FERGUSLEA PROPERTIES LTD.

90 WOODRIDGE CRES. TOWERS, OTTAWA

ADEQUACY OF SERVICES STUDY

JULY 12, 2022

90 WOODRIDGE CRES. TOWERS, OTTAWA

ADEQUACY OF SERVICES STUDY

FERGUSLEA PROPERTIES LTD.

PROJECT NO.: 211-08772-00
DATE: JULY 12, 2022

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July 12, 2022

Ferguslea Properties Ltd.
Accora Village
98 Woodridge Cr.
Ottawa ON K2B 7S9

Attention: Steve Ryan, Vice President Asset Management

Dear Sir:

Subject: 90 Woodridge Cres. Towers, Ottawa - Adequacy of Services Study

We are pleased to deliver the enclosed Adequacy of Services Study in support of the application for an Official Plan and Zoning By-law Amendment for the subject residential development project, revised according to comments received by the City of Ottawa. This study presents the existing potable water and sanitary sewer capacity of the services near the site, per coordination with the City, compared against estimations of demand (including fire flow) based on current conceptual design of the site. There is also discussion regarding the stormwater management criteria which will be fully developed during design stage.

Should there be any questions or comments regarding this report, please do not hesitate to contact the undersigned.

Kind regards,

Stephen McCaughey, P.Eng.
Project Engineer

WSP ref.: 211-08772-00

SIGNATURES

PREPARED BY

Stephen McCaughey, P.Eng.
Project Engineer

July 12, 2022
Date

APPROVED BY

Ishaque Jafferjee, P.Eng.
Senior Project Engineer

July 12, 2022
Date

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1 INTRODUCTION

WSP was retained by Ferguslea Properties Ltd. to provide engineering services for the adequacy of services for the 90 Woodridge Cres. re-zoning and development in Ottawa, ON. The services investigated are potable water, sanitary sewer, storm sewer, and electrical power.

1.1 SITE DESCRIPTION

This site is the east undeveloped portion of the 90 Woodridge Cres. approximately 0.9 ha located along the south side of Woodridge Crescent near Bayshore Transit Station to the east (see Figure 1-2 and Figure 1-2). The proposed development is two high-rise residential towers between 37 to 40 storeys along with two-storey each underground parking. The buildings will have a combined gross floor area of approximately 61,000 m^2. See Appendix A for architectural conceptual design upon which this report is based.

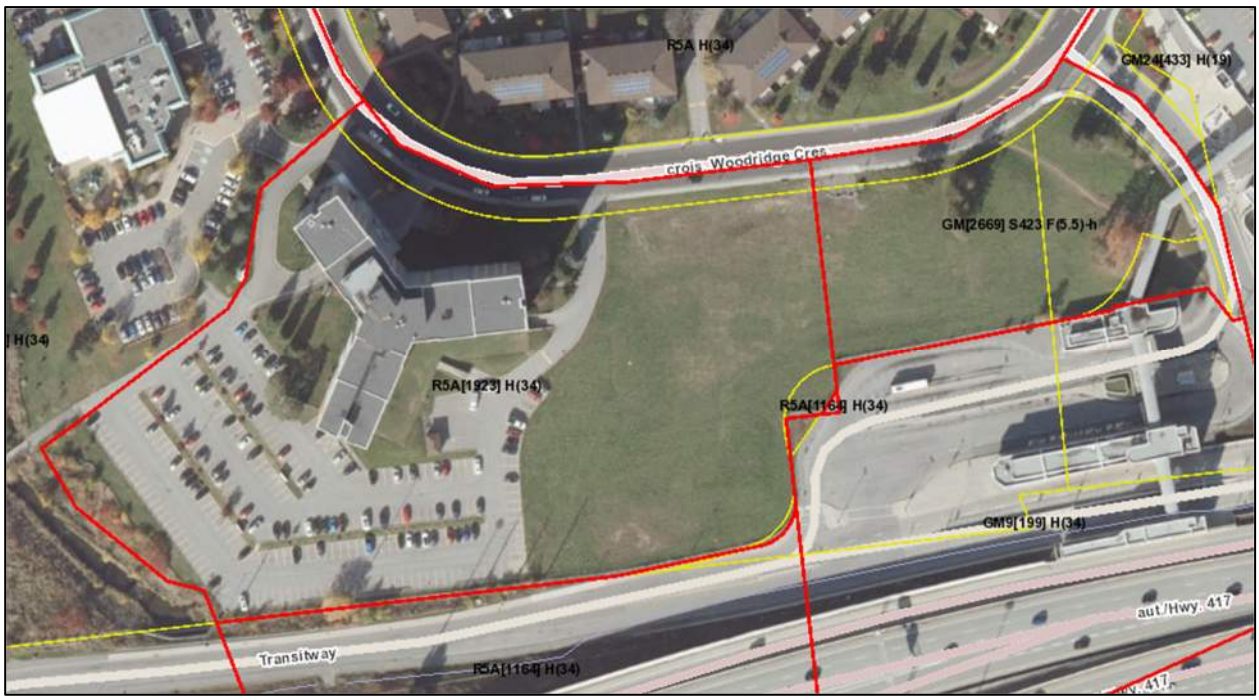


Figure 1-1 90 Woodridge Cres. Site Location

Figure 1-2 Project Site Definition

1.2 EXISTING INFRASTRUCTURE

The existing civil infrastructure near the site is located along Woodridge Crescent to the north of the site. This civil infrastructure encompasses, in nominal dimensions:

- 200mm PVC potable watermain
- 250mm concrete sanitary sewer
- 675-750mm concrete storm sewer.

According to GeoOttawa, the sanitary sewer may be asbestos cement which would invoke special handling requirements; as such, the existing sewer material should be confirmed. In addition, there are existing storm and sanitary sewers that run through and near the site:

- 300mm storm sewer in the north-east corner of site
- 1200mm storm sewer along the south edge of site
- 1200mm sanitary sewer running from south to north through the site

The 300mm storm sewer will be removed as the sewer infrastructure upstream will also be removed as part of the Bayshore Light Rail Transit project and Bayshore Residential Tower development in the adjacent sites. The 1200mm storm sewer may create a conflict of with the proposed development at this time, however the clearance between the two will be validated as the development progresses to detailed design. The 1200mm sanitary sewer, however, will definitely create a conflict with the proposed development and will need to be relocated. The proposed relocation will be presented in the conceptual servicing plan in Appendix C. The relocation design will be detailed further in subsequent detailed design phases.

The nearest fire hydrant is located immediately outside the site, at the northeast corner, with two additional fire hydrants located within 150m. See Figure 1-3 for schematic of nearby civil infrastructure captured from the GeoOttawa website.

The potable watermain is within the 1W pressure zone. The sanitary sewer on Woodridge Cres. ultimately discharges to the West Nepean Collector on Carling Ave. north of the site. The storm sewer on Woodridge Cres. discharges to Graham Creek less than 1 km northwest of the site, and the creek discharges to the Ottawa River through Andrew Haydon Park less than 1 km northwards.

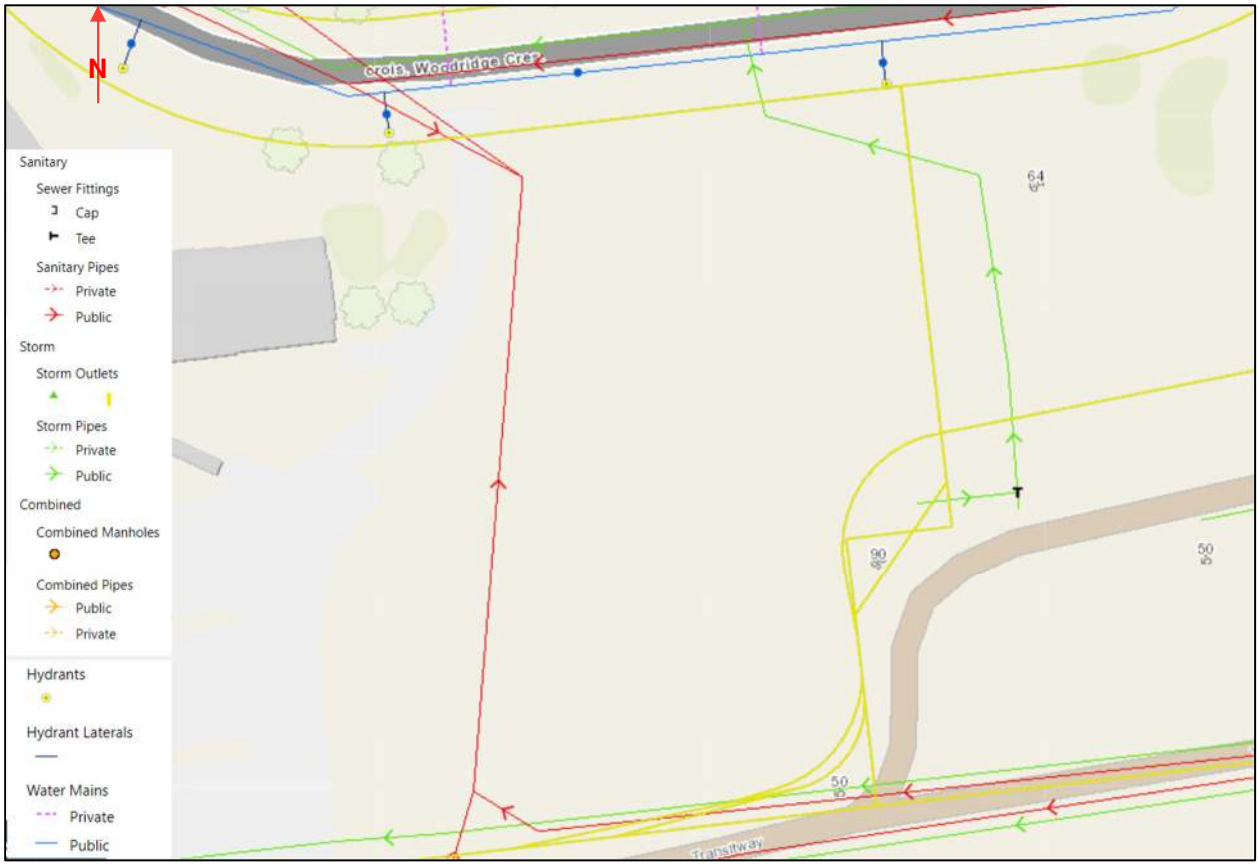


Figure 1-3 Civil Infrastructure around Site (GeoOttawa)

1.3 REFERENCES

This study of servicing adequacy was undertaken in conformance with, and utilizing information from, the following documents:

- Ottawa Sewer Design Guidelines, Second Edition, Document SDG002, October 2012, City of Ottawa including:
    - Technical Bulletin ISDTB-2012-4 (June 20, 2012)
    - Technical Bulletin ISDTB-2014-01 (February 5, 2014)
    - Technical Bulletin PIEDTB-2016-01 (September 6, 2018)
    - Technical Bulletin ISDTB-2018-01 (March 21,2018)
    - Technical Bulletin ISDTB-2018-04 (June 27, 2018)

- Ottawa Design Guidelines – Water Distribution, July 2010 (WDG001), including:
    - Technical Bulletin ISDTB-2014-02 (May 27, 2014)
    - Technical Bulletin ISTB-2018-02 (March 21, 2018)
- Fire Underwriters Survey, Water Supply for Public Fire Protection (FUS), 2020.

