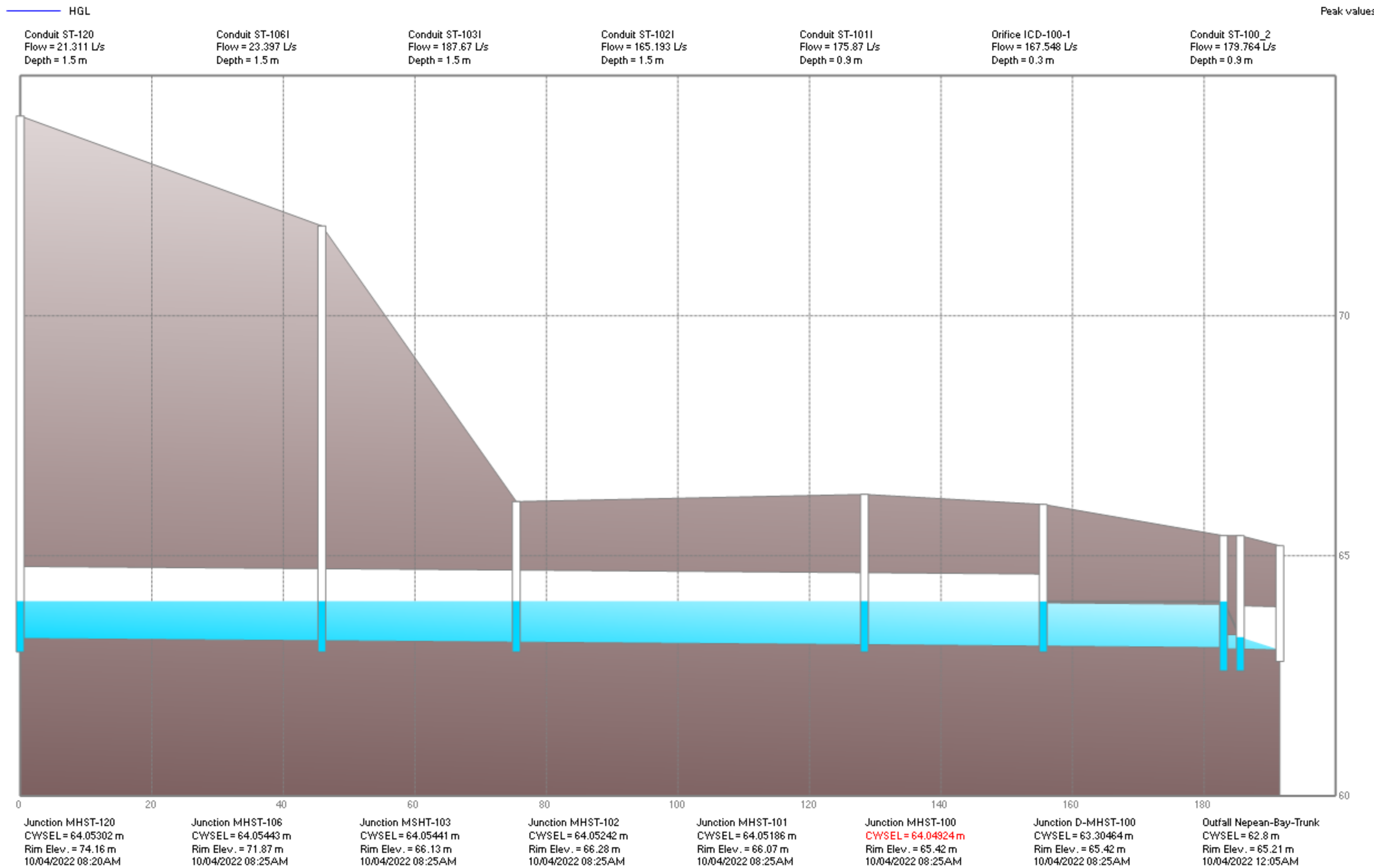


Figure 5: Road A

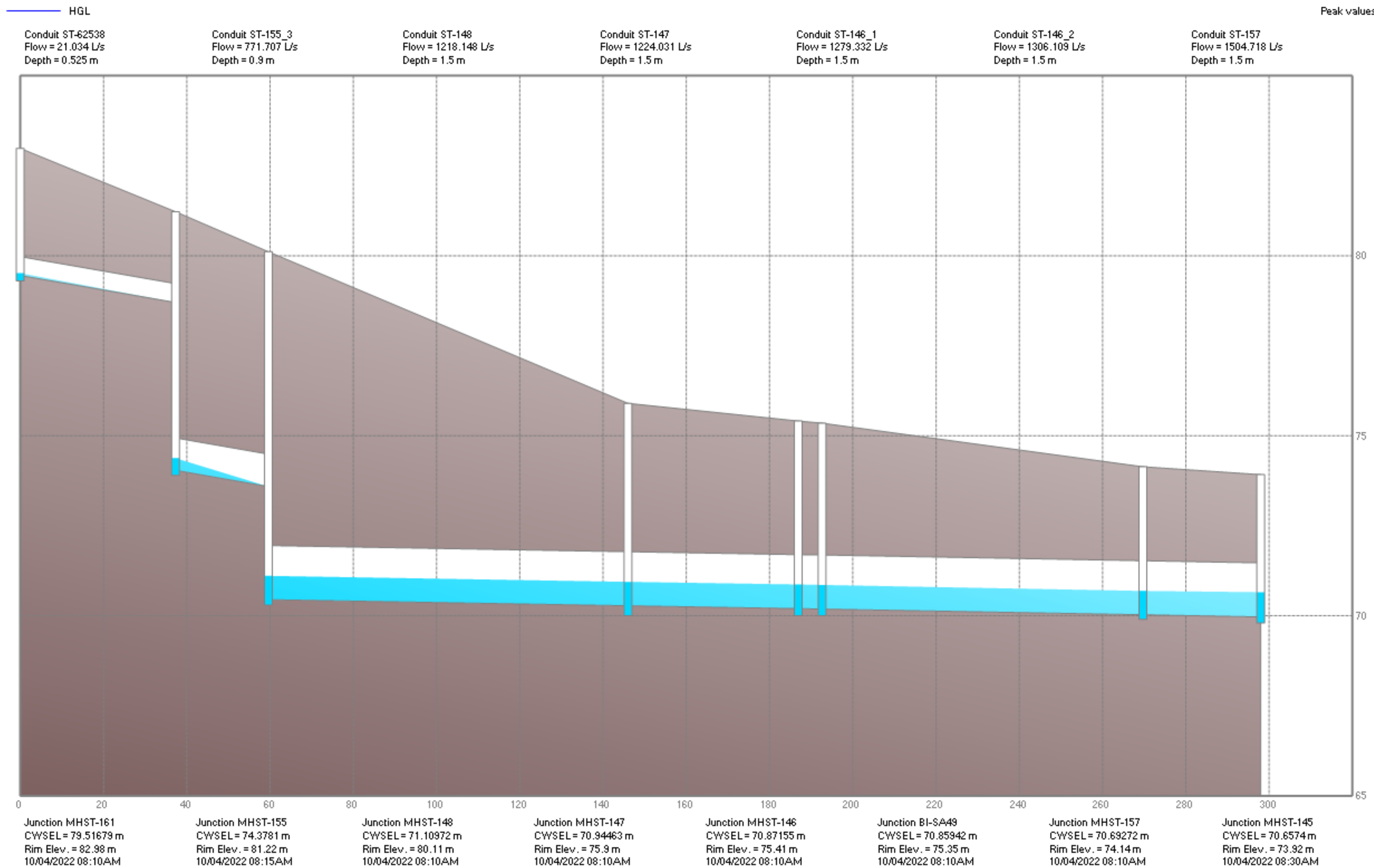


Figure 6: Road D

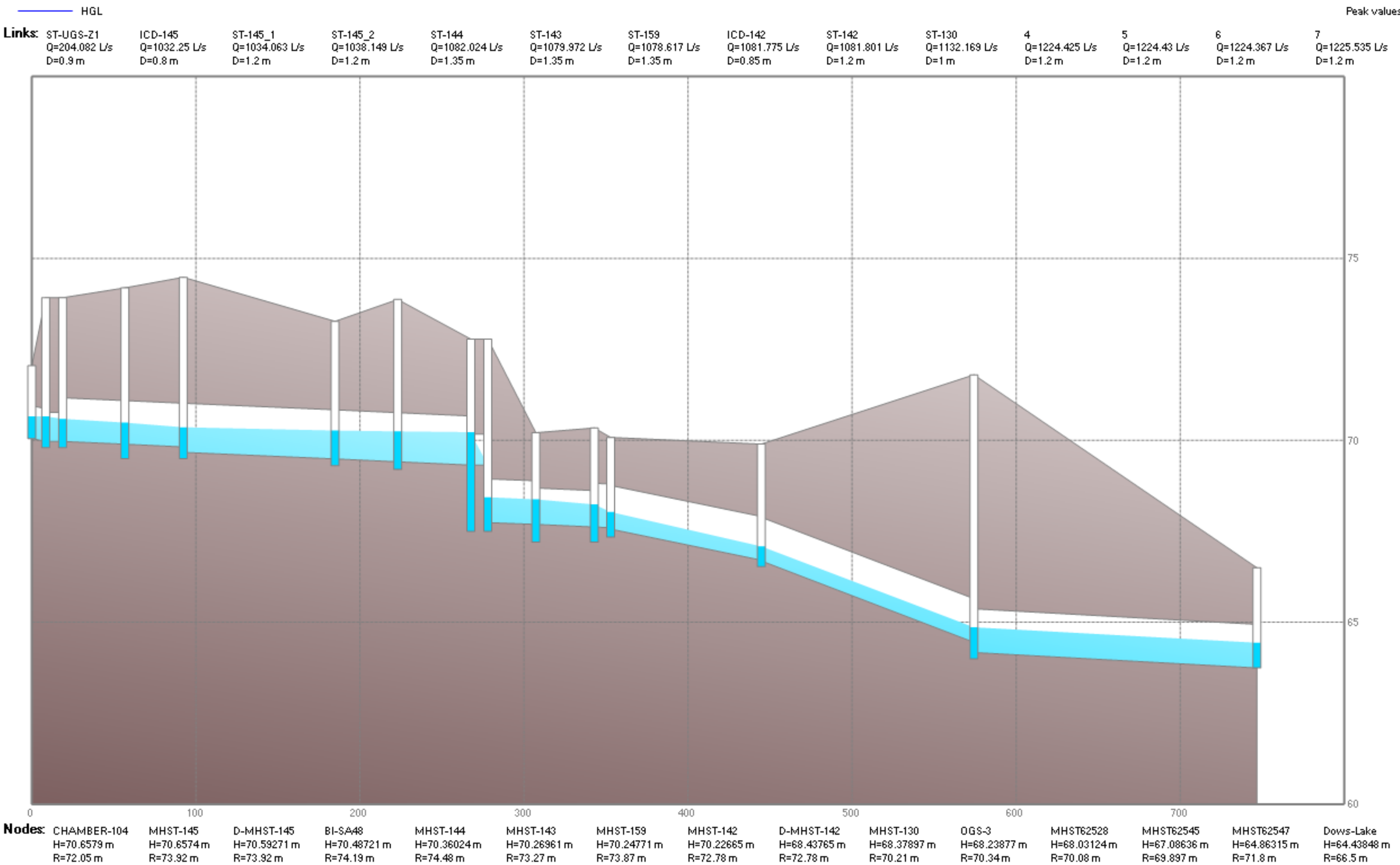


Figure 7: Road D to Outfall

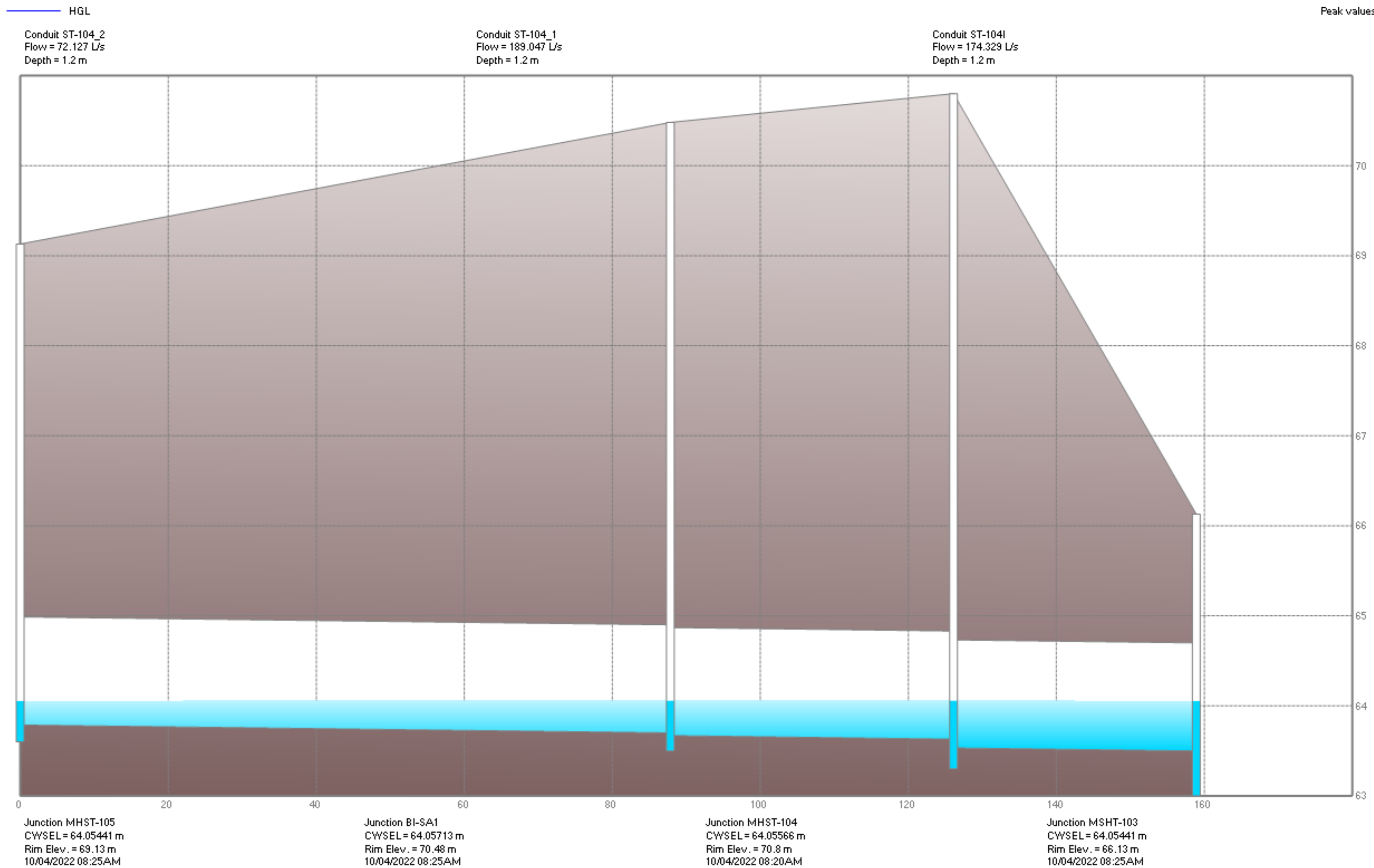


Figure 8: Road B

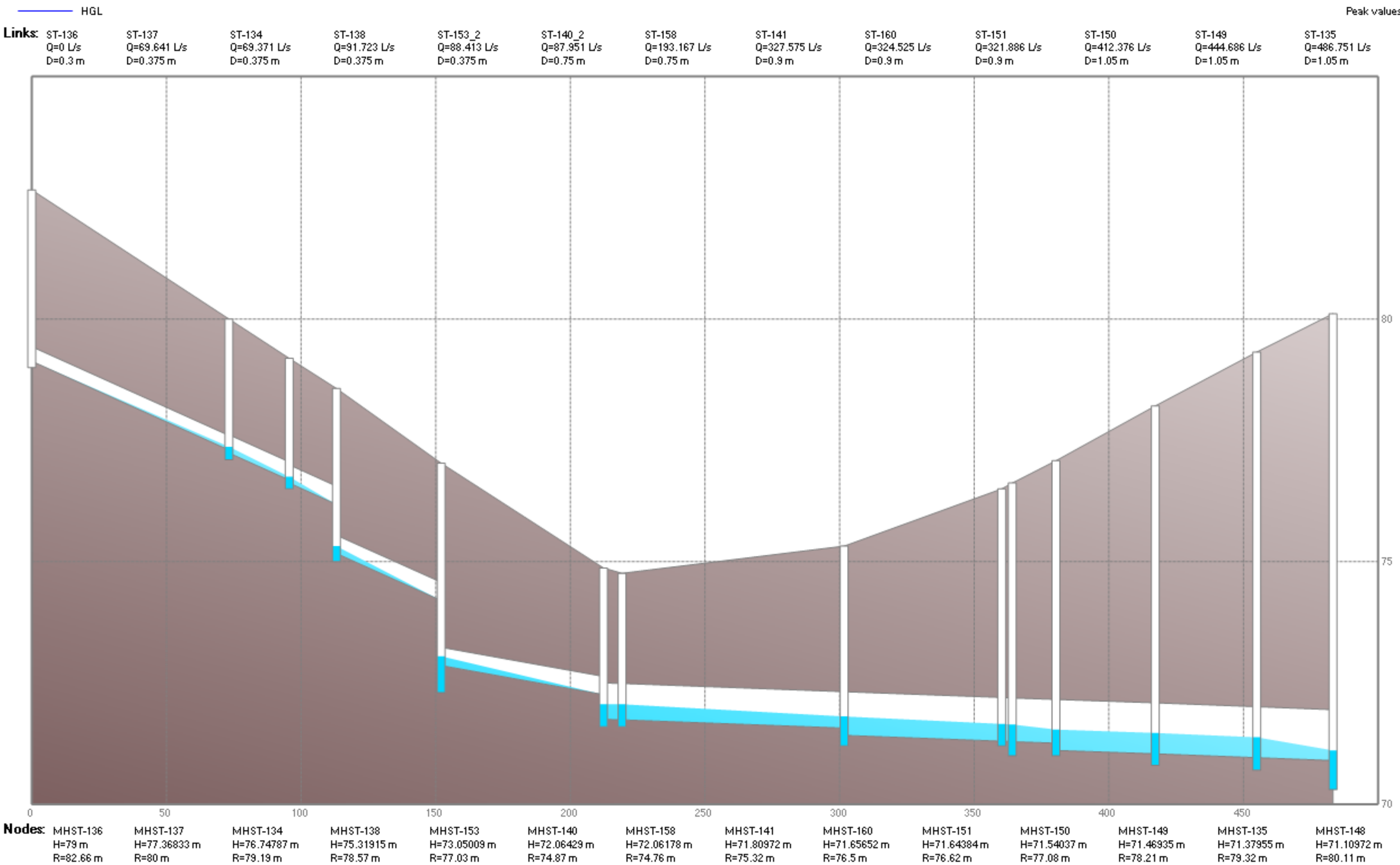


Figure 9: Road E

Table 1: Orifices

Name	Inlet Node	Outlet Node	Type	Cross-Section	Height (m)	Inlet Elev. (m)	Discharge Coeff.	Max. |Flow| (L/s)	Contributing Area (ha)	Contributing Imp. Area (ha)
ICD-100-1	MHST-100	D-MHST-100	SIDE	CIRCULAR	0.3	63.06	0.62	167.99	3.641	2.579
ICD-100-2	MHST-100	D-MHST-100	SIDE	CIRCULAR	0.1	63.85	0.62	8.45	3.641	2.579
ICD-142	MHST-142	D-MHST-142	SIDE	CIRCULAR	0.85	69.32	0.62	1082.53	24.887	10.859
ICD-145	MHST-145	D-MHST-145	SIDE	RECT_CLOSED	0.8	69.97	0.62	1036.99	23.279	9.629
ICD-155	D-MHST-155	MHST-155	SIDE	CIRCULAR	0.675	74.1	0.62	763.88	13.523	4.382
ICD-170	MHST-170	DMHST-170	SIDE	CIRCULAR	0.1	71.96	0.62	16.95	0.826	0.539

Table 2: Conduits

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
1	MHST-158-S	S-60	295	0.035	74.95	69.04	TRAPEZOIDAL	0.5	0.02004	0	0
10	CBMHST105	CBMHST103	17.6	0.013	72.4	72.13	CIRCULAR	0.375	0.01534	142.68	1.98
2	MHST-105-S	Wales-OLF-N03	17	0.016	68.69	68.2	IRREGULAR	0	0.02884	13.3	0.6
3	Preston	Preston_Street	10	0.013	61.03	60.9	CIRCULAR	0.3	0.013	82	1.71
4	OGS-3	MHST62528	10	0.013	67.62	67.6	CIRCULAR	1.2	0.002	1228.68	2.12
5	MHST62528	MHST62545	91.8	0.013	67.56	66.707	CIRCULAR	1.2	0.00929	1228.78	2.97
6	MHST62545	MHST62547	129.6	0.013	66.687	64.45	CIRCULAR	1.2	0.01726	1228.5	3.69
7	MHST62547	Dows-Lake	172.5	0.013	64.17	63.745	CIRCULAR	1.2	0.00246	1226.83	1.81
8	POW_D1	OGS-3	180	0.035	78.7	69.7	TRAPEZOIDAL	0.55	0.05006	210.79	1.27
8_1	CHAMBER-103	D-MHST-155	3.1	0.013	74.12	74.1	CIRCULAR	0.9	0.00645	763.88	1.2
9	CBMHST103	CHAMBER-102	2.6	0.013	72.1	72.07	CIRCULAR	0.375	0.01154	142.66	1.84
CA-OLF_2	Carling_OLF1	Carling_OLFN1	120.425	0.016	66.5	65.408	IRREGULAR	0	0.00907	28.67	0.48
CA-OLF_3	Carling_OLFN3	Carling_OLF	66.467	0.016	64.8	64.6	IRREGULAR	0	0.00301	64.68	0.48
CA-OLF_4	Carling_OLFN1	Carling_OLFN3	67.075	0.016	65.408	64.8	IRREGULAR	0	0.00906	54.19	0.45
CA-STM	IN119607	D-MHST-100	86	0.013	63.1	62.8	CIRCULAR	0.3	0.00349	5.84	0.11

