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FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

FOR

TIMBERCREEK COMMUNITIES HERON GATE COMMUNITY

CITY OF OTTAWA

PROJECT NO.: 18-1080

APRIL 2019 – REV 1

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
FOR
HERON GATE COMMUNITY

TIMBERCREEK COMMUNITIES

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1.0 INTRODUCTION

David Schaeffer Engineering Limited (DSEL) has been retained by Timbercreek Communities to prepare a Functional Servicing and Stormwater Management (FSR) report in support of the application for a Plan of Subdivision for the Heron Gate community.

As indicated by ***Figure 1,*** below, the lands are bound by Heron Road to the north, the Sandalwood Park to the east, and Walkley Road to the south. The subject site is zoned Arterial Mainstreet (AM) and Residential Fifth Density (R5).

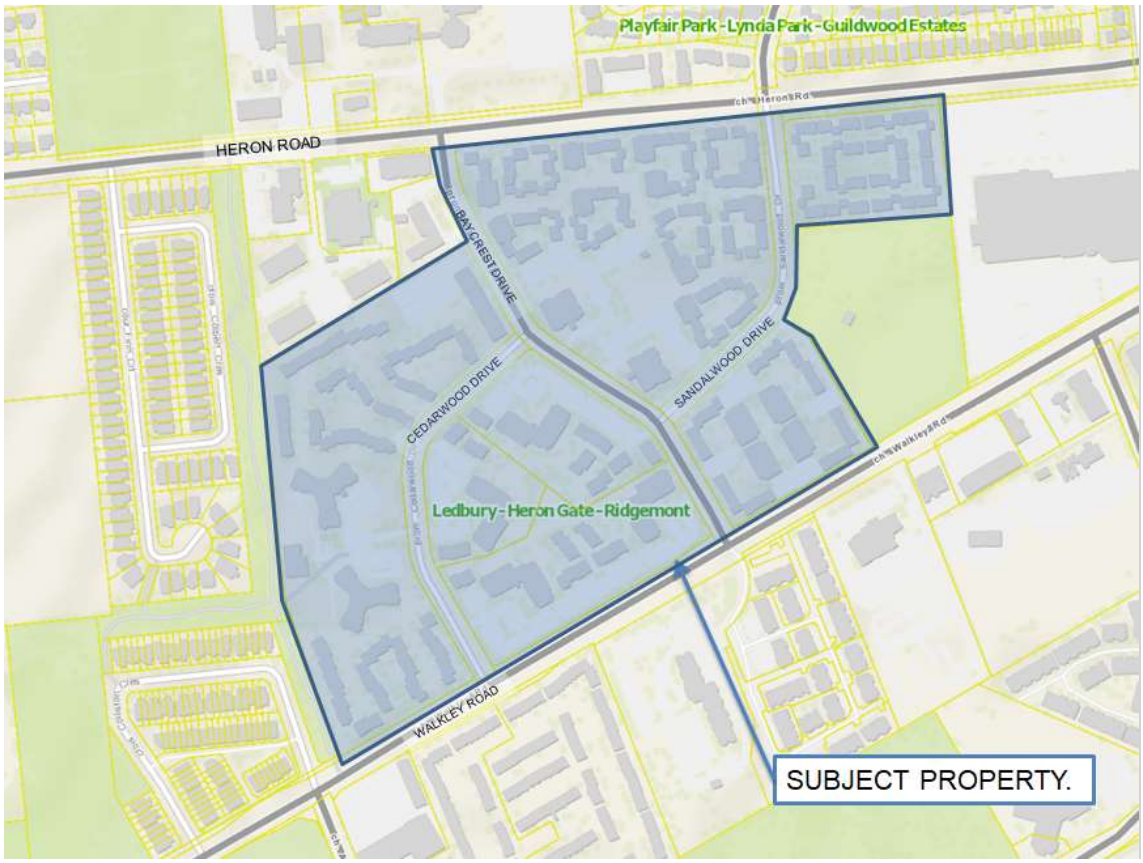


Figure 1: Site Location

The FSR study area:

- measures approximately 22.8 ha;
- is located within the City of Ottawa urban boundary in the Alta Vista ward;
- is under the jurisdiction of the Rideau Valley Conservation Authority (RVCA);
- is located south of an existing community centre at 1480 Heron Road; and
- is located east of Sandalwood Park and the Heron Gate Shopping Centre at 1670 Heron Road and 1718 Heron Road.

The objective of this report is to provide sufficient detail to demonstrate that the proposed Subdivision is supported by existing municipal services.

1.1 Existing Conditions

The existing site contains a subdivision consisting of ***307*** townhomes and ***1,209*** apartment units. The completed development proposes to retain five existing high-rise apartment buildings, located at: 2850 Cedarwood Drive; 2870 Cedarwood Drive; 2840 Baycrest Drive; 2851 Baycrest Drive; and 2861 Baycrest Drive. The apartment buildings that are contemplated to be retained consist of ***957*** apartment units. The ***307*** existing townhomes are contemplated to be reconstructed as part of the re-development.

Sewer and watermain mapping were collected from the City of Ottawa to evaluate the existing services located within the adjacent municipal right-of-ways. Refer to drawing ***EX-WTR, EX-SAN,*** and ***EX-STM*** (located in ***Drawings/Figures***) for existing servicing layouts.

1.2 Development Concept

The development concept, prepared by Dialog Design, is included in ***Drawings/Figures***.

The proposed land use within the study area consists of a combination of townhomes, mid-rise and high-rise apartment buildings; which will be accessed via a local road network consisting of Cedarwood Drive, Baycrest Drive and Sandalwood Drive. Proposed Stormwater management design for the subject site requires the construction of off-site storm sewers and storm ditches. It is anticipated that Timbercreek Communities will be responsible for securing planning and construction approvals for all required off-site infrastructure.

The Concept Plan contemplates the following residential developments:

- Townhomes – Approximately ***315 units***;
- Mid-Rise and High-Rise Apartment Buildings – Approximately ***4,748 units*** and associated above ground and below ground parking lots; and
- Existing High-Rise Apartment Buildings – Approximately ***957 units***.

1.3 Required Permits / Approvals

The City of Ottawa must approve detailed engineering design drawings and reports prior to construction of the municipal infrastructure identified in this report. Approvals are expected to occur as part of the approval process for *Planning Act* development applications.

The following additional approvals and permits listed in ***Table 1,*** below, may be required prior to construction of the municipal infrastructure detailed herein. Please note that other permits and approvals may be required and will be addressed at the detailed design stage.

Table 1: Anticipated Permit/Approval Requirements

Agency	Permit/Approval Required	Trigger	Remarks
MOECC	Environmental Compliance Approval	Construction of new sanitary, storm sewers, and potential stormwater management works.	The MOECC is expected to review the stormwater collection system and wastewater collection system by transfer of review submission.
City of Ottawa	MOECP Form 1 – Record of Watermains Authorized as a Future Alteration.	Construction of watermains.	The City of Ottawa is expected to review the watermains on behalf of the MOECP through the Form 1 – Record of Watermains Authorized as a Future Alteration.
City of Ottawa / Private Landowners	Permission/license to access/occupation and/or legal property instruments.	Construction of servicing infrastructure (e.g. storm sewer, overland flow route) beyond the FSR study area.	Construction activities and permanent infrastructure beyond the FSR study area may trigger legal agreements.

1.4 Pre-consultation

Pre-consultation correspondence, along with the servicing guidelines checklist, is located in ***Appendix A***.

2.0 GUIDELINES, PREVIOUS STUDIES, AND REPORTS

2.1 Existing Studies, Guidelines, and Reports

The following studies were utilized in the preparation of this report:

- **Ottawa Sewer Design Guidelines**,
  City of Ottawa, *SDG002,* October 2012.
  (City Standards)
  - **Technical Bulletin ISTB-2018-01**
    City of Ottawa, March 21, 2018.
    (*ISTB-2018-01*)
  - **Technical Bulletin ISTB-2018-03**
    City of Ottawa, March 21, 2018.
    (*ISTB-2018-03*)
- **Ottawa Design Guidelines – Water Distribution**
  City of Ottawa, July 2010.
  (Water Supply Guidelines)
  - **Technical Bulletin ISD-2010-2**
    City of Ottawa, December 15, 2010.
    (*ISD-2010-2*)
  - **Technical Bulletin ISDTB-2014-02**
    City of Ottawa, May 27, 2014.
    (*ISDTB-2014-02*)
  - **Technical Bulletin ISDTB-2018-02**
    City of Ottawa, March 21, 2018.
    (*ISDTB-2018-02*)
- **Design Guidelines for Sewage Works,**
  Ministry of the Environment, 2008.
  (MOE* Design Guidelines*)
- **Stormwater Planning and Design Manual,**
  Ministry of the Environment, March 2003.
  (SWMP Design Manual)
- **Ontario Building Code Compendium**
  Ministry of Municipal Affairs and Housing Building Development Branch, January 1, 2010 Update
  (OBC)

- **Geotechnical Investigation Report, Herongate 7 Proposed Development**
  WSP Canada Inc., April 2016.
  (Geotechnical Report)

- **Site Servicing Report**
  MMM Group Limited (Project No. 14-16012), March 2017.
  (Block 1 Servicing Report)

- **Stormwater Management Report**
  MMM Group Limited (Project No. 14-16012), March 2017.
  (Block 1 SWM Report)

- **Hydraulic Capacity and Modelling Analysis – Herongate Subdivision Redevelopment**
  GeoAdvice Engineering Ltd. (Project ID: 2019-027-DSE), April 2019.
  (GeoAdvice Report)

3.0 WATER SUPPLY SERVICING

3.1 Existing Water Supply Services

The subject property lies within the City of Ottawa 2W2C pressure zone, as shown by the Pressure Zone map in ***Appendix B***. Local 203 mm diameter watermains exists within the Baycrest Drive, Sandalwood Drive, and Cedarwood Drive right-of-ways. A 305 mm diameter watermain and a 450 mm diameter watermain exists within the Heron Road and Walkley Road rights-of-way respectively. Refer to drawing ***EX-WTR***, included in ***Drawings/Figures***, for an existing watermain layout.

3.2 Water Supply Servicing Design

Table 2, below, summarizes the ***Water Supply Guidelines*** employed in the preparation of the preliminary water demand estimate prepared by GeoAdvice Engineering. Hydraulic modelling is included in ***Appendix B***.

Table 2: Water Supply Design Criteria

Design Parameter	Value
Residential Townhouse	2.7 Persons/unit
Residential Average Apartment	1.8 Persons/unit
Residential Average Daily Demand	280 L/person/day
Minimum Hour Peaking Factor	0.60**
Maximum Day Peaking Factor	1.90**
Peak Hour Peaking Factor	2.85**
Minimum Watermain Size	150 mm diameter
Minimum Depth of Cover	2.4 m from top of watermain to finished grade
During normal operating conditions desired operating pressure is within	350 kPa and 480 kPa
During normal operating conditions pressure must not drop below	275 kPa
During normal operating conditions pressure must not exceed	552 kPa
During fire flow operating pressure must not drop below	140 kPa

Daily average based on Appendix 4-A from **Water Supply Guidelines*
*** Residential Max. Daily and Max. Hourly peaking factors per MOE Guidelines for Drinking-Water Systems Table 3-1 for more than 3,000 persons. -Table updated to reflect ISD-2010-2*

Table 3, below, summarizes the anticipated water supply demand for the contemplated development based on the ***Water Supply Guidelines***.

Table 3: Water Demand – Ultimate

Design Parameter	Anticipated Demand[1] (L/min)
Average Daily Demand	2,162
Max Day + Fire Flow	4,108 + 22,000 = 26,108
Peak Hour	6,162
1) Water demand calculation per ***Water Supply Guidelines***. See ***Appendix B*** for detailed calculations.	

Fire flow requirements are to be determined in accordance with the City of Ottawa ***Water Supply Guidelines*** and the Ontario Building Code. GeoAdvice used the ***FUS*** method to establish a conservative estimation of fire flow. Refer to ***Appendix B*** for detailed FUS calculations included in the ***GeoAdvice Report***.

The following construction parameters were coordinated with Dialog Designs:

- Type of construction – Non-Combustible Construction;
- Occupancy type – Limited Combustibility; and
- Sprinkler Protection – Supervised Sprinkler System

The above assumptions result in an estimated fire flow of approximately ***22,000 L/min***. A certified fire protection system specialist would need to be employed to design the buildings fire suppression systems and confirm the actual fire flow demand.

The existing 203 mm diameter watermains within the Baycrest Drive, Sandalwood Drive, and Cedarwood Drive right-of-ways are not sufficiently sized to accommodate the ultimate development and will need to be increased to 305 mm diameter watermains. Refer to hydraulic modelling included in ***Appendix B*** for further details.

It is contemplated to replace the existing watermain network with 305 mm diameter watermains. Phasing of replacement will be reviewed at the detailed design stage.

3.2.1 Boundary Conditions

The City of Ottawa was contacted to obtain boundary conditions associated with the estimated water demand, as indicated in the boundary request correspondence included in ***Appendix B***. An updated boundary condition request was sent to the City of Ottawa on April 4th, 2019 due to revised water demands, however a response was not received at the time of publication. The revised water demands contemplate a 10% reduction in comparison to the previously requested demands. The results presented in this report are based on the boundary conditions for the conditions received on January 19th, 2019.

The City provided both the anticipated minimum and maximum water pressures, as well as, the estimated water pressure during fire flow demand for the demands as indicated by the correspondence in ***Appendix B***.

- Connection 1: Heron Road at Baycrest Drive (300 mm diameter); and
- Connection 2: Heron Road at Sandalwood Drive (300 mm diameter).
- Connection 3: Walkley Road at Baycrest Drive (450 mm diameter); and
- Connection 4: Walkley Road at Cedarwood Drive (450 mm diameter).

The boundary conditions are summarized in ***Table 4*** and ***Table 5*** for all contemplated connections to both Heron Road and Walkley Road, respectively. The boundary conditions provided by the City of Ottawa are enclosed in ***Appendix B***.

Table 4: Boundary Conditions – Heron Road

	Connection 1 Heron Road at Baycrest Drive		Connection 2 Heron Road at Sandalwood Drive	
Condition	**HGL (m)**	**Pressure (psi)**	**HGL (m)**	**Pressure (psi)**
Maximum HGL	131.5	51.1	130.5	52.2
Peak Hour (min pressure)	123.0	39.0	122.5	40.8
Max Day + Fire (483 L/s)	120.5	35.4	120.5	38.0

Table 5: Boundary Conditions Walkley Road

	Connection 1 Walkley Road at Baycrest Drive		Connection 2 Walkley Road at Cedarwood Drive	
Condition	**HGL (m)**	**Pressure (psi)**	**HGL (m)**	**Pressure (psi)**
Maximum HGL	131.0	55.1	132.0	60.4
Peak Hour (min pressure)	123.0	43.8	131.0	58.9
Max Day + Fire (167 L/s)	122.5	43.1	122.5	46.8

As indicated in ***Table 4*** and ***Table 5***, above, the peak hour pressure at Connection 1 falls below the required operating condition pressure as specified by the ***Water Supply Guidelines***. It is anticipated that booster pumps will be required to meet the required building pressures during peak hour demands and will be confirmed at the detailed design stage.

3.2.2 Summary of Hydraulic Modeling Analysis

As discussed in *Section 3.2*, the existing 203 mm diameter watermains within the Baycrest Drive, Sandalwood Drive, and Cedarwood Drive right-of-ways are not

sufficiently sized to accommodate the ultimate development and will need to be increased to 300 mm diameter watermains.

A complete watermain analysis of the future 305 mm diameter watermain network has been prepared to confirm that the network is sized adequately. Refer to the ***GeoAdvice Report,*** enclosed in ***Appendix B.***

System Pressures

The modeling indicates that the development can be adequately serviced by the contemplated watermain network. Modeled service pressures for the development are summarized in ***Table 6.*** The detailed pipe and junction tables are contained in the ***GeoAdvice Report***, enclosed in ***Appendix B.***

Table 6: Summary of Available System Pressures

	Minimum Hour Demand Maximum Pressure		Peak Hour Demand Minimum Pressure	
	kPA	psi	kPA	psi
Phase 1 – Existing Pressure Zone Configuration	352	51	262	38

The generally accepted best practice is to design new water distribution systems to operate between 350 kPa (50 psi) and 480 kPa (70 psi) as outlined in the City of Ottawa Design Guidelines. During normal operating conditions pressures must not drop below 275kPa. As conservative values were made for elevation and population numbers when requesting boundary conditions, it is anticipated that peak hour demand will meet the minimum required pressure at all locations. Furthermore, contemplated units have been reduced since the initial boundary condition request was made on January 19th, 2019. The model will be updated upon receipt of updated boundary conditions at the reduced estimated demands.

Available Fire Flows

The minimum allowable pressure under fire flow conditions is 140 kPa (20 psi) at the location of the fire. A summary of the available fire flows is presented in ***Table 7***. The detailed fire flow reports are found in the ***GeoAdvice Report*** enclosed in ***Appendix B***.

Table 7: Summary of Available Fire Flows

	Required Fire Flow (L/s)	Minimum Available Flow (L/s)	Junction ID
Phase 1 – Existing Pressure Zone Configuration	333	556	J-06
	367	837	J-03

As shown in ***Table 7***, the model predicts the network will be able to provide all required fire flows under the proposed pressure zone configuration. Four hydrants will be required to provide a total flow of ***367 L/s***. As per *Table 18.5.4.3* in City in Ottawa Technical Bulletin ISTB-2018-02, one hydrant can deliver +/- 5,700 L/min if it is located within 75 m of the structure. Hydrant locations will be determined during the detailed design phase of this development and will be placed in accordance with City of Ottawa design guidelines. Detailed results are included in the ***GeoAdvice Report***, enclosed in ***Appendix B***.

3.3 Water Supply Conclusion

Anticipated water demand under proposed conditions was submitted to the City of Ottawa for establishing boundary conditions.

As indicated by the hydraulic model, the existing 203 mm diameter watermains within the Baycrest Drive, Sandalwood Drive, and Cedarwood Drive right-of-ways are not sufficiently sized to accommodate the ultimate development. It is contemplated that the existing watermains be replaced with 305 mm diameter watermains to service the ultimate build-out. Phasing to be reviewed at detailed design.

Based on the current boundary conditions provided by the City, booster pumps may be required in order to meet minimum pressure during peak hour demands. Booster pump requirement to be determined at detailed design stage.

DSEL employed a daily consumption rate of 280 L/person/day to align with the revised wastewater rates identified by City of Ottawa Technical Bulletin ISTB-2018-03. As a result, DSEL is submitting for a deviation from the ***Water Supply Guidelines***.

4.0 WASTEWATER SERVICING

4.1 Existing Wastewater Services

The subject site lies within the South Ottawa Collector Sewer catchment area, as shown by the City sewer mapping included in ***Appendix C***. The existing 300 mm diameter sanitary sewers located within the Heron Road and Walkley Road right-of-ways are available to service the contemplated development. Municipal infrastructure within Heron Road and Walkley Road is tributary to the South Ottawa Collector Sewer, which is located approximately 4.5 km and 4.6 km downstream, respectively.

There is an existing 300 mm diameter sanitary sewer located within the Albion Road right-of-way. Municipal infrastructure within Albion Road is tributary to the South Ottawa Collector Sewer, which is located approximately 430 m downstream.

The existing subdivision is currently serviced via the existing sanitary sewers within the Baycrest Drive, Cedarwood Drive, and Sandalwood Drive right-of-ways. Refer to drawing ***EXSAN,*** included in ***Drawings/Figures***, for a detailed layout. All sewer discharge to Walkley Road and Heron Road is ultimately tributary to the South Ottawa Collector sewer.

Table 8, below, demonstrates the estimated peak flow for the existing subdivision. See ***Appendix C*** for associated calculations.

Table 8
Summary of Estimated Peak Wastewater Flow – Existing Subdivision

Design Parameter	Total Flow (L/s)
Estimated Average Dry Weather Flow	10.04
Estimated Peak Dry Weather Flow	29.55
Estimated Peak Wet Weather Flow	**42.09**

4.2 Wastewater Design

Based on consultation with City staff, an HGL analysis for the contemplated development was prepared for the existing sanitary sewers within Heron Road and Walkley Road. As indicated by the hydraulic assessment, included in ***Appendix C*** for reference, there is approximately ***35 L/s*** and ***20 L/s*** of capacity currently available in the Heron Road and Walkley Road sanitary sewers, respectively. Once the existing buildings contemplated to be demolished are off-line, approximately ***62 L/s*** of capacity will be available within the Walkley Road sanitary sewer.

Based on coordination with the City, an infiltration rate of 0.55 L/s/ha has been applied to the existing subdivision for the purposes of estimating existing wastewater discharge.

In order to assess the available capacity, a sanitary analysis was conducted for the local municipal sanitary sewers located within the Albion Road right-of-way. The catchment

area serviced by the Albion Road sanitary sewer was identified and evaluated by reviewing existing development and zoning within the area. The analysis was conducted from the site to the upstream extents of the drainage area, located near the intersection of Colbert Crescent and Finn Court. An infiltration rate of 0.55 L/s/ha has been applied to recently constructed subdivision to the East, consistent with the City's HGL analysis.

Based on the sanitary analysis, the controlling section of the local sewer system is located at the intersection of Albion Road and Heatherington Road, with an available residual capacity of ***25.0 L/s***; detailed calculations are included in ***Appendix C***.

Due to the capacity constraints within the Heron Road, Walkley Road, and Albion Road sanitary sewers, the development is contemplated to be staged in three phases.

Table 9, below, summarizes the ***City Standards*** employed in the design of the proposed wastewater sewer system.

Table 9
Wastewater Design Criteria

Design Parameter	Value
Residential Townhome	2.7 L/person/d
Residential Bachelor Apartment	1.4 L/person/d
Residential 1 Bedroom Apartment	1.4 L/person/d
Residential 2 Bedroom Apartment	2.1 L/person/d
Residential 3 Bedroom Apartment	3.1 L/person/d
Residential Average Apartment	1.8 L/person/d
Residential Average Daily Demand	280 L/person/d
Residential Peaking Factor	Harmon's Peaking Factor. Max 4.0, Min 2.0 Harmon's Correction Factor 0.8
Infiltration and Inflow Allowance	0.05 L/s/ha (Dry Weather) 0.28 L/s/ha (Wet Weather) 0.33 L/s/ha (Total) 0.55 L/s/ha *
Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} AR^{2/3} S^{1/2}$
Minimum Sewer Size	200 mm diameter
Minimum Manning's 'n'	0.013
Minimum Depth of Cover	2.5 m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6 m/s
Maximum Full Flowing Velocity	3.0 m/s
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012. *Infiltration Rate for Existing Subdivision based on consultation with the City of Ottawa.	

4.2.1 Wastewater Design – Phase I

The contemplated Phase I development includes the construction of Block 1. As indicated by the Site Servicing Report (***Block 1 Servicing Report***), prepared by MMM Group and dated March 2017, the Block 1 development is proposed to be serviced via the existing

300 mm diameter sanitary sewer within the Heron Road right-of-way. The peak wet weather flow rate for the Block 1 development was estimated to be ***10.75 L/s***.

The contemplated Phase I development includes the construction of Block 2. It is contemplated that Block 2 will be serviced via the existing 300 mm diameter sanitary sewer within the Heron Road right-of-way. As indicated by ***Table 10,*** below, the estimated peak wet weather flow rate for Block 2 is ***13.79 L/s***. Refer to ***Appendix C*** for detailed calculations and ***Drawings/Figures*** for drawing ***SAN-1*** for the detailed Phase sanitary servicing layout.

It is anticipated that no modifications to the existing sanitary sewers within Baycrest Drive, Cedarwood Drive, Sandalwood Drive, Heron Road, and Walkley Road will be required to support the Phase I development. The apartment buildings to be retained will continue to be serviced via the sanitary sewers within Baycrest Drive and Cedarwood Drive, which are ultimately tributary to the Walkley Road sanitary sewer.

Table 10, below, demonstrates the anticipated peak flow from the Phase I development. See ***Appendix C*** for associated calculations.

Table 10
Summary of Estimated Peak Wastewater Flow – Phase I

		Design Parameter		
Development Block	**Outlet**	**Estimated Average Dry Weather Flow (L/s)**	**Estimated Peak Dry Weather Flow (L/s)**	**Estimated Peak Wet Weather Flow (L/s)**
Block 1*	Heron Road	-	-	10.75
Block 2	Heron Road	5.24	13.02	13.79
Total	Heron Road	-	-	**24.54**
2850 & 2870 Cedarwood Drive	Walkley Road	3.29	8.08	8.87
2840 Baycrest Drive	Walkley Road	0.76	1.91	1.93
2851 Baycrest Drive	Walkley Road	0.88	2.14	2.40
2861 Baycrest Drive	Walkley Road	1.18	2.90	3.16
Total	Walkley Road	-	-	**16.34**
As indicated by the **Block 1 Servicing Report prepared by MMM Group Limited.*				

As summarized by ***Table 10,*** above, the total estimated sanitary flow, based on the Concept Plan provided in ***Drawings/Figures,*** anticipates a peak wet weather flow of ***24.54 L/s*** to the Heron Road sanitary sewer. Based on consultation with City staff, the available capacity within the Heron Road sanitary sewer is ***35 L/s***; the residual capacity after the Phase I development is estimated to be ***10.46 L/s***.

As summarized by ***Table 10,*** above, the total estimated peak wet weather sanitary flow tributary to the existing sanitary sewer within Walkley Road is ***16.34 L/s***. Based on

consultation with City staff, the available capacity within the Walkley Road is ***62.09 L/s***; the residual capacity after the Phase I development is estimated to be ***45.73 L/s***.

4.2.2 Wastewater Design – Phase II

The contemplated Phase II development includes the construction of Block 3. It is contemplated that Block 3 will be serviced via the existing 250 mm diameter sanitary sewer within the Sandalwood Drive right-of-way. As indicated by ***Table 11,*** below, the estimated peak wet weather flow rate for Block 3 is ***14.23 L/s***.

The contemplated Phase II development also includes the construction of Block 8. It is contemplated that Block 8 will be serviced via the existing 250 mm diameter sanitary sewer within the Baycrest Drive right-of-way. As indicated by ***Table 11,*** below, the estimated peak wet weather flow rate for Block 8 is ***17.26 L/s***.

Additionally, the contemplated Phase II development includes the construction of Block 9. It is contemplated that Block 9 will be serviced via the existing 250 mm diameter sanitary sewer within the Baycrest Drive right-of-way. As indicated by ***Table 11,*** below, the estimated peak wet weather flow rate for Block 9 is ***12.48 L/s***. Refer to ***Appendix C*** for detailed calculations and drawing ***SAN-2*** (included in ***Drawings/Figures***) for the detailed Phase II sanitary servicing layout.

In order to accommodate Blocks 8 and 9 modifications will be required to the existing sewer within the Baycrest Drive right-of-way. The existing sewer located between Sandalwood Drive and Walkley Road will require a 300 mm diameter sanitary sewer to provide capacity to the contemplated Phase II development.

It is anticipated that no modifications to the existing sanitary sewers within Cedarwood Drive, Sandalwood Drive, Heron Road, and Walkley Road will be required to support the Phase II development. The apartment buildings that are to be retained will continue to be serviced via the sanitary sewers within Baycrest Drive and Cedarwood Drive, which are ultimately tributary to the Walkley Road sanitary sewer.

Table 11, below, demonstrates the anticipated peak flow from the Phase II development. See ***Appendix C*** for associated calculations.

Table 11
Summary of Estimated Peak Wastewater Flow – Phase II

		Design Parameter		
Development Block	**Outlet**	**Estimated Average Dry Weather Flow (L/s)**	**Estimated Peak Dry Weather Flow (L/s)**	**Estimated Peak Wet Weather Flow (L/s)**
Block 3	Walkley Road	5.55	13.93	14.23
Block 8	Walkley Road	6.62	16.51	17.26
Block 9	Walkley Road	4.79	11.93	12.48
Total	Walkley Road	**16.96**	**42.37**	**43.98**

The residual capacity within the Walkley Road sanitary sewer is ***45.73 L/s*** after the Phase II development. As summarized by ***Table 11,*** above, the total estimated sanitary flow, based on the Concept Plan provided in ***Drawings/Figures,*** anticipates a peak wet weather flow of ***43.98 L/s*** to the Walkley Road sanitary sewer. As a result, it is estimated that approximately ***1.75 L/s*** of available capacity will be available after the Phase II development is complete.

