

CHEO INTEGRATED TREATMENT CENTRE

SERVICING AND STORMWATER MANAGEMENT REPORT | April 1, 2025

WALTERFEDY

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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 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 Integrated Treatment Centre 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, Geofirma Engineering, prepared for 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. City of Ottawa Technical Bulletin ISTB-2018-02, March 2018
4. Stormwater Management Planning and Design Manual, Ministry of the Environment, Conservation and Parks (MECP), March 2003.
5. Design Guidelines for Sewage Works, Ministry of the Environment, Conservation and Parks, March 2019.
6. 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 watermain 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 Integrated Treatment Centre 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. Scenario 1 has been considered for design.

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 the proposed storm sewer network. This subdrain system is designed with an invert of 79.60 around the perimeter of the building where the groundwater contours are highest, and leaves the building at an invert of 78.60 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, except for in major storm events where the groundwater level rises locally.

3.3 Quality and Discharge

As part of the hydrogeologic investigation, samples of groundwater were collected and analyzed for compliance with the 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 (1.9x), Nonyl phenol (4x), Manganese (17x) and Chloroform (2.9x) are noted.

Given the subdrain system will only potentially be activated during storm events, the concentrations of the above parameters will become heavily diluted once mixed with stormwater from the remainder of the system. Under scenario one, approximately 3,400 L/day (0.04 L/s) of groundwater flows will initially mix with up to 174.56 L/s of stormwater (100-year storm event). The groundwater flow represents approximately 0.02% of the overall flows discharging to the Ring Road major system, and 0.01% of the overall flows discharging from the overall area analyzed (based on a combined 100-year flow rate of 374.56 L/s [storm sewer system + Ring Road major system]).

The dilution represented above will result in the above concentrations falling within the acceptable ranges per the City of Ottawa Sewer Use By-Law. An inspection manhole is located immediately downstream of the subdrainage system for testing purposes. Existing Manhole 46 can be used to test dilution with the Ring Road Major system, and Existing Manhole 32 can be used to test dilution with the overall study area.

Some strategies to reduce/limit TSS entering the system will be detailed in Section 7.5. TSS removal will also reduce Nonyl phenol and Chloroform.

A backflow preventor is proposed for the discharge sewer from the subdrainage system.

4.0 PROPOSED CONDITIONS

The Development is to consist of a six-storey integrated care facility. The proposed Integrated Treatment Centre 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 1.5. 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	2.17	ha
Peaking Factor	1.5	
Peak Domestic Wastewater Flow	1.06	L/s
Site Area	2.17	ha
Infiltration Allowance (0.33 L/s/ha)	0.72	L/s
Total Sanitary Drainage	1.77	L/s

It should be noted that the proposed lengths of sanitary sewer that will connect the proposed integrated treatment centre to the existing sanitary sewer system are servicing lines. As such, the anticipated maximum drainage rate that the pipe lengths are expected to convey can be calculated using the OBC fixture unit method, as per Section 8.0 of the Ontario Building Code (OBC). The maximum probable drainage rate was calculated using Table 7.4.10.5 of the OBC, a summary of the calculation completed is provided in Table III below. Detailed calculations are provided within Appendix B.

Table III: OBC Sanitary Flow Calculation

Total Number of Fixture Units (as per Mechanical plans)	1180	
Maximum Drainage Rate for the Proposed Fixture Unit Count (as per Table 7.4.10.5)	189.84	Gal/min
Total Sanitary Drainage	14.38	L/s

After comparing the results of the two sanitary flow calculation methods shown above, it was decided that the OBC sanitary flow rate was used for the design of the proposed servicing pipes. This value was chosen to be used within the servicing design because it yielded the largest flow rate, and is also more accurate to the daily anticipated flow rate through the proposed pipe lengths due to the fact that it considers the typical use case scenarios of the fixture units that will be installed in the proposed building.

As discussed above, the total sanitary discharge expected from the site is 14.38 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 IV 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 IV: 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. A sanitary sewer design sheet can be found in Appendix B. It is understood that the proposed sewer lengths will not be flowing at their full flow capacities, as such partially full pipe flow calculations were completed to ensure that the self-cleaning velocity of 0.6 m/s was able to be achieved under the anticipated sanitary flow conditions for the proposed building. Partially full flow calculations are presented in Appendix B to illustrate compliance.

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 Integrated Treatment Centre is 5.92 L/s. Therefore, it is anticipated that the 250mm-diameter sanitary sewer will be sufficient to convey the sewage to the existing sanitary sewer system on Ring Road. A sanitary sewer design sheet has been provided in Appendix B to demonstrate that the proposed sanitary sewer lengths have adequate capacity for the development.

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 outlined within the Preliminary Functional Servicing Study conducted by Stantec (dated October 25, 2022). Staffing and visitor/patient numbers utilized within the calculations were derived from the Functional Program Space Allocations report. Maximum day and peak hourly demands were determined by multiplying the average day demand and maximum day demand calculated by their associated peaking factors – as determined by the *Ottawa Design Guidelines – Water Distribution* (July 2010). A summary of the domestic water demand calculations is provided in Table V.

Table V: 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	1.50	
Peak Hour Factor	1.80	
Maximum Day Domestic Water Demand (Staff)	2.49	L/s
Peak Hour Domestic Water Demand (Staff)	4.49	L/s
Average Daily Domestic Water Demand (Patients)	25	L/c/d
Number of Patients Anticipated	251	
Maximum Day Peaking Factor	1.50	
Peak Hour Factor	1.80	
Maximum Day Domestic Water Demand (Patients)	0.12	L/s
Peak Hour Domestic Water Demand (Patients)	0.20	L/s
Total Maximum Day Domestic Water Demand	2.61	L/s
Total Peak Hour Domestic Water Demand	4.68	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 are 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 are 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 VI identifies the available credits that can be applied depending on the design of the automatic sprinkler system.

Table VI: 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 VII summarizes the exposed risks identified, their measured separation differences, and the exposure adjustment charge applied.

Table VII: 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 VIII.

Table VIII: 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 119.61 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 119.61 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 119.61 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 119.61 L/s is available at the building FFE at approximately 27.7 PSI, demonstrating adequate pressure is available to service the building.

Finally, several municipal hydrants are located within 75 m of the proposed buildings. As per the City of Ottawa's technical bulletin ISTB-2018-02, Hydrants with a class of AA contribute a fire flow of 5,700 L/min. Given the calculated required fire flow of approximately 7,000 L/min, two AA class hydrants will be required to be provided within 75 m of the building in order to provide the required fire flow. As illustrated on Drawing C1201, 3 hydrants are provided within 75 m of the building – therefore meeting the required fire flow as per ISTB-2018-02.

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 1.694 ha) directs runoff towards Ring Road in the form of overland flow, while the remaining 1.889 ha directs runoff towards the storm sewer system. It should be noted that several external catchment areas were noted to contribute runoff to the outlets. An existing catchment area plan and flow schematic of the pre-development conditions has been provided within Appendix A of this report. A summary of the pre-development catchment parameters is provided within Table IX and Table X, with a more detailed calculation being provided in Table 2 of Appendix C.

Table IX: Summary of Pre-Development Catchment Parameters Contributing to the Ring Road Major System

CATCHMENT ID	DESCRIPTION	AREA (HA)
EXT-1	Section of ring road on the southern limits of the Site	0.256
EXT-2	Portion of existing external asphalt parking lot that directs runoff onto entrance driveway to CHEO entrance	0.146
100	The northern most portion of the existing external asphalt parking lot	0.105
103B	Southwestern portion of existing asphalt parking lot west of the main entrance to CHEO	0.618
104	Existing gravel overflow parking west of the main entrance to CHEO	0.351

Table X: Summary of Pre-Development Catchment Parameters Contributing to the Storm Sewer System

CATCHMENT ID	DESCRIPTION	AREA (HA)
EXT-3	External catchment capturing flows from external asphalt parking lot	0.962
101	Existing landscaped area south of the existing CHEO main entrance	0.102
102	Southeast portion of existing driveway connecting Ring Road to the main entrance of CHEO	0.349
103A	Existing asphalt parking lot west of the main entrance to CHEO	0.287
105	Landscaped area located north of the main entrance of the existing CHEO building	0.189

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 XI and Table XII, with a detailed breakdown of the calculation provided within Table 2 in Appendix C

Table XI: Allowable Release Rate to Ring Road Major System

Area of Catchment (A)	1.694	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)	180.85	L/s

Table XII: Allowable Release Rate to Storm Sewer System

Area of Catchment (A)	1.889	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)	201.67	L/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 XIII.

Table XIII: 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	0.11
223	Portion of existing external asphalt parking lot that directs runoff onto entrance driveway to CHEO entrance	0.11
224A	Northern portion of proposed Integrate Treatment Centre Building - attenuated by green roof system	0.14
224B	Central portion of proposed Integrate Treatment Centre Building - attenuated by control flow roof drains	0.22
224C	Southern portion of proposed Integrate Treatment Centre Building - attenuated by green roof system	0.12
225A	Northern portion of the driveway between proposed Integrated Treatment Centre building and existing CHEO entrance	0.17
225B	Southern Portion of the driveway between proposed Integrated Treatment Centre building and existing CHEO entrance	0.29
226	South intersection between Site driveway and Ring Road	0.10
227	Proposed parking lot in front of the Integrated Treatment Centre building	0.43
228	Proposed landscaped area on northern limits of the Site	0.21
229	Existing landscaped area in front of CHEO Max Keeping Wing	0.15

Modelling of post-development conditions was completed in PCSWMM. A table summarizing the peak flow rates generated during all modelled storm events within each of the above catchment areas has been provided within Table 5 of Appendix D. A storm sewer design sheet can be found in Appendix C.

As noted in Section 3.2, a proposed subdrainage system will any and all convey groundwater discharge to the nearby storm sewer system on Site. In order to account for the proposed groundwater discharge from this system a base flow of approximately 0.04 L/s was added to the node representing the connection to the weeping tile system.

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 XIV.

Table XIV: Peak Flow Rates from Parking Garage Site to be Attenuated by Integrated Treatment Centre 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, and adding in the 50 and 100 year flows coming down Ring Road from the Parking Garage, 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. 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 Integrated Treatment Centre (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 75 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 141 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 6 in Appendix C.

7.4.2 Control Flow Roof Drains

In order to attenuate flows stemming from the proposed Integrated Treatment Centre, twelve control flow roof drains are proposed to be installed on the rooftop 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 approximately 1547 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 6 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 665 m² of roof area on the Integrated Treatment Centre 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 84 ADS SC-310 StormTech chambers. This detention gallery provides 84.20m³ of storage 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 roof catchment 224C, any runoff generated from catchment 224C that exceeds the capacity of the proposed green roof system that services the catchment will spill to grade onto catchment 227. Flow from the gallery is controlled using a 75 mm diameter orifice plate located at DCBMH38. 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 6 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 XV and Table XVI.

Table XV: 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	201.67	201.67	71.46
5-Year	273.58	201.67	101.29
10-Year	320.71	201.67	123.68
25-Year	379.92	201.67	153.88
50-Year	423.98	201.67	178.38
100-Year	468.84	201.67	200.92

Table XVI: Comparison of Pre- and Post-Development Peak Flow Rates to Ring Road Major 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	180.85	180.85	62.56
5-Year	245.34	180.85	90.17
10-Year	287.60	180.85	109.07
25-Year	340.70	180.85	134.53
50-Year	380.21	180.85	154.11
100-Year	420.45	180.85	174.56

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.

As noted in Sections 3.2 and 3.3, the hydrogeological investigations on Site revealed concentrations of TSS, Nonyl phenol, Manganese, and Chloroform that exceeded the allowable concentrations listed within the City of Ottawa Sewer Use By-Law (2003-5134). It should be noted that the expected flow rates from the building's subdrainage system are negligibly small when compared to the expected peak flow rates that will be conveyed through the storm sewer system (between 70.47 and 200.01 L/s depending on the storm event in question). This flow will also only enter the system during major storm events when the groundwater level rises high enough to enter the system. Therefore, it is expected that the mixing between the contaminated groundwater discharge and cleaner discharge being conveyed through the storm sewer system will result in concentrations of the above-noted contaminants falling within the allowable limits at the outfall of the storm sewer system.

Several measures have been taken to limit TSS levels discharging from the site. This includes ensuring the entire subdrainage system has pipes wrapped with filter socks to limit TSS entering the system. The storm sewer system also includes sumps in all manholes. Finally, an oil-grit separator is located at the outfall of the CHEO system to provide treatment to this heavily diluted flow.

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.
- The subdrain system under the floor of the proposed building may discharge groundwater during larger storm events due to fluctuations in groundwater elevations. Quality control of the groundwater will be achieved through dilution of the peak flows with the storm sewer system as well as TSS removal through the filter sock around the perforated pipes of the subdrain system, the sumps in the storm manholes and the oil grit interceptors in the overall CHEO campus.
- 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. Hydrant coverage is provided by the existing hydrant on Ring Road, as well as two relocated hydrants on the internal road.
- Stormwater quantity control requirements will be met through the implementation of a combination of an underground storage gallery, surface ponding measures, on line orifice control and flow control roof drains.
- No additional stormwater 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



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Partner

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A handwritten signature in black ink, appearing to read "C. Mahoney".

Circe Mahoney
Water Resources EIT, Civil Engineering

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APPENDIX A

Catchment Area and Flow Schematic Figures

10

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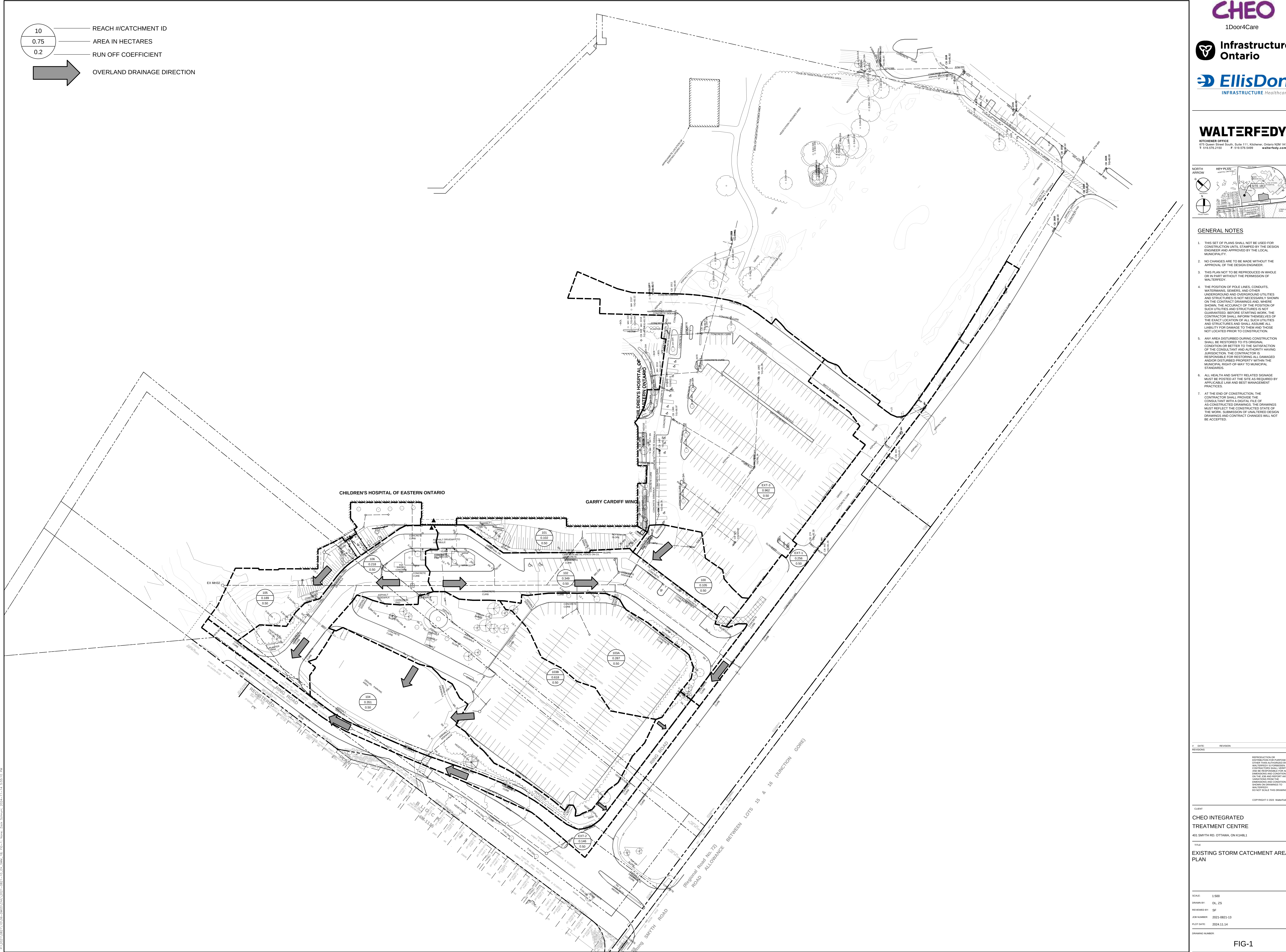
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REACH #/CATCHMENT ID

AREA IN HECTARES

RUN OFF COEFFICIENT

OVERLAND DRAINAGE DIRECTION



CHEO

1Door4Care

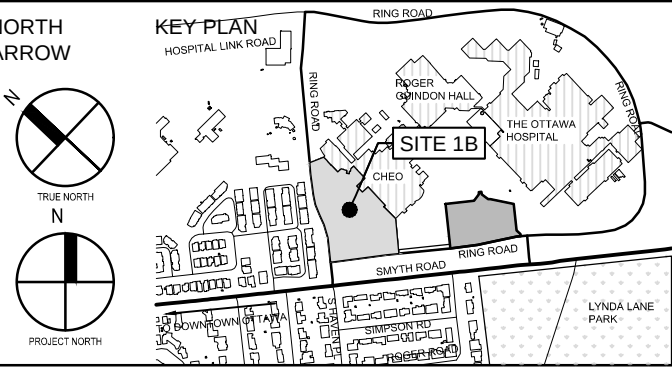
Infrastructure Ontario

EllisDon

INFRASTRUCTURE Healthcare

WALTERFEDY

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- GENERAL NOTES**
1. THIS SET OF PLANS SHALL NOT BE USED FOR CONSTRUCTION UNTIL STAMPED BY THE DESIGN ENGINEER AND APPROVED BY THE LOCAL MUNICIPALITY.
 2. NO CHANGES ARE TO BE MADE WITHOUT THE APPROVAL OF THE DESIGN ENGINEER.
 3. THIS PLAN NOT TO BE REPRODUCED IN WHOLE OR IN PART WITHOUT THE PERMISSION OF WALTERFEDY.
 4. THE POSITION OF POLE LINES, CONDUITS, WATERMANS, SEWERS, AND OTHER UNDERGROUND AND OVERGROUND UTILITIES 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.
 5. 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.
 6. ALL HEALTH AND SAFETY RELATED SIGNAGE MUST BE POSTED AT THE SITE AS REQUIRED BY APPLICABLE LAW AND BEST MANAGEMENT PRACTICES.
 7. 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.

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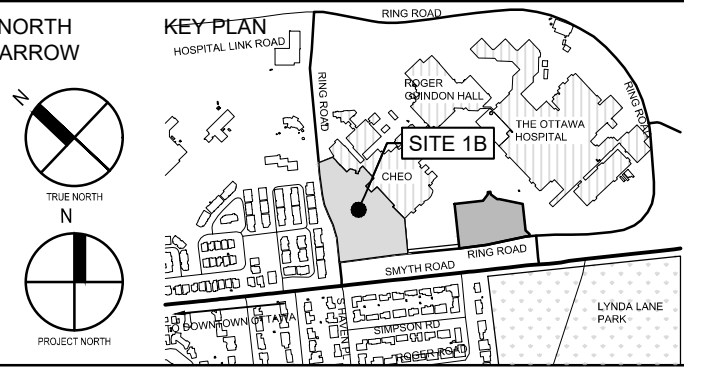
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REACH #/CATCHMENT ID

AREA IN HECTARES

RUN OFF COEFFICIENT

OVERLAND DRAINAGE DIRECTION



- GENERAL NOTES
1. THIS SET OF PLANS SHALL NOT BE USED FOR CONSTRUCTION UNTIL STAMPED BY THE DESIGN ENGINEER AND APPROVED BY THE LOCAL MUNICIPALITY.

2. NO CHANGES ARE TO BE MADE WITHOUT THE APPROVAL OF THE DESIGN ENGINEER.

3. THIS PLAN NOT TO BE REPRODUCED IN WHOLE OR IN PART WITHOUT THE PERMISSION OF WALTERFEDY.

4. THE POSITION OF POLE LINES, CONDUITS, WATERMANS, SEWERS, AND OTHER UNDERGROUND AND OVERGROUND UTILITIES 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.

5. 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.

6. ALL HEALTH AND SAFETY RELATED SIGNAGE MUST BE POSTED AT THE SITE AS REQUIRED BY APPLICABLE LAW AND BEST MANAGEMENT PRACTICES.

7. 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.

12	24/11/27	ISSUED FOR 100% CD SUBMISSION
10	24/09/20	ISSUED FOR CD-60 SITE CURB AT TUNNEL
9	24/08/23	ISSUED FOR BUILDING PERMIT
8	24/08/23	ISSUED FOR SITE PLAN CONTROL
7	24/08/07	ISSUED FOR 50% CD SUBMISSION
6	24/06/01	ISSUED FOR 100% OF SUBMISSION R2
5	24/05/10	ISSUED FOR FOUNDATION PERMIT
4	24/04/19	ISSUED FOR 100% DO SUBMISSION
3	24/01/24	RE-ISSUED FOR BUILDING PERMIT (TUNNEL)
2	23/12/20	ISSUED FOR BUILDING PERMIT (TUNNEL)
1	23/12/15	RE-ISSUED FOR 50% DO SUBMISSION
0	23/12/15	ISSUED FOR 50% DO SUBMISSION

#	DATE	REVISION
1	2024-11-20	ISSUED FOR 100% CD SUBMISSION

REPRODUCTION OR REUSE OF THIS DRAWING FOR ANY PURPOSES OTHER THAN AUTHORIZED BY WALTERFEDY IS PROHIBITED. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DAMAGE TO THE WORK AND ANY LIABILITY FOR DAMAGE TO THEM AND THOSE NOT LOCATED PRIOR TO CONSTRUCTION. DO NOT SCALE THIS DRAWING.

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CLIENT

CHEO INTEGRATED
TREATMENT CENTRE
401 BAYVIEW RD. OTTAWA, ON K1H8L1

TITLE

STORM CATCHMENT AREA PLAN

SCALE: 1:500

DRAWN BY: DL, TK, ZS

REVIEWED BY: SF

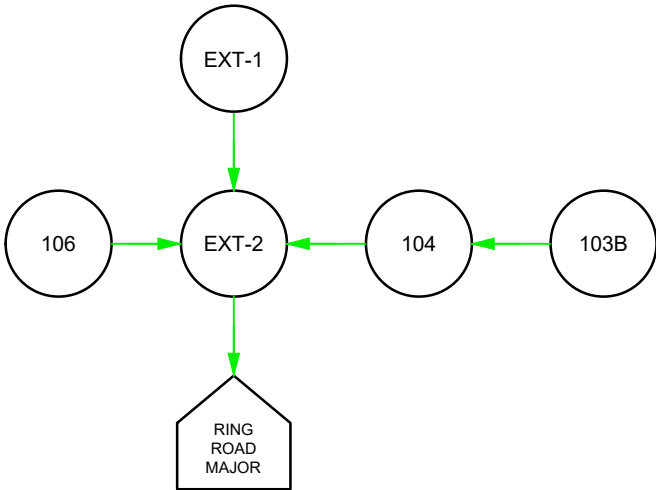
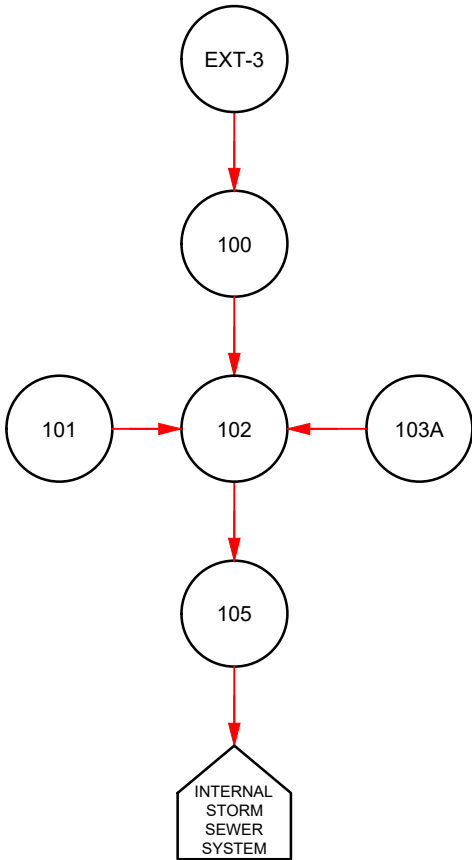
JOB NUMBER: 2021-0821-13

PLOT DATE: 2024-11-20

DRAWING NUMBER

FIG-2

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LEGEND

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1234

CATCHMENT
JUNCTION
STORAGE
MAJOR OVERLAND FLOW CONDUIT
MINOR FLOW CONDUIT
OUTFALL

PROJECT:
CHEO INTEGRATED TREATMENT CENTRE
OTTAWA, ONTARIO

TITLE:
EXISTING CONDITIONS: PCSWMM MODEL SCHEMATIC

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WALTERFEDY

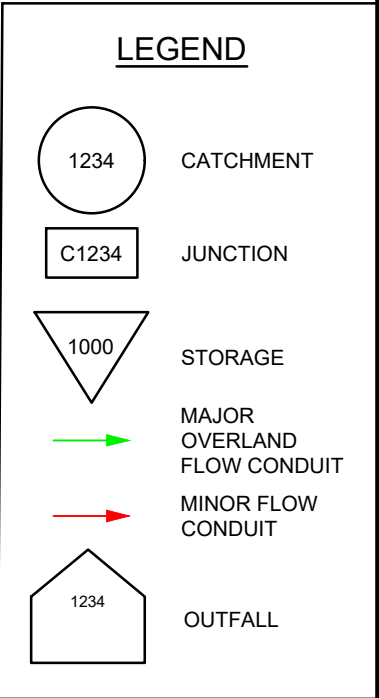
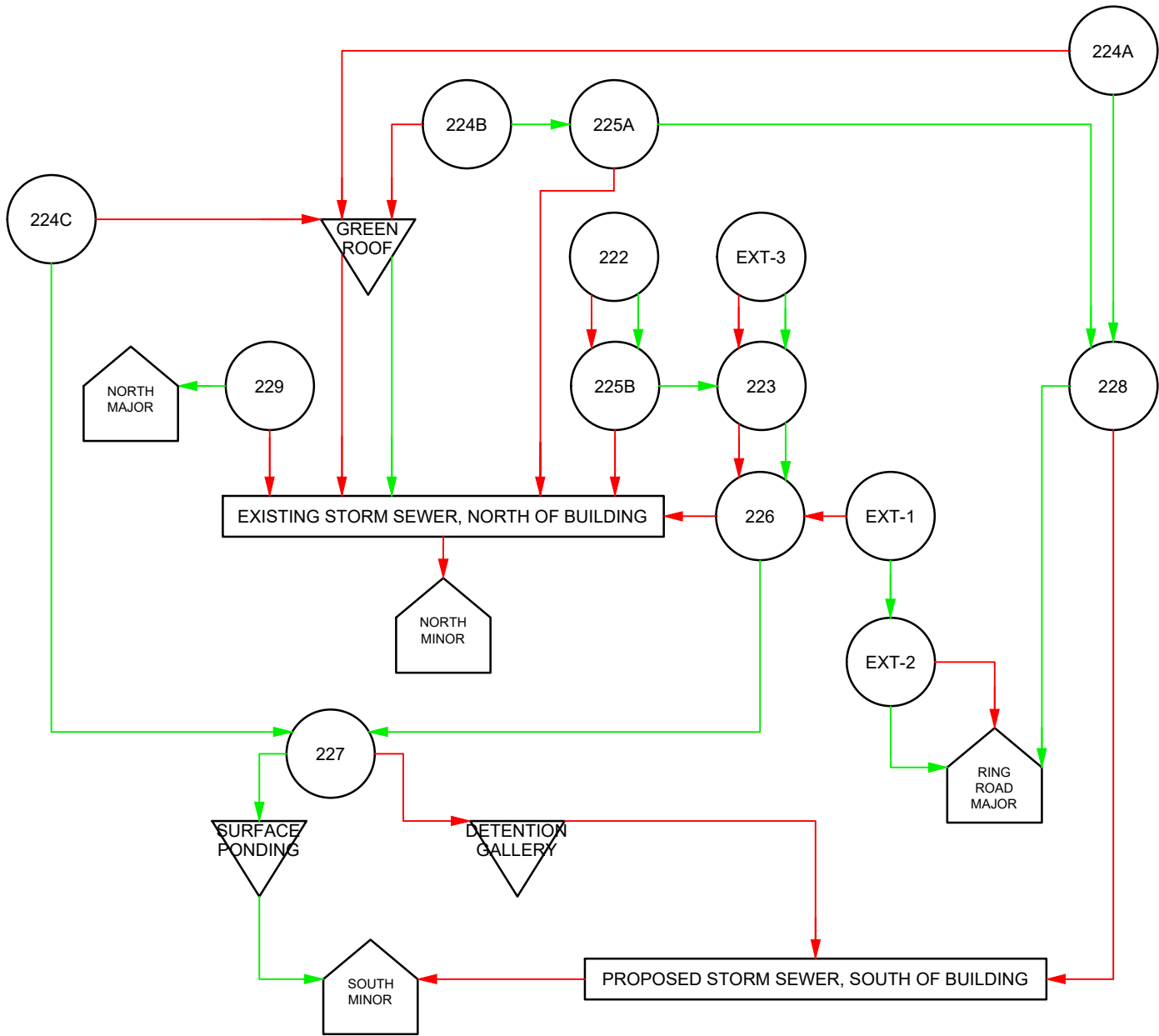
KITCHENER OFFICE
675 Queen Street South, Suite 111, Kitchener, Ontario N2M 1A1
T: 519.576.2150 F: 519.576.5499 walterfedy.com

SCALE: N/A	DATE: 2024-11-14
DRAWN BY: ZS	PROJECT NO.: 2021-0821-13
CHECKED BY: SF	FILE: 2021-0821-13_FLOW_SCHEM

SHEET NO.:

FIG-3

P:\2021\0821\13\06-DWGS\CIVIL\2021-0821-13_FLOW_SCHEMATICS; FIG. 4; DWG To PDF no layers.pc3; Zack Schnurr; 2024-11-14 5:45:16 PM



PROJECT:
CHEO INTEGRATED TREATMENT CENTRE
OTTAWA, ONTARIO

TITLE:
PROPOSED CONDITIONS: PCSWM MODEL SCHEMATIC

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WALTERFEDY

KITCHENER OFFICE
675 Queen Street South, Suite 111, Kitchener, Ontario N2M 1A1
T: 519.576.2150 F: 519.576.5499 walterfedy.com

SCALE: N/A	DATE: 2024-11-14
DRAWN BY: ZS	PROJECT NO.: 2021-0821-13
CHECKED BY: SF	FILE: 2021-0821-13_FLOW_SCHEM

SHEET NO.:
FIG-4

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	2.17	28000	60,810	1.50		1.06
Infiltration Allowance	2.17				0.33	0.72
Total						1.77

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

Hydraulic Load (Fixture Unit Calculation) for Wastewater Demand per OBCTotal Number of Fixture Units^[1] 1180.00**Interpolation of Anticipated Maximum Drainage Rate:**Maximum Drainage Rate for a total FU count of 1000 (as
per Table 7.4.10.5) 174.00 gal/minMaximum Drainage Rate for a total FU count of 2000 (as
per Table 7.4.10.5) 262.00 gal/min**Maximum Drainage Rate for proposed FU count (as per
Table 7.4.10.5) 189.84 gal/min****Maximum Drainage Rate 14.38 L/s**

Notes:

[1] Refer to mechanical plans for more details

Use the total Fixture Unit count and the table below to calculate the flow

Table 7.4.10.5.
Maximum Probable Drainage Rate, gal/min
Forming Part of Sentence 7.4.10.5.(2)

Item	Column 1	Column 2	Column 3	Column 4
	<i>Fixture Units in Service</i>	<i>Fixture Units</i>	<i>Fixture Units</i>	<i>Fixture Units</i>
		Col. 1	Col. 1 × 10	Col. 1 × 100
1.	100	53	174	900
2.	90	51	164	835
3.	80	49	153	750
4.	70	47	140	680
5.	60	44	128	600
6.	50	41	115	520
7.	40	38	102	435
8.	30	33	88	350
9.	20	27	72	262
10.	10	21	53	174

Project:	CHEO Integrated Treatment Centre							Design Data Min. Velocity 0.6 m/s Max. Velocity 3.0 m/s Manning's 'n' 0.013 Infiltration 0.330 L/s/ha			SANITARY SEWER DESIGN CALCULATIONS Residential Harmon 350 L/c/day Institutional 1.5 28000 L/Gross Ha/day															
Project No:	2021-0821-13																									
Date:	2025-02-21																									
Designed By:	ZS Checked By: SF																									
Description				Pipe Data From To Length (m)			Residential Area Units Density Population (ha) (ppu) (people)				Cumulative Area Population Peak Factor (ha) (people)			Institutional Area Total Area (ha) (ha)		Infiltration Area Total Area (ha) (ha)		Flow (L/s)	Total Flow (L/s)	Design Data Diameter Slope Q _{FULL} V _{FULL} Q/Q _{FULL} (mm) (%) (L/s) (m/s)						
Proposed Integrated Treatment Centre				SAN CON. 1 MH13A 16.3			0 0.00 0				0.00 0 3.60			2.17 2.17		2.17 2.17		1.77	1.77	250	0.53	43.29	0.88	0.04		
				MH13A EX.MH13A 15.3			0 0.00 0				0.00 0 0.00					0.00 2.17		1.77	1.77	300	0.50	68.38	0.97	0.03		
Per OBC:																	14.38	250	0.53	43.29	0.88	0.33				
																	14.38	300	0.50	68.38	0.97	0.21				