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-100_2	D-MHST-100	Nepean-Bay-Trunk	6	0.013	63.06	63.04	CIRCULAR	0.9	0.00333	180.23	1.3
ST-100-S	MHST-100-S	Carling_OLFN3	11	0.013	65.42	64.8	IRREGULAR	0	0.05645	31.11	0.42
ST-101I	MHST-101	MHST-100	27.419	0.013	63.12	63.09	CIRCULAR	0.9	0.00109	176.53	0.5
ST-101I-S	MHST-101-S	MHST-100-S	27.419	0.013	66.07	65.42	IRREGULAR	0	0.02371	31.23	0.69
ST-102	CBMHST-101	CBMHST105	48	0.013	73.63	72.43	CIRCULAR	0.375	0.02501	142.08	2.46
ST-102I	MHST-102	MHST-101	27.18	0.013	63.15	63.12	CIRCULAR	1.5	0.0011	169.75	0.4
ST-102I-S	MHST-102-S	MHST-101-S	27.18	0.013	66.28	66.07	IRREGULAR	0	0.00773	11.71	0.26
ST-103I	MSHT-103	MHST-102	52.936	0.013	63.203	63.15	CIRCULAR	1.5	0.001	188	0.47
ST-103I-S	MSHT-103-S	MHST-102-S	52.936	0.013	66.13	66.28	IRREGULAR	0	-0.00283	7.09	0.14
ST-104	CBMHST-104	CBMHST-101	15.1	0.013	74.14	73.84	CIRCULAR	0.375	0.01987	142.43	2.33
ST-104_1	BI-SA1	MHST-104	38.268	0.013	63.67	63.631	CIRCULAR	1.2	0.00102	189.53	1.07
ST-104_2	MHST-105	BI-SA1	87.842	0.013	63.788	63.7	CIRCULAR	1.2	0.001	73.75	0.48
ST-104I	MHST-104	MSHT-103	32.803	0.013	63.533	63.5	CIRCULAR	1.2	0.00101	197.57	1.06
ST-105I_1-S	BI-SA1-S	MHST-105-S	87.84	0.013	70.15	68.64	IRREGULAR	0	0.01719	74.03	0.6
ST-105I_2-S	MHST-104-S	BI-SA1-S	37.727	0.013	70.8	70.15	IRREGULAR	0	0.01723	21.61	0.38
ST-106I	MHST-106	MSHT-103	29.577	0.013	63.233	63.203	CIRCULAR	1.5	0.00101	36.63	0.1
ST-106I-S	MHST-106-S	MSHT-103-S	29.577	0.013	71.87	66.13	IRREGULAR	0	0.19783	43.57	0.93
ST-107	DMHST-170	MHST-158	13.5	0.013	71.93	71.8	CIRCULAR	0.3	0.00963	31.54	1.14
ST-108	CBMH108	CBMH109	35.7	0.013	71.56	71.49	CIRCULAR	0.6	0.00196	15.02	0.52
ST-109	CBMH109	CBMH110	20.8	0.013	71.49	71.45	CIRCULAR	0.6	0.00192	15	0.53
ST-110	CBMH110	MHST-135	17.9	0.013	71.45	71.41	CIRCULAR	0.6	0.00223	15	0.63
ST-111	CBMH111	CBMH108	15.3	0.013	71.59	71.56	CIRCULAR	0.6	0.00196	15.09	0.52
ST-120	MHST-120	MHST-106	45.853	0.013	63.278	63.233	CIRCULAR	1.5	0.00098	33.93	0.14
ST-120-S	MHST-120-S	MHST-106-S	45.853	0.013	74.16	71.87	IRREGULAR	0	0.05	30.31	0.88
ST-130	MHST-130	OGS-3	35.6	0.013	67.69	67.62	CIRCULAR	1	0.00197	1132.94	2.09
ST-131	MHST-131	MHST-130	47.9	0.013	68.12	68.07	CIRCULAR	0.825	0.00104	200.71	1.15
ST-132	MHST-132	MHST-156	41.86	0.013	73.25	72.62	CIRCULAR	0.45	0.01505	97.19	1.89

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-133	MHST-133	MHST-131	51.37	0.013	68.17	68.12	CIRCULAR	0.825	0.00097	202.78	0.94
ST-134	MHST-134	MHST-138	17.5	0.013	76.62	76.18	CIRCULAR	0.375	0.02515	69.84	2.1
ST-135	MHST-135	MHST-148	28.3	0.013	70.96	70.9	CIRCULAR	1.05	0.00212	506.53	1.62
ST-136	MHST-136	MHST-137	73.2	0.013	79.13	77.3	CIRCULAR	0.3	0.02501	0	0
ST-137	MHST-137	MHST-134	22.4	0.013	77.24	76.68	CIRCULAR	0.375	0.02501	69.84	2.09
ST-138	MHST-138	MHST-153	38.9	0.013	75.17	74.2	CIRCULAR	0.375	0.02494	93.05	2.26
ST-139	MHST-139	MHST-133	72.94	0.013	68.32	68.25	CIRCULAR	0.75	0.00096	18.46	0.39
ST-140_2	MHST-140	MHST-158	6.9	0.013	71.75	71.74	CIRCULAR	0.75	0.00145	91.81	0.5
ST-141	MHST-141	MHST-160	58.5	0.013	71.42	71.3	CIRCULAR	0.9	0.00205	339.66	1.33
ST-141-S	MHST-151-S	MHST-141-S	70.7	0.013	76.58	75.32	IRREGULAR	0	0.01782	156.82	0.93
ST-142	D-MHST-142	MHST-130	29.3	0.013	67.74	67.69	CIRCULAR	1.2	0.00171	1082.72	1.6
ST-143	MHST-143	MHST-159	38.2	0.013	69.49	69.41	CIRCULAR	1.35	0.00209	1080.09	1.3
ST-144	MHST-144	MHST-143	92.5	0.013	69.67	69.49	CIRCULAR	1.35	0.00195	1084.1	1.45
ST-145_1	D-MHST-145	BI-SA48	38	0.013	69.97	69.894	CIRCULAR	1.2	0.002	1036.94	1.8
ST-145_2	BI-SA48	MHST-144	35.6	0.013	69.894	69.82	CIRCULAR	1.2	0.00208	1040.08	1.95
ST-146_1	MHST-146	BI-SA49	5.7	0.013	70.2	70.189	CIRCULAR	1.5	0.00193	1403.95	1.75
ST-146_1-S	MHST-146-S	BI-SA49-S	5.693	0.013	75.44	75.351	IRREGULAR	0	0.01564	58.22	0.6
ST-146_2	BI-SA49	MHST-157	77.1	0.013	70.189	70.03	CIRCULAR	1.5	0.00206	1430.33	1.81
ST-146_2-S	BI-SA49-S	MHST-157-S	77.118	0.013	75.351	74.14	IRREGULAR	0	0.01571	36.95	0.39
ST-147	MHST-147	MHST-146	40.9	0.013	70.28	70.2	CIRCULAR	1.5	0.00196	1335.24	1.67
ST-147-S	MHST-147-S	MHST-146-S	40.768	0.013	75.9	75.44	IRREGULAR	0	0.01128	56.82	0.53
ST-148	MHST-148	MHST-147	86.4	0.013	70.45	70.28	CIRCULAR	1.5	0.00197	1309	1.66
ST-148-S	MHST-148-S	MHST-147-S	93.313	0.013	80.11	75.9	IRREGULAR	0	0.04516	37.39	0.51
ST-149	MHST-149	MHST-135	37.7	0.013	71.04	70.96	CIRCULAR	1.05	0.00212	462.02	1.39
ST-149-S	MHST-135-S	MHST-149-S	34.9	0.013	79.32	78.21	IRREGULAR	0	0.03182	70.43	0.67
ST-150	MHST-150	MHST-149	36.9	0.013	71.11	71.04	CIRCULAR	1.05	0.0019	422.63	1.25
ST-150-S	MHST-149-S	MHST-150-S1	45	0.013	78.21	77.08	IRREGULAR	0	0.02512	108.5	0.59

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-151	MHST-151	MHST-150	16.2	0.013	71.29	71.26	CIRCULAR	0.9	0.00185	339.94	1.49
ST-151-S	MHST-150-S1	MHST-151-S	16.1	0.013	77.08	76.58	IRREGULAR	0	0.03107	158.64	1.06
ST-153_2	MHST-153	MHST-140	60.3	0.013	72.86	72.26	CIRCULAR	0.375	0.00995	92.08	1.61
ST-154	MHST-154	CHAMBER-103	16	0.013	75.8	75.72	CIRCULAR	0.9	0.005	1459.37	2.66
ST-154A	MHST-154A	MHST-154B	15.51	0.013	76.18	76.1	CIRCULAR	0.9	0.00516	1461.06	2.67
ST-154B	MHST-154B	MHST-154	35.9	0.013	76.04	75.86	CIRCULAR	0.9	0.00501	1457.98	2.62
ST-155_2-S	D-MHST-155-S	MHST-148-S	52.7	0.013	83.11	80.11	IRREGULAR	0	0.05702	6.54	0.26
ST-155_3	MHST-155	MHST-148	22.3	0.013	74.04	73.59	CIRCULAR	0.9	0.02018	772.47	3.53
ST-156	MHST-156	MHST-157	35.51	0.013	70.1	70.03	CIRCULAR	1.5	0.00197	283.42	0.58
ST-157	MHST-157	MHST-145	28.3	0.013	70.03	69.97	CIRCULAR	1.5	0.00212	1639.03	2.15
ST-157-S	MHST-157-S	MHST-145-S	28.171	0.013	74.14	73.92	IRREGULAR	0	0.00781	57.85	0.37
ST-158	MHST-158	MHST-141	82.5	0.013	71.74	71.57	CIRCULAR	0.75	0.00206	208.1	1.25
ST-158-S	MHST-141-S	MHST-158-S	75.107	0.013	75.32	74.85	IRREGULAR	0	0.00626	96.98	0.56
ST-159	MHST-159	MHST-142	44.6	0.013	69.41	69.32	CIRCULAR	1.35	0.00202	1078.83	1.14
ST-160	MHST-160	MHST-151	3.95	0.013	71.3	71.29	CIRCULAR	0.9	0.00253	339.57	1.41
ST-162	CBMHST-162	MHST-154A	5.35	0.013	76.27	76.24	CIRCULAR	0.9	0.00561	1376.07	2.61
ST-62534	MHST-62534	CBMHST-162	7.16	0.013	76.3	76.27	CIRCULAR	0.9	0.00419	1375.92	3.65
ST-62538	MHST-161	MHST-155	37.3	0.013	79.45	78.7	CIRCULAR	0.525	0.02011	21.1	1.32
ST-G107	MHST-107	OGS1	52.5	0.013	62.03	61.24	CIRCULAR	0.3	0.01505	21.69	1.14
ST-OGS1_2	OGS1	Preston	10	0.013	61.21	61.06	CIRCULAR	0.3	0.015	57.12	1.63
ST-P3	DICB3	IN119608	71.1	0.013	64.23	63.8	CIRCULAR	0.2	0.00605	0	0
ST-P46	IN119608	IN119607	30	0.013	63.5	63.2	CIRCULAR	0.2	0.01	0	0
ST-SA1	MH-SA1	BI-SA1	24.65	0.013	69.45	69.08	CIRCULAR	0.3	0.01501	60.25	1.71
ST-SA48	MH-SA48	BI-SA48	10.8	0.013	72	71.78	CIRCULAR	0.3	0.02037	3.19	0.81
ST-SA49	MH-SA49	BI-SA49	21	0.013	72.8	72.38	CIRCULAR	0.3	0.02	4.03	0.86
ST-SA50	MH-SA50	MHST-147	20.47	0.013	73.15	72.74	CIRCULAR	0.45	0.02003	7.64	0.99
ST-SA51-1	MH-SA51-1	MHST-141	32.56	0.013	73.5	73.17	CIRCULAR	0.375	0.01014	3.19	0.62

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-SA51-2	MH-SA51-2	MHST-160	33.2	0.013	73.5	73.17	CIRCULAR	0.45	0.00994	3.19	0.59
ST-SA52	MH-SA52	MHST-139	28.6	0.013	68.92	68.49	CIRCULAR	0.525	0.01504	8.96	0.92
ST-SA53	MH-ST53	MHST-133	24.9	0.013	69.04	68.79	CIRCULAR	0.3	0.01004	4.07	0.68
ST-SA54	MH-SA54	MHST-142	2.45	0.013	71.38	71.33	CIRCULAR	0.3	0.02041	4.01	0.87
ST-SA55	MH-SA55	MHST-143	47.61	0.013	72.5	71.55	CIRCULAR	0.45	0.01996	1.77	0.63
ST-Sa56	MH-SA56	MHST-144	21.47	0.013	72.5	72.07	CIRCULAR	0.45	0.02003	249.06	2.68
ST-UGS6B	CHAMBER-102	MHST-170	10.6	0.013	72.07	71.96	CIRCULAR	0.375	0.01038	67.56	0.78
ST-UGS-Z1	CHAMBER-104	MHST-145	8.42	0.013	70.05	69.97	CIRCULAR	0.9	0.0095	1004.73	3.37
ST-xx	MH-SAxx	MHST-107	10.7	0.013	62.45	62.15	CIRCULAR	0.2	0.02805	7.01	1.21
WD-OLF_3	Wales-OLF-N03	Wales-OLF-N04	81.193	0.016	68.2	66.75	IRREGULAR	0	0.01786	13.06	0.69
WD-OLF_4	Wales-OLF-N04	Wales-OLF-N05	94.991	0.016	66.75	65.5	IRREGULAR	0	0.01316	10.34	0.66

Table 3: Storages

Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)	Hours Flooded (h)	Max. Flood Rate (L/s)	Total Flood Vol. (ML)	Avg. Percent Full (%)	Max. Volume (1000 m³)	Max. Percent Full (%)	Max. Outflow (L/s)
CHAMBER-102	72.07	73.32	1.25	0.6	72.67	186.22	0	0	0	11	0.15	48	67.56
CHAMBER-103	74.12	77.12	3	0.93	75.05	1459.37	0	0	0	4	0.651	31	763.88
CHAMBER-104	70.05	72.05	2	0.61	70.66	1004.73	0	0	0	5	0.915	30	208.44
R-48	73	73.15	0.15	0.03	73.03	39.7	0	0	0	9	0.045	23	3.19
R-49	74	74.15	0.15	0.03	74.03	47.09	0	0	0	8	0.053	22	4.03
R-50	77	77.15	0.15	0.03	77.03	95.14	0	0	0	9	0.114	22	7.64
R-52	69	69.15	0.15	0.03	69.03	108.26	0	0	0	8	0.131	22	8.96
R-53	70	70.15	0.15	0.03	70.03	49.78	0	0	0	8	0.057	22	4.07
R-54	72	72.15	0.15	0.03	72.03	49.01	0	0	0	8	0.056	22	4.01
S-14B	61.65	63.3	1.65	1.51	63.16	23	0	0	0	1	0.001	5	18.84

Table 3: Storages (continued...)

Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)	Hours Flooded (h)	Max. Flood Rate (L/s)	Total Flood Vol. (ML)	Avg. Percent Full (%)	Max. Volume (1000 m³)	Max. Percent Full (%)	Max. Outflow (L/s)
S-15	62.1	63.9	1.8	1.48	63.58	30.94	0	0	0	1	0.017	16	7.16
S-19	64	66	2	1.54	65.54	24.94	0	0	0	0	0.014	5	3.65
S-21B	63.54	65.7	2.16	1.71	65.25	138.87	0	0	0	7	0.213	17	3.85
S-26B	67.33	69.7	2.37	1.86	69.19	77.64	0	0	0	1	0.048	16	14.03
S-26D	67.66	69.31	1.65	1.22	68.88	14.53	0	0	0	0	0.003	6	3.21
S-3	62.2	64.24	2.04	1.66	63.86	63.65	0	0	0	1	0.018	22	23.93
S-60	67.84	70.25	2.41	1.56	69.4	105.95	0	0	0	4	0.047	10	3.68
S-63	78.2	82.42	4.22	3.14	81.34	140.44	0	0	0	0	0.016	6	85.97
SA-1	69.5	72.5	3	1.05	70.55	348.88	0	0	0	4	0.232	35	60
SA-2	62.6	65.6	3	0.97	63.57	247.05	0	0	0	18	0.292	32	7
SA-CUP	72.5	75.5	3	0.26	72.76	163.35	0	0	0	2	0.132	9	15

Table 4: Weirs

Name	Inlet Node	Outlet Node	Type	Height (m)	Side Slope (m/m)	Inlet Elev. (m)	Discharge Coeff. (m³/s)	Max. |Flow| (L/s)	Contributing Area (ha)	Contributing Imp. Area (ha)
Weir-142	MHST-142	D-MHST-142	TRANSVERSE	0.5	0	70.5	1.65	0	24.887	10.859
Weir-145	MHST-145	D-MHST-145	TRANSVERSE	1	0	71.25	1.65	0	23.279	9.629
Weir-155	D-MHST-155	MHST-155	TRANSVERSE	1	0	76.45	1.65	0	13.523	4.382
Weir-170	MHST-170	DMHST-170	TRANSVERSE	0.3	0	72.6	1.65	14.59	0.826	0.539

Table 5: Outfalls

Name	Inflows	Invert Elev. (m)	Rim Elev. (m)	Type	Max. Depth (m)	Max. HGL (m)	Time Max. HGL (M/D/Y)	Max. Total Inflow (L/s)	Max. Flow (L/s)	Total Flow (ML)	Contributing Area (ha)	Contributing Imp. Area (ha)
Carling_OLF	NO	64.6	64.8	FREE	0.08	64.68	10/04/2022 08:12 AM	82.24	82.24	0.102	1.367	0.782
Dows-Lake	NO	63.745	66.5	NORMAL	0.69	64.44	10/04/2022 08:24 AM	1226.83	1226.83	9.994	29.569	13.18
LRT-Corridor	NO	56	57	FREE	0	56	10/04/2022 00:00 AM	12.24	12.24	0.006	0.059	0
Nepean-Bay-Trunk	NO	62.8	65.21	NORMAL	0	62.8	10/04/2022 00:00 AM	180.23	180.23	2.076	5.404	2.914
Preston_Street	NO	60.9	63.76	NORMAL	0.19	61.09	10/04/2022 08:10 AM	82	82	0.678	2.471	1.526

Table 6: Subcatchments

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
1	24hr-5yr	SA-1	1.216139	3	100	0.016	0.15	1.57	4.67	25	64.03	0	348.5	
10	24hr-5yr	13B_2	0.099916	3	8.07	0.016	0.15	1.57	4.67	25	64.03	50.14	15.11	
11	24hr-5yr	MHST-105-S	0.045673	3	100	0.016	0.15	1.57	4.67	25	64.03	0	13.22	
12	24hr-5yr	BI-SA1-S	0.127648	5	56.48	0.016	0.15	1.57	4.67	25	64.03	23.34	33.19	
13B_1	24hr-5yr	MHST-104-S	0.13	5	100	0.016	0.15	1.57	4.67	25	64.03	0	37.52	
13B_2	24hr-5yr	BI-SA1-S	0.22	5	100	0.016	0.15	1.57	4.67	25	64.03	0	72.34	
14	24hr-5yr	Carling_OLF	0.058029	3	60.27	0.016	0.15	1.57	4.67	25	64.03	21.8	12.8	
14B	24hr-5yr	S-14B	0.1272	3	0	0.016	0.15	1.57	4.67	25	64.03	54.07	23	
15	24hr-5yr	S-15	0.364274	3	3.61	0.016	0.15	1.57	4.67	25	64.03	53.72	30.94	
16	24hr-5yr	LRT-Corridor	0.022914	3	0	0.016	0.15	1.57	4.67	25	64.03	53.66	5.04	
17	24hr-5yr	LRT-Corridor	0.036056	3	0	0.016	0.15	1.57	4.67	25	64.03	53.88	7.21	
18	24hr-5yr	Carling_OLF	0.119323	3	3.43	0.016	0.15	1.57	4.67	25	64.03	52.97	14.77	
19	24hr-5yr	S-19	0.2044	3	8.76	0.016	0.15	1.57	4.67	25	64.03	50.24	24.94	
2	24hr-5yr	SA-2	0.711441	3	100	0.016	0.15	1.57	4.67	25	64.03	0	220.56	
20	24hr-5yr	Carling_OLFN1	0.243417	8	0	0.016	0.15	1.57	4.67	25	64.03	54.19	41.11	
21B	24hr-5yr	S-21B	0.432546	10	0	0.016	0.15	1.57	4.67	25	64.03	70.82	138.87	

Table 6: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
22B_1	24hr-5yr	MHST-120-S	0.269974	5	100	0.016	0.15	1.57	4.67	25	64.03	0	77.15	
22B_2	24hr-5yr	MHST-106-S	0.06376	5	100	0.016	0.15	1.57	4.67	25	64.03	0	18.45	
22B_3	24hr-5yr	MSHT-103-S	0.136614	5	100	0.016	0.15	1.57	4.67	25	64.03	0	39.49	
22B_4	24hr-5yr	MHST-102-S	0.073863	5	100	0.016	0.15	1.57	4.67	25	64.03	0	21.38	
22B_5	24hr-5yr	MHST-101-S	0.093958	5	100	0.016	0.15	1.57	4.67	25	64.03	0	27.19	
24	24hr-5yr	MHST-107	0.034783	3	55.8	0.016	0.15	1.57	4.67	25	64.03	23.99	8.08	
25	24hr-5yr	OGS1	0.046463	3	80.56	0.016	0.15	1.57	4.67	25	64.03	10.53	12.34	
26B	24hr-5yr	S-26B	0.707526	9.406	16.46	0.016	0.15	1.57	4.67	25	64.03	46.63	77.64	
26D	24hr-5yr	S-26D	0.079723	25	0	0.016	0.15	1.57	4.67	25	64.03	54.05	14.53	
27	24hr-5yr	MHST-101-S	0.076061	3	61.17	0.016	0.15	1.57	4.67	25	64.03	20.85	19.89	
28	24hr-5yr	MHST-102-S	0.076646	5	63.2	0.016	0.15	1.57	4.67	25	64.03	19.74	20.27	
29	24hr-5yr	7	0.011277	3	0	0.016	0.15	1.57	4.67	25	64.03	54.85	1.33	
2B	24hr-5yr	SA-2	0.090802	3	100	0.016	0.15	1.57	4.67	25	64.03	0	26.28	
3	24hr-5yr	S-3	0.21539	3	31.75	0.016	0.15	1.57	4.67	25	64.03	41.46	63.65	
3B	24hr-5yr	3	0.0393	3	100	0.016	0.15	1.57	4.67	25	64.03	0	11.37	
4	24hr-5yr	2	0.019571	3	100	0.016	0.15	1.57	4.67	25	64.03	0	5.66	
40	24hr-5yr	MHST-156	1.18634	6.77	47.28	0.016	0.15	1.57	4.67	25	64.03	29.6	202.28	
41	24hr-5yr	MHST-132	1.522779	3	14.99	0.016	0.15	1.57	4.67	25	64.03	49.74	98.54	
42_1	24hr-5yr	MHST-135-S	0.38897	5	75.19	0.016	0.15	1.57	4.67	25	64.03	13.37	103.86	
42_2	24hr-5yr	MHST-149-S	0.30146	5	75.19	0.016	0.15	1.57	4.67	25	64.03	13.39	79.7	
42_3	24hr-5yr	MHST-150-S1	0.59319	2	75.19	0.016	0.15	1.57	4.67	25	64.03	13.59	146.45	
42_4	24hr-5yr	MHST-141-S	0.45704	2	75.19	0.016	0.15	1.57	4.67	25	64.03	11.38	84.82	PurpleRoof
43	24hr-5yr	SA-CUP	0.56665	2	100	0.016	0.15	1.57	4.67	25	64.03	0	163.35	
44	24hr-5yr	MHST-62534	12.74513	1	32.06	0.016	0.15	1.57	4.67	25	64.03	39.85	1375.82	
45	24hr-5yr	63	0.36482	4	25.66	0.016	0.15	1.57	4.67	25	64.03	41.59	46.05	
45_A	24hr-5yr	MHST-138	0.192111	4	0	0.016	0.15	1.57	4.67	25	64.03	54.76	23.82	
46	24hr-5yr	21B	0.887972	10	21	0.016	0.15	1.57	4.67	25	64.03	48.1	165.32	