4.2.3 Wastewater Design – Phase III

The contemplated Phase III development includes the construction of Block 4. It is contemplated that Block 4 will be serviced via the existing 250 mm diameter sanitary sewer within the Cedarwood Drive right-of-way. As indicated by ***Table 8,*** which follows, the estimated peak wet weather flow rate for Block 4 is ***7.95 L/s***.

It is contemplated that the existing apartment building at 2840 Baycrest Drive will maintain the existing connection to the 250 mm diameter sanitary sewer within the Baycrest Drive right-of-way. As indicated by ***Table 12***, the estimated peak wet weather flow rate for 2840 Baycrest Drive is ***1.93 L/s***.

The contemplated Phase III development also includes the construction of Block 5. It is contemplated that Block 5 will be serviced via the existing 250 mm diameter sanitary sewer within the Cedarwood Drive right-of-way. As indicated by ***Table 12,*** the estimated peak wet weather flow rate for Block 5 is ***1.69 L/s***.

Based on the Concept Plan, prepared by Dialog Design and included in ***Drawings/Figures***, the contemplated development within Block 5 will require modifications to the existing sanitary sewer, located north of the 2850 Cedarwood Drive. The existing sewer is currently providing servicing to the apartment building that is contemplated to remain. No modifications to the existing service connection to 2870 Cedarwood Drive are contemplated. It is contemplated that the afore mentioned existing apartment buildings will be serviced via the existing 250 mm diameter sanitary sewer within the Cedarwood Drive right-of-way. As indicated by ***Table 12,*** the estimated peak wet weather flow rate for 2850 & 2870 Cedarwood Drive is ***8.87 L/s***.

The contemplated Phase III development also includes the construction of Block 6. It is contemplated that Block 6 will be serviced via the existing 250 mm diameter sanitary sewer within the Cedarwood Drive right-of-way. As indicated by ***Table 12,*** the estimated peak wet weather flow rate for Block 6 is ***4.85 L/s***.

Additionally, the contemplated Phase III development includes the construction of Block 7. It is contemplated that Block 7 will be serviced via the future 300 mm diameter sanitary sewer within the Walkley Road right-of-way, which is ultimately tributary to the future 300 mm diameter sanitary sewer within Albion Road. As indicated by ***Table 12,*** the estimated peak wet weather flow rate for Block 7 is ***9.40 L/s***; refer to ***Drawings/Figures*** for detailed calculations and drawing ***SAN-3*** for the detailed Phase III sanitary servicing layout.

Table 12, below, demonstrates the anticipated peak flow from the contemplated Phase III development. See ***Appendix C*** for associated calculations.

Table 12
Summary of Estimated Peak Wastewater Flow – Phase III

		Design Parameter		
Development Block	**Outlet**	**Estimated Average Dry Weather Flow (L/s)**	**Estimated Peak Dry Weather Flow (L/s)**	**Estimated Peak Wet Weather Flow (L/s)**
Block 4	Albion Road	3.03	7.54	7.95
Block 5*	Albion Road	0.67	1.69	1.69
Block 6	Albion Road	1.63	3.94	4.58
Block 7	Albion Road	3.63	9.06	9.40
2850 & 2870 Cedarwood Drive	Albion Road	3.29	8.08	8.87
2840 Baycrest Drive	Albion Road	0.76	1.91	1.93
Total	Albion Road	**13.01**	**32.22**	**34.42**
**Infiltration rate account for in 2850 & 2870 Cedarwood Drive Analysis*				

As discussed in *Section 4.2*, ***25.02 L/s*** of capacity is available within the existing 300 mm diameter sanitary sewer within the Albion Road right-of-way, which is tributary to the South Ottawa Collector Trunk sewer. ***Table 12,*** above, indicates that the anticipated peak wet weather flow rate for the Phase III development is ***34.42 L/s***.

Based on consultation with City staff, a connection to the existing Albion Road sanitary sewer is available to service the development. As illustrated by drawing ***SAN-4,*** included in ***Drawings/Figures***, a 300 mm diameter sanitary sewer extension is contemplated within the Walkley Road and Albion Road right-of-ways to support the Phase III development. In addition, the existing 300 mm diameter sanitary sewer within Albion Road is expected to be upsized to a 375 mm diameter sanitary sewer, up to the connection to the South Ottawa Collector Trunk sewer. Refer to drawing ***SAN-3*** and ***SAN-4,*** both located in ***Drawings/Figures*** or accompanying this report, for further details.

Once the Phase III development has been completed, the residual capacity within the Heron Road, Walkley Road, and Albion Road sanitary sewers is estimated to be ***10.46 L/s***, ***12.55 L/s***, and ***4.71 L/s***, respectively. The analysis above indicates that sufficient capacity is available in the local sewers to accommodate the contemplated development.

4.3 Wastewater Servicing Conclusions

The site is tributary to the South Ottawa Trunk Collector sewer; the existing subdivision is currently serviced via existing sanitary sewers within the Baycrest Drive, Sandalwood Drive, and Cedarwood Drive right-of-ways.

The contemplated Phase I development includes the construction of Block 1 and Block 2. Both developments are contemplated to be serviced via the existing 300 mm diameter sanitary sewer within Heron Road.

The contemplated Phase II development includes the construction of Block 3, Block 8, and Block 9. Block 3 is contemplated to be serviced via the existing 250 mm diameter sanitary sewer within Sandalwood Drive, Block 8 is contemplated to be serviced via the existing 250 mm diameter sanitary sewer within Baycrest , and Block 9 is contemplated to be serviced via the existing 250 mm diameter sanitary sewer within Baycrest Drive. The existing buildings located at 2840 Baycrest Drive and 2860 Baycrest Drive are to remain and will continue to discharge wastewater to the existing sewers within Baycrest Drive.

The contemplated Phase III development includes the construction of Block 4, Block 5, Block 6, and Block 7. Block 4, Block 5 and Block 6 are contemplated to be serviced via the existing 250 mm diameter sanitary sewer within Cedarwood Drive. Block 7 is contemplated to be serviced via the future 300 mm diameter sanitary sewer within Walkley Road. The existing buildings located at 2851 Baycrest Drive, 2850 Cedarwood Drive, and 2870 Cedarwood Drive are to remain and will contribute wastewater to the sanitary sewer within Baycrest Drive and Cedarwood Drive, ultimately tributary to the future Albion Road sanitary sewer.

The ultimate development contemplates replacing the existing sanitary sewer within Baycrest Drive and Albion Road with a 300 mm diameter sanitary sewer and contemplates the construction of a new sanitary sewer within Walkley Road and Albion Road.

The proposed wastewater design conforms to all relevant ***City Standards***.

5.0 STORMWATER MANAGEMENT

5.1 Existing Stormwater Services

Stormwater runoff from the subject property is tributary to the City of Ottawa sewer system and is located within the Ottawa Central sub-watershed. As such, approvals for proposed development within this area are under the approval authority of the City of Ottawa.

Flows that influence the watershed in which the subject property is located are further reviewed by the principal authority. The subject property is located within the Ottawa River watershed, and is therefore subject to review by the Rideau Valley Conservation Authority (RVCA). Consultation with the RVCA is located in ***Appendix A***.

The existing subdivision is serviced via the existing storm sewers within the Baycrest Drive, Cedarwood Drive, and Sandalwood Drive right-of-ways. Refer to drawing ***EXSTM,*** included in ***Drawings/Figures***, for a detailed layout.

5.2 Post-development Stormwater Management Target

Stormwater management requirements for the proposed development were reviewed with the City of Ottawa, where the proposed development is required to:

- Meet allowable release rates based on a Rational Method Coefficient of 0.50, employing the City of Ottawa IDF parameters for a 2-year storm with a calculated time of concentration;
- Attenuate all storms up to and including the City of Ottawa 100-year design event on site; and
- Quality controls are not anticipated to be required for the contemplated development due to the site's distance from the outlet; correspondence with the RVCA is included in ***Appendix A***.

An existing storm sewer calculation sheet was prepared for the local sewers in order to estimate the time of concentration for the municipal sewers within the Baycrest Drive, Sandalwood Drive, and Cedarwood Drive right-of-ways. The anticipated time of concentration for the existing subdivision to outlet to the existing 900 mm diameter storm sewer within Walkley Road is ***16.7*** minutes.

Based on the above the allowable release rate for the proposed development is ***80.7 L/s/ha***.

Table 13, below, summarizes the allowable release rates and estimated drainage area for each Block of the contemplated development.

Table 13
Stormwater Allowable Release Rate

Development Block	Estimated Drainage Area	Allowable Release Rate
	(ha)	(L/s)
Block 1*	-	158.8
Block 2	2.78	223.9
Block 3	2.95	237.9
Block 4	2.11	170.2
Block 5	2.80	226.3
Block 6	2.29	184.9
Block 7	1.22	98.5
Block 8	2.68	216.5
Block 9	1.98	159.6
Total	**-**	**1,576.6**
*As Per ***Block 1 SWM Report*** prepared by MMM Group Limited.		

5.3 Proposed Stormwater Management System – Phase I

To meet the stormwater objectives the contemplated Phase I development may contain a combination of roof top flow attenuation along with surface and subsurface storage.

The contemplated Phase I development includes the construction of Block 1. As indicated by the Site Servicing Report (***Block 1 SWM Report***), prepared by MMM Group and dated March 2017, the Block 1 development is proposed to be serviced via the existing 900 mm diameter storm sewer within the Heron Road right-of-way. Refer to the ***Block 1 SWM Report*** for further details.

The contemplated Phase I development also includes the construction of Block 2. It is contemplated that Block 2 will be serviced via the existing 450 mm diameter storm sewer within the Baycrest Drive right-of-way. Refer to ***Drawings/Figures*** for both the detailed calculations and drawing ***STM-1*** for a detailed Phase I servicing layout.

It is anticipated that no modifications to the existing storm sewers within Baycrest Drive, Cedarwood Drive, Sandalwood Drive, Heron Road, and Walkley Road are required to support the Phase I development. The apartment buildings that are to be retained will continue to be serviced via the storm sewers within Baycrest Drive and Cedarwood Drive, which are ultimately tributary to Walkley Road.

Table 14, summarizes post-development flow rates. The following storage requirement estimate assumes that approximately 10% of the development area will be directed to the outlet without flow attenuation. These areas will be compensated for in areas with flow attenuation controls.

Table 14
Stormwater Flow Rate Summary – Phase I

Control Area	5-Year Release Rate	5-Year Storage	100-Year Release Rate	100-Year Storage
	(L/s)	(m^3)	(L/s)	(m^3)
Block 2	111.7	485.31	223.90	969.8

As summarized by ***Table 14,*** above, approximately ***969.8 m^3*** of storage will be required for Block 2 in order to meet the target release rate established in *Section 5.2.*

Actual storage volumes will need to be confirmed at the detailed design stage based on a number of factors including grading constraints.

5.4 Proposed Stormwater Management System – Phase II

To meet the stormwater objectives the contemplated Phase II development may contain a combination of roof top flow attenuation, along with surface and subsurface storage.

It is anticipated that no modifications to the existing storm sewers within Baycrest Drive, Cedarwood Drive, Sandalwood Drive, Heron Road, and Walkley Road are required to support the Phase II development. The apartment buildings located at 2840 Baycrest Drive, 2850 Cedarwood Drive, and 2870 Cedarwood Drive will continue to be serviced via the storm sewers within Baycrest Drive and Cedarwood Drive, which are ultimately tributary to the Walkley Road storm sewer.

The contemplated Phase II development includes the construction of Block 3, 8, and 9. It is contemplated that Block 3, including 2851 & 2861 Baycrest Drive, will be serviced via the existing 525 mm diameter storm sewer within the Sandalwood Drive right-of-way; Block 8 will be serviced via the existing 750 mm diameter storm sewer within the Baycrest Drive right-of-way; and Block 9 will be serviced via the existing 750 mm diameter storm sewer within Baycrest right-of-way. Refer to ***Appendix D*** for detailed calculations and ***Drawings/Figures*** for drawing ***STM-2***, which indicates a detailed Phase II servicing layout.

Table 15, below, summarizes post-development flow rates. The following storage requirement estimate assumes that approximately 10% of the development area will be directed to the outlet without flow attenuation. These areas will be compensated for in areas with flow attenuation controls.

Table 15
Stormwater Flow Rate Summary – Phase II

Control Area	5-Year Release Rate	5-Year Storage	100-Year Release Rate	100-Year Storage
	(L/s)	(m^3)	(L/s)	(m^3)
Block 3 *	118.7	515.62	237.89	1030.3
Block 8	108.0	469.24	216.49	937.7
Block 9	79.6	345.96	159.61	691.3
Total	**306.3**	**1330.82**	**613.99**	**2658.9**

Actual storage volumes need to be confirmed at the detailed design stage based on a number of factors, including grading constraints.

5.5 Proposed Stormwater Management System – Phase III

To meet the stormwater objectives the contemplated Phase III development may contain a combination of roof top flow attenuation along with surface and subsurface storage.

The contemplated Phase III development includes the construction of Block 4, 5, 6, and 7. It is anticipated that modifications to the existing storm sewers within Cedarwood Drive will be required to support the Phase III development. Refer to drawing ***STM-3***, included for a detailed servicing layout.

It is contemplated that Block 4, including 2840 Baycrest Drive, will be serviced via the future 750 mm diameter storm sewer within the Cedarwood Drive right-of-way. It is contemplated that Block 5, including 2850 & 2870 Cedarwood Drive, will be serviced via the future 825 mm diameter storm sewer within the Cedarwood Drive right-of-way. In addition, it is proposed that Block 6 and Block 7 will be serviced via the future 750 mm diameter storm sewer and the future 900 mm diameter storm sewer within the Cedarwood Drive right-of-way. Refer to ***Appendix D*** for detailed calculations and ***Drawings/Figures*** for drawing ***STM-3***, which indicates a detailed Phase III servicing layout.

Table 16, below, summarizes post-development flow rates. The following storage requirement estimate assumes that approximately 10% of the development area will be directed to the outlet without flow attenuation. These areas will be compensated for in areas with flow attenuation controls.

Table 16
Stormwater Flow Rate Summary – Phase III

Control Area	5-Year Release Rate	5-Year Storage	100-Year Release Rate	100-Year Storage
	(L/s)	(m^3)	(L/s)	(m^3)
Block 4	85.0	369.00	170.24	737.3
Block 5	112.9	490.43	226.27	980.0
Block 6	92.3	400.77	184.90	800.8
Block 7	49.1	213.48	98.49	426.6
Total	**339.3**	**1473.68**	**679.9**	**2944.7**

Actual storage volumes need to be confirmed at the detailed design stage based on a number of factors, including grading constraints.

5.6 Stormwater Servicing Conclusions

Post development stormwater runoff will be required to be restricted to the allowable target release rate for storm events up to and including the 100-year storm in accordance with City of Ottawa ***City Standards***. The post-development allowable release rate was calculated as ***80.7 L/s/ha*** based on consultation with the City of Ottawa.

To meet the stormwater objectives the contemplated Phase I, Phase II and Phase III development may contain a combination of roof top flow attenuation along with surface and subsurface storage.

Actual storage volumes need to be confirmed at the detailed design stage based on a number of factors including grading constraints.

Quality controls are not anticipated to be required for the contemplated development due to the site's distance from the outlet.

The proposed stormwater design conforms to all relevant ***City Standards*** and Policies for approval.

6.0 UTILITIES

Gas, Hydro services currently exist within the Cedarwood Drive, Sandalwood Drive, Baycrest Drive, Walkley Road, and Heron Road right-of-ways. Utility servicing will be coordinated with the individual utility companies prior to site development.

7.0 EROSION AND SEDIMENT CONTROL

Soil erosion occurs naturally and is a function of soil type, climate and topography. The extent of erosion losses is exaggerated during construction where vegetation has been removed and the top layer of soil becomes agitated.

Prior to topsoil stripping, earthworks or underground construction, erosion and sediment controls will be implemented and will be maintained throughout construction.

Silt fence will be installed around the perimeter of the site and will be cleaned and maintained throughout construction. Silt fence will remain in place until the working areas have been stabilized and re-vegetated.

Catch basins will have filter fabric installed under the grate during construction to protect from silt entering the storm sewer system.

A mud mat will be installed at the construction access in order to prevent mud tracking onto adjacent roads.

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

- Limit extent of exposed soils at any given time;
- Re-vegetate exposed areas as soon as possible;
- Minimize the area to be cleared and grubbed;
- Protect exposed slopes with plastic or synthetic mulches;
- Install silt fence to prevent sediment from entering existing ditches;
- No refueling or cleaning of equipment near existing watercourses;
- Provide sediment traps and basins during dewatering;
- Install filter cloth between catch basins and frames;
- Plan construction at proper time to avoid flooding; and
- Establish material stockpiles away from watercourses, so that barriers and filters may be installed.

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

- Verification that water is not flowing under silt barriers; and
- Clean and change filter cloth at catch basins.

8.0 CONCLUSION AND RECOMMENDATIONS

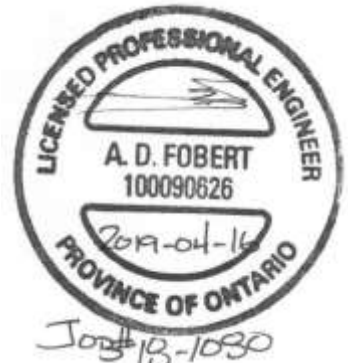
David Schaeffer Engineering Ltd. (DSEL) has been retained by Timbercreek to prepare a Functional Servicing and Stormwater Management report in support of the application for a Plan of Subdivision for the Heron Gate community. The preceding report outlines the following:

- The development is contemplated to be completed in three phases. Modifications to the local watermain, sanitary sewer, and storm sewer will be required to support the ultimate development;
- An updated boundary condition request was sent to the City of Ottawa however were not received at the time of publication;
- The FUS method for estimating fire flow indicated a maximum fire flow of ***22,000 L/min*** is required for the contemplated development;
- Based on the sanitary analysis conducted the existing municipal sewer infrastructure has sufficient capacity to support the development;
- Based on consultation with the City of Ottawa, the contemplated development will be required to attenuate post development flows to an equivalent release rate of ***80.7 L/s/ha*** for all storms up to and including the 100-year storm event;
- It is contemplated that stormwater objectives may be met through storm water retention via roof top, surface and subsurface storage to attenuate flow to the established release rate above and will be confirmed at the detailed design stage;
- Quality controls are not anticipated to be required for the contemplated development due to the site's distance from the outlet;
- Any development on the subject property may require Ontario Water Resources Act (OWRA) s.53 approval from the Ministry of the Environment (MOECP) for sanitary and stormwater discharge.

Prepared by,
David Schaeffer Engineering Ltd.

Per: Alison J. Gosling, EIT

Reviewed by,
David Schaeffer Engineering Ltd.



Per: Adam D. Fobert, P.Eng

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APPENDIX A

Pre-Consultation

DEVELOPMENT SERVICING STUDY CHECKLIST

18-1080 11/04/2019

4.1 General Content		
☐	Executive Summary (for larger reports only).	N/A
☒	Date and revision number of the report.	Report Cover Sheet
☒	Location map and plan showing municipal address, boundary, and layout of proposed development.	Drawings/Figures
☒	Plan showing the site and location of all existing services.	EX-WTR, EX-SAN, EX-STM
☒	Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	Section 1.0
☒	Summary of Pre-consultation Meetings with City and other approval agencies.	Section 1.3
☒	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.	Section 2.1
☒	Statement of objectives and servicing criteria.	Section 1.0
☒	Identification of existing and proposed infrastructure available in the immediate area.	Sections 3.1, 4.1, 5.1
☐	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).	N/A
☐	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.	N/A
☐	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.	N/A
☐	Proposed phasing of the development, if applicable.	N/A
☒	Reference to geotechnical studies and recommendations concerning servicing.	Section 1.4
☐	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	N/A

4.2 Development Servicing Report: Water		
☐	Confirm consistency with Master Servicing Study, if available	N/A
☒	Availability of public infrastructure to service proposed development	Section 3.1
☒	Identification of system constraints	Section 3.1
☒	Identify boundary conditions	Section 3.1, 3.2
☒	Confirmation of adequate domestic supply and pressure	Section 3.3

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☒	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.	Section 3.2
☐	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.	N/A
☐	Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design	N/A
☐	Address reliability requirements such as appropriate location of shut-off valves	N/A
☐	Check on the necessity of a pressure zone boundary modification	N/A
☒	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	Section 3.2, 3.3
☐	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.	N/A
☐	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.	N/A
☒	Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Section 3.2
☐	Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	N/A

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).	Section 4.2
☐	Confirm consistency with Master Servicing Study and/or justifications for deviations.	N/A
☐	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.	N/A
☒	Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Section 4.1
☒	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)	Section 4.2
☒	Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	Section 4.2, Appendix C
☒	Description of proposed sewer network including sewers, pumping stations, and forcemains.	Section 4.2
☐	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).	N/A

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☐	Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	N/A
☐	Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	N/A
☐	Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	N/A
☐	Special considerations such as contamination, corrosive environment etc.	N/A

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)	Section 5.1
☒	Analysis of available capacity in existing public infrastructure.	Section 5.1, Appendix D
☒	A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	Drawings/Figures
☒	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.	Section 5.2
☒	Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Section 5.2
☒	Description of the stormwater management concept with facility locations and descriptions with references and supporting information	Section 5.3
☐	Set-back from private sewage disposal systems.	N/A
☐	Watercourse and hazard lands setbacks.	N/A
☒	Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	Appendix A
☐	Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	N/A
☒	Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).	Section 5.3
☐	Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	N/A
☒	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.	Section 5.1, 5.3
☐	Any proposed diversion of drainage catchment areas from one outlet to another.	N/A
☐	Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	N/A
☐	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.	N/A
☐	Identification of potential impacts to receiving watercourses	N/A
☐	Identification of municipal drains and related approval requirements.	N/A

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☒	Descriptions of how the conveyance and storage capacity will be achieved for the development.	Section 5.3
☐	100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	N/A
☐	Inclusion of hydraulic analysis including hydraulic grade line elevations.	N/A
☒	Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Section 6.0
☐	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.	N/A
☐	Identification of fill constraints related to floodplain and geotechnical investigation.	N/A

4.5 Approval and Permit Requirements: Checklist

☒	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 ct. 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.	Section 1.2
☐	Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	N/A
☐	Changes to Municipal Drains.	N/A
☐	Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	N/A

4.6 Conclusion Checklist

☒	Clearly stated conclusions and recommendations	Section 8.0
☐	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	

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

MEMO

Date: March 13, 2015

To / Destinataire	Kersten Nitsche, Planner
From / Expéditeur	Cody Oram, Project Manager, Infrastructure Approvals
Subject / Objet	**Pre-Application Consultation** **Herongate Re-Development & Ward No.18,**

File No. PC2015-0068

Please note the following information regarding the engineering design submission for the above noted site in view of a Site Plan Application being applied for:

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

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

3. 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).

4. The Stormwater Management Criteria, for individual subject sites submitted for site plan application, is to be based on the following:

i. The storm event using the IDF information derived from the Meteorological Services of Canada rainfall data, taken from the MacDonald Cartier Airport, collected 1966 to 1997.
ii. The public separated sewer system within the site limits is built pre-1970; and therefore the design of the storm sewers are based on a 2 year storm.
iii. 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.
iv. The pre-development runoff coefficient or a maximum equivalent 'C' of 0.5, whichever is less.
v. A calculated time of concentration (Cannot be less than 10 minutes).
vi. The City's downstream storm system outfalls to the Mather Award Drain and the subject site is located within the Greens Creek Study Area. Please contact Jocelyn Chandler, Planner, RVCA (jocelyn.chandler@rvca.ca) regarding water quality treatment.

Note: There may be area specific SWM Criteria that may apply. Check for any related SWM &/or Sub-watershed studies that may have been completed.

5. Services (Storm, Sanitary & Water Supply)
   i. The existing area currently is serviced with a combination of private and public infrastructure within the site limits. The public infrastructure within Baycrest Dr., Sandalwood Dr., and Cedarwood Dr. connect to the public infrastructure within Walkley Road. The area is to maintain the existing drainage patterns and continue to utilize the connections to Walkley Road. A master servicing study needs to be conducted to confirm that the existing public infrastructure within the development limits can accommodate the anticipated increase in demand from the future ultimate build out.
   ii. No new connections to the Central Walkley Trunk storm sewer east of the Baycrest Dr. and Walkley Rd. intersection will be permitted.

6. Water Boundary condition requests must include the location of the service and the expected loads required by the proposed development. Please provide the following information:
   i. Location of service
   ii. Type of development and the amount of fire flow required.
   iii. Average daily demand: ___ l/s.
   iv. Maximum daily demand: ___l/s.
   v. Maximum hourly daily demand: ___ l/s.

7. Guide for completing Phase One and Two Environmental Site Assessments under Ontario Regulation 153/04.

Should you have any questions or require additional information, please contact me directly at (613) 580-2424, x 13422 or by email at cody.oram@ottawa.ca .

Alison Gosling

From: Alison Gosling
Sent: Tuesday, April 2, 2019 1:43 PM
To: 'Jamie Batchelor'
Cc: 'Eric Lalande'
Subject: 18-1080 Heron Gate Community

Good afternoon,

We wanted to touch base with you regarding the re-development of Heron Gate community.

The development involves the construction of a fifteen high-rise apartment buildings, thirty medium-rise apartment buildings, and 314 townhomes. In addition to the new construction, the development will retain 5 existing apartment towers.

The development proposes to outlet to the existing storm sewer within Walkley Road. The existing storm sewer travels approximately ***6.0 km*** to an outlet into the stormwater pond located near the Hunt Club Road and Hawthorne Road intersection.

It is anticipated that stormwater quality controls are not required as the development due to the distance to the outlet. Can you please confirm?

Thank you,

Alison Gosling, E.I.T.
Junior Project Manager

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext.542
cell: (343) 542-9218
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APPENDIX B

Water Supply

Herongate
Contemplated Site Conditions
City of Ottawa - Boundary Condition Conversions

Boundary Conditions Unit Conversion

Connection 1 (Heron)
Grnd Elev 95.62

	m H_2O	PSI	kPa
Avg. Day	**131.5**	51.1	352.0
Peak Hour	**123**	39.0	268.6
Max Day + FF	**120.5**	35.4	244.1

Connection 2 (Heron)
Grnd Elev 93.82

	m H_2O	PSI	kPa
Avg. Day	**130.5**	52.2	359.8
Peak Hour	**122.5**	40.8	281.4
Max Day + FF	**120.5**	38.0	261.7

Connection 3 (Walkley)
Grnd Elev 92.24

	m H_2O	PSI	kPa
Avg. Day	**131**	55.1	380.2
Peak Hour	**123**	43.8	301.8
Max Day +	**122.5**	43.1	296.9

Connection 4 (Walkley)
Grnd Elev 89.58

	m H_2O	PSI	kPa
Avg. Day	**132**	60.4	416.1
Peak Hour	**131**	58.9	406.3
Max Day +	**122.5**	46.8	322.9

Alison Gosling

From: Baker, Adam <adam.baker@ottawa.ca>
Sent: Wednesday, January 30, 2019 3:30 PM
To: Alison Gosling; Oram, Cody
Subject: RE: 18-1080 Heron Gate - Boundary Condition Request
Attachments: 1080 Heron Gate Jan 2019.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Hello,

Please find attached your boundary conditions:

The following are boundary conditions, HGL, for hydraulic analysis at 1080 Heron Gate (zone 2C) assumed to be connected to the 406mm on Walkley and 305mm on Heron Rd

(see attached PDF for location).

