

1 DOOR 4 CARE CHEO INTEGRATED TREATMENT CENTRE

SERVICING AND STORMWATER MANAGEMENT REPORT | August 23, 2024

WALTERFEDY

TABLE OF CONTENTS

	Page
1.0 INTRODUCTION.....	3
1.1 Site Location and Background.....	3
1.2 Reference Reports and Drawings.....	3
2.0 EXISTING CONDITIONS.....	4
2.1 Topography, Land Use and Drainage.....	4
2.2 Existing Servicing.....	5
2.3 Other Existing Utilities.....	5
2.4 Geotechnical Investigation.....	5
2.5 Hydrogeological Investigation.....	6
2.6 Source Water Protection.....	7
3.0 GROUND WATER CONTROL.....	7
3.1 Short Term Discharge (During Construction).....	7
3.2 Long-Term Discharge (Subdrainage System).....	7
3.3 Quality and Discharge.....	8
4.0 PROPOSED CONDITIONS.....	8
5.0 SANITARY SERVICING.....	8
5.1 Design Criteria.....	8
5.2 Total Sanitary Demand.....	9
5.3 Wastewater Collection and Discharge.....	9
6.0 WATER DISTRIBUTION DESIGN.....	10
6.1 Design Criteria.....	10
6.3 Fire Water Demand.....	10
6.4 Municipal System Capacity and Service Design.....	13
7.0 STORM SERVICING AND STORMWATER MANAGEMENT.....	14
7.1 Design Criteria.....	14
7.2 Existing Stormwater Management Controls.....	14
7.3 Existing Conditions.....	15
7.4 Proposed Conditions.....	16
7.5 Quality Control.....	19
7.6 Water Balance.....	19
8.0 CONSTRUCTION EROSION AND SEDIMENT CONTROL.....	19

TABLES

Table I: Source Protection Details	7
Table II: Sanitary Flow Calculation	9
Table III: Sanitary Service Design	9
Table IV: Summary of Domestic Water Demand Calculations	10
Table V: Sprinkler Credits (FUS 2020)	12
Table VI: Summary of Exposure Charges Applied	13
Table VII: Summary of Required Fire Flow Calculations	13
Table VIII: Summary of Pre-Development Catchment Parameters	15
Table IX: Allowable Release Rate to Storm Sewer System	16
Table X: Allowable Release Rate to Ring Road	16
Table XI: Proposed Catchment Parameters	17
Table XII: Peak Flow Rates from Parking Garage Site to be Attenuated by 1Door4Care Measures	17
Table XIII: Comparison of Pre- and Post-Development Peak Flow Rates to the Storm Sewer System	19
Table XIV: Comparison of Pre- and Post-Development Peak Flow Rates to Ring Road	19

APPENDICES

Appendix A – Catchment Area Plans and Flow Schematics
Appendix B - Water and Wastewater Servicing Information
Appendix C – Stormwater Management Information
Appendix D – PCSWMM Report Files

1.0 INTRODUCTION

WalterFedy was retained by EllisDon to provide civil consulting engineering services in support of the construction of the Children's Hospital of Eastern Ontario's (CHEO) new 1Door4Care integrated treatment centre at 401 Smyth Road, in the City of Ottawa.

The proposed development plan is to construct a new state-of-the-art treatment center where CHEO will be able to improve access to services that were previously scattered throughout the Champlain region. The development will provide care and support services for developmental, rehabilitation, behavioural, autism, mental health, communication disorders, and community services in one building. The building will contain a variety of focused areas including medical staff workplaces, clinical areas, and school/pre-school areas to best provide an integrated transmural care model and act as the interface between primary and secondary care.

The new building will replace an existing surface parking lot located southeast of the existing CHEO building and north of the intersection between Ring Road and Smyth Road. A small parking lot is to be provided at the southeast corner of the building, connected to an accessway provided on the western face of the building. A loading entrance ramp will also be provided along the southern end of the building. The balance of the site will remain largely unchanged and will comprise of landscaped areas and pedestrian walkways.

The purpose of this report is to identify how the Site will be serviced for water, sanitary, and storm and to demonstrate compliance with municipal and provincial standards for site servicing and stormwater management.

1.1 Site Location and Background

The overall CHEO campus occupies approximately 13.9 hectares of land on the southwest corner of the Ottawa Health Science Centre (OHSC) campus. The site for the proposed 1Door4Care facility is located in the southwest corner of the CHEO campus and encompasses an area of approximately 2.06 hectares.

The site is bounded by the existing CHEO campus buildings to the north and east and Ring Road to the west and south.

In general, the site slopes from east to west, ranging in elevations from 79.14m at the northwest corner of the site to an elevation of 82.37m along the eastern edge of the site.

1.2 Reference Reports and Drawings

In preparation of this report, the following background information was referenced:

1. 1Door4Care: CHEO Integrated Treatment Centre Preliminary Development Feasibility Review, Fotenn Planning + Design, prepared for Infrastructure Ontario, October 2022
2. Subsurface Utility Engineering Services Report, Annis O'Sullivan Vollebakk Ltd., prepared for Infrastructure Ontario, February 2020
3. 1Door4Care: CHEO Integrated Treatment Centre Preliminary Functional Servicing Study, Stantec Consulting Ltd., prepared for Infrastructure Ontario, October 2022
4. 1Door4Care: CHEO Integrated Treatment Centre – Climate Risk Assessment, Stantec Consulting Ltd., prepared for Infrastructure Ontario, December 2022

5. Phase One Environmental Site Assessment, GHD Ltd., prepared for Infrastructure Ontario, June 2020
6. Phase Two Environmental Site Assessment, GHD Ltd., prepared for Infrastructure Ontario, June 2020
7. 1Door4Care: CHEO Integrated Treatment Centre – Geotechnical Investigation Report, GHD Ltd., prepared for Infrastructure Ontario, October 2022
8. Preliminary Geotechnical Design Recommendations, 1Door4Care, CHEO Integrated Treatment Centre, Thurber Engineering Ltd., prepared for EllisDon, December 2022
9. 1Door 4Care: CHEO Integrated Treatment Centre – Hydrogeological Assessment, GHD Ltd., prepared for Infrastructure Ontario, October 2022
10. Ottawa Health Sciences Centre Site Services Assessment, J.L. Richards & Associates Ltd., prepared for the Ottawa Health Sciences Centre, January 2011
11. Ottawa Health Sciences Centre Storm and Sanitary Sewer Capacity Assessment, Morrison Hershfield, prepared for the University of Ottawa, May 2017
12. CHEO 1Door4Care Functional Program Space Allocations, CHEO Resource Planning Group, April 2020
13. Ottawa Health Sciences Centre Stormwater Master Plan, Morrison Hershfield, prepared for the Children’s Hospital of Eastern Ontario (CHEO) & Ottawa Children’s Treatment Centre (OCTC), July 2019
14. CHEO 1Door4Care Building, Groundwater Management Report, CHEO Complex, 401 & 407 Smyth Road, Ottawa, Ontario, August 2024

The following guidance documents were also referenced in preparation of this report:

1. City of Ottawa: Sewer Design Guidelines, The City of Ottawa, October 2012
2. Ottawa Design Guidelines - Water Distribution, The City of Ottawa, July 2010
3. Stormwater Management Planning and Design Manual, Ministry of the Environment, Conservation and Parks (MECP), March 2003.
4. Design Guidelines for Sewage Works, Ministry of the Environment, Conservation and Parks, March 2019.
5. Design Guidelines for Drinking Water Systems, Ministry of the Environment, Conservation and Parks, May 2019.

2.0 EXISTING CONDITIONS

2.1 Topography, Land Use and Drainage

Existing topographical and legal boundary information for this site was obtained from a survey by Annis, O’Sullivan, Vollebakk Ltd., dated February 2020. The Site occupies approximately 2.06 ha of land located in the southwestern corner of the overall Ottawa Health Services Centre (OHSC) campus.

The topography on site ranges from an elevation of 79.14m at the northwest corner of the site to an elevation of 82.37m along the eastern edge of the site. Based on the topographic survey, various catchbasin structures are located on site, connected to an existing storm sewer traversing the site. The majority of the catchbasins are located within the existing asphalt parking lot in the southern part of the site.

No existing stormwater controls appear to exist on site. The drainage from the site is ultimately conveyed through a series of storm sewers towards the northwest corner of the OHSC campus where the campus' internal storm system connects to the City of Ottawa's storm sewers. The City of Ottawa's storm sewers ultimately drains to the Rideau River.

2.2 Existing Servicing

Two watermains are in close proximity to the Site. A 200mm diameter watermain exists along Ring Road, running along the western boundary of the Site. A 300mm diameter watermain exists within the access road running along the eastern boundary of the site. The existing CHEO building located east of the site is connected to the 300mm-diameter watermain.

An existing 535mm-diameter storm sewer exists along the eastern boundary of the site, underneath of the access road to the main CHEO building. A 375mm-diameter storm sewer exists within Ring Road along the western boundary of the Site. Both storm sewer lines connect to a larger storm sewer line, ultimately leading to a series of 1350mm-diameter storm sewers located in the northwestern corner of the OHSC campus that connect to the City of Ottawa's storm sewer system which ultimately outlets to the Rideau River.

A 300mm-diameter sanitary sewer exists along the access road to the east of the Site. This sewer runs north along the access road and connects to a 381mm-diameter sanitary sewer running towards the northwest corner of the OHSC campus. The system eventually connects to the Rideau River Collector Sewer west of Riverside Drive.

2.3 Other Existing Utilities

Based on the Report for Subsurface Utility Engineering Services created by Annis O'Sullivan Vollebakk Ltd., it is understood that hydro Ottawa and private service electric power, Bell, Rogers, and Telus telecommunications, Enbridge natural gas mains, as well as municipal and private water, sanitary, and storm sewers are readily available within the adjacent rights-of-way and access roads. It is noted that an existing unknown utility easement is shown to bisect the site from northeast to southwest. The status of the utility easement is currently unknown and should be examined further during detailed design.

2.4 Geotechnical Investigation

GHD Ltd. was retained by Infrastructure Ontario to complete a preliminary geotechnical investigation for the proposed development. Supplemental commentary was provided by Thurber Engineering as part of the project team. These reports are provided under a separate cover. The following summarizes the findings of the geotechnical investigation as they relate to proposed grading, servicing, and stormwater management:

- A preliminary investigation was completed in December 2019. During the preliminary investigation a total of 14 boreholes were advanced on site to assess the geotechnical conditions, ten of which also included installation of groundwater monitoring wells
- A supplementary geotechnical investigation was completed in July 2022. A total of 10 boreholes were advanced on site to assess the geotechnical conditions, four of which also included installation of groundwater monitoring wells.

- Topsoil was encountered in six boreholes. The thickness of the topsoil layer ranged from approximately 50mm to 100mm in thickness. Asphalt ranging in thickness between 50mm to 75mm was encountered in the remaining boreholes on site.
- All boreholes noted a layer of fill, extending a depth of 0.4 to 3.2m below grade. In general, the fill material consisted of a heterogeneous mixture of gravelly sand/silty sand/sandy silt or sand and gravel. Organic material such as rootlets and wood pieces as well as asphalt fragments were found within the fill layer.
- Native soil with a varying composition from silty sand/ gravelly sand/ sand and silt/ sandy gravel/ clayey silt was encountered in all boreholes and extended to depths of 1.2 to 3.5m below grade.
- Bedrock was encountered in all boreholes (with the exception of BH14, MW18, BH19, and BH22) at a depth of 1.9 to 3.8m below grade. The bedrock was noted to be shale bedrock and was visually identified as the Georgian Bay Formation. A review of bedrock geology maps of the Ottawa area was conducted for the subsequent Thurber Engineering memorandum, where it was found that the site is located at the border of Carlsbad and Billings Shale formations, not the Georgian Bay Formation referenced in the original GHD report. It was noted that this formation generally consists of dark grey weak to moderately strong shale.
- Adjeleian Allen Rubeli Ltd. created a report in 1998 detailing “swelling shale” conditions that were encountered at the Children’s Treatment Centre in the OHSC campus. The report indicated that the swelling shale phenomenon has caused heaving by a factor of 2 to 3mm per year with no evidence to suggest that the swelling will cease in the future.

2.5 Hydrogeological Investigation

GHD Ltd. was retained by Infrastructure Ontario to complete a preliminary hydrogeological investigation for the proposed development. The report is provided under a separate cover. The following summarizes the findings of the hydrogeological investigation as they relate to site servicing and stormwater management:

- The native glaciolacustrine deposit underlying the fill material found on site forms an aquitard layer. Based on hydraulic testing, the horizontal hydraulic conductivity for the aquitard ranged from 1.02×10^{-2} cm/sec to 9.81×10^{-6} cm/s.
- The weathered shale bedrock underlying the site also forms an aquitard. Based on hydraulic testing, the horizontal hydraulic conductivity of the bedrock ranged from 2.22×10^{-3} cm/s to 1.66×10^{-4} cm/s. It was noted that the higher hydraulic conductivity of the bedrock may represent local marginal aquifer conditions within the weathered bedrock.
- Four Guelph Parameter infiltration tests were conducted on the shallow unsaturated soil on Site. Testing indicated that the shallow silt with sand overburden has a medium to high infiltration rate of 34 to 171 mm/hr.
- Groundwater levels measured in the shallow monitoring wells screened across the overburden bedrock contact ranged from 1.31 to 5.16m below grade. The water table elevation was found to range from approximately 77.07 to 79.58m above mean sea level.

2.6 Source Water Protection

According to the Province of Ontario’s Source Protection Information Atlas, the Site is not part of any water quality or quantity source water protection areas. As such, the Rideau Valley Source Protection Plan is not applicable to this development. Table I provides the source protection details for the Site.

Table I: Source Protection Details

SOURCE PROTECTION AREA	RIDEAU VALLEY
Water Quality	
Wellhead Protection Area	No
Wellhead Protection Area E (GUDI):	No
Intake Protection Zone:	No
Issue Contributing Area:	No
Significant Groundwater Recharge Area:	No
Highly Vulnerable Aquifer:	No
Event Based Area:	No
Water Quantity	
Wellhead Protection Area Q1:	No
Wellhead Protection Area Q2:	No
Intake Protection Zone Q:	No

3.0 GROUND WATER CONTROL

3.1 Short Term Discharge (During Construction)

The proposed development of the new 1Door4Care facility includes the construction of an underground tunnel segment spanning between the proposed building and the existing CHEO campus, as well as one level of the building which will be located partially below the existing ground surface of the Site. According to the Hydrogeological Assessment conducted by GHD, a worst-case dewatering rate of 257.97 m³/day but typical dewatering rate of 85.99 m³/day was established based on a 3x safety factor. The predicted groundwater takings for construction excavation purposes are above the Ministry of the Environment Conservation and Parks (MECP) Environmental Activity and Sector Registry (EASR) limit of 50,000 L/day. Based on this, an EASR for groundwater takings for excavation purposes will be required.

It is noted that the short-term dewatering rate is subject to change, and may potentially be lower, depending on the shoring methodology that is selected. Watertight shoring systems may limit the ingress of water, and dewatering could be completed over a longer timeframe, should the construction timelines permit it, resulting in an overall lower discharge rate. The conservative flow rate is used for the purposes of this functional assessment.

The geotechnical assessment for the dewatering impact to existing structures and sewers around the site will result in negligible increase of effective stress and is not anticipated to be of concern.

3.2 Long-Term Discharge (Subdrainage System)

Based on the Groundwater Management Report prepared by Geofirma Engineering (August 2024), three hypothetical groundwater discharge scenarios were considered upon building construction. Each of these systems would discharge to the storm sewer system, as per their report. The first scenario is that the groundwater elevation will not fluctuate and consistently remain at 79.6 mASL (highest recorded elevation by GHD). This would result in 3,400 L/day of discharge. The second scenario was an increase by 0.5m to a maximum

elevation of 80.1 mASL, with an estimated discharge of 14,400 L/day. The final scenario was an increase by 1m, with a maximum elevation of 80.6 mASL, and resulting 37,400 L/day of discharge required.

A building subdrainage system is proposed through a 9m grid of 100mm diameter perforated pipes, with a 150mm diameter header draining the system via gravity to an external sump pit. This subdrain system is designed with an invert of 79.60 around the perimeter of the building where the groundwater contours are highest, and has a lowest invert of 78.90 at the south side of the building west of the main entrance where the groundwater contours are lowest. It is anticipated that this subdrain system will rarely be used. A pump is being sized to discharge any drainage to the project's storm sewer system.

3.3 Quality and Discharge

As part of the hydrogeological investigation, samples of groundwater were collected and analyzed for compliance with City of Ottawa Sewer Use By-Law (2003-5134). The analysis notes that exceedances of Nonyl phenol and TKN parameters with respect to the sanitary sewer system. When compared to storm sewer use parameters, exceedances for TSS, Nonyl phenol, Manganese and Chloroform are noted. The Groundwater Management Report prepared by Geofirma Engineering speaks to the water quality exceedances and proposes solutions both during and post construction.

4.0 PROPOSED CONDITIONS

The Development is to consist of a six-storey integrated care facility. The proposed 1Door4Care building will incorporate educational services, medical staff workplaces, clinical areas, therapeutic areas, and community learning areas under one roof.

5.0 SANITARY SERVICING

5.1 Design Criteria

The City of Ottawa relies on their *Ottawa Sewer Design Guidelines* for design of wastewater and stormwater infrastructure, and *Technical Bulletin ISTB-2018-01* for revisions to these standards. The following requirements are noted for the development:

- A Manning's Roughness Coefficient of 0.013 for all PVC pipes and all new sanitary sewer systems
- A minimum velocity of 0.6 m/s and maximum velocity of 3.0 m/s is permitted within the pipe
- An average wastewater flow rate for medical centers of 275 L/capita/day for medical staff
- An average wastewater flow rate for medical centers of 25 L/capita/day for patients
- An institutional peaking factor of 1.5
- A total inflow/infiltration allowance of 0.33 L/s/effective gross ha

The proposed development is expected to discharge domestic sanitary sewage to the private sanitary sewer system on site.

5.2 Total Sanitary Demand

The City of Ottawa's *Ottawa Sewer Design Guidelines* provides daily sewage flow values for a number of different land uses. The guidelines provides a per-hectare flow rate of 28,000 L/gross hectare/day for institutional areas. The guidelines also provide an institutional peaking factor of 2.5. These values were utilized in order to calculate the expected wastewater demand from the site. A summary of the calculation is provided in Table II below.

Table II: Sanitary Flow Calculation

Average Daily Wastewater Flow (Institutional)	28,000	L/ha/d
Site Area	2.06	ha
Peaking Factor	1.5	
Peak Domestic Wastewater Flow	1.00	L/s
Site Area	2.06	ha
Infiltration Allowance (0.33 L/s/ha)	0.68	L/s
Total Sanitary Drainage	1.68	L/s

The total sanitary discharge expected from the site is 1.68 L/s. The design of the sewers for this project was completed using the Chézy-Manning formula with a roughness coefficient of 0.013 in accordance with City of Ottawa Guidelines. Table III below illustrates the minimum design considerations for the service connection to the private sanitary sewer on Ring Road to ensure compliance with MECP requirements and provide self cleansing velocities within the pipe.

Table III: Sanitary Service Design

Diameter of Service	250	mm
Minimum Slope of Service	0.53	%
Full Flow Capacity	43.29	L/s
Full Flow Velocity	0.88	m/s

A minimum 250mm-diameter service at 0.53% is proposed to convey flows to the Ring Road system. All sanitary sewers will be constructed at a minimum depth of 1.8m below ground surface to prevent freezing. Insulation will be provided for sewers that cannot be placed at this minimum depth to prevent freezing.

5.3 Wastewater Collection and Discharge

Downstream from the site, wastewater is collected in the 300mm-diameter private sanitary sewer located in the access road along the eastern boundary of the site. The 2011 Site Servicing Assessment conducted by J.L. Richards indicated that the existing wastewater discharge entering this sewer segment from CHEO is approximately 4.24 L/s. Table SS3 of the report provided in Appendix B illustrates that the full flow capacity of this sewer segment is 88.05 L/s. The combined wastewater inflow from the existing CHEO campus and proposed 1Door4Care Facility is 5.92 L/s. Therefore, it is anticipated that the 300mm-diameter sanitary sewer will be sufficient to convey the sewage to the existing sanitary sewer system on Ring Road.

A capacity assessment of the existing system was completed in 2011 by J.L. Richards. The subsequent report notes that the sanitary sewers within the north-west corner of the OHSC campus had a capacity of over 215 L/s at the outlet of the OHSC campus sewer system, and 325 L/s downstream of the National Defence Medical Centre. No capacity constraints were noted in the downstream system at the time of the report.

6.0 WATER DISTRIBUTION DESIGN

A 200mm-diameter watermain exists along Ring Road at the western limits of the Site, and a 300mm-diameter watermain exists along the access road at the eastern limits of the Site.

6.1 Design Criteria

The City of Ottawa's *Ottawa Design Guidelines – Water Distribution* defer to MECP requirements for water distribution. In accordance with MECP guidelines, the water distribution system shall be capable of delivering the water demands at a minimum residual pressure of 275 kPa (40 psi) in a non-fire scenario and at a minimum residual pressure of 140 kPa (20 psi) in the event of a fire. Under standard conditions, the MECP guidelines recommend an operating pressure in the range of 350 kPa (50 psi) to 480 kPa (70 psi), with pressure at any point in the system not exceeding 700 kPa (100 psi).

To comply with CAN/CSA standards for health-care facilities, the proposed building will be provided with a redundant water supply for domestic water and fire protection.

6.2 Domestic Water Demand (City of Ottawa Per-Capita Sewage Generation)

The domestic water demand for the plant is calculated using the same methodology as the sanitary demand noted in Section 5.2. Maximum day and peak hourly demands were determined by multiplying the average day demands calculated by their associated peaking factors – as determined by the MECP's *Design Guidelines for Drinking Water Systems*. A summary of the domestic water demand calculations is provided in Table IV.

Table IV: Summary of Domestic Water Demand Calculations

Average Daily Domestic Water Demand (Staff)	275	L/c/d
Number of Staff Anticipated	522	
Maximum Day Peaking Factor	2.75	
Peak Hour Factor	4.13	
Maximum Day Domestic Water Demand (Staff)	4.60	L/s
Peak Hour Domestic Water Demand (Staff)	6.90	L/s
Average Daily Domestic Water Demand (Patients)	25	L/c/d
Number of Patients Anticipated	251	
Maximum Day Peaking Factor	3.60	
Peak Hour Factor	5.40	
Maximum Day Domestic Water Demand (Patients)	0.30	L/s
Peak Hour Domestic Water Demand (Patients)	0.40	L/s
Total Maximum Day Domestic Water Demand	4.90	L/s
Total Peak Hour Domestic Water Demand	7.30	L/s

6.3 Fire Water Demand

Water demand for fire protection was calculated in accordance with the Fire Underwriter's Survey *Water Supply for Public Fire Protection* (FUS 2020).

It is understood that from a building code perspective, the proposed building will be classified as consisting of non-combustible construction.

6.3.1 FUS 2020 Methodology

The required fire flow (RFF) is calculated based on a coefficient of construction (C) and the effective floor area (A)

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

The following sections outline reasoning used to determine the values of the above coefficients, as well as the adjustments made to the required fire flow for the proposed development.

(1) Coefficient of Construction

The FUS 2020 classification uses different definitions for the type of construction, corresponding to a type of construction coefficient used in the calculations. FUS 2020 has the following definitions that are considered applicable to the development:

- **Fire-Resistive Construction (Type I) (C=0.6):** A building is considered to be of Fire-resistive construction (Type I) when all structural elements, walls, arches, floors, and roof are constructed with a minimum 2-hour fire resistance rating, and all materials used in the construction of the structural elements, walls, arches, floors, and roofs are constructed with non-combustible materials.
- **Non-combustible Construction (Type II) (C=0.8):** A building is considered to be of Non-combustible construction (Type II) when all structural elements, walls, arches, floors, and roofs are constructed with a minimum 1-hour fire resistance rating and are constructed with non-combustible materials.

Based on the Preliminary Code Review, the facility does not classify as a Fire-Resistive Construction (C=0.6), as all structural members do not have a 2-hour fire resistance rating ("Roofs that do not support an occupancy do not require fire-resistance ratings"). As such, a Coefficient of Construction, C=0.8, is proposed for the development under FUS 2020.

(2) Effective Floor Area

The vertical openings and exterior vertical communications of the building are noted to have a fire resistance rating of at least one hour. This combined with the Construction Coefficient of the building being below 1.0 gives that the area to be used in the FUS calculations shall consider the largest floor area plus 25% of each of the two immediately adjoining floors. For this building, an overall Effective Floor Area of 7,098 m² was utilized in the calculations.

Based on the above, an RFF of 15,000 LPM (250 L/s) is noted for this building.

(3) Occupancy Charge

The RFF calculated within the above section can be modified depending on the various occupancy classes defined within FUS 2020. Occupancy charges area assigned based on the fire hazard level associated with the contents that will be stored within the proposed development. The main categories defined under FUS 2020 area as follows:

- **Non-combustible Contents (-25%):** includes merchandise or materials (including stock, furniture, and equipment) which in permissible quantities does not themselves constitute an active fuel for the spread of fire.
- **Limited Combustible Contents (-15%):** includes merchandise or materials of a low combustibility, with limited concentration of combustible materials.
- **Combustible Contents (0%):** Includes merchandise or materials of moderate combustibility
- **Free Burning Contents (+15%):** Includes merchandise or materials which burn freely, constituting an active fuel
- **Rapid Burning Contents (+25%):** Includes merchandise or materials which either burn with great intensity, spontaneously ignite and are difficult to extinguish, or give off flammable or explosive vapours at ordinary temperature.

The proposed development falls into the major occupancy category of “care and treatment occupancies” from the National Building Code of Canada (NBC). This major occupancy category has a suggested occupancy charge of non-combustible to limited combustible contents according to FUS 2020. To calculate the most conservative RFF, it was decided that a limited combustible content occupancy charge of -15% would be applied.

(4) Automatic Sprinkler Protection

The required RFF can be further reduced depending on the adequacy of the automatic sprinkler system provided. Table V identifies the available credits that can be applied depending on the design of the automatic sprinkler system.

Table V: Sprinkler Credits (FUS 2020)

Automatic Sprinkler System Design	Credit
Automatic sprinkler protection designed and installed in accordance with NFPA 13	30%
Water supply is standard for both the system and Fire Department hose lines	10%
Fully supervised system	10%

Given the design of the sprinkler system for the proposed building, all three of the above listed credits were applied to the system, resulting in an RFF reduction of 50%.

(5) Exposure Charge Adjustment

The RFF of the development can be increased depending on the distance between exposed risks (i.e. structures, stored materials, forests, etc.) and the proposed development. The exposure charges applied to the building depends on the separation distance between the building, the length-height factor of the exposing building face, and the exposed risk. **Table VI** summarizes the exposed risks identified, their measured separation differences, and the exposure adjustment charge applied.

Table VI: Summary of Exposure Charges Applied

EXPOSED RISK IDENTIFIED	SEPARATION DISTANCE MEASURED	EXPOSURE CHARGE APPLIED
Existing Max Keeping Wing	27m	3%
Existing CHEO Main Building	>30m	0%
Existing Residential Area South of Site	28m	3%
Total Exposure Charge Applied		6%

(6) *Total Required Fire Flow*

A summary of the calculated RFF and subsequent modifications made using the FUS 2020 methodology is provided in Table VII.

Table VII: Summary of Required Fire Flow Calculations

Calculated Required Fire Flow	15,000 L/min
Occupancy Charge Applied	-15%
Adjusted Required Fire Flow	12,750 L/min
Automated Sprinkler Protection Credit Applied	-50%
Adjusted Required Fire Flow	6,375 L/min
Exposure Charges Applied	+6%
Adjusted Required Fire Flow	7,000 L/min
Total Required Fire Flow	117 L/s

6.4 Municipal System Capacity and Service Design

Hydrant flow testing was conducted by Clean Water Works on the Ottawa Health Science Centre Campus throughout April and May 2021. The report prepared by Clean Water Works is provided within Appendix B. One hydrant tested during this inspection was noted to be within close proximity to the Site (Hydrant PH328-20). The results of the flow tests noted that a static pressure of 60 PSI was available at the Site, and a residual pressure of 50 PSI was measured at a flow of 1090 GPM. An N185 graph of the results is included within Appendix B. Extrapolating the results of the flow test, it is noted that the rated capacity of the system at 20 PSI is in the order of 2305 GPM or approximately 145 L/s. The required maximum day demand plus fire flow of 122 L/s is available at approximately 30 PSI.

In addition to the above, headloss calculations were completed based on transmission losses, elevation losses, and minor losses to confirm adequate pressures are available at the building FFE. Beginning with transmission losses and using the Hazen-Williams Equation, utilizing a diameter of 200mm, roughness coefficient, C, of 150 for PVC pipe, and a length of 18.4 m - a total major head loss of 0.943 m (1.34 PSI) is noted for the 122 L/s combination maximum day demand and fire flow.

From the connection to existing at an invert of 81.91 m to the building connection at an invert of 81.70 m, a loss of 0.50m (0.71 PSI) is noted.

Finally, from the connection point to the building FFE, there are several minor losses noted beginning with branch flow from the tee at the main (k=1.0) and open water valve (k=0.15). Utilizing a velocity of 3.88 m/s (based on a diameter of 200 mm and combination of maximum day demand and fire flow of 122 L/s), a pressure drop of 1.26 PSI is noted from minor losses.

In total, a pressure drop of 2.30 PSI is anticipated. Therefore, the 122 L/s is available at the building FFE at approximately 27.7 PSI, demonstrating adequate pressure is available to service the building.

Finally, the municipal hydrant on Ring Road south of the 1Door4Care building is located within 45m of the fire department connection. This hydrant is expected to provide the required fire flow at or above the minimum 140 kPa residual pressure. Per Table 2 of FUS 2020, for a fire flow of 7,000 L/min, the minimum number of hydrants is noted to be 1.

7.0 STORM SERVICING AND STORMWATER MANAGEMENT

7.1 Design Criteria

Morrison Hershfield completed a Stormwater Master Plan for the OHSC campus in July, 2019. The conclusions and recommendations of the Stormwater Master Plan governs all stormwater management measures on Site. The following is the design criteria based on the most stringent requirements from the MECP in addition to the conclusions and recommendations of the Stormwater Master Plan:

- **Quantity Control:** Provide attenuation such that peak flows for proposed conditions are equal to or less than the peak flow recorded for the pre-development 2-year design storm event. The attenuation is to be provided for the 2-year through 100-year design events. The 3-hour City of Ottawa design storm events will be used for this assessment for all event to the 100-year. Peak flow shall be determined using a C value of 0.5 in accordance with the City of Ottawa Sewer Design Guidelines.
- **Quality Control:** Quality Control is provided by the oil grit separator installed at the northwester corner of the entire OHSC campus. No further water quality control measures are anticipated to be needed for the proposed development.
- **Water Balance:** Review significance of existing groundwater systems and develop recommendations for groundwater recharge and water balance to the extent technically, physically and economically practicable.

7.2 Existing Stormwater Management Controls

The evaluation of the existing storm sewer conditions conducted as part of the Master Plan prepared by Morrison Hershfield found several problems with the stormwater management system in the OHSC campus. Existing conditions modelling of the system indicated that, under the 5-year and 100-year storm events, peak flow directed to the receiving Alta Vista Hospital Link (AVHL) sewer exceeded the 10-year flow of 3,920 L/s that the sewer was designed for. In addition to the peak flow exceedance noted above, it was also found that 20% of storm sewers within the campus exceeded their theoretical full flow capacity under the 2-year storm event. This number increases to 37% under the 5-year storm event and 60% under the 100-year storm event. The modelling conducted also indicated that elevated hydraulic grade line elevations exist in the minor system during intense storm events.

