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FUNCTIONAL SERVICING REPORT

FOR

7000 CAMPEAU DRIVE

CITY OF OTTAWA

MINTO COMMUNITIES ON BEHALF OF CLUBLINK CORPORATION ULC

PROJECT NO.: 18-1061

SEPTEMBER 2019 – SUBMISSION 1

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1.0 INTRODUCTION

David Schaeffer Engineering Limited (DSEL) and J.F. Sabourin and Associates (JFSA) have been retained by Minto Communities on behalf of ClubLink Corporation ULC to prepare a Functional Servicing Report (FSR) in support of the contemplated re-development of the existing Kanata Golf and Country Club lands located at 7000 Campeau Drive, Ottawa.

The subject property is located within the City of Ottawa urban boundary, in the Kanata North Ward. As illustrated in the ***Location Plan*** found in ***Appendix A***, the subject property is comprised of four parcels of land and measures approximately ***70.9 ha*** in area. The parcels are accessed from Campeau Drive and Knudson Drive. Kanata Avenue is to the west and the site is north of Highway 417. The lands are currently zoned Parks and Open Space (O1A).

The planned residential development involves the construction of single family (detached) homes, executive/avenue townhomes, and medium density products. The current unit breakdown, based on the Land Use Concept Plan, attached as ***Figure 2*** in ***Appendix A*** is as follows:

Table 1
Proposed Unit Breakdown

Unit Type	Net Area (ha)	Number of Units	Person per unit (1)	Estimated Population
Single Family	22.76	545	3.4	1,853
Executive Townhomes	11.05	498	2.7	1,345
Avenue Townhomes	1.02	88	2.3	203
Medium Density	2.97	371	2.3	854
		1,502		4,255

The objective of this report is to provide sufficient detail to demonstrate that the proposed development area can be supported by municipal services based on design criteria of the City of Ottawa, The Ontario Ministry of the Environment, Conservation and Parks (MECP) and general industry practice.

1.1 Existing Conditions/Servicing

The proposed development area is currently utilized as a golf course facility (Kanata Golf and Country Club) and is owned and operated by ClubLink. The site topography varies, following land contours, and consists of landscaped areas typical of golf course composition.

The existing surrounding community right-of-ways (ROW) contain various sizes of sanitary/storm sewers and watermain infrastructure. The location and sizes are reflected in the servicing drawings included at the rear of this report. Additionally, existing storm and sanitary easements transect the property at various locations. These easements will be relocated according to the evolving development concept plans. Relocation of any trunk servicing infrastructure would ultimately have to be coordinated with City staff and appropriate MECP Environmental Compliance Approvals.

1.2 Required Permits / Approvals

The following table summarizes a list of potential permits and / or approvals.

Table 2: Required Permits / Approvals

Agency	Approval Type	Trigger	Remarks
City of Ottawa	Application for Zoning Amendment and Plan of Subdivision	Application by Proponent	
Ministry of the Environment, Conservation and Parks (MECP)	Environmental Compliance Approval for sanitary and storm sewers	Construction of new sanitary and storm sewers throughout the subdivision.	The MECP will issue an ECA for the sanitary and storm sewer design through the City of Ottawa transfer of review process.
City of Ottawa	Commence Work Notification (CWN)	Construction of new sanitary and storm sewers throughout the subdivision.	The City of Ottawa will issue a commence work notification for construction of the sanitary and storm sewers once an ECA is issued by the MECP.
City of Ottawa	MECP Form 1 – Record of Watermains Authorized as a Future Alteration	Construction of watermains throughout the subdivision.	The City of Ottawa is expected to review the watermains on behalf of the MECP through the Form 1 – Record of Watermains Authorized as a Future Alteration.
Mississippi Valley Conservation Authority (MVCA)	Alteration of Waterways Permit under O.Reg. 174/06	Development Application by Proponent	Any requirements would be established with the MVCA through the subdivision design process.

1.3 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 ISDTB-2014-01
    City of Ottawa, February 5, 2014
    (ITSB-2014-01)
  - Technical Bulletin PIEDTB-2016-01
    City of Ottawa, September 6, 2016
    (PIEDTB-2016-01)
- Technical Bulletin ISTB-2018-01
  City of Ottawa, March 21, 2018
  (ISTB-2018-01)
- Technical Bulletin ISTB-2018-04
  City of Ottawa, June 27, 2018
  (ISTB-2018-04)
- 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-2014-2
  City of Ottawa, May 27, 2014.
  (ISDTB-2014-2)
- Technical Bulletin ISTB-2018-02
  City of Ottawa, March 21, 2018
  (ISTB-2018-02)
- Design Guidelines for Sewage Works,
  Ministry of the Environment, Conservation and Parks, 2008 (formerly MOECC).
  (MECP Design Guidelines*)*
- Stormwater Planning and Design Manual,
  Ministry of the Environment, March 2003. (formerly MOE)
  (SWMP Design Manual)

- Ontario Building Code Compendium
  Ministry of Municipal Affairs and Housing Building Development Branch, January 1, 2010 Update *(OBC)*

- Water Supply for Public Fire Protection
  Fire Underwriters Survey, 1999.
  (FUS)

- City of Ottawa Infrastructure Master Plan, 2013

- Kanata North Community Design Plan, Master Servicing Study
  Novatech Engineering, June 28, 2016. *(KNCDP)*

- Geotechnical Investigation, Proposed Residential Development, Kanata Lakes Golf and Country Club, 7000 Campeau Drive, Ottawa, Ontario
  Paterson Group, July 30, 2019 (Report: PG4135-2) *(Paterson Report)*

- Master Sanitary Servicing Plan – Kanata Lakes, Broughton & Interstitial Lands
  Stantec Consulting Ltd., December 2007. (*Stantec MSSP*)

- West Urban Community (WUC) Wastewater Collection Model Development and System Capacity Assessment
  Stantec Consulting Ltd., May 2012. (*Stantec WUC Model*)

- West Urban Community – Wastewater Collection System Master Servicing Plan
  R.V. Anderson Associates Ltd., July 2012. (*RVAA Wastewater MP)*

- Proposed Redevelopment of Kanata Golf and Country Club: SWM Pond Sizing
  J.F. Sabourin and Associates Inc., September 30, 2019 (*JFSA Ponds*)

- Kanata Golf and Country Club – 2018 Surface Infiltration Testing
  J.F. Sabourin and Associates Inc., February 6, 2019 (*JFSA Infiltration*)

- Kanata Golf and Country Club – 2018-2019 Monitoring and Hydrologic Model Calibration Report
  J.F. Sabourin and Associates Inc., February 6, 2019 (*JFSA Infiltration*)

2.0 WATER SUPPLY SERVICING

The subject property lies within the City of Ottawa 3W pressure zone, as shown by the Pressure Zone map excerpt found in ***Appendix B***.

Potable water pressure is regulated in this pressure zone by the Campeau Drive P.S., Glen Cairn P.S., and the Stittsville Elevated Tank. The Campeau Drive P.S. and Glen Cairn P.S. both have a Nominal Discharge HGL of 160 m, according to the City of Ottawa Infrastructure Master Plan. The facilities combined have a total capacity of 187.5 ML/d and a firm capacity of 107.5 ML/d. The Stittsville Elevated tank is at 161 m and manages 4.5 ML of potable water.

The various design criteria are summarized in the following table.

Table 3: Water Supply Design Criteria

Design Parameter	Value
Residential - Single Family	3.4 p/unit
Residential - Townhome	2.7 p/unit
Institutional	28,000 L/ha/day
(1) Residential – Basic Day Demand (BSDY)	180 L/cap/day (Singles); 198 L/cap/day (Townhomes)
(1) Residential - Maximum Daily Demand (MXDY)	As per 2013 WMP
(1) Residential – Peak Hour Demand (PKHR)	As per 2013 WMP
Fire Flow	Calculated as per the Fire Underwriter's Survey 1999.
Minimum Watermain Size	150 mm diameter
Service Lateral Size	19 mm dia Soft Copper Type 'K' or approved equivalent
Minimum Depth of Cover	2.4 m from top of watermain to finished grade
Peak hourly demand operating pressure	275 kPa and 690 kPa
Fire flow operating pressure minimum	140 kPa
Extracted from Section 4: Ottawa Design Guidelines, Water Distribution (July 2010), ISDTB-2010-2	

The internal watermains will connect to existing watermain infrastructure within the adjacent residential development ROWs.

The contemplated and existing watermains are depicted in ***Drawing 1,*** provided in ***Appendix E*** of this report. A preliminary hydraulic analysis was prepared for the water distribution network to confirm that water supply is available within the required pressure range, under the anticipated demand during average day, peak hour and fire flow conditions and was based on boundary conditions requested from the City of Ottawa. Refer to the *Hydraulic Capacity and Modeling Analysis, 7000 Campeau Drive - Kanata prepared by GeoAdvice Engineering Inc. dated July 19, 2019* ***(GeoAdvice Water Analysis)***, enclosed in ***Appendix B.***

2.1 Fire Flow Demand

Detailed Fire flow calculations for single detached dwellings have not been provided for this functional level analysis. However, typical values for single detached dwellings and traditional townhomes at the City of Ottawa's cap of 10,000 L/min (167 L/s) have been used as outlined in *ISDTB-2014-02*. The required fire flow for higher density back-to-back townhomes is 15,000 L/min (250 L/s) so a conservative fire flow of 250 L/s was assumed, which is a typical requirement for similar land uses.

2.2 Boundary Conditions

Boundary conditions were requested from the City of Ottawa for Peak Hour, Max Day Plus Fire Flow and Maximum HGL (high pressure check) conditions and can be found in the appendices of the *GeoAdvice Water Analysis*, located in ***Appendix B*** of this report. At the time of the boundary condition request the development area concept plan was still being developed, as such, a conservative unit density of 28 units/ha was used to assess the potential water demands for the generation of the boundary conditions. This conservative estimate ensured that the analysis completed would be reflective of the ability of the existing water supply network to service the property.

The following tables demonstrate that the current development concept (as per ***Table 1*** of this report) results in a unit and associated population count that is lower than the data used to generate the boundary conditions. As such, the boundary conditions were conservative for the proposed development area.

Table 4A: Estimated Water Demands (Connections 1 and 2)

Demand Type	Demand	
	Preliminary Demands Submitted for Boundary Conditions	Refined Demands for Current Concept Plan
	L/min	L/min
Average Daily Demand	282.9	**223.6**
Maximum Daily Demand	707.3	**559.0**
Peak Hour	1556.0	**1229.9**
Fire Flow #1 Demand	10,000	**10,000**
Based on Connection Points #1 and #2 as shown in the Boundary Conditions provided by City of Ottawa		

Table 4B: Estimated Water Demands (Connections 3 to 6)

Demand Type	Demand	
	Preliminary Demands Submitted for Boundary Conditions	Refined Demands for Current Concept Plan
	L/min	L/min
Average Daily Demand	811.6	**639.5**
Maximum Daily Demand	2029.0	**1598.8**
Peak Hour	4463.9	**3517.4**
Fire Flow #1 Demand	15,000	**15,000**
Based on Connection Points #3, 4, 5 & 6 as shown in the Boundary Conditions provided by City of Ottawa		

2.3 Summary of Hydraulic Modeling Analysis

A complete watermain analysis has been prepared to confirm that the proposed development is serviceable with appropriate sized watermain infrastructure. Preliminary analysis for the network indicates that 200 mm, 250 mm and 300 mm diameter sizes will deliver potable water throughout the proposed development during average daily, peak hourly, and fire flow scenarios.

Refer to the ***GeoAdvice Water Analysis,*** enclosed in ***Appendix B.***

2.3.1 System Pressures

The modeling indicates that the proposed development can be adequately serviced by the proposed watermain network. Modeled service pressures for the proposed development are summarized in the following table while the detailed pipe and junction tables are contained in the ***GeoAdvice Water Analysis,*** enclosed in ***Appendix B.***

Table 5: Summary of Available System Pressures

	Average Day Demand Maximum Pressure		Peak Hour Demand Minimum Pressure	
	kPA	psi	kPA	psi
Development Area	656	95	532	77

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. Based on the anticipated service pressures, pressure reducing valves may be required in the development area.

2.3.2 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 6,*** below. The detailed fire flow reports are found in the ***GeoAdvice Report*** enclosed in ***Appendix B***.

Table 6: Summary of Available Fire Flows

	Required Fire Flow (L/s)	Minimum Available Flow (L/s)	Junction ID
Development Area	167	219	J-5
	250	288	J-15

As shown in the above table, the model predicts the network will be able to provide all required fire flows based on the boundary conditions provided. Detailed results are included in the ***GeoAdvice Report***, enclosed in ***Appendix B***. In the circumstance of development phasing the appropriate analyses would be undertaken to ensure that sufficient fire flows are available at each stage of the development.

2.4 Water Supply Conclusion

The watermain network must be capable of delivering potable water within the City's recommended pressure ranges during average daily, peak hour, and maximum day plus fire flow demands. Preliminary analysis for the network indicates that a series of contemplated 200 mm, 250 mm and 300 mm diameter sizes will sufficiently deliver potable water throughout the contemplated development, with connections to existing watermains at Campeau Drive, Knudson Drive, Weslock Way and Beaverbrook Road.

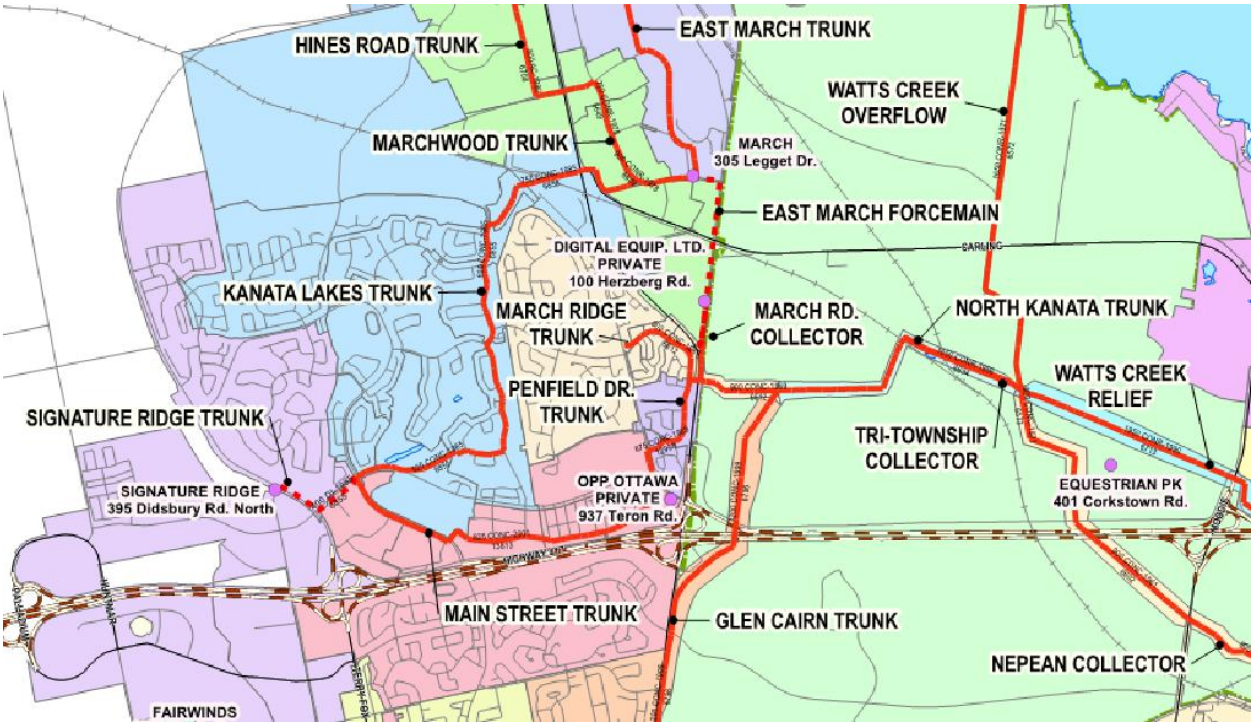
Water supply will be available within the required pressure range under the anticipated demand during average day, peak hour and fire flow conditions. Phase specific analysis would be undertaken to ensure that the system is sufficiently serviced during various stages of development.

The proposed water supply design conforms to all relevant City guidelines and policies and conforms to the new guidelines.

3.0 WASTEWATER SERVICING

The subject property is located within the Kanata Lakes Trunk Sewer catchment area. The existing trunk sewer bi-sects the southern portion of the property, in a northeasterly direction, from Campeau Drive to Rosenfield Crescent. This section of the trunk sewer is a 525 mm diameter pipe and ranges between 4 m and 6 m deep.

The following overview image extracted from the City of Ottawa 'Sanitary Trunk Sewers and Collection Area Map' (April 2014) illustrates the catchment area and trunk sewer routing.



In the current condition, the Kanata Lakes Trunk Sewer conveys flow to the 900 mm Marchwood Trunk sewer on Legget Drive (west of Schneider Road) where wastewater flows are then conveyed to the March Road Pumping Station (***March P.S.***). The Village of Carp, the existing business park west of Herzberg Road, Morgan's Grant, and Shirley's Brook Communities are tributary to the ***March P.S.*** Flow is conveyed through the ***March P.S.*** by a forcemain within Legget Drive and Herzberg Road to the North Kanata Trunk.

Redevelopment of the subject property will utilize the Kanata Lakes Trunk Sewer and adjacent local sewers to service the property. Connection points and peak wet weather flow are summarized in the following table below.

Table 7: Summary of Wastewater Connections

Connection Point Description	Proposed Area (Ha)	Proposed Population	Peak Wet Weather Flow (L/s)	Connection MH (DSEL)[1]	Connection MH (City HGL Analysis)[2]
Relocated Trunk Sewer, North of Campeau	16.26	1288	18.65	MH10	MHSA00860
Knudson Drive, South of Sherk Crescent	4.64	368	5.62	MH17A	MHSA00850
Knudson Drive, North of Sherk Crescent	12.29	974	14.30	MH26	MHSA00841
Knudson Drive, East of Kanata Avenue	9.93	787	11.67	MH32C	MHSA00835
Weslock Way, North of Knudson Drive	9.54	756	11.23	MH33	MHSA00834
Weslock Way, South of Zokol Crescent	9.70	769	11.41	MH36	MHSA00831
Weslock Way, North of Zokol Crescent	6.29	498	7.53	MH40	MHSA00827
Total	**68.65**	**5440**	**71.47[3]**		

1) Refer to Drawing 2 in Appendix E for DSEL MH identification
2) Refer to HGL Analysis prepared by the City of Ottawa included in ***Appendix C*** for City MH identification
3) Total Peak Wet Weather Flow not summative due to differing time to peak (Harmon's Peaking Factor for Total = 2.77)

The total anticipated wet weather flow contributions from the subject property to the Kanata Lakes Trunk sewer is ***71.47 L/s***, refer to ***Appendix C*** for anticipated wastewater calculations.

Based on correspondence with the City of Ottawa, included in ***Appendix C***, the ***March P.S.*** has a capacity of ***412 L/s*** and receives wet weather flow of ***± 325 L/s,*** resulting in a residual capacity of ***± 87 L/s*****,** sufficient to convey the flow from the contemplated development.

The ***KNCDP*** for the Kanata North Urban Expansion Area (***KNUEA***) summarizes that the lower-reach of the Marchwood Trunk has a free-flowing capacity of ***1,100 L/s*** with an estimated peak flow of ***230 L/s*** in 2010 and projected flow of ***592 L/s*** in 2031 (which includes the ***KNUEA*** area). The residual capacity in the existing and future condition is sufficient to convey the anticipated flow from the subject property. Excerpts from the ***KNCDP*** are provided in **Appendix C**.

A detailed review of the available capacity within the existing Kanata Lakes Trunk Sewer up to the Marchwood Trunk has been provided in the attached calculation sheets, found in ***Appendix C***. The following City criteria, summarized in the following table, below were used to evaluate the new flows into the existing system.

Table 8: Wastewater Design Criteria

Design Parameter	Value
Residential - Single Family	3.4 persons/unit
Residential - Townhome	2.7 persons/unit
Residential - Average Daily Demand	280 L/d/per
Residential - Peaking Factor	Harmon's Peaking Factor. Max 3.8, Min 2.0
Harmon - Correction Factor	0.80
Institutional – Average Flow	28,000 L/ha/day
Institutional – Peaking Factor	1.5 if ICI in contributing area is >20% 1.0 if ICI in contributing area is <20%
Infiltration and Inflow Allowance	0.33 L/s/ha
Park Flow	9,300 L/ha/day
Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} A R^{2/3} S^{1/2}$
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 and Technical Bulletin ISTB-2018-01.	

Refer to the ***Sanitary Servicing Plan, Drawing 2 (Appendix E)*** and sanitary sewer design sheet in ***Appendix C*** for details.

Based on the sanitary design sheet, the anticipated wastewater flow from the subject property can be accommodated within the Kanata Trunk sewer.

The City of Ottawa provided a Hydraulic Grade Line (HGL) analysis of the Kanata Lakes Trunk Sewer and Marchwood Trunk Sewer up to the ***March P.S.*** for the current (2013) and future (2060) conditions, see ***Appendix C***. The 2013 model illustrates that sewers up to the ***March P.S.*** result in flows between ***43.83 L/s*** and ***295.67 L/s*** with conduits between ***23%-43%*** full at the critical nodes. The 2060 model indicates that flows are between ***199.87 L/s*** and ***675.99 L/s*** with conduits between ***57%-80%*** full at critical nodes. The City has found no HGL issues in the 2013 and 2060 model scenarios. It is anticipated the wastewater flow from the subject property can be accommodated without a negative impact to the Kanata Lakes Trunk sewer HGL.

Based on the above analysis of the ***March P.S.***, Marchwood Trunk and Kanata Lakes Trunk Sewer, there is sufficient capacity in the current condition to accommodate the anticipated flow of ***71.47 L/s*** from the subject property.

Based on correspondence with the City of Ottawa in April 2019, included in ***Appendix C***, there are future modifications anticipated to the wastewater trunk infrastructure and pump stations within the vicinity of the contemplated development, summarized further below.

As described in the *West Urban Community – Wastewater Collection System Master Servicing Plan (RV Anderson & Associates Ltd., 2013) (**RVAA Wastewater MP**)*, *City of Ottawa Infrastructure Master Plan (2013) **(IMP)*** and *Kanata North Community Design Plan –*

Master Servicing Study (Novatech, 2016) (***KNCDP***), it is contemplated to install a gravity sanitary sewer from the ***March P.S.*** to the North Kanata Trunk, referred to as North Kanata Trunk – Phase 2. Additionally, the City of Ottawa has provided a conceptual design of the modifications to the ***March P.S.*** and the future North Kanata Trunk – Phase 2 sewer, prepared by Jacobs (formerly CH2M Hill), which is included in ***Appendix C.*** The proposed construction of the North Kanata Trunk – Phase 2, redirects flow from the Kanata Lakes Trunk and Marchwood Trunk from the ***March P.S.,*** thus providing a gravity connection to the North Kanata Trunk sewer. Timing of the gravity sewer installation is to be confirmed by the City of Ottawa. The ***March P.S.*** is contemplated to be converted to a lift station in order to continue to convey flow from East March Trunk to the proposed North Kanata Trunk – Phase 2.

As noted in the *West Urban Community (WUC) Wastewater Collection Model Development and System Capacity Assessment (Stantec 2012)* (***Stantec WUC Model***) report, a diversion structure was designed to limit the flow contributions to 140 L/s from the Signature Ridge catchment area to the Kanata Lakes Trunk. Once the flow level is achieved the excess flows are to be conveyed to the Main Street/Penfield Drive sewers. As per the correspondence in ***Appendix C*** from the City of Ottawa, upgrades to the Signature Ridge Pump Station (***SRPS***) and forcemain will be redirected away from the Kanata Lakes Trunk Sewer to the Penfield Trunk sewer. Timing of the upgrades is to be confirmed by City of Ottawa. In accordance with the direction provided by the City of Ottawa in April 2019, the sanitary design sheet does not include the 140 L/s from the ***SRPS***.

Based on the review of the contemplated changes to the ***March P.S.*** and ***SRPS***, there is available capacity in the future condition to accommodate the anticipated wastewater flow from the subject property.

4.0 STORMWATER MANAGEMENT

The subject lands are tributary to the Kizell Drain Wetland Complex and to Watts Creek. Lands west of Knudson Drive and Weslock Way drain to the Kizell Drain Wetland Complex, while the lands to the east are tributary to Watts Creek. Drainage from the entire development is conveyed to the various outlets through existing storm sewers.

It is contemplated to service the proposed development with five stormwater management ponds equipped with oil grit separators. The stormwater management facilities were strategically located at low points in the development where each could outlet to the existing storm trunk sewer along Knudson Drive / Weslock Way. The following table summarizes pond volumes and outflow rates:

Table 9: Pond Size and Outflow Summary(1)

Pond	Area	Imperviousness	2-Year		5-Year		100-Year	
			Target Outflow	Storage	Target Outflow	Storage	Target Outflow	Storage
	(ha)	(%)	(m^3/s)	(m^3)	(m^3/s)	(m^3)	(m^3/s)	(m^3)
Pond 1	59.59	51%	0.201	6,430	0.295	10,045	1.179	20,000
Pond 2	27.16	56%	0.111	4,170	0.162	6,650	0.649	12,700
Pond 3(2)	9.38	60%	-	-	-	-	-	-
Pond 4	50.2	56%	0.156	4,800	0.228	7,440	0.913	16,100
Pond 5	13.1	57%	0.067	1,400	0.098	2,360	0.392	4,850

Notes:
(1) Pond outflow and storage values are derived directly from the JFSA modelling files provided with the SWM Pond sizing study.
(2) As noted in the JFSA report a storage volume has not been provided for Pond 3 as the required storage volume and release rates for this pond were substantially smaller than the 4 other proposed SWM ponds. This pond can still be included in the development, but the analysis was completed and has shown that a working SWM solution is possible without it.

J.F. Sabourin and Associates (JFSA) was retained to review existing site drainage conditions, prepare a preliminary calibrated model, and assess the impacts of the proposed stormwater management strategy on the receiving system. The JFSA reporting, modeling, analysis and recommendations are provided under separate cover. The main text for the memo associated with the stormwater management pond sizing is provided for reference in ***Appendix D***. For detailed modelling files the JFSA report should be referenced.

Table 10 summaries peak inflow to the Beaver Pond under various scenarios and rainfall events. ***Table 11*** outlines the resulting outflows from the Beaver Pond. Note that the Environmental Compliance Approval associated with the Beaver Pond (Approval Number 5190-7L6RRY found in ***Appendix D***) specifies a controlled release rate of 0.960m^3/s to the Kizell Drain. The following is a brief description of the scenarios assessed by JFSA:

- Existing Conditions- *(Ex-Calib):*
  - Reflective of the current conditions (2019) with some of the model parameters adjusted to more closely match the field data obtained.
- The Kanata Golf and Country Club with SWM controls- (Ex-Calib + KGCC+SWM):

- Reflective of existing conditions with the proposed Kanata Golf and Country Club Development in place with 5 Storm Water Management (SWM) ponds in place and appropriately sized to ensure no adverse impacts downstream.

- Kanata Lakes Development - (Ex-Calib+KNL):
  - Reflective of existing conditions with the inclusion of the Kanata Lakes Developments Stages 7, 8 & 9 in place.
- The Kanata Golf and Country Club with SWM controls + Kanata Lakes Development - (Ex-Calib + KGCC+SWM+KNL):
  - Reflective of existing conditions with the proposed Kanata Golf and Country Club Development with 5 Storm Water Management (SWM) ponds in place and the Kanata Lakes Developments Stages 7, 8 & 9 in place.

Table 10: Peak Flow Summary – Inflow to Beaver Pond

	Peak Flow (m^3/s)					
Scenario	**2-year**	**5-year**	**10-year**	**25-year**	**50-year**	**100-year**
EX-Calib	5.454	8.553	11.588	16.374	24.209	30.042
Ex-Calib + KGCC+SWM	3.040	4.815	6.282	9.368	15.150	19.388
EX-Calib+KNL	12.385	21.416	28.036	37.158	43.739	49.953
Ex-Calib + KGCC+SWM+KNL	10.196	17.695	22.735	29.313	34.433	39.292

Table 11: Peak Flow Summary – Outflow from Beaver Pond to Kizell Drain

	Peak Flow (m^3/s)					
Scenario	**2-year**	**5-year**	**10-year**	**25-year**	**50-year**	**100-year**
EX-Calib	0.484	0.667	0.750	0.876	0.940	1.005*
Ex-Calib + KGCC+SWM	0.475	0.654	0.741	0.866	0.936	1.003*
EX-Calib+KNL	0.674	0.830	0.932	1.046	1.127	1.207
Ex-Calib + KGCC+SWM+KNL	0.665	0.813	0.923	1.039	1.124	1.206

As illustrated in **Table 10**, the peak outflow from the Beaver Pond to the Kizell Drain is comparable to the release rate for the existing and redeveloped KGCC with stormwater management in place.

The ***Storm Servicing Plan*** provided in ***Appendix E*** illustrates sewer routing and proposed pond block locations and sizes.

5.0 SITE GRADING

A geotechnical investigation of the subject property was undertaken by Paterson Group.

The development area has locations that will be constrained by grade raise restrictions of 2 m to 2.5m as documented in the investigation. The *Permissible Grade Raise Plans* are provided in ***Appendix E*** for reference. A preliminary overall grading plan is also provided for context.

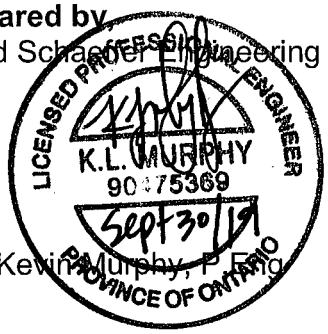
The servicing and grading have been designed as low as possible, to minimize the proposed grade raise required and follow site topography. Should mitigation measures be required due to grade raise exceedance, alternatives are proposed in the ***Paterson Report***.

6.0 CONCLUSION AND RECOMMENDATIONS

Minto Communities on behalf of ClubLink Corporation ULC has proposed the redevelopment of the existing Kanata Golf and Country Club lands. A review of the functional servicing for the subject area yields the following conclusions:

- Based on the review of available background materials, and surrounding water infrastructure boundary conditions, there is sufficient potable water to support the development area;
- Wastewater services will be provided through a network of gravity sewers that will outlet to the Kanata Lakes Trunk sanitary sewer at several locations. Through review of the City of Ottawa modifications to the March Road Pump Station and Signature Ridge Pump Station and analysis of the Kanata Lakes Trunk sanitary sewer, there will be sufficient capacity to accommodate the anticipated wastewater flow from the subject property.
- Stormwater services will be provided through gravity sewers that outlet to five new stormwater management facilities in order to mitigate any impacts on downstream existing infrastructure and facilities. The combination of quality and quantity control measures will be implemented to meet MECP and City of Ottawa criteria.
- Grade raise restrictions do exist on the subject property. Where they cannot be met, potential mitigation measures detailed within the geotechnical report (ie. preload/surcharging of areas or use of lightweight fill) are suggested.