***Note**: Demands assumed split evenly between the four connections. Fire flow of 483 L/s was assigned to a node in the middle of the development.*

	Connection 1	Connection 2	Connection 3	Connection 4
Min HGL	123.0m	122.5m	123.0m	123.5m
Max HGL	131.5m	130.5m	131.0m	132.0m
MaxDay + FireFlow (483 L/s)*	120.5m	120.5m	122.5m	123.0m

**Resulting fire flow HGL assuming the fire flow of 483L/s is assigned to a node in the middle of the development*

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,

Adam Baker, EIT
Engineering Intern

Planning, Infrastructure and Economic Development Department - Services de la planification, de l'infrastructure et du développement économique
Development Review - South 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 26552, Adam.Baker@ottawa.ca

From: Alison Gosling <AGosling@dsel.ca>
Sent: Saturday, January 19, 2019 11:17 AM
To: Oram, Cody <Cody.Oram@ottawa.ca>; Baker, Adam <adam.baker@ottawa.ca>
Subject: 18-1080 Heron Gate - Boundary Condition Request

Good morning Cody and Adam,

We would like to request water boundary conditions for Heron Road/Walkley Road using the following proposed development demands:

1. Location of Service / Street Number: Heron Gate Community including:

   Heron Road and Baycrest Drive – 2816 Heron Road / Baycrest Drive / Cedarwood Drive / Sandalwood Drive / Walkley Road (Heron Walkley Park to Sandalwood Park)

2. Type of development and the amount of fire flow required for the proposed development:

   - The development would include approximately ***314 townhomes***, and approximately ***5109 units*** within multiple low-rise/high-rise condominiums/apartments with underground parking. The existing apartment buildings that are proposed to remain contain ***956 units.*** This is a multiple phase development and all site statistics are based on a high level conceptual plan.

   - It is anticipated that the development will have maintain multiple connection to be serviced from the existing 305mm diameter watermain within the Heron Road. right-of-way, as well as maintaining multiple connection to the existing 406mm diameter watermain within Walkley Road shown by the attached map.

   - Fire demand based on Technical Bulletin ISTB-2018-02 has been used to calculate an estimate the max fire demand of ***29,000 L/min***. Refer to the attached for detailed calculations.

	L/min	L/s
Avg. Daily	2389.7	39.83
Max Day	5974.3	99.57
Peak Hour	13143.5	219.06

If you have any questions, please feel free to contact me.

Thank you,

Alison Gosling, E.I.T.
Project Coordinator / Junior Designer

DSEL
david schaeffer engineering ltd.

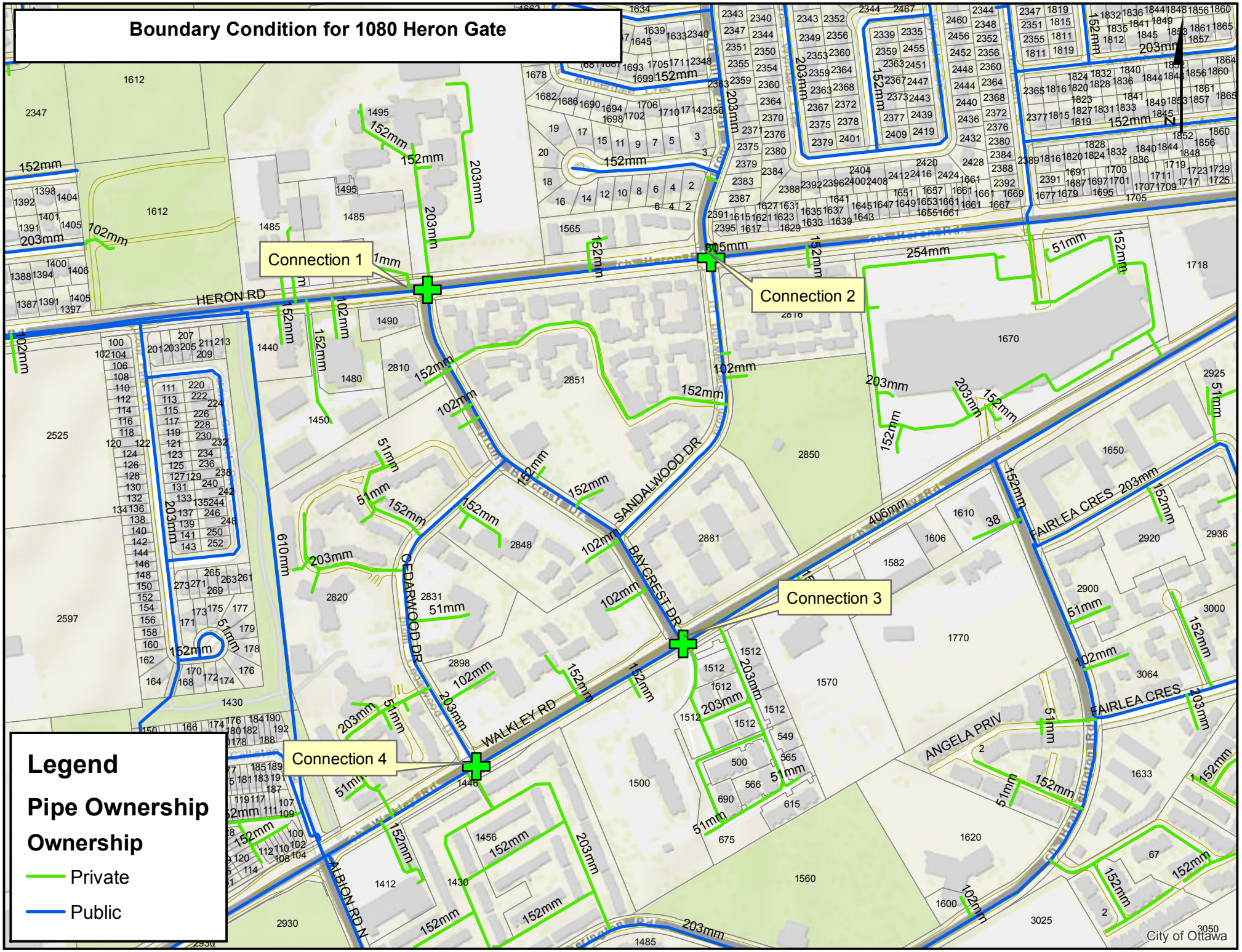
120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext.542
fax: (613) 836-7183
email: agosling@dsel.ca

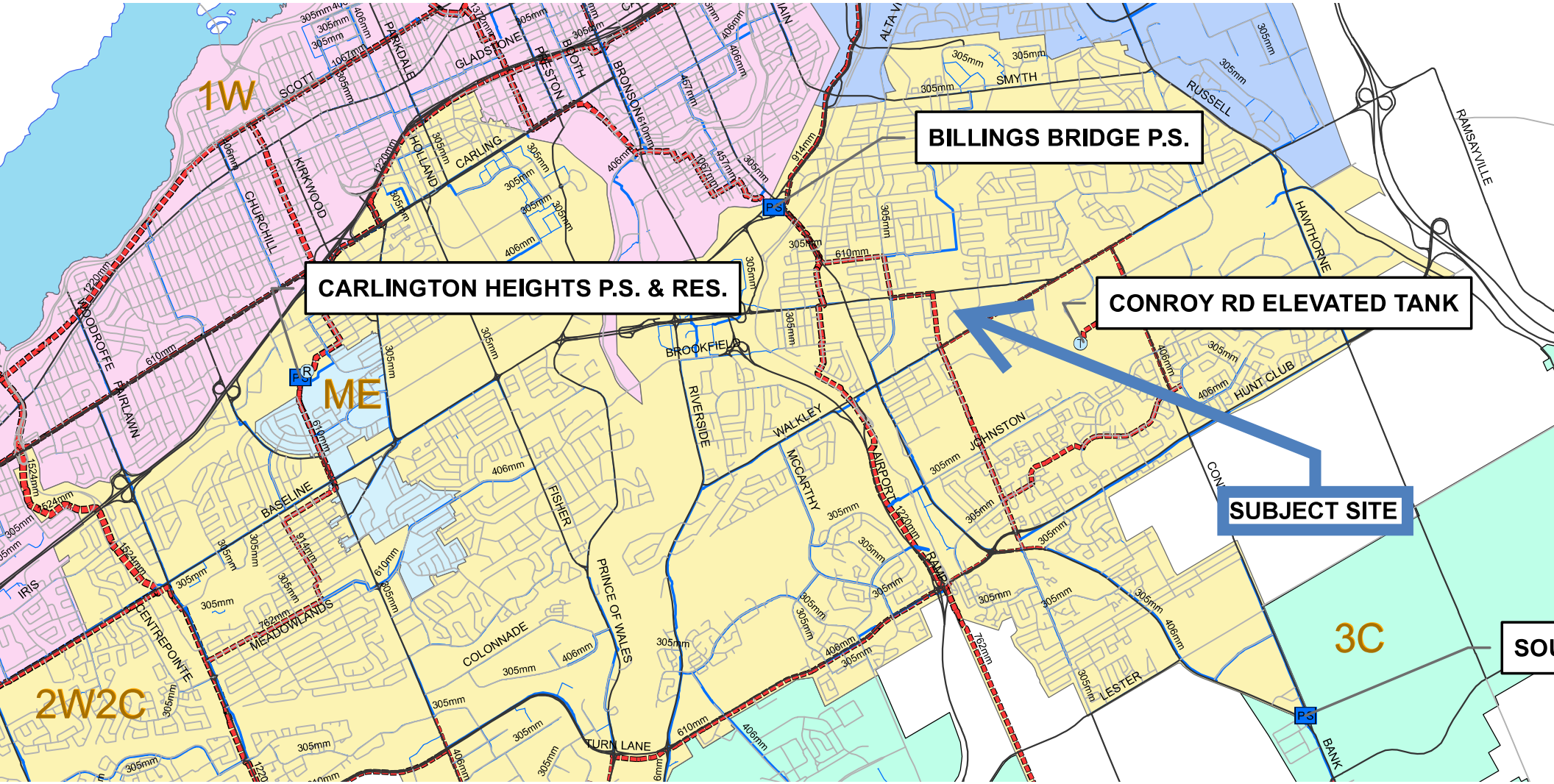
'

'

Boundary Condition for 1080 Heron Gate



CITY OF OTTAWA - WATER DISTRIBUTION SYSTEM



Hydraulic Capacity and Modeling Analysis Heron Gate Subdivision Redevelopment

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: April 10, 2019

Contact: Mr. Werner de Schaetzen, Ph.D., P.Eng.
Project: 2019-027-DSE

OQM | Organizational Quality Management Program

Document History and Version Control

Revision No.	Date	Document Description	Revised By	Reviewed By
R0	April 5, 2019	Draft	Adrien d'Andrade	Werner de Schaetzen
R1	April 10, 2019	Final	Adrien d'Andrade	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 water main network for the Heron Gate subdivision redevelopment ("Development") in the City of Ottawa, ON ("City").

The Heron Gate subdivision is located between Heron Road and Walkley Road, and between Cedarwood Drive and Sandalwood Drive. To the north of the subdivision there is an existing 300 mm trunk main on Heron Road, and to the south there is an existing 450 mm trunk main on Walkley Road. The subdivision is currently serviced by a network of 200 mm water mains on Baycrest Drive, Cedarwood Dive, and Sandalwood Drive.

Within the subdivision there are currently several residential towers and townhomes that are serviced by the water network. Five (5) of these towers will remain with the redevelopment, and the remaining towers and townhomes will be redeveloped. The redevelopment consists of 315 townhome units and 4,748 apartment units (mid-rise and towers).

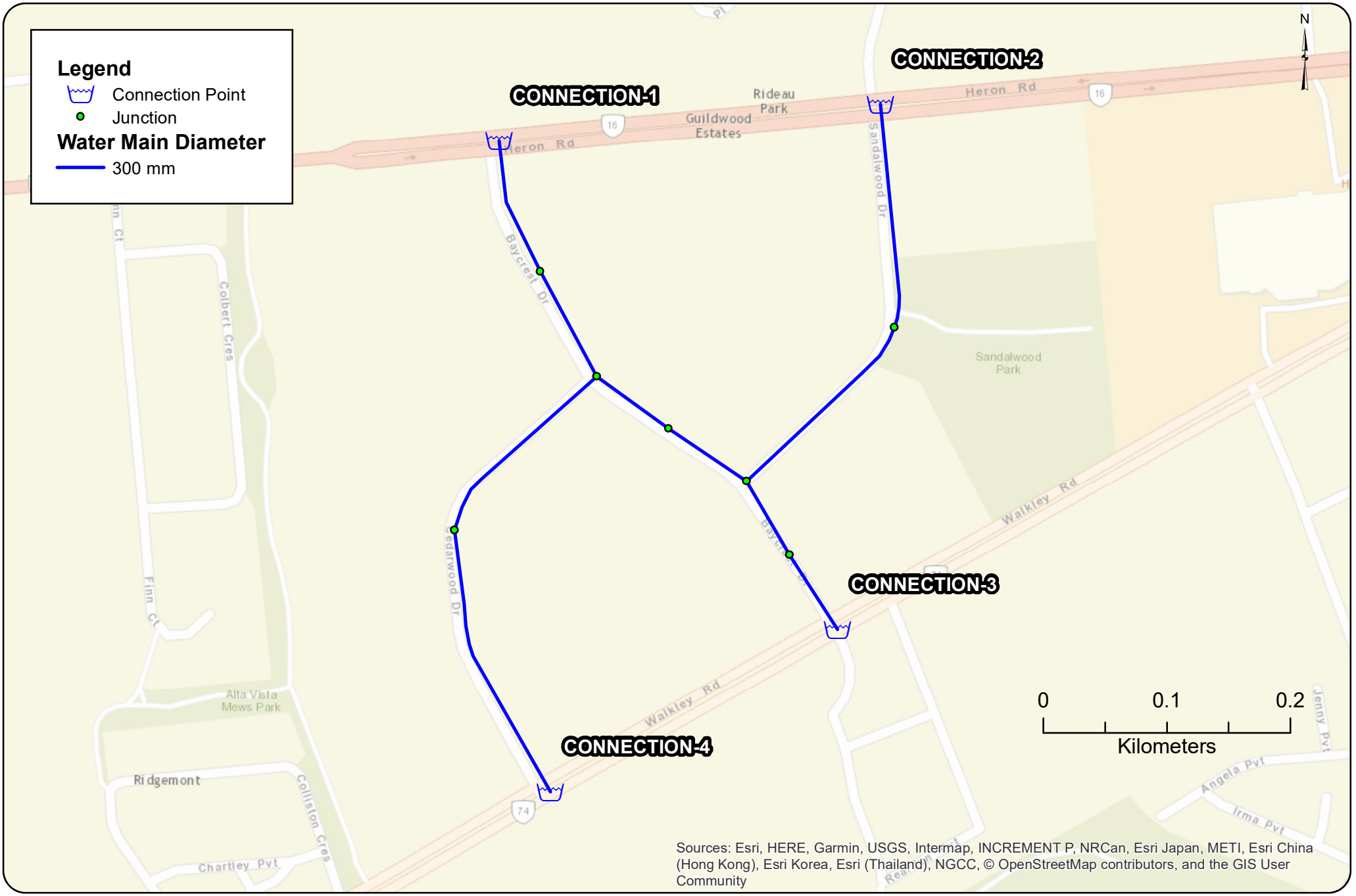
The Heron Gate subdivision model will have four (4) connections to the City water distribution system:

- Connection 1: Heron Road at Baycrest Drive
- Connection 2: Heron Road at Sandalwood Drive
- Connection 3: Walkley Road at Baycrest Drive
- Connection 4: Walkley Road at Cedarwood Drive

The development site is shown in **Figure 1.1** 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. 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**
Heron Gate Subdivision Redevelopment
Client: **David Schaeffer Engineering Ltd.**
Date: **April 2019**
Created by: **Ad'A**
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 the pipe network layout provided by DSEL to GeoAdvice on February 21, 2019.

2.2 Elevations

At the time of this report, no grading plan was available for the development site. Elevations of the modeled junctions were assigned based on the highest connection point elevation of 95.66 m, provided by DSEL to GeoAdvice on April 2, 2018. This is a conservative approach and should be updated once a site grading plan is available.

2.3 Consumer Demands

The residential demand rate of 280 L/cap/d was used as per City of Ottawa technical bulletin ISTB 2018-01. Peaking factors were taken from the Ministry of Environment (MOE) Design Guidelines for Drinking-Water Systems *Table 3-1: Peaking Factors* for a population between 10,001-25,000. A summary of the rates and peaking factors relevant for this development is shown in **Table 2.1** below.

Table 2.1: City of Ottawa Demand Rate and MOE Peaking Factors

Demand Type	Amount	Unit
Average Day Demand		
Residential	280	L/c/d
Maximum Daily Demand		
Residential	1.90 x avg. day	L/c/d
Peak Hour Demand		
Residential	2.85 x max. day	L/c/d
Minimum Hour Demand		
Residential	0.60 x avg. day	L/c/d

Table 2.2 summarizes the water demand calculations for the Heron Gate subdivision.

Table 2.2: Development Residential Population and Demand Calculations

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)
Existing Units							
Apartment	957	1.8	1,723	5.58	10.61	15.91	3.35
Proposed Units							
Townhouse	315	2.7	851	2.76	5.24	7.86	1.65
Apartment	4,748	1.8	8,546	27.70	52.62	78.94	16.62
Total	**6,020**		**11,120**	**36.04**	**68.47**	**102.70**	**21.62**

***City of Ottawa Design Guidelines**

Demands were uniformly distributed to the model nodes within the subdivision.

2.4 Fire Flow Demand

Fire flow calculations were completed for the worst-case dwelling types 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.

FUS fire flow requirements of 300 L/s, 333 L/s, and 367 L/s were calculated at various building groups within the subdivision. Detailed calculations can be found in **Appendix A**. Note that analysis was not completed at the 300 L/s fire flow requirement as the adjacent building had a higher required fire flow of 333 L/s.

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

The spatial allocation of the required fire flows is 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: Heron Road at Baycrest Drive
- Connection 2: Heron Road at Sandalwood Drive
- Connection 3: Walkley Road at Baycrest Drive
- Connection 4: Walkley Road at Cedarwood Drive

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

Boundary conditions were provided for Peak Hour, Maximum Day plus Fire and Average Day (high pressure check) conditions. It is important to note that boundary conditions were requested by DSEL based on preliminary demand and fire flow calculations that are higher than those presented in this report. Due to time constraints of this submission, and the time to receive updated boundary conditions, analysis was completed with the available boundary conditions. This is a conservative approach as the updated boundary conditions should provide higher connection HGL's due to the reduced development demand.

The table below summarizes the boundary conditions used to size the Heron Gate subdivision redevelopment water network.

Table 2.3: Boundary Conditions (Provided by DSEL on February 21, 2019)

Condition	Development Demand (L/s)	Connection 1 HGL (m)	Connection 2 HGL (m)	Connection 3 HGL (m)	Connection 4 HGL (m)
Min Hour (max. pressure)	19.9	131.5	130.5	131.0	132.0
Peak Hour (min. pressure)	219.1	123.0	122.5	123.0	123.5
Max Day + Fire Flow (483 L/s)	582.6	120.5	120.5	122.5	123.0

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 (/)
300	297	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. The boundary conditions provide by DSEL on February 21, 2019 were used to size the network, and the results are presented in the following sections.

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

4.1 Development Pressure Analysis

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

Table 4.1: Summary of Available Service Pressures

Minimum Hour Demand Maximum Pressure	Peak Hour Demand Minimum Pressure
51 psi	38 psi

As outlined in the City of Ottawa Design Guidelines, the generally accepted best practice is to design new water distribution systems to operate between 50 psi and 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 80 psi.

Note that under peak hour demand conditions, the development does not meet the pressure requirement of 40 psi (pressures are within 5%). Conservative values for boundary conditions and elevations were used in this analysis. If the development elevations are lower than the assumed value, and updated boundary conditions based on the lower demands are used, the peak hour pressures will likely meet the required pressures (≥ 40 psi).

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

4.2 Development Fire Flow Analysis

A summary of the minimum available fire flows in the subdivision is shown below.

Table 4.2: Summary of Minimum Available Fire Flows

Required Fire Flow	Minimum Available Flow*	Junction ID
333 L/s	556 L/s	J-06
367 L/s	837 L/s	J-03

*Available flow at 20 psi based on the boundary conditions at 483 L/s. Actual available fire flow should be validated within the City's model.

As shown below, the model predicts that the fire flow requirements can be met throughout the Heron Gate subdivision with the proposed water main layout shown in **Figure 1.1**.

A summary of the residual pressures in the Heron Gate subdivision is shown below in **Table 4.3**. The minimum allowable pressure under fire flow conditions is 20 psi at the location of the fire.

Table 4.3: Summary of Residual Pressures (MDD + FF)

Maximum Residual Pressure (psi)	Average Residual Pressure (psi)	Minimum Residual Pressure (psi)
30	32	33

As show in **Table 4.3**, the model predicts that the residual pressure requirements can be met throughout the Heron Gate subdivision with the proposed water main layout shown in **Figure 1.1**.

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

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-2014-02.

The Heron Gate subdivision redevelopment services a total average day demand of 3,113 m^3/day; as such, at least two (2) feeds are required.

5.2 Valves

No comment has been made in this technical memorandum with respect to exact placement of isolation valves within the distribution network for the Heron Drive subdivision redevelopment 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 Heron Drive subdivision redevelopment are expected to identify valves in accordance with the requirements noted above.

5.3 Hydrants

No comment has been made in this technical memorandum with respect to exact placement of hydrants within the distribution network for the Heron Drive subdivision redevelopment 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

The detailed engineering drawings for the Heron Drive subdivision redevelopment are expected to identify hydrants in accordance with the requirements noted above or to meet required fire flows.

6 Conclusions

The hydraulic capacity and modeling analysis of the Heron Drive subdivision redevelopment yielded the following conclusions:

- The proposed water main network can deliver all required domestic and fire flows under the provided boundary conditions.
- Domestic pressures expected to range between 38 psi and 51 psi.
- Residual pressures expected to range between 30 psi and 33 psi.

Submission

Prepared by:

Adrien d'Andrade, E.I.T.
Hydraulic Modeler / Project Engineer

Approved by:

April 19, 2019

LICENSED PROFESSIONAL ENGINEER
W. B. F. de Schaetzen
100116349
PROVINCE OF ONTARIO

Werner de Schaetzen, Ph.D., P.Eng.
Senior Modeling Review / Project Manager

OQM | Organizational Quality Management Program

Appendix A FUS Fire Flow Calculations

FUS Required Fire Flow Calculation

Client: David Schaeffer Engineering Ltd.
Project: 2019-027-DSE
Development: Heron Gate — Buildings 7.1, 7.2, 7.3
Zoning: Multi Family Residential
Date: April 2, 2019

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

A. Type of Construction: Non-Combustible Construction

B. Ground Floor Area: 2,840 m^2 — Total ground floor area for FUS study area

C. Number of Storeys: 15 — Building with the greatest number of floors in FUS study area

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

C: Coefficient related to the type of construction — **C =** 0.82 — Building type weighted average

A: Effective area — **A =** 19,800 m^2 — Effective area for the FUS study area

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

F = 25,328 L/min **D =** 25,000 L/min*

E. Occupancy

Occupancy content hazard: Limited Combustible — -15 % of **D** = **-3,750 L/min** **E =** 21,250 L/min

F. Sprinkler Protection

Automatic sprinkler protection: Complete Protection — - 45.5 % of **E** = **-9,659 L/min** **F =** 11,591 L/min

*Area weighted average

G. Exposures

Side	Distance	Distance		Exposure	
West	Beyond 45 m	>45		0	%
East	Fire Wall	FM		10	%
North	30.1 to 45 m	31.3		5	%
South	10.1 to 20 m	20.4		15	%
	Total	**30**	% of **E**	**+ 6,375**	**L/min**

G = 17,966 L/min

H. Wood Shake Charge: No — **0 L/min** **H =** 17,966 L/min

For wood shingle or shake roofs

Total Fire Flow Required	**18,000**	**L/min***
	300	**L/s**
Required Duration of Fire Flow	**4**	**Hrs**
Required Volume of Fire Flow	**4,320**	**m^3**

*Rounded to the nearest 1,000 L/min

The Total Required Fire Flow for the Heron Gate 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

Notes to calculations

Type of Construction	Coefficient	Unit
Wood Frame Construction	1.5	-
Ordinary Construction	1	-
Non-Combustible Construction	0.8	-
Fire Resistive Construction (< 2 hrs)	0.7	-
Fire Resistive Construction (> 2 hrs)	0.6	-

Occupancy Fire Hazard	Factor	Unit
Non-Combustible	-25	%
Limited Combustible	-15	%
Combustible	0	%
Free Burning	15	%
Rapid Burning	25	%

Sprinkler Protection	Factor	Unit
Complete Protection	-50	%
Complete + Fire Resistive	-70	%
None	0	%

Zoning
Single Family Residential
Multi Family Residential
Commercial
Institutional
Industrial

Wood Shake Charge	Factor	Unit
Yes	4000	L/min
No	0	L/min

Exposures	Factor
0.0 to 3 m	25%
3.1 to 10 m	20%
10.1 to 20 m	15%
20.1 to 30 m	10%
30.1 to 45 m	5%
Beyond 45 m	0%
Fire Wall	10%

Required Duration of Fire Flow	
Fire Flow Required (L/min)	Duration (hours)
2,000 or less	1.00
3000	1.25
4000	1.50
5000	1.75
6000	2.00
7000	2.00
8000	2.00
9000	2.00
10000	2.00
11000	2.25
12000	2.50
13000	2.75
14000	3.00
15000	3.25
16000	3.50
17000	3.75
18000	4.00
19000	4.25
20000	4.50
21000	4.75
22000	5.00
23000	5.25
24000	5.50
25000	5.75
26000	6.00
27000	6.25
28000	6.50
29000	6.75
30000	7.00
31000	7.25
32000	7.50
33000	7.75
34000	8.00
35000	8.25
36000	8.50
37000	8.75
38000	9.00
39000	9.25
40000 and over	9.50

Notes to calculations

Separation Distance	Length-Height Factor of Exposed Wall of Adjacent Structure	Construction of Exposed Wall of Adjacent Structure			
		Wood Frame or Non-Combustible	Ordinary or Fire-Resistive		
			With Unprotected Openings	With Semi-Protected Openings	Blank Wall
0.0 to 3 m	0-30 m-storeys	22%	21%	16%	0%
	31-60 m-storeys	23%	22%	17%	0%
	61-90 m-storeys	24%	23%	18%	0%
	91-120 m-storeys	25%	24%	19%	0%
	Over 120 m-storeys	25%	25%	20%	0%
3.1 to 10 m	0-30 m-storeys	17%	15%	11%	0%
	31-60 m-storeys	18%	16%	12%	0%
	61-90 m-storeys	19%	18%	14%	0%
	91-120 m-storeys	20%	19%	15%	0%
	Over 120 m-storeys	20%	19%	15%	0%
10.1 to 20 m	0-30 m-storeys	12%	10%	7%	0%
	31-60 m-storeys	13%	11%	8%	0%
	61-90 m-storeys	14%	13%	10%	0%
	91-120 m-storeys	15%	14%	11%	0%
	Over 120 m-storeys	15%	15%	12%	0%
20.1 to 30 m	0-30 m-storeys	8%	6%	4%	0%
	31-60 m-storeys	8%	7%	5%	0%
	61-90 m-storeys	9%	8%	6%	0%
	91-120 m-storeys	10%	9%	7%	0%
	Over 120 m-storeys	10%	10%	8%	0%
30.1 to 45 m	All	5%	5%	5%	0%

Type of Wall
Unprotected Openings
Semi-Protected Openings
Blank Wall

Side	Distance	Length-Storey	Range
West	>45	0	N/A
East	FM	0	FM
North	31.3	969	Over 120 m-storeys
South	20.4	298	Over 120 m-storeys

Heron Gate - FUS Required Fire Flow Summary

Heron Gate	
Type of Construction	Non-Combustible Construction
Construction Coefficient	0.82
Effective Total Area (m^2)	19,800
Required Fire Flow (L/min)	25,000
Occupancy Charge	-15
Sprinkler Protection Reduction	-45
Exposure (%)	
North (%)	0
East (%)	10
South (%)	5
West (%)	15
Total Exposure (%)	30
Wood Shake Charge (L/min)	0
Total Required Fire Flow (L/min)	18,000
Total Required Fire Flow (L/s)	300