In addition, the minutes for the Pre-Application Consultation Meeting for this application are provided for reference in Appendix B.

2 POTABLE WATER

2.1 DEMAND CRITERIA

The potable water demand was calculated based on the architectural conceptual design of the site to estimate residential unit numbers and floor area. The domestic demand criteria are from the City of Ottawa Design Guidelines – Water Distribution (2010), applicable criteria summarized in Table 2-1 and Table 2-2.

Table 2-1 Residential Potable Water Demand Criteria

Demand	Value	Unit
Residential Avg. Day Demand	280	L/cap/d
Residential Max. Day Factor	2.5 x Avg. Day	
Residential Peak Hour Factor	2.2 x Max. Day	

Table 2-2 Apartment Unit Density Criteria

Apartment Unit Type	Persons/Unit
Bachelor	1.4
1 Bedroom	1.4
2 Bedroom	2.1
3 Bedroom	3.1
Average Apt.	1.8

The estimation of fire demand is from the Fire Underwriters Survey - Water Supply for Public Fire Protection (2000), summarized in Table 2-3. The base fire demand is calculated based on construction type and occupancy, then modified based on sprinkler system and proximity to nearby structures.

Table 2-3 FUS Fire Demand Calculation Criteria

Base Formula	$F = 220*C\sqrt{A}$ Where; F = minimum required fire flow in L/min C = construction type coefficient A = Total above grade floor area in m^2
Construction Type ‘C’	1.5 for wood frame construction 1.0 for regular construction 0.8 for non-combustible construction

	0.6 for fire-resistive construction
Modification of 'F' for occupancy (F_{mod})	Less 25% for non-combustible occupancy Less 15% for limited combustible occupancy No change for regular combustible occupancy Plus 15% for free burning occupancy Plus 25% for rapid burning occupancy
Reduction of 'F_{mod}' for sprinkler protection	Less 50% for complete sprinkler system Less 30% for basic NFPA 13 conforming system Additional 10% reduction for standard water lines Additional 10% reduction for supervised system *Max. 50% reduction in category
Addition of 'F_{mod}' for building exposure (each side)	Plus 25% for 0-3m separation Plus 20% for 3-10m separation Plus 15% for 10-20m separation Plus 10% for 20-30m separation Plus 5% for 30-45m separation *Max. total addition of 75% for all sides

2.2 DOMESTIC DEMAND ESTIMATION

The domestic potable water demand was calculated based on the design criteria in Section 2.1 and the architectural conceptual design of the two high-rise towers. Without a known unit breakdown the average apartment rate of 1.8 persons per unit was assumed. The summary of the conceptual design, as it relates to domestic potable water demand is presented in Table 2-4.

Table 2-4 Residential Population Estimation from Conceptual Design

Unit Type	**South Tower**		**North Tower**	
Total	280 units	**504 capita**	304 units	**547 capita**

Following this the domestic potable water demand was calculated and is presented in Table 2-5. While the demand of the two high-rises was calculated separately, only the total demands are relevant since only a single metered service will be provided for the two towers.

Table 2-5 Domestic Potable Water Demand

	South Tower	**North Tower**	**Total**
Average Day Demand	1.63 L/s	1.77 L/s	**3.41 L/s**
Max. Day Demand	4.08 L/s	4.43 L/s	**8.52 L/s**
Peak Hour Demand	8.98 L/s	9.75 L/s	**18.74 L/s**

2.3 FIRE DEMAND ESTIMATION

The fire demand was calculated based on the design criteria in Section 2.1 and the architectural conceptual design of the two high-rise towers. The summary of the fire demand calculation is presented in Table 2-6. The fire demand is calculated for the two towers separately, but the relevant fire demand for the site is the maximum value between the two. For a non-combustible construction, per the FUS criteria, a reduced gross floor area is permitted based on the two largest adjacent floors and 50% of the next eight floors above.

Table 2-6 Fire Demand of Potable Water

	South Tower		North Tower	
	Criteria	**Value**	**Criteria**	**Value**
Construction Type 'C'	Non-combustible	0.8	Non-combustible	0.8
Gross Floor Area		4,734 m^2		4,734 m^2
Base Fire Demand 'F' (nearest 1,000 L/min)		12,000 L/min		12,000 L/min
Occupancy	Limited combustible	-15%	Limited combustible	-15%
Occupancy-modified Fire Demand 'F_{mod}'		10,200 L/min		10,200 L/min
Sprinkler Protection	Complete	-50%	Complete	-50%
Exposure	~40m to Ex. Tower	+5%	~15m to Adjacent Property Tower	+15%
Final Fire Demand (nearest 1,000 L/min)		6,000 L/min (100.00 L/s)		7,000 L/min (116.67 L/s)
Final Fire Demand for Site				**7,000 L/min (116.67 L/s)**

2.4 PROPOSED SERVICE CONNECTION

In accordance with the City's Water Distribution Guidelines, since the site has an average day demand of greater than 50 m^3/d (0.58 L/s) two watermain connections will be required for redundancy. The two service laterals will connect to the 200mm watermain on Woodridge Cres. near one another with a valve installed on the watermain between the two connections to facilitate isolation. Within the site, the two laterals will be looped within the building complex to ensure redundancy of supply for both towers. The internal looping of the water will be coordinated with the Mechanical Designer during the design phase. See Appendix C for a marked-up drawing as the Conceptual Site Servicing Plan.

2.5 EXISTING CAPACITY

For purposes of adequacy of existing services, the following verifications were completed to check pressure and flow requirements:

- Average day flow, maximum system pressure
- Peak hour flow, minimum system pressure
- Maximum day and fire flow, minimum system pressure during fire

Following correspondence with the City (see Appendix B), the following existing boundary conditions were confirmed at the City connection:

- Assumed average watermain elevation of 63.5m above sea level (mASL)
- Minimum hydraulic grade line: 106.0m (60 psi pressure)
- Maximum hydraulic grade line: 115.6m (74 psi pressure)
- Hydraulic grade line during Max Day + Fire Flow: 84.1m (29 psi pressure)

Per the City's Water Distribution Guidelines during typical domestic demands pressures must be within 40-80 psi (275-550 kPa), with 20 psi (140 kPa) the minimum during fire demand and 100 psi (690 kPa) the maximum.

The twin service laterals were modelled in EPANET v2.0 to verify pressures at the connection points and building. The model outputs are provided in Appendix D. At average day demand the maximum pressure was 74 psi (510 kPa). At peak hour flow the minimum pressure was 60 psi (420 kPa). Therefore, domestic demands can be serviced within the City's current pressure boundaries.

The twin service laterals were modelled in EPANET v2.2 to verify pressures at the connection points to the building. The model outputs are summarized in Table 2-7 and detailed in Appendix D. Based on the results, domestic and fire demands can be serviced within the City's pressure boundaries.

Table 2-7 Residual Watermain Pressure

	Demand	Pressure at Building
Average Day	3.4 L/s	74 psi (510 kPa)
Peak Hour	18.7 L/s	60 psi (420 kPa)
Max Day + Fire	125 L/s	27 psi (190 kPa)

As further justification of the fire flow capacity per the City's Technical Bulletin ISTB-2018-02 Appendix I "Guideline on Coordination of Hydrant Placement with Required Fire Flow" Table 1 provides a holistic estimation of available capacity to based on proximity and type of hydrants near site in question. There are two Class AA hydrants within 75m of the site and two Class AA hydrants within 150m of the site. According to the table there is a total theoretical capacity of 317 L/s at 20 psi from these four hydrants, more than sufficient to support the estimated fire flow demand of the site.

3 SANITARY SEWER

3.1 DEMAND CRITERIA

The sanitary sewer demand was calculated based on the architectural conceptual design of the site to estimate residential unit numbers. The domestic demand criteria are from the City of Ottawa Sewer Design Guidelines (2012) and City of Ottawa Technical Bulletin ISTB-2018-01 (2018), summarized in Table 3-1, Table 3-2, and Table 3-3.

Table 3-1 Residential Sanitary Sewer Demand Criteria

Demand	Value	Unit
Residential Avg. Day Demand	280	L/cap/d
Residential Peaking Factor (Harmon Equation)	$PF = 1 + \left(\frac{14}{4 + \sqrt{\frac{Population}{1000}}} \right) * 0.8$ (Min. 2.0; Max. 4.0)	

Table 3-2 Apartment Unit Density Criteria

Apartment Unit Type	Persons/Unit
Bachelor	1.4
1 Bedroom	1.4
2 Bedroom	2.1
3 Bedroom	3.1
Average Apt.	1.8

Table 3-3 Peak Infiltration Allowance

Demand	Value	Unit
Peak Infiltration Allowance	0.33	L/s/ha

3.2 DEMAND ESTIMATION

The sanitary sewer demand was calculated based on the design criteria in Section 3.1 and the architectural conceptual design of the two high-rise towers. Without a known unit breakdown the average apartment rate of 1.8 persons per unit was assumed. The summary of the conceptual design, as it relates to sanitary sewer demand is presented in Table 3-4.

Table 3-4 Residential Population Estimation from Conceptual Design

Unit Type	South Tower		North Tower	
Total	280 units	**504 capita**	304 units	**547 capita**

Following this the sanitary sewer demand was calculated and is presented in Table 3-5. While the demand of the two high-rises was calculated separately, only the total demands are relevant since only a single service lateral will be provided for the two towers.

Table 3-5 Sanitary Sewer Residential Demand

	East Tower	West Tower	Total
Residential Average Day Demand	1.63 L/s	1.77 L/s	3.40 L/s
Residential Peaking Factor	3.38	3.36	
Residential Peak Daily Demand	5.52 L/s	5.96 L/s	**11.48 L/s**
Peak Infiltration Flow	0.15 L/s	0.15 L/s	**0.30 L/s**
			11.78 L/s

3.3 PROPOSED SERVICE CONNECTION

In accordance with the City's Sewer Design Guidelines, the sewer lateral should be designed with a minimum slope of 1%, minimum diameter of 135mm, and peak velocity between 0.6-3.0 m/s. A 150mm service lateral, assuming the minimum slope of 1%, will sufficiently carry the demand with velocities between 0.6-3.0 m/s. A monitoring maintenance hole will also be proposed inside the property line as per the Sewer Use By-law. Since the receiving sewer on Woodridge Cres. is a 250mm diameter concrete pipe (and service lateral greater than 50% of receiving sewer diameter), a maintenance hole will be installed on the sewer at the location of the connection. As noted in Section 1.2 the existing sanitary sewer may be asbestos cement and therefore will require special requirements to connect to. See Appendix C for a marked up drawing as the Conceptual Site Servicing Plan.