Prepared by,
David Schaeffer Engineering Ltd.



Per: Kevin Murphy, P. Eng.

Reviewed by,
David Schaeffer Engineering Ltd.

Per: Stephen J. Pichette, P. Eng.

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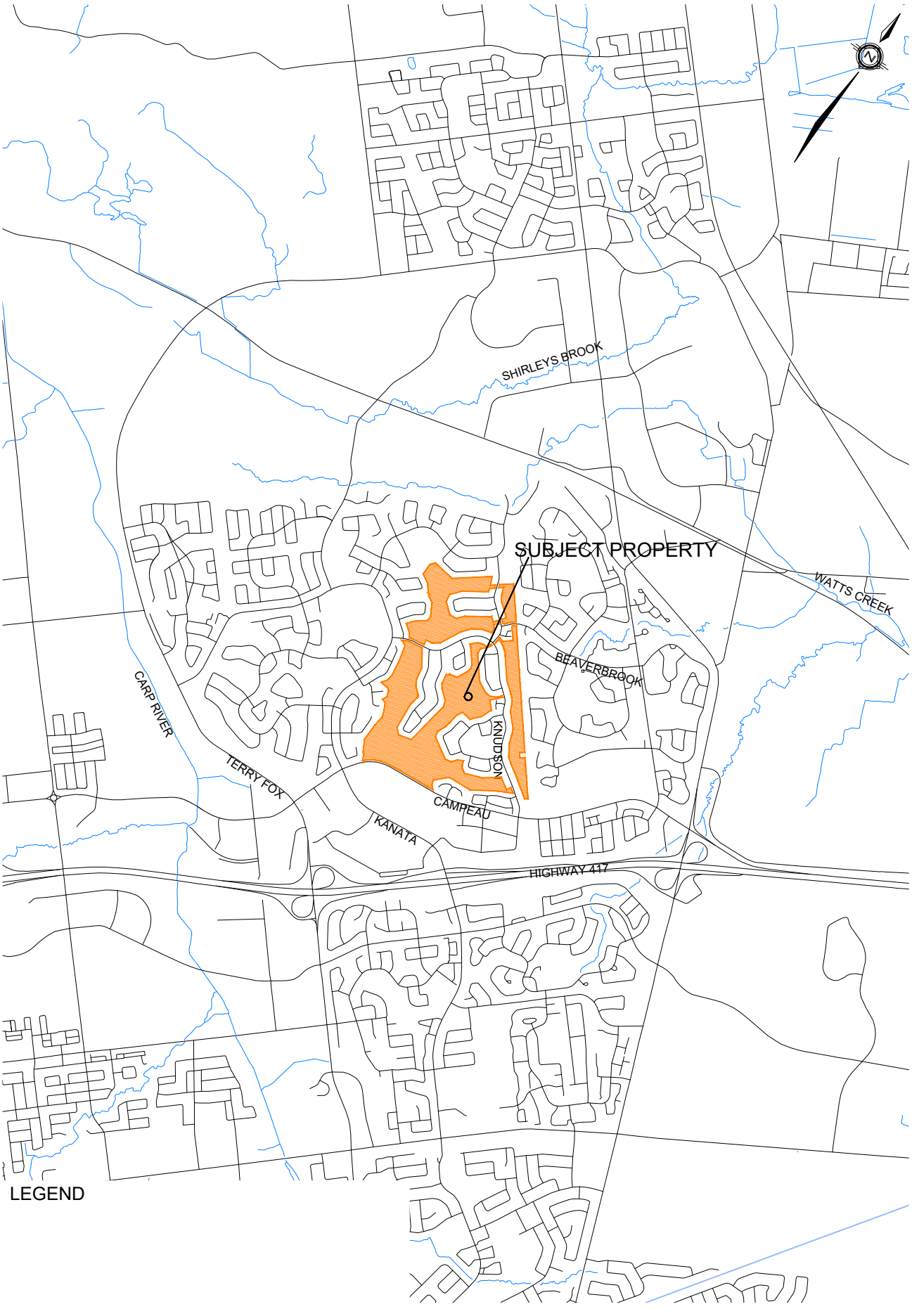
APPENDIX A



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Tel. (613) 836-0856
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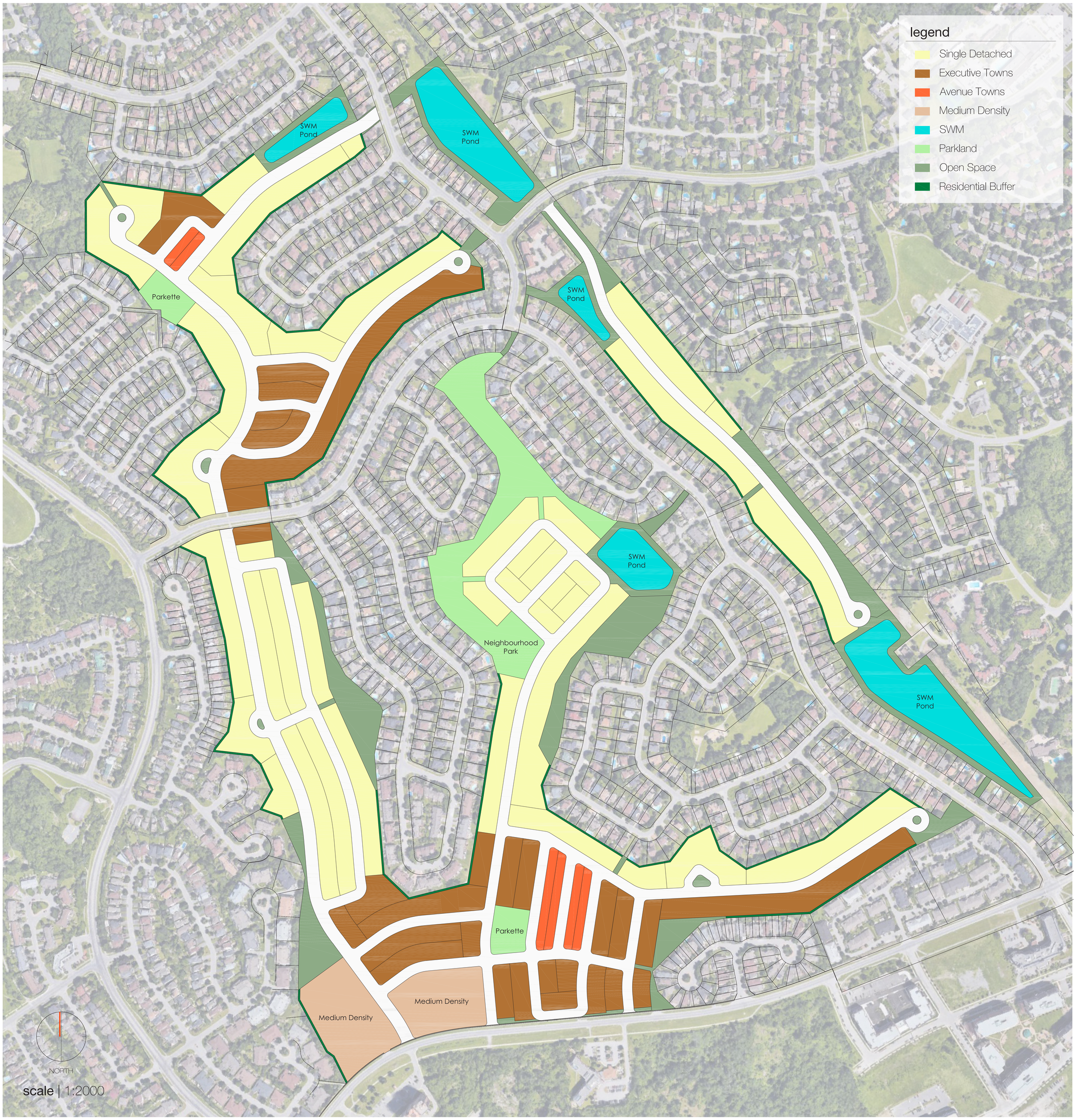
www.DSEL.ca

7000 CAMPEAU DRIVE

CITY OF OTTAWA

SITE LOCATION

SCALE:	NTS	PROJECT No.:	18-1061
DATE:	AUGUST 2019	FIGURE:	01F



concept stats

Concept Plan V8.0

Frontage

Product Type	Length (m)	%
Single Detached	6355.13	60.8%
Executive Towns	3408.70	32.6%
Avenue Towns	696.83	6.7%
Total	10460.66	100.0%

Road Length

Road Type	Length (m)	%
13.25m Local	197.48	2.5%
14.50m Local	49.31	0.6%
16.50m Local	5965.63	75.1%
20.00m Collector	1735.80	21.8%
Total	7948.22	100.0%

Area Summary

Area Type	Area (ha.)	Area (ac.)	%
Single Detached	22.76	56.25	32.1%
Executive Towns	11.05	27.30	15.6%
Avenue Towns	1.02	2.52	1.4%
Medium Density	2.97	7.34	4.2%
Roads	13.65	33.73	19.3%
Total Net Net Area	51.45	127.13	72.6%
Parkland	4.36	10.77	6.2%
Open Space	5.36	13.24	7.6%
Pond	8.02	19.82	11.3%
Residential Buffer(1)	1.70	4.20	2.4%
Subtotal Green Space Area	19.44	48.04	27.4%
Total Gross Area	70.89	175.17	100.0%

(1) Plan utilizes a 3m buffer where adjacent to existing residential property.

Unit Count

Product Type	Unit Width & UPH	Units	%	% By Product	Product Type
Single Detached	11.7	545	36.3%	36.3%	Singles
Executive Towns	6.5	498	33.2%	39.0%	Towns
Avenue Towns	7.5	88	5.9%		
Medium Density (4)	125	371	24.7%	24.7%	Condo
Total		1502	100.0%	100.0%	

(1) Average Single Detached width (11.7m) is based on Minto products 30'/36'/43'.
(2) Average Executive Townhome width (6.5m) is based on Minto TH products.
(3) Average Avenue Townhome width (7.5m) is based on Minto products.
(4) Based on a density of 125 units/ha.

minto Communities

NAK design strategies

FIGURE 2

MINTO | PROJECT FORE

land use concept plan

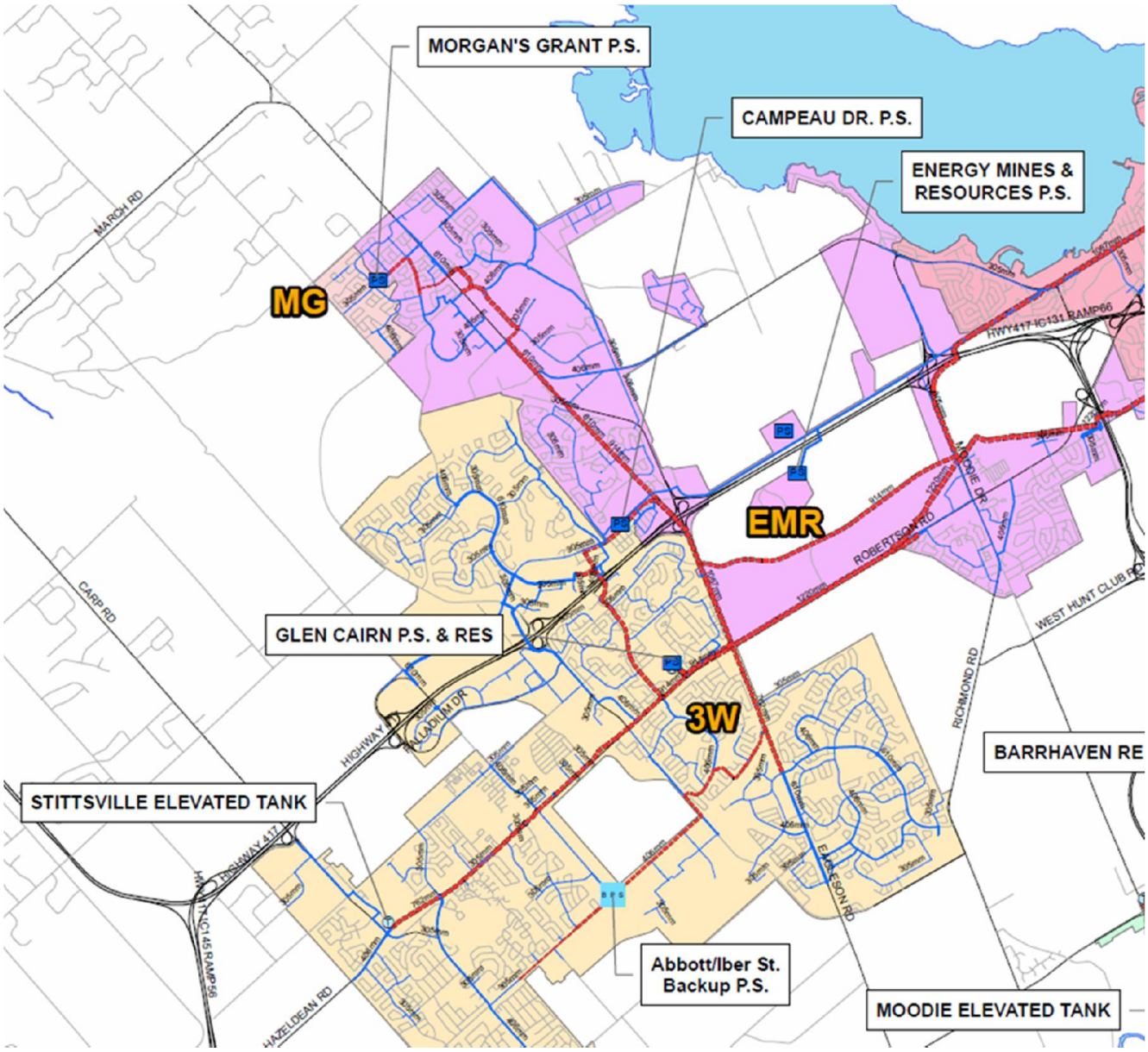
Version 8.1

date | 7 may 2019

APPENDIX B

City of Ottawa Pressure Zone Map (excerpt)

Water Supply



Hydraulic Capacity and Modeling Analysis 7000 Campeau Drive Development Area - Kanata

Final Report

Prepared for:
David Schaeffer Engineering Ltd.
120 Iber Road, Unit 103
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Prepared by:
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Unit 203, 2502 St. John's Street
Port Moody, BC V3H 2B4

Submission Date: July 19th, 2019

Contact: Mr. Werner de Schaetzen, Ph.D., P.Eng.
Project: 2019-054-DSE

OQM | Organizational Quality Management Program

Document History and Version Control

Revision No.	Date	Document Description	Revised By	Reviewed By
R0	May 27, 2019	Draft	Renaud Dufays	Werner de Schaetzen
R1	July 19, 2019	Final	Renaud Dufays	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 study the feasibility of a proposed water main network for the 7000 Campeau Drive development project in the Kanata North Ward ("Development") in the City of Ottawa, ON ("City").

The proposed development consists of 70.9 ha of golf courses lands (zoned O1A) and is planned to be rezoned to accommodate residential development. The development involves the construction of single family dwellings, traditional townhomes, back-to-back townhomes and high density buildings.

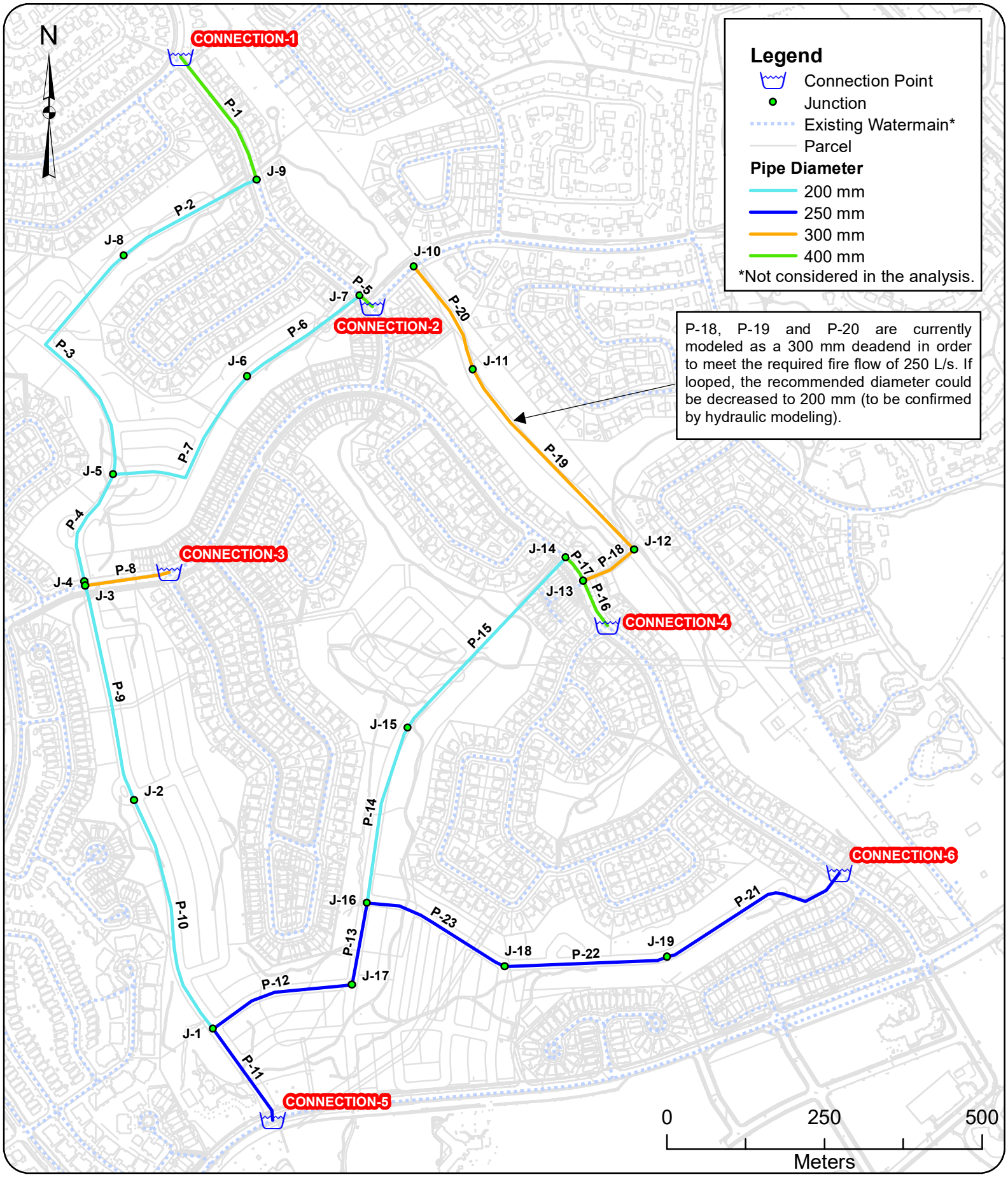
The development will have six (6) connections to the City water distribution system:

- Connection 1: Weslock Way and Walden Drive
- Connection 2: Weslock Way and Beaverbrook Road
- Connection 3: Knudson Drive and Shaugnessy Crescent
- Connection 4: Knudson Drive and Sherk Crescent
- Connection 5: 6738 Campeau Drive
- Connection 6: Knudson Drive and Morenz Terrace

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

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

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



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis 7000 Campeau Drive Development Area - Kanata**
Project ID: **2019-054-DSE**
Client: **David Schaeffer Engineering Ld.**
Date: **May 2019**
Created by: **RD**
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 prepared by DSEL (2019-05-21_1061_Wtr_coord.dwg) and provided to GeoAdvice on May 21st, 2019.

2.2 Elevations

Elevations of the modeled junctions were assigned according to a site grading plan prepared by DSEL (01D_1061_Grad-01D.pdf) and provided to GeoAdvice on May 21st, 2019.

2.3 Consumer Demands

Demand calculations were performed by DSEL and checked by GeoAdvice. The assumptions used for the demand calculations are summarized in **Table 2.1** below.

Table 2.1: Demand Calculation Assumptions

Item	Assumption
Development Area	70.9 ha
Residential Unit Density	28 unit/ha
Residential Units	39.6% Single Family 44.0% Townhome 16.4% Medium Density
Population Density	Single Family: 3.4 cap/unit Townhome: 2.7 cap/unit Medium Density: 1.8 cap/unit
Residential Average Day Demand	280 L/cap/day
Residential Maximum Daily Demand	2.5 x avg. day
Residential Peak Hour Demand	2.2 x max. day

Water demands are shown in in **Table 2.2** below.

Table 2.2: Demand Calculations

Demand Area	Connections	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)
1	1 and 2	4.7	11.8	25.9
2	3, 4, 5 and 6	13.5	33.8	74.4
Total		**18.2**	**45.6**	**100.3**

Demands were grouped in two demand areas and evenly applied to all the nodes within each demand area. For this analysis, the two demand areas are not hydraulically connected to each other. This is due to the boundary conditions provided by the City (see **Section 2.5**). The demand areas are shown in **Appendix A**.

2.4 Fire Flow Demand

Fire flow calculations were also completed by DSEL for each demand area and are summarized in **Table 2.3** below.

Table 2.3: Required Fire Flows

Demand Area	Connections	Required Fire Flow (L/s)
1	1 and 2	167
2	3, 4, 5 and 6	250

Fire flow simulations were completed at each node except for J-4 as J-3 and J-4 are redundant. 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: Weslock Way and Walden Drive
- Connection 2: Weslock Way and Beaverbrook Road
- Connection 3: Knudson Drive and Shaugnessy Crescent
- Connection 4: Knudson Drive and Sherk Crescent
- Connection 5: 6738 Campeau Drive
- Connection 6: Knudson Drive and Morenz Terrace

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

Boundary conditions were provided for Average Day, Maximum Day plus Fire and Peak Hour Demand conditions and can be found in **Appendix C**.

Table 2.4 summarizes the boundary conditions used to size the water network.

Table 2.4: Boundary Conditions

Condition	Connection 1 HGL (m)	Connection 2 HGL (m)	Connection 3 HGL (m)	Connection 4 HGL (m)	Connection 5 HGL (m)	Connection 6 HGL (m)
Average Day (max. pressure)	161.7	162.1	162.1	161.7	161.8	161.8
Peak Hour (min. pressure)	158.3	157.3	157.3	158.5	159.1	159.1
Max Day + Fire Flow (167 L/s)	156.4	157.5	-	-	-	-
Max Day + Fire Flow (250 L/s)	-	-	156.1	155.5	157.2	157.2

3 Hydraulic Capacity Design Criteria

3.1 Pipe Characteristics

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

Table 3.1: Model Pipe Characteristics

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

3.2 Pressure Requirements

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

Table 3.2: Pressure Requirements

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

4 Hydraulic Capacity Analysis

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

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

4.1 Development Pressure Analysis

The modeling results indicate that the 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** below.

Table 4.1: Summary of Available Service Pressures

Average Day Demand Maximum Pressure	Peak Hour Demand Minimum Pressure
656 kPa (95 psi)	532 kPa (77 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 350 kPa (50 psi) and 480 kPa (70 psi). The maximum pressure at any point in the distribution system in occupied areas outside of the public right-of-way shall not exceed 552 kPa (80 psi). As such, based on the City boundary conditions, pressure reducing valves may be required.

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

4.2 Development Fire Flow Analysis

Summaries of the minimum available fire flows are shown below in **Table 4.2**.

Table 4.2: Summary of Minimum Available Fire Flows

Required Fire Flow	Minimum Available Flow	Junction ID
167 L/s	219 L/s	J-5
250 L/s	273 L/s	J-2

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

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

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

Maximum Residual Pressure	Average Residual Pressure	Minimum Residual Pressure
190 kPa (28 psi)	412 kPa (60 psi)	596 kPa (86 psi)

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

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

5 Conclusions

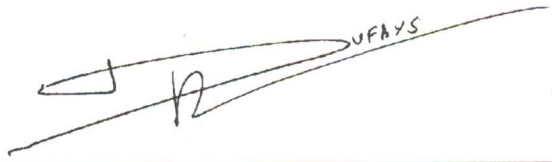
The hydraulic capacity and modeling analysis of 7000 Campeau Drive development project in the Kanata North Ward yielded the following conclusions:

- The proposed water main network can deliver all domestic flows, with service pressures expected to range between 532 kPa (77 psi) and 656 kPa (95 psi).
- The proposed water main network is able to deliver fire flows at all junctions.
- Pressure reducing valves may be required, since maximum pressures are predicted to exceed the City of Ottawa Design Guidelines.

Finally, please note that the development was analyzed as two disconnected water networks due to the boundary conditions provided by the City. This analysis may have oversized some water mains. For example, pipes P-18, P-19 and P-20 (proposed size 300 mm) were modeled as a deadend. Those pipes will likely be looped and may require smaller diameters.

Submission

Prepared by:



Renaud Dufays
Hydraulic Modeler

Approved by:

July 19 2019

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

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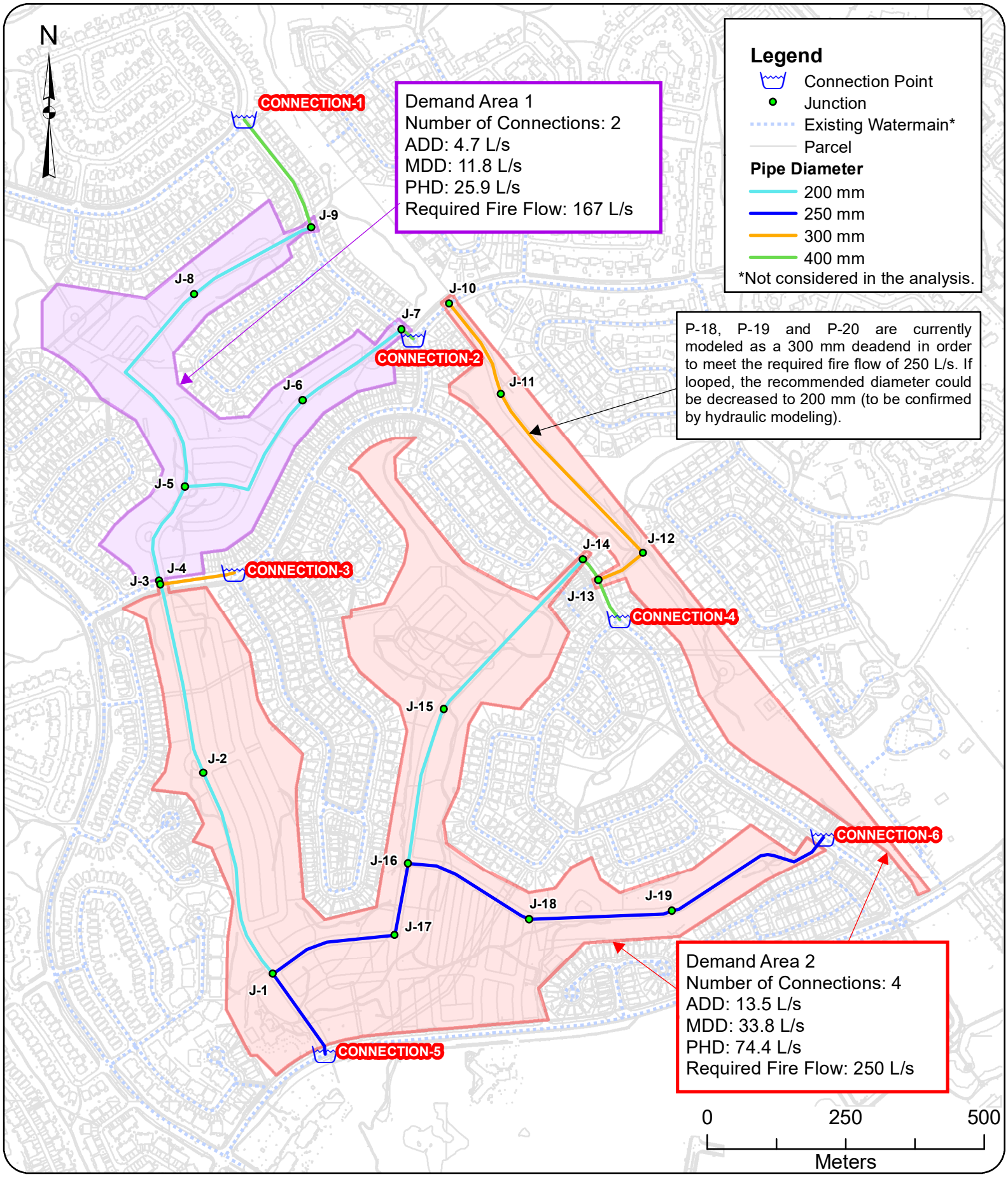
GeoADVICE

Appendix A Domestic Water Demand Calculations and Allocation



GeoAdvice Engineering Inc.