FUS Required Fire Flow Calculation

Client: David Schaeffer Engineering Ltd.
Project: 2019-027-DSE
Development: Heron Gate — Buildings 3.4,3.5,3.6
Zoning: Multi Family Residential
Date: April 2, 2019

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

A. Type of Construction: Non-Combustible Construction

B. Ground Floor Area: 2,740 m^2 — Total ground floor area for FUS study area

C. Number of Storeys: 15 — Building with the greatest number of floors in FUS study area

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

C: Coefficient related to the type of construction — **C =** 0.8 — Building type weighted average

A: Effective area — **A =** 25200 m^2 — Effective area for the FUS study area

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

F = 27,939 L/min **D =** 28,000 L/min*

E. Occupancy

Occupancy content hazard: Limited Combustible — -15 % of **D** **-4,200 L/min** **E =** 23,800 L/min

F. Sprinkler Protection

Automatic sprinkler protection: Complete Protection — - 50.0 % of **E** **-11,900 L/min** **F =** 11,900 L/min

*Area weighted average

G. Exposures

Side	Distance	Length		Exposure	
West	10.1 to 20 m	15.6		11	%
East	10.1 to 20 m	16.5		10	%
North	30.1 to 45 m	31.3		5	%
South	20.1 to 30 m	24		10	%
	Total	**36**	% of **E**	**+ 8,568**	**L/min**

G = 20,468 L/min

H. Wood Shake Charge — No — **0 L/min** **H =** 20,468 L/min

For wood shingle or shake roofs

Total Fire Flow Required	**20,000**	**L/min***
	333	**L/s**
Required Duration of Fire Flow	**4.5**	**Hrs**
Required Volume of Fire Flow	**5,400**	**m^3**

*Rounded to the nearest 1,000 L/min

The Total Required Fire Flow for the Heron Gate 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

Notes to calculations

Type of Construction	Coefficient	Unit
Wood Frame Construction	1.5	-
Ordinary Construction	1	-
Non-Combustible Construction	0.8	-
Fire Resistive Construction (< 2 hrs)	0.7	-
Fire Resistive Construction (> 2 hrs)	0.6	-

Occupancy Fire Hazard	Factor	Unit
Non-Combustible	-25	%
Limited Combustible	-15	%
Combustible	0	%
Free Burning	15	%
Rapid Burning	25	%

Sprinkler Protection	Factor	Unit
Complete Protection	-50	%
Complete + Fire Resistive	-70	%
None	0	%

Zoning
Single Family Residential
Multi Family Residential
Commercial
Institutional
Industrial

Wood Shake Charge	Factor	Unit
Yes	4000	L/min
No	0	L/min

Exposures	Factor
0.0 to 3 m	25%
3.1 to 10 m	20%
10.1 to 20 m	15%
20.1 to 30 m	10%
30.1 to 45 m	5%
Beyond 45 m	0%
Fire Wall	10%

Required Duration of Fire Flow	
Fire Flow Required (L/min)	Duration (hours)
2,000 or less	1.00
3000	1.25
4000	1.50
5000	1.75
6000	2.00
7000	2.00
8000	2.00
9000	2.00
10000	2.00
11000	2.25
12000	2.50
13000	2.75
14000	3.00
15000	3.25
16000	3.50
17000	3.75
18000	4.00
19000	4.25
20000	4.50
21000	4.75
22000	5.00
23000	5.25
24000	5.50
25000	5.75
26000	6.00
27000	6.25
28000	6.50
29000	6.75
30000	7.00
31000	7.25
32000	7.50
33000	7.75
34000	8.00
35000	8.25
36000	8.50
37000	8.75
38000	9.00
39000	9.25
40000 and over	9.50

Notes to calculations

Separation Distance	Length-Height Factor of Exposed Wall of Adjacent Structure	Construction of Exposed Wall of Adjacent Structure			
		Wood Frame or Non-Combustible	Ordinary or Fire-Resistive		
			With Unprotected Openings	With Semi-Protected Openings	Blank Wall
0.0 to 3 m	0-30 m-storeys	22%	21%	16%	0%
	31-60 m-storeys	23%	22%	17%	0%
	61-90 m-storeys	24%	23%	18%	0%
	91-120 m-storeys	25%	24%	19%	0%
	Over 120 m-storeys	25%	25%	20%	0%
3.1 to 10 m	0-30 m-storeys	17%	15%	11%	0%
	31-60 m-storeys	18%	16%	12%	0%
	61-90 m-storeys	19%	18%	14%	0%
	91-120 m-storeys	20%	19%	15%	0%
	Over 120 m-storeys	20%	19%	15%	0%
10.1 to 20 m	0-30 m-storeys	12%	10%	7%	0%
	31-60 m-storeys	13%	11%	8%	0%
	61-90 m-storeys	14%	13%	10%	0%
	91-120 m-storeys	15%	14%	11%	0%
	Over 120 m-storeys	15%	15%	12%	0%
20.1 to 30 m	0-30 m-storeys	8%	6%	4%	0%
	31-60 m-storeys	8%	7%	5%	0%
	61-90 m-storeys	9%	8%	6%	0%
	91-120 m-storeys	10%	9%	7%	0%
	Over 120 m-storeys	10%	10%	8%	0%
30.1 to 45 m	All	5%	5%	5%	0%

Type of Wall
Unprotected Openings
Semi-Protected Openings
Blank Wall

Side	Distance	Length-Storey	Range
West	15.6	52	31-60 m-storeys
East	16.5	121	Over 120 m-storeys
North	31.3	111	91-120 m-storeys
South	24	279	Over 120 m-storeys

Heron Gate - FUS Required Fire Flow Summary

Heron Gate	
Type of Construction	Non-Combustible Construction
Construction Coefficient	0.8
Effective Total Area (m^2)	25,200
Required Fire Flow (L/min)	28,000
Occupancy Charge	-15
Sprinkler Protection Reduction	-50
Exposure (%)	
North (%)	11
East (%)	10
South (%)	5
West (%)	10
Total Exposure (%)	36
Wood Shake Charge (L/min)	0
Total Required Fire Flow (L/min)	20,000
Total Required Fire Flow (L/s)	333

FUS Required Fire Flow Calculation

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

Client: David Schaeffer Engineering Ltd.
Project: 2019-027-DSE
Development: Heron Gate — Buildings 8.8,8.9,8.10
Zoning: Multi Family Residential
Date: April 2, 2019

A. Type of Construction: Non-Combustible Construction

B. Ground Floor Area: 2,640 m^2 — Total ground floor area for FUS study area

C. Number of Storeys: 27 — Building with the greatest number of floors in FUS study area

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

C: Coefficient related to the type of construction — **C =** 0.8 — Building type weighted average

A: Effective area — **A =** 36,380 m^2 — Effective area for the FUS study area

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

F = 33,569 L/min **D =** 34,000 L/min*

E. Occupancy

Occupancy content hazard: Limited Combustible — -15 % of **D** = **-5,100 L/min** **E =** 28,900 L/min

F. Sprinkler Protection

Automatic sprinkler protection: Complete Protection — - 50.0 % of **E** = **-14,450 L/min** **F =** 14,450 L/min

*Area weighted average

G. Exposures

Side	Distance	Distance		Exposure	
West	20.1 to 30 m	29.5		10	%
East	20.1 to 30 m	27		10	%
North	30.1 to 45 m	31.3		5	%
South	Beyond 45 m	>45		0	%
	Total	**25**	% of **E**	**+ 7,225**	**L/min**

G = 21,675 L/min

H. Wood Shake Charge — No — **0 L/min** **H =** 21,675 L/min

For wood shingle or shake roofs

Total Fire Flow Required	**22,000**	**L/min***
	367	**L/s**
Required Duration of Fire Flow	**5**	**Hrs**
Required Volume of Fire Flow	**6,600**	**m^3**

*Rounded to the nearest 1,000 L/min

The Total Required Fire Flow for the Heron Gate 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

Notes to calculations

Type of Construction	Coefficient	Unit
Wood Frame Construction	1.5	-
Ordinary Construction	1	-
Non-Combustible Construction	0.8	-
Fire Resistive Construction (< 2 hrs)	0.7	-
Fire Resistive Construction (> 2 hrs)	0.6	-

Occupancy Fire Hazard	Factor	Unit
Non-Combustible	-25	%
Limited Combustible	-15	%
Combustible	0	%
Free Burning	15	%
Rapid Burning	25	%

Sprinkler Protection	Factor	Unit
Complete Protection	-50	%
Complete + Fire Resistive	-70	%
None	0	%

Zoning
Single Family Residential
Multi Family Residential
Commercial
Institutional
Industrial

Wood Shake Charge	Factor	Unit
Yes	4000	L/min
No	0	L/min

Exposures	Factor
0.0 to 3 m	25%
3.1 to 10 m	20%
10.1 to 20 m	15%
20.1 to 30 m	10%
30.1 to 45 m	5%
Beyond 45 m	0%
Fire Wall	10%

Required Duration of Fire Flow	
Fire Flow Required (L/min)	Duration (hours)
2,000 or less	1.00
3000	1.25
4000	1.50
5000	1.75
6000	2.00
7000	2.00
8000	2.00
9000	2.00
10000	2.00
11000	2.25
12000	2.50
13000	2.75
14000	3.00
15000	3.25
16000	3.50
17000	3.75
18000	4.00
19000	4.25
20000	4.50
21000	4.75
22000	5.00
23000	5.25
24000	5.50
25000	5.75
26000	6.00
27000	6.25
28000	6.50
29000	6.75
30000	7.00
31000	7.25
32000	7.50
33000	7.75
34000	8.00
35000	8.25
36000	8.50
37000	8.75
38000	9.00
39000	9.25
40000 and over	9.50

Notes to calculations

Separation Distance	Length-Height Factor of Exposed Wall of Adjacent Structure	Construction of Exposed Wall of Adjacent Structure			
		Wood Frame or Non-Combustible	Ordinary or Fire-Resistive		
			With Unprotected Openings	With Semi-Protected Openings	Blank Wall
0.0 to 3 m	0-30 m-storeys	22%	21%	16%	0%
	31-60 m-storeys	23%	22%	17%	0%
	61-90 m-storeys	24%	23%	18%	0%
	91-120 m-storeys	25%	24%	19%	0%
	Over 120 m-storeys	25%	25%	20%	0%
3.1 to 10 m	0-30 m-storeys	17%	15%	11%	0%
	31-60 m-storeys	18%	16%	12%	0%
	61-90 m-storeys	19%	18%	14%	0%
	91-120 m-storeys	20%	19%	15%	0%
	Over 120 m-storeys	20%	19%	15%	0%
10.1 to 20 m	0-30 m-storeys	12%	10%	7%	0%
	31-60 m-storeys	13%	11%	8%	0%
	61-90 m-storeys	14%	13%	10%	0%
	91-120 m-storeys	15%	14%	11%	0%
	Over 120 m-storeys	15%	15%	12%	0%
20.1 to 30 m	0-30 m-storeys	8%	6%	4%	0%
	31-60 m-storeys	8%	7%	5%	0%
	61-90 m-storeys	9%	8%	6%	0%
	91-120 m-storeys	10%	9%	7%	0%
	Over 120 m-storeys	10%	10%	8%	0%
30.1 to 45 m	All	5%	5%	5%	0%

Type of Wall
Unprotected Openings
Semi-Protected Openings
Blank Wall

Side	Distance	Length-Storey	Range
West	29.5	153	Over 120 m-storeys
East	27	378	Over 120 m-storeys
North	31.3	182	Over 120 m-storeys
South	>45	0	>45

Heron Gate - FUS Required Fire Flow Summary

Heron Gate	
Type of Construction	Non-Combustible Construction
Construction Coefficient	0.8
Effective Total Area (m^2)	36,380
Required Fire Flow (L/min)	34,000
Occupancy Charge	-15
Sprinkler Protection Reduction	-50
Exposure (%)	
North (%)	10
East (%)	10
South (%)	5
West (%)	0
Total Exposure (%)	25
Wood Shake Charge (L/min)	0
Total Required Fire Flow (L/min)	22,000
Total Required Fire Flow (L/s)	367

FUS Required Fire Flow Calculation

Client: David Schaeffer Engineering Ltd.
Project: 2019-027-DSE
Development: Heron Gate — Buildings 4.3,4.4,4.5
Zoning: Multi Family Residential
Date: April 2, 2019

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

A. Type of Construction: Non-Combustible Construction

B. Ground Floor Area: 1,824 m^2 — Total ground floor area for FUS study area

C. Number of Storeys: 25 — Building with the greatest number of floors in FUS study area

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

C: Coefficient related to the type of construction — **C =** 0.8 — Building type weighted average

A: Effective area — **A =** 30,200 m^2 — Effective area for the FUS study area

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

F = 30,586 L/min **D =** 31,000 L/min*

E. Occupancy

Occupancy content hazard: Limited Combustible — -15 % of **D** — **-4,650 L/min** — **E = 26,350 L/min**

F. Sprinkler Protection

Automatic sprinkler protection: Complete Protection — - 50.0 % of **E** — **-13,175 L/min** — **F = 13,175 L/min**

*Area weighted average

G. Exposures

Side	Distance	Distance		Exposure	
West	20.1 to 30 m	24		10	%
East	20.1 to 30 m	27		10	%
North	20.1 to 30 m	24		7	%
South	Beyond 45 m	>45		0	%
	Total	**27**	% of **E**	**+ 7,115**	**L/min**

G = 20,290 L/min

H. Wood Shake Charge: No — **0 L/min** — **H = 20,290 L/min**

For wood shingle or shake roofs

Total Fire Flow Required	**20,000**	**L/min***
	333	**L/s**
Required Duration of Fire Flow	**4.5**	**Hrs**
Required Volume of Fire Flow	**5,400**	**m^3**

*Rounded to the nearest 1,000 L/min

The Total Required Fire Flow for the Heron Gate 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

Notes to calculations

Type of Construction	Coefficient	Unit
Wood Frame Construction	1.5	-
Ordinary Construction	1	-
Non-Combustible Construction	0.8	-
Fire Resistive Construction (< 2 hrs)	0.7	-
Fire Resistive Construction (> 2 hrs)	0.6	-

Occupancy Fire Hazard	Factor	Unit
Non-Combustible	-25	%
Limited Combustible	-15	%
Combustible	0	%
Free Burning	15	%
Rapid Burning	25	%

Sprinkler Protection	Factor	Unit
Complete Protection	-50	%
Complete + Fire Resistive	-70	%
None	0	%

Zoning
Single Family Residential
Multi Family Residential
Commercial
Institutional
Industrial

Wood Shake Charge	Factor	Unit
Yes	4000	L/min
No	0	L/min

Exposures	Factor
0.0 to 3 m	25%
3.1 to 10 m	20%
10.1 to 20 m	15%
20.1 to 30 m	10%
30.1 to 45 m	5%
Beyond 45 m	0%
Fire Wall	10%

Required Duration of Fire Flow	
Fire Flow Required (L/min)	Duration (hours)
2,000 or less	1.00
3000	1.25
4000	1.50
5000	1.75
6000	2.00
7000	2.00
8000	2.00
9000	2.00
10000	2.00
11000	2.25
12000	2.50
13000	2.75
14000	3.00
15000	3.25
16000	3.50
17000	3.75
18000	4.00
19000	4.25
20000	4.50
21000	4.75
22000	5.00
23000	5.25
24000	5.50
25000	5.75
26000	6.00
27000	6.25
28000	6.50
29000	6.75
30000	7.00
31000	7.25
32000	7.50
33000	7.75
34000	8.00
35000	8.25
36000	8.50
37000	8.75
38000	9.00
39000	9.25
40000 and over	9.50

Notes to calculations

Separation Distance	Length-Height Factor of Exposed Wall of Adjacent Structure	Construction of Exposed Wall of Adjacent Structure			
		Wood Frame or Non-Combustible	Ordinary or Fire-Resistive		
			With Unprotected Openings	With Semi-Protected Openings	Blank Wall
0.0 to 3 m	0-30 m-storeys	22%	21%	16%	0%
	31-60 m-storeys	23%	22%	17%	0%
	61-90 m-storeys	24%	23%	18%	0%
	91-120 m-storeys	25%	24%	19%	0%
	Over 120 m-storeys	25%	25%	20%	0%
3.1 to 10 m	0-30 m-storeys	17%	15%	11%	0%
	31-60 m-storeys	18%	16%	12%	0%
	61-90 m-storeys	19%	18%	14%	0%
	91-120 m-storeys	20%	19%	15%	0%
	Over 120 m-storeys	20%	19%	15%	0%
10.1 to 20 m	0-30 m-storeys	12%	10%	7%	0%
	31-60 m-storeys	13%	11%	8%	0%
	61-90 m-storeys	14%	13%	10%	0%
	91-120 m-storeys	15%	14%	11%	0%
	Over 120 m-storeys	15%	15%	12%	0%
20.1 to 30 m	0-30 m-storeys	8%	6%	4%	0%
	31-60 m-storeys	8%	7%	5%	0%
	61-90 m-storeys	9%	8%	6%	0%
	91-120 m-storeys	10%	9%	7%	0%
	Over 120 m-storeys	10%	10%	8%	0%
30.1 to 45 m	All	5%	5%	5%	0%

Type of Wall
Unprotected Openings
Semi-Protected Openings
Blank Wall

Side	Distance	Length-Storey	Range
West	24	179	Over 120 m-storeys
East	27	90	61-90 m-storeys
North	24	32	31-60 m-storeys
South	>45	0	>45

Heron Gate - FUS Required Fire Flow Summary

Heron Gate	
Type of Construction	Non-Combustible Construction
Construction Coefficient	0.8
Effective Total Area (m^2)	30,200
Required Fire Flow (L/min)	31,000
Occupancy Charge	-15
Sprinkler Protection Reduction	-50
Exposure (%)	
North (%)	10
East (%)	10
South (%)	7
West (%)	0
Total Exposure (%)	27
Wood Shake Charge (L/min)	0
Total Required Fire Flow (L/min)	20,000
Total Required Fire Flow (L/s)	333

FUS Required Fire Flow Calculation

Client: David Schaeffer Engineering Ltd.
Project: 2019-027-DSE
Development: Heron Gate — Buildings 3.7,3.8,3.9
Zoning: Multi Family Residential
Date: April 2, 2019

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

A. Type of Construction: Non-Combustible Construction

B. Ground Floor Area: 2,040 m^2 — Total ground floor area for FUS study area

C. Number of Storeys: 20 — Building with the greatest number of floors in FUS study area

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

C: Coefficient related to the type of construction — **C =** 0.8 — Building type weighted average

A: Effective area — **A =** 26,000 m^2 — Effective area for the FUS study area

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

F = 28,379 L/min **D =** 28,000 L/min*

E. Occupancy

Occupancy content hazard: Limited Combustible — -15 % of **D** = **-4,200 L/min** **E =** **23,800 L/min**

F. Sprinkler Protection

Automatic sprinkler protection: Complete Protection — - 50.0 % of **E** = **-11,900 L/min** **F =** **11,900 L/min**

*Area weighted average

G. Exposures

Side	Distance	Distance		Exposure	
West	20.1 to 30 m	24		10	%
East	30.1 to 45 m	27		10	%
North	20.1 to 30 m	24		10	%
South	30.1 to 45 m	38		5	%
	Total	**35**	% of **E**	**+ 8,330**	**L/min**

G = **20,230 L/min**

H. Wood Shake Charge — No — **0 L/min** **H =** **20,230 L/min**

For wood shingle or shake roofs

Total Fire Flow Required	**20,000**	**L/min***
	333	**L/s**
Required Duration of Fire Flow	**4.5**	**Hrs**
Required Volume of Fire Flow	**5,400**	**m^3**

*Rounded to the nearest 1,000 L/min

The Total Required Fire Flow for the Heron Gate 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

Notes to calculations

Type of Construction	Coefficient	Unit
Wood Frame Construction	1.5	-
Ordinary Construction	1	-
Non-Combustible Construction	0.8	-
Fire Resistive Construction (< 2 hrs)	0.7	-
Fire Resistive Construction (> 2 hrs)	0.6	-

Occupancy Fire Hazard	Factor	Unit
Non-Combustible	-25	%
Limited Combustible	-15	%
Combustible	0	%
Free Burning	15	%
Rapid Burning	25	%

Sprinkler Protection	Factor	Unit
Complete Protection	-50	%
Complete + Fire Resistive	-70	%
None	0	%

Zoning
Single Family Residential
Multi Family Residential
Commercial
Institutional
Industrial

Wood Shake Charge	Factor	Unit
Yes	4000	L/min
No	0	L/min

Exposures	Factor
0.0 to 3 m	25%
3.1 to 10 m	20%
10.1 to 20 m	15%
20.1 to 30 m	10%
30.1 to 45 m	5%
Beyond 45 m	0%
Fire Wall	10%

Required Duration of Fire Flow	
Fire Flow Required (L/min)	Duration (hours)
2,000 or less	1.00
3000	1.25
4000	1.50
5000	1.75
6000	2.00
7000	2.00
8000	2.00
9000	2.00
10000	2.00
11000	2.25
12000	2.50
13000	2.75
14000	3.00
15000	3.25
16000	3.50
17000	3.75
18000	4.00
19000	4.25
20000	4.50
21000	4.75
22000	5.00
23000	5.25
24000	5.50
25000	5.75
26000	6.00
27000	6.25
28000	6.50
29000	6.75
30000	7.00
31000	7.25
32000	7.50
33000	7.75
34000	8.00
35000	8.25
36000	8.50
37000	8.75
38000	9.00
39000	9.25
40000 and over	9.50

Notes to calculations

Separation Distance	Length-Height Factor of Exposed Wall of Adjacent Structure	Construction of Exposed Wall of Adjacent Structure			
		Wood Frame or Non-Combustible	Ordinary or Fire-Resistive		
			With Unprotected Openings	With Semi-Protected Openings	Blank Wall
0.0 to 3 m	0-30 m-storeys	22%	21%	16%	0%
	31-60 m-storeys	23%	22%	17%	0%
	61-90 m-storeys	24%	23%	18%	0%
	91-120 m-storeys	25%	24%	19%	0%
	Over 120 m-storeys	25%	25%	20%	0%
3.1 to 10 m	0-30 m-storeys	17%	15%	11%	0%
	31-60 m-storeys	18%	16%	12%	0%
	61-90 m-storeys	19%	18%	14%	0%
	91-120 m-storeys	20%	19%	15%	0%
	Over 120 m-storeys	20%	19%	15%	0%
10.1 to 20 m	0-30 m-storeys	12%	10%	7%	0%
	31-60 m-storeys	13%	11%	8%	0%
	61-90 m-storeys	14%	13%	10%	0%
	91-120 m-storeys	15%	14%	11%	0%
	Over 120 m-storeys	15%	15%	12%	0%
20.1 to 30 m	0-30 m-storeys	8%	6%	4%	0%
	31-60 m-storeys	8%	7%	5%	0%
	61-90 m-storeys	9%	8%	6%	0%
	91-120 m-storeys	10%	9%	7%	0%
	Over 120 m-storeys	10%	10%	8%	0%
30.1 to 45 m	All	5%	5%	5%	0%

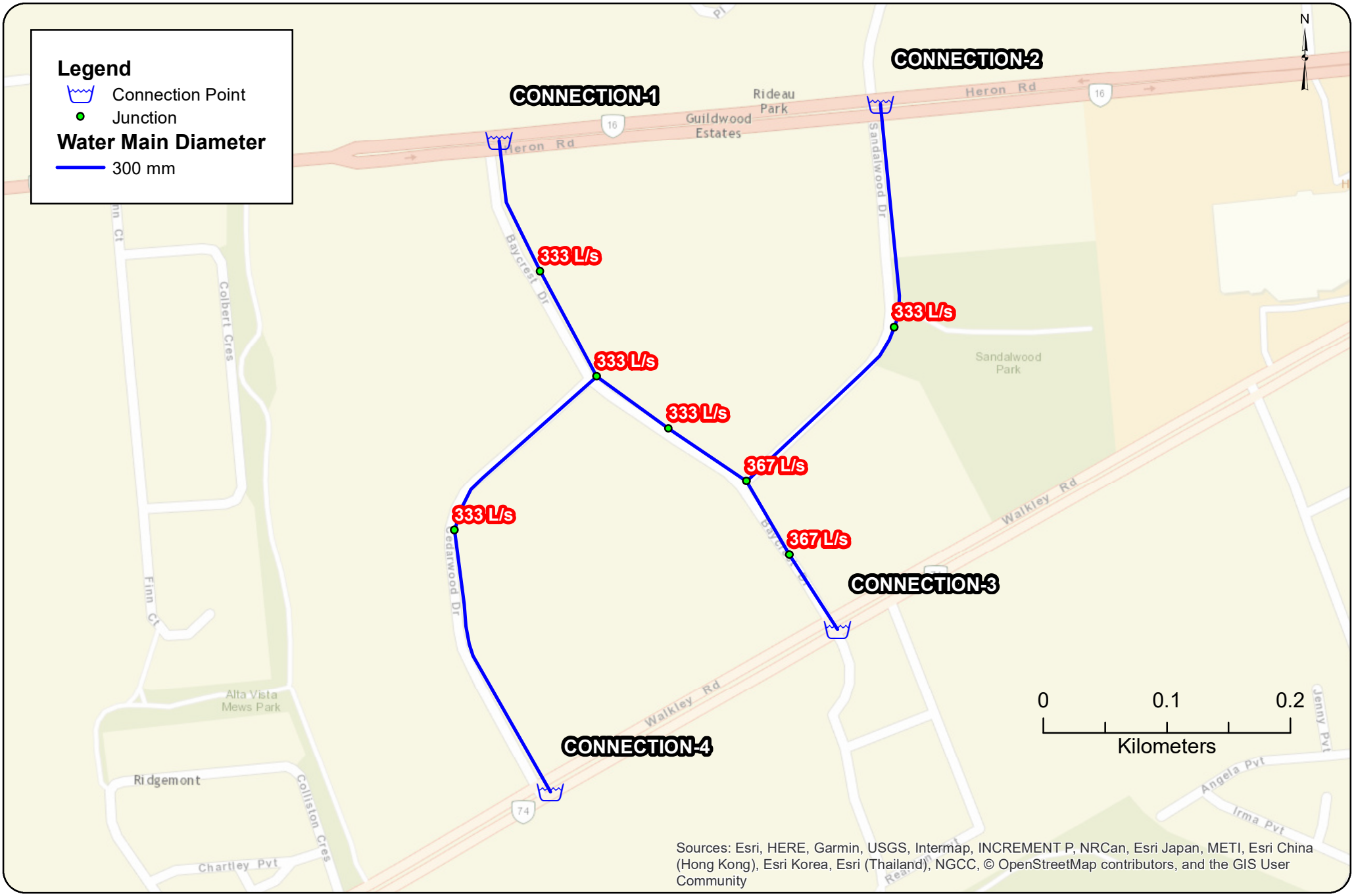
Type of Wall
Unprotected Openings
Semi-Protected Openings
Blank Wall

Side	Distance	Length-Storey	Range
West	24	179	Over 120 m-storeys
East	27	90	61-90 m-storeys
North	24	341	Over 120 m-storeys
South	38	610	Over 120 m-storeys

Heron Gate - FUS Required Fire Flow Summary

Heron Gate	
Type of Construction	Non-Combustible Construction
Construction Coefficient	0.8
Effective Total Area (m^2)	26,000
Required Fire Flow (L/min)	28,000
Occupancy Charge	-15
Sprinkler Protection Reduction	-50
Exposure (%)	
North (%)	10
East (%)	10
South (%)	10
West (%)	5
Total Exposure (%)	35
Wood Shake Charge (L/min)	0
Total Required Fire Flow (L/min)	20,000
Total Required Fire Flow (L/s)	333

