Servicing and Stormwater Management Report: The Landing on Main (1364-1370 Stittsville Main Street)

Stantec Project No. 160401727

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Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

Stantec Consulting Ltd. has been commissioned by Bayview Stittsville Inc. to prepare the following servicing and stormwater management (SWM) report in support of a site plan control application for the development of a new four (4) storey Mixed Use building, surrounding site works, and parking areas located within the properties known municipally as 1364, 1368, and 1370 Stittsville Main Street. The properties are located along Stittsville Main Street in the City of Ottawa and have been unoccupied by residential dwellings since approximately 2016.

The subject property is approximately 0.51 ha in area containing no existing structures and consisting primarily of grassed areas and trees. The architect (Mataj Architects Inc.) has prepared a proposed site plan to support the site plan control application (see **Appendix B**). The site plan proposes 71 units, a total of 87 surface parking spaces, and commercial space on the ground level. The new building will be serviced via the existing municipal water, stormwater and wastewater mains on Stittsville Main Street.

Figure 1-1 : Key Plan

1.1 OBJECTIVE

This servicing and stormwater management report has been prepared to demonstrate that the existing municipal infrastructure servicing the project site is sufficient to meet the servicing requirements of the development while adopting the most suitable stormwater management approach that complies with the City of Ottawa guidelines and applicable environmental laws required for the site plan control application.

Criteria and constraints provided by the City of Ottawa in previous consultations as well as existing site conditions have been used as a basis for the design and the preparation of this report. Specific elements and potential development constraints to be addressed are as follows:

- **Potable Water Servicing**
    - Estimate water demands for the proposed redevelopment which will be serviced by an existing 406 mm diameter ductile iron watermain fronting the site along Stittsville Main Street.
    - Watermain servicing for the development is to provide average day, maximum day and peak hour demands (i.e., non-emergency conditions) at pressures within the acceptable range of 50 to 80 psi (345 to 552 kPa).
    - Under fire flow (emergency) conditions with maximum day demands, the water distribution system is to maintain a minimum pressure greater than 20 psi (140 kPa).
- **Wastewater Servicing**
    - Estimate wastewater flows contributed by the development and demonstrate that the new building can be adequately serviced by the existing 300 mm diameter PVC sanitary sewer on Stittsville Main Street.
- **Stormwater Management and Servicing**
    - Determine the stormwater management storage requirements to meet the allowable release rate.
    - To establish that the predevelopment impervious ratio for the site is not being increased and therefore existing stormwater management is not impacted by the development.
    - Post-development 100-year peak flows controlled to the pre-development 5-year release rate with a runoff coefficient of C=0.35 and concentration time of 10 mins.
- Prepare a grading plan in accordance with the proposed site plan and existing grades.

Drawing SSP-1 in **Appendix F** shows the general arrangement and details of the proposed services on the site.

2.0 REFERENCES

Documents referenced in preparation of this Servicing and stormwater management report for 1364-1370 Stittsville Main Street include:

- Geotechnical Investigation – Proposed Seniors' Residence – 1364, 1368, and 1370 Stittsville Main Street, Ottawa, ON, Houle Chevrier Engineering, May 25, 2015.
- Subsurface Investigation Report (53-BSI-R1) – 1364, 1368 and 1370 Stittsville Main St., Ottawa, ON, K2S 1V4, Yuri Mendez Engineering, June 20, 2022.
- City of Ottawa Sewer Design Guidelines, 2nd Edition, City of Ottawa, October 2012.
- City of Ottawa Design Guidelines – Water Distribution, 1st Edition, Infrastructure Services Department, City of Ottawa, July 2010.
- Technical Bulletin ISDTB-2014-02 Revision to Ottawa Design Guidelines – Water, City of Ottawa, May 2014.
- Technical Bulletin PIEDTB-2016-01 Revisions to Ottawa Design Guidelines – Sewer, City of Ottawa, September 2016.
- Technical Bulletin ISTB-2018-01 Revision to Ottawa Design Guidelines – Sewer, City of Ottawa, March 2018.
- Technical Bulletin ISTB-2018-02 Revision to Ottawa Design Guidelines – Water Distribution, City of Ottawa, March 2018.
- Technical Bulletin ISTB-2021-03 Revision to Ottawa Design Guidelines – Water Distribution, City of Ottawa, August 2021.

3.0 POTABLE WATER SERVICING

3.1 BACKGROUND

The subject site is located within the City of Ottawa's 3W pressure zone. The site will be serviced by two proposed connections to the existing 406 mm diameter DI watermain fronting the site on Stittsville Main Street. There are also existing hydrants within proximity of the subject site including a hydrant adjacent to the site fronting Holy Spirit Catholic School, and on the southwest corner of the Beverly Street-Stittsville Main Street intersection. It is anticipated that potable water demand and emergency fire flow requirements for the site will be met by the existing infrastructure.

3.2 WATER DEMANDS

3.2.1 Domestic Water Demands

Water demands were calculated using the City of Ottawa Water Distribution Guidelines (2010) to determine the typical operating pressures to be expected at the building (see detailed calculations in **Appendix A.1**). A demand rate of 280 L/cap/day was applied for the population of the proposed site per Technical Bulletin ISTB 2021-03. The average daily (AVDY) residential demand was estimated with population densities as per City of Ottawa Guidelines; density of 1.4 persons per one-bedroom apartment and 2.1 persons per two-bedroom apartment.

A demand of 28,000 L/ha/day was applied to the 458 m^2 communal amenity space. Maximum day (MXDY) demands were determined by multiplying the AVDY demands by a factor of 2.5 for residential areas and by a factor of 1.5 for amenity areas. Peak hourly (PKHR) demands were determined by multiplying the MXDY demands by a factor of 2.2 for residential areas and by a factor of 1.8 for amenity areas. The estimated demands are summarized in **Table 3.1** below.

Table 3.1: Estimated Water Demands

Demand Type	Population	Area (m^2)	AVDY (L/s)	MXDY (L/s)	PKHR (L/s)
Residential	132	-	0.43	1.07	2.35
Amenity Space	-	458	0.01	0.02	0.04
Total Site:	132	-	**0.44**	**1.09**	**2.39**

Based on these results, it is expected that only one private water service connection to the building will be required which will adequately provide potable water supply to the development. However, to decrease the vulnerability of the water system in case of breaks, a second 200mm diameter connection has been provided to the existing 406mm diameter watermain.

3.2.2 Fire Flow Demands

As confirmed by the architect, the building is sprinklered and of Group C occupancy constructed with combustible materials without fire resistance ratings. The initial fire flow analysis in earlier submissions of this report used the OBC demands, however based on City comments and as mentioned in Technical Bulletin ISTB-2021-03, fire flow requirements were estimated using Fire Underwriters Survey (FUS) and determined to be approximately 24,000 L/min (400.0 L/s). The FUS estimate is based on a building of wood frame construction. Additionally, it is anticipated that the building will be sprinklered, with final sprinkler design to conform to the NFPA 13 standards. The proposed connection is shown in **Drawing SSP-1** in **Appendix F**. Detailed fire flow calculations per the FUS methodology are provided in **Appendix A.2**. Correspondence with the City has been provided in **Appendix A.3.**

3.3 BOUNDARY CONDITIONS

Boundary conditions were provided by the City of Ottawa and are presented in **Table 3.2** (see **Appendix A.3** for correspondence).

Table 3.2: Boundary Conditions

Connection 1 – Stittsville Main St.

Demand Scenario	Head (m)	Pressure (psi)
Maximum HGL	160.8	59.7
Peak Hour	156.3	53.4
Max Day + Fire Flow (24,000 LPM)	150.2	44.6

Connection 2 – Stittsville Main St.

Demand Scenario	Head (m)	Pressure (psi)
Maximum HGL	160.8	61.5
Peak Hour	156.2	55.0
Max Day + Fire Flow (24,000 LPM)	149.2	45.1

Connection 3 – Beverly St.

Demand Scenario	Head (m)	Pressure (psi)
Maximum HGL	160.8	61.5
Peak Hour	156.2	55.0
Max Day + Fire Flow (24,000 LPM)	136.9	27.5

3.4 DOMESTIC DEMAND RESULTS

The desired normal operating objective pressure range as per the City of Ottawa 2010 Water Distribution Design Guidelines is 345 kPa (50 psi) to 552 kPa (80 psi) and no less than 276 kPa (40 psi) at ground elevation under normal operation conditions. Furthermore, the maximum pressure at any point in the water distribution should not exceed 100 psi as per the Ontario Building/Plumbing Code; pressure

reducing measures are required to service areas where pressures greater than 552 kPa (80 psi) are anticipated.

The proposed finished floor elevation at the ground floor is 118.69 m and will serve as the elevation for the calculation of residual pressures at ground level. As per the Boundary Conditions (Oct 17th, 2022), the on-site pressures are expected to range from 368 to 413 kPa (53.4 to 59.9 psi) under normal operating conditions. Due to head loss of about 34.7 kPa (5.0 psi) for each storey, it is expected that the upper storey (the fourth floor) will experience minimum pressure in the range of 264 to 309 kPa (38 to 45 psi). Calculation of the residual pressures have been provided in **Appendix A.4** These values are below the normal operating pressure range as defined by City of Ottawa design guidelines which requires 276 to 552 kPa (40 to 80 psi). Consequently, the building will require a booster pump for the proposed development.

According to the modeling results, the maximum daily demand for the building is 412.99 kPa (59.90 psi) and the peak hourly demand for the building is 368.20 kPa (53.40 psi) respectively. Thus, they meet the current pressure requirements as per the Water Distribution Guidelines.

3.5 FIRE FLOW RESULTS

In order to assess the adequacy of supply of fire flows while maintaining allowable pressure, Stantec has undertaken a multi-hydrant water network modeling analysis. Field hydrant testing is also provided to provide further context.

3.5.1 Multi-Hydrant Water Network Analysis

A water distribution system model was built using the EPANET2 module in PCSWMM and was used to assess whether the water main system can provide water demands and meet required pressure ranges across various demand scenarios.

Two proposed watermain connections (sized at 200 mm in diameter) to the existing 406 mm water main in front of the building on Stittsville Main Street will provide looping and redundancy.

As per Technical Bulletin ISTB 2021-03, hydrants providing fire flow must be within 150m of the site as measured along fire access routes, and despite what model results or flow tests demonstrate, hydrants can only be credited with providing a maximum of 5,700 L/min; credited amounts are further reduced based on distance from the building. The model includes three fire hydrants along the street, all within 105 m of the site and two proposed on-site private fire hydrants. The distances between the site and the fire hydrants are shown in **Table 3.3**.

Table 3.3: Distribution Fire Flow Demand into Model

Location	Distance to Building (m)	Fire Flow Demand (L/min)	Fire Flow Demand (L/s)
Northwest Fire Hydrant	104.5	3,800	63.33
Front Fire Hydrant	28.2	5,700	95.00
Southeast Fire Hydrant	95.8	3,800	63.33
On-Site Fire Hydrant #1	Local	5700	95.00
On-Site Fire Hydrant #2	Local	5700	95.00
Total		**24,700**	**411.67**

The maximum daily plus fire flow (24,000 LPM) boundary condition was applied in the model, along with the domestic demand at the building, with the net fire flow split between the five fire hydrants as indicated in **Table 3.3**. The minimum required pressure is 196 kPa (equivalent to 20 psi) in the entire system. The model result indicates the minimum pressure point occurs at the southeast fire hydrant on Beverly St with 216.97 kPa (31.47 psi). Therefore, the system can provide sufficient fire flow while maintaining the minimum pressure. The water network model and model inputs and outputs can be found in **Appendix A.5**.

3.5.2 Hydrant Testing

Fire hydrant testing in the field has been conducted on the closest public hydrant (across from the site on Stittsville Main Street) and the results are shown **in Table 3.4**. Hydrant Flow test data has been provided in **Appendix A.5**.

Table 3.4- Fire Hydrant Testing Result

Pressure (psi)	Flow (GPM)	Flow (L/s)
56	0	0
53	919	57.98
51	1193	71.86

The equation for determining available fire flow at 20 psi based on hydrant flow results is:

$$Q_R = Q_F \times (h_r \div h_f)^{0.54}$$

where:

Q_R = Flow predicted at the desired residual pressure, gpm

Q_F = Total flow measured during the test, gpm

h_r = Pressure drop to the desired residual pressure, psi

h_f = Pressure drop measured during the test, psi

The resulting available flow at the hydrant at 20 psi is 2,479.8 GPM or 9,398.5 LPM (156.6 L/s). While Technical Bulletin ISTB 2021-03 caps the maximum amount that an individual hydrant can be credited as providing, field testing data is invaluable for confirming actual pressures and flows, and is provided for context in conjunction with the modeling results.

4.0 WASTEWATER SERVICING

4.1 BACKGROUND

An existing 300 mm diameter PVC sanitary sewer fronts the site on Stittsville Main Street. This sanitary sewer collects wastewater from the existing buildings along Stittsville Main Street. The new development will be serviced via a new 200 mm dia. sanitary service internal to the property before reaching the ultimate 300 mm PVC sanitary outlet with a connection at the existing sanitary manhole fronting the site (Ex. SAN MH290). **Drawing SSP-1** in **Appendix F** shows the proposed wastewater service connection for the site.

4.2 DESIGN CRITERIA

As outlined in the City of Ottawa Sewer Design Guidelines and the MECP's Design Guidelines for Sewage Works, the following criteria were used to calculate estimated wastewater flow rates and to size the sanitary sewers:

- Minimum Velocity – 0.6 m/s (0.8 m/s for upstream sections)
- Maximum Velocity – 3.0 m/s
- Manning roughness coefficient for all smooth wall pipes – 0.013
- Minimum size – 200mm dia. for residential areas
- Average Wastewater Generation – 280L/cap/day
- Maximum Peak Factor – 4.0 (Harmon's)
- Extraneous Flow Allowance – 0.33 l/s/ha (conservative value)
- Manhole Spacing – 120 m
- Minimum Cover – 2.5m

4.3 PROPOSED SERVICING

The proposed site will be serviced by gravity sewers which will direct the wastewater flows (approx. 1.7 L/s with allowance for infiltration) to the proposed 300 mm diameter sanitary sewer on Stittsville Main Street. The proposed drainage pattern is detailed on **Drawing SSP-1**. A sanitary sewer design sheet for the proposed service lateral is included in **Appendix C.2.** A backwater valve is to be installed on the proposed sanitary service within the site to prevent any surcharge from the downstream sanitary sewer from impacting the proposed property.

5.0 STORMWATER MANAGEMENT

5.1 OBJECTIVES

The goal of this stormwater servicing and stormwater management (SWM) plan is to determine the measures necessary to control the quantity and quality of stormwater released from the proposed development, to meet the criteria established during the consultation process with City of Ottawa and Mississippi Valley Conservation Authority (MVCA), and to provide sufficient details required for approval and construction.

Drawing SD-1 shows the drainage condition of the existing site. The majority of the site has a sloping tendency toward the south, while the portion of the site fronting Stittsville Main Street drains toward the street and east. Existing buildings have been demolished.

5.2 SWM CRITERIA AND CONSTRAINTS

Criteria were established by combining current design practices outlined by the City of Ottawa Design Guidelines (2012), and through consultation with City of Ottawa staff. The following summarizes the criteria, with the source of each criterion indicated in brackets:

General

- Use of the dual drainage principle (City of Ottawa).
- Wherever feasible and practical, site-level measures should be used to reduce and control the volume and rate of runoff (City of Ottawa)
- Assess impact of 100-year event outlined in the City of Ottawa Sewer Design Guidelines on major & minor drainage system (City of Ottawa)

Storm Sewer & Inlet Controls

- Size storm sewers to convey 2-year storm event under free-flow conditions using City of Ottawa I-D-F parameters (City of Ottawa).
- Proposed site to discharge to the existing 600mm diameter storm sewer within the Stittsville Main Street at the northern boundary of the subject site (City of Ottawa).
- All stormwater runoff from the site up to and including the 100-year storm event to be stored on site and released into the minor system at a maximum discharge equivalent to the 5-year storm predevelopment release rate to Stittsville Main Street storm sewer at a maximum runoff coefficient of 0.5.
- 100-year Storm HGL to be a minimum of 0.30 m below building foundation footing (City of Ottawa).
- 80% TSS removal for the site for water quality control
- Site required to meet total infiltration of 262 mm per year

Surface Storage & Overland Flow

- Building openings to be a minimum of 0.30m above the 100-year water level (City of Ottawa)
- Maximum depth of flow under either static or dynamic conditions shall be less than 0.30m (City of Ottawa)
- Provide adequate emergency overflow conveyance off-site (City of Ottawa)

Other criteria considered in the SWM design are described in Section 5 of the Ottawa Sewer Design Guidelines (October 2012) including all subsequent technical bulletins.

5.3 STORMWATER MANAGEMENT DESIGN

The intent of the stormwater management plan presented herein is to mitigate any negative impact that the proposed development will have on the existing storm sewer infrastructure, while providing adequate capacity to service the proposed buildings, parking and access areas. The proposed stormwater management plan is designed to detain runoff on site and within subsurface storage to ensure that peak flows after construction will not exceed the allowable site release rate detailed below.

PCSWMM modeling was employed to assess the rate and volume of runoff generated during post-development conditions. The site was subdivided into subcatchments (subareas) tributary to stormwater controls as defined by the location of inlet control devices. A summary of subcatchment areas and runoff coefficients is provided in **Drawing SD-2** indicating the stormwater management subcatchments.

5.3.1 Allowable Release Rate

Based on consultation with City of Ottawa staff, post-development allowable peak flows up to the 100-year event are to be controlled to the pre-development 5-year peak flow levels. Excess stormwater is to be restricted on-site using control measures. The selection of runoff coefficient is the smaller of 0.5 and the value representing the pre-development condition. The existing site condition is vacant with a runoff coefficient of 0.2. A runoff coefficient of 0.35 was used for the site based on the impervious areas that existed on the properties prior to the demolition of the on-site dwellings. Additionally, a time of concentration for the development area was calculated using Kirpich's equation and was found to be less than the minimum time of concentration of 10 minutes. Therefore, a time of concentration of 10 minutes was used as per the City's requirements provided during pre-consultation.

The development target release rate for the site area has been determined using the rational method based on the criteria above, the 5-year Ottawa IDF equation, and a time of concentration of 10 minutes. Peak flow rates have been calculated using the rational method as follows:

$$Q = 2.78\,(C)(I)(A)$$

Where:

$Q = peak\ flow\ rate, L/s$

$C = site\ runoff\ coefficient$

$I = rainfall\ intensity, mm/hr\ (per\ City\ of\ Ottawa\ IDF\ curves)$
$A = drainage\ area, ha$

$$5 - year\ Intensity\ (mm/hr) = \frac{998.071}{(10 + 6.053)^{0.814}} = 104.19\ mm/hr$$

$$Q = 2.78(0.35)(104.19 mm/hr)(0.51\ ha) = \mathbf{51.7\ L/s}$$

Therefore, the post-development peak flows up to the 100-year storm event must be controlled to the target flow rate mentioned in **Table 5.1.**

Table 5.1: Target Release Rate

Design Storm	Target Flow Rate (L/s)
5-Year Event (Pre-development Conditions)	51.7

5.3.2 Site Storage Requirements

To meet the restrictive stormwater release criteria for the proposed development, rooftop storage will be used to promote stormwater detention on building roof tops and reduce the peak outflow from the site. Additionally, an underground stormwater storage system is proposed in conjunction with ICDs within selected upstream catchbasins to control flows and promote surface ponding for the applicable storm events (2-year to 100-year events). The proposed ICD schedule, ponding areas, and underground storage tank details are specified in **Drawing SD-2**.

A PC-SWMM model was built to model the proposed storm sewers and it is used to estimate the required inlet control sizing and roof/subsurface storage configuration.

5.3.2.1 Rooftop Storage

It is proposed to control stormwater on the building rooftops by installing restricted flow roof drains. The analysis assumes that both roofs will be equipped with standard Watts Model R1100 Accuflow Roof Drains.

Watts Drainage “Accutrol” roof drain weir data has been used to calculate a practical roof release rate and detention storage volume for the rooftops. It should be noted that the “Accutrol” weir has been used as an example only, and that other products may be specified for use, provided that the total roof drain release rate is restricted to match the maximum rate of release indicated in **Table 5.2**, and that sufficient roof storage is provided to meet (or exceed) the resulting volume of detained stormwater. Proposed drain release rates have been calculated based on the Accutrol weir setting at various opening sizes. Calculation Tables have been provided in **Appendix D.5**. Storage volume and controlled release rate are summarized in **Table 5.2:**

Table 5.2: Roof Control Areas

Area ID	Design Storm	Roof Drain	Depth (mm)	Discharge (L/s)	Volume Stored (m^3)	Drawdown Time (hr)
R101A	2-Year	5-Notch 50% Open	98	4.68	20	1.3
	100-Year		148	6.24	68	3.6
R101B	2-Year	1-Notch 25% Open	81	0.73	0.6	0.2
	100-Year		132	0.89	3	0.9
R101C	2-Year	1-Notch 25% Open	81	0.73	0.6	0.2
	100-Year		132	0.89	3	0.9
R101D	2-Year	1-Notch 25% Open	15	0.19	0	0
	100-Year		38	0.48	0.01	0

The total roof area of the proposed building is approx. 2,000 m^2 with 80% (1,600 m^2) of the roof area assumed to be available for storage, with the runoff coefficient for the roof area as C = 0.90. The roof area drains are specified as shown in **Table 5.2**, and have been designed to optimize the maximum allowable ponding depth of 0.15m as per the Ontario Building Code. Drain drawdown times for the 100-year storm event are also shown in **Table 5.2.**

5.3.2.2 Surface Storage

Surface storage over catchbasins will be utilized during storm events to help adequately control flows and achieve the target allowable release rate for the proposed development. It is proposed that inlet control devices (ICDs) be installed within specified catchbasins to promote ponding in designated areas. Ponding areas and the ICD schedule are specified in **Drawing SD-2** and **Table 5.3** outlines the surface storage potential within specified subcatchments. This design has ensured that no surface ponding will occur during the 2-year storm event.

Table 5.3: 2-Year and 100-Year Surface Storage Requirements

CB ID	Design Storm	ICD Type	Controlled Release (L/s)	Volume Available (m^3)	Volume Stored (m^3)
CB 102B	2-Year	83 mm Orifice	12.27	13.40	0.49
	100-Year		17.14	13.40	7.40
CB 102C	2-Year	150 mm Orifice	6.30	0.63	0.06
	100-Year		26.89	0.63	0.52
CB 102D	2-Year	90 mm Orifice	6.50	0.90	0.13
	100-Year		18.27	0.90	0.78
CB 103A	2-Year	Vortex LMF 80	5.84	16.10	1
	100-Year		6.77	16.10	5.60
CB 103B	2-Year	Vortex LMF 80	7.04	17.70	1
	100-Year		7.28	17.70	7.72

CB ID	Design Storm	ICD Type	Controlled Release (L/s)	Volume Available (m^3)	Volume Stored (m^3)
CB 103C	2-Year	150 mm Orifice	0.00	0.63	0
	100-Year		7.86	0.63	0.50

The total available volume for surface storage within the site is approximately 49 m^3. In the 2-year storm event, 3 m^3 of water will be stored within the catchbasins, and in the 100-year storm event 23 m^3 of restricted flow will be stored within the catchbasins or in surface storage.

5.3.2.3 Subsurface Storage

An underground stormwater tank is proposed to store run-off from within the site area via a series of catchbasins, which will control and direct flows to the underground storage tank. The underground storage will accommodate both active stormwater storage and infiltration stormwater storage (discussed in **section 5.3.5**). An underground Stormtech chamber system with a 124 m^3 capacity has been selected which provides adequate infiltration and stormwater storage (see **Appendix D.9** for more information). A summary of the volumes and elevations associated with the active and infiltration portions of the underground storage system are presented in **Table 5.4**.

Table 5.4: Subsurface Storage Summary

	Bottom Elevation (m)	Top Elevation (m)	Available Volume (m^3)
Active Storage:	116.30	117.60	95.50
Infiltration Storage:	115.90	116.30	28.40
		Total:	**123.90**

The active storage volume is proposed to attenuate peak flows at a controlled flow rate from the tank of 10.1 L/s and 20.2 L/s in the 2-Year and 100-Year events, respectively. Approximately 91 m^3 of active storage is being used during the 100-year storm event, or ~95% of active storage capacity. See **Figure 5-1** for a schematic view of how the infiltration and active storage will be configured.

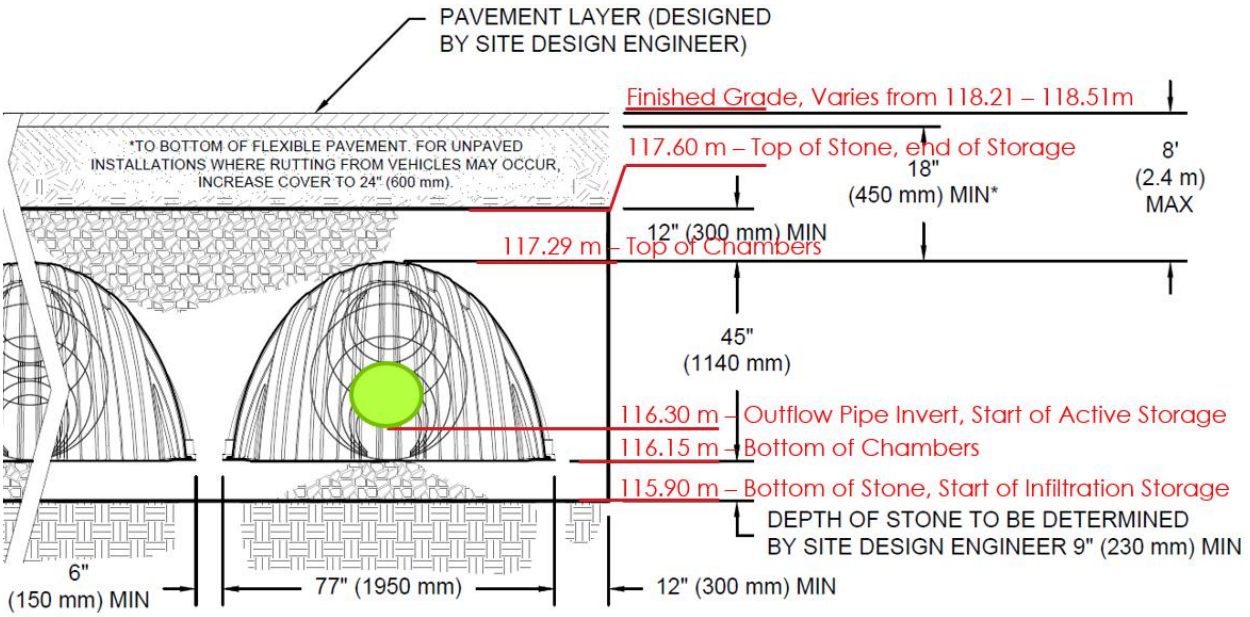

Figure 5-1: Schematic typical cross-section of the StormTech Underground Storage System, with propsoed elevations in red.

The subsurface stormwater storage tank invert elevation was set at the obvert of the storm sewer on Stittsville Main Street (116.3 m) in order to avoid backwater effects on the outlet orifice and backfilling of the storage; the bottom of the stone granular (115.9 m) was also set 1 m above the measured groundwater levels (114.9 m) to avoid reduction in storage capacity due to groundwater elevations.

As seen in **Drawing SD-2**, a Stormtech MC-3500 system has been selected for the subsurface storage and consequently, the storage curves have been updated in the PCSWMM model. Furthermore, the storage curve (see **Appendix D.1**), demonstrates that the required active underground storage can be accommodated in this area.

Controlled release rates and storage volumes required are summarized in **Table 5.5**.

Table 5.5: Subsurface Storage

Storm Return Period	Area ID	Design Head (m)	Discharge (L/s)	Orifice Type	$V_{required}$ * (m^3)
2-year	L103A, L103B, L103C, L102A, L102B, L102C, L102D, EXT-1, EXT-2	0.72	10.1	95 mm Orifice ICD	32
100-year		1.58	20.2		91

*Note: $V_{required}$ represents volume above the infiltration volume, i.e. volumes above the 116.3 m elevation.

In order to be conservative, the infiltration volume has been rendered ineffective during model runs by setting an initial depth of water up to 116.30 m and assuming a zero-infiltration rate during the model run.

5.3.2.4 Uncontrolled Release

Due to grading restrictions, three subcatchment areas have been designed to sheet flow uncontrolled as determined by the site grading design and the natural topography. The UNC-3 catchment area discharges off-site uncontrolled to the adjacent Stittsville Main Street ROW. The UNC-1 and UNC-2 catchment areas will discharge off-site uncontrolled to the adjacent south-east property. The amount of flow to the adjacent property will be less than that in pre-development conditions since most of the area will be redirected to the proposed drainage system. Moreover, runoff from UNC-2 will be directed by finished grade along the northeast property line to ROW, as shown in **Drawing GP-1**. Peak discharges from uncontrolled areas have been considered in the overall SWM plan and the target release rate has been satisfied by overcontrolling the discharge rates throughout the rest of the site.

Table 5.6 summarizes the estimated uncontrolled storm release rates during the 2-year and 100-year storm events.

Table 5.6: 2-Year and 100-Year Peak Uncontrolled (Non-Tributary) Release Rates

Area ID	Area (ha)	2-Year Event Discharge (L/s)	100-Year Event Discharge (L/s)
UNC-1	0.034	4.29	15.18
UNC-2	0.0064	0.01	2.02
UNC-3	0.020	3.19	9.62

5.3.3 Results

The maximum discharge flow from the entire site and external areas was obtained by adding the each of the primary outlet hydrographs (see **Figure 5-2** for 100-year results). These components are the uncontrolled flow (in grey) and the controlled flow (in yellow) from the roofs and underground storage, resulting in a combined total stormwater outflow hydrograph (in blue). The maximum discharge flow will be 50.16 L/s during the 100-year storm event.

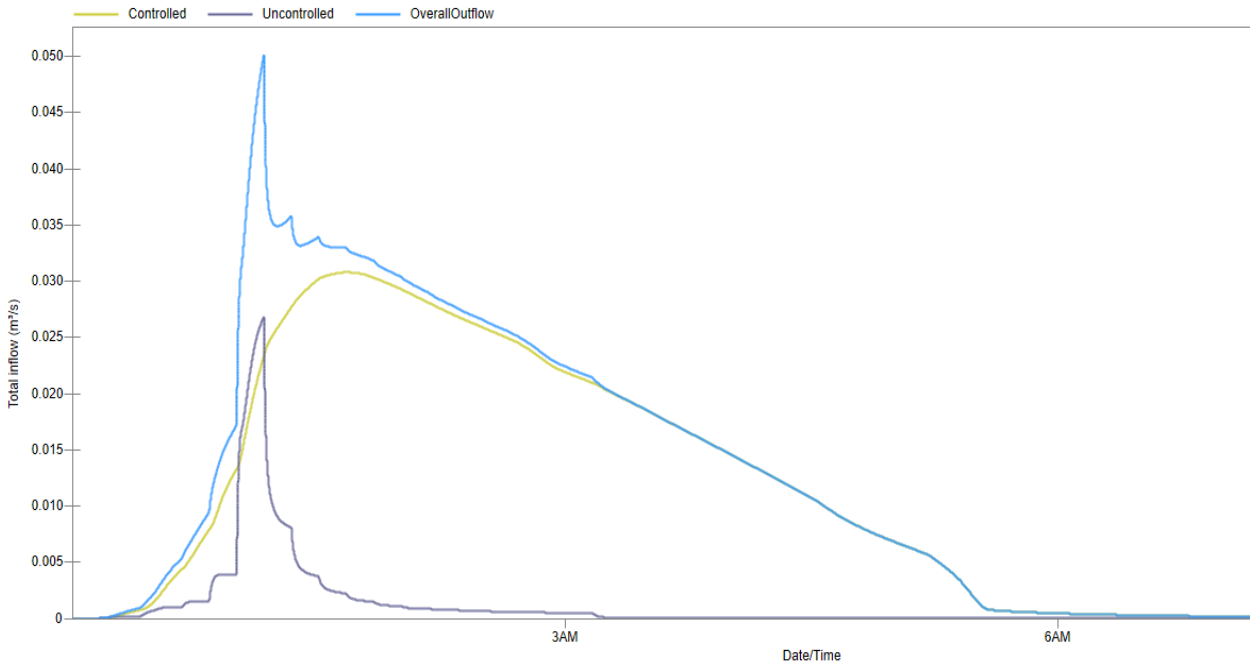

Figure 5-2: Hydrographs for Uncontrolled areas ("Uncontrolled", in grey), Controlled flows from Roof and Underground Storage ("Controlled" in yellow), and the combination of the two together ("OverallOutflow" in blue).

Table 5.7 demonstrates that the proposed stormwater management plan provides adequate attenuation storage to control post-development flows to below the target ate.

Table 5.7: Summary of Total 2 and 100-Year Event Release Rates

Summary To Outlet	2-Year Peak Discharge (L/s)	100-Year Peak Discharge (L/s)
Total	**23.36**	**50.16**
Target	**51.7**	**51.7**

5.3.4 Water Quality

It is required that 80% of the total suspended solids (TSS) be captured before discharging to the existing storm main, according to correspondence with the Mississippi Valley Conservation Authority (MVCA). An oil-grit separator treatment system within the site will be implemented and Contech's Stormceptor has been specified for this purpose, capturing runoff from the roofs and the underground storage. Using a fine particle size distribution and the Stormceptor Sizing Tool, a Stormceptor model EFO4 has been selected that will achieve 93% TSS removal, exceeding the minimum required TSS removal level. The detailed Stormceptor sizing report is included in **Appendix D.7**.

While a Forterra Stormceptor EFO4 has been specified, the objective is to demonstrate the ability to meet the water quality requirement. Other treatment systems with equivalent TSS removal capabilities might also be used.

MVCA has also asked that temperature mitigations be considered since flows ultimately discharge to Poole Creek. It is anticipated that the underground storage space and granular material will provide a large surface contact area and a detention time that will allow the water to exchange heat with the storage media and lower overall water temperature.

5.3.5 Annual Infiltration Capture

MVCA has indicated that the development site needs to target a total infiltration of 262 mm per year, according to the Carp River Subwatershed Study. As can be seen from the below **Figure** 5-3 taken from the Carp River Subwatershed Study, the annual precipitation is 943 mm, and the target infiltration rate is derived from the fact that this site lies within an area of high infiltration potential soils (i.e. sandy soils).

City of Ottawa
Carp River Watershed/Subwatershed Study

Table 8.3.11
Water Balance Components - Carp River Subwatershed

Infiltration Potential	Soil Type	Hydrologic Soil Group	Soil Moisture Retention (mm)	Precipn. (mm)	ET (mm)	Runoff (mm)	Equiv. Runoff coeff.	Infiltr. (mm/yr)
High	Fine sand	A	100	943	559	123	0.32	262
Moderate	Fine sand & silt or clay loam - shallow limestone bedrock	C	250	943	574	268	0.72	104
Low or Not Classified	clay and till - shallow Precambrian bedrock	D	200	943	579	292	0.80	73

Notes:

- Monthly precipitation (P) and temperatures from Canadian Climate Normals (1971-2000) for the Ottawa International Airport.
- Soil Types from published geology and soil survey mapping
- Hydrologic Soil Groups from SCS (U.S. Soil Conservation Service)
- Soil Moisture Retention for deeply-rooted vegetation (0.67 -1.25 metres) as defined by Thornthwaite & Mather.
- Evapotranspiration (ET) calculated by the Thornthwaite & Mather method.
- Runoff (RO) and runoff coefficients based, in part, on curve number (CN) in the SCS method.
- Infiltration calculated by difference) INF = P -ET - RO), assuming changes in soil moisture are zero.
- The values shown in the above table should be used for defining existing (undeveloped) conditions.

Figure 5-3: Water Balance Components – Carp River Subwatershed Study

As requested by the City, to meet the infiltration requirements Stantec has used an annual water balance approach. The rainfall parameters and the methodology from the Carp River Watershed Study have been used to compare the pre and post development conditions.

The water balance analysis for the site is presented in **Table 5.8**, including the amount of precipitation on the site and the runoff, infiltration, and evaporation.

Table 5.8 - Summary of Water Balance Results

OUTFLOW AREAS	Precipitation			Evapotranspiration			Infiltration			Runoff		
	(cu.m/yr)	(mm/yr)	Percent	(cu.m/yr)	(mm/yr)	Percent	(cu.m/yr)	(mm/yr)	Percent	(cu.m/yr)	(mm/yr)	Percent
Pre-Development Conditions	5432	943	***100%***	3220	559	***59%***	1,509	262	***28%***	703	122	***13%***
Post-Development Conditions												
Uncontrolled Drainage	575	943	***100%***	338	553	***59%***	158	259	***28%***	79	130	***14%***
Controlled Drainage	3008	943	***100%***	562	176	***19%***	263	83	***9%***	2,183	684	***73%***
Roof Drainage	1848	943	***100%***	0	0	***0%***	0	0	***0%***	1,848	943	***100%***
Total (without UG infiltration):	**5432**	**943**	***100%***	**899**	**156**	***17%***	**422**	**73**	***8%***	**4111**	**714**	***76%***
Infiltration Augmentation							1561			-1561		
Post Development Water Balance	**5432**	**943**	**100%**	**899**	**156**	**17%**	**1982**	**344**	**36%**	**2550**	**443**	**47%**

As can be seen in the annual water balance spreadsheet in **Appendix D.8,** in order to reach the target infiltration rate, an underground storage has been provided to capture the rainfall and store a volume of up to 28 m^3 for infiltration (see **Appendix D.1** for Stormtech Design Sheet). The runoff volume and corresponding rainfall volume (12.81 mm) required to completely fill the infiltration volume was determined.

The historical hourly rainfall volumes were collected from the Ottawa Macdonald-Cartier Gauge for the years 1971-2000 and are presented in **Figure 5-4.**

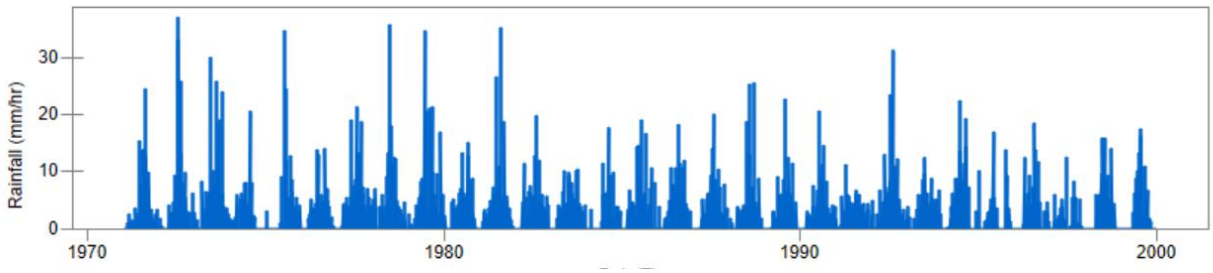

Figure 5-4: Rainfall Events 1971-2000

Calculations of daily rainfall volume percentile were calculated and ranked in to determine the percentile rainfall events which would be captured within the storage for infiltration. The methodology used for

calculation of percentile rainfall is outlined in the *LEED Stormwater Management Quantity Credit Requirement*[1], a common industry standard methos also used by the US EPA (see **Appendix D.10** for the calculation sheet).

Figure 5-5: Percentile-Precipitation Event Graph represents the percentile-precipitation events ranked. It can be seen that the required rainfall for completely using the infiltration storage (12.81 mm) corresponds to a value of 71.5%, meaning 71.5% of all daily rainfall values are equal or smaller than this amount = meaning that 71.5% of all events will be captured by the infiltration storage (this also corresponds to 71.5% of all rainfall volume).

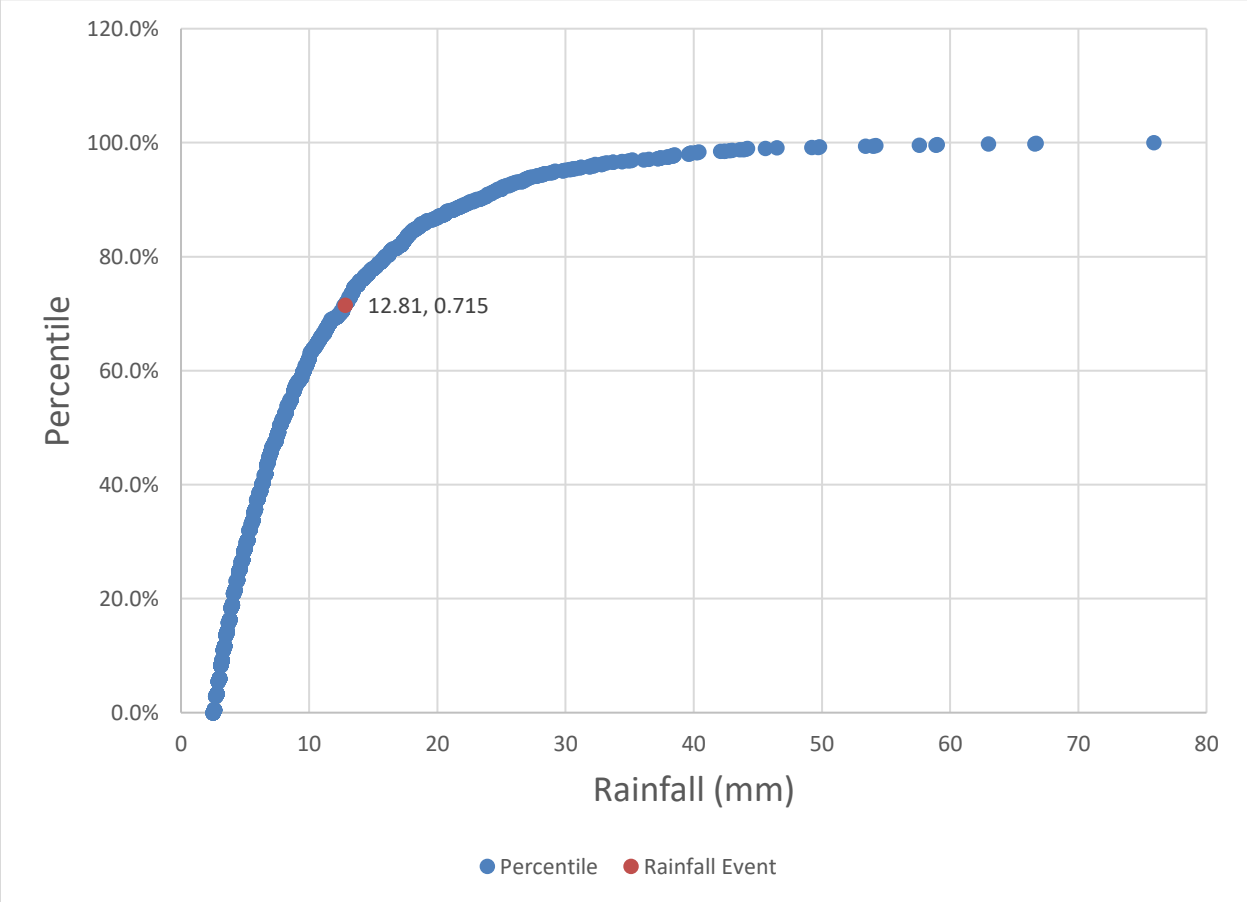

Figure 5-5: Percentile-Precipitation Event Graph, Daily Rainfall, 1971-2000

[1] Stormwater Management | U.S. Green Building Council (usgbc.org)

Using the smaller ratio of 71.5% infiltration capture and applying it to the annual runoff amount entering the storage chamber allows us to calculate the annual volume which is infiltrated through the storage chamber.

Hence, after comparing the pre-development to post-development water balance components, it was found that post-development the site infiltration would be more than the pre-development conditions (see

Table 5.9) for the site.

Table 5.9 - Comparison of Pre and Post Development Infiltration Rates

	Precipitation			Evapotranspiration			Infiltration			Runoff		
	(cu.m/yr)	(mm/yr)	Percent	(cu.m/yr)	(mm/yr)	Percent	(cu.m/yr)	(mm/yr)	Percent	(cu.m/yr)	(mm/yr)	Percent
Pre-Development Conditions	5432	943	*100%*	3220	559	*59%*	1509	262	*28%*	703	122	*13%*
Post-Development Conditions	5432	943	100%	899	156	17%	1982	344	36%	2550	443	47%

In the Subsurface Investigation Report (see **Appendix E.2)**, the following rates for the site soils were reported:

- permeability (360 mm/hr),
- percolation (150 mm/hr)
- infiltration (250 mm/hr)

The lowest of these three values was taken, i.e., 150mm/hr (percolation) for analysis of infiltrative capacity of the bed. The existing geotechnical report has characterized site soils as silty sand, silty sand and gravel, and sand. Over a bed area of 125 m^2, infiltration of 150 mm/hour (minimum rate taken to be conservative) would take 1.5 hours to infiltrate 28 m^3 of storage. As can be seen from the rates mentioned above, the site soils have the capacity for adequately infiltrating within a 24-hour drawdown period, reducing the likelihood of spilling from the infiltration storage during a back-to-back storm event. Thus, the site will have adequate storage space and infiltrative capacity to accommodate the infiltration volume.

6.0 SITE GRADING AND DRAINAGE

The proposed development site measures approximately 0.51 ha in area and in the present consists of grassed area with some trees. The site slopes from southwest to northeast, with grades at property corners varying by approximately 1.6 m across the site. Overland flow is generally being directed to the adjacent Stittsville Main Street ROW. A detailed grading plan (see **Drawing GP-1**) has been provided to satisfy any stormwater management requirements and provide for minimum cover requirements for storm and sanitary sewers where possible. Existing grades at the rear of the property have been maintained. Site grading has been established to provide emergency overland flow routes required for stormwater management in accordance with City of Ottawa requirements.

The subject site maintains emergency overland flow routes for flows deriving from storm events in excess of the maximum design event to the existing Stittsville Main Street ROW as depicted in **Drawing GP-1.** The site grading plan maintains the general drainage pattern of the existing condition site and matches all perimeter grades.

7.0 UTILITIES

As the subject site lies within a developed residential community, Hydro, Bell, Gas and Cable servicing for the proposed development should be readily available. It is anticipated that existing infrastructure will be sufficient to provide a means of distribution for the proposed site. Exact size, location and routing of utilities, along with determination of any off-site works required for redevelopment, will be finalized after design circulation.

8.0 APPROVALS

An Environmental Compliance Approvals (ECAs) under the Ontario Water Resources Act will likely be required by the Ontario Ministry of Environment, Conservation and Parks (MECP) for the underground storage chambers. However, an ECA is not expected to be required for the proposed sewers as they will be approved under the building code act and the entirety of the site is maintained under one ownership.

The Mississippi Valley Conservation Authority (MVCA) will need to be consulted in order to obtain municipal approval for site development. A Requirement for a MECP Permit to Take Water (PTTW) may be required and can be confirmed by the geotechnical consultant at the time of application

9.0 EROSION CONTROL DURING CONSTRUCTION

In order to protect downstream water quality and prevent sediment build up in catch basins and storm sewers, erosion and sediment control measures must be implemented during construction. The following recommendations will be included in the contract documents and communicated to the Contractor.

1. Implement best management practices to provide appropriate protection of the existing and proposed drainage system and the receiving water course(s).
2. Limit the extent of the exposed soils at any given time.
3. Re-vegetate exposed areas as soon as possible.
4. Minimize the area to be cleared and grubbed.
5. Protect exposed slopes with geotextiles, geogrid, or synthetic mulches.
6. Provide sediment traps and basins during dewatering works.
7. Install sediment traps (such as SiltSack® by Terrafix) between catch basins and frames.
8. Schedule the construction works at times which avoid flooding due to seasonal rains.

The Contractor will also be required to complete inspections and guarantee the proper performance of their erosion and sediment control measures at least after every rainfall. The inspections are to include:

- Verification that water is not flowing under silt barriers.
- Cleaning and changing the sediment traps placed on catch basins.

Refer to **Drawing ECDS-1** for the proposed location of silt fences, straw bales, and other erosion control measures.

10.0 GEOTECHNICAL INVESTIGATION

Several geotechnical investigations have been conducted within the subject site and the information has been summarized in the following sections. In 2015, a geotechnical report was provided by Houle Chevrier Engineering, and most recently an updated investigation was provided in April 2022 by Yuri Mendez Engineering.

10.1 2015 GEOTECHNICAL INVESTIGATION

Houle Chevrier Engineering was commissioned in 2015 to conduct a geotechnical investigation for a proposed 4-storey residential building to be located at 1364-1370 Stittsville Main Street in the City of Ottawa. The objective of the geotechnical investigation was determining the subsoil and groundwater conditions at this site by means of borehole analysis as well as to provide geotechnical recommendations pertaining to design of the proposed development including construction considerations which may impact the design. A geotechnical investigation was completed for the subject site by Houle Chevrier Engineering on May 25, 2015. The report summarizes the existing soil conditions within the subject area and provides construction recommendations. For details which are not summarized below, please see the original geotechnical report included in **Appendix E.1**.

Subsurface soil conditions within the subject site were determined from five (5) boreholes which were completed in May 2015. The boreholes were advanced to depths ranging from about 2.4 to 6 metres below the ground surface and all boreholes were terminated on practical refusal on or within inferred bedrock. Well screens were installed in two (2) of the boreholes (15-3B and 15-4) to measure groundwater levels. Topsoil fill material was encountered from the surface in three (3) of the boreholes and ranged in thickness from about 0.05 to 0.08 m. In general, the fill material consisted of topsoil fill material and crushed stone, then by brown, grey-brown, and dark grey-brown silty sand, silty sand and gravel, and sand ranging in thickness from about 0.5 to 2.3 meters. Inferred bedrock was encountered at between 2.4m to 6 m, however it should be noted that the auger refusal can occur on cobbles/boulders and may not necessarily represent bedrock.

Groundwater levels were found to range from 2.6 m to 3.9 m below the ground surface and are subject to seasonal fluctuations.

No grade-raise restrictions for the proposed building foundation were recommended for the subject site and a MOECC Permit to Take Water is not expected to be required.

The minimum pavement structure considered acceptable for the parking areas are provided in **Table 10.1** below.

Table 10.1: Recommended Pavement Structure – Parking Areas

Thickness (mm)	Material Description
50	Superpave 12.5 (Traffic Level A or B)
150	OPSS Granular A base
300	OPSS Granular B Type II Subbase

For areas to be used by heavy truck traffic (i.e. access roads, loading bays, and truck parking areas) the acceptable pavement structures are provided in **Table 10.2.**

Table 10.2: Recommended Pavement Structure – Heavy Truck Access Lane

Thickness (mm)	Material Description
90	Hot Mix Asphaltic Concrete (40 mm Superpave 12.5 Traffic Level B over 50 mm Superpave 19.0 (Traffic Level B))
150	OPSS Granular A base
400	OPSS Granular B Type II Subbase

10.2 2022 SUBSURFACE SITE INVESTIGATION

Yuri Mendez Engineering (YME) was commissioned to conduct a Subsurface Investigation for 1364-1370 Stittsville Main St. and issue recommendations for a proposed 4-storey apartment building development. The report (53-BSI-R1) was prepared on June 20, 2022 and describes the subsurface conditions within the site boundaries. In addition, the report acknowledges and responds to the first submission comments provided by the City of Ottawa. The geotechnical report can be found in **Appendix E.2**. It was submitted to the City under separate cover and has since been reviewed by City staff, who have provided comments. Responses to Geotechnical Comments are provided in **Appendix E.3**.

Subsurface soil conditions within the subject site were determined from six (6) boreholes which were completed on March 28, 2022. The boreholes were advanced to depths ranging from 1.88 to 5.97 meters below the ground surface and all boreholes were terminated on practical auger refusal on or within inferred bedrock suggesting that bedrock depths increase from the back of the property at 2 m depth to the front at roughly 6 m. The soil profile primarily consists of dense well graded sand and gravel. Groundwater levels were measured in standpipes installed in BH4 (WL=114.8m) and BH6 (WL=114.8m) and the groundwater table was found to be at a depth of 2.65 and 3.2 meters, respectively. BH6 is the closest borehole to the proposed underground stormwater storage location. The bottom of the chambers for the underground storage is set at 115.8m, 1 m above the groundwater levels observed. If seasonal fluctuations in groundwater levels reached the level of the underground storage, the local groundwater table would be drawn down by the sewer outlet. The groundwater levels may also reflect the surface water level conditions in Poole Creek.

As specified by YME, the general quality of the near surface undisturbed soil to serve as the foundation for the pavement structure are assumed to be fair as defined in the AASHTO guide. Tables 3, 4, and 5

within Appendix D of the Geotechnical report (53-BSI-R1) should be referenced to select the pavement structure for each traffic class on fair soils encountered at the site.

A Permit to Take Water (PTTW) is required for pumping from excavations exceeding 400 cubic meters per day. As specified in the report, given the size of the proposed excavations within the site and the soil conditions assessed, pumping from excavations it is not expected to exceed the threshold of 400 cubic meters per day and the requirement of a PTTW may not apply to the proposed development. Metered outlets must be maintained and recorded throughout construction as proof and confirmation that the OWRA regulations are adhered to.

11.0 CONCLUSIONS

11.1 WATER SERVICING

It is expected that the existing 406 mm diameter water distribution network within Stittsville Main Street can sufficiently support the proposed development's domestic demands. Upon receipt of the boundary conditions for the existing distribution system and a modeling analysis of a multi-hydrant firefighting scenario, the calculated domestic demands and the FUS fire flow demand of 24,000 L/min for the subject site can be met. The existing watermain on Stittsville Main Street has sufficient capacity to sustain the required domestic and emergency fire flow demands.

11.2 WASTEWATER SERVICING

An existing 300 mm diameter PVC sanitary sewer fronts the site on Stittsville Main Street. The proposed development will be serviced through the internal plumbing of the building which will outlet to a new single 200 mm diameter sanitary lateral complete with backwater valve, proposed to serve the entire site, with a sanitary connection to the existing sanitary MH fronting the site (SAN MH 290).

11.3 STORMWATER SERVICING AND MANAGEMENT

The stormwater management plan provided can effectively control on-site runoff and meet the target allowable release rate. Roof storage, surface storage, and underground storage will be utilized to provide additional detention benefits by controlling the expected post-development 100-year storm run-off from the proposed development area to the 5-year pre-development runoff release rate. The ultimate storm outlet will be the 600 mm diameter stormwater network along Stittsville Main Street, eventually discharging to the Poole Creek. A Stormceptor is provided to meet the 80% TSS removal water quality requirement. Infiltration volume storage is provided below the active storage volume in the underground storage area to capture storms and exceed the 262 mm/year infiltration target. Detention and attenuation in the underground storage areas will provide temperature mitigation before discharging to the Poole Creek.

11.4 GEOTECHNICAL CONSIDERATIONS

A geotechnical investigation was conducted by Houle Chevrier Engineering in 2015 and by Yuri Mendez Engineering in 2022 to determine the subsurface properties of the site, including groundwater elevations. The proposed underground stormwater storage tanks are set higher than the measured groundwater depths. A set of recommendations are provided in the updated report as geotechnical guidance for the design and construction.

11.5 GRADING

The proposed development site measures approximately 0.51 ha in area and consists of grassed area and trees. The site grading and drainage will be maintained as much as possible and will not be adversely impacted by the proposed development.

11.6 UTILITIES

The site is within a residential neighbourhood and currently serviced by existing utilities providing natural gas and fibre optics telecommunication services. The site is expected to be serviced through connections to these existing services.

APPENDICES

Appendix A POTABLE WATER SERVICING

A.1 WATER DEMAND CALCULATIONS

The Landing on Main (1364-1370 Stittsville Main Street)
Domestic Water Demand Estimates

Site Plan provided by Mataj Architects Inc. (2022-03-25)
Project No. 160401727

Population densities as per Ottawa Design Guidelines:

1 Bedroom Apartment	1.4	ppu
2 Bedroom Apartment	2.1	ppu

Demand conversion factors as per Ottawa Design Guidelines - Water Distribution:

Residential	280	L/cap/day

Unit Type	Amenity space (m²)	Number of Apt Units	Estimated Population	Daily Rate of Demand	Avg. Day Demand		Max. Day Demand [1]		Peak Hour Demand [1]	
					(L/min)	(L/s)	(L/min)	(L/s)	(L/min)	(L/s)
Apartment Units										
1 Bedroom		25	35	280	6.8	0.11	17.0	0.28	37.4	0.62
2 Bedroom		46	97	280	18.8	0.31	47.0	0.78	103.3	1.72
Amenity Space	458			28000	0.9	0.01	1.3	0.02	2.4	0.04
Total Site :		**71**	**132**		**26.5**	**0.44**	**65.3**	**1.09**	**143.1**	**2.39**

1 Average day water demand for residential areas: 280 L/cap/d per Technical bulletin ISTB 2021-03

2 Average day water demand for Amenity/Office areas: 28,000 L/ha/d (Based on commercial water demand rates)

3 The City of Ottawa water demand criteria used to estimate peak demand rates for residential areas are as follows:
maximum day demand rate = 2.5 x average day demand rate for residential
peak hour demand rate = 2.2 x maximum day demand rate for residential

4 Water demand criteria used to estimate peak demand rates for amenity/lobby areas are as follows:
maximum daily demand rate = 1.5 x average day demand rate
peak hour demand rate = 1.8 x maximum day demand rate

A.2 FUS FIRE FLOW CALCULATIONS

FUS Fire Flow Calculation Sheet

Stantec Project #: 160401727
Project Name: The Landing on Main (1364-1370 Stittsville Main Street)
Date: 3/25/2022
e Flow Calculation #: 1
Description: 4-Storey Residential Apartment Building

Notes: 4-storey residential apartment. Building information from Site Plan by Matajarchitects (2022-02-09)

Step	Task	Notes	Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Wood Frame	1.5	-
2	Determine Ground Floor Area of One Unit	Used the 'gross floor area' of the third floor (floor with the largest footprint, 1847 m^2). Methodoloogy taken from Section 3.2.2.45 of the Ontario Building Code	1847	-
	Determine Number of Adjoining Units	Includes adjacent wood frame structures separated by 3m or less	1	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space	4	-
4	Determine Required Fire Flow	($F = 220 \times C \times A^{1/2}$). Round to nearest 1000 L/min	-	28000
5	Determine Occupancy Charge	Limited Combustible	-15%	23800
6	Determine Sprinkler Reduction	Conforms to NFPA 13	-30%	-9520
		Standard Water Supply	-10%	
		Not Fully Supervised or N/A	0%	
		% Coverage of Sprinkler System	100%	

7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	> 45	47	4	> 120	Wood Frame or Non-Combustible	0%	9520
		East	3.1 to 10	31	4	> 120	Wood Frame or Non-Combustible	20%	
		South	30.1 to 45	19	4	61-90	Wood Frame or Non-Combustible	5%	
		West	10.1 to 20	67	4	> 120	Wood Frame or Non-Combustible	15%	

8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min	24000
		Total Required Fire Flow in L/s	400.0
		Required Duration of Fire Flow (hrs)	5.50
		Required Volume of Fire Flow (m^3)	7920

A.3 BOUNDARY CONDITIONS

Boundary Conditions
1364 Stittsville Main Street

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	26	0.43
Maximum Daily Demand	64	1.07
Peak Hour	141	2.35
Fire Flow Demand #1	15,000	250.00
Fire Flow Demand #2	24,000	400.00

Location

Results

Connection 1 – Stittsville Main St.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	160.8	59.7
Peak Hour	156.3	53.4
Max Day plus Fire 1	153.0	48.6
Max Day plus Fire 2	150.2	44.6

Ground Elevation = 118.8 m

Connection 2 – Stittsville Main St.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	160.8	61.5
Peak Hour	156.2	55.0
Max Day plus Fire 1	152.5	49.8
Max Day plus Fire 2	149.2	45.1

Ground Elevation = 117.5 m

Connection 3 – Beverly St.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	160.8	61.5
Peak Hour	156.2	55.0
Max Day plus Fire 1	147.4	42.5
Max Day plus Fire 2	136.9	27.5

Ground Elevation = 117.5 m

Disclaimer

The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

From: Dieme, Abi
To: Mott, Peter
Cc: Kilborn, Kris
Subject: RE: 1364 Stittsville Main Street Boundary Condition Request
Date: Tuesday, March 22, 2022 2:50:26 PM
Attachments: image002.png

Hi Peter,

Our Water Resources group just expressed concerns about the high fire flow, but I haven't received the actual boundary conditions yet.
They indicated that they would provide boundary conditions with a certain range of fire flow including the high 24,000 L/min but strongly encourage the reduction of the fire flow with onsite measures.
The City will require multi hydrant analysis to demonstrate how you would plan to respond to such big fire demand.
I'll reach out as soon as I receive any further information from them.

Regards,
Abi

From: Mott, Peter <Peter.Mott@stantec.com>
Sent: March 22, 2022 1:50 PM
To: Dieme, Abi <Abibatou.Dieme@ottawa.ca>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>
Subject: RE: 1364 Stittsville Main Street Boundary Condition Request

Hello Abi – Wondering if you have heard back from the Water Resources Group regarding the below BC request?

Thanks in advance for your response to my inquiry.

Best,

Peter

From: Dieme, Abi <Abibatou.Dieme@ottawa.ca>
Sent: Thursday, March 17, 2022 1:44 PM
To: Mott, Peter <Peter.Mott@stantec.com>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>; Thiffault, Dustin <Dustin.Thiffault@stantec.com>
Subject: RE: 1364 Stittsville Main Street Boundary Condition Request

Hi Peter,

I have forwarded your email to the Water Resources Group. I'll get back to you as soon as I obtain an answer.

Regards,
Abi

From: Mott, Peter <Peter.Mott@stantec.com>
Sent: March 17, 2022 1:30 PM
To: Dieme, Abi <Abibatou.Dieme@ottawa.ca>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>; dustin.thiffault@stantec.com
Subject: RE: 1364 Stittsville Main Street Boundary Condition Request

Hello Abi,

Just wanted to follow with you and see what the status of the below BC request to keep the SPA for our client moving forward. As we continue to work with the City to discuss alternatives to the FUS methodology for this development, our hope is to get a response so that we can plan accordingly for potential onsite measures. Please let me know how you would like to proceed at your earliest convenience.

Feel free to contact me at +1(343) 999-8172 or we can set up a Teams meeting to discuss.

Best,

Peter Mott EIT
Engineering Intern, Community Development

Mobile: +1 (343) 999-8172
Peter.Mott@stantec.com
Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

From: Mott, Peter
Sent: Tuesday, March 15, 2022 3:55 PM
To: Dieme, Abi <Abibatou.Dieme@ottawa.ca>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>; Thiffault, Dustin <Dustin.Thiffault@stantec.com>
Subject: RE: 1364 Stittsville Main Street Boundary Condition Request

Hello Abi – Thank you for your response and consideration regarding this matter. I believe there continues to be conflicting beliefs between the City of Ottawa and Consulting Engineers on the appropriate use of the FUS criteria to determine fire flows for new developments. This topic will likely be discussed between our organizations in days to come by more senior staff, however, in the interim I would like to request the boundary conditions for our site based on the FUS methodology, as requested.

- Average Day Demand: 0.43 L/s (25.6 L/min)
- Maximum Day Demand: 1.07 L/s (64.0 L/min)
- Peak Hour Demand: 2.35 L/s (140.7 L/min)
- Fire Flow: 150 L/s (24,000 L/min) (Based on FUS attached)

Based on your previous response this exceeds the City's design fire flow of 13,000 L/min for this area, however, your response will help us move forward with this submission and determine the appropriate design.

As always, feel free to contact me through Teams or at +1(343) 999-8172 to discuss.

Best,

Peter Mott EIT
Engineering Intern, Community Development

Mobile: +1 (343) 999-8172
Peter.Mott@stantec.com
Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

From: Dieme, Abi <Abibatou.Dieme@ottawa.ca>
Sent: Monday, March 14, 2022 2:02 PM
To: Mott, Peter <Peter.Mott@stantec.com>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>
Subject: RE: 1364 Stittsville Main Street Boundary Condition Request

Hi Peter,

Thank you for your patience. The most recent technical bulletin is ISTB-2021-03. It recognizes that the requirements for the levels of fire protection on private property in urban areas are covered under the Ontario Building Code. This is specially for sites where one connection to a building is proposed (no watermain design or fire hydrants.). However, the same bulletin indicates that whenever the OBC methods yields a fire flow of 9000 L/min, the FUS method shall be used to determine the required fire flow.
The rationale you've provided below justifies why the City recognizes the use of the OBC method in determining required fire flow for certain developments in the first

place. I would need further arguments to justify why we should deviate from the tech bulletin requirements and allow a required fire flow of 9000 L/min as per the OBC method for this project.
My understanding is Allan Evans was part of the team that implemented this requirement in the latest tech bulletin.
Once you provide further information, I can circulate internally for review and discussion, however I can't guarantee that deviation will be permitted as this has already been discussed internally.

Regards,
Abi

From: Mott, Peter <Peter.Mott@stantec.com>
Sent: March 14, 2022 12:58 PM
To: Dieme, Abi <Abibatou.Dieme@ottawa.ca>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>
Subject: RE: 1364 Stittsville Main Street Boundary Condition Request

Hello Abi – I hope you had a good weekend. I was wondering if you have any updates with regards to my below email? Please let me know at your earliest convenience.

Best,

Peter

From: Mott, Peter
Sent: Wednesday, March 9, 2022 12:29 PM
To: Dieme, Abi <Abibatou.Dieme@ottawa.ca>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>
Subject: RE: 1364 Stittsville Main Street Boundary Condition Request

Hello Abi – There seemed to have been some confusion on our end from our newer staff with regards to the fire flow requirements that will govern our apartment building design.

Given there will be no new watermains provided internally to the site and that we only require service connection(s) to the existing 406 mm public watermain along Stittsville Main Street (i.e. No pipe sizing will be required), I have provided the updated fire flow of 9000 L/min based the OFM/OBC methodology. I understand that the most recent technical bulletin ISTB-2018-02 replaces 4.2.11 and suggests that when the maximum 9000 L/min demand is reached via the OBC method that the FUS methodology shall be implemented, however I wish to challenge that requirement as there will be no affected pipe sizing in this instance, and with 3 blue capped hydrants within 70 m of the site I believe the maximum fire flow of 13,000 L/min that you suggested below in our initial BC request is more than sufficient for the proposed design.

I hope we can come to a reasonable conclusion for the fire flow requirement for the proposed site based on the above rationale or, if required, we can perhaps bring Alan Evans (City of Ottawa Chief Fire

Engineer) into the discussion to get his thoughts and insights for the FFR for the 1364 Stittsville Main Street development.

Thank you for your consideration and any comments and rationale on your end would be greatly appreciated. Please find below the updated BC request for the proposed site.

- Average Day Demand: 0.43 L/s (25.6 L/min)
- Maximum Day Demand: 1.07 L/s (64.0 L/min)
- Peak Hour Demand: 2.35 L/s (140.7 L/min)
- Fire Flow: 150 L/s (9000 L/min) (Based on OBC)

Feel free to contact me through Teams or at +1(343) 999-8172 to discuss.

Best,

Peter Mott EIT
Engineering Intern, Community Development

Mobile: +1 (343) 999-8172
Peter.Mott@stantec.com
Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

From: Dieme, Abi <Abibatou.Dieme@ottawa.ca>
Sent: Thursday, March 3, 2022 10:15 AM
To: Wu, Michael <Michael.Wu@stantec.com>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>; Mott, Peter <Peter.Mott@stantec.com>
Subject: RE: 1364 Stittsville Main Street Boundary Condition Request

Hi Michael,

Our Water Resources group has indicated that the required fire flow of 16,000 L/min exceeds the City's design fire flow of 13,000 L/min. On-site measures are required to reduce the required fire flow. Please send me updated FUS calculations.

Regards,
Abi

From: Wu, Michael <Michael.Wu@stantec.com>
Sent: February 25, 2022 8:53 AM
To: Dieme, Abi <Abibatou.Dieme@ottawa.ca>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>; Mott, Peter <Peter.Mott@stantec.com>
Subject: RE: 1364 Stittsville Main Street Boundary Condition Request

Hi Abi:

Thanks for pointing that out. In that case, please disregard the 233.3 L/s (14000 L/min) for the required fire flow.

The attached calculation of 266.7 L/s (16000 L/min) is correct, I somehow typed in 14000 L/min by mistake, guess that's what happens when I did not zoom in on the spreadsheet and read the "6" as a "4".

Hope this helps, and please let me know if you need any more information.

Michael Wu, EIT
Civil Engineering Intern, Community Development

Mobile: (613) 858-0548
michael.wu@stantec.com

Stantec
300 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

From: Dieme, Abi <Abibatou.Dieme@ottawa.ca>
Sent: Thursday, 24 February, 2022 16:51
To: Wu, Michael <Michael.Wu@stantec.com>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>; Mott, Peter <Peter.Mott@stantec.com>
Subject: RE: 1364 Stittsville Main Street Boundary Condition Request

Thanks for clarifying. Also wanted to flag that the attached calculations showed a RFF of 16000 L/min instead if 14000 L/min indicated below.

Regards,
Abi

From: Wu, Michael <Michael.Wu@stantec.com>
Sent: February 24, 2022 4:37 PM
To: Dieme, Abi <Abibatou.Dieme@ottawa.ca>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>; Mott, Peter <Peter.Mott@stantec.com>
Subject: RE: 1364 Stittsville Main Street Boundary Condition Request

Hi Abi:

Thank you for the email. It was more of an assumption that there would be a two-hour fire separation between the floors and 1-hour fire protection on the vertical communication when determining the fire flow demand, though considering that the proposed apartment consists of 4-storeys and is only residential, we decided to modify the methodology for the floor area and provide the following amended water demand:

- Average Day Demand: 0.43 L/s (25.6 L/min) (36.864 m^3/day)
- Maximum Day Demand: 1.07 L/s (64.0 L/min)
- Peak Hour Demand: 2.35 L/s (140.7 L/min)
- Fire Flow: 233.3 L/s (14000 L/min) (Based on FUS)

Attached are the boundary condition map, water demand sheet, modified FUS sheet and the site plan.

We appreciate your time looking into this for us, and please don't hesitate to reach out if you need any more information.

Best regards,

Michael Wu, EIT
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Mobile: (613) 858-0548
michael.wu@stantec.com

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From: Dieme, Abi <Abibatou.Dieme@ottawa.ca>
Sent: Wednesday, 23 February, 2022 15:31
To: Wu, Michael <Michael.Wu@stantec.com>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>; Mott, Peter <Peter.Mott@stantec.com>
Subject: RE: 1364 Stittsville Main Street Boundary Condition Request

Hi Michael,

I wanted to request clarification on the method used to determine the total area for the fire flow calculations. Page 17 of the FUS Water Supply for Public Fire protection indicates that it is applicable for fire resistive buildings while the proposed development is ordinary construction. Could you please specify why this method could be applied for this development?

> For fire-resistive buildings, consider the two largest adjoining floors plus 50 percent of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25 percent of each of the two immediately adjoining floors.

Regards,
Abi

From: Wu, Michael <Michael.Wu@stantec.com>
Sent: February 17, 2022 3:06 PM
To: Dieme, Abi <Abibatou.Dieme@ottawa.ca>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>; Mott, Peter <Peter.Mott@stantec.com>
Subject: 1364 Stittsville Main Street Boundary Condition Request

We would like to request hydraulic boundary conditions for the proposed residential development at 1364 Stittsville Main Street. The developer is looking to construct a 4-storey apartment building with 71 apartment units projected to serve 132 residents.

The new apartment building is projected to be served by a new water service connection fed by the existing 406mm dia. Watermain on Stittsville Main Street. The water demand for the proposed development is as follows:

- Average Day Demand: 0.43 L/s (25.6 L/min) (36.864 m^3/day)
- Maximum Day Demand: 1.07 L/s (64.0 L/min)
- Peak Hour Demand: 2.35 L/s (140.7 L/min)
- Fire Flow: 166.7 L/s (10000 L/min) (Based on FUS)

Attached are the boundary condition map, draft site plan and water demand and fire flow calculation sheets for your information.

We appreciate your time looking into this for us, and please do not hesitate to contact me if you have any questions or comments.

Best regards,

Michael Wu, EIT
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michael.wu@stantec.com

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From: Dieme, Abi
To: Wu, Michael
Cc: Kilborn, Kris; Mott, Peter
Subject: RE: 1364 Stittsville Main Street Boundary Condition Request
Date: Thursday, March 3, 2022 10:14:48 AM
Attachments: image001.png

Hi Michael,

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Regards,
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Sent: February 25, 2022 8:53 AM
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A.4 SITE HYDRAULIC ANALYSIS

Stantec	Project:	**1364-1370 Stittsville Main Street**	No. **160401727**
	SITE PLAN HYDRAULIC ANALYSIS		
	Revision:	03	Prepared By: AM
	Revision Date:	27-Oct-2022	Checked By: NC

BOUNDARY CONDITIONS (BC)	
Connection at Stittsville Main Street	
Site Plan Revision Date	27-Oct-2022
Min. HGL (m)	156.23
Max. HGL (m)	160.8
Max. Day + Fire Flow (150 L/s)	143.38

Ground Floor Elevation (GFE) (Level 01) (m)	118.69

GROUND FLOOR (GF) PRESSURE RANGE				
	GF HGL (m)	**GF Pressure (kPa)**	**GF Pressure (psi)**	**Outcome**
	= BC HGL (m) - FFE (m)	= GF HGL (m) x 9.804 (kPa/m)	= GF Pressure (kPA) x 0.145 (psi/kPa)	If min <50 psi: booster pump If max >100 psi: pressure reducer
Minimum Normal	37.54	368.0	53.4	No Booster Pump Required
Maximum Normal	42.11	412.9	59.9	No Pressure Reducer Required

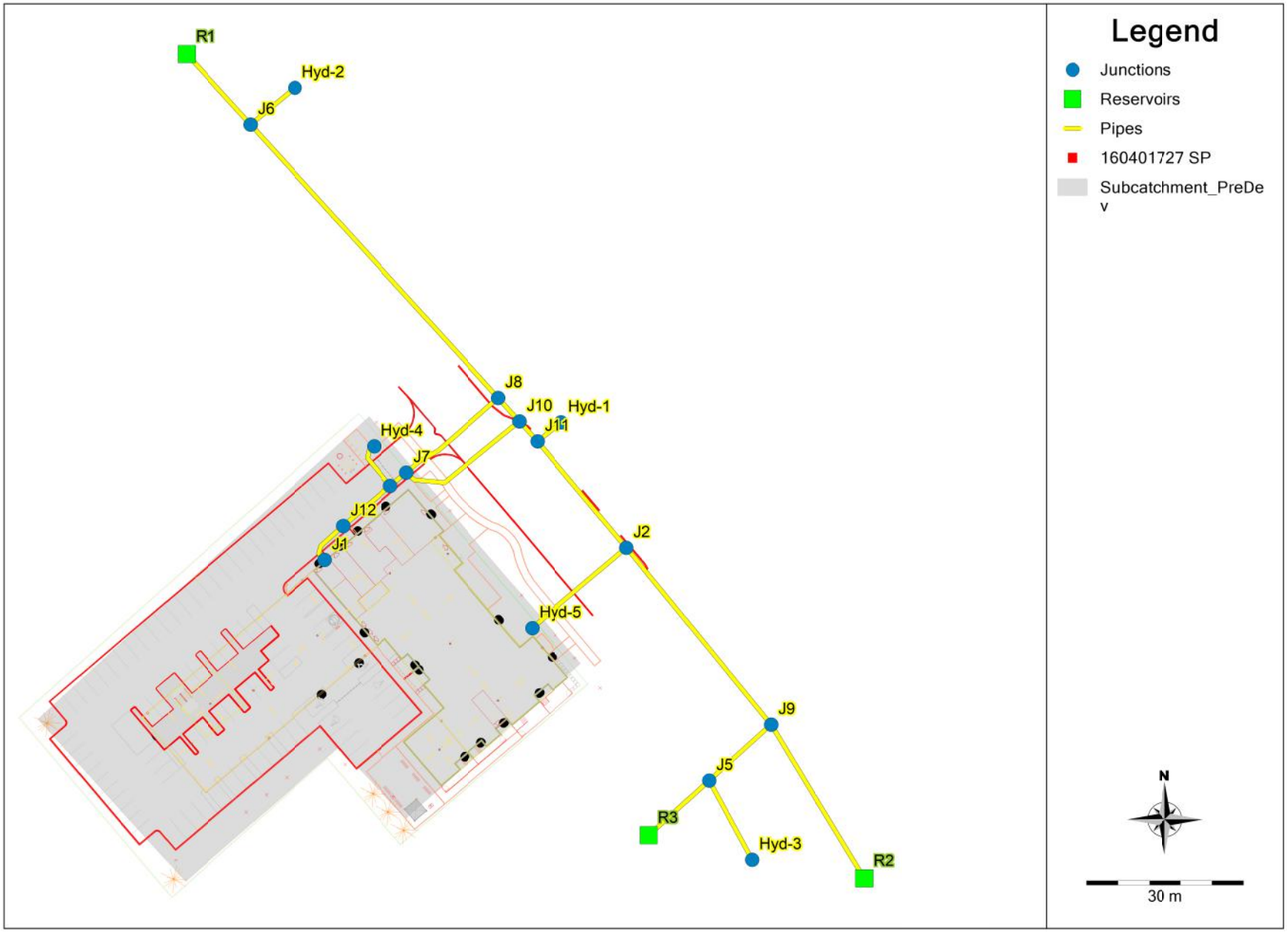
Number of Floors Not Below Ground	4
Approximate Height of One Storey (m)	3.54325
Pressure Drop Per Floor (kPa)	34.7
Pressure Drop Per Floor (psi)	5.0

RESIDUAL PRESSURE RANGE IN MULTI-LEVEL BUILDINGS			
	Residual Pressure (kPa)	**Residual Pressure (psi)**	**Outcome**
Top Floor Min	264	38	Booster Pump Required
Top Floor Max	309	45	
Maximum Number of Floors Above Ground at Minimum Pressure	2		

RESIDUAL PRESSURE FROM FIRE FLOW			
	Residual HGL (m)	**Residual Pressure (kPa)**	**Residual Pressure (psi)**
Ground Floor	24.69	242	35.1
Top Floor	14.06	138	20.0

Pressure Check		
	Pressure (kPa)	**Pressure (psi)**
Pressure Below Minimum	<138	<20
Pressure Below Normal	138-345	20-50
Pressure Within Normal Range	345-552	50-80
Pressure Above Normal Range	552-690	80-100
Pressure Above Maximum	>690	>100

A.5 WATER NETWORK MODEL AND MODEL INPUT & OUTPUT FILES


R1
Hyd-2
J6
J8
J10
Hyd-1
J11
Hyd-4
J7
J12
J1
J2
Hyd-5
J9
J5
R3
Hyd-3
R2
Legend
Junctions
Reservoirs
Pipes
160401727 SP
Subcatchment_PreDe
v
N
30 m

Max Day and Fire Flow Input

[JUNCTIONS]

;ID	Elev	Demand	Pattern
J1	118.69	1.09	
Hyd-3	117.1	63.33	
Hyd-1	117.9	95	
Hyd-2	118.4	63.34	
J6	118.3	0	
J5	116.9	0	
J9	117.1	0	
J2	117.3	0	
J7	118.2	0	
J8	117.9	0	
J10	117.85	0	
J11	117.8	0	
J3	118.35	0	
Hyd-5	118.25	95	
Hyd-4	118.48	95	
J12	118.4	0	

[RESERVOIRS]

;ID	Head	Pattern
R1	150.2	
R2	149.2	
R3	136.9	

[TANKS]

;ID	Elevation	InitLevel	MinLevel	MaxLevel	Diameter	MinVol	VolCurve	Overflow

[PIPES]

;ID	Node1	Node2	Length	Diameter	Roughness	MinorLoss	Status
C1_1	J8	J7	22.757	200	110	0	Open
C2	J6	Hyd-2	11.05	150	100	0	Open
C2_1	R1	J6	18.244	406	120	0	Open
C3	Hyd-1	J11	5.835	150	100	0	Open
C4	J5	Hyd-3	17.26	150	100	0	Open
C8	R3	J5	15.654	203	110	0	Open
C1	J10	J7	26.496	200	110	0	Open
C3_2	R2	J9	34.425	406	120	0	Open
C5_2	J5	J9	16.039	203	110	0	Open
C2_3	J8	J10	6.055	406	120	0	Open
C6	J2	Hyd-5	26.278	150	100	0	Open

C3_3 J9 J2 40.639 406 120 0 Open
C2_2 J6 J8 70.726 406 120 0 Open
C2_4 J10 J11 5.153 406 120 0 Open
C2_6 J11 J2 29.744 406 120 0 Open
C1_3 J7 J3 4.001 200 110 0 Open
C5 J3 Hyd-4 9.654 150 100 0 Open
C1_4 J3 J12 11.886 200 110 0 Open
C1_5 J12 J1 8.832 150 100 0 Open

[PUMPS]
;ID Node1 Node2 Parameters
;---------- ---------- ---------- ----------

[VALVES]
;ID Node1 Node2 Diameter Type Setting MinorLoss
;---------- ---------- ---------- ---------- ---- ---------- ----------

[DEMANDS]
;Junction Demand Pattern Category
;---------- ---------- ---------- ----------

[STATUS]
;ID Status/Setting
;---------- ----------

[PATTERNS]
;ID Multipliers
;---------- ----------

[CURVES]
;ID X-Value Y-Value
;---------- ---------- ----------

[ENERGY]
Global Efficiency 75
Global Price 0
Demand Charge 0

[EMITTERS]
;Junction Coefficient
;---------- ----------

[QUALITY]
;Node InitQual
;---------- ----------

[SOURCES]

```
;Node           Type        Quality     Pattern
;--------------- ------------ ------------ ----------------

[REACTIONS]
Order Bulk            1
Order Tank            1
Order Wall            1
Global Bulk           0
Global Wall           0
Limiting Potential    0
Roughness Correlation  0

[REACTIONS]
;Type     Pipe/Tank       Coefficient
;-------- ---------------- ----------------

[MIXING]
;Tank           Model
;---------------- ------------

[OPTIONS]
Units              LPS
Headloss           H-W
Specific Gravity   1.0
Viscosity          1.0
Trials             40
Accuracy           0.001
CHECKFREQ          2
MAXCHECK           10
DAMPLIMIT          0
Unbalanced         Continue 10
Pattern            1
Demand Multiplier  1.0
Emitter Exponent   0.5
Quality            None mg/L
Diffusivity        1.0
Tolerance          0.01

[REPORT]
Status             Full
Summary            No
Page               0

[TIMES]
Duration           03:00
Hydraulic Timestep  01:00
Quality Timestep   00:05
```

Pattern Timestep 01:00
Pattern Start 00:00
Report Timestep 01:00
Report Start 00:00
Start ClockTime 12 am
Statistic NONE

[TAGS]

[COORDINATES]
;Node X-Coord Y-Coord
;---------- ---------- ----------
J1 427269.178 5012614.8
Hyd-3 427350.606 5012556.476
Hyd-1 427314.932 5012640.603
Hyd-2 427264.478 5012705.197
J6 427255.907 5012698.228
J5 427342.532 5012571.724
J9 427354.573 5012582.311
J2 427329.133 5012613.986
J7 427285.067 5012631.343
J8 427302.886 5012645.391
J10 427306.907 5012640.869
J11 427310.33 5012637.02
J3 427281.977 5012628.803
Hyd-5 427307.469 5012602.563
Hyd-4 427278.897 5012636.413
J12 427272.792 5012621.264
R1 427243.789 5012711.858
R2 427372.044 5012552.662
R3 427330.783 5012561.388

[VERTICES]
;Link X-Coord Y-Coord
;---------- ---------- ----------
C1_1 427291.260448027 5012635.48463104
C1_1 427287.932131356 5012633.63973707
C1 427292.361704221 5012629.29947587
C1 427286.634813555 5012629.8789359
C6 427314.198146332 5012601.51304393
C3_3 427337.241675378 5012603.93277214
C3_3 427333.878624912 5012608.11003483
C3_3 427330.447254548 5012612.37715766
C5 427277.603453425 5012634.18123023
C5 427277.904005438 5012635.54659509
C1_5 427268.544974734 5012617.50200739
C1_5 427268.12023184 5012616.04574604

Max Day and Fire Flow Output

Junctions:

Name	X-Coordinate	Y-Coordinate	Elevation (m)	Base Demand	Demand Pattern
J1	427269.2	5012615	118.69	1.09	
Hyd-3	427350.6	5012556.5	117.1	63.33	
Hyd-1	427314.938	5012640.5	117.9	95	
Hyd-2	427264.469	5012705	118.4	63.34	
J6	427255.9	5012698	118.3	0	
J5	427342.531	5012571.5	116.9	0	
J9	427354.563	5012582.5	117.1	0	
J2	427329.125	5012614	117.3	0	
J7	427285.063	5012631.5	118.2	0	
J8	427302.875	5012645.5	117.9	0	
J10	427306.9	5012641	117.85	0	
J11	427310.344	5012637	117.8	0	
J3	427281.969	5012629	118.35	0	
Hyd-5	427307.469	5012602.5	118.25	95	
Hyd-4	427278.9	5012636.5	118.48	95	
J12	427272.781	5012621.5	118.4	0	

Reservoirs:

Name	X-Coordinate	Y-Coordinate	Total Head (m)	Head Pattern	Initial Quality
R1	427243.781	5012712	150.2		0
R2	427372.031	5012552.5	149.2		0
R3	427330.781	5012561.5	136.9		0

Pipes:

Name	Inlet Node	Outlet Node	Length (m)	Diameter (mm)	Roughness
C1_1	J8	J7	22.757	200	110
C2	J6	Hyd-2	11.05	150	100
C2_1	R1	J6	18.244	406	120
C3	Hyd-1	J11	5.835	150	100
C4	J5	Hyd-3	17.26	150	100
C8	R3	J5	15.654	203	110
C1	J10	J7	26.496	200	110
C3_2	R2	J9	34.425	406	120
C5_2	J5	J9	16.039	203	110
C2_3	J8	J10	6.055	406	120
C6	J2	Hyd-5	26.278	150	100
C3_3	J9	J2	40.639	406	120
C2_2	J6	J8	70.726	406	120
C2_4	J10	J11	5.153	406	120
C2_6	J11	J2	29.744	406	120
C1_3	J7	J3	4.001	200	110
C5	J3	Hyd-4	9.654	150	100
C1_4	J3	J12	11.886	200	110
C1_5	J12	J1	8.832	150	100

Junctions:

Name	Demand Category	Emitter Coefficient	Initial Quality	Source Quality
J1	1	0	0	0
Hyd-3	1	0	0	0
Hyd-1	1	0	0	0
Hyd-2	1	0	0	0
J6	1	0	0	0
J5	1	0	0	0
J9	1	0	0	0
J2	1	0	0	0
J7	1	0	0	0
J8	1	0	0	0
J10	1	0	0	0
J11	1	0	0	0
J3	1	0	0	0
Hyd-5	1	0	0	0
Hyd-4	1	0	0	0
J12	1	0	0	0

Reservoirs:

Name	Source Quality	Source Pattern	Source Type	Max. Demand
R1	0		CONCEN	-363.6
R2	0		CONCEN	-287.7
R3	0		CONCEN	238.6

Pipes:

Name	Loss Coefficient	Initial Status	Bulk Coefficient	Wall Coefficient
C1_1	0	Open	-99	-99
C2	0	Open	-99	-99
C2_1	0	Open	-99	-99
C3	0	Open	-99	-99
C4	0	Open	-99	-99
C8	0	Open	-99	-99
C1	0	Open	-99	-99
C3_2	0	Open	-99	-99
C5_2	0	Open	-99	-99
C2_3	0	Open	-99	-99
C6	0	Open	-99	-99
C3_3	0	Open	-99	-99
C2_2	0	Open	-99	-99
C2_4	0	Open	-99	-99
C2_6	0	Open	-99	-99
C1_3	0	Open	-99	-99
C5	0	Open	-99	-99
C1_4	0	Open	-99	-99
C1_5	0	Open	-99	-99

Junctions:

Name	Source Pattern	Source Type	Needed Fire Flow	Fire Flow Period
J1		CONCEN	0	
Hyd-3		CONCEN	0	
Hyd-1		CONCEN	0	
Hyd-2		CONCEN	0	
J6		CONCEN	0	
J5		CONCEN	0	
J9		CONCEN	0	
J2		CONCEN	0	
J7		CONCEN	0	
J8		CONCEN	0	
J10		CONCEN	0	
J11		CONCEN	0	
J3		CONCEN	0	
Hyd-5		CONCEN	0	
Hyd-4		CONCEN	0	
J12		CONCEN	0	

Reservoirs:

Name	Total Demand Volume	Max. Head (m)	Max. Pressure (m)	Min. Pressure (m)
R1	-5237000	150.2	0	0
R2	-4143000	149.2	0	0
R3	3436000	136.9	0	0

Pipes:

Name	Control Rules	Simple Controls	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
C1_1	NO	NO	51.83	1.65
C2	NO	NO	63.34	3.584
C2_1	NO	NO	363.6	2.809
C3	NO	NO	95	5.376
C4	NO	NO	63.33	3.584
C8	NO	NO	238.6	7.372
C1	NO	NO	44.26	1.409
C3_2	NO	NO	287.7	2.222
C5_2	NO	NO	301.9	9.328
C2_3	NO	NO	248.5	1.919
C6	NO	NO	95	5.376
C3_3	NO	NO	14.22	0.11
C2_2	NO	NO	300.3	2.32
C2_4	NO	NO	204.2	1.577
C2_6	NO	NO	109.2	0.844
C1_3	NO	NO	96.09	3.059
C5	NO	NO	95	5.376
C1_4	NO	NO	1.09	0.035
C1_5	NO	NO	1.09	0.062

Junctions:

Name	Min. Residual Pressure (m)	Max. Pipe Velocity (m/s)	Residual Fire Flow Pressure (m)
J1	0	0	-35.1
Hyd-3	0	0	0
Hyd-1	0	0	0
Hyd-2	0	0	0
J6	0	0	0
J5	0	0	0
J9	0	0	0
J2	0	0	0
J7	0	0	0
J8	0	0	0
J10	0	0	0
J11	0	0	0
J3	0	0	0
Hyd-5	0	0	0
Hyd-4	0	0	0
J12	0	0	0

Reservoirs:

Name	Max. Quality	Min. Quality	Demand
R1	0	0	-363.649
R2	0	0	-287.696
R3	0	0	238.585

Pipes:

Name	Min. |Velocity| (m/s)	Max. Headloss (m/km)	Flow
C1_1	1.65	18.69	51.834
C2	3.584	131.2	63.34
C2_1	2.809	18.65	363.649
C3	5.376	278	-95
C4	3.584	131.2	63.33
C8	7.372	293.7	-238.585
C1	1.409	13.94	44.256
C3_2	2.222	12.08	287.696
C5_2	9.328	454.3	-301.915
C2_3	1.919	9.211	248.475
C6	5.376	278	95
C3_3	0.11	0.046	-14.219
C2_2	2.32	13.08	300.309
C2_4	1.577	6.406	204.219
C2_6	0.844	2.01	109.219
C1_3	3.059	58.61	96.09
C5	5.376	278	95
C1_4	0.035	0.015	1.09
C1_5	0.062	0.071	1.09

Junctions:

Name	Available fire flow	Available Residual Pressure (m)	Critical Fire Flow Pipe
J1	192.4	14	
Hyd-3	0	0	
Hyd-1	0	0	
Hyd-2	0	0	
J6	0	0	
J5	0	0	
J9	0	0	
J2	0	0	
J7	0	0	
J8	0	0	
J10	0	0	
J11	0	0	
J3	0	0	
Hyd-5	0	0	
Hyd-4	0	0	
J12	0	0	

Reservoirs:

Name	Head	Pressure	Quality
R1	150.2	0	0
R2	149.2	0	0
R3	136.9	0	0

Pipes:

Name	Velocity	Unit Headloss	Quality
C1_1	1.65	18.686	0
C2	3.584	131.22	0
C2_1	2.809	18.648	0
C3	5.376	277.993	0
C4	3.584	131.181	0
C8	7.372	293.734	0
C1	1.409	13.944	0
C3_2	2.222	12.084	0
C5_2	9.328	454.261	0
C2_3	1.919	9.211	0
C6	5.376	277.993	0
C3_3	0.11	0.046	0
C2_2	2.32	13.083	0
C2_4	1.577	6.406	0
C2_6	0.844	2.01	0
C1_3	3.059	58.61	0
C5	5.376	277.994	0
C1_4	0.035	0.015	0
C1_5	0.062	0.071	0

Junctions:

Name	Max Fire Flow Velocity (m/s)	Max. Demand	Total Demand Volume	Max. Head (m)
J1	0	1.09	15700	148.274
Hyd-3	0	63.33	912000	139.234
Hyd-1	0	95	1368000	147.224
Hyd-2	0	63.34	912100	148.41
J6	0	0	0	149.86
J5	0	0	0	141.498
J9	0	0	0	148.784
J2	0	0	0	148.786
J7	0	0	0	148.509
J8	0	0	0	148.934
J10	0	0	0	148.879
J11	0	0	0	148.846
J3	0	0	0	148.275
Hyd-5	0	95	1368000	141.481
Hyd-4	0	95	1368000	145.591
J12	0	0	0	148.275

Reservoirs:

Name	GIS_LENGTH (m)	GIS_AREA (m²)	GIS_PARTS
R1	0	0	1
R2	0	0	1
R3	0	0	1

Pipes:

Name	Status	Setting	Reaction Rate	Friction Factor
C1_1	3	110	0	0.027
C2	3	100	0	0.03
C2_1	3	120	0	0.019
C3	3	100	0	0.028
C4	3	100	0	0.03
C8	3	110	0	0.022
C1	3	110	0	0.028
C3_2	3	120	0	0.02
C5_2	3	110	0	0.021
C2_3	3	120	0	0.02
C6	3	100	0	0.028
C3_3	3	120	0	0.03
C2_2	3	120	0	0.019
C2_4	3	120	0	0.021
C2_6	3	120	0	0.023
C1_3	3	110	0	0.025
C5	3	100	0	0.028
C1_4	3	110	0	0.048
C1_5	3	100	0	0.055

Junctions:

Name	Max. Pressure (m)	Min. Pressure (m)	Max. Quality	Min. Quality	Demand	Head
J1	29.58	29.58	0	0	1.09	148.274
Hyd-3	22.13	22.13	0	0	63.33	139.234
Hyd-1	29.32	29.32	0	0	95	147.224
Hyd-2	30.01	30.01	0	0	63.34	148.41
J6	31.56	31.56	0	0	0	149.86
J5	24.6	24.6	0	0	0	141.498
J9	31.68	31.68	0	0	0	148.784
J2	31.49	31.49	0	0	0	148.786
J7	30.31	30.31	0	0	0	148.509
J8	31.03	31.03	0	0	0	148.934
J10	31.03	31.03	0	0	0	148.879
J11	31.05	31.05	0	0	0	148.846
J3	29.92	29.92	0	0	0	148.275
Hyd-5	23.23	23.23	0	0	95	141.481
Hyd-4	27.11	27.11	0	0	95	145.591
J12	29.87	29.87	0	0	0	148.275

