Site Servicing & Stormwater Management Report
Embassy and Consulate of the State of Qatar

Client:
GRC Architects Inc.

Project Number:
OTT-00261664-A0

Prepared By: Aaditya Jariwala, M.Eng.

Reviewed By: Alam Ansari, M.Sc., P. Eng.

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Date Submitted:
March 1, 2022

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Type of Document:
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Date Submitted:
March 1, 2022

Legal Notification

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Table of Contents

List of Appendices

1 Introduction

EXP Services Inc. (EXP) was retained by GRC Architects Inc. to provide Site Servicing and Stormwater Management report for the embassy and consulate of the State of Qatar in Ottawa, Canada.

The site is 0.75 hectares in area and is bound by Macdonald Cartier Bridge approach to the north, King Edward Avenue to the east, Boteler Street to the south and the Embassy of United Arab Emirates to the west.

This servicing design report will address SWM, the quality and quantity control requirements for the proposed drainage areas of the three-storey institutional building, determine how the proposed building will be serviced with sanitary, storm and water services, determine the size of the proposed services and identify the locations of the connections to the existing services. Servicing, Grading and Drainage and SWM plans for the development of the proposed building at 187 Boteler Street are included with this report.

Refer to Figure 1 in Appendix A for the site location.

2 References

Various documents were referred to in preparing the current report including:

- Sewer Design Guidelines, Second Edition, Document SDG002, October 2012, City of Ottawa (Guidelines) including:
    - Technical Bulletin ISDTB-2012-4 (20 June 2012)
    - Technical Bulletin ISDTB-2014-01 (05 February 2014)
    - Technical Bulletin PIEDTB-2016-01 (September 6, 2016)
    - Technical Bulletin ISDTB-2018-01 (21 March 2018)
    - Technical Bulletin ISDTB-2018-04 (27 June 2018)
    - Technical Bulletin ISDTB-2019-02 (08 July 2019)
- Ottawa Design Guidelines – Water Distribution, July 2010 (WDG001), including:
    - Technical Bulletin ISDTB-2014-02 (May 27, 2014)
    - Technical Bulletin ISTB-2018-02 (21 March 2018)
- Ontario Ministry of Transportation (MTO) Drainage Manual, 1995-1997
- Stormwater Management Planning and Design Manual, Ontario Ministry of the Environment and Climate Change, March 2003 (SMPDM).
- Design Guidelines for Drinking-Water Systems, Ontario Ministry of the Environment and Climate Change, 2008 (GDWS).
- Fire Underwriters Survey, Water Supply for Public Fire Protection (FUS), 1999
- Ontario Building Code 2012, Ministry of Municipal Affairs and Housing

3 Watermain Design

3.1 Required Fire Flow

The fire flow demand calculations were prepared based on the Fire Underwriters Survey (FUS, 1999) criteria. The proposed building's type of construction is classified as non-combustible. The building will have a fully supervised sprinkler system and limited combustible contents. The required fire flow was determined to be 100 L/s. Refer to Appendix B for detailed fire flow demand calculations and the architect's confirmation email regarding type of construction.

3.2 Watermain Design

There is an existing municipal 200mm diameter watermain on Boteler Street. The proposed building will be serviced by a new 150mm diameter water service lateral connected to the municipal 200mm diameter watermain on Boteler Street.

The domestic water demands for the proposed building were calculated as per the City of Ottawa Water Design Guidelines (July 2010). The institutional average consumption rate of 28,000 L/gross ha/day was used. The institutional peak factors were 1.5 and 1.8 for the max. day and peak hour demands respectively. Refer to Appendix A for calculation details. The proposed building's domestic demands were as follows:

Institutional Water Demand

Average daily demand = 0.24 L/s

Maximum daily demand = 0.36 L/s

Maximum hourly daily demand = 0.66 L/s

3.3 Pressure Check

The boundary conditions provided by the City of Ottawa indicates that the minimum and maximum pressure in the existing municipal 200mm diameter watermain at the connection point on Boteler Street is 71.2 psi (491.9 kPa) and 83.3 psi (574.3 kPa), respectively. In addition, the residual pressure of 71.9 psi (495.9 kPa) was indicated by the city during max day + fire flow demand of 83.4 L/s. Based on the existing watermain pressure and 150mm diameter water service connection, the residual pressure at the proposed building basement was estimated to range from 73.6 psi to 85.8. The residual water pressures in the proposed watermain are greater than the minimum requirement of 20psi (140kPa). However, the residual pressure may exceed the maximum allowable limit of 80 psi. therefore, the pressure reducing measures will be required within the building. Further details to be provided by the mechanical consultant. During the max day + fire flow demand of 100.4 L/s, a residual pressure of 67.8 psi was estimated at the building basement. Therefore, the existing water supply system will have adequate capacity to meet the domestic and fire demands for the proposed building. Refer to appendix A for detailed calculations.

4 Sanitary Sewer Design

4.1 Peak Design Flow

There is an existing municipal 250mm diameter sanitary sewer on Boteler Street flowing from west to east, eventually discharging into 375mm diameter sanitary sewer on Cumberland Street. The anticipated peak sanitary flows from the proposed institutional site have been calculated as per the City of Ottawa Sewer Design Guidelines (October 2012). The anticipated peak sanitary flows are calculated as follows:

Design Flows

Institutional Design Flow:	28,000 L/gross ha/day
Development Area:	0.75 hectares
Peak Factor:	1.5
Extraneous Flow:	0.33 L/s/ha
Peak Design Flow:	=(28000L/ha/day)(0.75 ha)(1.5)(1/86400)+(0.75ha)(0.33L/s/ha)
	=**0.61 L/s**

The proposed building at 187 Boteler Street will be serviced by a new 200mm diameter sanitary service that will ultimately convey the sanitary flow to the municipal 250mm diameter sanitary sewer via sanitary manholes SANMH 101 and the sanitary monitoring manhole. The 200mm diameter sanitary service will be installed at a minimum slope of 2.0%. An additional 200mm diameter sanitary service at a minimum slope of 2.0%, will be connected to SANMH 101 within the property to convey the sanitary flows from Guard House. At this slope, the 200mm diameter sanitary services will have a capacity of 51 L/s and a full flow velocity of 1.72 m/s, which will be sufficient to service proposed development. Refer to the sanitary sewer design sheet in Appendix C and the Site Servicing plan (dwg #C100) in Appendix E.

5 Stormwater Management

5.1 Storm Design Criteria

The storm sewer system was designed in conformance with the City of Ottawa Sewer Design Guidelines (October 2012). The stormwater servicing design criteria for the proposed development is as follows:

- The proposed on-site storm sewer network / minor system is designed using Rational Method and Manning's Equation to convey runoff under free flow conditions for the 2-year return period.
- Post-development discharge rate for up to 100-year storm event to be controlled to 2-year pre-development discharge rates.
- Maximum allowable ponding depth is 300 mm.
- Flows from storm events greater than the 100-year return period will be directed overland towards the front of the property on Boteler Street.
- Average runoff coefficients were calculated for each inlet drainage area using a runoff coefficient of 0.20 for pervious surfaces and 0.90 for impervious surfaces.
- Estimated storage volumes are based on the Modified Rational Method.
- Minimum freeboard of 300mm between the 100-year overland spill elevation and finished floor elevation.

5.2 Pre-Development Conditions

The 0.75-hectare site at 187 Boteler Street is currently a vacant land covered with trees and bushes. Surface runoff from the property flows southerly towards Boteler Street. In addition, the existing site receives additional stormwater flows from approximately 0.06 ha of external drainage areas. These areas include the landscape buffer of the Macdonald Cartier Bridge Approach on the north side of the property and landscape area on the northeast side of the property.

5.3 Allowable Release Rate

The allowable release rate for the site is calculated based on area E1 (0.75 ha), runoff coefficient of 0.22 and a time of concentration of 10 minutes. Refer to drawing # C400 SWM1 for the pre-existing conditions of the site.

Table D2 in Appendix D provides the pre-development discharge rates from the site during 2-year, 5-year and 100-year storm events as 35.2 L/s, 47.8 L/s and 102.4 L/s, respectively. These estimated pre-development discharge rates do not include the external drainage from 0.06 ha of City's land.

The allowable release rate for the 0.75-hectare drainage area is calculated as 35.2 L/s.

5.4 Post-Development Conditions

Stormwater from the 0.75ha drainage area will be controlled and released at a rate less than the allowable release rate for storms up to and including the 100-year storm event. An overland flow route is provided for storms greater than the 100-year event.

5.4.1 Storage Requirements and Allocation

Post development runoff will be detained on-site for storms up to and including the 100-year storm. The required SWM storage volumes will be achieved using the surface ponding in the landscaped areas, storage on the roof of the new building, a cistern under basement floor and stormtech chambers under the parking lot for up to 100-year storm event.

Surface ponding volumes over catch basins and catch basin manholes were determined by applying the pyramid volume equation of one-third of the depth multiplied by the surface area of the pond. Ponding depths for the subject site must be equal to or less than 300 mm for the 100-year storm event.

Refer to Stormwater Management Plan drawing #C500 for the drainage areas in Appendix E and refer to Appendix D for the detailed stormwater management spreadsheet calculations. The following table 5-1 summarizes the release rates and storage requirements for the 0.75ha drainage area, which includes the proposed embassy building at 187 Boteler Street.

Table 5-1: Summary of SWM Storage Requirements

Area ID	Outlet Location	Area (ha)	Runoff Coefficient 'C'	100 Year Release (L/s)	100 Year storage required (m^3)	100 Year surface storage provided (m^3)	Control Method
A1	Roof Drain	0.07	0.90	**4.1**	26.7	36.5	Flow Controlled Drains
A2	Roof Drain	0.03	0.90	**2.0**	12.3	17.1	
A3	Roof Drain	0.03	0.90	**1.8**	10.3	14.5	
A4	Courtyard	0.07	0.59	**4.0**	37.2	50.0	Controlled Pump Discharge
A5	Trench Drain	0.02	0.90				
A6	Transformer Area	0.02	0.90				
A7	CBMH201	0.08	0.76	**6.0**	37.4	49.4	Hydrovex 100VHV-1
	CBMG202						
A8	Landscaped	0.01	0.44				
A9	CBMH203	0.19	0.20	**6.0**	34.8	90.0	Hydrovex 75VHV-1
A10	CB101	0.20	0.20				
A11	Uncontrolled	0.01	0.90	2.9	-	-	
A12	Uncontrolled	0.01	0.90	7.4	-	-	
A13	Exterior Drainage	0.06	0.20	7.7	-	-	
	TOTAL	**0.75**					
			Totals:	**34.2**	**158.8**	**257.5**	
	Total Allowable Release L/s:			**35.2**			

***Bold** flows are controlled.

The 100-year controlled release rate from 0.75ha area is 34.2 L/s, which is less than the total allowable release rate of 35.2 L/s. The available storage volume of 257.5 m^3 is more than the required volume of 158.8 m^3. An additional 7.7 L/s uncontrolled discharge rate is proposed during 100-year storm event from 0.06ha external City lands north and northeast of the subject property. A swale is proposed just outside the property line to run along the north and northeast property line and discharge towards Boteler Street and King Edward Ave. Refer to the site grading plan dwg #C200 for details.

5.4.2 Flow Control Device Sizing

Stormwater runoff from the 0.75ha area will be detained using inlet control devices (ICDs) within the storm system and flow control roof drains. The roof flow control drains will be Watts Accutrol flow weir. There are two (2) proposed ICDs. Refer to the Site Servicing Plan drawing # SS for the ICD locations and Appendix D for Hydrovex flow regulator selections.

The stormwater runoff from the courtyard, trench drain at the basement parking entry ramp and hydro transformer area will be attained by controlled pump discharge from cistern under basement garage. Further details on cistern and pump type will be provided by structural and mechanical consultants.

5.4.3 Quality Control

Quality control for the proposed development will be provided by the proposed 1800mm diameter Stormceptor STC-EFO6 model or approved equivalent, which will provide the required level of 80% TSS removal for 0.75ha drainage area. Refer to Appendix D for the stormceptor sizing report and STC-EFO6 model detail drawing.

6 Erosion and Sediment Control

During all construction activities, erosion and sedimentation shall be controlled by the following techniques:

- Extent of exposed soils shall be limited at any given time;
- Exposed areas shall be re-vegetated as soon as possible;
- Minimize the area to be cleared and disruption of adjacent areas;
- Siltsack or approved equivalent shall be installed inside all catch basins, catch basin manholes, and storm manholes as identified on the erosion and sediment control plan;
- Visual inspection shall be completed daily on sediment control barriers and any damage repaired immediately. Care will be taken to prevent damage during construction operations;
- In some cases, barriers may be removed temporarily to accommodate the construction operations. The affected barriers will be reinstated at night when construction is completed;
- Sediment control devices will be cleaned of accumulated silt as required. The deposits will be disposed of as per the requirements of the contract;
- During construction, if the engineer believes that additional prevention methods are required to control erosion and sedimentation, the contractor will install additional silt fences or other methods as required to the satisfaction of the engineer; and,
- Construction and maintenance requirements for erosion and sediment controls are to comply with Ontario Provincial Standard Specification (OPSS) 805.

7 Conclusions

This report addresses the adequacy of the existing municipal services to service the proposed development at 187 Boteler Street. Based on the analysis provided in this report, the conclusions are as follows:

- The proposed three storey embassy building will be serviced by a 150mm diameter watermain, which will adequately service the proposed development for the domestic and fire flow demands.
- The proposed building will be serviced by a 200mm diameter sanitary sewer, which will adequately service the proposed development.
- SWM for the proposed development will be achieved by restricting all stormwater discharge rates up to the 100-year post development flow to the allowable release rate. The quantity control criteria for the site is to restrict the 100-year post-development release rate to the 2-year pre-development flow using the calculated runoff coefficients and a time of concentration of 10 minutes.
- Required on-site SWM storage volumes will be achieved using the surface storage in the landscaped areas, roof storage, a cistern under the basement floor and stormtech chambers for up to 100-year storm event.
- Quality control will be provided by the Stormceptor STC-EFO6 model or approved equivalent.
- Temporary erosion and sediment control measures for the subject site have been identified.
- Overland flow routes have been provided for the subject site.
- During all construction activities, erosion and sedimentation shall be controlled.

Appendix A – Figures

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exp.

DESIGN	---	QATAR EMBASSY	SCALE N.T.S
DRAWN	---		SKETCH NO
DATE	---	SITE LOCATION PLAN	FIG A1
FILE NO	---		

Appendix B – Water Servicing

TABLE B1: Water Demand Chart

Location: Qatar Embassy - 187 Boteler St.
Project No: OTT-00261664-A0
Designed by: A. Elgayar
Checked By: A. Ansari
Date Revised: January 2021

Water Consumption
Institutional = **28,000** L/gross ha/day

	No. of Residential Units											Residential Demands in (L/sec)					Institutional						Total Demands (L/sec)		
	Singles/Semis/Towns				Apartments								Peaking Factors (x Avg Day)						Peaking Factors (x Avg Day)						
Proposed	Single Family	Semi-Detached	Duplexz	Townhome	Bachelor	1 Bedroom	2 Bedroom	3 Bedroom	4 Bedroom	Avg Apt.	Total Persons (pop)	Avg. Day Demand (L/day)	Max Day	Peak Hour	Max Day Demand (L/day)	Peak Hour Demand (L/day)	Area (m^2)	Avg Demand (L/day)	Max Day	Peak Hour	Max Day Demand (L/day)	Peak Hour Demand (L/day)	Avg Day (L/s)	Max Day (L/s)	Max Hour (L/s)
Qatar Embassy																	7,495	20,986	1.50	1.80	31,479	56,662	0.24	0.36	0.66

TABLE B2
FIRE FLOW REQUIREMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 1999
Building # / Type: Qatar Embassy

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where: F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input			Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Non-combustible Construction			0.8	
	Ordinary Construction	1					
	Non-combustible Construction	0.8					
	Fire Resistive Construction	0.6					
Input Building Floor Areas (A)			Area	% Used	Area Used	3129.0 m²	
	Floor 3		730	100%	730.0		
	Floor 2		730	100%	730.0		
	Floor 1 (main level)		1669	100%	1669.0		
	Basement (at least 50% below grade)		1128	0%	0		
Fire Flow (F)	F = 220 * C * SQRT(A)						9,845
Fire Flow (F)	Rounded to nearest 1,000						**10,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-1,500	8,500
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	Adequate Sprinkler Conforms to NFPA13	-30%	-2,550	5,950
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	-850	5,100
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Fully Supervised Sprinkler System	-10%	-850	4,250
	Not Fully Supervised or N/A	0%				

Task	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposing Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
Choose Structure Exposure Distance	North	89.1	6	> 45.1	Type B	44	3	132	6	0%	18%	1,530	5,780
	East	515	6	> 45.1	Type B	0	0	0	6	0%			
	South	25.65	4	20.1 to 30	Type B	42.68	3	128.04	4E	10%			
	West	29	4	20.1 to 30	Type B	9.2	1	9.2	4A	8%			

Task		
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	**6,000**
	Total Required Fire Flow (RFF), L/sec =	**100**
	Can the Total Fire Flow be Capped at 10,000 L/min (167 L/sec) based on "TECHNCAL BULLETIN ISTB-2018-02", (yes/no) =	**No**
	Total Required Fire Flow (RFF). If RFF < 167 use RFF (L/sec) =	**100**

Exposure Charges for Exposing Walls of Wood Frame Construction (from Table G5)

Type A	Wood-Frame or non-conbustible
Type B	Ordinary or fire-resisitve with unprotected openings
Type C	Ordinary or fire-resisitve with semi-protected openings
Type D	Ordinary or fire-resisitve with blank wall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
30.1m to 45m	5
> 45.1m	6

TABLE B3

ESTIMATED WATER PRESSURE AT PROPOSED BUILDING

Description	From	To	Demand (L/sec)	Pipe Length (m)	Pipe Dia (mm)	Dia (m)	Q (m3/sec)	Area (m2)	C	Vel (m/s)	Slope of HGL (m/m)	Head Loss (m)	Elev From (m)	Elev To (m)	*Elev Diff (m)	Pressure From kPa	(psi)	Pressure To kPa	(psi)	Pressure Drop (psi)
Avg Day Conditons																				
Single 150mm water service	Main	Building	0.24	17 m	150	0.150	0.0002	0.017671	110	0.0137	3.7E-06	6E-05	56.45	54.70	1.8	574.4	(83.3)	591.5	(85.8)	-2.5
Max Day Conditons																				
Single 150mm watermain	Main	Building	0.36	17 m	150	0.150	0.0004	0.017671	110	0.0206	7.8E-06	0.0001	56.45	54.70	1.8	492.0	(71.4)	509.1	(73.8)	-2.5
Peak Hour Conditons																				
Single 150mm watermain	Main	Building	0.66	17 m	150	0.150	0.0007	0.017671	110	0.0371	2.3E-05	0.0004	56.45	54.70	1.8	492.0	(71.4)	509.1	(73.8)	-2.5
Max Day + Fire Flow Conditons																				
Single 150mm watermain	Main	Building	100.36	17 m	150	0.150	0.1004	0.017671	110	5.6795	0.25748	4.2561	56.45	54.70	1.8	492.0	(71.4)	467.4	(67.8)	3.6

Water Demand Info

Average Demand =	0.24	L/sec
Max Day Demand =	0.36	L/sec
Peak Hr Deamand =	0.66	L/sec
Fireflow Requriement =	100	L/sec
Max Day Plus FF Demand =	100.4	L/sec

Pipe Lengths

From watermain to building =	17 m
Hazen Williams C Factor for Friction Loss in Pipe, C=	110

Boundary Conditon

	Min HGL	Max HGL	Max Day + Fireflow	
HGL (m)	106.6	115	107.0	(From City of Ottawa)
Approx Ground Elev (m) =	56.45	56.45	56.45	
Approx Bldg FF Elev (m) =	54.70	54.70	54.70	
Pressure (m) =	50.15	58.55	50.55	
Pressure (Pa) =	491,972	574,376	495,896	
Pressure (psi) =	71.4	83.3	71.9	

Aly Elgayar

From: Carolyn Jones <cjones@grcarchitects.com>
Sent: Monday, January 11, 2021 1:40 PM
To: Aly Elgayar
Subject: FW: Qatar Embassy - Confirmations Required for Fire Flow Calcs

Hi Aly,
Please see email from Pat below. We would be Class 3 Non-Combustible.

Thanks

Carolyn Jones
Senior Associate | Employée-associée senior
OAA OAQ MRAIC LEED-AP BD + C

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From: Patrick Dubuc <PDubuc@grcarchitects.com>
Sent: Monday, January 11, 2021 12:42 PM
To: Carolyn Jones <cjones@grcarchitects.com>
Subject: RE: Qatar Embassy - Confirmations Required for Fire Flow Calcs

Carolyn,

Qatar will be a mixed of non-combustible (class 3) for the walls and fire resistive (class 6) for the floor slabs and roof if built of solid concrete. Based on a combination; I believe Qatar would fall under Class 3 Non-Combustible.