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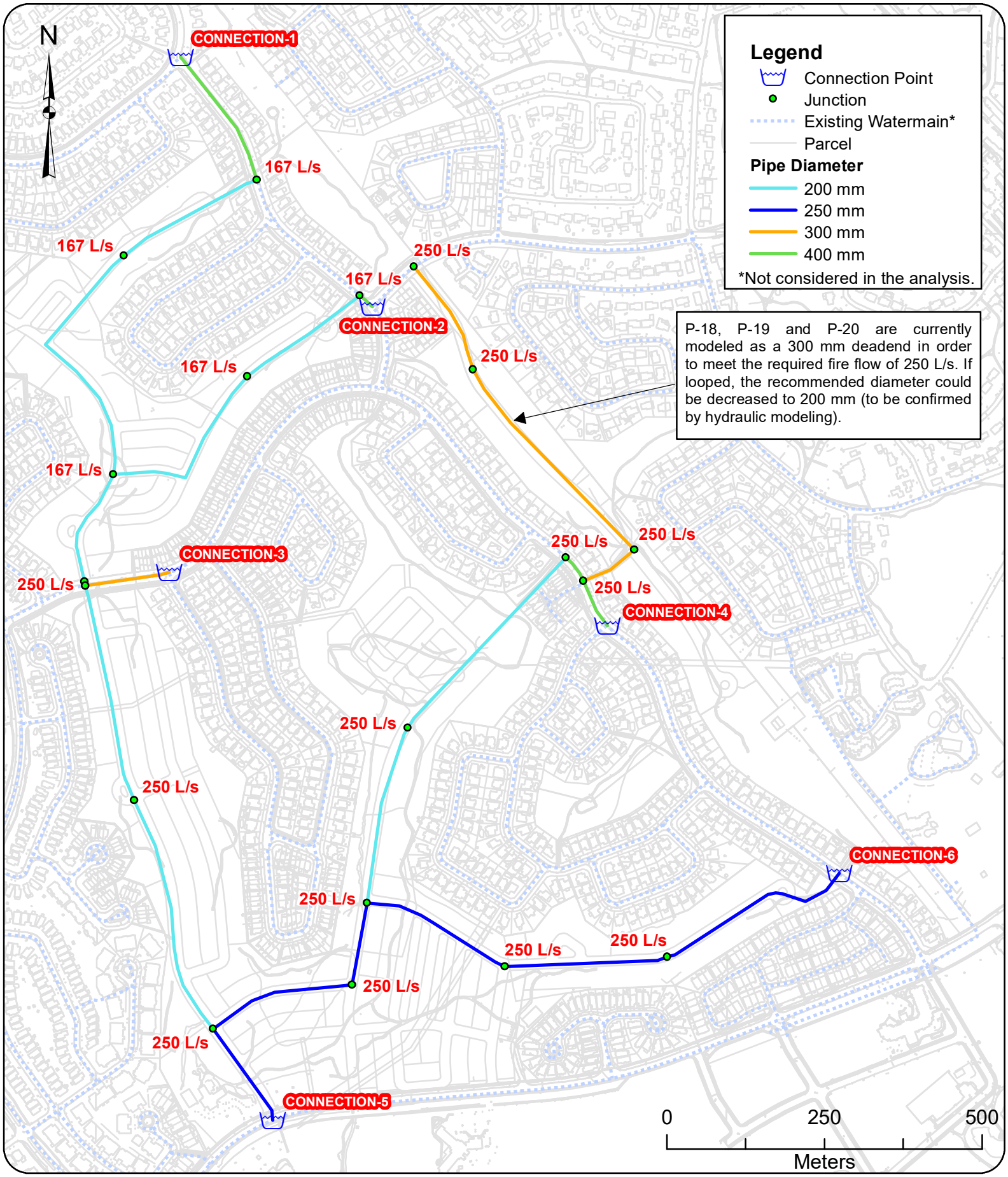
Project ID: **2019-054-DSE**
Client: **David Schaeffer Engineering Ld.**
Date: **May 2019**
Created by: **RD**
Reviewed by: **WdS**

Demand Allocation

Figure A.1

Appendix B FUS Fire Flow Calculations and Allocation



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Created by: **RD**
Reviewed by: **WdS**

Required Fire Flow

Figure B.1

Appendix C Boundary Conditions

BOUNDARY CONDITIONS

Boundary Conditions For: 1061 7000 Campeau Drive

Date of Boundary Conditions: 2019-Apr-09

Provided Information:

Scenario	Demand	
	L/min	L/s
Average Daily Demand	282.9	4.7
Maximum Daily Demand	707.3	11.8
Peak Hour	1556.0	25.9
Fire Flow #1 Demand	10,000	166.7

Number Of Connections: 2

Scenario	Demand	
	L/min	L/s
Average Daily Demand	811.6	13.5
Maximum Daily Demand	2029.0	33.8
Peak Hour	4463.9	74.4
Fire Flow #1 Demand	15,000	250.0

Number Of Connections: 3

Location:

BOUNDARY CONDITIONS

Results:

Connection #: 1

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.7	92.3
Peak Hour	158.3	87.5
Max Day Plus Fire (10,000) L/min	156.4	84.8

[1]Elevation: **96.710 m**

Connection #: 2

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	162.1	93.0
Peak Hour	157.3	86.2
Max Day Plus Fire (10,000) L/min	157.5	86.4

[1]Elevation: **96.620 m**

Connection #: 3

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	162.1	85.2
Peak Hour	157.3	78.4
Max Day Plus Fire (15,000) L/min	156.1	76.7

[1]Elevation: **102.110 m**

Connection #: 4

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.7	92.2
Peak Hour	158.5	87.6
Max Day Plus Fire (15,000) L/min	155.5	83.4

BOUNDARY CONDITIONS

[1]Elevation: **96.800 m**

Connection #: 5

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.8	85.2
Peak Hour	159.1	81.4
Max Day Plus Fire (15,000) L/min	157.2	78.7

[1]Elevation: **101.790 m**

Connection #: 6

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.8	85.4
Peak Hour	159.1	81.6
Max Day Plus Fire (15,000) L/min	157.2	78.9

[1]Elevation: **101.670 m**

Notes:

1) As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:

a) If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
b) Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

Disclaimer

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

Appendix D Pipe and Junction Model Inputs

Model Inputs

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness ()
P-1	CONNECTION-1	J-9	232	400	120
P-2	J-9	J-8	243	204	110
P-3	J-8	J-5	435	204	110
P-4	J-5	J-4	189	204	110
P-5	CONNECTION-2	J-7	27	400	120
P-6	J-7	J-6	220	204	110
P-7	J-6	J-5	305	204	110
P-8	CONNECTION-3	J-3	135	297	120
P-9	J-3	J-2	350	204	110
P-10	J-2	J-1	390	204	110
P-11	CONNECTION-5	J-1	175	250	110
P-12	J-1	J-17	238	250	110
P-13	J-17	J-16	132	250	110
P-14	J-16	J-15	287	204	110
P-15	J-15	J-14	369	204	110
P-16	CONNECTION-4	J-13	81	400	120
P-17	J-13	J-14	47	400	120
P-18	J-13	J-12	96	297	120
P-19	J-12	J-11	385	297	120
P-20	J-11	J-10	191	297	120
P-21	CONNECTION-6	J-19	321	250	110
P-22	J-19	J-18	259	250	110
P-23	J-18	J-16	245	250	110

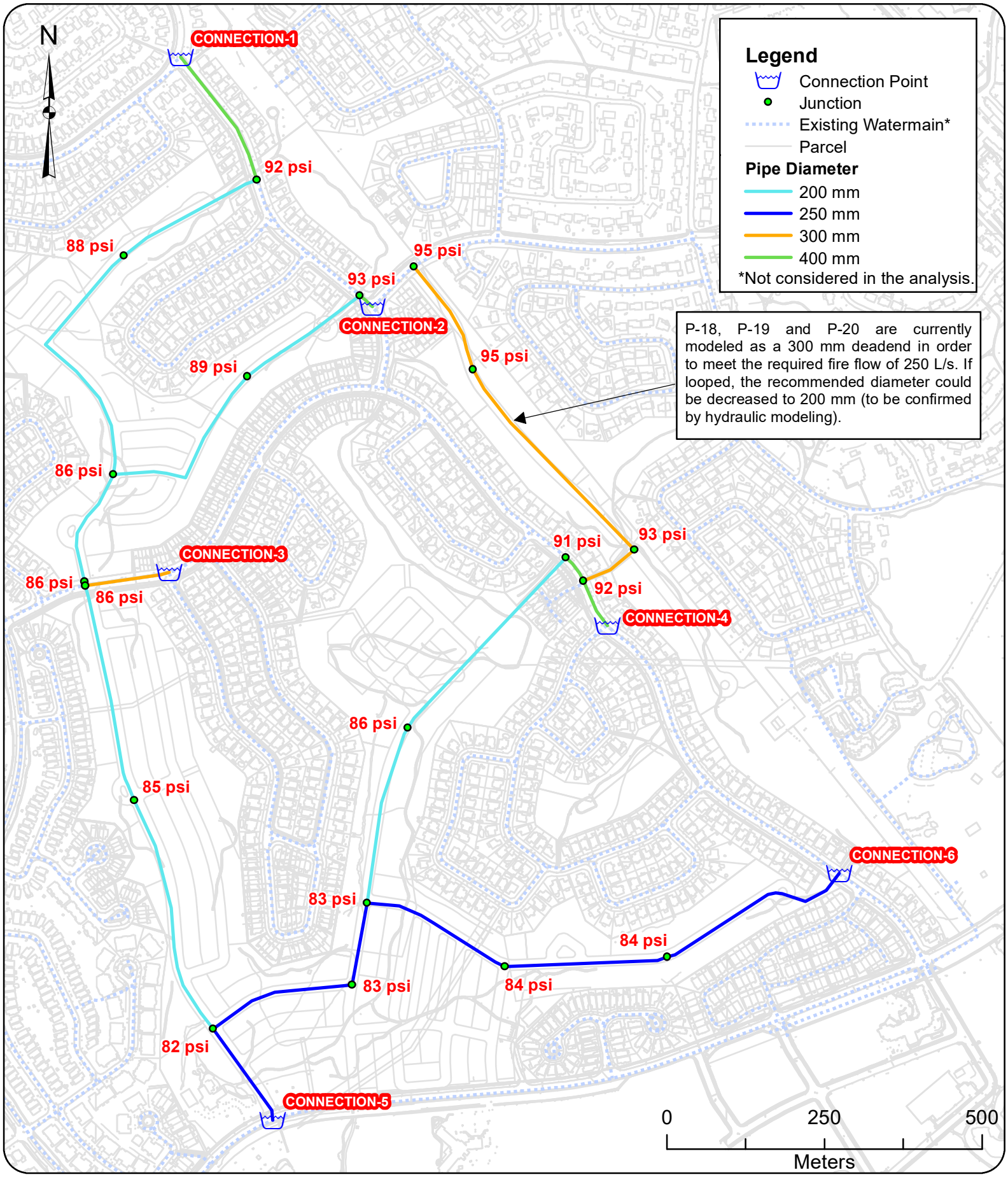
ID	Elevation (m)	ADD (L/s)
J-1	104.42	1.04
J-2	102.16	1.04
J-3	101.50	1.04
J-4	101.47	0.78
J-5	101.30	0.78
J-6	99.10	0.78
J-7	96.57	0.78
J-8	99.73	0.78
J-9	96.72	0.78
J-10	94.75	1.04
J-11	95.00	1.04
J-12	96.08	1.04
J-13	96.67	1.04
J-14	97.75	1.04
J-15	101.06	1.04
J-16	103.21	1.04
J-17	103.21	1.04
J-18	102.88	1.04
J-19	102.66	1.04

Appendix E MHD and PHD Model Results

Average Day 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-1	CONNECTION-1	J-9	232.0	400	120	-3.87	0.03	0.00	0.00
P-2	J-9	J-8	243.1	204	110	-4.65	0.14	0.05	0.20
P-3	J-8	J-5	435.3	204	110	-5.43	0.17	0.11	0.26
P-4	J-5	J-4	188.6	204	110	0.78	0.02	0.00	0.01
P-5	CONNECTION-2	J-7	26.8	400	120	8.55	0.07	0.00	0.02
P-6	J-7	J-6	219.7	204	110	7.77	0.24	0.11	0.51
P-7	J-6	J-5	304.5	204	110	6.99	0.21	0.13	0.42
P-8	CONNECTION-3	J-3	134.7	297	120	8.34	0.12	0.01	0.08
P-9	J-3	J-2	349.8	204	110	7.30	0.22	0.16	0.45
P-10	J-2	J-1	390.0	204	110	6.26	0.19	0.13	0.34
P-11	CONNECTION-5	J-1	174.5	250	110	-0.57	0.01	0.00	0.00
P-12	J-1	J-17	237.5	250	110	4.65	0.09	0.02	0.07
P-13	J-17	J-16	131.9	250	110	3.61	0.07	0.01	0.05
P-14	J-16	J-15	286.8	204	110	4.09	0.13	0.04	0.15
P-15	J-15	J-14	368.6	204	110	3.05	0.09	0.03	0.09
P-16	CONNECTION-4	J-13	81.0	400	120	2.15	0.02	0.00	0.00
P-17	J-13	J-14	47.0	400	120	-2.01	0.02	0.00	0.00
P-18	J-13	J-12	95.7	297	120	3.12	0.05	0.00	0.01
P-19	J-12	J-11	385.4	297	120	2.08	0.03	0.00	0.01
P-20	J-11	J-10	190.8	297	120	1.04	0.02	0.00	0.00
P-21	CONNECTION-6	J-19	321.4	250	110	3.60	0.07	0.01	0.05
P-22	J-19	J-18	258.7	250	110	2.56	0.05	0.01	0.02
P-23	J-18	J-16	245.0	250	110	1.52	0.03	0.00	0.01

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J-1	1.04	104.42	162	82
J-2	1.04	102.16	162	85
J-3	1.04	101.50	162	86
J-4	0.78	101.47	162	86
J-5	0.78	101.30	162	86
J-6	0.78	99.10	162	89
J-7	0.78	96.57	162	93
J-8	0.78	99.73	162	88
J-9	0.78	96.72	162	92
J-10	1.04	94.75	162	95
J-11	1.04	95.00	162	95
J-12	1.04	96.08	162	93
J-13	1.04	96.67	162	92
J-14	1.04	97.75	162	91
J-15	1.04	101.06	162	86
J-16	1.04	103.21	162	83
J-17	1.04	103.21	162	83
J-18	1.04	102.88	162	84
J-19	1.04	102.66	162	84



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis 7000 Campeau Drive Development Area - Kanata**
Project ID: **2019-054-DSE**
Client: **David Schaeffer Engineering Ld.**
Date: **May 2019**
Created by: **RD**
Reviewed by: **WdS**

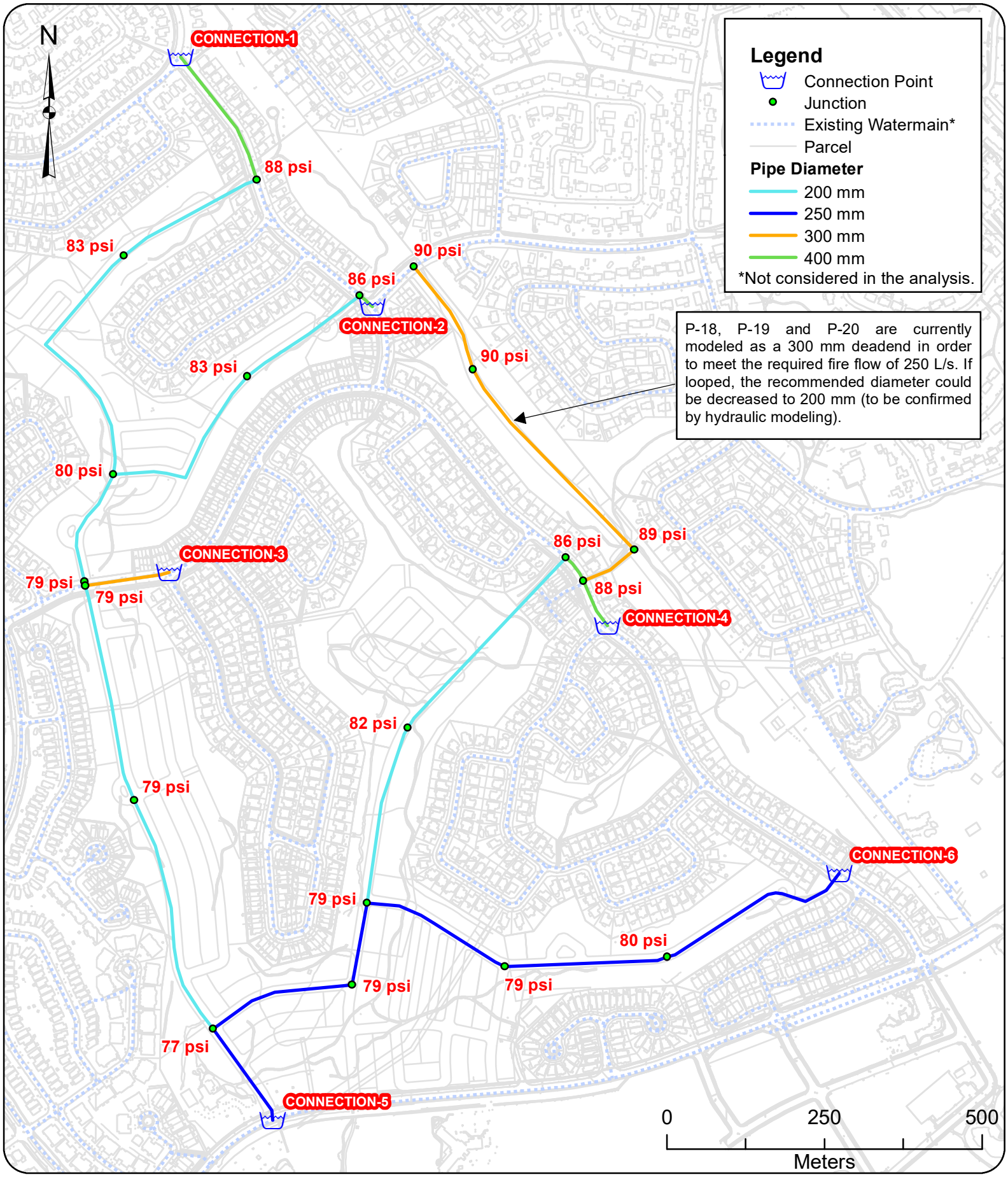
ADD Pressure Results

Figure E.1

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-1	CONNECTION-1	J-9	232.0	400	120	20.41	0.16	0.02	0.10
P-2	J-9	J-8	243.1	204	110	16.11	0.49	0.47	1.95
P-3	J-8	J-5	435.3	204	110	11.81	0.36	0.48	1.10
P-4	J-5	J-4	188.6	204	110	4.30	0.13	0.03	0.17
P-5	CONNECTION-2	J-7	26.8	400	120	5.39	0.04	0.00	0.01
P-6	J-7	J-6	219.7	204	110	1.09	0.03	0.00	0.01
P-7	J-6	J-5	304.5	204	110	-3.21	0.10	0.03	0.10
P-8	CONNECTION-3	J-3	134.7	297	120	-6.44	0.09	0.01	0.05
P-9	J-3	J-2	349.8	204	110	-12.16	0.37	0.40	1.16
P-10	J-2	J-1	390.0	204	110	-17.88	0.55	0.92	2.36
P-11	CONNECTION-5	J-1	174.5	250	110	32.63	0.66	0.47	2.67
P-12	J-1	J-17	237.5	250	110	9.03	0.18	0.06	0.25
P-13	J-17	J-16	131.9	250	110	3.31	0.07	0.01	0.04
P-14	J-16	J-15	286.8	204	110	5.81	0.18	0.08	0.29
P-15	J-15	J-14	368.6	204	110	0.09	0.00	0.00	0.00
P-16	CONNECTION-4	J-13	81.0	400	120	28.51	0.23	0.01	0.18
P-17	J-13	J-14	47.0	400	120	5.63	0.04	0.00	0.01
P-18	J-13	J-12	95.7	297	120	17.16	0.25	0.03	0.30
P-19	J-12	J-11	385.4	297	120	11.44	0.17	0.05	0.14
P-20	J-11	J-10	190.8	297	120	5.72	0.08	0.01	0.04
P-21	CONNECTION-6	J-19	321.4	250	110	19.66	0.40	0.34	1.05
P-22	J-19	J-18	258.7	250	110	13.94	0.28	0.14	0.55
P-23	J-18	J-16	245.0	250	110	8.22	0.17	0.05	0.21

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J-1	5.72	104.42	159	77
J-2	5.72	102.16	158	79
J-3	5.72	101.50	157	79
J-4	4.30	101.47	157	79
J-5	4.30	101.30	157	80
J-6	4.30	99.10	157	83
J-7	4.30	96.57	157	86
J-8	4.30	99.73	158	83
J-9	4.30	96.72	158	88
J-10	5.72	94.75	158	90
J-11	5.72	95.00	158	90
J-12	5.72	96.08	158	89
J-13	5.72	96.67	158	88
J-14	5.72	97.75	158	86
J-15	5.72	101.06	158	82
J-16	5.72	103.21	159	79
J-17	5.72	103.21	159	79
J-18	5.72	102.88	159	79
J-19	5.72	102.66	159	80



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis 7000 Campeau Drive Development Area - Kanata**
Project ID: **2019-054-DSE**
Client: **David Schaeffer Engineering Ld.**
Date: **May 2019**
Created by: **RD**
Reviewed by: **WdS**

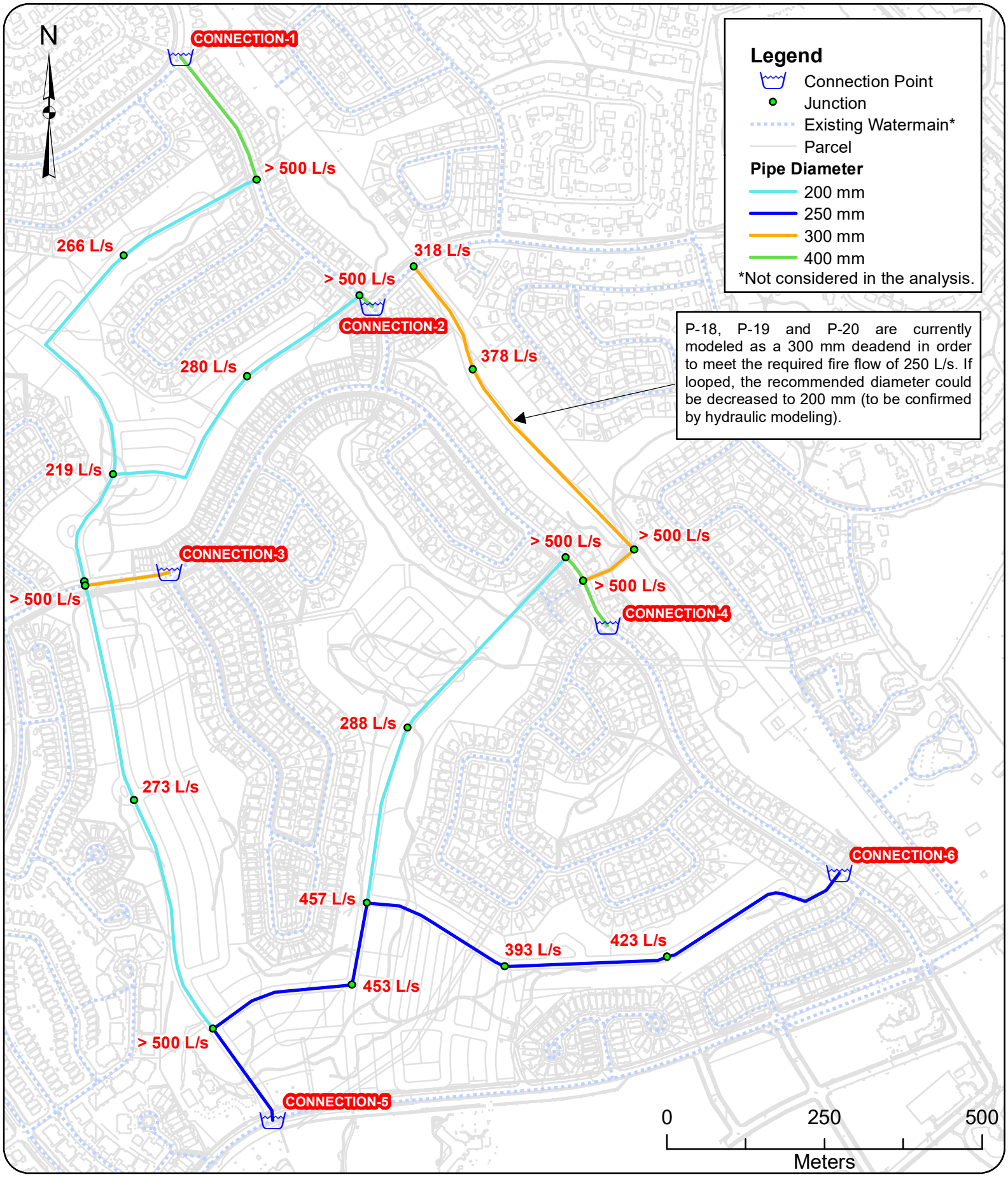
PHD Pressure Results

Figure E.2

Appendix F MDD+FF Model Results

Fire Flow Modeling Results

ID	Static Demand (L/s)	Static Pressure (psi)	Static Head (m)	Fire-Flow Demand (L/s)	Residual Pressure (psi)	Available Flow at Hydrant (L/s)	Available Flow Pressure (psi)
J-1	2.60	75	157	250	63	> 500	20
J-2	2.60	77	156	250	28	273	20
J-3	2.60	78	156	250	71	> 500	20
J-5	1.97	79	157	167	42	219	20
J-6	1.97	83	157	167	58	280	20
J-7	1.97	87	158	167	86	> 500	20
J-8	1.97	81	157	167	54	266	20
J-9	1.97	85	156	167	83	> 500	20
J-10	2.60	86	155	250	43	318	20
J-11	2.60	86	155	250	54	378	20
J-12	2.60	84	155	250	77	> 500	20
J-13	2.60	84	156	250	83	> 500	20
J-14	2.60	82	156	250	80	> 500	20
J-15	2.60	78	156	250	33	288	20
J-16	2.60	76	157	250	57	457	20
J-17	2.60	76	157	250	57	453	20
J-18	2.60	77	157	250	51	393	20

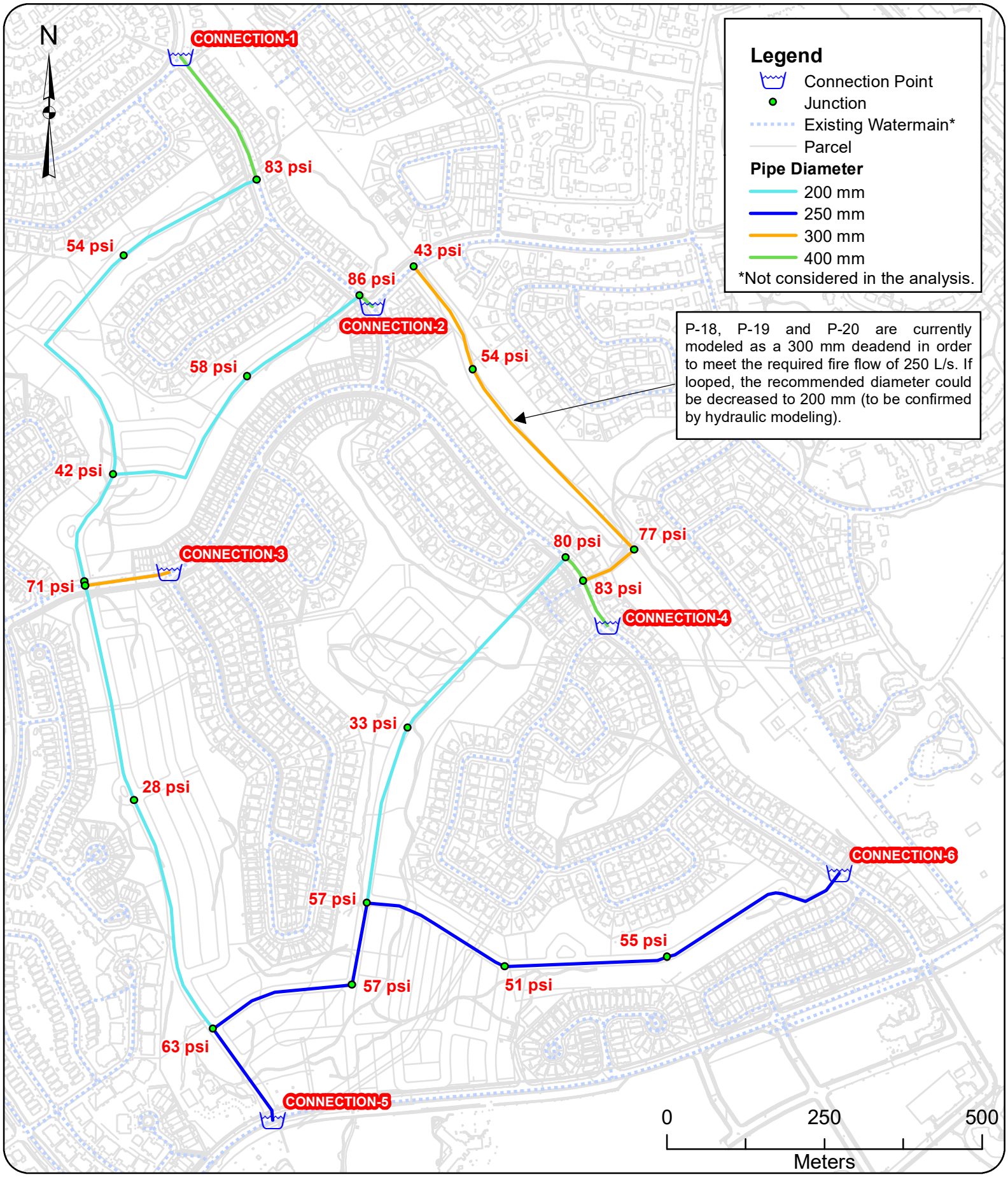


GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis 7000 Campeau Drive Development Area - Kanata**
Project ID: **2019-054-DSE**
Client: **David Schaeffer Engineering Ld.**
Date: **May 2019**
Created by: **RD**
Reviewed by: **WdS**

Available Fire Flow @ 20 psi

Figure F.1



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis 7000 Campeau Drive Development Area - Kanata**
Project ID: **2019-054-DSE**
Client: **David Schaeffer Engineering Ld.**
Date: **May 2019**
Created by: **RD**
Reviewed by: **WdS**

Residual Pressure @ Required Fire Flow

Figure F.2

APPENDIX C

7000 Campeau Drive
Area To MH10

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2012

Site Area 16.260 **ha**

Extraneous Flow Allowances

Infiltration / Inflow **5.37 L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	Pop
Single Family	3.4	180	613
Semi-detached and duplex	2.7		0
Townhouse	2.7	200	541
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	75	134

16.260 ha
455.28 Total units
* estimated based on 28units/ha per client

Unit mix
39.6% Single family
44.0% Townhomes
16.4% Medium Density

Total Pop **1288**

Average Domestic Flow **4.17 L/s**

Peaking Factor **3.18**

Peak Domestic Flow **13.28 L/s**

Institutional / Commercial / Industrial Contributions

Property Type	Unit Rate	No. of Units	Avg Wastewater (L/s)
Nursing / Rest homes	450 L/bed/d		0.00
Housekeeping Facilities	225 L/per/d		0.00
Dining room	125 L/per/d		0.00
Commercial floor space*	5 $L/m^2/d$		0.00
Hospitals	900 L/bed/d		0.00
School	70 L/student/d		0.00
Industrial - Light**	35,000 L/gross ha/d		0.00
Industrial - Heavy**	55,000 L/gross ha/d		0.00

Average I/C/I Flow **0.00**

Peak Institutional / Commercial Flow 0.00
Peak Industrial Flow** 0.00
Peak I/C/I Flow **0.00**

** assuming a 12 hour commercial operation*
*** peak industrial flow per City of Ottawa Sewer Design Guidelines Appendix 4B*

Total Estimated Average Dry Weather Flow Rate	**4.17 L/s**
Total Estimated Peak Dry Weather Flow Rate	**13.28 L/s**
Total Estimated Peak Wet Weather Flow Rate	**18.65 L/s**

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2012

Site Area 4.640 **ha**

Extraneous Flow Allowances

Infiltration / Inflow **1.53 L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	Pop
Single Family	3.4	51	175
Semi-detached and duplex	2.7		0
Townhouse	2.7	57	154
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	21	38