To remedy these noted issues, three recommendations were provided. These recommendations included implementing backflow preventers on all building drainage connections to the minor system, installing inlet control devices on highlighted catchbasin structures, and instating strict stormwater quantity control criteria on all future development within the OHSC campus. The phasing and priority of the above recommendations were suggested to be completed in the order that they were presented above.

The subject site itself does not appear to have any existing controls. The 2019 *Stormwater Masterplan* by Morrison Hershfield recommends that all future developments across the OHSC campus control post-development peak flows (up to and including the 100-year storm event) to the pre-existing 2-year storm event using stormwater retention measures. In addition, peak flows under pre-existing conditions are stipulated to be determined using a runoff coefficient of 0.5 in accordance with the City of Ottawa Sewer Design Guidelines.

7.3 Existing Conditions

Under existing conditions, runoff from the Site is directed towards two outlets. A portion of the Site (approximately 2.191 ha) directs runoff towards Ring Road in the form of overland flow, while the remaining 1.545 ha directs runoff towards the storm sewer system. It should be noted that a number of external catchment areas were noted to contribute runoff to the outlets. An existing catchment area plan has been provided within Appendix A of this report. A summary of the pre-development catchment parameters is provided within **Table VIII**.

Table VIII: Summary of Pre-Development Catchment Parameters

CATCHMENT ID	DESCRIPTION	AREA (HA)
EXT-1	External catchment capturing flows from ring road on the southeastern edge of the Site	0.275
EXT-2	External catchment capturing flows from ring road on the northwestern edge of the Site	0.280
EXT-3	External catchment capturing flows from external asphalt parking lot – directs flows to Ring Road	0.962
101	Existing landscaped area south of the existing CHEO main entrance – directs flows to catchment 102 and ultimate enters storm sewer system	0.102
102	Southeast portion of existing driveway connecting Ring Road to the main entrance of CHEO – directs flow to storm sewer system	0.349
103	Existing asphalt parking lot west of the main entrance to CHEO – directs flows to the storm sewer system	0.905
104	Existing gravel overflow parking west of the main entrance to CHEO – directs flows to Ring Road uncontrolled	0.351
105	Landscaped area located north of the main entrance of the existing CHEO building – directs flows to the storm sewer system	0.189
106	Northwest portion of the existing driveway connecting Ring Road to the main entrance of CHEO – directs flow to Ring Road uncontrolled	0.218
107	The northern most portion of the existing external asphalt parking lot – conveys flows uncontrolled to Ring Road	0.105

As per the Stormwater Master Plan created by Morrison Hershfield, the allowable release rate from the Site is set as the pre-development peak flow rate under the 2-year design storm event using a runoff coefficient of 0.50. This allowable release rate was determined using the rational method. The rainfall intensity used within the rational method calculation was determined using the intensity-duration-frequency (IDF) curve parameters for the 2-year storm event alongside a time of concentration of 10 minutes. The parameters utilized within the rational method calculation as well as the allowable release rates calculated are summarized in **Table IX** and **Table X** below.

Table IX: Allowable Release Rate to Storm Sewer System

Area of Catchment (A)	1.545	ha
Runoff Coefficient (C)	0.50	-
IDF Curve Parameters from City of Ottawa Sewer Design Guidelines		
a	732.951	-
b	6.199	min
c	0.810	-
Time of Concentration (t_c)	10	min
Rainfall intensity (i)	76.805	mm/hr
2-Year Pre-Development Peak Flow Rate (North Hospital)	99.32	m³/s

Table X: Allowable Release Rate to Ring Road

Area of Catchment (A)	2.191	ha
Runoff Coefficient (C)	0.50	-
IDF Curve Parameters from City of Ottawa Sewer Design Guidelines		
A	732.951	-
B	6.199	min
C	0.810	-
Time of Concentration (t_c)	10	min
Rainfall intensity (i)	76.805	mm/hr
2-Year Pre-Development Peak Flow Rate (Ring Road)	160.45	m³/s

7.4 Proposed Conditions

Under proposed conditions the overall percent imperviousness for the Site was calculated to be approximately 75%. A catchment area plan of proposed conditions as well as a flow schematic of proposed conditions have been included within Appendix A of this report. A summary of post-development catchment parameters has been provided in **Table XI**.

Table XI: Proposed Catchment Parameters

CATCHMENT ID	DESCRIPTION	AREA (HA)
EXT-1	Section of ring road on the southern limits of the Site	0.28
EXT-2	Section of ring road on the western limits of the Site	0.28
EXT-3	Existing asphalt parking lot - directs runoff to Site	0.96
222	Landscaped area south of existing CHEO main entrance	0.10
223	Portion of existing external asphalt parking lot that directs runoff onto entrance driveway to CHEO entrance	0.11
224	Proposed 1Door4Care building	0.48
225a	Northern portion of the driveway between proposed 1Door4Care building and existing CHEO entrance	0.198
225b	Southern portion of the driveway between proposed 1Door4Care building and existing CHEO entrance	0.295
226	South intersection between Site driveway and Ring Road	0.10
227	Proposed parking lot in front of the 1Door4Care building	0.39
228	Proposed landscaped area on northern limits of the Site	0.23
229	Existing landscaped area in front of CHEO Max Keeping Wing	0.15

Additionally, as noted within the *CHEO 1Door4Care Parking Garage Servicing and Stormwater Management Report* completed by WalterFedy (revised December 1, 2023), post-development peak flow rates directed towards Ring Road from the parking garage side exceeded the allowable release rates under the 50-year and 100-year storm events. These overages were added to first ring road node within this stormwater management model in order to better reflect post-development conditions. The peak flow rates, and base flow rates utilized within the modelling are illustrated in Table XII below.

Table XII: Peak Flow Rates from Parking Garage Site to be Attenuated by 1Door4Care Measures

DESIGN STORM EVENT	ALLOWABLE RELEASE RATE (L/S)	POST-DEVELOPMENT PEAK FLOW RATE (L/S)	FLOW RATE ADDED TO MODEL (L/S)
50-Year	22.74	25.34	2.60
100-Year	22.74	29.02	6.28

The proposed development will increase the peak outflow of the Site, therefore necessitating peak flow reduction measures. The following sections outline the stormwater management practices that are proposed to be implemented in order to attenuate flows to the noted allowable release rates.

It should be noted that no attenuation measures have been proposed within catchments 228, 225b, and 226 due to the steep grades within these areas – these catchments will mainly produce uncontrolled flow directed to Ring Road. It should also be noted that the proposed drop curb shown on the southern edge of the loading dock ramp allows for portions of the uncontrolled flow produced from catchments 225b and 226 to spill into catchment 227 – allowing for some flow attenuation measures for these catchments. In order to provide sufficient attenuation measures such that outflow from the Site meets the quantity control requirements, the proposed detention

storage, surface ponding, flow control roof drains, and green roof measures have been designed as to limit the flow exiting these measures as much as possible. A flow schematic of proposed conditions has been provided within Appendix A for reference.

7.4.1 Surface Ponding

Surface ponding is proposed to occur on the parking area located southwest of the proposed 1Door4Care building (catchment 227). As per the *1Door4Care: CHEO Integrated Treatment Centre – Climate Risk Assessment Report* completed by Stantec in 2022, surface ponding was restricted to storm events larger than the 5-year storm event. This was accomplished utilizing a 200 mm diameter orifice plate installed downstream of CBMH38. This orifice plate was sized such that flows from the 5-year design storm event would be able to pass through without interference while flows generated from the 10- through 100-year design storm events were restricted such that ponding could occur.

Ponding was restricted to a maximum depth of 0.30 m with a maximum allowable ponded volume of 117 m³. Peak inflow/outflow rates and maximum storage volumes recorded for the surface ponding storage node within all modelled storm events are listed within Table 5 in Appendix C.

7.4.2 Control Flow Roof Drains

In order to attenuate flows stemming from the proposed 1Door4Care building, twenty-seven control flow roof drains are proposed to be installed on various rooftop areas of the proposed building. Control flow roof drains were modelled as Zurn Z-105 Control-Flo drains with a drainage function of 0.38 L/s per 25 mm of head. Rooftop ponding was restricted to a total area of 2060.94 m² with a maximum depth of 0.150 m. Peak inflow/outflow rates and maximum storage volumes recorded for the roof ponding storage node within all modelled storm events are listed within Table 5 in Appendix C. A summary of the roof drain characteristics utilized within all modelled storm scenarios is similarly located in Appendix C.

7.4.3 Green Roof

It is proposed that approximately 650 m² of roof area on the 1Door4Care building be converted into green roof space. The green roof system is comprised of Sopranature Toundra Box complete with a retention board base layer. Together, the system is capable of retaining 67.2 mm of rainwater – rainwater in excess of this amount is sent to conventional roof drains and is directed to the storm sewer outlet for the building. Product specifications for the Toundra Box are provided in Appendix C.

7.4.4 Detention Gallery

In order to further attenuate flows directed towards the existing storm sewer system, an underground detention gallery comprised of 45 ADS SC-740 StormTech chambers. This detention gallery provides 108.7 m³ of storage (above the bottom stone layer) and will receive flows from the southern parking area on Site (catchment 227). Additionally, this gallery is expected to receive a portion of the overland flows generated from catchments 222, 225, and 226 through the proposed drop curb located along the western edge of the loading ramp. Flow from the gallery is controlled using a 150 mm diameter orifice plate located at CBMH38. The small diameter of the proposed orifice plate acts to constrict flow leaving the gallery, thereby requiring the usage of the provided storage volume. Peak inflow/outflow rates and maximum storage volumes recorded for the detention gallery node within all modelled storm events are listed within Table 5 in Appendix C.

The peak flow rates recorded under post-development conditions after the implementation of the above noted stormwater management measures is summarized within Table XIII and Table XIV.

Table XIII: Comparison of Pre- and Post-Development Peak Flow Rates to the Storm Sewer System

DESIGN STORM EVENT	PRE-DEVELOPMENT PEAK FLOW RATE (L/S)	ALLOWABLE RELEASE RATE (L/S)	POST-DEVELOPMENT PEAK FLOW RATE (L/S)
2-Year	99.32	99.32	61.48
5-Year	134.74	99.32	77.23
10-Year	157.95	99.32	81.85
25-Year	187.11	99.32	87.83
50-Year	208.81	99.32	92.33
100-Year	230.91	99.32	96.99

Table XIV: Comparison of Pre- and Post-Development Peak Flow Rates to Ring Road

DESIGN STORM EVENT	PRE-DEVELOPMENT PEAK FLOW RATE (L/S)	ALLOWABLE RELEASE RATE (L/S)	POST-DEVELOPMENT PEAK FLOW RATE (L/S)
2-Year	160.45	160.45	48.34
5-Year	217.67	160.45	72.85
10-Year	255.17	160.45	90.19
25-Year	302.28	160.45	112.96
50-Year	337.33	160.45	131.63
100-Year	373.03	160.45	156.35

As seen in the tables above, the proposed stormwater management measures are capable of successfully reducing the post-development peak flow rates to the allowable release rate.

7.5 Quality Control

It is understood that the existing private storm sewer network already has quality control measures in place at the downstream end of the system. To supplement the downstream measures, drainage from the site is directed towards a detention gallery equipped with an isolator row. The LID measure will reduce maintenance needs and provide additional TSS removal for runoff from the site to act as an upstream quality control prior to the existing downstream quality control measures.

7.6 Water Balance

The increase in imperviousness will locally alter water balance as compared to existing conditions. The exact impact will have to be evaluated based on the other stormwater design decisions.

8.0 CONSTRUCTION EROSION AND SEDIMENT CONTROL

Prior to start of any construction, all erosion and sediment control measures will be installed and inspected by the Consultant. The measures will also be periodically inspected and upgraded/altered as site conditions change. Periodic inspections will consist of visual observation of the effectiveness of the control measures and sediment migration offsite. Construction inspections will be conducted biweekly and within 24 hours of any rainfall event of 25mm or greater, until such a time that paving works are complete and vegetation has established itself to a density equivalent to 70% of the background native vegetation density. Records of all inspections will be maintained and made available to the RVCA, City of Ottawa and the MECP upon request.

Any sediment tracked onto the roadway during the course of construction will be cleaned by the Contractor. To minimize the amount of mud tracked onto the roadway, a mud-mat will be installed at all construction exits and the contractor will be required to ensure that vehicles leave through the exit. The mudmat will be periodically inspected and cleaned as required to ensure it is functioning as intended.

Each inlet structure to remain, and new inlet structures to be installed will require a heavy-duty silt sac to be installed. Filter fabric will be wrapped around the lids of all manholes to prevent intrusion of sediment into the storm sewer network. The inserts will be cleaned once they reach one-third their sediment accumulation capacity or as per the manufacturer's recommendations.

All erosion and sediment control measures will be removed at the end of construction.

9.0 CONCLUSIONS

Based on the servicing design presented in this report, the following conclusions are presented:

- The Site is not located within a Source Protection Area, and the Rideau Valley Source Protection Policies will not apply to the site.
- Sanitary discharge from the site will be conveyed to the OHSC campus' private sanitary sewer system through the existing 300mm-diameter sewer to the east of the site.
- No capacity concerns exist in downstream sanitary infrastructure.
- Water servicing will be provided from the 300mm diameter watermain running underneath the access road east of the Site.
- Based on hydrant flow testing completed for the greater campus, adequate flow and pressures are expected to be available to service the anticipated domestic and fire demand for the proposed development.
- Stormwater quantity control requirements will be met through the implementation of a combination of an underground storage gallery, surface ponding measures, and flow control roof drains.
- No additional water quality control measures are required for the Site.
- Erosion and Sediment Control measures will ensure protection of the adjacent natural features. Measures will be put in place prior to any construction activity and maintained until construction is completed and ground surfaces have been stabilized.

All of which is respectfully submitted,

WALTERFEDY



Shelley Forwell, P.Eng.
Design Engineer, Civil Engineering
Partner

sforwell@walterfedy.com
519.576.2150 Ext. 241

A handwritten signature in black ink that reads "C. Mahoney".

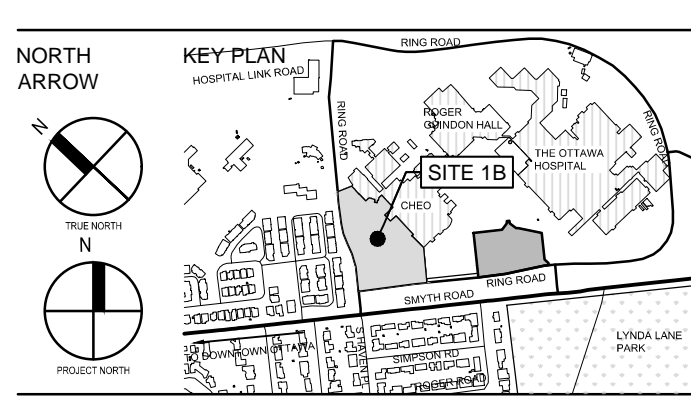
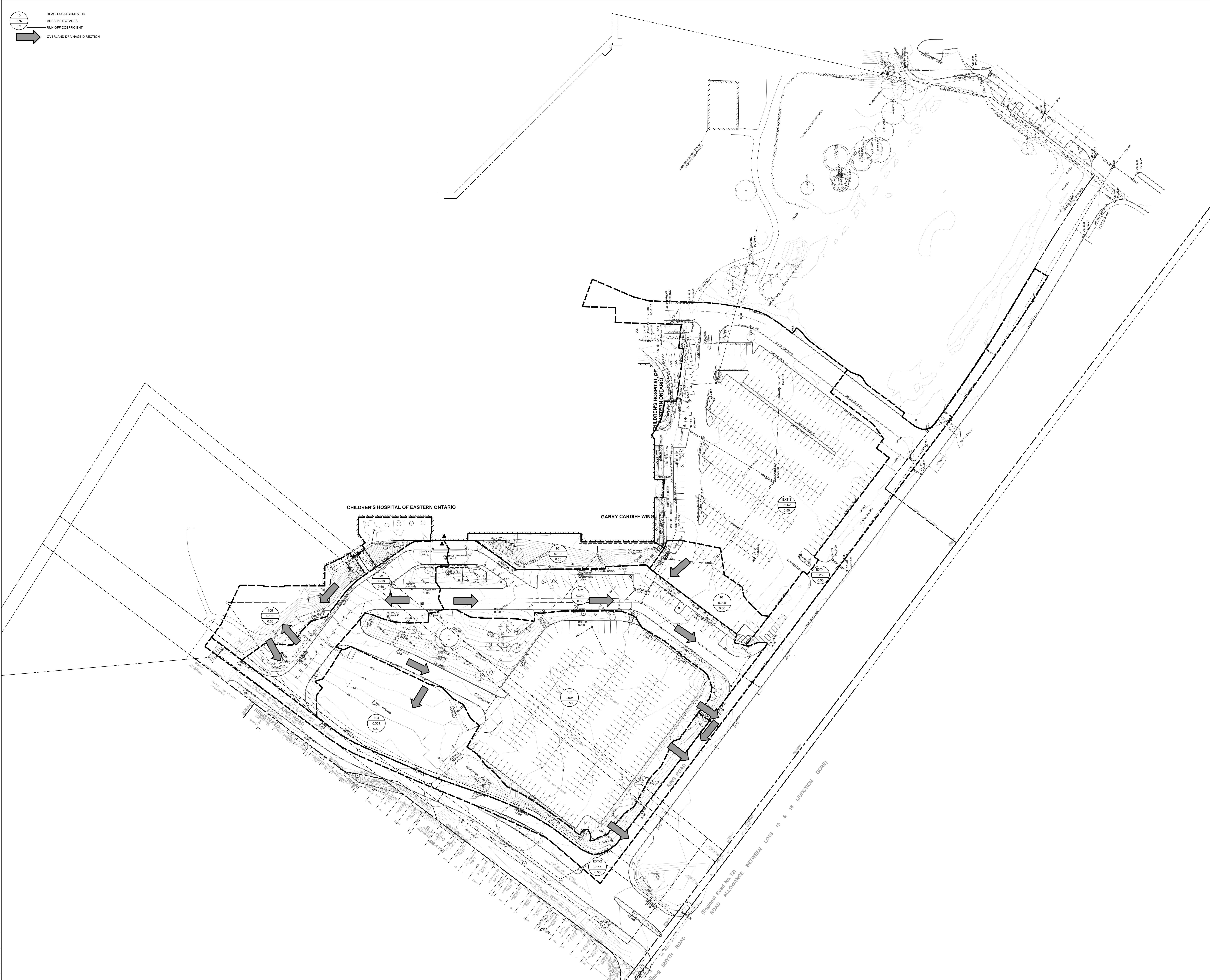
Circe Mahoney
Water Resources EIT, Civil Engineering

cmahoney@walterfedy.com
519.576.2150 Ext. 414

APPENDIX A

Catchment Area and Flow Schematic Figures

10 REACH/STATIONING ID
 0.15 AREA IN HECTARES
 0.2 RUN OFF COEFFICIENT
 OVERLAND DRAINAGE DIRECTION



- GENERAL NOTES**
- THIS SET OF PLANS SHALL NOT BE USED FOR CONSTRUCTION UNTIL STAMPED BY THE DESIGN ENGINEER AND APPROVED BY THE LOCAL MUNICIPALITY.
 - NO CHANGES ARE TO BE MADE WITHOUT THE APPROVAL OF THE DESIGN ENGINEER.
 - THIS PLAN NOT TO BE REPRODUCED IN WHOLE OR IN PART WITHOUT THE PERMISSION OF WALTERFEDY.
 - THE POSITION OF POLE LINES, CONDUITS, WATERMANS, SEWERS, AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED BEFORE STARTING WORK. THE CONTRACTOR SHALL INFORM THEMSELVES OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM AND THOSE NOT LOCATED PRIOR TO CONSTRUCTION.
 - ANY AREA DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO ITS ORIGINAL CONDITION OR BETTER TO THE SATISFACTION OF THE CONSULTANT AND AUTHORITY HAVING JURISDICTION. THE CONTRACTOR IS RESPONSIBLE FOR RESTORING ALL DAMAGED AND/OR DISTURBED PROPERTY WITHIN THE MUNICIPAL RIGHT-OF-WAY TO MUNICIPAL STANDARDS.
 - ALL HEALTH AND SAFETY RELATED SIGNAGE MUST BE POSTED AT THE SITE AS REQUIRED BY APPLICABLE LAW AND BEST MANAGEMENT PRACTICES.
 - AT THE END OF CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE THE CONSULTANT WITH A DIGITAL FILE OF AS-CONSTRUCTED DRAWINGS. THE DRAWINGS MUST REFLECT THE CONSTRUCTED STATE OF THE WORK. SUBMISSION OF UNALTERED DESIGN DRAWINGS AND CONTRACT CHANGES WILL NOT BE ACCEPTED.

DATE	REVISION

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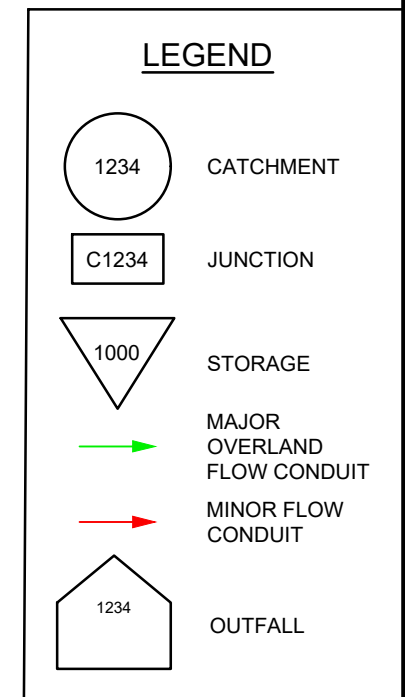
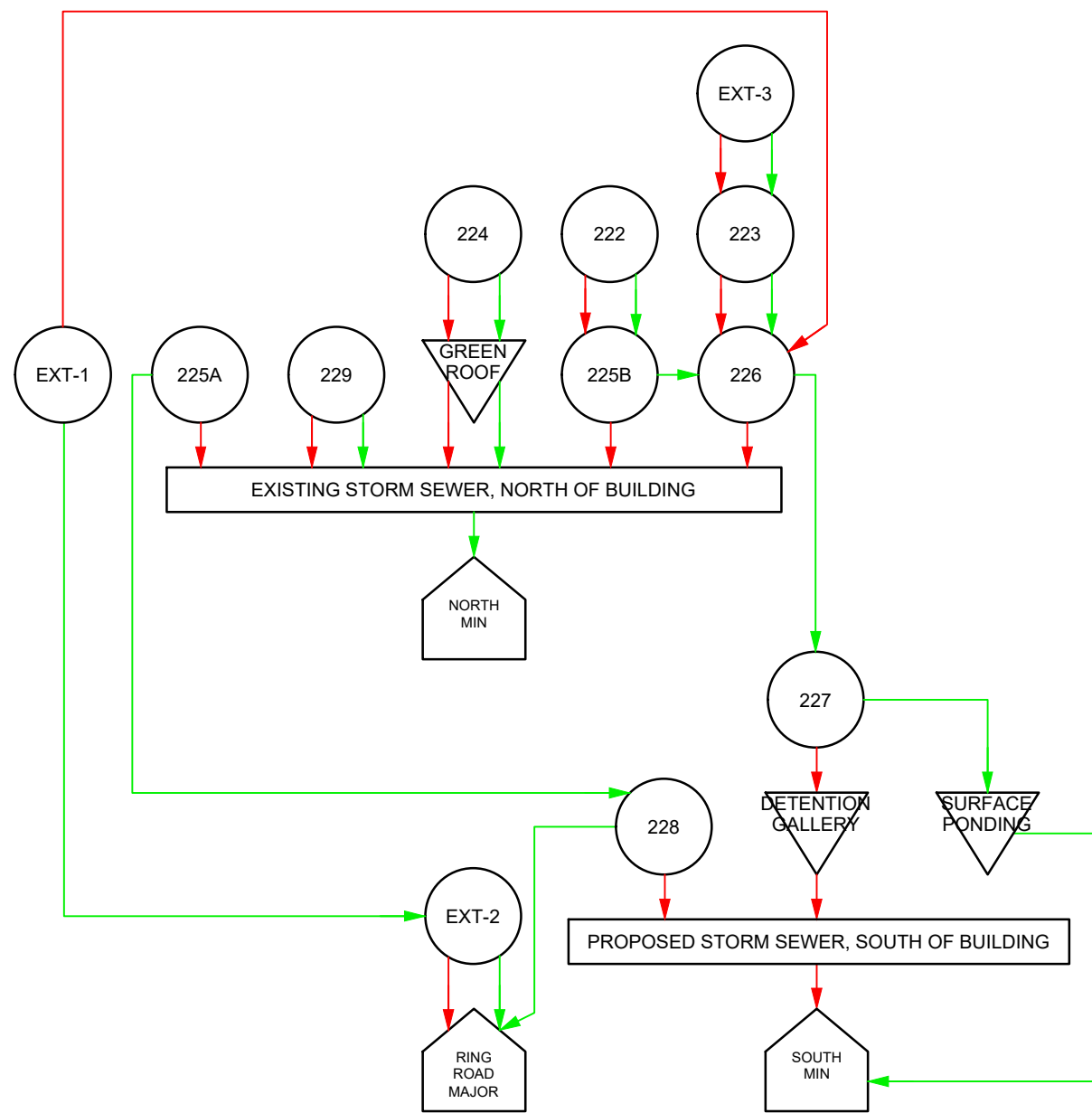
CLIENT
1DOOR4CARE: CHEO INTEGRATED TREATMENT CENTRE: 1DOOR4CARE
 401 SMYTH RD, OTTAWA, ON K1H8L1

TITLE
EXISTING STORM CATCHMENT AREA PLAN

SCALE: 1:500
 DRAWN BY: DL_ZS
 REVIEWED BY: SF
 JOB NUMBER: 2021-0821-13
 PLOT DATE: 2024-02-16
 DRAWING NUMBER

FIG-1

P:\2021\0821\13\06-DWGS\CIVIL\2021-0821-13_PR_SCHEMATIC; FIG. 3; DWG To PDF no layers.pc3; Zack Schnurr; 2024-02-16 2:21:27 PM



PROJECT:
CHEO - 1DOOR4CARE
OTTAWA, ONTARIO

TITLE:
PROPOSED CONDITIONS: PCSWMM MODEL SCHEMATIC

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SCALE: N/A DATE: 2024-02-16

DRAWN BY: ZS PROJECT NO.: 2021-0821-13

CHECKED BY: SF FILE: 2021-0821-13_PR_SCHEMATIC

SHEET NO.:

FIG-3

APPENDIX B

Servicing Details

WASTEWATER GENERATION

MECP Design Criteria

WALTERFEDY

Project	CHEO 1Door4Care
Project #	2021-0821-13
Designer	CM
Address	401 Smyth Road, Ottawa, Ontario
Description	Anticipated Wastewater Flows Generated

Building Description	Site Area ¹ (ha)	Average Daily Wastewater Flow (L/gross Ha/day) ²	Average Wastewater Generated (L/day)	Peaking Factor ³	Infiltration Allowance ² (L/s/ha)	Peak Domestic Wastewater Flow (L/s)
Proposed 1Door4Care Facility	2.06	28000	57,680	1.50		1.00
Infiltration Allowance	2.06				0.33	0.68
Total						1.68

Notes:

1. Site Area based on Civil Drawings
2. Per Capita Demands and Infiltration Allowance taken from City of Ottawa's Ottawa Sewer Design Guidelines
3. Peaking Factor taken from City of Ottawa's Sewer Design Guidelines for institutional developments

REQUIRED DOMESTIC WATER DEMAND**WALTERFEDY**

MECP Design Criteria

Project	CHEO 1Door4Care
Project #	2021-0821-13
Designer	CM
Address	401 Smyth Road, Ottawa, Ontario
Description	Domestic Flows - Proposed Conditions

Building Description	Gross Floor Area ¹ (m ²)	Population ²	Per Capita Demand (L/capita/day) ³	Average Water Demand (L/day)	Maximum Day Peaking Factor ⁴	Peak Hour Factor ⁴	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)	Water Service Size (mm)	Water Service Velocity ³ (m/s)
Proposed 1Door4Care Facility - Staff	19,596	522	275	143,550	2.75	4.13	4.6	6.9	200	0.22
Proposed 1Door4Care Facility - Patients	19,596	275	25	6,875	3.60	5.40	0.3	0.4	200	0.01
Total							4.9	7.3	200	0.23
Fire Flow								150	200	4.77

Notes:

1. GFA based on architectural design
2. Anticipated staff and patient population taken from CHEO 1Door4Care Functional Program Space Allocation Report
3. Per Capita Demands taken from City of Ottawa's Ottawa Sewer Design Guidelines
4. Maximum Day and Peak Hour Peaking Factors Determined using MECP's Design Guidelines for Drinking Water Systems Tables 3-1 and 3-3

REQUIRED FIRE FLOW

Water Supply for Public Fire Protection (FUS 2020)

WALTERFEDY

Project	CHEO 1Door4Care
Project #	2021-0821-13
Designer	CM
Address	401 Smyth Road, Ottawa, Ontario
Description	Fire Flows - 1Door4Care Building

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

F = Required fire flow (LPM)

C = Coefficient related to type of construction

A = Total floor area (including all storeys but excluding any basement levels at least 50% below grade)

Type of Construction	Non-Combustible Construction	C =	0.8
Description	Unprotected Metal Structural Components, Masonry or Metal Walls. All Structural Members are Constructed with Minimum 1 Hour Fire Rating		

Floor Area	20101.26	m ²
# Storeys	6	
Fire Resistant Building?	NO	
Vertical Openings and Exterior Vertical Communications protected with minimum one (1) hr rating?		YES
Area	7098	m ²
Description	Area of Largest Floor + 25% of each of the floor areas directly adjoining it	
Required Fire Flow	15000	L/min

Occupancy Charge	Limited-Combustible Contents
Fire Flow Reduction	-15% OR -2250 L/min
Required Fire Flow	12750 L/min