ANGLE	FLOW DEPTH	AREA	WETTED PERIMETER	HYDRAULIC RADIUS	DISCHARGE	VELOCITY
Theta (θ)	d/D	A/A _{FULL}	P/P _{FULL}	R/R _{FULL}	Q/Q _{FULL}	V/V _{FULL}
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.100	0.001	0.000	0.016	0.002	0.000	0.014
0.200	0.002	0.000	0.032	0.007	0.000	0.035
0.300	0.006	0.001	0.048	0.015	0.000	0.061
0.400	0.010	0.002	0.064	0.026	0.000	0.089
0.500	0.016	0.003	0.080	0.041	0.000	0.119
0.600	0.022	0.006	0.095	0.059	0.001	0.151
0.700	0.030	0.009	0.111	0.080	0.002	0.185
0.800	0.039	0.013	0.127	0.103	0.003	0.220
0.900	0.050	0.019	0.143	0.130	0.005	0.256
1.000	0.061	0.025	0.159	0.159	0.007	0.293
1.100	0.074	0.033	0.175	0.190	0.011	0.330
1.200	0.087	0.043	0.191	0.223	0.016	0.368
1.300	0.102	0.054	0.207	0.259	0.022	0.406
1.400	0.118	0.066	0.223	0.296	0.029	0.444
1.500	0.134	0.080	0.239	0.335	0.039	0.482
1.600	0.152	0.096	0.255	0.375	0.050	0.520
1.700	0.170	0.113	0.271	0.417	0.063	0.558
1.800	0.189	0.131	0.286	0.459	0.078	0.595
1.900	0.209	0.152	0.302	0.502	0.096	0.632
2.000	0.230	0.174	0.318	0.545	0.116	0.667
2.100	0.251	0.197	0.334	0.589	0.138	0.703
2.200	0.273	0.221	0.350	0.633	0.163	0.737
2.300	0.296	0.247	0.366	0.676	0.190	0.770
2.400	0.319	0.274	0.382	0.719	0.220	0.802
2.500	0.342	0.303	0.398	0.761	0.252	0.833
2.600	0.366	0.332	0.414	0.802	0.286	0.863
2.700	0.390	0.362	0.430	0.842	0.322	0.891
2.800	0.415	0.392	0.446	0.880	0.360	0.919
2.900	0.440	0.423	0.462	0.918	0.400	0.944
3.000	0.465	0.455	0.477	0.953	0.441	0.968
3.100	0.490	0.487	0.493	0.987	0.482	0.991
3.142	0.500	0.500	0.500	1.000	0.500	1.000
3.200	0.515	0.519	0.509	1.018	0.525	1.012
3.300	0.540	0.550	0.525	1.048	0.568	1.032
3.400	0.564	0.582	0.541	1.075	0.611	1.049
3.500	0.589	0.613	0.557	1.100	0.653	1.066
3.600	0.614	0.643	0.573	1.123	0.695	1.080
3.700	0.638	0.673	0.589	1.143	0.736	1.093
3.800	0.662	0.702	0.605	1.161	0.776	1.105
3.900	0.685	0.730	0.621	1.176	0.814	1.114
4.000	0.708	0.757	0.637	1.189	0.850	1.122
4.100	0.731	0.783	0.653	1.200	0.884	1.129
4.200	0.752	0.807	0.668	1.208	0.915	1.134
4.300	0.774	0.830	0.684	1.213	0.944	1.137
4.400	0.794	0.852	0.700	1.216	0.970	1.139
4.500	0.814	0.872	0.716	1.217	0.994	1.140
4.600	0.833	0.890	0.732	1.216	1.014	1.139
4.700	0.851	0.907	0.748	1.213	1.032	1.137
4.800	0.869	0.922	0.764	1.208	1.046	1.134
4.900	0.885	0.936	0.780	1.201	1.058	1.130
5.000	0.901	0.948	0.796	1.192	1.066	1.124
5.100	0.915	0.959	0.812	1.182	1.072	1.118
5.200	0.928	0.968	0.828	1.170	1.075	1.110
5.300	0.941	0.976	0.844	1.157	1.076	1.102
5.400	0.952	0.982	0.859	1.143	1.074	1.093
5.500	0.962	0.988	0.875	1.128	1.070	1.084
5.600	0.971	0.992	0.891	1.113	1.065	1.074
5.700	0.979	0.995	0.907	1.097	1.058	1.063
5.800	0.985	0.997	0.923	1.080	1.050	1.053
5.900	0.991	0.999	0.939	1.063	1.040	1.042
6.000	0.995	0.999	0.955	1.047	1.030	1.031
6.100	0.998	1.000	0.971	1.030	1.020	1.020
6.200	1.000	1.000	0.987	1.013	1.009	1.009
6.283	1.000	1.000	1.000	1.000	1.000	1.000

Flow Depth

$$\frac{d}{D} = \frac{1 - \cos\left(\frac{\theta}{2}\right)}{2}$$

Area

$$A = \frac{D^2}{8} (\theta - \sin\theta)$$

Wetted Perimeter

$$P = \frac{D}{2} \theta$$

Hydraulic Radius

$$R = \frac{D}{4} \left(1 - \frac{\sin\theta}{\theta}\right)$$

A/A_{FULL}

$$\frac{\theta - \sin\theta}{2\pi}$$

P/P_{FULL}

$$\frac{\theta}{2\pi}$$

R/R_{FULL}

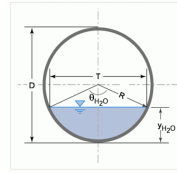
$$\frac{A \times P}{A_{FULL} \times P_{FULL}}$$

Q/Q_{FULL}

$$\frac{A}{A_{FULL}} \times \left(\frac{R}{R_{FULL}}\right)^{\frac{5}{3}}$$

V/V_{FULL}

$$\frac{Q}{Q_{FULL}} \times \frac{A_{FULL}}{A}$$



Determine the Anticipated Velocity at the Maximum Expected Flow (Q) 300mm dia pipe @ 0.50%			
Parameter	Value	Units	Notes
Q _{FULL}	68.38	L/s	Flow when pipe is flowing full
Q	14.38	L/s	Flow anticipated to be directed to the pipe from OBC calculations
Q/Q _{FULL}	0.210		
V/V _{FULL}	0.790		As determined by interpolating the table on the left
V _{FULL}	0.97	m/s	Velocity when pipe is flowing full
V	0.764	m/s	Velocity anticipated at the flow rate (Q) listed above

REQUIRED DOMESTIC WATER DEMAND MECP Design Criteria WALTERFEDY										
Project	CHEO Integrated Treatment Centre									
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	21,718	522	275	143,550	1.50	1.80	2.5	4.49	200	0.14
Proposed 1Door4Care Facility - Patients	21,718	251	25	6,275	1.50	1.80	0.1	0.20	200	0.01
Total							2.60	4.68	150	0.26
Fire Flow								117	200	3.72

Notes:

1. GFA based on architectural design
2. Anticipated staff and patient population taken from "1DOOR4CARE: CHEO INTEGRATED TREATMENT CENTRE - PRELIMINARY FUNCTIONAL SERVICING STUDY (1DOOR4CARE), prepared by Stantec October 25, 2022"
3. Per Capita Demands taken from City of Ottawa's Ottawa Sewer Design Guidelines, Appendix 4-A.
4. Maximum Day and Peak Hour Peaking Factors Determined using City of Ottawa Water Distribution Guidelines

REQUIRED FIRE FLOW

Water Supply for Public Fire Protection (FUS 2020)

WALTERFEDY

Project CHEO Integrated Treatment Centre
 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 21718 m²
 # Storeys 6
 Fire Resistant Building? NO
 Vertical Openings and Exterior Vertical Communications protected with minimum one (1) hr rating? YES

Area 7098 m²
 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

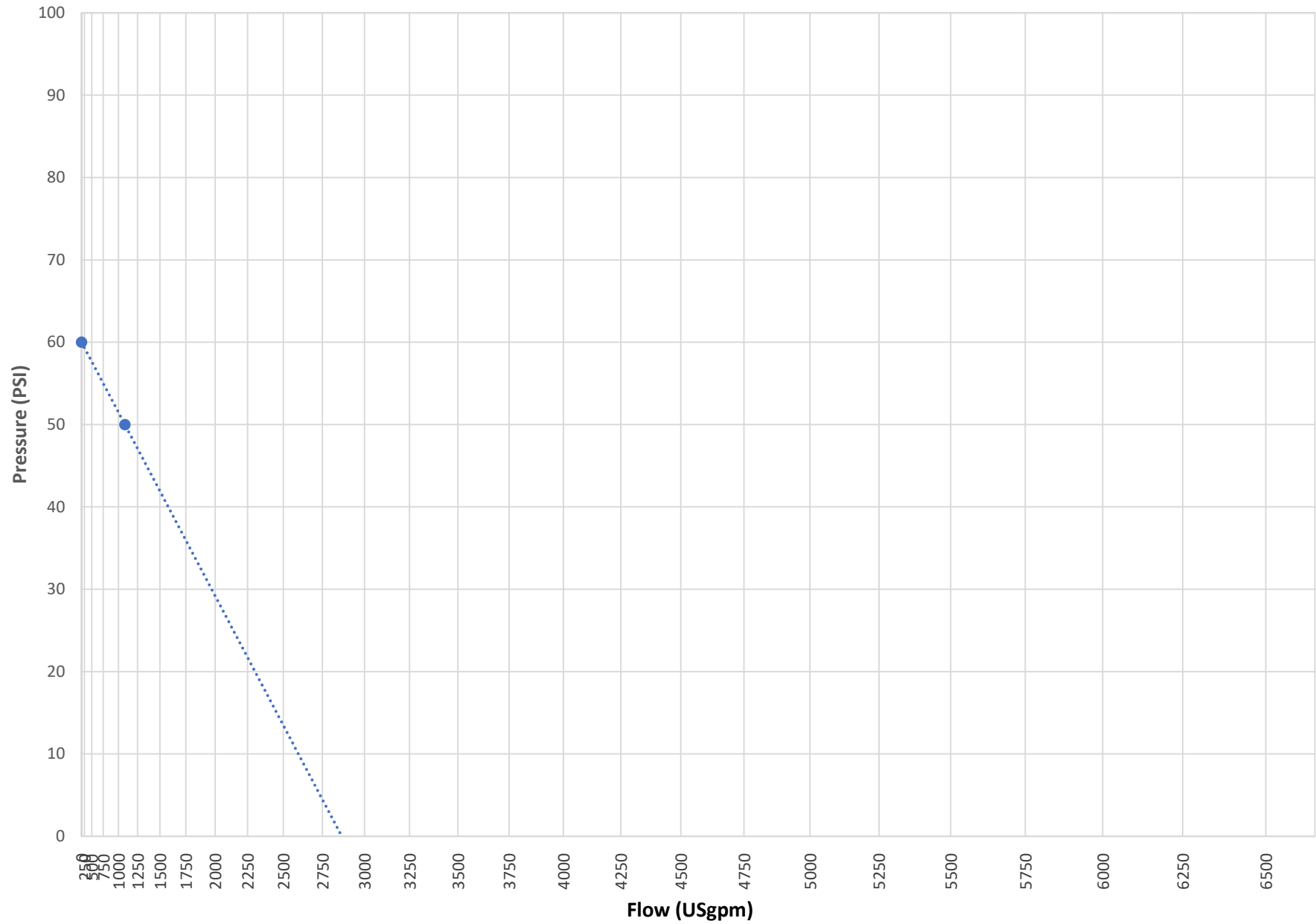
Exposure 3 (West) Distance N/A m Length-Height Factor N/A Charge 0%
 Description N/A

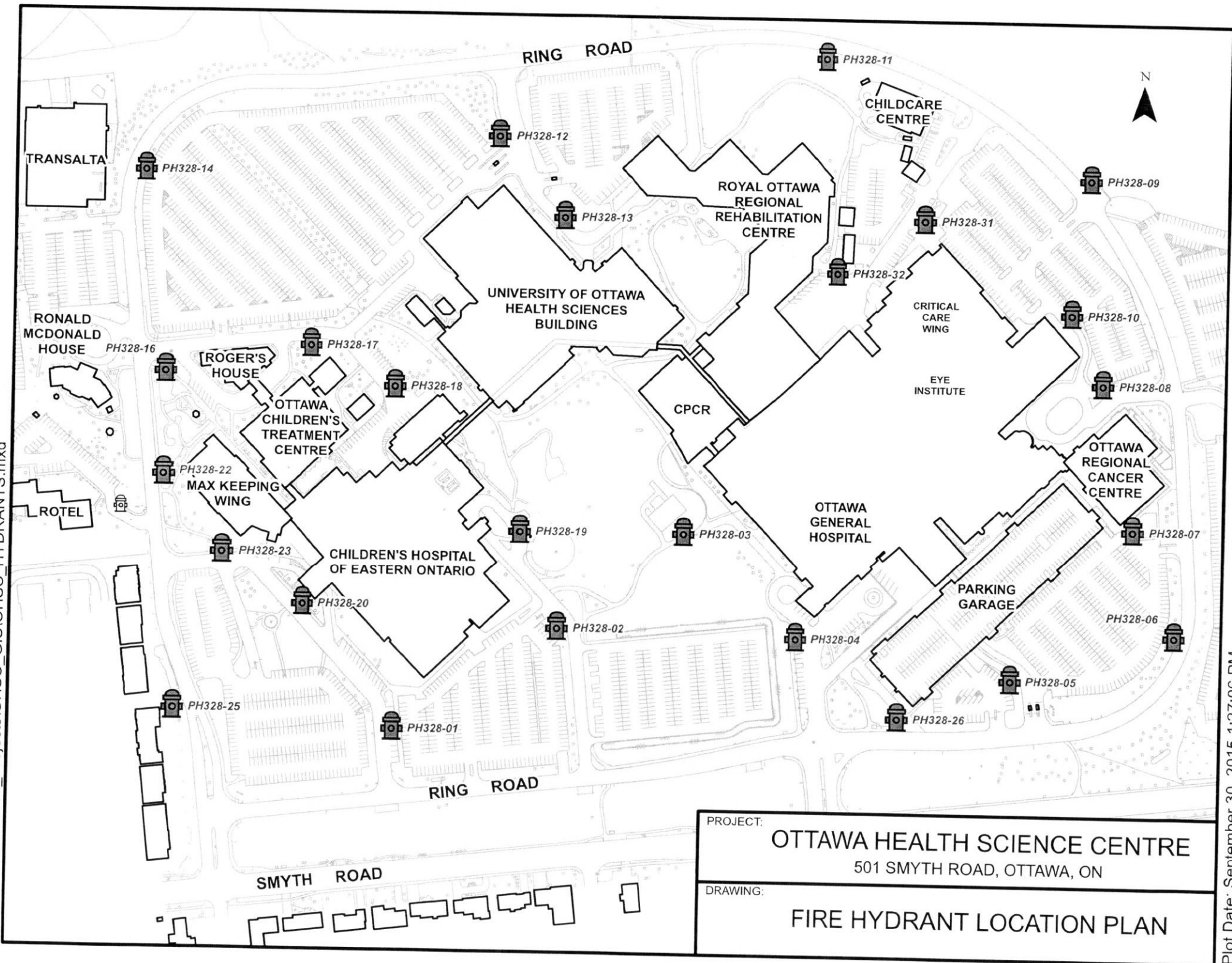
Exposure 4 (South) Distance 23 m Length-Height Factor >100 Charge 3%
 Description Existing Residential Buildings

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





Compliance Report



Fire Hydrant #: PH328- 0/

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): 48
Pitot Reading (GPM): 1160
Static Pressure (PSI): 60
Residual Pressure (PSI): 50

Flow @ 20 PSI (GPM): 2452

Visual inspection:

	Yes / No
Hydrant Accessible	☒ ☐
Caps Present	☒ ☐
Caps Easily Removed	☒ ☐
Barrel Draining	☒ ☐
Water Level	Drained
Painting Required	☐ ☒

Hydrant is in Compliance with Ontario Fire Code

YES



NO





FH ID #: PPH328-01

Date: 23 / 04 / 21 dd/mm/yy

W.O. #: 101791

Fire Hydrant Inspection Report

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

Isolation Valve		Yes	No	Nozzles and Threads		Yes	No
<u>VP063</u> Visible		☒		Loose			☒
Operates properly		☒		Damaged		☒	
Cap in place		☒		Leaking			☒
Valve open		☒		Repaired			☒
Barrel		Yes	No	Proper nozzle orientation		☒	
Self draining		☒		Pumper nozzle		☒	
Water level	Dry			Hydrant		Yes	No
Plugged			☒	Colour coded		☒	
Ground Flange		Yes	No	Painting required			☒
Solid		☒		Lubricate upper stem		☒	
Buried			☒	Operation satisfactory		☒	
Damaged			☒	Restoration required		☒	
Caps and Gaskets		Yes	No	Hydrant marker in place		☒	
Missing			☒				
Replaced			☒				
Lubricated		☒					

Hydro Static Testing	Yes	No	Flow Testing	
Prior to opening - underground leak	☒		Pitot reading (PSI) <u>48</u>	
Fully open - above ground leak		☒	Pitot reading (GPM) <u>1160</u>	
Fully open - underground leak	☒		Static Pressure (PSI) <u>60</u>	
Fully closed - underground leak	☒		Volume of water used (GPM x total flow min.)	
			Residual pressure (PSI) <u>50</u>	
			Flow @ 20 PSI <u>2452</u>	

Comments: slight damage to both hose nozzles.

Possible underground leak upstream from main valve disc.

L> Re & Re (approx 6 ft to top of valve)

Compliance Report



Fire Hydrant #: PH328- 02

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): 50
Pitot Reading (GPM): 1190
Static Pressure (PSI): 64
Residual Pressure (PSI): 54

Flow @ 20 PSI (GPM): 2649

Visual inspection:

	Yes / No
Hydrant Accessible	☒ ☐
Caps Present	☒ ☐
Caps Easily Removed	☒ ☐
Barrel Draining	☒ ☐
Water Level	Drained
Painting Required	☐ ☒

Hydrant is in Compliance with Ontario Fire Code

YES



NO





FH ID #: PH328-02

Date: 27 / 04 / 21 dd/mm/yy

W.O. #: 101791

Fire Hydrant Inspection Report

Customer	TCH	Contact	
Site Name	General campus	Phone #	
Site Address	501 Smyth	P.O. #	
Inspected By	AVR	Make / Model	
Inspection #	1 2 3 4 (5) 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
VP 067	Visible	✓		Loose			✓
	Operates properly	✓		Damaged			✓
	Cap in place	✓		Leaking			✓
	Valve open	✓		Repaired			✓
Barrel		Yes	No	Proper nozzle orientation		✓	
Water level	Self draining	✓		Pumper nozzle		✓	
	Dry			Hydrant		Yes	No
Ground Flange	Plugged		✓	Colour coded	✓		
	Solid	✓		Painting required			✓
	Buried		✓	Lubricate upper stem	✓		
Caps and Gaskets	Damaged		✓	Operation satisfactory	✓		
	Yes	No		Restoration required	✓		
	Missing		✓	Hydrant marker in place	✓		
	Replaced		✓				
	Lubricated	✓					

Hydro Static Testing	Yes	No	Flow Testing	
Prior to opening - underground leak		✓	Pitot reading (PSI)	50
Fully open - above ground leak	✓		Pitot reading (GPM)	1190
Fully open - underground leak			Static Pressure (PSI)	64
Fully closed - underground leak		✓	Volume of water used (GPM x total flow min.)	
			Residual pressure (PSI)	54
			Flow @ 20 PSI	2649

Comments:

Leaking from bonnet → Top seats

Possible internal damage → Conversion

Compliance Report



Fire Hydrant #: PH328- 03

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): 44
Pitot Reading (GPM): 1110
Static Pressure (PSI): 60
Residual Pressure (PSI): 50

Flow @ 20 PSI (GPM): 2347

Visual inspection:

	Yes / No
Hydrant Accessible	☒ ☐
Caps Present	☒ ☐
Caps Easily Removed	☒ ☐
Barrel Draining	☒ ☐
Water Level	Drained
Painting Required	☐ ☒

Hydrant is in Compliance with Ontario Fire Code

YES



NO





FH ID #: PH 328-03

Date: 27 / 04 / 21 dd/mm/yy

W.O. #: 101791

Fire Hydrant Inspection Report

Customer	ToH	Contact	
Site Name	General Campus	Phone #	
Site Address	501 Smyth	P.O. #	
Inspected By	AKR	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
<u>VP 005</u>	Visible	☒			Loose		☒
	Operates properly	☒			Damaged		☒
	Cap in place	☒			Leaking		☒
	Valve open	☒			Repaired		☒
Barrel		Yes	No	Proper nozzle orientation		☒	
Self draining		☒		Pumper nozzle		☒	
Water level	Dry			Hydrant		Yes	No
Plugged			☒	Colour coded		☒	
Ground Flange		Yes	No	Painting required			☒
Solid		☒		Lubricate upper stem		☒	
Buried			☒	Operation satisfactory		☒	
Damaged			☒	Restoration required			☒
Caps and Gaskets		Yes	No	Hydrant marker in place		☒	
Missing			☒				
Replaced			☒				
Lubricated		☒					

Hydro Static Testing		Yes	No	Flow Testing	
Prior to opening - underground leak			☒	Pitot reading (PSI) <u>44</u>	
Fully open - above ground leak			☒	Pitot reading (GPM) <u>over 1110</u>	
Fully open - underground leak			☒	Static Pressure (PSI) <u>60</u>	
Fully closed - underground leak			☒	Volume of water used (GPM x total flow min.) <u>50</u>	
				Residual pressure (PSI)	
				Flow @ 20 PSI <u>2347</u>	

Comments:

Compliance Report



Fire Hydrant #: PH328- 04

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): 40
Pitot Reading (GPM): 1060
Static Pressure (PSI): 62
Residual Pressure (PSI): 52

Flow @ 20 PSI (GPM): 2300

Visual inspection:

	Yes / No
Hydrant Accessible	☒ ☐
Caps Present	☒ ☐
Caps Easily Removed	☒ ☐
Barrel Draining	☒ ☐
Water Level	Drained
Painting Required	☐ ☒

Hydrant is in Compliance with Ontario Fire Code

YES



NO





FH ID #: PH328-04

Date: 27/04/21 dd/mm/yy

W.O. #: 101791

Fire Hydrant Inspection Report

Customer	TCH	Contact	
Site Name	General Campus	Phone #	
Site Address	501 Smyth	P.O. #	
Inspected By	AKR	Make / Model	
Inspection #	1 2 3 4 5 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
VP 063	Visible	✓			Loose		✓
	Operates properly	✓			Damaged		✓
	Cap in place	✓			Leaking		✓
	Valve open	✓			Repaired		✓
Barrel		Yes	No	Proper nozzle orientation		✓	
Water level	Self draining	✓		Pumper nozzle		✓	
	Dry			Hydrant		Yes	No
Ground Flange	Plugged		✓	Colour coded		✓	
	Solid	✓		Painting required			✓
	Buried		✓	Lubricate upper stem		✓	
	Damaged		✓	Operation satisfactory		✓	
Caps and Gaskets		Yes	No	Restoration required			✓
	Missing		✓	Hydrant marker in place		✓	
	Replaced		✓				
	Lubricated	✓					

Hydro Static Testing	Yes	No	Flow Testing	
Prior to opening - underground leak		✓	Pitot reading (PSI)	40
Fully open - above ground leak		✓	Pitot reading (GPM)	1060
Fully open - underground leak		✓	Static Pressure (PSI)	82
Fully closed - underground leak		✓	Volume of water used (GPM x total flow min.)	
			Residual pressure (PSI)	52
			Flow @ 20 PSI	2300

Comments:

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	☒ ☐
Caps Present	☒ ☐
Caps Easily Removed	☒ ☐
Barrel Draining	☒ ☐
Water Level	Drained
Painting Required	☐ ☒

**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	ToH	Contact	
Site Name	General Campus	Phone #	
Site Address	501 Smyth	P.O. #	
Inspected By	AJR	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
Visible		☒		Loose			☒
Operates properly				Damaged		☒	
Cap in place		☒		Leaking			☒
Valve open				Repaired			☒
Barrel		Yes	No	Proper nozzle orientation		☒	
Self draining		☒		Pumper nozzle		☒	
Water level	Dry			Hydrant		Yes	No
Plugged			☒	Colour coded		☒	
Ground Flange		Yes	No	Painting required			☒
Solid		☒		Lubricate upper stem		☒	
Buried			☒	Operation satisfactory		☒	
Damaged			☒	Restoration required		☒	
Caps and Gaskets		Yes	No	Hydrant marker in place		☒	
Missing			☒				
Replaced			☒				
Lubricated		☒					

Hydro Static Testing		Yes	No	Flow Testing		
Prior to opening - underground leak			☒	Pitot reading (PSI)		42
Fully open - above ground leak		☒		Pitot reading (GPM)		1090
Fully open - underground leak			☒	Static Pressure (PSI)		60
Fully closed - underground leak			☒	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

Compliance Report



Fire Hydrant #: PH328- 23

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	☒ ☐
Caps Present	☒ ☐
Caps Easily Removed	☒ ☐
Barrel Draining	☒ ☐
Water Level	Drained
Painting Required	☐ ☒

Hydrant is in Compliance with Ontario Fire Code

YES



NO





FH ID #: PH 328-23

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

W.O. #: 101791

Fire Hydrant Inspection Report

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

Isolation Valve		Yes	No	Nozzles and Threads		Yes	No
<u>No iso valve</u>	Visible	<u>N</u>			Loose		
	Operates properly	<u>N</u>			Damaged		
	Cap in place	<u>A</u>			Leaking		
	Valve open				Repaired		
Barrel		Yes	No	Proper nozzle orientation			
	Self draining	<u>✓</u>		Pumper nozzle			
Water level	Dry			Hydrant		Yes	No
	Plugged			Colour coded			
Ground Flange		Yes	No	Painting required			
	Solid	<u>✓</u>		Lubricate upper stem			
	Buried		<u>✓</u>	Operation satisfactory			
	Damaged		<u>✓</u>	Restoration required			
Caps and Gaskets		Yes	No	Hydrant marker in place			
	Missing		<u>✓</u>				
	Replaced		<u>✓</u>				
	Lubricated	<u>✓</u>					

Hydro Static Testing		Yes	No	Flow Testing	
Prior to opening - underground leak			<u>✓</u>	Pitot reading (PSI)	<u>42</u>
Fully open - above ground leak	<u>✓</u>			Pitot reading (GPM)	<u>1090</u>
Fully open - underground leak			<u>✓</u>	Static Pressure (PSI)	<u>60</u>
Fully closed - underground leak			<u>✓</u>	Volume of water used (GPM x total flow min.)	
				Residual pressure (PSI)	<u>50</u>
				Flow @ 20 PSI	<u>2304</u>

Comments: Draining very slow.
Already checked ports in December
↳ Excavate
Leaking from bonnet.
Had new seals in December
↳ Internals worn out.
Getting tough to operate again.

⇒ Re & Re + iso valve

Compliance Report



Fire Hydrant #: PH328- 25

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): 48
Pitot Reading (GPM): 1160
Static Pressure (PSI): 62
Residual Pressure (PSI): 52

Flow @ 20 PSI (GPM): 2517

Visual inspection:

	Yes / No
Hydrant Accessible	☒ ☐
Caps Present	☒ ☐
Caps Easily Removed	☒ ☐
Barrel Draining	☒ ☐
Water Level	Drained
Painting Required	☐ ☒

**Hydrant is in Compliance with
Ontario Fire Code**

YES



NO





FH ID #: PH328-25

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

W.O. #: 101791

Fire Hydrant Inspection Report

Customer	TOH	Contact	
Site Name	General Campus	Phone #	
Site Address	501 Smyth	P.O. #	
Inspected By	AKR	Make / Model	
Inspection #	1 2 3 4 5 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
Visible		☒		Loose			☒
Operates properly		☒		Damaged			☒
Cap in place		☒		Leaking			☒
Valve open		☒		Repaired			☒
Barrel		Yes	No	Proper nozzle orientation		Yes	No
Self draining		☒		Pumper nozzle		☒	
Water level	Dry			Hydrant		Yes	No
Plugged			☒	Colour coded		☒	
Ground Flange		Yes	No	Painting required			☒
Solid		☒		Lubricate upper stem			☒
Buried			☒	Operation satisfactory		☒	
Damaged			☒	Restoration required		☒	
Caps and Gaskets		Yes	No	Hydrant marker in place		☒	
Missing			☒				
Replaced			☒				
Lubricated		☒					

Hydro Static Testing	Yes	No	Flow Testing	
Prior to opening - underground leak		☒	Pitot reading (PSI)	48
Fully open - above ground leak	☒		Pitot reading (GPM)	1160
Fully open - underground leak		☒	Static Pressure (PSI)	62
Fully closed - underground leak		☒	Volume of water used (GPM x total flow min.)	
			Residual pressure (PSI)	52
			Flow @ 20 PSI	2517

Comments: Leaking from barrel.
Cracked bearing housing
↳ Hydratube conversion

Compliance Report



Fire Hydrant #: PH328-26

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): 40
Pitot Reading (GPM): 1060
Static Pressure (PSI): 62
Residual Pressure (PSI): 52

Flow @ 20 PSI (GPM): 2300

Visual inspection:

	Yes / No
Hydrant Accessible	☒ ☐
Caps Present	☒ ☐
Caps Easily Removed	☒ ☐
Barrel Draining	☒ ☐
Water Level	Drained
Painting Required	☐ ☒

Hydrant is in Compliance with Ontario Fire Code

YES



NO





FH ID #: PH 328-26

Date: 03 / 05 / 21 dd/mm/yy

W.O. #: 101791

Fire Hydrant Inspection Report

Customer	<u>ICM</u>	Contact	
Site Name	<u>General Campus</u>	Phone #	
Site Address	<u>301 Smyth</u>	P.O. #	
Inspected By	<u>A.R.</u>	Make / Model	
Inspection #	<u>1 2 3 4 5 6 7 SP</u>	Year of Man.	
Barrel Ext.		Hose Nozzles	
Flange Elev.		Hydrant Colour	Body: Top:

Isolation Valve		Yes	No	Nozzles and Threads		Yes	No
<u>VP 053</u>	Visible		<u>X</u>		Loose		<u>✓</u>
	Operates properly				Damaged		<u>✓</u>
	Cap in place				Leaking		<u>✓</u>
	Valve open				Repaired		<u>✓</u>
Barrel		Yes	No	Proper nozzle orientation			<u>✓</u>
	Self draining	<u>✓</u>		Pumper nozzle		<u>✓</u>	
Water level	Dry			Hydrant		Yes	No
	Plugged		<u>✓</u>	Colour coded		<u>✓</u>	
Ground Flange		Yes	No	Painting required			<u>✓</u>
	Solid	<u>✓</u>		Lubricate upper stem		<u>✓</u>	
	Buried		<u>✓</u>	Operation satisfactory		<u>✓</u>	
	Damaged		<u>✓</u>	Restoration required			<u>✓</u>
Caps and Gaskets		Yes	No	Hydrant marker in place		<u>✓</u>	
	Missing		<u>✓</u>				
	Replaced		<u>✓</u>				
	Lubricated	<u>✓</u>					

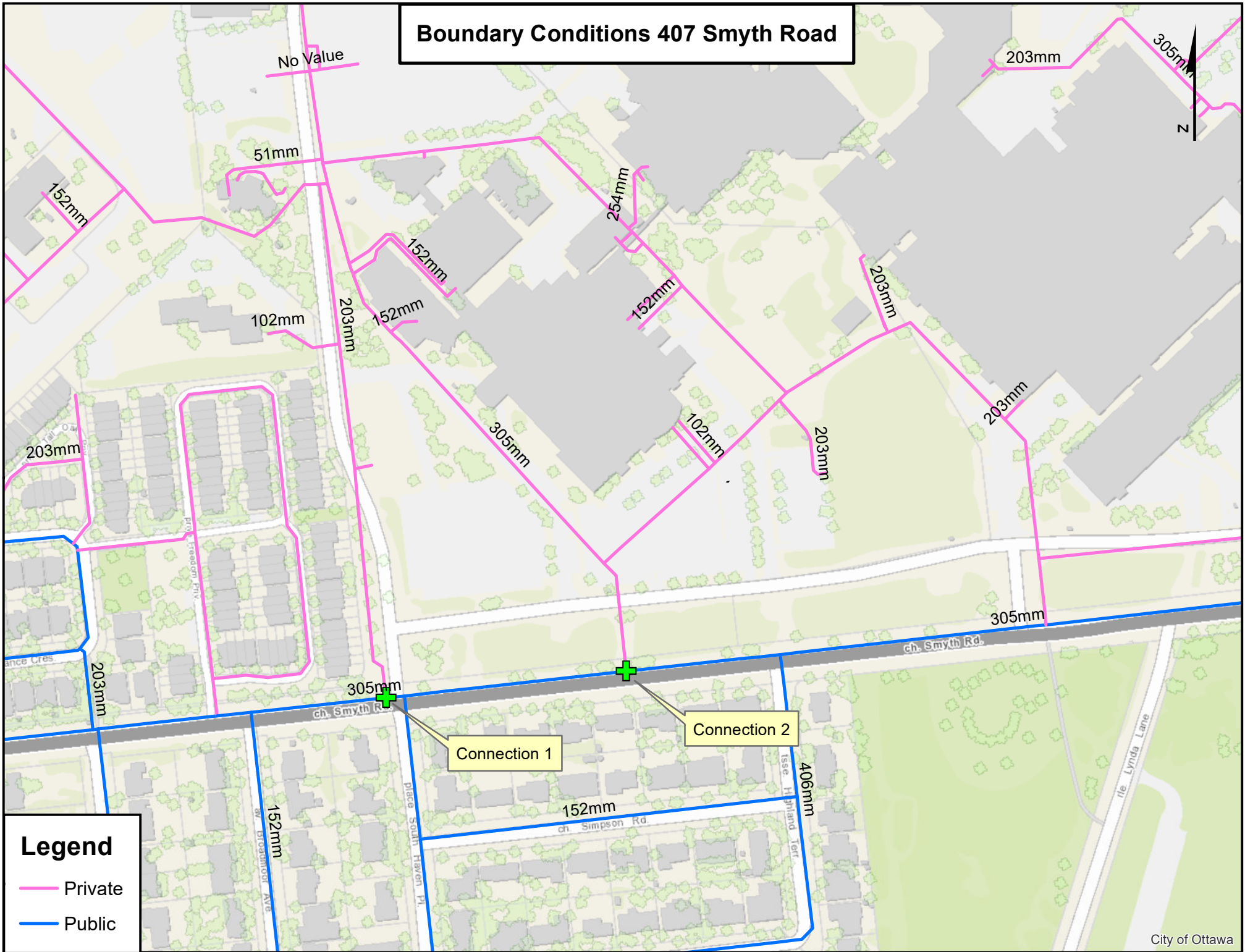
Hydro Static Testing		Yes	No	Flow Testing	
Prior to opening - underground leak			<u>✓</u>	Pitot reading (PSI)	<u>40</u>
Fully open - above ground leak			<u>✓</u>	Pitot reading (GPM)	<u>1060</u>
Fully open - underground leak			<u>✓</u>	Static Pressure (PSI)	<u>62</u>
Fully closed - underground leak			<u>✓</u>	Volume of water used (GPM x total flow min.)	
				Residual pressure (PSI)	<u>52</u>
				Flow @ 20 PSI	<u>2300</u>

Comments:

Valve not visible, able to isolate with zone valves. This will turn off 3 or 4 hydrants together. No buildings affected.