3.4 EXISTING CAPACITY

Following correspondence with the City, it was confirmed that the receiving sanitary sewers have sufficient capacity for the estimated 11.78 L/s peak sanitary flow. Correspondence with the City is provided in Appendix B for reference.

3.5 EXISTING TRUNK SEWER

As identified in Section 1.2, the existing 1200mm sanitary trunk sewer that runs south to north will be in conflict with the proposed structure. In the Conceptual Site Servicing Plan in Appendix C the trunk sewer relocation has been identified with a proposed conceptual realignment for discussion purposes. The details of the relocation will be developed during the Detailed Design phase. Considerations for design include the available drop from the upstream to downstream connection points, and the necessity to maintain the trunk sewer flows during the construction, which may include bypass pumping during the connections to the existing sewers.

4 STORM SEWER

4.1 DEMAND & DESIGN CRITERIA

Per the Pre-Consultation Meeting with the City, all post-development peak flows up to and including the 100-year storm must be controlled to a release rate of the 2-year pre-development peak flow. The existing capacity of the storm sewer was not determined since the site will necessarily be required to release storm runoff at pre-development rates, and it is assumed the storm infrastructure is currently adequate for this 2-year storm pre-development peak flow rate. These stormwater controls can be implemented through Best Management Practices such as underground stormwater detention tanks, inlet control devices, and infiltration promotion.

For reference, an estimation of the required storage was completed. Using the City's IDF curves and a 10-minute Time of Concentration, the maximum allowable discharge (equal to the 2-yr pre-development rate) is approximately 38 L/s. Based on the conceptual architectural site plan, during the 100-yr storm the maximum stormwater storage required would be approximately 305 m^3. See Appendix E for details of the preliminary stormwater management calculations. This required storage can be facilitated through combinations of rooftop storage, underground storage, or cistern storage within the building footprint.

4.1.1 RIDEAU VALLEY CONSERVATION AUTHORITY CONSULTATION

In addition to this quantitative stormwater control, qualitative control will also be needed as typically required by Rideau Valley Conservation Authority (RVCA). Per pre-consultation with the Authority provided in Appendix B, an 80% TSS reduction will be required since the site is less than 1 km from the receiving water body, Graham Creek. This quality control will be achieved through an oil & grit separator prior to discharge.

4.1.2 MINISTRY OF THE ENVIRONMENT, CONSERVATION AND PARKS CONSULTATION

Given the site is a single, non-industrial property and no external sanitary or storm sewage is anticipated to enter the property an Environmental Compliance Approval (ECA) is not anticipated to be required by the Ministry of the Environment, Conservation and Parks (MECP). This will be verified as part of the Site Plan Control process.

4.2 EXISTING TRUNK SEWER

As identified in Section 1.2, the existing 1200mm storm trunk sewer that runs east to west may be in conflict with the proposed structure. In the Conceptual Site Servicing Plan in Appendix C the trunk sewer relocation has been identified with a proposed conceptual realignment for discussion purposes. The details of the relocation will be developed during the Detailed Design phase. Considerations for design include the available drop from the upstream to downstream connection points, and the necessity to maintain the trunk sewer flows during the construction, which may include bypass pumping during the connections to the existing sewers.

5 CONCLUSION

WSP was retained by Ferguslea Properties Ltd. to provide this Adequacy of Services Study in support of the Zoning By-Law Amendment Application for the subject site located at 90 Woodridge Crescent and planned twin high-rise residential towers therein. The services investigated were potable water, sanitary sewer, and storm sewer.

The preliminary water demand was calculated as 18.7 L/s peak hour domestic demand and 125 L/s max day plus fire flow. Per coordination with the City for the supply watermain boundary conditions, a 200mm main on Woodridge Cres., it was confirmed the existing system has sufficient capacity to supply the domestic and fire demand estimates within system pressure limits.

The preliminary sanitary sewer demand was calculated as 11.8 L/s peak demand. Per coordination with the City it was confirmed that the proposed receiving sewer, a 250mm sanitary sewer on Woodridge Cres., has sufficient capacity to receive the proposed demand.

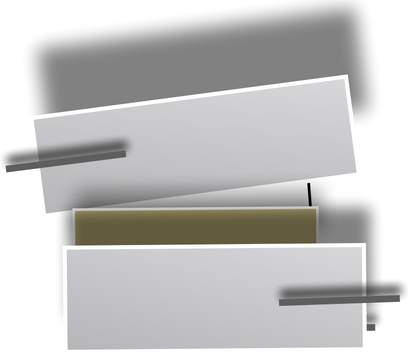
The site will be required by the City to limit the discharge rate of the stormwater to the pre-development 2yr storm rate, storing the stormwater up to the post-development 100yr storm, along with providing quality control prior to discharge to the municipal storm sewer. Preliminary estimates of the runoff rates lead to an approximate maximum discharge rate of 38 L/s, with a required storage for approximately 305 m^3.

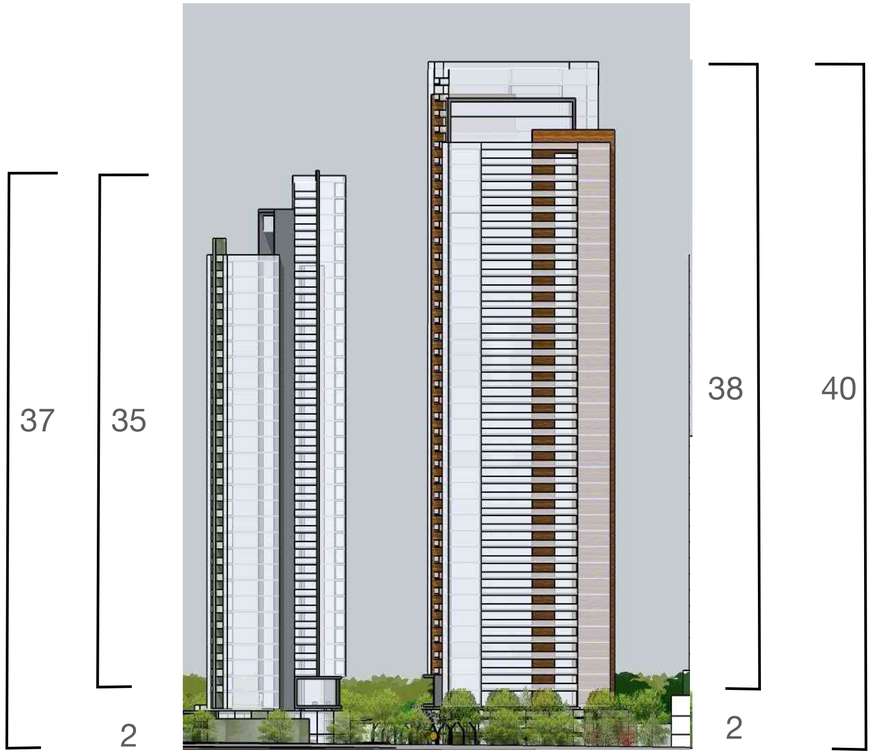
There exists conflicts between the proposed buildings and the existing 1200mm sanitary sewer and 1200mm storm sewer that runs through the property. These trunk sewers will have to be relocated in order to accommodate the proposed buildings, certainly the sanitary sewer and potentially the storm sewer (the building footprint will be re-examined in consideration of the conflict). The details for the relocations will be developed during subsequent detailed design phases.

Therefore, it is confirmed the existing infrastructure is sufficient to support the proposed development. It should be noted that all demand calculations are estimates based on conceptual architectural plans and are subject to change during the design phase.

APPENDIX

A ARCHITECTURAL CONCEPTUAL DESIGN





Typical Floor Plate

approx-789 M2 / 8,500 s.f.

Proposed Unit #'s

35 floors x 8 units = 280units
35 floors x 7 units = 245 units

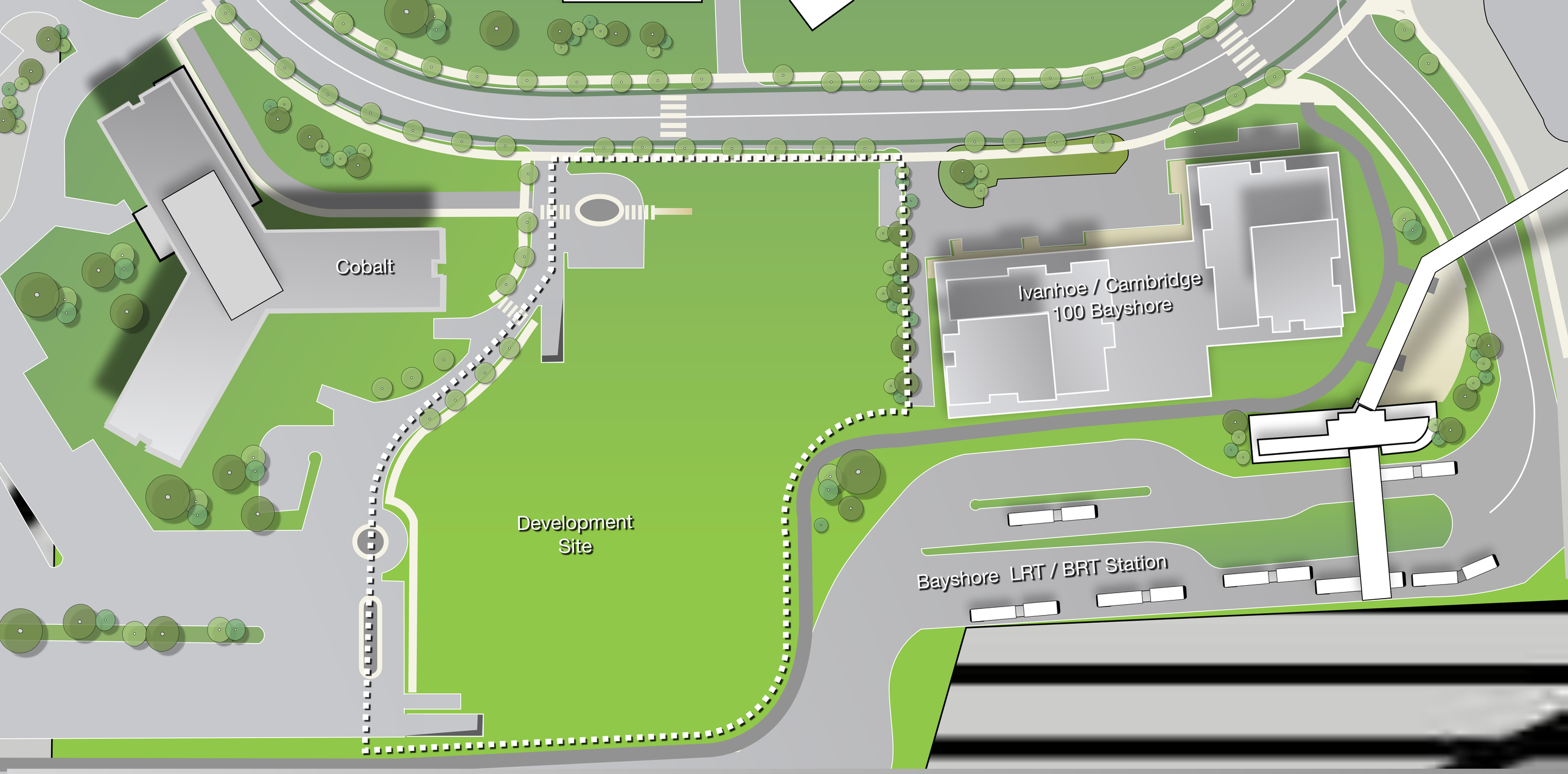
38 floors x 8 units = 304 units
38 floors x 7 units = 266 units

Range 584 units / 511 units

Proposed Parking

Two Linked / two level below grade garages
4 levels = 448 parking spots +/-

Parking Ratio between:
.78 per unit and .88 per unit



Accora VILLAGE

Ferguslea PROPERTIES

Urban Design / Massing Studies

WOODRIDGE TOWERS

bbb architects Ottawa Inc.