Patrick Dubuc
Senior Associate | Employé-associé senior

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From: Aly Elgayar <Aly.ElGayar@exp.com>
Sent: Thursday, January 7, 2021 4:52 PM
To: Carolyn Jones <cjones@grcarchitects.com>
Cc: Alam Ansari <alam.ansari@exp.com>; Patrick Dubuc <PDubuc@grcarchitects.com>
Subject: RE: Qatar Embassy - Confirmations Required for Fire Flow Calcs

Hi Carolyn,

Thanks for the confirmations. Regarding the construction type, non-combustible or fire resistive construction are classified as two different types of construction for calculating the required fire flow. Please refer to the below definitions extracted the guidelines and confirm which one is applicable for the proposed building.

c. **Non-combustible (Construction class 3):** Buildings with exterior walls, floors, and roof of noncombustible or slow-burning materials supported by noncombustible or slow-burning supports (including noncombustible or slow-burning roof decks on noncombustible or slow-burning supports, regardless of the type of insulation on the roof surface).

d. **Masonry non-combustible (Construction class 4):** Buildings with exterior walls of fire resistive construction (not less than one hour), or of masonry, not less than 4 inches in thickness and with noncombustible or slow-burning floors and roof (including noncombustible or slow burning roof decks on noncombustible or slow-burning supports, regardless of the type of insulation on the roof surface).

e. **Modified fire resistive (Construction class 5):** Buildings with exterior walls, floors, and roof constructed of masonry materials described in f. below, deficient in thickness, but not less than 4 inches; or fire-resistive materials described in f. below, with a fire-resistance rating of less than two hours, but not less than one hour.

f. **Fire resistive (Construction class 6):** Buildings constructed of any combination of the following materials:

Exterior walls or exterior structural frame:

- Solid masonry, including reinforced concrete, not less than 4 inches in thickness
- Hollow masonry not less than 12 inches in thickness
- Hollow masonry less than 12 inches, but not less than 8 inches in thickness, with a listed fire-resistance rating of not less than two hours
- Assemblies with a fire-resistance rating of not less than two hours

Note: Panel or curtain sections of masonry may be of any thickness.

Floors and roof:

- Monolithic floors and roof of reinforced concrete with slabs not less than 4 inches in thickness
- Construction known as "joist systems" (or pan-type construction) with slabs supported by concrete joists spaced not more than 36 inches on centers with a slab thickness not less than 2 ¾ inches
- Floor and roof assemblies with a fire-resistance rating of not less than two hours

Structural metal supports:

- Horizontal and vertical load-bearing protected metal supports (including pre-stressed concrete units) with a fire-resistance rating of not less than two hours

Note: Wherever in the SCOPES reference is made to "pre-stressed," this term shall also include "post-tensioned."

Thank you,

Aly Elgayar, M.A.Sc.
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From: Carolyn Jones <cjones@grcarchitects.com>
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Cc: Alam Ansari <alam.ansari@exp.com>; Patrick Dubuc <PDubuc@grcarchitects.com>
Subject: RE: Qatar Embassy - Confirmations Required for Fire Flow Calcs

Hi Aly,

Please see responses below in red.

Carolyn Jones
Senior Associate | Employée-associée senior
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To: Carolyn Jones <cjones@grcarchitects.com>
Cc: Alam Ansari <alam.ansari@exp.com>
Subject: Qatar Embassy - Confirmations Required for Fire Flow Calcs

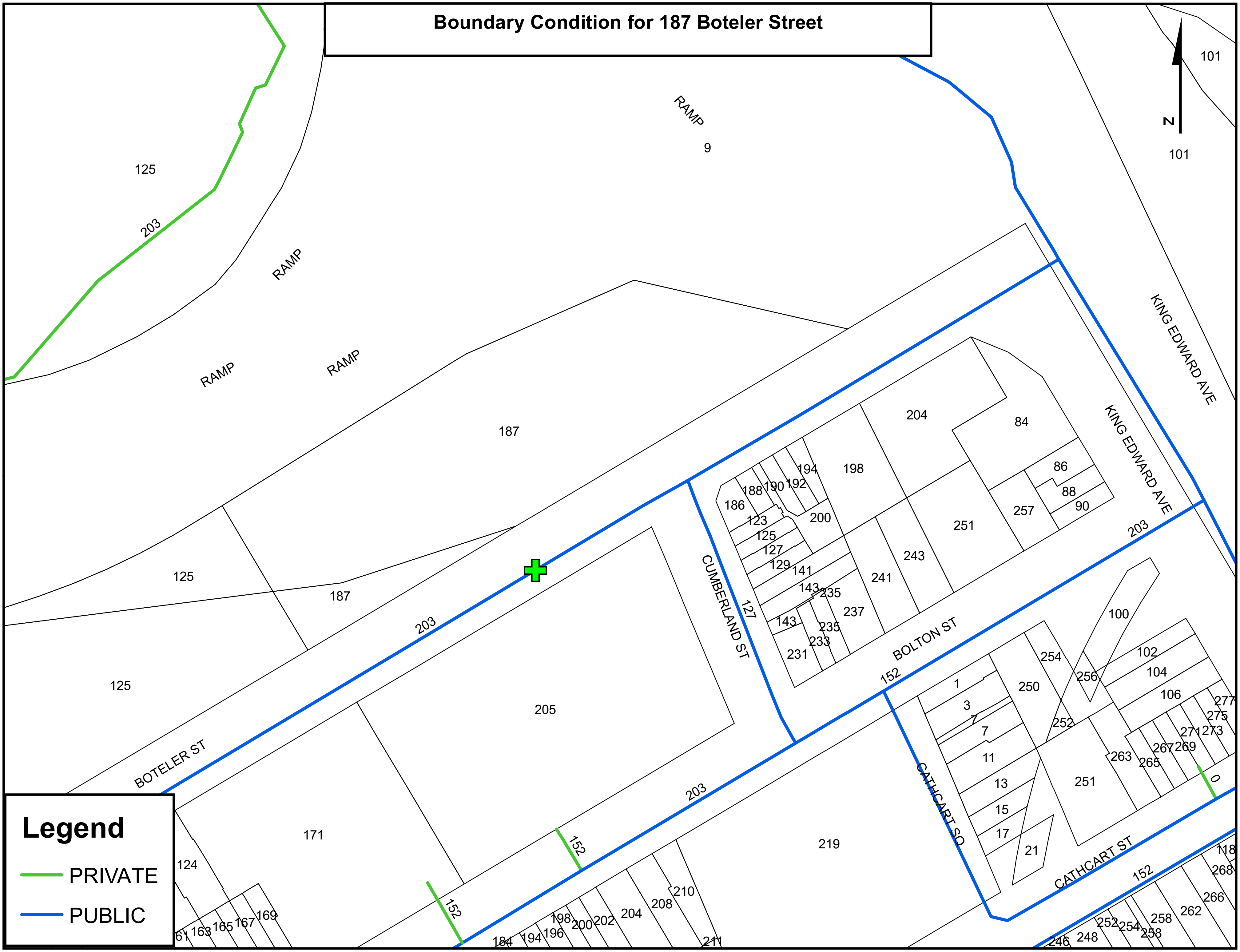
Hi Carolyn,

Can you please provide confirmation for the following questions in regards to the fire flow calculations:

- Is the construction type (frame) going to be non-combustible or fire resistive construction? yes
- Will a sprinkler system be installed throughout the entire building? yes
- Also if a sprinkler system will be installed, will it be fully supervised? yes

Thank you,

Aly Elgayar, M.A.Sc.
EXP | Engineering Designer
t : +1.613.688.1899, 3225 | m : +1.613.282.0561 | e : aly.elgayar@exp.com
2650 Queensview Drive
Suite 100
Ottawa, ON K2B 8H6
CANADA


Boundary Condition for 187 Boteler Street
N
Legend
PRIVATE
PUBLIC
BOTELER ST
CUMBERLAND ST
BOLTON ST
KING EDWARD AVE
CATHCART SQ
CATHCART ST
RAMP
187
205
203
152
127
125
171
219
101
9

Aly Elgayar

From: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>
Sent: Wednesday, January 20, 2021 3:22 PM
To: Aly Elgayar
Cc: Mottalib, Abdul; Deiaco, Simon
Subject: FW: 187 Boteler St. Qatar Embassy - Water Boundary Request
Attachments: 187 Boteler Street January 2021.pdf

Hello Aly,

Please see the water boundary conditions below as requested.

--

Thanks,

Abdul
Mohammad Abdul Mottalib, P. Eng.
Extension: 27798

From: ....
Sent: January 19, 2021 6:59 AM
To: Whelan, Amy <amy.whelan@ottawa.ca>
Subject: RE: 187 Boteler St. Qatar Embassy - Water Boundary Request

Hi Amy,

Please review and ensure demand submissions are correct prior to sending them to Water Resources for boundary conditions.

Thank you,

The following are boundary conditions, HGL, for hydraulic analysis 187 Boteler (zone 1W) assumed to be connected to the 203mm on Boteler Street (see attached PDF for location).

Minimum HGL = 106.6m

Maximum HGL = 115.0m

Max Day + Fire Flow (83 L/s) = 107.0m

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

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

From: Aly Elgayar <Aly.ElGayar@exp.com>
Sent: 2021/01/18 12:53 PM
To: Whelan, Amy <amy.whelan@ottawa.ca>
Cc: Steele, Matt <Matt.Steele@ottawa.ca>
Subject: RE: 187 Boteler St. Qatar Embassy - Water Boundary Request

My apologies, there was indeed a calculation error in one of the cells that I should have caught. Please find attached the corrected domestic water demand calculations.

Domestic Water Demands

- Average Day = 0.24 L/sec
- Max Day = 0.36 L/sec
- Max Hour = 0.66 L/sec

Thank you,

Aly Elgayar, M.A.Sc.
EXP | Engineering Designer
t : +1.613.688.1899, 3225 | m : +1.613.282.0561 | e : aly.elgayar@exp.com

---

From: Whelan, Amy <amy.whelan@ottawa.ca>
Sent: Monday, January 18, 2021 12:08 PM
To: Aly Elgayar <Aly.ElGayar@exp.com>
Cc: Steele, Matt <Matt.Steele@ottawa.ca>
Subject: FW: 187 Boteler St. Qatar Embassy - Water Boundary Request

Hi Aly,

Can you please read the email thread below and verify the demands provided?

Kind regards,

Amy

From: Steele, Matt <Matt.Steele@ottawa.ca>
Sent: January 18, 2021 11:39 AM
To: Whelan, Amy <amy.whelan@ottawa.ca>
Subject: RE: 187 Boteler St. Qatar Embassy - Water Boundary Request

Good Morning Amy,

I think there are errors in the demands provided (Max Day & Peak Hour Demand seem to be low compared to the Average Day Demand).

Matt

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

From: Whelan, Amy <amy.whelan@ottawa.ca>
Sent: 2021/01/13 9:41 AM
To: Steele, Matt <Matt.Steele@ottawa.ca>
Subject: 187 Boteler St. Qatar Embassy - Water Boundary Request

Hi Matt,

Can you please provide the water boundary conditions for 187 Boteler street (proposed Qatar Embassy) given the attached water and fire flow demand calculations, sketch indicating the approximate proposed water service location, and the below information:

Domestic Water Demands

- Average Day = 0.24 L/sec
- Max Day = 0.13 L/sec
- Max Hour = 0.23 L/sec

Required Fire Flow

- RFF = 83 L/sec

Thanks,

Amy Whelan, E.I.T
Engineering Intern
Planning, Infrastructure and Economic Development – Service de la planification, de l’infrastructure et du développement économique
Development Review – Central Branch
City of Ottawa | Ville d’Ottawa
110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste 26642, amy.whelan@ottawa.ca

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'

Appendix C – Sanitary Sewer Design Sheet

Table D1
Stormwater Management Summary

Area ID	Outlet Location	Area (ha)	Runoff Coefficient 'C'	100 Year Release (L/s)	100 Year storage required (m³)	100 Year surface storage provided (m³)	Control Method
A1	Roof Drain	0.07	0.90	**4.1**	26.7	36.5	WATTS Flow Controlled Drains
A2	Roof Drain	0.03	0.90	**2.0**	12.3	17.1	
A3	Roof Drain	0.03	0.90	**1.8**	10.3	14.5	
A4	Courtyard	0.07	0.59	**4.0**	37.2	50.0	Controlled Pump Discharge
A5	Trench Drain	0.02	0.90				
A6	Transformer Area	0.02	0.90				
A7	CBMH201 / CBMG202	0.08	0.76	**6.0**	37.4	49.4	Hydrovex 100VHV-1
A8	Landscaped	0.01	0.44				
A9	CBMH203	0.19	0.20	**6.0**	34.8	90.0	Hydrovex 75VHV-1
A10	CB101	0.20	0.20				
A11	Uncontrolled	0.01	0.90	2.9	-	-	
A12	Uncontrolled	0.01	0.90	7.4	-	-	
A13	*Exterior Drainage*	*0.06*	*0.20*	*7.7*	-	-	
	TOTAL	**0.75**					
			Totals:	**34.2**	**158.8**	**257.5**	
			Total Allowable Release L/s:	**35.2**			

Appendix D – Stormwater Management Design Sheet

exp.

TABLE C1 - SANITARY SEWER CALCULATION SHEET

LOCATION				RESEDENTIAL AREAS AND POPULAITONS												COMMERCIAL			INDUSTRIAL			INSTITUTIONAL			INFILTRATION				SEWER DATA						
					NUMBER OF UNITS							POPULATION				AREA (ha)			AREA (ha)						AREA (ha)										
Street	U/S MH	D/S MH	Desc	Area (ha)	Singles	Semis	Towns	1-Bed Apt.	2-Bed Apt.	3-Bed Apt.	4-Bed Apt.	INDIV	ACCU	Peak Factor	Peak Flow (L/sec)	INDIV	ACCU	Peak Flow (L/sec)	INDIV	ACCU	Peak Factor (per MOE)	AREA (Ha)	ACCU AREA (Ha)	Peak Flow (L/sec)	INDIV	ACCU	INFILT FLOW (L/s)	TOTAL FLOW (L/s)	Nom Dia (mm)	Actual Dia (mm)	Slope (%)	Length (m)	Capacity (L/sec)	Q/Q_{CAP} (%)	Full Velocity (m/s)
Site	BLDG	SANMH 101		0.75										4.00								0.75	0.7495	0.36434	0.750	0.750	0.25	0.61	200	207.26	2.00	0.600	51.0	1%	1.72
	Guard House	SANMH 101												4.00									0.7495	0.36434		0.750	0.25	0.61	200	207.26	2.00	18.300	51.0	1%	1.72
	SANMH 101	SAN Monitoring MH												4.00									0.7495	0.36434		0.750	0.25	0.61	200	207.26	2.00	3.540	51.0	1%	1.72
Boteler Street	SAN Monitoring MH	SAN Main												4.00									0.7495	0.36434		0.750	0.25	0.61	200	207.26	5.22	9.200	82.4	1%	2.77
				0.750																					**0.750**			**0.61**							

Residential Avg. Daily Flow, q (L/p/day) =	280	Commercial Peak Factor =	1.5	(when area >20%)	Peak Population Flow, (L/sec) =	P*q*M/86.4	Unti Type	Persons/Unit
Commercial Avg. Daily Flow (L/gross ha/day) =	28,000		1.0	(when area <20%)	Peak Extraneous Flow, (L/sec) =	I*Ac	Singles	3.0
or L/gross ha/sec =	0.324				Residential Peaking Factor, M =	1 + (14/(4+P^0.5)) * K	Semi-Detached	2.7
Institutianal Avg. Daily Flow (L/s/ha) =	28,000	Institutional Peak Factor =	1.5	(when area >20%)	A_c = Cumulative Area (hectares)		Townhomes	2.7
or L/gross ha/sec =	0.324		1.0	(when area <20%)	P = Population (thousands)		Single Apt. Unit	1.4
Light Industrial Flow (L/gross ha/day) =	35,000						2-bed Apt. Unit	2.1
or L/gross ha/sec =	0.40509	Residential Correction Factor, K =	0.80		Sewer Capacity, Qcap (L/sec) =	1/N $S^{1/2}$ $R^{2/3}$ A_c	3-bed Apt. Unit	3.1
Light Industrial Flow (L/gross ha/day) =	55,000	Manning N =	0.013		(Manning's Equation)		4-bed Apt. Unit	3.8
or L/gross ha/sec =	0.637	Peak extraneous flow, I (L/s/ha) =	0.33	(Total I/I)				

Designed:	Project:
A. Jariwala, M.Eng.	Qatar Embassy
Checked:	Location:
A. Ansari, M.Sc., P.Eng.	187 Boteler Street, Ottawa, ON
File Reference:	Page No:
261664 - SAN Design Sheet.xlsx	**1 of 1**

Table D2
SWM PRE-DEVELOPMENT RUNOFF

Area No	Outlet Location	Area (ha)	Time of Conc. T_c (min)	Storm = 2-year			Storm = 5-year			Storm = 100-year		
				C_{AVG}	I_2 (mm/hr)	Q (L/sec)	C_{AVG}	I_5 (mm/hr)	Q (L/sec)	$C_{AVG-100Yr}$	I_{100} (mm/hr)	Q (L/sec)
E1	Boteler Street	0.75	10	0.22	76.81	35.2	0.22	104.19	47.8	0.28	178.56	102.4
Total		0.75				35.2			47.8			102.4

Allowable Release rate for up to 100-year post-development storm events

Notes
1) Intensity, $I_2 = 732.951/(Tc+6.199)^{0.810}$ (2-year, City of Ottawa)
2) Intensity, $I_5 = 998.071/(Tc+6.035)^{0.814}$ (5-year, City of Ottawa)
3) Intensity, $I_{100} = 1735.688/(Tc+6.014)^{0.820}$ (100-year, City of Ottawa)
4) Time of Concentration: T_c=10min
4) Flows under column Q_{CAP} which are **bold**, denotes flows that are controlled.

Table D3 - CALCULATION OF AVERAGE RUNOFF COEFFICIENTS (POST-DEVELOPMENT)

Area No.	Outlet Location	Asphalt/Concrete Areas		Roof Areas		Pavers/Gravel Areas		Grassed Areas		Sum AC	Total Area (m^2)	C_{AVG}
		Area (m^2)	A * C	Area (m^2)	A * C	Area (m^2)	A * C	Area (m^2)	A * C			
		C=0.90		C=0.90		C=0.90		C=0.20				
A1	Roof Drain		0.0	730.11	657.1		0.0		0.00	657.1	730.11	0.90
A2	Roof Drain		0.0	342.26	308.0		0.0		0.00	308.0	342.26	0.90
A3	Roof Drain		0.0	290.35	261.3		0.0		0.00	261.3	290.35	0.90
A4	Courtyard		0.0		0.0	369.33	332.4	293.50	58.70	391.1	662.83	0.59
A5	Trench Drain	219.79	197.8		0.0		0.0		0.00	197.8	219.79	0.90
A6	Transformer Area	165.44	148.9		0.0		0.0		0.00	148.9	165.44	0.90
A7	CBMH201	338.10	304.3		0.0		0.0	83.47	16.69	642.0	843.12	0.76
	CBMG202	338.10	304.3		0.0		0.0	83.47	16.69			
A8	Landscaped		0.0		0.0	36.22	32.6	69.23	13.85	46.4	105.45	0.44
A9	CBMH203		0.0		0.0		0.0	1949.64	389.93	389.9	1949.64	0.20
A10	CB101		0.0		0.0		0.0	1975.77	395.15	395.2	1975.77	0.20
A11	Uncontrolled	57.94	52.1		0.0		0.0		0.00	52.1	57.94	0.90
A12	Uncontrolled	115.48	103.9	34.02	30.6		0.0		0.00	134.6	149.50	0.90
A13	*Exterior Drainage*		*0.0*		*0.0*		*0.0*	*623.63*	*124.73*	*124.7*	*623.63*	*0.20*
							Average Runoff Coeff =			C_{AVG} =	3,624 / 7,492	= 0.48

Table D4
SWM POST-DEVELOPMENT RUNOFF (UNCONTROLLED AND CONTROLLED)

Area No	Outlet Location	Area (ha)	Time of Conc. T_c (min)	Storm = 2-year				Storm = 5-year				Storm = 100-year			
				C_{AVG}	I_2 (mm/hr)	Q (L/sec)	Q_{CAP} (L/sec)	C_{AVG}		Q (L/sec)	Q_{CAP} (L/sec)	$C_{AVG\text{-}100Yr}$	I_{100} (mm/hr)	Q (L/sec)	Q_{CAP} (L/sec)
A1	Roof Drain	0.0730	10	0.90	76.81	14.0	**1.6**	0.90	104.19	19.0	**2.2**	1.00	178.56	36.2	**4.1**
A2	Roof Drain	0.0342	10	0.90	76.81	6.6	**0.8**	0.90	104.19	8.9	**1.1**	1.00	178.56	17.0	**2.0**
A3	Roof Drain	0.0290	10	0.90	76.81	5.6	**0.7**	0.90	104.19	7.6	**0.9**	1.00	178.56	14.4	**1.8**
A4	Courtyard	0.0663	10	0.59	76.81	8.4	**1.4**	0.59	104.19	11.3	**1.9**	0.74	178.56	24.3	**4.0**
A5	Trench Drain	0.0220	10	0.90	76.81	4.2		0.90	104.19	5.7		1.00	178.56	10.9	
A6	Transformer Area	0.0165	10	0.90	76.81	3.2		0.90	104.19	4.3		1.00	178.56	8.2	
A7	CBMH201 CBMG202	0.0843	10	0.76	76.81	13.7	**2.1**	0.76	104.19	18.6	**2.8**	0.95	178.56	39.8	**6.0**
A8	Landscaped	0.0105	10	0.44	76.81	1.0		0.44	104.19	1.3		0.55	178.56	2.9	
A9	CBMH203	0.1950	10	0.20	76.81	8.3	**2.1**	0.20	104.19	11.3	**2.8**	0.25	178.56	24.2	**6.0**
A10	CB101	0.1976	10	0.20	76.81	8.4		0.20	104.19	11.4		0.25	178.56	24.5	
A11	Uncontrolled	0.0058	10	0.90	76.81	1.1	1.1	0.90	104.19	1.5	1.5	1.00	178.56	2.9	2.9
A12	Uncontrolled	0.0150	10	0.90	76.81	2.9	2.9	0.90	104.19	3.9	3.9	1.00	178.56	7.4	7.4
A13	*Exterior Drainage*	*0.0624*	*10*	*0.20*	*76.81*	*2.7*	*2.7*	*0.20*	*104.19*	*3.6*	*3.6*	*0.25*	*178.56*	*7.7*	*7.7*
Total		0.749				77.4	**12.6**			105.0	**17.0**			212.8	**34.2**

Notes
1) Intensity, $I_2 = 732.951/(Tc+6.199)^{0.810}$ (2-year, City of Ottawa)
2) Intensity, $I_5 = 998.071/(Tc+6.035)^{0.814}$ (5-year, City of Ottawa)
3) Intensity, $I_{100} = 1735.688/(Tc+6.014)^{0.820}$ (100-year, City of Ottawa)
4) Time of Concentration: T_c=10min
4) Flows under column Q_{CAP} which are **bold**, denotes flows that are controlled.