Hydrant is accessible by Ontario Fire Code standards, however, we do recommend rotating the hydrant to facilitate quicker/easier hook ups during an emergency situation.

Boundary Conditions 407 Smyth Road



RE: CHEO ITC - Water Boundary Condition Request

From Bramah, Bruce <bruce.bramah@ottawa.ca>

Date Tue 12/17/2024 7:27 AM

To Michael Munde <mmunde@ellisdon.com>

Cc Faris Eltayeb <feltayeb@ellisdon.com>; ed-41236@gatethree.ca <ed-41236@gatethree.ca>

Good morning,

Yes, we will process the BC request. Typically results will be received within 2-3 weeks.

Thanks

--

Bruce Bramah, P.Eng

Project Manager

Planning, Development, and Building Services Department | Direction générale des services de la planification, de l'aménagement et du bâtiment

Development Review - South Branch

City of Ottawa | Ville d'Ottawa

110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1

613.580.2424 ext./poste 29686, Bruce.Bramah@ottawa.ca

From: Michael Munde <mmunde@ellisdon.com>

Sent: December 17, 2024 6:04 AM

To: Bramah, Bruce <bruce.bramah@ottawa.ca>

Cc: Faris Eltayeb <feltayeb@ellisdon.com>; ed-41236@gatethree.ca

Subject: Re: CHEO ITC - Water Boundary Condition Request

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Good morning, Bruce

Just wanted to confirm that you've received everything you for this.

Cheers,
Michael Munde | EllisDon Corp.
Senior Project Manager
613-315-6854

From: Michael Munde <mmundee@ellisdon.com>
Sent: Friday, December 13, 2024 11:00:50 AM
To: Bramah, Bruce <bruce.bramah@ottawa.ca>
Cc: Faris Eltayeb <feltayeb@ellisdon.com>; ed-41236@gatethree.ca <ed-41236@gatethree.ca>
Subject: Re: CHEO ITC - Water Boundary Condition Request

Hi Bruce,

Please updated information below:

Location of Service – north side of building, connecting to CHEO campus system - refer to Site Servicing drawing

Total Fire flow per FUS – 117 L/s - Non combustible construction, occupancy charge (-15%), auto sprinkler credit (-50%), exposure (+6%)

Average Day – 1.73L/s

Max Day – 2.61 L/s

Peak hour daily demand - **4.70L/s**

Cheers,

Michael Munde | EllisDon Corp.

Senior Project Manager

C: 613-315-6854

E: mmundee@ellisdon.com

From: Bramah, Bruce <bruce.bramah@ottawa.ca>
Sent: Thursday, December 12, 2024 11:33 AM
To: Michael Munde <mmundee@ellisdon.com>
Cc: Faris Eltayeb <feltayeb@ellisdon.com>; ed-41236@gatethree.ca <ed-41236@gatethree.ca>
Subject: RE: CHEO ITC - Water Boundary Condition Request

Hi Michael,

As per the Technical Bulletin ISD-2010-02 and Ottawa Water Design Guideline 4.2.8, Table 2: The peaking factor for Max Day is 1.5 x Avg Day, Max Hour is 1.8 x Max Day.

Your Max Hour demand is currently showing 1.8 x Avg Day which does not meet our guidelines. Please revise your Max Hour accordingly and resubmit.

Thanks,

--

Bruce Bramah, P.Eng

Project Manager

Planning, Development, and Building Services Department | Direction générale des services de la planification, de l'aménagement et du bâtiment

Development Review - South Branch

City of Ottawa | Ville d'Ottawa

110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1

613.580.2424 ext./poste 29686, Bruce.Bramah@ottawa.ca

From: Michael Munde <mmundee@ellisdon.com>
Sent: December 12, 2024 10:11 AM
To: Bramah, Bruce <bruce.bramah@ottawa.ca>
Cc: Faris Eltayeb <feltayeb@ellisdon.com>; ed-41236@gatethree.ca
Subject: Re: CHEO ITC - Water Boundary Condition Request

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Bruce,

Location of Service – north side of building, connecting to CHEO campus system - refer to Site Servicing drawing

Total Fire flow per FUS – 117 L/s - Non combustible construction, occupancy charge (-15%), auto sprinkler credit (-50%), exposure (+6%)

Average Day – 1.73L/s

Max Day – 2.61 L/s

Peak hour daily demand 3.13L/s

Cheers,

Michael Mundeel | EllisDon Corp.

Senior Project Manager

C: 613-315-6854

E: mmundee@ellisdon.com

From: Bramah, Bruce <bruce.bramah@ottawa.ca>

Sent: Thursday, December 12, 2024 7:58 AM

To: Michael Mundeel <mmundee@ellisdon.com>

Cc: Faris Eltayeb <feltayeb@ellisdon.com>; ed-41236@gatethree.ca <ed-41236@gatethree.ca>

Subject: RE: CHEO ITC - Water Boundary Condition Request

Good morning Michael,

Boundary condition request shall provide the following information as per the pre-consultation notes:

Water boundary condition requests must include the location of the service(s) and the expected loads required by the proposed developments. Please provide all the following information:

- o Location of service(s)
- o Type of development and the amount of fire flow required (as per FUS, 2020).
- o Average daily demand: ___ l/s.

- o Maximum daily demand: ____ l/s.
- o Maximum hourly daily demand: ____ l/s.

Fire protection (Fire demand, Hydrant Locations)

Please provide a rough Geo-Ottawa image showing with the existing connection locations to the public watermain and the required fire flow as per FUS 2020. Please also provide the calculations table as they differ from the domestic water demand table within the first submission and the Ottawa Water Design Guidelines.

Thanks,

--

Bruce Bramah, P.Eng

Project Manager

Planning, Development, and Building Services Department | Direction générale des services de la planification, de l'aménagement et du bâtiment

Development Review - South Branch

City of Ottawa | Ville d'Ottawa

110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1

613.580.2424 ext./poste 29686, Bruce.Bramah@ottawa.ca

From: Michael Munde <mmunde@ellisdon.com>

Sent: December 12, 2024 6:45 AM

To: Bramah, Bruce <bruce.bramah@ottawa.ca>

Cc: Faris Eltayeb <feltayeb@ellisdon.com>; ed-41236@gatethree.ca

Subject: CHEO ITC - Water Boundary Condition Request

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Hi Bruce,

Thanks for your call this morning and clarifying the comment regarding the boundary conditions.

Here is the requested information:

Average Day – 1.73L/s

Max Day – 2.61 L/s

Peak hour daily demand 3.13L/s

Cheers,

Michael Mundeel | EllisDon Corp.

Senior Project Manager

C: 613-315-6854

E: mmundeel@ellisdon.com

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,

RE: CHEO ITC - Water Boundary Condition Request

From Bramah, Bruce <bruce.bramah@ottawa.ca>

Date Fri 12/20/2024 11:47 AM

To Michael Munde <mmunde@ellisdon.com>

Cc Faris Eltayeb <feltayeb@ellisdon.com>; ed-41236@gatethree.ca <ed-41236@gatethree.ca>

 1 attachment (1 MB)

407 Smyth Road December 2024.pdf;

Hi Michael,

Quick turn around on this one, please see below:

The following are boundary conditions, HGL, for hydraulic analysis at 407 Smyth Road (zone 2W2C) assumed to be connected via two connections at the 305 mm watermain on Smyth Road (see attached PDF for location).

Both Connections:

Min HGL: 123.5 m

Max HGL: 131.1 m

Max Day + FF (117.0 L/s): 122.4 m (Connection 1), 123.5 m (Connection 2)

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

Thanks,

--

Bruce Bramah, P.Eng

Project Manager

Planning, Development, and Building Services Department | Direction générale des services de la planification, de l'aménagement et du bâtiment

Development Review - South Branch

City of Ottawa | Ville d'Ottawa

110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1

613.580.2424 ext./poste 29686, Bruce.Bramah@ottawa.ca

From: Michael Munde <mmunde@ellisdon.com>

Sent: December 13, 2024 11:01 AM

To: Bramah, Bruce <bruce.bramah@ottawa.ca>

Cc: Faris Eltayeb <feltayeb@ellisdon.com>; ed-41236@gatethree.ca

Subject: Re: CHEO ITC - Water Boundary Condition Request

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Hi Bruce,

Please updated information below:

Location of Service – north side of building, connecting to CHEO campus system - refer to Site Servicing drawing

Total Fire flow per FUS – 117 L/s - Non combustible construction, occupancy charge (-15%), auto sprinkler credit (-50%), exposure (+6%)

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Max Day – 2.61 L/s

Peak hour daily demand - **4.70L/s**

Cheers,

Michael Munde | EllisDon Corp.

Senior Project Manager

C: 613-315-6854

E: mmundee@ellisdon.com

From: Bramah, Bruce <bruce.bramah@ottawa.ca>

Sent: Thursday, December 12, 2024 11:33 AM

To: Michael Munde <mmundee@ellisdon.com>

Cc: Faris Eltayeb <feltayeb@ellisdon.com>; ed-41236@gatethree.ca <ed-41236@gatethree.ca>

Subject: RE: CHEO ITC - Water Boundary Condition Request

Hi Michael,

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Your Max Hour demand is currently showing 1.8 x Avg Day which does not meet our guidelines. Please revise your Max Hour accordingly and resubmit.

Thanks,

--

Bruce Bramah, P.Eng

Project Manager

Planning, Development, and Building Services Department | Direction générale des services de la planification, de l'aménagement et du bâtiment

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Senior Project Manager

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E: mmundee@ellisdon.com

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Subject: RE: CHEO ITC - Water Boundary Condition Request

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- o Average daily demand: ____ l/s.
- o Maximum daily demand: ____ l/s.
- o Maximum hourly daily demand: ____ l/s.

Fire protection (Fire demand, Hydrant Locations)

Please provide a rough Geo-Ottawa image showing with the existing connection locations to the public watermain and the required fire flow as per FUS 2020. Please also provide the calculations table as they differ from the domestic water demand table within the first submission and the Ottawa Water Design Guidelines.

Thanks,

--

Bruce Bramah, P.Eng

Project Manager

Planning, Development, and Building Services Department | Direction générale des services de la planification, de l'aménagement et du bâtiment

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From: Michael Munde <mmundee@ellisdon.com>
Sent: December 12, 2024 6:45 AM
To: Bramah, Bruce <bruce.bramah@ottawa.ca>
Cc: Faris Eltayeb <feltayeb@ellisdon.com>; ed-41236@gatethree.ca
Subject: CHEO ITC - Water Boundary Condition Request

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Hi Bruce,

Thanks for your call this morning and clarifying the comment regarding the boundary conditions.
Here is the requested information:

Average Day – 1.73L/s

Max Day – 2.61 L/s

Peak hour daily demand 3.13L/s

Cheers,

Michael Mundee | EllisDon Corp.

Senior Project Manager

C: 613-315-6854

E: mmundee@ellisdon.com

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APPENDIX C

Stormwater Management Details

TABLE 1
DESIGN STORM PARAMETERS

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
CHEO INTEGRATED TREATMENT CENTRE
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
PRE-DEVELOPMENT CATCHMENT AREA PARAMETERS AND ALLOWABLE RELEASE RATES

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
CHEO INTEGRATED TREATMENT CENTRE
OTTAWA, ONTARIO

Subcatchment	Comment	Area (ha)	Runoff Coefficient ^[1]
Existing Conditions Catchment Area Parameters			
To Ring Road Major System			
EXT-1	Section of ring road on the southern limits of the Site	0.256	0.5
EXT-2	Portion of existing external asphalt parking lot that directs runoff onto entrance driveway to CHEO entrance	0.146	0.5
100	The northern most portion of the existing external asphalt parking lot	0.105	0.5
103B	Southwestern portion of existing asphalt parking lot west of the main entrance to CHEO	0.618	0.5
104	Existing gravel overflow parking west of the main entrance to CHEO	0.351	0.5
106	Northwest portion of the existing driveway connecting Ring Road to the main entrance of CHEO	0.218	0.5
Total to Ring Road		1.694	0.5
To Storm Sewer System			
EXT-3	External catchment capturing flows from external asphalt parking lot	0.962	0.5
101	Existing landscaped area south of the existing CHEO main entrance	0.102	0.5
102	Southeast portion of existing driveway connecting Ring Road to the main entrance of CHEO	0.349	0.5
103A	Existing asphalt parking lot west of the main entrance to CHEO	0.287	0.5
105	Landscaped area located north of the main entrance of the existing CHEO building	0.189	0.5
Total to Storm Sewer System		1.889	0.5

Notes:
(1) Runoff Coefficient of 0.5 has been applied as per the recommendations listed within the "*Ottawa Health Sciences Centre Stormwater Master Plan*" prepared by Morrison Hershfield (July 2019)
(2) The allowable release rates have 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.

Allowable Release Rate Calculations, Rational Method Formula: Q = 2.78*C*I*A				
Outlet ID	Total Contributing Area (ha)	Runoff Coefficient ^[1]	2-year Design Storm Intensity (mm/hr) ^[2]	Allowable Peak Flow Rate (L/s)
Ring Road Major System	1.694	0.5	76.81	180.85
Storm Sewer System	1.889	0.5	76.81	201.67

TABLE 3
PROPOSED CATCHMENT PARAMETERS

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
CHEO INTEGRATED TREATMENT CENTRE
OTTAWA, ONTARIO

Subcatchment	Comment	Area (ha)	Percent Impervious ² (%)	Width (m)	Flow Length (m)	Slope (%)	Mannings Roughness		Horton Infiltration ¹			Depression Storage		Percent Zero Impervious (%)	Subarea Routing	Percent Routed (%)
							Impervious	Pervious	Max. Infiltration Rate (mm/hr)	Min. Infiltration Rate (mm/hr)	Decay Constant (1/hr)	Impervious (mm)	Pervious (mm)			
Proposed Conditions																
Internal Catchments																
222	Landscaped area south of existing CHEO main entrance	0.11	30	53	20	0.5	0.013	0.240	76.20	13.20	4.14	1.57	4.67	25	OUTLET	100
223	Portion of existing external asphalt parking lot that directs runoff onto entrance driveway to CHEO entrance	0.11	87	40	28	0.5	0.013	0.240	76.20	13.20	4.14	1.57	4.67	25	OUTLET	100
224A	Northern portion of proposed Integrate Treatment Centre Building - attenuated by green roof system	0.14	90	37	37	0.5	0.013	0.240	76.20	13.20	4.14	1.57	4.67	25	OUTLET	100
224B	Central portion of proposed Integrate Treatment Centre Building - attenuated by control flow roof drains	0.22	90	79	28	0.5	0.013	0.240	76.20	13.20	4.14	1.57	4.67	25	OUTLET	100
224C	Southern portion of proposed Integrate Treatment Centre Building - attenuated by green roof system	0.12	90	44	28	0.5	0.013	0.240	76.20	13.20	4.14	1.57	4.67	25	OUTLET	100
225A	Northern portion of the driveway between proposed Integrated Treatment Centre building and existing CHEO entrance	0.17	82	34	49	2.5	0.013	0.240	76.20	13.20	4.14	1.57	4.67	25	OUTLET	100
225B	Southern Portion of the driveway between proposed Integrated Treatment Centre building and existing CHEO entrance	0.29	82	28	106	2.1	0.013	0.240	76.20	13.20	4.14	1.57	4.67	25	OUTLET	100
226	South intersection between Site driveway and Ring Road	0.10	79	27	37	3.5	0.013	0.240	76.20	13.20	4.14	1.57	4.67	25	OUTLET	100
227	Proposed parking lot in front of the Integrated Treatment Centre bu	0.43	75	57	76	2.0	0.013	0.240	76.20	13.20	4.14	1.57	4.67	25	OUTLET	100
228	Proposed landscaped area on northern limits of the Site	0.21	25	21	100	6.9	0.013	0.240	76.20	13.20	4.14	1.57	4.67	25	OUTLET	100
229	Existing landscaped area in front of CHEO Max Keeping Wing	0.15	38	15	101	4.9	0.013	0.240	76.20	13.20	4.14	1.57	4.67	25	OUTLET	100
External Catchments																
EXT-1	Section of ring road on the southern limits of the Site	0.28	90	15	183	0.5	0.013	0.240	76.20	13.20	4.14	1.57	4.67	25	OUTLET	100
EXT-2	Section of ring road on the western limits of the Site	0.28	90	187	15	0.5	0.013	0.240	76.20	13.20	4.14	1.57	4.67	25	OUTLET	100
EXT-3	Existing asphalt parking lot - directs runoff to Site	0.96	86	61	158	0.5	0.013	0.240	76.20	13.20	4.14	1.57	4.67	25	OUTLET	100
Total (site)		2.05	71													
Total (included external)		3.57	78													

Notes:
(1) Horton InfiltrationMethod Parameters taken from [Ottawa Design Guidelines - Sewer](#) , October 2012

TABLE 4
PEAK RUNOFF VOLUMES

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
CHEO INTEGRATED TREATMENT CENTRE
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	5	7	8	9	11	12
223	131	182	215	257	289	322
224A	19	26	31	37	41	46
224B	30	41	49	58	65	73
224C	11	15	18	22	24	29
225A	21	29	34	41	46	52
225B	41	56	65	78	88	99
226	133	188	225	271	306	343
227	58	79	93	112	128	145
228	8	11	13	16	18	21
229	9	12	14	16	18	20
EXT-1	37	50	59	70	78	87
EXT-2	39	53	62	74	84	93
EXT-3	123	168	197	234	262	292

TABLE 5
PEAK RUNOFF FLOW RATES

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
CHEO INTEGRATED TREATMENT CENTRE
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	6.51	8.98	10.65	13.03	14.93	16.98
223	34.34	54.68	72.67	97.51	117.46	138.96
224A	17.58	26.34	32.26	40.07	46.07	52.29
224B	27.63	41.39	50.70	62.97	72.39	82.17
224C	12.09	17.56	21.22	26.07	29.77	33.59
225A	27.22	37.94	45.14	54.97	62.56	70.44
225B	38.47	56.31	68.27	84.08	96.21	108.82
226	36.36	60.96	80.82	107.90	129.50	152.72
227	68.82	93.87	111.49	137.62	158.15	179.47
228	11.08	15.22	18.04	22.11	25.41	28.97
229	6.34	9.78	12.14	15.28	17.70	20.25
EXT-1	9.85	16.08	20.84	27.37	32.60	38.24
EXT-2	44.59	63.87	76.75	93.86	106.92	120.37
EXT-3	37.95	62.95	81.23	106.17	126.07	147.43

TABLE 6
GALLERY PERFORMANCE SUMMARY

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
CHEO INTEGRATED TREATMENT CENTRE
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	60.13	29.36	27	77.86
	5-year	86.16	32.40	40	77.94
	10-year	96.07	34.07	49	78.00
	25-year	106.89	30.04	63	78.11
	50-year	116.54	27.89	74	78.23
	100-year	134.43	36.25	83	78.33
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)
Surface Ponding					
	2-year	68.82	68.82	0	79.60
	5-year	93.87	93.87	0	79.60
	10-year	111.49	84.24	8	79.73
	25-year	137.62	100.39	11	79.74
	50-year	158.15	112.38	13	79.75
	100-year	179.47	121.20	16	79.75
PCSWMM Model Element	Design Storm	Peak Inflow (L/s)	Peak Outflow to Storm Sewer Network (L/s)	Max. Storage Volume (m ³)	Max. Ponding Depth (m)
Roof Storage					
	2-year	27.63	15.50	19	0.01
	5-year	41.39	20.67	26	0.02
	10-year	50.70	25.84	31	0.02
	25-year	62.97	31.01	37	0.02
	50-year	72.39	36.18	41	0.03
	100-year	82.17	38.76	46	0.03

**TABLE 7
OUTLET COMPARISONS**

**FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
CHEO INTEGRATED TREATMENT CENTRE
OTTAWA, ONTARIO**

Design Storm Event	To Storm Sewer System		
	Existing (L/s)	Allowable ⁽¹⁾ (L/s)	Proposed (L/s)
2-year	201.67	201.67	71.46
5-year	273.58	201.67	101.29
10-year	320.71	201.67	123.68
25-year	379.92	201.67	153.88
50-year	423.98	201.67	178.38
100-year	468.84	201.67	200.92

Design Storm Event	To Ring Road Major System		
	Existing (L/s)	Allowable ⁽¹⁾ (L/s)	Proposed (L/s)
2-year	180.85	180.85	62.56
5-year	245.34	180.85	90.17
10-year	287.60	180.85	109.07
25-year	340.70	180.85	134.53
50-year	380.21	180.85	154.11
100-year	420.45	180.85	174.56

Notes:

(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 - CATCHMENT 224B

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
CHEO INTEGRATED TREATMENT CENTRE
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	2210	m ²
Number of Roof Drains	12	
Stage-Storage-Discharge Curve		
head (m)	Discharge (L/s)	Storage (m ³)
0.000	0.00	0.0
0.025	4.56	38.7
0.050	9.12	77.4
0.075	13.68	116.0
0.100	18.24	154.7
0.125	22.80	193.4
0.150	27.36	232.1

*Note: Roof Storage = Area x Head x 0.7

STORMWATER MANAGEMENT CALCULATIONS
ORIFICE DESIGN CALCULATION

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
CHEO INTEGRATED TREATMENT CENTRE
OTTAWA, ONTARIO

Parameters for Orifice Plate - CBMH40

$$Q = C_d A \sqrt{2gh}$$

Discharge Coefficient (C_d)	0.62 -
Diameter of Orifice	0.075 m
Area of Orifice	0.004 m ²
Acceleration due to Gravity (g)	9.81 m/s
Max. Water Level in CBMH40 - 5 Yr	77.94 m
Centreline Elevation of Orifice Plate	77.37 m
Hydraulic Head (h)	0.572 m

Calculated Max. Flow out of Orifice (Q)	9.18 L/s
Modelled Max. Flow out of Orifice	8.87 L/s
Difference	0.31 L/s

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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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-SOPRARETENTIO-BOARD.indd

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

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER:	HAIDER NASRULLAH 647-850-9417 HAIDER.NASRULLAH@ADSPIPE.COM
ADS SALES REP:	BRAD DUNLOP 613-893-7336 BRAD.DUNLOP@ADSPIPE.COM
PROJECT NO:	S352402
ONTARIO SITE COORDINATOR:	RYAN RUBENSTEIN 519-710-3687 RYAN.RUBENSTEIN@ADSPIPE.COM



1 DOOR 4 CARE AT CHEO ELLIS DON

OTTAWA, ON

SC-310 STORMTECH CHAMBER SPECIFICATIONS

- CHAMBERS SHALL BE STORMTECH SC-310.
- CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE OR POLYETHYLENE COPOLYMERS.
- CHAMBERS SHALL BE CERTIFIED TO CSA B184, "POLYMERIC SUB-SURFACE STORMWATER MANAGEMENT STRUCTURES", AND MEET THE REQUIREMENTS OF ASTM F2922 (POLETHYLENE) OR ASTM F2418 (POLYPROPYLENE), "STANDARD SPECIFICATION FOR CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
- CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
- THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE CSA S6 CL-625 TRUCK AND THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
- CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
- REQUIREMENTS FOR HANDLING AND INSTALLATION:
 - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
 - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 50 mm (2").
 - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 400 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 23° C / 73° F), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
- ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
 - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
 - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
 - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2922 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
- CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.
- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECHNICAL NOTE 6.32 FOR MANIFOLD SIZING GUIDANCE. DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- ADS DOES NOT DESIGN OR PROVIDE MEMBRANE LINER SYSTEMS. TO MINIMIZE THE LEAKAGE POTENTIAL OF LINER SYSTEMS, THE MEMBRANE LINER SYSTEM SHOULD BE DESIGNED BY A KNOWLEDGEABLE GEOTEXTILE PROFESSIONAL AND INSTALLED BY A QUALIFIED CONTRACTOR.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF THE SC-310 SYSTEM

- STORMTECH SC-310 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
- STORMTECH SC-310 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/SC-800/DC-780 CONSTRUCTION GUIDE".
- CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
 - STONESHOOTER LOCATED OFF THE CHAMBER BED.
 - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
 - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
- THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
- JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
- MAINTAIN MINIMUM - 150 mm (6") SPACING BETWEEN THE CHAMBER ROWS.
- EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE; AASHTO M43 #3, 357, 4, 467, 5, 56, OR 57.
- THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
- ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

- STORMTECH SC-310 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/SC-800/DC-780 CONSTRUCTION GUIDE".
- THE USE OF CONSTRUCTION EQUIPMENT OVER SC-310 & SC-740 CHAMBERS IS LIMITED:
 - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
 - NO RUBBER TIRED LOADERS, DUMP TRUCKS, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/SC-800/DC-780 CONSTRUCTION GUIDE".
 - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH SC-310/SC-740/SC-800/DC-780 CONSTRUCTION GUIDE".
- FULL 900 mm (36") OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO THE CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

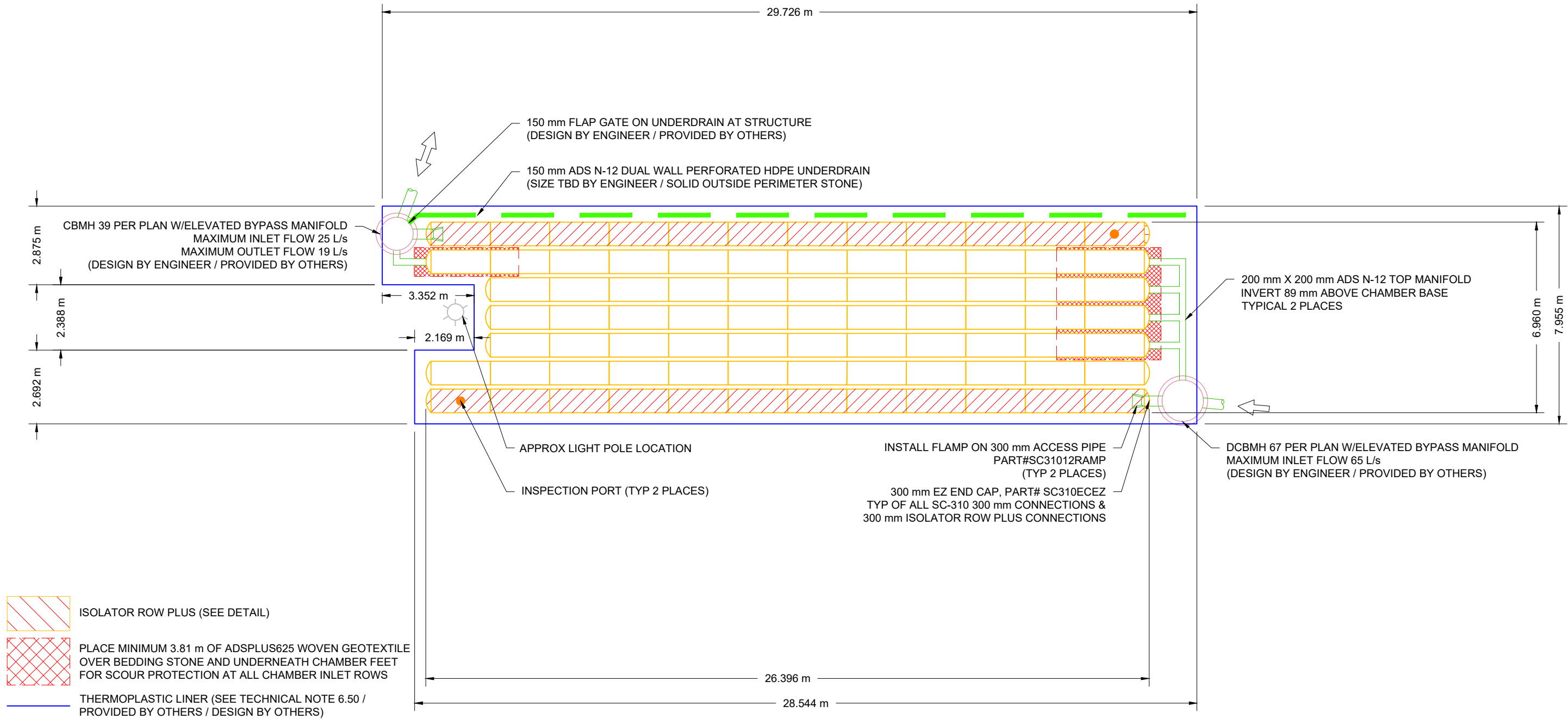
CONTACT STORMTECH AT 1-800-821-6710 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

PROPOSED LAYOUT

81	STORMTECH SC-310 CHAMBERS
14	STORMTECH SC-310 END CAPS
152	STONE ABOVE (mm)
152	STONE BELOW (mm)
40	% STONE VOID
84.3	INSTALLED SYSTEM VOLUME (m³) (PERIMETER STONE INCLUDED)
225.2	SYSTEM AREA (m²)
79.7	SYSTEM PERIMETER (m)
PROPOSED ELEVATIONS	
80.617	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED)
78.789	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC)
78.636	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC)
78.636	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT)
78.636	MINIMUM ALLOWABLE GRADE (TOP OF RIGID PAVEMENT)
78.331	TOP OF STONE
78.179	TOP OF SC-310 CHAMBER
77.862	200 mm TOP MANIFOLD/CONNECTION INVERT
77.796	300 mm ISOLATOR ROW PLUS CONNECTION INVERT
77.773	BOTTOM OF SC-310 CHAMBER
77.621	UNDERDRAIN INVERT
77.621	BOTTOM OF STONE

NOTES

- THE STORMTECH SYSTEM DEPICTED DOES NOT CONTAIN PROPER WATER QUALITY MEASURES. ABSENCE OF WATER QUALITY MEASURES CAN RESULT IN UNTREATED STORMWATER. ADS RECOMMENDS THE USE OF ISOLATOR ROW PLUS AND AN UPSTREAM HIGH FLOW BYPASS ON ALL STORMTECH SYSTEMS TO PROPERLY DIRECT THE FIRST FLUSH.



1 DOOR 4 CARE AT CHEO
ELLIS DON
OTTAWA, ON

DATE: 5/18/23
PROJECT #: S352402

DRAWN: RCT
CHECKED: RCT

DATE	DRWN	CHKD	DESCRIPTION
3/6/25	RCT	RCT	NEW PLANS FOR OVERLAY
12/09/24	RCT	RCT	REVISED PER NEW PLANS

StormTech®
Chamber System
1-800-821-6710 | WWW.STORMTECH.COM

4640 TRUEMAN BLVD
HILLIARD, OH 43026

SCALE = 1 : 150

2 SHEET
OF 5

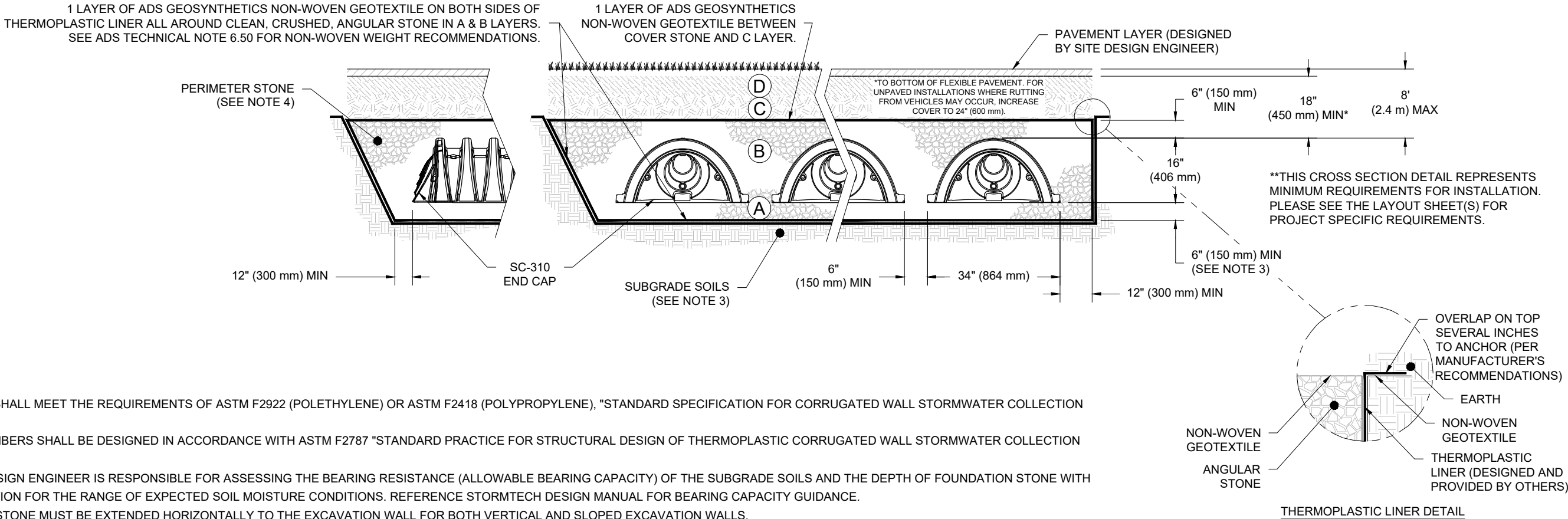
THIS DRAWING HAS BEEN PREPARED BASED ON INFORMATION PROVIDED TO ADS/STORMTECH UNDER THE DIRECTION OF THE PROJECT'S ENGINEER OF RECORD ("EOR"), OR OTHER PROJECT REPRESENTATIVE. THIS DRAWING IS NOT INTENDED FOR USE IN BIDDING OR CONSTRUCTION WITHOUT THE EOR'S PRIOR APPROVAL. EOR SHALL REVIEW THIS DRAWING PRIOR TO BIDDING AND/OR CONSTRUCTION. IT IS THE ULTIMATE RESPONSIBILITY OF THE EOR TO ENSURE THAT THE PRODUCT(S) DEPICTED AND ALL ASSOCIATED DETAILS MEET ALL APPLICABLE LAWS, REGULATIONS, AND PROJECT REQUIREMENTS.

