david schaeffer engineering ltd

120 Iber Road, Suite 103
Ottawa, Ontario K2S 1E9
Tel. (613)836-0856
Fax (613) 836-7183
www.DSEL.ca

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

FOR

CAMPANALE HOMES
5 ORCHARD DRIVE

CITY OF OTTAWA

PROJECT NO.: 18-1006

JUNE 2018-REV 1

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
FOR
CAMPANALE HOMES
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1.0 INTRODUCTION

David Schaeffer Engineering Ltd. (DSEL) has been retained by Campanale Homes to prepare a Functional Servicing and Stormwater Management Report in support of the Draft Plan of Subdivision (DPS) for the proposed development at 5 Orchard Drive.

The subject property is located within the City of Ottawa urban boundary, in the Stittsville ward. As illustrated in ***Figure 1***, the subject property is facing Hazeldean Road to the north, Fingerwood Drive to the east, a local restaurant to the west and residences to the south. The subject property measures approximately ***3.98 ha*** and is designated Arterial Mainstreet (AM9) under the current City of Ottawa zoning by-law.

Figure 1: Site Location

The proposed development consists of ***1.87 ha*** of commercial space and ***2.16 ha*** of residential land, comprised of 65 townhouse units, 2 semi-detached units, and 7 single lots.

The objective of this report is to support the application for Draft Plan of Subdivision by providing sufficient detail to demonstrate that the proposed development is supported by existing and proposed municipal servicing infrastructure and to demonstrate that the site design conforms to current City of Ottawa design standards.

1.1 Existing Conditions

The subject site is currently undeveloped. Two existing parallel ditches run from the south side of the property toward two ditch-inlet catch basins (DICBs) at the north edge of the property along Hazeldean Road. The existing DICBs outlet into the existing 675mm diameter stormwater on Hazeldean Road. There is also a ditch along the southern property line which collects storm water runoff from the existing residential units on the adjacent property and outlets into the western most ditch of the two previously mentioned ditches.. Note that in existing conditions there is a drop in elevation between the gravel shoulder and the subject property, to the north along Hazeldean Road. Sewer system and watermain distribution mapping collected from the City of Ottawa indicate that the following services exist across the property frontages within the adjacent municipal right-of-ways:

Hazeldean Road

- 762 mm watermain
- 675 mm storm sewer
- 450 mm storm sewer
- 150 mm sanitary sewer at northwest corner of site
- 675 mm sanitary sewer at northeast of site

Fringewood Drive

- 200 mm watermain

1.2 Required Permits / Approvals

Development of the site is subject to the City of Ottawa Planning and Development Approvals process. The City of Ottawa must approve detailed engineering design drawings and reports, prepared to support the proposed development plan.

The subject property contains existing trees. Development, which may require removal of existing trees, may be subject to the City of Ottawa Urban Tree Conservation By-law No. 2009-200.

1.3 Pre-consultation

Pre-consultation correspondence and the servicing guidelines checklist are located in ***Appendix A***.

Further pre-consultation with City Staff has been completed via email. Associated correspondence is located in ***Appendix A***.

2.0 GUIDELINES, PREVIOUS STUDIES, AND REPORTS

2.1 Existing Studies, Guidelines, and Reports

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

- **Ottawa Sewer Design Guidelines,**
  City of Ottawa, 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)

- **Ottawa Design Guidelines – Water Distribution**
  City of Ottawa, July 2010.
  (Water Supply Guidelines)

  - **Technical Bulletin ISD-2010-2**
    City of Ottawa, December 15, 2010.
    (ISDTB-2010-2)

  - **Technical Bulletin ISDTB-2014-02**
    City of Ottawa, May 27, 2014.
    (ISDTB-2014-02)

  - **Technical Bulletin ISDTB-2018-02**
    City of Ottawa, March 21, 2018.
    (ISDTB-2018-02)

- **Stormwater Planning and Design Manual,**
  Ministry of the Environment, March 2003.
  (SWMP Design Manual)

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

- **West End Pumping Stations Decommissioning & By-Pass Sewers Fringewood Drive By-Pass Sewer Design**

Novatech, May 2018.
(Fringewood By-Pass Sewer Design)

- **Hunting Properties Development / Proposed Realignment of Channel on 2 and 3 Iber Road**
  JF Sabourin and Associates Inc., March 2017.
  (JFSA Channel Realignment)

3.0 WATER SUPPLY SERVICING

3.1 Existing Water Supply Services

The subject property lies within the City of Ottawa 3W pressure zone, as shown by the Pressure Zone map in ***Appendix B.*** Watermains exist within Hazeldean Road and Fringewood Drive.

3.2 Water Supply Servicing Design

The subject property is proposed to be serviced through two connections to the existing 203mm watermain within Fringewood Drive.

Table 1 summarizes the ***Water Supply Guidelines*** employed in the preparation of the water demand estimate.

Table 1
Water Supply Design Criteria

Design Parameter	Value
Commercial-Floor space	2.5 L/m^2/d
Single Family House	3.4 P/unit
Semi-Detached House	2.7 P/unit
Townhouse	2.7 P/unit
Average Daily Demand	280 L/d/per
Residential Maximum Daily Demand	3.6 x Average Daily *
Residential Maximum Hourly	5.4 x Average Daily *
Commercial Maximum Daily Demand	1.5 x avg. day L/gross ha/d
Commercial Maximum Hour Demand	1.8 x avg. day L/gross ha/d
Minimum Watermain Size	150 mm diameter
Minimum Depth of Cover	2.4 m from top of watermain to finished grade
During normal operating conditions desired operating pressure is within	350 kPa and 480 kPa
During normal operating conditions pressure must not drop below	275 kPa
During normal operating conditions pressure shall not exceed	552 kPa
During fire flow operating pressure must not drop below	140 kPa

** Residential Max. Daily and Max. Hourly peaking factors per MOE Guidelines for Drinking-Water Systems Table 3-3 for 0 to 500 persons.*
*** Table updated to reflect ISD-2010-2*

Table 2 summarizes the anticipated water demand and boundary conditions for the proposed development; calculated using the ***Water Supply Guidelines.***

Table 2
Proposed Water Demand

Design Parameter	Anticipated Demand[1] (L/min)	Boundary Conditions[2] Fringewood Dr. (South of valve) (m H_2O / kPa)	Boundary Conditions[2] Fringewood Drive (North of valve) (m H_2O / kPa)
Average Daily Demand	71.2	56.4 / 553.7	56.0 / 549.3
Max Day + Fire Flow (@10,000L/min)	190.9+10,000 = 10,190.9	40.8 / 400.6	53.3 / 522.8
Max Day + Fire Flow (@15,000L/min)	190.9+15,000 = 15,190.9	26.1 / 256.4	52.4 / 513.9
Peak Hour	300.3	52.6 / 516.4	52.7 / 516.9

1) Water demand calculation per ***Water Supply Guidelines***. See ***Appendix B*** for detailed calculations.
2) Boundary conditions supplied by the City of Ottawa for the demands indicated in the correspondence; assumed ground elevation 104.56m for connection 1 and 105.01m for connection 2 to the municipal watermain. See ***Appendix A.***

The residential component of the development is contemplated to meet the criteria for the ***10,000L/min*** maximum fire flow cap, as per ***ISDTB-2014-02.*** As the commercial component is considered a future development and details have not yet been established, a maximum fire flow for this section was assumed to be ***15,000L/min*** until further details are confirmed.

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

3.3 Watermain Modelling

EPANet was utilized to model the proposed watermain system during peak hour, average day and max daily water demand, plus fire flow scenarios. The model was developed to assess pipe sizing.

EPANET uses pipe length, pipe diameter, elevation and friction loss factors based on pipe diameter obtained from ***Water Supply Guidelines, Table 4.4***. Minor loss coefficients based on bends, valves and tees in the pipe were also utilized in the model. EPANet calculated pressure drop using the Hazen-Williams equation and is used to assess the pressure that is being provided to each node.

To model the maximum daily flow scenario, ***10,000L/min*** was applied to each of the proposed hydrants for the residential part of the site and ***15,000L/min*** at the connection to the future commercial component of the property.

Table 3 below summarizes pressures reported during both average day, peak hour and maximum daily plus fire flow scenarios for nodes at points of interest.

Table 3
Model Simulation Output Summary

Node ID	Average Day (kPa)	Peak Hour (kPa)	Max Day + Fire Flow (10,000L/min) (kPa)	Max Day + Fire Flow (15,000L/min) (kPa)
10	553.3	516.4	399.6	255.4
12	551.8	516.7	401.3	252.0
14	552.0	516.6	395.3	251.1
15	552.4	517.0	330.5	232.1
17	551.5	516.8	409.5	253.2
18	552.2	516.8	381.3	247.2
19	551.6	516.8	396.0	175.1
20	552.4	517.2	303.3	203.9
21	552.6	517.3	269.8	214.2
23	552.8	517.5	284.8	209.8
25	552.1	516.4	395.9	251.7

The pressures modeled in average day scenario are close to or exceed the maximum allowable per ***Table 2***. Pressures exceed the desired operation pressure in the peak hour scenario, however, do not exceed the maximum allowable pressure. It is recommended a pressure check is performed during construction to determine if pressure reducing valves are required.

The pressures during maximum daily plus fire flow scenarios fall within the required pressure range outlined in ***Table 2***. The node yielding the lowest pressure during fire flow scenario at ***10,000L/min*** is node 21. For the fire flow scenario at ***15,000 L/min***, fire flow was modeled through the connection point to the future commercial development at node 19.

Model output reports, as well as, figures for each model scenario are found in ***Appendix B***.

3.4 Water Supply Conclusion

It is proposed to service the development from two connections to the existing 203mm watermain within Fringewood Drive.

The contemplated development was analyzed assuming ***10,000L/min*** and ***15,000L/min*** maximum fire flows for the residential and commercial components, respectively.

Water modeling was completed to confirm that adequate pressure is available to service the proposed development based on boundary conditions received from the ***City of Ottawa***. Fire flow scenario pressures fall within the guidelines outline in ***Table 2***, however, pressure check should be completed during construction to determine if pressure reducing valves will be required. The municipal system is capable of delivering water within the ***Water Supply Guidelines*** pressure range.

The design of the water distribution system conforms to all relevant City Guidelines and Policies.

4.0 WASTEWATER SERVICING

4.1 Existing Wastewater Services

The subject property lies within the future Kanata West Pump Station catchment area, per the Kanata West Master Servicing Plan.

There is an existing 675mm diameter sanitary sewer within Hazeldean Road. There currently is no sanitary sewer services within Fringewood Drive on the section of the road directly adjacent to the subject property.

Based on pre-consultation with the City of Ottawa, the Hazeldean Road sanitary sewer is sized to convey the flow from the site, however, only until the Kanata West Pumping Station (KWPS) is in operation (slated for completion in June 2018). It is anticipated the contemplated development will proceed after the completion of the KWPS, therefore, the downstream system will have capacity to convey flow from the subject property.

4.2 Wastewater Design

The proposed development will be serviced via a connection to the existing 675mm diameter sanitary sewer within Hazeldean Road through a future sanitary sewer within Fringewood Drive, running along the east end of the property.

Table 4 summarizes the ***City Standards*** employed in the calculation of wastewater flow rates for the proposed development.

Table 4
Wastewater Design Criteria

Design Parameter	Value
Average Daily Demand	280 L/d/per
Single Family House	3.4 P/unit
Semi-Detached House	2.7 P/unit
Townhouse	2.7 P/unit
Peaking Factor	Harmon's Peaking Factor. Max 3.8, Min 2.0
Commercial Floor Space	28,000 L/ha/d
Infiltration and Inflow Allowance	0.28 L/s/ha
Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} AR^{2/3} S^{1/2}$
Commercial Peaking Factor	1.50 per City of Ottawa Sewer Design Guidelines Appendix 4B
Minimum Sanitary Sewer Lateral	135 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.	

Table 5 demonstrates the anticipated peak flow from the proposed development. See ***Appendix C*** for associated calculations.

Table 5
Summary of Proposed Wastewater Flows

Design Parameter	Anticipated Sanitary Flow (L/s)
Average Dry Weather Flow Rate	**1.26**
Peak Dry Weather Flow Rate	**3.24**
Peak Wet Weather Flow Rate	**4.51**

The estimated sanitary flow for the contemplated development anticipates a peak wet weather flow of ***4.51 L/s***.

A future sanitary sewer is contemplated to be constructed within Fringewood Drive starting in May 2019. The sanitary sewer is being constructed to allow for a gravity sanitary connection from the existing subdivision to the north to by-pass the existing Fringewood Pump Station and be directed to the existing 675mm sanitary sewer within Hazeldean Road.

The subject property has been contemplated in the sizing of the future sanitary sewer, with a total estimated peak flow equal to ***6.22L/s***. The contemplated development results in a reduction of ***1.71L/s*** flow to the future sanitary sewer than contemplated in the ***Fringewood By-Pass Sewer Design***, therefore, the future sewer has sufficient capacity to convey the wastewater flow from the subject site. Refer to ***Appendix C*** for a copy of the ***Fringewood By-Pass Sewer Design,*** including future sanitary design sheets and sanitary drainage figure.

4.3 Wastewater Servicing Conclusions

The site is tributary to the existing sanitary sewer within Hazeldean Road.

A future sanitary sewer is contemplated to be constructed adjacent to the subject property within Fringewood Drive. The proposed development results in a decrease in wastewater flow of ***1.71L/s*** to the future sanitary sewer compared to the ***Fringewood By-Pass Sewer Design.*** The future sanitary sewer has sufficient capacity to convey wastewater flow from the subject property.

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

5.0 STORMWATER MANAGEMENT

5.1 Existing Stormwater Services

Stormwater runoff from the subject property is tributary to the Carp River sub-watershed via Poole Creek and City of Ottawa storm sewer system and is reviewed by the Mississippi Valley Conservation Authority (MVCA).

Two parallel ditches currently exist on the subject property that lead to two existing DICBs; refer to ***DICB 1*** and ***DICB 2*** on drawing ***EX-SWM-1*** located in ***Drawings/Figures***. The majority of the flow from the subject site is picked up by the ditch draining to ***DICB 1*** with the east portion of the site is directed to ***DICB 2***. A portion of the site to the west is directed to Poole Creek, denoted as U1 on the drawing ***EX-SWM-1*** located in ***Drawings/Figures***.

Based on the topographic survey of Hazeldean Road adjacent to the site, major overland flow is directed east and south down Fringewood Drive. The Major overland flow route for this area, shown as EX-1, would enter the site and be captured by ***DICB 2***. It is anticipated spill to the site would only occur in major storm events as the existing CB and storm sewer is anticipated to capture the minor system events on Hazeldean Road.

The runoff from the rear yards of the Cloverloft Court properties that bound the south edge of the subject property, shown as EX2 and EX3 in ***EX-SWM-1***, flow into a rear yard ditch that runs along the south property line of the subject property. Drainage area EX2 would drain to the ***DICB 1,*** whereas, EX3 would drain to the Fringewood Drive roadside ditch and eventually to ***DICB 2***.

Drainage from the existing subdivision to the south of the subject property drains east towards the intersection of Fringewood Drive and Cloverloft Court. Note that a culvert crossing Fringewood Drive at Cloverloft Court may intercept some drainage from EX5, however this analysis assumes all EX5 drainage by-passes this culvert and is directed south to ***DICB 2.***

The estimated pre-development peak flows from the subject site and external areas for the 2, 5, and 100-year events are summarized in ***Table 6*** and ***Table 7:***

Table 6
Summary of Existing Peak Storm Flow Rates from Subject Property

City of Ottawa Design Storm	Estimated Peak Flow Rate to DICB1 (3.031 Ha) (L/s)	Estimated Peak Flow Rate to DICB2 (0.779 Ha) (L/s)	Estimate Peak Flow to Poole Creek (0.164 Ha) (L/s)
2-year	67.0	16.5	11.9
5-year	90.1	22.2	16.1
100-year	191.6	47.1	34.6

Table 7
Summary of Existing Peak Storm Flow Rates from External Area

City of Ottawa Design Storm	External Peak Flow Rate to DICB1 (EX2 0.334 Ha) (L/s)	Estimated Peak Flow Rate to DICB2 (EX1, EX3, EX4, EX5 4.462 Ha) (L/s)
2-year	23.3	258.8
5-year	31.5	348.7
100-year	67.5	655.4

It is anticipated that no stormwater management controls for flow attenuation exist on-site.