Table 6: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
47_1	24hr-5yr	D-MHST-155-S	0.11038	3	65.86	0.016	0.15	1.57	4.67	25	64.03	18.45	27.97	
47_2	24hr-5yr	MHST-148-S	0.46158	3	65.86	0.016	0.15	1.57	4.67	25	64.03	18.97	100.26	
47_3	24hr-5yr	MHST-147-S	0.19065	3	65.86	0.016	0.15	1.57	4.67	25	64.03	18.59	45.84	
47_4	24hr-5yr	MHST-146-S	0.40137	3	65.86	0.016	0.15	1.57	4.67	25	64.03	18.9	88.66	
47_5	24hr-5yr	MHST-157-S	0.25086	3	65.86	0.016	0.15	1.57	4.67	25	64.03	18.69	58.51	
48	24hr-5yr	R-48	0.137722	2	100	0.016	0.4	1.57	4.67	25	64.03	0	39.7	
49	24hr-5yr	R-49	0.16391	2	100	0.016	0.4	1.57	4.67	25	64.03	0	47.09	
5	24hr-5yr	preston	0.012005	3	100	0.016	0.15	1.57	4.67	25	64.03	0	3.47	
50	24hr-5yr	R-50	0.34548	2	100	0.016	0.4	1.57	4.67	25	64.03	0	95.14	
51_1	24hr-5yr	MH-SA51-1	0.637265	2	30	0.016	0.15	1.57	4.67	25	64.03	5.71	3.19	PurpleRoof
51_2	24hr-5yr	MH-SA51-2	0.637265	2	30	0.016	0.15	1.57	4.67	25	64.03	5.71	3.19	PurpleRoof
52	24hr-5yr	R-52	0.39976	2	100	0.016	0.4	1.57	4.67	25	64.03	0	108.26	
53	24hr-5yr	R-53	0.173497	2	100	0.016	0.4	1.57	4.67	25	64.03	0	49.78	
54	24hr-5yr	R-54	0.17076	2	100	0.016	0.4	1.57	4.67	25	64.03	0	49.01	
55	24hr-5yr	MH-SA55	0.353278	2	30	0.016	0.15	1.57	4.67	25	64.03	5.69	1.77	PurpleRoof
56	24hr-5yr	MH-SA56	0.945966	2	86.18	0.016	0.15	1.57	4.67	25	64.03	7.53	249.44	
57	24hr-5yr	Carling_OLF1	0.154931	15	6.12	0.016	0.15	1.57	4.67	25	64.03	50.51	32.87	
58	24hr-5yr	46	0.442854	16	33.5	0.016	0.15	1.57	4.67	25	64.03	36.67	72.87	
59	24hr-5yr	MHST-133	0.753001	2	90.56	0.016	0.15	1.57	4.67	25	64.03	5.13	200.62	
6	24hr-5yr	3	0.1396	3	2.06	0.016	0.15	1.57	4.67	25	64.03	53.61	17.98	
60	24hr-5yr	S-60	0.217787	25	0	0.016	0.15	1.57	4.67	25	64.03	59.33	105.95	
60A	24hr-5yr	60B	0.243636	25	19.96	0.016	0.15	1.57	4.67	25	64.03	43.48	44.53	
60B	24hr-5yr	60	0.39679	25	0	0.016	0.15	1.57	4.67	25	64.03	72.13	114.64	
60C	24hr-5yr	60B	0.507297	25	35	0.016	0.15	1.57	4.67	25	64.03	35.66	89.99	
61	24hr-5yr	CBMHST-104	0.65834	3	62.04	0.016	0.15	1.57	4.67	25	64.03	20.95	142.7	
62	24hr-5yr	POW_D1	0.266185	4.97	68.32	0.016	0.15	1.57	4.67	25	64.03	18.35	51.98	
62A	24hr-5yr	POW_D1	0.519395	6	0.04	0.016	0.15	1.57	4.67	25	64.03	57.6	18.5	

Table 6: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
62B	24hr-5yr	62	0.07117	3	0	0.016	0.15	1.57	4.67	25	64.03	56.76	3.53	
62C	24hr-5yr	POW_D1	1.13365	5	58.05	0.016	0.15	1.57	4.67	25	64.03	25.03	161.33	
63	24hr-5yr	S-63	0.41268	2	49.11	0.016	0.15	1.57	4.67	25	64.03	31.2	140.44	
64	24hr-5yr	CHAMBER-102	0.16771	6	78.06	0.016	0.15	1.57	4.67	25	64.03	11.78	45.84	
65	24hr-5yr	MHST-137	0.523363	3.598	41.91	0.016	0.15	1.57	4.67	25	64.03	33.86	70.36	
7	24hr-5yr	2	0.016512	3	100	0.016	0.15	1.57	4.67	25	64.03	0	5.81	
8	24hr-5yr	2	0.01883	3	100	0.016	0.15	1.57	4.67	25	64.03	0	5.45	
9	24hr-5yr	1	0.019216	3	100	0.016	0.15	1.57	4.67	25	64.03	0	5.56	

PCSWMM Report

24 Hour - 100 Year Storm

Model Partial Green Roof_November-2023.inp

Parsons

November 24, 2023

Table of Contents

Summary 1: Runoff quantity continuity

Name	Partial Green Roof_November-2023
Initial LID storage (mm)	0.247
Initial snow cover (mm)	n/a
Total precipitation (mm)	106.607
Outfall runon (mm)	n/a
Evaporation loss (mm)	0.000
Infiltration loss (mm)	39.665
Surface runoff (mm)	61.667
LID drainage (mm)	2.731
Snow removed (mm)	n/a
Final snow cover (mm)	n/a
Final storage (mm)	2.838
Continuity error (%)	-0.044

Summary 2: Flow routing continuity

Name	Partial Green Roof_November-2023
Dry weather inflow (ML)	0.000
Wet weather inflow (ML)	24.120
Groundwater inflow (ML)	0.000
RDII inflow (ML)	0.000
External inflow (ML)	1.151
External outflow (ML)	25.332
Flooding loss (ML)	0.002
Evaporation loss (ML)	0.000
Exfiltration loss (ML)	0.000
Initial stored volume (ML)	0.000
Final stored volume (ML)	1.525
Continuity error (%)	-6.284