Appendix B Required Fire Flows



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Project: **Hydraulic Capacity and Modeling Analysis**
Heron Gate Subdivision Redevelopment
Client: **David Schaeffer Engineering Ltd.**
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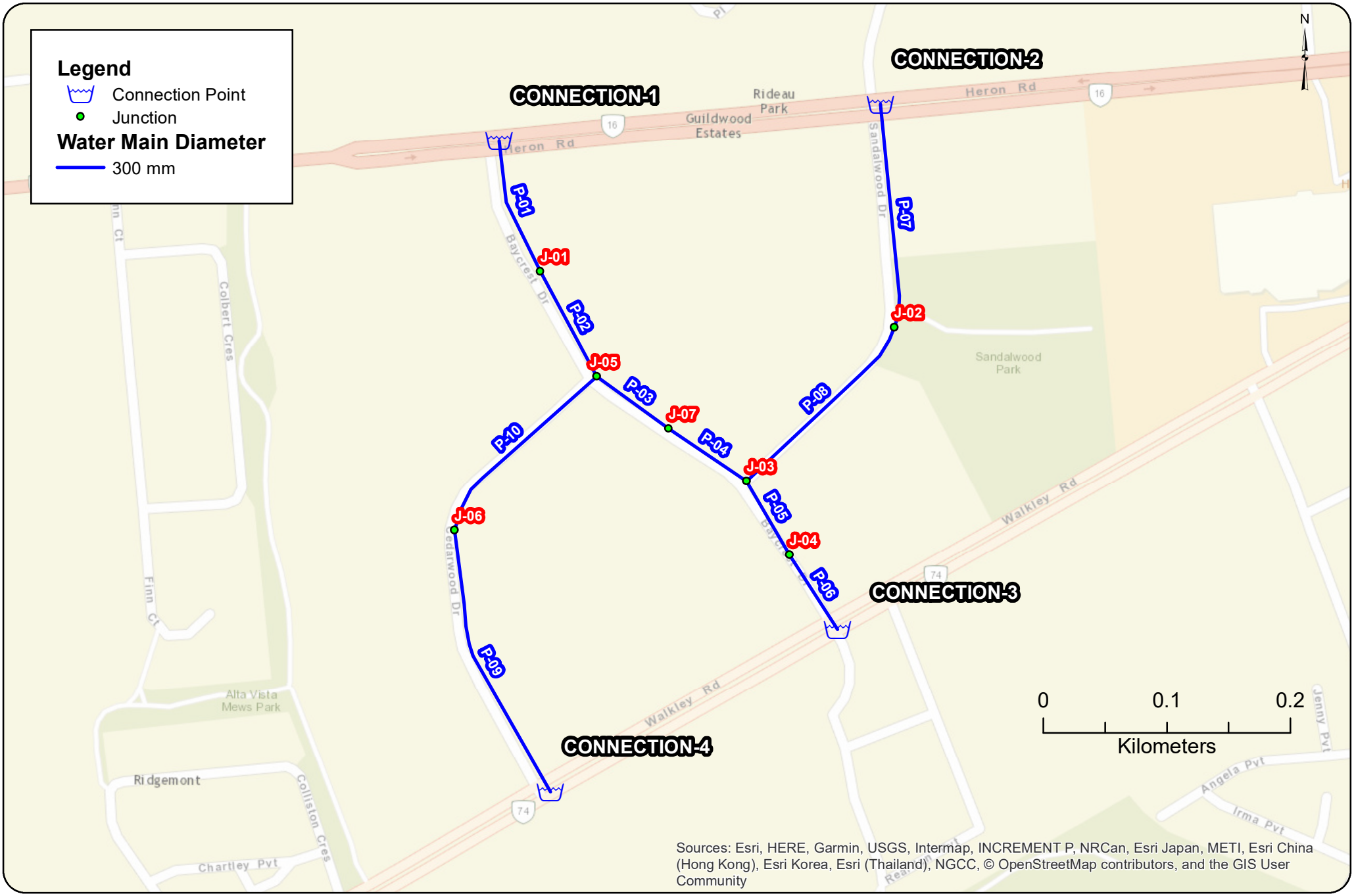
Created by: **Ad'A**
Reviewed by: **WdS**

Required Fire Flow

Figure B.1

Appendix C Pipe and Junction Model Inputs



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System Layout

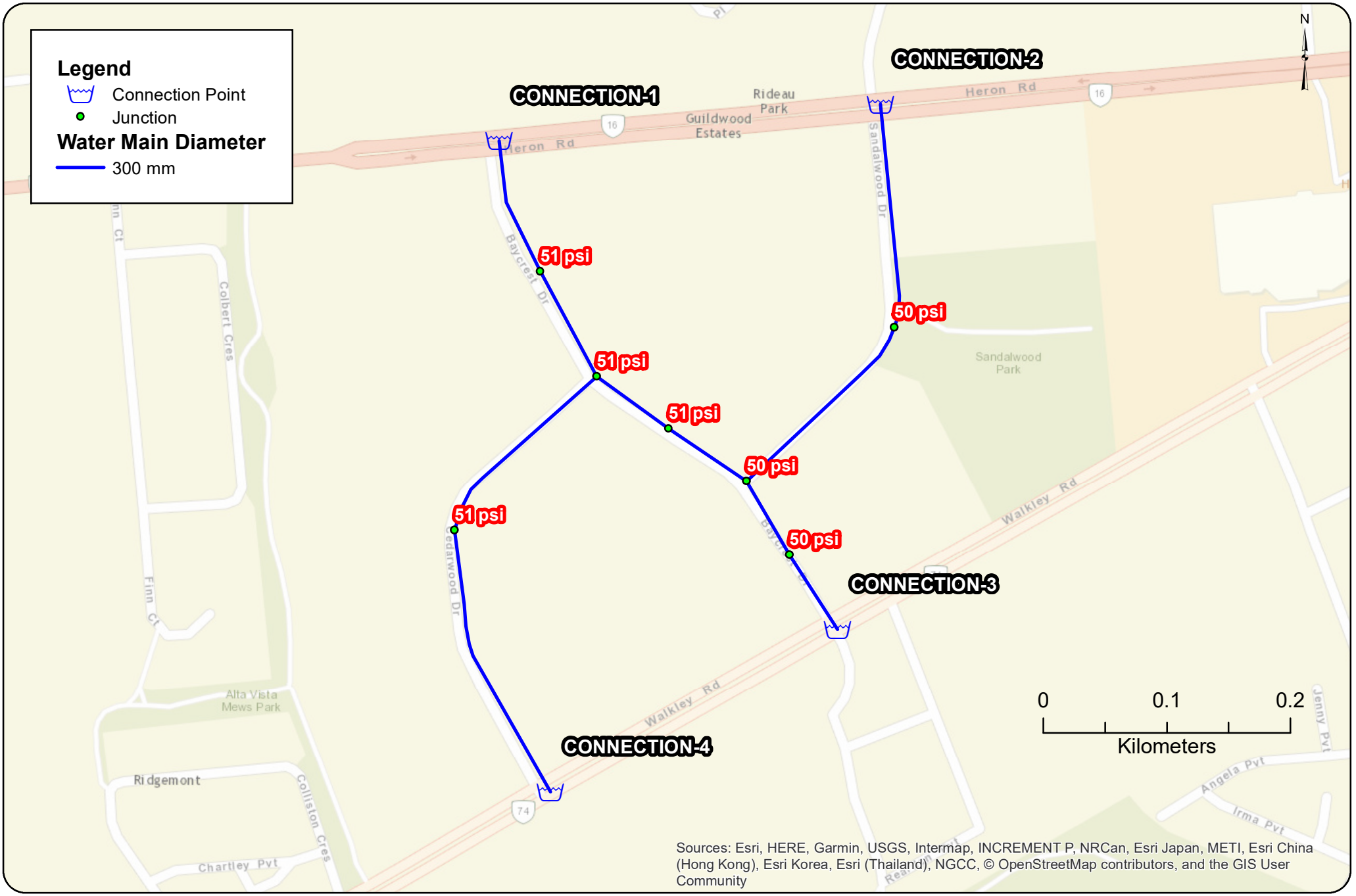
Figure C.1

Model Inputs

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness
P-01	CONNECTION-1	J-01	112.32	297	120
P-02	J-01	J-05	96.35	297	120
P-03	J-05	J-07	71.98	297	120
P-04	J-03	J-07	76.14	297	120
P-05	J-04	J-03	68.90	297	120
P-06	CONNECTION-3	J-04	71.56	297	120
P-07	CONNECTION-2	J-02	181.94	297	120
P-08	J-02	J-03	173.77	297	120
P-09	CONNECTION-4	J-06	229.58	297	120
P-10	J-06	J-05	172.50	297	120

ID	Elevation (m)	ADD (L/s)
J-01	95.66	5.15
J-02	95.66	5.15
J-03	95.66	5.15
J-04	95.66	5.15
J-05	95.66	5.15
J-06	95.66	5.15
J-07	95.66	5.15

Appendix D MHD and PHD Model Results



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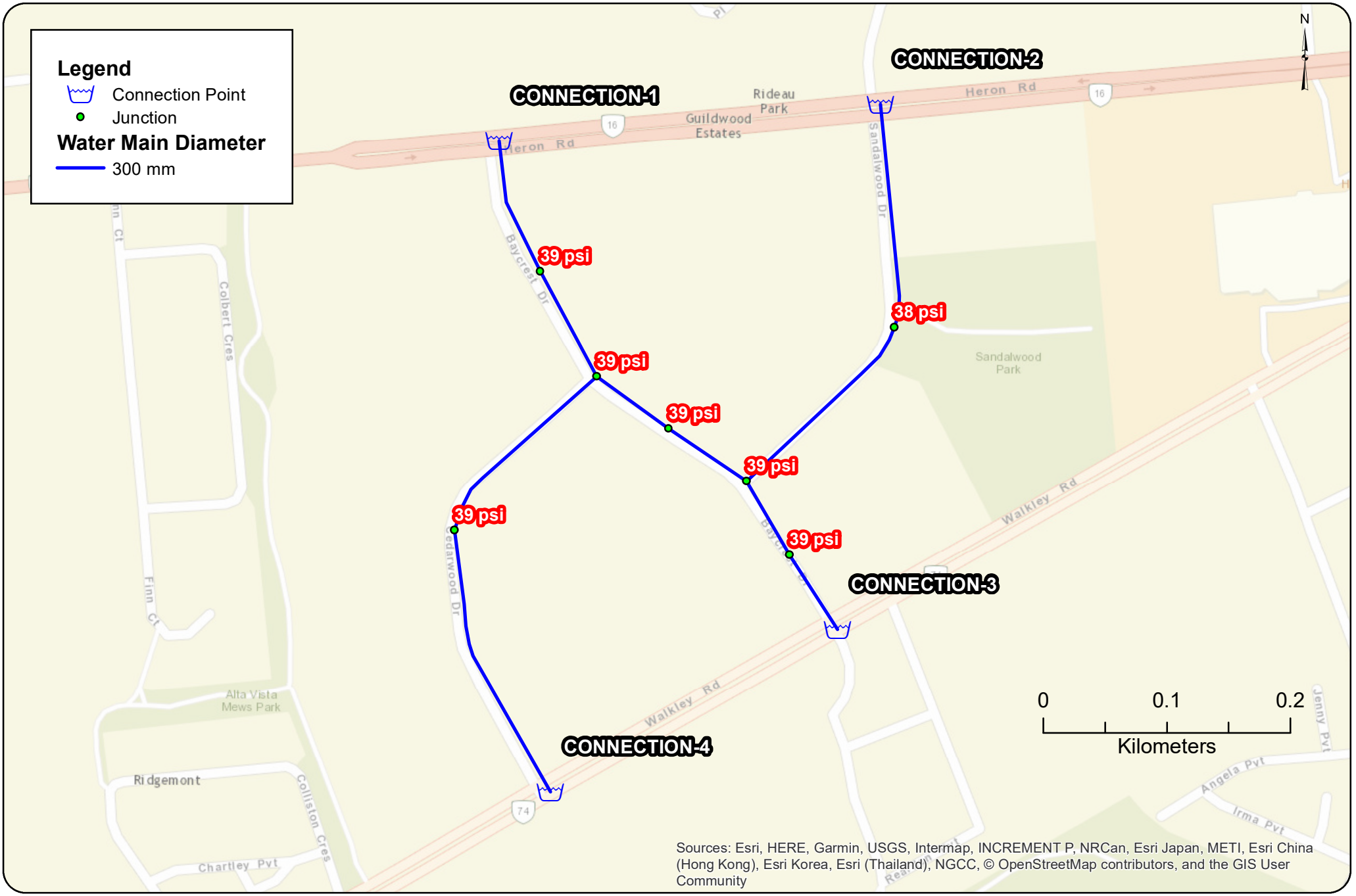
Minimum Hour Demand Pressure

Figure D.1



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Peak Hour Demand Pressure Results

Figure D.2

Minimum Hour Demand Modeling Results

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/km)
P-01	CONNECTION-1	J-01	112.32	297	120	23.88	0.34	0.06	0.55
P-02	J-01	J-05	96.35	297	120	20.79	0.30	0.04	0.43
P-03	J-05	J-07	71.98	297	120	56.89	0.82	0.20	2.75
P-04	J-03	J-07	76.14	297	120	-53.80	0.78	0.19	2.48
P-05	J-04	J-03	68.90	297	120	-9.18	0.13	0.01	0.09
P-06	CONNECTION-3	J-04	71.56	297	120	-6.09	0.09	0.00	0.04
P-07	CONNECTION-2	J-02	181.94	297	120	-38.44	0.55	0.24	1.33
P-08	J-02	J-03	173.77	297	120	-41.53	0.60	0.27	1.54
P-09	CONNECTION-4	J-06	229.58	297	120	42.28	0.61	0.36	1.59
P-10	J-06	J-05	172.50	297	120	39.19	0.57	0.24	1.38

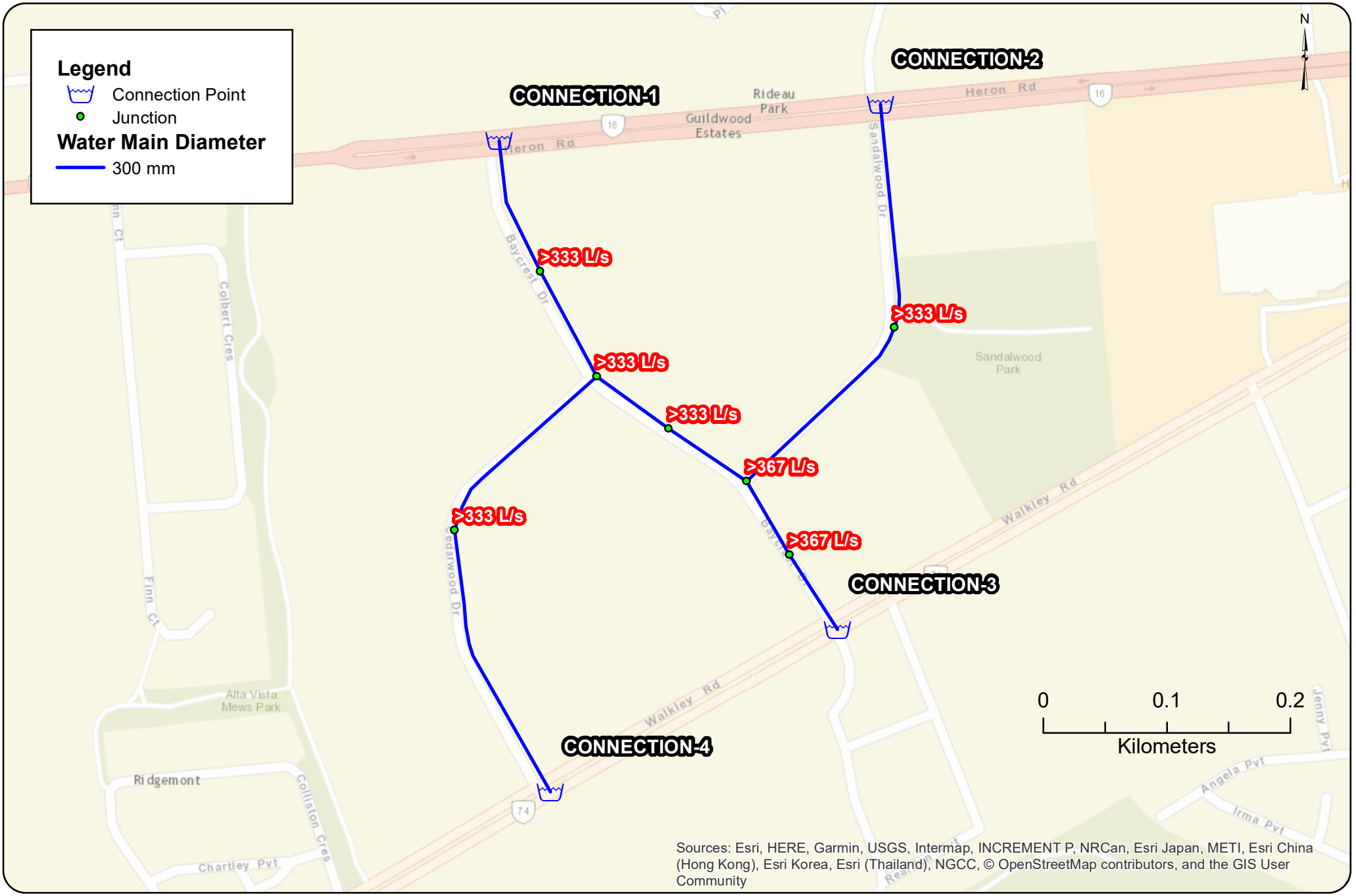
ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J-01	3.09	95.66	131	51
J-02	3.09	95.66	131	50
J-03	3.09	95.66	131	50
J-04	3.09	95.66	131	50
J-05	3.09	95.66	131	51
J-06	3.09	95.66	132	51
J-07	3.09	95.66	131	51

Peak Hour Demand Modeling Results

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/km)
P-01	CONNECTION-1	J-01	112.32	297	120	29.56	0.43	0.09	0.82
P-02	J-01	J-05	96.35	297	120	14.89	0.21	0.02	0.23
P-03	J-05	J-07	71.98	297	120	32.67	0.47	0.07	0.99
P-04	J-03	J-07	76.14	297	120	-18.00	0.26	0.02	0.33
P-05	J-04	J-03	68.90	297	120	32.87	0.47	0.07	1.00
P-06	CONNECTION-3	J-04	71.56	297	120	47.54	0.69	0.14	1.97
P-07	CONNECTION-2	J-02	181.94	297	120	-21.53	0.31	0.08	0.46
P-08	J-02	J-03	173.77	297	120	-36.20	0.52	0.21	1.19
P-09	CONNECTION-4	J-06	229.58	297	120	47.13	0.68	0.45	1.94
P-10	J-06	J-05	172.50	297	120	32.46	0.47	0.17	0.97

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J-01	14.67	95.66	123	39
J-02	14.67	95.66	123	38
J-03	14.67	95.66	123	39
J-04	14.67	95.66	123	39
J-05	14.67	95.66	123	39
J-06	14.67	95.66	123	39
J-07	14.67	95.66	123	39

Appendix E MDD+FF Model Results



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Heron Gate Subdivision Redevelopment
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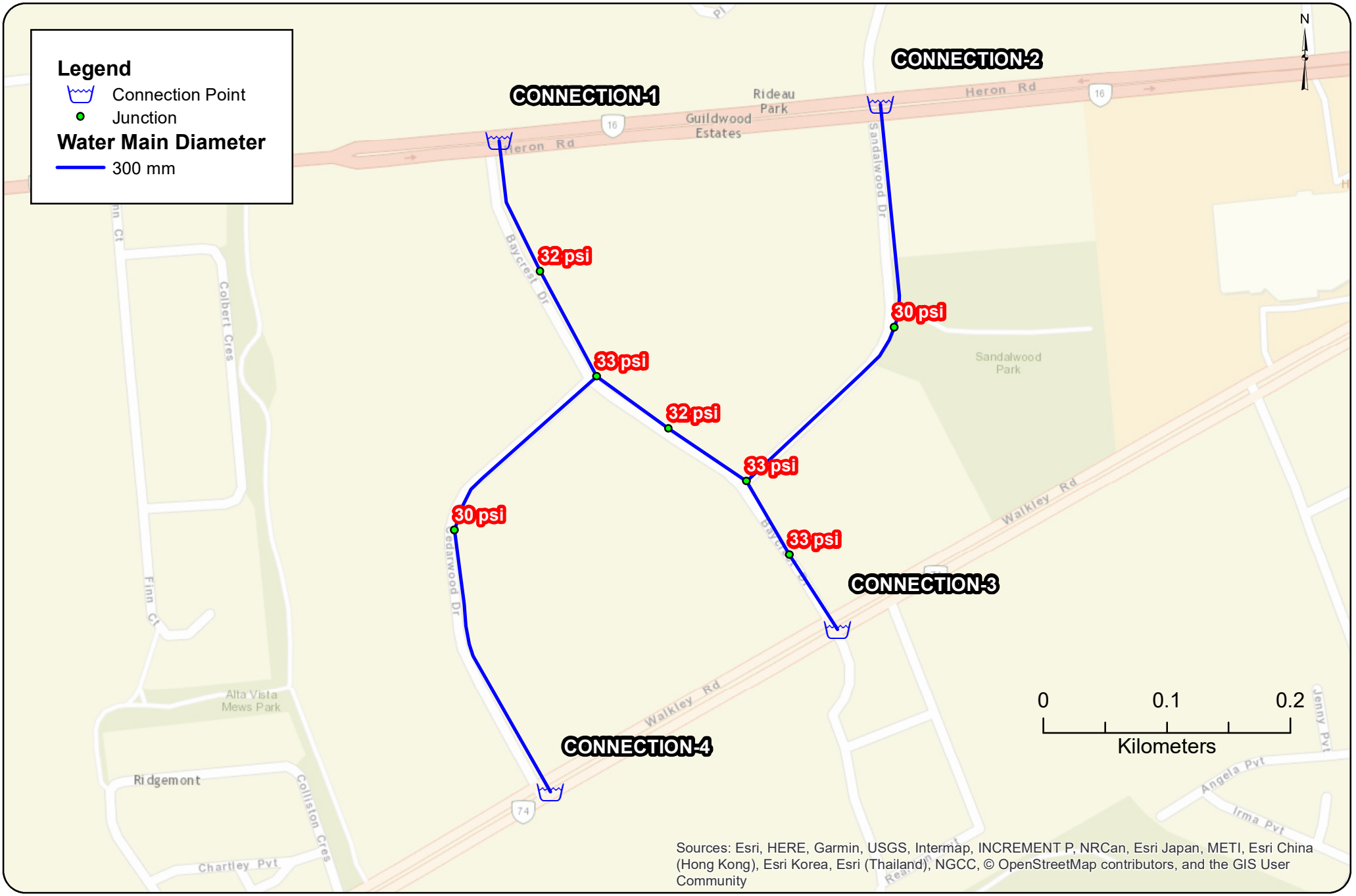
Available Fire Flow Results @ 20 psi

Figure E.1



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Reviewed by: **WdS**

Residual Pressure Results

Figure E.2

Fire Flow Modeling Results

ID	Static Demand (L/s)	Fire-Flow Demand (L/s)	Residual Pressure (psi)	Available Flow at Hydrant (L/s)	Available Flow Pressure (psi)
J-01	9.78	333	32	704	20
J-02	9.78	333	30	578	20
J-03	9.78	367	33	837	20
J-04	9.78	367	33	869	20
J-05	9.78	333	33	766	20
J-06	9.78	333	30	556	20
J-07	9.78	333	32	699	20

APPENDIX C

Wastewater Collection

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area		22.80	ha	
Existing Residential Sanitary Design Flows	**Itration Rate - Existing Subdivision**	0.55	L/s/ha	**Per Coordination with City of Ottawa staff*
	Flow Rate	42.09	L/s	
	Total	**42.09**	**L/s**	
Existing Towers to Remain (@280 L/person/d):				
	2850 & 2870 Cedarwood Drive (@ 280 L/person/d)	8.87	L/s	To Heron Sanitary Sewer
	2840 & 2851 & 2861 Baycrest Drive (@ 280 L/person/d)	7.49	L/s	To Walkley Sanitary Sewer
	Total	**16.36**	**L/s**	To Albion Sanitary Sewer
Target Flow Rate (Heron)		**35.00**	**L/s**	
Target Flow Rate (Walkley)		**62.09**	**L/s**	*(20 L/s + 42.1 L/s Existing Subdivision)*
Target Flow Rate (Albion)		**25.02**	**L/s**	
Target Flow Rate (Total)		122.12	L/s	
Target Flow Rate (Available) *		**105.76**	**L/s**	

**Does not include existing towers that are to remain.*

Phase 1:

			Capacity - Heron		Capacity - Walkley		Capacity - Albion	
Block 1	**10.75**	**L/s**	35.00	L/s	62.09	L/s	25.02	L/s
To Heron			**24.25**	**L/s - Available**	62.09	L/s	25.02	L/s
Block 2	**13.79**	**L/s**	24.25	L/s	62.09	L/s	25.02	L/s
To Heron			**10.46**	**L/s - Available**	62.09	L/s	25.02	L/s
Baycrest Towers + Cedarwood Towers	**16.36**	**L/s**	10.46	L/s	62.09	L/s	25.02	L/s
To Walkley			10.46	L/s	**45.73**	**L/s - Available**	25.02	L/s

Phase 2:

			Capacity - Heron		Capacity - Walkley		Capacity - Albion	
Block 3	**14.23**	**L/s**			45.73	L/s **		
To Walkley					**31.50**	**L/s - Available**		
Block 9	**12.48**	**L/s**			31.50	L/s		
To Walkley					**19.02**	**L/s - Available**		
Block 8	**17.26**	**L/s**			19.02	L/s		
To Walkley					**1.75**	**L/s - Available**		

*** Includes Baycrest and Cedarwood Existing Tower Flow Rates*

Phase 3 (Before Sewer Upgrades):
Before Sewer Upgrades

			Capacity - Heron		Capacity - Walkley		Capacity - Albion	
Block 4 + 2840 Baycrest	**9.88**	**L/s**			3.68	L/s	25.02	L/s
To Albion					3.68	L/s	**15.15**	**L/s - Available**
Block 5 + Cedarwood Towers	**10.55**	**L/s**			12.55	L/s	15.15	L/s
To Albion					12.55	L/s	**4.59**	**L/s - Available**
Block 6	**4.58**	**L/s**			12.55	L/s	4.59	L/s
To Albion					12.55	L/s	0.01	L/s
Block 7	**9.40**	**L/s**			12.55	L/s	0.01	L/s
To Albion					12.55	L/s	-9.39	**L/s - Available**

After Sewer Upgrades

			Capacity - Heron		Capacity - Walkley		Capacity - Albion	
Block 4 + 2840 Baycrest	**9.88**	**L/s**			12.55	L/s	39.12	L/s
To Albion					12.55	L/s	**29.24**	**L/s - Available**
Block 5 + Cedarwood Towers	**10.55**	**L/s**			12.55	L/s	29.24	L/s
To Albion					12.55	L/s	**18.69**	**L/s - Available**
Block 6	**4.58**	**L/s**			12.55	L/s	18.69	L/s
To Albion					12.55	L/s	14.11	**L/s - Available**
Block 7	**9.40**	**L/s**			12.55	L/s	14.11	L/s
To Albion					12.55	L/s	4.71	**L/s - Available**

Herongate
Contemplated Site Conditions

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area 22.80 **ha**

Extraneous Flow Allowances

Infiltration / Inflow (Dry) **12.54 L/s** **0.55 L/s/ha per consultation with City staff*

Domestic Contributions

Unit Type	**Unit Rate**	**Units**	**Pop**
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7	307	829
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4	10	14
1 Bedroom	1.4	443	621
2 Bedroom	2.1	712	1496
3 Bedroom	3.1	44	137
Average	1.8		0

Total Pop **3097**

Average Domestic Flow **10.04 L/s**

Peaking Factor **2.94**

Peak Domestic Flow **29.55 L/s**

Total Estimated Average Dry Weather Flow Rate	**10.04 L/s**
Total Estimated Peak Dry Weather Flow Rate	**29.55 L/s**
Total Estimated Peak Wet Weather Flow Rate	**42.09 L/s**