A capacity analysis of the existing DICB capture rate and DICB leads was completed to determine if the existing DICB are capable of capturing the 100-year storm in the 100-year storm event. DICB elevation, head and capture rate are summarized in ***Table 8*** below:

Table 8
Summary of Existing DICB Capture Rate

Parameter	DICB 1	DICB 2
DICB Grate Invert Elevation (m)	103.98	103.65
DICB Lead Invert (m)	102.94	102.71
Ponding Level[1] (m)	104.57	104.57
Assumed Downstream HGL[2] (m)	103.08	102.77
Total Head[3] (m)	1.49	1.80
DICB Grate Capture Rate[4] (L/s)	1700	1700
375mm DICB Lead Capture[5] (L/s)	364	400

1) 2H:1V slope for DICB, Top of DICB Grate 450mm above invert
2) Downstream HGL assumed equal to obvert of Ex. 675mm Storm within Hazeldean Road
3) Total Head equal to Ponding Level less the downstream HGL
4) DICB capture rate determined from Design Chart 4.20 from the MTO Drainage Management Manual, 1997 assuming 450mm of ponding, capture rate multiplied by 2 to account for 1200mm x 600mm grate
5) Orifice equation used per the ***City Standards***, refer to ***Appendix D*** for orifice equation

Per the above, the flow through the DICB lead will restrict flow to ***364 L/s*** and ***400 L/s*** to ***DICB 1*** and ***DICB 2***, respectively.

Based on the topographic survey, overland spill would occur once ponding reached an elevation of 104.57m where it would spill over Fringewood Drive to the east side of the ROW. Based on the capture rate summarized above, it is anticipated that the DICBs would be able to capture the flow in the pre-development 100-year storm event from the subject property excluding external area.

Due to the large external area directed to ***DICB 2*** spill may occur during the 100-year storm event over Fringewood Drive.

5.2 Post-development Stormwater Management Target

Based on City of Ottawa standards, stormwater management requirements for the proposed development are as follows:

- Allowable release rate is determined to ensure no increase in storm flow to the Hazeldean storm sewer in the post-development conditions compared to the pre-development condition to ensure no negative impacts on the downstream storm system;
- Based on pre-development calculations, the 100-year and 5-year allowable release rates are determined to be **112.3 *L/s*** and ***238.7 L/s*** respectively, refer to ***Appendix D*** for time of concentration and peak flow calculations;
- Allowable release rate for the residential and commercial portions proportional to their area, 100-year flow rates equal to ***121.7 L/s*** and ***116.9 L/s*** for the Residential Portion (51% of site) and Commercial Area (49% of site), respectively;
- All storms, up to and including the City of Ottawa 100-year design event, are to be attenuated on site;
- Quality controls are required as per correspondence with the MVCA, 70% TSS removal will be necessary. Refer to ***Appendix A*** for correspondence.

5.3 Proposed Stormwater Management System

It is proposed that the stormwater for the development will be serviced by the existing 675mm diameter storm sewer on Hazeldean Road via a new storm sewer extended south on Fringewood Drive.

The residential component of the development would consist of a proposed 450mm diameter storm sewer that would connect to a proposed 675mm diameter storm sewer within Fringewood Drive. The commercial component of the site would connect independently to the proposed storm sewer within Fringewood Drive. The existing swale along Fringewood Drive would be regraded to flow towards the existing ***DICB 2***.

The proposed swale will convey possible overland flow from Hazeldean Road, Fringewood Road and external drainage from the subdivision to the south of the site from entering the subject site. Refer to drawing ***SWM-1*** for storm servicing and stormwater management details.

Table 9 summarizes post-development flow rates and anticipated storage for the development of the property.

Table 9
Stormwater Flowrate and Storage Summary

Control Area	5-Year Release Rate	5-Year Storage	100-Year Release Rate	100-Year Storage
	(L/s)	(m^3)	(L/s)	(m^3)
Unattenuated Areas	7.5	0.0	16.1	0.0
Residential Areas	49.7	245.0	105.6	521.8
Total Residential	**57.3**	**245.0**	**121.7**	**521.8**
Commercial Areas	55.0	353.3	116.9	636.1
Total Comm + Res	**112.3**	**598.4**	**238.7**	**1157.9**

It is anticipated that ***521.8 m^3*** of storage will be required for the residential development and ***636.1 m^3*** of storage will be needed for the future commercial development in order

to attenuate flows to the target flow rate of ***238.7 L/s*** in the 100-year storm event***.*** Refer to storage calculations that are contained within ***Appendix D***.

To achieve the allowable release rate, the proposed development will employ a combination of Low Impact Development (LID) practice infiltration chambers in the road and rear yards as well as take advantage of surface ponding on the street in accordance with the ***City Standards.*** The commercial block is contemplated to use similar stormwater management techniques to attenuate to the allowable release rate.

The unattenuated area directed to Poole Creek, U1 on drawing ***SWM-1***, is less than the flow to Poole Creek in the pre-development condition shown in ***Table 7*** for the 5 and 100-year storm events. The drainage area consists of rear yard and roof drains, considered clean water, therefore, quality controls are not anticipated for the uncontrolled area draining to Poole Creek.

Quality controls in the form of Oil-Grit-Seperators in combination with proposed LIDs will be used to achieve 70% TSS Removal.

Due to the depth of the existing storm sewer within Hazeldean Road, the proposed units closest to Fringewood Drive will be required to use sump pumps discharging to the surface to service the foundation drains, refer to ***CSP-1*** for units proposed to be sump pumped.

5.4 Stormwater Servicing Conclusions

Post development stormwater runoff will be required to be restricted to the allowable target release rate for storm events up to and including the 100-year storm in accordance with City of Ottawa ***City Standards***. The post-development allowable release rate to the sewer within Hazeldean Road was calculated to be ***238.7 L/s***, with an estimated ***521.8m^3*** of storage for the residential development and ***636.1m^3*** in the future commercial development required to meet this release rate.

Quality controls are contemplated in the form of an Oil-Grit Separator and proposed LIDs.

Four blocks of townhomes will be required to be sump pumped due to the shallow connection to the existing storm sewer within Hazeldean Road.

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

6.0 UTILITIES

Utility servicing will be coordinated with the individual utility companies prior to site development.

7.0 EROSION AND SEDIMENT CONTROL

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

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

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

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

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

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

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

Establish material stockpiles away from watercourses, so that barriers and filters may be installed.

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

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

8.0 CONCLUSION AND RECOMMENDATIONS

David Schaeffer Engineering Ltd. (DSEL) has been retained to prepare a Functional Servicing and Stormwater Management report in support of the application for Draft Plan of Subdivision for the proposed development at 5 Orchard Drive. The preceding report outlines the following:

- Based on boundary conditions provided by the City the existing municipal water infrastructure is capable of providing the proposed development with water within the City's required pressure range. Pressure reducing valves will be required;
- The proposed development is anticipated to have a peak wet weather flow of ***4.51 L/s*** directed to the Stittsville Trunk Sewer, the property has been contemplated in the future sewer to be installed within Fringewood Drive.
- Based on the *City Standards*, the proposed development will be required to attenuate post development flows to an equivalent release rate of ***238.7 L/s*** to the sewer within Hazeldean Road, for all storms up to and including the 100-year storm event.
- It is anticipated that ***521.8 m³*** of storage will be required for the residential development and ***636.1 m³*** of storage will be needed for the future commercial development so that the stormwater release rate can be attenuated to the allowable release rate to the storm sewer within Hazeldean Road.
- Utility services would need to be coordinated with utility companies prior to development.

Prepared by,
David Schaeffer Engineering Ltd.

Per: Steven L. Merrick, P.Eng.

Reviewed by,
David Schaeffer Engineering Ltd.

Per: Adam D. Fobert, P.Eng.

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APPENDIX A

Pre-Consultation

DEVELOPMENT SERVICING STUDY CHECKLIST

15-812 11/12/2015

4.1 General Content		
☐	Executive Summary (for larger reports only).	N/A
☒	Date and revision number of the report.	Report Cover Sheet
☒	Location map and plan showing municipal address, boundary, and layout of proposed development.	Drawings/Figures
☒	Plan showing the site and location of all existing services.	Figure 1
☒	Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	Section 1.0
☒	Summary of Pre-consultation Meetings with City and other approval agencies.	Section 1.3
☒	Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.	Section 2.1
☒	Statement of objectives and servicing criteria.	Section 1.0
☒	Identification of existing and proposed infrastructure available in the immediate area.	Sections 3.1, 4.1, 5.1
☐	Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	N/A
☒	Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	GP-1
☐	Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	N/A
☐	Proposed phasing of the development, if applicable.	N/A
☒	Reference to geotechnical studies and recommendations concerning servicing.	Section 1.4
☒	All preliminary and formal site plan submissions should have the following information: -Metric scale -North arrow (including construction North) -Key plan -Name and contact information of applicant and property owner -Property limits including bearings and dimensions -Existing and proposed structures and parking areas -Easements, road widening and rights-of-way -Adjacent street names	SSP-1

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

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

☒	Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.	Section 3.2
☐	Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.	N/A
☐	Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design	N/A
☐	Address reliability requirements such as appropriate location of shut-off valves	N/A
☐	Check on the necessity of a pressure zone boundary modification	N/A
☒	Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range	Section 3.2, 3.3
☐	Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	N/A
☐	Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	N/A
☒	Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Section 3.2
☐	Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	N/A

4.3 Development Servicing Report: Wastewater

☒	Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).	Section 4.2
☐	Confirm consistency with Master Servicing Study and/or justifications for deviations.	N/A
☐	Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	N/A
☒	Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Section 4.1
☒	Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	Section 4.2
☒	Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	Section 4.2, Appendix C
☒	Description of proposed sewer network including sewers, pumping stations, and forcemains.	Section 4.2
☐	Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	N/A

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

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

4.4 Development Servicing Report: Stormwater Checklist

☒	Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)	Section 5.1
☒	Analysis of available capacity in existing public infrastructure.	Section 5.1, Appendix D
☒	A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	Drawings/Figures
☒	Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	Section 5.2
☒	Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Section 5.2
☒	Description of the stormwater management concept with facility locations and descriptions with references and supporting information	Section 5.3
☐	Set-back from private sewage disposal systems.	N/A
☐	Watercourse and hazard lands setbacks.	N/A
☒	Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	Appendix A
☐	Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	N/A
☒	Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).	Section 5.3
☐	Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	N/A
☒	Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	Section 5.1, 5.3
☐	Any proposed diversion of drainage catchment areas from one outlet to another.	N/A
☐	Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	N/A
☐	If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.	N/A
☐	Identification of potential impacts to receiving watercourses	N/A
☐	Identification of municipal drains and related approval requirements.	N/A

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

☒	Descriptions of how the conveyance and storage capacity will be achieved for the development.	Section 5.3
☐	100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	N/A
☐	Inclusion of hydraulic analysis including hydraulic grade line elevations.	N/A
☒	Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Section 6.0
☐	Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	N/A
☐	Identification of fill constraints related to floodplain and geotechnical investigation.	N/A

4.5 Approval and Permit Requirements: Checklist

☒	Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement ct. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.	Section 1.2
☐	Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	N/A
☐	Changes to Municipal Drains.	N/A
☐	Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	N/A

4.6 Conclusion Checklist

☒	Clearly stated conclusions and recommendations	Section 8.0
☐	Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	
☐	All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario	

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

Steve Merrick

From: Moodie, Derrick <Derrick.Moodie@ottawa.ca>
Sent: Tuesday, January 17, 2017 4:44 PM
To: Adam Fobert
Cc: Steve Pichette
Subject: RE: 5 Orchard Drive

Further to your conversation with Steve Pichette earlier today, please find below a summary of our servicing inquiries.

1) Water: We have discussed water connections with Santhosh. He has confirmed that we cannot connect to the existing 762mm diameter watermain. We anticipate that the contemplated development will involve more than 50units and therefore requires a looped connection. Santosh has indicated that Sweetnam is available, however connecting to this location involves crossing Poole Creek. We propose that we make a looped connection to Fringewood. Note that the Fringewood main is part of robust looped system with connections to Sweetnam and Iber, via Harry Douglas as well as Abott via Granite Ridge.
   Agree, As long as the applicant/consultant demonstrate that the connection to water main on Fringewood meet the water demand and pressure requirements

2) Storm: There is limited background information available for the existing storm sewers on Hazeldean. Santhosh is providing us with a report that was an earlier version of the materials submitted to the MOE. However, the materials are not the final approved plans / report. We are in possession of a background report for the Hazeldean Road widening, the appendices have been scanned and are not legible. DSEL have completed a review of the drainage on the site. It appears that drainage from the existing site is being picked up by ditch inlet catchbasins. Our preliminary analysis of the capacity of the sewers shows that the site has been accommodated for. We require confirmation that no additional quality treatment is necessary and that the site can be temporarily accommodated within the existing temporary facilitate on Hazeldean (250m east of Huntmar). Ultimately this site is part of the drainage area tributary to the future Pond 5 on Richcraft's lands per the KWMS.
   Storm - Based on the available information, I am not sure if the existing storm sewer on Hazeldean Rd. is adequately sized to receive flow from this site. The applicant/consultant needs to clearly demonstrate that the existing storm sewer on Hazeldean Road is adequately sized to receive flow from this site, based on the approved drainage area plan and storm sewer design sheet for the Hazeldean Road widening project.
   Quality treatment – The applicant/consultant needs to consult with Conservation Authority to determine if any quality treatment is required.
   Existing temporary storm pond – The applicant/Consultant needs to demonstrate that the subject land is located within the catchment area of the existing temporary storm pond
   Future pond 5 – The applicant/consultant needs to demonstrate that the subject land/site is located within the catchment area of the future pond 5

3) Sanitary (DC Charges): Can you confirm that no additional fees or charges are required to connect to the Hazeldean sanitary sewer, other than development charges?
   If this site is located within the sanitary catchment area of the Hazeldean sanitary sewer, I don't believe there is a connection fee applicable to this site.

Thank you for your time. Please feel free to contact either myself or Steve Pichette.

Adam Fobert, P.Eng.
Manager of Site Plan Design

DSEL
david schaeffer engineering ltd.

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

office: (613) 836-0856
direct: (613) 836-0626
cell: (613) 222-9493
email: afobert@DSEL.ca

Steve Merrick

To: Adam Fobert
Subject: RE: Pre-Consultation Follow-Up: 5 Orchard Drive

From: McCreight, Laurel [mailto:Laurel.McCreight@ottawa.ca]
Sent: Wednesday, January 10, 2018 4:09 PM
To: Cody Campanale
Subject: Pre-Consultation Follow-Up: 5 Orchard Drive

Hi Cody,

Please refer to the below regarding our Pre-Consultation Meeting on Monday January 8, 2018 on 5 Orchard Drive. I have also attached the Plans & Study List.