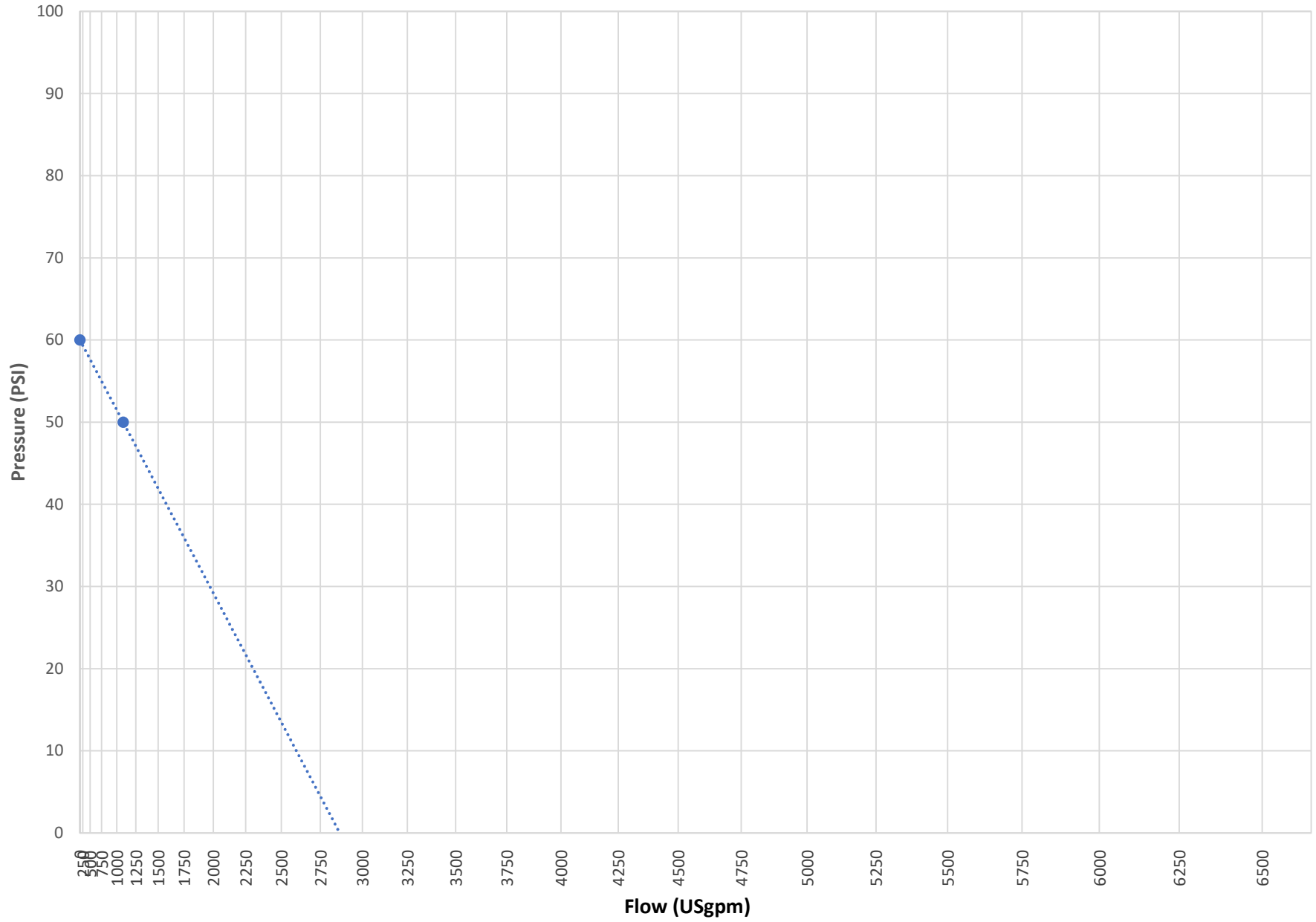
Automated Sprinkler Protection	YES	
Designed to NFPA 13 Standard	YES	-30%
Standard Water Supply to Sprinklers and Standpipes	YES	-10%
Fully Supervised System	YES	-10%
Fire Flow Adjustment		-6375 L/min

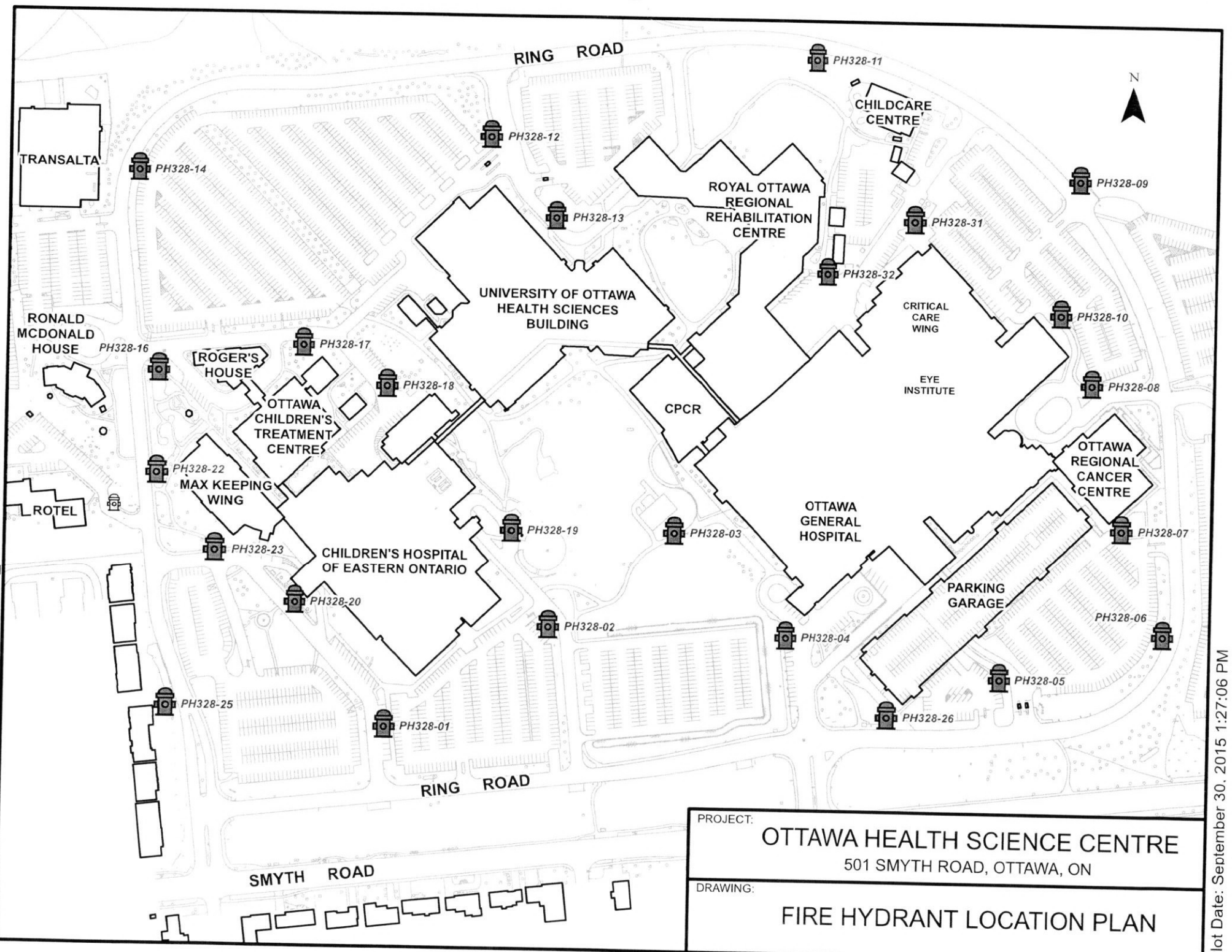
Exposure 1 (North)	Distance	27	m	Length-Height Factor	>100	Charge	3%
Description	Existing Max Keeping Wing						
Exposure 2 (East)	Distance	>30	m	Length-Height Factor	N/A	Charge	0%
Description	Existing CHEO Main Building						
Exposure 3 (West)	Distance	N/A	m	Length-Height Factor	N/A	Charge	0%
Description	N/A						
Exposure 4 (South)	Distance	23	m	Length-Height Factor	>100	Charge	3%
Description	Existing Residential Buildings						

Total Exposure Charge	6%
Fire Flow Adjustment	765 L/min

Total Required Fire Flow	7000	L/min
Total Required Fire Flow	1849	U.S. GPM
Total Required Fire Flow	117	L/s

N185 Residual Pressure vs. Hydrant Flow - Hydrant PH328-20





PROJECT:
OTTAWA HEALTH SCIENCE CENTRE
501 SMYTH ROAD, OTTAWA, ON

DRAWING:
FIRE HYDRANT LOCATION PLAN



Compliance Report

Fire Hydrant #: PH328- 20

Date: April/May 2021
Work Order #: 101791
Client: The Ottawa Hospital
Contact: David Eastman
Contact Phone: 613-295-8562
Customer PO #:
Site Name: General Campus
Site Address: 501 Smyth
Inspected by: Andries van Rozen
Inspection #:

Hydrant Make and Model: ((See Master List))
Year Manufactured: ((See Master List))
Hydrant Location: ((See Map))
Surface Condition: ((See Master List))
Seat Valve Size: ((See Master List))
Flange Elevation: ((See Master List))
Hydrant Colour - Body: Red
- Bonnet: Blue
Valve Location: ((See Master List))
Surface Condition: ((See Master List))

Flow Test Results:

Pitot Reading (PSI): 42
Pitot Reading (GPM): 1090
Static Pressure (PSI): 60
Residual Pressure (PSI): 50

Flow @ 20 PSI (GPM): 2304

Visual inspection:

	Yes / No
Hydrant Accessible	<input checked="" type="checkbox"/> <input type="checkbox"/>
Caps Present	<input checked="" type="checkbox"/> <input type="checkbox"/>
Caps Easily Removed	<input checked="" type="checkbox"/> <input type="checkbox"/>
Barrel Draining	<input checked="" type="checkbox"/> <input type="checkbox"/>
Water Level	Drained
Painting Required	<input type="checkbox"/> <input checked="" type="checkbox"/>

Hydrant is in Compliance with Ontario Fire Code

YES **NO**



FH ID #: PH 328-20

Date: 28 / 04 / 21 dd/mm/yy

W.O. #: 101791

Fire Hydrant Inspection Report

Customer	Toll	Contact	
Site Name	General Campus	Phone #	
Site Address	501 Smyth	P.O. #	
Inspected By	AVR	Make / Model	
Inspection #	1 2 3 4 <u>5</u> 6 7 SP	Year of Man.	
Barrel Ext.		Hose Nozzles	
Flange Elev.		Hydrant Colour	Body: Top:

Isolation Valve		Yes	No	Nozzles and Threads		Yes	No
<i>✓ P o f o</i>	Visible	<input checked="" type="checkbox"/>			Loose		<input checked="" type="checkbox"/>
	Operates properly				Damaged	<input checked="" type="checkbox"/>	
	Cap in place	<input checked="" type="checkbox"/>			Leaking		<input checked="" type="checkbox"/>
	Valve open				Repaired		<input checked="" type="checkbox"/>
Barrel		Yes	No		Proper nozzle orientation	<input checked="" type="checkbox"/>	
	Self draining	<input checked="" type="checkbox"/>			Pumper nozzle	<input checked="" type="checkbox"/>	
Water level	Dry			Hydrant		Yes	No
	Plugged		<input checked="" type="checkbox"/>		Colour coded	<input checked="" type="checkbox"/>	
Ground Flange		Yes	No		Painting required		<input checked="" type="checkbox"/>
	Solid	<input checked="" type="checkbox"/>			Lubricate upper stem	<input checked="" type="checkbox"/>	
	Buried		<input checked="" type="checkbox"/>		Operation satisfactory	<input checked="" type="checkbox"/>	
	Damaged		<input checked="" type="checkbox"/>		Restoration required	<input checked="" type="checkbox"/>	
Caps and Gaskets		Yes	No		Hydrant marker in place	<input checked="" type="checkbox"/>	
	Missing		<input checked="" type="checkbox"/>				
	Replaced		<input checked="" type="checkbox"/>				
	Lubricated	<input checked="" type="checkbox"/>					

Hydro Static Testing		Yes	No	Flow Testing		
	Prior to opening - underground leak		<input checked="" type="checkbox"/>		Pitot reading (PSI)	42
	Fully open - above ground leak	<input checked="" type="checkbox"/>			Pitot reading (GPM)	1090
	Fully open - underground leak		<input checked="" type="checkbox"/>		Static Pressure (PSI)	60
	Fully closed - underground leak		<input checked="" type="checkbox"/>		Volume of water used (GPM x total flow min.)	
					Residual pressure (PSI)	50
					Flow @ 20 PSI	2300

Comments: Damage to hose nozzle thread.
 cracked bearing housing.
 Leaking from operating nut.
 ↳ Conversion

APPENDIX C

Stormwater Management Details

**TABLE 1
DESIGN STORM PARAMETERS**

**FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
CHEO 1DOOR4CARE - PARKING GARAGE
OTTAWA, ONTARIO**

Design Storm	IDF Storm Parameters			Time of Peak r	Storm Duration D (h)	Max. Rainfall Intensity (mm/hr)	Max. Rainfall Depth (mm)
	a	b	c				
2-year	732.951	6.199	0.810	0.3	3	76.8	31.9
5-year	998.071	6.053	0.814	0.3	3	104.2	42.5
10-year	1174.184	6.014	0.816	0.3	3	122.1	49.5
25-year	1402.884	6.018	0.819	0.3	3	144.7	58.3
50-year	1569.580	6.014	0.820	0.3	3	161.5	64.8
100-year	1735.688	6.014	0.820	0.3	3	178.6	71.7

Notes:

(1) IDF curve parameters taken from City of Ottawa Sewer Design Guidelines (October 2012)

TABLE 2
PROPOSED CATCHMENT PARAMETERS
FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
CHEO 1DOOR4CARE
OTTAWA, ONTARIO

Subcatchment	Comment	Area (ha)	Percent Impervious ² (%)	Width (m)	Flow Length (m)	Slope (%)	Mannings Roughness		Horton Infiltration ¹			Depression Storage		Subarea Routing	Percent Routed (%)	
							Impervious	Pervious	Max. Infiltration Rate (mm/hr)	Min. Infiltration Rate (mm/hr)	Decay Constant (1/hr)	Impervious (mm)	Pervious (mm)			Percent Zero Impervious (%)
Proposed Conditions																
<u>Internal Catchments</u>																
222	Landscaped area south of existing CHEO main entrance	0.10	30	69	15	0.5	0.013	0.250	76.20	13.20	4.14	1.57	4.67	0	OUTLET	100
223	Portion of existing external asphalt parking lot that directs runoff onto entrance driveway to CHEO entrance	0.11	87	20	57	0.5	0.013	0.250	76.20	13.20	4.14	1.57	4.67	0	OUTLET	100
224	Proposed 1Door4Care building	0.48	90	320	15	2.0	0.013	0.250	76.20	13.20	4.14	1.57	4.67	0	OUTLET	100
225a	Northern portion of the driveway between proposed 1Door4Care building and existing CHEO entrance	0.20	82	26	75	0.5	0.013	0.250	76.20	13.20	4.14	1.57	4.67	0	OUTLET	100
225b	Southern Portion of the driveway between proposed 1Door4Care building and existing CHEO entrance	0.30	82	39	75	1.0	0.013	0.250	76.20	13.20	4.14	1.57	4.67	0	OUTLET	100
226	South intersection between Site driveway and Ring Road	0.10	79	15	65	2.0	0.013	0.250	76.20	13.20	4.14	1.57	4.67	0	OUTLET	100
227	Proposed parking lot in front of the 1Door4Care building	0.39	75	46	85	1.5	0.013	0.250	76.20	13.20	4.14	1.57	4.67	0	OUTLET	100
228	Proposed landscaped area on northern limits of the Site	0.23	64	27	83	1.0	0.013	0.250	76.20	13.20	4.14	1.57	4.67	0	OUTLET	100
229	Existing landscaped area in front of CHEO Max Keeping Wing	0.15	38	15	100	2.0	0.013	0.250	76.20	13.20	4.14	1.57	4.67	0	OUTLET	100
<u>External Catchments</u>																
EXT-1	Section of ring road on the southern limits of the Site	0.28	90	275	10	0.5	0.013	0.250	76.20	13.20	4.14	1.57	4.67	0	OUTLET	100
EXT-2	Section of ring road on the western limits of the Site	0.28	90	280	10	0.5	0.013	0.250	76.20	13.20	4.14	1.57	4.67	0	OUTLET	100
EXT-3	Existing asphalt parking lot - directs runoff to Site	0.96	86	65	148	0.5	0.013	0.250	76.20	13.20	4.14	1.57	4.67	0	OUTLET	100
Total (site)		2.06	75													
Total (included external)		3.58	80													

Notes:

(1) Horton Infiltration Method Parameters taken from *Ottawa Design Guidelines - Sewer*, October 2012

**TABLE 3
PEAK RUNOFF VOLUMES**

**FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
CHEO 1DOOR4CARE
OTTAWA, ONTARIO**

Subcatchment	Design Storms					
	2-year (m ³)	5-year (m ³)	10-year (m ³)	25-year (m ³)	50-year (m ³)	100-year (m ³)
Proposed Conditions						
222	10	14	18	24	29	35
223	30	41	49	58	65	73
224	114	160	192	232	262	294
225a	50	69	82	98	111	124
225b	82	115	139	170	194	219
226	50	71	85	103	117	131
227	90	126	152	184	209	235
228	85	125	153	188	215	243
229	18	25	31	40	48	56
EXT-1	71	97	114	136	153	171
EXT-2	72	98	116	139	156	175
EXT-3	248	338	399	477	537	600

**TABLE 4
PEAK RUNOFF FLOW RATES**

**FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
CHEO 1DOOR4CARE
OTTAWA, ONTARIO**

Subcatchment	Design Storms					
	Chicago 2-Year (L/s)	Chicago 5-Year (L/s)	Chicago 10-Year (L/s)	Chicago 25-Year (L/s)	Chicago 50-Year (L/s)	Chicago 100-Year (L/s)
Proposed Conditions						
222	6.48	9.25	11.25	13.91	15.99	18.19
223	10.50	16.36	20.49	25.93	30.13	34.53
224	80.08	123.84	152.22	183.86	206.64	229.83
225a	32.52	46.28	55.73	67.85	76.98	86.36
225b	54.33	77.73	93.83	114.45	129.98	145.92
226	20.86	31.40	38.79	48.40	55.74	63.41
227	61.11	86.85	104.87	128.17	145.84	164.06
228	48.34	72.85	90.19	112.96	130.65	149.26
229	11.04	15.87	19.22	23.59	26.93	30.41
EXT-1	13.98	21.47	26.72	34.40	40.74	47.55
EXT-2	14.24	21.86	27.21	35.03	41.48	48.41
EXT-3	48.92	75.10	93.47	120.34	142.51	166.33

**TABLE 5
GALLERY PERFORMANCE SUMMARY**

**FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
CHEO 1DOOR4CARE
OTTAWA, ONTARIO**

PCSWMM Model Element	Design Storm	Peak Inflow (L/s)	Peak Outflow to Storm Sewer Network (L/s)	Max. Storage Volume (m ³)	Max. Ponding Elevation (m)
Detention Gallery					
	2-year	126.22	40.69	79	78.60
	5-year	182.81	49.70	109	78.97
	10-year	216.68	49.77	109	78.97
	25-year	287.00	49.73	109	78.97
	50-year	345.20	49.69	109	78.97
	100-year	374.29	49.76	109	78.97
Surface Ponding					
	2-year	72.58	72.86	0	79.60
	5-year	105.07	105.07	0	79.60
	10-year	135.41	123.93	39	79.70
	25-year	235.13	147.06	50	79.73
	50-year	292.20	162.55	62	79.76
	100-year	322.46	175.55	70	79.78
Roof Storage					
	2-year	80.08	15.50	72	0.04
	5-year	115.40	20.67	101	0.05
	10-year	136.58	25.84	120	0.06
	25-year	162.94	31.01	144	0.07
	50-year	182.50	36.18	162	0.08
	100-year	202.42	38.76	181	0.09

**TABLE 6
OUTLET COMPARISONS**

**FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
CHEO 1DOOR4CARE
OTTAWA, ONTARIO**

Design Storm Event	To Storm Sewer		
	Existing (L/s)	Allowable ⁽¹⁾ (L/s)	Proposed (L/s)
2-year	99.32	99.32	61.48
5-year	134.74	99.32	77.23
10-year	157.95	99.32	81.85
25-year	187.11	99.32	87.83
50-year	208.81	99.32	92.33
100-year	230.91	99.32	96.99

Design Storm Event	To Ring Road		
	Existing (L/s)	Allowable ⁽¹⁾ (L/s)	Proposed (L/s)
2-year	160.45	160.45	48.34
5-year	217.67	160.45	72.85
10-year	255.17	160.45	90.19
25-year	302.28	160.45	112.96
50-year	337.33	160.45	131.63
100-year	373.03	160.45	156.35

(1) The allowable release rate has been set equal to the outflow from a pre-development, 2-year storm event with a runoff coefficient of 0.5 as per the Stormwater Master Plan created by Morrison Hershfield.

STORMWATER MANAGEMENT CALCULATIONS
FLOW CONTROL ROOF DRAIN DESIGN

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
CHEO 1DOOR4CARE
OTTAWA, ONTARIO

Roof Drain Characteristics		
Drainage function (Zurn Z-105 Control-Flo Drain)	0.38	L/s/25 mm of head
Max ponding depth	150	mm

Building Roof Requirement		
Roof area serviced by flow control roof drains	2060.94	m ²
Number of Roof Drains	17	

Stage-Storage-Discharge Curve		
head (m)	Discharge (L/s)	Storage (m ³)
0.000	0.00	0.0
0.025	6.46	36.1
0.050	12.92	72.1
0.075	19.38	108.2
0.100	25.84	144.3
0.125	32.30	180.3
0.150	38.76	216.4

*Note: Roof Storage = Area x Head x 0.7

SOPRANATURE SOPRARETENTIO BOARD

TECHNICAL DATA SHEET 230328SCANE

(supersedes -)



VEGETATIVE SOLUTION
COMPLEMENTARY PRODUCT

APPLICATIONS

ROOFS

PLAZA-DECKS

DESCRIPTION

SOPRARETENTIO BOARD is a drainage board with water retention properties made from 100% recycled polyester. SOPRARETENTIO BOARD is used in flat or slope green roofing systems to retain a certain amount of water and channel excess to the water outlets. It can also be used on any roofs or plaza-decks that needs water management or be used as a protection board over the waterproofing membranes.

INSTALLATION

Install all the SOPRARETENTIO BOARD side by side directly on the surface making sure to leave no gaps between the boards.

FOR COMPLETE INFORMATION ON PRODUCT INSTALLATION, PLEASE CONSULT YOUR SOPREMA REPRESENTATIVE.

PACKAGING

Specifications	SOPRARETENTIO BOARD
Dimensions	1 m x 1.2 m (3.3 x 4 ft)
Coverage per roll	1.2 m ² (13.2 ft ²)
Thickness	30 mm (1.18 in)

PROPERTIES

Properties	Standards	SOPRARETENTIO BOARD
Material	-	100% Recycled Polyester
Colour	-	Dark Grey
Compressive Strength <i>10% deformation</i>	ASTM D 1621	2.9 kPa (0.42 psi)
Dry Weight	ASTM E 2397	3.0 kg/m ² (0.6 lb/ft ²)
Fully Saturated Water retention	ASTM E 2397	21.6 L/m ²
Puncture Resistance	ASTM D 4833	220 N (49.5 lbf)
Flow Rate <i>at 20 kPa</i>	ASTM D 4716 Hydraulic gradient of 1.0	0,21 L/s/m (0.017 gal US/min/ft)

(All values are nominal)



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TDS-SOPRARETENTIO-BOARD.incd

SOPRANATURE TOUNDRA BOX

TECHNICAL DATA SHEET 210721SCANE

(supersedes 210129SCANE)



VEGETATIVE SOLUTION

APPLICATIONS

ROOFS

PLAZA-DECKS

DESCRIPTION

SOPRANATURE's TOUNDRA BOX is a patented pre-vegetated system. It is composed of a box made of 100% recycled polypropylene and recyclable removable side boards, containing a filter cloth and a growing medium in which a mix of sedum species is cultivated. The mix of sedums can be adapted according to the hardness zone and climatic conditions.

The TOUNDRA BOX system can be installed on SOPRANATURE green roofs, garden terraces, and plaza decks.

INSTALLATION

The TOUNDRA BOX boxes are installed with their side boards (removable upper part). The side boards must be removed up to the second-to-last installed row only, as the last row supports the substrate. The side boards can be recycled.

The installation of the TOUNDRA BOX system must be immediately followed by saturation watering.

FOR FURTHER DETAILS ON PRODUCT INSTALLATION AS WELL AS RECOMMENDATIONS ON RUSTICITY ZONES AND CLIMATE ZONES, PLEASE CONSULT A SOPREMA REPRESENTATIVE.

PACKAGING

Specifications	TOUNDRA BOX
Box material	100%-recycled polypropylene
Filter cloth material	Non-woven polypropylene
Box dimensions	300 mm × 600 mm (11.8 in × 23.6 in)
Total height	Upon delivery
	195 mm (7.7 in)
	After removing the side boards
	100 mm (3.9 in)
Coverage of vegetation at installation	≥ 90%

(All values are nominal)

PROPERTIES

Properties	Standards	TOUNDRA BOX
Density	ASTM E2399	106.0 to 124.2 kg/m ² (21.7 to 25.5 lb/ft ²)
Water retention capacity	ASTM E2397	45.6 L/m ² (1.1 Gallon/ft ²)
Wind flow resistance	CSA A123.24	200 [133] Km/h (124 [83] mph)*

*Values between brackets include safety factor.
(All values are nominal)

STORAGE AND HANDLING

The storage time of a pallet of stacked TOUNDRA BOX boxes should not exceed 48 hours. In the case of long-term storage, contact our SOPRANATURE Department to determine the precautions to consider. Store the TOUNDRA BOX out of direct sunlight in a ventilated place.



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NOTE: All products manufactured by SOPREMA Inc. comply with the description and properties indicated in the technical data sheet that was current at the date of manufacture.

TDS-TOUNDRA-BOX-Soprema-en.indd

APPENDIX D

PCSWMM Report Files

2021-0821-13: 2 Year Proposed Results

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.3)

 WARNING 04: minimum elevation drop used for Conduit C2
 WARNING 02: maximum depth increased for Node CBMH54-S
 WARNING 02: maximum depth increased for Node EX.MH34-S
 WARNING 02: maximum depth increased for Node EX.MH36-S

Element Count

Number of rain gages 7
 Number of subcatchments ... 12
 Number of nodes 30
 Number of links 27
 Number of pollutants 0
 Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
100Yr	100Yr	INTENSITY	10 min.
10Yr	10Yr	INTENSITY	10 min.
2_yr	2_yr	INTENSITY	10 min.
25Yr	25Yr	INTENSITY	10 min.
2Yr	2Yr	INTENSITY	10 min.
50Yr	50Yr	INTENSITY	10 min.
5Yr	5Yr	INTENSITY	10 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage
Outlet					
222	0.10	52.00	30.00	0.5000	2_yr
225b					
223	0.11	20.00	87.00	0.0100	2_yr
226					
224	0.48	320.00	90.00	2.0000	2_yr
Roof					

2021-0821-13: 2 Year Proposed Results

225a	0.20	26.40	82.00	0.5000	2_yr
228					
225b	0.29	39.33	82.00	1.0000	2_yr
EX.MH36-S					
226	0.10	15.08	79.00	1.5000	2_yr
EX.MH34-S					
227	0.39	46.35	75.00	1.0000	2_yr
CBMH54-S					
228	0.23	27.47	64.00	2.0000	2_yr
RingRoadMajor					
229	0.15	15.30	38.00	0.1000	2_yr
EX.MH32					
EXT-1	0.28	10.00	90.00	0.0000	2_yr
EX.MH34-S					
EXT-2	0.28	10.00	90.00	0.0000	2_yr
RingRoadMajor					
EXT-3	0.96	54.97	86.00	0.0000	2_yr
223					

LID Control Summary

Imperv Subcatchment Treated	% Perv LID Control Treated	No. of Units	Unit Area	Unit Width	% Area Covered	%

224 0.00	GreenRoof 0.00	1	650.00	0.00	13.54	

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow

CBMH38	JUNCTION	77.74	1.91	0.0	
CBMH38_Orifice	JUNCTION	77.74	1.91	0.0	
CBMH52	JUNCTION	76.58	2.51	0.0	
CBMH54	JUNCTION	78.18	1.67	0.0	
CBMH54-S	JUNCTION	79.84	0.40	0.0	
CBMH92	JUNCTION	77.33	2.25	0.0	
CBMH94	JUNCTION	76.91	2.45	0.0	
EX.MH31	JUNCTION	76.62	5.64	0.0	
EX.MH34	JUNCTION	78.40	2.89	0.0	

2021-0821-13: 2 Year Proposed Results

Item	Type	Value 1	Value 2	Value 3	Flag
EX.MH34-S	JUNCTION	81.29	0.40	0.0	
EX.MH36	JUNCTION	77.61	4.86	0.0	
EX.MH36-S	JUNCTION	82.28	0.40	0.0	
EX.MH43	JUNCTION	78.74	1.84	0.0	
EX.MH43-S	JUNCTION	80.58	0.30	0.0	
EX.MH44	JUNCTION	78.00	1.77	0.0	
EX.MH44-S	JUNCTION	79.77	0.30	0.0	
EX.MH45	JUNCTION	77.63	1.72	0.0	
EX.MH45-S	JUNCTION	79.35	0.30	0.0	
EX.MH46	JUNCTION	76.65	2.32	0.0	
J2	JUNCTION	78.40	5.80	0.0	
STM-MH1	JUNCTION	79.21	2.64	0.0	
STM-MH14	JUNCTION	79.01	2.35	0.0	
STM-MH14-S	JUNCTION	81.36	0.30	0.0	
STM-MH1-S	JUNCTION	81.85	0.30	0.0	Yes
EX.MH32	OUTFALL	75.74	0.53	0.0	
Minor2	OUTFALL	75.80	0.30	0.0	
RingRoadMajor	OUTFALL	78.97	0.30	0.0	
Detention	STORAGE	77.90	1.07	0.0	
Roof	STORAGE	78.65	0.15	0.0	
SurfacePonding	STORAGE	79.60	0.28	0.0	

Link Summary

Name	From Node	To Node	Type	Length

C1	STM-MH1	STM-MH14	CONDUIT	61.7
0.3242	0.0130			
C10	EX.MH43	EX.MH44	CONDUIT	71.4
0.9944	0.0130			
C10-S	EX.MH43-S	EX.MH44-S	CONDUIT	71.4
1.1345	0.0160			
C11	EX.MH45	EX.MH46	CONDUIT	37.1
1.8332	0.0130			
C11-S	EX.MH45-S	RingRoadMajor	CONDUIT	37.1
1.0243	0.0160			
C12	EX.MH44	EX.MH45	CONDUIT	35.1
1.0542	0.0130			
C12-S	EX.MH44-S	EX.MH45-S	CONDUIT	35.1
1.1967	0.0160			
C13	EX.MH46	CBMH52	CONDUIT	10.5
0.6857	0.0130			
C14	EX.MH34	EX.MH36	CONDUIT	60.8
1.2995	0.0130			

2021-0821-13: 2 Year Proposed Results

C14-S	EX.MH34-S	EX.MH43-S	CONDUIT	60.8
1.1678	0.0160			
C15	EX.MH31	EX.MH32	CONDUIT	86.4
1.0139	0.0130			
C1-S	STM-MH1-S	STM-MH14-S	CONDUIT	61.7
0.7943	0.0160			
C2	J2	EX.MH31	CONDUIT	16.0
0.0019	0.0130			
C3	STM-MH14	EX.MH34	CONDUIT	60.8
1.0042	0.0130			
C3-S	STM-MH14-S	EX.MH34-S	CONDUIT	60.8
0.1152	0.0160			
C4	EX.MH36	J2	CONDUIT	80.0
-0.9913	0.0130			
C4-S	EX.MH36-S	EX.MH34-S	CONDUIT	80.0
1.2376	0.0160			
C5	CBMH54	Detention	CONDUIT	25.2
0.4960	0.0130			
C5-S	CBMH54-S	SurfacePonding	CONDUIT	35.0
0.6857	0.0160			
C6	CBMH38_Orifice	CBMH92	CONDUIT	39.8
0.9423	0.0130			
C7	CBMH92	CBMH94	CONDUIT	39.7
0.9950	0.0130			
C8	CBMH94	CBMH52	CONDUIT	33.0
1.0061	0.0130			
C9	Detention	CBMH38	CONDUIT	26.1
1.1878	0.0130			
CBMH52	CBMH52	Minor2	CONDUIT	39.0
1.9953	0.0130			
OR1	CBMH38	CBMH38_Orifice	ORIFICE	
OL1	SurfacePonding	Detention	OUTLET	
RoofDrain	Roof	J2	OUTLET	