Reservoirs:

Name
R1
R2
R3

Pipes:

Name	GIS_LENGTH (m)	GIS_AREA (m^2)	GIS_PARTS
C1_1	22.759	0	1
C2	11.05	0	1
C2_1	18.244	0	1
C3	5.835	0	1
C4	17.26	0	1
C8	15.654	0	1
C1	26.496	0	1
C3_2	34.425	0	1
C5_2	16.039	0	1
C2_3	6.055	0	1
C6	26.278	0	1
C3_3	40.64	0	1
C2_2	70.726	0	1
C2_4	5.153	0	1
C2_6	29.744	0	1
C1_3	4.001	0	1
C5	9.647	0	1
C1_4	11.887	0	1
C1_5	8.826	0	1

Junctions:

Name	Pressure	Quality	GIS_LENGTH (m)	GIS_AREA (m²)	GIS_PARTS
J1	29.584	0	0	0	1
Hyd-3	22.134	0	0	0	1
Hyd-1	29.324	0	0	0	1
Hyd-2	30.01	0	0	0	1
J6	31.56	0	0	0	1
J5	24.598	0	0	0	1
J9	31.684	0	0	0	1
J2	31.486	0	0	0	1
J7	30.309	0	0	0	1
J8	31.034	0	0	0	1
J10	31.029	0	0	0	1
J11	31.046	0	0	0	1
J3	29.925	0	0	0	1
Hyd-5	23.231	0	0	0	1
Hyd-4	27.111	0	0	0	1
J12	29.875	0	0	0	1

Reservoirs:

Name
R1
R2
R3

Pipes:

Name
C1_1
C2
C2_1
C3
C4
C8
C1
C3_2
C5_2
C2_3
C6
C3_3
C2_2
C2_4
C2_6
C1_3
C5
C1_4
C1_5

Max Day Demand Input

[JUNCTIONS]

;ID	Elev	Demand	Pattern
J1	118.69	1.09	
Hyd-3	117.1	0	
Hyd-1	117.9	0	
Hyd-2	118.4	0	
J6	118.3	0	
J5	116.9	0	
J9	117.1	0	
J2	117.3	0	
J7	118.2	0	
J8	117.9	0	
J10	117.85	0	
J11	117.8	0	
J3	118.35	0	
Hyd-5	118.25	0	
Hyd-4	118.48	0	
J12	118.4	0	

[RESERVOIRS]

;ID	Head	Pattern
R1	156.3	
R2	156.2	
R3	156.2	

[TANKS]

;ID	Elevation	InitLevel	MinLevel	MaxLevel	Diameter	MinVol	VolCurve	Overflow

[PIPES]

;ID	Node1	Node2	Length	Diameter	Roughness	MinorLoss	Status
C1_1	J8	J7	22.757	200	110	0	Open
C2	J6	Hyd-2	11.05	150	100	0	Open
C2_1	R1	J6	18.244	406	120	0	Open
C3	Hyd-1	J11	5.835	150	100	0	Open
C4	J5	Hyd-3	17.26	150	100	0	Open
C8	R3	J5	15.654	203	110	0	Open
C1	J10	J7	26.496	200	110	0	Open
C3_2	R2	J9	34.425	406	120	0	Open
C5_2	J5	J9	16.039	203	110	0	Open
C2_3	J8	J10	6.055	406	120	0	Open
C6	J2	Hyd-5	26.278	150	100	0	Open

C3_3 J9 J2 40.639 406 120 0 Open
C2_2 J6 J8 70.726 406 120 0 Open
C2_4 J10 J11 5.153 406 120 0 Open
C2_6 J11 J2 29.744 406 120 0 Open
C1_3 J7 J3 4.001 200 110 0 Open
C5 J3 Hyd-4 9.654 150 100 0 Open
C1_4 J3 J12 11.886 200 110 0 Open
C1_5 J12 J1 8.832 150 100 0 Open

[PUMPS]
;ID Node1 Node2 Parameters
;---------- ---------- ---------- ----------

[VALVES]
;ID Node1 Node2 Diameter Type Setting MinorLoss
;---------- ---------- ---------- ---------- ---- ---------- ----------

[DEMANDS]
;Junction Demand Pattern Category
;---------- ---------- ---------- ----------

[STATUS]
;ID Status/Setting
;---------- ----------

[PATTERNS]
;ID Multipliers
;---------- ----------

[CURVES]
;ID X-Value Y-Value
;---------- ---------- ----------

[ENERGY]
Global Efficiency 75
Global Price 0
Demand Charge 0

[EMITTERS]
;Junction Coefficient
;---------- ----------

[QUALITY]
;Node InitQual
;---------- ----------

[SOURCES]

```
;Node           Type        Quality     Pattern
;--------------- ------------ ------------ ----------------

[REACTIONS]
Order Bulk            1
Order Tank            1
Order Wall            1
Global Bulk           0
Global Wall           0
Limiting Potential    0
Roughness Correlation  0

[REACTIONS]
;Type     Pipe/Tank       Coefficient
;-------- ---------------- ----------------

[MIXING]
;Tank           Model
;---------------- ------------

[OPTIONS]
Units              LPS
Headloss           H-W
Specific Gravity   1.0
Viscosity          1.0
Trials             40
Accuracy           0.001
CHECKFREQ          2
MAXCHECK           10
DAMPLIMIT          0
Unbalanced         Continue 10
Pattern            1
Demand Multiplier  1.0
Emitter Exponent   0.5
Quality            None mg/L
Diffusivity        1.0
Tolerance          0.01

[REPORT]
Status             No
Summary            No
Page               0

[TIMES]
Duration           03:00
Hydraulic Timestep  01:00
Quality Timestep   00:05
```

Pattern Timestep 01:00
Pattern Start 00:00
Report Timestep 01:00
Report Start 00:00
Start ClockTime 12 am
Statistic NONE

[TAGS]

[COORDINATES]
;Node X-Coord Y-Coord
;---------- ---------- ----------
J1 427269.178 5012614.8
Hyd-3 427350.606 5012556.476
Hyd-1 427314.932 5012640.603
Hyd-2 427264.478 5012705.197
J6 427255.907 5012698.228
J5 427342.532 5012571.724
J9 427354.573 5012582.311
J2 427329.133 5012613.986
J7 427285.067 5012631.343
J8 427302.886 5012645.391
J10 427306.907 5012640.869
J11 427310.33 5012637.02
J3 427281.977 5012628.803
Hyd-5 427307.469 5012602.563
Hyd-4 427278.897 5012636.413
J12 427272.792 5012621.264
R1 427243.789 5012711.858
R2 427372.044 5012552.662
R3 427330.783 5012561.388

[VERTICES]
;Link X-Coord Y-Coord
;---------- ---------- ----------
C1_1 427291.260448027 5012635.48463104
C1_1 427287.932131356 5012633.63973707
C1 427292.361704221 5012629.29947587
C1 427286.634813555 5012629.8789359
C6 427314.198146332 5012601.51304393
C3_3 427337.241675378 5012603.93277214
C3_3 427333.878624912 5012608.11003483
C3_3 427330.447254548 5012612.37715766
C5 427277.603453425 5012634.18123023
C5 427277.904005438 5012635.54659509
C1_5 427268.544974734 5012617.50200739
C1_5 427268.12023184 5012616.04574604

Max Day Demand Output

Junctions:

Name	X-Coordinate	Y-Coordinate	Elevation (m)	Base Demand	Demand Pattern
J1	427269.2	5012615	118.69	1.09	
Hyd-3	427350.6	5012556.5	117.1	0	
Hyd-1	427314.938	5012640.5	117.9	0	
Hyd-2	427264.469	5012705	118.4	0	
J6	427255.9	5012698	118.3	0	
J5	427342.531	5012571.5	116.9	0	
J9	427354.563	5012582.5	117.1	0	
J2	427329.125	5012614	117.3	0	
J7	427285.063	5012631.5	118.2	0	
J8	427302.875	5012645.5	117.9	0	
J10	427306.9	5012641	117.85	0	
J11	427310.344	5012637	117.8	0	
J3	427281.969	5012629	118.35	0	
Hyd-5	427307.469	5012602.5	118.25	0	
Hyd-4	427278.9	5012636.5	118.48	0	
J12	427272.781	5012621.5	118.4	0	

Reservoirs:

Name	X-Coordinate	Y-Coordinate	Total Head (m)	Head Pattern	Initial Quality
R1	427243.781	5012712	156.3		0
R2	427372.031	5012552.5	156.2		0
R3	427330.781	5012561.5	156.2		0

Pipes:

Name	Inlet Node	Outlet Node	Length (m)	Diameter (mm)	Roughness
C1_1	J8	J7	22.757	200	110
C2	J6	Hyd-2	11.05	150	100
C2_1	R1	J6	18.244	406	120
C3	Hyd-1	J11	5.835	150	100
C4	J5	Hyd-3	17.26	150	100
C8	R3	J5	15.654	203	110
C1	J10	J7	26.496	200	110
C3_2	R2	J9	34.425	406	120
C5_2	J5	J9	16.039	203	110
C2_3	J8	J10	6.055	406	120
C6	J2	Hyd-5	26.278	150	100
C3_3	J9	J2	40.639	406	120
C2_2	J6	J8	70.726	406	120
C2_4	J10	J11	5.153	406	120
C2_6	J11	J2	29.744	406	120
C1_3	J7	J3	4.001	200	110
C5	J3	Hyd-4	9.654	150	100
C1_4	J3	J12	11.886	200	110
C1_5	J12	J1	8.832	150	100

Junctions:

Name	Demand Category	Emitter Coefficient	Initial Quality	Source Quality
J1	1	0	0	0
Hyd-3	1	0	0	0
Hyd-1	1	0	0	0
Hyd-2	1	0	0	0
J6	1	0	0	0
J5	1	0	0	0
J9	1	0	0	0
J2	1	0	0	0
J7	1	0	0	0
J8	1	0	0	0
J10	1	0	0	0
J11	1	0	0	0
J3	1	0	0	0
Hyd-5	1	0	0	0
Hyd-4	1	0	0	0
J12	1	0	0	0

Reservoirs:

Name	Source Quality	Source Pattern	Source Type	Max. Demand (L/s)
R1	0		CONCEN	-52.61
R2	0		CONCEN	44.61
R3	0		CONCEN	6.907

Pipes:

Name	Loss Coefficient	Initial Status	Bulk Coefficient	Wall Coefficient
C1_1	0	Open	-99	-99
C2	0	Open	-99	-99
C2_1	0	Open	-99	-99
C3	0	Open	-99	-99
C4	0	Open	-99	-99
C8	0	Open	-99	-99
C1	0	Open	-99	-99
C3_2	0	Open	-99	-99
C5_2	0	Open	-99	-99
C2_3	0	Open	-99	-99
C6	0	Open	-99	-99
C3_3	0	Open	-99	-99
C2_2	0	Open	-99	-99
C2_4	0	Open	-99	-99
C2_6	0	Open	-99	-99
C1_3	0	Open	-99	-99
C5	0	Open	-99	-99
C1_4	0	Open	-99	-99
C1_5	0	Open	-99	-99

Junctions:

Name	Source Pattern	Source Type	Needed Fire Flow	Fire Flow Period
J1		CONCEN	0	
Hyd-3		CONCEN	0	
Hyd-1		CONCEN	0	
Hyd-2		CONCEN	0	
J6		CONCEN	0	
J5		CONCEN	0	
J9		CONCEN	0	
J2		CONCEN	0	
J7		CONCEN	0	
J8		CONCEN	0	
J10		CONCEN	0	
J11		CONCEN	0	
J3		CONCEN	0	
Hyd-5		CONCEN	0	
Hyd-4		CONCEN	0	
J12		CONCEN	0	

Reservoirs:

Name	al Demand Volum	Max. Head (m)	Max. Pressure (m)	Min. Pressure (m)
R1	-757600	156.3	0	0
R2	642400	156.2	0	0
R3	99460	156.2	0	0

Pipes:

Name	Control Rules	Simple Controls	Max. |Flow| (L/s)	Max. |Velocity| (m/s)
C1_1	NO	NO	2.817	0.09
C2	NO	NO	0	0
C2_1	NO	NO	52.61	0.406
C3	NO	NO	0	0
C4	NO	NO	0	0
C8	NO	NO	6.907	0.213
C1	NO	NO	1.727	0.055
C3_2	NO	NO	44.61	0.345
C5_2	NO	NO	6.907	0.213
C2_3	NO	NO	49.79	0.385
C6	NO	NO	0	0
C3_3	NO	NO	51.52	0.398
C2_2	NO	NO	52.61	0.406
C2_4	NO	NO	51.52	0.398
C2_6	NO	NO	51.52	0.398
C1_3	NO	NO	1.09	0.035
C5	NO	NO	0	0
C1_4	NO	NO	1.09	0.035
C1_5	NO	NO	1.09	0.062

Junctions:

Name	Min. Residual Pressure (m)	Max. Pipe Velocity (m/s)	ual Fire Flow Pressur
J1	0	0	-35.1
Hyd-3	0	0	0
Hyd-1	0	0	0
Hyd-2	0	0	0
J6	0	0	0
J5	0	0	0
J9	0	0	0
J2	0	0	0
J7	0	0	0
J8	0	0	0
J10	0	0	0
J11	0	0	0
J3	0	0	0
Hyd-5	0	0	0
Hyd-4	0	0	0
J12	0	0	0

Reservoirs:

Name	Max. Quality	Min. Quality	Demand
R1	0	0	-52.608
R2	0	0	44.611
R3	0	0	6.907

Pipes:

Name	Min. |Velocity| (m/s)	Max. Headloss (m/km)	Flow
C1_1	0.09	0.085	2.817
C2	0	0	0
C2_1	0.406	0.52	52.608
C3	0	0	0
C4	0	0	0
C8	0.213	0.416	-6.907
C1	0.055	0.034	-1.727
C3_2	0.345	0.383	-44.611
C5_2	0.213	0.416	-6.907
C2_3	0.385	0.47	49.791
C6	0	0	0
C3_3	0.398	0.5	-51.518
C2_2	0.406	0.52	52.608
C2_4	0.398	0.498	51.518
C2_6	0.398	0.5	51.518
C1_3	0.035	0.014	1.09
C5	0	0	0
C1_4	0.035	0.014	1.09
C1_5	0.062	0.072	1.09

Junctions:

Name	Available fire flow	ilable Residual Pressure	Critical Fire Flow Pipe
J1	192.4	14	
Hyd-3	0	0	
Hyd-1	0	0	
Hyd-2	0	0	
J6	0	0	
J5	0	0	
J9	0	0	
J2	0	0	
J7	0	0	
J8	0	0	
J10	0	0	
J11	0	0	
J3	0	0	
Hyd-5	0	0	
Hyd-4	0	0	
J12	0	0	

Reservoirs:

Name	Head	Pressure	Quality
R1	156.3	0	0
R2	156.2	0	0
R3	156.2	0	0

Pipes:

Name	Velocity	Unit Headloss	Quality
C1_1	0.09	0.085	0
C2	0	0	0
C2_1	0.406	0.52	0
C3	0	0	0
C4	0	0	0
C8	0.213	0.416	0
C1	0.055	0.034	0
C3_2	0.345	0.383	0
C5_2	0.213	0.416	0
C2_3	0.385	0.47	0
C6	0	0	0
C3_3	0.398	0.5	0
C2_2	0.406	0.519	0
C2_4	0.398	0.498	0
C2_6	0.398	0.5	0
C1_3	0.035	0.014	0
C5	0	0	0
C1_4	0.035	0.014	0
C1_5	0.062	0.072	0

Junctions:

Name	ire Flow Velocity	Max. Demand	tal Demand Volu	Max. Head (m)	Max. Pressure (m)
J1	0	1.09	15700	156.251	37.56
Hyd-3	0	0	0	156.206	39.11
Hyd-1	0	0	0	156.248	38.35
Hyd-2	0	0	0	156.291	37.89
J6	0	0	0	156.291	37.99
J5	0	0	0	156.206	39.31
J9	0	0	0	156.213	39.11
J2	0	0	0	156.233	38.93
J7	0	0	0	156.252	38.05
J8	0	0	0	156.254	38.35
J10	0	0	0	156.251	38.4
J11	0	0	0	156.248	38.45
J3	0	0	0	156.252	37.9
Hyd-5	0	0	0	156.233	37.98
Hyd-4	0	0	0	156.252	37.77
J12	0	0	0	156.252	37.85

Reservoirs:

Name	GIS_LENGTH (m)	GIS_AREA (m²)	GIS_PARTS
R1	0	0	1
R2	0	0	1
R3	0	0	1

Pipes:

Name	Status	Setting	Reaction Rate	Friction Factor	GIS_LENGTH (m)
C1_1	3	110	0	0.042	22.759
C2	3	100	0	0	11.05
C2_1	3	120	0	0.025	18.244
C3	3	100	0	0	5.835
C4	3	100	0	0	17.26
C8	3	110	0	0.036	15.654
C1	3	110	0	0.045	26.496
C3_2	3	120	0	0.026	34.425
C5_2	3	110	0	0.036	16.039
C2_3	3	120	0	0.025	6.055
C6	3	100	0	0	26.278
C3_3	3	120	0	0.025	40.64
C2_2	3	120	0	0.025	70.726
C2_4	3	120	0	0.025	5.153
C2_6	3	120	0	0.025	29.744
C1_3	3	110	0	0.045	4.001
C5	3	100	0	0	9.647
C1_4	3	110	0	0.046	11.887
C1_5	3	100	0	0.055	8.826

Junctions:

Name	Min. Pressure (r	Max. Quality	Min. Qualit	Demand	Head	Pressure	Quality
J1	37.56	0	0	1.09	156.251	37.561	0
Hyd-3	39.11	0	0	0	156.206	39.107	0
Hyd-1	38.35	0	0	0	156.248	38.348	0
Hyd-2	37.89	0	0	0	156.291	37.891	0
J6	37.99	0	0	0	156.291	37.991	0
J5	39.31	0	0	0	156.206	39.307	0
J9	39.11	0	0	0	156.213	39.113	0
J2	38.93	0	0	0	156.233	38.933	0
J7	38.05	0	0	0	156.252	38.052	0
J8	38.35	0	0	0	156.254	38.354	0
J10	38.4	0	0	0	156.251	38.401	0
J11	38.45	0	0	0	156.248	38.448	0
J3	37.9	0	0	0	156.252	37.902	0
Hyd-5	37.98	0	0	0	156.233	37.983	0
Hyd-4	37.77	0	0	0	156.252	37.772	0
J12	37.85	0	0	0	156.252	37.852	0

Reservoirs:

Name
R1
R2
R3

Pipes:

Name	GIS_AREA (m²)	GIS_PARTS
C1_1	0	1
C2	0	1
C2_1	0	1
C3	0	1
C4	0	1
C8	0	1
C1	0	1
C3_2	0	1
C5_2	0	1
C2_3	0	1
C6	0	1
C3_3	0	1
C2_2	0	1
C2_4	0	1
C2_6	0	1
C1_3	0	1
C5	0	1
C1_4	0	1
C1_5	0	1

Junctions:

Name	GIS_LENGTH (m)	GIS_AREA (m²	GIS_PARTS
J1	0	0	1
Hyd-3	0	0	1
Hyd-1	0	0	1
Hyd-2	0	0	1
J6	0	0	1
J5	0	0	1
J9	0	0	1
J2	0	0	1
J7	0	0	1
J8	0	0	1
J10	0	0	1
J11	0	0	1
J3	0	0	1
Hyd-5	0	0	1
Hyd-4	0	0	1
J12	0	0	1

Reservoirs:

Name
R1
R2
R3

Pipes:

Name
C1_1
C2
C2_1
C3
C4
C8
C1
C3_2
C5_2
C2_3
C6
C3_3
C2_2
C2_4
C2_6
C1_3
C5
C1_4
C1_5

Peak Hour Demand Input

[JUNCTIONS]

;ID	Elev	Demand	Pattern
J1	118.69	2.39	
Hyd-3	117.1	0	
Hyd-1	117.9	0	
Hyd-2	118.4	0	
J6	118.3	0	
J5	116.9	0	
J9	117.1	0	
J2	117.3	0	
J7	118.2	0	
J8	117.9	0	
J10	117.85	0	
J11	117.8	0	
J3	118.35	0	
Hyd-5	118.25	0	
Hyd-4	118.48	0	
J12	118.4	0	

[RESERVOIRS]

;ID	Head	Pattern
R1	156.3	
R2	156.2	
R3	156.2	

[TANKS]

;ID	Elevation	InitLevel	MinLevel	MaxLevel	Diameter	MinVol	VolCurve	Overflow

[PIPES]

;ID	Node1	Node2	Length	Diameter	Roughness	MinorLoss	Status
C1_1	J8	J7	22.757	200	110	0	Open
C2	J6	Hyd-2	11.05	150	100	0	Open
C2_1	R1	J6	18.244	406	120	0	Open
C3	Hyd-1	J11	5.835	150	100	0	Open
C4	J5	Hyd-3	17.26	150	100	0	Open
C8	R3	J5	15.654	203	110	0	Open
C1	J10	J7	26.496	200	110	0	Open
C3_2	R2	J9	34.425	406	120	0	Open
C5_2	J5	J9	16.039	203	110	0	Open
C2_3	J8	J10	6.055	406	120	0	Open
C6	J2	Hyd-5	26.278	150	100	0	Open

C3_3 J9 J2 40.639 406 120 0 Open
C2_2 J6 J8 70.726 406 120 0 Open
C2_4 J10 J11 5.153 406 120 0 Open
C2_6 J11 J2 29.744 406 120 0 Open
C1_3 J7 J3 4.001 200 110 0 Open
C5 J3 Hyd-4 9.654 150 100 0 Open
C1_4 J3 J12 11.886 200 110 0 Open
C1_5 J12 J1 8.832 150 100 0 Open

[PUMPS]
;ID Node1 Node2 Parameters
;---------- ---------- ---------- ----------

[VALVES]
;ID Node1 Node2 Diameter Type Setting MinorLoss
;---------- ---------- ---------- ---------- ---- ---------- ----------

[DEMANDS]
;Junction Demand Pattern Category
;---------- ---------- ---------- ----------

[STATUS]
;ID Status/Setting
;---------- ----------

[PATTERNS]
;ID Multipliers
;---------- ----------

[CURVES]
;ID X-Value Y-Value
;---------- ---------- ----------

[ENERGY]
Global Efficiency 75
Global Price 0
Demand Charge 0

[EMITTERS]
;Junction Coefficient
;---------- ----------

[QUALITY]
;Node InitQual
;---------- ----------

[SOURCES]

```
;Node           Type        Quality     Pattern
;--------------- ------------ ------------ ----------------

[REACTIONS]
Order Bulk            1
Order Tank            1
Order Wall            1
Global Bulk           0
Global Wall           0
Limiting Potential    0
Roughness Correlation  0

[REACTIONS]
;Type     Pipe/Tank       Coefficient
;-------- ---------------- ----------------

[MIXING]
;Tank           Model
;---------------- ------------

[OPTIONS]
Units              LPS
Headloss           H-W
Specific Gravity   1.0
Viscosity          1.0
Trials             40
Accuracy           0.001
CHECKFREQ          2
MAXCHECK           10
DAMPLIMIT          0
Unbalanced         Continue 10
Pattern            1
Demand Multiplier  1.0
Emitter Exponent   0.5
Quality            None mg/L
Diffusivity        1.0
Tolerance          0.01

[REPORT]
Status             No
Summary            No
Page               0

[TIMES]
Duration           03:00
Hydraulic Timestep  01:00
Quality Timestep   00:05
```

Pattern Timestep 01:00
Pattern Start 00:00
Report Timestep 01:00
Report Start 00:00
Start ClockTime 12 am
Statistic NONE

[TAGS]

[COORDINATES]
;Node X-Coord Y-Coord
;---------- ---------- ----------
J1 427269.178 5012614.8
Hyd-3 427350.606 5012556.476
Hyd-1 427314.932 5012640.603
Hyd-2 427264.478 5012705.197
J6 427255.907 5012698.228
J5 427342.532 5012571.724
J9 427354.573 5012582.311
J2 427329.133 5012613.986
J7 427285.067 5012631.343
J8 427302.886 5012645.391
J10 427306.907 5012640.869
J11 427310.33 5012637.02
J3 427281.977 5012628.803
Hyd-5 427307.469 5012602.563
Hyd-4 427278.897 5012636.413
J12 427272.792 5012621.264
R1 427243.789 5012711.858
R2 427372.044 5012552.662
R3 427330.783 5012561.388

[VERTICES]
;Link X-Coord Y-Coord
;---------- ---------- ----------
C1_1 427291.260448027 5012635.48463104
C1_1 427287.932131356 5012633.63973707
C1 427292.361704221 5012629.29947587
C1 427286.634813555 5012629.8789359
C6 427314.198146332 5012601.51304393
C3_3 427337.241675378 5012603.93277214
C3_3 427333.878624912 5012608.11003483
C3_3 427330.447254548 5012612.37715766
C5 427277.603453425 5012634.18123023
C5 427277.904005438 5012635.54659509
C1_5 427268.544974734 5012617.50200739
C1_5 427268.12023184 5012616.04574604

Peak Hour Demand Output

Junctions:

Name	X-Coordinate	Y-Coordinate	Elevation (m)	Base Demand	Demand Pattern
J1	427269.2	5012615	118.69	2.39	
Hyd-3	427350.6	5012556.5	117.1	0	
Hyd-1	427314.938	5012640.5	117.9	0	
Hyd-2	427264.469	5012705	118.4	0	
J6	427255.9	5012698	118.3	0	
J5	427342.531	5012571.5	116.9	0	
J9	427354.563	5012582.5	117.1	0	
J2	427329.125	5012614	117.3	0	
J7	427285.063	5012631.5	118.2	0	
J8	427302.875	5012645.5	117.9	0	
J10	427306.9	5012641	117.85	0	
J11	427310.344	5012637	117.8	0	
J3	427281.969	5012629	118.35	0	
Hyd-5	427307.469	5012602.5	118.25	0	
Hyd-4	427278.9	5012636.5	118.48	0	
J12	427272.781	5012621.5	118.4	0	

Reservoirs:

Name	X-Coordinate	Y-Coordinate	Total Head (m)	Head Pattern	Initial Quality
R1	427243.781	5012712	156.3		0
R2	427372.031	5012552.5	156.2		0
R3	427330.781	5012561.5	156.2		0

Pipes:

Name	Inlet Node	Outlet Node	Length (m)	Diameter (mm)	Roughness
C1_1	J8	J7	22.757	200	110
C2	J6	Hyd-2	11.05	150	100
C2_1	R1	J6	18.244	406	120
C3	Hyd-1	J11	5.835	150	100
C4	J5	Hyd-3	17.26	150	100
C8	R3	J5	15.654	203	110
C1	J10	J7	26.496	200	110
C3_2	R2	J9	34.425	406	120
C5_2	J5	J9	16.039	203	110
C2_3	J8	J10	6.055	406	120
C6	J2	Hyd-5	26.278	150	100
C3_3	J9	J2	40.639	406	120
C2_2	J6	J8	70.726	406	120
C2_4	J10	J11	5.153	406	120
C2_6	J11	J2	29.744	406	120
C1_3	J7	J3	4.001	200	110
C5	J3	Hyd-4	9.654	150	100
C1_4	J3	J12	11.886	200	110
C1_5	J12	J1	8.832	150	100

Junctions:

Name	Demand Category	Emitter Coefficient	Initial Quality	Source Quality
J1	1	0	0	0
Hyd-3	1	0	0	0
Hyd-1	1	0	0	0
Hyd-2	1	0	0	0
J6	1	0	0	0
J5	1	0	0	0
J9	1	0	0	0
J2	1	0	0	0
J7	1	0	0	0
J8	1	0	0	0
J10	1	0	0	0
J11	1	0	0	0
J3	1	0	0	0
Hyd-5	1	0	0	0
Hyd-4	1	0	0	0
J12	1	0	0	0

Reservoirs:

Name	Source Quality	Source Pattern	Source Type	Max. Demand
R1	0		CONCEN	-53.29
R2	0		CONCEN	44.07
R3	0		CONCEN	6.824

Pipes:

Name	Loss Coefficient	Initial Status	Bulk Coefficient	Wall Coefficient
C1_1	0	Open	-99	-99
C2	0	Open	-99	-99
C2_1	0	Open	-99	-99
C3	0	Open	-99	-99
C4	0	Open	-99	-99
C8	0	Open	-99	-99
C1	0	Open	-99	-99
C3_2	0	Open	-99	-99
C5_2	0	Open	-99	-99
C2_3	0	Open	-99	-99
C6	0	Open	-99	-99
C3_3	0	Open	-99	-99
C2_2	0	Open	-99	-99
C2_4	0	Open	-99	-99
C2_6	0	Open	-99	-99
C1_3	0	Open	-99	-99
C5	0	Open	-99	-99
C1_4	0	Open	-99	-99
C1_5	0	Open	-99	-99

Junctions:

Name	Source Pattern	Source Type	Needed Fire Flow
J1		CONCEN	0
Hyd-3		CONCEN	0
Hyd-1		CONCEN	0
Hyd-2		CONCEN	0
J6		CONCEN	0
J5		CONCEN	0
J9		CONCEN	0
J2		CONCEN	0
J7		CONCEN	0
J8		CONCEN	0
J10		CONCEN	0
J11		CONCEN	0
J3		CONCEN	0
Hyd-5		CONCEN	0
Hyd-4		CONCEN	0
J12		CONCEN	0

Reservoirs:

Name	otal Demand Volum	Max. Head (m)	Max. Pressure (m)
R1	-767300	156.3	0
R2	634600	156.2	0
R3	98260	156.2	0

Pipes:

Name	Control Rules	Simple Controls	Max. |Flow| (L/s)
C1_1	NO	NO	3.297
C2	NO	NO	0
C2_1	NO	NO	53.29
C3	NO	NO	0
C4	NO	NO	0
C8	NO	NO	6.824
C1	NO	NO	0.907
C3_2	NO	NO	44.07
C5_2	NO	NO	6.824
C2_3	NO	NO	49.99
C6	NO	NO	0
C3_3	NO	NO	50.9
C2_2	NO	NO	53.29
C2_4	NO	NO	50.9
C2_6	NO	NO	50.9
C1_3	NO	NO	2.39
C5	NO	NO	0
C1_4	NO	NO	2.39
C1_5	NO	NO	2.39

Junctions:

Name	Fire Flow Period	Min. Residual Pressure (m)	lax. Pipe Velocity (m/
J1		0	0
Hyd-3		0	0
Hyd-1		0	0
Hyd-2		0	0
J6		0	0
J5		0	0
J9		0	0
J2		0	0
J7		0	0
J8		0	0
J10		0	0
J11		0	0
J3		0	0
Hyd-5		0	0
Hyd-4		0	0
J12		0	0

Reservoirs:

Name	Min. Pressure (m)	Max. Quality	Min. Quality
R1	0	0	0
R2	0	0	0
R3	0	0	0

Pipes:

Name	Max. |Velocity| (m/s)	Min. |Velocity| (m/s)	Max. Headloss (m/km
C1_1	0.105	0.105	0.114
C2	0	0	0
C2_1	0.412	0.412	0.532
C3	0	0	0
C4	0	0	0
C8	0.211	0.211	0.408
C1	0.029	0.029	0.011
C3_2	0.34	0.34	0.374
C5_2	0.211	0.211	0.406
C2_3	0.386	0.386	0.473
C6	0	0	0
C3_3	0.393	0.393	0.489
C2_2	0.412	0.412	0.532
C2_4	0.393	0.393	0.487
C2_6	0.393	0.393	0.488
C1_3	0.076	0.076	0.06
C5	0	0	0
C1_4	0.076	0.076	0.063
C1_5	0.135	0.135	0.303

Junctions:

Name	Residual Fire Flow Pressure (m)	Available fire flow	Available Residual Pressure (m)
J1	-35.1	192.4	14
Hyd-3	0	0	0
Hyd-1	0	0	0
Hyd-2	0	0	0
J6	0	0	0
J5	0	0	0
J9	0	0	0
J2	0	0	0
J7	0	0	0
J8	0	0	0
J10	0	0	0
J11	0	0	0
J3	0	0	0
Hyd-5	0	0	0
Hyd-4	0	0	0
J12	0	0	0

Reservoirs:

Name	Demand	Head	Pressure
R1	-53.287	156.3	0
R2	44.073	156.2	0
R3	6.824	156.2	0

Pipes:

Name	Flow	Velocity	Unit Headloss
C1_1	3.297	0.105	0.114
C2	0	0	0
C2_1	53.287	0.412	0.532
C3	0	0	0
C4	0	0	0
C8	-6.824	0.211	0.408
C1	-0.907	0.029	0.011
C3_2	-44.073	0.34	0.375
C5_2	-6.824	0.211	0.406
C2_3	49.99	0.386	0.473
C6	0	0	0
C3_3	-50.897	0.393	0.489
C2_2	53.287	0.412	0.532
C2_4	50.897	0.393	0.487
C2_6	50.897	0.393	0.488
C1_3	2.39	0.076	0.06
C5	0	0	0
C1_4	2.39	0.076	0.063
C1_5	2.39	0.135	0.303

Junctions:

Name	itical Fire Flow	Pilax Fire Flow	Velocity (m/	Max. Demand	otal Demand Volum	Max. Head (m)
J1		0		2.39	34420	156.246
Hyd-3		0		0	0	156.206
Hyd-1		0		0	0	156.247
Hyd-2		0		0	0	156.29
J6		0		0	0	156.29
J5		0		0	0	156.206
J9		0		0	0	156.213
J2		0		0	0	156.233
J7		0		0	0	156.25
J8		0		0	0	156.253
J10		0		0	0	156.25
J11		0		0	0	156.247
J3		0		0	0	156.25
Hyd-5		0		0	0	156.233
Hyd-4		0		0	0	156.25
J12		0		0	0	156.249

Reservoirs:

Name	Quality	GIS_LENGTH (m)	GIS_AREA (m²)	GIS_PARTS
R1	0	0	0	1
R2	0	0	0	1
R3	0	0	0	1

Pipes:

Name	Quality	Status	Setting	Reaction Rate	Friction Factor
C1_1	0	3	110	0	0.041
C2	0	3	100	0	0
C2_1	0	3	120	0	0.025
C3	0	3	100	0	0
C4	0	3	100	0	0
C8	0	3	110	0	0.037
C1	0	3	110	0	0.05
C3_2	0	3	120	0	0.026
C5_2	0	3	110	0	0.036
C2_3	0	3	120	0	0.025
C6	0	3	100	0	0
C3_3	0	3	120	0	0.025
C2_2	0	3	120	0	0.025
C2_4	0	3	120	0	0.025
C2_6	0	3	120	0	0.025
C1_3	0	3	110	0	0.041
C5	0	3	100	0	0
C1_4	0	3	110	0	0.042
C1_5	0	3	100	0	0.049

Junctions:

Name	lax. Pressure (r	lin. Pressure (r	Max. Qualit	Min. Qualit	Demand	Head	Pressure
J1	37.56	37.56	0	0	2.39	156.25	37.556
Hyd-3	39.11	39.11	0	0	0	156.21	39.106
Hyd-1	38.35	38.35	0	0	0	156.25	38.347
Hyd-2	37.89	37.89	0	0	0	156.29	37.89
J6	37.99	37.99	0	0	0	156.29	37.99
J5	39.31	39.31	0	0	0	156.21	39.306
J9	39.11	39.11	0	0	0	156.21	39.113
J2	38.93	38.93	0	0	0	156.23	38.933
J7	38.05	38.05	0	0	0	156.25	38.05
J8	38.35	38.35	0	0	0	156.25	38.353
J10	38.4	38.4	0	0	0	156.25	38.4
J11	38.45	38.45	0	0	0	156.25	38.447
J3	37.9	37.9	0	0	0	156.25	37.9
Hyd-5	37.98	37.98	0	0	0	156.23	37.983
Hyd-4	37.77	37.77	0	0	0	156.25	37.77
J12	37.85	37.85	0	0	0	156.25	37.849

Reservoirs:

Name
R1
R2
R3

Pipes:

Name	GIS_LENGTH (m	GIS_AREA (m²)	GIS_PARTS
C1_1	22.759	0	1
C2	11.05	0	1
C2_1	18.244	0	1
C3	5.835	0	1
C4	17.26	0	1
C8	15.654	0	1
C1	26.496	0	1
C3_2	34.425	0	1
C5_2	16.039	0	1
C2_3	6.055	0	1
C6	26.278	0	1
C3_3	40.64	0	1
C2_2	70.726	0	1
C2_4	5.153	0	1
C2_6	29.744	0	1
C1_3	4.001	0	1
C5	9.647	0	1
C1_4	11.887	0	1
C1_5	8.826	0	1

Junctions:

Name	Quality	S_LENGTH (m	S_AREA (m	GIS_PARTS
J1	0	0	0	1
Hyd-3	0	0	0	1
Hyd-1	0	0	0	1
Hyd-2	0	0	0	1
J6	0	0	0	1
J5	0	0	0	1
J9	0	0	0	1
J2	0	0	0	1
J7	0	0	0	1
J8	0	0	0	1
J10	0	0	0	1
J11	0	0	0	1
J3	0	0	0	1
Hyd-5	0	0	0	1
Hyd-4	0	0	0	1
J12	0	0	0	1

Reservoirs:

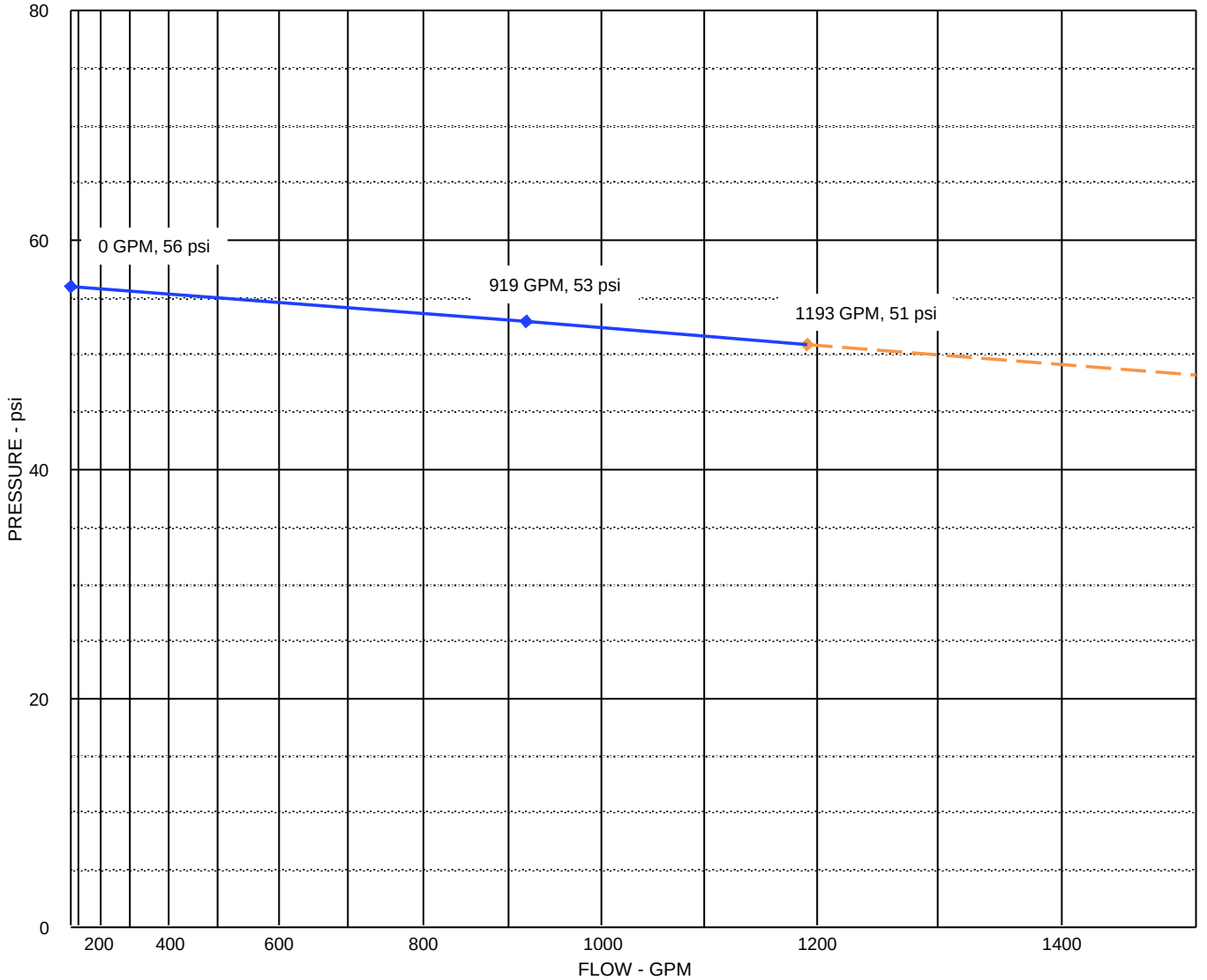
Name
R1
R2
R3

Pipes:

Name
C1_1
C2
C2_1
C3
C4
C8
C1
C3_2
C5_2
C2_3
C6
C3_3
C2_2
C2_4
C2_6
C1_3
C5
C1_4
C1_5

A.6 HYDRANT FLOW DATA – AVAILABLE WATER SUPPLY

Available Water Supply Graph



1364-1370 Stittsville Main St

Ottawa, ON

Test By

Pro-Tek Mechanical

Test Date

May 10, 2022

Results

Pressure (PSI)	Flow (GPM)
56 PSI	0 GPM
53 PSI	919 GPM
51 PSI	1193 GPM

NORRIS FIRE

Appendix B PROPOSED SITE PLAN

STITTSVILLE APARTMENT BUILDING

ADDRESS: 1364-1370 Stittsville Main St, Stittsville, ON K2S 1V4

ISSUED FOR SITE PLAN APPLICATION - 2nd SUBMISSION - JUNE 24, 2022

ARCHITECTURAL	
ASP-1	SITE PLAN-ROOF LEVEL
ASP-2	SITE PLAN-GRADE LEVEL
ASP-3	SITE PLAN-LOADING SPACE TRUCK MANEUVERING
A201	GROUND FLOOR PLAN
A301	EAST & WEST ELEVATIONS
A302	NORTH & SOUTH ELEVATIONS

CLIENT:

BAYVIEW GROUP
108 Chestnut St Toronto,
Ontario M5G 1R3, CA

Imran Gulamani,Vice-President
email: imran.gulamani@bayviewgroup.com
phone: T: 416-597-6368

ARCHITECTURAL

MATAJ ARCHITECTS INC.
418 Iroquois Shore Road, Unit 206.
Oakville, ON L6H 0X7

Eva Mataj
email: eva@matajarchitects.com
phone: 905.281.4441 ext 101

ELECTRICAL

Design Works Engineering
826 King St. N., Unit 15, Waterloo,
ON N2J 4G8

Moses Norga, P.Eng., M.Eng
email: mosesn@designworkseng.com
phone: +1 780 814 5533

LANDSCAPE:

JAMES B. LENNOX & ASSOCIATES INC.
3332 Carling Ave.
Ottawa, ON K2H 5A8

Mike Lennox
email: ml@jbla.ca
phone: 613.722.5168

CIVIL ENGINEER:

STANTEC CONSULTING LTC
400-1331 Clyde Avenue
Ottawa, ON K2C 3G4

Kris Kilborn
email: kris.kilborn@stantec.com
phone: 613.724.4337

COVER SHEET

SITE PLAN LEGEND

	PROPERTY LINE		WALL MOUNTED LIGHT FIXTURE -REFER TO ELECTRICAL DWGS
	BUILDING SETBACK LINE		RECESSED EXTERIOR LIGHT FIXTURE @ SOFFIT & PROTE COCHERE -REFER TO ELECTRICAL DWGS
	LANDSCAPE BUFFER	▨	NEW HEAVY DUTY ASPHALT PAVING (REMAINDER OF THE SITE TO RECEIVE LIGHT DUTY ASPHALT PAVING)
CD	CURB DEPRESSION		DECORATIVE NON-SLIP SURFACE PAVING UNDER PORTE COCHERE (REFER TO LANDSCAPE DWGS)
▲	ENTRY/ EXIT ACCESS POINTS		LANDSCAPED AREA
	EXISTING TOWN HYDRANT		POURED CONCRETE PAD AT LOADING AREA & WASTE COLLECTION
	PROPOSED LOCATION OF NEW FIRE HYDRANT W/ STEEL BOLLARDS -REFER TO CIVIL DWGS	●	STEEL BOLLARD (REFER TO DETAIL XX.X)
	FIRE DEPARTMENT CONNECTION	X	PARKING COUNT
	HOSE BIB (REFER TO MECHANICAL DWGS)	FRS	FIRE ROUTE SIGN TO BE POSTED UNDER DESIGNATED MUNICIPAL BYLAW 2003-499. REFER TO DETAI 2/A102
	PAD MOUNTED HYDRO TRANSFORMER W/ STEEL BOLLARDS	104.04	PROPOSED GRADING (REFER TO CIVIL DWGS)
	DOUBLE HEADED LIGHT FIXTURE ON CONCRETE BASE -REFER TO ELECTRICAL		CONDENSING UNIT ON 4" CONCRETE PAD (REFER TO MECH DWGS)
	SINGLE HEADED LIGHT FIXTURE ON CONCRETE BASE -REFER TO ELECTRICAL DWGS		SNOW STORAGE AREA (OWNER TO TAKE NECESSARY PRECAUTIONS W/ SNOW REMOVAL COMPANY)
	SINGLE HEADED LIGHT FIXTURE ON CONCRETE BASE W/ ELECTRICAL OUTLET -REFER TO ELECTRICAL DWGS		

ROOM MIX

	AREA(SQ m)	AREA(SQ ft)	1ST FLOOR	2ND FLOOR	3RD FLOOR	4TH FLOOR	TOTAL	Total	PERCENTAGE
1 BDRM TYPE A	56	602	0	3	3	3	9	25	35%
1 BDRM TYPE B	56	605	0	1	1	1	3		
1 BDRM TYPE C	57	616	1	1	1	1	4		
1 BDRM TYPE D W/DEN	64	683	0	1	1	1	3		
1 BDRM ACC	56	602	1	2	2	1	6		
2 BDRM TYPE A / 1.5 Washroom	72	775	0	1	1	1	3	46	65%
2 BDRM TYPE B / 2 Washroom	80	864	1	8	8	8	25		
2 BDRM TYPE C / 2 Washroom	93	1007	1	1	1	0	3		
2 BDRM TYPE D / 2 Washroom	79	852	0	1	1	1	3		
2 BDRM TYPE E / 1.5 Washroom	70	750	0	1	1	1	3		
2 BDRM TYPE F/ 2 Washroom	83	895	1	1	1	1	4		
2BDRM ACC	77	833	1	1	1	2	5		
TOTAL			6	22	22	21	71	71	100%
TOTAL ACC UNITS							11		15.5%

2 ROOM MIX
ASP-1 N.T.S.

CREDIT NOTES:

THIS SITEPLAN IS BASED UPONT AND MUST BE READ IN CONJUNCTION WITH THE SURVEY FOR THIS PROPERTY. MATAJ ARCHITECTS ACCEPTS NO RESPONSIBILITY FOR THE ACCURACY, OR COMPLETENESS OF THE DATA SUPPLIED AND SUCH DATA IS NOT INCLUDED UNDER SEALS OF CERTIFICATION, IF ANY.

LEGAL LAND DESCRIPTION:

PART OF LOT 23
CONCESSION 11
GEOGRAPHIC TOWNSHIP OF GOULBOURN
CITY OF OTTAWA

TOPO SURVEYORS INFO:

ONTARIO LAND SURVEYORS
ANNIS, O'SULLIVAN, VOLLEBEKK LTD
14 CONCOURSE GATE, SUITE 500
NEPEAN, ONTARIO K2E 7S6
(613) 727-0850
EMAIL: Nepean@aovltd.com

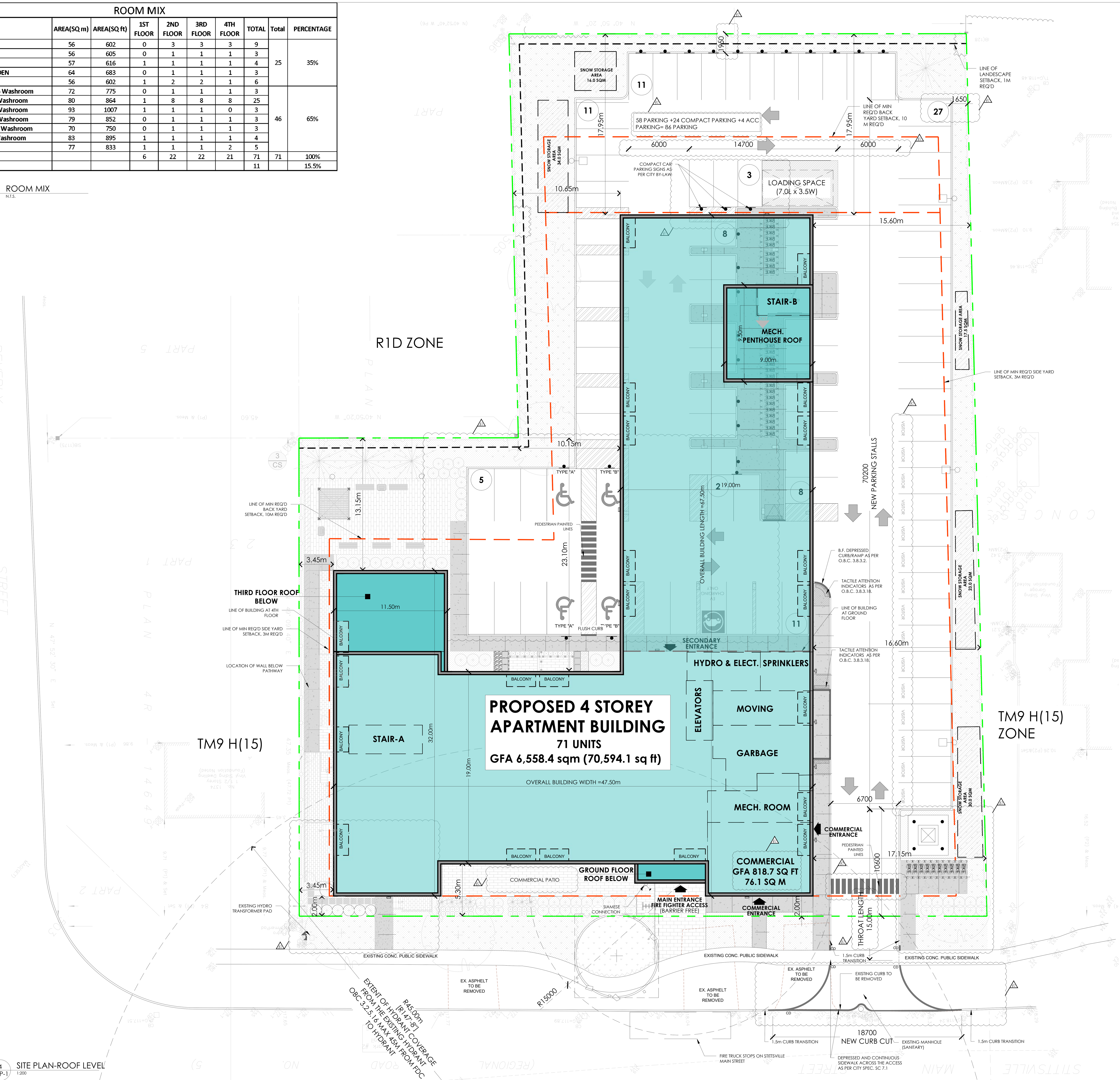
SITE PLAN- GENERAL NOTES

1. ALL EXISTING PAVEMENT, CURBS, SIDEWALKS, DRIVEWAYS AN DBOULEVARD AREAS DISTURBED BY THE CONSTRUCTION ME BE REINSTATED TO THE SATISFACTION OF THE TOWN
2. A MINIMUM SETBACK OF 1.0m FROM STREET FURNTIURE TO PROPOSED DRIVEWAYS AND SIDEWALKS SHALL BE MAINTAINED. ALL EXISTING STREET FURNITURE TO BE RELOATED BY THE CONTRACTOR/OWNER TO A SETBACK OF 1.0m. THE COST OF RELCOATION OF ANY UTILITY IS THE RESPONSIBILITY OF THE DEVELOPER/ OWNER
3. THE CONTRACTOR/ OWNER IS RESPONSIBLE FOR ALL UTILITY LOCATES AND DAMAGE/ DISTURBANCE DURING CONSTRUCTION.
4. ALL BARRIER-FREE ENTRANCES AND BARRIER FREE PATHS OF TRAVEL MUST COMPLY WITH O.B.C. 3.8.
5. THE OWNER/ CONTRACTOR SHALL SUPPLY ALL FIRE ROUTE AND BARRIER-FREE SIGNS AS SET OUT IN THE TOWN BY-LAWS AND DESIGN CRITERIA
6. ALL EXTERIOR ILLUMINATION TO BE DIRECTED DOWNWARD AS WELL AS INWARD AND DESIGNED TO MAINAIN XERO CUTOFF LIGHT DISTRIBUTION AT THE PROPERTY LINE
7. ALL DOWNSPOUTS TO BE CONNECTED TO THE STORM DRAINAGE SYSTEM
8. ALL CONDENSING UNITS TO BE SCREENED ON THE GROUND FLOOR
9. SEPARATE PERMITS ARE REQUIRED FOR ANY SIGNAGE ON THE PROPERY
10. WHERE POSSIBLE TREES ARE TO BE PROTECTED FROM CONSTRUCTION

1 SITE LOCATION
ASP-1 N.T.S.

SITE STATISTICS			
ZONING	TM9 H(15)		
	TRADITIONAL MAIN STREET ZONE		
COVERAGE CALCULATIONS	**SM**	**SF**	**ACRES**
TOTAL SITE AREA	5008.0	53905.6	1.238
BUILDING AREA	1840.7	19812.6	
Building coverage as a percentage of property area	36.75%		
COMMERCIAL AREA	76.1	818.7	
GLAZING CALCULATIONS	**SM**	**SF**	**%**
TOTAL GORUND FLOOR ELEVATION AREA	202.5		
TOTAL WINDOW AREA	81.5		40.247%
TOTAL TRANSPARENT GLAZING AREA	79.1		97.055%
SETBACKS	**REQ'D (m)**	**PROVIDED (m)**	
MAX FRONT YARD	3.0	2.00	
MIN REAR YARD	10.0	17.95	
MIN REAR 45d ANGULAR PLANE	12.85	13.15	
MIN SIDE YARD SECTION 197(3)(d)	3.0	3.45	
MIN INTERIOR SIDE,ABUTTING A RESIDENTIAL ZONE	7.5	10.15	
WIDTH OF LANDSCAPE STRIP			
(i) ABUTTING A RESIDENTIAL, MAY BE REDUCED TO 1m WHERE A MINIMUM 1.4m HIGH OPAQUE FENCE IS PROVIDED	1m	1.43m /This requirement has been met by keeping the existing cedar hedge which is playing the role of 1.4m high opaque fence.	
(ii) IN ALL OTHER CASES	NO MIN	VARIES (1.5m to 2m)	
MINIMUM WIDTH OF LANDSCAPED AREA AROUND A PARKING LOT - FOR A PARKING LOT CONTAINING MORE THAN 10 BUT FEWER THAN 100 SPACES			
(a) ABUTTING A STREET	3.0	3.135	
(b) NOT ABUTTING A STREET	1.5	1.65	
HEIGHT OF BUILDING	**MAX**	**PROVIDED**	
(MEASURED TO T/O ROOF DECK)	15m	14.173 m	
GROSS FLOOR AREA (GFA) WITHOUT BALCONIES	**SM**	**SF**	
GROUND FLOOR	1,101.54	11,856.9	
SECOND FLOOR	1,840.65	19,812.6	
THIRD FLOOR	1,840.65	19,812.6	
FOURTH FLOOR	1,753.00	18,869.1	
TOTAL GFA	6,535.8	70,351.2	
PARKING REQUIREMENTS Residential use	**REQ'D**	**PROVIDED**	
1.0 PARKING/UNIT	**71**	**71**	
REDUCED PARKING SPACES (COMPACT CARS) UP TO 50% OF THE PARKING SPACES		24	
TYPICAL PARCKING STALLS PROVIDED		43	
ACC PARKING PROVIDED		4	
VISITOR PARKING-0.2 PARKING /UNIT	**14.2**	**15**	
TOTAL NO. OF SPACES	85.2	86	
BIKE RACKS			
0.5 PARKING/UNIT	35.5	36	
Aminities REQUIREMENTS Residential use	**REQ'D**	**PROVIDED**	
6 sq m /UNIT	426	458.29	
ACCESSIBLE PARKING (CITY OF OTTAWA ACCESSIBILITY DESIGN STANDARDS)	**REQ'D**	**PROVIDED**	
76 -100 PARKING SPACES, 4 ACCESSIBLE SPACES REQ'D	4	4	
TYPE A (VAN), MIN WIDTH=3400	2	2	
TYPE B, MIN WIDTH=2400	2	2	
DRIVEWAYS AND AISLE REQUIREMENTS	**REQ'D (MIN)**	**PROVIDED**	
TWO-WAY DRIVEWAY	6.7	6.7	
TWO-WAY PARKING AISLE	6.7	6.7	
LOADING REQUIREMENTS	**REQ'D**	**PROVIDED**	
IN THE TM ZONE, A VEHICLE LOADING SPACE IS REQUIRED FOR USES THAT HAVE A GFA OF 1000 SQ M OR MORE	1	1	

2 SITE STATISTICS
ASP-1 N.T.S.



4 SITE PLAN-ROOF LEVEL
ASP-1 1:200

Project North:
True North:
Key Plan:

No.	Date:	Issue/Revision	By:
2	22/06/24	Issued for SPA - 2nd submission	AB
1	22/03/18	Issued for Site plan Application	AB

Drawing Issues/Revisions:

Note:
ALL DIMENSIONS AND INFORMATION SHOWN ON THESE DRAWINGS MUST BE CHECKED AND VERIFIED ON SITE AND ANY DISCREPANCIES REPORTED TO THE ARCHITECT PRIOR TO CONSTRUCTION AND FABRICATION OF ITS COMPONENTS. SHOULD EXISTING CONDITIONS OR SERVICES BE FOUND TO VARY FROM THAT INDICATED ON THE DRAWINGS, THE ARCHITECT MUST BE NOTIFIED IMMEDIATELY.

FEATURES OF CONSTRUCTION NOT FULLY SHOWN ARE ASSUMED TO BE THE SAME CHARACTER AS THOSE NOTED FOR SIMILAR CONDITIONS.

UNLESS SPECIFICALLY NOTED OTHERWISE ON THE DRAWINGS, NO PROVISION HAS BEEN MADE IN THE DESIGN FOR CONDITIONS OCCURRING DURING CONSTRUCTION. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE ALL NECESSARY BRACING, SHORINGS, SHEET PILING OR OTHER TEMPORARY SUPPORTS, TO SAFEGUARD ALL EXISTING OR ADJACENT STRUCTURES AFFECTED BY THIS WORK.

USE LATEST REVISED DRAWINGS. DO NOT SCALE DRAWINGS.

WORK IN PROGRESS

MATAJ ARCHITECTS INC

Architect's Stamp

MATAJ ARCHITECTS INCORPORATED
206-418 Iroquois Shore Rd
Oakville Ontario
L6H 0X7
T.905.281.4444

Project:
THE LANDING ON MAIN APARTMENT BUILDING
1364-1370 Stittsville Main St, Stittsville, ON K2S 1V4

Sheet Title:
SITE PLAN - ROOF LEVEL

Design By:	Drawn By:	Approved By:
EM	SF	EM
Scale: 1:200	Date: 22-03-25	Project No.: 21-061

Drawing No:
ASP-1

City's Application Number D07-12-22-0059
City's Plan Number:

SITE PLAN LEGEND

	PROPERTY LINE		WALL MOUNTED LIGHT FIXTURE -REFER TO ELECTRICAL DWGS
	BUILDING SETBACK LINE		RECESSED EXTERIOR LIGHT FIXTURE @ SOFFIT & PROTE COCHERE -REFER TO ELECTRICAL DWGS
	LANDSCAPE BUFFER	▨	NEW HEAVY DUTY ASPHALT PAVING (REMAINDER OF THE SITE TO RECEIVE LIGHT DUTY ASPHALT PAVING)
CD	CURB DEPRESSION		DECORATIVE NON-SLIP SURFACE PAVING UNDER PORTE COCHERE (REFER TO LANDSCAPE DWGS)
▲	ENTRY/ EXIT ACCESS POINTS		LANDSCAPED AREA
	EXISTING TOWN HYDRANT		POURED CONCRETE PAD AT LOADING AREA & WASTE COLLECTION
	PROPOSED LOCATION OF NEW FIRE HYDRANT W/ STEEL BOLLARDS -REFER TO CIVIL DWGS	●	STEEL BOLLARD (REFER TO DETAIL XX.X)
	FIRE DEPARTMENT CONNECTION	X	PARKING COUNT
	HOSE BIB (REFER TO MECHANICAL DWGS)	FRS	FIRE ROUTE SIGN TO BE POSTED UNDER DESIGNATED MUNICIPAL BYLAW 2003-499. REFER TO DETAI 2/A102
	PAD MOUNTED HYDRO TRANSFORMER W/ STEEL BOLLARDS	104.04	PROPOSED GRADING (REFER TO CIVIL DWGS)
	DOUBLE HEADED LIGHT FIXTURE ON CONCRETE BASE -REFER TO ELECTRICAL		CONDENSING UNIT ON 4" CONCRETE PAD (REFER TO MECH DWGS)
	SINGLE HEADED LIGHT FIXTURE ON CONCRETE BASE -REFER TO ELECTRICAL DWGS		SNOW STORAGE AREA (OWNER TO TAKE NECESSARY PRECAUTIONS W/ SNOW REMOVAL COMPANY)
	SINGLE HEADED LIGHT FIXTURE ON CONCRETE BASE W/ ELECTRICAL OUTLET -REFER TO ELECTRICAL DWGS		

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GEOGRAPHIC TOWNSHIP OF GOULBOURN
CITY OF OTTAWA

TOPO SURVEYORS INFO:

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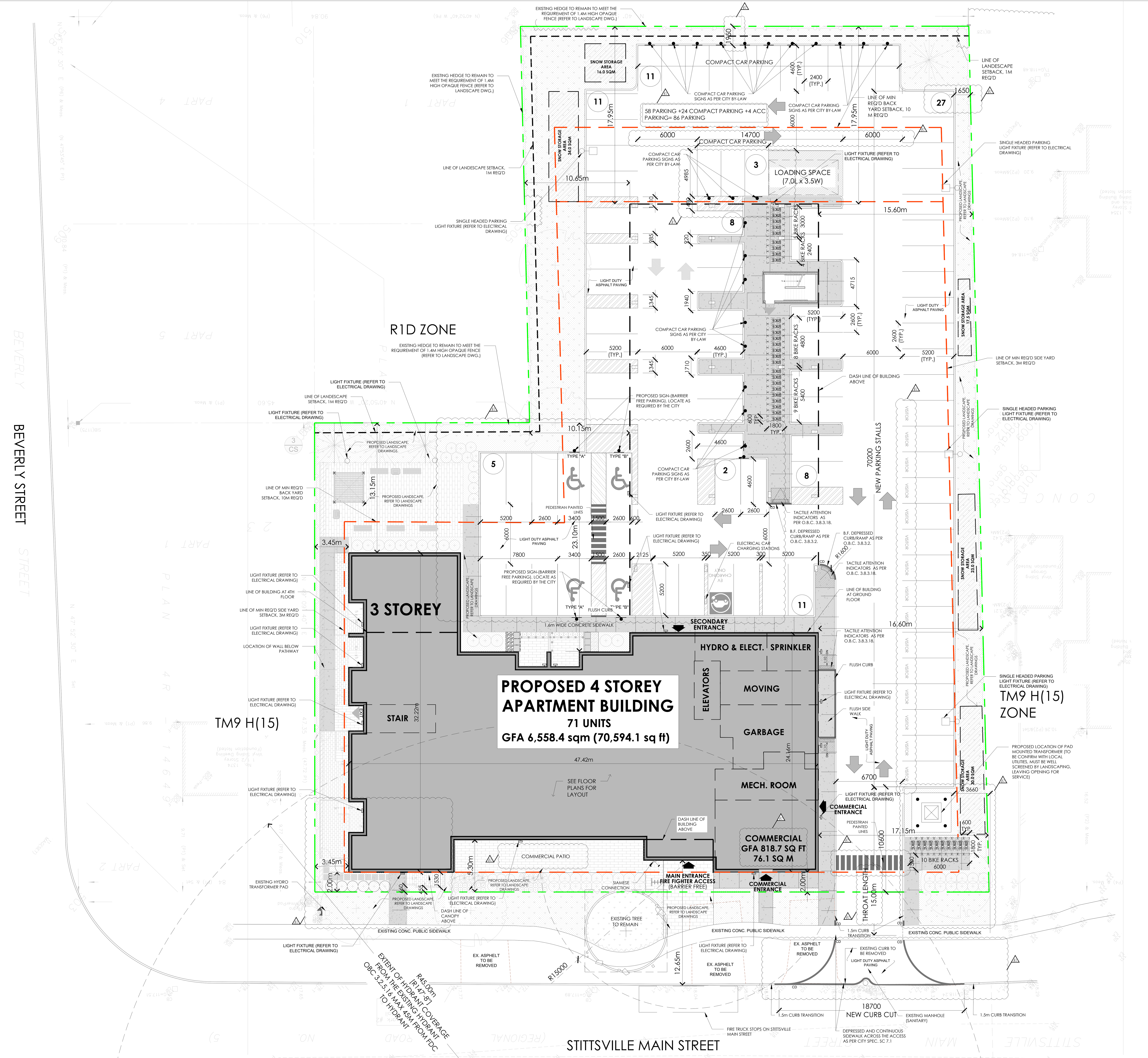
ANNIS, O'SULLIVAN, VOLLEBEKK LTD
14 CONCOURSE GATE, SUITE 500
NEPEAN, ONTARIO K2E 7S6
(613) 727-0850
EMAIL: Nepean@aovltd.com

SITE PLAN- GENERAL NOTES

1. ALL EXISTING PAVEMENT, CURBS, SIDEWALKS, DRIVEWAYS AN DBOULEVARD AREAS DISTURBED BY THE CONSTRUCTION ME BE REINSTATED TO THE SATISFACTION OF THE TOWN
2. A MINIMUM SETBACK OF 1.0m FROM STREET FURNTIURE TO PROPOSED DRIVEWAYS AND SIDEWALKS SHALL BE MAINTAINED. ALL EXISTING STREET FURNITURE TO BE RELOATED BY THE CONTRACTOR/OWNER TO A SETBACK OF 1.0m. THE COST OF RELCOATION OF ANY UTILITY IS THE RESPONSIBILITY OF THE DEVELOPER/ OWNER
3. THE CONTRACTOR/ OWNER IS RESPONSIBLE FOR ALL UTILITY LOCATES AND DAMAGE/ DISTURBANCE DURING CONSTRUCTION.
4. ALL BARRIER-FREE ENTRANCES AND BARRIER FREE PATHS OF TRAVEL MUST COMPLY WITH O.B.C. 3.8.
5. THE OWNER/ CONTRACTOR SHALL SUPPLY ALL FIRE ROUTE AND BARRIER-FREE SIGNS AS SET OUT IN THE TOWN BY-LAWS AND DESIGN CRITERIA
6. ALL EXTERIOR ILLUMINATION TO BE DIRECTED DOWNWARD AS WELL AS INWARD AND DESIGNED TO MAINAIN XERO CUTOFF LIGHT DISTRIBUTION AT THE PROPERTY LINE
7. ALL DOWNSPOUTS TO BE CONNECTED TO THE STORM DRAINAGE SYSTEM
8. ALL CONDENSING UNITS TO BE SCREENED ON THE GROUND FLOOR
9. SEPARATE PERMITS ARE REQUIRED FOR ANY SIGNAGE ON THE PROPERY
10. WHERE POSSIBLE TREES ARE TO BE PROTECTED FROM CONSTRUCTION



Project North:
True North:
Key Plan:

No.	Date:	Issue/Revision	By:
2	22/06/24	Issued for SPA - 2nd submission	AB
1	22/03/18	Issued for Site plan Application	AB

Drawing Issues/Revisions:

Note:
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WORK IN PROGRESS

MATAJ ARCHITECTS INC

Architect's Stamp

MATAJ ARCHITECTS INCORPORATED
206-418 Iroquois Shore Rd
Oakville Ontario
L6H 0X7
T.905.281.4444

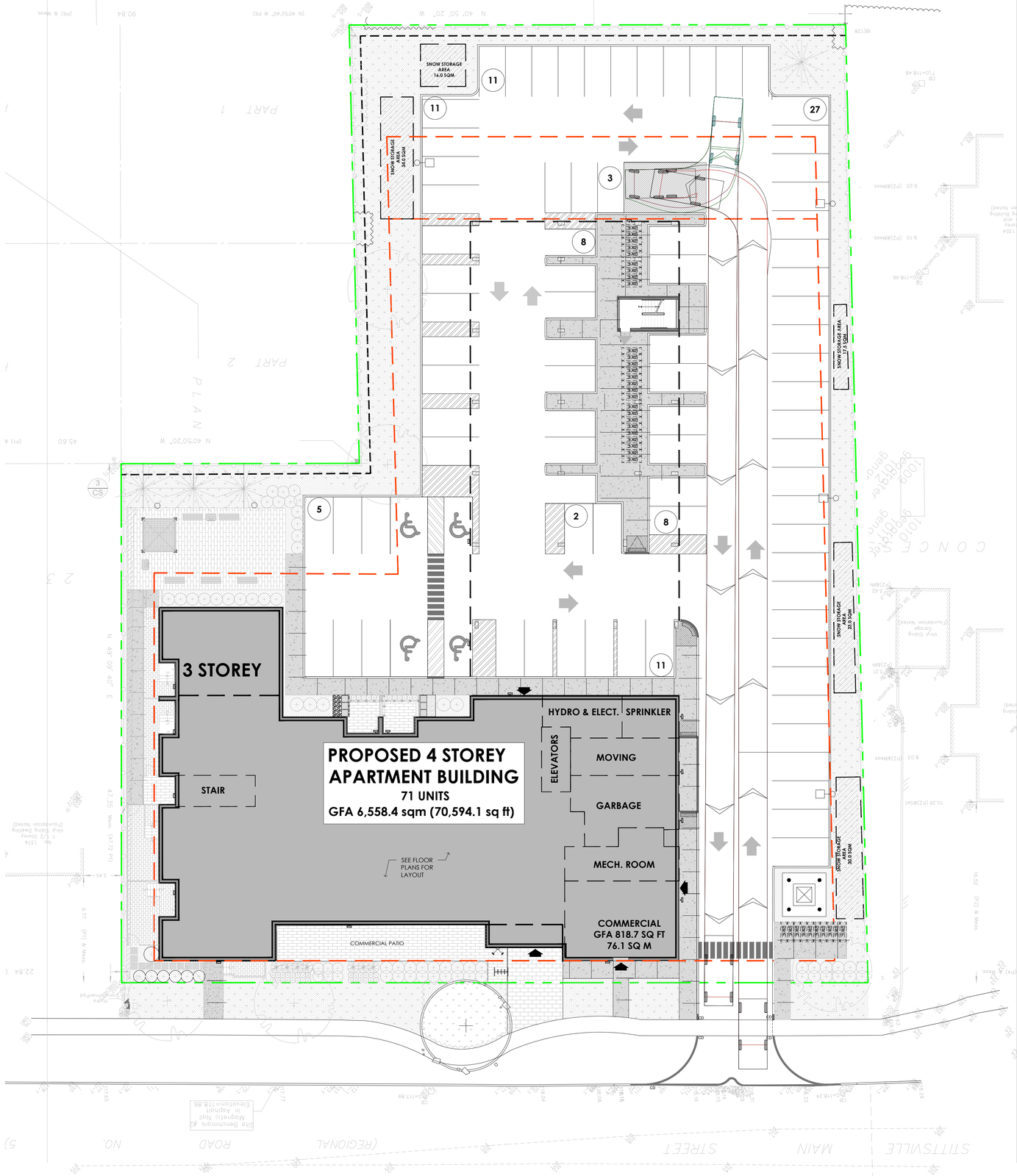
Project:
THE LANDING ON MAIN APARTMENT BUILDING
1364-1370 Stittsville Main St, Stittsville, ON K2S 1V4

Sheet Title:
SITE PLAN - GRADE LEVEL

Design By:	Drawn By:	Approved By:
EM	SF	EM
Scale: 1:200	Date: 22-02-09	Project No.: 21-061

Drawing No:
ASP-2

City's Application Number D07-12-22-0059
City's Plan Number:



Project North:	True North:

Key Plan:

No.	Date:	Issue/Revision	By:
2	22/06/24	Issued for SPA - 2nd submission	AB
1	22/03/18	Issued for Site plan Application	AB

Drawing Issues/Revisions:

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Architect's Stamp

MATAJ ARCHITECTS INCORPORATED
206-418 Iroquois Shore Rd
Oakville Ontario
L6H 0X7
T 905.281.4444

Project:

THE LANDING ON MAIN APARTMENT BUILDING

1364-1370 Stittsville Main St, Stittsville, ON K2S 1V4

Sheet Title:

SITE PLAN- LOADING SPACE TRUCK MANEUVERING

Design By:	Drawn By:	Approved By:
EM	SF	EM
Scale: 1:200	Date: 22-02-09	Project No.: 21-061

Drawing No:

ASP-3

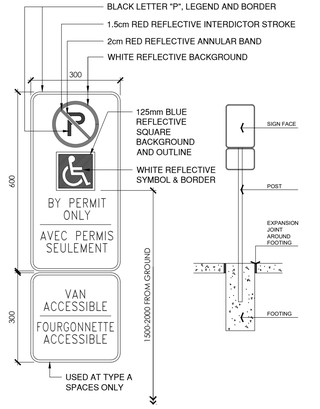
City's Application Number D07-12-22-0059
City's Plan Number:

ALL ACCESSIBLE PARKING STALLS SHALL BE DESIGNATED BY ONE SIGN PER BAY MEETING ACCESSIBILITY DESIGN STANDARDS:

- MARK WITH INTERNATIONAL SYMBOL OF ACCESSIBILITY;
- ENSURE SIZE OF 300 MM WIDE BY 600 MM HIGH (MINIMUM);
- MOUNT AT HEIGHT OF 1500 MM TO 2000 MM (CENTRE) (E.G., WALL OR POST-MOUNTED) FROM GROUND / FLOOR;
- ENSURE A HIGH TONAL CONTRAST IS PROVIDED BETWEEN SIGN AND BACKGROUND ENVIRONMENT;
- PROVIDE INFORMATION TEXT, COMPLIANT WITH CITY BY-LAW REQUIREMENTS; AND
- PROVIDE ADDITIONAL BILINGUAL SIGNAGE THAT IDENTIFIES TYPE A SPACES AS "VAN ACCESSIBLE / FOURGONNETE ACCESSIBLE".

SIGNAGE FACE:
0.064mm GAUGE ALUMINUM SIGN BLANK, WHITE BACKGROUND WITH TOP AND BOTTOM MOUNT HOLES

MOUNTING:
THE SIGN FACE MUST BE SECURED TO A POST WITH TWO GALVANIZED 12mm HEX, HEAD BOLTS AND NUTS WITH FLAT WASHERS ON BOTH SIDES



2-BARRIER FREE SIGN FACE | 3-MOUNTING DETAIL

1 ASP-3 DETAIL - BF PARKING SIGN
1:10

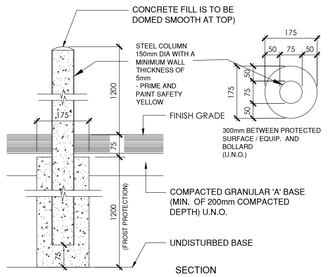
COMPACT CAR PARKING (RIGHT ARROW) | COMPACT CAR PARKING (BIDIRECTIONAL ARROW) | COMPACT CAR PARKING (LEFT ARROW)

COMPACT CAR PARKING SIGNS LOCATED AS PER SITE PLAN

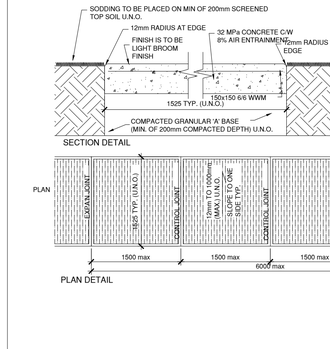
SIGNAGE FACE:
REFLECTIVE ALUMINUM, WHITE BACKGROUND WITH TOP AND BOTTOM MOUNTING HOLES

MOUNTING:
THE SIGN FACE MUST BE SECURED TO A POST WITH TWO GALVANIZED 12mm HEX, HEAD BOLTS AND NUTS WITH FLAT WASHERS ON BOTH SIDES

2 ASP-3 DETAIL - COMPACT CAR PARKING SIGN
1:10

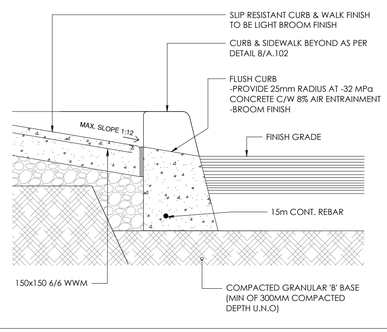


3 ASP-3 DETAIL - TYP BOLLARD
1:10

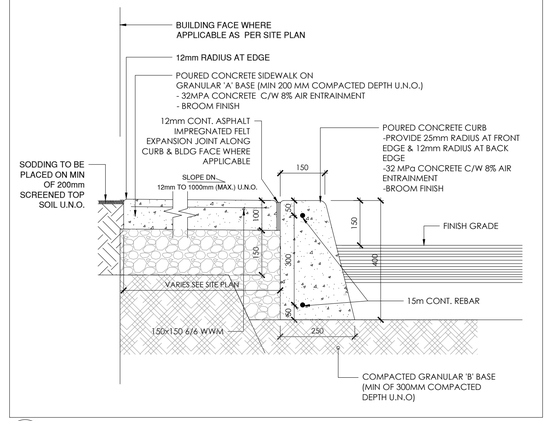


NOTE:
- EXPANSION JOINTS IN SIDEWALK ARE TO BE PROVIDED AT A MAXIMUM OF 6M APART OR AS REQUIRED.
- TRANSVERSE CONTRACTION JOINTS TO BE PROVIDED AT A MAXIMUM OF 1.5M APART OR AS REQUIRED.
- ALL CONCRETE WALKS ARE TO BE SEALED WITH 'SEALTIGHT 1220 WHITE PIGMENTED CURING COMPOUND' BY W.R. MEADOWS OR APPROVED EQUAL APPLICATION AS PER MANUFACTURE SPECIFICATIONS.

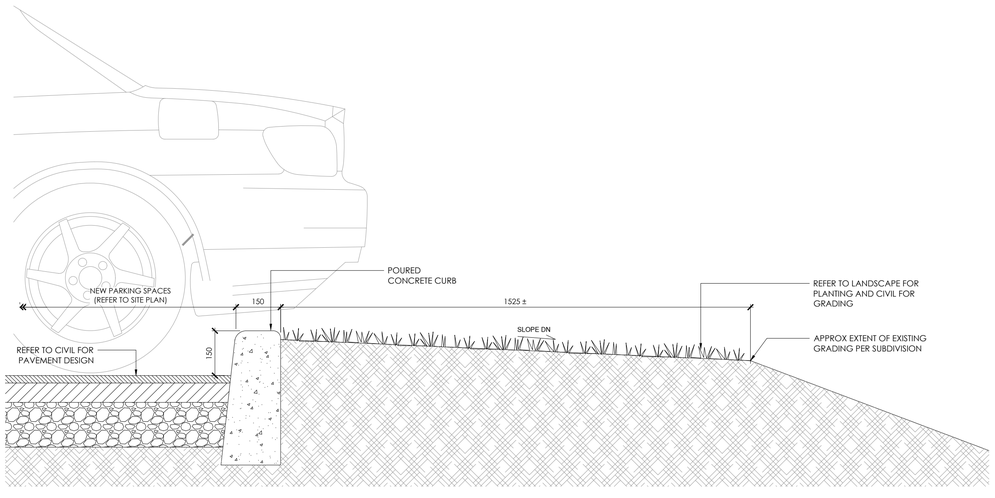
4 ASP-3 DETAIL - CONC SIDEWALK
1:10



5 ASP-3 SECTION DETAIL - FLUSH CURB @ SIDEWALK
1:10



6 ASP-3 SECTION DETAIL - CONC CURB @ SIDEWALK
1:10



7 ASP-3 DETAIL - CURB AT PARKING
1:10

Project North: | True North:

Key Plan:

No.	Date:	Issue/Revision	By:
2	22/06/24	Issued for SPA - 2nd submission	AB
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Drawing Issues/Revisions:

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WORK IN PROGRESS

MATAJ ARCHITECTS INC

Architect's Stamp

MATAJ ARCHITECTS INCORPORATED
206-418 Iroquois Shore Rd
Oakville Ontario
L6H 0X7
T.905.281.4444

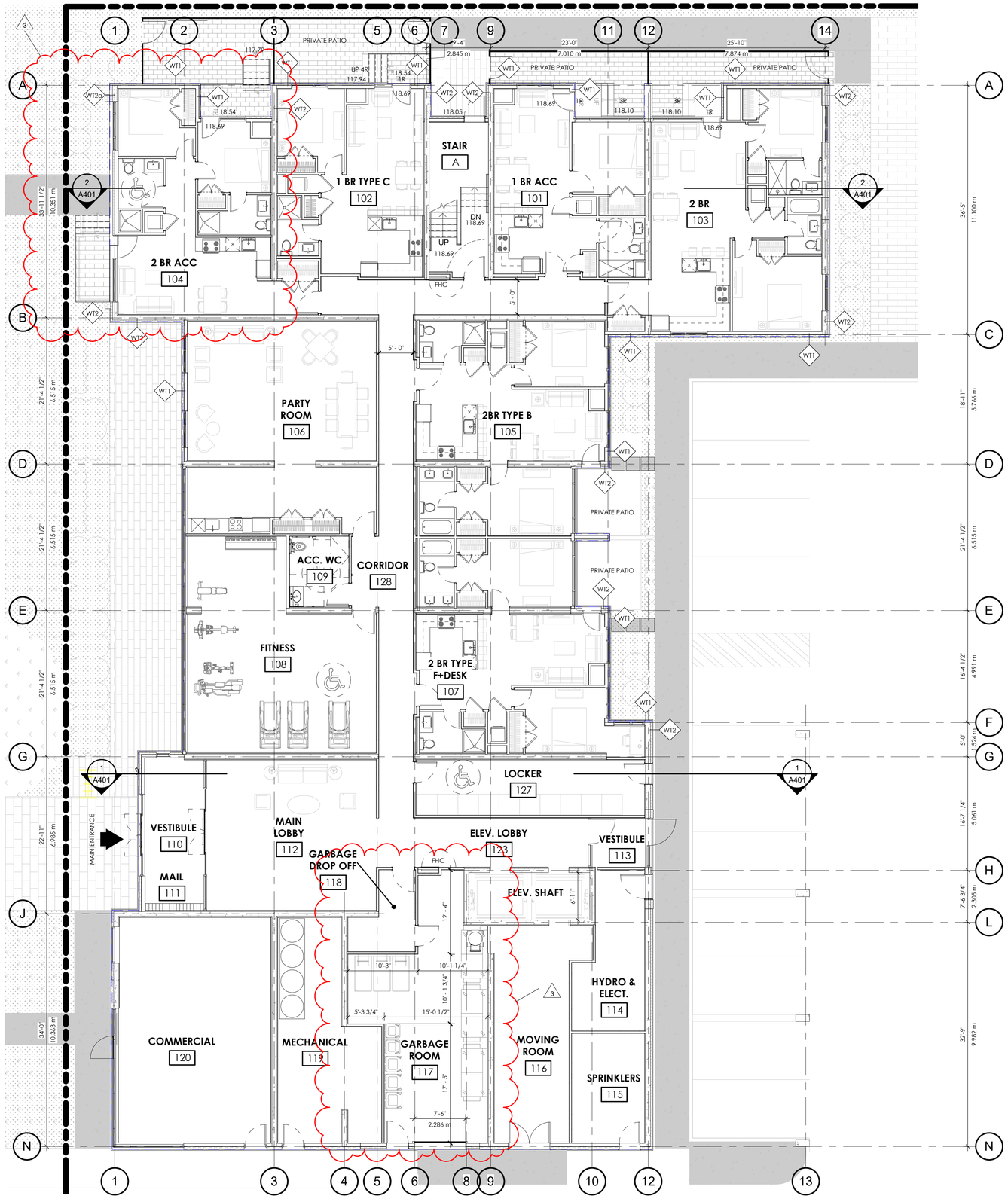
Project:
THE LANDING ON MAIN APARTMENT BUILDING
1364-1370 Stittsville Main St, Stittsville, ON K2S 1V4

Sheet Title:
SITE PLAN-DETAILS

Design By:	Drawn By:	Approved By:
EM	SF	EM
Scale: 1:10	Date: 22-03-25	Project No.: 21-061

Drawing No:
ASP-4

City's Application Number D07-12-22-0059
City's Plan Number:



Project North:	True North:

REV	DESCRIPTION	REV. DATE
3	ISSUED FOR SPA - 2nd SUBMISSION	22/06/24
2	ISSUED FOR SITE PLAN APPLICATION	22/03/18
1	ISSUED FOR COORDINATION	2021 07 -

Drawing Issues/Revisions:

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418 Iroquois Shore Road, Unit 206,
Oakville Ontario
L6H 0X7
T.905.281.4444

Project:

THE LANDING ON MAIN APARTMENT BUILDING

1364-1370 STITTSVILLE MAIN ST., STITTSVILLE, ON K2S 1V4

Sheet Title:

GROUND FLOOR PLAN

Design By:	Drawn By:	Approved By:
EM	BL/TV	EM
Scale:	Date:	Project No.:
1 : 100	22-03-25	21-061

Drawing No:

A201 Of:

City's application Number D07-12-22-0059
City's Plan Number:

NOTES:

1 - CM/BUILDER SHALL PROVIDE ACTUAL SAMPLE FINISHES ON EXTERIOR WALLS FOR OWNERSHIP APPROVAL BEFORE WORK COMMENCES ON FINAL EXTERIOR FINISHES REGARDLESS OF ARCHITECTS OR OWNERSHIPS EARLIER SAMPLE APPROVAL IN REGARDS, ESPECIALLY AS IT PERTAINS TO STUCCO COLOR SELECTIONS

2 - CM AND/OR RELATED TRADE TO SUBMIT COLOR OPTIONS FOR ALL EXTERIOR MECHANICAL LOUVERS & CAPS BEFORE BEFORE WORK IS EXECUTED ON SITE SO THAT COLOR MATCHING TO ADJACENT FINISH IS OBTAINTED.

SPECIAL INSTRUCTIONS

A	TYPICAL WALL PLANE, 0.00
B	6" PROJECTION FROM 'A'
C	2" RECCESSED FROM 'A'
D	2" PROJECTION FROM 'A'

MATERIAL LEGEND

EXTERIOR ELEVATION LEGEND

E01	EIFS - BRICK PATTERN - KENDALL CHARCOAL, BM HC-166
E02	EIFS C/W HORIZONTAL REVEALS - GREY
E03	EIFS - SANDSTONE FINISH - WHITE DOVE, BM OC 17
E04	EIFS - WOOD GRAIN - TIMBER TEAK
E05	ACM - WOOD GRAIN - TIMBER TEAK
E06	ACM - KENDALL CHARCOAL, BM HC-166
E07	GLASS GUARD RAIL
E08	WAC LIGHTING (WS-W29118), 3000K, BLACK FINISH
E10	EXPOSED CONCRETE - GREY
E11	CONTINUED LED LIGHTING-FLUSH MOUNTED LENS
E12	CONCEALED LED LINEAR LIGHT

2 A301 EAST ELEVATION (STITTSVILLE MAIN ST.)
1 : 100

HATCH DENOTES BIRD FRIENDLY GLAZING PRODUCT: AviProtek® T - TRANSPARENT BIRD FRIENDLY GLASS BY WALKER OR APPROVED EQUAL https://www.walkerglass.com/products/transparent-bird-friendly-glass

Specifications for effective visual markers:
- High colour contrast to the glass surface.
- Must be applied to the exterior (first) surface of the glass.
- Any pattern of visual marker is acceptable (i.e. lines, dots, etc.) as long as a maximum spacing of 50 mm by 50 mm is used.
- Individual marker elements should be a minimum of 4 mm diameter, or 2 mm wide by 8 mm long for linear elements.

1 A301 WEST ELEVATION (REAR)
1 : 100

REV	DESCRIPTION	REV. DATE
3	ISSUED FOR SPA - 2nd SUBMISSION	22/06/24
2	ISSUED FOR SITE PLAN APPLICATION	22/03/18
1	ISSUED FOR COORDINATION	2021 07 -

Drawing Issues/Revisions:

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Architect's Stamp

MATAJ ARCHITECTS
INCORPORATED
418 Iroquois Shore Road, Unit 206,
Oakville Ontario
L6H 0X7
T.905.281.4444

Project:
THE LANDING ON MAIN APARTMENT BUILDING
1364-1370 STITTSVILLE MAIN ST., STITTSVILLE, ON K2S 1V4

Sheet Title:
EAST & WEST ELEVATIONS

Design By:	Drawn By:	Approved By:
EM	BL	EM
Scale:	Date:	Project No.:
As indicated	22-03-25	21-061

Drawing No:
3 **A301** Of:

City's application Number D07-12-22-0059
City's Plan Number:

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SPECIAL INSTRUCTIONS

A	TYPICAL WALL PLANE, 0.00
B	6" PROJECTION FROM 'A'
C	2" RECCESSED FROM 'A'
D	2" PROJECTION FROM 'A'

2 NORTH ELEVATION
A302 1 : 100

1 SOUTH ELEVATION
A302 1 : 100

EXTERIOR ELEVATION LEGEND

E01	EIFS - BRICK PATTERN - KENDALL CHARCOAL, BM HC-166
E02	EIFS C/W HORIZONTAL REVEALS - GREY
E03	EIFS - SANDSTONE FINISH - WHITE DOVE, BM OC 17
E04	EIFS - WOOD GRAIN - TIMBER TEAK
E05	ACM - WOOD GRAIN - TIMBER TEAK
E06	ACM - KENDALL CHARCOAL, BM HC-166
E07	GLASS GUARD RAIL
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E12	CONCEALED LED LINEAR LIGHT

REV	DESCRIPTION	REV. DATE
3	ISSUED FOR SPA - 2nd SUBMISSION	22/06/24
2	ISSUED FOR SITE PLAN APPLICATION	22/03/18
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418 Iroquois Shore Road, Unit 206,
Oakville Ontario
L6H 0X7
T.905.281.4444

Project:

THE LANDING ON MAIN APARTMENT BUILDING

1364-1370 STITTSVILLE MAIN ST., STITTSVILLE, ON K2S 1V4

Sheet Title:

NORTH & SOUTH ELEVATIONS

Design By:	Drawn By:	Approved By:
EM	BL	EM
Scale: 1 : 100	Date: 22-03-25	Project No.: 21-061

Drawing No: 3 **A302** Of:

City's application Number D07-12-22-0059
City's Plan Number:

Appendix C WASTEWATER SERVICING

C.1 PRECONSULTATION WITH CITY OF OTTAWA

Pre-Application Consultation Meeting Notes

2:00pm to 3:00pm, November 2, 2021, via Microsoft Teams
Property Address: 1364 - 1370 Stittsville Main Street
File No.: PC2021-0369

Attendees:

Molly Smith – Planner, City of Ottawa
Matthew Ippersiel – Urban Designer, City of Ottawa
Mark Richardson – Planning Forester, City of Ottawa
Matthew Hayley – Environmental Planner, City of Ottawa
Abi Dieme – Infrastructure Project Manager, City of Ottawa
Neeti Paudel – Transportation Project Manager, City of Ottawa
Jeffrey Ren – Co-op Student, City of Ottawa
Sameer Gulamani – Bayview Group
Alnoor Gulamani – Bayview Group
Eric Schlange – Demarco Construction
Rod Price – Demarco Construction

Regrets:

Kersten Nitsche – Parks Planner, City of Ottawa

Applicant's Proposal:

- The applicant is proposing to develop a five-storey mid-rise rental apartment building with two levels of underground parking and a ground floor commercial unit. The exact number of apartment dwelling units and parking spaces is to be determined.

Preliminary comments and questions from staff and agencies, including follow-up actions:

Planning:

- The application will be reviewed against the recently Council approved Official Plan.
- Please review the policies and provisions that the proposed development is subject to:
    - The subject site is designated as 'Suburban (West) Transect', 'Mainstreet Corridor' with an 'Evolving Neighbourhood Overlay' in the New Official Plan
    - The subject site falls within the Stittsville Main Street Secondary Plan and is designated as 'Mainstreet' within the 'Poole Creek Precinct' in the secondary plan
    - The subject site is zoned TM9 H(15) – Traditional Mainstreet, Stittsville Main Street Subzone, Maximum Height 15 metres

- Please note that although a maximum height of 15 metres is permitted by the Zoning By-law, Section 3.1 of the Stittsville Main Street Secondary Plan and Section 198(9)(g)(i) of the Zoning By-law both stipulates that the maximum building height is four storeys for all buildings.
- Review the Secondary Plan regarding building heights - Building heights of between two to four storeys inclusive are permitted under the secondary plan policies with additional policies regarding the façade setback above the second storey and an angular plane requirement for developments abutting a residential zone.
- The angular plane provided at the rear yard is appreciated.
- Please note that an additional storey above four storeys would require an Official Plan Amendment to amend the applicable secondary plan policies; for the first two years following Minister approval of the New Official Plan, City Council has discretion under the Planning Act to not accept requests for amendment to the New Official Plan; should an Official Plan Amendment be requested, City staff will have to seek direction from Council with respect to whether any amendments or any class of amendments will be permitted during the two year period.
- Please note that the New Official Plan was approved by City Council on October 27, 2021 and is subject to review by the Ministry of Municipal Affairs and Housing; a revised version of the approved Official Plan that included approved Council motions was not available at the time of the pre-application consultation. Please review the final New Official Plan policies once they become available.
- Please note that the glazing requirements outlined under Section 198(9)(d) of the Zoning By-law do not require 80% of the façade to consist of transparent glazing – only 80% of the windows and doors that are provided must consist of transparent glazing. The provision applies to both residential and commercial uses. However, Section 197(1)(c) requires a minimum of 50% of the ground floor façade facing the main street be comprised of transparent windows and active entrances. Review the Zoning By-law Sections 197 and the TM9 Subzone in full to ensure zoning compliancy.
- The façade facing the main street must include at least one active entrance serving each residential or non-residential use occupying any part of the ground floor.
- Please ensure that any and all applicable side and rear yard provisions are being met; please note that the minimum rear yard setback is 10 metres when the rear lot line does not abut a TM9 zone.
- The subject site falls under Area C with respect to minimum parking requirements – a Mixed Use Development will require the following parking ratios:
    - 1 resident parking space per dwelling unit
    - 0.2 visitor parking spaces per dwelling unit
    - 0.5 bicycle parking spaces per dwelling unit, although a greater ratio of bicycle parking stalls would be appreciated.