4.640 ha
129.92 Total units
* estimated based on 28units/ha per client

Unit mix
39.6% Single family
44.0% Townhomes
16.4% Medium Density

Total Pop **368**

Average Domestic Flow **1.19 L/s**

Peaking Factor **3.43**

Peak Domestic Flow **4.09 L/s**

Institutional / Commercial / Industrial Contributions

Property Type	Unit Rate	No. of Units	Avg Wastewater (L/s)
Nursing / Rest homes	450 L/bed/d		0.00
Housekeeping Facilities	225 L/per/d		0.00
Dining room	125 L/per/d		0.00
Commercial floor space*	5 $L/m^2/d$		0.00
Hospitals	900 L/bed/d		0.00
School	70 L/student/d		0.00
Industrial - Light**	35,000 L/gross ha/d		0.00
Industrial - Heavy**	55,000 L/gross ha/d		0.00

Average I/C/I Flow **0.00**

Peak Institutional / Commercial Flow 0.00
Peak Industrial Flow** 0.00
Peak I/C/I Flow **0.00**

** assuming a 12 hour commercial operation*
*** peak industrial flow per City of Ottawa Sewer Design Guidelines Appendix 4B*

Total Estimated Average Dry Weather Flow Rate	**1.19 L/s**
Total Estimated Peak Dry Weather Flow Rate	**4.09 L/s**
Total Estimated Peak Wet Weather Flow Rate	**5.62 L/s**

Minto - On Behalf of ClubLink Corporation
7000 Campeau Drive
Area To MH26

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2012

Site Area 12.290 **ha**

Extraneous Flow Allowances

Infiltration / Inflow **4.06 L/s**

Domestic Contributions

Unit Type	**Unit Rate**	**Units**	**Pop**
Single Family	3.4	136	463
Semi-detached and duplex	2.7		0
Townhouse	2.7	151	409
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	56	102

12.290 ha
344.12 Total units
* estimated based on 28units/ha per client

Unit mix
39.6% Single family
44.0% Townhomes
16.4% Medium Density

Total Pop **974**

Average Domestic Flow **3.16 L/s**

Peaking Factor **3.25**

Peak Domestic Flow **10.24 L/s**

Institutional / Commercial / Industrial Contributions

Property Type	**Unit Rate**	**No. of Units**	**Avg Wastewater (L/s)**
Nursing / Rest homes	450 L/bed/d		0.00
Housekeeping Facilities	225 L/per/d		0.00
Dining room	125 L/per/d		0.00
Commercial floor space*	5 $L/m^2/d$		0.00
Hospitals	900 L/bed/d		0.00
School	70 L/student/d		0.00
Industrial - Light**	35,000 L/gross ha/d		0.00
Industrial - Heavy**	55,000 L/gross ha/d		0.00

Average I/C/I Flow **0.00**

Peak Institutional / Commercial Flow 0.00
Peak Industrial Flow** 0.00
Peak I/C/I Flow **0.00**

** assuming a 12 hour commercial operation*
*** peak industrial flow per City of Ottawa Sewer Design Guidelines Appendix 4B*

Total Estimated Average Dry Weather Flow Rate	**3.16 L/s**
Total Estimated Peak Dry Weather Flow Rate	**10.24 L/s**
Total Estimated Peak Wet Weather Flow Rate	**14.30 L/s**

Minto - On Behalf of ClubLink Corporation
7000 Campeau Drive
Area To MH32C

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2012

Site Area 9.930 **ha**

Extraneous Flow Allowances

Infiltration / Inflow **3.28 L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	Pop
Single Family	3.4	110	374
Semi-detached and duplex	2.7		0
Townhouse	2.7	122	330
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	46	82

9.930 ha
278.04 Total units
* estimated based on 28units/ha per client

Unit mix
39.6% Single family
44.0% Townhomes
16.4% Medium Density

Total Pop **787**

Average Domestic Flow **2.55 L/s**

Peaking Factor **3.29**

Peak Domestic Flow **8.39 L/s**

Institutional / Commercial / Industrial Contributions

Property Type	Unit Rate	No. of Units	Avg Wastewater (L/s)
Nursing / Rest homes	450 L/bed/d		0.00
Housekeeping Facilities	225 L/per/d		0.00
Dining room	125 L/per/d		0.00
Commercial floor space*	5 $L/m^2/d$		0.00
Hospitals	900 L/bed/d		0.00
School	70 L/student/d		0.00
Industrial - Light**	35,000 L/gross ha/d		0.00
Industrial - Heavy**	55,000 L/gross ha/d		0.00

Average I/C/I Flow **0.00**

Peak Institutional / Commercial Flow 0.00
Peak Industrial Flow** 0.00
Peak I/C/I Flow **0.00**

** assuming a 12 hour commercial operation*
*** peak industrial flow per City of Ottawa Sewer Design Guidelines Appendix 4B*

Total Estimated Average Dry Weather Flow Rate	**2.55 L/s**
Total Estimated Peak Dry Weather Flow Rate	**8.39 L/s**
Total Estimated Peak Wet Weather Flow Rate	**11.67 L/s**

Minto - On Behalf of ClubLink Corporation
7000 Campeau Drive
Area To MH33

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2012

Site Area 9.540 **ha**

Extraneous Flow Allowances

Infiltration / Inflow **3.15 L/s**

Domestic Contributions

Unit Type	**Unit Rate**	**Units**	**Pop**
Single Family	3.4	106	360
Semi-detached and duplex	2.7		0
Townhouse	2.7	118	317
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	44	79

9.540 ha
267.12 Total units
* estimated based on 28units/ha per client

Unit mix
39.6% Single family
44.0% Townhomes
16.4% Medium Density

Total Pop **756**

Average Domestic Flow **2.45 L/s**

Peaking Factor **3.30**

Peak Domestic Flow **8.08 L/s**

Institutional / Commercial / Industrial Contributions

Property Type	**Unit Rate**	**No. of Units**	**Avg Wastewater (L/s)**
Nursing / Rest homes	450 L/bed/d		0.00
Housekeeping Facilities	225 L/per/d		0.00
Dining room	125 L/per/d		0.00
Commercial floor space*	5 $L/m^2/d$		0.00
Hospitals	900 L/bed/d		0.00
School	70 L/student/d		0.00
Industrial - Light**	35,000 L/gross ha/d		0.00
Industrial - Heavy**	55,000 L/gross ha/d		0.00

Average I/C/I Flow **0.00**

Peak Institutional / Commercial Flow 0.00
Peak Industrial Flow** 0.00
Peak I/C/I Flow **0.00**

** assuming a 12 hour commercial operation*
*** peak industrial flow per City of Ottawa Sewer Design Guidelines Appendix 4B*

Total Estimated Average Dry Weather Flow Rate	**2.45 L/s**
Total Estimated Peak Dry Weather Flow Rate	**8.08 L/s**
Total Estimated Peak Wet Weather Flow Rate	**11.23 L/s**

Minto - On Behalf of ClubLink Corporation
7000 Campeau Drive
Area To MH36

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2012

Site Area 9.700 **ha**

Extraneous Flow Allowances

Infiltration / Inflow **3.20 L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	Pop
Single Family	3.4	108	366
Semi-detached and duplex	2.7		0
Townhouse	2.7	120	323
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	45	80

9.700 ha
271.6 Total units
* estimated based on 28units/ha per client

Unit mix
39.6% Single family
44.0% Townhomes
16.4% Medium Density

Total Pop **769**

Average Domestic Flow **2.49 L/s**

Peaking Factor **3.30**

Peak Domestic Flow **8.21 L/s**

Institutional / Commercial / Industrial Contributions

Property Type	Unit Rate	No. of Units	Avg Wastewater (L/s)
Nursing / Rest homes	450 L/bed/d		0.00
Housekeeping Facilities	225 L/per/d		0.00
Dining room	125 L/per/d		0.00
Commercial floor space*	5 $L/m^2/d$		0.00
Hospitals	900 L/bed/d		0.00
School	70 L/student/d		0.00
Industrial - Light**	35,000 L/gross ha/d		0.00
Industrial - Heavy**	55,000 L/gross ha/d		0.00

Average I/C/I Flow **0.00**

Peak Institutional / Commercial Flow 0.00
Peak Industrial Flow** 0.00
Peak I/C/I Flow **0.00**

** assuming a 12 hour commercial operation*
*** peak industrial flow per City of Ottawa Sewer Design Guidelines Appendix 4B*

Total Estimated Average Dry Weather Flow Rate	**2.49 L/s**
Total Estimated Peak Dry Weather Flow Rate	**8.21 L/s**
Total Estimated Peak Wet Weather Flow Rate	**11.41 L/s**

7000 Campeau Drive
Area To MH40

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2012

Site Area 6.290 **ha**

Extraneous Flow Allowances

Infiltration / Inflow **2.08 L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	Pop
Single Family	3.4	70	237
Semi-detached and duplex	2.7		0
Townhouse	2.7	77	209
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	29	52

6.290 ha
176.12 Total units
* estimated based on 28units/ha per client

Unit mix
39.6% Single family
44.0% Townhomes
16.4% Medium Density

Total Pop **498**

Average Domestic Flow **1.62 L/s**

Peaking Factor **3.38**

Peak Domestic Flow **5.46 L/s**

Institutional / Commercial / Industrial Contributions

Property Type	Unit Rate	No. of Units	Avg Wastewater (L/s)
Nursing / Rest homes	450 L/bed/d		0.00
Housekeeping Facilities	225 L/per/d		0.00
Dining room	125 L/per/d		0.00
Commercial floor space*	5 $L/m^2/d$		0.00
Hospitals	900 L/bed/d		0.00
School	70 L/student/d		0.00
Industrial - Light**	35,000 L/gross ha/d		0.00
Industrial - Heavy**	55,000 L/gross ha/d		0.00

Average I/C/I Flow **0.00**

Peak Institutional / Commercial Flow 0.00
Peak Industrial Flow** 0.00
Peak I/C/I Flow **0.00**

** assuming a 12 hour commercial operation*
*** peak industrial flow per City of Ottawa Sewer Design Guidelines Appendix 4B*

Total Estimated Average Dry Weather Flow Rate	**1.62 L/s**
Total Estimated Peak Dry Weather Flow Rate	**5.46 L/s**
Total Estimated Peak Wet Weather Flow Rate	**7.53 L/s**

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2012

Site Area 68.650 **ha**

Extraneous Flow Allowances

Infiltration / Inflow **22.65 L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	Pop
Single Family	3.4	761	2589
Semi-detached and duplex	2.7		0
Townhouse	2.7	846	2284
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	315	567

68.650 ha
1922.2 Total units
* estimated based on 28units/ha per client

Unit mix
39.6% Single family
44.0% Townhomes
16.4% Medium Density

Total Pop **5440**

Average Domestic Flow **17.63 L/s**

Peaking Factor **2.77**

Peak Domestic Flow **48.81 L/s**

Institutional / Commercial / Industrial Contributions

Property Type	Unit Rate	No. of Units	Avg Wastewater (L/s)
Nursing / Rest homes	450 L/bed/d		0.00
Housekeeping Facilities	225 L/per/d		0.00
Dining room	125 L/per/d		0.00
Commercial floor space*	5 $L/m^2/d$		0.00
Hospitals	900 L/bed/d		0.00
School	70 L/student/d		0.00
Industrial - Light**	35,000 L/gross ha/d		0.00
Industrial - Heavy**	55,000 L/gross ha/d		0.00

Average I/C/I Flow **0.00**

Peak Institutional / Commercial Flow 0.00
Peak Industrial Flow** 0.00
Peak I/C/I Flow **0.00**

** assuming a 12 hour commercial operation*
*** peak industrial flow per City of Ottawa Sewer Design Guidelines Appendix 4B*

Total Estimated Average Dry Weather Flow Rate	**17.63 L/s**
Total Estimated Peak Dry Weather Flow Rate	**48.81 L/s**
Total Estimated Peak Wet Weather Flow Rate	**71.47 L/s**

SANITARY SEWER CALCULATION SHEET - EXISTING CONDITIONS

PROJECT: **Kanata Golf and Country Club**
LOCATION: **7000 Campeau Drive**
FILE REF: **18-1061**
DATE: **7-Aug-19**

DESIGN PARAMETERS

Avg. Daily Flow Res.	280	L/p/d	Peak Fact Res. Per Harmons: Min = 2.0, Max =3.8		Infiltration / Inflow	0.33	L/s/ha
Avg. Daily Flow Comm.	28,000	L/ha/d	Harmon Correction Factor	0.8	Min. Pipe Velocity	0.60	m/s full flowing
Avg. Daily Flow Instit.	28,000	L/ha/d	Peak Fact. Comm.	1 (< 20% ICI)	Max. Pipe Velocity	3.00	m/s full flowing
Avg. Daily Flow Indust.	35,000	L/ha/d	Peak Fact. Instit.	1 (< 20% ICI)	Mannings N	0.013	
Ex. Population Per Hectare*	69	Pop/Ha	Peak Fact. Indust. per MOE graph				

*Based on an average from Areas 2, 12 and 10.

Location				Residential Area and Population					Commercial		Institutional		Industrial		Infiltration				Pipe Data										
Area ID	Up	Down	Area (ha)	Pop.	Cumulative Area (ha)	Cumulative Pop.	Peak. Fact. (-)	Q_{res} (L/s)	Area (ha)	Accu. Area (ha)	Area (ha)	Accu. Area (ha)	Area (ha)	Accu. Area (ha)	Q_{C+I+I} (L/s)	Total Area (ha)	Accu. Area (ha)	Infiltration Flow (L/s)	Total Flow (L/s)	DIA (mm)	Upstream Invert (m)	Downstream Invert (m)	Length (m)	Slope (%)	$A_{hydraulic}$ (m^2)	R (m)	Velocity (m/s)	Q_{cap} (L/s)	Q / Q full (-)	Qresidual (L/s)
Campeau Drive																													
	1	2		0	0.000	0	3.80	0.00		0.00		0.00		0.00	0.0	0.000	0.000	0.000	0.00	525	97.57	97.52	16.9	0.296	0.216	0.131	1.08	233.9	0.00	233.9
2	2	3	7.47	515	7.47	515	3.37	5.64	0.07	0.07		0.00		0.00	0.0	7.540	7.540	2.488	8.15	525	97.52	97.33	78.2	0.243	0.216	0.131	0.98	212.0	0.04	203.8
	3	4		0	7.470	515	3.37	5.64		0.07		0.00		0.00	0.0	0.000	7.540	2.488	8.15	525	97.3	97.09	76.4	0.275	0.216	0.131	1.04	225.5	0.04	217.3
4	4	5	13.02	898	20.49	1414	3.16	14.47		0.07		0.00		0.00	0.0	13.020	20.560	6.785	21.28	525	97.09	97.02	24.1	0.290	0.216	0.131	1.07	231.8	0.09	210.5
5	5	6	1.31	0	21.80	1414	3.16	14.47	0.11	0.18		0.00		0.00	0.1	1.420	21.980	7.253	21.78	525	97.02	96.79	91.7	0.251	0.216	0.131	0.99	215.4	0.10	193.6
	6	7		0	21.80	1414	3.16	14.47		0.18		0.00		0.00	0.1	0.000	21.980	7.253	21.78	525	96.76	96.51	100.6	0.249	0.216	0.131	0.99	214.4	0.10	192.6
Private Property																													
	7	8		0	21.80	1414	3.16	14.47		0.18		0.00		0.00	0.1	0.000	21.980	7.253	21.78	525	96.48	96.11	149.6	0.247	0.216	0.131	0.99	213.9	0.10	192.1
	8	9		0	21.80	1414	3.16	14.47		0.18		0.00		0.00	0.1	0.000	21.980	7.253	21.78	525	96.09	95.73	125.4	0.287	0.216	0.131	1.06	230.4	0.09	208.6
9	9	10	6.16	425	27.96	1839	3.09	18.42		0.18		0.00		0.00	0.1	6.160	28.140	9.286	27.77	525	95.73	95.37	149.8	0.240	0.216	0.131	0.97	210.8	0.13	183.1
Rosenfield Crescent																													
10	10	11	3.32	229	31.28	2068	3.06	20.50		0.18		0.00		0.00	0.1	3.320	31.460	10.382	30.94	525	95.29	95.24	19.1	0.262	0.216	0.131	1.02	220.0	0.14	189.1
	11	12		0	31.28	2068	3.06	20.50		0.18		0.00		0.00	0.1	0.000	31.460	10.382	30.94	525	95.19	94.99	80.9	0.247	0.216	0.131	0.99	213.8	0.14	182.9
Sherk Crescent																													
12	12	13	6.53	451	37.81	2519	3.00	24.52		0.18		0.00		0.00	0.1	6.530	37.990	12.537	37.12	525	94.97	94.9	23.2	0.302	0.216	0.131	1.09	236.2	0.16	199.1
	13	14		0	37.81	2519	3.00	24.52		0.18		0.00		0.00	0.1	0.000	37.990	12.537	37.12	525	94.88	94.73	50.5	0.297	0.216	0.131	1.08	234.4	0.16	197.3
	14	15		0	37.81	2519	3.00	24.52		0.18		0.00		0.00	0.1	0.000	37.990	12.537	37.12	525	94.7	94.47	92.2	0.249	0.216	0.131	0.99	214.8	0.17	177.7
	15	16		0	37.81	2519	3.00	24.52		0.18		0.00		0.00	0.1	0.000	37.990	12.537	37.12	525	94.45	94.37	37.8	0.212	0.216	0.131	0.91	197.8	0.19	160.7
	16	17		0	37.81	2519	3.00	24.52		0.18		0.00		0.00	0.1	0.000	37.990	12.537	37.12	525	94.36	94.12	88.5	0.271	0.216	0.131	1.03	224.0	0.17	186.8
Knudson Drive																													
17&17A	17	18	9.68	668	47.49	3186	2.94	30.32		0.18		0.00		0.00	0.1	9.680	47.670	15.731	46.11	525	94.1	93.97	42.8	0.304	0.216	0.131	1.09	237.0	0.19	190.9
	18	19		0	47.49	3186	2.94	30.32		0.18		0.00		0.00	0.1	0.000	47.670	15.731	46.11	525	93.95	93.71	57.9	0.415	0.216	0.131	1.28	276.9	0.17	230.8
19	19	20	1.86	128	49.35	3315	2.92	31.41		0.18		0.00		0.00	0.1	1.860	49.530	16.345	47.82	525	93.69	93.49	83.5	0.240	0.216	0.131	0.97	210.5	0.23	162.7
	20	21		0	49.35	3315	2.92	31.41		0.18		0.00		0.00	0.1	0.000	49.530	16.345	47.82	525	93.47	93.34	51.2	0.254	0.216	0.131	1.00	216.7	0.22	168.9
	21	22		0	49.35	3315	2.92	31.41		0.18		0.00		0.00	0.1	0.000	49.530	16.345	47.82	525	93.33	93.12	71.9	0.292	0.216	0.131	1.07	232.4	0.21	184.6
22	22	23	5.17	357	54.52	3671	2.89	34.42		0.18		0.00		0.00	0.1	5.170	54.700	18.051	52.53	525	93.1	93	37.5	0.267	0.216	0.131	1.03	222.1	0.24	169.6
	23	25		0	54.52	3671	2.89	34.42		0.18		0.00		0.00	0.1	0.000	54.700	18.051	52.53	600	92.93	92.83	61.6	0.210	0.283	0.150	1.00	281.4	0.19	228.8
	25	26		0	54.52	3671	2.89	34.42		0.18		0.00		0.00	0.1	0.000	54.700	18.051	52.53	600	92.8	92.72	31.3	0.256	0.283	0.150	1.10	310.4	0.17	257.9
26	26	27	4.99	344	59.51	4016	2.87	37.29		0.18		0.00		0.00	0.1	4.990	59.690	19.698	57.05	600	92.67	92.56	57.5	0.191	0.283	0.150	0.95	268.6	0.21	211.5
	27	28		0	59.51	4016	2.87	37.29		0.18		0.00		0.00	0.1	0.000	59.690	19.698	57.05	600	92.54	92.37	51.4	0.331	0.283	0.150	1.25	353.1	0.16	296.1
	28	29		0	59.51	4016	2.87	37.29		0.18		0.00		0.00	0.1	0.000	59.690	19.698	57.05	600	92.37	92.15	100.6	0.219	0.283	0.150	1.02	287.1	0.20	230.1
	29	30		0	59.51	4016	2.87	37.29		0.18		0.00		0.00	0.1	0.000	59.690	19.698	57.05	600	92.13	91.91	94.3	0.233	0.283	0.150	1.05	296.6	0.19	239.5
30	30	31	1.85	128	61.36	4143	2.86	38.35		0.18		0.00		0.00	0.1	1.850	61.540	20.308	58.71	600	91.8	91.69	51.3	0.214	0.283	0.150	1.01	284.3	0.21	225.6
	31	32		0	61.36	4143	2.86	38.35		0.18		0.00		0.00	0.1	0.000	61.540	20.308	58.71	600	91.67	91.56	40.1	0.274	0.283	0.150	1.14	321.6	0.18	262.9
32	101	102	35.65	2460	35.65	2460	3.01	24.01		0.00		0.00		0.00	0.0	35.650	35.650	11.765	35.77	375	95.7	95.59	40.3	0.273	0.110	0.094	0.83	91.6	0.39	55.8
	102	103		0	35.65	2460	3.01	24.01		0.00		0.00		0.00	0.0	0.000	35.650	11.765	35.77	375	95.57	95.27	110.5	0.271	0.110	0.094	0.83	91.4	0.39	55.6
	103	104		0	35.65	2460	3.01	24.01		0.00		0.00		0.00	0.0	0.000	35.650	11.765	35.77	375	95.22	95.14	31.5	0.254	0.110	0.094	0.80	88.4	0.40	52.6
	104	105		0	35.65	2460	3.01	24.01		0.00		0.00		0.00	0.0	0.000	35.650	11.765	35.77	375	95.12	95.04	33.7	0.237	0.110	0.094	0.77	85.4	0.42	49.7
32A	105	106	12.60	869	48.25	3329	2.92	31.54		0.00		0.00		0.00	0.0	12.600	48.250	15.923	47.46	375	94.98	94.87	19.7	0.558	0.110	0.094	1.19	131.0	0.36	83.6
	106	107		0	48.25	3329	2.92	31.54		0.00		0.00		0.00	0.0	0.000	48.250	15.923	47.46	375	94.86	94.82	17.4	0.230	0.110	0.094	0.76	84.1	0.56	36.6
	107	108		0	48.25	3329	2.92	31.54		0.00		0.00		0.00	0.0	0.000	48.250	15.923	47.46	375	94.77	94.6	67.5	0.252	0.110	0.094	0.80	88.0	0.54	40.5
32B	108	109	9.12	629	57.37	3959	2.87	36.82		0.00		0.00		0.00	0.0	9.120	57.370	18.932	55.75	375	94.59	94.38	70.2	0.299	0.110	0.094	0.87	95.9	0.58	40.1
	109	110		0	57.37	3959	2.87	36.82		0.00		0.00		0.00	0.0	0.000	57.370	18.932	55.75	375	94.38	94.22	57.0	0.281	0.110	0.094	0.84	92.9	0.60	37.1

SANITARY SEWER CALCULATION SHEET - EXISTING CONDITIONS

PROJECT: **Kanata Golf and Country Club**
LOCATION: **7000 Campeau Drive**
FILE REF: **18-1061**
DATE: **7-Aug-19**

DESIGN PARAMETERS

Avg. Daily Flow Res.	280	L/p/d	Peak Fact Res. Per Harmons: Min = 2.0, Max =3.8		Infiltration / Inflow	0.33	L/s/ha
Avg. Daily Flow Comm.	28,000	L/ha/d	Harmon Correction Factor	0.8	Min. Pipe Velocity	0.60	m/s full flowing
Avg. Daily Flow Instit.	28,000	L/ha/d	Peak Fact. Comm.	1 (< 20% ICI)	Max. Pipe Velocity	3.00	m/s full flowing
Avg. Daily Flow Indust.	35,000	L/ha/d	Peak Fact. Instit.	1 (< 20% ICI)	Mannings N	0.013	
Ex. Population Per Hectare*	69	Pop/Ha	Peak Fact. Indust. per MOE graph				

*Based on an average from Areas 2, 12 and 10.

Location				Residential Area and Population					Commercial		Institutional		Industrial		Infiltration				Pipe Data											
Area ID	Up	Down	Area	Pop.	Cumulative		Peak.	Q_{res}	Area	Accu.	Area	Accu.	Area	Accu.	Q_{C+I+I}	Total	Accu.	Infiltration	Total	DIA	Upstream	Downstream	Length	Slope	$A_{hydraulic}$	R	Velocity	Q_{cap}	Q / Q full	Qresidual
					Area	Pop.	Fact.			Area		Area		Area		Area	Area	Flow	Flow		Invert	Invert								
			(ha)		(ha)		(-)	(L/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(ha)	(ha)	(L/s)	(L/s)	(mm)	(m)	(m)	(m)	(%)	(m^2)	(m)	(m/s)	(L/s)	(-)	(L/s)
	110	111		0	57.37	3959	2.87	36.82		0.00		0.00		0.00	0.0	0.000	57.370	18.932	55.75	375	94.18	93.94	57.0	0.421	0.110	0.094	1.03	113.8	0.49	58.0
	111	112		0	57.37	3959	2.87	36.82		0.00		0.00		0.00	0.0	0.000	57.370	18.932	55.75	375	93.9	93.77	43.0	0.302	0.110	0.094	0.87	96.4	0.58	40.7
	112	113		0	57.37	3959	2.87	36.82		0.00		0.00		0.00	0.0	0.000	57.370	18.932	55.75	375	93.76	93.63	42.0	0.310	0.110	0.094	0.88	97.5	0.57	41.8
	113	32		0	57.37	3959	2.87	36.82		0.00		0.00		0.00	0.0	0.000	57.370	18.932	55.75	375	93.63	93.4	43.0	0.535	0.110	0.094	1.16	128.2	0.43	72.5
Weslock Way																														
	32	33		0	118.73	8102	2.64	69.21		0.18		0.00		0.00	0.1	0.000	118.910	39.240	108.51	600	91.496	91.374	52.0	0.235	0.283	0.150	1.05	297.4	0.36	188.9
	33	34		0	118.73	8102	2.64	69.21		0.18		0.00		0.00	0.1	0.000	118.910	39.240	108.51	600	91.334	91.249	41.0	0.207	0.283	0.150	0.99	279.6	0.39	171.1
	34	35		0	118.73	8102	2.64	69.21		0.18		0.00		0.00	0.1	0.000	118.910	39.240	108.51	600	91.243	91.162	41.9	0.193	0.283	0.150	0.95	270.0	0.40	161.5
	35	36		0	118.73	8102	2.64	69.21		0.18		0.00		0.00	0.1	0.000	118.910	39.240	108.51	600	91.084	90.91	65.2	0.267	0.283	0.150	1.12	317.2	0.34	208.7
	36	37		0	118.73	8102	2.64	69.21		0.18		0.00		0.00	0.1	0.000	118.910	39.240	108.51	600	90.91	90.792	64.6	0.183	0.283	0.150	0.93	262.4	0.41	153.9
37	37	38	3.52	243	122.25	8345	2.63	71.01		0.18		0.00		0.00	0.1	3.520	122.430	40.402	111.47	600	90.792	90.613	45.6	0.393	0.283	0.150	1.36	384.7	0.29	273.2
	38	39		0	122.25	8345	2.63	71.01		0.18		0.00		0.00	0.1	0.000	122.430	40.402	111.47	600	90.61	90.509	38.0	0.266	0.283	0.150	1.12	316.6	0.35	205.1
39	39	40	5.02	346	127.27	8691	2.61	73.57		0.18		0.00		0.00	0.1	5.020	127.450	42.059	115.69	600	90.509	90.278	89.3	0.259	0.283	0.150	1.10	312.3	0.37	196.6
	40	41		0	127.27	8691	2.61	73.57		0.18		0.00		0.00	0.1	0.000	127.450	42.059	115.69	600	90.278	90.14	51.5	0.268	0.283	0.150	1.12	317.8	0.36	202.2
	41	42		0	127.27	8691	2.61	73.57		0.18		0.00		0.00	0.1	0.000	127.450	42.059	115.69	600	90.14	90.02	78.7	0.152	0.283	0.150	0.85	239.8	0.48	124.1
	42	43		0	127.27	8691	2.61	73.57		0.18		0.00		0.00	0.1	0.000	127.450	42.059	115.69	600	90	89.8	79.9	0.250	0.283	0.150	1.09	307.2	0.38	191.5
Walden Drive																														
43	43	44	10.63	733	137.90	9425	2.58	78.93		0.18		0.00		0.00	0.1	10.630	138.080	45.566	124.55	600	89.76	89.6	55.3	0.289	0.283	0.150	1.17	330.3	0.38	205.7
	44	45		0	137.90	9425	2.58	78.93		0.18		0.00		0.00	0.1	0.000	138.080	45.566	124.55	600	89.59	89.48	46.3	0.238	0.283	0.150	1.06	299.4	0.42	174.9
	45	46		0	137.90	9425	2.58	78.93		0.18		0.00		0.00	0.1	0.000	138.080	45.566	124.55	600	89.48	89.141	129.4	0.262	0.283	0.150	1.11	314.3	0.40	189.7
46	46	47	95.04	6558	232.94	15982	2.40	124.33		0.18	0.81	0.81		0.00	0.3	95.850	233.930	77.197	201.85	675	86.294	86.019	84.0	0.327	0.358	0.169	1.34	481.0	0.42	279.1
Kimmins Court																														
	47	48		0	232.94	15982	2.40	124.33		0.18		0.81		0.00	0.3	0.000	233.930	77.197	201.85	675	85.903	85.788	50.8	0.226	0.358	0.169	1.12	399.9	0.50	198.0
48	48	49	2.93	202	235.87	16185	2.40	125.67		0.18		0.81		0.00	0.3	2.930	236.860	78.164	204.15	675	85.788	85.678	31.4	0.351	0.358	0.169	1.39	497.9	0.41	293.8
	49	50		0	235.87	16185	2.40	125.67		0.18		0.81		0.00	0.3	0.000	236.860	78.164	204.15	675	85.678	85.603	26.2	0.286	0.358	0.169	1.26	449.7	0.45	245.6
	50	51		0	235.87	16185	2.40	125.67		0.18		0.81		0.00	0.3	0.000	236.860	78.164	204.15	675	85.603	85.345	93.2	0.277	0.358	0.169	1.24	442.2	0.46	238.1
	51	52		0	235.87	16185	2.40	125.67		0.18		0.81		0.00	0.3	0.000	236.860	78.164	204.15	675	85.315	85.201	40.7	0.280	0.358	0.169	1.24	444.9	0.46	240.7
	52	53		0	235.87	16185	2.40	125.67		0.18		0.81		0.00	0.3	0.000	236.860	78.164	204.15	675	85.168	85.041	65.8	0.193	0.358	0.169	1.03	369.4	0.55	165.3
	53	54		0	235.87	16185	2.40	125.67		0.18		0.81		0.00	0.3	0.000	236.860	78.164	204.15	675	85.01	84.875	54.5	0.248	0.358	0.169	1.17	418.4	0.49	214.2
	54	55		0	235.87	16185	2.40	125.67		0.18		0.81		0.00	0.3	0.000	236.860	78.164	204.15	675	81.286	80.992	47.3	0.622	0.358	0.169	1.85	662.7	0.31	458.6
Station Road																														
Future Development	55	56	180.03	10805	415.90	26990	2.22	194.00		0.18		0.81		0.00	0.3	180.030	416.890	137.574	331.90	750	81.286	80.992	96.4	0.305	0.442	0.188	1.39	614.8	0.54	282.9
	56	57		0	415.90	26990	2.22	194.00		0.18		0.81		0.00	0.3	0.000	416.890	137.574	331.90	750	80.971	80.673	111.1	0.268	0.442	0.188	1.31	576.6	0.58	244.7
	57	57A		0	415.90	26990	2.22	194.00		0.18		0.81		0.00	0.3	0.000	416.890	137.574	331.90	750	80.673	80.096	54.1	1.067	0.442	0.188	2.60	1149.7	0.29	817.8
	57A	58		0	415.90	26990	2.22	194.00		0.18		0.81		0.00	0.3	0.000	416.890	137.574	331.90	750	78.316	78.038	56.5	0.492	0.442	0.188	1.77	780.9	0.43	449.0
58	58	59	8.79	0	424.69	26990	2.22	194.00	2.86	3.04		0.81		0.00	1.2	11.650	428.540	141.418	336.67	750	76.138	75.961	63.4	0.279	0.442	0.188	1.33	588.2	0.57	251.6
	59	60		0	424.69	26990	2.22	194.00		3.04		0.81		0.00	1.2	0.000	428.540	141.418	336.67	750	76.138	75.666	95.1	0.496	0.442	0.188	1.78	784.3	0.43	447.6
60	60	61	19.97	0	444.66	26990	2.22	194.00	4.05	7.09		0.81		0.00	2.6	24.020	452.560	149.345	345.91	750	75.659	75.413	43.1	0.571	0.442	0.188	1.90	841.1	0.41	495.2
	61	62		0	444.66	26990	2.22	194.00		7.09		0.81		0.00	2.6	0.000	452.560	149.345	345.91	750	75.36	75.062	96.8	0.308	0.442	0.188	1.40	617.7	0.56	271.8
62	62	63	0.88	0	445.54	26990	2.22	194.00	1.20	8.29		0.81		0.00	2.9	2.080	454.640	150.031	346.98	750	74.999	74.779	79.8	0.276	0.442	0.188	1.32	584.5	0.59	237.6
	63	64		0	445.54	26990	2.22	194.00		8.29		0.81		0.00	2.9	0.000	454.640	150.031	346.98	750	74.748	74.581	54.3	0.308	0.442	0.188	1.40	617.4	0.56	270.4
	64	65		0	445.54	26990	2.22	194.00		8.29		0.81		0.00	2.9	0.000	454.640	150.031	346.98	750	74.562	74.413	47.1	0.316	0.442	0.188	1.42	626.2	0.55	279.2
	65	66	0.10	7	445.64	26997	2.22	194.05	0.22	8.51		0.81		0.00	3.0	0.320	454.960	150.137	347.20	750	74.368	74.128	76.8	0.312	0.442	0.188	1.41	622.3	0.56	275.1
	66	67		0	445.64	26997	2.22	194.05		8.51		0.81		0.00	3.0	0.000	454.960	150.137	347.20	750	74.121	73.824	81.2	0.366	0.442	0.188	1.52	673.3	0.52	326.1
	67	68		0	445.64	26997	2.22	194.05		8.51		0.81		0.00	3.0	0.000	454.960	150.137	347.20	750	73.787	73.727	17.2	0.349	0.442	0.188	1.49	657.5	0.53	310.3
	68	69		0	445.64	26997	2.22	194.05		8.51		0.81		0.00	3.0	0.000	454.960	150.137	347.20	750	73.7	73.466	81.8	0.286	0.442	0.188	1.35	595.4	0.58	248.2

Population of 10,805.8 and area of 180.03 ha obtained from Kanata Lakes North Serviceability Study, Appendix A-Sanitary Sewer Design. By CCL, dated June 06.