Cross Section Summary

Full Conduit Flow	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels

C1 162.35	CIRCULAR	0.45	0.16	0.11	0.45	1
C10 96.44	CIRCULAR	0.30	0.07	0.07	0.30	1

2021-0821-13: 2 Year Proposed Results

C10-S	Street	0.30	2.00	0.19	10.00	1
4452.27						
C11	CIRCULAR	0.30	0.07	0.07	0.30	1
130.94						
C11-S	Street	0.30	2.00	0.19	10.00	1
4230.49						
C12	CIRCULAR	0.30	0.07	0.07	0.30	1
99.29						
C12-S	Street	0.30	2.00	0.19	10.00	1
4572.58						
C13	CIRCULAR	0.30	0.07	0.07	0.30	1
80.08						
C14	CIRCULAR	0.45	0.16	0.11	0.45	1
325.02						
C14-S	Street	0.30	2.00	0.19	10.00	1
4517.17						
C15	CIRCULAR	0.53	0.22	0.13	0.53	1
433.08						
C1-S	Street	0.30	2.00	0.19	10.00	1
3725.39						
C2	CIRCULAR	0.53	0.22	0.13	0.53	1
18.77						
C3	CIRCULAR	0.45	0.16	0.11	0.45	1
285.72						
C3-S	Street	0.30	2.00	0.19	10.00	1
1418.90						
C4	CIRCULAR	0.53	0.22	0.13	0.53	1
428.21						
C4-S	Full_Street	0.40	8.00	0.20	40.00	1
18752.45						
C5	CIRCULAR	0.30	0.07	0.07	0.30	1
68.11						
C5-S	Full_Street	0.40	8.00	0.20	40.00	1
13958.72						
C6	CIRCULAR	0.30	0.07	0.07	0.30	1
93.87						
C7	CIRCULAR	0.30	0.07	0.07	0.30	1
96.47						
C8	CIRCULAR	0.30	0.07	0.07	0.30	1
97.00						
C9	CIRCULAR	0.30	0.07	0.07	0.30	1
105.40						
CBMH52	CIRCULAR	0.30	0.07	0.07	0.30	1
136.60						

 Street Summary

2021-0821-13: 2 Year Proposed Results

Street Street
Area:

0.0005	0.0018	0.0041	0.0072	0.0113
0.0162	0.0221	0.0288	0.0365	0.0450
0.0545	0.0648	0.0761	0.0882	0.1013
0.1152	0.1301	0.1458	0.1625	0.1800
0.1985	0.2178	0.2381	0.2592	0.2813
0.3042	0.3281	0.3528	0.3785	0.4050
0.4325	0.4608	0.4901	0.5200	0.5500
0.5800	0.6100	0.6400	0.6700	0.7000
0.7300	0.7600	0.7900	0.8200	0.8500
0.8800	0.9100	0.9400	0.9700	1.0000

Hrad:

0.0151	0.0303	0.0454	0.0606	0.0757
0.0909	0.1060	0.1212	0.1363	0.1515
0.1666	0.1818	0.1969	0.2121	0.2272
0.2424	0.2575	0.2726	0.2878	0.3029
0.3181	0.3332	0.3484	0.3635	0.3787
0.3938	0.4090	0.4241	0.4393	0.4544
0.4696	0.4847	0.4999	0.5249	0.5548
0.5848	0.6147	0.6445	0.6743	0.7041
0.7338	0.7636	0.7932	0.8229	0.8525
0.8821	0.9116	0.9411	0.9706	1.0000

Width:

0.0300	0.0600	0.0900	0.1200	0.1500
0.1800	0.2100	0.2400	0.2700	0.3000
0.3300	0.3600	0.3900	0.4200	0.4500
0.4800	0.5100	0.5400	0.5700	0.6000
0.6300	0.6600	0.6900	0.7200	0.7500
0.7800	0.8100	0.8400	0.8700	0.9000
0.9300	0.9600	0.9900	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000

Street Full_Street
Area:

0.0004	0.0016	0.0036	0.0064	0.0100
0.0144	0.0196	0.0256	0.0324	0.0400
0.0484	0.0576	0.0676	0.0784	0.0900
0.1024	0.1156	0.1296	0.1444	0.1600
0.1764	0.1936	0.2116	0.2304	0.2500
0.2704	0.2916	0.3136	0.3364	0.3600
0.3844	0.4096	0.4356	0.4624	0.4900
0.5184	0.5476	0.5776	0.6084	0.6400
0.6724	0.7056	0.7396	0.7744	0.8100
0.8464	0.8836	0.9216	0.9604	1.0000

Hrad:

2021-0821-13: 2 Year Proposed Results

0.0200	0.0399	0.0599	0.0798	0.0998
0.1197	0.1397	0.1596	0.1796	0.1995
0.2195	0.2394	0.2594	0.2793	0.2993
0.3192	0.3392	0.3591	0.3791	0.3990
0.4190	0.4389	0.4589	0.4788	0.4988
0.5187	0.5387	0.5586	0.5786	0.5985
0.6185	0.6384	0.6584	0.6783	0.6983
0.7182	0.7382	0.7582	0.7784	0.7985
0.8187	0.8388	0.8590	0.8791	0.8993
0.9194	0.9396	0.9597	0.9799	1.0000

Width:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000
0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

Analysis Options

Flow Units LPS
 Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
 Infiltration Method HORTON
 Flow Routing Method DYNWAVE
 Surcharge Method EXTRAN
 Starting Date 01/04/2023 00:00:00
 Ending Date 01/04/2023 15:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:01:00
 Wet Time Step 00:05:00
 Dry Time Step 00:05:00
 Routing Time Step 5.00 sec
 Variable Time Step YES
 Maximum Trials 8
 Number of Threads 4
 Head Tolerance 0.001524 m

2021-0821-13: 2 Year Proposed Results

```

*****
Runoff Quantity Continuity      Volume      Depth
                                hectare-m   mm
*****
Total Precipitation .....      0.114      31.880
Evaporation Loss .....         0.000       0.000
Infiltration Loss .....        0.024       6.677
Surface Runoff .....           0.044      12.263
Final Storage .....            0.047      13.046
Continuity Error (%) .....     -0.333
    
```

```

*****
Flow Routing Continuity      Volume      Volume
                                hectare-m   10^6 ltr
*****
Dry Weather Inflow .....      0.000       0.000
Wet Weather Inflow .....      0.044       0.439
Groundwater Inflow .....      0.000       0.000
RDII Inflow .....             0.000       0.000
External Inflow .....         0.034       0.339
External Outflow .....        0.075       0.750
Flooding Loss .....           0.000       0.000
Evaporation Loss .....        0.000       0.000
Exfiltration Loss .....       0.000       0.000
Initial Stored Volume .....    0.000       0.000
Final Stored Volume .....     0.003       0.029
Continuity Error (%) .....    -0.067
    
```

```

*****
Highest Continuity Errors
*****
Node EX.MH44-S (10.75%)
Node EX.MH45-S (8.76%)
Node EX.MH36 (4.35%)
    
```

```

*****
Time-Step Critical Elements
*****
None
    
```

```

*****
Highest Flow Instability Indexes
*****
All links are stable.
    
```

2021-0821-13: 2 Year Proposed Results

Most Frequent Nonconverging Nodes

Node EX.MH32 (0.05%)
 Node Minor2 (0.05%)
 Node RingRoadMajor (0.05%)
 Node EX.MH36 (0.04%)
 Node CBMH38 (0.01%)

Routing Time Step Summary

Minimum Time Step : 1.50 sec
 Average Time Step : 4.99 sec
 Maximum Time Step : 5.00 sec
 % of Time in Steady State : 0.00
 Average Iterations per Step : 2.01
 % of Steps Not Converging : 0.05
 Time Step Frequencies :
 5.000 - 3.155 sec : 99.87 %
 3.155 - 1.991 sec : 0.08 %
 1.991 - 1.256 sec : 0.05 %
 1.256 - 0.792 sec : 0.00 %
 0.792 - 0.500 sec : 0.00 %

Subcatchment Runoff Summary

Perv	Total	Total	Total	Total	Total	Total	Imperv
Runoff	Runoff	Total	Peak	Total	Evap	Infil	Runoff
Subcatchment	Subcatchment	Precip	Runoff	Runoff	mm	mm	mm
mm	mm	10^6 ltr	mm	mm	mm	mm	mm
			LPS	Coeff			

222		31.88		0.00	0.00	22.32	9.13
0.01	9.14	0.01	6.69	0.287			
223		31.88		0.00	0.00	4.14	26.40
0.00	26.40	0.03	10.50	0.828			
224		31.88		0.00	0.00	2.76	23.67

2021-0821-13: 2 Year Proposed Results

0.02	23.70	0.11	80.08	0.743			
225a			31.88	0.00	0.00	5.74	25.08
0.00	25.09	0.05	32.52	0.787			
225b			31.88	3.22	0.00	6.24	27.74
0.09	27.82	0.08	55.29	0.793			
226			31.88	30.71	0.00	10.24	48.39
2.95	51.34	0.05	20.86	0.820			
227			31.88	0.00	0.00	7.97	22.95
0.00	22.96	0.09	61.11	0.720			
228			31.88	21.78	0.00	15.73	33.52
3.67	37.18	0.08	48.34	0.693			
229			31.88	0.00	0.00	19.77	11.61
0.00	11.61	0.02	11.04	0.364			
EXT-1			31.88	0.00	0.00	3.19	0.00
0.00	0.00	0.00	0.00	0.000			
EXT-2			31.88	0.00	0.00	3.19	0.00
0.00	0.00	0.00	0.00	0.000			
EXT-3			31.88	0.00	0.00	4.46	0.00
0.00	0.00	0.00	0.00	0.000			

LID Performance Summary

Drain	Initial	Final	Continuity	Total	Evap	Infil	Surface
Outflow	Storage	Storage	Error	Inflow	Loss	Loss	Outflow
Subcatchment	mm	LID Control	%	mm	mm	mm	mm
224		GreenRoof		31.88	0.00	0.00	0.00
0.00	0.00	31.88	0.00				

Node Depth Summary

Node	Type	Average	Maximum	Maximum	Time of Max	Reported
		Depth	Depth	HGL	Occurrence	Max Depth
		Meters	Meters	Meters	days hr:min	Meters

2021-0821-13: 2 Year Proposed Results

CBMH38	JUNCTION	0.00	40.69	0	01:17		0
0.212 -0.064							
CBMH38_Orifice	JUNCTION	0.00	40.69	0	01:17		0
0.212 -0.040							
CBMH52	JUNCTION	0.00	40.71	0	01:19		0
0.214 0.016							
CBMH54	JUNCTION	54.34	54.34	0	01:00		0.0825
0.0825 0.829							
CBMH54-S	JUNCTION	73.82	73.82	0	01:00		0.14
0.14 0.022							
CBMH92	JUNCTION	0.00	40.69	0	01:18		0
0.212 -0.001							
CBMH94	JUNCTION	0.00	40.68	0	01:18		0
0.212 -0.008							
EX.MH31	JUNCTION	0.00	15.34	0	01:32		0
0.434 0.084							
EX.MH34	JUNCTION	0.00	6.38	0	00:45		0
0.338 0.422							
EX.MH34-S	JUNCTION	-34.16	54.34	0	01:00		-0.0322
0.0841 0.908							
EX.MH36	JUNCTION	0.00	6.65	0	00:43		0
0.336 4.543							
EX.MH36-S	JUNCTION	55.29	55.29	0	01:00		0.0821
0.0821 -0.774							
EX.MH43	JUNCTION	0.00	0.00	0	00:00		0
0 0.000 ltr							
EX.MH43-S	JUNCTION	-15.66	15.66	0	01:04		-0.0495
0.0497 0.054							
EX.MH44	JUNCTION	0.00	0.00	0	00:00		0
0 0.000 ltr							
EX.MH44-S	JUNCTION	0.00	0.02	0	09:43		0
0.000268 12.046							
EX.MH45	JUNCTION	0.00	0.00	0	00:00		0
0 0.000 ltr							
EX.MH45-S	JUNCTION	0.00	0.02	0	10:06		0
0.000239 9.602							
EX.MH46	JUNCTION	0.08	0.86	0	00:58		0.0015
0.0016 0.531							
J2	JUNCTION	0.00	15.35	0	01:31		0
0.435 0.381							
STM-MH1	JUNCTION	0.00	0.00	0	00:00		0
0 0.000 ltr							
STM-MH14	JUNCTION	6.28	6.28	0	00:30		0.338
0.338 0.134							
STM-MH14-S	JUNCTION	-6.28	6.28	0	00:30		-0.338
0.338 0.005							
STM-MH1-S	JUNCTION	6.28	6.28	0	00:00		0.339
0.339 0.226							

2021-0821-13: 2 Year Proposed Results

EX.MH32		OUTFALL	11.04	20.78	0	01:00	0.0178
0.451	0.000						
Minor2		OUTFALL	0.00	40.70	0	01:19	0
0.214	0.000						
RingRoadMajor		OUTFALL	48.34	48.34	0	01:00	0.0833
0.085	0.000						
Detention		STORAGE	72.58	126.22	0	01:00	0.14
0.222	-0.270						
Roof		STORAGE	80.08	80.08	0	01:00	0.114
0.114	0.001						
SurfacePonding		STORAGE	-72.58	72.58	0	01:00	-0.14
0.14	-0.234						

Node Surcharge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
CBMH38	JUNCTION	1.37	0.491	1.119
CBMH54	JUNCTION	0.62	0.136	1.229
EX.MH36	JUNCTION	14.29	0.388	3.947

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Max Occurrence	Maximum Outflow Storage Unit	Average Volume	Avg Pcmt Full	Evap Loss	Exfil Loss	Maximum Volume	Max Pcmt Full	Time of days
hr:min	LPS	1000 m ³				1000 m ³		

2021-0821-13: 2 Year Proposed Results

Time	Area	Flow	Volume	Flow	Volume	Flow	Volume	Flow
01:17	40.69	0.015	13.7	0.0	0.0	0.079	72.4	0
01:30	9.07	0.017	5.4	0.0	0.0	0.072	23.4	0
00:55	72.86	0.000	0.0	0.0	0.0	0.000	0.0	0

 Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
EX.MH32	96.56	8.66	20.78	0.451
Minor2	93.78	4.26	40.70	0.214
RingRoadMajor	30.49	5.18	48.34	0.085
System	73.61	18.09	98.73	0.750

 Street Flow Summary

Peak Flow Capture Street Pcnt	Avg. Flow Capture Conduit Pcnt	Bypass Peak Flow Freq LPS Pcnt	Back Maximum Flow Spread Freq Pcnt	Peak Maximum Capture / Inlet LPS	Peak Bypass Inlet Flow Design LPS	Inlet Location	Inlet
C10-S		0.025	0.263	0.003	Inlet	ON-GRADE	4
C11-S		0.021	0.263	0.003	Inlet	ON-SAG	4
C12-S		0.024	0.263	0.003	Inlet	ON-GRADE	4
C14-S		15.661	1.218	0.024	Inlet	ON-GRADE	1

2021-0821-13: 2 Year Proposed Results

100.00	100.00	0.00	0.00	15.66	0.00		
C1-S		6.280	0.915	0.018	Inlet	ON-GRADE	1
100.00	100.00	0.00	0.00	6.28	0.00		
C3-S		0.000	1.182	0.024	Inlet	ON-GRADE	1
C4-S		54.337	2.219	0.044	Inlet	ON-GRADE	4
100.00	100.00	0.00	0.00	6.79	0.00		
C5-S		72.575	1.731	0.035	Inlet	ON-GRADE	7
100.00	100.00	0.00	0.00	5.18	0.00		

Link Flow Summary

Link	Type	Maximum Flow LPS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.00	0 00:00	0.00	0.00	0.05
C10	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C10-S	CONDUIT	0.02	0 09:43	0.10	0.00	0.01
C11	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C11-S	CONDUIT	0.02	0 10:23	0.00	0.00	0.01
C12	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C12-S	CONDUIT	0.02	0 10:06	0.10	0.00	0.01
C13	CONDUIT	0.86	0 00:58	0.20	0.01	0.27
C14	CONDUIT	6.65	0 00:43	0.79	0.02	0.64
C14-S	CONDUIT	15.66	0 01:04	1.05	0.00	0.08
C15	CONDUIT	15.34	0 01:33	0.94	0.04	0.13
C1-S	CONDUIT	6.28	0 00:30	0.76	0.00	0.06
C2	CONDUIT	15.34	0 01:32	0.54	0.82	0.19
C3	CONDUIT	6.38	0 00:45	0.77	0.02	0.19
C3-S	CONDUIT	0.00	0 00:34	0.00	0.00	0.08
C4	CONDUIT	6.78	0 00:43	0.06	0.02	0.61
C4-S	CONDUIT	54.34	0 01:00	0.57	0.00	0.11
C5	CONDUIT	53.45	0 01:00	0.97	0.78	1.00
C5-S	CONDUIT	72.58	0 01:00	1.20	0.01	0.09
C6	CONDUIT	40.69	0 01:18	1.20	0.43	0.48
C7	CONDUIT	40.68	0 01:18	1.23	0.42	0.48
C8	CONDUIT	40.69	0 01:18	1.32	0.42	0.45
C9	CONDUIT	40.69	0 01:17	0.88	0.39	1.00
CBMH52	CONDUIT	40.70	0 01:19	1.65	0.30	0.38
OR1	ORIFICE	40.69	0 01:17			1.00
OL1	DUMMY	0.67	0 00:55			
RoofDrain	DUMMY	9.07	0 01:30			

2021-0821-13: 2 Year Proposed Results

C5	1.00	0.04	0.61	0.00	0.33	0.00	0.00	0.03	0.86
0.00									
C5-S	1.00	0.03	0.00	0.00	0.01	0.97	0.00	0.00	0.00
0.00									
C6	1.00	0.06	0.00	0.00	0.00	0.00	0.00	0.94	0.00
0.00									
C7	1.00	0.06	0.00	0.00	0.00	0.00	0.00	0.94	0.00
0.00									
C8	1.00	0.06	0.00	0.00	0.44	0.50	0.00	0.00	0.35
0.00									
C9	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.85
0.00									
CBMH52	1.00	0.06	0.00	0.00	0.00	0.94	0.00	0.00	0.00
0.00									

 Conduit Surcharge Summary

Conduit	----- Both Ends	Hours Full Upstream	----- Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C14	0.01	0.01	14.37	0.01	0.01
C4	0.01	0.01	14.29	0.01	0.01
C5	0.62	0.62	0.86	0.01	0.01
C9	0.86	0.86	1.37	0.01	0.01

Analysis begun on: Fri Apr 12 11:13:45 2024
 Analysis ended on: Fri Apr 12 11:13:46 2024
 Total elapsed time: 00:00:01

2021-0821-13: 5 Year Proposed Results

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.3)

 WARNING 04: minimum elevation drop used for Conduit C2
 WARNING 02: maximum depth increased for Node CBMH54-S
 WARNING 02: maximum depth increased for Node EX.MH34-S
 WARNING 02: maximum depth increased for Node EX.MH36-S

Element Count

Number of rain gages 7
 Number of subcatchments ... 12
 Number of nodes 30
 Number of links 27
 Number of pollutants 0
 Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
100Yr	100Yr	INTENSITY	10 min.
10Yr	10Yr	INTENSITY	10 min.
25Yr	25Yr	INTENSITY	10 min.
2Yr	2Yr	INTENSITY	10 min.
5_yr	5_yr	INTENSITY	10 min.
50Yr	50Yr	INTENSITY	10 min.
5Yr	5Yr	INTENSITY	10 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage
Outlet					
222	0.10	52.00	30.00	0.5000	5_yr
225b					
223	0.11	20.00	87.00	0.0100	5_yr
226					
224	0.48	320.00	90.00	2.0000	5_yr
Roof					

2021-0821-13: 5 Year Proposed Results

225a	0.20	26.40	82.00	0.5000	5_yr
228					
225b	0.29	39.33	82.00	1.0000	5_yr
EX.MH36-S					
226	0.10	15.08	79.00	1.5000	5_yr
EX.MH34-S					
227	0.39	46.35	75.00	1.0000	5_yr
CBMH54-S					
228	0.23	27.47	64.00	2.0000	5_yr
RingRoadMajor					
229	0.15	15.30	38.00	0.1000	5_yr
EX.MH32					
EXT-1	0.28	10.00	90.00	0.0000	5_yr
EX.MH34-S					
EXT-2	0.28	10.00	90.00	0.0000	5_yr
RingRoadMajor					
EXT-3	0.96	54.97	86.00	0.0000	5_yr
223					

LID Control Summary

Imperv Subcatchment Treated	% Perv LID Control Treated	No. of Units	Unit Area	Unit Width	% Area Covered	%
-----	-----					
224 0.00	GreenRoof 0.00	1	650.00	0.00	13.54	

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
-----	-----				
CBMH38	JUNCTION	77.74	1.91	0.0	
CBMH38_Orifice	JUNCTION	77.74	1.91	0.0	
CBMH52	JUNCTION	76.58	2.51	0.0	
CBMH54	JUNCTION	78.18	1.67	0.0	
CBMH54-S	JUNCTION	79.84	0.40	0.0	
CBMH92	JUNCTION	77.33	2.25	0.0	
CBMH94	JUNCTION	76.91	2.45	0.0	
EX.MH31	JUNCTION	76.62	5.64	0.0	
EX.MH34	JUNCTION	78.40	2.89	0.0	

2021-0821-13: 5 Year Proposed Results

Item	Type	Value 1	Value 2	Value 3	Value 4
EX.MH34-S	JUNCTION	81.29	0.40	0.0	
EX.MH36	JUNCTION	77.61	4.86	0.0	
EX.MH36-S	JUNCTION	82.28	0.40	0.0	
EX.MH43	JUNCTION	78.74	1.84	0.0	
EX.MH43-S	JUNCTION	80.58	0.30	0.0	
EX.MH44	JUNCTION	78.00	1.77	0.0	
EX.MH44-S	JUNCTION	79.77	0.30	0.0	
EX.MH45	JUNCTION	77.63	1.72	0.0	
EX.MH45-S	JUNCTION	79.35	0.30	0.0	
EX.MH46	JUNCTION	76.65	2.32	0.0	
J2	JUNCTION	78.40	5.80	0.0	
STM-MH1	JUNCTION	79.21	2.64	0.0	
STM-MH14	JUNCTION	79.01	2.35	0.0	
STM-MH14-S	JUNCTION	81.36	0.30	0.0	
STM-MH1-S	JUNCTION	81.85	0.30	0.0	Yes
EX.MH32	OUTFALL	75.74	0.53	0.0	
Minor2	OUTFALL	75.80	0.30	0.0	
RingRoadMajor	OUTFALL	78.97	0.30	0.0	
Detention	STORAGE	77.90	1.07	0.0	
Roof	STORAGE	78.65	0.15	0.0	
SurfacePonding	STORAGE	79.60	0.28	0.0	

Link Summary

Name	From Node	To Node	Type	Length

C1	STM-MH1	STM-MH14	CONDUIT	61.7
0.3242	0.0130			
C10	EX.MH43	EX.MH44	CONDUIT	71.4
0.9944	0.0130			
C10-S	EX.MH43-S	EX.MH44-S	CONDUIT	71.4
1.1345	0.0160			
C11	EX.MH45	EX.MH46	CONDUIT	37.1
1.8332	0.0130			
C11-S	EX.MH45-S	RingRoadMajor	CONDUIT	37.1
1.0243	0.0160			
C12	EX.MH44	EX.MH45	CONDUIT	35.1
1.0542	0.0130			
C12-S	EX.MH44-S	EX.MH45-S	CONDUIT	35.1
1.1967	0.0160			
C13	EX.MH46	CBMH52	CONDUIT	10.5
0.6857	0.0130			
C14	EX.MH34	EX.MH36	CONDUIT	60.8
1.2995	0.0130			

2021-0821-13: 5 Year Proposed Results

C14-S	EX.MH34-S	EX.MH43-S	CONDUIT	60.8
1.1678	0.0160			
C15	EX.MH31	EX.MH32	CONDUIT	86.4
1.0139	0.0130			
C1-S	STM-MH1-S	STM-MH14-S	CONDUIT	61.7
0.7943	0.0160			
C2	J2	EX.MH31	CONDUIT	16.0
0.0019	0.0130			
C3	STM-MH14	EX.MH34	CONDUIT	60.8
1.0042	0.0130			
C3-S	STM-MH14-S	EX.MH34-S	CONDUIT	60.8
0.1152	0.0160			
C4	EX.MH36	J2	CONDUIT	80.0
-0.9913	0.0130			
C4-S	EX.MH36-S	EX.MH34-S	CONDUIT	80.0
1.2376	0.0160			
C5	CBMH54	Detention	CONDUIT	25.2
0.4960	0.0130			
C5-S	CBMH54-S	SurfacePonding	CONDUIT	35.0
0.6857	0.0160			
C6	CBMH38_Orifice	CBMH92	CONDUIT	39.8
0.9423	0.0130			
C7	CBMH92	CBMH94	CONDUIT	39.7
0.9950	0.0130			
C8	CBMH94	CBMH52	CONDUIT	33.0
1.0061	0.0130			
C9	Detention	CBMH38	CONDUIT	26.1
1.1878	0.0130			
CBMH52	CBMH52	Minor2	CONDUIT	39.0
1.9953	0.0130			
OR1	CBMH38	CBMH38_Orifice	ORIFICE	
OL1	SurfacePonding	Detention	OUTLET	
RoofDrain	Roof	J2	OUTLET	

Cross Section Summary

Full Conduit Flow	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels

C1	CIRCULAR	0.45	0.16	0.11	0.45	1
162.35						
C10	CIRCULAR	0.30	0.07	0.07	0.30	1
96.44						

2021-0821-13: 5 Year Proposed Results

C10-S 4452.27	Street	0.30	2.00	0.19	10.00	1
C11 130.94	CIRCULAR	0.30	0.07	0.07	0.30	1
C11-S 4230.49	Street	0.30	2.00	0.19	10.00	1
C12 99.29	CIRCULAR	0.30	0.07	0.07	0.30	1
C12-S 4572.58	Street	0.30	2.00	0.19	10.00	1
C13 80.08	CIRCULAR	0.30	0.07	0.07	0.30	1
C14 325.02	CIRCULAR	0.45	0.16	0.11	0.45	1
C14-S 4517.17	Street	0.30	2.00	0.19	10.00	1
C15 433.08	CIRCULAR	0.53	0.22	0.13	0.53	1
C1-S 3725.39	Street	0.30	2.00	0.19	10.00	1
C2 18.77	CIRCULAR	0.53	0.22	0.13	0.53	1
C3 285.72	CIRCULAR	0.45	0.16	0.11	0.45	1
C3-S 1418.90	Street	0.30	2.00	0.19	10.00	1
C4 428.21	CIRCULAR	0.53	0.22	0.13	0.53	1
C4-S 18752.45	Full_Street	0.40	8.00	0.20	40.00	1
C5 68.11	CIRCULAR	0.30	0.07	0.07	0.30	1
C5-S 13958.72	Full_Street	0.40	8.00	0.20	40.00	1
C6 93.87	CIRCULAR	0.30	0.07	0.07	0.30	1
C7 96.47	CIRCULAR	0.30	0.07	0.07	0.30	1
C8 97.00	CIRCULAR	0.30	0.07	0.07	0.30	1
C9 105.40	CIRCULAR	0.30	0.07	0.07	0.30	1
CBMH52 136.60	CIRCULAR	0.30	0.07	0.07	0.30	1

 Street Summary

2021-0821-13: 5 Year Proposed Results

Street Street
Area:

0.0005	0.0018	0.0041	0.0072	0.0113
0.0162	0.0221	0.0288	0.0365	0.0450
0.0545	0.0648	0.0761	0.0882	0.1013
0.1152	0.1301	0.1458	0.1625	0.1800
0.1985	0.2178	0.2381	0.2592	0.2813
0.3042	0.3281	0.3528	0.3785	0.4050
0.4325	0.4608	0.4901	0.5200	0.5500
0.5800	0.6100	0.6400	0.6700	0.7000
0.7300	0.7600	0.7900	0.8200	0.8500
0.8800	0.9100	0.9400	0.9700	1.0000

Hrad:

0.0151	0.0303	0.0454	0.0606	0.0757
0.0909	0.1060	0.1212	0.1363	0.1515
0.1666	0.1818	0.1969	0.2121	0.2272
0.2424	0.2575	0.2726	0.2878	0.3029
0.3181	0.3332	0.3484	0.3635	0.3787
0.3938	0.4090	0.4241	0.4393	0.4544
0.4696	0.4847	0.4999	0.5249	0.5548
0.5848	0.6147	0.6445	0.6743	0.7041
0.7338	0.7636	0.7932	0.8229	0.8525
0.8821	0.9116	0.9411	0.9706	1.0000

Width:

0.0300	0.0600	0.0900	0.1200	0.1500
0.1800	0.2100	0.2400	0.2700	0.3000
0.3300	0.3600	0.3900	0.4200	0.4500
0.4800	0.5100	0.5400	0.5700	0.6000
0.6300	0.6600	0.6900	0.7200	0.7500
0.7800	0.8100	0.8400	0.8700	0.9000
0.9300	0.9600	0.9900	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000

Street Full_Street
Area:

0.0004	0.0016	0.0036	0.0064	0.0100
0.0144	0.0196	0.0256	0.0324	0.0400
0.0484	0.0576	0.0676	0.0784	0.0900
0.1024	0.1156	0.1296	0.1444	0.1600
0.1764	0.1936	0.2116	0.2304	0.2500
0.2704	0.2916	0.3136	0.3364	0.3600
0.3844	0.4096	0.4356	0.4624	0.4900
0.5184	0.5476	0.5776	0.6084	0.6400
0.6724	0.7056	0.7396	0.7744	0.8100
0.8464	0.8836	0.9216	0.9604	1.0000

Hrad:

2021-0821-13: 5 Year Proposed Results

0.0200	0.0399	0.0599	0.0798	0.0998
0.1197	0.1397	0.1596	0.1796	0.1995
0.2195	0.2394	0.2594	0.2793	0.2993
0.3192	0.3392	0.3591	0.3791	0.3990
0.4190	0.4389	0.4589	0.4788	0.4988
0.5187	0.5387	0.5586	0.5786	0.5985
0.6185	0.6384	0.6584	0.6783	0.6983
0.7182	0.7382	0.7582	0.7784	0.7985
0.8187	0.8388	0.8590	0.8791	0.8993
0.9194	0.9396	0.9597	0.9799	1.0000

Width:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000
0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

Analysis Options

Flow Units LPS
 Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
 Infiltration Method HORTON
 Flow Routing Method DYNWAVE
 Surchage Method EXTRAN
 Starting Date 01/04/2023 00:00:00
 Ending Date 01/04/2023 15:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:01:00
 Wet Time Step 00:05:00
 Dry Time Step 00:05:00
 Routing Time Step 5.00 sec
 Variable Time Step YES
 Maximum Trials 8
 Number of Threads 4
 Head Tolerance 0.001524 m

2021-0821-13: 5 Year Proposed Results

```

*****
Runoff Quantity Continuity      Volume      Depth
                                hectare-m   mm
*****
Total Precipitation .....      0.152      42.540
Evaporation Loss .....          0.000      0.000
Infiltration Loss .....         0.029      8.159
Surface Runoff .....            0.062     17.344
Final Storage .....             0.062     17.190
Continuity Error (%) .....      -0.358
    
```

```

*****
Flow Routing Continuity      Volume      Volume
                                hectare-m   10^6 ltr
*****
Dry Weather Inflow .....       0.000      0.000
Wet Weather Inflow .....       0.062      0.621
Groundwater Inflow .....       0.000      0.000
RDII Inflow .....              0.000      0.000
External Inflow .....          0.034      0.339
External Outflow .....         0.093      0.933
Flooding Loss .....            0.000      0.000
Evaporation Loss .....         0.000      0.000
Exfiltration Loss .....        0.000      0.000
Initial Stored Volume .....     0.000      0.000
Final Stored Volume .....       0.003      0.029
Continuity Error (%) .....     -0.225
    
```

```

*****
Highest Continuity Errors
*****
Node EX.MH36 (4.34%)
Node EX.MH44-S (2.66%)
Node EX.MH45-S (1.76%)
    
```

```

*****
Time-Step Critical Elements
*****
None
    
```

```

*****
Highest Flow Instability Indexes
*****
All links are stable.
    
```

