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DESIGN BRIEF

FOR

585 BOBOLINK RIDGE
TAMARACK HOMES

CITY OF OTTAWA

PROJECT NO.: 21-1261

JANUARY 2022
1ST SUBMISSION

**DESIGN BRIEF
FOR
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TAMARACK HOMES**

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1.0 INTRODUCTION & BACKGROUND

David Schaeffer Engineering Limited (DSEL) has prepared this Design Brief in support of development of 585 Bobolink Ridge on behalf of Tamarack Homes.

The study area is located within 585 Bobolink Ridge in the City of Ottawa urban boundary, in the Ward 6 – Stittsville Glen Gower as illustrated in ***Figure 1.1***, the study area is bounded by Putney Crescent to the west, Bobolink Ridge to the south, Robert Grant Avenue to the east and a public pathway to the North. The site is a 1.19-hectare parcel located within CRT developments Inc. Phase 1 Westwood subdivision.

Figure 1.1: Site Location

The study area and surrounding lands are governed by the broader Fernbank Community Design Plan (*FCDP*) *(City of Ottawa, 2009),* the Master Servicing Study *(MSS) and* Environmental Management Plan *(EMP).* A Design Brief for the phase 1 of CRT lands was prepared by IBI Group in 2017 that established a municipal servicing strategy for the Phase 1 CRT lands in keeping with the planning level solutions identified in the *MSS* and

EMP. The Phase 1 CRT Lands Design Brief identifies existing infrastructure and environmental constraints, describes the neighborhood-level trunk services that will service all properties within its study area, including the 585 Bobolink Ridge parcel, establishes targets for future site-specific stormwater management plans.

This Design Brief is provided to demonstrate conformance with the design criteria of the City of Ottawa, the CRT Lands Phase 1 Design Brief, background studies including the *MSS*, and general industry practice. It provides detailed water, sanitary sewer, stormwater management and grading design information to support the development of the study area. This report should be read in conjunction with the Engineering Drawings (DSEL, Jan 13, 2022).

This Design Brief and detailed engineering submission have been prepared by **David Schaeffer Engineering Ltd**., with a watermain analysis prepared by **GeoAdvice Engineering Inc.**, and geotechnical analysis prepared by **Paterson Group Inc**.

1.1 Development Concept

The site plan for the proposed development concept at 585 Bobolink Ridge, (Block 243 on Plan 43-1619) has been included in ***Appendix A***. The proposed development consists of 8 blocks for a total of 76 back-to-back townhomes. ***Table 1.1*** presented below provides a projected population count for the site. The private roads being proposed within the site consist of 11.6m wide Condo ROWs with 6.0m wide pavement widths, as shown in the Engineering drawing set. The proposed development concept is in general conformance with the FCDP.

Table 1.1: Development Statistic Projections

Land Use	Total Area (ha)	Projected Residential Units	Residential Population per Unit *	Projected Population *
Block 243 (585 Bobolink Ridge)	1.19	76 B2Bs	2.7	206

** NOTE: Population projections may differ from population estimates used in background Transportation Studies, Planning Rationale, and other studies. Population projection and residential population per unit values are based on Ministry of Environment, Conservation and Parks guidelines for servicing demand calculations. Local Roads are included in Total Area estimates above.*

1.2 Existing Conditions

The lot is currently vacant, generally covered with grass and has a gravel access lane. The existing elevations for the site generally range between 107.5 and 109.2m. There is a slight east-west ridge located roughly at the center of the site creating fall to both the north and south.

The soil profile for this site is detailed in the *Geotechnical Investigation – Proposed Residential Development 585 Bobolink Ridge, Report: PG5858-1 (Dated July 5th, 2021, Paterson Group).* The report indicates that the subsurface profile generally consists of brown silty sand with gravel, cobbles, boulders and trace organics with glacial till encountered in some areas. As practical refusal was encountered at depths ranging from 1.7 to 3.8m, the Paterson report inferred it to be bedrock. No permissible grade raise restrictions are recommended per the Paterson report.

1.3 Required Permits / Approvals

Development of the study area is expected to be subject to the following permits and approvals presented in ***Table 1.2***.

Table 1.2: Anticipated Permit/Approval Requirements

Agency	Permit/Approval Required	Trigger	Remarks
MECP/City of Ottawa	Environmental Compliance Approval	Construction of new sanitary sewers, storm sewers, and stormwater management works.	The City of Ottawa is expected to review all stormwater collection system, stormwater management, and wastewater collection system on behalf of the MECP by transfer of review authority.
MECP	Permit to Take Water (PTTW)	Construction of proposed land uses (e.g. basements for residential homes) and services.	Pumping of groundwater or surface water may be required during construction, given site conditions, proposed land uses, and on-site/off-site municipal infrastructure.
City of Ottawa	MOE Form 1 – Record of Watermains Authorized as a Future Alteration.	Construction of watermains.	The City of Ottawa is expected to review the watermains on behalf of the MECP through the Form 1 – Record of Watermains Authorized as a Future Alteration.
City of Ottawa	Commence Work Notification (CWN)	Construction of new sanitary and storm sewer throughout the subdivision.	The City of Ottawa will issue a commence work notification for construction of the sanitary and storm sewers once an ECA is issued by the MECP.

1.4 Pre-Consultation

Pre-application consultation was conducted on April 13th, between the City of Ottawa and the developers as part of the Site Plan Control Application process. Various stakeholders provided written comments that were recorded and formalized in meeting minutes.

Per the City of Ottawa Transfer of Review Agreement No. TOR-OTT-E-2019-01, it is assumed that MECP pre-consultation is not required, as the City of Ottawa is expected to agree that the proposed works fall under Schedule A of the agreement. As such, the City of Ottawa is expected to review the proposed infrastructure on behalf of MECP as part of issuing Environmental Compliance Approval for the appropriate works.

2.0 GUIDELINES, PREVIOUS STUDIES, AND REPORTS

2.1 Existing Studies, Guidelines, and Reports

The following key studies were utilized in the preparation of this report:

- **Ottawa Sewer Design Guidelines**,
  City of Ottawa, *SDG002,* October 2012
  (Sewer Design Guidelines)

- **Technical Bulletin ISDTB-2014-01, Revisions to Ottawa Design Guidelines - Sewer**
  City of Ottawa, February 5, 2014.
  (ISDTB-2014-01)

- **Technical Bulletin PIEDTB-2016-01, Revisions to Ottawa Design Guidelines – Sewer**,
  City of Ottawa, September 6, 2016.
  (PIEDTB-2016-01)

- **Technical Bulletin ISTB-2018-01, Revisions to Ottawa Design Guidelines –** Sewer,
  City of Ottawa, March 21, 2018.
  (ISTB-2018-01)

- **Technical Bulletin ISTB-2019-02, Revisions to Ottawa Design Guidelines** – Sewer,
  City of Ottawa, July 8, 2019.
  (ISTB-2019-02)

- **Ottawa Design Guidelines – Water Distribution,**
  City of Ottawa, July 2010.
  (Water Supply Guidelines)

- **Technical Bulletin ISD-2010-2**
  City of Ottawa, December 15, 2010.
  *(*ISDTB-2010-2*)*

- **Technical Bulletin ISDTB-2014-02**
  City of Ottawa, May 27, 2014.
  *(*ISDTB-2014-02*)*

- **Technical Bulletin ISTB-2018-02**
  City of Ottawa, March 21, 2018
  *(*ISDTB-2018-02*)*

- **Fire Underwriters Survey, 1999.**
  (FUS)

- **Design Guidelines for Sewage Works**,
  Ministry of the Environment, 2008.
  (MECP Design Guidelines)

- **Stormwater Planning and Design Manual**,
  Ministry of the Environment, March 2003.
  (SWMP Design Manual)

- **Ontario Building Code Compendium,**
  Ministry of Municipal Affairs and Housing Building Development Branch, 2012 and as updated from time to time.
  (OBC)

- **Ontario Building Code Compendium,**
  Ministry of Municipal Affairs and Housing Building Development Branch, 2012 and as updated from time to time.
  (OBC)

- **Fernbank Community Design Plan MSS**
  Novatech Consulting Engineers 2009

- **Fernbank Community Sanitary Trunk Sewer Report**
  Novatech Consulting Engineers 2012

- **CRT Lands Phase 1, Fernbank Community Servicing Brief**
  IBI Group, July 2017

  CRT Lands Phase 1, Fernbank Community Servicing Brief Blk 324
  IBI Group, July 2021

3.0 WATER SUPPLY SERVICING

3.1 Existing Water Supply Services

There is an existing 200mm dia. watermain service connecting to an active 300mm dia. watermain on Bobolink Ridge at the eastern boundary of the site. A 200mm dia. watermain is also present on Putney Crescent located to the west of the site.

3.2 Water Supply Servicing Design

The site will be serviced via a local 150mm dia. and 200mm dia. watermains on private streets with individual services to units. Two connections will be made to the existing system within the vicinity of site, 1 connection will be made on the existing 200mm dia. stub connected to the 300mm dia. watermain on Bobolink Ridge, and a second connection will be on the existing 200mm dia. watermain on Putney Crescent.

Table 3.1: Water Supply Design Criteria

Design Parameter	Value
Residential – Townhome/ Semi	2.7 p/unit
Residential Average Daily Demand	280 L/d/p
Residential – Maximum Daily Demand	4.9 x Average Daily Demand
Residential – Maximum Hourly Demand	7.4 x Maximum Daily Demand
Residential – Minimum Hourly Demand	0.1 x Average Daily Demand
Minimum Watermain Size	150 mm diameter
Minimum Depth of Cover	2.4 m from top of watermain to finished grade
During normal operating conditions desired operating pressure is within	350 kPa and 48 0kPa
During normal operating conditions pressure must not drop below	275 kPa
During normal operating conditions pressure must not exceed	552 kPa
During fire flow operating pressure must not drop below	140 kPa

Notes:
- *Extracted from Section 4: Ottawa Design Guidelines, Water Distribution (July 2010), Table 4.1 – Per Unit Populations and Table 4.2 – Consumption Rates for Subdivisions of 501 to 3,000 Persons.*
- *No Outdoor Water Demand considered for residential uses.*
- *Residential Average Daily Demand assumed to be 280 L/d/P in accordance with 2018 changes to Sanitary Design Guidelines, see Section 4.0.*

All local watermains within the site were designed in accordance with the *Water Supply Guidelines*, as summarized in ***Table 3.1*** above.

A summary of the anticipated water demands for the study area are summarized in ***Table 3.2***. Boundary conditions have been provided by the City of Ottawa based on these demands, and can be found in ***Appendix B***, as part of the *Hydraulic Capacity and Modeling Analysis – Bobolink Ridge (GeoAdvice Report)* (GeoAdvice, January 11th, 2022). Small altercations were undertaken by the Developer since the water demands were calculated. The small change consists of removing 2 units therefore calculations presented below and within the GeoAdvice report reference 78 units however the plan has been updated to consist of 76 units. The results remain valid and relevant for their intended purposes.

Table 3.4: Summary of Water Demands

Dwelling Type	Number of Units	**Population**		**Allocated Demand**	**Avg Day** (L/s)	**Max Day** 4.9 x Avg Day (L/s)	**Peak Hour** 7.4 x Max Day (L/s)	**Min Hour** 0.1 x Avg Day (L/s)
		Persons per unit	Population per dwelling type					
Back-to-Back Townhomes	78	2.7	2.7	280 L/c/d	0.75	3.68	5.56	0.08

Note, a small buffer (10%) was applied to the population estimates to account for any minor changes that may occur prior to the full buildout of the development.

Fire flow calculations for the back-to-back townhouses are detailed in the GeoAdvice Report found in ***Appendix B***. The fire flows are calculated in accordance with the Fire Underwriters Survey's Water Supply for Public Fire Protection Guideline (1999) as amended by ISTB-2014-02 & ISTB-2018-02. A range of fire flows (167 L/s to 283 L/s) was included in the boundary conditions request. Hydraulic grade lines (HGL) for intermediate flows between 167 L/s and 283 L/s have been interpolated using the boundary conditions provided by the City.

The boundary conditions provided by the City of Ottawa for use in the hydraulic analysis related to the subject site are summarized in ***Table 3.3***.

Table 3.5: Boundary Conditions

Condition	**Connection 1 HGL (m)** (Bobolink Ridge)	**Connection 2 HGL (m)** (Putney Crescent)
Average Day Demand	161.2	161.2
Peak Hour (min. pressure)	156.4	156.4
Max Day + Fire (167 L/s)	153.7	146.5
Max Day + Fire (267 L/s)**	148.9	131.5
Max Day + Fire (283 L/s)	148.1	129.1

**interpolated value

3.2.1 Watermain Modelling

A hydraulic analysis was completed for the study area within the *GeoAdvice Report*. The analysis, including the watermain network configuration and sizing, is provided in ***Appendix B.***

Modelling was carried out for minimum hour, peak hour and maximum day plus fire flow. Modelling results shown in ***Table 3.4*** indicate that the development can be adequately serviced for minimum hour and peak hour criteria.

Table 3.6: Summary of Available Service Pressures

Average Day Demand Maximum Pressure (kPa)	**Peak Hour Demand Minimum Pressure (kPa)**
75 psi (520 kPa)	67 psi (464kPa)

The results presented in the table above indicate that the pressures are within the OSDG best practices for new water distribution systems to operate between 350 kPa and 480 kPa.

Per ***Table 3.1,*** the minimum allowable pressure under fire flow conditions is 140 kPa (20 psi) at the location of the fire. A summary of available fire is shown below in ***Table 3.5***. Further details can be found in ***Appendix B****.*

Table 3.7: Summary of Available Fire Flows

Required Fire Flow (L/s)	**Minimum Available Fire Flow (L/s)**
267	292

3.3 Water Supply Conclusion

The proposed watermain network conforms to all relevant City and MECP *Water Supply Guidelines*. The hydraulic analysis of the proposed watermain network, completed within the *GeoAdvice Report*, concludes that all required domestic and fire flows can be met throughout the study area upon full buildout of the development. Anticipated fire flow requirements can be met throughout the development lands according to City Guidelines and ISTB-2018-02.

4.0 WASTEWATER SERVICING

4.1 Existing Wastewater Services

The subject lands are tributary to the existing 750mm dia. Stittsville Trunk Sewer located on Abbott Street and ultimately the Hazeldean Pumping Station (HPS). There is an existing capped 200 mm dia. sanitary sewer at the southern end of the subject site within the property limits. The capped sewer connects to a 250mm dia. sewer on Bobolink Ridge. The Bobolink sanitary sewer is part of a larger system that eventually connects to the Stittsville Trunk Sewer.

4.2 Wastewater Design

The study area will be serviced by a network of 200mm dia. gravity sewers. The sanitary sewer network was designed in accordance with the wastewater design parameters from ISTB-2018-01 and the *Sewer Design Guidelines*, summarized in ***Table 4.1*** below.

Table 4.1: Wastewater Design Criteria

Design Parameter	Value
Residential - Single Family	3.4 p/unit
Residential – Townhome/ Semi	2.7 p/unit
Residential Townhouse/Back-to-Back	2.1 p/unit
Residential Apartment (High Density)	1.8 p/unit
Average Daily Demand	280 L/d/per
Peaking Factor	Harmon’s Peaking Factor, where K=0.8
Commercial / Institutional Flows	28,000 L/gross ha/day
Commercial / Institutional Peak Factor	1.5 if contribution >20%, otherwise 1.0
Light Industrial Flows	35,000 L/gross ha/day
Industrial Peaking Factor	Per Figure in Appendix 4-B, City of Ottawa Guidelines
Infiltration and Inflow Allowance	0.33 L/s/gross ha for all areas
Park Peaking Factor	1.0
Sanitary sewers are to be sized employing the Manning’s Equation	$Q = \frac{1}{n} A R^{2/3} S^{1/2}$
Minimum Sewer Size	200 mm diameter
Minimum Manning’s ‘n’	0.013
Minimum Depth of Cover	2.5 m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6 m/s
Maximum Full Flowing Velocity	3.0 m/s
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012, Technical Bulletins, and recent residential subdivisions in the City of Ottawa.	

A flow allocation of 2.10 L/s was allocated for 585 Bobolink Ridge land parcel as part of the CRT Lands Phase 1 Design Brief (IBI Group, 2017). The design sheets provided in the 2017 IBI report are presented in ***Appendix C***. As noted above, all of the CRT lands, including this site, are tributary to the Hazeldean Pumping Station (HPS). In 2014, the City completed upgrades to increase the capacity of the HPS and accommodate the Fernbank Community. As part of the CRT Phase 1 design brief, sanitary HGLs were calculated and updated from the numbers presented in the 2009 FCDP MSS. The results presented in in the CRT Phase 1 design brief concluded that sanitary HGL levels within the sanitary system were lower than those previously predicted in the MSS, even with the additional flow. Different loss coefficient used between analysis was cited as the reason for this.

Table 4.2: Wastewater Peak Flow

Area (Ha.)	Number of Units	**Population**		**Allocated Demand**	**Avg Day** (L/s)	**I/I (L/s)**	**Peak Factor**	**Peak Flow (L/s)**
		Persons per unit	Population					
Back-to-Back Townhomes	76	2.7	206	280 L/c/d	0.67	0.39	3.51	2.35

A wastewater peak flow for the proposed development of 2.35 L/s was calculated based on the parameters presented in ***Table 4.1***. The peak flow is 0.25 L/s greater than the allocated flow from the CRT Lands Phase 1 design brief. Based on the sanitary design sheet for the entire CRT development presented in ***Appendix C*** there is sufficient residual capacity in the receiving sewer system to accommodate the small increase in peak flow.

4.3 Wastewater Servicing Conclusions

The sewers have generally been designed in conformance with all relevant City of Ottawa and MECP Guidelines and Policies, excluding the proposed deviation reducing drops at maintenance holes. Per ISTB-2018-01, the City's current design parameters represent a flow reduction from the outdated standards used within the *MSS*.

5.0 STORMWATER MANAGEMENT

5.1 Existing Stormwater Drainage

The site currently sheet drains to adjacent streets with no specific outlet or catch basins on-site. The undeveloped parcel is relatively flat with an east-west ridge in the center, therefore stormwater currently ponds on site or sheet flows to adjacent properties. There is an existing 825mm dia. storm sewer stubbed and capped at the southern portion of the parcel.

5.2 Stormwater Management Criteria

Stormwater management requirements for the study area have been adopted from the *MSS*, *EMP*, CRT Land Phase 1 design brief, the Fernbank Pond 5 Stormwater Management Facility Report and Design Brief (IBI Group, May 2016) and West Park Pond 6 Stormwater Management Report and Design Brief Report, IBI Group.

The following criteria was considered as part of the stormwater management strategy within the study area and conveyance to the proposed stormwater management Pond 5, among other requirements:

Storm sewers on local roads are designed to provide a minimum 5-year level of service per the City's latest Technical Bulletin PIEDTB-2016-01.

Under full flow conditions, the allowable velocity in storm sewers is to be no less than 0.80 m/s and no greater than 6.0 m/s.

For the 100-year storm and for local and collector roads, the maximum depth of water (static and/or dynamic) on streets, rear yards, public space and parking areas shall not exceed 0.35 m at the gutter. For arterial roads, no barrier curb overtopping is permitted.

The major system is designed with sufficient capacity to allow the excess runoff of a 100-year storm to be conveyed within the public ROW or adjacent to the right-of-way provided that the water level must not touch any part of the building envelope, and must maintain 15 cm vertical clearance between spill elevation on the street and the ground elevation at the nearest building envelope.

5.3 Stormwater Management Strategy

Stormwater runoff will be directed to a series of catch basins located at street sags that will collect the runoff and discharge to the minor system. Underground storage tanks will be utilized to store excess runoff generated by larger storm events in order to respect the allocated release rate for the site set out by the Pond's 5 and 6 design and CRT Phase 1 lands design brief. The underground storage tank flow restriction controls (Inlet Control Devices) will be located upstream of connections to the local storm sewer system, to maintain hydraulic separation from storm service connections to the proposed homes.

5.3.1 Minor System

The study area is to be serviced by a storm sewer system designed in accordance with the amendment to the storm sewer and stormwater management elements of *PIETB-2016-01*. As described in ***Section 5.2***, the minor storm system is proposed to be designed for a minimum of the 5-year event as the site is comprised of local streets.

The proposed gravity storm sewer network ranges from 250 mm to 450 mm and generally follows the local road network and dedicated servicing easements, as shown in ***Drawings 4-10***. The proposed sewers collect stormwater runoff from the 585 Bobolink Ridge development and directs stormwater to two separate outlets. There is an existing 675mm dia. storm sewer located at the southern edge of the property within the property limit boundaries. This storm sewer is the dedicated outlet for the southern portion of the site, roughly 0.65ha. The capped stub is connected to a storm sewer system on Bobolink Ridge that is tributary to Pond 5. The minor system release rate for this outlet is 133 L/s as per the design sheets, drainage plans and modelling files extracted from the CRT Phase 1 Design Brief are presented in ***Appendix D.***

The northern portion of the site, roughly 0.56 ha. will outlet to a 450mm dia. sewer at the northeast end of the land parcel. The 450mm dia. outlet was designed as part of the Block 324 design from the neighboring property. The storm system is tributary to Pond 6. The minor system release rate for this outlet is 112.87 L/s as per the design sheets and modelling files extracted from the CRT Phase 1 BLK 324 Design Brief presented in ***Appendix D.***

Table 5.1 summarizes the standards that have been employed in the detailed design of the storm sewer network, meeting the criteria described in ***Section 5.2***. The storm sewer design uses inlet control devices (ICDs) to ensure that storm flows entering the minor system are limited to the flows described above.

Table 5.1: Storm Sewer Design Criteria

Design Parameter	Value
Minor System Design Return Period	2-Year (Local Streets), 5-Year (Collector Streets), 10-Year (Arterial Streets) – PIEDTB-2016-01
Major System Design Return Period	100-Year
Intensity Duration Frequency Curve (IDF) 2-year storm event: A = 723.951, B = 6.199, C = 0.810 5-year storm event: A = 998.071, B = 6.053, C = 0.814	$i = \frac{A}{(t_c + B)^C}$
Minimum Time of Concentration	10 minutes
Rational Method	$Q = CiA$
Runoff coefficient for paved and roof areas	0.90
Runoff coefficient for landscaped areas	0.20

Storm sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} A R^{2/3} S^{1/2}$
Minimum Sewer Size	250 mm diameter
Minimum Manning's 'n'	0.013
Service Lateral Size	100 mm dia PVC SDR 28 with a minimum slope of 1.0%.
Minimum Depth of Cover	1.7m from crown of sewer to grade *(based on recent residential subdivisions in City of Ottawa)*
Minimum Full Flowing Velocity	0.8 m/s
Maximum Full Flowing Velocity	6.0 m/s
Clearance from 100-Year Hydraulic Grade Line to Building Opening	0.30 m
Max. Allowable Flow Depth on Municipal Roads	35 cm above gutter (PIEDTB-2016-01)
Extracted from City of Ottawa Sewer Design Guidelines, October 2012, as amended by PIEDTB-2016-01, *and based on recently approved residential subdivision designs in City of Ottawa.*	

Rational method design sheets and runoff coefficient calculations are presented in ***Appendix D.***

5.3.2 Quality Control

The storm outlets are tributary to two separate ponds, Pond 5 and Pond 6. Both of these facilities provide end of pipe quality control, are constructed and are operational. As such, no quality control is provided on-site.

5.3.3 Quantity Control

Minor system allowable release rates were established for both outlets based the existing reports as described in ***section 5.3.1***. Excess runoff during larger storm events will be stored in underground tanks where the flow will be directed to the minor system at a controlled rate.

Stormtech® Chambers are being proposed to accomplish the required storage volumes. Street drainage will be directed towards catch basins that outlet to the storage chambers. The chambers will be connected upstream of maintenance holes that will be equipped with ICDs which will restrict the flow to the allowable release rates established in section 5.3.1. The storm sewers on the local roads are designed to convey any flow generated from the foundation drains. As the storm sewer system is not upstream of any inlet control devices, foundation drains will remain hydraulically disconnected from the site stormwater quantity controls, and basements will be protected should the tank outlets become obstructed or plugged.

5.4 Stormwater Management Calculations

The modified rational method (MRM) was used to size the storage tanks and ensure that allowable release rates are respected. Any uncontrolled flow was subtracted from the total controlled flow rate to ensure the sum of the controlled and uncontrolled peak runoffs respect the allowable release rates. As foundation drains are connected to the storm sewers downstream of any flow controls, foundation drainage was also subtracted from the total allowable release rates.

Table 5.2: Storage Requirements Bobolink Ridge Outlet (south)

Control Area	Area	5-year Release Rate	5-year Required Storage	100-Year Release Rate	100-Year Required Storage	100-Year Available Storage
	(Ha.)	(L/s)	(m^3)	(L/s)	(m^3)	(m^3)
Foundation Drainage	N/A	20.7	0.0	20.7	0.0	0.0
Unattenuated Areas	0.08	16.4	0.0	35.2	0.0	0.0
Attenuated Areas	0.62	61.6	57.3	75.3	176.4	186.6
Total	**0.70**	**98.7**	**57.3**	**131.2**	**176.4**	**186.6**

As indicated in ***Table 5.2*** the allowable release rate of 133 L/s prescribed under the CRT Phase 1 Design Brief has been respected. In order to achieve the allowable release a total storage volume of 176.4m^3 will be required. Two Stormtech® chambers are being proposed in to achieve this which have a storage 186.6 m^3 storage capacity as shown in ***Drawings 4 and 5***.

As indicated in ***Table 5.3*** (below) the allowable release rate of 112.87 L/s prescribed under the CRT Phase 1 BLK 324 Design Brief has been respected. In order to achieve the allowable release a total storage volume of 93.5m^3 will be required. A Stormtech ® chamber with a 94.6m^3 capacity being proposed in to achieve this storage volume as shown in ***Drawings 4 and 5***.

The Modified Rational Method was originally intended to be used for above grade storage where the change in head applied through the orifice equation had little variation. As the release rates fluctuate from maximum peak flow for underground storage due to the varying head, the variation in head has been accounted for in the storage volume calculations. Rather than using maximum head to calculate the release rates, the mid-point of the storage tanks was used as the design head in the orifice equation to size the tanks. Maximum release rates were verified (maximum head) to ensure the maximum allowable was respected. Complete stormwater management calculations are presented in ***Appendix D***.

Table 5.3: Storage Requirements for Block 324 Outlet (north)

Control Area	Area	5-year Release Rate	5-year Required Storage	100-Year Release Rate	100-Year Required Storage	100-Year Available Storage
	(Ha.)	**(L/s)**	**(m^3)**	**(L/s)**	**(m^3)**	**(m^3)**
Foundation Drainage	N/A	13.5	0.0	13.5	0.0	0.0
Unattenuated Areas		3.6	0.0	7.7	0.0	0.0
Attenuated Areas		65.8	26.9	90.9	93.5	94.6
Total		**82.9**	**26.9**	**112.1**	**93.5**	**94.6**

Both the CRT Phase 1 BLK 324 Design report and the CRT Phase 1, Fernbank Community Servicing Brief confirm that both receiving outlets are free-flowing under the 1:100year storms. Underground storage tanks and inlet control devices are proposed to control the flow to the allowable release rate. As the controlled release rate is less than the 5-year flow used to size the minor system, the local sewer network is expected to be free flowing under the 1:100 year storm event.

5.5 Grading & Drainage

The following additional grading criteria and guidelines have been applied to detailed design, per City of Ottawa *Sewer Design Guidelines*:

- Driveway slopes will have a maximum slope of 6%;
- Slope in grassed areas will be between 2% and 5%;
- Grades in excess of 7% will require terracing to a maximum of a 3:1 slope;
- Swales are to be 0.15m deep with 3:1 side slopes unless otherwise indicated on the drawings; and,

Detailed grading design is presented in ***Drawing 12***.

5.6 Stormwater Servicing Conclusions

A network of local gravity sewers is proposed within the study area to capture stormwater and convey the flows to the proposed trunk storm sewer network. The storm sewers have been sized by the rational method and inlet control devices and orifices are used to maintain the allowable release to the existing minor system. Quality control will be achieved via existing stormwater management facilities.

6.0 UTILITIES

Utility services were consulted for the development of the cross-sections within the development.

Hydro Ottawa is reported to have infrastructure located on Robert Grant Road that will be utilized to service the units. Hydro Ottawa has indicated that a 3-phase transformer will be required for the site. The transformer will be located within an easement east of TH units 21 & 30.

Enbridge Gas is reported to have services up to near the subject site. Connections will be made to existing infrastructure to service the units.

Bell and Rogers are reported to have services up to near the subject site. Connections will be made to existing infrastructure to service the units.

DSEL has begun coordination with the utility services to confirm the servicing plans and begin detailed utility design for the study area.

7.0 EROSION AND SEDIMENT CONTROL

Soil erosion occurs naturally and is a function of soil type, climate and topography. The extent of erosion losses is exaggerated where vegetation has been removed during construction and the top layer of soil becomes agitated, and where increased stormwater runoff is directed to natural areas.

Prior to earthworks or underground construction, erosion and sediment controls will be implemented and will be maintained throughout construction.

The erosion and sediment controls will include (but are not limited to):

Minimize the area to be cleared and grubbed.

Plan construction at proper time to avoid flooding.

Provide sediment traps and basins during dewatering.

Silt fence to be installed around the perimeter of the site and to be cleaned and maintained throughout construction. Silt fence to remain in place until the working areas have been stabilized and re-vegetated. See ***Drawings 17 & 18***.

A mud mat to be installed at the construction access in order to prevent mud tracking onto adjacent roads.

Catch basins to have inserts installed under the grate during construction to protect from silt entering the storm sewer system.

Extent of exposed soils to be limited at any given time, and exposed areas will be re-vegetated as soon as possible.

Exposed slopes to be protected with plastic or synthetic mulches.

Stockpiles of cleared materials as well as equipment fueling and maintenance areas to be located away from swales, watercourses, and other conveyance routes.

Seepage barriers such as silt fencing, straw bale check dams and other sediment and erosion control measures to be installed in any temporary drainage stormwater conveyance channels and around disturbed areas during construction and stockpiles of fine material.

Filter inserts to remain on open surface structures such as manholes and catch basins until these structures are commissioned and put into use, streets are asphalted and curbed, and the surrounding landscape is stabilized.

The contractor will, at every rainfall, complete inspections and guarantee proper performance. The inspection is to include:

- Verification that water is not flowing under silt barriers.
- Clean and change inserts at catch basins.

A qualified Inspector will give recommendations related to the mitigation measures that are being implemented and maintained. Bulkhead barriers, filter clothes on open surface structures, silt fencing, and other ES&C measures may require removal of sediment and repairs. The City of Ottawa's Protocol for Wildlife Protection is to be followed during construction.

After build-out of the development, applicable sewers will be inspected and cleaned. All sediment and construction fencing should be removed following construction, providing there is no exposed soil or other potential sources of sedimentation.

8.0 CONCLUSIONS AND RECOMMENDATIONS

This Design Brief has been prepared on behalf of Tamarack Homes.

This Design Brief is to be read in conjunction with the first submission of the 585 Bobolink Drive detailed engineering drawing package, dated January 13th, 2022.

The key features of the detailed design of the proposed development are as follows:

- Two connections will be made to the existing watermains located on Putney Drive and Bobolink Ridge. The proposed watermain network conforms to all relevant City and MECP *Water Supply Guidelines*. The hydraulic analysis of the proposed watermain network, completed within the *GeoAdvice Report*, concludes that all required domestic and fire flows can be met throughout the study area upon full buildout of the development. Anticipated fire flow requirements can be met throughout the development lands according to City Guidelines and ISTB-2018-02.

- Wastewater service will be provided through gravity sewers that have generally been designed in conformance with all relevant City of Ottawa and MECP Guidelines and Policies. A series of gravity sewers will collect wastewater to an existing service stub located on Bobolink Drive.

- Stormwater management will be achieved using a series of local storm sewers to collect foundation drains and retention tanks that collect surface water. Two designated outlets on Bobolink Ridge and to adjacent Block 324 will be utilized as downstream receivers and established release rates for the system will be respected.

- The infrastructure identified in this Design Brief is expected to require approval from the City of Ottawa, Ontario Ministry of the Environment, Conservation and Parks prior to construction.

Prepared by,
David Schaeffer Engineering Ltd.

LICENSED PROFESSIONAL ENGINEER
A. M. J. TOURIGNY
100227731
2022-11-14
PROVINCE OF ONTARIO
JOB 1261

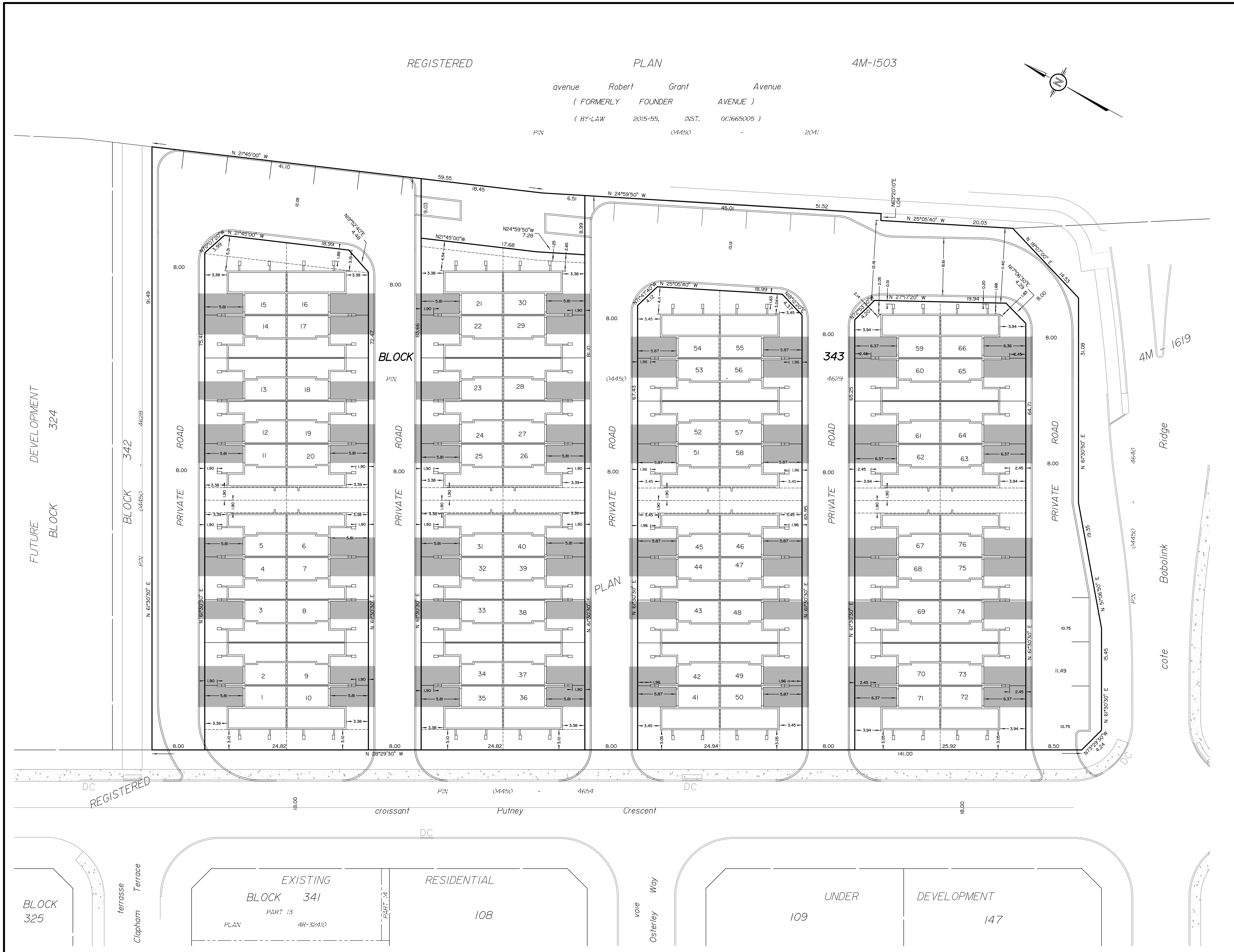
Per: Alexandre Tourigny, P.Eng.

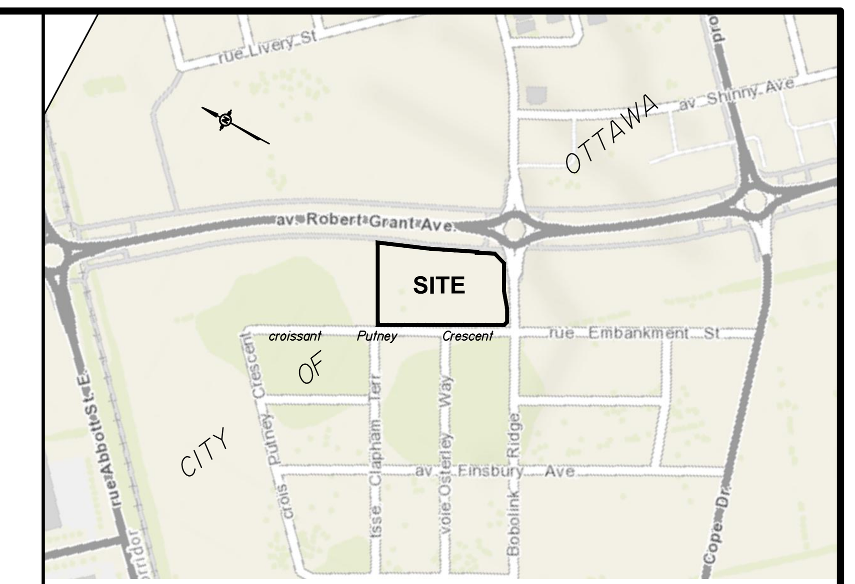
David Schaeffer Engineering Ltd.

Per: Matt Wingate, P.Eng

APPENDIX A

Legal Plan and Site Plan





KEY MAP
NOT TO SCALE

SITE PLAN

BLOCK 343
REGISTERED PLAN 4M-1619
CITY OF OTTAWA
Prepared by Annis, O'Sullivan, Vollebekk Ltd.

Scale 1 : 250

Metric
DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

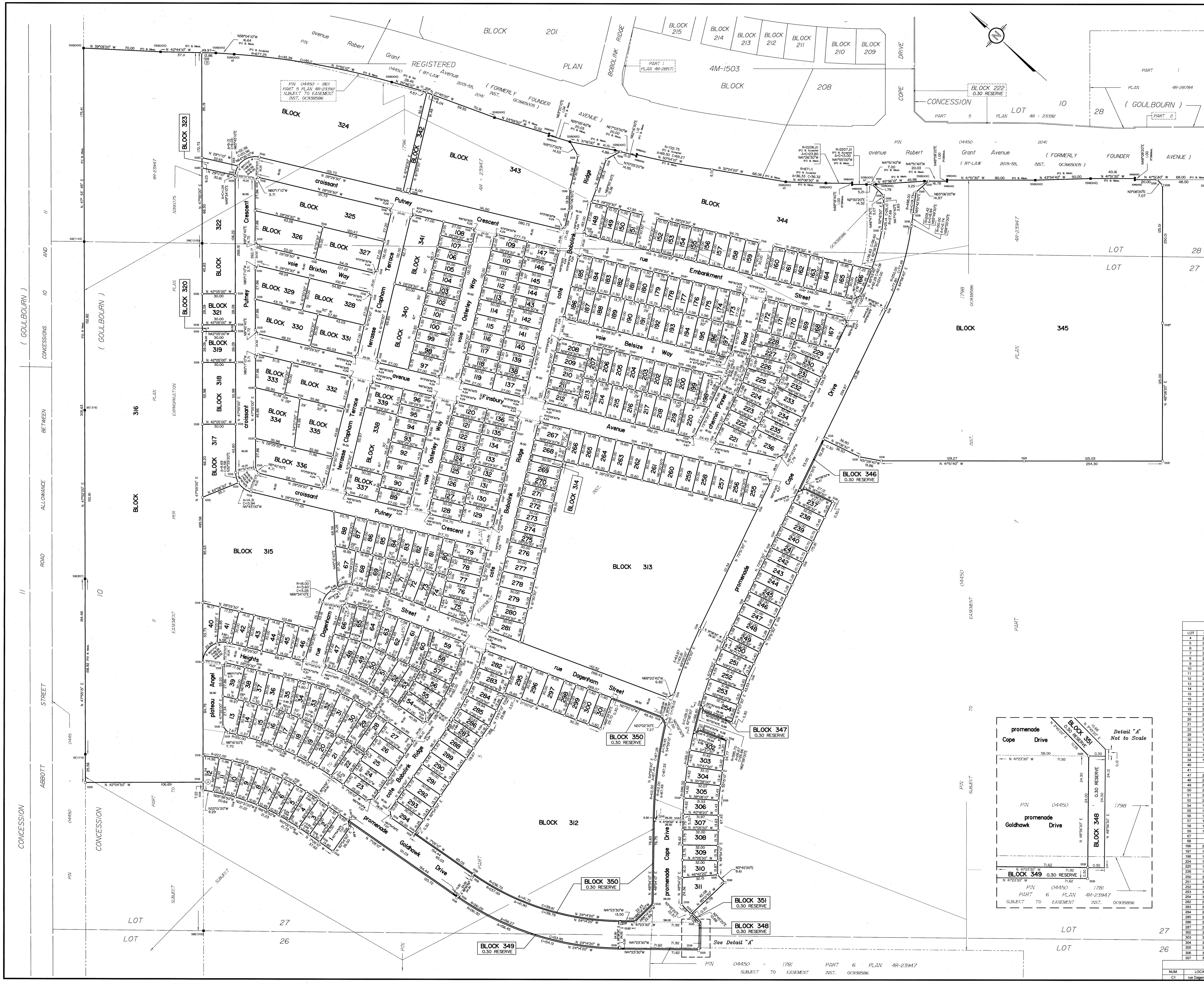
TOTAL BACK TO BACK UNIITS = 76

NO.	REVISION	DATE	
5	REVISIONS	DEC. 13, 2021	N
4	REVISIONS	AUG. 25, 2021	N
3	REVISIONS	AUG. 25, 2021	N
2	REVISIONS	AUG. 16, 2021	N
1	PLAN PREPARED	JUNE 9, 2021	N

WESTWOOD DEVELOPMENT
TAMARACK
CITY OF OTTAWA

ANNIS, O'SULLIVAN, VOLLEBEKK LTD.
14 Concourse Gate, Suite 500
Nepean, Ont. K2E 7S6
Phone: (613) 727-0850 / Fax: (613) 727-1079
Ontario Land Surveyors

Job No. 22111-21 Tamarack Blk 343 4M-1619 SP D5 | N



APPROVED UNDER SECTION 51 OF THE PLANNING ACT BY THE CITY OF OTTAWA.

