Stormwater Management & Servicing Report

3555 Borrisokane Road, Barrhaven

City of Ottawa

PEARSON ENGINEERING

PEARSONENG.COM

(Revised July 2024)

July 2023

22099

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Stormwater Management & Servicing Report
3555 Borrisokane Road, Barrhaven

1. Introduction

PEARSON Engineering Ltd. has been retained by the Ottawa Korean Community Church (Client) to prepare a Stormwater Management (SWM) & Servicing Report in support of a proposed church facility. The development is located at 3555 Borrisokane Road in the City of Ottawa (City).

The subject property is approximately 1.39 ha in size and fronts onto Borrisokane Road to the west, vacant industrial lot to the north, drainage course to the east and environmentally protected lands to the south. The Project site currently consists of a vacant lot and proposes the development of a single-storey church and associated parking lot. The location of the site can be seen on Figure 1.

The objective of this report is to assess the existing municipal infrastructure in the vicinity of the Project, the onsite Stormwater Management (SWM) facilities and internal services required to service the proposed Project. The report also includes design calculations and a brief outline of the proposed internal services, as well as comments regarding the ability of the various secondary utilities to service the site.

2. Supporting Documents

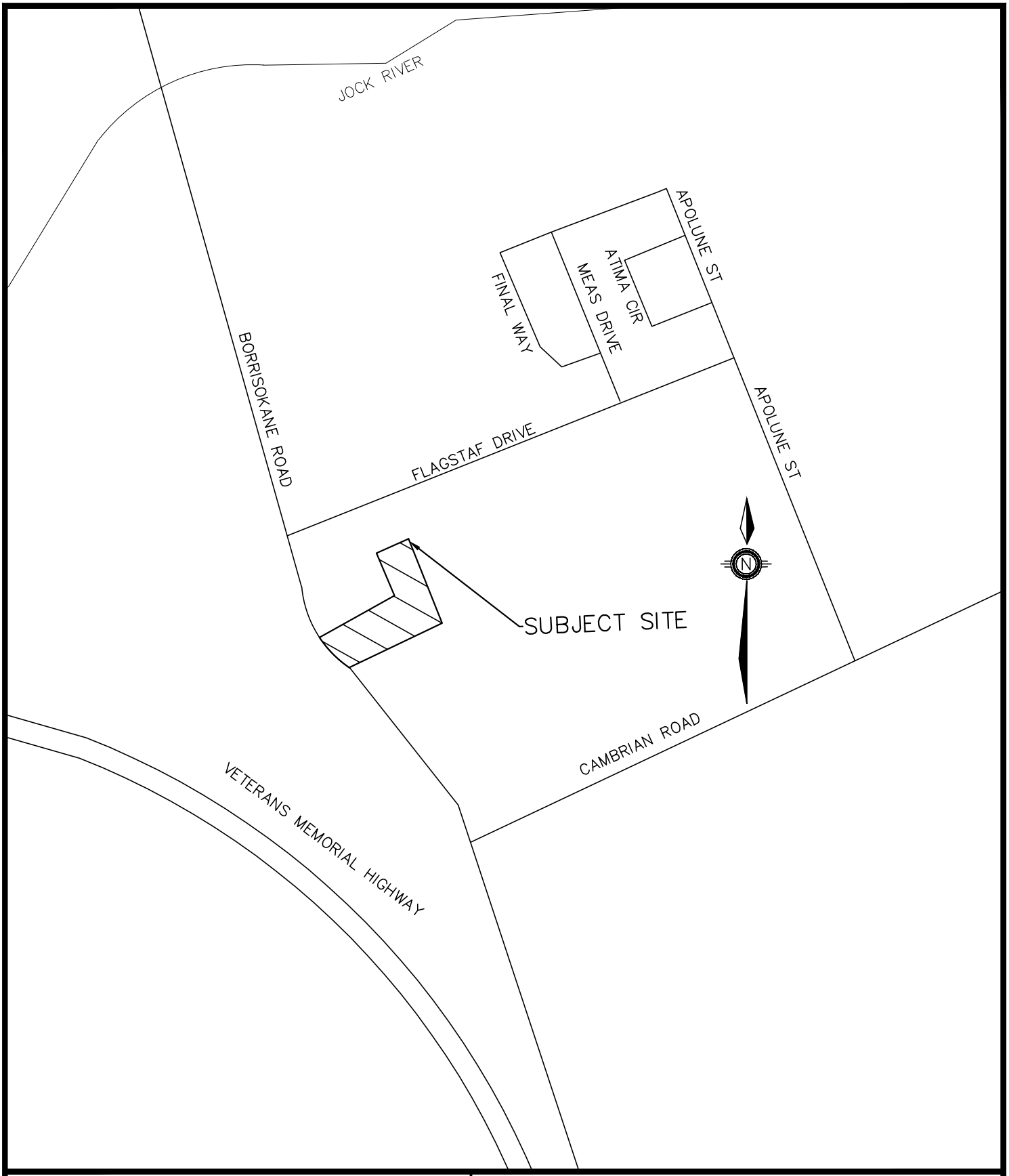
The following documents have been referenced in the preparation of this report:

- Ministry of the Environment, Design Guidelines for Sewage Works, 2008
- Ministry of the Environment, Design Guidelines for Drinking-Water Systems, 2008
- Ministry of the Environment, Stormwater Management Planning and Design Manual, March 2003
- City of Ottawa Sewer Design Guidelines, October 2012
- City of Ottawa Water Distribution Design Guidelines, July 2010

3. Water Supply and Distribution

3.1. Water Servicing Design Criteria

The site is to have an Institutional land use area of approximately 1.39 ha. Utilizing the City of Ottawa Water Distribution Design Guidelines for Commercial and Institutional Use of 28,000 L/ha/day, an Average Day Demand (ADD) of 0.45 L/s was calculated. A Peak Rate factor of 1.80 was used in calculating a Peak Hour Demand (PHD) of 1.22 L/s for the development. Calculations for the domestic water requirements for the site can be found in Appendix A.



KOREAN COMMUNITY CHURCH
3555 BORRISOKANE ROAD
CITY OF OTTAWA

SITE LOCATION PLAN

PEARSON ENGINEERING
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	NW/MWD	HORIZ SCALE	N/A	PROJECT #	22099
DRAWN BY	JM	VERT SCALE	N/A	DRAWING #	FIG–1
CHECKED BY	MWD	DATE	JUNE 2023	REVISION #	0

3.2. Internal Water Distribution System

As part of the Half Moon Bay West Subdivision, watermain was installed on Flaggstaff Drive and service stubs were provided for the proposed development block that will contain a car wash, the Korean Church and future development block. The Project will be serviced by extending the existing 200mm diameter water service stubs through the access/servicing easement past the future development site to the property line of the Korean Church site which provide domestic and fire flows. A 50 mm diameter water service for domestic use and a 150 mm diameter water service for fire use are proposed for the development from the property line to the Church building. An internal fire hydrant is proposed to provide adequate firefighting coverage as per City standards. Proposed layout of the water services can be seen on SS-1 Drawing in Appendix J.

3.3. Fire Fighting Requirements

Fire Flow calculations have been conducted as per FUS guidelines and resulted in a required fire flow of 133 L/s (2112 GPM). As per Figure F.1 of the Hydraulic Capacity and Modeling Analysis completed by GeoAdvice Engineering Inc. in support of Phase 3 of the Half Moon Bay Subdivision, the available fire flow at the watermain junction closest to the project site, J-82, is 372 L/s. The Hydraulic Capacity and Modeling Analysis Report can be seen in Appendix F.

The Boundary Conditions for the site were provided by the City of Ottawa using the project's domestic and fire flow demands. Water pressures shown in Table 1A and Table 1B were calculated based on the Hydraulic Grade Lines (HGL) provided by the City for existing and future conditions respectively. When comparing to the minimum and maximum allowable water pressures from City of Ottawa Water Design Guidelines, it can be seen that the site water pressures fall within City limits for the future conditions. Fire flow analysis, water pressure conversion and boundary conditions supplied by the City for both existing and future conditions can be found in Appendix A.

Table 1A: Existing Boundary Conditions

Design Parameter	Demand (L/s)	HGL (m)	Pressure (PSI)	Pressure (kPa)	City of Ottawa minimum (kPa)	City of Ottawa maximum (kPa)
Average Daily Demand	N/A	156.5	89.2	614.7	-	552
Peak Hour	N/A	142.6	69.4	478.5	276	552
Max Day + Fire Flow	N/A	137.7	62.4	430.4	140	552

Table 1B: Proposed Boundary Conditions

Design Parameter	Demand (L/s)	HGL (m)	Pressure (PSI)	Pressure (kPa)	City of Ottawa minimum (kPa)	City of Ottawa maximum (kPa)
Average Daily Demand	0.45	146.8	75.4	519.6	-	552
Peak Hour	1.22	142.8	69.7	480.4	276	552
Max Day + Fire Flow	133.7	142.4	69.1	476.5	140	552

4. Sanitary Servicing

4.1. Sanitary Design Criteria

The site is to have an Institutional land use area of approximately 1.39 ha. Utilizing the City of Ottawa Sewer Design Guidelines for Commercial and Institutional Use of 28,000 L/ha/day, an Average Day Demand (ADD) of 0.45 L/s was calculated. Using a Peak Rate factor of 1.50 and an infiltration allowance of 0.33 L/ha/s, a peak flow of 1.13 L/s was calculated for the proposed development. Calculations for the sanitary flows for the site can be found in Appendix B.

4.2. Internal Sanitary Sewer System

The sanitary sewers will be constructed in accordance with the City of Ottawa's Sewer Design Guidelines and the Ministry of the Environment, Conservation and Parks (MECP) guidelines in order to service the Project. Similar to the water servicing for the project, the existing sanitary sewer stub will be extended to the Korean Church property line through an access/servicing easement. A proposed 200 mm diameter sanitary sewer system for this Project is to convey sanitary flow to the proposed sanitary stub provided by the Carwash project which connects to monitoring MH1A and ultimately to the 300 mm diameter sanitary sewer on the Flagstaff Drive.

The actual velocity was calculated as per the City of Ottawa Sewer Guidelines for all sanitary sewers that have a flow depth of less than 30% of the diameter. Results provided in Appendix B demonstrate that an actual velocity of 0.60 m/s to 0.82 m/s is provided for the Project's proposed sanitary sewers, which is meeting the City's minimum velocity criteria of 0.60 m/s. Therefore, the Project's sanitary sewers will provide adequate self-cleansing velocities.

As per the Sanitary Sewer Calculation Sheet completed by DSEL for Flagstaff Drive, a future residential flow of 8.31 L/s was calculated from the east of the project site. The 300 mm diameter sanitary sewer on Flagstaff Drive runs east to west and has a capacity of 43.3 L/s at a slope of 0.20%. The Carwash Project (Part 1), future light industrial (Part 3), and the project site will therefore utilize approximately 20.5% of the sewer's capacity. As the proposed peak flow from the project site is 2.6 % of the current capacity of the existing sewer, it is expected to have sufficient capacity to convey the sanitary design flows. Refer to Drawing SS-1 for the proposed sanitary servicing layout in Appendix J.

5. Stormwater Management

A key component of the development is the need to address environmental and related SWM issues. These are examined in a framework aimed at meeting the City of Ottawa and MECP requirements. This report focuses on the necessary measures to satisfy the MECP's SWM requirements.

It is understood the objectives of the SWM plan are to:

- Protect life and property from flooding and erosion;
- Maintain water quality for ecological integrity, recreational opportunities, etc.;
- Protect and maintain groundwater flow regime(s);
- Protect aquatic and fishery communities and habitats; and
- Maintain and protect significant natural features.

5.1. Analysis Methodology

The design of the SWM Facilities for this site has been conducted in accordance with:

- The Ministry of the Environment, Stormwater Management Planning and Design Manual, March 2003
- City of Ottawa, Sewer Design Guidelines, October 2012

In order to design the facilities to meet these requirements, it is essential to select the appropriate modeling methodology for the storm system design. Given the size of the site, the Rational Method is appropriate for the design for the SWM system.

5.2. Existing Drainage Conditions

The Project site consists of a cleared lot with a temporary drainage channel along the south side of the property. Most of the site drains overland to a ditch along Borrisokane Road, the rest of the site drains overland to a water course in the Half Moon Bay West Subdivision. Both ultimately leading to Jock River. Details of existing storm drainage conditions are shown on Drawing STM-1 in Appendix J.

Paterson Group completed a geotechnical investigation for the site dated March 7th, 2019. The investigation revealed that the site consists of a layer of peat followed by brown silty sand with clay and this layer is followed by grey silty clay. There was no Groundwater found below the existing ground surface.

The site is located within the Half Moon Bay West Phase 3 subdivision. From the DSEL Storm Drainage Plan, dated August 2022, the allowable runoff coefficient for the site is 0.80. The Modified Rational Method and the City of Ottawa IDF curve parameters were used to determine allowable peak flows for the site and can be seen in Table 2 below. DSEL Storm Drainage Plan can be found in Appendix E. Detailed calculations for the existing drainage conditions can be found in Appendix C.

Table 2: Allowable Peak Flows

	2 Year Storm	5 Year Storm	100 Year Storm
Allowable Peak Flows (L/s)	225.8	306.4	306.4

5.3. Proposed Storm Drainage System

Post-development drainage patterns for the site will generally follow pre-development drainage conditions. The majority of the paved areas will be conveyed overland to a catchbasin and storm sewer system, sized for the 5-year storm event located throughout the site. A portion to the south of the proposed building will flow uncontrolled towards the existing ditch on Borrisokane Road and to the woodland area to the east. Stormwater from the building will drain via a roof leader to the storm sewer which outlets to the existing ditch on Borrisokane Road.

The project's storm sewer was sized for the minor storm event, defined as all storms up to and including the 5-year storm event, using the rational method. An orifice plate will be implemented downstream of CBMH3 to reduce the post-development peak flows leaving the site, causing stormwater to back up onto the surface. Surface ponding on the parking lot provides a total of 178 m^3 of storage volume and underground structures provide a 24.62 m^3 of volume. In the event of a storm greater than 100-year storm and/or if the orifice plate becomes blocked, stormwater will be conveyed overland through the top of curb weir located in the northwest corner of the parking lot towards the existing roadside ditch on Borrisokane Road.

As per the City of Ottawa Sewer Design Guidelines, the 100-year plus 20% stress test event was considered to convey the flows without negatively affecting the building. A 10.0 m wide emergency weir located in the northwest corner of the parking lot will convey storm flows greater than the 100-year storm event. Calculations in Appendix C demonstrate that the separation between the 20% stress test conveyance elevation and the finished floor elevation of the church building will be 0.23 m. Post-development storm drainage patterns can be found on Drawing STM-2 in Appendix H.

5.4. Stormwater Quantity Control

The proposed development will increase the imperviousness of the site and as such the post development peak flows will increase. The calculated post-development runoff coefficient of 0.63 is smaller than the allowable runoff coefficient (as per DSEL Drawings) of 0.80. However, as per the City of Ottawa Sewer Design Guidelines, the 100-year post-development runoff is required to be controlled to the 5-year allowable flow values.

Quantity control on site will be provided through the use of surface ponding throughout the parking lot. A 250 mm diameter orifice plate will be implemented downstream of CBMH3 to reduce the post-development peak flows leaving the site, causing stormwater to back up onto the surface. Calculations in Appendix C demonstrate that 163 m^3 of volume is required to control the 100-year storm event to the 5-year pre-development values. The site has been graded to provide a total of 178 m^3 of storage in form of surface ponding and 24.6 m^3 within underground structures with a maximum depth of 0.30 m as per the SSD calculations sheet in Appendix C. Table 3 summarizes post-development peak flows for the development.

Table 3: Post-Development Peak Flows

	2 Year Storm	5 Year Storm	10 Year Storm	25 Year Storm	50 Year Storm	100 Year Storm
Controlled Peak Flows (L/s)	110.0	148.9	163.0	168.3	170.8	172.4
Uncontrolled Flows (L/s)	44.6	60.6	71.0	92.5	112.6	129.7
Total Flows (L/s)	154.6	209.5	234.0	260.8	283.4	302.1

By comparing Table 2 and 3, it can be seen that the post-development peak flows for the 2-year to 100-year storm has been reduced to at below 5-year allowable flow values.

5.5. Stormwater Quality Control

The MECP in March 2003 issued a “Stormwater Management Planning and Design Manual”. This manual has been adopted by a variety of agencies including the City of Ottawa. The objective of the Stormwater Quality Control will be to ensure Enhanced Protection quality control as stated in the MECP manual. To achieve enhanced protection, permanent and temporary control of erosion and sediment transport are proposed and are discussed in the following sections.

5.5.1. Permanent Quality Control

The development's active parking facilities pose a risk to stormwater quality through the collection of grit, salt, sand and oils on the paved surface. A CDS Oil/Grit Separator or equivalent treatment unit is proposed in order to treat the stormwater released from the site to MECP's Enhanced or Level 1 Protection standards. The MECP standards stipulates a Total Suspended Solids (TSS) removal of at least 80%. The CDS 2020-5-C unit will treat the post-development flows to the required MECP quality standard, achieving 81% TSS removal. Refer to Appendix D for OGS Unit Manufacturer specifications and TSS removal table.

5.5.2. Quality Control During Construction Activities

During construction, earth grading and excavation will create the potential for soil erosion and sedimentation. It is imperative that effective environmental and sedimentation controls are in place and maintained throughout the duration of construction activities to ensure stormwater runoff's quality.

Therefore, the following recommendations shall be implemented and maintained during construction to achieve acceptable stormwater runoff quality:

- Installation of silt fence along the entire perimeter of the site to reduce sediment migration onto surrounding properties;
- Restoration of exposed surfaces with vegetative and non-vegetative material as soon as construction schedules permit. The duration in which surfaces are disturbed/exposed shall not exceed 30 days;
- Reduce stormwater drainage velocities where possible; and,
- Minimize the amount of existing vegetation removed.

6. Conclusions

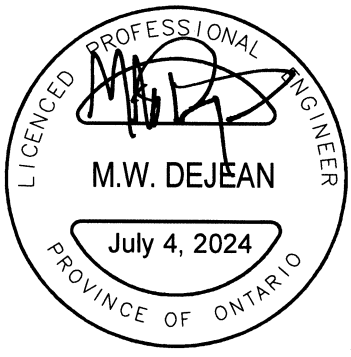
The proposed development will require the connection of sanitary and watermain services to the existing services.

Quantity control for the site is provided through surface ponding which will reduce the 100-year post development peak flows to the 5-year allowable peak flow levels.

An OGS unit is provided for the required quality control to satisfy the MECP Enhanced level requirements.

All of which is respectfully submitted,

Pearson Engineering Ltd.



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Appendix A

Water Servicing and Fire Flow Calculations

3555 Borrisokane Road, Barrhaven
Water Flow Calculations - Part 5

Design Criteria:

Average Water Consumption Rate (Q):	28,000	L/ha/d
Max. Daily Factor:	1.50	(From, Table 4.2, Ottawa Design
Max. Hour Factor:	1.80	Guidelines for Water DIstribution)

Site Data:

Description	Density	Site Area	Flow Rate	Peaking Factors	
Institutional	13,923 m^2	1.39 ha	28,000 L/ha/d	Max Daily Factor*	1.50
				Max Hour Factor*	1.80
				*From Ottawa Design Guidelines based on Institutional Land Use	

Calculate Average Day Demand:

ADD	=	28,000	x	1.39
ADD	=	38,984	L/day	
ADD	=	0.45	L/s	

Calculate Max Daily Flow

MDF	=	0.45	x	1.50
MDF	=	0.68	L/s	

Calculate Max Hour Demand

PHD	=	0.68	x	1.80
PHD	**=**	**1.22**	**L/s**	
PHD	**=**	**19.30**	**GPM**	

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3555 Borrisokane Road, Barrhaven
Fire Flow Calculations

Required fire flow calculations as per the Fire Underwritors Survey's Water Supply for Public Fire Protection - 2020:

Location:	3555 Borrisokane Road, Barrhaven
OBC Occupancy:	A-2 - Churches
Building Foot Print:	2,914 m^2
# of Stories:	1

Date: 7/3/2024
Project: Korean Community Church
Project Number: 22099

Type	Construction Class	Charge
5	Wood Frame	1.50
4	Heavy Timber (A-D)	0.80 - 1.50
3	Ordinary	1.00
2	Non-Combustible	0.80
1	Fire Resistive	0.60

Construction Class: Type 2 — Non-Combustible

Automated Sprinkler Protection:		**Credit**	**Total**
NFPA 13 sprinkler standard	No	0%	
Standard Water Supply	No	0%	0%
Fully Supervised System	No	0%	

Contents	Charge
Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Burning	25%

Contents Factor: Limited Combustible **Charge:** -15%

Exposure Side & Building	Length - Height Ratio	Distance to Exposure Building (m)	Charge
North Prop. Commercial	> 100	>30	0%
East Ex. Cleared lot	> 100	>30	0%
South Ex. Woodland Area	> 100	>30	0%
West Ex. Cleared lot	> 100	>30	0%
		Total:	**0%**

Separation Distance	Charge
0.0 - 3.0 m	10%
3.1 - 10.0 m	8%
10.1 - 20.0 m	5%
20.1 - 30.0 m	3%
> 30.1 m	0%

Are Buildings Contigious? No

Fire Resistant Building: Are vertical openings and exterior vertical communications protected with a minimum one (1) hr rating?

Calculations: *C* = 0.8 — Non-Combustible

Required Fire Flow ***RFF = 220 x C x √A***

Where: *RFF* = required fire flow in liters per minute
C = Coefficient related to the type of construction
A = the total floor area in square meters (excluding basements in building considered)

Total Effective Area *A* = 2,914 m²

RFF = 9,500 L/min
Round to Nearest 1000 L/min RFF = 9,000 L/min

* Must be > 2,000 L/min or < 45,000 L/min

Correction Factors:

Contents Charge		-1,350	L/min
RFF Adjusted for Contents	**E =**	7,650	L/min
Reduction For Sprinkler	**F =**	0	L/min
RFF w/ Sprinkler Reduction		7,650	L/min

As per "Water Supply for Public Fire Protection" pg.20 note H:
RFF = **E - F + G**

Exposure Charge	**G =**	0	L/min
RFF w/ Exposure Charge		7,650	L/min
Required Fire Flow:	**RFF =**	7,650	L/min

RFF = 7650 L/min - 0 L/min + 0 L/min
RFF = 7650 L/min

Round to Nearest 1,000 L/min	**RFF =**	**8,000**	**L/min**
	RFF=	**2,112**	**GPM**
	RFF =	**133**	**L/s**

3555 Borrisokane Road, Barrhaven
Existing Boundary Conditions Unit Conversion

Project: Korean Community Church

Project Number: 22099

Street: Borrisokane Road

Ground Elev (m): 93.8

	Height (m)	m H_2O	PSI	kPa
Avg. Day	156.5	62.7	89.2	614.7
Peak Hour	142.6	48.8	69.4	478.5
Max Day + Fire Flow	137.7	43.9	62.4	430.4

3555 Borrisokane Road, Barrhaven
Proposed Boundary Conditions Unit Conversion

Project: Korean Community Church

Project Number: 22099

Street: Borrisokane Road

Ground Elev (m): 93.8

	Height (m)	m H_2O	PSI	kPa
Avg. Day	146.8	53.0	75.4	519.6
Peak Hour	142.8	49.0	69.7	480.4
Max Day + Fire Flow	142.4	48.6	69.1	476.5

Appendix B

Sanitary Servicing Calculations

3555 Borrisokane Road, Barrhaven
Sanitary Flow Calculations - Part 5

Design Criteria

Average Water Consumption Rate (Q):	28,000	L/ha/d
Peak Flow	Qp = P * Q * M / 86,400	
Peaking Factor (M)	1.50	(From Ottawa Design Guidelines based on Institutional Land Use)
Infiltration Allowance (I_A):	0.33	L/ha/s

Site Data

Description	Density		Site Area	Flow Rate	
Institutional	13,923	m^2	1.39 ha	28,000	L/ha/d

Calculate Average Daily Demand:

$$\text{ADD} = \frac{28{,}000 \times 1.39}{86{,}400}$$

ADD = 0.45 L/s

Infiltration Allowance: = 0.33 x 1.39

= 0.46 L/s

Calculate Peak Flow:

Qp = 0.45 x 1.50

= 0.68 L/s

Calculate Peak Flow (with Infiltration Allowance

Qp (with I_A) = 0.46 + 0.68

= 1.14 L/s

3555 Borrisokane Road, Barrhaven
Sanitary Sewer Design Sheet

n = 0.013

$M = 1+(14/(4+(P/1000)^{0.5}))$ (1.5 <= M <= 4)

Q_i = 0.23 L/ha/day

$Q_{Industrial}$ = 35 m^3/ha/day

$Q_{tot} = Q_{Industrial} + Q_i$

Date: 3-Jul-24

File: 22099

Contract/Project: 3555 Borrisokane Rd., Barrhaven

Areas	Manhole		Area	Area	M	Industrial Flow	Length	Q_i (ACC.)	Total Q	D	S	Q Full	V Actual	V Full	Percent Full
	From	To	(ha)	(ACC.)		(L/s)	(m)	(L/s)	(L/s)	(mm)	(%)	(L/s)	(m/s)	(m/s)	(%)
Part 5	SAN CAP	MH4A	1.39	0.00	4.00	0.00	22.3	0.46	1.14	200	0.56	24.5	0.60	0.78	4.6
	MH4A	MH3A	0.00	0.00	4.00	0.00	33.8	0.00	1.14	200	0.56	24.5	0.60	0.78	4.6
Part 3	MH3A	MH2A	0.38	0.38	4.00	1.32	56.1	0.13	2.58	200	0.65	26.4	0.82	0.84	9.8
Part 1	MH2A	MH1A	0.53	0.53	4.00	6.14	22.1	0.18	8.90	200	0.65	26.4	*	0.84	33.6
	MH1A	TEE	-	-	4.00	0.00	14.0	0.00	8.90	200	0.65	26.4	*	0.84	33.6
	EX MH 338A	EX MH 339A	-	-	-	-	49.5	-	17.21	300	0.20	43.3	*	0.61	39.8

Note: * indicates that the actual velocity calculation is not required as the flow depth is more than 0.30 m.
The Flow of 17.21 L/s = 8.90 L/s (Part 5, Part 3, Part 1) + 8.31 L/s (Future residential to the east as per DSEL Sanitary Catchments)

Appendix C

Stormwater Management Calculations

3555 Borrisokane Rd, Barrhaven
Calculation of Runoff Coefficients

Runoff Coefficient	=	0.20	0.90	0.90	0.80	0.90		Weighted
Surface Cover	=	Grass	Asphalt	Building	Gravel	Conc.		Runoff Coefficient
Allowable	Total Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)		
1	13232	13232	0	0	0	0		0.80
Pre Total	13232	13232	0	0	0	0		0.80
Post-Development	Total Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)		
1	1453	0	0	1453	0	0		0.90
2	7204	2058	4422	40	0	685		0.70
3	4575	2893	0	1501	0	181		0.46
Post Total	13232	4951	4422	2994	0	866		0.64

Note: As per DSEL Half Moon Bay West Phase 3 Storm Drainage Plan, an allowable runoff coefficient of 0.80 was used in calculating Pre-development peak flows.