General

- Mixed use development of free-hold residential townhomes and semi-detached dwellings on a public road, combined with a commercial component fronting Hazeldean Road
- The commercial component would have two drive-throughs
- Ideally would like to taylor the development to future tenants and configure the concept based on tenants
- Discussion around how to proceed with applications
    - Recommended to file a subdivision application to create the residential lots and one commercial block
    - When a more defined concept has evolved for the commercial block, a site plan application can be filed
    - The site plan can be phased so long as zoning is met
- If the gross floor area of the commercial component exceeds 1,858 square metres (20,000 square feet) the site plan application will be subject to the Urban Design Review Panel because Hazeldean is an Arterial Mainstreet
- Please refer to the link for "Guide to Preparing Studies and Plans" in the attached plan/study list for proper submission requirements
- Digital copies of all plans and studies are to be submitted with the application
- It is suggested to contact the Ward Councillor, Shad Qadri (shad.qadri@ottawa.ca) of your proposal

Planning

- The proposal will be reviewed on OP policies related to General Urban Area (2.5.1 and 4.11) and Arterial Mainstreets (3.6.3) and on following zoning provisions.
- OP section 3.6.1.6 (b, d) is looking for connections for pedestrians and cyclists
- A pedestrian connection from the proposed subdivision to the commercial block should be provided
    - This will provide pedestrians and faster means to access Hazeldean
- Regard for compatibility with existing residential development to the south
- The addition of semi-detached dwellings are not permitted under the current zoning
    - A zoning by-law amendment would be required to add this use
- The treatment of the end units along Fringewood will be an important element
- Attempt to avoid as much of a noise wall as possible along Fringewood
- Please be cognisant of street trees in the townhome scenario (ex. Space and soil volume)
- A possibility could be the introduction of bungalow townhomes
- Parkland dedication is based on 1.0 ha /300 units for residential and 2% of the land value for commercial development

Engineering

- I understand the DSEL has spoken with Santhosh Kuruvilla (please continue to contact Santhosh for engineering matters on this project Santhosh.kuruvilla@ottawa.ca)
- The allowable stormwater release rate must be controlled to the 2-year, 5-year or 10-year pre-development level depending on the design return period of the receiving sewer
- Please demonstrate Hazeldean Road Storm sewers are adequately sized to receive stormwater runoff from this site
- The plans or reports for the Hazeldean Road widening project can be obtained by contacting the City of Ottawa information Centre at informationcentre@ottawa.ca or contact the design consultant McCormick Rankin Corporation
- Hazeldean sanitary sewers are sized to receive flows from this site, however, the sanitary sewers are not operational until the Kanata west pumping station construction is complete (planned to be commissioned in June 2018, subject to change)
    - As an interim solution, you may direct 5 L/S of sanitary flow to the Sweetnam Drive sewer
    - However, this flow needs to be redirected to Hazeldean Rd. sewer once the Kanata west pumping station construction is complete.
- As the Fringewood pumping station is at or near capacity, no sanitary flow can be directed to Fringewood Drive sanitary sewer
- A slope stability analysis may be required to determine the required setback for any proposed buildings from the Poole Creek
- Please contact or pre-consult with the Conservation Authority to determine the stormwater treatment requirement
    - Include the correspondence in the stormwater management/site servicing report.
- Please contact the Ministry of the Environment (MOE) to determine if Environmental Compliance Approval (ECA) is required and ensure that this correspondence is included in the stormwater management/site servicing report.
- Engineering plans must be submitted on standard A1 size (594mm x 841mm) sheets
    - All engineering plans and reports must be signed, sealed, and dated by the engineer of record

Transportation

- Show all road details for Hazeldean and Fringewood when submitting drawings (ie curb line work, pavement markings, median locations, sidewalks, etc)
- Denote lane widths, radii, etc
- ROW protection on Hazeldean 37.5 metres
- Private access minimum distance to signalized intersection as per TAC design
    - On Hazeldean 70 metres
    - On Fringewood 15 metres
- Clear throat length for the commercial block as per TAC design
    - Drive-in >200 square metres needs a 40 metres length clear throat off of an arterial
    - The other two building will be a minimum of 15-2 5metres length clear throat off of an arterial depending on what the uses will be
- Transportation Impact Assessment (TIA) guidelines have been revised
    - Need to see if the development will trigger the need for a TIA to be prepared
- The proposal may require a signalled intersection if placed at Cedarow Court to allow for all directional access- will be need to be addressed in the TIS
- Road modification may be needed if a eastbound right-turn lane is required off of Hazeldean (TIS to confirm)

- Road noise analysis required for residential
- Noise study required for commercial if any of the tenants will be noise sensitive users (ie day care, offices, etc)
- Stationary noise analysis required if there are any exposed mechanical on the commercial building and their impacts to the surrounding noise sensitive land uses.
- Please contact Rosanna Baggs (rosanna.baggs@ottawa.ca) for any transportation related questions

Environmental

- Poole Creek is type 1-2 cold fish habitat
- Please note that setback requirements from Poole Creek is whichever of the following is greater: 30m normal high water mark, floodplain, geotechnical hazard, meaderbelt (65 metres)
- The Poole Creek corridor should be enhanced with native vegetation to supplement existing natural vegetation
    - Please use a naturalization planting plan
- Discussion regarding the spillway (floodplain) onto the property and this could be addressed with MVCA
- An Environmental Impact Statement is required.
    - Please have the report address the potential of endangered and threatened species habitat (e.g., butternut trees, turtles) and wildlife linkage along the Poole Creek corridor
    - Please contact MNRF Kemptville District office to obtain a complete list
- There is a portion of the site that is zoned O1R (Parks & Open Space)
    - This zoning dates back to the Township of Goulbourn and was zoned EPA (Environmental Protection Area) (please see attached screen capture from Township of Goulbourn Zoning By-law 40-99)
    - Based on the development proposed, part of the development is within this zone, which is not permitted (not even backyards)
    - Should you wish to amend this zone, a Zoning By-law Amendment is required
    - The removal of this zone would have to be rationalized in the EIS
- OP sections 2.4.5 and 4.6.3.4: Public access to shorelines along all waterways which is accomplished by requiring that the land be dedicated
    - The dedicates lands should be accessible from a public road
- Tree retention along creek corridor is required
    - Please consider tree retention near rear property lines, future parklands, and where appropriate.
- A tree permit is needed to remove trees 10 cm in diameter or larger
- A Tree Conservation Report can be combined with the Environmental Impact Statement.
- The information required in a Tree Conservation Report:
    - Tree species, diameter and health condition
    - Trees proposed for retention or removal
    - Protection details of retained trees
- For more information on the process or help with tree retention options, contact Mark Richardson mark.richardson@ottawa.ca

Mississippi Valley Conservation Authority

- Meeting held with the applicant and MVCA prior to the Christmas holidays
- Email from Niall Oddie attached

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

Regards,
Laurel

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

City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 16587

ottawa.ca/planning / ottawa.ca/urbanisme

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Genavieve Melatti

From: Nader Nakhaei <NNakhaei@mvc.on.ca>
Sent: Tuesday, June 5, 2018 9:32 AM
To: Genavieve Melatti
Cc: Steve Merrick
Subject: RE: 5 Orchard Drive

Hi Genavieve,

The stormwater quality target for the Carp River is a 'Normal' Level of Protection (i.e. 70% TSS removal). Please let me know if you have any further question or concern.

Cheers,

Nader Nakhaei, Ph.D. | Postdoctoral Felllow / Water Resources Engineer (EIT) | Mississippi Valley Conservation Authority
www.mvc.on.ca | t. 613 253 0006 ext. 259 | f. 613 253 0122 | NNakhaei@mvc.on.ca

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From: Genavieve Melatti [mailto:GMelatti@dsel.ca]
Sent: Tuesday, June 5, 2018 9:14 AM
To: Nader Nakhaei <NNakhaei@mvc.on.ca>
Cc: Steve Merrick <SMerrick@dsel.ca>
Subject: 5 Orchard Drive

Good morning Nader,

We wanted to touch base with you regarding 5 Orchard Drive.

The development proposes a residential component consisting of 65 townhomes, 2 semi-detached homes and 7 single family residences. It also contemplates a future commercial component. The development will discharge stormwater into the existing 675 mm diameter storm sewer within Hazeldean Road. Stormwater collected form site travels approximately 0.7 km before discharging into a pond on the north side of Hazeldean Road show below. Discharge from the pond travels an additional 0.97m through an open ditch to Carp River.

Can you please confirm the TSS removal required and what quality controls may be required?

Please feel free to let me know if you have any questions or would like to discuss.

Thank you,

Genavieve Melatti
Project Coordinator/ Junior Designer

DSEL
david schaeffer engineering ltd.

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

phone: (613) 836-0856 ext. 569
email: gmelatti@DSEL.ca

APPENDIX B

Water Supply

WEST

350-015

3W

3W PRESSURE ZONE

2016 Water Distribution System

Department of Infrastructure Services

This map was compiled from existing & collected engineering Information from the City of Ottawa Geographic Information System and is protected by copyright. The location of Infrastructure is approximate and should not be used for construction purposes.

Scale 1:2500

Ottawa

Legend

- Public Hydrant
- Private Hydrant
- Summer only Flusher Hydrant
- Flusher Hydrant
- Acoustic Fibre Optic
- Gate Valve
- Tapping Valve
- Butterfly Valve (B)
- Buried Valve (BU)
- Drain Pipe
- Check Valve (CV)
- Closed Valve (CL)
- Drain-Out Valve (D)
- Left Hand Valve (L)
- Spot Elevation (X 84.9)
- Pressure Reducing Valve (P)
- Air Relief Valve (A)
- Bypass Valve (Y)
- Feedermain Valve (F000)
- Inspection Plate (IP 363)
- Cap
- Reducer
- Jump
- Water Meter (M)
- Water Service
- Backbone Pipe
- 203 PVC-1981 Watermain with Pipe Diameter, Material and Install Year
- Pipe Casing
- 2W Pressure Zone Delineation and Identifier
- Well (W)
- Elevated Tank (T)
- Water Pumping Station (PS)
- Water Reservoir
- Water Treatment Plant (WTP)

Pipe Equivalents

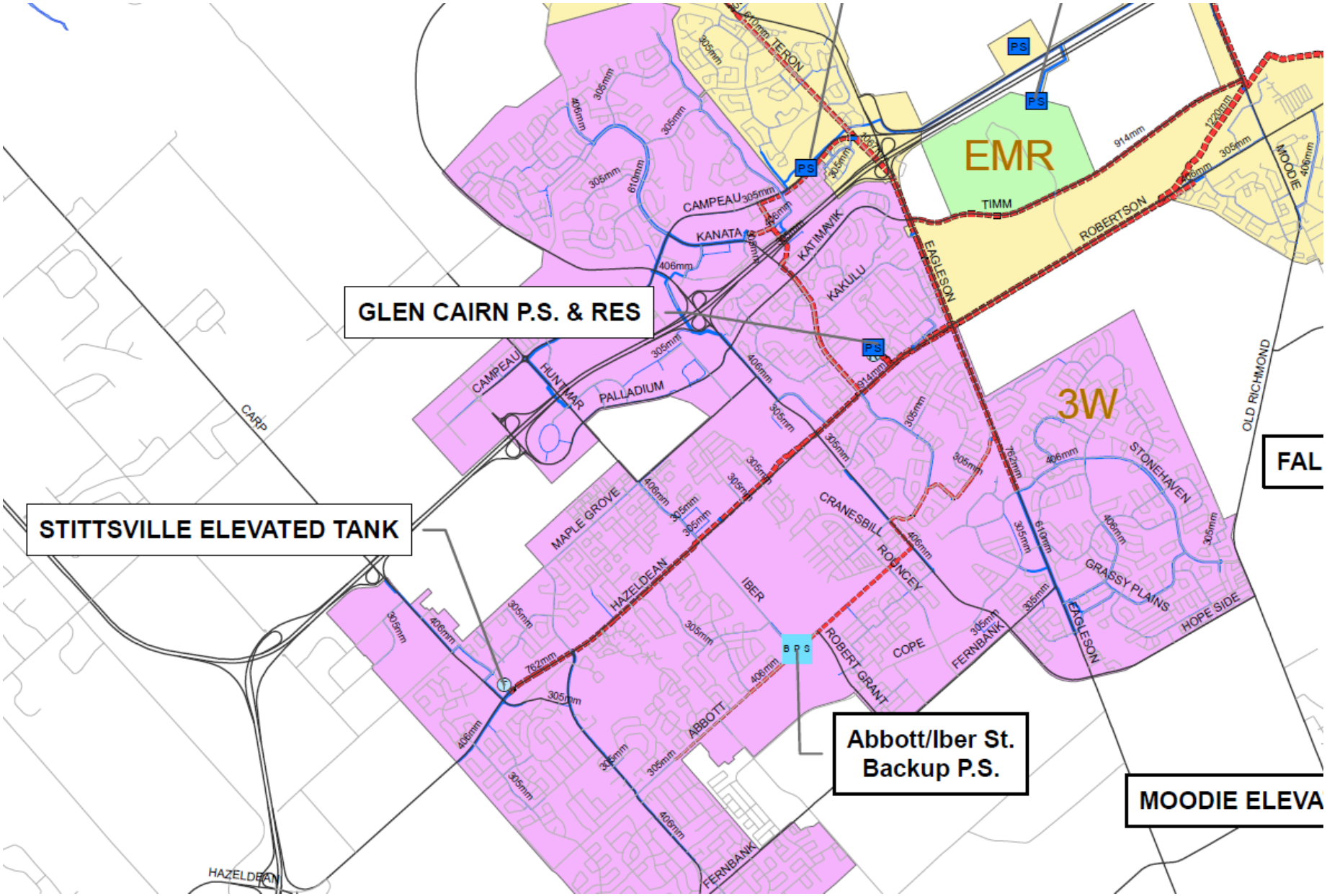
nominal (mm)	actual (inches)	nominal (mm)	actual (inches)	nominal (mm)	actual (inches)
100	4	675	27	1800	72
150	6	750	30	1950	78
200	8	825	33	2025	80
250	10	900	36	2100	84
300	12	975	39	2250	90
375	15	1050	42	2400	96
400	16	1200	48	2550	102
450	18	1350	54	2700	108
525	21	1500	60	2850	114
600	24	1650	66	3000	120

Pipe Materials

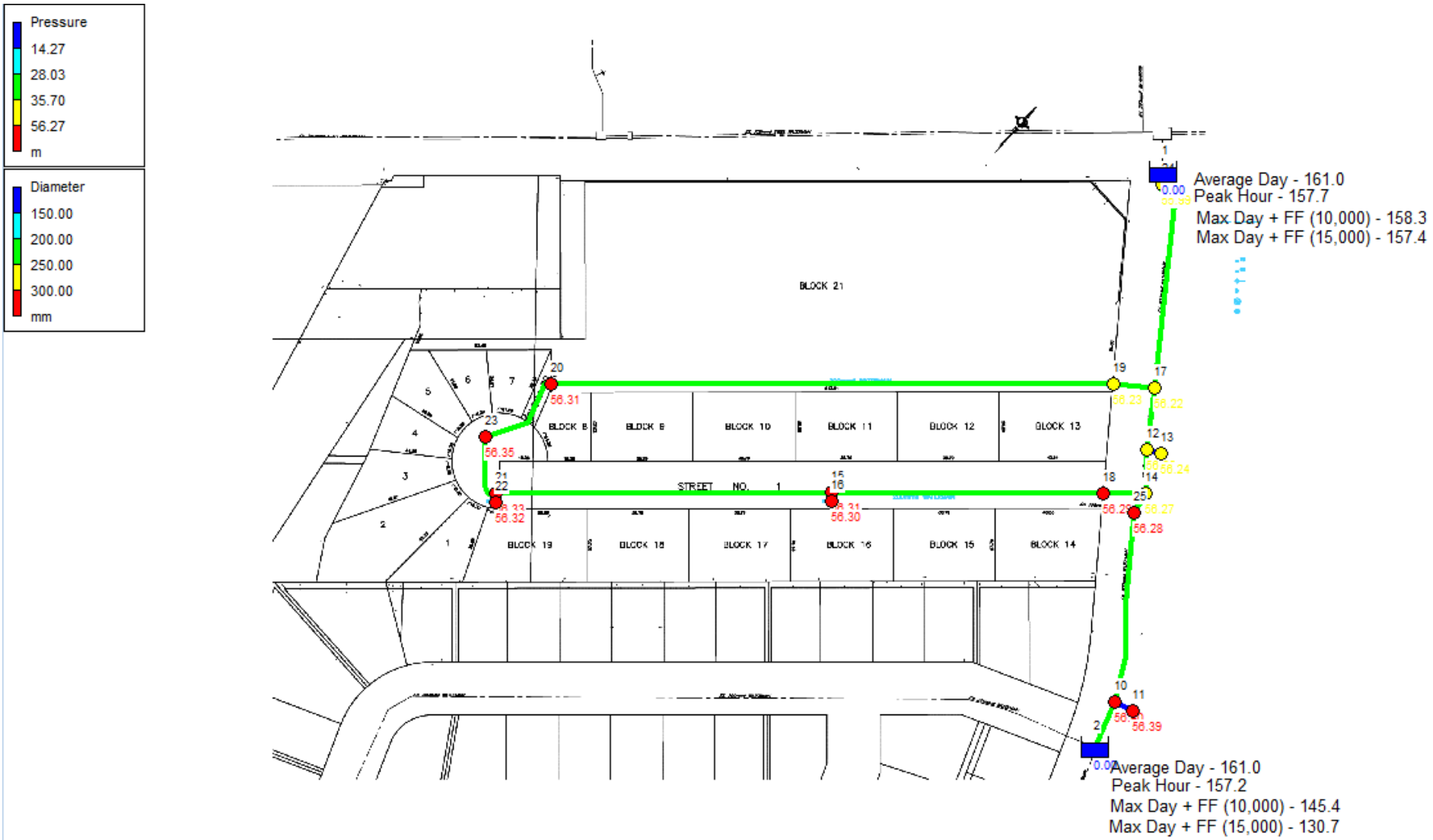
A - ASBESTOS
CI - CAST IRON
CO - COPPER
CO0 - AWWA C300
CO1 - AWWA C301
CO2 - AWWA C302
CO3 - AWWA C303
DI - DUCTILE IRON
PE - POLYETHYLENE (DR11 TO DR21)
PVC - POLYVINYL CHLORIDE
STC - CONCRETE LINED STEEL PIPE
UCI - UNLINED CAST IRON
UNK - UNKNOWN MATERIAL