SANITARY SEWER CALCULATION SHEET - PROPOSED CONDITIONS

PROJECT: **Kanata Golf and Country Club**
LOCATION: **7000 Campeau Drive**
FILE REF: **18-1061**
DATE: **7-Aug-19**

DESIGN PARAMETERS

Avg. Daily Flow Res.	280	L/p/d	Peak Fact Res. Per Harmons: Min = 2.0, Max =3.8		Infiltration / Inflow	0.33	L/s/ha
Avg. Daily Flow Comm.	28,000	L/ha/d	Harmon Correction Factor	0.8	Min. Pipe Velocity	0.60	m/s full flowing
Avg. Daily Flow Instit.	28,000	L/ha/d	Peak Fact. Comm.	1 (< 20% ICI)	Max. Pipe Velocity	3.00	m/s full flowing
Avg. Daily Flow Indust.	35,000	L/ha/d	Peak Fact. Instit.	1 (< 20% ICI)	Mannings N	0.013	
Ex Population Per Hectare	69	Pop/Ha	Peak Fact. Indust. per MOE graph				

*Based on an average from Areas 2, 12 and 10.

Location			Residential Area and Population						Commercial		Institutional		Industrial		Infiltration				Pipe Data										
Area ID	Up	Down	Area	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	Upstream Invert	Downstream Invert	Length	Slope	$A_{hydraulic}$	R	Velocity	Q_{cap}	Q / Q full	Qresidual
			(ha)		(ha)		(-)	(L/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(ha)	(ha)	(L/s)	(L/s)	(mm)	(m)	(m)	(m)	(%)	(m^2)	(m)	(m/s)	(L/s)	(-)	(L/s)
Campeau Drive																														
	1	2		0	0.000	0	3.80	0.00		0.00		0.00		0.00	0.0	0.000	0.000	0.000	0.00	525	97.57	97.52	16.9	0.296	0.216	0.131	1.08	233.9	0.00	233.9
2	2	3	7.47	515	7.47	515	3.37	5.64	0.07	0.07		0.00		0.00	0.0	7.540	7.540	2.488	8.15	525	97.52	97.33	78.2	0.243	0.216	0.131	0.98	212.0	0.04	203.8
	3	4		0	7.470	515	3.37	5.64		0.07		0.00		0.00	0.0	0.000	7.540	2.488	8.15	525	97.3	97.09	76.4	0.275	0.216	0.131	1.04	225.5	0.04	217.3
4	4	5	13.02	898	20.49	1414	3.16	14.47		0.07		0.00		0.00	0.0	13.020	20.560	6.785	21.28	525	97.09	97.02	24.1	0.290	0.216	0.131	1.07	231.8	0.09	210.5
5	5	6	1.31	0	21.80	1414	3.16	14.47	0.11	0.18		0.00		0.00	0.1	1.420	21.980	7.253	21.78	525	97.02	96.79	91.7	0.251	0.216	0.131	0.99	215.4	0.10	193.6
	6	7		0	21.80	1414	3.16	14.47		0.18		0.00		0.00	0.1	0.000	21.980	7.253	21.78	525	96.76	96.51	100.6	0.249	0.216	0.131	0.99	214.4	0.10	192.6
	7	201		0	21.80	1414	3.16	14.47		0.18		0.00		0.00	0.1	0.000	21.980	7.253	21.78	525	96.48	96.41	35.0	0.200	0.216	0.131	0.89	192.2	0.11	170.5
Future Development																														
FUTURE1	201	202	16.26	1288	38.06	2702	2.98	26.13		0.18		0.00		0.00	0.1	16.260	38.240	12.619	38.81	525	96.41	96.18	113.3	0.203	0.216	0.131	0.90	193.8	0.20	155.0
	202	203		0	38.06	2702	2.98	26.13		0.18		0.00		0.00	0.1	0.000	38.240	12.619	38.81	525	96.18	96.04	72.5	0.193	0.216	0.131	0.87	189.0	0.21	150.2
	203	204		0	38.06	2702	2.98	26.13		0.18		0.00		0.00	0.1	0.000	38.240	12.619	38.81	525	96.04	95.96	40.2	0.199	0.216	0.131	0.89	191.9	0.20	153.1
	204	205		0	38.06	2702	2.98	26.13		0.18		0.00		0.00	0.1	0.000	38.240	12.619	38.81	525	95.96	95.87	44.5	0.202	0.216	0.131	0.89	193.3	0.20	154.5
	205	206		0	38.06	2702	2.98	26.13		0.18		0.00		0.00	0.1	0.000	38.240	12.619	38.81	525	95.87	95.73	71.2	0.197	0.216	0.131	0.88	190.7	0.20	151.9
	206	207		0	38.06	2702	2.98	26.13		0.18		0.00		0.00	0.1	0.000	38.240	12.619	38.81	525	95.73	95.58	71.2	0.211	0.216	0.131	0.91	197.4	0.20	158.6
	207	208		0	38.06	2702	2.98	26.13		0.18		0.00		0.00	0.1	0.000	38.240	12.619	38.81	525	95.58	95.53	25.6	0.195	0.216	0.131	0.88	190.1	0.20	151.3
9	208	10	6.16	425	44.22	3127	2.94	29.81		0.18		0.00		0.00	0.1	6.160	44.400	14.652	44.52	525	95.53	95.37	85.0	0.188	0.216	0.131	0.86	186.6	0.24	142.0
Rosenfield Crescent																														
10	10	11	3.32	229	47.54	3356	2.92	31.76		0.18		0.00		0.00	0.1	3.320	47.720	15.748	47.57	525	95.29	95.24	19.1	0.262	0.216	0.131	1.02	220.0	0.22	172.5
	11	12		0	47.54	3356	2.92	31.76		0.18		0.00		0.00	0.1	0.000	47.720	15.748	47.57	525	95.19	94.99	80.9	0.247	0.216	0.131	0.99	213.8	0.22	166.3
Sherk Crescent																														
12	12	13	6.53	451	54.07	3807	2.88	35.55		0.18		0.00		0.00	0.1	6.530	54.250	17.903	53.51	525	94.97	94.9	23.2	0.302	0.216	0.131	1.09	236.2	0.23	182.7
	13	14		0	54.07	3807	2.88	35.55		0.18		0.00		0.00	0.1	0.000	54.250	17.903	53.51	525	94.88	94.73	50.5	0.297	0.216	0.131	1.08	234.4	0.23	180.9
	14	15		0	54.07	3807	2.88	35.55		0.18		0.00		0.00	0.1	0.000	54.250	17.903	53.51	525	94.7	94.47	92.2	0.249	0.216	0.131	0.99	214.8	0.25	161.3
	15	16		0	54.07	3807	2.88	35.55		0.18		0.00		0.00	0.1	0.000	54.250	17.903	53.51	525	94.45	94.37	37.8	0.212	0.216	0.131	0.91	197.8	0.27	144.3
	16	17		0	54.07	3807	2.88	35.55		0.18		0.00		0.00	0.1	0.000	54.250	17.903	53.51	525	94.36	94.12	88.5	0.271	0.216	0.131	1.03	224.0	0.24	170.4
Knudson Drive																														
FUTURE2	17A	17B	4.64	368	4.64	368	3.43	4.09		0.00		0.00		0.00	0.0	4.640	4.640	1.531	5.62											
17A	17A	17B	6.89	475	11.53	843	3.28	8.96		0.00		0.00		0.00	0.0	6.890	11.530	3.805	12.76	250	96.55	96.2	103.2	0.339	0.049	0.063	0.71	34.6	0.37	21.9
17	17B	17	2.79	193	14.32	1036	3.23	10.85		0.00		0.00		0.00	0.0	2.790	14.320	4.726	15.58	250	94.11	93.95	228.1	0.300	0.049	0.063	0.66	32.6	0.48	17.0
	17	18		0	68.39	4842	2.81	44.04		0.18		0.00		0.00	0.1	0.000	68.570	22.628	66.73	525	94.1	93.97	42.8	0.304	0.216	0.131	1.09	237.0	0.28	170.3
	18	19		0	68.39	4842	2.81	44.04		0.18		0.00		0.00	0.1	0.000	68.570	22.628	66.73	525	93.95	93.71	57.9	0.415	0.216	0.131	1.28	276.9	0.24	210.2
19	19	20	1.86	128	70.25	4971	2.80	45.07		0.18		0.00		0.00	0.1	1.860	70.430	23.242	68.37	525	93.69	93.49	83.5	0.240	0.216	0.131	0.97	210.5	0.32	142.1
	20	21		0	70.25	4971	2.80	45.07		0.18		0.00		0.00	0.1	0.000	70.430	23.242	68.37	525	93.47	93.34	51.2	0.254	0.216	0.131	1.00	216.7	0.32	148.3
	21	22		0	70.25	4971	2.80	45.07		0.18		0.00		0.00	0.1	0.000	70.430	23.242	68.37	525	93.33	93.12	71.9	0.292	0.216	0.131	1.07	232.4	0.29	164.1
22	22	23	5.17	357	75.42	5327	2.78	47.92		0.18		0.00		0.00	0.1	5.170	75.600	24.948	72.93	525	93.1	93	37.5	0.267	0.216	0.131	1.03	222.1	0.33	149.2
	23	25		0	75.42	5327	2.78	47.92		0.18		0.00		0.00	0.1	0.000	75.600	24.948	72.93	600	92.93	92.83	61.6	0.210	0.283	0.150	1.00	281.4	0.26	208.5
	25	26		0	75.42	5327	2.78	47.92		0.18		0.00		0.00	0.1	0.000	75.600	24.948	72.93	600	92.8	92.72	31.3	0.256	0.283	0.150	1.10	310.4	0.23	237.5
FUTURE3	26	27	12.29	974	12.29	974	3.25	10.25		0.00		0.00		0.00	0.0	12.290	12.290	4.056	14.30											
26	26	27	4.99	344	92.70	6646	2.70	58.21		0.18		0.00		0.00	0.1	4.990	92.880	30.650	88.92	600	92.67	92.54	57.5	0.226	0.283	0.150	1.03	292.0	0.30	203.0
	27	28		0	92.70	6646	2.70	58.21		0.18		0.00		0.00	0.1	0.000	92.880	30.650	88.92	600	92.54	92.37	51.4	0.331	0.283	0.150	1.25	353.1	0.25	264.2
	28	29		0	92.70	6646	2.70	58.21		0.18		0.00		0.00	0.1	0.000	92.880	30.650	88.92	600	92.37	92.15	100.6	0.219	0.283	0.150	1.02	287.1	0.31	198.2
	29	30		0	92.70	6646	2.70	58.21		0.18		0.00		0.00	0.1	0.000	92.880	30.650	88.92	600	92.13	91.91	94.3	0.233	0.283	0.150	1.05	296.6	0.30	207.7
30	30	31	1.85	128	94.55	6773	2.70	59.19		0.18		0.00		0.00	0.1	1.850	94.730	31.261	90.51	600	91.8	91.69	51.3	0.214	0.283	0.150	1.01	284.3	0.32	193.8
	31	32		0	94.55	6773	2.70	59.19		0.18		0.00		0.00	0.1	0.000	94.730	31.261	90.51	600	91.67	91.56	40.1	0.274	0.283	0.150	1.14	321.6	0.28	231.1
Weslock Way																														
FUTURE4	101	102	9.93	787	9.93	787	3.29	8.40		0.00		0.00		0.00	0.0	9.930	9.930	3.277	11.67											
32	101	102	35.65	2460	45.58	3247	2.93	30.83		0.00		0.00		0.00	0.0	35.650	45.580	15.041	45.88	375	95.7	95.59	40.3	0.273	0.110	0.094	0.83	91.6	0.50	45.7
	102	103		0	45.58	3247	2.93	30.83		0.00		0.00		0.00	0.0	0.000	45.580	15.041	45.88	375	95.57	95.27	110.5	0.271	0.110	0.094	0.83	91.4	0.50	45.5
	103	104		0	45.58	3247	2.93	30.83		0.00		0.00		0.00	0.0	0.000	45.580	15.041	45.88	375	95.22	95.14	31.5	0.254	0.110	0.094	0.80	88.4	0.52	42.5
	104	105		0	45.58	3247	2.93	30.83		0.00		0.00		0.00	0.0	0.000	45.580	15.041	45.88	375	95.12	95.04	33.7	0.237	0.110	0.094	0.77	85.4	0.54	39.5
32A	105	106	12.60	869	58.18	4116	2.86	38.12		0.00		0.00		0.00	0.0	12.600	58.180	19.199	57.32	375	94.98	94.87	19.7	0.558	0.110	0.094	1.19	131.0	0.44	73.7
	106	107		0	58.18	4116	2.86	38.12		0.00		0.00		0.00	0.0	0.000	58.180	19.199	57.32	375	94.86	94.82	17.4	0.230	0.110	0.094	0.76	84.1	0.68	26.7
	107	108		0	58.18	4116	2.86	38.12		0.00		0.00		0.00	0.0	0.000	58.180	19.199	57.32	375	94.77	94.6	67.5	0.252	0.110	0.094	0.80	88.0	0.65	30.7
32B	108	109	9.12	629	67.30	4746	2.81	43.26		0.00		0.00		0.00	0.0	9.120	67.300	22.209	65.47	375	94.59	94.38	72.0	0.292	0.110	0.094	0.86	94.7	0.69	29.2
	109	110		0	67.30	4746	2.81	43.26		0.00		0.00		0.00	0.0	0.000	67.300	22.209	65.47	375	94.38	94.22	57.0	0.281	0.110	0.094	0.84	92.9	0.70	27.4
	110	111		0	67.30	4746	2.81	43.26		0.00		0.00		0.00	0.0	0.000	67.300	22.209	65.47	375	94.18	93.94	57.0	0.421	0.110	0.094	1.03	113.8	0.58	48.3
	111	112		0	67.30	4746	2.81	43.26		0.00		0.00		0.00	0.0	0.000	67.300	22.209	65.47	375	93.9	93.77	43.0	0.302	0.110	0.094	0.87	96.4	0.68	30.9

SANITARY SEWER CALCULATION SHEET - PROPOSED CONDITIONS

PROJECT: **Kanata Golf and Country Club**
LOCATION: **7000 Campeau Drive**
FILE REF: **18-1061**
DATE: **7-Aug-19**

DESIGN PARAMETERS

Avg. Daily Flow Res.	280 L/p/d	Peak Fact Res. Per Harmons: Min = 2.0, Max =3.8		Infiltration / Inflow	0.33 L/s/ha
Avg. Daily Flow Comm.	28,000 L/ha/d	Harmon Correction Factor	0.8	Min. Pipe Velocity	0.60 m/s full flowing
Avg. Daily Flow Instit.	28,000 L/ha/d	Peak Fact. Comm.	1 (< 20% ICI)	Max. Pipe Velocity	3.00 m/s full flowing
Avg. Daily Flow Indust.	35,000 L/ha/d	Peak Fact. Instit.	1 (< 20% ICI)	Mannings N	0.013
Ex Population Per Hectare	69 Pop/Ha	Peak Fact. Indust. per MOE graph			

*Based on an average from Areas 2, 12 and 10.

Location			Residential Area and Population						Commercial		Institutional		Industrial		Infiltration				Pipe Data										
Area ID	Up	Down	Area	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	Upstream Invert	Downstream Invert	Length	Slope	$A_{hydraulic}$	R	Velocity	Q_{cap}	Q / Q full	Qresidual
			(ha)		(ha)		(-)	(L/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(ha)	(ha)	(L/s)	(L/s)	(mm)	(m)	(m)	(m)	(%)	(m^2)	(m)	(m/s)	(L/s)	(-)	(L/s)
	112	113		0	67.30	4746	2.81	43.26		0.00		0.00		0.00	0.0	0.000	67.300	22.209	65.47	375	93.76	93.63	42.0	0.310	0.110	0.094	0.88	97.5	0.67	32.1
	113	32		0	67.30	4746	2.81	43.26		0.00		0.00		0.00	0.0	0.000	67.300	22.209	65.47	375	93.63	93.4	43.0	0.535	0.110	0.094	1.16	128.2	0.51	62.8
Walden Drive																														
32	32	33		0	161.85	11519	2.51	93.88		0.18		0.00		0.00	0.1	0.000	162.030	53.470	147.40	600	91.496	91.374	52.0	0.235	0.283	0.150	1.05	297.4	0.50	150.0
FUTURE5	33	34	9.54	756	171.39	12275	2.49	99.16		0.18		0.00		0.00	0.1	9.540	171.570	56.618	155.83											
	34	35		0	171.39	12275	2.49	99.16		0.18		0.00		0.00	0.1	0.000	171.570	56.618	155.83	600	91.243	91.162	41.9	0.193	0.283	0.150	0.95	270.0	0.58	114.1
	35	36		0	171.39	12275	2.49	99.16		0.18		0.00		0.00	0.1	0.000	171.570	56.618	155.83	600	91.084	90.91	65.2	0.267	0.283	0.150	1.12	317.2	0.49	161.4
FUTURE6	36	37	9.70	769	181.09	13044	2.47	104.47		0.18		0.00		0.00	0.1	9.700	181.270	59.819	164.35											
37	37	38	3.52	243	184.61	13287	2.46	106.14		0.18		0.00		0.00	0.1	3.520	184.790	60.981	167.18	600	90.792	90.613	45.6	0.393	0.283	0.150	1.36	384.7	0.43	217.5
	38	39		0	184.61	13287	2.46	106.14		0.18		0.00		0.00	0.1	0.000	184.790	60.981	167.18	600	90.61	90.509	38.0	0.266	0.283	0.150	1.12	316.6	0.53	149.4
39	39	40	5.02	346	189.63	13633	2.46	108.51		0.18		0.00		0.00	0.1	5.020	189.810	62.637	171.21	600	90.509	90.278	89.3	0.259	0.283	0.150	1.10	312.3	0.55	141.1
FUTURE7	40	41	6.29	499	195.92	14132	2.44	111.91		0.18		0.00		0.00	0.1	6.290	196.100	64.713	176.68											
	41	42		0	195.92	14132	2.44	111.91		0.18		0.00		0.00	0.1	0.000	196.100	64.713	176.68	600	90.14	90.02	78.7	0.152	0.283	0.150	0.85	239.8	0.74	63.1
	42	43		0	195.92	14132	2.44	111.91		0.18		0.00		0.00	0.1	0.000	196.100	64.713	176.68	600	90	89.8	79.9	0.250	0.283	0.150	1.09	307.2	0.58	130.5
Walden Drive																														
43	43	44	10.63	733	206.55	14866	2.43	116.86		0.18		0.00		0.00	0.1	10.630	206.730	68.221	185.14	600	89.76	89.6	55.3	0.289	0.283	0.150	1.17	330.3	0.56	145.1
	44	45		0	206.55	14866	2.43	116.86		0.18		0.00		0.00	0.1	0.000	206.730	68.221	185.14	600	89.59	89.48	46.3	0.238	0.283	0.150	1.06	299.4	0.62	114.3
	45	46		0	206.55	14866	2.43	116.86		0.18		0.00		0.00	0.1	0.000	206.730	68.221	185.14	600	89.48	89.141	129.4	0.262	0.283	0.150	1.11	314.3	0.59	129.1
46	46	47	95.04	6558	301.59	21423	2.30	159.55		0.18	0.81	0.81		0.00	0.3	95.850	302.580	99.851	259.72	675	86.294	86.019	84.0	0.327	0.358	0.169	1.34	481.0	0.54	221.2
Kimmins Court																														
	47	48		0	301.59	14866	2.43	116.86		0.18		0.81		0.00	0.3	0.000	302.580	99.851	217.03	675	85.903	85.788	50.8	0.226	0.358	0.169	1.12	399.9	0.54	182.8
48	48	49	2.93	202	304.52	15068	2.42	118.22		0.18		0.81		0.00	0.3	2.930	305.510	100.818	219.36	675	85.788	85.678	31.4	0.351	0.358	0.169	1.39	497.9	0.44	278.6
	49	50		0	304.52	15068	2.42	118.22		0.18		0.81		0.00	0.3	0.000	305.510	100.818	219.36	675	85.678	85.603	26.2	0.286	0.358	0.169	1.26	449.7	0.49	230.4
	50	51		0	304.52	15068	2.42	118.22		0.18		0.81		0.00	0.3	0.000	305.510	100.818	219.36	675	85.603	85.345	93.2	0.277	0.358	0.169	1.24	442.2	0.50	222.9
	51	52		0	304.52	15068	2.42	118.22		0.18		0.81		0.00	0.3	0.000	305.510	100.818	219.36	675	85.315	85.201	40.7	0.280	0.358	0.169	1.24	444.9	0.49	225.5
	52	53		0	304.52	15068	2.42	118.22		0.18		0.81		0.00	0.3	0.000	305.510	100.818	219.36	675	85.168	85.041	65.8	0.193	0.358	0.169	1.03	369.4	0.59	150.0
	53	54		0	304.52	15068	2.42	118.22		0.18		0.81		0.00	0.3	0.000	305.510	100.818	219.36	675	85.01	84.875	54.5	0.248	0.358	0.169	1.17	418.4	0.52	199.0
	54	55		0	304.52	15068	2.42	118.22		0.18		0.81		0.00	0.3	0.000	305.510	100.818	219.36	675	81.286	80.992	47.3	0.622	0.358	0.169	1.85	662.7	0.33	443.4
Station Road																														
Future Development	55	56	180.03	10805	484.55	25873	2.23	187.20		0.18		0.81		0.00	0.3	180.030	485.540	160.228	347.75	750	81.286	80.992	96.4	0.305	0.442	0.188	1.39	614.8	0.57	267.1
	56	57		0	484.55	25873	2.23	187.20		0.18		0.81		0.00	0.3	0.000	485.540	160.228	347.75	750	80.971	80.673	111.1	0.268	0.442	0.188	1.31	576.6	0.60	228.8
	57	57A		0	484.55	25873	2.23	187.20		0.18		0.81		0.00	0.3	0.000	485.540	160.228	347.75	750	80.673	80.096	54.1	1.067	0.442	0.188	2.60	1149.7	0.30	802.0
	57A	58		0	484.55	25873	2.23	187.20		0.18		0.81		0.00	0.3	0.000	485.540	160.228	347.75	750	78.316	78.038	56.5	0.492	0.442	0.188	1.77	780.9	0.45	433.2
58	58	59	11.65	0	496.20	25873	2.23	187.20	2.86	3.04		0.81		0.00	1.2	14.510	500.050	165.017	353.46	750	76.138	75.961	63.4	0.279	0.442	0.188	1.33	588.2	0.60	234.8
	59	60		0	496.20	25873	2.23	187.20		3.04		0.81		0.00	1.2	0.000	500.050	165.017	353.46	750	76.138	75.666	95.1	0.496	0.442	0.188	1.78	784.3	0.45	430.8
60	60	61	24.02	0	520.22	25873	2.23	187.20	4.05	7.09		0.81		0.00	2.6	28.070	528.120	174.280	364.04	750	75.659	75.413	43.1	0.571	0.442	0.188	1.90	841.1	0.43	477.0
	61	62		0	520.22	25873	2.23	187.20		7.09		0.81		0.00	2.6	0.000	528.120	174.280	364.04	750	75.36	75.062	96.8	0.308	0.442	0.188	1.40	617.7	0.59	253.7
62	62	63	2.08	0	522.30	25873	2.23	187.20	1.20	8.29		0.81		0.00	2.9	3.280	531.400	175.362	365.51	750	74.999	74.779	79.8	0.276	0.442	0.188	1.32	584.5	0.63	219.0
	63	64		0	522.30	25873	2.23	187.20		8.29		0.81		0.00	2.9	0.000	531.400	175.362	365.51	750	74.748	74.581	54.3	0.308	0.442	0.188	1.40	617.4	0.59	251.9
	64	65		0	522.30	25873	2.23	187.20		8.29		0.81		0.00	2.9	0.000	531.400	175.362	365.51	750	74.562	74.413	47.1	0.316	0.442	0.188	1.42	626.2	0.58	260.7
	65	66	0.32	22	522.62	25895	2.23	187.33	0.22	8.51		0.81		0.00	3.0	0.540	531.940	175.540	365.89	750	74.368	74.128	76.8	0.312	0.442	0.188	1.41	622.3	0.59	256.4
	66	67		0	522.62	25895	2.23	187.33		8.51		0.81		0.00	3.0	0.000	531.940	175.540	365.89	750	74.121	73.824	81.2	0.366	0.442	0.188	1.52	673.3	0.54	307.4
	67	68		0	522.62	25895	2.23	187.33		8.51		0.81		0.00	3.0	0.000	531.940	175.540	365.89	750	73.787	73.727	17.2	0.349	0.442	0.188	1.49	657.5	0.56	291.6
	68	69		0	522.62	25895	2.23	187.33		8.51		0.81		0.00	3.0	0.000	531.940	175.540	365.89	750	73.7	73.466	81.8	0.286	0.442	0.188	1.35	595.4	0.61	229.5

Population of 10,805.8 and area of 180.03 ha obtained from Kanata Lakes North Serviceability Study, Appendix A-Sanitary Sewer Design. By CCL, dated June 06.