2021-0821-13: 5 Year Proposed Results

Most Frequent Nonconverging Nodes

- Node EX.MH32 (0.05%)
- Node Minor2 (0.05%)
- Node RingRoadMajor (0.05%)
- Node EX.MH36 (0.04%)
- Node CBMH38 (0.01%)

Routing Time Step Summary

```

Minimum Time Step      :      0.66 sec
Average Time Step      :      4.99 sec
Maximum Time Step      :      5.00 sec
% of Time in Steady State :      0.00
Average Iterations per Step :      2.03
% of Steps Not Converging :      0.05
Time Step Frequencies :
  5.000 - 3.155 sec    :      99.89 %
  3.155 - 1.991 sec    :      0.06 %
  1.991 - 1.256 sec    :      0.03 %
  1.256 - 0.792 sec    :      0.02 %
  0.792 - 0.500 sec    :      0.01 %
    
```

Subcatchment Runoff Summary

Perv	Total	Total	Total	Total	Total	Total	Imperv
Runoff	Runoff	Total	Peak	Total	Evap	Infil	Runoff
Subcatchment	Runoff	Precip	Runoff	Runon	mm	mm	mm
mm	mm	10^6 ltr	mm	Coeff			

222		42.54		0.00	0.00	27.08	12.33
2.79	15.12	0.02	11.35	0.355			
223		42.54		0.00	0.00	5.28	35.73
0.26	35.99	0.04	16.36	0.846			
224		42.54		0.00	0.00	3.13	31.97

2021-0821-13: 5 Year Proposed Results

0.60	32.57	0.16	115.40	0.766			
225a			42.54	0.00	0.00	6.96	33.91
0.73	34.64	0.07	46.28	0.814			
225b			42.54	5.33	0.00	7.20	38.28
1.46	39.74	0.12	78.84	0.830			
226			42.54	41.87	0.00	10.87	65.68
6.94	72.62	0.07	31.40	0.860			
227			42.54	0.00	0.00	9.70	31.03
0.97	32.00	0.13	86.85	0.752			
228			42.54	30.08	0.00	16.99	45.68
9.28	54.97	0.13	72.85	0.757			
229			42.54	0.00	0.00	25.78	15.70
0.60	16.31	0.02	15.87	0.383			
EXT-1			42.54	0.00	0.00	4.25	0.00
0.00	0.00	0.00	0.00	0.000			
EXT-2			42.54	0.00	0.00	4.25	0.00
0.00	0.00	0.00	0.00	0.000			
EXT-3			42.54	0.00	0.00	5.96	0.00
0.00	0.00	0.00	0.00	0.000			

 LID Performance Summary

Drain	Initial	Final	Continuity	Total	Evap	Infil	Surface
Outflow	Storage	Storage	Error	Inflow	Loss	Loss	Outflow
Subcatchment	mm	LID Control	%	mm	mm	mm	mm
224		GreenRoof		42.54	0.00	0.00	0.00
0.00	0.00	42.54	0.00				

 Node Depth Summary

Node	Type	Average	Maximum	Maximum	Time of Max	Reported
		Depth	Depth	HGL	Occurrence	Max Depth
		Meters	Meters	Meters	days hr:min	Meters

2021-0821-13: 5 Year Proposed Results

CBMH38	JUNCTION	0.11	1.12	78.86	0	01:08	1.12
CBMH38_Orifice	JUNCTION	0.03	0.17	77.91	0	01:10	0.17
CBMH52	JUNCTION	0.02	0.13	76.71	0	01:11	0.13
CBMH54	JUNCTION	0.06	0.85	79.03	0	01:08	0.85
CBMH54-S	JUNCTION	0.01	0.08	79.92	0	01:00	0.08
CBMH92	JUNCTION	0.03	0.17	77.51	0	01:11	0.17
CBMH94	JUNCTION	0.03	0.17	77.08	0	01:11	0.17
EX.MH31	JUNCTION	0.05	0.07	76.69	0	01:30	0.07
EX.MH34	JUNCTION	0.10	0.13	78.53	0	01:29	0.13
EX.MH34-S	JUNCTION	0.01	0.05	81.34	0	01:02	0.05
EX.MH36	JUNCTION	0.86	0.92	78.53	0	01:29	0.92
EX.MH36-S	JUNCTION	0.01	0.05	82.33	0	01:00	0.05
EX.MH43	JUNCTION	0.00	0.00	78.74	0	00:00	0.00
EX.MH43-S	JUNCTION	0.00	0.03	80.61	0	01:06	0.03
EX.MH44	JUNCTION	0.00	0.01	78.01	0	01:04	0.01
EX.MH44-S	JUNCTION	0.00	0.03	79.80	0	01:09	0.03
EX.MH45	JUNCTION	0.00	0.01	77.64	0	01:33	0.01
EX.MH45-S	JUNCTION	0.00	0.03	79.38	0	01:10	0.03
EX.MH46	JUNCTION	0.01	0.06	76.71	0	01:11	0.06
J2	JUNCTION	0.09	0.13	78.53	0	01:29	0.13
STM-MH1	JUNCTION	0.00	0.00	79.21	0	00:00	0.00
STM-MH14	JUNCTION	0.05	0.05	79.06	0	00:23	0.05
STM-MH14-S	JUNCTION	0.00	0.00	81.36	0	00:23	0.00
STM-MH1-S	JUNCTION	0.04	0.04	81.89	0	15:00	0.04
EX.MH32	OUTFALL	0.05	0.07	75.81	0	01:30	0.07
Minor2	OUTFALL	0.02	0.13	75.93	0	01:11	0.13
RingRoadMajor	OUTFALL	0.00	0.03	79.00	0	01:10	0.03
Detention	STORAGE	0.22	1.07	78.97	0	01:08	1.07
Roof	STORAGE	0.01	0.05	78.70	0	01:24	0.05
SurfacePonding	STORAGE	0.00	0.07	79.67	0	01:21	0.07

Node Inflow Summary

Total	Flow		Maximum	Maximum		Lateral
Inflow	Balance		Lateral	Total	Time of Max	Inflow
Volume	Error		Inflow	Inflow	Occurrence	Volume
Node	Percent	Type	LPS	LPS	days hr:min	10^6 ltr
ltr						10^6

2021-0821-13: 5 Year Proposed Results

CBMH38	JUNCTION	0.00	49.70	0	01:08		0
0.3 -0.070							
CBMH38_Orifice	JUNCTION	0.00	49.64	0	01:09		0
0.3 -0.016							
CBMH52	JUNCTION	0.00	49.89	0	01:11		0
0.304 0.008							
CBMH54	JUNCTION	77.43	77.43	0	01:00		0.118
0.118 0.517							
CBMH54-S	JUNCTION	106.85	106.85	0	01:00		0.192
0.192 -0.285							
CBMH92	JUNCTION	0.00	49.62	0	01:10		0
0.3 -0.000							
CBMH94	JUNCTION	0.00	49.62	0	01:11		0
0.3 -0.004							
EX.MH31	JUNCTION	0.00	18.87	0	01:29		0
0.476 0.076							
EX.MH34	JUNCTION	0.00	6.38	0	00:43		0
0.338 0.421							
EX.MH34-S	JUNCTION	-46.63	77.43	0	01:00		-0.0466
0.119 0.594							
EX.MH36	JUNCTION	0.00	7.11	0	00:43		0
0.337 4.534							
EX.MH36-S	JUNCTION	78.84	78.84	0	01:00		0.117
0.117 -0.579							
EX.MH43	JUNCTION	0.00	0.00	0	00:00		0
0 0.000 ltr							
EX.MH43-S	JUNCTION	-20.00	30.15	0	01:04		-0.0658
0.0706 -0.008							
EX.MH44	JUNCTION	0.08	0.08	0	01:01		0.000182
0.000182 -0.269							
EX.MH44-S	JUNCTION	-0.08	8.28	0	01:07		-0.000182
0.0049 2.728							
EX.MH45	JUNCTION	0.08	0.16	0	01:05		0.000177
0.00036 0.619							
EX.MH45-S	JUNCTION	-0.08	7.49	0	01:09		-0.000177
0.00458 1.795							
EX.MH46	JUNCTION	0.08	0.79	0	00:56		0.00395
0.00438 0.210							
J2	JUNCTION	0.00	18.87	0	01:27		0
0.478 0.345							
STM-MH1	JUNCTION	0.00	0.00	0	00:00		0
0 0.000 ltr							
STM-MH14	JUNCTION	6.28	6.28	0	00:23		0.338
0.338 0.134							
STM-MH14-S	JUNCTION	-6.28	6.28	0	00:23		-0.338
0.338 0.005							
STM-MH1-S	JUNCTION	6.28	6.28	0	00:00		0.339
0.339 0.226							

2021-0821-13: 5 Year Proposed Results

EX.MH32		OUTFALL	15.87	27.36	0	01:00	0.0249
0.501	0.000						
Minor2		OUTFALL	0.00	49.87	0	01:11	0
0.304	0.000						
RingRoadMajor		OUTFALL	72.85	72.85	0	01:00	0.121
0.128	0.000						
Detention		STORAGE	105.07	182.81	0	01:00	0.192
0.351	-0.272						
Roof		STORAGE	115.40	115.40	0	01:00	0.156
0.156	0.002						
SurfacePonding		STORAGE	-105.07	105.07	0	01:00	-0.151
0.193	0.154						

Node Surcharge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
CBMH38	JUNCTION	1.83	0.824	0.786
CBMH54	JUNCTION	1.20	0.553	0.812
EX.MH36	JUNCTION	14.29	0.398	3.937

Node Flooding Summary

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate LPS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 ltr	Maximum Poned Depth Meters
Detention	0.41	59.20	0 01:10	0.041	0.000

Storage Volume Summary

2021-0821-13: 5 Year Proposed Results

```

-----
Max      Maximum
Occurrence  Outflow
Storage Unit
hr:min      LPS

Average    Avg    Evap  Exfil    Maximum    Max    Time of
Volume    Pcnt   Pcnt  Pcnt    Volume    Pcnt
1000 m³   Full   Loss  Loss    1000 m³   Full   days
  
```

```

-----
Detention
01:08      49.70
Roof
01:24      12.60
SurfacePonding
01:21      105.52

0.019    17.2    0.0    0.0      0.109    100.0    0
0.023    7.5     0.0    0.0      0.101    32.5     0
0.000    0.0     0.0    0.0      0.011    2.1      0
  
```

 Outfall Loading Summary

```

-----
Flow      Avg      Max      Total
Freq      Flow     Flow     Volume
Pcnt      LPS      LPS      10^6 ltr
-----
EX.MH32   97.13    9.56     27.36    0.501
Minor2    94.14    6.01     49.87    0.304
RingRoadMajor  24.82    9.58     72.85    0.128
-----
System    72.03    25.15    134.34   0.934
  
```

 Street Flow Summary

```

-----
-----
Peak      Avg.    Bypass    Back      Peak      Peak
Flow      Flow    Flow      Maximum   Capture   Bypass
Capture   Capture  Flow      Flow     / Inlet    Inlet
Street    Conduit  Freq      Spread   Inlet      Flow
Pcnt      Pcnt    Pcnt      Pcnt     LPS        m        LPS
          Pcnt    Pcnt     Pcnt     Pcnt     LPS        LPS

Inlet      Inlet
Location
  
```

2021-0821-13: 5 Year Proposed Results

C10-S		8.275	1.414	0.028	Inlet	ON-GRADE	4
0.97	33.92	66.48	0.00	0.02	8.20		
C11-S		6.797	1.366	0.027	Inlet	ON-SAG	4
1.18	39.63	69.88	0.00	0.02	6.72		
C12-S		7.487	1.367	0.027	Inlet	ON-GRADE	4
1.07	33.62	62.54	0.00	0.02	7.41		
C14-S		30.149	1.992	0.040	Inlet	ON-GRADE	1
66.34	99.42	2.85	0.00	20.00	10.15		
C1-S		6.280	0.915	0.018	Inlet	ON-GRADE	1
100.00	100.00	0.00	0.00	6.28	0.00		
C3-S		0.000	1.357	0.027	Inlet	ON-GRADE	1
C4-S		77.428	2.571	0.051	Inlet	ON-GRADE	4
100.00	100.00	0.00	0.00	9.68	0.00		
C5-S		105.067	2.709	0.054	Inlet	ON-GRADE	7
100.00	97.17	4.25	0.88	7.50	0.00		

Link Flow Summary

Link	Type	Maximum Flow LPS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.00	0 00:00	0.00	0.00	0.05
C10	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C10-S	CONDUIT	8.28	0 01:07	0.50	0.00	0.09
C11	CONDUIT	0.16	0 01:33	0.33	0.00	0.03
C11-S	CONDUIT	6.80	0 01:10	0.36	0.00	0.09
C12	CONDUIT	0.08	0 01:05	0.27	0.00	0.02
C12-S	CONDUIT	7.49	0 01:09	0.46	0.00	0.09
C13	CONDUIT	0.79	0 00:56	0.19	0.01	0.32
C14	CONDUIT	7.11	0 00:43	0.79	0.02	0.65
C14-S	CONDUIT	30.15	0 01:04	1.11	0.01	0.13
C15	CONDUIT	18.87	0 01:30	1.00	0.04	0.14
C1-S	CONDUIT	6.28	0 00:23	0.76	0.00	0.06
C2	CONDUIT	18.87	0 01:29	0.58	1.01	0.21
C3	CONDUIT	6.38	0 00:43	0.77	0.02	0.20
C3-S	CONDUIT	0.00	0 00:29	0.00	0.00	0.09
C4	CONDUIT	7.23	0 00:43	0.06	0.02	0.62
C4-S	CONDUIT	77.43	0 01:00	0.61	0.00	0.13
C5	CONDUIT	77.29	0 01:00	1.09	1.13	1.00
C5-S	CONDUIT	105.07	0 01:00	1.33	0.01	0.14
C6	CONDUIT	49.62	0 01:10	1.25	0.53	0.55

2021-0821-13: 5 Year Proposed Results

C2	1.00	0.03	0.00	0.00	0.00	0.00	0.00	0.97	0.00
0.00									
C3	1.00	0.00	0.00	0.00	0.95	0.05	0.00	0.00	0.95
0.00									
C3-S	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.97
0.00									
C4	1.00	0.00	0.03	0.00	0.97	0.00	0.00	0.00	0.02
0.00									
C4-S	1.00	0.02	0.00	0.00	0.94	0.04	0.00	0.00	0.93
0.00									
C5	1.00	0.03	0.60	0.00	0.33	0.00	0.00	0.03	0.83
0.00									
C5-S	1.00	0.02	0.00	0.00	0.04	0.94	0.00	0.00	0.03
0.00									
C6	1.00	0.05	0.00	0.00	0.00	0.00	0.00	0.95	0.00
0.00									
C7	1.00	0.05	0.00	0.00	0.00	0.00	0.00	0.95	0.00
0.00									
C8	1.00	0.06	0.00	0.00	0.59	0.35	0.00	0.00	0.60
0.00									
C9	1.00	0.05	0.00	0.00	0.94	0.01	0.00	0.00	0.82
0.00									
CBMH52	1.00	0.06	0.00	0.00	0.00	0.94	0.00	0.00	0.00
0.00									

 Conduit Surcharge Summary

Conduit	----- Both Ends	Hours Full Upstream	----- Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C14	0.01	0.01	14.37	0.01	0.01
C2	0.01	0.01	0.01	0.27	0.01
C4	0.01	0.01	14.29	0.01	0.01
C5	1.18	1.20	1.37	0.08	0.10
C9	1.37	1.37	1.83	0.01	0.01

Analysis begun on: Fri Apr 12 11:13:47 2024
 Analysis ended on: Fri Apr 12 11:13:47 2024
 Total elapsed time: < 1 sec

2021-0821-13: 10 Year Proposed Results

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.3)

 WARNING 04: minimum elevation drop used for Conduit C2
 WARNING 02: maximum depth increased for Node CBMH54-S
 WARNING 02: maximum depth increased for Node EX.MH34-S
 WARNING 02: maximum depth increased for Node EX.MH36-S

Element Count

Number of rain gages 7
 Number of subcatchments ... 12
 Number of nodes 30
 Number of links 27
 Number of pollutants 0
 Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
10_yr	10_yr	INTENSITY	10 min.
100Yr	100Yr	INTENSITY	10 min.
10Yr	10Yr	INTENSITY	10 min.
25Yr	25Yr	INTENSITY	10 min.
2Yr	2Yr	INTENSITY	10 min.
50Yr	50Yr	INTENSITY	10 min.
5Yr	5Yr	INTENSITY	10 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage
Outlet					
222	0.10	52.00	30.00	0.5000	10_yr
225b					
223	0.11	20.00	87.00	0.0100	10_yr
226					
224	0.48	320.00	90.00	2.0000	10_yr
Roof					

2021-0821-13: 10 Year Proposed Results

225a	0.20	26.40	82.00	0.5000	10_yr
228					
225b	0.29	39.33	82.00	1.0000	10_yr
EX.MH36-S					
226	0.10	15.08	79.00	1.5000	10_yr
EX.MH34-S					
227	0.39	46.35	75.00	1.0000	10_yr
CBMH54-S					
228	0.23	27.47	64.00	2.0000	10_yr
RingRoadMajor					
229	0.15	15.30	38.00	0.1000	10_yr
EX.MH32					
EXT-1	0.28	10.00	90.00	0.0000	10_yr
EX.MH34-S					
EXT-2	0.28	10.00	90.00	0.0000	10_yr
RingRoadMajor					
EXT-3	0.96	54.97	86.00	0.0000	10_yr
223					

LID Control Summary

Imperv Subcatchment Treated	% Perv Treated	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	%
224 0.00	0.00	GreenRoof	1	650.00	0.00	13.54	

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
CBMH38	JUNCTION	77.74	1.91	0.0	
CBMH38_Orifice	JUNCTION	77.74	1.91	0.0	
CBMH52	JUNCTION	76.58	2.51	0.0	
CBMH54	JUNCTION	78.18	1.67	0.0	
CBMH54-S	JUNCTION	79.84	0.40	0.0	
CBMH92	JUNCTION	77.33	2.25	0.0	
CBMH94	JUNCTION	76.91	2.45	0.0	
EX.MH31	JUNCTION	76.62	5.64	0.0	
EX.MH34	JUNCTION	78.40	2.89	0.0	

2021-0821-13: 10 Year Proposed Results

Item	Type	Value 1	Value 2	Value 3	Value 4
EX.MH34-S	JUNCTION	81.29	0.40	0.0	
EX.MH36	JUNCTION	77.61	4.86	0.0	
EX.MH36-S	JUNCTION	82.28	0.40	0.0	
EX.MH43	JUNCTION	78.74	1.84	0.0	
EX.MH43-S	JUNCTION	80.58	0.30	0.0	
EX.MH44	JUNCTION	78.00	1.77	0.0	
EX.MH44-S	JUNCTION	79.77	0.30	0.0	
EX.MH45	JUNCTION	77.63	1.72	0.0	
EX.MH45-S	JUNCTION	79.35	0.30	0.0	
EX.MH46	JUNCTION	76.65	2.32	0.0	
J2	JUNCTION	78.40	5.80	0.0	
STM-MH1	JUNCTION	79.21	2.64	0.0	
STM-MH14	JUNCTION	79.01	2.35	0.0	
STM-MH14-S	JUNCTION	81.36	0.30	0.0	
STM-MH1-S	JUNCTION	81.85	0.30	0.0	Yes
EX.MH32	OUTFALL	75.74	0.53	0.0	
Minor2	OUTFALL	75.80	0.30	0.0	
RingRoadMajor	OUTFALL	78.97	0.30	0.0	
Detention	STORAGE	77.90	1.07	0.0	
Roof	STORAGE	78.65	0.15	0.0	
SurfacePonding	STORAGE	79.60	0.28	0.0	

Link Summary

Name	From Node	To Node	Type	Length
----- C1	STM-MH1	STM-MH14	CONDUIT	61.7
0.3242 0.0130				
C10	EX.MH43	EX.MH44	CONDUIT	71.4
0.9944 0.0130				
C10-S	EX.MH43-S	EX.MH44-S	CONDUIT	71.4
1.1345 0.0160				
C11	EX.MH45	EX.MH46	CONDUIT	37.1
1.8332 0.0130				
C11-S	EX.MH45-S	RingRoadMajor	CONDUIT	37.1
1.0243 0.0160				
C12	EX.MH44	EX.MH45	CONDUIT	35.1
1.0542 0.0130				
C12-S	EX.MH44-S	EX.MH45-S	CONDUIT	35.1
1.1967 0.0160				
C13	EX.MH46	CBMH52	CONDUIT	10.5
0.6857 0.0130				
C14	EX.MH34	EX.MH36	CONDUIT	60.8
1.2995 0.0130				

2021-0821-13: 10 Year Proposed Results

C14-S	EX.MH34-S	EX.MH43-S	CONDUIT	60.8
1.1678	0.0160			
C15	EX.MH31	EX.MH32	CONDUIT	86.4
1.0139	0.0130			
C1-S	STM-MH1-S	STM-MH14-S	CONDUIT	61.7
0.7943	0.0160			
C2	J2	EX.MH31	CONDUIT	16.0
0.0019	0.0130			
C3	STM-MH14	EX.MH34	CONDUIT	60.8
1.0042	0.0130			
C3-S	STM-MH14-S	EX.MH34-S	CONDUIT	60.8
0.1152	0.0160			
C4	EX.MH36	J2	CONDUIT	80.0
-0.9913	0.0130			
C4-S	EX.MH36-S	EX.MH34-S	CONDUIT	80.0
1.2376	0.0160			
C5	CBMH54	Detention	CONDUIT	25.2
0.4960	0.0130			
C5-S	CBMH54-S	SurfacePonding	CONDUIT	35.0
0.6857	0.0160			
C6	CBMH38_Orifice	CBMH92	CONDUIT	39.8
0.9423	0.0130			
C7	CBMH92	CBMH94	CONDUIT	39.7
0.9950	0.0130			
C8	CBMH94	CBMH52	CONDUIT	33.0
1.0061	0.0130			
C9	Detention	CBMH38	CONDUIT	26.1
1.1878	0.0130			
CBMH52	CBMH52	Minor2	CONDUIT	39.0
1.9953	0.0130			
OR1	CBMH38	CBMH38_Orifice	ORIFICE	
OL1	SurfacePonding	Detention	OUTLET	
RoofDrain	Roof	J2	OUTLET	

 Cross Section Summary

Full Conduit Flow	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels
----- C1	CIRCULAR	0.45	0.16	0.11	0.45	1
162.35						
C10	CIRCULAR	0.30	0.07	0.07	0.30	1
96.44						

2021-0821-13: 10 Year Proposed Results

C10-S	Street	0.30	2.00	0.19	10.00	1
4452.27						
C11	CIRCULAR	0.30	0.07	0.07	0.30	1
130.94						
C11-S	Street	0.30	2.00	0.19	10.00	1
4230.49						
C12	CIRCULAR	0.30	0.07	0.07	0.30	1
99.29						
C12-S	Street	0.30	2.00	0.19	10.00	1
4572.58						
C13	CIRCULAR	0.30	0.07	0.07	0.30	1
80.08						
C14	CIRCULAR	0.45	0.16	0.11	0.45	1
325.02						
C14-S	Street	0.30	2.00	0.19	10.00	1
4517.17						
C15	CIRCULAR	0.53	0.22	0.13	0.53	1
433.08						
C1-S	Street	0.30	2.00	0.19	10.00	1
3725.39						
C2	CIRCULAR	0.53	0.22	0.13	0.53	1
18.77						
C3	CIRCULAR	0.45	0.16	0.11	0.45	1
285.72						
C3-S	Street	0.30	2.00	0.19	10.00	1
1418.90						
C4	CIRCULAR	0.53	0.22	0.13	0.53	1
428.21						
C4-S	Full_Street	0.40	8.00	0.20	40.00	1
18752.45						
C5	CIRCULAR	0.30	0.07	0.07	0.30	1
68.11						
C5-S	Full_Street	0.40	8.00	0.20	40.00	1
13958.72						
C6	CIRCULAR	0.30	0.07	0.07	0.30	1
93.87						
C7	CIRCULAR	0.30	0.07	0.07	0.30	1
96.47						
C8	CIRCULAR	0.30	0.07	0.07	0.30	1
97.00						
C9	CIRCULAR	0.30	0.07	0.07	0.30	1
105.40						
CBMH52	CIRCULAR	0.30	0.07	0.07	0.30	1
136.60						

 Street Summary

2021-0821-13: 10 Year Proposed Results

Street Street
Area:

0.0005	0.0018	0.0041	0.0072	0.0113
0.0162	0.0221	0.0288	0.0365	0.0450
0.0545	0.0648	0.0761	0.0882	0.1013
0.1152	0.1301	0.1458	0.1625	0.1800
0.1985	0.2178	0.2381	0.2592	0.2813
0.3042	0.3281	0.3528	0.3785	0.4050
0.4325	0.4608	0.4901	0.5200	0.5500
0.5800	0.6100	0.6400	0.6700	0.7000
0.7300	0.7600	0.7900	0.8200	0.8500
0.8800	0.9100	0.9400	0.9700	1.0000

Hrad:

0.0151	0.0303	0.0454	0.0606	0.0757
0.0909	0.1060	0.1212	0.1363	0.1515
0.1666	0.1818	0.1969	0.2121	0.2272
0.2424	0.2575	0.2726	0.2878	0.3029
0.3181	0.3332	0.3484	0.3635	0.3787
0.3938	0.4090	0.4241	0.4393	0.4544
0.4696	0.4847	0.4999	0.5249	0.5548
0.5848	0.6147	0.6445	0.6743	0.7041
0.7338	0.7636	0.7932	0.8229	0.8525
0.8821	0.9116	0.9411	0.9706	1.0000

Width:

0.0300	0.0600	0.0900	0.1200	0.1500
0.1800	0.2100	0.2400	0.2700	0.3000
0.3300	0.3600	0.3900	0.4200	0.4500
0.4800	0.5100	0.5400	0.5700	0.6000
0.6300	0.6600	0.6900	0.7200	0.7500
0.7800	0.8100	0.8400	0.8700	0.9000
0.9300	0.9600	0.9900	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000

Street Full_Street
Area:

0.0004	0.0016	0.0036	0.0064	0.0100
0.0144	0.0196	0.0256	0.0324	0.0400
0.0484	0.0576	0.0676	0.0784	0.0900
0.1024	0.1156	0.1296	0.1444	0.1600
0.1764	0.1936	0.2116	0.2304	0.2500
0.2704	0.2916	0.3136	0.3364	0.3600
0.3844	0.4096	0.4356	0.4624	0.4900
0.5184	0.5476	0.5776	0.6084	0.6400
0.6724	0.7056	0.7396	0.7744	0.8100
0.8464	0.8836	0.9216	0.9604	1.0000

Hrad:

2021-0821-13: 10 Year Proposed Results

0.0200	0.0399	0.0599	0.0798	0.0998
0.1197	0.1397	0.1596	0.1796	0.1995
0.2195	0.2394	0.2594	0.2793	0.2993
0.3192	0.3392	0.3591	0.3791	0.3990
0.4190	0.4389	0.4589	0.4788	0.4988
0.5187	0.5387	0.5586	0.5786	0.5985
0.6185	0.6384	0.6584	0.6783	0.6983
0.7182	0.7382	0.7582	0.7784	0.7985
0.8187	0.8388	0.8590	0.8791	0.8993
0.9194	0.9396	0.9597	0.9799	1.0000

Width:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000
0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

Analysis Options

Flow Units LPS
 Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
 Infiltration Method HORTON
 Flow Routing Method DYNWAVE
 Surcharge Method EXTRAN
 Starting Date 01/04/2023 00:00:00
 Ending Date 01/04/2023 15:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:01:00
 Wet Time Step 00:05:00
 Dry Time Step 00:05:00
 Routing Time Step 5.00 sec
 Variable Time Step YES
 Maximum Trials 8
 Number of Threads 4
 Head Tolerance 0.001524 m

2021-0821-13: 10 Year Proposed Results

```

*****
Runoff Quantity Continuity      Volume      Depth
                                hectare-m   mm
*****
Total Precipitation .....      0.177      49.534
Evaporation Loss .....          0.000      0.000
Infiltration Loss .....         0.032      8.919
Surface Runoff .....            0.075     20.915
Final Storage .....             0.071     19.837
Continuity Error (%) .....      -0.273
    
```

```

*****
Flow Routing Continuity      Volume      Volume
                                hectare-m   10^6 ltr
*****
Dry Weather Inflow .....       0.000      0.000
Wet Weather Inflow .....       0.075      0.749
Groundwater Inflow .....       0.000      0.000
RDII Inflow .....              0.000      0.000
External Inflow .....           0.034      0.339
External Outflow .....          0.106      1.061
Flooding Loss .....             0.000      0.000
Evaporation Loss .....          0.000      0.000
Exfiltration Loss .....         0.000      0.000
Initial Stored Volume .....     0.000      0.000
Final Stored Volume .....       0.003      0.029
Continuity Error (%) .....      -0.226
    
```

```

*****
Highest Continuity Errors
*****
Node EX.MH36 (4.33%)
Node EX.MH44-S (1.63%)
Node EX.MH45-S (1.05%)
    
```

```

*****
Time-Step Critical Elements
*****
None
    
```

```

*****
Highest Flow Instability Indexes
*****
All links are stable.
    
```

2021-0821-13: 10 Year Proposed Results

Most Frequent Nonconverging Nodes

- Node EX.MH32 (0.06%)
- Node Minor2 (0.06%)
- Node RingRoadMajor (0.06%)
- Node EX.MH36 (0.05%)
- Node CBMH38 (0.01%)

Routing Time Step Summary

```

Minimum Time Step      :      1.77 sec
Average Time Step      :      5.00 sec
Maximum Time Step      :      5.00 sec
% of Time in Steady State :      0.00
Average Iterations per Step :      2.04
% of Steps Not Converging :      0.06
Time Step Frequencies  :
  5.000 - 3.155 sec    :      99.93 %
  3.155 - 1.991 sec    :      0.06 %
  1.991 - 1.256 sec    :      0.01 %
  1.256 - 0.792 sec    :      0.00 %
  0.792 - 0.500 sec    :      0.00 %
    
```

Subcatchment Runoff Summary

Perv	Total	Total	Total	Total	Total	Total	Imperv
Runoff	Runoff	Total	Peak	Total	Evap	Infil	Runoff
Subcatchment	Subcatchment	Precip	Runoff	Runon	mm	mm	mm
mm	mm	Runoff	mm	Coeff	mm	mm	mm

		10^6 ltr	LPS				
222		49.53	0.00	0.00	28.72	14.44	
6.10	20.54	0.02	15.32	0.415			
223		49.53	0.00	0.00	5.74	41.86	
0.71	42.57	0.05	20.49	0.859			
224		49.53	0.00	0.00	3.32	37.45	

2021-0821-13: 10 Year Proposed Results

1.10	38.61	0.19	136.58	0.779			
225a			49.53	0.00	0.00	7.37	39.71
1.58	41.29	0.08	55.73	0.834			
225b			49.53	7.24	0.00	7.58	45.63
2.70	48.34	0.14	95.26	0.851			
226			49.53	49.52	0.00	11.20	77.28
9.73	87.01	0.09	38.79	0.878			
227			49.53	0.00	0.00	10.29	36.33
2.14	38.47	0.15	104.87	0.777			
228			49.53	35.86	0.00	17.65	53.88
13.28	67.17	0.15	90.19	0.787			
229			49.53	0.00	0.00	28.81	18.39
1.92	20.31	0.03	19.22	0.410			
EXT-1			49.53	0.00	0.00	4.95	0.00
0.00	0.00	0.00	0.00	0.000			
EXT-2			49.53	0.00	0.00	4.95	0.00
0.00	0.00	0.00	0.00	0.000			
EXT-3			49.53	0.00	0.00	6.93	0.00
0.00	0.00	0.00	0.00	0.000			