- Please perform a full zoning review for the proposed development prior to submitting any applications; please include a full zoning compliance table on the submitted site plan.
- Please note that in the case of a hydro pole, the front yard setback may be 2 metres, and from a high voltage power line, the front yard setback may be 5 metres for that portion of the building affected by the high voltage power line.
- Please consider enlarging the ground floor commercial space.
- Please note that if the abutting corner lot is also purchased, placing the vehicular access off of Beverly Street is preferred over an access off of Stittsville Main Street.
- If the tree at the front of the property is evaluated to be in good health, it should be retained.
- Provided that a fifth storey is not pursued, the application will be considered Site Plan Control (Complex – Manager Approval, Public Consultation), rather than an Official Plan amendment. Please find the application form and information on fees here.
- The application will be subject to public consultation (conducted through the posting of on-site signage, the notification of community groups, and through the City of Ottawa's DevApps website); please note that the Councillor may also ask for a Community Information and Comment Session.
- Please reach out to Councillor Glen Gower (Glen.Gower@ottawa.ca) so that the Ward Councillor is aware of the plans for the site.

Please contact Development Review Planner Molly Smith (Molly.Smith@ottawa.ca) for follow-up questions.

Environmental Planning:

- Site Plan Applications: Mid to high rise residential (above 4 storeys) and medium to large scale commercial / industrial / institutional need to incorporate:
    - Bird-safe glass or integrated protection measures may be required through conditions of site plan approval for projects involving large expanses of glazing.
- If they are not going above four stories, they should be aware of the risk factors (e.g., glass and related design traps such as corner glass and fly-through conditions, ventilation grates and open pipes, landscaping, light pollution) and address they as well as they can.

From <https://ottawa.ca/en/planning-development-and-construction/developing-property/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans>

- Please note that Butternut Trees will need to be protected
- Please consider preserving tree canopies where possible to reduce the urban heat island effect.

Please contact Environmental Planner Matthew Hayley (Matthew.Hayley@ottawa.ca) for follow-up questions.

Forestry:

- Silver maple on Stittsville Main will be a challenge for removal
- City trees – sidewalk setback to retain the tree
- Professional forester recommended
- Structural RPF assessment for retention
- a Tree Conservation Report (TCR) must be supplied for review along with the suite of other plans/reports required by the City
    a. an approved TCR is a requirement of Site Plan approval.
    b. The TCR may be combined with the LP provided all information is supplied
    c. the City recommends that a Registered Professional Forester be consulted prior to submission specifically with regard to the City-owned silver maple at 1368
- As of January 1 2021, any removal of privately-owned trees 10cm or larger in diameter, or publicly (City) owned trees of any diameter requires a tree permit issued under the Tree Protection Bylaw (Bylaw 2020 – 340); the permit will be based on an approved TCR and made available at or near plan approval.
- The Planning Forester from Planning and Growth Management as well as foresters from Forestry Services will review the submitted TCR
    a. If tree removal is required, both municipal and privately-owned trees will be addressed in a single permit issued through the Planning Forester
    b. Compensation may be required for city owned trees – if so, it will need to be paid prior to the release of the tree permit
- the TCR must list all trees on site, as well as off-site trees if the CRZ extends into the developed area, by species, diameter and health condition
- please identify trees by ownership – private onsite, private on adjoining site, city owned, co-owned (trees on a property line)
- the TCR must list all trees on adjacent sites if they have a critical root zone that extends onto the development site
- If trees are to be removed, the TCR must clearly show where they are, and document the reason they cannot be retained
- All retained trees must be shown and all retained trees within the area impacted by the development process must be protected as per City guidelines available at Tree Protection Specification or by searching Ottawa.ca
    a. the location of tree protection fencing must be shown on a plan
    b. show the critical root zone of the retained trees
    c. if excavation will occur within the critical root zone, please show the limits of excavation
- the Planning Forester requests that all efforts be made to retain the City-owned silver maple – it's removal will require the City approval and this may not be forthcoming
- For more information on the process or help with tree retention options, contact Mark Richardson mark.richardson@ottawa.ca or on City of Ottawa

Landscape Plan tree planting requirements:

For additional information on the following please contact adam.palmer@Ottawa.ca

Ensure that tree planting opportunities are maximized

Minimum Setbacks

- Maintain 1.5m from sidewalk or MUP/cycle track.
- Maintain 2.5m from curb
- Coniferous species require a minimum 4.5m setback from curb, sidewalk or MUP/cycle track/pathway.
- Maintain 7.5m between large growing trees, and 4m between small growing trees. Park or open space planting should consider 10m spacing.
- Adhere to Ottawa Hydro's planting guidelines (species and setbacks) when planting around overhead primary conductors.

Tree specifications

- Minimum stock size: 50mm tree caliper for deciduous, 200cm height for coniferous.
- Maximize the use of large deciduous species wherever possible to maximize future canopy coverage
- Tree planting on city property shall be in accordance with the City of Ottawa's Tree Planting Specification; and include watering and warranty as described in the specification (can be provided by Forestry Services).
- Plant native trees whenever possible
- No root barriers, dead-man anchor systems, or planters are permitted.
- No tree stakes unless necessary (and only 1 on the prevailing winds side of the tree)

Hard surface planting

- Curb style planter is highly recommended
- No grates are to be used and if guards are required, City of Ottawa standard (which can be provided) shall be used.
- Trees are to be planted at grade

Soil Volume

- Please ensure adequate soil volumes are met:

Tree Type/Size	Single Tree Soil Volume (m3)	Multiple Tree Soil Volume (m3/tree)
Ornamental	15	9
Columnar	15	9
Small	20	12
Medium	25	15
Large	30	18
Conifer	25	15

Please note that these soil volumes are not applicable in cases with Sensitive Marine Clay.

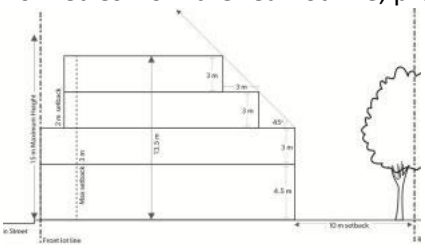
Sensitive Marine Clay

- Please follow the City's 2017 Tree Planting in Sensitive Marine Clay guidelines

Please contact Planning Forester Mark Richardson (Mark.Richardson@ottawa.ca) for follow-up questions.

Urban Design:

- Stittsville Main Secondary Plan and Community Design Plan apply
- Please reference the Stittsville Main Street Community Design Plan (SMS CDP) and Secondary Plan (SP) to help inform the design of the building as the design progresses. The architectural directions in the CDP should guide the building design as closely as possible.
- This property is located in the Stittsville Main Design Priority Area. These are areas in the city where the new Official Plan anticipates design excellence and a high-quality public realm treatment to be achieved.
- It is strongly recommended that the fifth floor of the building be eliminated. The Stittsville Main Street CDP and SP envision the street as having a maximum 15m and four storeys.
- This property is located in the Poole Creek Precinct in the SMS CDP. The plan explores the means to achieve a stronger main street environment in this precinct.
- Per the direction of the CDP, a 2-metre step back of the floors above the second storey is required on the front facade.
- Please demonstrate that the proposal is properly adhering to angular plane requirements in the rear of the property. (No part of a building on a lot with a rear lot line abutting a residential zone may project above a 45 degree angular plane measured at a height of 7.5 metres from a point 10 metres from the rear lot line, projecting upwards towards the front lot line).



- It is strongly recommended that non-residential units be integrated into the ground floor fronting on the Main Street in order to promote an active pedestrian environment and the social and economic role of Stittsville Main Street. This is the vision of the SMS CDP and SP.
- The ground floor floor-to-ceiling height should be raised to an appropriate height to support non-residential uses.
- Should the provision of retail at grade not be possible, consider the following:
    - Heighten the ground floor to an appropriate floor-to-ceiling height for retail, regardless of use, and design the ground floor with flexibility in mind to facilitate the eventual conversion of the units to a non-residential use. As the street evolves and market conditions change, retail may one day become desirable.
    - Dedicate a greater amount of the ground floor fronting the mainstreet to the amenity space to provide animation on the street.
    - Consider live-work units for the portion of the building fronting onto Stittsville Main.

    - Set the building back from the front property line to provide space for a landscaping treatment. Per the direction of the SP, a stepback above the second floor would not be required in this case.
- Please be aware that a Public Realm Plan is currently underway along Stittsville Main Street and the public right-of-way abutting this property falls within the study area. For more information on the project and to stay informed on updates, please reference the project website.
- As currently proposed (at five storeys), a Formal Review with the City's Urban Design Review Panel (UDRP) is required. Please contact the Panel Coordinator to schedule the meeting. Providing them with an early "heads-up" on which meeting is being targeted, once it is known, is recommended. A full list of upcoming panel meeting dates, submission deadlines and other information can be found on the UDRP website.
- Please take note that a proposed four-storey building on this property would not be subject to UDRP review.
- An Urban Design Brief is required as a part of your submission. This may be combined with your Planning Rationale report. Please refer to the attached Urban Design Brief Terms of Reference to inform the content of the brief.
- Councillor Gower is looking to revitalize Stittsville Mainstreet.

Please contact Urban Designer Matthew Ippersiel (Matthew.Ippersiel@ottawa.ca) for follow-up questions.

Transportation:

- Follow Traffic Impact Assessment Guidelines
    - If the site does not meet the site generation trigger based on the new TRANS trip manual – less than 60 person trips, module 4.5-4.9 may be exempted.
    - Applicant advised that their application will not be deemed complete until the submission of the draft step 1-4, including the functional draft RMA package (if applicable) and/or monitoring report (if applicable). Collaboration and communication between development proponents and City staff are required at the end of every step of the TIA process.
    - Request base mapping asap if RMA is required. Contact Engineering Services (https://ottawa.ca/en/city-hall/planning-and-development/engineering-services)
- The ROW protection along Stittsville Main is 23m and is protected for this site.
- Noise Impact Studies required for the following:
    - Road
    - Stationary (if there will be any exposed mechanical equipment due to the proximity to neighbouring noise sensitive land uses)
- The proposed access on Stittsville main is very close to the intersection and will not be supported. Please ensure the access is moved as far as possible. Minimum corner clearance per TAC guidelines is 70 m from the intersection.
- An update to the TRANS Trip Generation Manual has been completed (October 2020). This manual (attached) is to be utilized for this TIA.
- On site plan:
    - Show all details of the roads abutting the site up to and including the opposite curb; include such items as pavement markings, accesses and/or sidewalks.

    - Turning templates will be required for all accesses showing the largest vehicle to access the site; required for internal movements and at all access (entering and exiting and going in both directions).
    - Show all curb radii measurements; ensure that all curb radii are reduced as much as possible
    - Show lane/aisle widths.
- As the site proposed is residential, AODA legislation applies for all areas accessible to the public (i.e. outdoor pathways, parking, etc.). Consider using the City's Accessibility Design Standards.
- Access is close to intersection – 14/15 metres proposed whereas TAC requires 70 metres; Beverly Street would require 55 metres and would be preferred

Please contact Transportation Project Manager Neeti Paudel (Neeti.Paudel@ottawa.ca) for follow-up questions.

Infrastructure:

Infrastructure Information – All existing and proposed utilities (municipal pipes) must be shown on the servicing plans

Water:

District Plan No.3W

Verify with ROW Approvals Unit if frontage charges apply ($190.00 per metre) ☒ **Yes** ☐ **No**

The frontage charge is the charge payable by any person applying for a water service connection permit to one of the ROC (Region of Ottawa) financed watermains, based on the frontage of the property to which the service is to be provided. The frontage charge is payable **before the service connection is approved and constructed**. Frontage charges are applicable to all watermains installed after January 1, 1969."

Connection point: 406mm DI watermain on Stittsville main

Submission documents must include:

- Boundary conditions (civil consultant to request boundary conditions from the City's assigned Project Manager, Development Review). Water boundary conditions request must include the location of the service and the expected loads required by the proposed development. Please provide all the following information:
  - Location of service (show on a plan or map)
  - Type of development and the amount of fire flow required.
  - Average daily demand: ___ l/s.
  - Maximum daily demand: ___l/s.
  - Maximum hourly daily demand: ___ l/s.
  - Supporting Calculations for all demands listed above and required fire flow per Ontario Building Code or Fire Underwriter Surveys if fire flow is greater than 9000 L/min.
- Watermain system analysis demonstrating adequate pressure per section 4.2.2 of the Water Distribution Guidelines.
- Fire protection (Fire demand, Hydrant Locations). A hydrant coverage table and map demonstrating adequate fire protection shall be included. Please review Technical Bulletin ISTB-2018-02, Appendix I table 1 – maximum flow to be considered from a given hydrant

- Proposed emergency route (to be satisfactory to Fire Services)

Further note that:

- Residential buildings with a basic day demand greater than 50 m3/day shall be connected with a minimum of two water services, separated by an isolation valve, to avoid the creation of a vulnerable service area
- A water meter sizing questionnaire (water data card) will have to be completed prior to receiving a water permit (water card will be provided post approval)

Sanitary:

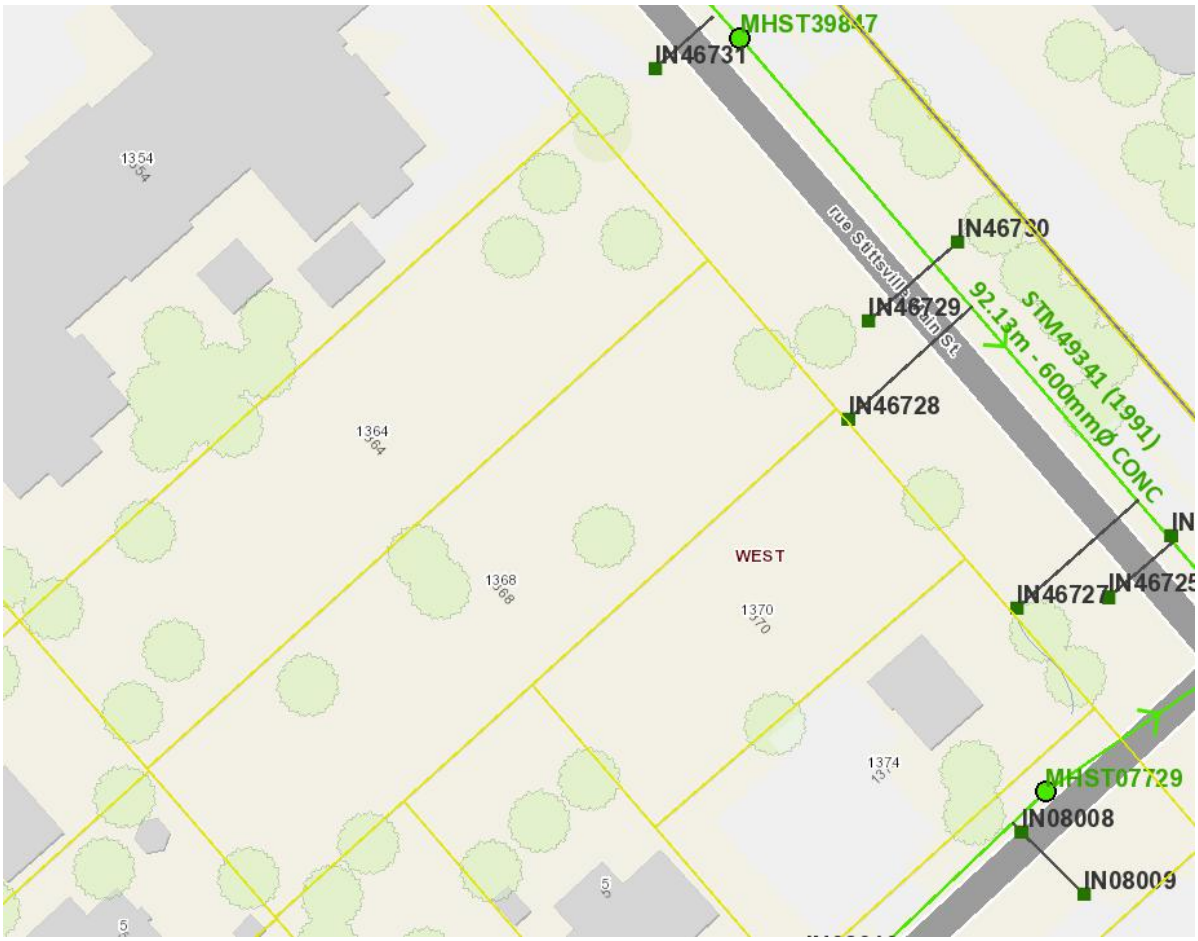
Connection Point: 300mm sanitary main on Stittsville main

Is a monitoring manhole required on private property? ☒ **Yes** ☐ **No**

- Provide an analysis to demonstrate that there is adequate residual capacity in the receiving and downstream wastewater system to accommodate the proposed development
- Please apply the wastewater design flow parameters in Technical Bulletin PIEDTB-2018-01.

Storm:

Connection Point**:** 600mm storm sewer on Stittsville Main St.



Stormwater Management:

- Quality Control:
  Mississippi Valley Conservation Authority to provide criteria.
- Quantity Control:
  - Design storm for receiving sewer: 5-year design storm
  - Runoff coefficient (C): C=0.5 or C=pre-development, whichever is less
  - Time of concentration (Tc): To be calculated, min Tc=10mins
  - Allowable flow rate: Control the 100-year event to the 5-year event
- Please see full infrastructure comments in email attachment.

Please contact Infrastructure Project Manager Abi Dieme (Abibatou.Dieme@ottawa.ca) for follow-up questions.

Parks:

- Pursuant to Section 3 and Section 10(1) Parkland Dedication By-law 2009-05, as amended, cash-in-lieu of parkland shall be paid by the Owner at the time of Site Plan Agreement registration.

Please contact Parks Planner Kersten Nitsche (Kersten.Nitsche@ottawa.ca) for follow-up questions.

MVCA (Mississippi Valley Conservation Authority):

MVCA will review the proposed stormwater management for the development.

- The development is located in a high groundwater recharge area according to the Carp River Watershed Subwatershed Study, which requires an annual infiltration target of 262 mm/yr.
- Poole Creek is a cool water system therefore temperature mitigation will be an important consideration.
- An enhanced level of protection (80% TSS removal) is required for water quality control.
- Poole Creek is a part of the City Stream Watch program, more information about the creek is available on our website.
- Details regarding the Upper Poole Creek Restoration Plan are also available on our website.

Other

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

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

Please do not hesitate to contact me if you have any questions.

Regards,
Molly Smith

Planner II / Urbaniste II
Development Review West / Examen des demandes d'aménagement ouest
City of Ottawa / Ville d'Ottawa
613.580.2424 ext. 25910
ottawa.ca/planning / ottawa.ca/urbanisme

C.2 SANITARY SEWER CALCULATION SHEET

Stantec

SUBDIVISION:

STITTSVILLE APARTMENTS 1364
STITTSVILLE MAIN STREET

DATE: 3/25/2022
REVISION: 1
DESIGNED BY: MJS
CHECKED BY: PM

SANITARY SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160401727

DESIGN PARAMETERS

MAX PEAK FACTOR (RES.)=	4.0	AVG. DAILY FLOW / PERSON	280 l/p/day	MINIMUM VELOCITY	0.60 m/s
MIN PEAK FACTOR (RES.)=	2.0	COMMERCIAL	28,000 l/ha/day	MAXIMUM VELOCITY	3.00 m/s
PEAKING FACTOR (INDUSTRIAL):	2.4	INDUSTRIAL (HEAVY)	55,000 l/ha/day	MANNINGS n	0.013
PEAKING FACTOR (ICI >20%):	1.5	INDUSTRIAL (LIGHT)	35,000 l/ha/day	BEDDING CLASS	B
PERSONS / SINGLE	3.4	INSTITUTIONAL	28,000 l/ha/day	MINIMUM COVER	2.50 m
PERSONS / TOWNHOME	2.7	INFILTRATION	0.33 l/s/Ha	HARMON CORRECTION FACTOR	0.8
PERSONS / APARTMENT	1.8				

LOCATION			RESIDENTIAL AREA AND POPULATION									COMMERCIAL		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		GREEN / UNUSED		C+I+I	INFILTRATION			TOTAL	PIPE							
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA	SINGLE	UNITS TOWN	APT	POP.	CUMULATIVE AREA	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	PEAK FLOW	TOTAL AREA	ACCU. AREA	INFILT. FLOW	FLOW	LENGTH	DIA	MATERIAL	CLASS	SLOPE	CAP. (FULL)	CAP. V PEAK FLOW	VEL. (FULL)	VEL. (ACT.)
			(ha)					(ha)			(l/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(l/s)	(ha)	(ha)	(l/s)	(l/s)	(m)	(mm)			(%)	(l/s)	(%)	(m/s)	(m/s)
R2A	BLDG SAN	2	0.20	0	0	0	132	0.20	132	3.57	1.5	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.20	0.20	0.1	1.6	4.7	150	PVC	DR 28	1.00	15.3	**10.41%**	0.86	0.46
G2A	2	1	0.00	0	0	0	0	0.20	132	3.57	1.5	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.30	0.0	0.30	0.51	0.2	1.7	14.6	200	PVC	SDR 35	2.00	47.3	**3.59%**	1.49	0.59
	1	EX 290	0.00	0	0	0	0	0.20	132	3.57	1.5	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.0	0.00	0.51	0.2	1.7	10.2	200	PVC	SDR 35	2.00	47.3	**3.59%**	1.49	0.59
																												200							

Appendix D STORMWATER SERVICING AND MANAGEMENT

D.1 STORMTECH STORAGE STAGING CURVE

Project: **1364-1370 Stittsville Main Street**

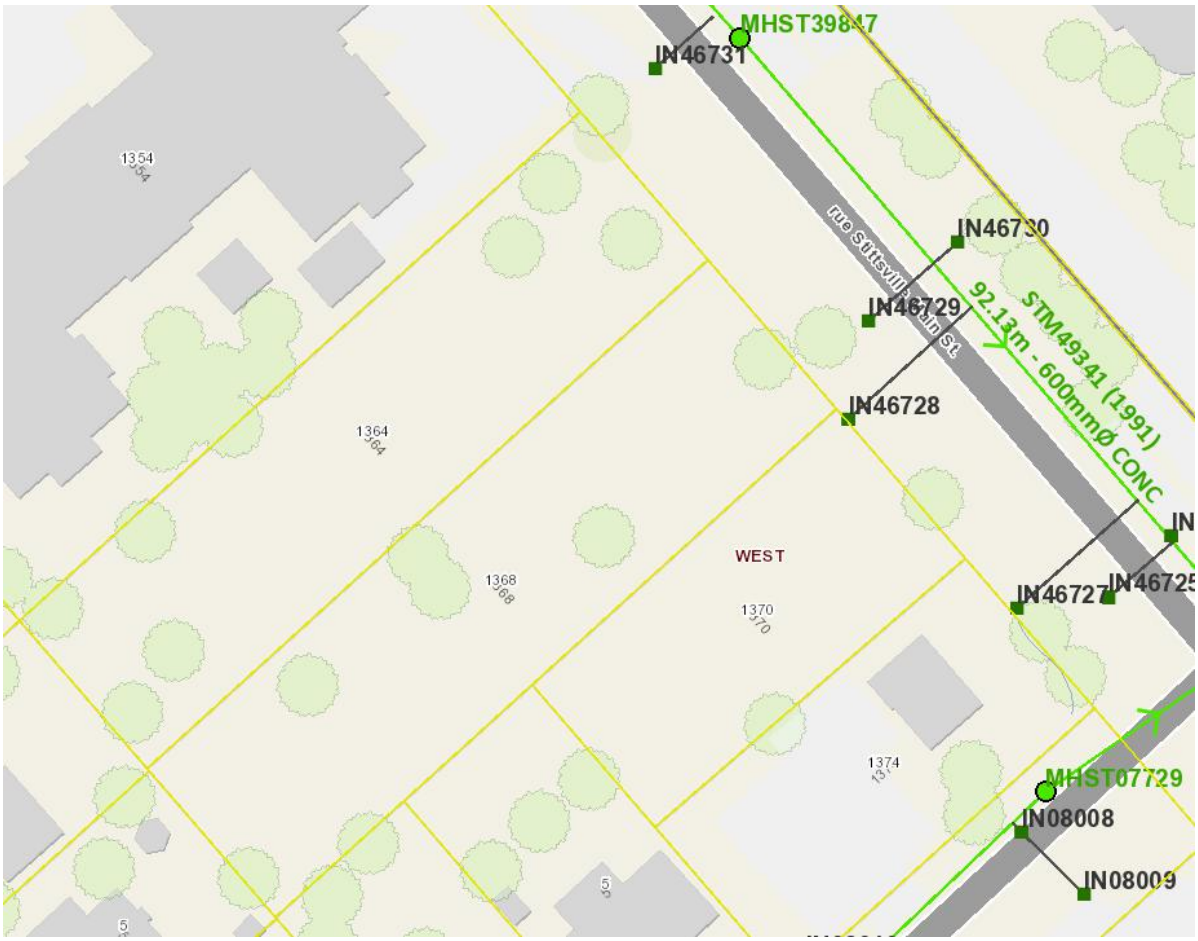
Chamber Model -	MC-3500	
Units -	**Metric**	
Number of Chambers -	20	
Number of End Caps -	10	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	115.90	m
Amount of Stone Above Chambers -	305	mm
Amount of Stone Below Chambers -	229	mm

125.32 sq.meters Min. Area - 107.17 sq.meters

StormTech MC-3500 Cumulative Storage Volumes

Height of System *(mm)*	Incremental Single Chamber *(CUBIC METERS)*	Incremental Single End Cap *(CUBIC METERS)*	Incremental Chambers *(CUBIC METERS)*	Incremental End Cap *(CUBIC METERS)*	Incremental Stone *(CUBIC METERS)*	Incremental Ch, EC and Stone *(CUBIC METERS)*	Cumulative System *(CUBIC METERS)*	Elevation *(METERS)*
1676	0.00	0.00	0.00	0.00	1.273	1.27	123.89	117.58
1651	0.00	0.00	0.00	0.00	1.273	1.27	122.62	117.55
1626	0.00	0.00	0.00	0.00	1.273	1.27	121.35	117.53
1600	0.00	0.00	0.00	0.00	1.273	1.27	120.08	117.50
1575	0.00	0.00	0.00	0.00	1.273	1.27	118.80	117.47
1549	0.00	0.00	0.00	0.00	1.273	1.27	117.53	117.45
1524	0.00	0.00	0.00	0.00	1.273	1.27	116.26	117.42
1499	0.00	0.00	0.00	0.00	1.273	1.27	114.99	117.40
1473	0.00	0.00	0.00	0.00	1.273	1.27	113.71	117.37
1448	0.00	0.00	0.00	0.00	1.273	1.27	112.44	117.35
1422	0.00	0.00	0.00	0.00	1.273	1.27	111.17	117.32
1397	0.00	0.00	0.00	0.00	1.273	1.27	109.90	117.30
1372	0.00	0.00	0.03	0.00	1.259	1.29	108.62	117.27
1346	0.01	0.00	0.11	0.01	1.226	1.34	107.33	117.25
1321	0.01	0.00	0.17	0.01	1.202	1.38	105.99	117.22
1295	0.01	0.00	0.23	0.01	1.175	1.42	104.61	117.20
1270	0.02	0.00	0.39	0.02	1.109	1.52	103.19	117.17
1245	0.03	0.00	0.58	0.02	1.030	1.64	101.67	117.14
1219	0.04	0.00	0.71	0.03	0.977	1.72	100.04	117.12
1194	0.04	0.00	0.81	0.04	0.936	1.78	98.32	117.09
1168	0.04	0.00	0.89	0.04	0.900	1.83	96.54	117.07
1143	0.05	0.00	0.97	0.05	0.867	1.88	94.71	117.04
1118	0.05	0.01	1.04	0.05	0.838	1.92	92.83	117.02
1092	0.05	0.01	1.10	0.06	0.811	1.97	90.91	116.99
1067	0.06	0.01	1.16	0.06	0.786	2.00	88.94	116.97
1041	0.06	0.01	1.21	0.07	0.762	2.04	86.94	116.94
1016	0.06	0.01	1.26	0.07	0.740	2.07	84.90	116.92
991	0.07	0.01	1.31	0.08	0.720	2.10	82.83	116.89
965	0.07	0.01	1.35	0.08	0.701	2.13	80.73	116.87
940	0.07	0.01	1.39	0.08	0.682	2.16	78.60	116.84
914	0.07	0.01	1.43	0.09	0.665	2.18	76.44	116.81
889	0.07	0.01	1.47	0.09	0.649	2.21	74.25	116.79
864	0.08	0.01	1.50	0.09	0.633	2.23	72.05	116.76
838	0.08	0.01	1.54	0.10	0.618	2.25	69.81	116.74
813	0.08	0.01	1.57	0.10	0.604	2.28	67.56	116.71
787	0.08	0.01	1.60	0.11	0.591	2.30	65.28	116.69
762	0.08	0.01	1.63	0.11	0.578	2.32	62.99	116.66
737	0.08	0.01	1.66	0.11	0.565	2.33	60.67	116.64
711	0.08	0.01	1.68	0.12	0.554	2.35	58.34	116.61
686	0.09	0.01	1.71	0.12	0.543	2.37	55.99	116.59
660	0.09	0.01	1.73	0.12	0.532	2.38	53.62	116.56
635	0.09	0.01	1.75	0.12	0.522	2.40	51.24	116.54
610	0.09	0.01	1.77	0.13	0.512	2.41	48.84	116.51
584	0.09	0.01	1.79	0.13	0.503	2.43	46.43	116.48
559	0.09	0.01	1.81	0.13	0.495	2.44	44.00	116.46
533	0.09	0.01	1.83	0.14	0.486	2.45	41.56	116.43
508	0.09	0.01	1.85	0.14	0.478	2.46	39.11	116.41
483	0.09	0.01	1.86	0.14	0.471	2.48	36.64	116.38
457	0.09	0.01	1.88	0.14	0.464	2.49	34.17	116.36
432	0.09	0.01	1.89	0.15	0.457	2.50	31.68	116.33
406	0.10	0.01	1.91	0.15	0.450	2.51	29.19	116.31
381	0.10	0.01	1.92	0.15	0.444	2.52	26.68	116.28
356	0.10	0.02	1.93	0.15	0.438	2.52	24.17	116.26
330	0.10	0.02	1.95	0.15	0.432	2.53	21.64	116.23
305	0.10	0.02	1.96	0.16	0.427	2.54	19.11	116.20
279	0.10	0.02	1.97	0.16	0.422	2.55	16.57	116.18
254	0.10	0.02	1.99	0.17	0.411	2.56	14.02	116.15
229	0.00	0.00	0.00	0.00	1.273	1.27	11.45	116.13
203	0.00	0.00	0.00	0.00	1.273	1.27	10.18	116.10
178	0.00	0.00	0.00	0.00	1.273	1.27	8.91	116.08
152	0.00	0.00	0.00	0.00	1.273	1.27	7.64	116.05
127	0.00	0.00	0.00	0.00	1.273	1.27	6.36	116.03
102	0.00	0.00	0.00	0.00	1.273	1.27	5.09	116.00
76	0.00	0.00	0.00	0.00	1.273	1.27	3.82	115.98
51	0.00	0.00	0.00	0.00	1.273	1.27	2.55	115.95
25	0.00	0.00	0.00	0.00	1.273	1.27	1.27	115.93

D.2 CORRESPONDENCE WITH CITY ON STORMWATER CRITERIA



Stormwater Management:

- Quality Control:
  Mississippi Valley Conservation Authority to provide criteria.
- Quantity Control:
  - Design storm for receiving sewer: 5-year design storm
  - Runoff coefficient (C): C=0.5 or C=pre-development, whichever is less
  - Time of concentration (Tc): To be calculated, min Tc=10mins
  - Allowable flow rate: Control the 100-year event to the 5-year event
- Please see full infrastructure comments in email attachment.

Please contact Infrastructure Project Manager Abi Dieme (Abibatou.Dieme@ottawa.ca) for follow-up questions.

Parks:

- Pursuant to Section 3 and Section 10(1) Parkland Dedication By-law 2009-05, as amended, cash-in-lieu of parkland shall be paid by the Owner at the time of Site Plan Agreement registration.

Please contact Parks Planner Kersten Nitsche (Kersten.Nitsche@ottawa.ca) for follow-up questions.

D.3 CORRESPONDENCE WITH MVCA ON STORMWATER QUALITY CONTROL

From: Erica Ogden
To: Mott, Peter
Cc: Kilborn, Kris
Subject: RE: Quality Control Requirements - The Landing on Main (1364-1370 Stittsville Main Street)
Date: Thursday, March 31, 2022 4:23:06 PM

Hello Peter,
Thank you for reaching out to MVCA.
While roof top runoff can be considered clean, the remainder of the site requires water quality treatment. The subject property will be outletting to Poole Creek, therefore an enhanced level of water quality protection is required, which requires 80 % total suspended solids removal. In addition, this portion of Poole Creek has been identified as a cold-cool water system, therefore temperature mitigation should be taken into consideration.
The subject property is also located within the Carp River Watershed Subwatershed Study Area, which establishes annual infiltration targets. The subject property is located within a high groundwater recharge area which has an annual infiltration target of 262mm/yr.
Poole Creek is a part of the City Stream Watch program, more information about the creek is available on our website. Details regarding the Upper Poole Creek Restoration Plan are also available on our website.
If you have any questions, please feel free to contact me.
Thank you,
Erica C. Ogden, MCIP, RPP | Environmental Planner | Mississippi Valley Conservation Authority
10970 Highway 7, Carleton Place, ON K7C 3P1
www.mvc.on.ca |c. 613 451 0463 |o. 613 253 0006 ext. 229| eogden@mvc.on.ca

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From: Diane Reid
Sent: March 29, 2022 11:47 AM
To: Mott, Peter <Peter.Mott@stantec.com>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>; Erica Ogden <eogden@mvc.on.ca>
Subject: RE: Quality Control Requirements - The Landing on Main (1364-1370 Stittsville Main Street)

Hi Peter, As the subject property is in the City of Ottawa, your inquiry has been redirected to Erica Ogden <eogden@mvc.on.ca> in our office. I'm sure Erica will follow up asap.

Regards,
Diane Reid

From: Mott, Peter <Peter.Mott@stantec.com>
Sent: March 29, 2022 10:23 AM
To: Diane Reid <dreid@mvc.on.ca>
Cc: Kilborn, Kris <kris.kilborn@stantec.com>
Subject: Quality Control Requirements - The Landing on Main (1364-1370 Stittsville Main Street)

Hi Diane,

We've been retained to help develop a 71-unit apartment building at 1364-1370 Stittsville Main Street in Ottawa. The site has been unoccupied by residential dwellings as of 2015/2016. The proposed development will include a 4-storey apartment building covering a majority of the property, and parking areas within the property providing 87 parking spaces.

We are looking to confirm if quality control measures are required on-site. The proposed building includes a flat roof which will store and discharge stormwater into a cistern and ultimately into the 600 mm diameter storm sewer within Stittsville Main Street. We understand that rooftop runoff is considered clean water and does not require further water quality treatment. Please review the site servicing plan attached and confirm if quality treatment is required for the site. If you need any other information feel free to call.

Thank you,

Peter Mott EIT
Engineering Intern, Community Development

Mobile: +1 (343) 999-8172
Peter.Mott@stantec.com
Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

D.4 STORM DESIGN SHEET

Stantec

STITTSVILL APARTMENTS

DATE: 2022-12-22
REVISION: 3
DESIGNED BY: AM
CHECKED BY: NC

FILE NUMBER: **160401727**

STORM SEWER DESIGN SHEET
(City of Ottawa)

DESIGN PARAMETERS
$I = a / (t+b)^c$ (As per City of Ottawa Guidelines, 2012)

	1:2 yr	1:5 yr	1:10 yr	1:100 yr
a =	732.951	998.071	1174.184	1735.688
b =	6.199	6.053	6.014	6.014
c =	0.810	0.814	0.816	0.820

MANNING'S n = 0.013 BEDDING CLASS = B
MINIMUM COVER: 2.00 m
TIME OF ENTRY 10 min

LOCATION			DRAINAGE AREA																						PIPE SELECTION										
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (2-YEAR) (ha)	AREA (5-YEAR) (ha)	AREA (10-YEAR) (ha)	AREA (100-YEAR) (ha)	AREA (ROOF) (ha)	C (2-YEAR) (-)	C (5-YEAR) (-)	C (10-YEAR) (-)	C (100-YEAR) (-)	A x C (2-YEAR) (ha)	ACCUM AxC (2YR) (ha)	A x C (5-YEAR) (ha)	ACCUM. AxC (5YR) (ha)	A x C (10-YEAR) (ha)	ACCUM. AxC (10YR) (ha)	A x C (100-YEAR) (ha)	ACCUM. AxC (100YR) (ha)	T of C (min)	$I_{2\text{-YEAR}}$ (mm/h)	$I_{5\text{-YEAR}}$ (mm/h)	$I_{10\text{-YEAR}}$ (mm/h)	$I_{100\text{-YEAR}}$ (mm/h)	$Q_{CONTROL}$ (L/s)	ACCUM. $Q_{CONTROL}$ (L/s)	Q_{ACT} (CIA/360) (L/s)	LENGTH (m)	PIPE WIDTH OR DIAMETEF (mm)	PIPE HEIGHT (mm)	PIPE SHAPE (-)	MATERIAL (-)	CLASS (-)	SLOPE %	Q_{CAP} (FULL) (L/s)	% FULL (-)	VEL. (FULL) (m/s)	VEL. (ACT) (m/s)	TIME OF FLOW (min)
L103A	103A	103	0.04	0.00	0.00	0.00	0.00	0.85	0.00	0.00	0.00	0.030	0.030	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	6.5	8.1	200	200	CIRCULAR	PVC	-	1.00	33.3	**19.46%**	1.05	0.68	0.20
																				10.20																			
L103C	103C	SEWER	0.03	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.005	0.005	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	1.1	13.0	250	250	CIRCULAR	PVC	-	0.50	42.7	**2.50%**	0.86	0.31	0.69
																				10.69																			
L103B	103B	103	0.04	0.00	0.00	0.00	0.00	0.88	0.00	0.00	0.00	0.037	0.042	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	9.0	23.6	250	250	CIRCULAR	PVC	-	0.50	42.7	**20.96%**	0.86	0.57	0.69
																				10.69																			
	103	102	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.072	0.000	0.000	0.000	0.000	0.000	0.000	10.69	74.24	100.66	117.98	172.45	0.0	0.0	14.9	22.1	250	250	CIRCULAR	PVC	-	0.50	42.7	**34.93%**	0.86	0.66	0.56
																				11.25																			
L102B	102B	102	0.07	0.00	0.00	0.00	0.00	0.82	0.00	0.00	0.00	0.055	0.055	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	11.7	23.6	200	200	CIRCULAR	PVC	-	5.02	74.6	**15.61%**	2.35	1.42	0.28
																				10.28																			
L102C, EXT2	102C	102	0.08	0.00	0.00	0.00	0.00	0.42	0.00	0.00	0.00	0.035	0.035	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	7.5	7.4	200	200	CIRCULAR	PVC	-	4.00	66.6	**11.19%**	2.10	1.14	0.11
																				10.11																			
L102A	102	STRG TNK	0.03	0.00	0.00	0.00	0.00	0.90	0.00	0.00	0.00	0.025	0.187	0.000	0.000	0.000	0.000	0.000	0.000	11.25	72.31	98.01	114.86	167.86	0.0	0.0	37.5	2.1	300	300	CIRCULAR	PVC	-	1.00	96.2	**38.97%**	1.37	1.09	0.03
																				11.28																			
L102D, EXT1	102D	STRG TNK	0.04	0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.030	0.030	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	6.3	9.0	200	200	CIRCULAR	PVC	-	5.20	76.0	**8.29%**	2.39	1.18	0.13
																				10.13																			
	101A	101	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.216	0.000	0.000	0.000	0.000	0.000	0.000	11.28	72.20	97.86	114.69	167.61	0.0	0.0	43.3	6.2	300	300	CIRCULAR	PVC	-	0.40	60.8	**71.26%**	0.86	0.82	0.13
																				11.41																			
R101A, R101B, R101C, R101D	BLDG STM	101	0.00	0.00	0.00	0.00	0.20	0.90	0.00	0.00	0.00	0.176	0.176	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	9.0	9.0	9.0	6.2	200	200	CIRCULAR	PVC	-	1.00	33.3	**27.02%**	1.05	0.74	0.14
																				10.14																			
	101	EX SEWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.216	0.000	0.000	0.000	0.000	0.000	0.000	11.41	71.78	97.29	114.01	166.61	0.0	9.0	52.1	36.3	300	300	CIRCULAR	PVC	-	0.40	60.8	**85.65%**	0.86	0.87	0.70

D.5 ROOF DRAIN CALCULATIONS

Project #160401727, 1364-1370 Stittsville Main Street
Roof Drain Design Sheet, Area R101A
Standard Watts Model R1100 Accutrol Roof Drain

Rating Curve				Volume Estimation				
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m) Increment	Volume (cu. m) Accumulated	Water Depth (m)
0.000	0.0000	0.0000	0	0.000	0	0	0	0.000
0.025	**0.0003**	0.0016	0	0.025	39	0	0	0.025
0.050	**0.0006**	0.0032	3	0.050	157	2	3	0.050
0.075	**0.0008**	0.0039	9	0.075	354	6	9	0.075
0.100	**0.0009**	0.0047	21	0.100	629	12	21	0.100
0.125	**0.0011**	0.0055	41	0.125	983	20	41	0.125
0.150	**0.0013**	0.0063	71	0.150	1416	30	71	0.150

Rooftop Storage Summary

Total Building Area (sq.m)		1770.000011
Assume Available Roof Area (sq.	80%	1416.000009
Roof Imperviousness		0.99
Roof Drain Requirement (sq.m/Notch)		232
Number of Roof Notches*		5
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		71
Estimated 100 Year Drawdown Time (h)		3.6

* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).

* Note: Number of drains can be reduced if multiple-notch drain used.

Calculation Results	2yr	100yr	Available
Qresult (cu.m/s)	0.005	0.006	-
Depth (m)	0.098	0.148	0.150
Volume (cu.m)	20.2	68.2	70.8
Draintime (hrs)	1.3	3.6	

From Watts Drain Catalogue

Head (m)	L/s Open	75%	**50%**	25%	Closed
0.025	0.3154	0.3154	**0.3154**	0.3154	0.3154
0.050	0.6308	0.6308	**0.6308**	0.6308	0.3154
0.075	0.9462	0.8674	**0.7885**	0.7097	0.3154
0.100	1.2617	1.1040	**0.9462**	0.7885	0.3154
0.125	1.5771	1.3405	**1.1040**	0.8674	0.3154
0.150	1.8925	1.5771	**1.2617**	0.9462	0.3154

Project #160401727, 1364-1370 Stittsville Main Street
Roof Drain Design Sheet, Area R101B
Standard Watts Model R1100 Accutrol Roof Drain

Rating Curve				Volume Estimation				
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m) Increment	Volume (cu. m) Accumulated	Water Depth (m)
0.000	0.0000	0.0000000	0	0.000	0	0	0	0.000
0.025	0.0003	0.0003154	0	0.025	2	0	0	0.025
0.050	0.0006	0.0006308	0	0.050	8	0	0	0.050
0.075	0.0007	0.0007097	0	0.075	18	0	0	0.075
0.100	0.0008	0.0007885	1	0.100	32	1	1	0.100
0.125	0.0009	0.0008674	2	0.125	50	1	2	0.125
0.150	0.0009	0.0009463	4	0.150	72	2	4	0.150

Rooftop Storage Summary

Total Building Area (sq.m)		89.99999613
Assume Available Roof Area (sq.	80%	71.9999969
Roof Imperviousness		0.99
Roof Drain Requirement (sq.m/Notch)		232
Number of Roof Notches*		1
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		4
Estimated 100 Year Drawdown Time (h)		0.9

* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).

* Note: Number of drains can be reduced if multiple-notch drain used.

Calculation Results	2yr	100yr	Available
Qresult (cu.m/s)	0.001	0.001	-
Depth (m)	0.081	0.132	0.150
Volume (cu.m)	0.6	2.5	3.6
Draintime (hrs)	0.2	0.9	

From Watts Drain Catalogue

Head (m)	L/s Open	0.75	0.5	0.25	Closed
0.025	0.3154	0.3154	0.3154	0.3154	0.3154
0.05	0.6308	0.6308	0.6308	0.6308	0.3154
0.075	0.9462	0.8674	0.7885	0.7097	0.3154
0.1	1.2617	1.1040	0.9462	0.7885	0.3154
0.125	1.5771	1.3405	1.1040	0.8674	0.3154
0.15	1.8925	1.5771	1.2617	0.9462	0.3154

Project #160401727, 1364-1370 Stittsville Main Street
Roof Drain Design Sheet, Area R101C
Standard Watts Model R1100 Accutrol Roof Drain

Rating Curve				Volume Estimation				
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m) Increment	Volume (cu. m) Accumulated	Water Depth (m)
0.000	0.0000	0.0000	0	0.000	0	0	0	0.000
0.025	0.0003	0.0003	0	0.025	2	0	0	0.025
0.050	0.0006	0.0006	0	0.050	8	0	0	0.050
0.075	0.0007	0.0007	0	0.075	18	0	0	0.075
0.100	0.0008	0.0008	1	0.100	32	1	1	0.100
0.125	0.0009	0.0009	2	0.125	50	1	2	0.125
0.150	0.0009	0.0009	4	0.150	72	2	4	0.150

Rooftop Storage Summary

Total Building Area (sq.m)		89.99999613
Assume Available Roof Area (sq.	80%	71.9999969
Roof Imperviousness		0.99
Roof Drain Requirement (sq.m/Notch)		232
Number of Roof Notches*		1
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		4
Estimated 100 Year Drawdown Time (h)		0.9

* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).

* Note: Number of drains can be reduced if multiple-notch drain used.

Calculation Results	2yr	100yr	Available
Qresult (cu.m/s)	0.001	0.001	-
Depth (m)	0.081	0.132	0.150
Volume (cu.m)	0.6	2.5	3.6
Draintime (hrs)	0.2	0.9	

From Watts Drain Catalogue

Head (m)	L/s Open	75%	50%	**25%**	Closed
0.025	0.3154	0.3154	0.3154	**0.3154**	0.3154
0.050	0.6308	0.6308	0.6308	**0.6308**	0.3154
0.075	0.9462	0.8674	0.7885	**0.7097**	0.3154
0.100	1.2617	1.1040	0.9462	**0.7885**	0.3154
0.125	1.5771	1.3405	1.1040	**0.8674**	0.3154
0.150	1.8925	1.5771	1.2617	**0.9462**	0.3154

Project #160401727, 1364-1370 Stittsville Main Street
Roof Drain Design Sheet, Area R101D
Standard Watts Model R1100 Accutrol Roof Drain

Rating Curve				Volume Estimation				
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m) Increment	Volume (cu. m) Accumulated	Water Depth (m)
0.000	0.0000	0.0000000	0	0.000	0	0	0	0.000
0.025	0.0003	0.0003154	0	0.025	0	0	0	0.025
0.050	0.0006	0.0006308	0	0.050	1	0	0	0.050
0.075	0.0007	0.0007097	0	0.075	2	0	0	0.075
0.100	0.0008	0.0007885	0	0.100	4	0	0	0.100
0.125	0.0009	0.0008674	0	0.125	6	0	0	0.125
0.150	0.0009	0.0009463	0	0.150	8	0	0	0.150

Rooftop Storage Summary

Total Building Area (sq.m)		10.00000047
Assume Available Roof Area (sq.	80%	8.00000038
Roof Imperviousness		0.99
Roof Drain Requirement (sq.m/Notch)		232
Number of Roof Notches*		1
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		0
Estimated 100 Year Drawdown Time (h)		0.0

* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).

* Note: Number of drains can be reduced if multiple-notch drain used.

Calculation Results	2yr	100yr	Available
Qresult (cu.m/s)	0.000	0.000	-
Depth (m)	0.015	0.038	0.150
Volume (cu.m)	0.0	0.0	0.4
Draintime (hrs)	0.0	0.0	

From Watts Drain Catalogue

Head (m)	L/s Open	0.75	0.5	**0.25**	Closed
0.025	0.3154	0.3154	0.3154	**0.3154**	0.3154
0.05	0.6308	0.6308	0.6308	**0.6308**	0.3154
0.075	0.9462	0.8674	0.7885	**0.7097**	0.3154
0.1	1.2617	1.1040	0.9462	**0.7885**	0.3154
0.125	1.5771	1.3405	1.1040	**0.8674**	0.3154
0.15	1.8925	1.5771	1.2617	**0.9462**	0.3154

D.6 VORTEX LMF FLOW CHART

	VORTEX ICD OPENING SIZE													
Head (m)	**40**	**45**	**50**	**55**	**60**	**65**	**70**	**75**	**80**	**85**	**90**	**95**	**100**	**105**
0.10	0.42	0.57	0.73	0.90	1.05	1.15	1.30	1.59	1.81	2.02	2.21	2.56	2.79	3.11
0.20	0.59	0.80	1.02	1.23	1.47	1.60	1.88	2.24	2.56	2.86	3.17	3.59	3.98	4.39
0.30	0.73	0.98	1.24	1.49	1.79	1.96	2.32	2.74	3.13	3.51	3.90	4.38	4.88	5.37
0.40	0.85	1.14	1.43	1.72	2.06	2.27	2.69	3.16	3.61	4.05	4.51	5.05	5.64	6.19
0.50	0.95	1.27	1.59	1.91	2.30	2.54	3.02	3.54	4.04	4.53	5.05	5.65	6.31	6.92
0.60	1.04	1.39	1.75	2.09	2.52	2.78	3.31	3.87	4.43	4.96	5.54	6.18	6.92	7.58
0.70	1.13	1.51	1.88	2.26	2.71	3.01	3.58	4.18	4.78	5.36	5.99	6.68	7.47	8.19
0.80	1.21	1.61	2.02	2.42	2.90	3.22	3.83	4.47	5.11	5.73	6.41	7.14	7.99	8.76
0.90	1.28	1.71	2.14	2.56	3.07	3.42	4.07	4.75	5.42	6.08	6.80	7.57	8.47	9.29
1.0	1.35	1.80	2.25	2.70	3.24	3.60	4.29	5.00	5.71	6.41	7.17	7.98	8.93	9.79
1.2	1.48	1.98	2.47	2.96	3.55	3.95	4.71	5.48	6.26	7.02	7.86	8.74	9.78	10.73
1.4	1.61	2.14	2.67	3.20	3.83	4.27	5.09	5.92	6.76	7.58	8.50	9.44	10.56	11.58
1.6	1.72	2.29	2.85	3.42	4.09	4.57	5.45	6.33	7.23	8.11	9.09	10.10	11.29	12.39
1.8	1.82	2.43	3.03	3.63	4.34	4.85	5.78	6.72	7.67	8.60	9.64	10.71	11.98	13.14
2.0	1.93	2.56	3.19	3.83	4.57	5.12	6.10	7.08	8.08	9.06	10.17	11.29	12.63	13.85
2.5	2.16	2.86	3.57	4.28	5.10	5.73	6.83	7.92	9.04	10.14	11.37	12.62	14.11	15.48
3.0	2.37	3.14	3.91	4.69	5.59	6.29	7.49	8.67	9.90	11.10	12.46	13.83	15.46	16.96
5	3.06	4.06	5.06	6.07	7.21	8.14	9.68	11.20	12.78	14.34	16.10	17.86	19.95	21.90
7	3.63	4.80	5.99	7.19	8.52	9.65	11.46	13.26	15.12	16.96	19.06	21.14	23.60	25.92
9	4.12	5.45	6.80	8.16	9.66	10.95	13.01	15.04	17.15	19.24	21.62	23.98	26.76	29.39
11	4.56	6.03	7.52	9.02	10.68	12.12	14.38	16.63	18.96	21.27	23.90	26.51	29.58	32.50
13	4.96	6.55	8.17	9.81	11.60	13.18	15.64	18.08	20.61	23.12	25.99	28.82	32.16	35.33
15	5.33	7.04	8.78	10.54	12.46	14.17	16.81	19.42	22.14	24.84	27.92	30.96	34.54	37.95

D.7 DETAILED STORMCEPTOR SIZING REPORT

Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

12/16/2022

Province:	Ontario
City:	Ottawa
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20
Site Name:	
Drainage Area (ha):	0.28
% Imperviousness:	67.85

Runoff Coefficient 'c': 0.70

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	6.39
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	69.00
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	1364-1370 Stittsville Main Street
Project Number:	60311
Designer Name:	Ashmeet Singh Muker
Designer Company:	Stantec
Designer Email:	ashmeetsingh.muker@stantec.com
Designer Phone:	780-994-0296
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	93
EFO6	98
EFO8	99
EFO10	100
EFO12	100

Recommended Stormceptor EFO Model: EFO4

Estimated Net Annual Sediment (TSS) Load Reduction (%): 93

Water Quality Runoff Volume Capture (%): > 90

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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 waterwavs.

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

Stormceptor® EF Sizing Report

Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.6	8.6	0.28	17.0	14.0	100	8.6	8.6
1	20.3	29.0	0.55	33.0	28.0	100	20.3	29.0
2	16.2	45.2	1.10	66.0	55.0	100	16.2	45.2
3	12.0	57.2	1.65	99.0	83.0	98	11.8	57.0
4	8.4	65.6	2.20	132.0	110.0	95	8.0	65.0
5	5.9	71.6	2.75	165.0	138.0	92	5.5	70.5
6	4.6	76.2	3.30	198.0	165.0	88	4.1	74.5
7	3.1	79.3	3.85	231.0	193.0	84	2.6	77.1
8	2.7	82.0	4.40	264.0	220.0	82	2.3	79.4
9	3.3	85.3	4.95	297.0	248.0	81	2.7	82.1
10	2.3	87.6	5.50	330.0	275.0	80	1.8	83.9
11	1.6	89.2	6.05	363.0	303.0	78	1.2	85.1
12	1.3	90.5	6.60	396.0	330.0	77	1.0	86.2
13	1.7	92.2	7.16	429.0	358.0	76	1.3	87.5
14	1.2	93.5	7.71	462.0	385.0	75	0.9	88.4
15	1.2	94.6	8.26	495.0	413.0	73	0.8	89.2
16	0.7	95.3	8.81	528.0	440.0	72	0.5	89.7
17	0.7	96.1	9.36	561.0	468.0	71	0.5	90.3
18	0.4	96.5	9.91	594.0	495.0	70	0.3	90.5
19	0.4	96.9	10.46	627.0	523.0	68	0.3	90.8
20	0.2	97.1	11.01	660.0	550.0	67	0.1	91.0
21	0.5	97.5	11.56	694.0	578.0	66	0.3	91.3
22	0.2	97.8	12.11	727.0	605.0	65	0.2	91.4
23	1.0	98.8	12.66	760.0	633.0	64	0.6	92.1
24	0.3	99.1	13.21	793.0	660.0	64	0.2	92.3
25	0.0	99.1	13.76	826.0	688.0	64	0.0	92.3
30	0.9	100.0	16.51	991.0	826.0	63	0.6	92.8
35	0.0	100.0	19.26	1156.0	963.0	62	0.0	92.8
40	0.0	100.0	22.02	1321.0	1101.0	59	0.0	92.8
45	0.0	100.0	24.77	1486.0	1238.0	56	0.0	92.8
Estimated Net Annual Sediment (TSS) Load Reduction =								**93 %**

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

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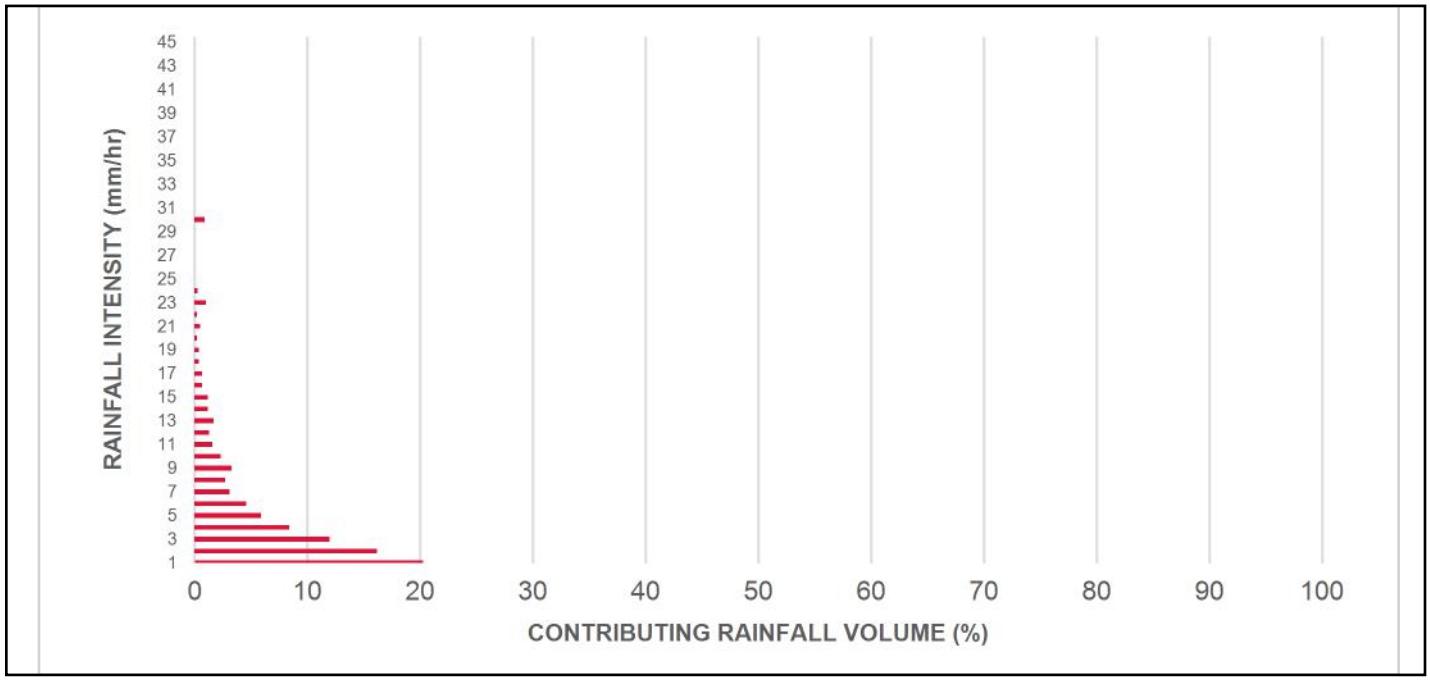
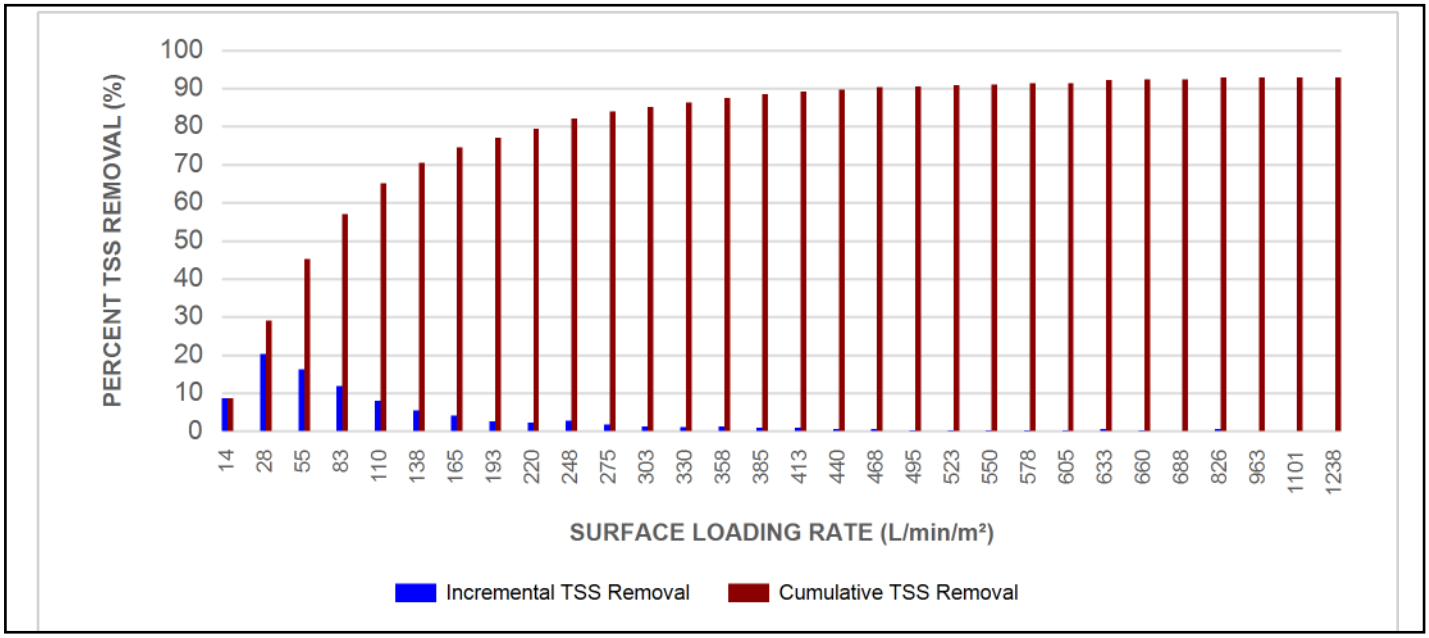
RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



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

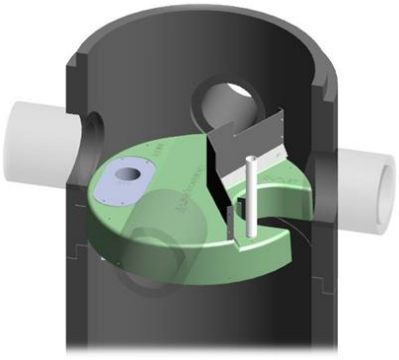
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test 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.

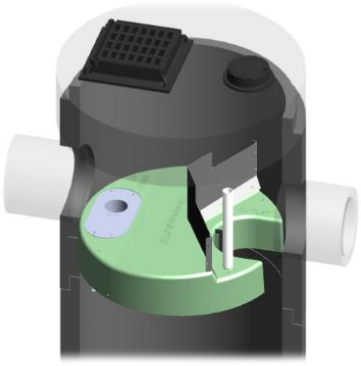
DESIGN FLEXIBILITY

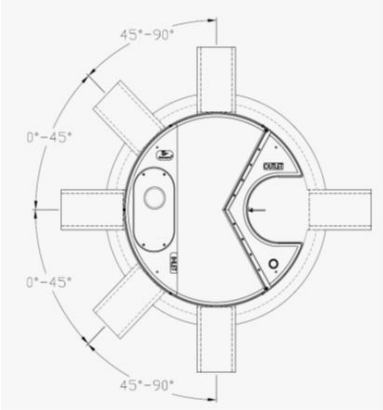
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend 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)	(ft^3)	(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/ft^3)

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** S**eparators**

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 of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

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/m^2 to 2600 L/min/m^2) 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.

D.8 ANNUAL WATER BALANCE SHEET

Water Balance and Infiltration Calculations

Project : 1364-1370 Stittsville Main Street

Existing Drainage Conditions

	Cover	Soils	Topography
	Cultivated	Sandy	Rolling Land (~2%)

The soils are: High Infiltration Potential — 262 mm/yr Infiltration Rate (1)
559 mm/yr Evapotranspiration Rate (3)

Area with:	High Infiltration Potential	0.58	ha	% Impervious	19.53	Runoff Coeff	0.34
	Total	0.6	ha	% Impervious	19.53		

	High Infiltration Potential		
Precipitation	943	mm/yr (2)	
Evapotranspiration	559	mm/yr (3)	(ET*(1-%IMP))
Infiltration	262	mm/yr	(INFIL*(1-%IMP))
Evaporation (Open Water)	0	mm/yr (4)	
Runoff	123	mm/yr	

Precipitation	5,432	m^3/yr	943.0 mm/yr
Total Evapotranspiration (pre)	3,220	m^3/yr	559.0 mm/yr
Total Predevelopment Infiltration	**1,509**	**m^3/yr**	**262.0 mm/yr**
Total Evaporation (pre)	0	m^3/yr	0.0 mm/yr
Total Runoff (pre)	703	m^3/yr	122.0 mm/yr

Proposed Drainage Conditions - Uncontrolled (UNC-1, UNC-2, UNC-3)

Surface Water Regime

	Cover	Soils	Topography
	Cultivated	Sandy	Rolling Land (~2%)

The soils are: High Infiltration Potential — 262 mm/yr Infiltration Rate (1)
559 mm/yr Evapotranspiration Rate (3)

Area with:	High Infiltration Potential	0.061	ha	% Impervious	1%
	Total	0.061	ha	% Impervious	1%

	High Infiltration Potential		
Precipitation	943	mm/yr (2)	
Evapotranspiration	553	mm/yr (3)	(ET*(1-%IMP))
Infiltration	259	mm/yr	(INFIL*(1-%IMP))
Evaporation	0	mm/yr (4)	
Runoff	130	mm/yr	

Precipitation	575	m^3/yr	943 mm/yr
Total Evapotranspiration (post)	338	m^3/yr	553 mm/yr
Total Infiltration (post)	158	m^3/yr	259 mm/yr
Total Evaporation (post)	0	m^3/yr	0 mm/yr
Total Runoff (post)	79	m^3/yr	130 mm/yr

Infiltration Post Development is **158 m^3/yr** 259.4 mm/yr

Proposed Drainage Conditions - Roof (R101A, R101B, R101C, R101D)

Surface Water Regime

	Cover	Soils	Topography
	Cultivated	Sandy	Rolling Land (~2%)

The soils are: High Infiltration Potential — 262 mm/yr Infiltration Rate (1)
559 mm/yr Evapotranspiration Rate (3)

Area with:	Average For Stage	0.196	ha	% Impervious	100%
	Total	0.196	ha	% Impervious	100%

	Average For Stage		
Precipitation	943	mm/yr (2)	
Evapotranspiration	0	mm/yr (3)	(ET*(1-%IMP))
Infiltration	0	mm/yr	(INFIL*(1-%IMP))
Evaporation	0	mm/yr (4)	
Runoff	943	mm/yr	

Precipitation	1,848	m3/yr	943	mm/yr
Total Evapotranspiration (post)	0	m3/yr	0	mm/yr
Total Infiltration (post)	0	m3/yr	0	mm/yr
Total Evaporation (post)	0	m3/yr	0	mm/yr
Total Runoff (post)	1,848	m3/yr	943	mm/yr

Infiltration Post Development is **0 m3/yr** 0.0 mm/yr

Proposed Drainage Conditions - Controlled (L103A, L103B, L103C, L102A, L102B, L102C, L102D, EXT-1, EXT-2)

Surface Water Regime

Cover	Soils	Topography
Cultivated	Sandy	Rolling Land (~2%)

The soils are: High Infiltration Potential

262 mm/yr Infiltration Rate (1)

559 mm/yr Evapotranspiration Rate (3)

Area with:	Average For Stage	0.319	ha	% Impervious	68.50%	Runoff Coeff	0.68
	Total	0.319	ha	% Impervious	68.50%		

	Average For Stage		
Precipitation	943	mm/yr (2)	
Evapotranspiration	176	mm/yr (3)	(ET*(1-%IMP))
Infiltration	83	mm/yr	(INFIL*(1-%IMP))
Evaporation	0	mm/yr (4)	
Runoff	684	mm/yr	

Precipitation	3,008	m3/yr	943	mm/yr
Total Evapotranspiration (post)	562	m3/yr	176	mm/yr
Total Infiltration (post)	263	m3/yr	83	mm/yr
Total Evaporation (post)	0	m3/yr	0	mm/yr
Total Runoff (post)	2,183	m3/yr	684	mm/yr

Infiltration Post Development is **263 m3/yr** 82.5 mm/yr

Infiltration Augmentation

Stormtech MC-3500 System (Area):	125	m^2	
Available Infiltration Volume:	28	m^3	(Taken from Stormtech Design Sheet)

Runoff rate needed to fill the infiltration volume within storage	8.78	mm	(Avail Infil Vol/Area)
% Imperviousness for the controlled site	68.5%		
Rainfall rate needed to fill the infiltration volume within storage	12.81	mm	(Runoff/Imperv)
Percentile Rainfall events getting trapped within the storage	71.5%		(attached Rainfall Vol Percentile Calculator)
Volume captured in the system	1561	**m3/yr**	(Percentile Rainfall Trapped*Total Runoff)

Total Added Infiltration:	**1,561**	**m3/yr**	
Average Infiltration from the site	**422**	**m3/yr**	73.2 mm/yr
Total Post Development Infiltration	**1,982**	**m3/yr**	344.2 mm/yr

SUMMARY

Infiltration required as per Carp Watershed Study	**262**	**mm/yr**
Infiltration rate calculated as per Water Balance	**344**	**mm/yr**

(1) Precipitation, Infiltration and Evapotranspiration values based on the Carp River Watershed Study

D.9 STORMTECH CHAMBER SYSTEM

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	

Advanced Drainage Systems, Inc.

SiteAssist™
FOR STORMTECH
INSTALLATION INSTRUCTIONS
VISIT OUR APP

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STITTSVILLE, ON, CANADA

MC-3500 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-3500.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL BE CERTIFIED TO CSA B184, "POLYMERIC SUB-SURFACE STORMWATER MANAGEMENT STRUCTURES", AND MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE CSA S6 CL-625 TRUCK AND THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 75 mm (3").
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 23° C / 73° F), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-3500 CHAMBER SYSTEM

1. STORMTECH MC-3500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 150 mm (6") SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 300 mm (12") INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE WELL GRADED BETWEEN ¾" AND 2" (20-50 mm)..
9. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
10. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
11. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-3500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. FULL 900 mm (36") OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

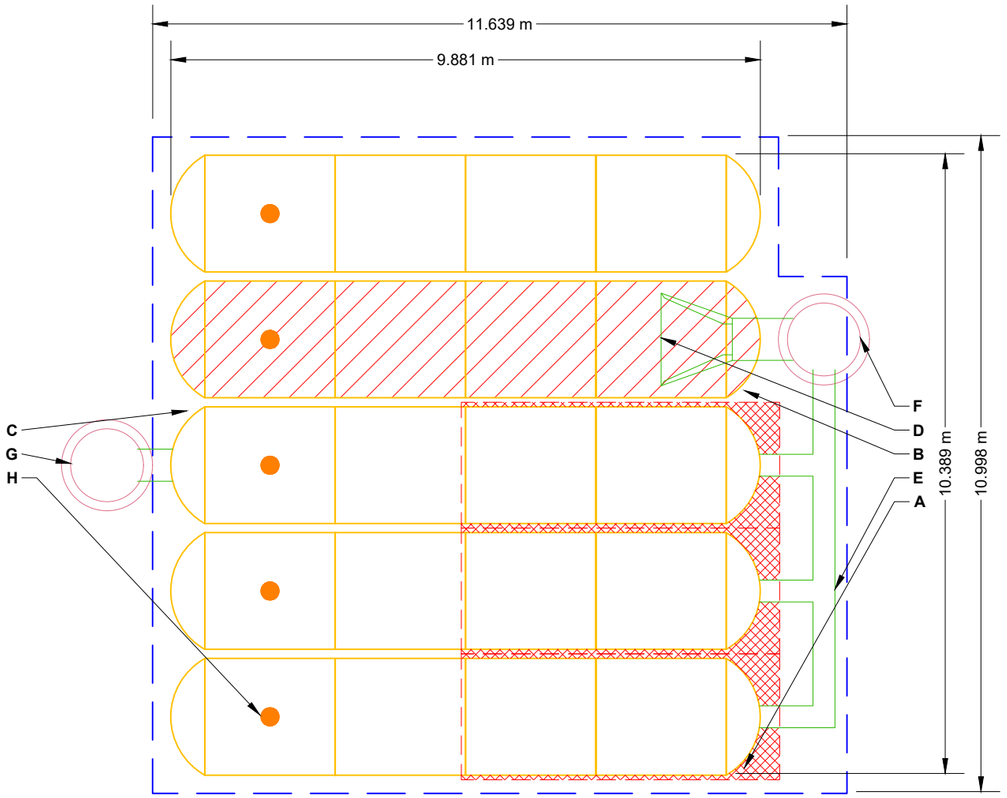
USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

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

PROPOSED LAYOUT		CONCEPTUAL ELEVATIONS	
20	STORMTECH MC-3500 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	3.810
10	STORMTECH MC-3500 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	1.981
305	STONE ABOVE (mm)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	1.829
229	STONE BELOW (mm)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	1.829
40	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	1.829
123.9	INSTALLED SYSTEM VOLUME (m^3) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	1.676
		TOP OF MC-3500 CHAMBER:	1.372
		300 mm x 300 mm TOP MANIFOLD INVERT:	0.898
		600 mm ISOLATOR ROW PLUS INVERT:	0.281
125.3	SYSTEM AREA (m^2)	450 mm BOTTOM CONNECTION INVERT:	0.274
45.3	SYSTEM PERIMETER (m)	BOTTOM OF MC-3500 CHAMBER:	0.229
		BOTTOM OF STONE:	0.000

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	300 mm TOP CORED END CAP, PART#: MC3500IEPP12T / TYP OF ALL 300 mm TOP CONNECTIONS	670 mm	
PREFABRICATED END CAP	B	600 mm BOTTOM CORED END CAP, PART#: MC3500IEPP24BC / TYP OF ALL 600 mm BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	52 mm	
PREFABRICATED END CAP	C	450 mm BOTTOM CORED END CAP, PART#: MC3500IEPP18BC / TYP OF ALL 450 mm BOTTOM CONNECTIONS	45 mm	
FLAMP	D	INSTALL FLAMP ON 600 mm ACCESS PIPE / PART#: MC350024RAMP		
MANIFOLD	E	300 mm x 300 mm TOP MANIFOLD, ADS N-12	670 mm	
CONCRETE STRUCTURE	F	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		190 L/s IN
CONCRETE STRUCTURE	G	OCS (DESIGN BY ENGINEER / PROVIDED BY OTHERS)		113 L/s OUT
INSPECTION PORT	H	100 mm SEE DETAIL (TYP 5 PLACES)		



ISOLATOR ROW PLUS
(SEE DETAIL)

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

BED LIMITS

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE #6.32 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
- **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

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

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

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

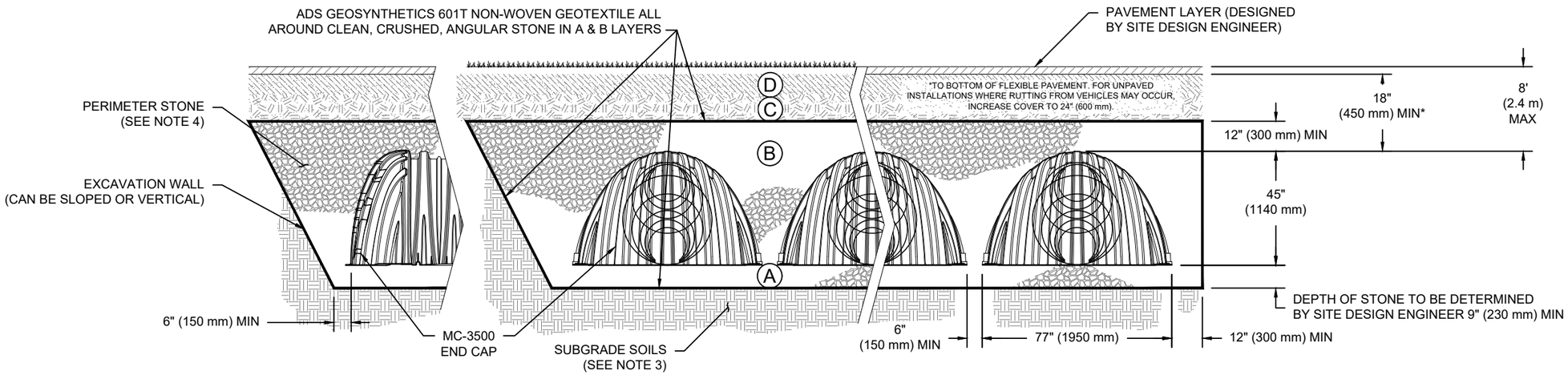
SCALE = 1 : 100

SHEET
2 OF 5

ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

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PROJECT #:

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4640 TRUEMAN BLVD
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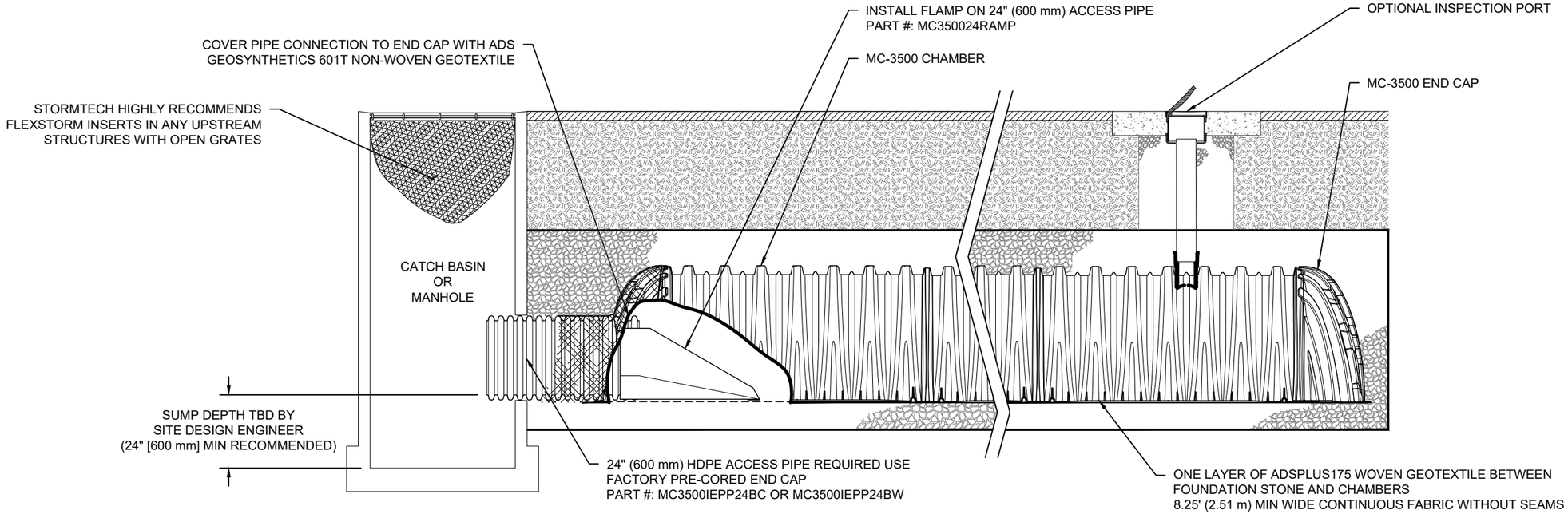
1-800-733-7473



MC-3500 ISOLATOR ROW PLUS DETAIL
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

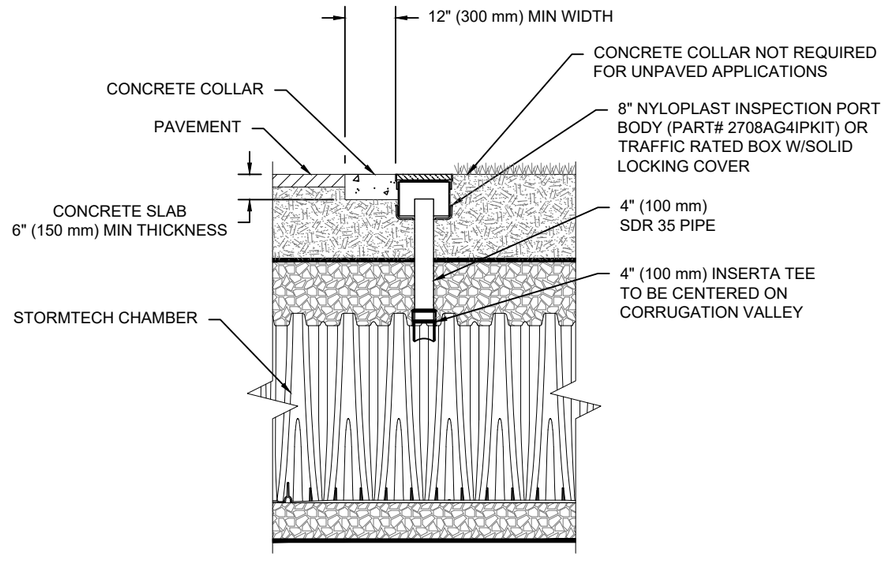
STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.

2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



NOTE:
INSPECTION PORTS MAY BE CONNECTED THROUGH ANY CHAMBER CORRUGATION VALLEY.

4" PVC INSPECTION PORT DETAIL
(MC SERIES CHAMBER)
NTS

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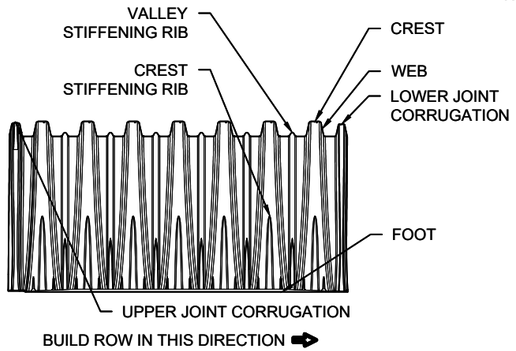
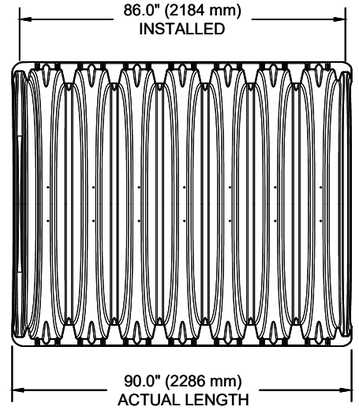
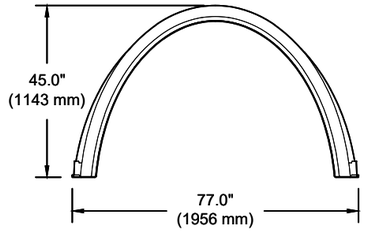
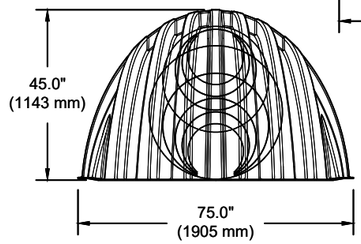
MC-3500 TECHNICAL SPECIFICATION

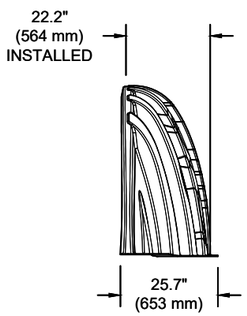
NTS











NOMINAL CHAMBER SPECIFICATIONS

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

NOMINAL END CAP SPECIFICATIONS

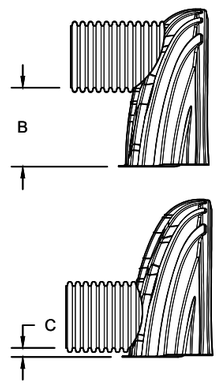
SIZE (W X H X INSTALLED LENGTH)	75.0" X 45.0" X 22.2"	(1905 mm X 1143 mm X 564 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	45.1 CUBIC FEET	(1.28 m³)
WEIGHT	49 lbs.	(22.2 kg)

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

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

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

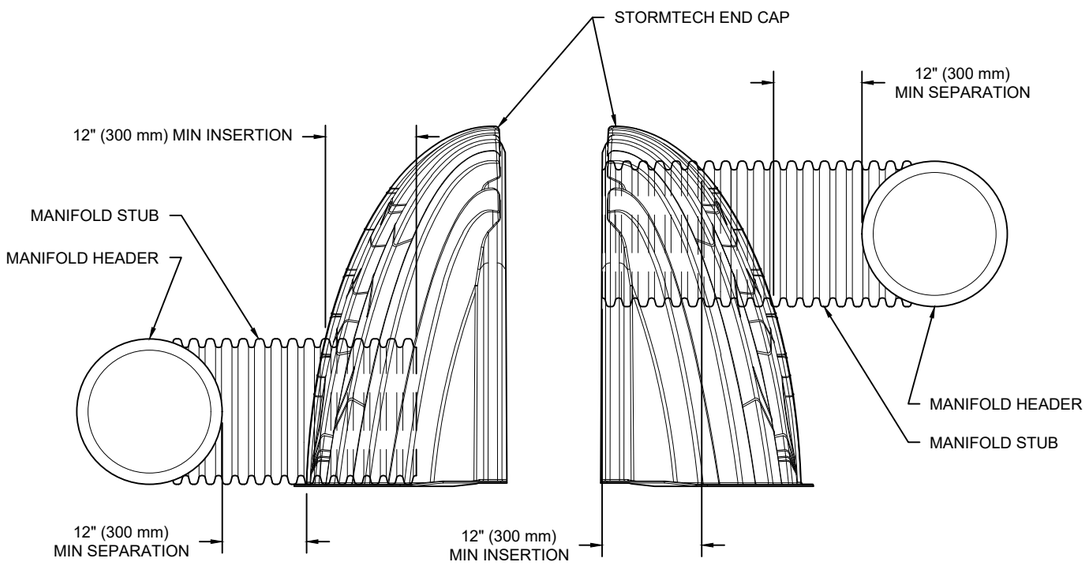
NOTE: ALL DIMENSIONS ARE NOMINAL



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

MC-SERIES END CAP INSERTION DETAIL

NTS



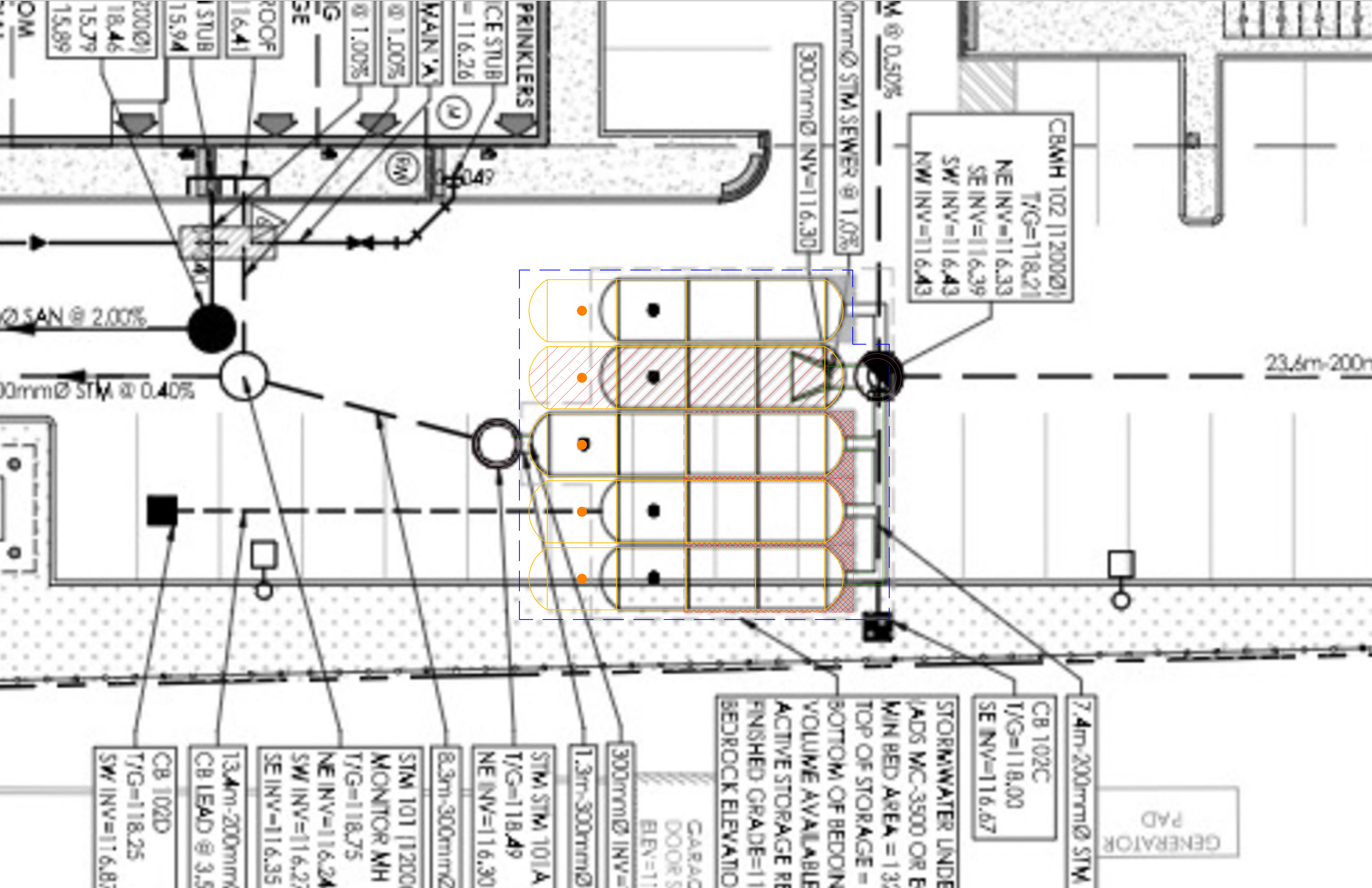
NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

1364-1370 STITTSVILLE MAIN STREET COPY
STITTSVILLE, ON, CANADA

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

DATE	DRW	CHK	DESCRIPTION

StormTech®
Chamber System
888-892-2694 | WWW.STORMTECH.COM
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473
ADS.



CBMH 102 (1200Ø)
T/G=118.21
NE INV=116.33
SE INV=116.39
SW INV=116.43
NW INV=116.43
300mmØ INV=116.30
300mmØ STM SEWER @ 1.0%
CB 102D
T/G=118.25
MONITOR MH
T/G=118.75
NE INV=116.24
SE INV=116.35
T/G=118.49
NE INV=116.30
CB 102C
T/G=118.00
SE INV=116.67
GENERATOR PAD

D.10 PERCENTILE RAINFALL VOLUME CALCULATION SHEET

Calculation of Percentile for Rainfall Volumes, Using Ottawa MacDonald-Cartier Gauge, 1971-2000

Uses methodology for calculation of percentile rainfall outlined in LEED Stormwater Management Quantity Credit Requirement, referencing these documents:
https://www.usgbc.org/credits/cities-plan-deisgn-communities-plan-design/v41-15
https://www.epa.gov/sites/default/files/2015-08/documents/epa_swm_guidance.pdf
Uses hourly rainfall aggregated into daily events, neglecting all days with less then 2.5mm of rain.

