Servicing Report – 3368 Carling Avenue

Project # 160401218

Prepared for:
Cardel Developments Ltd.

Prepared by:
Stantec Consulting Ltd.

April 6, 2021

Sign-off Sheet

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Prepared by _____
(signature)

Dustin Thiffault, P.Eng.

Reviewed by _____
(signature)

Sheridan Gillis

Stantec

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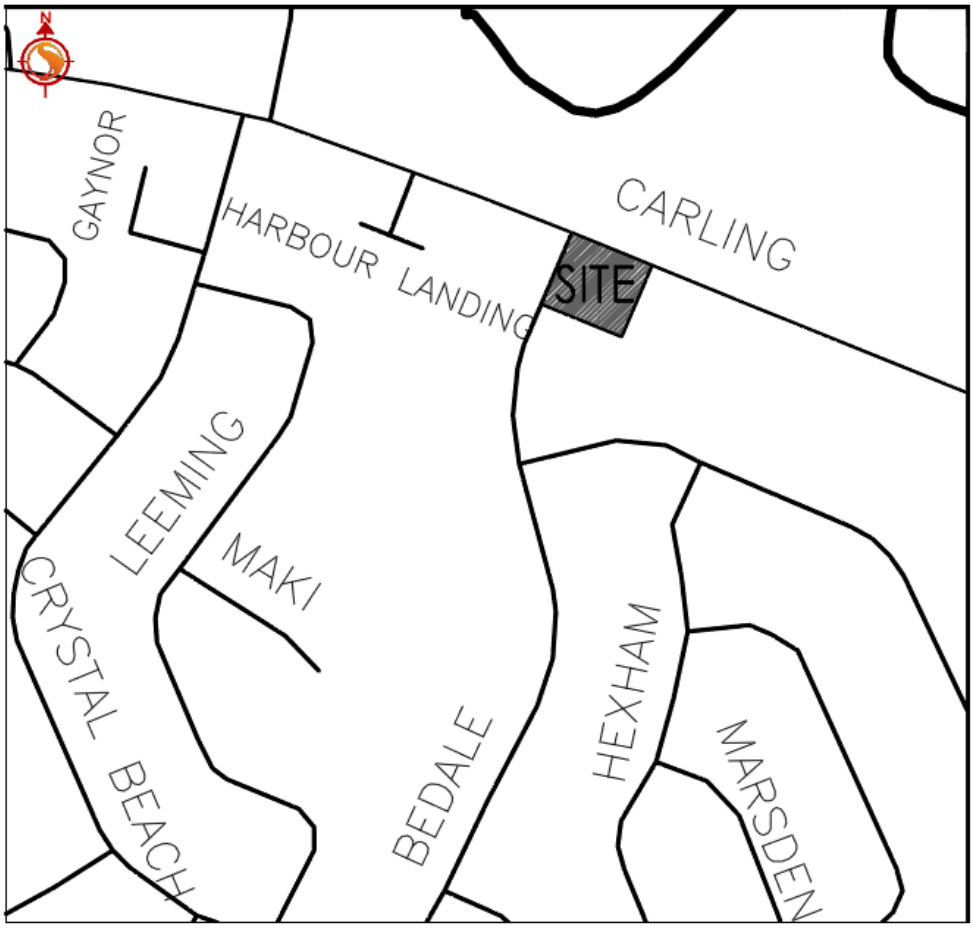
1.0 INTRODUCTION

Stantec Consulting Ltd. has been commissioned by Cardel Developments Ltd. to prepare a servicing study in support of Site Plan Control submission of the proposed development located at 3368 Carling Avenue. The proposed development has been modified from past submissions to incorporate additional room for a hydro transformer pad located at the southwest of the property, and to address existing service laterals from the adjacent building at 3364 Carling that had previously passed through the development via easement at the southerly property line. Existing services to 3364 Carling have been removed based on prior correspondence with Cardel (see **Appendix E**). Service lateral stubs for the proposed development were previously installed for the development concurrently with reconstruction of the Bedale Drive sanitary sewer during 2016-2018.

The site is situated on the south side of Carling Avenue and southeast of the intersection of Bedale Drive and Carling Avenue within the City of Ottawa. The proposed infill development would replace an existing commercial property with a three-storey apartment complex comprising 15 total residential units, as well as one level of underground parking. The conceptual site development plan used for the purpose of this servicing brief is shown as **Figure 1**. The 0.101ha (0.249 acre) site was previously occupied by a single storey brick dwelling which has been previously demolished, and associated asphalt parking areas. The site is presently zoned Local Commercial, which permits the proposed development plan. The intent of this report is to provide a servicing scenario for the site that is free of conflicts, provides on-site servicing in accordance with City of Ottawa design guidelines, and utilizes the existing local infrastructure in accordance with the guidelines outlined per consultation with City of Ottawa staff.

Figure 1: Location Plan



2.0 BACKGROUND

Documents referenced in preparation of the design for the 3368 Carling Avenue development include:

- Geotechnical Investigation – Proposed Multi-Storey Building – 3368 Carling Avenue, Patersongroup Consulting Engineers, January 6, 2015.
- Crystal Beach Drive Sanitary Sewer Construction (Drawings – As-built), Stantec Consulting Ltd., September 21, 2018.
- City of Ottawa Sewer Design Guidelines, City of Ottawa, October 2012.
- City of Ottawa Design Guidelines – Water Distribution, City of Ottawa, July 2010.

3.0 WATER SUPPLY SERVICING

3.1 BACKGROUND

The proposed development comprises one three storey residential apartment building, complete with associated infrastructure and access areas. The site is located on the south side of Carling Avenue and southeast of the intersection with Bedale Drive. The site will be serviced via a previously installed 100mm building service connection to the existing 150mm dia. watermain within the Bedale Drive ROW at the western boundary of the site. The property is located within the City's Pressure Zone 1W. Ground elevations of the site are approximately 64.7m. Under normal operating conditions, hydraulic gradelines vary from approximately 106.4m to 115.1m as confirmed through updated boundary conditions provided by the City of Ottawa (see **Appendix A.3**).

3.2 WATER DEMANDS

Water demands for the development were estimated using the Ministry of Environment's Design Guidelines for Drinking Water Systems (2008). A daily rate of 350 L/cap/day has been applied for the population of the proposed site. Population densities have been assumed as 1.8 pers./unit based on an average apartment unit layout. See **Appendix A.1** for detailed domestic water demand estimates.

The average day demand (AVDY) for the entire site was determined to be 0.11 L/s. The maximum daily demand (MXDY) is 2.5 times the AVDY (residential property), which equals 0.27 L/s. The peak hour demand (PKHR) is 2.2 times the MXDY, totaling 0.60 L/s.

Wood frame construction (structure entirely combustible) was considered in the assessment for fire flow requirements. No sprinkler system was assumed for construction of the proposed building. As no on-site private watermain is proposed, fire flow requirements were based on Office of the Fire Marshal (OFM) guidelines in support of the Ontario Building Code (OBC). Based on calculations per the OFM Guidelines (**Appendix A.2**), the maximum required fire flow for this development is 105 L/s (6,300L/min).

3.3 PROPOSED SERVICING

Per the boundary conditions provided by the City of Ottawa (based on a fire flow demand of 6300L/min) and based on an approximate elevation on-site of 64.7m, adequate domestic flows are available for the subject site, with pressures ranging from 41.7m (59 psi) to 50.4m (72 psi). This pressure range is within the guideline of 50-80 psi based on Ottawa's Design Guidelines for Water Distribution.

Boundary conditions for the proposed development under maximum day demands and fire flow requirements per the OFM methodology demonstrate that the system will maintain a residual pressure of approximately the required 140 kPa (20 psi). The above demonstrates that the existing watermain within Carling Avenue can provide adequate fire flows at or in excess of flow requirements for the subject site.

An existing hydrant is located approximately 70m east of the subject site on Carling Avenue, and a second hydrant is located on the west side of Bedale Drive within 35m of the proposed building's primary entrance. Both hydrant locations are within 90m per City of Ottawa standards.

3.4 SUMMARY OF FINDINGS

The proposed development is located in an area of the City's water distribution system that has sufficient capacity to provide both the required domestic and emergency fire flows. Based on the boundary conditions provided by City of Ottawa, the required fire flows are available for this development based on OFM guidelines and as per the City of Ottawa water distribution guidelines.

4.0 WASTEWATER SERVICING

4.1 BACKGROUND

The site will be serviced via a 600mm diameter sanitary sewer within Bedale Drive installed as part of recent infrastructure upgrades to the Crystal Beach area. The 600mm diameter sewer replaced a 375mm sanitary main situated within the Bedale Drive ROW at the western boundary of the site (see **Drawing SSP-1**). A 150mm connection to the 600mm diameter sewer was made available for the subject site as part of the reconstruction of sewers within the Bedale Drive ROW. It is proposed to connect to the existing 150mm diameter service lateral to service the proposed 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
- 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. 0.38 L/s with allowance for infiltration) to the proposed 600mm diameter sanitary sewer on Bedale Drive. The proposed drainage pattern is detailed on **Drawing SSP-1**. A sanitary sewer design sheet for the proposed service lateral is included in **Appendix B.1**. A backwater valve is to be installed on the proposed sanitary service within the site and on all sanitary branches in the underground parking level to prevent any surcharge from the downstream sanitary sewer from impacting the proposed property.

5.0 STORMWATER MANAGEMENT

5.1 OBJECTIVES

The objective of this stormwater management plan is to determine the measures necessary to control the quantity/quality of stormwater released from the proposed development to criteria established during the pre-consultation/zoning process, and to provide sufficient detail for approval and construction.

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 5-year storm event under free-flow conditions using City of Ottawa I-D-F parameters (City of Ottawa).
- Quality/quantity control requirements for site discharge were not identified as a requirement for the subject site, provided discharge rates do not increase dramatically in the post-development scenario (City of Ottawa, RVCA).
- Proposed site to discharge to the existing 300mm diameter storm sewer within the Bedale Drive ROW at the western boundary of the subject site (City of Ottawa).
- 100-year Storm HGL to be a minimum of 0.30 m below building foundation footing (City of Ottawa).

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)

5.3 STORMWATER MANAGEMENT

The Modified Rational Method 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 subareas and runoff coefficients is provided in **Appendix C**, and **Drawing SD-1** indicates the stormwater management subcatchments.

5.3.1 Allowable Release Rate

Based on consultation with City of Ottawa staff, restrictions on the peak post-development discharge rate from the subject site are not required should the post development peak flowrate not increase dramatically beyond the 5-year event pre-development scenario calculated with a maximum runoff coefficient of 0.5. The predevelopment release rate for the area has been determined using the rational method based on the criteria above. A time of concentration for the predevelopment area (10 minutes) was assigned based on the relatively small site and its proximity to the existing drainage outlet for the site. C coefficient values have been increased by 25% for the post-development 100-year storm event based on MTO Drainage Manual recommendations. Peak flow rates have been calculated using the rational method as follows:

Q = 2.78 CiA
Where: Q = peak flow rate, L/s
A = drainage area, ha
I = rainfall intensity, mm/hr (per Ottawa IDF curves)
C = site runoff coefficient

Table 1: Target Release Rate

Design Storm	Target Flow Rate (L/s)
5-Year Event	14.5

5.3.2 Storage Requirements

It is proposed that rooftop storage via restricted roof release be used to reduce site peak outflow to reduce the impact on downstream infrastructure.

5.3.2.1 Rooftop Storage

It is proposed to retain stormwater on the building rooftops by installing restricted flow roof drains. The following calculations assume the roof 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 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 ¼ open. Storage volume and controlled release rate are summarized in **Table 2**:

Table 2: Roof Control Area

Design Storm	Depth (mm)	Discharge (L/s)	Volume Stored (m^3)
5-Year	107	2.5 (0.625 / drain)	7.4 (1.9m3/drain)
100-Year	147	2.5 (0.625 / drain)	18.6 (4.7m3/drain)

Number of roof drains: 4

5.3.2.2 Uncontrolled Release

The balance of the site is proposed to either drain to unrestricted catchbasins on-site or release uncontrolled to the adjacent ROW tributary to the 300mm outlet sewer within the Bedale Drive ROW.

Table 3 summarizes the estimated uncontrolled storm release rates during the 5 and 100-year storm events.

Table 3: 5 and 100 Year Peak Uncontrolled Discharge Summary

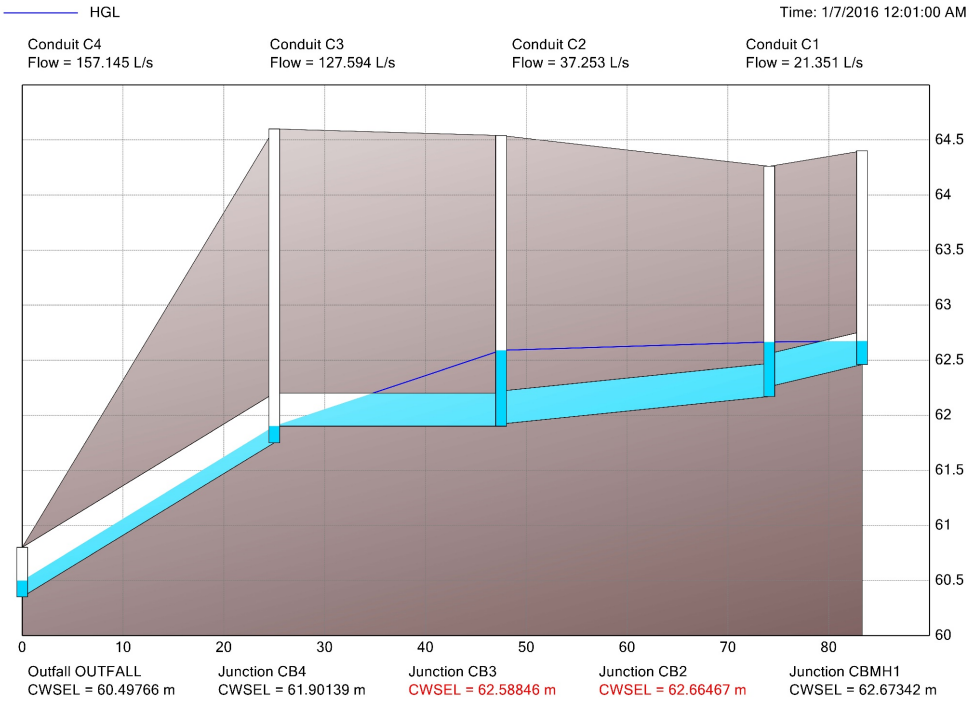
Drainage Area	5-Year Event Discharge (L/s)	100-Year Event Discharge (L/s)
UNC-1	6.9	14.9

5.3.3 Downstream Infrastructure

Although a peak outflow target for the site has not been set, it is required that peak discharge from the site will not have deleterious effect on the downstream 300mm storm sewer within Bedale up to its ultimate outlet north of Carling Avenue to the Ottawa River. External drainage areas for each downstream structure have been conservatively approximated based on topographical mapping for the area, as well as approximate location of downstream structures and adjacent buildings. As the downstream pipe crossing at Carling Avenue has been demonstrated on as-built drawings as being installed at 0% slope, a PCSWMM model of the receiving sewer was created to simulate a pressure flow scenario for the sewer. Inflows were modeled as constant baseline for each structure without inlet restriction as determined for the peak discharge during the 100-year storm event and calculated by the rational method for

each subarea. Refer to PCSWMM model input and output files included as part of **Appendix C** for details.