LID Performance Summary

Drain	Initial	Final	Continuity	Total	Evap	Infil	Surface
Outflow	Storage	Storage	Error	Inflow	Loss	Loss	Outflow
Subcatchment	mm	LID Control	%	mm	mm	mm	mm
224		GreenRoof		49.53	0.00	0.00	0.39
0.00	0.00	45.60	7.15				

Node Depth Summary

Node	Type	Average	Maximum	Maximum	Time of Max	Reported
		Depth	Depth	HGL	Occurrence	Max Depth
		Meters	Meters	Meters	days hr:min	Meters

2021-0821-13: 10 Year Proposed Results

CBMH38		JUNCTION	0.00	49.77	0	01:03	0
0.359	-0.086						
CBMH38_Orifice		JUNCTION	0.00	49.67	0	01:03	0
0.359	-0.007						
CBMH52		JUNCTION	0.00	49.89	0	01:06	0
0.363	0.006						
CBMH54		JUNCTION	93.02	93.02	0	01:00	0.143
0.143	0.340						
CBMH54-S		JUNCTION	124.87	124.87	0	01:00	0.225
0.225	-0.620						
CBMH92		JUNCTION	0.00	49.62	0	01:05	0
0.359	-0.000						
CBMH94		JUNCTION	0.00	49.62	0	01:06	0
0.359	-0.003						
EX.MH31		JUNCTION	0.00	21.27	0	01:28	0
0.505	0.072						
EX.MH34		JUNCTION	0.00	6.39	0	00:43	0
0.338	0.421						
EX.MH34-S		JUNCTION	-55.06	93.02	0	01:00	-0.0578
0.145	0.471						
EX.MH36		JUNCTION	0.00	7.19	0	00:43	0
0.337	4.529						
EX.MH36-S		JUNCTION	95.26	95.26	0	01:00	0.143
0.143	-0.478						
EX.MH43		JUNCTION	0.00	0.00	0	00:00	0
0	0.000 ltr						
EX.MH43-S		JUNCTION	-20.00	38.38	0	01:03	-0.0735
0.0848	-0.041						
EX.MH44		JUNCTION	0.08	0.08	0	00:59	0.000212
0.000212	-0.214						
EX.MH44-S		JUNCTION	-0.08	16.52	0	01:05	-0.000212
0.0113	1.653						
EX.MH45		JUNCTION	0.08	0.16	0	01:03	0.000208
0.00042	0.535						
EX.MH45-S		JUNCTION	-0.08	15.53	0	01:07	-0.000208
0.0109	1.061						
EX.MH46		JUNCTION	0.08	0.65	0	00:54	0.00396
0.00444	0.207						
J2		JUNCTION	0.00	21.27	0	01:27	0
0.507	0.325						
STM-MH1		JUNCTION	0.00	0.00	0	00:00	0
0	0.000 ltr						
STM-MH14		JUNCTION	6.28	6.28	0	00:21	0.338
0.338	0.134						
STM-MH14-S		JUNCTION	-6.28	6.28	0	00:21	-0.338
0.338	0.005						
STM-MH1-S		JUNCTION	6.28	6.28	0	00:00	0.339
0.339	0.226						

2021-0821-13: 10 Year Proposed Results

EX.MH32		OUTFALL	19.22	31.98	0	01:00	0.0311
0.536	0.000						
Minor2		OUTFALL	0.00	49.87	0	01:09	0
0.363	0.000						
RingRoadMajor		OUTFALL	90.19	90.19	0	01:00	0.149
0.163	0.000						
Detention		STORAGE	123.47	216.68	0	01:00	0.226
0.5	-0.303						
Roof		STORAGE	136.58	136.58	0	01:00	0.185
0.185	0.002						
SurfacePonding		STORAGE	-123.47	135.41	0	01:04	-0.0935
0.26	0.612						

Node Surcharge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
CBMH38	JUNCTION	2.18	0.824	0.786
CBMH54	JUNCTION	1.58	0.723	0.642
EX.MH36	JUNCTION	14.30	0.404	3.931

Node Flooding Summary

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate LPS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 ltr	Maximum Poned Depth Meters
Detention	0.84	136.60	0 01:04	0.133	0.000

Storage Volume Summary

2021-0821-13: 10 Year Proposed Results

```

-----
Max      Maximum
Occurrence  Outflow
Storage Unit
hr:min      LPS

Average    Avg    Evap  Exfil    Maximum    Max    Time of
Volume    Pcnt   Pcnt  Pcnt    Volume    Pcnt
1000 m³   Full   Loss  Loss    1000 m³   Full   days
  
```

```

-----
Detention
01:03      49.77
Roof
01:24      15.00
SurfacePonding
01:25      123.93

0.021    19.4    0.0    0.0      0.109    100.0    0
0.027    8.8     0.0    0.0      0.120    38.7     0
0.002    0.4     0.0    0.0      0.042    8.5      0
  
```

 Outfall Loading Summary

```

-----
Flow      Avg      Max      Total
Freq      Flow     Flow     Volume
Pcnt      LPS      LPS      10^6 ltr
-----
EX.MH32   97.54    10.18    31.98    0.536
Minor2    94.40    7.14     49.87    0.363
RingRoadMajor
25.13    11.97    90.19    0.163
-----
System    72.36    29.29    159.38    1.062
  
```

 Street Flow Summary

```

-----
-----
Peak      Avg.    Bypass    Back      Peak      Peak
Flow      Flow    Flow      Maximum   Capture   Bypass
Capture   Capture  Flow      Flow     / Inlet   Inlet
Street    Conduit  Freq      Freq     m         m         Flow
Pcnt      Pcnt    Pcnt      Pcnt     LPS      LPS      LPS
Location
  
```

2021-0821-13: 10 Year Proposed Results

C10-S		16.519	1.850	0.037	Inlet	ON-GRADE	4
0.48	29.82	70.24	0.00	0.02	16.44		
C11-S		14.633	1.835	0.037	Inlet	ON-SAG	4
0.55	33.86	73.99	0.00	0.02	14.55		
C12-S		15.534	1.818	0.036	Inlet	ON-GRADE	4
0.52	29.32	67.39	0.00	0.02	15.45		
C14-S		38.377	2.296	0.046	Inlet	ON-GRADE	1
52.11	98.84	4.00	0.00	20.00	18.38		
C1-S		6.280	0.915	0.018	Inlet	ON-GRADE	1
100.00	100.00	0.00	0.00	6.28	0.00		
C3-S		0.000	1.427	0.029	Inlet	ON-GRADE	1
C4-S		93.019	2.755	0.055	Inlet	ON-GRADE	4
100.00	100.00	0.00	0.00	11.63	0.00		
C5-S		123.467	3.639	0.073	Inlet	ON-GRADE	7
100.00	97.83	3.63	6.99	8.82	0.00		

Link Flow Summary

Link	Type	Maximum Flow LPS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.00	0 00:00	0.00	0.00	0.05
C10	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C10-S	CONDUIT	16.52	0 01:05	0.56	0.00	0.12
C11	CONDUIT	0.16	0 01:37	0.33	0.00	0.03
C11-S	CONDUIT	14.63	0 01:08	0.43	0.00	0.12
C12	CONDUIT	0.08	0 01:03	0.27	0.00	0.02
C12-S	CONDUIT	15.53	0 01:07	0.51	0.00	0.12
C13	CONDUIT	0.65	0 00:54	0.19	0.01	0.32
C14	CONDUIT	7.19	0 00:43	0.79	0.02	0.65
C14-S	CONDUIT	38.38	0 01:03	1.11	0.01	0.15
C15	CONDUIT	21.27	0 01:28	1.04	0.05	0.15
C1-S	CONDUIT	6.28	0 00:21	0.76	0.00	0.06
C2	CONDUIT	21.27	0 01:28	0.61	1.13	0.22
C3	CONDUIT	6.39	0 00:43	0.77	0.02	0.21
C3-S	CONDUIT	0.00	0 00:26	0.00	0.00	0.10
C4	CONDUIT	7.27	0 00:43	0.06	0.02	0.63
C4-S	CONDUIT	93.02	0 01:00	0.64	0.00	0.14
C5	CONDUIT	92.85	0 01:00	1.31	1.36	1.00
C5-S	CONDUIT	123.47	0 01:00	1.40	0.01	0.18
C6	CONDUIT	49.62	0 01:05	1.25	0.53	0.55

2021-0821-13: 10 Year Proposed Results

C2	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	0.00
0.00									
C3	1.00	0.00	0.00	0.00	0.95	0.05	0.00	0.00	0.95
0.00									
C3-S	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.97
0.00									
C4	1.00	0.00	0.02	0.00	0.98	0.00	0.00	0.00	0.02
0.00									
C4-S	1.00	0.02	0.00	0.00	0.93	0.05	0.00	0.00	0.93
0.00									
C5	1.00	0.03	0.60	0.00	0.34	0.00	0.00	0.03	0.81
0.00									
C5-S	1.00	0.02	0.00	0.00	0.07	0.90	0.00	0.00	0.07
0.00									
C6	1.00	0.05	0.00	0.00	0.00	0.00	0.00	0.95	0.00
0.00									
C7	1.00	0.05	0.00	0.00	0.00	0.00	0.00	0.95	0.00
0.00									
C8	1.00	0.05	0.00	0.00	0.59	0.36	0.00	0.00	0.60
0.00									
C9	1.00	0.05	0.00	0.00	0.94	0.00	0.00	0.00	0.80
0.00									
CBMH52	1.00	0.05	0.00	0.00	0.00	0.94	0.00	0.00	0.00
0.00									

 Conduit Surcharge Summary

Conduit	----- Both Ends	Hours Full Upstream	----- Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C14	0.01	0.01	14.37	0.01	0.01
C2	0.01	0.01	0.01	1.33	0.01
C4	0.01	0.01	14.30	0.01	0.01
C5	1.56	1.58	1.73	0.14	0.15
C9	1.73	1.73	2.18	0.01	0.01

Analysis begun on: Fri Apr 12 11:13:45 2024
 Analysis ended on: Fri Apr 12 11:13:46 2024
 Total elapsed time: 00:00:01

2021-0821-13: 25 Year Proposed Results

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.3)

 WARNING 04: minimum elevation drop used for Conduit C2
 WARNING 02: maximum depth increased for Node CBMH54-S
 WARNING 02: maximum depth increased for Node EX.MH34-S
 WARNING 02: maximum depth increased for Node EX.MH36-S

Element Count

Number of rain gages 7
 Number of subcatchments ... 12
 Number of nodes 30
 Number of links 27
 Number of pollutants 0
 Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
100Yr	100Yr	INTENSITY	10 min.
10Yr	10Yr	INTENSITY	10 min.
25_yr	25_yr	INTENSITY	10 min.
25Yr	25Yr	INTENSITY	10 min.
2Yr	2Yr	INTENSITY	10 min.
50Yr	50Yr	INTENSITY	10 min.
5Yr	5Yr	INTENSITY	10 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage
Outlet					
222	0.10	52.00	30.00	0.5000	25_yr
225b					
223	0.11	20.00	87.00	0.0100	25_yr
226					
224	0.48	320.00	90.00	2.0000	25_yr
Roof					

2021-0821-13: 25 Year Proposed Results

225a	0.20	26.40	82.00	0.5000	25_yr
228					
225b	0.29	39.33	82.00	1.0000	25_yr
EX.MH36-S					
226	0.10	15.08	79.00	1.5000	25_yr
EX.MH34-S					
227	0.39	46.35	75.00	1.0000	25_yr
CBMH54-S					
228	0.23	27.47	64.00	2.0000	25_yr
RingRoadMajor					
229	0.15	15.30	38.00	0.1000	25_yr
EX.MH32					
EXT-1	0.28	10.00	90.00	0.0000	25_yr
EX.MH34-S					
EXT-2	0.28	10.00	90.00	0.0000	25_yr
RingRoadMajor					
EXT-3	0.96	54.97	86.00	0.0000	25_yr
223					

LID Control Summary

Imperv Subcatchment Treated	% Perv Treated	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	%
224 0.00	0.00	GreenRoof	1	650.00	0.00	13.54	

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
CBMH38	JUNCTION	77.74	1.91	0.0	
CBMH38_Orifice	JUNCTION	77.74	1.91	0.0	
CBMH52	JUNCTION	76.58	2.51	0.0	
CBMH54	JUNCTION	78.18	1.67	0.0	
CBMH54-S	JUNCTION	79.84	0.40	0.0	
CBMH92	JUNCTION	77.33	2.25	0.0	
CBMH94	JUNCTION	76.91	2.45	0.0	
EX.MH31	JUNCTION	76.62	5.64	0.0	
EX.MH34	JUNCTION	78.40	2.89	0.0	

2021-0821-13: 25 Year Proposed Results

Item	Type	Value 1	Value 2	Value 3	Value 4
EX.MH34-S	JUNCTION	81.29	0.40	0.0	
EX.MH36	JUNCTION	77.61	4.86	0.0	
EX.MH36-S	JUNCTION	82.28	0.40	0.0	
EX.MH43	JUNCTION	78.74	1.84	0.0	
EX.MH43-S	JUNCTION	80.58	0.30	0.0	
EX.MH44	JUNCTION	78.00	1.77	0.0	
EX.MH44-S	JUNCTION	79.77	0.30	0.0	
EX.MH45	JUNCTION	77.63	1.72	0.0	
EX.MH45-S	JUNCTION	79.35	0.30	0.0	
EX.MH46	JUNCTION	76.65	2.32	0.0	
J2	JUNCTION	78.40	5.80	0.0	
STM-MH1	JUNCTION	79.21	2.64	0.0	
STM-MH14	JUNCTION	79.01	2.35	0.0	
STM-MH14-S	JUNCTION	81.36	0.30	0.0	
STM-MH1-S	JUNCTION	81.85	0.30	0.0	Yes
EX.MH32	OUTFALL	75.74	0.53	0.0	
Minor2	OUTFALL	75.80	0.30	0.0	
RingRoadMajor	OUTFALL	78.97	0.30	0.0	
Detention	STORAGE	77.90	1.07	0.0	
Roof	STORAGE	78.65	0.15	0.0	
SurfacePonding	STORAGE	79.60	0.28	0.0	

Link Summary

Name	From Node	To Node	Type	Length
%Slope Roughness				

C1	STM-MH1	STM-MH14	CONDUIT	61.7
0.3242 0.0130				
C10	EX.MH43	EX.MH44	CONDUIT	71.4
0.9944 0.0130				
C10-S	EX.MH43-S	EX.MH44-S	CONDUIT	71.4
1.1345 0.0160				
C11	EX.MH45	EX.MH46	CONDUIT	37.1
1.8332 0.0130				
C11-S	EX.MH45-S	RingRoadMajor	CONDUIT	37.1
1.0243 0.0160				
C12	EX.MH44	EX.MH45	CONDUIT	35.1
1.0542 0.0130				
C12-S	EX.MH44-S	EX.MH45-S	CONDUIT	35.1
1.1967 0.0160				
C13	EX.MH46	CBMH52	CONDUIT	10.5
0.6857 0.0130				
C14	EX.MH34	EX.MH36	CONDUIT	60.8
1.2995 0.0130				

2021-0821-13: 25 Year Proposed Results

C14-S	EX.MH34-S	EX.MH43-S	CONDUIT	60.8
1.1678	0.0160			
C15	EX.MH31	EX.MH32	CONDUIT	86.4
1.0139	0.0130			
C1-S	STM-MH1-S	STM-MH14-S	CONDUIT	61.7
0.7943	0.0160			
C2	J2	EX.MH31	CONDUIT	16.0
0.0019	0.0130			
C3	STM-MH14	EX.MH34	CONDUIT	60.8
1.0042	0.0130			
C3-S	STM-MH14-S	EX.MH34-S	CONDUIT	60.8
0.1152	0.0160			
C4	EX.MH36	J2	CONDUIT	80.0
-0.9913	0.0130			
C4-S	EX.MH36-S	EX.MH34-S	CONDUIT	80.0
1.2376	0.0160			
C5	CBMH54	Detention	CONDUIT	25.2
0.4960	0.0130			
C5-S	CBMH54-S	SurfacePonding	CONDUIT	35.0
0.6857	0.0160			
C6	CBMH38_Orifice	CBMH92	CONDUIT	39.8
0.9423	0.0130			
C7	CBMH92	CBMH94	CONDUIT	39.7
0.9950	0.0130			
C8	CBMH94	CBMH52	CONDUIT	33.0
1.0061	0.0130			
C9	Detention	CBMH38	CONDUIT	26.1
1.1878	0.0130			
CBMH52	CBMH52	Minor2	CONDUIT	39.0
1.9953	0.0130			
OR1	CBMH38	CBMH38_Orifice	ORIFICE	
OL1	SurfacePonding	Detention	OUTLET	
RoofDrain	Roof	J2	OUTLET	

 Cross Section Summary

Full Conduit Flow	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels
----- C1	CIRCULAR	0.45	0.16	0.11	0.45	1
162.35						
C10	CIRCULAR	0.30	0.07	0.07	0.30	1
96.44						

2021-0821-13: 25 Year Proposed Results

C10-S	Street	0.30	2.00	0.19	10.00	1
4452.27						
C11	CIRCULAR	0.30	0.07	0.07	0.30	1
130.94						
C11-S	Street	0.30	2.00	0.19	10.00	1
4230.49						
C12	CIRCULAR	0.30	0.07	0.07	0.30	1
99.29						
C12-S	Street	0.30	2.00	0.19	10.00	1
4572.58						
C13	CIRCULAR	0.30	0.07	0.07	0.30	1
80.08						
C14	CIRCULAR	0.45	0.16	0.11	0.45	1
325.02						
C14-S	Street	0.30	2.00	0.19	10.00	1
4517.17						
C15	CIRCULAR	0.53	0.22	0.13	0.53	1
433.08						
C1-S	Street	0.30	2.00	0.19	10.00	1
3725.39						
C2	CIRCULAR	0.53	0.22	0.13	0.53	1
18.77						
C3	CIRCULAR	0.45	0.16	0.11	0.45	1
285.72						
C3-S	Street	0.30	2.00	0.19	10.00	1
1418.90						
C4	CIRCULAR	0.53	0.22	0.13	0.53	1
428.21						
C4-S	Full_Street	0.40	8.00	0.20	40.00	1
18752.45						
C5	CIRCULAR	0.30	0.07	0.07	0.30	1
68.11						
C5-S	Full_Street	0.40	8.00	0.20	40.00	1
13958.72						
C6	CIRCULAR	0.30	0.07	0.07	0.30	1
93.87						
C7	CIRCULAR	0.30	0.07	0.07	0.30	1
96.47						
C8	CIRCULAR	0.30	0.07	0.07	0.30	1
97.00						
C9	CIRCULAR	0.30	0.07	0.07	0.30	1
105.40						
CBMH52	CIRCULAR	0.30	0.07	0.07	0.30	1
136.60						

 Street Summary

2021-0821-13: 25 Year Proposed Results

Street Street
Area:

0.0005	0.0018	0.0041	0.0072	0.0113
0.0162	0.0221	0.0288	0.0365	0.0450
0.0545	0.0648	0.0761	0.0882	0.1013
0.1152	0.1301	0.1458	0.1625	0.1800
0.1985	0.2178	0.2381	0.2592	0.2813
0.3042	0.3281	0.3528	0.3785	0.4050
0.4325	0.4608	0.4901	0.5200	0.5500
0.5800	0.6100	0.6400	0.6700	0.7000
0.7300	0.7600	0.7900	0.8200	0.8500
0.8800	0.9100	0.9400	0.9700	1.0000

Hrad:

0.0151	0.0303	0.0454	0.0606	0.0757
0.0909	0.1060	0.1212	0.1363	0.1515
0.1666	0.1818	0.1969	0.2121	0.2272
0.2424	0.2575	0.2726	0.2878	0.3029
0.3181	0.3332	0.3484	0.3635	0.3787
0.3938	0.4090	0.4241	0.4393	0.4544
0.4696	0.4847	0.4999	0.5249	0.5548
0.5848	0.6147	0.6445	0.6743	0.7041
0.7338	0.7636	0.7932	0.8229	0.8525
0.8821	0.9116	0.9411	0.9706	1.0000

Width:

0.0300	0.0600	0.0900	0.1200	0.1500
0.1800	0.2100	0.2400	0.2700	0.3000
0.3300	0.3600	0.3900	0.4200	0.4500
0.4800	0.5100	0.5400	0.5700	0.6000
0.6300	0.6600	0.6900	0.7200	0.7500
0.7800	0.8100	0.8400	0.8700	0.9000
0.9300	0.9600	0.9900	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000

Street Full_Street
Area:

0.0004	0.0016	0.0036	0.0064	0.0100
0.0144	0.0196	0.0256	0.0324	0.0400
0.0484	0.0576	0.0676	0.0784	0.0900
0.1024	0.1156	0.1296	0.1444	0.1600
0.1764	0.1936	0.2116	0.2304	0.2500
0.2704	0.2916	0.3136	0.3364	0.3600
0.3844	0.4096	0.4356	0.4624	0.4900
0.5184	0.5476	0.5776	0.6084	0.6400
0.6724	0.7056	0.7396	0.7744	0.8100
0.8464	0.8836	0.9216	0.9604	1.0000

Hrad:

2021-0821-13: 25 Year Proposed Results

0.0200	0.0399	0.0599	0.0798	0.0998
0.1197	0.1397	0.1596	0.1796	0.1995
0.2195	0.2394	0.2594	0.2793	0.2993
0.3192	0.3392	0.3591	0.3791	0.3990
0.4190	0.4389	0.4589	0.4788	0.4988
0.5187	0.5387	0.5586	0.5786	0.5985
0.6185	0.6384	0.6584	0.6783	0.6983
0.7182	0.7382	0.7582	0.7784	0.7985
0.8187	0.8388	0.8590	0.8791	0.8993
0.9194	0.9396	0.9597	0.9799	1.0000

Width:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000
0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

Analysis Options

Flow Units LPS
 Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
 Infiltration Method HORTON
 Flow Routing Method DYNWAVE
 Surcharge Method EXTRAN
 Starting Date 01/04/2023 00:00:00
 Ending Date 01/04/2023 15:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:01:00
 Wet Time Step 00:05:00
 Dry Time Step 00:05:00
 Routing Time Step 5.00 sec
 Variable Time Step YES
 Maximum Trials 8
 Number of Threads 4
 Head Tolerance 0.001524 m

2021-0821-13: 25 Year Proposed Results

```

*****
Runoff Quantity Continuity      Volume      Depth
                                hectare-m   mm
*****
Total Precipitation .....      0.209      58.261
Evaporation Loss .....         0.000      0.000
Infiltration Loss .....        0.035      9.757
Surface Runoff .....           0.091      25.481
Final Storage .....            0.083      23.070
Continuity Error (%) .....     -0.081
    
```

```

*****
Flow Routing Continuity      Volume      Volume
                                hectare-m   10^6 ltr
*****
Dry Weather Inflow .....      0.000      0.000
Wet Weather Inflow .....      0.091      0.913
Groundwater Inflow .....      0.000      0.000
RDII Inflow .....             0.000      0.000
External Inflow .....          0.034      0.339
External Outflow .....         0.122      1.224
Flooding Loss .....            0.000      0.000
Evaporation Loss .....         0.000      0.000
Exfiltration Loss .....        0.000      0.000
Initial Stored Volume .....    0.000      0.000
Final Stored Volume .....      0.003      0.029
Continuity Error (%) .....     -0.129
    
```

```

*****
Highest Continuity Errors
*****
Node EX.MH36 (4.33%)
Node EX.MH44-S (1.09%)
    
```

```

*****
Time-Step Critical Elements
*****
None
    
```

```

*****
Highest Flow Instability Indexes
*****
All links are stable.
    
```


2021-0821-13: 25 Year Proposed Results

Most Frequent Nonconverging Nodes

- Node EX.MH32 (0.06%)
- Node Minor2 (0.06%)
- Node RingRoadMajor (0.06%)
- Node EX.MH36 (0.04%)
- Node CBMH38 (0.01%)

Routing Time Step Summary

Minimum Time Step : 0.77 sec
 Average Time Step : 5.00 sec
 Maximum Time Step : 5.00 sec
 % of Time in Steady State : 0.00
 Average Iterations per Step : 2.04
 % of Steps Not Converging : 0.06
 Time Step Frequencies :
 5.000 - 3.155 sec : 99.94 %
 3.155 - 1.991 sec : 0.04 %
 1.991 - 1.256 sec : 0.02 %
 1.256 - 0.792 sec : 0.00 %
 0.792 - 0.500 sec : 0.01 %

Subcatchment Runoff Summary

Perv	Total	Total	Total	Total	Total	Total	Imperv
Runoff	Runoff	Total	Peak	Runoff	Evap	Infil	Runoff
Subcatchment	Runoff	Runoff	Precip	Runon	mm	mm	mm
mm	mm	10^6 ltr	mm	Coeff	mm	mm	mm
			LPS				
222		58.26		0.00	0.00	30.26	17.04
10.79	27.84	0.03	20.82	0.478			
223		58.26		0.00	0.00	6.14	49.50
1.45	50.95	0.06	25.93	0.875			
224		58.26		0.00	0.00	3.52	44.21
1.80	46.18	0.22	162.94	0.793			

2021-0821-13: 25 Year Proposed Results

225a			58.26	0.00	0.00	7.77	46.94
2.79	49.73	0.10	67.85	0.854			
225b			58.26	9.81	0.00	7.97	54.95
4.40	59.35	0.18	116.68	0.872			
226			58.26	59.27	0.00	11.54	91.91
13.33	105.24	0.10	48.40	0.895			
227			58.26	0.00	0.00	10.85	42.93
3.81	46.74	0.18	128.17	0.802			
228			58.26	43.19	0.00	18.36	64.17
18.44	82.61	0.19	112.96	0.814			
229			58.26	0.00	0.00	31.67	21.74
4.48	26.22	0.04	23.59	0.450			
EXT-1			58.26	0.00	0.00	5.83	0.00
0.00	0.00	0.00	0.00	0.000			
EXT-2			58.26	0.00	0.00	5.83	0.00
0.00	0.00	0.00	0.00	0.000			
EXT-3			58.26	0.00	0.00	8.16	0.00
0.00	0.00	0.00	0.00	0.000			

 LID Performance Summary

Drain	Initial	Final	Continuity	Total	Evap	Infil	Surface
Outflow	Storage	Storage	Error	Inflow	Loss	Loss	Outflow
Subcatchment	LID Control	LID Control	%	mm	mm	mm	mm
mm	mm	mm					
224		GreenRoof		58.26	0.00	0.00	1.27
0.00	0.00	45.60	19.56				

 Node Depth Summary

Node	Type	Average Depth	Maximum Depth	Maximum HGL	Time of Max Occurrence	Reported Max Depth
		Meters	Meters	Meters	days hr:min	Meters
CBMH38	JUNCTION	0.17	1.12	78.86	0 01:01	1.12

2021-0821-13: 25 Year Proposed Results

CBMH38		JUNCTION	0.00	49.73	0	01:00	0
0.431	-0.072						
CBMH38_Orifice		JUNCTION	0.00	49.67	0	01:01	0
0.431	-0.008						
CBMH52		JUNCTION	0.00	49.89	0	01:04	0
0.436	0.005						
CBMH54		JUNCTION	114.16	114.16	0	01:00	0.176
0.176	0.205						
CBMH54-S		JUNCTION	148.17	148.17	0	01:00	0.266
0.266	-0.912						
CBMH92		JUNCTION	0.00	49.62	0	01:02	0
0.431	-0.000						
CBMH94		JUNCTION	0.00	49.62	0	01:03	0
0.431	-0.002						
EX.MH31		JUNCTION	0.00	24.27	0	01:28	0
0.541	0.067						
EX.MH34		JUNCTION	0.00	6.40	0	00:42	0
0.338	0.422						
EX.MH34-S		JUNCTION	-66.91	114.16	0	01:00	-0.0725
0.177	0.380						
EX.MH36		JUNCTION	0.00	7.29	0	00:42	0
0.337	4.525						
EX.MH36-S		JUNCTION	116.68	116.68	0	01:00	0.175
0.175	-0.397						
EX.MH43		JUNCTION	0.00	0.00	0	00:00	0
0	0.000 ltr						
EX.MH43-S		JUNCTION	-20.00	47.42	0	01:02	-0.0816
0.103	-0.050						
EX.MH44		JUNCTION	0.08	0.08	0	00:57	0.000241
0.000241	-0.181						
EX.MH44-S		JUNCTION	-0.08	25.96	0	01:04	-0.000241
0.0211	1.104						
EX.MH45		JUNCTION	0.08	0.16	0	01:02	0.000237
0.000478	0.474						
EX.MH45-S		JUNCTION	-0.08	25.10	0	01:05	-0.000237
0.0207	0.734						
EX.MH46		JUNCTION	0.08	0.42	0	00:52	0.00396
0.00449	0.202						
J2		JUNCTION	0.00	24.28	0	01:26	0
0.543	0.303						
STM-MH1		JUNCTION	0.00	0.00	0	00:00	0
0	0.000 ltr						
STM-MH14		JUNCTION	6.28	6.28	0	00:19	0.338
0.338	0.134						
STM-MH14-S		JUNCTION	-6.28	6.28	0	00:19	-0.338
0.338	0.005						
STM-MH1-S		JUNCTION	6.28	6.28	0	00:00	0.339
0.339	0.226						
EX.MH32		OUTFALL	23.59	37.96	0	01:00	0.0401

2021-0821-13: 25 Year Proposed Results

0.581	0.000						
Minor2		OUTFALL	0.00	49.87	0	01:07	0
0.436	0.000						
RingRoadMajor		OUTFALL	112.96	112.96	0	01:00	0.184
0.207	0.000						
Detention		STORAGE	162.09	287.00	0	01:01	0.268
0.798	-0.177						
Roof		STORAGE	162.94	162.94	0	01:00	0.222
0.222	0.003						
SurfacePonding		STORAGE	-146.54	235.13	0	01:01	0.0897
0.469	0.743						

Node Surcharge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
CBMH38	JUNCTION	2.57	0.824	0.786
CBMH54	JUNCTION	2.05	1.030	0.335
EX.MH36	JUNCTION	14.30	0.412	3.923

Node Flooding Summary

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate LPS	Time of Max Occurrence days hr:min	Total Flood Volume 10 ⁶ ltr	Maximum Poned Depth Meters
Detention	1.29	237.15	0 01:01	0.358	0.000

Storage Volume Summary

2021-0821-13: 25 Year Proposed Results

Max Occurrence hr:min	Maximum Storage Unit LPS	Average Volume 1000 m ³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m ³	Max Pcnt Full	Time of days
01:00	49.73	0.024	22.1	0.0	0.0	0.109	100.0	0
01:24	18.01	0.033	10.6	0.0	0.0	0.144	46.5	0
01:30	147.06	0.006	1.1	0.0	0.0	0.084	17.1	0

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10 ⁶ ltr
EX.MH32	97.70	11.02	37.96	0.581
Minor2	94.67	8.53	49.87	0.436
RingRoadMajor	25.53	15.03	112.96	0.207
System	72.63	34.59	192.03	1.224

Street Flow Summary

Peak Flow Capture Street Pcnt	Avg. Flow Capture Conduit Pcnt	Bypass Peak Flow Freq LPS Pcnt	Back Maximum Flow Spread Freq Pcnt	Peak Maximum Capture Depth / Inlet LPS	Peak Bypass Flow Inlet Design LPS	Inlet Location	Inlet
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2021-0821-13: 25 Year Proposed Results