NORTH KANATA
TRUNK SEWER - PHASE 2

CIVIL
OVERALL SITE PLAN

CARINA DUCLOS, P.Eng
MANAGER, DESIGN & CONSTRUCTION BRANCH 2

Justin Kurosky, P.Eng
Project Manager

ch2m:

Ottawa

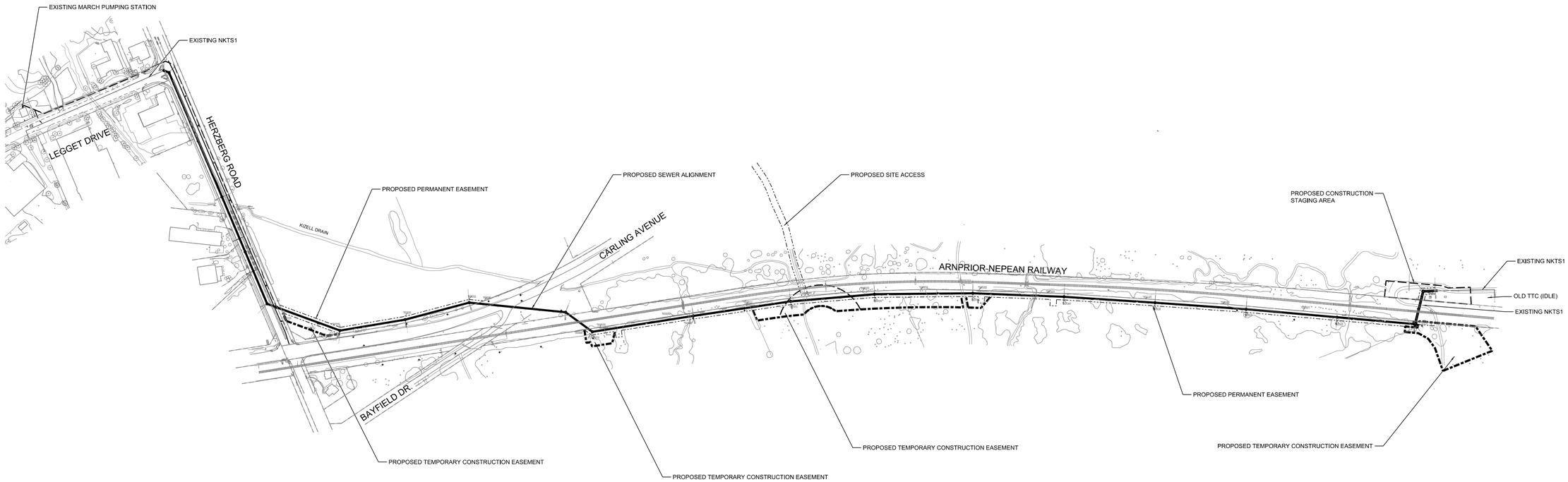
Contract No. ISD12-2011	Dwg. No. C-003
Sheet 4 of 39	
Asset No. --------	
Asset Group ISD	
Des. M.H.	Chk'd. P.P.
Dwn. D.L.	Chk'd. P.P.
Utility Circ. No. ------	Index No. ------
Const. Inspector ----------	
Scale: 1:2000 HORIZONTAL 0m 25 50 100	

NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

REVISIONS

No.	Description	By	Date (yyyy/mm/dd)
1	ISSUED FOR APPROVALS	M.H.	2017/06/23
2	ISSUED FOR UTILITY CIRCULATION	M.H.	2017/06/28

NOT FOR CONSTRUCTION



FILENAME:ISD12-2011-001-OSP.dgn PLOT DATE: 2017\08\16 PLOT TIME: 8:42:03 AM

Utility Circ

462754

SIGNATURE RIDGE TRUNK SEWER

① PLAN & PROFILE DWG. NO.

---FORCE MAIN

——GRAVITY SEWER

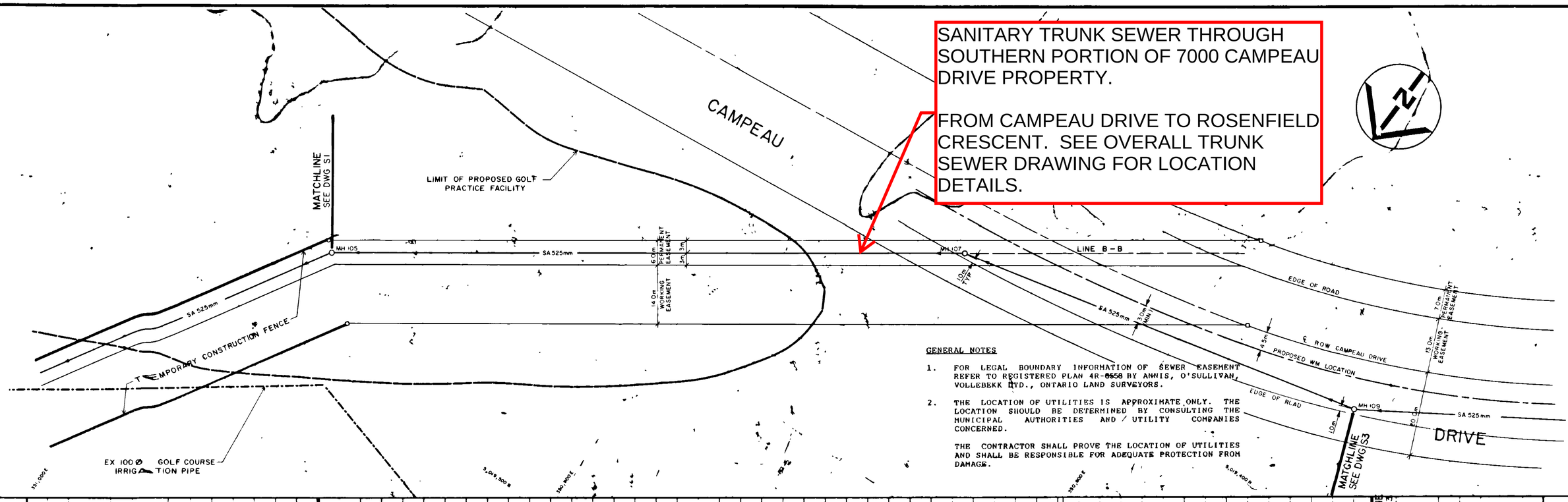
TRUNK SEWER LOCATION THROUGH SOUTHERN PORTION OF 7000 CAMPEAU DRIVE PROPERTY.
SEE PROFILE DRAWINGS IN APPENDIX B.

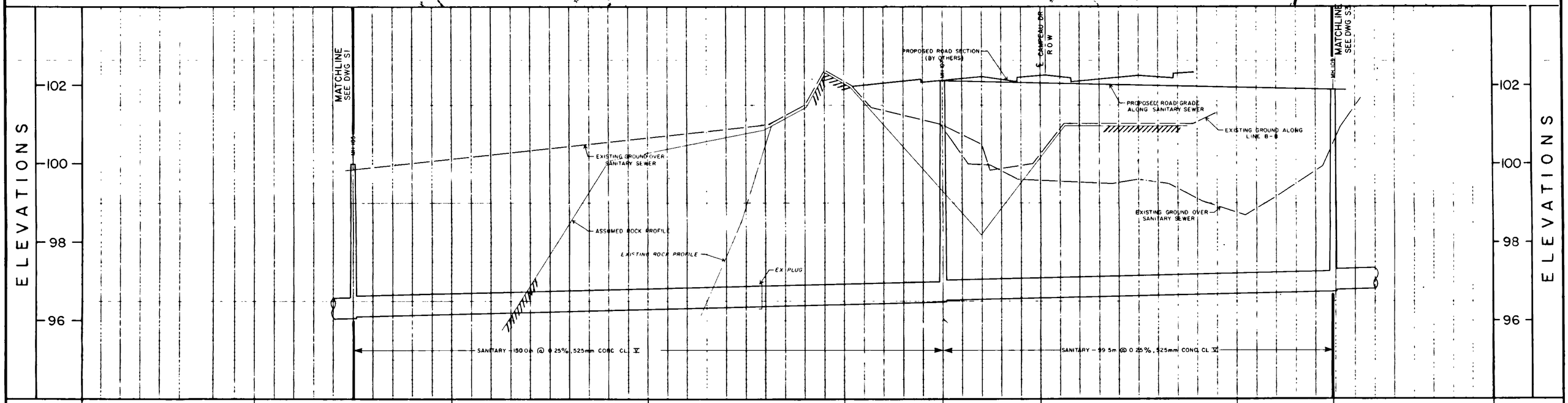
S-2414

6855

SANITARY TRUNK SEWER THROUGH SOUTHERN PORTION OF 7000 CAMPEAU DRIVE PROPERTY.

FROM CAMPEAU DRIVE TO ROSENFIELD CRESCENT. SEE OVERALL TRUNK SEWER DRAWING FOR LOCATION DETAILS.





CENTRE LINE ROAD ELEVATION												CENTRE LINE ROAD ELEVATION
WATERMAIN TOP ELEVATION												WATERMAIN TOP ELEVATION
STORM INVERT												STORM INVERT
SANITARY INVERT		96.09 96.07 96.10 96.11				EX PLUG 96.33		96.48 96.51			96.76 96.79	SANITARY INVERT
CENTRE LINE SEWER CHAINAGE	0+250	0+275	0+300	0+350		0+379	0+400	0+425	0+450	0+500	0+524.5	CENTRE LINE SEWER CHAINAGE

GENERAL NOTES

1. FOR LEGAL BOUNDARY INFORMATION OF SEWER EASEMENT REFER TO REGISTERED PLAN 4R-6658 BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD., ONTARIO LAND SURVEYORS.
2. THE LOCATION OF UTILITIES IS APPROXIMATE ONLY. THE LOCATION SHOULD BE DETERMINED BY CONSULTING THE MUNICIPAL AUTHORITIES AND / UTILITY COMPANIES CONCERNED.

   THE CONTRACTOR SHALL PROVE THE LOCATION OF UTILITIES AND SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION FROM DAMAGE.

No	DATE	REVISIONS	BY
2	1/09/89	REV LOCATION MH 107 TO 115	RG
1	9/02/89	ADDED TEMPORARY CONSTRUCTION FENCE & IRRIGATION PIPE	RG
0	11/01/89	ISSUED FOR APPROVAL	RG

No	DATE	REVISIONS	BY

SCALES
HORIZONTAL 1:500
VERTICAL 1:50

UMA Engineering Ltd
Engineers & Planners

CAMPEAU CORPORATION

KANATA LAKES
TRUNK SANITARY SEWER
CONNECTION TO
ASHFORD MARTIN LANDS

DESIGN LME
CHECKED
DRAWN RGV
CHECKED
APPROVED BNC

S-2414-6

CITY OF KANATA
DEPARTMENT OF ENGINEERING AND PUBLIC WORKS

SANITARY SEWER EASEMENT

STA 0+275 TO STA 0+524.5

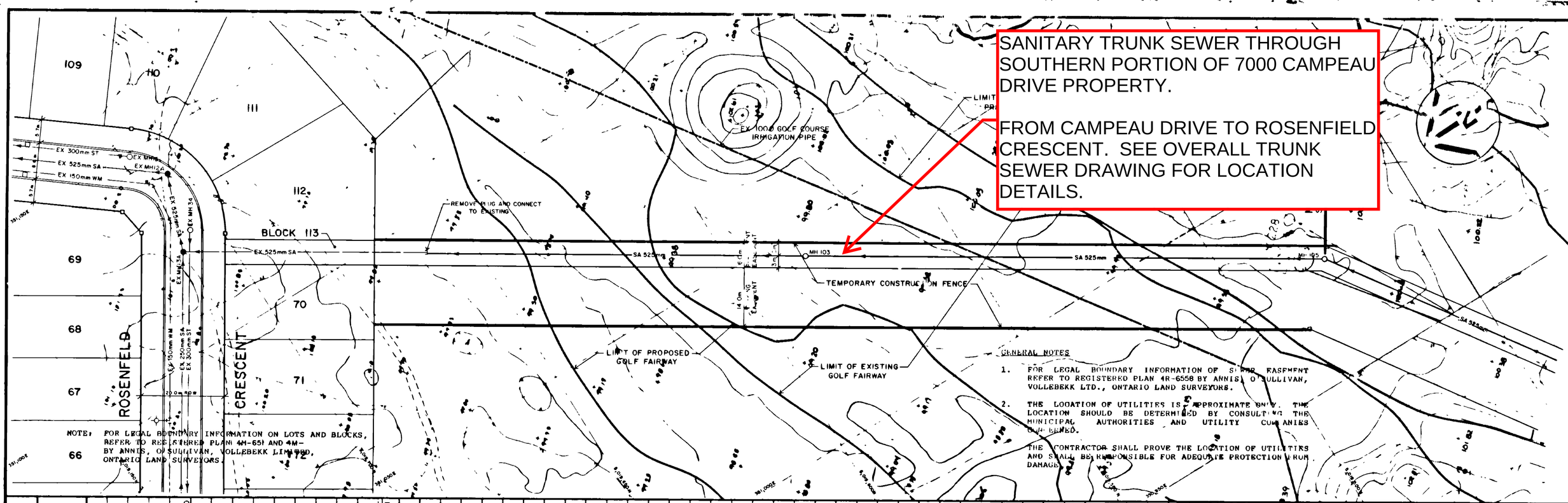
6

PROJ. No 4994-012
CONT No
DATED DECEMBER 1989
DWG No S2

685

SANITARY TRUNK SEWER THROUGH SOUTHERN PORTION OF 7000 CAMPEAU DRIVE PROPERTY.

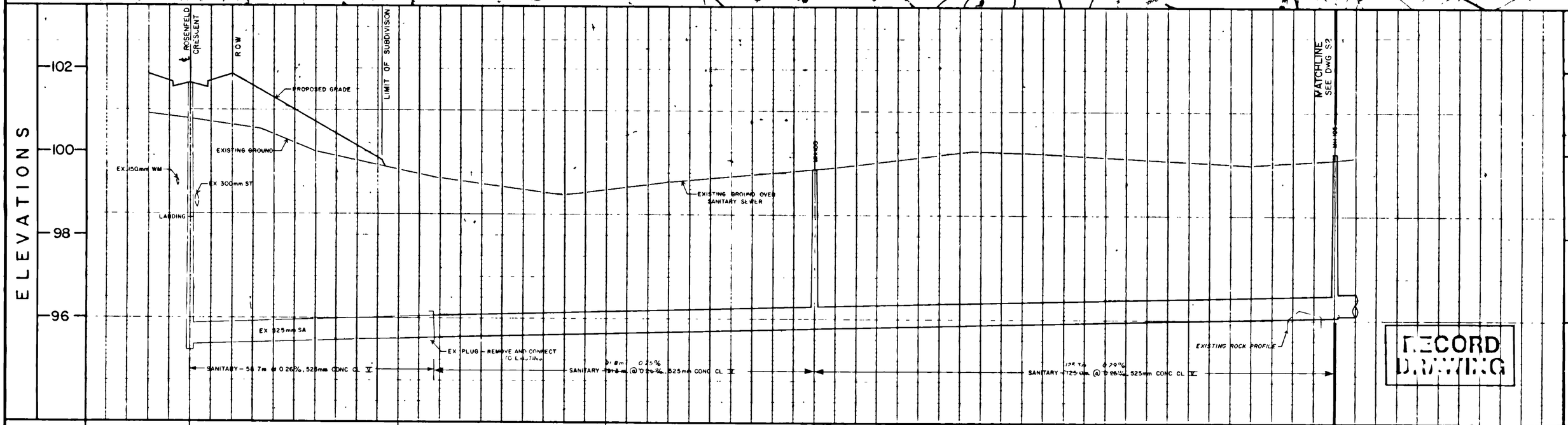
FROM CAMPEAU DRIVE TO ROSENFIELD CRESCENT. SEE OVERALL TRUNK SEWER DRAWING FOR LOCATION DETAILS.



GENERAL NOTES

1. FOR LEGAL BOUNDARY INFORMATION OF SEWER EASEMENT REFER TO REGISTERED PLAN 4R-6558 BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD., ONTARIO LAND SURVEYORS.
2. THE LOCATION OF UTILITIES IS APPROXIMATE ONLY. THE LOCATION SHOULD BE DETERMINED BY CONSULTING THE MUNICIPAL AUTHORITIES AND UTILITY COMPANIES CONCERNED.

THE CONTRACTOR SHALL PROVE THE LOCATION OF UTILITIES AND SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION FROM DAMAGE.



CENTRE LINE ROAD ELEVATION			101.66	101.53	101.86																			CENTRE LINE ROAD ELEVATION
WATERMAIN TOP ELEVATION																								WATERMAIN TOP ELEVATION
STORM INVERT																								STORM INVERT
SANITARY INVERT			95.29 F	95.37	96.91 W				95.50				95.73	95.76					96.09	96.12	96.14	96.11		SANITARY INVERT
CENTRE LINE SEWER CHAINAGE			0+000	0+004.3	0+010			0+046	0+050			0+100	0+150			0+200			0+250	0+275		0+300		CENTRE LINE SEWER CHAINAGE

No	DATE	REVISIONS	BY
3	5/04/89	RECORD DRAWING	RGV
2	4/03/89	ELIMINATED MH 101 AND MOVED MH 103	RGV
1	9/02/89	ADDED TEMPORARY CONSTRUCTION FENCE & IRRIGATION PIPE	RGV
0	11/01/89	ISSUED FOR APPROVAL	RGV

SCALES
HORIZONTAL 1:500
VERTICAL 1:50

UMA Engineering Ltd
Engineers & Planners
Ottawa, Ontario

CAMPEAU CORPORATION

KANATA LAKES
TRUNK SANITARY SEWER
CONNECTION TO
ASELFORD MARTIN LANDS

DESIGN LME
CHECKED
DRAWN RGV
CHECKED
APPROVED BNC

S-2414-7

CITY OF KANATA
DEPARTMENT OF ENGINEERING AND PUBLIC WORKS

SANITARY SEWER EASEMENT

STA. 0+000 TO STA. 0+275

1

PROJ No 4994-012
CONT No
DATE DECEMBER 1988
DWG No S1

6858

6.0 WASTEWATER SERVICING

6.1 Introduction

As indicated previously, the subject development is within the City of Ottawa West Urban Community (former City of Kanata). This area is serviced by local gravity sewers and pump stations that discharge to a regional trunk system that carries flows to the Robert O. Pickard Environmental Centre for treatment of wastewater.

There are several trunk sanitary sewers and pump stations servicing the West Urban Community including the East March Trunk, Marchwood Trunk, Kanata Lakes Trunk, North Kanata Trunk, March Pump Station, and the Briar Ridge Pump Station. These all drain into the Watt's Creek Relief Sewer that provides service to the entire West Urban Community and flows into the Acres Road Pump Station. An Existing Wastewater Collection System Schematic (Figure 2) from the 2013 Infrastructure Master Plan is included in **Appendix C-1** for reference.

The outlet for the Kanata North Urban Expansion Area is the existing March Pump Station. The City has indicated that the inlet to the March Pump Station is a reasonable limit for wastewater analysis.

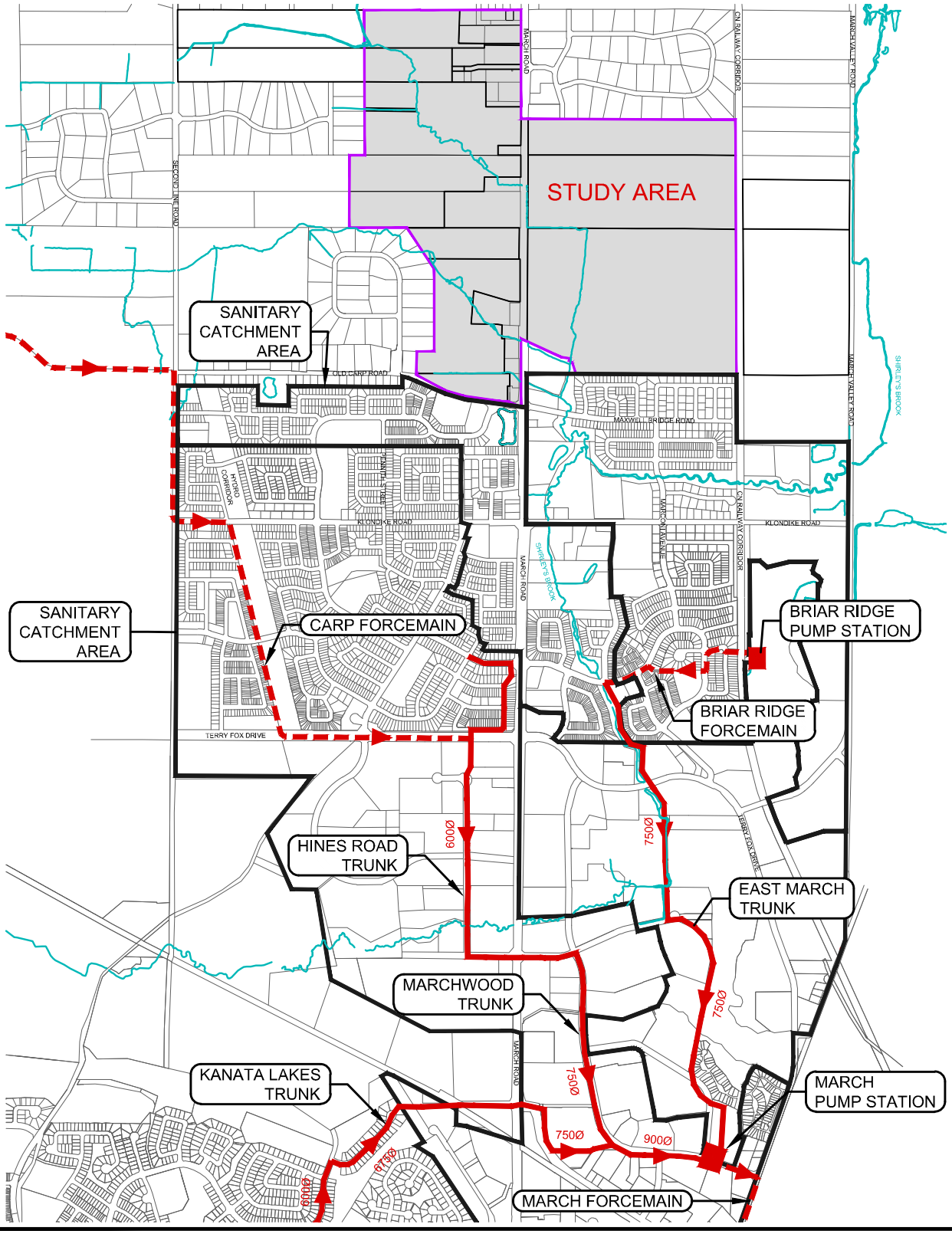
Based on the proposed land use, a probable wastewater flow was calculated to be 182.2L/s. Further details on the calculations of this flow rate are discussed in Section 6.6.1.2.

6.2 Existing Wastewater Infrastructure

There are three trunk sewers that drain to the March Pump Station. These are the East March Trunk, Marchwood Trunk and the Kanata Lakes Trunk. These trunk sewers and their drainage boundaries are shown on **Figure 6.2.** The East March Trunk and Marchwood Trunk sewers are the two most viable options to service development of the KNUEA. The Kanata Lakes Trunk Sewer is located farther from the development area and is not a viable option for servicing the Kanata North Urban Expansion Area.

The following is a brief description of each trunk sewer along with capacity and probable flow rates. The flow generation and wastewater modelling, completed in 2013 on behalf of the City, is provided in the *2013 Infrastructure Master Plan Wastewater Collection System Assessment* (2013 IMP) prepared by Stantec, dated Sept 2013. This document provides the most current sanitary analysis of the entire City and establishes a basis upon which the KNUEA can be evaluated. Where information was not available in the 2013 IMP, namely for trunk sewers, information was obtained from the *West Urban Community – Wastewater Collection System Master Servicing Plan Study* (2012 WUC, RVA, July 2012).

The data obtained from the above noted Master Plans provides flow data for existing flows monitored as of 2010, and projected flows for 2031. The projected flow data in the 2031 IMP has accounted for the full development/buildout of the KNUEA. Therefore during the analysis of KNUEA on existing infrastructure, design KNUEA flows have only been added where 2013 IMP data was not available.



KANATA NORTH
COMMUNITY DESIGN PLAN

NOVATECH
Engineers, Planners & Landscape Architects

FIGURE NO. 6.2
NORTH KANATA WASTEWATER TRUNK INFRASTRUCTURE

DATE
FEB 2016

JOB
112117

SCALE
N.T.S.

M:\2012\112117\CADDesign_MSS\FIGURES\FIGURE 7.1 - WASTEWATER COLLECTION INFRASTRUCTURE.dwg, WW COLL, Feb 23, 2016 - 1:40pm, lseely

SHT8x11.DWG - 216mmx279mm

The **East March Trunk** (EMT) is a 750mm diameter pipe that extends north from the March Pump Station through the Kanata Research Park to Shirleyôs Brook Drive, with the upper reach generally follows the creek corridor. The pipe has a free-flow capacity of 550 L/s and an obvert elevation of 72.1m at Shirleyôs Brook Drive. Flow generation and modelling for the City indicates peak flow rates in the EMT of 96 L/s in 2010, and projects a flow of 255 L/s in 2031. Therefore, the EMT is currently flowing at approximately 17% of the free-flow capacity, and will reach 46% at build-out. These values account for the full buildout of the KNUEA.

The **Marchwood Trunk** (MWT) is 750mm to 900mm in diameter, and generally follows Legget Drive. Flow from the Kanata Lakes Trunk combines with the Marchwood Trunk, west of Schneider Road, in a 900mm diameter sewer which conveys all flows to the March Pump Station. Upstream, the MWT decreases in size to a 750mm pipe south of Farrar Road; the trunk continues north on Legget Drive, turning west at Solandt Drive and generally services land on the west side of March Road. The upper reach of the MWT is located at the intersection of Solandt Drive and Hines Road with an obvert elevation of 77.3m. The lower-reach of the MWT has a free-flow capacity of 1,100 L/s. Flow generation by the City has an estimated peak flow of 230 L/s in 2010, and 592 L/s in 2031. This puts the free-flow capacity at approximately 21% (2010) and 54% (2031), including full development of the KNUEA.

The **Hines Road Trunk** (HRT) is essentially a northward continuation of the Marchwood Trunk. The HRT is a 600mm gravity pipe that services lands in North Kanata, and conveys flow from the Carp Forcemain to the Marchwood Trunk and March Pump Station. The upper reach of the HRT is located at the intersection of Morganôs Grant Way and March Road with an obvert elevation of 79.7m. The upper-reach of the MWT has a free-flow capacity of 205 L/s, based on as-built information. The free flow capacity of the HRT is unknown.

The **March Pump Station** (MPS) is located at the downstream end of these trunk sewers with a firm capacity of 490 L/s. City modelling has peak flows of 326 L/s (2010) and 771 L/s (2031). This represents 67% and 157% of the firm capacity. Pumps currently discharge through the March Forcemain, routing flow south along Herzberg Road to the March Road Trunk. There are significant planned changes that will affect how this facility operates, and the reader is directed to the next section on planned infrastructure for details.

The **Briar Ridge Pump Station** (BRPS) is located south of Klondike Road and east of the railway corridor. This facility discharges into the East March Trunk and has a firm design capacity of 183 L/s with three pumps installed. Due to low initial flows, only two of the three pumps are currently installed; as such the station has a temporary firm capacity of 53 L/s. Flow monitoring by City staff will determine when the third pump is required.

Capacities of the various systems are summarized in in **Table 6.2**. This information is taken from the 2013 IMP, 2012 WUC, and supplementary 2013 IMP data provided by the City. Relevant excerpts and supplementary information are included in **Appendix C-2** for reference.

Table 6.2: Existing Capacity and 2031 Wastewater Flow

Infrastructure	Obvert Elevation	Flow	Ex. Capacity	Design Flow	Q/Q_{full} Capacity (%)	Available Flow
		2010 (L/s)	**(L/s)**	**2031 (L/s)**	**2031**	**2031 (L/s)**
March Pump Station	-	**371(2008)**	**416 (IMP)** **586 (upgrade)***	**256**	**44%**	**330**
Briar Ridge Pump Station	61.15	21**	53 (Ex) 183 (Ult) **175 (IMP)**	**124**	**71%**	**51**
East March Trunk	72.1	*96*	*550 (WUC)* *259 (Asbuilt)****	**255**	98%	5***
MarchWood Trunk	77.3	*230*	*1,100*	**592**	54%	508
Hines Road Trunk	79.7		205	**135**	66%	70

Note values in bold are from the 2013 IMP (and supplementary data), italics are from the 2012 WUC report.

*March Pump Station is scheduled to be upgraded to an ultimate firm capacity of +/-586L/s per March PS Class EA report.

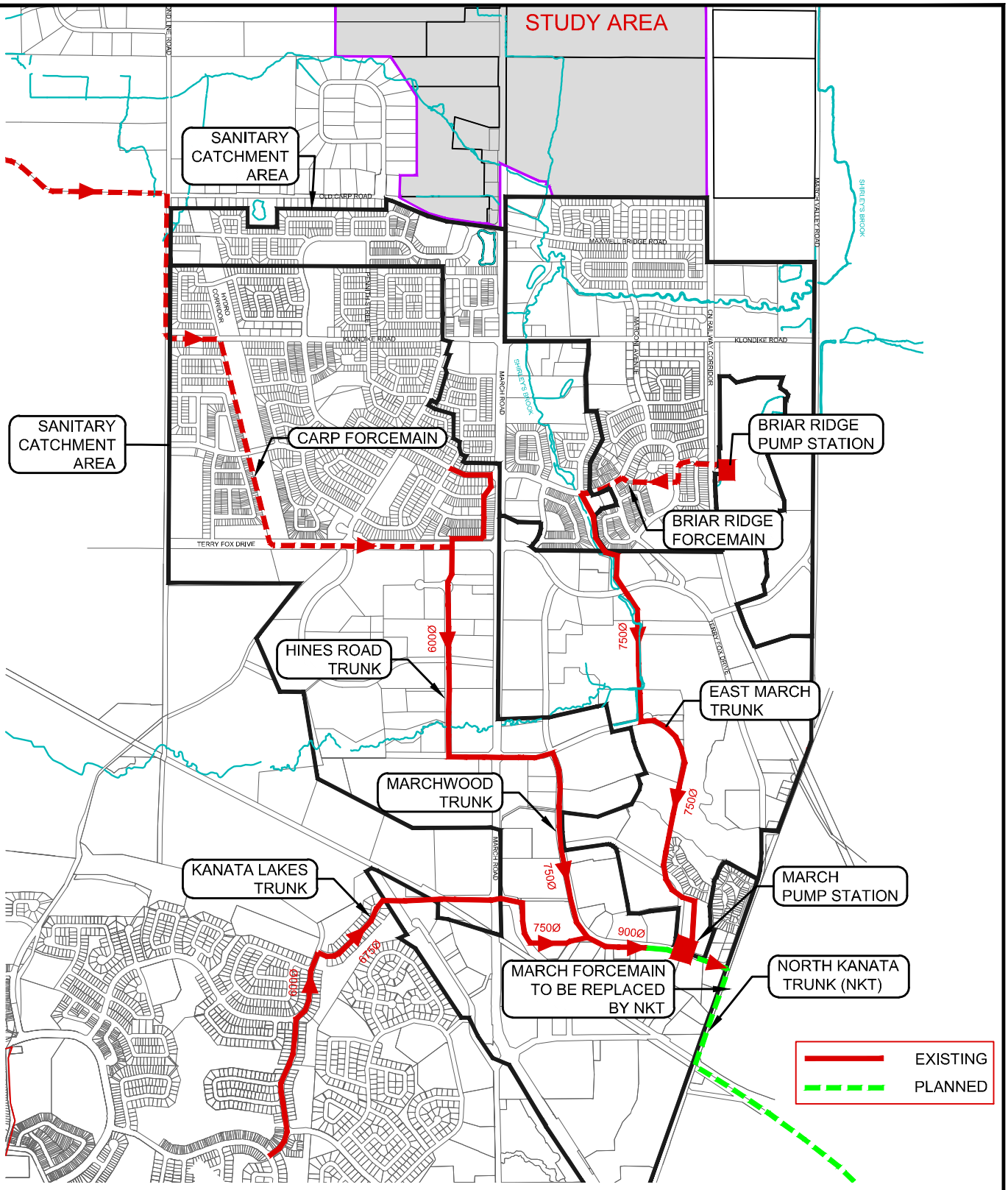
** Based on monitored SCADA data provided by the City included in **Appendix C**.