THIS 21st DAY OF February, 2019

STEPHEN WILLIS, MCIP, RPP
GENERAL MANAGER
PLANNING, INFRASTRUCTURE AND ECONOMIC DEVELOPMENT DEPARTMENT
CITY OF OTTAWA

PLAN 4M- 1619

I CERTIFY THAT THIS PLAN IS REGISTERED IN THE LAND REGISTRY OFFICE FOR THE LAND TITLES DIVISION OF OTTAWA-CARLETON NO. 4 AT 14:31 O'CLOCK ON THE 12 DAY OF March 2019 AND ENTERED IN THE PARCEL REGISTER FOR PROPERTY IDENTIFIERS 04450-1781, 04450-1796, 04450-1798 and 04450-1801 AND THE REQUIRED CONSENTS ARE REGISTERED AS PLAN DOCUMENT NO. OC2083814

'A. mcmullen'
REPRESENTATIVE FOR LAND REGISTRAR

This plan comprises part of PIN's 04450-1781, 04450-1796 and 04450-1798 and all of PIN 04450-1801.

PIN 04450-1781: Part of Blocks 348 and 349. Part of promenade Goldhawk Drive.

PIN 04450-1796: All of Lots 1 to 165, 168 to 236 and 255 to 301. All of Blocks 312 to 323, 325 to 341, 343 and 350. All of plateau Angel Heights, voie Belsize Way, cote Bobolink Ridge, voie Brixton Way, terrasse Clapham Terrace, rue Dagenham Street, avenue Finsbury Avenue, voie Osterley Way, chemin Pinner Road and croissant Putney Crescent. Part of Lots 166 and 167. Part of Blocks 324, 342, 344 and 349. Part of promenade Cope Drive, rue Embankment Street and promenade Goldhawk Drive.

PIN 04450-1798: All of Lots 237 to 254, 302 to 311. All of Blocks 345, 346, 347 and 351. Part of Lots 166 and 167. Part of Blocks 344 and 348. Part of promenade Cope Drive, promenade Goldhawk Drive and rue Embankment Street.

PIN 04450-1801: Part of Blocks 324 and 342.

Block 316 is subject to easement, Inst. N391075.
Lots 1 to 311, both inclusive, Blocks 312 to 345, both inclusive, the Streets, namely, plateau Angel Heights, voie Belsize Way, cote Bobolink Ridge, voie Brixton Way, terrasse Clapham Terrace, promenade Cope Drive, rue Dagenham Street, rue Embankment Street, avenue Finsbury Avenue, promenade Goldhawk Drive, voie Osterley Way, chemin Pinner Road, croissant Putney Crescent and the Reserves, namely, Blocks 346, 347, 348, 349, 350 and 351 are subject to easement, Inst. OC938586.

PLAN OF SUBDIVISION OF

PART OF LOTS 26, 27 And 28
CONCESSION 10
Geographic Township of Goulbourn
CITY OF OTTAWA
Surveyed by Annis , O'Sullivan , Vollebekk Ltd.

Scale 1 : 1000
40 30 20 10 0 20 40 Metres

Metric
DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

SURVEYOR'S CERTIFICATE
I CERTIFY THAT :

1. This survey and plan are correct and in accordance with the Surveys Act, the Surveyors Act and the Land Titles Act and the regulations made under them.
2. The Survey was completed on the 15th day of February 2019.

Feb 19/2019
Date

Andre Roy
Ontario Land Surveyor

OWNER'S CERTIFICATE

THIS IS TO CERTIFY THAT :

1. Lots 1 to 311, both inclusive, Blocks 312 to 345, both inclusive, the Streets, namely, plateau Angel Heights, voie Belsize Way, cote Bobolink Ridge, three portions, voie Brixton Way, terrasse Clapham Terrace, both portions, promenade Cope Drive, rue Dagenham Street, rue Embankment Street, avenue Finsbury Avenue, promenade Goldhawk Drive, voie Osterley Way, both portions, chemin Pinner Road, croissant Putney Crescent and the Reserves, namely, Blocks 346, 347, 348, 349, 350 and 351 have been laid out in accordance with our instructions.
2. The Streets are dedicated to City of Ottawa as public highways.

Dated the 20th day of February, 2019

Jim Burghout,
CRT Development Inc.
I have the authority to bind the corporation.

CURVE SCHEDULE

LOT	RADIUS	ARC	CHORD	BEARING
4	227.00	12.36	12.35	N8°38'40"W
5	227.00	12.19	12.18	N11°44'30"W
6	227.00	12.16	12.16	N14°49'00"W
7	227.00	12.15	12.15	N17°53'10"W
8	227.00	12.30	12.30	N20°58'10"W
9	227.00	12.30	12.30	N24°04'30"W
10	227.00	11.96	11.96	N27°08'10"W
11	227.00	11.96	11.96	N30°09'20"W
12	227.00	14.95	14.94	N33°33'10"W
13	251.00	7.67	7.67	N29°54'30"W
14	251.00	11.37	11.37	N27°44'00"W
15	251.00	11.37	11.37	N25°08'10"W
16	251.00	11.37	11.37	N22°32'30"W
17	251.00	11.75	11.75	N19°54'10"W
18	251.00	11.75	11.75	N17°13'10"W
19	251.00	11.08	11.08	N14°36'50"W
20	251.00	11.37	11.37	N12°03'10"W
21	251.00	13.78	13.78	N9°10'50"W
22	251.00	2.29	2.29	N7°20'50"W
29	182.00	8.64	8.64	N8°26'50"W
30	182.00	13.58	13.58	N11°56'40"W
31	182.00	13.59	13.58	N16°13'10"W
32	182.00	13.47	13.47	N20°28'50"W
33	182.00	13.92	13.91	N24°47'30"W
34	182.00	4.80	4.80	N27°44'10"W
40	18.00	22.96	21.44	N84°27'40"E
41	18.00	9.58	9.47	N43°44'40"W
47	200.00	9.37	9.37	N22°52'30"W
48	200.00	10.76	10.76	N19°59'20"W
49	200.00	10.41	10.41	N16°57'20"W
50	200.00	10.59	10.59	N13°57'00"W
51	200.00	10.85	10.85	N10°52'40"W
52	200.00	7.81	7.81	N8°12'20"W
54	182.00	2.26	2.26	N82°33'30"E
55	182.00	13.31	13.30	N80°06'20"E
56	182.00	13.06	13.06	N75°57'20"E
57	182.00	13.06	13.06	N71°50'40"E
58	182.00	11.77	11.77	N67°56'00"E
59	182.00	12.58	12.58	N64°06'00"E
67	18.00	11.81	11.60	N52°58'50"W
68	18.00	1.79	1.79	N31°20'10"W
166	224.00	25.45	25.43	N70°33'10"E
197	150.00	2.85	2.85	N62°03'10"E
198	150.00	5.38	5.38	N72°49'50"E
224	168.00	11.88	11.88	N71°50'00"E
225	168.00	13.62	13.61	N67°29'00"E
226	168.00	10.71	10.71	N63°20'10"E
250	386.00	7.69	7.69	N73°17'20"E
251	386.00	14.59	14.59	N71°38'00"E
252	386.00	14.59	14.59	N69°28'10"E
253	386.00	14.26	14.26	N67°19'40"E
254	386.00	10.38	10.38	N65°29'50"E
282	200.00	13.96	13.96	N64°42'40"E
283	200.00	13.59	13.58	N68°39'20"E
284	200.00	13.85	13.85	N72°35'10"E
285	200.00	13.42	13.42	N76°29'30"E
286	200.00	11.03	11.02	N79°59'30"E
287	200.00	4.68	4.68	N82°14'30"E
302	386.00	14.70	14.70	N59°28'00"E
303	386.00	14.62	14.62	N57°17'20"E
304	386.00	14.62	14.62	N55°07'10"E
305	386.00	14.62	14.62	N52°56'50"E
306	386.00	14.62	14.62	N50°46'40"E
307	386.00	5.32	5.32	N49°17'50"E

CURVE SCHEDULE

NUM.	LOCATION	RADIUS	ARC	CHORD	BEARING
C1	rue Dagenham Street	18.00	13.60	13.28	N50°08'20"W

NOTES AND LEGEND

—□—	denotes	Survey Monument Planted.
—■—	"	Survey Monument Found
SIB	"	Standard Iron Bar.
SSIB	"	Short Standard Iron Bar.
CC	"	Cut Cross.
IB	"	Iron Bar.
*	"	0.30 long Survey Monument
NT	"	Nontangential
(AOG)	"	Annis, O'Sullivan, Vollebekk Ltd.
(P1)	"	Registered Plan 4M-1503
(P2)	"	Plan 4R-23947

All planted survey monuments are IB's unless otherwise noted.
Distances shown on curved limits are Arc distances unless otherwise noted.

Distances shown on this plan are ground distances and can be converted to grid distances by multiplying by the combined scale factor of 0.999913.

Bearings are grid, derived from Can-Net 3.0 Real Time Network GPS observations on reference points A and B, shown hereon, having a bearing of N 47°55'00" E and are referenced to Specified Control Points 01919750705 and 01919770923, MTM Zone 9 (76°30' West Longitude) NAD-83 (original).

Coordinates are derived from Can-Net 3.0 Real Time Network GPS observations referenced to Specified Control Points 01919750705 and 01919770923, MTM Zone 9 (76°30' West Longitude) NAD-83 (original).

Coordinate values are to urban accuracy in accordance with O. Reg. 216/10.

. 01919750705	Northing	5016816.93	Easting	360806.84
. 01919770923	Northing	5013536.21	Easting	346275.92
. Point A	Northing	5014527.30	Easting	351804.24
. Point B	Northing	5014970.33	Easting	352294.86

Caution: Coordinates cannot, in themselves, be used to re-establish corners or boundaries shown on this plan.

ANNIS, O'SULLIVAN, VOLLEBEKK LTD.
14 Concourse Gate, Suite 500
Nepean, Ont. K2E 7S6
Phone: (613) 727-0850 / Fax: (613) 727-1079
Email: Nepean@aovltd.com
Ontario Land Surveyors

Job No. 14777-14 Claridge Pt Lts 26 27 28 C10 GO SUBI F | N

PC2021-0126

Pre-Application Consultation Meeting (Via Teams)

Site Plan Control Application: 585 Bobolink Ridge

April 13, 2021, 2:30:pm

Attendees

Kathy Rygus - Development Review Planner, City of Ottawa
Eric Surprenant - Project Manager (Infrastructure), City of Ottawa
Randolph Wang - Urban Design Planner, City of Ottawa
Peter Hume – HP Urban
Michelle Taggart - Taggart

Applicant's overview of proposal

- The site is a 1.19-hectare parcel (Block 243 on Plan 4M-1619) located at 585 Bobolink Ridge in CRT Developments Inc. Phase 1 Westwood subdivision. The property is bounded by Putney Crescent on the west, Bobolink Ridge on the south, Robert Grant Avenue on the east and a public pathway block on the north. The site is currently vacant.
- The zoning of the site is R4Z, permitting back-to-back townhouses, stacked units and low rise apartments.
- The proposed site plan is for 8 blocks of back-to-back townhouses on private streets, with 72 units total. Each unit would have a garage and driveway; no visitor parking is required or provided. One access is proposed from Putney Crescent.

Process

1. The application type for the proposed development is Site Plan Control, Complex, Manager Approval. The application is subject to public notification through the Devapps website and an onsite sign. The fee is $59,338.80 with additional engineering fees and a $1,040 Conservation Authority fee. Information on process, timeline and fees for the different applications can be found here.
2. Fees are not required to be paid at the time of application submission. An email with instructions for payment of fees will be sent by the assigned planner once a file number has been assigned.
3. Information on process, timeline and fees can be found here.
4. The application should be submitted digitally with PDFs of all documents (attached in the e-mail or link to dropbox provided). Please send application to planningcirculations@ottawa.ca. Please cc the Senior Planner in Development Review West, Wendy Tse: Wendy.tse@ottawa.ca
5. A list of required plans and studies is provided.

Planning & Urban Design

Please accept these comments on behalf of PRUD for the proposed Site Plan Control.

1. A Design Brief is required as part of the submission. The Terms of Reference of the Design Brief is attached for convenience.
2. Robert Grant is an Arterial Mainstreet and the site is within a Design Priority Area. However, it is exempted from UDRP review due to the proposed building heights.
3. With respect to the site plan presented at the preconsultation meeting:
    a. The intent to limit vehicular access is understood;
    b. However, the resulting site plan shows roads throughout the entire site with "double street" conditions along Robert Grant, Bobolink, Putney, and the multi-use pathway.
4. Please study alternative site plan options.
    a. Such options should aim to reduce the amount of roadway, increase landscaping and provide building frontages on public street.
    b. As an alternative to the long "double streets", please consider short "window street".
    c. When studying the options please take into consideration the CRT proposal to the north to ensure some coordination.
    d. For reference, the attached PDF shows a possible option that mimics some design elements of the CRT proposal. Such an option is not without its own challenges, for example, private driveways on Putney.
    e. The design should also include a pedestrian entrance on Robert Grant to allow for easy pedestrian movement between the future BRT station and the site.
    f. The design should provide continuous tree canopies along all public streets as well as the multi-use pathway to the north. Coordination of tree planting along the multi-use pathway is required between this site and the CRT site.
    g. Visitor parking should be located internal to the site.

Please contact Randolph Wang for questions: Randolph.wang@ottawa.ca

Infrastructure

1. The easterly lot line is abutting Robert Grant Avenue. Tie-in of grading is important and noise walls or retaining walls are to be avoided.

2. The site is zoned to accommodate the type of development proposed, so we do not anticipate servicing constraints.

3. The servicing connections (water and sewers) are on Bobolink Ridge. The servicing proposal must abide by the sanitary and storm drainage plan for the subdivision. Even if multiple access points from Putney are proposed in the Urban Design suggestions, the sewer connections should still be provided from a single connection point.

4. As it relates to stormwater management; there are no anticipated issues however there will be a need to demonstrate that imperviousness ratios are in accordance with Master Servicing study requirements etc. and stormwater management on site is provided as required…
5. A request for boundary conditions will need to be submitted.
6. As a residential site plan block, there will be requirements to demonstrate Fire Flow, via FUS methodology with all required measures implemented for fire area compartmentalization. At minimum there will be a need for water-loss leak detection chamber at property line and potential for fire-flow bypass metre at lot line is anticipated with sub-metering at units.
7. The Servicing Study Guidelines for Development Applications are available at the following address: http://ottawa.ca/en/development-application-review-process-0/servicing-study-guidelines-development-applications
8. Servicing and site works shall be in accordance with the following documents:

- Ottawa Sewer Design Guidelines (October 2012)
- Ottawa Design Guidelines – Water Distribution (2010)
- Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)
- City of Ottawa Slope Stability Guidelines for Development Applications (revised 2012)
- City of Ottawa Environmental Noise Control Guidelines (January, 2016)
- City of Ottawa Accessibility Design Standards (2012)
- Ottawa Standard Tender Documents (latest version)
- Ontario Provincial Standards for Roads & Public Works (2013)

9. Record drawings and utility plans are also available for purchase from the City (Contact the City's Information Centre by email at InformationCentre@ottawa.ca or by phone at 613- 580-2424 x.44455.

Should you have any questions or require additional information, please contact Eric Surprenant by e-mail: Eric.surprenant@ottawa.ca

Transportation/Noise

1. No TIA is required (less than 90 units)
2. A noise impact assessment is required

Feel free to contact Mike Giampa for follow-up questions: Mike.giampa@ottawa.ca

PC2021-0126

Tree Conservation

1. A Tree Conservation Report (TCR) is required if trees are present on site. If there are no private or city owned trees on/near the site, a TCR is not required and an email stating no trees are present will be sufficient.
2. Any removal of privately-owned trees 10 cm or larger in diameter requires a tree permit issued under the Urban Tree Conservation Bylaw.
3. The TCR must list all trees on-site by species, diameter and health condition. Note that TCR must address all trees with a critical root zone that extends into the developable area.
4. If trees are to be removed, the TCR must clearly show where they are and document the reason they cannot be retained.
5. All retained trees must also be shown and all retained trees within the area impacted by the development process must be protected as per the City guidelines listed on Ottawa.ca.
6. The City encourages the retention of healthy trees wherever possible.
7. The removal of City-owned trees will require the permission of Forestry Services who will also review the submitted TCR.

Please contact Mark Richardson Mark.richardson@ottawa.ca for questions.

Please refer to the links to "Guide to preparing studies and plans" and fees for further information. Additional information is available related to building permits, development charges, and the Accessibility Design Standards. Be aware that other fees and permits may be required, outside of the development review process. You may obtain background drawings by contacting informationcentre@ottawa.ca

These preconsultation comments are valid for one year. If you submit a development application after this time, you may be required to meet for another preconsultation meeting and/or the submission requirements may change. You are as well encouraged to contact us for a follow-up meeting if the plan/concept will be further refined.

Feel free to contact me at Kathy.rygus@ottawa.ca if you have any questions.

Kathy Rygus

Planner, Development Review West

APPENDIX B

Hydraulic Network Analysis

Hydraulic Capacity and Modeling Analysis Bobolink Ridge

Final Report

Prepared for:
David Schaeffer Engineering Ltd.
120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

Prepared by:
GeoAdvice Engineering Inc.
Unit 203, 2502 St. John's Street
Port Moody, BC V3H 2B4

Submission Date: January 11, 2022

Contact: Mr. Werner de Schaetzen, Ph.D., P.Eng.
Project: 2021-110-DSE

Document History and Version Control

Revision No.	Date	Document Description	Revised By	Reviewed By
R0	December 22, 2021	Draft	Ben Loewen	Werner de Schaetzen
R1	January 11, 2022	Final	Ben Loewen	Werner de Schaetzen

Statement of Qualifications and Limitations
This document represents GeoAdvice Engineering Inc. best professional judgment based on the information available at the time of its completion and as appropriate for the project scope of work. Services performed in developing the content of this document have been conducted in a manner consistent with that level and skill ordinarily exercised by a member of the engineering profession currently practicing under similar conditions. No warranty, express or implied is made.

Contents

1 Introduction

GeoAdvice Engineering Inc. ("GeoAdvice") was retained by David Schaeffer Engineering Ltd. ("DSEL") to size the proposed water main network for Bobolink Ridge development ("Development") in the City of Ottawa, ON ("City").

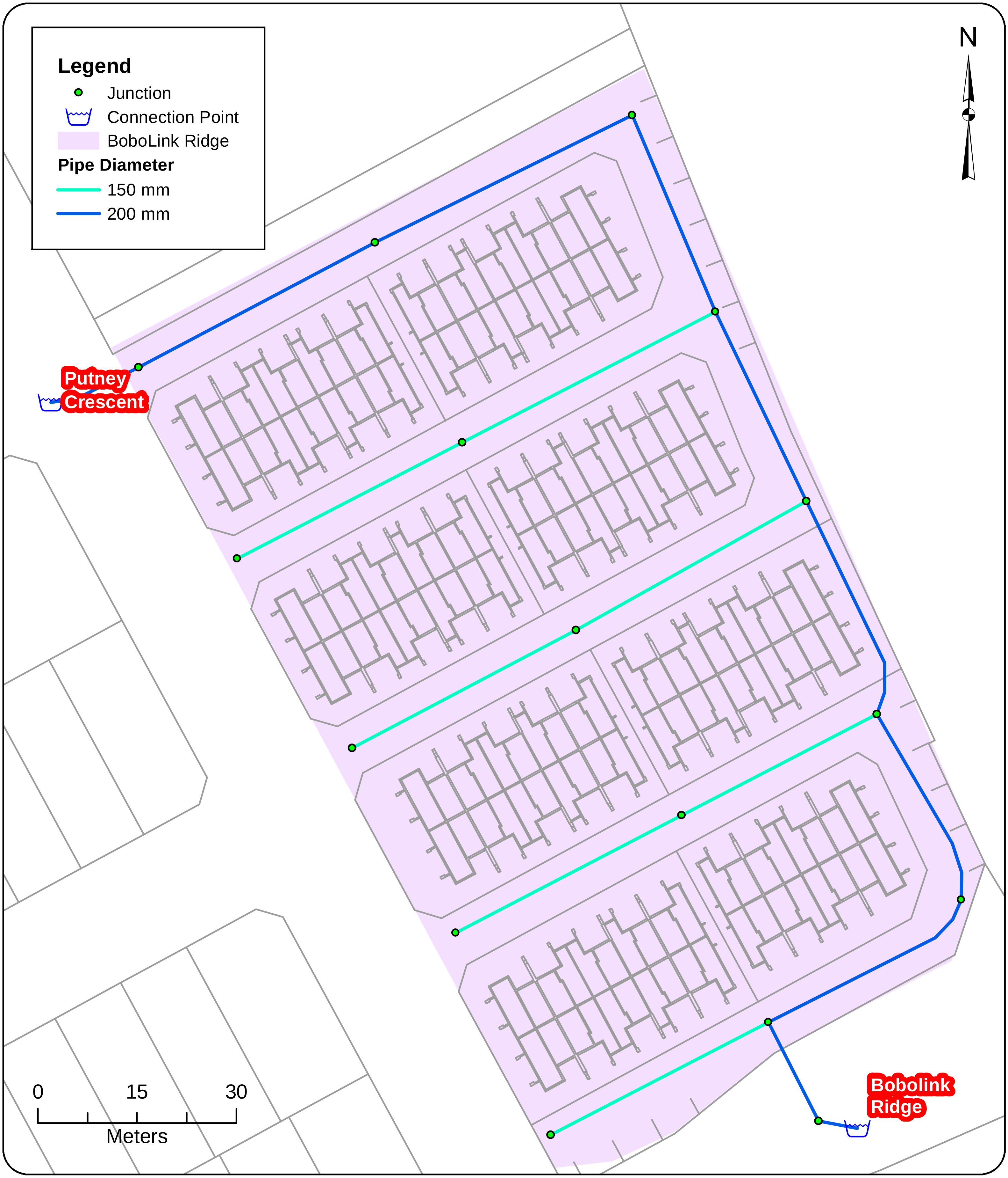
The development will have two (2) connections to the City water distribution system:

- Connection 1: Bobolink Ridge
- Connection 2: Putney Crescent

The development site is shown in **Figure 1.1** on the following page, with the final recommended pipe diameters.

This report describes the assumptions and results of the hydraulic modeling and capacity analysis using InfoWater (Innovyze), a GIS water distribution system modeling and management software application.

The results presented in this report are based on the analysis of steady state simulations. The predicted available fire flows, as calculated by the hydraulic model, represent the flow available in the water main while maintaining a residual pressure of 20 psi at the hydrant. No extended period simulations were completed in this analysis to assess the water quality or to assess the hydraulic impact on storage and pumping.



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis**
Bobolink Ridge
2021-110-DSE
Client: **David Schaeffer Engineering Ltd.**
Date: **December 2021**
Created by: **BL**
Reviewed by: **WdS**

Bobolink Ridge Site Layout and Connection Point

Figure 1.1

2 Modeling Considerations

2.1 Water Main Configuration

The water main network was modeled based on drawings prepared by DSEL and provided to GeoAdvice on November 16th, 2021.

2.2 Elevations

Elevations of the modeled junctions were assigned according to a preliminary site grading plan prepared by DSEL and provided to GeoAdvice on December 21st, 2021.

2.3 Consumer Demands

The proposed residential demands for the development were based on a demand rate of 280 L/cap/d as per the City of Ottawa technical bulletin ISTB 2018-01. Demand factors used for this analysis were taken according to the Ministry of Environment (MOE) Design Guidelines *Table 3-3 Peaking Factors for Drinking-Water Systems Serving Fewer than 500 People*. Population densities were assigned according to *Table 4.1 Per Unit Populations* from the City of Ottawa Design Guidelines. A 10% buffer was applied to population estimates to account for any minor changes that may occur during the detailed design of the subdivision. A summary of these tables highlighting relevant data for this development is shown in **Table 2.1**.

Table 2.1: City of Ottawa Demand Factors

Demand Type	Amount	Units
Average Day Demand		
Residential	280	L/c/d
Maximum Daily Demand		
Residential	4.9 x avg. day	L/c/d
Peak Hour Demand		
Residential	7.4 x avg. day	L/c/d
Minimum Hour Demand		
Residential	0.1 x avg. day	L/c/d

Table 2.2 summarizes the water demand calculations for development.

Table 2.2: Development Population and Demand Calculations – Bobolink Ridge

Dwelling Type	Number of Units	Persons Per Unit*	Population **	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)	Minimum Hour Demand (L/s)
Back-to-Back Townhouse	78	2.7	280	0.75	3.68	5.56	0.08

*City of Ottawa Design Guidelines.
**10% buffer was applied to population estimates to account for any minor changes that may occur during the detailed design of the subdivision.

Demands were uniformly distributed to the model nodes. Detailed calculations of demands are shown in **Appendix A**.

2.4 Fire Flow Demand

Fire flow calculations were completed in accordance with the Fire Underwriters Survey's (FUS) Water Supply for Public Fire Protection Guideline (1999) and City of Ottawa Technical Bulletin ISTB-2018-02. The FUS calculations for the back-to-back townhouse blocks yielded the following required fire flows:

- 10-unit back-to-back townhouse: 16,000 L/min (267 L/s), no firewall accounted for
- 8-unit back-to-back townhouse: 12,000 L/min (200 L/s), no firewall accounted for

Using the more conservative flow, the water network was assessed using a fire flow of 267 L/s.

Fire flow simulations were completed at each model node representing a proposed hydrant location. Hydrant locations were provided by DSEL provided to GeoAdvice on December 17th, 2021.

Detailed FUS fire flow calculations as well as the illustrated spatial allocation of the required fire flows are shown in **Appendix B**.

2.5 Boundary Conditions

The boundary conditions were provided by the City of Ottawa in the form of Hydraulic Grade Line (HGL) at the following locations:

- Connection 1: Bobolink Ridge
- Connection 2: Putney Crescent

The above connection points are illustrated in **Figure 1.1**.

Boundary conditions were provided for Peak Hour (PHD), Maximum Day plus Fire (MDD+FF) and Average Day (ADD) demand conditions. The City boundary conditions were provided to GeoAdvice on December 14, 2021 and can be found in **Appendix C**.

Table 2.3 summarizes the City of Ottawa boundary conditions used to size the water network.

Table 2.3: Boundary Conditions

Condition	Connection 1 HGL (m)	Connection 2 HGL (m)
Average Day Demand	161.2	161.2
Peak Hour (min. pressure)	156.4	156.4
Max Day + Fire Flow (167 L/s)	153.7	146.5
Max Day + Fire Flow (267 L/s)*	148.9	131.5
Max Day + Fire Flow (283 L/s)	148.1	129.1

* Interpolated values

3 Hydraulic Capacity Design Criteria

3.1 Pipe Characteristics

Pipe characteristics of internal diameter (ID) and Hazen-Williams C factors were assigned in the model according to the City of Ottawa Design Guidelines for PVC water main material. Pipe characteristics used for the development are outlined in **Table 3.1** below.

Table 3.1: Model Pipe Characteristics

Nominal Diameter (mm)	ID PVC (mm)	Hazen Williams C-Factor (/)
150	155	100
200	204	110
250	250	110
300	297	120
400	400	120

3.2 Pressure Requirements

As outlined in the City of Ottawa Design Guidelines, the generally accepted best practice is to design new water distribution systems to operate between 350 kPa (50 psi) and 480 kPa (70 psi). The maximum pressure at any point in the distribution system in occupied areas outside of the public right-of-way shall not exceed 552 kPa (80 psi). Pressure requirements are outlined in **Table 3.2.**

Table 3.2: Pressure Requirements

Demand Condition	Minimum Pressure		Maximum Pressure	
	(kPa)	(psi)	(kPa)	(psi)
Normal Operating Pressure (maximum daily flow)	350	50	480	70
Peak Hour Demand (minimum allowable pressure)	276	40	-	-
Maximum Fixture Pressure (Ontario Building Code)	-	-	552	80
Maximum Distribution Pressure (minimum hour check)	-	-	552	80
Maximum Day Plus Fire	140	20	-	-

4 Hydraulic Capacity Analysis

The proposed water mains within the development were sized to the minimum diameter which would satisfy the greater of maximum day plus fire and peak hour demand. Modeling was carried out for average day, peak hour and maximum day plus fire flow using InfoWater.

Detailed pipe and junction model input data can be found in **Appendix D**.

4.1 Development Pressure Analysis

The modeling results indicate that the development can be adequately serviced by the proposed water main layout shown in **Figure 1.1**. Modeled service pressures for the development are summarized in **Table 4.1** below.

Table 4.1: Summary of Available Service Pressures

Average Day Demand Maximum Pressure	Peak Hour Demand Minimum Pressure
75 psi (520 kPa)	67 psi (464 kPa)

As outlined in the City of Ottawa Design Guidelines, the generally accepted best practice is to design new water distribution systems to operate between 350 kPa (50 psi) and 480 kPa (70 psi). The maximum pressure at any point in the distribution system in occupied areas outside of the public right-of-way shall not exceed 552 kPa (80 psi).

Detailed pipe and junction result tables and maps can be found in **Appendix E**.

4.2 Development Fire Flow Analysis

Summaries of the minimum available fire flow in the development is shown in **Table 4.2**.

Table 4.2: Summary of Minimum Available Fire Flows

Required Fire Flow	Minimum Available Flow*	Junction ID
267 L/s	292 L/s	J-13

As shown in **Table 4.2**, the fire flow requirements can be met at all hydrant junctions within the development.

Summaries of the residual pressures in the development are shown in **Table 4.3**. The minimum allowable pressure under fire flow conditions is 140 kPa (20 psi) at the location of the fire.

Table 4.3: Summary of the Residual Pressures (MDD + FF)

Maximum Residual Pressure	Average Residual Pressure	Minimum Residual Pressure
27 psi (189 kPa)	25 psi (172 kPa)	23 psi (159 kPa)

As shown in **Table 4.3**, there is sufficient residual pressure at all the hydrant junctions within the development.

Detailed fire flow results and figures illustrating the fire flow results can be found in **Appendix F**.

5 Other Servicing Considerations

5.1 Water Supply Security

The City of Ottawa Design Guidelines allow single feed systems for developments up to a total average day demand of 50 m^3/day and require two (2) feeds if the development exceeds 50 m^3/day for supply security, according to Technical Bulletin ISDTB-2018-02.

The Bobolink Ridge development services a total average day demand of 65 m^3/day; as such, two (2) feeds are required. Two (2) feeds to the development from Bobolink Ridge and Putney Crescent were modeled as part of the analysis.

5.2 Valves

No comment has been made in this report with respect to exact placement of isolation valves within the distribution network for the development other than to summarize the City of Ottawa Design Guidelines for number, location, and spacing of isolation valves:

- Tee intersection – two (2) valves
- Cross intersection – three (3) valves
- Valves shall be located 2 m away from the intersection
- 300 m spacing for 150 mm to 400 mm diameter valves
- Gate valves for 100 mm to 300 mm diameter mains
- Butterfly valves for 400 mm and larger diameter mains

Drain valves are not strictly required under the City of Ottawa Design Guidelines for water mains under 600 mm in diameter. The Guidelines indicate that “small diameter water mains shall be drained through hydrant via pumping if needed.”

Air valves are not strictly required under the City of Ottawa Design Guidelines for water mains up to and including 400 mm in diameter. The Guidelines indicate that air removal “can be accomplished by the strategic positioning of hydrant at the high points to remove the air or by installing or utilizing available 50 mm chlorination nozzles in 300 mm and 400 mm chambers.”

The detailed engineering drawings for the development are expected to identify valves in accordance with the requirements noted above.

5.3 Hydrants

No additional comment has been made in this report with respect to exact placement of hydrants within the distribution network for the development other than to summarize the City of Ottawa Design Guidelines for maximum hydrant spacing:

- 125 m for single family unit residential areas on lots where frontage at the street line is 15 m or longer
- 110 m for single family unit residential areas on lots where frontage at the street line is less than 15 m and for residential areas zoned for row housing, doubles or duplexes
- 90 m for institutional, commercial, industrial, apartments and high-density areas

Additionally, based on the FUS document *Water Supply for Public Fire Protection (1999)*, the hydrant coverage areas for the following fire flows are:

- 267 L/s: 9,500 m^2 (radial coverage of 55 m)

The detailed engineering drawings for the development are expected to identify hydrant locations in accordance with the requirements noted above.

5.4 Water Quality

The turnover rate of the water within the development network, calculated from the connections to the development is about 5 hours (ADD is 65 m^3/day).

The above rate is based on the volume of the development network and the development average day demand.

6 Conclusions

The hydraulic capacity and modeling analysis of the Bobolink Ridge development yielded the following conclusions:

- The proposed water main network can deliver all domestic flows, with service pressures expected to range between 67 psi (464 kPa) and 75 psi (520 kPa).
- The proposed water main network is able to deliver fire flows at all junctions.

Submission

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Appendix A Domestic Water Demand Calculations and Allocation

Consumer Water Demands

Residential Demands

Dwelling Type	Number of Units	Population*		Average Day Demand			Max Day 4.9 x Avg. Day (L/s)	Peak Hour 7.4 x Avg. Day (L/s)	Min Hour 0.1 x Avg. Day (L/s)
		Persons per Unit	Population Per Dwelling Type	(L/c/d)	(L/d)	(L/s)			
Back-to-Back Townhome**	78	2.7	232	280	64,960	0.75	3.68	5.56	0.08
Subtotal	**78**		**232**		**64,960**	**0.75**	**3.68**	**5.56**	**0.08**

		Max Day	Peak Hour	Min Hour
Total		**3.68**	**5.56**	**0.08**

*10% increase applied to account for possible future refinements in concept plan, as per DSEL

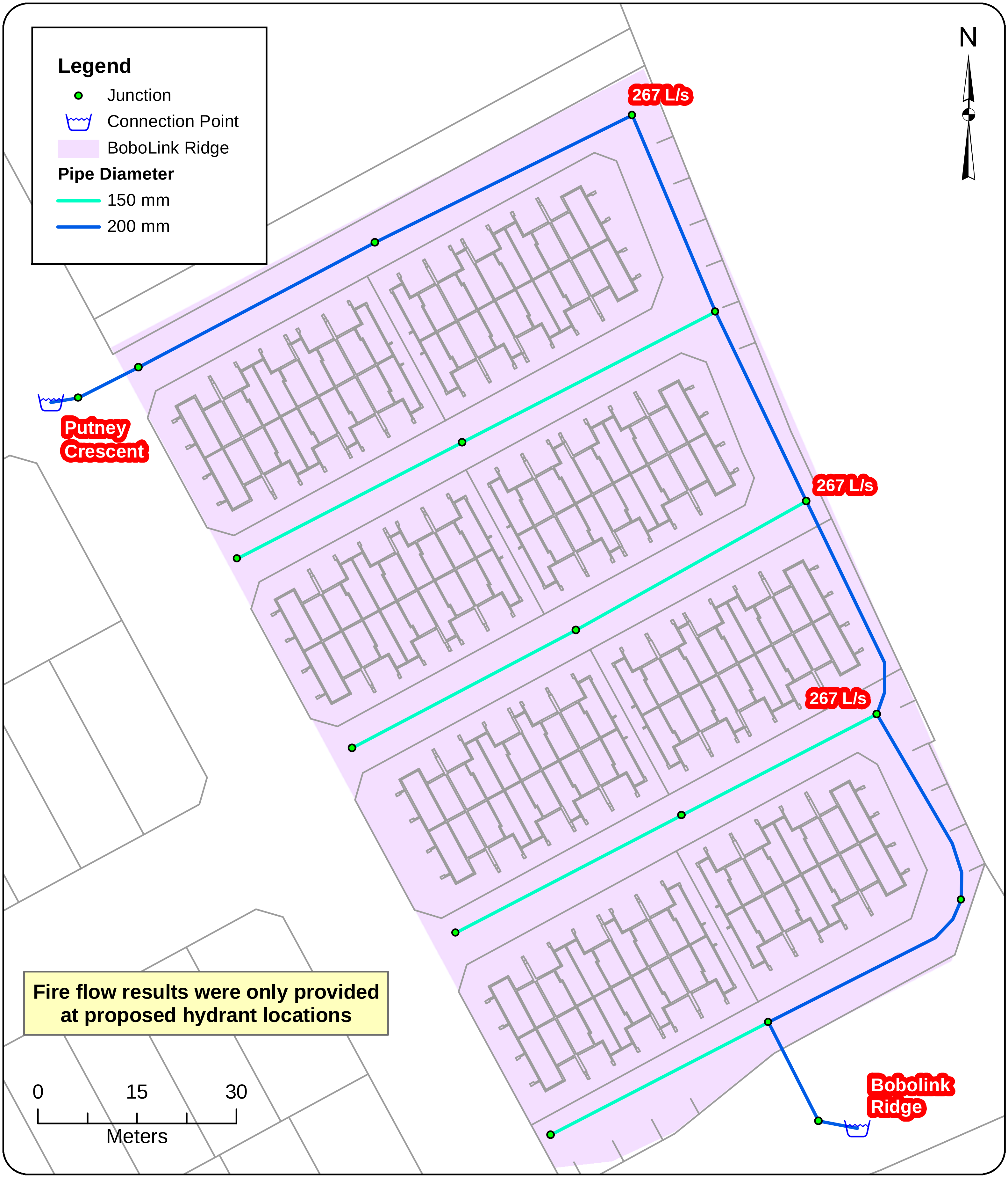
**Peaking factors based on development population <500 capita from the MOE Design Guidelines

<u>Domestic Demand Calculations and Allocation</u>

Bobolink Domestic Demands

Demand Polygon	Junction ID	Dwelling Type	Number of Units	Population	Average Day Demand			Max Day 4.9 x Avg. Day (L/s)	Peak Hour 7.4 x Avg. Day (L/s)	Min Hour 0.1 x Avg. Day (L/s)
					L/c/d	L/d	L/s			
1	J-01	Back-to-Back Townhouse	78	232	280	64,960	0.05	0.25	0.37	0.01
	J-02						0.05	0.25	0.37	0.01
	J-03						0.05	0.25	0.37	0.01
	J-04						0.05	0.25	0.37	0.01
	J-05						0.05	0.25	0.37	0.01
	J-06						0.05	0.25	0.37	0.01
	J-07						0.05	0.25	0.37	0.01
	J-08						0.05	0.25	0.37	0.01
	J-09						0.05	0.25	0.37	0.01
	J-10						0.05	0.25	0.37	0.01
	J-11						0.05	0.25	0.37	0.01
	J-12						0.05	0.25	0.37	0.01
	J-13						0.05	0.25	0.37	0.01
	J-14						0.05	0.25	0.37	0.01
	J-15						0.05	0.25	0.37	0.01

Appendix B FUS Fire Flow Calculations and Allocation



GeoAdvice Engineering Inc.

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Bobolink Ridge
2021-110-DSE
Client: **David Schaeffer Engineering Ltd.**
Date: **December 2021**
Created by: **BL**
Reviewed by: **WdS**

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Required Fire Flow
Bobolink Ridge

Figure B.1

FUS Required Fire Flow Calculation

Calculations Based on "Water Supply for Public Fire Protection", Fire Underwriters Survey, 1999.

Client: David Schaeffer Engineering Ltd.
Project: 2021-110-DSE
Development: 585 Bobolink Ridge — 10-unit back-to-back townhouse
Zoning: Multi Family Residential — Note: For other back-to-back townhouse blocks, a similar fire flow as calculated below will be used.
Date: November 19, 2021

A. Type of Construction: Wood Frame Construction

B. Ground Floor Area: N/A m^2

C. Number of Storeys: 3

Note: The back-to-back townhouse dwellings are separated by less than 3 m; therefore, they must be considered as one fire area. The combined area of 10 units is considered in this calculation.