Figure 2: 100-Year Event HGL of Receiving Sewer



5.3.4 Results

Table 4 demonstrates that the proposed stormwater management plan provides adequate attenuation storage and demonstrates a minor increase (2.9L/s) beyond the pre-development 5-year storm peak discharge rate.

Table 4: Summary of Total 5 and 100-Year Event Release Rates

	5-Year Peak Discharge (L/s)	100-Year Peak Discharge (L/s)
Uncontrolled	6.9	14.9
Roof	2.5	2.5
Total	**9.5**	**17.4**
Pre-Development (5yr, C=0.5)	**14.5**	**14.5**

6.0 GRADING AND DRAINAGE

The proposed development site measures approximately 0.101ha in area. The site slopes gently from southeast to northwest, with grades at property corners varying by approximately 0.4m across the site. Overland flow is generally being directed to the adjacent Bedale Drive ROW, which slopes from north to south at the boundary of the subject site. A detailed grading plan (see **Drawing GP-1**) has been provided to satisfy any stormwater management requirements, adhere to permissible grade raise restrictions (see **Section 10.0**) for the site, and provide for minimum cover requirements for storm and sanitary sewers where possible. A series of retaining walls have been proposed to account for grade change across the property to incorporate private terraces. Building entrance elevations vary and are controlled by internal staircases/landings. 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 Carling Avenue and Bedale Drive ROWs as depicted in **Drawing GP-1.**

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

It is not expected that Environmental Compliance Approvals (ECAs, formerly Certificates of Approval (CofA)) under the Ontario Water Resources Act will be required by the Ontario Ministry of Environment (MOECC), as the proposed sewers will be approved under the building code act. Correspondence with the Rideau Valley Conservation Authority (RVCA) has confirmed that no quality control requirements for stormwater discharge will be required for the subject site. The Rideau Valley Conservation Authority will need to be consulted in order to obtain municipal approval for site development.A Requirement for a MOE Permit to Take Water (PTTW) may be required as a result of excavation for below grade parking. The geotechnical consultant shall confirm at the time of application requirements for any such PTTW.

9.0 EROSION CONTROL DURING CONSTRUCTION

Erosion and sediment controls must be in place during construction. The following recommendations to the contractor will be included in contract documents.

1. Implement best management practices to provide appropriate protection of the existing and proposed drainage system and the receiving water course(s).
2. Limit extent of 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 plastic or synthetic mulches.
6. Provide sediment traps and basins during dewatering.
7. Install sediment traps (such as SiltSack® by Terrafix) between catch basins and frames.
8. Plan construction at proper time to avoid flooding.

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

9. Verification that water is not flowing under silt barriers.
10. Clean and change silt traps at catch basins.

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

10.0 GEOTECHNICAL INVESTIGATION AND ENVIRONMENTAL ASSESSMENT

A geotechnical Investigation Report was prepared by Patersongroup on January 6, 2016. The report summarizes the existing soil conditions within the subject area and construction recommendations. For details which are not summarized below, please see the original Paterson report.

A subsurface investigation was conducted and concluded that the site is underlain by a native silty clay layer extending to depths of 10.7m to 12.2m below ground surface. Bedrock was encountered within 14.8m to 15.8m below ground surface. Groundwater elevations vary on site between 3.2m and 4.5m below ground surface. Grade raise fill restrictions across the site have been established at 1.5m. The grade raise restrictions were accounted for in the grading design of the property. Refer to Report #PG3682-1 for additional Geotechnical information.

The required pavement structure for proposed hard surfaced areas are outlined in **Table 5 and Table 6** below:

Table 5: Pavement Structure – Car Only Parking Areas

Thickness (mm)	Material Description
50	Wear Course – Superpave 12.5 Asphaltic Concrete
150	Base – OPSS Granular A Crushed Stone
300	Subbase - OPSS Granular B Type II
-	Subgrade – Either fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or fill.

Table 6: Pavement Structure – Access Lanes

Thickness (mm)	Material Description
40	Wear Course – Superpave 12.5 Asphaltic Concrete
50	Binder Course – Superpave 19.0 Asphaltic Concrete
150	Base – OPSS Granular A Crushed Stone
400	Subbase - OPSS Granular B Type II
-	Subgrade – Either fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or fill.

11.0 CONCLUSIONS

11.1 WATER SERVICING

Based on the supplied boundary conditions for existing watermains and estimated domestic and fire flow demands for the subject site, it is anticipated that the proposed servicing in this development will provide sufficient capacity to sustain both the required domestic demands and emergency fire flow demands of the proposed site. Fire flows greater than those required per the OFM Guidelines are available for this development.

11.2 SANITARY SERVICING

The proposed sanitary sewer network is sufficiently sized to provide gravity drainage of the site. The proposed site will be serviced by a gravity sewer service lateral which will direct wastewater flows (approx. 0.38 L/s) to a 600mm dia. sanitary sewer to be constructed within the Bedale Drive ROW at the western boundary of the property. The proposed drainage outlet has sufficient capacity to receive sanitary discharge from the site based on pre-consultation through City of Ottawa staff, and through design of the off-site infrastructure improvements within the Crystal Beach area.

11.3 STORMWATER SERVICING

The proposed stormwater management plan is in compliance with the goals specified through consultation with the City of Ottawa. An on-site storage pipe has been proposed to limit peak storm sewer inflows to downstream combined sewers to predevelopment levels as determined by City of Ottawa staff. The downstream receiving sewer has sufficient capacity to receive runoff volumes from the site based on a PCSWMM model developed for the downstream receiving sewer.

11.4 GRADING

Grading for the site has been designed to provide an emergency overland flow route as per City requirements and reflects the grade raise restrictions recommended in the Geotechnical Investigation Report prepared by Patersongroup on January 6, 2016. Erosion and sediment control measures will be implemented during construction to reduce the impact on existing facilities.

11.5 UTILITIES

Utility infrastructure exists within the existing Carling Avenue and Bedale Drive ROWs at the northern and western boundaries of the proposed site. 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 will be finalized after design circulation.

11.6 APPROVALS/PERMITS

An MOE Environmental Compliance Approval is not expected to be required for the subject site as the on-site sewers are subject to the Building Code. A Permit to Take Water is anticipated to be required for pumping requirements for subsurface parking excavation. The Rideau Valley Conservation Authority will need to be consulted in order to obtain municipal approval for site development. No other approval requirements from other regulatory agencies are anticipated.

Appendix A WATER SUPPLY SERVICING

A.1 DOMESTIC WATER DEMAND ESTIMATE

3368 Carling Ave

- Based on Site Plan A1.1 prepared by Rosaline J. Hill dated July 22, 2020

Building ID	Area (m^2)	Population	Daily Rate of Demand [1]	Avg Day Demand		Max Day Demand [2]		Peak Hour Demand [2]	
				(L/min)	(L/s)	(L/min)	(L/s)	(L/min)	(L/s)
BLDG		27	350	6.6	0.11	16.4	0.27	36.1	0.60
Total Site :				**6.6**	**0.11**	**16.4**	**0.27**	**36.1**	**0.60**

1 Population counts based on a density of 1.8 persons/Apartment

2 Average day water demand for residential areas equal to 350 L/cap/d

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

peak hour demand rate = 2.2 x maximum day demand rate

Referenced from the City of Ottawa Sewer Design Guidelines (October 2012) and the Ottawa Design Guidelines: Water Distribution (July 2010)

A.2 FIRE FLOW REQUIREMENTS PER OFM

Fire Flow Calculations as per Ontario Building Code 2006 (Appendix A)

Job#	160401218	Designed by:	WAJ
Date	6-Oct-20	Checked by:	DCT
		Description:	3-Storey Res. + basement

$Q = KVS_{tot}$

Q = Volume of water required (L)
V = Total building volume (m3)
K = Water supply coefficient from Table 1
S_{tot} = Sotal of spatial coefficeint values from property line exposures on all sides as obtained from the formula

$S_{tot} = 1.0 + [S_{side1} + S_{side2} + S_{side3} + S_{side4}]$

1	Type of construction	Building Classification		Water Supply Coefficient
	combustible without Fire-Resistance Ratings	A-2, B-1, B-2, B-3, C, D		23
2	Area of one floor (m^2)	number of floors	Avg. height of ceiling (m)	Total Building Volume (m^3)
	494	4	2.94	5,809
3	Side	Exposure Distance (m)	Spatial Coefficient	Total Spatial Coeffiecient
	North	1	0.5	2
	East	2	0.5	
	South	11.2	0	
	West	3.1	0.5	
4	Established Fire Safety Plan?	Reduction in Volume (%)		Total Volume Reduction
	no	0%		0%
5				**Total Volume 'Q' (L)**
				267,214
				Minimum Required Fire Flow (L/min)
				6,300

A.3 BOUNDARY CONDITIONS

Nwanise, Nwanise

From: Elsayed, Ahmed <ahmed.elsayed@ottawa.ca>
Sent: Thursday, April 1, 2021 9:01 AM
To: Nwanise, Nwanise
Cc: Gillis, Sheridan; Thiffault, Dustin
Subject: RE: 3368 Carling Ave - Hydraulic boundary conditions request
Attachments: 3368 Carling April 2021.pdf

Hi Nwanise,

The following are boundary conditions, HGL, for hydraulic analysis at 3368 Carling (zone 1W) assumed to be connected to the 152 mm on Bedale Drive (see attached PDF for locations).
Minimum HGL = 106.4 m
Maximum HGL = 115.1 m
Max Day + Fire Flow (105 L/s) = 101.2 m
These are for current conditions and are based on computer model simulation.
Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

Thanks,
Ahmed

From: Nwanise, Nwanise <Nwanise.Nwanise@stantec.com>
Sent: Wednesday, March 24, 2021 9:47 AM
To: Elsayed, Ahmed <ahmed.elsayed@ottawa.ca>
Cc: Gillis, Sheridan <Sheridan.Gillis@stantec.com>; Thiffault, Dustin <Dustin.Thiffault@stantec.com>
Subject: 3368 Carling Ave - Hydraulic boundary conditions request

Hi Ahmed,

As advised by the city in the engineering comments on our 2nd submission, we would like to request a revised water boundary conditions for Cardel's proposed development at 3368 Carling Avenue. We will be proposing to maintain the location of the connection to the 150mm watermain on Bedale but Fire Flows would be supplied via the existing infrastructure on Carling avenue.

The demands are as follows:

Type of Development: Proposed 15-unit apartment building.
Location of water service: Proposed connection to the 150mm diameter watermain on Bedale Drive, water
Average Day Demand: 0.11 L/s
Maximum Day Demand: 0.27 L/s
Peak Hourly: 0.60 L/s
Fire Flow: 105 L/s (6,300L/min)

Fire flow calculations are based on the OFM OBC method as no new fire hydrant will be introduced to the site.

The calculations are also attached, if you have any question please feel free to contact me.

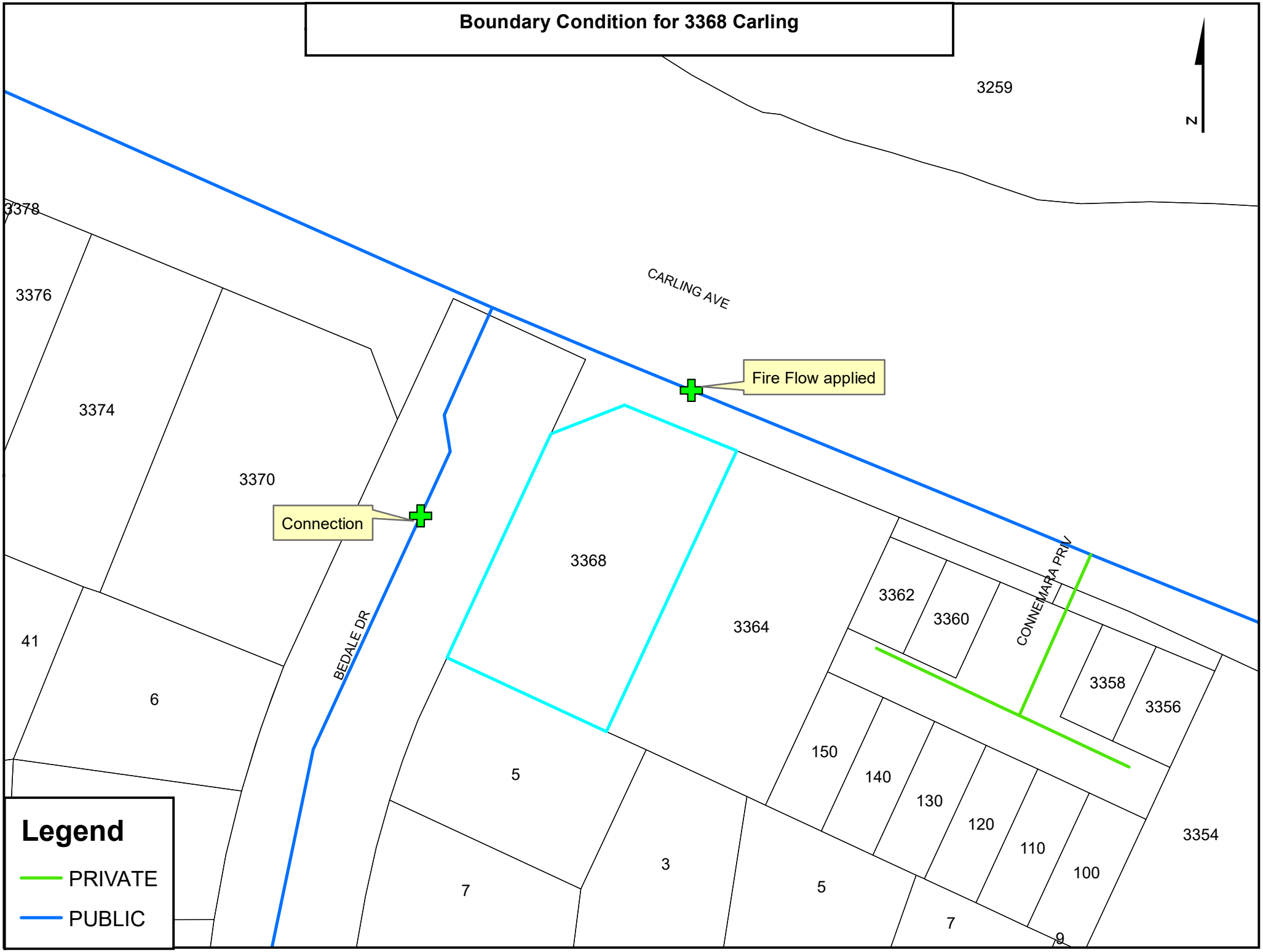
Thank you.