Table D5

Estimate of Storage Required for 2-yr and 100-yr Storms (Modified Rational Method)

Area No:	A1	
C_{AVG} =	0.90	(2-yr, 5-yr)
C_{AVG} =	1.00	(100-yr)
Time Interval =	5	(mins)
Drainage Area =	0.0730	(hectares)

Duration, T_D (min)	Release Rate = 2.8 (L/sec); Return Period = 2 (years); IDF Parameters, A = 732.951, B = 0.810, C = 6.199 ($I = A/(T_D+C)^B$)					Release Rate = 4.1 (L/sec); Return Period = 100 (years); IDF Parameters, A = 1735.688, 0.820, C = 6.014 ($I = A/(T_D+C)^B$)				
	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	167.2	30.5	2.82	27.7	0	398.6	80.9	4.126	76.8	0.0
5	103.6	18.9	2.82	16.1	5	242.7	49.3	4.126	45.1	13.5
10	76.8	14.0	2.82	11.2	7	178.6	36.2	4.126	32.1	19.3
15	61.8	11.3	2.82	8.5	8	142.9	29.0	4.126	24.9	22.4
20	52.0	9.5	2.82	6.7	8	120.0	24.3	4.126	20.2	24.3
25	45.2	8.3	2.82	5.4	**8**	103.8	21.1	4.126	17.0	25.4
30	40.0	7.3	2.82	4.5	8	91.9	18.6	4.126	14.5	26.1
35	36.1	6.6	2.82	3.8	8	82.6	16.8	4.126	12.6	26.5
40	32.9	6.0	2.82	3.2	8	75.1	15.3	4.126	11.1	**26.7**
45	30.2	5.5	2.82	2.7	7	69.1	14.0	4.126	9.9	26.7
50	28.0	5.1	2.82	2.3	7	64.0	13.0	4.126	8.9	26.6
55	26.2	4.8	2.82	2.0	6	59.6	12.1	4.126	8.0	26.3
60	24.6	4.5	2.82	1.7	6	55.9	11.3	4.126	7.2	26.0
65	23.2	4.2	2.82	1.4	5	52.6	10.7	4.126	6.6	25.6
70	21.9	4.0	2.82	1.2	5	49.8	10.1	4.126	6.0	25.1
75	20.8	3.8	2.82	1.0	4	47.3	9.6	4.126	5.5	24.6
80	19.8	3.6	2.82	0.8	4	45.0	9.1	4.126	5.0	24.0
85	18.9	3.5	2.82	0.6	3	43.0	8.7	4.126	4.6	23.4
90	18.1	3.3	2.82	0.5	3	41.1	8.3	4.126	4.2	22.8
95	17.4	3.2	2.82	0.4	2	39.4	8.0	4.126	3.9	22.1
100	16.7	3.1	2.82	0.2	1	37.9	7.7	4.126	3.6	21.4
105	16.1	2.9	2.82	0.1	1	36.5	7.4	4.126	3.3	20.7
Maximum Storage Requried =					**8.1**					**26.7**

Notes

1) Peak flow is equal to the product of 2.78 x C x I x A

2) Rainfall Intensity, $I = A/(T_D+C)^B$, where T_D = storm duration (mins)

3) Release Rate = Desired Capture (Release) Rate

4) Storage Rate = Peak Flow - Release Rate

5) Storage = Duration x Storage Rate

6) Maximium Storage = Max Storage Over Duration

7) A,B,C are IDF Parameters for Town of Hawkesbury. From Town of Hawkesbury Design Guidelines, Section 5.2.1.1.

Table D6

Estimate of Storage Required for 2-yr and 100-yr Storms (Modified Rational Method)

Area No: A2

C_{AVG} = 0.90 (2-yr, 5-yr)

C_{AVG} = 1.00 (100-yr)

Time Interval = 10 (mins)

Drainage Area = 0.0342 (hectares)

Duration, T_D (min)	Release Rate = 1.4 (L/sec); Return Period = 2 (years); IDF Parameters, A = 732.951, B = 0.810, C = 6.199 ($I = A/(T_D+C)^B$)					Release Rate = 2.0 (L/sec); Return Period = 100 (years); IDF Parameters, A = 1735.688, 0.820, C = 6.014 ($I = A/(T_D+C)^B$)				
	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	167.2	14.3	1.39	12.9	0	398.6	37.9	2.032	35.9	0.0
10	76.8	6.6	1.39	5.2	3	178.6	17.0	2.032	15.0	9.0
20	52.0	4.5	1.39	3.1	**4**	120.0	11.4	2.032	9.4	11.3
30	40.0	3.4	1.39	2.0	4	91.9	8.7	2.032	6.7	12.1
40	32.9	2.8	1.39	1.4	3	75.1	7.1	2.032	5.1	**12.3**
50	28.0	2.4	1.39	1.0	3	64.0	6.1	2.032	4.1	12.2
60	24.6	2.1	1.39	0.7	3	55.9	5.3	2.032	3.3	11.8
70	21.9	1.9	1.39	0.5	2	49.8	4.7	2.032	2.7	11.4
80	19.8	1.7	1.39	0.3	1	45.0	4.3	2.032	2.2	10.8
90	18.1	1.6	1.39	0.2	1	41.1	3.9	2.032	1.9	10.2
100	16.7	1.4	1.39	0.0	0	37.9	3.6	2.032	1.6	9.4
110	15.6	1.3	1.39	-0.1	0	35.2	3.3	2.032	1.3	8.7
120	14.6	1.2	1.39	-0.1	-1	32.9	3.1	2.032	1.1	7.9
130	13.7	1.2	1.39	-0.2	-2	30.9	2.9	2.032	0.9	7.1
140	12.9	1.1	1.39	-0.3	-2	29.2	2.8	2.032	0.7	6.2
150	12.3	1.0	1.39	-0.3	-3	27.6	2.6	2.032	0.6	5.4
160	11.7	1.0	1.39	-0.4	-4	26.2	2.5	2.032	0.5	4.5
170	11.1	1.0	1.39	-0.4	-4	25.0	2.4	2.032	0.3	3.6
180	10.6	0.9	1.39	-0.5	-5	23.9	2.3	2.032	0.2	2.6
190	10.2	0.9	1.39	-0.5	-6	22.9	2.2	2.032	0.1	1.7
200	9.8	0.8	1.39	-0.6	-7	22.0	2.1	2.032	0.1	0.7
210	9.4	0.8	1.39	-0.6	-7	21.1	2.0	2.032	0.0	-0.2
Maximum Storage Requried =					**3.7**					**12.3**

Notes

1) Peak flow is equal to the product of 2.78 x C x I x A

2) Rainfall Intensity, $I = A/(T_D+C)^B$, where T_D = storm duration (mins)

3) Release Rate = Desired Capture (Release) Rate

4) Storage Rate = Peak Flow - Release Rate

5) Storage = Duration x Storage Rate

6) Maximium Storage = Max Storage Over Duration

7) A,B,C are IDF Parameters for City of Ottawa. From Ottawa Sewer Design Guidelines, Section 5.4.2.

Table D7
Estimate of Storage Required for 2-yr and 100-yr Storms (Modified Rational Method)

Area No:	A3	
C_{AVG} =	0.90	(2-yr, 5-yr)
C_{AVG} =	1.00	(100-yr)
Time Interval =	10	(mins)
Drainage Area =	0.0290	(hectares)

.

Duration, T_D (min)	Release Rate = 1.2 (L/sec); Return Period = 2 (years); IDF Parameters, A = 732.951, B = 0.810, C = 6.199 ($I = A/(T_D+C)^B$)					Release Rate = 1.8 (L/sec); Return Period = 100 (years); IDF Parameters, A = 1735.688, 0.820, C = 6.014 ($I = A/(T_D+C)^B$)				
	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	167.2	12.1	1.19	11.0	0	398.6	32.2	1.767	30.4	0.0
10	76.8	5.6	1.19	4.4	3	178.6	14.4	1.767	12.6	7.6
20	52.0	3.8	1.19	2.6	3	120.0	9.7	1.767	7.9	9.5
30	40.0	2.9	1.19	1.7	3	91.9	7.4	1.767	5.6	10.2
40	32.9	2.4	1.19	1.2	3	75.1	6.1	1.767	4.3	10.3
50	28.0	2.0	1.19	0.8	3	64.0	5.2	1.767	3.4	10.2
60	24.6	1.8	1.19	0.6	2	55.9	4.5	1.767	2.7	9.9
70	21.9	1.6	1.19	0.4	2	49.8	4.0	1.767	2.3	9.5
80	19.8	1.4	1.19	0.3	1	45.0	3.6	1.767	1.9	9.0
90	18.1	1.3	1.19	0.1	1	41.1	3.3	1.767	1.6	8.4
100	16.7	1.2	1.19	0.0	0	37.9	3.1	1.767	1.3	7.8
110	15.6	1.1	1.19	-0.1	0	35.2	2.8	1.767	1.1	7.1
120	14.6	1.1	1.19	-0.1	-1	32.9	2.7	1.767	0.9	6.4
130	13.7	1.0	1.19	-0.2	-2	30.9	2.5	1.767	0.7	5.7
140	12.9	0.9	1.19	-0.2	-2	29.2	2.4	1.767	0.6	4.9
150	12.3	0.9	1.19	-0.3	-3	27.6	2.2	1.767	0.5	4.2
160	11.7	0.8	1.19	-0.3	-3	26.2	2.1	1.767	0.4	3.4
170	11.1	0.8	1.19	-0.4	-4	25.0	2.0	1.767	0.3	2.6
180	10.6	0.8	1.19	-0.4	-4	23.9	1.9	1.767	0.2	1.8
190	10.2	0.7	1.19	-0.4	-5	22.9	1.8	1.767	0.1	0.9
200	9.8	0.7	1.19	-0.5	-6	22.0	1.8	1.767	0.0	0.1
210	9.4	0.7	1.19	-0.5	-6	21.1	1.7	1.767	-0.1	-0.8
Maximum Storage Requried =					**3.1**					**10.3**

Notes

1) Peak flow is equal to the product of 2.78 x C x I x A
2) Rainfall Intensity, $I = A/(T_D+C)^B$, where T_D = storm duration (mins)
3) Release Rate = Desired Capture (Release) Rate
4) Storage Rate = Peak Flow - Release Rate
5) Storage = Duration x Storage Rate
6) Maximium Storage = Max Storage Over Duration
7) A,B,C are IDF Parameters for City of Ottawa. From Ottawa Sewer Design Guidelines, Section 5.4.2.

Table D8
Estimate of Storage Required for 2-yr and 100-yr Storms (Modified Rational Method)

Area No: A4,A5,A6
C_{AVG} = 0.70 (2-yr, 5-yr)
C_{AVG} = 0.88 (100-yr)
Time Interval = 5 (mins)
Drainage Area = 0.10 (hectares)

Duration, T_D (min)	Release Rate = 1.4 (L/sec); Return Period = 2 (years); IDF Parameters, A = 732.951, B = 0.810, ($I = A/(T_D+C)^B$), C = 6.199					Release Rate = 4.0 (L/sec); Return Period = 100 (years); IDF Parameters, A = 1735.688, 0.820, ($I = A/(T_D+C)^B$), C = 6.014				
	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	167.2	34.3	1.38	32.9	0	398.6	102.2	4.000	98.2	0.0
5	103.6	21.2	1.38	19.9	6	242.7	62.2	4.000	58.2	17.5
10	76.8	15.8	1.38	14.4	9	178.6	45.8	4.000	41.8	25.1
15	61.8	12.7	1.38	11.3	10	142.9	36.6	4.000	32.6	29.4
20	52.0	10.7	1.38	9.3	11	120.0	30.8	4.000	26.8	32.1
25	45.2	9.3	1.38	7.9	12	103.8	26.6	4.000	22.6	33.9
30	40.0	8.2	1.38	6.8	12	91.9	23.6	4.000	19.6	35.2
35	36.1	7.4	1.38	6.0	13	82.6	21.2	4.000	17.2	36.1
40	32.9	6.7	1.38	5.4	13	75.1	19.3	4.000	15.3	36.6
45	30.2	6.2	1.38	4.8	13	69.1	17.7	4.000	13.7	37.0
50	28.0	5.8	1.38	4.4	13	64.0	16.4	4.000	12.4	37.2
55	26.2	5.4	1.38	4.0	13	59.6	15.3	4.000	11.3	**37.2**
60	24.6	5.0	1.38	3.7	**13**	55.9	14.3	4.000	10.3	37.2
65	23.2	4.7	1.38	3.4	13	52.6	13.5	4.000	9.5	37.0
70	21.9	4.5	1.38	3.1	13	49.8	12.8	4.000	8.8	36.8
75	20.8	4.3	1.38	2.9	13	47.3	12.1	4.000	8.1	36.5
80	19.8	4.1	1.38	2.7	13	45.0	11.5	4.000	7.5	36.2
85	18.9	3.9	1.38	2.5	13	43.0	11.0	4.000	7.0	35.8
90	18.1	3.7	1.38	2.3	13	41.1	10.5	4.000	6.5	35.3
95	17.4	3.6	1.38	2.2	13	39.4	10.1	4.000	6.1	34.8
100	16.7	3.4	1.38	2.1	12	37.9	9.7	4.000	5.7	34.3
105	16.1	3.3	1.38	1.9	12	36.5	9.4	4.000	5.4	33.8
Maximum Storage Requried =					**13.2**					**37.2**

Notes
1) Peak flow is equal to the product of 2.78 x C x I x A
2) Rainfall Intensity, $I = A/(T_D+C)^B$, where T_D = storm duration (mins)
3) Release Rate = Desired Capture (Release) Rate
4) Storage Rate = Peak Flow - Release Rate
5) Storage = Duration x Storage Rate
6) Maximium Storage = Max Storage Over Duration
7) A,B,C are IDF Parameters for City of Ottawa. From Ottawa Sewer Design Guidelines, Section 5.4.2.

Table D9
Estimate of Storage Required for 2-yr and 100-yr Storms (Modified Rational Method)

Area No: A7, A8
C_{AVG} = 0.73 (2-yr, 5-yr)
C_{AVG} = 0.91 (100-yr)
Time Interval = 10 (mins)
Drainage Area = 0.095 (hectares)

Duration, T_D (min)	Release Rate = 2.1 (L/sec); Return Period = 2 (years); IDF Parameters, A = 732.951, B = 0.810; ($I = A/(T_D+C)^B$), C = 6.199					Release Rate = 3.0 (L/sec); Return Period = 100 (years); IDF Parameters, A = 1735.688, 0.820; ($I = A/(T_D+C)^B$), C = 6.014				
	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	167.2	32.0	2.06	29.9	0	398.6	95.4	3.000	92.4	0.0
10	76.8	14.7	2.06	12.6	8	178.6	42.7	3.000	39.7	23.8
20	52.0	10.0	2.06	7.9	9	120.0	28.7	3.000	25.7	30.8
30	40.0	7.7	2.06	5.6	10	91.9	22.0	3.000	19.0	34.2
40	32.9	6.3	2.06	4.2	**10**	75.1	18.0	3.000	15.0	35.9
50	28.0	5.4	2.06	3.3	10	64.0	15.3	3.000	12.3	36.9
60	24.6	4.7	2.06	2.6	9	55.9	13.4	3.000	10.4	37.3
70	21.9	4.2	2.06	2.1	9	49.8	11.9	3.000	8.9	**37.4**
80	19.8	3.8	2.06	1.7	8	45.0	10.8	3.000	7.8	37.3
90	18.1	3.5	2.06	1.4	8	41.1	9.8	3.000	6.8	36.9
100	16.7	3.2	2.06	1.1	7	37.9	9.1	3.000	6.1	36.4
110	15.6	3.0	2.06	0.9	6	35.2	8.4	3.000	5.4	35.8
120	14.6	2.8	2.06	0.7	5	32.9	7.9	3.000	4.9	35.1
130	13.7	2.6	2.06	0.6	4	30.9	7.4	3.000	4.4	34.3
140	12.9	2.5	2.06	0.4	3	29.2	7.0	3.000	4.0	33.4
150	12.3	2.3	2.06	0.3	3	27.6	6.6	3.000	3.6	32.4
160	11.7	2.2	2.06	0.2	2	26.2	6.3	3.000	3.3	31.5
170	11.1	2.1	2.06	0.1	1	25.0	6.0	3.000	3.0	30.4
180	10.6	2.0	2.06	0.0	0	23.9	5.7	3.000	2.7	29.4
190	10.2	1.9	2.06	-0.1	-1	22.9	5.5	3.000	2.5	28.2
200	9.8	1.9	2.06	-0.2	-2	22.0	5.3	3.000	2.3	27.1
210	9.4	1.8	2.06	-0.3	-3	21.1	5.1	3.000	2.1	25.9
Maximum Storage Requried =					**10.1**					**37.4**

Notes
1) Peak flow is equal to the product of 2.78 x C x I x A
2) Rainfall Intensity, $I = A/(T_D+C)^B$, where T_D = storm duration (mins)
3) Release Rate = Desired Capture (Release) Rate
4) Storage Rate = Peak Flow - Release Rate
5) Storage = Duration x Storage Rate
6) Maximium Storage = Max Storage Over Duration
7) A,B,C are IDF Parameters for City of Ottawa. From Ottawa Sewer Design Guidelines, Section 5.4.2.

Table D10

Estimate of Storage Required for 2-yr and 100-yr Storms (Modified Rational Method)

Area No:	A9,A10	
C_{AVG} =	0.20	(2-yr, 5-yr)
C_{AVG} =	0.25	(100-yr)
Time Interval =	5	(mins)
Drainage Area =	0.3925	(hectares)

Duration, T_D (min)	Release Rate = 2.1 (L/sec); Return Period = 2 (years); IDF Parameters, A = 732.951, B = 0.810, C = 6.199 ($I = A/(T_D+C)^B$)					Release Rate = 6.0 (L/sec); Return Period = 100 (years); IDF Parameters, A = 1735.688, B = 0.820, C = 6.014 ($I = A/(T_D+C)^B$)				
	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	167.2	36.5	2.06	34.4	0	398.6	108.7	6.000	102.7	0.0
5	103.6	22.6	2.06	20.5	6	242.7	66.2	6.000	60.2	18.1
10	76.8	16.8	2.06	14.7	9	178.6	48.7	6.000	42.7	25.6
15	61.8	13.5	2.06	11.4	10	142.9	39.0	6.000	33.0	29.7
20	52.0	11.4	2.06	9.3	11	120.0	32.7	6.000	26.7	32.1
25	45.2	9.9	2.06	7.8	12	103.8	28.3	6.000	22.3	33.5
30	40.0	8.7	2.06	6.7	12	91.9	25.1	6.000	19.1	34.3
35	36.1	7.9	2.06	5.8	12	82.6	22.5	6.000	16.5	34.7
40	32.9	7.2	2.06	5.1	**12**	75.1	20.5	6.000	14.5	**34.8**
45	30.2	6.6	2.06	4.5	12	69.1	18.8	6.000	12.8	34.7
50	28.0	6.1	2.06	4.1	12	64.0	17.4	6.000	11.4	34.3
55	26.2	5.7	2.06	3.6	12	59.6	16.3	6.000	10.3	33.9
60	24.6	5.4	2.06	3.3	12	55.9	15.2	6.000	9.2	33.3
65	23.2	5.1	2.06	3.0	12	52.6	14.4	6.000	8.4	32.6
70	21.9	4.8	2.06	2.7	11	49.8	13.6	6.000	7.6	31.9
75	20.8	4.5	2.06	2.5	11	47.3	12.9	6.000	6.9	31.0
80	19.8	4.3	2.06	2.3	11	45.0	12.3	6.000	6.3	30.1
85	18.9	4.1	2.06	2.1	11	43.0	11.7	6.000	5.7	29.2
90	18.1	4.0	2.06	1.9	10	41.1	11.2	6.000	5.2	28.2
95	17.4	3.8	2.06	1.7	10	39.4	10.8	6.000	4.8	27.1
100	16.7	3.7	2.06	1.6	10	37.9	10.3	6.000	4.3	26.0
105	16.1	3.5	2.06	1.5	9	36.5	10.0	6.000	4.0	24.9
Maximum Storage Requried =					**12.3**					**34.8**

Notes

1) Peak flow is equal to the product of 2.78 x C x I x A

2) Rainfall Intensity, $I = A/(T_D+C)^B$, where T_D = storm duration (mins)

3) Release Rate = Desired Capture (Release) Rate

4) Storage Rate = Peak Flow - Release Rate

5) Storage = Duration x Storage Rate

6) Maximium Storage = Max Storage Over Duration

7) A,B,C are IDF Parameters for City of Ottawa. From Ottawa Sewer Design Guidelines, Section 5.4.2.

TABLE D11: 2-YEAR STORM SEWER CALCULATION SHEET

exp.