D. Required Fire Flow*: $F = 220C\sqrt{A}$

C: Coefficient related to the type of construction — **C =** 1.5

A: Effective area — **A =** 1359 m^2 (Combined area of 10 units)

The total floor area in m^2 in the building being considered

F = 12,164 L/min — **D = 12,000 L/min***

E. Occupancy

Occupancy content hazard — Limited Combustible — -15 % of **D** — **-1,800 L/min** — **E = 10,200 L/min**

F. Sprinkler Protection

Automatic sprinkler protection — None — 0 % of **E** — **0 L/min** — **F = 10,200 L/min**

G. Exposures

Side	Separation Distance	Length-Height Factor - Adjacent Structure	Construction Type - Adjacent Structure	Exposure
East	3.1 to 10 m	31-60 m-storeys	Wood Frame or Non-Combustible	18%
South	10.1 to 20 m	61-90 m-storeys	Wood Frame or Non-Combustible	14%
West	20.1 to 30 m	31-60 m-storeys	Wood Frame or Non-Combustible	8%
North	10.1 to 20 m	91-120 m-storeys	Wood Frame or Non-Combustible	15%
			Total	**55%**

% of **E** — **+ 5,610 L/min** — **G = 15,810 L/min**

H. Wood Shake Charge — No — **0 L/min** — **H = 15,810 L/min**

For wood shingle or shake roofs

Total Fire Flow Required	**16,000**	**L/min****
	267	**L/s**
Required Duration of Fire Flow	**3.5**	**Hrs**
Required Volume of Fire Flow	**3,360**	**m^3**

*Rounded to the nearest 1,000 L/min

The Total Required Fire Flow for the 585 Bobolink Ridge development should be reviewed when drawings and site plans have been finalized. The Total Required Fire Flow may be reduced or increased depending on area, construction, occupancy, exposures, and level of sprinkler protection. If any of these items change, the Total Required Fire Flow should be reviewed to determine the impact.

Consideration should be given for fire prevention during construction phases as the required fire flows during construction of buildings is substantially higher than after the buildings are occupied. This is due to exposed framing and inactive sprinkler systems. Fires starting in unprotected portion of buildings quickly become too strong for sprinkler systems in protected portion of buildings. As such, special precautions should be taken any time construction is occurring.

* The amount and rate of water application required in firefighting to confine and control the fires possible in a building or group of buildings which comprise essentially the same fire area by virtue of immediate exposure.

** Rounded to the nearest 1,000 L/min

FUS Required Fire Flow Calculation

Calculations Based on "Water Supply for Public Fire Protection", Fire Underwriters Survey, 1999.

Client: David Schaeffer Engineering Ltd.

Project: 2021-110-DSE

Development: 585 Bobolink Ridge — 8-unit back-to-back townhouse

Zoning: Multi Family Residential — Note: For other back-to-back townhouse blocks, a similar fire flow as calculated below will be used.

Date: November 19, 2021

A. Type of Construction: Wood Frame Construction

B. Ground Floor Area: ______ m^2

C. Number of Storeys: 3

Note: The back-to-back townhouse dwellings are separated by less than 3 m; therefore, they must be considered as one fire area. The combined area of 8 units is considered in this calculation.

D. Required Fire Flow*: $F = 220C\sqrt{A}$

C: Coefficient related to the type of construction — **C =** 1.5

A: Effective area — **A =** 1092 **m^2** (Combined area of 8 units)

The total floor area in m^2 in the building being considered

F = 10,904 L/min — **D = 11,000 L/min***

E. Occupancy

Occupancy content hazard — Limited Combustible — -15 % of **D** — **-1,650 L/min** — **E = 9,350 L/min**

F. Sprinkler Protection

Automatic sprinkler protection — None — 0 % of **E** — **0 L/min** — **F = 9,350 L/min**

G. Exposures

Side	Separation Distance	Length-Height Factor - Adjacent Structure	Construction Type - Adjacent Structure	Exposure
East	Beyond 45 m	0-30 m-storeys	Wood Frame or Non-Combustible	0%
South	Beyond 45 m	0-30 m-storeys	Wood Frame or Non-Combustible	0%
West	3.1 to 10 m	31-60 m-storeys	Wood Frame or Non-Combustible	18%
North	10.1 to 20 m	61-90 m-storeys	Wood Frame or Non-Combustible	14%
			Total	**32%**

% of **E** — **+ 2,992 L/min** — **G = 12,342 L/min**

H. Wood Shake Charge — No — **0 L/min** — **H = 12,342 L/min**

For wood shingle or shake roofs

Total Fire Flow Required	**12,000**	**L/min****
	200	**L/s**
Required Duration of Fire Flow	**2.5**	**Hrs**
Required Volume of Fire Flow	**1,800**	**m^3**

*Rounded to the nearest 1,000 L/min

The Total Required Fire Flow for the 585 Bobolink Ridge development should be reviewed when drawings and site plans have been finalized. The Total Required Fire Flow may be reduced or increased depending on area, construction, occupancy, exposures, and level of sprinkler protection. If any of these items change, the Total Required Fire Flow should be reviewed to determine the impact.

Consideration should be given for fire prevention during construction phases as the required fire flows during construction of buildings is substantially higher than after the buildings are occupied. This is due to exposed framing and inactive sprinkler systems. Fires starting in unprotected portion of buildings quickly become too strong for sprinkler systems in protected portion of buildings. As such, special precautions should be taken any time construction is occurring.

* The amount and rate of water application required in firefighting to confine and control the fires possible in a building or group of buildings which comprise essentially the same fire area by virtue of immediate exposure.

** Rounded to the nearest 1,000 L/min

Appendix C Boundary Conditions

Boundary Conditions
585 Bobolink Ridge

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	45	0.75
Maximum Daily Demand	221	3.68
Peak Hour	334	5.56
Fire Flow Demand #1	10,000	166.67
Fire Flow Demand #2	17,000	283.33

Location

Results

Connection 1 – Bobolink Ridge

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.2	74.9
Peak Hour	156.4	68.1
Max Day plus Fire 1	153.7	64.1
Max Day plus Fire 2	148.1	56.2

Ground Elevation = 108.6 m

Connection 2 – Putney Cres.

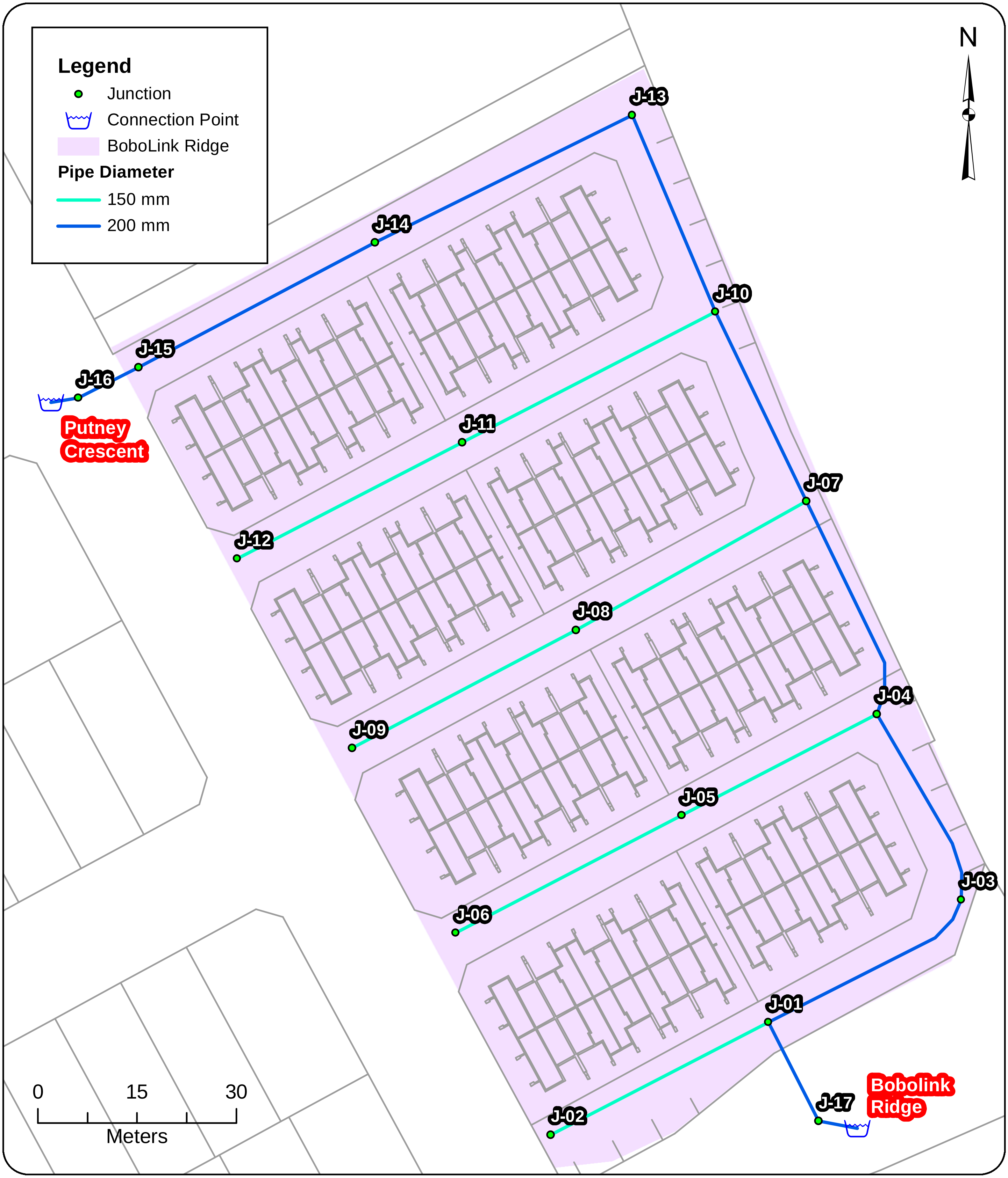
Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.2	75.7
Peak Hour	156.4	68.9
Max Day plus Fire 1	146.5	54.8
Max Day plus Fire 2	129.1	30.0

Ground Elevation = 108.0 m

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. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

Appendix D Pipe and Junction Model Inputs



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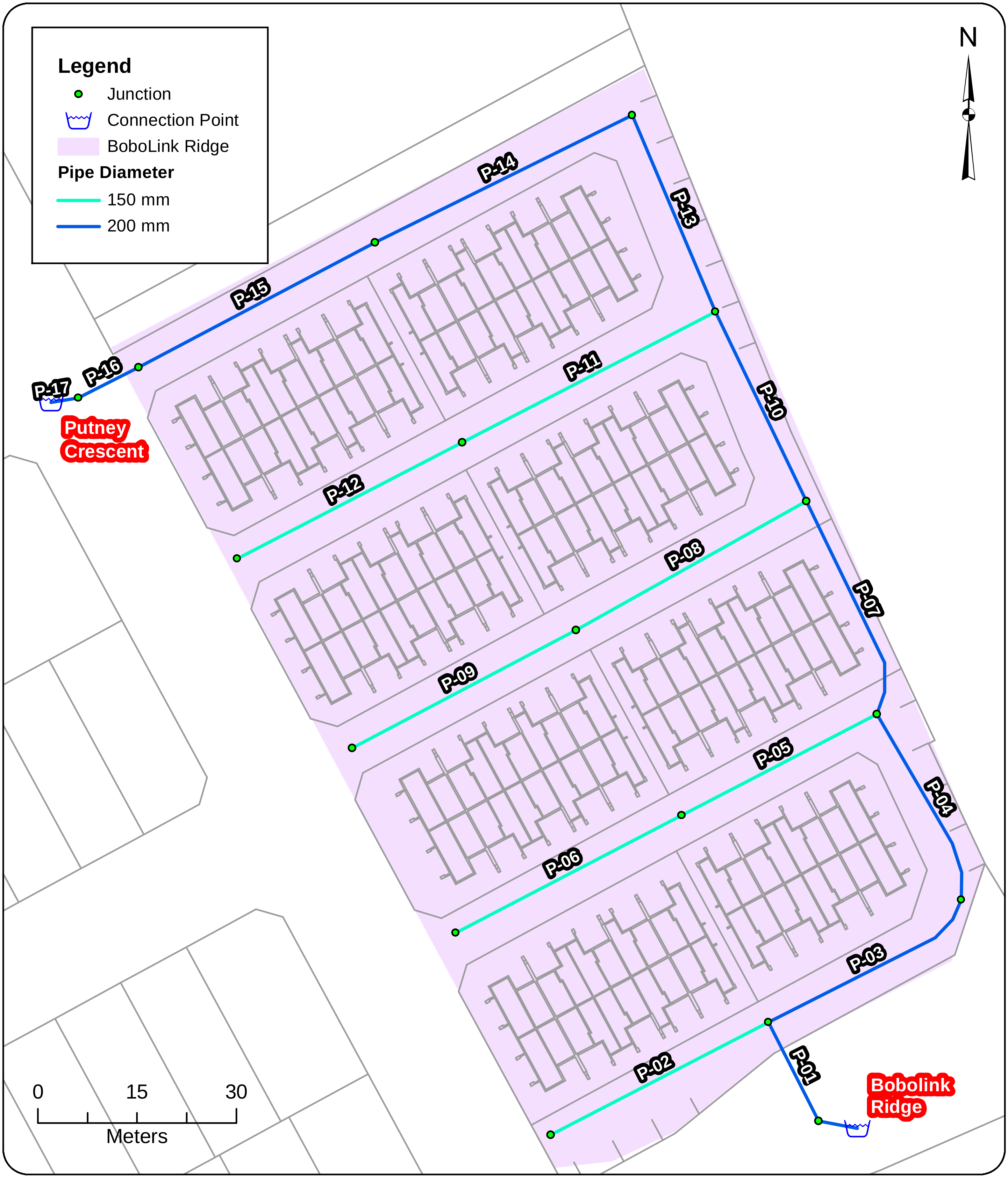
Junction IDs
Bobolink Ridge

Figure D.1



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Pipe IDs
Bobolink Ridge

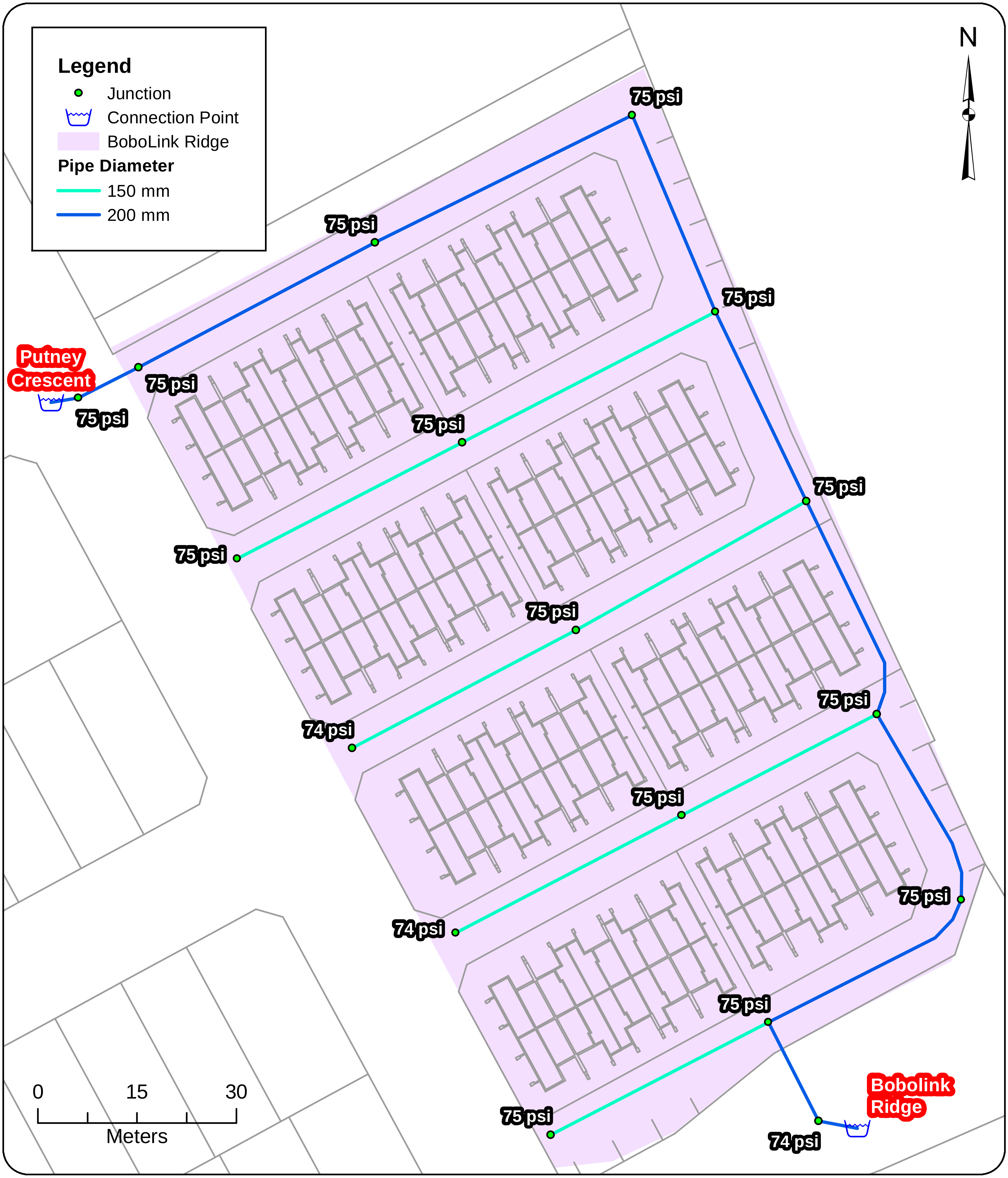
Figure D.2

Model Inputs

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness ()
P-01	J-17	J-01	16.73	204	110
P-02	J-01	J-02	37.04	155	100
P-03	J-01	J-03	35.31	204	110
P-04	J-03	J-04	31.33	204	110
P-05	J-04	J-05	33.26	155	100
P-06	J-05	J-06	38.53	155	100
P-07	J-04	J-07	35.09	204	110
P-08	J-07	J-08	39.87	155	100
P-09	J-08	J-09	38.28	155	100
P-10	J-07	J-10	31.70	204	110
P-11	J-10	J-11	43.03	155	100
P-12	J-11	J-12	38.32	155	100
P-13	J-10	J-13	32.31	204	110
P-14	J-13	J-14	43.36	204	110
P-15	J-14	J-15	40.42	204	110
P-16	J-15	J-16	10.22	204	110
P-17	J-16	RES-02	4.18	204	110
P-18	RES-01	J-17	5.98	204	110

ID	Elevation (m)
J-01	108.52
J-02	108.79
J-03	108.56
J-04	108.57
J-05	108.59
J-06	108.81
J-07	108.44
J-08	108.75
J-09	109.01
J-10	108.28
J-11	108.48
J-12	108.79
J-13	108.15
J-14	108.41
J-15	108.47
J-16	108.40
J-17	108.87

Appendix E ADD and PHD Model Results



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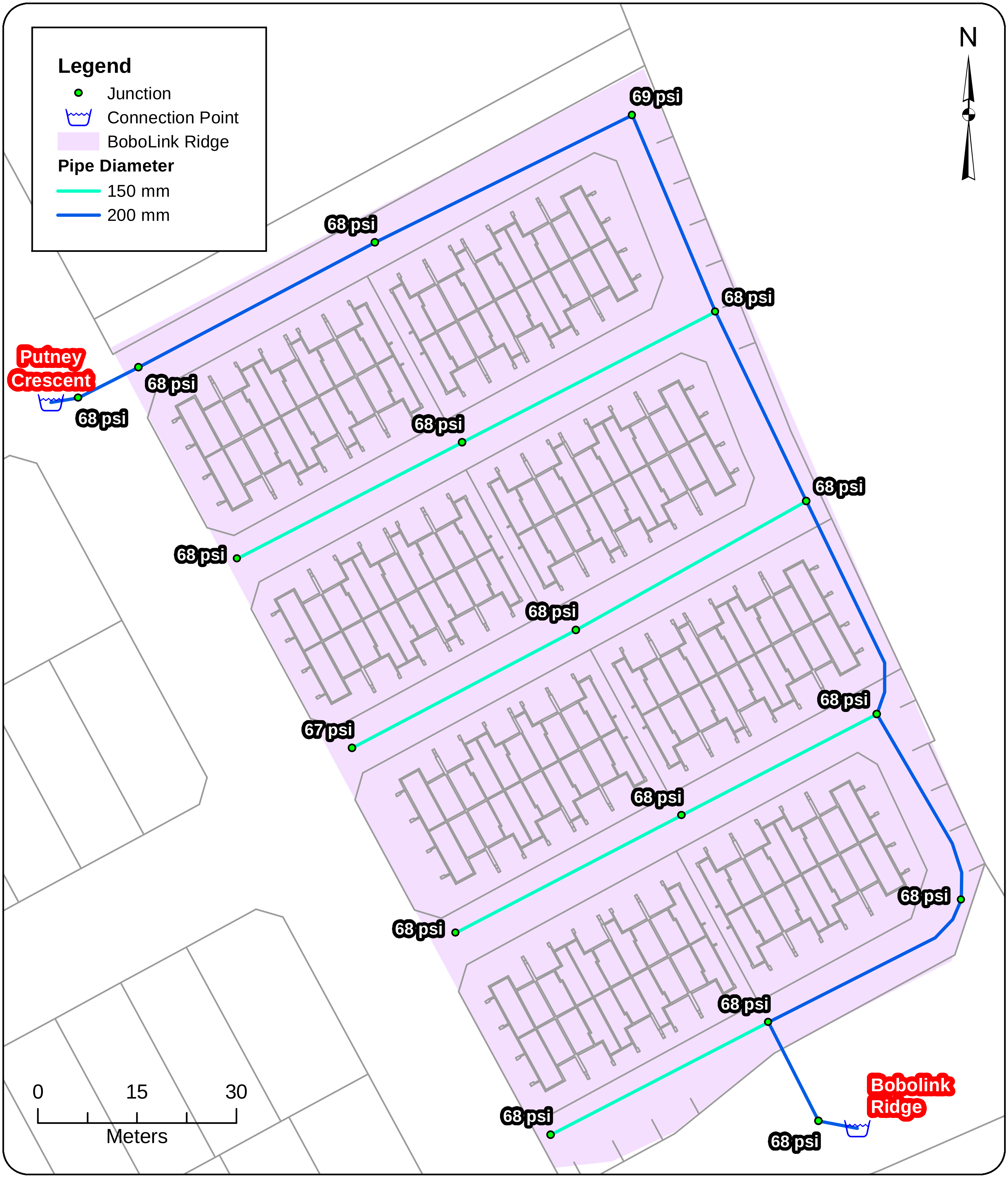
ADD Pressure Results
Bobolink Ridge

Figure E.1

Average Day Demand Modeling Results - Bobolink Ridge

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/k-m)
P-01	J-17	J-01	16.73	204	110	0.41	0.01	0.00	0.00
P-02	J-01	J-02	37.04	155	100	0.05	0.00	0.00	0.00
P-03	J-01	J-03	35.31	204	110	0.30	0.01	0.00	0.00
P-04	J-03	J-04	31.33	204	110	0.25	0.01	0.00	0.00
P-05	J-04	J-05	33.26	155	100	0.10	0.01	0.00	0.00
P-06	J-05	J-06	38.53	155	100	0.05	0.00	0.00	0.00
P-07	J-04	J-07	35.09	204	110	0.10	0.00	0.00	0.00
P-08	J-07	J-08	39.87	155	100	0.10	0.01	0.00	0.00
P-09	J-08	J-09	38.28	155	100	0.05	0.00	0.00	0.00
P-10	J-07	J-10	31.70	204	110	-0.05	0.00	0.00	0.00
P-11	J-10	J-11	43.03	155	100	0.10	0.01	0.00	0.00
P-12	J-11	J-12	38.32	155	100	0.05	0.00	0.00	0.00
P-13	J-10	J-13	32.31	204	110	-0.20	0.01	0.00	0.00
P-14	J-13	J-14	43.36	204	110	-0.25	0.01	0.00	0.00
P-15	J-14	J-15	40.42	204	110	-0.30	0.01	0.00	0.00
P-16	J-15	J-16	10.22	204	110	-0.35	0.01	0.00	0.00
P-17	J-16	RES-02	4.18	204	110	-0.35	0.01	0.00	0.00
P-18	RES-01	J-17	5.98	204	110	0.41	0.01	0.00	0.00

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J-01	0.05	108.52	161	75
J-02	0.05	108.79	161	75
J-03	0.05	108.56	161	75
J-04	0.05	108.57	161	75
J-05	0.05	108.59	161	75
J-06	0.05	108.81	161	74
J-07	0.05	108.44	161	75
J-08	0.05	108.75	161	75
J-09	0.05	109.01	161	74
J-10	0.05	108.28	161	75
J-11	0.05	108.48	161	75
J-12	0.05	108.79	161	75
J-13	0.05	108.15	161	75
J-14	0.05	108.41	161	75
J-15	0.05	108.47	161	75
J-16	0.00	108.40	161	75
J-17	0.00	108.87	161	74



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis**
Bobolink Ridge
2021-110-DSE
Client: **David Schaeffer Engineering Ltd.**
Date: **December 2021**
Created by: **BL**
Reviewed by: **WdS**

PHD Pressure Results
Bobolink Ridge

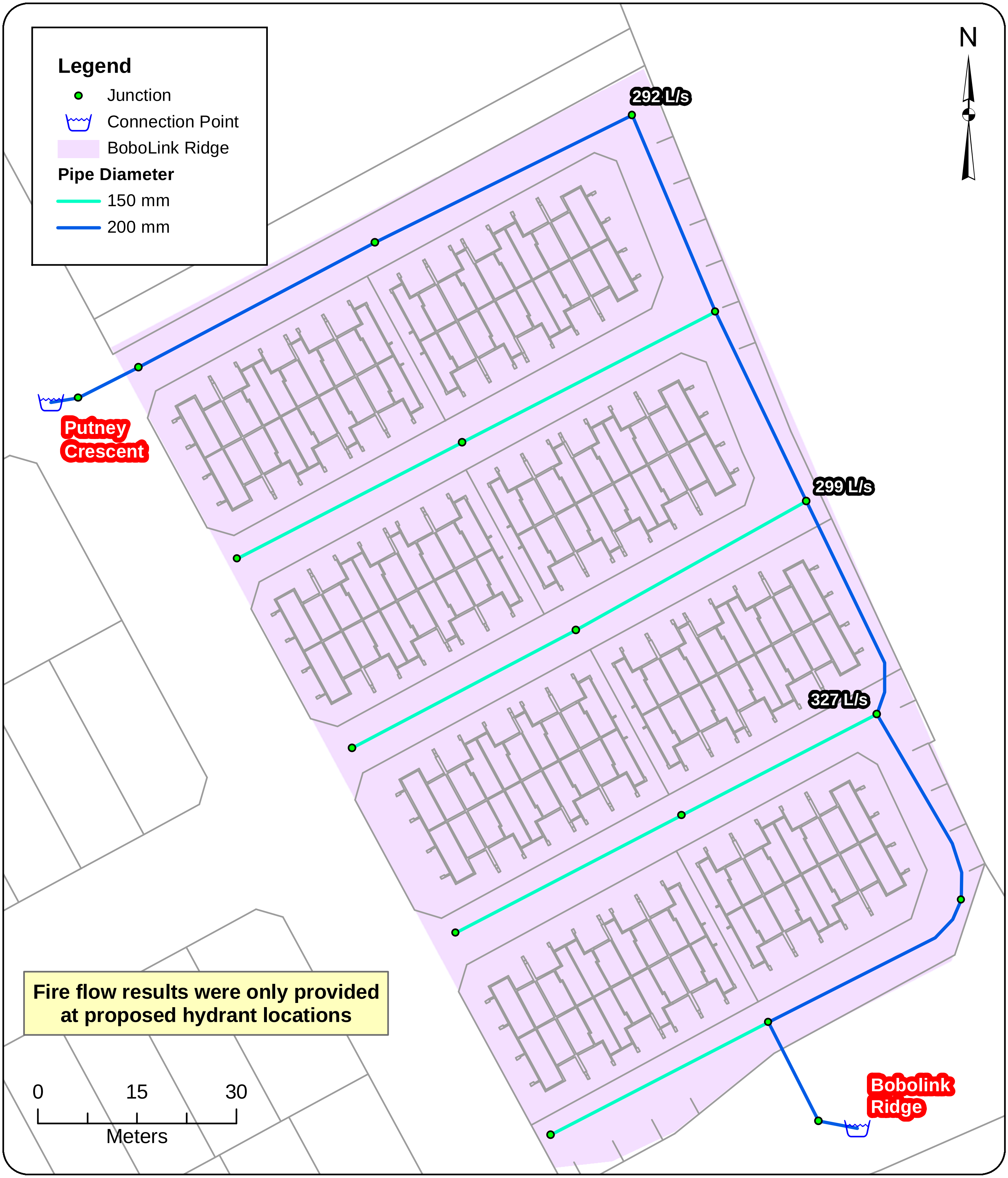
Figure E.2

Peak Hour Demand Modeling Results - Bobolink Ridge

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/k-m)
P-01	J-17	J-01	16.73	204	110	3.00	0.09	0.00	0.09
P-02	J-01	J-02	37.04	155	100	0.37	0.02	0.00	0.01
P-03	J-01	J-03	35.31	204	110	2.26	0.07	0.00	0.05
P-04	J-03	J-04	31.33	204	110	1.89	0.06	0.00	0.04
P-05	J-04	J-05	33.26	155	100	0.74	0.04	0.00	0.03
P-06	J-05	J-06	38.53	155	100	0.37	0.02	0.00	0.01
P-07	J-04	J-07	35.09	204	110	0.77	0.02	0.00	0.01
P-08	J-07	J-08	39.87	155	100	0.74	0.04	0.00	0.03
P-09	J-08	J-09	38.28	155	100	0.37	0.02	0.00	0.01
P-10	J-07	J-10	31.70	204	110	-0.34	0.01	0.00	0.00
P-11	J-10	J-11	43.03	155	100	0.74	0.04	0.00	0.03
P-12	J-11	J-12	38.32	155	100	0.37	0.02	0.00	0.01
P-13	J-10	J-13	32.31	204	110	-1.45	0.04	0.00	0.02
P-14	J-13	J-14	43.36	204	110	-1.82	0.06	0.00	0.03
P-15	J-14	J-15	40.42	204	110	-2.19	0.07	0.00	0.05
P-16	J-15	J-16	10.22	204	110	-2.56	0.08	0.00	0.07
P-17	J-16	RES-02	4.18	204	110	-2.56	0.08	0.00	0.06
P-18	RES-01	J-17	5.98	204	110	3.00	0.09	0.00	0.09

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J-01	0.37	108.52	156	68
J-02	0.37	108.79	156	68
J-03	0.37	108.56	156	68
J-04	0.37	108.57	156	68
J-05	0.37	108.59	156	68
J-06	0.37	108.81	156	68
J-07	0.37	108.44	156	68
J-08	0.37	108.75	156	68
J-09	0.37	109.01	156	67
J-10	0.37	108.28	156	68
J-11	0.37	108.48	156	68
J-12	0.37	108.79	156	68
J-13	0.37	108.15	156	69
J-14	0.37	108.41	156	68
J-15	0.37	108.47	156	68
J-16	0.00	108.40	156	68
J-17	0.00	108.87	156	68

Appendix F MDD+FF Model Results

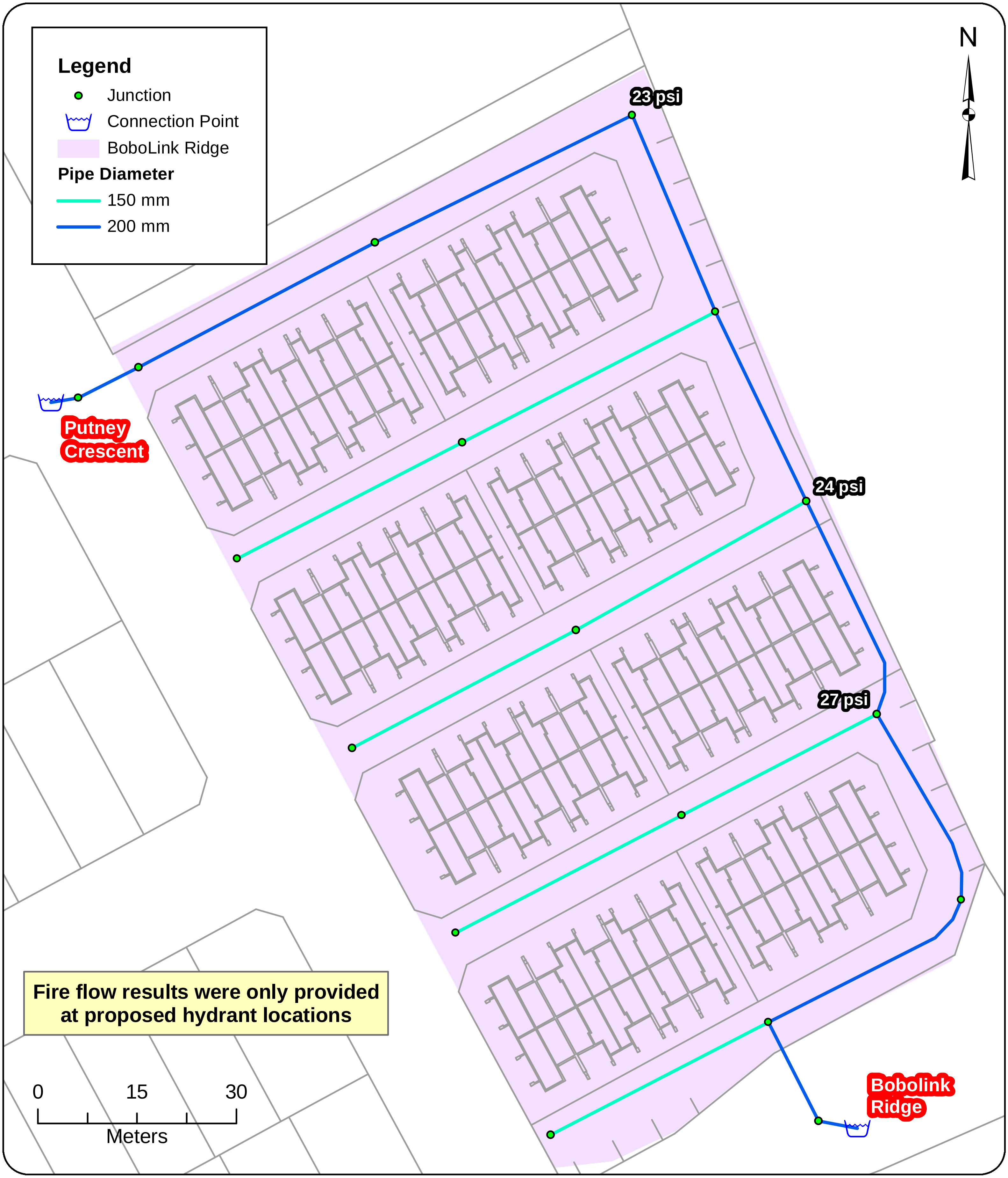


GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis**
Bobolink Ridge
2021-110-DSE
Client: **David Schaeffer Engineering Ltd.**
Date: **December 2021**
Created by: **BL**
Reviewed by: **WdS**

Available Fire Flow
Bobolink Ridge

Figure F.1



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis**
Bobolink Ridge
2021-110-DSE
Client: **David Schaeffer Engineering Ltd.**
Date: **December 2021**
Created by: **BL**
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DISCLAIMER: GeoAdvice does not warrant in any way the accuracy and completeness of the information shown on this map. Field verification of the accuracy and completeness of the information shown on this map is the sole responsibility of the user.

Residual Pressure Bobolink Ridge

Figure F.2

Fire Flow Modeling Results - Bobolink Ridge

ID	Static Demand (L/s)	Static Pressure (psi)	Static Head (m)	Fire-Flow Demand (L/s)	Residual Pressure (psi)	Available Flow at Hydrant (L/s)	Available Flow Pressure (psi)
J-04	0.25	49	143	267	27	327	20
J-07	0.25	47	141	267	24	299	20
J-13	0.25	41	137	267	23	292	20

APPENDIX C

Sanitary Servicing Documents

SANITARY SEWER CALCULATION SHEET

Ottawa

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION									COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	UNITS Singles	UNITS Townhouse	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
PRIVATE ROAD 3																													
	9A	10A	0.23	18			49	0.23	49	3.65	0.58		0.00		0.00		0.00	0.00	0.23	0.23	0.08	0.66	71.0	200	0.65	26.44	0.02	0.84	0.35
To PRIVATE ROAD 2, Pipe 10A - 11A								0.23	49				0.00		0.00		0.00			0.23									
PRIVATE ROAD 1																													
	3A	4A	0.26	20			54	0.26	54	3.65	0.64		0.00		0.00		0.00	0.00	0.26	0.26	0.09	0.72	77.0	200	0.65	26.44	0.03	0.84	0.36
To SERVICING 2, Pipe 4A - 5A								0.26	54				0.00		0.00		0.00			0.26									
	16A	1A	0.16	10			27	0.16	27	3.69	0.32		0.00		0.00		0.00	0.00	0.16	0.16	0.05	0.38	73.0	200	0.65	26.44	0.01	0.84	0.29
	1A	2A						0.16	27	3.69	0.32		0.00		0.00		0.00	0.00	0.00	0.16	0.05	0.38	7.0	200	0.35	19.40	0.02	0.62	0.24
	2A	4A						0.16	27	3.69	0.32		0.00		0.00		0.00	0.00	0.00	0.16	0.05	0.38	29.5	200	0.35	19.40	0.02	0.62	0.24
To SERVICING 2, Pipe 4A - 5A								0.16	27				0.00		0.00		0.00			0.16									
SERVICING 2																													
Contribution From PRIVATE ROAD 1, Pipe 2A - 4A								0.16	27				0.00		0.00		0.00		0.16	0.16									
Contribution From PRIVATE ROAD 1, Pipe 3A - 4A								0.26	54				0.00		0.00		0.00		0.26	0.42									
	4A	5A						0.42	81	3.61	0.95		0.00		0.00		0.00	0.00	0.00	0.42	0.14	1.09	3.5	200	0.35	19.40	0.06	0.62	0.33
	5A	6A						0.42	81	3.61	0.95		0.00		0.00		0.00	0.00	0.00	0.42	0.14	1.09	31.5	200	0.35	19.40	0.06	0.62	0.33
	6A	8A						0.42	81	3.61	0.95		0.00		0.00		0.00	0.00	0.00	0.42	0.14	1.09	4.0	200	0.35	19.40	0.06	0.62	0.33
To PRIVATE ROAD 2, Pipe 8A - 10A								0.42	81				0.00		0.00		0.00			0.42									
PRIVATE ROAD 2																													
	13A	14A	0.09	5			14	0.09	14	3.72	0.17		0.00		0.00		0.00	0.00	0.09	0.09	0.03	0.20	31.0	200	0.65	26.44	0.01	0.84	0.24
To SERVICING 1, Pipe 14A - EX. 129A								0.09	14				0.00		0.00		0.00			0.09									
	7A	8A	0.25	19			52	0.25	52	3.65	0.61		0.00		0.00		0.00	0.00	0.25	0.25	0.08	0.70	73.0	200	0.65	26.44	0.03	0.84	0.36
Contribution From SERVICING 2, Pipe 6A - 8A								0.42	81				0.00		0.00		0.00		0.42	0.67									
	8A	10A						0.67	133	3.57	1.54		0.00		0.00		0.00	0.00	0.00	0.67	0.22	1.76	33.0	200	0.35	19.40	0.09	0.62	0.38
Contribution From PRIVATE ROAD 3, Pipe 9A - 10A								0.23	49				0.00		0.00		0.00		0.23	0.90									
	10A	11A						0.90	182	3.53	2.08		0.00		0.00		0.00	0.00	0.00	0.90	0.30	2.38	28.5	200	0.35	19.40	0.12	0.62	0.42
	11A	12A						0.90	182	3.53	2.08		0.00		0.00		0.00	0.00	0.00	0.90	0.30	2.38	10.0	200	0.35	19.40	0.12	0.62	0.42
	12A	14A	0.06	4			11	0.96	193	3.52	2.20		0.00		0.00		0.00	0.00	0.06	0.96	0.32	2.52	29.5	200	0.35	19.40	0.13	0.62	0.42
To SERVICING 1, Pipe 14A - EX. 129A								0.96	193				0.00		0.00		0.00			0.96									
SERVICING 1																													
Contribution From PRIVATE ROAD 2, Pipe 12A - 14A								0.96	193				0.00		0.00		0.00		0.96	0.96									
Contribution From PRIVATE ROAD 2, Pipe 13A - 14A								0.09	14				0.00		0.00		0.00		0.09	1.05									
	14A	EX. 129A						1.05	207	3.51	2.36		0.00		0.00		0.00	0.00	0.00	1.05	0.35	2.70	15.5	200	0.35	19.40	0.14	0.62	0.43

LICENSED PROFESSIONAL ENGINEER
S. L. MERRICK
100186523
2022-01-13
PROVINCE OF ONTARIO

21-1261

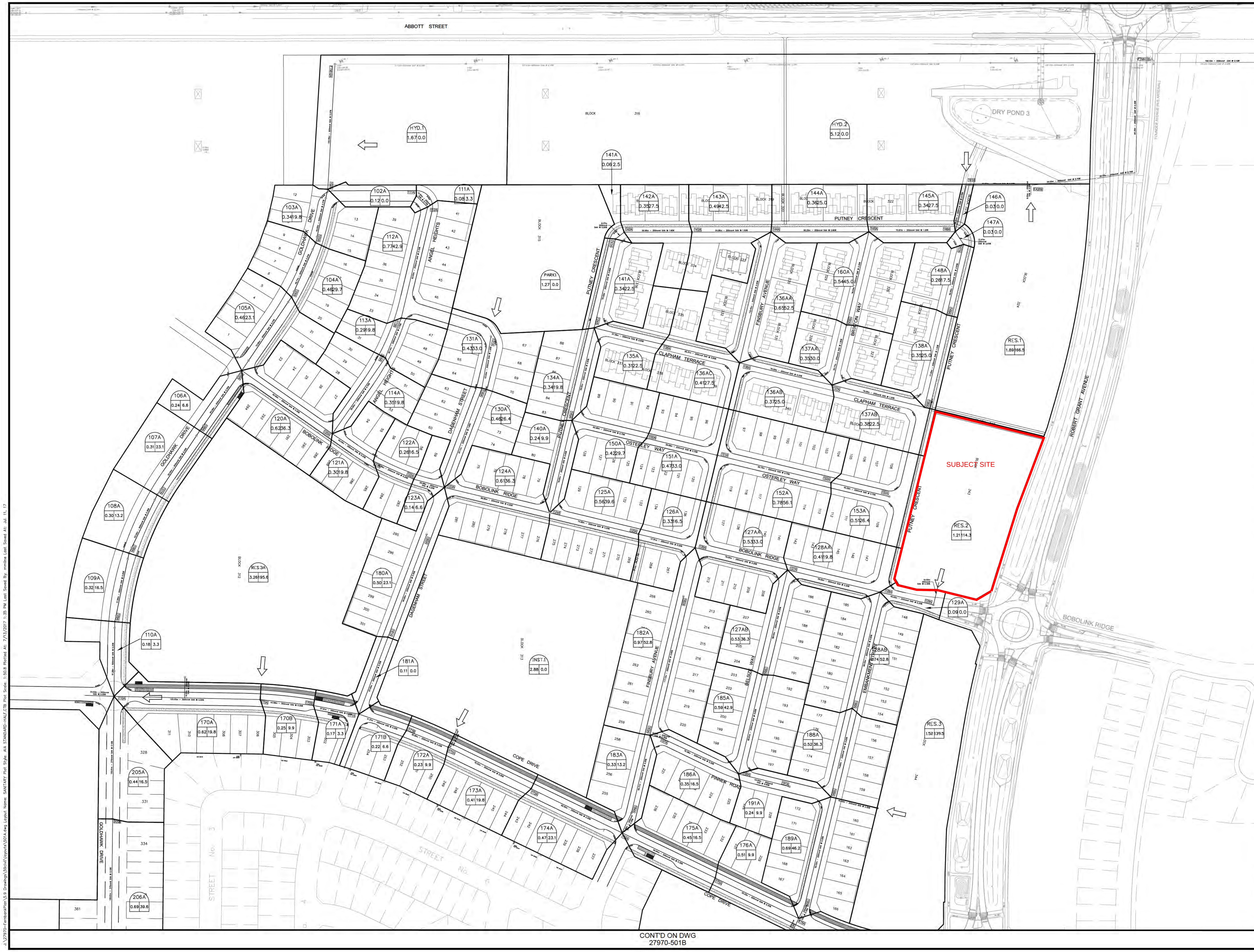
DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha
Average Daily Flow =	280	l/p/day		
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha
Max Res. Peak Factor =	4.00			
Commercial/Inst./Park Peak Factor =	1.00			
Institutional =	0.32	l/s/Ha		

Industrial Peak Factor = as per MOE Graph

Extraneous Flow =		0.330	L/s/ha	
Minimum Velocity =		0.600	m/s	
Manning's n =	(Conc)	0.013	(Pvc)	0.013
Townhouse coeff=		2.7		
Single house coeff=		3.4		

Designed: GGG	PROJECT: **BOBALINK DRIVE - PHASE 1**
Checked: SLM	LOCATION: **City of Ottawa**
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No. 14	File Ref: 12-1261
Date: **13 Jan 2022**	Sheet No. 1 of 1



REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ____________________

Date ____________________ 2017

Plan Number ____________________

LEGEND :

- AREA ID #
- POPULATION
- AREA IN HECTARES
- FUTURE MINOR FLOW DIRECTION

NOTES:

1. THIS ALLOWANCE IS FOR OPA66 EXPANSION AREAS 6a, 6b AND 6c.
2. AN ALLOWANCE OF 100l/s HAS BEEN MADE FOR FLOWS TRIBUTARY TO THE LAIRD STREET PUMP STATION.