348-016	350-016	352-016
348-015	350-015	352-015
348-014	350-014	352-014

Pressure Zone Map



Average Day


Pressure
14.27
28.03
35.70
56.27
m
Diameter
150.00
200.00
250.00
300.00
mm
BLOCK 21
BLOCK 8
BLOCK 9
BLOCK 10
BLOCK 11
BLOCK 12
BLOCK 13
BLOCK 19
BLOCK 18
BLOCK 17
BLOCK 16
BLOCK 15
BLOCK 14
STREET NO. 1
Average Day - 161.0
Peak Hour - 157.7
Max Day + FF (10,000) - 158.3
Max Day + FF (15,000) - 157.4
Average Day - 161.0
Peak Hour - 157.2
Max Day + FF (10,000) - 145.4
Max Day + FF (15,000) - 130.7

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*                            E P A N E T                             *
*                     Hydraulic and Water Quality                    *
*                     Analysis for Pipe Networks                     *
*                           Version 2.0                              *
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Input File: 2018-05-29_1006_avg-day_ggm.net
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Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	1	24	1	200
2	24	17	79.9	200
3	17	19	16.23	200
4	19	20	213.04	200
5	20	23	35.73	200
6	23	21	24.78	200
7	21	22	1000	12
8	21	15	127.54	200
9	15	16	1000	12
10	15	18	103.24	200
11	18	14	15.79	200
12	17	12	24.29	200
13	12	13	1000	12
14	12	14	16.35	200
15	14	25	8.96	200
16	25	10	72.63	200
17	10	11	1000	12
18	10	2	18.42	200

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality
10	0.00	161.00	56.40	0.00
11	0.00	161.00	56.39	0.00
12	0.00	161.00	56.25	0.00
13	0.00	161.00	56.24	0.00
14	0.00	161.00	56.27	0.00
15	10.03	161.00	56.31	0.00
16	0.00	161.00	56.30	0.00

17	0.00	161.00	56.22	0.00
18	10.03	161.00	56.29	0.00
19	31.10	161.00	56.23	0.00
20	0.00	161.00	56.31	0.00
21	10.03	161.00	56.33	0.00
22	0.00	161.00	56.32	0.00

Node Results: (continued)

Node ID	Demand LPM	Head m	Pressure m	Quality	
23	10.03	161.00	56.35	0.00	
24	0.00	161.00	55.99	0.00	
25	0.00	161.00	56.28	0.00	
1	-38.32	161.00	0.00	0.00	Reservoir
2	-32.91	161.00	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
1	38.32	0.02	0.00	Open
2	38.32	0.02	0.01	Open
3	41.95	0.02	0.01	Open
4	10.85	0.01	0.00	Open
5	10.85	0.01	0.00	Open
6	0.82	0.00	0.00	Open
7	0.00	0.00	0.00	Open
8	-9.21	0.00	0.00	Open
9	0.00	0.00	0.00	Open
10	-19.25	0.01	0.00	Open
11	-29.28	0.02	0.00	Open
12	-3.63	0.00	0.00	Open
13	0.00	0.00	0.00	Open
14	-3.63	0.00	0.00	Open
15	-32.91	0.02	0.01	Open
16	-32.91	0.02	0.00	Open
17	0.00	0.00	0.00	Open
18	-32.91	0.02	0.00	Open

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*                          E P A N E T                       *
*                  Hydraulic and Water Quality               *
*                  Analysis for Pipe Networks                *
*                        Version 2.0                         *
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Input File: 2018-05-29_1006_avg-day_ggm.net

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	1	24	1	200
2	24	17	79.9	200
3	17	19	16.23	200
4	19	20	213.04	200
5	20	23	35.73	200
6	23	21	24.78	200
7	21	22	2.13	150
8	21	15	127.54	200
9	15	16	2.13	150
10	15	18	103.24	200
11	18	14	15.79	200
12	17	12	24.29	200
13	12	13	2.94	150
14	12	14	16.35	200
15	14	25	8.96	200
16	25	10	72.63	200
17	10	11	3	150
18	10	2	18.42	200

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality hours
10	0.00	161.00	56.40	0.00
11	0.00	161.00	56.39	0.00
12	0.00	161.00	56.25	0.00
13	0.00	161.00	56.24	0.00
14	0.00	161.00	56.27	0.00
15	10.03	161.00	56.31	0.00
16	0.00	161.00	56.30	0.00

17	0.00	161.00	56.22	0.00
18	10.03	161.00	56.29	0.00
19	31.10	161.00	56.23	0.00
20	0.00	161.00	56.31	0.00
21	10.03	161.00	56.33	0.00
22	0.00	161.00	56.32	0.00

Page 2

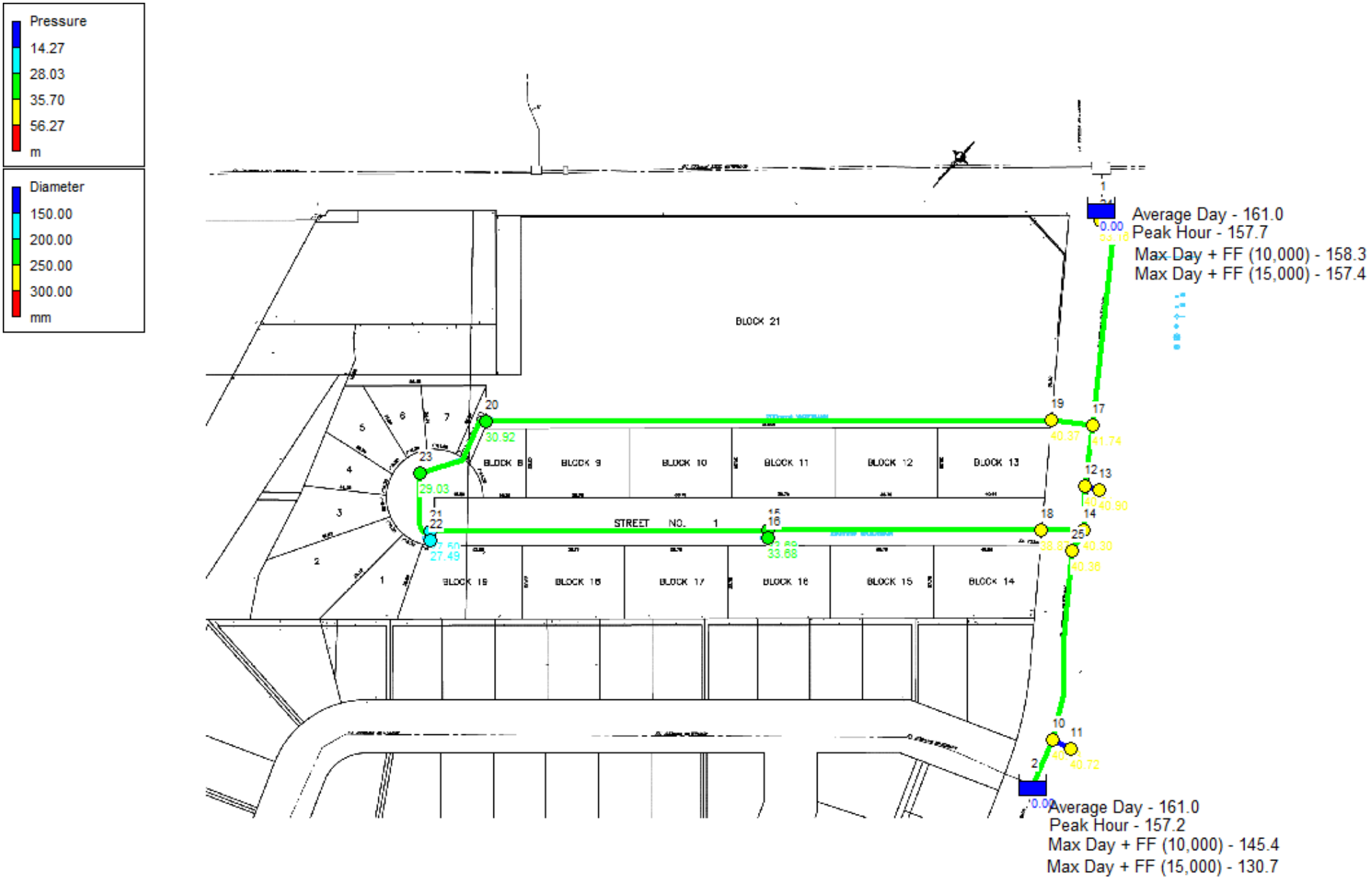
Node Results: (continued)

Node ID	Demand LPM	Head m	Pressure m	Quality hours	
23	10.03	161.00	56.35	0.00	
24	0.00	161.00	55.99	0.00	
25	0.00	161.00	56.28	0.00	
1	-38.32	161.00	0.00	0.00	Reservoir
2	-32.91	161.00	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
1	38.32	0.02	0.00	Open
2	38.32	0.02	0.01	Open
3	41.95	0.02	0.01	Open
4	10.85	0.01	0.00	Open
5	10.85	0.01	0.00	Open
6	0.82	0.00	0.00	Open
7	0.00	0.00	0.00	Open
8	-9.22	0.00	0.00	Open
9	0.00	0.00	0.00	Open
10	-19.25	0.01	0.00	Open
11	-29.28	0.02	0.00	Open
12	-3.63	0.00	0.00	Open
13	0.00	0.00	0.00	Open
14	-3.63	0.00	0.00	Open
15	-32.91	0.02	0.01	Open
16	-32.91	0.02	0.00	Open
17	0.00	0.00	0.00	Open
18	-32.91	0.02	0.00	Open

Max Daily Demand + Fire Flow (10,000L/min)



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

Input File: 2018-05-29_1006_max-day+ff-10000_ggm.net

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	1	24	1	200
2	24	17	79.9	200
3	17	19	16.23	200
4	19	20	213.04	200
5	20	23	35.73	200
6	23	21	24.78	200
7	21	22	2.13	150
8	21	15	127.54	200
9	15	16	2.13	150
10	15	18	103.24	200
11	18	14	15.79	200
12	17	12	24.29	200
13	12	13	2.94	150
14	12	14	16.35	200
15	14	25	8.96	200
16	25	10	72.63	200
17	10	11	3	150
18	10	2	18.42	200

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality hours
10	0.00	145.33	40.73	0.00
11	0.00	145.33	40.72	0.00
12	0.00	145.66	40.91	0.00
13	0.00	145.66	40.90	0.00
14	0.00	145.03	40.30	0.00
15	36.05	138.38	33.69	0.00
16	0.00	138.38	33.68	0.00

17	0.00	146.52	41.74	0.00
18	36.05	143.58	38.87	0.00
19	46.70	145.14	40.37	0.00
20	0.00	135.61	30.92	0.00
21	10036.05	132.17	27.50	0.00
22	0.00	132.17	27.49	0.00

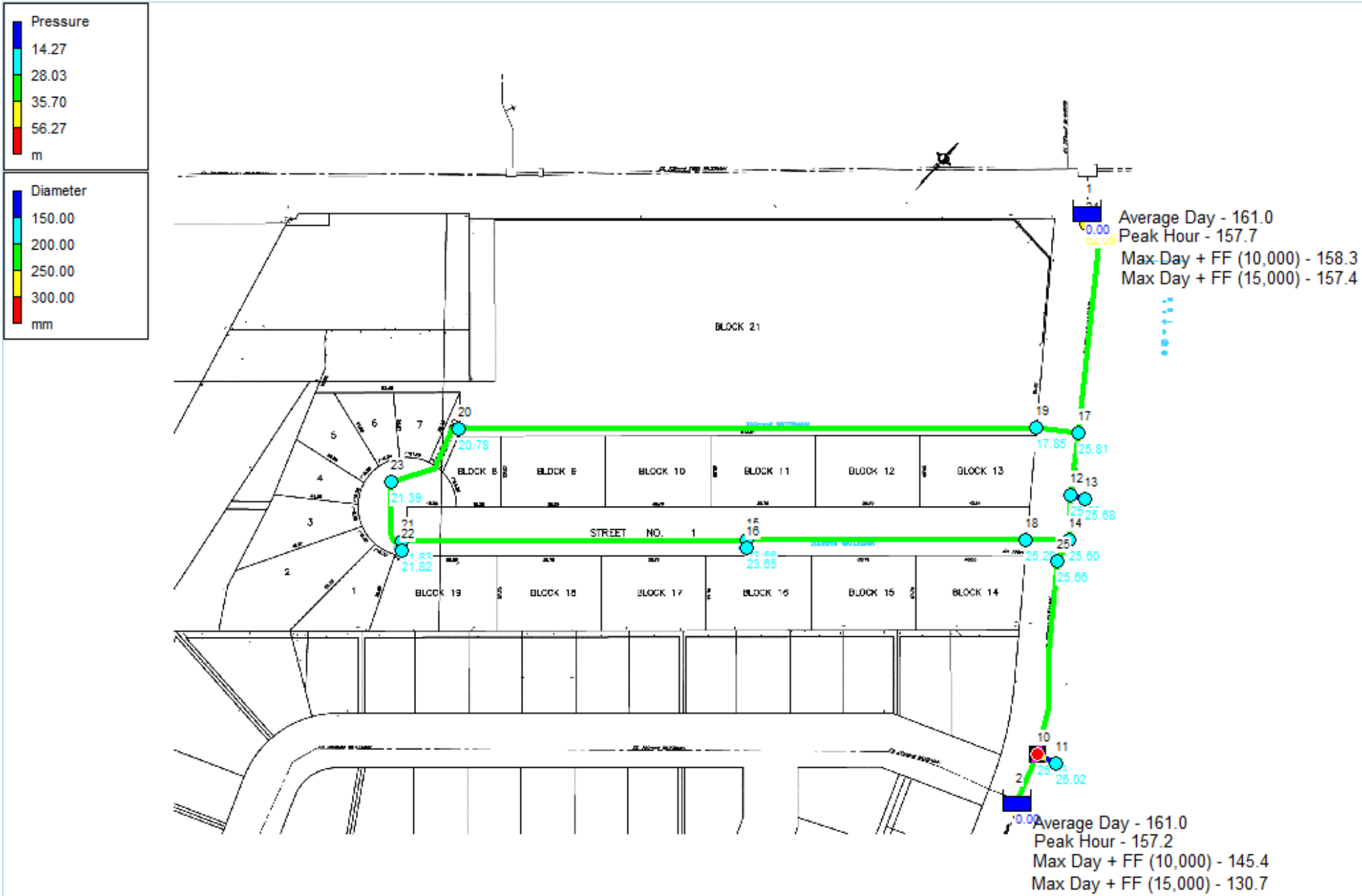
Node Results: (continued)

Node ID	Demand LPM	Head m	Pressure m	Quality hours	
23	36.05	133.68	29.03	0.00	
24	0.00	158.17	53.16	0.00	
25	0.00	145.08	40.36	0.00	
1	-9012.55	158.30	0.00	0.00	Reservoir
2	-1178.35	145.40	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
1	9012.55	4.78	134.06	Open
2	9012.55	4.78	145.72	Open
3	5008.78	2.66	85.06	Open
4	4962.08	2.63	44.72	Open
5	4962.08	2.63	54.27	Open
6	4926.03	2.61	60.64	Open
7	0.00	0.00	0.00	Open
8	-5110.02	2.71	48.63	Open
9	0.00	0.00	0.00	Open
10	-5146.07	2.73	50.43	Open
11	-5182.12	2.75	91.99	Open
12	4003.78	2.12	35.51	Open
13	0.00	0.00	0.00	Open
14	4003.77	2.12	38.27	Open
15	-1178.35	0.63	5.32	Open
16	-1178.35	0.63	3.43	Open
17	0.00	0.00	0.00	Open
18	-1178.35	0.63	3.75	Open