Date	Duration (h)	Maximum Rainfall (mm/hr)	Minimum Rainfall (mm/hr)	Mean Rainfall (mm/hr)	Duration of Exceedances (h)	Duration of Deficits (h)	Number of Exceedances	Number of Deficits	Volume of Exceedances (mm)	Volume of Deficits (mm)	Total Rainfall (mm)	Percentile	Infiltration Amount (mm)	Bypass Amount (mm)
10/6/1995 0:00	24	13.8	0	3.163	24	6	1	1	75.9	0	75.9	100.0%	11.5	64.4
8/5/1981 0:00	24	35.3	0	2.779	24	16	1	3	66.7	0	66.7	99.9%	11.5	55.2
6/3/1995 0:00	24	16.9	0	2.775	24	11	1	2	66.6	0	66.6	99.8%	11.5	55.1
9/14/1979 0:00	24	9.5	0	2.625	24	11	1	2	63	0	63	99.8%	11.5	51.5
7/24/1987 0:00	24	20	0	2.458	24	13	1	4	59	0	59	99.7%	11.5	47.5
10/21/1995 0:00	24	9.3	0	2.454	24	5	1	4	58.9	0	58.9	99.6%	11.5	47.4
9/11/1986 0:00	24	10.7	0	2.4	24	5	1	4	57.6	0	57.6	99.6%	11.5	46.1
7/17/1992 0:00	24	23.6	0	2.258	24	9	1	4	54.2	0	54.2	99.5%	11.5	42.7
7/20/1990 0:00	24	20.6	0	2.25	24	11	1	2	54	0	54	99.4%	11.5	42.5
8/7/1972 0:00	24	25.9	0	2.225	24	9	1	4	53.4	0	53.4	99.4%	11.5	41.9
6/22/1981 0:00	24	17.3	0	2.075	24	13	1	3	49.8	0	49.8	99.3%	11.5	38.3
6/21/1972 0:00	24	9.1	0	2.071	24	7	1	3	49.7	0	49.7	99.2%	11.5	38.2
8/4/1981 0:00	24	28.4	0	2.05	24	19	1	3	49.2	0	49.2	99.2%	11.5	37.7
8/4/1992 0:00	24	31.5	0	1.938	24	12	1	2	46.5	0	46.5	99.1%	11.5	35
6/25/1988 0:00	24	18.8	0	1.9	24	16	1	4	45.6	0	45.6	99.0%	11.5	34.1
3/21/1980 0:00	24	4.6	0	1.842	24	4	1	3	44.2	0	44.2	99.0%	11.5	32.7
6/16/1979 0:00	24	34.9	0	1.838	24	21	1	2	44.1	0	44.1	98.9%	11.5	32.6
7/13/1972 0:00	24	33.3	0	1.829	24	20	1	3	43.9	0	43.9	98.8%	11.5	32.4
8/8/1973 0:00	24	25.9	0	1.817	24	17	1	2	43.6	0	43.6	98.8%	11.5	32.1
10/25/1980 0:00	24	8.9	0	1.792	24	11	1	1	43	0	43	98.7%	11.5	31.5
9/8/1981 0:00	24	18.7	0	1.783	24	17	1	2	42.8	0	42.8	98.6%	11.5	31.3
11/26/1979 0:00	24	16.9	0	1.767	24	14	1	4	42.4	0	42.4	98.5%	11.5	30.9
7/29/1986 0:00	24	18.3	0	1.767	24	19	1	2	42.4	0	42.4	98.5%	11.5	30.9
11/8/1996 0:00	24	3.1	0	1.754	24	2	1	1	42.1	0	42.1	98.5%	11.5	30.6
2/21/1997 0:00	24	5.9	0	1.683	24	9	1	2	40.4	0	40.4	98.4%	11.5	28.9
8/25/1982 0:00	24	9.5	0	1.679	24	13	1	2	40.3	0	40.3	98.3%	11.5	28.8
10/5/1983 0:00	24	10.1	0	1.675	24	11	1	3	40.2	0	40.2	98.3%	11.5	28.7
9/12/1987 0:00	24	10.4	0	1.658	24	11	1	5	39.8	0	39.8	98.2%	11.5	28.3
6/27/1994 0:00	24	9.9	0	1.654	24	9	1	3	39.7	0	39.7	98.1%	11.5	28.2
9/6/1999 0:00	24	11	0	1.654	24	17	1	3	39.7	0	39.7	98.1%	11.5	28.2
9/1/1977 0:00	24	18.9	0	1.65	24	18	1	3	39.6	0	39.6	98.0%	11.5	28.1
7/20/1975 0:00	24	24.6	0	1.604	24	18	1	2	38.5	0	38.5	97.9%	11.5	27
3/13/1977 0:00	24	4.3	0	1.6	24	1	1	2	38.4	0	38.4	97.7%	11.5	26.9
6/18/1978 0:00	24	36	0	1.6	24	20	1	3	38.4	0	38.4	97.7%	11.5	26.9
8/12/1984 0:00	24	17.8	0	1.6	24	12	1	5	38.4	0	38.4	97.7%	11.5	26.9
7/12/1972 0:00	24	37.3	0	1.596	24	22	1	2	38.3	0	38.3	97.7%	11.5	26.8
10/20/1989 0:00	24	11.5	0	1.583	24	8	1	3	38	0	38	97.5%	11.5	26.5
3/27/1992 0:00	24	6.8	0	1.583	24	10	1	1	38	0	38	97.5%	11.5	26.5
7/31/1996 0:00	24	18.5	0	1.579	24	11	1	4	37.9	0	37.9	97.5%	11.5	26.4
8/10/1971 0:00	24	24.6	0	1.558	24	18	1	4	37.4	0	37.4	97.3%	11.5	25.9
6/17/1985 0:00	24	14.7	0	1.558	24	20	1	1	37.4	0	37.4	97.3%	11.5	25.9
8/28/1990 0:00	24	14.6	0	1.558	24	18	1	3	37.4	0	37.4	97.3%	11.5	25.9
10/5/1973 0:00	24	24.1	0	1.55	24	16	1	3	37.2	0	37.2	97.2%	11.5	25.7
7/26/1988 0:00	24	25.3	0	1.55	24	19	1	4	37.2	0	37.2	97.2%	11.5	25.7
7/27/1989 0:00	24	22.7	0	1.521	24	17	1	4	36.5	0	36.5	97.1%	11.5	25
7/24/1975 0:00	24	17.3	0	1.504	24	18	1	4	36.1	0	36.1	97.0%	11.5	24.6
9/30/1990 0:00	24	8.3	0	1.467	24	12	1	2	35.2	0	35.2	97.0%	11.5	23.7
7/8/1975 0:00	24	34.8	0	1.463	24	22	1	2	35.1	0	35.1	96.9%	11.5	23.6
6/25/1994 0:00	24	13.5	0	1.454	24	16	1	3	34.9	0	34.9	96.8%	11.5	23.4
6/16/1973 0:00	24	6.4	0	1.433	24	12	1	2	34.4	0	34.4	96.7%	11.5	22.9
8/2/1979 0:00	24	14.8	0	1.433	24	20	1	3	34.4	0	34.4	96.7%	11.5	22.9
3/4/1974 0:00	24	5.8	0	1.404	24	12	1	1	33.7	0	33.7	96.6%	11.5	22.2
1/15/1995 0:00	24	5.3	0	1.404	24	6	1	3	33.7	0	33.7	96.6%	11.5	22.2
4/4/1987 0:00	24	5.2	0	1.383	24	8	1	2	33.2	0	33.2	96.5%	11.5	21.7
7/14/1987 0:00	24	14.1	0	1.375	24	18	1	3	33	0	33	96.4%	11.5	21.5
5/19/1976 0:00	24	4.3	0	1.367	24	1	1	2	32.8	0	32.8	96.2%	11.5	21.3
7/1/1979 0:00	24	20.6	0	1.367	24	15	1	4	32.8	0	32.8	96.2%	11.5	21.3
9/21/1983 0:00	24	10	0	1.367	24	15	1	2	32.8	0	32.8	96.2%	11.5	21.3
9/20/1976 0:00	24	4.8	0	1.346	24	7	1	2	32.3	0	32.3	96.2%	11.5	20.8
4/9/1980 0:00	24	5.2	0	1.342	24	5	1	1	32.2	0	32.2	96.0%	11.5	20.7
11/28/1993 0:00	24	4.8	0	1.342	24	8	1	3	32.2	0	32.2	96.0%	11.5	20.7
7/17/1977 0:00	24	21.3	0	1.333	24	20	1	2	32	0	32	96.0%	11.5	20.5
3/17/1973 0:00	24	8.4	0	1.329	24	6	1	4	31.9	0	31.9	95.8%	11.5	20.4

Date	Duration (h)	Maximum Rainfall (mm/hr)	Minimum Rainfall (mm/hr)	Mean Rainfall (mm/hr)	Duration of Exceedances (h)	Duration of Deficits (h)	Number of Exceedances	Number of Deficits	Volume of Exceedances (mm)	Volume of Deficits (mm)	Total Rainfall (mm)	Percentile	Infiltration Amount (mm)	Bypass Amount (mm)
6/15/1981 0:00	24	26.8	0	1.329	24	20	1	3	31.9	0	31.9	95.8%	11.5	20.4
7/17/1971 0:00	24	13.7	0	1.325	24	17	1	1	31.8	0	31.8	95.8%	11.5	20.3
4/11/1978 0:00	24	5.9	0	1.3	24	7	1	2	31.2	0	31.2	95.7%	11.5	19.7
6/6/1994 0:00	24	8.7	0	1.3	24	13	1	1	31.2	0	31.2	95.7%	11.5	19.7
7/18/1974 0:00	24	20.6	0	1.296	24	21	1	1	31.1	0	31.1	95.6%	11.5	19.6
5/19/1986 0:00	24	7.6	0	1.283	24	8	1	5	30.8	0	30.8	95.5%	11.5	19.3
11/8/1972 0:00	24	2.5	0	1.275	24	3	1	2	30.6	0	30.6	95.4%	11.5	19.1
5/11/1981 0:00	24	4.4	0	1.275	24	10	1	3	30.6	0	30.6	95.4%	11.5	19.1
10/15/1991 0:00	24	4.3	0	1.267	24	12	1	2	30.4	0	30.4	95.3%	11.5	18.9
6/11/1973 0:00	24	30	0	1.263	24	22	1	2	30.3	0	30.3	95.3%	11.5	18.8
8/24/1988 0:00	24	4	0	1.25	24	6	1	2	30	0	30	95.2%	11.5	18.5
9/10/1981 0:00	24	5.1	0	1.242	24	13	1	4	29.8	0	29.8	95.1%	11.5	18.3
5/22/1986 0:00	24	6.8	0	1.242	24	15	1	1	29.8	0	29.8	95.1%	11.5	18.3
8/28/1976 0:00	24	14	0	1.217	24	16	1	4	29.2	0	29.2	95.0%	11.5	17.7
8/6/1984 0:00	24	10.2	0	1.208	24	18	1	3	29	0	29	94.8%	11.5	17.5
5/20/1986 0:00	24	5	0	1.208	24	10	1	3	29	0	29	94.8%	11.5	17.5
9/1/1989 0:00	24	12.5	0	1.208	24	14	1	3	29	0	29	94.8%	11.5	17.5
9/17/1988 0:00	24	25.5	0	1.2	24	18	1	3	28.8	0	28.8	94.7%	11.5	17.3
5/21/1979 0:00	24	8.9	0	1.183	24	13	1	4	28.4	0	28.4	94.6%	11.5	16.9
8/4/1988 0:00	24	11.7	0	1.183	24	16	1	2	28.4	0	28.4	94.6%	11.5	16.9
8/29/1979 0:00	24	21.5	0	1.179	24	19	1	3	28.3	0	28.3	94.5%	11.5	16.8
5/18/1973 0:00	24	5.1	0	1.175	24	2	1	2	28.2	0	28.2	94.4%	11.5	16.7
10/27/1981 0:00	24	3.5	0	1.175	24	5	1	2	28.2	0	28.2	94.4%	11.5	16.7
1/14/1992 0:00	24	4.9	0	1.175	24	12	1	2	28.2	0	28.2	94.4%	11.5	16.7
5/17/1991 0:00	24	5.6	0	1.167	24	9	1	2	28	0	28	94.3%	11.5	16.5
12/25/1979 0:00	24	5.8	0	1.158	24	6	1	1	27.8	0	27.8	94.2%	11.5	16.3
9/27/1985 0:00	24	3.4	0	1.158	24	6	1	2	27.8	0	27.8	94.2%	11.5	16.3
8/14/1971 0:00	24	12.7	0	1.154	24	19	1	3	27.7	0	27.7	94.1%	11.5	16.2
5/31/1993 0:00	24	5.8	0	1.142	24	10	1	3	27.4	0	27.4	94.0%	11.5	15.9
10/23/1972 0:00	24	2.5	0	1.133	24	3	1	3	27.2	0	27.2	93.9%	11.5	15.7
6/24/1986 0:00	24	6.1	0	1.133	24	12	1	3	27.2	0	27.2	93.9%	11.5	15.7
8/28/1971 0:00	24	4.8	0	1.129	24	8	1	3	27.1	0	27.1	93.8%	11.5	15.6
9/5/1973 0:00	24	19.1	0	1.125	24	19	1	2	27	0	27	93.7%	11.5	15.5
7/10/1989 0:00	24	8.5	0	1.125	24	15	1	3	27	0	27	93.7%	11.5	15.5
7/22/1972 0:00	24	13.7	0	1.121	24	19	1	2	26.9	0	26.9	93.6%	11.5	15.4
9/11/1975 0:00	24	12.7	0	1.121	24	18	1	2	26.9	0	26.9	93.6%	11.5	15.4
4/20/1982 0:00	24	5.4	0	1.117	24	11	1	3	26.8	0	26.8	93.4%	11.5	15.3
6/12/1986 0:00	24	7.3	0	1.117	24	11	1	2	26.8	0	26.8	93.4%	11.5	15.3
10/7/1998 0:00	24	6.9	0	1.112	24	11	1	3	26.7	0	26.7	93.4%	11.5	15.2
4/2/1979 0:00	24	3.7	0	1.108	24	7	1	2	26.6	0	26.6	93.2%	11.5	15.1
8/5/1990 0:00	24	9.2	0	1.108	24	8	1	4	26.6	0	26.6	93.2%	11.5	15.1
4/21/1991 0:00	24	4.8	0	1.1	24	12	1	1	26.4	0	26.4	93.2%	11.5	14.9
11/4/1982 0:00	24	2.2	0.2	1.092	24	0	1	0	26.2	0	26.2	93.1%	11.5	14.7
1/26/1978 0:00	24	6.9	0	1.088	24	12	1	2	26.1	0	26.1	93.0%	11.5	14.6
7/2/1994 0:00	24	14.1	0	1.087	24	20	1	2	26.1	0	26.1	93.0%	11.5	14.6
11/27/1993 0:00	24	6.7	0	1.079	24	11	1	1	25.9	0	25.9	92.9%	11.5	14.4
6/22/1988 0:00	24	16.4	0	1.075	24	16	1	3	25.8	0	25.8	92.7%	11.5	14.3
4/8/1991 0:00	24	11.3	0	1.075	24	17	1	4	25.8	0	25.8	92.7%	11.5	14.3
4/10/1993 0:00	24	3.2	0	1.075	24	4	1	1	25.8	0	25.8	92.7%	11.5	14.3
7/24/1999 0:00	24	16.2	0	1.071	24	18	1	3	25.7	0	25.7	92.7%	11.5	14.2
7/26/1986 0:00	24	6.4	0	1.067	24	18	1	3	25.6	0	25.6	92.5%	11.5	14.1
9/8/1987 0:00	24	9	0	1.067	24	12	1	2	25.6	0	25.6	92.5%	11.5	14.1
5/24/1993 0:00	24	3.8	0	1.058	24	14	1	2	25.4	0	25.4	92.5%	11.5	13.9
4/27/1973 0:00	24	6.4	0	1.054	24	13	1	1	25.3	0	25.3	92.4%	11.5	13.8
5/2/1983 0:00	24	5.3	0	1.05	24	12	1	4	25.2	0	25.2	92.3%	11.5	13.7
9/26/1977 0:00	24	7.2	0	1.046	24	12	1	2	25.1	0	25.1	92.3%	11.5	13.6
10/3/1973 0:00	24	6.1	0	1.042	24	17	1	3	25	0	25	91.9%	11.5	13.5
11/17/1978 0:00	24	4.6	0	1.042	24	12	1	1	25	0	25	91.9%	11.5	13.5
9/23/1981 0:00	24	2.7	0	1.042	24	7	1	3	25	0	25	91.9%	11.5	13.5
6/24/1984 0:00	24	6	0	1.042	24	15	1	4	25	0	25	91.9%	11.5	13.5
7/31/1992 0:00	24	8.4	0	1.042	24	11	1	1	25	0	25	91.9%	11.5	13.5
7/31/1979 0:00	24	21.2	0	1.033	24	20	1	2	24.8	0	24.8	91.9%	11.5	13.3
6/22/1979 0:00	24	13.9	0	1.029	24	17	1	3	24.7	0	24.7	91.8%	11.5	13.2
10/8/1983 0:00	24	3	0	1.025	24	9	1	1	24.6	0	24.6	91.6%	11.5	13.1
5/5/1985 0:00	24	4.1	0	1.025	24	9	1	2	24.6	0	24.6	91.6%	11.5	13.1
8/8/1996 0:00	24	13.9	0	1.025	24	19	1	2	24.6	0	24.6	91.6%	11.5	13.1
9/27/1998 0:00	24	14.1	0	1.025	24	16	1	4	24.6	0	24.6	91.6%	11.5	13.1
5/18/1980 0:00	24	4.2	0	1.021	24	6	1	2	24.5	0	24.5	91.5%	11.5	13
8/28/1992 0:00	24	6.1	0	1.017	24	12	1	3	24.4	0	24.4	91.4%	11.5	12.9

Date	Duration (h)	Maximum Rainfall (mm/hr)	Minimum Rainfall (mm/hr)	Mean Rainfall (mm/hr)	Duration of Exceedances (h)	Duration of Deficits (h)	Number of Exceedances	Number of Deficits	Volume of Exceedances (mm)	Volume of Deficits (mm)	Total Rainfall (mm)	Percentile	Infiltration Amount (mm)	Bypass Amount (mm)
8/4/1994 0:00	24	11.4	0	1.017	24	18	1	3	24.4	0	24.4	91.4%	11.5	12.9
8/5/1977 0:00	24	13.3	0	1.013	24	17	1	3	24.3	0	24.3	91.3%	11.5	12.8
9/26/1975 0:00	24	6.4	0	1.008	24	13	1	4	24.2	0	24.2	91.1%	11.5	12.7
9/18/1976 0:00	24	6.9	0	1.008	24	17	1	3	24.2	0	24.2	91.1%	11.5	12.7
6/15/1993 0:00	24	5.7	0	1.008	24	16	1	4	24.2	0	24.2	91.1%	11.5	12.7
4/28/1988 0:00	24	2.2	0	1	24	4	1	3	24	0	24	91.0%	11.5	12.5
8/4/1991 0:00	24	5.8	0	1	24	8	1	5	24	0	24	91.0%	11.5	12.5
5/26/1994 0:00	24	7.2	0	0.9958	24	12	1	3	23.9	0	23.9	90.9%	11.5	12.4
8/6/1990 0:00	24	5.9	0	0.9917	24	12	1	3	23.8	0	23.8	90.6%	11.5	12.3
6/29/1994 0:00	24	22.6	0	0.9917	24	22	1	2	23.8	0	23.8	90.6%	11.5	12.3
8/28/1994 0:00	24	19.2	0	0.9917	24	17	1	4	23.8	0	23.8	90.6%	11.5	12.3
4/20/1996 0:00	24	12.6	0	0.9917	24	11	1	4	23.8	0	23.8	90.6%	11.5	12.3
5/28/1981 0:00	24	5.7	0	0.9833	24	13	1	2	23.6	0	23.6	90.4%	11.5	12.1
8/15/1981 0:00	24	5.3	0	0.9833	24	12	1	4	23.6	0	23.6	90.4%	11.5	12.1
10/2/1988 0:00	24	4.6	0	0.9833	24	9	1	4	23.6	0	23.6	90.4%	11.5	12.1
5/9/1974 0:00	24	2.5	0	0.975	24	3	1	2	23.4	0	23.4	90.2%	11.5	11.9
5/7/1989 0:00	24	5	0	0.975	24	15	1	2	23.4	0	23.4	90.2%	11.5	11.9
11/15/1991 0:00	24	2.9	0	0.975	24	10	1	3	23.4	0	23.4	90.2%	11.5	11.9
10/17/1993 0:00	24	2.6	0	0.975	24	6	1	3	23.4	0	23.4	90.2%	11.5	11.9
8/3/1972 0:00	24	13.2	0	0.9708	24	19	1	3	23.3	0	23.3	90.1%	11.5	11.8
1/8/1978 0:00	24	5.1	0	0.9625	24	15	1	2	23.1	0	23.1	90.1%	11.5	11.6
9/1/1980 0:00	24	10	0	0.9583	24	16	1	4	23	0	23	89.9%	11.5	11.5
7/23/1990 0:00	24	9	0	0.9583	24	16	1	3	23	0	23	89.9%	11.5	11.5
10/9/1976 0:00	24	3.8	0	0.9542	24	12	1	3	22.9	0	22.9	89.9%	11.5	11.4
4/27/1979 0:00	24	3.3	0	0.95	24	12	1	2	22.8	0	22.8	89.7%	11.5	11.3
2/14/1984 0:00	24	3.2	0	0.95	24	7	1	2	22.8	0	22.8	89.7%	11.5	11.3
9/3/1993 0:00	24	8.7	0	0.9417	24	14	1	4	22.6	0	22.6	89.7%	11.5	11.1
8/18/1990 0:00	24	11.1	0	0.9375	24	21	1	2	22.5	0	22.5	89.6%	11.5	11
8/25/1985 0:00	24	6.2	0	0.9333	24	15	1	3	22.4	0	22.4	89.4%	11.5	10.9
7/24/1988 0:00	24	13	0	0.9333	24	17	1	2	22.4	0	22.4	89.4%	11.5	10.9
11/5/1988 0:00	24	8.9	0	0.9333	24	17	1	1	22.4	0	22.4	89.4%	11.5	10.9
5/12/1974 0:00	24	4.8	0	0.9292	24	7	1	4	22.3	0	22.3	89.3%	11.5	10.8
9/1/1982 0:00	24	11.9	0	0.9208	24	21	1	2	22.1	0	22.1	89.1%	11.5	10.6
7/27/1993 0:00	24	6.1	0	0.9208	24	15	1	3	22.1	0	22.1	89.1%	11.5	10.6
8/21/1994 0:00	24	14.3	0	0.9208	24	16	1	2	22.1	0	22.1	89.1%	11.5	10.6
5/3/1997 0:00	24	5.2	0	0.9167	24	13	1	3	22	0	22	89.1%	11.5	10.5
9/13/1971 0:00	24	9.9	0	0.9083	24	16	1	3	21.8	0	21.8	88.8%	11.5	10.3
5/30/1983 0:00	24	4.3	0	0.9083	24	12	1	2	21.8	0	21.8	88.8%	11.5	10.3
10/3/1984 0:00	24	9.9	0	0.9083	24	17	1	3	21.8	0	21.8	88.8%	11.5	10.3
6/29/1987 0:00	24	7.6	0	0.9083	24	18	1	3	21.8	0	21.8	88.8%	11.5	10.3
6/13/1998 0:00	24	7.1	0	0.9083	24	19	1	2	21.8	0	21.8	88.8%	11.5	10.3
9/8/1996 0:00	24	5.9	0	0.9042	24	6	1	4	21.7	0	21.7	88.7%	11.5	10.2
8/1/1982 0:00	24	19.8	0	0.9	24	21	1	2	21.6	0	21.6	88.6%	11.5	10.1
7/12/1992 0:00	24	6.5	0	0.9	24	16	1	2	21.6	0	21.6	88.6%	11.5	10.1
8/3/1978 0:00	24	11.2	0	0.8917	24	14	1	6	21.4	0	21.4	88.4%	11.5	9.9
7/29/1985 0:00	24	5.5	0	0.8917	24	14	1	4	21.4	0	21.4	88.4%	11.5	9.9
8/1/1973 0:00	24	7.6	0	0.8833	24	14	1	4	21.2	0	21.2	88.2%	11.5	9.7
10/4/1983 0:00	24	10.4	0	0.8833	24	12	1	3	21.2	0	21.2	88.2%	11.5	9.7
10/9/1990 0:00	24	3.3	0	0.8833	24	7	1	2	21.2	0	21.2	88.2%	11.5	9.7
9/26/1998 0:00	24	14.1	0	0.8833	24	19	1	2	21.2	0	21.2	88.2%	11.5	9.7
2/24/1985 0:00	24	3.3	0	0.875	24	4	1	2	21	0	21	88.1%	11.5	9.5
6/26/1983 0:00	24	9.9	0	0.8667	24	17	1	3	20.8	0	20.8	88.0%	11.5	9.3
1/20/1995 0:00	24	4.2	0	0.8667	24	13	1	2	20.8	0	20.8	88.0%	11.5	9.3
9/12/1996 0:00	24	4.7	0	0.8625	24	14	1	3	20.7	0	20.7	87.9%	11.5	9.2
9/30/1972 0:00	24	5.3	0	0.8583	24	15	1	3	20.6	0	20.6	87.5%	11.5	9.1
7/21/1980 0:00	24	6.1	0	0.8583	24	15	1	3	20.6	0	20.6	87.5%	11.5	9.1
8/31/1980 0:00	24	12.7	0	0.8583	24	19	1	3	20.6	0	20.6	87.5%	11.5	9.1
9/12/1986 0:00	24	9	0	0.8583	24	19	1	3	20.6	0	20.6	87.5%	11.5	9.1
6/26/1998 0:00	24	15.8	0	0.8583	24	17	1	3	20.6	0	20.6	87.5%	11.5	9.1
7/1/1999 0:00	24	11.9	0	0.8583	24	21	1	2	20.6	0	20.6	87.5%	11.5	9.1
7/15/1977 0:00	24	13.2	0	0.85	24	21	1	2	20.4	0	20.4	87.3%	11.5	8.9
8/26/1985 0:00	24	16.7	0	0.85	24	21	1	2	20.4	0	20.4	87.3%	11.5	8.9
4/13/1994 0:00	24	4.3	0	0.85	24	9	1	7	20.4	0	20.4	87.3%	11.5	8.9
7/17/1999 0:00	24	17.5	0	0.85	24	21	1	2	20.4	0	20.4	87.3%	11.5	8.9
7/8/1980 0:00	24	7.5	0	0.8417	24	16	1	4	20.2	0	20.2	87.2%	11.5	8.7
6/7/1971 0:00	24	15.5	0	0.8375	24	19	1	3	20.1	0	20.1	87.1%	11.5	8.6
8/18/1973 0:00	24	13.7	0	0.8375	24	22	1	2	20.1	0	20.1	87.1%	11.5	8.6
7/16/1972 0:00	24	11.7	0	0.8333	24	19	1	4	20	0	20	86.9%	11.5	8.5
6/23/1985 0:00	24	8.8	0	0.8333	24	19	1	2	20	0	20	86.9%	11.5	8.5

Date	Duration (h)	Maximum Rainfall (mm/hr)	Minimum Rainfall (mm/hr)	Mean Rainfall (mm/hr)	Duration of Exceedances (h)	Duration of Deficits (h)	Number of Exceedances	Number of Deficits	Volume of Exceedances (mm)	Volume of Deficits (mm)	Total Rainfall (mm)	Percentile	Infiltration Amount (mm)	Bypass Amount (mm)
7/16/1985 0:00	24	19	0	0.8333	24	20	1	2	20	0	20	86.9%	11.5	8.5
5/28/1977 0:00	24	5.6	0	0.8292	24	14	1	4	19.9	0	19.9	86.8%	11.5	8.4
10/1/1985 0:00	24	4.1	0	0.825	24	12	1	2	19.8	0	19.8	86.7%	11.5	8.3
9/29/1986 0:00	24	11.2	0	0.825	24	18	1	2	19.8	0	19.8	86.7%	11.5	8.3
10/7/1995 0:00	24	10.5	0	0.8208	24	18	1	1	19.7	0	19.7	86.6%	11.5	8.2
6/27/1986 0:00	24	5.3	0	0.8167	24	12	1	3	19.6	0	19.6	86.5%	11.5	8.1
8/13/1990 0:00	24	2	0	0.8167	24	11	1	2	19.6	0	19.6	86.5%	11.5	8.1
7/19/1992 0:00	24	12.4	0	0.8083	24	19	1	2	19.4	0	19.4	86.4%	11.5	7.9
3/12/1985 0:00	24	6.6	0	0.8	24	13	1	3	19.2	0	19.2	86.3%	11.5	7.7
5/26/1991 0:00	24	4.6	0	0.8	24	12	1	3	19.2	0	19.2	86.3%	11.5	7.7
5/23/1977 0:00	24	19.1	0	0.7958	24	23	1	2	19.1	0	19.1	86.1%	11.5	7.6
6/15/1982 0:00	24	5.3	0	0.7958	24	16	1	1	19.1	0	19.1	86.1%	11.5	7.6
9/29/1997 0:00	24	5	0	0.7958	24	12	1	3	19.1	0	19.1	86.1%	11.5	7.6
10/1/1977 0:00	24	3.4	0	0.7917	24	9	1	2	19	0	19	85.9%	11.5	7.5
7/8/1978 0:00	24	18.1	0	0.7917	24	21	1	3	19	0	19	85.9%	11.5	7.5
5/16/1981 0:00	24	7.1	0	0.7917	24	13	1	5	19	0	19	85.9%	11.5	7.5
8/23/1998 0:00	24	9.4	0	0.7833	24	18	1	3	18.8	0	18.8	85.8%	11.5	7.3
8/21/1997 0:00	24	5.3	0	0.7792	24	14	1	4	18.7	0	18.7	85.7%	11.5	7.2
6/14/1998 0:00	24	4.7	0	0.7792	24	14	1	3	18.7	0	18.7	85.7%	11.5	7.2
8/16/1978 0:00	24	10.6	0	0.775	24	20	1	3	18.6	0	18.6	85.3%	11.5	7.1
8/13/1984 0:00	24	11.3	0	0.775	24	16	1	2	18.6	0	18.6	85.3%	11.5	7.1
4/3/1990 0:00	24	2.3	0	0.775	24	2	1	2	18.6	0	18.6	85.3%	11.5	7.1
5/17/1992 0:00	24	12.9	0	0.775	24	20	1	2	18.6	0	18.6	85.3%	11.5	7.1
9/22/1992 0:00	24	12.3	0	0.775	24	17	1	3	18.6	0	18.6	85.3%	11.5	7.1
1/4/1993 0:00	24	3	0	0.775	24	8	1	1	18.6	0	18.6	85.3%	11.5	7.1
4/13/1972 0:00	24	4.1	0	0.7667	24	14	1	4	18.4	0	18.4	85.0%	11.5	6.9
8/30/1980 0:00	24	15	0	0.7667	24	22	1	2	18.4	0	18.4	85.0%	11.5	6.9
2/23/1981 0:00	24	3.4	0	0.7667	24	12	1	3	18.4	0	18.4	85.0%	11.5	6.9
5/24/1999 0:00	24	6.3	0	0.7667	24	13	1	2	18.4	0	18.4	85.0%	11.5	6.9
10/13/1985 0:00	24	7	0	0.7625	24	17	1	4	18.3	0	18.3	84.9%	11.5	6.8
5/6/1997 0:00	24	3.5	0	0.7625	24	10	1	2	18.3	0	18.3	84.9%	11.5	6.8
6/30/1980 0:00	24	13.3	0	0.7583	24	20	1	2	18.2	0	18.2	84.7%	11.5	6.7
6/16/1981 0:00	24	9.6	0	0.7583	24	17	1	4	18.2	0	18.2	84.7%	11.5	6.7
9/6/1982 0:00	24	4.2	0	0.7583	24	12	1	2	18.2	0	18.2	84.7%	11.5	6.7
7/29/1980 0:00	24	5.4	0	0.7542	24	12	1	4	18.1	0	18.1	84.7%	11.5	6.6
11/10/1975 0:00	24	5.3	0	0.75	24	18	1	2	18	0	18	84.4%	11.5	6.5
6/11/1979 0:00	24	5.5	0	0.75	24	12	1	5	18	0	18	84.4%	11.5	6.5
5/2/1989 0:00	24	1.6	0	0.75	24	3	1	2	18	0	18	84.4%	11.5	6.5
6/20/1999 0:00	24	10	0	0.75	24	21	1	2	18	0	18	84.4%	11.5	6.5
9/29/1972 0:00	24	3.6	0	0.7458	24	15	1	2	17.9	0	17.9	84.2%	11.5	6.4
10/2/1977 0:00	24	2	0	0.7458	24	3	1	2	17.9	0	17.9	84.2%	11.5	6.4
6/13/1978 0:00	24	5.6	0	0.7458	24	13	1	3	17.9	0	17.9	84.2%	11.5	6.4
5/27/1981 0:00	24	5.5	0	0.7417	24	14	1	3	17.8	0	17.8	83.9%	11.5	6.3
6/18/1984 0:00	24	11.5	0	0.7417	24	19	1	3	17.8	0	17.8	83.9%	11.5	6.3
1/20/1986 0:00	24	3.7	0	0.7417	24	9	1	5	17.8	0	17.8	83.9%	11.5	6.3
10/21/1993 0:00	24	5	0	0.7417	24	18	1	1	17.8	0	17.8	83.9%	11.5	6.3
9/27/1982 0:00	24	3.5	0	0.7375	24	8	1	4	17.7	0	17.7	83.8%	11.5	6.2
8/23/1984 0:00	24	8.8	0	0.7375	24	6	1	4	17.7	0	17.7	83.8%	11.5	6.2
7/26/1971 0:00	24	12.7	0	0.7333	24	18	1	2	17.6	0	17.6	83.4%	11.5	6.1
10/30/1973 0:00	24	3.8	0	0.7333	24	13	1	3	17.6	0	17.6	83.4%	11.5	6.1
10/9/1977 0:00	24	4	0	0.7333	24	15	1	3	17.6	0	17.6	83.4%	11.5	6.1
3/14/1978 0:00	24	3.8	0	0.7333	24	14	1	3	17.6	0	17.6	83.4%	11.5	6.1
8/19/1978 0:00	24	12.3	0	0.7333	24	18	1	4	17.6	0	17.6	83.4%	11.5	6.1
3/31/1982 0:00	24	11.4	0	0.7333	24	18	1	3	17.6	0	17.6	83.4%	11.5	6.1
5/30/1972 0:00	24	4.6	0	0.725	24	15	1	3	17.4	0	17.4	82.8%	11.5	5.9
4/24/1977 0:00	24	3.8	0	0.725	24	14	1	3	17.4	0	17.4	82.8%	11.5	5.9
9/13/1977 0:00	24	5.5	0	0.725	24	13	1	1	17.4	0	17.4	82.8%	11.5	5.9
6/23/1979 0:00	24	13.9	0	0.725	24	18	1	1	17.4	0	17.4	82.8%	11.5	5.9
11/3/1982 0:00	24	3.1	0	0.725	24	5	1	2	17.4	0	17.4	82.8%	11.5	5.9
11/11/1984 0:00	24	3.2	0	0.725	24	9	1	1	17.4	0	17.4	82.8%	11.5	5.9
2/23/1985 0:00	24	2.1	0	0.725	24	8	1	1	17.4	0	17.4	82.8%	11.5	5.9
10/24/1985 0:00	24	10.7	0	0.725	24	18	1	3	17.4	0	17.4	82.8%	11.5	5.9
5/16/1986 0:00	24	5	0	0.725	24	14	1	5	17.4	0	17.4	82.8%	11.5	5.9
9/22/1973 0:00	24	4.3	0	0.7208	24	15	1	3	17.3	0	17.3	82.6%	11.5	5.8
4/1/1976 0:00	24	3	0	0.7208	24	11	1	3	17.3	0	17.3	82.6%	11.5	5.8
2/20/1981 0:00	24	2.6	0	0.7208	24	5	1	5	17.3	0	17.3	82.6%	11.5	5.8
11/15/1989 0:00	24	4.5	0	0.7208	24	10	1	3	17.3	0	17.3	82.6%	11.5	5.8
5/8/1982 0:00	24	2	0	0.7167	24	5	1	3	17.2	0	17.2	82.1%	11.5	5.7
3/19/1983 0:00	24	4.2	0	0.7167	24	10	1	2	17.2	0	17.2	82.1%	11.5	5.7

Date	Duration (h)	Maximum Rainfall (mm/hr)	Minimum Rainfall (mm/hr)	Mean Rainfall (mm/hr)	Duration of Exceedances (h)	Duration of Deficits (h)	Number of Exceedances	Number of Deficits	Volume of Exceedances (mm)	Volume of Deficits (mm)	Total Rainfall (mm)	Percentile	Infiltration Amount (mm)	Bypass Amount (mm)
7/27/1984 0:00	24	5.6	0	0.7167	24	14	1	2	17.2	0	17.2	82.1%	11.5	5.7
11/10/1984 0:00	24	3.4	0	0.7167	24	5	1	2	17.2	0	17.2	82.1%	11.5	5.7
9/28/1996 0:00	24	4.6	0	0.7167	24	12	1	4	17.2	0	17.2	82.1%	11.5	5.7
6/22/1997 0:00	24	12.5	0	0.7167	24	20	1	1	17.2	0	17.2	82.1%	11.5	5.7
7/16/1998 0:00	24	15.8	0	0.7167	24	20	1	3	17.2	0	17.2	82.1%	11.5	5.7
5/11/1995 0:00	24	2.3	0	0.7125	24	7	1	2	17.1	0	17.1	82.0%	11.5	5.6
9/20/1975 0:00	24	8.6	0	0.7083	24	19	1	2	17	0	17	81.9%	11.5	5.5
6/21/1982 0:00	24	4.9	0	0.7083	24	16	1	2	17	0	17	81.9%	11.5	5.5
7/8/1992 0:00	24	8.4	0	0.7083	24	17	1	1	17	0	17	81.9%	11.5	5.5
4/16/1994 0:00	24	6.1	0	0.7042	24	18	1	3	16.9	0	16.9	81.8%	11.5	5.4
10/10/1985 0:00	24	3.6	0	0.7	24	15	1	2	16.8	0	16.8	81.5%	11.5	5.3
6/10/1989 0:00	24	5.8	0	0.7	24	10	1	4	16.8	0	16.8	81.5%	11.5	5.3
4/22/1991 0:00	24	3.1	0	0.7	24	5	1	2	16.8	0	16.8	81.5%	11.5	5.3
11/23/1992 0:00	24	3.3	0	0.7	24	14	1	3	16.8	0	16.8	81.5%	11.5	5.3
7/19/1996 0:00	24	6.7	0	0.6958	24	15	1	3	16.7	0	16.7	81.5%	11.5	5.2
5/31/1978 0:00	24	13.3	0	0.6875	24	21	1	2	16.5	0	16.5	81.4%	11.5	5
7/10/1973 0:00	24	10.2	0	0.6833	24	18	1	3	16.4	0	16.4	81.1%	11.5	4.9
5/17/1990 0:00	24	7.6	0	0.6833	24	12	1	4	16.4	0	16.4	81.1%	11.5	4.9
9/3/1992 0:00	24	10.8	0	0.6833	24	18	1	3	16.4	0	16.4	81.1%	11.5	4.9
1/13/1995 0:00	24	10	0	0.6833	24	19	1	3	16.4	0	16.4	81.1%	11.5	4.9
11/2/1997 0:00	24	2.9	0	0.6833	24	9	1	4	16.4	0	16.4	81.1%	11.5	4.9
6/1/1972 0:00	24	2.8	0	0.6792	24	13	1	3	16.3	0	16.3	80.9%	11.5	4.8
6/9/1972 0:00	24	9.4	0	0.6792	24	19	1	2	16.3	0	16.3	80.9%	11.5	4.8
7/10/1972 0:00	24	6.4	0	0.675	24	17	1	5	16.2	0	16.2	80.4%	11.5	4.7
12/23/1979 0:00	24	1.7	0	0.675	24	9	1	2	16.2	0	16.2	80.4%	11.5	4.7
4/25/1980 0:00	24	3.6	0	0.675	24	12	1	4	16.2	0	16.2	80.4%	11.5	4.7
5/8/1983 0:00	24	2.9	0	0.675	24	9	1	2	16.2	0	16.2	80.4%	11.5	4.7
5/31/1985 0:00	24	14.4	0	0.675	24	20	1	3	16.2	0	16.2	80.4%	11.5	4.7
12/1/1985 0:00	24	8	0	0.675	24	20	1	1	16.2	0	16.2	80.4%	11.5	4.7
9/29/1990 0:00	24	6.2	0	0.675	24	14	1	3	16.2	0	16.2	80.4%	11.5	4.7
9/18/1992 0:00	24	5.9	0	0.675	24	18	1	4	16.2	0	16.2	80.4%	11.5	4.7
9/7/1999 0:00	24	4.4	0	0.675	24	11	1	2	16.2	0	16.2	80.4%	11.5	4.7
6/30/1979 0:00	24	5.2	0	0.6708	24	13	1	4	16.1	0	16.1	80.2%	11.5	4.6
5/16/1994 0:00	24	8.7	0	0.6708	24	17	1	3	16.1	0	16.1	80.2%	11.5	4.6
3/28/1985 0:00	24	4.6	0	0.6667	24	18	1	2	16	0	16	80.2%	11.5	4.5
7/23/1971 0:00	24	13.7	0	0.6625	24	18	1	3	15.9	0	15.9	80.0%	11.5	4.4
4/28/1997 0:00	24	2.9	0	0.6625	24	9	1	2	15.9	0	15.9	80.0%	11.5	4.4
7/9/1999 0:00	24	6.1	0	0.6625	24	18	1	2	15.9	0	15.9	80.0%	11.5	4.4
5/17/1978 0:00	24	9.1	0	0.6583	24	18	1	4	15.8	0	15.8	79.6%	11.5	4.3
5/12/1979 0:00	24	8.3	0	0.6583	24	18	1	4	15.8	0	15.8	79.6%	11.5	4.3
8/23/1979 0:00	24	10.8	0	0.6583	24	21	1	2	15.8	0	15.8	79.6%	11.5	4.3
5/31/1992 0:00	24	4.2	0	0.6583	24	6	1	3	15.8	0	15.8	79.6%	11.5	4.3
6/2/1999 0:00	24	6.7	0	0.6583	24	19	1	2	15.8	0	15.8	79.6%	11.5	4.3
9/18/1982 0:00	24	3.7	0	0.6542	24	14	1	3	15.7	0	15.7	79.5%	11.5	4.2
6/20/1993 0:00	24	9.6	0	0.6542	24	14	1	2	15.7	0	15.7	79.5%	11.5	4.2
8/29/1975 0:00	24	5.3	0	0.65	24	10	1	4	15.6	0	15.6	79.1%	11.5	4.1
8/8/1978 0:00	24	12.6	0	0.65	24	20	1	3	15.6	0	15.6	79.1%	11.5	4.1
10/6/1981 0:00	24	5.7	0	0.65	24	16	1	4	15.6	0	15.6	79.1%	11.5	4.1
8/21/1986 0:00	24	5.1	0	0.65	24	18	1	2	15.6	0	15.6	79.1%	11.5	4.1
4/28/1987 0:00	24	2.6	0	0.65	24	9	1	3	15.6	0	15.6	79.1%	11.5	4.1
10/28/1998 0:00	24	4.4	0	0.65	24	17	1	2	15.6	0	15.6	79.1%	11.5	4.1
10/14/1978 0:00	24	3.1	0	0.6417	24	12	1	3	15.4	0	15.4	78.8%	11.5	3.9
10/21/1979 0:00	24	9.5	0	0.6417	24	21	1	2	15.4	0	15.4	78.8%	11.5	3.9
6/6/1981 0:00	24	4.9	0	0.6417	24	16	1	4	15.4	0	15.4	78.8%	11.5	3.9
4/3/1988 0:00	24	3.6	0	0.6417	24	14	1	5	15.4	0	15.4	78.8%	11.5	3.9
3/2/1991 0:00	24	5.7	0	0.6417	24	16	1	2	15.4	0	15.4	78.8%	11.5	3.9
7/15/1972 0:00	24	5.8	0	0.6333	24	18	1	3	15.2	0	15.2	78.3%	11.5	3.7
9/22/1980 0:00	24	8.6	0	0.6333	24	19	1	1	15.2	0	15.2	78.3%	11.5	3.7
8/10/1984 0:00	24	6.9	0	0.6333	24	20	1	4	15.2	0	15.2	78.3%	11.5	3.7
10/8/1984 0:00	24	2.5	0	0.6333	24	9	1	2	15.2	0	15.2	78.3%	11.5	3.7
6/27/1987 0:00	24	9.4	0	0.6333	24	21	1	3	15.2	0	15.2	78.3%	11.5	3.7
9/7/1996 0:00	24	11.6	0	0.6333	24	19	1	3	15.2	0	15.2	78.3%	11.5	3.7
7/9/1998 0:00	24	9.1	0	0.6333	24	20	1	1	15.2	0	15.2	78.3%	11.5	3.7
8/10/1979 0:00	24	4	0	0.625	24	13	1	3	15	0	15	77.9%	11.5	3.5
10/12/1979 0:00	24	3.6	0	0.625	24	12	1	4	15	0	15	77.9%	11.5	3.5
7/18/1982 0:00	24	12.7	0	0.625	24	22	1	2	15	0	15	77.9%	11.5	3.5
7/11/1984 0:00	24	6.2	0	0.625	24	19	1	2	15	0	15	77.9%	11.5	3.5
10/7/1987 0:00	24	4.4	0	0.625	24	12	1	4	15	0	15	77.9%	11.5	3.5
9/22/1990 0:00	24	3.2	0	0.625	24	10	1	3	15	0	15	77.9%	11.5	3.5

Date	Duration (h)	Maximum Rainfall (mm/hr)	Minimum Rainfall (mm/hr)	Mean Rainfall (mm/hr)	Duration of Exceedances (h)	Duration of Deficits (h)	Number of Exceedances	Number of Deficits	Volume of Exceedances (mm)	Volume of Deficits (mm)	Total Rainfall (mm)	Percentile	Infiltration Amount (mm)	Bypass Amount (mm)
6/5/1975 0:00	24	3	0	0.6208	24	16	1	2	14.9	0	14.9	77.9%	11.5	3.4
5/28/1973 0:00	24	3.8	0	0.6167	24	13	1	5	14.8	0	14.8	77.6%	11.5	3.3
7/3/1986 0:00	24	7.1	0	0.6167	24	20	1	2	14.8	0	14.8	77.6%	11.5	3.3
7/5/1986 0:00	24	10.6	0	0.6167	24	20	1	3	14.8	0	14.8	77.6%	11.5	3.3
6/17/1989 0:00	24	5.8	0	0.6167	24	17	1	3	14.8	0	14.8	77.6%	11.5	3.3
9/22/1989 0:00	24	5.8	0	0.6167	24	18	1	3	14.8	0	14.8	77.6%	11.5	3.3
4/10/1983 0:00	24	3.5	0	0.6125	24	11	1	2	14.7	0	14.7	77.4%	11.5	3.2
4/4/1990 0:00	24	2.5	0	0.6125	24	4	1	3	14.7	0	14.7	77.4%	11.5	3.2
5/3/1979 0:00	24	5.8	0	0.6083	24	14	1	3	14.6	0	14.6	77.0%	11.5	3.1
5/27/1985 0:00	24	6.5	0	0.6083	24	17	1	3	14.6	0	14.6	77.0%	11.5	3.1
6/8/1987 0:00	24	4.6	0	0.6083	24	17	1	4	14.6	0	14.6	77.0%	11.5	3.1
10/13/1990 0:00	24	2.6	0	0.6083	24	15	1	2	14.6	0	14.6	77.0%	11.5	3.1
12/18/1990 0:00	24	3	0	0.6083	24	12	1	4	14.6	0	14.6	77.0%	11.5	3.1
4/12/1995 0:00	24	2.7	0	0.6083	24	12	1	2	14.6	0	14.6	77.0%	11.5	3.1
7/3/1992 0:00	24	7.2	0	0.6042	24	15	1	5	14.5	0	14.5	77.0%	11.5	3
8/22/1984 0:00	24	8.8	0	0.6	24	20	1	1	14.4	0	14.4	76.6%	11.5	2.9
8/30/1984 0:00	24	9.4	0	0.6	24	21	1	3	14.4	0	14.4	76.6%	11.5	2.9
8/19/1985 0:00	24	6.3	0	0.6	24	19	1	3	14.4	0	14.4	76.6%	11.5	2.9
4/25/1993 0:00	24	5.9	0	0.6	24	18	1	2	14.4	0	14.4	76.6%	11.5	2.9
5/31/1998 0:00	24	6	0	0.6	24	20	1	2	14.4	0	14.4	76.6%	11.5	2.9
10/6/1972 0:00	24	2.3	0	0.5958	24	15	1	1	14.3	0	14.3	76.6%	11.5	2.8
6/8/1976 0:00	24	13.7	0	0.5917	24	22	1	2	14.2	0	14.2	76.1%	11.5	2.7
4/14/1979 0:00	24	5.4	0	0.5917	24	16	1	3	14.2	0	14.2	76.1%	11.5	2.7
8/18/1986 0:00	24	11.4	0	0.5917	24	20	1	2	14.2	0	14.2	76.1%	11.5	2.7
8/27/1986 0:00	24	10	0	0.5917	24	20	1	1	14.2	0	14.2	76.1%	11.5	2.7
5/14/1987 0:00	24	5	0	0.5917	24	18	1	1	14.2	0	14.2	76.1%	11.5	2.7
10/18/1990 0:00	24	3.6	0	0.5917	24	18	1	2	14.2	0	14.2	76.1%	11.5	2.7
10/14/1998 0:00	24	3.2	0	0.5917	24	12	1	3	14.2	0	14.2	76.1%	11.5	2.7
1/9/1978 0:00	24	4.2	0	0.5833	24	19	1	2	14	0	14	75.8%	11.5	2.5
8/24/1978 0:00	24	4.1	0	0.5833	24	16	1	1	14	0	14	75.8%	11.5	2.5
9/30/1986 0:00	24	12	0	0.5833	24	18	1	3	14	0	14	75.8%	11.5	2.5
9/29/1987 0:00	24	7.1	0	0.5833	24	19	1	2	14	0	14	75.8%	11.5	2.5
11/17/1987 0:00	24	7.7	0	0.5833	24	15	1	4	14	0	14	75.8%	11.5	2.5
5/18/1976 0:00	24	2.5	0	0.5792	24	14	1	4	13.9	0	13.9	75.7%	11.5	2.4
6/11/1976 0:00	24	6.1	0	0.5792	24	16	1	5	13.9	0	13.9	75.7%	11.5	2.4
6/16/1976 0:00	24	13	0	0.575	24	22	1	2	13.8	0	13.8	75.1%	11.5	2.3
11/13/1978 0:00	24	3.7	0	0.575	24	17	1	1	13.8	0	13.8	75.1%	11.5	2.3
9/13/1980 0:00	24	3.5	0	0.575	24	16	1	1	13.8	0	13.8	75.1%	11.5	2.3
3/30/1981 0:00	24	2.5	0	0.575	24	9	1	4	13.8	0	13.8	75.1%	11.5	2.3
5/3/1983 0:00	24	6.5	0	0.575	24	16	1	2	13.8	0	13.8	75.1%	11.5	2.3
8/26/1986 0:00	24	10	0	0.575	24	21	1	1	13.8	0	13.8	75.1%	11.5	2.3
8/20/1989 0:00	24	3.6	0	0.575	24	14	1	4	13.8	0	13.8	75.1%	11.5	2.3
4/20/1991 0:00	24	1.6	0	0.575	24	8	1	3	13.8	0	13.8	75.1%	11.5	2.3
11/1/1975 0:00	24	3.3	0	0.5708	24	15	1	3	13.7	0	13.7	75.1%	11.5	2.2
8/21/1973 0:00	24	5.3	0	0.5667	24	17	1	2	13.6	0	13.6	74.8%	11.5	2.1
3/31/1976 0:00	24	5.1	0	0.5667	24	14	1	4	13.6	0	13.6	74.8%	11.5	2.1
12/3/1982 0:00	24	4.2	0	0.5667	24	18	1	1	13.6	0	13.6	74.8%	11.5	2.1
11/22/1990 0:00	24	2.5	0	0.5667	24	9	1	5	13.6	0	13.6	74.8%	11.5	2.1
9/8/1999 0:00	24	4.6	0	0.5667	24	12	1	5	13.6	0	13.6	74.8%	11.5	2.1
12/5/1973 0:00	24	2.5	0	0.5625	24	15	1	5	13.5	0	13.5	74.6%	11.5	2
4/2/1977 0:00	24	5.3	0	0.5625	24	15	1	2	13.5	0	13.5	74.6%	11.5	2
5/28/1995 0:00	24	4.5	0	0.5625	24	14	1	2	13.5	0	13.5	74.6%	11.5	2
12/9/1971 0:00	24	3.3	0	0.5583	24	17	1	2	13.4	0	13.4	73.8%	11.5	1.9
4/20/1978 0:00	24	2.6	0	0.5583	24	12	1	3	13.4	0	13.4	73.8%	11.5	1.9
4/14/1980 0:00	24	3.9	0	0.5583	24	14	1	1	13.4	0	13.4	73.8%	11.5	1.9
6/20/1980 0:00	24	6.9	0	0.5583	24	16	1	4	13.4	0	13.4	73.8%	11.5	1.9
2/11/1981 0:00	24	2.7	0	0.5583	24	8	1	3	13.4	0	13.4	73.8%	11.5	1.9
4/18/1985 0:00	24	4.7	0	0.5583	24	18	1	2	13.4	0	13.4	73.8%	11.5	1.9
8/28/1988 0:00	24	7.1	0	0.5583	24	15	1	5	13.4	0	13.4	73.8%	11.5	1.9
12/23/1990 0:00	24	3.1	0	0.5583	24	16	1	1	13.4	0	13.4	73.8%	11.5	1.9
10/2/1991 0:00	24	3.8	0	0.5583	24	13	1	4	13.4	0	13.4	73.8%	11.5	1.9
9/26/1994 0:00	24	7.3	0	0.5583	24	19	1	3	13.4	0	13.4	73.8%	11.5	1.9
6/7/1996 0:00	24	4.6	0	0.5583	24	14	1	3	13.4	0	13.4	73.8%	11.5	1.9
8/27/1997 0:00	24	8	0	0.5583	24	21	1	2	13.4	0	13.4	73.8%	11.5	1.9
12/6/1972 0:00	24	6.1	0	0.5542	24	20	1	2	13.3	0	13.3	73.6%	11.5	1.8
9/23/1993 0:00	24	4.5	0	0.5542	24	19	1	2	13.3	0	13.3	73.6%	11.5	1.8
6/7/1995 0:00	24	11.7	0	0.5542	24	20	1	3	13.3	0	13.3	73.6%	11.5	1.8
4/4/1974 0:00	24	3.8	0	0.55	24	17	1	4	13.2	0	13.2	72.9%	11.5	1.7
4/3/1982 0:00	24	3.2	0	0.55	24	14	1	4	13.2	0	13.2	72.9%	11.5	1.7

Date	Duration (h)	Maximum Rainfall (mm/hr)	Minimum Rainfall (mm/hr)	Mean Rainfall (mm/hr)	Duration of Exceedances (h)	Duration of Deficits (h)	Number of Exceedances	Number of Deficits	Volume of Exceedances (mm)	Volume of Deficits (mm)	Total Rainfall (mm)	Percentile	Infiltration Amount (mm)	Bypass Amount (mm)
7/11/1982 0:00	24	5.5	0	0.55	24	17	1	2	13.2	0	13.2	72.9%	11.5	1.7
5/15/1983 0:00	24	10.2	0	0.55	24	21	1	1	13.2	0	13.2	72.9%	11.5	1.7
4/9/1991 0:00	24	11.3	0	0.55	24	14	1	3	13.2	0	13.2	72.9%	11.5	1.7
4/15/1991 0:00	24	3	0	0.55	24	11	1	3	13.2	0	13.2	72.9%	11.5	1.7
1/5/1993 0:00	24	3.9	0	0.55	24	17	1	1	13.2	0	13.2	72.9%	11.5	1.7
7/3/1993 0:00	24	12.6	0	0.55	24	22	1	2	13.2	0	13.2	72.9%	11.5	1.7
12/1/1996 0:00	24	2.7	0	0.55	24	13	1	3	13.2	0	13.2	72.9%	11.5	1.7
7/7/1999 0:00	24	13.2	0	0.55	24	23	1	2	13.2	0	13.2	72.9%	11.5	1.7
5/12/1997 0:00	24	3.9	0	0.5458	24	12	1	3	13.1	0	13.1	72.9%	11.5	1.6
10/11/1975 0:00	24	2.8	0	0.5417	24	13	1	2	13	0	13	72.2%	11.5	1.5
9/1/1976 0:00	24	2.8	0	0.5417	24	12	1	3	13	0	13	72.2%	11.5	1.5
7/29/1977 0:00	24	5.3	0	0.5417	24	18	1	3	13	0	13	72.2%	11.5	1.5
7/18/1981 0:00	24	4.3	0	0.5417	24	18	1	1	13	0	13	72.2%	11.5	1.5
7/21/1983 0:00	24	7.9	0	0.5417	24	20	1	3	13	0	13	72.2%	11.5	1.5
7/14/1985 0:00	24	12.1	0	0.5417	24	22	1	2	13	0	13	72.2%	11.5	1.5
9/23/1986 0:00	24	3.7	0	0.5417	24	17	1	2	13	0	13	72.2%	11.5	1.5
10/29/1986 0:00	24	2.4	0	0.5417	24	16	1	2	13	0	13	72.2%	11.5	1.5
3/31/1987 0:00	24	2.9	0	0.5417	24	10	1	2	13	0	13	72.2%	11.5	1.5
12/21/1990 0:00	24	3.9	0	0.5417	24	19	1	1	13	0	13	72.2%	11.5	1.5
6/18/1998 0:00	24	9.5	0	0.5417	24	20	1	2	13	0	13	72.2%	11.5	1.5
8/8/1983 0:00	24	6.2	0	0.5375	24	17	1	4	12.9	0	12.9	71.9%	11.5	1.4
8/13/1997 0:00	24	3.1	0	0.5375	24	14	1	2	12.9	0	12.9	71.9%	11.5	1.4
11/1/1997 0:00	24	5	0	0.5375	24	18	1	2	12.9	0	12.9	71.9%	11.5	1.4
9/30/1999 0:00	24	6.8	0	0.5375	24	15	1	3	12.9	0	12.9	71.9%	11.5	1.4
6/18/1977 0:00	24	4.3	0	0.5333	24	16	1	2	12.8	0	12.8	71.5%	11.5	1.3
8/28/1978 0:00	24	3.6	0	0.5333	24	16	1	3	12.8	0	12.8	71.5%	11.5	1.3
5/30/1980 0:00	24	6.2	0	0.5333	24	20	1	3	12.8	0	12.8	71.5%	11.5	1.3
8/27/1980 0:00	24	9.3	0	0.5333	24	19	1	4	12.8	0	12.8	71.5%	11.5	1.3
10/26/1981 0:00	24	2.9	0	0.5333	24	12	1	2	12.8	0	12.8	71.5%	11.5	1.3
6/2/1995 0:00	24	9.6	0	0.5333	24	21	1	2	12.8	0	12.8	71.5%	11.5	1.3
9/9/1999 0:00	24	4.7	0	0.5292	24	19	1	2	12.7	0	12.7	71.4%	11.5	1.2
10/28/1972 0:00	24	2.5	0	0.525	24	10	1	4	12.6	0	12.6	70.5%	11.5	1.1
3/14/1977 0:00	24	1.8	0	0.525	24	10	1	2	12.6	0	12.6	70.5%	11.5	1.1
6/2/1977 0:00	24	4.6	0	0.525	24	16	1	4	12.6	0	12.6	70.5%	11.5	1.1
7/29/1978 0:00	24	4.9	0	0.525	24	17	1	3	12.6	0	12.6	70.5%	11.5	1.1
4/12/1980 0:00	24	3.2	0	0.525	24	14	1	3	12.6	0	12.6	70.5%	11.5	1.1
9/13/1987 0:00	24	3.4	0	0.525	24	15	1	3	12.6	0	12.6	70.5%	11.5	1.1
10/24/1988 0:00	24	2.9	0	0.525	24	14	1	3	12.6	0	12.6	70.5%	11.5	1.1
5/20/1990 0:00	24	2.2	0	0.525	24	12	1	2	12.6	0	12.6	70.5%	11.5	1.1
4/10/1991 0:00	24	10.8	0	0.525	24	20	1	3	12.6	0	12.6	70.5%	11.5	1.1
7/22/1991 0:00	24	6.6	0	0.525	24	20	1	1	12.6	0	12.6	70.5%	11.5	1.1
10/10/1991 0:00	24	3.3	0	0.525	24	17	1	2	12.6	0	12.6	70.5%	11.5	1.1
6/19/1992 0:00	24	4.1	0	0.525	24	17	1	2	12.6	0	12.6	70.5%	11.5	1.1
10/2/1993 0:00	24	2.8	0	0.525	24	17	1	3	12.6	0	12.6	70.5%	11.5	1.1
9/27/1994 0:00	24	3	0	0.525	24	13	1	5	12.6	0	12.6	70.5%	11.5	1.1
5/14/1995 0:00	24	5.2	0	0.5208	24	17	1	3	12.5	0	12.5	70.5%	11.5	1
11/8/1977 0:00	24	6.9	0	0.5167	24	16	1	3	12.4	0	12.4	70.0%	11.5	0.9
5/25/1979 0:00	24	3.4	0	0.5167	24	14	1	3	12.4	0	12.4	70.0%	11.5	0.9
5/30/1979 0:00	24	5.1	0	0.5167	24	17	1	3	12.4	0	12.4	70.0%	11.5	0.9
11/11/1983 0:00	24	2.4	0	0.5167	24	9	1	1	12.4	0	12.4	70.0%	11.5	0.9
3/25/1988 0:00	24	3.9	0	0.5167	24	18	1	1	12.4	0	12.4	70.0%	11.5	0.9
5/12/1989 0:00	24	9.1	0	0.5167	24	11	1	6	12.4	0	12.4	70.0%	11.5	0.9
12/5/1994 0:00	24	3.1	0	0.5167	24	14	1	4	12.4	0	12.4	70.0%	11.5	0.9
12/31/1972 0:00	24	2.8	0	0.5125	24	14	1	2	12.3	0	12.3	69.9%	11.5	0.8
6/13/1974 0:00	24	8.1	0	0.5083	24	22	1	3	12.2	0	12.2	69.5%	11.5	0.7
6/6/1975 0:00	24	9.1	0	0.5083	24	21	1	3	12.2	0	12.2	69.5%	11.5	0.7
7/28/1975 0:00	24	11.9	0	0.5083	24	22	1	2	12.2	0	12.2	69.5%	11.5	0.7
12/15/1975 0:00	24	4.1	0	0.5083	24	15	1	3	12.2	0	12.2	69.5%	11.5	0.7
1/11/1980 0:00	24	2.3	0	0.5083	24	14	1	2	12.2	0	12.2	69.5%	11.5	0.7
8/14/1984 0:00	24	4.4	0	0.5083	24	17	1	4	12.2	0	12.2	69.5%	11.5	0.7
10/5/1988 0:00	24	1.5	0	0.5083	24	6	1	3	12.2	0	12.2	69.5%	11.5	0.7
10/16/1989 0:00	24	5	0	0.5042	24	19	1	2	12.1	0	12.1	69.4%	11.5	0.6
9/25/1975 0:00	24	4.8	0	0.5	24	18	1	2	12	0	12	69.2%	11.5	0.5
10/13/1975 0:00	24	3.8	0	0.5	24	17	1	2	12	0	12	69.2%	11.5	0.5
10/16/1992 0:00	24	3.9	0	0.5	24	17	1	3	12	0	12	69.2%	11.5	0.5
9/19/1971 0:00	24	3	0	0.4958	24	15	1	2	11.9	0	11.9	69.2%	11.5	0.4
6/16/1974 0:00	24	3.3	0	0.4917	24	10	1	5	11.8	0	11.8	69.1%	11.5	0.3
7/25/1996 0:00	24	7.2	0	0.4875	24	21	1	3	11.7	0	11.7	69.0%	11.5	0.2
4/1/1973 0:00	24	3.3	0	0.4833	24	14	1	3	11.6	0	11.6	68.3%	11.5	0.1

Date	Duration (h)	Maximum Rainfall (mm/hr)	Minimum Rainfall (mm/hr)	Mean Rainfall (mm/hr)	Duration of Exceedances (h)	Duration of Deficits (h)	Number of Exceedances	Number of Deficits	Volume of Exceedances (mm)	Volume of Deficits (mm)	Total Rainfall (mm)	Percentile	Infiltration Amount (mm)	Bypass Amount (mm)
6/15/1973 0:00	24	1.5	0	0.4833	24	12	1	3	11.6	0	11.6	68.3%	11.5	0.1
10/1/1978 0:00	24	3.4	0	0.4833	24	16	1	2	11.6	0	11.6	68.3%	11.5	0.1
12/24/1979 0:00	24	2.5	0	0.4833	24	13	1	2	11.6	0	11.6	68.3%	11.5	0.1
10/26/1983 0:00	24	1.1	0	0.4833	24	5	1	5	11.6	0	11.6	68.3%	11.5	0.1
9/20/1987 0:00	24	3.4	0	0.4833	24	6	1	3	11.6	0	11.6	68.3%	11.5	0.1
4/29/1988 0:00	24	2.9	0	0.4833	24	14	1	4	11.6	0	11.6	68.3%	11.5	0.1
9/15/1991 0:00	24	3.6	0	0.4833	24	16	1	3	11.6	0	11.6	68.3%	11.5	0.1
11/12/1992 0:00	24	2.3	0	0.4833	24	13	1	2	11.6	0	11.6	68.3%	11.5	0.1
8/27/1993 0:00	24	3.9	0	0.4833	24	20	1	3	11.6	0	11.6	68.3%	11.5	0.1
7/16/1996 0:00	24	7.3	0	0.4833	24	21	1	3	11.6	0	11.6	68.3%	11.5	0.1
8/22/1971 0:00	24	3.8	0	0.4792	24	15	1	2	11.5	0	11.5	68.0%	11.5	0
4/4/1973 0:00	24	2	0	0.4792	24	12	1	2	11.5	0	11.5	68.0%	11.5	0
8/3/1974 0:00	24	7.9	0	0.4792	24	21	1	2	11.5	0	11.5	68.0%	11.5	0
8/5/1976 0:00	24	4.6	0	0.4792	24	19	1	2	11.5	0	11.5	68.0%	11.5	0
11/11/1995 0:00	24	2.5	0	0.4792	24	11	1	4	11.5	0	11.5	68.0%	11.5	0
9/26/1980 0:00	24	4.3	0	0.475	24	17	1	4	11.4	0	11.4	67.5%	11.4	0
5/28/1982 0:00	24	7.6	0	0.475	24	19	1	4	11.4	0	11.4	67.5%	11.4	0
3/26/1992 0:00	24	1.3	0	0.475	24	10	1	3	11.4	0	11.4	67.5%	11.4	0
7/4/1992 0:00	24	5.2	0	0.475	24	19	1	2	11.4	0	11.4	67.5%	11.4	0
1/24/1993 0:00	24	2	0	0.475	24	12	1	2	11.4	0	11.4	67.5%	11.4	0
11/5/1993 0:00	24	2.9	0	0.475	24	14	1	2	11.4	0	11.4	67.5%	11.4	0
6/22/1996 0:00	24	4.2	0	0.475	24	14	1	4	11.4	0	11.4	67.5%	11.4	0
7/28/1998 0:00	24	8.7	0	0.475	24	20	1	2	11.4	0	11.4	67.5%	11.4	0
7/6/1971 0:00	24	4.1	0	0.4708	24	16	1	3	11.3	0	11.3	67.3%	11.3	0
5/3/1974 0:00	24	2.8	0	0.4708	24	14	1	3	11.3	0	11.3	67.3%	11.3	0
9/20/1997 0:00	24	5.5	0	0.4708	24	14	1	3	11.3	0	11.3	67.3%	11.3	0
8/8/1976 0:00	24	3	0	0.4667	24	16	1	5	11.2	0	11.2	66.6%	11.2	0
7/13/1981 0:00	24	11	0	0.4667	24	22	1	2	11.2	0	11.2	66.6%	11.2	0
8/2/1987 0:00	24	4.2	0	0.4667	24	16	1	2	11.2	0	11.2	66.6%	11.2	0
6/30/1988 0:00	24	3.8	0	0.4667	24	17	1	6	11.2	0	11.2	66.6%	11.2	0
10/28/1990 0:00	24	2.6	0	0.4667	24	12	1	5	11.2	0	11.2	66.6%	11.2	0
8/24/1993 0:00	24	4.4	0	0.4667	24	15	1	4	11.2	0	11.2	66.6%	11.2	0
7/8/1994 0:00	24	8.2	0	0.4667	24	22	1	1	11.2	0	11.2	66.6%	11.2	0
1/16/1995 0:00	24	1.7	0	0.4667	24	10	1	1	11.2	0	11.2	66.6%	11.2	0
12/13/1996 0:00	24	4.6	0	0.4667	24	11	1	5	11.2	0	11.2	66.6%	11.2	0
9/11/1997 0:00	24	3.1	0	0.4667	24	10	1	4	11.2	0	11.2	66.6%	11.2	0
7/31/1971 0:00	24	5.1	0	0.4625	24	17	1	3	11.1	0	11.1	66.6%	11.1	0
10/1/1975 0:00	24	3.8	0	0.4583	24	17	1	2	11	0	11	66.1%	11	0
10/6/1979 0:00	24	3.8	0	0.4583	24	17	1	3	11	0	11	66.1%	11	0
5/12/1981 0:00	24	2	0	0.4583	24	14	1	4	11	0	11	66.1%	11	0
5/18/1986 0:00	24	10.6	0	0.4583	24	21	1	3	11	0	11	66.1%	11	0
8/9/1986 0:00	24	5.7	0	0.4583	24	20	1	3	11	0	11	66.1%	11	0
10/24/1987 0:00	24	2.4	0	0.4583	24	14	1	1	11	0	11	66.1%	11	0
8/4/1999 0:00	24	10.8	0	0.4583	24	22	1	2	11	0	11	66.1%	11	0
8/2/1972 0:00	24	4.8	0	0.4542	24	17	1	2	10.9	0	10.9	65.9%	10.9	0
5/31/1974 0:00	24	7.9	0	0.4542	24	21	1	3	10.9	0	10.9	65.9%	10.9	0
10/14/1995 0:00	24	3	0	0.4542	24	13	1	2	10.9	0	10.9	65.9%	10.9	0
4/29/1974 0:00	24	3.3	0	0.45	24	15	1	3	10.8	0	10.8	65.4%	10.8	0
10/31/1976 0:00	24	2	0	0.45	24	13	1	2	10.8	0	10.8	65.4%	10.8	0
9/14/1977 0:00	24	6.2	0	0.45	24	19	1	3	10.8	0	10.8	65.4%	10.8	0
4/4/1981 0:00	24	3.6	0	0.45	24	13	1	5	10.8	0	10.8	65.4%	10.8	0
8/2/1986 0:00	24	9.1	0	0.45	24	21	1	3	10.8	0	10.8	65.4%	10.8	0
11/26/1986 0:00	24	2.9	0	0.45	24	18	1	3	10.8	0	10.8	65.4%	10.8	0
8/2/1989 0:00	24	2.8	0	0.45	24	18	1	2	10.8	0	10.8	65.4%	10.8	0
5/17/1995 0:00	24	4	0	0.45	24	15	1	2	10.8	0	10.8	65.4%	10.8	0
7/27/1973 0:00	24	3.3	0	0.4458	24	18	1	6	10.7	0	10.7	65.1%	10.7	0
9/30/1977 0:00	24	2.5	0	0.4458	24	15	1	4	10.7	0	10.7	65.1%	10.7	0
7/28/1982 0:00	24	2.7	0	0.4458	24	15	1	2	10.7	0	10.7	65.1%	10.7	0
4/24/1998 0:00	24	5.9	0	0.4458	24	18	1	3	10.7	0	10.7	65.1%	10.7	0
4/2/1973 0:00	24	2.3	0	0.4417	24	6	1	4	10.6	0	10.6	64.7%	10.6	0
9/6/1979 0:00	24	9.9	0	0.4417	24	20	1	4	10.6	0	10.6	64.7%	10.6	0
6/1/1986 0:00	24	5.1	0	0.4417	24	17	1	4	10.6	0	10.6	64.7%	10.6	0
7/13/1986 0:00	24	7.4	0	0.4417	24	20	1	2	10.6	0	10.6	64.7%	10.6	0
9/10/1986 0:00	24	4.8	0	0.4417	24	19	1	2	10.6	0	10.6	64.7%	10.6	0
10/5/1995 0:00	24	5.2	0	0.4417	24	20	1	1	10.6	0	10.6	64.7%	10.6	0
8/25/1998 0:00	24	7.1	0	0.4417	24	19	1	2	10.6	0	10.6	64.7%	10.6	0
6/25/1971 0:00	24	3.3	0	0.4375	24	17	1	3	10.5	0	10.5	64.3%	10.5	0
10/19/1975 0:00	24	3.3	0	0.4375	24	17	1	3	10.5	0	10.5	64.3%	10.5	0
8/13/1976 0:00	24	3	0	0.4375	24	18	1	3	10.5	0	10.5	64.3%	10.5	0

Date	Duration (h)	Maximum Rainfall (mm/hr)	Minimum Rainfall (mm/hr)	Mean Rainfall (mm/hr)	Duration of Exceedances (h)	Duration of Deficits (h)	Number of Exceedances	Number of Deficits	Volume of Exceedances (mm)	Volume of Deficits (mm)	Total Rainfall (mm)	Percentile	Infiltration Amount (mm)	Bypass Amount (mm)
11/2/1995 0:00	24	3.6	0	0.4375	24	14	1	3	10.5	0	10.5	64.3%	10.5	0
9/13/1996 0:00	24	3.2	0	0.4375	24	16	1	5	10.5	0	10.5	64.3%	10.5	0
11/6/1981 0:00	24	2.1	0	0.4333	24	14	1	3	10.4	0	10.4	64.0%	10.4	0
6/6/1985 0:00	24	6.2	0	0.4333	24	20	1	2	10.4	0	10.4	64.0%	10.4	0
10/13/1986 0:00	24	2.9	0	0.4333	24	13	1	4	10.4	0	10.4	64.0%	10.4	0
11/6/1988 0:00	24	4.8	0	0.4333	24	16	1	2	10.4	0	10.4	64.0%	10.4	0
1/23/1992 0:00	24	2.7	0	0.4333	24	16	1	1	10.4	0	10.4	64.0%	10.4	0
9/26/1976 0:00	24	2.8	0	0.4292	24	15	1	2	10.3	0	10.3	63.8%	10.3	0
9/13/1994 0:00	24	2.8	0	0.4292	24	16	1	2	10.3	0	10.3	63.8%	10.3	0
6/12/1997 0:00	24	7.5	0	0.4292	24	18	1	2	10.3	0	10.3	63.8%	10.3	0
7/23/1999 0:00	24	4	0	0.4292	24	16	1	4	10.3	0	10.3	63.8%	10.3	0
6/12/1981 0:00	24	3.7	0	0.425	24	18	1	3	10.2	0	10.2	63.4%	10.2	0
11/23/1982 0:00	24	5.7	0	0.425	24	18	1	2	10.2	0	10.2	63.4%	10.2	0
10/2/1989 0:00	24	4.4	0	0.425	24	17	1	3	10.2	0	10.2	63.4%	10.2	0
9/2/1997 0:00	24	8.2	0	0.425	24	22	1	2	10.2	0	10.2	63.4%	10.2	0
7/5/1999 0:00	24	10.2	0	0.425	24	23	1	2	10.2	0	10.2	63.4%	10.2	0
8/27/1972 0:00	24	8.1	0	0.4208	24	22	1	2	10.1	0	10.1	63.2%	10.1	0
4/19/1978 0:00	24	2.3	0	0.4208	24	15	1	2	10.1	0	10.1	63.2%	10.1	0
9/27/1993 0:00	24	5.1	0	0.4208	24	14	1	2	10.1	0	10.1	63.2%	10.1	0
5/4/1972 0:00	24	1.8	0	0.4167	24	15	1	1	10	0	10	62.2%	10	0
5/23/1974 0:00	24	4.8	0	0.4167	24	18	1	4	10	0	10	62.2%	10	0
6/17/1977 0:00	24	7.6	0	0.4167	24	20	1	3	10	0	10	62.2%	10	0
8/23/1978 0:00	24	3.8	0	0.4167	24	20	1	1	10	0	10	62.2%	10	0
6/11/1982 0:00	24	6.1	0	0.4167	24	19	1	1	10	0	10	62.2%	10	0
3/18/1983 0:00	24	4.1	0	0.4167	24	19	1	1	10	0	10	62.2%	10	0
6/27/1984 0:00	24	2.9	0	0.4167	24	19	1	3	10	0	10	62.2%	10	0
7/2/1986 0:00	24	6.8	0	0.4167	24	22	1	2	10	0	10	62.2%	10	0
9/20/1988 0:00	24	7.3	0	0.4167	24	20	1	3	10	0	10	62.2%	10	0
6/23/1990 0:00	24	6.7	0	0.4167	24	16	1	6	10	0	10	62.2%	10	0
6/16/1991 0:00	24	3.7	0	0.4167	24	14	1	6	10	0	10	62.2%	10	0
9/10/1991 0:00	24	4.8	0	0.4167	24	19	1	5	10	0	10	62.2%	10	0
5/1/1992 0:00	24	4.7	0	0.4167	24	17	1	2	10	0	10	62.2%	10	0
9/21/1992 0:00	24	2.8	0	0.4167	24	16	1	2	10	0	10	62.2%	10	0
6/17/1997 0:00	24	6.1	0	0.4167	24	19	1	2	10	0	10	62.2%	10	0
7/17/1998 0:00	24	9.4	0	0.4167	24	21	1	4	10	0	10	62.2%	10	0
9/18/1972 0:00	24	9.9	0	0.4125	24	23	1	2	9.9	0	9.9	61.7%	9.9	0
9/18/1973 0:00	24	3.3	0	0.4125	24	17	1	1	9.9	0	9.9	61.7%	9.9	0
7/16/1976 0:00	24	5.8	0	0.4125	24	18	1	5	9.9	0	9.9	61.7%	9.9	0
5/2/1977 0:00	24	2.8	0	0.4125	24	19	1	2	9.9	0	9.9	61.7%	9.9	0
9/26/1993 0:00	24	4.1	0	0.4125	24	14	1	4	9.9	0	9.9	61.7%	9.9	0
5/29/1995 0:00	24	3.3	0	0.4125	24	19	1	4	9.9	0	9.9	61.7%	9.9	0
4/16/1996 0:00	24	2.1	0	0.4125	24	11	1	4	9.9	0	9.9	61.7%	9.9	0
11/17/1977 0:00	24	5.4	0	0.4083	24	20	1	3	9.8	0	9.8	61.0%	9.8	0
11/7/1980 0:00	24	1.7	0	0.4083	24	15	1	1	9.8	0	9.8	61.0%	9.8	0
9/26/1981 0:00	24	4.9	0	0.4083	24	18	1	2	9.8	0	9.8	61.0%	9.8	0
10/23/1981 0:00	24	2.2	0	0.4083	24	17	1	2	9.8	0	9.8	61.0%	9.8	0
10/7/1982 0:00	24	5.1	0	0.4083	24	20	1	3	9.8	0	9.8	61.0%	9.8	0
6/27/1983 0:00	24	6.5	0	0.4083	24	18	1	2	9.8	0	9.8	61.0%	9.8	0
7/5/1983 0:00	24	9.2	0	0.4083	24	21	1	4	9.8	0	9.8	61.0%	9.8	0
6/11/1987 0:00	24	4.6	0	0.4083	24	19	1	1	9.8	0	9.8	61.0%	9.8	0
8/20/1988 0:00	24	3.3	0	0.4083	24	17	1	3	9.8	0	9.8	61.0%	9.8	0
7/4/1991 0:00	24	4.3	0	0.4083	24	20	1	1	9.8	0	9.8	61.0%	9.8	0
6/10/1996 0:00	24	9.2	0	0.4083	24	22	1	2	9.8	0	9.8	61.0%	9.8	0
9/11/1978 0:00	24	3.1	0	0.4042	24	16	1	5	9.7	0	9.7	60.9%	9.7	0
5/2/1998 0:00	24	5	0	0.4042	24	10	1	6	9.7	0	9.7	60.9%	9.7	0
11/2/1972 0:00	24	2.8	0	0.4	24	10	1	3	9.6	0	9.6	60.0%	9.6	0
6/7/1973 0:00	24	4.3	0	0.4	24	18	1	2	9.6	0	9.6	60.0%	9.6	0
9/20/1977 0:00	24	1.8	0	0.4	24	8	1	4	9.6	0	9.6	60.0%	9.6	0
8/5/1979 0:00	24	6	0	0.4	24	19	1	3	9.6	0	9.6	60.0%	9.6	0
10/12/1983 0:00	24	2.3	0	0.4	24	12	1	3	9.6	0	9.6	60.0%	9.6	0
7/25/1986 0:00	24	6	0	0.4	24	20	1	2	9.6	0	9.6	60.0%	9.6	0
9/15/1986 0:00	24	3.1	0	0.4	24	17	1	1	9.6	0	9.6	60.0%	9.6	0
5/11/1987 0:00	24	3.3	0	0.4	24	15	1	4	9.6	0	9.6	60.0%	9.6	0
7/14/1988 0:00	24	4.6	0	0.4	24	18	1	4	9.6	0	9.6	60.0%	9.6	0
4/4/1989 0:00	24	2.7	0	0.4	24	18	1	3	9.6	0	9.6	60.0%	9.6	0
8/6/1989 0:00	24	6.5	0	0.4	24	20	1	5	9.6	0	9.6	60.0%	9.6	0
5/10/1990 0:00	24	3.7	0	0.4	24	18	1	2	9.6	0	9.6	60.0%	9.6	0
7/30/1996 0:00	24	2.5	0	0.4	24	16	1	2	9.6	0	9.6	60.0%	9.6	0
7/13/1971 0:00	24	6.1	0	0.3958	24	18	1	2	9.5	0	9.5	59.7%	9.5	0

Date	Duration (h)	Maximum Rainfall (mm/hr)	Minimum Rainfall (mm/hr)	Mean Rainfall (mm/hr)	Duration of Exceedances (h)	Duration of Deficits (h)	Number of Exceedances	Number of Deficits	Volume of Exceedances (mm)	Volume of Deficits (mm)	Total Rainfall (mm)	Percentile	Infiltration Amount (mm)	Bypass Amount (mm)
10/9/1971 0:00	24	2.3	0	0.3958	24	14	1	2	9.5	0	9.5	59.7%	9.5	0
9/2/1975 0:00	24	5.3	0	0.3958	24	19	1	2	9.5	0	9.5	59.7%	9.5	0
12/1/1977 0:00	24	3.5	0	0.3958	24	16	1	2	9.5	0	9.5	59.7%	9.5	0
8/23/1982 0:00	24	5.7	0	0.3958	24	18	1	2	9.5	0	9.5	59.7%	9.5	0
9/17/1997 0:00	24	5.5	0	0.3958	24	20	1	2	9.5	0	9.5	59.7%	9.5	0
11/7/1975 0:00	24	3.8	0	0.3917	24	20	1	2	9.4	0	9.4	58.8%	9.4	0
5/11/1976 0:00	24	3.3	0	0.3917	24	16	1	3	9.4	0	9.4	58.8%	9.4	0
3/4/1977 0:00	24	4.1	0	0.3917	24	19	1	2	9.4	0	9.4	58.8%	9.4	0
7/13/1977 0:00	24	8.6	0	0.3917	24	22	1	2	9.4	0	9.4	58.8%	9.4	0
4/10/1978 0:00	24	2.6	0	0.3917	24	15	1	1	9.4	0	9.4	58.8%	9.4	0
5/15/1978 0:00	24	1.9	0	0.3917	24	10	1	5	9.4	0	9.4	58.8%	9.4	0
6/5/1978 0:00	24	3	0	0.3917	24	17	1	3	9.4	0	9.4	58.8%	9.4	0
5/26/1981 0:00	24	6.2	0	0.3917	24	20	1	4	9.4	0	9.4	58.8%	9.4	0
10/18/1981 0:00	24	3.4	0	0.3917	24	18	1	3	9.4	0	9.4	58.8%	9.4	0
5/30/1988 0:00	24	4	0	0.3917	24	18	1	2	9.4	0	9.4	58.8%	9.4	0
4/10/1990 0:00	24	1.9	0	0.3917	24	14	1	3	9.4	0	9.4	58.8%	9.4	0
4/22/1996 0:00	24	4.3	0	0.3917	24	18	1	3	9.4	0	9.4	58.8%	9.4	0
9/19/1997 0:00	24	4	0	0.3917	24	18	1	2	9.4	0	9.4	58.8%	9.4	0
10/15/1975 0:00	24	2.8	0	0.3875	24	15	1	4	9.3	0	9.3	58.5%	9.3	0
3/30/1979 0:00	24	3.2	0	0.3875	24	12	1	4	9.3	0	9.3	58.5%	9.3	0
4/13/1982 0:00	24	1.7	0	0.3875	24	13	1	4	9.3	0	9.3	58.5%	9.3	0
10/1/1982 0:00	24	5.8	0	0.3875	24	20	1	3	9.3	0	9.3	58.5%	9.3	0
5/3/1971 0:00	24	3.6	0	0.3833	24	15	1	3	9.2	0	9.2	58.2%	9.2	0
5/17/1973 0:00	24	1.8	0	0.3833	24	12	1	4	9.2	0	9.2	58.2%	9.2	0
11/16/1989 0:00	24	2.5	0	0.3833	24	17	1	3	9.2	0	9.2	58.2%	9.2	0
9/10/1990 0:00	24	4.6	0	0.3833	24	20	1	3	9.2	0	9.2	58.2%	9.2	0
10/11/1990 0:00	24	3	0	0.3833	24	14	1	5	9.2	0	9.2	58.2%	9.2	0
6/1/1993 0:00	24	4.7	0	0.3833	24	18	1	4	9.2	0	9.2	58.2%	9.2	0
6/22/1972 0:00	24	7.9	0	0.3792	24	15	1	4	9.1	0	9.1	58.1%	9.1	0
4/20/1986 0:00	24	3	0	0.375	24	16	1	2	9	0	9	57.6%	9	0
5/1/1986 0:00	24	4.9	0	0.375	24	21	1	2	9	0	9	57.6%	9	0
10/14/1986 0:00	24	4.3	0	0.375	24	19	1	2	9	0	9	57.6%	9	0
6/9/1993 0:00	24	8.6	0	0.375	24	21	1	3	9	0	9	57.6%	9	0
5/18/1996 0:00	24	6.2	0	0.375	24	22	1	2	9	0	9	57.6%	9	0
6/27/1998 0:00	24	15.8	0	0.375	24	20	1	3	9	0	9	57.6%	9	0
8/6/1999 0:00	24	6.2	0	0.375	24	22	1	2	9	0	9	57.6%	9	0
6/21/1971 0:00	24	7.6	0	0.3708	24	20	1	2	8.9	0	8.9	57.1%	8.9	0
4/19/1972 0:00	24	2.5	0	0.3708	24	15	1	3	8.9	0	8.9	57.1%	8.9	0
6/23/1972 0:00	24	3.8	0	0.3708	24	19	1	3	8.9	0	8.9	57.1%	8.9	0
8/2/1974 0:00	24	3	0	0.3708	24	17	1	2	8.9	0	8.9	57.1%	8.9	0
1/9/1975 0:00	24	2	0	0.3708	24	16	1	2	8.9	0	8.9	57.1%	8.9	0
5/1/1976 0:00	24	3	0	0.3708	24	19	1	1	8.9	0	8.9	57.1%	8.9	0
3/28/1977 0:00	24	2.8	0	0.3708	24	19	1	1	8.9	0	8.9	57.1%	8.9	0
10/13/1983 0:00	24	4.3	0	0.3708	24	18	1	2	8.9	0	8.9	57.1%	8.9	0
11/24/1973 0:00	24	3.6	0	0.3667	24	18	1	4	8.8	0	8.8	56.4%	8.8	0
10/26/1978 0:00	24	1.9	0	0.3667	24	16	1	3	8.8	0	8.8	56.4%	8.8	0
6/19/1982 0:00	24	3.5	0	0.3667	24	14	1	3	8.8	0	8.8	56.4%	8.8	0
10/23/1983 0:00	24	1.7	0	0.3667	24	12	1	4	8.8	0	8.8	56.4%	8.8	0
11/2/1983 0:00	24	3.9	0	0.3667	24	18	1	2	8.8	0	8.8	56.4%	8.8	0
12/9/1987 0:00	24	3.6	0	0.3667	24	19	1	2	8.8	0	8.8	56.4%	8.8	0
8/25/1988 0:00	24	2.8	0	0.3667	24	15	1	4	8.8	0	8.8	56.4%	8.8	0
3/17/1990 0:00	24	2	0	0.3667	24	13	1	2	8.8	0	8.8	56.4%	8.8	0
11/16/1990 0:00	24	3.5	0	0.3667	24	19	1	2	8.8	0	8.8	56.4%	8.8	0
10/16/1993 0:00	24	2.1	0	0.3667	24	16	1	3	8.8	0	8.8	56.4%	8.8	0
6/14/1999 0:00	24	8.8	0	0.3667	24	23	1	2	8.8	0	8.8	56.4%	8.8	0
8/8/1972 0:00	24	5.6	0	0.3583	24	20	1	2	8.6	0	8.6	55.0%	8.6	0
9/10/1976 0:00	24	4.8	0	0.3583	24	21	1	2	8.6	0	8.6	55.0%	8.6	0
8/24/1979 0:00	24	3.4	0	0.3583	24	20	1	2	8.6	0	8.6	55.0%	8.6	0
10/5/1979 0:00	24	1.9	0	0.3583	24	15	1	4	8.6	0	8.6	55.0%	8.6	0
11/22/1979 0:00	24	1	0	0.3583	24	5	1	4	8.6	0	8.6	55.0%	8.6	0
10/3/1980 0:00	24	7	0	0.3583	24	21	1	1	8.6	0	8.6	55.0%	8.6	0
10/4/1980 0:00	24	3.3	0	0.3583	24	17	1	4	8.6	0	8.6	55.0%	8.6	0
2/19/1981 0:00	24	2.3	0	0.3583	24	16	1	4	8.6	0	8.6	55.0%	8.6	0
4/23/1981 0:00	24	4.8	0	0.3583	24	14	1	3	8.6	0	8.6	55.0%	8.6	0
6/1/1982 0:00	24	4	0	0.3583	24	20	1	3	8.6	0	8.6	55.0%	8.6	0
8/26/1983 0:00	24	5	0	0.3583	24	21	1	2	8.6	0	8.6	55.0%	8.6	0
10/27/1986 0:00	24	3.5	0	0.3583	24	14	1	6	8.6	0	8.6	55.0%	8.6	0
7/3/1987 0:00	24	8	0	0.3583	24	20	1	4	8.6	0	8.6	55.0%	8.6	0
8/17/1987 0:00	24	8.6	0	0.3583	24	23	1	2	8.6	0	8.6	55.0%	8.6	0

Date	Duration (h)	Maximum Rainfall (mm/hr)	Minimum Rainfall (mm/hr)	Mean Rainfall (mm/hr)	Duration of Exceedances (h)	Duration of Deficits (h)	Number of Exceedances	Number of Deficits	Volume of Exceedances (mm)	Volume of Deficits (mm)	Total Rainfall (mm)	Percentile	Infiltration Amount (mm)	Bypass Amount (mm)
10/10/1988 0:00	24	2.5	0	0.3583	24	16	1	2	8.6	0	8.6	55.0%	8.6	0
6/9/1989 0:00	24	2.1	0	0.3583	24	17	1	3	8.6	0	8.6	55.0%	8.6	0
10/5/1991 0:00	24	3.4	0	0.3583	24	15	1	1	8.6	0	8.6	55.0%	8.6	0
4/17/1993 0:00	24	2.1	0	0.3583	24	11	1	6	8.6	0	8.6	55.0%	8.6	0
8/2/1993 0:00	24	5	0	0.3583	24	22	1	3	8.6	0	8.6	55.0%	8.6	0
8/31/1994 0:00	24	1.4	0	0.3583	24	12	1	5	8.6	0	8.6	55.0%	8.6	0
4/25/1996 0:00	24	2	0	0.3583	24	17	1	2	8.6	0	8.6	55.0%	8.6	0
10/1/1998 0:00	24	3.1	0	0.3583	24	16	1	2	8.6	0	8.6	55.0%	8.6	0
11/1/1973 0:00	24	2.3	0	0.3542	24	13	1	4	8.5	0	8.5	54.8%	8.5	0
3/4/1979 0:00	24	1.8	0	0.3542	24	13	1	3	8.5	0	8.5	54.8%	8.5	0
5/22/1974 0:00	24	4.3	0	0.35	24	19	1	4	8.4	0	8.4	54.1%	8.4	0
6/26/1980 0:00	24	4	0	0.35	24	18	1	4	8.4	0	8.4	54.1%	8.4	0
7/15/1980 0:00	24	5.4	0	0.35	24	17	1	5	8.4	0	8.4	54.1%	8.4	0
5/30/1981 0:00	24	2.8	0	0.35	24	18	1	2	8.4	0	8.4	54.1%	8.4	0
1/19/1986 0:00	24	2	0	0.35	24	13	1	3	8.4	0	8.4	54.1%	8.4	0
5/23/1986 0:00	24	3.6	0	0.35	24	16	1	2	8.4	0	8.4	54.1%	8.4	0
4/20/1990 0:00	24	1.8	0	0.35	24	14	1	3	8.4	0	8.4	54.1%	8.4	0
6/18/1993 0:00	24	2.1	0	0.35	24	13	1	3	8.4	0	8.4	54.1%	8.4	0
7/8/1993 0:00	24	5.7	0	0.35	24	21	1	3	8.4	0	8.4	54.1%	8.4	0
3/1/1997 0:00	24	3.8	0	0.35	24	18	1	2	8.4	0	8.4	54.1%	8.4	0
7/1/1998 0:00	24	2	0	0.35	24	14	1	3	8.4	0	8.4	54.1%	8.4	0
4/22/1976 0:00	24	3.6	0	0.3458	24	18	1	4	8.3	0	8.3	53.9%	8.3	0
7/29/1983 0:00	24	8.1	0	0.3458	24	22	1	2	8.3	0	8.3	53.9%	8.3	0
6/21/1993 0:00	24	2.1	0	0.3458	24	15	1	4	8.3	0	8.3	53.9%	8.3	0
8/16/1996 0:00	24	4.8	0	0.3458	24	20	1	3	8.3	0	8.3	53.9%	8.3	0
5/4/1971 0:00	24	1.8	0	0.3417	24	14	1	4	8.2	0	8.2	52.7%	8.2	0
4/28/1973 0:00	24	2.3	0	0.3417	24	14	1	3	8.2	0	8.2	52.7%	8.2	0
5/1/1973 0:00	24	2.8	0	0.3417	24	15	1	2	8.2	0	8.2	52.7%	8.2	0
7/24/1974 0:00	24	3	0	0.3417	24	18	1	4	8.2	0	8.2	52.7%	8.2	0
7/2/1975 0:00	24	5.6	0	0.3417	24	19	1	4	8.2	0	8.2	52.7%	8.2	0
12/6/1975 0:00	24	3	0	0.3417	24	17	1	2	8.2	0	8.2	52.7%	8.2	0
8/12/1976 0:00	24	3.6	0	0.3417	24	20	1	3	8.2	0	8.2	52.7%	8.2	0
5/9/1983 0:00	24	3.2	0	0.3417	24	18	1	3	8.2	0	8.2	52.7%	8.2	0
6/17/1983 0:00	24	7.5	0	0.3417	24	21	1	3	8.2	0	8.2	52.7%	8.2	0
11/5/1984 0:00	24	3.9	0	0.3417	24	14	1	4	8.2	0	8.2	52.7%	8.2	0
8/15/1985 0:00	24	5.1	0	0.3417	24	20	1	3	8.2	0	8.2	52.7%	8.2	0
1/17/1988 0:00	24	1.8	0	0.3417	24	14	1	1	8.2	0	8.2	52.7%	8.2	0
8/17/1991 0:00	24	4.4	0	0.3417	24	19	1	1	8.2	0	8.2	52.7%	8.2	0
9/25/1991 0:00	24	1.6	0	0.3417	24	12	1	1	8.2	0	8.2	52.7%	8.2	0
6/26/1993 0:00	24	3.6	0	0.3417	24	19	1	2	8.2	0	8.2	52.7%	8.2	0
12/10/1993 0:00	24	2.4	0	0.3417	24	15	1	5	8.2	0	8.2	52.7%	8.2	0
10/2/1999 0:00	24	2.4	0	0.3417	24	16	1	2	8.2	0	8.2	52.7%	8.2	0
10/6/1971 0:00	24	2.3	0	0.3375	24	16	1	5	8.1	0	8.1	52.5%	8.1	0
6/4/1973 0:00	24	4.8	0	0.3375	24	21	1	2	8.1	0	8.1	52.5%	8.1	0
9/3/1974 0:00	24	2	0	0.3375	24	13	1	2	8.1	0	8.1	52.5%	8.1	0
7/27/1975 0:00	24	3	0	0.3375	24	20	1	3	8.1	0	8.1	52.5%	8.1	0
8/9/1972 0:00	24	3	0	0.3333	24	17	1	5	8	0	8	51.7%	8	0
10/13/1973 0:00	24	2.5	0	0.3333	24	17	1	3	8	0	8	51.7%	8	0
1/1/1979 0:00	24	2.4	0	0.3333	24	15	1	4	8	0	8	51.7%	8	0
4/29/1980 0:00	24	1.4	0	0.3333	24	14	1	6	8	0	8	51.7%	8	0
9/2/1980 0:00	24	6.8	0	0.3333	24	20	1	2	8	0	8	51.7%	8	0
10/25/1984 0:00	24	2	0	0.3333	24	17	1	1	8	0	8	51.7%	8	0
5/5/1986 0:00	24	3.2	0	0.3333	24	17	1	3	8	0	8	51.7%	8	0
7/25/1987 0:00	24	5.2	0	0.3333	24	22	1	2	8	0	8	51.7%	8	0
9/4/1988 0:00	24	2.5	0	0.3333	24	11	1	2	8	0	8	51.7%	8	0
11/9/1989 0:00	24	2.3	0	0.3333	24	11	1	3	8	0	8	51.7%	8	0
5/23/1992 0:00	24	3.8	0	0.3333	24	18	1	3	8	0	8	51.7%	8	0
6/24/1994 0:00	24	7.6	0	0.3333	24	22	1	1	8	0	8	51.7%	8	0
7/23/1974 0:00	24	1.8	0	0.3292	24	17	1	1	7.9	0	7.9	51.4%	7.9	0
4/21/1976 0:00	24	2.8	0	0.3292	24	20	1	2	7.9	0	7.9	51.4%	7.9	0
4/22/1977 0:00	24	2.8	0	0.3292	24	14	1	4	7.9	0	7.9	51.4%	7.9	0
12/12/1984 0:00	24	3.1	0	0.3292	24	20	1	1	7.9	0	7.9	51.4%	7.9	0
10/9/1993 0:00	24	2.2	0	0.3292	24	19	1	2	7.9	0	7.9	51.4%	7.9	0
5/7/1976 0:00	24	2.8	0	0.325	24	17	1	4	7.8	0	7.8	50.6%	7.8	0
7/26/1979 0:00	24	2.4	0	0.325	24	16	1	3	7.8	0	7.8	50.6%	7.8	0
8/12/1980 0:00	24	3.3	0	0.325	24	20	1	2	7.8	0	7.8	50.6%	7.8	0
4/6/1986 0:00	24	1.8	0	0.325	24	10	1	5	7.8	0	7.8	50.6%	7.8	0
5/27/1986 0:00	24	7.8	0	0.325	24	23	1	2	7.8	0	7.8	50.6%	7.8	0
10/3/1986 0:00	24	2.9	0	0.325	24	15	1	4	7.8	0	7.8	50.6%	7.8	0