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7	RESUBMISSION FOR MOE APPROVAL	JIM	17:07:14
6	SUBMISSION FOR MOE APPROVAL	JIM	17:02:10
5	SUBMISSION #5 FOR CITY REVIEW	JIM	16:11:10
4	SUBMISSION #4 FOR CITY REVIEW	JIM	15:06:15
3	SUBMISSION #3 FOR CITY REVIEW	JIM	14:08:22
2	SUBMISSION #2 FOR CITY REVIEW	JIM	14:01:22
1	SUBMISSION #1 FOR CITY REVIEW	JIM	13:08:29

CRT DEVELOPMENT INC.

IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title

CRT LANDS
FERNBANK COMMUNITY
PHASE 1

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
2017/07/14
PROVINCE OF ONTARIO

Drawing Title

SANITARY DRAINAGE
AREA PLAN

Scale
1:1250

Design	Date
J.I.M.	OCTOBER '12
Drawn	**Checked**
M.M.	P.K.
Project No.	**Drawing No.**
27970	501A

D07-16-11-0003

#17366

IBI GROUP
IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

SANITARY SEWER DESIGN SHEET

PROJECT: CRT DEVELOPMENT
LOCATION: CITY OF OTTAWA
CLIENT: CRT DEVELOPMENT INC.

LOCATION				RESIDENTIAL									ICI AREAS							INFILTRATION ALLOWANCE			TOTAL	PROPOSED SEWER DESIGN						
				UNIT TYPES				AREA	POPULATION		PEAK	PEAK	AREA (Ha)						PEAK	AREA (Ha)		FLOW	FLOW	CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE	
											FACTOR	FLOW	INSTITUTIONAL		COMMERCIAL		INDUSTRIAL		FLOW									(full)	CAPACITY	
STREET	AREA ID	FROM MH	TO MH	SF	SD	TH	APT	(Ha)	IND	CUM		(L/s)	IND	CUM	IND	CUM	IND	CUM	(L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(m/s)	L/s	(%)
PUTNEY CRESCENT	141A	141A	142A			1		0.06	2.5	2.5	4.00	0.04		0.00		0.00		0.00	0.00	0.06	0.06	0.02	0.06	24.19	9.07	200	0.50	0.746	24.14	99.76
PUTNEY CRESCENT	142A	142A	143A			11		0.35	27.5	30.0	4.00	0.49		0.00		0.00		0.00	0.00	0.35	0.41	0.11	0.60	47.16	55.56	200	1.90	1.454	46.56	98.73
PUTNEY CRESCENT	143A	143A	144A			17		0.49	42.5	72.5	4.00	1.17		0.00		0.00		0.00	0.00	0.49	0.90	0.25	1.43	41.91	64.86	200	1.50	1.292	40.48	96.60
FINSBURY AVENUE	136AA	136A	144A			21		0.65	52.5	52.5	4.00	0.85		0.00		0.00		0.00	0.00	0.65	0.65	0.18	1.03	53.56	110.44	200	2.45	1.652	52.52	98.07
PUTNEY CRESCENT	144A	144A	145A			10		0.36	25.0	150.0	4.00	2.43		0.00		0.00		0.00	0.00	0.36	1.91	0.53	2.97	32.46	80.25	200	0.90	1.001	29.50	90.86
CLAPHAM TERRACE	136AB	136A	137A			10		0.37	25.0	25.0	4.00	0.41		0.00		0.00		0.00	0.00	0.37	0.37	0.10	0.51	24.19	78.00	200	0.50	0.746	23.69	97.90
BRIXTON WAY	137AA	137A	160A			12		0.35	30.0	55.0	4.00	0.89		0.00		0.00		0.00	0.00	0.35	0.72	0.20	1.09	41.91	50.77	200	1.50	1.292	40.81	97.39
BRIXTON WAY	160A	160A	145A			18		0.54	45.0	100.0	4.00	1.62		0.00		0.00		0.00	0.00	0.54	1.26	0.35	1.97	52.45	78.53	200	2.35	1.617	50.48	96.24
PUTNEY CRESCENT	145A	145A	146A			11		0.34	27.5	277.5	4.00	4.50		0.00		0.00		0.00	0.00	0.34	3.51	0.98	5.48	39.76	70.87	200	1.35	1.226	34.28	86.22
CLAPHAM WAY	137AB	137A	138A			9		0.38	22.5	22.5	4.00	0.36		0.00		0.00		0.00	0.00	0.38	0.38	0.11	0.47	37.48	78.00	200	1.20	1.156	37.01	98.74
PUTNEY CRESCENT	138A	138A	148A			10		0.35	25.0	47.5	4.00	0.77		0.00		0.00		0.00	0.00	0.35	0.73	0.20	0.97	40.49	77.95	200	1.40	1.248	39.51	97.59
PUTNEY CRESCENT	148A	148A	147A			7		0.26	17.5	65.0	4.00	1.05		0.00		0.00		0.00	0.00	0.26	0.99	0.28	1.33	55.70	59.50	200	2.65	1.718	54.37	97.61
PUTNEY CRESCENT	147A	147A	146A			0		0.03	0.0	65.0	4.00	1.05		0.00		0.00		0.00	0.00	0.03	1.02	0.29	1.34	55.70	12.47	200	2.65	1.718	54.36	97.60
BLOCK 323	146A	146A	161A			0		0.03	0.0	342.5	4.00	5.55		0.00		0.00		0.00	0.00	0.03	4.56	1.28	6.83	28.63	38.97	200	0.70	0.883	21.80	76.15
BLOCK 316	HYD. 2	161A	*Ex.209*			0		5.12	0.0	342.5	4.00	5.55		0.00		0.00		0.00	0.00	5.12	9.68	2.71	8.26	28.63	53.67	200	0.70	0.883	20.37	71.15
BLOCK 324	RES.1	BULKHEAD	*Ex.209*					1.89	170.1	170.1	4.00	2.76		0.00		0.00		0.00	0.00	1.89	1.89	0.53	3.29	43.87	8.00	250	0.50	0.866	40.58	92.51
				Refer to ECA No. 9079-9LNNZC dated July 9, 2014 for description of existing sewers.																										

Design Parameters:

Residential			ICI Areas			Peak Factor
SF	3.3	p/p/u	INST	50,000	L/Ha/day	1.5
TH/SD	2.5	p/p/u	COM	50,000	L/Ha/day	1.5
APT	1.8	p/p/u	IND	35,000	L/Ha/day	MOE Chart
Low	60	p/p/Ha				
Med	75	p/p/Ha				
High	90	p/p/Ha				

Notes:

1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day
3. Infiltration allowance: 0.28 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+P^0.5))
   where P = population in thousands

Designed: J.I.M.

Checked: P.K.

Dwg. Reference: 27970 - 501, 501A, 501B

No.	Revision	Date
1.	Submission No. 1 to City of Ottawa	2013-08-29
2.	Submission No. 2 to City of Ottawa	2014-01-22
3.	Submission No. 3 to City of Ottawa	2014-08-22
4.	Submission No. 4 to City of Ottawa	2015-06-15
5.	Submission No. 5 to City of Ottawa	2016-11-10
6.	Submission for MOE Approval	2017-02-10
7.	Resubmission for MOE Approval	2017-07-14

File Reference:	Date:	Sheet No:
27970.5.7.1	2017-07-14	1 of 4

IBI GROUP

IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

SANITARY SEWER DESIGN SHEET

PROJECT: CRT DEVELOPMENT
LOCATION: CITY OF OTTAWA
CLIENT: CRT DEVELOPMENT INC.

LOCATION				RESIDENTIAL									ICI AREAS							INFILTRATION ALLOWANCE			TOTAL	PROPOSED SEWER DESIGN						
				UNIT TYPES				AREA	POPULATION		PEAK	PEAK	AREA (Ha)						PEAK	AREA (Ha)		FLOW	FLOW	CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE	
													INSTITUTIONAL		COMMERCIAL		INDUSTRIAL											(full)	CAPACITY	
STREET	AREA ID	FROM MH	TO MH	SF	SD	TH	APT	(Ha)	IND	CUM	FACTOR	FLOW (L/s)	IND	CUM	IND	CUM	IND	CUM	FLOW (L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(m/s)	L/s	(%)
CLAPHAM TERRACE	136AC	136A	135A			11		0.41	27.5	27.5	4.00	0.45		0.00		0.00		0.00	0.00	0.41	0.41	0.11	0.56	27.59	65.31	200	0.65	0.851	27.03	97.97
CLAPHAM TERRACE	135A	135A	134A			9		0.31	22.5	50.0	4.00	0.81		0.00		0.00		0.00	0.00	0.31	0.72	0.20	1.01	27.59	57.36	200	0.65	0.851	26.57	96.33
PUTNEY CRESCENT	141A	141A	134A			9		0.34	22.5	22.5	4.00	0.36		0.00		0.00		0.00	0.00	0.34	0.34	0.10	0.46	32.46	75.02	200	0.90	1.001	32.00	98.58
PUTNEY CRESCENT	134A	134A	140A	6				0.34	19.8	92.3	4.00	1.50		0.00		0.00		0.00	0.00	0.34	1.40	0.39	1.89	32.46	78.00	200	0.90	1.001	30.57	94.18
OSTERLEY WAY	153A	153A	152A	8				0.51	26.4	26.4	4.00	0.43		0.00		0.00		0.00	0.00	0.51	0.51	0.14	0.57	29.63	49.25	200	0.75	0.914	29.06	98.07
OSTERLEY WAY	152A	152A	151A	17				0.78	56.1	82.5	4.00	1.34		0.00		0.00		0.00	0.00	0.78	1.29	0.36	1.70	29.63	95.75	200	0.75	0.914	27.93	94.27
OSTERLEY WAY	151A	151A	150A	10				0.47	33.0	115.5	4.00	1.87		0.00		0.00		0.00	0.00	0.47	1.76	0.49	2.36	29.63	59.68	200	0.75	0.914	27.27	92.02
OSTERLEY WAY	150A	150A	140A	9				0.42	29.7	145.2	4.00	2.35		0.00		0.00		0.00	0.00	0.42	2.18	0.61	2.96	29.63	62.98	200	0.75	0.914	26.67	90.00
PUTNEY CRESCENT	140A	140A	124A	3				0.24	9.9	247.4	4.00	4.01		0.00		0.00		0.00	0.00	0.24	3.82	1.07	5.08	32.46	78.00	200	0.90	1.001	27.38	84.36
BLOCK 343	RES.2	BLKHD	129A					1.21	108.9	108.9	4.00	1.76		0.00		0.00		0.00	0.00	1.21	1.21	0.34	2.10	20.24	19.00	200	0.35	0.624	18.14	89.61
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BOBOLINK RIDGE	128AA	128A	127A	6				0.41	19.8	128.7	4.00	2.09		0.00		0.00		0.00	0.00	0.41	1.71	0.48	2.56	31.02	78.00	250	0.25	0.612	28.46	91.73
BOBOLINK RIDGE	127AA	127A	126A	10				0.53	33.0	161.7	4.00	2.62		0.00		0.00		0.00	0.00	0.53	2.24	0.63	3.25	31.02	78.00	250	0.25	0.612	27.77	89.53
BOBOLINK RIDGE	126A	126A	125A	5				0.33	16.5	178.2	4.00	2.89		0.00		0.00		0.00	0.00	0.33	2.57	0.72	3.61	31.02	47.81	250	0.25	0.612	27.41	88.37
BOBOLINK RIDGE	125A	125A	124A	12				0.56	39.6	217.8	4.00	3.53		0.00		0.00		0.00	0.00	0.56	3.13	0.88	4.41	31.02	74.85	250	0.25	0.612	26.61	85.80
BOBOLINK RIDGE	124A	124A	123A	11				0.61	36.3	501.5	3.97	8.07		0.00		0.00		0.00	0.00	0.61	7.56	2.12	10.19	31.02	88.85	250	0.25	0.612	20.83	67.15
DAGENHAM STREET	PARK1, 131A	131A	130A	7				1.70	23.1	23.1	4.00	0.37		0.00		0.00		0.00	0.00	1.70	1.70	0.48	0.85	34.22	43.00	200	1.00	1.055	33.37	97.51
DAGENHAM STREET	130A	130A	123A	8				0.46	26.4	49.5	4.00	0.80		0.00		0.00		0.00	0.00	0.46	2.16	0.60	1.41	34.22	87.11	200	1.00	1.055	32.81	95.89
BOBOLINK RIDGE	123A	123A	122A	2				0.14	6.6	557.6	3.95	8.92		0.00		0.00		0.00	0.00	0.14	9.86	2.76	11.68	31.02	25.98	250	0.25	0.612	19.34	62.34
BOBOLINK RIDGE	122A	122A	121A	5				0.26	16.5	574.1	3.94	9.17		0.00		0.00		0.00	0.00	0.26	10.12	2.83	12.00	31.02	36.36	250	0.25	0.612	19.02	61.31
BOBOLINK RIDGE	121A	121A	120A	6				0.30	19.8	593.9	3.93	9.47		0.00		0.00		0.00	0.00	0.30	10.42	2.92	12.38	31.02	40.43	250	0.25	0.612	18.64	60.08
ANGEL HEIGHTS	111A	111A	112A	1				0.08	3.3	3.3	4.00	0.05		0.00		0.00		0.00	0.00	0.08	0.08	0.02	0.08	28.63	12.92	200	0.70	0.883	28.55	99.73
ANGEL HEIGHTS	112A	112A	113A	13				0.77	42.9	46.2	4.00	0.75		0.00		0.00		0.00	0.00	0.77	0.85	0.24	0.99	28.63	95.21	200	0.70	0.883	27.64	96.55
ANGEL HEIGHTS	113A	113A	114A	6				0.29	19.8	66.0	4.00	1.07		0.00		0.00		0.00	0.00	0.29	1.14	0.32	1.39	28.63	38.92	200	0.70	0.883	27.24	95.15
ANGEL HEIGHTS	114A	114A	120A	6				0.35	19.8	85.8	4.00	1.39		0.00		0.00		0.00	0.00	0.35	1.49	0.42	1.81	28.63	70.46	200	0.70	0.883	26.82	93.69
BOBOLINK RIDGE	120A	120A	105A	11				0.62	36.3	716.0	3.89	11.28		0.00		0.00		0.00	0.00	0.62	12.53	3.51	14.79	36.70	90.60	250	0.35	0.724	21.91	59.71

Design Parameters:

Residential			ICI Areas			Peak Factor
SF	3.3	p/p/u	INST	50,000	L/Ha/day	1.5
TH/SD	2.5	p/p/u	COM	50,000	L/Ha/day	1.5
APT	1.8	p/p/u	IND	35,000	L/Ha/day	MOE Chart
Low	60	p/p/Ha				
Med	75	p/p/Ha				
High	90	p/p/Ha				

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day
3. Infiltration allowance: 0.28 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+P^0.5))
   where P = population in thousands

Designed: J.I.M.

Checked: P.K.

Dwg. Reference: 27970 - 501, 501A, 501B

No.	Revision	Date
1.	Submission No. 1 to City of Ottawa	2013-08-29
2.	Submission No. 2 to City of Ottawa	2014-01-22
3.	Submission No. 3 to City of Ottawa	2014-08-22
4.	Submission No. 4 to City of Ottawa	2015-06-15
5.	Submission No. 5 to City of Ottawa	2016-11-10
6.	Submission for MOE Approval	2017-02-10
7.	Resubmission for MOE Approval	2017-07-14

File Reference:	Date:	Sheet No:
27970.5.7.1	2017-07-14	2 of 4

IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

SANITARY SEWER DESIGN SHEET

PROJECT: CRT DEVELOPMENT
LOCATION: CITY OF OTTAWA
CLIENT: CRT DEVELOPMENT INC.

LOCATION				RESIDENTIAL									ICI AREAS							INFILTRATION ALLOWANCE			TOTAL	PROPOSED SEWER DESIGN						
				UNIT TYPES				AREA	POPULATION		PEAK	PEAK	AREA (Ha)						PEAK	AREA (Ha)		FLOW	FLOW	CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
													INSTITUTIONAL		COMMERCIAL		INDUSTRIAL													
STREET	AREA ID	FROM MH	TO MH	SF	SD	TH	APT	(Ha)	IND	CUM	FACTOR	FLOW (L/s)	IND	CUM	IND	CUM	IND	CUM	FLOW (L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(full) (m/s)	L/s	(%)
EMBANKMENT STREET	128AB	128A	188A	16				0.74	52.8	52.8	4.00	0.86		0.00		0.00		0.00	0.00	0.74	0.74	0.21	1.06	27.59	98.00	200	0.65	0.851	26.52	96.15
EMBANKMENT STREET	188A	188A	189A	11				0.52	36.3	89.1	4.00	1.44		0.00		0.00		0.00	0.00	0.52	1.26	0.35	1.80	27.59	74.80	200	0.65	0.851	25.79	93.49
BLOCK 344	RES.3	192A	189A					1.52	136.8	136.8	4.00	2.22		0.00		0.00		0.00	0.00	1.52	1.52	0.43	2.64	20.24	40.00	200	0.35	0.624	17.60	86.95
EMBANKMENT STREET	189A	189A	190A	14				0.69	46.2	272.1	4.00	4.41		0.00		0.00		0.00	0.00	0.69	3.47	0.97	5.38	20.24	92.53	200	0.35	0.624	14.86	73.42
EMBANKMENT STREET		190A	176A	0				0.00	0.0	272.1	4.00	4.41		0.00		0.00		0.00	0.00	0.00	3.47	0.97	5.38	20.24	10.78	200	0.35	0.624	14.86	73.42
BLOCK 345	INST.2	BULKHEAD	176A	0				0.00	0.0	0.0	4.00	0.00	6.53	6.53		0.00		0.00	5.67	6.53	6.53	1.83	7.50	20.24	21.00	200	0.35	0.624	12.75	62.97
COPE DRIVE	176A	176A	175A	3				0.63	9.9	282.0	4.00	4.57		6.53		0.00		0.00	5.67	0.63	10.63	2.98	13.21	20.24	76.03	200	0.35	0.624	7.03	34.72
COPE DRIVE	175A	175A	174A	5				0.46	16.5	298.5	4.00	4.84		6.53		0.00		0.00	5.67	0.46	11.09	3.11	13.61	20.24	84.94	200	0.35	0.624	6.63	32.76
BELSIZE WAY	127AB	127A	185A	11				0.53	36.3	36.3	4.00	0.59		0.00		0.00		0.00	0.00	0.53	0.53	0.15	0.74	27.59	88.50	200	0.65	0.851	26.85	97.33
BELSIZE WAY	185A	185A	186A	13				0.59	42.9	79.2	4.00	1.28		0.00		0.00		0.00	0.00	0.59	1.12	0.31	1.60	27.59	83.61	200	0.65	0.851	25.99	94.21
PINNER ROAD	191A	191A	186A	3				0.24	9.9	9.9	4.00	0.16		0.00		0.00		0.00	0.00	0.24	0.24	0.07	0.23	27.59	43.00	200	0.65	0.851	27.36	99.17
PINNER ROAD	186A	186A	187A	5				0.35	16.5	105.6	4.00	1.71		0.00		0.00		0.00	0.00	0.35	1.71	0.48	2.19	20.24	70.39	200	0.35	0.624	18.05	89.18
PINNER ROAD		187A	183A	0				0.00	0.0	105.6	4.00	1.71		0.00		0.00		0.00	0.00	0.00	1.71	0.48	2.19	20.24	9.00	200	0.35	0.624	18.05	89.18
FINSBURY AVENUE	182A	182A	183A	16				0.97	52.8	52.8	4.00	0.86		0.00		0.00		0.00	0.00	0.97	0.97	0.27	1.13	32.46	117.13	200	0.90	1.001	31.33	96.53
FINSBURY AVENUE	183A	183A	184A	4				0.33	13.2	171.6	4.00	2.78		0.00		0.00		0.00	0.00	0.33	3.01	0.84	3.62	20.24	65.71	200	0.35	0.624	16.62	82.10
FINSBURY AVENUE		184A	174A	0				0.00	0.0	171.6	4.00	2.78		0.00		0.00		0.00	0.00	0.00	3.01	0.84	3.62	20.24	17.89	200	0.35	0.624	16.62	82.10
COPE DRIVE	174A	174A	173A	7				0.47	23.1	493.2	3.98	7.95		6.53		0.00		0.00	5.67	0.47	14.57	4.08	17.69	31.02	82.90	250	0.25	0.612	13.33	42.96
COPE DRIVE	173A	173A	172A	6				0.41	19.8	513.0	3.97	8.25		6.53		0.00		0.00	5.67	0.41	14.98	4.19	18.11	31.02	76.02	250	0.25	0.612	12.91	41.62
BLOCK 313	INST.1	BULKHEAD	172A	0				0.00	0.0	0.0	4.00	0.00	2.88	2.88		0.00		0.00	2.50	2.88	2.88	0.81	3.31	20.24	16.00	200	0.35	0.624	16.94	83.67
COPE DRIVE	172A	172A	171B	3				0.23	9.9	522.9	3.96	8.40		9.41		0.00		0.00	8.17	0.23	18.09	5.07	21.63	31.02	36.96	250	0.25	0.612	9.39	30.27
COPE DRIVE	171B	171B	171A	2				0.22	6.6	529.5	3.96	8.50		9.41		0.00		0.00	8.17	0.22	18.31	5.13	21.79	31.02	41.21	250	0.25	0.612	9.23	29.75
DAGENHAM STREET	180A	180A	181A	7				0.50	23.1	23.1	4.00	0.37		0.00		0.00		0.00	0.00	0.50	0.50	0.14	0.51	20.24	90.00	200	0.35	0.624	19.73	97.46
DAGENHAM STREET	181A	181A	171A	0				0.11	0.0	23.1	4.00	0.37		0.00		0.00		0.00	0.00	0.11	0.61	0.17	0.55	20.24	67.50	200	0.35	0.624	19.70	97.31
COPE DRIVE	171A	171A	170B	1				0.17	3.3	555.9	3.95	8.90		9.41		0.00		0.00	8.17	0.17	19.09	5.35	22.41	45.12	37.91	300	0.20	0.618	22.71	50.33
COPE DRIVE	170B	170B	170A	3				0.25	9.9	565.8	3.95	9.04		9.41		0.00		0.00	8.17	0.25	19.34	5.42	22.63	45.12	43.98	300	0.20	0.618	22.49	49.84
BLOCK 312	RES.3A	BULKHEAD	sewer	0				3.26	195.6	195.6	4.00	3.17		0.00		0.00		0.00	0.00	3.26	3.26	0.91	4.08	20.24	16.22	200	0.35	0.624	16.16	79.83
COPE DRIVE	170A	170A	110A	6				0.62	19.8	781.2	3.87	12.24		9.41		0.00		0.00	8.17	0.62	23.22	6.50	26.91	45.12	120.00	300	0.20	0.618	18.21	40.36
GOLDHAWK DRIVE	306A	SOUTH	303A	31				1.83	102.3	102.3	4.00	1.66		0.00		0.00		0.00	0.00	1.83	1.83	0.51	2.17							
STREET NO. 26	304A	WEST	303A	14				0.69	46.2	46.2	4.00	0.75		0.00		0.00		0.00	0.00	0.69	0.69	0.19	0.94							
GOLDHAWK DRIVE	303A	303A	302A	10				0.62	33.0	181.5	4.00	2.94		0.00		0.00		0.00	0.00	0.62	3.14	0.88	3.82	20.24	94.58	200	0.35	0.624	16.42	81.13
Future Street	RES.5, 5A, Park3	EAST	302A					23.97	1421.4	1421.4	3.70	21.28		0.00		0.00		0.00	0.00	23.97	23.97	6.71	28.00							
GOLDHAWK DRIVE	302A	302A	301A	10				0.56	33.0	1635.9	3.65	24.20		0.00		0.00		0.00	0.00	0.56	27.67	7.75	31.95	50.44	70.68	300	0.25	0.691	18.49	36.66
GOLDHAWK DRIVE	301A	301A	207A	6				0.37	19.8	1655.7	3.65	24.47		0.00		0.00		0.00	0.00	0.37	28.04	7.85	32.32	50.44	70.00	300	0.25	0.691	18.12	35.93
STREET NO. 2	RES.4	EAST	207A					13.88	832.8	832.8	3.85	12.99		0.00		0.00		0.00	0.00	13.88	13.88	3.89	16.87							
GOLDHAWK DRIVE	207A	207A	206A	17				0.86	56.1	2544.6	3.50	36.10		0.00		0.00		0.00	0.00	0.86	42.78	11.98	48.08	70.84	107.19	375	0.15	0.621	22.76	32.13
GOLDHAWK DRIVE	206A	206A	205A	12				0.69	39.6	2584.2	3.50	36.60		0.00		0.00		0.00	0.00	0.69	43.47	12.17	48.78	70.84	106.61	375	0.15	0.621	22.07	31.15
GOLDHAWK DRIVE	205A	205A	110A	5				0.44	16.5	2600.7	3.49	36.81		0.00		0.00		0.00	0.00	0.44	43.91	12.29	49.11	70.84	100.61	375	0.15	0.621	21.73	30.68

Design Parameters:

Residential			ICI Areas			Peak Factor
SF	3.3	p/p/u	INST	50,000	L/Ha/day	1.5
TH/SD	2.5	p/p/u	COM	50,000	L/Ha/day	1.5
APT	1.8	p/p/u	IND	35,000	L/Ha/day	MOE Chart
Low	60	p/p/Ha				
Med	75	p/p/Ha				
High	90	p/p/Ha				

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day
3. Infiltration allowance: 0.28 L/s/Ha
4. Residential Peaking Factor:
Harmon Formula = 1+(14/(4+P^0.5))
where P = population in thousands

Designed: J.I.M.
Checked: P.K.
Dwg. Reference: 27970 - 501, 501A, 501B

No.	Revision	Date
1.	Submission No. 1 to City of Ottawa	2013-08-29
2.	Submission No. 2 to City of Ottawa	2014-01-22
3.	Submission No. 3 to City of Ottawa	2014-08-22
4.	Submission No. 4 to City of Ottawa	2015-06-15
5.	Submission No. 5 to City of Ottawa	2016-11-10
6.	Submission for MOE Approval	2017-02-10
7.	Resubmission for MOE Approval	2017-07-14

File Reference:	Date:	Sheet No:
27970.5.7.1	2017-07-14	3 of 4

IBI GROUP

IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

SANITARY SEWER DESIGN SHEET

PROJECT: CRT DEVELOPMENT
LOCATION: CITY OF OTTAWA
CLIENT: CRT DEVELOPMENT INC.

LOCATION				RESIDENTIAL									ICI AREAS							INFILTRATION ALLOWANCE			TOTAL	PROPOSED SEWER DESIGN						
				UNIT TYPES				AREA	POPULATION		PEAK	PEAK	AREA (Ha)						PEAK	AREA (Ha)		FLOW	FLOW	CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
											FACTOR	FLOW	INSTITUTIONAL		COMMERCIAL		INDUSTRIAL		FLOW									(full)		
STREET	AREA ID	FROM MH	TO MH	SF	SD	TH	APT	(Ha)	IND	CUM		(L/s)	IND	CUM	IND	CUM	IND	CUM	(L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(m/s)	L/s	(%)
																							0.00							
	LSPS	Allowance						0.00	0.0	0.0													108.00							
	STITTSVILLE 6 PS		110A					0.00	0.0	0.0				0.00		0.00		0.00	0.00				84.00							
Future Street	INST.3	BLKHD	110A					0.00	0.0	0.0			2.47	2.47		0.00		0.00	2.14											
	PARK4	BLKHD	110A					0.83	0.0	0.0				0.00		0.00		0.00	0.00											
	PARK5	BLKHD	110A					1.04	0.0	0.0				0.00		0.00		0.00	0.00											
	RES.9	BLKHD	110A					34.81	2610.8	2610.8				0.00		0.00		0.00	0.00											
	RES.7	BLKHD	110A					4.24	318.0	318.0				0.00		0.00		0.00	0.00											
	RES.13	BLKHD	110A					2.22	133.2	133.2				0.00		0.00		0.00	0.00											
	RES.12	BLKHD	110A					43.89	2633.4	2633.4				0.00		0.00		0.00	0.00											
	INST.4	BLKHD	110A					0.00	0.0	0.0			2.44	2.44		0.00		0.00	2.12											
	COMM.	BLKHD	110A					0.00	0.0	0.0				0.00	0.63	0.63		0.00	0.55											
	HYD.4	BLKHD	110A					3.06	0.0	0.0				0.00		0.00		0.00	0.00											
	RES.8	BLKHD	110A					2.30	172.5	172.5				0.00		0.00		0.00	0.00											
	HYD.5	BLKHD	110A					5.20	0.0	0.0				0.00		0.00		0.00	0.00											
Future Street	RES.11	BLKHD	110A					6.91	414.6	414.6				0.00		0.00		0.00	0.00											
	PARK6	BLKHD	110A					1.19	0.0	0.0				0.00		0.00		0.00	0.00											
	RES.10	BLKHD	110A					1.92	115.2	115.2				0.00		0.00		0.00	0.00											
	HYD.3	BLKHD	110A					6.31	0.0	0.0				0.00		0.00		0.00	0.00											
TOTAL		**BLKHD**	**110A**					**113.92**		**6397.7**	**3.14**	**81.49**		**4.91**		**0.63**		**0.00**	**4.81**	**119.46**	**119.46**	**33.45**	**311.74**	**320.28**	**24.02**	**600**	**0.25**	**1.097**	**8.54**	**2.67**
GOLDHAWK DRIVE		**110A**	**109A**					**0.00**	**0.0**	**9779.6**	**2.96**	**117.43**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**186.59**	**52.25**	**374.66**	**378.96**	**61.28**	**600**	**0.35**	**1.298**	**4.30**	**1.14**
GOLDHAWK DRIVE	**110A**	**1101A**	**1092A**	**1**				**0.18**	**3.3**	**3.3**	**4.00**	**0.05**								**0.18**	**0.18**	**0.05**	**0.10**	**28.63**	**61.28**	**200**	**0.70**	**0.883**	**28.52**	**99.64**
GOLDHAWK DRIVE		**109A**	**108A**					**0.00**	**0.0**	**9782.9**	**2.96**	**117.47**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**186.77**	**52.30**	**374.74**	**378.96**	**57.50**	**600**	**0.35**	**1.298**	**4.22**	**1.11**
GOLDHAWK DRIVE	**109A**	**1091A**	**1082A**	5				**0.32**	**16.5**	**16.5**	**4.00**	**0.27**								**0.32**	**0.32**	**0.09**	**0.36**	**28.63**	**57.50**	**200**	**0.70**	**0.883**	**28.27**	**98.75**
GOLDHAWK DRIVE		**108A**	**107A**					**0.00**	**0.0**	**9799.4**	**2.96**	**117.64**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**187.09**	**52.39**	**375.00**	**378.96**	**53.32**	**600**	**0.35**	**1.298**	**3.96**	**1.05**
GOLDHAWK DRIVE	**108A**	**1081A**	**1072A**	**4**				**0.30**	**13.2**	**13.2**	**4.00**	**0.21**							**0.00**	**0.30**	**0.30**	**0.08**	**0.30**	**28.63**	**53.32**	**200**	**0.70**	**0.883**	**28.33**	**98.96**
GOLDHAWK DRIVE		**107A**	**106A**					**0.00**	**0.0**	**9812.6**	**2.96**	**117.77**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**187.39**	**52.47**	**375.22**	**378.96**	**62.94**	**600**	**0.35**	**1.298**	**3.74**	**0.99**
GOLDHAWK DRIVE	**107A**	**1071A**	**1062A**	**7**				**0.31**	**23.1**	**23.1**	**4.00**	**0.37**		**0.00**		**0.00**		**0.00**	**0.00**	**0.31**	**0.31**	**0.09**	**0.46**	**28.63**	**62.94**	**200**	**0.70**	**0.883**	**28.17**	**98.39**
GOLDHAWK DRIVE		**106A**	**105A**					**0.00**	**0.0**	**9835.7**	**2.96**	**118.01**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**187.70**	**52.56**	**375.54**	**378.96**	**60.09**	**600**	**0.35**	**1.298**	**3.42**	**0.90**
GOLDHAWK DRIVE	**106A**	**1061A**	**1052A**	**2**				**0.24**	**6.6**	**6.6**	**4.00**	**0.11**		**0.00**		**0.00**		**0.00**	**0.00**	**0.24**	**0.24**	**0.07**	**0.17**	**28.63**	**60.09**	**200**	**0.70**	**0.883**	**28.45**	**99.39**
		105A	**104A**					**0.00**	**0.0**	**10558.3**	**2.93**	**125.37**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**200.47**	**56.13**	**386.48**	**389.64**	**72.85**	**600**	**0.37**	**1.335**	**3.16**	**0.81**
GOLDHAWK DRIVE	**105A**	**1051A**	**1042A**	**7**				**0.45**	**23.1**	**23.1**	**4.00**	**0.37**								**0.45**	**0.45**	**0.13**	**0.50**	**27.59**	**72.85**	**200**	**0.65**	**0.851**	**27.09**	**98.19**
GOLDHAWK DRIVE		**104A**	**103A**					**0.00**	**0.0**	**10581.4**	**2.93**	**125.60**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**200.92**	**56.26**	**386.84**	**389.64**	**48.77**	**600**	**0.37**	**1.335**	**2.80**	**0.72**
GOLDHAWK DRIVE	**104A**	**1041A**	**1032A**	**9**				**0.47**	**29.7**	**29.7**	**4.00**	**0.48**							**0.00**	**0.47**	**0.47**	**0.13**	**0.61**	**27.59**	**48.77**	**200**	**0.65**	**0.851**	**26.97**	**97.78**
GOLDHAWK DRIVE		**103A**	**102A**					**0.00**	**0.0**	**10611.1**	**2.93**	**125.90**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**201.39**	**56.39**	**387.27**	**389.64**	**45.00**	**600**	**0.37**	**1.335**	**2.37**	**0.61**
GOLDHAWK DRIVE	**103A, HYD1**	**1031A**	**1021A**	**6**				**2.01**	**19.8**	**19.8**	**4.00**	**0.32**							**0.00**	**2.01**	**2.01**	**0.56**	**0.88**	**27.59**	**45.00**	**200**	**0.65**	**0.851**	**26.70**	**96.80**
GOLDHAWK DRIVE	**102A**	**102A**	***FT-24 (EX)***					**0.12**	**0.0**	**10630.9**	**2.93**	**126.10**		**14.32**		**0.63**		**0.00**	**12.98**	**0.12**	**203.52**	**56.99**	**388.07**	**389.64**	**102.59**	**600**	**0.37**	**1.335**	**1.57**	**0.40**
HYDRO EASEMENT		***FT-24 (EX)***	***FT-23 (EX)***					**0.00**	**0.0**	**10650.7**	**2.93**	**126.30**		**14.32**		**0.63**		**0.00**	**12.98**	**0.00**	**205.53**	**57.55**	**388.83**	**400.03**	**107.50**	**600**	**0.39**	**1.371**	**11.20**	**2.80**

Design Parameters:

Residential			ICI Areas			Peak Factor
SF	3.3	p/p/u	INST	50,000	L/Ha/day	1.5
TH/SD	2.5	p/p/u	COM	50,000	L/Ha/day	1.5
APT	1.8	p/p/u	IND	35,000	L/Ha/day	MOE Chart
Low	60	p/p/Ha				
Med	75	p/p/Ha				
High	90	p/p/Ha				

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day
3. Infiltration allowance: 0.28 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+P^0.5))
   where P = population in thousands

Designed: J.I.M.

Checked: P.K.