ACCEPTABLE FILL MATERIALS: STORMTECH SC-310 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	FINAL FILL: FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER.	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	3.25	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	INITIAL FILL: FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145 ¹ A-1, A-2-4, A-3 OR AASHTO M43 ¹ 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	EMBEDMENT STONE: FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE ⁵	AASHTO M43 ¹ 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	FOUNDATION STONE: FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE ⁵	AASHTO M43 ¹ 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. ^{2,3}

PLEASE NOTE:

1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.
5. WHERE RECYCLED CONCRETE AGGREGATE IS USED IN LAYERS 'A' OR 'B' THE MATERIAL SHOULD ALSO MEET THE ACCEPTABILITY CRITERIA OUTLINED IN TECHNICAL NOTE 6.20 "RECYCLED CONCRETE STRUCTURAL BACKFILL".



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2922 (POLETHYLENE) OR ASTM F2418 (POLYPROPYLENE), "STANDARD SPECIFICATION FOR CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-310 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS. REFERENCE STORMTECH DESIGN MANUAL FOR BEARING CAPACITY GUIDANCE.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
 - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
 - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 2".
 - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2922 SHALL BE GREATER THAN OR EQUAL TO 400 LBS/FT/%. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

1 DOOR 4 CARE AT CHEO

ELLIS DON
OTTAWA, ON

DATE: 5/18/23

PROJECT #: S352402

RCT

RCT

RCT

RCT

NEW PLANS FOR OVERLAY

REVISED PER NEW PLANS

DESCRIPTION

DATE

DRWN

CHKD

StormTech®
Chamber System

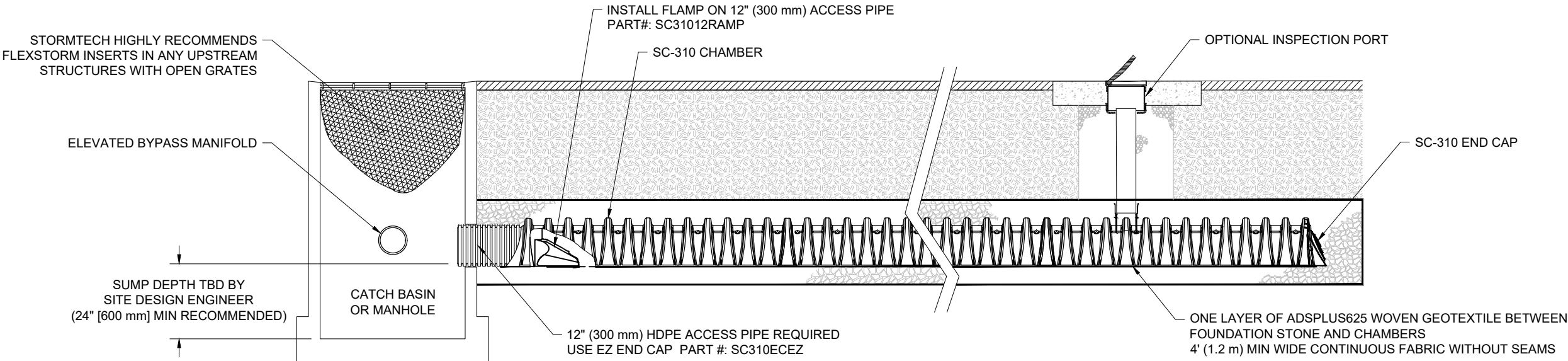
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4640 TRUEMAN BLVD
HILLIARD, OH 43026

ADS

3 SHEET
OF 5

THIS DRAWING IS NOT INTENDED FOR USE IN BIDDING OR CONSTRUCTION WITHOUT THE EOR'S PRIOR APPROVAL. EOR SHALL REVIEW THIS DRAWING PRIOR TO BIDDING AND/OR CONSTRUCTION. IT IS THE ULTIMATE RESPONSIBILITY OF THE EOR TO ENSURE THAT THE PRODUCT(S) DERIVED AND ALL ASSOCIATED DETAILS MEET ALL APPLICABLE LAWS, REGULATIONS, AND PROJECT REQUIREMENTS.



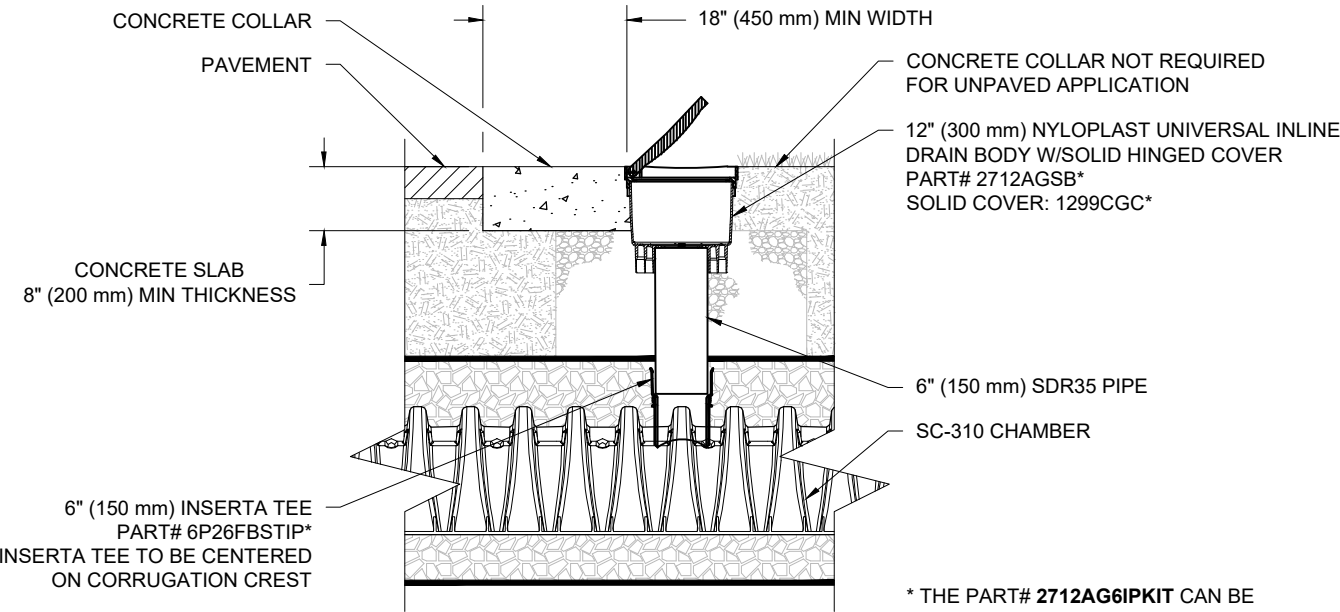
SC-310 ISOLATOR ROW PLUS DETAIL
NTS

INSPECTION & MAINTENANCE

- STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
 - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
 - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
 - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
 - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
 - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
 - B. ALL ISOLATOR PLUS ROWS
 - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
 - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
 - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
 - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
 - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
 - B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
 - C. VACUUM STRUCTURE SUMP AS REQUIRED
- STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.
- STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



* THE PART# 2712AG6IPKIT CAN BE USED TO ORDER ALL NECESSARY COMPONENTS FOR A SOLID LID INSPECTION PORT INSTALLATION

SC-310 6" (150 mm) INSPECTION PORT DETAIL
NTS

1 DOOR 4 CARE AT CHEO
ELLIS DON
OTTAWA, ON

DATE: 5/18/23
PROJECT #: S352402
DRAWN: RCT
CHECKED: RCT

DATE	DESCRIPTION
3/6/25	RCT NEW PLANS FOR OVERLAY
12/09/24	RCT REVISED PER NEW PLANS
DATE	DRWN CHKD

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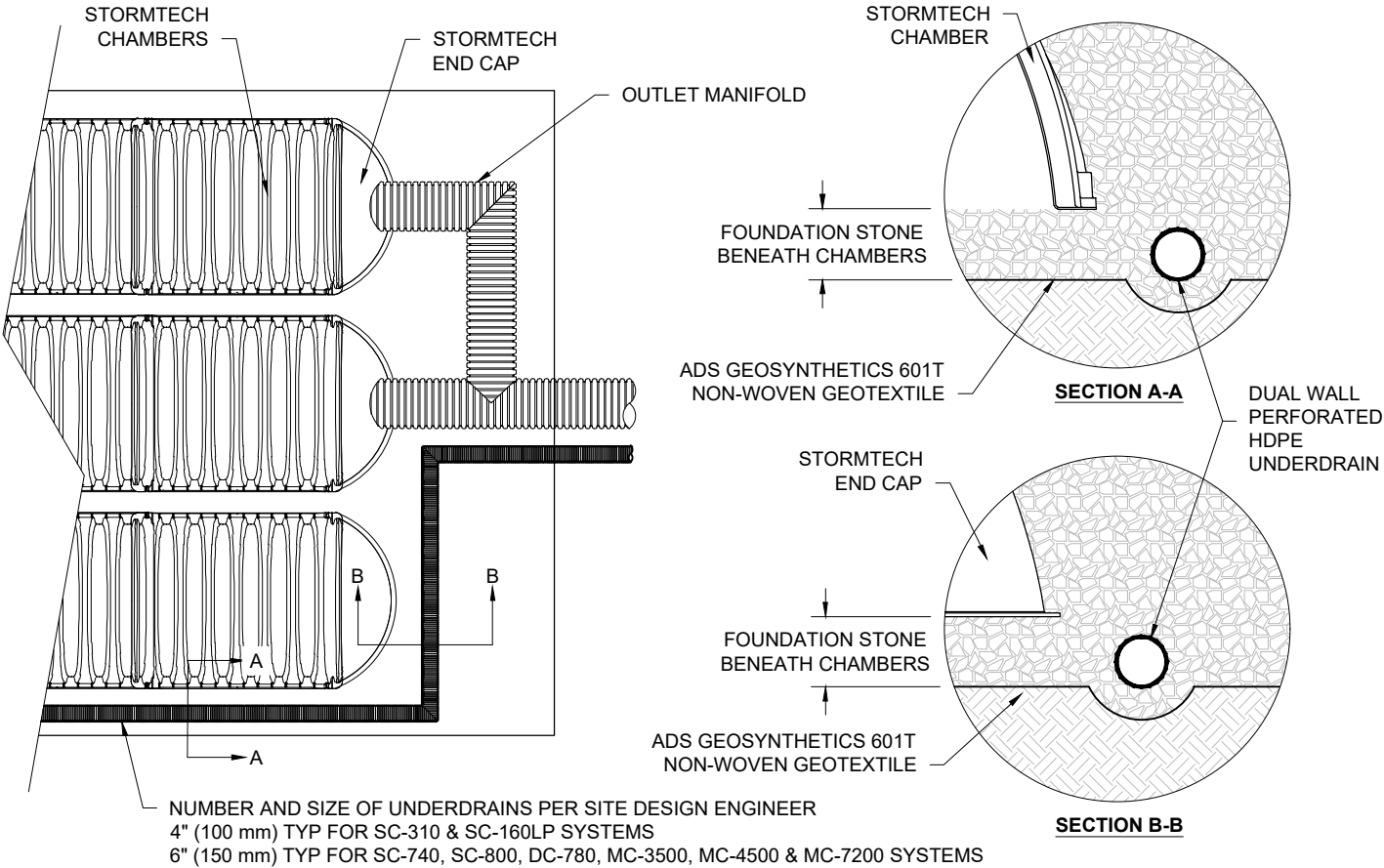
ADS

THIS DRAWING HAS BEEN PREPARED BASED ON INFORMATION PROVIDED TO ADS/STORMTECH UNDER THE DIRECTION OF THE PROJECT'S ENGINEER OF RECORD (EOR). IT IS THE ULTIMATE RESPONSIBILITY OF THE EOR TO ENSURE THAT THE PRODUCT(S) SPECIFIED AND ALL ASSOCIATED DETAILS MEET ALL APPLICABLE LAWS, REGULATIONS, AND PROJECT REQUIREMENTS.

4 SHEET
OF 5

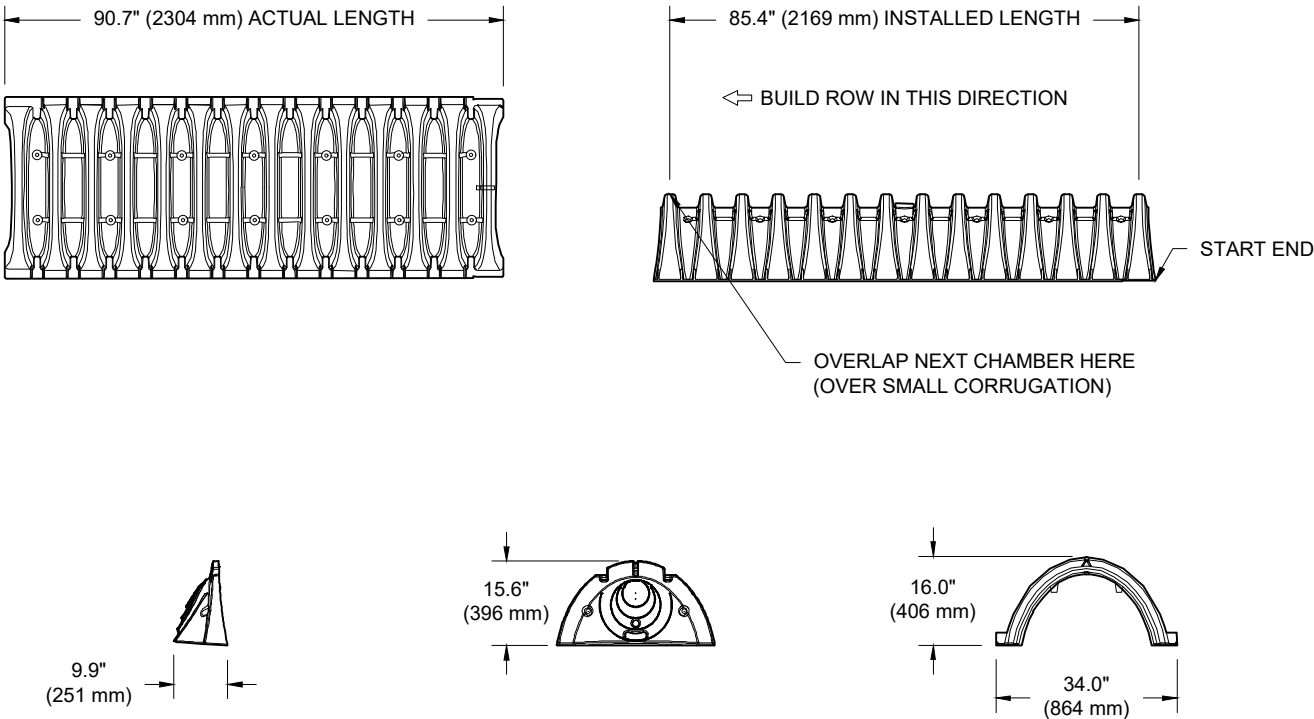
UNDERDRAIN DETAIL

NTS



SC-310 TECHNICAL SPECIFICATION

NTS

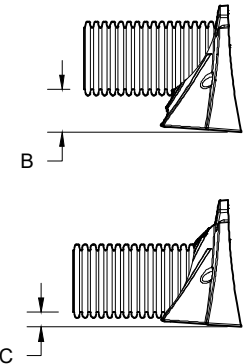


NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	34.0" X 16.0" X 85.4"	(864 mm X 406 mm X 2169 mm)
CHAMBER STORAGE	14.7 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	31.0 CUBIC FEET	(0.88 m³)
WEIGHT	35.0 lbs.	(16.8 kg)

*ASSUMES 6" (152 mm) ABOVE, BELOW, AND BETWEEN CHAMBERS

PART #	STUB	B	C
SC310EPE06TPC	6" (150 mm)	5.8" (147 mm)	---
SC310EPE06BPC		---	0.5" (13 mm)
SC310EPE08TPC	8" (200 mm)	3.5" (89 mm)	---
SC310EPE08BPC		---	0.6" (15 mm)
SC310EPE10TPC	10" (250 mm)	1.4" (36 mm)	---
SC310EPE10BPC		---	0.7" (18 mm)
SC310ECEZ*	12" (300 mm)	---	0.9" (23 mm)



ALL STUBS, EXCEPT FOR THE SC310ECEZ ARE PLACED AT BOTTOM OF END CAP SUCH THAT THE OUTSIDE DIAMETER OF THE STUB IS FLUSH WITH THE BOTTOM OF THE END CAP. FOR ADDITIONAL INFORMATION CONTACT STORMTECH AT 1-888-892-2694.

* FOR THE SC310ECEZ THE 12" (300 mm) STUB LIES BELOW THE BOTTOM OF THE END CAP APPROXIMATELY 0.25" (6 mm). BACKFILL MATERIAL SHOULD BE REMOVED FROM BELOW THE N-12 STUB SO THAT THE FITTING SITS LEVEL.

NOTE: ALL DIMENSIONS ARE NOMINAL; PRE-CORED END CAPS END WITH "PC"

1 DOOR 4 CARE AT CHEO

ELLIS DON
OTTAWA, ON

DATE: 5/18/23
PROJECT #: S352402

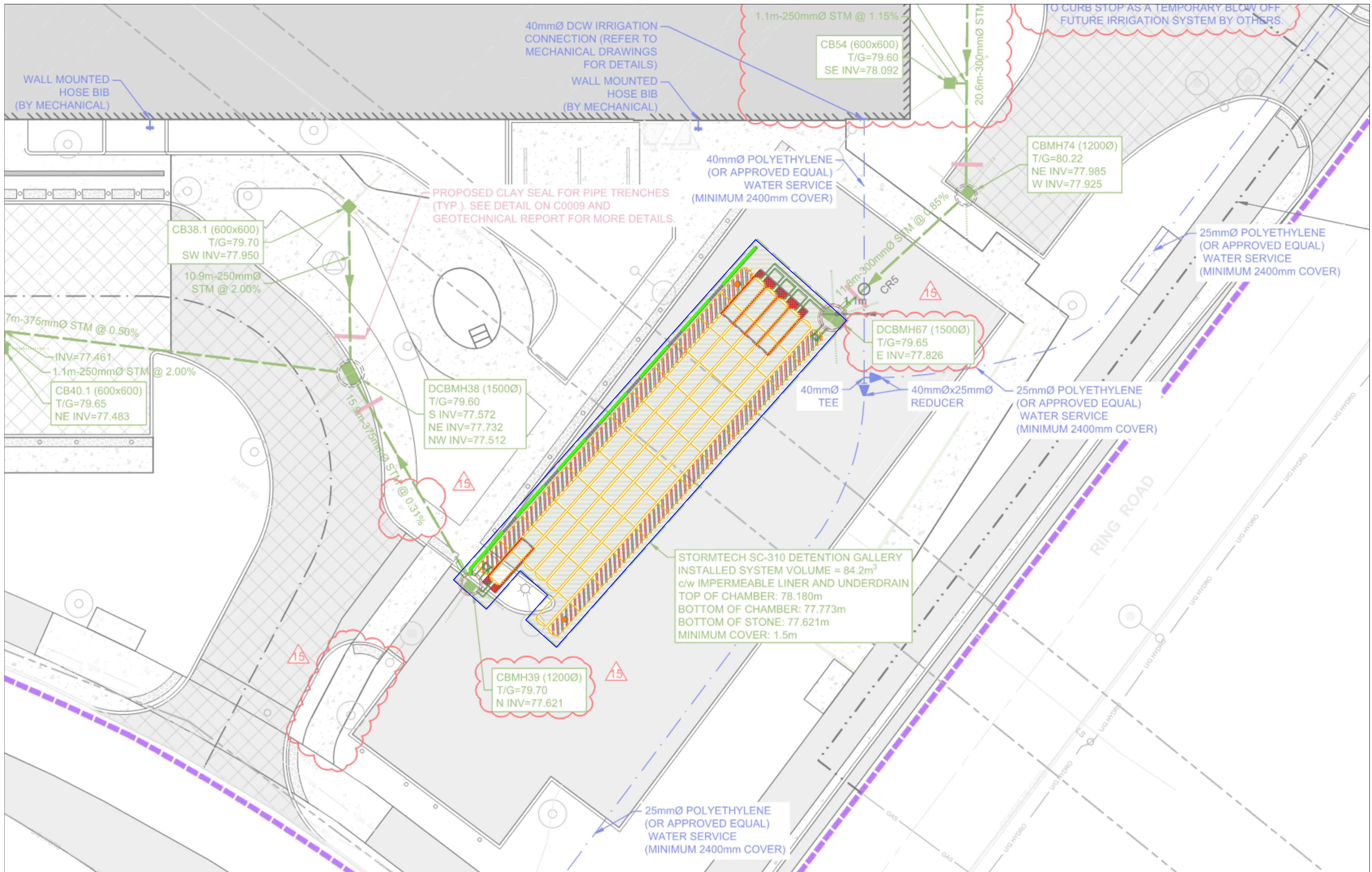
DRAWN: RCT
CHECKED: RCT

DATE	DESCRIPTION
3/6/25	RCT NEW PLANS FOR OVERLAY
12/09/24	RCT REVISED PER NEW PLANS

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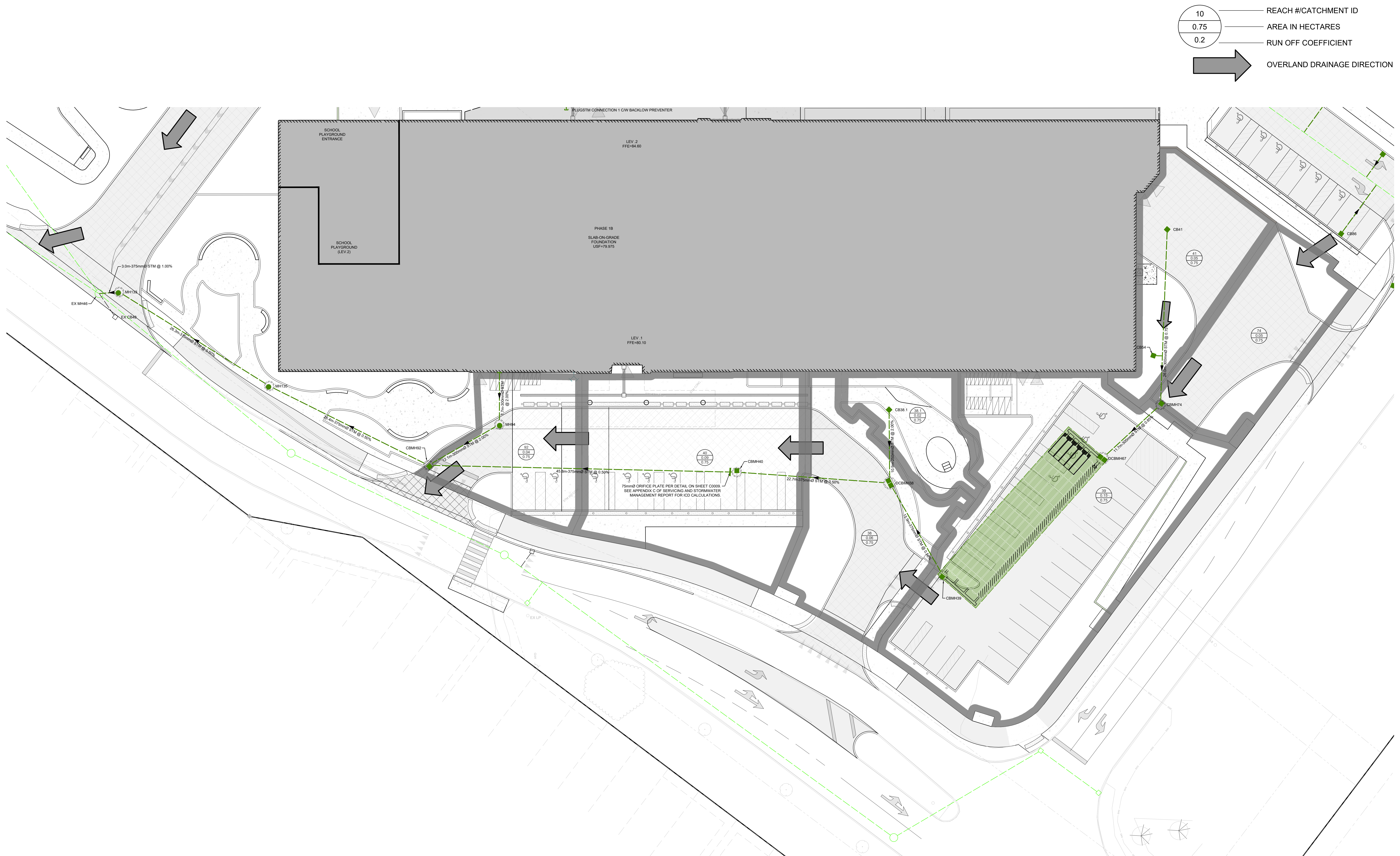
4640 TRUEMAN BLVD
HILLIARD, OH 43026

5 SHEET
OF 5



WALTERFEDY

Project: Project No: Date: Designed By:	EllisDon - CHEO P3								Storm Parameters		STORM SEWER DESIGN CALCULATIONS										
	2021-0821-10										A	998.071	Design Frequency			5	Maximum Permitted Full Flow Velocity (m/s)				6.00
	24-Feb-25								B	6.053	0.013	Minimum Permitted Full Flow Velocity (m/s)				0.80					
	TDK	Checked By:	SF						C	0.814	Manning's 'n'										
	Pipe Data			Drainage Area					Time				Design Flow		Pipe Flow						
	From	To	Length (m)	Area ID	Area (ha)	C	AC	ΣAC	Inlet (min)	System (min)	I (mm/hr)	Q (cu.m/s)	Diameter (mm)	Slope (%)	Q _{FULL} (cu.m/s)	Q/Q _{FULL}	V _{FULL} (m/s)	V (m/s)	Flow Time (min)		
	CB41	CBMH74	20.6	41	0.05	0.75	0.04	0.04	10.00	10.00	104.2	0.012	300	0.95	0.094	12.3%	1.33	0.90	0.38	No Surcharge	
	CBMH74	DCBMH67	11.8	74	0.05	0.75	0.04	0.08		10.38	102.2	0.023	300	0.85	0.089	25.5%	1.26	1.05	0.19	No Surcharge	
										10.57											
	CBMH39	DCBMH38	15.9	39	0.15	0.75	0.11	0.19	10.57	10.57	101.3	0.053	375	0.31	0.098	54.7%	0.88	0.90	0.29	No Surcharge	
										10.86											
	CB38.1	DCBMH38	10.9	38	0.02	0.75	0.02	0.02	10.00	10.00	104.2	0.006	250	2.00	0.084	6.9%	1.71	0.98	0.18	No Surcharge	
										10.18											
	DCBMH38	CBMH40	41.7	38	0.06	0.75	0.05	0.26	10.86	10.86	99.9	0.072	375	0.50	0.124	58.2%	1.12	1.16	0.60	No Surcharge	
										11.45											
	CBMH40	CBMH92	27.2	40	0.09	0.75	0.07	0.33	11.45	11.45	97.1	0.00821	375	0.50	0.123	6.6%	1.12	0.63	0.72	No Surcharge	
										12.17		*Flow overridden to demonstrate max flow through orifice									
	MH94	CBMH92	12.1	-	0.00	0.00	0.00	0.00	10.00	10.00	104.2	0.00004	300	2.00	0.137	0.0%	1.93	0.21	0.98	No Surcharge	
										10.98		*Flow overridden to demonstrate base flow through weeping tile system									
	CBMH92	MH135	26.4	92	0.04	0.75	0.03	0.03	12.17	12.17	94.0	0.008	375	0.50	0.124	6.3%	1.12	0.63	0.70	No Surcharge	
	MH135	MH133	26.3	-	0.00	0.00	0.00	0.03		12.87	91.1	0.008	375	0.50	0.124	6.2%	1.12	0.62	0.70	No Surcharge	
	MH133	MH46 EX	3.0	-	0.00	0.00	0.00	0.03		13.57	88.5	0.007	375	1.00	0.175	4.2%	1.59	0.79	0.06	No Surcharge	
										13.64											
	CBMH55	MH31 EX	14.2	55	0.06	0.90	0.05	0.05	10.00	10.00	104.2	0.029	450	1.09	0.298	9.7%	1.87	1.19	0.20	No Surcharge	
				*Area of canopy & ground surface for this catchment						10.20	*Flow from building included										



APPENDIX D

PCSWMM Report Files

2021-0821-13: 2Yr Post-Development

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

WARNING 09: time series interval greater than recording interval for Rain Gage 2Yr

Element Count

Number of rain gages 6
 Number of subcatchments ... 14
 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	5 min.
10Yr	10Yr	INTENSITY	5 min.
25Yr	25Yr	INTENSITY	5 min.
2Yr	2Yr	INTENSITY	5 min.
50Yr	50Yr	INTENSITY	5 min.
5Yr	5Yr	INTENSITY	5 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
222	0.11	53.00	30.00	0.1000	2Yr	225B
223	0.11	40.14	87.00	0.1000	2Yr	226
224A	0.14	37.12	90.00	0.0000	2Yr	228
224B	0.22	77.00	90.00	0.1000	2Yr	Roof_Storage
224C	0.12	43.66	90.00	0.1000	2Yr	227
225A	0.17	34.21	82.00	2.5000	2Yr	EX.MH31-S
225B	0.29	27.63	82.00	2.1000	2Yr	EX.MH36-S
226	0.10	26.63	79.00	3.5000	2Yr	EX.MH34-S
227	0.43	172.40	75.00	3.0000	2Yr	SurfaceStorage
228	0.21	18.61	25.00	3.0000	2Yr	RingRoadMajor
229	0.15	14.59	38.00	0.1000	2Yr	NorthMajor
EXT-1	0.28	15.00	90.00	0.1000	2Yr	EX.MH34-S
EXT-2	0.28	186.67	90.00	0.1000	2Yr	RingRoadMajor
EXT-3	0.96	61.04	86.00	0.1000	2Yr	223

LID Control Summary

Subcatchment	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	% Imperv Treated	% Perv Treated
224A	GreenRoof	1	246.92	16.43	18.16	0.00	0.00
224C	GreenRoof	1	418.41	16.43	34.02	0.00	0.00

Node Summary

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

2021-0821-13: 2Yr Post-Development

cbmh40	JUNCTION	77.37	2.28	0.0	
CBMH52	JUNCTION	76.58	2.51	0.0	
CBMH55	JUNCTION	77.37	6.92	0.0	
CBMH92	JUNCTION	77.11	2.42	0.0	Yes
DCBMH38	JUNCTION	77.51	2.09	0.0	
EX.MH31	JUNCTION	76.62	5.64	0.0	
EX.MH31-S	JUNCTION	82.26	0.30	0.0	
EX.MH31-S1	JUNCTION	82.26	0.30	0.0	
EX.MH34	JUNCTION	78.40	2.89	0.0	
EX.MH34-S	JUNCTION	81.29	0.30	0.0	Yes
EX.MH36	JUNCTION	77.53	4.38	0.0	
EX.MH36-S	JUNCTION	81.92	0.30	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	
EX.MH46-S	JUNCTION	78.96	0.30	0.0	
EXMH32	JUNCTION	75.74	2.69	0.0	
MH133	JUNCTION	76.75	2.40	0.0	
MH135	JUNCTION	76.95	2.50	0.0	
STM1	JUNCTION	77.60	6.75	0.0	
NorthMajor	OUTFALL	0.00	0.00	0.0	
RingRoadMajor	OUTFALL	78.62	0.30	0.0	
StormSewerSystem	OUTFALL	75.64	0.53	0.0	
Detention	STORAGE	77.62	0.71	0.0	
Roof_Storage	STORAGE	84.35	0.15	0.0	
SurfaceStorage	STORAGE	79.60	0.30	0.0	

Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness

C1	STM1	CBMH55	CONDUIT	8.4	2.0123	0.0130
C10	EX.MH45	EX.MH46	CONDUIT	37.1	2.6424	0.0130
C10-S	EX.MH45-S	EX.MH46-S	CONDUIT	37.1	1.0486	0.0160
C11	EX.MH46	CBMH52	CONDUIT	10.5	0.6857	0.0130
C11-S	EX.MH46-S	RingRoadMajor	CONDUIT	10.5	3.2398	0.0160
C12	CBMH52	EXMH32	CONDUIT	51.6	1.5079	0.0130
C13	MH135	MH133	CONDUIT	26.8	0.4925	0.0130
C13-S	EX.MH34-S	EX.MH43-S	CONDUIT	128.3	0.5536	0.0160
C14	MH133	EX.MH46	CONDUIT	2.6	1.1539	0.0130
C2	CBMH55	EX.MH31	CONDUIT	14.2	1.0916	0.0130
C3	EX.MH31	EXMH32	CONDUIT	86.7	1.0104	0.0130
C3-S	EX.MH31-S	EX.MH46-S	CONDUIT	84.2	3.9211	0.0160
C4	EX.MH36	EX.MH31	CONDUIT	97.2	0.9002	0.0130
C4-S	EX.MH31-S1	EX.MH36-S	CONDUIT	97.2	0.3498	0.0160
C5	EX.MH34	EX.MH36	CONDUIT	60.8	1.3241	0.0130
C5-S	EX.MH36-S	EX.MH34-S	CONDUIT	60.8	1.0362	0.0160
C6	DCBMH38	cbmh40	CONDUIT	22.7	0.5022	0.0130
C8	EX.MH43	EX.MH44	CONDUIT	71.4	1.0365	0.0130
C8-S	EX.MH43-S	EX.MH44-S	CONDUIT	71.4	1.1345	0.0160
C9	EX.MH44	EX.MH45	CONDUIT	35.1	1.0542	0.0130
C9-S	EX.MH44-S	EX.MH45-S	CONDUIT	35.1	1.1967	0.0160
CBMH32	EXMH32	StormSewerSystem	CONDUIT	10.0	1.0001	0.0130
CBMH92	CBMH92	MH135	CONDUIT	26.4	0.5000	0.0130
Ctention	Detention	DCBMH38	CONDUIT	15.9	0.4969	0.0130
C7	cbmh40	CBMH92	ORIFICE			
CFRD	Roof_Storage	STM1	OUTLET			
OL1	SurfaceStorage	Detention	OUTLET			

Cross Section Summary

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	0.45	0.16	0.11	0.45	1	404.46
C10	CIRCULAR	0.38	0.11	0.09	0.38	1	285.03
C10-S	RingRoad	0.30	2.29	0.24	9.00	1	5642.11
C11	CIRCULAR	0.38	0.11	0.09	0.38	1	145.20
C11-S	RingRoad	0.30	2.29	0.24	9.00	1	9917.45
C12	CIRCULAR	0.47	0.18	0.12	0.47	1	404.43
C13	CIRCULAR	1.00	0.79	0.25	1.00	1	1682.76
C13-S	RingRoad	0.30	2.29	0.24	9.00	1	4099.48
C14	CIRCULAR	0.38	0.11	0.09	0.38	1	188.35
C2	CIRCULAR	0.45	0.16	0.11	0.45	1	297.90
C3	CIRCULAR	0.53	0.22	0.13	0.53	1	432.33
C3-S	HospitalRamp	0.30	2.60	0.23	10.50	1	12183.67
C4	CIRCULAR	0.53	0.22	0.13	0.53	1	408.07
C4-S	RingRoad	0.30	2.29	0.24	9.00	1	3258.74
C5	CIRCULAR	0.45	0.16	0.11	0.45	1	328.09
C5-S	RingRoad	0.30	2.29	0.24	9.00	1	5608.82
C6	CIRCULAR	0.38	0.11	0.09	0.38	1	124.26
C8	CIRCULAR	0.30	0.07	0.07	0.30	1	98.45
C8-S	RingRoad	0.30	2.29	0.24	9.00	1	5868.79
C9	CIRCULAR	0.30	0.07	0.07	0.30	1	99.29
C9-S	RingRoad	0.30	2.29	0.24	9.00	1	6027.37
CBMH32	CIRCULAR	0.53	0.22	0.13	0.53	1	430.10
CBMH92	CIRCULAR	0.38	0.11	0.09	0.38	1	123.99
Ctention	CIRCULAR	0.38	0.11	0.09	0.38	1	123.59

Street Summary

Street RingRoad

Area:

0.0008	0.0031	0.0071	0.0125	0.0196
0.0282	0.0384	0.0502	0.0635	0.0784
0.0949	0.1129	0.1325	0.1537	0.1765
0.2000	0.2235	0.2471	0.2706	0.2941
0.3176	0.3412	0.3647	0.3882	0.4118
0.4353	0.4588	0.4824	0.5059	0.5294
0.5529	0.5765	0.6000	0.6235	0.6471
0.6706	0.6941	0.7176	0.7412	0.7647
0.7882	0.8118	0.8353	0.8588	0.8824
0.9059	0.9294	0.9529	0.9765	1.0000

Hrad:

0.0123	0.0246	0.0369	0.0492	0.0615
0.0738	0.0861	0.0984	0.1107	0.1230
0.1353	0.1476	0.1599	0.1722	0.1845
0.2089	0.2331	0.2574	0.2815	0.3056
0.3296	0.3535	0.3774	0.4015	0.4250
0.4488	0.4724	0.4960	0.5195	0.5430
0.5664	0.5897	0.6130	0.6363	0.6594
0.6825	0.7056	0.7286	0.7515	0.7744
0.7972	0.8200	0.8427	0.8653	0.8879
0.9104	0.9329	0.9553	0.9777	1.0000

Width:

[illegible]

2021-0821-13: 2Yr Post-Development

Street HospitalRamp

Area:

0.0007	0.0028	0.0062	0.0111	0.0173
0.0249	0.0339	0.0443	0.0561	0.0693
0.0838	0.0997	0.1171	0.1358	0.1558
0.1773	0.2002	0.2242	0.2485	0.2727
0.2970	0.3212	0.3455	0.3697	0.3939
0.4182	0.4424	0.4667	0.4909	0.5152
0.5394	0.5636	0.5879	0.6121	0.6364
0.6606	0.6848	0.7091	0.7333	0.7576
0.7818	0.8061	0.8303	0.8545	0.8788
0.9030	0.9273	0.9515	0.9758	1.0000

Hrad:

0.0126	0.0251	0.0377	0.0503	0.0628
0.0754	0.0879	0.1005	0.1131	0.1256
0.1382	0.1508	0.1633	0.1759	0.1884
0.2010	0.2136	0.2323	0.2571	0.2819
0.3066	0.3312	0.3558	0.3804	0.4049
0.4293	0.4537	0.4780	0.5023	0.5265
0.5507	0.5748	0.5989	0.6229	0.6469
0.6708	0.6946	0.7184	0.7422	0.7659
0.7895	0.8131	0.8366	0.8601	0.8836
0.9070	0.9303	0.9536	0.9768	1.0000

Width:

0.0571	0.1143	0.1714	0.2286	0.2857
0.3429	0.4000	0.4571	0.5143	0.5714
0.6286	0.6857	0.7429	0.8000	0.8571
0.9143	0.9714	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	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

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 11/12/2024 00:00:00

Ending Date 11/13/2024 00:00:00

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 2

Head Tolerance 0.001500 m

Runoff Quantity Continuity

Volume

hectare-m

Depth

mm

2021-0821-13: 2Yr Post-Development

Initial LID Storage	0.001	0.242
Total Precipitation	0.057	15.940
Evaporation Loss	0.000	0.000
Infiltration Loss	0.015	4.093
Surface Runoff	0.038	10.540
Final Storage	0.007	1.863
Continuity Error (%)	-1.940	

	Volume hectare-m	Volume 10 ⁶ ltr
Flow Routing Continuity		
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.038	0.376
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.055	0.546
External Outflow	0.092	0.925
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	0.001	0.009
Continuity Error (%)	-1.328	

Time-Step Critical Elements

Link C14 (99.45%)

Highest Flow Instability Indexes

Link C6 (2)

Most Frequent Nonconverging Nodes

Convergence obtained at all time steps.

Routing Time Step Summary

Minimum Time Step	:	1.36 sec
Average Time Step	:	3.78 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	:	72.58 %
3.155 - 1.991 sec	:	5.78 %
1.991 - 1.256 sec	:	21.63 %
1.256 - 0.792 sec	:	0.00 %
0.792 - 0.500 sec	:	0.00 %

Subcatchment Runoff Summary

Total Precip	Total Runon	Total Evap	Total Infil	Imperv Runoff	Perv Runoff	Total Runoff	Total Runoff	Peak Runoff	Runoff Coeff
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2021-0821-13: 2Yr Post-Development									
Subcatchment	mm	mm	mm	mm	mm	mm	mm	10^6 ltr	LPS
222	15.94	0.00	0.00	11.16	4.69	0.00	4.69	0.00	6.51 0.294
223	15.94	107.87	0.00	8.29	107.00	7.86	114.86	0.13	34.34 0.928
224A	15.94	0.00	0.00	1.30	14.21	0.00	14.21	0.02	17.58 0.574
224B	15.94	0.00	0.00	1.59	13.74	0.00	13.74	0.03	27.63 0.862
224C	15.94	0.00	0.00	1.05	9.15	0.00	9.15	0.01	12.09 0.574
225A	15.94	0.00	0.00	2.87	12.79	0.00	12.79	0.02	27.22 0.802
225B	15.94	1.70	0.00	3.17	13.95	0.00	13.95	0.04	38.47 0.791
226	15.94	133.62	0.00	13.86	117.48	17.77	135.24	0.13	36.36 0.904
227	15.94	2.61	0.00	4.64	13.52	0.00	13.52	0.06	68.82 0.729
228	15.94	0.00	0.00	11.96	3.91	0.00	3.91	0.01	11.08 0.245
229	15.94	0.00	0.00	9.88	5.76	0.00	5.76	0.01	6.34 0.361
EXT-1	15.94	0.00	0.00	1.59	13.35	0.00	13.35	0.04	9.85 0.837
EXT-2	15.94	0.00	0.00	1.59	13.93	0.00	13.93	0.04	44.59 0.874
EXT-3	15.94	0.00	0.00	2.23	12.78	0.00	12.78	0.12	37.95 0.802

LID Performance Summary

Subcatchment	LID Control	Total Inflow mm	Evap Loss mm	Infil Loss mm	Surface Outflow mm	Drain Outflow mm	Initial Storage mm	Final Storage mm	Continuity Error %
224A	GreenRoof	15.94	0.00	0.00	0.00	0.00	13.00	28.94	0.00
224C	GreenRoof	15.94	0.00	0.00	0.00	0.00	13.00	28.94	0.00

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
cbmh40	JUNCTION	0.09	0.63	77.99	0 00:57	0.51
CBMH52	JUNCTION	0.05	0.13	76.71	0 01:17	0.13
CBMH55	JUNCTION	0.01	0.03	77.40	0 01:38	0.03
CBMH92	JUNCTION	0.02	0.07	77.17	0 01:18	0.07
DCBMH38	JUNCTION	0.06	0.38	77.89	0 01:09	0.37
EX.MH31	JUNCTION	0.01	0.07	76.69	0 00:59	0.07
EX.MH31-S	JUNCTION	0.00	0.03	82.29	0 00:55	0.03
EX.MH31-S1	JUNCTION	0.00	0.00	82.26	0 00:00	0.00
EX.MH34	JUNCTION	0.01	0.07	78.47	0 00:57	0.07
EX.MH34-S	JUNCTION	0.03	0.06	81.35	0 01:08	0.06
EX.MH36	JUNCTION	0.01	0.07	77.61	0 00:59	0.07
EX.MH36-S	JUNCTION	0.01	0.04	81.96	0 00:56	0.04
EX.MH43	JUNCTION	0.05	0.12	78.86	0 01:16	0.12
EX.MH43-S	JUNCTION	0.02	0.03	80.61	0 01:18	0.03
EX.MH44	JUNCTION	0.06	0.14	78.14	0 01:17	0.14
EX.MH44-S	JUNCTION	0.01	0.02	79.79	0 01:19	0.02
EX.MH45	JUNCTION	0.05	0.10	77.73	0 01:17	0.10
EX.MH45-S	JUNCTION	0.01	0.02	79.37	0 01:23	0.02
EX.MH46	JUNCTION	0.07	0.17	76.82	0 01:17	0.17
EX.MH46-S	JUNCTION	0.01	0.02	78.98	0 00:57	0.02
EXMH32	JUNCTION	0.06	0.14	75.88	0 01:09	0.14
MH133	JUNCTION	0.02	0.06	76.82	0 01:17	0.06
MH135	JUNCTION	0.02	0.05	77.00	0 01:18	0.05
STM1	JUNCTION	0.01	0.02	77.62	0 01:38	0.02
NorthMajor	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
RingRoadMajor	OUTFALL	0.00	0.02	78.64	0 00:57	0.02
StormSewerSystem	OUTFALL	0.06	0.14	75.78	0 01:09	0.14
Detention	STORAGE	0.06	0.24	77.86	0 01:17	0.24
Roof_Storage	STORAGE	0.00	0.01	84.36	0 01:38	0.01

2021-0821-13: 2Yr Post-Development

SurfaceStorage	STORAGE	0.00	0.00	79.60	0	00:56	0.00
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Node Inflow Summary

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
cbmh40	JUNCTION	0.00	19.56	0 00:57	0	0.0555	-0.304
CBMH52	JUNCTION	6.65	63.65	0 01:17	0.0428	0.819	0.051
CBMH55	JUNCTION	0.00	2.19	0 01:38	0	0.0303	0.001
CBMH92	JUNCTION	0.04	8.76	0 00:57	0.00346	0.0591	0.013
DCBMH38	JUNCTION	0.00	29.36	0 00:57	0	0.0587	-0.228
EX.MH31	JUNCTION	0.00	17.20	0 00:59	0	0.0548	-0.021
EX.MH31-S	JUNCTION	27.22	27.22	0 00:55	0.0214	0.0214	-0.624
EX.MH31-S1	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
EX.MH34	JUNCTION	17.49	17.49	0 00:56	0.0245	0.0245	-0.011
EX.MH34-S	JUNCTION	45.51	56.17	0 01:05	0.687	0.728	0.358
EX.MH36	JUNCTION	0.00	17.20	0 00:57	0	0.0245	-0.011
EX.MH36-S	JUNCTION	38.47	38.47	0 00:55	0.0408	0.0408	-0.733
EX.MH43	JUNCTION	31.39	31.39	0 01:16	0.435	0.435	0.042
EX.MH43-S	JUNCTION	-31.39	52.39	0 01:16	-0.435	0.726	0.242
EX.MH44	JUNCTION	12.36	43.66	0 01:16	0.173	0.608	0.066
EX.MH44-S	JUNCTION	-12.36	20.61	0 01:18	-0.173	0.289	0.149
EX.MH45	JUNCTION	4.93	48.50	0 01:17	0.069	0.677	0.030
EX.MH45-S	JUNCTION	-4.93	8.21	0 01:20	-0.069	0.115	0.186
EX.MH46	JUNCTION	15.08	60.70	0 01:17	0.0403	0.776	0.029
EX.MH46-S	JUNCTION	-15.08	25.13	0 00:55	-0.0403	0.0674	0.409
EXMH32	JUNCTION	0.00	71.49	0 01:09	0	0.873	0.044
MH133	JUNCTION	0.00	8.23	0 01:18	0	0.0591	0.010
MH135	JUNCTION	0.00	8.28	0 01:18	0	0.0591	0.008
STM1	JUNCTION	0.00	2.19	0 01:38	0	0.0303	0.007
NorthMajor	OUTFALL	6.34	6.34	0 00:55	0.00851	0.00851	0.000
RingRoadMajor	OUTFALL	51.06	56.22	0 00:55	0.00453	0.0571	0.000
StormSewerSystem	OUTFALL	0.00	71.46	0 01:09	0	0.873	0.000
Detention	STORAGE	0.00	60.13	0 00:57	0	0.0615	0.196
Roof_Storage	STORAGE	27.63	27.63	0 00:55	0.0303	0.0303	-0.004
SurfaceStorage	STORAGE	68.82	68.82	0 00:55	0.0582	0.0582	-0.024

Node Surge 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
cbmh40	JUNCTION	1.22	0.221	1.656

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

2021-0821-13: 2Yr Post-Development

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
Detention	0.006	7.1	0.0	0.0	0.027	32.1	0 01:17	29.36
Roof_Storage	0.005	2.3	0.0	0.0	0.019	8.0	0 01:38	2.19
SurfaceStorage	0.000	0.0	0.0	0.0	0.000	0.0	0 00:56	68.82

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
NorthMajor	29.73	0.74	6.34	0.009
RingRoadMajor	99.93	1.23	56.22	0.057
StormSewerSystem	99.60	15.07	71.46	0.873
System	76.42	17.04	91.57	0.938

Street Flow Summary

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

C10-S			3.215	0.713	0.014	Inlet	ON-GRADE	1	60.00	60.00	99.90	0.00	0.96
1.29													
C11-S			8.127	0.914	0.018	Inlet	ON-SAG	1	81.84	99.83	1.38	0.00	3.33
1.48													
C13-S			52.394	2.218	0.044	Inlet	ON-GRADE	1	59.92	60.00	99.99	0.00	15.70
21.00													
C3-S			24.624	1.156	0.023	Inlet	ON-GRADE	1	60.00	60.00	91.73	0.00	7.39
9.85													
C4-S			0.000	0.915	0.018	Inlet	ON-GRADE	1					
C5-S			29.156	2.100	0.042	Inlet	ON-GRADE	1	60.00	60.00	88.24	0.00	8.75
11.66													
C8-S			20.608	1.418	0.028	Inlet	ON-GRADE	1	60.00	60.00	99.93	0.00	6.18
8.24													
C9-S			8.214	1.001	0.020	Inlet	ON-GRADE	1	60.00	60.00	99.92	0.00	2.46
3.29													

Link Flow Summary

Maximum Time of Max Maximum Max/ Max/

2021-0821-13: 2Yr Post-Development							
Link	Type	Flow LPS	Occurrence days hr:min	Veloc m/sec	Full Flow	Full Depth	
C1	CONDUIT	2.19	0 01:38	0.67	0.01	0.05	
C10	CONDUIT	48.50	0 01:17	1.33	0.17	0.37	
C10-S	CONDUIT	3.21	0 01:23	0.31	0.00	0.05	
C11	CONDUIT	60.69	0 01:17	1.49	0.42	0.40	
C11-S	CONDUIT	8.13	0 00:57	0.48	0.00	0.06	
C12	CONDUIT	63.63	0 01:17	1.66	0.16	0.27	
C13	CONDUIT	8.23	0 01:18	0.57	0.00	0.05	
C13-S	CONDUIT	52.39	0 01:16	0.54	0.01	0.15	
C14	CONDUIT	8.30	0 01:11	0.84	0.04	0.21	
C2	CONDUIT	2.19	0 01:38	0.55	0.01	0.06	
C3	CONDUIT	16.98	0 00:59	0.56	0.04	0.20	
C3-S	CONDUIT	24.62	0 00:55	0.93	0.00	0.08	
C4	CONDUIT	16.05	0 00:59	0.91	0.04	0.14	
C4-S	CONDUIT	0.00	0 00:00	0.00	0.00	0.06	
C5	CONDUIT	17.20	0 00:57	1.09	0.05	0.16	
C5-S	CONDUIT	29.16	0 00:56	0.35	0.01	0.14	
C6	CONDUIT	19.56	0 00:57	0.52	0.16	1.00	
C8	CONDUIT	31.37	0 01:16	1.08	0.32	0.43	
C8-S	CONDUIT	20.61	0 01:18	0.51	0.00	0.09	
C9	CONDUIT	43.65	0 01:17	1.59	0.44	0.41	
C9-S	CONDUIT	8.21	0 01:20	0.41	0.00	0.07	
CBMH32	CONDUIT	71.46	0 01:09	1.47	0.17	0.28	
CBMH92	CONDUIT	8.28	0 01:18	0.65	0.07	0.17	
Ctention	CONDUIT	29.36	0 00:57	0.83	0.24	0.70	
C7	ORIFICE	8.72	0 00:57			1.00	
CFRD	DUMMY	2.19	0 01:38				
OL1	DUMMY	53.49	0 00:56				

Flow Classification Summary

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class								
		----- Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C10	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00
C10-S	1.00	0.01	0.00	0.00	0.02	0.97	0.00	0.00	0.01	0.00
C11	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.14	0.00
C11-S	1.00	0.01	0.00	0.00	0.01	0.98	0.00	0.00	0.01	0.00
C12	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C13	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C13-S	1.00	0.00	0.00	0.00	0.87	0.13	0.00	0.00	0.00	0.00
C14	1.00	0.00	0.00	0.00	0.02	0.02	0.00	0.96	0.00	0.00
C2	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C3	1.00	0.00	0.04	0.00	0.96	0.00	0.00	0.00	0.98	0.00
C3-S	1.00	0.00	0.00	0.00	0.88	0.12	0.00	0.00	0.95	0.00
C4	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	0.00	0.00
C4-S	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C5	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	0.00	0.00
C5-S	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C6	1.00	0.03	0.00	0.00	0.09	0.00	0.00	0.88	0.01	0.00
C8	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.99	0.00
C8-S	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C9-S	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
CBMH32	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.04	0.00
CBMH92	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
Ctention	1.00	0.03	0.00	0.00	0.07	0.00	0.00	0.90	0.01	0.00

Conduit Surcharge Summary

Conduit	-----	Hours Full	-----	Hours	Hours
	Both Ends	Upstream	Dnstream	Above Full	Capacity

C6	0.02	0.02	1.22	0.01	0.01

Analysis begun on: Wed Nov 20 08:03:02 2024
Analysis ended on: Wed Nov 20 08:03:03 2024
Total elapsed time: 00:00:01

2021-0821-13: 5Yr Post-Development

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

WARNING 09: time series interval greater than recording interval for Rain Gage 5Yr

Element Count

Number of rain gages 6
 Number of subcatchments ... 14
 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	5 min.
10Yr	10Yr	INTENSITY	5 min.
25Yr	25Yr	INTENSITY	5 min.
2Yr	2Yr	INTENSITY	5 min.
50Yr	50Yr	INTENSITY	5 min.
5Yr	5Yr	INTENSITY	5 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
222	0.11	53.00	30.00	0.1000	5Yr	225B
223	0.11	40.14	87.00	0.1000	5Yr	226
224A	0.14	37.12	90.00	0.0000	5Yr	228
224B	0.22	77.00	90.00	0.1000	5Yr	Roof_Storage
224C	0.12	43.66	90.00	0.1000	5Yr	227
225A	0.17	34.21	82.00	2.5000	5Yr	EX.MH31-S
225B	0.29	27.63	82.00	2.1000	5Yr	EX.MH36-S
226	0.10	26.63	79.00	3.5000	5Yr	EX.MH34-S
227	0.43	172.40	75.00	3.0000	5Yr	SurfaceStorage
228	0.21	18.61	25.00	3.0000	5Yr	RingRoadMajor
229	0.15	14.59	38.00	0.1000	5Yr	NorthMajor
EXT-1	0.28	15.00	90.00	0.1000	5Yr	EX.MH34-S
EXT-2	0.28	186.67	90.00	0.1000	5Yr	RingRoadMajor
EXT-3	0.96	61.04	86.00	0.1000	5Yr	223

LID Control Summary

Subcatchment	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	% Imperv Treated	% Perv Treated
224A	GreenRoof	1	246.92	16.43	18.16	0.00	0.00
224C	GreenRoof	1	418.41	16.43	34.02	0.00	0.00

Node Summary

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

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cbmh40	JUNCTION	77.37	2.28	0.0	
CBMH52	JUNCTION	76.58	2.51	0.0	
CBMH55	JUNCTION	77.37	6.92	0.0	
CBMH92	JUNCTION	77.11	2.42	0.0	Yes
DCBMH38	JUNCTION	77.51	2.09	0.0	
EX.MH31	JUNCTION	76.62	5.64	0.0	
EX.MH31-S	JUNCTION	82.26	0.30	0.0	
EX.MH31-S1	JUNCTION	82.26	0.30	0.0	
EX.MH34	JUNCTION	78.40	2.89	0.0	
EX.MH34-S	JUNCTION	81.29	0.30	0.0	Yes
EX.MH36	JUNCTION	77.53	4.38	0.0	
EX.MH36-S	JUNCTION	81.92	0.30	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	
EX.MH46-S	JUNCTION	78.96	0.30	0.0	
EXMH32	JUNCTION	75.74	2.69	0.0	
MH133	JUNCTION	76.75	2.40	0.0	
MH135	JUNCTION	76.95	2.50	0.0	
STM1	JUNCTION	77.60	6.75	0.0	
NorthMajor	OUTFALL	0.00	0.00	0.0	
RingRoadMajor	OUTFALL	78.62	0.30	0.0	
StormSewerSystem	OUTFALL	75.64	0.53	0.0	
Detention	STORAGE	77.62	0.71	0.0	
Roof_Storage	STORAGE	84.35	0.15	0.0	
SurfaceStorage	STORAGE	79.60	0.30	0.0	

Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness

C1	STM1	CBMH55	CONDUIT	8.4	2.0123	0.0130
C10	EX.MH45	EX.MH46	CONDUIT	37.1	2.6424	0.0130
C10-S	EX.MH45-S	EX.MH46-S	CONDUIT	37.1	1.0486	0.0160
C11	EX.MH46	CBMH52	CONDUIT	10.5	0.6857	0.0130
C11-S	EX.MH46-S	RingRoadMajor	CONDUIT	10.5	3.2398	0.0160
C12	CBMH52	EXMH32	CONDUIT	51.6	1.5079	0.0130
C13	MH135	MH133	CONDUIT	26.8	0.4925	0.0130
C13-S	EX.MH34-S	EX.MH43-S	CONDUIT	128.3	0.5536	0.0160
C14	MH133	EX.MH46	CONDUIT	2.6	1.1539	0.0130
C2	CBMH55	EX.MH31	CONDUIT	14.2	1.0916	0.0130
C3	EX.MH31	EXMH32	CONDUIT	86.7	1.0104	0.0130
C3-S	EX.MH31-S	EX.MH46-S	CONDUIT	84.2	3.9211	0.0160
C4	EX.MH36	EX.MH31	CONDUIT	97.2	0.9002	0.0130
C4-S	EX.MH31-S1	EX.MH36-S	CONDUIT	97.2	0.3498	0.0160
C5	EX.MH34	EX.MH36	CONDUIT	60.8	1.3241	0.0130
C5-S	EX.MH36-S	EX.MH34-S	CONDUIT	60.8	1.0362	0.0160
C6	DCBMH38	cbmh40	CONDUIT	22.7	0.5022	0.0130
C8	EX.MH43	EX.MH44	CONDUIT	71.4	1.0365	0.0130
C8-S	EX.MH43-S	EX.MH44-S	CONDUIT	71.4	1.1345	0.0160
C9	EX.MH44	EX.MH45	CONDUIT	35.1	1.0542	0.0130
C9-S	EX.MH44-S	EX.MH45-S	CONDUIT	35.1	1.1967	0.0160
CBMH32	EXMH32	StormSewerSystem	CONDUIT	10.0	1.0001	0.0130
CBMH92	CBMH92	MH135	CONDUIT	26.4	0.5000	0.0130
Ctention	Detention	DCBMH38	CONDUIT	15.9	0.4969	0.0130
C7	cbmh40	CBMH92	ORIFICE			
CFRD	Roof_Storage	STM1	OUTLET			
OL1	SurfaceStorage	Detention	OUTLET			

Cross Section Summary

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	0.45	0.16	0.11	0.45	1	404.46
C10	CIRCULAR	0.38	0.11	0.09	0.38	1	285.03
C10-S	RingRoad	0.30	2.29	0.24	9.00	1	5642.11
C11	CIRCULAR	0.38	0.11	0.09	0.38	1	145.20
C11-S	RingRoad	0.30	2.29	0.24	9.00	1	9917.45
C12	CIRCULAR	0.47	0.18	0.12	0.47	1	404.43
C13	CIRCULAR	1.00	0.79	0.25	1.00	1	1682.76
C13-S	RingRoad	0.30	2.29	0.24	9.00	1	4099.48
C14	CIRCULAR	0.38	0.11	0.09	0.38	1	188.35
C2	CIRCULAR	0.45	0.16	0.11	0.45	1	297.90
C3	CIRCULAR	0.53	0.22	0.13	0.53	1	432.33
C3-S	HospitalRamp	0.30	2.60	0.23	10.50	1	12183.67
C4	CIRCULAR	0.53	0.22	0.13	0.53	1	408.07
C4-S	RingRoad	0.30	2.29	0.24	9.00	1	3258.74
C5	CIRCULAR	0.45	0.16	0.11	0.45	1	328.09
C5-S	RingRoad	0.30	2.29	0.24	9.00	1	5608.82
C6	CIRCULAR	0.38	0.11	0.09	0.38	1	124.26
C8	CIRCULAR	0.30	0.07	0.07	0.30	1	98.45
C8-S	RingRoad	0.30	2.29	0.24	9.00	1	5868.79
C9	CIRCULAR	0.30	0.07	0.07	0.30	1	99.29
C9-S	RingRoad	0.30	2.29	0.24	9.00	1	6027.37
CBMH32	CIRCULAR	0.53	0.22	0.13	0.53	1	430.10
CBMH92	CIRCULAR	0.38	0.11	0.09	0.38	1	123.99
Ctention	CIRCULAR	0.38	0.11	0.09	0.38	1	123.59

Street Summary

Street RingRoad

Area:

0.0008	0.0031	0.0071	0.0125	0.0196
0.0282	0.0384	0.0502	0.0635	0.0784
0.0949	0.1129	0.1325	0.1537	0.1765
0.2000	0.2235	0.2471	0.2706	0.2941
0.3176	0.3412	0.3647	0.3882	0.4118
0.4353	0.4588	0.4824	0.5059	0.5294
0.5529	0.5765	0.6000	0.6235	0.6471
0.6706	0.6941	0.7176	0.7412	0.7647
0.7882	0.8118	0.8353	0.8588	0.8824
0.9059	0.9294	0.9529	0.9765	1.0000

Hrad:

0.0123	0.0246	0.0369	0.0492	0.0615
0.0738	0.0861	0.0984	0.1107	0.1230
0.1353	0.1476	0.1599	0.1722	0.1845
0.2089	0.2331	0.2574	0.2817	0.3056
0.3296	0.3535	0.3774	0.4013	0.4250
0.4488	0.4724	0.4960	0.5195	0.5430
0.5664	0.5897	0.6130	0.6363	0.6594
0.6825	0.7056	0.7286	0.7515	0.7744
0.7972	0.8200	0.8427	0.8653	0.8879
0.9104	0.9329	0.9553	0.9777	1.0000

Width:

[illegible]

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Street HospitalRamp

Area:

0.0007	0.0028	0.0062	0.0111	0.0173
0.0249	0.0339	0.0443	0.0561	0.0693
0.0838	0.0997	0.1171	0.1358	0.1558
0.1773	0.2002	0.2242	0.2485	0.2727
0.2970	0.3212	0.3455	0.3697	0.3939
0.4182	0.4424	0.4667	0.4909	0.5152
0.5394	0.5636	0.5879	0.6121	0.6364
0.6606	0.6848	0.7091	0.7333	0.7576
0.7818	0.8061	0.8303	0.8545	0.8788
0.9030	0.9273	0.9515	0.9758	1.0000

Hrad:

0.0126	0.0251	0.0377	0.0503	0.0628
0.0754	0.0879	0.1005	0.1131	0.1256
0.1382	0.1508	0.1633	0.1759	0.1884
0.2010	0.2136	0.2323	0.2571	0.2819
0.3066	0.3312	0.3558	0.3804	0.4049
0.4293	0.4537	0.4780	0.5023	0.5265
0.5507	0.5748	0.5989	0.6229	0.6469
0.6708	0.6946	0.7184	0.7422	0.7659
0.7895	0.8131	0.8366	0.8601	0.8836
0.9070	0.9303	0.9536	0.9768	1.0000

Width:

0.0571	0.1143	0.1714	0.2286	0.2857
0.3429	0.4000	0.4571	0.5143	0.5714
0.6286	0.6857	0.7429	0.8000	0.8571
0.9143	0.9714	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	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

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 11/12/2024 00:00:00

Ending Date 11/13/2024 00:00:00

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 2

Head Tolerance 0.001500 m

Runoff Quantity Continuity

Volume

hectare-m

Depth

mm

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Initial LID Storage	0.001	0.242
Total Precipitation	0.076	21.270
Evaporation Loss	0.000	0.000
Infiltration Loss	0.019	5.270
Surface Runoff	0.052	14.545
Final Storage	0.008	2.113
Continuity Error (%)	-1.929	

	Volume hectare-m	Volume 10^6 ltr
Flow Routing Continuity		
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.052	0.519
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.055	0.546
External Outflow	0.107	1.068
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	0.001	0.009
Continuity Error (%)	-1.174	

Time-Step Critical Elements

Link C14 (99.47%)

Highest Flow Instability Indexes

Link C6 (1)

Most Frequent Nonconverging Nodes

Node NorthMajor (0.06%)
Node RingRoadMajor (0.06%)
Node StormSewerSystem (0.06%)
Node cbmh40 (0.06%)
Node DCBMH38 (0.03%)

Routing Time Step Summary

Minimum Time Step : 0.56 sec
Average Time Step : 3.63 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 : 68.55 %
3.155 - 1.991 sec : 3.94 %
1.991 - 1.256 sec : 27.47 %
1.256 - 0.792 sec : 0.04 %
0.792 - 0.500 sec : 0.00 %

Subcatchment Runoff Summary

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Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
222	21.27	0.00	0.00	14.89	6.36	0.00	6.36	0.01	8.98	0.299
223	21.27	147.10	0.00	8.57	145.91	13.42	159.33	0.18	54.68	0.946
224A	21.27	0.00	0.00	1.74	19.39	0.00	19.39	0.03	26.34	0.587
224B	21.27	0.00	0.00	2.13	18.75	0.00	18.75	0.04	41.39	0.882
224C	21.27	0.00	0.00	1.40	12.48	0.00	12.48	0.02	17.56	0.587
225A	21.27	0.00	0.00	3.83	17.37	0.00	17.37	0.03	37.94	0.816
225B	21.27	2.30	0.00	4.24	18.98	0.00	18.98	0.06	56.31	0.805
226	21.27	185.34	0.00	14.29	162.56	29.28	191.83	0.19	60.96	0.928
227	21.27	3.56	0.00	6.21	18.27	0.00	18.27	0.08	93.87	0.736
228	21.27	0.00	0.00	15.95	5.30	0.00	5.30	0.01	15.22	0.249
229	21.27	0.00	0.00	13.19	7.85	0.00	7.85	0.01	9.78	0.369
EXT-1	21.27	0.00	0.00	2.13	18.20	0.00	18.20	0.05	16.08	0.856
EXT-2	21.27	0.00	0.00	2.13	18.97	0.00	18.97	0.05	63.87	0.892
EXT-3	21.27	0.00	0.00	2.98	17.43	0.00	17.43	0.17	62.95	0.820