Figure 1: Extent 1

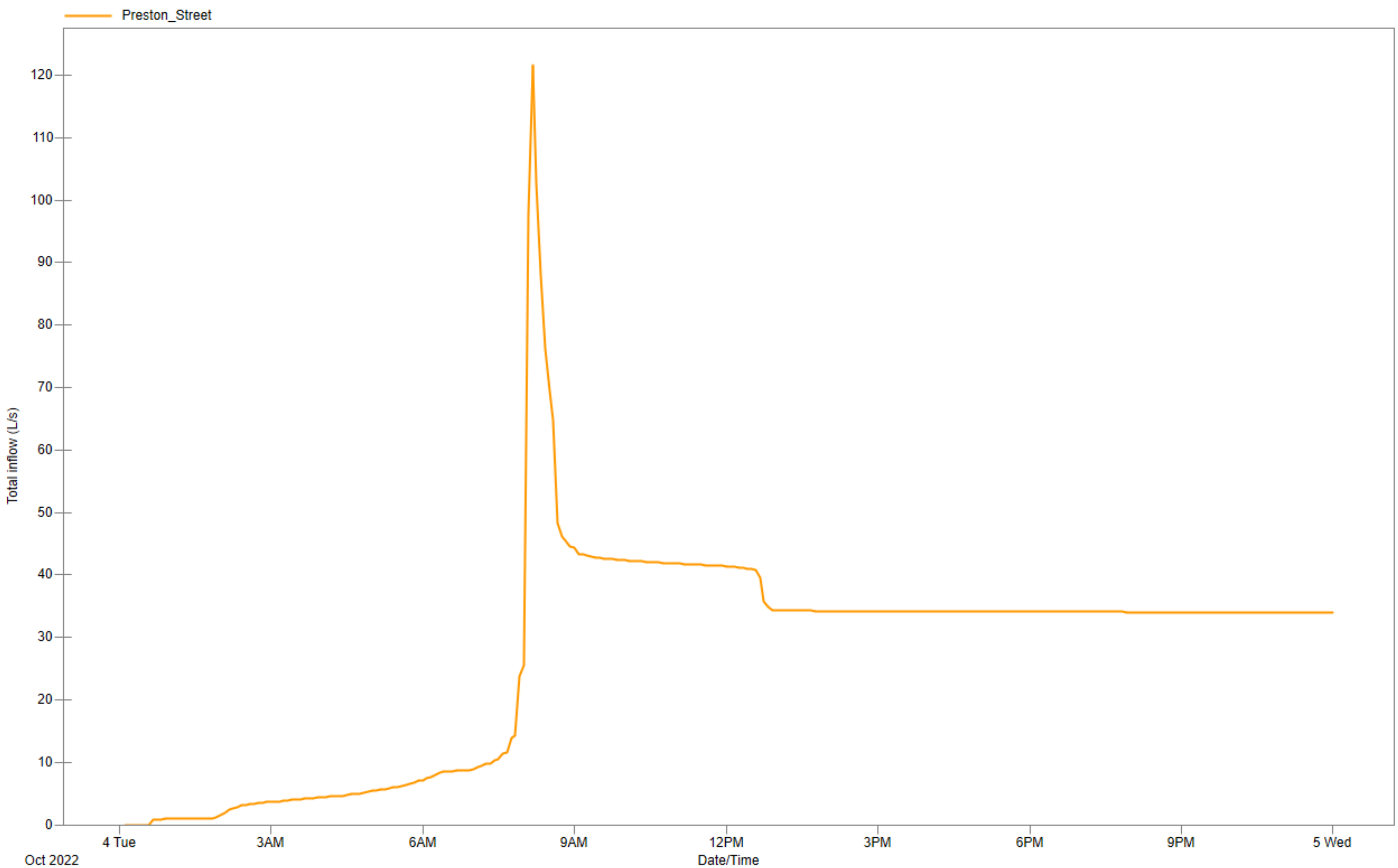


Figure 2: Preston Outfall

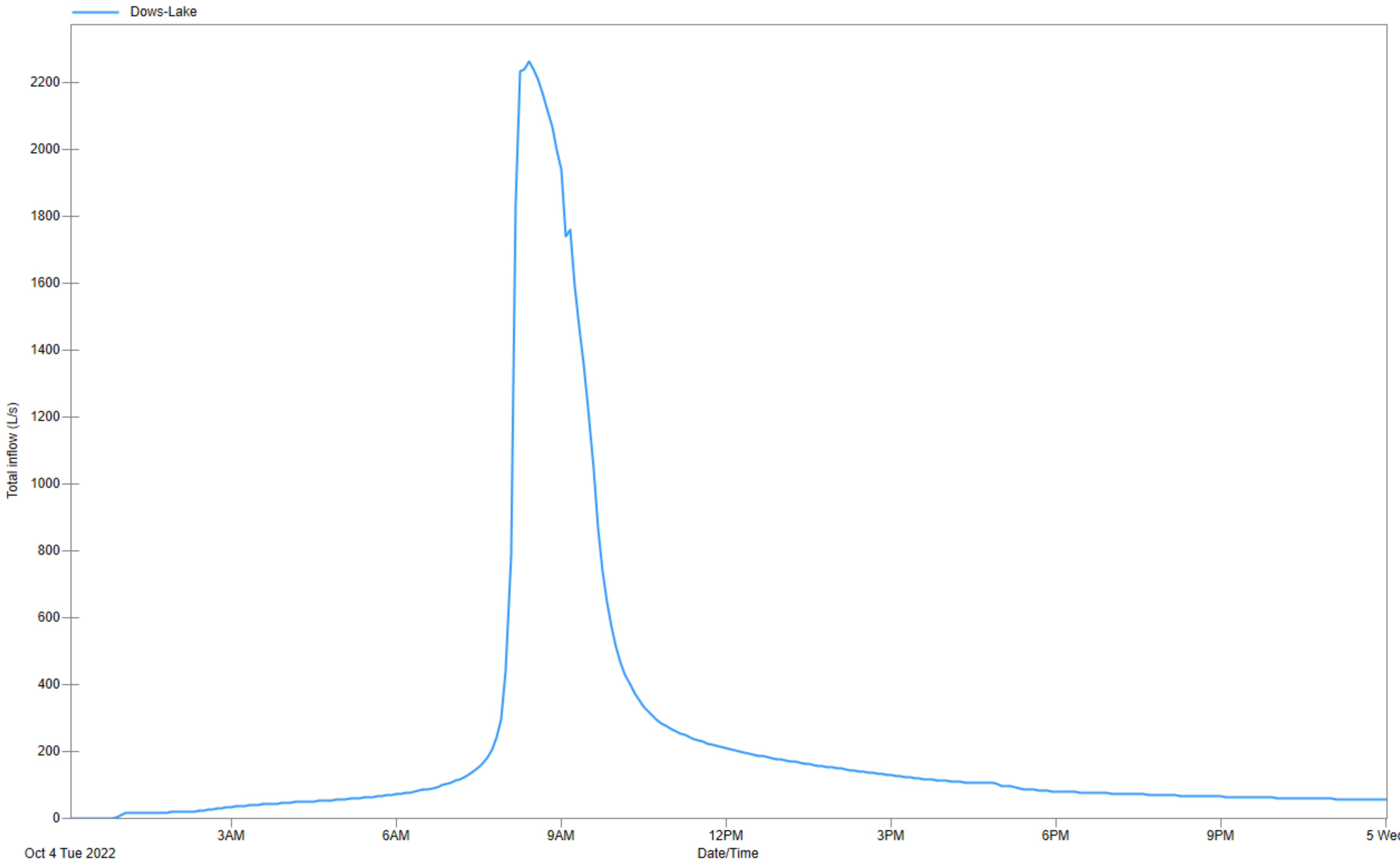


Figure 3: Dows Lake Outfall

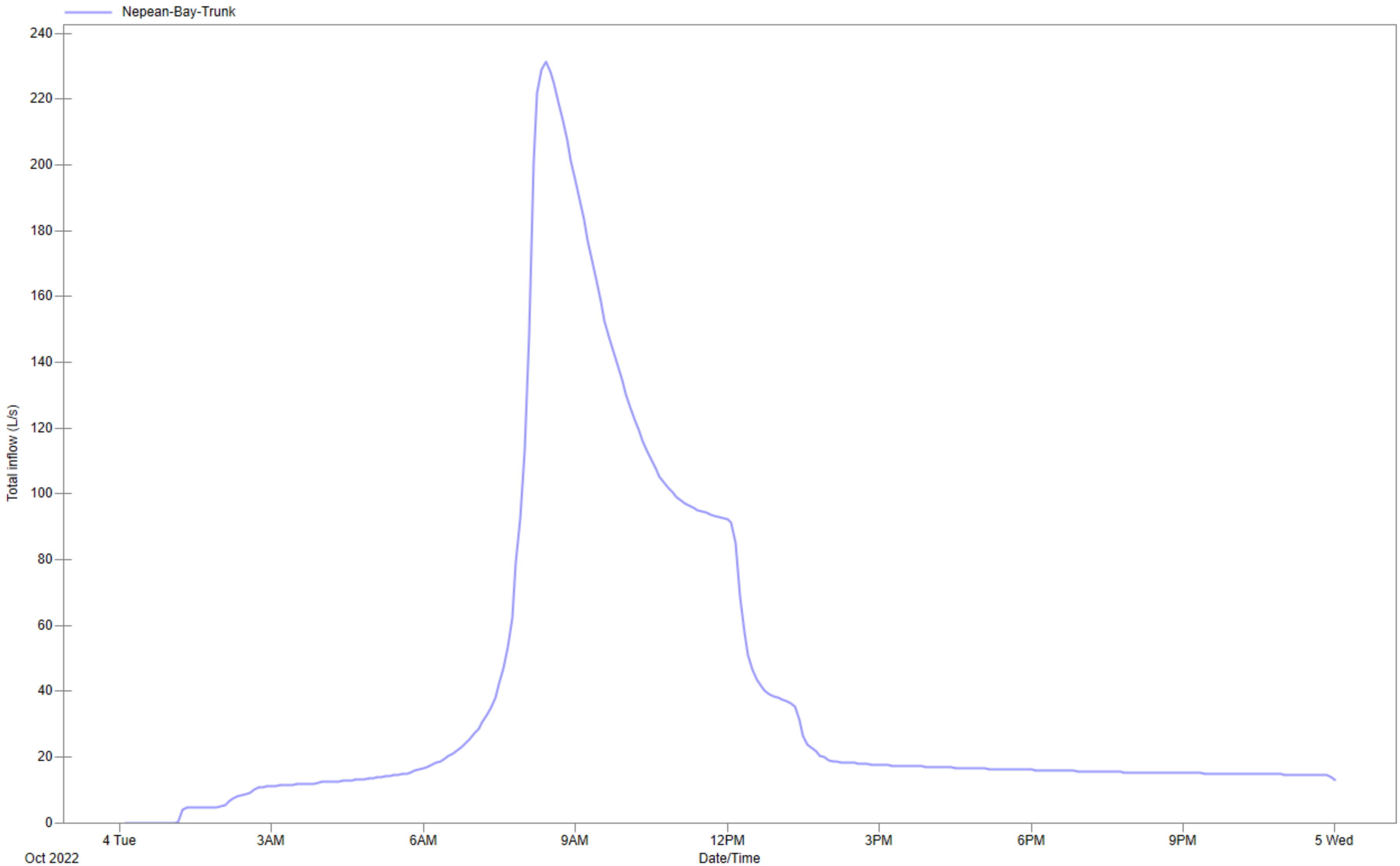


Figure 4: Nepean Bay Outfall

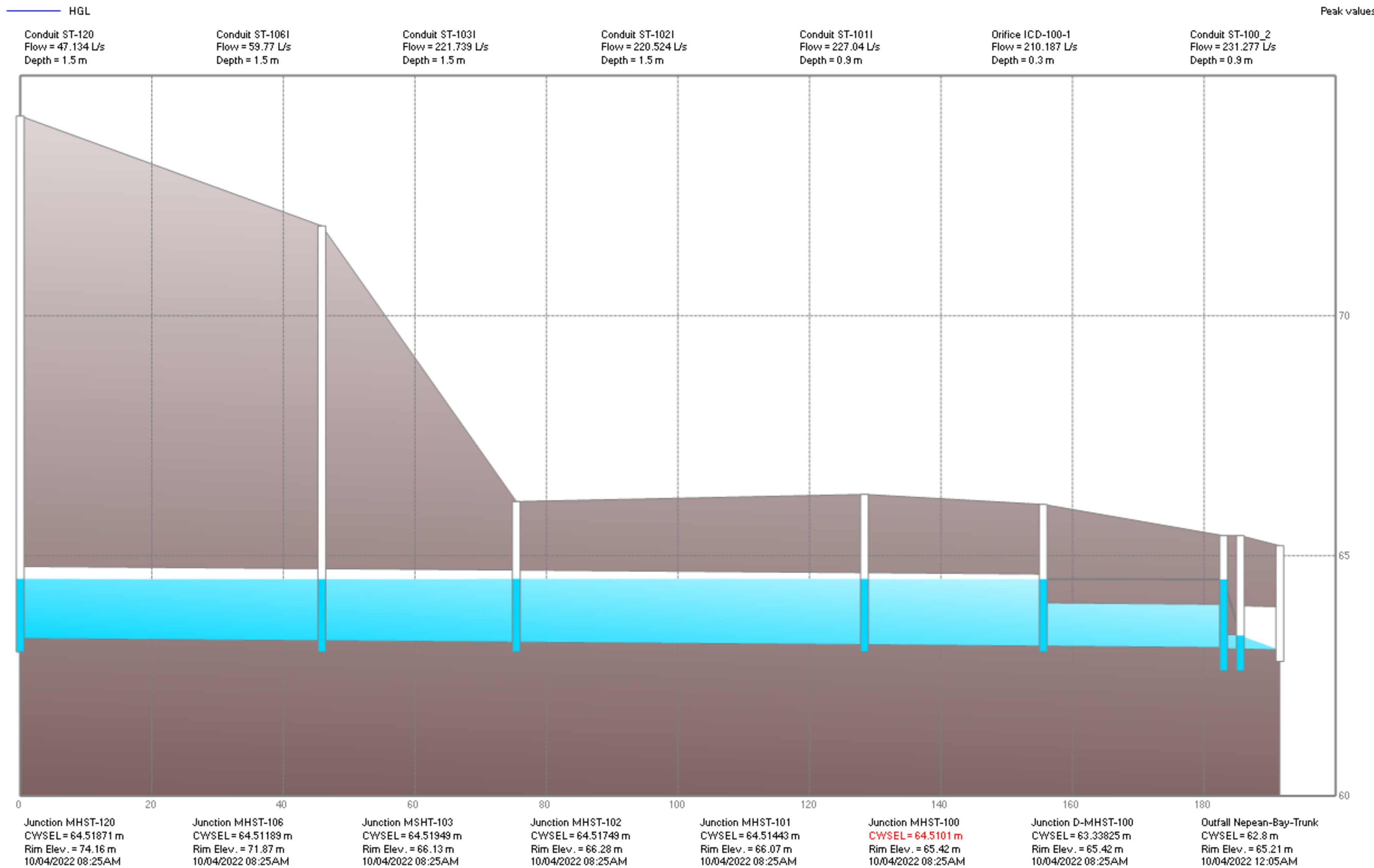


Figure 5: Road A

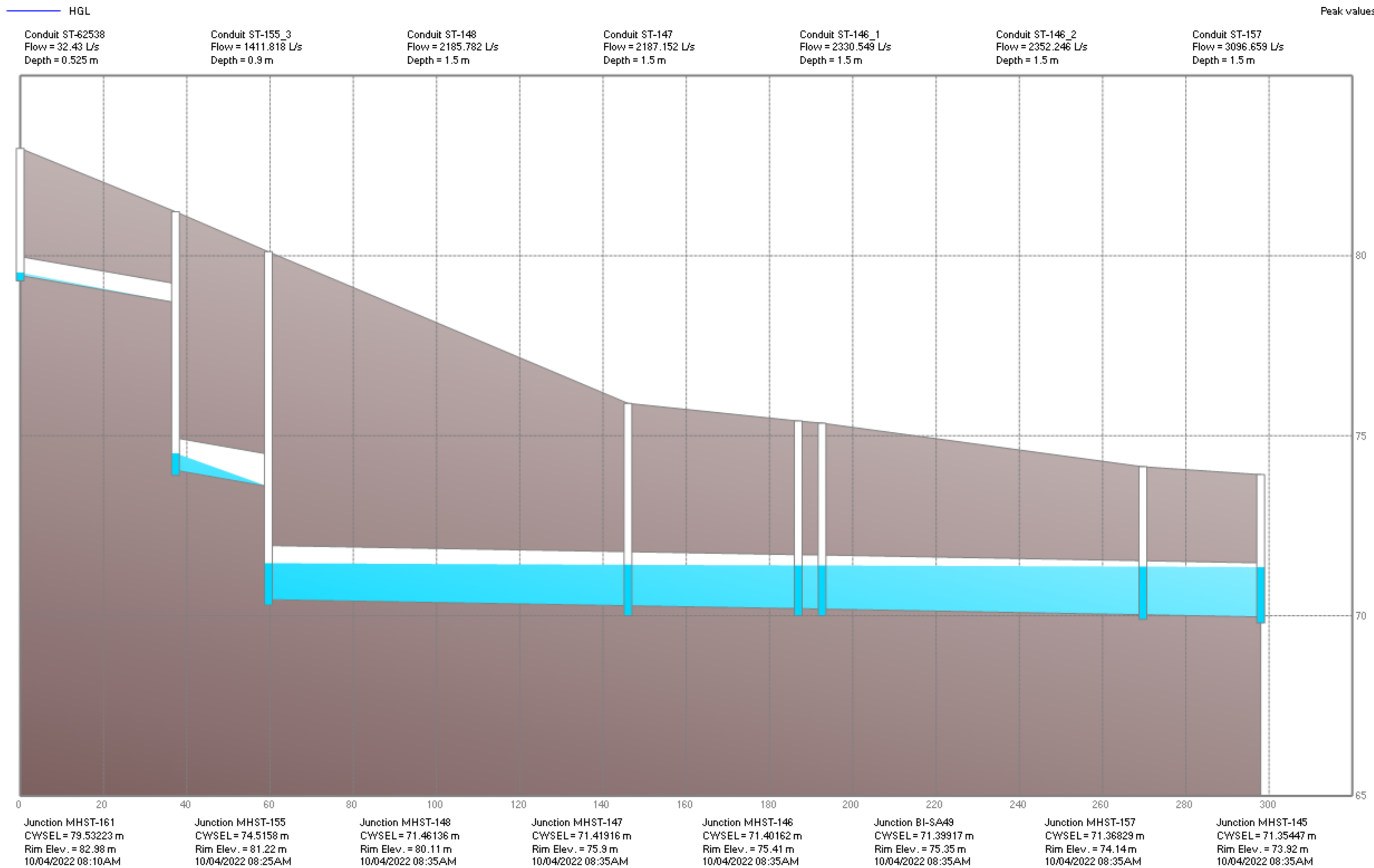


Figure 6: Road D

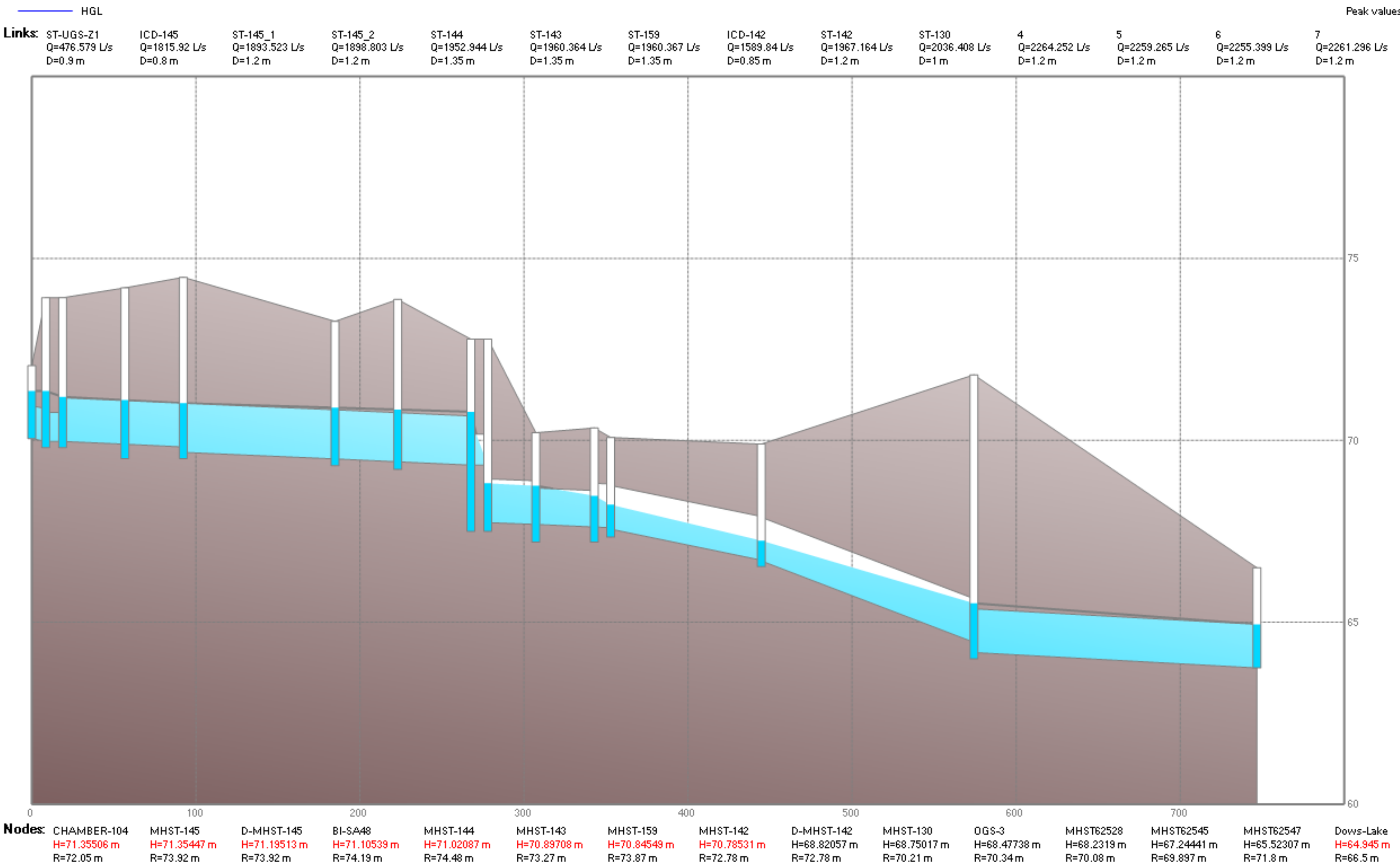


Figure 7: Road D to Outfall

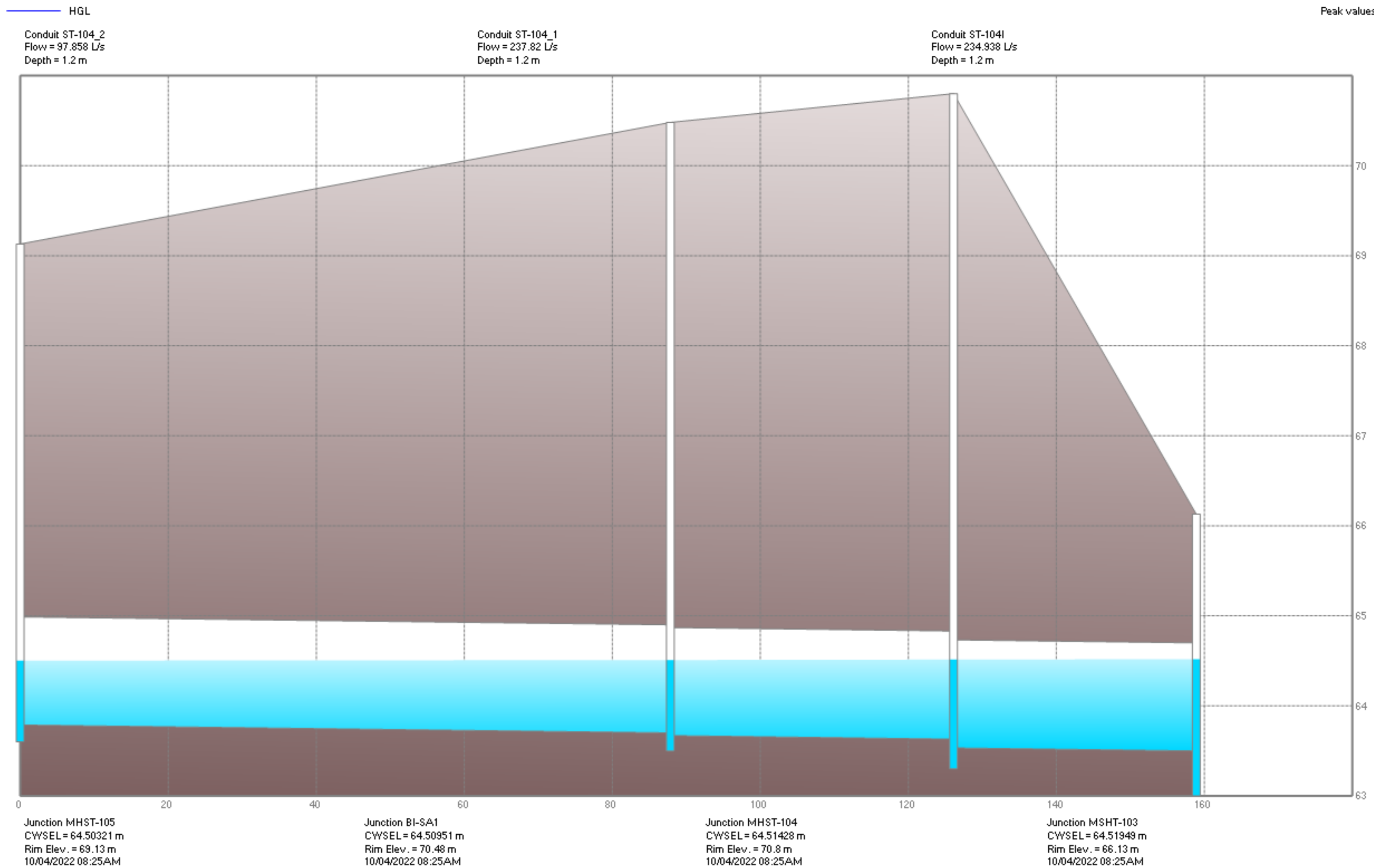


Figure 8: Road B

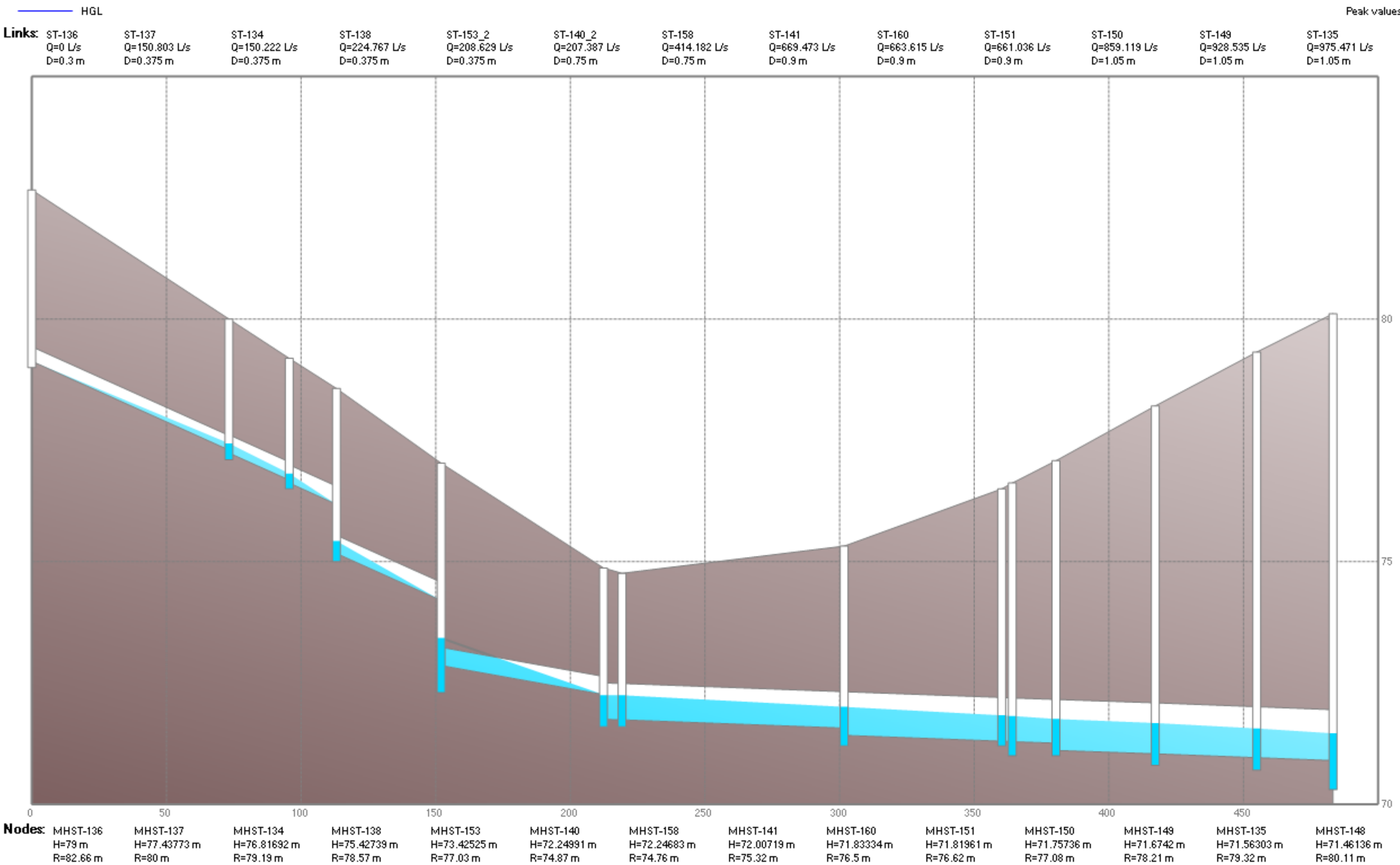


Figure 9: Road E

Table 1: Orifices

Name	Inlet Node	Outlet Node	Type	Cross-Section	Height (m)	Inlet Elev. (m)	Discharge Coeff.	Max. |Flow| (L/s)	Contributing Area (ha)	Contributing Imp. Area (ha)
ICD-100-1	MHST-100	D-MHST-100	SIDE	CIRCULAR	0.3	63.06	0.62	211.1	3.641	2.579
ICD-100-2	MHST-100	D-MHST-100	SIDE	CIRCULAR	0.1	63.85	0.62	17	3.641	2.579
ICD-142	MHST-142	D-MHST-142	SIDE	CIRCULAR	0.85	69.32	0.62	1589.9	24.887	10.859
ICD-145	MHST-145	D-MHST-145	SIDE	RECT_CLOSED	0.8	69.97	0.62	1818.47	23.279	9.629
ICD-155	D-MHST-155	MHST-155	SIDE	CIRCULAR	0.675	74.1	0.62	1385.39	13.523	4.382
ICD-170	MHST-170	DMHST-170	SIDE	CIRCULAR	0.1	71.96	0.62	17.18	0.826	0.539

Table 2: Conduits

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
1	MHST-158-S	S-60	295	0.035	74.95	69.04	TRAPEZOIDAL	0.5	0.02004	24.98	0.1
10	CBMHST105	CBMHST103	17.6	0.013	72.4	72.13	CIRCULAR	0.375	0.01534	292.76	2.65
2	MHST-105-S	Wales-OLF-N03	17	0.016	68.69	68.2	IRREGULAR	0	0.02884	36.11	0.73
3	Preston	Preston_Street	10	0.013	61.03	60.9	CIRCULAR	0.3	0.013	124.31	1.78
4	OGS-3	MHST62528	10	0.013	67.62	67.6	CIRCULAR	1.2	0.002	2274.86	2.67
5	MHST62528	MHST62545	91.8	0.013	67.56	66.707	CIRCULAR	1.2	0.00929	2274.98	3.48
6	MHST62545	MHST62547	129.6	0.013	66.687	64.45	CIRCULAR	1.2	0.01726	2274.67	3.83
7	MHST62547	Dows-Lake	172.5	0.013	64.17	63.745	CIRCULAR	1.2	0.00246	2274.43	2.01
8	POW_D1	OGS-3	180	0.035	78.7	69.7	TRAPEZOIDAL	0.55	0.05006	499.05	1.65
8_1	CHAMBER-103	D-MHST-155	3.1	0.013	74.12	74.1	CIRCULAR	0.9	0.00645	1405.28	2.21
9	CBMHST103	CHAMBER-102	2.6	0.013	72.1	72.07	CIRCULAR	0.375	0.01154	292.74	2.65
CA-OLF_2	Carling_OLF1	Carling_OLFN1	120.425	0.016	66.5	65.408	IRREGULAR	0	0.00907	69.32	0.57
CA-OLF_3	Carling_OLFN3	Carling_OLF	66.467	0.016	64.8	64.6	IRREGULAR	0	0.00301	222.68	0.66
CA-OLF_4	Carling_OLFN1	Carling_OLFN3	67.075	0.016	65.408	64.8	IRREGULAR	0	0.00906	167.75	0.58
CA-STM	IN119607	D-MHST-100	86	0.013	63.1	62.8	CIRCULAR	0.3	0.00349	5.89	0.11

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-100_2	D-MHST-100	Nepean-Bay-Trunk	6	0.013	63.06	63.04	CIRCULAR	0.9	0.00333	231.86	1.39
ST-100-S	MHST-100-S	Carling_OLFN3	11	0.013	65.42	64.8	IRREGULAR	0	0.05645	72.13	0.5
ST-101I	MHST-101	MHST-100	27.419	0.013	63.12	63.09	CIRCULAR	0.9	0.00109	228.11	0.49
ST-101I-S	MHST-101-S	MHST-100-S	27.419	0.013	66.07	65.42	IRREGULAR	0	0.02371	72.14	0.86
ST-102	CBMHST-101	CBMHST105	48	0.013	73.63	72.43	CIRCULAR	0.375	0.02501	292.76	2.65
ST-102I	MHST-102	MHST-101	27.18	0.013	63.15	63.12	CIRCULAR	1.5	0.0011	226.37	0.39
ST-102I-S	MHST-102-S	MHST-101-S	27.18	0.013	66.28	66.07	IRREGULAR	0	0.00773	26.56	0.32
ST-103I	MSHT-103	MHST-102	52.936	0.013	63.203	63.15	CIRCULAR	1.5	0.001	243.11	0.45
ST-103I-S	MSHT-103-S	MHST-102-S	52.936	0.013	66.13	66.28	IRREGULAR	0	-0.00283	16.09	0.14
ST-104	CBMHST-104	CBMHST-101	15.1	0.013	74.14	73.84	CIRCULAR	0.375	0.01987	292.74	2.65
ST-104_1	BI-SA1	MHST-104	38.268	0.013	63.67	63.631	CIRCULAR	1.2	0.00102	260.66	1.14
ST-104_2	MHST-105	BI-SA1	87.842	0.013	63.788	63.7	CIRCULAR	1.2	0.001	105.97	0.53
ST-104I	MHST-104	MSHT-103	32.803	0.013	63.533	63.5	CIRCULAR	1.2	0.00101	247.05	1
ST-105I_1-S	BI-SA1-S	MHST-105-S	87.84	0.013	70.15	68.64	IRREGULAR	0	0.01719	131.65	0.72
ST-105I_2-S	MHST-104-S	BI-SA1-S	37.727	0.013	70.8	70.15	IRREGULAR	0	0.01723	43.74	0.45
ST-106I	MHST-106	MSHT-103	29.577	0.013	63.233	63.203	CIRCULAR	1.5	0.00101	82.84	0.1
ST-106I-S	MHST-106-S	MSHT-103-S	29.577	0.013	71.87	66.13	IRREGULAR	0	0.19783	94.06	0.92
ST-107	DMHST-170	MHST-158	13.5	0.013	71.93	71.8	CIRCULAR	0.3	0.00963	144.77	2.05
ST-108	CBMH108	CBMH109	35.7	0.013	71.56	71.49	CIRCULAR	0.6	0.00196	15.01	0.52
ST-109	CBMH109	CBMH110	20.8	0.013	71.49	71.45	CIRCULAR	0.6	0.00192	15.5	0.53
ST-110	CBMH110	MHST-135	17.9	0.013	71.45	71.41	CIRCULAR	0.6	0.00223	17.78	0.64
ST-111	CBMH111	CBMH108	15.3	0.013	71.59	71.56	CIRCULAR	0.6	0.00196	15.04	0.52
ST-120	MHST-120	MHST-106	45.853	0.013	63.278	63.233	CIRCULAR	1.5	0.00098	72.29	0.12
ST-120-S	MHST-120-S	MHST-106-S	45.853	0.013	74.16	71.87	IRREGULAR	0	0.05	69.28	1.1
ST-130	MHST-130	OGS-3	35.6	0.013	67.69	67.62	CIRCULAR	1	0.00197	2038.52	2.69
ST-131	MHST-131	MHST-130	47.9	0.013	68.12	68.07	CIRCULAR	0.825	0.00104	334.91	1.29
ST-132	MHST-132	MHST-156	41.86	0.013	73.25	72.62	CIRCULAR	0.45	0.01505	287.02	2.47