Return Period Storm =	**2**	(2-years, 100-years)
Default Inlet Time=	10	(minutes)
Manning Coefficient =	0.013	(dimensionless)

LOCATION			AREA (hectares)				FLOW (UNRESTRICTED)							SEWER DATA										
Location	From Node	To Node	Area No.	Area (ha)	∑ Area (ha)	Average R	Indiv. 2.78*A*R	Accum. 2.78*A*R	Tc (mins)	I (mm/h)	Indiv. Flow (L/sec)	Return Period	Q (L/sec)	Dia (mm) Actual	Dia (mm) Nominal	Type	Slope (%)	Length (m)	Capacity (L/sec)	Velocity (m/s) Vf	Velocity (m/s) Va	Time in Pipe, Tt (min)	Hydraulic Ratios Qa/Qf	Hydraulic Ratios Va/Vf
187 BOTELER STREET	CB 101	CBMH 203	A10	0.1976	0.198	0.20	0.11	0.11	10.00	76.81	8.44	2.00	8.4	251.46	250	PVC	0.50	40.62	42.7	0.86	0.57	1.18	0.20	0.67
	CBMH 203	STMMH 302	A9	0.1950	0.393	0.20	0.11	0.22	11.18	72.55	7.86	2.00	15.8	251.46	250	PVC	0.50	5.65	42.7	0.86	0.61	0.16	0.37	0.71
	CB 102	CBMH 204	A6	0.0165	0.017	0.90	0.04	0.04	10.00	76.81	3.18	2.00	3.2	251.46	250	PVC	1.00	14.86	60.4	1.21	0.56	0.44	0.05	0.46
	CBMH 204	Cistern	A4	0.066	0.083	0.59	0.11	0.15	10.44	75.14	8.17	2.00	11.3	251.46	250	PVC	1.00	23.87	60.4	1.21	0.78	0.51	0.19	0.64
	Building	STMMH 301	A1-A6	0.241	0.241	0.81	0.55	0.55	10.00	76.81	41.94	2.00	41.9	251.46	250	PVC	2.00	4.21	85.4	1.71	1.21	0.06	0.49	0.71
	STMMH 301	STMMH 302			0.241			0.55	10.06	76.58		2.00	41.8	299.36	300	PVC	0.60	6.74	74.5	1.06	0.75	0.15	0.56	0.71
	CBMH 202	STMMH 302	A7, A8	0.095	0.095	0.73	0.19	0.19	10.00	76.81	14.70	2.00	14.7	251.46	250	PVC	0.50	2.06	42.7	0.86	0.60	0.06	0.34	0.70
	STMMH 302	OGS			0.728			0.96	11.34	72.03		2.00	68.8	366.42	375	PVC	0.30	3.22	90.3	0.87	0.85	0.06	0.76	0.98
	OGS	STM Monitoring MH			0.728			0.96	11.40	71.82		2.00	68.6	366.42	375	PVC	0.30	11.99	90.3	0.87	0.85	0.23	0.76	0.98
	STM Monitoring MH	STMMH 303			0.728			0.96	11.63	71.06		2.00	67.9	366.42	375	PVC	0.30	7.31	90.3	0.87	0.85	0.14	0.75	0.98
TOTALS =							**1.11**											**120.53**						

Definitions:
Q = 2.78*AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Watershed Area (hectares)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficients (dimensionless)

Notes:

		2yr	**100yr**
Ottawa Rainfall Intensity Values:	a =	732.951	1735.688
From Sewer Desing Guidelines, 2004	b=	0.810	0.820
	c =	6.199	6.014

Designed: **A. Jariwala, M.Eng.**	Project: **187 BOTELER STREET**	
Checked: **A. Ansari, PEng.**	Location: **Ottawa, Ontario**	
Dwg Reference: **C100**	File Ref: **261664 2-Year Storm Design Sheets**	Sheet No: **1 of 1**

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

09/29/2021

Province:	Ontario
City:	Ottawa
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20
Site Name:	
Drainage Area (ha):	0.71
Runoff Coefficient 'c':	0.50
Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0
Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	12.04
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	102.00
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	Qatar Embassy
Project Number:	261664
Designer Name:	Aaditya Jariwala
Designer Company:	EXP Inc
Designer Email:	aaditya.jariwala@exp.com
Designer Phone:	613-816-5961
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	76
EFO6	85
EFO8	90
EFO10	91
EFO12	92

Recommended Stormceptor EFO Model: EFO6

Estimated Net Annual Sediment (TSS) Load Reduction (%): 85

Water Quality Runoff Volume Capture (%): > 90

THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

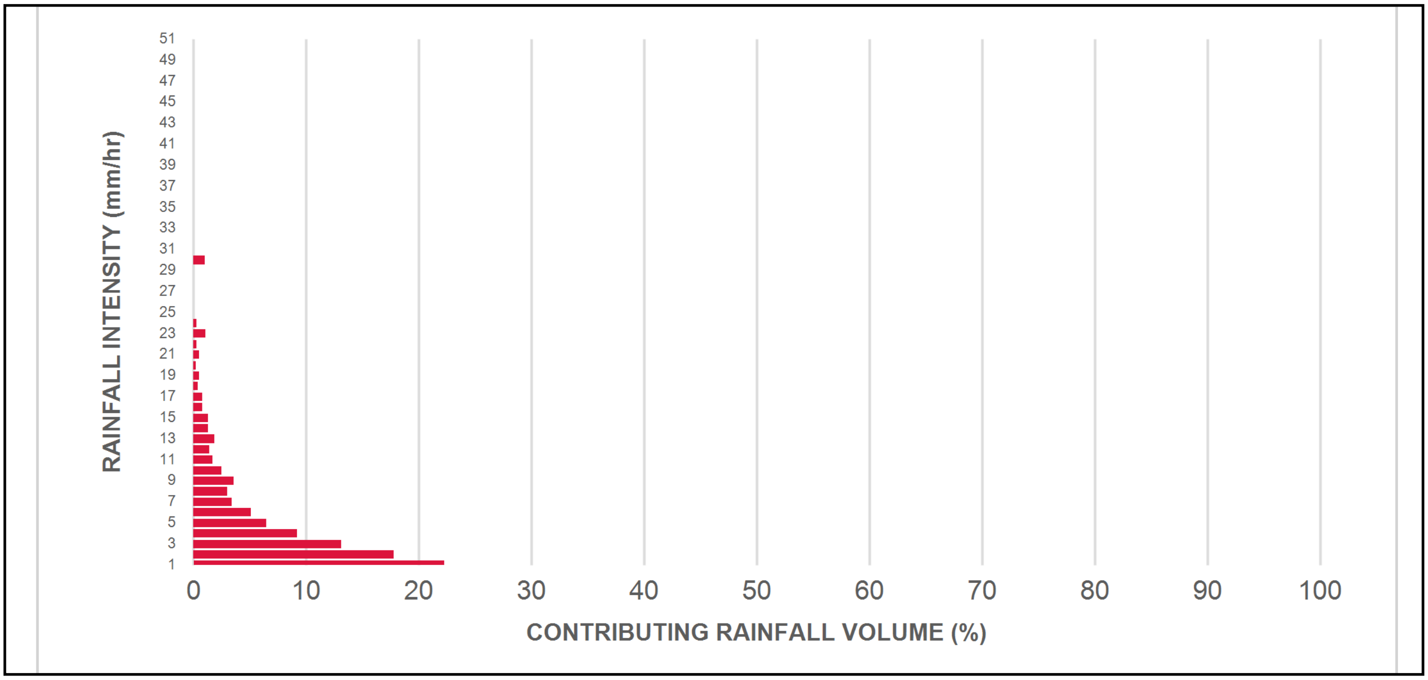
►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (μm)	Percent Less Than	Particle Size Fraction (μm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

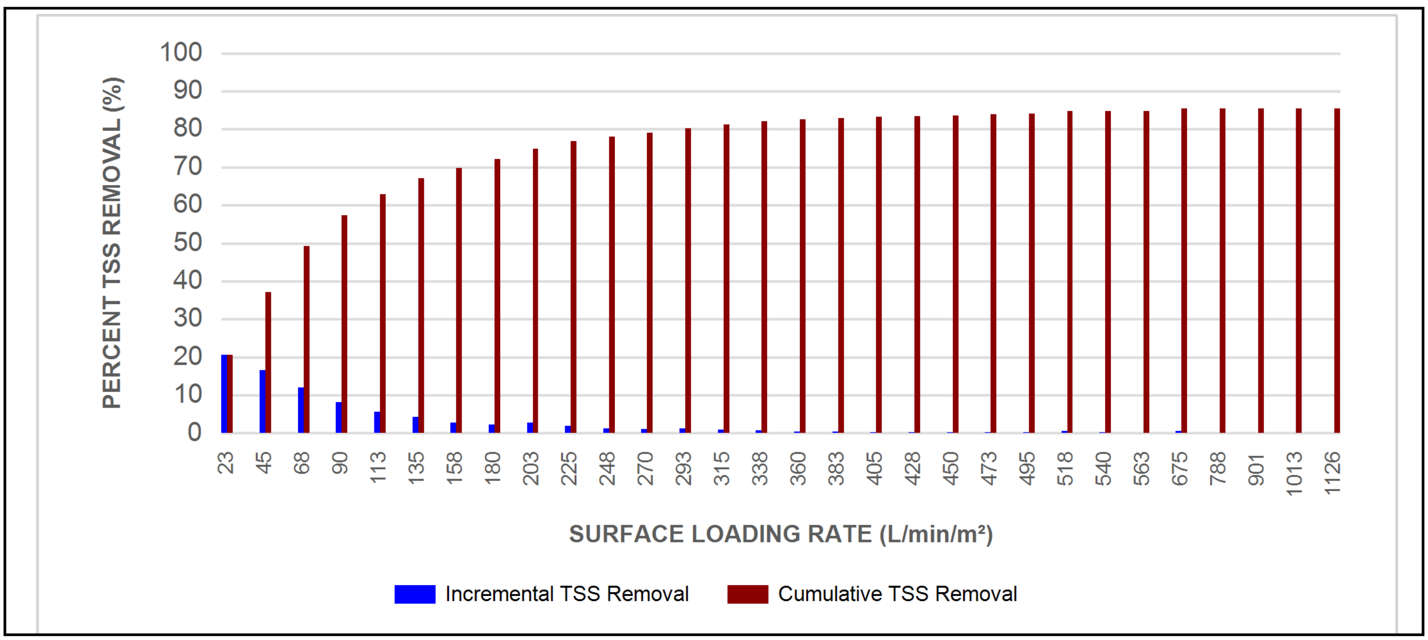
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate ($L/min/m^2$)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
1	22.3	22.3	0.99	59.0	23.0	93	20.7	20.7
2	17.8	40.0	1.97	118.0	45.0	93	16.5	37.2
3	13.1	53.1	2.96	178.0	68.0	91	12.0	49.2
4	9.2	62.4	3.95	237.0	90.0	88	8.1	57.3
5	6.5	68.9	4.93	296.0	113.0	86	5.6	62.9
6	5.1	74.0	5.92	355.0	135.0	84	4.2	67.1
7	3.4	77.3	6.91	414.0	158.0	81	2.7	69.8
8	3.0	80.3	7.90	474.0	180.0	78	2.3	72.2
9	3.6	84.0	8.88	533.0	203.0	76	2.8	74.9
10	2.5	86.5	9.87	592.0	225.0	74	1.9	76.8
11	1.7	88.2	10.86	651.0	248.0	72	1.2	78.0
12	1.4	89.6	11.84	711.0	270.0	70	1.0	79.1
13	1.9	91.5	12.83	770.0	293.0	68	1.3	80.3
14	1.3	92.8	13.82	829.0	315.0	66	0.9	81.2
15	1.3	94.1	14.80	888.0	338.0	64	0.8	82.0
16	0.8	94.9	15.79	947.0	360.0	62	0.5	82.5
17	0.8	95.7	16.78	1007.0	383.0	60	0.5	83.0
18	0.4	96.1	17.76	1066.0	405.0	58	0.3	83.2
19	0.5	96.6	18.75	1125.0	428.0	57	0.3	83.5
20	0.2	96.8	19.74	1184.0	450.0	57	0.1	83.6
21	0.5	97.3	20.72	1243.0	473.0	56	0.3	83.9
22	0.3	97.6	21.71	1303.0	495.0	55	0.1	84.1
23	1.1	98.7	22.70	1362.0	518.0	55	0.6	84.7
24	0.3	99.0	23.69	1421.0	540.0	54	0.2	84.8
25	0.0	99.0	24.67	1480.0	563.0	53	0.0	84.8
30	1.0	100.0	29.61	1776.0	675.0	52	0.5	85.4
35	0.0	100.0	34.54	2072.0	788.0	51	0.0	85.4
40	0.0	100.0	39.48	2369.0	901.0	51	0.0	85.4
45	0.0	100.0	44.41	2665.0	1013.0	50	0.0	85.4
50	0.0	100.0	49.35	2961.0	1126.0	49	0.0	85.4
Estimated Net Annual Sediment (TSS) Load Reduction =								**85 %**

Climate Station ID: 6105978 *Years of Rainfall Data*: 20

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

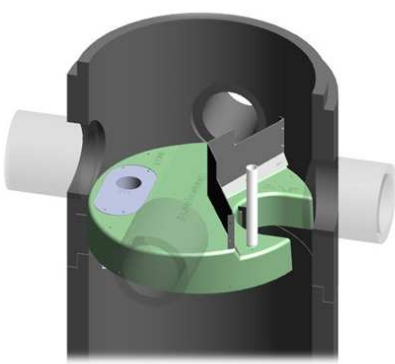
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

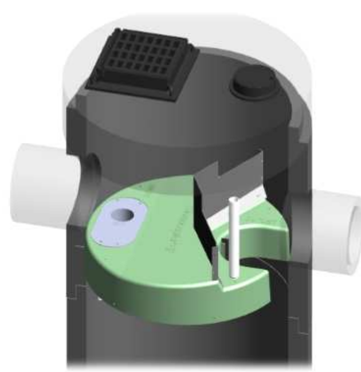
DESIGN FLEXIBILITY

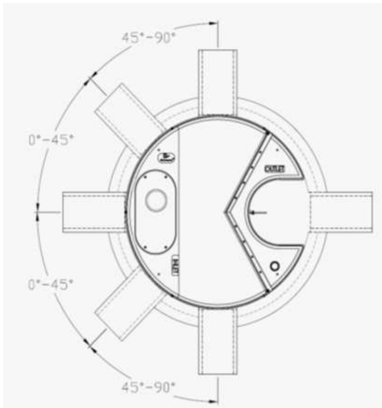
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft³)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing shall be determined using historical rainfall data and a sediment removal performance curve derived from the actual third-party verified laboratory testing data. The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m2 to 2600 L/min/m2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

User Inputs

Chamber Model:	SC-740
Outlet Control Structure:	Yes
Project Name:	
Engineer:	Aaditya Jariwala
Project Location:	
Measurement Type:	Metric
Required Storage Volume:	37.88 cubic meters.
Stone Porosity:	40%
Stone Foundation Depth:	152 mm.
Stone Above Chambers:	152 mm.
Average Cover Over Chambers:	457 mm.
Design Constraint Dimensions:	(15.00 m. x 15.00 m.)

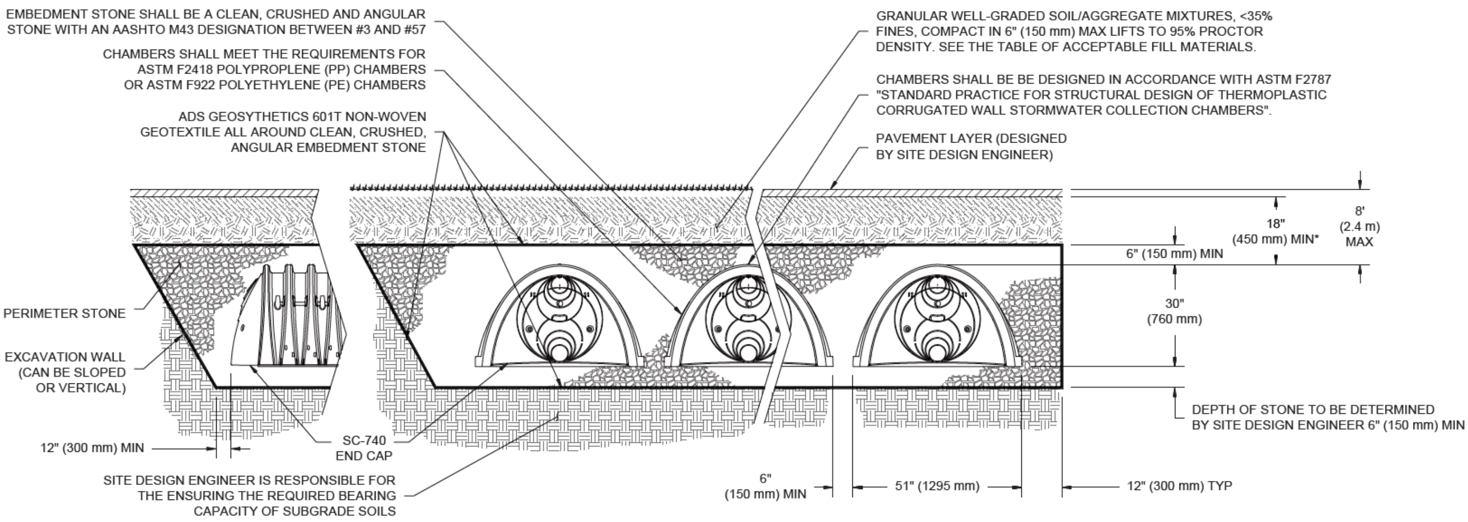
Results

System Volume and Bed Size

Installed Storage Volume:	39.64 cubic meters.
Storage Volume Per Chamber:	1.30 cubic meters.
Number Of Chambers Required:	15
Number Of End Caps Required:	6
Chamber Rows:	3
Maximum Length:	13.14 m.
Maximum Width:	4.98 m.
Approx. Bed Size Required:	65.49 square meters.

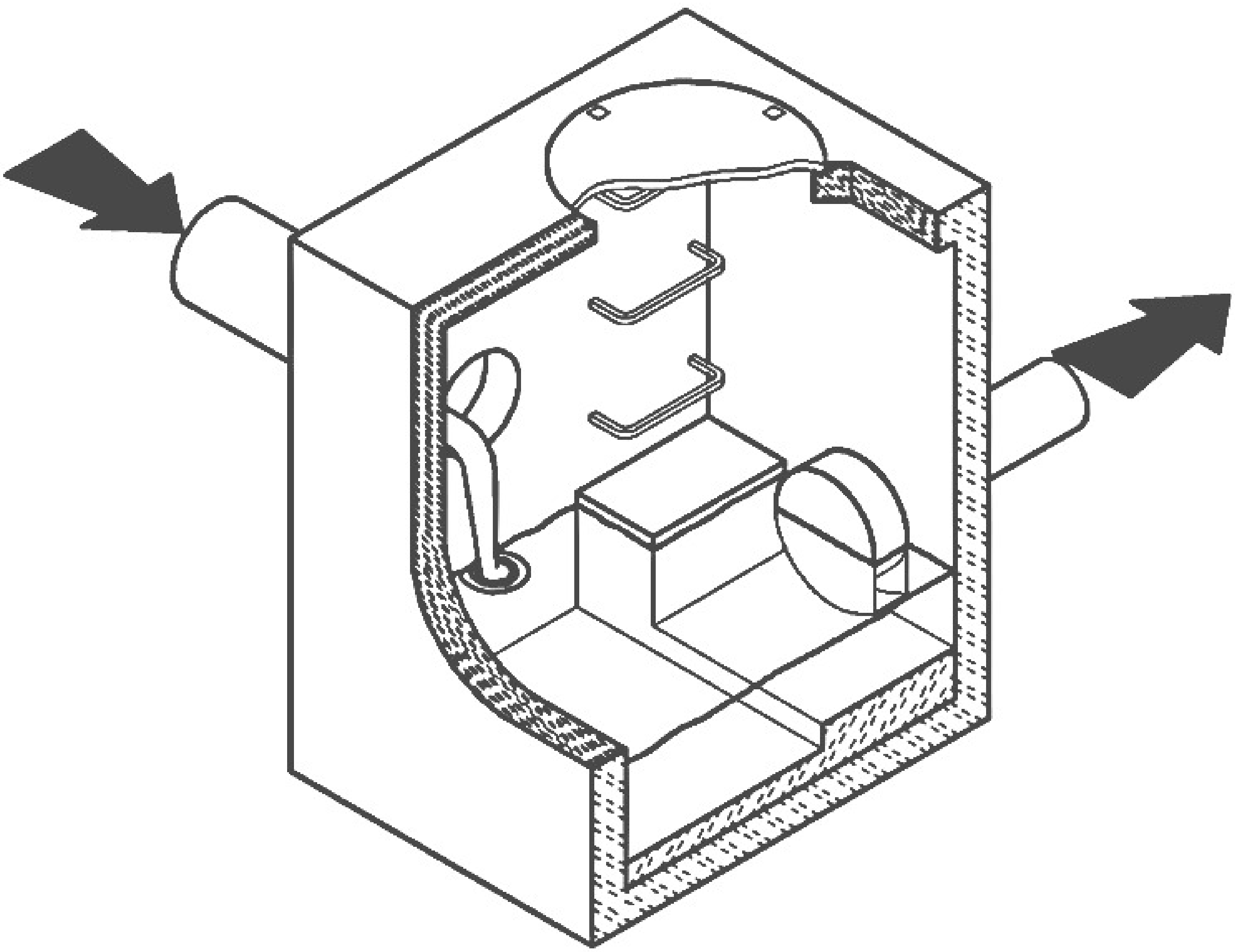
System Components

Amount Of Stone Required:	50.37 cubic meters
Volume Of Excavation (Not Including Fill):	69.86 cubic meters
Non-woven Geotextile Required (excluding Isolator Row):	243.48 square meters
Non-woven Geotextile Required (Isolator Row):	39.66 square meters
Total Non-woven Geotextile Required:	283.14 square meters
Woven Geotextile Required (excluding Isolator Row):	15.83 square meters
Woven Geotextile Required (Isolator Row):	24.79 square meters
Total Woven Geotextile Required:	40.62 square meters



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

® HYDROVEX® VHV / SVHV
Vertical Vortex Flow Regulator



JOHN MEUNIER

APPLICATIONS

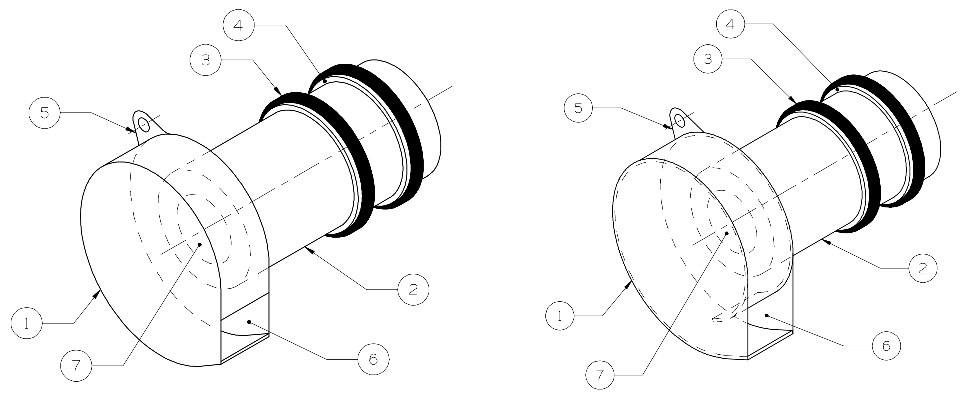
One of the major problems of urban wet weather flow management is the runoff generated after a heavy rainfall. During a storm, uncontrolled flows may overload the drainage system and cause flooding. Due to increased velocities, sewer pipe wear is increased dramatically and results in network deterioration. In a combined sewer system, the wastewater treatment plant may also experience significant increases in flows during storms, thereby losing its treatment efficiency.