Herongate

Contemplated Site Conditions - 2851 Baycrest

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area 0.93 **ha**

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	**0.05**	**L/s**
Infiltration / Inflow (Wet)	**0.26**	**L/s**
Infiltration / Inflow (Total)	**0.31**	**L/s**

Domestic Contributions

Unit Type	**Unit Rate**	**Units**	**Pop**
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7		0
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4	2	3
1 Bedroom	1.4	57	80
2 Bedroom	2.1	82	173
3 Bedroom	3.1		0
Average	1.8		0

Total Pop	**256**	
Average Domestic Flow	**0.83**	**L/s**
Peaking Factor	**2.52**	*** Ultimate Peaking Factor**
Peak Domestic Flow	**2.09**	**L/s**

Total Estimated Average Dry Weather Flow Rate	**0.88**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**2.14**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**2.40**	**L/s**

Herongate

Contemplated Site Conditions - 2861 Baycrest

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area	0.93	**ha**

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	**0.05**	**L/s**
Infiltration / Inflow (Wet)	**0.26**	**L/s**
Infiltration / Inflow (Total)	**0.31**	**L/s**

Domestic Contributions

Unit Type	**Unit Rate**	**Units**	**Pop**
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7		0
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4	2	3
1 Bedroom	1.4	77	108
2 Bedroom	2.1	113	238
3 Bedroom	3.1		0
Average	1.8		0

Total Pop	**349**	
Average Domestic Flow	**1.13**	**L/s**
Peaking Factor	**2.52**	*** Ultimate Peaking Factor**
Peak Domestic Flow	**2.86**	**L/s**

Total Estimated Average Dry Weather Flow Rate	**1.18**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**2.90**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**3.16**	**L/s**

Herongate

Contemplated Site Conditions - 2840 Baycrest

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area 0.06 **ha**

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	**0.00**	**L/s**
Infiltration / Inflow (Wet)	**0.02**	**L/s**
Infiltration / Inflow (Total)	**0.02**	**L/s**

Domestic Contributions

Unit Type	**Unit Rate**	**Units**	**Pop**
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7		0
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4	4	6
1 Bedroom	1.4	31	44
2 Bedroom	2.1	63	133
3 Bedroom	3.1	16	50
Average	1.8		0

Total Pop	**233**	
Average Domestic Flow	**0.76**	**L/s**
Peaking Factor	**2.52**	*** Ultimate Peaking Factor**
Peak Domestic Flow	**1.91**	**L/s**

Total Estimated Average Dry Weather Flow Rate	**0.76**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**1.91**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**1.93**	**L/s**

Timbercreek
Herongate
Contemplated Site Conditions
Cedarwood Towers to Remain

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area	2.80	**ha**

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	**0.14**	**L/s**
Infiltration / Inflow (Wet)	**0.79**	**L/s**
Infiltration / Inflow (Total)	**0.93**	**L/s**

Domestic Contributions

Unit Type	**Unit Rate**	**Units**	**Pop**
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7		0
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4	2	3
1 Bedroom	1.4	182	255
2 Bedroom	2.1	298	626
3 Bedroom	3.1	28	87
Average	1.8		0

Total Pop	**971**	
Average Domestic Flow	**3.15**	**L/s**
Peaking Factor	**2.52**	*** Ultimate Peaking Factor**
Peak Domestic Flow	**7.94**	**L/s**

Total Estimated Average Dry Weather Flow Rate	**3.29**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**8.08**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**8.87**	**L/s**

Herongate
Contemplated Site Conditions

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area	13.833	**ha**	**Excluding Block 1*

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	**0.69**	**L/s**
Infiltration / Inflow (Wet)	**3.87**	**L/s**
Infiltration / Inflow (Total)	**4.56**	**L/s**

Domestic Contributions

Unit Type	**Unit Rate**	**Units**	**Pop**
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7	315	851
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4	10	14
1 Bedroom	1.4	347	486
2 Bedroom	2.1	556	1168
3 Bedroom	3.1	44	137
Average	1.8	4748	8547
		Total Pop	**11203**

Average Domestic Flow	**36.31**	**L/s**
Peaking Factor	**2.52**	
Peak Domestic Flow	**91.65**	**L/s**

Total Estimated Average Dry Weather Flow Rate	**37.00**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**92.34**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**96.22**	**L/s**

Herongate
Contemplated Site Conditions - Block 2

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area 2.775 **ha**

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	**0.14**	**L/s**
Infiltration / Inflow (Wet)	**0.78**	**L/s**
Infiltration / Inflow (Total)	**0.92**	**L/s**

Domestic Contributions

Unit Type	**Unit Rate**	**Units**	**Pop**
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7	68	184
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8	772	1390
		Total Pop	**1574**

Average Domestic Flow **5.10** **L/s**

Peaking Factor **2.52** *** Ultimate Peaking Factor**

Peak Domestic Flow **12.88** **L/s**

Total Estimated Average Dry Weather Flow Rate	**5.24**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**13.02**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**13.79**	**L/s**

Herongate

Contemplated Site Conditions - Block 3

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area 1.090 **ha**

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	**0.05**	**L/s**
Infiltration / Inflow (Wet)	**0.31**	**L/s**
Infiltration / Inflow (Total)	**0.36**	**L/s**

Domestic Contributions

Unit Type	**Unit Rate**	**Units**	**Pop**
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7	43	117
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8	877	1579
		Total Pop	**1696**

Average Domestic Flow	**5.50**	**L/s**	
Peaking Factor	**2.52**	*** Ultimate Peaking Factor**	
Peak Domestic Flow	**13.87**	**L/s**	

Total Estimated Average Dry Weather Flow Rate	**5.55**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**13.93**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**14.23**	**L/s**

Herongate

Contemplated Site Conditions - Block 4

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area 1.460 **ha**

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	**0.07**	**L/s**
Infiltration / Inflow (Wet)	**0.41**	**L/s**
Infiltration / Inflow (Total)	**0.48**	**L/s**

Domestic Contributions

Unit Type	**Unit Rate**	**Units**	**Pop**
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7	35	95
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8	454	818
		Total Pop	**913**

Average Domestic Flow	**2.96**	**L/s**	
Peaking Factor	**2.52**	*** Ultimate Peaking Factor**	
Peak Domestic Flow	**7.47**	**L/s**	

Total Estimated Average Dry Weather Flow Rate	**3.03**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**7.54**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**7.95**	**L/s**

Herongate

Contemplated Site Conditions - Block 5

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area 0.000 **ha** **Accounted for by Baycrest Towers*

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	**0.00**	**L/s**
Infiltration / Inflow (Wet)	**0.00**	**L/s**
Infiltration / Inflow (Total)	**0.00**	**L/s**

Domestic Contributions

Unit Type	**Unit Rate**	**Units**	**Pop**
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7	76	206
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8		0
		Total Pop	**206**

Average Domestic Flow	**0.67**	**L/s**
Peaking Factor	**2.52**	*** Ultimate Peaking Factor**
Peak Domestic Flow	**1.69**	**L/s**

Total Estimated Average Dry Weather Flow Rate	**0.67**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**1.69**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**1.69**	**L/s**

Herongate

Contemplated Site Conditions - Block 6

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area 2.292 **ha**

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	**0.11**	**L/s**
Infiltration / Inflow (Wet)	**0.64**	**L/s**
Infiltration / Inflow (Total)	**0.76**	**L/s**

Domestic Contributions

Unit Type	**Unit Rate**	**Units**	**Pop**
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7		0
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8	259	467
		Total Pop	**467**

Average Domestic Flow **1.51** **L/s**

Peaking Factor **2.52** *** Ultimate Peaking Factor**

Peak Domestic Flow **3.82** **L/s**

Total Estimated Average Dry Weather Flow Rate	**1.63**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**3.94**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**4.58**	**L/s**

Herongate
Contemplated Site Conditions - Block 7

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area 1.221 **ha**

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	**0.06**	**L/s**
Infiltration / Inflow (Wet)	**0.34**	**L/s**
Infiltration / Inflow (Total)	**0.40**	**L/s**

Domestic Contributions

Unit Type	**Unit Rate**	**Units**	**Pop**
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7	19	52
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8	582	1048
		Total Pop	**1100**

Average Domestic Flow **3.56** **L/s**

Peaking Factor **2.52** *** Ultimate Peaking Factor**

Peak Domestic Flow **9.00** **L/s**

Total Estimated Average Dry Weather Flow Rate	**3.63**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**9.06**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**9.40**	**L/s**

Herongate
Contemplated Site Conditions - Block 8

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area 2.683 **ha**

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	**0.13**	**L/s**
Infiltration / Inflow (Wet)	**0.75**	**L/s**
Infiltration / Inflow (Total)	**0.89**	**L/s**

Domestic Contributions

Unit Type	**Unit Rate**	**Units**	**Pop**
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7	74	200
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8	1001	1802
		Total Pop	**2002**

Average Domestic Flow	**6.49**	**L/s**	
Peaking Factor	**2.52**	*** Ultimate Peaking Factor**	
Peak Domestic Flow	**16.38**	**L/s**	

Total Estimated Average Dry Weather Flow Rate	**6.62**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**16.51**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**17.26**	**L/s**

Herongate
Contemplated Site Conditions - Block 9

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area 1.978 **ha**

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	**0.10**	**L/s**
Infiltration / Inflow (Wet)	**0.55**	**L/s**
Infiltration / Inflow (Total)	**0.65**	**L/s**

Domestic Contributions

Unit Type	**Unit Rate**	**Units**	**Pop**
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7		0
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8	803	1446
		Total Pop	**1446**

Average Domestic Flow	**4.69**	**L/s**	
Peaking Factor	**2.52**	*** Ultimate Peaking Factor**	
Peak Domestic Flow	**11.83**	**L/s**	

Total Estimated Average Dry Weather Flow Rate	**4.79**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**11.93**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**12.48**	**L/s**

SANITARY SEWER CALCULATION SHEET

CLIENT: **TIMBERCREEK**
LOCATION: **HERON GATE COMMUNITY**
FILE REF: **18-1080**
DATE: **03-Apr-19**

Existing Site Conditions

DESIGN PARAMETERS

Avg. Daily Flow Res.	280	L/p/d	Peak Fact Res. Per Harmons: Min = 2.0, Max =4.0		Infiltration / Inflow	0.55	L/s/ha
Avg. Daily Flow Comm.	28,000	L/ha/d	Peak Fact. Comm.	1.5	Min. Pipe Velocity	0.60	m/s full flowing
Avg. Daily Flow Instit.	28,000	L/ha/d	Peak Fact. Instit.	1.5	Max. Pipe Velocity	3.00	m/s full flowing
Avg. Daily Flow Indust.	35,000	L/ha/d	Peak Fact. Indust. per MOE graph		Mannings N	0.013	

Location			Residential Area and Population									Commercial		Institutional		Industrial			Infiltration				Pipe Data							
Area ID	Up	Down	Area	Number of Units by type				Pop.	Cumulative Area	Cumulative Pop.	Peak. Fact.	Q_{res}	Area	Accu. Area	Area	Accu. Area	Area	Accu. Area	Q_{C+I+I}	Total Area	Accu. Area	Infiltration * Flow	Total Flow	DIA	Slope	Length	$A_{hydraulic}$	R	Velocity	Q_{cap}	Q / Q full
			(ha)	Singles	Semi's	Town's	Apt's		(ha)		(-)	(L/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(ha)	(ha)	(L/s)	(L/s)	(mm)	(%)	(m)	(m^2)	(m)	(m/s)	(L/s)	(-)
Sandalwood	Heron		11.400			154	605	1503.0	11.400	1503.0	3.68	17.92		0.00		0.00		0.00	0.0	11.400	11.400	6.270	24.19	250	0.63	73.2	0.049	0.063	0.96	47.2	0.51
			0.000					0.0	11.400	1503.0	3.68	17.92		0.00		0.00		0.00	0.0	0.000	11.400	6.270	24.19	250	0.63	73.2	0.049	0.063	0.96	47.2	0.51
			0.000					0.0	11.400	1503.0	3.68	17.92		0.00		0.00		0.00	0.0	0.000	11.400	6.270	24.19	250	0.63	42.7	0.049	0.063	0.96	47.3	0.51
			0.000					0.0	11.400	1503.0	3.68	17.92		0.00		0.00		0.00	0.0	0.000	11.400	6.270	24.19	250	0.63	73.2	0.049	0.063	0.96	47.2	0.51
		Baycrest	0.000					0.0	11.400	1503.0	3.68	17.92		0.00		0.00		0.00	0.0	0.000	11.400	6.270	24.19	250	0.65	73.9	0.049	0.063	0.98	47.9	0.50
Baycrest	Cedarwood		0.000					0.0	0.000	0.0	4.00	0.00		0.00		0.00		0.00	0.0	0.000	0.000	0.000	0.00	250	2.81	61.0	0.049	0.063	2.03	99.6	0.00
		Sandalwood	0.000					0.0	0.000	0.0	4.00	0.00		0.00		0.00		0.00	0.0	0.000	0.000	0.000	0.00	250	1.52	67.1	0.049	0.063	1.49	73.3	0.00
	Sandalwood		0.000					0.0	11.400	1503.0	3.68	17.92		0.00		0.00		0.00	0.0	0.000	0.000	0.000	17.92	250	0.61	68.9	0.049	0.063	0.95	46.4	0.39
		Walkley	0.000					0.0	11.400	1503.0	3.68	17.92		0.00		0.00		0.00	0.0	0.000	0.000	0.000	17.92	250	0.51	66.5	0.049	0.063	0.87	42.5	0.42
Baycrest	Heron		11.400			154	605	1503.0	11.400	1503.0	3.68	17.92		0.00		0.00		0.00	0.0	11.400	11.400	7.169	25.09	250	1.02	30.5	0.049	0.063	1.22	60.0	0.42
			0.000					0.0	11.400	1503.0	3.68	17.92		0.00		0.00		0.00	0.0	0.000	11.400	6.270	24.19	250	1.00	80.2	0.049	0.063	1.21	59.4	0.41
			0.000					0.0	11.400	1503.0	3.68	17.92		0.00		0.00		0.00	0.0	0.000	11.400	6.270	24.19	250	1.00	76.2	0.049	0.063	1.21	59.4	0.41
			0.000					0.0	11.400	1503.0	3.68	17.92		0.00		0.00		0.00	0.0	0.000	11.400	6.270	24.19	250	0.40	67.1	0.049	0.063	0.77	37.7	0.64
			0.000					0.0	11.400	1503.0	3.68	17.92		0.00		0.00		0.00	0.0	0.000	11.400	6.270	24.19	250	0.40	67.1	0.049	0.063	0.77	37.7	0.64
			0.000					0.0	11.400	1503.0	3.68	17.92		0.00		0.00		0.00	0.0	0.000	11.400	6.270	24.19	250	0.41	32.0	0.049	0.063	0.77	37.9	0.64
			0.000					0.0	11.400	1503.0	3.68	17.92		0.00		0.00		0.00	0.0	0.000	11.400	6.270	24.19	250	0.38	49.7	0.049	0.063	0.75	36.8	0.66
			0.000					0.0	11.400	1503.0	3.68	17.92		0.00		0.00		0.00	0.0	0.000	11.400	6.270	24.19	250	0.41	48.8	0.049	0.063	0.78	38.1	0.64
			0.000					0.0	11.400	1503.0	3.68	17.92		0.00		0.00		0.00	0.0	0.000	11.400	6.270	24.19	250	0.15	66.5	0.049	0.063	0.47	23.1	1.05
			0.000					0.0	11.400	1503.0	3.68	17.92		0.00		0.00		0.00	0.0	0.000	11.400	6.270	24.19	250	0.71	67.8	0.049	0.063	1.02	50.0	0.48

Location			Residential Area and Population									Commercial		Institutional		Industrial			Infiltration				Pipe Data							
Area ID	Up	Down	Area	Number of Units by type				Pop.	Cumulative Area	Cumulative Pop.	Peak. Fact.	Q_{res}	Area	Accu. Area	Area	Accu. Area	Area	Accu. Area	Q_{C+I+I}	Total Area	Accu. Area	Infiltration * Flow	Total Flow	DIA	Slope	Length	$A_{hydraulic}$	R	Velocity	Q_{cap}	Q / Q full
			(ha)	Singles	Semi's	Town's	Apt's		(ha)		(-)	(L/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(ha)	(ha)	(L/s)	(L/s)	(mm)	(%)	(m)	(m^2)	(m)	(m/s)	(L/s)	(-)
Albion		Albion	14.720	68		195		758.0	14.720	758.0	3.87	9.52		0.00	11.16	11.16		0.00	9.7	25.880	25.880	14.234	33.44	300	0.37	120.4	0.071	0.075	0.83	58.5	0.57
			0.000					0.0	14.720	758.0	3.87	9.52		0.00		11.16		0.00	9.7	0.000	25.880	14.234	33.44	300	0.73	288.6	0.071	0.075	1.17	82.9	0.40

SANITARY SEWER CALCULATION SHEET

CLIENT: **TIMBERCREEK**
LOCATION: **HERON GATE COMMUNITY**
FILE REF: **18-1080**
DATE: **03-Apr-19**

Proposed Site Conditions

DESIGN PARAMETERS

Avg. Daily Flow Res.	280 L/p/d	Peak Fact Res. Per Harmons: Min = 2.0, Max =4.0		Infiltration / Inflow	0.33 L/s/ha *
Avg. Daily Flow Comm.	28,000 L/ha/d	Peak Fact. Comm.	1.5	Min. Pipe Velocity	0.60 m/s full flowing
Avg. Daily Flow Instit.	28,000 L/ha/d	Peak Fact. Instit.	1.5	Max. Pipe Velocity	3.00 m/s full flowing
Avg. Daily Flow Indust.	35,000 L/ha/d	Peak Fact. Indust. per MOE graph		Mannings N	0.013

Location			Residential Area and Population									Commercial		Institutional		Industrial			Infiltration				Pipe Data							
Area ID	Up	Down	Area	Number of Units by type				Pop.	Cumulative Area	Cumulative Pop.	Peak. Fact.	Q_{res}	Area	Accu. Area	Area	Accu. Area	Area	Accu. Area	Q_{C+I+I}	Total Area	Accu. Area	Infiltration * Flow	Total Flow	EX.DIA	PROP.DIA	Slope	Length	$A_{hydraulic}$	R	Velocity	Q_{cap}
			(ha)	Singles	Semi's	Town's	Apt's		(ha)		(-)	(L/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(ha)	(ha)	(L/s)	(L/s)	(mm)	(mm)	(%)	(m)	(m^2)	(m)	(m/s)	(L/s)
	Sandalwood/Heron		0.000					0.0	0.000	0.0	4.00	0.00		0.00		0.00		0.00	0.0	0.000	0.000	0.000	0.00	250	250	0.63	73.2	0.049	0.063	0.96	47.2
			0.000					0.0	0.000	0.0	4.00	0.00		0.00		0.00		0.00	0.0	0.000	0.000	0.000	0.00	250	250	0.63	73.2	0.049	0.063	0.96	47.2
			0.000					0.0	0.000	0.0	4.00	0.00		0.00		0.00		0.00	0.0	0.000	0.000	0.000	0.00	250	250	0.63	42.7	0.049	0.063	0.96	47.3
Block 3 + PH1 Tributary to Walkley			2.948				43	1210	2294.0	2.948	2294.0	3.54	26.31		0.00		0.00		0.00	0.0	2.948	2.948	0.973	27.28	250	250	0.63	73.2	0.049	0.063	0.96	47.2
		Sandalwood/Baycrest	0.000					0.0	2.948	2294.0	3.54	26.31		0.00		0.00		0.00	0.0	0.000	2.948	0.973	27.28	250	250	0.65	73.9	0.049	0.063	0.98	47.9
	Cedarwood/Baycrest		0.000					0.0	0.000	0.0	4.00	0.00		0.00		0.00		0.00	0.0	0.000	0.000	0.000	0.00	250	250	2.81	61.0	0.049	0.063	2.03	99.6
		Sandalwood	0.000					0.0	0.000	0.0	4.00	0.00		0.00		0.00		0.00	0.0	0.000	0.000	0.000	0.00	250	250	1.52	67.1	0.049	0.063	1.49	73.3
Block 8 & 9	Sandalwood		4.661				74	1804	3447.0	7.609	5741.0	3.19	59.33		0.00		0.00		0.00	0.0	4.661	4.661	1.538	60.87	250	300	0.61	68.9	0.049	0.075	1.07	52.4
		Baycrest/Walkley	0.000					0.0	7.609	5741.0	3.19	59.33		0.00		0.00		0.00	0.0	0.000	4.661	1.538	60.87	250	300	0.51	66.5	0.049	0.075	0.98	48.0
	Baycrest/Heron		0.000					0.0	0.000	0.0	4.00	0.00		0.00		0.00		0.00	0.0	0.000	0.000	0.000	0.00	250	250	1.02	30.5	0.049	0.063	1.22	60.0
			0.000					0.0	0.000	0.0	4.00	0.00		0.00		0.00		0.00	0.0	0.000	0.000	0.000	0.00	250	250	1.00	80.2	0.049	0.063	1.21	59.4
2840 Baycrest			0.065				114	205.0	0.065	205.0	4.00	2.66		0.00		0.00		0.00	0.0	0.065	0.065	0.021	2.68	250	250	1.00	76.2	0.049	0.063	1.21	59.4
			0.000					0.0	0.065	205.0	4.00	2.66		0.00		0.00		0.00	0.0	0.000	0.065	0.021	2.68	250	250	0.40	67.1	0.049	0.063	0.77	37.7
Block 4			1.460				35	454	912.0	1.524	1117.0	3.77	13.64		0.00		0.00		0.00	0.0	1.460	1.524	0.503	14.14	250	250	0.40	67.1	0.049	0.063	0.77	37.7
			0.000					0.0	1.524	1117.0	3.77	13.64		0.00		0.00		0.00	0.0	0.000	1.524	0.503	14.14	250	250	0.41	32.0	0.049	0.063	0.77	37.9
Block 5 (Cedarwood Towers)			2.804				76	510	1123.0	4.329	2240.0	3.55	25.75		0.00		0.00		0.00	0.0	2.804	4.329	1.428	27.18	250	250	0.38	49.7	0.049	0.063	0.75	36.8
Block 6			2.292					259	466.0	6.620	2706.0	3.48	30.52		0.00		0.00		0.00	0.0	2.292	6.620	2.185	32.70	250	250	0.41	48.8	0.049	0.063	0.78	38.1
			0.000					0.0	6.620	2706.0	3.48	30.52		0.00		0.00		0.00	0.0	0.000	6.620	2.185	32.70	250	300	0.15	66.5	0.049	0.075	0.53	26.1
		Baycrest/Walkley	0.000					0.0	6.620	2706.0	3.48	30.52		0.00		0.00		0.00	0.0	0.000	6.620	2.185	32.70	250	300	0.71	67.8	0.049	0.075	1.15	56.5
	Baycrest/Walkley		0.000					0.0	6.620	2706.0	3.48	30.52		0.00		0.00		0.00	0.0	0.000	6.620	2.185	32.70	250	300	0.35	39.9	0.049	0.075	0.81	39.8
Block 7			1.221				19	582	1099.0	7.841	3805.0	3.35	41.34		0.00		0.00		0.00	0.0	1.221	7.841	2.588	43.93	250	300	0.34	84.8	0.049	0.075	0.80	39.3
		Walkley/Albion	0.000					0.0	7.841	3805.0	3.35	41.34		0.00		0.00		0.00	0.0	0.000	7.841	2.588	43.93	250	300	0.34	65.6	0.049	0.075	0.79	38.9
	Walkley/Albion		0.000					0.0	7.841	3805.0	3.35	41.34		0.00		0.00		0.00	0.0	0.000	7.841	2.588	43.93	250	300	0.34	120.0	0.049	0.075	0.80	39.3
			0.000					0.0	7.841	3805.0	3.35	41.34		0.00		0.00		0.00	0.0	0.000	7.841	2.588	43.93	250	300	0.38	120.0	0.049	0.075	0.84	41.1
*			14.720	68			195		758.0	22.561	4563.0	3.28	48.53		0.00		11.16		0.00	9.7	25.880	33.721	16.822	75.04	300	375	0.37	120.4	0.071	0.094	0.96	67.8
		South Ottawa Trunk	0.000					0.0	22.561	4563.0	3.28	48.53		0.00		11.16		0.00	9.7	0.000	33.721	16.822	75.04	300	375	0.73	288.6	0.071	0.094	1.36	96.2

** Infiltration Rate of 0.55 L/s/ha applied to Existing Subdivisions based on consultation with City staff.*

Alison Gosling

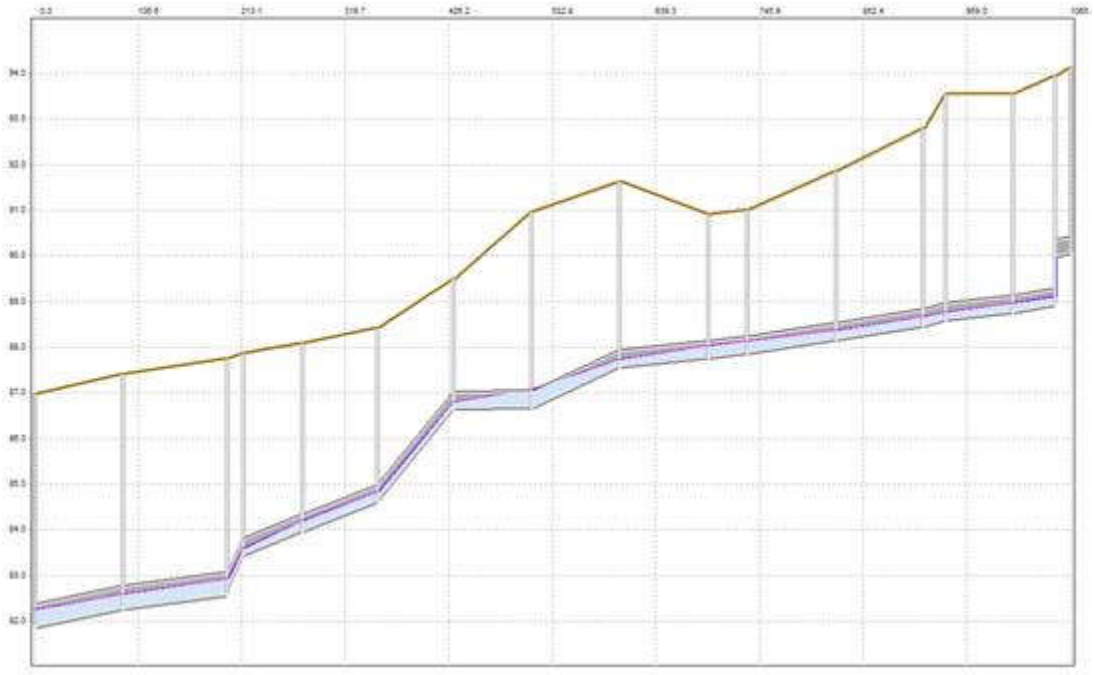
From: Oram, Cody <Cody.Oram@ottawa.ca>
Sent: Thursday, February 7, 2019 8:49 AM
To: Alison Gosling
Cc: Baker, Adam
Subject: RE: 18-1080 Heron Gate - Sanitary Sewer Capacity

Follow Up Flag: Follow up
Flag Status: Flagged

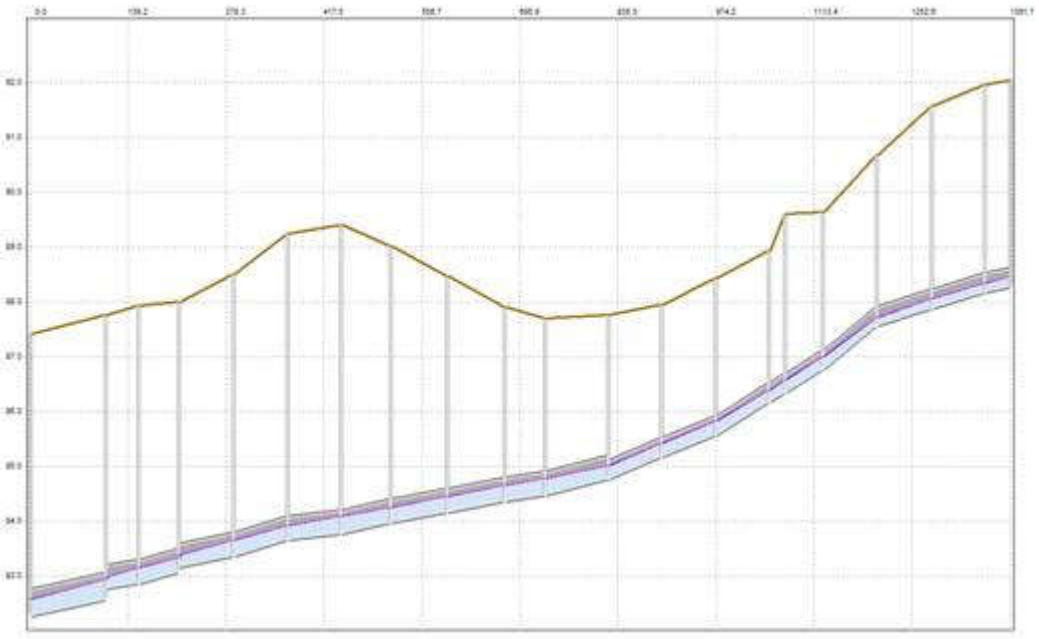
Hi Alison,

The City's Water Resources group did a hydraulic assessment of the sanitary system using XP-SWMM and found that there is limited capacity in both the Heron and Walkley systems. Please find below additional information provided by their group.