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-133	MHST-133	MHST-131	51.37	0.013	68.17	68.12	CIRCULAR	0.825	0.00097	348.47	1.1
ST-134	MHST-134	MHST-138	17.5	0.013	76.62	76.18	CIRCULAR	0.375	0.02515	151.47	2.57
ST-135	MHST-135	MHST-148	28.3	0.013	70.96	70.9	CIRCULAR	1.05	0.00212	1000.35	2.01
ST-136	MHST-136	MHST-137	73.2	0.013	79.13	77.3	CIRCULAR	0.3	0.02501	0	0
ST-137	MHST-137	MHST-134	22.4	0.013	77.24	76.68	CIRCULAR	0.375	0.02501	151.39	2.57
ST-138	MHST-138	MHST-153	38.9	0.013	75.17	74.2	CIRCULAR	0.375	0.02494	226.27	2.8
ST-139	MHST-139	MHST-133	72.94	0.013	68.32	68.25	CIRCULAR	0.75	0.00096	36.08	0.46
ST-140_2	MHST-140	MHST-158	6.9	0.013	71.75	71.74	CIRCULAR	0.75	0.00145	215.04	0.7
ST-141	MHST-141	MHST-160	58.5	0.013	71.42	71.3	CIRCULAR	0.9	0.00205	710.04	1.69
ST-141-S	MHST-151-S	MHST-141-S	70.7	0.013	76.58	75.32	IRREGULAR	0	0.01782	287.1	1.1
ST-142	D-MHST-142	MHST-130	29.3	0.013	67.74	67.69	CIRCULAR	1.2	0.00171	1967.39	1.86
ST-143	MHST-143	MHST-159	38.2	0.013	69.49	69.41	CIRCULAR	1.35	0.00209	1960.51	1.39
ST-144	MHST-144	MHST-143	92.5	0.013	69.67	69.49	CIRCULAR	1.35	0.00195	1952.95	1.58
ST-145_1	D-MHST-145	BI-SA48	38	0.013	69.97	69.894	CIRCULAR	1.2	0.002	1894.04	1.74
ST-145_2	BI-SA48	MHST-144	35.6	0.013	69.894	69.82	CIRCULAR	1.2	0.00208	1899.72	1.9
ST-146_1	MHST-146	BI-SA49	5.7	0.013	70.2	70.189	CIRCULAR	1.5	0.00193	2495.15	2.02
ST-146_1-S	MHST-146-S	BI-SA49-S	5.693	0.013	75.44	75.351	IRREGULAR	0	0.01564	171.67	0.79
ST-146_2	BI-SA49	MHST-157	77.1	0.013	70.189	70.03	CIRCULAR	1.5	0.00206	2556.16	2.08
ST-146_2-S	BI-SA49-S	MHST-157-S	77.118	0.013	75.351	74.14	IRREGULAR	0	0.01571	120.65	0.58
ST-147	MHST-147	MHST-146	40.9	0.013	70.28	70.2	CIRCULAR	1.5	0.00196	2358.49	1.91
ST-147-S	MHST-147-S	MHST-146-S	40.768	0.013	75.9	75.44	IRREGULAR	0	0.01128	156.43	0.68
ST-148	MHST-148	MHST-147	86.4	0.013	70.45	70.28	CIRCULAR	1.5	0.00197	2294.93	1.88
ST-148-S	MHST-148-S	MHST-147-S	93.313	0.013	80.11	75.9	IRREGULAR	0	0.04516	116.58	0.71
ST-149	MHST-149	MHST-135	37.7	0.013	71.04	70.96	CIRCULAR	1.05	0.00212	945.84	1.77
ST-149-S	MHST-135-S	MHST-149-S	34.9	0.013	79.32	78.21	IRREGULAR	0	0.03182	144.99	0.81
ST-150	MHST-150	MHST-149	36.9	0.013	71.11	71.04	CIRCULAR	1.05	0.0019	882.19	1.6
ST-150-S	MHST-149-S	MHST-150-S1	45	0.013	78.21	77.08	IRREGULAR	0	0.02512	215.13	0.73

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-151	MHST-151	MHST-150	16.2	0.013	71.29	71.26	CIRCULAR	0.9	0.00185	718.92	1.91
ST-151-S	MHST-150-S1	MHST-151-S	16.1	0.013	77.08	76.58	IRREGULAR	0	0.03107	288.03	1.22
ST-153_2	MHST-153	MHST-140	60.3	0.013	72.86	72.26	CIRCULAR	0.375	0.00995	215.81	2
ST-154	MHST-154	CHAMBER-103	16	0.013	75.8	75.72	CIRCULAR	0.9	0.005	3246.92	5.1
ST-154A	MHST-154A	MHST-154B	15.51	0.013	76.18	76.1	CIRCULAR	0.9	0.00516	3245.77	5.1
ST-154B	MHST-154B	MHST-154	35.9	0.013	76.04	75.86	CIRCULAR	0.9	0.00501	3246.69	5.1
ST-155_2-S	D-MHST-155-S	MHST-148-S	52.7	0.013	83.11	80.11	IRREGULAR	0	0.05702	20.27	0.38
ST-155_3	MHST-155	MHST-148	22.3	0.013	74.04	73.59	CIRCULAR	0.9	0.02018	1413.37	4.14
ST-156	MHST-156	MHST-157	35.51	0.013	70.1	70.03	CIRCULAR	1.5	0.00197	728.46	0.75
ST-157	MHST-157	MHST-145	28.3	0.013	70.03	69.97	CIRCULAR	1.5	0.00212	3180.45	2.7
ST-157-S	MHST-157-S	MHST-145-S	28.171	0.013	74.14	73.92	IRREGULAR	0	0.00781	152.35	0.45
ST-158	MHST-158	MHST-141	82.5	0.013	71.74	71.57	CIRCULAR	0.75	0.00206	466.26	1.59
ST-158-S	MHST-141-S	MHST-158-S	75.107	0.013	75.32	74.85	IRREGULAR	0	0.00626	172.92	0.55
ST-159	MHST-159	MHST-142	44.6	0.013	69.41	69.32	CIRCULAR	1.35	0.00202	1960.51	1.37
ST-160	MHST-160	MHST-151	3.95	0.013	71.3	71.29	CIRCULAR	0.9	0.00253	714.73	1.82
ST-162	CBMHST-162	MHST-154A	5.35	0.013	76.27	76.24	CIRCULAR	0.9	0.00561	3148.29	4.95
ST-62534	MHST-62534	CBMHST-162	7.16	0.013	76.3	76.27	CIRCULAR	0.9	0.00419	3148.64	4.95
ST-62538	MHST-161	MHST-155	37.3	0.013	79.45	78.7	CIRCULAR	0.525	0.02011	32.44	1.5
ST-G107	MHST-107	OGS1	52.5	0.013	62.03	61.24	CIRCULAR	0.3	0.01505	30.56	1.05
ST-OGS1_2	OGS1	Preston	10	0.013	61.21	61.06	CIRCULAR	0.3	0.015	78.26	1.68
ST-P3	DICB3	IN119608	71.1	0.013	64.23	63.8	CIRCULAR	0.2	0.00605	0	0
ST-P46	IN119608	IN119607	30	0.013	63.5	63.2	CIRCULAR	0.2	0.01	0	0
ST-SA1	MH-SA1	BI-SA1	24.65	0.013	69.45	69.08	CIRCULAR	0.3	0.01501	60.15	1.7
ST-SA48	MH-SA48	BI-SA48	10.8	0.013	72	71.78	CIRCULAR	0.3	0.02037	5.41	0.95
ST-SA49	MH-SA49	BI-SA49	21	0.013	72.8	72.38	CIRCULAR	0.3	0.02	6.85	1.01
ST-SA50	MH-SA50	MHST-147	20.47	0.013	73.15	72.74	CIRCULAR	0.45	0.02003	12.99	1.16
ST-SA51-1	MH-SA51-1	MHST-141	32.56	0.013	73.5	73.17	CIRCULAR	0.375	0.01014	16.63	1

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-SA51-2	MH-SA51-2	MHST-160	33.2	0.013	73.5	73.17	CIRCULAR	0.45	0.00994	16.63	0.98
ST-SA52	MH-SA52	MHST-139	28.6	0.013	68.92	68.49	CIRCULAR	0.525	0.01504	15.24	1.08
ST-SA53	MH-ST53	MHST-133	24.9	0.013	69.04	68.79	CIRCULAR	0.3	0.01004	6.91	0.79
ST-SA54	MH-SA54	MHST-142	2.45	0.013	71.38	71.33	CIRCULAR	0.3	0.02041	6.8	1.01
ST-SA55	MH-SA55	MHST-143	47.61	0.013	72.5	71.55	CIRCULAR	0.45	0.01996	9.22	1.05
ST-Sa56	MH-SA56	MHST-144	21.47	0.013	72.5	72.07	CIRCULAR	0.45	0.02003	455.74	2.95
ST-UGS6B	CHAMBER-102	MHST-170	10.6	0.013	72.07	71.96	CIRCULAR	0.375	0.01038	144.58	1.31
ST-UGS-Z1	CHAMBER-104	MHST-145	8.42	0.013	70.05	69.97	CIRCULAR	0.9	0.0095	2041.53	3.97
ST-xx	MH-SAxx	MHST-107	10.7	0.013	62.45	62.15	CIRCULAR	0.2	0.02805	7.01	1.21
WD-OLF_3	Wales-OLF-N03	Wales-OLF-N04	81.193	0.016	68.2	66.75	IRREGULAR	0	0.01786	35.53	0.88
WD-OLF_4	Wales-OLF-N04	Wales-OLF-N05	94.991	0.016	66.75	65.5	IRREGULAR	0	0.01316	34.3	0.76

Table 3: Storages

Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)	Hours Flooded (h)	Max. Flood Rate (L/s)	Total Flood Vol. (ML)	Avg. Percent Full (%)	Max. Volume (1000 m^3)	Max. Percent Full (%)	Max. Outflow (L/s)
CHAMBER-102	72.07	73.32	1.25	0.9	72.97	374.27	0	0	0	13	0.224	72	144.58
CHAMBER-103	74.12	77.12	3	2.4	76.52	3246.92	0	0	0	8	1.686	80	1405.28
CHAMBER-104	70.05	72.05	2	1.31	71.36	2041.53	0	0	0	10	1.958	65	524.73
R-48	73	73.15	0.15	0.06	73.06	68.24	0	0	0	14	0.077	40	5.41
R-49	74	74.15	0.15	0.06	74.06	81.13	0	0	0	13	0.09	38	6.85
R-50	77	77.15	0.15	0.06	77.06	167.61	0	0	0	14	0.194	38	12.99
R-52	69	69.15	0.15	0.06	69.06	192.14	0	0	0	14	0.223	37	15.24
R-53	70	70.15	0.15	0.06	70.06	85.83	0	0	0	14	0.097	38	6.91
R-54	72	72.15	0.15	0.06	72.06	84.49	0	0	0	13	0.095	37	6.8
S-14B	61.65	63.3	1.65	1.65	63.3	56.35	0.07	27	0.002	4	0.013	100	20.15

Table 3: Storages (continued...)

Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)	Hours Flooded (h)	Max. Flood Rate (L/s)	Total Flood Vol. (ML)	Avg. Percent Full (%)	Max. Volume (1000 m³)	Max. Percent Full (%)	Max. Outflow (L/s)
S-15	62.1	63.9	1.8	1.77	63.87	117.34	0	0	0	14	0.097	87	7.79
S-19	64	66	2	1.65	65.65	78.44	0	0	0	4	0.06	23	3.78
S-21B	63.54	65.7	2.16	1.91	65.45	490.68	0	0	0	31	0.662	51	4.1
S-26B	67.33	69.7	2.37	2.24	69.57	240.03	0	0	0	13	0.204	68	15.46
S-26D	67.66	69.31	1.65	1.42	69.08	35.37	0	0	0	3	0.019	38	3.49
S-3	62.2	64.24	2.04	2.04	64.24	163.47	0	0	0	70	0.081	100	26.69
S-60	67.84	70.25	2.41	1.98	69.82	397.5	0	0	0	23	0.19	42	4.18
S-63	78.2	82.42	4.22	3.99	82.19	308.97	0	0	0	2	0.117	43	97.88
SA-1	69.5	72.5	3	2.24	71.74	607.11	0	0	0	13	0.492	75	60
SA-2	62.6	65.6	3	1.88	64.48	427.8	0	0	0	40	0.564	63	7
SA-CUP	72.5	75.5	3	0.54	73.04	280.78	0	0	0	5	0.268	18	15

Table 4: Weirs

Name	Inlet Node	Outlet Node	Type	Height (m)	Side Slope (m/m)	Inlet Elev. (m)	Discharge Coeff. (m³/s)	Max. |Flow| (L/s)	Contributing Area (ha)	Contributing Imp. Area (ha)
Weir-142	MHST-142	D-MHST-142	TRANSVERSE	0.5	0	70.5	1.65	377.33	24.887	10.859
Weir-145	MHST-145	D-MHST-145	TRANSVERSE	1	0	71.25	1.65	139.3	23.279	9.629
Weir-155	D-MHST-155	MHST-155	TRANSVERSE	1	0	76.45	1.65	19.89	13.523	4.382
Weir-170	MHST-170	DMHST-170	TRANSVERSE	0.3	0	72.6	1.65	131.37	0.826	0.539

Table 5: Outfalls

Name	Inflows	Invert Elev. (m)	Rim Elev. (m)	Type	Max. Depth (m)	Max. HGL (m)	Time Max. HGL (M/D/Y)	Max. Total Inflow (L/s)	Max. Flow (L/s)	Total Flow (ML)	Contributing Area (ha)	Contributing Imp. Area (ha)
Carling_OLF	NO	64.6	64.8	FREE	0.13	64.73	10/04/2022 08:11 AM	286.47	286.47	0.287	1.367	0.782
Dows-Lake	NO	63.745	66.5	NORMAL	1.2	64.94	10/04/2022 08:10 AM	2274.43	2274.43	19.296	29.569	13.18
LRT-Corridor	NO	56	57	FREE	0	56	10/04/2022 00:00 AM	26.54	26.54	0.021	0.059	0
Nepean-Bay-Trunk	NO	62.8	65.21	NORMAL	0	62.8	10/04/2022 00:00 AM	231.86	231.86	3.385	5.404	2.914
Preston_Street	NO	60.9	63.76	NORMAL	0.3	61.2	10/04/2022 08:07 AM	124.31	124.31	2.344	2.471	1.526

Table 6: Subcatchments

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
1	24hr-100yr	SA-1	1.216139	3	100	0.016	0.15	1.57	4.67	25	106.61	0	606.73	
10	24hr-100yr	13B_2	0.099916	3	8.07	0.016	0.15	1.57	4.67	25	106.61	66.43	42.14	
11	24hr-100yr	MHST-105-S	0.045673	3	100	0.016	0.15	1.57	4.67	25	106.61	0	22.65	
12	24hr-100yr	BI-SA1-S	0.127648	5	56.48	0.016	0.15	1.57	4.67	25	106.61	31.15	60.86	
13B_1	24hr-100yr	MHST-104-S	0.13	5	100	0.016	0.15	1.57	4.67	25	106.61	0	64.44	
13B_2	24hr-100yr	BI-SA1-S	0.22	5	100	0.016	0.15	1.57	4.67	25	106.61	0	146	
14	24hr-100yr	Carling_OLF	0.058029	3	60.27	0.016	0.15	1.57	4.67	25	106.61	28.82	26.31	
14B	24hr-100yr	S-14B	0.1272	3	0	0.016	0.15	1.57	4.67	25	106.61	71.9	56.35	
15	24hr-100yr	S-15	0.364274	3	3.61	0.016	0.15	1.57	4.67	25	106.61	70.71	117.34	
16	24hr-100yr	LRT-Corridor	0.022914	3	0	0.016	0.15	1.57	4.67	25	106.61	71.61	10.35	
17	24hr-100yr	LRT-Corridor	0.036056	3	0	0.016	0.15	1.57	4.67	25	106.61	71.76	16.19	
18	24hr-100yr	Carling_OLF	0.119323	3	3.43	0.016	0.15	1.57	4.67	25	106.61	70.04	47.06	
19	24hr-100yr	S-19	0.2044	3	8.76	0.016	0.15	1.57	4.67	25	106.61	66.34	78.44	
2	24hr-100yr	SA-2	0.711441	3	100	0.016	0.15	1.57	4.67	25	106.61	0	382.55	
20	24hr-100yr	Carling_OLFN1	0.243417	8	0	0.016	0.15	1.57	4.67	25	106.61	71.99	106.47	
21B	24hr-100yr	S-21B	0.432546	10	0	0.016	0.15	1.57	4.67	25	106.61	94.92	490.68	

Table 6: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
22B_1	24hr-100yr	MHST-120-S	0.269974	5	100	0.016	0.15	1.57	4.67	25	106.61	0	133.35	
22B_2	24hr-100yr	MHST-106-S	0.06376	5	100	0.016	0.15	1.57	4.67	25	106.61	0	31.62	
22B_3	24hr-100yr	MSHT-103-S	0.136614	5	100	0.016	0.15	1.57	4.67	25	106.61	0	67.74	
22B_4	24hr-100yr	MHST-102-S	0.073863	5	100	0.016	0.15	1.57	4.67	25	106.61	0	36.64	
22B_5	24hr-100yr	MHST-101-S	0.093958	5	100	0.016	0.15	1.57	4.67	25	106.61	0	46.6	
24	24hr-100yr	MHST-107	0.034783	3	55.8	0.016	0.15	1.57	4.67	25	106.61	31.85	16.27	
25	24hr-100yr	OGS1	0.046463	3	80.56	0.016	0.15	1.57	4.67	25	106.61	14	22.51	
26B	24hr-100yr	S-26B	0.707526	9.406	16.46	0.016	0.15	1.57	4.67	25	106.61	61.36	240.03	
26D	24hr-100yr	S-26D	0.079723	25	0	0.016	0.15	1.57	4.67	25	106.61	71.89	35.37	
27	24hr-100yr	MHST-101-S	0.076061	3	61.17	0.016	0.15	1.57	4.67	25	106.61	27.81	36.41	
28	24hr-100yr	MHST-102-S	0.076646	5	63.2	0.016	0.15	1.57	4.67	25	106.61	26.35	36.77	
29	24hr-100yr	7	0.011277	3	0	0.016	0.15	1.57	4.67	25	106.61	72.52	4.41	
2B	24hr-100yr	SA-2	0.090802	3	100	0.016	0.15	1.57	4.67	25	106.61	0	45.04	
3	24hr-100yr	S-3	0.21539	3	31.75	0.016	0.15	1.57	4.67	25	106.61	55.26	163.47	
3B	24hr-100yr	3	0.0393	3	100	0.016	0.15	1.57	4.67	25	106.61	0	19.49	
4	24hr-100yr	2	0.019571	3	100	0.016	0.15	1.57	4.67	25	106.61	0	9.71	
40	24hr-100yr	MHST-156	1.18634	6.77	47.28	0.016	0.15	1.57	4.67	25	106.61	38.92	454.3	
41	24hr-100yr	MHST-132	1.522779	3	14.99	0.016	0.15	1.57	4.67	25	106.61	65.74	289.99	
42_1	24hr-100yr	MHST-135-S	0.38897	5	75.19	0.016	0.15	1.57	4.67	25	106.61	17.81	188.37	
42_2	24hr-100yr	MHST-149-S	0.30146	5	75.19	0.016	0.15	1.57	4.67	25	106.61	17.82	145.77	
42_3	24hr-100yr	MHST-150-S1	0.59319	2	75.19	0.016	0.15	1.57	4.67	25	106.61	17.97	279.42	
42_4	24hr-100yr	MHST-141-S	0.45704	2	75.19	0.016	0.15	1.57	4.67	25	106.61	15.12	161.88	PurpleRoof
43	24hr-100yr	SA-CUP	0.56665	2	100	0.016	0.15	1.57	4.67	25	106.61	0	280.78	
44	24hr-100yr	MHST-62534	12.74513	1	32.06	0.016	0.15	1.57	4.67	25	106.61	52.72	3149.2	
45	24hr-100yr	63	0.36482	4	25.66	0.016	0.15	1.57	4.67	25	106.61	54.72	126.96	
45_A	24hr-100yr	MHST-138	0.192111	4	0	0.016	0.15	1.57	4.67	25	106.61	72.44	76.6	
46	24hr-100yr	21B	0.887972	10	21	0.016	0.15	1.57	4.67	25	106.61	63.64	477.39	

Table 6: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
47_1	24hr-100yr	D-MHST-155-S	0.11038	3	65.86	0.016	0.15	1.57	4.67	25	106.61	24.54	52.8	
47_2	24hr-100yr	MHST-148-S	0.46158	3	65.86	0.016	0.15	1.57	4.67	25	106.61	24.99	202.23	
47_3	24hr-100yr	MHST-147-S	0.19065	3	65.86	0.016	0.15	1.57	4.67	25	106.61	24.65	89.72	
47_4	24hr-100yr	MHST-146-S	0.40137	3	65.86	0.016	0.15	1.57	4.67	25	106.61	24.92	178.59	
47_5	24hr-100yr	MHST-157-S	0.25086	3	65.86	0.016	0.15	1.57	4.67	25	106.61	24.73	116.23	
48	24hr-100yr	R-48	0.137722	2	100	0.016	0.4	1.57	4.67	25	106.61	0	68.24	
49	24hr-100yr	R-49	0.16391	2	100	0.016	0.4	1.57	4.67	25	106.61	0	81.13	
5	24hr-100yr	preston	0.012005	3	100	0.016	0.15	1.57	4.67	25	106.61	0	5.95	
50	24hr-100yr	R-50	0.34548	2	100	0.016	0.4	1.57	4.67	25	106.61	0	167.61	
51_1	24hr-100yr	MH-SA51-1	0.637265	2	30	0.016	0.15	1.57	4.67	25	106.61	7.58	16.63	PurpleRoof
51_2	24hr-100yr	MH-SA51-2	0.637265	2	30	0.016	0.15	1.57	4.67	25	106.61	7.58	16.63	PurpleRoof
52	24hr-100yr	R-52	0.39976	2	100	0.016	0.4	1.57	4.67	25	106.61	0	192.14	
53	24hr-100yr	R-53	0.173497	2	100	0.016	0.4	1.57	4.67	25	106.61	0	85.83	
54	24hr-100yr	R-54	0.17076	2	100	0.016	0.4	1.57	4.67	25	106.61	0	84.49	
55	24hr-100yr	MH-SA55	0.353278	2	30	0.016	0.15	1.57	4.67	25	106.61	7.56	9.22	PurpleRoof
56	24hr-100yr	MH-SA56	0.945966	2	86.18	0.016	0.15	1.57	4.67	25	106.61	9.98	455.79	
57	24hr-100yr	Carling_OLF1	0.154931	15	6.12	0.016	0.15	1.57	4.67	25	106.61	67.32	70.19	
58	24hr-100yr	46	0.442854	16	33.5	0.016	0.15	1.57	4.67	25	106.61	48.4	181.29	
59	24hr-100yr	MHST-133	0.753001	2	90.56	0.016	0.15	1.57	4.67	25	106.61	6.81	362.97	
6	24hr-100yr	3	0.1396	3	2.06	0.016	0.15	1.57	4.67	25	106.61	70.93	56.18	
60	24hr-100yr	S-60	0.217787	25	0	0.016	0.15	1.57	4.67	25	106.61	76.71	372.57	
60A	24hr-100yr	60B	0.243636	25	19.96	0.016	0.15	1.57	4.67	25	106.61	57.71	107.87	
60B	24hr-100yr	60	0.39679	25	0	0.016	0.15	1.57	4.67	25	106.61	97.32	372	
60C	24hr-100yr	60B	0.507297	25	35	0.016	0.15	1.57	4.67	25	106.61	47.15	216.55	
61	24hr-100yr	CBMHST-104	0.65834	3	62.04	0.016	0.15	1.57	4.67	25	106.61	27.65	292.76	
62	24hr-100yr	POW_D1	0.266185	4.97	68.32	0.016	0.15	1.57	4.67	25	106.61	24.1	110.81	
62A	24hr-100yr	POW_D1	0.519395	6	0.04	0.016	0.15	1.57	4.67	25	106.61	75.78	94.21	