Orient, size and locate the buildings to minimize macro-climate impacts on partner buildings
And maximize views and right to light for all

Right-to Light

Accora VILLAGE

Ferguslea PROPERTIES

Urban Design / Massing Studies

Micro-Climate / Right to Light

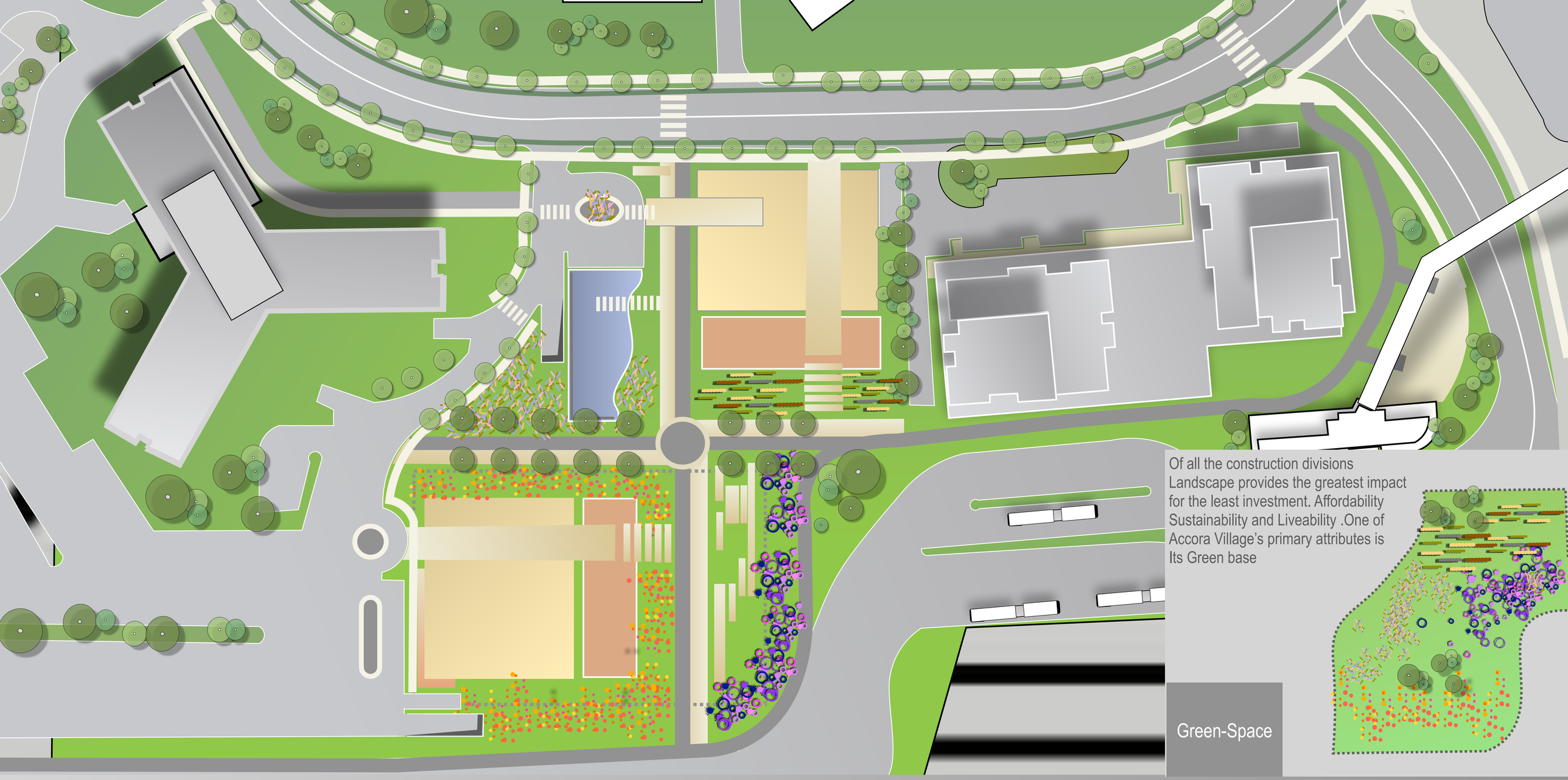
Provide simple and intuitive access to parking and building loading and services. Locate In a manner that is unobtrusive and away from pedestrian walks and amenity spaces.

Site Services

Accora VILLAGE | Ferguslea PROPERTIES

Building Entrances Drop-Off

Building Services / Parking Access



Of all the construction divisions Landscape provides the greatest impact for the least investment. Affordability Sustainability and Liveability .One of Accora Village's primary attributes is Its Green base

Green-Space

Accora VILLAGE

Ferguslea PROPERTIES

Urban Design

Green-Space

WOODRIDGE TOWERS

bbb architects Ottawa Inc.

APPENDIX

B EXTERNAL COMMUNICATIONS

From: McCreight, Laurel <Laurel.McCreight@ottawa.ca>
Sent: Monday, June 14, 2021 2:28 PM
To: Emilie Coyle <coyle@fotenn.com>
Subject: Pre-Consultation Follow-Up: Accora Village

Hi Julie,

Please refer to the below regarding the Pre-Application Consultation Meeting held on Wednesday June 2, 2021 for several properties within Accora Village for a Zoning By-law Amendment in order to increase building heights and densities, and an Official Plan Amendment and Zoning By-law Amendment application for a high-rise development on vacant land. I have also attached the required Plans & Study List for both application submissions.

Below are staff's preliminary comments based on the information available at the time of pre-consultation meeting:

Planning

- For the redevelopment of the overall site:
  - Manor Park is undertaking a similar process by applying for an Official Plan Amendment and then a scoped, small scale secondary plan will be developed; after the OPA process, zoning recommendations are introduced.
  - A similar process can be followed for this redevelopment in lieu of a secondary planning process by way of a Master Plan.
- For the proposed high-rise development on vacant land (90 Woodridge Crescent):
  - Required plans and studies will be very similar to what was required for 100 Bayshore Drive.
  - The applicant is seeking to amend site specific policy that applies to this site (3.6.1.17):
    - To proceed without a secondary planning process;
    - Exceed height limits in excess of 12-storeys; and
    - Relief is also required as the property does not front on an arterial road, which the OP requires.
  - Section 37 may apply depending on final configuration of the proposal.
    - Please provide an analysis on whether or not Section 37 applies.
  - Parks will collect cash-in-lieu of parkland for the development in accordance with Parkland Dedication By-law No. 2009-95 through the future site plan application(s).
  - Please develop a concept plan for the development.
  - It is encouraged to submit a concept plan for additional comments prior to the submission of a development application.
  - The proposed development requires Official Plan Amendment, Minor Zoning By-law Amendment and Site Plan Control (Complex) applications; information on the fees and application forms for Official Plan Amendments can be found here, information on the fees and application forms for Zoning By-law Amendments can be found here and information on the fees and application forms for Site Plan Control can be found here.
  - If two or more applications are submitted at the same time and for the same lands, each planning fee will be reduced by 10%.
  - Please note that additional Official Plan policies will apply if a high-rise 31+ tower is proposed.
  - The City's Bird-Safe Design Guidelines have been approved and are now required to be followed.
- A consolidated OPA can be submitted to deal with the vacant site and the overall lands, however, the Master Plan must accompany the OPA and not the ZBLA.

- Please note that the Draft Official Plan is expected to come into effect in the coming months; while the site specific policies are expected to be carried over, they may be cleaned up through the New Official Plan process; please be aware that the new Official Plan may have some impacts on the applications for the subject site.

Urban Design

Accora Neighbourhood Development Master Plan

- A Design Brief is required as part of the submission. The Terms of Reference of the Design Brief is attached for convenience. Please note both a shadow and a wind study are required.
- A portion of the site along Carling is within the Design Priority Area.
    - Technically, only development within that portion of the site is subject to the review by the City's Urban Design Review Panel (UDPR).
    - However, given the significance of the development and based on recent best practices in the City, such as the redevelopment of Manor Park, it is recommended that the applicants consult the UDRP as part of the master planning consultation process.
    - Based on relevant recent examples, a more productive form of UDRP review may be focused review, where a subcommittee of the UDRP comprising a few selected members work with the applicant team in a workshop setting to discuss issues and develop ideas.
    - The focused review is not part of the UDRP regular meetings and is scheduled based on availability of the subcommittee and the applicant team.
    - If this is agreeable by the applicant team, we can discuss further on the organization and logistics of such focused review.
- The master plan should address arrange of planning and design issues, including public realm (streets, pathways, parks, open spaces) built form, mobility, and services.
    - Recent examples have shown that social aspects of planning are often in the forefront of planning deliberation.

High-Rise at 90 Woodridge Crescent

- A Design Brief is required as part of the submission.
    - The Terms of Reference of the Design Brief is attached for convenience.
    - Please note both a shadow and a wind study are required.
- The site is not within a Design Priority Area and therefore, the proposed development is not subject to UDRP review. However, based on recent experience with 100 Bayshore Drive, UDRP review is highly recommended.
- It is also recommended that a second staff pre-consultation be held once the preliminary design concept and options are developed.
    - At the second staff pre-consultation, the merits of a potential UDRP pre-consultation can be determined.
- In the absence of a detailed neighbourhood level plan, the development of the design should follow the general policies of the Official Plan, as well as the City's Urban Design Guidelines for High-Rise Buildings.
- Given the context of the site, the development concept and options should address the principles of transit-oriented development, provide a public realm that supports pedestrians, ensure good relationship between neighbouring developments, demonstrate appropriate transition to adjacent areas, and present a positive image of the city.
- The proposed development's role in shaping the "gateway" for the scenic entry route should also be considered.
- Applicable guidelines are in effect; normal separation and transition guidelines should be respected.