Regards,

Nwanise Nwanise, EIT
Engineering intern, Community Development

Direct: (647) 400-1759
Mobile: (647) 400-1759
nwanise.nwanise@stantec.com

Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4


Boundary Condition for 3368 Carling
N
3259
3378
3376
3374
3370
CARLING AVE
Fire Flow applied
Connection
3368
3364
BEDALE DR
CONNEMARA PRIV
3362
3360
3358
3356
3354
41
6
5
7
3
5
7
9
150
140
130
120
110
100
Legend
PRIVATE
PUBLIC

Appendix B WASTEWATER SERVICING

B.1 SANITARY SEWER DESIGN SHEET

Stantec

SUBDIVISION: **3368 CARLING AVE**

DATE: 6/10/2020
REVISION: 3
DESIGNED BY: WAJ
CHECKED BY: DCT

SANITARY SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 16041218

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 / TOWN	2.7	INFILTRATION	0.33	L/s/ha	HARMON CORRECTION FACTOR	0.8	
PERSONS / AVG 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	AVERAGE APT.	TOWN	SINGLE	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)
BLDG	BLDG	TEE	0.100	15	0	0	27	0.10	27	4.00	0.35	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.100	0.10	0.03	0.38	12.0	150 300	PVC	DR 28	1.00	15.3	**2.50%**	0.86	0.31

Appendix C STORMWATER MANAGEMENT

C.1 STORM SEWER DESIGN SHEET

Stantec

3368 Carling Ave

DATE: 2021-04-09
REVISION: 3
DESIGNED BY: WAJ
CHECKED BY: DCT

FILE NUMBER: **160401218**

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 DIAMETEI (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)
BLDG, UNC-1	STM100	ST10	0.00	0.051	0.00	0.00	0.049	0.00	0.47	0.00	0.00	0.000	0.000	0.024	0.024	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	2.5	2.5	9.4	6.7	200	200	CIRCULAR	PVC	-	1.00	33.3	**28.33%**	1.05	0.76	0.15
EX-ST1A	ST10	ST3	0.00	0.041	0.00	0.00	0.000	0.00	0.67	0.00	0.00	0.000	0.000	0.027	0.051	0.000	0.000	0.000	0.000	10.15	76.24	103.42	121.23	177.22	0.0	2.5	17.3	9.2	300	300	CIRCULAR	PVC	-	2.22	143.3	**12.06%**	2.04	1.14	0.13
EX-ST2A	ST3	407017	0.00	0.036	0.00	0.00	0.000	0.00	0.90	0.00	0.00	0.000	0.000	0.032	0.084	0.000	0.000	0.000	0.000	10.28	75.74	102.72	120.41	176.01	0.0	2.5	26.4	26.6	300	300	CIRCULAR	CONCRETE	-	0.94	93.2	**28.34%**	1.32	0.95	0.46
EX-ST3A	407017	407018	0.00	0.294	0.00	0.00	0.000	0.00	0.63	0.00	0.00	0.000	0.000	0.185	0.269	0.000	0.000	0.000	0.000	10.75	74.05	100.40	117.68	172.00	0.0	2.5	77.5	22.5	300	300	CIRCULAR	CONCRETE	-	0.00	0.0	*	0.00	0.00	-
EX-ST4A	407018	OUTLET	0.00	0.105	0.00	0.00	0.000	0.00	0.90	0.00	0.00	0.000	0.000	0.095	0.364	0.000	0.000	0.000	0.000	11.21	72.45	98.20	115.08	168.19	0.0	2.5	101.7	25.0	450	450	CIRCULAR	CSP	-	5.60	703.9	**14.44%**	4.29	2.54	0.16
																				11.38									450	450								

See PCSWMM model for design verification

C.2 RATIONAL METHOD CALCULATIONS

Stormwater Management Calculations

File No: **1604012128**
Project: **3368 Carling Avenue**
Date: **20-Aug-20**

SWM Approach:
Post-development to Pre-development flows

Post-Development Site Conditions:

Overall Runoff Coefficient for Site and Sub-Catchment Areas

Runoff Coefficient Table

Catchment Type	Sub-catchment Area ID / Description		Area (ha) "A"		Runoff Coefficient "C"	"A x C"		Overall Runoff Coefficient
Uncontrolled - Tributary	UNC-1	Hard	0.020		0.9	0.018		
		Soft	0.031		0.2	0.006		
		Subtotal		0.051			0.02397	0.470
Roof	ROOF	Hard	0.049		0.9	0.044		
		Soft	0.000		0.2	0.000		
		Subtotal		0.049			0.0441	0.900
Total				**0.100**			**0.068**	
Overall Runoff Coefficient= C:								**0.68**

Total Roof Areas	**0.049 ha**
Total Tributary Surface Areas (Controlled and Uncontrolled)	**0.051 ha**
Total Tributary Area to Outlet	**0.100 ha**
Total Uncontrolled Areas (Non-Tributary)	**0.000 ha**
Total Site	**0.100 ha**

Stormwater Management Calculations

Project #1604012128, 3368 Carling Avenue
Modified Rational Method Calculatons for Storage

5 yr Intensity
City of Ottawa

$I = a/(t + b)^c$

a =	998.071
b =	6.053
c =	0.814

t (min)	I (mm/hr)
5	141.18
10	104.19
15	83.56
20	70.25
25	60.90
30	53.93
35	48.52
40	44.18
45	40.63
50	37.65
55	35.12
60	32.94

5 YEAR Predevelopment Target Release from Site

Subdrainage Area: Predevelopment Tributary Area to Outlet
Area (ha): 0.1000
C: 0.50

Typical Time of Concentration

tc (min)	I (5 yr) (mm/hr)	Qtarget (L/s)
10	104.19	**14.5**

5 YEAR Modified Rational Method for Entire Site

Subdrainage Area: UNC-1 — Uncontrolled - Tributary
Area (ha): 0.05
C: 0.47

tc (min)	I (5 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	104.19	6.9	6.9		
20	70.25	4.7	4.7		
30	53.93	3.6	3.6		
40	44.18	2.9	2.9		
50	37.65	2.5	2.5		
60	32.94	2.2	2.2		
70	29.37	2.0	2.0		
80	26.56	1.8	1.8		
90	24.29	1.6	1.6		
100	22.41	1.5	1.5		
110	20.82	1.4	1.4		
120	19.47	1.3	1.3		

Subdrainage Area: ROOF — Roof
Area (ha): 0.05 — Maximum Storage Depth: 150 mm
C: 0.90

tc (min)	I (5 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)	
10	104.19	12.8	2.5	10.3	6.2	101.5	0.00
20	70.25	8.6	2.5	6.1	7.3	106.8	0.00
30	53.93	6.6	2.5	4.1	**7.4**	107.0	0.00
40	44.18	5.4	2.5	2.9	6.9	105.1	0.00
50	37.65	4.6	2.5	2.1	6.3	102.1	0.00
60	32.94	4.0	2.5	1.5	5.5	97.4	0.00
70	29.37	3.6	2.5	1.1	4.5	90.4	0.00
80	26.56	3.3	2.5	0.7	3.5	83.0	0.00
90	24.29	3.0	2.5	0.5	2.5	75.0	0.00
100	22.41	2.7	2.5	0.2	1.3	58.9	0.00
110	20.82	2.6	2.4	0.1	0.7	48.5	0.00
120	19.47	2.4	2.3	0.1	0.6	45.6	0.00

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
5-year Water Level	107.0	0.11	2.5	7.4	19.6	OK

SUMMARY TO OUTLET

		Vrequired	Vavailable*	
Tributary Area	0.049 ha			
Total 5yr Flow to Sewer	2.5 L/s	7	20 m^3	Ok
Non-Tributary Area	0.051 ha			
Total 5yr Flow Uncontrolled	6.9 L/s			
Total Area	0.100 ha			
Total 5yr Flow	9.5 L/s			
Target	14.5 L/s			

Project #1604012128, 3368 Carling Avenue
Modified Rational Method Calculatons for Storage

100 yr Intensity
City of Ottawa

$I = a/(t + b)^c$

a =	1735.688
b =	6.014
c =	0.820

t (min)	I (mm/hr)
5	242.70
10	178.56
15	142.89
20	119.95
25	103.85
30	91.87
35	82.58
40	75.15
45	69.05
50	63.95
55	59.62
60	55.89

100 YEAR Predevelopment Target Release from Site

Subdrainage Area: Predevelopment Tributary Area to Outlet
Area (ha): 0.1000
C: 0.50

Estimated Time of Concentration after Development

tc (min)	I (5 yr) (mm/hr)	Qtarget (L/s)
10	104.19	**14.5**

100 YEAR Modified Rational Method for Entire Site

Subdrainage Area: UNC-1 — Uncontrolled - Tributary
Area (ha): 0.05
C: 0.59

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	14.9	14.9		
20	119.95	10.0	10.0		
30	91.87	7.7	7.7		
40	75.15	6.3	6.3		
50	63.95	5.3	5.3		
60	55.89	4.7	4.7		
70	49.79	4.1	4.1		
80	44.99	3.7	3.7		
90	41.11	3.4	3.4		
100	37.90	3.2	3.2		
110	35.20	2.9	2.9		
120	32.89	2.7	2.7		

Subdrainage Area: ROOF — Roof
Area (ha): 0.05 — Maximum Storage Depth: 150 mm
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)	
10	178.56	24.3	2.5	21.8	13.1	130.3	0.00
20	119.95	16.3	2.5	13.8	16.6	140.9	0.00
30	91.87	12.5	2.5	10.0	18.0	145.1	0.00
40	75.15	10.2	2.5	7.7	18.5	146.7	0.00
50	63.95	8.7	2.5	6.2	**18.6**	146.9	0.00
60	55.89	7.6	2.5	5.1	18.3	146.1	0.00
70	49.79	6.8	2.5	4.3	17.9	144.8	0.00
80	44.99	6.1	2.5	3.6	17.3	143.0	0.00
90	41.11	5.6	2.5	3.1	16.6	141.0	0.00
100	37.90	5.2	2.5	2.6	15.8	138.6	0.00
110	35.20	4.8	2.5	2.3	15.0	136.1	0.00
120	32.89	4.5	2.5	2.0	14.1	133.3	0.00

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
100-year Water Level	146.9	0.15	2.5	18.6	19.6	OK

SUMMARY TO OUTLET

		Vrequired	Vavailable*	
Tributary Area	0.049 ha			
Total 5yr Flow to Sewer	2.5 L/s	19	20 m^3	Ok
Non-Tributary Area	0.051 ha			
Total 100yr Flow Uncontrolled	14.9 L/s			
Total Area	0.100 ha			
Total 100yr Flow	17.4 L/s			
Target	14.5 L/s			

Project #1604012128, 3368 Carling Avenue
Roof Drain Design Sheet, Area ROOF
Standard Watts Model R1100 Accuflow 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	0.0013	0	0.025	11	0	0	0.025
0.050	0.0006	0.0025	1	0.050	44	1	1	0.050
0.075	0.0006	0.0025	2	0.075	98	2	2	0.075
0.100	0.0006	0.0025	6	0.100	174	3	6	0.100
0.125	0.0006	0.0025	11	0.125	272	6	11	0.125
0.150	0.0006	0.0025	20	0.150	392	8	20	0.150

Drawdown Estimate			
Total Volume (cu.m)	Total Time (sec)	Vol (cu.m)	Detention Time (hr)
0.0	0.0	0.0	0
0.6	251.7	0.6	0.06992
2.4	683.2	1.7	0.25969
5.7	1330.4	3.4	0.62924
11.3	2193.4	5.5	1.23851
19.5	3272.1	8.3	2.14742

Rooftop Storage Summary

Total Building Area (sq.m)		490
Assume Available Roof Area (sq.	80%	392
Roof Imperviousness		0.99
Roof Drain Requirement (sq.m/Notch)		232
Number of Roof Notches*		4
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		20
Estimated 100 Year Drawdown Time (h)		2.0

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

From Watts Drain Catalogue

Head (m)	L/s Open	75%	50%	25%	**Closed**
0.025	0.3155	0.3155	0.3155	0.3155	**0.3155**
0.050	0.6309	0.6309	0.6309	0.6309	**0.6309**
0.075	0.9464	0.8675	0.7886	0.7098	**0.6309**
0.100	1.2618	1.1041	0.9464	0.7886	**0.6309**
0.125	1.5773	1.3407	1.1041	0.8675	**0.6309**
0.150	1.8927	1.5773	1.2618	0.9464	**0.6309**

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

Calculation Results	**5yr**	**100yr**	**Available**
Qresult (cu.m/s)	0.003	0.003	-
Depth (m)	0.107	0.147	0.150
Volume (cu.m)	7.4	18.6	19.6
Draintime (hrs)	0.8	2.0	

Gillis, Sheridan

From: Debbie Bellinger <Debbie.Bellinger@nelliganlaw.ca>
Sent: Thursday, February 18, 2021 11:08 AM
To: Chris Collins
Cc: Jane Nugent; Brian Hebert
Subject: Draft letter to Christine Enta and Simon Deiaco
Attachments: Ltr to City of Ottawa.pdf (Attachment).pdf; Ltr to Ryan Garrett.pdf; Cover Letter to Ryan Garrett re APS.pdf; Ltr to Ryan Garrett.pdf (Attachment).pdf; Sewer Application (October 2, 2018).pdf

Hi Chris,
See below. Jane, please convert to a letter for my signature following Chris' review. Chris will send photos that will also need to be attached (in addition to the attachments above).

Dear Simon and Christine,

Re: file Number D07-12-16-0016
3368 Carling Avenue
Cardel Homes

Our client, Cardel, is proceeding with a development application for its property at the corner of Bedale and Carling Avenues. You might recall our issue on behalf of Cardel Homes with respect to the neighbouring doctors, who, at the time, had services over the Cardel Lands without the benefit of an easement. Ultimately, after many months of investigating alternate servicing options, the doctors obtained approval to install a septic system to service their property. The pipes removed in August 2018.

No municipal services were ever installed in the City's "easement in gross. Furthermore such an easement would not apply to private services (since removed). All properties along Carling, including the adjacent lands are otherwise serviced.

The issue of services to the adjacent lands has come up again in the application for Site Plan approval wherein Laurel McReight is asking for the following in first review comments: *confirmation that the services that were in an easement to service the property next to ours were removed.*

The first three attachments contain some of the background information re: these issues. The fourth attachment is our notice to the neighbouring owners, through its solicitors, Soloway Wright confirming the removal of the Services. I am also attaching photographs taken at the time of removal.

We do not want any reference in the comments or conditions to this application with respect to there being an easement to service the property next to the subject lands. There was and is no such easement. We therefore request that any reference to the past servicing of the adjacent lands or any potential easement for prior servicing be removed from the comments.

If you agree, we will forward documents pertaining to the release of the easement in gross for your review in order to tidy this up.