A simple means of controlling excessive water runoff is by controlling excessive flows at their origin (manholes). **John Meunier Inc.** manufactures the **HYDROVEX® VHV / SVHV** line of vortex flow regulators to control stormwater flows in sewer networks, as well as manholes.

The vortex flow regulator design is based on the fluid mechanics principle of the forced vortex. This grants flow regulation without any moving parts, thus reducing maintenance. The operation of the regulator, depending on the upstream head and discharge, switches between orifice flow (gravity flow) and vortex flow. Although the concept is quite simple, over 12 years of research have been carried out in order to get a high performance.

The **HYDROVEX® VHV / SVHV** Vertical Vortex Flow Regulators **(refer to Figure 1)** are manufactured entirely of stainless steel, and consist of a hollow body (**1**) (in which flow control takes place) and an outlet orifice (**7**). Two rubber "O" rings (**3**) seal and retain the unit inside the outlet pipe. Two stainless steel retaining rings (**4**) are welded on the outlet sleeve to ensure that there is no shifting of the "O" rings during installation and use.

1. **BODY**
2. **SLEEVE**
3. **O-RING**
4. **RETAINING RINGS (SQUARE BAR)**
5. **ANCHOR PLATE**
6. **INLET**
7. **OUTLET ORIFICE**



VHV ***SVHV***

FIGURE 1: HYDROVEX® VHV-SVHV VERTICAL VORTREX FLOW REGULATORS

ADVANTAGES

- The **HYDROVEX® VHV / SVHV** line of flow regulators are manufactured entirely of stainless steel, making them durable and corrosion resistant.
- Having no moving parts, they require minimal maintenance.
- The geometry of the **HYDROVEX® VHV / SVHV** flow regulators allows a control equal to an orifice plate, having a cross section area 4 to 6 times smaller. This decreases the chance of blockage of the regulator, due to sediments and debris found in stormwater flows. **Figure 2** illustrates the comparison between a regulator model 100 SVHV-2 and an equivalent orifice plate. One can see that for the same height of water, the regulator controls a flow approximately four times smaller than an equivalent orifice plate.
- Installation of the **HYDROVEX® VHV / SVHV** flow regulators is quick and straightforward and is performed after all civil works are completed.
- Installation requires no special tools or equipment and may be carried out by any contractor.
- Installation may be carried out in existing structures.

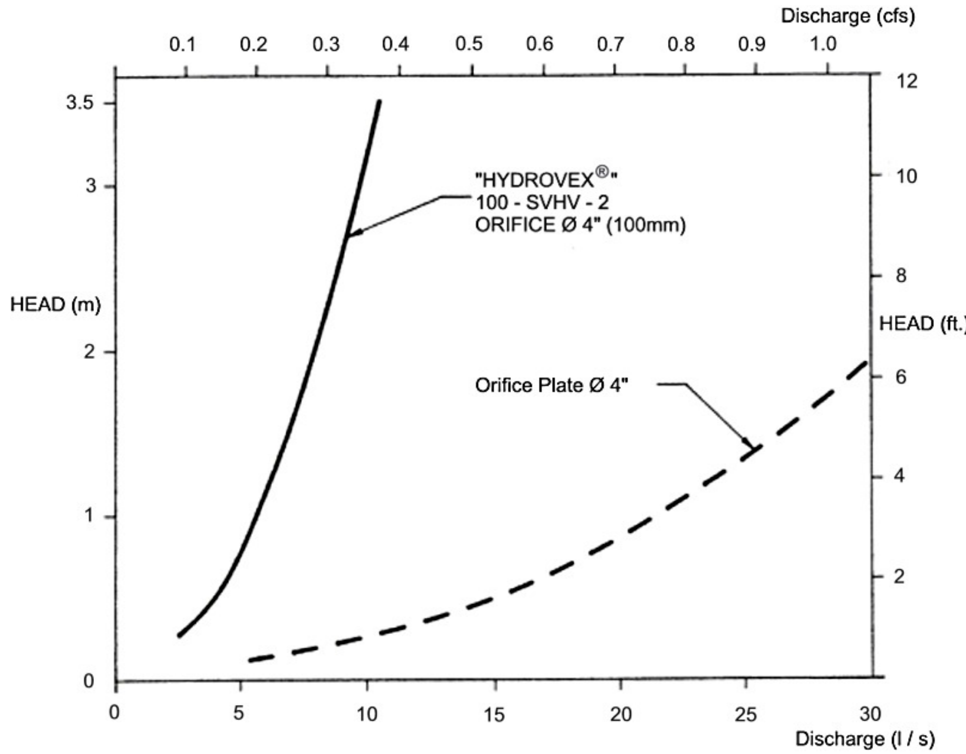


FIGURE 2: DISCHARGE CURVE SHOWING A HYDROVEX® FLOW REGULATOR VS AN ORIFICE PLATE

SELECTION

Selection of a **VHV or SVHV** regulator can be easily made using the selection charts found at the back of this brochure (see **Figure 3**). These charts are a graphical representation of the maximum upstream water pressure (head) and the maximum discharge at the manhole outlet. The maximum design head is the difference between the maximum upstream water level and the invert of the outlet pipe. All selections should be verified by John Meunier Inc. personnel prior to fabrication.

Example:

✓ Maximum design head	2m (6.56 ft.)
✓ Maximum discharge	6 L/s (0.2 cfs)
✓ Using **Figure 3** - VHV	model required is a **75 VHV-1**

INSTALLATION REQUIREMENTS

All **HYDROVEX® VHV / SVHV** flow regulators can be installed in circular or square manholes. **Figure 4** gives the various minimum dimensions required for a given regulator. ***It is imperative to respect the minimum clearances shown to ensure easy installation and proper functioning of the regulator.***

SPECIFICATIONS

In order to specify a **HYDROVEX®** regulator, the following parameters must be defined:

- The model number (ex: 75-VHV-1)
- The diameter and type of outlet pipe (ex: 6" diam. SDR 35)
- The desired discharge (ex: 6 l/s or 0.21 CFS)
- The upstream head (ex: 2 m or 6.56 ft.) *
- The manhole diameter (ex: 36" diam.)
- The minimum clearance "H" (ex: 10 inches)
- The material type (ex: 304 s/s, 11 Ga. standard)

***** *Upstream head is defined as the difference in elevation between the maximum upstream water level and the invert of the outlet pipe where the HYDROVEX® flow regulator is to be installed.***

PLEASE NOTE THAT WHEN REQUESTING A PROPOSAL, WE SIMPLY REQUIRE THAT YOU PROVIDE US WITH THE FOLLOWING:

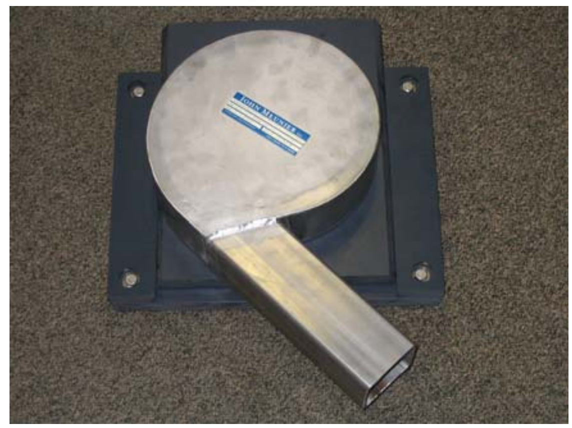
- ***project design flow rate***
- ***pressure head***
- ***chamber's outlet pipe diameter and type***

Typical VHV model in factory

OPTIONS

FV – SVHV (mounted on sliding plate)

VHV-1-O (standard model with odour control inlet)



FV – VHV-O (mounted on sliding plate with odour control inlet)

VHV with Gooseneck assembly in existing chamber without minimum release at the bottom

VHV with air vent for minimal slopes

VHV Vertical Vortex Flow Regulator

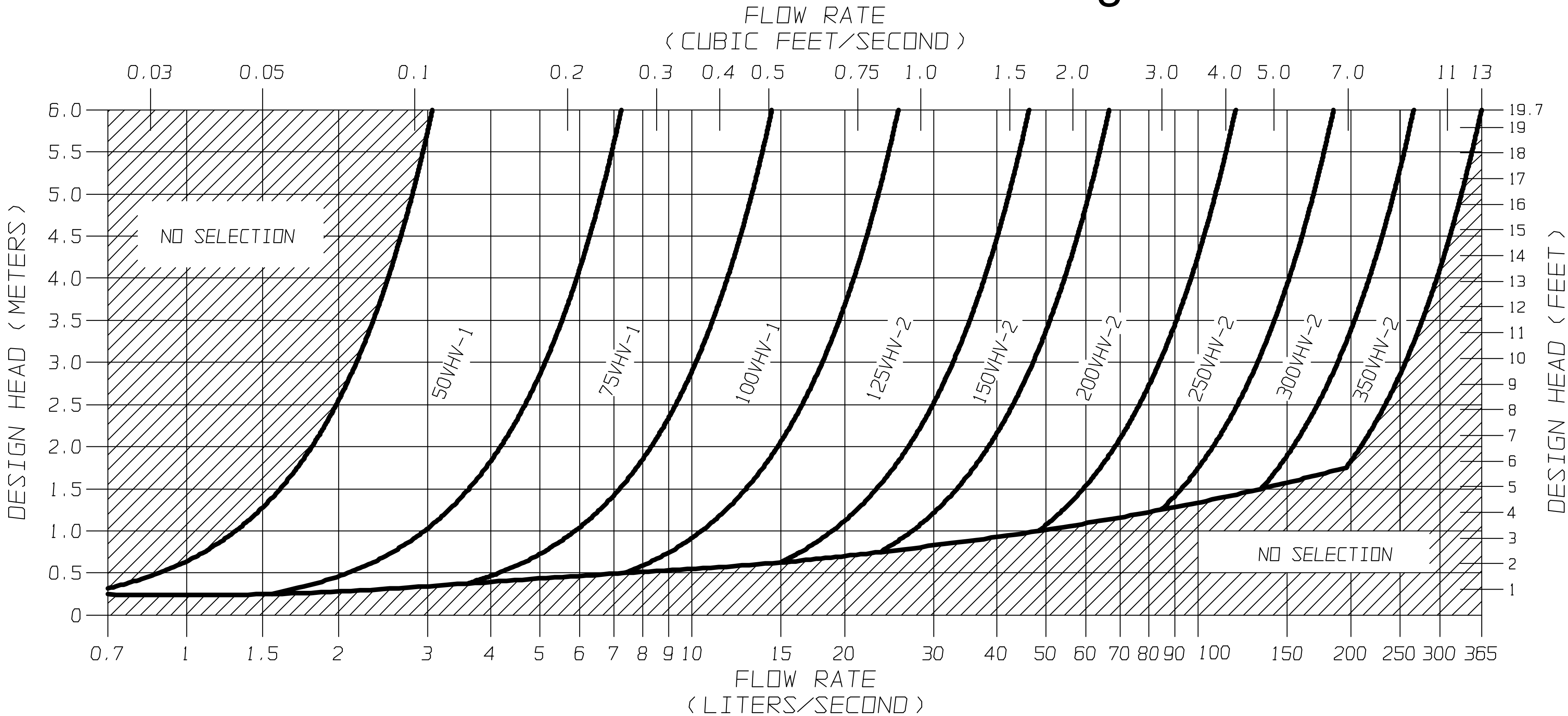


FIGURE 3 - VHV

SVHV Vertical Vortex Flow Regulator

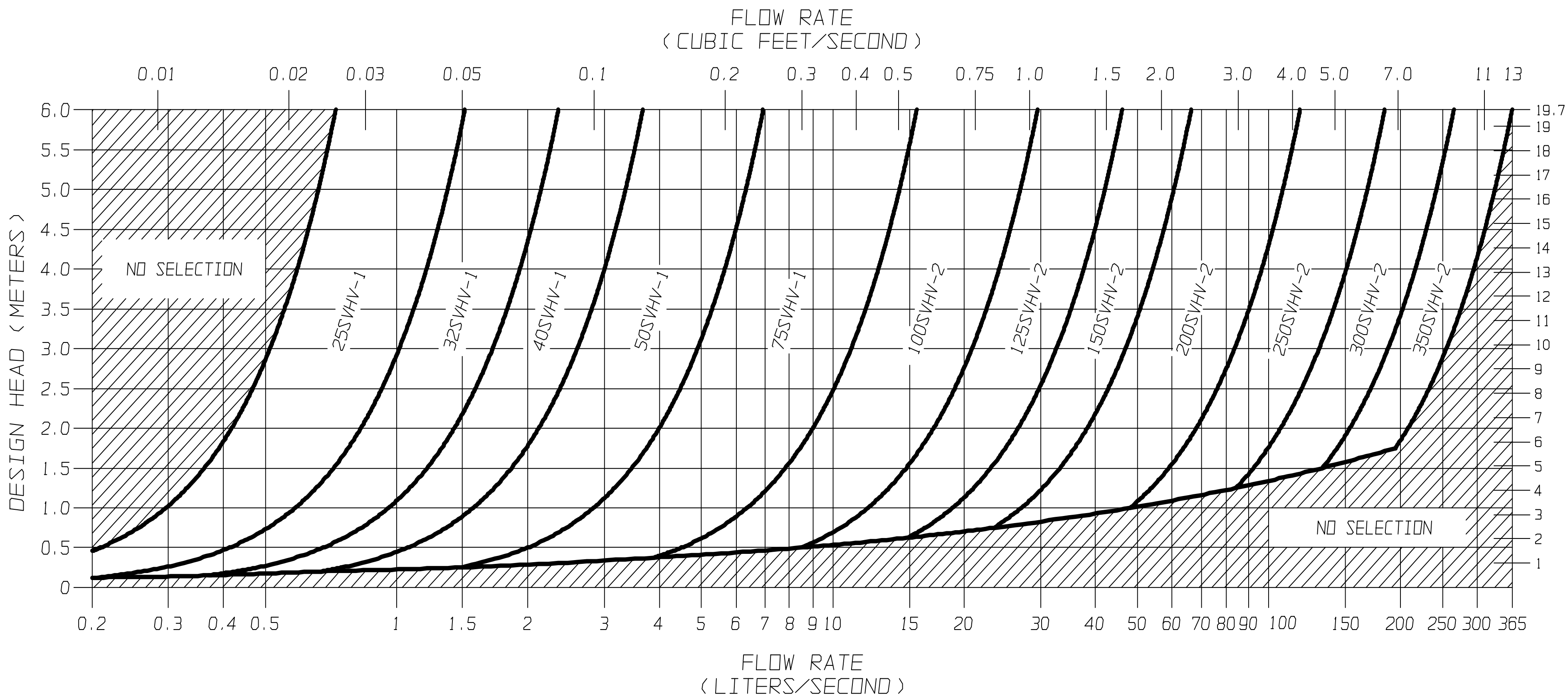
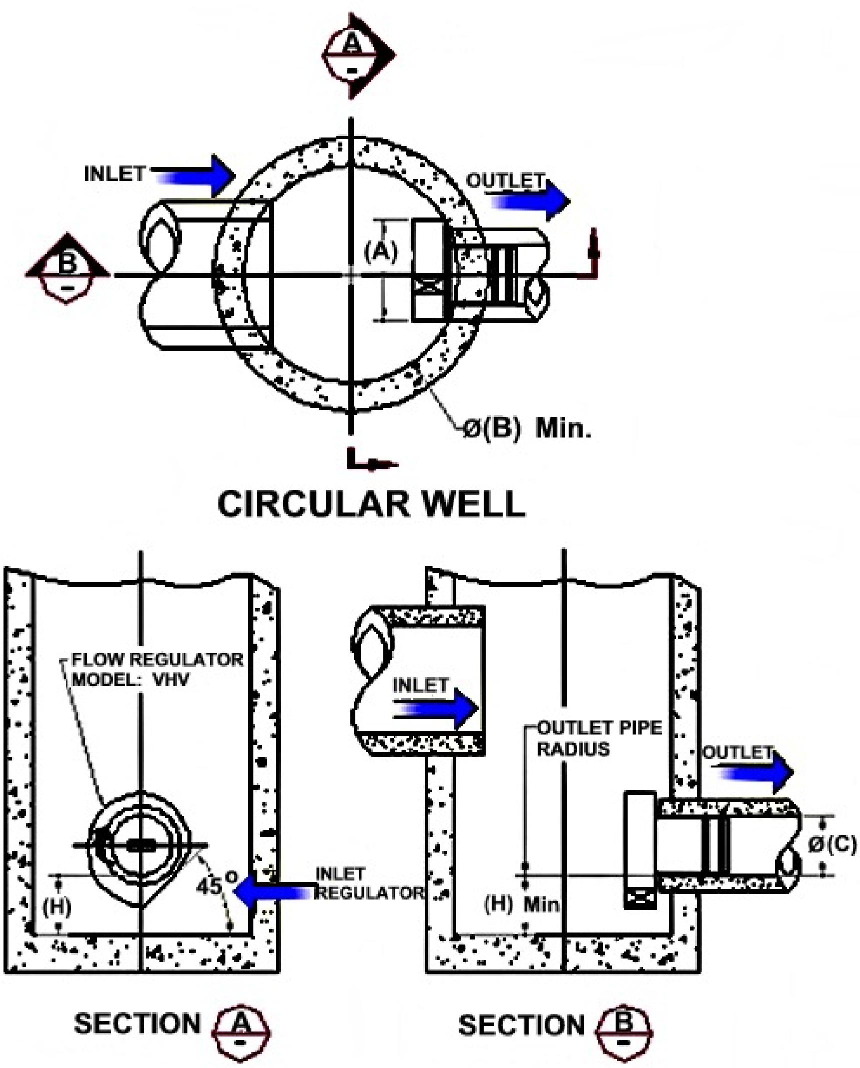


FIGURE 3 - SVHV

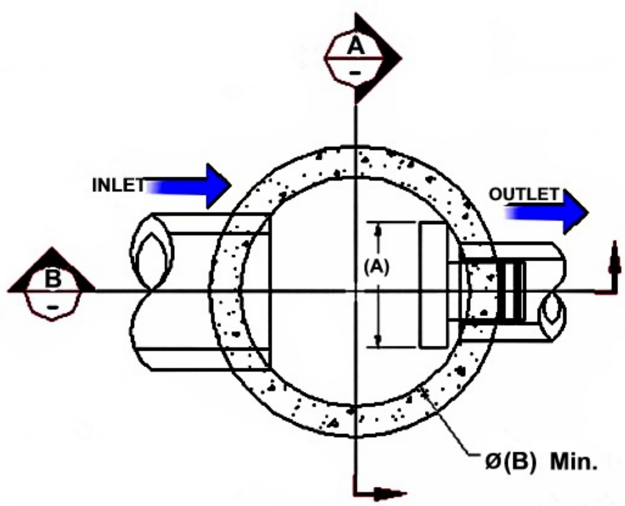
FLOW REGULATOR TYPICAL INSTALLATION IN CIRCULAR MANHOLE
FIGURE 4 (MODEL VHV)

Model Number	Regulator Diameter		Minimum Manhole Diameter		Minimum Outlet Pipe Diameter		Minimum Clearance	
	A (mm)	**A** (in.)	**B** (mm)	**B** (in.)	**C** (mm)	**C** (in.)	**H** (mm)	**H** (in.)
50VHV-1	150	6	600	24	150	6	150	6
75VHV-1	250	10	600	24	150	6	150	6
100VHV-1	325	13	900	36	150	6	200	8
125VHV-2	275	11	900	36	150	6	200	8
150VHV-2	350	14	900	36	150	6	225	9
200VHV-2	450	18	1200	48	200	8	300	12
250VHV-2	575	23	1200	48	250	10	350	14
300VHV-2	675	27	1600	64	250	10	400	16
350VHV-2	800	32	1800	72	300	12	500	20

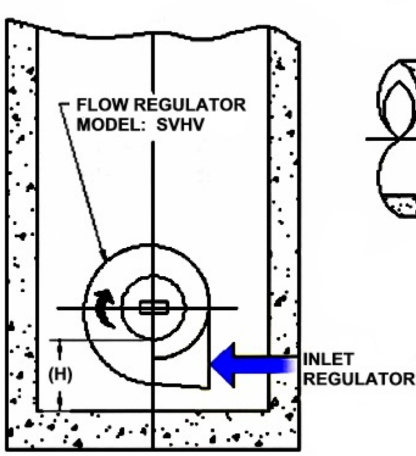


FLOW REGULATOR TYPICAL INSTALLATION IN CIRCULAR MANHOLE
FIGURE 4 (MODEL SVHV)

