SERVICING AND STORMWATER MANAGEMENT REPORT

ELLISDON INFRASTRUCTURE HEALTHCARE

CHEO 1DOOR4CARE PARKING GARAGE

401 SMYTH ROAD
OTTAWA, ONTARIO

Project No.: 2021-0821-10

August 16, 2023

WALTERFEDY

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CHEO 1Door4Care Integrated Treatment Centre
401 Smyth Road, Ottawa

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1.0 INTRODUCTION

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

The proposed development plan is to construct a new parking garage on the CHEO campus to meet the forecasted parking demand that will come with the completion of the new 1Door4Care Building. The development will consist of a seven-storey parking garage structure containing approximately 1,050 parking spaces. The proposed parking garage will have a footprint area of approximately 4,807 m^2.

The new parking garage will replace an existing surface parking lot located southeast of the existing CHEO building and southwest of the Ottawa Hospital General Campus.

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 new parking garage has an area of approximately 1.19 hectares will be located on the eastern edge of the CHEO campus – replacing an existing gravel parking lot (Lot E).

The site is bounded by a wooded area to the north, Ring Road to the south, the Ottawa Hospital General Campus to the east, and the CHEO visitor parking lot (Lot A) to the west.

In general, the site slopes from east to west, ranging in elevations from 82.166m along the eastern limits of the site to approximately 82.231m at the southwest corner of the site. The site is currently occupied by an existing gravel parking lot with an asphalt pathway running alongside the northern limits 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 (Parking Garage)*, Fotenn Planning + Design, prepared for Infrastructure Ontario, October 2022
2. *1Door4Care: CHEO Integrated Treatment Centre Preliminary Functional Servicing Study (Parking Garage),* Stantec Consulting Ltd., prepared for Infrastructure Ontario, October 2022
3. *1Door4Care: CHEO Integrated Treatment Centre – Climate Risk Assessment,* Stantec Consulting Ltd., prepared for Infrastructure Ontario, December 2022
4. *Phase One Environmental Site Assessment*, GHD Ltd., prepared for Infrastructure Ontario, June 2020
5. *Phase Two Environmental Site Assessment*, GHD Ltd., prepared for Infrastructure Ontario, June 2020
6. *1Door4Care: CHEO Integrated Treatment Centre – Geotechnical Investigation Report (Parking Garage)*, GHD Ltd., prepared for Infrastructure Ontario, October 2022
7. *1Door 4Care: CHEO Integrated Treatment Centre – Hydrogeological Assessment (Parking Garage)*, 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. *Children's Hospital of Eastern Ontario Parking Garage SPC Application*, B+H Architects, prepared for the City of Ottawa, November 2022
10. *Civil Design Narrative CHEO Parking Garage*, EXP Services inc., prepared for B+H Architects, November 2022
11. *Ottawa Health Sciences Centre Site Services Assessment*, J.L. Richards & Associates Ltd., prepared for the Ottawa Health Sciences Centre, January 2011
12. *Ottawa Health Sciences Centre Storm and Sanitary Sewer Capacity Assessment*, Morrison Hershfield, prepared for the University of Ottawa, May 2017
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. Various Subsurface Utilities Locates, T2 Utility Engineers., prepared for Infrastructure Ontairo, February 2020

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

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

2.0 EXISTING CONDITIONS

2.1 Topography, Land Use and Drainage

Existing topographical and legal boundary information for this site was obtained from a survey by Annis, O'Sullivan, Vollebekk Ltd., dated May 2021. The Site occupies approximately 1.19 ha of land located on the eastern extent of the overall CHEO campus. The majority of the site is currently occupied by an existing gravel parking lot, with gravel surfaces occupying approximately 9,024 m^2 of the site. The site also contains entirely impervious surfaces such as asphalt and concrete, occupying an area of approximately 57.6 m^2.

The topography on site ranges from an elevation of 81.91m along the western edge of the stie to an elevation of 82.22m on the southwestern corner of the site. Based on the topographic survey, there are no catchbasin structures located on 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

A 300mm diameter watermain exists north of the site and runs along the pedestrian access path connecting the CHEO buildings to the Ottawa General Hospital. A second 300mm diameter watermain runs along the southeastern boundary of the site, fronting the main entrance to the Ottawa General Hospital.

An existing 750mm-diameter storm sewer runs along the northern boundary of the site, underneath of the pedestrian access road connecting the CHEO campus to the Ottawa General Hospital. A separate 375mm

diameter storm sewer also runs along the eastern edge 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 on the northern edge of the site, underneath of the pedestrian access between the CHEO Campus and Ottawa General Hospital. A separate 200mm sanitary sewer exists along the eastern limits of the site. Both sanitary sewers run northwards, and eventually discharge to the 381mm-diameter trunk sewer running west along the northern segment of Ring Road. The system eventually connects to the Rideau River Collector Sewer west of Riverside Drive.

2.3 Other Existing Utilities

Based on utilities information provided by T2 Utility Engineers, it is understood that hydro, gas, and communications servicing lines are readily available in the adjacent rights-of-ways and access roads. Streetlight services are provided in the existing parking area and will be removed or relocated as necessary to facilitate the construction of the proposed parking garage. Local utility companies will be contacted to confirm the capacity of existing utilities and confirm if any upsizing of existing services will be required to service the proposed parking garage.

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 2021. During the preliminary investigation a total of 11 boreholes were advanced on site to assess the geotechnical conditions, four of which also included installation of groundwater monitoring wells.

- A supplementary geotechnical investigation was completed in June 2022. A total of 12 boreholes were advanced on site to assess the geotechnical conditions, two of which also included installation of groundwater monitoring wells.

- A layer of asphaltic concrete was found in all boreholes with the exception of boreholes B1-21 to B3-21, BH4-21, BH6-21, BH7-21, MW9-22 to BH12-22, and BH14-22 to BH18-22. The asphaltic concrete layer was noted to have a thickness ranging between 50mm and 175mm.

- All boreholes noted a layer of fill/disturbed native soil, extending a depth of 0.3 to 1.1m below grade. In general, the fill material consisted of a heterogeneous mixture of gravelly sand/silty sand/sandy silt or sand and gravel. 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 (with the exception of BH1-21 to MW5-21, BH7-21 to M28-21, and BH15022) and extended to depths of 0.6 to 1.2m below grade. The native soil was found to contain some silt and trace clay.

- Bedrock was encountered in all boreholes at a depth of 0.4 to 1.2m 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 site is primarily underlain by fill, a gravelly sand to sand deposit, and weathered and competent shale bedrock. During the hydrogeological investigation, the fill and gravelly sand to sand deposit were unsaturated while groundwater was found to be present within the weathered bedrock.

- The weathered shale bedrock underlying the site forms an aquitard. Based on hydraulic testing, the horizontal hydraulic conductivity of the bedrock was found to be approximately 9.44 x 10^{-4} cm/s.

- The shallow course textured soils found on site were determined to have a high infiltration rate of 214 mm/hr. It was noted that while the soils were very permeable, infiltration on site is constrained by shallow bedrock and saturated conditions during precipitation events. The high permeability of the soils paired with the high bedrock on site leads to 'perched groundwater' conditions.

- Groundwater levels measured from January 2021 to August 2022 ranged from 1.32m to 3.09m below grade, with the water table elevation ranging from approximately 78.68m to 80.88m 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 parking garage on the CHEO campus will require excavations to provide servicing to the Site. Based on the Hydrogeological Assessment of the Site conducted by GHD, an anticipated dewatering rate of 41.73 m^3/day was calculated using a 3x safety factor. The predicted groundwater takings are below the Ministry of the Environment, Conservation and Parks (MECP) Environmental Activity and Sector Registry (EASR) limit of 50,000 L/day. Therefore, it is not anticipated that an EASR is required for the utility excavations on Site.

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 Quality and Discharge

As part of the hydrogeological investigation, samples of groundwater were collected and analyzed for compliance with City of Ottawa Sewer Use By-Law (2003-514) parameters. The analysis notes that the discharge would be a combination of groundwater, surface water runoff and precipitation into the open excavation pits and would require further assessment to confirm its quality and requirement for pre-treatment. Prior to discharge to the sewer, a City of Ottawa sewer-use discharge permit will be required.

4.0 PROPOSED CONDITIONS

The Development is to consist of a seven-storey parking garage structure to support the construction and operation of the new 1Door4Care facility. The proposed development will contain approximately 1,050 parking spaces.

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. 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 0.6m/s and maximum velocity of 3.0m/s is permitted within the pipe
- An average wastewater flow rate for institutional areas of 28,000 L/ha/day
- An institutional peaking factor of 1.5
- An infiltration allowance of 0.33 L/s/effective gross ha

The proposed development is expected to discharge all drips collected within the parking garage (including windblown rain, snow, and precipitation carried in by vehicles) to the sanitary sewer system, with the exception of drainage collected on the uppermost open storey of the structure.

5.2 Total Sanitary Demand

The proposed development is expected to discharge domestic sanitary sewage to the private sanitary sewer system on site. Under the City of Ottawa's *Ottawa Sewer Design Guidelines*, institutional areas are given an average sewage flow rate of 28,000 L/ha/day and is to be peaked using a peaking factor of 1.5. The total calculated wastewater from the site was calculated as shown in Table II below.

Table II: Sanitary Flow Calculation

Average Daily Wastewater Flow (Institutional Areas)	28,000	*L/ha/day*
Site Area	1.19	Ha
Average Daily Wastewater Flow	0.386	L/s
Peaking Factor	1.5	
Peak Domestic Wastewater Flow	**0.579**	**L/s**
Site Area	1.19	ha
Infiltration Allowance (0.33 L/s/ha)	0.393	L/s
Total Sanitary Drainage	**0.972**	**L/s**

It should be noted that there are no washrooms in this parking garage, and the floor drains are being directed to the storm sewer. As such, it is anticipated that the anticipated sanitary flow will be significantly less than what is listed above.

5.3 Wastewater Collection and Discharge

Wastewater from the site will be collected in private sanitary sewers within the site. It is anticipated that a 300mm diameter sanitary sewer will be sufficient to convey the sewage to the existing sanitary sewer located north of the site.