C10-S		25.956	2.204	0.044	Inlet	ON-GRADE	4
0.31	26.81	73.10	0.00	0.02	25.88		
C11-S		24.056	2.210	0.044	Inlet	ON-SAG	4
0.33	30.05	76.86	0.00	0.02	23.98		
C12-S		25.096	2.185	0.044	Inlet	ON-GRADE	4
0.32	26.31	70.73	0.00	0.02	25.02		
C14-S		47.419	2.563	0.051	Inlet	ON-GRADE	1
42.18	98.15	5.12	0.00	20.00	27.42		
C1-S		6.280	0.915	0.018	Inlet	ON-GRADE	1
100.00	100.00	0.00	0.00	6.28	0.00		
C3-S		0.000	1.501	0.030	Inlet	ON-GRADE	1
C4-S		114.164	2.945	0.059	Inlet	ON-GRADE	4
100.00	100.00	0.00	0.00	14.27	0.00		
C5-S		162.091	4.447	0.089	Inlet	ON-GRADE	7
0.00	99.06	2.21	13.88	0.00	162.09		

Link Flow Summary

Link	Type	Maximum Flow LPS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.00	0 00:00	0.00	0.00	0.05
C10	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C10-S	CONDUIT	25.96	0 01:04	0.59	0.01	0.15
C11	CONDUIT	0.16	0 01:41	0.33	0.00	0.03
C11-S	CONDUIT	24.06	0 01:07	0.49	0.01	0.15
C12	CONDUIT	0.08	0 01:02	0.27	0.00	0.02
C12-S	CONDUIT	25.10	0 01:05	0.56	0.01	0.15
C13	CONDUIT	0.42	0 00:52	0.19	0.01	0.32
C14	CONDUIT	7.23	0 00:43	0.79	0.02	0.66
C14-S	CONDUIT	47.42	0 01:02	1.11	0.01	0.17
C15	CONDUIT	24.27	0 01:28	1.08	0.06	0.16
C1-S	CONDUIT	6.28	0 00:19	0.76	0.00	0.06
C2	CONDUIT	24.27	0 01:28	0.64	1.29	0.23
C3	CONDUIT	6.40	0 00:42	0.77	0.02	0.21
C3-S	CONDUIT	0.00	0 00:23	0.00	0.00	0.10
C4	CONDUIT	7.27	0 00:43	0.06	0.02	0.64
C4-S	CONDUIT	114.16	0 01:00	0.66	0.01	0.15
C5	CONDUIT	114.04	0 01:00	1.61	1.67	1.00
C5-S	CONDUIT	162.09	0 01:01	1.46	0.01	0.22
C6	CONDUIT	49.62	0 01:02	1.25	0.53	0.55
C7	CONDUIT	49.62	0 01:03	1.28	0.51	0.54

2021-0821-13: 25 Year Proposed Results

C8	CONDUIT	49.62	0	01:03	1.38	0.51	0.51
C9	CONDUIT	49.73	0	01:00	0.73	0.47	1.00
CBMH52	CONDUIT	49.87	0	01:07	1.73	0.37	0.43
OR1	ORIFICE	49.67	0	01:01			1.00
OL1	DUMMY	94.89	0	01:30			
RoofDrain	DUMMY	18.01	0	01:24			

 Flow Classification Summary

--

Inlet Conduit Ctrl	Adjusted /Actual Length	----- Fraction of Time in Flow Class							
		Dry	Dry	Dry	Crit	Crit	Crit	Crit	Norm Ltd

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C1 0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
C10 0.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C10-S 0.00	1.00	0.03	0.00	0.00	0.70	0.27	0.00	0.00	0.82
C11 0.00	1.00	0.06	0.00	0.00	0.00	0.00	0.00	0.94	0.00
C11-S 0.00	1.00	0.07	0.00	0.00	0.04	0.90	0.00	0.00	0.01
C12 0.00	1.00	0.06	0.00	0.00	0.93	0.00	0.00	0.00	0.93
C12-S 0.00	1.00	0.06	0.00	0.00	0.62	0.32	0.00	0.00	0.85
C13 0.00	1.00	0.05	0.01	0.00	0.94	0.00	0.00	0.00	0.39
C14 0.00	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.04
C14-S 0.00	1.00	0.02	0.00	0.00	0.25	0.73	0.00	0.00	0.37
C15 0.00	1.00	0.03	0.00	0.00	0.01	0.96	0.00	0.00	0.23
C1-S 0.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
C2	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	0.00

2021-0821-13: 25 Year Proposed Results

0.00										
C3	1.00	0.00	0.00	0.00	0.95	0.05	0.00	0.00	0.95	
0.00										
C3-S	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.97	
0.00										
C4	1.00	0.00	0.02	0.00	0.98	0.00	0.00	0.00	0.02	
0.00										
C4-S	1.00	0.02	0.00	0.00	0.93	0.05	0.00	0.00	0.93	
0.00										
C5	1.00	0.03	0.60	0.00	0.34	0.00	0.00	0.03	0.78	
0.00										
C5-S	1.00	0.02	0.00	0.00	0.11	0.87	0.00	0.00	0.11	
0.00										
C6	1.00	0.05	0.00	0.00	0.00	0.00	0.00	0.95	0.00	
0.00										
C7	1.00	0.05	0.00	0.00	0.00	0.00	0.00	0.95	0.00	
0.00										
C8	1.00	0.05	0.00	0.00	0.58	0.36	0.00	0.00	0.59	
0.00										
C9	1.00	0.05	0.00	0.00	0.95	0.01	0.00	0.00	0.78	
0.00										
CBMH52	1.00	0.05	0.00	0.00	0.00	0.95	0.00	0.00	0.00	
0.00										

 Conduit Surcharge Summary

Conduit	----- Both Ends	Hours Full Upstream	----- Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C14	0.01	0.01	14.38	0.01	0.01
C2	0.01	0.01	0.01	2.01	0.01
C4	0.01	0.01	14.30	0.01	0.01
C5	2.03	2.05	2.19	0.19	0.23
C9	2.19	2.19	2.57	0.01	0.01

Analysis begun on: Fri Apr 12 11:13:45 2024
 Analysis ended on: Fri Apr 12 11:13:47 2024
 Total elapsed time: 00:00:02

2021-0821-13: 50 Year Proposed Results

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.3)

 WARNING 04: minimum elevation drop used for Conduit C2
 WARNING 02: maximum depth increased for Node CBMH54-S
 WARNING 02: maximum depth increased for Node EX.MH34-S
 WARNING 02: maximum depth increased for Node EX.MH36-S

Element Count

Number of rain gages 7
 Number of subcatchments ... 12
 Number of nodes 30
 Number of links 27
 Number of pollutants 0
 Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
100Yr	100Yr	INTENSITY	10 min.
10Yr	10Yr	INTENSITY	10 min.
25Yr	25Yr	INTENSITY	10 min.
2Yr	2Yr	INTENSITY	10 min.
50_yr	50_yr	INTENSITY	10 min.
50Yr	50Yr	INTENSITY	10 min.
5Yr	5Yr	INTENSITY	10 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage
Outlet					
222	0.10	52.00	30.00	0.5000	50_yr
225b					
223	0.11	20.00	87.00	0.0100	50_yr
226					
224	0.48	320.00	90.00	2.0000	50_yr
Roof					

2021-0821-13: 50 Year Proposed Results

225a	0.20	26.40	82.00	0.5000	50_yr
228					
225b	0.29	39.33	82.00	1.0000	50_yr
EX.MH36-S					
226	0.10	15.08	79.00	1.5000	50_yr
EX.MH34-S					
227	0.39	46.35	75.00	1.0000	50_yr
CBMH54-S					
228	0.23	27.47	64.00	2.0000	50_yr
RingRoadMajor					
229	0.15	15.30	38.00	0.1000	50_yr
EX.MH32					
EXT-1	0.28	10.00	90.00	0.0000	50_yr
EX.MH34-S					
EXT-2	0.28	10.00	90.00	0.0000	50_yr
RingRoadMajor					
EXT-3	0.96	54.97	86.00	0.0000	50_yr
223					

LID Control Summary

Imperv Subcatchment Treated	% Perv Treated	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	%
224 0.00	0.00	GreenRoof	1	650.00	0.00	13.54	

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
CBMH38	JUNCTION	77.74	1.91	0.0	
CBMH38_Orifice	JUNCTION	77.74	1.91	0.0	
CBMH52	JUNCTION	76.58	2.51	0.0	
CBMH54	JUNCTION	78.18	1.67	0.0	
CBMH54-S	JUNCTION	79.84	0.40	0.0	
CBMH92	JUNCTION	77.33	2.25	0.0	
CBMH94	JUNCTION	76.91	2.45	0.0	
EX.MH31	JUNCTION	76.62	5.64	0.0	
EX.MH34	JUNCTION	78.40	2.89	0.0	

2021-0821-13: 50 Year Proposed Results

Item	Type	Value 1	Value 2	Value 3	Value 4
EX.MH34-S	JUNCTION	81.29	0.40	0.0	
EX.MH36	JUNCTION	77.61	4.86	0.0	
EX.MH36-S	JUNCTION	82.28	0.40	0.0	
EX.MH43	JUNCTION	78.74	1.84	0.0	
EX.MH43-S	JUNCTION	80.58	0.30	0.0	
EX.MH44	JUNCTION	78.00	1.77	0.0	
EX.MH44-S	JUNCTION	79.77	0.30	0.0	
EX.MH45	JUNCTION	77.63	1.72	0.0	
EX.MH45-S	JUNCTION	79.35	0.30	0.0	
EX.MH46	JUNCTION	76.65	2.32	0.0	
J2	JUNCTION	78.40	5.80	0.0	
STM-MH1	JUNCTION	79.21	2.64	0.0	
STM-MH14	JUNCTION	79.01	2.35	0.0	
STM-MH14-S	JUNCTION	81.36	0.30	0.0	
STM-MH1-S	JUNCTION	81.85	0.30	0.0	Yes
EX.MH32	OUTFALL	75.74	0.53	0.0	
Minor2	OUTFALL	75.80	0.30	0.0	
RingRoadMajor	OUTFALL	78.97	0.30	0.0	
Detention	STORAGE	77.90	1.07	0.0	
Roof	STORAGE	78.65	0.15	0.0	
SurfacePonding	STORAGE	79.60	0.28	0.0	

Link Summary

Name	From Node	To Node	Type	Length
%Slope Roughness				

C1	STM-MH1	STM-MH14	CONDUIT	61.7
0.3242 0.0130				
C10	EX.MH43	EX.MH44	CONDUIT	71.4
0.9944 0.0130				
C10-S	EX.MH43-S	EX.MH44-S	CONDUIT	71.4
1.1345 0.0160				
C11	EX.MH45	EX.MH46	CONDUIT	37.1
1.8332 0.0130				
C11-S	EX.MH45-S	RingRoadMajor	CONDUIT	37.1
1.0243 0.0160				
C12	EX.MH44	EX.MH45	CONDUIT	35.1
1.0542 0.0130				
C12-S	EX.MH44-S	EX.MH45-S	CONDUIT	35.1
1.1967 0.0160				
C13	EX.MH46	CBMH52	CONDUIT	10.5
0.6857 0.0130				
C14	EX.MH34	EX.MH36	CONDUIT	60.8
1.2995 0.0130				

2021-0821-13: 50 Year Proposed Results

C14-S	EX.MH34-S	EX.MH43-S	CONDUIT	60.8
1.1678	0.0160			
C15	EX.MH31	EX.MH32	CONDUIT	86.4
1.0139	0.0130			
C1-S	STM-MH1-S	STM-MH14-S	CONDUIT	61.7
0.7943	0.0160			
C2	J2	EX.MH31	CONDUIT	16.0
0.0019	0.0130			
C3	STM-MH14	EX.MH34	CONDUIT	60.8
1.0042	0.0130			
C3-S	STM-MH14-S	EX.MH34-S	CONDUIT	60.8
0.1152	0.0160			
C4	EX.MH36	J2	CONDUIT	80.0
-0.9913	0.0130			
C4-S	EX.MH36-S	EX.MH34-S	CONDUIT	80.0
1.2376	0.0160			
C5	CBMH54	Detention	CONDUIT	25.2
0.4960	0.0130			
C5-S	CBMH54-S	SurfacePonding	CONDUIT	35.0
0.6857	0.0160			
C6	CBMH38_Orifice	CBMH92	CONDUIT	39.8
0.9423	0.0130			
C7	CBMH92	CBMH94	CONDUIT	39.7
0.9950	0.0130			
C8	CBMH94	CBMH52	CONDUIT	33.0
1.0061	0.0130			
C9	Detention	CBMH38	CONDUIT	26.1
1.1878	0.0130			
CBMH52	CBMH52	Minor2	CONDUIT	39.0
1.9953	0.0130			
OR1	CBMH38	CBMH38_Orifice	ORIFICE	
OL1	SurfacePonding	Detention	OUTLET	
RoofDrain	Roof	J2	OUTLET	

 Cross Section Summary

Full Conduit Flow	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels
----- C1	CIRCULAR	0.45	0.16	0.11	0.45	1
162.35						
C10	CIRCULAR	0.30	0.07	0.07	0.30	1
96.44						

2021-0821-13: 50 Year Proposed Results

C10-S 4452.27	Street	0.30	2.00	0.19	10.00	1
C11 130.94	CIRCULAR	0.30	0.07	0.07	0.30	1
C11-S 4230.49	Street	0.30	2.00	0.19	10.00	1
C12 99.29	CIRCULAR	0.30	0.07	0.07	0.30	1
C12-S 4572.58	Street	0.30	2.00	0.19	10.00	1
C13 80.08	CIRCULAR	0.30	0.07	0.07	0.30	1
C14 325.02	CIRCULAR	0.45	0.16	0.11	0.45	1
C14-S 4517.17	Street	0.30	2.00	0.19	10.00	1
C15 433.08	CIRCULAR	0.53	0.22	0.13	0.53	1
C1-S 3725.39	Street	0.30	2.00	0.19	10.00	1
C2 18.77	CIRCULAR	0.53	0.22	0.13	0.53	1
C3 285.72	CIRCULAR	0.45	0.16	0.11	0.45	1
C3-S 1418.90	Street	0.30	2.00	0.19	10.00	1
C4 428.21	CIRCULAR	0.53	0.22	0.13	0.53	1
C4-S 18752.45	Full_Street	0.40	8.00	0.20	40.00	1
C5 68.11	CIRCULAR	0.30	0.07	0.07	0.30	1
C5-S 13958.72	Full_Street	0.40	8.00	0.20	40.00	1
C6 93.87	CIRCULAR	0.30	0.07	0.07	0.30	1
C7 96.47	CIRCULAR	0.30	0.07	0.07	0.30	1
C8 97.00	CIRCULAR	0.30	0.07	0.07	0.30	1
C9 105.40	CIRCULAR	0.30	0.07	0.07	0.30	1
CBMH52 136.60	CIRCULAR	0.30	0.07	0.07	0.30	1

Street Summary

2021-0821-13: 50 Year Proposed Results

Street Street
Area:

0.0005	0.0018	0.0041	0.0072	0.0113
0.0162	0.0221	0.0288	0.0365	0.0450
0.0545	0.0648	0.0761	0.0882	0.1013
0.1152	0.1301	0.1458	0.1625	0.1800
0.1985	0.2178	0.2381	0.2592	0.2813
0.3042	0.3281	0.3528	0.3785	0.4050
0.4325	0.4608	0.4901	0.5200	0.5500
0.5800	0.6100	0.6400	0.6700	0.7000
0.7300	0.7600	0.7900	0.8200	0.8500
0.8800	0.9100	0.9400	0.9700	1.0000

Hrad:

0.0151	0.0303	0.0454	0.0606	0.0757
0.0909	0.1060	0.1212	0.1363	0.1515
0.1666	0.1818	0.1969	0.2121	0.2272
0.2424	0.2575	0.2726	0.2878	0.3029
0.3181	0.3332	0.3484	0.3635	0.3787
0.3938	0.4090	0.4241	0.4393	0.4544
0.4696	0.4847	0.4999	0.5249	0.5548
0.5848	0.6147	0.6445	0.6743	0.7041
0.7338	0.7636	0.7932	0.8229	0.8525
0.8821	0.9116	0.9411	0.9706	1.0000

Width:

0.0300	0.0600	0.0900	0.1200	0.1500
0.1800	0.2100	0.2400	0.2700	0.3000
0.3300	0.3600	0.3900	0.4200	0.4500
0.4800	0.5100	0.5400	0.5700	0.6000
0.6300	0.6600	0.6900	0.7200	0.7500
0.7800	0.8100	0.8400	0.8700	0.9000
0.9300	0.9600	0.9900	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000

Street Full_Street
Area:

0.0004	0.0016	0.0036	0.0064	0.0100
0.0144	0.0196	0.0256	0.0324	0.0400
0.0484	0.0576	0.0676	0.0784	0.0900
0.1024	0.1156	0.1296	0.1444	0.1600
0.1764	0.1936	0.2116	0.2304	0.2500
0.2704	0.2916	0.3136	0.3364	0.3600
0.3844	0.4096	0.4356	0.4624	0.4900
0.5184	0.5476	0.5776	0.6084	0.6400
0.6724	0.7056	0.7396	0.7744	0.8100
0.8464	0.8836	0.9216	0.9604	1.0000

Hrad:

2021-0821-13: 50 Year Proposed Results

0.0200	0.0399	0.0599	0.0798	0.0998
0.1197	0.1397	0.1596	0.1796	0.1995
0.2195	0.2394	0.2594	0.2793	0.2993
0.3192	0.3392	0.3591	0.3791	0.3990
0.4190	0.4389	0.4589	0.4788	0.4988
0.5187	0.5387	0.5586	0.5786	0.5985
0.6185	0.6384	0.6584	0.6783	0.6983
0.7182	0.7382	0.7582	0.7784	0.7985
0.8187	0.8388	0.8590	0.8791	0.8993
0.9194	0.9396	0.9597	0.9799	1.0000

Width:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000
0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

Analysis Options

Flow Units LPS
 Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
 Infiltration Method HORTON
 Flow Routing Method DYNWAVE
 Surcharge Method EXTRAN
 Starting Date 01/04/2023 00:00:00
 Ending Date 01/04/2023 15:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:01:00
 Wet Time Step 00:05:00
 Dry Time Step 00:05:00
 Routing Time Step 5.00 sec
 Variable Time Step YES
 Maximum Trials 8
 Number of Threads 4
 Head Tolerance 0.001524 m

2021-0821-13: 50 Year Proposed Results

```

*****
Volume                               Depth
Runoff Quantity Continuity          hectare-m          mm
*****                               - - - - -          - - - - -
Total Precipitation .....           0.232             64.845
Evaporation Loss .....              0.000             0.000
Infiltration Loss .....             0.037             10.343
Surface Runoff .....               0.104             28.978
Final Storage .....                0.091             25.510
Continuity Error (%) .....         0.022
    
```

```

*****
Volume                               Volume
Flow Routing Continuity            hectare-m          10^6 ltr
*****                               - - - - -          - - - - -
Dry Weather Inflow .....           0.000             0.000
Wet Weather Inflow .....           0.104             1.038
Groundwater Inflow .....           0.000             0.000
RDII Inflow .....                  0.000             0.000
External Inflow .....              0.034             0.339
External Outflow .....             0.135             1.350
Flooding Loss .....               0.000             0.000
Evaporation Loss .....             0.000             0.000
Exfiltration Loss .....            0.000             0.000
Initial Stored Volume .....         0.000             0.000
Final Stored Volume .....           0.003             0.029
Continuity Error (%) .....        -0.175
    
```

```

*****
Highest Continuity Errors
*****
Node EX.MH36 (4.32%)
    
```

```

*****
Time-Step Critical Elements
*****
None
    
```

```

*****
Highest Flow Instability Indexes
*****
All links are stable.
    
```

```

*****
    
```

2021-0821-13: 50 Year Proposed Results

Most Frequent Nonconverging Nodes

- Node EX.MH32 (0.06%)
- Node Minor2 (0.06%)
- Node RingRoadMajor (0.06%)
- Node EX.MH36 (0.04%)
- Node CBMH38 (0.01%)

Routing Time Step Summary

```

Minimum Time Step      :      1.97 sec
Average Time Step      :      5.00 sec
Maximum Time Step      :      5.00 sec
% of Time in Steady State :      0.00
Average Iterations per Step :      2.04
% of Steps Not Converging :      0.06
Time Step Frequencies :
  5.000 - 3.155 sec    :      99.95 %
  3.155 - 1.991 sec    :      0.04 %
  1.991 - 1.256 sec    :      0.01 %
  1.256 - 0.792 sec    :      0.00 %
  0.792 - 0.500 sec    :      0.00 %
    
```

Subcatchment Runoff Summary

Perv	Total	Total	Total	Total	Total	Total	Imperv
Runoff	Runoff	Precip	Peak	Runoff	Evap	Infil	Runoff
Subcatchment	Runoff	Runoff	Runoff	Runoff	Coeff	mm	mm
mm	mm	10^6 ltr	mm	LPS	mm	mm	mm

222		64.85		0.00	0.00	31.26	19.03
14.50	33.53	0.03	25.18	0.517			
223		64.85		0.00	0.00	6.37	55.27
2.08	57.35	0.07	30.13	0.884			
224		64.85		0.00	0.00	3.65	49.36
2.30	51.92	0.25	182.50	0.801			
225a		64.85		0.00	0.00	8.02	52.39

2021-0821-13: 50 Year Proposed Results

3.75	56.14	0.11	76.98	0.866			
225b			64.85	11.82	0.00	8.23	62.03
5.72	67.76	0.20	133.01	0.884			
226			64.85	66.71	0.00	11.78	103.01
16.10	119.11	0.12	55.74	0.905			
227			64.85	0.00	0.00	11.21	47.91
5.13	53.04	0.21	145.84	0.818			
228			64.85	48.75	0.00	18.81	71.97
22.43	94.40	0.22	130.65	0.831			
229			64.85	0.00	0.00	33.36	24.27
6.89	31.15	0.05	26.93	0.480			
EXT-1			64.85	0.00	0.00	6.48	0.00
0.00	0.00	0.00	0.00	0.000			
EXT-2			64.85	0.00	0.00	6.48	0.00
0.00	0.00	0.00	0.00	0.000			
EXT-3			64.85	0.00	0.00	9.08	0.00
0.00	0.00	0.00	0.00	0.000			

LID Performance Summary

Drain	Initial	Final	Continuity	Total	Evap	Infil	Surface
Outflow	Storage	Storage	Error	Inflow	Loss	Loss	Outflow
Subcatchment	LID Control	LID Control	%	mm	mm	mm	mm
mm	mm	mm					
224		GreenRoof		64.85	0.00	0.00	1.92
0.00	0.00	45.60	26.71				

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
CBMH38	JUNCTION	0.20	1.12	78.86	0 00:59	1.12
CBMH38_Orifice	JUNCTION	0.04	0.17	77.91	0 01:01	0.17

2021-0821-13: 50 Year Proposed Results

CBMH52	JUNCTION	0.03	0.13	76.71	0	01:07	0.13
CBMH54	JUNCTION	0.13	1.51	79.68	0	01:00	1.49
CBMH54-S	JUNCTION	0.01	0.09	79.93	0	00:59	0.09
CBMH92	JUNCTION	0.04	0.17	77.51	0	01:02	0.17
CBMH94	JUNCTION	0.04	0.17	77.08	0	02:26	0.17
EX.MH31	JUNCTION	0.05	0.09	76.70	0	01:28	0.09
EX.MH34	JUNCTION	0.10	0.15	78.55	0	01:26	0.15
EX.MH34-S	JUNCTION	0.01	0.06	81.35	0	01:01	0.06
EX.MH36	JUNCTION	0.87	0.94	78.55	0	01:27	0.94
EX.MH36-S	JUNCTION	0.01	0.06	82.34	0	01:00	0.06
EX.MH43	JUNCTION	0.00	0.00	78.74	0	00:00	0.00
EX.MH43-S	JUNCTION	0.00	0.05	80.63	0	01:03	0.05
EX.MH44	JUNCTION	0.00	0.01	78.01	0	01:00	0.01
EX.MH44-S	JUNCTION	0.00	0.05	79.82	0	01:04	0.05
EX.MH45	JUNCTION	0.00	0.01	77.64	0	01:44	0.01
EX.MH45-S	JUNCTION	0.00	0.05	79.40	0	01:06	0.05
EX.MH46	JUNCTION	0.02	0.06	76.71	0	01:02	0.06
J2	JUNCTION	0.10	0.15	78.55	0	01:27	0.15
STM-MH1	JUNCTION	0.00	0.00	79.21	0	00:00	0.00
STM-MH14	JUNCTION	0.05	0.05	79.06	0	00:17	0.05
STM-MH14-S	JUNCTION	0.00	0.00	81.36	0	00:16	0.00
STM-MH1-S	JUNCTION	0.04	0.04	81.89	0	15:00	0.04
EX.MH32	OUTFALL	0.05	0.09	75.83	0	01:28	0.09
Minor2	OUTFALL	0.03	0.13	75.93	0	01:08	0.13
RingRoadMajor	OUTFALL	0.00	0.05	79.02	0	01:06	0.05
Detention	STORAGE	0.29	1.07	78.97	0	00:59	1.07
Roof	STORAGE	0.02	0.08	78.73	0	01:24	0.08
SurfacePonding	STORAGE	0.02	0.16	79.76	0	01:33	0.16

Node Inflow Summary

Total Flow		Maximum Lateral Inflow	Maximum Total Inflow	Time of Max Occurrence	Lateral Inflow Volume	
Volume Node ltr	Error Percent	Type	LPS	days hr:min	10^6 ltr	
CBMH38		JUNCTION	0.00	49.69	0 00:59	0

2021-0821-13: 50 Year Proposed Results

0.487	-0.059						
CBMH38_Orifice		JUNCTION	0.00	49.67	0	00:59	0
0.487	-0.008						
CBMH52		JUNCTION	0.00	49.87	0	01:05	0
0.492	0.004						
CBMH54		JUNCTION	129.89	129.89	0	01:00	0.2
0.2	0.051						
CBMH54-S		JUNCTION	165.84	165.84	0	01:00	0.296
0.296	-1.067						
CBMH92		JUNCTION	0.00	49.62	0	01:01	0
0.487	-0.000						
CBMH94		JUNCTION	0.00	49.62	0	01:02	0
0.487	-0.002						
EX.MH31		JUNCTION	0.00	26.57	0	01:27	0
0.569	0.064						
EX.MH34		JUNCTION	0.00	6.40	0	00:42	0
0.338	0.422						
EX.MH34-S		JUNCTION	-75.48	129.89	0	01:00	-0.0837
0.202	0.336						
EX.MH36		JUNCTION	0.00	7.47	0	00:41	0
0.337	4.517						
EX.MH36-S		JUNCTION	133.01	133.01	0	01:00	0.2
0.2	-0.357						
EX.MH43		JUNCTION	0.00	0.00	0	00:00	0
0	0.000 ltr						
EX.MH43-S		JUNCTION	-20.00	53.77	0	01:01	-0.087
0.116	-0.053						
EX.MH44		JUNCTION	0.08	0.08	0	00:56	0.000258
0.000258	-0.168						
EX.MH44-S		JUNCTION	-0.08	32.49	0	01:03	-0.000258
0.0293	0.859						
EX.MH45		JUNCTION	0.08	0.16	0	01:01	0.000254
0.000513	0.434						
EX.MH45-S		JUNCTION	-0.08	31.70	0	01:05	-0.000254
0.0288	0.584						
EX.MH46		JUNCTION	0.08	0.39	0	00:51	0.00396
0.00453	0.202						
J2		JUNCTION	0.00	26.57	0	01:26	0
0.571	0.288						
STM-MH1		JUNCTION	0.00	0.00	0	00:00	0
0	0.000 ltr						
STM-MH14		JUNCTION	6.28	6.28	0	00:17	0.338
0.338	0.134						
STM-MH14-S		JUNCTION	-6.28	6.28	0	00:16	-0.338
0.338	0.005						
STM-MH1-S		JUNCTION	6.28	6.28	0	00:00	0.339
0.339	0.226						
EX.MH32		OUTFALL	26.93	42.47	0	01:00	0.0477
0.616	0.000						

2021-0821-13: 50 Year Proposed Results

Minor2	0.492	0.000	OUTFALL	0.00	49.86	0	01:08	0
RingRoadMajor	0.242	0.000	OUTFALL	130.57	131.63	0	01:04	0.211
Detention	1.09	-0.159	STORAGE	195.04	345.20	0	01:00	0.299
Roof	0.249	0.003	STORAGE	182.50	182.50	0	01:00	0.249
SurfacePonding	0.696	0.573	STORAGE	-161.92	292.20	0	01:00	0.296

Node Surcharge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
CBMH38	JUNCTION	2.88	0.824	0.786
CBMH54	JUNCTION	2.38	1.208	0.157
EX.MH36	JUNCTION	14.31	0.417	3.918

Node Flooding Summary

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate LPS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 ltr	Maximum Poned Depth Meters
Detention	1.64	295.43	0 01:00	0.595	0.000

Storage Volume Summary

Average Avg Evap Exfil Maximum Max Time of

2021-0821-13: 50 Year Proposed Results

Max Occurrence hr:min	Maximum Storage Unit LPS	Volume 1000 m ³	Pcnt Full	Pcnt Loss	Pcnt Loss	Volume 1000 m ³	Pcnt Full	days
00:59	49.69	0.026	24.1	0.0	0.0	0.109	100.0	0
01:24	20.31	0.037	11.9	0.0	0.0	0.162	52.4	0
01:33	162.55	0.010	2.0	0.0	0.0	0.119	24.1	0

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10 ⁶ ltr
EX.MH32	97.91	11.66	42.47	0.616
Minor2	94.86	9.60	49.86	0.492
RingRoadMajor	25.93	17.29	131.63	0.242
System	72.90	38.55	219.06	1.350

Street Flow Summary

Peak Flow Capture Street Pcnt	Avg. Flow Capture Conduit Pcnt	Bypass Peak Flow Freq LPS Pcnt	Back Maximum Flow Spread Freq Pcnt	Peak Maximum Capture / Inlet m LPS	Peak Bypass Depth Inlet Flow Design LPS	Inlet Location	Inlet
---	--	---	---	---	---	-------------------	-------

2021-0821-13: 50 Year Proposed Results

C10-S		32.487	2.405	0.048	Inlet	ON-GRADE	4
0.25	25.45	74.56	0.00	0.02	32.41		
C11-S		30.747	2.426	0.049	Inlet	ON-SAG	4
0.26	28.09	78.46	0.00	0.02	30.67		
C12-S		31.696	2.396	0.048	Inlet	ON-GRADE	4
0.25	24.70	72.58	0.00	0.02	31.62		
C14-S		53.768	2.725	0.054	Inlet	ON-GRADE	1
37.20	97.68	5.74	0.00	20.00	33.77		
C1-S		6.280	0.915	0.018	Inlet	ON-GRADE	1
100.00	100.00	0.00	0.00	6.28	0.00		
C3-S		0.000	1.553	0.031	Inlet	ON-GRADE	1
C4-S		129.894	3.076	0.062	Inlet	ON-GRADE	4
100.00	100.00	0.00	0.00	16.24	0.00		
C5-S		195.037	4.997	0.100	Inlet	ON-GRADE	7
0.00	99.41	1.57	18.64	0.00	195.04		