3555 Borrisokane Rd, Barrhaven
Allowable Peak Flows

City of Ottawa

Storm Event (yrs)	Coeff A	Coeff B	Coeff C
2	**732.95**	**6.20**	**0.81**
5	**998.07**	**6.05**	**0.81**
10	**1174.18**	**6.01**	**0.82**
25	**1402.88**	**6.02**	**0.82**
50	**1569.58**	**6.01**	**0.82**
100	**1735.69**	**6.01**	**0.82**

Modified Rational Method
$Q = CiCIA / 360$

Where:

- Q - Flow Rate (m^3/s)
- C - Rational Method Runoff Coefficient
- I - Storm Intensity (mm/hr)
- A - Area (ha.)
- Ci - Peaking Coefficient

Area Number	1	
Area	1.32	ha
Runoff Coefficient	0.80	*
Time of Concentration	10	min
Return Rate	2	year
Peaking Coefficient (Ci)	1.00	
Rainfall Intensity	76.81	mm/hr
Allowable Peak Flow	225.8	L/s

Return Rate	5	year
Peaking Coefficient (Ci)	1.00	
Rainfall Intensity	104.19	mm/hr
Allowable Peak Flow	306.4	L/s

Note: As per DSEL Half Moon Bay West Phase 3 Storm Drainage Plan, an allowable runoff coefficient of 0.80 was used in calculating peak flows.

3555 Borrisokane Rd, Barrhaven
Post-Development Peak Flows

City of Ottawa

Storm Event (yrs)	Coeff A	Coeff B	Coeff C
2	**732.95**	**6.20**	**0.81**
5	**998.07**	**6.05**	**0.81**
10	**1174.18**	**6.01**	**0.82**
25	**1402.88**	**6.02**	**0.82**
50	**1569.58**	**6.01**	**0.82**
100	**1735.69**	**6.01**	**0.82**

Modified Rational Method
Q = CiCIA / 360

Where:

- Q - Flow Rate (m^3/s)
- C - Rational Method Runoff Coefficient
- I - Storm Intensity (mm/hr)
- A - Area (ha.)
- Ci - Peaking Coefficient

	Controlled Area		Uncontrolled Area	
Area Number	1 to 2		3	
Area	0.87	ha	0.46	ha
Runoff Coefficient	0.73		0.46	
Time of Concentration	10	min	10	min
Return Rate	2	year	2	year
Peaking Coefficient (Ci)	1.00		1.00	
Rainfall Intensity	76.81	mm/hr	76.81	mm/hr
Post-Development Peak Flow	135.5	L/s	44.6	L/s
Return Rate	5	year	5	year
Peaking Coefficient (Ci)	1.00		1.00	
Rainfall Intensity	104.19	mm/hr	104.19	mm/hr
Post-Development Peak Flow	183.8	L/s	60.6	L/s
Return Rate	10	year	10	year
Peaking Coefficient (Ci)	1.00		1.00	
Rainfall Intensity	122.14	mm/hr	122.14	mm/hr
Post-Development Peak Flow	215.5	L/s	71.0	L/s
Return Rate	25	year	25	year
Peaking Coefficient (Ci)	1.10		1.10	
Rainfall Intensity	144.69	mm/hr	144.69	mm/hr
Post-Development Peak Flow	280.8	L/s	92.5	L/s
Return Rate	50	year	50	year
Peaking Coefficient (Ci)	1.20		1.20	
Rainfall Intensity	161.47	mm/hr	161.47	mm/hr
Post-Development Peak Flow	341.8	L/s	112.6	L/s
Return Rate	100	year	100	year
Peaking Coefficient (Ci)	1.25		1.25	
Rainfall Intensity	178.56	mm/hr	178.56	mm/hr
Post-Development Peak Flow	393.8	L/s	129.7	L/s
Return Rate	100	year + 20% s	100	year + 20% s
Peaking Coefficient (Ci)	1.50		1.50	
Rainfall Intensity	178.56	mm/hr	178.56	mm/hr
Post-Development Peak Flow	472.5	L/s	155.7	L/s

3555 Borrisokane Rd, Barrhaven
Stage-Storage-Discharge Table

Elevation (m)	Volume (m^3)	Cum. Vol. (m^3)	Orifice Head (m)	Orifice Flow (L/s)	Weir Head (m)	Weir Flow (L/s)	Total Flow (L/s)	
90.97	0	0	0.000	0.0	0.000	0.0	0.0	
91.78	23.2	23.2	0.685	113.4	0.000	0.0	113.4	
92.40	0.0	23.2	1.305	156.5	0.000	0.0	156.5	
92.45	0.8	24.0	1.355	159.5	0.000	0.0	159.5	
92.50	5.0	29.0	1.405	162.4	0.000	0.0	162.4	
92.55	14.0	42.9	1.455	165.2	0.000	0.0	165.2	
92.60	29.1	72.1	1.505	168.0	0.000	0.0	168.0	
92.65	49.6	121.7	1.555	170.8	0.000	0.0	170.8	
92.66	13.0	134.6	1.565	171.4	0.000	0.0	171.4	
92.67	14.2	148.9	1.575	171.9	0.000	0.0	171.9	
92.68	15.8	164.6	1.585	172.5	0.000	0.0	172.5	
92.69	17.5	182.1	1.595	173.0	0.000	0.0	173.0	
92.70	19.3	201.4	1.605	173.5	0.000	0.0	173.5	
92.75	0	201	1.655	176.2	0.050	47.5	223.7	
92.80	0	201	1.705	178.9	0.100	134.4	313.3	
92.85	0	201	1.755	181.5	0.150	246.9	428.4	
92.90	0	201	1.805	184.0	0.200	380.1	564.2	*
92.95	0	201	1.855	186.6	0.250	531.3	717.8	
93.00	0	201	1.905	189.1	0.300	698.3	887.4	

Orifice Plate	
Diameter	250 mm
Invert Elevation	90.97
Orifice Constant	0.63
Orifice Centroid	91.10
Orifice Flow Formula	0.63π(D/2,000)2 x (2x9.81xH)0.5

Emergency Overflow Weir	
Width	5.00 m
Invert of Weir	92.70 m
Weir Flow Formula	$1.7WH^{1.5}$

Note: * indicates the 100-year + 20% stress test event flows which will be conveyed through the emergency overflow weir at 0.23 m below the finished floor elevation.

PEARSON ENGINEERING

3555 Borrisokane Rd, Barrhaven
Quantity Control Volume Calculations

DATE: 3-Jul-24
FILE: 22099
CONTRACT/PROJECT: 3555 Borrisokane Rd, Barrhaven
COMPLETED BY: NP

Modified Rational Method Parameters

Pre Development Area (ha)	Post Development Area (ha)	Time of Concentration (min)	Time Increments (min)	Pre Development Runoff Coefficient	Post Development Runoff Coefficient
1.32	0.87	10	1	0.80	0.73

Note: Refer to page Calculation of Runoff Coefficients for detailed calculations of Modified Rational Method parameters.

Pre-Development Runoff Rate

	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
C	0.80	0.80	0.80	0.88	0.96	1.00
I	76.81	104.19	122.14	144.69	161.47	178.56
A	1.32	1.32	1.32	1.32	1.32	1.32
Q	225.8	306.4	359.2	468.0	569.8	656.3

Note: Q = 0.00278CIA

Rainfall Station	City of Ottawa

Surface Ponding Design Inputs

Storm Event (yrs)	Chicago Storm Coefficient A	Chicago Storm Coefficient B	Chicago Storm Coefficient C	Allowable Outflow (L/s)	Post Development Runoff Coefficient
2	732.95	6.20	0.81	110.0	0.73
5	998.07	6.05	0.81	148.9	0.73
10	1174.18	6.01	0.82	163.0	0.73
25	1402.88	6.02	0.82	168.3	0.81
50	1569.58	6.01	0.82	170.8	0.88
100	1735.69	6.01	0.82	172.4	0.92

Storm Event (yrs)	Storage (m^3)	Time (min)
2	16	13
5	22	12
10	34	13
25	77	17
50	122	20
100	163	23

Note: Storage volume calculated as per Hydrology Handbook, Second Edition, American Society of Civil Engineers, 1996

Time (min)	2 Year Intensity mm/hr	Inflow L/s	Outflow L/s	Storage m^3	Difference	5 Year Intensity mm/hr	Inflow L/s	Outflow L/s	Storage m^3	Difference	10 Year Intensity mm/hr	Inflow L/s	Outflow L/s	Storage m^3	Difference	25 Year Intensity mm/hr	Inflow L/s	Outflow L/s	Storage m^3	Difference	50 Year Intensity mm/hr	Inflow L/s	Outflow L/s	Storage m^3	Difference	100 Year Intensity mm/hr	Inflow L/s	Outflow L/s	Storage m^3	Difference
1	148.14	261.6	110.0	-21	9	203.51	359.0	148.9	-28	13	239.57	422.6	163.0	-28	15	284.43	552.0	168.3	-22	21	317.75	672.7	170.8	-16	27	351.38	774.9	172.4	-10	32
2	133.33	235.4	110.0	-11	7	182.69	322.3	148.9	-15	10	214.88	379.1	163.0	-13	12	255.03	494.9	168.3	-1	16	284.86	603.1	170.8	11	21	315.00	694.7	172.4	21	25
3	121.46	214.5	110.0	-4	5	166.09	293.0	148.9	-5	7	195.22	344.4	163.0	-2	9	231.63	449.5	168.3	15	13	258.67	547.6	170.8	32	17	286.05	630.8	172.4	46	20
4	111.72	197.3	110.0	1	4	152.51	269.1	148.9	2	6	179.16	316.1	163.0	7	7	212.51	412.4	168.3	28	10	237.29	502.4	170.8	49	14	262.41	578.7	172.4	66	17
5	103.57	182.9	110.0	5	3	141.18	249.1	148.9	8	4	165.77	292.5	163.0	14	5	196.58	381.5	168.3	39	8	219.48	464.6	170.8	63	11	242.70	535.2	172.4	83	14
6	96.64	170.6	110.0	9	3	131.57	232.1	148.9	12	3	154.42	272.4	163.0	20	4	183.08	355.3	168.3	47	7	204.38	432.7	170.8	74	9	226.01	498.4	172.4	97	11
7	90.66	160.1	110.0	11	2	123.30	217.5	148.9	15	2	144.67	255.2	163.0	24	3	171.48	332.8	168.3	54	6	191.41	405.2	170.8	83	8	211.67	466.8	172.4	108	10
8	85.46	150.9	110.0	13	1	116.11	204.8	148.9	18	2	136.19	240.3	163.0	27	2	161.39	313.2	168.3	59	4	180.14	381.4	170.8	91	6	199.20	439.3	172.4	118	8
9	80.87	142.8	110.0	14	1	109.79	193.7	148.9	20	1	128.74	227.1	163.0	30	2	152.54	296.0	168.3	64	4	170.24	360.4	170.8	97	5	188.25	415.2	172.4	126	7
10	76.81	135.6	110.0	15	1	104.19	183.8	148.9	21	1	122.14	215.5	163.0	32	1	144.69	280.8	168.3	68	3	161.47	341.8	170.8	103	4	178.56	393.8	172.4	133	6
11	73.17	129.2	110.0	16	0	99.19	175.0	148.9	22	0	116.25	205.1	163.0	33	1	137.69	267.2	168.3	70	2	153.65	325.3	170.8	107	4	169.91	374.7	172.4	139	5
12	69.89	123.4	110.0	16	0	94.70	167.1	148.9	22	0	110.96	195.8	163.0	33	0	131.40	255.0	168.3	73	2	146.62	310.4	170.8	111	3	162.13	357.5	172.4	144	4
13	66.93	118.2	110.0	16	0	90.63	159.9	148.9	22	0	106.17	187.3	163.0	34	0	125.71	244.0	168.3	74	1	140.26	296.9	170.8	114	2	155.11	342.1	172.4	148	4
14	64.23	113.4	110.0	16	-16	86.93	153.4	148.9	22	-22	101.82	179.6	163.0	34	0	120.55	233.9	168.3	75	1	134.49	284.7	170.8	116	2	148.72	328.0	172.4	151	3
15	61.77	109.1	0.0	0	0	83.56	147.4	0.0	0	0	97.85	172.6	163.0	33	-1	115.83	224.8	168.3	76	0	129.22	273.6	170.8	118	1	142.89	315.1	172.4	154	2
16	59.50	105.1	0.0	0	0	80.46	141.9	0.0	0	0	94.21	166.2	163.0	32	-32	111.50	216.4	168.3	76	0	124.39	263.3	170.8	120	1	137.55	303.3	172.4	157	2
17	57.42	101.4	0.0	0	0	77.61	136.9	0.0	0	0	90.86	160.3	0.0	0	0	107.52	208.7	168.3	77	0	119.94	253.9	170.8	121	1	132.63	292.5	172.4	159	2
18	55.49	98.0	0.0	0	0	74.97	132.3	0.0	0	0	87.76	154.8	0.0	0	0	103.84	201.5	168.3	76	-1	115.83	245.2	170.8	121	0	128.08	282.5	172.4	160	1
19	53.70	94.8	0.0	0	0	72.53	128.0	0.0	0	0	84.88	149.8	0.0	0	0	100.43	194.9	168.3	76	-1	112.01	237.1	170.8	122	0	123.87	273.2	172.4	161	1
20	52.03	91.9	0.0	0	0	70.25	123.9	0.0	0	0	82.21	145.0	0.0	0	0	97.26	188.7	168.3	75	-1	108.47	229.6	170.8	122	0	119.95	264.5	172.4	162	1
21	50.48	89.1	0.0	0	0	68.13	120.2	0.0	0	0	79.72	140.6	0.0	0	0	94.30	183.0	168.3	74	-1	105.17	222.6	170.8	122	0	116.30	256.5	172.4	163	0
22	49.02	86.6	0.0	0	0	66.15	116.7	0.0	0	0	77.39	136.5	0.0	0	0	91.53	177.6	168.3	73	-1	102.08	216.1	170.8	121	-1	112.88	248.9	172.4	163	0
23	47.66	84.1	0.0	0	0	64.29	113.4	0.0	0	0	75.21	132.7	0.0	0	0	88.94	172.6	168.3	72	-72	99.18	210.0	170.8	121	-1	109.68	241.9	172.4	163	0
24	46.37	81.9	0.0	0	0	62.54	110.3	0.0	0	0	73.15	129.1	0.0	0	0	86.51	167.9	0.0	0	0	96.47	204.2	170.8	120	-1	106.68	235.2	172.4	163	0
25	45.17	79.7	0.0	0	0	60.90	107.4	0.0	0	0	71.22	125.7	0.0	0	0	84.22	163.4	0.0	0	0	93.91	198.8	170.8	119	-1	103.85	229.0	172.4	163	-1
26	44.03	77.7	0.0	0	0	59.35	104.7	0.0	0	0	69.40	122.4	0.0	0	0	82.05	159.2	0.0	0	0	91.50	193.7	170.8	118	-1	101.18	223.1	172.4	162	-1
27	42.95	75.8	0.0	0	0	57.88	102.1	0.0	0	0	67.68	119.4	0.0	0	0	80.01	155.3	0.0	0	0	89.22	188.9	170.8	116	-1	98.66	217.6	172.4	161	-1
28	41.93	74.0	0.0	0	0	56.49	99.7	0.0	0	0	66.05	116.5	0.0	0	0	78.08	151.5	0.0	0	0	87.06	184.3	170.8	115	-2	96.27	212.3	172.4	160	-1
29	40.96	72.3	0.0	0	0	55.18	97.3	0.0	0	0	64.51	113.8	0.0	0	0	76.25	148.0	0.0	0	0	85.02	180.0	170.8	113	-2	94.01	207.3	172.4	159	-1
30	40.04	70.7	0.0	0	0	53.93	95.1	0.0	0	0	63.05	111.2	0.0	0	0	74.51	144.6	0.0	0	0	83.08	175.9	170.8	112	-2	91.87	202.6	172.4	158	-1
31	39.17	69.2	0.0	0	0	52.74	93.0	0.0	0	0	61.65	108.8	0.0	0	0	72.86	141.4	0.0	0	0	81.23	172.0	170.8	110	-110	89.83	198.1	172.4	156	-2

: Maximum Storage Volume

PEARSON ENGINEERING

Q = 0.0028*C*I*A (m^3/s)
C = Runoff Coefficient
I = Rainfall Intensity = $A/(Time+B)^C$
A = Area (ha)

3555 Borrisokane Rd, Barrhaven
Storm Sewer Design Sheet
5-Year Storm Event

DATE: 3-Jul-24
FILE: 22099
CONTRACT/PROJECT: 3555 Borrisokane Road

Areas	Manhole		Length	Increment			Total	Flow Time (min)		I	Total Q	S	D	Q Full	V Full	% Full
	From	To	(m)	C	A	CA	CA	TO	IN	(mm/h)	(L/s)	(%)	(mm)	(L/s)	(m/s)	
2	CB1	CBMH1	24.0	0.54	0.32	0.17	0.17	10.00	0.27	104.19	50.1	1.50	250	72.8	1.48	68.8%
2	CBMH1	CBMH2	25.3	0.84	0.13	0.11	0.29	10.27	0.38	102.79	81.7	0.50	375	124.0	1.12	65.9%
2	CBMH2	CBMH5	43.5	0.72	0.08	0.06	0.34	10.64	0.65	100.91	96.4	0.50	375	124.0	1.12	77.8%
1	BLD	CBMH3	15.7	0.90	0.07	0.06	0.06	10.00	0.21	104.19	17.4	2.00	150	21.5	1.22	80.7%
1	BLD	TEE	13.7	0.90	0.06	0.05	0.05	10.00	0.14	104.19	15.7	3.50	150	28.5	1.61	54.9%
2	CBMH3	CBMH4	27.3	0.78	0.06	0.05	0.16	10.21	0.47	103.07	46.3	0.50	300	68.4	0.97	67.8%
2	CBMH4	MH1	16.2	0.82	0.08	0.06	0.22	10.68	0.24	100.71	62.5	0.50	375	124.0	1.12	50.4%
2	MH1	CBMH5	21.4	0.00	0.00	0.00	0.22	10.93	0.32	99.54	61.8	0.50	375	124.0	1.12	49.9%
-	CBMH5	OGS	5.8	0.72	0.08	0.06	0.63	11.29	0.07	97.84	148.9 *	0.50	525	304.1	1.40	48.9%
-	OGS	OUTLET	18.4	0.00	0.00	0.00	0.63	11.36	0.22	97.52	148.9 *	0.50	525	304.1	1.40	48.9%

Note: * indicates orifice plate flow

Appendix D

OGS Unit Manufacturer Specifications and TSS Removal Table

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD BASED ON A FINE PARTICLE SIZE DISTRIBUTION

Project Name:	3555 Borrisokane Rd	**Engineer:**	**Pearson Engineering**
Location:	Ottawa, ON	**Contact:**	Nikhil Parmar E.I.T.
OGS #:	OGS	**Report Date:**	26-Jun-23

Area	0.97	ha	**Rainfall Station #**	215	
Weighted C	0.76		**Particle Size Distribution**	FINE	
CDS Model	2020		**CDS Treatment Capacity**	31	l/s

Rainfall Intensity[1] (mm/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (l/s)	Treated Flowrate (l/s)	Operating Rate (%)	Removal Efficiency (%)	Incremental Removal (%)
0.5	9.2%	9.2%	1.0	1.0	3.3	97.9	9.0
1.0	10.6%	19.8%	2.0	2.0	6.6	97.0	10.3
1.5	9.9%	29.7%	3.1	3.1	9.9	96.0	9.5
2.0	8.4%	38.1%	4.1	4.1	13.2	95.1	8.0
2.5	7.7%	45.8%	5.1	5.1	16.4	94.1	7.2
3.0	5.9%	51.7%	6.1	6.1	19.7	93.2	5.5
3.5	4.4%	56.1%	7.2	7.2	23.0	92.3	4.0
4.0	4.7%	60.7%	8.2	8.2	26.3	91.3	4.3
4.5	3.3%	64.0%	9.2	9.2	29.6	90.4	3.0
5.0	3.0%	67.1%	10.2	10.2	32.9	89.4	2.7
6.0	5.4%	72.4%	12.3	12.3	39.5	87.5	4.7
7.0	4.4%	76.8%	14.3	14.3	46.1	85.7	3.7
8.0	3.5%	80.3%	16.4	16.4	52.6	83.8	3.0
9.0	2.8%	83.2%	18.4	18.4	59.2	81.9	2.3
10.0	2.2%	85.3%	20.5	20.5	65.8	80.0	1.7
15.0	7.0%	92.3%	30.7	30.7	98.7	70.6	4.9
20.0	4.5%	96.9%	41.0	31.2	100.0	53.3	2.4
25.0	1.4%	98.3%	51.2	31.2	100.0	42.7	0.6
30.0	0.7%	99.0%	61.5	31.2	100.0	35.6	0.2
35.0	0.5%	99.5%	71.7	31.2	100.0	30.5	0.1
40.0	0.5%	100.0%	82.0	31.2	100.0	26.7	0.1
45.0	0.0%	100.0%	92.2	31.2	100.0	23.7	0.0
50.0	0.0%	100.0%	102.5	31.2	100.0	21.3	0.0
							87.5

Removal Efficiency Adjustment[2] = 6.5%

Predicted Net Annual Load Removal Efficiency = 81.0%

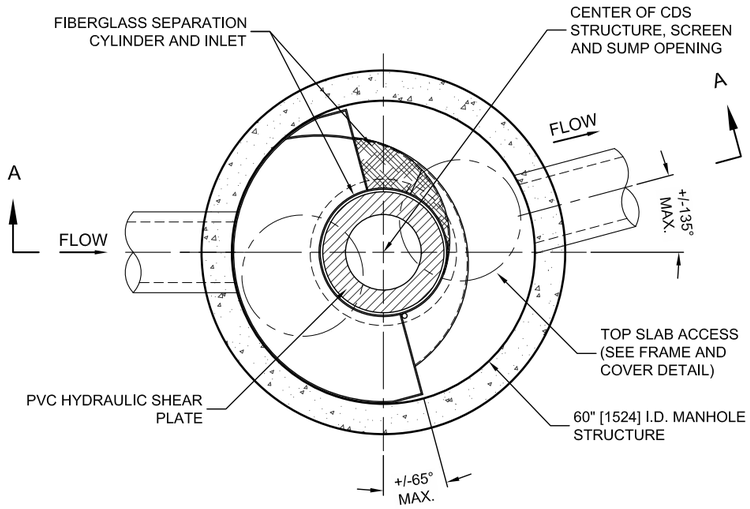
Predicted % Annual Rainfall Treated = 97.4%

1 - Based on 42 years of hourly rainfall data from Canadian Station 6105976, Ottawa ON

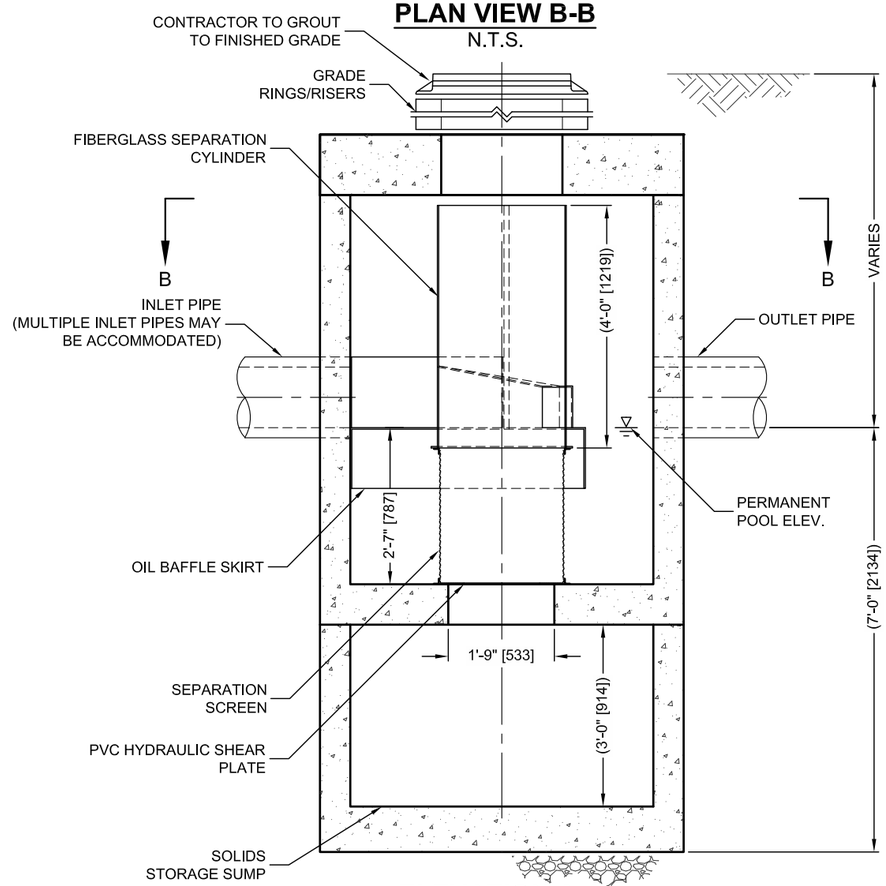
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

* CDS Efficiency based on testing conducted at the University of Central Florida

** CDS design flowrate and scaling based on standard manufacturer model & product specifications



PLAN VIEW B-B
N.T.S.