The design of the sewers for this project was completed using the Chézy-Manning formula with a roughness coefficient of 0.013 in accordance with City of Ottawa Guidelines. Table III below illustrates the minimum design considerations for the service connection to the northern 150mm diameter sanitary sewer to ensure compliance with MECP requirements and provide self cleansing velocities within the pipe.

Table III: Sanitary Service Design

Diameter of Service	150	*mm*
Minimum Slope of Service	4.18	*%*
Full Flow Capacity	31.14	*L/s*
Full Flow Velocity	1.76	*m/s*

The sanitary sewers will be constructed at a minimum depth of 1.2m below ground surface to prevent freezing. Insulation will be provided for sewers that cannot be placed at this minimum depth to prevent freezing.

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).

6.2 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.

6.2.1 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

FUS 2020 notes that for open parking garages, the area of the largest floor should be used as the Total Effective Area. As such, the total effective floor area used within the calculation was approximately 4807 m^2.

Based on the above, an RFF of 12,000 LPM (200 L/s) is noted for this building.

(3) Occupancy Charge

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

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

The proposed development falls into the major occupancy category of "storage garages, including open air parking garages" from the National Building Code of Canada (NBC). This major occupancy category has a suggested occupancy charge of combustible according to FUS 2020; therefore, no adjustments were made to the calculated RFF.

(4) Automatic Sprinkler Protection

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

Table IV: 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 and the exposed risk. Table V summarizes the exposed risks identified, their measured separation differences, and the exposure adjustment charge applied.

Table V: Summary of Exposure Charges Applied

Exposed Risk Identified	Separation Distance Measured	Exposure Charge Applied
Main CHEO Building	>30m	0%
The Ottawa General Hospital Campus	>30m	0%
Total Exposure Charge Applied		**0%**

(6) Total Required Fire Flow

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

Table VI: Summary of Required Fire Flow Calculations

Calculated Required Fire Flow	12,000 L/min
Occupancy Charge Applied	0%
Adjusted Required Fire Flow	12,000 L/min
Automated Sprinkler Protection Credit Applied	-50%
Adjusted Required Fire Flow	6,000 L/min
Exposure Charges Applied	0%
Adjusted Required Fire Flow	6,000 L/min
Total Required Fire Flow	**100 L/s**

6.3 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 were noted to be within close proximity to the Site (Hydrant PPH328-02). The results of the flow test noted that a static pressure of 50 PSI was available at the Site, and a residual pressure of 54 PSI was measured at a flow of 1190 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 2650 GPM or approximately 168 L/s. This value is greater than the calculated fire flow rate of 100 L/s, therefore no impacts to the municipal system are expected as a result of this development.

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 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 existing 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 be installed on all building drainage connections to the minor system, inlet control devices should be installed on highlighted catchbasin structures, and future development within the OHSC campus adhere to strict stormwater quantity control criteria. 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. As summarized above, the *Stormwater Master Plan* for the OHSC campus completed by Morrison Hershfield in 2019 provides several criteria for stormwater management design on the campus. The report states that peak flows from future developments under all storm events shall be controlled to the pre-existing 2-year storm conditions. Additionally, peak flow from pre-development conditions shall be determined using a runoff coefficient value 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. The majority of the Site (approximately 0.99 ha) directs runoff to the wooded area along the northern boundary of the Site, while the remaining 0.20 ha directs runoff towards the Ring Road storm sewer system. An existing catchment areas plan has been provided within Appendix A of this report. A summary of the pre-development catchment parameters is provided within Table VII below.

Table VII: Summary of Pre-Development Catchment Parameters

Catchment ID	Description	Area (ha)
101	Main portion of the existing gravel parking lot – directs runoff to north hospital outlet.	0.99
102	Northwest portion of the existing gravel parking lot – directs runoff to Ring Road storm sewer.	0.14
103	Southwest portion of the existing gravel parking lot – directs runoff to Ring Road storm sewer.	0.06

As per the *Stormwater Master Plan* created by Morrison Hershfield, the allowable release rate form 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 VIII and Table IX.

Table VIII: Allowable Release Rate to the North Hospital Storm Sewer

Area of Catchment (A)	0.989	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)	**0.106**	**m^3/s**

Table IX: Allowable Release Rate to the Ring Road Storm Sewer

Area of Catchment (A)	0.20	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)	**0.021**	**m^3/s**

7.4 Proposed Conditions

Under proposed conditions the overall percent impervious for the Site was calculated to be 75%. A catchment area plan of proposed conditions has been included within Appendix A of this report. A summary of post-development catchment parameters has been provided in Table X below.

Table X: Proposed Catchment Parameters

Catchment ID	Description	Area (ha)
201A	North portion of proposed parking garage - directs flow to North Hospital	0.25
201B	South portion of proposed parking garage - minor flows directed to North Hospital, major flows directed to Ring Road	0.24
202	South portion of restored gravel area - minor flows directed to North Hospital, major flows directed to Ring Road	0.13
203	North portion of restored gravel area - directs flow to North Hospital	0.11
204	North entrance driveway - directs flow to North Hospital	0.10
205	North entrance driveway - directs flow to North Hospital	0.07
206	West pedestrian pathway - minor flows directed to North Hospital, major flows directed to Ring Road	0.03
207	South parking garage entrance - directs flows to Ring Road	0.12
208	East landscaped areas - directs flows to North Hospital	0.13

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

7.4.1 Surface Ponding

Surface ponding is proposed to occur on the restored gravel areas to the west of the proposed parking garage structure (Catchments 202 and 203). 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 2-year storm event. This was accomplished utilizing a 150 mm diameter orifice plate installed downstream of CBMH3. This orifice plate was sized such that flows from the 2-year design storm event would be able to pass through without interference while flows generated from the 5- 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 32.4 m^3. Peak inflow/outflow rates and maximum storage volumes recorded for the surface ponding storage node within all modelled storm events are listed within Table 5 in Appendix C.

7.4.2 Detention Gallery

In order to further attenuate flows directed towards the existing north hospital storm system, an underground detention gallery comprised of 96 ADS SC-740 StormTech chambers. This detention gallery provides 226.76 m^3 of storage and will receive flows from the storm sewers and overland flow along the northern driveway on Site. The proposed storm sewer system was designed for the 100-year design storm event, storm sewer design sheets have been provided within Appendix C. Peak inflow/outflow rates and maximum storage volumes recorded for the detention gallery node within all modelled storm events are listed within Table 5 in Appendix C.

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

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

Design Storm Event	Pre-Development Peak Flow Rate (m^3/s)	Allowable Release Rate (m^3/s)	Post-Development Peak Flow Rate (m^3/s)
2-Year	0.106	0.106	0.066
5-Year	0.143	0.106	0.083
10-Year	0.168	0.106	0.084
25-Year	0.199	0.106	0.086
50-Year	0.222	0.106	0.087
100-Year	0.245	0.106	0.089

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

Design Storm Event	Pre-Development Peak Flow Rate (m^3/s)	Allowable Release Rate (m^3/s)	Post-Development Peak Flow Rate (m^3/s)
2-Year	0.021	0.021	0.001
5-Year	0.029	0.021	0.004
10-Year	0.034	0.021	0.013
25-Year	0.040	0.021	0.023
50-Year	0.045	0.021	0.030
100-Year	0.050	0.021	0.035

As seen in Table XI, the proposed stormwater management measures are capable of successfully reducing the post-development peak flow rates to the allowable release rate. Post-development peak flow rates directed towards Ring Road can be seen to slightly surpass the allowable release rate to the outlet, but remain below the calculated pre-development peak flow rates for their respective storm events. These overages will continue to flow west as uncontrolled surface flow to the CHEO 1Door4Care facility, where flows will enter the facility's stormwater management system and be treated and attenuated. Given that the post-development peak flow rates directed towards Ring Road remain below the calculated pre-development peak flow conditions for each storm event, runoff directed towards Ring Road will not be worse than those seen within existing conditions. Therefore, no further stormwater management measures will be necessary within interim conditions.

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. Therefore, quality control shall not be required for this site. However, the drainage from the site is directed towards a detention gallery equipped with an isolator row. The isolator row will reduce maintenance needs and provide additional TSS removal for runoff from the site to act as an upstream quality control prior to the OGS.

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 apply to the site.
- Sanitary discharge from the site will be conveyed to the municipal sanitary sewer to the northwest corner of the OHSC campus.
- No capacity concerns are noted within the downstream sanitary infrastructure.
- Water servicing will be provided from the 300mm diameter watermain running along the pedestrian access road north of the Site.
- Hydrant flow testing indicates that the existing water distribution system can accommodate the anticipated post-development water demand within the acceptable pressure range. No concerns are anticipated.
- A private fire hydrant will be provided within 45m of the fire department connection, connected to the municipal service. This hydrant is expected to provide the required fire flow at or above the minimum 140 kPa residual pressure. This is only applicable to the approach noted above.
- Peak stormwater flow control will be required for this Site. Peak flow rates directed towards the existing storm sewer system to the North of the Site are shown to be attenuated to the allowable peak flow rate through the implementation of surface ponding and underground detention gallery. Increases in major storm peak flow directed to Ring Road will continue west where it will be captured and attenuated by the stormwater management infrastructure for the CHEO 1Door4Care facility.
- Water quality controls are provided for the OHSC at the downstream outlet to the municipal system. The detention gallery is equipped with an isolator row for some LID treatment. No additional water quality controls are required on Site.
- Erosion and Sediment Control measures will ensure protection of the adjacent natural features and the municipal roadside ditch. 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,