Please contact Urban Design Planner, Randolph Wang for follow-up questions.

Rideau Valley Conservation Authority

- Natural Hazards:
    - The west end of the proposed CDP area is affected by potential slope stability hazards along Graham Creek. Future redevelopment will be required to setback from the slope hazard, slope stability

assessments will be required for projects near this feature. Opportunities to maintain and improve natural buffers will be encouraged.

- Natural Heritage:
    - Graham Creek is currently bounding the western edge of the proposed CDP area, redevelopment along this area should maintain 30 metre setback from the normal highwater mark of the watercourse. This will be expected of new development. Opportunities to maintain and improve natural buffers will be encouraged. But also this is an area where some of the natural channel still remains. Any opportunities to provide improvements to Grahams creek will be encouraged through the redevelopment process. Opportunities exist to improve existing setbacks of building and parking areas along this natural corridor.
- Please refer to the The City Stream Watch report for Graham Creek. From the Report, the area adjacent to the proposed CDP was identified some areas of concern such as invasive speices and water quality (high pH).
- Stormwater Management:
    - The subject area currently has several outlets to Graham's creek, redevelopment will be expected to provide water quality protection at an enhanced level (minimum 80% TSS removal).

Please contact Eric Lalande at the RVCA for follow-up questions.

Environmental

- The subject property is part of the natural heritage system:
    - Graham Creek is considered Significant Valley Lands.
    - Under the recently in-effect Significant Woodlands Policy, the size of the woodlot would be deemed to be significant, requiring an EIS.
- Consultant must also address species at risk and appropriate setbacks from watercourse in EIS.
- Graham Creek and the woodlot are major assets and should be considered in the design of the development.
    - Address how the community can interact with these areas, and bring this forward in the EIS.
- Schedule K in Official Plan identifies Intake Protection Area because of proximity to nearby Britannia water treatment plant.
    - This requires involvement by the City's Risk Management Official under the Clean Water Act to screen for potential significant threat activities associated with the proposal.
    - The City's Risk Management Official (Tessa Di Iorio) will work directly with the applicant on the screening requirement.

Please contact Environmental Planner, Sami Rehman for follow-up questions.

Engineering

- Servicing and site works shall be in accordance with the following documents:
    - Ottawa Sewer Design Guidelines (October 2012)
    - Ottawa Design Guidelines – Water Distribution (2010)
    - Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)
    - City of Ottawa Slope Stability Guidelines for Development Applications (revised 2012)
    - City of Ottawa Environmental Noise Control Guidelines (January, 2016)
    - City of Ottawa Park and Pathway Development Manual (2012)
    - City of Ottawa Accessibility Design Standards (2012)
    - Ottawa Standard Tender Documents (latest version)
    - Ontario Provincial Standards for Roads & Public Works (2013)
- Record drawings and utility plans are also available for purchase from the City (Contact the City's Information Centre by email at InformationCentre@ottawa.ca or by phone at (613) 580-2424 x.44455).
- The Stormwater Management Criteria, for the subject site, is to be based on the following:
    - The IDF information derived from the Meteorological Services of Canada rainfall data, taken from the MacDonald Cartier Airport, collected 1966 to 1997

- A calculated time of concentration (Cannot be less than 10 minutes)
- The SWM approach will depend on the proposed re-development:
  - **If Accora village is proposed to be re-developed in its entirety**:
    - A SWM master plan would be required (for both quality and quantity control), sizing it as per the guidelines and providing an overall SWM strategy.
    - The maximum release rate to Graham Creek would likely be limited to existing, which is roughly the 2-year flow. Flow in excess of the 2-year return period could be proposed if a study of Graham Creek is provided which can support how greater flows have no impact on the creek.
  - **If the re-development is proposed on a Site-by-site basis**:
    - SWM for quantity control would be requested. The existing storm system was built pre-1970; the flow from each site will need to be controlled to the 2 year event. Flows to the storm sewer in excess of the 2-year storm release rate, up to and including the 100-year storm event, must be detained on site.
    - Please use the pre-development runoff coefficient or a maximum equivalent 'C' of 0.5, whichever is less (§ 8.3.7.3).
- As per the RVCA (please see attached): "redevelopment will be expected to provide water quality protection at an enhanced level (minimum 80% TSS removal)".

- With respect to Sanitary Sewers, future sanitary flows would need to be provided based on the proposed intensification to identify the impact on the downstream West Nepean Collector. The City would add the proposed flows to the model to assess / simulate the impact.
- Water Boundary condition requests must include the location of the service and the expected loads required by the proposed development. Please provide the following information:
  - Location of service
  - Type of development and the amount of fire flow required (as per FUS, 1999).
  - Average daily demand: ___ l/s.
  - Maximum daily demand: ___l/s.
  - Maximum hourly daily demand: ___ l/s.
  - Note that if Accora Village is proposed to re-develop in its entirety, the proponent may be required to (or may consider) modelling the loop along Woodridge Crescent to provide sub-division level details above.
- As per the RVCA (below): "the west end of the proposed CDP area is affected by potential slope stability hazards along Graham Creek. Future redevelopment will be required to setback from the slope hazard, slope stability assessments will be required for projects near this feature. Opportunities to maintain and improve natural buffers will be encouraged."
- In addition to a Site Servicing Plan and Site Servicing Study (which may or may not be separate from the SWM Report / Master Plan), the proponent will need to provide adequacy of public services, a stormwater management report, preliminary geotechnical study and slope-stability study.
- MOECC ECA Requirements:
  - An MOECC Environmental Compliance Approval may be required for the proposed development.
  - Phase 1 ESAs and Phase 2 ESAs must conform to clause 4.8.4 of the Official Plan that requires that development applications conform to Ontario Regulation 153/04.
- A master plan would require a master servicing study including stormwater master plan
- It is recommended that the master plan exercise looks at the infrastructure for the whole site even if the development will occur on a site by site basis

Please contact Infrastructure Project Manager, Eric Surprenant for follow-up questions.

Transportation

- Follow Traffic Impact Assessment Guidelines.
  - Screening form to start, full Traffic Impact Assessment if any of the triggers on the screening form are satisfied.

    - Start this process as soon as possible.
    - Applicant advised that their application will not be deemed complete until the submission of the draft step 1-4, including the functional draft RMA package (if applicable) and/or monitoring report (if applicable).
- Ministry of Transportation will most likely want to review based on the proximity to the 417 and on/off ramps.
- Manor Park has a master TIA with separate TIAs as the different phases.
- The TMP is being updated but consultants can work with the status quo.
- Designing Neighbourhood Collector Streets guidelines have been released.
- Updated Trans trip manual to be used and can be provided.
- No updates for LRT completion timeline.

Please contact Transportation Project Manager, Mike Giampa for follow-up questions.

Other

- Plans are to be standard A1 size (594 mm x 841 mm) sheets, 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.
- For sites containing one or more buildings with a total GFA greater than 2000 square metres OR retail shopping complexes with a total GFA greater than 10,000 square metres OR sites containing office buildings with total GFA greater than 10,000 square metres hotels and motels with more than 75 units OR (human) hospitals OR educational institutions with more than 350 students OR manufacturing establishments working more than 16,000 person-hours in a month]
    - A Waste Reduction Workplan Summary is required for the construction project as required by O.Reg. 102/94, being “Waste Audits and Waste Reduction Work Plans” made under the Environmental Protection Act, RSO 1990, c E.19, as amended.
- You are encouraged to contact the Ward Councillor, Theresa Kavanagh about the proposal.

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

These 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.

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

Regards,
Laurel

Laurel McCreight MCIP, RPP
Planner
Development Review West
Urbaniste
Examen des demandes d'aménagement ouest

City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 16587
ottawa.ca/planning / ottawa.ca/urbanisme

'

'

McCaughey, Stephen

From: Rathnasooriya, Shika <Thakshika.Rathnasooriya@ottawa.ca>
Sent: Tuesday, July 12, 2022 1:37 PM
To: McCaughey, Stephen
Cc: Elsby, Cam; McCreight, Laurel
Subject: FW: 90 Woodridge Cres. - Fire Flow Boundary Condition
Attachments: 90 Woodridge Crescent July 2022.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Stephen,

The following are boundary conditions, HGL, for hydraulic analysis at 90 Woodridge Crescent (zone 1W) assumed to be a dual connection to the 203 mm watermain on Woodridge Crescent (see attached PDF for location).

Both Connections

Minimum HGL: 106.0 m

Maximum HGL: 115.6 m

Max Day + Fire Flow (83.33 L/s): 96.4 m

Max Day + Fire Flow (125 L/s): 84.1 m

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

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

Thanks,
Shika

From: McCaughey, Stephen <Stephen.Mccaughey@wsp.com>
Sent: July 05, 2022 2:27 PM
To: Elsby, Cam <Cam.Elsby@ottawa.ca>
Cc: McCreight, Laurel <Laurel.McCreight@ottawa.ca>; Surprenant, Eric <Eric.Surprenant@ottawa.ca>; Schaeffer, Gabrielle <gabrielle.schaeffer@Ottawa.ca>
Subject: RE: 90 Woodridge Cres. - Fire Flow Boundary Condition

Hi Cam,

Wondering if I can get an updated fire flow boundary condition for this 90 Woodridge Cres site, using a non-combustible construction coefficient I get a Max Day + Fire Flow of 125.18 L/s

Thank you,

Stephen McCaughey, P.Eng., PMP
T +1 613-690-3955 (Direct)
T +1 613-829-2800 (Office)

From: Elsby, Cam <Cam.Elsby@ottawa.ca>
Sent: Tuesday, March 08, 2022 12:41 PM
To: McCaughey, Stephen <Stephen.Mccaughey@wsp.com>
Cc: McCreight, Laurel <Laurel.McCreight@ottawa.ca>; Surprenant, Eric <Eric.Surprenant@ottawa.ca>; Schaeffer, Gabrielle <gabrielle.schaeffer@Ottawa.ca>
Subject: RE: 90 Woodridge Cres. - Potential Sewer Conflicts for ZBLA

Good afternoon Stephen,

Please note that in the FUS calculations to use a coefficient (C) = 0.6, a fire resistant rating of 3 hours or more is required, which may be difficult to achieve. Please find below boundary conditions as requested:

The following are boundary conditions, HGL, for hydraulic analysis at 90 Woodridge Crescent (zone 1W) assumed to be a dual connection to the 203 mm watermain on Woodridge Crescent (see attached PDF for location).