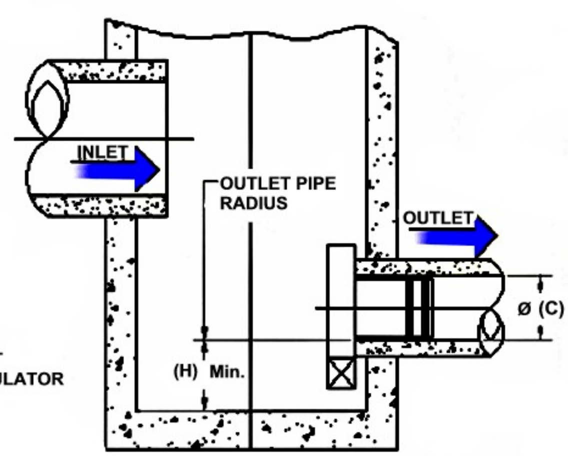
Model Number	Regulator Diameter		Minimum Manhole Diameter		Minimum Outlet Pipe Diameter		Minimum Clearance	
	A (mm)	**A** (in.)	**B** (mm)	**B** (in.)	**C** (mm)	**C** (in.)	**H** (mm)	**H** (in.)
25 SVHV-1	125	5	600	24	150	6	150	6
32 SVHV-1	150	6	600	24	150	6	150	6
40 SVHV-1	200	8	600	24	150	6	150	6
50 SVHV-1	250	10	600	24	150	6	150	6
75 SVHV-1	375	15	900	36	150	6	275	11
100 SVHV-2	275	11	900	36	150	6	250	10
125 SVHV-2	350	14	900	36	150	6	300	12
150 SVHV-2	425	17	1200	48	150	6	350	14
200 SVHV-2	575	23	1600	64	200	8	450	18
250 SVHV-2	700	28	1800	72	250	10	550	22
300 SVHV-2	850	34	2400	96	250	10	650	26
350 SVHV-2	1000	40	2400	96	250	10	700	28



CIRCULAR WELL



SECTION A

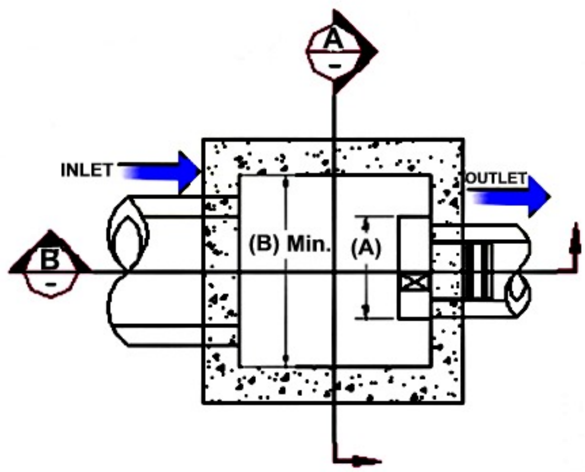


SECTION B

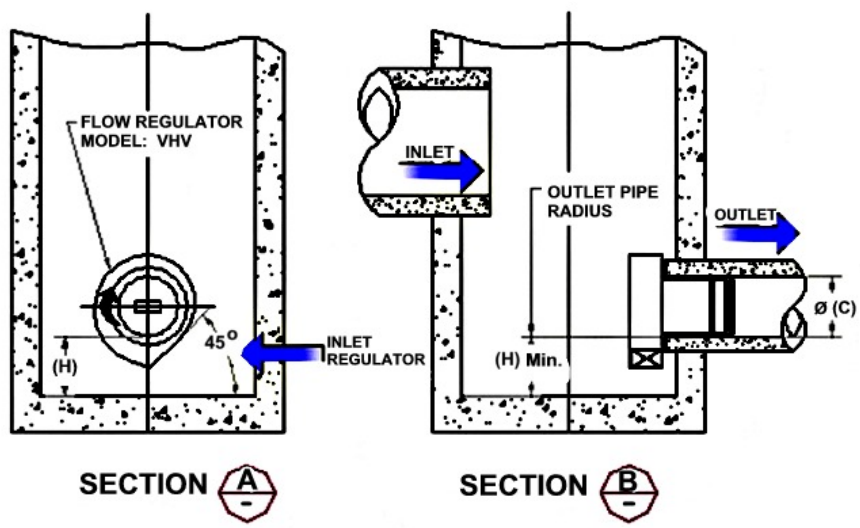
FLOW REGULATOR TYPICAL INSTALLATION IN SQUARE MANHOLE
FIGURE 4 (MODEL VHV)

Model Number	Regulator Diameter		Minimum Chamber Width		Minimum Outlet Pipe Diameter		Minimum Clearance	
	A (mm)	**A** (in.)	**B** (mm)	**B** (in.)	**C** (mm)	**C** (in.)	**H** (mm)	**H** (in.)
50VHV-1	150	6	600	24	150	6	150	6
75VHV-1	250	10	600	24	150	6	150	6
100VHV-1	325	13	600	24	150	6	200	8
125VHV-2	275	11	600	24	150	6	200	8
150VHV-2	350	14	600	24	150	6	225	9
200VHV-2	450	18	900	36	200	8	300	12
250VHV-2	575	23	900	36	250	10	350	14
300VHV-2	675	27	1200	48	250	10	400	16
350VHV-2	800	32	1200	48	300	12	500	20

NOTE: *In the case of a square manhole, the outlet flow pipe must be centered on the wall to ensure enough clearance for the unit.*



SQUARE / RECTANGULAR WELL

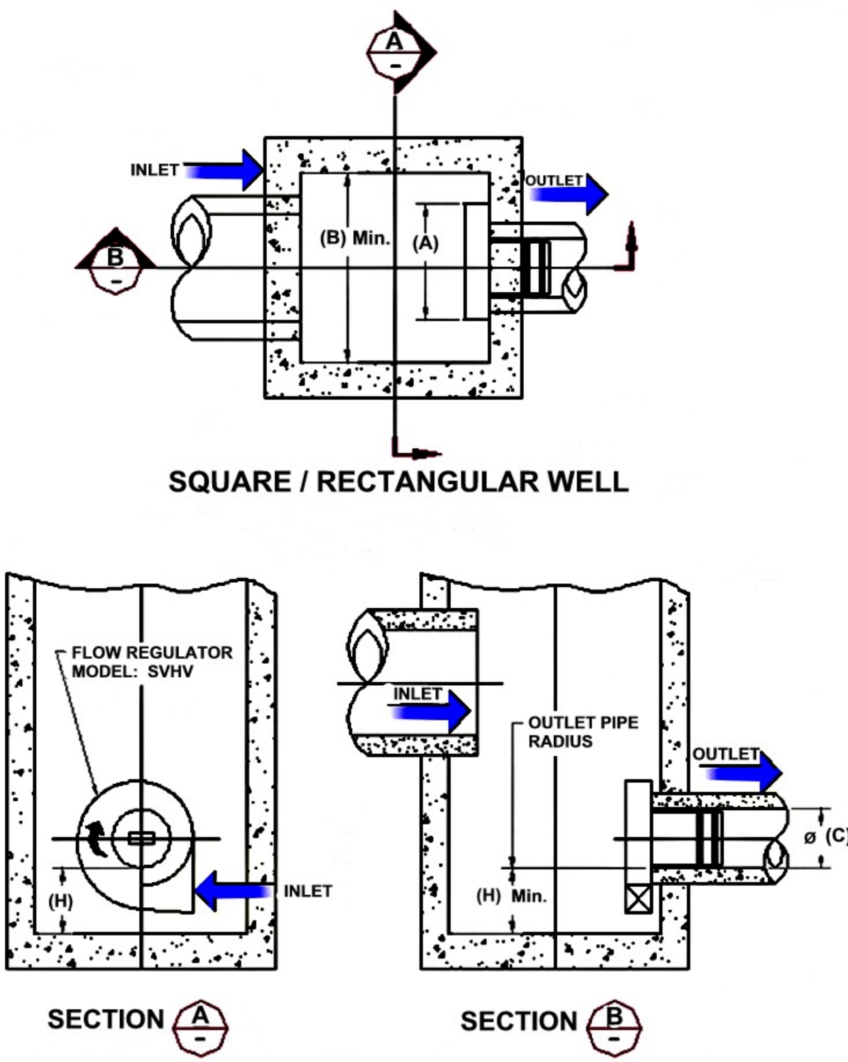


SECTION A   SECTION B

FLOW REGULATOR TYPICAL INSTALLATION IN SQUARE MANHOLE
FIGURE 4 (MODEL SVHV)

Model Number	Regulator Diameter		Minimum Chamber Width		Minimum Outlet Pipe Diameter		Minimum Clearance	
	A (mm)	**A** (in.)	**B** (mm)	**B** (in.)	**C** (mm)	**C** (in.)	**H** (mm)	**H** (in.)
25 SVHV-1	125	5	600	24	150	6	150	6
32 SVHV-1	150	6	600	24	150	6	150	6
40 SVHV-1	200	8	600	24	150	6	150	6
50 SVHV-1	250	10	600	24	150	6	150	6
75 SVHV-1	375	15	600	24	150	6	275	11
100 SVHV-2	275	11	600	24	150	6	250	10
125 SVHV-2	350	14	600	24	150	6	300	12
150 SVHV-2	425	17	600	24	150	6	350	14
200 SVHV-2	575	23	900	36	200	8	450	18
250 SVHV-2	700	28	900	36	250	10	550	22
300 SVHV-2	850	34	1200	48	250	10	650	26
350 SVHV-2	1000	40	1200	48	250	10	700	28

NOTE: *In the case of a square manhole, the outlet flow pipe must be centered on the wall to ensure enough clearance for the unit.*



INSTALLATION

The installation of a **HYDROVEX®** regulator may be undertaken once the manhole and piping is in place. Installation consists of simply fitting the regulator into the outlet pipe of the manhole. **John Meunier Inc.** recommends the use of a lubricant on the outlet pipe, in order to facilitate the insertion and orientation of the flow controller.

MAINTENANCE

HYDROVEX® regulators are manufactured in such a way as to be maintenance free; however, a periodic inspection (every 3-6 months) is suggested in order to ensure that neither the inlet nor the outlet has become blocked with debris. The manhole should undergo periodically, particularly after major storms, inspection and cleaning as established by the municipality

GUARANTY

The **HYDROVEX®** line of **VHV / SVHV** regulators are guaranteed against both design and manufacturing defects for a period of 5 years. Should a unit be defective, **John Meunier Inc.** is solely responsible for either modification or replacement of the unit.

John Meunier Inc.
ISO 9001 : 2008

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Revised: 2011-05-03

Appendix E – Drawings

DESCRIPTION	EXISTING	PROPOSED
SITE FEATURES		
PROPERTY LINE		
TERRACING (3:1 TYPICAL)		
℄ DITCH/SWALE AND DIRECTION OF FLOW		
℄ ROAD/ALIGNMENT		
CHAINLINK FENCE	X	X
POST AND RAIL FENCE		
SIDEWALK (TYPE AS NOTED ON DRAWINGS)		
BARRIER CURB (SC1.1)		
MOUNTABLE CURB (SC1.3)		
DEPRESSED CURB	DC	DC
TACTILE WALKING SURFACE INDICATOR "TWSI" (SC7.3)		
BUILDING ENTRY/EXIT	xR	
POST	POST	POST
SIGN	SIGN	SIGN
BOLLARD	BOLL	
VEGETATION		
SERVICES AND STRUCTURES		
SANITARY SEWER	SA EX.250mmø SAN SA	250mmø SAN
COMBINATION SEWER	EX.300mmø COMB	300mmø COMB
STORM SEWER	ST EX.375mmø STM ST	375mmø STM
STORM SUBDRAIN	EX.150mmø SUBDRAIN	150mmø SUBDRAIN
HI-40 THERMAL INSULATION AS PER OPSD 514.010		
SANITARY MANHOLE	EX.SAN	SANMH 100
COMBINATION MANHOLE	EX.COMB	COMBMH 100
STORM MANHOLE	EX.STM	STMMH 300
CATCHBASIN MANHOLE	EX.CBMH	CBMH 200
CATCHBASIN	EX.CB	CB1
DOUBLE CATCHBASIN	EX.DCB	DCB1
CATCHBASIN ELBOW (S30)	EX.CBE	CBE
CATCHBASIN TEE (S31)	EX.CBT	CBT
CURB INLET CATCHBASIN	EX.CICB	CICB 1
DITCH INLET CATCHBASIN	EX.DICB	DICB 1
WATERMAIN	200mmø W WATERMAIN	200mmø WATERMAIN
IRRIGATION	IR IR	IR IR
VALVE AND VALVE BOX	V&VB	V&VB
VALVE AND VALVE CHAMBER	V&VC	V&VC
FIRE HYDRANT	FH	FH
SIAMESE CONNECTION	SC	SC
WATER METER	M	M
REMOTE WATER METER	RM	RM
45° BEND	45°	45°
22.5° BEND	22°	22°
11.25° BEND	11°	11°
TEE	200X150 TEE	200X150 TEE
REDUCER	200X100 RED	200X100 RED
CROSS	300X200 CROSS	300X200 CROSS
CURB STOP	CS	CS
WATER WELL	W	W
GRADING		
GROUND ELEVATION	X 100.00	X 100.00
SWALE ELEVATION	X 100.00(S)	X 100.00(S)
TOP OF GRATE ELEVATION	T/G=100.00	T/G=100.00
TOP OF WALL ELEVATION	X 100.00 T/W	X 100.00 T/W
BOTTOM OF WALL ELEVATION	X 100.00 B/W	X 100.00 B/W
FINISHED FLOOR ELEVATION	FF=100.00	FF=100.00
BASEMENT FLOOR ELEVATION	BF=100.00	BF=100.00
SLOPE AND DIRECTION OF FLOW	2.0%	2.0%
OVERLAND FLOW ROUTE ONSITE		
OVERLAND FLOW ROUTE EXTERNAL		
STORMWATER MANAGEMENT		
STORM DRAINAGE AREA BOUNDARY		
STORM DRAINAGE AREA NUMBER STORM DRAINAGE AREA IN HECTARES RUN-OFF COEFFICENT	1 0.06 0.75	1 0.06 0.75
5 YEAR PONDING AREA	5 YR	5 YR
100 YEAR PONDING AREA	100 YR	100 YR

DESCRIPTION	
MISCELLANEOUS	
REMOVED	X X X REM
RELOCATED	REL
ADJUSTED	ADJ
LIGHT DUTY PAVEMENT REFER TO NOTES FOR COMPOSITION	
HEAVY DUTY PAVEMENT REFER TO NOTES FOR COMPOSITION	
ROAD REINSTATEMENT AS PER CITY STANDARD R10	
CURBE AND SIDEWALK REINSTATEMENT AS PER CITY STD. SC4.	
RIP-RAP AS PER OPSD 810.010	
LANDSCAPE REINSTATEMENT	
PROPOSED SOFT LANDSCAPING	
PROPOSED CONCRETE PAVERS	

GENERAL NOTES:

1. ALL WORKS AND MATERIALS SHALL CONFORM TO THE LATEST REVISIONS OF THE STANDARDS AND SPECIFICATIONS OF THE CITY OF OTTAWA, ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD) AND SPECIFICATIONS (OPSS), WHERE APPLICABLE.
2. THE LOCATION OF UTILITIES IS APPROXIMATE ONLY, AND THE EXACT LOCATION SHOULD BE DETERMINED BY CONSULTING THE MUNICIPAL AUTHORITIES AND UTILITY COMPANIES CONCERNED. THE CONTRACTOR IS RESPONSIBLE TO PROVIDE THE LOCATION AND STATUS OF UTILITIES AND SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION OF PLANT AND EQUIPMENT FROM DAMAGE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR OR REPLACEMENT OF ANY SERVICES OR UTILITIES DISTURBED DURING CONSTRUCTION, TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION.
3. THE CONTRACTOR SHALL VERIFY THE LOCATION AND ELEVATION OF EXISTING SERVICES PRIOR TO ANY CONSTRUCTION. THE CONTRACTOR SHALL CONFIRM LOCATIONS AND ELEVATIONS OF EXISTING SERVICES AND STRUCTURES TO BE CONNECTED TO AND EXISTING SERVICES THAT MAY BE DAMAGED OR CAUSE CONFLICTS PRIOR TO CONSTRUCTION OF ANY NEW SEWER, WATER AND/OR STORM WATER WORKS. ALL DIMENSIONS SHALL BE CHECKED AND VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. ANY DISCREPANCIES, INTERPRETATIONS, CHANGES AND ADDITIONS TO THESE DRAWINGS MUST BE BROUGHT TO THE ATTENTION OF THE ENGINEER, WHEN NOTED AND BEFORE PROCEEDING WITH CONSTRUCTION WORKS. DO NOT CONTINUE CONSTRUCTION IN AREAS WHERE DISCREPANCIES APPEAR UNTIL SUCH DISCREPANCIES HAVE BEEN RESOLVED.
4. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SPECIFIED. ALL DRAWINGS SHOULD NOT BE SCALED BY THE CONTRACTOR. ANY MISSING OR QUESTIONABLE DIMENSIONS ARE TO BE CONFIRMED WITH THE ENGINEER IN WRITING.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL PERMITS REQUIRED AND BEAR COST OF THE SAME.
6. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE "OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS", THE GENERAL CONTRACTOR SHALL BE DEEMED TO BE THE CONSTRUCTOR AS DEFINED IN THE ACT.
7. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL EXCAVATION, BACKFILL AND REINSTATEMENT OF ALL AREAS DISTURBED DURING CONSTRUCTION TO THE SATISFACTION OF THE ENGINEER, THE CITY OF OTTAWA AND THE AUTHORITY HAVING JURISDICTION.
8. ANY AREAS BEYOND THE LIMIT OF THE SITE DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION AT THE CONTRACTOR'S EXPENSE.
9. THE CONTRACTOR SHALL COMPLY WITH THE CITY OF OTTAWA REQUIREMENTS FOR TRAFFIC CONTROL WHEN WORKING ON CITY STREETS. ALL CONSTRUCTION SIGNAGE MUST CONFORM TO THE M.T.O. BOOK 7 AND T.A.C MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (LATEST AMENDMENT).
10. THE SUPPORT OF ALL UTILITIES SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION.
11. THERE WILL BE NO SUBSTITUTION OF MATERIALS UNLESS WRITTEN APPROVAL BY THE ENGINEER HAS BEEN OBTAINED.
12. EXCESS EXCAVATED MATERIAL SHALL BE REMOVED FROM THE SITE.
13. THE SITE LAYOUT IS THE RESPONSIBILITY OF THE CONTRACTOR. AS-BUILT SITE SERVICING & GRADING DRAWINGS SHALL BE MAINTAINED ON SITE BY THE CONTRACTOR.
14. THE CONTRACTOR WILL BE RESPONSIBLE FOR ADDITIONAL BEDDING OR ADDITIONAL STRENGTH PIPE IF THE MAXIMUM TRENCH WIDTH, AS SPECIFIED BY OPSD, IS EXCEEDED.
15. ALL NECESSARY CLEARING AND GRUBBING SHALL BE COMPLETED AY THE CONTRACTOR. REVIEW WITH ENGINEER AND THE CITY OF OTTAWA PRIOR TO ANY TREE CUTTING.
16. ALL EDGES OF DISTURBED PAVEMENT SHALL BE SAW CUT TO FORM A NEAT AND STRAIGHT LINE PRIOR TO PLACING NEW PAVEMENT.
17. ALL BOREHOLES SHOWN ON THE DRAWINGS ARE FOR INFORMATION ONLY. FOR GEOTECHNICAL INFORMATION REFER TO GEOTECHNICAL INVESTIGATION REPORT PREPARED BY EXP. SERVICES INC, DATED MAY 14, 2019.
18. THE CONTRACTOR SHALL APPRAISE HIS/HER SELF OF ALL SURFACE AND SUBSURFACE CONDITIONS TO BE ENCOUNTERED AND SHALL CARRY OUT THEIR OWN TEST PITS AS REQUIRED TO MAKE THEIR OWN INDEPENDENT ASSESSMENT OF GROUND CONDITIONS. THE CONTRACTOR SHALL NOT MAKE ANY CLAIM FOR ANY EXTRA COST DUE TO ANY SUCH GROUND CONDITIONS VARYING FROM THOSE ANTICIPATED BY THE CONTRACTOR.
19. DO NOT CONSTRUCT USING DRAWINGS THAT ARE NOT MARKED "ISSUED FOR CONSTRUCTION".
20. FOR TOPOGRAPHICAL INFORMATION REFER TO PLAN PREPARED BY FAIRHALL MOFFAT WOODLAND LIMITED. DATED APRIL 3, 2019.
21. CIVIL DRAWINGS TO BE READ IN CONJUNCTION WITH ARCHITECTURAL, LANDSCAPE AND LEGAL DRAWINGS.
22. ALL NECESSARY CLEARING AND GRUBBING SHALL BE COMPLETED BY THE CONTRACTOR. REVIEW WITH CONTRACT ADMINISTRATOR AND THE CITY OF OTTAWA PRIOR TO ANY TREE CUTTING.
23. STREET LIGHTING SHALL BE TO CITY OF OTTAWA STANDARDS.