Date	Duration (h)	Maximum Rainfall (mm/hr)	Minimum Rainfall (mm/hr)	Mean Rainfall (mm/hr)	Duration of Exceedances (h)	Duration of Deficits (h)	Number of Exceedances	Number of Deficits	Volume of Exceedances (mm)	Volume of Deficits (mm)	Total Rainfall (mm)	Percentile	Infiltration Amount (mm)	Bypass Amount (mm)
10/4/1986 0:00	24	3.2	0	0.325	24	15	1	3	7.8	0	7.8	50.6%	7.8	0
5/6/1991 0:00	24	2.3	0	0.325	24	17	1	4	7.8	0	7.8	50.6%	7.8	0
10/4/1993 0:00	24	3.2	0	0.325	24	18	1	3	7.8	0	7.8	50.6%	7.8	0
5/31/1994 0:00	24	5.6	0	0.325	24	22	1	2	7.8	0	7.8	50.6%	7.8	0
6/12/1998 0:00	24	1.8	0	0.325	24	17	1	2	7.8	0	7.8	50.6%	7.8	0
9/16/1999 0:00	24	3.9	0	0.325	24	20	1	1	7.8	0	7.8	50.6%	7.8	0
5/7/1983 0:00	24	1.8	0	0.3208	24	9	1	4	7.7	0	7.7	50.4%	7.7	0
11/15/1993 0:00	24	2.5	0	0.3208	24	14	1	4	7.7	0	7.7	50.4%	7.7	0
4/27/1994 0:00	24	5.3	0	0.3208	24	17	1	5	7.7	0	7.7	50.4%	7.7	0
4/13/1971 0:00	24	1.3	0	0.3167	24	16	1	3	7.6	0	7.6	49.2%	7.6	0
6/15/1972 0:00	24	4.6	0	0.3167	24	22	1	2	7.6	0	7.6	49.2%	7.6	0
11/10/1977 0:00	24	2.4	0	0.3167	24	16	1	2	7.6	0	7.6	49.2%	7.6	0
5/20/1978 0:00	24	4.2	0	0.3167	24	20	1	3	7.6	0	7.6	49.2%	7.6	0
10/7/1979 0:00	24	3.4	0	0.3167	24	15	1	8	7.6	0	7.6	49.2%	7.6	0
4/29/1981 0:00	24	1.9	0	0.3167	24	17	1	2	7.6	0	7.6	49.2%	7.6	0
6/29/1982 0:00	24	5.7	0	0.3167	24	22	1	2	7.6	0	7.6	49.2%	7.6	0
7/4/1983 0:00	24	6.5	0	0.3167	24	21	1	1	7.6	0	7.6	49.2%	7.6	0
7/4/1986 0:00	24	2.9	0	0.3167	24	19	1	2	7.6	0	7.6	49.2%	7.6	0
5/23/1987 0:00	24	3.4	0	0.3167	24	11	1	5	7.6	0	7.6	49.2%	7.6	0
8/31/1987 0:00	24	3.4	0	0.3167	24	17	1	4	7.6	0	7.6	49.2%	7.6	0
5/6/1989 0:00	24	2	0	0.3167	24	17	1	3	7.6	0	7.6	49.2%	7.6	0
6/3/1989 0:00	24	3.9	0	0.3167	24	22	1	1	7.6	0	7.6	49.2%	7.6	0
7/8/1990 0:00	24	3	0	0.3167	24	18	1	2	7.6	0	7.6	49.2%	7.6	0
7/30/1990 0:00	24	5.7	0	0.3167	24	21	1	1	7.6	0	7.6	49.2%	7.6	0
5/1/1991 0:00	24	6	0	0.3167	24	21	1	3	7.6	0	7.6	49.2%	7.6	0
6/30/1992 0:00	24	3.7	0	0.3167	24	19	1	2	7.6	0	7.6	49.2%	7.6	0
4/22/1993 0:00	24	2.5	0	0.3167	24	19	1	2	7.6	0	7.6	49.2%	7.6	0
5/9/1997 0:00	24	2	0	0.3167	24	13	1	6	7.6	0	7.6	49.2%	7.6	0
4/29/1971 0:00	24	2.5	0	0.3125	24	16	1	4	7.5	0	7.5	48.6%	7.5	0
5/26/1971 0:00	24	2.5	0	0.3125	24	17	1	5	7.5	0	7.5	48.6%	7.5	0
8/18/1972 0:00	24	6.9	0	0.3125	24	21	1	3	7.5	0	7.5	48.6%	7.5	0
7/31/1982 0:00	24	6.1	0	0.3125	24	19	1	6	7.5	0	7.5	48.6%	7.5	0
8/22/1982 0:00	24	2.4	0	0.3125	24	16	1	1	7.5	0	7.5	48.6%	7.5	0
9/23/1982 0:00	24	4.3	0	0.3125	24	21	1	2	7.5	0	7.5	48.6%	7.5	0
10/31/1989 0:00	24	3	0	0.3125	24	19	1	2	7.5	0	7.5	48.6%	7.5	0
11/5/1990 0:00	24	2.3	0	0.3125	24	19	1	1	7.5	0	7.5	48.6%	7.5	0
11/21/1975 0:00	24	2.8	0	0.3083	24	19	1	2	7.4	0	7.4	47.7%	7.4	0
10/3/1977 0:00	24	1.3	0	0.3083	24	13	1	1	7.4	0	7.4	47.7%	7.4	0
6/4/1981 0:00	24	5.8	0	0.3083	24	21	1	3	7.4	0	7.4	47.7%	7.4	0
8/9/1981 0:00	24	3.8	0	0.3083	24	20	1	3	7.4	0	7.4	47.7%	7.4	0
8/31/1981 0:00	24	5.2	0	0.3083	24	17	1	3	7.4	0	7.4	47.7%	7.4	0
11/20/1981 0:00	24	1.4	0	0.3083	24	14	1	5	7.4	0	7.4	47.7%	7.4	0
3/13/1982 0:00	24	4.7	0	0.3083	24	19	1	4	7.4	0	7.4	47.7%	7.4	0
11/4/1984 0:00	24	3	0	0.3083	24	19	1	2	7.4	0	7.4	47.7%	7.4	0
5/29/1987 0:00	24	6.1	0	0.3083	24	21	1	3	7.4	0	7.4	47.7%	7.4	0
5/20/1988 0:00	24	3.4	0	0.3083	24	18	1	5	7.4	0	7.4	47.7%	7.4	0
6/21/1990 0:00	24	3.2	0	0.3083	24	20	1	2	7.4	0	7.4	47.7%	7.4	0
12/30/1990 0:00	24	1.6	0	0.3083	24	16	1	3	7.4	0	7.4	47.7%	7.4	0
8/9/1991 0:00	24	1.9	0	0.3083	24	13	1	2	7.4	0	7.4	47.7%	7.4	0
6/13/1992 0:00	24	6.2	0	0.3083	24	20	1	3	7.4	0	7.4	47.7%	7.4	0
8/2/1992 0:00	24	2.8	0	0.3083	24	15	1	4	7.4	0	7.4	47.7%	7.4	0
10/2/1973 0:00	24	2.3	0	0.3042	24	15	1	2	7.3	0	7.3	47.5%	7.3	0
6/25/1982 0:00	24	1.3	0	0.3042	24	11	1	3	7.3	0	7.3	47.5%	7.3	0
5/8/1999 0:00	24	2.7	0	0.3042	24	18	1	3	7.3	0	7.3	47.5%	7.3	0
5/31/1973 0:00	24	6.1	0	0.3	24	21	1	4	7.2	0	7.2	46.9%	7.2	0
9/6/1973 0:00	24	6.1	0	0.3	24	21	1	2	7.2	0	7.2	46.9%	7.2	0
4/25/1977 0:00	24	1	0	0.3	24	11	1	3	7.2	0	7.2	46.9%	7.2	0
7/1/1977 0:00	24	2	0	0.3	24	17	1	6	7.2	0	7.2	46.9%	7.2	0
9/9/1980 0:00	24	3.4	0	0.3	24	21	1	2	7.2	0	7.2	46.9%	7.2	0
8/24/1981 0:00	24	4.2	0	0.3	24	20	1	4	7.2	0	7.2	46.9%	7.2	0
10/4/1990 0:00	24	3.5	0	0.3	24	17	1	3	7.2	0	7.2	46.9%	7.2	0
9/8/1992 0:00	24	5	0	0.3	24	21	1	3	7.2	0	7.2	46.9%	7.2	0
10/11/1992 0:00	24	3.9	0	0.3	24	18	1	5	7.2	0	7.2	46.9%	7.2	0
11/8/1975 0:00	24	4.8	0	0.2958	24	21	1	3	7.1	0	7.1	46.6%	7.1	0
4/23/1976 0:00	24	2.8	0	0.2958	24	20	1	3	7.1	0	7.1	46.6%	7.1	0
11/9/1979 0:00	24	1.7	0	0.2958	24	18	1	1	7.1	0	7.1	46.6%	7.1	0
7/4/1981 0:00	24	3.1	0	0.2958	24	21	1	3	7.1	0	7.1	46.6%	7.1	0
4/15/1972 0:00	24	1.8	0	0.2917	24	16	1	2	7	0	7	45.7%	7	0
6/25/1972 0:00	24	2.8	0	0.2917	24	19	1	1	7	0	7	45.7%	7	0

Date	Duration (h)	Maximum Rainfall (mm/hr)	Minimum Rainfall (mm/hr)	Mean Rainfall (mm/hr)	Duration of Exceedances (h)	Duration of Deficits (h)	Number of Exceedances	Number of Deficits	Volume of Exceedances (mm)	Volume of Deficits (mm)	Total Rainfall (mm)	Percentile	Infiltration Amount (mm)	Bypass Amount (mm)
10/8/1977 0:00	24	2.8	0	0.2917	24	16	1	3	7	0	7	45.7%	7	0
9/18/1979 0:00	24	5.9	0	0.2917	24	22	1	2	7	0	7	45.7%	7	0
7/28/1980 0:00	24	2.4	0	0.2917	24	17	1	3	7	0	7	45.7%	7	0
7/28/1981 0:00	24	2.5	0	0.2917	24	16	1	3	7	0	7	45.7%	7	0
8/11/1981 0:00	24	2.2	0	0.2917	24	17	1	2	7	0	7	45.7%	7	0
11/1/1986 0:00	24	2.1	0	0.2917	24	18	1	2	7	0	7	45.7%	7	0
9/23/1988 0:00	24	2.8	0	0.2917	24	19	1	3	7	0	7	45.7%	7	0
11/27/1990 0:00	24	4.2	0	0.2917	24	18	1	6	7	0	7	45.7%	7	0
3/27/1991 0:00	24	3	0	0.2917	24	18	1	3	7	0	7	45.7%	7	0
7/21/1991 0:00	24	3.4	0	0.2917	24	20	1	2	7	0	7	45.7%	7	0
8/30/1991 0:00	24	5.8	0	0.2917	24	20	1	3	7	0	7	45.7%	7	0
10/23/1992 0:00	24	2.6	0	0.2917	24	19	1	3	7	0	7	45.7%	7	0
7/6/1999 0:00	24	4.3	0	0.2917	24	21	1	3	7	0	7	45.7%	7	0
5/16/1972 0:00	24	1.8	0	0.2875	24	18	1	2	6.9	0	6.9	45.0%	6.9	0
11/28/1973 0:00	24	2.8	0	0.2875	24	14	1	4	6.9	0	6.9	45.0%	6.9	0
4/22/1974 0:00	24	6.1	0	0.2875	24	21	1	3	6.9	0	6.9	45.0%	6.9	0
9/19/1975 0:00	24	1	0	0.2875	24	12	1	2	6.9	0	6.9	45.0%	6.9	0
6/25/1977 0:00	24	4.3	0	0.2875	24	20	1	2	6.9	0	6.9	45.0%	6.9	0
4/15/1983 0:00	24	1.2	0	0.2875	24	10	1	5	6.9	0	6.9	45.0%	6.9	0
5/5/1993 0:00	24	3.1	0	0.2875	24	19	1	3	6.9	0	6.9	45.0%	6.9	0
9/16/1994 0:00	24	3.1	0	0.2875	24	19	1	2	6.9	0	6.9	45.0%	6.9	0
6/30/1996 0:00	24	3.8	0	0.2875	24	20	1	4	6.9	0	6.9	45.0%	6.9	0
7/23/1996 0:00	24	3.9	0	0.2875	24	20	1	2	6.9	0	6.9	45.0%	6.9	0
9/17/1973 0:00	24	3.3	0	0.2833	24	20	1	1	6.8	0	6.8	44.0%	6.8	0
10/16/1977 0:00	24	1.7	0	0.2833	24	11	1	2	6.8	0	6.8	44.0%	6.8	0
10/20/1979 0:00	24	3.7	0	0.2833	24	19	1	2	6.8	0	6.8	44.0%	6.8	0
12/12/1979 0:00	24	2.1	0	0.2833	24	17	1	4	6.8	0	6.8	44.0%	6.8	0
8/3/1980 0:00	24	3.5	0	0.2833	24	17	1	4	6.8	0	6.8	44.0%	6.8	0
9/21/1980 0:00	24	6.6	0	0.2833	24	22	1	2	6.8	0	6.8	44.0%	6.8	0
6/30/1981 0:00	24	5.5	0	0.2833	24	22	1	2	6.8	0	6.8	44.0%	6.8	0
11/21/1982 0:00	24	2	0	0.2833	24	15	1	4	6.8	0	6.8	44.0%	6.8	0
6/6/1983 0:00	24	2.7	0	0.2833	24	18	1	2	6.8	0	6.8	44.0%	6.8	0
9/28/1986 0:00	24	5.5	0	0.2833	24	22	1	1	6.8	0	6.8	44.0%	6.8	0
7/8/1991 0:00	24	3.3	0	0.2833	24	21	1	3	6.8	0	6.8	44.0%	6.8	0
4/16/1992 0:00	24	1.9	0	0.2833	24	18	1	3	6.8	0	6.8	44.0%	6.8	0
6/20/1992 0:00	24	3.9	0	0.2833	24	22	1	2	6.8	0	6.8	44.0%	6.8	0
4/21/1995 0:00	24	3	0	0.2833	24	19	1	3	6.8	0	6.8	44.0%	6.8	0
4/23/1996 0:00	24	1.4	0	0.2833	24	16	1	2	6.8	0	6.8	44.0%	6.8	0
8/15/1997 0:00	24	3.6	0	0.2833	24	20	1	2	6.8	0	6.8	44.0%	6.8	0
5/19/1973 0:00	24	2.3	0	0.2792	24	17	1	4	6.7	0	6.7	43.5%	6.7	0
7/9/1974 0:00	24	4.3	0	0.2792	24	19	1	2	6.7	0	6.7	43.5%	6.7	0
6/7/1975 0:00	24	1.8	0	0.2792	24	15	1	3	6.7	0	6.7	43.5%	6.7	0
9/27/1975 0:00	24	1.5	0	0.2792	24	15	1	5	6.7	0	6.7	43.5%	6.7	0
7/13/1978 0:00	24	3.7	0	0.2792	24	18	1	2	6.7	0	6.7	43.5%	6.7	0
9/14/1996 0:00	24	2.7	0	0.2792	24	20	1	3	6.7	0	6.7	43.5%	6.7	0
6/28/1999 0:00	24	3.4	0	0.2792	24	20	1	2	6.7	0	6.7	43.5%	6.7	0
4/2/1971 0:00	24	1.3	0	0.275	24	15	1	1	6.6	0	6.6	41.9%	6.6	0
7/19/1972 0:00	24	5.6	0	0.275	24	22	1	2	6.6	0	6.6	41.9%	6.6	0
6/29/1977 0:00	24	1.8	0	0.275	24	17	1	5	6.6	0	6.6	41.9%	6.6	0
9/17/1977 0:00	24	6	0	0.275	24	20	1	3	6.6	0	6.6	41.9%	6.6	0
10/22/1977 0:00	24	2.6	0	0.275	24	18	1	3	6.6	0	6.6	41.9%	6.6	0
6/12/1978 0:00	24	3.7	0	0.275	24	22	1	2	6.6	0	6.6	41.9%	6.6	0
6/14/1978 0:00	24	3.7	0	0.275	24	22	1	2	6.6	0	6.6	41.9%	6.6	0
4/4/1980 0:00	24	1.7	0	0.275	24	14	1	5	6.6	0	6.6	41.9%	6.6	0
6/8/1981 0:00	24	3.9	0	0.275	24	21	1	2	6.6	0	6.6	41.9%	6.6	0
9/12/1981 0:00	24	4.9	0	0.275	24	21	1	2	6.6	0	6.6	41.9%	6.6	0
8/22/1983 0:00	24	2.2	0	0.275	24	16	1	2	6.6	0	6.6	41.9%	6.6	0
11/20/1983 0:00	24	3.1	0	0.275	24	21	1	1	6.6	0	6.6	41.9%	6.6	0
12/15/1983 0:00	24	4	0	0.275	24	21	1	3	6.6	0	6.6	41.9%	6.6	0
7/18/1984 0:00	24	2.9	0	0.275	24	20	1	2	6.6	0	6.6	41.9%	6.6	0
8/23/1986 0:00	24	2.1	0	0.275	24	18	1	3	6.6	0	6.6	41.9%	6.6	0
4/23/1987 0:00	24	1.5	0	0.275	24	14	1	3	6.6	0	6.6	41.9%	6.6	0
6/28/1987 0:00	24	3.9	0	0.275	24	20	1	4	6.6	0	6.6	41.9%	6.6	0
5/11/1989 0:00	24	2.2	0	0.275	24	16	1	3	6.6	0	6.6	41.9%	6.6	0
10/5/1989 0:00	24	3.2	0	0.275	24	20	1	1	6.6	0	6.6	41.9%	6.6	0
10/12/1992 0:00	24	5.2	0	0.275	24	19	1	3	6.6	0	6.6	41.9%	6.6	0
7/22/1994 0:00	24	3.1	0	0.275	24	20	1	3	6.6	0	6.6	41.9%	6.6	0
6/11/1995 0:00	24	5.4	0	0.275	24	21	1	1	6.6	0	6.6	41.9%	6.6	0
9/27/1996 0:00	24	1.4	0	0.275	24	15	1	3	6.6	0	6.6	41.9%	6.6	0

Date	Duration (h)	Maximum Rainfall (mm/hr)	Minimum Rainfall (mm/hr)	Mean Rainfall (mm/hr)	Duration of Exceedances (h)	Duration of Deficits (h)	Number of Exceedances	Number of Deficits	Volume of Exceedances (mm)	Volume of Deficits (mm)	Total Rainfall (mm)	Percentile	Infiltration Amount (mm)	Bypass Amount (mm)
9/10/1999 0:00	24	2.5	0	0.275	24	18	1	1	6.6	0	6.6	41.9%	6.6	0
10/23/1999 0:00	24	1.6	0	0.275	24	14	1	3	6.6	0	6.6	41.9%	6.6	0
4/27/1995 0:00	24	2.2	0	0.2708	24	16	1	4	6.5	0	6.5	41.7%	6.5	0
4/18/1997 0:00	24	1.6	0	0.2708	24	11	1	1	6.5	0	6.5	41.7%	6.5	0
6/8/1971 0:00	24	3.3	0	0.2667	24	20	1	3	6.4	0	6.4	40.4%	6.4	0
7/23/1972 0:00	24	3.3	0	0.2667	24	21	1	2	6.4	0	6.4	40.4%	6.4	0
6/22/1973 0:00	24	3.6	0	0.2667	24	21	1	2	6.4	0	6.4	40.4%	6.4	0
8/2/1973 0:00	24	5.3	0	0.2667	24	21	1	2	6.4	0	6.4	40.4%	6.4	0
6/17/1974 0:00	24	3.6	0	0.2667	24	19	1	2	6.4	0	6.4	40.4%	6.4	0
7/4/1974 0:00	24	3.8	0	0.2667	24	20	1	3	6.4	0	6.4	40.4%	6.4	0
5/26/1979 0:00	24	3.8	0	0.2667	24	18	1	3	6.4	0	6.4	40.4%	6.4	0
5/19/1982 0:00	24	6.4	0	0.2667	24	23	1	2	6.4	0	6.4	40.4%	6.4	0
11/11/1982 0:00	24	1.5	0	0.2667	24	18	1	1	6.4	0	6.4	40.4%	6.4	0
4/29/1987 0:00	24	1.8	0	0.2667	24	15	1	2	6.4	0	6.4	40.4%	6.4	0
11/8/1988 0:00	24	1.8	0	0.2667	24	16	1	3	6.4	0	6.4	40.4%	6.4	0
3/25/1989 0:00	24	1.5	0	0.2667	24	16	1	3	6.4	0	6.4	40.4%	6.4	0
4/14/1990 0:00	24	2.1	0	0.2667	24	16	1	2	6.4	0	6.4	40.4%	6.4	0
12/22/1990 0:00	24	2.2	0	0.2667	24	12	1	2	6.4	0	6.4	40.4%	6.4	0
9/26/1991 0:00	24	4.1	0	0.2667	24	20	1	4	6.4	0	6.4	40.4%	6.4	0
10/19/1991 0:00	24	2.7	0	0.2667	24	17	1	2	6.4	0	6.4	40.4%	6.4	0
11/3/1992 0:00	24	2.6	0	0.2667	24	20	1	3	6.4	0	6.4	40.4%	6.4	0
6/13/1996 0:00	24	6	0	0.2667	24	22	1	2	6.4	0	6.4	40.4%	6.4	0
4/6/1997 0:00	24	2.2	0	0.2667	24	16	1	1	6.4	0	6.4	40.4%	6.4	0
6/25/1999 0:00	24	5.8	0	0.2667	24	20	1	4	6.4	0	6.4	40.4%	6.4	0
8/27/1971 0:00	24	1.3	0	0.2625	24	16	1	3	6.3	0	6.3	40.0%	6.3	0
5/6/1972 0:00	24	2.8	0	0.2625	24	17	1	2	6.3	0	6.3	40.0%	6.3	0
9/3/1972 0:00	24	1.8	0	0.2625	24	18	1	3	6.3	0	6.3	40.0%	6.3	0
3/21/1976 0:00	24	2.5	0	0.2625	24	15	1	5	6.3	0	6.3	40.0%	6.3	0
4/30/1996 0:00	24	2.5	0	0.2625	24	19	1	3	6.3	0	6.3	40.0%	6.3	0
8/22/1997 0:00	24	4.5	0	0.2625	24	20	1	3	6.3	0	6.3	40.0%	6.3	0
6/15/1998 0:00	24	1.9	0	0.2625	24	18	1	2	6.3	0	6.3	40.0%	6.3	0
12/10/1971 0:00	24	3.3	0	0.2583	24	18	1	4	6.2	0	6.2	38.9%	6.2	0
5/29/1973 0:00	24	1.3	0	0.2583	24	17	1	3	6.2	0	6.2	38.9%	6.2	0
5/25/1974 0:00	24	5.1	0	0.2583	24	20	1	4	6.2	0	6.2	38.9%	6.2	0
4/26/1979 0:00	24	1.7	0	0.2583	24	16	1	2	6.2	0	6.2	38.9%	6.2	0
10/13/1979 0:00	24	2.8	0	0.2583	24	18	1	3	6.2	0	6.2	38.9%	6.2	0
7/20/1986 0:00	24	2.6	0	0.2583	24	21	1	3	6.2	0	6.2	38.9%	6.2	0
5/22/1987 0:00	24	2	0	0.2583	24	18	1	4	6.2	0	6.2	38.9%	6.2	0
8/29/1987 0:00	24	2.2	0	0.2583	24	20	1	2	6.2	0	6.2	38.9%	6.2	0
10/30/1987 0:00	24	1.6	0	0.2583	24	15	1	4	6.2	0	6.2	38.9%	6.2	0
8/2/1988 0:00	24	5.8	0	0.2583	24	22	1	2	6.2	0	6.2	38.9%	6.2	0
5/13/1989 0:00	24	2.8	0	0.2583	24	19	1	2	6.2	0	6.2	38.9%	6.2	0
6/4/1989 0:00	24	3.7	0	0.2583	24	18	1	1	6.2	0	6.2	38.9%	6.2	0
6/6/1992 0:00	24	1.7	0	0.2583	24	12	1	4	6.2	0	6.2	38.9%	6.2	0
11/10/1992 0:00	24	2	0	0.2583	24	17	1	2	6.2	0	6.2	38.9%	6.2	0
8/20/1993 0:00	24	2.3	0	0.2583	24	18	1	5	6.2	0	6.2	38.9%	6.2	0
10/8/1993 0:00	24	2.9	0	0.2583	24	20	1	3	6.2	0	6.2	38.9%	6.2	0
8/12/1972 0:00	24	5.8	0	0.2542	24	22	1	2	6.1	0	6.1	38.6%	6.1	0
7/2/1974 0:00	24	3	0	0.2542	24	21	1	3	6.1	0	6.1	38.6%	6.1	0
4/5/1987 0:00	24	1.3	0	0.2542	24	15	1	4	6.1	0	6.1	38.6%	6.1	0
9/28/1993 0:00	24	5.1	0	0.2542	24	19	1	1	6.1	0	6.1	38.6%	6.1	0
6/1/1999 0:00	24	1.9	0	0.2542	24	19	1	2	6.1	0	6.1	38.6%	6.1	0
6/2/1971 0:00	24	1.3	0	0.25	24	17	1	2	6	0	6	37.5%	6	0
11/16/1977 0:00	24	1.2	0	0.25	24	14	1	3	6	0	6	37.5%	6	0
9/3/1978 0:00	24	4.8	0	0.25	24	20	1	2	6	0	6	37.5%	6	0
8/14/1980 0:00	24	4.1	0	0.25	24	19	1	3	6	0	6	37.5%	6	0
2/2/1981 0:00	24	1.1	0	0.25	24	12	1	2	6	0	6	37.5%	6	0
4/1/1981 0:00	24	2.9	0	0.25	24	20	1	2	6	0	6	37.5%	6	0
4/14/1981 0:00	24	2.2	0	0.25	24	20	1	2	6	0	6	37.5%	6	0
7/1/1983 0:00	24	4.1	0	0.25	24	22	1	2	6	0	6	37.5%	6	0
10/5/1986 0:00	24	3.4	0	0.25	24	21	1	2	6	0	6	37.5%	6	0
10/20/1987 0:00	24	2.4	0	0.25	24	19	1	2	6	0	6	37.5%	6	0
11/8/1987 0:00	24	1.5	0	0.25	24	17	1	1	6	0	6	37.5%	6	0
3/12/1990 0:00	24	2.9	0	0.25	24	17	1	3	6	0	6	37.5%	6	0
9/4/1991 0:00	24	2.8	0	0.25	24	20	1	1	6	0	6	37.5%	6	0
1/4/1992 0:00	24	2.4	0	0.25	24	18	1	2	6	0	6	37.5%	6	0
7/13/1992 0:00	24	6.5	0	0.25	24	21	1	1	6	0	6	37.5%	6	0
8/26/1994 0:00	24	3.2	0	0.25	24	22	1	2	6	0	6	37.5%	6	0
5/20/1996 0:00	24	4.4	0	0.25	24	22	1	2	6	0	6	37.5%	6	0

Date	Duration (h)	Maximum Rainfall (mm/hr)	Minimum Rainfall (mm/hr)	Mean Rainfall (mm/hr)	Duration of Exceedances (h)	Duration of Deficits (h)	Number of Exceedances	Number of Deficits	Volume of Exceedances (mm)	Volume of Deficits (mm)	Total Rainfall (mm)	Percentile	Infiltration Amount (mm)	Bypass Amount (mm)
6/18/1997 0:00	24	2.8	0	0.25	24	16	1	2	6	0	6	37.5%	6	0
11/21/1973 0:00	24	2.3	0	0.2458	24	20	1	1	5.9	0	5.9	37.3%	5.9	0
4/14/1974 0:00	24	5.1	0	0.2458	24	21	1	2	5.9	0	5.9	37.3%	5.9	0
6/16/1997 0:00	24	2.7	0	0.2458	24	18	1	2	5.9	0	5.9	37.3%	5.9	0
4/21/1971 0:00	24	1	0	0.2417	24	11	1	3	5.8	0	5.8	35.7%	5.8	0
8/30/1971 0:00	24	2.5	0	0.2417	24	21	1	2	5.8	0	5.8	35.7%	5.8	0
10/7/1972 0:00	24	1.3	0	0.2417	24	16	1	2	5.8	0	5.8	35.7%	5.8	0
10/16/1972 0:00	24	3	0	0.2417	24	22	1	2	5.8	0	5.8	35.7%	5.8	0
1/11/1975 0:00	24	3	0	0.2417	24	20	1	3	5.8	0	5.8	35.7%	5.8	0
7/27/1978 0:00	24	3.5	0	0.2417	24	20	1	3	5.8	0	5.8	35.7%	5.8	0
7/2/1979 0:00	24	3.4	0	0.2417	24	18	1	5	5.8	0	5.8	35.7%	5.8	0
9/17/1983 0:00	24	1.8	0	0.2417	24	18	1	4	5.8	0	5.8	35.7%	5.8	0
8/7/1984 0:00	24	5.8	0	0.2417	24	23	1	2	5.8	0	5.8	35.7%	5.8	0
9/5/1985 0:00	24	2.2	0	0.2417	24	18	1	4	5.8	0	5.8	35.7%	5.8	0
9/13/1986 0:00	24	5.8	0	0.2417	24	23	1	2	5.8	0	5.8	35.7%	5.8	0
10/21/1986 0:00	24	3.3	0	0.2417	24	21	1	2	5.8	0	5.8	35.7%	5.8	0
3/30/1987 0:00	24	1.6	0	0.2417	24	16	1	3	5.8	0	5.8	35.7%	5.8	0
5/27/1987 0:00	24	5.8	0	0.2417	24	23	1	2	5.8	0	5.8	35.7%	5.8	0
6/28/1988 0:00	24	3.2	0	0.2417	24	20	1	2	5.8	0	5.8	35.7%	5.8	0
8/14/1988 0:00	24	4.3	0	0.2417	24	21	1	3	5.8	0	5.8	35.7%	5.8	0
8/21/1988 0:00	24	5.4	0	0.2417	24	22	1	1	5.8	0	5.8	35.7%	5.8	0
6/18/1989 0:00	24	1.9	0	0.2417	24	18	1	5	5.8	0	5.8	35.7%	5.8	0
9/29/1991 0:00	24	2.2	0	0.2417	24	19	1	2	5.8	0	5.8	35.7%	5.8	0
2/19/1992 0:00	24	2.6	0	0.2417	24	15	1	4	5.8	0	5.8	35.7%	5.8	0
10/19/1992 0:00	24	0.7	0	0.2417	24	11	1	3	5.8	0	5.8	35.7%	5.8	0
9/10/1993 0:00	24	2	0	0.2417	24	15	1	3	5.8	0	5.8	35.7%	5.8	0
8/25/1994 0:00	24	5.4	0	0.2417	24	22	1	3	5.8	0	5.8	35.7%	5.8	0
6/3/1999 0:00	24	5.6	0	0.2417	24	22	1	1	5.8	0	5.8	35.7%	5.8	0
10/25/1971 0:00	24	1.8	0	0.2375	24	16	1	3	5.7	0	5.7	35.2%	5.7	0
4/13/1977 0:00	24	2.3	0	0.2375	24	20	1	3	5.7	0	5.7	35.2%	5.7	0
7/14/1983 0:00	24	4.8	0	0.2375	24	22	1	2	5.7	0	5.7	35.2%	5.7	0
5/21/1986 0:00	24	2.1	0	0.2375	24	18	1	3	5.7	0	5.7	35.2%	5.7	0
7/15/1996 0:00	24	2.3	0	0.2375	24	18	1	4	5.7	0	5.7	35.2%	5.7	0
7/30/1998 0:00	24	5.1	0	0.2375	24	21	1	2	5.7	0	5.7	35.2%	5.7	0
9/29/1999 0:00	24	1.9	0	0.2375	24	17	1	3	5.7	0	5.7	35.2%	5.7	0
10/14/1971 0:00	24	3.3	0	0.2333	24	21	1	2	5.6	0	5.6	33.7%	5.6	0
10/24/1972 0:00	24	1.3	0	0.2333	24	15	1	2	5.6	0	5.6	33.7%	5.6	0
2/22/1974 0:00	24	2	0	0.2333	24	18	1	3	5.6	0	5.6	33.7%	5.6	0
8/13/1975 0:00	24	2.8	0	0.2333	24	20	1	2	5.6	0	5.6	33.7%	5.6	0
5/31/1976 0:00	24	2.5	0	0.2333	24	20	1	2	5.6	0	5.6	33.7%	5.6	0
6/14/1976 0:00	24	3.3	0	0.2333	24	21	1	2	5.6	0	5.6	33.7%	5.6	0
10/26/1980 0:00	24	0.8	0	0.2333	24	11	1	4	5.6	0	5.6	33.7%	5.6	0
9/4/1981 0:00	24	2.3	0	0.2333	24	18	1	3	5.6	0	5.6	33.7%	5.6	0
7/2/1982 0:00	24	2.8	0	0.2333	24	21	1	2	5.6	0	5.6	33.7%	5.6	0
9/16/1983 0:00	24	1.8	0	0.2333	24	16	1	1	5.6	0	5.6	33.7%	5.6	0
11/29/1984 0:00	24	1	0	0.2333	24	14	1	3	5.6	0	5.6	33.7%	5.6	0
6/16/1986 0:00	24	2.8	0	0.2333	24	20	1	3	5.6	0	5.6	33.7%	5.6	0
3/25/1987 0:00	24	1.8	0	0.2333	24	18	1	2	5.6	0	5.6	33.7%	5.6	0
11/10/1988 0:00	24	2.5	0	0.2333	24	20	1	3	5.6	0	5.6	33.7%	5.6	0
9/14/1989 0:00	24	1.7	0	0.2333	24	17	1	2	5.6	0	5.6	33.7%	5.6	0
9/23/1990 0:00	24	1.9	0	0.2333	24	17	1	4	5.6	0	5.6	33.7%	5.6	0
3/16/1993 0:00	24	1.6	0	0.2333	24	16	1	1	5.6	0	5.6	33.7%	5.6	0
3/21/1994 0:00	24	1.6	0	0.2333	24	18	1	2	5.6	0	5.6	33.7%	5.6	0
4/2/1994 0:00	24	3.8	0	0.2333	24	21	1	2	5.6	0	5.6	33.7%	5.6	0
4/26/1994 0:00	24	1.5	0	0.2333	24	16	1	3	5.6	0	5.6	33.7%	5.6	0
6/5/1996 0:00	24	2.1	0	0.2333	24	15	1	4	5.6	0	5.6	33.7%	5.6	0
6/27/1996 0:00	24	3	0	0.2333	24	20	1	2	5.6	0	5.6	33.7%	5.6	0
11/9/1996 0:00	24	3.1	0	0.2333	24	14	1	4	5.6	0	5.6	33.7%	5.6	0
6/21/1997 0:00	24	4.6	0	0.2333	24	20	1	2	5.6	0	5.6	33.7%	5.6	0
7/3/1972 0:00	24	1.8	0	0.2292	24	18	1	2	5.5	0	5.5	33.2%	5.5	0
8/19/1974 0:00	24	2.3	0	0.2292	24	19	1	2	5.5	0	5.5	33.2%	5.5	0
7/12/1976 0:00	24	3.3	0	0.2292	24	18	1	2	5.5	0	5.5	33.2%	5.5	0
10/18/1985 0:00	24	1.1	0	0.2292	24	16	1	1	5.5	0	5.5	33.2%	5.5	0
7/17/1991 0:00	24	4.1	0	0.2292	24	21	1	2	5.5	0	5.5	33.2%	5.5	0
4/5/1997 0:00	24	1.6	0	0.2292	24	18	1	1	5.5	0	5.5	33.2%	5.5	0
7/4/1998 0:00	24	1.8	0	0.2292	24	15	1	4	5.5	0	5.5	33.2%	5.5	0
5/25/1971 0:00	24	1.5	0	0.225	24	18	1	3	5.4	0	5.4	32.2%	5.4	0
9/14/1971 0:00	24	2	0	0.225	24	19	1	2	5.4	0	5.4	32.2%	5.4	0
6/12/1975 0:00	24	1.3	0	0.225	24	16	1	4	5.4	0	5.4	32.2%	5.4	0

Date	Duration (h)	Maximum Rainfall (mm/hr)	Minimum Rainfall (mm/hr)	Mean Rainfall (mm/hr)	Duration of Exceedances (h)	Duration of Deficits (h)	Number of Exceedances	Number of Deficits	Volume of Exceedances (mm)	Volume of Deficits (mm)	Total Rainfall (mm)	Percentile	Infiltration Amount (mm)	Bypass Amount (mm)
9/12/1975 0:00	24	3	0	0.225	24	19	1	1	5.4	0	5.4	32.2%	5.4	0
7/13/1976 0:00	24	2	0	0.225	24	17	1	3	5.4	0	5.4	32.2%	5.4	0
9/21/1978 0:00	24	3.7	0	0.225	24	19	1	4	5.4	0	5.4	32.2%	5.4	0
3/25/1979 0:00	24	4	0	0.225	24	21	1	2	5.4	0	5.4	32.2%	5.4	0
11/10/1979 0:00	24	2.5	0	0.225	24	18	1	1	5.4	0	5.4	32.2%	5.4	0
2/24/1981 0:00	24	1.5	0	0.225	24	15	1	2	5.4	0	5.4	32.2%	5.4	0
10/5/1985 0:00	24	2.3	0	0.225	24	16	1	3	5.4	0	5.4	32.2%	5.4	0
6/3/1987 0:00	24	2.4	0	0.225	24	19	1	4	5.4	0	5.4	32.2%	5.4	0
11/28/1988 0:00	24	1.8	0	0.225	24	18	1	3	5.4	0	5.4	32.2%	5.4	0
4/22/1992 0:00	24	1.5	0	0.225	24	20	1	1	5.4	0	5.4	32.2%	5.4	0
7/5/1992 0:00	24	2	0	0.225	24	19	1	4	5.4	0	5.4	32.2%	5.4	0
11/26/1992 0:00	24	2.5	0	0.225	24	17	1	3	5.4	0	5.4	32.2%	5.4	0
6/24/1972 0:00	24	1.5	0	0.2208	24	14	1	5	5.3	0	5.3	32.0%	5.3	0
3/5/1974 0:00	24	3	0	0.2208	24	19	1	2	5.3	0	5.3	32.0%	5.3	0
1/22/1993 0:00	24	2	0	0.2208	24	16	1	2	5.3	0	5.3	32.0%	5.3	0
9/13/1972 0:00	24	2	0	0.2167	24	18	1	3	5.2	0	5.2	30.3%	5.2	0
10/22/1972 0:00	24	1.5	0	0.2167	24	16	1	4	5.2	0	5.2	30.3%	5.2	0
5/3/1973 0:00	24	2.8	0	0.2167	24	19	1	5	5.2	0	5.2	30.3%	5.2	0
6/23/1973 0:00	24	3.3	0	0.2167	24	19	1	5	5.2	0	5.2	30.3%	5.2	0
6/20/1974 0:00	24	4.1	0	0.2167	24	20	1	3	5.2	0	5.2	30.3%	5.2	0
11/12/1975 0:00	24	1.8	0	0.2167	24	17	1	2	5.2	0	5.2	30.3%	5.2	0
4/5/1977 0:00	24	1.3	0	0.2167	24	16	1	3	5.2	0	5.2	30.3%	5.2	0
12/25/1977 0:00	24	4	0	0.2167	24	21	1	2	5.2	0	5.2	30.3%	5.2	0
5/8/1978 0:00	24	3.8	0	0.2167	24	21	1	1	5.2	0	5.2	30.3%	5.2	0
5/21/1978 0:00	24	4.6	0	0.2167	24	21	1	2	5.2	0	5.2	30.3%	5.2	0
9/6/1978 0:00	24	4.6	0	0.2167	24	20	1	5	5.2	0	5.2	30.3%	5.2	0
11/28/1979 0:00	24	2.2	0	0.2167	24	18	1	2	5.2	0	5.2	30.3%	5.2	0
10/17/1980 0:00	24	2	0	0.2167	24	20	1	1	5.2	0	5.2	30.3%	5.2	0
2/25/1981 0:00	24	1	0	0.2167	24	12	1	6	5.2	0	5.2	30.3%	5.2	0
7/9/1981 0:00	24	4.2	0	0.2167	24	22	1	2	5.2	0	5.2	30.3%	5.2	0
10/12/1982 0:00	24	3.8	0	0.2167	24	20	1	2	5.2	0	5.2	30.3%	5.2	0
11/2/1982 0:00	24	3.4	0	0.2167	24	19	1	2	5.2	0	5.2	30.3%	5.2	0
5/20/1985 0:00	24	1.8	0	0.2167	24	19	1	5	5.2	0	5.2	30.3%	5.2	0
6/13/1985 0:00	24	1.7	0	0.2167	24	15	1	4	5.2	0	5.2	30.3%	5.2	0
10/28/1988 0:00	24	3.2	0	0.2167	24	18	1	2	5.2	0	5.2	30.3%	5.2	0
6/8/1989 0:00	24	4.5	0	0.2167	24	22	1	2	5.2	0	5.2	30.3%	5.2	0
8/22/1991 0:00	24	3.6	0	0.2167	24	20	1	3	5.2	0	5.2	30.3%	5.2	0
6/22/1993 0:00	24	3.2	0	0.2167	24	22	1	2	5.2	0	5.2	30.3%	5.2	0
7/6/1993 0:00	24	4.8	0	0.2167	24	22	1	2	5.2	0	5.2	30.3%	5.2	0
3/29/1997 0:00	24	1.2	0	0.2167	24	14	1	3	5.2	0	5.2	30.3%	5.2	0
5/15/1997 0:00	24	2.1	0	0.2167	24	19	1	3	5.2	0	5.2	30.3%	5.2	0
9/2/1998 0:00	24	3.5	0	0.2167	24	21	1	3	5.2	0	5.2	30.3%	5.2	0
10/18/1975 0:00	24	1.5	0	0.2125	24	19	1	2	5.1	0	5.1	29.9%	5.1	0
11/18/1981 0:00	24	1	0	0.2125	24	12	1	3	5.1	0	5.1	29.9%	5.1	0
8/9/1992 0:00	24	3.7	0	0.2125	24	21	1	2	5.1	0	5.1	29.9%	5.1	0
2/27/1997 0:00	24	1.5	0	0.2125	24	18	1	3	5.1	0	5.1	29.9%	5.1	0
7/23/1998 0:00	24	2.7	0	0.2125	24	20	1	4	5.1	0	5.1	29.9%	5.1	0
7/25/1999 0:00	24	3.6	0	0.2125	24	21	1	2	5.1	0	5.1	29.9%	5.1	0
4/18/1972 0:00	24	1.3	0	0.2083	24	13	1	4	5	0	5	28.8%	5	0
6/24/1976 0:00	24	1.3	0	0.2083	24	19	1	2	5	0	5	28.8%	5	0
8/9/1978 0:00	24	4.8	0	0.2083	24	22	1	2	5	0	5	28.8%	5	0
10/25/1978 0:00	24	2.6	0	0.2083	24	20	1	3	5	0	5	28.8%	5	0
10/2/1980 0:00	24	1.8	0	0.2083	24	19	1	2	5	0	5	28.8%	5	0
5/15/1981 0:00	24	2.8	0	0.2083	24	22	1	2	5	0	5	28.8%	5	0
7/15/1985 0:00	24	2.4	0	0.2083	24	20	1	2	5	0	5	28.8%	5	0
6/7/1986 0:00	24	3.4	0	0.2083	24	19	1	5	5	0	5	28.8%	5	0
9/30/1987 0:00	24	1.7	0	0.2083	24	16	1	4	5	0	5	28.8%	5	0
7/21/1990 0:00	24	1.8	0	0.2083	24	19	1	3	5	0	5	28.8%	5	0
7/31/1990 0:00	24	2	0	0.2083	24	19	1	1	5	0	5	28.8%	5	0
10/3/1991 0:00	24	2.5	0	0.2083	24	18	1	3	5	0	5	28.8%	5	0
11/19/1991 0:00	24	4.4	0	0.2083	24	20	1	2	5	0	5	28.8%	5	0
1/3/1993 0:00	24	2.2	0	0.2083	24	21	1	1	5	0	5	28.8%	5	0
6/22/1994 0:00	24	4	0	0.2083	24	21	1	2	5	0	5	28.8%	5	0
9/24/1996 0:00	24	1.2	0	0.2083	24	16	1	3	5	0	5	28.8%	5	0
8/20/1998 0:00	24	3.7	0	0.2083	24	20	1	3	5	0	5	28.8%	5	0
6/8/1972 0:00	24	3.8	0	0.2042	24	21	1	2	4.9	0	4.9	28.3%	4.9	0
1/23/1973 0:00	24	1	0	0.2042	24	14	1	7	4.9	0	4.9	28.3%	4.9	0
8/24/1975 0:00	24	4.6	0	0.2042	24	22	1	3	4.9	0	4.9	28.3%	4.9	0
11/21/1977 0:00	24	2.9	0	0.2042	24	18	1	4	4.9	0	4.9	28.3%	4.9	0

Date	Duration (h)	Maximum Rainfall (mm/hr)	Minimum Rainfall (mm/hr)	Mean Rainfall (mm/hr)	Duration of Exceedances (h)	Duration of Deficits (h)	Number of Exceedances	Number of Deficits	Volume of Exceedances (mm)	Volume of Deficits (mm)	Total Rainfall (mm)	Percentile	Infiltration Amount (mm)	Bypass Amount (mm)
11/15/1984 0:00	24	3.9	0	0.2042	24	20	1	2	4.9	0	4.9	28.3%	4.9	0
2/19/1997 0:00	24	1.1	0	0.2042	24	18	1	2	4.9	0	4.9	28.3%	4.9	0
6/10/1998 0:00	24	3.5	0	0.2042	24	21	1	2	4.9	0	4.9	28.3%	4.9	0
4/2/1974 0:00	24	1.5	0	0.2	24	19	1	2	4.8	0	4.8	26.8%	4.8	0
4/23/1974 0:00	24	1	0	0.2	24	15	1	5	4.8	0	4.8	26.8%	4.8	0
7/10/1975 0:00	24	2.5	0	0.2	24	21	1	1	4.8	0	4.8	26.8%	4.8	0
6/20/1977 0:00	24	2.8	0	0.2	24	21	1	2	4.8	0	4.8	26.8%	4.8	0
12/6/1979 0:00	24	1.8	0	0.2	24	18	1	2	4.8	0	4.8	26.8%	4.8	0
4/9/1981 0:00	24	2.5	0	0.2	24	18	1	5	4.8	0	4.8	26.8%	4.8	0
7/2/1981 0:00	24	2.7	0	0.2	24	22	1	2	4.8	0	4.8	26.8%	4.8	0
8/30/1981 0:00	24	4.8	0	0.2	24	23	1	2	4.8	0	4.8	26.8%	4.8	0
9/27/1981 0:00	24	3.2	0	0.2	24	18	1	4	4.8	0	4.8	26.8%	4.8	0
5/31/1982 0:00	24	1.9	0	0.2	24	19	1	2	4.8	0	4.8	26.8%	4.8	0
9/3/1982 0:00	24	2.3	0	0.2	24	18	1	5	4.8	0	4.8	26.8%	4.8	0
6/11/1986 0:00	24	2.2	0	0.2	24	20	1	2	4.8	0	4.8	26.8%	4.8	0
5/17/1987 0:00	24	1.4	0	0.2	24	14	1	6	4.8	0	4.8	26.8%	4.8	0
5/31/1987 0:00	24	2.2	0	0.2	24	19	1	2	4.8	0	4.8	26.8%	4.8	0
10/8/1987 0:00	24	1.9	0	0.2	24	18	1	3	4.8	0	4.8	26.8%	4.8	0
11/18/1987 0:00	24	7.7	0	0.2	24	20	1	4	4.8	0	4.8	26.8%	4.8	0
1/18/1988 0:00	24	1.1	0	0.2	24	10	1	4	4.8	0	4.8	26.8%	4.8	0
5/16/1988 0:00	24	1.6	0	0.2	24	18	1	3	4.8	0	4.8	26.8%	4.8	0
6/29/1988 0:00	24	2.4	0	0.2	24	20	1	2	4.8	0	4.8	26.8%	4.8	0
11/8/1989 0:00	24	2.9	0	0.2	24	20	1	1	4.8	0	4.8	26.8%	4.8	0
5/11/1994 0:00	24	1.6	0	0.2	24	19	1	4	4.8	0	4.8	26.8%	4.8	0
6/25/1996 0:00	24	1.7	0	0.2	24	18	1	6	4.8	0	4.8	26.8%	4.8	0
9/29/1996 0:00	24	4.6	0	0.2	24	22	1	2	4.8	0	4.8	26.8%	4.8	0
5/2/1972 0:00	24	2	0	0.1958	24	18	1	4	4.7	0	4.7	26.5%	4.7	0
8/23/1972 0:00	24	2.3	0	0.1958	24	19	1	3	4.7	0	4.7	26.5%	4.7	0
8/31/1976 0:00	24	1.8	0	0.1958	24	20	1	1	4.7	0	4.7	26.5%	4.7	0
12/4/1982 0:00	24	2.9	0	0.1958	24	20	1	1	4.7	0	4.7	26.5%	4.7	0
2/22/1985 0:00	24	2.1	0	0.1958	24	20	1	2	4.7	0	4.7	26.5%	4.7	0
12/11/1971 0:00	24	3.3	0	0.1917	24	22	1	2	4.6	0	4.6	25.2%	4.6	0
6/26/1976 0:00	24	2.5	0	0.1917	24	20	1	3	4.6	0	4.6	25.2%	4.6	0
3/15/1983 0:00	24	1.3	0	0.1917	24	15	1	3	4.6	0	4.6	25.2%	4.6	0
4/30/1983 0:00	24	1.5	0	0.1917	24	18	1	2	4.6	0	4.6	25.2%	4.6	0
7/17/1984 0:00	24	2.9	0	0.1917	24	22	1	1	4.6	0	4.6	25.2%	4.6	0
7/20/1984 0:00	24	2.6	0	0.1917	24	22	1	2	4.6	0	4.6	25.2%	4.6	0
6/12/1985 0:00	24	1.5	0	0.1917	24	18	1	3	4.6	0	4.6	25.2%	4.6	0
4/7/1986 0:00	24	1.4	0	0.1917	24	17	1	3	4.6	0	4.6	25.2%	4.6	0
4/15/1988 0:00	24	1.8	0	0.1917	24	18	1	3	4.6	0	4.6	25.2%	4.6	0
9/14/1988 0:00	24	2.1	0	0.1917	24	20	1	3	4.6	0	4.6	25.2%	4.6	0
8/4/1989 0:00	24	3.9	0	0.1917	24	20	1	3	4.6	0	4.6	25.2%	4.6	0
11/7/1989 0:00	24	1.2	0	0.1917	24	19	1	2	4.6	0	4.6	25.2%	4.6	0
6/3/1990 0:00	24	1.8	0	0.1917	24	19	1	3	4.6	0	4.6	25.2%	4.6	0
9/15/1990 0:00	24	2.7	0	0.1917	24	18	1	4	4.6	0	4.6	25.2%	4.6	0
9/23/1991 0:00	24	3	0	0.1917	24	17	1	4	4.6	0	4.6	25.2%	4.6	0
5/2/1992 0:00	24	1.8	0	0.1917	24	18	1	4	4.6	0	4.6	25.2%	4.6	0
5/6/1993 0:00	24	3.4	0	0.1917	24	22	1	2	4.6	0	4.6	25.2%	4.6	0
5/28/1993 0:00	24	1.4	0	0.1917	24	17	1	2	4.6	0	4.6	25.2%	4.6	0
4/25/1994 0:00	24	1.4	0	0.1917	24	16	1	3	4.6	0	4.6	25.2%	4.6	0
9/12/1997 0:00	24	2	0	0.1917	24	20	1	2	4.6	0	4.6	25.2%	4.6	0
7/24/1971 0:00	24	13.7	0	0.1875	24	19	1	4	4.5	0	4.5	24.8%	4.5	0
6/26/1972 0:00	24	1	0	0.1875	24	16	1	5	4.5	0	4.5	24.8%	4.5	0
11/13/1973 0:00	24	1	0	0.1875	24	15	1	4	4.5	0	4.5	24.8%	4.5	0
9/18/1975 0:00	24	1	0	0.1875	24	17	1	2	4.5	0	4.5	24.8%	4.5	0
7/11/1976 0:00	24	3.6	0	0.1875	24	20	1	4	4.5	0	4.5	24.8%	4.5	0
11/23/1979 0:00	24	2.5	0	0.1875	24	20	1	2	4.5	0	4.5	24.8%	4.5	0
9/26/1972 0:00	24	2	0	0.1833	24	18	1	3	4.4	0	4.4	23.3%	4.4	0
6/24/1973 0:00	24	3.6	0	0.1833	24	22	1	3	4.4	0	4.4	23.3%	4.4	0
6/19/1976 0:00	24	3.3	0	0.1833	24	21	1	3	4.4	0	4.4	23.3%	4.4	0
9/16/1977 0:00	24	1.8	0	0.1833	24	17	1	3	4.4	0	4.4	23.3%	4.4	0
11/15/1977 0:00	24	3.1	0	0.1833	24	21	1	2	4.4	0	4.4	23.3%	4.4	0
7/17/1980 0:00	24	1.6	0	0.1833	24	18	1	4	4.4	0	4.4	23.3%	4.4	0
5/19/1983 0:00	24	1.6	0	0.1833	24	18	1	2	4.4	0	4.4	23.3%	4.4	0
5/22/1983 0:00	24	3.4	0	0.1833	24	21	1	2	4.4	0	4.4	23.3%	4.4	0
11/21/1983 0:00	24	1.8	0	0.1833	24	20	1	1	4.4	0	4.4	23.3%	4.4	0
12/2/1985 0:00	24	2.2	0	0.1833	24	19	1	3	4.4	0	4.4	23.3%	4.4	0
6/12/1987 0:00	24	4.6	0	0.1833	24	19	1	1	4.4	0	4.4	23.3%	4.4	0
4/24/1988 0:00	24	0.8	0	0.1833	24	15	1	5	4.4	0	4.4	23.3%	4.4	0

Date	Duration (h)	Maximum Rainfall (mm/hr)	Minimum Rainfall (mm/hr)	Mean Rainfall (mm/hr)	Duration of Exceedances (h)	Duration of Deficits (h)	Number of Exceedances	Number of Deficits	Volume of Exceedances (mm)	Volume of Deficits (mm)	Total Rainfall (mm)	Percentile	Infiltration Amount (mm)	Bypass Amount (mm)
11/10/1990 0:00	24	2.5	0	0.1833	24	21	1	2	4.4	0	4.4	23.3%	4.4	0
5/24/1991 0:00	24	3.3	0	0.1833	24	22	1	2	4.4	0	4.4	23.3%	4.4	0
8/21/1991 0:00	24	2.1	0	0.1833	24	17	1	4	4.4	0	4.4	23.3%	4.4	0
6/5/1992 0:00	24	1.1	0	0.1833	24	18	1	3	4.4	0	4.4	23.3%	4.4	0
11/4/1992 0:00	24	1.8	0	0.1833	24	18	1	2	4.4	0	4.4	23.3%	4.4	0
11/5/1992 0:00	24	1.5	0	0.1833	24	18	1	2	4.4	0	4.4	23.3%	4.4	0
8/4/1993 0:00	24	1.9	0	0.1833	24	20	1	2	4.4	0	4.4	23.3%	4.4	0
9/8/1993 0:00	24	3.6	0	0.1833	24	21	1	3	4.4	0	4.4	23.3%	4.4	0
9/9/1993 0:00	24	3.1	0	0.1833	24	21	1	3	4.4	0	4.4	23.3%	4.4	0
4/30/1994 0:00	24	1.8	0	0.1833	24	21	1	1	4.4	0	4.4	23.3%	4.4	0
5/29/1994 0:00	24	2	0	0.1833	24	18	1	3	4.4	0	4.4	23.3%	4.4	0
9/28/1994 0:00	24	1.2	0	0.1833	24	17	1	3	4.4	0	4.4	23.3%	4.4	0
4/16/1983 0:00	24	0.8	0	0.1792	24	14	1	3	4.3	0	4.3	23.1%	4.3	0
9/5/1986 0:00	24	3.7	0	0.1792	24	20	1	3	4.3	0	4.3	23.1%	4.3	0
8/14/1972 0:00	24	1.3	0	0.175	24	19	1	2	4.2	0	4.2	21.5%	4.2	0
11/2/1973 0:00	24	1.5	0	0.175	24	19	1	2	4.2	0	4.2	21.5%	4.2	0
12/27/1973 0:00	24	1.8	0	0.175	24	20	1	3	4.2	0	4.2	21.5%	4.2	0
3/13/1976 0:00	24	1.8	0	0.175	24	18	1	3	4.2	0	4.2	21.5%	4.2	0
5/9/1978 0:00	24	2.9	0	0.175	24	18	1	3	4.2	0	4.2	21.5%	4.2	0
3/24/1979 0:00	24	1.8	0	0.175	24	19	1	3	4.2	0	4.2	21.5%	4.2	0
9/10/1979 0:00	24	1.5	0	0.175	24	19	1	2	4.2	0	4.2	21.5%	4.2	0
5/9/1982 0:00	24	1.4	0	0.175	24	17	1	2	4.2	0	4.2	21.5%	4.2	0
9/14/1982 0:00	24	3.8	0	0.175	24	21	1	3	4.2	0	4.2	21.5%	4.2	0
10/8/1982 0:00	24	2.8	0	0.175	24	17	1	6	4.2	0	4.2	21.5%	4.2	0
4/9/1986 0:00	24	1.3	0	0.175	24	17	1	3	4.2	0	4.2	21.5%	4.2	0
6/7/1987 0:00	24	4	0	0.175	24	22	1	2	4.2	0	4.2	21.5%	4.2	0
4/8/1988 0:00	24	1.6	0	0.175	24	18	1	2	4.2	0	4.2	21.5%	4.2	0
8/6/1988 0:00	24	4	0	0.175	24	22	1	3	4.2	0	4.2	21.5%	4.2	0
5/8/1990 0:00	24	2.1	0	0.175	24	21	1	3	4.2	0	4.2	21.5%	4.2	0
7/16/1990 0:00	24	4.2	0	0.175	24	23	1	2	4.2	0	4.2	21.5%	4.2	0
3/7/1991 0:00	24	1.2	0	0.175	24	19	1	2	4.2	0	4.2	21.5%	4.2	0
8/1/1992 0:00	24	1.5	0	0.175	24	18	1	3	4.2	0	4.2	21.5%	4.2	0
8/30/1992 0:00	24	2.4	0	0.175	24	19	1	4	4.2	0	4.2	21.5%	4.2	0
10/9/1992 0:00	24	1.4	0	0.175	24	17	1	2	4.2	0	4.2	21.5%	4.2	0
11/11/1992 0:00	24	2	0	0.175	24	19	1	3	4.2	0	4.2	21.5%	4.2	0
5/15/1993 0:00	24	2	0	0.175	24	18	1	2	4.2	0	4.2	21.5%	4.2	0
9/17/1993 0:00	24	1.1	0	0.175	24	17	1	4	4.2	0	4.2	21.5%	4.2	0
10/24/1995 0:00	24	3.3	0	0.175	24	21	1	2	4.2	0	4.2	21.5%	4.2	0
6/2/1998 0:00	24	3.7	0	0.175	24	21	1	3	4.2	0	4.2	21.5%	4.2	0
4/24/1971 0:00	24	2	0	0.1708	24	20	1	2	4.1	0	4.1	20.9%	4.1	0
10/14/1972 0:00	24	2.5	0	0.1708	24	20	1	3	4.1	0	4.1	20.9%	4.1	0
4/30/1974 0:00	24	2.5	0	0.1708	24	20	1	2	4.1	0	4.1	20.9%	4.1	0
5/6/1974 0:00	24	1.5	0	0.1708	24	20	1	3	4.1	0	4.1	20.9%	4.1	0
7/31/1974 0:00	24	1.8	0	0.1708	24	19	1	6	4.1	0	4.1	20.9%	4.1	0
9/23/1976 0:00	24	1.5	0	0.1708	24	20	1	3	4.1	0	4.1	20.9%	4.1	0
7/31/1977 0:00	24	4.1	0	0.1708	24	23	1	2	4.1	0	4.1	20.9%	4.1	0
5/1/1994 0:00	24	1.8	0	0.1708	24	15	1	4	4.1	0	4.1	20.9%	4.1	0
6/25/1998 0:00	24	2.5	0	0.1708	24	18	1	4	4.1	0	4.1	20.9%	4.1	0
4/28/1971 0:00	24	1	0	0.1667	24	15	1	3	4	0	4	18.9%	4	0
7/11/1975 0:00	24	2.8	0	0.1667	24	19	1	5	4	0	4	18.9%	4	0
6/27/1978 0:00	24	3.4	0	0.1667	24	21	1	3	4	0	4	18.9%	4	0
7/19/1978 0:00	24	3.2	0	0.1667	24	20	1	4	4	0	4	18.9%	4	0
10/12/1978 0:00	24	3.4	0	0.1667	24	21	1	2	4	0	4	18.9%	4	0
11/6/1979 0:00	24	1	0	0.1667	24	17	1	3	4	0	4	18.9%	4	0
3/10/1980 0:00	24	2.6	0	0.1667	24	21	1	3	4	0	4	18.9%	4	0
3/18/1980 0:00	24	2.2	0	0.1667	24	20	1	4	4	0	4	18.9%	4	0
10/18/1980 0:00	24	2.5	0	0.1667	24	21	1	2	4	0	4	18.9%	4	0
9/22/1981 0:00	24	1	0	0.1667	24	14	1	4	4	0	4	18.9%	4	0
12/2/1982 0:00	24	2.1	0	0.1667	24	21	1	1	4	0	4	18.9%	4	0
6/19/1986 0:00	24	1.7	0	0.1667	24	20	1	2	4	0	4	18.9%	4	0
8/6/1986 0:00	24	3.8	0	0.1667	24	22	1	3	4	0	4	18.9%	4	0
3/26/1987 0:00	24	1.4	0	0.1667	24	17	1	5	4	0	4	18.9%	4	0
9/28/1987 0:00	24	2.5	0	0.1667	24	21	1	2	4	0	4	18.9%	4	0
4/23/1988 0:00	24	1	0	0.1667	24	17	1	3	4	0	4	18.9%	4	0
4/27/1988 0:00	24	2	0	0.1667	24	21	1	1	4	0	4	18.9%	4	0
8/9/1988 0:00	24	1.3	0	0.1667	24	18	1	4	4	0	4	18.9%	4	0
5/26/1989 0:00	24	1.8	0	0.1667	24	19	1	4	4	0	4	18.9%	4	0
11/4/1990 0:00	24	1.1	0	0.1667	24	18	1	2	4	0	4	18.9%	4	0
10/1/1991 0:00	24	2.2	0	0.1667	24	20	1	2	4	0	4	18.9%	4	0

Date	Duration (h)	Maximum Rainfall (mm/hr)	Minimum Rainfall (mm/hr)	Mean Rainfall (mm/hr)	Duration of Exceedances (h)	Duration of Deficits (h)	Number of Exceedances	Number of Deficits	Volume of Exceedances (mm)	Volume of Deficits (mm)	Total Rainfall (mm)	Percentile	Infiltration Amount (mm)	Bypass Amount (mm)
9/27/1992 0:00	24	1	0	0.1667	24	19	1	3	4	0	4	18.9%	4	0
11/25/1992 0:00	24	1.1	0	0.1667	24	18	1	3	4	0	4	18.9%	4	0
10/20/1993 0:00	24	3.4	0	0.1667	24	22	1	1	4	0	4	18.9%	4	0
7/15/1994 0:00	24	3.1	0	0.1667	24	22	1	1	4	0	4	18.9%	4	0
9/11/1996 0:00	24	3.4	0	0.1667	24	22	1	1	4	0	4	18.9%	4	0
12/16/1996 0:00	24	1	0	0.1667	24	18	1	2	4	0	4	18.9%	4	0
12/17/1996 0:00	24	1	0	0.1667	24	13	1	3	4	0	4	18.9%	4	0
4/22/1997 0:00	24	3.6	0	0.1667	24	22	1	2	4	0	4	18.9%	4	0
8/23/1997 0:00	24	2.5	0	0.1667	24	21	1	3	4	0	4	18.9%	4	0
9/14/1998 0:00	24	2.4	0	0.1667	24	21	1	2	4	0	4	18.9%	4	0
3/29/1973 0:00	24	0.8	0	0.1625	24	15	1	4	3.9	0	3.9	18.4%	3.9	0
6/10/1973 0:00	24	2.3	0	0.1625	24	21	1	3	3.9	0	3.9	18.4%	3.9	0
11/27/1973 0:00	24	0.8	0	0.1625	24	16	1	3	3.9	0	3.9	18.4%	3.9	0
9/13/1975 0:00	24	1.5	0	0.1625	24	18	1	3	3.9	0	3.9	18.4%	3.9	0
5/6/1976 0:00	24	1.3	0	0.1625	24	19	1	2	3.9	0	3.9	18.4%	3.9	0
10/17/1977 0:00	24	1.4	0	0.1625	24	18	1	3	3.9	0	3.9	18.4%	3.9	0
10/4/1978 0:00	24	2.5	0	0.1625	24	18	1	4	3.9	0	3.9	18.4%	3.9	0
4/1/1971 0:00	24	1.5	0	0.1583	24	20	1	1	3.8	0	3.8	16.3%	3.8	0
10/7/1976 0:00	24	1.5	0	0.1583	24	20	1	3	3.8	0	3.8	16.3%	3.8	0
9/21/1977 0:00	24	1.1	0	0.1583	24	16	1	5	3.8	0	3.8	16.3%	3.8	0
5/7/1978 0:00	24	3.8	0	0.1583	24	23	1	1	3.8	0	3.8	16.3%	3.8	0
9/27/1978 0:00	24	2.7	0	0.1583	24	22	1	1	3.8	0	3.8	16.3%	3.8	0
8/18/1979 0:00	24	1.5	0	0.1583	24	18	1	5	3.8	0	3.8	16.3%	3.8	0
6/29/1980 0:00	24	1.6	0	0.1583	24	21	1	2	3.8	0	3.8	16.3%	3.8	0
9/14/1980 0:00	24	3.4	0	0.1583	24	21	1	3	3.8	0	3.8	16.3%	3.8	0
4/18/1981 0:00	24	2.1	0	0.1583	24	21	1	3	3.8	0	3.8	16.3%	3.8	0
10/14/1982 0:00	24	1.2	0	0.1583	24	17	1	4	3.8	0	3.8	16.3%	3.8	0
3/9/1983 0:00	24	1.6	0	0.1583	24	18	1	4	3.8	0	3.8	16.3%	3.8	0
4/4/1983 0:00	24	1.4	0	0.1583	24	20	1	3	3.8	0	3.8	16.3%	3.8	0
8/29/1984 0:00	24	2.3	0	0.1583	24	21	1	3	3.8	0	3.8	16.3%	3.8	0
3/11/1985 0:00	24	1.3	0	0.1583	24	19	1	1	3.8	0	3.8	16.3%	3.8	0
10/9/1985 0:00	24	0.9	0	0.1583	24	16	1	2	3.8	0	3.8	16.3%	3.8	0
3/19/1986 0:00	24	0.9	0	0.1583	24	16	1	3	3.8	0	3.8	16.3%	3.8	0
6/26/1987 0:00	24	1.2	0	0.1583	24	18	1	3	3.8	0	3.8	16.3%	3.8	0
10/27/1987 0:00	24	1.3	0	0.1583	24	17	1	2	3.8	0	3.8	16.3%	3.8	0
4/4/1988 0:00	24	1.7	0	0.1583	24	19	1	4	3.8	0	3.8	16.3%	3.8	0
4/26/1988 0:00	24	2	0	0.1583	24	19	1	4	3.8	0	3.8	16.3%	3.8	0
5/13/1988 0:00	24	1.5	0	0.1583	24	18	1	3	3.8	0	3.8	16.3%	3.8	0
5/15/1988 0:00	24	2.4	0	0.1583	24	21	1	1	3.8	0	3.8	16.3%	3.8	0
10/18/1988 0:00	24	1.4	0	0.1583	24	19	1	2	3.8	0	3.8	16.3%	3.8	0
5/3/1989 0:00	24	1.2	0	0.1583	24	17	1	2	3.8	0	3.8	16.3%	3.8	0
5/30/1989 0:00	24	1.5	0	0.1583	24	15	1	3	3.8	0	3.8	16.3%	3.8	0
9/19/1990 0:00	24	2.2	0	0.1583	24	18	1	3	3.8	0	3.8	16.3%	3.8	0
8/16/1991 0:00	24	1.4	0	0.1583	24	18	1	3	3.8	0	3.8	16.3%	3.8	0
11/24/1991 0:00	24	1	0	0.1583	24	18	1	2	3.8	0	3.8	16.3%	3.8	0
6/24/1992 0:00	24	1.1	0	0.1583	24	17	1	4	3.8	0	3.8	16.3%	3.8	0
6/13/1994 0:00	24	1.9	0	0.1583	24	19	1	2	3.8	0	3.8	16.3%	3.8	0
8/20/1994 0:00	24	1.5	0	0.1583	24	21	1	2	3.8	0	3.8	16.3%	3.8	0
4/3/1995 0:00	24	1.9	0	0.1583	24	20	1	2	3.8	0	3.8	16.3%	3.8	0
5/23/1995 0:00	24	1.4	0	0.1583	24	18	1	1	3.8	0	3.8	16.3%	3.8	0
7/14/1971 0:00	24	2.8	0	0.1542	24	20	1	3	3.7	0	3.7	15.8%	3.7	0
11/15/1973 0:00	24	1.3	0	0.1542	24	18	1	2	3.7	0	3.7	15.8%	3.7	0
7/20/1993 0:00	24	3.7	0	0.1542	24	23	1	2	3.7	0	3.7	15.8%	3.7	0
9/15/1993 0:00	24	1.6	0	0.1542	24	20	1	3	3.7	0	3.7	15.8%	3.7	0
8/20/1996 0:00	24	1.6	0	0.1542	24	19	1	2	3.7	0	3.7	15.8%	3.7	0
9/23/1997 0:00	24	1.8	0	0.1542	24	19	1	2	3.7	0	3.7	15.8%	3.7	0
9/8/1998 0:00	24	1.4	0	0.1542	24	17	1	2	3.7	0	3.7	15.8%	3.7	0
5/16/1971 0:00	24	2	0	0.15	24	20	1	1	3.6	0	3.6	14.2%	3.6	0
10/24/1971 0:00	24	1.8	0	0.15	24	21	1	2	3.6	0	3.6	14.2%	3.6	0
1/21/1974 0:00	24	1.3	0	0.15	24	20	1	2	3.6	0	3.6	14.2%	3.6	0
10/13/1978 0:00	24	2.1	0	0.15	24	20	1	1	3.6	0	3.6	14.2%	3.6	0
7/20/1981 0:00	24	0.8	0	0.15	24	16	1	4	3.6	0	3.6	14.2%	3.6	0
9/19/1981 0:00	24	3	0	0.15	24	22	1	2	3.6	0	3.6	14.2%	3.6	0
11/12/1982 0:00	24	1.2	0	0.15	24	16	1	3	3.6	0	3.6	14.2%	3.6	0
6/5/1985 0:00	24	2.1	0	0.15	24	18	1	3	3.6	0	3.6	14.2%	3.6	0
9/4/1985 0:00	24	3	0	0.15	24	22	1	2	3.6	0	3.6	14.2%	3.6	0
10/15/1985 0:00	24	1.7	0	0.15	24	21	1	2	3.6	0	3.6	14.2%	3.6	0
10/26/1986 0:00	24	2.3	0	0.15	24	21	1	1	3.6	0	3.6	14.2%	3.6	0
11/3/1987 0:00	24	0.9	0	0.15	24	16	1	4	3.6	0	3.6	14.2%	3.6	0

Date	Duration (h)	Maximum Rainfall (mm/hr)	Minimum Rainfall (mm/hr)	Mean Rainfall (mm/hr)	Duration of Exceedances (h)	Duration of Deficits (h)	Number of Exceedances	Number of Deficits	Volume of Exceedances (mm)	Volume of Deficits (mm)	Total Rainfall (mm)	Percentile	Infiltration Amount (mm)	Bypass Amount (mm)
11/5/1987 0:00	24	1.4	0	0.15	24	19	1	2	3.6	0	3.6	14.2%	3.6	0
4/14/1988 0:00	24	1.1	0	0.15	24	16	1	3	3.6	0	3.6	14.2%	3.6	0
7/25/1988 0:00	24	1.5	0	0.15	24	19	1	3	3.6	0	3.6	14.2%	3.6	0
9/27/1988 0:00	24	1.6	0	0.15	24	19	1	3	3.6	0	3.6	14.2%	3.6	0
3/28/1989 0:00	24	3.1	0	0.15	24	21	1	3	3.6	0	3.6	14.2%	3.6	0
8/21/1989 0:00	24	2.9	0	0.15	24	20	1	4	3.6	0	3.6	14.2%	3.6	0
11/11/1989 0:00	24	1.1	0	0.15	24	18	1	2	3.6	0	3.6	14.2%	3.6	0
10/24/1991 0:00	24	2.4	0	0.15	24	22	1	2	3.6	0	3.6	14.2%	3.6	0
11/30/1991 0:00	24	3.2	0	0.15	24	21	1	4	3.6	0	3.6	14.2%	3.6	0
6/21/1992 0:00	24	0.9	0	0.15	24	17	1	5	3.6	0	3.6	14.2%	3.6	0
7/26/1993 0:00	24	3.2	0	0.15	24	21	1	3	3.6	0	3.6	14.2%	3.6	0
11/11/1993 0:00	24	1.4	0	0.15	24	18	1	5	3.6	0	3.6	14.2%	3.6	0
7/11/1995 0:00	24	3.6	0	0.15	24	23	1	1	3.6	0	3.6	14.2%	3.6	0
4/25/1971 0:00	24	1.3	0	0.1458	24	18	1	3	3.5	0	3.5	13.6%	3.5	0
5/4/1973 0:00	24	0.8	0	0.1458	24	17	1	6	3.5	0	3.5	13.6%	3.5	0
5/9/1973 0:00	24	1	0	0.1458	24	16	1	4	3.5	0	3.5	13.6%	3.5	0
5/10/1973 0:00	24	1.3	0	0.1458	24	19	1	1	3.5	0	3.5	13.6%	3.5	0
9/12/1977 0:00	24	2.3	0	0.1458	24	20	1	2	3.5	0	3.5	13.6%	3.5	0
4/17/1982 0:00	24	1.1	0	0.1458	24	19	1	3	3.5	0	3.5	13.6%	3.5	0
10/1/1990 0:00	24	1.3	0	0.1458	24	18	1	2	3.5	0	3.5	13.6%	3.5	0
12/2/1993 0:00	24	1.3	0	0.1458	24	20	1	1	3.5	0	3.5	13.6%	3.5	0
3/21/1995 0:00	24	0.9	0	0.1458	24	15	1	3	3.5	0	3.5	13.6%	3.5	0
5/3/1972 0:00	24	1.8	0	0.1417	24	20	1	2	3.4	0	3.4	11.7%	3.4	0
7/25/1972 0:00	24	1.8	0	0.1417	24	20	1	4	3.4	0	3.4	11.7%	3.4	0
5/24/1974 0:00	24	1	0	0.1417	24	17	1	7	3.4	0	3.4	11.7%	3.4	0
6/8/1975 0:00	24	1.5	0	0.1417	24	20	1	2	3.4	0	3.4	11.7%	3.4	0
11/30/1975 0:00	24	1.5	0	0.1417	24	18	1	5	3.4	0	3.4	11.7%	3.4	0
4/16/1979 0:00	24	1.4	0	0.1417	24	18	1	2	3.4	0	3.4	11.7%	3.4	0
11/24/1979 0:00	24	2.6	0	0.1417	24	20	1	3	3.4	0	3.4	11.7%	3.4	0
5/10/1981 0:00	24	2.3	0	0.1417	24	20	1	1	3.4	0	3.4	11.7%	3.4	0
10/7/1981 0:00	24	0.8	0	0.1417	24	14	1	4	3.4	0	3.4	11.7%	3.4	0
5/25/1983 0:00	24	1.2	0	0.1417	24	19	1	1	3.4	0	3.4	11.7%	3.4	0
6/8/1985 0:00	24	1.7	0	0.1417	24	17	1	3	3.4	0	3.4	11.7%	3.4	0
4/8/1986 0:00	24	1.2	0	0.1417	24	13	1	4	3.4	0	3.4	11.7%	3.4	0
9/4/1986 0:00	24	1.5	0	0.1417	24	21	1	2	3.4	0	3.4	11.7%	3.4	0
10/2/1987 0:00	24	1.1	0	0.1417	24	17	1	4	3.4	0	3.4	11.7%	3.4	0
3/27/1988 0:00	24	1.3	0	0.1417	24	20	1	2	3.4	0	3.4	11.7%	3.4	0
4/3/1989 0:00	24	1	0	0.1417	24	17	1	4	3.4	0	3.4	11.7%	3.4	0
5/21/1989 0:00	24	0.9	0	0.1417	24	17	1	4	3.4	0	3.4	11.7%	3.4	0
6/2/1989 0:00	24	1.3	0	0.1417	24	20	1	3	3.4	0	3.4	11.7%	3.4	0
9/9/1989 0:00	24	1.8	0	0.1417	24	22	1	2	3.4	0	3.4	11.7%	3.4	0
10/17/1990 0:00	24	2.6	0	0.1417	24	20	1	2	3.4	0	3.4	11.7%	3.4	0
4/30/1992 0:00	24	1.4	0	0.1417	24	19	1	3	3.4	0	3.4	11.7%	3.4	0
12/20/1992 0:00	24	1.1	0	0.1417	24	18	1	2	3.4	0	3.4	11.7%	3.4	0
4/11/1993 0:00	24	1.8	0	0.1417	24	20	1	1	3.4	0	3.4	11.7%	3.4	0
6/5/1993 0:00	24	1.1	0	0.1417	24	19	1	3	3.4	0	3.4	11.7%	3.4	0
9/6/1993 0:00	24	0.9	0	0.1417	24	17	1	2	3.4	0	3.4	11.7%	3.4	0
6/12/1994 0:00	24	2.8	0	0.1417	24	21	1	3	3.4	0	3.4	11.7%	3.4	0
9/1/1994 0:00	24	1.9	0	0.1417	24	21	1	1	3.4	0	3.4	11.7%	3.4	0
11/12/1995 0:00	24	2.1	0	0.1417	24	22	1	1	3.4	0	3.4	11.7%	3.4	0
8/3/1999 0:00	24	3.2	0	0.1417	24	22	1	2	3.4	0	3.4	11.7%	3.4	0
2/27/1971 0:00	24	2.5	0	0.1375	24	21	1	2	3.3	0	3.3	11.0%	3.3	0
10/10/1971 0:00	24	1.5	0	0.1375	24	21	1	1	3.3	0	3.3	11.0%	3.3	0
8/1/1972 0:00	24	2.3	0	0.1375	24	22	1	2	3.3	0	3.3	11.0%	3.3	0
1/22/1973 0:00	24	1.5	0	0.1375	24	20	1	2	3.3	0	3.3	11.0%	3.3	0
8/27/1974 0:00	24	0.8	0	0.1375	24	17	1	3	3.3	0	3.3	11.0%	3.3	0
4/26/1976 0:00	24	0.8	0	0.1375	24	16	1	5	3.3	0	3.3	11.0%	3.3	0
9/25/1977 0:00	24	1.2	0	0.1375	24	19	1	4	3.3	0	3.3	11.0%	3.3	0
12/5/1982 0:00	24	0.9	0	0.1375	24	19	1	3	3.3	0	3.3	11.0%	3.3	0
7/15/1990 0:00	24	1.6	0	0.1375	24	17	1	4	3.3	0	3.3	11.0%	3.3	0
10/8/1998 0:00	24	1.1	0	0.1375	24	19	1	2	3.3	0	3.3	11.0%	3.3	0
9/13/1999 0:00	24	0.9	0	0.1375	24	19	1	1	3.3	0	3.3	11.0%	3.3	0
6/21/1974 0:00	24	1.5	0	0.1333	24	19	1	2	3.2	0	3.2	9.2%	3.2	0
6/7/1978 0:00	24	0.8	0	0.1333	24	20	1	2	3.2	0	3.2	9.2%	3.2	0
6/19/1978 0:00	24	1.4	0	0.1333	24	19	1	3	3.2	0	3.2	9.2%	3.2	0
11/24/1978 0:00	24	1.5	0	0.1333	24	19	1	2	3.2	0	3.2	9.2%	3.2	0
10/28/1979 0:00	24	0.5	0	0.1333	24	16	1	4	3.2	0	3.2	9.2%	3.2	0
5/7/1980 0:00	24	1.1	0	0.1333	24	20	1	3	3.2	0	3.2	9.2%	3.2	0
7/2/1980 0:00	24	1.8	0	0.1333	24	18	1	2	3.2	0	3.2	9.2%	3.2	0

Date	Duration (h)	Maximum Rainfall (mm/hr)	Minimum Rainfall (mm/hr)	Mean Rainfall (mm/hr)	Duration of Exceedances (h)	Duration of Deficits (h)	Number of Exceedances	Number of Deficits	Volume of Exceedances (mm)	Volume of Deficits (mm)	Total Rainfall (mm)	Percentile	Infiltration Amount (mm)	Bypass Amount (mm)
9/17/1980 0:00	24	2.9	0	0.1333	24	22	1	2	3.2	0	3.2	9.2%	3.2	0
2/28/1981 0:00	24	0.9	0	0.1333	24	17	1	4	3.2	0	3.2	9.2%	3.2	0
9/17/1981 0:00	24	1.4	0	0.1333	24	20	1	3	3.2	0	3.2	9.2%	3.2	0
10/15/1981 0:00	24	1.6	0	0.1333	24	21	1	2	3.2	0	3.2	9.2%	3.2	0
10/6/1983 0:00	24	1.4	0	0.1333	24	19	1	3	3.2	0	3.2	9.2%	3.2	0
2/18/1984 0:00	24	1.5	0	0.1333	24	19	1	1	3.2	0	3.2	9.2%	3.2	0
9/10/1984 0:00	24	1.8	0	0.1333	24	18	1	2	3.2	0	3.2	9.2%	3.2	0
11/1/1984 0:00	24	2.8	0	0.1333	24	21	1	2	3.2	0	3.2	9.2%	3.2	0
4/28/1985 0:00	24	0.8	0	0.1333	24	18	1	2	3.2	0	3.2	9.2%	3.2	0
11/9/1986 0:00	24	1.1	0	0.1333	24	17	1	2	3.2	0	3.2	9.2%	3.2	0
6/4/1990 0:00	24	2.4	0	0.1333	24	21	1	3	3.2	0	3.2	9.2%	3.2	0
6/29/1990 0:00	24	1.6	0	0.1333	24	18	1	4	3.2	0	3.2	9.2%	3.2	0
3/6/1991 0:00	24	1.2	0	0.1333	24	20	1	1	3.2	0	3.2	9.2%	3.2	0
7/9/1993 0:00	24	3.2	0	0.1333	24	23	1	1	3.2	0	3.2	9.2%	3.2	0
7/12/1993 0:00	24	3	0	0.1333	24	22	1	2	3.2	0	3.2	9.2%	3.2	0
3/22/1994 0:00	24	1.6	0	0.1333	24	16	1	2	3.2	0	3.2	9.2%	3.2	0
6/7/1994 0:00	24	4.6	0	0.1333	24	22	1	2	3.2	0	3.2	9.2%	3.2	0
6/14/1994 0:00	24	3.2	0	0.1333	24	23	1	1	3.2	0	3.2	9.2%	3.2	0
8/15/1998 0:00	24	2.5	0	0.1333	24	21	1	3	3.2	0	3.2	9.2%	3.2	0
8/17/1999 0:00	24	1.7	0	0.1333	24	22	1	2	3.2	0	3.2	9.2%	3.2	0
9/14/1999 0:00	24	2.8	0	0.1333	24	22	1	2	3.2	0	3.2	9.2%	3.2	0
5/27/1971 0:00	24	1.3	0	0.1292	24	20	1	3	3.1	0	3.1	8.3%	3.1	0
10/4/1971 0:00	24	1.8	0	0.1292	24	22	1	2	3.1	0	3.1	8.3%	3.1	0
11/19/1971 0:00	24	2.5	0	0.1292	24	21	1	4	3.1	0	3.1	8.3%	3.1	0
9/7/1972 0:00	24	1	0	0.1292	24	19	1	3	3.1	0	3.1	8.3%	3.1	0
1/19/1973 0:00	24	1	0	0.1292	24	18	1	3	3.1	0	3.1	8.3%	3.1	0
7/31/1973 0:00	24	1	0	0.1292	24	19	1	2	3.1	0	3.1	8.3%	3.1	0
1/27/1974 0:00	24	1.5	0	0.1292	24	19	1	3	3.1	0	3.1	8.3%	3.1	0
9/24/1975 0:00	24	1.3	0	0.1292	24	20	1	2	3.1	0	3.1	8.3%	3.1	0
8/15/1976 0:00	24	2.8	0	0.1292	24	22	1	3	3.1	0	3.1	8.3%	3.1	0
3/10/1979 0:00	24	1.1	0	0.1292	24	18	1	2	3.1	0	3.1	8.3%	3.1	0
6/27/1993 0:00	24	2.3	0	0.1292	24	21	1	3	3.1	0	3.1	8.3%	3.1	0
5/15/1994 0:00	24	1.1	0	0.1292	24	19	1	2	3.1	0	3.1	8.3%	3.1	0
5/1/1997 0:00	24	2.3	0	0.1292	24	19	1	4	3.1	0	3.1	8.3%	3.1	0
5/20/1971 0:00	24	1.5	0	0.125	24	21	1	2	3	0	3	6.0%	3	0
5/11/1973 0:00	24	1	0	0.125	24	18	1	5	3	0	3	6.0%	3	0
5/7/1974 0:00	24	1	0	0.125	24	17	1	4	3	0	3	6.0%	3	0
7/21/1975 0:00	24	1.5	0	0.125	24	21	1	2	3	0	3	6.0%	3	0
6/9/1978 0:00	24	3	0	0.125	24	23	1	2	3	0	3	6.0%	3	0
5/19/1979 0:00	24	2.5	0	0.125	24	22	1	2	3	0	3	6.0%	3	0
4/28/1980 0:00	24	0.5	0	0.125	24	16	1	2	3	0	3	6.0%	3	0
6/18/1980 0:00	24	1.3	0	0.125	24	19	1	3	3	0	3	6.0%	3	0
7/25/1980 0:00	24	2.4	0	0.125	24	22	1	2	3	0	3	6.0%	3	0
8/16/1981 0:00	24	1.2	0	0.125	24	18	1	5	3	0	3	6.0%	3	0
9/2/1981 0:00	24	1.4	0	0.125	24	20	1	2	3	0	3	6.0%	3	0
5/10/1983 0:00	24	1.4	0	0.125	24	19	1	5	3	0	3	6.0%	3	0
5/26/1983 0:00	24	1.6	0	0.125	24	21	1	1	3	0	3	6.0%	3	0
9/7/1983 0:00	24	3	0	0.125	24	23	1	2	3	0	3	6.0%	3	0
9/10/1983 0:00	24	2.8	0	0.125	24	22	1	3	3	0	3	6.0%	3	0
9/3/1984 0:00	24	1.3	0	0.125	24	21	1	2	3	0	3	6.0%	3	0
9/9/1987 0:00	24	1.8	0	0.125	24	21	1	2	3	0	3	6.0%	3	0
7/11/1988 0:00	24	1	0	0.125	24	19	1	4	3	0	3	6.0%	3	0
10/17/1988 0:00	24	1.6	0	0.125	24	21	1	3	3	0	3	6.0%	3	0
8/3/1989 0:00	24	2.3	0	0.125	24	21	1	2	3	0	3	6.0%	3	0
8/15/1989 0:00	24	1.9	0	0.125	24	21	1	3	3	0	3	6.0%	3	0
10/15/1989 0:00	24	3	0	0.125	24	23	1	1	3	0	3	6.0%	3	0
11/1/1989 0:00	24	1.7	0	0.125	24	20	1	4	3	0	3	6.0%	3	0
9/24/1990 0:00	24	0.7	0	0.125	24	15	1	2	3	0	3	6.0%	3	0
11/22/1992 0:00	24	1.2	0	0.125	24	20	1	1	3	0	3	6.0%	3	0
4/21/1993 0:00	24	0.9	0	0.125	24	17	1	3	3	0	3	6.0%	3	0
6/6/1993 0:00	24	1	0	0.125	24	17	1	3	3	0	3	6.0%	3	0
9/2/1993 0:00	24	1.6	0	0.125	24	20	1	2	3	0	3	6.0%	3	0
10/3/1993 0:00	24	1.4	0	0.125	24	19	1	2	3	0	3	6.0%	3	0
6/28/1994 0:00	24	1.4	0	0.125	24	20	1	3	3	0	3	6.0%	3	0
3/20/1995 0:00	24	1.4	0	0.125	24	18	1	4	3	0	3	6.0%	3	0
5/19/1996 0:00	24	3	0	0.125	24	23	1	1	3	0	3	6.0%	3	0
2/26/1997 0:00	24	1.1	0	0.125	24	20	1	1	3	0	3	6.0%	3	0
8/29/1998 0:00	24	0.9	0	0.125	24	20	1	3	3	0	3	6.0%	3	0
9/15/1998 0:00	24	0.6	0	0.125	24	17	1	5	3	0	3	6.0%	3	0

Date	Duration (h)	Maximum Rainfall (mm/hr)	Minimum Rainfall (mm/hr)	Mean Rainfall (mm/hr)	Duration of Exceedances (h)	Duration of Deficits (h)	Number of Exceedances	Number of Deficits	Volume of Exceedances (mm)	Volume of Deficits (mm)	Total Rainfall (mm)	Percentile	Infiltration Amount (mm)	Bypass Amount (mm)
5/25/1999 0:00	24	1	0	0.125	24	19	1	2	3	0	3	6.0%	3	0
5/2/1973 0:00	24	1	0	0.1208	24	18	1	4	2.9	0	2.9	5.5%	2.9	0
6/29/1973 0:00	24	1.3	0	0.1208	24	20	1	3	2.9	0	2.9	5.5%	2.9	0
7/31/1983 0:00	24	0.9	0	0.1208	24	18	1	5	2.9	0	2.9	5.5%	2.9	0
5/28/1994 0:00	24	1.8	0	0.1208	24	21	1	3	2.9	0	2.9	5.5%	2.9	0
4/4/1995 0:00	24	2.1	0	0.1208	24	20	1	3	2.9	0	2.9	5.5%	2.9	0
9/15/1996 0:00	24	1.6	0	0.1208	24	18	1	2	2.9	0	2.9	5.5%	2.9	0
5/9/1999 0:00	24	1.4	0	0.1208	24	19	1	3	2.9	0	2.9	5.5%	2.9	0
9/11/1971 0:00	24	1.5	0	0.1167	24	21	1	3	2.8	0	2.8	3.3%	2.8	0
1/13/1972 0:00	24	1.8	0	0.1167	24	22	1	2	2.8	0	2.8	3.3%	2.8	0
6/16/1975 0:00	24	2	0	0.1167	24	21	1	2	2.8	0	2.8	3.3%	2.8	0
9/6/1975 0:00	24	1.3	0	0.1167	24	21	1	3	2.8	0	2.8	3.3%	2.8	0
4/27/1976 0:00	24	1	0	0.1167	24	17	1	6	2.8	0	2.8	3.3%	2.8	0
6/28/1977 0:00	24	1.8	0	0.1167	24	22	1	1	2.8	0	2.8	3.3%	2.8	0
8/29/1977 0:00	24	2.8	0	0.1167	24	23	1	2	2.8	0	2.8	3.3%	2.8	0
9/28/1977 0:00	24	2	0	0.1167	24	21	1	2	2.8	0	2.8	3.3%	2.8	0
4/1/1978 0:00	24	2.6	0	0.1167	24	22	1	3	2.8	0	2.8	3.3%	2.8	0
3/5/1979 0:00	24	1.2	0	0.1167	24	19	1	3	2.8	0	2.8	3.3%	2.8	0
8/27/1979 0:00	24	1.2	0	0.1167	24	18	1	2	2.8	0	2.8	3.3%	2.8	0
7/11/1980 0:00	24	2.8	0	0.1167	24	23	1	2	2.8	0	2.8	3.3%	2.8	0
11/6/1980 0:00	24	0.6	0	0.1167	24	17	1	2	2.8	0	2.8	3.3%	2.8	0
5/25/1981 0:00	24	1.3	0	0.1167	24	20	1	4	2.8	0	2.8	3.3%	2.8	0
10/21/1984 0:00	24	1.4	0	0.1167	24	21	1	3	2.8	0	2.8	3.3%	2.8	0
5/6/1985 0:00	24	2	0	0.1167	24	22	1	2	2.8	0	2.8	3.3%	2.8	0
6/22/1985 0:00	24	1.4	0	0.1167	24	20	1	2	2.8	0	2.8	3.3%	2.8	0
8/8/1986 0:00	24	1.8	0	0.1167	24	20	1	2	2.8	0	2.8	3.3%	2.8	0
9/5/1988 0:00	24	1.5	0	0.1167	24	21	1	2	2.8	0	2.8	3.3%	2.8	0
11/13/1988 0:00	24	0.7	0	0.1167	24	15	1	3	2.8	0	2.8	3.3%	2.8	0
4/17/1989 0:00	24	1	0	0.1167	24	18	1	3	2.8	0	2.8	3.3%	2.8	0
9/23/1989 0:00	24	5.8	0	0.1167	24	22	1	1	2.8	0	2.8	3.3%	2.8	0
5/5/1990 0:00	24	1.5	0	0.1167	24	18	1	3	2.8	0	2.8	3.3%	2.8	0
8/15/1990 0:00	24	2.2	0	0.1167	24	20	1	3	2.8	0	2.8	3.3%	2.8	0
9/20/1990 0:00	24	2	0	0.1167	24	22	1	2	2.8	0	2.8	3.3%	2.8	0
7/25/1991 0:00	24	1.8	0	0.1167	24	20	1	2	2.8	0	2.8	3.3%	2.8	0
5/13/1992 0:00	24	2	0	0.1167	24	21	1	3	2.8	0	2.8	3.3%	2.8	0
8/8/1992 0:00	24	2	0	0.1167	24	21	1	3	2.8	0	2.8	3.3%	2.8	0
8/10/1992 0:00	24	1	0	0.1167	24	21	1	3	2.8	0	2.8	3.3%	2.8	0
4/28/1993 0:00	24	2.6	0	0.1167	24	22	1	3	2.8	0	2.8	3.3%	2.8	0
10/12/1993 0:00	24	1.6	0	0.1167	24	22	1	2	2.8	0	2.8	3.3%	2.8	0
6/30/1994 0:00	24	2.8	0	0.1167	24	23	1	2	2.8	0	2.8	3.3%	2.8	0
7/1/1995 0:00	24	2	0	0.1167	24	22	1	2	2.8	0	2.8	3.3%	2.8	0
7/14/1996 0:00	24	2.6	0	0.1167	24	22	1	2	2.8	0	2.8	3.3%	2.8	0
8/1/1996 0:00	24	1	0	0.1167	24	20	1	3	2.8	0	2.8	3.3%	2.8	0
5/8/1971 0:00	24	1.3	0	0.1125	24	19	1	3	2.7	0	2.7	2.9%	2.7	0
4/23/1972 0:00	24	0.8	0	0.1125	24	19	1	3	2.7	0	2.7	2.9%	2.7	0
9/20/1973 0:00	24	0.8	0	0.1125	24	18	1	3	2.7	0	2.7	2.9%	2.7	0
10/20/1973 0:00	24	1	0	0.1125	24	18	1	3	2.7	0	2.7	2.9%	2.7	0
6/2/1994 0:00	24	1.6	0	0.1125	24	20	1	2	2.7	0	2.7	2.9%	2.7	0
5/21/1997 0:00	24	0.9	0	0.1125	24	18	1	3	2.7	0	2.7	2.9%	2.7	0
7/16/1971 0:00	24	2	0	0.1083	24	21	1	2	2.6	0	2.6	0.5%	2.6	0
7/1/1973 0:00	24	1.8	0	0.1083	24	22	1	2	2.6	0	2.6	0.5%	2.6	0
6/25/1976 0:00	24	1	0	0.1083	24	19	1	1	2.6	0	2.6	0.5%	2.6	0
8/24/1977 0:00	24	1.3	0	0.1083	24	21	1	2	2.6	0	2.6	0.5%	2.6	0
6/26/1978 0:00	24	2.1	0	0.1083	24	21	1	2	2.6	0	2.6	0.5%	2.6	0
9/20/1978 0:00	24	1.6	0	0.1083	24	20	1	4	2.6	0	2.6	0.5%	2.6	0
11/14/1978 0:00	24	2.2	0	0.1083	24	21	1	1	2.6	0	2.6	0.5%	2.6	0
5/13/1979 0:00	24	0.8	0	0.1083	24	19	1	2	2.6	0	2.6	0.5%	2.6	0
3/17/1980 0:00	24	1.1	0	0.1083	24	18	1	3	2.6	0	2.6	0.5%	2.6	0
4/24/1981 0:00	24	0.6	0	0.1083	24	16	1	6	2.6	0	2.6	0.5%	2.6	0
7/1/1981 0:00	24	1.2	0	0.1083	24	20	1	2	2.6	0	2.6	0.5%	2.6	0
9/7/1981 0:00	24	2.6	0	0.1083	24	23	1	2	2.6	0	2.6	0.5%	2.6	0
10/2/1981 0:00	24	0.8	0	0.1083	24	16	1	4	2.6	0	2.6	0.5%	2.6	0
8/27/1982 0:00	24	2	0	0.1083	24	22	1	2	2.6	0	2.6	0.5%	2.6	0
9/6/1983 0:00	24	2.6	0	0.1083	24	23	1	2	2.6	0	2.6	0.5%	2.6	0
12/1/1984 0:00	24	1	0	0.1083	24	18	1	3	2.6	0	2.6	0.5%	2.6	0
6/9/1987 0:00	24	1.1	0	0.1083	24	21	1	2	2.6	0	2.6	0.5%	2.6	0
7/20/1987 0:00	24	2.6	0	0.1083	24	23	1	2	2.6	0	2.6	0.5%	2.6	0
9/19/1987 0:00	24	0.6	0	0.1083	24	17	1	3	2.6	0	2.6	0.5%	2.6	0
10/23/1987 0:00	24	1.2	0	0.1083	24	20	1	4	2.6	0	2.6	0.5%	2.6	0

Date	Duration (h)	Maximum Rainfall (mm/hr)	Minimum Rainfall (mm/hr)	Mean Rainfall (mm/hr)	Duration of Exceedances (h)	Duration of Deficits (h)	Number of Exceedances	Number of Deficits	Volume of Exceedances (mm)	Volume of Deficits (mm)	Total Rainfall (mm)	Percentile	Infiltration Amount (mm)	Bypass Amount (mm)
10/28/1987 0:00	24	0.8	0	0.1083	24	19	1	2	2.6	0	2.6	0.5%	2.6	0
9/16/1989 0:00	24	0.8	0	0.1083	24	19	1	2	2.6	0	2.6	0.5%	2.6	0
10/19/1989 0:00	24	1.6	0	0.1083	24	21	1	1	2.6	0	2.6	0.5%	2.6	0
10/12/1990 0:00	24	0.6	0	0.1083	24	17	1	2	2.6	0	2.6	0.5%	2.6	0
12/4/1990 0:00	24	1	0	0.1083	24	17	1	5	2.6	0	2.6	0.5%	2.6	0
9/27/1991 0:00	24	1.2	0	0.1083	24	20	1	2	2.6	0	2.6	0.5%	2.6	0
3/10/1992 0:00	24	0.9	0	0.1083	24	19	1	3	2.6	0	2.6	0.5%	2.6	0
4/21/1992 0:00	24	0.9	0	0.1083	24	19	1	3	2.6	0	2.6	0.5%	2.6	0
8/26/1992 0:00	24	2.4	0	0.1083	24	22	1	3	2.6	0	2.6	0.5%	2.6	0
4/24/1993 0:00	24	1.2	0	0.1083	24	20	1	1	2.6	0	2.6	0.5%	2.6	0
12/3/1993 0:00	24	1.4	0	0.1083	24	21	1	2	2.6	0	2.6	0.5%	2.6	0
10/3/1995 0:00	24	1.8	0	0.1083	24	22	1	1	2.6	0	2.6	0.5%	2.6	0
11/7/1996 0:00	24	1.3	0	0.1083	24	20	1	5	2.6	0	2.6	0.5%	2.6	0
7/13/1998 0:00	24	1.7	0	0.1083	24	20	1	3	2.6	0	2.6	0.5%	2.6	0
7/27/1998 0:00	24	2.4	0	0.1083	24	22	1	3	2.6	0	2.6	0.5%	2.6	0
9/29/1998 0:00	24	1.1	0	0.1083	24	19	1	1	2.6	0	2.6	0.5%	2.6	0
7/3/1973 0:00	24	2.5	0	0.1042	24	23	1	2	2.5	0	2.5	0.0%	2.5	0
9/27/1973 0:00	24	2	0	0.1042	24	22	1	2	2.5	0	2.5	0.0%	2.5	0
6/28/1976 0:00	24	2.5	0	0.1042	24	23	1	2	2.5	0	2.5	0.0%	2.5	0
7/8/1983 0:00	24	2.1	0	0.1042	24	22	1	2	2.5	0	2.5	0.0%	2.5	0
4/5/1991 0:00	24	0.6	0	0.1042	24	16	1	3	2.5	0	2.5	0.0%	2.5	0
8/27/1992 0:00	24	1.4	0	0.1042	24	20	1	4	2.5	0	2.5	0.0%	2.5	0
4/19/1995 0:00	24	0.9	0	0.1042	24	21	1	3	2.5	0	2.5	0.0%	2.5	0
5/29/1998 0:00	24	1.6	0	0.1042	24	20	1	3	2.5	0	2.5	0.0%	2.5	0
6/9/1999 0:00	24	1.2	0	0.1042	24	20	1	3	2.5	0	2.5	0.0%	2.5	0
												Sums:	**11856.5**	**4775.3**
												Percentages:	**71%**	**29%**

129
150
0.15
19.35 cu.m/hr
464.4 cu.m/day

0.319 ha
3190 sq.m
7.84 mm
25.0 cu.m
1.3 hours infiltration time

Appendix E EXTERNAL REPORTS

E.1 GEOTECHNICAL INVESTIGATION BY HOULE CHEVRIER ENGINEERING (MAY 2015)

Houle Chevrier Engineering

Geotechnical Investigation
Proposed Seniors' Residence
1364, 1368 and 1370 Stittsville Main Street
Ottawa, Ontario

a GEMTEC company

Houle Chevrier Engineering

DRAFT

Submitted to:

Revera Inc.
55 Standish Court, 7th Floor
Mississauga, Ontario
L5R 4B2

Geotechnical Investigation
Proposed Seniors' Residence
1364, 1368 and 1370 Stittsville Main Street
Ottawa, Ontario

May 25, 2015
Project: 15-095

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

This report presents the results of a geotechnical investigation carried out for a proposed seniors' residence at 1364, 1368 and 1370 Stittsville Main Street in the City of Ottawa, Ontario. The purpose of the investigation was to identify the general subsurface conditions at the site by means of a limited number of boreholes and, based on the factual information obtained, to provide engineering guidelines on the geotechnical design aspects of the project, including construction considerations that could influence design decisions.