Both Connections

Minimum HGL: 106.0 m

Maximum HGL: 115.6 m

Max Day + Fire Flow (83.33 L/s): 96.4 m

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

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

Please don't hesitate to reach out should you have any further questions or concerns.

Kind regards,

Cam Elsby, EIT
Engineering Intern
Planning, Real Estate and Economic Development Department | Services de la planification, des biens immobiliers et du développement économique
Development Review – West Branch
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West Ottawa, ON | 110, avenue Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste 21443
cam.elsby@ottawa.ca

From: McCaughey, Stephen <Stephen.Mccaughey@wsp.com>
Sent: March 04, 2022 9:52 AM
To: Elsby, Cam <Cam.Elsby@ottawa.ca>
Cc: McCreight, Laurel <Laurel.McCreight@ottawa.ca>; Surprenant, Eric <Eric.Surprenant@ottawa.ca>; Schaeffer, Gabrielle <gabrielle.schaeffer@Ottawa.ca>
Subject: RE: 90 Woodridge Cres. - Potential Sewer Conflicts for ZBLA

Hi Cam,

Fire-resistivity of the construction is confirmed per attached email from the Planner. At this stage of ZBLA I trust this is sufficient to validate the assumptions. If needed during the SPA stage we can go into more detail to validate the assumptions.

Can you confirm when we can expect the boundary conditions?

Thank you,

Stephen McCaughey, P.Eng., PMP
T +1 613-690-3955 (Direct)
T +1 613-829-2800 (Office)

From: Elsby, Cam <Cam.Elsby@ottawa.ca>
Sent: Wednesday, February 23, 2022 4:42 PM
To: McCaughey, Stephen <Stephen.Mccaughey@wsp.com>
Cc: McCreight, Laurel <Laurel.McCreight@ottawa.ca>; Surprenant, Eric <Eric.Surprenant@ottawa.ca>; Schaeffer, Gabrielle <gabrielle.schaeffer@Ottawa.ca>
Subject: RE: 90 Woodridge Cres. - Potential Sewer Conflicts for ZBLA

Good afternoon Stephen,

Upon further review of the fire flow calculations, it was noted that a C value of 0.6 was implemented throughout the FUS calculations. Please provide supporting documentation to confirm that construction methods and protection requirements for the proposed work conform with those described on page 23 of the Fire Underwriters Survey Water Supply for Public Fire Protection document.

Please don't hesitate to reach out should you have any questions or concerns.

Kind regards,

Cam Elsby, EIT
Engineering Intern
Planning, Real Estate and Economic Development Department | Services de la planification, des biens immobiliers et du développement économique
Development Review – West Branch
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West Ottawa, ON | 110, avenue Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste 21443
cam.elsby@ottawa.ca

From: McCaughey, Stephen <Stephen.Mccaughey@wsp.com>
Sent: February 17, 2022 10:42 AM
To: Elsby, Cam <Cam.Elsby@ottawa.ca>
Cc: McCreight, Laurel <Laurel.McCreight@ottawa.ca>; Surprenant, Eric <Eric.Surprenant@ottawa.ca>; Schaeffer, Gabrielle <gabrielle.schaeffer@Ottawa.ca>
Subject: RE: 90 Woodridge Cres. - Potential Sewer Conflicts for ZBLA

Thanks for the comments, the issues were the rounding and presentation of some of the numbers but it doesn't materially change the calculations.

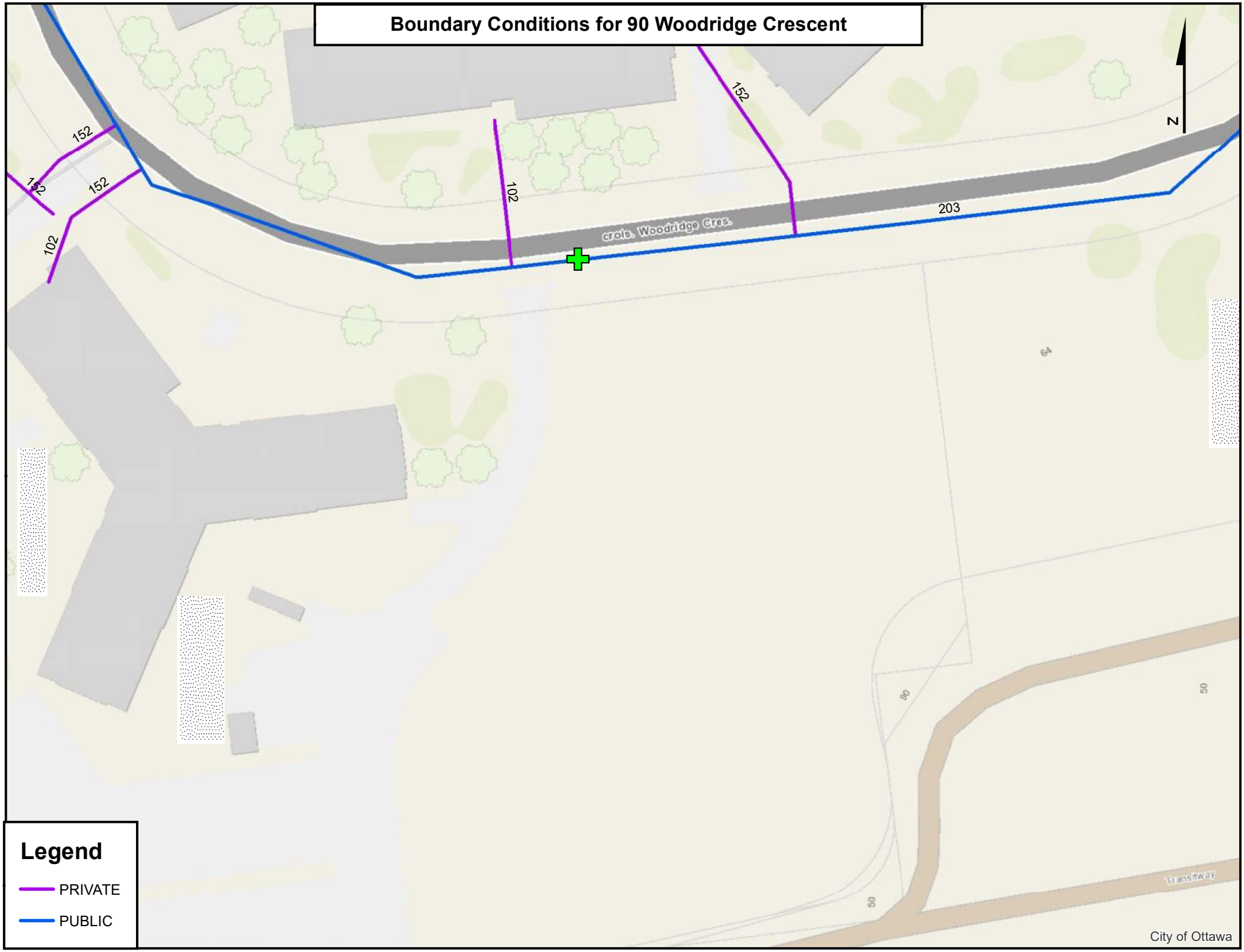
1. Average daily demand (l/s): 3.41 L/s
2. Maximum daily demand (l/s): 8.52 L/s
3. Maximum hourly demand (l/s): 18.73 L/s
4. Fire flow demand (provide fire detailed flow calculations based on the fire underwriters survey method): 83.33 L/s

The water service connection is proposed near the existing entrance to the site, just west of the in-line valve. This connection may shift down the road as the design progresses but at this ZBLA stage it's a reasonable estimate.

Thank you,

Stephen McCaughey, P.Eng., PMP

Boundary Conditions for 90 Woodridge Crescent



McCaughey, Stephen

From: Schaeffer, Gabrielle <gabrielle.schaeffer@Ottawa.ca>
Sent: Tuesday, February 15, 2022 1:58 PM
To: McCaughey, Stephen; Elsby, Cam
Cc: McCreight, Laurel; Surprenant, Eric
Subject: RE: 90 Woodridge Cres. - Potential Sewer Conflicts for ZBLA

Hi Stephen,

I have already heard back from asset management regarding the sanitary flows: There is capacity for the proposed 11 L/s. Connection can be made to the Woodridge sanitary sewer or to a connection at the Graham Creek Collector Junction MH.

Regards,
Gabrielle

From: Schaeffer, Gabrielle
Sent: February 15, 2022 10:15 AM
To: McCaughey, Stephen <Stephen.Mccaughey@wsp.com>; Elsby, Cam <Cam.Elsby@ottawa.ca>
Cc: McCreight, Laurel <Laurel.McCreight@ottawa.ca>; Surprenant, Eric <Eric.Surprenant@ottawa.ca>
Subject: FW: 90 Woodridge Cres. - Potential Sewer Conflicts for ZBLA

Hi Stephen,

I have reached out to asset management regarding the sanitary capacity.

Cam will review the water demand calculations and coordinate the boundary conditions for you.

Regards,
Gabrielle (Gabi) Schaeffer, P.Eng
Senior Engineer - Infrastructure Applications

City of Ottawa
Development Review - West Branch
Planning, Real Estate and Economic Development Department
110 Laurier Ave West, 4th Floor East;
Ottawa ON K1P 1J1
Cell: 613-227-7419

From: McCaughey, Stephen <Stephen.Mccaughey@wsp.com>
Sent: February 14, 2022 4:30 PM
To: Schaeffer, Gabrielle <gabrielle.schaeffer@Ottawa.ca>
Cc: McCreight, Laurel <Laurel.McCreight@ottawa.ca>; Surprenant, Eric <Eric.Surprenant@ottawa.ca>
Subject: RE: 90 Woodridge Cres. - Potential Sewer Conflicts for ZBLA

Hi Gabrielle,

Hoping you can help follow up on a request I sent into Eric while he is away. Looking at boundary conditions and sanitary capacity for the site at 90 Woodridge.

Thank you!