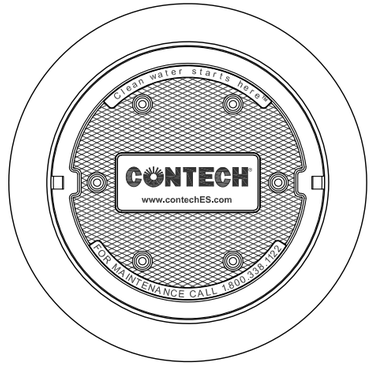


ELEVATION A-A
N.T.S.

CDS PMSU2020-5-C DESIGN NOTES

THE STANDARD CDS PMSU2020-5-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
CUSTOMIZABLE SUMP DEPTH AVAILABLE
ANTI-FLOTATION DESIGN AVAILABLE UPON REQUEST



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (CFS OR L/s)	*
PEAK FLOW RATE (CFS OR L/s)	*
RETURN PERIOD OF PEAK FLOW (YRS)	*
SCREEN APERTURE (2400 OR 4700)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

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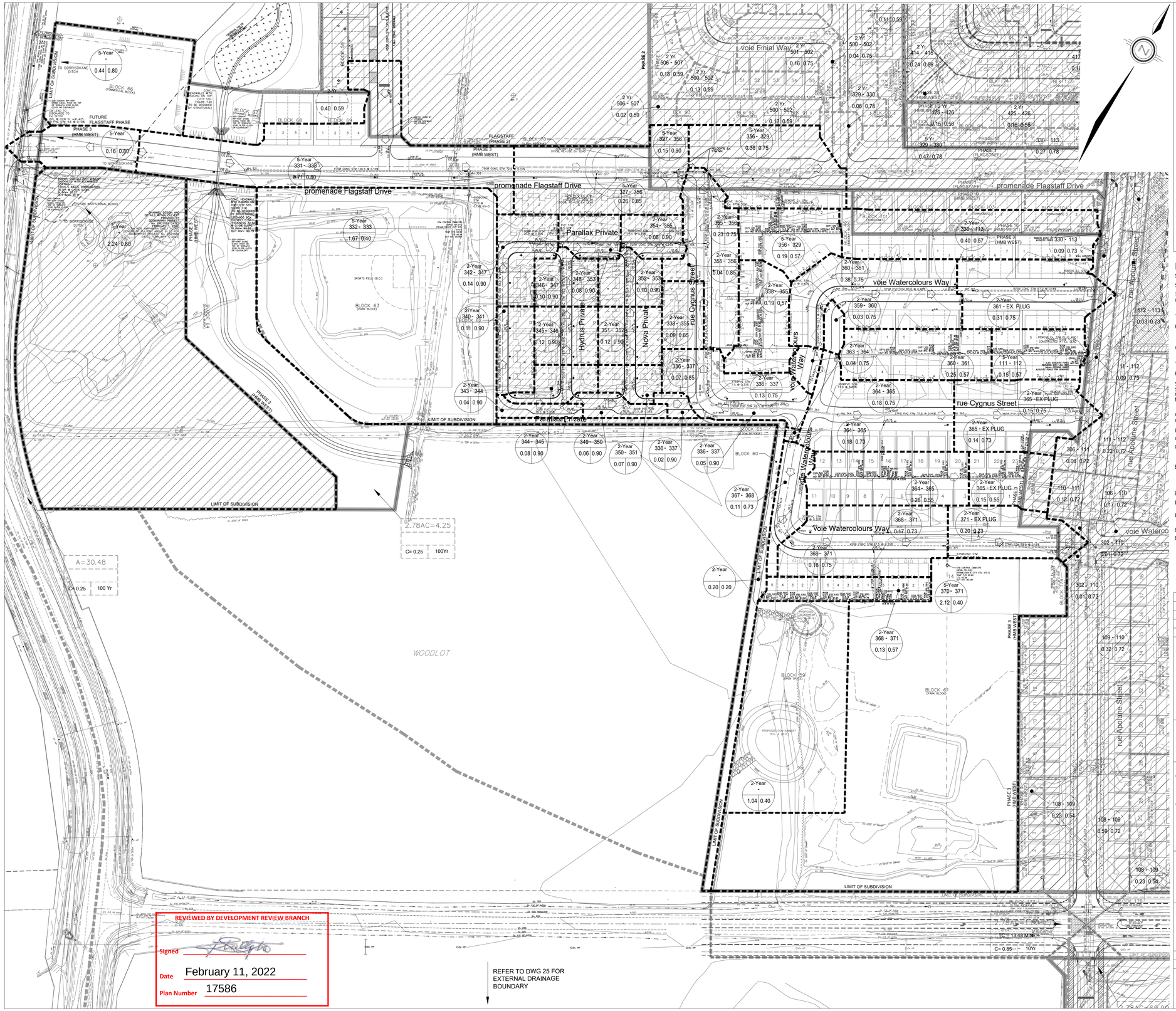
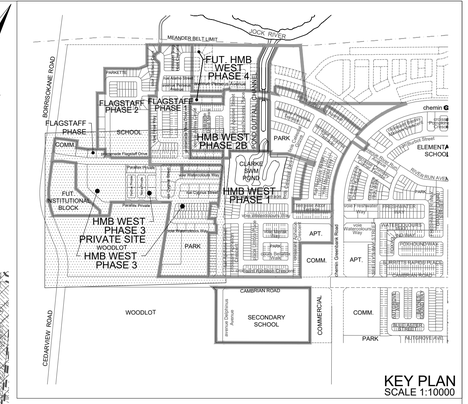
CDS PMSU2020-5-C
INLINE CDS
STANDARD DETAIL

Appendix E

DSEL Storm Drainage Plan





LEGEND

- STORM DRAINAGE BOUNDARY
- STORM DRAINAGE BOUNDARY (OTHER PHASES)
- STORM FREQUENCY — 2Yr
- UPSTREAM MH TO DOWNSTREAM MH — 43 - 44
- AREA IN HECTARES — 0.37 0.51
- RUNOFF COEFFICIENT
- UPSTREAM MH TO DOWNSTREAM MH — 21–23
- AREA IN OTHER PHASES IN HECTARES — 0.28 0.78
- RUNOFF COEFFICIENT
- STREET CATCHBASIN & LEAD
- STREET CATCHBASIN WITH CLOSED LID & LEAD MAINTENANCE HOLE — MH202
- CURB INLET CATCHBASIN & LEAD CATCHBASIN/ MAINTENANCE HOLE — CBMH201
- INTERCONNECTED CATCH BASIN & LEADS
- CAP
- OVERLAND FLOW DIRECTION
- EXTERNAL OVERLAND FLOW DIRECTION
- EMERGENCY OVERLAND FLOW DIRECTION
- EXTERNAL 2.78AC = — 2.78AC=14.40
- EXTERNAL TIME OF CONCENTRATION — TC=14.5 MIN
- EXTERNAL BLENDED RUNOFF COEFFICIENT — C= 0.70
- EXTERNAL STORM FREQUENCY — 2YR

No.	BY	DATE	DESCRIPTION
5	S.L.M.	22.02.08	5th SUBMISSION
4	S.L.M.	22.01.19	4th SUBMISSION
3	S.L.M.	21.11.18	3rd SUBMISSION
2	S.L.M.	21.08.31	2nd SUBMISSION

TOPOGRAPHIC INFORMATION

TOPOGRAPHIC INFORMATION PROVIDED BY J.D. BARNES LIMITED, PROJECT No. 16-10-100-00, DATED FEBRUARY 22, 2017
TOPOGRAPHIC INFORMATION FOR BORRISOKANE ROAD PROVIDED BY J.D. BARNES LIMITED, PROJECT No. 18-10-145-00, RECEIVED ON JULY 10, 2019

LEGAL INFORMATION

CALCULATED M-PLAN PROVIDED BY J.D. BARNES LIMITED, PROJECT No. 16-10-100-00, DATED NOVEMBER 10, 2021

BENCH MARK

ELEVATIONS ARE GEODETIC AND ARE REFERRED TO THE PUBLISHED BENCHMARK NUMBER 0011964U3710 HAVING AN ELEVATION OF 71.724 M.

MATTAMY (HALF MOON BAY) LTD.

HALF MOON BAY WEST PHASE 3

DSEL
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LICENSED PROFESSIONAL ENGINEER S.L. MERRICK 100186523 PROVINCE OF ONTARIO

Ottawa CITY OF OTTAWA

REVIEWED BY DEVELOPMENT REVIEW BRANCH
Signed
Date February 11, 2022
Plan Number 17586

STORM DRAINAGE PLAN

DRAWN BY: G.G.G.	CHECKED BY: S.L.M.	PROJECT No.	19–1140
DESIGNED BY: G.G.G.	CHECKED BY: S.L.M.		
SCALE: 1:1000		SHEET No.	24

CITY FILE No. D07-16-26-0023 P3 CITY PLAN No. 17586

Appendix F

Hydraulic Capacity and Modeling Analysis (Completed by Geo Advice)

Hydraulic Capacity and Modeling Analysis Mattamy Half Moon Bay West Phase 3

Final Report

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

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

Submission Date: May 31, 2021

Contact: Mr. Werner de Schaetzen, Ph.D., P.Eng.
Project: 2021-033-DSE

Document History and Version Control

Revision No.	Date	Document Description	Revised By	Reviewed By
R0	May 11, 2021	Draft	Ben Loewen	Werner de Schaetzen
R1	May 25, 2021	Updated Draft	Ben Loewen	Werner de Schaetzen
R2	May 31, 2021	Final	Ben Loewen	Werner de Schaetzen

Statement of Qualifications and Limitations

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

Contents

1 Introduction

GeoAdvice Engineering Inc. ("GeoAdvice") was retained by David Schaeffer Engineering Ltd. ("DSEL") to size the proposed water main network for Phase 3 of the Mattamy Half Moon Bay West (HMBW) development ("Development") in the City of Ottawa, ON ("City").

Analysis for one (1) scenario of the Mattamy HMBW Phase 3 development was completed using boundary conditions provided by the City (Scenario 2 in **Appendix C**) and is discussed within this report. The analysis includes the demands for the following existing developments in addition to the proposed Mattamy HMBW Phase 3 demands:

- Mattamy HMBW Phases 1, 2, and 10, Flagstaff Phase 1 (Glenview Homes development)

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

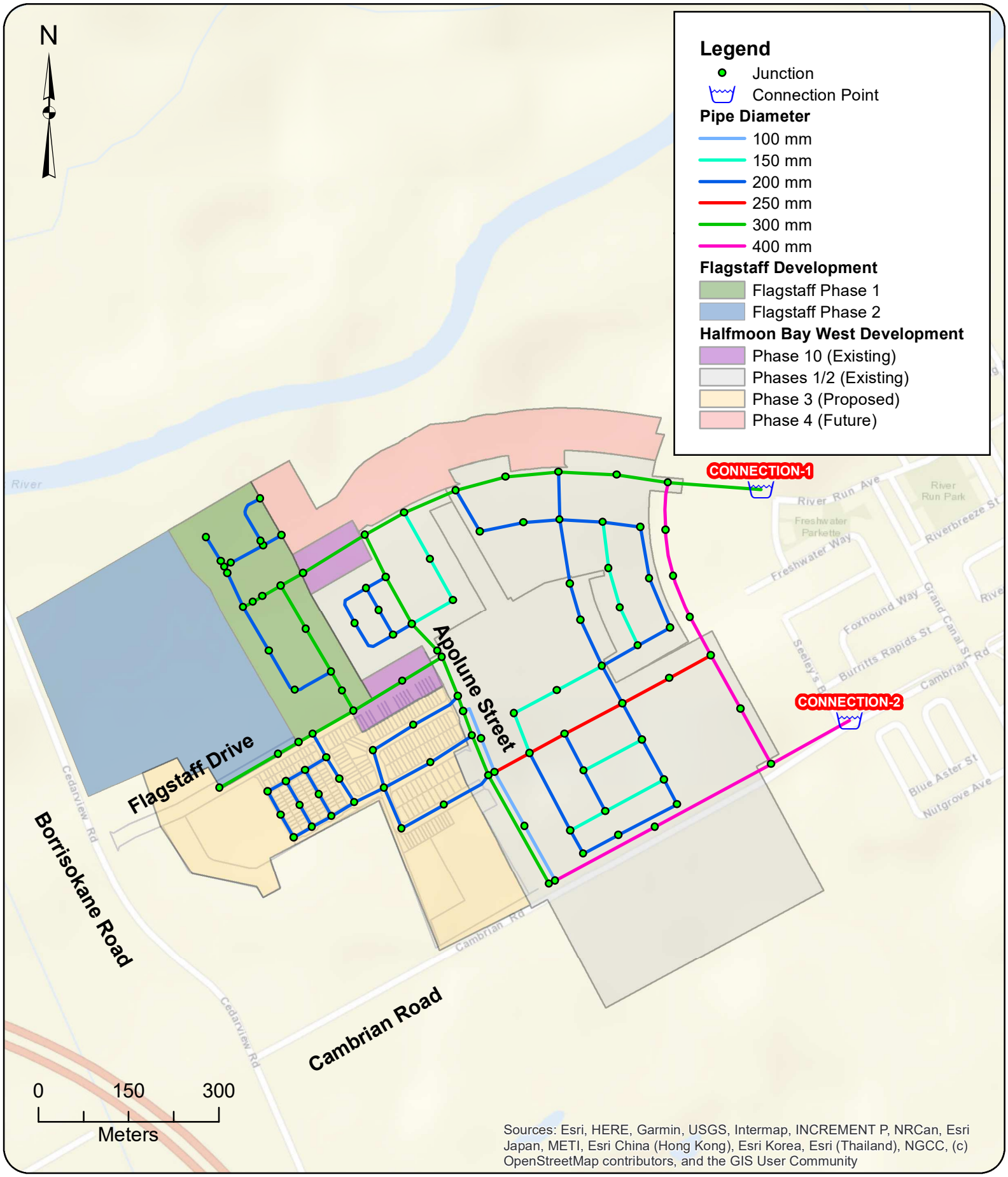
- Connection 1: Perseus Avenue
- Connection 2: Cambrian Road

HMBW Phase 3 will connect east to Apolune Street in Mattamy HMBW Phase 1 and north to Flagstaff Drive.

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

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

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



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis Mattamy Half Moon Bay West Phase 3 2021-033-DSE**
Client: **David Schaeffer Engineering Ltd.**
Date: **May 2021**
Created by: **BL**
Reviewed by: **WdS**

Site Layout and Connection Points

Figure 1.1

2 Modeling Considerations

2.1 Water Main Configuration

The water main network was modeled based on drawings prepared by DSEL (16-10-100_M-Plan PH3 (April22-21).dwg) and provided to GeoAdvice on April 26th, 2021.

The 300 mm water main on Flagstaff Drive is expected to extend to Borrisokane Road as per the Barrhaven South Master Servicing Study. No analysis was conducted for the water main west of pipe P-102 shown in **Appendix D**.

2.2 Elevations

Elevations of the modeled junctions were assigned according to a preliminary site grading plan prepared by DSEL (2020-12-04_1140_grad_wcs.dwg) and provided to GeoAdvice on April 26th, 2021. The preliminary site grading plan provided was based on a different road alignment from that of the final road alignment of the development and as such, the allocation of the elevations was approximated using best judgement.

2.3 Consumer Demands

The existing residential demands (Mattamy HMBW Phases 1, 2, 10 and Flagstaff Phase 1) and the proposed residential demands for the Mattamy HMBW Phase 3 development were based on a demand rate of 280 L/cap/d as per City of Ottawa technical bulletin ISTB 2018-01. The park rate of 28,000 L/ha/d was assumed as per the City of Ottawa design guidelines and are consistent with similar previously completed developments within the City of Ottawa. Demand factors used for this analysis were taken according to the City of Ottawa 2010 Design Guidelines *Table 4.2 Consumption Rate for Subdivisions of 501 to 3,000 Persons*. Population densities were assigned according to *Table 4.1 Per Unit Populations* from the City of Ottawa Design Guidelines. A summary of these tables highlighting relevant data for this development is shown in **Table 2.1**.

Finally, the Mattamy HMBW Phase 3 water main network was also analyzed for an ultimate condition including the demands for the planned future Mattamy Phase 4 of the HMBW development and Flagstaff Phase 2 using boundary conditions provided by the City (Scenario 3 in **Appendix C**). The proposed water main network was confirmed to not require any changes in this ultimate condition.

Table 2.1: City of Ottawa Demand Factors

Demand Type	Amount	Units
Average Day Demand		
Residential	280	L/c/d
Park	28,000	L/ha/d
Maximum Daily Demand		
Residential	2.5 x avg. day	L/c/d
Park	1.5 x avg. day	L/ha/d
Peak Hour Demand		
Residential	2.2 x max. day	L/c/d
Park	1.8 x max. day	L/ha/d
Minimum Hour Demand		
Residential	0.5 x avg. day	L/c/d
Park	0.5 x avg. day	L/ha/d

Table 2.2 to **Table 2.3** summarize the water demand calculations for Mattamy HMBW Phase 3.

Table 2.2: Development Population and Demand Calculations – Mattamy HMBW Phase 3

Dwelling Type	Number of Units	Persons Per Unit*	Population	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)	Minimum Hour Demand (L/s)
Single Detached	23	3.4	87	0.28	0.70	1.55	0.14
Traditional Townhome	111	2.7	330	1.07	2.67	5.88	0.53
Back-to-Back Townhouse	94	2.7	280	0.91	2.27	4.99	0.45
Total	**228**		**697**	**2.26**	**5.65**	**12.42**	**1.13**

*City of Ottawa Design Guidelines.

Table 2.3: Non Residential Demand Calculations – Mattamy HMBW Phase 3

Land Use Type	Area (ha)	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)	Minimum Hour Demand (L/s)
Park	4.52	1.46	2.20	3.96	0.73

Demands were grouped into demand polygons then uniformly distributed to the model nodes located within each polygon. Detailed calculations of demands as well as the illustrated allocation areas are shown in **Appendix A**.

2.4 Fire Flow Demand

Fire flow calculations were completed in accordance with the Fire Underwriters Survey's (FUS) Water Supply for Public Fire Protection Guideline (1999) and City of Ottawa Technical Bulletin ISTB-2018-02. The required fire flow for single detached and traditional townhomes that meet Technical Bulletin ISTB-2018-02 requirements are to be capped at 10,000 L/min (167 L/s). For the townhouse units where the 10,000 L/min cap could not be applied, the FUS calculations yielded the following required fire flows:

- Block 40: 11,000 L/min (183 L/s)
- Block 33: 16,000 L/min (267 L/s)

The FUS calculations for the back-to-back townhouse blocks yielded the following required fire flows:

- 12-unit back-to-back townhouse: 14,000 L/min (233 L/s), accounts for one (1) firewall
- 10-unit back-to-back townhouse: 14,000 L/min (233 L/s), accounts for one (1) firewall
- 8-unit back-to-back townhouse: 16,000 L/min (267 L/s), no firewall accounted for

At this time, there is not enough information available to calculate the required fire flows of the park. As such, the following required fire flow was assumed, based on similar information from previously completed projects:

- Park: 167 L/s

Fire flow simulations were completed at each model node. The locations of nodes do not necessarily represent hydrant locations.

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

2.5 Boundary Conditions

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

- Connection 1: Perseus Avenue
- Connection 2: Cambrian Road

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

Boundary conditions were provided for Peak Hour (PHD), Maximum Day plus Fire (MDD+FF) and Minimum Hour (high pressure check, MHD) demand conditions.

Under existing conditions, the Mattamy HMBW development will be serviced by the Barrhaven pressure zone (zone BARR); however, in the future, it will be serviced by the South Urban Community (SUC) pressure zone. The future pressure realignment for the SUC pressure zone includes the previous 3C pressure zone, portions of the current adjacent pressure zones, and the portion of the BARR pressure zone where the Mattamy HMBW development is located. The future SUC pressure zone is expected to be serviced by additional pumps and storage tanks.

Boundary conditions were provided under the existing and future pressure zone configurations. As the timeline for the pressure zone realignment is unconfirmed at this time, a hybrid approach was used to ensure that the most conservative option was selected for each of the PHD, MDD+FF and MHD scenarios.

The results presented in this report are based on this hybrid approach, which uses the most conservative HGLs for the PHD, MDD+FF and MHD scenarios from both of the existing and future boundary conditions as outlined below:

- The HGLs provided by the City for the PHD and MHD scenarios under the existing condition are more conservative than those of the SUC Zone reconfiguration condition.
- The HGLs provided by the City for the MDD+FF scenarios are more conservative under the SUC Zone reconfiguration condition than those of the existing condition.

The City boundary conditions were provided to GeoAdvice on April 9, 2021 and can be found in **Appendix C**.

The demands from the Flagstaff Phase 1 and the Mattamy Half Moon Bay West Phases 1, 2, 3 and 10 were included in the boundary condition request as they are located downstream from the connection points used in the boundary conditions.

Table 2.4 summarizes the City of Ottawa boundary conditions used (Scenario 2) to size the water network.

Table 2.4: Boundary Conditions

Condition	Connection 1 HGL (m)	Connection 2 HGL (m)
Min Hour (max. pressure)	158.3*	158.3*
Peak Hour (min. pressure)	136.4*	136.4*
Max Day + Fire Flow (167 L/s)	140.5**	140.7**
Max Day + Fire Flow (183 L/s)	137.9**	138.3**
Max Day + Fire Flow (233 L/s)	137.0**	137.4**
Max Day + Fire Flow (267 L/s)	134.0**	134.5**

*Based on the existing boundary conditions provided by the City of Ottawa.
** Based on the SUC Zone reconfiguration boundary conditions provided by the City of Ottawa.

3 Hydraulic Capacity Design Criteria

3.1 Pipe Characteristics

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

Table 3.1: Model Pipe Characteristics

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

3.2 Pressure Requirements

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

Table 3.2: Pressure Requirements

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

4 Hydraulic Capacity Analysis

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

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

4.1 Development Pressure Analysis

The modeling results indicate that the Mattamy HMBW Phase 3 development can be adequately serviced by the proposed water main layout shown in **Figure 1.1**. Modeled service pressures for the Mattamy HMBW Phase 3 development are summarized in **Table 4.1** below.

Table 4.1: Summary of Mattamy HMBW Phase 3 Available Service Pressures

Minimum Hour Demand Maximum Pressure	Peak Hour Demand Minimum Pressure
93 psi (640 kPa)	61 psi (418 kPa)

As outlined in the City of Ottawa Design Guidelines, the generally accepted best practice is to design new water distribution systems to operate between 350 kPa (50 psi) and 480 kPa (70 psi). The maximum pressure at any point in the distribution system in occupied areas outside of the public right-of-way shall not exceed 552 kPa (80 psi). As such, based on the City boundary conditions for the minimum hour demand, pressure reducing valves may be required throughout Mattamy HMBW Phase 3. In summary:

- Under the existing pressure zone conditions, any location with elevation lower than 102 m may experience high pressures (≥ 80 psi).
- Under the future pressure zone conditions, any location with the elevation lower than 91.5 m may experience high pressures (≥ 80 psi).

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

4.2 Development Fire Flow Analysis

Summaries of the minimum available fire flows in Mattamy HMBW Phase 3 is shown in **Table 4.2**.

Table 4.2: Summary of the Mattamy HMBW Phase 3 Minimum Available Fire Flows

Required Fire Flow	Minimum Available Flow*	Junction ID
167 L/s	372 L/s	J-82
183 L/s	510 L/s	J-89
233 L/s	277 L/s	J-99
267 L/s	353 L/s	J-91

*The predicted available fire flows, as calculated by the hydraulic model, represent the flow available in the water main while maintaining a residual pressure of 20 psi at the hydrant. High available fire flows (>500 L/s) are theoretical values. Actual available fire flow is limited by the hydraulic losses through the hydrant lateral and hydrant port sizes.

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

Summaries of the residual pressures in Mattamy HMBW Phase 3 is shown below in **Table 4.3**. The minimum allowable pressure under fire flow conditions is 140 kPa (20 psi) at the location of the fire.

Table 4.3: Summary of the Mattamy HMBW Phase 3 Residual Pressures (MDD + FF)

Maximum Residual Pressure	Average Residual Pressure	Minimum Residual Pressure
59 psi (405 kPa)	45 psi (312 kPa)	32 psi (217 kPa)

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

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

5 Other Servicing Considerations

5.1 Water Supply Security

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

The HMBW Phase 3 development services a total average day demand of 322 m^3/day; as such, two (2) feeds are required. Four (4) feeds to the Mattamy HMBW Phase 3 development from Apolune Street and Flagstaff Drive were modeled as part of the analysis.

5.2 Valves

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

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

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

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

The detailed engineering drawings for the Mattamy HMBW Phase 3 development are expected to identify valves in accordance with the requirements noted above.

5.3 Hydrants

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

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

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

- 167 L/s: 12,000 m^2 (radial coverage of 62 m)
- 183 L/s: 11,500 m^2 (radial coverage of 61 m)
- 233 L/s: 10,000 m^2 (radial coverage of 56 m)
- 267 L/s: 9,500 m^2 (radial coverage of 55 m)

The detailed engineering drawings for the Mattamy HMBW Phase 3 development are expected to identify hydrant locations in accordance with the requirements noted above.

5.4 Water Quality

The turnover rate of the water within the Mattamy HMBW Phase 3 development network, calculated from the connections to the development is about 5 hours (ADD is 322 m^3/day).

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

6 Conclusions

The hydraulic capacity and modeling analysis of the Mattamy HMBW Phase 3 development yielded the following conclusions:

- The proposed water main network can deliver all domestic flows, with service pressures expected to range between 61 psi (418 kPa) and 93 psi (640 kPa).
- The proposed water main network is able to deliver fire flows at all junctions.
- Pressure reducing valves may be required, since maximum pressures are predicted to exceed the City of Ottawa Design Guidelines (> 80 psi).
    - Under the existing pressure zone conditions, any location with elevation lower than 102 m may experience high pressures (≥ 80 psi).
    - Under the future pressure zone conditions, any location with the elevation lower than 91.5 m may experience high pressures (≥ 80 psi).
- Hydraulic modeling was completed using a hybrid format of the boundary conditions provided, using the most conservative HGLs from the existing and SUC Zone reconfiguration conditions for the PHD, MDD+FF and MHD scenarios.
    - The HGLs for the PHD and MHD scenarios under the existing condition are more conservative than those of the SUC Zone reconfiguration condition.
    - The HGLs for the MDD+FF scenarios are more conservative under the SUC Zone reconfiguration condition than those of the existing condition.