 Link Flow Summary

Link	Type	Maximum Flow LPS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.00	0 00:00	0.00	0.00	0.05
C10	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C10-S	CONDUIT	32.49	0 01:03	0.61	0.01	0.16
C11	CONDUIT	0.16	0 01:40	0.33	0.00	0.03
C11-S	CONDUIT	30.75	0 01:06	0.52	0.01	0.16
C12	CONDUIT	0.08	0 01:01	0.26	0.00	0.02
C12-S	CONDUIT	31.70	0 01:05	0.58	0.01	0.16
C13	CONDUIT	0.39	0 00:51	0.19	0.00	0.32
C14	CONDUIT	7.04	0 00:42	0.79	0.02	0.67
C14-S	CONDUIT	53.77	0 01:01	1.11	0.01	0.18
C15	CONDUIT	26.57	0 01:28	1.11	0.06	0.17
C1-S	CONDUIT	6.28	0 00:16	0.76	0.00	0.06
C2	CONDUIT	26.57	0 01:27	0.66	1.42	0.24
C3	CONDUIT	6.40	0 00:42	0.77	0.02	0.22
C3-S	CONDUIT	0.00	0 00:22	0.00	0.00	0.10
C4	CONDUIT	6.98	0 00:42	0.06	0.02	0.64
C4-S	CONDUIT	129.89	0 01:00	0.68	0.01	0.15
C5	CONDUIT	129.89	0 01:00	1.84	1.91	1.00
C5-S	CONDUIT	195.04	0 01:00	1.50	0.01	0.25
C6	CONDUIT	49.62	0 01:01	1.25	0.53	0.55
C7	CONDUIT	49.62	0 01:02	1.28	0.51	0.54
C8	CONDUIT	49.62	0 01:02	1.38	0.51	0.51

2021-0821-13: 50 Year Proposed Results

C3 0.00	1.00	0.00	0.00	0.00	0.95	0.05	0.00	0.00	0.95
C3-S 0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98
C4 0.00	1.00	0.00	0.02	0.00	0.98	0.00	0.00	0.00	0.03
C4-S 0.00	1.00	0.02	0.00	0.00	0.93	0.05	0.00	0.00	0.93
C5 0.00	1.00	0.02	0.60	0.00	0.34	0.00	0.00	0.03	0.76
C5-S 0.00	1.00	0.02	0.00	0.00	0.14	0.85	0.00	0.00	0.13
C6 0.00	1.00	0.05	0.00	0.00	0.00	0.00	0.00	0.95	0.00
C7 0.00	1.00	0.05	0.00	0.00	0.00	0.00	0.00	0.95	0.00
C8 0.00	1.00	0.05	0.00	0.00	0.58	0.37	0.00	0.00	0.59
C9 0.00	1.00	0.05	0.00	0.00	0.95	0.01	0.00	0.00	0.76
CBMH52 0.00	1.00	0.05	0.00	0.00	0.00	0.95	0.00	0.00	0.00

 Conduit Surcharge Summary

Conduit	----- Both Ends	Hours Full Upstream	----- Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C14	0.01	0.01	14.38	0.01	0.01
C2	0.01	0.01	0.01	2.31	0.01
C4	0.01	0.01	14.31	0.01	0.01
C5	2.36	2.38	2.50	0.23	0.28
C9	2.50	2.50	2.88	0.01	0.01

Analysis begun on: Fri Apr 12 11:13:47 2024
 Analysis ended on: Fri Apr 12 11:13:48 2024
 Total elapsed time: 00:00:01

2021-0821-13: 100 Year Proposed Results

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.3)

 WARNING 04: minimum elevation drop used for Conduit C2
 WARNING 02: maximum depth increased for Node CBMH54-S
 WARNING 02: maximum depth increased for Node EX.MH34-S
 WARNING 02: maximum depth increased for Node EX.MH36-S

Element Count

Number of rain gages 7
 Number of subcatchments ... 12
 Number of nodes 30
 Number of links 27
 Number of pollutants 0
 Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
100_yr	100_yr	INTENSITY	10 min.
100Yr	100Yr	INTENSITY	10 min.
10Yr	10Yr	INTENSITY	10 min.
25Yr	25Yr	INTENSITY	10 min.
2Yr	2Yr	INTENSITY	10 min.
50Yr	50Yr	INTENSITY	10 min.
5Yr	5Yr	INTENSITY	10 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage
Outlet					
222	0.10	52.00	30.00	0.5000	100_yr
225b					
223	0.11	20.00	87.00	0.0100	100_yr
226					
224	0.48	320.00	90.00	2.0000	100_yr
Roof					

2021-0821-13: 100 Year Proposed Results

225a	0.20	26.40	82.00	0.5000	100_yr
228					
225b	0.29	39.33	82.00	1.0000	100_yr
EX.MH36-S					
226	0.10	15.08	79.00	1.5000	100_yr
EX.MH34-S					
227	0.39	46.35	75.00	1.0000	100_yr
CBMH54-S					
228	0.23	27.47	64.00	2.0000	100_yr
RingRoadMajor					
229	0.15	15.30	38.00	0.1000	100_yr
EX.MH32					
EXT-1	0.28	10.00	90.00	0.0000	100_yr
EX.MH34-S					
EXT-2	0.28	10.00	90.00	0.0000	100_yr
RingRoadMajor					
EXT-3	0.96	54.97	86.00	0.0000	100_yr
223					

LID Control Summary

Imperv Subcatchment Treated	% Perv LID Control Treated	No. of Units	Unit Area	Unit Width	% Area Covered	%
-----	-----					
224 0.00	GreenRoof 0.00	1	650.00	0.00	13.54	

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
-----	-----				
CBMH38	JUNCTION	77.74	1.91	0.0	
CBMH38_Orifice	JUNCTION	77.74	1.91	0.0	
CBMH52	JUNCTION	76.58	2.51	0.0	
CBMH54	JUNCTION	78.18	1.67	0.0	
CBMH54-S	JUNCTION	79.84	0.40	0.0	
CBMH92	JUNCTION	77.33	2.25	0.0	
CBMH94	JUNCTION	76.91	2.45	0.0	
EX.MH31	JUNCTION	76.62	5.64	0.0	
EX.MH34	JUNCTION	78.40	2.89	0.0	

2021-0821-13: 100 Year Proposed Results

Item	Type	Value 1	Value 2	Value 3	Value 4
EX.MH34-S	JUNCTION	81.29	0.40	0.0	
EX.MH36	JUNCTION	77.61	4.86	0.0	
EX.MH36-S	JUNCTION	82.28	0.40	0.0	
EX.MH43	JUNCTION	78.74	1.84	0.0	
EX.MH43-S	JUNCTION	80.58	0.30	0.0	
EX.MH44	JUNCTION	78.00	1.77	0.0	
EX.MH44-S	JUNCTION	79.77	0.30	0.0	
EX.MH45	JUNCTION	77.63	1.72	0.0	
EX.MH45-S	JUNCTION	79.35	0.30	0.0	
EX.MH46	JUNCTION	76.65	2.32	0.0	
J2	JUNCTION	78.40	5.80	0.0	
STM-MH1	JUNCTION	79.21	2.64	0.0	
STM-MH14	JUNCTION	79.01	2.35	0.0	
STM-MH14-S	JUNCTION	81.36	0.30	0.0	
STM-MH1-S	JUNCTION	81.85	0.30	0.0	Yes
EX.MH32	OUTFALL	75.74	0.53	0.0	
Minor2	OUTFALL	75.80	0.30	0.0	
RingRoadMajor	OUTFALL	78.97	0.30	0.0	
Detention	STORAGE	77.90	1.07	0.0	
Roof	STORAGE	78.65	0.15	0.0	
SurfacePonding	STORAGE	79.60	0.28	0.0	

Link Summary

Name	From Node	To Node	Type	Length

C1	STM-MH1	STM-MH14	CONDUIT	61.7
0.3242	0.0130			
C10	EX.MH43	EX.MH44	CONDUIT	71.4
0.9944	0.0130			
C10-S	EX.MH43-S	EX.MH44-S	CONDUIT	71.4
1.1345	0.0160			
C11	EX.MH45	EX.MH46	CONDUIT	37.1
1.8332	0.0130			
C11-S	EX.MH45-S	RingRoadMajor	CONDUIT	37.1
1.0243	0.0160			
C12	EX.MH44	EX.MH45	CONDUIT	35.1
1.0542	0.0130			
C12-S	EX.MH44-S	EX.MH45-S	CONDUIT	35.1
1.1967	0.0160			
C13	EX.MH46	CBMH52	CONDUIT	10.5
0.6857	0.0130			
C14	EX.MH34	EX.MH36	CONDUIT	60.8
1.2995	0.0130			

2021-0821-13: 100 Year Proposed Results

C14-S	EX.MH34-S	EX.MH43-S	CONDUIT	60.8
1.1678	0.0160			
C15	EX.MH31	EX.MH32	CONDUIT	86.4
1.0139	0.0130			
C1-S	STM-MH1-S	STM-MH14-S	CONDUIT	61.7
0.7943	0.0160			
C2	J2	EX.MH31	CONDUIT	16.0
0.0019	0.0130			
C3	STM-MH14	EX.MH34	CONDUIT	60.8
1.0042	0.0130			
C3-S	STM-MH14-S	EX.MH34-S	CONDUIT	60.8
0.1152	0.0160			
C4	EX.MH36	J2	CONDUIT	80.0
-0.9913	0.0130			
C4-S	EX.MH36-S	EX.MH34-S	CONDUIT	80.0
1.2376	0.0160			
C5	CBMH54	Detention	CONDUIT	25.2
0.4960	0.0130			
C5-S	CBMH54-S	SurfacePonding	CONDUIT	35.0
0.6857	0.0160			
C6	CBMH38_Orifice	CBMH92	CONDUIT	39.8
0.9423	0.0130			
C7	CBMH92	CBMH94	CONDUIT	39.7
0.9950	0.0130			
C8	CBMH94	CBMH52	CONDUIT	33.0
1.0061	0.0130			
C9	Detention	CBMH38	CONDUIT	26.1
1.1878	0.0130			
CBMH52	CBMH52	Minor2	CONDUIT	39.0
1.9953	0.0130			
OR1	CBMH38	CBMH38_Orifice	ORIFICE	
OL1	SurfacePonding	Detention	OUTLET	
RoofDrain	Roof	J2	OUTLET	

 Cross Section Summary

Full Conduit Flow	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels
----- C1	CIRCULAR	0.45	0.16	0.11	0.45	1
162.35						
C10	CIRCULAR	0.30	0.07	0.07	0.30	1
96.44						

2021-0821-13: 100 Year Proposed Results						
C10-S	Street	0.30	2.00	0.19	10.00	1
4452.27						
C11	CIRCULAR	0.30	0.07	0.07	0.30	1
130.94						
C11-S	Street	0.30	2.00	0.19	10.00	1
4230.49						
C12	CIRCULAR	0.30	0.07	0.07	0.30	1
99.29						
C12-S	Street	0.30	2.00	0.19	10.00	1
4572.58						
C13	CIRCULAR	0.30	0.07	0.07	0.30	1
80.08						
C14	CIRCULAR	0.45	0.16	0.11	0.45	1
325.02						
C14-S	Street	0.30	2.00	0.19	10.00	1
4517.17						
C15	CIRCULAR	0.53	0.22	0.13	0.53	1
433.08						
C1-S	Street	0.30	2.00	0.19	10.00	1
3725.39						
C2	CIRCULAR	0.53	0.22	0.13	0.53	1
18.77						
C3	CIRCULAR	0.45	0.16	0.11	0.45	1
285.72						
C3-S	Street	0.30	2.00	0.19	10.00	1
1418.90						
C4	CIRCULAR	0.53	0.22	0.13	0.53	1
428.21						
C4-S	Full_Street	0.40	8.00	0.20	40.00	1
18752.45						
C5	CIRCULAR	0.30	0.07	0.07	0.30	1
68.11						
C5-S	Full_Street	0.40	8.00	0.20	40.00	1
13958.72						
C6	CIRCULAR	0.30	0.07	0.07	0.30	1
93.87						
C7	CIRCULAR	0.30	0.07	0.07	0.30	1
96.47						
C8	CIRCULAR	0.30	0.07	0.07	0.30	1
97.00						
C9	CIRCULAR	0.30	0.07	0.07	0.30	1
105.40						
CBMH52	CIRCULAR	0.30	0.07	0.07	0.30	1
136.60						

Street Summary

2021-0821-13: 100 Year Proposed Results

Street Street
Area:

0.0005	0.0018	0.0041	0.0072	0.0113
0.0162	0.0221	0.0288	0.0365	0.0450
0.0545	0.0648	0.0761	0.0882	0.1013
0.1152	0.1301	0.1458	0.1625	0.1800
0.1985	0.2178	0.2381	0.2592	0.2813
0.3042	0.3281	0.3528	0.3785	0.4050
0.4325	0.4608	0.4901	0.5200	0.5500
0.5800	0.6100	0.6400	0.6700	0.7000
0.7300	0.7600	0.7900	0.8200	0.8500
0.8800	0.9100	0.9400	0.9700	1.0000

Hrad:

0.0151	0.0303	0.0454	0.0606	0.0757
0.0909	0.1060	0.1212	0.1363	0.1515
0.1666	0.1818	0.1969	0.2121	0.2272
0.2424	0.2575	0.2726	0.2878	0.3029
0.3181	0.3332	0.3484	0.3635	0.3787
0.3938	0.4090	0.4241	0.4393	0.4544
0.4696	0.4847	0.4999	0.5249	0.5548
0.5848	0.6147	0.6445	0.6743	0.7041
0.7338	0.7636	0.7932	0.8229	0.8525
0.8821	0.9116	0.9411	0.9706	1.0000

Width:

0.0300	0.0600	0.0900	0.1200	0.1500
0.1800	0.2100	0.2400	0.2700	0.3000
0.3300	0.3600	0.3900	0.4200	0.4500
0.4800	0.5100	0.5400	0.5700	0.6000
0.6300	0.6600	0.6900	0.7200	0.7500
0.7800	0.8100	0.8400	0.8700	0.9000
0.9300	0.9600	0.9900	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000

Street Full_Street
Area:

0.0004	0.0016	0.0036	0.0064	0.0100
0.0144	0.0196	0.0256	0.0324	0.0400
0.0484	0.0576	0.0676	0.0784	0.0900
0.1024	0.1156	0.1296	0.1444	0.1600
0.1764	0.1936	0.2116	0.2304	0.2500
0.2704	0.2916	0.3136	0.3364	0.3600
0.3844	0.4096	0.4356	0.4624	0.4900
0.5184	0.5476	0.5776	0.6084	0.6400
0.6724	0.7056	0.7396	0.7744	0.8100
0.8464	0.8836	0.9216	0.9604	1.0000

Hrad:

2021-0821-13: 100 Year Proposed Results

0.0200	0.0399	0.0599	0.0798	0.0998
0.1197	0.1397	0.1596	0.1796	0.1995
0.2195	0.2394	0.2594	0.2793	0.2993
0.3192	0.3392	0.3591	0.3791	0.3990
0.4190	0.4389	0.4589	0.4788	0.4988
0.5187	0.5387	0.5586	0.5786	0.5985
0.6185	0.6384	0.6584	0.6783	0.6983
0.7182	0.7382	0.7582	0.7784	0.7985
0.8187	0.8388	0.8590	0.8791	0.8993
0.9194	0.9396	0.9597	0.9799	1.0000

Width:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000
0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

Analysis Options

Flow Units LPS
 Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
 Infiltration Method HORTON
 Flow Routing Method DYNWAVE
 Surcharge Method EXTRAN
 Starting Date 01/04/2023 00:00:00
 Ending Date 01/04/2023 15:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:01:00
 Wet Time Step 00:05:00
 Dry Time Step 00:05:00
 Routing Time Step 5.00 sec
 Variable Time Step YES
 Maximum Trials 8
 Number of Threads 4
 Head Tolerance 0.001524 m

2021-0821-13: 100 Year Proposed Results

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*****
Runoff Quantity Continuity      Volume      Depth
                                hectare-m   mm
*****
Total Precipitation .....      0.257      71.708
Evaporation Loss .....         0.000      0.000
Infiltration Loss .....        0.039      10.927
Surface Runoff .....           0.117      32.640
Final Storage .....           0.100      28.052
Continuity Error (%) .....     0.123
    
```

```

*****
Flow Routing Continuity      Volume      Volume
                                hectare-m   10^6 ltr
*****
Dry Weather Inflow .....     0.000      0.000
Wet Weather Inflow .....     0.117      1.169
Groundwater Inflow .....     0.000      0.000
RDII Inflow .....            0.000      0.000
External Inflow .....         0.034      0.339
External Outflow .....        0.148      1.480
Flooding Loss .....           0.000      0.000
Evaporation Loss .....         0.000      0.000
Exfiltration Loss .....        0.000      0.000
Initial Stored Volume .....    0.000      0.000
Final Stored Volume .....      0.003      0.029
Continuity Error (%) .....    -0.121
    
```

```

*****
Highest Continuity Errors
*****
Node EX.MH36 (4.32%)
    
```

```

*****
Time-Step Critical Elements
*****
None
    
```

```

*****
Highest Flow Instability Indexes
*****
All links are stable.
    
```

```

*****
    
```

2021-0821-13: 100 Year Proposed Results

Most Frequent Nonconverging Nodes

- Node EX.MH32 (0.05%)
- Node Minor2 (0.05%)
- Node RingRoadMajor (0.05%)
- Node EX.MH36 (0.03%)
- Node CBMH38 (0.01%)

Routing Time Step Summary

Minimum Time Step : 1.76 sec
 Average Time Step : 5.00 sec
 Maximum Time Step : 5.00 sec
 % of Time in Steady State : 0.00
 Average Iterations per Step : 2.05
 % of Steps Not Converging : 0.05
 Time Step Frequencies :
 5.000 - 3.155 sec : 99.95 %
 3.155 - 1.991 sec : 0.04 %
 1.991 - 1.256 sec : 0.01 %
 1.256 - 0.792 sec : 0.00 %
 0.792 - 0.500 sec : 0.00 %

Subcatchment Runoff Summary

Perv	Total	Total	Total	Total	Total	Total	Imperv
Runoff	Runoff	Precip	Peak	Runoff	Evap	Infil	Runoff
Subcatchment	Runoff	Runoff	Runoff	Runoff	mm	mm	mm
mm	mm	10^6 ltr	mm	mm	mm	mm	mm

222		71.71		0.00	0.00	32.23	21.11
18.44	39.55	0.04	29.79	0.552			
223		71.71		0.00	0.00	6.58	61.28
2.77	64.05	0.07	34.53	0.893			
224		71.71		0.00	0.00	3.78	54.70
2.80	57.86	0.28	202.42	0.807			
225a		71.71		0.00	0.00	8.27	58.07

2021-0821-13: 100 Year Proposed Results

4.76	62.83	0.12	86.36	0.876			
225b			71.71	13.94	0.00	8.48	69.44
7.12	76.56	0.23	149.90	0.894			
226			71.71	74.51	0.00	12.00	114.61
19.01	133.63	0.13	63.41	0.914			
227			71.71	0.00	0.00	11.55	53.10
6.54	59.64	0.23	164.06	0.832			
228			71.71	54.56	0.00	19.21	80.09
26.66	106.75	0.24	149.26	0.845			
229			71.71	0.00	0.00	34.85	26.90
9.67	36.57	0.06	30.41	0.510			
EXT-1			71.71	0.00	0.00	7.17	0.00
0.00	0.00	0.00	0.00	0.000			
EXT-2			71.71	0.00	0.00	7.17	0.00
0.00	0.00	0.00	0.00	0.000			
EXT-3			71.71	0.00	0.00	10.04	0.00
0.00	0.00	0.00	0.00	0.000			

LID Performance Summary

Drain	Initial	Final	Continuity	Total	Evap	Infil	Surface
Outflow	Storage	Storage	Error	Inflow	Loss	Loss	Outflow
Subcatchment	LID Control	LID Control	%	mm	mm	mm	mm
mm	mm	mm					
224		GreenRoof		71.71	0.00	0.00	2.61
0.00	0.00	45.60	32.77				

Node Depth Summary

Node	Type	Average	Maximum	Maximum	Time of Max	Reported
		Depth	Depth	HGL	Occurrence	Max Depth
		Meters	Meters	Meters	days hr:min	Meters
CBMH38	JUNCTION	0.22	1.12	78.86	0 00:58	1.12
CBMH38_Orifice	JUNCTION	0.04	0.17	77.91	0 01:00	0.17

2021-0821-13: 100 Year Proposed Results

CBMH52	JUNCTION	0.03	0.13	76.71	0	01:06	0.13
CBMH54	JUNCTION	0.15	1.70	79.88	0	01:00	1.68
CBMH54-S	JUNCTION	0.01	0.09	79.93	0	00:58	0.09
CBMH92	JUNCTION	0.04	0.17	77.51	0	01:01	0.17
CBMH94	JUNCTION	0.04	0.17	77.08	0	02:29	0.17
EX.MH31	JUNCTION	0.05	0.09	76.71	0	01:27	0.09
EX.MH34	JUNCTION	0.10	0.16	78.56	0	01:26	0.16
EX.MH34-S	JUNCTION	0.01	0.06	81.35	0	01:01	0.06
EX.MH36	JUNCTION	0.87	0.95	78.56	0	01:27	0.95
EX.MH36-S	JUNCTION	0.01	0.07	82.35	0	01:00	0.07
EX.MH43	JUNCTION	0.00	0.00	78.74	0	00:00	0.00
EX.MH43-S	JUNCTION	0.00	0.05	80.63	0	01:03	0.05
EX.MH44	JUNCTION	0.00	0.01	78.01	0	00:59	0.01
EX.MH44-S	JUNCTION	0.00	0.05	79.82	0	01:04	0.05
EX.MH45	JUNCTION	0.00	0.01	77.64	0	01:46	0.01
EX.MH45-S	JUNCTION	0.00	0.05	79.40	0	01:05	0.05
EX.MH46	JUNCTION	0.02	0.06	76.71	0	01:01	0.06
J2	JUNCTION	0.10	0.15	78.56	0	01:27	0.15
STM-MH1	JUNCTION	0.00	0.00	79.21	0	00:00	0.00
STM-MH14	JUNCTION	0.05	0.05	79.06	0	00:16	0.05
STM-MH14-S	JUNCTION	0.00	0.00	81.36	0	00:16	0.00
STM-MH1-S	JUNCTION	0.04	0.04	81.89	0	15:00	0.04
EX.MH32	OUTFALL	0.05	0.09	75.83	0	01:28	0.09
Minor2	OUTFALL	0.03	0.13	75.93	0	01:06	0.13
RingRoadMajor	OUTFALL	0.00	0.05	79.02	0	01:05	0.05
Detention	STORAGE	0.31	1.07	78.97	0	00:58	1.07
Roof	STORAGE	0.02	0.09	78.74	0	01:24	0.09
SurfacePonding	STORAGE	0.02	0.18	79.78	0	01:36	0.18

Node Inflow Summary

Total Flow		Maximum Lateral	Maximum Total Inflow	Time of Max Occurrence	Lateral Inflow Volume
Node	Error Percent	Type	LPS	days hr:min	10^6 ltr
CBMH38		JUNCTION	0.00	0 00:58	0

2021-0821-13: 100 Year Proposed Results

0.544	-0.056						
CBMH38_Orifice		JUNCTION	0.00	49.70	0	00:58	0
0.544	-0.007						
CBMH52		JUNCTION	0.00	49.87	0	01:03	0
0.549	0.004						
CBMH54		JUNCTION	146.47	146.47	0	01:00	0.226
0.226	-0.056						
CBMH54-S		JUNCTION	184.06	184.06	0	01:00	0.327
0.327	-1.220						
CBMH92		JUNCTION	0.00	49.62	0	01:00	0
0.544	-0.000						
CBMH94		JUNCTION	0.00	49.62	0	01:01	0
0.544	-0.002						
EX.MH31		JUNCTION	0.00	28.92	0	01:27	0
0.597	0.060						
EX.MH34		JUNCTION	0.00	6.40	0	00:41	0
0.338	0.422						
EX.MH34-S		JUNCTION	-84.54	146.47	0	01:00	-0.0955
0.228	0.301						
EX.MH36		JUNCTION	0.00	7.65	0	00:41	0
0.337	4.512						
EX.MH36-S		JUNCTION	149.90	149.90	0	01:00	0.226
0.226	-0.325						
EX.MH43		JUNCTION	0.00	0.00	0	00:00	0
0	0.000 ltr						
EX.MH43-S		JUNCTION	-20.00	60.46	0	01:01	-0.0924
0.13	-0.051						
EX.MH44		JUNCTION	0.08	0.08	0	00:56	0.000273
0.000273	-0.154						
EX.MH44-S		JUNCTION	-0.08	39.34	0	01:03	-0.000273
0.0382	0.719						
EX.MH45		JUNCTION	0.08	0.16	0	01:00	0.000269
0.000542	0.410						
EX.MH45-S		JUNCTION	-0.08	38.60	0	01:04	-0.000269
0.0376	0.492						
EX.MH46		JUNCTION	0.08	0.43	0	00:49	0.00396
0.00455	0.202						
J2		JUNCTION	0.00	28.92	0	01:26	0
0.6	0.274						
STM-MH1		JUNCTION	0.00	0.00	0	00:00	0
0	0.000 ltr						
STM-MH14		JUNCTION	6.28	6.28	0	15:00	0.338
0.338	0.134						
STM-MH14-S		JUNCTION	-6.28	6.28	0	15:00	-0.338
0.338	0.005						
STM-MH1-S		JUNCTION	6.28	6.28	0	00:00	0.339
0.339	0.226						
EX.MH32		OUTFALL	30.41	47.13	0	01:00	0.056
0.653	0.000						

2021-0821-13: 100 Year Proposed Results

Minor2	OUTFALL	0.00	49.86	0	01:06	0
0.548 0.000						
RingRoadMajor	OUTFALL	149.18	156.35	0	01:03	0.239
0.279 0.000						
Detention	STORAGE	211.16	374.29	0	00:59	0.331
1.37 -0.113						
Roof	STORAGE	202.42	202.42	0	01:00	0.278
0.278 0.003						
SurfacePonding	STORAGE	-174.72	322.46	0	00:59	0.483
0.908 0.603						

Node Surcharge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
CBMH38	JUNCTION	3.20	0.824	0.786
CBMH54	JUNCTION	2.70	1.402	0.000
EX.MH36	JUNCTION	14.31	0.422	3.913

Node Flooding Summary

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate LPS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 ltr	Maximum Poned Depth Meters
Detention	2.01	324.57	0 00:59	0.815	0.000

Storage Volume Summary

Average	Avg	Evap	Exfil	Maximum	Max	Time of
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2021-0821-13: 100 Year Proposed Results

Max Occurrence hr:min	Maximum Outflow Storage Unit LPS	Volume 1000 m ³	Pcnt Full	Pcnt Loss	Pcnt Loss	Volume 1000 m ³	Pcnt Full	days
00:58	49.76	0.028	26.1	0.0	0.0	0.109	100.0	0
01:24	22.66	0.041	13.2	0.0	0.0	0.181	58.5	0
01:36	175.55	0.015	3.0	0.0	0.0	0.155	31.3	0

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10 ⁶ ltr
EX.MH32	98.16	12.32	47.13	0.653
Minor2	95.07	10.69	49.86	0.548
RingRoadMajor	26.06	19.83	156.35	0.279
System	73.10	42.85	248.69	1.481

Street Flow Summary

Peak Flow Capture Street Pcnt	Avg. Flow Capture Conduit Pcnt	Bypass Peak Flow Freq LPS Pcnt	Back Maximum Flow Spread Freq Pcnt	Peak Maximum Capture / Inlet Depth m LPS	Peak Bypass Inlet Flow Design LPS	Inlet Location	Inlet
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2021-0821-13: 100 Year Proposed Results

C10-S		39.343	2.586	0.052	Inlet	ON-GRADE	4
0.20	24.31	75.54	0.00	0.02	39.26		
C11-S		37.716	2.618	0.052	Inlet	ON-SAG	4
0.21	26.62	79.56	0.00	0.02	37.64		
C12-S		38.595	2.584	0.052	Inlet	ON-GRADE	4
0.21	23.46	74.05	0.00	0.02	38.52		
C14-S		60.457	2.875	0.057	Inlet	ON-GRADE	1
33.08	97.25	6.27	0.00	20.00	40.46		
C1-S		6.280	0.915	0.018	Inlet	ON-GRADE	1
100.00	100.00	0.00	0.00	6.28	0.00		
C3-S		0.000	1.607	0.032	Inlet	ON-GRADE	1
C4-S		146.466	3.206	0.064	Inlet	ON-GRADE	4
100.00	100.00	0.00	0.00	18.31	0.00		
C5-S		211.162	5.471	0.109	Inlet	ON-GRADE	7
0.00	99.58	1.15	23.29	0.00	211.16		

Link Flow Summary

Link	Type	Maximum Flow LPS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.00	0 00:00	0.00	0.00	0.05
C10	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C10-S	CONDUIT	39.34	0 01:03	0.62	0.01	0.17
C11	CONDUIT	0.16	0 01:46	0.33	0.00	0.03
C11-S	CONDUIT	37.72	0 01:05	0.55	0.01	0.17
C12	CONDUIT	0.08	0 01:00	0.26	0.00	0.02
C12-S	CONDUIT	38.60	0 01:04	0.60	0.01	0.17
C13	CONDUIT	0.43	0 00:49	0.19	0.01	0.32
C14	CONDUIT	6.74	0 00:42	0.79	0.02	0.68
C14-S	CONDUIT	60.46	0 01:01	1.11	0.01	0.19
C15	CONDUIT	28.92	0 01:28	1.14	0.07	0.17
C1-S	CONDUIT	6.28	0 15:00	0.76	0.00	0.06
C2	CONDUIT	28.92	0 01:27	0.68	1.54	0.25
C3	CONDUIT	6.40	0 00:41	0.77	0.02	0.23
C3-S	CONDUIT	0.00	0 00:20	0.00	0.00	0.11
C4	CONDUIT	6.68	0 00:42	0.06	0.02	0.65
C4-S	CONDUIT	146.47	0 01:00	0.71	0.01	0.16
C5	CONDUIT	146.45	0 01:00	2.07	2.15	1.00
C5-S	CONDUIT	211.16	0 00:59	1.52	0.02	0.27
C6	CONDUIT	49.62	0 01:00	1.25	0.53	0.55
C7	CONDUIT	49.62	0 01:01	1.28	0.51	0.54
C8	CONDUIT	49.62	0 01:01	1.38	0.51	0.51

2021-0821-13: 100 Year Proposed Results

C3 0.00	1.00	0.00	0.00	0.00	0.95	0.05	0.00	0.00	0.95
C3-S 0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98
C4 0.00	1.00	0.00	0.02	0.00	0.98	0.00	0.00	0.00	0.03
C4-S 0.00	1.00	0.02	0.00	0.00	0.93	0.06	0.00	0.00	0.93
C5 0.00	1.00	0.02	0.60	0.00	0.35	0.00	0.00	0.03	0.74
C5-S 0.00	1.00	0.02	0.00	0.00	0.16	0.82	0.00	0.00	0.16
C6 0.00	1.00	0.04	0.00	0.00	0.00	0.00	0.00	0.96	0.00
C7 0.00	1.00	0.05	0.00	0.00	0.00	0.00	0.00	0.95	0.00
C8 0.00	1.00	0.05	0.00	0.00	0.57	0.38	0.00	0.00	0.58
C9 0.00	1.00	0.04	0.00	0.00	0.95	0.01	0.00	0.00	0.74
CBMH52 0.00	1.00	0.05	0.00	0.00	0.00	0.95	0.00	0.00	0.00

 Conduit Surcharge Summary

Conduit	----- Both Ends	Hours Full Upstream	----- Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C14	0.01	0.01	14.38	0.01	0.01
C2	0.01	0.01	0.01	2.57	0.01
C4	0.01	0.01	14.31	0.01	0.01
C5	2.68	2.70	2.81	0.28	0.31
C9	2.81	2.81	3.20	0.01	0.01

Analysis begun on: Fri Apr 12 11:13:45 2024
 Analysis ended on: Fri Apr 12 11:13:46 2024
 Total elapsed time: 00:00:01