Dwg. Reference: 27970 - 501, 501A, 501B

No.	Revision	Date
1.	Submission No. 1 to City of Ottawa	2013-08-29
2.	Submission No. 2 to City of Ottawa	2014-01-22
3.	Submission No. 3 to City of Ottawa	2014-08-22
4.	Submission No. 4 to City of Ottawa	2015-06-15
5.	Submission No. 5 to City of Ottawa	2016-11-10
6.	Submission for MOE Approval	2017-02-10
7.	Resubmission for MOE Approval	2017-07-14

File Reference:	Date:	Sheet No:
27970.5.7.1	2017-07-14	4 of 4

APPENDIX D

Stormwater Servicing Documents

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Ottawa

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Arterial Roads Return Frequency = 10 years

Manning 0.013

LOCATION			AREA (Ha)																FLOW						SEWER DATA								
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min)	Q/Q full
PRIVATE ROAD 3																																	
FOUNDATION FLOW (0.45 L/s/unit)																								8									
	203	204																	10.00	76.81	104.19	122.14	178.56	8	250	250	PVC	0.50	71.0	42.0499	0.8566	1.3814	0.190
To PRIVATE ROAD 2, Pipe 204 - 205																			11.38					8									
							0.01	0.85	0.02	0.02																							
							0.09	0.85	0.21	0.24																							
							0.13	0.85	0.31	0.54																							
							0.15	0.85	0.35	0.90																							
	210	204					0.18	0.85	0.43	1.32									10.00	76.81	104.19	122.14	178.56	138	450	450	CONC	0.40	3.0	180.3170	1.1338	0.0441	0.765
To PRIVATE ROAD 2, Pipe 204 - 205										1.32									10.04														
PRIVATE ROAD 2																																	
FOUNDATION FLOW (0.45 L/s/unit)							0.00	0.00	0.00	0.00														2									
							0.01	0.85	0.02	0.02																							
							0.01	0.85	0.02	0.05																							
							0.03	0.76	0.06	0.11																							
	207	208					0.04	0.85	0.09	0.21									10.00	76.81	104.19	122.14	178.56	24	300	300	PVC	0.35	31.5	57.2089	0.8093	0.6487	0.413
To SERVICING 1, Pipe 208 - EX. MH 129										0.21									10.65					2									
FOUNDATION FLOW (0.45 L/s/unit)																								9									
	201	202																	10.00	76.81	104.19	122.14	178.56	9	250	250	PVC	0.45	73.0	39.8920	0.8127	1.4971	0.214
	202	204																	11.50	71.50	96.90	113.55	165.94	9	250	250	PVC	0.45	33.0	39.8920	0.8127	0.6768	0.214
Contribution From PRIVATE ROAD 3, Pipe 203 - 204										0.00									11.38					8									
Contribution From PRIVATE ROAD 3, Pipe 210 - 204										1.32									10.04														
	204	205							0.00	1.32									12.17	69.36	93.96	110.09	160.86	141	450	450	CONC	0.35	31.5	168.6711	1.0605	0.4950	0.835
	205	206							0.00	1.32									12.67	67.88	91.93	107.71	157.36	138	450	450	CONC	0.30	10.0	156.1591	0.9819	0.1697	0.885
FOUNDATION FLOW (0.45 L/s/unit)									0.00	1.32														2									
	206	208							0.00	1.32									12.84	67.39	91.26	106.91	156.19	139	450	450	CONC	0.35	29.5	168.6711	1.0605	0.4636	0.825
To SERVICING 1, Pipe 208 - EX. MH 129										1.32									13.30					18									
SERVICING 1																																	
Contribution From PRIVATE ROAD 2, Pipe 206 - 208										1.32									13.30					18									
Contribution From PRIVATE ROAD 2, Pipe 207 - 208										0.21									10.65					2									
	208	EX. MH 129							0.00	1.53									13.30	66.09	89.48	104.81	153.11	157	675	675	CONC	0.12	11.0	291.1883	0.8137	0.2253	0.540
PRIVATE ROAD 1																																	
FOUNDATION FLOW (0.45 L/s/unit)									0.00	0.00														5									
	103	104							0.00	0.00									10.00	76.81	104.19	122.14	178.56	5	250	250	PVC	0.45	79.0	39.8920	0.8127	1.6202	0.113
To SERVICING 3, Pipe 104 - 105										0.00									11.62					5									
FOUNDATION FLOW (0.45 L/s/unit)									0.00	0.00														9									
	101	102							0.00	0.00									10.00	76.81	104.19	122.14	178.56	9	250	250	PVC	0.50	77.0	42.0499	0.8566	1.4981	0.214
	102	104							0.00	0.00									11.50	71.49	96.89	113.55	165.93	9	250	250	PVC	0.45	37.5	39.8920	0.8127	0.7691	0.226
To SERVICING 3, Pipe 104 - 105										0.00									12.27					9									
SERVICING 3																																	
Contribution From PRIVATE ROAD 1, Pipe 102 - 104										0.00									12.27					9									
Contribution From PRIVATE ROAD 1, Pipe 103 - 104										0.00									11.62					5									
	104	105							0.00	0.00									12.27	69.07	93.57	109.63	160.19	14	300	300	PVC	1.95	2.5	135.0353	1.9104	0.0218	0.100
To SERVICING 3, Pipe 105 - MH 202 (B.O.)										0.00									12.29					14									
SERVICING 3																																	
							0.05	0.85	0.12	0.12																							
							0.12	0.85	0.28	0.40																							
							0.13	0.85	0.31	0.71																							
	107	105					0.15	0.85	0.35	1.06									10.00	76.81	104.19	122.14	178.56	111	450	450	CONC	0.25	3.0	142.5531	0.8963	0.0558	0.777
Contribution From SERVICING 3, Pipe 104 - 105										0.00									12.29					14									
	105	MH 202 (B.O.)							0.00	1.06									12.29	69.01	93.48	109.53	160.03	113	450	450	PVC	0.25	10.5	142.5531	0.8963	0.1952	0.792

LICENSED PROFESSIONAL ENGINEER
S. L. MERRICK
100186523
2022-01-13
PROVINCE OF ONTARIO

JOB # 21-1261

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: GGG	PROJECT:	BOBALINK DRIVE - BLOCK 343	
Checked: SLM	LOCATION:	City of Ottawa	
Dwg. Reference: Dwg 15	File Ref: 21-1261	Date: 13 Jan 2022	Sheet No. SHEET 1 OF 1

1261_STM.xlsx

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Drainage Area

Area ID	DCB 1		
Area	0.05	ha	
C	0.85	Rational Method runoff coefficient	
t_c	10.0	min	
Cascading Flow	52.2	L/s	<-- From CB 3

	5-year	100-year	
i	104.2	178.6	mm/hr
Q	12.3	21.1	L/s
Q w/ Cascading	64.5	73.3	L/s

Grate Capacity

Ponding Depth	0.15	m	
Single CB Capacity	120	L/s	OK
Twin CB Capacity	169	L/s	OK

Depth	OPSD 400.01	
H	SINGLE *	TWIN *
(m)	(L/s)	(L/s)
0	0	0
0.01	1	1
0.02	2	3
0.03	4	5
0.04	7	9
0.05	11	16
0.06	16	27
0.07	20	36
0.08	36	54
0.09	48	71
0.1	61	91
0.11	73	109
0.12	86	127
0.13	99	140
0.14	109	155
0.15	120	169
0.16	129	183
0.17	136	196
0.18	145	211
0.19	150	228
0.2	156	243
0.21	161	259
0.22	167	275
0.23	172	291
0.24	176	307
0.25	181	322
0.26	186	337
0.27	189	354
0.28	194	371
0.29	199	387
0.3	202	403

CB Lead Capacity

Upstream Flow	0	L/s	
Diameter	300	mm	
Slope	1.00	%	
$A_{hydraulic}$	0.071	m^2	
R	0.075	m	
CB Lead Capacity	96.7	L/s	OK

Cascading Flow

Cascading Flow NO CASCADING FLOW
Flow Directed

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Drainage Area

Area ID	DCB 2	
Area	0.25	ha
C	0.85	Rational Method runoff coefficient
t_c	10.0	min
Cascading Flow	0.0	L/s

	5-year	100-year	
i	104.2	178.6	mm/hr
Q	61.5	105.4	L/s
Q w/ Cascading	61.5	105.4	L/s

Grate Capacity

Ponding Depth	0.11	m	
Single CB Capacity	73	L/s	CHECK
Twin CB Capacity	109	L/s	OK

Depth H (m)	OPSD 400.01 SINGLE * (L/s)	TWIN * (L/s)
0	0	0
0.01	1	1
0.02	2	3
0.03	4	5
0.04	7	9
0.05	11	16
0.06	16	27
0.07	20	36
0.08	36	54
0.09	48	71
0.1	61	91
0.11	73	109
0.12	86	127
0.13	99	140
0.14	109	155
0.15	120	169
0.16	129	183
0.17	136	196
0.18	145	211
0.19	150	228
0.2	156	243
0.21	161	259
0.22	167	275
0.23	172	291
0.24	176	307
0.25	181	322
0.26	186	337
0.27	189	354
0.28	194	371
0.29	199	387
0.3	202	403

CB Lead Capacity

Upstream Flow	0	L/s	
Diameter	375	mm	
Slope	0.50	%	
$A_{hydraulic}$	0.110	m^2	
R	0.094	m	
CB Lead Capacity	124.0	L/s	OK

Cascading Flow

Cascading Flow NO CASCADING FLOW
Cascading Flow Directed To

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Drainage Area

Area ID	CB 3	
Area	0.15	ha
C	0.85	Rational Method runoff coefficient
t_c	10.0	min
Cascading Flow	0.0	L/s

	5-year	100-year	
i	104.2	178.6	mm/hr
Q	36.9	63.2	L/s
Q w/ Cascading	36.9	63.2	L/s

Grate Capacity

Ponding Depth	0.05	m	
Single CB Capacity	11	L/s	CHECK
Twin CB Capacity	16	L/s	CHECK

Depth H (m)	OPSD 400.01 SINGLE * (L/s)	TWIN * (L/s)
0	0	0
0.01	1	1
0.02	2	3
0.03	4	5
0.04	7	9
0.05	11	16
0.06	16	27
0.07	20	36
0.08	36	54
0.09	48	71
0.1	61	91
0.11	73	109
0.12	86	127
0.13	99	140
0.14	109	155
0.15	120	169
0.16	129	183
0.17	136	196
0.18	145	211
0.19	150	228
0.2	156	243
0.21	161	259
0.22	167	275
0.23	172	291
0.24	176	307
0.25	181	322
0.26	186	337
0.27	189	354
0.28	194	371
0.29	199	387
0.3	202	403

CB Lead Capacity

Upstream Flow	0	L/s	
Diameter	200	mm	
Slope	1.00	%	
$A_{hydraulic}$	0.031	m^2	
R	0.050	m	
CB Lead Capacity	32.8	L/s	CHECK

Cascading Flow

Cascading Flow	52.2 L/s
Flow Directed	DCB 1

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Drainage Area

Area ID	DCB 5		
Area	0.13	ha	
C	0.85	Rational Method runoff coefficient	
t_c	10.0	min	
Cascading Flow	26.9	L/s	<- From CB 8

	5-year	100-year	
i	104.2	178.6	mm/hr
Q	32.0	54.8	L/s
Q w/ Cascading	58.9	81.8	L/s

Grate Capacity

Ponding Depth	0.15	m	
Single CB Capacity	120	L/s	OK
Twin CB Capacity	169	L/s	OK

Depth H (m)	OPSD 400.01 SINGLE * (L/s)	TWIN * (L/s)
0	0	0
0.01	1	1
0.02	2	3
0.03	4	5
0.04	7	9
0.05	11	16
0.06	16	27
0.07	20	36
0.08	36	54
0.09	48	71
0.1	61	91
0.11	73	109
0.12	86	127
0.13	99	140
0.14	109	155
0.15	120	169
0.16	129	183
0.17	136	196
0.18	145	211
0.19	150	228
0.2	156	243
0.21	161	259
0.22	167	275
0.23	172	291
0.24	176	307
0.25	181	322
0.26	186	337
0.27	189	354
0.28	194	371
0.29	199	387
0.3	202	403

CB Lead Capacity

Upstream Flow	0	L/s	
Diameter	375	mm	
Slope	1.00	%	
$A_{hydraulic}$	0.110	m^2	
R	0.094	m	
CB Lead Capacity	175.3	L/s	OK

Cascading Flow

Cascading Flow NO CASCADING FLOW
Cascading Flow Directed To

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Drainage Area

Area ID	DCB 6	
Area	0.19	ha
C	0.85	Rational Method runoff coefficient
t_c	10.0	min
Cascading Flow	0.0	L/s

	5-year	100-year	
i	104.2	178.6	mm/hr
Q	46.7	80.1	L/s
Q w/ Cascading	46.7	80.1	L/s

Grate Capacity

Ponding Depth	0.25	m	
Single CB Capacity	181	L/s	OK
Twin CB Capacity	322	L/s	OK

Depth H (m)	OPSD 400.01 SINGLE * (L/s)	OPSD 400.01 TWIN * (L/s)
0	0	0
0.01	1	1
0.02	2	3
0.03	4	5
0.04	7	9
0.05	11	16
0.06	16	27
0.07	20	36
0.08	36	54
0.09	48	71
0.1	61	91
0.11	73	109
0.12	86	127
0.13	99	140
0.14	109	155
0.15	120	169
0.16	129	183
0.17	136	196
0.18	145	211
0.19	150	228
0.2	156	243
0.21	161	259
0.22	167	275
0.23	172	291
0.24	176	307
0.25	181	322
0.26	186	337
0.27	189	354
0.28	194	371
0.29	199	387
0.3	202	403

CB Lead Capacity

Upstream Flow	0	L/s	
Diameter	300	mm	
Slope	1.00	%	
$A_{hydraulic}$	0.071	m^2	
R	0.075	m	
CB Lead Capacity	96.7	L/s	OK

Cascading Flow

Cascading Flow NO CASCADING FLOW
Cascading Flow Directed To

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Drainage Area

Area ID	DCB 7	
Area	0.15	ha
C	0.85	Rational Method runoff coefficient
t_c	10.0	min
Cascading Flow	0.0	L/s

	5-year	100-year	
i	104.2	178.6	mm/hr
Q	36.9	63.2	L/s
Q w/ Cascading	36.9	63.2	L/s

Grate Capacity

Ponding Depth	0.09	m	
Single CB Capacity	48	L/s	CHECK
Twin CB Capacity	71	L/s	OK

Depth H (m)	OPSD 400.01 SINGLE * (L/s)	OPSD 400.01 TWIN * (L/s)
0	0	0
0.01	1	1
0.02	2	3
0.03	4	5
0.04	7	9
0.05	11	16
0.06	16	27
0.07	20	36
0.08	36	54
0.09	48	71
0.1	61	91
0.11	73	109
0.12	86	127
0.13	99	140
0.14	109	155
0.15	120	169
0.16	129	183
0.17	136	196
0.18	145	211
0.19	150	228
0.2	156	243
0.21	161	259
0.22	167	275
0.23	172	291
0.24	176	307
0.25	181	322
0.26	186	337
0.27	189	354
0.28	194	371
0.29	199	387
0.3	202	403

CB Lead Capacity

Upstream Flow	11	L/s	<- From CB 8
Diameter	300	mm	
Slope	1.00	%	
$A_{hydraulic}$	0.071	m^2	
R	0.075	m	
CB Lead Capacity	96.7	L/s	OK

Cascading Flow

Cascading Flow NO CASCADING FLOW
Cascading Flow Directed To

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Drainage Area

Area ID	CB 8		
Area	0.09	ha	
C	0.85	Rational Method runoff coefficient	
t_c	10.0	min	
Cascading Flow	0.0	L/s	<- From CB 7

	5-year	100-year	
i	104.2	178.6	mm/hr
Q	22.1	37.9	L/s
Q w/ Cascading	22.1	37.9	L/s

Grate Capacity

Ponding Depth	0.05	m	
Single CB Capacity	11	L/s	CHECK
Twin CB Capacity	16	L/s	CHECK

Depth H (m)	OPSD 400.01 SINGLE * (L/s)	OPSD 400.01 TWIN * (L/s)
0	0	0
0.01	1	1
0.02	2	3
0.03	4	5
0.04	7	9
0.05	11	16
0.06	16	27
0.07	20	36
0.08	36	54
0.09	48	71
0.1	61	91
0.11	73	109
0.12	86	127
0.13	99	140
0.14	109	155
0.15	120	169
0.16	129	183
0.17	136	196
0.18	145	211
0.19	150	228
0.2	156	243
0.21	161	259
0.22	167	275
0.23	172	291
0.24	176	307
0.25	181	322
0.26	186	337
0.27	189	354
0.28	194	371
0.29	199	387
0.3	202	403

CB Lead Capacity

Upstream Flow	0	L/s	
Diameter	200	mm	
Slope	1.00	%	
$A_{hydraulic}$	0.031	m^2	
R	0.050	m	
CB Lead Capacity	32.8	L/s	CHECK

Cascading Flow

Cascading Flow	26.9
Cascading Flow Directed To	DCB 5

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Drainage Area

Area ID	CB 10	
Area	0.04	ha
C	0.85	Rational Method runoff coefficient
t_c	10.0	min
Cascading Flow	0.0	L/s

	5-year	**100-year**	
i	104.2	178.6	mm/hr
Q	9.8	16.9	L/s
Q w/ Cascading	9.8	16.9	L/s

Grate Capacity

Ponding Depth	0.07	m	
Single CB Capacity	20	L/s	OK
Twin CB Capacity	36	L/s	OK

Depth H (m)	**OPSD 400.01 SINGLE * (L/s)**	**TWIN * (L/s)**
0	0	0
0.01	1	1
0.02	2	3
0.03	4	5
0.04	7	9
0.05	11	16
0.06	16	27
0.07	20	36
0.08	36	54
0.09	48	71
0.1	61	91
0.11	73	109
0.12	86	127
0.13	99	140
0.14	109	155
0.15	120	169
0.16	129	183
0.17	136	196
0.18	145	211
0.19	150	228
0.2	156	243
0.21	161	259
0.22	167	275
0.23	172	291
0.24	176	307
0.25	181	322
0.26	186	337
0.27	189	354
0.28	194	371
0.29	199	387
0.3	202	403

CB Lead Capacity

Upstream Flow	0	L/s	
Diameter	200	mm	
Slope	1.00	%	
$A_{hydraulic}$	0.031	m^2	
R	0.050	m	
CB Lead Capacity	32.8	L/s	OK

Cascading Flow

Cascading Flow NO CASCADING FLOW
Cascading Flow Directed To

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Drainage Area

Area ID	CB 11	
Area	0.01	ha
C	0.85	Rational Method runoff coefficient
t_c	10.0	min
Cascading Flow	0.0	L/s

	5-year	100-year	
i	104.2	178.6	mm/hr
Q	2.5	4.2	L/s
Q w/ Cascading	2.5	4.2	L/s

Grate Capacity

Ponding Depth	0.07	m	
Single CB Capacity	20	L/s	OK
Twin CB Capacity	36	L/s	OK

Depth H (m)	OPSD 400.01 SINGLE * (L/s)	TWIN * (L/s)
0	0	0
0.01	1	1
0.02	2	3
0.03	4	5
0.04	7	9
0.05	11	16
0.06	16	27
0.07	20	36
0.08	36	54
0.09	48	71
0.1	61	91
0.11	73	109
0.12	86	127
0.13	99	140
0.14	109	155
0.15	120	169
0.16	129	183
0.17	136	196
0.18	145	211
0.19	150	228
0.2	156	243
0.21	161	259
0.22	167	275
0.23	172	291
0.24	176	307
0.25	181	322
0.26	186	337
0.27	189	354
0.28	194	371
0.29	199	387
0.3	202	403

CB Lead Capacity

Upstream Flow	16.9	L/s	<-- From CB 10
Diameter	200	mm	
Slope	1.00	%	
$A_{hydraulic}$	0.031	m^2	
R	0.050	m	
CB Lead Capacity	32.8	L/s	OK

Cascading Flow

Cascading Flow NO CASCADING FLOW
Cascading Flow Directed To

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Drainage Area

Area ID	CB 13	
Area	0.01	ha
C	0.85	Rational Method runoff coefficient
t_c	10.0	min
Cascading Flow	0.0	L/s

	5-year	100-year	
i	104.2	178.6	mm/hr
Q	2.5	4.2	L/s
Q w/ Cascading	2.5	4.2	L/s

Grate Capacity

Ponding Depth	0.04	m	
Single CB Capacity	7	L/s	OK
Twin CB Capacity	9	L/s	OK

Depth H (m)	OPSD 400.01 SINGLE * (L/s)	TWIN * (L/s)
0	0	0
0.01	1	1
0.02	2	3
0.03	4	5
0.04	7	9
0.05	11	16
0.06	16	27
0.07	20	36
0.08	36	54
0.09	48	71
0.1	61	91
0.11	73	109
0.12	86	127
0.13	99	140
0.14	109	155
0.15	120	169
0.16	129	183
0.17	136	196
0.18	145	211
0.19	150	228
0.2	156	243
0.21	161	259
0.22	167	275
0.23	172	291
0.24	176	307
0.25	181	322
0.26	186	337
0.27	189	354
0.28	194	371
0.29	199	387
0.3	202	403

* From MTO Drainage Management Manual (1997) Design Chart 4.19

CB Lead Capacity

Upstream Flow	6.6	L/s	<-- 5-Yr Flow from CB 12
Diameter	200	mm	
Slope	1.00	%	
$A_{hydraulic}$	0.031	m^2	
R	0.050	m	
CB Lead Capacity	32.8	L/s	OK

Cascading Flow

Cascading Flow NO CASCADING FLOW
Flow Directed

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

DSEL

Target Flow Rate

Q 133.00 L/s <-- Per CRT Phase 1 Design Brief prepared by IBI dated July 2017

Estimate Flow from Foundation Drainage

Groundwater flow rate 0.45 L/s/home *(per Ottawa Sewer Design Guidelines 5.4.7)*
Unit Count 46
Q 20.7 L/s

Estimated Post Development Peak Flow from Unattenuated Areas

Area EX 149-128 0.05
C 0.68
Area CB 12 0.03 <-- Assume drainage to CB 12 uncontrolled, CB is not at a low point
C 0.76

Total Area 0.08 ha
C 0.71 Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}* (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10.0	104.2	16.4	16.4	0.0	0.0	178.6	35.2	35.2	0.0	0.0

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

Estimated Post Development Peak Flow from Attenuated Areas

Area ID 210-204
Available Sub-surface Storage

Total Subsurface Storage (m^3) 169.8 <-- Provided storage excludes storage volume below system invert

Stage Attenuated Areas Storage Summary

		Surface Storage			Surface and Subsurface Storage			
	Stage	**Ponding**	**h_o**	**delta d**	**V***	**V_{acc}****	**$Q_{release}$†**	**$V_{drawdown}$**
	(m)	**(m^2)**	**(m)**	**(m)**	**(m^3)**	**(m^3)**	**(L/s)**	**(hr)**
Orifice INV	105.42		0.00			0.0	0.0	0.00
Storage Chamber INV	106.15		0.73	0.73		0.0	38.3	0.00
Storage Chamber SL	106.72		1.30	0.57	84.9	84.9	51.0	0.46
StorageChamber OBV	107.29		1.88	0.57	84.9	169.8	61.1	0.77

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate calculated from orifice equation

Orifice Location **MH 210** **Dia** 145
Total Area 0.56 ha <-- Sum of Drainage to DCB 6, DCB 5, DCB 7, CB 8, CB 9
C 0.85 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	5-year					**100-year**				
t_c	**i**	**Q_{actual}‡**	**$Q_{release}$**	**Q_{stored}**	**V_{stored}**	**i**	**Q_{actual}‡**	**$Q_{release}$**	**Q_{stored}**	**V_{stored}**
(min)	**(mm/hr)**	**(L/s)**	**(L/s)**	**(L/s)**	**(m^3)**	**(mm/hr)**	**(L/s)**	**(L/s)**	**(L/s)**	**(m^3)**
10	104.2	137.8	46.8	90.9	54.6	178.6	277.8	51.0	226.8	136.1
15	83.6	110.5	46.8	63.6	57.3	142.9	222.3	51.0	171.3	154.2
20	70.3	92.9	46.8	46.1	55.3	120.0	186.6	51.0	135.6	162.7
25	60.9	80.5	46.8	33.7	50.5	103.8	161.5	51.0	110.6	165.9
30	53.9	71.3	46.8	24.5	44.0	91.9	142.9	51.0	91.9	165.5
35	48.5	64.2	46.8	17.3	36.4	82.6	128.5	51.0	77.5	162.7
40	44.2	58.4	46.8	11.6	27.8	75.1	116.9	51.0	65.9	158.2
45	40.6	53.7	46.8	6.9	18.6	69.1	107.4	51.0	56.4	152.4
50	37.7	49.8	46.8	3.0	8.9	64.0	99.5	51.0	48.5	145.5
55	35.1	46.4	46.4	0.0	0.0	59.6	92.7	51.0	41.8	137.9
60	32.9	43.6	43.6	0.0	0.0	55.9	86.9	51.0	36.0	129.5
65	31.0	41.0	41.0	0.0	0.0	52.6	81.9	51.0	30.9	120.6
70	29.4	38.8	38.8	0.0	0.0	49.8	77.5	51.0	26.5	111.2
75	27.9	36.9	36.9	0.0	0.0	47.3	73.5	51.0	22.5	101.4
80	26.6	35.1	35.1	0.0	0.0	45.0	70.0	51.0	19.0	91.3
85	25.4	33.5	33.5	0.0	0.0	43.0	66.8	51.0	15.8	80.8
90	24.3	32.1	32.1	0.0	0.0	41.1	64.0	51.0	13.0	70.1
95	23.3	30.8	30.8	0.0	0.0	39.4	61.3	51.0	10.4	59.1
100	22.4	29.6	29.6	0.0	0.0	37.9	59.0	51.0	8.0	47.9
105	21.6	28.5	28.5	0.0	0.0	36.5	56.8	51.0	5.8	36.6
110	20.8	27.5	27.5	0.0	0.0	35.2	54.8	51.0	3.8	25.0

5-year Qattenuated	**46.8 L/s**	**100-year $Q_{attenuated}$**	**61.1 L/s**
5-year Max. Storage Required	**57.3 m^3**	**100-year Max. Storage Required**	**165.9 m^3**
Est. 5-year Storage Elevation	**106.5 m**	**Est. 100-year Storage Elevation**	**107.3 m**

Notes:
- Required storage volumes calculated using Q Release at the midpoint of the Storage tank
- Flow from the storage tank assumes maximum Q Release at the tank obvert

Area ID 207-208
Available Sub-surface Storage

Total Subsurface Storage (m^3) 16.8 <-- Provided storage excludes storage volume below system invert

Stage Attenuated Areas Storage Summary

		Surface Storage			Surface and Subsurface Storage			
	Stage	**Ponding**	**h_o**	**delta d**	**V***	**V_{acc}****	**$Q_{release}$†**	**$V_{drawdown}$**
	(m)	**(m^2)**	**(m)**	**(m)**	**(m^3)**	**(m^3)**	**(L/s)**	**(hr)**
Orifice INV	106.05		0.00			0.0	0.0	0.00
Storage Chamber INV	106.70		0.65	0.65		0.0	9.6	0.00
Storage Chamber SL	107.08		1.03	0.38	8.4	8.4	12.1	0.19
Storage Chamber OBV	107.46		1.41	0.38	8.4	16.8	14.2	0.33

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate calculated from orifice equation

Orifice Location **MH 207** **Dia** 75
Total Area 0.06 ha <-- Sum of Drainage to CB 10, CB 11, CB 13
C 0.85 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	5-year					100-year				
t_c (min)	**i (mm/hr)**	**Q_{actual}‡ (L/s)**	**$Q_{release}$ (L/s)**	**Q_{stored} (L/s)**	**V_{stored} (m^3)**	**i (mm/hr)**	**Q_{actual}‡ (L/s)**	**$Q_{release}$ (L/s)**	**Q_{stored} (L/s)**	**V_{stored} (m^3)**
10	104.2	14.8	14.8	0.0	0.0	178.6	29.8	12.1	17.7	10.6
15	83.6	11.8	11.8	0.0	0.0	142.9	23.8	12.1	11.7	10.5
20	70.3	10.0	10.0	0.0	0.0	120.0	20.0	12.1	7.9	9.5
25	60.9	8.6	8.6	0.0	0.0	103.8	17.3	12.1	5.2	7.8
30	53.9	7.6	7.6	0.0	0.0	91.9	15.3	12.1	3.2	5.8
35	48.5	6.9	6.9	0.0	0.0	82.6	13.8	12.1	1.7	3.5
40	44.2	6.3	6.3	0.0	0.0	75.1	12.5	12.1	0.4	1.0
45	40.6	5.8	5.8	0.0	0.0	69.1	11.5	11.5	0.0	0.0
50	37.7	5.3	5.3	0.0	0.0	64.0	10.7	10.7	0.0	0.0
55	35.1	5.0	5.0	0.0	0.0	59.6	9.9	9.9	0.0	0.0
60	32.9	4.7	4.7	0.0	0.0	55.9	9.3	9.3	0.0	0.0
65	31.0	4.4	4.4	0.0	0.0	52.6	8.8	8.8	0.0	0.0
70	29.4	4.2	4.2	0.0	0.0	49.8	8.3	8.3	0.0	0.0
75	27.9	4.0	4.0	0.0	0.0	47.3	7.9	7.9	0.0	0.0
80	26.6	3.8	3.8	0.0	0.0	45.0	7.5	7.5	0.0	0.0
85	25.4	3.6	3.6	0.0	0.0	43.0	7.2	7.2	0.0	0.0
90	24.3	3.4	3.4	0.0	0.0	41.1	6.9	6.9	0.0	0.0
95	23.3	3.3	3.3	0.0	0.0	39.4	6.6	6.6	0.0	0.0
100	22.4	3.2	3.2	0.0	0.0	37.9	6.3	6.3	0.0	0.0
105	21.6	3.1	3.1	0.0	0.0	36.5	6.1	6.1	0.0	0.0
110	20.8	2.9	2.9	0.0	0.0	35.2	5.9	5.9	0.0	0.0

5-year Qattenuated	**14.8 L/s**	**100-year $Q_{attenuated}$**	**14.2 L/s**
5-year Max. Storage Required	**0.0 m^3**	**100-year Max. Storage Required**	**10.6 m^3**
Est. 5-year Storage Elevation	**106.1 m**	**Est. 100-year Storage Elevation**	**107.2 m**

Notes:
- Required storage volumes calculated using Q Release at the midpoint of the Storage tank
- Flow from the storage tank assumes maximum Q Release at the tank obvert

Summary of Release Rates and Storage Volumes

Control Area	5-year Release Rate (L/s)	5-year Required Storage (m^3)	100-Year Release Rate (L/s)	100-Year Required Storage (m^3)	100-Year Available Storage (m^3)
Foundation Drainage	20.7	0.0	20.7	0.0	0.0
Unattenuated Areas	16.4	0.0	35.2	0.0	0.0
Attenutated Areas	61.6	57.3	75.3	176.4	186.6
Total	**98.7**	**57.3**	**131.2**	**176.4**	**186.6**

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Target Flow Rate

Q 112.87 L/s CRT Phase 1 Blk 324 Design Brief prepared by IBI dated July 2021

Estimated Flow from Foundation Drainage

Groundwater flow rate 0.45 L/s/home *(per Ottawa Sewer Design Guidelines 5.4.7)*
Unit Count 30
Q 13.5 L/s

Estimated Post Development Peak Flow from Unattenuated Areas

Area EXT 0.01
C 0.2
Area EX138-148 0.02
C 0.52

Total Area 0.03 ha
C 0.41 Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}^* (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10.0	104.2	3.6	3.6	0.0	0.0	178.6	7.7	7.7	0.0	0.0

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

Estimated Post Development Peak Flow from Attenuated Areas

Area ID 107-105
Available Sub-surface Storage

Total Subsurface Storage (m^3) 94.6 <-- Provided storage excludes storage volume below system invert

Stage Attenuated Areas Storage Summary

		Surface Storage			Surface and Subsurface Storage			
	Stage	**Ponding**	**h_o**	**delta d**	**V***	**V_{acc}****	**$Q_{release}$†**	**$V_{drawdown}$**
	(m)	**(m^2)**	**(m)**	**(m)**	**(m^3)**	**(m^3)**	**(L/s)**	**(hr)**
Orifice INV	104.72		0.00			0.0	0.0	0.00
Storage Chamber INV	105.55		0.83	0.83		0.0	54.0	0.00
Storage Chamber SL	106.31		1.59	0.76	47.3	47.3	74.7	0.18
Storage Chamber OBV	107.08		2.36	0.76	47.3	94.6	90.9	0.29

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate calculated from orifice equation

Orifice Location **MH 107** **Dia** 167
Total Area 0.45 ha <-- Sum of Drainage to DCB 1, DCB 2, CB 3, CB 4
C 0.85 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	5-year					100-year				
t_c	**i**	**Q_{actual}‡**	**$Q_{release}$**	**Q_{stored}**	**V_{stored}**	**i**	**Q_{actual}‡**	**$Q_{release}$**	**Q_{stored}**	**V_{stored}**
(min)	**(mm/hr)**	**(L/s)**	**(L/s)**	**(L/s)**	**(m^3)**	**(mm/hr)**	**(L/s)**	**(L/s)**	**(L/s)**	**(m^3)**
10	104.2	110.7	65.8	44.9	26.9	178.6	223.2	74.7	148.5	89.1
15	83.6	88.8	65.8	23.0	20.7	142.9	178.6	74.7	103.9	93.5
20	70.3	74.6	65.8	8.8	10.6	120.0	149.9	74.7	75.2	90.2
25	60.9	64.7	64.7	0.0	0.0	103.8	129.8	74.7	55.1	82.6
30	53.9	57.3	57.3	0.0	0.0	91.9	114.8	74.7	40.1	72.2
35	48.5	51.5	51.5	0.0	0.0	82.6	103.2	74.7	28.5	59.8
40	44.2	46.9	46.9	0.0	0.0	75.1	93.9	74.7	19.2	46.1
45	40.6	43.2	43.2	0.0	0.0	69.1	86.3	74.7	11.6	31.3
50	37.7	40.0	40.0	0.0	0.0	64.0	79.9	74.7	5.2	15.6
55	35.1	37.3	37.3	0.0	0.0	59.6	74.5	74.5	0.0	0.0
60	32.9	35.0	35.0	0.0	0.0	55.9	69.9	69.9	0.0	0.0
65	31.0	33.0	33.0	0.0	0.0	52.6	65.8	65.8	0.0	0.0
70	29.4	31.2	31.2	0.0	0.0	49.8	62.2	62.2	0.0	0.0
75	27.9	29.6	29.6	0.0	0.0	47.3	59.1	59.1	0.0	0.0
80	26.6	28.2	28.2	0.0	0.0	45.0	56.2	56.2	0.0	0.0
85	25.4	27.0	27.0	0.0	0.0	43.0	53.7	53.7	0.0	0.0
90	24.3	25.8	25.8	0.0	0.0	41.1	51.4	51.4	0.0	0.0
95	23.3	24.8	24.8	0.0	0.0	39.4	49.3	49.3	0.0	0.0
100	22.4	23.8	23.8	0.0	0.0	37.9	47.4	47.4	0.0	0.0
105	21.6	22.9	22.9	0.0	0.0	36.5	45.6	45.6	0.0	0.0
110	20.8	22.1	22.1	0.0	0.0	35.2	44.0	44.0	0.0	0.0

5-year Qattenuated	**65.8 L/s**	**100-year $Q_{attenuated}$**	**90.9 L/s**
5-year Max. Storage Required	**26.9 m^3**	**100-year Max. Storage Required**	**93.5 m^3**
Est. 5-year Storage Elevation	**106.0 m**	**Est. 100-year Storage Elevation**	**107.1 m**

Notes:
- Required storage volumes calculated using Q Release at the midpoint of the Storage tank
- Flow from the storage tank assumes maximum Q Release at the tank obvert

Summary of Release Rates and Storage Volumes

Control Area	**5-year Release Rate (L/s)**	**5-year Required Storage (m^3)**	**100-Year Release Rate (L/s)**	**100-Year Required Storage (m^3)**	**100-Year Available Storage (m^3)**
Foundation Drainage	13.5	0.0	13.5	0.0	0.0
Unattenuated Areas	3.6	0.0	7.7	0.0	0.0
Attenutated Areas	65.8	26.9	90.9	93.5	94.6
Total	**82.9**	**26.9**	**112.0**	**93.5**	**94.6**

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	

ADS
Advanced Drainage Systems, Inc.

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BOBOLINK RIDGE - MH 207

OTTAWA, ONTARIO

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 F2418-16a, "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/IN/IN. 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

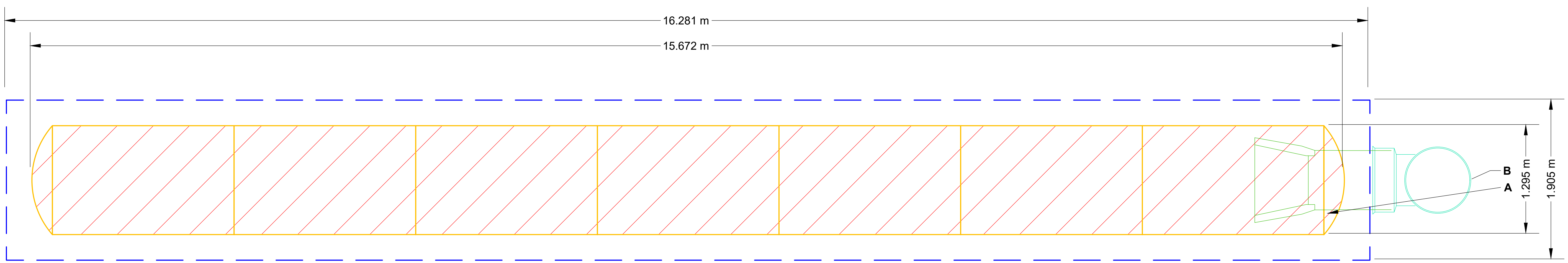
7	STORMTECH SC-740 CHAMBERS
2	STORMTECH SC-740 END CAPS
152	STONE ABOVE (mm)
152	STONE BELOW (mm)
40	STONE VOID
18.7	INSTALLED SYSTEM VOLUME (m^3) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)
31.0	SYSTEM AREA (m^2)
36.4	SYSTEM PERIMETER (m)

CONCEPTUAL ELEVATIONS

MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	3.353
MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	1.524
MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	1.372
MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	1.372
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	1.372
TOP OF STONE:	1.067
TOP OF SC-740 CHAMBER:	0.914
600 mm ISOLATOR ROW PLUS INVERT:	0.155
BOTTOM OF SC-740 CHAMBER:	0.152
BOTTOM OF STONE:	0.000

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	600 mm BOTTOM PREFABRICATED END CAP, PART#: SC740EPE24BR / TYP OF ALL 600 mm ISOLATOR ROW PLUS CONNECTIONS	3 mm	
NYLOPLAST (INLET W/ ISO PLUS ROW)	B	750 mm DIAMETER (610 mm SUMP MIN)		



ISOLATOR ROW PLUS (SEE DETAIL)

NO WOVEN GEOTEXTILE

BED LIMITS

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.
- **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

BOBOLINK RIDGE - MH 207
OTTAWA, ONTARIO

DATE:
DRAWN: BC
PROJECT #:
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DATE	DRW	CHK	DESCRIPTION

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

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

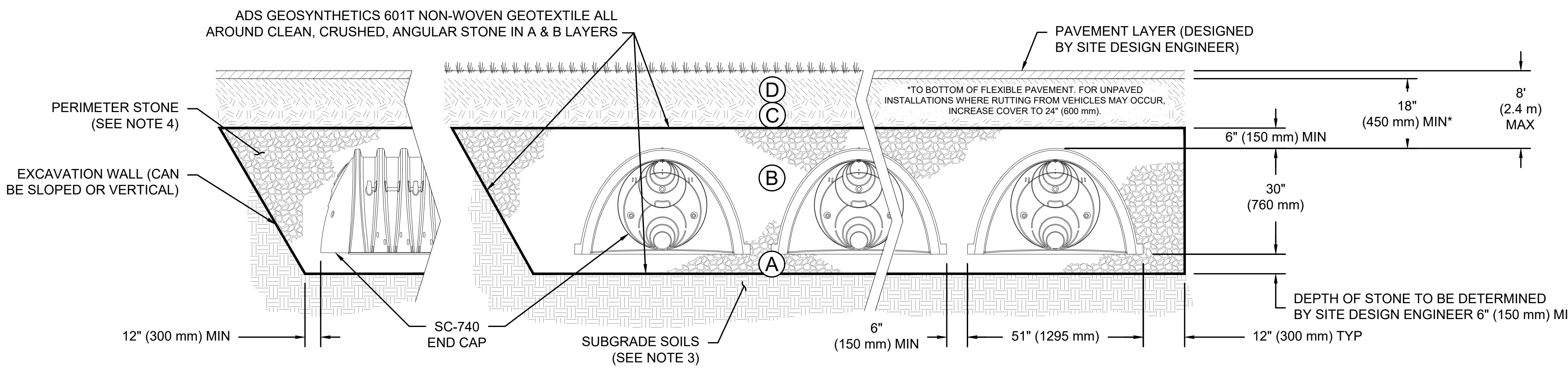
SCALE = 1 : 50

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.



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "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 AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 550 LBS/IN/IN. 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.

BOBOLINK RIDGE - MH 207
OTTAWA, ONTARIO

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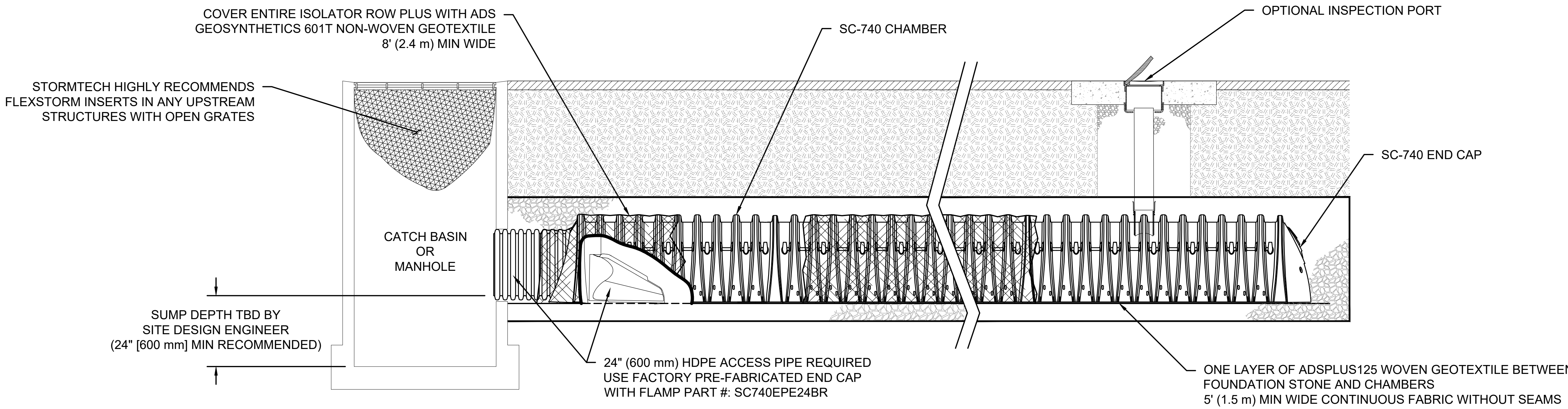

SC-740 ISOLATOR ROW PLUS DETAIL

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.