Submission

Prepared by:

Ben Loewen, E.I.T.
Hydraulic Modeler / Project Engineer

Approved by:

May 31, 2021

LICENSED PROFESSIONAL ENGINEER
W. B. F. de Schaetzen
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Werner de Schaetzen, Ph.D., P.Eng.
Senior Modeling Review / Project Manager

Appendix A Domestic Water Demand Calculations and Allocation

Consumer Water Demands

HMBW Phase 3 Residential Demands

Dwelling Type	Number of Units	Population*		Average Day Demand			Max Day 2.5 x Avg. Day (L/s)	Fire Flow (L/s)	Peak Hour 2.2 x Max Day (L/s)	Min Hour 0.5 x Avg. Day (L/s)
		Persons per Unit	Population Per Dwelling Type	(L/c/d)	(L/d)	(L/s)				
Single Detached	23	3.4	87	280	24,360	0.28	0.70		1.55	0.14
Traditional Townhome	111	2.7	330		92,400	1.07	2.67		5.88	0.53
Back-to-Back Townhome	94	2.7	280		78,400	0.91	2.27		4.99	0.45
Subtotal	**228**		**697**		**195,160**	**2.26**	**5.65**		**12.42**	**1.13**

HMBW Phase 3 Non Residential Demands

Property Type	Area (ha)		Average Day Demand			Max Day 1.5 x Avg. Day (L/s)	Fire Flow (L/s)	Peak Hour 1.8 x Max Day (L/s)	Min Hour 0.5 x Avg. Day (L/s)
			(L/ha/d)	(L/d)	(L/s)				
Park	4.52		28,000	126,560	1.46	2.20		3.96	0.73
Subtotal	**4.52**			**126,560**	**1.46**	**2.20**		**3.96**	**0.73**

Flagstaff	Number of Units	Population	Non Residential Area (ha)		**ADD**	**MDD**	**PHD**	**MHD**
Phase 1 Total Demand:	155	485			1.57	3.93	8.64	0.79

Half Moon Bay West	Number of Units	Population	Non Residential Area (ha)		**ADD**	**MDD**	**PHD**	**MHD**
Phase 1 Total Demand:	353	1,049	9.18		6.37	12.96	26.73	3.19
Phase 2A Total Demand:	156	502	1.00		1.95	4.55	9.82	0.98
Phase 2B Total Demand:	127	377			1.22	3.05	6.72	0.61
Phase 10 Total Demand:	60	171			0.55	1.39	3.05	0.28
Phase 3 Total Demand*:	228	697	4.52		3.72	7.84	16.38	1.86

Scenario Totals		**ADD**	**MDD**	**PHD**	**MHD**
Scenario 2	Flagstaff Phase 1, HMBW Phases 1, 2A, 2B, 3, 10	**15.40**	**33.73**	**71.34**	**7.70**

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

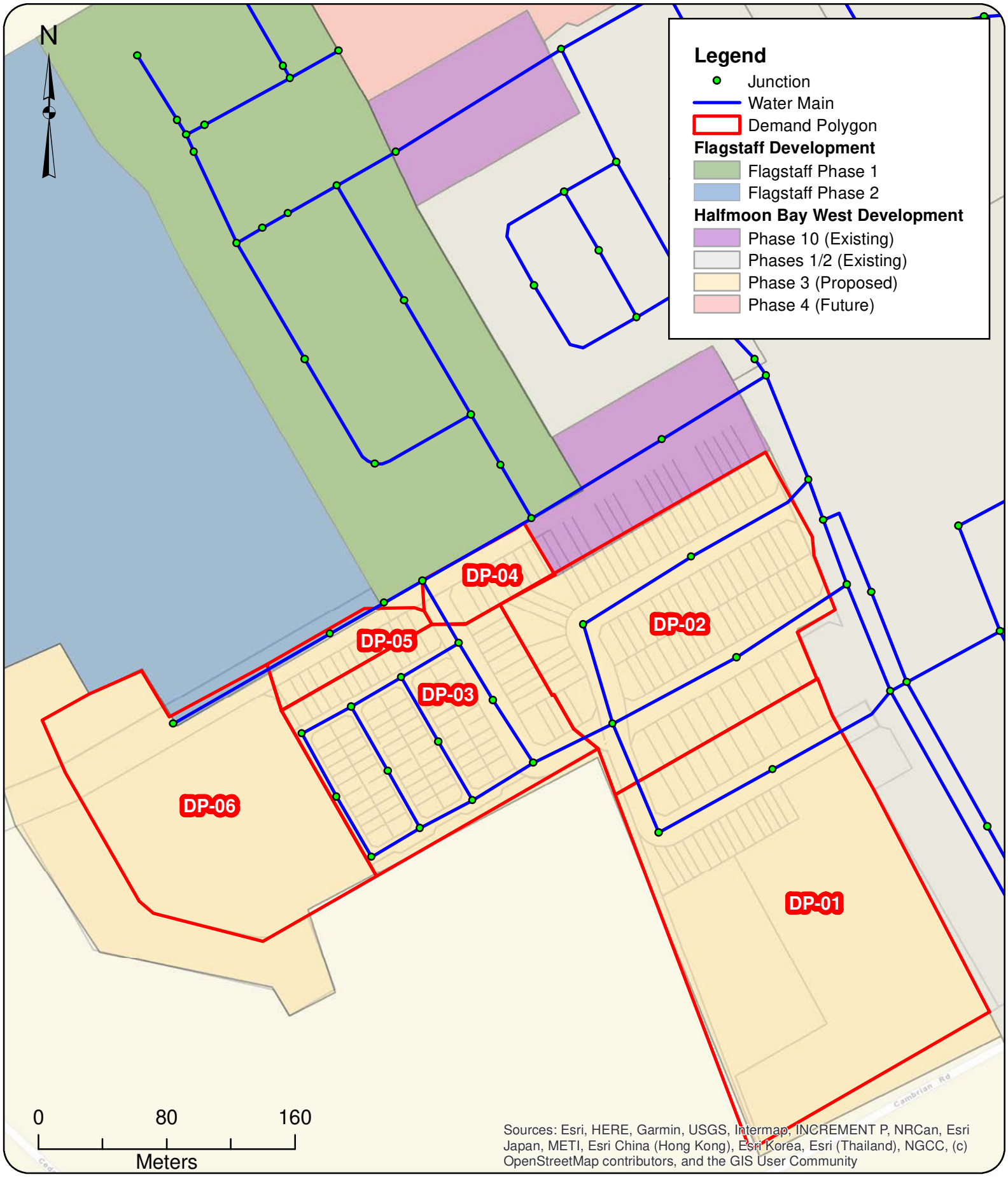
Domestic Demand Calculations and Allocation

HMBW Phase 3 Domestic Demands

Demand Polygon	Junction ID	Dwelling Type	Number of Units	Population	Average Day Demand			Max Day 2.5 x Avg. Day (L/s)	Peak Hour 2.2 x Max Day (L/s)	Min Hour 0.5 x Avg. Day (L/s)
					L/c/d	L/d	L/s			
1	J-87	Single Detached	11	42	280	12,068	0.14	0.35	0.77	0.07
	J-88	Traditional Townhouse	15	45	280	12,068	0.14	0.35	0.77	0.07
2	J-89	Single Detached	12	45	280	17,121	0.20	0.50	1.09	0.10
	J-90					17,121	0.20	0.50	1.09	0.10
	J-91	Traditional Townhouse	67	199	280	17,121	0.20	0.50	1.09	0.10
	J-92					17,121	0.20	0.50	1.09	0.10
3	J-93	Traditional Townhouse	12	36	280	6,393	0.07	0.18	0.41	0.04
	J-94					6,393	0.07	0.18	0.41	0.04
	J-95					6,393	0.07	0.18	0.41	0.04
	J-96					6,393	0.07	0.18	0.41	0.04
	J-97					6,393	0.07	0.18	0.41	0.04
	J-98					6,393	0.07	0.18	0.41	0.04
	J-99	Back-to-Back Townhouse	80	238	280	6,393	0.07	0.18	0.41	0.04
	J-100					6,393	0.07	0.18	0.41	0.04
	J-101					6,393	0.07	0.18	0.41	0.04
	J-102					6,393	0.07	0.18	0.41	0.04
	J-103					6,393	0.07	0.18	0.41	0.04
	J-104					6,393	0.07	0.18	0.41	0.04
4	J-105	Traditional Townhouse	9	27	280	7,492	0.09	0.22	0.48	0.04
5	J-107	Back-to-Back Townhouse	14	42	280	11,677	0.14	0.34	0.74	0.07
7	J-82	Traditional Townhouse	8	24	280	6,659	0.08	0.19	0.42	0.04
Total:			**228**	**697**		**195,160**	**2.26**	**5.65**	**12.42**	**1.13**

HMBW Phase 3 Non-Domestic Demands

Property Type	Junction ID	Phase	Area (ha)	Average Day Demand			Max Day 1.5 x Avg. Day (L/s)	Peak Hour 1.8 x Max Day (L/s)	Min Hour 0.5 x Avg. Day (L/s)
				(L/ha/d)	(L/d)	(L/s)			
Park	J-87	Phase 3	2.85	28,000	79,800	0.92	1.39	2.49	0.46
Park	J-82	Phase 3	1.67	28,000	46,760	0.54	0.27	0.49	0.09
Total:			**4.52**		**126,560**	**1.46**	**1.66**	**2.98**	**0.55**



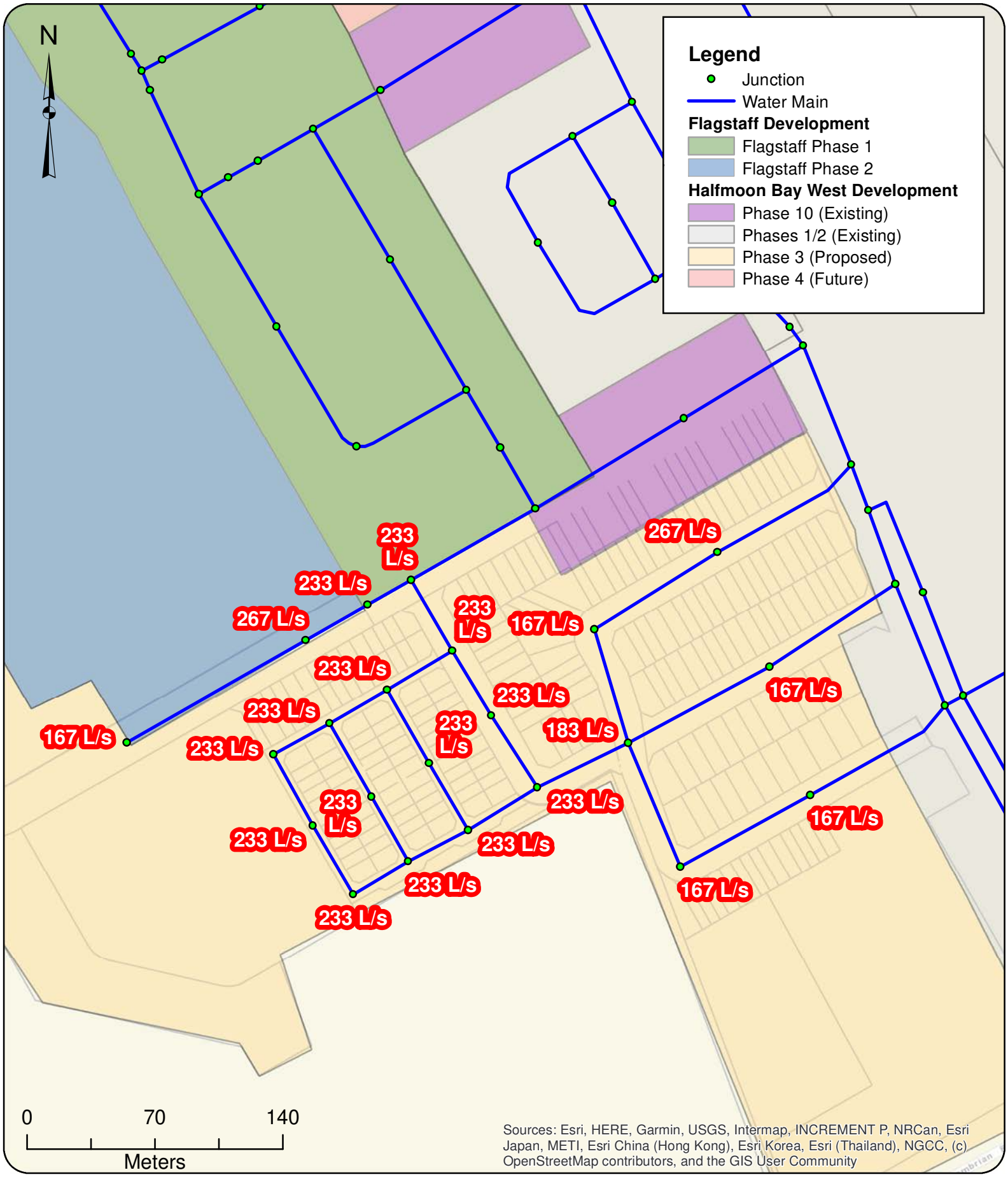
GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis Mattamy Half Moon Bay West Phase 3 2021-033-DSE**
Client: **David Schaeffer Engineering Ltd.**
Date: **May 2021**
Created by: **BL**
Reviewed by: **WdS**

Demand Allocation

Figure A.1

Appendix B FUS Fire Flow Calculations and Allocation



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis Mattamy Half Moon Bay West Phase 3 2021-033-DSE**
Client: **David Schaeffer Engineering Ltd.**
Date: **May 2021**
Created by: **BL**
Reviewed by: **WdS**

Required Fire Flow Flagstaff Phase 2

Figure B.1

FUS Required Fire Flow Calculation

Client: David Schaeffer Engineering Ltd.

Project: 2021-033-DSE

Development: Half Moon Bay West Phase 3 — Townhouse Block 40

Zoning: Multi Family Residential

Date: May 10, 2021

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

Note: For other townhouse blocks that do not comply with the City of Ottawa Technical Bulletin ISDTB-2018-02 4.2, a similar fire flow as calculated below will be used (Block 37).

A. Type of Construction: Wood Frame Construction

B. Ground Floor Area: 358 m^2

C. Number of Storeys: 2

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

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

A: Effective area — **A =** 715 m^2

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

F = 8,826 L/min **D =** 9,000 L/min*

E. Occupancy

Occupancy content hazard: Limited Combustible — -15 % of **D** **-1,350** L/min **E =** 7,650 L/min

F. Sprinkler Protection

Automatic sprinkler protection: None — 0 % of **E** **0** L/min **F =** 7,650 L/min

G. Exposures

Side	Separation Distance	Length-Height Factor - Adjacent Structure	Construction Type - Adjacent Structure	Exposure
North	30.1 to 45 m	31-60 m-storeys	Wood Frame or Non-Combustible	5%
East	3.1 to 10 m	0-30 m-storeys	Wood Frame or Non-Combustible	17%
South	3.1 to 10 m	0-30 m-storeys	Wood Frame or Non-Combustible	17%
West	20.1 to 30 m	31-60 m-storeys	Wood Frame or Non-Combustible	8%
			Total	**47%**

% of **E** **+ 3,596** L/min **G =** 11,246 L/min

H. Wood Shake Charge — No — **0** L/min **H =** 11,246 L/min

For wood shingle or shake roofs

Total Fire Flow Required	**11,000**	**L/min****
	183	**L/s**
Required Duration of Fire Flow	**2.25**	**Hrs**
Required Volume of Fire Flow	**1,485**	**m^3**

*Rounded to the nearest 1,000 L/min

The Total Required Fire Flow for the Half Moon Bay West Phase 3 development should be reviewed when drawings and site plans have been finalized. The Total Required Fire Flow may be reduced or increased depending on area, construction, occupancy, exposures, and level of sprinkler protection. If any of these items change, the Total Required Fire Flow should be reviewed to determine the impact.

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

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

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

FUS Required Fire Flow Calculation

Client: David Schaeffer Engineering Ltd.
Project: 2021-033-DSE
Development: Half Moon Bay West Phase 3 — Townhouse Block 33
Zoning: Multi Family Residential
Date: May 10, 2021

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

Note: For other townhouse blocks that do not comply with the City of Ottawa Technical Bulletin ISDTB-2018-02 4.2, a similar fire flow as calculated below will be used.

A. Type of Construction: Wood Frame Construction

B. Ground Floor Area: 609 m^2 — Note: Block 33 has 7 units

C. Number of Storeys: 2

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

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

A: Effective area — **A =** 1218 m^2

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

F = 11,517 L/min **D = 12,000 L/min***

E. Occupancy

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

F. Sprinkler Protection

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

G. Exposures

Side	Separation Distance	Length-Height Factor - Adjacent Structure	Construction Type - Adjacent Structure	Exposure
North	10.1 to 20 m	61-90 m-storeys	Wood Frame or Non-Combustible	14%
East	3.1 to 10 m	0-30 m-storeys	Wood Frame or Non-Combustible	17%
South	20.1 to 30 m	61-90 m-storeys	Wood Frame or Non-Combustible	9%
West	3.1 to 10 m	0-30 m-storeys	Wood Frame or Non-Combustible	17%
			Total	**57%**

% of **E** **+ 5,814 L/min** **G = 16,014 L/min**

H. Wood Shake Charge — No — **0 L/min** **H = 16,014 L/min**

For wood shingle or shake roofs

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

*Rounded to the nearest 1,000 L/min

The Total Required Fire Flow for the Half Moon Bay West Phase 3 development should be reviewed when drawings and site plans have been finalized. The Total Required Fire Flow may be reduced or increased depending on area, construction, occupancy, exposures, and level of sprinkler protection. If any of these items change, the Total Required Fire Flow should be reviewed to determine the impact.

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

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

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

FUS Required Fire Flow Calculation

Client: David Schaeffer Engineering Ltd.
Project: 2021-033-DSE
Development: Half Moon Bay West Phase 3 — 12-unit Back-to-Back Townhouse
Zoning: Multi Family Residential — Firewall located in the middle of the block.
Date: May 10, 2021

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

A. Type of Construction: Wood Frame Construction

B. Ground Floor Area: 353 m^2

C. Number of Storeys: 3

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

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

A: Effective area — **A =** 1059 m^2

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

F = 10,738 L/min **D = 11,000 L/min***

E. Occupancy

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

F. Sprinkler Protection

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

G. Exposures

Side	Separation Distance	Length-Height Factor - Adjacent Structure	Construction Type - Adjacent Structure	Exposure
North	Firewall	61-90 m-storeys	Wood Frame or Non-Combustible	10%
East	10.1 to 20 m	31-60 m-storeys	Wood Frame or Non-Combustible	13%
South	3.1 to 10 m	61-90 m-storeys	Wood Frame or Non-Combustible	19%
West	10.1 to 20 m	31-60 m-storeys	Wood Frame or Non-Combustible	13%
			Total	**55%**

% of **E** **+ 5,143 L/min** **G = 14,493 L/min**

H. Wood Shake Charge — No — **0 L/min** **H = 14,493 L/min**

For wood shingle or shake roofs

Total Fire Flow Required	**14,000**	**L/min****
	233	**L/s**
Required Duration of Fire Flow	**3**	**Hrs**
Required Volume of Fire Flow	**2,520**	**m^3**

*Rounded to the nearest 1,000 L/min

The Total Required Fire Flow for the Half Moon Bay West Phase 3 development should be reviewed when drawings and site plans have been finalized. The Total Required Fire Flow may be reduced or increased depending on area, construction, occupancy, exposures, and level of sprinkler protection. If any of these items change, the Total Required Fire Flow should be reviewed to determine the impact.

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

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

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

12-unit Back-to-Back Townhouse

FUS Required Fire Flow Calculation

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

Client: David Schaeffer Engineering Ltd.
Project: 2021-033-DSE
Development: Half Moon Bay West Phase 3 — 10-unit Back-to-Back Townhouse
Zoning: Multi Family Residential — Firewall located with 6 units on one side and 4 units on the other.
Date: May 10, 2021

A. Type of Construction: Wood Frame Construction

B. Ground Floor Area: 357 m^2

C. Number of Storeys: 3

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

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

A: Effective area — **A =** 1071 m^2

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

F = 10,798 L/min **D = 11,000 L/min***

E. Occupancy

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

F. Sprinkler Protection

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

G. Exposures

Side	Separation Distance	Length-Height Factor - Adjacent Structure	Construction Type - Adjacent Structure	Exposure
North	3.1 to 10 m	61-90 m-storeys	Wood Frame or Non-Combustible	19%
East	10.1 to 20 m	31-60 m-storeys	Wood Frame or Non-Combustible	13%
South	Firewall	61-90 m-storeys	Wood Frame or Non-Combustible	10%
West	10.1 to 20 m	31-60 m-storeys	Wood Frame or Non-Combustible	13%
			Total	**55%**

% of **E** **+ 5,143 L/min** **G = 14,493 L/min**

H. Wood Shake Charge — No — **0 L/min** **H = 14,493 L/min**

For wood shingle or shake roofs

Total Fire Flow Required	**14,000**	**L/min****
	233	**L/s**
Required Duration of Fire Flow	**3**	**Hrs**
Required Volume of Fire Flow	**2,520**	**m^3**

*Rounded to the nearest 1,000 L/min

The Total Required Fire Flow for the Half Moon Bay West Phase 3 development should be reviewed when drawings and site plans have been finalized. The Total Required Fire Flow may be reduced or increased depending on area, construction, occupancy, exposures, and level of sprinkler protection. If any of these items change, the Total Required Fire Flow should be reviewed to determine the impact.

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

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

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

10-unit Back-to-Back Townhouse

FUS Required Fire Flow Calculation

Client: David Schaeffer Engineering Ltd.
Project: 2021-033-DSE
Development: Half Moon Bay West Phase 3 — 8-unit Back-to-Back Townhouse
Zoning: Multi Family Residential — No Firewall
Date: May 10, 2021

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

A. Type of Construction: Wood Frame Construction

B. Ground Floor Area: 481 m^2

C. Number of Storeys: 3

Note: The exposure to the School block located to the North was taken at the property line to be conservative.

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

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

A: Effective area — **A =** 1444 m^2

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

F = 12,538 L/min **D = 13,000 L/min***

E. Occupancy

Occupancy content hazard: Limited Combustible — -15 % of **D** **-1,950 L/min** **E = 11,050 L/min**

F. Sprinkler Protection

Automatic sprinkler protection: None — 0 % of **E** **0 L/min** **F = 11,050 L/min**

G. Exposures

Side	Separation Distance	Length-Height Factor - Adjacent Structure	Construction Type - Adjacent Structure	Exposure
North	20.1 to 30 m	31-60 m-storeys	Wood Frame or Non-Combustible	8%
East	3.1 to 10 m	61-90 m-storeys	Wood Frame or Non-Combustible	19%
South	10.1 to 20 m	61-90 m-storeys	Wood Frame or Non-Combustible	14%
West	Beyond 45 m	0-30 m-storeys	Wood Frame or Non-Combustible	0%
			Total	**41%**

% of **E** **+ 4,531 L/min** **G = 15,581 L/min**

H. Wood Shake Charge — No — **0 L/min** **H = 15,581 L/min**

For wood shingle or shake roofs

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

*Rounded to the nearest 1,000 L/min

The Total Required Fire Flow for the Half Moon Bay West Phase 3 development should be reviewed when drawings and site plans have been finalized. The Total Required Fire Flow may be reduced or increased depending on area, construction, occupancy, exposures, and level of sprinkler protection. If any of these items change, the Total Required Fire Flow should be reviewed to determine the impact.

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

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

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

Back-to-Back Townhouse Proposed Fire Wall Locations

Fire wall locations are based off the FUS calculations completed, which were the worst-case scenarios for each townhouse block type (8-unit, 10-unit, 12-unit). It is possible that by completing additional FUS calculations, the fire wall recommendations may not be the same for the other back-to-back townhouse blocks.