All of which is respectfully submitted,

WALTERFEDY

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

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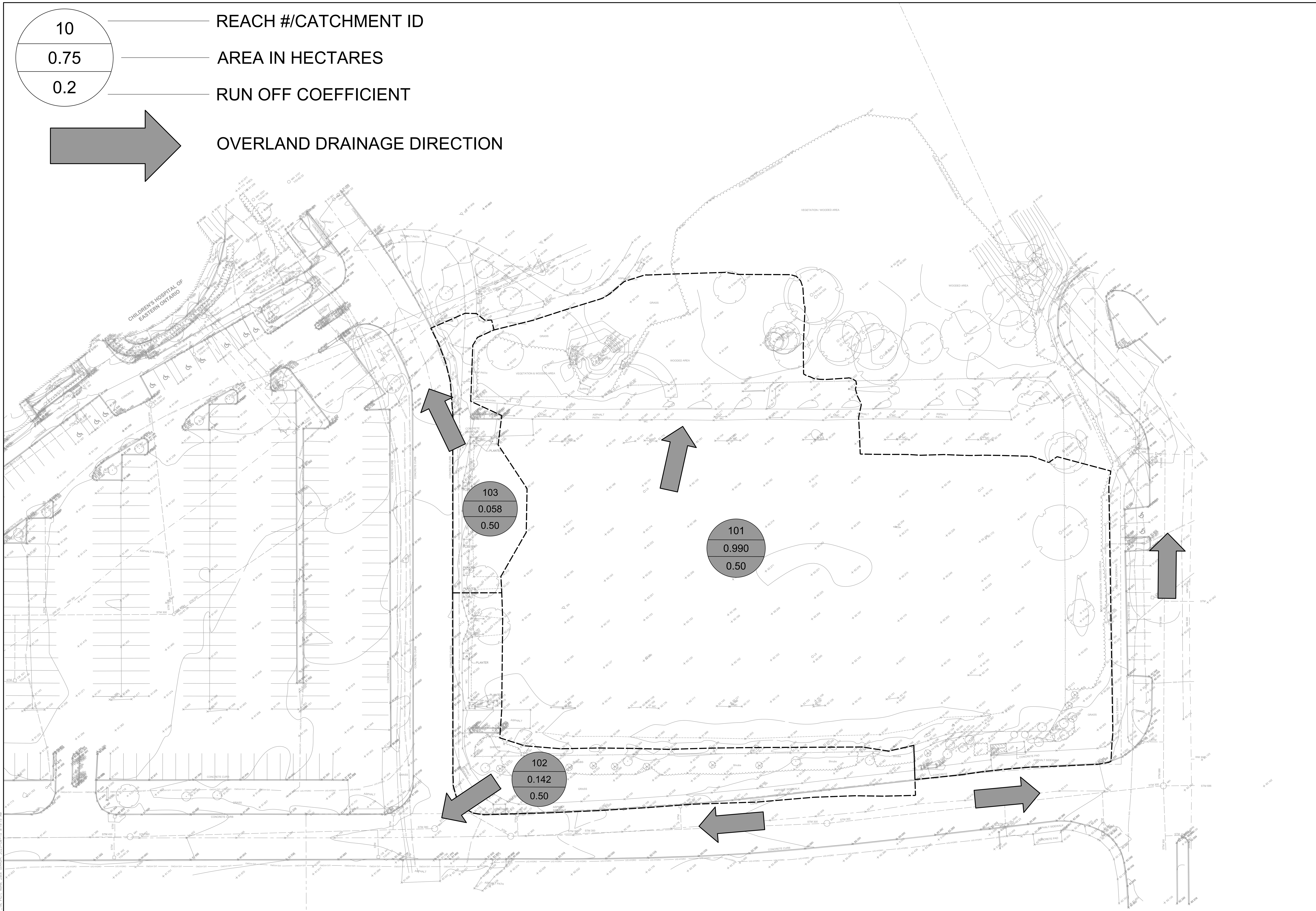
Circe Mahoney
Water Resources EIT, Civil Engineering

cmahoney@walterfedy.com
519.576.2150 Ext. 414

APPENDIX A

Figures

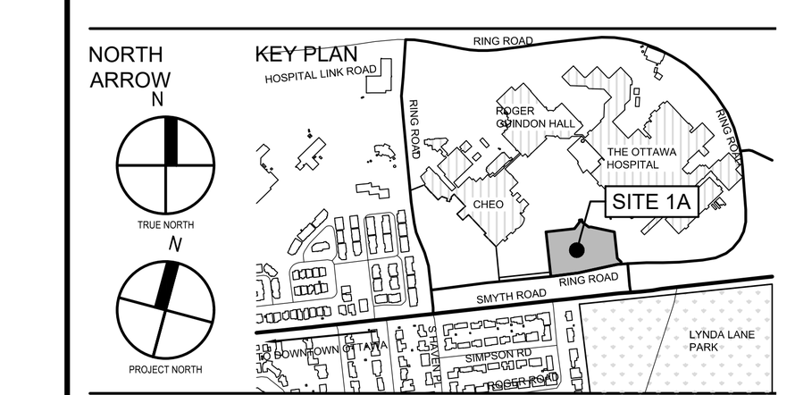


CHEO 1Door4Care

Infrastructure Ontario

EllisDon INFRASTRUCTURE Healthcare

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



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, WATERMAINS, SEWERS, AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM THEMSELVES OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM AND THOSE NOT LOCATED PRIOR TO CONSTRUCTION.
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.

#	DATE:	REVISION:

REVISIONS

CLIENT

1DOOR4CARE: CHEO INTEGRATED TREATMENT CENTRE: PARKING GARA

401 SMYTH RD. OTTAWA, ON K1H8L1

TITLE

EXISTING CATCHMENT AREAS PLAN - PARKING GARAGE

SCALE: 1:250
DRAWN BY: DR,RB
REVIEWED BY: RK
JOB NUMBER: 2021-0821-10
PLOT DATE: 2023.08.15

DRAWING NUMBER:

FIG1

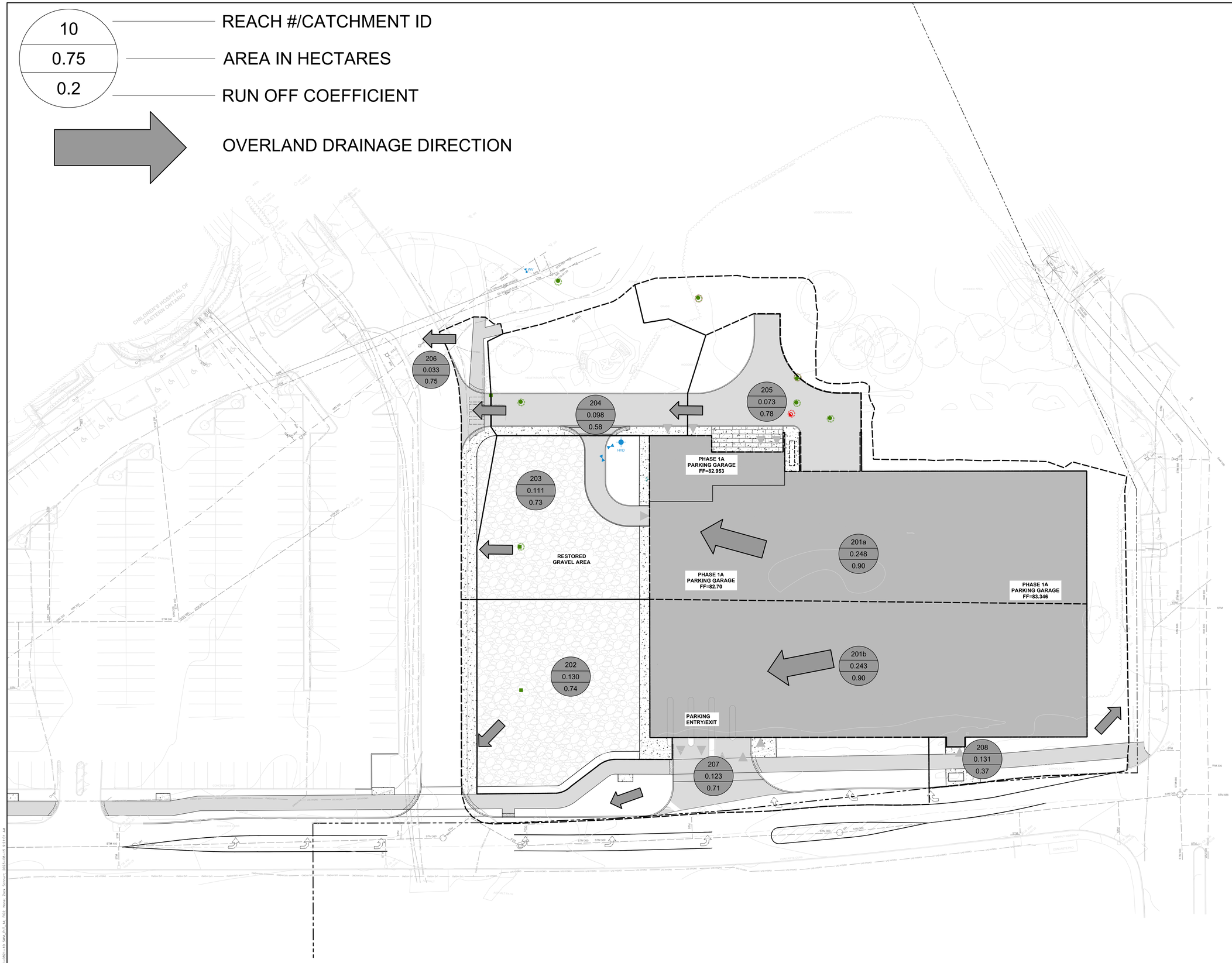
10
0.75
0.2

REACH #/CATCHMENT ID

AREA IN HECTARES

RUN OFF COEFFICIENT

OVERLAND DRAINAGE DIRECTION



CHEO
1Door4Care

Infrastructure Ontario

EllisDon
INFRASTRUCTURE Healthcare

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

NORTH ARROW

KEY PLAN

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.
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#	DATE:	REVISION:
REVISIONS		

CLIENT

1DOOR4CARE: CHEO INTEGRATED TREATMENT CENTRE: PARKING GARA

401 SMYTH RD. OTTAWA, ON K1H8L1

TITLE

PROPOSED CATCHMENT AREAS PLAN - PARKING GARAGE

SCALE:	1:250
DRAWN BY:	DR,RB
REVIEWED BY:	RK
JOB NUMBER:	2021-0821-10
PLOT DATE:	2023.08.15

DRAWING NUMBER:

FIG2

APPENDIX B

Water and Wastewater Servicing Information

WASTEWATER GENERATION

MECP Design Criteria

WALTERFEDY

Project	CHEO 1Door4Care Parking Garage
Project #	2021-0821-10
Designer	CM
Address	401 Smyth Road, Ottawa, Ontario
Description	Domestic Flows - Proposed Condtions

Building Description	Site Area[1] (ha)	Average Daily Wastewater Flow (L/gross hectare/day)[3]	Average Wastewater Generated (L/day)	Peaking Factor[3]	Infiltration Allowance[2] (L/s/ha)	Peak Domestic Wastewater Flow (L/s)
1Door4Care - Parking Garage	1.19	28000	33,320	1.50		0.58
Infiltration Allowance	1.19				0.33	0.39
Total						**0.97**

Notes:

1. Site Area based on Civil Drawings
2. Average Daily Wastewater Flow and Infiltration Allowance taken from City of Ottawa's Ottawa Sewer Design Guidelines for Institutional Developments
3. Peaking Factor taken from City of Ottawa's Sewer Design Guidelines for institutional developments

REQUIRED FIRE FLOW

Water Supply for Public Fire Protection (FUS 2020)

WALTERFEDY

Project	CHEO 1Door4Care
Project #	2021-0821-10
Designer	CM
Address	401 Smyth Road, Ottawa, Ontario
Description	Fire Flows (Parking Garage)

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

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	32292	m^2
# Storeys	7	
Fire Resistant Building?	NO	

Vertical Openings and Exterior Vertical Communications protected with minimum one (1) hr rating? YES

Area	4807	m^2
Description	Open Air Parking Garage - Area of largest floor to be used as the total effective area	
Required Fire Flow	12000	L/min

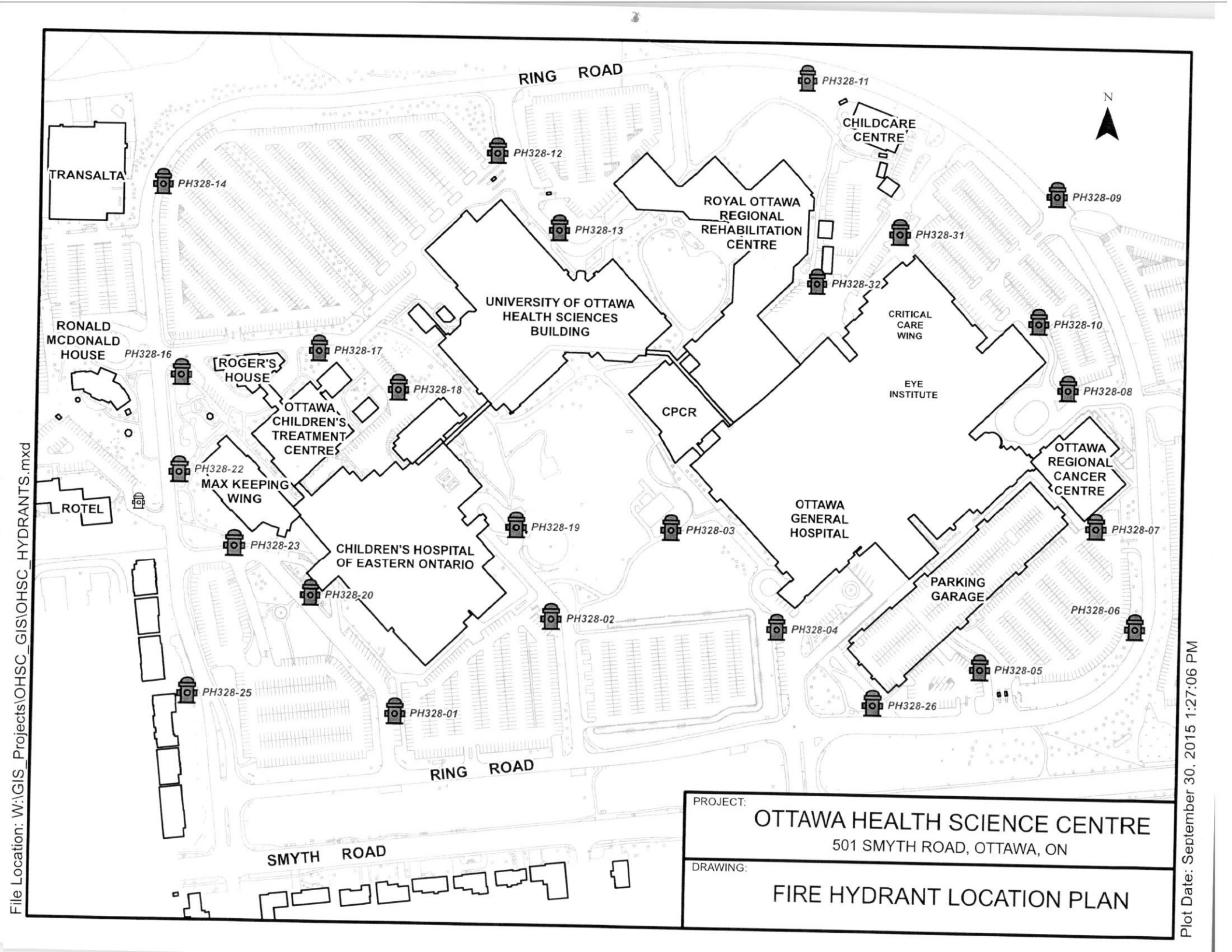
Occupancy Charge	Combustible Contents			
Fire Flow Reduction	0%	**OR**	0	L/min
Required Fire Flow	12000	L/min		

Automated Sprinker 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		-6000	L/min

Exposure 1 (North)	**Distance**	>30	m	**Charge**	0%
Description	University of Ottawa Roger Guindon Hall				
Exposure 2 (East)	**Distance**	>30	m	**Charge**	0%
Description	The Ottawa Hospital General Campus				
Exposure 3 (West)	**Distance**	>30	m	**Charge**	0%
Description	Main CHEO Campus Buildings				
Exposure 4 (South)	**Distance**	>30	m	**Charge**	0%
Description	Existing Residential Buildings				

Total Exposure Charge	0%	
Fire Flow Adjustment	0	L/min

Total Required Fire Flow	6000	L/min
Total Required Fire Flow	1585	U.S. GPM
Total Required Fire Flow	100	L/s



PROJECT:

OTTAWA HEALTH SCIENCE CENTRE

501 SMYTH ROAD, OTTAWA, ON

DRAWING:

FIRE HYDRANT LOCATION PLAN

File Location: W:\GIS_Projects\OHSC_GIS\OHSC_HYDRANTS.mxd

Plot Date: September 30, 2015 1:27:06 PM

Compliance Report

CLEAN WATER WORKS

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** ☐

CLEAN WATER WORKS

FH ID #: PH328 - 02

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	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
VP 067 Visible	✓	
Operates properly	✓	
Cap in place	✓	
Valve open	✓	
Barrel	**Yes**	**No**
Self draining	✓	
Water level ____ Dry		
Plugged		✓
Ground Flange	**Yes**	**No**
Solid	✓	
Buried		✓
Damaged		✓
Caps and Gaskets	**Yes**	**No**
Missing		✓
Replaced		✓
Lubricated	✓	

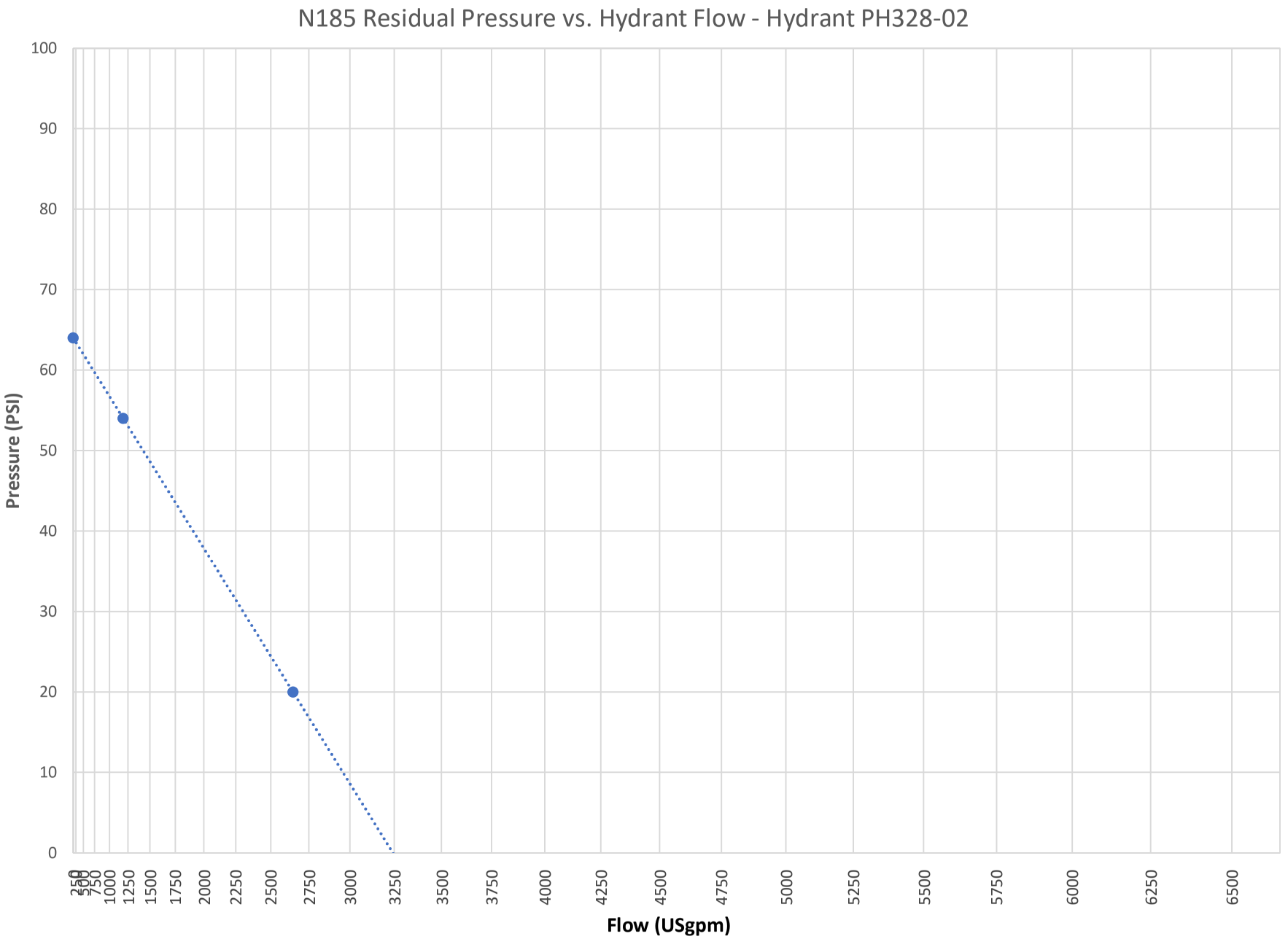
Nozzles and Threads	Yes	No
Loose		✓
Damaged		✓
Leaking		✓
Repaired		✓
Proper nozzle orientation	✓	
Pumper nozzle	✓	
Hydrant	**Yes**	**No**
Colour coded	✓	
Painting required		✓
Lubricate upper stem	✓	
Operation satisfactory	✓	
Restoration required	✓	
Hydrant marker in place	✓	