Table 6: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
62B	24hr-100yr	62	0.07117	3	0	0.016	0.15	1.57	4.67	25	106.61	74.58	16.74	
62C	24hr-100yr	POW_D1	1.13365	5	58.05	0.016	0.15	1.57	4.67	25	106.61	33.47	330.51	
63	24hr-100yr	S-63	0.41268	2	49.11	0.016	0.15	1.57	4.67	25	106.61	41.78	308.97	
64	24hr-100yr	CHAMBER-102	0.16771	6	78.06	0.016	0.15	1.57	4.67	25	106.61	15.72	81.54	
65	24hr-100yr	MHST-137	0.523363	3.598	41.91	0.016	0.15	1.57	4.67	25	106.61	44.68	152.53	
7	24hr-100yr	2	0.016512	3	100	0.016	0.15	1.57	4.67	25	106.61	0	12.33	
8	24hr-100yr	2	0.01883	3	100	0.016	0.15	1.57	4.67	25	106.61	0	9.34	
9	24hr-100yr	1	0.019216	3	100	0.016	0.15	1.57	4.67	25	106.61	0	9.53	

PCSWMM Report

24 Hour - Stress Test Event

Model Partial Green Roof_November-2023.inp

Parsons

November 24, 2023

Table of Contents

Summary 1: Runoff quantity continuity

Name	Partial Green Roof_November-2023
Initial LID storage (mm)	0.247
Initial snow cover (mm)	n/a
Total precipitation (mm)	127.928
Outfall runon (mm)	n/a
Evaporation loss (mm)	0.000
Infiltration loss (mm)	44.249
Surface runoff (mm)	77.448
LID drainage (mm)	3.654
Snow removed (mm)	n/a
Final snow cover (mm)	n/a
Final storage (mm)	2.882
Continuity error (%)	-0.045

Summary 2: Flow routing continuity

Name	Partial Green Roof_November-2023
Dry weather inflow (ML)	0.000
Wet weather inflow (ML)	30.376
Groundwater inflow (ML)	0.000
RDII inflow (ML)	0.000
External inflow (ML)	1.151
External outflow (ML)	31.169
Flooding loss (ML)	0.012
Evaporation loss (ML)	0.000
Exfiltration loss (ML)	0.000
Initial stored volume (ML)	0.000
Final stored volume (ML)	2.150
Continuity error (%)	-5.722