Appendix C Boundary Conditions

Boundary Conditions
Flagstaff and Mattamy's Half Moon Bay West

Location

Scenario 1

Provided Information

Scenario 1	Demand	
	L/min	L/s
Average Daily Demand	403	6.71
Maximum Daily Demand	1,756	29.26
Peak Hour	3,708	61.80
Fire Flow Demand #1	10,000	166.67
Fire Flow Demand #2	13,000	216.67
Fire Flow Demand #3	14,000	233.33
Fire Flow Demand #4	17,000	283.33

Results – Existing Conditions

Connection 1 – Greenbank Road / Cambrian Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	157.0	89.6
Peak Hour	136.9	61.0
Max Day plus Fire 1	144.6	72.0
Max Day plus Fire 2	141.0	66.9
Max Day plus Fire 3	139.7	65.0
Max Day plus Fire 4	135.2	58.6

Ground Elevation = 94.0 m

Connection 2 – Greenbank Road / Perseus Avenue

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	157.0	90.3
Peak Hour	136.9	61.8
Max Day plus Fire 1	144.9	73.1
Max Day plus Fire 2	141.4	68.2
Max Day plus Fire 3	140.1	66.3
Max Day plus Fire 4	135.7	60.1

Ground Elevation = 93.5 m

Results – SUC Zone Reconfiguration

Connection 1 – Greenbank Road / Cambrian Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	147.6	76.3
Peak Hour	140.9	66.7
Max Day plus Fire 1	140.7	66.5
Max Day plus Fire 2	138.2	62.9
Max Day plus Fire 3	137.3	61.6
Max Day plus Fire 4	134.3	57.3

Ground Elevation = 94.0 m

Connection 2 – Greenbank Road / Perseus Avenue

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	147.6	77.1
Peak Hour	140.9	67.5
Max Day plus Fire 1	140.9	67.6
Max Day plus Fire 2	138.6	64.2
Max Day plus Fire 3	137.7	62.9
Max Day plus Fire 4	134.8	58.9

Ground Elevation = 93.5 m

Scenario 2

Provided Information

Scenario 2	Demand	
	L/min	L/s
Average Daily Demand	491	8.19
Maximum Daily Demand	2,117	35.29
Peak Hour	4,456	74.26
Fire Flow Demand #1	10,000	166.67
Fire Flow Demand #2	13,000	216.67
Fire Flow Demand #3	14,000	233.33
Fire Flow Demand #4	17,000	283.33

Results – Existing Conditions

Connection 1 – Greenbank Road / Cambrian Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	158.3	91.4
Peak Hour	136.4	60.4
Max Day plus Fire 1	144.2	71.5
Max Day plus Fire 2	140.6	66.2
Max Day plus Fire 3	139.2	64.3
Max Day plus Fire 4	134.6	57.8

Ground Elevation = 94.0 m

Connection 2 – Greenbank Road / Perseus Avenue

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	158.3	92.2
Peak Hour	136.4	61.1
Max Day plus Fire 1	144.5	72.6
Max Day plus Fire 2	140.9	67.5
Max Day plus Fire 3	139.6	65.6
Max Day plus Fire 4	135.2	59.4

Ground Elevation = 93.5 m

Results – SUC Zone Reconfiguration

Connection 1 – Greenbank Road / Cambrian Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	147.6	76.3
Peak Hour	140.2	65.8
Max Day plus Fire 1	140.5	66.2
Max Day plus Fire 2	137.9	62.5
Max Day plus Fire 3	137.0	61.2
Max Day plus Fire 4	134.0	56.9

Ground Elevation = 94.0 m

Connection 2 – Greenbank Road / Perseus Avenue

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	147.6	77.0
Peak Hour	140.2	66.5
Max Day plus Fire 1	140.7	67.3
Max Day plus Fire 2	138.3	63.8
Max Day plus Fire 3	137.4	62.5
Max Day plus Fire 4	134.5	58.5

Ground Elevation = 93.5 m

Scenario 3

Provided Information

Scenario 3	Demand	
	L/min	L/s
Average Daily Demand	579	9.65
Maximum Daily Demand	2,499	41.65
Peak Hour	5,259	87.65
Fire Flow Demand #1	10,000	166.67
Fire Flow Demand #2	13,000	216.67
Fire Flow Demand #3	14,000	233.33
Fire Flow Demand #4	17,000	283.33

Results – Existing Conditions

Connection 1 – Greenbank Road / Cambrian Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	159.1	92.7
Peak Hour	135.1	58.4
Max Day plus Fire 1	143.8	70.9
Max Day plus Fire 2	140.1	65.6
Max Day plus Fire 3	138.7	63.6
Max Day plus Fire 4	134.1	57.1

Ground Elevation = 94.0 m

Connection 2 – Greenbank Road / Perseus Avenue

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	159.1	93.4
Peak Hour	135.1	59.2
Max Day plus Fire 1	144.1	72.0
Max Day plus Fire 2	140.5	66.9
Max Day plus Fire 3	139.1	65.0
Max Day plus Fire 4	134.7	58.7

Ground Elevation = 93.5 m

Results – SUC Zone Reconfiguration

Connection 1 – Greenbank Road / Cambrian Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	147.6	76.2
Peak Hour	139.5	64.7
Max Day plus Fire 1	140.3	65.8
Max Day plus Fire 2	137.7	62.2
Max Day plus Fire 3	136.7	60.8
Max Day plus Fire 4	133.6	56.4

Ground Elevation = 94.0 m

Connection 2 – Greenbank Road / Perseus Avenue

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	147.6	77.0
Peak Hour	139.5	65.5
Max Day plus Fire 1	140.5	66.9
Max Day plus Fire 2	138.0	63.4
Max Day plus Fire 3	137.1	62.2
Max Day plus Fire 4	134.2	58.0

Ground Elevation = 93.5 m

Scenario 4

Provided Information

Scenario 4	Demand	
	L/min	L/s
Average Daily Demand	613	10.21
Maximum Daily Demand	2,643	44.05
Peak Hour	5,563	92.72
Fire Flow Demand #1	10,000	166.67
Fire Flow Demand #2	13,000	216.67
Fire Flow Demand #3	14,000	233.33
Fire Flow Demand #4	17,000	283.33

Results – Existing Conditions

Connection 1 – Greenbank Road / Cambrian Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	159.1	92.6
Peak Hour	134.5	57.7
Max Day plus Fire 1	143.7	70.7
Max Day plus Fire 2	139.9	65.4
Max Day plus Fire 3	138.5	63.4
Max Day plus Fire 4	133.9	56.8

Ground Elevation = 94.0 m

Connection 2 – Greenbank Road / Perseus Avenue

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	159.1	93.4
Peak Hour	134.5	58.4
Max Day plus Fire 1	143.9	71.8
Max Day plus Fire 2	140.3	66.6
Max Day plus Fire 3	138.9	64.7
Max Day plus Fire 4	134.5	58.4

Ground Elevation = 93.5 m

Results – SUC Zone Reconfiguration

Connection 1 – Greenbank Road / Cambrian Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	147.6	76.2
Peak Hour	139.2	64.3
Max Day plus Fire 1	140.2	65.7
Max Day plus Fire 2	137.6	62.0
Max Day plus Fire 3	136.6	60.7
Max Day plus Fire 4	133.5	56.3

Ground Elevation = 94.0 m

Connection 2 – Greenbank Road / Perseus Avenue

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	147.6	77.0
Peak Hour	139.2	65.1
Max Day plus Fire 1	140.4	66.8
Max Day plus Fire 2	137.9	63.3
Max Day plus Fire 3	137.0	62.0
Max Day plus Fire 4	134.1	57.9

Ground Elevation = 93.5 m

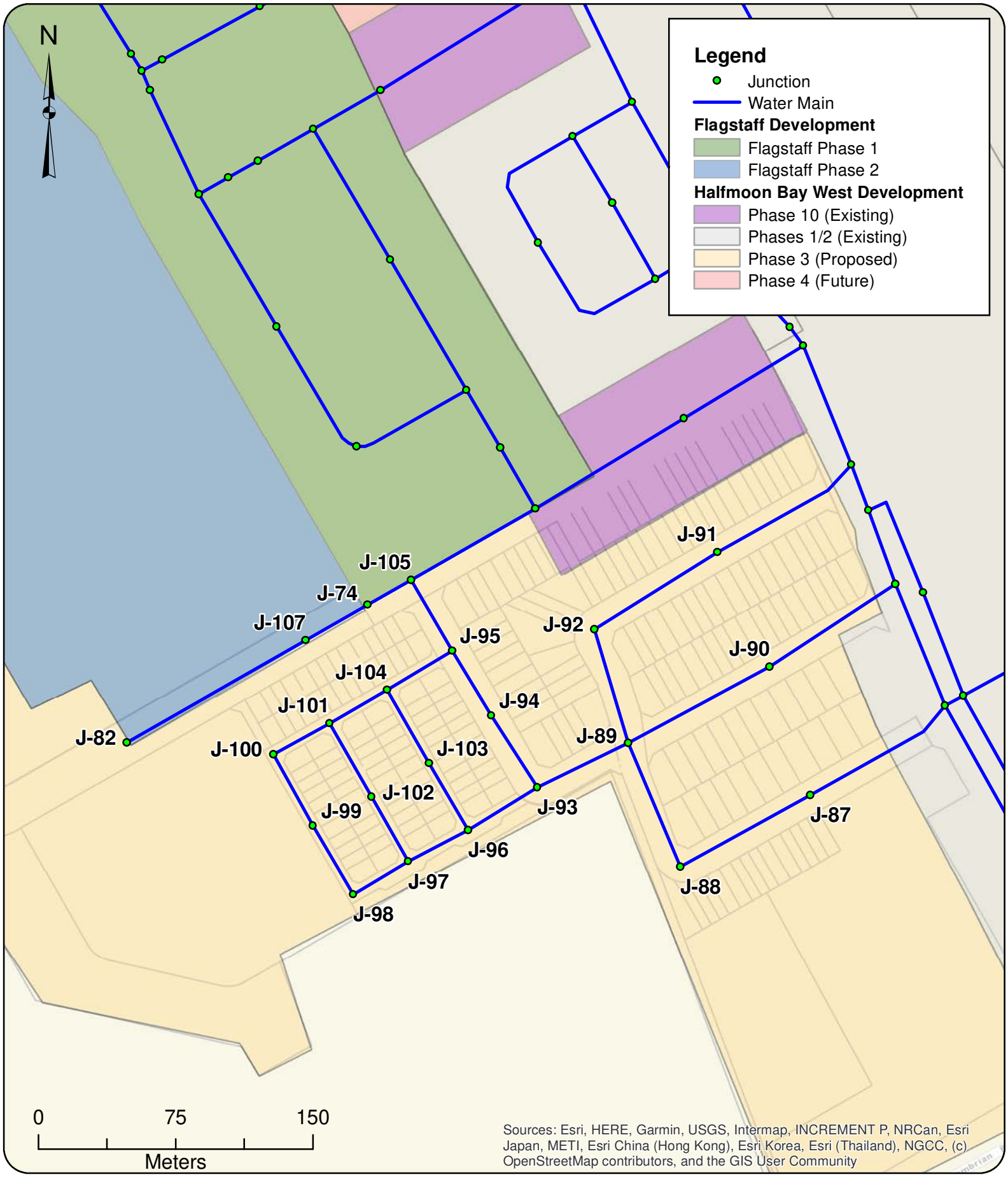
Notes

1. As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:
    a. If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
    b. Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

Disclaimer

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

Appendix D Pipe and Junction Model Inputs

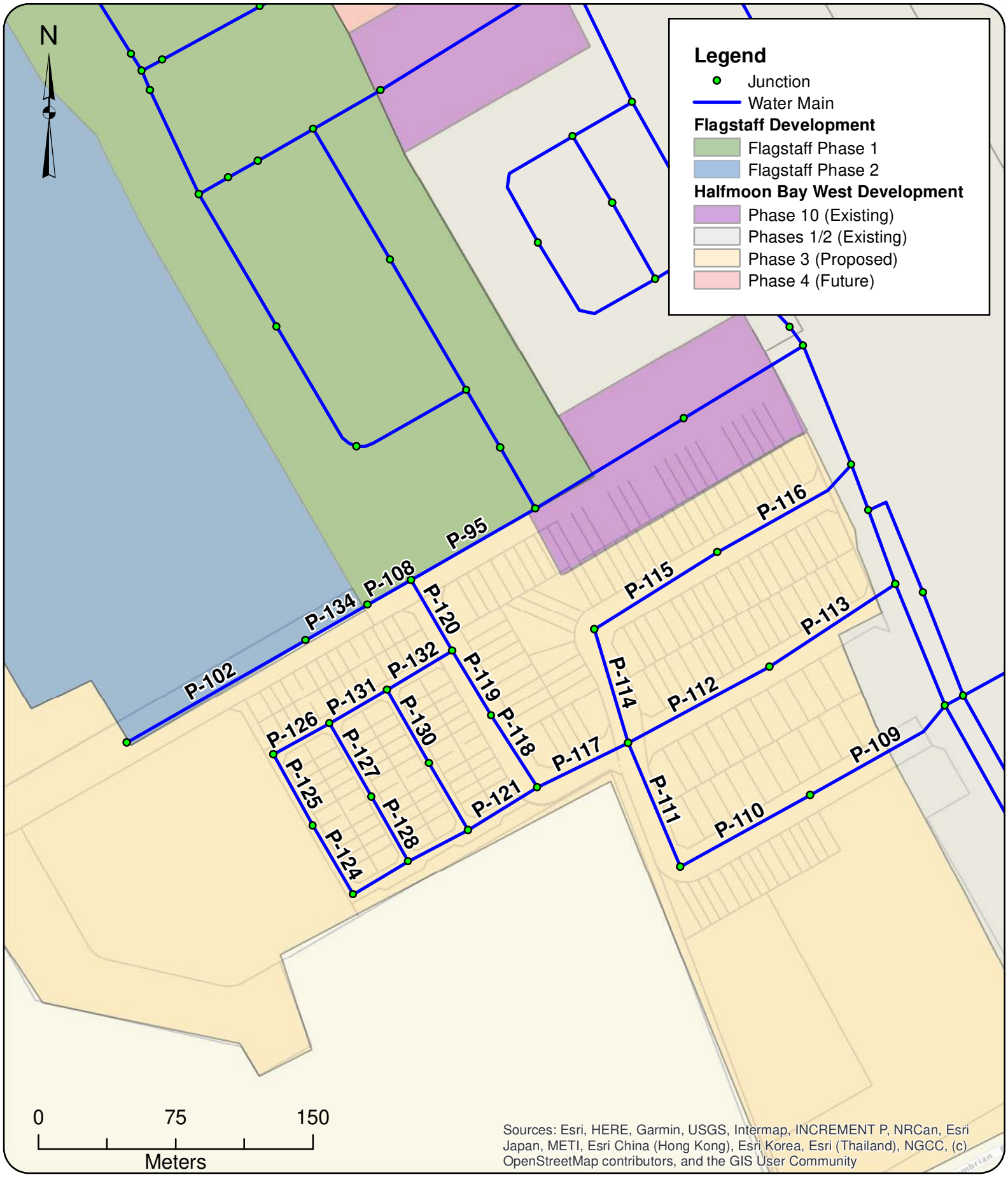


GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis Mattamy Half Moon Bay West Phase 3 2021-033-DSE**
Client: **David Schaeffer Engineering Ltd.**
Date: **May 2021**
Created by: **BL**
Reviewed by: **WdS**

Junction IDs

Figure D.1



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Date: **May 2021**
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Reviewed by: **WdS**

Pipe IDs

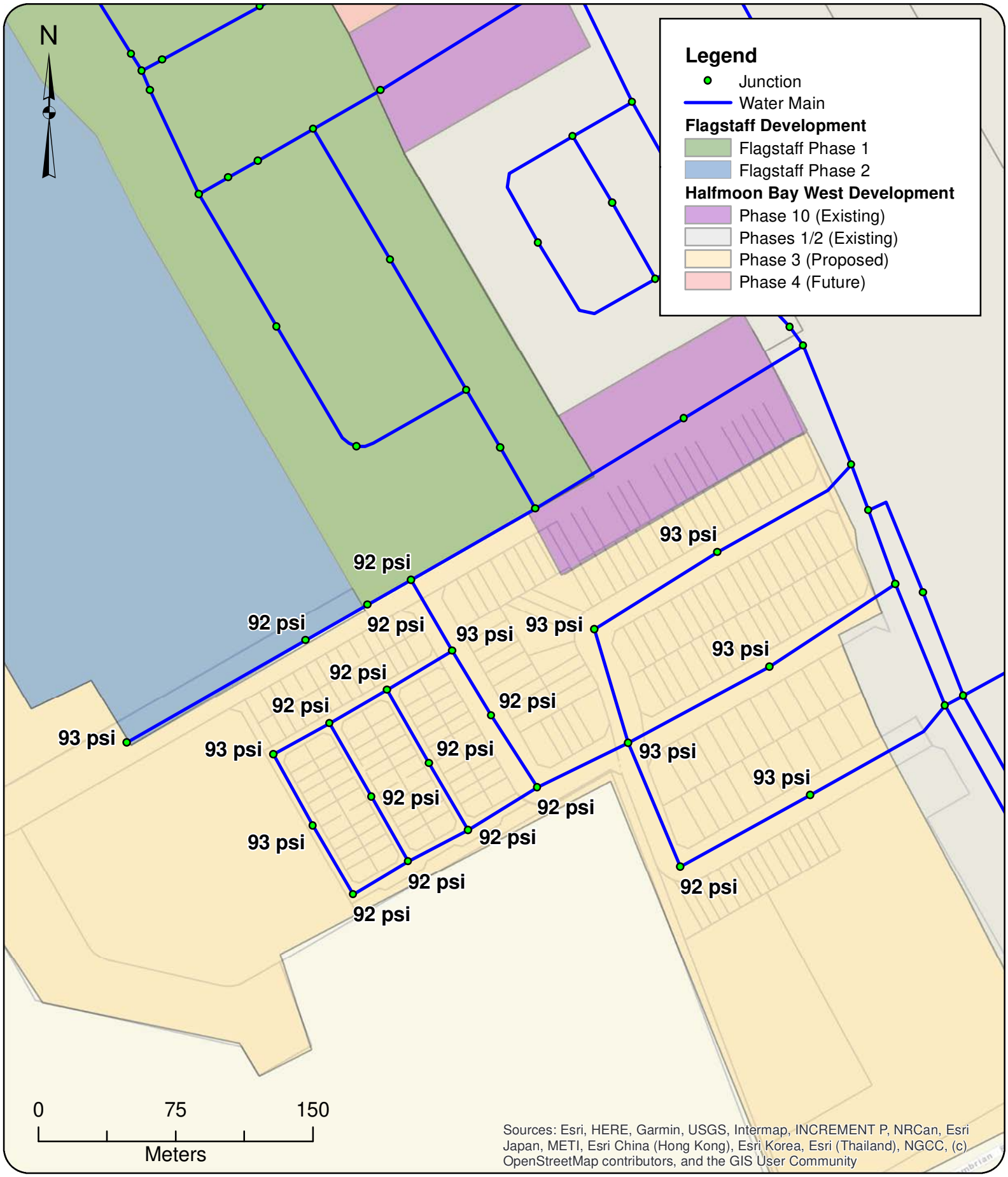
Figure D.2

Model Inputs

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness ()
P-102	J-82	J-107	112.76	297	120
P-108	J-105	J-74	27.31	297	120
P-109	J-14	J-87	89.29	204	110
P-110	J-87	J-88	81.18	204	110
P-111	J-88	J-89	73.64	204	110
P-112	J-89	J-90	87.69	204	110
P-113	J-90	J-13	82.42	204	110
P-114	J-89	J-92	64.70	204	110
P-115	J-92	J-91	79.40	204	110
P-116	J-91	J-19	88.28	204	110
P-117	J-89	J-93	55.19	204	110
P-118	J-93	J-94	46.56	204	110
P-119	J-94	J-95	41.31	204	110
P-120	J-95	J-105	44.98	204	110
P-121	J-93	J-96	44.58	204	110
P-122	J-96	J-97	37.02	204	110
P-123	J-97	J-98	35.03	204	110
P-124	J-98	J-99	43.48	204	110
P-125	J-99	J-100	44.77	204	110
P-126	J-100	J-101	35.00	204	110
P-127	J-101	J-102	46.13	204	110
P-128	J-102	J-97	40.79	204	110
P-129	J-96	J-103	42.30	204	110
P-130	J-103	J-104	46.37	204	110
P-131	J-104	J-101	36.29	204	110
P-132	J-104	J-95	41.56	204	110
P-134	J-107	J-74	39.00	297	120
P-95	J-73	J-105	78.42	297	120

ID	Elevation (m)
J-100	93.10
J-101	93.40
J-102	93.40
J-103	93.40
J-104	93.30
J-105	93.43
J-107	93.46
J-74	93.46
J-82	93.08
J-87	93.10
J-88	93.30
J-89	93.20
J-90	93.10
J-91	93.00
J-92	93.20
J-93	93.40
J-94	93.30
J-95	93.20
J-96	93.40
J-97	93.50
J-98	93.30
J-99	93.20

Appendix E MHD and PHD Model Results



GeoAdvice Engineering Inc.

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Client: **David Schaeffer Engineering Ltd.**
Date: **May 2021**
Created by: **BL**
Reviewed by: **WdS**

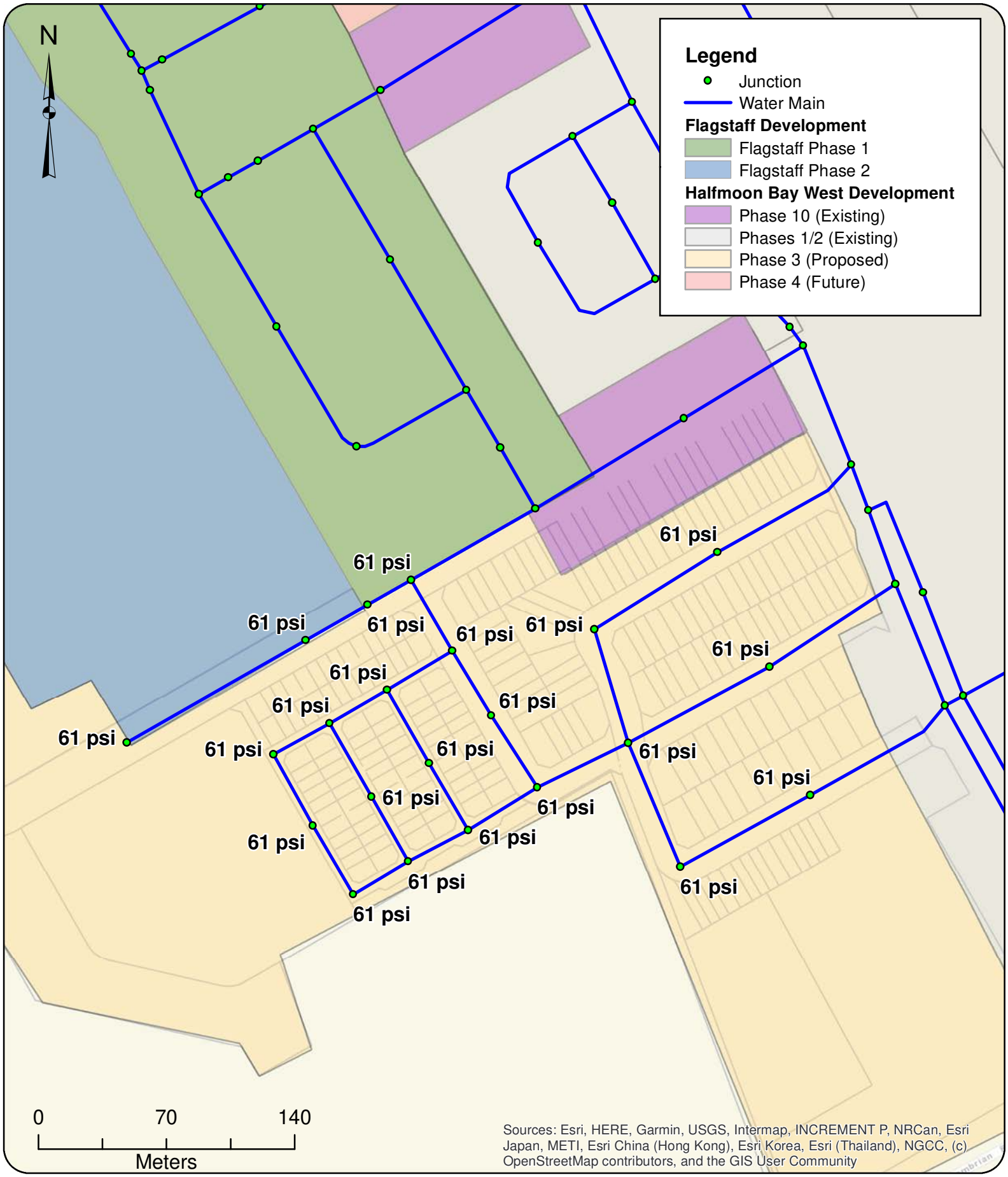
MHD Pressure Results HMBW Phase 3

Figure E.1

Minimum Hour Demand Modeling Results - Half Moon Bay West Phase 3

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/k-m)
P-102	J-82	J-107	112.76	297	120	-0.13	0.00	0.00	0.00
P-108	J-105	J-74	27.31	297	120	0.25	0.00	0.00	0.00
P-109	J-14	J-87	89.29	204	110	0.63	0.02	0.00	0.01
P-110	J-87	J-88	81.18	204	110	0.10	0.00	0.00	0.00
P-111	J-88	J-89	73.64	204	110	0.03	0.00	0.00	0.00
P-112	J-89	J-90	87.69	204	110	-0.28	0.01	0.00	0.00
P-113	J-90	J-13	82.42	204	110	-0.38	0.01	0.00	0.00
P-114	J-89	J-92	64.70	204	110	-0.09	0.00	0.00	0.00
P-115	J-92	J-91	79.40	204	110	-0.18	0.01	0.00	0.00
P-116	J-91	J-19	88.28	204	110	-0.28	0.01	0.00	0.00
P-117	J-89	J-93	55.19	204	110	0.29	0.01	0.00	0.00
P-118	J-93	J-94	46.56	204	110	0.08	0.00	0.00	0.00
P-119	J-94	J-95	41.31	204	110	0.04	0.00	0.00	0.00
P-120	J-95	J-105	44.98	204	110	-0.15	0.01	0.00	0.00
P-121	J-93	J-96	44.58	204	110	0.18	0.01	0.00	0.00
P-122	J-96	J-97	37.02	204	110	0.11	0.00	0.00	0.00
P-123	J-97	J-98	35.03	204	110	0.06	0.00	0.00	0.00
P-124	J-98	J-99	43.48	204	110	0.02	0.00	0.00	0.00
P-125	J-99	J-100	44.77	204	110	-0.02	0.00	0.00	0.00
P-126	J-100	J-101	35.00	204	110	-0.06	0.00	0.00	0.00
P-127	J-101	J-102	46.13	204	110	0.02	0.00	0.00	0.00
P-128	J-102	J-97	40.79	204	110	-0.02	0.00	0.00	0.00
P-129	J-96	J-103	42.30	204	110	0.03	0.00	0.00	0.00
P-130	J-103	J-104	46.37	204	110	-0.01	0.00	0.00	0.00
P-131	J-104	J-101	36.29	204	110	0.11	0.00	0.00	0.00
P-132	J-104	J-95	41.56	204	110	-0.16	0.01	0.00	0.00
P-134	J-107	J-74	39.00	297	120	-0.20	0.00	0.00	0.00
P-95	J-73	J-105	78.42	297	120	0.45	0.01	0.00	0.00

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J-100	0.04	93.10	158	93
J-101	0.04	93.40	158	92
J-102	0.04	93.40	158	92
J-103	0.04	93.40	158	92
J-104	0.04	93.30	158	92
J-105	0.04	93.43	158	92
J-107	0.07	93.46	158	92
J-74	0.06	93.46	158	92
J-82	0.13	93.08	158	93
J-87	0.53	93.10	158	93
J-88	0.07	93.30	158	92
J-89	0.10	93.20	158	93
J-90	0.10	93.10	158	93
J-91	0.10	93.00	158	93
J-92	0.10	93.20	158	93
J-93	0.04	93.40	158	92
J-94	0.04	93.30	158	92
J-95	0.04	93.20	158	93
J-96	0.04	93.40	158	92
J-97	0.04	93.50	158	92
J-98	0.04	93.30	158	92
J-99	0.04	93.20	158	93



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis Mattamy Half Moon Bay West Phase 3 2021-033-DSE**
Client: **David Schaeffer Engineering Ltd.**
Date: **May 2021**
Created by: **BL**
Reviewed by: **WdS**