Regards,

Debbie Bellinger

Debbie Bellinger
Lawyer
Nelligan O'Brien Payne LLP

50 O'Connor, Suite 300, Ottawa ON K1P 6L2
Tel/Tél: 613-231-8309 | Fax/Téléc: 613-788-3671
www.nelliganlaw.ca

COVID-19 Update. The office of Nelligan Law is open with many of the team continuing to work from home. Reception is open and accepting packages, however, we continue to encourage electronic correspondence. If arriving at our office new protocols have been put in place to ensure the safety of our employees and clients.

Thiffault, Dustin

To: Lisa Dalla Rosa
Subject: RE: 3368 Carling Avenue

From: Jocelyn Chandler [mailto:jocelyn.chandler@rvca.ca]
Sent: Monday, January 25, 2016 3:07 PM
To: Gillis, Sheridan
Subject: Re: 3368 Carling Avenue

Hello Sheridan, Thank you for contacting me. Based on the site plan you have sent me, there appears to be limited drive aisles and no surface parking. Although it is a very short distance for stormwater to travel and outlet to the Ottawa River, we general deem rooftop and landscape areas to be 'clean' for the purpose of surface water in this context, therefore we do not advise any additional on-site quality controls are required for this project.
Jocelyn

Jocelyn Chandler M.Pl. MCIP, RPP
Planner, RVCA
t) 613-692-3571 x1137
f) 613-692-0831
jocelyn.chandler@rvca.ca
www.rvca.ca
mail: Box 599 3889 Rideau Valley Dr., Manotick, ON K4M 1A5
courier: 3889 Rideau Valley Dr., Nepean, ON K2C 3H1

From: Gillis, Sheridan <Sheridan.Gillis@stantec.com>
Sent: January 19, 2016 7:56 PM
To: Jocelyn Chandler
Subject: 3368 Carling Avenue

Hi Jocelyn,
We've been retained by Cardel to help develop a 15 unit apartment building at 3368 Carling Avenue. The site was formerly a single storey commercial building with asphalt covering the remainder of the site. The proposed development will include the apartment building, a ramp to underground parking, and a mixture of hard surface and soft surface landscaped areas.

The city requires us to attenuate peak flows to predevelopment levels, so we will be providing roof-top control of stormwater which will be released to a proposed 200mm storm service connecting to the municipal system on Bedale Drive. The Bedale Drive municipal sewer then crosses Carling Avenue and discharges to the Ottawa River. I've attached the proposed site plan and preliminary servicing plan of the site for your reference.

We are looking to confirm RVCA requirements for quality control on-site. Can you please review and let me know. If you need any other information feel free to call.

Best Regards,

Sheridan Gillis

Project Manager, Urban Land Engineering
Stantec
400 - 1331 Clyde Avenue Ottawa ON K2C 3G4
Phone: (613) 725-5551

Mobile: (613) 799-1363
sheridan.gillis@stantec.com

Design with community in mind

January 05, 2016 File No: **PC2015-0309**

To / Destinataire	**Simon Deiaco, Planner**
From / Expéditeur	**Syd Robertson, Project Manager, Infrastructure Approvals**
Subject / Objet	**Pre-Application Consultation** **3368 Carling Ave, Ward 7, Ottawa, ON** *The applicant is proposing to construct a 3-storey condominium apartment building containing 14 units, with one level of underground parking providing 18 parking spaces, in addition to two outdoor surface parking spaces. The building will include rooftop amenity space. Access to the site will be off of Bedale Drive, south of the proposed building, and will consist of a heated ramp down to the underground parking.*

Please note the following information pertaining to the engineering design submission for the above noted site:

1. Storm and Sanitary Sewer Services:

i. All servicing works to be coordinated with the Capital Works Project on Bedale Drive which includes the replacement of 375mm dia sanitary sewer with a 600mm dia. sanitary sewer in 2016 & the resurfacing the roadway in 2017. There are no proposed storm sewer works fronting 3368 Bedale Drive.

Note: A copy of the plan & profile drawing will be forwarded to the consultant when it becomes available.

ii. Connect the sanitary service to the proposed 600mm dia sanitary sewermain, above the springline of the main, as per Std Dwg S11.1 for connections to flexible main sewers.

iii. A storm connection to the existing CB on Bedale Drive will be permitted providing that the CB is replaced with a CBMH at the Owner's expense. The City will replace the last section of the downstream storm system (approx. 21m x 450mm dia CSP) as part of the City's Rehabilitation Program.

iv. Monitoring manholes will not be required.

2. Stormwater Management:

The Stormwater Management Criteria, for the subject site, is to be based on the following:

i. The 5-yr storm event using the IDF information derived from the Meteorological Services of Canada rainfall data, taken from the MacDonald Cartier Airport, collected 1966 to 1997.

ii. A maximum equivalent 'C' of 0.5.

iii. A time of concentration of 10 minutes.

iv. Flows to the storm sewer in excess of the 5-year storm release rate, up to and including the 100-year storm event, must be detained on site.

v. Water quality treatment requirements – Contact Jocelyn Chandler, Planner, RVCA, by phone at (613) 692-3571, ext. 1137, or by email at jocelyn.chandler@rvca.ca.

3. Water Supply:

Water Boundary condition requests must include the location of the service and the expected loads required by the proposed development. Please provide the following information:

i. Location of service

ii. Type of development

iii. Amount of fire flow required: ___l/s

(Calculations as per the FUS Method – Refer to ISDTB-2014-02).

iv. Average daily demand: ___ l/s.

v. Maximum daily demand: ___l/s – *Refer to ISDTB-2010-02.*

vi. Maximum hourly daily demand: ___ l/s

4. Sidewalks & Curbs:

i. Redundant accesses to be fully reinstated to City standards with full height curb and sidewalk.

ii. Sidewalks to be completely replaced on both frontages, to current City standard widths (*2.0m wide on Carling Avenue & 1.8m wide on Bedale Drive).*

5. Road Widening and Corner Sight Triangle:

Confirm that the road widening & corner sight triangle requirements are satisfied as per the City's Official Plan.

6. Phase I ESA:

Phase I Environmental Site Assessment is to be completed as per Ontario Regulation 153/04.

7. References:

i. The Servicing Study Guidelines for Development Applications are available at the following address: http://ottawa.ca/en/development-application-review-process-0/servicing-study-guidelines-development-applications

ii. Servicing & site works shall be in accordance with the following documents:
   - Ottawa Sewer Design Guidelines (2013)
   - Ottawa Design Guidelines – Water Distribution (2010)
   - Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)
   - City of Ottawa Slope Stability Guidelines for Development Applications (2004)
   - City of Ottawa Environmental Noise Control Guidelines (2006)
   - City of Ottawa Park and Pathway Development Manual (2012)
   - City of Ottawa Accessibility Design Standards (2012)
   - Ottawa Standard Tender Documents (2015)
   - Ontario Provincial Standards for Roads & Public Works (2015)

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

Should you have any questions or require additional information, please contact me directly at (613) 580-2424, x 27916 or by email at Syd.Robertson@ottawa.ca.

Gillis, Sheridan

From: Robertson, Syd <Syd.Robertson@ottawa.ca>
Sent: Tuesday, January 26, 2016 9:35 AM
To: Gillis, Sheridan
Subject: RE: 3368 Carling Ave - Pre-Consultation Follow-Up, January 2016

Hi Sheridan:

The cistern can be eliminated from the SWM proposal providing the additional flows to the storm system are as indicated in your email below (approx. 8 L/s). Consideration was based on the relatively small lot size (0.1 ha) and that the subject site is in close proximity to the storm outlet.

Syd Robertson, C.E.T.
Project Manager, Infrastructure Approvals
Development Review Services Branch, Urban Outer Core
Planning & Growth Management Department
110 Laurier Ave. W., 4th Floor E
Ottawa, ON K1P 1J1

City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 27916
ottawa.ca/planning / ottawa.ca/urbanisme

From: Gillis, Sheridan [mailto:Sheridan.Gillis@stantec.com]
Sent: January 25, 2016 5:11 PM
To: Robertson, Syd
Subject: RE: 3368 Carling Ave - Pre-Consultation Follow-Up, January 2016

Hi Syd,
Just wondering if you've received any feedback on the requirement for additional quantity control on the Carling Site?

From: Gillis, Sheridan
Sent: Tuesday, January 19, 2016 7:21 PM
To: 'Robertson, Syd'
Subject: RE: 3368 Carling Ave - Pre-Consultation Follow-Up, January 2016

Hi Syd,
Following up on our phone conversation from last week, we've completed some preliminary stormwater analysis for the Carling site including modeling of the storm sewer outlet from our site to the Ottawa River (using overall drainage limits from the as-built profiles and available topo information). It looks like with the roof top storage the storm sewer has sufficient capacity for our site. Unfortunately although the sewer has capacity, restricting our site to the pre-development release rate will require that we install a cistern under the floor slab in the basement to provide additional storage. The cistern would provide less than 6.0cu.m of storage but add substantial cost and complexity to the mechanical system, and will need to be pumped from below the basement floor slab.

Without the cistern we would be directing approx. **8 L/sec** more to the storm sewer than the allowable release rate of 14.5 L/sec (CIA 2.78*0.50*104.19*0.10).

Given the limited inflow into the storm sewer and the proximity to the Ottawa River would a release rate slightly higher than the allowable pre-development value be considered by the city. Again this is all predicated on the sewer having sufficient capacity, which we would need to demonstrate in our submission.

Please let me know if this is something the city would consider. If you need any other information just let me know and we'll send it over.
Thanks again,

Sheridan Gillis
Project Manager, Urban Land Engineering
Stantec
400 - 1331 Clyde Avenue Ottawa ON K2C 3G4
Phone: (613) 725-5551

Mobile: (613) 799-1363
sheridan.gillis@stantec.com

Stantec
Design with community in mind

From: Robertson, Syd [mailto:Syd.Robertson@ottawa.ca]
Sent: Tuesday, January 05, 2016 2:14 PM
To: Gillis, Sheridan
Cc: lisa.dallarosa@cardelhomes.com; Deiaco, Simon; rosaline@rjhill.ca; Sarah@fdfountain.com
Subject: RE: 3368 Carling Ave - Pre-Consultation Follow-Up, January 2016

Hi Sheridan,

Attached please find a revised copy of the pre-consultation servicing memo, for the above noted site, which has been revised as follows:

- A storm connection to the existing CB on Bedale Drive will be permitted providing that the CB is replaced with a CBMH at the Owner's expense.
- Confirmation of the applicable SWM Criteria (To be based on the 5-yr storm event, C = 0.5, Tc = 10 minutes)

Please call me if you have any questions.

Thanks,

Syd Robertson, C.E.T.
Project Manager, Infrastructure Approvals
Development Review Services Branch, Urban Outer Core
Planning & Growth Management Department
110 Laurier Ave. W., 4th Floor E
Ottawa, ON K1P 1J1

PLANNING AND GROWTH MANAGEMENT
URBANISME ET GESTION DE LA CROISSANCE

City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 27916
ottawa.ca/planning / ottawa.ca/urbanisme

From: Gillis, Sheridan [mailto:Sheridan.Gillis@stantec.com]
Sent: December 21, 2015 2:38 PM
To: Robertson, Syd
Subject: RE: 3368 Carling Ave - Pre-Consultation Follow-Up, December 2015

Hi Syd,
Just following up on the engineering feedback for 3368 Carling Avenue. My initial impression is that the storm criteria, and requirement to connect to the Bedale 900mm will add substantial cost for the development. Given that the existing site is completely impervious, and we will actually be adding more landscaped area, and attenuating flows up to the 100 year storm we would expect substantially less contribution to the existing storm sewer. With that in mind, would there be any opportunity to front end, or cost share on replacement of the CSP to allow us to use the current outlet?
Let me know, or feel free to call if you'd like to discuss in more detail,
Best Regards,

Sheridan Gillis
Project Manager, Urban Land Engineering
Stantec
400 - 1331 Clyde Avenue Ottawa ON K2C 3G4
Phone: (613) 725-5551

Mobile: (613) 799-1363
sheridan.gillis@stantec.com

Stantec
Design with community in mind

From: Lisa Dalla Rosa [mailto:lisa.dallarosa@cardelhomes.com]
Sent: Thursday, December 17, 2015 1:32 PM
To: ROSALINE HILL (rosaline@rjhill.ca); Gillis, Sheridan; Sarah Marsh (Sarah@fdfountain.com)
Subject: FW: 3368 Carling Ave - Pre-Consultation Follow-Up, December 2015

Please see the attached and below.

Thanks.

LDR

From: Deiaco, Simon [mailto:Simon.Deiaco@ottawa.ca]
Sent: Thursday, December 17, 2015 11:45 AM
To: Lisa Dalla Rosa <lisa.dallarosa@cardelhomes.com>
Cc: Deiaco, Simon <Simon.Deiaco@ottawa.ca>; Robertson, Syd <Syd.Robertson@ottawa.ca>; 'rosaline@rjhill.ca' <rosaline@rjhill.ca>
Subject: 3368 Carling Ave - Pre-Consultation Follow-Up, December 2015

Lisa, following up from our preconsultation meeting I am attaching some preliminary comments along with the submission requirements for an application for Site Plan Control.

Urban Design

As we will be expecting additional design material as the project evolves, here are some areas that may benefit from further consideration:

- Exterior amenity space, location and design;
- Access ramp and entrance stair (to be fully on private property) design and location;
- Entrance feature/canopy to identify building's main entrance;
- Size of parking ramp (width, see below);
- Side-yard material treatment regarding second exiting and access to exterior amenity space;
- Location and layout of front and side-yard landscaping;
- Material and design of large concrete elements.

Planning

- The required yard setbacks should be taken from the existing property line. Staff will work with your team to ensure that the new building does not encroach (either above or below grade) onto the new limit of the City right of way. This new limit should be shown on all plans.

- Staff appreciate your letter going out to the community in advance of an application and consultation with the Ward office. As part of the site plan control process a public meeting may be organized through the Ward office.

- It was noted that you have approached the neighbouring property to the east regarding a potential acquisition or collaboration. Has this avenue been exhausted?

- Future discussions will have to take place on the need for any relief required through the Committee of Adjustment.

- Section 107(aa)(i) states that the *maximum* width of a driveway is 3.6m leading to less that 20 spaces. Please revise accordingly.

- The site may be subject to municipal waste collection. This will be determined ASAP.

- Prior to formal submission, staff recommends a follow up meeting with the Ward office.

Engineering Review

Please see the attached documents and image.