SANITARY SEWER NOTES

1. ALL SANITARY SEWER MATERIALS AND INSTALLATION SHALL CONFORM TO THE LATEST REVISIONS OF THE STANDARDS AND SPECIFICATIONS OF THE CITY OF OTTAWA, ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD) AND SPECIFICATIONS (OPSS).
2. ALL SANITARY SEWERS SHALL BE PVC SDR 35, IPEX "RING-TITE" (OR EQUIVALENT), AS PER CSA STANDARD 8182.2 OR LATEST AMENDMENT, UNLESS OTHERWISE NOTED.
3. SANITARY SEWER TRENCH AND BEDDING SHALL BE AS PER CITY OF OTTAWA STD. S6 AND S7, CLASS 'B BEDDING UNLESS OTHERWISE NOTED.
4. ALL SANITARY LATERALS ARE TO BE PVC SDR 28, IPEX "RING-TITE" (OR EQUIVALENT), ANY COLOR EXCEPT WHITE AND MARKED WITH A 50MM X 100MM WOODEN MARKER, EXTENDING FROM THE INVERT TO 1.0 M ABOVE GRADE PAINTED RED.
5. SEWER BEDDING AS PER CITY STANDARD S6 & S7. GRANULAR 'A' BEDDING TO BE INCREASED TO 300MM WHERE SEWERS ARE BELOW THE GROUNDWATER TABLE.
6. SANITARY SEWER MANHOLES SHALL BE BENCHED AS PER OPSD 701.021. SANITARY MANHOLE FRAME AND COVERS SHALL BE AS PER CITY OF OTTAWA STD. S24 AND S25. SAFETY PLATFORMS SHALL BE AS PER OPSD 404.02. DROP STRUCTURES SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA SPECIFICATIONS AND OPSD 1003.01.
7. THE CONTRACTOR SHALL CONDUCT INFILTRATION/EXFILTRATION (AS PER CURRENT OPSS) TESTING ON ALL NEWLY INSTALLED SANITARY SEWERS. THE TEST SHALL BE PERFORMED IMMEDIATELY AFTER SEWER INSTALLATION AND VIEWED BY THE ENGINEER.
8. THE CONTRACTOR SHALL CONDUCT CCTV INSPECTION OF ALL NEWLY INSTALLED SANITARY SEWERS AND EXISTING SEWERS CONNECTED TO. THE TEST SHALL BE PERFORMED IMMEDIATELY AFTER SEWERS INSTALLED.
9. ALL SERVICE CONNECTIONS TO BE CONSTRUCTED AS PER CITY STANDARD S11 & S11.1.
10. THE CONTRACTOR SHALL CONSTRUCT FLEXIBLE SANITARY SEWERS IN ACCORDANCE WITH OPSD 802.010 AND 802.013. DURING CONSTRUCTION, THE CONTRACTOR SHALL PROTECT THE PIPES FROM HEAVY CONSTRUCTION EQUIPMENT. BEDDING AND BACKFILL SHALL BE COMPACTED TO A MINIMUM OF 95% SPMDD.
11. ALL SANITARY BUILDING DRAINS TO BE EQUIPPED WITH SANITARY BACKWATER VALVES INSTALLED PER CITY OF OTTAWA STANDARD DRAWING S14.1.
12. WITHIN THE FROST ZONE, THE BACKFILL IN THE SERVICE TRENCHES SHOULD MATCH THE SOIL ON SIDES TO MINIMIZE DIFFERENTIAL FROST HEAVING IN THE SUBGRADE.
13. MINIMUM SOIL COVER TO BE 2.1m TO PROTECT SEWERS FROM FROST DAMAGE. IN AREAS WHERE ADEQUATE FROST COVER CANNOT BE ACHIEVED, EQUIVALENT THERMAL INSULATION TO BE INSTALLED AS PER OPSD 514.010

STORM SEWER NOTES

1. ALL STORM SEWER MATERIALS AND INSTALLATION SHALL CONFORM TO THE LATEST REVISIONS OF THE STANDARDS AND SPECIFICATIONS OF THE CITY OF OTTAWA, ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD) AND SPECIFICATIONS (OPSS).
2. ALL REINFORCED CONCRETE STORM SEWER PIPE SHALL BE IN ACCORDANCE WITH CSA A257.2 (LATEST AMENDMENT). ALL NON-REINFORCED CONCRETE STORM SEWER PIPE SHALL BE IN ACCORDANCE WITH CSA A257.L (LATEST AMENDMENT). PIPE SHALL BE JOINTED WITH STD. RUBBER GASKETS AS PER CSA A257.3 (LATEST AMENDMENT).
3. ALL PVC STORM SEWERS ARE TO BE SDR 35 APPROVED PER C.S.A. B182.2 OR LATEST AMENDMENT, UNLESS OTHERWISE SPECIFIED.
4. THE CONTRACTOR SHALL CONSTRUCT FLEXIBLE STORM SEWERS IN ACCORDANCE WITH OPSD 802.010 AND 802.013. RIGID STORM PIPE SHALL BE CONSTRUCTED IN ACCORDANCE WITH OPSD 802.030. DURING CONSTRUCTION THE CONTRACTOR SHALL PROTECT THE PIPES FROM HEAVY CONSTRUCTION EQUIPMENT. BEDDING AND BACKFILL SHALL BE COMPACTED TO A MINIMUM OF 95% SPMDD.
5. SEWER BEDDING AS PER CITY STANDARD S6 & S7.
6. ALL STORM LATERALS SHALL BE PVC SDR 28, WHITE IN COLOR AND MARKED WITH A 50mm X 100mm WOODEN MARKER EXTENDING FROM THE INVERT TO 1.0M ABOVE GRADE PAINTED GREEN.
7. ALL SERVICE CONNECTIONS TO BE CONSTRUCTED AS PER CITY STANDARD S11 & S11.1.
8. WITHIN THE FROST ZONE, THE BACKFILL IN THE SERVICE TRENCHES SHOULD MATCH THE SOIL ON SIDES TO MINIMIZE DIFFERENTIAL FROST HEAVING IN THE SUBGRADE
9. MINIMUM SOIL COVER TO BE 2.1M TO PROTECT SEWERS FROM FROST DAMAGE. IN AREAS WHERE ADEQUATE FROST COVER CANNOT BE ACHIEVED, EQUIVALENT THERMAL INSULATION TO BE INSTALLED AS PER OPSD 514.010
10. ALL STORM SERVICES TO BE EQUIPPED WITH APPROVED BACKWATER VALVES.
11. STORM MANHOLE FRAME AND COVERS SHALL BE AS PER CITY OF OTTAWA STD. S24, S24.1 AND S25.
12. SAFETY PLATFORMS SHALL BE IN ACCORDANCE WITH OPSD 404.02.
13. DROP STRUCTURES SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA SPECIFICATIONS AND OPSD 1003.01.
14. STORM SEWER MANHOLES SERVING LOCAL SEWERS LESS THAN 900MM SHALL BE CONSTRUCTED WITH A 300MM SUMP. FOR STORM SEWERS 900MM AND OVER USE BENCHING IN ACCORDANCE WITH OPSD 701 .021.
15. SINGLE AND DOUBLE CATCHBASINS SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. S1. AND OPSD 705.020, RESPECTIVELY. FRAMES AND GRATE SHALL BE AS PER CITY OF OTTAWA STD. S19 FOR REAR LOT CATCHBASINS, AND STREET CATCHBASINS.
16. CURB INLET TYPE CATCH BASIN (CICB) SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. S3. AND GRATE SHALL BE AS PER CITY OF OTTAWA STD. S22 AND S23, UNLESS OTHERWISE NOTED.
17. SINGLE AND DOUBLE CATCHBASIN LEADS SHALL BE 200MM AND 250MM DIA (MIN) RESPECTIVELY, 1.0% SLOPE (MIN.) UNLESS OTHERWISE NOTED.
18. ALL CATCHBASINS AND CATCHBASIN MANHOLES SHALL HAVE SUMPS WITH 300MM DEPTH, UNLESS OTHERWISE NOTED.
19. CONTRACTOR SHALL ENSURE THAT CATCHBASINS ARE INSTALLED AT THE LOW POINT OF SAG CURB WORKS.
20. THE STORM SEWER CLASSES HAVE BEEN DESIGNED BASED ON BEDDING CONDITIONS SPECIFIED. WHERE THE SPECIFIED TRENCH WIDTH IS EXCEEDED, THE CONTRACTOR SHALL BE REQUIRED TO PROVIDE ADDITIONAL BEDDING, A DIFFERENT TYPE OF BEDDING OR A HIGHER PIPE STRENGTH AT HIS OWN EXPENSE AND SHALL ALSO BE RESPONSIBLE FOR EXTRA TEMPORARY AND/OR PERMANENT REPAIRS MADE NECESSARY BY THE WIDENED TRENCH.
21. THE CONTRACTOR SHALL CONDUCT CCTV INSPECTION OF ALL NEWLY INSTALLED STORM SEWERS AND EXISTING SEWERS CONNECTED TO. THE TEST SHALL BE PERFORMED IMMEDIATELY AFTER SEWERS INSTALLED.

WATERMAIN NOTES

1. ALL WATERMAIN MATERIALS AND INSTALLATION SHALL CONFORM TO THE LATEST REVISIONS OF THE STANDARDS AND SPECIFICATIONS OF THE CITY OF OTTAWA, ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD) AND SPECIFICATIONS (OPSS).
2. NO WORK SHALL COMMENCE UNLESS A CITY WATER WORKS INSPECTOR IS ON SITE. WATERMAIN CONNECTIONS BY CITY OF OTTAWA FORCES WITH ALL EXCAVATION BACKFILL AND ROAD REINSTATEMENT BY CONTRACTOR.
3. ALL PVC WATERMAINS SHALL BE EQUAL TO AWWA C-900 CLASS 150, SDR 18, OR APPROVED EQUAL.
4. WATERMAINS TRENCH AND BEDDING SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD W17, UNLESS OTHERWISE SPECIFIED. BEDDING AND COVER MATERIAL SHALL BE SPECIFIED BY PROJECT GEOTECHNICAL ENGINEER.
5. ALL PVC WATERMAINS SHALL BE INSTALLED WITH A 10 GAUGE STRANDED COPPER TWU OR RWU TRACER WIRE IN ACCORDANCE WITH CITY OF OTTAWA STD. W36.
6. WATER SERVICES ARE TO BE TYPE K SOFT COPPER AS PER CITY OF OTTAWA STD. W26 UNLESS OTHERWISE SPECIFIED. ALL WATER SERVICES CROSSING SEWERS ARE TO BE INSTALLED AS PER CITY OF OTTAWA STD. W38. WATER SERVICES SHALL BE MARKED WITH A "50mm X 100mm", EXTENDING FROM THE INVERT TO 1.0M ABOVE GRADE PAINTED BLUE. STAND POSTS/SHUT-OFFS SHALL BE INSTALLED AT THE PROPERTY LINE.
7. CATHODIC PROTECTION IS REQUIRED ON ALL METALLIC FITTINGS AS PER CITY OF OTTAWA STD. W40 AND W42.
8. VALVE BOXES SHALL BE INSTALLED AS PER CITY OF OTTAWA DETAIL W24.
9. ALL FIRE HYDRANTS TO BE INSTALLED AS PER CITY STANDARD W19 AND LOCATED AS PER CITY STANDARD W18 AND/OR CITY STANDARD CROSS SECTIONS.
10. ALL WATERMAINS TO BE INSTALLED AT MINIMUM COVER OF 2.4m.
11. THRUST BLOCKS AND RESTRAINT AS PER CITY OF OTTAWA DWGS: W25.3 AND W25.4, W25.5 AND W25.6.
12. IF WATERMAIN MUST BE DEFLECTED TO MEET ALIGNMENT, ENSURE THAT THE AMOUNT OF DEFLECTION USED IS LESS THAN HALF THAT RECOMMENDED BY THE MANUFACTURER.
13. DISINFECTION AND TESTING OF WATERMAIN TO BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARDS.
14. WATER METERS TO BE INSTALLED AS PER W30 FOR WATER SERVICES.
15. THE CONTRACTOR SHALL PROVIDE ALL TEMPORARY CAPS, PLUGS AND BLOW-OFFS AND NOZZLES REQUIRED FOR TESTING AND DISINFECTION OF THE WATERMAN.
16. INSULATION FOR WATERMAIN CROSSING OVER AND BELOW SEWER SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. W25.2 AND W25, RESPECTIVELY, WHERE WATERMAN COVER IS LESS THAN 2.4m.
17. WHERE THE SEPARATION BETWEEN SERVICES AND MANHOLES IS LESS THAN 1.2m, WATER SERVICES ARE TO BE INSULATED AS PER CITY OF OTTAWA STD. W23.
18. AS PER CITY GUIDELINE, THE MINIMUM VERTICAL CLEARANCE BETWEEN WATERMAIN AND SEWER / UTILITY IS 0.25M FOR CROSSING OVER THE SEWER, AS PER CITY STD W25.2. FOR CROSSING UNDER SEWER, THE MINIMUM VERTICAL CLEARANCE IS 0.50M AS PER CITY STD. W25. FOR CROSSING UNDER SEWER, ADEQUATE STRUCTURAL SUPPORT FOR THE SEWERS IS REQUIRED TO PREVENT EXCESSIVE DEFLECTION OF JOINTS AND SETTLING. THE LENGTH OF WATER PIPE SHALL BE CENTERED AT THE POINT OF CROSSING SO THAT THE JOINTS WILL BE EQUIDISTANT AND AS FAR AS POSSIBLE FROM THE SEWER.

ROADWAY SPECIFICATIONS

1. ALL TOPSOIL AND ORGANIC MATERIAL SHALL BE STRIPPED WITHIN THE ROAD ALLOWANCE PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
2. CONCRETE CURB SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. SCI.1.1(BARRIER CURB) AND SC1.3 (MOUNTABLE CURB), AS NOTED. PROVISION SHALL BE MADE FOR CURB DEPRESSIONS AT SIDEWALKS AND DRIVEWAYS.
3. ROAD SUBDRAINS SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. R1. SUBDRAINS SHALL BE 6M IN LENGTH AT CATCHBASINS. SUBDRAINS SHALL BE INSTALLED BOTH SIDES AT LOWPOINTS AND ON THE HIGH SIDE AT FLOWBY CATCHBASINS.
4. PAVEMENT REINSTATEMENT FOR SERVICE AND UTILITY CUTS SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. R10 AND OPSD 509.010, OPSS 310.
5. GRANULAR "A" SHALL BE PLACED TO A MINIMUM THICKNESS OF 300MM AROUND ALL STRUCTURES WITHIN PAVEMENT AREA.
6. ALL GRANULAR FOR ROADS SHALL BE COMPACTED TO A MINIMUM OF 98% STANDARD PROCTOR DENSITY.
7. ASPHALT WEAR COURSE SHALL NOT BE PLACED UNTIL THE VIDEO INSPECTION OF SEWERS & NECESSARY REPAIRS HAVE BEEN CARRIED OUT TO THE SATISFACTION OF THE ENGINEER.
8. SUB- EXCAVATE SOFT AREAS AND FILL WITH GRANULAR 'B' COMPACTED IN MAXIMUM 300MM LIFTS.
9. PAVEMENT STRUCTURE: REFER TO THE GEOTECHNICAL INVESTIGATION REPORT DATED 10 JULY, 2019 PREPARED BY PATERSON GROUP.

GENERAL NOTES FOR GRADING

1. IT SHALL BE THE BUILDER'S RESPONSIBILITY TO ENSURE THAT GRADING AROUND HYDRANTS, TRANSFORMERS, AND UTILITY PEDESTALS, ETC., MEET CURRENT CITY OF OTTAWA, HYDRO AND UTILITY COMPANY REQUIREMENTS.
2. ALL GROUND SURFACES SHALL BE EVENLY GRADED WITHOUT PONDING AREAS AND WITHOUT LOW POINTS EXCEPT WHERE APPROVED SWALE OR CATCH BASIN OUTLETS ARE PROVIDED.
3. CONTRACTOR TO ADJUST EXISTING CATCH BASINS, MANHOLES, FIRE HYDRANTS, VALVE CHAMBERS AND VALVE BOXES TO FINAL GRADE AS REQUIRED.
4. CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PROTECT EXISTING FOUNDATIONS OF ADJACENT BUILDINGS DURING EXCAVATION AND CONSTRUCTION PERIOD.
5. GRADING IN GRASSED AREAS WILL BE BETWEEN 2% TO 7%. GRADES IN EXCESS OF 7% WILL REQUIRE A MAXIMUM 3:1 TERRACING.

PRELIMINARY
NOT FOR CONSTRUCTION

no.	date	revision / issue	by
3	17/02/22	ISSUED FOR SPA	AJ
2	02/12/21	ISSUED FOR 66%	AJ
1	05/10/21	ISSUED FOR REVIEW	AJ

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project title
NEW QATAR EMBASSY AND CONSULATE
Ottawa Ontario

drawing title
LEGENDS AND NOTES

date	job.no. OTT-00261664-A0
scales -	
drawn A.Jariwala	drawing no.
approved A.Ansari	**C-001**
plot date 05/10/2021	

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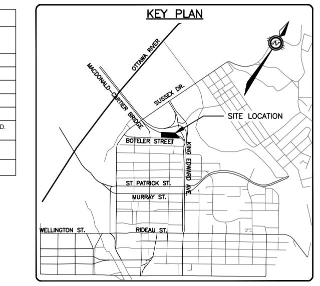
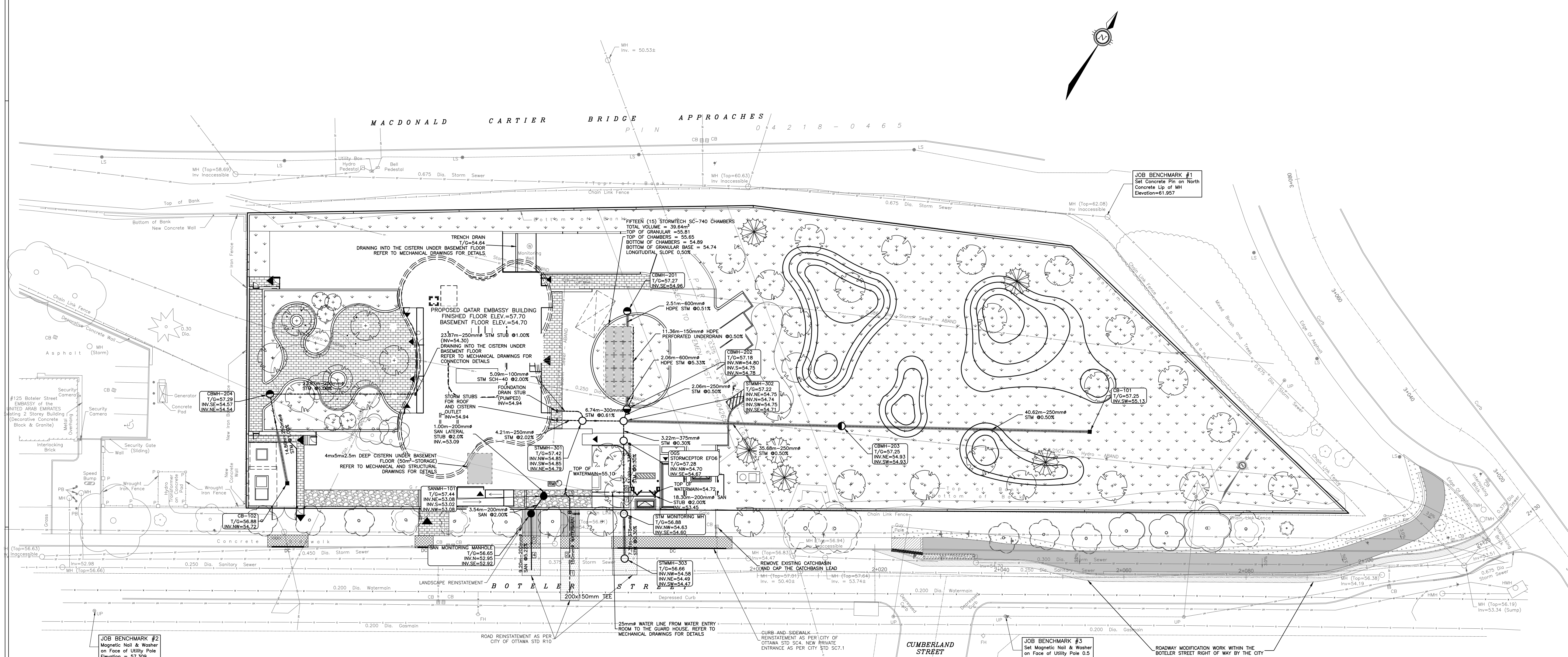
WATERMAIN / SEWER CROSSING TABLE												
LOCATION	FINISHED GRADE (m)	SANITARY SEWER			STORM SEWER			WATERMAIN			CLEARANCES (mm)	COMMENTS
		INV ELEV (m)	DIA (mm)	OBV ELEV (m)	INV ELEV (m)	DIA (mm)	OBV ELEV (m)	INV ELEV (m)	DIA (mm)	OBV ELEV (m)		
1	56.51	51.36	250	51.61				53.96	150	54.11	2350	
2	56.48				54.41	375	54.785	53.93	150	54.08	330	
3	57.50	53.16	200	53.36				54.95	150	55.10	1590	
4	56.47	52.53	200	52.73	54.37	375	54.745				1640	
5	56.6	52.65	200	52.85	54.19	450	54.64				1340	
6	57.36				54.65	375	55.025	54.325	25	54.35	300	WATER SERVICE BELOW SEWER AS PER CITY STD. W38
7	57.4	53.35	200	53.55	54.64	375	55.015				1090	

KEY PLAN



ICD SUMMARY TABLE					
Control Location	Post-Dev Area No.	Max Flow (L/sec)	Max Head (m)	Type	Model
CBMH 203	A9, A10	6.00	2.6	Hydrovex	100-VHV-1
CBMH 202	A7	6.00	1.08	Hydrovex	75-VHV-1