Below is the HGL along Walkley and Heron under existing conditions using the new Sewer Design flows and an critical I/I of 0.55 l/s/ha (which we have experienced in these older separated systems). As you can see, we currently have the capacity to convey existing flows without causing basement flooding.

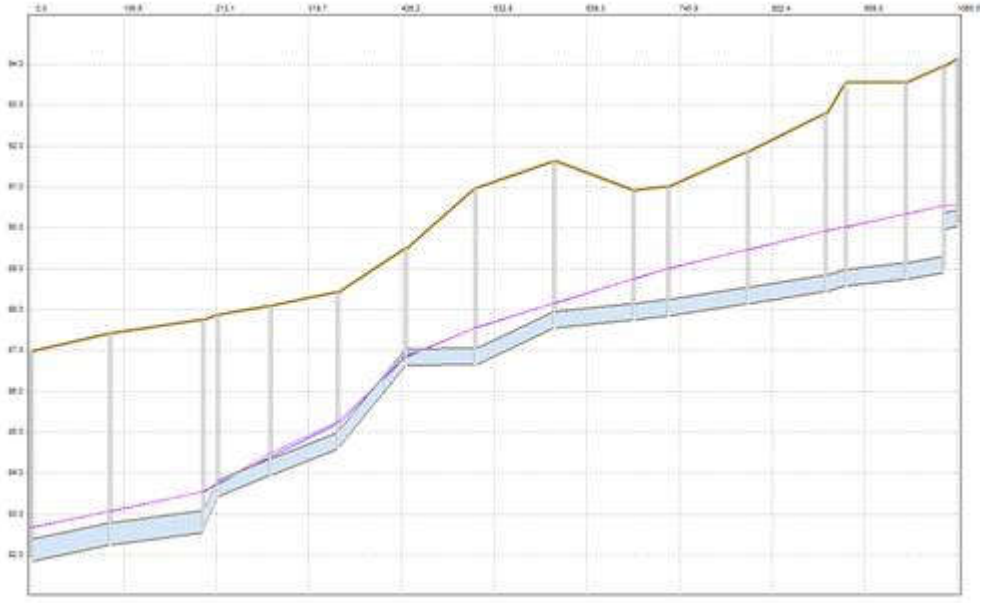


Heron – Existing HGL

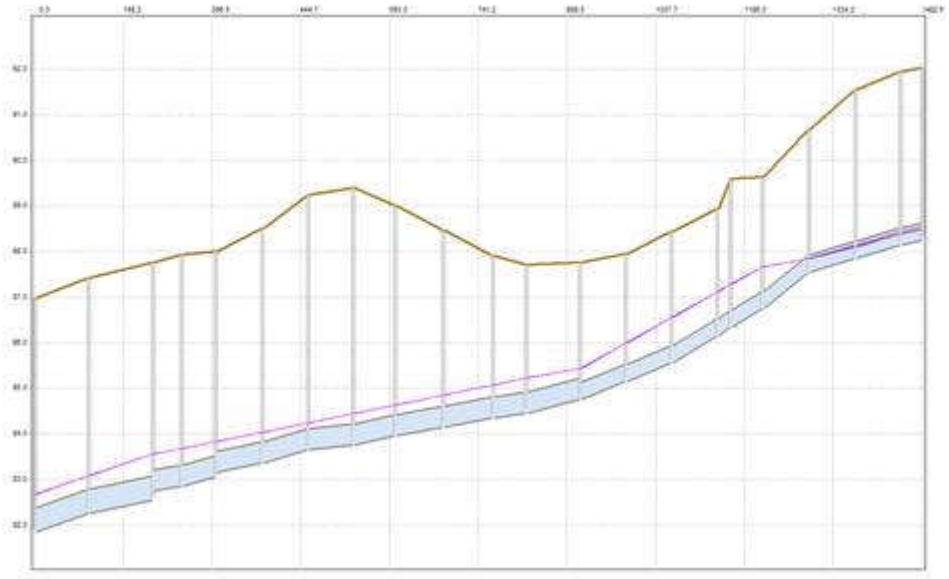


Walkley Existing HGL

The consultant is asking for an increase in flow of 100 L/s and would wishes to split the flow between Walkly and Heron. What we found is that we can only add 55 L/s to this system before the HGL reaches basement elevations during a critical rainfall event. The following figures show the HGL with 35 L/s added to Heron and 20 L/s added to Walkley (over and above existing flows).

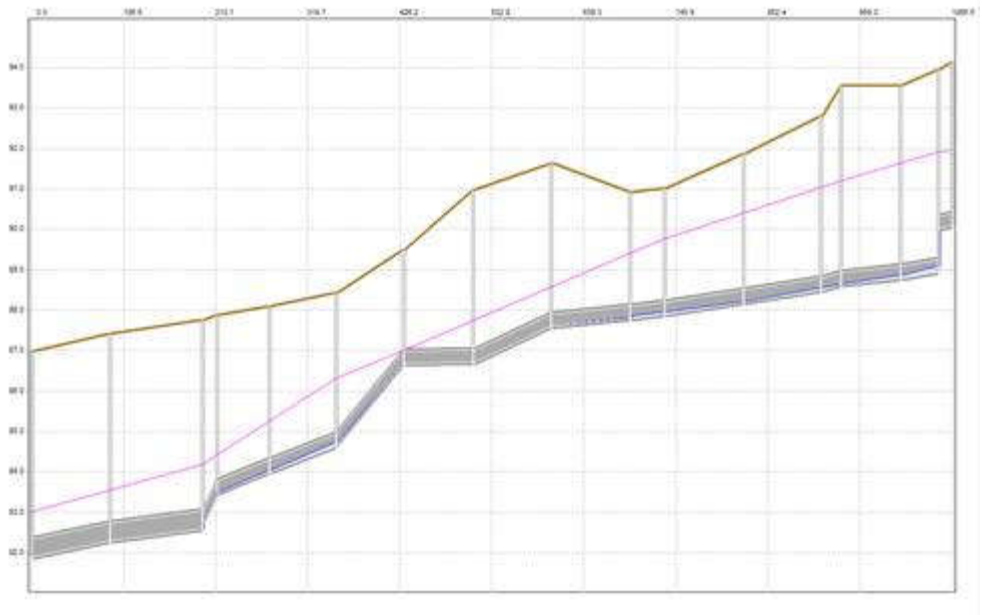


Heron with 35 L/s added

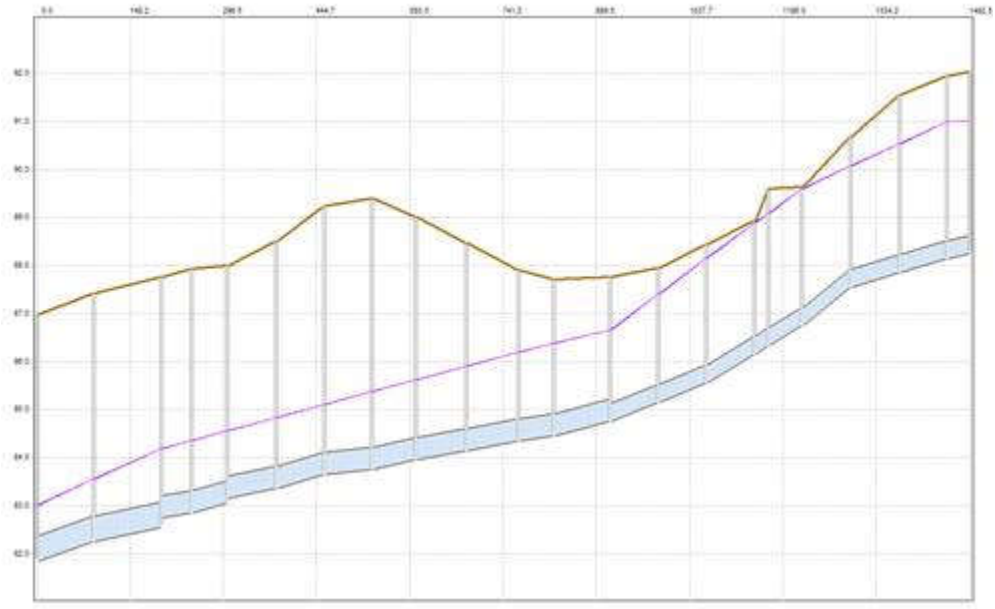


Walkley with 20 L/s added

The following graphs shows the impact of adding the full 100 L/s of additional flow requested (50 L/s on Heron and 50 L/s on Walkley).



Heron with 50 L/s added



Walkley with 50 L/s added

Even if we upgrade the pipes on either Heron or Walkley, we would still have a problem further downstream. Their best bet may be to go South to the South Ottawa Collector, but this will most likely need new sanitary infrastructure.

When you've had a chance to review the information, let's connect to discuss potential solutions to address the capacity constraints.

Cody Oram, P.Eng. Senior Engineer
Development Review, South Services
Planning, Infrastructure and Economic Development Department | Services de planification, d'infrastructure et de développement économique
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 **13422**, fax/téléc:613-580-2576, cody.oram@ottawa.ca

From: Oram, Cody
Sent: Thursday, January 31, 2019 10:57 AM
To: 'Alison Gosling' <AGosling@dsel.ca>
Cc: Baker, Adam <Adam.Baker@ottawa.ca>
Subject: RE: 18-1080 Heron Gate - Sanitary Sewer Capacity

Hi Alison,

I've reviewed your sanitary flow rate calculations and have sent them to our Water Resources group for review and comments regarding the downstream capacity. We typically receive comments within 10 business days. I will share the comments when received.

I've attached the pre-consult notes from the 2015 meeting. Please note this area is fully separated but uncontrolled (i.e. no ICD's). We would be looking to implement ICD's in the public roadways in the future, so private roads would also need to consider dual drainage.

If you have any questions, please let me know.
Cody

Cody Oram, P.Eng. Senior Engineer
Development Review, South Services
Planning, Infrastructure and Economic Development Department | Services de planification, d'infrastructure et de développement économique
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 **13422**, fax/téléc:613-580-2576, cody.oram@ottawa.ca

From: Alison Gosling <AGosling@dsel.ca>
Sent: Wednesday, January 30, 2019 3:37 PM
To: Oram, Cody <Cody.Oram@ottawa.ca>
Cc: Baker, Adam <adam.baker@ottawa.ca>
Subject: RE: 18-1080 Heron Gate - Sanitary Sewer Capacity

Good afternoon Cody,

Can you please confirm when you will be able to confirm capacity within the local sanitary sewers?

As discussed earlier this month, can you please forward any pre-consultation notes you have for this development? Please see attached correspondence for reference.

Please feel free to call to discuss.

Thanks in advance,

Alison Gosling, E.I.T.
Project Coordinator / Junior Designer

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext.542
fax: (613) 836-7183
email: agosling@dsel.ca

From: Alison Gosling
Sent: Tuesday, January 22, 2019 5:23 PM
To: 'Oram, Cody' <Cody.Oram@ottawa.ca>
Cc: 'Steve Pichette' <spichette@dsel.ca>
Subject: 18-1080 Heron Gate - Sanitary Sewer Capacity

Good afternoon Cody,

As discussed, we would like to request a sanitary capacity analysis for Heron Road and Walkley Road using the following contemplated post-development demands:

1. Location of Service / Street Number: The Heron Gate Community is bound by Heron Road to the North and Walkley Road to the South.

2. Existing Development:

   - The subject site measures ***25.5 ha*** and currently consists of ***1516 residential units***. Please refer to the existing wastewater calculations attached for a detailed unit breakdown.
   - Based on available City mapping, sanitary flow from the subject site currently travels to the existing 300mm diameter sanitary sewer within Walkley Road via an existing 250mm diameter internal network. Please refer to the map below for the existing sanitary sewer network.

3. Contemplated Development:

   - The phased development proposes to retain seven existing apartment buildings, consisting of ***957 apartment units***.
   - The contemplated development would include approximately ***314 townhomes*** and approximately ***5109 apartment units***, including the ***957 apartment units*** retained via the existing apartment buildings.
   - It is contemplated to service the development via the existing 300mm diameter sanitary sewer within Walkley Road and the existing 300mm diameter sanitary sewer within Heron Road.

Table 1, below, estimates the existing and completed wastewater flows from the development.

	Existing Flow (L/s)	**Contemplated Flow (L/s)**
Total Estimated Average Dry Weather Flow Rate	**13.91**	**51.40**

Total Estimated Peak Dry Weather Flow Rate	**50.46**	**150.62**
Total Estimated Peak Wet Weather Flow Rate	**51.74**	**151.89**

Please let us know if you have any questions.

Thank you,

Alison Gosling, E.I.T.
Project Coordinator / Junior Designer

DSEL

david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext.542
fax: (613) 836-7183
email: agosling@dsel.ca

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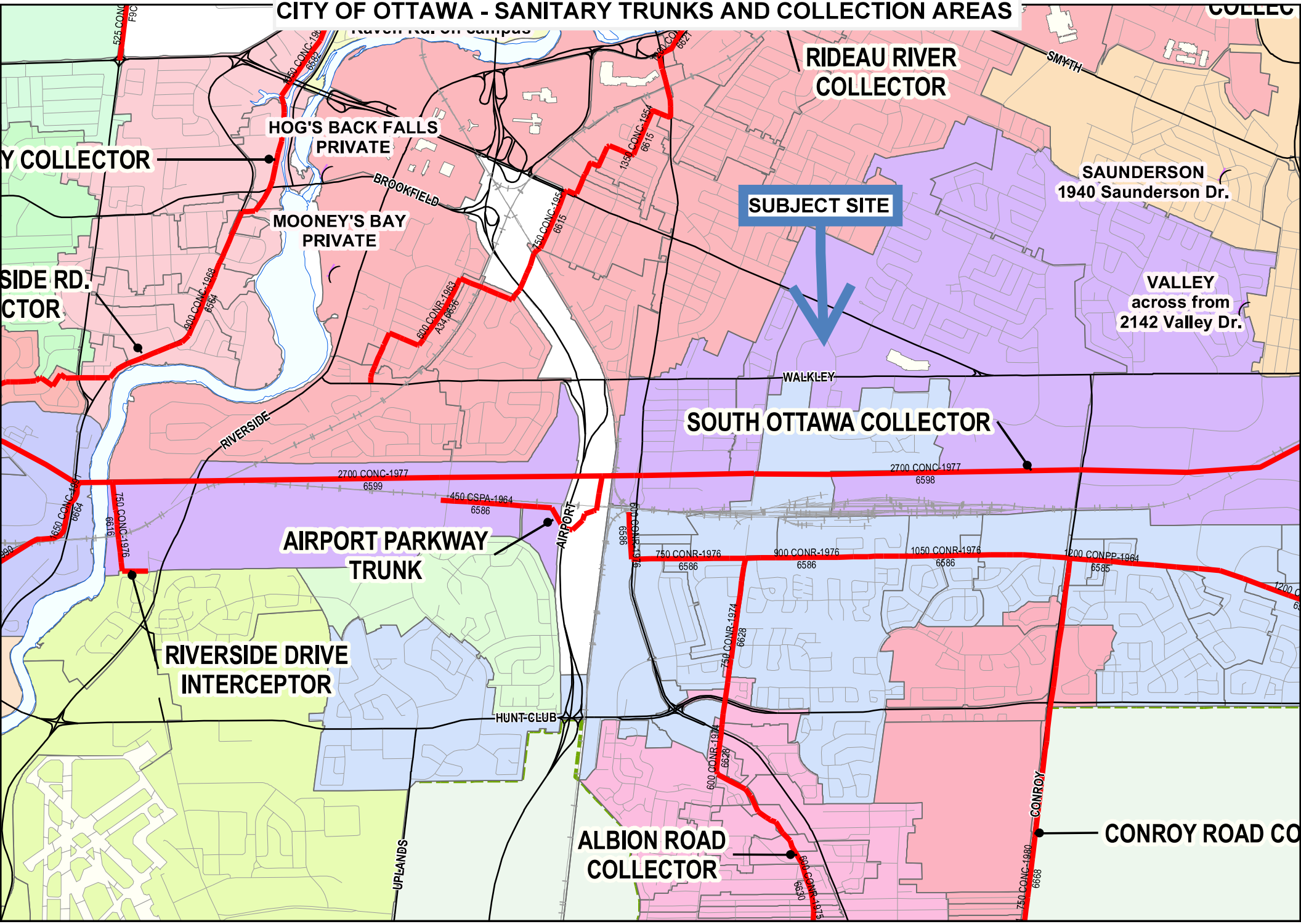
CITY OF OTTAWA - SANITARY TRUNKS AND COLLECTION AREAS
RIDEAU RIVER COLLECTOR
SMYTH
HOG'S BACK FALLS PRIVATE
Y COLLECTOR
BROOKFIELD
MOONEY'S BAY PRIVATE
SUBJECT SITE
SAUNDERSON
1940 Saunderson Dr.
SIDE RD.
CTOR
VALLEY
across from
2142 Valley Dr.
WALKLEY
SOUTH OTTAWA COLLECTOR
RIVERSIDE
2700 CONC-1977
6599
2700 CONC-1977
6598
450 CSPA-1964
6586
AIRPORT
AIRPORT PARKWAY TRUNK
750 CONR-1976
6586
900 CONR-1976
6586
1050 CONR-1976
6586
1200 CONPP-1964
6585
750 CONR-1974
6628
RIVERSIDE DRIVE INTERCEPTOR
HUNT CLUB
600 CONR-1974
6628
ALBION ROAD COLLECTOR
CONROY
CONROY ROAD CO
UPLANDS
600 CONR-1975
6630
750 CONC-1980
6668

APPENDIX D

Stormwater Management

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Target Flow Rate

Area	18.81	ha
C	0.50	Rational Method runoff coefficient
t_c	16.7	min

2-year

i	58.1	mm/hr
Q	1517.5	L/s
Q	80.7	L/s/ha

Estimated Post Development Peak Flow from Unattenuated Areas

Total Area	1.88	ha
C	0.85	Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}* (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
16.7	78.5	348.7	348.7	0.0	0.0	134.2	701.2	701.2	0.0	0.0

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

Estimated Post Development Peak Flow from Attenuated Areas

Total Area	16.93	ha
C	0.85	Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	104.2	4164.3	404.9	3759.4	2255.6	178.6	8395.8	816.3	7579.6	4547.7
15	83.6	3339.5	405.7	2933.8	2640.4	142.9	6718.9	816.3	5902.6	5312.3
20	70.3	2807.7	406.4	2401.4	2881.6	120.0	5640.1	816.3	4823.8	5788.5
25	60.9	2433.8	406.9	2027.0	3040.4	103.8	4882.9	816.3	4066.6	6099.9
30	53.9	2155.3	407.3	1748.0	3146.5	91.9	4319.6	816.3	3503.4	6306.0
35	48.5	1939.1	407.6	1531.4	3216.0	82.6	3882.8	816.3	3066.6	6439.8
40	44.2	1765.9	408.0	1358.0	3259.1	75.1	3533.3	816.3	2717.1	6520.9
45	40.6	1623.8	408.2	1215.6	3282.0	69.1	3246.7	816.3	2430.5	6562.3
50	37.7	1504.9	408.5	1096.4	3289.2	64.0	3007.1	816.3	2190.8	6572.5
55	35.1	1403.8	408.7	995.0	3283.7	59.6	2803.5	816.3	1987.2	6557.9
60	32.9	1316.6	408.9	907.7	3267.8	55.9	2628.2	816.3	1811.9	6522.8
65	31.0	1240.7	409.1	831.6	3243.2	52.6	2475.4	816.3	1659.2	6470.7
70	29.4	1173.9	409.3	764.6	3211.3	49.8	2341.1	816.3	1524.8	6404.3
75	27.9	1114.6	409.5	705.1	3173.1	47.3	2221.9	816.3	1405.7	6325.5
80	26.6	1061.6	409.6	652.0	3129.5	45.0	2115.5	816.3	1299.2	6236.1
85	25.4	1013.9	409.8	604.1	3081.0	43.0	2019.7	816.3	1203.4	6137.4
90	24.3	970.7	409.9	560.8	3028.4	41.1	1933.0	816.3	1116.8	6030.5
95	23.3	931.4	410.0	521.4	2972.0	39.4	1854.2	816.3	1037.9	5916.3
100	22.4	895.5	410.2	485.4	2912.2	37.9	1782.2	816.3	965.9	5795.5
105	21.6	862.6	410.3	452.3	2849.4	36.5	1716.1	816.3	899.8	5668.9
110	20.8	832.2	410.4	421.8	2783.9	35.2	1655.2	816.3	838.9	5537.0

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

5-year $Q_{attenuated}$	**408.50 L/s**	**100-year $Q_{attenuated}$**	**816.27 L/s**
5-year Max. Storage Required	**3289.2 m^3**	**100-year Max. Storage Required**	**6572.5 m^3**

Summary of Release Rates and Storage Volumes

Control Area	5-Year Release Rate (L/s)	5-Year Storage (m^3)	100-Year Release Rate (L/s)	100-Year Storage (m^3)
Unattenuated Areas	348.73	0.0	701.22	0.0
Attenutated Areas	408.50	3289.2	816.27	6572.5
Total	**757.2**	**3289.16**	**1517.49**	**6572.5**

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Target Flow Rate

Area 2.78 ha
C 0.50 Rational Method runoff coefficient
t_c 16.7 min

2-year
i 58.1 mm/hr
Q 223.9 L/s

Estimated Post Development Peak Flow from Unattenuated Areas

Total Area 0.28 ha
C 0.85 Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}* (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
16.7	78.5	51.5	51.5	0.0	0.0	134.2	103.5	103.5	0.0	0.0

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

Estimated Post Development Peak Flow from Attenuated Areas

Total Area 2.50 ha
C 0.85 Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	104.2	614.4	59.7	554.7	332.8	178.6	1238.8	120.4	1118.3	671.0
15	83.6	492.7	59.9	432.9	389.6	142.9	991.4	120.4	870.9	783.8
20	70.3	414.3	60.0	354.3	425.2	120.0	832.2	120.4	711.7	854.1
25	60.9	359.1	60.0	299.1	448.6	103.8	720.5	120.4	600.0	900.0
30	53.9	318.0	60.1	257.9	464.3	91.9	637.4	120.4	516.9	930.4
35	48.5	286.1	60.1	226.0	474.5	82.6	572.9	120.4	452.5	950.2
40	44.2	260.6	60.2	200.4	480.9	75.1	521.3	120.4	400.9	962.1
45	40.6	239.6	60.2	179.4	484.3	69.1	479.1	120.4	358.6	968.2
50	37.7	222.0	60.3	161.8	485.3	64.0	443.7	120.4	323.3	969.8
55	35.1	207.1	60.3	146.8	484.5	59.6	413.7	120.4	293.2	967.6
60	32.9	194.3	60.3	133.9	482.2	55.9	387.8	120.4	267.3	962.4
65	31.0	183.1	60.4	122.7	478.5	52.6	365.2	120.4	244.8	954.7
70	29.4	173.2	60.4	112.8	473.8	49.8	345.4	120.4	225.0	944.9
75	27.9	164.5	60.4	104.0	468.2	47.3	327.8	120.4	207.4	933.3
80	26.6	156.6	60.4	96.2	461.7	45.0	312.1	120.4	191.7	920.1
85	25.4	149.6	60.5	89.1	454.6	43.0	298.0	120.4	177.6	905.6
90	24.3	143.2	60.5	82.7	446.8	41.1	285.2	120.4	164.8	889.8
95	23.3	137.4	60.5	76.9	438.5	39.4	273.6	120.4	153.1	872.9
100	22.4	132.1	60.5	71.6	429.7	37.9	263.0	120.4	142.5	855.1
105	21.6	127.3	60.5	66.7	420.4	36.5	253.2	120.4	132.8	836.4
110	20.8	122.8	60.6	62.2	410.8	35.2	244.2	120.4	123.8	817.0

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

5-year $Q_{attenuated}$ 60.27 L/s **100-year $Q_{attenuated}$ 120.44 L/s**
5-year Max. Storage Required 485.3 m^3 **100-year Max. Storage Required 969.8 m^3**

Summary of Release Rates and Storage Volumes

Control Area	5-Year Release Rate (L/s)	5-Year Storage (m^3)	100-Year Release Rate (L/s)	100-Year Storage (m^3)
Unattenuated Areas	51.45	0.0	103.46	0.0
Attenutated Areas	60.27	485.3	120.44	969.8
Total	**111.7**	**485.31**	**223.90**	**969.8**

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Target Flow Rate

Area 2.95 ha
C 0.50 Rational Method runoff coefficient
t_c 16.7 min

2-year
i 58.1 mm/hr
Q 237.9 L/s

Estimated Post Development Peak Flow from Unattenuated Areas

Total Area 0.29 ha
C 0.85 Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}* (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
16.7	78.5	54.7	54.7	0.0	0.0	134.2	109.9	109.9	0.0	0.0

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

Estimated Post Development Peak Flow from Attenuated Areas

Total Area 2.65 ha
C 0.85 Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	104.2	652.8	63.5	589.3	353.6	178.6	1316.2	128.0	1188.2	712.9
15	83.6	523.5	63.6	459.9	413.9	142.9	1053.3	128.0	925.3	832.8
20	70.3	440.1	63.7	376.4	451.7	120.0	884.2	128.0	756.2	907.4
25	60.9	381.5	63.8	317.8	476.6	103.8	765.5	128.0	637.5	956.2
30	53.9	337.9	63.8	274.0	493.2	91.9	677.2	128.0	549.2	988.6
35	48.5	304.0	63.9	240.1	504.2	82.6	608.7	128.0	480.7	1009.5
40	44.2	276.8	64.0	212.9	510.9	75.1	553.9	128.0	425.9	1022.2
45	40.6	254.6	64.0	190.6	514.5	69.1	509.0	128.0	381.0	1028.7
50	37.7	235.9	64.0	171.9	515.6	64.0	471.4	128.0	343.4	1030.3
55	35.1	220.1	64.1	156.0	514.8	59.6	439.5	128.0	311.5	1028.0
60	32.9	206.4	64.1	142.3	512.3	55.9	412.0	128.0	284.0	1022.5
65	31.0	194.5	64.1	130.4	508.4	52.6	388.1	128.0	260.1	1014.4
70	29.4	184.0	64.2	119.9	503.4	49.8	367.0	128.0	239.0	1004.0
75	27.9	174.7	64.2	110.5	497.4	47.3	348.3	128.0	220.4	991.6
80	26.6	166.4	64.2	102.2	490.6	45.0	331.6	128.0	203.7	977.6
85	25.4	158.9	64.2	94.7	483.0	43.0	316.6	128.0	188.7	962.1
90	24.3	152.2	64.3	87.9	474.7	41.1	303.0	128.0	175.1	945.4
95	23.3	146.0	64.3	81.7	465.9	39.4	290.7	128.0	162.7	927.5
100	22.4	140.4	64.3	76.1	456.5	37.9	279.4	128.0	151.4	908.5
105	21.6	135.2	64.3	70.9	446.7	36.5	269.0	128.0	141.1	888.7
110	20.8	130.5	64.3	66.1	436.4	35.2	259.5	128.0	131.5	868.0