Hydro Static Testing	Yes	No
Prior to opening – underground leak		✓
Fully open – above ground leak	✓	
Fully open – underground leak		
Fully closed – underground leak		✓

Flow Testing	
Pitot reading (PSI)	50
Pitot reading (GPM)	1190
Static Pressure (PSI)	64
Volume of water used (GPM x total flow min.)	
Residual pressure (PSI)	54
Flow @ 20 PSI	2649

Comments: Leaking from bonnet ⇒ Top Seals

Possible internal damage ⇒ Conversion


N185 Residual Pressure vs. Hydrant Flow - Hydrant PH328-02
Pressure (PSI)
100
90
80
70
60
50
40
30
20
10
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
2750
3000
3250
3500
3750
4000
4250
4500
4750
5000
5250
5500
5750
6000
6250
6500
Flow (USgpm)

APPENDIX C

Stormwater Management Information
5 Year Storm Sewer Design Sheet
100 Year Storm Sewer Design Sheet

TABLE 1
DESIGN STORM PARAMETERS

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

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

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

TABLE 2
PROPOSED CATCHMENT PARAMETERS

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

							Mannings Roughness		Horton Infiltration[1]			Depression Storage				
Subcatchment	Comment	Area (ha)	Percent Impervious[2] (%)	Width (m)	Flow Length (m)	Slope (%)	Impervious	Pervious	Max. Infiltration Rate (mm/hr)	Min. Infiltration Rate (mm/hr)	Decay Constant (1/hr)	Impervious (mm)	Pervious (mm)	Percent Zero Impervious (%)	Subarea Routing	Percent Routed (%)
To the Ottawa Health Science Centre Campus Storm Sewer System																
201A	North portion of proposed parking garage - directs flow to North Hospital	0.25	90	20	124	0.5	0.013	0.250	76.20	13.20	4.14	1.57	4.67	0	OUTLET	100
201B	South portion of proposed parking garage - minor flows directed to North Hospital, major flows directed to Ring Road	0.24	90	20	122	0.5	0.013	0.250	76.20	13.20	4.14	1.57	4.67	0	OUTLET	100
202	South portion of restored gravel area - minor flows directed to North Hospital, major flows directed to Ring Road	0.13	74	15	89	1.8	0.013	0.250	76.20	13.20	4.14	1.57	4.67	0	OUTLET	100
203	North portion of restored gravel area - directs flow to North Hospital	0.11	73	15	74	1.8	0.013	0.250	76.20	13.20	4.14	1.57	4.67	0	OUTLET	100
204	North entrance driveway - directs fow to North Hospital	0.10	58	15	65	2.6	0.013	0.250	76.20	13.20	4.14	1.57	4.67	0	OUTLET	100
205	North entrance driveway - directs flow to North Hospital	0.07	78	24	30	2.2	0.013	0.250	76.20	13.20	4.14	1.57	4.67	0	OUTLET	100
206	West pedestrian pathway - minor flows directed to North Hospital, major flows directed to Ring Road	0.03	75	5	66	1.8	0.013	0.250	76.20	13.20	4.14	1.57	4.67	0	OUTLET	100
207	South parking garage entrance - directs flows to Ring Road	0.12	71	5	246	1.0	0.013	0.250	76.20	13.20	4.14	1.57	4.67	0	OUTLET	100
208	East landscaped areas - directs flows to North Hospital	0.13	37	5	262	0.5	0.013	0.250	76.20	13.20	4.14	1.57	4.67	0	OUTLET	100
Total (site)		1.19	75													

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

TABLE 3
PEAK RUNOFF VOLUMES

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
CHEO 1DOOR4CARE - PARKING GARAGE
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						
201A	132	182	216	258	290	324
201B	67	91	108	129	145	161
202	51	74	90	111	126	143
203	25	34	41	50	57	64
204	17	25	31	39	45	51
205	145	203	241	290	327	365
206	8	11	13	16	18	20
207	27	37	44	54	61	69
208	15	21	26	33	39	46

TABLE 4
PEAK RUNOFF FLOW RATES

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

Subcatchment	Design Storms					
	Chicago 2-Year (m^3/s)	**Chicago** 5-Year (m^3/s)	**Chicago** 10-Year (m^3/s)	**Chicago** 25-Year (m^3/s)	**Chicago** 50-Year (m^3/s)	**Chicago** 100-Year (m^3/s)
Proposed Conditions						
201A	0.060	0.090	0.110	0.140	0.160	0.180
201B	0.040	0.060	0.070	0.080	0.100	0.110
202	0.020	0.040	0.040	0.050	0.060	0.070
203	0.020	0.020	0.030	0.030	0.040	0.040
204	0.010	0.020	0.020	0.030	0.030	0.040
205	0.060	0.090	0.120	0.140	0.170	0.190
206	0.010	0.010	0.010	0.010	0.010	0.010
207	0.020	0.020	0.030	0.030	0.040	0.040
208	0.010	0.010	0.020	0.020	0.020	0.020

TABLE 5
GALLERY PERFORMANCE SUMMARY

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

PCSWMM Model Element	Design Storm	Peak Inflow (m^3/s)	Peak Outflow to Storm Sewer Network (m^3/s)	Max. Storage Volume (m^3)	Max. Ponding Elevation (m)
Detention Gallery					
	2-year	0.105	0.068	105	79.60
	5-year	0.125	0.075	138	79.69
	10-year	0.124	0.075	150	79.73
	25-year	0.126	0.075	163	79.76
	50-year	0.128	0.075	174	79.79
	100-year	0.130	0.075	184	79.82

PCSWMM Model Element	Design Storm	Peak Inflow (m^3/s)	Peak Outflow to Storm Sewer Network (m^3/s)	Max. Storage Volume (m^3)	Max. Ponding Elevation (m)
Surface Ponding					
	2-year	0.015	0.015	0	81.57
	5-year	0.022	0.017	0	81.71
	10-year	0.027	0.019	10	81.73
	25-year	0.033	0.021	12	81.75
	50-year	0.037	0.022	13	81.76
	100-year	0.042	0.023	14	81.77

TABLE 6
OUTLET COMPARISONS

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

Design Storm Event	To Ring Road Storm Sewer		
	Existing (m^3/s)	Allowable [1] (m^3/s)	Proposed (m^3/s)
2-year	0.021	0.021	0.001
5-year	0.029	0.021	0.004
10-year	0.034	0.021	0.013
25-year	0.040	0.021	0.023
50-year	0.045	0.021	0.030
100-year	0.050	0.021	0.035

Design Storm Event	To North Hospital Storm Sewer		
	Existing (m^3/s)	Allowable [1] (m^3/s)	Proposed (m^3/s)
2-year	0.106	0.106	0.066
5-year	0.143	0.106	0.083
10-year	0.168	0.106	0.084
25-year	0.199	0.106	0.086
50-year	0.222	0.106	0.087
100-year	0.245	0.106	0.089

(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.

User Inputs

Chamber Model:	SC-740
Outlet Control Structure:	Yes
Project Name:	CHEO Parking Garage
Engineer:	Zack Schnurr
Project Location:	Ontario
Measurement Type:	Metric
Required Storage Volume:	226.90 cubic meters.
Stone Porosity:	40%
Stone Foundation Depth:	153 mm.
Stone Above Chambers:	153 mm.
Average Cover Over Chambers:	2438 mm.
Design Constraint Dimensions:	(19.01 m. x 20.01 m.)

Results

System Volume and Bed Size

Installed Storage Volume:	226.76 cubic meters.
Storage Volume Per Chamber:	1.30 cubic meters.
Number Of Chambers Required:	96
Number Of End Caps Required:	24
Chamber Rows:	12
Maximum Length:	19.76 m.
Maximum Width:	18.02 m.
Approx. Bed Size Required:	355.95 square meters.