BOBOLINK RIDGE - MH 207
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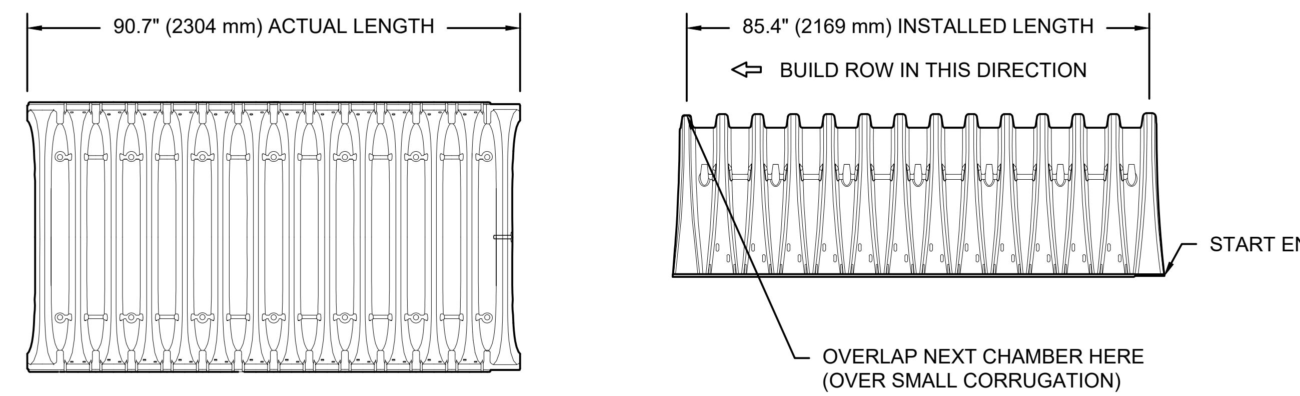
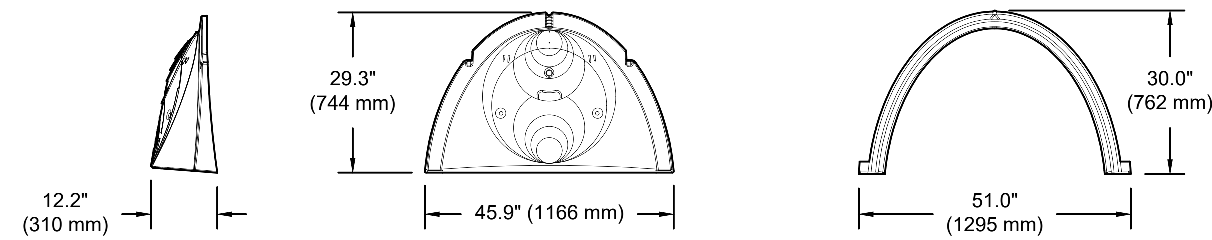
SC-740 TECHNICAL SPECIFICATION

NTS

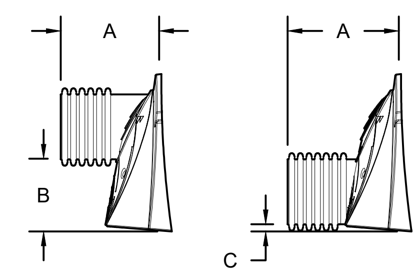




NOMINAL CHAMBER SPECIFICATIONS

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)
SC740EPE24B*	24" (600 mm)	18.5" (470 mm)	---	0.1" (3 mm)
SC740EPE24BR*	24" (600 mm)	18.5" (470 mm)	---	0.1" (3 mm)

ALL STUBS, EXCEPT FOR THE SC740EPE24B/SC740EPE24BR 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 SC740EPE24B/SC740EPE24BR 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

BOBOLINK RIDGE - MH 207
OTTAWA, ONTARIO
DRAWN: BC
CHECKED: N/A
DATE:
PROJECT #:

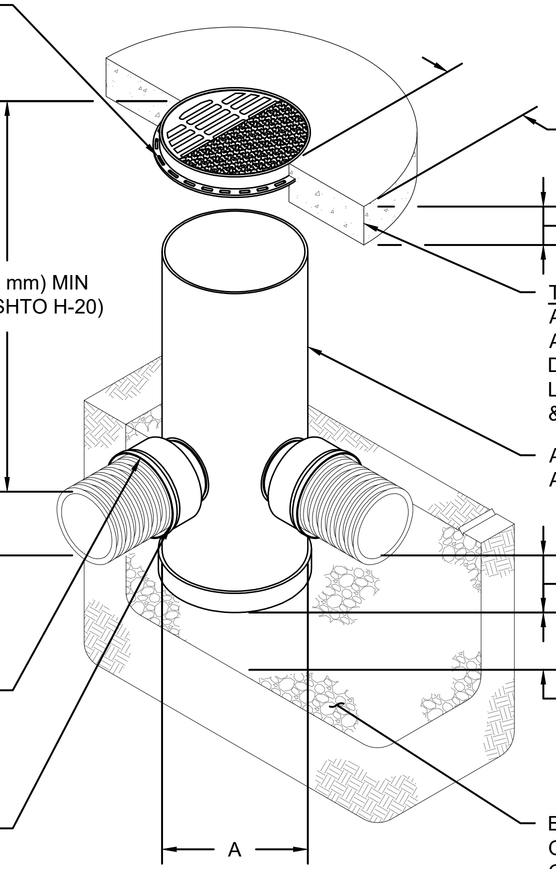
DATE	DRW	CHK	DESCRIPTION

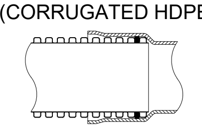
StormTech®
Chamber System
888-892-2694 | WWW.STORMTECH.COM

ADS
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

BOBOLINK RIDGE - MH 207

OTTAWA, ONTARIO

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PROJECT #:

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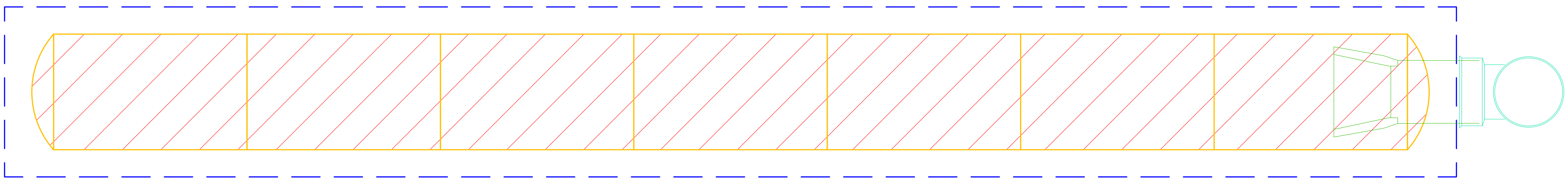
DATE	DRW	CHK	DESCRIPTION

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

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



PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	

ADS™
Advanced Drainage Systems, Inc.

SiteASSIST™
FOR STORMTECH INSTRUCTIONS, DOWNLOAD THE INSTALLATION APP

BOBOLINK RIDGE - MH 210 (A)

OTTAWA, ONTARIO

MC-3500 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-3500.
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 F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
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 75 mm (3").
   - 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 500 LBS/IN/IN. 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 MC-3500 CHAMBER SYSTEM

1. STORMTECH MC-3500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 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. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 300 mm (12") INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE WELL GRADED BETWEEN ¾" AND 2" (20-50 mm)..
9. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
10. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
11. 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 MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-3500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 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 CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

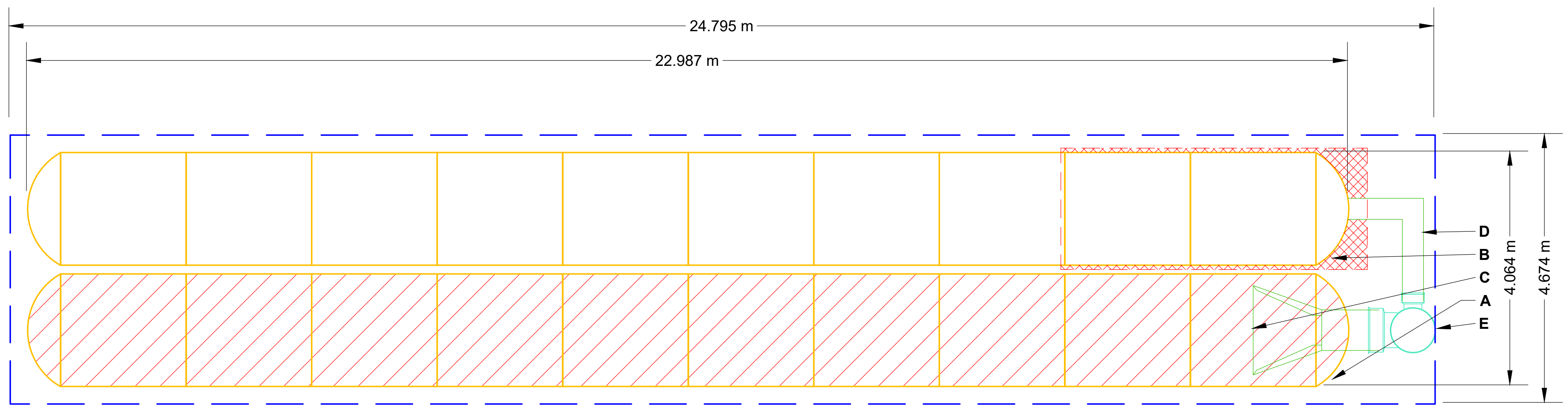
CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

PROPOSED LAYOUT	
20	STORMTECH MC-3500 CHAMBERS
4	STORMTECH MC-3500 END CAPS
305	STONE ABOVE (mm)
229	STONE BELOW (mm)
40	STONE VOID
116.1	INSTALLED SYSTEM VOLUME (m^3) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)
115.9	SYSTEM AREA (m^2)
58.9	SYSTEM PERIMETER (m)

CONCEPTUAL ELEVATIONS	
MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	3.810
MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	1.981
MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	1.829
MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	1.829
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	1.829
TOP OF STONE:	1.676
TOP OF MC-3500 CHAMBER:	1.372
300 mm x 300 mm TOP MANIFOLD INVERT:	0.898
600 mm ISOLATOR ROW PLUS INVERT:	0.281
BOTTOM OF MC-3500 CHAMBER:	0.229
BOTTOM OF STONE:	0.000

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	600 mm BOTTOM CORED END CAP, PART#: MC3500IEPP24BC / TYP OF ALL 600 mm BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	52 mm	
PREFABRICATED END CAP	B	300 mm TOP CORED END CAP, PART#: MC3500IEPP12T / TYP OF ALL 300 mm TOP CONNECTIONS	671 mm	
FLAMP	C	INSTALL FLAMP ON 600 mm ACCESS PIPE / PART#: MC350024RAMP (TYP 2 PLACES)		
MANIFOLD	D	300 mm x 300 mm TOP MANIFOLD, ADS N-12	670 mm	
NYLOPLAST (INLET W/ ISO PLUS ROW)	E	750 mm DIAMETER (610 mm SUMP MIN)		70 L/s IN



ISOLATOR ROW PLUS
(SEE DETAIL)

PLACE MINIMUM 5.334 m OF ADSPLUS175 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

BED LIMITS

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.
- **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

BOBOLINK RIDGE - MH 210 (A)
OTTAWA, ONTARIO

DATE:
DRAWN: BC
PROJECT #:
CHECKED: N/A

DATE	DRW	CHK	DESCRIPTION

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

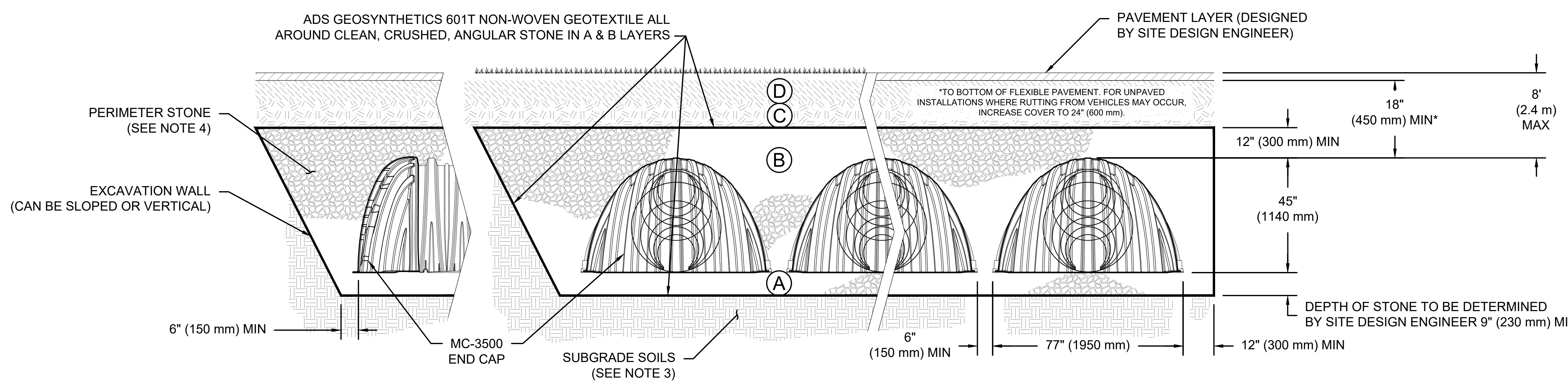
ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

SCALE = 1 : 100

ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 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 24" (600 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 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
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, 4	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, 4	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 9" (230 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.



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
2. MC-3500 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 3".
   - 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 500 LBS/IN/IN. 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.

BOBOLINK RIDGE - MH 210 (A)
OTTAWA, ONTARIO

DATE:
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DATE	DRW	CHK	DESCRIPTION

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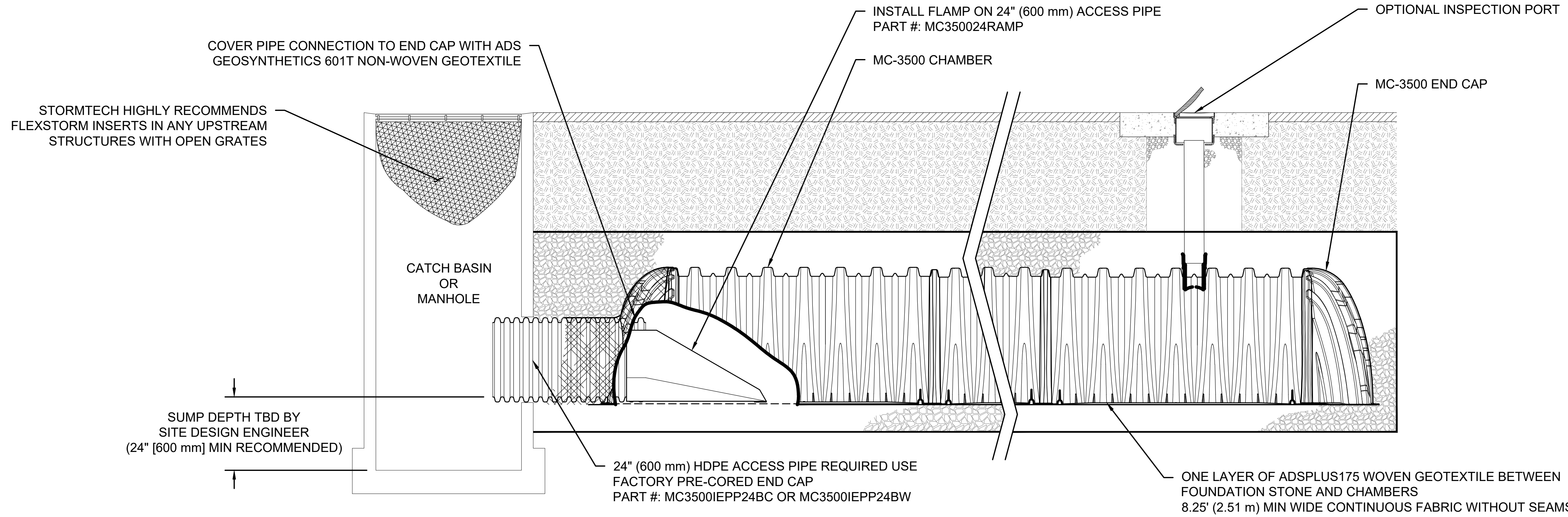

MC-3500 ISOLATOR ROW PLUS DETAIL

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.

BOBOLINK RIDGE - MH 210 (A)

OTTAWA, ONTARIO

DATE:

DRAWN: BC

PROJECT #:

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DATE	DRW	CHK	DESCRIPTION

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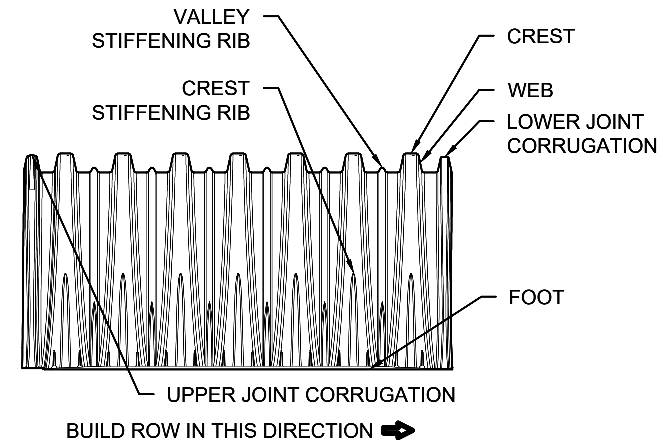
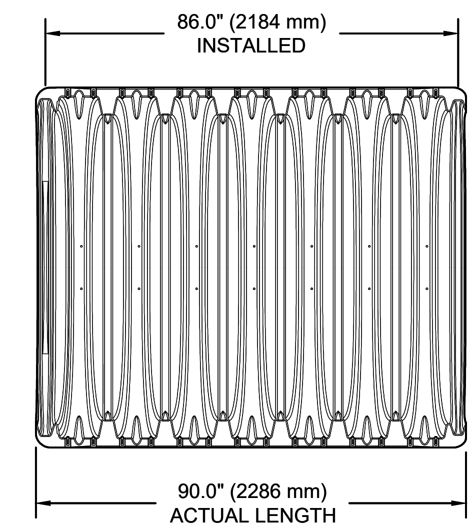
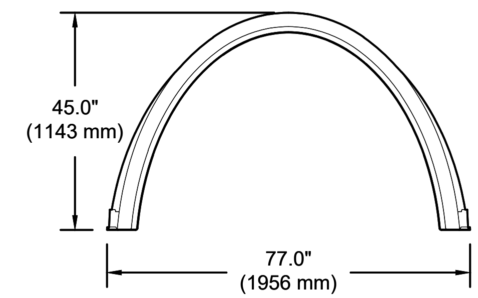
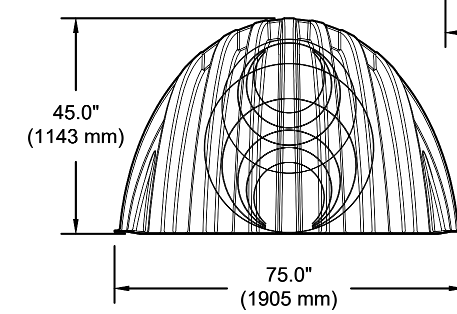
MC-3500 TECHNICAL SPECIFICATION

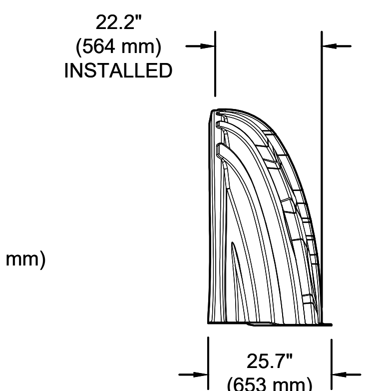
NTS











NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 86.0"	(1956 mm X 1143 mm X 2184 mm)
CHAMBER STORAGE	109.9 CUBIC FEET	(3.11 m³)
MINIMUM INSTALLED STORAGE*	175.0 CUBIC FEET	(4.96 m³)
WEIGHT	134 lbs.	(60.8 kg)

NOMINAL END CAP SPECIFICATIONS

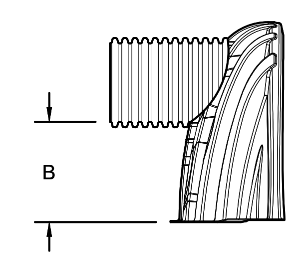
SIZE (W X H X INSTALLED LENGTH)	75.0" X 45.0" X 22.2"	(1905 mm X 1143 mm X 564 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	45.1 CUBIC FEET	(1.28 m³)
WEIGHT	49 lbs.	(22.2 kg)

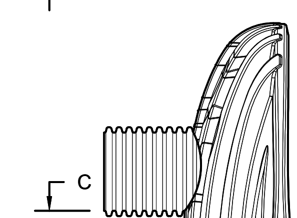
*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION, 6" SPACING BETWEEN CHAMBERS, 6" (152 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY

STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A WELDED CROWN PLATE END WITH "C"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC3500IEPP06T	6" (150 mm)	33.21" (844 mm)	---
MC3500IEPP06B		---	0.66" (17 mm)
MC3500IEPP08T	8" (200 mm)	31.16" (791 mm)	---
MC3500IEPP08B		---	0.81" (21 mm)
MC3500IEPP10T	10" (250 mm)	29.04" (738 mm)	---
MC3500IEPP10B		---	0.93" (24 mm)
MC3500IEPP12T	12" (300 mm)	26.36" (670 mm)	---
MC3500IEPP12B		---	1.35" (34 mm)
MC3500IEPP15T	15" (375 mm)	23.39" (594 mm)	---
MC3500IEPP15B		---	1.50" (38 mm)
MC3500IEPP18TC	18" (450 mm)	20.03" (509 mm)	---
MC3500IEPP18TW			
MC3500IEPP18BC		---	1.77" (45 mm)
MC3500IEPP18BW			
MC3500IEPP24TC	24" (600 mm)	14.48" (368 mm)	---
MC3500IEPP24TW			
MC3500IEPP24BC		---	2.06" (52 mm)
MC3500IEPP24BW			
MC3500IEPP30BC	30" (750 mm)	---	2.75" (70 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL

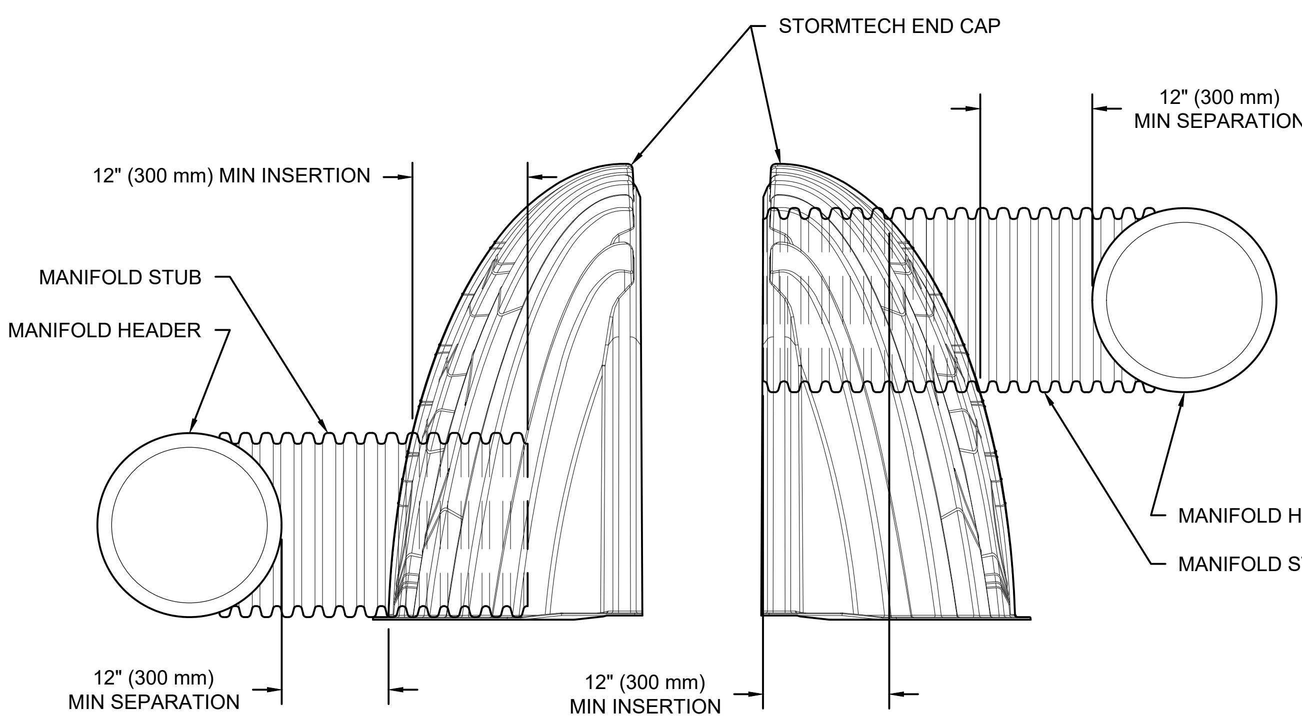




CUSTOM PRECORED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-3500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

MC-SERIES END CAP INSERTION DETAIL

NTS



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

BOBOLINK RIDGE - MH 210 (A)
OTTAWA, ONTARIO

DATE:	DRAWN: BC
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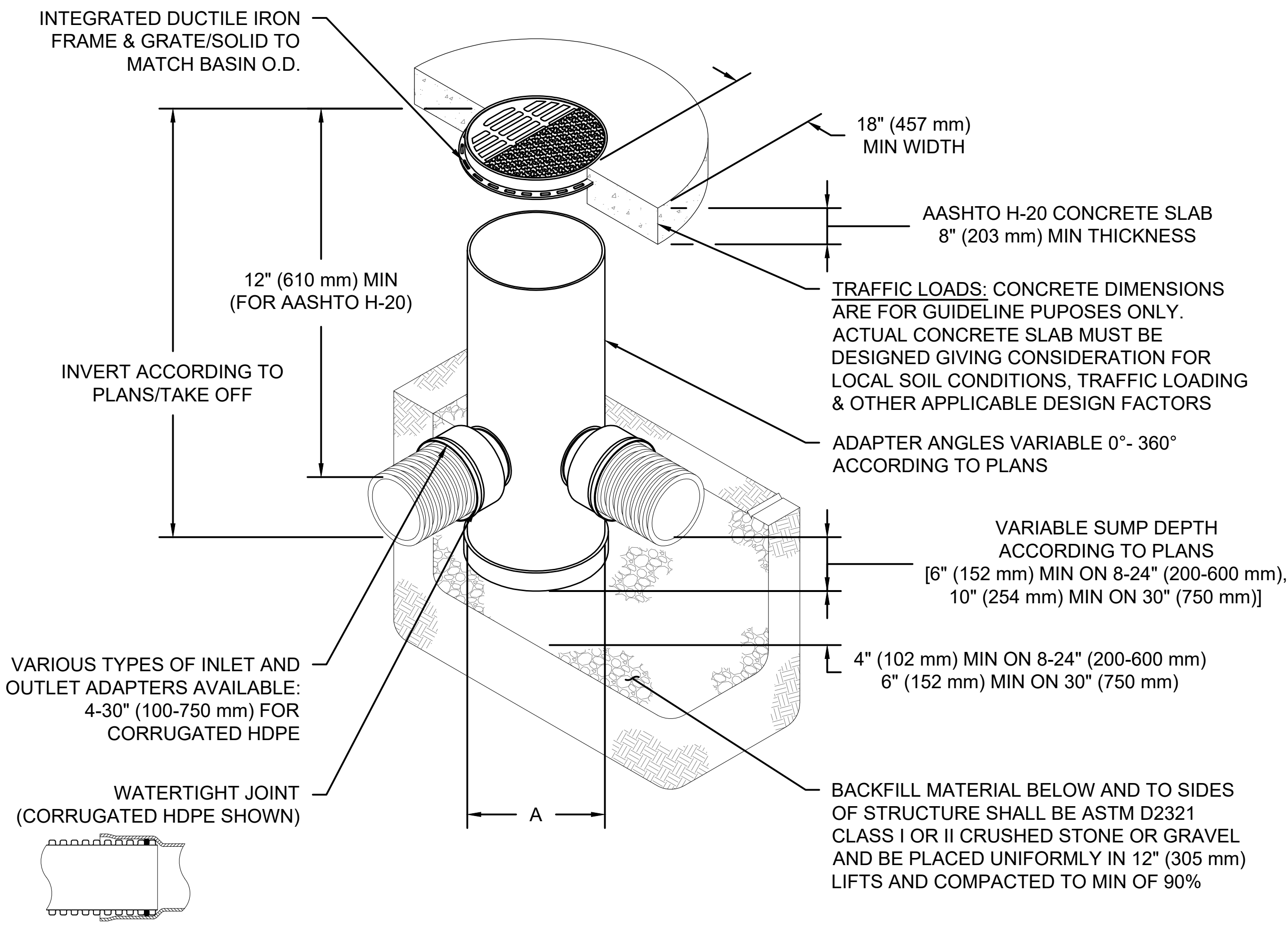
NYLOPLAST DRAIN BASIN

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

BOBOLINK RIDGE - MH 210 (A)

OTTAWA, ONTARIO

DATE:

DRAWN: BC

PROJECT #:

CHECKED: N/A

DATE	DRW	CHK	DESCRIPTION

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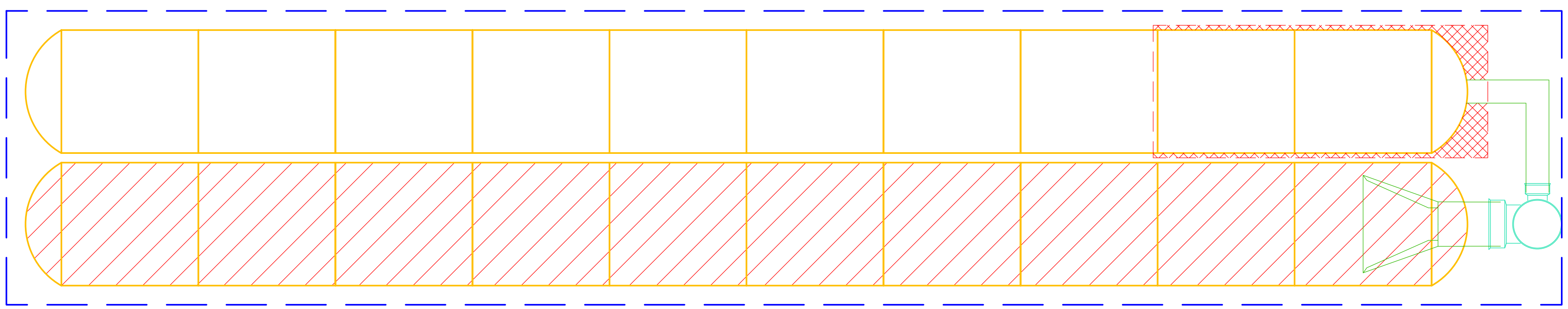


PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	

ADS™ Advanced Drainage Systems, Inc.

SiteASSIST™ FOR STORMTECH INSTRUCTIONS, DOWNLOAD THE INSTALLATION APP

BOBOLINK RIDGE - MH 210 (B)

OTTAWA, ONTARIO

MC-3500 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-3500.
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 F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
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 75 mm (3").
   - 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 500 LBS/IN/IN. 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 MC-3500 CHAMBER SYSTEM

1. STORMTECH MC-3500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 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. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 300 mm (12") INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE WELL GRADED BETWEEN ¾" AND 2" (20-50 mm).
9. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
10. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
11. 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 MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-3500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 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 CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING 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

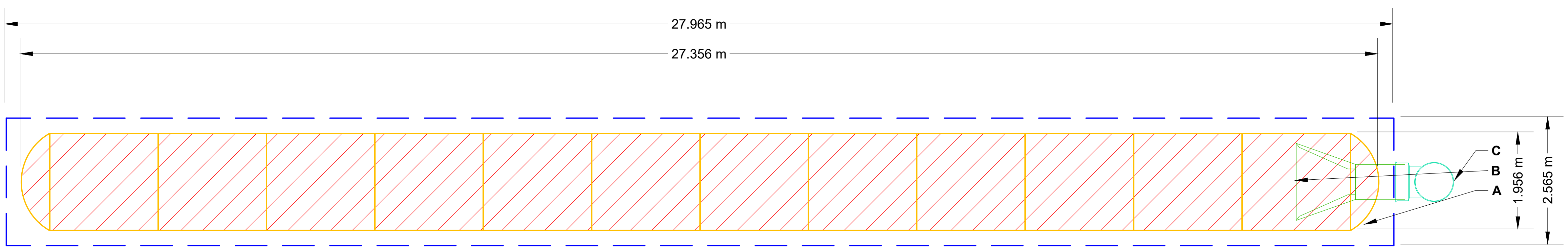
12	STORMTECH MC-3500 CHAMBERS
2	STORMTECH MC-3500 END CAPS
305	STONE ABOVE (mm)
229	STONE BELOW (mm)
40	STONE VOID
71.0	INSTALLED SYSTEM VOLUME (m^3) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)
71.7	SYSTEM AREA (m^2)
61.1	SYSTEM PERIMETER (m)

CONCEPTUAL ELEVATIONS

MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	3.810
MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	1.981
MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	1.829
MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	1.829
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	1.829
TOP OF STONE:	1.676
TOP OF MC-3500 CHAMBER:	1.372
600 mm ISOLATOR ROW PLUS INVERT:	0.281
BOTTOM OF MC-3500 CHAMBER:	0.229
BOTTOM OF STONE:	0.000

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	600 mm BOTTOM CORED END CAP, PART#: MC3500IEPP24BC / TYP OF ALL 600 mm BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	52 mm	
FLAMP	B	INSTALL FLAMP ON 600 mm ACCESS PIPE / PART#: MC350024RAMP (TYP 2 PLACES)		
NYLOPLAST (INLET W/ ISO PLUS ROW)	C	750 mm DIAMETER (610 mm SUMP MIN)		



ISOLATOR ROW PLUS (SEE DETAIL)

NO WOVEN GEOTEXTILE

BED LIMITS

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.
- **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

BOBOLINK RIDGE - MH 210 (B)

OTTAWA, ONTARIO

DRAWN: BC

CHECKED: N/A

DATE:

PROJECT #:

DATE	DRW	CHK	DESCRIPTION

StormTech® Chamber System

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ADS
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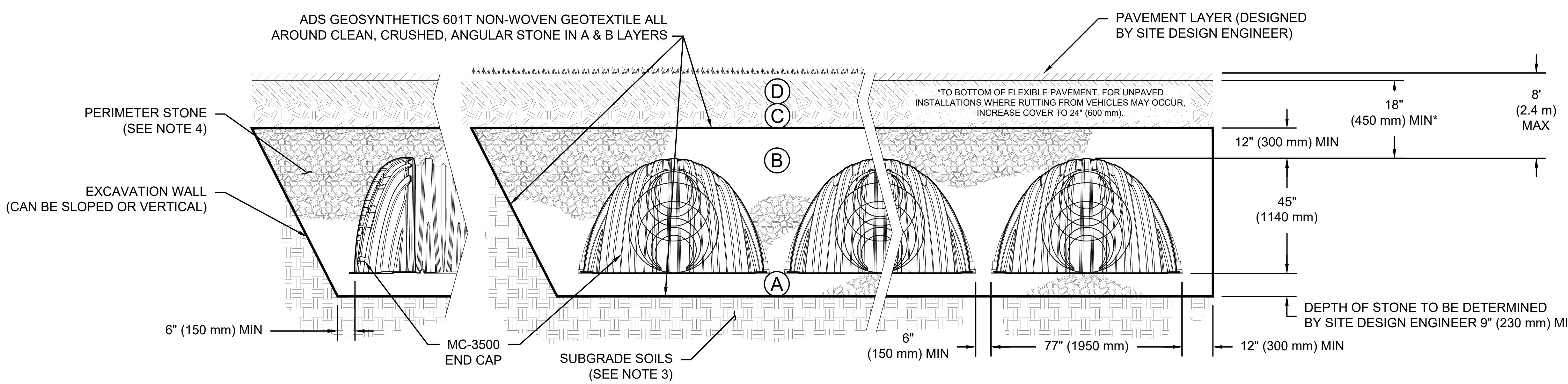
HILLIARD, OH 43026
1-800-733-7473

SCALE = 1 : 100

ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 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 24" (600 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 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
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, 4	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, 4	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 9" (230 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.



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
2. MC-3500 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 3".
   - 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 500 LBS/IN/IN. 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.

BOBOLINK RIDGE - MH 210 (B)
OTTAWA, ONTARIO
DATE:
DRAWN: BC
PROJECT #:
CHECKED: N/A

DATE	DRW	CHK	DESCRIPTION

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Chamber System
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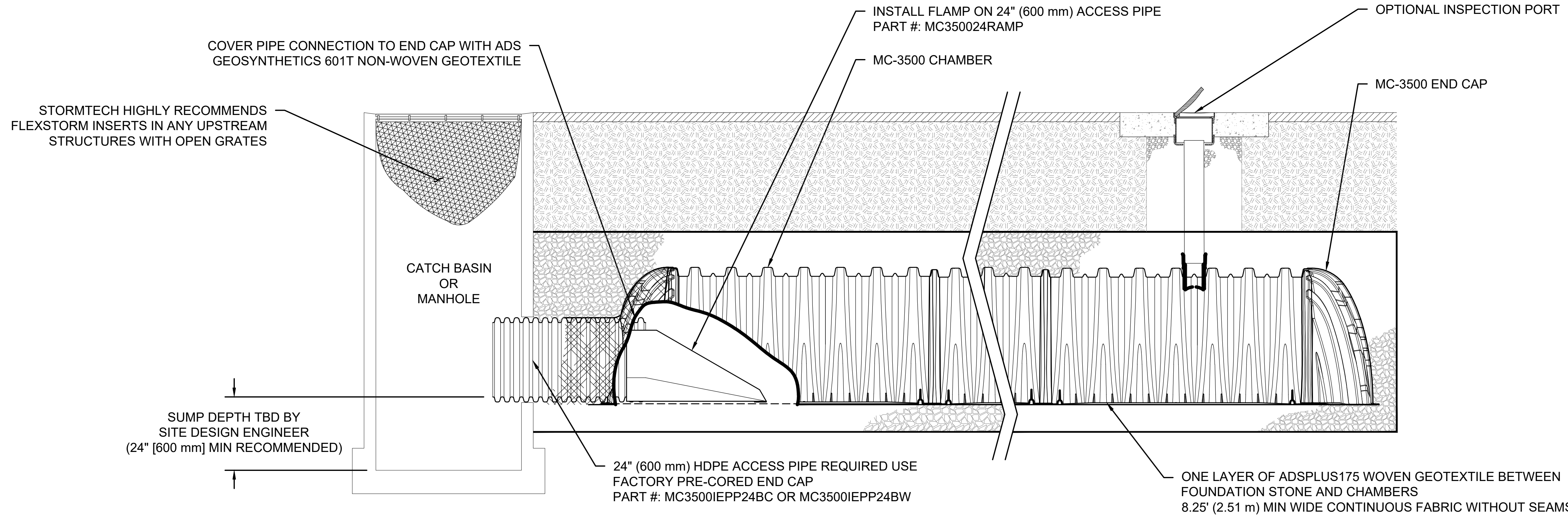

MC-3500 ISOLATOR ROW PLUS DETAIL

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.