Max Daily Demand + Fire Flow (15,000L/min)



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

Input File: 2018-05-29_1006_max-day+ff-15000_ggm.net

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	1	24	1	200
2	24	17	79.9	200
3	17	19	16.23	200
4	19	20	213.04	200
5	20	23	35.73	200
6	23	21	24.78	200
7	21	22	2.13	150
8	21	15	127.54	200
9	15	16	2.13	150
10	15	18	103.24	200
11	18	14	15.79	200
12	17	12	24.29	200
13	12	13	2.94	150
14	12	14	16.35	200
15	14	25	8.96	200
16	25	10	72.63	200
17	10	11	3	150
18	10	2	18.42	200

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality hours
10	0.00	130.63	26.03	0.00
11	0.00	130.63	26.02	0.00
12	0.00	130.44	25.69	0.00
13	0.00	130.44	25.68	0.00
14	0.00	130.33	25.60	0.00
15	36.05	128.35	23.66	0.00
16	0.00	128.35	23.65	0.00

17	0.00	130.59	25.81	0.00
18	36.05	129.91	25.20	0.00
19	15046.70	122.62	17.85	0.00
20	0.00	125.47	20.78	0.00
21	36.05	126.50	21.83	0.00
22	0.00	126.50	21.82	0.00

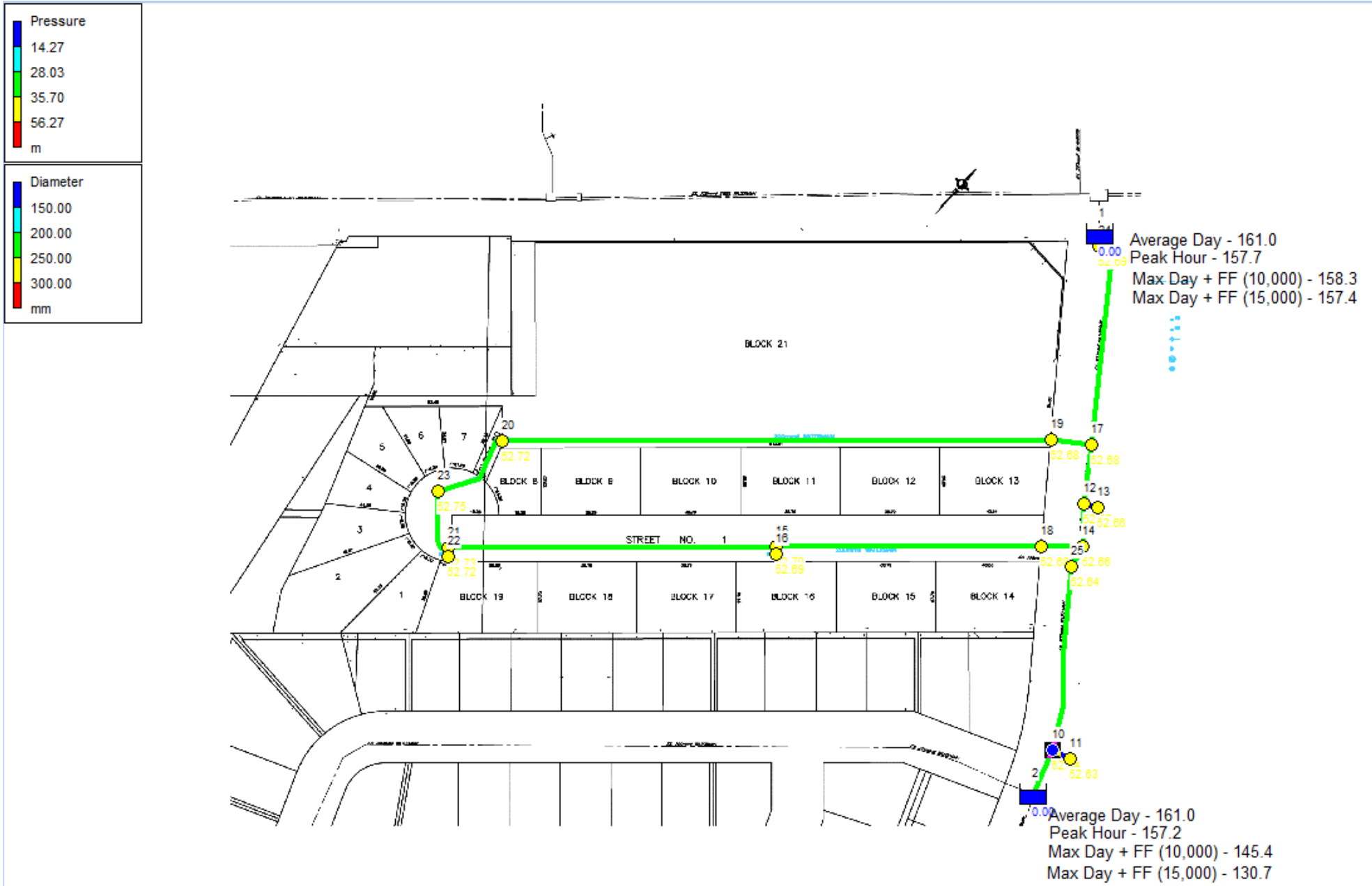
Node Results: (continued)

Node ID	Demand LPM	Head m	Pressure m	Quality hours	
23	36.05	126.04	21.39	0.00	
24	0.00	157.10	52.09	0.00	
25	0.00	130.38	25.66	0.00	
1	-14012.95	157.40	0.00	0.00	Reservoir
2	-1177.95	130.70	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
1	14012.95	7.43	303.59	Open
2	14012.95	7.43	331.79	Open
3	12458.20	6.61	490.96	Open
4	-2588.50	1.37	13.39	Open
5	-2588.50	1.37	15.99	Open
6	-2624.55	1.39	18.43	Open
7	0.00	0.00	0.00	Open
8	-2660.60	1.41	14.47	Open
9	0.00	0.00	0.00	Open
10	-2696.65	1.43	15.16	Open
11	-2732.70	1.45	26.91	Open
12	1554.75	0.82	6.03	Open
13	0.00	0.00	0.00	Open
14	1554.75	0.82	6.45	Open
15	-1177.95	0.62	5.32	Open
16	-1177.95	0.62	3.42	Open
17	0.00	0.00	0.00	Open
18	-1177.95	0.62	3.74	Open

Peak Hour


Pressure
14.27
28.03
35.70
56.27
m
Diameter
150.00
200.00
250.00
300.00
mm
BLOCK 21
BLOCK 8
BLOCK 9
BLOCK 10
BLOCK 11
BLOCK 12
BLOCK 13
STREET NO. 1
BLOCK 19
BLOCK 18
BLOCK 17
BLOCK 16
BLOCK 15
BLOCK 14
Average Day - 161.0
Peak Hour - 157.7
Max Day + FF (10,000) - 158.3
Max Day + FF (15,000) - 157.4
Average Day - 161.0
Peak Hour - 157.2
Max Day + FF (10,000) - 145.4
Max Day + FF (15,000) - 130.7

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

Input File: 2018-06-04_1006_peak-hour_ggm.net

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	1	24	1	200
2	24	17	79.9	200
3	17	19	16.23	200
4	19	20	213.04	200
5	20	23	35.73	200
6	23	21	24.78	200
7	21	22	2.13	150
8	21	15	127.54	200
9	15	16	2.13	150
10	15	18	103.24	200
11	18	14	15.79	200
12	17	12	24.29	200
13	12	13	2.94	150
14	12	14	16.35	200
15	14	25	8.96	200
16	25	10	72.63	200
17	10	11	3	150
18	10	2	18.42	200

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality hours
10	0.00	157.24	52.64	0.00
11	0.00	157.24	52.63	0.00
12	0.00	157.42	52.67	0.00
13	0.00	157.42	52.66	0.00
14	0.00	157.39	52.66	0.00
15	54.08	157.39	52.70	0.00
16	0.00	157.39	52.69	0.00

17	0.00	157.46	52.68	0.00
18	54.08	157.39	52.68	0.00
19	84.00	157.45	52.68	0.00
20	0.00	157.41	52.72	0.00
21	54.08	157.40	52.73	0.00
22	0.00	157.40	52.72	0.00

Node Results: (continued)

Node ID	Demand LPM	Head m	Pressure m	Quality hours	
23	54.08	157.40	52.75	0.00	
24	0.00	157.70	52.69	0.00	
25	0.00	157.36	52.64	0.00	
1	-1123.27	157.70	0.00	0.00	Reservoir
2	822.95	157.20	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
1	1123.27	0.60	2.83	Open
2	1123.27	0.60	3.02	Open
3	339.29	0.18	0.49	Open
4	255.29	0.14	0.18	Open
5	255.29	0.14	0.21	Open
6	201.21	0.11	0.15	Open
7	0.00	0.00	0.00	Open
8	147.13	0.08	0.07	Open
9	0.00	0.00	0.00	Open
10	93.05	0.05	0.03	Open
11	38.97	0.02	0.01	Open
12	783.98	0.42	1.67	Open
13	0.00	0.00	0.00	Open
14	783.98	0.42	1.78	Open
15	822.95	0.44	2.68	Open
16	822.95	0.44	1.75	Open
17	0.00	0.00	0.00	Open
18	822.95	0.44	1.91	Open

Campanale Homes
5 Orchard Drive
Proposed Site Conditions

Water Demand Design Flows per Unit Count
City of Ottawa - Water Distribution Guidelines, July 2010

Domestic Demand

Type of Housing	Per / Unit	Units	Pop
Single Family	3.4	7	24
Semi-detached	2.7	2	6
Townhouse	2.7	65	176
Apartment			0
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8		0

	Pop	Avg. Daily		Max Day		Peak Hour	
		m^3/d	L/min	m^3/d	L/min	m^3/d	L/min
Total Domestic Demand	206	57.7	40.1	207.6	144.2	311.5	216.3

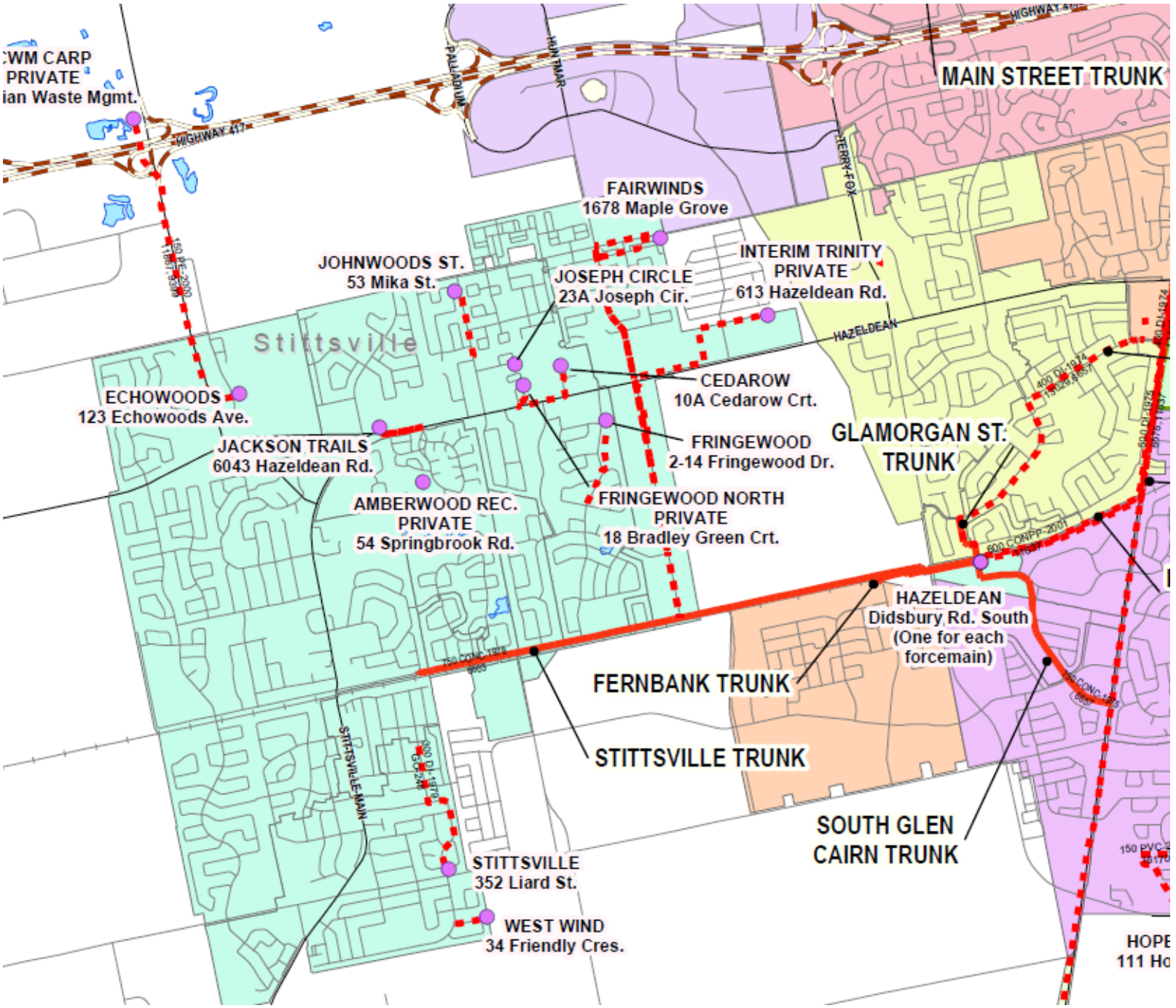
Institutional / Commercial / Industrial Demand

				Avg. Daily		Max Day		Peak Hour	
Property Type	**Unit Rate**		**Units**	m^3/d	L/min	m^3/d	L/min	m^3/d	L/min
Commercial Space	28,000.0	L/ha/d	2	44.80	31.1	67.2	46.7	121.0	84.0
Office	75	L/9.3m^2/d		0.00	0.0	0.0	0.0	0.0	0.0
Industrial - Light	35,000	L/gross ha/d		0.00	0.0	0.0	0.0	0.0	0.0
Industrial - Heavy	55,000	L/gross ha/d		0.00	0.0	0.0	0.0	0.0	0.0
Total I/CI Demand				44.8	31.1	67.2	46.7	121.0	84.0
Total Demand				**102.5**	**71.2**	**274.8**	**190.9**	**432.4**	**300.3**