LID Performance Summary

Subcatchment	LID Control	Total Inflow mm	Evap Loss mm	Infil Loss mm	Surface Outflow mm	Drain Outflow mm	Initial Storage mm	Final Storage mm	Continuity Error %
224A	GreenRoof	21.27	0.00	0.00	0.00	0.00	13.00	34.27	0.00
224C	GreenRoof	21.27	0.00	0.00	0.00	0.00	13.00	34.27	0.00

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
cbmh40	JUNCTION	0.13	0.62	77.99	0 00:55	0.58
CBMH52	JUNCTION	0.06	0.15	76.73	0 01:17	0.15
CBMH55	JUNCTION	0.01	0.03	77.40	0 01:37	0.03
CBMH92	JUNCTION	0.02	0.07	77.18	0 01:18	0.07
DCBMH38	JUNCTION	0.09	0.48	78.00	0 01:06	0.44
EX.MH31	JUNCTION	0.02	0.09	76.70	0 00:59	0.09
EX.MH31-S	JUNCTION	0.00	0.03	82.29	0 00:55	0.03
EX.MH31-S1	JUNCTION	0.00	0.00	82.26	0 00:00	0.00
EX.MH34	JUNCTION	0.01	0.09	78.49	0 00:57	0.09
EX.MH34-S	JUNCTION	0.03	0.07	81.36	0 01:07	0.07
EX.MH36	JUNCTION	0.01	0.09	77.62	0 00:58	0.09
EX.MH36-S	JUNCTION	0.01	0.04	81.96	0 00:56	0.04
EX.MH43	JUNCTION	0.05	0.13	78.87	0 01:18	0.13
EX.MH43-S	JUNCTION	0.02	0.04	80.62	0 01:11	0.04
EX.MH44	JUNCTION	0.06	0.18	78.18	0 01:12	0.18
EX.MH44-S	JUNCTION	0.01	0.03	79.80	0 01:14	0.03
EX.MH45	JUNCTION	0.05	0.13	77.76	0 01:13	0.13
EX.MH45-S	JUNCTION	0.01	0.02	79.37	0 01:18	0.02
EX.MH46	JUNCTION	0.07	0.21	76.86	0 01:16	0.21
EX.MH46-S	JUNCTION	0.01	0.02	78.98	0 00:57	0.02
EXMH32	JUNCTION	0.07	0.17	75.91	0 01:15	0.17
MH133	JUNCTION	0.02	0.12	76.87	0 01:16	0.11
MH135	JUNCTION	0.02	0.05	77.00	0 01:20	0.05
STM1	JUNCTION	0.01	0.03	77.63	0 01:37	0.03
NorthMajor	OUTFALL	0.00	0.00	0.00	0 00:00	0.00

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RingRoadMajor	OUTFALL	0.01	0.02	78.64	0	00:57	0.02
StormSewerSystem	OUTFALL	0.07	0.17	75.81	0	01:15	0.17
Detention	STORAGE	0.08	0.32	77.94	0	01:18	0.32
Roof_Storage	STORAGE	0.00	0.02	84.37	0	01:37	0.02
SurfaceStorage	STORAGE	0.00	0.00	79.60	0	00:56	0.00

Node Inflow Summary

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
cbmh40	JUNCTION	0.00	20.60	0 00:55	0	0.076	-0.105
CBMH52	JUNCTION	8.63	93.57	0 01:16	0.0471	0.921	0.045
CBMH55	JUNCTION	0.00	3.04	0 01:37	0	0.0414	0.001
CBMH92	JUNCTION	0.04	9.30	0 01:06	0.00346	0.0796	0.010
DCBMH38	JUNCTION	0.00	32.40	0 00:58	0	0.0778	-0.257
EX.MH31	JUNCTION	0.00	26.22	0 00:58	0	0.0749	-0.027
EX.MH31-S	JUNCTION	37.94	37.94	0 00:55	0.0292	0.0292	-0.606
EX.MH31-S1	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
EX.MH34	JUNCTION	26.33	26.33	0 00:56	0.0335	0.0335	-0.009
EX.MH34-S	JUNCTION	69.32	90.87	0 01:05	0.747	0.803	0.324
EX.MH36	JUNCTION	0.00	25.97	0 00:57	0	0.0335	-0.012
EX.MH36-S	JUNCTION	56.31	56.31	0 00:55	0.0556	0.0556	-0.812
EX.MH43	JUNCTION	40.00	40.00	0 01:04	0.474	0.474	0.039
EX.MH43-S	JUNCTION	-40.00	82.88	0 01:08	-0.474	0.801	0.237
EX.MH44	JUNCTION	23.24	63.24	0 01:12	0.195	0.669	0.060
EX.MH44-S	JUNCTION	-23.24	38.73	0 01:12	-0.195	0.325	0.138
EX.MH45	JUNCTION	9.21	72.27	0 01:13	0.0776	0.746	0.028
EX.MH45-S	JUNCTION	-9.21	15.36	0 01:15	-0.0776	0.129	0.184
EX.MH46	JUNCTION	21.28	94.58	0 01:17	0.0484	0.874	0.024
EX.MH46-S	JUNCTION	-21.28	35.47	0 00:55	-0.0484	0.0809	0.380
EXMH32	JUNCTION	0.00	101.47	0 01:14	0	0.995	0.040
MH133	JUNCTION	0.00	8.97	0 01:18	0	0.0796	0.021
MH135	JUNCTION	0.00	8.93	0 01:19	0	0.0796	0.009
STM1	JUNCTION	0.00	3.04	0 01:37	0	0.0414	0.004
NorthMajor	OUTFALL	9.78	9.78	0 00:55	0.0116	0.0116	0.000
RingRoadMajor	OUTFALL	72.85	80.39	0 00:55	0.0173	0.0753	0.000
StormSewerSystem	OUTFALL	0.00	101.29	0 01:15	0	0.995	0.000
Detention	STORAGE	0.00	86.16	0 00:56	0	0.0807	0.199
Roof_Storage	STORAGE	41.39	41.39	0 00:55	0.0414	0.0414	-0.002
SurfaceStorage	STORAGE	93.87	93.87	0 00:55	0.0787	0.0787	-0.005

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
cbmh40	JUNCTION	1.98	0.219	1.658
DCBMH38	JUNCTION	0.03	0.049	1.604

Node Flooding Summary

No nodes were flooded.

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Storage Volume Summary

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
Detention	0.009	10.4	0.0	0.0	0.040	47.8	0 01:18	32.40
Roof_Storage	0.008	3.3	0.0	0.0	0.026	11.1	0 01:37	3.04
SurfaceStorage	0.000	0.0	0.0	0.0	0.000	0.0	0 00:56	93.87

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
NorthMajor	32.69	0.92	9.78	0.012
RingRoadMajor	99.95	1.71	80.39	0.075
StormSewerSystem	99.62	18.27	101.29	0.995
System	77.42	20.89	136.13	1.082

Street Flow Summary

Peak Bypass Flow Street Conduit LPS	Peak Flow LPS	Maximum Spread m	Maximum Depth m	Inlet Design	Inlet Location	Inlet Capture Pcnt	Peak Flow Capture Pcnt	Avg. Flow Capture Pcnt	Bypass Flow Freq Pcnt	Back Flow Freq Pcnt	Peak Capture / Inlet LPS
C10-S 2.42	6.055	0.894	0.018	Inlet	ON-GRADE	1	60.00	60.00	99.91	0.00	1.82
C11-S 3.07	11.700	1.042	0.021	Inlet	ON-SAG	1	73.76	99.61	4.03	0.00	4.31
C13-S 42.88	82.882	2.669	0.053	Inlet	ON-GRADE	1	48.26	59.79	99.99	0.00	20.00
C3-S 13.95	34.867	1.319	0.026	Inlet	ON-GRADE	1	60.00	60.00	91.83	0.00	10.46
C4-S	0.000	1.067	0.021	Inlet	ON-GRADE	1					
C5-S 17.55	43.878	2.434	0.049	Inlet	ON-GRADE	1	60.00	60.00	89.39	0.00	13.16
C8-S 15.49	38.726	1.796	0.036	Inlet	ON-GRADE	1	60.00	60.00	99.94	0.00	11.62
C9-S 6.14	15.355	1.272	0.025	Inlet	ON-GRADE	1	60.00	60.00	99.92	0.00	4.61

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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	3.04	0 01:37	0.75	0.01	0.06
C10	CONDUIT	72.26	0 01:13	1.51	0.25	0.46
C10-S	CONDUIT	6.06	0 01:17	0.38	0.00	0.06
C11	CONDUIT	89.55	0 01:16	1.67	0.62	0.49
C11-S	CONDUIT	11.70	0 00:57	0.53	0.00	0.07
C12	CONDUIT	91.81	0 01:17	1.85	0.23	0.32
C13	CONDUIT	8.97	0 01:18	0.59	0.01	0.05
C13-S	CONDUIT	82.88	0 01:08	0.60	0.02	0.18
C14	CONDUIT	16.32	0 01:17	0.86	0.09	0.33
C2	CONDUIT	3.04	0 01:37	0.60	0.01	0.07
C3	CONDUIT	25.92	0 00:59	0.66	0.06	0.24
C3-S	CONDUIT	34.87	0 00:55	1.01	0.00	0.09
C4	CONDUIT	24.53	0 00:58	1.04	0.06	0.17
C4-S	CONDUIT	0.00	0 00:00	0.00	0.00	0.07
C5	CONDUIT	25.97	0 00:57	1.23	0.08	0.19
C5-S	CONDUIT	43.88	0 00:56	0.39	0.01	0.16
C6	CONDUIT	20.60	0 00:55	0.47	0.17	1.00
C8	CONDUIT	40.00	0 01:13	1.17	0.41	0.52
C8-S	CONDUIT	38.73	0 01:12	0.61	0.01	0.12
C9	CONDUIT	63.23	0 01:12	1.75	0.64	0.51
C9-S	CONDUIT	15.36	0 01:15	0.48	0.00	0.08
CBMH32	CONDUIT	101.29	0 01:15	1.62	0.24	0.33
CBMH92	CONDUIT	8.93	0 01:19	0.66	0.07	0.18
Ctention	CONDUIT	32.40	0 00:58	0.83	0.26	0.89
C7	ORIFICE	9.26	0 01:06			1.00
CFRD	DUMMY	3.04	0 01:37			
OL1	DUMMY	72.50	0 00:56			

Flow Classification Summary

Conduit	Adjusted /Actual Length	----- Up Dry	Down Dry	Sub Dry	Fraction of Sub Crit	Time in Flow Class Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C10	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00
C10-S	1.00	0.01	0.00	0.00	0.02	0.97	0.00	0.00	0.01	0.00
C11	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.15	0.00
C11-S	1.00	0.01	0.00	0.00	0.01	0.98	0.00	0.00	0.01	0.00
C12	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C13	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C13-S	1.00	0.00	0.00	0.00	0.87	0.13	0.00	0.00	0.00	0.00
C14	1.00	0.00	0.00	0.00	0.04	0.01	0.00	0.95	0.00	0.00
C2	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C3	1.00	0.00	0.04	0.00	0.96	0.00	0.00	0.00	0.99	0.00
C3-S	1.00	0.00	0.00	0.00	0.87	0.12	0.00	0.00	0.95	0.00
C4	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	0.00	0.00
C4-S	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C5	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C5-S	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C6	1.00	0.03	0.00	0.00	0.11	0.00	0.00	0.86	0.01	0.00
C8	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	0.99	0.00
C8-S	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C9-S	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
CBMH32	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.04	0.00

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CBMH92	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
Ctention	1.00	0.03	0.00	0.00	0.10	0.00	0.00	0.87	0.01	0.00

 Conduit Surcharge Summary

Conduit	Hours Full			Hours	
	----- Both Ends	Upstream	Dnstream	Above Full Normal Flow	Capacity Limited
C6	0.94	0.94	1.98	0.01	0.01
Ctention	0.01	0.01	0.03	0.01	0.01

Analysis begun on: Wed Nov 20 08:03:23 2024
 Analysis ended on: Wed Nov 20 08:03:24 2024
 Total elapsed time: 00:00:01

2021-0821-13: 10Yr Post-Development

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

WARNING 09: time series interval greater than recording interval for Rain Gage 10Yr

Element Count

Number of rain gages 6
 Number of subcatchments ... 14
 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	5 min.
10Yr	10Yr	INTENSITY	5 min.
25Yr	25Yr	INTENSITY	5 min.
2Yr	2Yr	INTENSITY	5 min.
50Yr	50Yr	INTENSITY	5 min.
5Yr	5Yr	INTENSITY	5 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
222	0.11	53.00	30.00	0.1000	10Yr	225B
223	0.11	40.14	87.00	0.1000	10Yr	226
224A	0.14	37.12	90.00	0.0000	10Yr	228
224B	0.22	77.00	90.00	0.1000	10Yr	Roof_Storage
224C	0.12	43.66	90.00	0.1000	10Yr	227
225A	0.17	34.21	82.00	2.5000	10Yr	EX.MH31-S
225B	0.29	27.63	82.00	2.1000	10Yr	EX.MH36-S
226	0.10	26.63	79.00	3.5000	10Yr	EX.MH34-S
227	0.43	172.40	75.00	3.0000	10Yr	SurfaceStorage
228	0.21	18.61	25.00	3.0000	10Yr	RingRoadMajor
229	0.15	14.59	38.00	0.1000	10Yr	NorthMajor
EXT-1	0.28	15.00	90.00	0.1000	10Yr	EX.MH34-S
EXT-2	0.28	186.67	90.00	0.1000	10Yr	RingRoadMajor
EXT-3	0.96	61.04	86.00	0.1000	10Yr	223

LID Control Summary

Subcatchment	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	% Imperv Treated	% Perv Treated
224A	GreenRoof	1	246.92	16.43	18.16	0.00	0.00
224C	GreenRoof	1	418.41	16.43	34.02	0.00	0.00

Node Summary

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

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cbmh40	JUNCTION	77.37	2.28	0.0	
CBMH52	JUNCTION	76.58	2.51	0.0	
CBMH55	JUNCTION	77.37	6.92	0.0	
CBMH92	JUNCTION	77.11	2.42	0.0	Yes
DCBMH38	JUNCTION	77.51	2.09	0.0	
EX.MH31	JUNCTION	76.62	5.64	0.0	
EX.MH31-S	JUNCTION	82.26	0.30	0.0	
EX.MH31-S1	JUNCTION	82.26	0.30	0.0	
EX.MH34	JUNCTION	78.40	2.89	0.0	
EX.MH34-S	JUNCTION	81.29	0.30	0.0	Yes
EX.MH36	JUNCTION	77.53	4.38	0.0	
EX.MH36-S	JUNCTION	81.92	0.30	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	
EX.MH46-S	JUNCTION	78.96	0.30	0.0	
EXMH32	JUNCTION	75.74	2.69	0.0	
MH133	JUNCTION	76.75	2.40	0.0	
MH135	JUNCTION	76.95	2.50	0.0	
STM1	JUNCTION	77.60	6.75	0.0	
NorthMajor	OUTFALL	0.00	0.00	0.0	
RingRoadMajor	OUTFALL	78.62	0.30	0.0	
StormSewerSystem	OUTFALL	75.64	0.53	0.0	
Detention	STORAGE	77.62	0.71	0.0	
Roof_Storage	STORAGE	84.35	0.15	0.0	
SurfaceStorage	STORAGE	79.60	0.30	0.0	

Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness

C1	STM1	CBMH55	CONDUIT	8.4	2.0123	0.0130
C10	EX.MH45	EX.MH46	CONDUIT	37.1	2.6424	0.0130
C10-S	EX.MH45-S	EX.MH46-S	CONDUIT	37.1	1.0486	0.0160
C11	EX.MH46	CBMH52	CONDUIT	10.5	0.6857	0.0130
C11-S	EX.MH46-S	RingRoadMajor	CONDUIT	10.5	3.2398	0.0160
C12	CBMH52	EXMH32	CONDUIT	51.6	1.5079	0.0130
C13	MH135	MH133	CONDUIT	26.8	0.4925	0.0130
C13-S	EX.MH34-S	EX.MH43-S	CONDUIT	128.3	0.5536	0.0160
C14	MH133	EX.MH46	CONDUIT	2.6	1.1539	0.0130
C2	CBMH55	EX.MH31	CONDUIT	14.2	1.0916	0.0130
C3	EX.MH31	EXMH32	CONDUIT	86.7	1.0104	0.0130
C3-S	EX.MH31-S	EX.MH46-S	CONDUIT	84.2	3.9211	0.0160
C4	EX.MH36	EX.MH31	CONDUIT	97.2	0.9002	0.0130
C4-S	EX.MH31-S1	EX.MH36-S	CONDUIT	97.2	0.3498	0.0160
C5	EX.MH34	EX.MH36	CONDUIT	60.8	1.3241	0.0130
C5-S	EX.MH36-S	EX.MH34-S	CONDUIT	60.8	1.0362	0.0160
C6	DCBMH38	cbmh40	CONDUIT	22.7	0.5022	0.0130
C8	EX.MH43	EX.MH44	CONDUIT	71.4	1.0365	0.0130
C8-S	EX.MH43-S	EX.MH44-S	CONDUIT	71.4	1.1345	0.0160
C9	EX.MH44	EX.MH45	CONDUIT	35.1	1.0542	0.0130
C9-S	EX.MH44-S	EX.MH45-S	CONDUIT	35.1	1.1967	0.0160
CBMH32	EXMH32	StormSewerSystem	CONDUIT	10.0	1.0001	0.0130
CBMH92	CBMH92	MH135	CONDUIT	26.4	0.5000	0.0130
Ctention	Detention	DCBMH38	CONDUIT	15.9	0.4969	0.0130
C7	cbmh40	CBMH92	ORIFICE			
CFRD	Roof_Storage	STM1	OUTLET			
OL1	SurfaceStorage	Detention	OUTLET			

Cross Section Summary

Area:

Hrad:

Width:[illegible]

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Street HospitalRamp

Area:

0.0007	0.0028	0.0062	0.0111	0.0173
0.0249	0.0339	0.0443	0.0561	0.0693
0.0838	0.0997	0.1171	0.1358	0.1558
0.1773	0.2002	0.2242	0.2485	0.2727
0.2970	0.3212	0.3455	0.3697	0.3939
0.4182	0.4424	0.4667	0.4909	0.5152
0.5394	0.5636	0.5879	0.6121	0.6364
0.6606	0.6848	0.7091	0.7333	0.7576
0.7818	0.8061	0.8303	0.8545	0.8788
0.9030	0.9273	0.9515	0.9758	1.0000

Hrad:

0.0126	0.0251	0.0377	0.0503	0.0628
0.0754	0.0879	0.1005	0.1131	0.1256
0.1382	0.1508	0.1633	0.1759	0.1884
0.2010	0.2136	0.2323	0.2571	0.2819
0.3066	0.3312	0.3558	0.3804	0.4049
0.4293	0.4537	0.4780	0.5023	0.5265
0.5507	0.5748	0.5989	0.6229	0.6469
0.6708	0.6946	0.7184	0.7422	0.7659
0.7895	0.8131	0.8366	0.8601	0.8836
0.9070	0.9303	0.9536	0.9768	1.0000

Width:

0.0571	0.1143	0.1714	0.2286	0.2857
0.3429	0.4000	0.4571	0.5143	0.5714
0.6286	0.6857	0.7429	0.8000	0.8571
0.9143	0.9714	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	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

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 11/12/2024 00:00:00

Ending Date 11/13/2024 00:00:00

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 2

Head Tolerance 0.001500 m

 Runoff Quantity Continuity

Volume
 hectare-m

Depth
 mm

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Initial LID Storage	0.001	0.242
Total Precipitation	0.088	24.767
Evaporation Loss	0.000	0.000
Infiltration Loss	0.022	6.039
Surface Runoff	0.061	17.215
Final Storage	0.008	2.276
Continuity Error (%)	-2.078	

	Volume hectare-m	Volume 10^6 ltr
Flow Routing Continuity		
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.061	0.614
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.055	0.546
External Outflow	0.116	1.163
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	0.001	0.009
Continuity Error (%)	-1.074	

Time-Step Critical Elements

Link C14 (99.49%)

Highest Flow Instability Indexes

All links are stable.

Most Frequent Nonconverging Nodes

Node NorthMajor (0.08%)
Node RingRoadMajor (0.08%)
Node StormSewerSystem (0.08%)
Node DCBMH38 (0.06%)
Node cbmh40 (0.06%)

Routing Time Step Summary

Minimum Time Step : 1.31 sec
Average Time Step : 3.53 sec
Maximum Time Step : 5.00 sec
% of Time in Steady State : 0.00
Average Iterations per Step : 2.03
% of Steps Not Converging : 0.08
Time Step Frequencies :
5.000 - 3.155 sec : 65.43 %
3.155 - 1.991 sec : 3.61 %
1.991 - 1.256 sec : 30.95 %
1.256 - 0.792 sec : 0.00 %
0.792 - 0.500 sec : 0.00 %

Subcatchment Runoff Summary

2021-0821-13: 10Yr Post-Development

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
222	24.77	0.00	0.00	17.34	7.46	0.02	7.48	0.01	10.65	0.302
223	24.77	172.91	0.00	8.73	171.50	17.12	188.62	0.22	72.67	0.954
224A	24.77	0.00	0.00	2.03	22.81	0.01	22.82	0.03	32.26	0.593
224B	24.77	0.00	0.00	2.48	22.05	0.01	22.07	0.05	50.70	0.891
224C	24.77	0.00	0.00	1.63	14.67	0.01	14.68	0.02	21.22	0.593
225A	24.77	0.00	0.00	4.46	20.40	0.03	20.43	0.03	45.14	0.825
225B	24.77	2.71	0.00	4.94	22.31	0.02	22.33	0.07	68.27	0.813
226	24.77	219.41	0.00	14.52	192.25	37.04	229.28	0.22	80.82	0.939
227	24.77	4.19	0.00	7.23	21.45	0.09	21.54	0.09	111.49	0.744
228	24.77	0.00	0.00	18.57	6.22	0.02	6.23	0.01	18.04	0.252
229	24.77	0.00	0.00	15.36	9.24	0.00	9.24	0.01	12.14	0.373
EXT-1	24.77	0.00	0.00	2.48	21.39	0.00	21.39	0.06	20.84	0.864
EXT-2	24.77	0.00	0.00	2.48	22.30	0.02	22.32	0.06	76.75	0.901
EXT-3	24.77	0.00	0.00	3.47	20.49	0.00	20.49	0.20	81.23	0.827

LID Performance Summary

Subcatchment	LID Control	Total Inflow mm	Evap Loss mm	Infil Loss mm	Surface Outflow mm	Drain Outflow mm	Initial Storage mm	Final Storage mm	Continuity Error %
224A	GreenRoof	24.77	0.00	0.00	0.00	0.00	13.00	37.77	-0.00
224C	GreenRoof	24.77	0.00	0.00	0.00	0.00	13.00	37.77	-0.00

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
cbmh40	JUNCTION	0.15	0.64	78.00	0 01:18	0.64
CBMH52	JUNCTION	0.06	0.17	76.75	0 01:15	0.17
CBMH55	JUNCTION	0.01	0.03	77.41	0 01:37	0.03
CBMH92	JUNCTION	0.03	0.07	77.18	0 01:19	0.07
DCBMH38	JUNCTION	0.11	0.51	78.02	0 01:00	0.49
EX.MH31	JUNCTION	0.02	0.10	76.71	0 00:58	0.10
EX.MH31-S	JUNCTION	0.00	0.04	82.30	0 00:55	0.03
EX.MH31-S1	JUNCTION	0.00	0.00	82.26	0 00:00	0.00
EX.MH34	JUNCTION	0.01	0.09	78.49	0 00:57	0.09
EX.MH34-S	JUNCTION	0.03	0.07	81.36	0 01:07	0.07
EX.MH36	JUNCTION	0.01	0.10	77.63	0 00:58	0.10
EX.MH36-S	JUNCTION	0.01	0.05	81.97	0 00:56	0.05
EX.MH43	JUNCTION	0.05	0.13	78.87	0 01:07	0.13
EX.MH43-S	JUNCTION	0.02	0.05	80.63	0 01:10	0.05
EX.MH44	JUNCTION	0.07	0.20	78.20	0 01:11	0.20
EX.MH44-S	JUNCTION	0.01	0.03	79.80	0 01:12	0.03
EX.MH45	JUNCTION	0.05	0.14	77.77	0 01:12	0.14
EX.MH45-S	JUNCTION	0.01	0.03	79.38	0 01:15	0.03
EX.MH46	JUNCTION	0.08	0.24	76.89	0 01:13	0.24
EX.MH46-S	JUNCTION	0.01	0.02	78.98	0 00:57	0.02
EXMH32	JUNCTION	0.07	0.19	75.93	0 01:12	0.19
MH133	JUNCTION	0.02	0.13	76.89	0 01:13	0.13
MH135	JUNCTION	0.02	0.05	77.00	0 01:28	0.05
STM1	JUNCTION	0.01	0.03	77.63	0 01:36	0.03
NorthMajor	OUTFALL	0.00	0.00	0.00	0 00:00	0.00

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RingRoadMajor	OUTFALL	0.01	0.02	78.64	0	00:57	0.02
StormSewerSystem	OUTFALL	0.07	0.19	75.83	0	01:12	0.19
Detention	STORAGE	0.10	0.38	78.00	0	01:18	0.38
Roof_Storage	STORAGE	0.01	0.02	84.37	0	01:36	0.02
SurfaceStorage	STORAGE	0.01	0.13	79.73	0	00:56	0.13

Node Inflow Summary

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
cbmh40	JUNCTION	0.00	13.31	0 00:54	0	0.0901	-0.085
CBMH52	JUNCTION	9.95	111.17	0 01:15	0.0503	0.988	0.042
CBMH55	JUNCTION	0.00	3.60	0 01:37	0	0.0487	0.001
CBMH92	JUNCTION	0.04	9.42	0 01:18	0.00346	0.0936	0.008
DCBMH38	JUNCTION	0.00	34.07	0 00:58	0	0.0911	-0.148
EX.MH31	JUNCTION	0.00	32.36	0 00:58	0	0.0881	-0.028
EX.MH31-S	JUNCTION	45.14	45.14	0 00:55	0.0343	0.0343	-0.617
EX.MH31-S1	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
EX.MH34	JUNCTION	32.30	32.30	0 00:56	0.0394	0.0394	-0.009
EX.MH34-S	JUNCTION	90.69	115.57	0 01:05	0.787	0.853	0.300
EX.MH36	JUNCTION	0.00	31.93	0 00:57	0	0.0394	-0.012
EX.MH36-S	JUNCTION	68.27	68.27	0 00:55	0.0654	0.0654	-0.826
EX.MH43	JUNCTION	40.00	40.00	0 00:59	0.491	0.491	0.037
EX.MH43-S	JUNCTION	-40.00	105.74	0 01:07	-0.491	0.85	0.235
EX.MH44	JUNCTION	35.79	75.79	0 01:11	0.214	0.705	0.057
EX.MH44-S	JUNCTION	-35.79	59.68	0 01:11	-0.214	0.357	0.131
EX.MH45	JUNCTION	14.05	89.53	0 01:12	0.0855	0.79	0.026
EX.MH45-S	JUNCTION	-14.05	23.42	0 01:13	-0.0855	0.142	0.183
EX.MH46	JUNCTION	25.33	106.63	0 01:13	0.0547	0.938	0.023
EX.MH46-S	JUNCTION	-25.33	42.21	0 00:55	-0.0547	0.0913	0.364
EXMH32	JUNCTION	0.00	123.70	0 01:11	0	1.08	0.038
MH133	JUNCTION	0.00	9.42	0 01:19	0	0.0936	0.006
MH135	JUNCTION	0.00	9.42	0 01:19	0	0.0936	0.000
STM1	JUNCTION	0.00	3.60	0 01:36	0	0.0487	0.003
NorthMajor	OUTFALL	12.14	12.14	0 00:55	0.0137	0.0137	0.000
RingRoadMajor	OUTFALL	87.47	96.93	0 00:55	0.0255	0.0877	0.000
StormSewerSystem	OUTFALL	0.00	123.68	0 01:12	0	1.08	0.000
Detention	STORAGE	0.00	96.07	0 00:56	0	0.094	0.137
Roof_Storage	STORAGE	50.70	50.70	0 00:55	0.0488	0.0488	-0.001
SurfaceStorage	STORAGE	111.49	111.49	0 00:55	0.0928	0.0928	-0.003

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
cbmh40	JUNCTION	2.37	0.230	1.647
DCBMH38	JUNCTION	0.93	0.076	1.577

Node Flooding Summary

No nodes were flooded.