PHD Pressure Results HMBW Phase 3

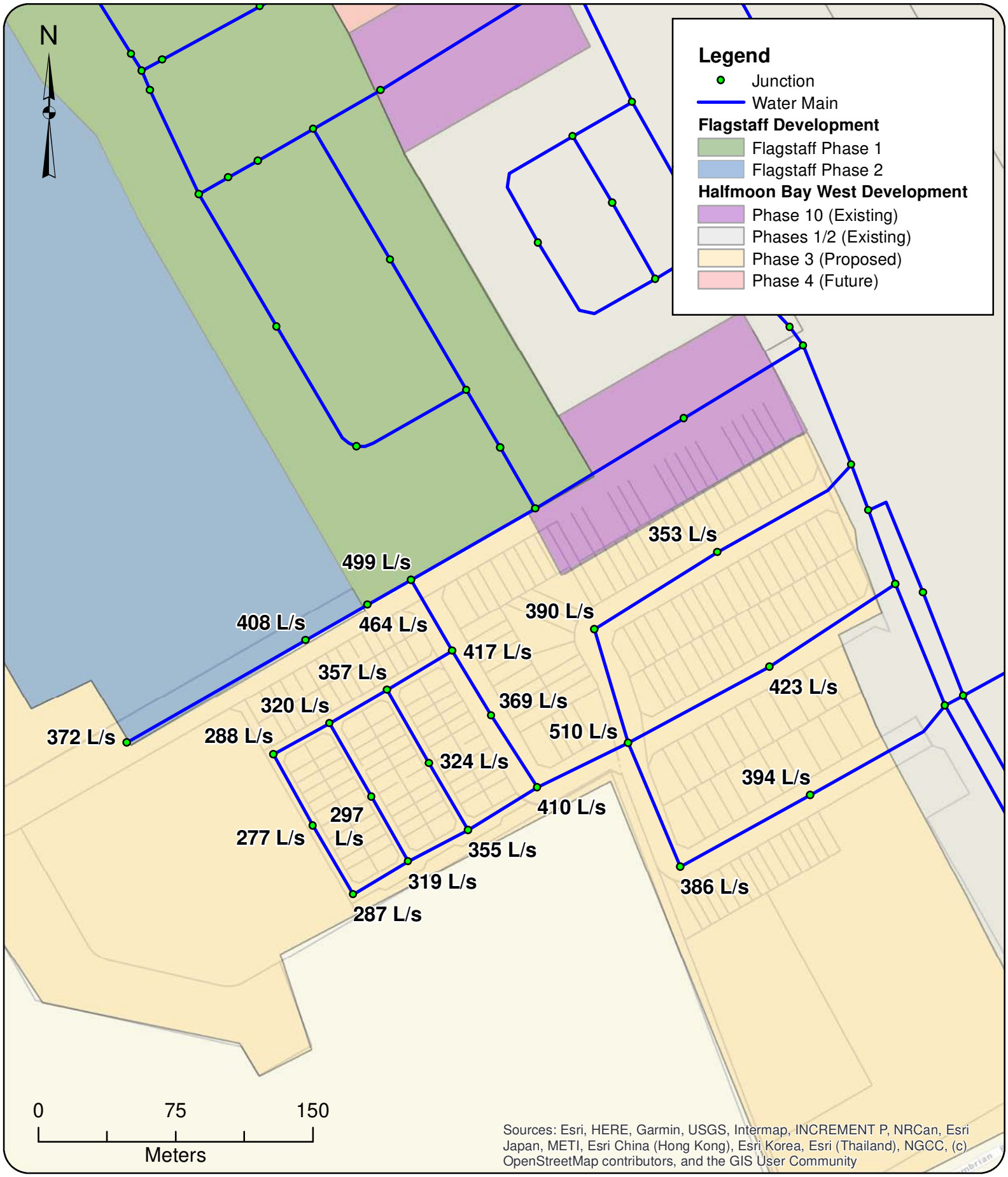
Figure E.2

Peak Hour Demand Modeling Results - Half Moon Bay West Phase 3

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/k-m)
P-102	J-82	J-107	112.76	297	120	-0.91	0.01	0.00	0.00
P-108	J-105	J-74	27.31	297	120	2.28	0.03	0.00	0.01
P-109	J-14	J-87	89.29	204	110	5.68	0.17	0.03	0.28
P-110	J-87	J-88	81.18	204	110	2.42	0.07	0.01	0.06
P-111	J-88	J-89	73.64	204	110	1.65	0.05	0.00	0.03
P-112	J-89	J-90	87.69	204	110	-2.63	0.08	0.01	0.07
P-113	J-90	J-13	82.42	204	110	-3.72	0.11	0.01	0.13
P-114	J-89	J-92	64.70	204	110	-0.46	0.01	0.00	0.00
P-115	J-92	J-91	79.40	204	110	-1.54	0.05	0.00	0.03
P-116	J-91	J-19	88.28	204	110	-2.63	0.08	0.01	0.07
P-117	J-89	J-93	55.19	204	110	3.65	0.11	0.01	0.12
P-118	J-93	J-94	46.56	204	110	1.16	0.04	0.00	0.02
P-119	J-94	J-95	41.31	204	110	0.75	0.02	0.00	0.01
P-120	J-95	J-105	44.98	204	110	-1.24	0.04	0.00	0.02
P-121	J-93	J-96	44.58	204	110	2.08	0.06	0.00	0.04
P-122	J-96	J-97	37.02	204	110	1.26	0.04	0.00	0.02
P-123	J-97	J-98	35.03	204	110	0.62	0.02	0.00	0.01
P-124	J-98	J-99	43.48	204	110	0.21	0.01	0.00	0.00
P-125	J-99	J-100	44.77	204	110	-0.20	0.01	0.00	0.00
P-126	J-100	J-101	35.00	204	110	-0.60	0.02	0.00	0.01
P-127	J-101	J-102	46.13	204	110	0.17	0.01	0.00	0.00
P-128	J-102	J-97	40.79	204	110	-0.23	0.01	0.00	0.00
P-129	J-96	J-103	42.30	204	110	0.42	0.01	0.00	0.00
P-130	J-103	J-104	46.37	204	110	0.01	0.00	0.00	0.00
P-131	J-104	J-101	36.29	204	110	1.18	0.04	0.00	0.02
P-132	J-104	J-95	41.56	204	110	-1.58	0.05	0.00	0.03
P-134	J-107	J-74	39.00	297	120	-1.65	0.02	0.00	0.00
P-95	J-73	J-105	78.42	297	120	4.00	0.06	0.00	0.02

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J-100	0.41	93.10	136	61
J-101	0.41	93.40	136	61
J-102	0.41	93.40	136	61
J-103	0.41	93.40	136	61
J-104	0.41	93.30	136	61
J-105	0.48	93.43	136	61
J-107	0.74	93.46	136	61
J-74	0.63	93.46	136	61
J-82	0.91	93.08	136	61
J-87	3.26	93.10	136	61
J-88	0.77	93.30	136	61
J-89	1.09	93.20	136	61
J-90	1.09	93.10	136	61
J-91	1.09	93.00	136	61
J-92	1.09	93.20	136	61
J-93	0.41	93.40	136	61
J-94	0.41	93.30	136	61
J-95	0.41	93.20	136	61
J-96	0.41	93.40	136	61
J-97	0.41	93.50	136	61
J-98	0.41	93.30	136	61
J-99	0.41	93.20	136	61

Appendix F MDD+FF Model Results

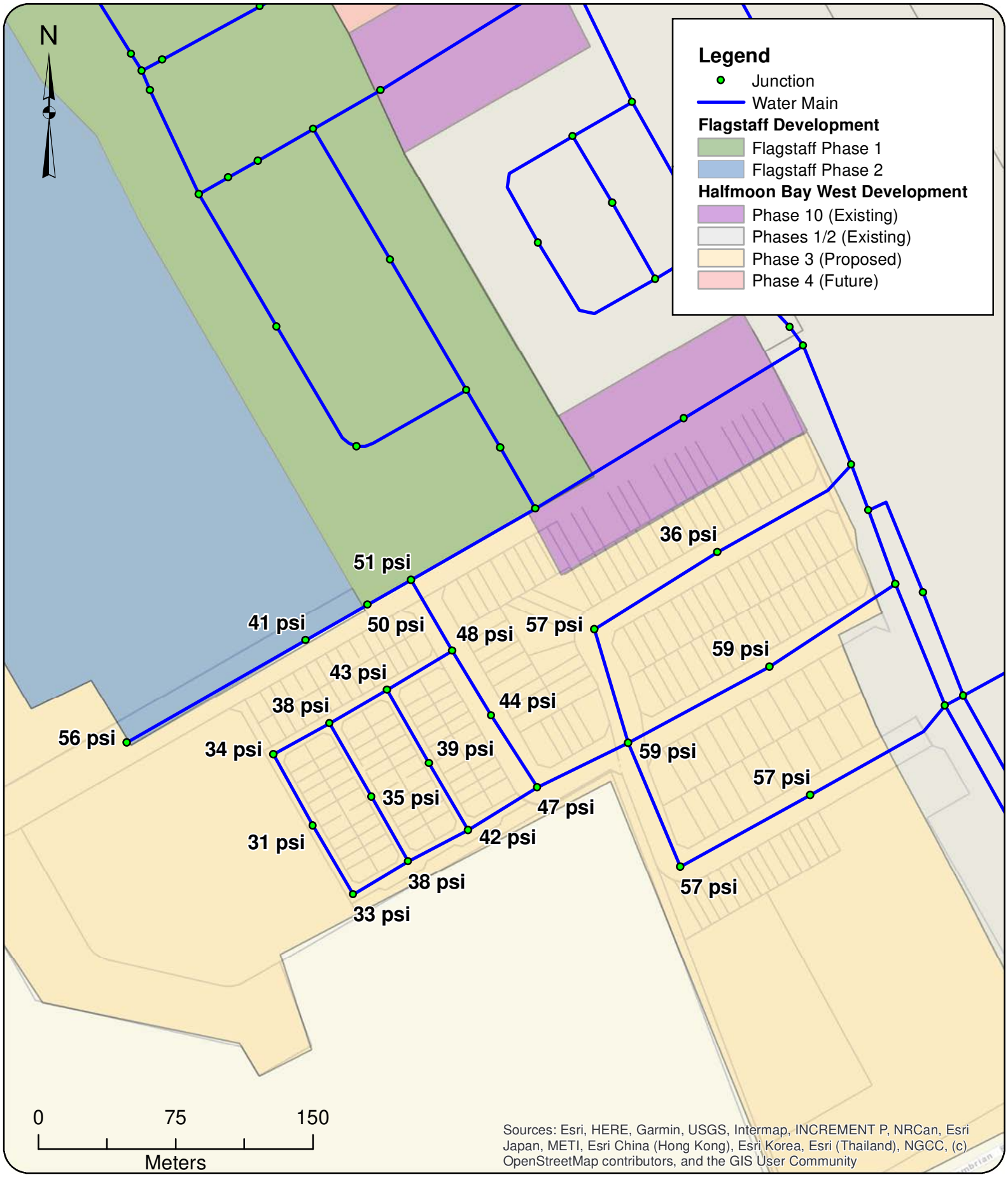


GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis Mattamy Half Moon Bay West Phase 3 2021-033-DSE**
Client: **David Schaeffer Engineering Ltd.**
Date: **May 2021**
Created by: **BL**
Reviewed by: **WdS**

Available Fire Flow @ 20 psi HMBW Phase 3

Figure F.1



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis Mattamy Half Moon Bay West Phase 2 2021-033-DSE**
Client: **David Schaeffer Engineering Ltd.**
Date: **May 2021**
Created by: **BL**
Reviewed by: **WdS**

Residual Pressure @ Required Fire Flow HMBW Phase 3

Figure F.2

Fire Flow Modeling Results - Half Moon Bay West Phase 3

ID	Static Demand (L/s)	Static Pressure (psi)	Static Head (m)	Fire-Flow Demand (L/s)	Residual Pressure (psi)	Available Flow at Hydrant (L/s)	Available Flow Pressure (psi)
J-82	0.46	67	141	167	56	372	20
J-87	1.74	67	141	167	57	394	20
J-88	0.35	67	141	167	57	386	20
J-90	0.50	67	141	167	59	423	20
J-92	0.50	67	141	167	57	390	20
J-89	0.50	66	140	183	59	510	20
J-100	0.19	63	137	233	34	288	20
J-101	0.19	62	137	233	38	320	20
J-102	0.19	62	137	233	35	297	20
J-103	0.19	62	137	233	39	324	20
J-104	0.19	62	137	233	43	357	20
J-105	0.22	62	137	233	51	499	20
J-74	0.29	62	137	233	50	464	20
J-93	0.19	62	137	233	47	410	20
J-94	0.19	62	137	233	44	369	20
J-95	0.19	62	137	233	48	417	20
J-96	0.19	62	137	233	42	355	20
J-97	0.19	62	137	233	38	319	20
J-98	0.19	62	137	233	33	287	20
J-99	0.19	62	137	233	31	277	20
J-107	0.34	59	135	267	41	408	20
J-91	0.50	60	135	267	36	353	20

Appendix G

Ottawa Servicing Report Checklist

Servicing study guidelines for development applications

4. Development Servicing Study Checklist

The following section describes the checklist of the required content of servicing studies. It is expected that the proponent will address each one of the following items for the study to be deemed complete and ready for review by City of Ottawa Infrastructure Approvals staff.

The level of required detail in the Servicing Study will increase depending on the type of application. For example, for Official Plan amendments and re-zoning applications, the main issues will be to determine the capacity requirements for the proposed change in land use and confirm this against the existing capacity constraint, and to define the solutions, phasing of works and the financing of works to address the capacity constraint. For subdivisions and site plans, the above will be required with additional detailed information supporting the servicing within the development boundary.

4.1 General Content

- ☐ Executive Summary (for larger reports only).
- ☒ Date and revision number of the report.
- ☒ Location map and plan showing municipal address, boundary, and layout of proposed development.
- ☒ Plan showing the site and location of all existing services.
- ☒ Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.
- ☒ Summary of Pre-consultation Meetings with City and other approval agencies.
- ☒ Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.
- ☒ Statement of objectives and servicing criteria.
- ☒ Identification of existing and proposed infrastructure available in the immediate area.
- ☐ Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).
- ☒ Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.
- ☐ Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.
- ☐ Proposed phasing of the development, if applicable.

☐ Reference to geotechnical studies and recommendations concerning servicing.

☒ All preliminary and formal site plan submissions should have the following information:
- Metric scale
- North arrow (including construction North)
- Key plan
- Name and contact information of applicant and property owner
- Property limits including bearings and dimensions
- Existing and proposed structures and parking areas
- Easements, road widening and rights-of-way
- Adjacent street names

4.2 Development Servicing Report: Water

☐ Confirm consistency with Master Servicing Study, if available
☒ Availability of public infrastructure to service proposed development
☐ Identification of system constraints
☐ Identify boundary conditions
☐ Confirmation of adequate domestic supply and pressure
☒ Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.
☐ Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.
☐ Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design
☐ Address reliability requirements such as appropriate location of shut-off valves
☐ Check on the necessity of a pressure zone boundary modification.
☒ Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range

- ☒ Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.
- ☐ Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.
- ☒ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.
- ☐ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.

4.3 Development Servicing Report: Wastewater

- ☒ Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).
- ☐ Confirm consistency with Master Servicing Study and/or justifications for deviations.
- ☐ Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.
- ☒ Description of existing sanitary sewer available for discharge of wastewater from proposed development.
- ☒ Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)
- ☐ Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix ‘C’) format.
- ☒ Description of proposed sewer network including sewers, pumping stations, and forcemains.
- ☐ Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).
- ☐ Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.
- ☐ Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.
- ☐ Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.
- ☐ Special considerations such as contamination, corrosive environment etc.

4.4 Development Servicing Report: Stormwater Checklist

- ☒ Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)
- ☒ Analysis of available capacity in existing public infrastructure.
- ☒ A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.
- ☒ Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.
- ☒ Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.
- ☒ Description of the stormwater management concept with facility locations and descriptions with references and supporting information.
- ☐ Set-back from private sewage disposal systems.
- ☐ Watercourse and hazard lands setbacks.
- ☒ Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.
- ☐ Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.
- ☒ Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).
- ☐ Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.
- ☒ Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.
- ☐ Any proposed diversion of drainage catchment areas from one outlet to another.
- ☐ Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.
- ☐ If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100 year return period storm event.
- ☐ Identification of potential impacts to receiving watercourses
- ☐ Identification of municipal drains and related approval requirements.
- ☒ Descriptions of how the conveyance and storage capacity will be achieved for the development.
- ☒ 100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.

- ☐ Inclusion of hydraulic analysis including hydraulic grade line elevations.
- ☒ Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.
- ☐ Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.
- ☐ Identification of fill constraints related to floodplain and geotechnical investigation.

4.5 Approval and Permit Requirements: Checklist

The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:

- ☐ Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.
- ☐ Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.
- ☐ Changes to Municipal Drains.
- ☐ Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)

4.6 Conclusion Checklist

- ☒ Clearly stated conclusions and recommendations
- ☐ Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.
- ☒ All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario

Appendix H

Pre-Consultation Summary

Pre-Application Consultation Meeting Notes

Property Address: 3555 Borrisokane
PC2023-0038,
February 23rd, 2023, MS Teams

Attendees:

Inwon Lee (Owner)
David Parker and Carlos (Architect)
Patrick McMahon (Transportation Project Manager, City of Ottawa)
Sami Rehman (Environmental Planner, Planner II, City of Ottawa)
Selma Hassan (Urban Designer, Planner II, City of Ottawa)
Jeannette Krabicka (Parks Planner, Planner II, City of Ottawa)
Bruce Bramah (Project Manager, City of Ottawa)
Stream Shen (File Lead, Planner III, City of Ottawa)
Adwoa Achireko (Student Planner, City of Ottawa)
Samuel Farkas (Student Planner, City of Ottawa)

Regrets:

- Eric Lalande (Planner, RVCA)
- Mark Richardson (Forester Planner, City of Ottawa)

Subject: 3555 Borrisokane **–** Korean Community Church

Meeting notes:

Opening & attendee introduction
- Introduction of meeting attendees
- Overview of proposal:
    - 1 storey building for a Korean Community Church
    - The class and office are accessory to the church.
    - Estimated highest attendance to be on Sunday at 500 people.
    - Weekday will be mostly empty.
    - Currently considering renting out part of the space as a day care.
    - Currently no trees on property.
    - There are currently no plan for the parcel north of the church.
    - The church will be building the road along the easterly property line connecting to Flagstaff.

Comments:

Planning (Shen, Stream Stream.Shen@ottawa.ca)

1. This is a pre-consultation for a Site Plan Control application, Complex threshold. Application form, information and fee can be found here. There is a proposed fee increase for April 1, 2023.

2. There will be impact to the site plan application process as a result of Bill 109 and Bill 23. Please review the engage Ottawa website for information and reach out to the file lead to confirm the updated process prior to submission.
3. Official Plan - Neighbourhood designation within the Suburban transect. Urban Natural Feature designation to the south.
4. Official Plan Annex 5 area specific policy 4 requires evidence that the owner is party to the barrhaven south cos t sharing agreement and that the owner has paid its share of any costs pursuant to the agreement as a condition of approval.
5. Barrhaven South Community Design Plan – Employment designation. Please review the CDP for any applicable policies.
6. Due to the location within the 500-metre influence area of the Trail Road Waste Facility, Conditions of development approval will include the provision of warning notices on title, noting the site's proximity to the landfill and the potential for odour and litter impacts; and the requirement for sealed, air-conditioned workplace units.
7. Zoning – Light Industrial, Exception 304 (IL[304]) which allows a place of warship as an additional permitted use.
8. Aisle width leading to parking spaces need to be a minimum of 6.7m.
9. Bicycle parking required at 1 per 1,500 m2 of gfa.
10. Vehicle parking required at 10 per 100m2 of gfa for the assembly area.
11. The City is working to implement the High Performance Development Standards by June 1, 2023. Detail information and submission requirements can be found in the attachment.
12. Please consult with the Ward Councillor (David Hill) prior to submission.

Urban Design (Hassan, Selma Selma.Hassan@ottawa.ca)

13. Design brief is required. Terms of reference is attached.
14. Please ensure the site is well landscaped, and new larger canopy trees are provided where possible, and
15. Please design the front of the building to have glazing and to address the front of the site appropriately.

Transportation (McMahon, Patrick patrick.mcmahon@ottawa.ca)

- Follow Traffic Impact Assessment Guidelines
    - Start this process as soon as possible.
    - The application will not be deemed complete until the submission of the draft step 1-4, including the functional draft RMA package (if applicable and/or monitoring report (if applicable). Collaboration and communication between development proponents and City staff are required at the end of every step of the TIA process.
- The right of way protection along Borrisokane Road is 37.5m, show this protection on the plan. A widening does not appear to be required.
- Noise Impact Studies required for the following:
    - Road (adjacent to Borrisokane and within 500m of Highway 416)
    - Stationary due to the proximity of an in-stream application for a car wash at the northern edge of the site. The car wash developer will not be responsible for any noise attenuation required.
- The clear throat length for this development along Borrisokane Road should be at least 15m from the edge of the right-of-way.
- Consider providing a pedestrian connection along the internal road to connect to Flagstaff.

- Consider ending the sidewalk along the frontage prior to the Borrisokane Road limits since there are no pedestrian facilities provided along Borrisokane Road.
- On site plan:
    - Show all details of the roads abutting the site up to and including the opposite curb; include such items as pavement markings, accesses and/or sidewalks.
    - Turning templates will be required for all accesses showing the largest vehicle to access the site; required for internal movements and at all access (entering and exiting and going in both directions).
    - Show all curb radii measurements; ensure that all curb radii are reduced as much as possible.
    - Show lane/aisle widths. Aisles must be 6.7m wide.
- As the proposed site is commercial/institutional/industrial and for general public use, AODA legislation applies.
- Consider using the City's Accessibility Design Standards.

Forestry (Richardson, Mark Mark.Richardson@ottawa.ca)

1. If trees >10cm in diameter will be impacted, a Tree Conservation Report (TCR) must be supplied for review along with the suite of other plans/reports required by the City
    a. an approved TCR is a requirement of Site Plan approval.
2. Any removal of privately-owned trees 10cm or larger in diameter, or city-owned trees of any diameter requires a tree permit issued under the Tree Protection Bylaw (Bylaw 2020 – 340); the permit will be based on an approved TCR and made available at or near plan approval.
3. The TCR must contain 2 separate plans:
    b. Plan/Map 1 - show existing conditions with tree cover information.
    c. Plan/Map 2 - show proposed development with tree cover information.
    d. Please ensure retained trees are shown on the landscape plan.
4. the TCR must list all trees on site, as well as off-site trees if the CRZ extends into the developed area, by species, diameter and health condition.
5. please identify trees by ownership – private onsite, private on adjoining site, city owned, co-owned (trees on a property line)
    e. Compensation may be required for the removal of city owned trees.
6. If trees are to be removed, the TCR must clearly show where they are, and document the reason they cannot be retained.
7. All retained trees must be shown, and all retained trees within the area impacted by the development process must be protected as per City guidelines available at Tree Protection Specification or by searching Ottawa.ca
    a. the location of tree protection fencing must be shown on the plan.
    b. show the critical root zone of the retained trees.
8. the City encourages the retention of healthy trees; if possible, please seek opportunities for retention of trees that will contribute to the design/function of the site.
9. For more information on the process or help with tree retention options, contact Mark Richardson mark.richardson@ottawa.ca or on City of Ottawa

Planning Forester LP tree planting requirements:

Please note that all process for reviewing and approving LP tree planting has changed at the City – in order to effectively review your submission in a timely manner the Planning Forester will need to ensure that all the bullets listed below have been addressed

1. Minimum Setbacks
    - Maintain 1.5m from sidewalk or MUP/cycle track or water service laterals.
    - Maintain 2.5m from curb
    - Coniferous species require a minimum 4.5m setback from curb, sidewalk or MUP/cycle track/pathway.
    - Maintain 7.5m between large growing trees, and 4m between small growing trees. Park or open space planting should consider 10m spacing, except where otherwise approved in naturalization / afforestation areas. Adhere to Ottawa Hydro's planting guidelines (species and setbacks) when planting around overhead primary conductors.
2. Tree specifications
    - Minimum stock size: 50mm tree caliper for deciduous, 200cm height for coniferous.
    - Maximize the use of large deciduous species wherever possible to maximize future canopy coverage
    - Tree planting on city property shall be in accordance with the City of Ottawa's Tree Planting Specification; and include watering and warranty as described in the specification (can be provided by Forestry Services).
    - Plant native trees whenever possible
    - No root barriers, dead-man anchor systems, or planters are permitted.
    - No tree stakes unless necessary (and only 1 on the prevailing winds side of the tree)
3. Hard surface planting
    - Curb style planter is highly recommended
    - No grates are to be used and if guards are required, City of Ottawa standard (which can be provided) shall be used.
    - Trees are to be planted at grade
4. Soil Volume
    - Please document on the LP that adequate soil volumes can be met:

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

Sensitive Marine Clay

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

Engineering (Bramah, Bruce bruce.bramah@ottawa.ca)

Servicing

Please note the Trail Road Waste Facility is near this property. Comments from the Trail Road Facility

will be provided once they are available.

Site servicing conditions/criteria shall be in accordance with HMBW Phase 4 servicing study.
Water and Sanitary service stubs off Flagstaff Drive within the existing servicing easement to be used.

Water

Boundary conditions:
Civil consultant must request boundary conditions from the City's assigned Project Manager prior to first submission.

- Water boundary condition requests must include the location of the service(s) and the expected loads required by the proposed developments. Please provide all the following information:
    - Location of service(s)
    - Type of development and the amount of fire flow required (as per FUS, 2020).
    - Average daily demand: ___ l/s.
    - Maximum daily demand: ___l/s.
    - Maximum hourly daily demand: ___ l/s.
- Fire protection (Fire demand, Hydrant Locations)
- A water meter sizing questionnaire (water data card) will have to be completed prior to receiving a water permit (water card will be provided post approval)

Sanitary Sewer

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

- The designer should be aware there may be limited capacity in the downstream sanitary sewer system. The sanitary demand needs to be coordinated with the City Planning Dept. to determine if the existing sanitary sewer system has sufficient capacity to support the proposed rezoning. Provide sanitary demands to the City project manager for coordination.

- Any premise in which there is commercial or institutional food preparation shall install a grease and oil inceptor on all fixtures.