Regards,

Simon M. Deiaco, MCIP, RPP
Planner III
Development Review (Urban Services)
Urbaniste III
Examen des project d'amenagement (Services urbains)

City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 15641
ottawa.ca/planning / ottawa.ca/urbanisme

C.3 PCSWMM MODEL INPUT AND OUTPUT FILES

```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option             Value
FLOW_UNITS           LPS
INFILTRATION         HORTON
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         ELEVATION
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           1/7/2016
START_TIME           00:00
REPORT_START_DATE    1/7/2016
REPORT_START_TIME    00:00
END_DATE             1/8/2016
END_TIME             00:00
SWEEP_START          1/1
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:05:00
DRY_STEP             00:05:00
ROUTING_STEP         5
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           8
HEAD_TOLERANCE       0
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
```

```
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0.0
DRY_ONLY         NO

[JUNCTIONS]
;;Name           Elevation  MaxDepth   InitDepth  SurDepth   Aponded
;;-------------- ---------- ---------- ---------- ---------- ----------
CB2              62.17      2.09       0          0          0
CB3              61.9       2.64       0          0          0
CB4              61.75      2.85       0          0          0
CBMH1            62.46      1.94       0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
OUTFALL          60.35      FREE                        NO

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset   OutOffset  InitFlow
MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ----------
----------
C1               CBMH1            CB2              9.2        0.013      62.46      62.26      0          0

C2               CB2              CB3              26.6       0.013      62.17      61.92      0          0

C3               CB3              CB4              22.5       0.013      61.9       61.9       0          0

C4               CB4              OUTFALL          25         0.013      61.75      60.35      0          0


[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- ---------- ----------
C1               CIRCULAR     0.3              0          0          0          1
```

```
C2               CIRCULAR     0.3              0          0          0          1
C3               CIRCULAR     0.3              0          0          0          1
C4               CIRCULAR     0.45             0          0          0          1

[LOSSES]
;;Link           Kentry     Kexit      Kavg       Flap Gate  Seepage
;;-------------- ---------- ---------- ---------- ---------- ----------
C1               0          0.199      0          NO         0
C2               0          0.168      0          NO         0
C3               0          0.021      0          NO         0
C4               0          0.021      0          NO         0

[INFLOWS]
;;Node           Constituent      Time Series      Type     Mfactor  Sfactor  Baseline Pattern
;;-------------- ---------------- ---------------- -------- -------- -------- -------- --------
CB2              FLOW             ""               FLOW     1.0      1        15.8
CB3              FLOW             ""               FLOW     1.0      1        90.3
CB4              FLOW             ""               FLOW     1.0      1        32.3
CBMH1            FLOW             ""               FLOW     1.0      1        32.3

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS       -274.238454486055 -28.585196955244 13.0589740231455 600.289136060124
UNITS            Meters

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
CB2              -190.402           4.486
CB3              -210.339           172.957
```

```
CB4              -238.252           365.352
CBMH1            0                  0
OUTFALL          -261.179           571.704

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
```

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

WARNING 04: minimum elevation drop used for Conduit C3

****
Element Count
****
Number of rain gages 0
Number of subcatchments ... 0
Number of nodes 5
Number of links 4
Number of pollutants 0
Number of land uses 0

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
CB2	JUNCTION	62.17	2.09	0.0	Yes
CB3	JUNCTION	61.90	2.64	0.0	Yes
CB4	JUNCTION	61.75	2.85	0.0	Yes
CBMH1	JUNCTION	62.46	1.94	0.0	Yes
OUTFALL	OUTFALL	60.35	0.45	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	CBMH1	CB2	CONDUIT	9.2	2.1744	0.0130
C2	CB2	CB3	CONDUIT	26.6	0.9399	0.0130
C3	CB3	CB4	CONDUIT	22.5	0.0014	0.0130
C4	CB4	OUTFALL	CONDUIT	25.0	5.6088	0.0130

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	0.30	0.07	0.07	0.30	1	142.60
C2	CIRCULAR	0.30	0.07	0.07	0.30	1	93.76
C3	CIRCULAR	0.30	0.07	0.07	0.30	1	3.56
C4	CIRCULAR	0.45	0.16	0.11	0.45	1	675.25

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... LPS
Process Models:
  Rainfall/Runoff ..... NO
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 01/07/2016 00:00:00
Ending Date 01/08/2016 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00

```
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001524 m


*************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
*************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.000         0.000
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         1.475        14.749
External Outflow .........         1.474        14.744
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.001         0.005
Continuity Error (%) .....        -0.002


**************************
Time-Step Critical Elements
**************************
Link C1 (99.99%)


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


************************
Routing Time Step Summary
************************
```

```
Minimum Time Step           :     2.44 sec
Average Time Step           :     2.78 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.02
Time Step Frequencies       :
    5.000 -  3.155 sec      :     0.04 %
    3.155 -  1.991 sec      :    99.96 %
    1.991 -  1.256 sec      :     0.00 %
    1.256 -  0.792 sec      :     0.00 %
    0.792 -  0.500 sec      :     0.00 %


*****************
Node Depth Summary
*****************
```

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
CB2	JUNCTION	0.53	0.55	62.72	0 00:01	0.53
CB3	JUNCTION	0.73	1.20	63.10	0 00:00	0.73
CB4	JUNCTION	0.15	0.16	61.91	0 00:00	0.15
CBMH1	JUNCTION	0.24	0.27	62.73	0 00:01	0.25
OUTFALL	OUTFALL	0.15	0.15	60.50	0 00:01	0.15

```
*****************
Node Inflow Summary
*****************
```

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent

CB2	JUNCTION	15.80	51.46	0	00:00	1.37	4.16	0.031
CB3	JUNCTION	90.30	140.74	0	00:00	7.8	12	0.022
CB4	JUNCTION	32.30	172.18	0	00:01	2.79	14.7	0.005
CBMH1	JUNCTION	32.30	32.30	0	00:00	2.79	2.79	0.014
OUTFALL	OUTFALL	0.00	172.32	0	00:01	0	14.7	0.000

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
CB2	JUNCTION	23.99	0.159	1.541
CB3	JUNCTION	23.99	0.875	1.445

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
OUTFALL	100.00	170.65	172.32	14.743
System	100.00	170.65	172.32	14.743

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	35.66	0 00:00	1.65	0.25	0.95
C2	CONDUIT	50.44	0 00:00	0.95	0.54	1.00
C3	CONDUIT	139.88	0 00:01	2.00	39.30	0.96
C4	CONDUIT	172.32	0 00:01	3.54	0.26	0.35

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C4	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full (Both Ends)	Hours Full (Upstream)	Hours Full (Dnstream)	Hours Above Full Normal Flow	Hours Capacity Limited
C1	0.01	0.01	23.99	0.01	0.01
C2	23.99	23.99	23.99	0.01	0.01
C3	0.01	23.99	0.01	24.00	0.01

Analysis begun on: Thu Apr 8 11:44:58 2021
Analysis ended on: Thu Apr 8 11:44:58 2021
Total elapsed time: < 1 sec

Appendix D GEOTECHNICAL INVESTIGATION

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

Paterson Group Inc.
Consulting Engineers
154 Colonnade Road South
Ottawa (Nepean), Ontario
Canada K2E 7J5

Tel: (613) 226-7381
Fax: (613) 226-6344
www.patersongroup.ca

patersongroup

Geotechnical Investigation

Proposed Multi-Storey Building
3368 Carling Avenue
Ottawa, Ontario

Prepared For

Cardel Homes

January 6, 2016

Report: PG3682-1

TABLE OF CONTENTS

PAGE

APPENDICES

1.0 Introduction

Paterson Group (Paterson) was commissioned by Cardel Homes to complete a geotechnical study for the proposed multi-storey building to be located at 3368 Carling Avenue, in the City of Ottawa, Ontario (refer to Figure 1 - Key Plan in Appendix 2).

The objectives of the geotechnical investigation were:

- ❑ to review existing borehole logs and available information;
- ❑ to provide geotechnical recommendations pertaining to design of the proposed development including construction considerations which may affect the design.

The following report has been prepared specifically and solely for the aforementioned project which is described herein. The report contains the original findings and includes geotechnical recommendations pertaining to the design and construction of the subject development as understood at the time of writing this report.

Investigating the presence or potential presence of contamination on the subject property was not part of the scope for this present investigation. Therefore, the present report does not address environmental issues.

2.0 Proposed Project

The proposed project will consist of a three to four storey building with one level of underground parking and will occupy the majority of the subject site.

3.0 Background Information

Four (4) boreholes were completed by SPL Consultants Limited in August 2014 within the subject site. Four boreholes were completed to provide general coverage of the proposed development. The boreholes were advanced to a maximum depth of 18 m and a groundwater monitoring well was installed at all of the borehole locations, except BH 14-2. The test hole locations are presented on Drawing PG3682-1 - Test Hole Location Plan included in Appendix 2. Diamond core drilling was completed at one location to confirm the depth to bedrock and bedrock quality.

The subsurface profiles are presented on the Log of Borehole sheets presented in Appendix 1.

3.1 Surface Conditions

The subject site is located at 3368 Carling Avenue, which is located at the southeast corner of the intersection of Carling Avenue and Bedale Drive in the City of Ottawa. The site was formerly occupied by a single storey commercial building with a single basement level. The single storey building was surrounded by an at grade, paved parking area. The subject site is approximately 1.5 m above the adjacent roadways and slopes from the building downward to the property boundaries. The subject site is surrounded by residential development to the east, west and south and green space to the north.

3.2 Subsurface Profile

Generally, the soil profile encountered at the borehole locations consists of a pavement structure and non-specified fill overlying a native silty clay layer which extends to 10.7 to 12.2 m below existing ground surface. The non-specified fill material consists of silty clay mixed with trace crushed stone and is approximately 1.2 to 1.5 m thick. The native silty clay layer consists of a stiff to very stiff crust extending to a 5 to 6 m depth followed by a 6.0 to 8.5 m thick unweathered silty clay, which is of a firm to very stiff consistency. The unweathered silty clay is underlain by very loose to loose silty sand till, which is approximately 2.7 to 5.1 m thickness and extends to bedrock. A limestone bedrock was encountered at a depth of 14.8 to 15.8 m.

Bedrock

Weathered limestone bedrock was encountered at depths ranging between 14.8 to 15.8 m below the existing ground surface. Bedrock was cored at BH14-2. Based on the recovered cores, the rock quality designation (RQD) values were calculated for the rock core and the bedrock quality was assessed based on the results. Generally, the bedrock is good to excellent quality.

Practical refusal to DCPT was encountered at BH 14-3 at 15.8 m depth. Additionally, practical refusal to augering was encountered at BH 14-1 and BH 14-4, at 14.9 m and 12.8 m, respectively.

Based on available geological mapping, dolomite bedrock of the Oxford Formation is present in this area with an overburden thickness ranging between 10 to 15 m.

Specific details of the soil profile at each test hole location are presented on the Soil Profile and Test Data sheets in Appendix 1.

3.3 Groundwater

Monitoring wells were installed at BH14-1, BH14-3 and BH14-4. Groundwater levels were obtained 7 days after the drilling program in the groundwater monitoring wells. The groundwater levels varied between 3.2 to 4.5 m below ground surface. Groundwater levels are subject to seasonal fluctuations and therefore, groundwater levels could be higher at the time of construction.

4.0 Discussion

4.1 Geotechnical Assessment

The subject site is satisfactory for the proposed development from a geotechnical perspective. It is anticipated that the proposed building will be constructed over conventional shallow footings.

Due to the presence of a silty clay deposit, a permissible grade raise restriction is required for the subject site.

The above and other considerations are further discussed in the following sections.

4.2 Site Grading and Preparation

Stripping Depth

Topsoil, deleterious fill and soils containing significant amounts of organics, should be stripped from under any buildings and other settlement sensitive structures. Precautions should be taken to ensure that all bearing surfaces and subgrade soils remain undisturbed during site preparation activities.

Fill Placement

Fill placed for grading beneath the proposed building, unless otherwise specified, should consist of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. The fill should be tested and approved prior to delivery to the site. The fill should be placed in maximum 300 mm thick lifts and be compacted to a minimum of 98% of the standard proctor maximum dry density (SPMDD).

Non-specified existing fill along with site-excavated soil can be placed as general landscaping fill where ground surface settlement is of minor concern. The backfill should be spread in thin lifts and at a minimum compacted by the tracks of the spreading equipment to minimize voids. If the backfill is to be placed to increase the subgrade level for paved areas, the material should be compacted in thin lifts to a minimum density of 95% of the respective SPMDD. Non-specified existing fill and site-excavated soils are not suitable for placement as backfill against foundation walls unless a composite drainage blanket connected to a perimeter drainage system is provided.

Protective Mud Slab

It is anticipated that the excavation bottom will be over a silty clay subgrade which will require protection from disturbance due to worker traffic. Consideration should be given to placing a 50 to 75 mm thick lean concrete mud slab over the undisturbed clay surface once exposed. The lean concrete should consist of a minimum 17 MPa compressive strength concrete.

4.3 Foundation Design

Shallow Footing Foundation

Strip footings, up to 3 m wide, and pad footings, up to 6 m wide, founded on an undisturbed, stiff silty clay bearing surface can be designed using a bearing resistance value at serviceability limit states (SLS) of **175 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **275 kPa**. A geotechnical resistance factor of 0.5 was applied to the reported bearing resistance value at ULS.

A permissible grade raise restriction of 1.5 m above existing ground surface is recommended for the subject site.

An undisturbed soil bearing surface consists of one from which all topsoil and deleterious materials, such as loose, frozen or disturbed soil, whether in situ or not, have been removed in the dry prior to the placement of concrete for footings.

The bearing resistance value given for footings at SLS will be subjected to potential post-construction total and differential settlements of 25 and 20 mm, respectively.

Lateral Support

The bearing medium under footing-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Adequate lateral support is provided to an engineered fill, stiff silty clay above the groundwater table when a plane extending horizontally and vertically from the underside of the footing at a minimum of 1.5H:1V passing through in situ soil of the same or higher bearing capacity as the bearing medium soil.

4.4 Design for Earthquakes

The site class for seismic site response can be taken as **Class D** for the foundations considered. Refer to the latest verision of the Ontario Building Code for a full discussion of the earthquake design requirements. The soils underlying the subject site are not susceptible to liquefaction.

4.5 Basement Slab

All organic containing and/or deleterious materials, as well as, disturbed soils should be removed from beneath the floor slab prior to placement of concrete. The basement area for the proposed building will be mostly parking and the recommended pavement structure noted in Subsection 4.8 will be applicable. However, if a concrete floor slab will be constructed for storage purposes, the upper 200 mm of sub-slab fill is recommended to consist of 19 mm clear crushed stone. All backfill material placed within the proposed building footprint should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 98% of the SPMDD.

All soft areas should be removed and backfilled with appropriate backfill material prior to placing any fill or concrete. OPSS Granular A or Granular B Type II, with a maximum particle size of 50 mm, are recommended for backfilling below the floor slab. All backfill material within the footprint of the proposed building should be placed in maximum 300 mm thick loose layers and compacted to a minimum of 98% of the SPMDD.

4.6 Basement Wall

There are several combinations of backfill materials and retained soils that could be applicable for the basement walls of the subject structure. However, the conditions can be well-represented by assuming the retained soil consists of a material with an angle of internal friction of 30 degrees and dry unit weight of 20 kN/m^3.