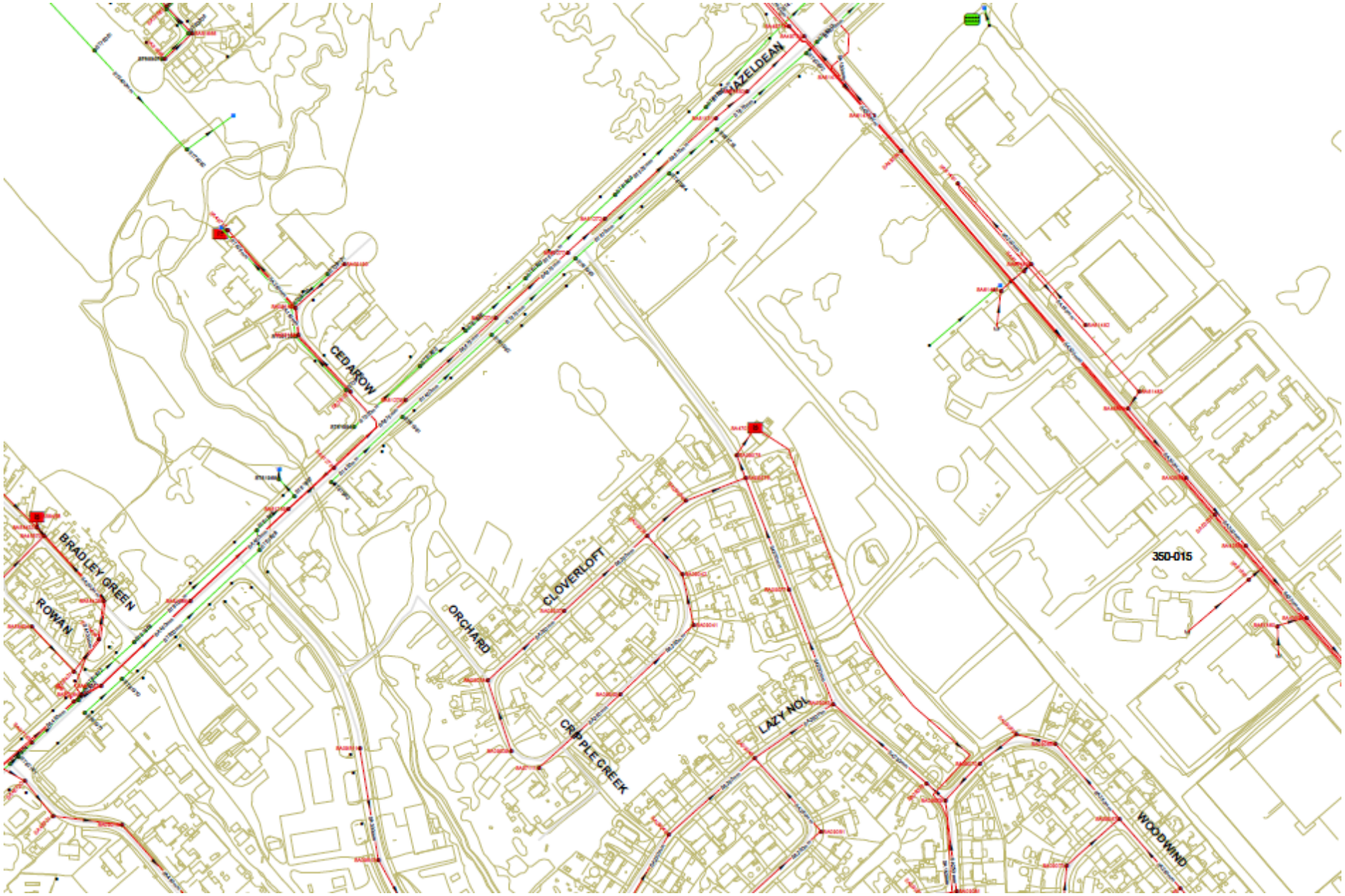
APPENDIX C

Wastewater Collection

Trunk Sanitary Sewers and Collection Areas Map



Existing Sanitary Map



Campanale Homes
5 Orchard Drive
Contemplated Flow to Fut. Fringewood Sanitary Sewer

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

Site Area 4.060 **ha**

Extraneous Flow Allowances

Infiltration / Inflow **1.30 L/s**

Domestic Contributions

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

Total Pop **361.8**

Average Domestic Flow **1.17 L/s**

Peaking Factor **3.43**

Peak Domestic Flow **4.03 L/s**

Institutional / Commercial / Industrial Contributions

Property Type	Unit Rate	No. of Units	Avg Wastewater (L/s)
Commercial floor space	28,000 L/ha/d	1.83	0.59
Pool	40 L/9.3m^2/d		0.00
Office	75 L/9.3m^2/d		0.00
Ex. Industrial - Light**	35,000 L/gross ha/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 **0.59**

Peak Institutional / Commercial Flow 0.89
Peak Industrial Flow** 0.00
Peak I/C/I Flow **0.89**

** 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	**1.77 L/s**
Total Estimated Peak Dry Weather Flow Rate	**4.92 L/s**
Total Estimated Peak Wet Weather Flow Rate	**6.22 L/s**

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

Site Area 3.980 **ha**

Extraneous Flow Allowances

Infiltration / Inflow **1.27 L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	Pop
Single Family	3.4	7	24
Semi-detached and duplex	2.7	2	6
Townhouse	2.7	65	176
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8		0

Total Pop **206**

Average Domestic Flow **0.67 L/s**

Peaking Factor **3.51**

Peak Domestic Flow **2.35 L/s**

Institutional / Commercial / Industrial Contributions

Property Type	Unit Rate		No. of Units	Avg Wastewater (L/s)
Commercial floor space	28,000	L/ha/d	1.83	0.59
Pool	40	L/9.3m^2/d		0.00
Office	75	L/9.3m^2/d		0.00
Ex. Industrial - Light**	35,000	L/gross ha/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 **0.59**

Peak Institutional / Commercial Flow 0.89
Peak Industrial Flow** 0.00
Peak I/C/I Flow **0.89**

*** peak industrial flow per City of Ottawa Sewer Design Guidelines Appendix 4B*

Total Estimated Average Dry Weather Flow Rate	**1.26 L/s**
Total Estimated Peak Dry Weather Flow Rate	**3.24 L/s**
Total Estimated Peak Wet Weather Flow Rate	**4.51 L/s**

SANITARY SEWER CALCULATION SHEET

CLIENT: **Campanale Homes**
LOCATION: **5 Orchard Drive**
FILE REF: **18-1016**
DATE: **5-Jun-18**

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	Peak Fact. Comm. If (Q_i/Q_{TOTAL}>20%)	1.5	Peak Fact. Comm.	1	Min. Pipe Velocity	0.60	m/s full flowing
Avg. Daily Flow Instit.	28,000	L/ha/d	Peak Fact. Instit. If (Q_i/Q_{TOTAL}>20%)	1.5	Peak Fact. Instit.	1	Max. Pipe Velocity	3.00	m/s full flowing
Avg. Daily Flow Indust	35,000	L/ha/d	Peak Fact. Indust. per MOE graph				Mannings N	0.013	
			Correction Factor K	0.8					

Location			Residential Area and Population									Commercial		Institutional		Industrial			Infiltration				Pipe Data							
Area ID	Up	Down	Area	Number of Units by type				Pop.	Cumulative Area	Cumulative Pop.	Peak. Fact.	Q_{res}	Area	Accu. Area	Area	Accu. Area	Area	Accu. Area	Q_{C+I+I}	Total Area	Accu. Area	Infiltration Flow	Total Flow	DIA	Slope	Length	$A_{hydraulic}$	R	Velocity	Q_{cap}	Q / Q full
			(ha)	Singles	Semi's	Town's	Apt's		(ha)		(-)	(L/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(ha)	(ha)	(L/s)	(L/s)	(mm)	(%)	(m)	(m^2)	(m)	(m/s)	(L/s)	(-)
SAN1	SAN101	SAN102	1.30	7	2	30		110.0	1.3	110.0	3.59	1.28	0.00	0.00	0.00	0.00	0.00	0.00	0.0	1.298	1.298	0.428	1.71	200	0.65	117.5	0.031	0.050	0.84	26.4	0.06
SAN2	SAN102	FUT.SAN103	0.85			35		95.0	2.146	205.0	3.52	2.34		0.00		0.00		0.00	0.0	0.848	2.146	0.708	3.04	200	1.76	118.5	0.031	0.050	1.39	43.5	0.07
	EX.SAN1	FUT.SAN103	0.000					0.0	0.000	0.0	3.80	0.00		0.00		0.00		0.00	0.0	0.000	0.000	0.000	0.00	250	0.96	76.7	0.049	0.063	1.19	58.3	0.00
	FUT.SAN103	FUT.SAN104	0.00					0.0	2.146	205.0	3.52	2.34		0.00		0.00		0.00	0.0	0.000	2.146	0.708	3.04	250	0.96	43.0	0.049	0.063	1.19	58.3	0.05
SAN3	SAN105	FUT.SAN104	0.00					0.0	0.000	0.0	3.80	0.00	1.83	1.83	0.00	0.00	0.00	0.00	0.9	1.828	1.828	0.603	1.49	200	2.00	14.2	0.031	0.050	1.48	46.4	0.03
	FUT.SAN104	FUT.SAN106	0.00					0.0	2.146	205.0	3.52	2.34		1.83		0.00		0.00	0.9	0.000	3.974	1.311	4.54	250	0.96	31.5	0.049	0.063	1.19	58.3	0.08
	FUT.SAN106	FUT. SAN107	0.00					0.0	2.146	205.0	3.52	2.34		1.83		0.00		0.00	0.9	0.000	3.974	1.311	4.54	250	0.96	37.0	0.049	0.063	1.19	58.3	0.08

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M E M O R A N D U M

DATE: MAY 16, 2018

TO: JEFF DELOYDE, CITY OF OTTAWA

FROM: KRISTYN BOEHME, NOVATECH

RE: WEST END PUMPING STATIONS DECOMMISSIONING & BY-PASS SEWERS
FRINGEWOOD DRIVE BY-PASS SEWER DESIGN

CC: BOB DOWDALL, NOVATECH

1.0 Introduction & Purpose

Novatech has been retained by the City of Ottawa to decommission five (5) pump stations in the Stitsville area, including the facility currently servicing Fringewood Drive and the adjacent streets. As part of the Fringewood pump station decommissioning, a by-pass sewer is required to divert flows from the pump station to the Hazeldean Trunk Sewer. This memo is intended to provide an overview of the new by-pass sewer design.

2.0 Design Criteria

Based on discussions with the City, peak design flows to be for sizing by-pass sewers should consider the following peak flows:

1. Measured Wet Weather Peak Flows (2014 WWF Event)
2. Pump Stations Capacity (from MOE C of A's)
3. Rationale Method using Drainage Areas and Populations

The greatest flow was used to establish the peak design flow to size the sewers.

2.1 Wet Weather Peak Flows

The peak wet weather flows (WWF) from the event of June 24, 2014 was provided by the City of Ottawa. The event peak flow at Fringewood pump station was 33.2L/s.

2.2 Pump Station Capacity

The capacity of the pump station was specified in the corresponding Certificates of Approvals (C of A). The C of A for Fringewood Pump Station is 27L/s.

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2.3 Drainage Areas and Population / Occupancy

Existing Development

The Fringewood area was divided into 14 drainage areas based on placement of the existing sanitary sewers flowing to the pump station and the vacant lands to the west, refer to **Appendix A: Drainage Areas**. Each drainage area was assigned unique Drainage Area ID's for the purposes of identification. Within each drainage area, each building type was defined by single family, semi-detached, duplex, townhouse, or apartment. Based on the building type, a general population density was applied to estimate the existing population. The total flow of the existing sanitary sewers was then calculated using the population of each drainage area, refer to **Appendix B: Sewer Design Sheets**. The total flow based on the existing population is 47.4L/s.

Potential Future Development

As part of the sanitary sewer design, a review of the potential future development within the project limits has been completed to project anticipated users of the underground sanitary sewer system and to ensure the new sewer will accommodate existing, as well as future development users.

The Fringewood area is designated as General Urban Area on Schedule B of the City of Ottawa Official Plan which permits all types and densities of housing, as well as employment, retail uses, service, industrial, cultural, leisure, greenspace, entertainment and institutional uses. However, it is not within the boundaries of a Community Design Plan (CDP) or Secondary Plan. Since the Official Plan designation permits a wide range of uses, existing zoning has been used to determine growth potential.

Fringewood Drive and the neighbouring side streets are an established residential neighbourhood characterized by single detached dwellings. Zoning primarily consists of R1L, with exception to one property with zoning L1 and the lands to the west with zoning AM9. R1 zones permit only single detached dwellings, as well as ancillary uses and generally permitted uses such as secondary suites, group homes, bed and breakfasts, etc. L1 zones permit only recreational uses such as community centres, day care, emergency services, park, etc. AM zones permit a broad range of uses including retail, service commercial, offices, residential and institutional uses in mixed-use buildings, or side by side in separate buildings.

As each lot in the R1 residential zone is currently occupied by a single-detached dwelling, the potential future development was considered negligible and the existing development population was used for future sizing. However, the vacant lands to the west (zoning AM) may undergo significant development in the nearby future. Through discussions with City Planning, it was noted that the lands north of Fringewood Drive (5734/5754 Hazldean Road) have an approved sanitary outlet to the Iber Road sewer system. The development plans for the lands to the south (5 Orchard Drive) are unknown at this time and these flows may be conveyed to the new by-pass sewer. As such, future population growth was estimated for this area.

The subject lands are located adjacent to Hazeldean Road. Given that Hazeldean is a Transit Priority Street, it was assumed the subject sites will develop similar to those neighbouring lands identified in the Fernbank Community Design Plan (CDP). The Fernbank CDP considers land use area for Mixed Use to be 55% residential and 50% commercial. Given the discrepancy, it was assumed 55%

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residential and 45% commercial. **Table 1** below documents the assumptions used to estimate the total projected population of the Subject Lands.

Table 1: Projected Population Assumptions from Fernbank CDP

	Target/gross ha
Land Use Designation	Mixed Use
Land Use: Mixed Use (Residential)	55% of lands
Land Use: Mixed Use (Commercial)	45% of lands
Residential Units	90 (units / ha)
Residential Population per Mixed Use Unit	1.8 (people per unit)
Neighbourhood Commercial	50 (jobs / ha)

The total flow based on the future population is 52.4L/s, refer to **Appendix C: Planning Input.**

3.0 By-Pass Sewer Design

Based on the foregoing analysis, the future drainage areas and population/density resulted with the highest peak flow of 52.4L/s and was used for sizing purposes. A 250mm dia. sanitary sewer can adequately accommodate these flows, refer to **Appendix B: Sewer Design Sheets**.

The proposed alignment will drain northwest on Fringewood Drive from the existing maintenance hole (MHSA 09075) to tie-in to the existing 250mm dia. stub approximately 10m southeast of Hazeldean Road that connects to the Hazeldean Trunk Sewer. The approximate length is 190m with a fixed slope of 0.96% between the upstream invert of MHSA 09075 (102.41m) and the downstream invert of the stub (100.93m).

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Appendix A

Drainage Areas

CITY OF OTTAWA
WEST END PUMP STATION DECOMMISSIONING AND BY-PASS SEWERS

SANITARY DRAINAGE AREA PLAN FRINGEWOOD PUMP STATION

ALAIN C. GONTHIER, P.Eng.	JEFF DELOYDE, P.Eng.
DIRECTOR	*SENIOR ENGINEER*

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Kanata, Ontario, Canada
K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email novatech-eng.com

Ottawa

Contract No.	Dwg. No.
ISD18-XXXX	XXX
Sheet XX of XX	

Asset No.

Asset Group: ISD

Des.	Chk'd.
KB	RJD
Dwn.	Chk'd.
ERA	KB

Utility Circ. No. | Index No.

Const. Inspector

Scale:

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

REVISIONS

No.	Description	By	Date (dd/mm/yy)

NOT FOR CONSTRUCTION

LEGEND

AREA
ID
E.U. | E.P. | F.U. | F.P.