Storm Sewer

- For concrete sewer pipe, maintenance holes shall be installed when the service is greater than 50% of the diameter of the mainline concrete pipe

- The Environmental Site Assessment (ESA) may provide recommendations where site contamination may be present. The recommendations from the ESA need to be coordinated with the servicing report to ensure compliance with the Sewer Use By-Law.

Stormwater Management

Quality Control:

- The Clarke storm water management pond does provide quality control for HMBW subdivision. The Rideau Valley Conservation Authority to provide any additional quality control requirements for the property.

Quantity Control:

- Provided by servicing study for HMBW Phase 4.

Ministry of Environment, Conservation and Parks (MECP)

All development applications should be considered for an Environmental Compliance Approval, under MECP regulations.

a. The consultants determine if an approval for sewage works under Section 53 of OWRA is required and determines what type of application. The City's project manager may help confirm and coordinate with the MECP as required.
b. The project will be either transfer of review (standard), transfer of review (additional), direct submission, or exempt as per O. Reg. 525/98.
c. Pre-consultation is not required if applying for standard or additional works (Schedule A of the Agreement) under Transfer Review.
d. Pre-consultation with local District office of MECP is recommended for direct submission.
e. Consultant completes an MECP request form for a pre-consultation. Sends request to moeccottawasewage@ontario.ca
f. ECA applications are required to be submitted online through the MECP portal. A business account required to submit ECA application. For more information visit https://www.ontario.ca/page/environmental-compliance-approval
g. It is unclear if the proposed development will remain as one property. An ECA will be required where the stormwater management services more than one property parcel.

NOTE: Site Plan Approval, or Draft Approval, is required before any Ministry of the Environment and Climate Change (MOECC) application is sent

General Service Design Comments

- The City of Ottawa requests that all new services be located within the existing service trench to minimize necessary road cuts.
- Monitoring manholes should be located within the property near the property line in an accessible location to City forces and free from obstruction (i.e. not a parking).
- Where service length is greater than 30 m between the building and the first maintenance hole / connection, a cleanout is required.
- The City of Ottawa Standard Detail Drawings should be referenced where possible for all work within the Public Right-of-Way.
- The upstream and downstream manhole top of grate and invert elevations are required for all new sewer connections.
- Services crossing the existing watermain or sewers need to clearly provide the obvert/invert elevations to demonstration minimum separation distances. A watermain crossing table may be provided.

Other

Are there are Capital Works Projects scheduled that will impact the application? ☐ Yes ☒ No

References and Resources

- As per section 53 of the Professional Engineers Act, O. Reg 941/40, R.S.O. 1990, all documents prepared by engineers must be signed and dated on the seal.
- All required plans are to be submitted on standard A1 size sheets (594mm x 841mm) sheets, utilizing a reasonable and appropriate metric scale as per City of Ottawa Servicing and Grading

Plan Requirements: title blocks are to be placed on the right of the sheets and not along the bottom. Engineering plans may be combined, but the Site Plans must be provided separately. Plans shall include the survey monument used to confirm datum. Information shall be provided to enable a non-surveyor to locate the survey monument presented by the consultant.

- All required plans & reports are to be provided in *.pdf format (at application submission and for any, and all, re-submissions)
- Please find relevant City of Ottawa Links to Preparing Studies and Plans below: https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans#standards-policies-and-guidelines
- To request City of Ottawa plan(s) or report information please contact the City of Ottawa Information Centre: InformationCentre@ottawa.ca<mailto:InformationCentre@ottawa.ca> (613) 580-2424 ext. 44455
- Geo-Ottawa http://maps.ottawa.ca/geoOttawa/

Environmental (Rehman, Sami Sami.Rehman@ottawa.ca)

The subject property is adjacent to an Urban Natural Feature (UNF), “Cambrian Road Woods”.

The City’s data also identifies a watercourse running through the property (across in west-east direction); what is the nature of the watercourse and will it be relocated?

As such, the proposed development will require an Environmental Impact Study (EIS), as per OP section 4.8.3. The EIS will need to address the following:

-consider the watercourse re-alignment and buffering the impacts to adjacent watercourse/amphibian corridor

-potential impacts of construction and operation of proposal

-some of the impacts include, but not limited to, stormwater, snow storage, noise, lighting, human presence on natural features (i.e. UNF and watercourse/amphibian corridor)

-potential impacts on significant habitat of threatened or endangered species

-adjacent significant woodlands

-adjacent significant wildlife habitat

-review and draw relevant recommendations from the Jock River Reach 1 Subwatershed Plan and Cambrian Wood’s Forest Management Plan

-given all the glass and potential design traps proposed with the buildings, review and incorporate design elements from the City’s Bird-Safe Design Guidelines into the proposal to avoid bird collisions

- review and draw best practices from the City’s Protocol for Wildlife Protection during Construction

- discuss potential impacts from landfill on the proposed development and vice versa; it might be worthwhile seeking input from Trail Rd facility

recommendations to enhance the adjacent natural features and contribute to the urban tree canopy

Please refer to the EIS requirements for further details: Environmental Impact Statement Guidelines (ottawa.ca)

If a Tree Conservation Report (TCR) is required, it can be combined with EIS to avoid duplications. I will default to the Forestry Planner to comment on the TCR requirement.

As for the proposed site plan, the City will be focusing on impacts on the realigned watercourse/amphibian corridor. Generally, we will be looking for a 10m setback. If there is interest in reducing that setback to 5m, then we'd be looking to naturalize the interface between the proposal and the corridor with locally appropriate native trees/shrubs/plants to mitigate impacts.

Staff are encouraged to hear that the proposed development admires the adjacent UNF but also have concerns with lighting and the patio facing the UNF. The proposal should be designed and operated to avoid impacts on the UNF, as well as, avoiding potential future wildlife-human conflicts. This maybe especially relevant if daycare is considered as a future use. Staff will be looking for the EIS to review potential impacts and provide recommendations and setbacks to demonstrate no negative impacts.

I would also recommend consulting with the Rideau Valley Conservation Authority to determine if any permits or approvals are required under their regulations.

Park (Krabicka, Jeannette Jeannette.Krabicka@ottawa.ca)

a. The amount of parkland dedication that is required is to be calculated as per the City of Ottawa Parkland Dedication By-law No 2022-280.
b. Parkland Dedication By-law, Section 11(2)(c) states: No conveyance of land or payment of cash-in-lieu under this by-law is required in the case of the development or redevelopment of:
    a. a place of worship, excluding any ancillary uses as defined by the Zoning By-law
c. "Ancillary Use" as defined by the Zoning By-law: Ancillary Use means a listed, permitted land use that is additional, secondary and complementary to a permitted principal use, but not accessory to the permitted principal use.
d. The potential ancillary uses identified during the pre-application consultation meeting included community rentals and day care. Both of these proposed uses are considered commercial uses; therefore, the spaces attributed to these uses are subject to parkland dedication.
e. However, Parkland Dedication By-law, Section 11(1) states:

    The conveyance of parkland or the payment of cash-in-lieu of parkland is not required for development or redevelopment where it is known, or can be demonstrated, that the required parkland conveyance or cash-in-lieu of parkland, or combination thereof, has been previously satisfied in accordance with the Planning Act, unless:
    a. there is a change in the proposed development or redevelopment that would increase the density providing a net dwelling unit gain;
    b. the proposed development or redevelopment increases the gross floor area of a nonresidential use; or

c. land originally proposed for development or redevelopment for commercial or industrial purposes is now proposed for development or redevelopment for other purposes that have a higher conveyance requirement pursuant to the rates described herein.

f. The proposed development is located within a subdivision where the parkland dedication requirement was previously satisfied for the entirety of this parcel/block, calculated at the commercial use rate of 2%. Please refer to the Development Review file D07-16-19-0011 ph3. Furthermore, sub-sections a, b, and c of Section 11(1) do not apply to the proposed development.
g. Therefore, based on Section 11(1) of the By-law and the proposed use as presented in the Preapplication Consultation meeting, this potential Site Plan Application proposal may be considered exempt from a parkland dedication requirement.
h. Please note that the park comments are preliminary and will be finalized (and subject to change) upon receipt of the development application. Additionally, if the proposed land use changes then the parkland dedication requirement be re-evaluated accordingly.

City Surveyor

- The determination of property boundaries, minimum setbacks and other regulatory constraints are a critical component of development. An Ontario Land Surveyor (O.L.S.) needs to be consulted at the outset of a project to ensure properties are properly defined and can be used as the geospatial framework for the development.
- Topographic details may also be required for a project and should be either carried out by the O.L.S. that has provided the Legal Survey or done in consultation with the O.L.S. to ensure that the project is integrated to the appropriate control network.

Questions regarding the above requirements can be directed to the City's Surveyor, Bill Harper, at Bill.Harper@ottawa.ca

Submission requirements

- Plans are to be standard A1 size (594 mm x 841 mm) or Arch D size (609.6 mm x 914.4 mm) sheets, dimensioned in metric and utilizing an appropriate Metric scale (1:200, 1:250, 1:300, 1:400 or 1:500).
- All PDF submitted documents are to be unlocked and flattened.
- These pre-con comments are valid for one year. If you submit a development application(s) after this time, you may be required to meet for another pre-consultation meeting and/or the submission requirements may change. You are as well encouraged to contact us for a follow-up meeting if the plan/concept will be further refined.

Appendix I

Correspondence with MECP

Nikhil Parmar

From: Hook, Jordan (MECP) <Jordan.Hook@ontario.ca>
Sent: October 6, 2023 9:02 AM
To: Nicole Wells
Subject: RE: ECA Application - 3555 Borrisokane Rd, Ottawa

Hi Nicole,

Thank you for the additional information. This will require an ECA.

Thanks,

Jordan

From: Nicole Wells <nwells@pearsoneng.com>
Sent: October 4, 2023 5:03 PM
To: Hook, Jordan (MECP) <Jordan.Hook@ontario.ca>
Subject: RE: ECA Application - 3555 Borrisokane Rd, Ottawa

Hi Jordan,

Please see my responses below in red. The building is a community church so it would be institutional. Zoning is light industrial with exception 304, which allows a place of worship. Let me know if you need any further info.

Thank you,

Nicole Wells, C.E.T.
Project Coordinator/Design Technologist

PEARSON ENGINEERING

OTTAWA OFFICE
900 Morrison Drive, Unit 100
Ottawa, ON K2H 8K7
P: 613-416-1232 ext. 249
nwells@pearsoneng.com
pearsoneng.com

BARRIE	GTA	OWEN SOUND
705-719-4785	905-597-5572	226-256-2957

From: Hook, Jordan (MECP) <Jordan.Hook@ontario.ca>
Sent: Wednesday, October 4, 2023 2:34 PM

To: Nicole Wells <nwells@pearsoneng.com>
Subject: FW: ECA Application - 3555 Borrisokane Rd, Ottawa

Hi Nicole,

I was forwarded your email from Kyle. I am an EO at the Ottawa District Office and can answer your question.

I have a few questions for you to help me determine if an ECA is required.

1. Will there be a stormwater management facility (based on the attached plans I don't see one)? We are proposing a 300mm orifice tube with surface ponding for quantity control and an OGS for quality control. However, we are in the process of addressing city comments which may result in the addition of some additional underground tanks.
2. Is this a combined system or only stormwater being collected and discharged to the one pipe on Borrisokane Road? Only stormwater being discharged.
3. Could you confirm if this is one lot or if there are multiple lots that would be part of the one discharge? This is for 1 lot. the other lots would be under separate SPAs.

Thank you,

Jordan

From: Nicole Wells <nwells@pearsoneng.com>
Sent: September 25, 2023 2:53 PM
To: Straberger, Kyle (He/Him) (MECP) <Kyle.Straberger@ontario.ca>
Subject: ECA Application - 3555 Borrisokane Rd, Ottawa

Hi Kyle,

We have a site at 3555 Borrisokane Rd in Ottawa where we are discharging our site's stormwater to the municipal ditch along Borrisokane Rd (Servicing and Catchment plans attached for reference). Can you confirm if we will need an ECA for the proposed outlet and for the flows directed to adjacent properties?

Thank you,

Nicole Wells, C.E.T.
Project Coordinator/Design Technologist

PEARSON ENGINEERING

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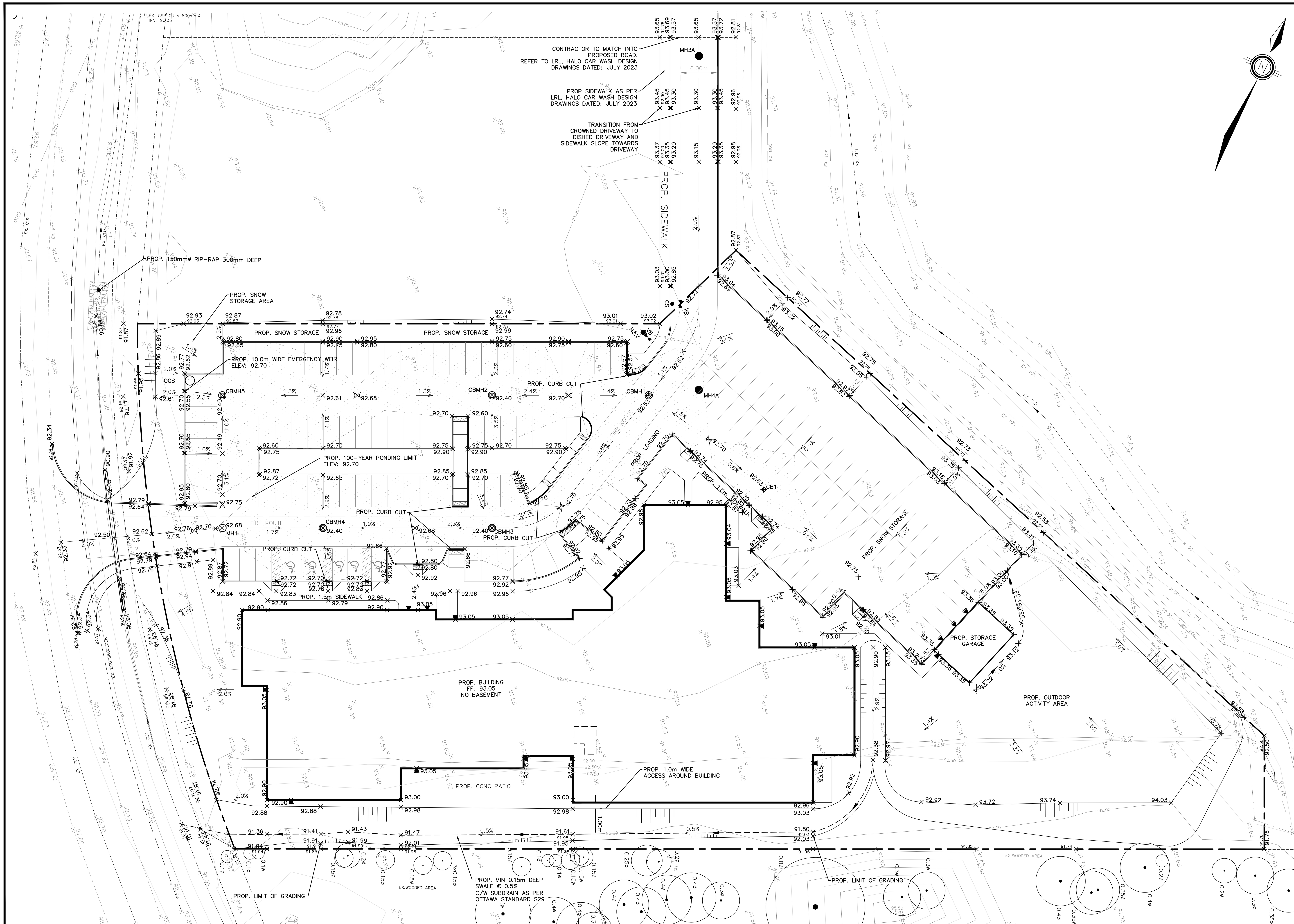
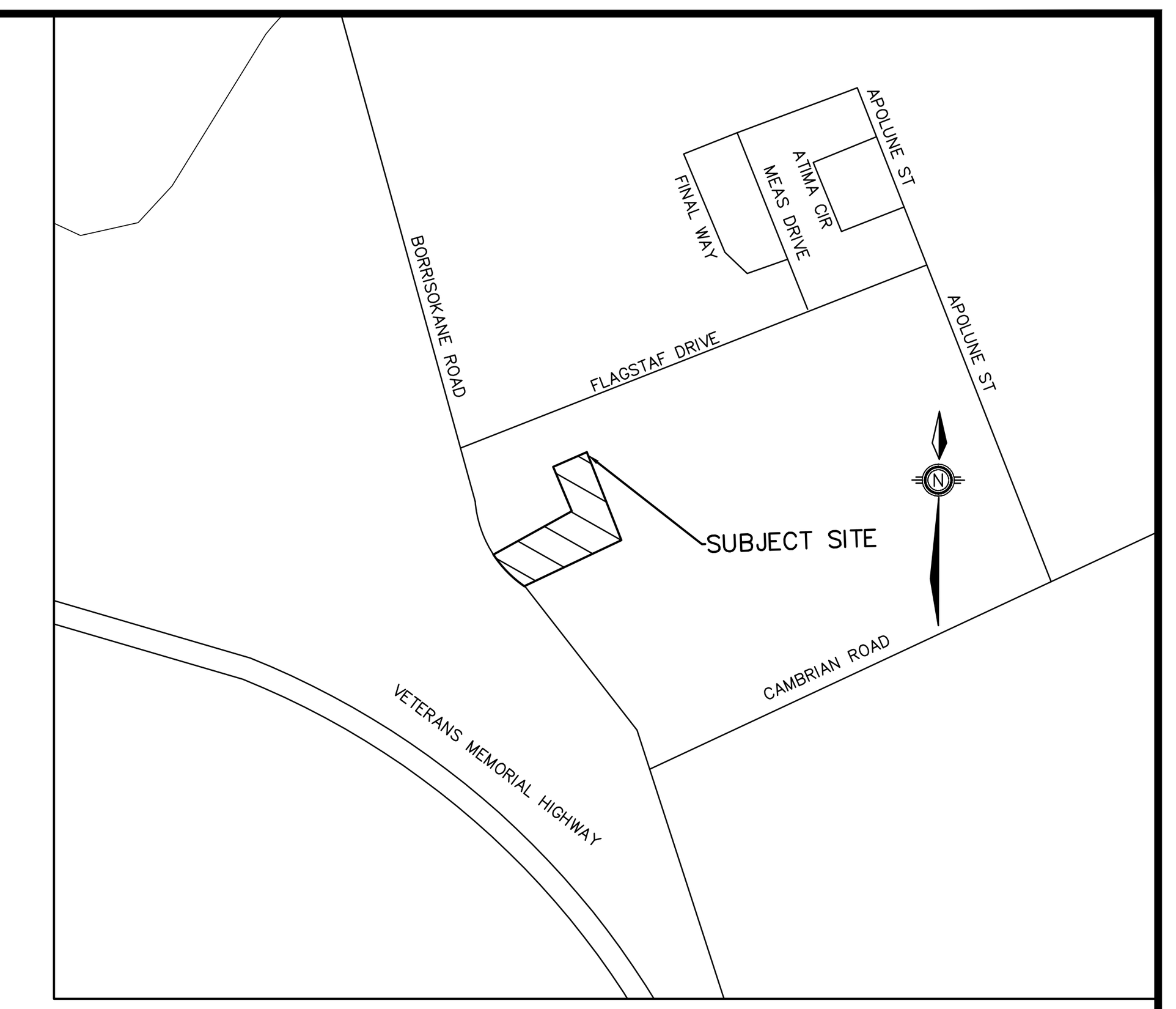
pearsoneng.com

BARRIE	GTA	OWEN SOUND
705-719-4785	905-597-5572	226-256-2957

Appendix J

Pearson Engineering Drawings





KEYMAP NTS

LEGEND

- CB — CATCH BASIN
- DCB — DOUBLE CATCH BASIN
- CBMH — CATCH BASIN
- MH — STORM MANHOLE
- MH — SANITARY MANHOLE
- SERVICE CAP
- H&V — FIRE HYDRANT
- VB — WATER VALVE
- CS — CURB STOP W/ SERVICE
- 254.63 / 254.09 — PROPOSED ELEVATION / EXISTING ELEVATION
- 1.5% — PROPOSED DIRECTION AND GRADE
- BACK OF CURB
- EDGE OF PAVEMENT
- CURB CUT LOCATION
- HIGH POINT
- MAX 3:1
- 100-YEAR PONDING LIMIT ELEV: 92.70
- TACTILE PLATE
- 91.68 — EX. TOPO ELEVATIONS
- OVERHEAD DOOR
- ENTRY LOCATION

SITE GRADING NOTES:

1. NO EXCESS DRAINAGE, DURING OR AFTER CONSTRUCTION TO BE DIRECTED TOWARDS NEIGHBORING PROPERTIES.
2. EXISTING DRAINAGE PATTERNS TO BE MAINTAINED.
3. ENSURE POSITIVE DRAINAGE AWAY FROM FOUNDATION
4. LANDSCAPE AREAS TO HAVE MINIMUM 2%, MAXIMUM 7% SLOPE UNLESS TERRACED AT 3:1 MAXIMUM.
5. NO ALTERATION TO EXISTING GRADES ON PROPERTY LINES.
6. USF TO BE MINIMUM 1.5m BELOW FINISHED GRADE OR INSULATION IS REQUIRED.
7. TOF TO BE MINIMUM 0.15m ABOVE FINISHED GRADE.
8. SUNKEN ENTRANCE DRAIN ANNOT CONNECT DIRECTLY TO WEEPING TILE. ANY WATER IN SUNKEN ENTRANCE TO DRAIN DOWN INTO PERMEABLE FILL WHERE IT WILL BE PICKED UP BY WEEPING TILE SYSTEM.
9. REFER TO LANDSCAPING PLAN FOR FENCING DETAILS

NO.	REVISION NOTE	DATE	BY
03.	AS PER UPDATED SITE PLAN	07/04/24	JM
02.	AS PER 2nd SUBMISSION COMMENTS	02/12/24	JM
01.	AS PER 1st SUBMISSION COMMENTS	11/02/23	JM

BENCHMARK:
SPIKE IN UTILITY POLE LOCATED ON THE SE CORNER OF THE BORRISOKANE RD. AND PROMENADE FLAGSTAFF DR. INTERSECTION.
ELEV: 92.96