If undrained conditions are anticipated, the applicable effective unit weight of the retained soil can be taken as 13 kN/m^3, where applicable. A hydrostatic pressure should be added to the total static earth pressure when calculating the effective unit weight. The total earth pressure (P_{AE}) includes both the static earth pressure component (P_o) and the seismic component (ΔP_{AE}).

Lateral Earth Pressures

The static horizontal earth pressure (P_o) can be calculated using a triangular earth pressure distribution equal to $K_o \cdot \gamma \cdot H$ where:

K_o = at-rest earth pressure coefficient of the applicable retained soil, 0.5
γ = unit weight of fill of the applicable retained soil (kN/m^3)
H = height of the wall (m)

An additional pressure having a magnitude equal to $K_o \cdot q$ and acting on the entire height of the wall should be added to the above diagram for any surcharge loading, q (kPa), that may be placed at ground surface adjacent to the wall. The surcharge pressure should only be applicable for static analyses and should not be calculated in conjunction with the seismic loading case.

Actual earth pressures could be higher than the “at-rest” case if care is not exercised during the compaction of the backfill materials to maintain a minimum separation of 0.3 m from the walls with the compaction equipment.

Seismic Earth Pressures

The seismic earth pressure (ΔP_{AE}) can be calculated using the earth pressure distribution equal to $0.375 \cdot a_c \cdot \gamma \cdot H^2/g$ where:

a_c = $(1.45-a_{max}/g)a_{max}$
γ = unit weight of fill of the applicable retained soil (kN/m^3)
H = height of the wall (m)
g = gravity, 9.81 m/s^2

The peak ground acceleration, (a_{max}), for the Ottawa area is 0.32g according to OBC 2012. Note that the vertical seismic coefficient is assumed to be zero.

The total earth pressure (P_{AE}) is considered to act at a height, h (m), from the base of the wall, where:

$h = \{Po \cdot (H/3) + \Delta P_{AE} \cdot (0.6 \cdot H)\}/P_{AE}$

The earth pressures calculated are unfactored. For the ULS case, the earth pressure loads should be factored as live loads, as per OBC 2012.

4.7 Pavement Structure

Asphalt pavement is not anticipated to be required at the subject site. However, should a flexible pavement be considered for the project, the recommended flexible pavement structures shown in Tables 1 and 2 would be applicable.

Table 1 - Recommended Flexible Pavement Structure - Car Only Parking Areas

Thickness (mm)	Material Description
50	**Wear Course -** HL-3 or Superpave 12.5 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
300	**SUBBASE** - OPSS Granular B Type II
	SUBGRADE - Either fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil or fill

Table 2 - Recommended Flexible Pavement Structure - Access Ramp	
Thickness (mm)	**Material Description**
40	**Wear Course** - HL-3 or Superpave 12.5 Asphaltic Concrete
50	**Binder Course** - HL-8 or Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
400	**SUBBASE** - OPSS Granular B Type II
	SUBGRADE - Either fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil or fill

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project.

If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type II material.

The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 98% of the SPMDD.

Pavement Structure Drainage

The pavement structure performance is dependent on the moisture condition at the contact zone between the subgrade material and granular base. Failure to provide adequate drainage under conditions of heavy wheel loading could result in the subgrade fines pumped into the stone subbase voids, thereby reducing the load bearing capacity.

Due to the impervious nature of the subgrade materials consideration should be provided to installing sub-drains during the pavement construction. The subdrains should extend in four orthogonal directions and longitudinally when placed along a curb. The clear crushed stone surrounding the drainage lines or the pipe, should be wrapped with suitable filter cloth. The subdrain inverts should be approximately 300 mm below subgrade level and placed in accordance with City of Ottawa specifications. The subgrade surface should be shaped to promote water flow to the drainage lines.

5.0 Design and Construction Precautions

5.1 Foundation Drainage and Backfill

A perimeter drainage system is recommended for the proposed building. The system should consist of a 150 mm diameter perforated corrugated plastic pipe, surrounded on all sides by 150 mm of 10 mm clear crushed stone, placed at the foundation level around the exterior perimeter of the structure. The pipe should have a positive outlet, such as a gravity connection to the storm sewer.

Backfill against the exterior sides of the foundation walls should consist of free-draining non frost susceptible granular materials. The greater part of the site excavated materials will be frost susceptible and, as such, are not recommended for placement as backfill against the foundation walls, unless placed in conjunction with a composite drainage system, such as Miradrain G100N or Delta Drain 6000. Imported granular materials, such as clean sand or OPSS Granular B Type I granular material, should be used for backfill material.

5.2 Protection of Footings Against Frost Action

Perimeter footings of heated structures are required to be insulated against the deleterious effect of frost action. A minimum of 1.5 m thick soil cover (or equivalent) should be provided.

A minimum of 2.1 m thick soil cover (or equivalent) should be provided for exterior unheated footings, such as exterior columns, piers, etc.

5.3 Excavation Side Slopes

Temporary Side Slopes

Excavation side slopes constructed in fill materials should excavated to acceptable slopes or retained by shoring systems from the beginning of the excavation until the structure is backfilled. Since the building will occupy the majority of the subject site, a temporary shoring system is anticipated for construction.

The excavation side slopes above the groundwater level extending to a maximum depth of 3 m should be cut back at 1H:1V or shallower. A shallower slope is required for excavations below groundwater level. The subsurface soils are considered to be a Type 2 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects.

Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should be kept away from the excavation sides.

Slopes in excess of 3 m in height should be periodically inspected by the geotechnical consultant in order to detect if the slopes are exhibiting signs of distress.

A trench box is recommended to protect personnel working in trenches with steep or vertical sides. Services are expected to be installed by "cut and cover" methods and excavations should not remain exposed for extended periods of time.

Temporary Shoring

Temporary shoring may be required for the overburden soil to complete the required excavations where insufficient room is available for open cut methods. The shoring requirements should be designed by a structural engineer, specializing in shoring design. The shoring will depend on the depth of the excavation, the proximity of the adjacent structures and the elevation of the adjacent building foundations, roadways and underground services.

The design and implementation of the temporary systems will be the responsibility of the excavation contractor. The geotechnical information provided below is to assist the contractor in completing a safe shoring system. The shoring designer should take into account the impact of a significant precipitation event and designate design measures to ensure that a precipitation event will not negatively impact the shoring system or soils supported by the system. Any changes during construction to the approved shoring design should be reported immediately to the owner's consultants prior to implementation.

The temporary system could consist of soldier pile and lagging system or interlocking steel sheet piling. Any additional loading due to street traffic, construction equipment, adjacent structures and facilities, etc., should be included to the earth pressures described below. The shoring system could be cantilevered, anchored or braced. Generally, the shoring systems is provided with tie-back rock anchors to ensure the stability. The shoring system is recommended to be adequately supported to resist toe failure and inspected to ensure that the sheet piles extend well below the excavation base. If consideration is given to utilizing a raker style support for the shoring system, the structural engineer should ensure that the design selected minimizes lateral movements to tolerable levels.

The earth pressures acting on the shoring system may be calculated with the following parameters.

Table 3 - Soil Parameters

Parameters	Values
Active Earth Pressure Coefficient (K_a)	0.33
Passive Earth Pressure Coefficient (K_p)	3
At-Rest Earth Pressure Coefficient (K_o)	0.5
Dry Unit Weight (γ), kN/m^3	20
Effective Unit Weight (γ), kN/m^3	13

The active earth pressure should be calculated where wall movements are permissible, while the at-rest pressure should be calculated if movement is not permissible. The dry unit weight should be calculated above the groundwater level while the effective unit weight should be calculated below the groundwater level.

A hydrostatic groundwater pressure should be included to the earth pressure distribution wherever the effective unit weight are calculated for earth pressures. If the groundwater level is lowered, the dry unit weight for the soil/bedrock should be calculated full weight, with no hydrostatic groundwater pressure component. For design purposes, the minimum factor of safety of 1.5 should be calculated.

5.4 Pipe Bedding and Backfill

Bedding and backfill materials should be in accordance with the most recent Material Specifications and Standard Detail Drawings from the City of Ottawa.

Excavation to approximately 4 m depth or shallower, below the existing grade, should be within the silty clay crust material. If deeper excavations are expected, the services will be excavated through the unweathered grey silty clay.

The pipe bedding for sewer and water pipes should consist of at least 150 mm of OPSS Granular A material. The material should be placed in maximum 300 mm thick lifts and compacted to a minimum of 95% of the SPMDD. The bedding material should extend at a minimum to the spring line of the pipe. The placement of clear stone is not recommended for bedding or cover as the finer particles of the native and backfill may migrate into the clear stone voids, thereby reducing the pipe support.

The cover material, which should consist of OPSS Granular A, should extend from the spring line of the pipe to at a minimum of 300 mm above the obvert of the pipe. The material should be placed in maximum 300 mm thick lifts and compacted to a minimum of 95% of the SPMDD.

Generally,the brown silty clay should be possible to place above the cover material if the excavation and backfilling operations are completed in dry weather conditions. Wet silty clay materials will be difficult for placement, as the high water content are impractical for the desired compaction without an extensive drying period.

Where hard surface areas are considered above the trench backfill, the trench backfill material within the frost zone (about 1.8 m below finished grade) should match the soils exposed at the trench walls to minimize differential frost heaving. The trench backfill should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 95% of the SPMDD.

To reduce long-term lowering of the groundwater level, clay seals should be provided in the service trenches, where the services are located below the local groundwater table. The seals should be a minimum of 1.5 m long (in the trench direction) and should extend from trench wall to trench wall. The seals should extend from the frost line and fully penetrate the bedding, subbedding and cover material. The barriers should consist of relatively dry impervious material placed in maximum 225 mm thick loose lifts and compacted to a minimum of 95% of the SPMDD. The clay seals should be placed at the site boundaries and at strategic locations at a maximum of 60 m intervals in the service trenches.

5.5 Groundwater Control

Due to the relatively impervious nature of the silty clay materials, groundwater infiltration into the excavations should be low and controllable by open sumps. A perched groundwater condition may be encountered within the silty sand deposit which may produce significant temporary groundwater infiltration levels. Pumping from open sumps should be sufficient to control the groundwater influx through the sides of shallow excavations.

A temporary MOE permit to take water (PTTW) will be required for this project if more than 50,000 L/day are to be pumped during the construction phase. At least 4 to 5 months should be allowed for completion of the application and issuance of the permit by the MOE.

The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium.

5.6 Winter Construction

The subsurface conditions mostly consist of frost susceptible materials. In presence of water and freezing conditions ice could form within the soil mass. Heaving and settlement upon thawing could occur. Precautions should be taken if winter construction is considered for this project.

In the event that construction is completed during below zero temperatures, the founding stratum and excavation side slopes should be protected from freezing temperatures by the installation of straw, propane heaters, tarpaulins or other suitable means. The excavation base should be insulated from sub-zero temperatures immediately upon exposure and until such time as heat is adequately supplied to the building and the footings are protected with sufficient soil cover to prevent freezing at founding level.

The trench excavations should be constructed in a manner that should avoid the introduction of frozen materials into the trenches. As well, pavement construction is difficult during winter. The subgrade consists of frost susceptible soils which will experience total and differential frost heaving as the construction is completed. In addition, the introduction of frost, snow or ice into the pavement materials, which is difficult to avoid, could adversely affect the performance of the pavement structure. Additional information could be provided, if required.

5.7 Corrosion Potential and Sulphate

The analytical test results indicate that the sulphate content is less than 0.1%. This result is indicative that Type 10 Portland cement (normal cement) would be appropriate. The results of the chloride content, pH and resistivity indicate the presence of a aggressive environment for exposed ferrous metals.

6.0 Recommendations

The following material testing and observation program should be performed by a geotechnical consultant and is required for the foundation design data provided herein to be applicable:

- ❏ Review of the proposed structure(s) and adjacent structures from a geotechnical perspective.
- ❏ Observation of all bearing surfaces prior to the placement of concrete.
- ❏ Sampling and testing of the concrete and fill materials used.
- ❏ Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- ❏ Observation of all subgrades prior to backfilling and follow-up field density tests to determine the level of compaction achieved.
- ❏ Sampling and testing of the bituminous concrete including mix design reviews.

A report confirming the work has been conducted in general accordance with the recommendations could be issued, upon request, following the completion of a satisfactory materials testing and observation program by the geotechnical consultant.

7.0 Statement of Limitations

The recommendations made in this report are for review and design purposes. Paterson requests permission to review the recommendations when the drawings and specifications are completed.

A soils investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, we request immediate notification to permit reassessment of our recommendations.

The recommendations provided herein should only be used by the design professionals associated with this project. They are not intended for contractors bidding on or undertaking the work. The latter should evaluate the factual information provided in this report and determine its suitability and completeness for their intended construction schedule and methods. Additional testing may be required for their purposes.

A geotechnical investigation is a limited sampling of a site. The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Cardel Homes and their agent(s) is not authorized without review by this firm for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.

Joe Forsyth, P.Eng.

David J. Gilbert, P. Eng.