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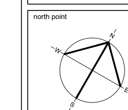

professional stamp

project title

NEW QATAR EMBASSY AND CONSULATE

Ottawa Ontario

drawing title

SITE SERVICING PLAN

date		job.no.	OTT-00261664-A0
scales	1:250		
drawn	A.Jariwala		
approved	A.Ansari	drawing no.	C-100
plot date	05/10/2021		

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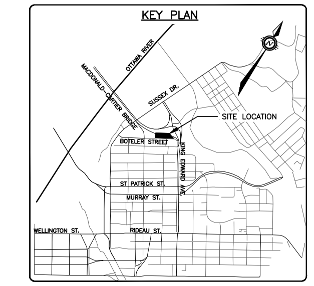

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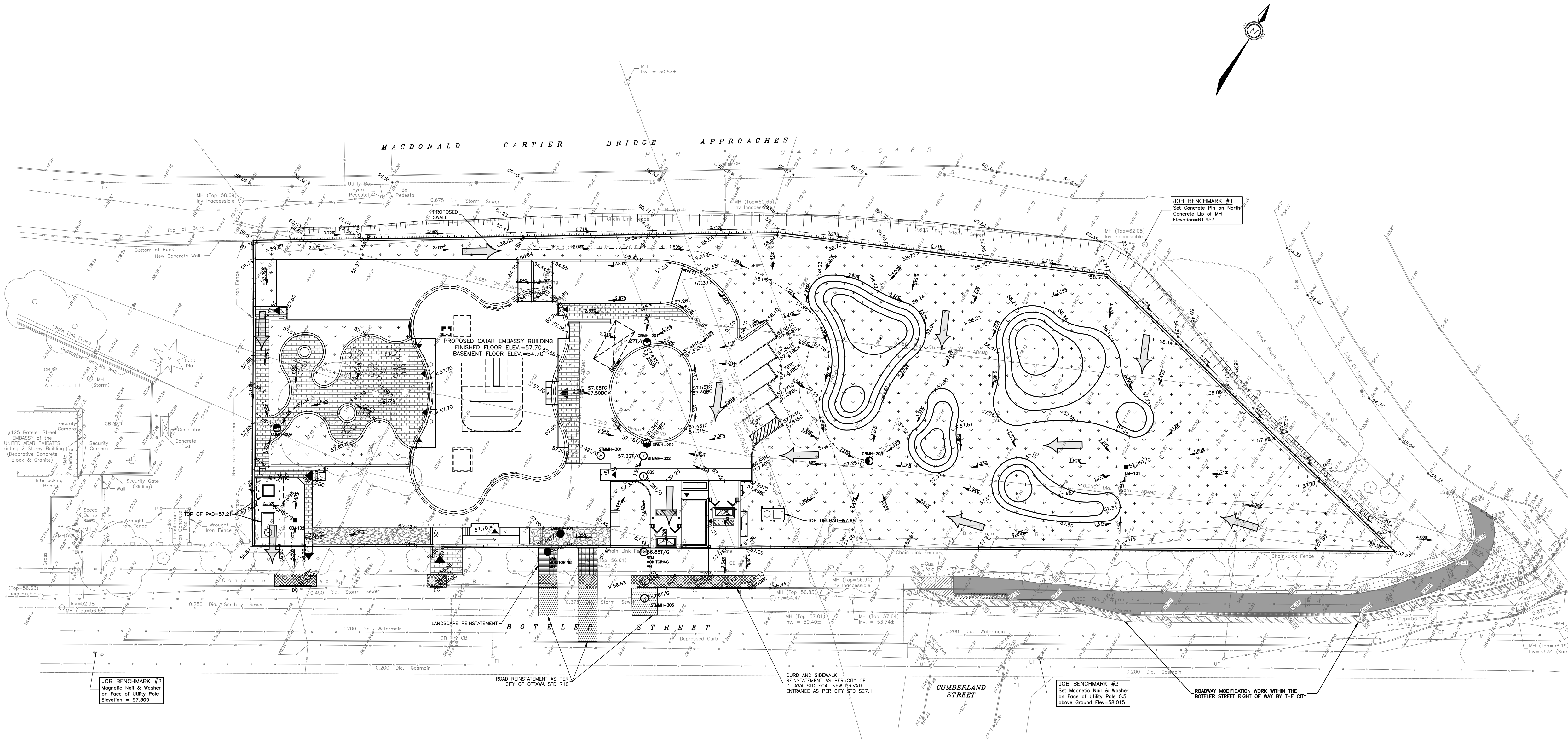

no.	date	revision / issue	by
5	17/02/22	ISSUED FOR SPA	AJ
4	02/12/21	ISSUED FOR 66%	AJ
3	05/10/21	ISSUED FOR REVIEW	AJ
2	08/09/21	ISSUED FOR 33%	AJ
1	19/02/21	ISSUED FOR COORDINATION	AJ

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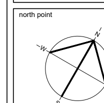

professional stamp

project title

NEW QATAR EMBASSY AND CONSULATE

Ottawa Ontario

drawing title

SITE GRADING PLAN

date		job.no.	OTT-00261664-A0
scales	1:250		
drawn	A.Jariwala		
approved	A.Ansari	drawing no.	C-200
plot date	05/10/2021		

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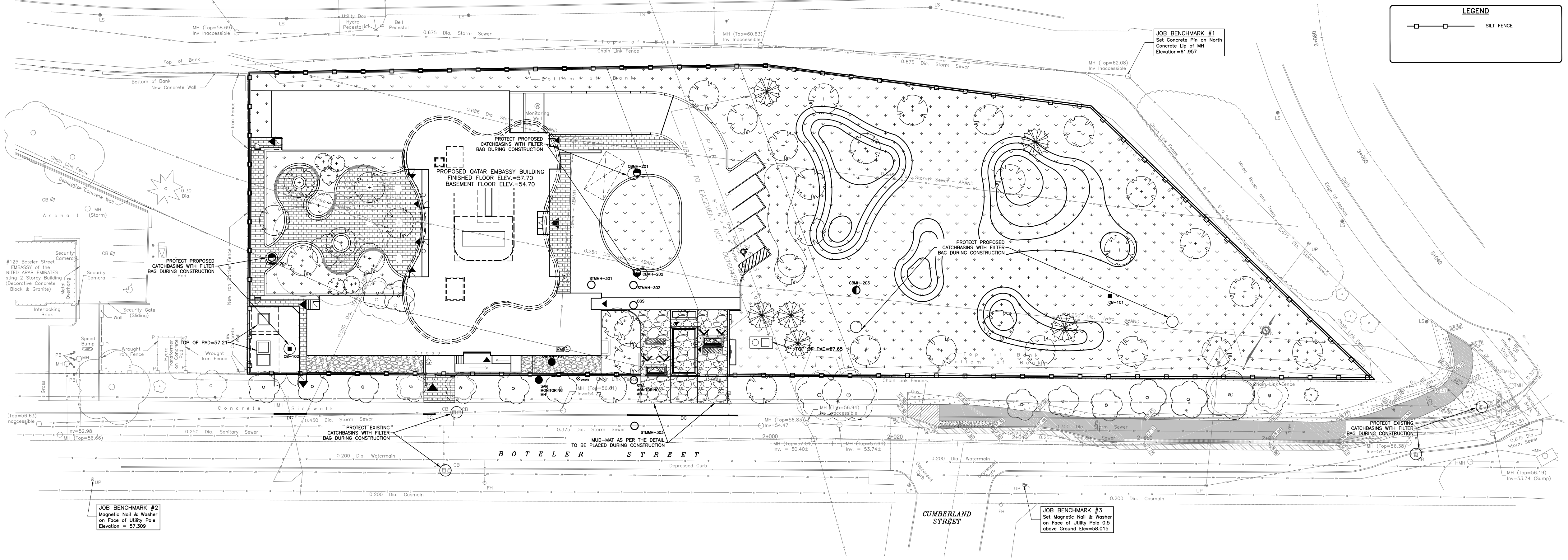

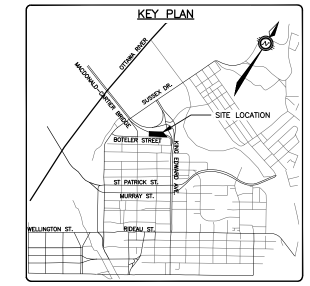

LEGEND

SILT FENCE

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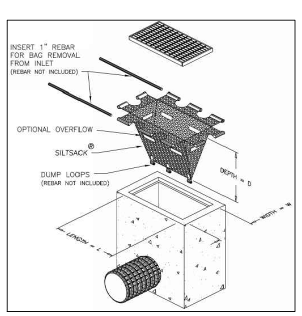
PRELIMINARY
NOT FOR CONSTRUCTION

EROSION AND SEDIMENT CONTROLS DURING CONSTRUCTION.

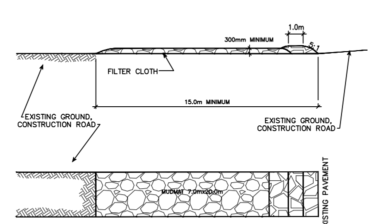
DURING ALL CONSTRUCTION ACTIVITIES, EROSION AND SEDIMENTATION SHALL BE CONTROLLED BY THE FOLLOWING TECHNIQUES:

1. LIMITING THE EXTENT OF EXPOSED SOILS AT ANY GIVEN TIME.
2. REVEGETATION OF EXPOSED AREAS AS SOON AS POSSIBLE.
3. MINIMIZATION OF AREA TO BE CLEARED AND DISRUPTION TO ADJACENT AREAS.
4. INSTALLATION OF FILTER CLOTH BETWEEN FRAME AND COVER ON ALL PROPOSED CATCH BASINS AND CATCH BASIN MANHOLES.
5. A SILT FENCE TO BE INSTALLED 0.3m INSIDE THE SITE PROPERTY LINE TO LOCATIONS SHOWN ON THIS DRAWING.
6. A VISUAL INSPECTION SHALL BE COMPLETED DAILY ON SEDIMENT CONTROL BARRIERS AND ANY DAMAGE REPAIRED IMMEDIATELY. CARE WILL BE TAKEN TO PREVENT DAMAGE DURING CONSTRUCTION OPERATIONS.
7. IN SOME CASES SOME BARRIERS MAY BE REMOVED TEMPORARILY TO ACCOMODATE THE CONSTRUCTION OPERATIONS. THE AFFECTED BARRIERS WILL BE REINSTATED AT NIGHT WHEN CONSTRUCTION IS COMPLETED.
8. THE SEDIMENT CONTROL DEVICES WILL BE CLEANED OF ACCUMULATED SILT AS REQUIRED. THE DEPOSITS WILL BE DISPOSED OF AS PER THE REQUIREMENTS OF THE CONTRACT.
9. DURING THE COURSE OF CONSTRUCTION IF THE ENGINEER BELIEVES THAT ADDITIONAL PREVENTION METHODS ARE REQUIRED TO CONTROL EROSION AND SEDIMENTATION, THE CONTRACTOR WILL INSTALL ADDITONAL SILT FENCES OR OTHER METHODS AS REQUIRED TO THE SATISFACTION OF THE ENGINEER.
10. CONSTRUCTION AND MAINTENANCE REQUIRMENTS FOR EROSION AND SEDIMENT CONTROLS TO COMPLY WITH ONTARIO PROVINCIAL STANDARD SPECIFICATION (OPSS) OPSS 805, AND CITY OF OTTAWA SPECIFICATIONS.
11. SEDIMENT AND EROSION CONTROL MEASURES MAY BE MODIFIED IN THE FIELD AT THE DISCRETION OF THE CITY OF OTTAWA SITE INSPECTOR OR CONSERVATION AUTHORITY.



PROVIDE FILTER BAGS AS SHOWN (GEO-SYNTHETICS MANUFACTURER OR APPROVED EQUIVALENT)

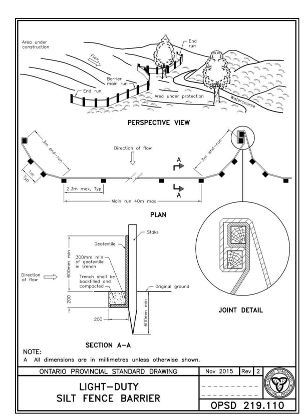
FILTER BAG DETAIL
N.T.S



NOTES:

1. STONE – USE CLEAR CRUSHED 100mm STONE.
2. LENGTH – AS REQUIRED BUT NOT LESS THAN 15.0m.
3. THICKNESS – NOT LESS THAN 300mm.
4. WIDTH – 7.0m MINIMUM, NOT LESS THAN THE WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS.
5. FILTER CLOTH – WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING STONE.
6. MAINTENANCE – THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT–OF–WAY. THIS MAY REQUIRED PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEAN OUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED OR TRACKED ONTO THE PUBLIC RIGHT–OF–WAY MUST BE REMOVED IMMEDIATELY.
7. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

MUD MAT DETAIL
N.T.S



NOTES:

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO WOOD POSTS WITH WIRE TIES OR STAPLES.
2. POSTS TO BE SPACED AT 2.3 METRES CENTRE TO CENTRE.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVERLAPPED BY A MINIMUM OF 500mm.
4. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.
5. WOOD POSTS TO BE HARDWOOD TYPE (50mm x 50mm).
6. GEOTEXTILE TO BE EMBEDDED 200mm INTO GROUND.
7. GEOTEXTILE TO CONFORM TO OPSS 805 STANDARDS.
8. SILT FENCE MUST BE INSTALLED BEFORE COMMENCEMENT OF CONSTRUCTION AND IN ACCORDANCE WITH DETAIL. SILT FENCE CAN BE REMOVED AFTER LANDSCAPING IS COMPLETE.
9. SEDIMENTS MUST BE CLEARED AWAY WHEN THEY REACH HALF THE HEIGHT OF THE FENCE.

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NEW QATAR EMBASSY AND CONSULATE

Ottawa Ontario

drawing title

EROSION AND SEDIMENT CONTROL PLAN

date		job.no.	OTT-00261664-A0
scales	1:250		
drawn	A.Jariwala		
approved	A.Ansari	drawing no.	C-300
plot date	05/10/2021		

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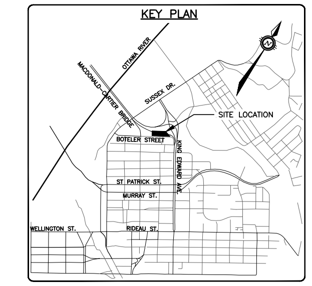

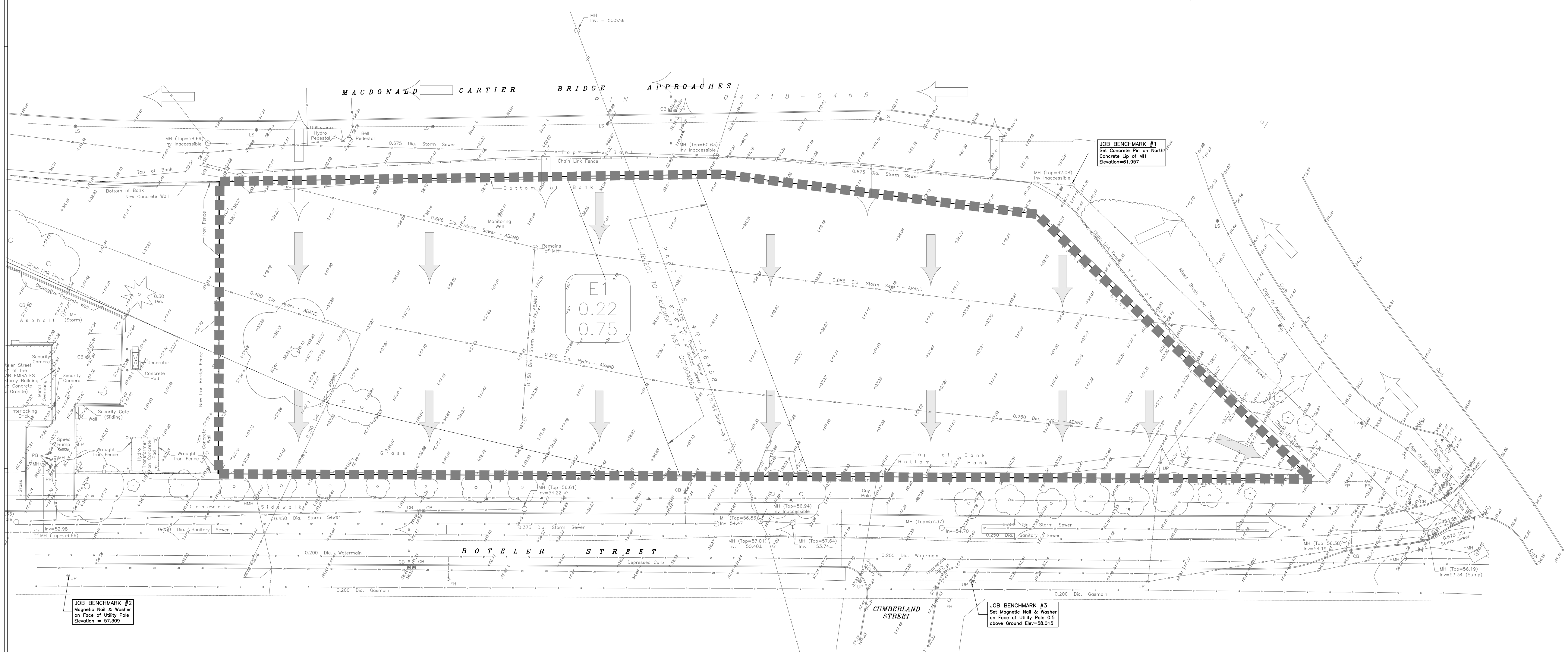

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Ottawa Ontario

drawing title

PRE-DEV STORMWATER MANAGEMENT PLAN

date		job.no.	OTT-00261664-A0
scales	1:250		
drawn	A.Jariwala	drawing no.	C-400
approved	A.Ansari		
plot date	05/10/2021		

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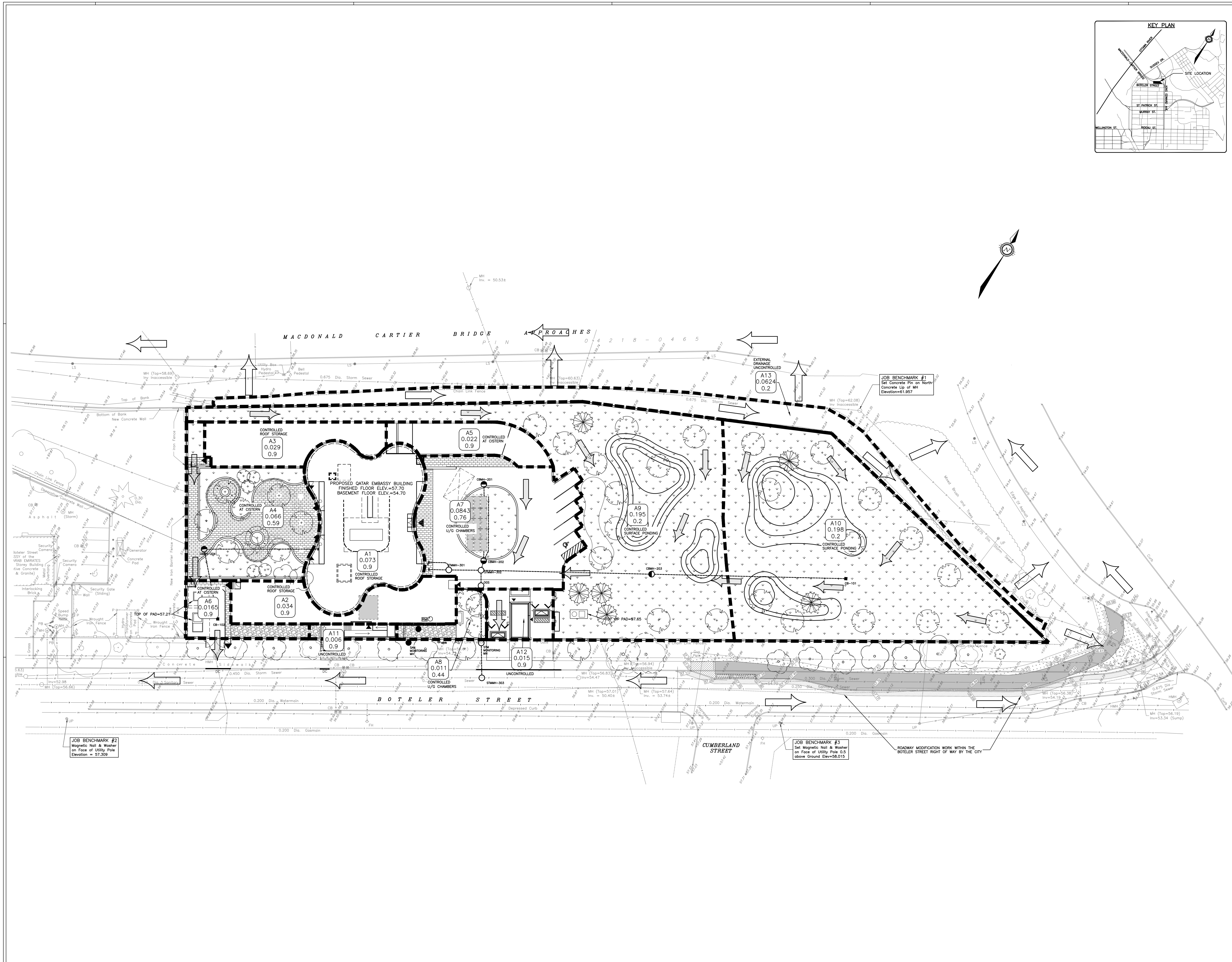

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NEW QATAR EMBASSY AND CONSULATE
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drawing title
POST-DEV STORMWATER MANAGEMENT PLAN

date		job.no.	OTT-00261664-A0
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drawn	A.Jariwala	drawing no.	C-500
approved	A.Ansari		
plot date	05/10/2021		

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