Figure 1: Extent 1

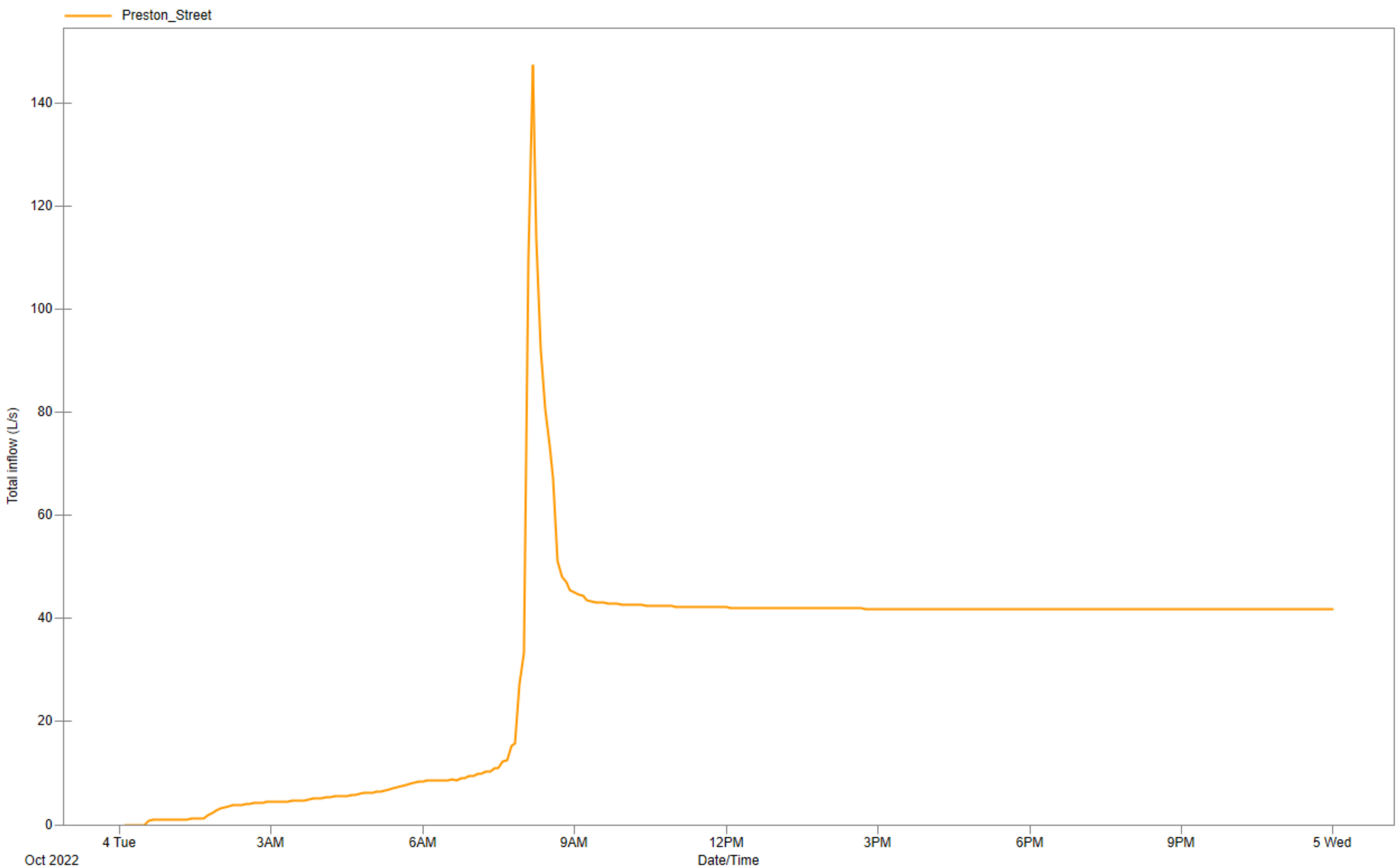


Figure 2: Preston Outfall

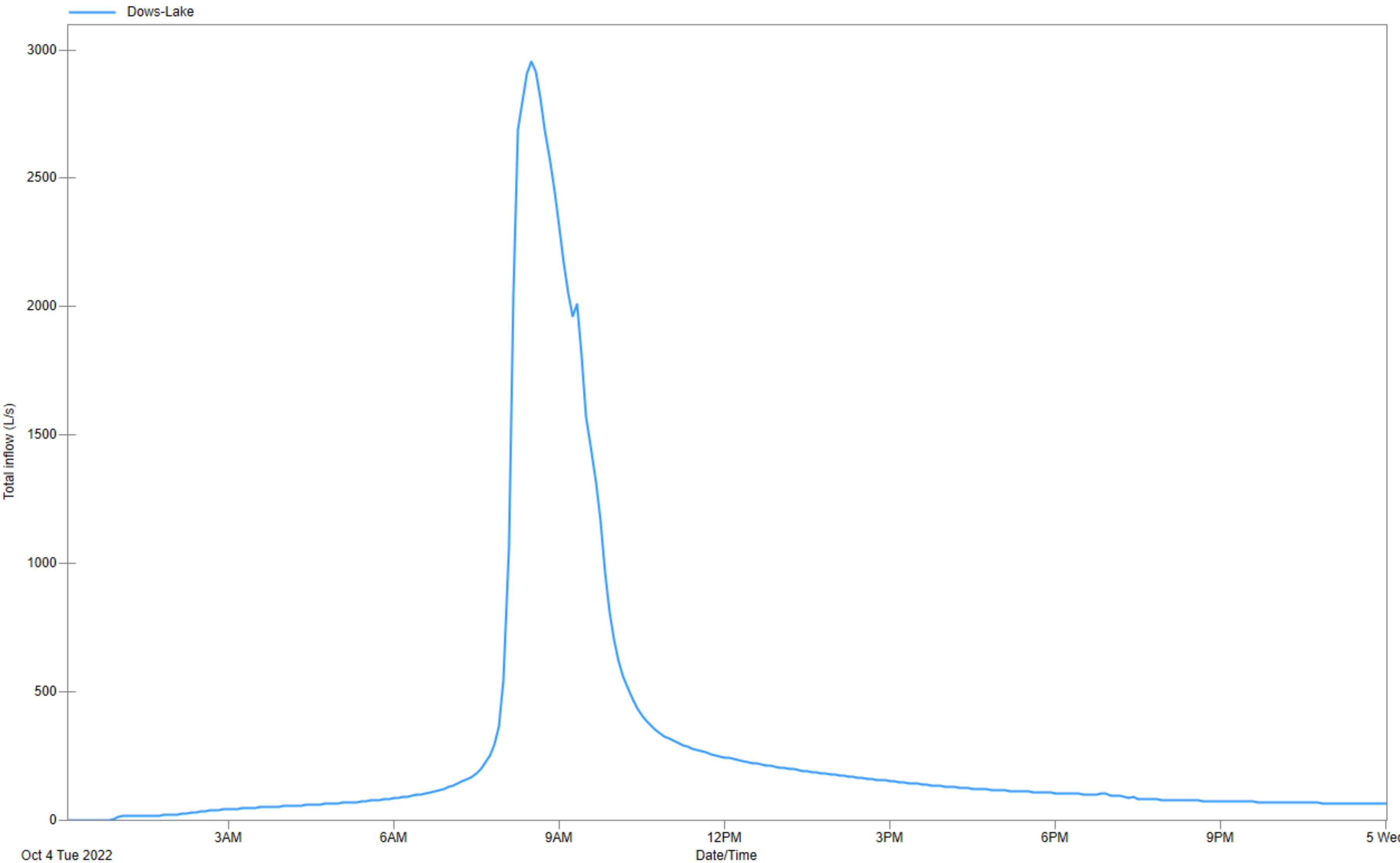


Figure 3: Dows Lake Outfall

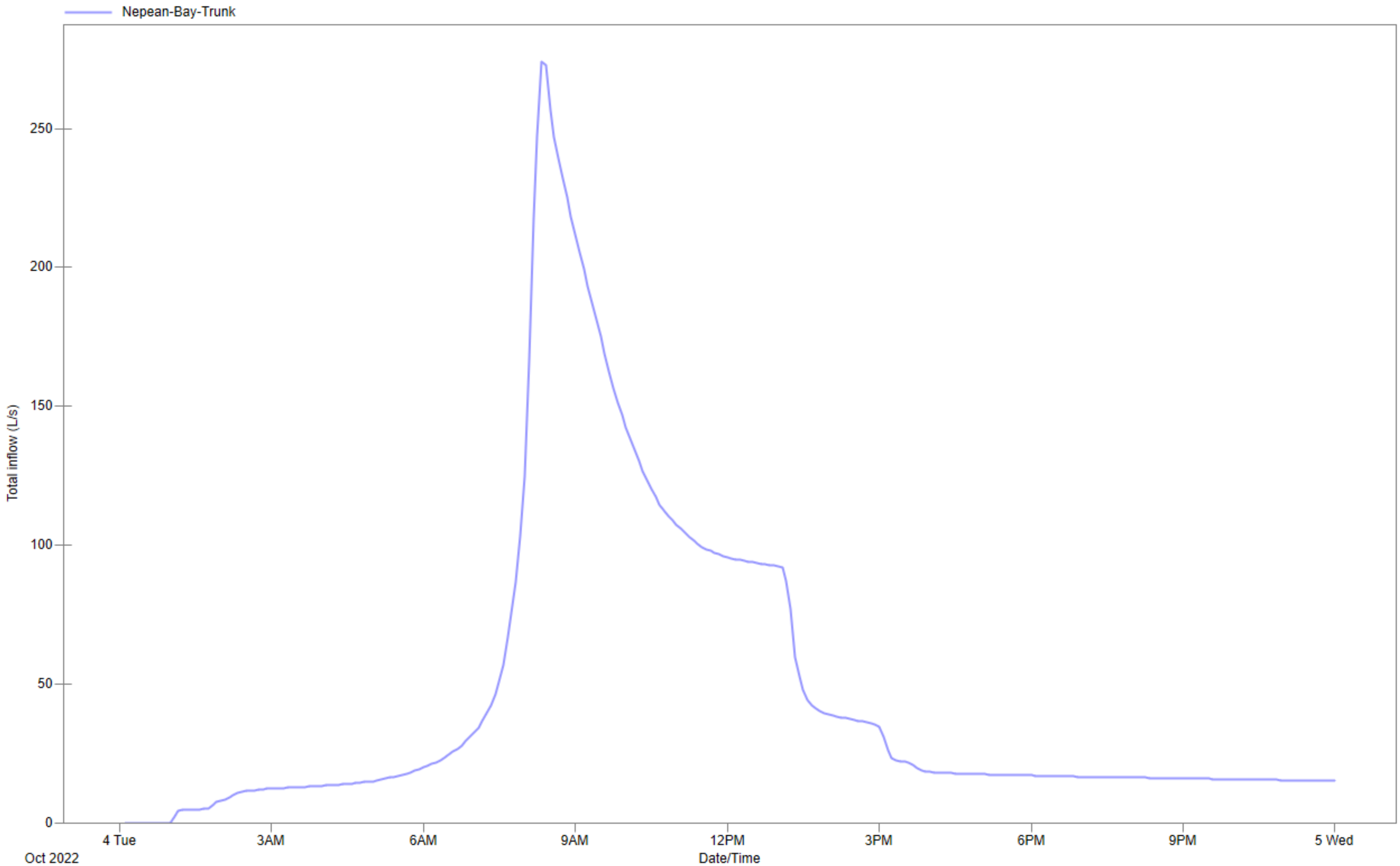


Figure 4: Nepean Bay Outfall

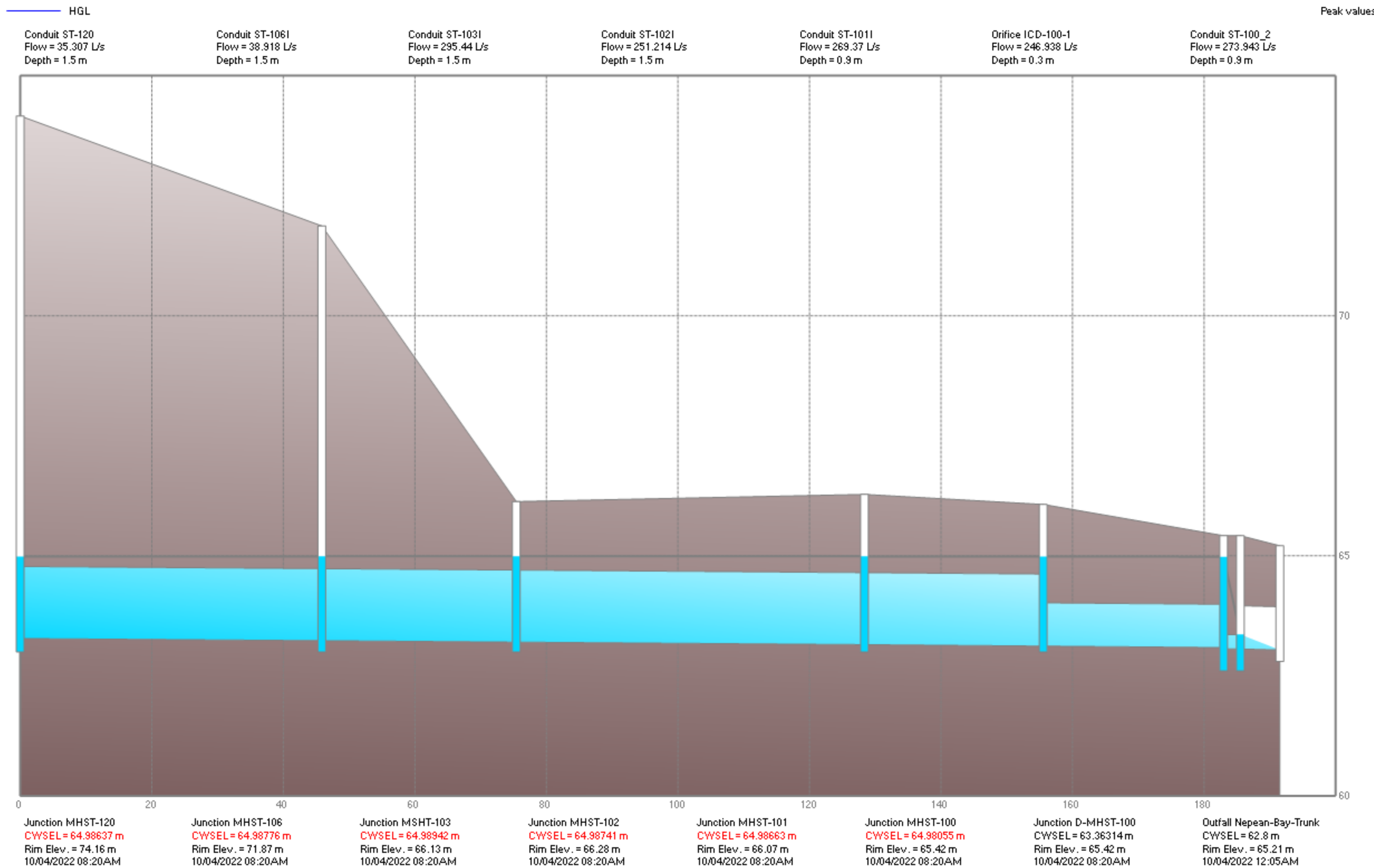


Figure 5: Road A

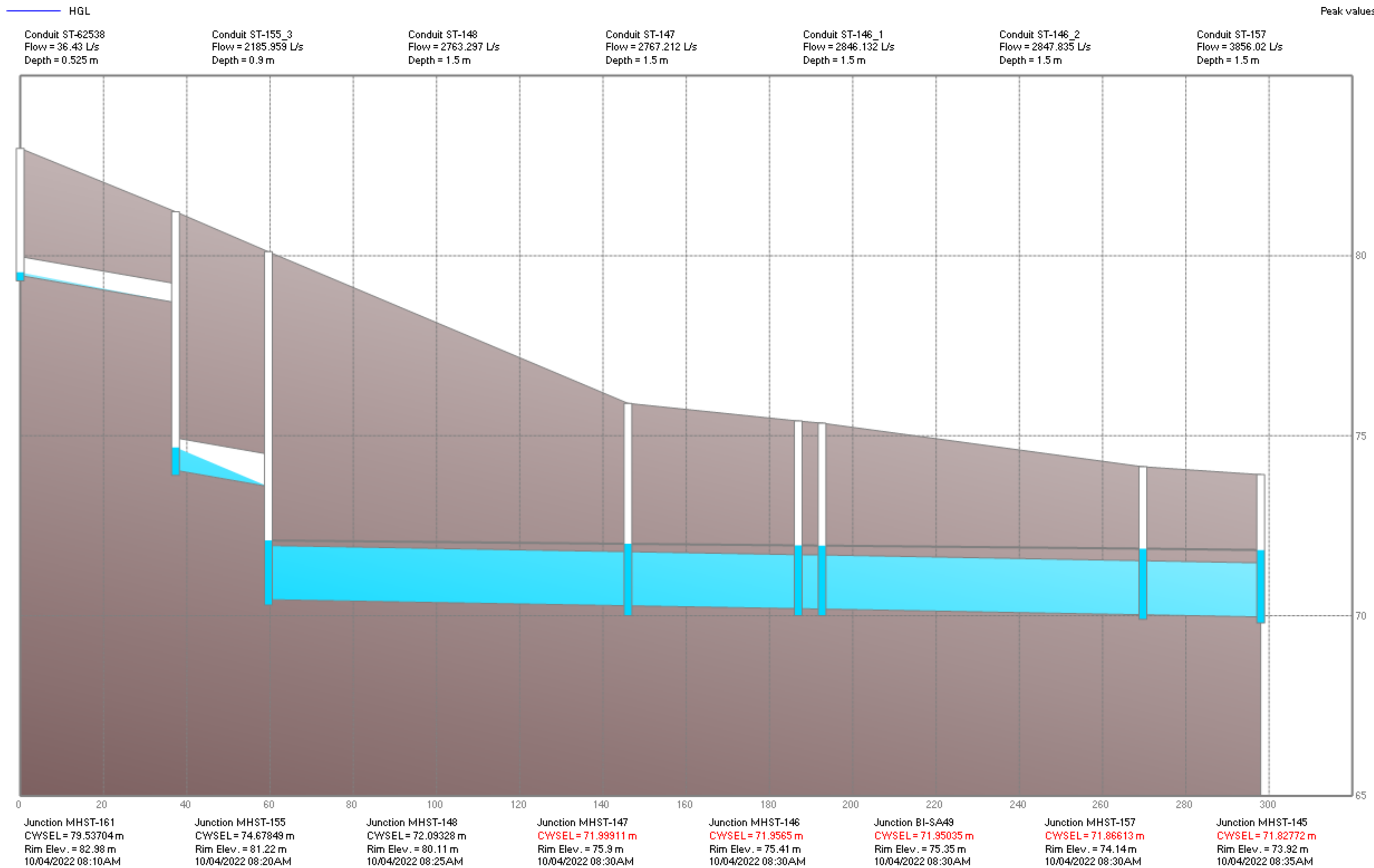


Figure 6: Road D

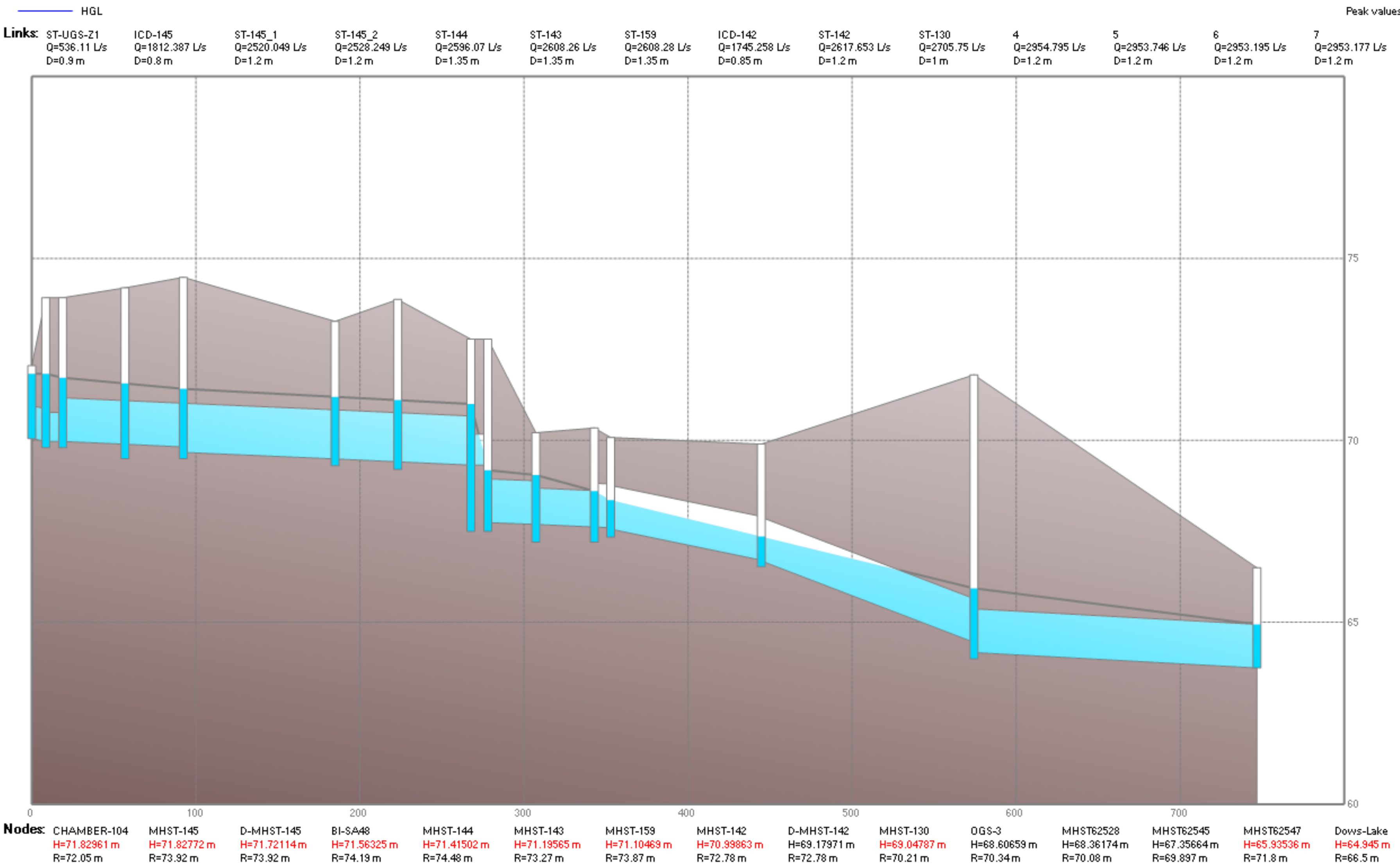


Figure 7: Road D to Outfall

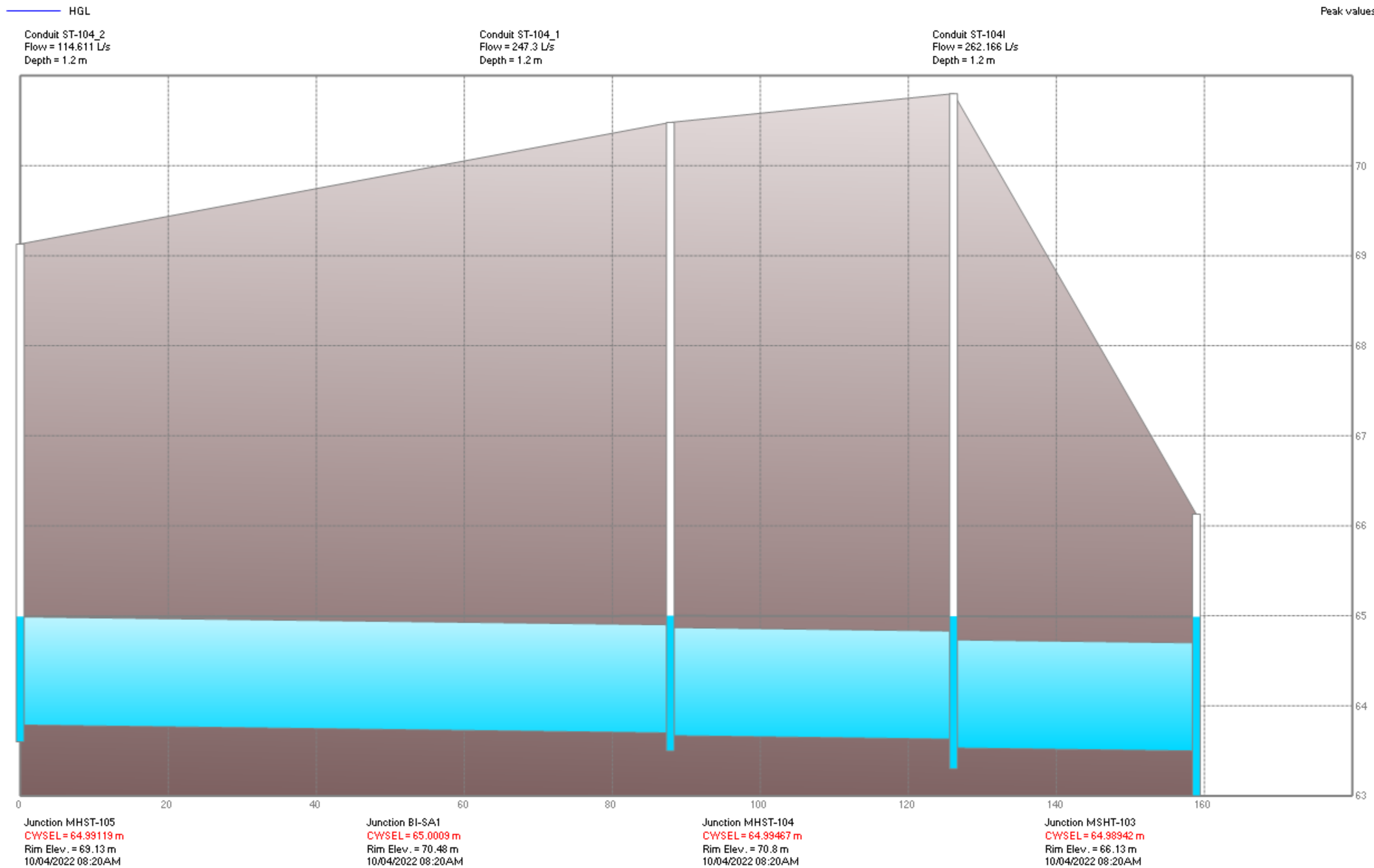


Figure 8: Road B

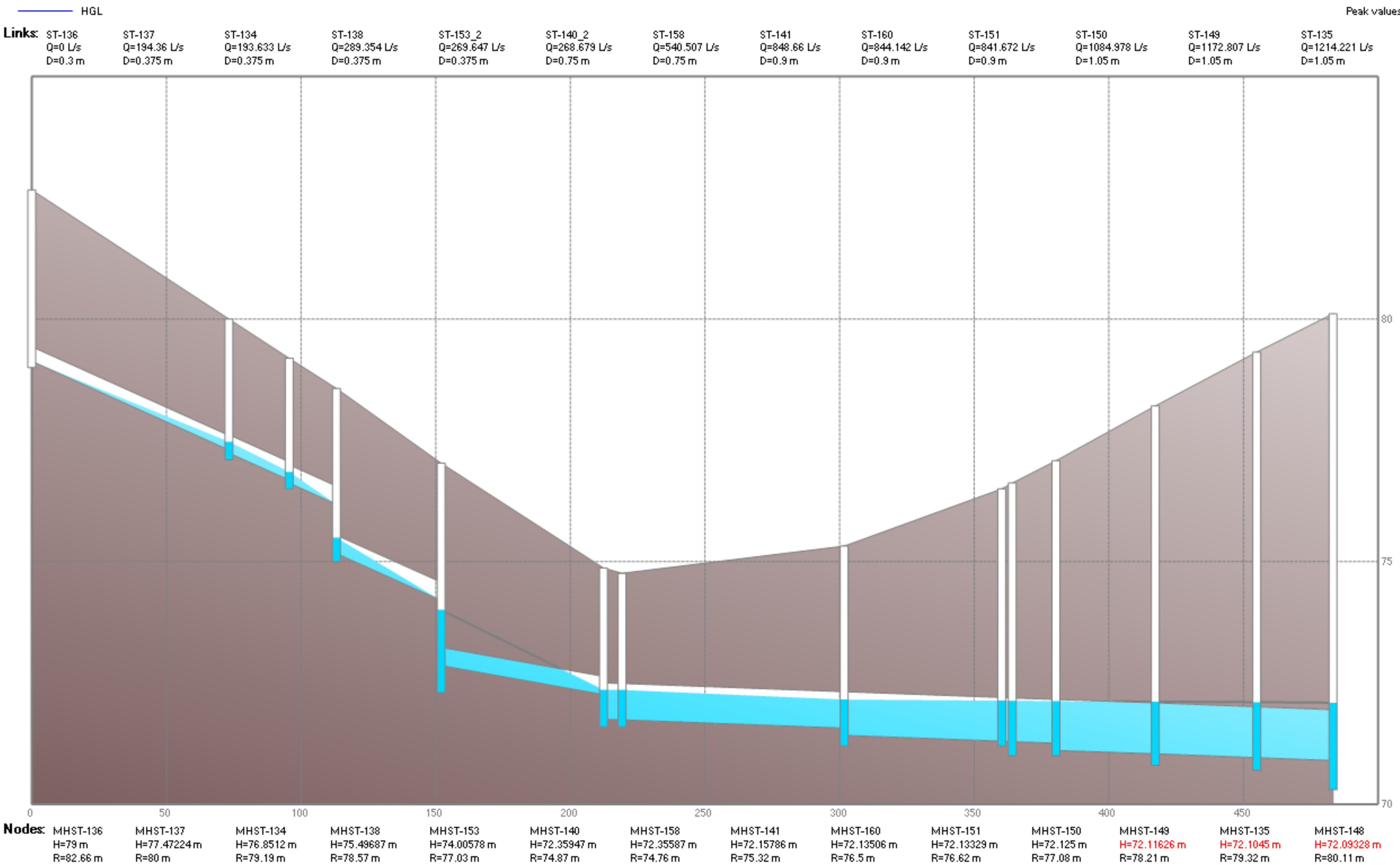


Figure 9: Road E

Table 1: Orifices

Name	Inlet Node	Outlet Node	Type	Cross-Section	Height (m)	Inlet Elev. (m)	Discharge Coeff.	Max. |Flow| (L/s)	Contributing Area (ha)	Contributing Imp. Area (ha)
ICD-100-1	MHST-100	D-MHST-100	SIDE	CIRCULAR	0.3	63.06	0.62	255.15	3.641	2.579
ICD-100-2	MHST-100	D-MHST-100	SIDE	CIRCULAR	0.1	63.85	0.62	23.59	3.641	2.579
ICD-142	MHST-142	D-MHST-142	SIDE	CIRCULAR	0.85	69.32	0.62	1746.85	24.887	10.859
ICD-145	MHST-145	D-MHST-145	SIDE	RECT_CLOSED	0.8	69.97	0.62	1816.87	23.279	9.629
ICD-155	D-MHST-155	MHST-155	SIDE	CIRCULAR	0.675	74.1	0.62	1498.95	13.523	4.382
ICD-170	MHST-170	DMHST-170	SIDE	CIRCULAR	0.1	71.96	0.62	17.18	0.826	0.539

Table 2: Conduits

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
1	MHST-158-S	S-60	295	0.035	74.95	69.04	TRAPEZOIDAL	0.5	0.02004	56.44	0.15
10	CBMHST105	CBMHST103	17.6	0.013	72.4	72.13	CIRCULAR	0.375	0.01534	362.89	3.29
2	MHST-105-S	Wales-OLF-N03	17	0.016	68.69	68.2	IRREGULAR	0	0.02884	50.18	0.76
3	Preston	Preston_Street	10	0.013	61.03	60.9	CIRCULAR	0.3	0.013	148.91	2.11
4	OGS-3	MHST62528	10	0.013	67.62	67.6	CIRCULAR	1.2	0.002	2955.47	3.03
5	MHST62528	MHST62545	91.8	0.013	67.56	66.707	CIRCULAR	1.2	0.00929	2955.47	3.68
6	MHST62545	MHST62547	129.6	0.013	66.687	64.45	CIRCULAR	1.2	0.01726	2955.52	3.89
7	MHST62547	Dows-Lake	172.5	0.013	64.17	63.745	CIRCULAR	1.2	0.00246	2955.55	2.61
8	POW_D1	OGS-3	180	0.035	78.7	69.7	TRAPEZOIDAL	0.55	0.05006	657.5	1.79
8_1	CHAMBER-103	D-MHST-155	3.1	0.013	74.12	74.1	CIRCULAR	0.9	0.00645	2182.29	3.43
9	CBMHST103	CHAMBER-102	2.6	0.013	72.1	72.07	CIRCULAR	0.375	0.01154	362.93	3.29
CA-OLF_2	Carling_OLF1	Carling_OLFN1	120.425	0.016	66.5	65.408	IRREGULAR	0	0.00907	85.85	0.59
CA-OLF_3	Carling_OLFN3	Carling_OLF	66.467	0.016	64.8	64.6	IRREGULAR	0	0.00301	292.03	0.7
CA-OLF_4	Carling_OLFN1	Carling_OLFN3	67.075	0.016	65.408	64.8	IRREGULAR	0	0.00906	213.59	0.62
CA-STM	IN119607	D-MHST-100	86	0.013	63.1	62.8	CIRCULAR	0.3	0.00349	5.98	0.11

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-100_2	D-MHST-100	Nepean-Bay-Trunk	6	0.013	63.06	63.04	CIRCULAR	0.9	0.00333	282.62	1.47
ST-100-S	MHST-100-S	Carling_OLFN3	11	0.013	65.42	64.8	IRREGULAR	0	0.05645	92.92	0.51
ST-101I	MHST-101	MHST-100	27.419	0.013	63.12	63.09	CIRCULAR	0.9	0.00109	278.75	0.49
ST-101I-S	MHST-101-S	MHST-100-S	27.419	0.013	66.07	65.42	IRREGULAR	0	0.02371	92.93	0.91
ST-102	CBMHST-101	CBMHST105	48	0.013	73.63	72.43	CIRCULAR	0.375	0.02501	362.9	3.29
ST-102I	MHST-102	MHST-101	27.18	0.013	63.15	63.12	CIRCULAR	1.5	0.0011	259.85	0.38
ST-102I-S	MHST-102-S	MHST-101-S	27.18	0.013	66.28	66.07	IRREGULAR	0	0.00773	34.07	0.34
ST-103I	MSHT-103	MHST-102	52.936	0.013	63.203	63.15	CIRCULAR	1.5	0.001	299.76	0.44
ST-103I-S	MSHT-103-S	MHST-102-S	52.936	0.013	66.13	66.28	IRREGULAR	0	-0.00283	20.63	0.15
ST-104	CBMHST-104	CBMHST-101	15.1	0.013	74.14	73.84	CIRCULAR	0.375	0.01987	362.92	3.29
ST-104_1	BI-SA1	MHST-104	38.268	0.013	63.67	63.631	CIRCULAR	1.2	0.00102	285.12	1.13
ST-104_2	MHST-105	BI-SA1	87.842	0.013	63.788	63.7	CIRCULAR	1.2	0.001	136.77	0.52
ST-104I	MHST-104	MSHT-103	32.803	0.013	63.533	63.5	CIRCULAR	1.2	0.00101	262.69	0.97
ST-105I_1-S	BI-SA1-S	MHST-105-S	87.84	0.013	70.15	68.64	IRREGULAR	0	0.01719	159.45	0.76
ST-105I_2-S	MHST-104-S	BI-SA1-S	37.727	0.013	70.8	70.15	IRREGULAR	0	0.01723	54.83	0.48
ST-106I	MHST-106	MSHT-103	29.577	0.013	63.233	63.203	CIRCULAR	1.5	0.00101	108.54	0.11
ST-106I-S	MHST-106-S	MSHT-103-S	29.577	0.013	71.87	66.13	IRREGULAR	0	0.19783	120.11	0.9
ST-107	DMHST-170	MHST-158	13.5	0.013	71.93	71.8	CIRCULAR	0.3	0.00963	186.66	2.64
ST-108	CBMH108	CBMH109	35.7	0.013	71.56	71.49	CIRCULAR	0.6	0.00196	25.14	0.52
ST-109	CBMH109	CBMH110	20.8	0.013	71.49	71.45	CIRCULAR	0.6	0.00192	50.83	0.53
ST-110	CBMH110	MHST-135	17.9	0.013	71.45	71.41	CIRCULAR	0.6	0.00223	67.35	0.63
ST-111	CBMH111	CBMH108	15.3	0.013	71.59	71.56	CIRCULAR	0.6	0.00196	20.65	0.52
ST-120	MHST-120	MHST-106	45.853	0.013	63.278	63.233	CIRCULAR	1.5	0.00098	86.67	0.12
ST-120-S	MHST-120-S	MHST-106-S	45.853	0.013	74.16	71.87	IRREGULAR	0	0.05	89.64	1.18
ST-130	MHST-130	OGS-3	35.6	0.013	67.69	67.62	CIRCULAR	1	0.00197	2715.45	3.46
ST-131	MHST-131	MHST-130	47.9	0.013	68.12	68.07	CIRCULAR	0.825	0.00104	387.57	1.3
ST-132	MHST-132	MHST-156	41.86	0.013	73.25	72.62	CIRCULAR	0.45	0.01505	400.95	2.55

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-133	MHST-133	MHST-131	51.37	0.013	68.17	68.12	CIRCULAR	0.825	0.00097	408.79	1.15
ST-134	MHST-134	MHST-138	17.5	0.013	76.62	76.18	CIRCULAR	0.375	0.02515	195.21	2.73
ST-135	MHST-135	MHST-148	28.3	0.013	70.96	70.9	CIRCULAR	1.05	0.00212	1228.01	2.14
ST-136	MHST-136	MHST-137	73.2	0.013	79.13	77.3	CIRCULAR	0.3	0.02501	0	0
ST-137	MHST-137	MHST-134	22.4	0.013	77.24	76.68	CIRCULAR	0.375	0.02501	195.09	2.72
ST-138	MHST-138	MHST-153	38.9	0.013	75.17	74.2	CIRCULAR	0.375	0.02494	291.14	2.9
ST-139	MHST-139	MHST-133	72.94	0.013	68.32	68.25	CIRCULAR	0.75	0.00096	38.51	0.48
ST-140_2	MHST-140	MHST-158	6.9	0.013	71.75	71.74	CIRCULAR	0.75	0.00145	277.32	0.73
ST-141	MHST-141	MHST-160	58.5	0.013	71.42	71.3	CIRCULAR	0.9	0.00205	875.47	1.77
ST-141-S	MHST-151-S	MHST-141-S	70.7	0.013	76.58	75.32	IRREGULAR	0	0.01782	350.09	1.13
ST-142	D-MHST-142	MHST-130	29.3	0.013	67.74	67.69	CIRCULAR	1.2	0.00171	2624.31	2.32
ST-143	MHST-143	MHST-159	38.2	0.013	69.49	69.41	CIRCULAR	1.35	0.00209	2615.49	1.83
ST-144	MHST-144	MHST-143	92.5	0.013	69.67	69.49	CIRCULAR	1.35	0.00195	2604.69	1.82
ST-145_1	D-MHST-145	BI-SA48	38	0.013	69.97	69.894	CIRCULAR	1.2	0.002	2526.47	2.23
ST-145_2	BI-SA48	MHST-144	35.6	0.013	69.894	69.82	CIRCULAR	1.2	0.00208	2533.36	2.24
ST-146_1	MHST-146	BI-SA49	5.7	0.013	70.2	70.189	CIRCULAR	1.5	0.00193	2921.63	2.02
ST-146_1-S	MHST-146-S	BI-SA49-S	5.693	0.013	75.44	75.351	IRREGULAR	0	0.01564	230.42	0.85
ST-146_2	BI-SA49	MHST-157	77.1	0.013	70.189	70.03	CIRCULAR	1.5	0.00206	2941.47	2.05
ST-146_2-S	BI-SA49-S	MHST-157-S	77.118	0.013	75.351	74.14	IRREGULAR	0	0.01571	163.78	0.63
ST-147	MHST-147	MHST-146	40.9	0.013	70.28	70.2	CIRCULAR	1.5	0.00196	2794.84	1.92
ST-147-S	MHST-147-S	MHST-146-S	40.768	0.013	75.9	75.44	IRREGULAR	0	0.01128	202.82	0.73
ST-148	MHST-148	MHST-147	86.4	0.013	70.45	70.28	CIRCULAR	1.5	0.00197	2798.88	1.92
ST-148-S	MHST-148-S	MHST-147-S	93.313	0.013	80.11	75.9	IRREGULAR	0	0.04516	159.82	0.79
ST-149	MHST-149	MHST-135	37.7	0.013	71.04	70.96	CIRCULAR	1.05	0.00212	1185.51	1.9
ST-149-S	MHST-135-S	MHST-149-S	34.9	0.013	79.32	78.21	IRREGULAR	0	0.03182	180.46	0.86
ST-150	MHST-150	MHST-149	36.9	0.013	71.11	71.04	CIRCULAR	1.05	0.0019	1102.4	1.69
ST-150-S	MHST-149-S	MHST-150-S1	45	0.013	78.21	77.08	IRREGULAR	0	0.02512	262.1	0.78