Report Distribution:

- ❑ Cardel Homes(3 copies)
- ❑ Paterson Group (1 copy)

APPENDIX 1

BOREHOLE LOGS BY OTHERS

ANALYTICAL TESTING RESULTS

LOG OF BOREHOLE BH14-1

PROJECT: Cardel Homes - 3368 Carling Avenue
CLIENT: Cardel Homes
PROJECT LOCATION: 3368 Carling Avenue, Ottawa, ON
DATUM: local
BH LOCATION: See Location Plan

DRILLING DATA
Method: Hollow Stem Auger Drilling
Diameter: 203
Date: Aug/21/2014

REF. NO.: 10000823
ENCL NO.:

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	"N" BLOWS / 0.3 m	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
101.1 / 0.0	**ASPHALT** 40 mm				
100.8 / 0.3	**CRUSHED SAND AND GRAVEL** brown, moist (Granular Base)				
	SILTY CLAY trace gravel, dark brown, moist, firm (FILL)	1	SS	2	
		2	SS	6	
99.6 / 1.5	**SILTY CLAY** grey brown, moist, stiff to very stiff (Weathered Crust)	3	SS	10	
		4	SS	12	
		5	SS	7	
	- silty sand seam	6	SS	17	
95.0 / 6.1	**SILTY CLAY** with silty sand seams, grey, wet, stiff to very stiff	7	SS	1	-Hollow stem augered to 6.1 m then advanced casing to 14.9 m
			VANE		
			VANE		

GROUND WATER CONDITIONS: Cuttings; Bentonite; W. L. 97.4 m Aug 28, 2014; Sand; Screen

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (25 50 75 100 125)
PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%) (25 50 75)
POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (KN/m³)

ELEVATION: 101, 99, 98, 97, 96, 95, 94, 93, 92

+4
+10

SPL SOIL LOG-OTTAWA 10000823 - 3368 CARLING AVENUE.GPJ SPL.GDT 17/9/14

Continued Next Page

GROUNDWATER ELEVATIONS
Shallow/ Single Installation ▽ ▼ Deep/Dual Installation ▽ ▼

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH14-1

PROJECT: Cardel Homes - 3368 Carling Avenue
CLIENT: Cardel Homes
PROJECT LOCATION: 3368 Carling Avenue, Ottawa, ON
DATUM: local
BH LOCATION: See Location Plan

DRILLING DATA
Method: Hollow Stem Auger Drilling
Diameter: 203
Date: Aug/21/2014

REF. NO.: 10000823
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	TYPE	"N" BLOWS/0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (25 50 75 100 125)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (25 50 75)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (KN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	SILTY CLAY with silty sand seams, grey, wet, stiff to very stiff(Continued)						91					
			8	SS	1		90					
			9A 9B	SS SS	1		89					
88.9												
12.2	**SILTY SAND** trace clay, grey, wet, very loose to loose		10	SS	1		88					
			11	SS	8							
			12	SS	2		87					
			13	SS	5							
86.2												
14.9	**End of Borehole** Notes: 1 - Borehole was advanced with hollow stem augers to 6.1 m depth then advanced with casing to 14.9 m depth. Casing filled with water prior to SPT sampling below 10.7 m depth. 2 - Borehole terminated at 14.9 m below surface on casing refusal. 3 - Water level on completion of sampling at a depth of 2.5 m below surface. 4 - 50 mm dia. monitoring well installed in adjacent auger hole 5 - Date Water Level Aug 28, 2014 3.7 m											

SPL SOIL LOG-OTTAWA 10000823 - 3368 CARLING AVENUE.GPJ SPL.GDT 17/9/14

GROUNDWATER ELEVATIONS
Shallow/ Single Installation ▽ ▼ Deep/Dual Installation ▽ ▼

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH14-2

PROJECT: Cardel Homes - 3368 Carling Avenue
CLIENT: Cardel Homes
PROJECT LOCATION: 3368 Carling Avenue, Ottawa, ON
DATUM: local
BH LOCATION: See Location Plan

DRILLING DATA
Method: Hollow Stem Auger Drilling
Diameter: 203
Date: Aug/19/2014

REF. NO.: 10000823
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS / 0.3 m
100.8					
100.7 / 0.1	**ASPHALT** 100 mm				
100.6 / 0.2	**CRUSHED SAND AND GRAVEL** brown, moist (Granular Base)				
	SILTY CLAY trace to some gravel, trace roots, brown, moist, firm (FILL)		1	SS	6
			2	SS	7
99.5 / 1.4	**SILTY CLAY** grey brown to brown, moist, stiff to very stiff (Weathered Crust)		3	SS	13
			4	SS	11
			5	SS	6
96.5 / 4.4	**SILTY CLAY** with silty sand seams, grey brown to grey, moist, stiff to very stiff		6	SS	2
				VANE	
				VANE	
	- grey below 6.0 m		7	SS	WH
				VANE	
				VANE	
			8A	SS	1
			8B	SS	
				VANE	
			9	SS	WH
				VANE	

GROUND WATER CONDITIONS

ELEVATION: 100, 99, 98, 97, 96, 95, 94, 93, 92, 91

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (25 50 75 100 125)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE
+4 >100 kPa
+6 +8 >100 kPa
+2 >100 kPa

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%) (25 50 75)

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (KN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

Continued Next Page

GROUNDWATER ELEVATIONS
Shallow/ Single Installation ▽ ▼ Deep/Dual Installation ▼ ▼

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH14-2

PROJECT: Cardel Homes - 3368 Carling Avenue
CLIENT: Cardel Homes
PROJECT LOCATION: 3368 Carling Avenue, Ottawa, ON
DATUM: local
BH LOCATION: See Location Plan

DRILLING DATA
Method: Hollow Stem Auger Drilling
Diameter: 203
Date: Aug/19/2014

REF. NO.: 10000823
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (KN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	SILTY CLAY with silty sand seams, grey brown to grey, moist, stiff to very stiff(Continued)			VANE						
			10	SS	WH		90			
				VANE						
				VANE			89			
88.8										
12.1	**SILTY SAND** trace clay, grey, wet, very loose		11	SS	WR		88			
			12	SS	2		87		21.1	0 73 24 3 - approx. 0.3 m of heave inside hollow stem auger when center plug removed
86.0							86			
14.8	**LIMESTONE** fresh, grey, thin to medium bedded with some shale seams, moderately to widely spaced discontinuities - TCR: 100% - SCR: 99% - RQD: 99%		1	CORE			85			
	- TCR: 97% - SCR: 92% - RQD: 85%		2	CORE			84			
82.9							83			
17.9	**End of Borehole** Notes: 1 - Switched from augering to NQ rock coring at a depth of 14.8 m below surface after encountering auger refusal. 2 - Water level after augering was at a depth of 6.9 m below surface. 3 - Water level after completion of borehole was at a depth of 7.0 m below surface									

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE
25 50 75 100 125 >100 kPa
PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%): 25 50 75

SPL SOIL LOG-OTTAWA 10000823 - 3368 CARLING AVENUE.GPJ SPL.GDT 17/9/14

GROUNDWATER ELEVATIONS
Shallow/ Single Installation ▽ ▼ Deep/Dual Installation ▽ ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH14-3

PROJECT: Cardel Homes - 3368 Carling Avenue
CLIENT: Cardel Homes
PROJECT LOCATION: 3368 Carling Avenue, Ottawa, ON
DATUM: local
BH LOCATION: See Location Plan

DRILLING DATA
Method: Hollow Stem Auger Drilling
Diameter: 203
Date: Aug/20/2014

REF. NO.: 10000823
ENCL NO.:

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS / 0.3 m "N"
100.8 / 0.0	**ASPHALT** 120 mm			
100.7 / 0.1	**CRUSHED SAND AND GRAVEL** grey brown, moist, loose (Granular Base)	1	SS	8
100.4 / 0.5	**SILTY CLAY** trace gravel, dark brown, moist, firm (FILL)	2	SS	6
99.3 / 1.5	**SILTY CLAY** grey brown, moist, stiff to very stiff (Weathered Crust)	3	SS	13
		4	SS	8
		5	SS	7
		6	SS	1
95.7 / 5.1	**SILTY CLAY** with silty sand seams, grey, wet, stiff to very stiff		VANE	
			VANE	
		7	TW	
			VANE	
			VANE	
		8	SS	1
			VANE	
			VANE	
		9	TW	

Cuttings
Bentonite
W. L. 96.3 m
Aug 28, 2014
Sand
Screen

DYNAMIC CONE PENETRATION RESISTANCE PLOT
SHEAR STRENGTH (kPa)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE
PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (KN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL
0 1 57 42

>100 kPa

Continued Next Page

GROUNDWATER ELEVATIONS
Shallow/ Single Installation ▽ ▼ Deep/Dual Installation ▽ ▼

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

SPL SOIL LOG-OTTAWA 10000823 - 3368 CARLING AVENUE.GPJ SPL.GDT 17/9/14

LOG OF BOREHOLE BH14-3

PROJECT: Cardel Homes - 3368 Carling Avenue
CLIENT: Cardel Homes
PROJECT LOCATION: 3368 Carling Avenue, Ottawa, ON
DATUM: local
BH LOCATION: See Location Plan

DRILLING DATA
Method: Hollow Stem Auger Drilling
Diameter: 203
Date: Aug/20/2014

REF. NO.: 10000823
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" BLOWS/0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (25 50 75 100 125)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (25 50 75)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (KN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
90.1	**SILTY CLAY** with silty sand seams, grey, wet, stiff to very stiff(Continued)											
10.7	**SILTY SAND** trace clay, grey, wet, very loose to loose		10	SS	1		90		○			
			11	SS	7		89		○		20.5	0 87 12 1
	- some silt		12	SS	3		88		○			
85.0			13	SS	5		87		○			0 70 24 6
15.8	**End of Borehole** Notes: 1 - Borehole terminated at 15.8 m below surface on auger refusal. 2 - Water level after completion of borehole was at a depth of 8.2 m below surface. 3 - 50 mm dia. monitoring well advanced in adjacent auger hole 4 - Date Water Level Aug 28, 2014 4.5 m						86 85					

SPL SOIL LOG-OTTAWA 10000823 - 3368 CARLING AVENUE.GPJ SPL.GDT 17/9/14

GROUNDWATER ELEVATIONS
Shallow/ Single Installation ▽ ▼ Deep/Dual Installation ▽ ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH14-4

PROJECT: Cardel Homes - 3368 Carling Avenue
CLIENT: Cardel Homes
PROJECT LOCATION: 3368 Carling Avenue, Ottawa, ON
DATUM: local
BH LOCATION: See Location Plan

DRILLING DATA
Method: Hollow Stem Auger Drilling
Diameter: 203
Date: Aug/20/2014

REF. NO.: 10000823
ENCL NO.:

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m
101.1 / 0.0	**ASPHALT** 120 mm			
100.9 / 0.1	**CRUSHED SAND AND GRAVEL** some silt, brown, moist (Granular Base)	1	SS	4
100.3 / 0.9	**SILTY CLAY** brown grey, moist, firm to stiff (FILL)	2	SS	8
99.7 / 1.4	**SILTY CLAY** brown, moist, stiff to very stiff (Weathered Crust)	3	SS	11
		4	SS	11
		5	SS	6
		6	SS	2
			VANE	
			VANE	
95.0 / 6.1	**SILTY CLAY** with silty sand seams, grey, wet, stiff to very stiff	7	SS	1
			VANE	
			VANE	
		8	TW	
			VANE	
			VANE	
	- firm at 9.8 m	9	SS	2
			VANE	

GROUND WATER CONDITIONS: Cuttings; Bentonite; W. L. 97.9 m Aug 28, 2014; Sand; Screen

ELEVATION: 101, 99, 97, 96, 94, 93, 92

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE; 25 50 75 100 125

VANE: >100 kPa; >100 kPa; 10; >100 kPa; 11; >100 kPa; 3

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%): 25 50 75

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (KN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

Continued Next Page

GROUNDWATER ELEVATIONS
Shallow/ Single Installation ▽ ▼ Deep/Dual Installation ▽ ▼

GRAPH NOTES
$+^3$, $\times^3$: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

SPL SOIL LOG-OTTAWA 10000823 - 3368 CARLING AVENUE.GPJ SPL.GDT 17/9/14

LOG OF BOREHOLE BH14-4

PROJECT: Cardel Homes - 3368 Carling Avenue
CLIENT: Cardel Homes
PROJECT LOCATION: 3368 Carling Avenue, Ottawa, ON
DATUM: local
BH LOCATION: See Location Plan

DRILLING DATA
Method: Hollow Stem Auger Drilling
Diameter: 203
Date: Aug/20/2014

REF. NO.: 10000823
ENCL NO.:

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (KN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	SILTY CLAY with silty sand seams, grey, wet, stiff to very stiff(Continued)			VANE			91	+2				
90.4							Cave					
10.7	**SILTY SAND** trace clay, grey, wet, very loose		10	SS	1		90		○			
							89					
88.3			11	SS	WH				○			
12.8	**End of Borehole** Notes: 1 - Borehole terminated at 12.8 m below surface. 2 - Water level upon completion of borehole was at a depth of 8.2 m below surface 3 - Date Water Level Aug 28, 2014 3.2 m											

SPL SOIL LOG-OTTAWA 10000823 - 3368 CARLING AVENUE.GPJ SPL.GDT 17/9/14

GROUNDWATER ELEVATIONS
Shallow/ Single Installation ▽ ▼ Deep/Dual Installation ▼ ▼

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

Client: SPL Consultants Ltd.
146 Colonnade Rd., Unit 17
Ottawa, ON
K2E 7Y1
Attention: Ms. Wendy McLaughlin
PO#:
Invoice to: SPL Consultants Ltd.

Report Number: 1418214
Date Submitted: 2014-08-27
Date Reported: 2014-08-29
Project: 10000823
COC #: 172975

				Lab I.D.	1129070	1129071	1129072
				Sample Matrix	Soil	Soil	Soil
				Sample Type			
				Sampling Date	2014-08-19	2014-08-19	2014-08-19
				Sample I.D.	BH 14-2 SS7	BH 14-3 SS3	BH 14-3 SS11
Group	**Analyte**	**MRL**	**Units**	**Guideline**			
Agri. - Soil	pH	2.0			8.8	8.1	8.9
General Chemistry	Cl	0.002	%		0.024	0.017	<0.002
	Electrical Conductivity	0.05	mS/cm		0.66	0.72	0.07
	Resistivity	1	ohm-cm		1520	1410	14300
	SO4	0.01	%		0.03	0.02	<0.01

Guideline = *** = Guideline Exceedence**
** = Analysis completed at Mississauga, Ontario.
Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