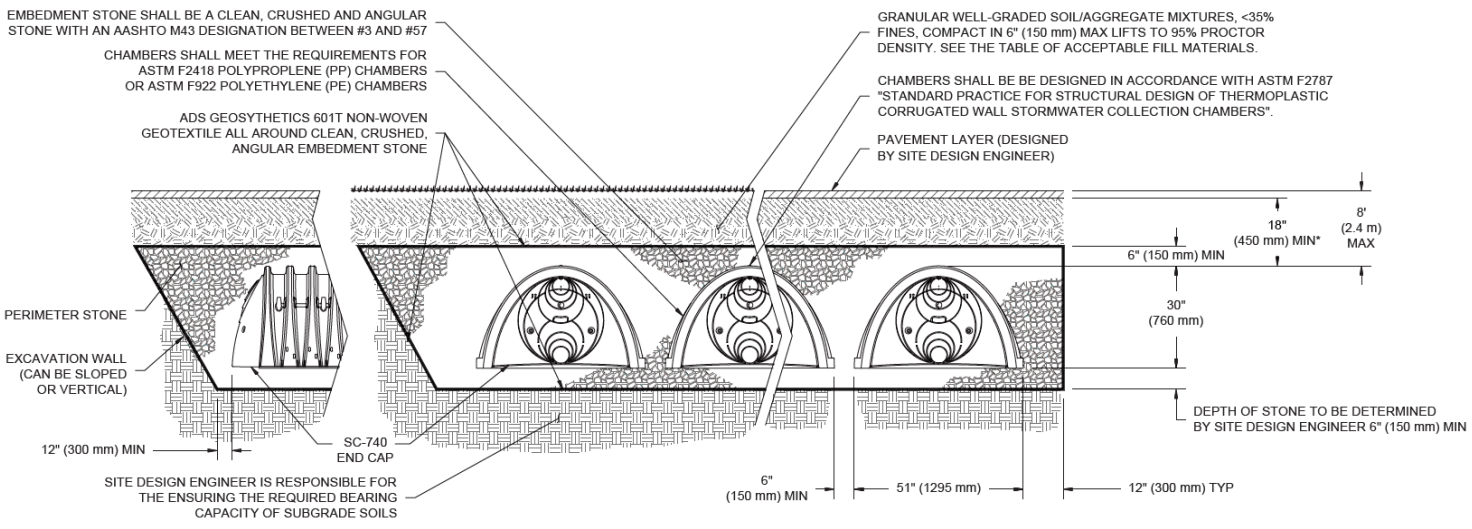
System Components

Amount Of Stone Required:	255 cubic meters
Volume Of Excavation (Not Including Fill):	380 cubic meters
Total Non-woven Geotextile Required:	1475 square meters
Woven Geotextile Required (excluding Isolator Row):	73 square meters
Woven Geotextile Required (Isolator Row):	33 square meters
Total Woven Geotextile Required:	106 square meters
Impervious Liner Required:	524 square meters

Impervious Liner notes:

Technical Note 6.50 : Thermoplastic Liners for Detention Systems

The impervious liner quantity shown is only an estimate. ADS does not provide or design impervious liners. Please contact a liner manufacturer for a final estimate.



*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (600 mm).

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	

Advanced Drainage Systems, Inc.

ADS SiteAssist™
FOR STORMTECH
INSTALLATION INSTRUCTIONS
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CHEO PARKING GARAGE

OTTAWA, ON, CANADA

SC-740 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH SC-740.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL BE CERTIFIED TO CSA B184, "POLYMERIC SUB-SURFACE STORMWATER MANAGEMENT STRUCTURES", AND MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. 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.
6. 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.
7. 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 AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 550 LBS/FT/%. 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.
8. 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 F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF THE SC-740 SYSTEM

1. STORMTECH SC-740 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. 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.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 150 mm (6") SPACING BETWEEN THE CHAMBER ROWS.
7. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 20-50 mm (3/4-2").
8. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
9. 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

1. STORMTECH SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
2. THE USE OF CONSTRUCTION EQUIPMENT OVER 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/DC-780 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. FULL 900 mm (36") OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

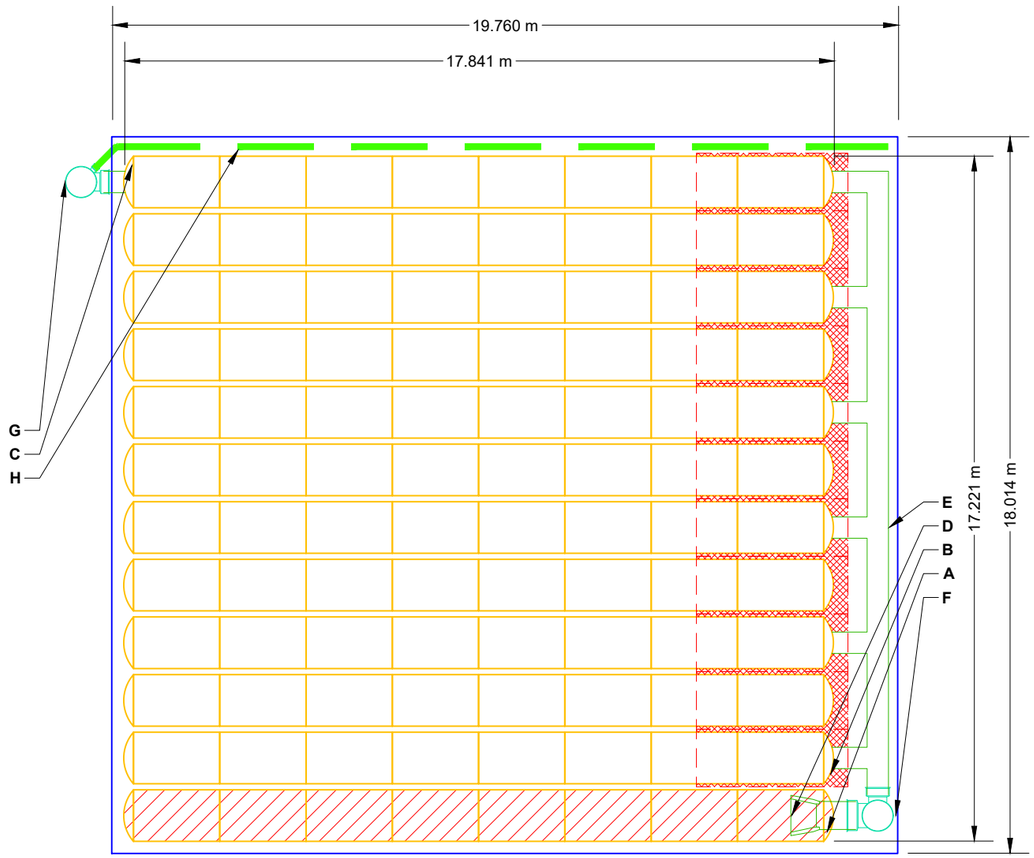
USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO THE CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

PROPOSED LAYOUT		PROPOSED ELEVATIONS:	
96	STORMTECH SC-740 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	82.727
24	STORMTECH SC-740 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	80.898
152	STONE ABOVE (mm)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	80.745
152	STONE BELOW (mm)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	80.745
40	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	80.745
226.8	INSTALLED SYSTEM VOLUME (m^3) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	80.441
		TOP OF SC-740 CHAMBER:	80.288
		450 mm x 450 mm TOP MANIFOLD INVERT:	79.653
		450 mm BOTTOM CONNECTION INVERT:	79.567
355.9	SYSTEM AREA (m^2)	600 mm ISOLATOR ROW PLUS INVERT:	79.529
75.5	SYSTEM PERIMETER (m)	BOTTOM OF SC-740 CHAMBER:	79.526
524	THERMOPLASTIC LINER (m^2) (20% OVERAGE)	UNDERDRAIN INVERT:	79.374
		BOTTOM OF STONE:	79.374

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED EZ END CAP	A	600 mm BOTTOM PREFABRICATED EZ END CAP, PART#: SC740ECEZ / TYP OF ALL 600 mm BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	3 mm	
PREFABRICATED END CAP	B	450 mm TOP PREFABRICATED END CAP, PART#: SC740EPE18T / TYP OF ALL 450 mm TOP CONNECTIONS	127 mm	
PREFABRICATED END CAP	C	450 mm BOTTOM PREFABRICATED END CAP, PART#: SC740EPE18B / TYP OF ALL 450 mm BOTTOM CONNECTIONS	41 mm	
FLAMP	D	INSTALL FLAMP ON 600 mm ACCESS PIPE / PART#: SC74024RAMP		
MANIFOLD	E	450 mm x 450 mm TOP MANIFOLD, ADS N-12	127 mm	
NYLOPLAST (INLET W/ ISO PLUS ROW)	F	750 mm DIAMETER (610 mm SUMP MIN)		408 L/s IN
NYLOPLAST (OUTLET)	G	750 mm DIAMETER (DESIGN BY ENGINEER)		113 L/s OUT
UNDERDRAIN	H	150 mm ADS N-12 DUAL WALL PERFORATED HDPE UNDERDRAIN		



ISOLATOR ROW PLUS
(SEE DETAIL)

PLACE MINIMUM 3.810 m OF ADSPLUS125 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

THERMOPLASTIC LINER (SEE TECH NOTE #6.50 PROVIDED BY OTHERS / DESIGN BY OTHERS)

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH 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.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
- ADS DOES NOT DESIGN OR PROVIDE MEMBRANE LINER SYSTEMS FOR CISTERNS (RAINWATER HARVESTING). 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.
- **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

CHEO PARKING GARAGE
OTTAWA, ON, CANADA
DATE:
DRAWN: ZS
CHECKED: N/A
PROJECT #:

DESCRIPTION	CHK	DRW	DATE

StormTech®
Chamber System
888-892-2694 | WWW.STORMTECH.COM

4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

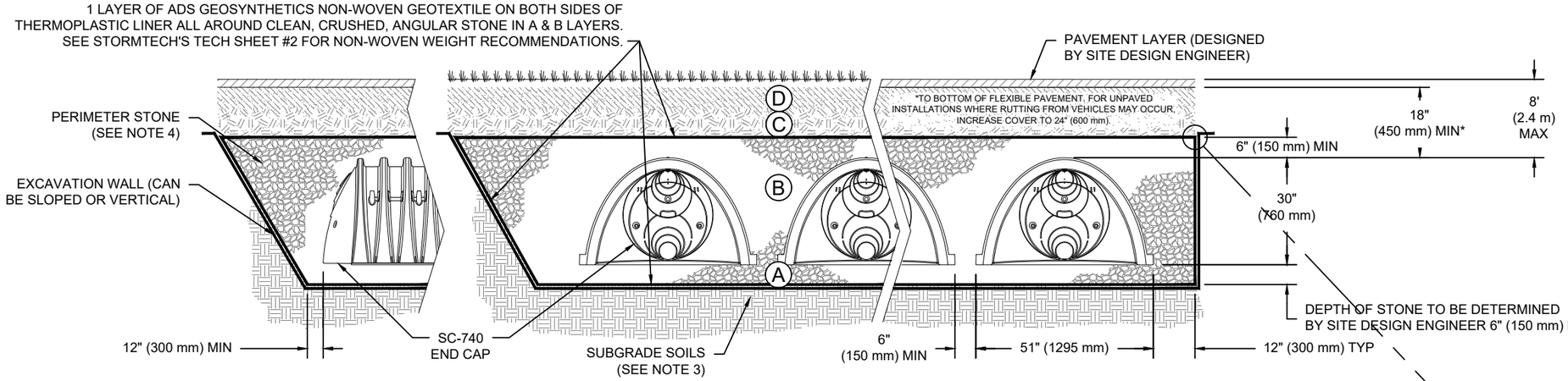
SCALE = 1 : 150

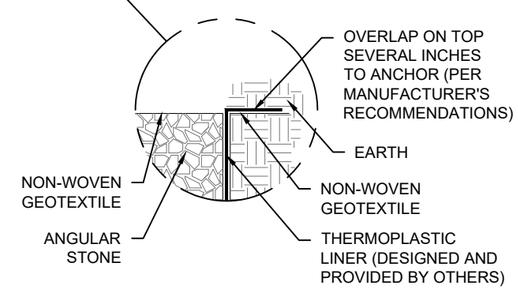
SHEET
2 OF 6

ACCEPTABLE FILL MATERIALS: STORMTECH SC-740 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.	N/A	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	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	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.