BOBOLINK RIDGE - MH 210 (B)
OTTAWA, ONTARIO

DATE: | DRAWN: BC
PROJECT #: | CHECKED: N/A

DATE	DRW	CHK	DESCRIPTION

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Chamber System
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ADS
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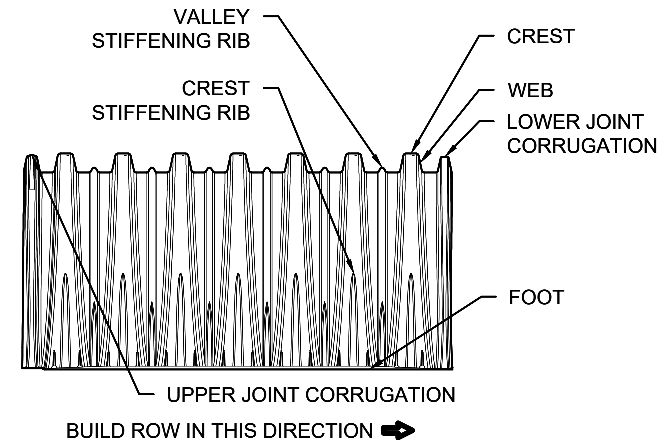
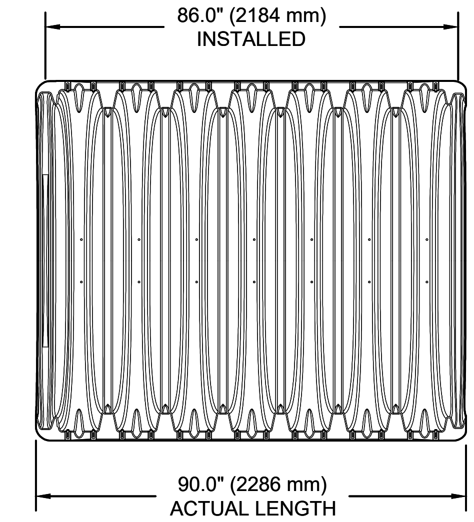
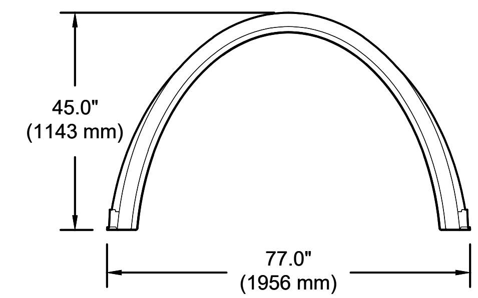
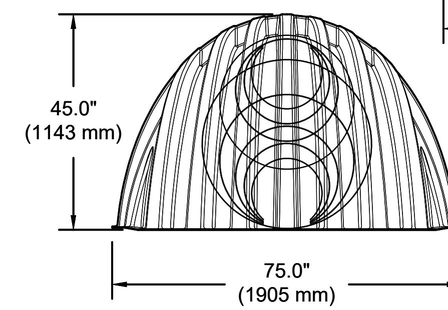
MC-3500 TECHNICAL SPECIFICATION

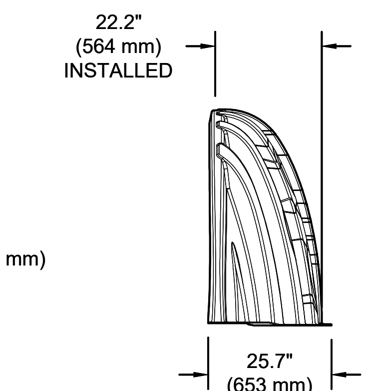
NTS











NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 86.0"	(1956 mm X 1143 mm X 2184 mm)
CHAMBER STORAGE	109.9 CUBIC FEET	(3.11 m³)
MINIMUM INSTALLED STORAGE*	175.0 CUBIC FEET	(4.96 m³)
WEIGHT	134 lbs.	(60.8 kg)

NOMINAL END CAP SPECIFICATIONS

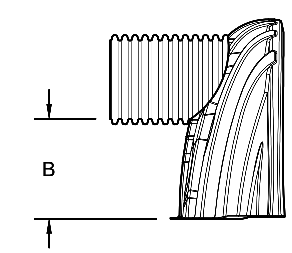
SIZE (W X H X INSTALLED LENGTH)	75.0" X 45.0" X 22.2"	(1905 mm X 1143 mm X 564 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	45.1 CUBIC FEET	(1.28 m³)
WEIGHT	49 lbs.	(22.2 kg)

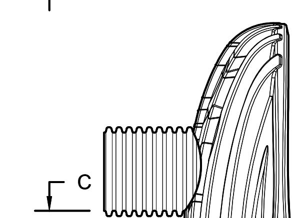
*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION, 6" SPACING BETWEEN CHAMBERS, 6" (152 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY

STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A WELDED CROWN PLATE END WITH "C"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC3500IEPP06T	6" (150 mm)	33.21" (844 mm)	---
MC3500IEPP06B		---	0.66" (17 mm)
MC3500IEPP08T	8" (200 mm)	31.16" (791 mm)	---
MC3500IEPP08B		---	0.81" (21 mm)
MC3500IEPP10T	10" (250 mm)	29.04" (738 mm)	---
MC3500IEPP10B		---	0.93" (24 mm)
MC3500IEPP12T	12" (300 mm)	26.36" (670 mm)	---
MC3500IEPP12B		---	1.35" (34 mm)
MC3500IEPP15T	15" (375 mm)	23.39" (594 mm)	---
MC3500IEPP15B		---	1.50" (38 mm)
MC3500IEPP18TC	18" (450 mm)	20.03" (509 mm)	---
MC3500IEPP18TW			
MC3500IEPP18BC		---	1.77" (45 mm)
MC3500IEPP18BW			
MC3500IEPP24TC	24" (600 mm)	14.48" (368 mm)	---
MC3500IEPP24TW			
MC3500IEPP24BC		---	2.06" (52 mm)
MC3500IEPP24BW			
MC3500IEPP30BC	30" (750 mm)	---	2.75" (70 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL

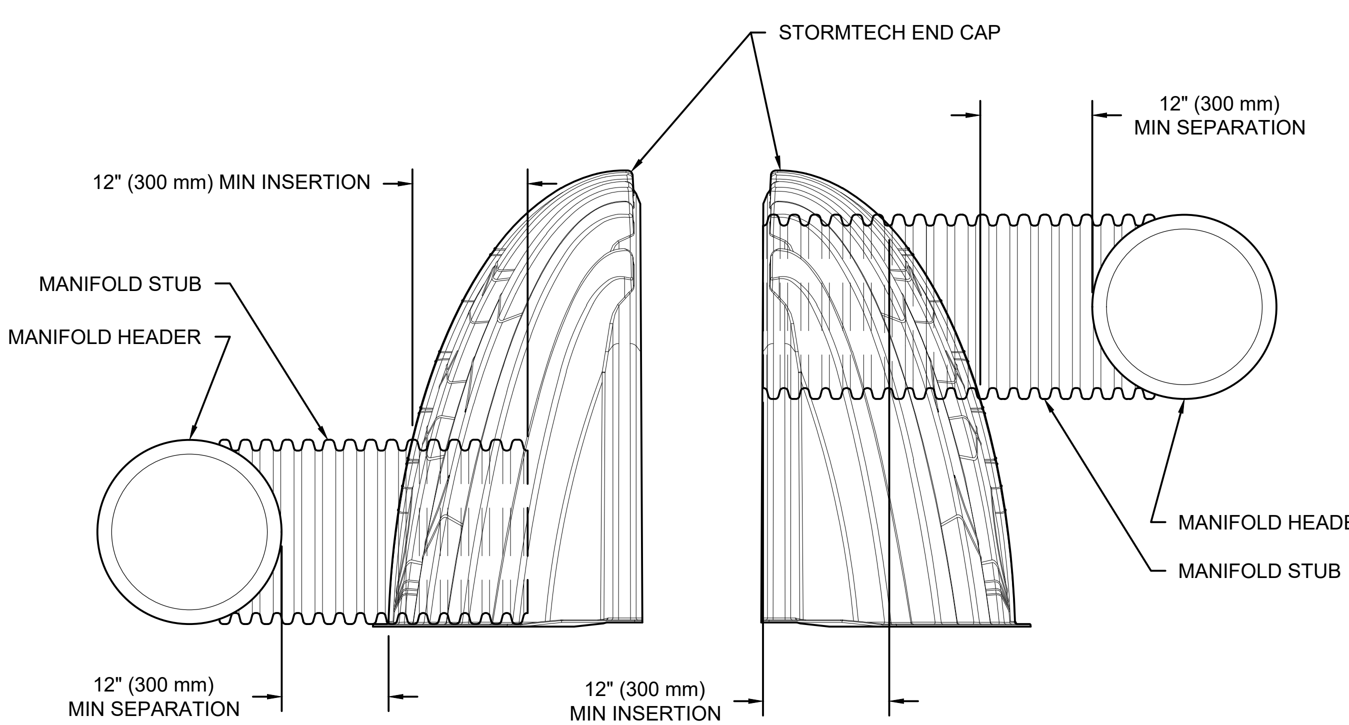




CUSTOM PRECORED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-3500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

MC-SERIES END CAP INSERTION DETAIL

NTS



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

BOBOLINK RIDGE - MH 210 (B)
OTTAWA, ONTARIO

DATE	DRW	CHK	DESCRIPTION

DATE:
DRAWN: BC
PROJECT #:
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NYLOPLAST DRAIN BASIN

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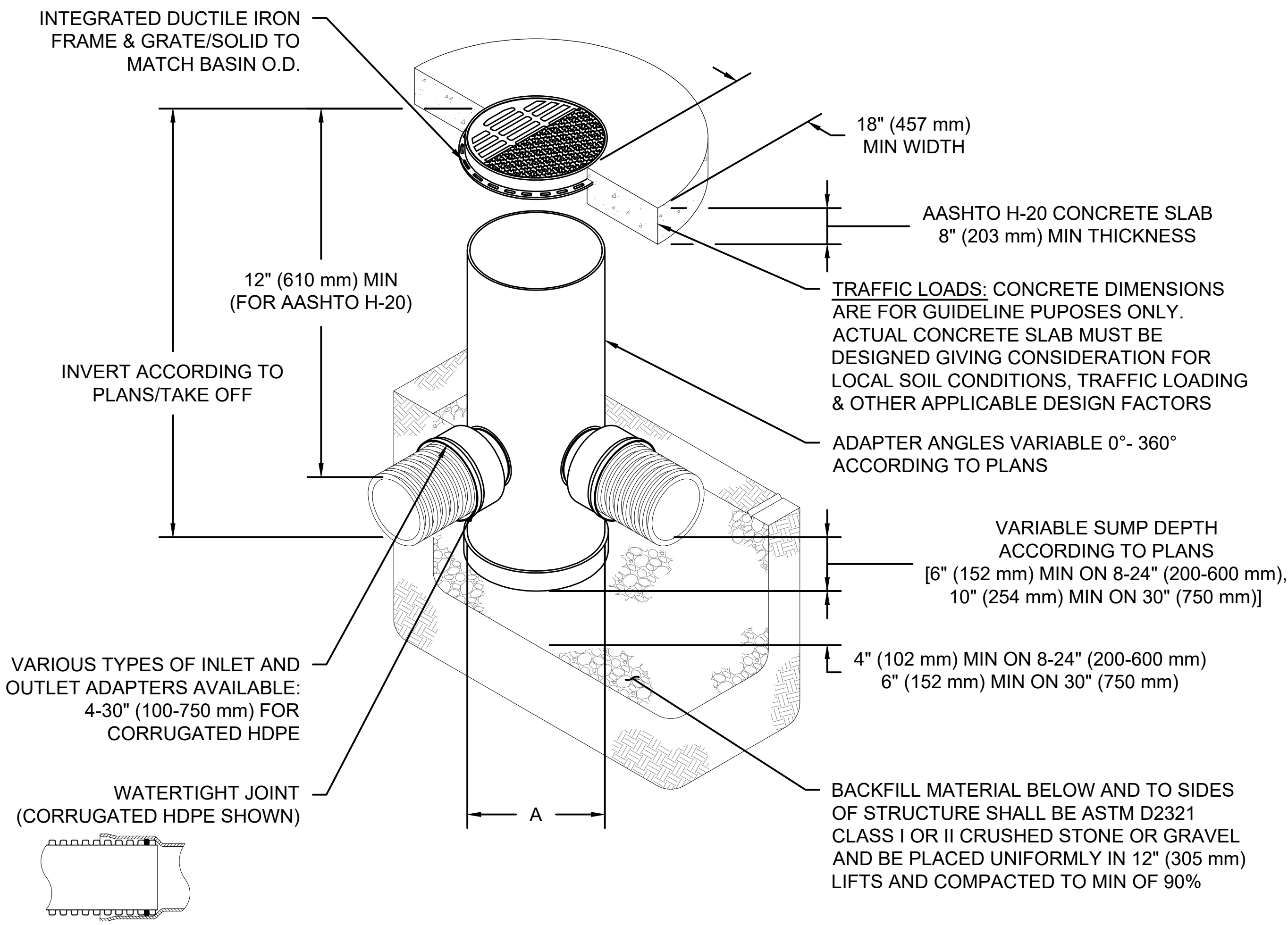

NOTES

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

BOBOLINK RIDGE - MH 210 (B)

OTTAWA, ONTARIO

DATE:

DRAWN: BC

PROJECT #:

CHECKED: N/A

DATE	DRW	CHK	DESCRIPTION

ADS
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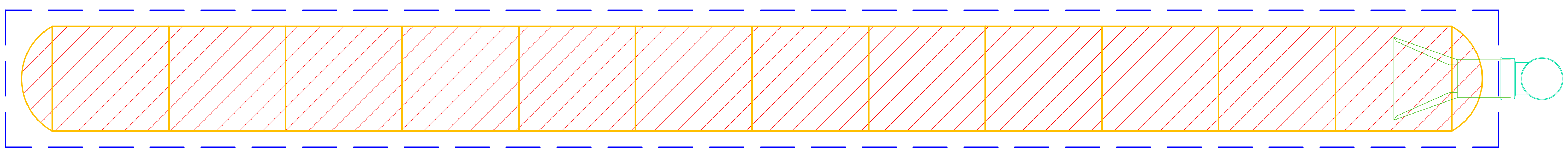


PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	

Advanced Drainage Systems, Inc.

SiteASSIST™
FOR STORMTECH INSTRUCTIONS, DOWNLOAD THE INSTALLATION APP

BOBOLINK RIDGE - MH 107

OTTAWA, ONTARIO

MC-4500 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-4500.
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 F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101.
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 75 mm (3").
   - 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 500 LBS/IN/IN. 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 MC-4500 CHAMBER SYSTEM

1. STORMTECH MC-4500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-4500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR 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 - 230 mm (9") SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 300 mm (12") INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE WELL GRADED BETWEEN ¾" AND 2" (20-50 mm).
9. STONE SHALL BE BROUGHT UP EVENLY AROUND CHAMBERS SO AS NOT TO DISTORT THE CHAMBER SHAPE. STONE DEPTHS SHOULD NEVER DIFFER BY MORE THAN 300 mm (12") BETWEEN ADJACENT CHAMBER ROWS.
10. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
11. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIAL BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
12. 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 MC-4500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-4500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 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 CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

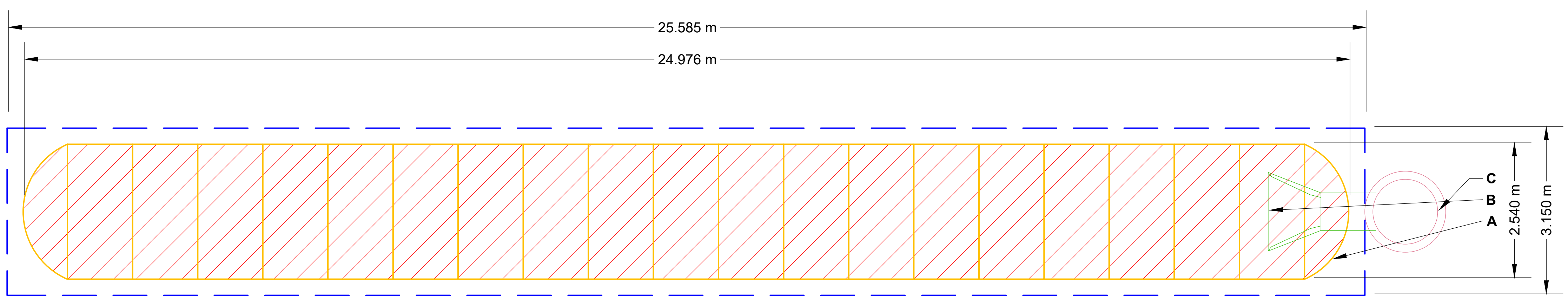
CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

PROPOSED LAYOUT	
19	STORMTECH MC-4500 CHAMBERS
2	STORMTECH MC-4500 END CAPS
305	STONE ABOVE (mm)
229	STONE BELOW (mm)
40	STONE VOID
102.0	INSTALLED SYSTEM VOLUME (m^3) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)
80.6	SYSTEM AREA (m^2)
57.5	SYSTEM PERIMETER (m)

CONCEPTUAL ELEVATIONS	
MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	3.886
MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	2.515
MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	2.362
MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	2.362
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	2.362
TOP OF STONE:	2.057
TOP OF MC-4500 CHAMBER:	1.753
600 mm ISOLATOR ROW PLUS INVERT:	0.286
BOTTOM OF MC-4500 CHAMBER:	0.229
BOTTOM OF STONE:	0.000

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	600 mm BOTTOM PARTIAL CUT END CAP, PART#: MC4500IEPP24B / TYP OF ALL 600 mm BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	57 mm	
FLAMP	B	INSTALL FLAMP ON 600 mm ACCESS PIPE / PART#: MC450024RAMP (TYP 2 PLACES)		
CONCRETE STRUCTURE	C	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		



ISOLATOR ROW PLUS (SEE DETAIL)

NO WOVEN GEOTEXTILE

BED LIMITS

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.
- **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

BOBOLINK RIDGE - MH 107

OTTAWA, ONTARIO

DATE:

DRAWN: BC

PROJECT #:

CHECKED: N/A

DATE	DRW	CHK	DESCRIPTION

StormTech® Chamber System

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ADS

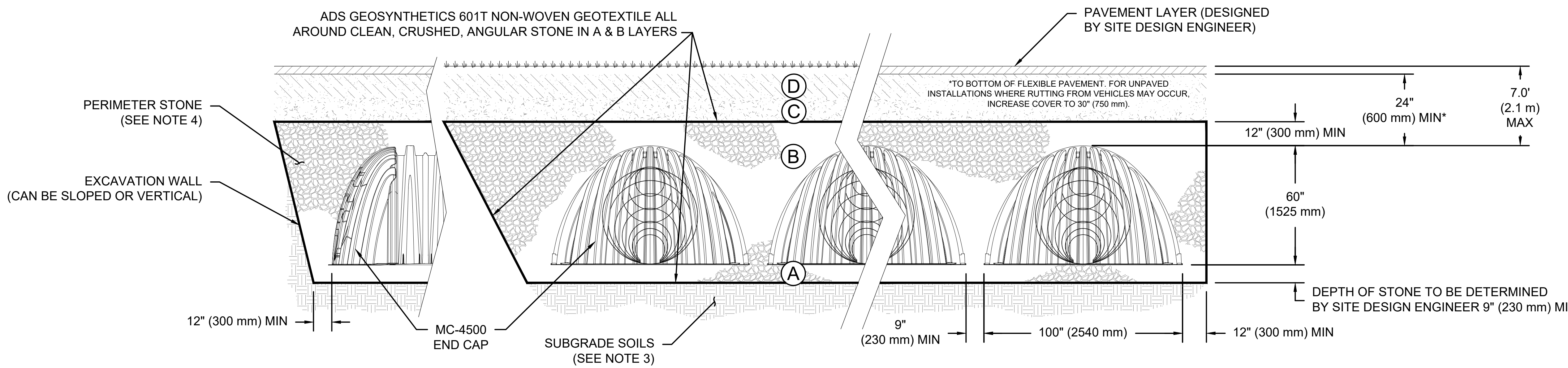
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

SCALE = 1 : 100

ACCEPTABLE FILL MATERIALS: STORMTECH MC-4500 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 24" (600 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 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
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, 4	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, 4	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 9" (230 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.



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
2. MC-4500 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 3".
   - 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 500 LBS/IN/IN. 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.

BOBOLINK RIDGE - MH 107
OTTAWA, ONTARIO

DATE:
DRAWN: BC
PROJECT #:
CHECKED: N/A

DATE	DRW	CHK	DESCRIPTION

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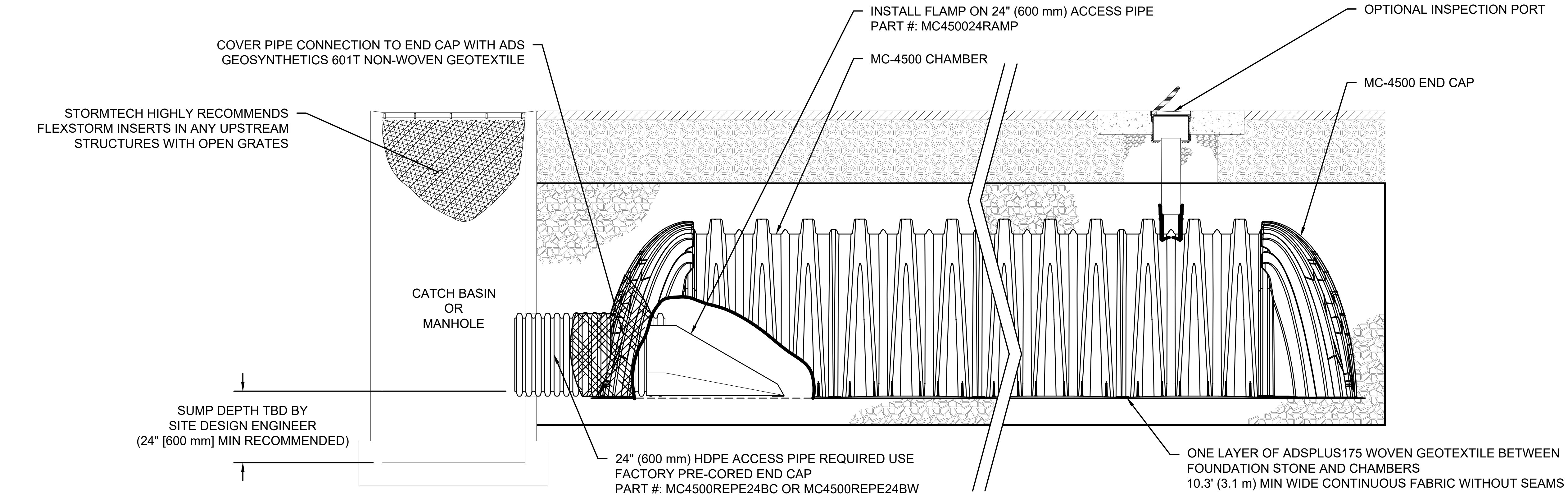

MC-4500 ISOLATOR ROW PLUS DETAIL

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.

BOBOLINK RIDGE - MH 107
OTTAWA, ONTARIO

DATE: | DRAWN: BC
PROJECT #: | CHECKED: N/A

DATE	DRW	CHK	DESCRIPTION

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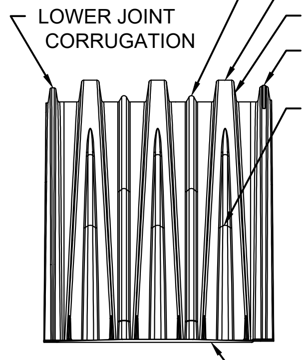
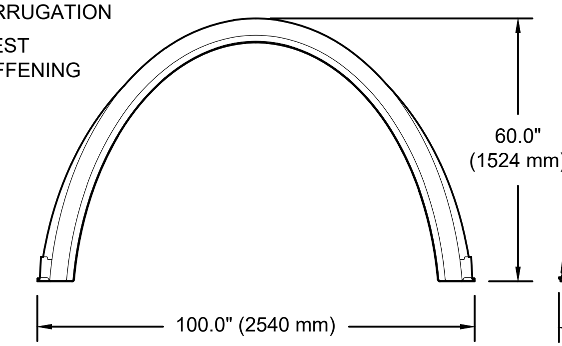
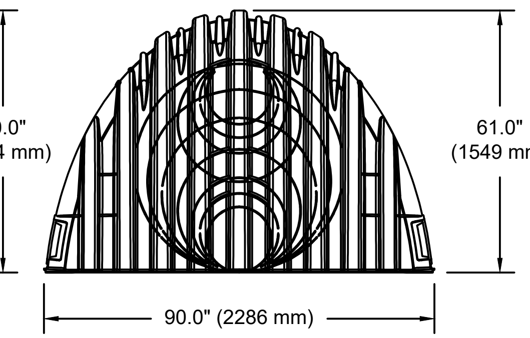
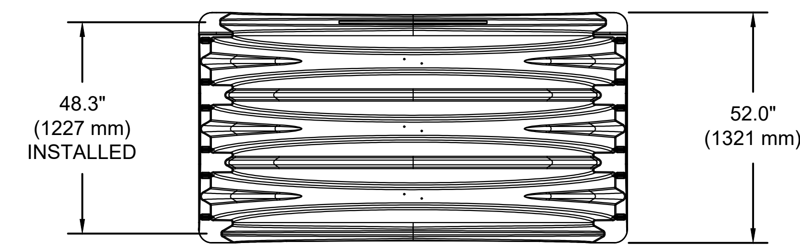
MC-4500 TECHNICAL SPECIFICATION

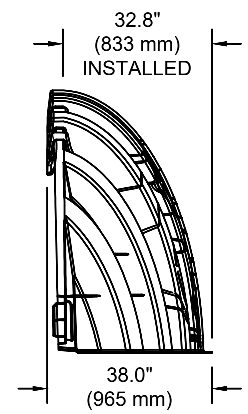
NTS











NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 48.3"	(2540 mm X 1524 mm X 1227 mm)
CHAMBER STORAGE	106.5 CUBIC FEET	(3.01 m³)
MINIMUM INSTALLED STORAGE*	162.6 CUBIC FEET	(4.60 m³)
WEIGHT (NOMINAL)	125.0 lbs.	(56.7 kg)

NOMINAL END CAP SPECIFICATIONS

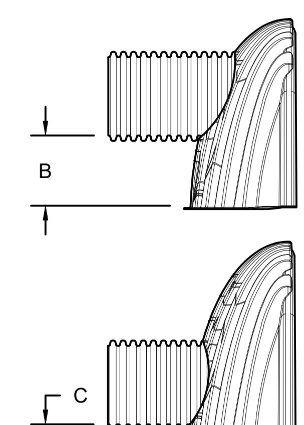
SIZE (W X H X INSTALLED LENGTH)	90.0" X 61.0" X 32.8"	(2286 mm X 1549 mm X 833 mm)
END CAP STORAGE	39.5 CUBIC FEET	(1.12 m³)
MINIMUM INSTALLED STORAGE*	115.3 CUBIC FEET	(3.26 m³)
WEIGHT (NOMINAL)	90 lbs.	(40.8 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS, 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC4500IEPP06T	6" (150 mm)	42.54" (1081 mm)	---
MC4500IEPP06B		---	0.86" (22 mm)
MC4500IEPP08T	8" (200 mm)	40.50" (1029 mm)	---
MC4500IEPP08B		---	1.01" (26 mm)
MC4500IEPP10T	10" (250 mm)	38.37" (975 mm)	---
MC4500IEPP10B		---	1.33" (34 mm)
MC4500IEPP12T	12" (300 mm)	35.69" (907 mm)	---
MC4500IEPP12B		---	1.55" (39 mm)
MC4500IEPP15T	15" (375 mm)	32.72" (831 mm)	---
MC4500IEPP15B		---	1.70" (43 mm)
MC4500IEPP18T	18" (450 mm)	29.36" (746 mm)	---
MC4500IEPP18TW			
MC4500IEPP18B		---	1.97" (50 mm)
MC4500IEPP18BW			
MC4500IEPP24T	24" (600 mm)	23.05" (585 mm)	---
MC4500IEPP24TW			
MC4500IEPP24B		---	2.26" (57 mm)
MC4500IEPP24BW			
MC4500IEPP30BW	30" (750 mm)	---	2.95" (75 mm)
MC4500IEPP36BW	36" (900 mm)	---	3.25" (83 mm)
MC4500IEPP42BW	42" (1050 mm)	---	3.55" (90 mm)

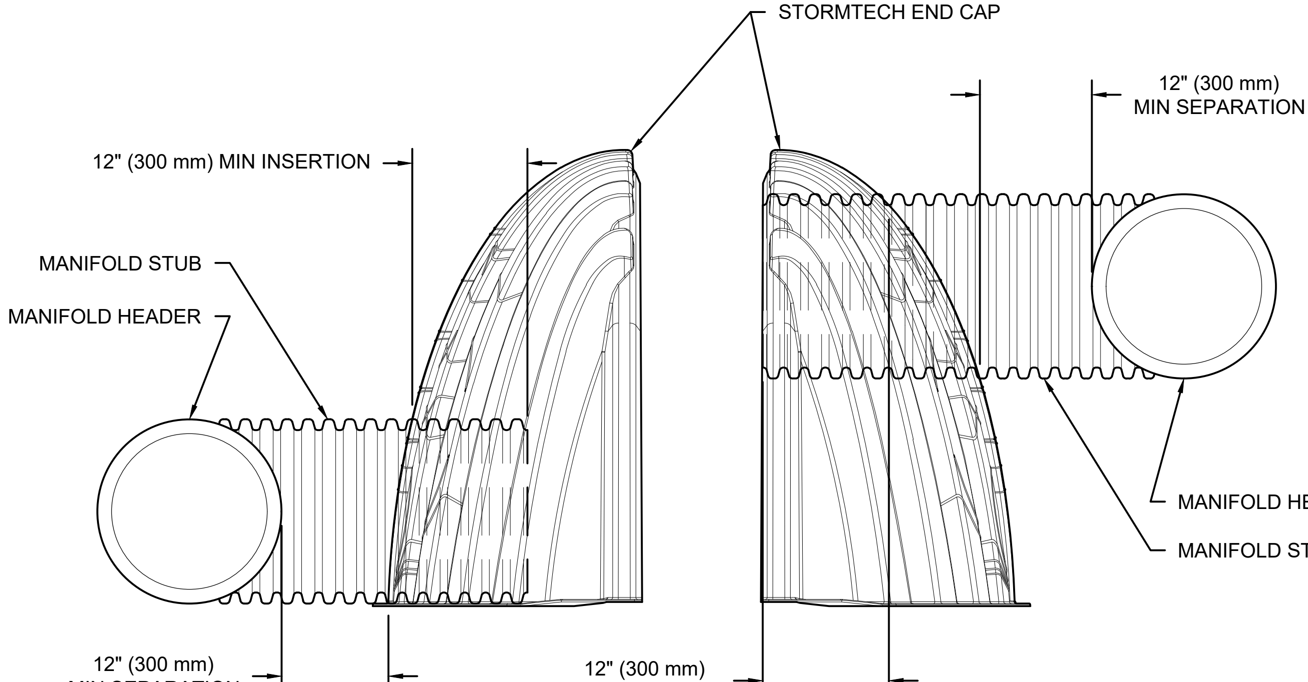
NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PARTIAL CUT INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-4500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

MC-SERIES END CAP INSERTION DETAIL

NTS



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

BOBOLINK RIDGE - MH 107
OTTAWA, ONTARIO

DATE:
DRAWN: BC
PROJECT #:
CHECKED: N/A

DATE	DRW	CHK	DESCRIPTION

THIS DRAWING HAS BEEN PREPARED BASED ON INFORMATION PROVIDED TO ADS UNDER THE DIRECTION OF THE SITE DESIGN ENGINEER OR OTHER PROJECT REPRESENTATIVE. THE SITE DESIGN ENGINEER SHALL REVIEW THIS DRAWING PRIOR TO CONSTRUCTION. IT IS THE ULTIMATE RESPONSIBILITY OF THE SITE DESIGN ENGINEER TO ENSURE THAT THE PRODUCT(S) DEPICTED AND ALL ASSOCIATED DETAILS MEET ALL APPLICABLE LAWS, REGULATIONS, AND PROJECT REQUIREMENTS.

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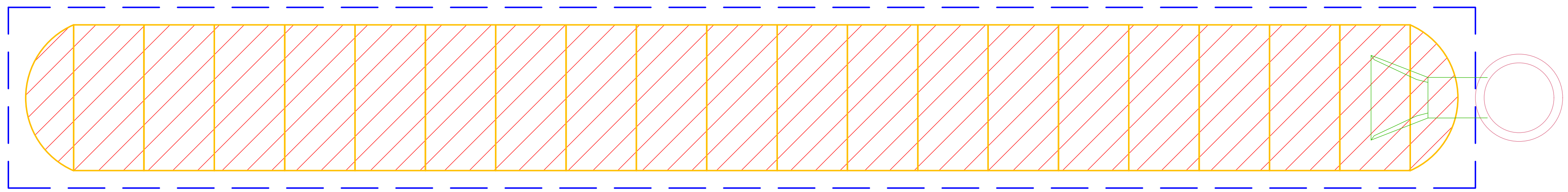
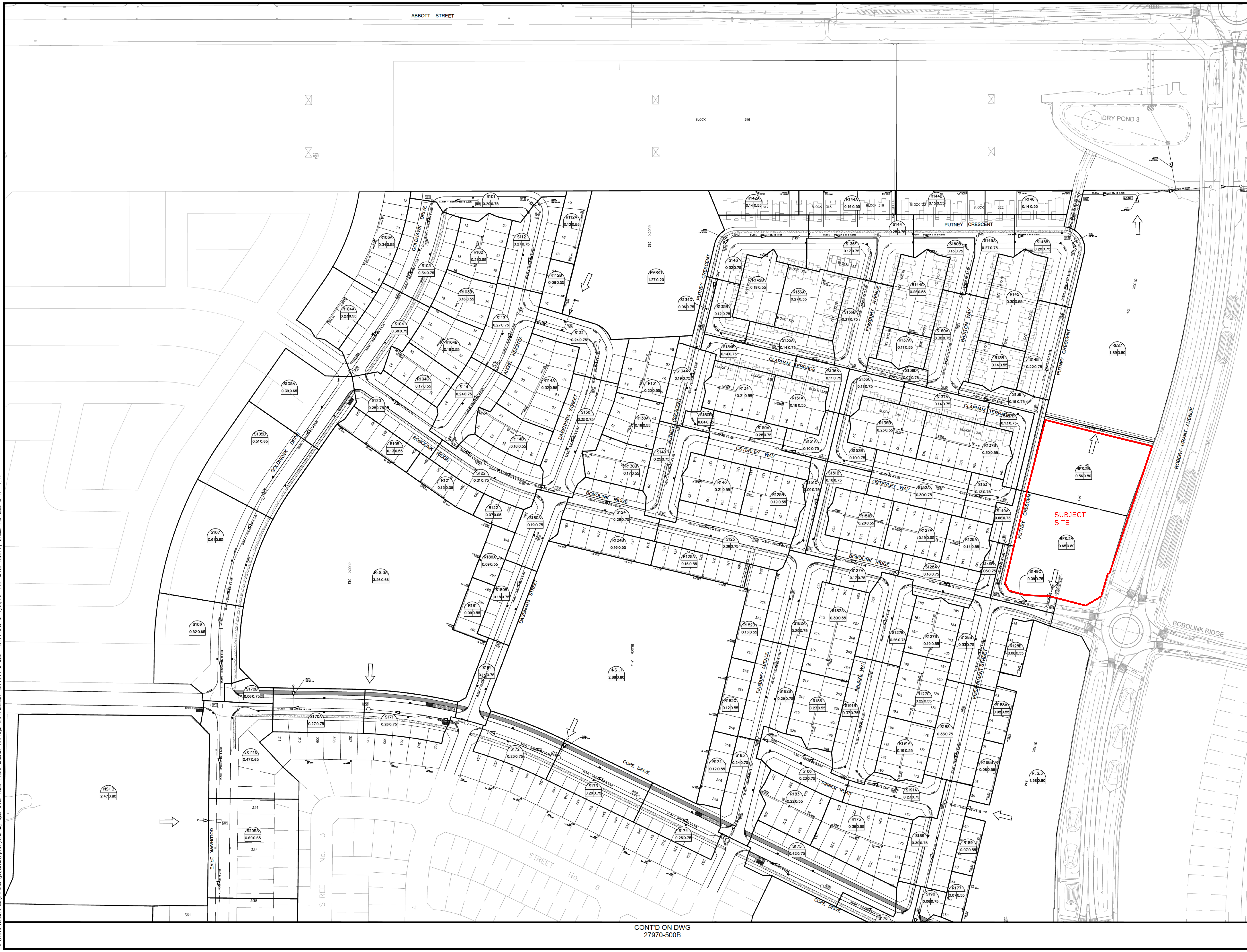
5 OF 5





REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ____________

Date ____________ 2017

Plan Number ____________

LEGEND :

S145 — AREA ID #

0.34 — RUN OFF COEFFICIENT

0.75 — AREA IN HECTARES

FUTURE MINOR FLOW DIRECTION

NOTES:

1. THIS ALLOWANCE IS FOR OPA66 EXPANSION AREAS 6a, 6b AND 6c.

2. AN ALLOWANCE OF 100l/s HAS BEEN MADE FOR FLOWS TRIBUTARY TO THE LAIRD STREET PUMP STATION.

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8	RESUBMISSION FOR MOE APPROVAL	JIM	17:07:14
7	SUBMISSION FOR MOE APPROVAL	JIM	17:02:10
6	SUBMISSION #5 FOR CITY REVIEW	JIM	16:11:10
5	SUBMISSION #4 FOR CITY REVIEW	JIM	15:06:15
4	SUBMISSION #3 FOR CITY REVIEW	JIM	14:08:22
3	SUBMISSION #2 FOR CITY REVIEW	JIM	14:01:22
2	REVISIONS AS PER RELOCATION OF FOUNDER AVENUE	JIM	13:12:12
1	SUBMISSION #1 FOR CITY REVIEW	JIM	13:08:29

CRT DEVELOPMENT INC.

IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title

CRT LANDS
FERNBANK COMMUNITY
PHASE 1

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
2017/07/14
PROVINCE OF ONTARIO

Drawing Title

STORM DRAINAGE
AREA PLAN

Scale 1:1250

Design	J.I.M.	Date	OCTOBER '12
Drawn	M.M.	Checked	P.K.
Project No.	27970	Drawing No.	500A

D07-16-11-0003

#17366

IBI GROUP
IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

STORM SEWER DESIGN SHEET

PROJECT: CRT DEVELOPMENT
LOCATION: CITY OF OTTAWA
CLIENT: CRT DEVELOPMENT INC.

LOCATION				AREA (Ha)										RATIONAL DESIGN FLOW													SEWER DATA								
STREET	AREA ID	FROM MH	TO MH	C= 0.20	C= 0.55	C= 0.65	C= 0.66	C= 0.75	C= 0.80	C= 0.90	C=	C=	C=	IND 2.78AC	CUM 2.78AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm) DIA	W	H	SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (5yr) (L/s)	(%)
PUTNEY CRESCENT	---	141	142					0.00						0.00	0.00	10.00	0.12	10.12	104.19	122.14	178.56	0.00				0.00	62.04	8.84	250			1.00	1.224	62.04	100.00%
PUTNEY CRESCENT	R142A, B	142	143		0.33									0.50	0.50	10.12	0.48	10.60	103.56	121.40	177.47	52.25				52.25	139.06	54.71	300			1.90	1.906	86.80	62.42%
PUTNEY CRESCENT	S143	143	144					0.32						0.67	1.17	10.60	0.68	11.28	101.13	118.54	173.26	118.50				118.50	266.03	65.86	450			0.80	1.620	147.53	55.45%
FINSBURY AVENUE	S136B, E, R136A	136	144		0.27			0.44						1.33	1.33	10.00	0.87	10.87	104.19	122.14	178.56	138.60				138.60	154.65	110.07	300			2.35	2.119	16.05	10.38%
PUTNEY CRESCENT	S144, R144A, B, C	144	145		0.57			0.25						1.39	3.89	11.28	0.74	12.02	97.90	114.73	167.68	381.31				381.31	401.29	80.25	525			0.80	1.796	19.98	4.98%
CLAPHAM TERRACE	S136C, D, R136B	136	137		0.23			0.18						0.73	0.73	10.00	0.94	10.94	104.19	122.14	178.56	75.75				75.75	100.88	77.99	300			1.00	1.383	25.14	24.92%
BRIXTON WAY	R137A	137	160		0.11									0.17	0.90	10.94	0.42	11.36	99.48	116.59	170.40	89.05				89.05	224.02	50.00	375			1.50	1.965	134.97	60.25%
BRIXTON WAY	S160A, B	160	145					0.43						0.90	1.79	11.36	0.54	11.90	97.50	114.26	166.98	174.69				174.69	280.40	78.98	375			2.35	2.459	105.71	37.70%
PUTNEY CRESCENT	S145A, B, R145	145	146		0.30			0.55						1.61	7.29	12.02	0.70	12.72	94.61	110.85	161.98	689.86				689.86	821.24	75.47	750			0.50	1.801	131.38	16.00%
CLAPHAM TERRACE	S137A, B, R137B	137	138		0.30			0.27						1.02	1.02	10.00	1.19	11.19	104.19	122.14	178.56	106.45				106.45	129.34	81.01	375			0.50	1.134	22.89	17.70%
PUTNEY CRESCENT	S138, R138	138	148		0.14			0.15						0.53	1.55	11.19	0.67	11.86	98.30	115.20	168.37	152.21				152.21	220.25	78.01	375			1.45	1.932	68.04	30.89%
PUTNEY CRESCENT	S148	148	147					0.22						0.46	2.01	11.86	0.38	12.24	95.28	111.65	163.15	191.25				191.25	297.76	59.30	375			2.65	2.612	106.51	35.77%
PUTNEY CRESCENT	---	147	146					0.00						0.00	2.01	12.24	0.10	12.34	93.68	109.76	160.37	188.02				188.02	332.54	12.13	450			1.25	2.026	144.52	43.46%
BLOCK 324		146	161											0.00	9.30	12.72	0.40	13.12	91.73	107.47	157.01	853.01				853.01	944.29	34.88	900			0.25	1.438	91.28	9.67%
BLOCK 324	R146	161	*Ex. 180*		0.14									0.21	9.51	13.12	0.56	13.68	90.15	105.61	154.28	857.65				857.65	944.29	48.00	900			0.25	1.438	86.65	9.18%
BLOCK 324	RES.1, RES. 2B	BULKHEAD	*Ex. 180*						2.45					5.45	5.45	13.00	0.07	13.07	90.63	106.17	155.11	493.82				493.82	731.45	5.00	900			0.15	1.114	237.62	32.49%

Refer to ECA No. 9079-9LNNZC dated July 9, 2014 for description of existing sewers.