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-151	MHST-151	MHST-150	16.2	0.013	71.29	71.26	CIRCULAR	0.9	0.00185	895.65	2.03
ST-151-S	MHST-150-S1	MHST-151-S	16.1	0.013	77.08	76.58	IRREGULAR	0	0.03107	350.89	1.28
ST-153_2	MHST-153	MHST-140	60.3	0.013	72.86	72.26	CIRCULAR	0.375	0.00995	277.64	2.53
ST-154	MHST-154	CHAMBER-103	16	0.013	75.8	75.72	CIRCULAR	0.9	0.005	4227.1	6.64
ST-154A	MHST-154A	MHST-154B	15.51	0.013	76.18	76.1	CIRCULAR	0.9	0.00516	4225.63	6.64
ST-154B	MHST-154B	MHST-154	35.9	0.013	76.04	75.86	CIRCULAR	0.9	0.00501	4226.77	6.64
ST-155_2-S	D-MHST-155-S	MHST-148-S	52.7	0.013	83.11	80.11	IRREGULAR	0	0.05702	27.55	0.44
ST-155_3	MHST-155	MHST-148	22.3	0.013	74.04	73.59	CIRCULAR	0.9	0.02018	2197.53	4.54
ST-156	MHST-156	MHST-157	35.51	0.013	70.1	70.03	CIRCULAR	1.5	0.00197	969.34	0.82
ST-157	MHST-157	MHST-145	28.3	0.013	70.03	69.97	CIRCULAR	1.5	0.00212	3868.49	2.89
ST-157-S	MHST-157-S	MHST-145-S	28.171	0.013	74.14	73.92	IRREGULAR	0	0.00781	199.68	0.48
ST-158	MHST-158	MHST-141	82.5	0.013	71.74	71.57	CIRCULAR	0.75	0.00206	568.32	1.66
ST-158-S	MHST-141-S	MHST-158-S	75.107	0.013	75.32	74.85	IRREGULAR	0	0.00626	219.85	0.59
ST-159	MHST-159	MHST-142	44.6	0.013	69.41	69.32	CIRCULAR	1.35	0.00202	2615.49	1.83
ST-160	MHST-160	MHST-151	3.95	0.013	71.3	71.29	CIRCULAR	0.9	0.00253	890.57	1.93
ST-162	CBMHST-162	MHST-154A	5.35	0.013	76.27	76.24	CIRCULAR	0.9	0.00561	4126.55	6.49
ST-62534	MHST-62534	CBMHST-162	7.16	0.013	76.3	76.27	CIRCULAR	0.9	0.00419	4127.51	6.49
ST-62538	MHST-161	MHST-155	37.3	0.013	79.45	78.7	CIRCULAR	0.525	0.02011	36.43	1.55
ST-G107	MHST-107	OGS1	52.5	0.013	62.03	61.24	CIRCULAR	0.3	0.01505	34.35	1.06
ST-OGS1_2	OGS1	Preston	10	0.013	61.21	61.06	CIRCULAR	0.3	0.015	85	1.65
ST-P3	DICB3	IN119608	71.1	0.013	64.23	63.8	CIRCULAR	0.2	0.00605	0	0
ST-P46	IN119608	IN119607	30	0.013	63.5	63.2	CIRCULAR	0.2	0.01	0	0
ST-SA1	MH-SA1	BI-SA1	24.65	0.013	69.45	69.08	CIRCULAR	0.3	0.01501	60.22	1.71
ST-SA48	MH-SA48	BI-SA48	10.8	0.013	72	71.78	CIRCULAR	0.3	0.02037	6.5	1
ST-SA49	MH-SA49	BI-SA49	21	0.013	72.8	72.38	CIRCULAR	0.3	0.02	8.23	1.07
ST-SA50	MH-SA50	MHST-147	20.47	0.013	73.15	72.74	CIRCULAR	0.45	0.02003	15.62	1.22
ST-SA51-1	MH-SA51-1	MHST-141	32.56	0.013	73.5	73.17	CIRCULAR	0.375	0.01014	21.83	1.09

Table 2: Conduits (continued...)

Name	Inlet Node	Outlet Node	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)	Cross-Section	Geom1 (m)	Slope (m/m)	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
ST-SA51-2	MH-SA51-2	MHST-160	33.2	0.013	73.5	73.17	CIRCULAR	0.45	0.00994	21.83	1.06
ST-SA52	MH-SA52	MHST-139	28.6	0.013	68.92	68.49	CIRCULAR	0.525	0.01504	19.61	1.13
ST-SA53	MH-ST53	MHST-133	24.9	0.013	69.04	68.79	CIRCULAR	0.3	0.01004	8.3	0.84
ST-SA54	MH-SA54	MHST-142	2.45	0.013	71.38	71.33	CIRCULAR	0.3	0.02041	8.17	1.07
ST-SA55	MH-SA55	MHST-143	47.61	0.013	72.5	71.55	CIRCULAR	0.45	0.01996	12.11	1.14
ST-Sa56	MH-SA56	MHST-144	21.47	0.013	72.5	72.07	CIRCULAR	0.45	0.02003	552.14	3.47
ST-UGS6B	CHAMBER-102	MHST-170	10.6	0.013	72.07	71.96	CIRCULAR	0.375	0.01038	186.53	1.69
ST-UGS-Z1	CHAMBER-104	MHST-145	8.42	0.013	70.05	69.97	CIRCULAR	0.9	0.0095	2546.13	4.23
ST-xx	MH-SAxx	MHST-107	10.7	0.013	62.45	62.15	CIRCULAR	0.2	0.02805	7.01	1.21
WD-OLF_3	Wales-OLF-N03	Wales-OLF-N04	81.193	0.016	68.2	66.75	IRREGULAR	0	0.01786	49.48	0.93
WD-OLF_4	Wales-OLF-N04	Wales-OLF-N05	94.991	0.016	66.75	65.5	IRREGULAR	0	0.01316	47.69	0.8

Table 3: Storages

Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)	Hours Flooded (h)	Max. Flood Rate (L/s)	Total Flood Vol. (ML)	Avg. Percent Full (%)	Max. Volume (1000 m³)	Max. Percent Full (%)	Max. Outflow (L/s)
CHAMBER-102	72.07	73.32	1.25	1.07	73.14	461.24	0	0	0	15	0.268	86	186.53
CHAMBER-103	74.12	77.12	3	2.93	77.05	4227.1	0	0	0	10	2.057	98	2182.29
CHAMBER-104	70.05	72.05	2	1.79	71.84	2546.13	0	0	0	13	2.681	89	592.39
R-48	73	73.15	0.15	0.07	73.07	81.92	0	0	0	17	0.093	48	6.5
R-49	74	74.15	0.15	0.07	74.07	97.43	0	0	0	16	0.108	45	8.23
R-50	77	77.15	0.15	0.07	77.07	202.35	0	0	0	17	0.233	46	15.62
R-52	69	69.15	0.15	0.07	69.07	232.41	0	0	0	17	0.268	45	18.33
R-53	70	70.15	0.15	0.07	70.07	103.09	0	0	0	17	0.116	46	8.3
R-54	72	72.15	0.15	0.07	72.07	101.48	0	0	0	16	0.114	45	8.17
S-14B	61.65	63.3	1.65	1.65	63.3	70	0.17	49.85	0.012	4	0.013	100	20.15

Table 3: Storages (continued...)

Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)	Hours Flooded (h)	Max. Flood Rate (L/s)	Total Flood Vol. (ML)	Avg. Percent Full (%)	Max. Volume (1000 m³)	Max. Percent Full (%)	Max. Outflow (L/s)
S-15	62.1	63.9	1.8	1.8	63.9	159.41	0	0	0	70	0.112	100	7.86
S-19	64	66	2	1.7	65.7	102.32	0	0	0	8	0.084	31	3.83
S-21B	63.54	65.7	2.16	2.01	65.55	677.38	0	0	0	43	0.889	69	4.21
S-26B	67.33	69.7	2.37	2.35	69.68	319.72	0	0	0	22	0.284	95	15.83
S-26D	67.66	69.31	1.65	1.49	69.15	43.9	0	0	0	6	0.028	54	3.59
S-3	62.2	64.24	2.04	2.04	64.24	207.93	0	0	0	70	0.081	100	26.69
S-60	67.84	70.25	2.41	2.16	70	573.3	0	0	0	36	0.287	63	4.36
S-63	78.2	82.42	4.22	4.11	82.31	390.28	0	0	0	4	0.18	66	99.51
SA-1	69.5	72.5	3	2.86	72.36	730.7	0	0	0	19	0.629	95	60
SA-2	62.6	65.6	3	2.36	64.96	514.49	0	0	0	52	0.707	79	7
SA-CUP	72.5	75.5	3	0.68	73.18	337.07	0	0	0	8	0.34	23	15

Table 4: Weirs

Name	Inlet Node	Outlet Node	Type	Height (m)	Side Slope (m/m)	Inlet Elev. (m)	Discharge Coeff. (m³/s)	Max. |Flow| (L/s)	Contributing Area (ha)	Contributing Imp. Area (ha)
Weir-142	MHST-142	D-MHST-142	TRANSVERSE	0.5	0	70.5	1.65	876.68	24.887	10.859
Weir-145	MHST-145	D-MHST-145	TRANSVERSE	1	0	71.25	1.65	1097.56	23.279	9.629
Weir-155	D-MHST-155	MHST-155	TRANSVERSE	1	0	76.45	1.65	683.36	13.523	4.382
Weir-170	MHST-170	DMHST-170	TRANSVERSE	0.3	0	72.6	1.65	175.76	0.826	0.539

Table 5: Outfalls

Name	Inflows	Invert Elev. (m)	Rim Elev. (m)	Type	Max. Depth (m)	Max. HGL (m)	Time Max. HGL (M/D/Y)	Max. Total Inflow (L/s)	Max. Flow (L/s)	Total Flow (ML)	Contributing Area (ha)	Contributing Imp. Area (ha)
Carling_OLF	NO	64.6	64.8	FREE	0.14	64.74	10/04/2022 08:10 AM	378.74	378.74	0.382	1.367	0.782
Dows-Lake	NO	63.745	66.5	NORMAL	1.2	64.94	10/04/2022 08:08 AM	2955.55	2955.55	24.034	29.569	13.18
LRT-Corridor	NO	56	57	FREE	0	56	10/04/2022 00:00 AM	32.68	32.68	0.028	0.059	0
Nepean-Bay-Trunk	NO	62.8	65.21	NORMAL	0	62.8	10/04/2022 00:00 AM	282.62	282.62	4.01	5.404	2.914
Preston_Street	NO	60.9	63.76	NORMAL	0.3	61.2	10/04/2022 08:04 AM	148.91	148.91	2.715	2.471	1.526

Table 6: Subcatchments

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
1	24hr-StressTest	SA-1	1.216139	3	100	0.016	0.15	1.57	4.67	25	127.93	0	730.32	
10	24hr-StressTest	13B_2	0.099916	3	8.07	0.016	0.15	1.57	4.67	25	127.93	74.56	53.45	
11	24hr-StressTest	MHST-105-S	0.045673	3	100	0.016	0.15	1.57	4.67	25	127.93	0	27.18	
12	24hr-StressTest	BI-SA1-S	0.127648	5	56.48	0.016	0.15	1.57	4.67	25	127.93	35.03	73.75	
13B_1	24hr-StressTest	MHST-104-S	0.13	5	100	0.016	0.15	1.57	4.67	25	127.93	0	77.35	
13B_2	24hr-StressTest	BI-SA1-S	0.22	5	100	0.016	0.15	1.57	4.67	25	127.93	0	180.28	
14	24hr-StressTest	Carling_OLF	0.058029	3	60.27	0.016	0.15	1.57	4.67	25	127.93	32.32	32.49	
14B	24hr-StressTest	S-14B	0.1272	3	0	0.016	0.15	1.57	4.67	25	127.93	80.77	70	
15	24hr-StressTest	S-15	0.364274	3	3.61	0.016	0.15	1.57	4.67	25	127.93	79.13	159.41	
16	24hr-StressTest	LRT-Corridor	0.022914	3	0	0.016	0.15	1.57	4.67	25	127.93	80.51	12.72	
17	24hr-StressTest	LRT-Corridor	0.036056	3	0	0.016	0.15	1.57	4.67	25	127.93	80.65	19.97	
18	24hr-StressTest	Carling_OLF	0.119323	3	3.43	0.016	0.15	1.57	4.67	25	127.93	78.55	61	
19	24hr-StressTest	S-19	0.2044	3	8.76	0.016	0.15	1.57	4.67	25	127.93	74.36	102.32	
2	24hr-StressTest	SA-2	0.711441	3	100	0.016	0.15	1.57	4.67	25	127.93	0	460.23	
20	24hr-StressTest	Carling_OLFN1	0.243417	8	0	0.016	0.15	1.57	4.67	25	127.93	80.86	133.06	
21B	24hr-StressTest	S-21B	0.432546	10	0	0.016	0.15	1.57	4.67	25	127.93	106.79	677.38	

Table 6: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
22B_1	24hr-StressTest	MHST-120-S	0.269974	5	100	0.016	0.15	1.57	4.67	25	127.93	0	160.25	
22B_2	24hr-StressTest	MHST-106-S	0.06376	5	100	0.016	0.15	1.57	4.67	25	127.93	0	37.95	
22B_3	24hr-StressTest	MSHT-103-S	0.136614	5	100	0.016	0.15	1.57	4.67	25	127.93	0	81.3	
22B_4	24hr-StressTest	MHST-102-S	0.073863	5	100	0.016	0.15	1.57	4.67	25	127.93	0	43.96	
22B_5	24hr-StressTest	MHST-101-S	0.093958	5	100	0.016	0.15	1.57	4.67	25	127.93	0	55.92	
24	24hr-StressTest	MHST-107	0.034783	3	55.8	0.016	0.15	1.57	4.67	25	127.93	35.77	19.9	
25	24hr-StressTest	OGS1	0.046463	3	80.56	0.016	0.15	1.57	4.67	25	127.93	15.72	27.21	
26B	24hr-StressTest	S-26B	0.707526	9.406	16.46	0.016	0.15	1.57	4.67	25	127.93	68.65	319.72	
26D	24hr-StressTest	S-26D	0.079723	25	0	0.016	0.15	1.57	4.67	25	127.93	80.76	43.9	
27	24hr-StressTest	MHST-101-S	0.076061	3	61.17	0.016	0.15	1.57	4.67	25	127.93	31.27	44.08	
28	24hr-StressTest	MHST-102-S	0.076646	5	63.2	0.016	0.15	1.57	4.67	25	127.93	29.62	44.49	
29	24hr-StressTest	7	0.011277	3	0	0.016	0.15	1.57	4.67	25	127.93	81.33	5.73	
2B	24hr-StressTest	SA-2	0.090802	3	100	0.016	0.15	1.57	4.67	25	127.93	0	54.05	
3	24hr-StressTest	S-3	0.21539	3	31.75	0.016	0.15	1.57	4.67	25	127.93	62.03	207.93	
3B	24hr-StressTest	3	0.0393	3	100	0.016	0.15	1.57	4.67	25	127.93	0	23.39	
4	24hr-StressTest	2	0.019571	3	100	0.016	0.15	1.57	4.67	25	127.93	0	11.65	
40	24hr-StressTest	MHST-156	1.18634	6.77	47.28	0.016	0.15	1.57	4.67	25	127.93	43.5	579.63	
41	24hr-StressTest	MHST-132	1.522779	3	14.99	0.016	0.15	1.57	4.67	25	127.93	73.08	401.46	
42_1	24hr-StressTest	MHST-135-S	0.38897	5	75.19	0.016	0.15	1.57	4.67	25	127.93	20.01	227.51	
42_2	24hr-StressTest	MHST-149-S	0.30146	5	75.19	0.016	0.15	1.57	4.67	25	127.93	20.03	176.2	
42_3	24hr-StressTest	MHST-150-S1	0.59319	2	75.19	0.016	0.15	1.57	4.67	25	127.93	20.16	340.96	
42_4	24hr-StressTest	MHST-141-S	0.45704	2	75.19	0.016	0.15	1.57	4.67	25	127.93	16.98	197	PurpleRoof
43	24hr-StressTest	SA-CUP	0.56665	2	100	0.016	0.15	1.57	4.67	25	127.93	0	337.07	
44	24hr-StressTest	MHST-62534	12.74513	1	32.06	0.016	0.15	1.57	4.67	25	127.93	58.59	4128.53	
45	24hr-StressTest	63	0.36482	4	25.66	0.016	0.15	1.57	4.67	25	127.93	61.2	167.1	
45_A	24hr-StressTest	MHST-138	0.192111	4	0	0.016	0.15	1.57	4.67	25	127.93	81.26	99.03	
46	24hr-StressTest	21B	0.887972	10	21	0.016	0.15	1.57	4.67	25	127.93	71.29	627.94	

Table 6: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
47_1	24hr-StressTest	D-MHST-155-S	0.11038	3	65.86	0.016	0.15	1.57	4.67	25	127.93	27.57	64.04	
47_2	24hr-StressTest	MHST-148-S	0.46158	3	65.86	0.016	0.15	1.57	4.67	25	127.93	27.98	250.98	
47_3	24hr-StressTest	MHST-147-S	0.19065	3	65.86	0.016	0.15	1.57	4.67	25	127.93	27.67	109.55	
47_4	24hr-StressTest	MHST-146-S	0.40137	3	65.86	0.016	0.15	1.57	4.67	25	127.93	27.91	221.1	
47_5	24hr-StressTest	MHST-157-S	0.25086	3	65.86	0.016	0.15	1.57	4.67	25	127.93	27.74	142.61	
48	24hr-StressTest	R-48	0.137722	2	100	0.016	0.4	1.57	4.67	25	127.93	0	81.92	
49	24hr-StressTest	R-49	0.16391	2	100	0.016	0.4	1.57	4.67	25	127.93	0	97.43	
5	24hr-StressTest	preston	0.012005	3	100	0.016	0.15	1.57	4.67	25	127.93	0	7.15	
50	24hr-StressTest	R-50	0.34548	2	100	0.016	0.4	1.57	4.67	25	127.93	0	202.35	
51_1	24hr-StressTest	MH-SA51-1	0.637265	2	30	0.016	0.15	1.57	4.67	25	127.93	8.51	21.83	PurpleRoof
51_2	24hr-StressTest	MH-SA51-2	0.637265	2	30	0.016	0.15	1.57	4.67	25	127.93	8.51	21.83	PurpleRoof
52	24hr-StressTest	R-52	0.39976	2	100	0.016	0.4	1.57	4.67	25	127.93	0	232.41	
53	24hr-StressTest	R-53	0.173497	2	100	0.016	0.4	1.57	4.67	25	127.93	0	103.09	
54	24hr-StressTest	R-54	0.17076	2	100	0.016	0.4	1.57	4.67	25	127.93	0	101.48	
55	24hr-StressTest	MH-SA55	0.353278	2	30	0.016	0.15	1.57	4.67	25	127.93	8.49	12.11	PurpleRoof
56	24hr-StressTest	MH-SA56	0.945966	2	86.18	0.016	0.15	1.57	4.67	25	127.93	11.2	552.14	
57	24hr-StressTest	Carling_OLF1	0.154931	15	6.12	0.016	0.15	1.57	4.67	25	127.93	75.67	86.28	
58	24hr-StressTest	46	0.442854	16	33.5	0.016	0.15	1.57	4.67	25	127.93	54.25	230.95	
59	24hr-StressTest	MHST-133	0.753001	2	90.56	0.016	0.15	1.57	4.67	25	127.93	7.64	439.34	
6	24hr-StressTest	3	0.1396	3	2.06	0.016	0.15	1.57	4.67	25	127.93	79.57	72.4	
60	24hr-StressTest	S-60	0.217787	25	0	0.016	0.15	1.57	4.67	25	127.93	85.52	517.11	
60A	24hr-StressTest	60B	0.243636	25	19.96	0.016	0.15	1.57	4.67	25	127.93	64.79	134.42	
60B	24hr-StressTest	60	0.39679	25	0	0.016	0.15	1.57	4.67	25	127.93	109.64	504.94	
60C	24hr-StressTest	60B	0.507297	25	35	0.016	0.15	1.57	4.67	25	127.93	52.87	272.94	
61	24hr-StressTest	CBMHST-104	0.65834	3	62.04	0.016	0.15	1.57	4.67	25	127.93	30.98	362.96	
62	24hr-StressTest	POW_D1	0.266185	4.97	68.32	0.016	0.15	1.57	4.67	25	127.93	26.82	142.03	
62A	24hr-StressTest	POW_D1	0.519395	6	0.04	0.016	0.15	1.57	4.67	25	127.93	84.41	138.53	

Table 6: Subcatchments (continued...)

Name	Rain Gage	Outlet	Area (ha)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Precipitation (mm)	Infiltration (mm)	Peak Runoff (L/s)	LID Names
62B	24hr-StressTest	62	0.07117	3	0	0.016	0.15	1.57	4.67	25	127.93	83.24	23.96	
62C	24hr-StressTest	POW_D1	1.13365	5	58.05	0.016	0.15	1.57	4.67	25	127.93	37.15	419.23	
63	24hr-StressTest	S-63	0.41268	2	49.11	0.016	0.15	1.57	4.67	25	127.93	46.93	390.28	
64	24hr-StressTest	CHAMBER-102	0.16771	6	78.06	0.016	0.15	1.57	4.67	25	127.93	17.67	98.34	
65	24hr-StressTest	MHST-137	0.523363	3.598	41.91	0.016	0.15	1.57	4.67	25	127.93	49.7	196.57	
7	24hr-StressTest	2	0.016512	3	100	0.016	0.15	1.57	4.67	25	127.93	0	15.33	
8	24hr-StressTest	2	0.01883	3	100	0.016	0.15	1.57	4.67	25	127.93	0	11.21	
9	24hr-StressTest	1	0.019216	3	100	0.016	0.15	1.57	4.67	25	127.93	0	11.44	