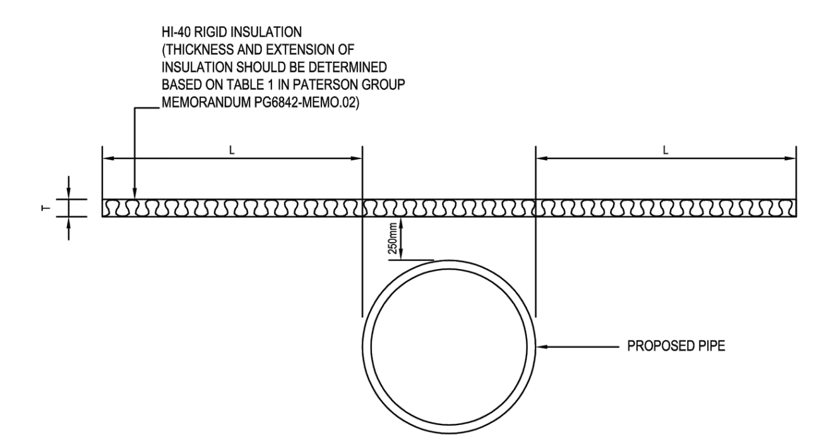
LICENCED PROFESSIONAL ENGINEER
M.W. DEJEAN
July 4, 2024
PROVINCE OF ONTARIO

KOREAN COMMUNITY CHURCH
3555 BORRISOKANE ROAD
CITY OF OTTAWA

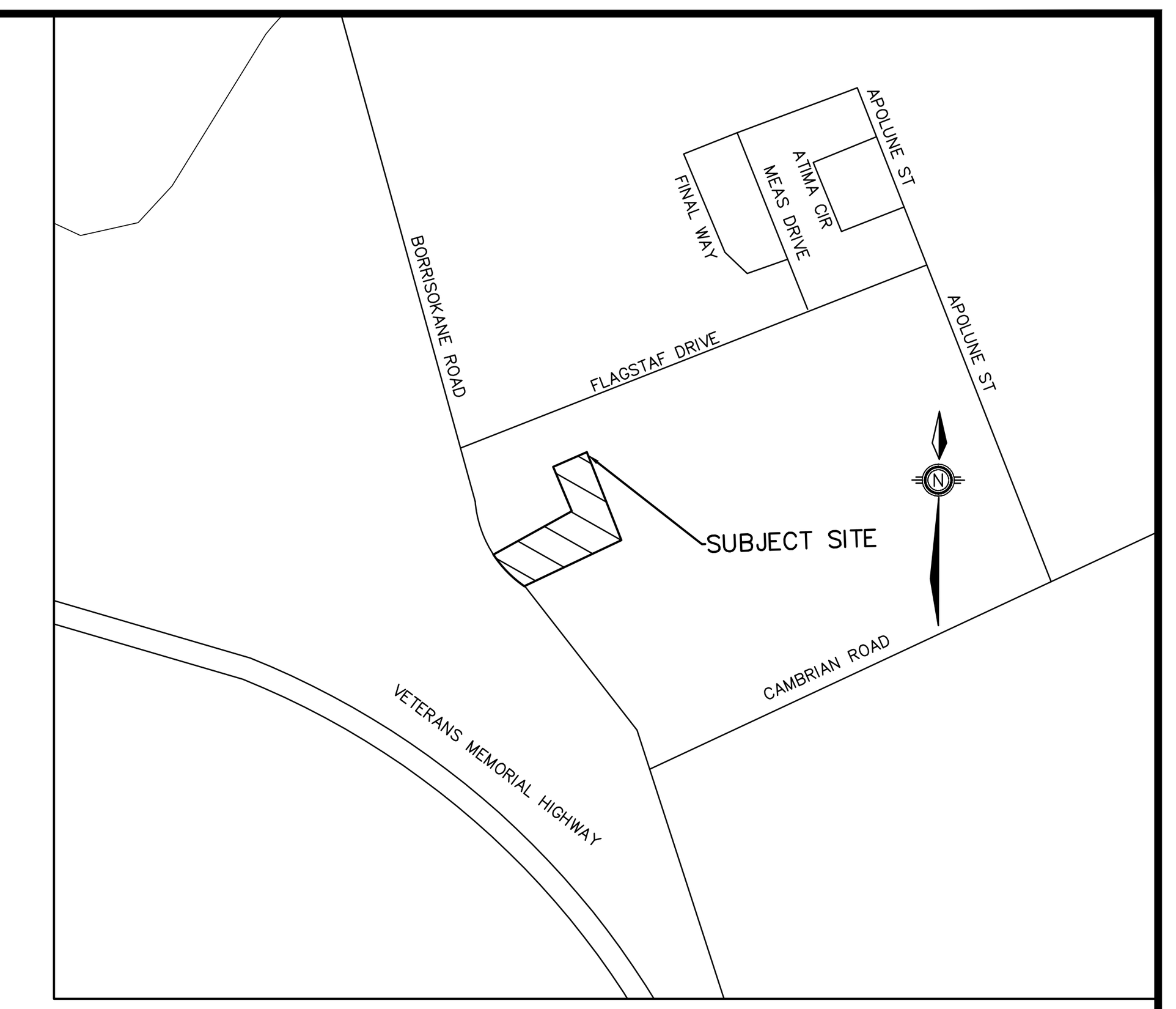
SITE GRADING PLAN

PEARSON ENGINEERING
PEARSONENG.COM PH. 705.719.4785

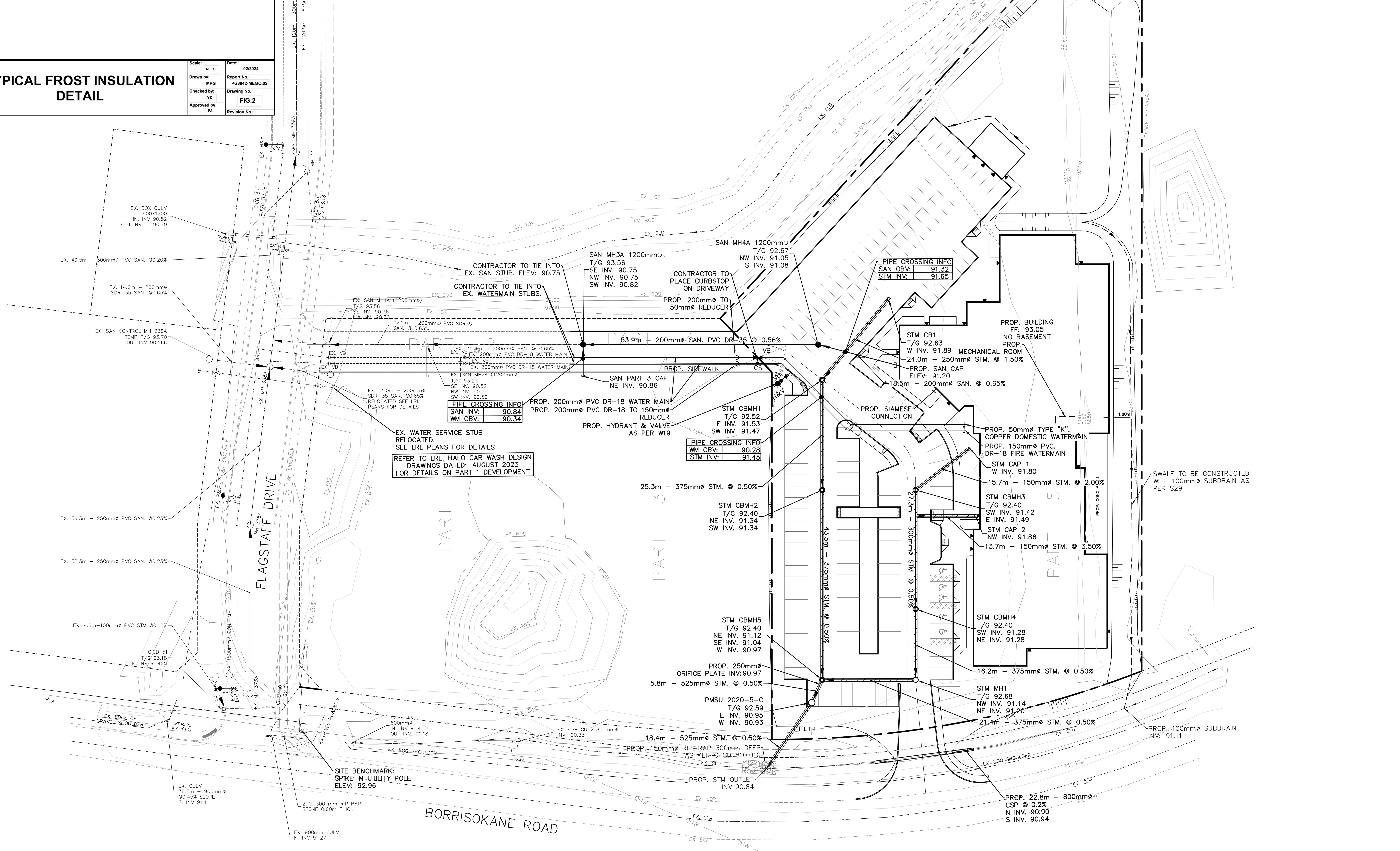
DESIGNED BY NW/MWD	HORIZ SCALE 1:300	PROJECT # 22099
DRAWN BY JM	VERT SCALE N/A	DRAWING # SG-1
CHECKED BY MWD	DATE JUNE 2023	REVISION # 3



PATERSON GROUP SOLUTION ORIENTED ENGINEERING	**TYPICAL FROST INSULATION DETAIL**	Scale: N.T.S	Date: 02/2024
		Drawn by: MPG	Report No.: PG6842-MEMO.02
		Checked by: YZ	Drawing No.: FIG.2
		Approved by: FA	Revision No.:



KEYMAP NTS



LEGEND

- CB — CATCH BASIN
- DCB — DOUBLE CATCH BASIN
- CBMH — CATCH BASIN
- MH — STORM MANHOLE
- MH — SANITARY MANHOLE
- SERVICE CAP
- H&V — FIRE HYDRANT
- VB — WATER VALVE
- CS — CURB STOP W/ SERVICE
- ×254.63 / 254.09 — PROPOSED ELEVATION / EXISTING ELEVATION
- 1.5% — PROPOSED DIRECTION AND GRADE
- BACK OF CURB
- EDGE OF PAVEMENT
- CURB CUT LOCATION
-) (— HIGH POINT
- PROPOSED PIPE INSULATION AS PER SS-1 DETAIL
- OVERHEAD DOOR
- ENTRY LOCATION

SITE SERVICING NOTES:

1. OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM CITY OF OTTAWA BEFORE COMMENCING WORK.
2. REFER TO CITY OF OTTAWA STANDARD R10 FOR ASPHALT TIE INS.
3. BACKWATER VALVES TO BE INSTALLED AS PER CITY OF OTTAWA STANDARD S14, AND S14.1 OR S14.2
4. EXISTING SERVICES TO BE BLANKED AT MAIN.
5. THERMAL INSULATION TO BE PROVIDED FOR WATER SERVICES LESS THAN 2.4m FROM OPEN STRUCTURES AS PER CITY OF OTTAWA STANDARD W23.
6. WATER SERVICE TO HAVE MORE THAN 2.4m OF COVER OR BE INSULATED AS PER CITY OF OTTAWA STANDARD DRAWING W22.
7. SUNKEN ENTRANCE DRAIN CANNOT CONNECT DIRECTLY TO WEEPING TILE. ANY WATER IN SUNKEN ENTRANCE TO DRAIN DOWN INTO PERMEABLE FILL WHERE IT WILL BE PICKED UP BY WEEPING TILE SYSTEM.

NO.	REVISION NOTE	DATE	BY
03.	AS PER UPDATED SITE PLAN	07/04/24	JM
02.	AS PER 2nd SUBMISSION COMMENTS	02/12/24	JM
01.	AS PER 1st SUBMISSION COMMENTS	11/02/23	JM

BENCHMARK
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M.W. DEJEAN
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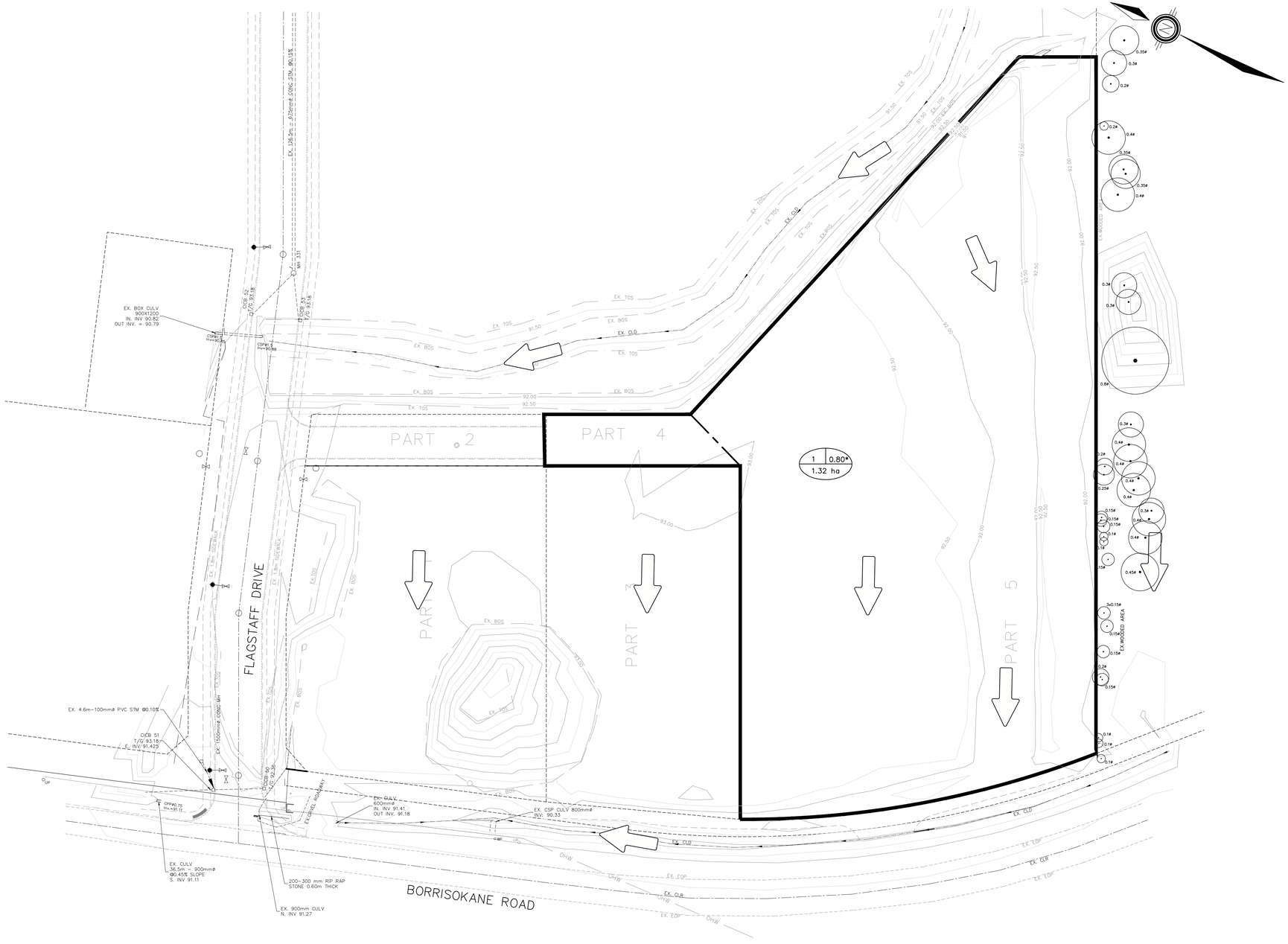
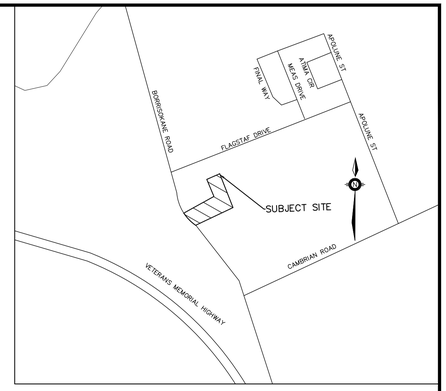
KOREAN COMMUNITY CHURCH
3555 BORRISOKANE ROAD
CITY OF OTTAWA

SITE SERVICING PLAN

PEARSON ENGINEERING
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	NW/MWD	HORIZ SCALE	1:500	PROJECT #	22099
DRAWN BY	JM	VERT SCALE	N/A	DRAWING #	SS-1
CHECKED BY	MWD	DATE	JUNE 2023	REVISION #	3





KEYMAP NTS

LEGEND

OVERLAND FLOW DIRECTION

CATCHMENT AREA — 1 | 0.75 | 1.00 ha — RUNOFF COEFFICIENT

AREA IN HECTARES

CATCHMENT BOUNDARY

*ALLOWABLE RUNOFF TAKEN FROM DSEL DESIGN BRIEF FOR THE HALF MOON BAY WEST SUBDIVISION PH. 3 DATED NOVEMBER 18, 2021

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03.	AS PER UPDATED SITE PLAN	07/04/24	JM
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BENCHMARK

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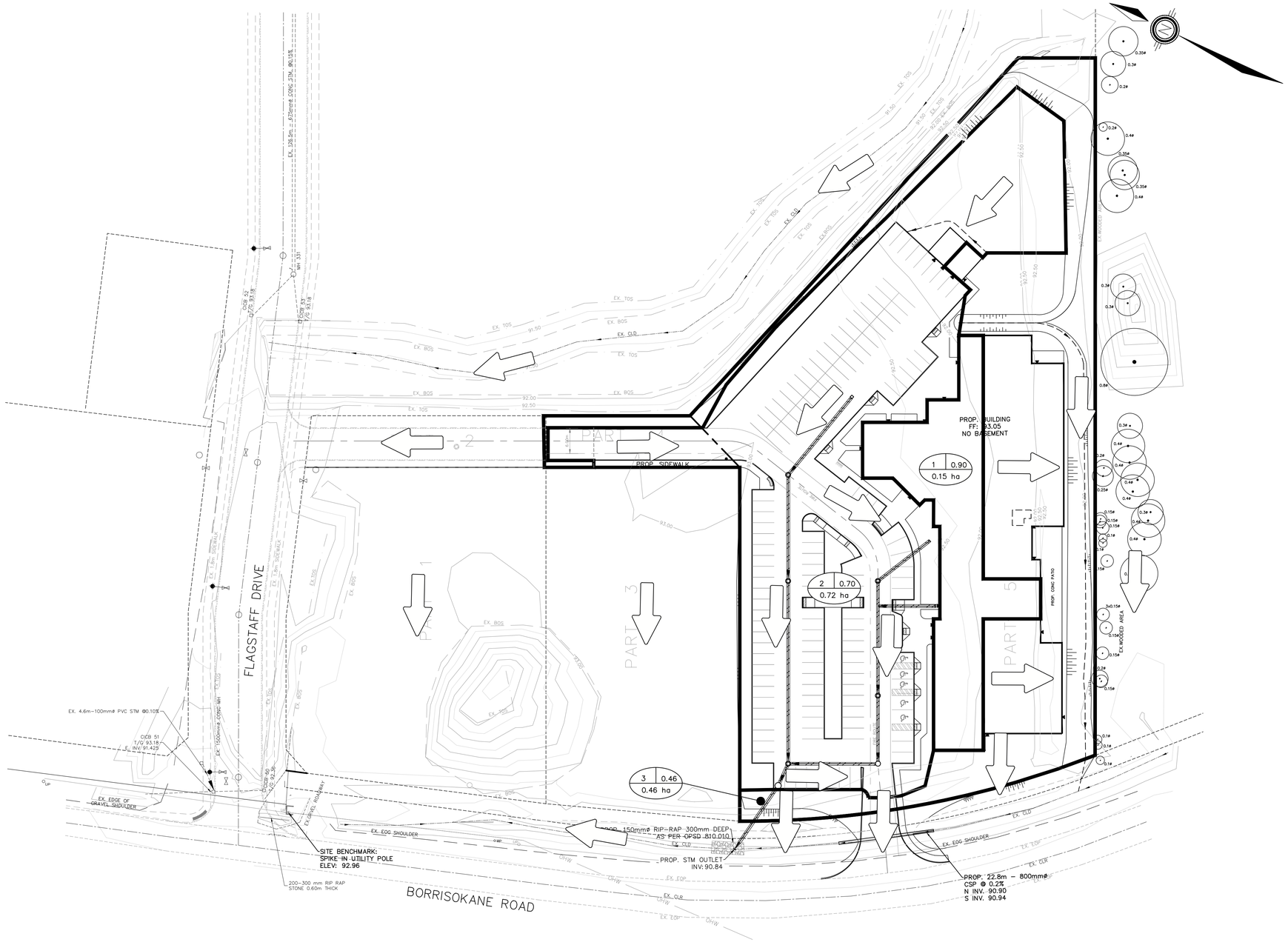
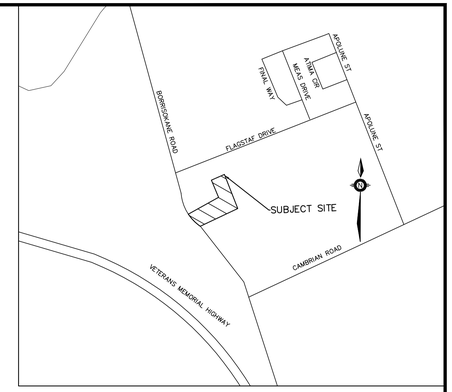
KOREAN COMMUNITY CHURCH
3555 BORRISOKANE ROAD
CITY OF OTTAWA

PRE–DEVELOPMENT STORM CATCHMENT PLAN

PEARSON ENGINEERING
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	NW/MWD	HORIZ SCALE	1:500
DRAWN BY	JM	VERT SCALE	N/A
CHECKED BY	MWD	DATE	JUNE 2023
PROJECT #	22099		
DRAWING #	STM–1		
REVISION #	3		





KEYMAP NTS

LEGEND

OVERLAND FLOW DIRECTION

CATCHMENT AREA — 1 | 0.75 — RUNOFF COEFFICIENT
1.00 ha
AREA IN HECTARES

CATCHMENT BOUNDARY

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BENCHMARK
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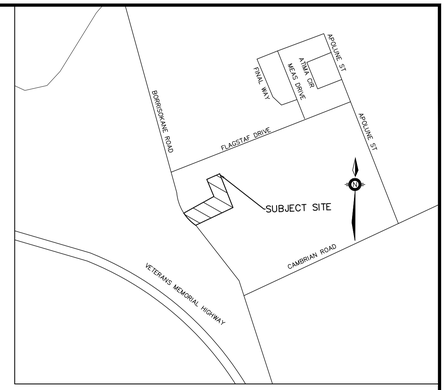
LICENCED PROFESSIONAL ENGINEER
M.W. DEJEAN
July 4, 2024
PROVINCE OF ONTARIO

KOREAN COMMUNITY CHURCH
3555 BORRISOKANE ROAD
CITY OF OTTAWA

POST-DEVELOPMENT STORM CATCHEMENT PLAN

PEARSON ENGINEERING
PEARSONENG.COM PH. 705.719.4785

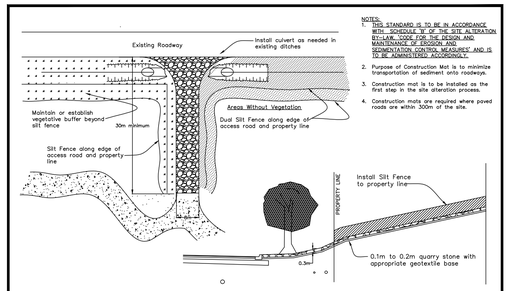
DESIGNED BY	NW/MWD	HORIZ SCALE	1:500
DRAWN BY	JM	VERT SCALE	N/A
CHECKED BY	MWD	DATE	JUNE 2023
PROJECT #	22099		
DRAWING #	STM-2		
REVISION #	3		



KEYMAP NTS

LEGEND

- EX. CB
- EX. DCB
- EX. CBMH
- EX. MH
- EX. MH
- HYD.
- VB
- PROP. SILT FENCE
- PROPERTY LINE
- OVERLAND FLOW ROUTE



NO.	REVISION	APR'D	DATE
1.	Standardized Dimension Text	J.S.	05.10.28

CONSTRUCTION ENTRANCE MAT

APR'D: R.G.N. DATE: 04.03.16
DRAWN: A.S.C SCALE: N.T.S

SEQUENCE OF CONSTRUCTION

1. ENGINEER TO BE NOTIFIED PRIOR TO INITIATION OF ANY ON SITE WORKS.
2. SILT FENCE AS PER OPSD 219.110
3. VEGETATION REMOVAL MAY COMMENCE AFTER ALL SILT FENCE IS INSTALLED AND APPROVED BY THE ENGINEER.
4. COMMENCE WITH EARTH WORKS AND SITE SERVICING.
5. INSTALLATION OF PROPOSED INFILTRATION FACILITIES TO THE TIME OF LANDSCAPING WORKS.
6. EROSION CONTROL MEASURES TO BE MAINTAINED AS DIRECTED BY THE ENGINEER DURING THE CONSTRUCTION PERIOD. ADDITIONAL CONTROL MEASURES MAY BE REQUIRED AT THE DISCRETION OF THE ENGINEER.
7. ALL DISTURBED GROUND LEFT INACTIVE FOR MORE THAN 30 DAYS SHALL BE STABILIZED WITH SEED, SOD, MULCH OR OTHER ADEQUATE COVERING, AS INSTRUCTED BY THE ENGINEER.

NOTES FOR SEDIMENT & EROSION CONTROL

1. DISTURBED AREAS THAT HAVE FAILED TO HAVE STABLE GROUND COVER ESTABLISHED BY OCTOBER 30TH SHALL BE PROTECTED WITH A SILTATION CONTROL FENCE OR STRAW MULCH ETC. AND MAINTAINED BY THE CONTRACTOR UNTIL VEGETATION BECOMES ESTABLISHED IN THE SUBSEQUENT GROWNG SEASON.
2. ANY DEWATERING WASTE SHALL BE DISCHARGED TO A VEGETATED AREA AT LEAST 30m FROM ANY WATERCOURSE AND FILTERED. FILTERING METHODS MUST BE APPROVED BY THE SITE ADMINISTRATOR.
3. SILT FENCE SHALL BE PUT IN PLACE PRIOR TO AND MAINTAINED DURING ALL GRADING. SILT FENCE TO BE INSPECTED PRIOR TO COMMENCEMENT OF EARTH GRADING ACTIVITIES. SILT FENCE TO BE INSPECTED AND REPAIRED OR REPLACED IF DAMAGED AS DIRECTED BY THE SITE ADMINISTRATOR.SILT CONTROLS TO BE INSPECTED ON A REGULAR BASIS AND AFTER EVERY RAIN EVENT. INSTALLATION SHALL BE TO THE MANUFACTURER'S RECOMMENDED SPECIFICATIONS.
4. THE CONTRACTOR SHALL BE PREPARED FOR UNEXPECTED CONDITIONS AND ACCORDINGLY HAVE STOCKPILED MATERIALS ON SITE FOR NECESSARY REPAIRS AS A RESULT OF FAILED OR INADEQUATE CONTROL MEASURES. ALL SEDIMENT AND EROSION CONTROL MEASURES SHALL BE INSPECTED AT LEAST ONCE A WEEK, AND AFTER EVERY RAINFALL EVENT.
6. CONTRACTOR SHALL OBTAIN A CURRENT COPY AND BECOME FAMILIAR WITH OPSS 577, CONSTRUCTION SPECIFICATION FOR TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES AS WELL AS ALL APPLICABLE MUNICIPAL STANDARDS.
7. THE CONTRACTOR MAY CONSIDER ALTERNATIVE SEDIMENT AND EROSION CONTROL MEASURES. SUCH MEASURES SHOULD BE PRESENTED IN WRITING FOR APPROVAL OF THE SITE ADMINISTRATOR AND MUST BE APPROVED IN WRITING BY THE MUNICIPALITY AND CONSERVATION AUTHORITY.
8. THE TOPS OF ALL FILTER FABRIC MUST BE A MINIMUM OF 1.0 METRES ABOVE THE GROUND LEVEL AND ATTACHED TO THE FENCE WITH A CONTINUOUS STEEL WIRE. ALTERNATIVELY, THE FILTER FABRIC MUST BE FOLDED OVER THE TOP OF THE FENCE AND ATTACHED TO THE FENCE WITH WIRE LOOPED THROUGH THE FABRIC ON BOTH SIDES OF THE FENCE. FILTER FABRIC IS TO BE TERRAFIX 270R OR EQUIVALENT.
9. ALL DISTURBED GROUND LEFT FOR MORE THAN 30 DAYS SHALL BE STABILIZED BY SEEDING, SODDING, MULCHING, OR COVERING OR OTHER EQUIVALENT CONTROL MEASURES. THIS PERIOD OF INACTIVITY SHALL BE AT THE DISCRETION OF THE CITY OF OTTAWA BUT SHALL NOT EXCEED THIRTY DAYS OR SUCH LONGER PERIOD DEEMED ADVISABLE BY THE CITY OF OTTAWA'S PLANNING, INFRASTRUCTURE AND ECONOMIC DEVELOPMENT DEPARTMENT.
10. CONTRACTOR RESPONSIBLE FOR MUD TRACKING, PREVENTION, AND MAINTENANCE ON BORRISOKANE RD.
11. ROADS TO BE LEFT IN A BROOM SWEPT CONDITION AT THE END OF EACH WORK DAY.
12. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALITIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.

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BENCHMARK
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M.W. DEJEAN
July 4, 2024
PROVINCE OF ONTARIO

KOREAN COMMUNITY CHURCH
3555 BORRISOKANE ROAD
CITY OF OTTAWA

EROSION PROTECTION AND REMOVALS PLAN

PEARSON ENGINEERING
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DESIGNED BY	NW/MWD	HORIZ SCALE	1:500
DRAWN BY	JM	VERT SCALE	N/A
CHECKED BY	MWD	DATE	JUNE 2023
PROJECT #	22099		
DRAWING #	EPR-1		
REVISION #	3		