Definitions:
Q = 2.78CiA, where:
Q = Peak Flow in Litres per Second (L/s)
A = Area in Hectares (Ha)
i = Rainfall intensity in millimeters per hour (mm/hr)
[i = 998.071 / (TC+6.053)^0.814] 5 YEAR
[i = 1174.184 / (TC+6.014)^0.816] 10 YEAR
[i = 1735.688 / (TC+6.014)^0.820] 100 YEAR

Notes:
1. Mannings coefficient (n) = 0.013

Designed: J.I.M.
Checked: P.K.
Dwg. Reference: 27970 - 500, 500A, 500B

No.	Revision	Date
1.	Submission No. 1 to City of Ottawa	2013-08-29
2.	Submission No. 2 to City of Ottawa	2014-01-22
3.	Submission No. 3 to City of Ottawa	2014-08-22
4.	Submission No. 4 to City of Ottawa	2015-06-15
5.	Submission No. 5 to City of Ottawa	2016-11-10
6.	Submission for MOE Approval	2017-02-10
7.	Resubmission for MOE Approval	2017-07-14

File Reference:	Date:	Sheet No:
27970.5.7.1	2017-07-14	1 of 3

IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

STORM SEWER DESIGN SHEET

PROJECT: CRT DEVELOPMENT
LOCATION: CITY OF OTTAWA
CLIENT: CRT DEVELOPMENT INC.

LOCATION				AREA (Ha)										RATIONAL DESIGN FLOW													SEWER DATA								
STREET	AREA ID	FROM MH	TO MH	C= 0.20	C= 0.55	C= 0.65	C= 0.66	C= 0.75	C= 0.80	C= 0.90	C=	C=	C=	IND 2.78AC	CUM 2.78AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm) DIA	W	H	SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (5yr) (L/s)	(%)
CLAPHAM TERRACE	S136A	136	135					0.17						0.35	0.35	10.00	1.03	11.03	104.19	122.14	178.56	36.93				36.93	50.02	61.00	250			0.65	0.987	13.09	26.16%
CLAPHAM TERRACE	S135A, B	135	134					0.26						0.54	0.90	11.03	1.08	12.11	99.05	116.08	169.66	88.80				88.80	108.21	61.66	375			0.35	0.949	19.41	17.94%
PUTNEY CRESCENT	---	141	134		0.00									0.00	0.00	10.00	1.31	11.31	104.19	122.14	178.56	0.00				0.00	108.21	74.74	375			0.35	0.949	108.21	100.00%
PUTNEY CRESCENT	S134A, B, C, R134	134	140		0.21			0.39						1.13	2.03	12.11	1.10	13.21	94.22	110.39	161.31	191.34				191.34	265.43	78.10	525			0.35	1.188	74.09	27.91%
OSTERLEY WAY	S153	153	152					0.12						0.25	0.25	10.00	1.04	11.04	104.19	122.14	178.56	26.07				26.07	43.87	53.80	250			0.50	0.866	17.80	40.57%
OSTERLEY WAY	S152A, B	152	151					0.40						0.83	1.08	11.04	1.82	12.85	99.02	116.05	169.61	107.36				107.36	148.72	98.72	450			0.25	0.906	41.36	27.81%
OSTERLEY WAY	S151A, R151A	151	150		0.18			0.10						0.48	1.57	12.85	0.96	13.81	91.21	106.85	156.10	143.00				143.00	170.86	59.71	450			0.33	1.041	27.86	16.30%
OSTERLEY WAY	S150A, B	150	140					0.32						0.67	2.24	13.81	0.91	14.72	87.62	102.63	149.90	195.83				195.83	257.73	63.00	525			0.33	1.153	61.90	24.02%
PUTNEY CRESCENT	S140, R140	140	124		0.21			0.25						0.84	5.11	14.72	0.91	15.63	84.48	98.93	144.48	431.53				431.53	636.13	76.57	750			0.30	1.395	204.60	32.16%
PUTNEY CRESCENT	S149A, B, S129C	149	128					0.22						0.46	0.46	10.00	0.61	10.61	104.19	122.14	178.56	47.79				47.79	62.04	45.00	250			1.00	1.224	14.25	22.96%
BLOCK 343	RES.2A	BULKHEAD	129						0.65					1.45	1.45	13.00	0.27	13.27	90.63	106.17	155.11	131.01				131.01	303.78	13.50	675			0.12	0.822	172.76	56.87%
BOBOLINK RIDGE		129	128					0.00						0.00	1.45	13.00	0.91	13.91	90.63	106.17	155.11	131.01				131.01	303.78	45.00	675			0.12	0.822	172.76	56.87%
BOBOLINK RIDGE	S128A, R128A	128	127		0.14			0.18						0.59	2.49	13.91	1.57	15.49	87.25	102.19	149.26	217.56				217.56	473.55	81.00	825			0.10	0.858	255.99	54.06%
BOBOLINK RIDGE	S127A, R127A	127	126		0.19			0.17						0.64	3.14	15.49	1.51	17.00	82.02	96.05	140.25	257.44				257.44	473.55	78.00	825			0.10	0.858	216.11	45.64%
FINSBURY AVENUE	S151B, C, R151B	151	126		0.20			0.25						0.83	0.83	10.00	0.79	10.79	104.19	122.14	178.56	86.17				86.17	117.21	76.50	300			1.35	1.606	31.04	26.48%
BOBOLINK RIDGE	---	126	125					0.00						0.00	3.97	17.00	0.81	17.81	77.61	90.86	132.63	307.77				307.77	597.22	44.30	900			0.10	0.909	289.46	48.47%
BOBOLINK RIDGE	S125, R125A, B	125	124		0.35			0.39						1.35	5.31	17.81	1.39	19.20	75.45	88.32	128.91	400.95				400.95	739.33	80.07	975			0.10	0.959	338.38	45.77%
BOBOLINK RIDGE	S124, R124A, B	124	123		0.32			0.26						1.03	11.45	19.20	1.23	20.44	72.05	84.32	123.05	825.24				825.24	1,760.81	88.10	1350			0.10	1.192	935.57	53.13%
DAGENHAM STREET	R131	131	130		0.20									0.31	0.31	10.00	0.84	10.84	104.19	122.14	178.56	31.86				31.86	59.68	41.39	300			0.35	0.818	27.82	46.61%
DAGENHAM STREET	S130, R130A, B	130	123		0.33			0.36						1.26	1.56	10.84	1.75	12.59	99.94	117.13	171.20	156.00				156.00	179.46	84.37	525			0.16	0.803	23.46	13.07%
BOBOLINK RIDGE	---	123	122		0.00									0.00	13.01	20.44	0.30	20.74	69.31	81.11	118.33	902.05				902.05	1,760.81	21.46	1350			0.10	1.192	858.77	48.77%
BOBOLINK RIDGE	S122, R122	122	121		0.17			0.31						0.91	13.92	20.74	0.39	21.13	68.68	80.36	117.24	956.05				956.05	3,040.59	39.49	1500			0.17	1.667	2084.54	68.56%
BOBOLINK RIDGE	R121	121	120		0.13									0.20	14.12	21.13	0.37	21.50	67.86	79.41	115.84	958.22				958.22	3,040.59	36.84	1500			0.17	1.667	2082.37	68.49%
ANGEL HEIGHTS	---	111	112		0.00									0.00	0.00	10.00	0.27	10.27	104.19	122.14	178.56	0.00				0.00	42.08	13.58	250			0.46	0.830	42.08	100.00%
ANGEL HEIGHTS	S112, R112A, B	112	113		0.20			0.27						0.87	0.87	10.27	1.68	11.95	102.77	120.47	176.10	89.29				89.29	139.51	85.60	450			0.22	0.850	50.22	36.00%
DAGENHAM STREET	PARK1	DICB	132	1.27										0.71	0.71	12.00	0.29	12.29	94.70	110.96	162.13	66.87				66.87	100.88	23.70	300			1.00	1.383	34.02	33.72%
DAGENHAM STREET	S132	132	113					0.24						0.50	1.21	12.29	0.55	12.83	93.49	109.54	160.05	112.80				112.80	210.32	42.00	450			0.50	1.281	97.52	46.37%
ANGEL HEIGHTS	S113	113	114					0.30						0.63	1.49	12.83	0.85	13.68	91.29	106.94	156.24	136.40				136.40	248.09	43.13	600			0.15	0.850	111.69	45.02%
ANGEL HEIGHTS	S114, R114	114	120		0.50			0.24						1.26	2.76	13.68	1.43	15.11	88.09	103.18	150.72	243.05				243.05	367.27	69.17	750			0.10	0.805	124.22	33.82%
BOBOLINK RIDGE	S120	120	105					0.28						0.58	17.46	21.50	0.96	22.45	67.13	78.54	114.57	1,172.18				1,172.18	3,040.59	95.64	1500			0.17	1.667	1868.41	61.45%
ANGEL HEIGHTS	S101	101	102					0.20						0.42	0.42	10.00	0.52	10.52	104.19	122.14	178.56	43.45				43.45	129.34	35.48	375			0.50	1.134	85.89	66.41%
GOLDHAWK DRIVE	R102	102	103		0.21									0.32	0.74	10.52	0.83	11.35	101.52	118.99	173.93	74.93				74.93	126.19	38.36	450			0.18	0.769	51.26	40.62%
GOLDHAWK DRIVE	S103, R103A, B	103	104		0.50			0.34						1.47	2.21	11.35	1.01	12.36	97.55	114.32	167.07	215.73				215.73	303.78	49.62	675			0.12	0.822	88.05	28.98%
GOLDHAWK DRIVE	S104, R104A, B, C	104	105		0.59			0.30						1.53	3.74	12.36	1.35	13.71	93.19	109.19	159.53	348.45				348.45	473.55	69.59	825			0.10	0.858	125.10	26.42%
GOLDHAWK DRIVE	S105A, S105B, R105	105	107		0.13	0.90								1.83	23.03	22.45	1.31	23.77	65.29	76.38	111.40	1,503.33				1,503.33	5,720.16	126.10	2100			0.10	1.600	4216.82	73.72%
GOLDHAWK DRIVE	S107	107	109			0.61								1.10	24.13	23.77	1.17	24.94	62.94	73.62	107.36	1,518.58				1,518.58	5,720.16	112.64	2100			0.10	1.600	4201.58	73.45%
GOLDHAWK DRIVE	S109	109	110			0.52								0.94	25.07	24.94	0.67	25.62	60.99	71.33	104.01	1,528.92				1,528.92	5,720.16	64.64	2100			0.10	1.600	4191.24	73.27%

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A = Area in Hectares (Ha)
i = Rainfall intensity in millimeters per hour (mm/hr)
[i = 998.071 / (TC+6.053)^0.814] 5 YEAR
[i = 1174.184 / (TC+6.014)^0.816] 10 YEAR
[i = 1735.688 / (TC+6.014)^0.820] 100 YEAR

Notes:
1. Mannings coefficient (n) = 0.013

Designed: J.I.M.
Checked: P.K.
Dwg. Reference: 27970 - 500, 500A, 500B

No.	Revision	Date
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3.	Submission No. 3 to City of Ottawa	2014-08-22
4.	Submission No. 4 to City of Ottawa	2015-06-15
5.	Submission No. 5 to City of Ottawa	2016-11-10
6.	Submission for MOE Approval	2017-02-10
7.	Resubmission for MOE Approval	2017-07-14

File Reference:	Date:	Sheet No:
27970.5.7.1	2017-07-14	2 of 3

IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

STORM SEWER DESIGN SHEET

PROJECT: CRT DEVELOPMENT
LOCATION: CITY OF OTTAWA
CLIENT: CRT DEVELOPMENT INC.

LOCATION				AREA (Ha)										RATIONAL DESIGN FLOW													SEWER DATA								
STREET	AREA ID	FROM MH	TO MH	C= 0.20	C= 0.55	C= 0.65	C= 0.66	C= 0.75	C= 0.80	C= 0.90	C=	C=	C=	IND 2.78AC	CUM 2.78AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm) DIA	W	H	SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (5yr) (L/s)	(%)
EMBANKMENT STREET	S128B, R128B	128	188		0.09			0.31						0.78	0.78	10.00	1.76	11.76	104.19	122.14	178.56	81.68				81.68	108.21	100.00	375			0.35	0.949	26.53	24.52%
EMBANKMENT STREET	S188, R188A, B	188	189		0.19			0.30						0.92	1.70	11.76	0.97	12.72	95.75	112.20	163.96	162.77				162.77	210.32	74.32	450			0.50	1.281	47.54	22.61%
BLOCK 344	RES.3	BULKHEAD	189						1.58					3.51	3.51	*13.95*	0.66	14.61	87.11	102.03	149.03	306.10				306.10	402.33	35.00	750			0.12	0.882	96.23	23.92%
EMBANKMENT STREET	S189, R189	189	190		0.09			0.28						0.72	5.94	14.61	1.69	16.30	84.83	99.35	145.10	503.52				503.52	739.33	97.00	975			0.10	0.959	235.81	31.89%
EMBANKMENT STREET	S190	190	176					0.05						0.10	6.04	16.30	0.20	16.50	79.59	93.19	136.05	480.69				480.69	739.33	11.54	975			0.10	0.959	258.64	34.98%
COPE DRIVE	S177, R177	177	176		0.08			0.14						0.41	0.41	10.00	1.17	11.17	104.19	122.14	178.56	43.16				43.16	59.68	57.46	300			0.35	0.818	16.52	27.69%
BLOCK 345 (SCHOOL)	INST.2	BULKHEAD	176						6.57					14.61	14.61	12.00	0.15	12.15	94.70	110.96	162.13	1,383.66				1,383.66	1,575.26	12.00	1200			0.15	1.349	191.60	12.16%
COPE DRIVE	S176	176	175					0.14						0.29	21.36	16.50	1.05	17.55	79.01	92.51	135.05	1,687.52				1,687.52	2,332.02	80.65	1500			0.10	1.278	644.51	27.64%
COPE DRIVE	S175, R175	175	174		0.36			0.42						1.43	22.78	17.55	1.12	18.67	76.14	89.13	130.09	1,734.64				1,734.64	2,332.02	86.28	1500			0.10	1.278	597.38	25.62%
FINSBURY AVENUE	S182A,B, R182A,B,C	182	183		0.58			0.58						2.10	2.10	10.00	1.57	11.57	104.19	122.14	178.56	218.40				218.40	283.76	119.30	525			0.40	1.270	65.35	23.03%
PINNER ROAD	S191, R191A	191	186		0.19			0.60						1.54	1.54	10.00	0.55	10.55	104.19	122.14	178.56	160.61				160.61	378.96	43.00	600			0.35	1.298	218.35	57.62%
BELSIZE WAY	S127B, R127B, C	127	185		0.41			0.26						1.17	1.17	10.00	1.31	11.31	104.19	122.14	178.56	121.80				121.80	188.11	90.00	450			0.40	1.146	66.31	35.25%
BELSIZE WAY	---	185	186											0.00	1.17	11.31	1.29	12.60	97.75	114.56	167.42	114.27				114.27	175.96	82.92	450			0.35	1.072	61.69	35.06%
PINNER ROAD	S186, R186	186	187		0.23			0.23						0.83	3.54	12.60	1.38	13.97	92.21	108.04	157.85	326.60				326.60	473.55	70.83	825			0.10	0.858	146.95	31.03%
PINNER ROAD	---	187	183					0.00						0.00	3.54	13.97	0.19	14.17	87.03	101.93	148.88	308.22				308.22	473.55	10.00	825			0.10	0.858	165.33	34.91%
FINSBURY AVENUE	S183, R183	183	184		0.22			0.24						0.84	6.47	14.17	1.14	15.30	86.34	101.13	147.71	559.05				559.05	900.87	68.70	1050			0.10	1.008	341.82	37.94%
FINSBURY AVENUE	---	184	174					0.00						0.00	6.47	15.30	0.32	15.62	82.59	96.71	141.22	534.72				534.72	900.87	19.07	1050			0.10	1.008	366.15	40.64%
COPE DRIVE	S174, R174	174	173		0.12			0.25						0.70	29.96	18.67	0.94	19.61	73.30	85.80	125.21	2,196.41				2,196.41	3,792.13	81.44	1800			0.10	1.444	1595.72	42.08%
COPE DRIVE	S173	173	172					0.29						0.60	30.57	19.61	0.84	20.46	71.11	83.22	121.43	2,173.69				2,173.69	3,792.13	73.01	1800			0.10	1.444	1618.44	42.68%
BLOCK 313 (SCHOOL)	INST.1	BULKHEAD	172						2.88					6.41	6.41	12.00	0.25	12.25	94.70	110.96	162.13	606.54				606.54	755.43	17.02	900			0.16	1.150	148.90	19.71%
COPE DRIVE	S172	172	171					0.23						0.48	37.45	20.46	0.93	21.39	69.27	81.05	118.25	2,594.13				2,594.13	3,792.13	80.84	1800			0.10	1.444	1198.00	31.59%
DAGENHAM STREET	S180A,B, R180A	180	181		0.09			0.37						0.91	0.91	10.00	1.42	11.42	104.19	122.14	178.56	94.72				94.72	245.74	94.00	525			0.30	1.100	151.02	61.46%
DAGENHAM STREET	S181, R181	181	171		0.09			0.14						0.43	1.34	11.42	1.23	12.66	97.23	113.94	166.51	130.14				130.14	286.47	72.50	600			0.20	0.982	156.32	54.57%
COPE DRIVE	S171	171	170					0.26						0.54	39.33	21.39	0.94	22.33	67.34	78.79	114.94	2,648.73				2,648.73	3,792.13	81.06	1800			0.10	1.444	1143.40	30.15%
BLOCK 312	RES.3A	CBMH549	sewer				3.26							5.98	5.98	12.00	0.22	12.22	94.70	110.96	162.13	566.42				566.42	844.60	16.74	900			0.20	1.286	278.18	32.94%
COPE DRIVE	S170A,B	170	110					0.33						0.69	46.00	22.33	1.33	23.66	65.53	76.66	111.82	3,014.45				3,014.45	4,694.42	121.89	1950			0.10	1.523	1679.97	35.79%
GOLDHAWK DRIVE	S110B	110	205			0.47								0.85	71.92	25.62	0.83	26.45	59.93	70.09	102.19	4,310.29				4,310.29	11,180.46	94.32	2700			0.10	1.892	6870.17	61.45%
														0.00																					
GOLDHAWK DRIVE	INST.3	BULKHEAD	205						2.47					5.49	5.49	12.00	0.17	12.17	94.70	110.96	162.13	520.19				520.19	620.09	17.00	675			0.50	1.679	99.90	16.11%
GOLDHAWK DRIVE	205A, 205B	205	206			1.46								2.64	80.05	26.45	0.94	27.39	58.68	68.62	100.04	4,697.53				4,697.53	11,180.46	107.00	2700			0.10	1.892	6482.93	57.98%
GOLDHAWK DRIVE	S206	206	207			0.84								1.52	81.57	27.39	0.90	28.29	57.33	67.04	97.72	4,676.48				4,676.48	11,726.17	107.16	2700			0.11	1.984	7049.69	60.12%
														0.00																					
STREET NO. 2	RES. 4, 6 & 7		207			22.96			1.89					45.69	45.69	10.00	0.83	10.83	104.19	122.14	178.56	4,760.80				4,760.80	5,720.16	80.00	2100			0.10	1.600	959.36	16.77%
STREET NO. 2	S305	305	CULVERT			0.03								0.05	0.05												13,335.43	22.00	1500			3.27	7.311	13335.43	100.00%
STREET NO. 26	S304	304	CULVERT			0.03								0.05	0.05												12,579.97	22.00	1500			2.91	6.896	12579.97	100.00%
FUTURE STREET	S304B	304	303			0.69								1.25	1.25												5,720.16	98.94	2100			0.10	1.600	5720.16	100.00%
GOLDHAWK DRIVE	S303, S306	303	302			3.19								5.76	7.01												5,720.16	94.58	2100			0.10	1.600	5720.16	100.00%
GOLDHAWK DRIVE	S302,Park3,Res 5	302	301	1.36		10.06								18.93	25.95	These pipes are sized by stormwater modeling (See Design Brief-Fernbank Pond 5 Stormwater Management Facility Report)											5,720.16	70.65	2100			0.10	1.600	5720.16	100.00%
GOLDHAWK DRIVE	S301	301	207			0.49								0.89	26.83												5,720.16	70.00	2100			0.10	1.600	5720.16	100.00%
STREET NO. 25	---	207	300											0.00	154.09												2,332.02	93.73	1500			0.10	1.278	2332.02	100.00%
POND		300	HEADWALL	9.21		52.74								100.42	254.51												3,006.86	75.63	1650			0.10	1.362	3006.86	100.00%

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Designed: J.I.M.
Checked: P.K.
Dwg. Reference: 27970 - 500, 500A, 500B

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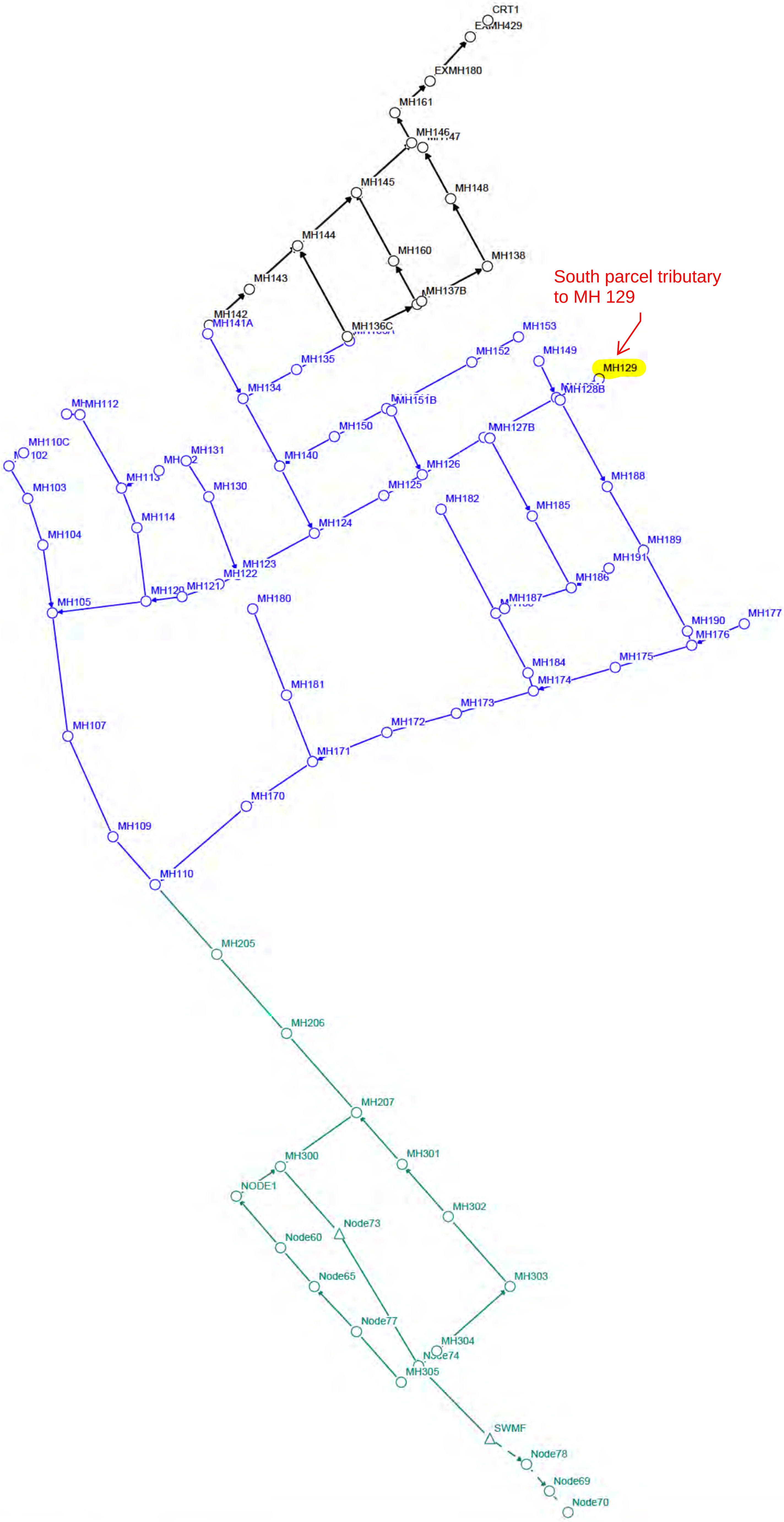
File Reference:	Date:	Sheet No:
27970.5.7.1	2017-07-14	3 of 3



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HGL SUMMARY PHASE 1 AND PHASE 1A

PHASE	MH	USF or Proposed Ground		100 year 3 hour Chicago		100 year 3 hour Chicago + 20%		July 1979		August 1988		August 1996	
			Elevation (m)	HGL (m)	Freeboard (m)	HGL (m)	Freeboard (m)	HGL (m)	Freeboard (m)	HGL (m)	Freeboard (m)	HGL (m)	Freeboard (m)
Trunk to Pond 5	MH207	Proposed Ground	107.17	104.53	2.64	104.58	2.59	104.55	2.62	104.54	2.63	104.23	2.94
	MH206	Proposed Ground	107.15	104.57	2.58	104.63	2.52	104.60	2.55	104.58	2.57	104.25	2.90
	MH205	Proposed Ground	107.28	104.62	2.66	104.68	2.60	104.64	2.64	104.62	2.66	104.28	3.00
1	MH110	Proposed Ground	107.52	104.69	2.83	104.75	2.77	104.71	2.81	104.69	2.83	104.33	3.19
1	MH109	Proposed Ground	107.45	104.71	2.74	104.77	2.68	104.72	2.73	104.71	2.74	104.33	3.12
1	MH107	Proposed Ground	107.41	104.73	2.68	104.80	2.61	104.75	2.66	104.73	2.68	Free flow	N/A
1	MH105	USF	105.65	104.76	0.89	104.83	0.82	104.79	0.86	104.77	0.88	Free flow	N/A
1	MH104	USF	105.85	104.80	1.05	104.87	0.98	104.83	1.02	104.81	1.04	Free flow	N/A
1	MH103	USF	105.75	104.81	0.94	104.89	0.86	104.85	0.90	104.83	0.92	Free flow	N/A
1	MH102	USF	105.95	104.82	1.13	104.89	1.06	104.85	1.10	104.84	1.11	Free flow	N/A
1	MH110C	Proposed Ground	107.93	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH170	USF	105.50	104.86	0.64	104.94	0.56	104.87	0.63	104.86	0.64	104.43	1.07
1	MH171	USF	105.35	104.96	0.39	105.04	0.31	104.96	0.39	104.96	0.39	104.48	0.87
1	MH172	USF	105.50	105.03	0.47	105.12	0.38	105.03	0.47	105.05	0.45	Free flow	N/A
1	MH173	USF	105.65	105.07	0.58	105.17	0.48	105.08	0.57	105.10	0.55	Free flow	N/A
1	MH174	USF	105.80	105.13	0.67	105.24	0.56	105.14	0.66	105.18	0.62	Free flow	N/A
1	MH175	USF	106.00	105.18	0.82	105.28	0.72	105.19	0.81	105.22	0.78	Free flow	N/A
1	MH176	USF	106.10	105.23	0.87	105.33	0.77	105.24	0.86	105.27	0.83	Free flow	N/A
1	MH177	Proposed Ground	106.55	105.28	1.27	105.34	1.21	105.30	1.25	105.34	1.21	Free flow	N/A
1	MH181	USF	105.65	105.19	0.46	105.28	0.37	105.06	0.59	105.06	0.59	Free flow	N/A
1	MH180	USF	105.85	105.42	0.43	105.52	0.33	105.18	0.67	105.19	0.66	Free flow	N/A
1	MH184	USF	105.68	105.19	0.49	105.30	0.38	105.20	0.48	105.24	0.44	Free flow	N/A
1	MH183	USF	105.95	105.32	0.63	105.42	0.53	105.34	0.61	105.38	0.57	Free flow	N/A
1	MH182	USF	106.19	105.83	0.36	105.96	0.23	105.86	0.33	105.92	0.27	Free flow	N/A
1	MH187	USF	105.75	105.37	0.38	105.47	0.28	105.39	0.36	105.44	0.31	Free flow	N/A
1	MH186	USF	106.05	105.53	0.52	105.68	0.37	105.57	0.48	105.63	0.42	Free flow	N/A
1	MH191	USF	106.02	105.61	0.41	105.78	0.24	105.67	0.35	105.73	0.29	Free flow	N/A
1	MH185	USF	106.45	105.66	0.79	105.82	0.63	105.72	0.73	105.77	0.68	Free flow	N/A
1	MH127	USF	106.70	105.80	0.90	105.99	0.71	105.87	0.83	105.92	0.78	Free flow	N/A
1	MH190	USF	106.35	105.26	1.09	105.36	0.99	105.26	1.09	105.30	1.05	Free flow	N/A
1	MH189	USF	106.05	105.31	0.74	105.41	0.64	105.31	0.74	105.34	0.71	Free flow	N/A
1	MH188	USF	106.55	105.44	1.11	105.58	0.97	105.46	1.09	105.49	1.06	Free flow	N/A
1	MH128	USF	106.65	Free flow	N/A	105.78	0.87	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH120	USF	105.70	104.87	0.83	104.95	0.75	104.90	0.80	104.87	0.83	Free flow	N/A
1	MH121	USF	105.70	104.88	0.82	104.96	0.74	104.92	0.78	104.88	0.82	Free flow	N/A
1	MH122	USF	105.90	Free flow	N/A	104.98	0.92	104.94	0.96	Free flow	N/A	Free flow	N/A
1	MH123	USF	106.00	Free flow	N/A	105.01	0.99	104.97	1.03	Free flow	N/A	Free flow	N/A
1	MH124	USF	106.10	Free flow	N/A	105.07	1.03	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH125	USF	106.20	Free flow	N/A	105.13	1.07	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH126	USF	106.35	Free flow	N/A	105.17	1.18	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH129	Proposed Ground	109.23	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH114	USF	106.00	104.97	1.03	105.08	0.92	105.03	0.97	104.98	1.02	Free flow	N/A
1	MH113	USF	106.05	105.09	0.96	105.21	0.84	105.17	0.88	105.12	0.93	Free flow	N/A
1	MH112	USF	106.10	105.16	0.94	105.28	0.82	105.25	0.85	105.19	0.91	Free flow	N/A
1	MH111	Proposed Ground	108.19	Free flow	N/A	105.28	2.91	105.25	2.94	105.20	2.99	Free flow	N/A
1	MH132	USF	106.15	Free flow	N/A	105.34	0.81	105.30	0.85	Free flow	N/A	Free flow	N/A
1	MH130	USF	106.25	105.02	1.23	105.12	1.13	105.09	1.16	105.02	1.23	Free flow	N/A
1	MH131	USF	106.15	Free flow	N/A	105.14	1.01	105.13	1.03	Free flow	N/A	Free flow	N/A
1	MH140	USF	106.25	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH134	USF	106.40	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A

CONNECTION POINT AT BOBLINK

MH U/S OF CONNECTION POINT

HGL SUMMARY PHASE 1 AND PHASE 1A

PHASE	MH	USF or Proposed Ground		100 year 3 hour Chicago		100 year 3 hour Chicago + 20%		July 1979		August 1988		August 1996	
			Elevation (m)	HGL (m)	Freeboard (m)	HGL (m)	Freeboard (m)	HGL (m)	Freeboard (m)	HGL (m)	Freeboard (m)	HGL (m)	Freeboard (m)
1	MH141	Proposed Ground	108.40	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH135	USF	106.76	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH150	USF	106.65	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH152	USF	107.40	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH153	USF	107.25	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH151	USF	107.00	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1	MH149	USF	106.71	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	CRT1	Proposed Ground	103.30	100.89	N/A	100.89	N/A	100.89	N/A	100.89	N/A	100.89	N/A
1A	MH162	Proposed Ground	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH161	Proposed Ground	104.20	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH146	USF	103.61	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH147	USF	104.06	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH148	USF	104.56	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH138	USF	106.01	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH145	USF	103.61	102.75	0.86	102.76	0.85	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH160	USF	105.53	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH137	USF	106.26	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH136	USF	106.71	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH144	USF	104.81	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH143	USF	105.11	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A
1A	MH142	USF	106.11	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A	Free flow	N/A

HGL SUMMARY PHASE 1
(TRIB. TO POND 5)

PHASE	MH	USF or Proposed Ground		100 year 24 hour SCS		100 year 24 hour SCS + 20%	
			Elevation (m)	HGL (m)	Freeboard (m)	HGL (m)	Freeboard (m)
Trunk to Pond 5	MH207	Proposed Ground	107.17	104.49	2.68	104.67	2.50
	MH206	Proposed Ground	107.15	104.53	2.62	104.73	2.42
	MH205	Proposed Ground	107.28	104.57	2.71	104.78	2.50
1	MH110	Proposed Ground	107.52	104.64	2.88	104.86	2.66
1	MH109	Proposed Ground	107.45	104.65	2.80	104.88	2.57
1	MH107	Proposed Ground	107.41	104.68	2.73	104.90	2.51
1	MH105	USF	105.65	104.71	0.94	104.94	0.71
1	MH104	USF	105.85	104.75	1.10	104.98	0.87
1	MH103	USF	105.75	104.76	0.99	105.00	0.75
1	MH102	USF	105.95	Free flow	N/A	105.00	0.95
1	MH110C	Proposed Ground	107.93	Free flow	N/A	105.01	2.92
1	MH170	USF	105.50	104.79	0.71	105.05	0.45
1	MH171	USF	105.35	104.87	0.48	105.16	0.19
1	MH172	USF	105.50	104.93	0.57	105.23	0.27
1	MH173	USF	105.65	104.97	0.68	105.28	0.37
1	MH174	USF	105.80	105.02	0.78	105.35	0.45
1	MH175	USF	106.00	105.06	0.94	105.39	0.61
1	MH176	USF	106.10	105.10	1.00	105.44	0.66
1	MH177	Proposed Ground	106.55	Free flow	N/A	105.45	1.10
1	MH181	USF	105.65	105.00	0.65	105.40	0.25
1	MH180	USF	105.85	105.23	0.62	105.63	0.22
1	MH184	USF	105.68	105.06	0.62	105.41	0.27
1	MH183	USF	105.95	105.14	0.81	105.54	0.41
1	MH182	USF	106.19	105.62	0.57	106.05	0.14
1	MH187	USF	105.75	105.16	0.59	105.59	0.16
1	MH186	USF	106.05	105.27	0.78	105.76	0.29
1	MH191	USF	106.02	105.33	0.69	105.84	0.18
1	MH185	USF	106.45	105.42	1.03	105.91	0.54
1	MH127	USF	106.70	Free flow	N/A	106.05	0.65
1	MH190	USF	106.35	105.13	1.22	105.47	0.88
1	MH189	USF	106.05	105.17	0.88	105.52	0.53
1	MH188	USF	106.55	Free flow	N/A	105.67	0.88
1	MH128	USF	106.65	Free flow	N/A	105.90	0.75
1	MH120	USF	105.70	104.81	0.89	105.05	0.65
1	MH121	USF	105.70	Free flow	N/A	105.07	0.63
1	MH122	USF	105.90	Free flow	N/A	105.09	0.81
1	MH123	USF	106.00	Free flow	N/A	105.12	0.88
1	MH124	USF	106.10	Free flow	N/A	105.16	0.94
1	MH125	USF	106.20	Free flow	N/A	105.21	0.99
1	MH126	USF	106.35	Free flow	N/A	105.25	1.10
1	MH129	Proposed Ground	109.23	Free flow	N/A	Free flow	N/A
1	MH114	USF	106.00	104.93	1.07	105.18	0.82
1	MH113	USF	106.05	105.05	1.00	105.32	0.73
1	MH112	USF	106.10	105.12	0.98	105.39	0.71
1	MH111	Proposed Ground	108.19	Free flow	N/A	105.40	2.79
1	MH132	USF	106.15	Free flow	N/A	105.46	0.69
1	MH130	USF	106.25	104.98	1.27	105.22	1.03
1	MH131	USF	106.15	Free flow	N/A	105.26	0.89
1	MH140	USF	106.25	Free flow	N/A	105.33	0.92
1	MH134	USF	106.40	Free flow	N/A	Free flow	N/A
1	MH141	Proposed Ground	108.40	Free flow	N/A	Free flow	N/A
1	MH135	USF	106.76	Free flow	N/A	Free flow	N/A
1	MH150	USF	106.65	Free flow	N/A	Free flow	N/A
1	MH152	USF	107.40	Free flow	N/A	Free flow	N/A
1	MH153	USF	107.25	Free flow	N/A	Free flow	N/A
1	MH151	USF	107.00	Free flow	N/A	Free flow	N/A
1	MH149	USF	106.71	Free flow	N/A	Free flow	N/A

HGL SUMMARY PHASE 1
(TRIB. TO POND 5)
25% SEDIMENT ACCUMULATION

PHASE	MH	USF or Proposed Ground		100 year 3 hour Chicago	
			Elevation (m)	HGL (m)	Freeboard (m)
Trunk to Pond 5	MH207	Proposed Ground	107.17	105.00	2.17
	MH206	Proposed Ground	107.15	105.10	2.05
	MH205	Proposed Ground	107.28	105.20	2.08
1	MH110	Proposed Ground	107.52	105.35	2.17
1	MH109	Proposed Ground	107.45	105.38	2.07
1	MH107	Proposed Ground	107.41	105.43	1.98
1	MH105	USF	105.65	105.48	0.17
1	MH104	USF	105.85	105.54	0.31
1	MH103	USF	105.75	105.61	0.14
1	MH102	USF	105.95	105.67	0.28
1	MH110C	Proposed Ground	107.93	105.82	2.11
1	MH170	USF	105.50	105.56	-0.06
1	MH171	USF	105.35	105.67	-0.32
1	MH172	USF	105.50	105.75	-0.25
1	MH173	USF	105.65	105.80	-0.15
1	MH174	USF	105.80	105.87	-0.07
1	MH175	USF	106.00	105.91	0.09
1	MH176	USF	106.10	105.96	0.14
1	MH177	Proposed Ground	106.55	106.04	0.51
1	MH181	USF	105.65	105.90	-0.25
1	MH180	USF	105.85	106.14	-0.29
1	MH184	USF	105.68	105.92	-0.24
1	MH183	USF	105.95	106.05	-0.10
1	MH182	USF	106.19	106.55	-0.36
1	MH187	USF	105.75	106.10	-0.35
1	MH186	USF	106.05	106.26	-0.21
1	MH191	USF	106.02	106.35	-0.33
1	MH185	USF	106.45	106.44	0.01
1	MH127	USF	106.70	106.68	0.02
1	MH190	USF	106.35	105.98	0.37
1	MH189	USF	106.05	106.04	0.01
1	MH188	USF	106.55	106.35	0.20
1	MH120	USF	105.70	105.67	0.03
1	MH121	USF	105.70	105.71	-0.01
1	MH122	USF	105.90	105.74	0.16
1	MH123	USF	106.00	105.79	0.21
1	MH124	USF	106.10	105.92	0.18
1	MH125	USF	106.20	106.14	0.06
1	MH126	USF	106.35	106.31	0.04
1	MH128	USF	106.65	106.91	-0.26
1	MH129	Proposed Ground	109.23	106.91	2.32
1	MH114	USF	106.00	105.79	0.21
1	MH113	USF	106.05	105.90	0.15
1	MH112	USF	106.10	106.06	0.04
1	MH111	Proposed Ground	108.19	106.08	2.11
1	MH132	USF	106.15	106.06	0.09
1	MH130	USF	106.25	105.89	0.36
1	MH131	USF	106.15	106.09	0.06
1	MH140	USF	106.25	106.00	0.25

The above results indicate that there is no major system flow from the site during the 100 year 3 hour Chicago analysis. Supporting information, the Velocity x Depth Calculation sheets are included within **Appendix D** for reference. Therefore, the proposed design will not have a negative impact on the existing downstream system.

All the total depths of flow and ponding during the 100 year storm event increased by 20%, the major system remains at or below 0.20m and therefore below the building openings at all locations, see the Velocity x Depth Calculation sheets provided in **Appendix D**.

4.8 Hydraulic Grade Line Analysis

As part of the Phase 1 design the storm HGL was established at various points, at MH 209 the HGL was established at 100.97, the invert of the storm sewer at MH 109 which connect to MH 209 is 100.89, since the sewers are sized to accommodate the 5 yr design event, and ICD's limit flow into the sewers to the 5yr even the HGL within the site is deemed to follow the obvert of the sewer.