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

5-year $Q_{attenuated}$ **64.04 L/s** **100-year $Q_{attenuated}$** **127.96 L/s**
5-year Max. Storage Required **515.6 m^3** **100-year Max. Storage Required** **1030.3 m^3**

Summary of Release Rates and Storage Volumes

Control Area	5-Year Release Rate (L/s)	5-Year Storage (m^3)	100-Year Release Rate (L/s)	100-Year Storage (m^3)
Unattenuated Areas	54.67	0.0	109.93	0.0
Attenutated Areas	64.04	515.6	127.96	1030.3
Total	**118.7**	**515.62**	**237.89**	**1030.3**

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Target Flow Rate

Area 2.11 ha
C 0.50 Rational Method runoff coefficient
t_c 16.7 min

2-year
i 58.1 mm/hr
Q 170.2 L/s

Estimated Post Development Peak Flow from Unattenuated Areas

Total Area 0.21 ha
C 0.85 Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}* (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
16.7	78.5	39.1	39.1	0.0	0.0	134.2	78.7	78.7	0.0	0.0

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

Estimated Post Development Peak Flow from Attenuated Areas

Total Area 1.90 ha
C 0.85 Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	104.2	467.2	45.4	421.8	253.1	178.6	941.9	91.6	850.3	510.2
15	83.6	374.6	45.5	329.1	296.2	142.9	753.8	91.6	662.2	596.0
20	70.3	315.0	45.6	269.4	323.3	120.0	632.7	91.6	541.2	649.4
25	60.9	273.0	45.6	227.4	341.1	103.8	547.8	91.6	456.2	684.3
30	53.9	241.8	45.7	196.1	353.0	91.9	484.6	91.6	393.0	707.5
35	48.5	217.5	45.7	171.8	360.8	82.6	435.6	91.6	344.0	722.5
40	44.2	198.1	45.8	152.3	365.6	75.1	396.4	91.6	304.8	731.6
45	40.6	182.2	45.8	136.4	368.2	69.1	364.2	91.6	272.7	736.2
50	37.7	168.8	45.8	123.0	369.0	64.0	337.4	91.6	245.8	737.3
55	35.1	157.5	45.9	111.6	368.4	59.6	314.5	91.6	222.9	735.7
60	32.9	147.7	45.9	101.8	366.6	55.9	294.8	91.6	203.3	731.8
65	31.0	139.2	45.9	93.3	363.8	52.6	277.7	91.6	186.1	725.9
70	29.4	131.7	45.9	85.8	360.3	49.8	262.6	91.6	171.1	718.5
75	27.9	125.0	45.9	79.1	356.0	47.3	249.3	91.6	157.7	709.6
80	26.6	119.1	46.0	73.1	351.1	45.0	237.3	91.6	145.8	699.6
85	25.4	113.7	46.0	67.8	345.7	43.0	226.6	91.6	135.0	688.5
90	24.3	108.9	46.0	62.9	339.7	41.1	216.9	91.6	125.3	676.5
95	23.3	104.5	46.0	58.5	333.4	39.4	208.0	91.6	116.4	663.7
100	22.4	100.5	46.0	54.5	326.7	37.9	199.9	91.6	108.4	650.2
105	21.6	96.8	46.0	50.7	319.7	36.5	192.5	91.6	100.9	636.0
110	20.8	93.4	46.0	47.3	312.3	35.2	185.7	91.6	94.1	621.2

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

5-year $Q_{attenuated}$ 45.83 L/s **100-year $Q_{attenuated}$ 91.57 L/s**
5-year Max. Storage Required 369.0 m^3 **100-year Max. Storage Required 737.3 m^3**

Summary of Release Rates and Storage Volumes

Control Area	5-Year Release Rate (L/s)	5-Year Storage (m^3)	100-Year Release Rate (L/s)	100-Year Storage (m^3)
Unattenuated Areas	39.12	0.0	78.67	0.0
Attenutated Areas	45.83	369.0	91.57	737.3
Total	**85.0**	**369.00**	**170.24**	**737.3**

Heron Gate
Proposed Site Conditions - Block 5

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Target Flow Rate

Area 2.80 ha
C 0.50 Rational Method runoff coefficient
t_c 16.7 min

2-year
i 58.1 mm/hr
Q 226.3 L/s

Estimated Post Development Peak Flow from Unattenuated Areas

Total Area 0.28 ha
C 0.85 Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}* (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
16.7	78.5	52.0	52.0	0.0	0.0	134.2	104.6	104.6	0.0	0.0

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

Estimated Post Development Peak Flow from Attenuated Areas

Total Area 2.52 ha
C 0.85 Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	104.2	620.9	60.4	560.5	336.3	178.6	1251.9	121.7	1130.2	678.1
15	83.6	497.9	60.5	437.4	393.7	142.9	1001.8	121.7	880.1	792.1
20	70.3	418.6	60.6	358.1	429.7	120.0	841.0	121.7	719.3	863.1
25	60.9	362.9	60.7	302.2	453.3	103.8	728.1	121.7	606.4	909.5
30	53.9	321.4	60.7	260.6	469.2	91.9	644.1	121.7	522.4	940.3
35	48.5	289.1	60.8	228.3	479.5	82.6	579.0	121.7	457.2	960.2
40	44.2	263.3	60.8	202.5	485.9	75.1	526.8	121.7	405.1	972.3
45	40.6	242.1	60.9	181.2	489.4	69.1	484.1	121.7	362.4	978.5
50	37.7	224.4	60.9	163.5	490.4	64.0	448.4	121.7	326.7	980.0
55	35.1	209.3	60.9	148.4	489.6	59.6	418.0	121.7	296.3	977.8
60	32.9	196.3	61.0	135.3	487.2	55.9	391.9	121.7	270.2	972.6
65	31.0	185.0	61.0	124.0	483.6	52.6	369.1	121.7	247.4	964.8
70	29.4	175.0	61.0	114.0	478.8	49.8	349.1	121.7	227.4	954.9
75	27.9	166.2	61.1	105.1	473.1	47.3	331.3	121.7	209.6	943.2
80	26.6	158.3	61.1	97.2	466.6	45.0	315.4	121.7	193.7	929.8
85	25.4	151.2	61.1	90.1	459.4	43.0	301.1	121.7	179.4	915.1
90	24.3	144.7	61.1	83.6	451.6	41.1	288.2	121.7	166.5	899.2
95	23.3	138.9	61.1	77.7	443.1	39.4	276.5	121.7	154.8	882.2
100	22.4	133.5	61.2	72.4	434.2	37.9	265.7	121.7	144.0	864.1
105	21.6	128.6	61.2	67.4	424.9	36.5	255.9	121.7	134.2	845.3
110	20.8	124.1	61.2	62.9	415.1	35.2	246.8	121.7	125.1	825.6

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

5-year $Q_{attenuated}$ 60.91 L/s **100-year $Q_{attenuated}$ 121.71 L/s**
5-year Max. Storage Required 490.4 m^3 **100-year Max. Storage Required 980.0 m^3**

Summary of Release Rates and Storage Volumes

Control Area	5-Year Release Rate (L/s)	5-Year Storage (m^3)	100-Year Release Rate (L/s)	100-Year Storage (m^3)
Unattenuated Areas	52.00	0.0	104.56	0.0
Attenutated Areas	60.91	490.4	121.71	980.0
Total	**112.9**	**490.43**	**226.27**	**980.0**

Timbercreek
Heron Gate
Proposed Site Conditions - Block 6

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Target Flow Rate

Area 2.29 ha
C 0.50 Rational Method runoff coefficient
t_c 16.7 min

2-year
i 58.1 mm/hr
Q 184.9 L/s

Estimated Post Development Peak Flow from Unattenuated Areas

Total Area 0.23 ha
C 0.85 Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}* (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
16.7	78.5	42.5	42.5	0.0	0.0	134.2	85.4	85.4	0.0	0.0

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

Estimated Post Development Peak Flow from Attenuated Areas

Total Area 2.06 ha
C 0.85 Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	104.2	507.4	49.3	458.1	274.8	178.6	1023.0	99.5	923.5	554.1
15	83.6	406.9	49.4	357.5	321.7	142.9	818.7	99.5	719.2	647.3
20	70.3	342.1	49.5	292.6	351.1	120.0	687.2	99.5	587.8	705.3
25	60.9	296.6	49.6	247.0	370.5	103.8	595.0	99.5	495.5	743.3
30	53.9	262.6	49.6	213.0	383.4	91.9	526.3	99.5	426.9	768.4
35	48.5	236.3	49.7	186.6	391.9	82.6	473.1	99.5	373.7	784.7
40	44.2	215.2	49.7	165.5	397.1	75.1	430.5	99.5	331.1	794.6
45	40.6	197.9	49.7	148.1	399.9	69.1	395.6	99.5	296.1	799.6
50	37.7	183.4	49.8	133.6	400.8	64.0	366.4	99.5	266.9	800.8
55	35.1	171.0	49.8	121.2	400.1	59.6	341.6	99.5	242.1	799.1
60	32.9	160.4	49.8	110.6	398.2	55.9	320.2	99.5	220.8	794.8
65	31.0	151.2	49.9	101.3	395.2	52.6	301.6	99.5	202.2	788.4
70	29.4	143.0	49.9	93.2	391.3	49.8	285.3	99.5	185.8	780.3
75	27.9	135.8	49.9	85.9	386.6	47.3	270.7	99.5	171.3	770.7
80	26.6	129.4	49.9	79.4	381.3	45.0	257.8	99.5	158.3	759.9
85	25.4	123.5	49.9	73.6	375.4	43.0	246.1	99.5	146.6	747.8
90	24.3	118.3	49.9	68.3	369.0	41.1	235.5	99.5	136.1	734.8
95	23.3	113.5	50.0	63.5	362.1	39.4	225.9	99.5	126.5	720.9
100	22.4	109.1	50.0	59.1	354.8	37.9	217.2	99.5	117.7	706.2
105	21.6	105.1	50.0	55.1	347.2	36.5	209.1	99.5	109.6	690.7
110	20.8	101.4	50.0	51.4	339.2	35.2	201.7	99.5	102.2	674.7

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

5-year $Q_{attenuated}$ 49.77 L/s **100-year $Q_{attenuated}$ 99.46 L/s**
5-year Max. Storage Required 400.8 m^3 **100-year Max. Storage Required 800.8 m^3**

Summary of Release Rates and Storage Volumes

Control Area	5-Year Release Rate (L/s)	5-Year Storage (m^3)	100-Year Release Rate (L/s)	100-Year Storage (m^3)
Unattenuated Areas	42.49	0.0	85.44	0.0
Attenutated Areas	49.77	400.8	99.46	800.8
Total	**92.3**	**400.77**	**184.90**	**800.8**

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Target Flow Rate

Area 1.22 ha
C 0.50 Rational Method runoff coefficient
t_c 16.7 min

2-year
i 58.1 mm/hr
Q 98.5 L/s

Estimated Post Development Peak Flow from Unattenuated Areas

Total Area 0.12 ha
C 0.85 Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}* (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
16.7	78.5	22.6	22.6	0.0	0.0	134.2	45.5	45.5	0.0	0.0

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

Estimated Post Development Peak Flow from Attenuated Areas

Total Area 1.10 ha
C 0.85 Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	104.2	270.3	26.3	244.0	146.4	178.6	544.9	53.0	492.0	295.2
15	83.6	216.8	26.3	190.4	171.4	142.9	436.1	53.0	383.1	344.8
20	70.3	182.2	26.4	155.9	187.0	120.0	366.1	53.0	313.1	375.7
25	60.9	158.0	26.4	131.6	197.3	103.8	316.9	53.0	263.9	395.9
30	53.9	139.9	26.4	113.5	204.2	91.9	280.4	53.0	227.4	409.3
35	48.5	125.9	26.5	99.4	208.7	82.6	252.0	53.0	199.0	418.0
40	44.2	114.6	26.5	88.1	211.5	75.1	229.3	53.0	176.4	423.2
45	40.6	105.4	26.5	78.9	213.0	69.1	210.7	53.0	157.8	425.9
50	37.7	97.7	26.5	71.2	213.5	64.0	195.2	53.0	142.2	426.6
55	35.1	91.1	26.5	64.6	213.1	59.6	182.0	53.0	129.0	425.6
60	32.9	85.5	26.5	58.9	212.1	55.9	170.6	53.0	117.6	423.4
65	31.0	80.5	26.6	54.0	210.5	52.6	160.7	53.0	107.7	420.0
70	29.4	76.2	26.6	49.6	208.4	49.8	151.9	53.0	99.0	415.7
75	27.9	72.3	26.6	45.8	206.0	47.3	144.2	53.0	91.2	410.6
80	26.6	68.9	26.6	42.3	203.1	45.0	137.3	53.0	84.3	404.8
85	25.4	65.8	26.6	39.2	200.0	43.0	131.1	53.0	78.1	398.4
90	24.3	63.0	26.6	36.4	196.6	41.1	125.5	53.0	72.5	391.4
95	23.3	60.5	26.6	33.8	192.9	39.4	120.3	53.0	67.4	384.0
100	22.4	58.1	26.6	31.5	189.0	37.9	115.7	53.0	62.7	376.2
105	21.6	56.0	26.6	29.4	184.9	36.5	111.4	53.0	58.4	367.9
110	20.8	54.0	26.6	27.4	180.7	35.2	107.4	53.0	54.5	359.4

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

5-year $Q_{attenuated}$ **26.51 L/s** **100-year $Q_{attenuated}$** **52.98 L/s**
5-year Max. Storage Required **213.5 m^3** **100-year Max. Storage Required** **426.6 m^3**

Summary of Release Rates and Storage Volumes

Control Area	5-Year Release Rate (L/s)	5-Year Storage (m^3)	100-Year Release Rate (L/s)	100-Year Storage (m^3)
Unattenuated Areas	22.63	0.0	45.51	0.0
Attenutated Areas	26.51	213.5	52.98	426.6
Total	**49.1**	**213.48**	**98.49**	**426.6**

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Target Flow Rate

Area	2.68	ha
C	0.50	Rational Method runoff coefficient
t_c	16.7	min

2-year

i	58.1	mm/hr
Q	216.5	L/s

Estimated Post Development Peak Flow from Unattenuated Areas

Total Area	0.27	ha
C	0.85	Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}* (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
16.7	78.5	49.8	49.8	0.0	0.0	134.2	100.0	100.0	0.0	0.0

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

Estimated Post Development Peak Flow from Attenuated Areas

Total Area	2.41	ha
C	0.85	Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	104.2	594.1	57.8	536.3	321.8	178.6	1197.8	116.5	1081.3	648.8
15	83.6	476.4	57.9	418.5	376.7	142.9	958.5	116.5	842.1	757.9
20	70.3	400.6	58.0	342.6	411.1	120.0	804.6	116.5	688.2	825.8
25	60.9	347.2	58.0	289.2	433.8	103.8	696.6	116.5	580.2	870.2
30	53.9	307.5	58.1	249.4	448.9	91.9	616.3	116.5	499.8	899.6
35	48.5	276.6	58.2	218.5	458.8	82.6	553.9	116.5	437.5	918.7
40	44.2	251.9	58.2	193.7	465.0	75.1	504.1	116.5	387.6	930.3
45	40.6	231.7	58.2	173.4	468.2	69.1	463.2	116.5	346.7	936.2
50	37.7	214.7	58.3	156.4	469.2	64.0	429.0	116.5	312.6	937.7
55	35.1	200.3	58.3	142.0	468.5	59.6	400.0	116.5	283.5	935.6
60	32.9	187.8	58.3	129.5	466.2	55.9	374.9	116.5	258.5	930.6
65	31.0	177.0	58.4	118.6	462.7	52.6	353.2	116.5	236.7	923.1
70	29.4	167.5	58.4	109.1	458.1	49.8	334.0	116.5	217.5	913.7
75	27.9	159.0	58.4	100.6	452.7	47.3	317.0	116.5	200.5	902.4
80	26.6	151.5	58.4	93.0	446.5	45.0	301.8	116.5	185.3	889.7
85	25.4	144.6	58.5	86.2	439.6	43.0	288.1	116.5	171.7	875.6
90	24.3	138.5	58.5	80.0	432.0	41.1	275.8	116.5	159.3	860.3
95	23.3	132.9	58.5	74.4	424.0	39.4	264.5	116.5	148.1	844.0
100	22.4	127.8	58.5	69.2	415.5	37.9	254.3	116.5	137.8	826.8
105	21.6	123.1	58.5	64.5	406.5	36.5	244.8	116.5	128.4	808.8
110	20.8	118.7	58.5	60.2	397.2	35.2	236.1	116.5	119.7	789.9

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

5-year $Q_{attenuated}$	**58.28 L/s**	**100-year $Q_{attenuated}$**	**116.45 L/s**
5-year Max. Storage Required	**469.2 m^3**	**100-year Max. Storage Required**	**937.7 m^3**

Summary of Release Rates and Storage Volumes

Control Area	5-Year Release Rate (L/s)	5-Year Storage (m^3)	100-Year Release Rate (L/s)	100-Year Storage (m^3)
Unattenuated Areas	49.75	0.0	100.04	0.0
Attenutated Areas	58.28	469.2	116.45	937.7
Total	**108.0**	**469.24**	**216.49**	**937.7**

Heron Gate
Proposed Site Conditions - Block 9

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Target Flow Rate

Area 1.98 ha
C 0.50 Rational Method runoff coefficient
t_c 16.7 min

2-year
i 58.1 mm/hr
Q 159.6 L/s

Estimated Post Development Peak Flow from Unattenuated Areas

Total Area 0.20 ha
C 0.85 Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}* (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
16.7	78.5	36.7	36.7	0.0	0.0	134.2	73.8	73.8	0.0	0.0

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

Estimated Post Development Peak Flow from Attenuated Areas

Total Area 1.78 ha
C 0.85 Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	104.2	438.0	42.6	395.4	237.3	178.6	883.1	85.9	797.2	478.3
15	83.6	351.3	42.7	308.6	277.7	142.9	706.7	85.9	620.8	558.8
20	70.3	295.3	42.7	252.6	303.1	120.0	593.2	85.9	507.4	608.9
25	60.9	256.0	42.8	213.2	319.8	103.8	513.6	85.9	427.7	641.6
30	53.9	226.7	42.8	183.9	331.0	91.9	454.3	85.9	368.5	663.3
35	48.5	204.0	42.9	161.1	338.3	82.6	408.4	85.9	322.5	677.4
40	44.2	185.7	42.9	142.8	342.8	75.1	371.6	85.9	285.8	685.9
45	40.6	170.8	42.9	127.9	345.2	69.1	341.5	85.9	255.6	690.2
50	37.7	158.3	43.0	115.3	346.0	64.0	316.3	85.9	230.4	691.3
55	35.1	147.7	43.0	104.7	345.4	59.6	294.9	85.9	209.0	689.8
60	32.9	138.5	43.0	95.5	343.7	55.9	276.4	85.9	190.6	686.1
65	31.0	130.5	43.0	87.5	341.1	52.6	260.4	85.9	174.5	680.6
70	29.4	123.5	43.1	80.4	337.8	49.8	246.2	85.9	160.4	673.6
75	27.9	117.2	43.1	74.2	333.8	47.3	233.7	85.9	147.9	665.3
80	26.6	111.7	43.1	68.6	329.2	45.0	222.5	85.9	136.7	655.9
85	25.4	106.6	43.1	63.5	324.1	43.0	212.4	85.9	126.6	645.5
90	24.3	102.1	43.1	59.0	318.5	41.1	203.3	85.9	117.5	634.3
95	23.3	98.0	43.1	54.8	312.6	39.4	195.0	85.9	109.2	622.3
100	22.4	94.2	43.1	51.1	306.3	37.9	187.5	85.9	101.6	609.6
105	21.6	90.7	43.2	47.6	299.7	36.5	180.5	85.9	94.6	596.3
110	20.8	87.5	43.2	44.4	292.8	35.2	174.1	85.9	88.2	582.4

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

5-year $Q_{attenuated}$ 42.97 L/s **100-year $Q_{attenuated}$ 85.86 L/s**
5-year Max. Storage Required 346.0 m^3 **100-year Max. Storage Required 691.3 m^3**

Summary of Release Rates and Storage Volumes

Control Area	5-Year Release Rate (L/s)	5-Year Storage (m^3)	100-Year Release Rate (L/s)	100-Year Storage (m^3)
Unattenuated Areas	36.68	0.0	73.76	0.0
Attenutated Areas	42.97	346.0	85.86	691.3
Total	**79.6**	**345.96**	**159.61**	**691.3**

Existing Flow Rate

										Sewer Data								
Area ID	**Up**	**Down**	**Area**	**C**	**Indiv AxC**	**Acc AxC**	**T_C**	**I***	**Q**	**DIA**	**Slope**	**Length**	**$A_{hydraulic}$**	**R**	**Velocity**	**Qcap**	**Time Flow**	**Q / Q full**
			(ha)	**(-)**			**(min)**	**(mm/hr)**	**(L/s)**	**(mm)**	**(%)**	**(m)**	**(m^2)**	**(m)**	**(m/s)**	**(L/s)**	**(min)**	**(-)**
Baycrest - Block 2	Heron		2.775	0.85	2.36	2.36	10.0	76.8	503.2	300	1.18	27.2	0.071	0.075	1.48	104.9	0.3	4.80
		Baycrest			0.00	2.36	10.3	102.6	672.3	300	0.94	83	0.071	0.075	1.33	93.7	1.0	7.17
	Baycrest			0.85	0.00	2.36	11.3	97.6	639.3	450	1.11	74	0.159	0.113	1.89	300.1	0.7	2.13
Cedarwood - Block 4			2.110	0.85	1.79	4.15	12.0	94.7	1092.1	525	0.33	69	0.216	0.131	1.15	248.3	1.0	4.40
					0.00	4.15	13.0	90.6	1045.1	600	0.29	65	0.283	0.150	1.17	332.0	0.9	3.15
					0.00	4.15	13.9	87.2	1005.7	600	0.67	33	0.283	0.150	1.77	501.3	0.3	2.01
Block 6			2.292	0.85	1.95	6.10	14.2	86.1	1459.0	750	0.40	50	0.442	0.188	1.59	704.1	0.5	2.07
Block 5			2.804	0.85	2.38	8.48	14.8	84.3	1987.6	750	0.36	53	0.442	0.188	1.51	666.6	0.6	2.98
Block 7			1.221	0.85	1.04	9.52	15.3	82.5	2180.9	750	0.47	58	0.442	0.188	1.72	759.6	0.6	2.87
		Walkley			0.00	9.52	15.9	80.7	2135.3	750	0.37	70	0.442	0.188	1.54	678.5	0.8	3.15
							16.7											
Baycrest - Block 3	Cedarwood		2.948	0.85	2.51	2.51	10.0	76.8	534.7	300	1.44	64	0.071	0.075	1.64	116.1	0.6	4.60
					0.00	2.51	10.6	100.9	702.3	300	1.41	65	0.071	0.075	1.62	114.9	0.7	6.11
Block 8			2.683	0.85	2.28	4.79	11.3	97.7	1299.4	750	0.72	67	0.442	0.188	2.13	942.3	0.5	1.38
Block 9		Walkley	1.978	0.85	1.68	6.47	11.8	95.4	1713.9	750	1.22	68	0.442	0.188	2.78	1230.0	0.4	1.39
							12.2											

** 2-Year Storm Event*

Rational Method Coefficient of 0.85 estimated for Existing Subdivision

Future - Controlled Flow + Increase Pipe Diameter/Adjust Existing Inverts

										Sewer Data								
Area ID	Up	Down	Area	C	Indiv AxC	Acc AxC	T_C	I*	Q*	DIA	Slope	Length	$A_{hydraulic}$	R	Velocity	Qcap	Time Flow	Q / Q full
			(ha)	(-)			(min)	(mm/hr)	(L/s)	(mm)	(%)	(m)	(m^2)	(m)	(m/s)	(L/s)	(min)	(-)
Phase I																		
Baycrest	Heron						10.0	76.8		300	1.18	27.2	0.071	0.075	1.48	104.9	0.3	0.00
		Baycrest					10.3	76.8		300	0.94	83	0.071	0.075	1.33	93.7	1.0	0.00
Block 2	Baycrest		2.775				11.3	97.6	225.3	450	1.11	74	0.159	0.113	1.89	300.1	0.7	0.75
							12.0	94.7	1092.1	525	0.33	69	0.216	0.131	1.15	248.3	1.0	4.40
							13.0	90.6	1045.1	600	0.45	65	0.283	0.150	1.45	410.1	0.7	2.55
							13.8	87.8	1005.7	600	0.67	33	0.283	0.150	1.77	501.3	0.3	2.01
							14.1	86.7	1459.0	750	0.40	50	0.442	0.188	1.59	704.1	0.5	2.07
Cedarwood Towers			2.804				14.6	84.9	1987.6	750	0.36	53	0.442	0.188	1.51	666.6	0.6	2.98
							15.2	83.0	2180.9	750	0.47	58	0.442	0.188	1.72	759.6	0.6	2.87
		Walkley					15.7	81.3	2135.3	750	0.37	70	0.442	0.188	1.54	678.5	0.8	3.15
Phase III																		
Baycrest	Heron						10.0	76.8		300	1.18	27.2	0.071	0.075	1.48	104.9	0.3	0.00
		Baycrest					10.3	76.8		300	0.94	83	0.071	0.075	1.33	93.7	1.0	0.00
Block 2	Baycrest		2.775				11.3	97.6	225.3	450	1.11	74	0.159	0.113	1.89	300.1	0.7	0.75
Cedarwood							12.0	94.7	225.3	525	**0.51**	69	0.216	0.131	1.41	306.3	0.8	0.74
Block 4			2.110				12.8	91.4	392.7	**750**	**0.20**	65	0.442	0.188	1.13	497.9	1.0	0.79
							13.8	87.7	392.7	**750**	**0.21**	33	0.442	0.188	1.16	512.7	0.5	0.77
Block 6			2.292				14.3	86.1	578.8	750	**0.42**	50	0.442	0.188	1.63	721.5	0.5	0.80
Block 5 + Cedarwood Towers			2.804				14.8	84.3	806.4	**825**	**0.51**	53	0.535	0.206	1.92	1024.5	0.5	0.79
Block 7			1.221				15.2	82.8	905.6	**900**	**0.40**	58	0.636	0.225	1.79	1140.0	0.5	0.79
		Walkley					15.8	81.2	905.6	**900**	**0.40**	70	0.636	0.225	1.80	1144.9	0.6	0.79
							16.4											
Phase II																		
Sandalwood	Heron						10.0	76.8	0.0	300	0.52	71	0.071	0.075	0.99	69.8	1.2	0.00
							11.2	98.3	0.0	375	0.29	76	0.110	0.094	0.85	94.3	1.5	0.00
Block 3 + Baycrest Towers			2.948				12.7	91.9	239.4	525	1.30	40	0.216	0.131	2.27	490.3	0.3	0.49
		Baycrest					13.0	90.7	239.4	600	0.62	149	0.283	0.150	1.72	485.1	1.4	0.49
Block 8	Baycrest		2.683				14.4	85.5	457.2	750	0.72	67	0.442	0.188	2.13	942.3	0.5	0.49
Block 9		Walkley	1.978				14.9	83.7	617.8	750	1.22	68	0.442	0.188	2.78	1230.0	0.4	0.50
							15.4											

** 2-Year Storm Event Target Release Rate*

Proposed change from existing conditions

DRAWINGS / FIGURES

Heron Gate Concept Plan | April 1, 2019 |

DIALOG

Timbercreek