*** Available Flow based on Novatech analysis of as-built capacity of the existing EMT. Supporting calculations are included in Table C-6e: Sanitary Sewer Capacity Analysis ï East March Trunk, included in **Appendix C**.

6.3 Planned Wastewater Infrastructure

There are two major planned wastewater infrastructure works planned as noted in the Cityôs 2013 Infrastructure Master Plan which will have an impact on the future servicing of the proposed development. The planned wastewater infrastructure works are shown on **Figure 6.3**.

Phase 2 of the **North Kanata Trunk** (NKT) will extend a 1200mm pipe with a design capacity of 1,290 L/s from the March Pump Station (MPS) to the temporary cap where Phase 1 construction ended. A gravity connection will be made from the Marchwood Trunk to the NKT, allowing wastewater to bypass the MPS. This measure will significantly reduce flow to the station, thereby increasing residual capacity at the MPS. Construction of the NKT is expected to be complete by 2018 as per the 2013 IMP.



KANATA NORTH
COMMUNITY DESIGN PLAN

NOVATECH
Engineers, Planners & Landscape Architects

FIGURE NO. 6.3

NORTH KANATA PLANNED WASTEWATER TRUNK INFRASTRUCTURE

DATE
FEB 2016

JOB
112117

SCALE
N.T.S.

M:\2012\112117\CADDesign_MSS\FIGURES\FIGURE 7.3 - PLANNED WASTEWATER INFRASTRUCTURE.dwg, PWW COLL, Feb 11, 2016 - 9:37am, lseely

SHT8x11.DWG - 216mmx279mm

The **March Pump Station** (MPS) will be converted to a low-lift facility that connects to the North Kanata Trunk. The March Forcemain will be decommissioned as part of these works. The 2013 IMP indicates that construction would occur sometime between 2013 and 2018. With diversion of the Marchwood Trunk, there will be no urgency to complete this project. The projected 2031 flow from the 2013 IMP in this configuration is 256 L/s, or 44% of the station firm capacity.

Supporting information on the Planned Wastewater Infrastructure work from the 2013 IMP is included in **Appendix C-1** for reference.

6.4 Viable Off-site Trunk Servicing Evaluation

As indicated previously, the Kanata Lakes Trunk Sewer is located farther from the development area and is not a viable option for servicing the proposed development. Therefore, the Hines Road, Marchwood and East March Trunk Sewers and the Briar Ridge Pump Station were evaluated to determine the preferred servicing option for the Kanata North Urban Expansion Area.

6.4.1 Trunk Sewers

There are two initial constraints to review when evaluating these trunk sewers which are elevation and capacity. The elevations were obtained from record drawings provided by the City and the capacities of each trunk sewer was obtained from the *WUC Master Servicing Plan by RVA*.

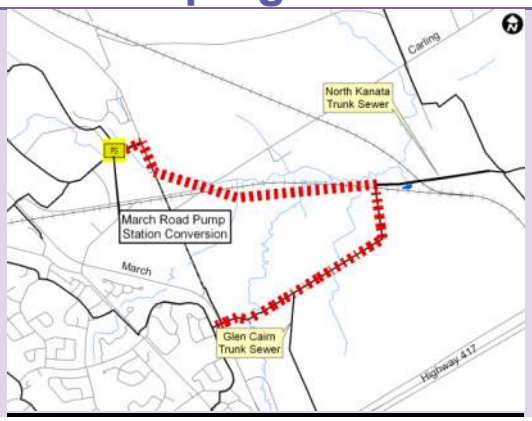
Elevation
Hines Road Trunk (by Morganôs Grant and March) = 79.7m
Marchwood Trunk (by Solandt and Hines) obvert = 77.3m
East March Trunk (by Shirleyôs Brook Dr.) obvert = 72.1m

Capacity
Hines Road Trunk = 205L/s (upper reach of MWT)
Marchwood Trunk = 1,100L/s, reaching 52% capacity by 2031 with a remaining capacity of 526 L/s.
East March Trunk = 550 L/s, reaching 31% capacity by 2031 with a remaining capacity is 378 L/s.

The capacities are based on the projected 2031 buildout of the existing drainage areas tributary to each trunk sewer and do not include the subject development. There are no indications that there are HGL issues in any of these trunk sewers, therefore HGL was not part of the initial evaluation.

Based on these two constraints the most viable option to provide a wastewater outlet for the subject lands is the East March Trunk Sewer. The connection point to the East March Trunk Sewer is proposed at the intersection of Shirleyôs Brook Drive and Sandhill Road just east of March Road. The East March Trunk Sewer and its catchment area are shown on **Figure 6.4.1**. There are two possible routes for a sewer to this connection point from the KNUEA. One is southward along March Road and along Shirleyôs Brook Drive. The second option is to service the development using the Briar Ridge Pump Station. A connection can be made to the existing sanitary sewer that runs along the Ottawa Central Railway corridor to the Briar Ridge Pump Station. The Briar Ridge Forcemain then connects to the East March

March Road Pumping Station Conversion



Scope and Justification

The March Pump Station was built in 1972. Currently the firm capacity of the station with one pump being out of services is rated at 490 L/s. The station pumps wastewater to the 600 mm dia. 1300 m long forcemain discharging to the March Road Trunk Sewer. A Class EA was completed in 2001 for the North Kanata Sanitary Sewage Infrastructure Upgrade Study. It recommended building the Kanata North Gravity Collector Sewer including gravity connection of the March Collector Sewer bypassing the March PS and conversion of the March PS to a low lift station.

The existing March PS can be retrofit to a low lift station or a new wet well can be added and existing structure to be used to house a valve chamber, stand-by power, controls, etc… or alternatively new PS can be built and existing structure be decommissioned and removed. Since the constructing new PS is an alternative option there is a requirement to conduct the Schedule B of the Class Environmental Assessment (EA) planning process. The Class EA for the station is currently under way.

Timing

2013 - 2018: Complete EA, detailed design and build the station.

Action Item Funding

Construction Cost Estimate = $3.4 M
Capital Cost Estimate* = $6.0 M (100% Development Charges, 0% Rate)
**Including construction cost, engineering, city internal costs and contingency allowance. Funding split subject to review as part of 2014 Development Charges By-Law.*

EA Requirements and Consultation

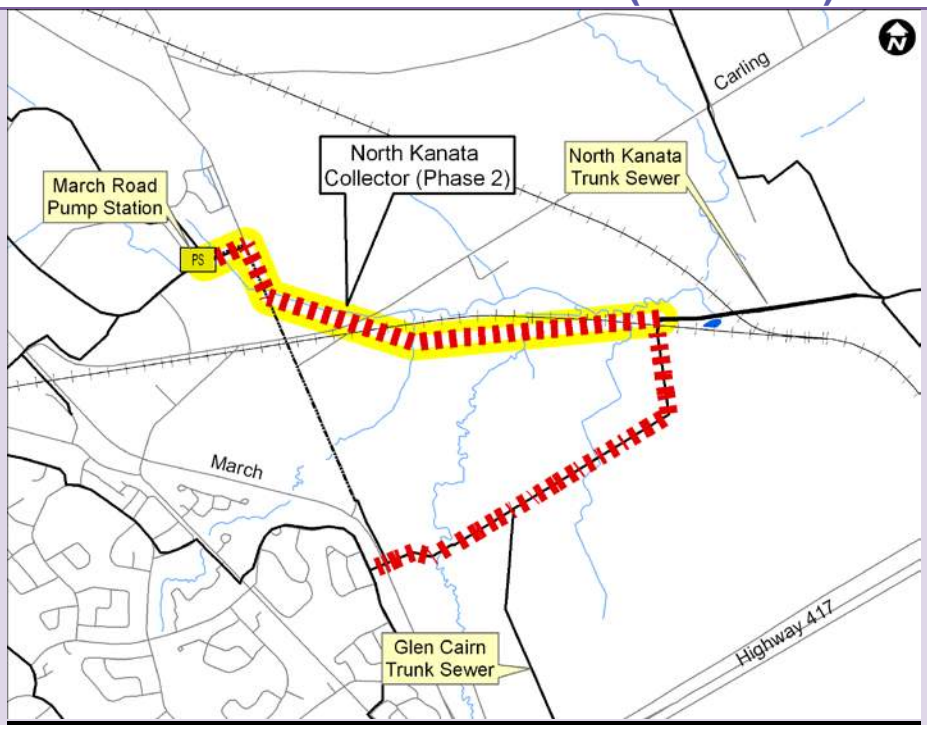
Class EA Schedule B project study is currently underway.

The EA recommendations will be presented to City Council for approval. Once approved by Council the 'Notice of Study Completion' will be posted for the 30 day review period.

Follow Up Actions

Coordinate with Kanata North Collector Sewer Phase 2 project.

North Kanata Collector (Phase 2)



Scope and Justification

Construct the North Kanata Phase 2 Sewer to provide capacity for the North Kanata growth area. This project was identified in the 1997 Wastewater Master Plan to provide infrastructure to convey the projected flows for the planning period. Follow up studies such as the Environmental Assessment (EA), Functional Design and Preliminary Design of sewers in the study area refined and confirmed the infrastructure, phasing, schedule and costing. The Phase 2 sewer will be 1200 mm dia. pipe and approximately 2100 m long.

Timing

2013-2018: Complete detailed design and construct the sewer.

Action Item Funding

Construction Cost Estimate = $5.5 M
Capital Cost Estimate* = $8.7 M (90% Development Charges, 10% Rate)
**Including construction cost, engineering, city internal costs and contingency allowance.*

EA Requirements and Consultation

Schedule B Class EA has been completed and the project is approved.

Follow Up Actions

Tender and Construction

Kevin Murphy

Subject: FW: 1061 7000 Campeau Drive - Pre consultation Follow-up

From: Candow, Julie
Sent: April 12, 2019 12:19 PM
To: 'Adam Fobert' <AFobert@dsel.ca>; Warnock, Charles <Charles.Warnock@ottawa.ca>; Moodie, Derrick <Derrick.Moodie@ottawa.ca>
Cc: Susan Murphy <SMurphy@minto.com>; Beth Henderson <BHenderson@minto.com>; mdror@bousfields.ca; Steve Pichette <SPichette@dsel.ca>
Subject: RE: 1061 7000 Campeau Drive - Pre consultation Follow-up

Hi Adam,

Please see outstanding responses in red below. You will receive a second email with a link to an FTP site which will provide the files noted below.

Should you have any questions please do not hesitate to call.

Julie Candow, P.Eng.
Project Manager - Infrastructure Approvals

City of Ottawa
Development Review - West Branch
Planning, Infrastructure and Economic Development Department
110 Laurier Ave., 4th Floor East;
Ottawa ON K1P 1J1
Tel: 613-580-2424 x 13850

From: Adam Fobert <AFobert@dsel.ca>
Sent: March 22, 2019 2:19 PM
To: Warnock, Charles <Charles.Warnock@ottawa.ca>; Moodie, Derrick <Derrick.Moodie@ottawa.ca>; Candow, Julie <julie.candow@ottawa.ca>
Cc: Susan Murphy <SMurphy@minto.com>; Beth Henderson <BHenderson@minto.com>; mdror@bousfields.ca; Steve Pichette <SPichette@dsel.ca>
Subject: 1061 7000 Campeau Drive - Pre consultation Follow-up

Hello City Staff,

As discussed during our pre-consultation regarding 7000 Campeau Drive, please see the below summary of information requests.

Let me know if you have any questions or comments

Water:
Please see the attached figure illustrating potential connection points.

Connection points 1 and 2 would have the following demands:
Average Daily: 282.9L/min

Max Day: 707.3 L/min
Peak Hour: 1556.0 L/min
Fire Flow: 10,000L/min

Connection points 3, 4, 5, and 6 would have the following demands:

Average Daily: 811.6L/min
Max Day: 2029.0L/min
Peak Hour: 4463.9L/min
Fire Flow: 15,000L/min

Wastewater:

- Please provide available calculation sheets for the existing trunk from Campeau Drive to the March Road PS. Design sheets for the Kanata Lakes trunk are shown in the 2007 Serviceability Study (FTP site). Design sheets are not available for the Marchwood Trunk. As-built drawings have been provided for the Kanata Lakes and Marchwood Trunk sewers (FTP site).
- Please provide available models of the existing trunk from Campeau to March Road PS. Existing and future flows and HGLs along the Kanata Lakes/Marchwood Trunk sewers from the golf course to Legget/Schneider are provided in an excel table (FTP site). Modelling of the trunk sewer system is not required. In the future, flows from the Signature Ridge Pump Station will be diverted from the Kanata Lakes sewer to the Penfield Trunk.
- The Infrastructure Master Plan outlined a number of upgrades to the March Road PS. What has taken place? The March PS will be converted to a lift station. The March PS project is on-going and Jacobs presented the 90% design review to City staff in Feb 2019. What is the current capacity of the facility? The rated capacity of the facility is 416 l/s. However, capacity at the station is not relevant to this application since the Marchwood Trunk sewer on Legget will no longer outlet to the March PS (refer to outdated drawings on FTP site that shows the conceptual plan). The North Kanata Trunk Phase 2, which is currently under construction, will convey flows from the Marchwood Trunk to the Watts Creek Relief Sewer. The City will provide an update on the expected completion date of the North Kanata Trunk Phase 2.
- Does the City have flow monitoring data at the March Road PS? If so, please provide. Dry weather flows range from 80 l/s (average) to 140 l/s (peak). Wet weather flows can reach +/- 325 l/s. Additional analysis of the March Pump Station is not required.

Stormwater:

- Please provide available calculation sheet for the existing trunk storm sewer from Campeau to the Beaver Pond. Design sheets are not available.
- Please provide the current model of the storm sewer system to the Beaver Pond. An existing conditions SWMHYMO model (JFSA, Sept 2015) of Kanata Lakes south of Beaver Pond and XP-SWMM/HEC-RAS models of Beaver Pond and Watts Creek (AECOM, 2014) are located on the FTP site. IBI recently updated the XP-SWMM/HEC-RAS models to support KNL Phase 9 (DSEL should obtain the latest models from IBI).
- Has there been a history of flooding / complaints of standing water in the surrounding subdivision?
- Has the City implemented ICD in the surrounding neighborhood?
- Does the City have any monitoring data within the storm sewer system or pond? If so, please provide.
- DSEL would like to request complete monitoring of the existing storm infrastructure at five locations. Please see plan attached.

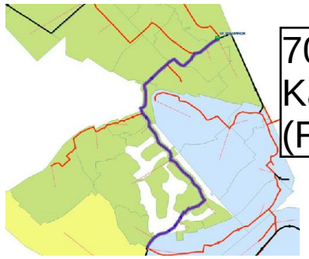
Adam Fobert, P.Eng.

DSEL

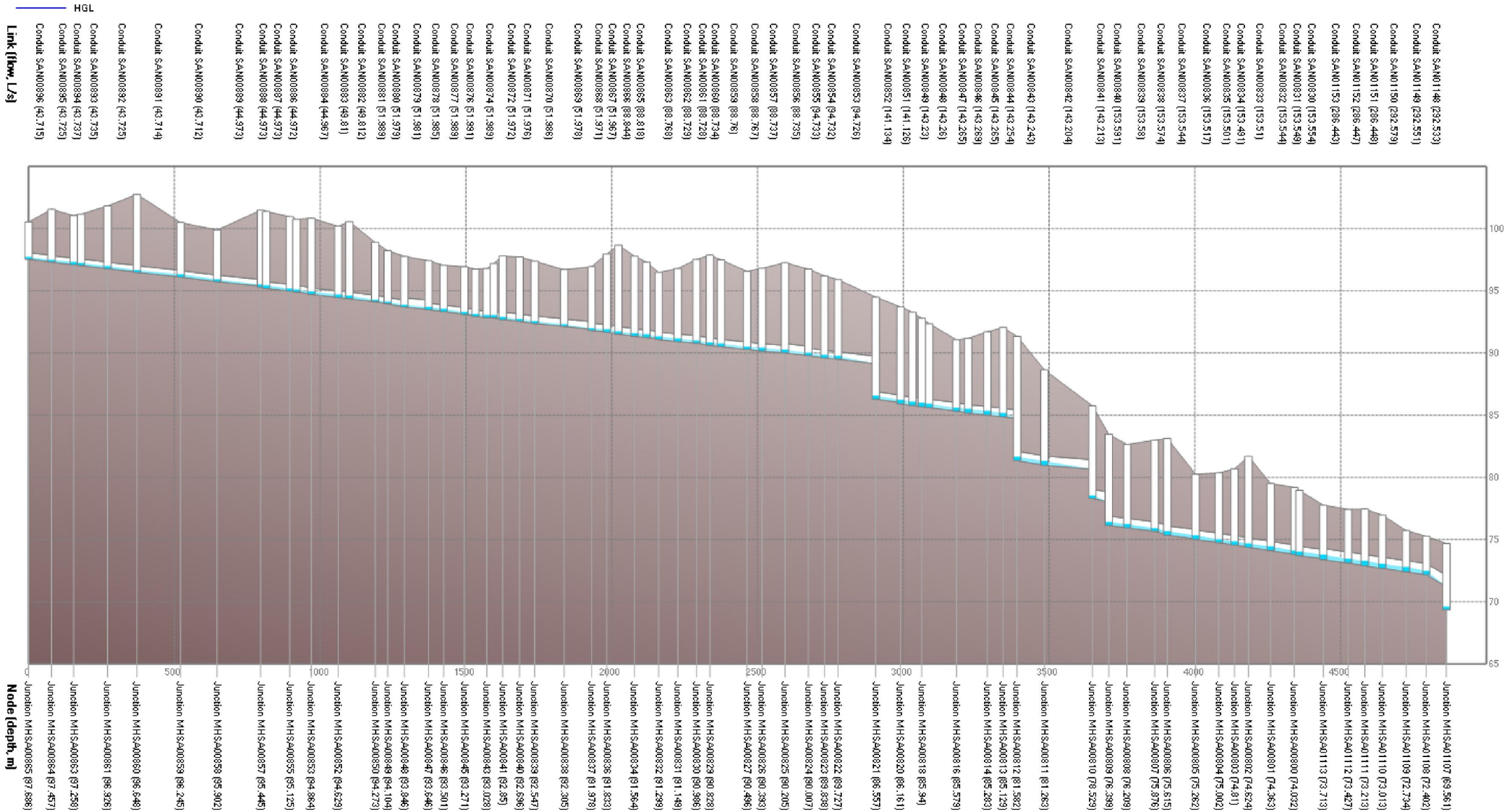
david schaeffer engineering ltd.

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

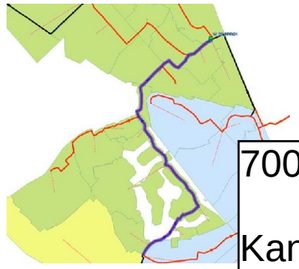
Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)
MHSA00865	97.52	100.53	3.01	0.17	97.69	43.83
MHSA00858	95.73	99.89	4.16	0.17	95.9	44.99
MHSA00852	94.45	100.19	5.74	0.18	94.63	49.82
MHSA00850	94.11	98.89	4.78	0.16	94.27	52
MHSA00835	91.50	98.66	7.16	0.22	91.72	88.87
MHSA00824	89.80	96.75	6.95	0.21	90.01	94.77
MHSA00811	80.97	88.66	7.69	0.29	81.26	143.26
MHSA00818	85.68	92.80	7.12	0.26	85.94	143.28
MHSA00809	76.14	83.47	7.33	0.26	76.4	153.59
MHSA01110	72.68	76.97	4.29	0.33	73.01	292.58
MHSA01107	69.35	74.70	5.35	0.21	69.56	295.67



7000CampeauDr_Wastewater_2013Existing
Kanata Lakes & Marchwood Trunk Sewers - HGL
(From Campeau To Legget/Schneider Rd)



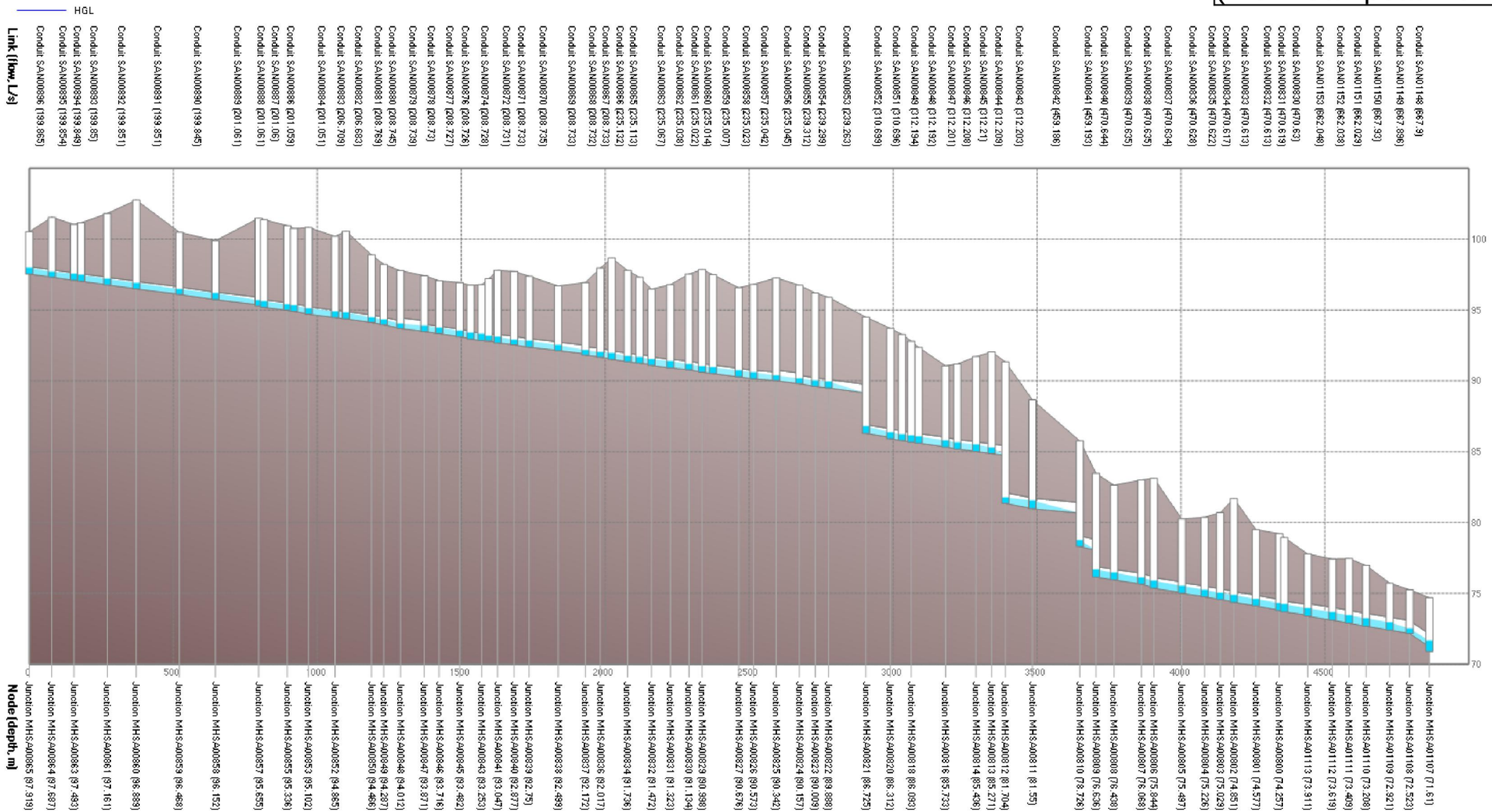
Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)
MHSA00865	97.52	100.53	3.01	0.40	97.92	199.87
MHSA00858	95.73	99.89	4.16	0.42	96.15	201.07
MHSA00852	94.45	100.19	5.74	0.42	94.87	206.72
MHSA00850	94.11	98.89	4.78	0.36	94.47	208.79
MHSA00835	91.50	98.66	7.16	0.39	91.89	235.19
MHSA00824	89.80	96.75	6.95	0.36	90.16	239.32
MHSA00818	85.68	92.80	7.12	0.41	86.09	312.22
MHSA00809	76.14	83.47	7.33	0.50	76.64	470.66
MHSA01110	72.68	76.97	4.29	0.52	73.21	667.96
MHSA01107	70.90	74.70	3.80	0.71	71.61	675.99



Note: MHSA00865 includes flow from Signature Ridge PS
In the future, flows from SRPS will be diverted to the Penfield Trui

7000CampeauDr_Wastewater_2060Future

Kanata Lakes & Marchwood Trunk Sewers - HGL (From Campeau To Legget/Schneider Rd)



APPENDIX D

Ontario

Ministry of the Environment
Ministère de l'Environnement

CERTIFICATE OF APPROVAL
MUNICIPAL AND PRIVATE SEWAGE WORKS
NUMBER 5190-7L6RRY
Issue Date: November 26, 2008

City of Ottawa
110 Laurier Avenue West
Ottawa, Ontario
K1P 1J1

Site Location: Kanata Lakes Stormwater Management Facility
Lot 6 and 7, Concession 2 and 3, March
City of Ottawa, Ontario

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

stormwater management *Works* for the treatment and disposal of stormwater runoff from a catchment area of 397 hectares, servicing Kanata Lakes Subdivision, to provide Enhanced (Level 1) water quality protection and to attenuate post-development peak flows in two cells in series, upstream Kizell Cell and downstream Beaver Cell, to a maximum flow rate of 0.96 cubic metres per second for the 100 year storm event, discharging to Kizell Drain, consisting of the following:

Stormwater Management System

Kizell Cell
a stormwater management wet pond, located west of Goulbourn Forced Road, having a minimum liquid retention volume of approximately 10,271 cubic metres at an elevation of 93.30 metres, and a maximum active retention volume of approximately 89,825 cubic metres at an elevation of 94.28 metres for the 100 year storm event, complete with two (2) energy dissipaters at the storm inlets to the cell, and one (1) outlet berm, discharging at a controlled flow rate of 1.16 cubic metres per second for the 100 year storm event to the downstream Beaver Cell;

Beaver Cell
a stormwater management wet pond, located east of Goulbourn Forced Road, having a minimum liquid retention volume of approximately 41,042 cubic metres at an elevation of 90.47 metres, and a maximum active volume of approximately 236,696 cubic metres at an elevation of 92.60 metres for the 100 year storm event, complete with three (3) storm inlets to the cell, two (2) with energy dissipaters, and one (1) outlet structure consists of a 600 millimetre diameter orifice at an invert elevation of 90.47 metres and an overflow weir set at an invert elevation of 92.60 metres, discharging at a controlled flow rate of 0.96 cubic metre per second for the 100 year storm event via an 80 metre long 1200 millimetre diameter culvert to Kizell Drain;

including erosion/sedimentation control measures during construction and all other controls and appurtenances essential for the proper operation of the aforementioned Works;

all in accordance with the following submitted supporting documents:

1. Application for Approval of Municipal and Private Sewage Works submitted by Guy Bourgon, Program manager, Infrastructure Approvals West of City of Ottawa dated October 21, 2008;

2. a letter dated October 9, 2008 and a letter date November 24, 2008 from Peter Spal, P.Eng., Manager - Water Resources of IBI Group, to the Ministry of the Environment;

3. *Kanata Lakes North Serviceability Study* dated June 2006 and prepared by IBI Group, including enclosed drawings

dated June 15, 2006 by IBI Group and Cumming Cockburn Ltd.;

4. *Kanata Lakes, Beaver Pond, Urban Stormwater quality Control,* dated November 1994, prepared by Cumming Cockburn Ltd;

5. *Kanata Lakes Dam & Outlet Structure Operation & Maintenance Manual* dated April 1990, prepared by Oliver, Mangione, McCalla & Associates Limited, Consulting Engineers; and

6. *Kanata Lakes Storm Drainage Report - Campeau Corporation* dated March 1985, prepared by Oliver, Mangione, McCalla & Associates Limited, Consulting Engineers.

For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:

1. "*Certificate*" means this entire certificate of approval document, issued in accordance with Section 53 of the Ontario Water Resources Act, and includes any schedules;

2. "*Director*" means any *Ministry* employee appointed by the Minister pursuant to section 5 of the Ontario Water Resources Act;

3. "*District Manager*" means the District Manager of the Ottawa District Office of the *Ministry*;

4. "*Ministry*" means the Ontario Ministry of the Environment;

5. "*Owner*" means City of Ottawa and includes its successors and assignees;

6. "*Works*" means the sewage works described in the *Owner*'s application, this *Certificate* and in the supporting documentation referred to herein, to the extent approved by this *Certificate*.

You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL PROVISIONS

(1) Except as otherwise provided by these Conditions, the *Owner* shall design, build, install, operate and maintain the *Works* in accordance with the description given in this *Certificate*, the application for approval of the works and the submitted supporting documents and plans and specifications as listed in this *Certificate*.

(2) Where there is a conflict between a provision of any submitted document referred to in this *Certificate* and the Conditions of this *Certificate*, the Conditions in this *Certificate* shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

(3) Where there is a conflict between the listed submitted documents, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

2. EXPIRY OF APPROVAL

The approval issued by this *Certificate* will cease to apply to those parts of the *Works* which have not been constructed within five (5) years of the date of this *Certificate*.

3. CHANGE OF OWNER

The *Owner* shall notify the *District Manager* and the *Director*, in writing, of any of the following changes within thirty (30) days of the change occurring:

(a) change of *Owner*;

(b) change of address of the *Owner*;

(c) change of partners where the *Owner* is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c.B17 shall be included in the notification to the *District Manager*; and

(d) change of name of the corporation where the *Owner* is or at any time becomes a corporation, and a copy of the most current information filed under the Corporations Information Act, R.S.O. 1990, c. C39 shall be included in the notification to the *District Manager*.

4. OPERATION AND MAINTENANCE.

(1) The *Owner* shall ensure that the design minimum liquid retention volume(s) is maintained at all times.

(2) The *Owner* shall inspect the *Works* at least once a year and, if necessary, clean and maintain the *Works* to prevent the excessive buildup of sediments and/or vegetation.

(3) The *Owner* shall maintain a logbook to record the results of these inspections and any cleaning and maintenance operations undertaken, and shall keep the logbook available for inspection by the *Ministry*. The logbook shall include the following:

(a) the name of the *Works*; and

(b) the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed.

5. RECORD KEEPING

The *Owner* shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the operation and maintenance activities required by this *Certificate*.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the *Works* are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the *Certificate* and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review.

2. Condition 2 is included to ensure that, when the *Works* are constructed, the *Works* will meet the standards that apply at the time of construction to ensure the ongoing protection of the environment..