Stephen McCaughey, P.Eng., PMP
T +1 613-690-3955 (Direct)
T +1 613-829-2800 (Office)

From: McCaughey, Stephen
Sent: Tuesday, January 18, 2022 2:49 PM
To: Surprenant, Eric <Eric.Surprenant@ottawa.ca>
Cc: McCreight, Laurel <Laurel.McCreight@ottawa.ca>
Subject: RE: 90 Woodridge Cres. - Potential Sewer Conflicts for ZBLA

Hi Eric,

Continuing on this 90 Woodridge site I want to request boundary conditions and sanitary capacity for the 200mm watermain and 250mm sanitary sewer that runs along Woodridge in front of the site. Based on conceptual design the demands are as follows:
Water Demand:

- Avg Day: 3.4 L/s
- Peak Hour: 18.7 L/s
- Max Day + Fire Flow: 92 L/s

Sanitary Demand:

- Avg Day: 3.4 L/s
- Peak: 11.78 L/s

Thank you,

Stephen McCaughey, P.Eng., PMP
T +1 613-690-3955 (Direct)
T +1 613-829-2800 (Office)

From: Surprenant, Eric <Eric.Surprenant@ottawa.ca>
Sent: Tuesday, January 04, 2022 4:30 PM
To: McCaughey, Stephen <Stephen.Mccaughey@wsp.com>
Cc: McCreight, Laurel <Laurel.McCreight@ottawa.ca>
Subject: Re: 90 Woodridge Cres. - Potential Sewer Conflicts for ZBLA

McCaughey, Stephen

From: Eric Lalande <eric.lalande@rvca.ca>
Sent: Friday, August 06, 2021 3:36 PM
To: McCaughey, Stephen
Subject: RE: 90 Woodridge Cres, Ottawa - Confirmation of SWM Criteria

Hi Stephen,

The Water Quality requirement is correct. As for quantity control, we defer the requirement to the City. Thusly, I will trust you can reach out to the City to obtain their requirements for the site.

Thanks,

Eric Lalande, MCIP, RPP
Planner, RVCA
613-692-3571 x1137

From: McCaughey, Stephen <Stephen.Mccaughey@wsp.com>
Sent: Friday, August 6, 2021 3:20 PM
To: Eric Lalande <eric.lalande@rvca.ca>
Subject: 90 Woodridge Cres, Ottawa - Confirmation of SWM Criteria

Hi Eric,

I'm working on a re-zoning application for the east portion of the 90 Woodridge Crescent lot in Ottawa that is currently undeveloped. We've received initial pre-consultation comments from the City which include a note of enhanced water quality (80% TSS reduction). We want to confirm this as well as the water quantity targets. The storm sewer on Woodridge discharges to Graham Creek in close proximity, and from similar site beside, I believe the post-development would need to be limited to the 2yr pre-development as opposed to 5yr but I wanted to confirm.

Thank you,

Stephen McCaughey, P.Eng.
Project Engineer
Municipal Infrastructure

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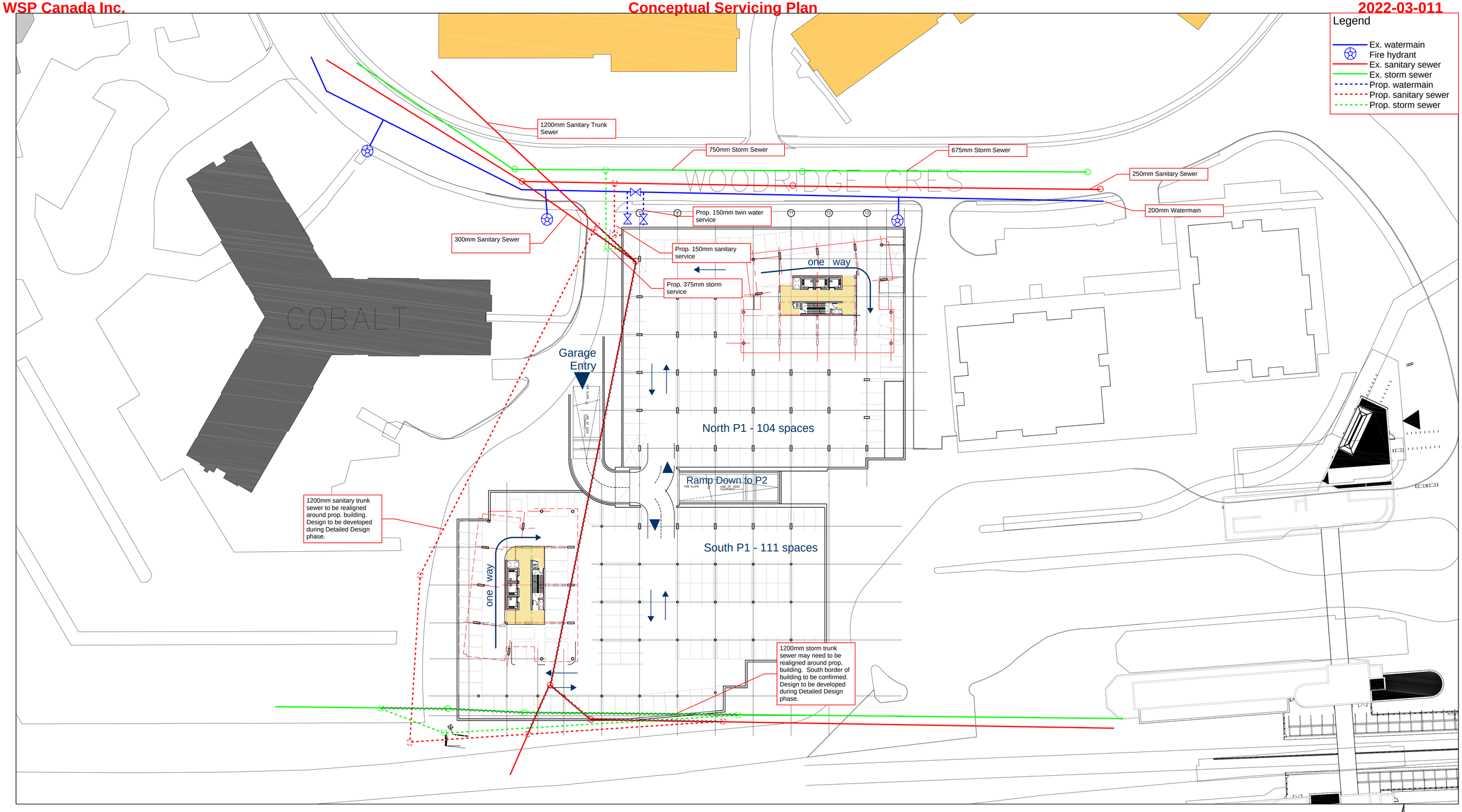
300-2611 Queensview Drive
Ottawa, Ontario
K2B 8K2 Canada

wsp.com

APPENDIX

C CONCEPTUAL SITE SERVICING PLAN



Accora VILLAGE | Ferguslea PROPERTIES

91 WOODRIDGE TOWERS

bbb architects Ottawa Inc.

PARKING LEVEL 1

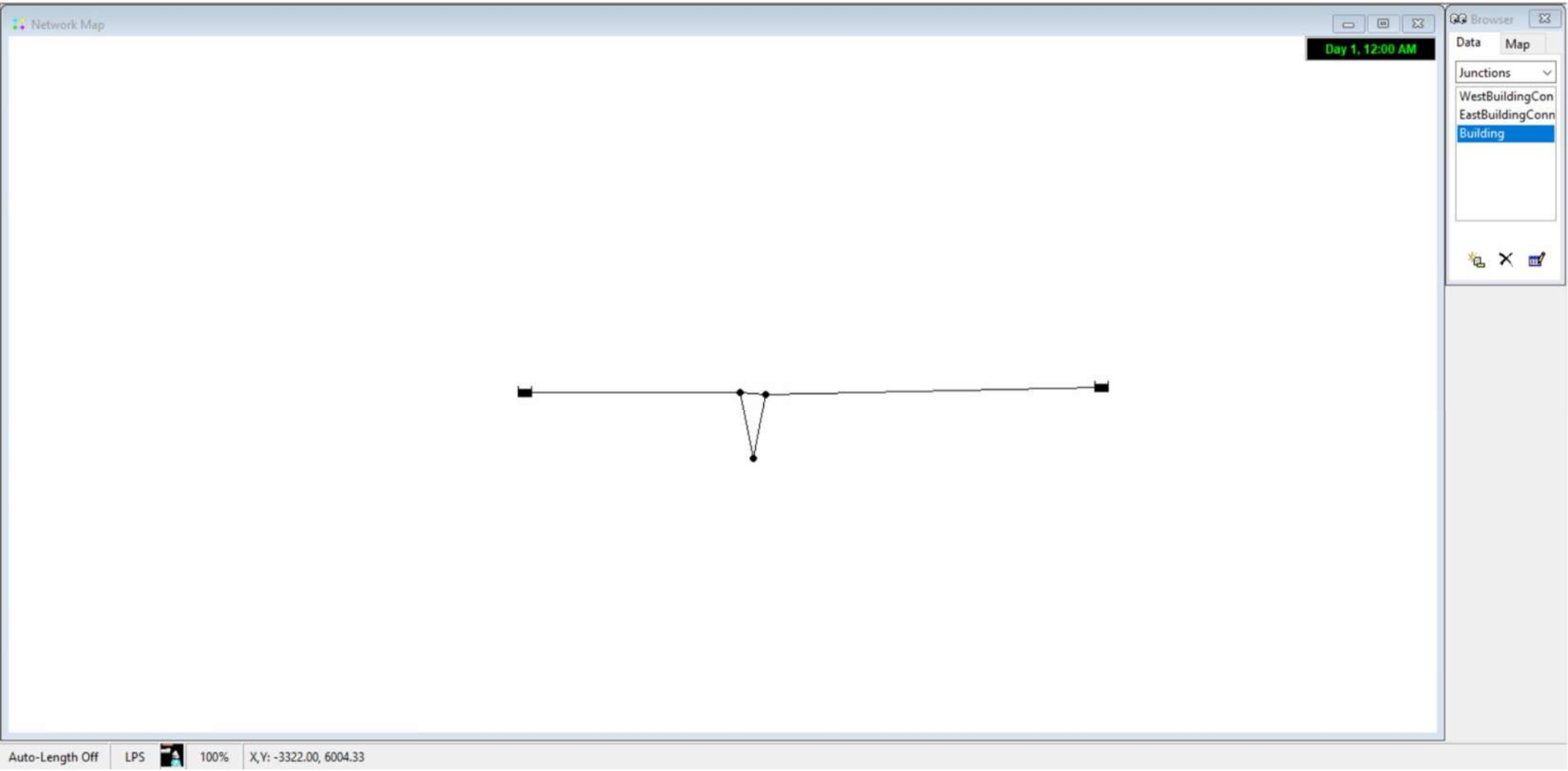
P1 Total 215 spaces

0 10 20 50 metres

N

APPENDIX

D WATER MODEL OUTPUT


Network Map
Day 1, 12:00 AM
Browser
Data
Map
Junctions
WestBuildingCon
EastBuildingConn
Building
Auto-Length Off
LPS
100%
X,Y: -3322.00, 6004.33

```
******************************************************************************
*                                E P A N E T                                 *
*                      Hydraulic and Water Quality                           *
*                      Analysis for Pipe Networks                            *
*                           Version 2.0                                      *
******************************************************************************

Input File: 90 Woodridge - Model.net
```