KEYPLAN

M:\2018\118022\CAD\Design\Figures\SAN\118022_SAN_DA.dwg, Fringewood, May 11, 2018 - 9:57am, kboehme

Appendix B

Sewer Design Sheets

SAN 1 - SANITARY SEWER DESIGN SHEET
POPULATION ESTIMATE
JOB# 118022

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Sanitary Area #1 - Fringewood

Address	Type	Pop. Factor	Units	Population
Woodwind Cres				
57	Single Family	3.4	1	3.4
55	Single Family	3.4	1	3.4
53	Single Family	3.4	1	3.4
51	Single Family	3.4	1	3.4
49	Single Family	3.4	1	3.4
47	Single Family	3.4	1	3.4
45	Single Family	3.4	1	3.4
36	Single Family	3.4	1	3.4
32	Single Family	3.4	1	3.4
30	Single Family	3.4	1	3.4
Dowdall Cres				
22	Single Family	3.4	1	3.4
		Total	11	37.4

Sanitary Area #2 - Fringewood

Address	Type	Pop. Factor	Units	Population
Woodwind Cres				
43	Single Family	3.4	1	3.4
28	Single Family	3.4	1	3.4
		Total	2	6.8

Sanitary Area #3 - Fringewood

Address	Type	Pop. Factor	Units	Population
Woodwind Cres				
41	Single Family	3.4	1	3.4
39	Single Family	3.4	1	3.4
37	Single Family	3.4	1	3.4
35	Single Family	3.4	1	3.4
		Total	4	13.6

Summary Charts

Fringewood	Total	
Sanitary Area	**Units**	**Population**
1	11	37.4
2	2	6.8
3	4	13.6
4	17	57.8
5	16	54.4
6	10	34
7	16	54.4
8	19	64.6
9	5	17
10	9	30.6
11	45	153
12	14	44.2
13	50	170
14	0	0
Total	218	737.8

Sanitary Area	Area(m^2)	Area (ha)
1	12836.17	1.28
2	2800.882	0.28
3	6859.468	0.69
4	13284.591	1.33
5	15989.287	1.60
6	10100.535	1.01
7	12626.086	1.26
8	15575.105	1.56
9	5396.262	0.54
10	8788.172	0.88
11	51152.337	5.12
12	19323.086	1.93
13	51670.735	5.17
14	40600	4.06
Total	**267002.72**	26.70

SAN 1 - SANITARY SEWER DESIGN SHEET
POPULATION ESTIMATE
JOB# 118022

NOVATECH
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Sanitary Area #4 - Fringewood

Address	Type	Pop. Factor	Units	Population
Woodwind Cres				
26	Single Family	3.4	1	3.4
24	Single Family	3.4	1	3.4
22	Single Family	3.4	1	3.4
20	Single Family	3.4	1	3.4
18	Single Family	3.4	1	3.4
16	Single Family	3.4	1	3.4
14	Single Family	3.4	1	3.4
12	Single Family	3.4	1	3.4
33	Single Family	3.4	1	3.4
31	Single Family	3.4	1	3.4
29	Single Family	3.4	1	3.4
27	Single Family	3.4	1	3.4
25	Single Family	3.4	1	3.4
23	Single Family	3.4	1	3.4
21	Single Family	3.4	1	3.4
19	Single Family	3.4	1	3.4
17	Single Family	3.4	1	3.4
		Total	17	57.8

Sanitary Area #5 - Fringewood

Address	Type	Pop. Factor	Units	Population
Dowdall Cres				
27	Single Family	3.4	1	3.4
23	Single Family	3.4	1	3.4
20	Single Family	3.4	1	3.4
19	Single Family	3.4	1	3.4
18	Single Family	3.4	1	3.4
16	Single Family	3.4	1	3.4
15	Single Family	3.4	1	3.4
14	Single Family	3.4	1	3.4
12	Single Family	3.4	1	3.4
11	Single Family	3.4	1	3.4
10	Single Family	3.4	1	3.4
8	Single Family	3.4	1	3.4
7	Single Family	3.4	1	3.4
6	Single Family	3.4	1	3.4
4	Single Family	3.4	1	3.4
2	Single Family	3.4	1	3.4
		Total	16	54.4

SAN 1 - SANITARY SEWER DESIGN SHEET
POPULATION ESTIMATE
JOB# 118022

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Sanitary Area #6 - Fringewood

Address	Type	Pop. Factor	Units	Population
Woodwind Cres				
15	Single Family	3.4	1	3.4
13	Single Family	3.4	1	3.4
11	Single Family	3.4	1	3.4
9	Single Family	3.4	1	3.4
8	Single Family	3.4	1	3.4
7	Single Family	3.4	1	3.4
6	Single Family	3.4	1	3.4
5	Single Family	3.4	1	3.4
4	Single Family	3.4	1	3.4
2	Single Family	3.4	1	3.4
		Total	10	34

Sanitary Area #7 - Fringewood

Address	Type	Pop. Factor	Units	Population
Fringewood Dr				
54	Single Family	3.4	1	3.4
53	Single Family	3.4	1	3.4
52	Single Family	3.4	1	3.4
51	Single Family	3.4	1	3.4
50	Single Family	3.4	1	3.4
49	Single Family	3.4	1	3.4
48	Single Family	3.4	1	3.4
47	Single Family	3.4	1	3.4
46	Single Family	3.4	1	3.4
45	Single Family	3.4	1	3.4
44	Single Family	3.4	1	3.4
43	Single Family	3.4	1	3.4
42	Single Family	3.4	1	3.4
41	Single Family	3.4	1	3.4
40	Single Family	3.4	1	3.4
38	Single Family	3.4	1	3.4
		Total	16	54.4

SAN 1 - SANITARY SEWER DESIGN SHEET
POPULATION ESTIMATE
JOB# 118022

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Sanitary Area #8 - Fringewood

Address	Type	Pop. Factor	Units	Population
Poole Creek Cres				
40	Single Family	3.4	1	3.4
41	Single Family	3.4	1	3.4
42	Single Family	3.4	1	3.4
43	Single Family	3.4	1	3.4
44	Single Family	3.4	1	3.4
45	Single Family	3.4	1	3.4
46	Single Family	3.4	1	3.4
47	Single Family	3.4	1	3.4
48	Single Family	3.4	1	3.4
49	Single Family	3.4	1	3.4
50	Single Family	3.4	1	3.4
51	Single Family	3.4	1	3.4
52	Single Family	3.4	1	3.4
53	Single Family	3.4	1	3.4
54	Single Family	3.4	1	3.4
55	Single Family	3.4	1	3.4
56	Single Family	3.4	1	3.4
58	Single Family	3.4	1	3.4
60	Single Family	3.4	1	3.4
		Total	19	64.6

Sanitary Area #9 - Fringewood

Address	Type	Pop. Factor	Units	Population
Fringewood Dr				
36	Single Family	3.4	1	3.4
34	Single Family	3.4	1	3.4
33	Single Family	3.4	1	3.4
32	Single Family	3.4	1	3.4
30	Single Family	3.4	1	3.4
		Total	5	17

Sanitary Area #10 - Fringewood

Address	Type	Pop. Factor	Units	Population
Fringewood Dr				
28	Single Family	3.4	1	3.4
27	Single Family	3.4	1	3.4
26	Single Family	3.4	1	3.4
25	Single Family	3.4	1	3.4
24	Single Family	3.4	1	3.4
23	Single Family	3.4	1	3.4
22	Single Family	3.4	1	3.4
21	Single Family	3.4	1	3.4
20	Single Family	3.4	1	3.4
		Total	9	30.6

SAN 1 - SANITARY SEWER DESIGN SHEET
POPULATION ESTIMATE
JOB# 118022

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Sanitary Area #11 - Fringewood

Address	Type	Pop. Factor	Units	Population
Lazy Nol Crt				
1	Single Family	3.4	1	3.4
2	Single Family	3.4	1	3.4
3	Single Family	3.4	1	3.4
4	Single Family	3.4	1	3.4
5	Single Family	3.4	1	3.4
7	Single Family	3.4	1	3.4
8	Single Family	3.4	1	3.4
9	Single Family	3.4	1	3.4
10	Single Family	3.4	1	3.4
11	Single Family	3.4	1	3.4
12	Single Family	3.4	1	3.4
14	Single Family	3.4	1	3.4
15	Single Family	3.4	1	3.4
16	Single Family	3.4	1	3.4
17	Single Family	3.4	1	3.4
18	Single Family	3.4	1	3.4
19	Single Family	3.4	1	3.4
20	Single Family	3.4	1	3.4
21	Single Family	3.4	1	3.4
22	Single Family	3.4	1	3.4
23	Single Family	3.4	1	3.4
25	Single Family	3.4	1	3.4
27	Single Family	3.4	1	3.4
29	Single Family	3.4	1	3.4
31	Single Family	3.4	1	3.4
32	Single Family	3.4	1	3.4
33	Single Family	3.4	1	3.4
35	Single Family	3.4	1	3.4
37	Single Family	3.4	1	3.4
39	Single Family	3.4	1	3.4
40	Single Family	3.4	1	3.4
41	Single Family	3.4	1	3.4
42	Single Family	3.4	1	3.4
43	Single Family	3.4	1	3.4
44	Single Family	3.4	1	3.4
45	Single Family	3.4	1	3.4
46	Single Family	3.4	1	3.4
47	Single Family	3.4	1	3.4
48	Single Family	3.4	1	3.4
49	Single Family	3.4	1	3.4
51	Single Family	3.4	1	3.4
52	Single Family	3.4	1	3.4
53	Single Family	3.4	1	3.4
55	Single Family	3.4	1	3.4
57	Single Family	3.4	1	3.4
		Total	45	153

SAN 1 - SANITARY SEWER DESIGN SHEET
POPULATION ESTIMATE
JOB# 118022

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Sanitary Area #12 - Fringewood

Address	Type	Pop. Factor	Units	Population
Fringewood Dr				
18	Single Family	3.4	1	3.4
17	Single Family	3.4	1	3.4
16	Single Family	3.4	1	3.4
15	Single Family	3.4	1	3.4
14	Commercial	FALSE	1	0
12	Single Family	3.4	1	3.4
11	Single Family	3.4	1	3.4
10	Single Family	3.4	1	3.4
9	Single Family	3.4	1	3.4
8	Single Family	3.4	1	3.4
7	Single Family	3.4	1	3.4
6	Single Family	3.4	1	3.4
5	Single Family	3.4	1	3.4
4	Single Family	3.4	1	3.4
		Total	14	44.2

Sanitary Area #13 - Fringewood

Address	Type	Pop. Factor	Units	Population
Cloverloft Crt				
3	Single Family	3.4	1	3.4
4	Single Family	3.4	1	3.4
5	Single Family	3.4	1	3.4
6	Single Family	3.4	1	3.4
7	Single Family	3.4	1	3.4
9	Single Family	3.4	1	3.4
10	Single Family	3.4	1	3.4
11	Single Family	3.4	1	3.4
15	Single Family	3.4	1	3.4
16	Single Family	3.4	1	3.4
17	Single Family	3.4	1	3.4
18	Single Family	3.4	1	3.4
19	Single Family	3.4	1	3.4
20	Single Family	3.4	1	3.4
21	Single Family	3.4	1	3.4
22	Single Family	3.4	1	3.4
23	Single Family	3.4	1	3.4
24	Single Family	3.4	1	3.4
25	Single Family	3.4	1	3.4
26	Single Family	3.4	1	3.4
27	Single Family	3.4	1	3.4
28	Single Family	3.4	1	3.4

SAN 1 - SANITARY SEWER DESIGN SHEET
POPULATION ESTIMATE
JOB# 118022

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29	Single Family	3.4	1	3.4
31	Single Family	3.4	1	3.4
33	Single Family	3.4	1	3.4
35	Single Family	3.4	1	3.4
37	Single Family	3.4	1	3.4
38	Single Family	3.4	1	3.4
39	Single Family	3.4	1	3.4
41	Single Family	3.4	1	3.4
43	Single Family	3.4	1	3.4
44	Single Family	3.4	1	3.4
45	Single Family	3.4	1	3.4
46	Single Family	3.4	1	3.4
47	Single Family	3.4	1	3.4
48	Single Family	3.4	1	3.4
49	Single Family	3.4	1	3.4
50	Single Family	3.4	1	3.4
51	Single Family	3.4	1	3.4
52	Single Family	3.4	1	3.4
53	Single Family	3.4	1	3.4
54	Single Family	3.4	1	3.4
55	Single Family	3.4	1	3.4
56	Single Family	3.4	1	3.4
57	Single Family	3.4	1	3.4
59	Single Family	3.4	1	3.4
61	Single Family	3.4	1	3.4
63	Single Family	3.4	1	3.4
65	Single Family	3.4	1	3.4
Fringewood Dr				
3	Single Family	3.4	1	3.4
		Total	50	170

Sanitary Area #14 - Fringewood

Orchard Drive				
5		FALSE	0	0
		Total	0	0

SAN 2 - SANITARY SEWER DESIGN SHEET
FUTURE POPULATION ESTIMATE
JOB# 118022

Sanitary Area	Area (ha)	Existing Units	Total		Future Units		Total	
		Sing. Family	Units	Pop.	Apart.	Sing. Family	Units	Pop.
Fringewood								
1	1.28	11	11	37.4	0	11	11	37.4
2	0.28	2	2	6.8	0	2	2	6.8
3	0.69	4	4	13.6	0	4	4	13.6
4	1.33	17	17	57.8	0	17	17	57.8
5	1.60	16	16	54.4	0	16	16	54.4
6	1.01	10	10	34	0	10	10	34.0
7	1.26	16	16	54.4	0	16	16	54.4
8	1.56	19	19	64.6	0	19	19	64.6
9	0.54	5	5	17	0	5	5	17.0
10	0.88	9	9	30.6	0	9	9	30.6
11	5.12	45	45	153	0	45	45	153.0
12	1.93	14	14	44.2	0	14	14	47.6
13	5.17	50	50	170	0	50	50	170.0
14	4.06	0	0	0	201	0	201	361.8

[1] Forecasted dwelling units are calculated based on growth projections prepared by Novatech's planning staff. The number of dwelling units applies a unit factor per hectare to determine the number of units based on expected development potential in the project area. The factors were provided from planning staff for each area.

SAN 3 - SANITARY SEWER DESIGN SHEET
JOB# 118022

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EXISTING FLOW

LOCATION				RESIDENTIAL AREA AND POPULATION						COMMERCIAL/INSTITUTIONAL			INFILTRATION				OTHER EXTRANEOUS FLOWS			FLOW	SEWER DATA							
	MANHOLES			Area	Pop.	Cumulative		Peak	Peak	Area	Peak	Peak	Total	Infiltration	Found. Drain	Combined	Rev. Slope	Flat	Combined	Total	Type of	Length	Diameter	Diameter	SLOPE	Velocity	Capacity	Ratio
STREET	FROM	TO	AREA ID	(ha)		Area (ha)	Pop.	Factor	Flow (l/s)	(ha)	Factor	Flow (l/s)	Area (ha)	Flow (l/s)	Allowance (l/s)	Add. Flow (l/s)	Driveways (l/s)	Roofs (l/s)	Ext Flows (l/s)	Flow (l/s)	Pipe	(m)	Actual (mm)	Nominal (mm)		(Full) (m/s)	(Full) (l/s)	Q/Qfull (%)
Woodwind			1	1.28	37.4	1.28	37.4	4.00	0.48				1.28	0.36	1.80	2.16				2.64	PVC	156.9	254	250	1.00	1.22	62.0	4%
			2	0.28	6.8	1.56	44.20	4.00	0.57				0.28	0.08	0.39	0.47				3.20	PVC	41.6	254	250	1.00	1.22	62.0	5%
			3	0.69	13.6	0.69	13.6	4.00	0.18				0.69	0.19	0.96	1.15				1.33	PVC	34.2	254	250	1.00	1.22	62.0	2%
			4	1.33	57.8	3.58	115.60	4.00	1.50				1.33	0.37	1.86	2.23				7.51	PVC	255.2	254	250	1.00	1.22	62.0	12%
Dowdall			5	1.60	54.4	1.60	54.4	4.00	0.71				1.60	0.45	2.24	2.69				3.39	PVC	255.0	254	250	1.00	1.22	62.0	5%
Woodwind			6	1.01	34	6.19	204.00	4.00	2.64				1.01	0.28	1.41	1.70				13.04	PVC	227.3	254	250	1.00	1.22	62.0	21%
Fringewood			7	1.26	54.4	1.26	54.4	4.00	0.71				1.26	0.35	1.77	2.12				2.83	PVC	210.3	254	250	0.60	0.95	48.0	6%
Poole Creek			8	1.56	64.6	1.56	64.6	4.00	0.84				1.56	0.44	2.18	2.62				3.45	PVC	272.0	254	250	1.00	1.22	62.0	6%
Fringewood			9	0.54	17	3.36	136.00	4.00	1.76				0.54	0.15	0.76	0.91				17.80	PVC	106.3	254	250	0.60	0.95	48.0	37%
			10	0.88	30.6	10.43	370.60	4.00	4.80				0.88	0.25	1.23	1.48				22.32	PVC	141.9	254	250	0.40	0.77	39.2	57%
Lazy Nol			11	5.12	153	5.12	153	4.00	1.98				5.12	1.43	7.16	8.59				10.58	PVC	772.8	254	250	1.00	1.22	62.0	17%
Fringewood			12	1.93	44.2	17.47	567.80	3.95	7.26	0.02	1.5	0.01	1.95	0.55	2.73	3.27				36.65	PVC	281.2	254	250	0.40	0.77	39.2	93%
Cloverloft			13	5.17	170	5.17	170	4.00	2.20				5.17	1.45	7.23	8.68				10.88	PVC	835.1	254	250	1.00	1.22	62.0	18%
Fringewood			14																								
			Outlet			22.64	737.80	3.88	9.28											47.35	PVC	190.0	254	250	0.96	1.20	60.7	78%

FUTURE FLOW (PEAK DESIGN FLOW)