The results of a Phase I Environmental Site Assessment have been provided in a separate report prepared by Houle Chevrier Engineering Ltd. for Revera Inc. As such, this report considers only the geotechnical aspects of the proposed development.

This geotechnical report was carried out in accordance with our proposal dated April 6, 2015.

2.0 PROJECT DESCRIPTION AND BACKGROUND INFORMATION

Plans are being prepared to construct a seniors' residence on a parcel of land located on the west side of Stittsville Main Street in Ottawa, Ontario (see Key Plan, Figure 1). The building will be constructed on the lands within 1364, 1368 and 1370 Stittsville Main Street.

The proposed building is to consist of a four (4) storey residential building. The building will either be connected with the existing seniors' building to the north, or may be free standing. Two options are being considered, one with a basement and one without. The structure may be serviced by new sanitary and storm sewers. A paved access roadway and parking area will be constructed as part of the development.

There are currently three (3) timber framed residential/commercial structures and one (1) detached garage on the lands. All of the lots front onto Stittsville Main Street, which is located next to the east side of the site. It is understood that the structures will be demolished as part of the development. The adjoining properties to the south and west are currently occupied by existing residential and commercial buildings.

The properties have a relatively flat topography and are at an elevation of approximately 118 to 119 metres Geodetic. Surrounding topography generally slopes gradually downwards towards Poole Creek to the southeast. The site is currently grass and tree covered.

3.0 REVIEW OF GEOLOGY MAPS

Surficial and bedrock geology maps of the Ottawa area indicate that the overburden in the vicinity of the subject properties generally consists of glacial till. The thickness of the overburden ranges from 3 to 10 metres. The bedrock is mapped as Paleozoic limestone of the Bobcaygeon formation.

Fill material associated with the current developments should also be expected across the site.

Groundwater flow often reflects topographic features and typically flows toward nearby lakes, rivers and wetland areas. Poole Creek is located to the southeast of the subject properties. It is expected that the local groundwater flow direction is to the southeast.

4.0 SUBSURFACE INVESTIGATION

The field work for this investigation was carried out on May 7 and 8, 2015. At that time, five (5) boreholes, numbered 15-1, 15-2, 15-3A, 15-3B, and 15-4, were advanced at the site using track and truck mounted drill rigs supplied and operated by George Downing Estate Drilling Ltd. from Grenville-sur-la-Rouge, Quebec. The boreholes were advanced to depths ranging from about 2.4 to 6.0 metres below ground surface. All of the boreholes were terminated on practical refusal on or within inferred bedrock. Standard penetration tests were carried out in the boreholes and samples of the soils encountered were recovered using a 50 millimetre diameter split barrel sampler. Well screens were installed in boreholes 15-3B and 15-4 to measure the groundwater levels. The field work was supervised throughout by a member of our engineering staff.

The recovered soil samples were returned to our laboratory for visual examination by the project engineer and laboratory classification testing (moisture content and grain size distribution testing). One (1) soil sample from borehole 15-4 was sent to Paracel Laboratories Ltd. for basic chemical testing related to corrosion of buried concrete and steel.

Descriptions of the subsurface conditions encountered in the boreholes are provided on the Record of Boreholes sheets in Appendix A. The locations of the boreholes are shown on Figure 2. The results of the laboratory classification testing are provided on the Record of Borehole sheets and on Figures A1 to A3. The results of the chemical testing relating to corrosion are provided in Appendix B.

The borehole locations and elevations were measured using our Trimble R8 GPS survey instrument. The elevations are referenced to Geodetic datum.

5.0 SUBSURFACE CONDITIONS

5.1 General

As previously indicated, the soil and groundwater conditions logged in the boreholes are given on the Record of Borehole sheets following the text of this report. The borehole logs indicate the subsurface conditions at the specific test locations only. Boundaries between zones on the logs are often not distinct, but rather are transitional and have been interpreted. Subsurface conditions at other than the test locations may vary from the conditions encountered in the boreholes. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties.

The soil descriptions in this report are based on commonly accepted methods of classification and identification employed in geotechnical practice. Classification and identification of soil involves judgement and Houle Chevrier Engineering Ltd. does not guarantee descriptions as exact, but infers accuracy to the extent that is common in current geotechnical practice.

The groundwater conditions described in this report refer only to those observed at the place and time of observation noted in the report. These conditions may vary seasonally or as a consequence of construction activities in the area.

The following presents an overview of the subsurface conditions encountered in the boreholes advanced during this investigation.

5.2 Topsoil Fill and Fill Material

A surficial layer of topsoil fill material was encountered in boreholes 15-1, 15-2 and 15-4. The thickness of the topsoil fill layer ranges from about 50 to 80 millimetres.

A surficial layer of crushed stone have a thickness of about 50 millimetres was encountered in borehole 13-3A and 13-3B.

Possible fill material was encountered beneath the topsoil fill and crushed stone. The depth to the base of the possible fill material ranges from about 0.2 to 1.1 metres below ground surface. As previously stated, residential/commercial structures exist on the site. As such the depth of fill material present on the site could be up to (or greater than) the depth of the existing basements.

The fill material encountered in the boreholes is variable in consistency and composition but can generally be described as brown, grey brown, and dark grey brown silty sand, silty sand and gravel, and sand.

A grain size distribution curve for a sample of the sand fill recovered from borehole 15-4 is provided in Figure A1 in Appendix A.

5.3 Sandy Silt, Silty Sand, and Sand

Deposits composed of sandy silt, silty sand, and sand were encountered below the topsoil and possible fill materials in boreholes 15-1, 15-3 and 15-4. These deposits have a thickness ranging from about 0.5 to 0.8 metres and extend to depths ranging from 0.7 to 2.3 metres below ground surface (elevation 115.7 to 118.0 metres).

Standard penetration tests carried out in these deposits gave N values ranging from of 3 to 9 blows for 0.3 metres of penetration, which reflect a very loose to loose relative density.

A grain size distribution curve for a sample of the sand is provided on Figure A2 in Appendix A. The moisture content of the sandy silt, silty sand and sand ranges from about 4 to 21 percent. A sample of the sandy silt recovered from borehole 15-4 appeared wet.

5.4 Sand and Gravel

Deposits of sand and gravel with cobbles and boulders were encountered below the possible fill materials and sandy silt, silty sand and sand deposits in all of the boreholes.

Standard penetration test carried out in the sand and gravel gave N values of 11 blows per 0.3 metres of penetration to more than 50 blows per 0.3 metres of penetration. It should be noted that the higher N values may not be representative of the in-situ density of the sand and gravel since they may have been caused by the presence of cobbles and/or boulders.

Grain size distribution curves for samples of the sand and gravel are provided on Figure A3. It should be noted that the tests were carried out on a 50 millimetre drive open samples of the sand and gravel do not reflect the presence of cobbles and boulders. The moisture content of the sand and gravel ranges from about 2 to 16 percent.

5.5 Practical Auger Refusal

Practical refusal to further advancement of the augers on/within inferred bedrock occurred at depths ranging from about 2.4 to 6.0 metres below ground surface (elevation 112.1 to 116.4 metres). It should be noted that the auger refusal can occur on cobbles/boulders and may not necessarily be representative of bedrock.

Possible weathered bedrock was encountered in borehole 15-4 at a depth of 5.8 metres below ground surface (elevation 112.7 metres).

5.6 Groundwater Levels

The groundwater levels measured in boreholes 15-3B and 15-4 were at about 2.6 and 3.9 metres below ground surface (elevation 114.6 to 114.7 metres) on May 14, 2015.

It should be noted that the groundwater level may be higher during wet periods of the year such as the early spring or fall, or following periods of precipitation. The groundwater levels may also reflect the surface water level conditions in Poole Creek.

5.7 Soil Sample Chemistry Relating to Corrosion

The results of chemical testing on a soil sample recovered from borehole 15-4 are provided in Appendix B and summarized below:

Table 5.1 – Summary of Corrosion Testing – Soil Sample

Parameter	Borehole 15-4
Chloride Content (mg/L)	-
Conductivity (microsiemens/centimetre)	-
pH	-
Sulphate Content (mg/L)	-

Please note that the chemical test results on the soil sample were not available at the time of this draft report.

6.0 GEOTECHNICAL GUIDELINES AND RECOMMENDATIONS

6.1 General

The information in the following sections is provided for the guidance of the designers and is intended for this project only. Contractors bidding on or undertaking the works should examine the factual results of the investigation, satisfy themselves as to the adequacy of the information for construction, and make their own interpretation of the factual data as it affects their construction techniques, schedule, safety and equipment capabilities.

The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at this site. The presence or implications of possible surface and/or subsurface contamination resulting from previous uses or activities of this site or adjacent properties, and/or resulting from the introduction onto the site of materials from off site sources are outside the terms of reference for this report.

6.2 Proposed Seniors' Building

6.2.1 Groundwater Constraints to Basement Construction

The site is underlain primarily by deposits of sand and gravel which have a relatively high hydraulic conductivity. If the sand and gravel deposits extend southward below Poole Creek, it is possible that the sand and gravel deposits at the site may be hydraulically connected with Poole Creek. In this case, the groundwater levels at the site may reflect the surface water level in the creek, and may be significantly higher during spring flood conditions.

Significant groundwater inflow is expected from the sand and gravel deposits into excavations that extend below the groundwater level. If the building is to have a basement, the following possible alternatives could be considered:

1) Construct the foundations above the maximum expected groundwater level to avoid possible significant groundwater flow into the foundation drainage system. For preliminary purposes, a worse case groundwater level could be taken as the 1:100 year flood level (i.e., 116.7 metres) in Poole Creek. Groundwater level monitoring is recommended if the basement option is carried forward to final design to assess long term groundwater levels, particularly during the spring thaw. Depending on the results of the monitoring, it may be possible lower the founding level without the need for waterproofing or enhanced drainage, as discussed in Alternatives 2 and 3 below.

2) Construct the basement level below the expected maximum groundwater level and provide enhanced drainage around and below the proposed building to prevent possible basement flooding. In this case, the groundwater should be discharged to a storm sewer which is capable of accommodating the expected flows. Details on the expected rate of groundwater inflow could be provided if this option is carried forward.

3) Construct the basement level below the expected maximum groundwater level and waterproof the foundations. Both the foundation walls and basement floor slab would have to be designed to resists hydrostatic pressures. Details on the geotechnical aspects of waterproofing the foundations could be provided if this option is carried forward.

4) Construct the basement level below the expected maximum groundwater level and provide standard drainage around and below the proposed building. In this case, provision should be made for possible flooding of the basement during flood level conditions in the creek. Details on this option could be provided if it is carried forward.

6.2.2 Overburden Excavation

Excavation for the proposed structure may be carried out through topsoil, fill, and native deposits of sandy silt, silty sand, sand, and sand and gravel. Any rubble, concrete, wood, etc. associated with the existing structures should be removed from the site.

The sides of the excavation should be sloped in accordance with the requirements in Ontario Regulation 213/91 under the Occupational Health and Safety Act. According to the act, the soils at this site can be classified as Type 3. Therefore, open cut excavations within the overburden deposits should be carried out with side slopes of 1 horizontal to 1 vertical, or flatter, extending from the base of the excavation.

No unusual problems are anticipated in excavating the fill material, sandy silt, silty sand, sand, and sand and gravel above the groundwater level. In contrast, excavation below the groundwater level within the sand and gravel could present significant constraints. Groundwater level lowering should be carried out in advance of construction if excavation is required below the groundwater level. Based on our experience, this could be achieved by means of a combination of wells/vacuum well points and pumping from within the excavation. The design and operation of the well/vacuum well point dewatering system should be carried out by an experienced groundwater level lowering specialist engineer.

It is noted that boulders should be expected in the sand and gravel deposits, and may require special handling and disposal.

6.2.3 Bedrock Excavation

Based on the results of the boreholes, bedrock excavation may be required along the west part of the site, depending on the proposed grades and whether or not the building has a basement.

Localized bedrock removal at this site could be carried out using (a) drill and blasting, (b) hoe ramming techniques in conjunction with line drilling on close centres or (c) a combination of both. Provided that good bedrock excavation techniques are used, the bedrock could be excavated using near vertical side walls. Any loose bedrock should be scaled from the sides of the excavation.

Any blasting should be carried out under the supervision of a blasting specialist engineer. As a guideline for blasting, the peak vibration limits suggested at the nearest structure or service are provided in Table 6.1.

Table 6.1 – Peak Vibration Limits

Frequency of Vibration (Hz)	Vibration Limits (millimetres/second)
<10	5
10 to 40	5 to 50 (interpolated)
>40	50

It is pointed out that the limits provided in Table 6.1, although conservative, were established to prevent damage to existing buildings and services that are in good condition; more stringent criteria may be required to prevent damage to freshly placed (uncured) concrete, and vibration sensitive equipment or utilities. Monitoring of the blasting should be carried out to ensure that the blasting meets the limiting vibration criteria. Pre-construction condition surveys of nearby structures and existing buried services should be carried out. The effects due to vibration from blasting can be controlled by limiting the size and amount of charge, using delayed detonation techniques, and the like. To reduce the effects of vibration on nearby services, we suggest that the separation distance between any blasting and existing underground services/structures be at least 3 metres. Any bedrock removal within these limits could be carried out using hoe ramming techniques in conjunction with line drilling on close centres, as discussed below. It is noted that the cost of bedrock removal generally increases the closer the bedrock removal is to any existing structures or services.

As an alternative to blasting, bedrock removal could be carried out using hoe ramming techniques in conjunction with line drilling on close centres. It is suggested that allowance be made for line drilling 75 to 100 millimetre diameter holes on 200 to 300 millimetre centres. The vibration effects of hoe ramming are usually minor and localized. Monitoring of the hoe ramming should be carried out, at least initially, to measure the vibrations to ensure that they are below the acceptable threshold values.

Any loose bedrock should be scaled from the sides of the excavation.

Based on our experience in this area, significant overbreak and underbreak should be expected in any bedrock removal, and the bedrock will naturally break along a bedding plane below the design depth of the excavation. As such, additional concrete will likely be required below the footings for the proposed structure.

6.2.4 Groundwater Pumping

6.2.4.1 Slab on Grade Option

For a slab on grade structure at this site, excavation for the proposed building will likely be limited to about 1.5 metres below ground surface. No unusual constraints are expected during excavation of the proposed structure. Groundwater flow into the excavation, if any, could likely be handled by pumping from sumps within the excavation.

6.2.4.2 Basement Option (Above the Maximum Expected Groundwater Level)

For a structure with a basement, the amount of groundwater pumping is not expected to exceed 50 cubic metres per day if the excavation for the foundations is kept above the groundwater level. In our opinion, an MOECC Permit to Take Water should not be required for the excavation of the foundations above the groundwater level. In contrast, an MOECC Permit to Take Water should be obtained in advance of construction if excavation for the proposed building is planned below the groundwater level. Based on our experience, we suggest that a Category 3 permit be obtained in this case. We recommend that the application for the permit be submitted well in advance of the construction, since issuance of the permit by the MOECC can take 90 days or more.

6.2.5 Foundation Bearing Pressures

The topsoil fill, fill material, backfill to the previous structures, rubble/debris associated with the previous structures, etc. are considered to be highly compressible and are not considered suitable for the support of the proposed seniors' building (i.e., foundations or rigid concrete slabs). All fill material, topsoil and former topsoil should be removed from the proposed building area. Based on the boreholes that were advanced during this ground investigation, it is considered that the proposed structure could be founded on spread footings (strip and pad foundations) bearing on or within native deposits of sandy silt, silty sand, sand, and sand and gravel.

In areas where the underside of footing level is above the level of the native soil or where subexcavation of soil is required, the grade below the proposed building could be raised with compacted granular material (engineered fill). The engineered fill should consist of granular material meeting Ontario Provincial Standard Specification (OPSS) requirements for Granular B Type II materials. Since the source of recycled material cannot be determined, it is suggested that any granular materials used beneath the proposed building be composed of virgin material only. Where wet conditions are encountered, the pad of engineered fill should be underlain by a woven geotextile meeting OPSS 1860 Class 1 requirements. The granular material should be compacted in maximum 200 millimetre thick lifts to at least 98 percent of the standard Proctor dry density value. To provide adequate spread of load below the footings, the material should extend at least 0.5 metres horizontally beyond the edge of the footings and down and out from this point at 1 horizontal to 1 vertical, or flatter.

The bearing pressures for spread footing foundations are presented in the table below:

Table 6.2 – Bearing Pressures for Spread Footing Design

Bearing Soil	Net Geotechnical Reaction at Serviceability Limit State (kilopascals)	Factored Net Geotechnical Resistance at Ultimate Limit State (kilopascals)
Sandy Silt, Silty Sand, Sand	100	200
Sand and Gravel	150	300
Bedrock	500	2000

Note: The above bearing values include the weight of the backfill material but do not include the weight of the footings.

The post construction total and differential settlement of footings at SLS should be less than 25 and 20 millimetres, respectively, provided that all loose or disturbed soil is removed from the bearing surfaces.

The foundation walls should be suitably reinforced in the areas where the foundation subgrade transitions from overburden to bedrock. The reinforcing should extend at least 3 metres in each direction from the zone of transition.

It is noted that the sand and gravel deposits contain cobbles and boulders. It is likely that the upper part of this deposit will become disturbed during excavation due to the presence of these obstructions. Where disturbance occurs, we recommend that the subgrade surface of the sand and gravel be compacted with a vibratory steel drum or diesel plate compactor under dry conditions. Where necessary, the grade could be levelled with compacted OPSS Granular A. Any grade raise fill should be compacted to at least 95 percent of the standard Proctor dry density value.

6.2.6 Frost Protection Requirements for Foundations

All exterior footings for the structure should be provided with at least 1.5 metres of earth cover for frost protection purposes. Isolated (unheated) piers that are located in areas that are to be cleared of snow should be provided with at least 1.8 metres of earth cover for frost protection purposes. The above frost protection requirements assume that the foundations are backfilled with sand or sand and gravel, as described in Section 6.3.8.

Alternatively, the required frost protection could be provided by means of a combination of earth cover and extruded polystyrene insulation. Further details regarding the insulation could be provided if necessary.

6.2.7 Seismic Design of the Proposed Structure

The native overburden deposits in the area of the proposed building are composed of deposits of sandy silt, silty sand, sand, and sand and gravel over bedrock.

Standard penetration tests carried out in the sandy silt, silty sand, sand and gravel deposits below the expected founding level range from 9 blows per 0.3 metres of penetration to over 50 blows per 75 millimetres of penetration. Based on Part 4 of the Ontario Building Code, in our opinion, Site Class C should be used for the seismic design of the proposed structure.

In our opinion there is no potential for liquefaction of the native overburden deposits at this site.

6.2.8 Foundation Wall and Pier Backfill

6.2.8.1 Slab on Grade Building Option

The fill materials and native deposits of sandy silt, silty sand and sand are frost susceptible and should not be used as backfill against foundation walls. To avoid frost adhesion and possible heaving, the foundations should be backfilled with imported, free-draining, non-frost susceptible granular material such as that meeting OPSS Granular B Type I or II requirements.

Where the backfill will ultimately support areas of hard surfacing (pavement, sidewalks or other similar surfaces), the backfill should be placed in maximum 200 millimetre thick lifts and should be compacted to at least 95 percent of the standard Proctor maximum dry density value using suitable vibratory compaction equipment. Light, walk behind compaction equipment should be used next to foundation walls to avoid excessive compaction induced stress on the foundation walls. If some settlement of the backfill is acceptable (for example, in landscaped areas), the backfill could be compacted to at least 90 percent of the standard Proctor maximum dry density value.

Where areas of hard surfacing (pavement or sidewalks, etc.) abut the proposed building, a gradual transition should be provided between those areas of hard surfacing underlain by non-frost susceptible granular wall backfill and those areas underlain by existing frost susceptible material to reduce the effects of differential frost heaving. It is suggested that granular frost tapers be constructed from 1.5 metres below finished grade to the underside of the granular subbase material for the hard surfaced areas. The frost tapers should be sloped at 1 horizontal to 1 vertical, or flatter.

Perimeter foundation drainage is not considered necessary for a slab on grade structure at this site, provided that the floor slab level is above the finished exterior ground surface level.

6.2.8.2 Basement Option (Above the Maximum Expected Groundwater Level)

The exterior of the foundation walls should be damp proofed and a perforated plastic foundation drain with a surround of clear crushed stone should be installed on the exterior of the foundation walls below the level of the basement floor slab. The drain should outlet by gravity to a sump from which the water is pumped or to a sewer.

To avoid frost adhesion and possible heaving, the foundations should be backfilled with imported, free-draining, non-frost susceptible granular material such as that meeting OPSS Granular B Type I or II requirements.

Where the backfill will ultimately support areas of hard surfacing (pavement, sidewalks or other similar surfaces), the backfill should be placed in maximum 200 millimetre thick lifts and should be compacted to at least 95 percent of the standard Proctor maximum dry density value using suitable vibratory compaction equipment. Light, walk behind compaction equipment should be used next to foundation walls to avoid excessive compaction induced stress on the foundation walls. If some settlement of the backfill is acceptable (for example, in landscaped areas), the backfill could be compacted to at least 90 percent of the standard Proctor maximum dry density value.

Where areas of hard surfacing (pavement or sidewalks, etc.) abut the proposed building, a gradual transition should be provided between those areas of hard surfacing underlain by non-frost susceptible granular wall backfill and those areas underlain by existing frost susceptible material to reduce the effects of differential frost heaving. It is suggested that granular frost tapers be constructed from 1.5 metres below finished grade to the underside of the granular subbase material for the hard surfaced areas. The frost tapers should be sloped at 1 horizontal to 1 vertical, or flatter.

Foundation walls that are backfilled with sand or sand and gravel should be designed to resist "at rest" earth pressures calculated using the following formula:

$$P_o = K_o (\gamma H + q)$$

Where,

P_o = At rest earth pressure at the bottom of the foundation wall (kilopascals)
K_o = At rest earth pressure coefficient (0.50)
γ = Unit weight of backfill material (22 kilonewtons per cubic metre)
H = Height of foundation wall (metres)
q = Uniform surcharge at ground surface behind the wall to take into account traffic, equipment, or stockpiled soil (typically 10 kilopascals)

Where conditions dictate, allowance should be made in the structural design of the foundation walls for active loads due to ground supported vehicles/equipment. For example, the horizontal

active load due to a uniform, vertical live load adjacent to the foundation wall could be determined using a horizontal earth pressure coefficient, K_o, of 0.50, times the vertical live load. The effects of other vertical loads (point loads, line loads, etc.) adjacent to or near the foundation walls could be provided, if required.

Heavy construction traffic should not be allowed to operate adjacent to the basement foundation walls for the proposed building (say within about 2 metres horizontal) during construction, without the approval of the designers.

Seismic shaking can increase the forces on the foundation walls during or following an earthquake. The increase in pressure during seismic shaking may be estimated using the method suggested by Wood (1973) for non-yielding smooth walls which are restrained against movement. The combined coefficient of static and seismic earth pressure on the back of the foundation walls can be calculated as 0.70. The static thrust component acts at H/3 and the dynamic thrust component acts at approximately 0.63H above the base of the foundation wall (where H is the height of the foundation wall).

6.2.9 Interior Slab Support

6.2.9.1 Slab on Grade Option

To prevent long term settlement of the floor slabs, all fill material, former topsoil, organic, loose, wet or deleterious material, building rubble, and concrete should be removed from below the slab on grade.

The grade within the proposed building could be raised, where necessary, with granular material meeting OPSS requirements for Granular B Type I or II. The use of Granular B Type II is preferred under wet conditions. The granular base for the proposed slab on grade should consist of at least 150 millimetres of OPSS Granular A.

OPSS documents allow recycled asphaltic concrete and concrete to be used in Granular A material. Since the source of recycled material cannot be determined, it is suggested that any granular materials used beneath the floor slab be composed of virgin material (100 percent crushed rock) for environmental reasons.

All imported granular materials placed below the proposed floor slab should be compacted in maximum 200 millimetre thick lifts to at least 95 percent of the standard Proctor maximum dry density value.

Underfloor drainage is not considered necessary provided that the floor slab level is above the finished exterior ground surface level.

Where any interior areas of the buildings will be unheated, thermal protection for the subgrade will be required where less than 1.5 metres of non-frost susceptible fill cover will exist below the floor slab. Further details on the insulation requirements could be provided, if necessary.

Proper moisture protection with a vapour retarder should be used for any slab on grade where the floor will be covered by moisture sensitive flooring material or where moisture sensitive equipment, products or environments will exist. The "Guide for Concrete Floor and Slab Construction", ACI 302.1R-04 should be considered for the design and construction of vapour retarders below the floor slab.

6.2.9.2 Basement Option (Above the Maximum Expected Groundwater Level)

To provide predictable settlement performance of the basement slab, all loose soil, fill, concrete and debris should be removed from the slab area. The base for the floor slab should consist of at least 200 millimetres of 19 millimetre clear crushed stone.

The clear crushed stone should be nominally compacted in maximum 300 millimetre thick lifts with at least 2 passes of a steel drum or diesel plate compactor.

If clear crushed stone is used below the basement floor slab, underfloor drains are not considered essential provided that the clear stone can outlet to the sump or sewer, and drains are installed to link any hydraulically isolated areas in the basement. The drains should outlet by gravity to a sump from which the water is pumped or by gravity to a sewer.

The floor slab should be wet cured to minimize shrinkage cracking and slab curling. The slab should be saw cut to about 1/3 the thickness of the slab as soon as curing of the concrete permits, in order to minimized shrinkage cracks.

Proper moisture protection with a vapour retarder should be used for any slab on grade where the floor will be covered by moisture sensitive flooring material or where moisture sensitive equipment, products or environments will exist. The "Guide for Concrete Floor and Slab Construction", ACI 302.1R-04 should be considered for the design and construction of vapour retarders below the floor slab.

6.3 Access Roadway and Parking Areas

6.3.1 Subgrade Preparation

In preparation for the construction of the access roadway and parking areas at this site, all surficial topsoil, and any loose/soft, wet, organic or deleterious materials should be removed from the proposed roadway and parking areas. This would include any rubble fill and debris associated with the previous structures.

Prior to placing granular fill for the access roadway, the exposed subgrade should be heavily proof rolled with a large (10 tonne) vibratory steel drum roller under dry conditions and

inspected and approved by geotechnical personnel. Any soft areas evident from the proof rolling should be subexcavated and replaced with suitable (dry) earth borrow.

It is not considered necessary to remove relatively clean fill material from within the access roadway and parking area provided that some future minor settlement and possible cracking of the asphaltic concrete can be tolerated. Fill material containing significant amounts of organic material, debris, rubble etc. should be excavated and replaced with suitable (dry) earth borrow. Any settlement of the asphaltic concrete paving could be corrected by padding.

Where exterior areas of hard surfacing will be constructed above the location of the demolished structures, a gradual transition should be provided between those areas underlain by non frost susceptible materials and those underlain by frost susceptible materials to reduce the effects of differential frost heaving. It is suggested that granular frost tapers be constructed from 1.5 metres below finished grade to the underside of the granular base/subbase material for the hard surfaced areas. The frost tapers should be sloped at 3 horizontal to 1 vertical.

6.3.2 Pavement Structure

The following minimum pavement structure is considered acceptable for the parking areas:

50 millimetres of Superpave 12.5 (Traffic Level A or B), over
150 milllimetres of OPSS Granular A base, over
300 millimetres of OPSS Granular B Type II subbase
(50 or 100 millimetres minus crushed stone)

For areas to be used by heavy truck traffic including fire trucks (i.e. access roads, loading bays and truck parking areas) the following pavement structure is considered acceptable:

90 millimetres of hot mix asphaltic concrete (40 millimetres of Superpave 12.5 (Traffic Level B), over 50 millimetres of Superpave 19.0 (Traffic Level B), over
150 millimetres of OPSS Granular A base, over
400 millimetres of OPSS Granular B Type II subbase
(50 or 100 millimetre minus crushed stone)

In accordance with current practice in the City of Ottawa, performance graded PG 58-34 asphaltic concrete should be specified.

The granular base and subbase materials should be compacted in maximum 300 millimetre thick lifts to at least 95 percent of the standard Proctor maximum dry density value. Care must be taken during placement and compaction of any granular materials to avoid disturbance to the subgrade soils.

6.3.3 Effects of Subgrade Disturbance and Construction Traffic

The above pavement structures assume that all trench backfill is adequately compacted, and that the roadway/parking area subgrade surface is prepared as described in this report. If the

subgrade surface becomes disturbed or wetted due to construction operations or precipitation, the Granular B Type II thickness given above may not be adequate and it may be necessary to increase the thickness of the Granular B Type II subbase and/or to incorporate a woven geotextile separator between the roadway subgrade surface and the granular subbase material. The adequacy of the design pavement thickness should be assessed by geotechnical personnel at the time of construction.

If the granular pavement materials are to be used by construction traffic, it may be necessary to increase the thickness of the Granular B Type II, install a woven geotextile separator between the roadway subgrade surface and the granular subbase material, or a combination of both, to prevent pumping and disturbance to the subbase material. The contractor should be made responsible for their construction access.

6.3.4 Pavement Drainage

Where storm sewers are used to convey surface water runoff, catch basins should be provided with minimum 3 metre long perforated stub drains which extend in at least two directions from each catch basin at the pavement subgrade level.

6.4 Site Services

6.4.1 Excavation

The excavations for the storm and sanitary sewers will be carried out through topsoil fill, fill material and native deposits of sandy silt, silty sand, sand, and sand and gravel. The sides of the excavations should be sloped in accordance with the requirements in the Ontario Occupational Health and Safety Act. According to the act, the fill material and native deposits at this site can be classified as Type 3. Therefore, for design purposes, allowance should be made for 1 horizontal to 1 vertical, or flatter, slopes in the fill material and native deposits. Alternatively, the excavations could be carried out near vertically within a tightly fitting, braced steel trench box designed specifically for this purpose.

No unusual problems are anticipated in excavating the fill material, sandy silt, silty sand, sand, and sand and gravel above the groundwater level. In contrast, excavation below the groundwater level within the sand and gravel could present significant constraints. Groundwater level lowering should be carried out in advance of construction if excavation is required below the groundwater level. Based on our experience, this could be achieved by means of a combination of wells/vacuum well points and pumping from within the excavation. The design and operation of the well/vacuum well point dewatering system should be carried out by an experienced groundwater level lowering specialist engineer.

The amount of groundwater pumping is not expected to exceed 50 cubic metres per day if the excavation for the foundations is kept above the groundwater level. In our opinion, an MOECC Permit to Take Water should not be required for the excavation of the foundations above the

groundwater level. In contrast, an MOECC Permit to Take Water should be obtained in advance of construction is excavation is planned below the groundwater level. Based on our experience, we suggest that a Category 3 permit be obtained in this case. We recommend that the application for the permit be submitted well in advance of the construction, since issuance of the permit by the MOECC can take 90 days or more.

6.4.2 Pipe Bedding

The bedding for the proposed flexible pipe services should be in accordance with Ontario Provincial Standard Drawing (OPSD) 802.010 for Type 3 Soil. The pipe bedding material should consist of at least 150 millimetres of well graded crushed stone meeting OPSS requirements for Granular A. OPSS documents allow recycled asphaltic concrete and concrete to be used in Granular A. Since the source of recycled material cannot be determined, it is suggested that any granular materials used in the service trenches be composed of virgin (i.e., not recycled) material only.

In areas where the subsoil is disturbed or where unsuitable material (such as fill, organic soil including topsoil fill, existing backfill material, building rubble/debris, etc.) exists below the pipe subgrade level, the disturbed/unsuitable material should be removed and replaced with a subbedding layer of compacted granular material, such as that meeting OPSS Granular A or Granular B Type II (50 or 100 millimetre minus crushed stone). To provide adequate support for the pipes in the long term in areas where subexcavation of material is required below design subgrade level, the excavations should be sized to allow a 1 horizontal to 2 vertical spread of granular material down and out from the bottom of the pipes. The use of clear crushed stone as a bedding or subbedding material should not be permitted.

It is noted that the sand and gravel deposits at this site can be disturbed during excavation due to the presence of cobbles and boulders. Any loosened sand and gravel should be compacted prior to placing the pipe bedding material.

Cover material, from pipe spring line to at least 300 millimetres above the top of the pipe, should consist of granular material, such as OPSS Granular A.

The subbedding, bedding and cover materials should be compacted in maximum 200 millimetre thick lifts to at least 95 percent of the standard Proctor dry density value.

6.4.3 Backfill

In areas where the service trench will be located below or in close proximity to existing or future areas of hard surfacing (pavement, sidewalk, etc.), acceptable native materials should be used as backfill between the subgrade level and the depth of seasonal frost penetration in order to reduce the potential for differential frost heaving between the area over the trench and the adjacent hard surfaced area. The depth of frost penetration in exposed areas can normally be taken as 1.8 metres below finished grade. Where native backfill is used, it should match the

native materials exposed on the trench walls. Backfill below the zone of seasonal frost penetration could consist of either acceptable native material or imported granular material conforming to OPSS Granular B Type I.

It is anticipated that most of the materials from the upper part of the excavations (with the exception of the topsoil or any debris associated with the previous structures) will be suitable for reuse as trench backfill. Any topsoil, organic soil, building rubble/debris, etc. should be wasted from the trench.

To minimize future settlement of the backfill and achieve an acceptable subgrade for the roadway, parking area, curbs, etc., the trench backfill should be compacted in maximum 300 millimetre thick lifts to at least 95 percent of the standard Proctor maximum dry density. The specified density may be reduced to 90 percent of the standard Proctor dry density in areas where the trench backfill is not located below or in close proximity to existing or future roadways, parking areas, sidewalks, etc. and provided that some settlement above the trench is acceptable.

The sandy silt and silty sand deposits have water contents that are too high for adequate compaction. Furthermore, depending on the weather conditions at the time of construction, some wetting of materials could occur. As such, the specified densities may not be possible to achieve and, as a consequence, some settlement for these backfill materials should be expected. Consideration could be given to implementing one or a combination of the following measures to reduce post construction settlement above the trenches, depending on the weather conditions encountered during the construction:

- Allow the overburden materials to dry prior to compaction;
- Reuse any wet materials in the lower part of the trenches and make provision to defer final placement of the final lift of the asphaltic concrete for 3 months, or longer, to allow some of the trench backfill settlement to occur and thereby improve the final pavement appearance.

6.4.4 Seepage Barriers

Seepage barriers should be installed along the sewer service trenches just inside the property line if the sewers are constructed below the groundwater level. The seepage barriers should begin at subgrade level and extend vertically through the granular pipe bedding and granular surround to within the native backfill materials, and horizontally across the full width of the service trench excavation. The seepage barriers could consist of 1.5 metre wide dykes of compacted weathered silty clay. The weathered silty clay should be compacted in maximum 300 millimetre thick lifts to at least 95 percent of the standard Proctor dry density value.

6.5 Additional Considerations

6.5.1 Corrosion of Buried Concrete and Steel

The measured sulphate concentration in the soil sample from borehole 15-4 is ___ milligrams per litre. According to Canadian Standards Associated (CSA) "Concrete Materials and Methods of Concrete Construction", the concentration of sulphate in the groundwater can be classified as ___. For ___ exposure conditions, ___ cement (formerly Type ___ cement) should be used in any concrete that will be in contact with the native soil.

Based in the conductivity and pH of the soil sample, the soil can be classified as ____ towards unprotected steel. It is noted that the corrosivity of the soil and the groundwater could vary throughout the year due to the application of sodium chloride for de-icing.

6.5.2 Vibration Effects

Some of the construction operations (such as granular material compaction, excavation, foundation construction etc.) will cause ground vibrations on and off of the site. The vibrations will attenuate with distance from the source, but may be felt at nearby structures.

It is recommended that vibration monitoring be carried out to measure the vibrations during any excavation, bedrock removal, and compaction of earth and granular fill material to check that they are below the acceptable threshold values that are provided in Section 6.2.3 of this report. It is noted that the vibration intensities required to cause damage to structures and services are much greater than the vibration intensities that can be felt by building occupants. Therefore, it is important that preconstruction surveys be carried out on the adjacent residences/structures as a precautionary measure in the event of possible claims for damages due to the construction.

6.5.3 Well Decommissioning

Standpipes were installed in boreholes 15-3B and 15-4 to measure groundwater levels. At the time of construction, the well screens should be decommissioned by a licensed well driller in accordance with provincial guidelines.

6.5.4 Winter Construction

Some of the soils at this site are highly frost susceptible and are prone to significant ice lensing. In order to carry out the work during freezing temperatures and maintain adequate performance the trench backfill as a access roadway and parking area subgrade, the service trenches should be opened for as short a time as practicable and the excavations should be carried out only in lengths which allow all of the construction operations, including backfilling, to be fully completed in one working day. The materials on the sides of the trenches should not be allowed to freeze. In addition, the backfill should be excavated, stored and replaced without being disturbed by frost or contaminated by snow or ice.

The native soil below the footings should be protected immediately from freezing using straw, propane heaters and insulated tarpaulins, or other suitable means.

6.5.5 Disposal of Excess Soil

It is noted that the professional services retained for this project include only the geotechnical aspects of the subsurface conditions at this site. The presence or implications of possible surface and/or subsurface contamination, including naturally occurring sources of contamination, are outside the terms of reference for this report. This report does not constitute a contaminated material management plan or an excess soil management plan.

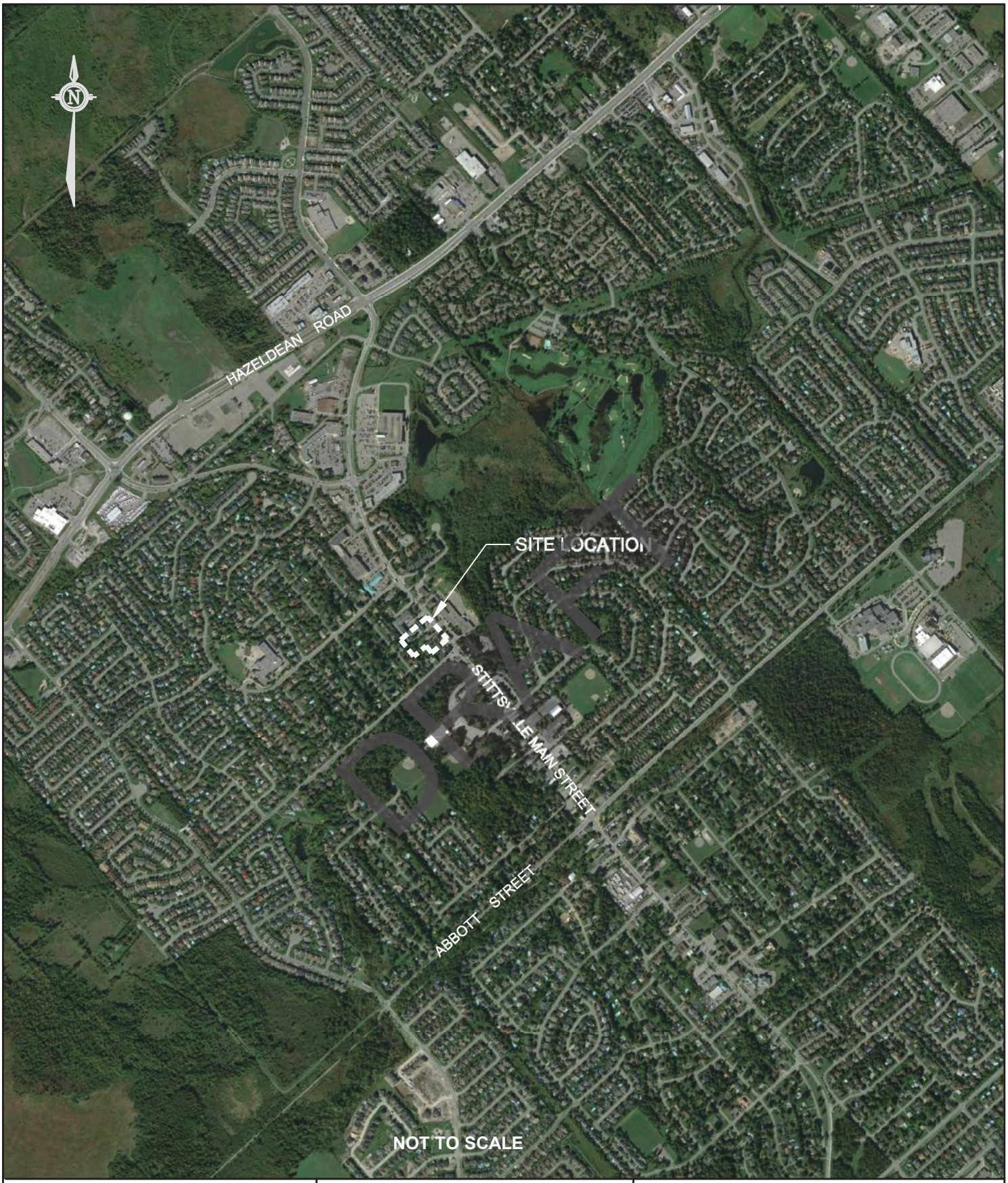
6.5.6 Design and Construction Review

The details for the proposed construction were not available to us at the time of preparation of this report. It is recommended that the design drawings be reviewed by the geotechnical engineer as the design progresses to ensure that the guidelines provided in this report have been interpreted as intended.

The engagement of the services of Houle Chevrier Engineering Ltd. during construction is recommended to confirm that the subsurface conditions throughout the proposed excavations do not materially differ from those given in the report and that the construction activities do not adversely affect the intent of the design. The subgrade surfaces for the building, site services and roadways should be inspected by Houle Chevrier Engineering Ltd. to ensure that suitable materials have been reached and properly prepared. The proof rolling should be observed throughout by geotechnical personnel. The placing and compaction of earth fill and imported granular materials should be inspected by geotechnical personnel to ensure that the materials used conform to the grading and compaction specifications.

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report, please do not hesitate to contact our office.

Andrew Chevrier, M.Eng.,P.Eng.
Senior Geotechnical Engineer



Houle Chevrier Engineering

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Project			Drawing		
GEOTECHNICAL INVESTIGATION 1364, 1368 & 1370 STITTSVILLE MAIN STREET STITTSVILLE, ONTARIO			KEY PLAN		
Drwn By	Chkd By	Date	Project No.	Revision No.	**FIGURE 1**
D.J.R.	A.C.	MAY 2015	15-095	0	

LEGEND

BH 15-1 / 118.71 — BOREHOLE LOCATION IN PLAN (current investigation by Houle Chevrier Engineering Ltd.); ELEVATION IN METRES GEODETIC DATUM

Scale 1:1000

0 20 40 60m

Houle Chevrier Engineering

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Client	Revera Inc.	Project	15-095
Location	1364, 1368 AND 1370 STITTSVILLE MAIN ST., OTTAWA, ON		
Drwn by: P.C.	Chkd by: A.C.	BOREHOLE LOCATION PLAN	
Date: MAY 2015	Rev.: 0	FIGURE 2	

APPENDIX A

Record of Borehole Sheets
and Figures A1 to A3

LIST OF ABBREVIATIONS AND TERMINOLOGY

SAMPLE TYPES

AS auger sample
CS chunk sample
DO drive open
MS manual sample
RC rock core
ST slotted tube
TO thin-walled open Shelby tube
TP thin-walled piston Shelby tube
WS wash sample

PENETRATION RESISTANCE

Standard Penetration Resistance, N

The number of blows by a 63.5 kg hammer dropped 760 millimetre required to drive a 50 mm drive open sampler for a distance of 300 mm. For split spoon samples where less than 300 mm of penetration was achieved, the number of blows is reported over the sampler penetration in mm.

Dynamic Penetration Resistance

The number of blows by a 63.5 kg hammer dropped 760 mm to drive a 50 mm diameter, 60° cone attached to 'A' size drill rods for a distance of 300 mm.

WH

Sampler advanced by static weight of hammer and drill rods.

WR

Sampler advanced by static weight of drill rods.

PH

Sampler advanced by hydraulic pressure from drill rig.

PM

Sampler advanced by manual pressure.

SOIL TESTS

C consolidation test
H hydrometer analysis
M sieve analysis
MH sieve and hydrometer analysis
U unconfined compression test
Q undrained triaxial test
V field vane, undisturbed and remoulded shear strength

SOIL DESCRIPTIONS

Relative Density	'N' Value
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	over 50

Consistency	Undrained Shear Strength (kPa)
Very soft	0 to 12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very Stiff	over 100

LIST OF COMMON SYMBOLS

c_u undrained shear strength
e void ratio
C_c compression index
c_v coefficient of consolidation
k coefficient of permeability
I_p plasticity index
n porosity
u pore pressure
w moisture content
w_L liquid limit
w_P plastic limit
ϕ^1 effective angle of friction
γ unit weight of soil
γ^1 unit weight of submerged soil
σ normal stress

BEDROCK DESCRIPTION TERMINOLOGY

STATE OF WEATHERING

Fresh: no visible sign of weathering.
Faintly weathered: weathering limited to the surfaces of major discontinuities.
Slightly weathered: penetrative weathering developed on open discontinuity surfaces but only slight weathering of rock material.
Moderately weathered: weathering extends throughout the rock mass, but the rock material is not friable.
Highly weathered: weathering extends throughout the rock mass and the rock material is partly friable.
Completely weathered: rock is wholly decomposed and in a friable condition but the rock texture and structure are preserved.

BEDDING THICKNESS

Description	Bedding Plane Spacing
Very thickly bedded	> 2 m
Thickly bedded	0.6 m to 2 m
Medium bedded	0.2 m to 0.6 m
Thinly bedded	60 mm to 0.2 m
Very thinly bedded	20 mm to 60 mm
Laminated	6 mm to 20 mm
Thinly laminated	< 6 mm

CORE CONDITION

Total Core Recovery (TCR): The percentage of solid drill core recovered regardless of quality or length, measured relative to the length of the total core run.

Solid Core Recovery (SCR): The percentage of solid drill core, regardless of length, recovered at full diameter, measured relative to the length of the total core run.

Rock Quality Designation (RQD): The percentage of solid drill core, greater than 100 mm in length, recovered at full diameter, measured relative to the length of the total core run. RQD varies from 0% for completely broken core to 100% for core in solid sticks.

PROJECT: 15-095

RECORD OF BOREHOLE 15-1

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: May 7 2015

SPT HAMMER: 63.5 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80) nat. V - + Q - ● rem. V - ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-5} 10^{-4} 10^{-3} 10^{-2}) / WATER CONTENT, PERCENT (Wp W Wl, 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		118.71							
		Dark brown sandy TOPSOIL FILL		118.63							
		Dark brown silty sand, some gravel (Possible FILL)		0.08							
				0.18	1	50 D.O.	4				
		Loose, grey brown, fine to medium SAND, some silt and gravel									
				118.02							
1		Compact, grey brown SAND and GRAVEL, trace to some silt, some fine to medium grained SAND layers		0.69	2	50 D.O.	23		○	Sieve (See Fig.A3)	
					3	50 D.O.	29		○		
2					4	50 D.O.	>50 for 75 mm		○		Backfilled borehole with soil cuttings
				116.35							
		Borehole terminated due to practical auger refusal on inferred bedrock		2.36							
3											
4											
5											
6											
7											
8											

DEPTH SCALE

1 to 40

Houle Chevrier Engineering

LOGGED: M.L.

CHECKED:

PROJECT: 15-095

RECORD OF BOREHOLE 15-2

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: May 8 2015

SPT HAMMER: 63.5 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80) nat. V - + Q -● rem. V - ⊕ U -○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-5} 10^{-4} 10^{-3} 10^{-2}) / WATER CONTENT, PERCENT (Wp W WI; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		117.87							
		TOPSOIL FILL		0.04							
		Loose, dark grey brown silty sand and gravel (Possible FILL)			1	50 D.O.	5				
				117.27							
1	Power Auger 200 mm Diameter Hollow Stem	Compact to very dense, grey brown SAND and GRAVEL, trace to some silt with cobbles and boulders		0.60	2	50 D.O.	13				
2					3	50 D.O.	48			Sieve (See Fig.A3)	
					4	50 D.O.	72				
3					5	50 D.O.	>50 for 75 mm				
				114.64							
		Borehole terminated due to practical auger refusal on inferred bedrock		3.23							Backfilled borehole with soil cuttings
4											
5											
6											
7											
8											

DEPTH SCALE

1 to 40

Houle Chevrier Engineering

LOGGED: M.L.

CHECKED:

PROJECT: 15-095

RECORD OF BOREHOLE 15-3A

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: May 8 2015

SPT HAMMER: 63.5 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80) nat. V - + Q -● rem. V - ⊕ U -○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-5} 10^{-4} 10^{-3} 10^{-2}) / WATER CONTENT, PERCENT (Wp W WI; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		117.24							
		Grey crushed stone (FILL)		0.05							
		Very loose, brown and dark grey brown silty sand, trace silt (Possible FILL)			1	50 D.O.	6				
1				116.28							
		Very loose, grey brown SILTY SAND, trace roots		0.96	2	50 D.O.	3				
				115.72							
		Compact to very dense, SAND and GRAVEL, trace to some silt, with cobbles and boulders		1.52	3	50 D.O.	>50 for 100 mm			Sieve (See Fig A3)	
2					4	50 D.O.	>50 for 0 mm				
3					5	50 D.O.	50				
4					6	50 D.O.	11				
					7	50 D.O.	> 50 for 100 mm				
5		Borehole terminated due to practical auger refusal on inferred bedrock		112.06 5.18							Backfilled borehole with soil cuttings
6											
7											
8											

DEPTH SCALE

1 to 40

Houle Chevrier Engineering

LOGGED: M.L.

CHECKED:

BOREHOLE LOG GINT LOGS MAY 7-8 2015.GPJ HOULE CHEVRIER 2015.GDT 25/5/15

PROJECT: 15-095

RECORD OF BOREHOLE 15-3B

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: May 8 2015

SPT HAMMER: 63.5 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80) nat. V - + rem. V - ⊕ Q - ● U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-5} 10^{-4} 10^{-3} 10^{-2}) / WATER CONTENT, PERCENT (Wp W Wl, 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		117.24							
		Soil stratigraphy not logged, see BH15-3A									
4				113.28 3.96							

Bentonite seal

Filter sand

51 mm diameter, 1.5 metres long well screen

Groundwater level at 2.58m below ground surface (elevation 114.66m) on May 14, 2015

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
15/05/14	2.58 ▽	114.66

DEPTH SCALE

1 to 40

Houle Chevrier Engineering

LOGGED: M.L.

CHECKED:

BOREHOLE LOG GINT LOGS MAY 7-8 2015.GPJ HOULE CHEVRIER 2015.GDT 25/5/15

PROJECT: 15-095

RECORD OF BOREHOLE 15-4

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: May 7 2015

SPT HAMMER: 63.5 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat. V - +, rem. V - ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-5} 10^{-4} 10^{-3} 10^{-2}) / WATER CONTENT, PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		118.50							
		TOPSOIL FILL		0.05							
		Very loose to loose, brown and dark grey brown sand, some silt, trace gravel (Possible FILL)			1	50 D.O.	4			Sieve (See Fig. A1)	Bentonite seal
1				117.43							
		Very loose, brown fine to coarse grained SAND, trace silt		1.07	2	50 D.O.	3			Sieve (See Fig. A2)	Backfilled with soil cuttings
				116.98							
2		Loose, grey brown SANDY SILT, some sand seams (Wet)		1.52	3	50 D.O.	9				
				116.21							
		Compact to very dense, grey brown SAND and GRAVEL, trace to some silt with cobbles and boulders		2.29	4	50 D.O.	>50 for 125 mm				
3					5	50 D.O.	55				Bentonite seal
											Filter sand
4					6	50 D.O.	>50 for 125 mm				
											51 mm diameter, 1.5 metres long well screen
5					7	50 D.O.	18				
					8	50 D.O.	>50 for 100 mm				
		Probable weathered BEDROCK		112.71 5.79							
6		Borehole terminated due to practical auger refusal on inferred bedrock		112.50 6.00							Groundwater level at 3.91m below ground surface (elevation 114.59m) on May 14, 2015
7											
8											

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
15/05/14	3.91 ▽	114.59

DEPTH SCALE

1 to 40

Houle Chevrier Engineering

LOGGED: M.L.

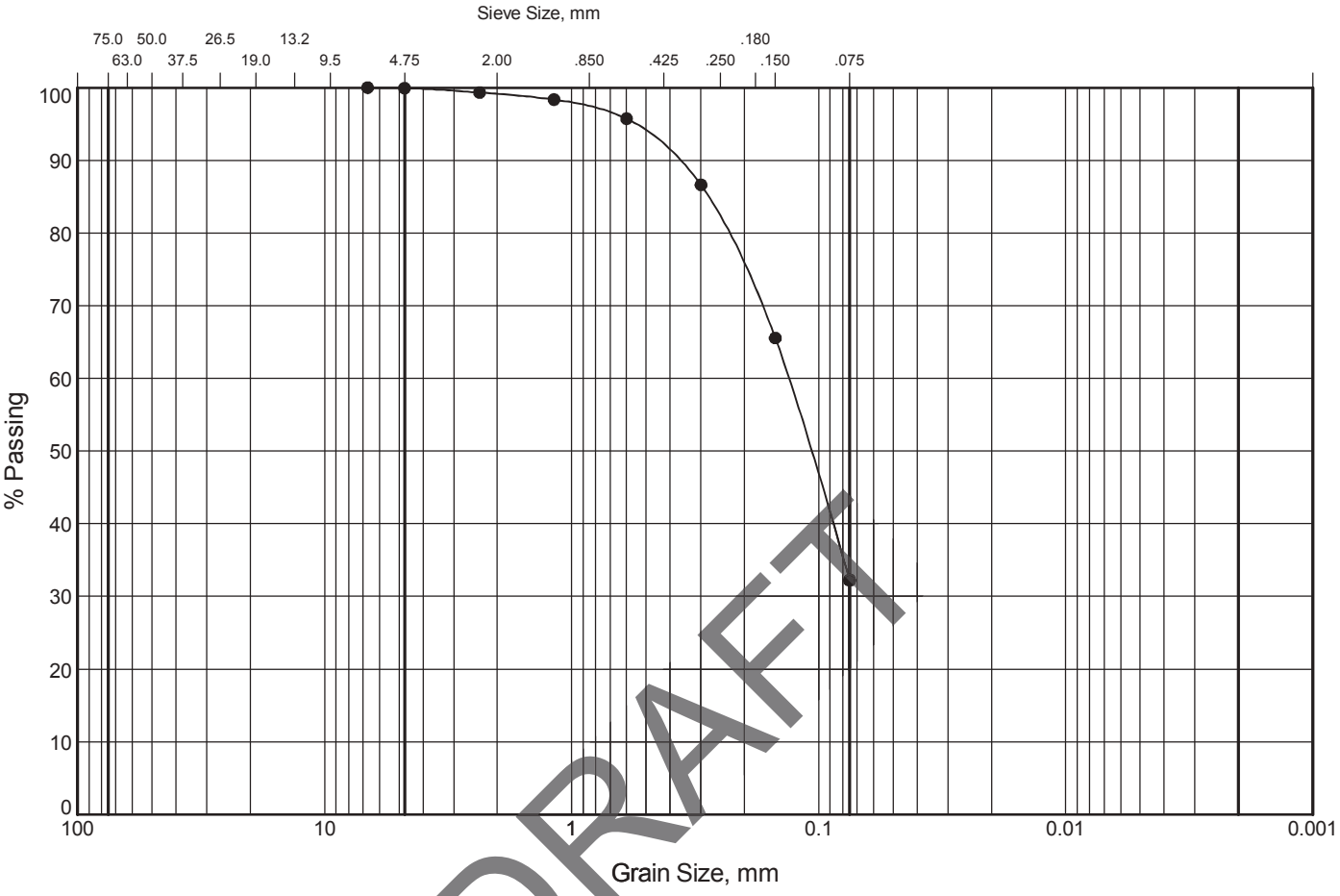
CHECKED:

BOREHOLE LOG GINT LOGS MAY 7-8 2015.GPJ HOULE CHEVRIER 2015.GDT 25/5/15

GRAIN SIZE DISTRIBUTION

FILL MATERIAL

FIGURE A1



COBBLES	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
	GRAVEL		SAND			

Legend	Borehole	Sample	Depth (m)	% Gravel	% Sand	% Silt & Clay
●	15-4	2A	0.8 - 1.1	0	68	32

Houle Chevrier Engineering

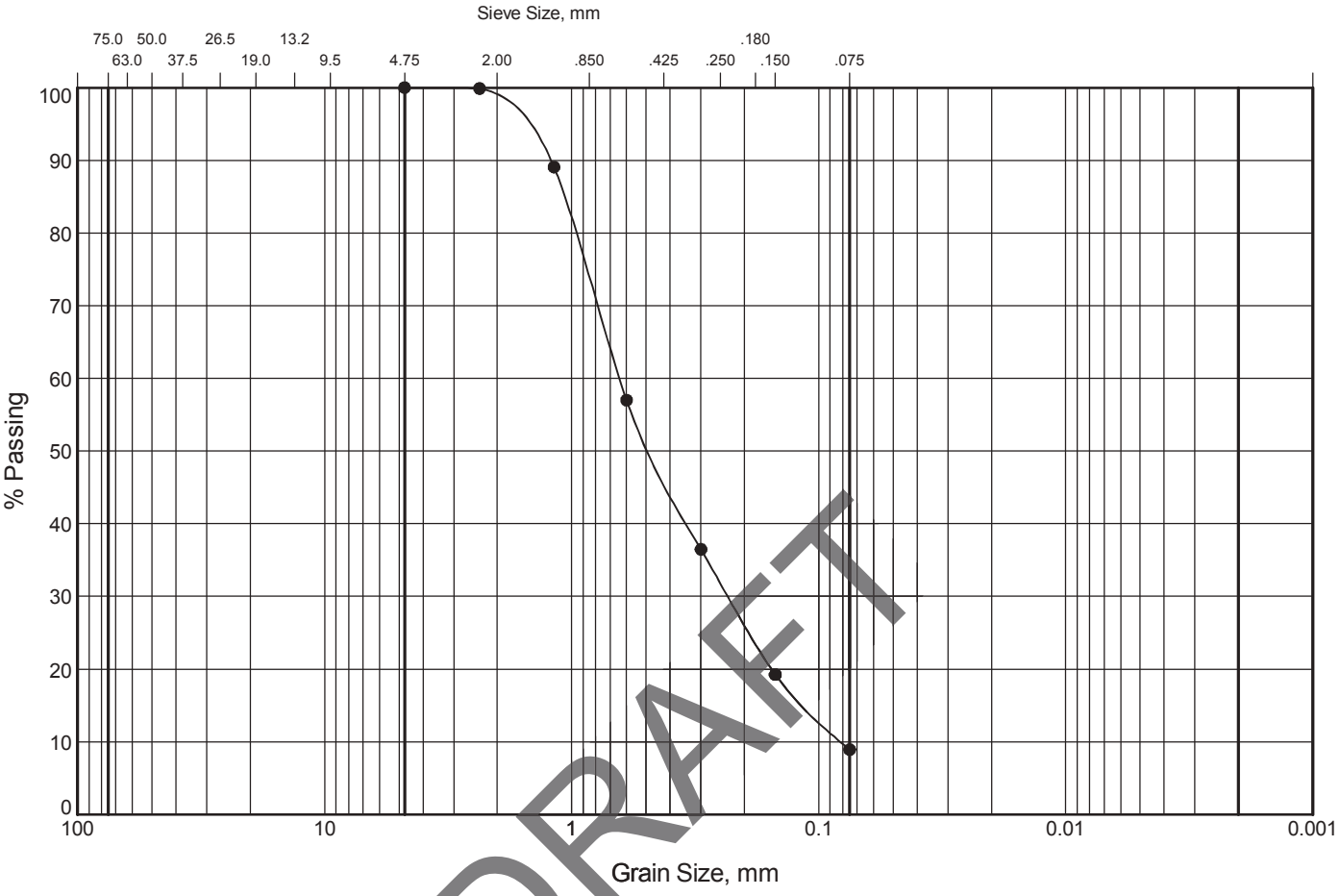
Date: May 2015

Project: 15-095

GRAIN SIZE DISTRIBUTION

SAND

FIGURE A2



COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Legend	Borehole	Sample	Depth (m)	% Gravel	% Sand	% Silt & Clay
●	15-4	2B	1.1 - 1.4	0	91	9

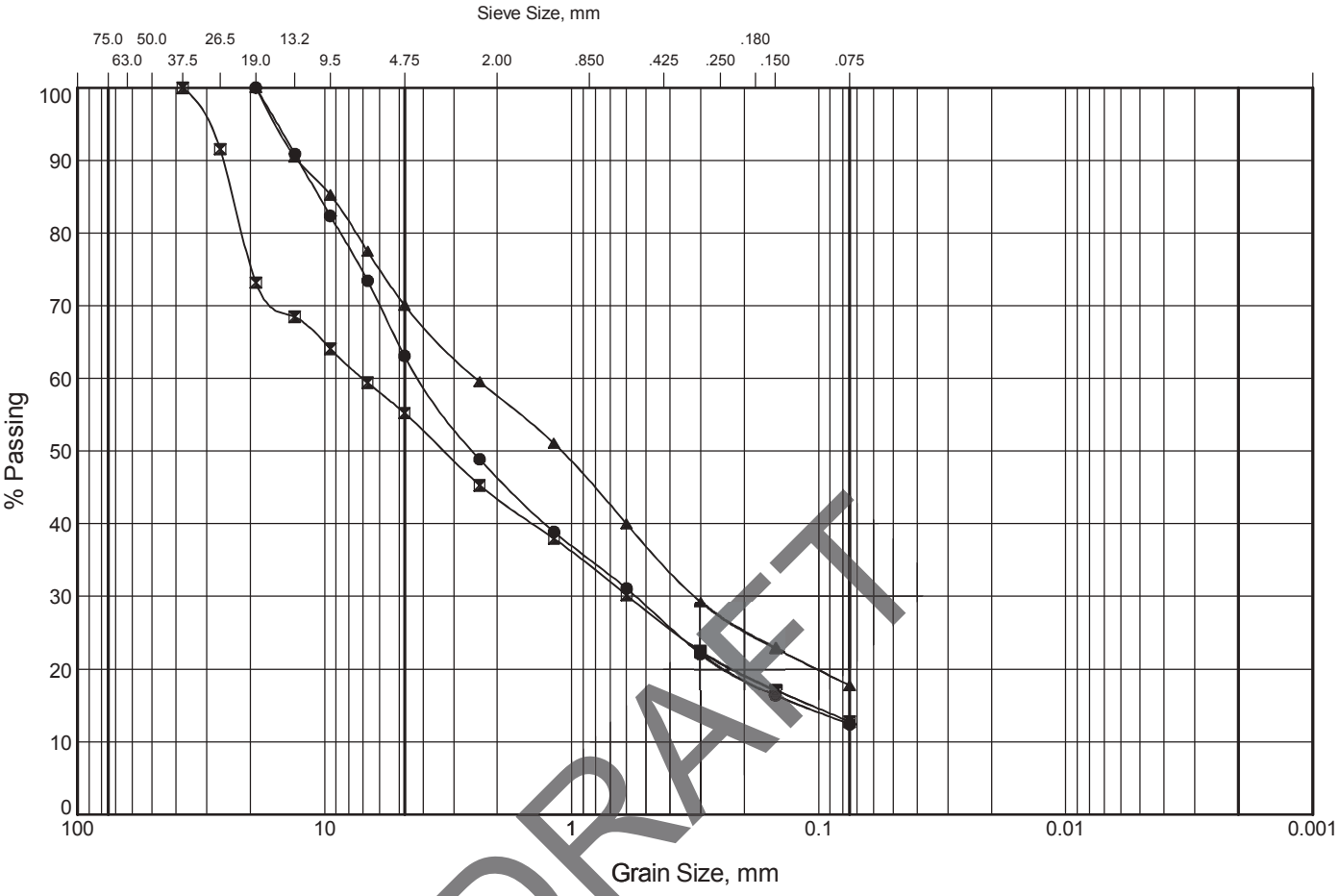
Houle Chevrier Engineering

Date: May 2015

Project: 15-095

GRAIN SIZE DISTRIBUTION
SAND AND GRAVEL

FIGURE A3



COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Legend	Borehole	Sample	Depth (m)	% Gravel	% Sand	% Silt & Clay
●	15-1	2	0.8 - 1.4	37	51	12
⊠	15-2	3	1.5 - 2.1	45	42	13
▲	15-3A	3	1.5 - 2.1	30	52	18

Houle Chevrier Engineering

Date: May 2015

Project: 15-095

APPENDIX B

Chemical Analysis of Soil Sampling Relating to Corrosion of Buried Steel and Concrete

geotechnical

environmental

hydrogeology

materials testing & inspection

E.2 SUBSURFACE INVESTIGATION REPORT BY YURI MENDEZ (APRIL 2022)

Subsurface Investigation Report

1364, 1368 and 1370 Stittsville Main St., Ottawa, ON, K2S 1V4

Abstract

This report presents the findings of a Subsurface Investigation completed at the 1364, 1368 and 1370 Stittsville Main St. parcels, in the City of Ottawa, ON and issue recommendations for a proposed 4 storey apartment building development. It provides technical information about the subsurface conditions at 6 borehole locations compiled from field sampling and testing. All boreholes were advanced to auger refusals suggesting bedrock depths increasing from the back of the property at 2 m depth to the front at roughly 6 m. The majority of the soil profile consists on dense well graded sand and gravel. The water table was found at approximately 3 m depth. The borehole locations are shown in figure 1 in page 9. The information reviewed also includes boreholes by others, readily available geologic information from the Geological Survey of Canada (GSC) and local climate data from Environment Canada.

Yuri Mendez M. Eng., P. Eng.

Report number: 53-BSI-R3[1]
October 18, 2022

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Engineering

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[1]For the account of Bayview Stittsville Inc. (BSI) as per proposal in email dated February 24, 2022 and subject to the user agreement in page 17 .

Report 53-BSI-R3
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Contents

Report 53-BSI-R3
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1 Introduction

This document reports the findings of a subsurface investigation completed at 1364, 1368 and 1370 Stittsville Main St., in the City of Ottawa, ON, K2S 1V4, having extents and geometry shown in figure 1 in page 9. The geotechnical materials in Ottawa and the surrounding areas are largely influenced by a history of glaciation, glacio-fluvial activity and the Champlain Sea. Common overburden materials include clay, very sensitive silty clay, till, boulder till, clean sand and silty sand overlying sedimentary rocks. Igneous and metamorphic rocks are also present. Organic materials have also influenced numerous soil deposits.

The investigation was carried out by advancing 6 boreholes through overburden soils and by proving bedrock depth by available exploration techniques for engineering purposes. The information compiled from the exploration and sampling and testing completed in the boreholes and a subsequent laboratory testing program of soils is to assist in the design and construction of a proposed 4 storey apartment building development. The information reviewed also includes boreholes by others, readily available geologic information from the Geological Survey of Canada (GSC), and local climate data from Environment Canada.

2 Report Organization

The body of this report and its appendices constitute the entire report. The discussion presented under sections in the body may refer to further information and/or background and/or details in the appendices. The reader is responsible of reviewing the information in the appendices. Other references may be presented as footnotes.

Future revisions to this report will be referred to as "53-BSI-R#", where # is the consecutive number of the revision. Additions and/or alterations and/or inclusions to the information provided in this report at the request of any institution and/or body with authority to request the additions and/or alterations and/or inclusion will be provided in a separate "Response to " (RT) section at the end of the report, before the appendices. The RT section shall state the section that is added and/or altered, the name of the person making the request and the reason. The section altered and or portions added will be provided in full as a subsection of the RT section. Any subsection added under the RT section will be considered a replacement to the original section.

Part I
Investigation

3 Sampling and Testing

The field and laboratory program set out in our proposal is guided by the following standards:

- ASTM D 420-98 Standard Guide to Site Characterization for Engineering Design and Construction Purposes,
- ASTM D5434 - 12 Standard Guide for Field Logging of Subsurface Explorations of Soil and Rock,
- ASTM D1586 - 11 Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils,

The ASTM D1586 tests were completed using an "auto safety" hammer rated at 60% energy.

The field program consisted in sampling the subsurface profile using boreholes located as shown in fig. 1 in page 9 along with field review, assessments and classification of samples.

The program also included an elevation survey referenced to the top of MH-S located in front of 1364 Stittsville Main St. which is understood to have a 118.14 m geodetic elevation. The program included in addition a laboratory review of samples recovered from the field.

The laboratory testing, soil sampling and field testing at each location are shown in the soil profile testing and sampling logs (BH) in the appendices.

Part II
Findings

4 Physical Settings, Strata and Topography

The site is presently relatively flat grass and topsoil covered area within a city block in Ottawa. It consists on the 1364, 1368 and 1370 Stittsville Main St. parcels in the City of Ottawa, ON. Figure 1 in page 9 shows a plan view of the site displaying the approximate test hole locations, elevations and depth.

Auger refusals suggest that the site is underlain by bedrock at depths varying between 2 and 6 m from the back of the property to the front respectively. The overburden materials were found to consistently consist on dense to very dense brown well graded sand and gravel throughout the site. A relatively thin near surface brown fine silty sand fill layer was also found at a few locations.

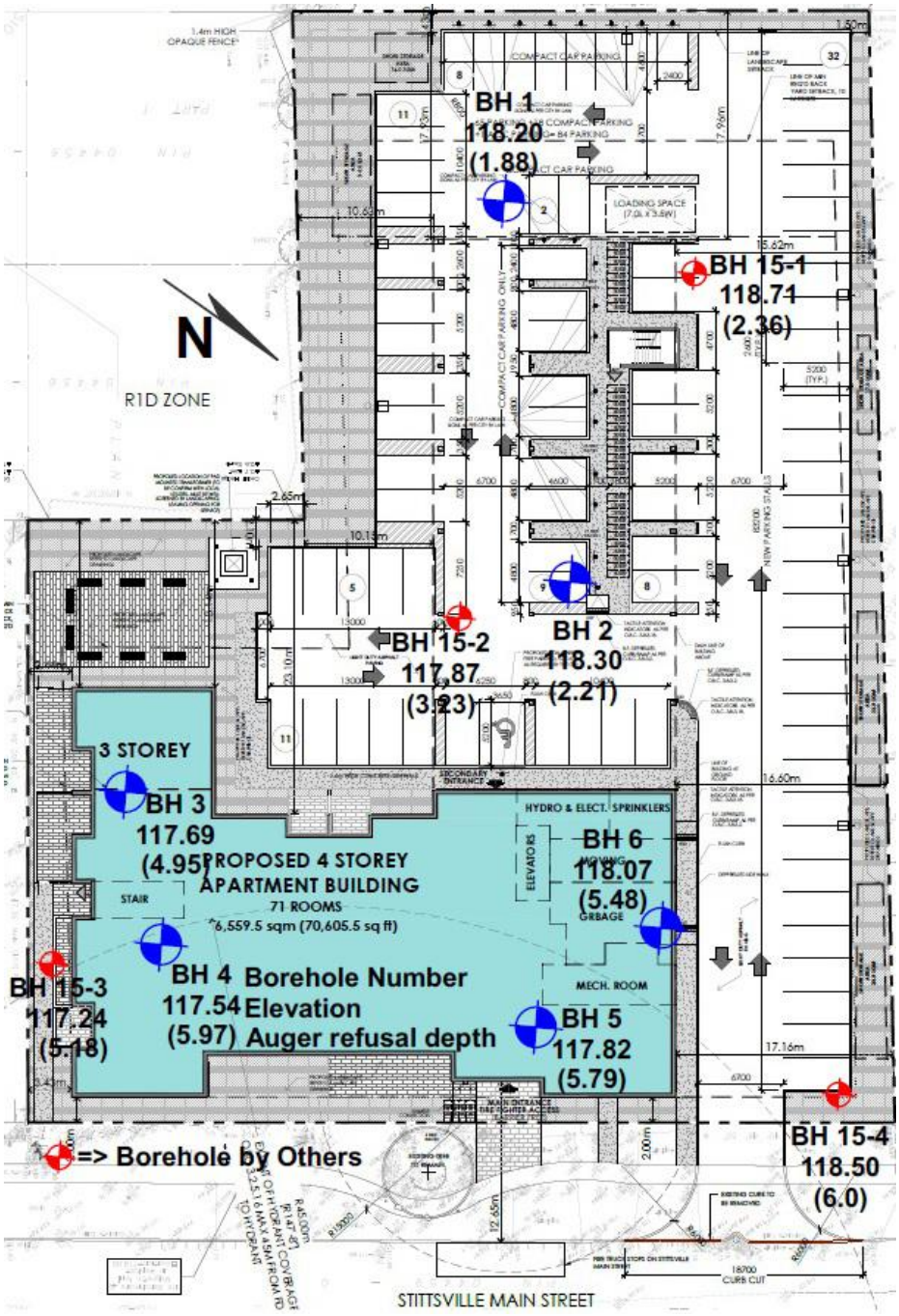

Figure 1: Test hole Locations Plan

The geology data base by Belanger J. R. 1998 suggests 3 to 10 m of overburden soils underlain by interbeddeded limestone and dolomite bedrock at this site.

4.1 Groundwater and Moisture

The water level was measured on April 02, 2022 in stand pipes installed in BH4 and BH6 at 2.65 and 3.2 m depth respectively and shown in the borehole logs. Two additional measurements were completed on October 10, 2022 in the same boreholes at 2.8 and 3.4 m depth respectively, Ground water measurements in stand pipe installations often require numerous assessments in combination with borehole data.

Field observations of soils as extracted in the field in the sampler, the measurements completed, coloration and stiffness suggest that the permanent water is at approximately 114.79 m elevation. Moisture contents vary above the ground water table.

4.2 Freezing Index, Frost Depth and Frost Susceptibility

It is generally assumed that the frost depth for the 1,000 degree Celsius-days freezing index applicable to Ottawa will reach no deeper than 1.8 m on bare ground (snow free) or pavement. It is also assumed that frost depth will reach no deeper than 1.5 m on snow covered ground.

Materials here classified as dense brown well graded sand and gravel are not frost susceptible.

Part III
Recommendations

The following set of the recommendations result from sampling and testing outlined in section 3 and from geotechnical engineering evaluation and assessments.

It is understood that the proposed development will consist of a 4 storey apartment building with an at grade slab and no basement.

5 Foundations General

Generally speaking, code compliant Part 9 and Part 4 residential buildings founded on spread footings can be considered for the proposed 4 storey apartment building.

5.1 Load and Resistance Factors

For the purpose of computations related to the service (SLS) and strength limits (ULS) note:

- A resistance factor is applied to the computed or estimated (nominal) bearing resistance from field or lab tests to obtain the strength limit for factored loads (ULS). The value of the resistance factor is stated for each option.
- An average load factor of 1.5 is assumed to compute the service limit (SLS).

5.2 Bearing Capacity of Strip and/or Pad Footings

Based on the findings of this investigation and geotechnical assessments, the following bearing capacity can be used *for strip footings up to 1.5 m wide and pad footings up to 3 m wide placed on undisturbed native dense brown well graded sand and gravel soils encountered in the testholes*:

- 300 kPa at service limit (SLS).
- 450 kPa for factored loads (ULS).

5.3 Settlements

For the footing loads provided in section 5.2 building settlements for foundations on undisturbed very stiff silty clay are not to exceed service limit values (SLS) of 25 mm and 20 mm total and differential settlements respectively at this site.

5.4 Foundation Wall Damproofing and Drainage

Foundation walls damproofing and foundation drainage are not required for foundations serving buildings of slab on grade construction not having floor levels lower than the finished grade on the perimeter.

Elevatior shafts often require drainage along their exterior perimeter. Appendix E.1 presents page 2 of NRC Construction Evaluation Reports CCMC 12658-R showing damproofing and foundation wall drainage system details satisfying the provisions under OBC 2012 and suitable for drainage along the perimeter of elevator shafts. Other available similar systems having the components shown in CCMC 12658-R may be used. Foundation drainage must be provided to daylight or a positive outlet, or sump.

6 Site Class for Seismic Design

At this site, the geotechnical testing completed are indicative of a Vs(30) exceeding 360 m/s. As such, site class C is assigned under the provisions in section 4.1.8.4 of the Ontario Building Code 2012 (OBC 2012) for seismic design.

7 Roadbed Soils and Pavement Structure

The flexible pavement structures supplied in this report follow the guidelines set out in AASHTO 1993 Guide for Design of Pavement Structures (AASHTO) for climatic Region III. Under AASHTO pavements are designed to withstand 20 year accumulated design Equivalent Single Axle 80 kN (18,000 pounds) load applications (ESALs). ESALs are a measure of mix traffic loads including vehicle loads and truck loads. The number of ESALs applications depend on traffic class and use.

Roadbed denotes the materials beneath pavement structures. The term pavement is used to denote the layered structure that forms a road carriageway or vehicle parking. *The general quality of the near surface undisturbed soil to serve as foundation for pavement structure (Roadbed soil) are assumed to be fair* as defined in the AASHTO guide. It is hence recommended to refer to the following information in appendix D:

- *Yuri Mendez Engineering's pavement catalog in appendix D.1 to select pavement structures* for traffic classes on the fair roadbed soils encountered at this site.
- Appendix D.2 for guidelines regarding frost heave.
- Appendix D.3 for frost protection recommendations for manholes and catch basin construction.

8 Excavations, Open Cuts, Trenches and Safety

Typically, the main concern when excavating soils or rock is the stability of the sides of excavations. The stability of the sides is achieved by either cutting the sides to safe slopes or by providing shoring. It is also an issue of safety because of imminent hazards to the safety of workers and to property. As such, excavations are governed by the provisions in the Occupational Health and Safety Act of Ontario (O. Reg. 213/91). The application of O. Reg. 213/91 requires a classification of soils in one or several of four types (type I to type IV).

At this site for soils can be considered type II under O. Reg. 213/91. As such, the following key aspects of O. Reg. 213/91 are applicable to excavations:

- Safe open cut is 1 vertical to 1 horizontal.
- Within 1.2 m of the bottom of open cut areas or trenches, the soil can be cut vertical.

Where the safe open cut is not provided, either the shoring systems described in O. Reg. 213/91 or engineered shoring systems need be used. Information regarding physical and mechanical properties of subsurface materials which will be required for shoring design are provided in this report.

8.1 Conditions Requiring Engineered Shoring

O. Reg. 213/91 describe the conditions in which engineered shoring systems are required. Some key aspects of O.Reg. 213/91 regarding the conditions in which an engineered shoring system is required are:

- Where soils are type I to III and the prescribed safe open cuts are not provided and
  - The excavation is not a trench or
  - The excavation is a trench either deeper than 6 m or wider than 3.6 m or both
- For trench excavations or open cut, where soils are type IV and the safe open cuts are not provided.

Note that along with the descriptions in O. Reg. 213/91 for soils type IV, any difficult soil having significant seepage and/or strength loss upon excavation such as caving soils can be rendered as type IV.

Note also that since excavation and safety are usually in control of the contractor, *shoring design and construction is done by the contractor.*

9 Reinstatement of Excavated Soils

Soils consisting of brown clean sand and/or brown dense well graded sand and gravel encountered at this site could be reinstated and compacted provided:

- Materials are sort out to ensure that only the brown clean sand and/or brown dense well graded sand and gravel is stock piled for re-use;
- Develop Proctor moisture density curves for compaction;
- Where the latter requirement is not completed the expected proctor density could also be estimated;
- the recommendations in appendix F are followed;
- Use accepted placement procedures, standards and passes of equipment.

To the extent they are needed, suitable material from the excavations that are not frozen can be used in the construction of required permanent earthfill.

10 Underground Corrosion

For the resistivity, PH and soluble ions concentrations found at this site and shown in the Paracel Laboratories certificate of analysis in appendix C.1, the soils are mildly corrosive. Resistivity, PH and soluble ions testing was completed

in a representative sample at 2.6 m depth in BH 1. After Romanoff (1957)[2], the following corrosion rates can be used:

1. For carbon steel:
    - 16 μm/year for the first 2 years,
    - 12 μm/year, thereafter.
2. For galvanized metal:
    - 4.6 μm/year for the first 2 years,
    - 3.2 μm/year until depletion of zinc,
    - 12 μm/year for carbon steel.

11 Potential of Sulphate Attack to Concrete

For the sulphate content less than 0.1% in soil encountered at this site, there are no restrictions to the cement type which can be used for underground structures. This refers to restrictions associated with sulphate attack only.

12 Stripping, Excavation to Undisturbed Soils and rock, Earth and Rock Fill Placement. Asphalt Placement and Compaction

Appendix F presents recommended geotechnical specifications and guidelines for stripping, earth excavation to undisturbed surfaces, earth and rock fill placement, asphalt placement, compacted lifts thicknesses for equipment type and compaction for different placements.

12.1 Winter Construction

In situ undisturbed materials consisting of brown clean sand and/or brown dense well graded sand and gravel encountered at this site are not sensitive to freezing temperatures. Construction during winter is still a challenging task due to the presence of frost, snow and ice. Snow and ice should be cleared from any geotechnical material present at this site prior to any backfill or placement of any structure. Concrete placement on frozen soils is not acceptable.

[2]Romanoff's work for the U. S. National Bureau of Standards is authoritative in underground corrosion

13 Responses to Comments from the City of Ottawa

This section provides information to amend this report in response to comments made under City of Ottawa (C of O) file No.: D07-12-22-0059 "Site Plan Control Application 1364-1370 Stittsville Main Street - 1st Review" dated June 14, 2022 and also in response to review comments from the 2nd submission of the Site Plan Application circulated August 8, 2022

13.1 Replacement to Section 1 Introduction

This document reports the findings of a subsurface investigation completed at 1364, 1368 and 1370 Stittsville Main St., in the City of Ottawa, ON, K2S 1V4, having extents and geometry shown in figure 1 in page 9. The geotechnical materials in Ottawa and the surrounding areas are largely influenced by a history of glaciation, glacio-fluvial activity and the Champlain Sea. Common overburden materials include clay, very sensitive silty clay, till, boulder till, clean sand and silty sand overlying sedimentary rocks. Igneous and metamorphic rocks are also present. Organic materials have also influenced numerous soil deposits.

The investigation was carried out by advancing 6 boreholes through overburden soils and by proving bedrock depth by available exploration techniques for engineering purposes. The information compiled from the exploration and sampling and testing completed in the boreholes and a subsequent laboratory testing program of soils is to assist in the design and construction of a proposed 4 storey apartment building development. The information reviewed also includes boreholes and laboratory tests by others, readily available geologic information from the Geological Survey of Canada (GSC), and local climate data from Environment Canada.

13.2 Replacement to Section 13.2 Sampling and Testing

The field and laboratory program set out in our proposal is guided by the following standards:

- ASTM D 420-98 Standard Guide to Site Characterization for Engineering Design and Construction Purposes,
- ASTM D5434 - 12 Standard Guide for Field Logging of Subsurface Explorations of Soil and Rock,
- ASTM D1586 - 11 Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils,

The ASTM D1586 tests were completed using an "auto safety" hammer rated at 60% energy.

The field program consisted in sampling the subsurface profile using boreholes located as shown in fig. 1 in page 9 along with field review, assessments and classification of samples.

The program also included an elevation survey referenced to the top of MH-S located in front of 1364 Stittsville Main St. which is understood to have a 118.14 m geodetic elevation. The program included in addition a laboratory review of samples recovered from the field and one sample submitted to a local laboratory to investigate soluble ions concentration, PH and resistivity.

The soil sampling and field testing at each location are shown in the soil profile testing and sampling logs (BH) in the appendices.

13.3 Inclusion of section "Water Inflow Within Excavations and Water Takings"

Water inflow within excavations in soils is influenced by the depth of excavations relative to the water table and flow behavior of water in soils as controlled by the permeability of soils. Due to the proposed founding depth and in view of the assessments under section 4.1 and information seen in the borehole logs, water inflow is expected to be low and controllable by pumping from open sumps. Service trenches deeper than about 3.4 may require short term pumping from well points to prevent caving.

13.3.1 Water Takings and Permits

Water takings from the environment, including groundwater in excavations, are regulated under Ontario Water Resources Act, R.S.O. 1990, c. O.40. (OWRA). The OWRA is enforced by the Ministry of Environment (MOE). Under the OWRA. a Permit to Take Water (PTTW) is required for pumping from excavations exceeding 400 cubic meters per day. Along with the consideration of ground water from excavations, PTTW applications require in addition the consideration of precipitation. The excavations at this site are subject to OWRA and this section is intended to provide criteria indicative of whether a PTTW may be required or not.

Given the size (area) of the proposed excavations, precipitation data in Ottawa and the soil conditions assessed under section 4.1 pumping from excavations is not expected to exceed the threshold of 400 cubic meters per day so that *the requirement of a PTTW may not apply to the proposed development.*

Metered outlets must be maintained and recorded as proof for confirmation in case that OWRA requires it. Note that PTTWs are issued after months of the first filing of documents.

13.4 Inclusion of section "Rates of Infiltration, Percolation and Permeability"

Values of permeability, infiltration and percolation which could be associated[3] to the native well graded sand encountered at this site are the following:

[3]MMAH Supplementary Standard SB-6 and approximate relationship between the permeability and infiltration rate

- Permeability of 1×10^{-2} cms/sec
- Percolation of 4 min/cm
- Infiltration of 25 cm/hr

13.5 Replacement to Section 11 "Potential of Sulphate Attack to Concrete"

Based on the Parcels Laboratory Results in Appendix C of this report, the sulphate content is 0.0019% which is below the 0.1% requirement threshold. Therefore there are no restrictions to the cement type which can be used for underground structures.

This refers to restrictions associated with sulphate attack only.