THERMOPLASTIC LINER DETAIL

NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-740 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.
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 SHALL BE GREATER THAN OR EQUAL TO 550 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 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

CHEO PARKING GARAGE
OTTAWA, ON, CANADA
DRAWN: ZS
CHECKED: N/A
PROJECT #:

DATE	DRW	CHK	DESCRIPTION

StormTech® Chamber System
888-892-2694 | WWW.STORMTECH.COM

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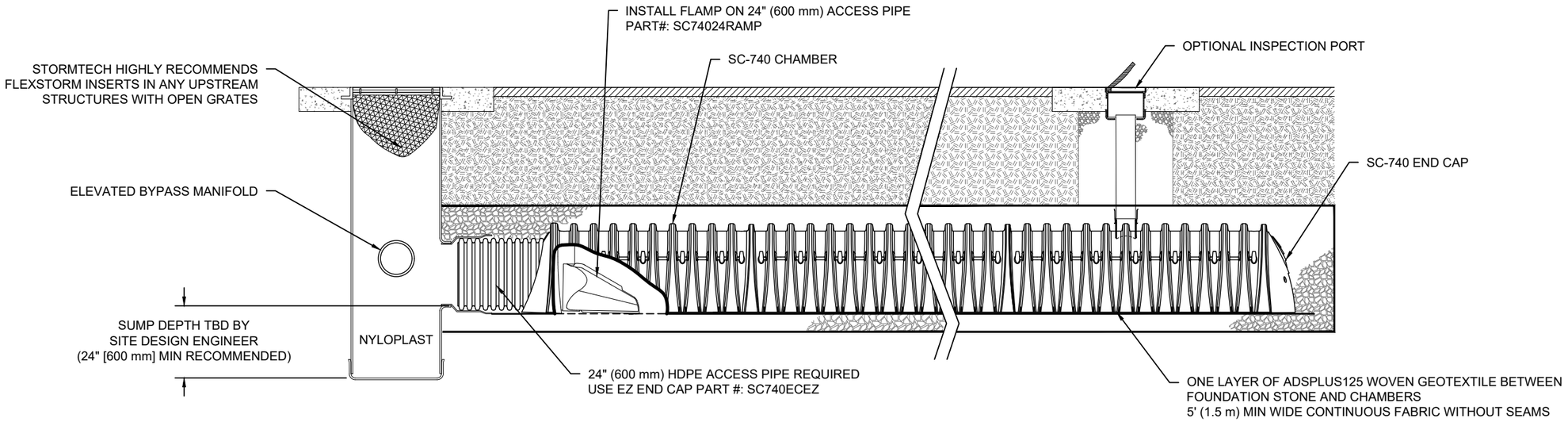
HILLIARD, OH 43026
1-800-733-7473



SC-740 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.

CHEO PARKING GARAGE
OTTAWA, ON, CANADA
DRAWN: ZS
CHECKED: N/A
DATE:
PROJECT #:

DATE	DRW	CHK	DESCRIPTION

StormTech®
Chamber System
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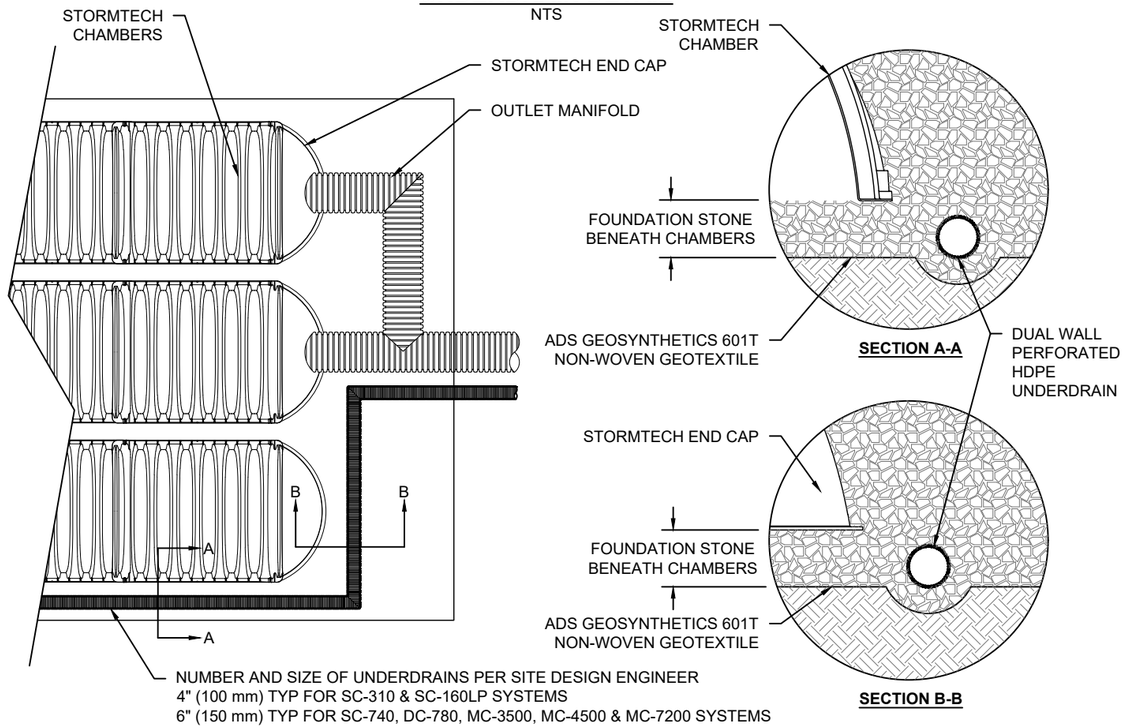
UNDERDRAIN DETAIL

NTS



SC-740 TECHNICAL SPECIFICATION

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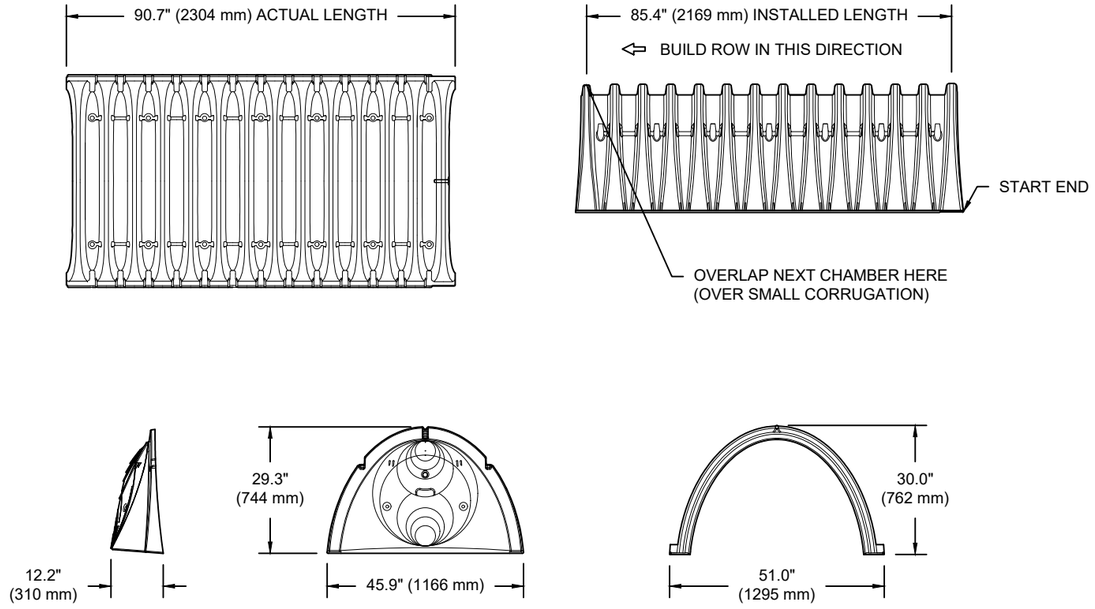
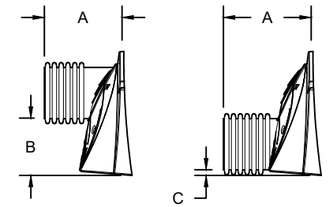


NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	51.0" X 30.0" X 85.4"	(1295 mm X 762 mm X 2169 mm)
CHAMBER STORAGE	45.9 CUBIC FEET	(1.30 m³)
MINIMUM INSTALLED STORAGE*	74.9 CUBIC FEET	(2.12 m³)
WEIGHT	75.0 lbs.	(33.6 kg)

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



PRE-FAB STUB AT BOTTOM OF END CAP WITH FLAMP END WITH "BR"
PRE-FAB STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PRE-FAB STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
PRE-CORED END CAPS END WITH "PC"