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
3	EastBuildingConnection	WestBuildingConnection	3	200
7	WestBuildingConnection	Building	8	150
8	EastBuildingConnection	Building	8	150
9	EastSupply	EastBuildingConnection	5	200
10	WestBuildingConnection	WestSupply	5	200

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality	
WestBuildingConnection	0.00	115.60	52.10	0.00	
EastBuildingConnection	0.00	115.60	52.10	0.00	
Building	3.41	115.60	52.10	0.00	
WestSupply	-1.71	115.60	0.00	0.00	Reservoir
EastSupply	-1.71	115.60	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
3	0.00	0.00	0.00	Open
7	1.71	0.10	0.16	Open
8	1.71	0.10	0.16	Open
9	1.71	0.05	0.03	Open
10	-1.71	0.05	0.03	Open

```
******************************************************************************
*                                E P A N E T                                 *
*                       Hydraulic and Water Quality                          *
*                       Analysis for Pipe Networks                           *
*                             Version 2.0                                    *
******************************************************************************

Input File: 90 Woodridge - Model.net


Link - Node Table:
------------------------------------------------------------------------
Link            Start           End                  Length  Diameter
ID              Node            Node                      m        mm
------------------------------------------------------------------------
3               EastBuildingConnectionWestBuildingConnection          3       200
7               WestBuildingConnectionBuilding                    8       150
8               EastBuildingConnectionBuilding                    8       150
9               EastSupply      EastBuildingConnection            5       200
10              WestBuildingConnectionWestSupply                  5       200

Node Results:
------------------------------------------------------------------------
Node                  Demand       Head  Pressure   Quality
ID                       LPS          m         m
------------------------------------------------------------------------
WestBuildingConnection       0.00    106.00     42.50      0.00
EastBuildingConnection       0.00    106.00     42.50      0.00
Building                18.73    105.97     42.47      0.00
WestSupply              -9.36    106.00      0.00      0.00 Reservoir
EastSupply              -9.36    106.00      0.00      0.00 Reservoir

Link Results:
------------------------------------------------------------------------
Link                    Flow  VelocityUnit Headloss    Status
ID                       LPS       m/s      m/km
------------------------------------------------------------------------
3                       0.00      0.00      0.00      Open
7                       9.36      0.53      3.81      Open
8                       9.36      0.53      3.81      Open
9                       9.36      0.30      0.79      Open
10                     -9.36      0.30      0.79      Open
```

```
******************************************************************************
*                                E P A N E T                                 *
*                       Hydraulic and Water Quality                          *
*                       Analysis for Pipe Networks                           *
*                             Version 2.0                                    *
******************************************************************************

Input File: 90 Woodridge - Model.net


Link - Node Table:
------------------------------------------------------------------------------
Link            Start           End                  Length  Diameter
ID              Node            Node                      m        mm
------------------------------------------------------------------------------
3               EastBuildingConnectionWestBuildingConnection          3       200
7               WestBuildingConnectionBuilding                    8       150
8               EastBuildingConnectionBuilding                    8       150
9               EastSupply      EastBuildingConnection            5       200
10              WestBuildingConnectionWestSupply                  5       200

Node Results:
------------------------------------------------------------------------------
Node                 Demand       Head   Pressure    Quality
ID                      LPS          m          m
------------------------------------------------------------------------------
WestBuildingConnection       0.00     83.97     20.47      0.00
EastBuildingConnection       0.00     83.97     20.47      0.00
Building             125.00     82.94     19.44      0.00
WestSupply           -62.50     84.10      0.00      0.00 Reservoir
EastSupply           -62.50     84.10      0.00      0.00 Reservoir

Link Results:
------------------------------------------------------------------------------
Link                   Flow  VelocityUnit Headloss    Status
ID                      LPS       m/s      m/km
------------------------------------------------------------------------------
3                      0.00      0.00      0.00      Open
7                     62.50      3.54    128.01      Open
8                     62.50      3.54    128.01      Open
9                     62.50      1.99     26.43      Open
10                   -62.50      1.99     26.43      Open
```

APPENDIX

E STORMWATER MANAGEMENT CALCULATIONS

TABLE 1 - PRE-DEVELOPMENT RUNOFF

Area Description	Area (ha)	Time of Conc, Tc (min)	Storm = 2 yr			Storm = 5 yr			Storm = 100 yr		
			I_2 (mm/hr)	Cavg	Q_2 (L/sec)	I_5 (mm/hr)	Cavg	Q_5 (L/sec)	I_{100} (mm/hr)	Cavg	Q_{100} (L/sec)
Proposed site	0.9	10	76.81	0.20	**38.4**	104.19	0.20	52.1	178.56	0.25	111.7
Allowable Capture Rate is based on 2-year storm at Tc=10 mins											
Q (L/sec) = 2.78 C I A											

2-year Storm	$C_{ASPH/ROOF/CONC}$	0.90	C_{GRASS} =	0.20	$C_{LANDSCAPE}$ =	0.50
5-year Storm	$C_{ASPH/ROOF/CONC}$	0.90	C_{GRASS} =	0.20	$C_{LANDSCAPE}$ =	0.50
100-year Storm	$C_{ASPH/ROOF/CONC}$	1.00	C_{GRASS} =	0.25	$C_{LANDSCAPE}$ =	0.63

$C_{(100\text{-}yr)}$ for post development flows is increased by 25% to a maximum of 1.00
Landscape areas include softscape overtop underground parking garage

TABLE 2- POST DEVELOPMENT AVERAGE RUNOFF COEFFICIENTS

Area No.	Asphalt/ Roof/ Conc Areas (m^2)	A * C_{ASPH}	Landscaped Areas (m^2)	A * C_{GRASS}	Sum AC	Total Area (m^2)	$C_{2\text{-}yr}$	$C_{5\text{-}yr}$	$C_{100\text{-}yr}$
A1	4500	4050.0	4500	2250.0	6300.0	9000.0	0.70	0.70	0.88
Total	4,500		4,500		6,300	9,000			

TABLE 3- POST DEVELOPMENT RUNOFF

Area No	Area (ha)	Storm = 2 yr				Storm = 5 yr				Storm = 100 yr			
		I_2 (mm/hr)	C_{AVG}	Q (l/s)	Q_{MAX} (l/s)	I_5 (mm/hr)	C_{AVG}	Q (l/s)	Q_{MAX} (l/s)	I_{100} (mm/hr)	C_{AVG}	Q (l/s)	Q_{MAX} (l/s)
A1	0.9	76.81	0.70	134.5	**38.4**	104.19	0.70	182.5	**38.4**	178.56	0.88	390.9	**38.4**
Totals	**0.9**			134.5	38.4			182.5	38.4			390.9	38.4

$I_2 = 732.951 / (Tc + 6.199)^{0.810}$
$I_5 = 998.071 / (Tc + 6.053)^{0.814}$
$I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$
Time of Concentration (min), Tc = 10 mins

TABLE 4 - STORAGE VOLUME REQUIRED (2-YEAR and 100-YEAR STORMS)

C_{AVG} = 0.70 (2-year)
C_{AVG} = 0.88 (100-year)
Time Interval = 5 (mins)
Drainage Area = 0.90000 (hectares)

	2-YEAR STORM					100-YEAR STORM				
	Release Rate = **38.4** (L/sec) Return Period = 2 (years) IDF Parameters, A = 732.951 , B = 0.810 (I = A/(T_c+C) , C = 6.199					Release Rate = **38.4** (L/sec) Return Period = 100 (years) IDF Parameters, A = 1735.688 , B = 0.820 (I = A/(T_c+C) , C = 6.014				
Time (min)	**Intensity, I (mm/hr)**	**Peak Flow (L/s)**	**Release Rate (L/s)**	**Storage Rate (L/s)**	**Storage Volume (m^3)**	**Intensity, I (mm/hr)**	**Peak Flow (L/s)**	**Release Rate (L/s)**	**Storage Rate (L/s)**	**Storage Volume (m^3)**
0	167.2	292.9	38.4	254.4	0.00	398.6	872.7	38.4	834.2	0.00
5	103.6	181.4	38.4	143.0	42.89	242.7	531.3	38.4	492.9	147.87
10	76.8	134.5	38.4	96.1	57.65	178.6	390.9	38.4	352.5	211.49
15	61.8	108.2	38.4	69.7	62.77	142.9	312.8	38.4	274.4	246.96
20	52.0	91.1	38.4	52.7	63.23	120.0	262.6	38.4	224.2	269.00
25	45.2	79.1	38.4	40.7	61.01	103.8	227.3	38.4	188.9	283.37
30	40.0	70.1	38.4	31.7	57.06	91.9	201.1	38.4	162.7	292.84
35	36.1	63.2	38.4	24.7	51.91	82.6	180.8	38.4	142.4	298.94
40	32.9	57.6	38.4	19.1	45.90	75.1	164.5	38.4	126.1	302.59
45	30.2	53.0	38.4	14.5	39.23	69.1	151.2	38.4	112.7	304.39
50	28.0	49.1	38.4	10.7	32.03	64.0	140.0	38.4	101.6	304.73
55	26.2	45.8	38.4	7.4	24.43	59.6	130.5	38.4	92.1	303.92
60	24.6	43.0	38.4	4.6	16.48	55.9	122.4	38.4	83.9	302.16
65	23.2	40.5	38.4	2.1	8.24	52.6	115.3	38.4	76.8	299.61
70	21.9	38.4	38.4	-0.1	-0.23	49.8	109.0	38.4	70.6	296.39
75	20.8	36.5	38.4	-2.0	-8.91	47.3	103.5	38.4	65.0	292.59
80	19.8	34.7	38.4	-3.7	-17.78	45.0	98.5	38.4	60.1	288.30
85	18.9	33.2	38.4	-5.3	-26.79	43.0	94.0	38.4	55.6	283.58
90	18.1	31.8	38.4	-6.7	-35.95	41.1	90.0	38.4	51.6	278.47
95	17.4	30.5	38.4	-7.9	-45.23	39.4	86.3	38.4	47.9	273.03
100	16.7	29.3	38.4	-9.1	-54.62	37.9	83.0	38.4	44.5	267.28
105	16.1	28.3	38.4	-10.2	-64.11	36.5	79.9	38.4	41.5	261.25
110	15.6	27.3	38.4	-11.2	-73.69	35.2	77.1	38.4	38.6	254.98
115	15.0	26.4	38.4	-12.1	-83.36	34.0	74.4	38.4	36.0	248.49
120	14.6	25.5	38.4	-12.9	-93.09	32.9	72.0	38.4	33.6	241.79
Max =					**63.23**					**304.73**

Notes
1) Peak flow is equal to 2.78 x C x I x A
2) Intensity, $I = A/(Tc+C)^B$
3) Release Rate = Min (Release Rate, Peak Flow)
4) Storage Rate = Peak Flow - Release Rate
5) Storage = Time x Storage Rate
6) Maximum Storage = Max Storage Over Time