Disclaimer

Bayview Stittsville Inc. BSI and other professionals understand that soils and groundwater information in this report has been collected in boreholes guided by standards and practice guidelines generally accepted for engineering characterization of ground conditions in Ontario and in no case borehole data and their interpretation warrant understanding of conditions away from the borehole locations. BSI accepts that as development will have spread away from the boreholes other designers will need the best opinion from the geotechnical consultant based on the findings of the investigation so that any statements which could be implicitly or explicitly depart from the conditions at borehole may be given to fulfill this need in good faith as best available opinion with the information available at the time without any warranties.

User Agreement

Acknowledgment of Duties

In this 53-BSI-R3 report, Yuri Mendez Engineering (YME) has pursued to fulfill every aspect of the obligations of professional engineers. As a part of those duties, from field work, operations, testing, analyses, application of knowledge and report, YME has ensured that it meats a high standard of Geotechnical engineering practice and care in the province of Ontario. Obligations under R.R.O. 1990, Reg. 941: Professional Engineers Act, R.S.O. 1990, c. P.28, further referred to as Reg. 941 which are of immediate interest to this service are:

"77. 7. A practitioner shall,

i. act towards other practitioners with courtesy and good faith,

ii. not accept an engagement to review the work of another practitioner for the same employer except with the knowledge of the other practitioner or except where the connection of the other practitioner with the work has been terminated,

iii. not maliciously injure the reputation or business of another practitioner,

8. A practitioner shall maintain the honour and integrity of the practitioners profession and without fear or favour expose before the proper tribunals unprofessional, dishonest or unethical conduct by any other practitioner."

Communications

53-BSI-R3 is to be used solely in connection with the 4 storey apartment building by Bayview Stittsville Inc. (BSI) and thus subject of communications amongst other professionals (OP), government bodies and authorities, and BSI for that purpose. YME demands great care in precluding damage to the integrity of this professional work which may arise from careless communications from engineers of Canada. OP and BSI acknowledge understanding that where any such communication occur in connection with this report, they are bound by this agreement as an extension to the standard of care embodied in R.R.O. 1990, Reg. 941 and thus accept that any correspondence from OP or the public seen to add any bad connotations to the breadth, depth, typesetting, typography, formal semantics and scope of this report or otherwise diminish the breadth of services and knowledge delivered in this report which in any way raise concerns or insecurities to the qualities and/or the *reasonable completeness* delivered to BSI in this report will be forwarded to YME.

Reasonable Completeness

OP and Bayview Stittsville Inc. acknowledge understanding that said care and said standard has been applied equality to the reasonable completeness of this report relative to the information available from the field program and acknowledge understanding that is neither feasible nor possible to convey geotechnical information in this report that would cover for every possible consideration by OP and/or BSI and that upon issuance it will be subject to reviews which may trigger the need to add information which at the discretion of YME will be added when considered within the practice obligations under Reg. 941. The geotechnical information here provided is thus envisioned as to cover for the scope and breadth of design figures and assessments generally foreseeable as needed by other designers at the time of issuance and which could be amended as needed within the context of services provided by other designers. YME agrees to issue revised versions of this 53-BSI-R3 report by adding R# to each revision where # is the number of the revision. OP covenant to conduct all communications in connection with these reviews following great care to preclude the suggestion of a breach to the reasonable completeness acknowledged herein. Written communications which may trigger reviews under this agreement will be acknowledged as requests for "review under the 53-BSI-R3 report user agreement". This reasonable completeness is also relative to the scope of services generally accepted in geotechnical engineering work in Ontario

Errors

Where errors are found during reviews under the 53-BSI-R3 report user agreement, OP covenant great care in communications to preclude the suggestion of a breach to the duties acknowledge herein which could induce damages to YME. Communications triggered by errors or any such communication which would render the person doing the request in a position of technical authority above the author implies an unauthorized review and constitute a serious breach of the code of ethics under Reg. 941 and damages to YME and so subject to disciplinary measures and/or liability for damages to YME. BSI is thus acquainted that correction of errors will be made and acknowledged by YME as they may arise in any professional work but in no way OP will purport or render such corrections as omissions departing away from the correction of errors set forth in this agreement. Where communications in connection with the correction of errors process set forth in this agreement raise concerns or insecurities to the qualities and/or the reasonable completeness delivered to BSI in this report occur, BSI covenants to inform YME. BSI is acquainted that such corrections are part of the natural processes associated with the applied sciences nature of this report and so typified explicitly in this agreement to protect YME from inappropriate manipulation of those processes by OP and others.

Part IV
Appendices
A Borehole Logs

Report 53-BSI-R3
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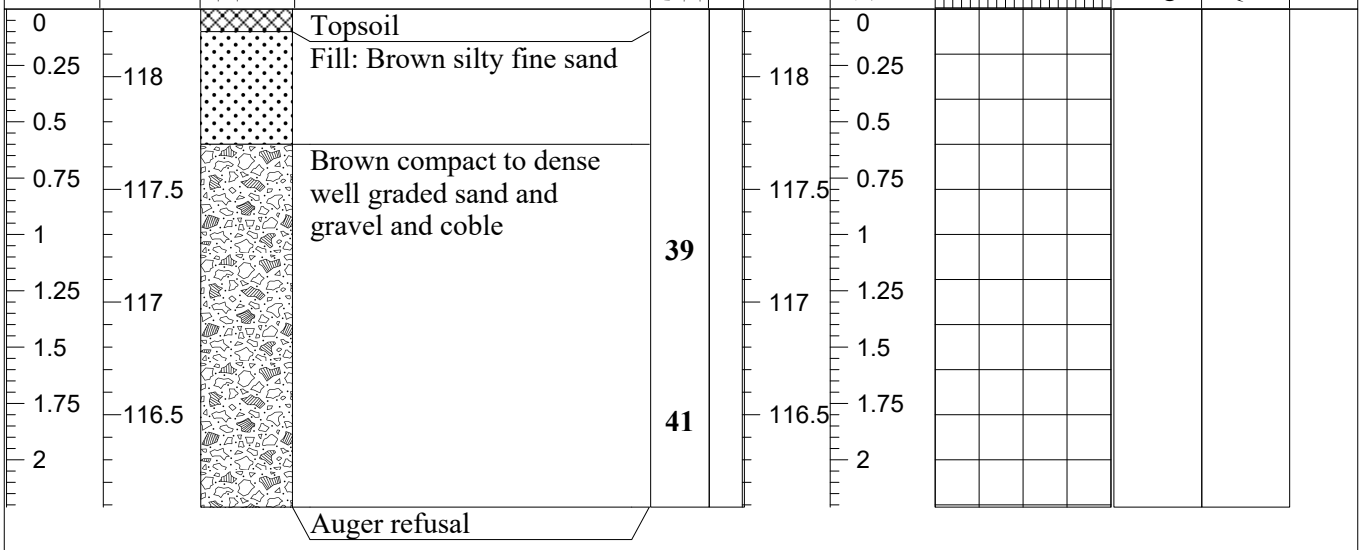
Project: **Proposed 4 Storey Building**		YME Yuri Mendez Engineering.
Location: **1364 to 1370 Stittsville Main St.**	Client: **Bayview Stittsville Inc.**	**Test Hole No.: BH1 of 6**
Job No.: **53-BSI**	Test Hole Type: **8" OD Auger.**	Date: **March 28, 2022**
"7" OD Auger."	SPT Hammer Type: **Safety auto hammer**	Logged By: **Yuri Mendez**

Depth (m)	Elevation (m) 118.2	Lithology and color	Material Description	Samples or Blows/Ft	Water	Elevation (m) 118.2	Depth (m)	Shear Strength (kPa)	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Rock Quality RQD %	Laboratory Tests: Other Lab Tests
0			Topsoil				0				
0.25			Fill: Brown silty fine sand				0.25				
0.5	117.8					117.8	0.5				
0.75							0.75				
1	117.3			3		117.3	1				
1.25			Brown compact to dense well graded sand and gravel and coble				1.25				
1.5	116.8					116.8	1.5				
1.75				16			1.75				
			Auger refusal								

S = Sample for lab review and moisture content

▼ Measured water level

Project: **Proposed 4 Storey Building**		YME Yuri Mendez Engineering.
Location: **1364 to 1370 Stittsville Main St.**	Client: **Bayview Stittsville Inc.**	**Test Hole No.: BH2 of 6**
Job No.: **53-BSI**	Test Hole Type: **8" OD Auger.**	Date: **March 28, 2022**
"7" OD Auger."	SPT Hammer Type: **Safety auto hammer**	Logged By: **Yuri Mendez**



S = Sample for lab review and moisture content

▼ Measured water level

Project: **Proposed 4 Storey Building**		YME Yuri Mendez Engineering.
Location: **1364 to 1370 Stittsville Main St.**	Client: **Bayview Stittsville Inc.**	**Test Hole No.: BH3 of 6**
Job No.: **53-BSI**	Test Hole Type: **8" OD Auger.**	Date: **March 28, 2022**
"7" OD Auger."	SPT Hammer Type: **Safety auto hammer**	Logged By: **Yuri Mendez**

Depth (m)	Elevation (m) 117.69	Lithology and color	Material Description	Samples or Blows/Ft	Water	Elevation (m) 117.69	Depth (m)	Shear Strength (kPa)	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Rock Quality RQD %	Laboratory Tests: Other Lab Tests
0			Topsoil				0				
0.25	117.4		Fill: Brown silty sand with trace clay			117.4	0.25				
0.5							0.5				
0.75	116.9		Brown silty fine sand			116.9	0.75				
1				5			1				
1.25	116.4					116.4	1.25				
1.5							1.5				
1.75	115.9		Brown compact to dense well graded sand and gravel and coble	27		115.9	1.75				
2							2				
2.25	115.4					115.4	2.25				
2.5				52			2.5				
2.75	114.9					114.9	2.75				
3			As above. Water table in borehole at approximately 3 m depth.				3				
3.25	114.4			10		114.4	3.25				
3.5							3.5				
3.75	113.9					113.9	3.75				
4				22			4				
4.25	113.4					113.4	4.25				
4.5							4.5				
4.75	112.9			36		112.9	4.75				
			Auger refusal								

S = Sample for lab review and moisture content

▼ Measured water level

Project: **Proposed 4 Storey Building**		YME Yuri Mendez Engineering.
Location: **1364 to 1370 Stittsville Main St.**	Client: **Bayview Stittsville Inc.**	**Test Hole No.: BH4 of 6**
Job No.: **53-BSI**	Test Hole Type: **8" OD Auger.**	Date: **March 28, 2022**
"7" OD Auger."	SPT Hammer Type: **Safety auto hammer**	Logged By: **Yuri Mendez**

Depth (m)	Elevation (m) 117.54	Lithology and color	Material Description	Samples or Blows/Ft	Water	Elevation (m) 117.54	Depth (m)	Shear Strength (kPa)	Laboratory Tests: Moisture Content (%)	Rock Quality RQD %	Other Lab Tests
0			Topsoil				0				
0.25	117.2		Fill: Brown silty sand with trace clay			117.2	0.25				
0.5							0.5				
0.75	116.7		Fill: Brown silty fine sand			116.7	0.75				
1				1			1				
1.25	116.2		Brown compact to dense well graded sand and gravel and coble			116.2	1.25				
1.5							1.5				
1.75	115.7			33		115.7	1.75				
2							2				
2.25	115.2					115.2	2.25				
2.5				33	▼		2.5				
2.75	114.7					114.7	2.75				
3			As above. Water table in borehole at approximately 3 m depth.				3				
3.25	114.2			37		114.2	3.25				
3.5							3.5				
3.75	113.7					113.7	3.75				
4				11			4				
4.25	113.2					113.2	4.25				
4.5							4.5				
4.75	112.7			39		112.7	4.75				
5							5				
5.25	112.2					112.2	5.25				
5.5							5.5				
5.75	111.7					111.7	5.75				
			Auger refusal								

S = Sample for lab review and moisture content

▼ Measured water level

Project: **Proposed 4 Storey Building**		YME Yuri Mendez Engineering.
Location: **1364 to 1370 Stittsville Main St.**	Client: **Bayview Stittsville Inc.**	**Test Hole No.: BH5 of 6**
Job No.: **53-BSI**	Test Hole Type: **8" OD Auger.**	Date: **March 28, 2022**
"7" OD Auger."	SPT Hammer Type: **Safety auto hammer**	Logged By: **Yuri Mendez**

Depth (m)	Elevation (m) 117.82	Lithology and color	Material Description	Samples or Blows/Ft	Water	Elevation (m) 117.82	Depth (m)	Shear Strength (kPa)	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Rock Quality RQD %	Laboratory Tests: Other Lab Tests
0			Topsoil				0				
0.25	117.5		Fill: Brown silty fine sand			117.5	0.25				
0.5							0.5				
0.75	117					117	0.75				
1				5			1				
1.25	116.5		Brown compact to dense well graded sand and gravel and coble			116.5	1.25				
1.5							1.5				
1.75	116			64		116	1.75				
2							2				
2.25	115.5					115.5	2.25				
2.5				42			2.5				
2.75	115					115	2.75				
3			As above. Water table in borehole at approximately 3 m depth.				3				
3.25	114.5			16		114.5	3.25				
3.5							3.5				
3.75	114					114	3.75				
4				8			4				
4.25	113.5					113.5	4.25				
4.5							4.5				
4.75	113			29		113	4.75				
5							5				
5.25	112.5					112.5	5.25				
5.5				73			5.5				
5.75			Auger refusal				5.75				

S = Sample for lab review and moisture content

▼ Measured water level

Project: **Proposed 4 Storey Building**		YME Yuri Mendez Engineering.
Location: **1364 to 1370 Stittsville Main St.**	Client: **Bayview Stittsville Inc.**	**Test Hole No.: BH6 of 6**
Job No.: **53-BSI**	Test Hole Type:	Date: **March 28, 2022**
"7" OD Auger."	SPT Hammer Type: **Safety auto hammer**	Logged By: **Yuri Mendez**

Depth (m)	Elevation (m) 118.07	Lithology and color	Material Description	Samples or Blows/Ft	Water	Elevation (m) 118.07	Depth (m)	Shear Strength (kPa)	Laboratory Tests: Moisture Content (%)	Rock Quality RQD %	Other Lab Tests
0	118		Topsoil			117.9	0				
0.25			Fill: Brown silty sand with trace clay				0.25				
0.5	117.5					117.4	0.5				
0.75			Fill: Brown silty fine sand				0.75				
1	117			5		116.9	1				
1.25							1.25				
1.5	116.5		Brown compact to dense well graded sand and gravel and coble			116.4	1.5				
1.75				47			1.75				
2	116					115.9	2				
2.25							2.25				
2.5	115.5			51		115.4	2.5				
2.75							2.75				
3	115		As above. Water table in borehole at approximately 3 m depth.		▼	114.9	3				
3.25				19			3.25				
3.5	114.5					114.4	3.5				
3.75							3.75				
4	114			78		113.9	4				
4.25							4.25				
4.5	113.5					113.4	4.5				
4.75				58			4.75				
5	113					112.9	5				
5.25							5.25				
5.5	112.5		Auger refusal			112.4	5.5				
5.75							5.75				

S = Sample for lab review and moisture content

▼ Measured water level

PROJECT: 15-095

RECORD OF BOREHOLE 15-1

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: May 7 2015

SPT HAMMER: 63.5 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat. V +, rem. V ⊕; Q ●, U ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-5} 10^{-4} 10^{-3} 10^{-2}); WATER CONTENT, PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		118.71							
		Dark brown sandy TOPSOIL FILL		118.63							
		Dark brown silty sand, some gravel (Possible FILL)		0.08							
				0.18	1	50 D.O.	4				
		Loose, grey brown, fine to medium SAND, some silt and gravel									
				118.02							
1		Compact, grey brown SAND and GRAVEL, trace to some silt, some fine to medium grained SAND layers		0.69	2	50 D.O.	23		○	Sieve (See Fig.A3)	
					3	50 D.O.	29		○		
2											
				116.35	4	50 D.O.	>50 for 75 mm		○		
		Borehole terminated due to practical auger refusal on inferred bedrock		2.36							Backfilled borehole with soil cuttings
3											
4											
5											
6											
7											
8											

DEPTH SCALE

1 to 40

Houle Chevrier Engineering

LOGGED: M.L.

CHECKED:

RECORD OF BOREHOLE 15-2

PROJECT: 15-095

LOCATION: See Borehole Location Plan, Figure 2

BORING DATE: May 8 2015

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.5 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat. V + Q●, rem. V ⊕ U○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-5} 10^{-4} 10^{-3} 10^{-2}) / WATER CONTENT, PERCENT (Wp W Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		117.87							
		TOPSOIL FILL		0.04							
		Loose, dark grey brown silty sand and gravel (Possible FILL)			1	50 D.O.	5				
				117.27							
1		Compact to very dense, grey brown SAND and GRAVEL, trace to some silt with cobbles and boulders		0.60	2	50 D.O.	13				
					3	50 D.O.	48			Sieve (See Fig.A3)	
2					4	50 D.O.	72				
3					5	50 D.O.	>50 for 75 mm				Backfilled borehole with soil cuttings
		Borehole terminated due to practical auger refusal on inferred bedrock		114.64 3.23							
4											
5											
6											
7											
8											

DEPTH SCALE

1 to 40

Houle Chevrier Engineering

LOGGED: M.L.

CHECKED:

PROJECT: 15-095

RECORD OF BOREHOLE 15-3A

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: May 8 2015

SPT HAMMER: 63.5 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat. V +, rem. V ⊕, Q ●, U ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-5} 10^{-4} 10^{-3} 10^{-2}) / WATER CONTENT, PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		117.24							
		Grey crushed stone (FILL)		0.05							
		Very loose, brown and dark grey brown silty sand, trace silt (Possible FILL)			1	50 D.O.	6				
1				116.28							
		Very loose, grey brown SILTY SAND, trace roots		0.96	2	50 D.O.	3				
				115.72							
		Compact to very dense, SAND and GRAVEL, trace to some silt, with cobbles and boulders		1.52	3	50 D.O.	>50 for 100 mm			Sieve (See Fig A3)	
2					4	50 D.O.	>50 for 0 mm				
3					5	50 D.O.	50				
4					6	50 D.O.	11				
					7	50 D.O.	> 50 for 100 mm				
5		Borehole terminated due to practical auger refusal on inferred bedrock		112.06 5.18							Backfilled borehole with soil cuttings
6											
7											
8											

DEPTH SCALE

1 to 40

Houle Chevrier Engineering

LOGGED: M.L.

CHECKED:

BOREHOLE LOG GINT LOGS MAY 7-8 2015.GPJ HOULE CHEVRIER 2015.GDT 25/5/15

RECORD OF BOREHOLE 15-4

PROJECT: 15-095

LOCATION: See Borehole Location Plan, Figure 2

BORING DATE: May 7 2015

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.5 kg; drop 0.76 m

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		118.50			
		TOPSOIL FILL		0.05			
		Very loose to loose, brown and dark grey brown sand, some silt, trace gravel (Possible FILL)			1	50 D.O.	4
1				117.43			
		Very loose, brown fine to coarse grained SAND, trace silt		1.07	2	50 D.O.	3
				116.98			
		Loose, grey brown SANDY SILT, some sand seams (Wet)		1.52	3	50 D.O.	9
2				116.21			
		Compact to very dense, grey brown SAND and GRAVEL, trace to some silt with cobbles and boulders		2.29	4	50 D.O.	>50 for 125 mm
3					5	50 D.O.	55
4					6	50 D.O.	>50 for 125 mm
					7	50 D.O.	18
5					8	50 D.O.	>50 for 100 mm
		Probable weathered BEDROCK		112.71 5.79			
6		Borehole terminated due to practical auger refusal on inferred bedrock		112.50 6.00			
7							
8							

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

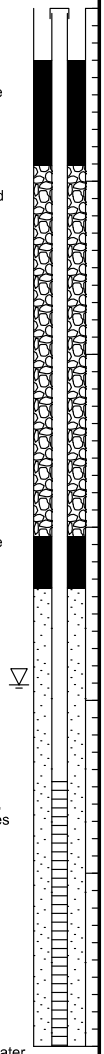
SHEAR STRENGTH Cu, kPa: nat. V - + Q - ●; rem. V - ⊕ U - ○; 20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-5} 10^{-4} 10^{-3} 10^{-2}

WATER CONTENT, PERCENT: Wp W Wl; 20 40 60 80

ADDITIONAL LAB. TESTING: Sieve (See Fig. A1); Sieve (See Fig. A2)

PIEZOMETER OR STANDPIPE INSTALLATION



Groundwater level at 3.91m below ground surface (elevation 114.59m) on May 14, 2015

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
15/05/14	3.91 ▽	114.59

DEPTH SCALE

1 to 40

Houle Chevrier Engineering

LOGGED: M.L.

CHECKED:

BOREHOLE LOG GINT LOGS MAY 7-8 2015.GPJ HOULE CHEVRIER 2015.GDT 25/5/15

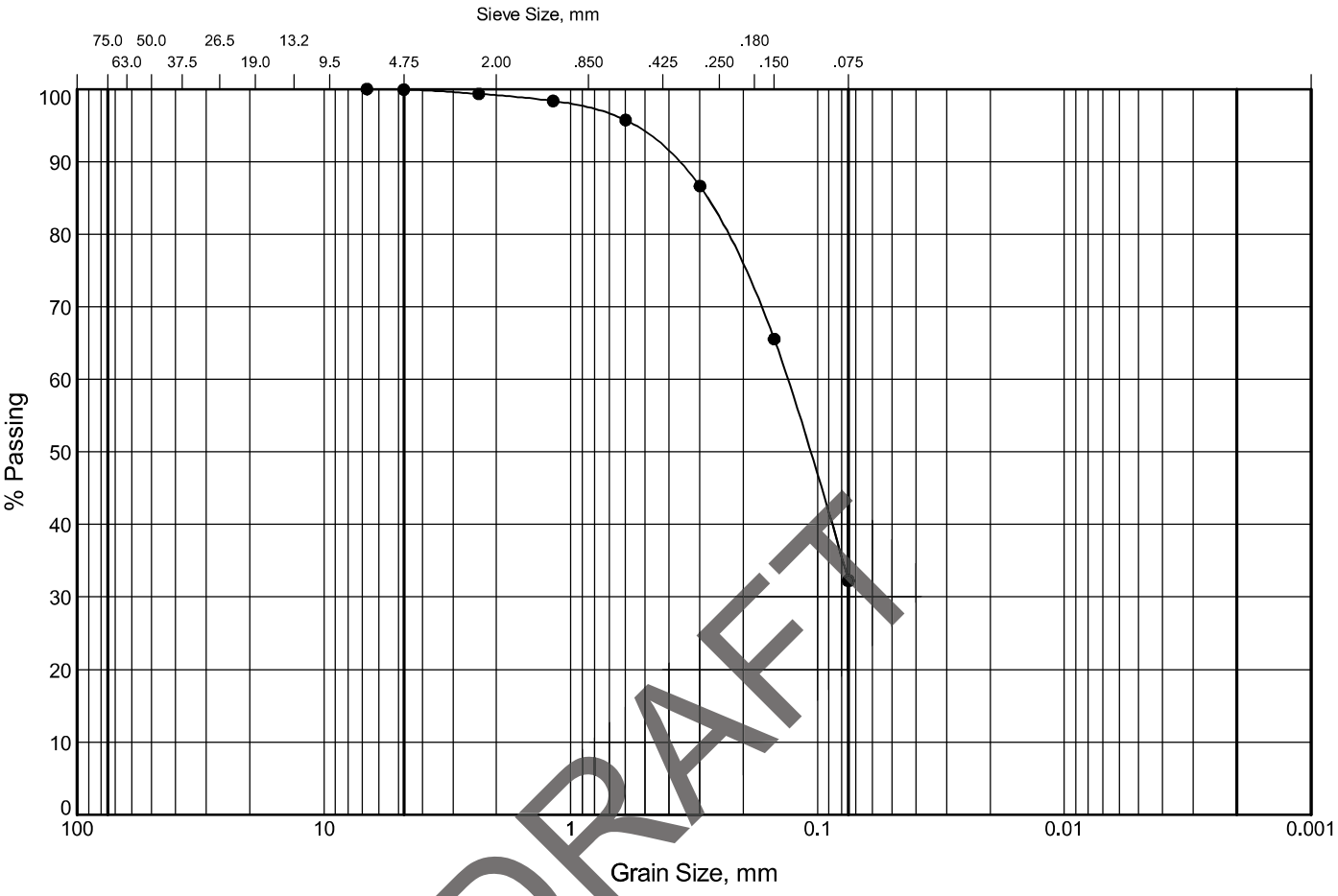
Appendix

B Laboratory Tests

GRAIN SIZE DISTRIBUTION

FILL MATERIAL

FIGURE A1



COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Legend	Borehole	Sample	Depth (m)	% Gravel	% Sand	% Silt & Clay
●	15-4	2A	0.8 - 1.1	0	68	32

Houle Chevrier Engineering

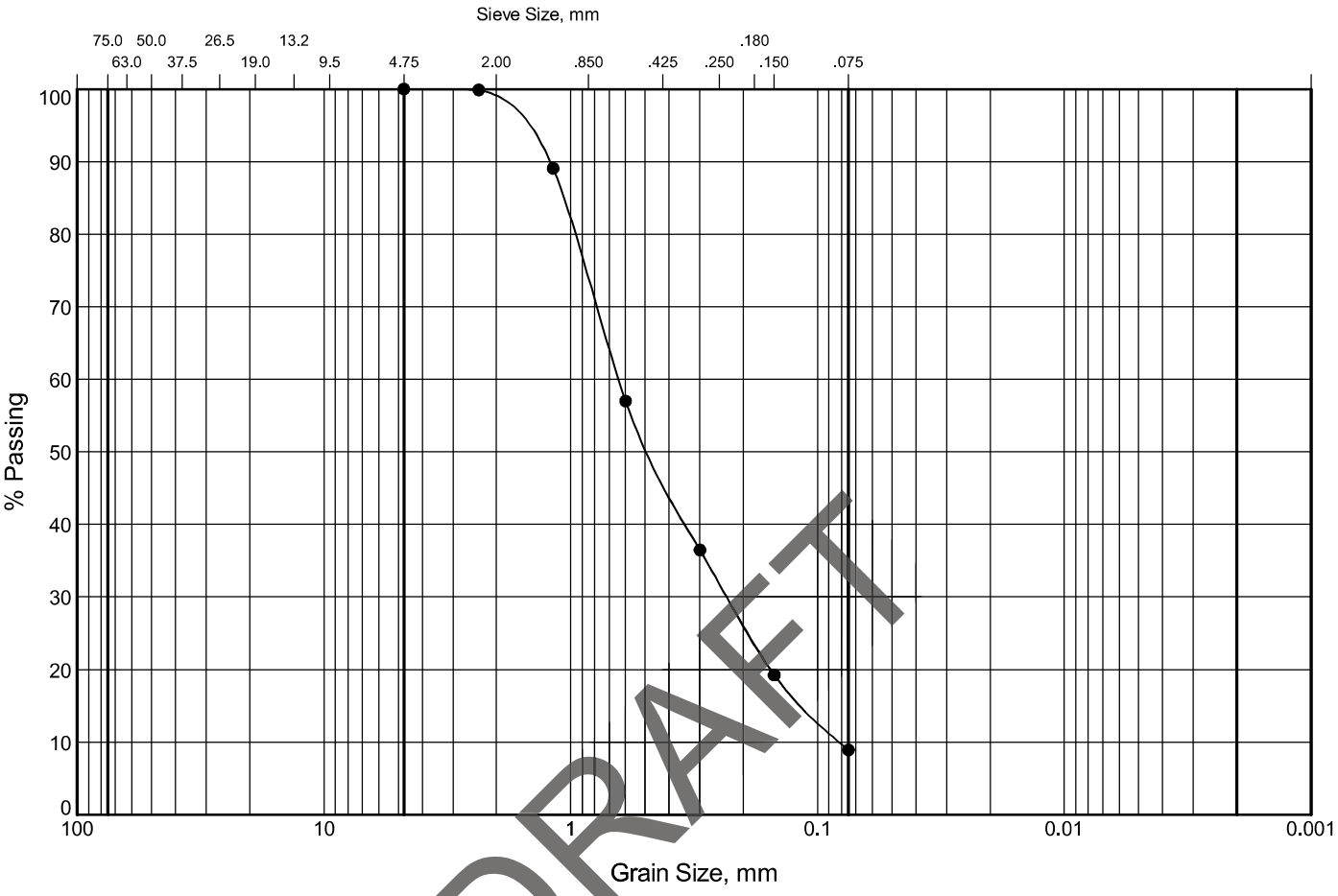
Date: May 2015

Project: 15-095

GRAIN SIZE DISTRIBUTION

SAND

FIGURE A2



COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Legend	Borehole	Sample	Depth (m)	% Gravel	% Sand	% Silt & Clay
●	15-4	2B	1.1 - 1.4	0	91	9

Houle Chevrier Engineering

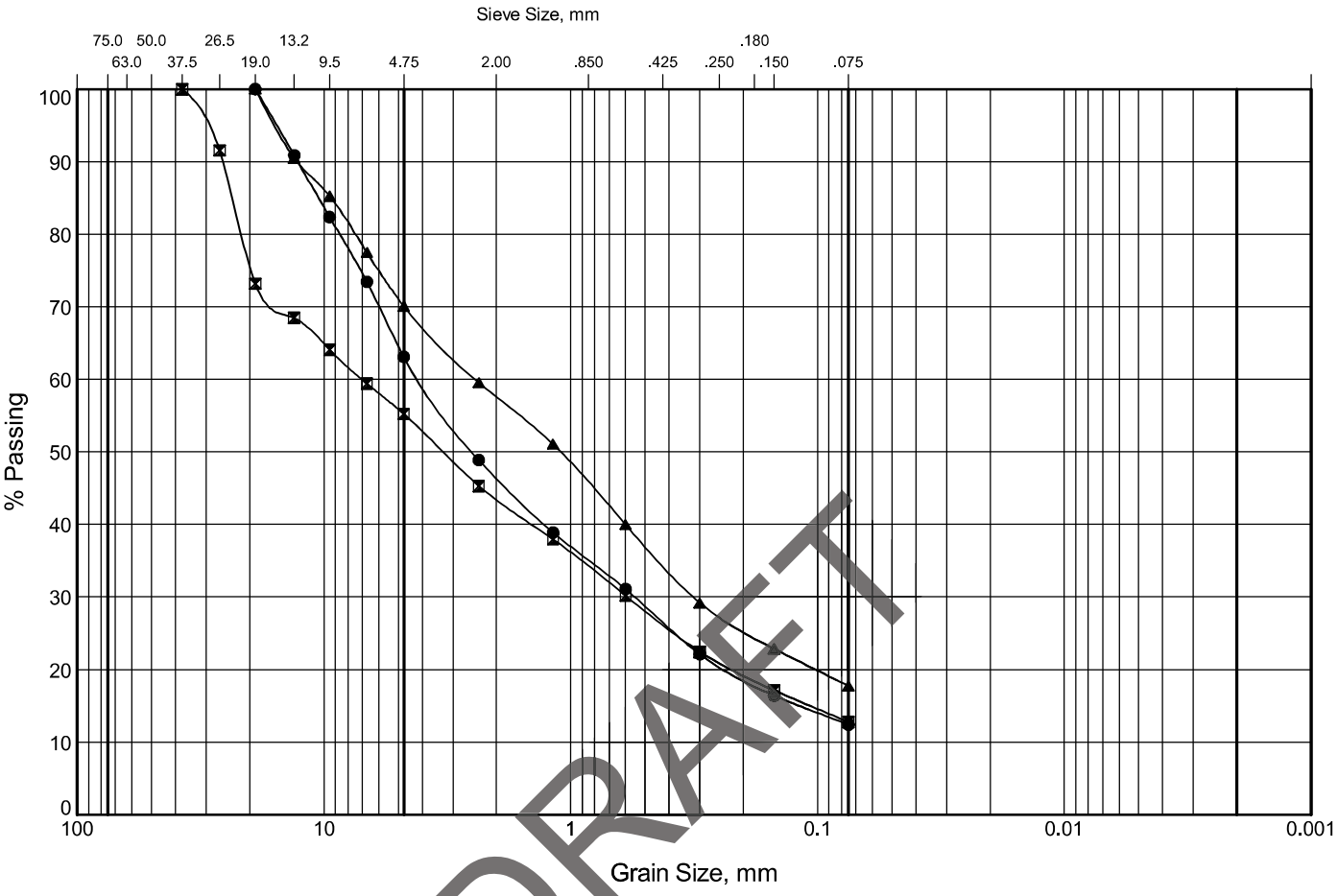
Date: May 2015

Project: 15-095

GRAIN SIZE DISTRIBUTION

SAND AND GRAVEL

FIGURE A3



COBBLES	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
	GRAVEL		SAND			

Legend	Borehole	Sample	Depth (m)	% Gravel	% Sand	% Silt & Clay
●	15-1	2	0.8 - 1.4	37	51	12
⊠	15-2	3	1.5 - 2.1	45	42	13
▲	15-3A	3	1.5 - 2.1	30	52	18

Houle Chevrier Engineering

Date: May 2015

Project: 15-095

Appendix

C Resistivity, PH and Soluble Salts Test

Certificate of Analysis

Client: Geoseismic

Client PO:

Report Date: 06-May-2022

Order Date: 2-May-2022

Project Description: 1364 Stittsville

	Client ID:	BH1 SS4	-	-	-
	Sample Date:	28-Mar-22 09:00	-	-	-
	Sample ID:	2219163-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	95.4	-	-	-
General Inorganics					
pH	0.05 pH Units	8.03 [1]	-	-	-
Resistivity	0.10 Ohm.m	66.0	-	-	-
Anions					
Chloride	5 ug/g dry	33 [1]	-	-	-
Sulphate	5 ug/g dry	19 [1]	-	-	-

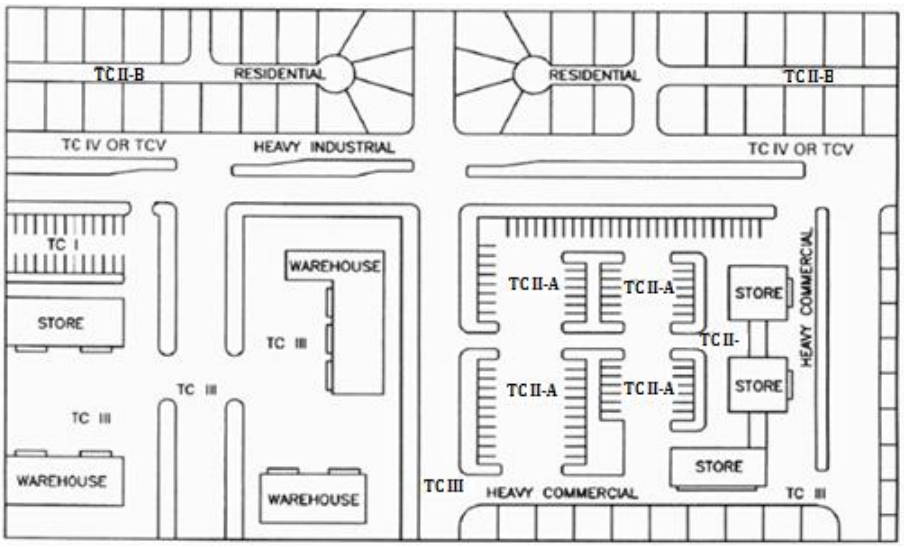


Figure 2: Traffic Classes

Appendix

D Pavement

D.1 Traffic Classes and Pavement Catalog

Figure 2 in page 37 presents a schematic site plan differentiating example uses for five traffic classes developed by the Wisconsin Asphalt Pavement Association and presented in their Design Guide May, 2001.

1. Refer to figure 2 in page 37 to differentiate pavement classes for the proposed 4 storey apartment building.
2. Refer to table 1 in page 38 for additional information and design ESALs.
3. Refer to Tables 2, 3 and 4 in page 38 to select pavement structures for each traffic class on fair soils encountered at this site.

Consult Yuri Mendez Engineering for pavement structures on roadbed consisting of newly placed engineered fill, underground parking or as required, where the roadbed is not the near surface fair soil encountered at this site.

D.2 Frost Heave in Pavements

Frost heave of founding materials for pavement induces reduction (serviceability losses) of the performance period (along with traffic ESALs) for which the structure was designed. Generally speaking, AASHTO 1993 does not provide for an increase in thicknesses (structural number) for reduction of losses, as such increase has very small influence in the detrimental effects of frost heave. Frost heave affects pavements by roughness induced by differential

Ontario Category	Classes	ESALs	Uses
A	I	50,000	Residential dead end and parking lots 50 stalls or less.
A	II-A	100,000	Parking lots 51 to 500 stalls.
A	II-B	200,000	Residential streets, parking lots more than 500 stalls.
B	III	600,000	Minor colectors, local streets and light industrial lots.
B	IV	900,000	Collector Streets and heavy industrial parking lots.
B	V	2,200,000	Minor Arterial.

Table 1: Design ESALs (20 years) and uses for traffic classes

Material	Specification	Thicknesses			
		Class I		Class II-A	
Class		mm	in	mm	in
Surface course	OPSS 1151 Superpave 9.5	50.8	2	50.8	2
Surface course	OPSS 1151 Superpave 12.5				
Binder course	OPSS 1151 Superpave 19.0				
Base	OPSS 1010 Granular A	152.4	6	152.4	6
Subbase	OPSS 1010 Granular B Type II	127.0	5	203.2	8
Subgrade	Undisturbed In situ Soil				

Table 2: Flexible Pavement Structure Classes I and II-A

Material	Specification	Thicknesses			
		Class II-B		Class III	
Class		mm	in	mm	in
Surface course	OPSS 1151 Superpave 9.5				
Surface course	OPSS 1151 Superpave 12.5	63.5	2.5	76.2	3
Binder course	OPSS 1151 Superpave 19.0				
Base	OPSS 1010 Granular A	152.4	6	152.4	6
Subbase	OPSS 1010 Granular B Type II	228.6	9	304.8	12
Subgrade	Undisturbed In situ Soil				

Table 3: Flexible Pavement Structure Classes II-B and III

Material	Specification	Thicknesses			
		Class IV		Class V	
Class		mm	in	mm	in
Surface course	OPSS 1151 Superpave 9.5	31.8	1.25		
Surface course	OPSS 1151 Superpave 12.5				
Binder course	OPSS 1151 Superpave 19.0	57.2	2.25		
Base	OPSS 1010 Granular A	152.4	6		
Subbase	OPSS 1010 Granular B Type II	330.2	13		
Subgrade	Undisturbed In situ Soil				

Table 4: Flexible Pavement Structure Classes IV and V

frost heave, i.e., if the longitudinal vertical alignment is all equally frost susceptible, there is negligible detrimental effect. This is difficult to achieve in urban developments in which services trenches are backfilled with non frost susceptible materials. For long lasting pavements on frost susceptible soils, the general guideline is, where possible; ensure that all soils serving as pavement foundation are equally frost susceptible. This could be achieved by providing frost susceptible backfill within 1.4 m of the pavement foundation in service trenches. Where measures to mitigate the effect of frost heave are not undertaken, decrease of the performance period is accepted to occur.

D.3 Frost Protection for Manholes, Catch Basins and Others

Manholes and catch basin type structures provide a cold bridge to a deeper portion of the soil profile and create localized areas prompt to pavement failure by excessive frost heave roughness in frost susceptible soils. This can be prevented by providing insulation extending downward around the structure and horizontally outward to create a transition from the varying pavement elevation to the more stable catch basin elevation. On the alternative, non frost susceptible backfill can be provided tapered outward from the structure to the surrounding pavement.

Report 53-BSI-R3
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Appendix

E Foundation Drainage

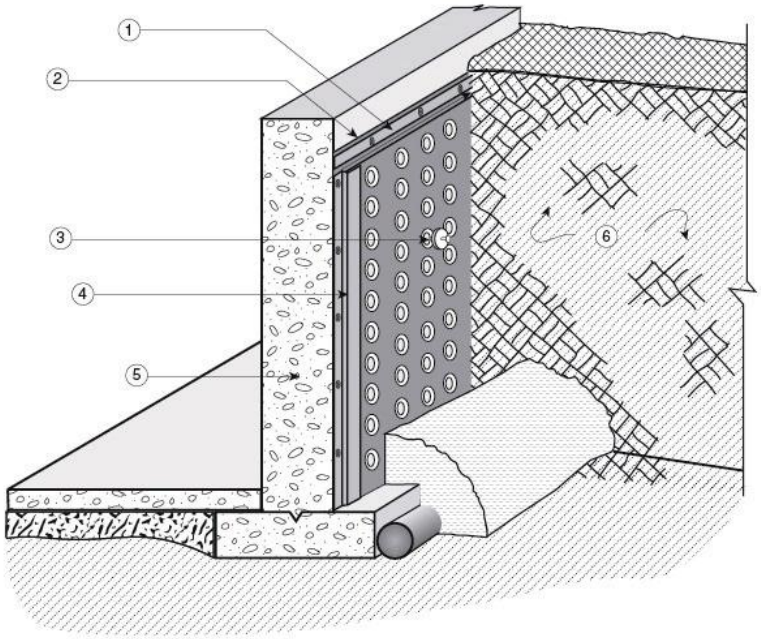

Figure 1. "Cosella-Dörken DELTA®-MS and DELTA®-MS CLEAR Dampproofing Membranes" – face in contact with the soil

1. **termination bar**
2. **caulking (behind membrane)**
3. **fastener**
4. **mould strip**
5. **concrete foundation**
6. **backfill**

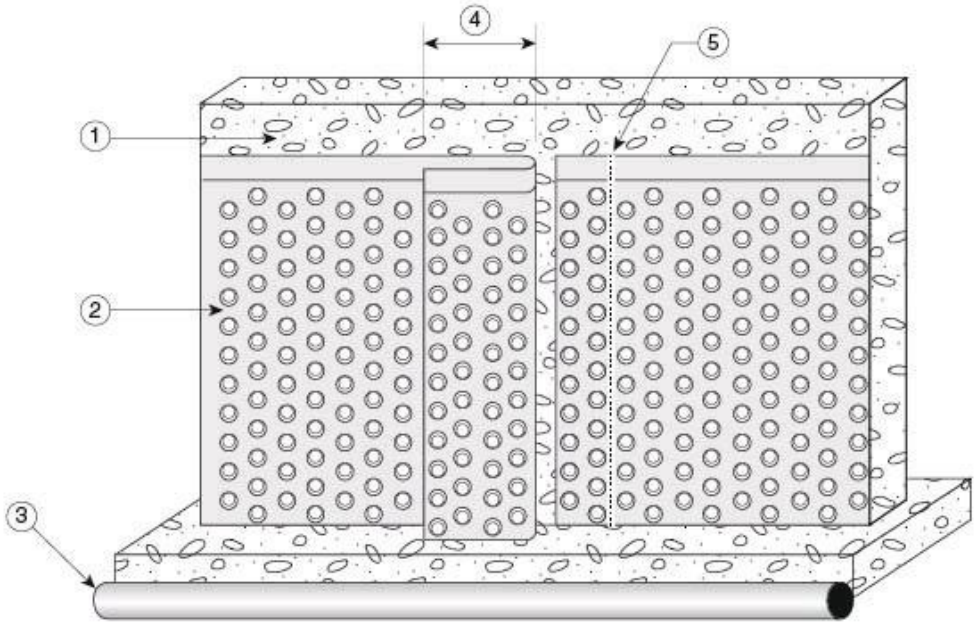

Figure 2. "Cosella-Dörken DELTA®-MS and DELTA®-MS CLEAR Dampproofing Membranes" – face in contact with the wall

1. **concrete foundation**
2. **membrane**
3. **drainage tile**
4. **minimum 6" overlap**
5. **caulking**

Appendix

F Construction Recommendations for Stripping, Earth and Rock Excavation to Undisturbed Soils, Earth and Rock Fill Placement, Asphalt Placement and Compaction

In the event that any of the following recommendations conflict with municipal and or provincial specifications, the most restrictive applies. For the case when products involving ground conditions are used, the manufacturer's specifications take precedence.

The contractor shall be prepared to proceed as directed by the geotechnical consultant within the framework of these recommendations. Construction methods will abide to these recommendations and/or be discussed and agreed upon with the consultant on site in real time or as expressed in writing.

F.1 Field Briefings

At any time in which the geotechnical consultant is required in the field for inspections, the contractor shall brief the consultant in real time about any work in progress or work to proceed at the time requiring excavation, rock excavation, placement, hauling in or out, re-working, compaction equipment weight and nature, equipment passes, moisture, stock piling, sorting of materials, stock piling, etc. of geotechnical materials. The briefing will sick approval of the methods and materials and will involve discussions regarding the source, nature and/or specifications of any source of materials brought or removed, and/or placed and/or stock piled and/or excavated from the site and discussions to meet geotechnical requirements. The consultant may choose to instate a log book in the field which may include the persons having authority to log as representative of the contractor.

F.2 Removal of Water

Removal and diversion of surface water and ground water will be planed prior to all earthwork within the scope of these recommendations. All surfaces in which to commence construction will be maintained dry and free of muddy conditions.

F.3 Earth Excavation

Earth excavations are subject to the provisions in O. Reg. 213/91: Construction Projects under Occupational Health and Safety Act. Refer to section 8 for key aspect of O. Reg. 213/91 applicable to the findings in testholes at this site.

For the purpose of these recommendations earth materials will be refer to as one or more of the general material classes: topsoil and organic soils, non engineered fill, granular fill, native soils and rock. Topsoil and organic soils and non engineered fill are the subject of striping in subsection F.3.3.

F.3.1 Suitability of Earth Materials

The suitability of material for specific purposes is determined by the geotechnical engineer. To the extent they are needed, suitable material from the excavations can be used in the construction of required permanent earthfill or rockfill.

F.3.2 Stockpiling and Sorting

Stockpiling is not an acceptable mean to build up the subgrade beneath the perimeter of structures of any kind. For stock piling, with the exception of native soils, material will be sorted in piles belonging exclusively to each material class. For native soils, sorting will be as determined by the geotechnical engineer. Mixed materials will be rendered unusable for uses other than the buildup of the subgrade in landscaped areas.

F.3.3 Striping

Topsoil and/or organic soils and/or existing fill must be removed from the perimeter of all proposed structures, including retaining wall, buildings, pavement, parking areas and earth or fill banks for grading.

F.3.4 Excavation to Undisturbed Soil Surface

All soil surfaces in which to commence construction for all structures are to be preserved in undisturbed condition (Undisturbed Soil Surface (USS)).

F.4 Foundations Placement

Place foundations on undisturbed brown well graded dense sand and gravel that is not frozen.

F.5 Imported Materials

Materials to be imported are subject to prior approval by the geotechnical engineer. The exceptions are granular materials having 12 % or less fines including clean sands. Fines are materials passing the # 200 sieve (70 μm).

F.6 Overexcavation

Excavation in earth beyond the specified lines and grades shall be corrected by filling the resulting voids with approved, compacted earthfill.

F.7 Earthfill

The type of Earthfill materials will be as indicated in plans and specifications. Suitability of earth materials will be determined by the geotechnical engineer.

Earthfill materials shall contain no frozen soil, sod, brush, roots, or other perishable material. Rock particles larger than 2/3 of the maximum approved lift thickness shall be removed prior to compaction of the fill.

For the purpose of this subsection all suitable materials will belong to one of the following two classes: *granular earthfill* and *select earthfill*. Granular eathfill will be any natural or crushed earth materials containing 12% or less passing the #200 sieve (70 μm). Select earthfill will be materials for which more than 12% passes the #200 sieve *and* have water content close to the optimum *and* have been rendered as suitable by the geotechnical engineer.

F.7.1 Granular Earthfill Placement

F.7.1.1 Moisture for Granular Earthfill

For granular earthfill it is to be assumed that moisture will be added for placement. Compaction in wet of optimum condition is preferred for granulars.

F.7.1.2 Compacted Lifts Thicknesses Equipment and Passes for Granular Eathfill

Compacted lifts will not exceed 250 mm. Subject to test trials a maximum compacted lift of 300 mm may be accepted provided vibratory compaction equipment rated at 60,000 lb-f (27,300 kg-f) of dynamic force is used.

For road construction passes are to overlap by 300 mm for full coverage.

Where non vibratory pneumatic compactors with ballast an tire pressure of 100 psi (7 kg/cm2) are used (9 or 13 ply) the compacted lift thicknesses will not exceed 150 mm for granular.

For services and culvert trenches, when using rammers and light vibratory plates weighing less than 115 kg (250 lbs) the compacted lift thicknesses will not exceed 100 and 125 mm respectively. For heavier trench equipment the compacted lifts will not exceed 250 mm.

No heavy equipment will be operated above the crown of pipes or culverts unless 1.2 m of fill has been placed or the subgrade elevation has been reached.

For all trenches below the water table, trench foundation not less than 200 mm will be provided as per materials and specification in Table 5 in page 47.

Materials lift placement beneath foundations, slabs or any placement not specified above must abide to the above specifications as they relate to the equipment being used.

F.7.2 Select Earthfill Placement

It is to be assumed that suitable select fill will be materials that will be excavated from the bank to be put directly on hauling equipment transported and dumped directly for spreading in lifts by push tractors, be added water and compacted. Stockpiling at the source or on site is not acceptable.

F.7.2.1 Moisture for Select Earthfill

It is to be assumed that moisture will be added for placement.

F.7.2.2 Compacted Lifts Thicknesses Equipment and Passes for Select Earthfill

Compacted lifts will not exceed 200 mm for heavy sheep foot rollers. Suitability of smooth vibratory rollers for the materials will be determined by the geotechnical engineer.

For road construction passes are to overlap by 300 mm for full coverage.

Where non vibratory pneumatic compactors with ballast an tire pressure of 100 psi (7 kg/cm2) are used (9 or 13 ply) the compacted lift thicknesses will not exceed 150 mm.

For services and culvert trenches, when using rammers and light vibratory plates weighing less than 115 kg (250 lbs) the compacted lift thicknesses will not exceed 100 and 125 mm respectively. For heavier trench equipment the compacted lifts will not exceed 200 mm.

No heavy equipment will be operated above the crown of pipes or culverts unless 1.2 m of fill has been placed or the subgrade elevation has been reached.

For all trenches below the water table, trench foundation not less than 200 mm will be provided as per materials and specification in Table 5 in page 47.

Materials lift placement beneath foundations, slabs or any placement not specified above must abide to the above specifications as they relate to the equipment being used.

F.7.3 Compaction Guide for Passes and Level of Compaction

The contents of this section are provided as guidelines for construction. The resulting compaction densities and compacted lift thicknesses can only be verified by actual testing and field trials respectively.

For equipment passes the contractor may consider not less than 4, 5 or 6 passes for 95, 98 or 100 % Proctor Standard compaction.

For granular materials loose lifts may be approximately 150, 175 and 235 mm for compacted lift thicknesses 125, 150 and 200 mm respectively.

For select earthfill materials loose lifts may be approximately 125 and 190 mm for compacted lift thicknesses 100 and 150 mm respectively.

F.8 Compaction General

It is to be assumed that water will be added for compaction and that the required maximum grain size shall be 3/4 of the compacted lift thickness.

Obtain the approximate loose lift thickness by dividing the compacted lift by 0.88. Compacted lifts are approximately 12% less than the loose lift thickness.

Each lift shall be compacted by the specified number of passes of the approved type and weight of roller or other equipment.

Table 5 in page 47 presents Proctor Standard (PS) compaction requirements for specified placement and materials.

F.9 Compaction Specific

F.9.1 Compaction Along Basement Walls, Retaining Walls and Structures

No heavy compaction equipment is to be operated within 0.9 m of any structure. The consolidation zone is defined as the zone within 0.9 m of the exterior edge of basements or the interior edge of retaining walls or any structure. Only light to very light compaction is to be applied along the consolidation zone with no more than 2 passes of light vibratory equipment.

F.9.2 Self Compacting Materials

There are no self compacting materials. Total fill thickness of 200 mm of granular materials consisting of more than 90% of one nominal size referred to as crushed stone are acceptable without compaction under concrete slabs.

F.9.3 Settlement Allowance and Overfill

The settlement (consolidation) of lightly compacted earthfill can be excessive. Overfill to compensate for settlement allowance will be discussed with the geotechnical engineer.

F.9.4 Compaction Quality Control

Provide moisture density relationships for Standard Proctor compaction for the proposed materials and source. Conduct one in situ test at randomly selected locations per 60 m3 of fill. This is approximately one test, each 300 m2 of lift in place. Nuclear or non-nuclear density probes testing can be used. Density probes will only measure the density within 0.12 m depth at the point of the measurement.

F.10 Asphalt Pavement

Place asphalt mix only when base course, or previous course is dry and air temperature is 7 degrees C and increasing.

Asphalt pavement mix temperatures at the time of placement will be within the range of 120 to 160 degrees C.

Do not place asphalt on a surface which is wet or covered by snow or ice or if the ground is frozen.

Material Placement	Material Description	% PS
Base	OPSS.MUNI 1010 Granular A	100
Subbase	OPSS.MUNI 1010 Granular B Type II	100
Subgrade	Granular earthfill (with 12 % or less fines) and 100% passing 106 mm sieve	95
	Select earthfill	95
Backfill for trenches under pavement	Granular earthfill (with 12 % or less fines) and 100% passing 106 mm sieve.	95
	Select earthfill	95
Under sidewalks top 200 mm	Any OPSS.MUNI 1010 Granular specification for which 100% passes the 26.5 mm sieve	95
Under foundations	OPSS.MUNI 1010 Granular B type 2 with 12% or less fines and for which 100% passes the 106 mm sieve	98
Backfill under slabs on grade	Cohesionless (with 12 % or less fines) and 100% passing 106 mm sieve.	100
	Select earthfill	100
Top 100 mm under slabs	Crushed stone 9.5 to 19 mm (use one or several sizes).	90
Pipe bedding and cover (150 mm for bedding to 150 mm above the crown)	Any OPSS.MUNI 1010 Granular specification for which 100% passes the 26.5 mm sieve	95
Trench foundation (stabilization minimum 200 mm)	Any OPSS 1010.MUNI Granular specification for which 100% passes the 106 mm sieve except Granular B Type I	95
Backfill for non building, non traffic and/or non parking areas	Granular (with 12 % or less fines) and 100% passing 106 mm sieve	90
	Select earthfill	90
Placement not specified above	Granular (with 12% or less fines) and 100% passing 106 mm sieve	95
	Select earthfill	95

Table 5: Proctor Standard (PS) compaction requirements for specified placement and materials.

F.10.1 Surface Preparation for Asphalt Pavement

It is to be assumed that rough grading and fine grading shall take place before asphalt placement. Rough grading will be completed to within ± 25 mm of the underside of asphalt and tested to meet the specified density. Fine grading and rolling will completed by the paving contractor. The granular material for fine grading will meet OPSS.MUNI 1010 Granular M.

F.10.2 Proof Rolling Prior to Asphalt Pavement

Conduct proof rolling using a single pass of a tandem-axle dump truck or a tri-axle dump truck with the third axle raised loaded to a minimum gross vehicle weight of 26 metric tons at walking speed. Rutting in excess of 25 mm is considered failure. Where proof rolling reveals areas of defective subgrade, Remove base, Sub-base and subgrade material to depth and extent and width that will allow reconstruction using the available equipment or as directed by the Consultant.

F.10.3 Asphalt compaction

The compacted lifts are accepted to be 80% of the loose lift thickness (the loose lift reduces thickness by 20% when compacted). Divide the compacted lift thickness by 0.8 to obtain the thickness of the loose lift.

Compaction will consist on at least three passes at approximately walking speed (5.4 km/hr) as follows: *break down rolling* using a vibratory steel drum roller, *intermediate rolling* with a static (non-vibrating) roller or a pneumatic roller and *finish rolling* with a smooth static roller.

E.3 RESPONSE TO CITY COMMENTS ON SUBSURFACE INVESTIGATION REPORT

P.O. Box 74087, RPO Beechwood, Ottawa, On., K1M 2H9
Phone: (613) 899 0834

Yuri Mendez
Engineering

Ottawa, June 20, 2022
No.: 1364-Stittsville-YME-L1

Rod Price, Project Manager
Bayview Stittsville Inc.
rod@demarcoconstruction.ca

Reference: Proposed development at 1364, 1368 and 1370 Stittsville Main St. in the City of Ottawa, ON. Site Plan Control Application - 1st Review Comments.

Subject: Response to comments 1.1 to 1.6 regarding Subsurface Investigation Report 53-BSI-R0.

In report 53-BSI-R0, grade raises are not restricted. A grading plan review will not be necessary as grading that could fail a geotechnical grading plan review cannot be envisioned for the proposed development. This responds to the subject comment 1.1 “grading plan review”.

The remainder comments are responded via a revised report 53-BSI-R1 (R1) attached to this submission. R1 contains a response to city comments section (RTCC) at the end of the report sections before the appendices. The modifications and/or additions to the report meant to respond to the comments are in that section.

The introduction section is reproduced in RTCC adding that the documents reviewed for the investigation include tests by others which have been added as an appendix with laboratory tests. This addition respond to comments 1.2 “laboratory tests” and 1.4 “gradations”.

The RTCC reproduces the section sampling and testing to reflect that the program itself did not include lab tests which also addresses the unintentionally omitted lab tests in the first R0 report in comment 1.2 “laboratory tests”. It should also be noted that the method of sampling is that of “ASTM D1586 - 11 Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils”. This addresses comment 1.3 “method of sampling”.

To address comment 1.5 regarding underground corrosion and sulphate content, the report R1 being submitted had this included in a submission to the owner who had not yet reached the City of Ottawa. You will note the sections and the appendix with the tests.

A section regarding water takings and permits was also added to the RTCC to respond comment 1.6.

Do not hesitate to contact us if you have any questions.

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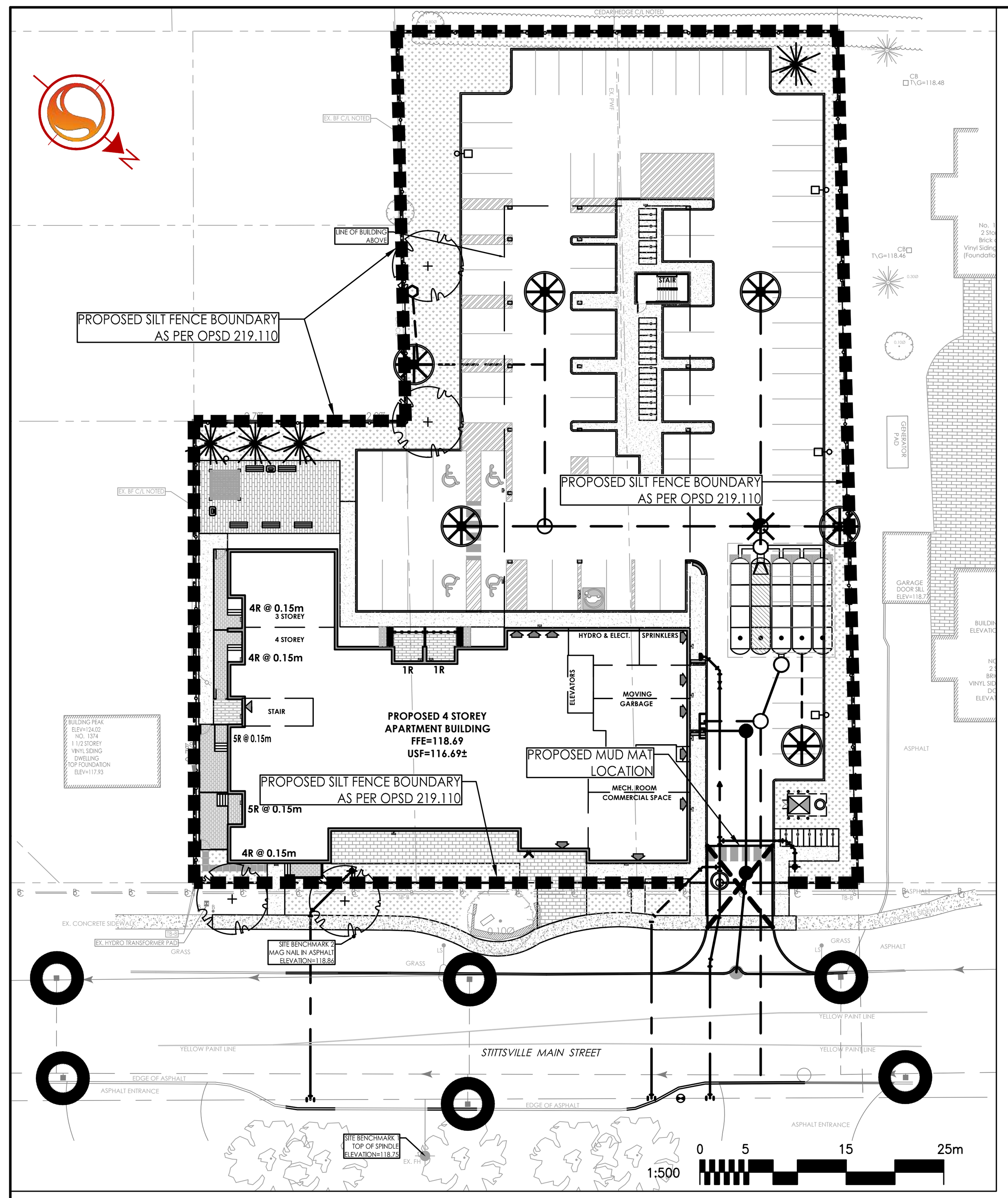
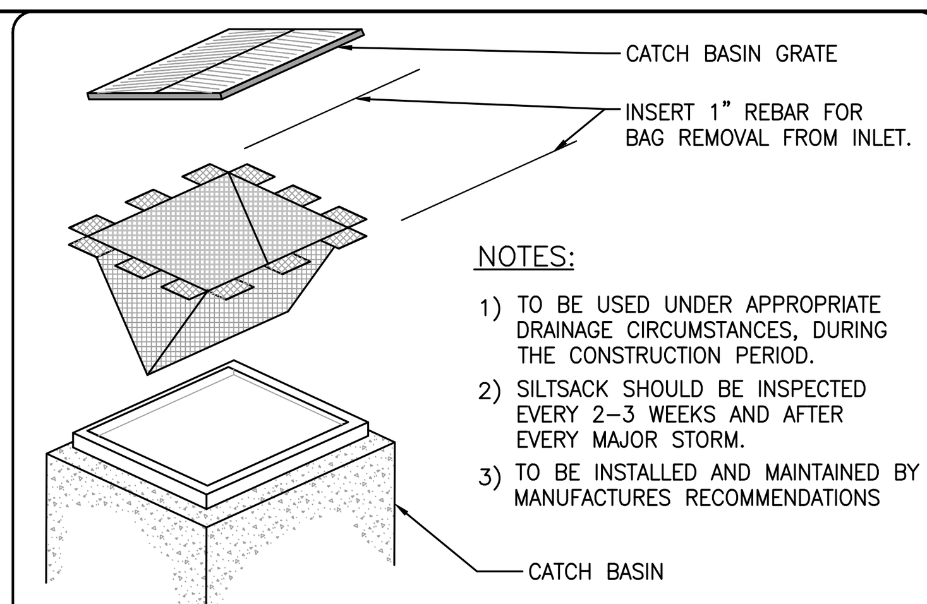
Yuri Mendez
Engineering

Yuri Mendez, M. Eng, P. Eng
No.: 1364-Stittsville-YME-L1

Appendix F DRAWINGS

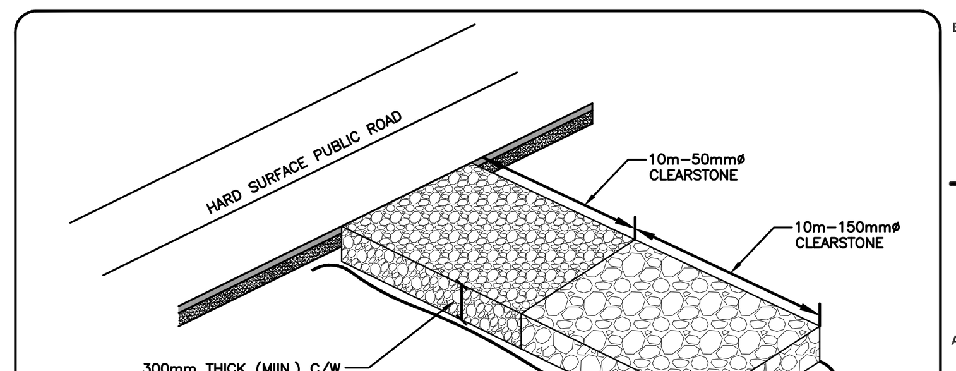




NOTES:

1) TO BE USED UNDER APPROPRIATE DRAINAGE CIRCUMSTANCES, DURING THE CONSTRUCTION PERIOD.
2) SILTSACK SHOULD BE INSPECTED EVERY 2–3 WEEKS AND AFTER EVERY MAJOR STORM.
3) TO BE INSTALLED AND MAINTAINED BY MANUFACTURES RECOMMENDATIONS

ROADSIDE CATCH BASIN PROTECTION DETAIL: TERRAFIX SILTSACK
SCALE: N.T.S.



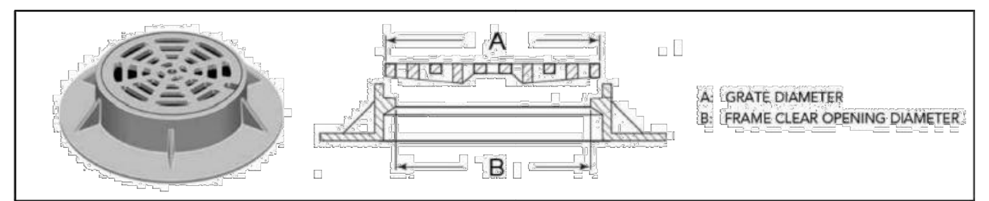
NOTES:

1. MUD MAT TO BE INSTALLED AT ALL CONSTRUCTION ENTRANCES
2. MUD MAT TO EXTEND FULL WIDTH OF ENTRANCE
3. IN THE CASE THAT THE ACCESS CROSSES A CULVERT OR DITCH, SEDIMENT FENCING SHOULD BE INSTALLED ALONG THE EDGES OF THE ACCESS TO PREVENT SEDIMENT FROM BEING WASHED AWAY WITH RUNOFF.
4. THE GRANULAR MATERIAL WILL REQUIRE PERIODIC REPLACEMENT AS IT BECOMES CONTAMINATED BY VEHICLE TRAFFIC.
5. SEDIMENT SHALL BE CLEANED FROM PUBLIC ROADS AT THE END OF EACH DAY.
6. STORM INLETS BOTH ON AND IN THE PROXIMITY OF THE SITE SHALL BE PROTECTED WITH INLET CONTROL MEASURES PRIOR TO ROAD CLEANING ACTIVITIES.

MUD MAT ENTRANCE DETAIL
SCALE: N.T.S.

FLEXSTORM P/Ns 62MHDRFX & 62MHDRFXP

RD INLET TYPE: RAISED CAST IRON FRAME AND ROUND GRATE



Pure Frame with FX Bag		Field Inlet Dimensions		Flexstorm Framing Dims		Flexstorm Ratings (50%)			Pure Frame with FX+ Bag	
ADS P/N	Flexstorm Item Code	A	B	B1	A1	Bag Capacity (ft³)	PC/PC+ Flow Rate (CFS)	Bypass (CFS)	ADS P/N	Flexstorm Item Code
62MHDRFX	P-RD-240-218-FX	24	21.75	21.3	23.3	0.8	1.4	2.5	62MHDRFXP	P-RD-240-218-FXP
62MHDRFX	P-RD-233-220-FX	23.25	22	21.3	23.3	0.7	1.3	2.5	62MHDRFXP	P-RD-233-220-FXP
62MHDRFX	P-RD-238-220-FX	23.75	22	21.3	23.3	0.8	1.4	2.5	62MHDRFXP	P-RD-238-220-FXP
62MHDRFX	P-RD-239-220-FX	23.87	22	21.3	23.3	0.8	1.4	2.5	62MHDRFXP	P-RD-239-220-FXP
62MHDRFX	P-RD-260-220-FX	26	22	21.3	23.3	0.8	1.4	2.5	62MHDRFXP	P-RD-260-220-FXP
62MHDRFX	P-RD-238-221-FX	23.75	22.125	21.3	23.3	0.8	1.4	2.5	62MHDRFXP	P-RD-238-221-FXP
62MHDRFX	P-RD-228-223-FX	22.75	22.25	20.5	22.5	0.7	1.3	2.4	62MHDRFXP	P-RD-228-223-FXP
62MHDRFX	P-RD-238-223-FX	23.75	22.25	21.3	23.3	0.8	1.4	2.5	62MHDRFXP	P-RD-238-223-FXP
62MHDRFX	P-RD-240-223-FX	24	22.25	21.3	23.3	0.8	1.4	2.5	62MHDRFXP	P-RD-240-223-FXP
62MHDRFX	P-RD-238-224-FX	23.75	22.375	21.3	23.3	0.8	1.4	2.5	62MHDRFXP	P-RD-238-224-FXP
62MHDRFX	P-RD-239-224-FX	23.87	22.375	21.3	23.3	0.8	1.4	2.5	62MHDRFXP	P-RD-239-224-FXP
62MHDRFX	P-RD-238-225-FX	23.75	22.5	21.3	23.3	0.8	1.4	2.5	62MHDRFXP	P-RD-238-225-FXP
62MHDRFX	P-RD-240-225-FX	24	22.5	21.3	23.3	0.8	1.4	2.5	62MHDRFXP	P-RD-240-225-FXP
62MHDRFX	P-RD-248-226-FX	24.75	22.62	22.5	24.5	0.9	1.4	2.6	62MHDRFXP	P-RD-248-226-FXP
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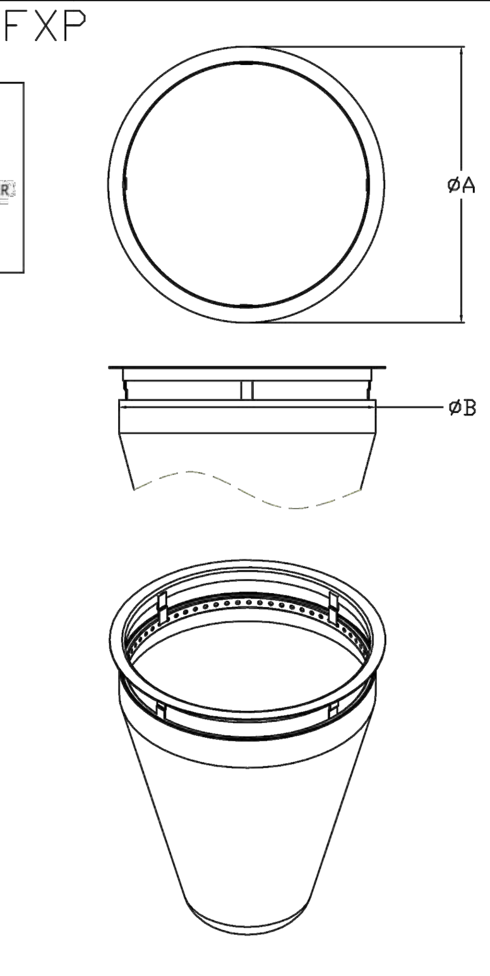
62MHDRFX	P-RD-238-230-FX	23.75	23	21.3	23.3	0.8	1.4	2.5	62MHDRFXP	P-RD-238-230-FXP
62MHDRFX	P-RD-240-230-FX	24	23	21.3	23.3	0.8	1.4	2.5	62MHDRFXP	P-RD-240-230-FXP
62MHDRFX	P-RD-250-230-FX	25	23	22.5	24.5	0.9	1.4	2.6	62MHDRFXP	P-RD-250-230-FXP
62MHDRFX	P-RD-254-230-FX	25.375	23	22.5	24.5	0.9	1.4	2.6	62MHDRFXP	P-RD-254-230-FXP
62MHDRFX	P-RD-256-230-FX	25.62	23	22.5	24.5	0.9	1.4	2.6	62MHDRFXP	P-RD-256-230-FXP
62MHDRFX	P-RD-258-230-FX	25.75	23	22.5	24.5	0.9	1.4	2.6	62MHDRFXP	P-RD-258-230-FXP
62MHDRFX	P-RD-248-234-FX	24.75	23.375	22.5	24.5	0.9	1.4	2.6	62MHDRFXP	P-RD-248-234-FXP
62MHDRFX	P-RD-260-235-FX	26	23.5	23.5	25.5	0.9	1.5	2.7	62MHDRFXP	P-RD-260-235-FXP
62MHDRFX	P-RD-258-236-FX	25.75	23.62	23.5	25.5	0.9	1.5	2.7	62MHDRFXP	P-RD-258-236-FXP
62MHDRFX	P-RD-258-238-FX	25.75	23.812	23.5	25.5	0.9	1.5	2.7	62MHDRFXP	P-RD-258-238-FXP
62MHDRFX	P-RD-253-240-FX	25.25	24	22.5	24.5	0.9	1.5	2.6	62MHDRFXP	P-RD-253-240-FXP
62MHDRFX	P-RD-258-240-FX	25.75	24	23.5	25.5	0.9	1.5	2.7	62MHDRFXP	P-RD-258-240-FXP
62MHDRFX	P-RD-260-240-FX	26	24	23.5	25.5	1.0	1.5	2.7	62MHDRFXP	P-RD-260-240-FXP
62MHDRFX	P-RD-268-240-FX	26.75	24	23.5	25.5	1.0	1.5	2.7	62MHDRFXP	P-RD-268-240-FXP
62MHDRFX	P-RD-260-241-FX	26	24.1	23.5	25.5	1.0	1.5	2.7	62MHDRFXP	P-RD-260-241-FXP
62MHDRFX	P-RD-263-241-FX	26.25	24.1	23.5	25.5	1.0	1.5	2.7	62MHDRFXP	P-RD-263-241-FXP
62MHDRFX	P-RD-258-241-FX	25.75	24.125	23.5	25.5	0.9	1.5	2.7	62MHDRFXP	P-RD-258-241-FXP
62MHDRFX	P-RD-258-243-FX	25.75	24.25	23.5	25.5	0.9	1.5	2.7	62MHDRFXP	P-RD-258-243-FXP



NOTES:

1. RATINGS SHOWN ARE FOR STANDARD 22" BAG DEPTH; "SHORT" 12" DEPTH BAGS ARE AVAILABLE WITH -S SUFFIX; RATINGS REDUCED BY ~50%.

2. THE FOLLOWING REQUIRES ADDITIONAL REVIEW

-GRATES WITH EXTENDED BOTTOMS

-ANY OBSTRUCTED INLET OPENINGS

FLEXSTORM INLET FILTERS PURE

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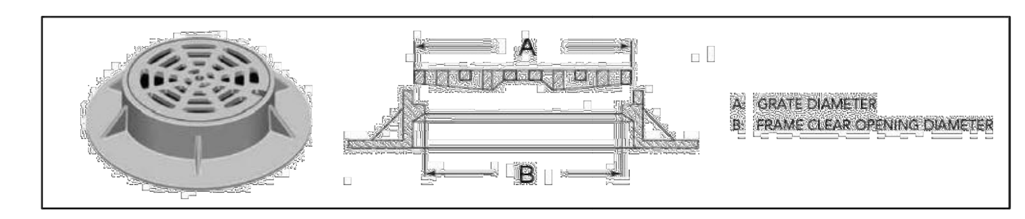
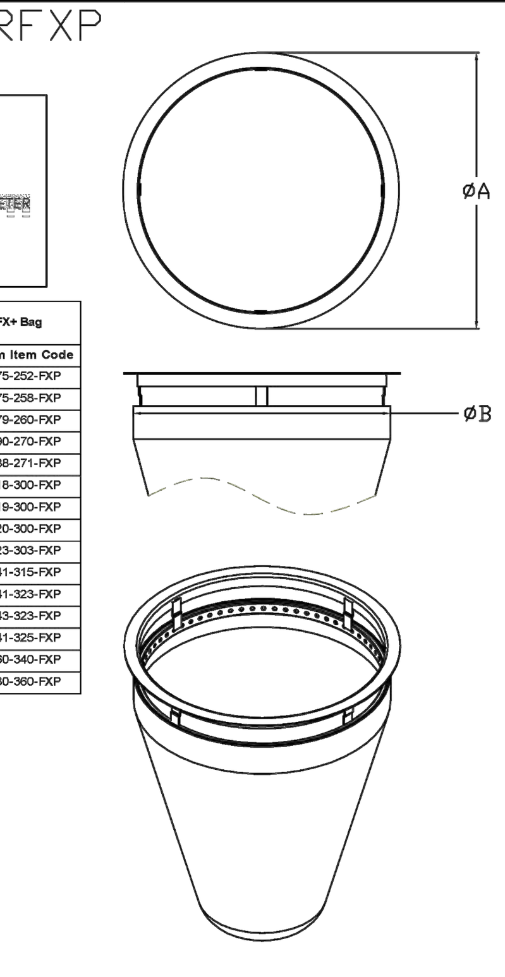
SIZE C | FRAME TYPE HDR | DWG NO RD-62MHDR-FX | REV A | SHEET 2 OF 2

FLEXSTORM P/Ns 62LHDRFX & 62LHDRFXP

RD INLET TYPE: RAISED CAST IRON FRAME AND ROUND GRATE



Pure Frame with FX Bag		Field Inlet Dimensions		Flexstorm Framing Dims		Flexstorm Ratings (Flow at 50% max)			Pure Frame with FX+ Bag	
ADS P/N	Flexstorm Item Code	A	B	B1	A1	Bag Capacity (ft³)	PC/PC+ Flow Rate (CFS)	Bypass (CFS)	ADS P/N	Flexstorm Item Code
62LHDRFX	P-RD-275-252-FX	27.5	25 1/6	25.0	27.0	2.1	1.6	5.8	62LHDRFXP	P-RD-275-252-FXP
62LHDRFX	P-RD-275-258-FX	27.5	25.75	25.0	27.0	2.2	1.6	5.8	62LHDRFXP	P-RD-275-258-FXP
62LHDRFX	P-RD-279-260-FX	27.875	26	25.0	27.0	2.2	1.6	5.8	62LHDRFXP	P-RD-279-260-FXP
62LHDRFX	P-RD-290-270-FX	29	27	26.5	28.5	2.4	1.7	6.1	62LHDRFXP	P-RD-290-270-FXP
62LHDRFX	P-RD-288-271-FX	28.75	27.125	26.5	28.5	2.4	1.7	6.1	62LHDRFXP	P-RD-288-271-FXP
62LHDRFX	P-RD-318-300-FX	31.75	30	29.5	31.5	3.0	1.9	6.8	62LHDRFXP	P-RD-318-300-FXP
62LHDRFX	P-RD-319-300-FX	31.87	30	29.5	31.5	3.0	1.9	6.8	62LHDRFXP	P-RD-319-300-FXP
62LHDRFX	P-RD-320-300-FX	32	30	29.5	31.5	3.0	1.9	6.8	62LHDRFXP	P-RD-320-300-FXP
62LHDRFX	P-RD-323-303-FX	32.25	30.25	29.5	31.5	3.1	1.9	6.8	62LHDRFXP	P-RD-323-303-FXP
62LHDRFX	P-RD-341-315-FX	34.125	31.5	31.3	33.3	3.3	2.0	7.2	62LHDRFXP	P-RD-341-315-FXP
62LHDRFX	P-RD-341-323-FX	34.125	32.25	32.0	34.0	3.5	2.0	7.4	62LHDRFXP	P-RD-341-323-FXP
62LHDRFX	P-RD-343-323-FX	34.25	32.25	32.0	34.0	3.5	2.0	7.4	62LHDRFXP	P-RD-343-323-FXP
62LHDRFX	P-RD-341-325-FX	34.125	32.5	32.0	34.0	3.5	2.0	7.4	62LHDRFXP	P-RD-341-325-FXP
62LHDRFX	P-RD-360-340-FX	36	34	33.5	35.5	3.9	2.1	7.8	62LHDRFXP	P-RD-360-340-FXP
62LHDRFX	P-RD-380-360-FX	38	36	35.5	37.5	4.4	2.3	8.2	62LHDRFXP	P-RD-380-360-FXP



NOTES:

1. RATINGS SHOWN ARE FOR STANDARD 22" BAG DEPTH; "SHORT" 12" DEPTH BAGS ARE AVAILABLE WITH -S SUFFIX; RATINGS REDUCED BY ~50%.

2. THE FOLLOWING REQUIRES ADDITIONAL REVIEW

-GRATES WITH EXTENDED BOTTOMS

-ANY OBSTRUCTED INLET OPENINGS

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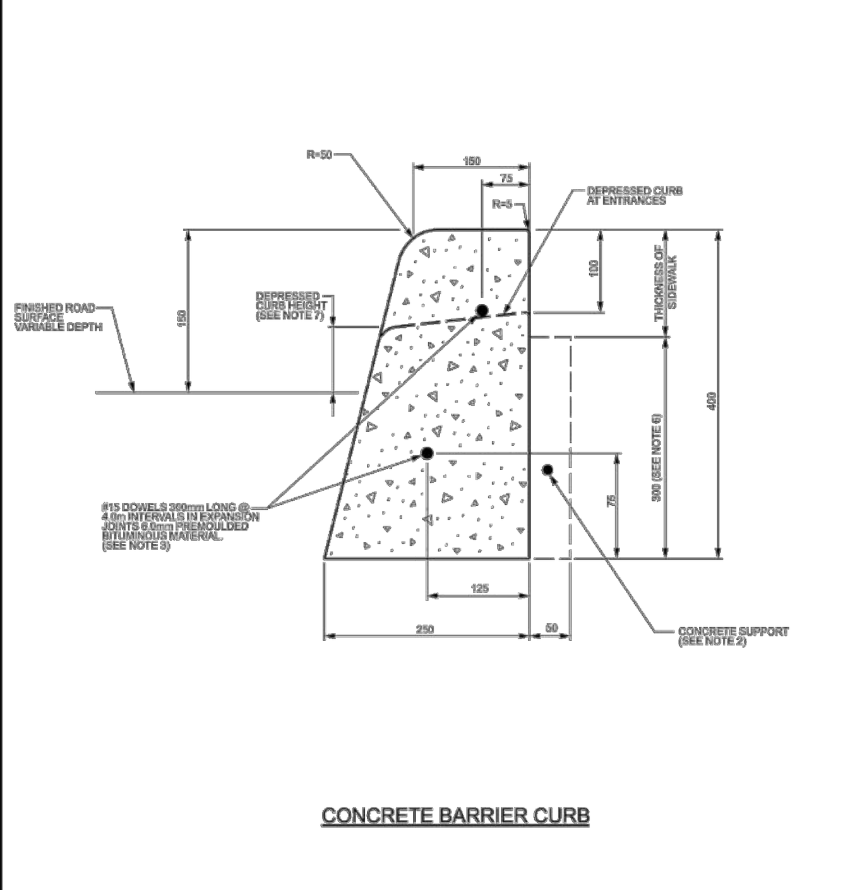
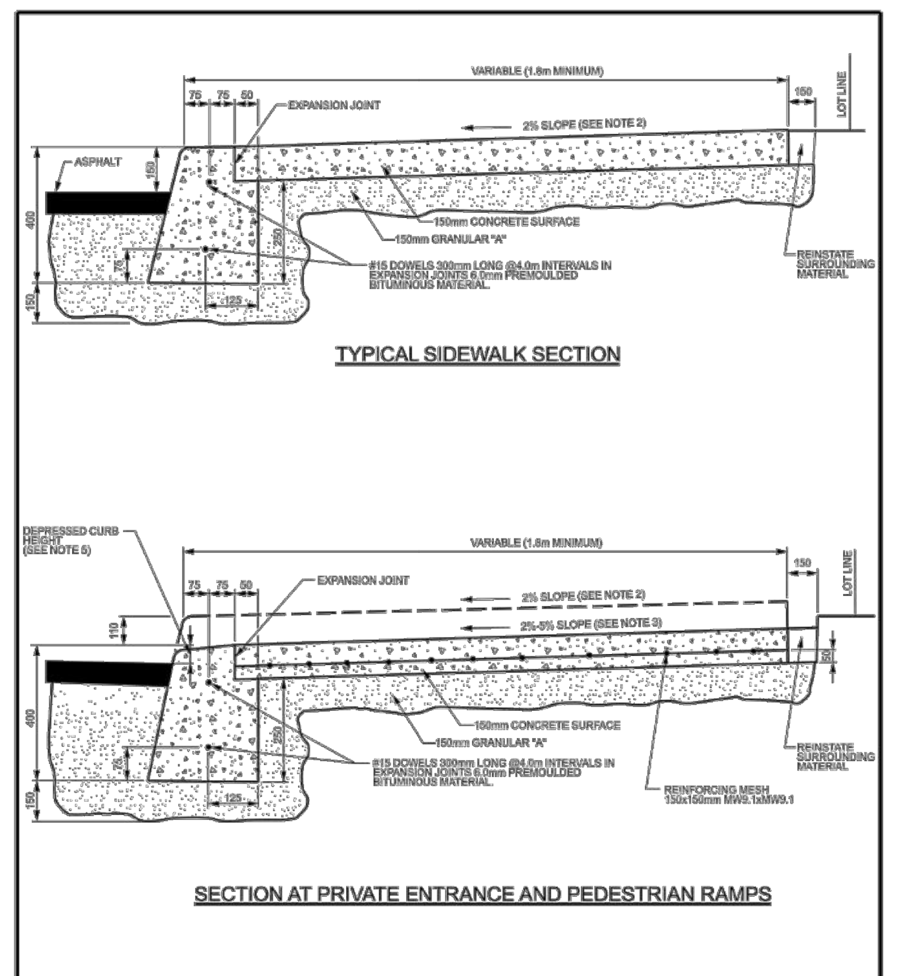
SIZE C | FRAME TYPE HDR | DWG NO RD-62LHDR-FX | REV A | SHEET 1 OF 1



NOTES:
1. THE FULL CURB DEPTH SHALL BE CARRIED THROUGH THE DEPRESSED ACCESS CROSSING.
2. A CONCRETE SUPPORT IS REQUIRED WHEN BUILT ADJACENT TO THE SIDEWALK.
3. IF AN EXTRUSION CURBING MACHINE IS USED, THE EXPANSION BITUMINOUS MATERIAL AND THE #15 DOWELS ARE TO BE PLACED AT THE END OF THE EXTRUSION.
4. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
5. DUMMY JOINTS SHALL BE 25mm DEEP, FRONT, BACK AND TOP OF SECTION AT 4m SPACING OR MATCH JOINTING WHERE SIDEWALK IS ADJACENT.
6. FOR DEPRESSED CURB AT ENTRANCES USE 250.
7. DEPRESSED CURB HEIGHT - FOR PEDESTRIAN CURB RAMPS 0 TO 6 mm AND FOR PRIVATE ENTRANCES 0 TO 13mm.

N.T.S.

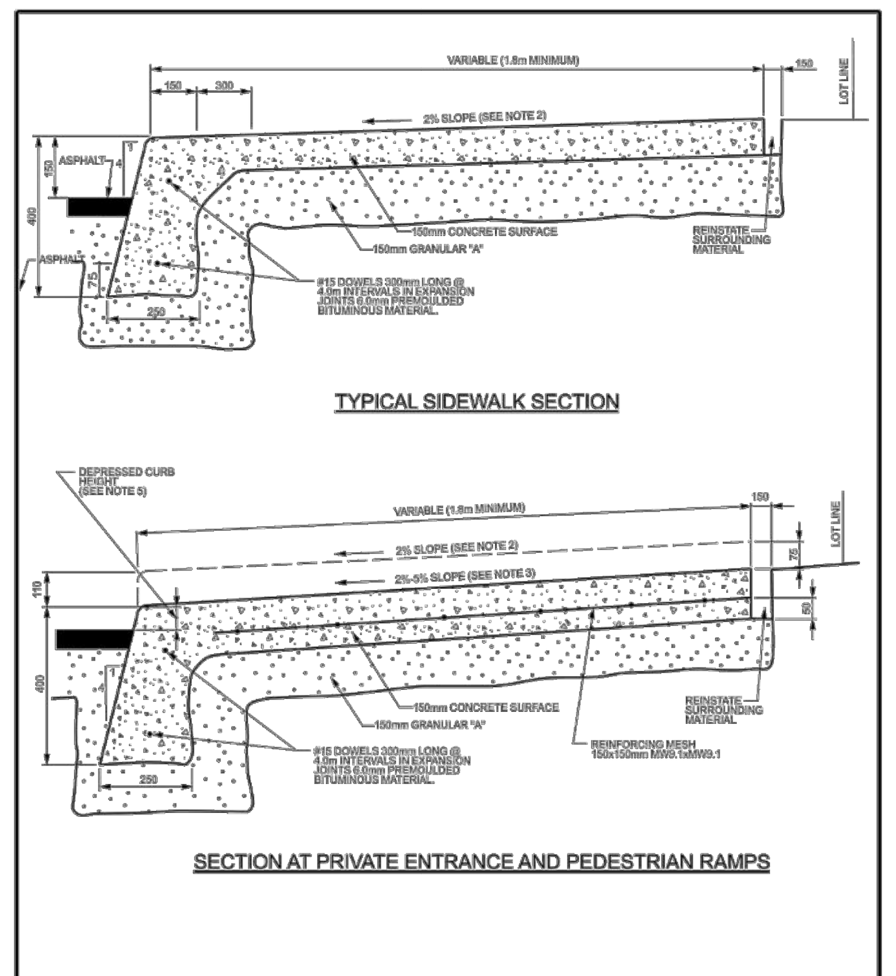
Ottawa — CONCRETE BARRIER CURB FOR GRANULAR BASE PAVEMENT (MODIFIED OPSD-600.110) — DATE: JANUARY 2003 — REV. DATE: MARCH 2021 — DWG. No.: SC1.1



NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
2. THE MAXIMUM SLOPE IS NOT TO EXCEED 2%.
3. FOR CURB RAMPS, SLOPE OF 2% TO 5%, MAXIMUM 8%..
4. EXPANSION AND DUMMY JOINTS AS PER SC5.
5. DEPRESSED CURB HEIGHT - FOR PEDESTRIAN CURB RAMPS 0 TO 6 mm AND FOR PRIVATE ENTRANCES 0 TO 13mm.

N.T.S.

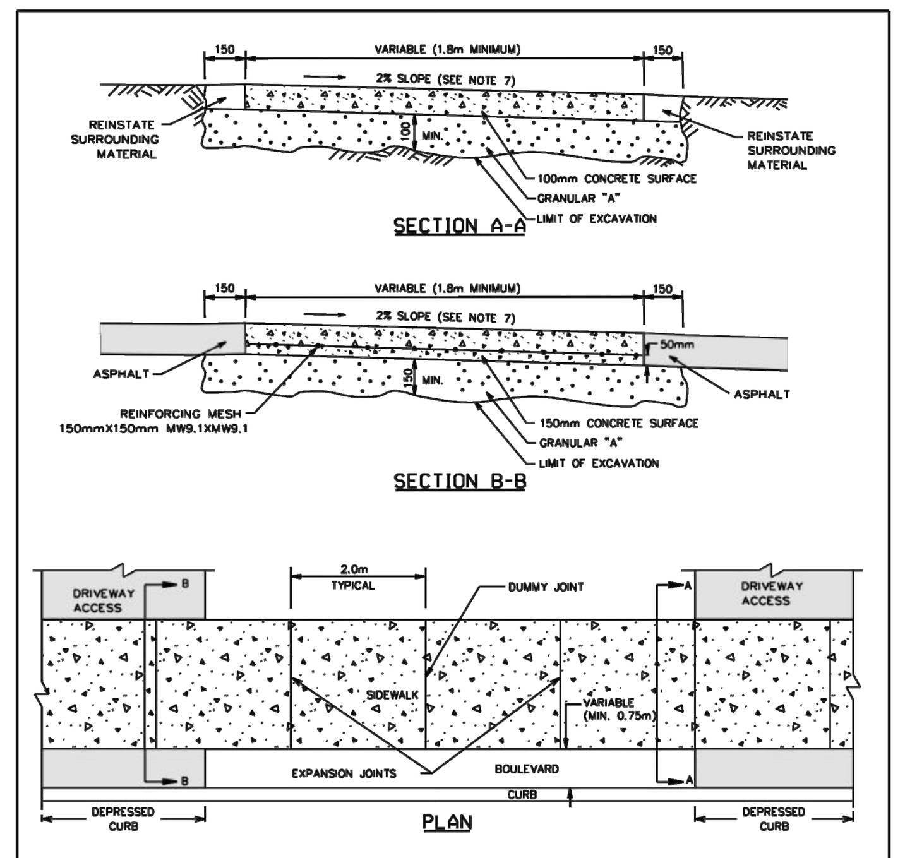
Ottawa — CONCRETE BARRIER CURB WITH SIDEWALK — DATE: JANUARY 2003 — REV. DATE: MARCH 2021 — DWG. No.: SC1.4



NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
2. THE MAXIMUM SLOPE IS NOT TO EXCEED 2%.
3. FOR CURB RAMPS, SLOPE OF 2% TO 5%, MAXIMUM 8%..
4. EXPANSION AND DUMMY JOINTS AS PER SC5.
5. DEPRESSED CURB HEIGHT - FOR PEDESTRIAN CURB RAMPS 0 TO 6 mm AND FOR PRIVATE ENTRANCES 0 TO 13mm.

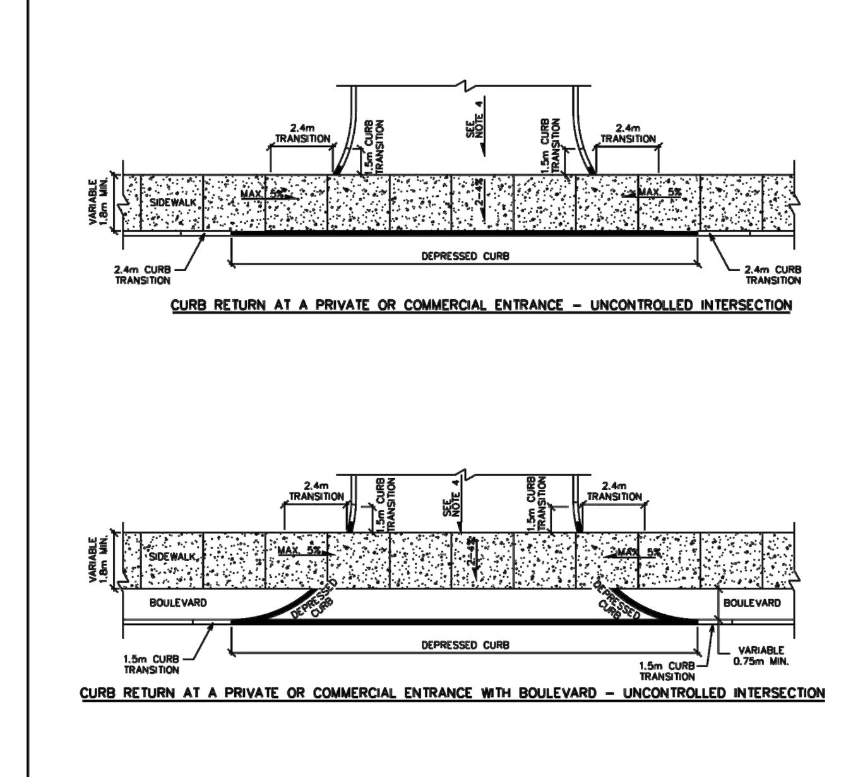
N.T.S.