3. Condition 3 is included to ensure that the Ministry records are kept accurate and current with respect to approved works and to ensure that subsequent owners of the works are made aware of the certificate and continue to operate the works in compliance with it.

4. Condition 4 is included to require that the *Works* be properly operated and maintained such that the environment is protected .

5. Condition 5 is included to require that all records are retained for a sufficient time period to adequately evaluate the long-term operation and maintenance of the *Works*.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto, Ontario
M5G 1E5

AND

The Director
Section 53, *Ontario Water Resources Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 26th day of November, 2008

Mansoor Mahmood, P.Eng.
Director
Section 53, *Ontario Water Resources Act*

NH/
c: District Manager, MOE Ottawa District Office
Lance Erion, P.Eng., IBI Group

J.F. Sabourin and Associates Inc.
52 Springbrook Drive,
Ottawa, ON K2S 1B9
T 613-836-3884 F 613-836-0332

Ottawa. ON
Paris. ON
Gatineau. QC
Montréal. QC

September 30, 2019 Project Number: P1581

David Schaeffer Engineering

120 Iber Road, Unit 103

Stittsville, ON K2S 1E9

Attention: Mr. Steve Pichette P.Eng

Subject: Proposed Redevelopment of Kanata Golf and Country Club: SWM Pond Sizing

J.F Sabourin and Associates (JFSA) were commissioned to complete a Storm Water Management (SWM) pond sizing for the proposed development at the site of the existing Kanata Golf and Country Club at 7000 Campeau Drive, Ottawa. The modelling work outlined in this memo builds on the 2017 Mississippi Valley Conservation Authority (MVCA) Watts Creek hydrologic model. The MVCA 2017 model was updated to reflect the proposed development based on the plan provided in August 2019 by David Schaefer Engineering Limited (DSEL). Using this plan, SWM ponds were sized to mitigate the proposed development's impacts on the operations of the Beaver Pond or the downstream watercourses (Kizell Drain and Watts Creek). The following memo outlines the impacts of the proposed development on both the operations of the existing Beaver Pond and downstream watercourses.

Note that there have been various 100-year target release rates set for the Beaver Pond over the past few years. The following outlines the various maximum allowable release rates for the pond and their sources:

- Environmental Compliance Approval (2008) - 0.96 m^3/s
- AECOM Study (2011-2015) - 1.20 m^3/s
- MVCA Floodplain Mapping study (2017) - 1.02 m^3/s
- AJ Robinson (quoted in the 2017 MVCA study) - 1.35 m^3/s

Using the 2017 MVCA model of record as a starting point, various model parameters were adjusted to produce hydrographs that more accurately reflected those observed at the field monitoring locations within the storm sewer system of Kanata Lakes. Full details of this calibration process are documented in JFSA's September 2019 report titled "Kanata Golf and Country Club 2018-2019 Monitoring and Model Calibration". This calibrated model, for existing conditions, was considered the baseline for the various scenarios assessed in this memo. Note that for any future development scenarios, City of Ottawa default hydrologic parameters were used for those areas.

The following is a brief description of the scenarios assessed in this study:

- **Existing Conditions-** *(Ex-Calib):*

  Reflective of the current conditions (2019) with various model parameters adjusted to more accurately reflect the field-collected data.

- **The Kanata Golf and Country Club Development with SWM controls-** (Ex-Calib + KGCC+SWM):

  Reflective of existing conditions with the proposed redevelopment of the Kanata Golf and Country Club in place with Storm Water Management (SWM) ponds conceptually sized to mitigate impacts downstream.

- **KNL Development -** (Ex-Calib+KNL):

  Reflective of existing conditions with the inclusion of the KNL Developments Stages 7, 8 & 9 in place as per MVCA's floodplain mapping study.

- **The Kanata Golf and Country Club Development with SWM controls + KNL Development -** (Ex-Calib + KGCC+SWM+KNL):

  Reflective of existing conditions with the KNL Development Stages 7, 8 & 9 in place and the proposed redevelopment of the Kanata Golf and Country Club with Storm Water Management (SWM) ponds.

The various scenarios discussed above were assessed using a range of design storms. Table 1 outlines the peak flows into and out of the Beaver Pond as well as at the critical erosion site identified approximately 500 m downstream of the pond outlet. To provide some context to the calibration process, the results from the 2017 MVCA existing conditions model have also been provided. Note that the updated model calibration process, which also removed the two underground storage routing commands that were previously inserted in the model to provide a better fit with measured pond levels, resulted in the peak flows out of the Beaver Pond under existing conditions to increase by anywhere from 0.190 m^3/s (for the 100-year flow) to 0.310 m^3/s (for the 10-year flow), when compared to the flows computed by the 2017 MVCA's existing conditions model. Consequently, the updated calibrated existing conditions model was considered to set the targets for matching post-development flows for the purposes of this analysis. Accordingly, the SWM ponds within this development were sized to ensure that these targets are met.

Comparing the results of the existing calibrated model to the scenario where the Kanata Golf and Country Club is redeveloped with SWM ponds in place, the peak flows out of the Beaver Pond, as well as further downstream, are not increased from existing conditions. From this analysis, it was found that a total on-site storage volume of 53,600 m^3 will need to be provided within the Kanata Golf and Country Club Development to ensure that peak flows out of the Beaver Pond are not increased once the development is in place. Table 2 below provides a break down of the storage volume required at each of the proposed SWM ponds. Note in this analysis, a required storage volume has not been provided for Pond 3 (which will control 9.38 ha of parklands) as the required storage volume and release rates for this pond were substantially smaller than the 4 other proposed SWM ponds.

Table 1: Peak Flow Summary - Watts Creek / Kizell Drain SWMHYMO Model
September 2019

Inflow to Beaver Pond

Scenario Name	Peak Flow (m^3/s)					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
MVCA-EX	0.409	1.132	3.052	6.265	9.474	13.141
EX-Calib	5.454	8.553	11.588	16.374	24.209	30.042
KGCC+SWM	3.040	4.815	6.282	9.368	15.150	19.388
KNL	12.385	21.416	28.036	37.158	43.739	49.953
Ex-Calib + KGCC+SWM +KNL	10.196	17.695	22.735	29.313	34.433	39.292

KNL - Kanata North Lakes
KGCC - Kanata Golf & Country Club

Outflow from Beaver Pond to Kizell Drain
(Flow Location 9)

Scenario Name	Peak Flow (m^3/s)					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
MVCA-EX	0.223	0.318	0.440	0.646	0.730	0.815
EX-Calib	0.484	0.667	0.750	0.876	0.940	1.005
KGCC+SWM	0.475	0.654	0.741	0.866	0.936	1.003
KNL	0.674	0.830	0.932	1.046	1.127	1.207
Ex-Calib + KGCC+SWM +KNL	0.665	0.813	0.923	1.039	1.124	1.206

KNL - Kanata North Lakes
KGCC - Kanata Golf & Country Club

Kizell Drain - Downstream of Station Road

Scenario Name	Peak Flow (m^3/s)					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
MVCA-EX	0.225	0.323	0.473	0.729	0.835	0.935
EX-Calib	0.553	0.874	1.074	1.351	1.551	1.758
KGCC+SWM	0.498	0.742	0.941	1.244	1.433	1.626
KNL	0.694	0.859	1.064	1.390	1.558	1.725
Ex-Calib + KGCC+SWM +KNL	0.673	0.816	0.973	1.318	1.480	1.647

KNL - Kanata North Lakes
KGCC - Kanata Golf & Country Club

The operation and configuration of the proposed SWM ponds may be further optimized during the detailed design stage, and the analysis provided in this memo should be considered primarily as a proof of concept.

Table 2: Kanata Golf & Country Club Required SWM Pond Volumes

Name	Required SWM Pond Volume (m^3)
Pond 1	20,000
Pond 2	12,700
Pond 3	N/A
Pond 4	16,100
Pond 5	4,850
Total	**53,650**

Based on MVCA's model, portions of the proposed KNL Development Stages 7, 8 & 9 will also drain to the existing Beaver Pond. Additional scenarios have been generated, where the Kanata Lakes lands are fully developed and where both Kanata Lakes and Kanata Golf and Country Club are developed. For this analysis, it has been assumed that no quantity controls will be implemented on the KNL Development. Based on model simulations of the KNL Development (excluding the Kanata Golf and Country Club Redevelopment) it was found that the peak flows out of the Beaver Pond will increase by anywhere from 0.163 m^3/s (for the 5-year event) to 0.202 m^3/s (for the 100-year event) above existing conditions. As the Kanata Golf and Country Club Redevelopment should not be required to offset the impacts of the KNL Development, the flows under the condition when KNL is fully developed have been considered the new target, for the scenario when the both KNL and Kanata Golf and Country Club are developed. Applying the SWM ponds outlined above to the Kanata Golf and Country Club lands with the KNL Development in place, it was found that peak flows out of the Beaver Pond will be very similar to when only the KNL Development is in place. All models discussed in this report are provided in Attachment A.

Matrix Solutions identified a critical erosion location on the Kizell Drain approximately 500 m downstream of the Beaver Pond outlet. From their geomorphological analysis, it was determined that this location has a critical shear stress of 20 N/m^2, which corresponds to a critical flow of 0.500 m^3/s. To assess the potential erosive impacts that the proposed developments may have on the creek, various scenarios were simulated using 39 years of hourly historical rainfall data taken from the Ottawa Airport. For each scenario, the total simulated erosive hours, cumulative work index and erosive volumes were calculated. This analysis was completed using both the critical shear stress and the critical flow determined by Matrix solutions for this location. Table 3 provides a full summary of these results using the provided critical shear stress. Table 4 provides a summary using the provided critical flow.

Table 3: Critical Shear Exceedance (20 pa) - Kizell Drain - Downstream of Station Road (Critical Erosion Location) - September 2019
Continuous Simulation (1967-2007)†

Scenario Name	Description	Drainage Area (ha)	Average Annual Flow (m^3/s)	Max Average Annual Flow (m^3/s)	Total Erosive Hours ˣ (Hrs)	Total Volume Exceedance (m^3)	Total Cumulative Work (pa.m)	Average Annual Erosive Hours (Hrs/Year)	Average Annual Volume Exceedance (m^3/Year)	Average Annual Cumulative Work (pa.m/Year)
MVCA-EX	MVCA's Official model converted back to existing conditions	444.5	0.030	0.051	240	4,731	228,308	6	121	5,854
EX-Calib	Existing conditions calibrated based on field data.	444.5	0.031	0.053	395	7,130	327,233	10	183	8,391
KGCC	Existing conditions with KGCC developed with SWM controls	444.0	0.034	0.057	498	8,385	389,152	13	215	9,978
KNL	Existing conditions with KNL Developed*	578.4	0.039	0.065	1027	14,289	661,250	26	366	16,955
KNL + KGCC	Existing conditions with KGCC developed with SWM controls and KNL Developed*	578.0	0.042	0.069	1296	17,281	800,302	33	443	20,521

KNL - Kanata Lakes North
KGCC - Kanata Golf & Country Club
Erosive analysis based on a critical flow of 20 pa
*Analysis assumes no SWM controls
† Continuous simulation exclude the years 2001 and 2005
ˣ Based on 39 years of continuous simulations

Table 4: Critical Flow Exceedance (500 L/s) - Kizell Drain - Downstream of Station Road (Critical Erosion Location) - September 2019

Scenario Name	Description	Drainage Area (ha)	Average Annual Flow (m^3/s)	Max Average Annual Flow (m^3/s)	Total Erosive Hours ˣ (Hrs)	Total Volume Exceedance (m^3)	Average Annual Erosive Hours (Hrs)	Average Annaul Volume Exceedance (m^3)
MVCA-EX	MVCA's Official model converted back to existing conditions	444.5	0.030	0.051	300	7,756	8	199
EX-Calib	Existing conditions calibrated based on field data.	444.5	0.031	0.053	650	12,799	17	328
KGCC+SWM	Existing conditions with KGCC developed with SWM controls	444.0	0.034	0.057	906	15,802	23	405
KNL	Existing conditions with KNL Developed*	578.4	0.039	0.065	1964	31,037	50	796
Ex-Calib + KGCC+SWM +KNL	Existing conditions with KGCC developed with SWM controls and KNL Developed*	578.0	0.042	0.069	2534	38,866	65	997

KNL - Kanata Lakes North
KGCC - Kanata Golf & Country Club
Erosive analysis based on a critical flow of 500 L/s
*Analysis assumes no SWM controls
† Continuous simulation exclude the years 2001 and 2005
ˣ Based on 39 years of continuous simulations

From these tables, it was found that the redevelopment of the Kanata Golf and Country Club will result in the annual erosive hours on the creek to increase by only 7 hours per year (based on critical flow). This corresponds to an average annual increase in erosive volume of 77 m³/year (based on critical flow) and an increase in average annual cumulative work of 1,588 pa.m/year. To provide some context to these numbers, when only the KNL Development is implemented the average annual erosive hours are increased by 34 hours a year, which corresponds to an annual volume exceedance of 468 m³ and an annual cumulative work increase of 8,565 pa.m above existing conditions.

Considering the KNL Development as the new baseline, and then implementing the Kanata Golf and Country Club Redevelopment with SWM Ponds, this results in the annual average erosive hours to increase by 15 hours, which corresponds to an annual volume exceedance of 201 m³ and an annual cumulative work increase of 3,565 pa.m above the new baseline conditions. This analysis indicates that the increases in potential erosion due to the inclusion of the Kanata Golf and Country club are minimal and manageable.

From this analysis, it was found that the proposed redevelopment of the Kanata Golf and Country Club can be implemented with SWM measures in place to ensure no adverse impacts to peak flows out of the existing Beaver Pond and on the downstream watercourse. It was determined that a total of approximately 53,000 m³ of on-site storage will need to be provided within the Kanata Golf and Country Club Development to ensure that these targets are met. A detailed erosion analysis was completed for each of the scenarios using 39 years of historical data. Increases in erosion due to the Kanata Golf and Country Club Redevelopment have been quantified and were found to be negligible and manageable.

Yours truly,

J.F Sabourin and Associates Inc.

Jonathon Burnett, P.Eng

Water Resources Engineer, JFSA

cc: J.F Sabourin, M.Eng, P.Eng

Director of Water Resources Projects

Table 1: Peak Flow Summary - Watts Creek / Kizell Drain SWMHYMO model

Table 2: Kanata Golf & Country Club Required SWM Pond Volumes

Table 3: Critical Shear Stress Analysis - Kizell Drain

Table 4: Critical Flow Analysis - Kizell Drain

Attachment A: SWMHYMO Model - MVCA Existing Conditions Model

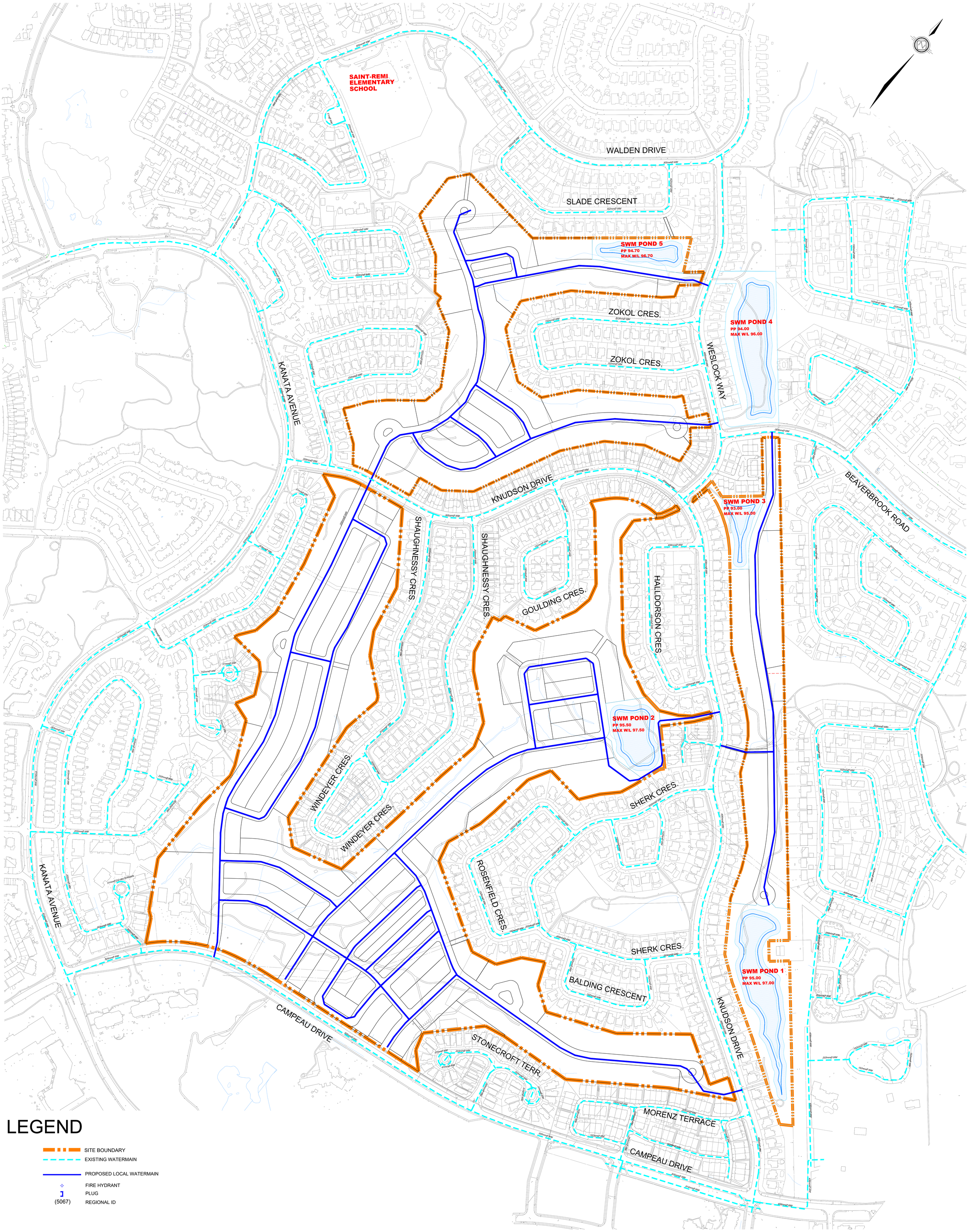
Attachment B: SWMHYMO Model – Existing Conditions Calibrated

Attachment C: SWMHYMO Model – Redeveloped Kanata Golf & Country Club with SWM

Attachment D: SWMHYMO Model – KNL Development

Attachment E: SWMHYMO Model - Redeveloped Kanata Golf and Country Club with SWM & Kanata Lakes Development

APPENDIX E



LEGEND

- SITE BOUNDARY
- EXISTING WATERMAIN
- PROPOSED LOCAL WATERMAIN
- FIRE HYDRANT
- PLUG
- (5067) REGIONAL ID

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7000 CAMPEAU DRIVE

CITY OF OTTAWA

WATERMAIN SERVICING PLAN

SCALE:	1:2000	PROJECT No.:	1061
DATE:	AUGUST 2019	DRAWING No.:	01D

KANATA LAKES TRUNK TRIBUTARY TO MARCH PUMP STATION

SAINT-REMI ELEMENTARY SCHOOL

KANATA LAKES TRUNK

WALDEN DRIVE

SLADE CRESCENT

43 | 10.63 | 0 | 733

6.29Ha | 79.2 | 499 | MH40 MH41 | Residential

39 | 5.02 | 0 | 349

SWM POND 5
PP 94.70
MAX W/L 96.70

SWM POND 4
PP 94.00
MAX W/L 96.00

ZOKOL CRES.

37 | 3.52 | 0 | 243

WESTLOCK WAY

32 | 35.65 | 0 | 2460

KANATA AVENUE

9.70Ha | 79.2 | 769 | MH36 MH37 | Residential

MH32C

MH32A

KANATA LAKES TRUNK

KNUDSON DRIVE

MH32B

SWM POND 3
PR 93.00
MAX W/L 95.00

BEAVERBROOK ROAD

SHAUGHNESSY CRES.

32B | 9.12 | 0 | 630

GOULDING CRES.

30 | 1.85 | 0 | 127

HALDORSON CRES.

26 | 4.99 | 0 | 344

9.93Ha | 79.2 | 787 | MH32C MH32B | Residential

32A | 12.60 | 0 | 870

2 | 7.54 | 0.07 | 520

4 | 13.02 | 0 | 898

12.29Ha | 79.2 | 974 | MH36 MH27 | Residential

SWM POND 2
PP 95.50
MAX W/L 97.50

9.54Ha | 79.2 | 756 | MH33 MH34 | Residential

WINDEYER CRES.

SHERK CRES.

22 | 5.17 | 0 | 356

19 | 1.86 | 0 | 128

16.26Ha | 79.2 | 1288 | MH10 MH11 | Residential

5 | 1.42 | 0.11 | 0

10 | 3.32 | 0 | 225

ROSENFIELD CRES.

KANATA LAKES TRUNK TO BE RE-ROUTED

KANATA LAKES TRUNK

12 | 6.53 | 0 | 450

BALDING CRESCENT

17 | 2.79 | 0 | 193

SWM POND 1
PP 95.00
MAX W/L 97.00

CAMPEAU DRIVE

4.64 | 79.2 | 368 | MH 17A MH 17B | Residential

STONECROFT TERR.

9 | 6.16 | 0 | 425

MORENZ TERRACE

17A | 6.95 | 0 | 480

MH1 MH2 MH3 MH4 MH5 MH6 MH7 MH8 MH9 MH10 MH11 MH12 MH13 MH14 MH15 MH16 MH17 MH17A MH17B MH18 MH19 MH20 MH21 MH22 MH23 MH24 MH25 MH26 MH27 MH28 MH29 MH30 MH32 MH33 MH34 MH35 MH36 MH37 MH38 MH39 MH40 MH41 MH42 MH43 MH44 MH45

LEGEND

- SUBJECT LANDS
- SANITARY TRUNK
- LOCAL SANITARY SEWER
- EXISTING SANITARY SEWER
- EXISTING SANITARY TRUNK
- SANITARY DRAINAGE AREA
- EXISTING SANITARY DRAINAGE AREA

0.2Ha | 3 | 11 — DRAINAGE AREA IN HECTARES; POPULATION PER HECTARE; POPULATION (UPSTREAM MH / DOWNSTREAM MH)

SANITARY MANHOLE

60 — EXTERNAL AREA ID

24.02 — DRAINAGE AREA IN HECTARES

4.05 | 0 — POPULATION

DSEL
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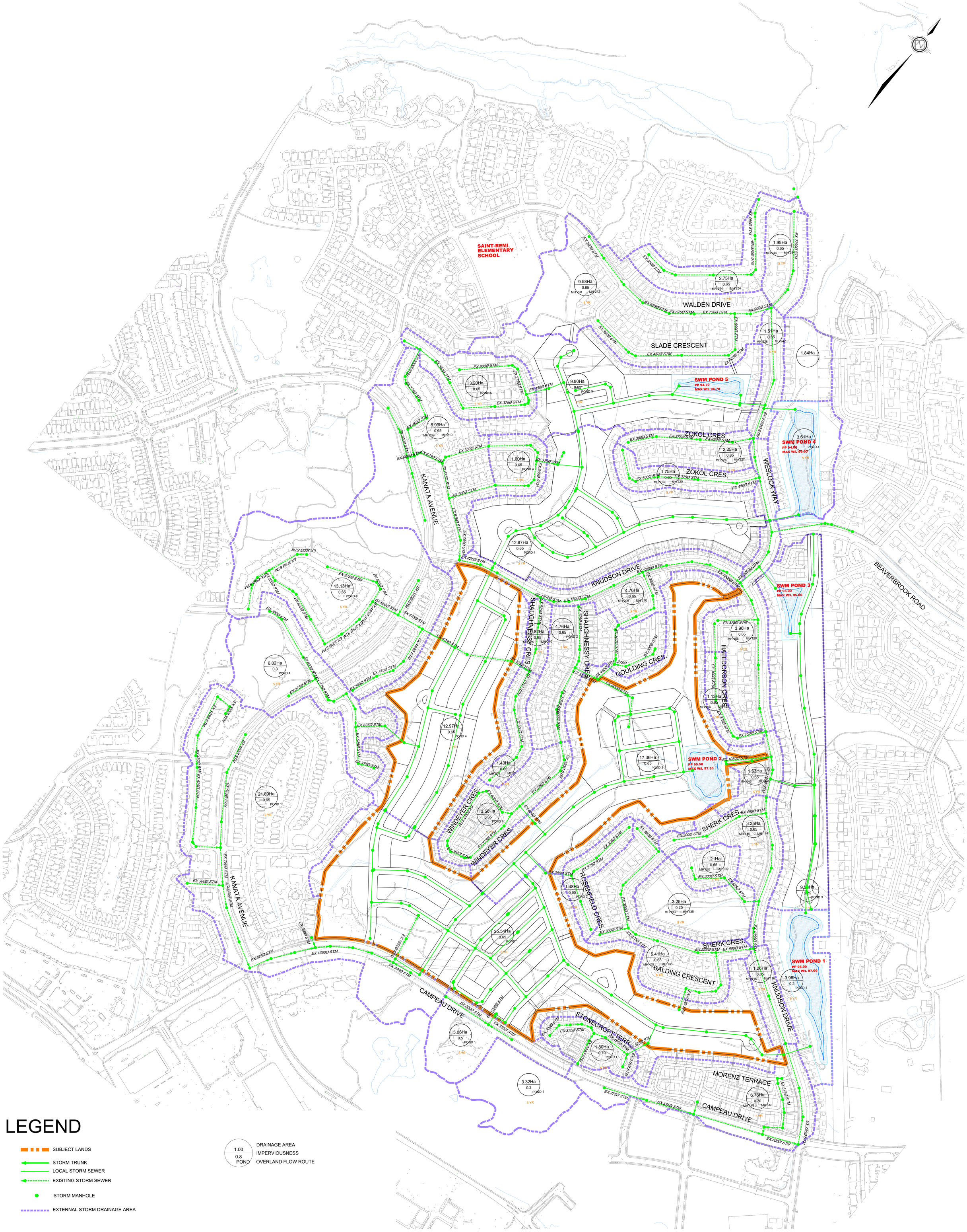
7000 CAMPEAU DRIVE

CITY OF OTTAWA

SANITARY SERVICING AND DRAINAGE PLAN

SCALE:	1:2000	PROJECT No.:	1061
DATE:	AUGUST 2019	DRAWING No.:	02D



LEGEND

- SUBJECT LANDS
- STORM TRUNK
- LOCAL STORM SEWER
- EXISTING STORM SEWER
- STORM MANHOLE
- EXTERNAL STORM DRAINAGE AREA

1.00 / 0.8 / POND — DRAINAGE AREA, IMPERVIOUSNESS, OVERLAND FLOW ROUTE

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7000 CAMPEAU DRIVE

CITY OF OTTAWA

STORM SERVICING AND DRAINAGE PLAN

SCALE:	1:2500	PROJECT No.:	1061
DATE:	AUGUST 2019	DRAWING No.:	03D

WALDEN DRIVE

SLADE CRESCENT

ZOKOL CRES.

KANATA AVENUE

KNUDSON DRIVE

SHAUGHNESSY CRES.

GOULDING CRES.

HALLDORSON CRES.

WESLOCK WAY

BEAVERBROOK ROAD

WINDEYER CRES.

ROSENFIELD CRES.

SHERK CRES.

BALDING CRESCENT

STONECROFT TERR.

MORENZ TERRACE

CAMPEAU DRIVE

SWM POND 5
PP 94.70
MAX W/L 96.70

SWM POND 4
PP 94.00
MAX W/L 96.00

SWM POND 3
PP 93.00
MAX W/L 95.00

SWM POND 2
PP 95.50
MAX W/L 97.50

SWM POND 1
PP 95.00
MAX W/L 97.00

MATCH EXISTING

LEGEND

- SITE BOUNDARY
- STORM OVERLAND FLOW ARROW
- 192.85 PROPOSED CENTERLINE ELEVATION
- 192.50 / 192.50 PROPOSED ELEVATION / EXISTING ELEVATION
- 244.50 EXISTING CONTOUR ELEVATION
- ←1.00m— GRADE CHANGE

CUT-FILL DEPTH ALONG CENTER LINE:

CUT DEPTH (m)	FILL DEPTH (m)
0 - 1.0	0 - 1.0
1.0 - 2.0	1.0 - 2.0
2.0 - 3.0	2.0 - 3.0
> 3.0	> 3.0

FOR DISCUSSION PURPOSES ONLY

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7000 CAMPEAU DRIVE

CITY OF OTTAWA

PRELIMINARY GRADING PLAN

SCALE:	1:2000	PROJECT No.:	1061
DATE:	AUGUST 2019	DRAWING No.:	04D

PERMISSIBLE GRADE RAISE

- UP TO 2.0m
- UP TO 2.5m
- NO GRADE RAISE RESTRICTIONS

LEGEND:

- BOREHOLE LOCATION, CURRENT INVESTIGATION
- BOREHOLE WITH MONITORING WELL LOCATION, CURRENT INVESTIGATION
- PROBEHOLE LOCATION, CURRENT INVESTIGATION
- BOREHOLE LOCATION, PREVIOUS INVESTIGATION, PATERSON GROUP REPORT PG4135, JANUARY 2018
- BOREHOLE LOCATION BY OTHERS
- 105.20 GROUND SURFACE ELEVATION (m)
- [104.29] BEDROCK SURFACE ELEVATION (m)
- (104.40) PRACTICAL REFUSAL TO AUGERING ELEVATION (m)
- {88.83} ELEVATION AT BOTTOM OF TEST HOLE, REFUSAL NOT ENCOUNTERED (m)

TEST HOLE LOCATIONS AND GROUND SURFACE ELEVATIONS (CURRENT INVESTIGATION) PROVIDED BY STANTEC GEOMATICS LIMITED.

SCALE: 1:2000

0 25 50 75 100 125 150m

paterson group
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

MINTO COMMUNITIES INC.

GEOTECHNICAL INVESTIGATION
KANATA GOLF AND COUNTRY CLUB
OTTAWA, ONTARIO

Title:

PERMISSIBLE GRADE RAISE PLAN

Stamp:

Scale:	1:2000
Drawn by:	MPG
Checked by:	RG
Approved by:	DJG
Date:	03/2019
Report No.:	PG4135
Drawing No.:	PG4135-3
Revision No.:	0

p:\autocad drawings\geotechnical\pg4135\pg4135 permissible grade raise plan.dwg

patersongroup
consulting engineers

154 Colonnade Road South
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Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL

MINTO COMMUNITIES INC.

GEOTECHNICAL INVESTIGATION
KANATA GOLF AND COUNTRY CLUB
OTTAWA, ONTARIO

Title:

PERMISSIBLE GRADE RAISE PLAN

Stamp:

Scale:	1:2000
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Checked by:	RG
Approved by:	DJG
Date:	03/2019
Report No.:	PG4135
Drawing No.:	PG4135-4
Revision No.:	0