APPENDIX 2

FIGURE 1 - KEY PLAN

DRAWING PG3682-1 - TEST HOLE LOCATION PLAN

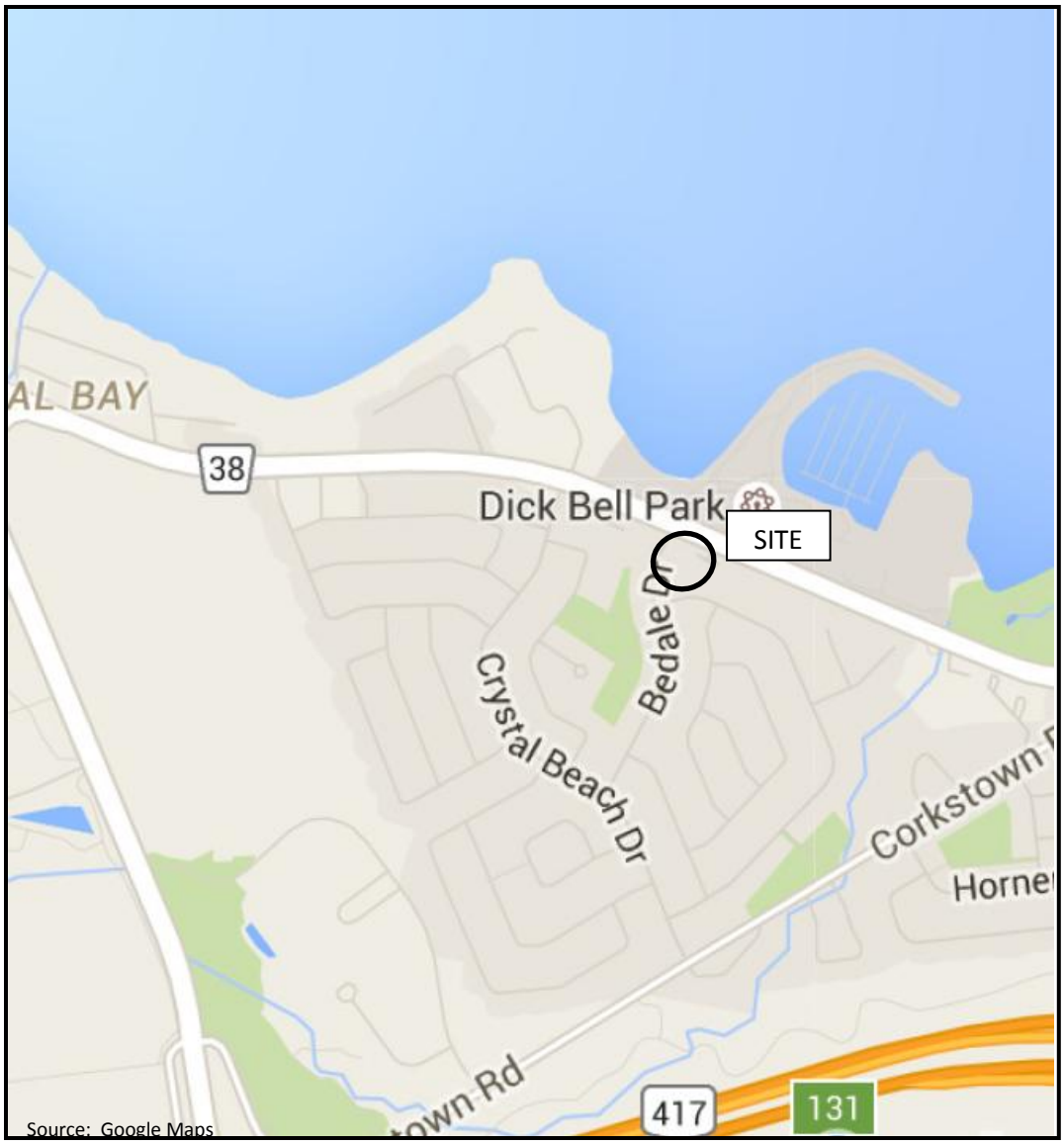
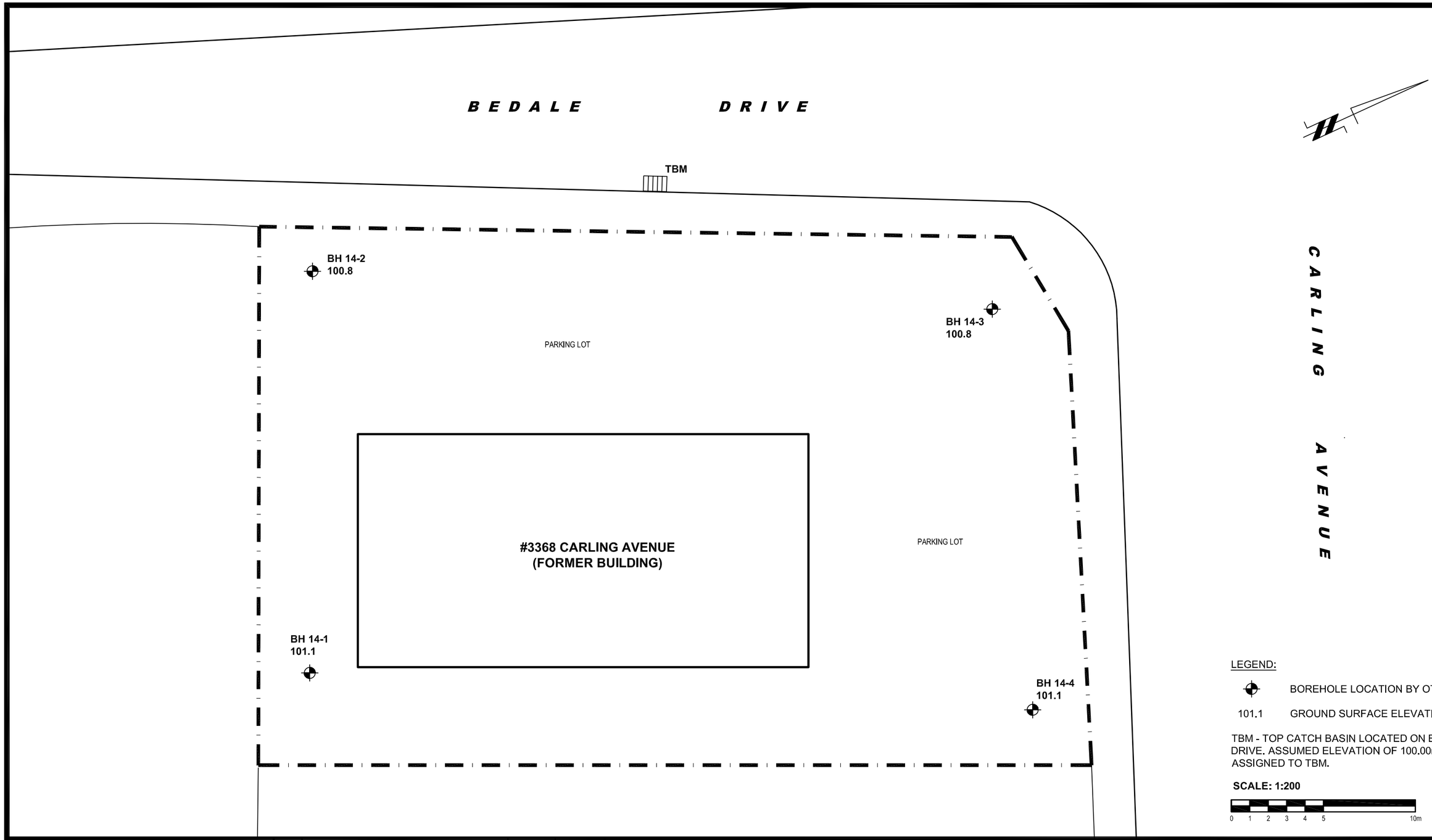


FIGURE 1

KEY PLAN



LEGEND:

BOREHOLE LOCATION BY OTHERS

101.1 GROUND SURFACE ELEVATION (m)

TBM - TOP CATCH BASIN LOCATED ON BEDALE DRIVE. ASSUMED ELEVATION OF 100.00m WAS ASSIGNED TO TBM.

SCALE: 1:200

0 1 2 3 4 5 10m

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL

CARDEL HOMES

GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL BUILDING - 3368 CARLING AVENUE
OTTAWA, ONTARIO

Title:

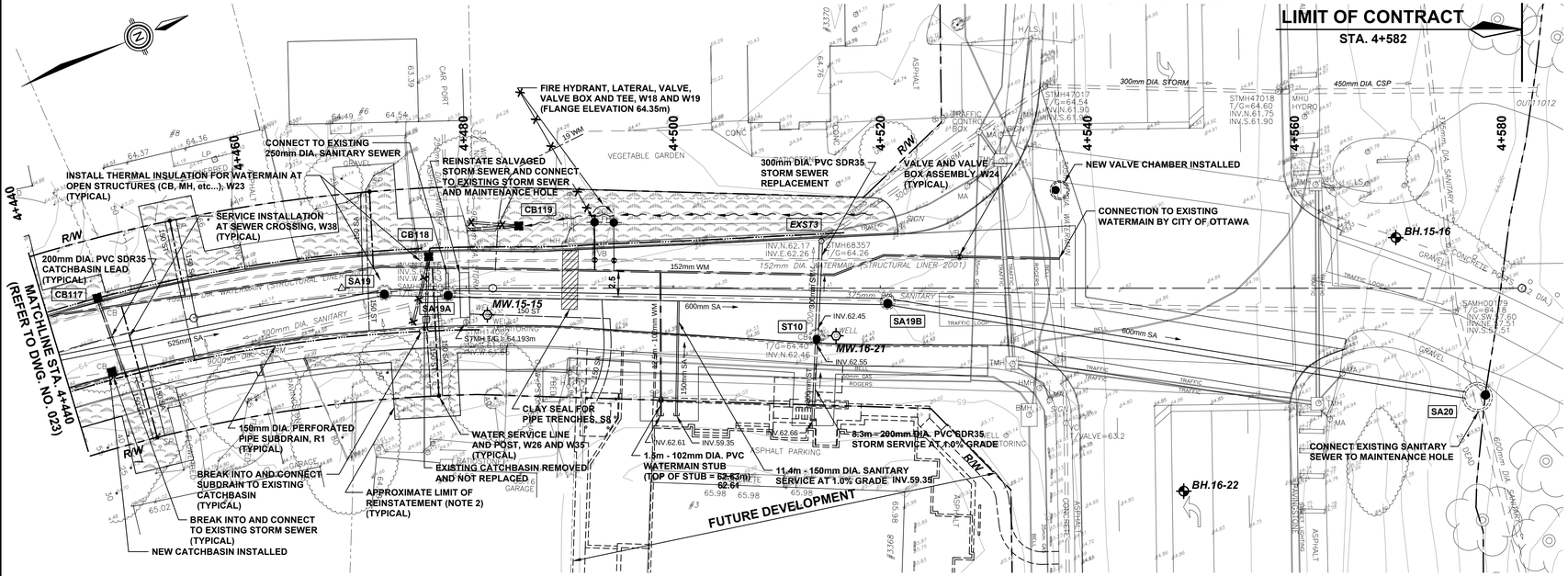
TEST HOLE LOCATION PLAN

Scale: 1:200	Date: 12/2015
Drawn by: CPB	Report No.: PG3682
Checked by: JF	Dwg. No.: PG3682-1
Approved by: DG	Revision No.: 0

p:\autocad drawings\geotechnical\pg3682-1 thlp.dwg

Appendix E DRAWINGS

BEDALE DRIVE



CRYSTAL BEACH DRIVE
SANITARY SEWER CONSTRUCTION
Crystal Beach Dr., Bedale Dr., Conniston Ave. Ullswater Dr., Hexham Rd., Whitburn Cr.
PLAN AND PROFILE
BEDALE DRIVE
STA. 4+440 TO STA. 4+580

ALAIN C. GONTHIER, P. ENG. Director	C. NEWCOMBE, P.ENG. Senior Engineer, Design and Construction (Municipal) - West

Stantec Consulting Ltd.
400 - 1331 Clyde Avenue
Ottawa ON Canada
K2C 3G4
Tel. 613 722 4420
www.stantec.com

Contract No.	Dwg. No.
ISD15-2057	024

Sheet 24 of 47

Asset No.

Asset Group

Des.	Chk'd.
M.J.T.	D.A.S.
Dwn.	Chk'd.
G.R.L.	D.A.S.

Utility Circ. No. | Index No.

Const. Inspector

Scale:
HORIZONTAL 1:250
0m 2.5 5 10
0m 1 2
VERTICAL 1:50

NOTE: The location of utilities is approximate only, 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 adequate protection from damage.

REVISIONS	No.	Description	By	Date (dd/mm/yyyy)
	6	ISSUED FOR CONSTRUCTION	D.A.S.	24/06/2016
	7	ISSUED FOR CHANGE ORDER 05	D.A.S.	25/11/2016
	8	AS-BUILT	D.A.S.	21/09/2018
	4	ISSUED FOR MUNICIPAL CONSENT	D.A.S.	22/03/2016
	5	ISSUED FOR TENDER	D.A.S.	20/04/2016

NOTES:

1. ALL PROPERTY AND TOPOGRAPHIC INFORMATION WAS PROVIDED BY THE CITY OF OTTAWA, SURVEYS AND MAPPING UNIT, FILE 18854.DGN DATED SEPTEMBER 2015.
2. REMOVAL/REINSTATEMENT AREAS IDENTIFIED ARE ESTIMATED BASED ON INFORMATION AVAILABLE AT THE TIME OF DESIGN. ACTUAL AREAS WILL VARY AND WILL BE FIELD MEASURED DURING CONSTRUCTION. EXACT LIMITS OF REINSTATEMENT WILL BE AS DIRECTED BY THE CONTRACT ADMINISTRATOR. THE CONTRACTOR SHALL NOT PERFORM LANDSCAPING OR DRIVEWAY REMOVAL UNTIL LIMITS ARE AGREED TO ON-SITE WITH THE CONTRACT ADMINISTRATOR. THE CONTRACTOR SHALL MINIMIZE IMPACT AREAS TO BE RESTORED.
3. GRADING LIMITS NOT ADJUSTED DUE TO ADDITION OF WATERMAIN TO CONTRACT.

SANITARY MAINTENANCE HOLE DATA

NO.	STATION	OFFSET (m)	TYPE		ELEVATION	
			Structure	Cover	Grade	Low Inv.
SA19	4+472.01	0.04 RT	701.010	S24	64.222	~~59.175~~ 59.175
SA19A	4+478.23	0.46 RT	701.010	S24	64.258	~~59.079~~ 59.079
SA19B	4+520.72	1.30 RT	701.010	S24	64.486	~~58.800~~ 58.800
SA20	4+578.51	13.7 RT	701.013	S24	64.805	~~57.585~~ 57.585

SANITARY SEWER DATA

NO. to NO. (high to low)		SIZE (mm)	LENGTH (m)	CLASS	INVERTS	
					Inlet	Outlet
SA19	SA19A	525	6.2	CONC. 100-D	59.175 ~~59.175~~	59.109 ~~59.12~~
SA19A	SA19B	600	42.5	CONC. 100-D	59.079 ~~59.08~~	58.850 ~~58.88~~
SA19B	SA20	600	59.1	CONC. 100-D	58.800 ~~58.80~~	58.433 ~~58.52~~
EXIST.	SA19A	250	2.0	PVC SDR 35	EXIST.	60.494 ~~60.51~~
CAP	EXIST.	150	11.4±	PVC SDR 35	59.35 ~~59.35~~	59.35 ~~60.45~~

CATCHBASIN & MAINTENANCE HOLE DATA

NO.	STATION	OFFSET (m)	TYPE		ELEVATION	
			Structure	Cover	Grade	Low Inv.
ST10	4+513.86	4.70 RT	701.010	S24.1	64.386	62.450 ~~62.550~~
EXST3	4+514.3±	4.5± LT	EXISTING	EXISTING	64.322	62.17±

STORM SEWER DATA

NO. to NO. (high to low)		SIZE (mm)	LENGTH (m)	CLASS	INVERTS	
					Inlet	Outlet
CAP	ST10	200	8.3	PVC SDR 35	62.569 ~~62.25~~	62.550 ~~62.56~~
ST10	EXST3	300	9.2	PVC SDR 35	62.450 ~~62.45~~	62.26±

CATCHBASIN & MAINTENANCE HOLE DATA

NO.	STATION	OFFSET (m)	TYPE		ELEVATION	
			Structure	Cover	Grade	Low Inv.
CB117	4+445.00	3.60 LT	705.010	S22/S23	63.885	62.685
CB118	4+476.50	3.60 LT	705.010	S19	64.135	62.935
CB119	4+485.08	6.0 LT	705.010	S19	64.200	63.000

AS-BUILT LEGEND:

- 150 SA — APPROXIMATE SANITARY SERVICE LATERAL LOCATION c/w PIPE SIZE
- 150 ST — APPROXIMATE STORM SERVICE LATERAL LOCATION c/w PIPE SIZE
- 19 WM — APPROXIMATE WATER SERVICE LATERAL LOCATION c/w PIPE SIZE

NOTE:

ALL NUMERICAL VALUES THAT ARE NOT STROKED OUT AND REPLACED ON AS-BUILT DRAWINGS ARE CONSIDERED TO BE DESIGN VALUES ONLY AND NOT MEASURED IN THE FIELD.