Ottawa — MONOLITHIC CONCRETE CURB AND SIDEWALK — DATE: MAY 2001 — REV. DATE: MARCH 2021 — DWG. No.: SC2



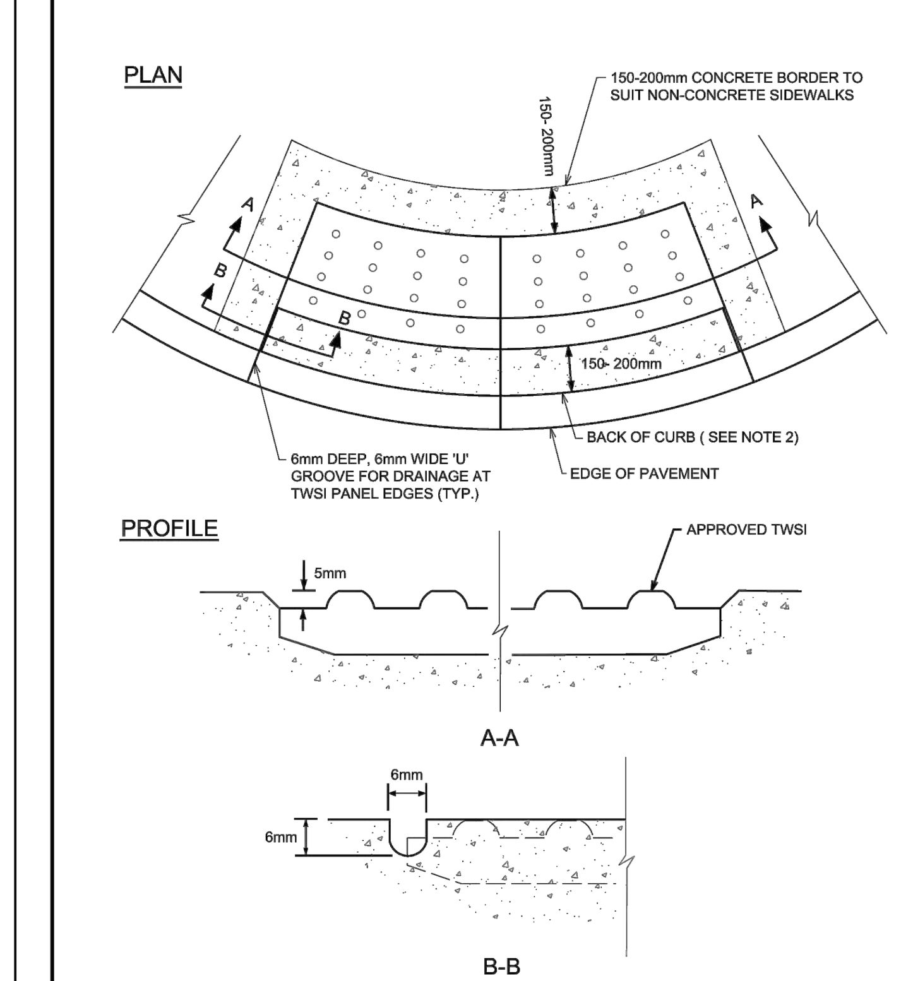
NOTES:
1. CONCRETE AND GRANULAR "A" IS TO BE INCREASED TO 150mm AT THE ENTRANCE AND 150x150mm MW9.1 x MW9.1 REINFORCING MESH IS TO BE PLACED MID DEPTH WITHIN DRIVEWAY ACCESS.
2. TRANSVERSE EXPANSION JOINTS ARE REQUIRED AT THE ENDS, THE MIDPOINT, AT INTERVALS OF 4m MAXIMUM, AND ALSO TO ISOLATE OBSTRUCTIONS FROM SIDEWALK, HYDRANTS, POLES, BUILDINGS, ETC.
3. WHEN THE OVERALL SIDEWALK WIDTH EXCEEDS 2.5m, A LONGITUDINAL CONSTRUCTION JOINT SHALL BE CREATED AT ITS MIDPOINT.
4. EDGES AND JOINTS ARE TO BE FINISHED WITH A 75mm EDGING TOOL.
5. ALL CONCRETE SIDEWALKS ARE TO HAVE A BROOM FINISH UNLESS OTHERWISE SPECIFIED.
6. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
7. THE MAXIMUM SLOPE IS NOT TO EXCEED 2%
8. INSTALL DUMMY TRANSVERSE JOINTS AS REQUIRED SO THERE IS A MAXIMUM SPACING OF 2m BETWEEN ALL JOINTS.
9. SIDEWALK NOT TO BE DEPRESSED ACROSS DRIVEWAY ACCESSES.
10. EXPANSION AND DUMMY JOINTS AS PER SC5

Ottawa — TYPICAL CONCRETE SIDEWALK IN BOULEVARD — DATE: MAY 2001 — REV. DATE: MARCH 2016 — DWG. No.: SC4



NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
2. CURB DETAILS SEE SC1.1, SC1.2 AND SC1.3.
3. SIDEWALK DETAILS SEE SC2 AND SC3.
4. MAXIMUM SLOPE VARIES, SEE PRIVATE APPROACH BYLAW.
5. UNCONTROLLED INTERSECTION MEANS AN ENTRANCE NOT LOCATED AT A TRAFFIC SIGNAL OR ALL-WAY STOP CONTROL.

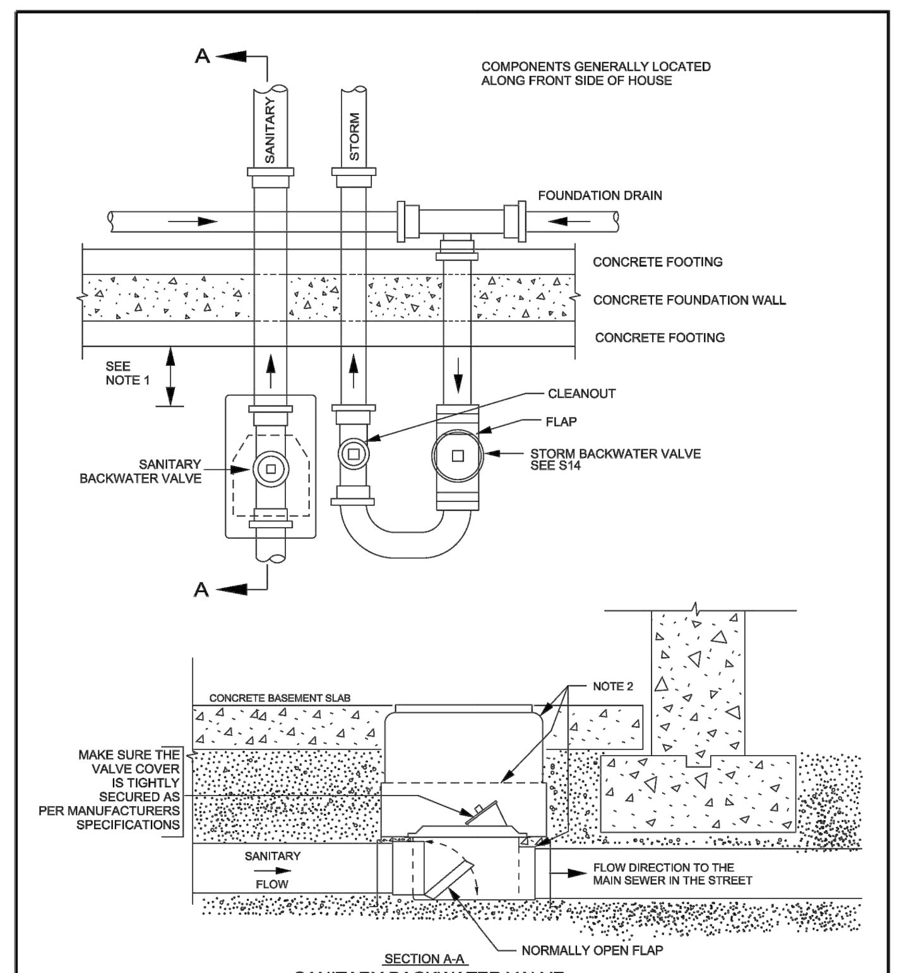
Ottawa — CURB RETURN ENTRANCES - UNCONTROLLED INTERSECTIONS — DATE: MARCH 2007 — REV. DATE: MARCH 2021 — DWG. No.: SC7.1



NOTES:
1. TOPS OF TWSI'S (TACTILE WALKING SURFACE INDICATOR) SHALL BE ALIGNED & LEVEL WITH THE ADJACENT CONCRETE SURFACE & INSTALLATION IN WET CONCRETE SHALL BE EFFECTIVE IN PERMANENTLY SECURING THE TWSI IN PLACE ONCE DRY.
2. FOR MONOLITHIC SIDEWALKS, TWSI SHALL BE 300 TO 350mm BACK FROM THE CURB FACE.

N.T.S.

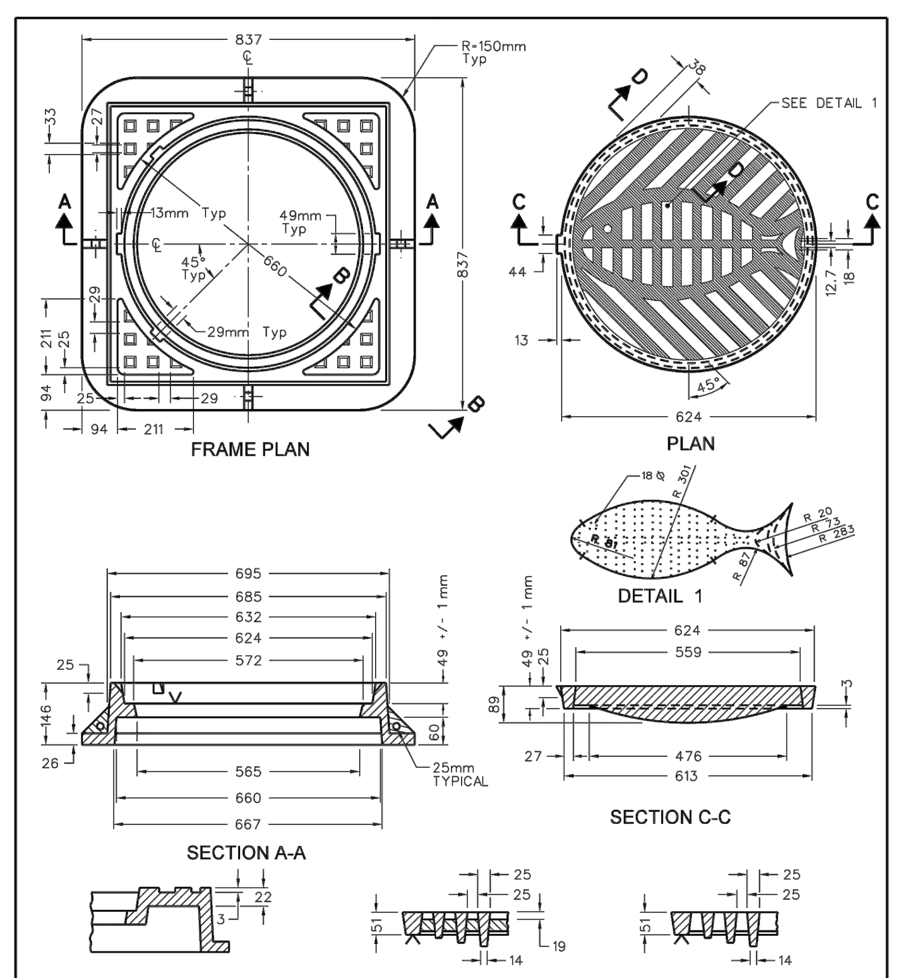
Ottawa — TWSI DETAIL — DATE: MARCH 2015 — REV. DATE: MARCH 2016 — DWG. No.: SC7.3



NOTES:
1. BACKWATER VALVE, CLEAN-OUTS AND ANY OTHER FITTINGS MUST BE INSTALLED A MINIMUM OF 300mm INSIDE OF THE BASEMENT FOOTING. THIS IS TO ENSURE THERE IS SUFFICIENT ROOM TO REPLACE THESE COMPONENTS IN THE FUTURE WITHOUT HAVING TO DAMAGE THE FOOTING/WALL DURING THE PROCESS
2. JOINTS BETWEEN THE ACCESS BOX SECTIONS AND THE ACCESS BOX AND THE BACKWATER VALVE AND THE FLOOR SLAB SHALL BE SEALED.

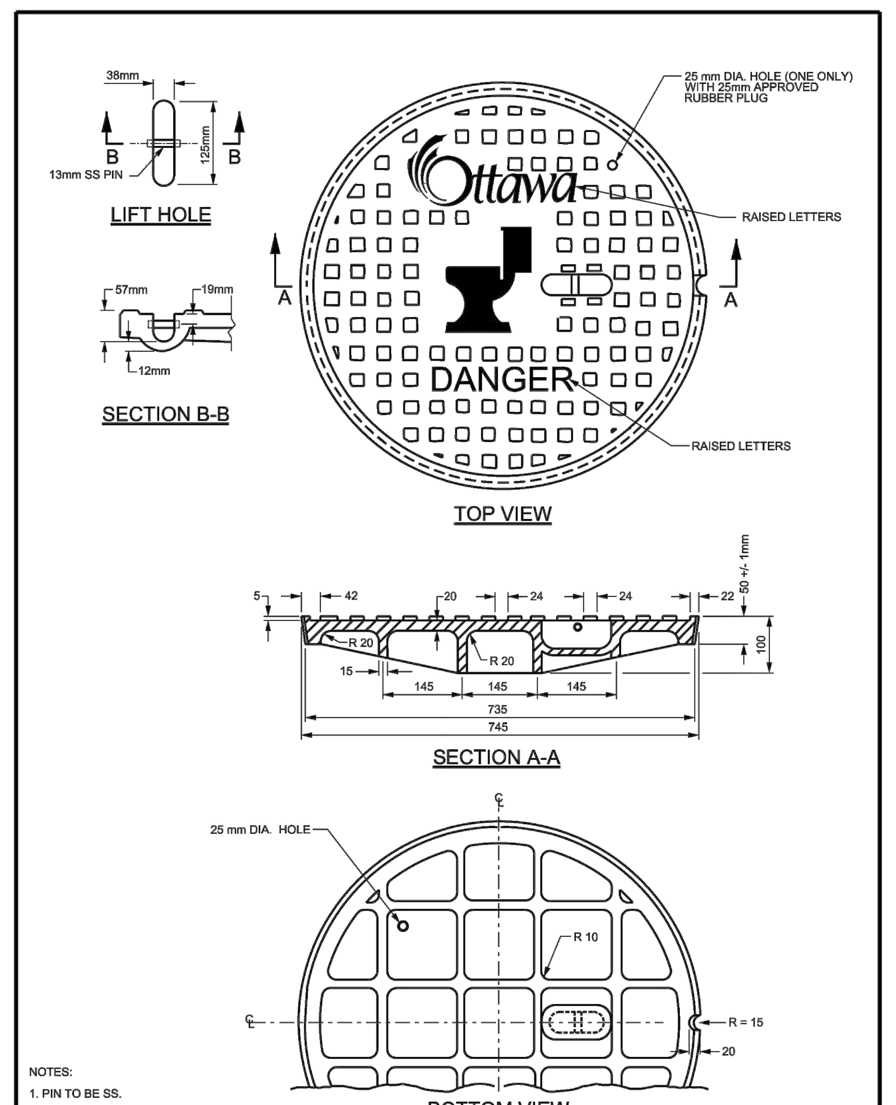
N.T.S.

Ottawa — SANITARY BACKWATER VALVE INSTALLATION TYPE 1 — DATE: MARCH 2010 — REV. DATE: MARCH 2011 — DWG. No.: S14.1



NOTES:
1. ALL DIMENSIONS SHOWN ARE FOR FINISHED CASTINGS ONLY. PATTERN MAKERS AND CASTING SHOP SHOULD MAKE ALLOWANCES ACCORDINGLY.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
3. FOR NEW CONSTRUCTION WHERE SURFACE INLETS ARE SPECIFIED.
4. COMPANIES WITH GRATE DIMENSIONS NOT EXACTLY THE SAME AS SHOWN ABOVE WILL ALSO BE CONSIDERED.
5. ALTERNATE SOLID COVER TO HAVE EYE 25mm Dia. HOLE WITH 25mm APPROVED PLUG

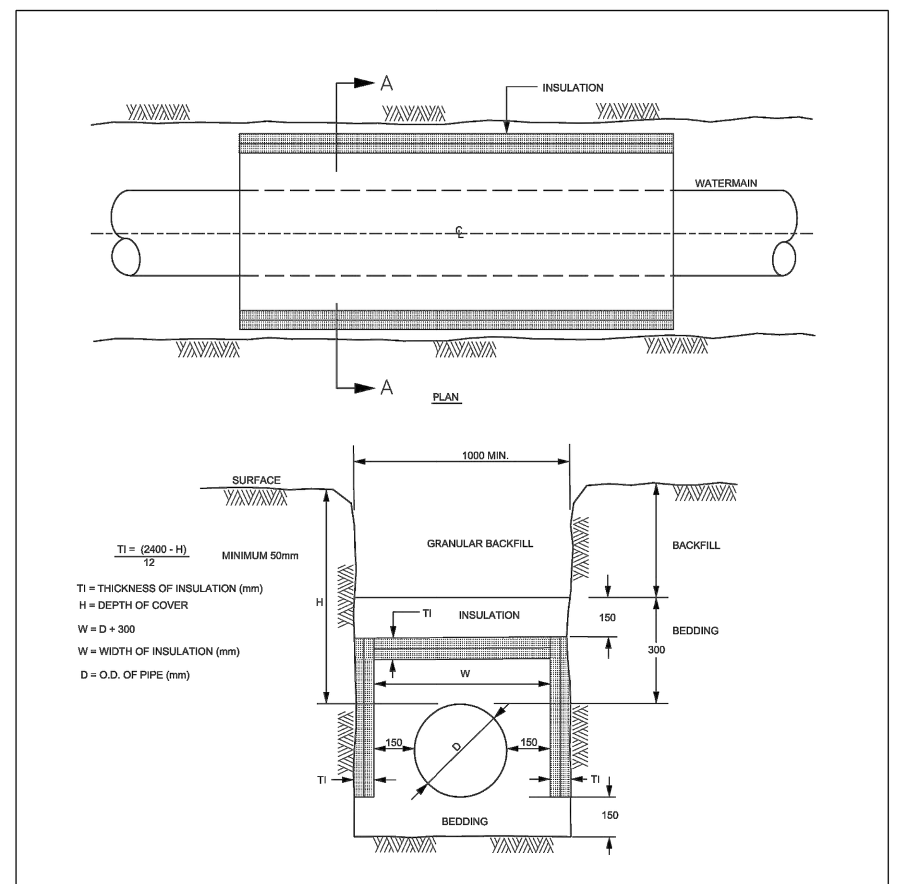
Ottawa — HEAVY DUTY "FISH" TYPE ROUND CATCH BASIN COVER (MODIFIED OPSD-400.07) — DATE: MAY 2005 — REV. DATE: MARCH 2017 — DWG. No.: S19



NOTES:
1. PIN TO BE SS.
2. FOR FRAME DETAIL SEE DWG No. S25.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.

N.T.S.

Ottawa — STANDARD CIRCULAR SANITARY & COMBINED MAINTENANCE HOLE COVER — DATE: MARCH 2008 — REV. DATE: MARCH 2017 — DWG. No.: S24

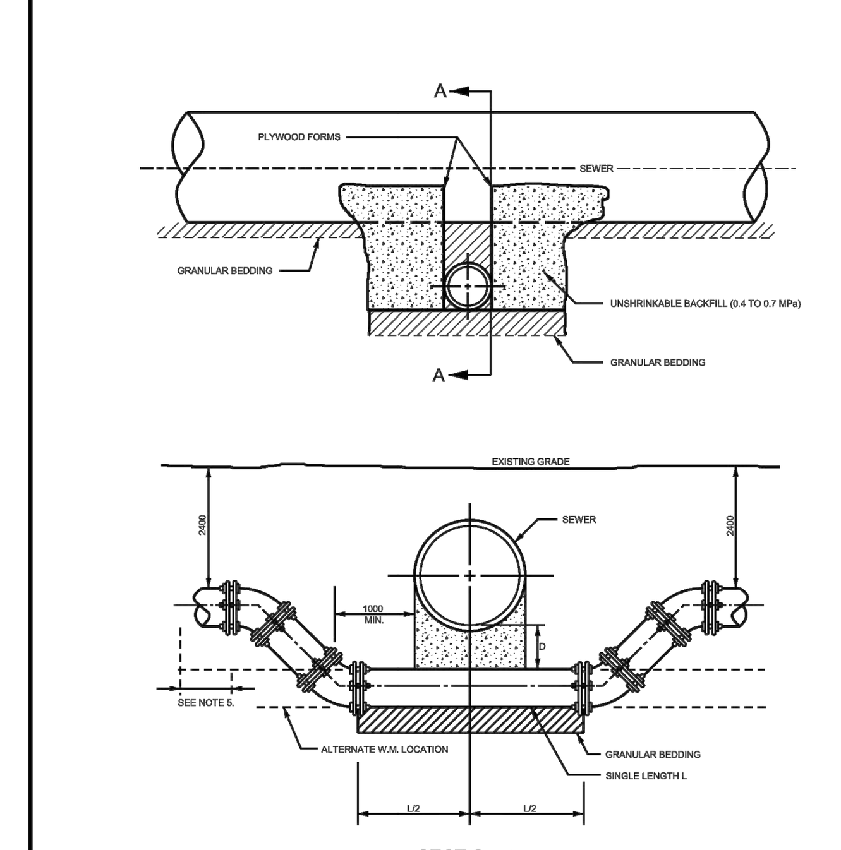


NOTES

FOR 150 - 400mm (NOMINAL DIAMETER) WATERMAINS, WHERE THE DEPTH OF COVER IS LESS THAN 2400mm

1. INCREMENTS OF THICKNESS SHALL BE ADJUSTABLE TO 25mm.
2. IN PROXIMITY OF MAINTENANCE HOLES, CULVERTS, CATCHBASINS, ETC., INSULATION SHALL BE PLACED PER DETAIL W23
3. DEPTH OF COVER LESS THAN 1200mm REQUIRES SPECIAL DESIGN
4. STAGGER JOINTS OF MULTIPLE SHEETS.
5. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.

Ottawa — THERMAL INSULATION FOR WATERMAINS IN SHALLOW TRENCHES — DATE: MAY 2001 — REV. DATE: MARCH 2013 — DWG. No.: W22

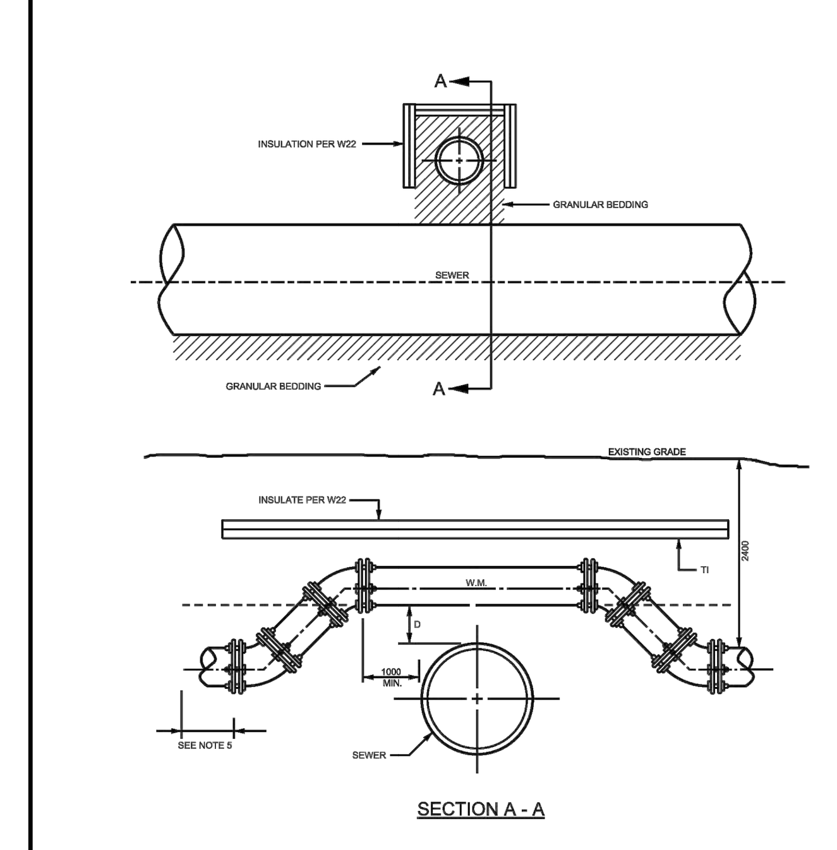


NOTES:

FOR WATERMAIN 100mm (NOMINAL) TO 400mm (NOMINAL)

1. BARREL TO INVERT SEPARATION (D) SHALL BE 500mm MINIMUM.
2. THRUST BLOCKS FOR MAINS LARGER THAN 400mm (NOMINAL) SHALL BE PER SPECIAL DESIGN.
3. FOR 300mm (NOMINAL) AND 400mm (NOMINAL) MAINS, BENDS SHALL BE MAX. 22° 30'.
4. CONCRETE FOR THRUST BLOCKS SHALL BE 20 MPa.
5. REFER TO W25.6 FOR RESTRAINED LENGTH REQUIREMENTS.
6. REFER TO W25.3 AND W25.4 FOR THRUST BLOCK REQUIREMENTS.
7. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
8. DESIGNED TO MEET THE INTENT OF THE MOE WATERMAIN DESIGN CRITERIA JUNE 2012.
9. CATHODIC PROTECTION MEASURES SHALL BE INSTALLED IN ACCORDANCE WITH W39, W40, AND W42.
10. TRACER WIRE REQUIRED FOR PVC, PEX AND HDPE WATERMAIN PIPE ONLY AS PER W36.

Ottawa — WATERMAIN CROSSING BELOW SEWER — DATE: MAY 2001 — REV. DATE: MARCH 2021 — DWG. No.: W25



NOTES:

FOR WATERMAIN 100mm (NOMINAL) TO 400mm (NOMINAL)

1. BARREL TO BARREL SEPARATION (D) SHALL BE 250mm MINIMUM.
2. THRUST BLOCKS FOR MAINS LARGER THAN 400mm (NOMINAL) SHALL BE PER SPECIAL DESIGN.
3. FOR 300mm (NOMINAL) AND 400mm (NOMINAL) MAINS, BENDS SHALL BE MAX. 22° 30'.
4. CONCRETE FOR THRUST BLOCKS SHALL BE 20 MPa.
5. REFER TO W25.6 FOR RESTRAINED LENGTH REQUIREMENTS.
6. REFER TO W25.3 AND W25.4 FOR THRUST BLOCK REQUIREMENTS.
7. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
8. DESIGNED TO MEET THE INTENT OF THE MOE WATERMAIN DESIGN CRITERIA JUNE 2012.
9. CATHODIC PROTECTION MEASURES SHALL BE INSTALLED IN ACCORDANCE WITH W39, W40, AND W42.
10. TRACER WIRE REQUIRED FOR PVC, PEX AND HDPE WATERMAIN PIPE ONLY AS PER W36.

Ottawa — WATERMAIN CROSSING OVER SEWER — DATE: MAY 2001 — REV. DATE: MARCH 2021 — DWG. No.: W25.2

Stantec

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Tel. 613.722.4420
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Legend

- PROPOSED SILT FENCE BOUNDARY AS PER OPSD 219.110
- PROPOSED CATCH BASIN PROTECTION AS PER FLEX STORM INLET FILTERS DETAIL. ITEM CODE P-RD-240-223-FX
- PROPOSED CATCH BASIN MH PROTECTION AS PER FLEX STORM INLET FILTERS DETAIL. ITEM CODE P-RD-290-270-FX
- PROPOSED CATCH BASIN PROTECTION AS PER TERRAFIX SILTSACK DETAIL
- PROPOSED MUD MAT LOCATION
- PROPOSED VALVE BOX
- PROPOSED VALVE CHAMBER
- PROPOSED FIRE HYDRANT
- PROPOSED SANITARY SEWER MANHOLE
- PROPOSED STORM SEWER MANHOLE
- PROPOSED CATCHBASIN

Best Management Practices

CONTRACTOR TO PROVIDE EROSION AND SEDIMENT CONTROLS (BEST MANAGEMENT PRACTICES) DURING CONSTRUCTION OF THIS PROJECT.

EROSION MUST BE MINIMIZED AND SEDIMENTS MUST BE REMOVED FROM CONSTRUCTION SITE RUN-OFF IN ORDER TO PROTECT DOWNSTREAM AREAS. DURING ALL CONSTRUCTION, EROSION AND SEDIMENTATION SHOULD BE CONTROLLED BY THE FOLLOWING TECHNIQUES:

1. LIMIT THE EXTENT OF EXPOSED SOILS AT ANY GIVEN TIME.
2. REVEGETATE EXPOSED AREAS AND SLOPES AS SOON AS POSSIBLE.
3. MINIMIZE AREA TO BE CLEARED AND GRUBBED.
4. PROTECT EXPOSED SLOPES WITH PLASTIC OR SYNTHETIC MULCHES.
5. INSTALL CATCH BASIN INSERTS OR EQUIVALENT IN ALL PROPOSED CATCH BASINS AND CATCH BASIN MANHOLES AND IN ALL EXISTING CATCH BASINS THAT WILL RECEIVE RUN-OFF FROM THE SITE.
6. A SILT FENCE SHALL BE INSTALLED AROUND THE PERIMETER OF ALL AND ANY STOCKPILES OF MATERIAL TO BE USED OR REMOVED FROM SITE. (LOCATION TO BE DETERMINED)
7. A VISUAL INSPECTION SHALL BE DONE DAILY ON SEDIMENT CONTROL MEASURES AND CLEANED OF ANY ACCUMULATED SILT AS REQUIRED. THE DEPOSITS WILL BE DISPOSED OFF SITE AS PER THE REQUIREMENTS OF THE CONTRACT.
8. SEDIMENT CONTROL BARRIERS MAY ONLY BE REMOVED TEMPORARILY WITH APPROVAL OF CONTRACT ADMINISTRATOR TO ACCOMMODATE CONSTRUCTION OPERATIONS. ALL AFFECTED BARRIERS MUST BE REINSTATED AT NIGHT WHEN CONSTRUCTION IS COMPLETED. NO REMOVAL WILL OCCUR IF THERE IS A SIGNIFICANT RAINFALL EVENT ANTICIPATED (>10mm) UNLESS A NEW DEVICE HAS BEEN INSTALLED TO PROTECT EXISTING STORM AND SANITARY SEWER SYSTEMS, OR DOWNSTREAM WATERCOURSES.
9. NO REFUELING OR CLEANING OF EQUIPMENT IS PERMITTED NEAR ANY EXISTING WATERWAY.
10. CONTRACTOR SHALL REMOVE SEDIMENT CONTROL MEASURES WHEN, IN THE OPINION OF THE CONTRACT ADMINISTRATOR, THE MEASURE(S) IS NO LONGER REQUIRED. NO CONTROL MEASURES SHALL BE PERMANENTLEY REMOVED WITHOUT PRIOR WRITTEN AUTHORIZATION FROM THE CONTRACT ADMINISTRATOR.
11. THE CONTRACTOR SHALL PERIODICALLY, OR WHEN REQUESTED BY THE CONTRACT ADMINISTRATOR, CLEAN OUT ACCUMULATED SEDIMENTS AS REQUIRED.
12. THE CONTRACTOR SHALL IMMEDIATELY REPORT TO THE ENGINEER ANY ACCIDENTAL DISCHARGES OF SEDIMENT MATERIAL INTO THE WATERCOURSE. APPROPRIATE RESPONSE MEASURES, INCLUDING ANY REPAIRS TO EXISTING CONTROL MEASURES OR THE IMPLEMENTATION OF ADDITIONAL CONTROL MEASURES, SHALL BE CARRIED OUT BY THE CONTRACTOR WITHOUT DELAY.
13. CONTRACTOR SHALL INSTALL MUD MATS AT BOTH ENTRANCES TO THE SITE.
14. STORMWATER SWALES TO BE COVERED WITH HYDRO-SEED AND MULCH.

Revision		By	Appd.	YY.MM.DD
4	REVISED AS PER CITY COMMENTS	MJS	NC	22.12.22
3	REVISED AS PER CITY COMMENTS	MJS	NC	22.10.27
2	REVISED AS PER CITY COMMENTS	MJS	NC	22.08.03
1	ISSUED FOR GEOTECH REVIEW	MJS	DT	22.07.11
0	ISSUED FOR SPA	MJS	DT	22.03.28

File Name: 160401727 DB.dwg	Dwn.	Chkd.	Dsgn.	YY.MM.DD
	MJS	PM	MJS	22.02.14

Permit-Seal

Client/Project
BAYVIEW STITTSVILLE INC.

THE LANDING ON MAIN
1364-1370 STITTSVILLE MAIN STREET
STITTSVILLE, ON, CANADA

Title
EROSION CONTROL PLAN AND DETAIL SHEET

Project No. 160401727 | Scale

Drawing No. ECDS-1 | Sheet 5 of 8 | Revision 4

D07-12-22-0059

PLAN # 18744

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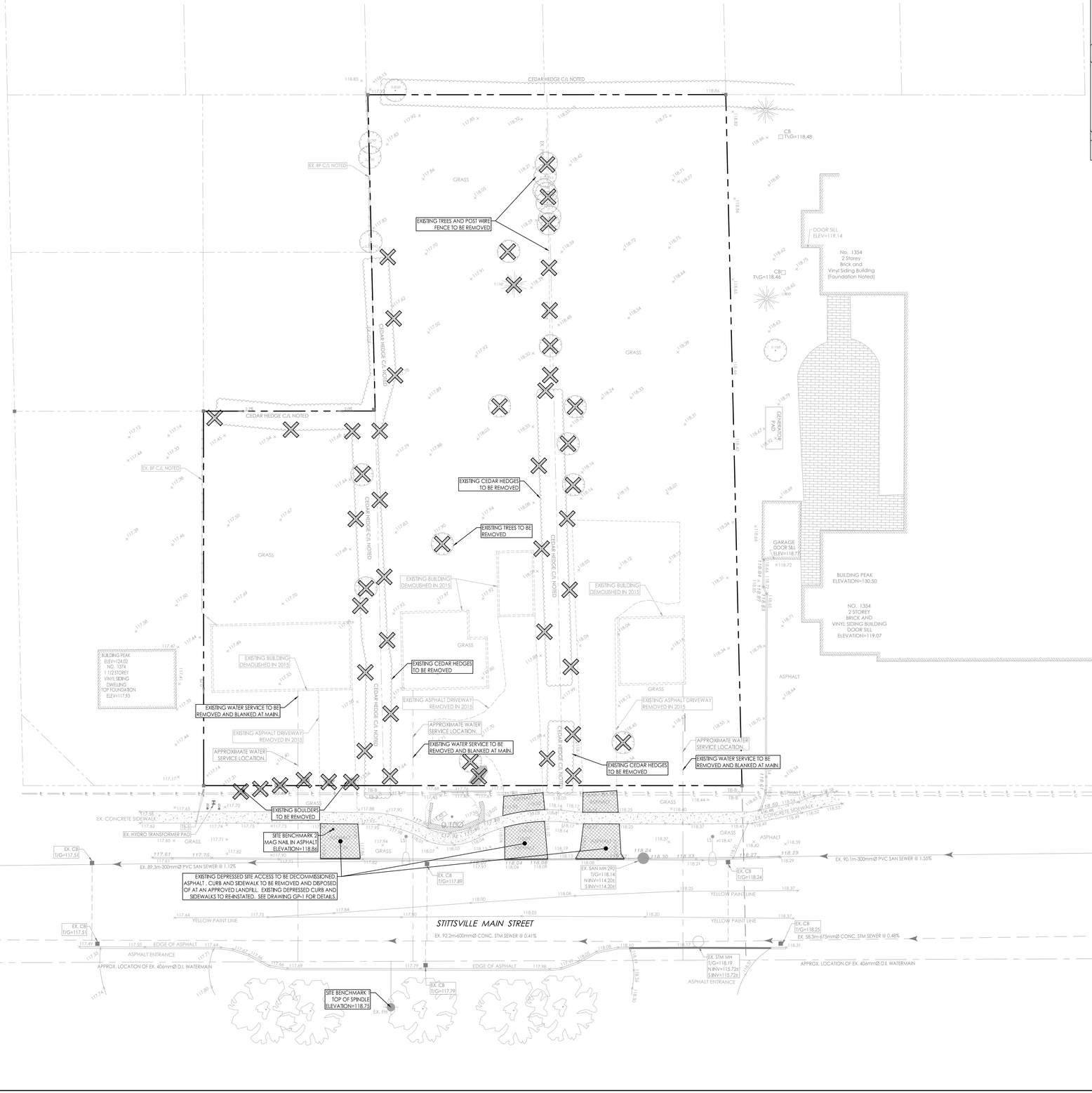

KEY PLAN
N.T.S.

Legend

- EXISTING WATERMAIN
- EXISTING VALVE AND VALVE BOX
- EXISTING VALVE CHAMBER
- EXISTING REDUCER
- EXISTING FIRE HYDRANT
- EXISTING SANITARY MH AND SEWER
- EXISTING STORM MH AND SEWER
- EXISTING CATCHBASIN MANHOLE
- EXISTING CATCHBASIN
- REMOVAL ITEMS
- ASPHALT REMOVAL

Notes

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4	REVISED AS PER CITY COMMENTS	MJS	NC	22.12.22
3	REVISED AS PER CITY COMMENTS	MJS	NC	22.10.27
2	REVISED AS PER CITY COMMENTS	MJS	NC	22.08.03
1	ISSUED FOR GEOTECH REVIEW	MJS	DT	22.07.11
0	ISSUED FOR SPA	MJS	DT	22.03.28
Revision		By	Appd.	YY.MM.DD

File Name: 160401727 D8.dwg	MJS	PM	MJS	22.02.14
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project
BAYVIEW STITTSVILLE INC.

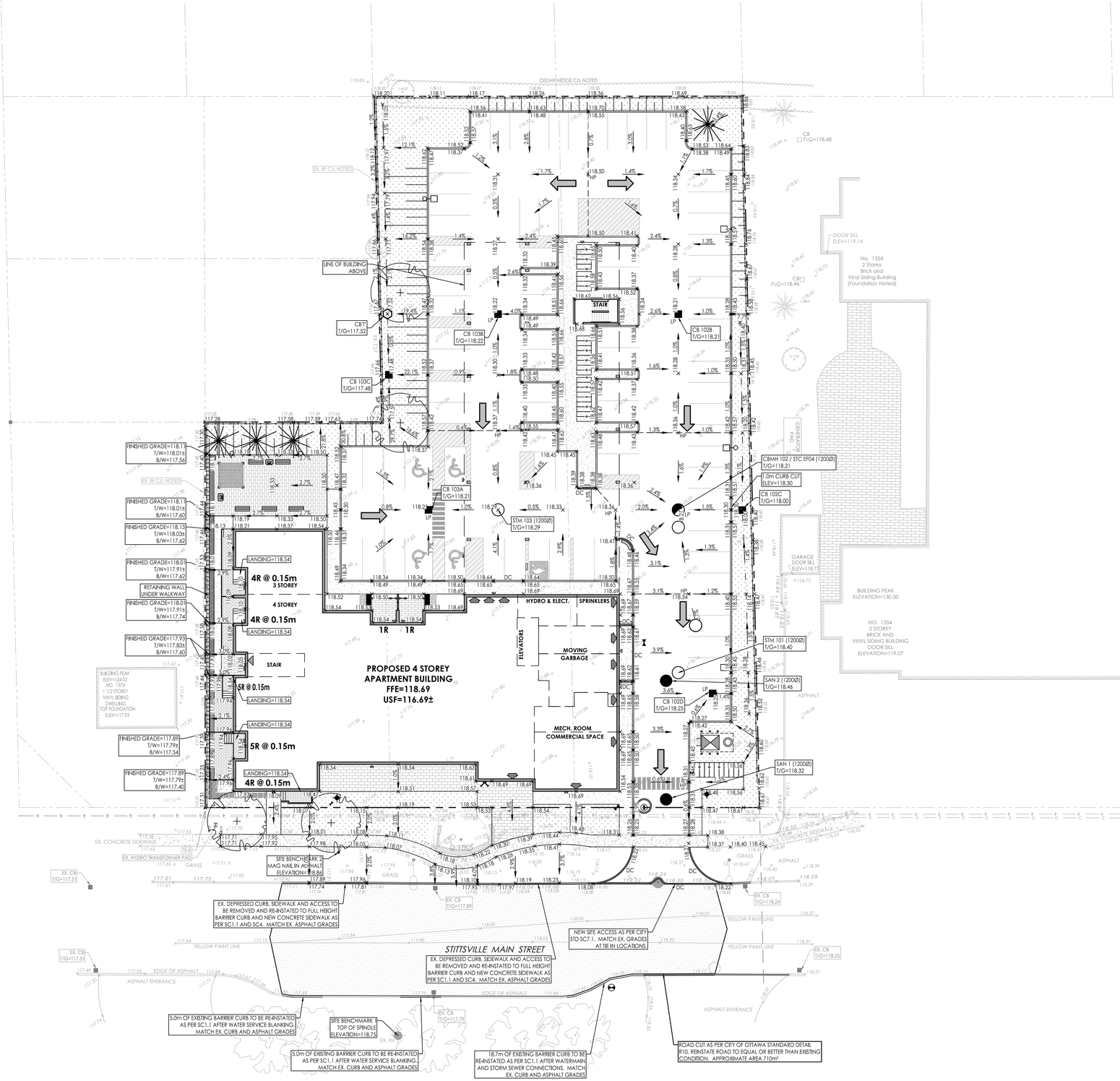
THE LANDING ON MAIN
1364-1370 STITTSVILLE MAIN STREET
STITTSVILLE, ON, CANADA

Title
EXISTING CONDITIONS AND REMOVALS PLAN

Project No.	Scale	Revision
160401727	1:250 (0 2.5 7.5 12.5m)	
Drawing No.	Sheet	
EX/RM-1	2 of 8	4

PLAN # 18744

D07-12-22-0059



Stantec

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Tel. 613.722.4420
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Legend

- 99.99 — ORIGINAL GROUND ELEVATION
- 99.99 — PROPOSED ELEVATION
- 99.99 / 99.88 — PROPOSED LOT CORNER ELEVATION / EXISTING ELEVATION AT LOT CORNER
- 2.0% — FLOW DIRECTION AND GRADE
- FFE=100.00 — FINISHED FIRST FLOOR ELEVATION
- USF=97.00 — UNDERSIDE OF FOOTING ELEVATION
- E.F. — ENGINEERED FILL REQUIRED
- 3:1 — TERRACING 3:1 SLOPE MAXIMUM (UNLESS OTHERWISE SHOWN)
- DIRECTION OF OVERLAND FLOW
- PROPOSED VALVE BOX
- PROPOSED VALVE CHAMBER
- PROPOSED FIRE HYDRANT
- PROPOSED SANITARY SEWER MANHOLE
- PROPOSED STORM SEWER MANHOLE
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN
- D.C. — PROPOSED DEPRESSED CURB LOCATION
- PROPOSED BARRIER CURB
- PROPOSED ASPHALT ACCESS LANES
- OVERLAND SPILL LOCATION
- TWSI LOCATION AS PER CITY STD

Notes

LIGHT DUTY AREAS
50mm SUPERPAVE 12.5 ASPHALTIC CONCRETE (TRAFFIC LEVEL A OR B)
150 OPSS GRANULAR 'A' BASE
300 OPSS GRANULAR 'B' TYPE II

4	REVISED AS PER CITY COMMENTS	MJS	NC	22.12.22
3	REVISED AS PER CITY COMMENTS	MJS	NC	22.10.27
2	REVISED AS PER CITY COMMENTS	MJS	NC	22.08.03
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File Name: 160401727 D8.dwg	MJS	PM	MJS	22.02.14
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project
BAYVIEW STITTSVILLE INC.

THE LANDING ON MAIN
1364-1370 STITTSVILLE MAIN STREET
STITTSVILLE, ON, CANADA

Title
GRADING PLAN

Project No. 160401727
Scale 1:250 (0, 2.5, 7.5, 12.5m)
Drawing No. GP-1
Sheet 4 of 8
Revision 4
PLAN # 18744

D07-12-22-0059

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2023/02/01 1:26 PM By: Sharp, Mike

ORIGINAL SHEET - ARCH D

GENERAL NOTES AND SPECIFICATIONS

1. ALL MATERIALS AND CONSTRUCTION METHODS TO BE IN ACCORDANCE WITH OPS AND CITY OF OTTAWA STANDARD SPECIFICATIONS AND DRAWINGS AND OPSD SUPPLEMENT, ONTARIO PROVINCIAL STANDARDS WILL APPLY WHERE NO CITY STANDARDS ARE AVAILABLE.
2. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL PERMITS REQUIRED AND BEAR COST OF SAME INCLUDING WATER PERMIT AND ASSOCIATED COSTS.
3. SERVICE AND UTILITY LOCATIONS ARE APPROXIMATE, CONTRACTOR TO VERIFY LOCATION AND ELEVATION OF EXISTING SERVICES AND UTILITIES PRIOR TO CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING LOCATES FROM ALL UTILITY COMPANIES TO LOCATE EXISTING UTILITIES PRIOR TO EXCAVATION. THE CONTRACTOR IS RESPONSIBLE FOR PROTECTION AND REINSTATEMENT.
4. ALL DISTURBED AREAS SHALL BE REINSTATED TO EQUAL OR BETTER CONDITION TO THE SATISFACTION OF THE ENGINEER & THE CITY. PAVEMENT REINSTATEMENT FOR SERVICE AND UTILITY CUTS SHALL BE IN ACCORDANCE WITH OPSD 509.010 AND OPSS 310.
5. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE "OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATION FOR CONSTRUCTION PROJECTS". THE GENERAL CONTRACTOR SHALL BE DEEMED TO BE THE CONSTRUCTOR AS DEFINED IN THE ACT.
6. THE CONTRACTOR SHALL SUBMIT AN EROSION AND SEDIMENTATION CONTROL PLAN THAT WILL IMPLEMENT BEST MANAGEMENT PRACTICES TO PROVIDE PROTECTION FOR RECEIVING STORM SEWERS OR DRAINAGE DURING CONSTRUCTION ACTIVITIES. THIS PLAN SHALL INCLUDE BUT NOT BE LIMITED TO CATCH BASINS INSERTS, STRAW BALE CHECK DAMS AND SEDIMENT CONTROLS AROUND ALL DISTURBED AREAS, DEWATERING SHALL BE PUMPED INTO SEDIMENT TRAPS.
7. SITE PLAN PREPARED BY MATAJ ARCHITECTS INC. DATED 2022-02-09, DRAWING ASP-1 AND ASP-2, PROJECT NAME: STITTSVILLE APARTMENT BUILDING. PROJECT No. 21-061.
8. TOPOGRAPHIC SURVEY SUPPLIED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD. PROJECT No. 22570-21 Demarco Pt Lt 23 Con II T DI. TOPOGRAPHIC PLAN OF SURVEY PART OF LOT 23, CONCESSION 11 GEOGRAPHIC TOWNSHIP OF GOULBOURN, CITY OF OTTAWA.
9. REFER TO LANDSCAPE ARCHITECTURE PLAN FOR ALL LANDSCAPING FEATURES (ie. TREES, WALKWAYS, PARK DETAILS, NOISE BARRIERS, FENCES etc.)
10. GEOTECHNICAL INVESTIGATION SUBSURFACE INVESTIGATION REPORT, 1364, 1368 AND 1370 STITTSVILLE MAIN STREET, OTTAWA, ONTARIO, K2S 1V4, PREPARED BY YURI MENDEZ ENGINEERING LTD. DATED JUNE 20, 2022. REPORT No 53-BSIAR1. GEOTECHNICAL INFORMATION PRESENTED ON THESE DRAWINGS MAY BE INTERPOLATED FROM THE ORIGINAL REPORT. REFER TO ORIGINAL GEOTECHNICAL REPORT FOR ADDITIONAL DETAILS AND TO VERIFY ASSUMPTIONS MADE HEREIN.
11. STREET LIGHTING TO CITY OF OTTAWA STANDARDS.
12. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED. DIMENSIONS SHALL BE CHECKED AND VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. ANY DISCREPANCIES TO BE REPORTED IMMEDIATELY TO ENGINEER.
13. THERE WILL BE NO SUBSTITUTION OF MATERIALS UNLESS PRIOR WRITTEN APPROVAL BY THE CONTRACT ADMINISTRATOR AND DIRECTOR OF ENGINEERING HAS BEEN OBTAINED.
14. HERITAGE OPERATIONS UNIT OF THE ONTARIO MINISTRY OF CULTURE TO BE NOTIFIED IF DEEPLY BURRIED ARCHEOLOGICAL REMAINS ARE FOUND ON THE PROPERTY DURING CONSTRUCTION ACTIVITIES.

ROADWORKS

1. ALL TOPSOIL AND ORGANIC MATERIAL TO BE STRIPPED FROM WITHIN THE FULL RIGHT OF WAY PRIOR TO CONSTRUCTION.
2. SUB-EXCAVATE SOFT AREAS & FILL WITH GRANULAR 'B' COMPACTED IN 0.30m LAYERS.
3. ALL GRANULAR FOR ROADS SHALL BE COMPACTED TO A MINIMUM OF 98% STANDARD PROCTOR MAXIMUM DRY DENSITY (SPMDD).
4. ROAD SUBDRAINS SHALL BE CONSTRUCTED AS PER CITY OF OTTAWA STANDARD R1.
5. ASPHALT WEAR COURSE SHALL NOT BE PLACED UNTIL THE VIDEO INSPECTION OF SEWERS & NECESSARY REPAIRS HAVE BEEN CARRIED OUT TO THE SATISFACTION OF THE CONSULTANT.
6. CONTRACTOR TO OBTAIN A ROAD OCCUPANCY PERMIT 48 HOURS PRIOR TO COMMENCING ANY WORK WITHIN THE MUNICIPAL ROAD ALLOWANCE IF REQUIRED BY THE MUNICIPALITY. ALL WORK ON THE MUNICIPAL RIGHT OF WAY AND EASEMENTS TO BE INSPECTED BY THE MUNICIPALITY PRIOR TO BACKFILLING.
7. PAVEMENT REINSTATEMENT FOR SERVICE AND UTILITY CUTS SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD R10, AND OPSD 509.010, AND OPSS 310.
8. CONCRETE CURBS SHALL BE CONSTRUCTED AS PER CITY STANDARD SC1.1 AND SC1.3 (BARRIER OR MOUNTABLE CURB AS SHOWN ON DRAWINGS).
9. CONCRETE SIDEWALKS SHALL BE CONSTRUCTED AS PER CITY STANDARDS SC3 AND SC1.4.
10. PAVEMENT CONSTRUCTION AS PER GEOTECHNICAL INVESTIGATION SUBSURFACE INVESTIGATION REPORT, 1364, 1368 AND 1370 STITTSVILLE MAIN STREET, OTTAWA, ONTARIO, K2S 1V4, PREPARED BY YURI MENDEZ ENGINEERING LTD. DATED JUNE 20, 2022. PROJECT No. 53-BSI-R1

    PAVEMENT STRUCTURE - ACCESS LANES
    50mm SUPERPAVE 12.5 ASPHALTIC CONCRETE (TRAFFIC LEVEL A OR B)
    150 OPSS GRANULAR 'A' BASE
    300 OPSS GRANULAR 'B' TYPE II

WATER SUPPLY SERVICING

10. THE CONTRACTOR SHALL CONSTRUCT WATERMAIN, WATER SERVICES, CONNECTIONS & APPURTENANCES AS PER CITY OF OTTAWA SPECIFICATIONS & SHALL CO-ORDINATE AND PAY ALL RELATED COSTS INCLUDING THE COST OF CONNECTION, INSPECTION & DISINFECTION BY CITY PERSONNEL.
11. WATERMAIN PIPE MATERIAL SHALL BE PVC CL.150 DR18. DEFLECTION OF WATERMAIN PIPE IS NOT TO EXCEED 1/2 OF THAT SPECIFIED BY THE MANUFACTURER. PVC WATERMAINS TO BE INSTALLED WITH TRACER WIRE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD W36.
12. WATER SERVICES ARE TO BE TYPE K SOFT COPPER AS PER CITY OF OTTAWA STANDARD W26 (UNLESS OTHERWISE NOTED). WATER SERVICE TO EXTEND 1.0M BEYOND PROPERTY LINE. STAND POST TO BE INSTALLED AT PROPERTY LINE.
13. FIRE HYDRANTS TO BE INSTALLED AS PER CITY OF OTTAWA STANDARDS W18 AND W19. NEW PRIVATE HYDRANTS INSTALLED ON SITE ARE TO BE INSTALLED TO FACE STITTSVILLE MAIN STREET.
14. WATER VALVES TO BE INSTALLED AS PER CITY OF OTTAWA STANDARD W24.
15. WATERMAIN TRENCH SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. W17 UNLESS OTHERWISE SPECIFIED. BEDDING AND COVER MATERIAL AS PER SECTION 6.4 OF THE GEOTECH REPORT.
16. SERVICE CONNECTIONS SHALL BE INSTALLED A MINIMUM OF 2400mm FROM ANY CATCHBASIN, MANHOLE, OR OBJECT THAT MAY CONTRIBUTE TO FREEZING. THERMAL INSULATION SHALL BE INSTALLED ON ALL PROPOSED CBS ON THE W/M STREET SIDE WHERE 2400mm SEPARATION CANNOT BE ACHIEVED.(AS PER CITY OF OTTAWA W22 & W23)
17. CATHODIC PROTECTION TO BE SUPPLIED ON METALLIC FITTINGS AS PER CITY OF OTTAWA W40 AND W42.
18. THRUST BLOCKS TO BE INSTALLED AS PER CITY OF OTTAWA STANDARDS W25.3 AND W25.4.
19. WATERMAIN TO HAVE MIN. 2.4m COVER. WHERE WATERMAIN COVER IS LESS THAN 2.4m, INSULATION TO BE SUPPLIED IN ACCORDANCE WITH CITY STANDARD W22.
20. WATERMAIN CROSSINGS ABOVE AND BELOW SEWERS TO BE INSTALLED AS PER CITY OF OTTAWA STANDARD W25 AND W25.2.
21. PRESSURE REDUCING VALVES (PRV'S) IF REQUIRED, TO BE INSTALLED AS PER ONTARIO PLUMBING CODE.

STORM AND SANITARY SEWERS

1. SANITARY SEWERS 375mm DIA. OR SMALLER SHALL BE PVC DR35. SANITARY SEWERS LARGER THAN 375mm SHALL BE CONCRETE CSA A 257.2 CLASS 100D AS PER OPSD 807.010.
2. STORM SEWERS 375mm DIA. OR SMALLER SHALL BE PVC DR35. STORM SEWERS LARGER THAN 375mm DIA. SHALL BE CONCRETE CSA A 257.2 CLASS 100-D AS PER OPSD 807.010
3. ALL STORM AND SANITARY SEWER BEDDING SHALL BE INSTALLED AS PER SECTION 6.4 OF THE GEOTECH REPORT.
4. STORM AND SANITARY MANHOLES SHALL BE 1200mm DIAMETER IN ACCORDANCE WITH OPSD-701.01 (UNLESS OTHERWISE NOTED) c/w FRAME AND COVER AS PER CITY OF OTTAWA S24, S24.1, AND S25 WHERE APPLICABLE. CATCH BASIN MANHOLE FRAME AND COVERS PER S25 AND S28.1. ALL STORM MANHOLES WITH SEWERS 900mm DIA SEWERS AND OVER IN SIZE SHALL BE BENCHED. ALL OTHER STORM MANHOLES SHALL BE COMPLETED WITH 300mm SUMPS AS PER CITY STANDARDS. SANITARY MANHOLES SHALL NOT HAVE SUMPS.
5. ALL SEWERS CONSTRUCTED WITH GRADES 0.50% OR LESS, TO BE INSTALLED WITH LASER AND CHECKED WITH LEVEL INSTRUMENT PRIOR TO BACKFILLING.
6. FOR STORM SEWER INSTALLATION (EXCLUDING CB LEADS) THE MINIMUM DEPTH OF COVER OVER THE CROWN OF THE SEWER IS 2.0m. FOR SANITARY SEWERS THE MINIMUM DEPTH OF COVER IS 2.5m OVER PIPE OBVERT.
7. ALL STORM AND SANITARY SERVICES TO BE EQUIPPED WITH APPROVED BACKWATER VALVES.
8. STORM AND SANITARY SERVICE LATERALS TO BE SDR 28 INSTALLED AT MIN. 1.0% SLOPE.
9. CATCH BASINS SHALL BE INSTALLED IN ACCORDANCE WITH CITY STANDARDS S1, S2, S3 c/w FRAME AND GRATE AS PER S19. CURB INLET FRAME AND GRATE PER S22 AND S23. CATCH BASIN MANHOLES FRAME AND GRATE AS PER S25 FRAME AND S28.1 COVER. PROVIDE 150mm ADJUSTED SPACERS. ALL CATCH BASINS SHALL HAVE SUMPS (600mm DEEP). STREET CATCH BASIN LEADS SHALL BE 200mm DIA.(MIN) PVC DR 35 AT 1.0% GRADE WHERE NOT OTHERWISE SHOWN ON PLAN. CATCH BASINS WILL BE INSTALLED WITH INLET CONTROL DEVICES (ICD) AS PER ICD SCHEDULE ON STORM DRAINAGE PLAN.
10. STREET CATCH BASINS TO BE INSTALLED c/w SUBDRAINS 3m LONG IN FOUR ORTHOGONAL DIRECTIONS OR LONGITUDINALLY WHEN PLACED ALONG A CURB, AND AT AN ELEVATION OF 300mm BELOW SUBGRADE LEVEL.
11. REAR LOT PERFORATED PIPE TO BE INSTALLED AS PER CITY OF OTTAWA STANDARDS S29. REAR LOT STRUCTURES TO BE INSTALLED AS PER CITY OF OTTAWA STANDARD W30 AND W31.
12. CLAY SEALS TO BE INSTALLED AS PER CITY STANDARD DRAWING S8. THE SEALS SHOULD BE AT LEAST 1.5m LONG (IN THE TRENCH DIRECTION) AND SHOULD EXTEND FROM TRENCH WALL TO TRENCH WALL. GENERALLY, THE SEALS SHOULD EXTEND FROM THE FROST LINE AND FULLY PENETRATE THE BEDDING, SUBBEDDING AND COVER MATERIAL. THE BARRIERS SHOULD CONSIST OF RELATIVELY DRY AND COMPACTABLE BROWN SILTY CLAY PLACED IN MAXIMUM 225mm THICK LOOSE LAYERS COMPACTED TO A MINIMUM OF 95% OF THE MATERIAL'S SPMDD. THE CLAY SEALS SHOULD BE PLACED AT THE SITE BOUNDARIES AND AT STRATEGIC LOCATIONS AT NO MORE THAN 60m INTERVALS IN THE SERVICE TRENCHES. FOR DETAILS REFER TO GEOTECHNICAL INVESTIGATION .
13. GRANULAR "A" SHALL BE PLACED TO A MINIMUM THICKNESS OF 300 mm AROUND ALL STRUCTURES WITHIN PAVEMENT AREA AND COMPACTED TO A MINIMUM OF 98% STANDARD PROCTOR DENSITY.
14. CONTRACTOR SHALL PERFORM LEAKAGE TESTING, IN THE PRESENCE OF THE CONSULTANT, FOR SANITARY SEWERS IN ACCORDANCE WITH OPSS 410 AND OPSS 407. CONTRACTOR SHALL PERFORM VIDEO INSPECTION OF ALL STORM AND SANITARY SEWERS. A COPY OF THE VIDEO AND INSPECTION REPORT SHALL BE SUBMITTED TO THE CONSULTANT FOR REVIEW.
15. ANY SEWER ABANDONMENT TO BE CONDUCTED ACCORDING TO CITY OF OTTAWA STANDARD S11.4
16. SEWERS WITH LESS THAN 1.5m COVER TO BE INSULATED IN ACCORDANCE WITH CITY STANDARD W22.

GRADING

1. ALL GRANULAR BASE & SUB BASE COURSE MATERIALS SHALL BE COMPACTED TO 98% STANDARD PROCTOR MAX. DRY DENSITY.
2. SUB-EXCAVATE SOFT AREAS & FILL WITH GRANULAR 'B' COMPACTED IN 0.15m LAYERS.
3. ALL DISTURBED GRASSED AREAS SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER, WITH SOD ON MIN. 100mm TOPSOIL. THE RELOCATION OF TREES AND SHRUBS SHALL BE SUBJECT TO APPROVAL BY THE PROJECT LANDSCAPE ARCHITECT OR ENGINEER.
4. 100 YEAR PONDING DEPTH TO BE 0.30m (MAXIMUM).
5. EMBANKMENTS TO BE SLOPED AT MIN. 3:1, UNLESS OTHERWISE SPECIFIED.
6. ALL SWALES TO BE MIN. 0.15m DEEP WITH MIN. 3:1 SIDE SLOPES UNLESS OTHERWISE NOTED. THE MINIMUM LONGITUDINAL SLOPE TO BE 1.5% OR 1.0% WHEN PERFORATED SUBDRAIN IS INSTALLED.
7. ALL ROOF DOWNSPOUTS TO DISCHARGE TO THE GROUND ONTO SPLASH PADS AND SHALL NOT BE DIRECTED TO THE STORM SEWER , OR THE BUILDING FOUNDATION DRAIN.
8. TOP OF GRATE (T/G) ELEVATIONS FOR ALL STREET CATCHBASINS SHOWN ON PLANS. REFER TO THE ELEVATION AT EDGE OF PAVEMENT, OR GUTTERLINE WHERE APPLICABLE.
9. ALL RETAINING WALLS GREATER THAN 1.0m IN HEIGHT ARE TO BE DESIGNED, APPROVED, AND STAMPED BY STRUCTURAL ENGINEER.
10. FENCES OR RAILINGS ARE REQUIRED FOR RETAINING WALLS GREATER THAN 0.60m IN HEIGHT.
11. EXCESS EXCAVATED MATERIAL SHALL BE REMOVED FROM THE SITE.
12. ALL NECESSARY CLEARING AND GRUBBING SHALL BE COMPLETED BY THE CONTRACTOR. REVIEW WITH CONTRACT ADMINISTRATOR AND THE CITY OF OTTAWA PRIOR TO TREE CUTTING.
13. REFER TO DRAWING EC DS-1 FOR EROSION AND SEDIMENT CONTROL DETAILS.

Best Management Practices

CONTRACTOR TO PROVIDE EROSION AND SEDIMENT CONTROLS (BEST MANAGEMENT PRACTICES) DURING CONSTRUCTION OF THIS PROJECT.

EROSION MUST BE MINIMIZED AND SEDIMENTS MUST BE REMOVED FROM CONSTRUCTION SITE RUN-OFF IN ORDER TO PROTECT DOWNSTREAM AREAS, DURING ALL CONSTRUCTION, EROSION AND SEDIMENTATION SHOULD BE CONTROLLED BY THE FOLLOWING TECHNIQUES:

1. LIMIT THE EXTENT OF EXPOSED SOILS AT ANY GIVEN TIME.
2. REVEGETATE EXPOSED AREAS AND SLOPES AS SOON AS POSSIBLE.
3. MINIMIZE AREA TO BE CLEARED AND GRUBBED.
4. PROTECT EXPOSED SLOPES WITH PLASTIC OR SYNTHETIC MULCHES.
5. INSTALL CATCH BASIN INSERTS OR EQUIVALENT IN ALL PROPOSED CATCH BASINS AND CATCH BASIN MANHOLES AND IN ALL EXISTING CATCH BASINS THAT WILL RECEIVE RUN-OFF FROM THE SITE.
6. A SILT FENCE SHALL BE INSTALLED AROUND THE PERIMETER OF ALL AND ANY STOCKPILES OF MATERIAL TO BE USED OR REMOVED FROM SITE. (LOCATION TO BE DETERMINED)
7. A VISUAL INSPECTION SHALL BE DONE DAILY ON SEDIMENT CONTROL MEASURES AND CLEANED OF ANY ACCUMULATED SILT AS REQUIRED. THE DEPOSITS WILL BE DISPOSED OFF SITE AS PER THE REQUIREMENTS OF THE CONTRACT.
8. SEDIMENT CONTROL BARRIERS MAY ONLY BE REMOVED TEMPORARILY WITH APPROVAL OF CONTRACT ADMINISTRATOR TO ACCOMMODATE CONSTRUCTION OPERATIONS. ALL AFFECTED BARRIERS MUST BE REINSTATED AT NIGHT WHEN CONSTRUCTION IS COMPLETED. NO REMOVAL WILL OCCUR IF THERE IS A SIGNIFICANT RAINFALL EVENT ANTICIPATED (>10mm) UNLESS A NEW DEVICE HAS BEEN INSTALLED TO PROTECT EXISTING STORM AND SANITARY SEWER SYSTEMS, OR DOWNSTREAM WATERCOURSES.
9. NO REFUELING OR CLEANING OF EQUIPMENT IS PERMITTED NEAR ANY EXISTING WATERWAY.
10. CONTRACTOR SHALL REMOVE SEDIMENT CONTROL MEASURES WHEN, IN THE OPINION OF THE CONTRACT ADMINISTRATOR, THE MEASURE(S) IS NO LONGER REQUIRED. NO CONTROL MEASURES SHALL BE PERMANENTLEY REMOVED WITHOUT PRIOR WRITTEN AUTHORIZATION FROM THE CONTRACT ADMINISTRATOR.
11. THE CONTRACTOR SHALL PERIODICALLY, OR WHEN REQUESTED BY THE CONTRACT ADMINISTRATOR, CLEAN OUT ACCUMULATED SEDIMENTS AS REQUIRED.
12. THE CONTRACTOR SHALL IMMEDIATELY REPORT TO THE ENGINEER ANY ACCIDENTAL DISCHARGES OF SEDIMENT MATERIAL INTO THE WATERCOURSE. APPROPRIATE RESPONSE MEASURES, INCLUDING ANY REPAIRS TO EXISTING CONTROL MEASURES OR THE IMPLEMENTATION OF ADDITIONAL CONTROL MEASURES, SHALL BE CARRIED OUT BY THE CONTRACTOR WITHOUT DELAY.
13. CONTRACTOR SHALL INSTALL MUD MATS AT BOTH ENTRANCES TO THE SITE.
14. STORMWATER SWALES TO BE COVERED WITH HYDRO-SEED AND MULCH.

LEGEND

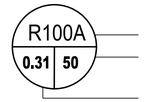
EXISTING CONDITIONS

- EXISTING WATERMAIN
- EXISTING VALVE AND VALVE BOX
- EXISTING VALVE CHAMBER
- EXISTING REDUCER
- EXISTING FIRE HYDRANT
- EXISTING SANITARY MH AND SEWER
- EXISTING STORM MH AND SEWER
- EXISTING CATCHBASIN MANHOLE
- EXISTING CATCHBASIN
- REMOVAL ITEMS
- ASPHALT REMOVAL

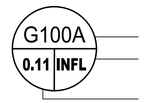
SERVICES

- PROPOSED WATERMAIN
- PROPOSED VALVE AND VALVE BOX
- PROPOSED VALVE CHAMBER
- PROPOSED REDUCER
- PROPOSED FIRE HYDRANT
- PROPOSED SANITARY SEWER
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN
- EXISTING WATERMAIN
- EXISTING VALVE AND VALVE BOX
- EXISTING VALVE CHAMBER
- EXISTING REDUCER
- EXISTING FIRE HYDRANT
- EXISTING SANITARY SEWER
- EXISTING STORM SEWER
- EXISTING CATCHBASIN MANHOLE
- EXISTING CATCHBASIN
- PROPOSED DEPRESSED CURB LOCATIONS
- PROPOSED BARRIER CURB
- THERMAL INSULATION ON STORM SEWER WHERE COVER IS LESS THAN 1.5m. THERMAL INSULATION ON WATERMAIN WHERE COVER IS LESS THAN 2.4m AS PER W22.
- WATER METER
- REMOTE WATER METER

SANITARY DRAINAGE



- SANITARY DRAINAGE AREA ID#
- POPULATION COUNT
- SANITARY DRAINAGE AREA ha.



- SANITARY DRAINAGE AREA ID#
- INFILTRATION RATE OF 0.33 L/s/Ha APPLIED
- SANITARY DRAINAGE AREA ha.
- SANITARY DRAINAGE AREA
- PROPOSED SANITARY MH AND SEWER
- EXISTING SANITARY MH AND SEWER

EROSION CONTROL

- PROPOSED SILT FENCE BOUNDARY AS PER OPSD 219.110
- PROPOSED CATCH BASIN PROTECTION AS PER FLEX STORM INLET FILTERS DETAIL. ITEM CODE P-RD-240-223-FX
- PROPOSED CATCH BASIN MH PROTECTION AS PER FLEX STORM INLET FILTERS DETAIL. ITEM CODE P-RD-290-270-FX
- PROPOSED CATCH BASIN PROTECTION AS PER TERRAFIX SILTSACK DETAIL
- PROPOSED MUD MAT LOCATION
- PROPOSED VALVE BOX
- PROPOSED VALVE CHAMBER
- PROPOSED FIRE HYDRANT
- PROPOSED SANITARY SEWER MANHOLE
- PROPOSED STORM SEWER MANHOLE
- PROPOSED CATCHBASIN

GRADING

- ORIGINAL GROUND ELEVATION
- PROPOSED ELEVATION
- PROPOSED LOT CORNER ELEVATION / EXISTING ELEVATION AT LOT CORNER
- FLOW DIRECTION AND GRADE
- FFE=100.00 FINISHED FIRST FLOOR ELEVATION
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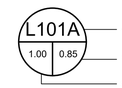
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN
- D.C. PROPOSED DEPRESSED CURB LOCATION
- PROPOSED BARRIER CURB
- PROPOSED ASPHALT ACCESS LANES
- OVERLAND SPILL LOCATION
- TWSI LOCATION AS PER CITY STD

STORM DRAINAGE



- AREA ID
- RUNOFF COEFFICIENT
- STORM DRAINAGE AREA ha.
- STORM DRAINAGE BOUNDARY

- AREA ID
- EXTERNAL RUNOFF COEFFICIENT
- EXTERNAL STORM DRAINAGE AREA ha.
- EXTERNAL STORM DRAINAGE BOUNDARY
- DIRECTION OF OVERLAND FLOW
- PROPOSED STORM MH AND SEWER
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN
- EXISTING STORM MH AND SEWER
- EXISTING CATCHBASIN
- THERMAL INSULATION ON STORM SEWER WHERE COVER IS LESS THAN 1.5m. THERMAL INSULATION ON WATERMAIN WHERE COVER IS LESS THAN 2.4m AS PER W22.
- MAXIMUM STATIC PONDING LIMITS

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Legend

Notes

Revision		By	Appd.	YY.MM.DD
4	REVISED AS PER CITY COMMENTS	MJS	NC	22.12.22
3	REVISED AS PER CITY COMMENTS	MJS	NC	22.10.27
2	REVISED AS PER CITY COMMENTS	MJS	NC	22.08.03
1	ISSUED FOR GEOTECH REVIEW	MJS	DT	22.07.11
0	ISSUED FOR SPA	MJS	DT	22.03.28

File Name: 160401727 D8.dwg	Dwn.	Chkd.	Dsgn.	YY.MM.DD
	MJS	PM	MJS	22.02.14

Permit-Seal

Client/Project
BAYVIEW STITTSVILLE INC.

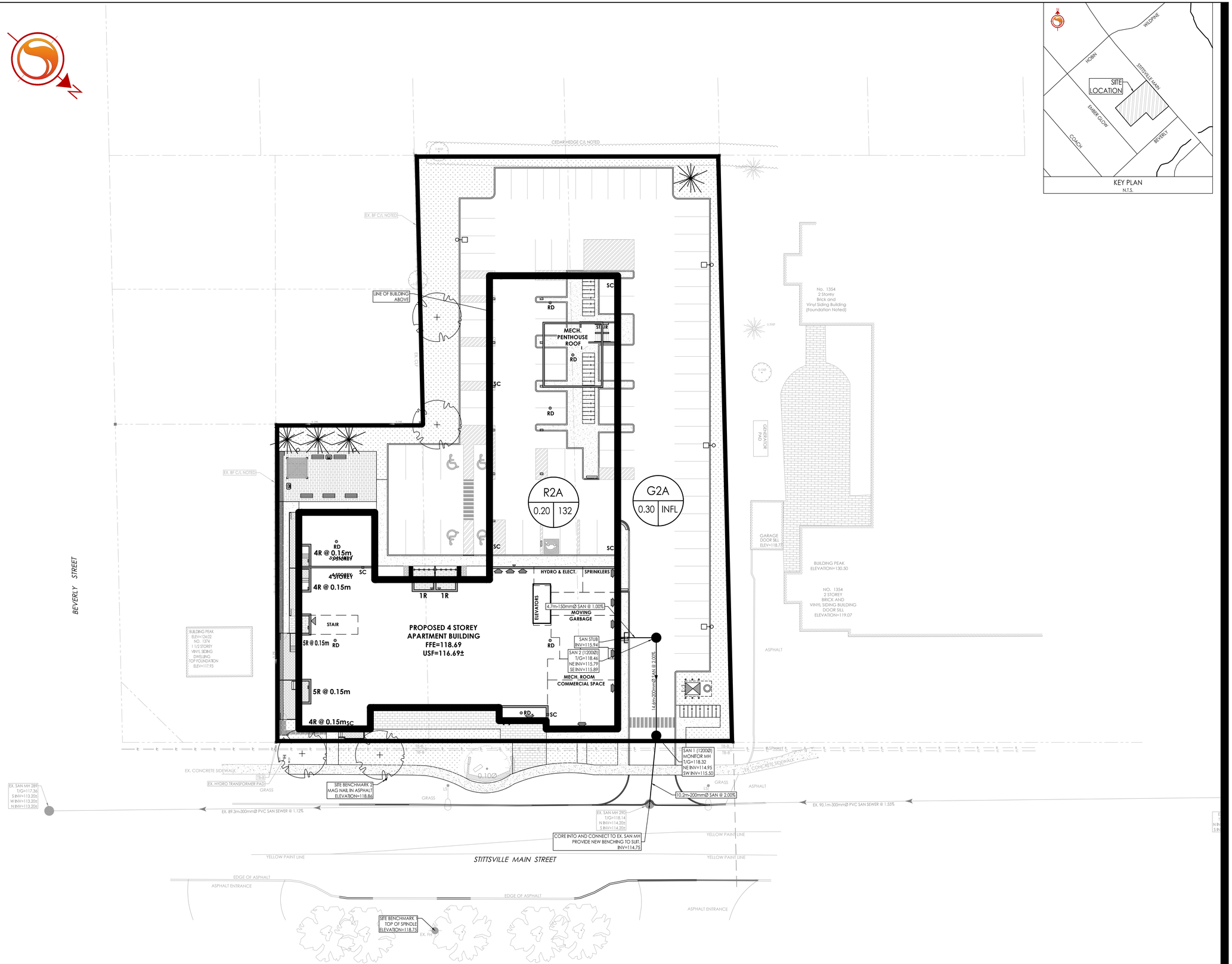
THE LANDING ON MAIN
1364-1370 STITTSVILLE MAIN STREET
STITTSVILLE, ON, CANADA

Title
NOTES AND LEGENDS PLAN

Project No.	Scale	Drawing No.	Sheet	Revision
160401727	1:500 (0 5 15 25m)	NL-1	1 of 8	4

PLAN # 18744

D07-12-22-0059



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Legend

R100A
0.31 | 50
- SANITARY DRAINAGE AREA ID#
- POPULATION COUNT
- SANITARY DRAINAGE AREA ha.

G100A
0.11 | INFL
- SANITARY DRAINAGE AREA ID#
- INFILTRATION RATE OF 0.33 L/s/Ha APPLIED
- SANITARY DRAINAGE AREA ha.

- SANITARY DRAINAGE AREA
- PROPOSED SANITARY MH AND SEWER
- EXISTING SANITARY MH AND SEWER

Notes

SANITARY STATS

BUILDING ROOM MIX
25 - 1 BEDROOM UNITS @ 1.4 PPU = 35 PEOPLE
46 - 2 BEDROOM UNITS @ 2.1 PPU = 97 PEOPLE

TOTAL POPULATION = 132
TOTAL COMMERCIAL SPACE = 74m² (0.0074ha) @ 28, 000 L/ha/day

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Permit-Seal

Client/Project
BAYVIEW STITTSVILLE INC.

THE LANDING ON MAIN
1364-1370 STITTSVILLE MAIN STREET
STITTSVILLE, ON, CANADA

Title
SANITARY DRAINAGE PLAN

Project No. 160401727
Scale 1:250 (0, 2.5, 7.5, 12.5m)
Drawing No. SA-1
Sheet 8 of 8
Revision 4
PLAN # 18744
D07-12-22-0059

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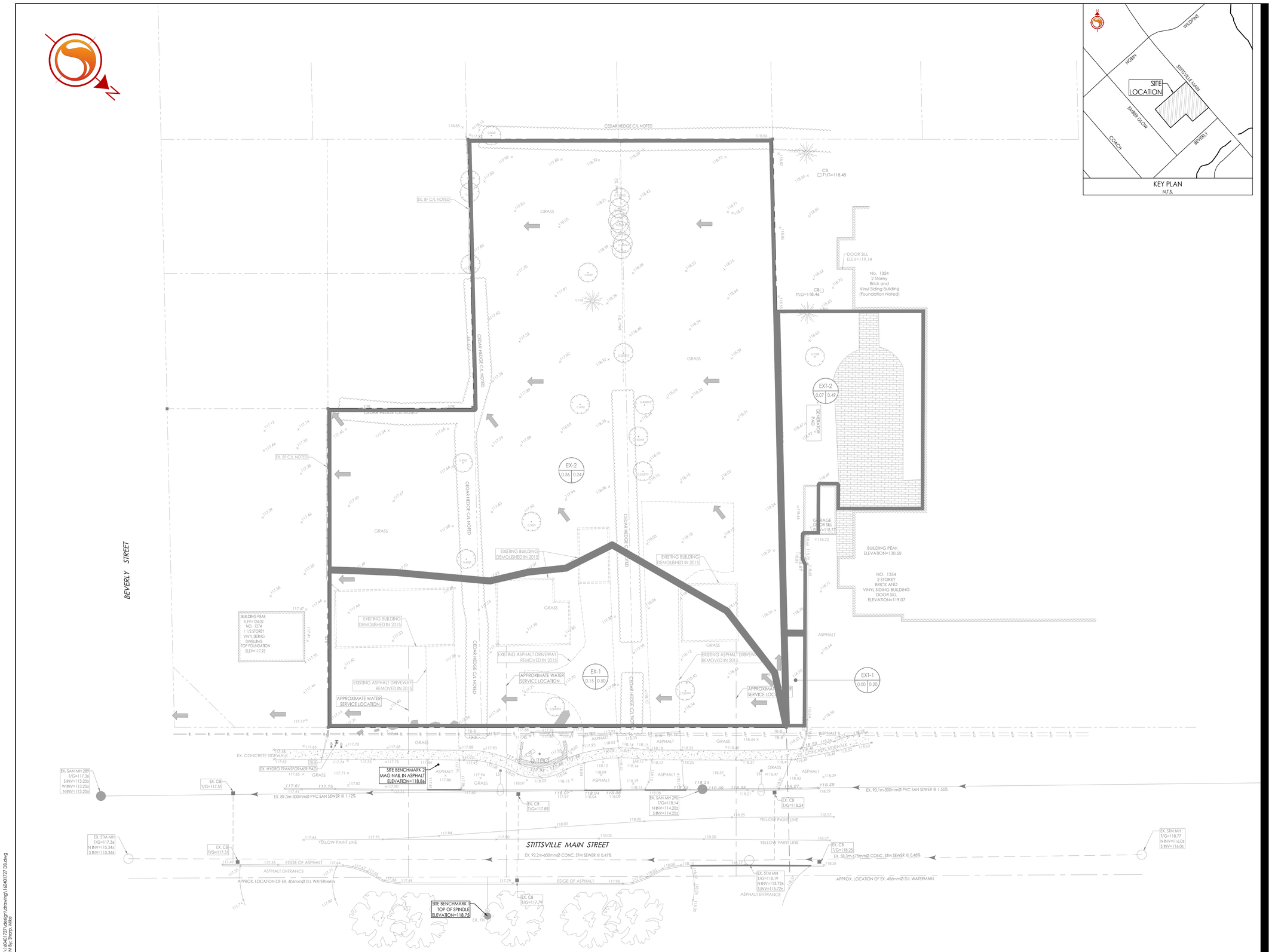

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Legend

EX-1 (1.00 | 0.50) — AREA ID; EXISTING RUNOFF COEFFICIENT; EXISTING STORM DRAINAGE AREA ha.
EXISTING STORM DRAINAGE BOUNDARY

EXT-1 (1.00 | 0.50) — AREA ID; EXTERNAL RUNOFF COEFFICIENT; EXTERNAL STORM DRAINAGE AREA ha.
EXTERNAL STORM DRAINAGE BOUNDARY

EXISTING DIRECTION OF OVERLAND FLOW
EXISTING STORM MH AND SEWER
EXISTING CATCHBASIN

Notes

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	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project
BAYVIEW STITTSVILLE INC.

THE LANDING ON MAIN
1364-1370 STITTSVILLE MAIN STREET
STITTSVILLE, ON, CANADA

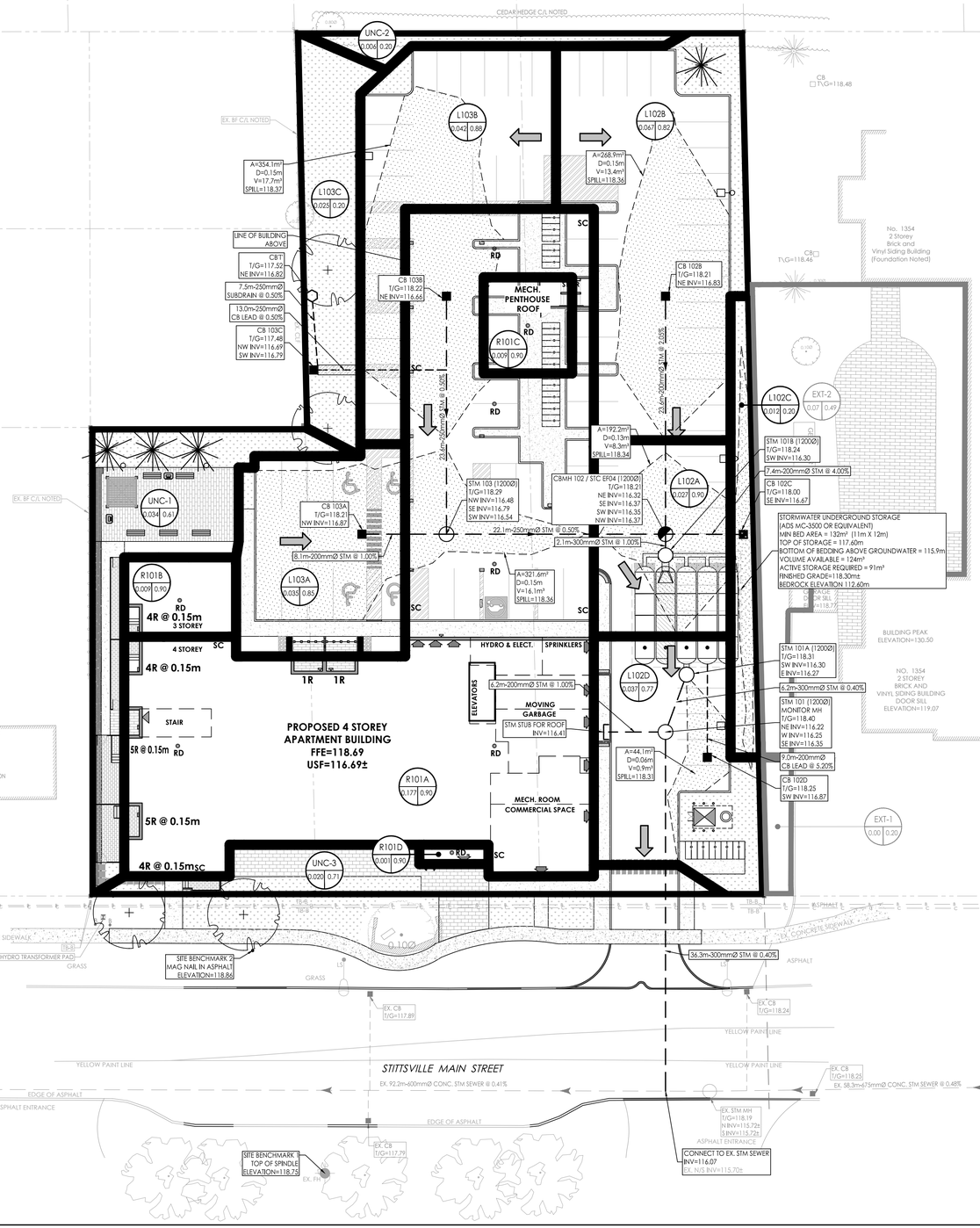
Title
PRE-DEVELOPMENT
EXISTING STORM DRAINAGE PLAN

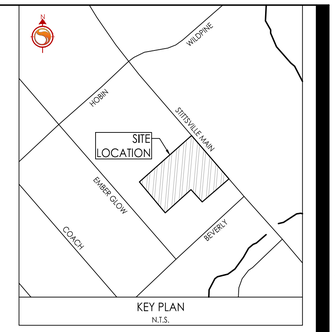
Project No.	Scale	Sheet	Revision
160401727	1:250 (0, 2.5, 7.5, 12.5m)	6 of 8	4

Drawing No. SD-1

PLAN # 18744

D07-12-22-0059





KEY PLAN
N.T.S.

SCHEDULE OF ROOF RELEASE RATES

DRAIN TYPE	TRIBUTARY AREA ID	# OF DRAINS	100YR Head (m)	100YR RELEASE RATE (L/s)	100YR PONDING VOLUME (m³)
WATTS ACCUFLOW (50% OPEN)	R101A	5	0.15	6.24	68
WATTS ACCUFLOW (25% OPEN)	R101B	1	0.13	0.89	3
WATTS ACCUFLOW (25% OPEN)	R101C	1	0.13	0.89	3
WATTS ACCUFLOW (25% OPEN)	R101D	1	0.04	0.48	0.01

ICD TABLE

CATCHBASIN / MANHOLE ID	TRIBUTARY AREA ID	ICD TYPE	2YR HEAD (m)	100YR HEAD (m)	2YR FLOW (L/s)	100YR FLOW (L/s)
MH 101A		95mm ORIFICE	0.72	1.58	10.09	20.19
CB 102B	L102B	83mm ORIFICE	0.77	1.47	12.27	17.14
CB 102C	L102C / EXT-2	150mm ORIFICE	0.10	0.82	6.30	26.89
CB 102D	L102D / EXT-1	90mm ORIFICE	0.21	1.24	6.50	18.27
CB 103A	L103A	VORTEX LMF 80	1.05	1.41	5.84	6.77
CB 103B	L103B	VORTEX LMF 80	1.52	1.63	7.04	7.28
CB 103C	L103C	150mm ORIFICE	0.0	0.81	0.0	7.86

*NOTE: HEAD VALUES DO NOT INCLUDED DOWNSTREAM TAILWATER EFFECTS.

Legend

- L101A / 1.00 / 0.85 — AREA ID; RUNOFF COEFFICIENT; STORM DRAINAGE AREA ha.
- STORM DRAINAGE BOUNDARY
- EXT-1 / 1.00 / 0.50 — AREA ID; EXTERNAL RUNOFF COEFFICIENT; EXTERNAL STORM DRAINAGE AREA ha.
- EXTERNAL STORM DRAINAGE BOUNDARY
- DIRECTION OF OVERLAND FLOW
- PROPOSED STORM MH AND SEWER
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN
- EXISTING STORM MH AND SEWER
- EXISTING CATCHBASIN
- THERMAL INSULATION ON STORM SEWER WHERE COVER IS LESS THAN 1.5m. THERMAL INSULATION ON WATERMAIN WHERE COVER IS LESS THAN 2.4m AS PER W22.
- MAXIMUM STATIC PONDING LIMITS

Notes

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Permit-Seal

Client/Project
BAYVIEW STITTSVILLE INC.

THE LANDING ON MAIN
1364-1370 STITTSVILLE MAIN STREET
STITTSVILLE, ON, CANADA

Title
STORM DRAINAGE PLAN

Project No. 160401727
Scale 1:250 (0 2.5 7.5 12.5m)
Drawing No. SD-2
Sheet 7 of 8
Revision 4
PLAN # 18744
D07-12-22-0059

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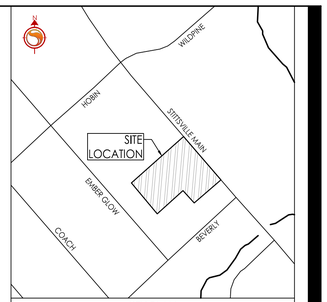
ORIGINAL SHEET - ARCH D

SEWER AND WATERMAIN CROSSING TABLE							
CROSSING	STM INV	STM OBV	SAN INV	SAN OBV	WTR TOP	WTR BTM
1	115.68(115.58)	116.28(116.38)			115.08	114.88
2	115.65(115.55)	116.25(116.35)			115.05	114.85
3			114.17	114.47	115.74	115.54
4	116.11	116.41	114.24	114.54		
5	116.19	116.49	115.57	115.77	116.94	116.79
6	116.39	116.59	115.92	116.07	117.24	117.09
7	115.51(115.41)	116.11(116.21)			114.91	114.76

* BRACKETS DENOTE ADJUSTED VALUE WITH CONCRETE PIPE THICKNESS



KEY PLAN
N.T.S.

200mmØ / 150mmØ WATERMAIN 'A'			
STATION	FINISHED GRADE	TOP W/M	ITEM
0+000	118.12	116.10±	200mmØ TVS CONNECTION TO EX.406mmØ D.I
0+000.9	118.12	115.720	45° VERTICAL BEND DEFLECT W/M AS PER W25
0+001.9	118.12	115.080	45° VERTICAL BEND DEFLECT W/M AS PER W25
0+002.9	118.13	115.080	45° VERTICAL BEND DEFLECT W/M AS PER W25
0+003.9	118.13	115.730	45° VERTICAL BEND DEFLECT W/M AS PER W25
0+013.9	118.14	115.740	11 ¼° HORIZONTAL BEND
0+019	118.26	115.860	11 ¼° HORIZONTAL BEND
0+022.2	118.31	115.910	W3 WATER CHAMBER
0+023.8	118.34	115.940	200mmØ X 200mmØ TEE
0+026.5	118.40	116.000	200mmØ X 150mmØ HYDRANT TEE
0+032.5	118.47	116.070	200mmØ X 150mmØ REDUCER
0+035.8	118.53	116.130	45° VERTICAL BEND DEFLECT W/M AS PER W25.2
0+036.8	118.54	117.020	45° VERTICAL BEND DEFLECT W/M AS PER W25.2
0+039.8	118.54	117.020	45° VERTICAL BEND DEFLECT W/M AS PER W25.2
0+040.8	118.54	116.140	45° VERTICAL BEND DEFLECT W/M AS PER W25.2
0+042.5	118.56	116.160	150mmØ VALVE AND VALVE BOX
0+044	118.56	116.160	45° HORIZONTAL BEND
0+046	118.64	116.240	45° HORIZONTAL BEND
0+046.6	118.66	116.260	150mm CAP AND THRUST BLOCK

150mmØ WATERMAIN 'HYDRANTS'			
STATION	FINISHED GRADE	TOP W/M	ITEM
0+000	118.40	116.000	200mmØ X 150mmØ HYDRANT TEE
0+005.8	118.46	116.060	150mmØ VALVE AND BOX
0+006.8	118.47	116.070	45° BEND
0+008.1	118.49	116.090	45° BEND
0+009.9	118.49	116.090	HYDRANT

SCHEDULE OF ROOF RELEASE RATES					
DRAIN TYPE	TRIBUTARY AREA ID	# OF DRAINS	100YR Head (m)	100YR RELEASE RATE (L/s)	100YR PONDING VOLUME (m³)
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CB 103A	L103A	VORTEX LMF 80	1.05	1.41	5.84	6.77
CB 103B	L103B	VORTEX LMF 80	1.52	1.63	7.04	7.28
CB 103C	L103C	150mm ORIFICE	0.0	0.81	0.0	7.86

*NOTE: HEAD VALUES DO NOT INCLUDED DOWNSTREAM TAILWATER EFFECTS.

Legend

- PROPOSED WATERMAIN
- PROPOSED VALVE AND VALVE BOX
- PROPOSED VALVE CHAMBER
- PROPOSED REDUCER
- PROPOSED FIRE HYDRANT
- PROPOSED SANITARY SEWER
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN
- EXISTING WATERMAIN
- EXISTING VALVE AND VALVE BOX
- EXISTING VALVE CHAMBER
- EXISTING REDUCER
- EXISTING FIRE HYDRANT
- EXISTING SANITARY SEWER
- EXISTING STORM SEWER
- EXISTING CATCHBASIN MANHOLE
- EXISTING CATCHBASIN
- PROPOSED DEPRESSED CURB LOCATIONS (DC)
- PROPOSED BARRIER CURB
- THERMAL INSULATION ON STORM SEWER WHERE COVER IS LESS THAN 1.5m. THERMAL INSULATION ON WATERMAIN WHERE COVER IS LESS THAN 2.4m AS PER W22.
- WATER METER (M)
- REMOTE WATER METER (RM)

Notes

1. FINAL METER AND REMOTE METER LOCATINS TO BE CONFIRMED BY MECHANICAL CONSULTANT.
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 SHALL PROVE THE LOCATION OF UTILITIES AND SHALL BE RESPONSIBLE FOR THEIR PROTECTION AND THE IMPLEMENTATION OF ANY NECESSARY PROCEDURES CALLED FOR IN THE APPROPRIATE STANDARD AND REGULATIONS.
3. INTERNAL PLUMBING AND SUMP PUMPS TO BE DESIGNED BY THE MECHANICAL CONSULTANT.
4. NEW PRIVATE HYDRANTS INSTALLED ON SITE ARE TO BE INSTALLED TO FACE STITTSVILLE MAIN STREET.

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Client/Project
BAYVIEW STITTSVILLE INC.

THE LANDING ON MAIN
1364-1370 STITTSVILLE MAIN STREET
STITTSVILLE, ON, CANADA

Title
SITE SERVICING PLAN

Project No.	Scale	Sheet	Revision
160401727	1:250 (0, 2.5, 7.5, 12.5m)	3 of 8	4

Drawing No. SSP-1

PLAN # 18744

D07-12-22-0059

ORIGINAL SHEET - ARCH D