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Storage Volume Summary

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
Detention	0.011	13.2	0.0	0.0	0.049	58.9	0 01:18	34.07
Roof_Storage	0.009	4.0	0.0	0.0	0.031	13.2	0 01:36	3.60
SurfaceStorage	0.000	0.1	0.0	0.0	0.008	5.9	0 00:56	84.24

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
NorthMajor	34.38	1.01	12.14	0.014
RingRoadMajor	99.96	2.00	96.93	0.088
StormSewerSystem	99.63	20.28	123.68	1.076
System	77.99	23.29	166.50	1.177

Street Flow Summary

Peak Bypass Flow Street Conduit LPS	Peak Flow LPS	Maximum Spread m	Maximum Depth m	Inlet Design	Inlet Location	Inlet Capture Pcnt	Peak Flow Capture Pcnt	Avg. Flow Capture Pcnt	Bypass Flow Freq Pcnt	Back Flow Freq Pcnt	Peak Capture / Inlet LPS
C10-S 3.68	9.210	1.032	0.021	Inlet	ON-GRADE	1	60.00	60.00	99.91	0.00	2.76
C11-S 4.08	14.033	1.118	0.022	Inlet	ON-SAG	1	70.91	99.31	5.76	0.00	4.98
C13-S 65.74	105.745	2.988	0.060	Inlet	ON-GRADE	1	37.83	59.46	99.99	0.00	20.00
C3-S 16.61	41.532	1.413	0.028	Inlet	ON-GRADE	1	60.00	60.00	88.49	0.00	12.46
C4-S	0.000	1.151	0.023	Inlet	ON-GRADE	1					
C5-S 21.55	53.850	2.633	0.053	Inlet	ON-GRADE	1	59.99	60.00	89.53	0.00	16.15
C8-S 23.89	59.675	2.107	0.042	Inlet	ON-GRADE	1	59.97	60.00	99.94	0.00	17.89
C9-S 9.37	23.418	1.492	0.030	Inlet	ON-GRADE	1	60.00	60.00	99.92	0.00	7.03

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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	3.60	0 01:37	0.79	0.01	0.07
C10	CONDUIT	89.52	0 01:12	1.59	0.31	0.51
C10-S	CONDUIT	9.21	0 01:15	0.43	0.00	0.07
C11	CONDUIT	106.49	0 01:13	1.73	0.73	0.55
C11-S	CONDUIT	14.03	0 00:57	0.55	0.00	0.07
C12	CONDUIT	111.12	0 01:15	1.95	0.27	0.36
C13	CONDUIT	9.42	0 01:19	0.60	0.01	0.06
C13-S	CONDUIT	105.74	0 01:07	0.62	0.03	0.20
C14	CONDUIT	12.30	0 01:30	0.87	0.07	0.40
C2	CONDUIT	3.60	0 01:37	0.64	0.01	0.08
C3	CONDUIT	32.01	0 00:58	0.70	0.07	0.26
C3-S	CONDUIT	41.53	0 00:55	1.05	0.00	0.09
C4	CONDUIT	30.32	0 00:58	1.11	0.07	0.18
C4-S	CONDUIT	0.00	0 00:00	0.00	0.00	0.08
C5	CONDUIT	31.93	0 00:57	1.31	0.10	0.21
C5-S	CONDUIT	53.85	0 00:56	0.41	0.01	0.18
C6	CONDUIT	13.31	0 00:54	0.49	0.11	1.00
C8	CONDUIT	40.00	0 01:07	1.20	0.41	0.55
C8-S	CONDUIT	59.68	0 01:11	0.68	0.01	0.14
C9	CONDUIT	75.77	0 01:11	1.82	0.76	0.57
C9-S	CONDUIT	23.42	0 01:13	0.54	0.00	0.10
CBMH32	CONDUIT	123.68	0 01:12	1.72	0.29	0.37
CBMH92	CONDUIT	9.42	0 01:19	0.67	0.08	0.18
Ctention	CONDUIT	34.07	0 00:58	0.76	0.28	0.97
C7	ORIFICE	9.38	0 01:18			1.00
CFRD	DUMMY	3.60	0 01:36			
OL1	DUMMY	84.24	0 00:56			

Flow Classification Summary

Conduit	Adjusted /Actual Length	----- Up Dry	Down Dry	Sub Dry	Fraction of Sub Crit	Time in Flow Sup Crit	Up Crit	Down Crit	Flow Class Norm Ltd	Inlet Ctrl
C1	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C10	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	1.00	0.00
C10-S	1.00	0.01	0.00	0.00	0.02	0.97	0.00	0.00	0.02	0.00
C11	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.15	0.00
C11-S	1.00	0.01	0.00	0.00	0.01	0.98	0.00	0.00	0.02	0.00
C12	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C13	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.01	0.00
C13-S	1.00	0.00	0.00	0.00	0.87	0.13	0.00	0.00	0.00	0.00
C14	1.00	0.00	0.00	0.00	0.04	0.01	0.00	0.95	0.00	0.00
C2	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C3	1.00	0.00	0.04	0.00	0.96	0.00	0.00	0.00	0.99	0.00
C3-S	1.00	0.00	0.00	0.00	0.87	0.13	0.00	0.00	0.95	0.00
C4	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C4-S	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C5	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C5-S	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C6	1.00	0.03	0.00	0.00	0.13	0.00	0.00	0.84	0.01	0.00
C8	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	0.99	0.00
C8-S	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C9-S	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
CBMH32	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.05	0.00

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CBMH92	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
Ctention	1.00	0.03	0.00	0.00	0.12	0.00	0.00	0.86	0.01	0.00

 Conduit Surcharge Summary

Conduit	Hours Full			Hours	
	----- Both Ends	Upstream	Dnstream	Above Full Normal Flow	Capacity Limited
C6	1.49	1.49	2.37	0.01	0.01
Ctention	0.01	0.01	0.93	0.01	0.01

Analysis begun on: Wed Nov 20 08:03:40 2024
 Analysis ended on: Wed Nov 20 08:03:41 2024
 Total elapsed time: 00:00:01

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

WARNING 09: time series interval greater than recording interval for Rain Gage 25Yr

Element Count

Number of rain gages 6
 Number of subcatchments ... 14
 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	5 min.
10Yr	10Yr	INTENSITY	5 min.
25Yr	25Yr	INTENSITY	5 min.
2Yr	2Yr	INTENSITY	5 min.
50Yr	50Yr	INTENSITY	5 min.
5Yr	5Yr	INTENSITY	5 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
222	0.11	53.00	30.00	0.1000	25Yr	225B
223	0.11	40.14	87.00	0.1000	25Yr	226
224A	0.14	37.12	90.00	0.0000	25Yr	228
224B	0.22	77.00	90.00	0.1000	25Yr	Roof_Storage
224C	0.12	43.66	90.00	0.1000	25Yr	227
225A	0.17	34.21	82.00	2.5000	25Yr	EX.MH31-S
225B	0.29	27.63	82.00	2.1000	25Yr	EX.MH36-S
226	0.10	26.63	79.00	3.5000	25Yr	EX.MH34-S
227	0.43	172.40	75.00	3.0000	25Yr	SurfaceStorage
228	0.21	18.61	25.00	3.0000	25Yr	RingRoadMajor
229	0.15	14.59	38.00	0.1000	25Yr	NorthMajor
EXT-1	0.28	15.00	90.00	0.1000	25Yr	EX.MH34-S
EXT-2	0.28	186.67	90.00	0.1000	25Yr	RingRoadMajor
EXT-3	0.96	61.04	86.00	0.1000	25Yr	223

LID Control Summary

Subcatchment	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	% Imperv Treated	% Perv Treated
224A	GreenRoof	1	246.92	16.43	18.16	0.00	0.00
224C	GreenRoof	1	418.41	16.43	34.02	0.00	0.00

Node Summary

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

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cbmh40	JUNCTION	77.37	2.28	0.0	
CBMH52	JUNCTION	76.58	2.51	0.0	
CBMH55	JUNCTION	77.37	6.92	0.0	
CBMH92	JUNCTION	77.11	2.42	0.0	Yes
DCBMH38	JUNCTION	77.51	2.09	0.0	
EX.MH31	JUNCTION	76.62	5.64	0.0	
EX.MH31-S	JUNCTION	82.26	0.30	0.0	
EX.MH31-S1	JUNCTION	82.26	0.30	0.0	
EX.MH34	JUNCTION	78.40	2.89	0.0	
EX.MH34-S	JUNCTION	81.29	0.30	0.0	Yes
EX.MH36	JUNCTION	77.53	4.38	0.0	
EX.MH36-S	JUNCTION	81.92	0.30	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	
EX.MH46-S	JUNCTION	78.96	0.30	0.0	
EXMH32	JUNCTION	75.74	2.69	0.0	
MH133	JUNCTION	76.75	2.40	0.0	
MH135	JUNCTION	76.95	2.50	0.0	
STM1	JUNCTION	77.60	6.75	0.0	
NorthMajor	OUTFALL	0.00	0.00	0.0	
RingRoadMajor	OUTFALL	78.62	0.30	0.0	
StormSewerSystem	OUTFALL	75.64	0.53	0.0	
Detention	STORAGE	77.62	0.71	0.0	
Roof_Storage	STORAGE	84.35	0.15	0.0	
SurfaceStorage	STORAGE	79.60	0.30	0.0	

Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness

C1	STM1	CBMH55	CONDUIT	8.4	2.0123	0.0130
C10	EX.MH45	EX.MH46	CONDUIT	37.1	2.6424	0.0130
C10-S	EX.MH45-S	EX.MH46-S	CONDUIT	37.1	1.0486	0.0160
C11	EX.MH46	CBMH52	CONDUIT	10.5	0.6857	0.0130
C11-S	EX.MH46-S	RingRoadMajor	CONDUIT	10.5	3.2398	0.0160
C12	CBMH52	EXMH32	CONDUIT	51.6	1.5079	0.0130
C13	MH135	MH133	CONDUIT	26.8	0.4925	0.0130
C13-S	EX.MH34-S	EX.MH43-S	CONDUIT	128.3	0.5536	0.0160
C14	MH133	EX.MH46	CONDUIT	2.6	1.1539	0.0130
C2	CBMH55	EX.MH31	CONDUIT	14.2	1.0916	0.0130
C3	EX.MH31	EXMH32	CONDUIT	86.7	1.0104	0.0130
C3-S	EX.MH31-S	EX.MH46-S	CONDUIT	84.2	3.9211	0.0160
C4	EX.MH36	EX.MH31	CONDUIT	97.2	0.9002	0.0130
C4-S	EX.MH31-S1	EX.MH36-S	CONDUIT	97.2	0.3498	0.0160
C5	EX.MH34	EX.MH36	CONDUIT	60.8	1.3241	0.0130
C5-S	EX.MH36-S	EX.MH34-S	CONDUIT	60.8	1.0362	0.0160
C6	DCBMH38	cbmh40	CONDUIT	22.7	0.5022	0.0130
C8	EX.MH43	EX.MH44	CONDUIT	71.4	1.0365	0.0130
C8-S	EX.MH43-S	EX.MH44-S	CONDUIT	71.4	1.1345	0.0160
C9	EX.MH44	EX.MH45	CONDUIT	35.1	1.0542	0.0130
C9-S	EX.MH44-S	EX.MH45-S	CONDUIT	35.1	1.1967	0.0160
CBMH32	EXMH32	StormSewerSystem	CONDUIT	10.0	1.0001	0.0130
CBMH92	CBMH92	MH135	CONDUIT	26.4	0.5000	0.0130
Ctention	Detention	DCBMH38	CONDUIT	15.9	0.4969	0.0130
C7	cbmh40	CBMH92	ORIFICE			
CFRD	Roof_Storage	STM1	OUTLET			
OL1	SurfaceStorage	Detention	OUTLET			

Cross Section Summary

Area:

Hrad:

Width:[illegible]

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Street HospitalRamp

Area:

0.0007	0.0028	0.0062	0.0111	0.0173
0.0249	0.0339	0.0443	0.0561	0.0693
0.0838	0.0997	0.1171	0.1358	0.1558
0.1773	0.2002	0.2242	0.2485	0.2727
0.2970	0.3212	0.3455	0.3697	0.3939
0.4182	0.4424	0.4667	0.4909	0.5152
0.5394	0.5636	0.5879	0.6121	0.6364
0.6606	0.6848	0.7091	0.7333	0.7576
0.7818	0.8061	0.8303	0.8545	0.8788
0.9030	0.9273	0.9515	0.9758	1.0000

Hrad:

0.0126	0.0251	0.0377	0.0503	0.0628
0.0754	0.0879	0.1005	0.1131	0.1256
0.1382	0.1508	0.1633	0.1759	0.1884
0.2010	0.2136	0.2323	0.2571	0.2819
0.3066	0.3312	0.3558	0.3804	0.4049
0.4293	0.4537	0.4780	0.5023	0.5265
0.5507	0.5748	0.5989	0.6229	0.6469
0.6708	0.6946	0.7184	0.7422	0.7659
0.7895	0.8131	0.8366	0.8601	0.8836
0.9070	0.9303	0.9536	0.9768	1.0000

Width:

0.0571	0.1143	0.1714	0.2286	0.2857
0.3429	0.4000	0.4571	0.5143	0.5714
0.6286	0.6857	0.7429	0.8000	0.8571
0.9143	0.9714	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	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

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 11/12/2024 00:00:00

Ending Date 11/13/2024 00:00:00

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 2

Head Tolerance 0.001500 m

 Runoff Quantity Continuity

Volume
 hectare-m

Depth
 mm

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Initial LID Storage	0.001	0.242
Total Precipitation	0.104	29.131
Evaporation Loss	0.000	0.000
Infiltration Loss	0.025	6.941
Surface Runoff	0.074	20.641
Final Storage	0.009	2.480
Continuity Error (%)	-2.346	

	Volume hectare-m	Volume 10 ⁶ ltr
Flow Routing Continuity		
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.074	0.737
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.055	0.546
External Outflow	0.128	1.285
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	0.001	0.009
Continuity Error (%)	-0.915	

Time-Step Critical Elements

Link C14 (99.50%)

Highest Flow Instability Indexes

Link C11 (2)

Most Frequent Nonconverging Nodes

Node NorthMajor (0.04%)

Node RingRoadMajor (0.04%)

Node StormSewerSystem (0.04%)

Node cbmh40 (0.03%)

Node DCBMH38 (0.02%)

Routing Time Step Summary

Minimum Time Step	:	0.88 sec
Average Time Step	:	3.39 sec
Maximum Time Step	:	5.00 sec
% of Time in Steady State	:	0.00
Average Iterations per Step	:	2.01
% of Steps Not Converging	:	0.04
Time Step Frequencies	:	
5.000 - 3.155 sec	:	61.39 %
3.155 - 1.991 sec	:	3.44 %
1.991 - 1.256 sec	:	35.17 %
1.256 - 0.792 sec	:	0.00 %
0.792 - 0.500 sec	:	0.00 %

Subcatchment Runoff Summary

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Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
222	29.13	0.00	0.00	20.37	8.84	0.13	8.96	0.01	13.03	0.308
223	29.13	205.26	0.00	8.90	203.55	21.78	225.33	0.26	97.51	0.961
224A	29.13	0.00	0.00	2.38	27.08	0.08	27.16	0.04	40.07	0.600
224B	29.13	0.00	0.00	2.90	26.18	0.08	26.26	0.06	62.97	0.902
224C	29.13	0.00	0.00	1.91	17.40	0.08	17.48	0.02	26.07	0.600
225A	29.13	0.00	0.00	5.21	24.16	0.23	24.39	0.04	54.97	0.837
225B	29.13	3.24	0.00	5.74	26.49	0.16	26.64	0.08	84.08	0.823
226	29.13	262.12	0.00	14.78	229.39	46.84	276.23	0.27	107.90	0.948
227	29.13	4.99	0.00	8.16	25.37	0.70	26.06	0.11	137.62	0.764
228	29.13	0.00	0.00	21.83	7.36	0.12	7.48	0.02	22.11	0.257
229	29.13	0.00	0.00	18.06	10.97	0.03	10.99	0.02	15.28	0.377
EXT-1	29.13	0.00	0.00	2.91	25.38	0.01	25.39	0.07	27.37	0.872
EXT-2	29.13	0.00	0.00	2.89	26.44	0.15	26.59	0.07	93.86	0.913
EXT-3	29.13	0.00	0.00	4.08	24.31	0.02	24.32	0.23	106.17	0.835

LID Performance Summary

Subcatchment	LID Control	Total Inflow mm	Evap Loss mm	Infil Loss mm	Surface Outflow mm	Drain Outflow mm	Initial Storage mm	Final Storage mm	Continuity Error %
224A	GreenRoof	29.13	0.00	0.00	0.00	0.00	13.00	42.13	-0.00
224C	GreenRoof	29.13	0.00	0.00	0.00	0.00	13.00	42.13	-0.00

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
cbmh40	JUNCTION	0.19	0.74	78.11	0 01:19	0.74
CBMH52	JUNCTION	0.06	0.19	76.77	0 01:13	0.19
CBMH55	JUNCTION	0.02	0.04	77.41	0 01:29	0.04
CBMH92	JUNCTION	0.03	0.07	77.18	0 01:19	0.07
DCBMH38	JUNCTION	0.14	0.60	78.11	0 01:19	0.60
EX.MH31	JUNCTION	0.02	0.11	76.72	0 00:58	0.11
EX.MH31-S	JUNCTION	0.00	0.04	82.30	0 00:55	0.04
EX.MH31-S1	JUNCTION	0.00	0.00	82.26	0 00:00	0.00
EX.MH34	JUNCTION	0.01	0.11	78.51	0 00:56	0.11
EX.MH34-S	JUNCTION	0.03	0.08	81.37	0 01:07	0.08
EX.MH36	JUNCTION	0.01	0.11	77.64	0 00:58	0.11
EX.MH36-S	JUNCTION	0.01	0.05	81.97	0 00:56	0.05
EX.MH43	JUNCTION	0.05	0.13	78.87	0 01:06	0.13
EX.MH43-S	JUNCTION	0.02	0.06	80.64	0 01:09	0.06
EX.MH44	JUNCTION	0.07	0.21	78.21	0 01:07	0.21
EX.MH44-S	JUNCTION	0.01	0.05	79.82	0 01:11	0.05
EX.MH45	JUNCTION	0.05	0.16	77.79	0 01:11	0.16
EX.MH45-S	JUNCTION	0.01	0.03	79.38	0 01:13	0.03
EX.MH46	JUNCTION	0.08	0.27	76.92	0 01:13	0.27
EX.MH46-S	JUNCTION	0.01	0.02	78.99	0 00:57	0.02
EXMH32	JUNCTION	0.07	0.22	75.96	0 01:12	0.22
MH133	JUNCTION	0.03	0.17	76.92	0 01:12	0.17
MH135	JUNCTION	0.02	0.06	77.00	0 01:29	0.06
STM1	JUNCTION	0.01	0.03	77.63	0 01:28	0.03
NorthMajor	OUTFALL	0.00	0.00	0.00	0 00:00	0.00

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RingRoadMajor	OUTFALL	0.01	0.02	78.65	0	00:57	0.02
StormSewerSystem	OUTFALL	0.07	0.22	75.86	0	01:13	0.22
Detention	STORAGE	0.13	0.49	78.11	0	01:19	0.49
Roof_Storage	STORAGE	0.01	0.02	84.37	0	01:28	0.02
SurfaceStorage	STORAGE	0.01	0.14	79.74	0	00:56	0.14

Node Inflow Summary

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
cbmh40	JUNCTION	0.00	13.26	0 00:53	0	0.11	-0.054
CBMH52	JUNCTION	11.74	142.44	0 01:13	0.0551	1.07	0.040
CBMH55	JUNCTION	0.00	4.31	0 01:29	0	0.058	0.001
CBMH92	JUNCTION	0.04	10.21	0 01:19	0.00346	0.113	0.007
DCBMH38	JUNCTION	0.00	30.04	0 00:58	0	0.11	-0.069
EX.MH31	JUNCTION	0.00	40.45	0 00:58	0	0.105	-0.028
EX.MH31-S	JUNCTION	54.97	54.97	0 00:55	0.041	0.041	-0.646
EX.MH31-S1	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
EX.MH34	JUNCTION	40.00	40.00	0 00:56	0.0471	0.0471	-0.009
EX.MH34-S	JUNCTION	119.56	148.96	0 01:05	0.836	0.915	0.276
EX.MH36	JUNCTION	0.00	39.72	0 00:57	0	0.0471	-0.014
EX.MH36-S	JUNCTION	84.08	84.08	0 00:55	0.078	0.078	-0.830
EX.MH43	JUNCTION	40.00	40.00	0 00:56	0.506	0.506	0.036
EX.MH43-S	JUNCTION	-40.00	135.11	0 01:07	-0.506	0.912	0.227
EX.MH44	JUNCTION	40.00	80.00	0 01:06	0.236	0.742	0.054
EX.MH44-S	JUNCTION	-40.00	90.06	0 01:10	-0.236	0.404	0.124
EX.MH45	JUNCTION	28.82	108.83	0 01:11	0.1	0.842	0.025
EX.MH45-S	JUNCTION	-28.82	48.03	0 01:11	-0.1	0.167	0.183
EX.MH46	JUNCTION	30.98	132.14	0 01:12	0.0647	1.02	0.020
EX.MH46-S	JUNCTION	-30.98	51.64	0 00:55	-0.0647	0.108	0.344
EXMH32	JUNCTION	0.00	153.89	0 01:12	0	1.18	0.036
MH133	JUNCTION	0.00	10.21	0 01:19	0	0.113	0.010
MH135	JUNCTION	0.00	10.21	0 01:19	0	0.113	-0.008
STM1	JUNCTION	0.00	4.31	0 01:28	0	0.058	0.003
NorthMajor	OUTFALL	15.28	15.28	0 00:55	0.0163	0.0163	0.000
RingRoadMajor	OUTFALL	107.27	119.25	0 00:55	0.0354	0.104	0.000
StormSewerSystem	OUTFALL	0.00	153.88	0 01:13	0	1.18	0.000
Detention	STORAGE	0.00	106.89	0 00:56	0	0.113	0.064
Roof_Storage	STORAGE	62.97	62.97	0 00:55	0.058	0.058	-0.001
SurfaceStorage	STORAGE	137.62	137.62	0 00:55	0.112	0.112	-0.007

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
cbmh40	JUNCTION	2.85	0.334	1.543
DCBMH38	JUNCTION	1.66	0.161	1.492

Node Flooding Summary

No nodes were flooded.

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Storage Volume Summary

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
Detention	0.015	17.8	0.0	0.0	0.063	75.5	0 01:19	30.04
Roof_Storage	0.011	4.9	0.0	0.0	0.037	15.8	0 01:28	4.31
SurfaceStorage	0.000	0.1	0.0	0.0	0.011	7.9	0 00:56	100.39

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
NorthMajor	35.54	1.15	15.28	0.016
RingRoadMajor	99.97	2.39	119.25	0.104
StormSewerSystem	99.64	22.96	153.88	1.179
System	78.39	26.50	206.79	1.299

Street Flow Summary

Peak Bypass Flow Street Conduit LPS	Peak Flow LPS	Maximum Spread m	Maximum Depth m	Inlet Design	Inlet Location	Inlet Capture Pcnt	Peak Flow Capture Pcnt	Avg. Flow Capture Pcnt	Bypass Flow Freq Pcnt	Back Flow Freq Pcnt	Peak Capture / Inlet LPS
C10-S 7.32	18.302	1.303	0.026	Inlet	ON-GRADE	1	60.00	60.00	99.91	0.00	5.49
C11-S 5.48	17.223	1.213	0.024	Inlet	ON-SAG	1	68.18	98.93	6.41	0.00	5.87
C13-S 95.11	135.106	3.330	0.067	Inlet	ON-GRADE	1	29.61	58.99	99.99	0.00	20.00
C3-S 20.34	50.854	1.528	0.031	Inlet	ON-GRADE	1	60.00	60.00	87.68	0.00	15.26
C4-S	0.000	1.251	0.025	Inlet	ON-GRADE	1					
C5-S 27.10	67.103	2.869	0.057	Inlet	ON-GRADE	1	59.61	60.00	89.25	0.00	20.00
C8-S 50.06	90.061	2.547	0.051	Inlet	ON-GRADE	1	44.41	59.80	99.94	0.00	20.00
C9-S 19.21	48.033	1.946	0.039	Inlet	ON-GRADE	1	60.00	60.00	99.92	0.00	14.41

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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	4.31	0 01:29	0.83	0.01	0.07
C10	CONDUIT	108.82	0 01:11	1.65	0.38	0.58
C10-S	CONDUIT	18.30	0 01:13	0.53	0.00	0.09
C11	CONDUIT	135.49	0 01:13	1.88	0.93	0.62
C11-S	CONDUIT	17.22	0 00:57	0.58	0.00	0.08
C12	CONDUIT	138.95	0 01:13	2.07	0.34	0.40
C13	CONDUIT	10.21	0 01:19	0.62	0.01	0.08
C13-S	CONDUIT	135.11	0 01:07	0.65	0.03	0.22
C14	CONDUIT	15.78	0 01:02	0.89	0.08	0.49
C2	CONDUIT	4.31	0 01:29	0.67	0.01	0.08
C3	CONDUIT	40.05	0 00:58	0.76	0.09	0.29
C3-S	CONDUIT	50.85	0 00:55	1.11	0.00	0.10
C4	CONDUIT	37.93	0 00:58	1.18	0.09	0.21
C4-S	CONDUIT	0.00	0 00:00	0.00	0.00	0.08
C5	CONDUIT	39.72	0 00:57	1.40	0.12	0.23
C5-S	CONDUIT	67.10	0 00:56	0.43	0.01	0.19
C6	CONDUIT	13.26	0 00:53	0.50	0.11	1.00
C8	CONDUIT	40.00	0 01:06	1.23	0.41	0.57
C8-S	CONDUIT	90.06	0 01:10	0.72	0.02	0.17
C9	CONDUIT	80.07	0 01:08	1.84	0.81	0.61
C9-S	CONDUIT	48.03	0 01:11	0.64	0.01	0.13
CBMH32	CONDUIT	153.88	0 01:13	1.82	0.36	0.41
CBMH92	CONDUIT	10.21	0 01:19	0.69	0.08	0.19
Ctention	CONDUIT	30.04	0 00:58	0.68	0.24	1.00
C7	ORIFICE	10.17	0 01:19			1.00
CFRD	DUMMY	4.31	0 01:28			
OL1	DUMMY	100.39	0 00:56			

Flow Classification Summary

Conduit	Adjusted /Actual Length	----- Up Dry		Fraction of Down Dry		Time in Flow Class Sub Crit		Time in Flow Class Sup Crit		Time in Flow Class Down Crit		Norm Ltd	Inlet Ctrl
C1	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C10	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	1.00	0.00	0.00	0.00
C10-S	1.00	0.01	0.01	0.00	0.02	0.97	0.00	0.00	0.00	0.02	0.00	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.16	0.00	0.00	0.00
C11-S	1.00	0.01	0.00	0.00	0.01	0.99	0.00	0.00	0.00	0.02	0.00	0.00	0.00
C12	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C13	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.02	0.00	0.00	0.00	0.00
C13-S	1.00	0.00	0.00	0.00	0.87	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C14	1.00	0.00	0.00	0.00	0.04	0.01	0.00	0.94	0.00	0.00	0.00	0.00	0.00
C2	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.00	0.04	0.00	0.96	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00
C3-S	1.00	0.00	0.00	0.00	0.88	0.12	0.00	0.00	0.00	0.95	0.00	0.00	0.00
C4	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
C4-S	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C5	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
C5-S	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
C6	1.00	0.03	0.00	0.00	0.15	0.00	0.00	0.83	0.01	0.00	0.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.02	0.98	0.00	0.00	0.00	0.99	0.00	0.00	0.00
C8-S	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C9-S	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBMH32	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.06	0.00	0.00	0.00

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CBMH92	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
Ctention	1.00	0.02	0.00	0.00	0.14	0.00	0.00	0.84	0.01	0.00

 Conduit Surcharge Summary

Conduit	Hours Full			Hours	
	----- Both Ends	Upstream	Dnstream	Above Full Normal Flow	Capacity Limited
C6	2.11	2.11	2.85	0.01	0.01
Ctention	1.04	1.04	1.66	0.01	0.01

Analysis begun on: Wed Nov 20 08:04:02 2024
 Analysis ended on: Wed Nov 20 08:04:04 2024
 Total elapsed time: 00:00:02

2021-0821-13: 50Yr Post-Development

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

WARNING 09: time series interval greater than recording interval for Rain Gage 50Yr

Element Count

Number of rain gages 6
 Number of subcatchments ... 14
 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	5 min.
10Yr	10Yr	INTENSITY	5 min.
25Yr	25Yr	INTENSITY	5 min.
2Yr	2Yr	INTENSITY	5 min.
50Yr	50Yr	INTENSITY	5 min.
5Yr	5Yr	INTENSITY	5 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
222	0.11	53.00	30.00	0.1000	50Yr	225B
223	0.11	40.14	87.00	0.1000	50Yr	226
224A	0.14	37.12	90.00	0.0000	50Yr	228
224B	0.22	77.00	90.00	0.1000	50Yr	Roof_Storage
224C	0.12	43.66	90.00	0.1000	50Yr	227
225A	0.17	34.21	82.00	2.5000	50Yr	EX.MH31-S
225B	0.29	27.63	82.00	2.1000	50Yr	EX.MH36-S
226	0.10	26.63	79.00	3.5000	50Yr	EX.MH34-S
227	0.43	172.40	75.00	3.0000	50Yr	SurfaceStorage
228	0.21	18.61	25.00	3.0000	50Yr	RingRoadMajor
229	0.15	14.59	38.00	0.1000	50Yr	NorthMajor
EXT-1	0.28	15.00	90.00	0.1000	50Yr	EX.MH34-S
EXT-2	0.28	186.67	90.00	0.1000	50Yr	RingRoadMajor
EXT-3	0.96	61.04	86.00	0.1000	50Yr	223

LID Control Summary

Subcatchment	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	% Imperv Treated	% Perv Treated
224A	GreenRoof	1	246.92	16.43	18.16	0.00	0.00
224C	GreenRoof	1	418.41	16.43	34.02	0.00	0.00

Node Summary

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

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cbmh40	JUNCTION	77.37	2.28	0.0	
CBMH52	JUNCTION	76.58	2.51	0.0	
CBMH55	JUNCTION	77.37	6.92	0.0	
CBMH92	JUNCTION	77.11	2.42	0.0	Yes
DCBMH38	JUNCTION	77.51	2.09	0.0	
EX.MH31	JUNCTION	76.62	5.64	0.0	
EX.MH31-S	JUNCTION	82.26	0.30	0.0	
EX.MH31-S1	JUNCTION	82.26	0.30	0.0	
EX.MH34	JUNCTION	78.40	2.89	0.0	
EX.MH34-S	JUNCTION	81.29	0.30	0.0	Yes
EX.MH36	JUNCTION	77.53	4.38	0.0	
EX.MH36-S	JUNCTION	81.92	0.30	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	
EX.MH46-S	JUNCTION	78.96	0.30	0.0	
EXMH32	JUNCTION	75.74	2.69	0.0	
MH133	JUNCTION	76.75	2.40	0.0	
MH135	JUNCTION	76.95	2.50	0.0	
STM1	JUNCTION	77.60	6.75	0.0	
NorthMajor	OUTFALL	0.00	0.00	0.0	
RingRoadMajor	OUTFALL	78.62	0.30	0.0	
StormSewerSystem	OUTFALL	75.64	0.53	0.0	
Detention	STORAGE	77.62	0.71	0.0	
Roof_Storage	STORAGE	84.35	0.15	0.0	
SurfaceStorage	STORAGE	79.60	0.30	0.0	

Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness

C1	STM1	CBMH55	CONDUIT	8.4	2.0123	0.0130
C10	EX.MH45	EX.MH46	CONDUIT	37.1	2.6424	0.0130
C10-S	EX.MH45-S	EX.MH46-S	CONDUIT	37.1	1.0486	0.0160
C11	EX.MH46	CBMH52	CONDUIT	10.5	0.6857	0.0130
C11-S	EX.MH46-S	RingRoadMajor	CONDUIT	10.5	3.2398	0.0160
C12	CBMH52	EXMH32	CONDUIT	51.6	1.5079	0.0130
C13	MH135	MH133	CONDUIT	26.8	0.4925	0.0130
C13-S	EX.MH34-S	EX.MH43-S	CONDUIT	128.3	0.5536	0.0160
C14	MH133	EX.MH46	CONDUIT	2.6	1.1539	0.0130
C2	CBMH55	EX.MH31	CONDUIT	14.2	1.0916	0.0130
C3	EX.MH31	EXMH32	CONDUIT	86.7	1.0104	0.0130
C3-S	EX.MH31-S	EX.MH46-S	CONDUIT	84.2	3.9211	0.0160
C4	EX.MH36	EX.MH31	CONDUIT	97.2	0.9002	0.0130
C4-S	EX.MH31-S1	EX.MH36-S	CONDUIT	97.2	0.3498	0.0160
C5	EX.MH34	EX.MH36	CONDUIT	60.8	1.3241	0.0130
C5-S	EX.MH36-S	EX.MH34-S	CONDUIT	60.8	1.0362	0.0160
C6	DCBMH38	cbmh40	CONDUIT	22.7	0.5022	0.0130
C8	EX.MH43	EX.MH44	CONDUIT	71.4	1.0365	0.0130
C8-S	EX.MH43-S	EX.MH44-S	CONDUIT	71.4	1.1345	0.0160
C9	EX.MH44	EX.MH45	CONDUIT	35.1	1.0542	0.0130
C9-S	EX.MH44-S	EX.MH45-S	CONDUIT	35.1	1.1967	0.0160
CBMH32	EXMH32	StormSewerSystem	CONDUIT	10.0	1.0001	0.0130
CBMH92	CBMH92	MH135	CONDUIT	26.4	0.5000	0.0130
Ctention	Detention	DCBMH38	CONDUIT	15.9	0.4969	0.0130
C7	cbmh40	CBMH92	ORIFICE			
CFRD	Roof_Storage	STM1	OUTLET			
OL1	SurfaceStorage	Detention	OUTLET			

Cross Section Summary

Area:

Hrad:

Width:[illegible]

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Street HospitalRamp

Area:

0.0007	0.0028	0.0062	0.0111	0.0173
0.0249	0.0339	0.0443	0.0561	0.0693
0.0838	0.0997	0.1171	0.1358	0.1558
0.1773	0.2002	0.2242	0.2485	0.2727
0.2970	0.3212	0.3455	0.3697	0.3939
0.4182	0.4424	0.4667	0.4909	0.5152
0.5394	0.5636	0.5879	0.6121	0.6364
0.6606	0.6848	0.7091	0.7333	0.7576
0.7818	0.8061	0.8303	0.8545	0.8788
0.9030	0.9273	0.9515	0.9758	1.0000

Hrad:

0.0126	0.0251	0.0377	0.0503	0.0628
0.0754	0.0879	0.1005	0.1131	0.1256
0.1382	0.1508	0.1633	0.1759	0.1884
0.2010	0.2136	0.2323	0.2571	0.2819
0.3066	0.3312	0.3558	0.3804	0.4049
0.4293	0.4537	0.4780	0.5023	0.5265
0.5507	0.5748	0.5989	0.6229	0.6469
0.6708	0.6946	0.7184	0.7422	0.7659
0.7895	0.8131	0.8366	0.8601	0.8836
0.9070	0.9303	0.9536	0.9768	1.0000

Width:

0.0571	0.1143	0.1714	0.2286	0.2857
0.3429	0.4000	0.4571	0.5143	0.5714
0.6286	0.6857	0.7429	0.8000	0.8571
0.9143	0.9714	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	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

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 11/12/2024 00:00:00

Ending Date 11/13/2024 00:00:00

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 2

Head Tolerance 0.001500 m

Runoff Quantity Continuity

Volume

hectare-m

Depth

mm

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Initial LID Storage	0.001	0.242
Total Precipitation	0.116	32.423
Evaporation Loss	0.000	0.000
Infiltration Loss	0.027	7.519
Surface Runoff	0.083	23.292
LID Drainage	0.000	0.008
Final Storage	0.009	2.626
Continuity Error (%)	-2.387	

	Volume hectare-m	Volume 10^6 ltr
Flow Routing Continuity	0.000	0.000
Dry Weather Inflow	0.083	0.831
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.055	0.546
External Inflow	0.138	1.379
External Outflow	0.000	0.000
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	0.001	0.009
Continuity Error (%)	-0.790	

Time-Step Critical Elements

Link C14 (99.52%)

Highest Flow Instability Indexes

Link C11 (3)
Link C14 (1)

Most Frequent Nonconverging Nodes

Node NorthMajor (0.03%)
Node RingRoadMajor (0.03%)
Node StormSewerSystem (0.03%)
Node cbmh40 (0.03%)
Node DCBMH38 (0.02%)

Routing Time Step Summary

Minimum Time Step : 1.27 sec
Average Time Step : 3.29 sec
Maximum Time Step : 5.00 sec
% of Time in Steady State : 0.00
Average Iterations per Step : 2.01
% of Steps Not Converging : 0.03
Time Step Frequencies :
5.000 - 3.155 sec : 58.53 %
3.155 - 1.991 sec : 3.41 %
1.991 - 1.256 sec : 38.05 %
1.256 - 0.792 sec : 0.00 %
0.792 - 0.500 sec : 0.00 %

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Subcatchment Runoff Summary

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
222	32.42	0.00	0.00	22.46	9.86	0.34	10.20	0.01	14.93	0.315
223	32.42	229.84	0.00	9.03	227.88	25.33	253.21	0.29	117.46	0.965
224A	32.42	0.00	0.00	2.65	30.32	0.17	30.49	0.04	46.07	0.610
224B	32.42	0.00	0.00	3.14	29.29	0.19	29.48	0.07	72.39	0.909
224C	32.42	0.00	0.00	2.06	19.46	0.17	19.77	0.02	29.77	0.610
225A	32.42	0.00	0.00	5.60	26.98	0.48	27.46	0.05	62.56	0.847
225B	32.42	3.69	0.00	6.17	29.66	0.43	30.09	0.09	96.21	0.833
226	32.42	294.55	0.00	14.97	257.61	54.28	311.89	0.31	129.50	0.954
227	32.42	5.60	0.00	8.56	28.30	1.37	29.67	0.13	158.15	0.780
228	32.42	0.00	0.00	24.09	8.21	0.33	8.54	0.02	25.41	0.263
229	32.42	0.00	0.00	20.05	12.27	0.07	12.35	0.02	17.70	0.381
EXT-1	32.42	0.00	0.00	3.22	28.39	0.04	28.43	0.08	32.60	0.877
EXT-2	32.42	0.00	0.00	3.10	29.56	0.30	29.86	0.08	106.92	0.921
EXT-3	32.42	0.00	0.00	4.51	27.19	0.05	27.24	0.26	126.07	0.840