PART #	STUB	A	B	C
SC740EPE06T / SC740EPE06TPC	6" (150 mm)	10.9" (277 mm)	18.5" (470 mm)	---
SC740EPE06B / SC740EPE06BPC			---	0.5" (13 mm)
SC740EPE08T /SC740EPE08TPC	8" (200 mm)	12.2" (310 mm)	16.5" (419 mm)	---
SC740EPE08B / SC740EPE08BPC			---	0.6" (15 mm)
SC740EPE10T / SC740EPE10TPC	10" (250 mm)	13.4" (340 mm)	14.5" (368 mm)	---
SC740EPE10B / SC740EPE10BPC			---	0.7" (18 mm)
SC740EPE12T / SC740EPE12TPC	12" (300 mm)	14.7" (373 mm)	12.5" (318 mm)	---
SC740EPE12B / SC740EPE12BPC			---	1.2" (30 mm)
SC740EPE15T / SC740EPE15TPC	15" (375 mm)	18.4" (467 mm)	9.0" (229 mm)	---
SC740EPE15B / SC740EPE15BPC			---	1.3" (33 mm)
SC740EPE18T / SC740EPE18TPC	18" (450 mm)	19.7" (500 mm)	5.0" (127 mm)	---
SC740EPE18B / SC740EPE18BPC			---	1.6" (41 mm)
SC740ECEZ*	24" (600 mm)	18.5" (470 mm)	---	0.1" (3 mm)

ALL STUBS, EXCEPT FOR THE SC740ECEZ 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 SC740ECEZ THE 24" (600 mm) STUB LIES BELOW THE BOTTOM OF THE END CAP APPROXIMATELY 1.75" (44 mm). BACKFILL MATERIAL SHOULD BE REMOVED FROM BELOW THE N-12 STUB SO THAT THE FITTING SITS LEVEL.

NOTE: ALL DIMENSIONS ARE NOMINAL

CHEO PARKING GARAGE
OTTAWA, ON, CANADA
DATE:
DRAWN: ZS
PROJECT #:
CHECKED: N/A

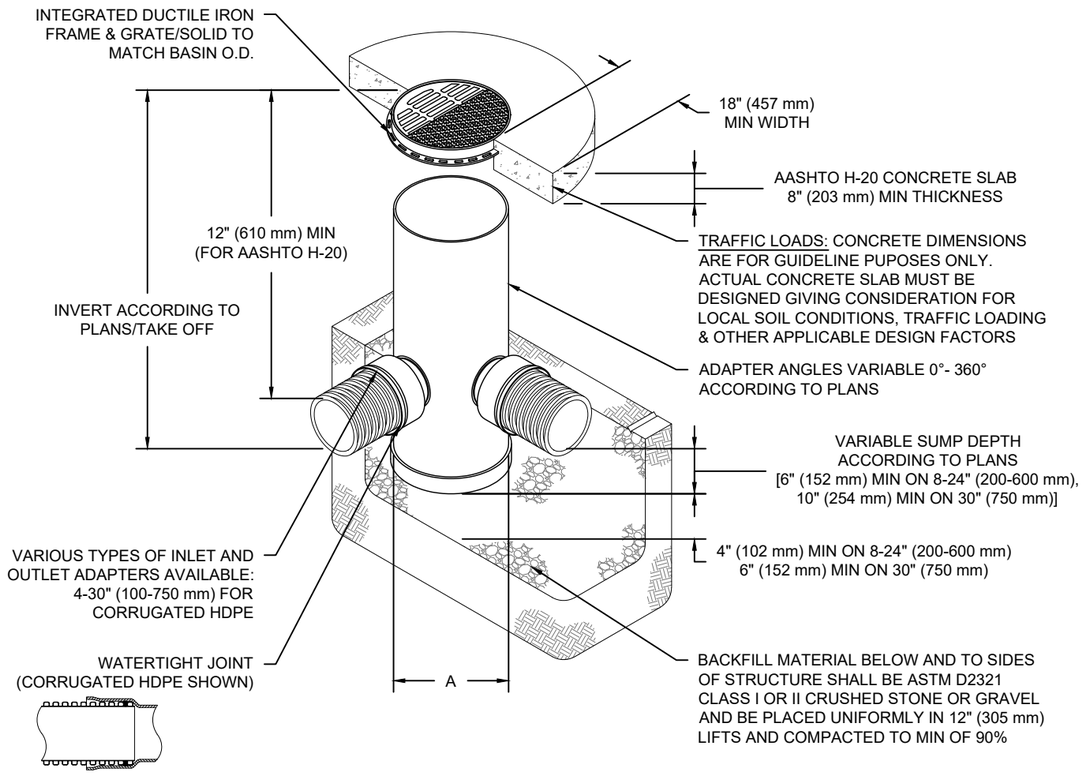
DATE	DRW	CHK	DESCRIPTION

StormTech®
Chamber System
888-892-2694 | WWW.STORMTECH.COM

4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

NYLOPLAST DRAIN BASIN

NTS



NOTES

1. 8-30" (200-750 mm) GRATES/SOLID COVERS SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05
2. 12-30" (300-750 mm) FRAMES SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05
3. DRAIN BASIN TO BE CUSTOM MANUFACTURED ACCORDING TO PLAN DETAILS
4. DRAINAGE CONNECTION STUB JOINT TIGHTNESS SHALL CONFORM TO ASTM D3212 FOR CORRUGATED HDPE (ADS & HANCOR DUAL WALL) & SDR 35 PVC
5. FOR COMPLETE DESIGN AND PRODUCT INFORMATION: **WWW.NYLOPLAST-US.COM**
6. TO ORDER CALL: **800-821-6710**

A	PART #	GRATE/SOLID COVER OPTIONS		
8" (200 mm)	2808AG	PEDESTRIAN LIGHT DUTY	STANDARD LIGHT DUTY	SOLID LIGHT DUTY
10" (250 mm)	2810AG	PEDESTRIAN LIGHT DUTY	STANDARD LIGHT DUTY	SOLID LIGHT DUTY
12" (300 mm)	2812AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
15" (375 mm)	2815AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
18" (450 mm)	2818AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
24" (600 mm)	2824AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
30" (750 mm)	2830AG	PEDESTRIAN AASHTO H-20	STANDARD AASHTO H-20	SOLID AASHTO H-20

CHEO PARKING GARAGE

OTTAWA, ON, CANADA

DATE:

DRAWN: ZS

PROJECT #:

CHECKED: N/A

DATE	DRW	CHK	DESCRIPTION

Nyloplast®

770-932-2443 | WWW.NYLOPLAST-US.COM

4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

STORM SEWER DESIGN SHEET - 5 Year Storm

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

IDF Data - 5 Year City of Ottawa	
A	998.071
B	6.053
C	0.814

Pipe Data		
Roughness (n)	0.013	
Min. Velocity	0.6	m/s
Max. Velocity	3	m/s

Pipe	Sewer Segments			Area		AC			Tc		Design Flow		Pipe Flow					
	From	To	L (m)	Inc (ha)	Total (ha)	C	Inc. (ha)	Total (ha)	Inlet (min)	System (min)	I (mm/hr)	Q (m^3/s)	D (mm)	Slope (design)	Qfull (m^3/s)	Q/QF	Velocity (m/s)	Travel Time (min)
1	CB55	MH40	6.4	0.10	0.10	0.60	0.06	0.06	10	10.00	104.2	0.017	200	2.00%	0.046	0.371	1.48	0.072
2	CB38	CBMH39	29	0.13	0.13	0.65	0.09	0.09	10	10.00	104.2	0.022	250	0.50%	0.042	0.523	0.86	0.564
3	CBMH39	MH40	29	0.11	0.24	0.70	0.08	0.16	10	10.56	101.3	0.022	250	0.50%	0.042	0.523	0.86	0.564
4	MH40	MH41	55.7	0.07	0.41	0.78	0.06	0.28	10	10.56	101.3	0.079	375	0.36%	0.105	0.747	0.95	0.975
5	STM1	MH71	9.2	0.49	0.91	0.90	0.44	0.44	10	10.00	104.2	0.128	375	3.75%	0.340	0.377	3.07	0.050
6	MH71	MH41	7.5	0.00	0.91			0.44	10	10.05	103.9	0.128	375	3.75%	0.340	0.376	3.07	0.041
7	MH41	CBMH48	5.2	0.00	1.32			0.72	10	10.041	104.0	0.208	600	0.90%	0.583	0.358	2.06	0.042

STORM SEWER DESIGN SHEET - 100 Year Storm

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

IDF Data - 100 Year City of Ottawa	
A	1735.688
B	6.014
C	0.820

IDF Data - 5 Year City of Ottawa	
A	998.071
B	6.053
C	0.814

Pipe Data		
Roughness (n)	0.013	
Min. Velocity	0.6	m/s
Max. Velocity	3	m/s

Pipe	Sewer Segments			Area		AC			Tc		Design Flow		Pipe Flow					
	From	To	L (m)	Inc (ha)	Total (ha)	C	Inc. (ha)	Total (ha)	Inlet (min)	System (min)	I (mm/hr)	Q (m^3/s)	D (mm)	Slope (design)	Qfull (m^3/s)	Q/QF	Velocity (m/s)	Travel Time (min)
1	CB50	MH40	6.4	0.10	0.10	0.60	0.06	0.06	10	10.00	178.6	0.029	200	2.00%	0.046	0.636	1.48	0.072
2	CB38	CBMH39	29	0.13	0.13	0.65	0.09	0.09	10	10.00	178.6	0.038	250	0.50%	0.042	0.904	0.86	0.564
3	CBMH39	MH40	29	0.60	0.73	0.70	0.42	0.51	10	10.56	173.6	0.038	250	0.50%	0.042	0.904	0.86	0.564
4	MH40	MH41	55.7	0.07	0.91	0.78	0.06	0.62	10	10.56	173.6	0.095	375	0.36%	0.105	0.903	0.95	0.975
5	STM1	MH71	9.2	0.49	1.40	0.90	0.44	0.44	10	10.00	104.2	0.128	375	3.75%	0.340	0.377	3.07	0.050
6	MH71	MH41	7.5	0.00	1.40			0.44	10	10.05	103.9	0.128	375	3.75%	0.340	0.377	3.07	0.041
7	MH41	CBMH48	5.2	0.00	2.30			1.06	10	10.041	178.2	0.527	600	0.90%	0.583	0.906	2.06	0.042