LID Performance Summary

Subcatchment	LID Control	Total Inflow mm	Evap Loss mm	Infil Loss mm	Surface Outflow mm	Drain Outflow mm	Initial Storage mm	Final Storage mm	Continuity Error %
224A	GreenRoof	32.42	0.00	0.00	0.00	0.42	13.00	45.00	-0.00
224C	GreenRoof	32.42	0.00	0.00	0.00	0.42	13.00	45.00	-0.00

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
cbmh40	JUNCTION	0.23	0.86	78.22	0 01:27	0.86
CBMH52	JUNCTION	0.07	0.21	76.79	0 01:13	0.21
CBMH55	JUNCTION	0.02	0.04	77.41	0 01:28	0.04
CBMH92	JUNCTION	0.03	0.08	77.18	0 01:28	0.08
DCBMH38	JUNCTION	0.17	0.71	78.23	0 01:27	0.71
EX.MH31	JUNCTION	0.02	0.11	76.73	0 00:59	0.11
EX.MH31-S	JUNCTION	0.00	0.04	82.30	0 00:55	0.04
EX.MH31-S1	JUNCTION	0.00	0.00	82.26	0 00:00	0.00
EX.MH34	JUNCTION	0.01	0.11	78.51	0 00:58	0.11
EX.MH34-S	JUNCTION	0.03	0.08	81.37	0 01:06	0.08
EX.MH36	JUNCTION	0.01	0.11	77.65	0 00:58	0.11
EX.MH36-S	JUNCTION	0.01	0.05	81.97	0 00:56	0.05
EX.MH43	JUNCTION	0.06	0.13	78.87	0 01:04	0.13
EX.MH43-S	JUNCTION	0.02	0.06	80.64	0 01:09	0.06
EX.MH44	JUNCTION	0.07	0.21	78.21	0 01:05	0.21
EX.MH44-S	JUNCTION	0.01	0.05	79.82	0 01:10	0.05
EX.MH45	JUNCTION	0.05	0.17	77.80	0 01:10	0.17
EX.MH45-S	JUNCTION	0.01	0.04	79.39	0 01:12	0.04
EX.MH46	JUNCTION	0.08	0.30	76.95	0 01:12	0.30
EX.MH46-S	JUNCTION	0.01	0.03	78.99	0 00:56	0.03
EXMH32	JUNCTION	0.07	0.24	75.98	0 01:11	0.24
MH133	JUNCTION	0.03	0.19	76.95	0 01:12	0.19
MH135	JUNCTION	0.02	0.06	77.00	0 01:32	0.06

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STM1	JUNCTION	0.02	0.03	77.63	0	01:28	0.03
NorthMajor	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
RingRoadMajor	OUTFALL	0.01	0.03	78.65	0	00:56	0.03
StormSewerSystem	OUTFALL	0.07	0.24	75.88	0	01:11	0.24
Detention	STORAGE	0.15	0.61	78.23	0	01:27	0.61
Roof_Storage	STORAGE	0.01	0.03	84.38	0	01:28	0.03
SurfaceStorage	STORAGE	0.01	0.15	79.75	0	00:56	0.15

Node Inflow Summary

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
cbmh40	JUNCTION	0.00	13.18	0 00:53	0	0.125	-0.037
CBMH52	JUNCTION	13.05	170.53	0 01:12	0.0592	1.14	0.031
CBMH55	JUNCTION	0.00	4.87	0 01:28	0	0.0654	0.001
CBMH92	JUNCTION	0.04	11.02	0 01:27	0.00346	0.129	0.006
DCBMH38	JUNCTION	0.00	27.89	0 00:57	0	0.125	-0.086
EX.MH31	JUNCTION	0.00	42.66	0 00:58	0	0.118	-0.029
EX.MH31-S	JUNCTION	62.56	62.56	0 00:55	0.0461	0.0461	-0.664
EX.MH31-S1	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
EX.MH34	JUNCTION	40.00	40.00	0 00:55	0.0524	0.0524	-0.008
EX.MH34-S	JUNCTION	142.36	175.59	0 01:05	0.874	0.963	0.260
EX.MH36	JUNCTION	0.00	40.00	0 00:58	0	0.0524	-0.013
EX.MH36-S	JUNCTION	96.21	96.21	0 00:55	0.0881	0.0881	-0.826
EX.MH43	JUNCTION	40.00	40.00	0 00:55	0.516	0.516	0.036
EX.MH43-S	JUNCTION	-40.00	158.17	0 01:07	-0.516	0.96	0.221
EX.MH44	JUNCTION	40.00	80.00	0 01:04	0.248	0.764	0.052
EX.MH44-S	JUNCTION	-40.00	113.13	0 01:09	-0.248	0.443	0.119
EX.MH45	JUNCTION	40.00	120.05	0 01:09	0.116	0.879	0.023
EX.MH45-S	JUNCTION	-40.00	71.48	0 01:11	-0.116	0.194	0.179
EX.MH46	JUNCTION	35.43	151.47	0 01:12	0.0743	1.08	0.026
EX.MH46-S	JUNCTION	-35.43	59.05	0 00:55	-0.0743	0.124	0.323
EXMH32	JUNCTION	0.00	178.62	0 01:10	0	1.26	0.034
MH133	JUNCTION	0.00	11.02	0 01:28	0	0.129	0.010
MH135	JUNCTION	0.00	11.02	0 01:28	0	0.129	-0.014
STM1	JUNCTION	0.21	4.87	0 01:28	0.000281	0.0654	0.002
NorthMajor	OUTFALL	17.70	17.70	0 00:55	0.0183	0.0183	0.000
RingRoadMajor	OUTFALL	122.61	136.41	0 00:55	0.0427	0.118	0.000
StormSewerSystem	OUTFALL	0.00	178.38	0 01:11	0	1.26	0.000
Detention	STORAGE	0.00	116.54	0 00:56	0	0.128	0.075
Roof_Storage	STORAGE	72.39	72.39	0 00:55	0.0651	0.0651	-0.001
SurfaceStorage	STORAGE	158.15	158.15	0 00:55	0.128	0.128	-0.006

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
cbmh40	JUNCTION	3.18	0.452	1.425
DCBMH38	JUNCTION	2.11	0.279	1.374

Node Flooding Summary

No nodes were flooded.

Storage Unit	Average Volume 1000 m ³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m ³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
Detention	0.018	21.6	0.0	0.0	0.074	88.9	0 01:27	27.89
Roof_Storage	0.013	5.6	0.0	0.0	0.041	17.8	0 01:28	4.87
SurfaceStorage	0.000	0.1	0.0	0.0	0.013	9.6	0 00:56	112.38

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
NorthMajor	35.55	1.28	17.70	0.018
RingRoadMajor	99.97	2.71	136.41	0.118
StormSewerSystem	99.65	25.03	178.38	1.258
System	78.39	29.02	238.19	1.394

							Peak	Avg.	Bypass	Back	Peak	
Bypass						Flow	Flow	Flow	Flow	Capture		
Flow	Street	Conduit	Flow	Spread	Depth	Inlet	Inlet	Inlet	Capture	Capture	Freq	Freq / Inlet
LPS			LPS	m	m	Design	Location		Pcnt	Pcnt	Pcnt	Pcnt LPS
C10-S 11.74			29.353	1.539	0.031	Inlet	ON-GRADE	1	60.00	60.00	99.92	0.00 8.81
C11-S 6.86			19.910	1.276	0.026	Inlet	ON-SAG	1	65.54	98.59	7.27	0.00 6.52
C13-S 118.17			158.174	3.552	0.071	Inlet	ON-GRADE	1	25.29	58.68	99.99	0.00 20.00
C3-S 23.27			58.170	1.608	0.032	Inlet	ON-GRADE	1	60.00	60.00	87.71	0.00 17.45
C4-S			0.000	1.319	0.026	Inlet	ON-GRADE	1				
C5-S 37.29			77.288	3.053	0.061	Inlet	ON-GRADE	1	51.75	59.94	87.55	0.00 20.00
C8-S 73.13			113.131	2.834	0.057	Inlet	ON-GRADE	1	35.36	59.52	99.94	0.00 20.00
C9-S 31.48			71.477	2.287	0.046	Inlet	ON-GRADE	1	55.96	59.99	99.93	0.00 20.00

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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	4.87	0 01:28	0.86	0.01	0.08
C10	CONDUIT	120.02	0 01:10	1.68	0.42	0.62
C10-S	CONDUIT	29.35	0 01:12	0.62	0.01	0.10
C11	CONDUIT	161.14	0 01:12	2.04	1.11	0.67
C11-S	CONDUIT	19.91	0 00:56	0.60	0.00	0.09
C12	CONDUIT	160.56	0 01:13	2.15	0.40	0.44
C13	CONDUIT	11.02	0 01:28	0.63	0.01	0.09
C13-S	CONDUIT	158.17	0 01:07	0.67	0.04	0.24
C14	CONDUIT	13.17	0 01:36	0.91	0.07	0.55
C2	CONDUIT	4.87	0 01:29	0.70	0.02	0.09
C3	CONDUIT	42.45	0 00:59	0.77	0.10	0.30
C3-S	CONDUIT	58.17	0 00:55	1.14	0.00	0.11
C4	CONDUIT	39.61	0 00:58	1.20	0.10	0.21
C4-S	CONDUIT	0.00	0 00:00	0.00	0.00	0.09
C5	CONDUIT	40.00	0 00:58	1.40	0.12	0.24
C5-S	CONDUIT	77.29	0 00:56	0.45	0.01	0.20
C6	CONDUIT	13.18	0 00:53	0.49	0.11	1.00
C8	CONDUIT	40.00	0 01:04	1.25	0.41	0.57
C8-S	CONDUIT	113.13	0 01:09	0.73	0.02	0.19
C9	CONDUIT	80.09	0 01:07	1.84	0.81	0.62
C9-S	CONDUIT	71.48	0 01:11	0.71	0.01	0.15
CBMH32	CONDUIT	178.38	0 01:11	1.89	0.41	0.45
CBMH92	CONDUIT	11.02	0 01:28	0.70	0.09	0.20
Ctention	CONDUIT	27.89	0 00:57	0.73	0.23	1.00
C7	ORIFICE	10.98	0 01:27			1.00
CFRD	DUMMY	4.87	0 01:28			
OL1	DUMMY	112.38	0 00:56			

Flow Classification Summary

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class -----								
		Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C10	1.00	0.00	0.00	0.00	0.03	0.97	0.00	0.00	1.00	0.00
C10-S	1.00	0.00	0.01	0.00	0.02	0.97	0.00	0.00	0.02	0.00
C11	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.17	0.00
C11-S	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	0.02	0.00
C12	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C13	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.02	0.00
C13-S	1.00	0.00	0.00	0.00	0.86	0.14	0.00	0.00	0.00	0.00
C14	1.00	0.00	0.00	0.00	0.05	0.01	0.00	0.94	0.00	0.00
C2	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C3	1.00	0.00	0.02	0.00	0.97	0.00	0.00	0.00	0.99	0.00
C3-S	1.00	0.00	0.00	0.00	0.88	0.12	0.00	0.00	0.94	0.00
C4	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C4-S	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C5	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C5-S	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C6	1.00	0.02	0.00	0.00	0.16	0.00	0.00	0.81	0.01	0.00
C8	1.00	0.00	0.00	0.00	0.02	0.98	0.00	0.00	0.99	0.00
C8-S	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00

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C9-S	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
CBMH32	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.06	0.00
CBMH92	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
Ctention	1.00	0.02	0.00	0.00	0.15	0.00	0.00	0.82	0.01	0.00

Conduit Surcharge Summary

Conduit	Hours Full			Hours Above Full		Hours
	Both Ends	Upstream	Dnstream	Normal Flow	Limited	Capacity
C11	0.01	0.01	0.01	0.09		0.01
C6	2.46	2.46	3.18	0.01		0.01
Ctention	1.59	1.59	2.11	0.01		0.01

Analysis begun on: Wed Nov 20 08:04:26 2024
Analysis ended on: Wed Nov 20 08:04:27 2024
Total elapsed time: 00:00:01

2021-0821-13: 100Yr Post-Development

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

WARNING 09: time series interval greater than recording interval for Rain Gage 100Yr

Element Count

Number of rain gages 6
 Number of subcatchments ... 14
 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	5 min.
10Yr	10Yr	INTENSITY	5 min.
25Yr	25Yr	INTENSITY	5 min.
2Yr	2Yr	INTENSITY	5 min.
50Yr	50Yr	INTENSITY	5 min.
5Yr	5Yr	INTENSITY	5 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
222	0.11	53.00	30.00	0.1000	100Yr	225B
223	0.11	40.14	87.00	0.1000	100Yr	226
224A	0.14	37.12	90.00	0.0000	100Yr	228
224B	0.22	77.00	90.00	0.1000	100Yr	Roof_Storage
224C	0.12	43.66	90.00	0.1000	100Yr	227
225A	0.17	34.21	82.00	2.5000	100Yr	EX.MH31-S
225B	0.29	27.63	82.00	2.1000	100Yr	EX.MH36-S
226	0.10	26.63	79.00	3.5000	100Yr	EX.MH34-S
227	0.43	172.40	75.00	3.0000	100Yr	SurfaceStorage
228	0.21	18.61	25.00	3.0000	100Yr	RingRoadMajor
229	0.15	14.59	38.00	0.1000	100Yr	NorthMajor
EXT-1	0.28	15.00	90.00	0.1000	100Yr	EX.MH34-S
EXT-2	0.28	186.67	90.00	0.1000	100Yr	RingRoadMajor
EXT-3	0.96	61.04	86.00	0.1000	100Yr	223

LID Control Summary

Subcatchment	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	% Imperv Treated	% Perv Treated
224A	GreenRoof	1	246.92	16.43	18.16	0.00	0.00
224C	GreenRoof	1	418.41	16.43	34.02	0.00	0.00

Node Summary

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

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cbmh40	JUNCTION	77.37	2.28	0.0	
CBMH52	JUNCTION	76.58	2.51	0.0	
CBMH55	JUNCTION	77.37	6.92	0.0	
CBMH92	JUNCTION	77.11	2.42	0.0	Yes
DCBMH38	JUNCTION	77.51	2.09	0.0	
EX.MH31	JUNCTION	76.62	5.64	0.0	
EX.MH31-S	JUNCTION	82.26	0.30	0.0	
EX.MH31-S1	JUNCTION	82.26	0.30	0.0	
EX.MH34	JUNCTION	78.40	2.89	0.0	
EX.MH34-S	JUNCTION	81.29	0.30	0.0	Yes
EX.MH36	JUNCTION	77.53	4.38	0.0	
EX.MH36-S	JUNCTION	81.92	0.30	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	
EX.MH46-S	JUNCTION	78.96	0.30	0.0	
EXMH32	JUNCTION	75.74	2.69	0.0	
MH133	JUNCTION	76.75	2.40	0.0	
MH135	JUNCTION	76.95	2.50	0.0	
STM1	JUNCTION	77.60	6.75	0.0	
NorthMajor	OUTFALL	0.00	0.00	0.0	
RingRoadMajor	OUTFALL	78.62	0.30	0.0	
StormSewerSystem	OUTFALL	75.64	0.53	0.0	
Detention	STORAGE	77.62	0.71	0.0	
Roof_Storage	STORAGE	84.35	0.15	0.0	
SurfaceStorage	STORAGE	79.60	0.30	0.0	

Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness

C1	STM1	CBMH55	CONDUIT	8.4	2.0123	0.0130
C10	EX.MH45	EX.MH46	CONDUIT	37.1	2.6424	0.0130
C10-S	EX.MH45-S	EX.MH46-S	CONDUIT	37.1	1.0486	0.0160
C11	EX.MH46	CBMH52	CONDUIT	10.5	0.6857	0.0130
C11-S	EX.MH46-S	RingRoadMajor	CONDUIT	10.5	3.2398	0.0160
C12	CBMH52	EXMH32	CONDUIT	51.6	1.5079	0.0130
C13	MH135	MH133	CONDUIT	26.8	0.4925	0.0130
C13-S	EX.MH34-S	EX.MH43-S	CONDUIT	128.3	0.5536	0.0160
C14	MH133	EX.MH46	CONDUIT	2.6	1.1539	0.0130
C2	CBMH55	EX.MH31	CONDUIT	14.2	1.0916	0.0130
C3	EX.MH31	EXMH32	CONDUIT	86.7	1.0104	0.0130
C3-S	EX.MH31-S	EX.MH46-S	CONDUIT	84.2	3.9211	0.0160
C4	EX.MH36	EX.MH31	CONDUIT	97.2	0.9002	0.0130
C4-S	EX.MH31-S1	EX.MH36-S	CONDUIT	97.2	0.3498	0.0160
C5	EX.MH34	EX.MH36	CONDUIT	60.8	1.3241	0.0130
C5-S	EX.MH36-S	EX.MH34-S	CONDUIT	60.8	1.0362	0.0160
C6	DCBMH38	cbmh40	CONDUIT	22.7	0.5022	0.0130
C8	EX.MH43	EX.MH44	CONDUIT	71.4	1.0365	0.0130
C8-S	EX.MH43-S	EX.MH44-S	CONDUIT	71.4	1.1345	0.0160
C9	EX.MH44	EX.MH45	CONDUIT	35.1	1.0542	0.0130
C9-S	EX.MH44-S	EX.MH45-S	CONDUIT	35.1	1.1967	0.0160
CBMH32	EXMH32	StormSewerSystem	CONDUIT	10.0	1.0001	0.0130
CBMH92	CBMH92	MH135	CONDUIT	26.4	0.5000	0.0130
Ctention	Detention	DCBMH38	CONDUIT	15.9	0.4969	0.0130
C7	cbmh40	CBMH92	ORIFICE			
CFRD	Roof_Storage	STM1	OUTLET			
OL1	SurfaceStorage	Detention	OUTLET			

Cross Section Summary

Area:

Hrad:

Width:[illegible]

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Street HospitalRamp

Area:

0.0007	0.0028	0.0062	0.0111	0.0173
0.0249	0.0339	0.0443	0.0561	0.0693
0.0838	0.0997	0.1171	0.1358	0.1558
0.1773	0.2002	0.2242	0.2485	0.2727
0.2970	0.3212	0.3455	0.3697	0.3939
0.4182	0.4424	0.4667	0.4909	0.5152
0.5394	0.5636	0.5879	0.6121	0.6364
0.6606	0.6848	0.7091	0.7333	0.7576
0.7818	0.8061	0.8303	0.8545	0.8788
0.9030	0.9273	0.9515	0.9758	1.0000

Hrad:

0.0126	0.0251	0.0377	0.0503	0.0628
0.0754	0.0879	0.1005	0.1131	0.1256
0.1382	0.1508	0.1633	0.1759	0.1884
0.2010	0.2136	0.2323	0.2571	0.2819
0.3066	0.3312	0.3558	0.3804	0.4049
0.4293	0.4537	0.4780	0.5023	0.5265
0.5507	0.5748	0.5989	0.6229	0.6469
0.6708	0.6946	0.7184	0.7422	0.7659
0.7895	0.8131	0.8366	0.8601	0.8836
0.9070	0.9303	0.9536	0.9768	1.0000

Width:

0.0571	0.1143	0.1714	0.2286	0.2857
0.3429	0.4000	0.4571	0.5143	0.5714
0.6286	0.6857	0.7429	0.8000	0.8571
0.9143	0.9714	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	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

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 11/12/2024 00:00:00

Ending Date 11/13/2024 00:00:00

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 2

Head Tolerance 0.001500 m

Runoff Quantity Continuity

Volume

hectare-m

Depth

mm

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Initial LID Storage	0.001	0.242
Total Precipitation	0.128	35.854
Evaporation Loss	0.000	0.000
Infiltration Loss	0.029	8.068
Surface Runoff	0.093	26.136
LID Drainage	0.000	0.072
Final Storage	0.010	2.722
Continuity Error (%)	-2.497	

	Volume hectare-m	Volume 10^6 ltr
Flow Routing Continuity	0.000	0.000
Dry Weather Inflow	0.094	0.935
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.055	0.546
External Inflow	0.148	1.476
External Outflow	0.000	0.003
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	0.001	0.009
Continuity Error (%)	-0.491	

Time-Step Critical Elements

Link C14 (99.54%)

Highest Flow Instability Indexes

Link C11 (3)
Link C14 (1)

Most Frequent Nonconverging Nodes

Node NorthMajor (0.05%)
Node RingRoadMajor (0.05%)
Node StormSewerSystem (0.05%)
Node cbmh40 (0.05%)
Node DCBMH38 (0.02%)

Routing Time Step Summary

Minimum Time Step : 1.25 sec
Average Time Step : 3.20 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 : 56.22 %
3.155 - 1.991 sec : 3.39 %
1.991 - 1.256 sec : 39.19 %
1.256 - 0.792 sec : 1.19 %
0.792 - 0.500 sec : 0.00 %

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Subcatchment Runoff Summary

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
222	35.85	0.00	0.00	24.40	10.94	0.84	11.78	0.01	16.98	0.329
223	35.85	255.84	0.00	9.17	253.56	29.08	282.63	0.32	138.96	0.969
224A	35.85	0.00	0.00	2.93	33.72	0.29	34.01	0.05	52.29	0.647
224B	35.85	0.00	0.00	3.35	32.54	0.35	32.89	0.07	82.17	0.917
224C	35.85	0.00	0.00	2.18	21.61	0.29	23.21	0.03	33.59	0.647
225A	35.85	0.00	0.00	5.94	29.94	0.82	30.76	0.05	70.44	0.858
225B	35.85	4.26	0.00	6.51	33.06	0.83	33.89	0.10	108.82	0.845
226	35.85	328.77	0.00	15.16	287.38	62.12	349.50	0.34	152.72	0.959
227	35.85	6.25	0.00	8.97	31.42	2.14	33.55	0.14	179.47	0.797
228	35.85	0.00	0.00	26.21	9.11	0.83	9.93	0.02	28.97	0.277
229	35.85	0.00	0.00	22.05	13.63	0.21	13.84	0.02	20.25	0.386
EXT-1	35.85	0.00	0.00	3.50	31.53	0.10	31.63	0.09	38.24	0.882
EXT-2	35.85	0.00	0.00	3.31	32.82	0.50	33.32	0.09	120.37	0.929
EXT-3	35.85	0.00	0.00	4.92	30.20	0.12	30.32	0.29	147.43	0.846

LID Performance Summary

Subcatchment	LID Control	Total Inflow mm	Evap Loss mm	Infil Loss mm	Surface Outflow mm	Drain Outflow mm	Initial Storage mm	Final Storage mm	Continuity Error %
224A	GreenRoof	35.85	0.00	0.00	0.00	3.85	13.00	45.00	-0.00
224C	GreenRoof	35.85	0.00	0.00	0.00	3.85	13.00	45.00	-0.00

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
cbmh40	JUNCTION	0.26	0.96	78.33	0 01:15	0.96
CBMH52	JUNCTION	0.07	0.22	76.80	0 01:12	0.22
CBMH55	JUNCTION	0.02	0.04	77.41	0 01:28	0.04
CBMH92	JUNCTION	0.03	0.08	77.19	0 01:16	0.08
DCBMH38	JUNCTION	0.20	0.82	78.33	0 01:15	0.82
EX.MH31	JUNCTION	0.02	0.11	76.73	0 00:59	0.11
EX.MH31-S	JUNCTION	0.00	0.04	82.30	0 00:55	0.04
EX.MH31-S1	JUNCTION	0.00	0.00	82.26	0 00:00	0.00
EX.MH34	JUNCTION	0.01	0.11	78.51	0 00:58	0.11
EX.MH34-S	JUNCTION	0.03	0.09	81.38	0 01:06	0.09
EX.MH36	JUNCTION	0.01	0.11	77.65	0 00:59	0.11
EX.MH36-S	JUNCTION	0.01	0.06	81.98	0 00:56	0.06
EX.MH43	JUNCTION	0.06	0.13	78.87	0 01:03	0.13
EX.MH43-S	JUNCTION	0.02	0.07	80.65	0 01:08	0.07
EX.MH44	JUNCTION	0.07	0.21	78.21	0 01:01	0.21
EX.MH44-S	JUNCTION	0.01	0.06	79.83	0 01:09	0.06
EX.MH45	JUNCTION	0.05	0.17	77.80	0 01:07	0.17
EX.MH45-S	JUNCTION	0.01	0.05	79.40	0 01:11	0.05
EX.MH46	JUNCTION	0.09	0.32	76.97	0 01:11	0.31
EX.MH46-S	JUNCTION	0.01	0.03	78.99	0 01:12	0.03
EXMH32	JUNCTION	0.08	0.25	75.99	0 01:11	0.25
MH133	JUNCTION	0.03	0.21	76.97	0 01:12	0.21
MH135	JUNCTION	0.03	0.06	77.01	0 01:19	0.06

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STM1	JUNCTION	0.02	0.04	77.64	0	01:28	0.04
NorthMajor	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
RingRoadMajor	OUTFALL	0.01	0.03	78.65	0	01:12	0.03
StormSewerSystem	OUTFALL	0.08	0.25	75.89	0	01:11	0.25
Detention	STORAGE	0.18	0.71	78.33	0	01:15	0.71
Roof_Storage	STORAGE	0.01	0.03	84.38	0	01:28	0.03
SurfaceStorage	STORAGE	0.01	0.15	79.75	0	00:56	0.15

Node Inflow Summary

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
cbmh40	JUNCTION	0.00	13.68	0 00:51	0	0.139	-0.029
CBMH52	JUNCTION	14.38	196.08	0 01:12	0.0648	1.21	0.024
CBMH55	JUNCTION	0.00	5.45	0 01:28	0	0.0752	0.001
CBMH92	JUNCTION	0.04	11.71	0 01:15	0.00346	0.142	0.006
DCBMH38	JUNCTION	0.00	36.25	0 00:56	0	0.139	-0.123
EX.MH31	JUNCTION	0.00	43.49	0 00:59	0	0.133	-0.025
EX.MH31-S	JUNCTION	70.44	70.44	0 00:55	0.0517	0.0517	-0.689
EX.MH31-S1	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
EX.MH34	JUNCTION	40.00	40.00	0 00:54	0.0578	0.0578	-0.007
EX.MH34-S	JUNCTION	166.76	204.16	0 01:05	0.914	1.01	0.242
EX.MH36	JUNCTION	0.00	40.00	0 00:58	0	0.0578	-0.011
EX.MH36-S	JUNCTION	108.82	108.82	0 00:55	0.0993	0.0993	-0.811
EX.MH43	JUNCTION	40.00	40.00	0 00:55	0.525	0.525	0.035
EX.MH43-S	JUNCTION	-40.00	182.95	0 01:07	-0.525	1.01	0.220
EX.MH44	JUNCTION	40.00	80.00	0 01:03	0.259	0.784	0.051
EX.MH44-S	JUNCTION	-40.00	136.26	0 01:09	-0.259	0.484	0.110
EX.MH45	JUNCTION	40.00	120.08	0 01:07	0.129	0.913	0.023
EX.MH45-S	JUNCTION	-40.00	96.09	0 01:10	-0.129	0.225	0.172
EX.MH46	JUNCTION	39.93	167.97	0 01:11	0.0884	1.14	0.030
EX.MH46-S	JUNCTION	-39.93	66.56	0 00:55	-0.0884	0.147	0.304
EXMH32	JUNCTION	0.00	201.07	0 01:11	0	1.34	0.032
MH133	JUNCTION	0.00	11.71	0 01:19	0	0.143	0.016
MH135	JUNCTION	0.00	11.71	0 01:16	0	0.142	-0.034
STM1	JUNCTION	0.38	5.45	0 01:28	0.00256	0.0752	0.001
NorthMajor	OUTFALL	20.25	20.25	0 00:55	0.0205	0.0205	0.000
RingRoadMajor	OUTFALL	138.53	154.31	0 00:55	0.0497	0.135	0.000
StormSewerSystem	OUTFALL	0.00	200.92	0 01:11	0	1.34	0.000
Detention	STORAGE	0.00	134.43	0 00:56	0	0.145	0.063
Roof_Storage	STORAGE	82.17	82.17	0 00:55	0.0727	0.0727	-0.001
SurfaceStorage	STORAGE	179.47	179.47	0 00:55	0.145	0.145	0.003

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
cbmh40	JUNCTION	3.45	0.558	1.319
DCBMH38	JUNCTION	2.39	0.384	1.269

Node Flooding Summary

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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 Ponded Depth Meters
Detention	0.10	14.62	0	01:15	0.003	0.000

Storage Volume Summary

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min		Maximum Outflow LPS
Detention	0.021	25.2	0.0	0.0	0.083	100.0	0	01:15	36.25
Roof_Storage	0.015	6.3	0.0	0.0	0.046	19.9	0	01:28	5.45
SurfaceStorage	0.000	0.2	0.0	0.0	0.016	11.5	0	00:56	121.20

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
NorthMajor	35.64	1.43	20.25	0.020
RingRoadMajor	99.98	3.14	154.31	0.135
StormSewerSystem	99.66	27.23	200.92	1.340
System	78.43	31.80	269.98	1.496

Street Flow Summary

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

C10-S		53.608	1.915	0.038	Inlet	ON-GRADE	1	59.99	60.00	99.92	0.00	16.08
21.45												
C11-S		22.623	1.338	0.027	Inlet	ON-SAG	1	63.58	98.22	7.62	0.00	7.19
8.24												
C13-S		182.948	3.762	0.075	Inlet	ON-GRADE	1	21.86	58.37	99.99	0.00	20.00
142.95												
C3-S		65.561	1.684	0.034	Inlet	ON-GRADE	1	60.00	60.00	87.77	0.00	19.67
26.22												
C4-S		0.000	1.385	0.028	Inlet	ON-GRADE	1					

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C5-S	88.021	3.234	0.065	Inlet	ON-GRADE	1	45.44	59.87	85.45	0.00	20.00
48.02											
C8-S	136.262	3.068	0.061	Inlet	ON-GRADE	1	29.36	59.21	99.94	0.00	20.00
96.26											
C9-S	96.087	2.664	0.053	Inlet	ON-GRADE	1	41.63	59.81	99.93	0.00	20.00
56.09											

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	5.45	0 01:28	0.89	0.01	0.08
C10	CONDUIT	120.03	0 01:07	1.66	0.42	0.65
C10-S	CONDUIT	53.61	0 01:11	0.73	0.01	0.13
C11	CONDUIT	181.85	0 01:11	2.16	1.25	0.72
C11-S	CONDUIT	22.62	0 01:12	0.62	0.00	0.09
C12	CONDUIT	180.87	0 01:12	2.22	0.45	0.47
C13	CONDUIT	11.71	0 01:19	0.64	0.01	0.10
C13-S	CONDUIT	182.95	0 01:07	0.69	0.04	0.25
C14	CONDUIT	17.44	0 01:36	0.92	0.09	0.60
C2	CONDUIT	5.45	0 01:28	0.72	0.02	0.09
C3	CONDUIT	43.38	0 00:59	0.75	0.10	0.32
C3-S	CONDUIT	65.56	0 00:55	1.17	0.01	0.11
C4	CONDUIT	39.88	0 00:59	1.20	0.10	0.21
C4-S	CONDUIT	0.00	0 00:00	0.00	0.00	0.09
C5	CONDUIT	40.00	0 00:58	1.40	0.12	0.24
C5-S	CONDUIT	88.02	0 00:56	0.45	0.02	0.22
C6	CONDUIT	13.68	0 00:51	0.46	0.11	1.00
C8	CONDUIT	40.00	0 01:03	1.25	0.41	0.57
C8-S	CONDUIT	136.26	0 01:09	0.73	0.02	0.20
C9	CONDUIT	80.08	0 01:06	1.85	0.81	0.62
C9-S	CONDUIT	96.09	0 01:10	0.73	0.02	0.18
CBMH32	CONDUIT	200.92	0 01:11	1.95	0.47	0.48
CBMH92	CONDUIT	11.71	0 01:16	0.72	0.09	0.21
Ctention	CONDUIT	36.25	0 00:56	0.76	0.29	1.00
C7	ORIFICE	11.67	0 01:15			1.00
CFRD	DUMMY	5.45	0 01:28			
OL1	DUMMY	121.20	0 00:57			

Flow Classification Summary

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class								
		Up Dry	Down Dry	Sub Dry	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl	
C1	1.00	0.01	0.00	0.00	0.00	0.00	0.99	0.00	0.00	
C10	1.00	0.00	0.00	0.00	0.04	0.96	0.00	0.00	1.00	0.00
C10-S	1.00	0.00	0.01	0.00	0.03	0.96	0.00	0.00	0.02	0.00
C11	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.18	0.00
C11-S	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	0.03	0.00
C12	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C13	1.00	0.00	0.00	0.00	0.03	0.00	0.00	0.97	0.03	0.00
C13-S	1.00	0.00	0.00	0.00	0.86	0.14	0.00	0.00	0.00	0.00
C14	1.00	0.00	0.00	0.00	0.05	0.01	0.00	0.94	0.00	0.00
C2	1.00	0.01	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00
C3	1.00	0.00	0.02	0.00	0.98	0.00	0.00	0.00	0.99	0.00
C3-S	1.00	0.00	0.00	0.00	0.88	0.12	0.00	0.00	0.94	0.00
C4	1.00	0.01	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00

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C4-S	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C5	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C5-S	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C6	1.00	0.02	0.00	0.00	0.17	0.00	0.00	0.80	0.01	0.00
C8	1.00	0.00	0.00	0.00	0.03	0.97	0.00	0.00	0.99	0.00
C8-S	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
C9-S	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
CBMH32	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.06	0.00
CBMH92	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
Ctention	1.00	0.02	0.00	0.00	0.16	0.00	0.00	0.81	0.01	0.00

Conduit Surcharge Summary

Conduit	----- Hours Full -----			Hours	
	Both Ends	Upstream	Dnstream	Above Full Normal Flow	Hours Capacity Limited
C11	0.01	0.01	0.01	0.22	0.01
C6	2.73	2.73	3.45	0.01	0.01
Ctention	1.98	1.98	2.39	0.01	0.01

Analysis begun on: Wed Nov 20 08:04:46 2024
Analysis ended on: Wed Nov 20 08:04:48 2024
Total elapsed time: 00:00:02