LOCATION				RESIDENTIAL AREA AND POPULATION						COMMERCIAL/INSTITUTIONAL			INFILTRATION				OTHER EXTRANEOUS FLOWS			FLOW	SEWER DATA							
	MANHOLES			Area	Pop.	Cumulative		Peak	Peak	Area	Peak	Peak	Total	Infiltration	Found. Drain	Combined	Rev. Slope	Flat	Combined	Total	Type of	Length	Diameter	Diameter	SLOPE	Velocity	Capacity	Ratio
STREET	FROM	TO	AREA ID	(ha)		Area (ha)	Pop.	Factor	Flow (l/s)	(ha)	Factor	Flow (l/s)	Area (ha)	Flow (l/s)	Allowance (l/s)	Add. Flow (l/s)	Driveways (l/s)	Roofs (l/s)	Ext Flows (l/s)	Flow (l/s)	Pipe	(m)	Actual (mm)	Nominal (mm)		(Full) (m/s)	(Full) (l/s)	Q/Qfull (%)
Woodwind			1	1.28	37.4	1.28	37.4	4.00	0.48				1.28	0.36	1.80	2.16				2.64	PVC	156.9	254	250	1.00	1.22	62.0	4%
			2	0.28	6.8	1.56	44.20	4.00	0.57				0.28	0.08	0.39	0.47				3.20	PVC	41.6	254	250	1.00	1.22	62.0	5%
			3	0.69	13.6	0.69	13.6	4.00	0.18				0.69	0.19	0.96	1.15				1.33	PVC	34.2	254	250	1.00	1.22	62.0	2%
			4	1.33	57.8	3.58	115.60	4.00	1.50				1.33	0.37	1.86	2.23				7.51	PVC	255.2	254	250	1.00	1.22	62.0	12%
Dowdall			5	1.60	54.4	1.60	54.4	4.00	0.71				1.60	0.45	2.24	2.69				3.39	PVC	255.0	254	250	1.00	1.22	62.0	5%
Woodwind			6	1.01	34	6.19	204.00	4.00	2.64				1.01	0.28	1.41	1.70				13.04	PVC	227.3	254	250	1.00	1.22	62.0	21%
Fringewood			7	1.26	54.4	1.26	54.4	4.00	0.71				1.26	0.35	1.77	2.12				2.83	PVC	210.3	254	250	0.60	0.95	48.0	6%
Poole Creek			8	1.56	64.6	1.56	64.6	4.00	0.84				1.56	0.44	2.18	2.62				3.45	PVC	272.0	254	250	1.00	1.22	62.0	6%
Fringewood			9	0.54	17	3.36	136.00	4.00	1.76				0.54	0.15	0.76	0.91				17.80	PVC	106.3	254	250	0.60	0.95	48.0	37%
			10	0.88	30.6	10.43	370.60	4.00	4.80				0.88	0.25	1.23	1.48				22.32	PVC	141.9	254	250	0.40	0.77	39.2	57%
Lazy Nol			11	5.12	153	5.12	153	4.00	1.98				5.12	1.43	7.16	8.59				10.58	PVC	772.8	254	250	1.00	1.22	62.0	17%
Fringewood			12	1.93	47.6	17.47	571.20	3.94	7.30	0.02	1.5	0.01	1.95	0.55	2.73	3.27				36.69	PVC	281.2	254	250	0.40	0.77	39.2	94%
Cloverloft			13	5.17	170	5.17	170	4.00	2.20				5.17	1.45	7.23	8.68				10.88	PVC	835.1	254	250	1.00	1.22	62.0	18%
Fringewood			14	4.06	361.8	26.70	1103.00	3.77	13.48	1.83	1.5	0.89								52.44	PVC	190.0	254	250	0.96	1.20	60.7	86%
			Outlet			26.70	1103.00	3.77	13.48											52.44	PVC	190.0	254	250	0.96	1.20	60.7	86%

DESIGN PARAMETERS

DEFINITIONS:

Residential Flow = 280L/person/day

Commercial/Institutional Flow = 28,000L/gross ha/day

Harmon Equation: $PF = 1 + \left(\frac{14}{4 + \left(\frac{P}{1000}\right)^{\frac{1}{2}}}\right) * K$, where

P = Population

K = Correction Factor (0.8)

*If the commercial/institutional area <20 % of total area, then K = 1.0

Infiltration Flow = 0.33L/s/effective gross ha

Foundation Drain Allowance = 1.4L/s/gross ha (less than 10 ha.)

Extraneous Flows: Q = 2.78 CIA (l/s), where

A = Area (ha)

I = Rainfall Intensity (mm/hr)

C = Runoff Coefficient

NOTES:

1) Design Flow Rates are based on the formulas located in the City of Ottawa Sewer Design Guidelines.

2) Population totals are based on current and anticipated residential intensification rates. (Refer to Section 4.0: Development Review of the Preliminary Design Report.)

3) Existing sanitary sewers are indicated in italics.

4) Peak Factors were calculated using the Harmon Equation.

5) Extraneous Flows are based on City of Ottawa IDF Curve 5 Year intensity with Minimum Time of Concentration of 10 min.

PROJECT INFORMATION

SANITARY DESIGN: NOVATECH

PROJECT: West End PS Decommissioning and By-Pass Sewers

CLIENT: City of Ottawa

DATE: May 16, 2018

DESIGNED: KB

CHECKED: RJD

DWG. REFERENCE: 118022_SAN_DA.dwg

Appendix C

Planning Input

Fringewood Properties

May 16, 208 Teresa Thomas

				Current Zoning			Projected Growth and Development					
Drainage Study Area ID	Property ID	Property Area (net ha)	Drainage Study Area (gross ha)	Zoning	Height Limit	Highest Density Permitted Use as per Zoning By-law	Anticipated Future Land Use* - based on current zoning or policy plans	Density, Residential (Units / Gross Ha Mixed Use*)	Residential Area	Commercial Area	Residential Population	Assumptions
14	PIN 044630331	3.8595	4.06	AM9	15m	Mixed Use with mid-rise apartment	Mixed Use (55% residential, 45% commercial/gross ha)	201	2.23	1.83	362	1, 2, 3
	Remainder Drainage Area	0.2005		AM9								

Assumptions

1	Given that Hazeldean is a Transit Priority Street we assume the Subject Sites will develop similarly to those neighbouring lands identified in the Fernbank CDP.
2	The fernbank CDP considers land use area for Mixed Use to be 55% residential and 50% commercial. Given the discrepancy, we have assumed 55% residential and 45% commercial.
3	People per Mixed Use unit taken from Fernbank CDP (1.8ppl/unit)

APPENDIX D

Stormwater Management

Estimated Peak Stormwater Flow Rate
City of Ottawa Sewer Design Guidelines, 2012

Tc Calculation / Peak Flow to DICB1 (DICB1)

Area	3.0310	ha
C	0.24	Rational Method runoff coefficient
L	248	m
Up Elev	107.45	m
Dn Elev	103.98	m
Slope	1.4	%
Tc	39.5	min

1) Time of Concentration per Federal Aviation Administration

$$t_c = \frac{1.8(1.1-C)L^{0.5}}{S^{0.333}}$$

tc, in minutes
C, rational method coefficient, (-)
L, length in ft
S, average watershed slope in %

Estimated Peak Flow

	2-year	5-year	100-year	
i	33.2	44.6	75.8	mm/hr
Q	67.0	90.1	191.6	L/s

Tc Calculation / Peak Flow to DICB2 (DICB2)

Area	0.7790	ha
C	0.23	Rational Method runoff coefficient
L	151	m
Up Elev	104.68	m
Dn Elev	103.65	m
Slope	0.7	%
Tc	39.6	min

1) Time of Concentration per Federal Aviation Administration

$$t_c = \frac{1.8(1.1-C)L^{0.5}}{S^{0.333}}$$

tc, in minutes
C, rational method coefficient, (-)
L, length in ft
S, average watershed slope in %

Estimated Peak Flow

	2-year	5-year	100-year	
i	33.1	44.5	75.7	mm/hr
Q	16.5	22.2	47.1	L/s

Tc Calculation / Peak Flow to Poole's Creek (Area U1)

Area	0.1640	ha
C	0.34	Rational Method runoff coefficient
L	15	m
Up Elev	107.25	m
Dn Elev	106.74	m
Slope	3.4	%
Tc	10.0	min

1) Time of Concentration per Federal Aviation Administration

$$t_c = \frac{1.8(1.1-C)L^{0.5}}{S^{0.333}}$$

tc, in minutes
C, rational method coefficient, (-)
L, length in ft
S, average watershed slope in %

Estimated Peak Flow

	2-year	5-year	100-year	
i	76.8	104.2	178.6	mm/hr
Q	11.9	16.1	34.6	L/s

Estimated Peak Stormwater Flow Rate
City of Ottawa Sewer Design Guidelines, 2012

Tc Calculation / Peak Flow from EX1

Area	0.5520	ha
C	0.80	Rational Method runoff coefficient
L	268	m
Up Elev	106.3	m
Dn Elev	104.82	m
Slope	0.6	%
Tc	19.5	min

1) Time of Concentration per Federal Aviation Administration

$$t_c = \frac{1.8(1.1-C)L^{0.5}}{S^{0.333}}$$

tc, in minutes
C, rational method coefficient, (-)
L, length in ft
S, average watershed slope in %

Estimated Peak Flow

	2-year	5-year	100-year*	
i	52.8	71.3	121.8	mm/hr
Q	64.8	87.5	99.3	L/s

*** 100-Year Flow equal to 100-Year subtract 5-Year assumed captured in minor system**

Tc Calculation / Peak Flow from EX2

Area	0.3340	ha
C	0.36	Rational Method runoff coefficient
L	33	m
Up Elev	107	m
Dn Elev	106.5	m
Slope	1.5	%
Tc	12.1	min

1) Time of Concentration per Federal Aviation Administration

$$t_c = \frac{1.8(1.1-C)L^{0.5}}{S^{0.333}}$$

tc, in minutes
C, rational method coefficient, (-)
L, length in ft
S, average watershed slope in %

Estimated Peak Flow

	2-year	5-year	100-year	
i	69.7	94.4	161.6	mm/hr
Q	23.3	31.5	67.5	L/s

Tc Calculation / Peak Flow from EX3

Area	0.1190	ha
C	0.33	Rational Method runoff coefficient
L	33	m
Up Elev	105	m
Dn Elev	104.5	m
Slope	1.5	%
Tc	12.6	min

1) Time of Concentration per Federal Aviation Administration

$$t_c = \frac{1.8(1.1-C)L^{0.5}}{S^{0.333}}$$

tc, in minutes
C, rational method coefficient, (-)
L, length in ft
S, average watershed slope in %

Estimated Peak Flow

	2-year	5-year	100-year	
i	68.2	92.4	158.1	mm/hr
Q	7.4	10.1	21.6	L/s

Tc Calculation / Peak Flow from EX4

Area	0.2420	ha
C	0.80	Rational Method runoff coefficient
L	120	m
Up Elev	104.82	m
Dn Elev	104.44	m
Slope	0.3	%
Tc	15.7	min

1) Time of Concentration per Federal Aviation Administration

$$t_c = \frac{1.8(1.1-C)L^{0.5}}{S^{0.333}}$$

tc, in minutes
C, rational method coefficient, (-)
L, length in ft
S, average watershed slope in %

Estimated Peak Flow

	2-year	5-year	100-year	
i	60.1	81.3	139.0	mm/hr
Q	32.3	43.7	93.5	L/s

Tc Calculation / Peak Flow from EX5

Area	3.5490	ha
C	0.45	Rational Method runoff coefficient
L	405	m
Up Elev	110	m
Dn Elev	103.75	m
Slope	1.5	%
Tc	36.9	min

1) Time of Concentration per Federal Aviation Administration

$$t_c = \frac{1.8(1.1-C)L^{0.5}}{S^{0.333}}$$

tc, in minutes
C, rational method coefficient, (-)
L, length in ft
S, average watershed slope in %

Estimated Peak Flow

	2-year	**5-year**	**100-year**	
i	34.8	46.8	79.6	mm/hr
Q	154.2	207.4	441.1	L/s

Estimated DICB Release Rate
City of Ottawa Sewer Design Guidelines, 2012

Orifice Equation DICB1		
Diameter of DICB Lead	0.375	m
Area of Orfice	0.110447	m2
Head	1.49	m
Q=	364	L/s

Orifice Equation DICB2		
Diameter of DICB Lead	0.375	m
Area of Orfice	0.110447	m2
Head	1.8	m
Q=	400	L/s

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

Target Flow Rate

	5-year		100-year
Q	112.3 L/s	**Q**	238.7 L/s

Estimated Post Development Peak Flow from Unattenuated Areas

Area ID U1
Total Area 0.13 ha
C 0.20 Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}* (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10.0	104.2	7.5	7.5	0.0	0.0	178.6	16.1	16.1	0.0	0.0

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

Estimated Post Development Peak Flow from Attenuated Areas

Area ID Residential
Total Area 1.96 ha
C 0.63 Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	104.2	357.4	49.7	307.7	184.6	178.6	765.6	105.6	660.0	396.0
15	83.6	286.6	49.7	236.9	213.2	142.9	612.7	105.6	507.1	456.4
20	70.3	241.0	49.7	191.2	229.5	120.0	514.3	105.6	408.7	490.4
25	60.9	208.9	49.7	159.1	238.7	103.8	445.2	105.6	339.6	509.5
30	53.9	185.0	49.7	135.2	243.4	91.9	393.9	105.6	288.3	518.9
35	48.5	166.4	49.7	116.7	245.0	82.6	354.1	105.6	248.5	521.8
40	44.2	151.6	49.7	101.8	244.4	75.1	322.2	105.6	216.6	519.8
45	40.6	139.4	49.7	89.6	242.0	69.1	296.1	105.6	190.5	514.2
50	37.7	129.2	49.7	79.4	238.3	64.0	274.2	105.6	168.6	505.8
55	35.1	120.5	49.7	70.7	233.5	59.6	255.6	105.6	150.0	495.1
60	32.9	113.0	49.7	63.3	227.8	55.9	239.6	105.6	134.0	482.6
65	31.0	106.5	49.7	56.8	221.3	52.6	225.7	105.6	120.1	468.5
70	29.4	100.7	49.7	51.0	214.3	49.8	213.5	105.6	107.9	453.1
75	27.9	95.7	49.7	45.9	206.7	47.3	202.6	105.6	97.0	436.5
80	26.6	91.1	49.7	41.4	198.6	45.0	192.9	105.6	87.3	419.0
85	25.4	87.0	49.7	37.3	190.2	43.0	184.2	105.6	78.6	400.7
90	24.3	83.3	49.7	33.6	181.3	41.1	176.3	105.6	70.7	381.6
95	23.3	79.9	49.7	30.2	172.2	39.4	169.1	105.6	63.5	361.8
100	22.4	76.9	49.7	27.1	162.8	37.9	162.5	105.6	56.9	341.5
105	21.6	74.0	49.7	24.3	153.1	36.5	156.5	105.6	50.9	320.6
110	20.8	71.4	49.7	21.7	143.2	35.2	150.9	105.6	45.3	299.2

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

5-year $Q_{attenuated}$	**49.73 L/s**	**100-year $Q_{attenuated}$**	**105.60 L/s**
5-year Max. Storage Required	**245.0 m^3**	**100-year Max. Storage Required**	**521.8 m^3**

Estimated Post Development Peak Flow from Attenuated Areas

Area ID Commercial
Total Area 1.83 ha
C 0.90 Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	104.2	476.7	55.0	421.7	253.0	178.6	907.7	116.9	790.7	474.4
15	83.6	382.3	55.0	327.3	294.5	142.9	726.4	116.9	609.4	548.5
20	70.3	321.4	55.0	266.4	319.7	120.0	609.7	116.9	492.8	591.4
25	60.9	278.6	55.0	223.6	335.4	103.8	527.9	116.9	410.9	616.4
30	53.9	246.7	55.0	191.7	345.1	91.9	467.0	116.9	350.1	630.1
35	48.5	222.0	55.0	167.0	350.6	82.6	419.8	116.9	302.8	635.9
40	44.2	202.1	55.0	147.1	353.1	75.1	382.0	116.9	265.0	636.1
45	40.6	185.9	55.0	130.9	353.3	69.1	351.0	116.9	234.1	632.0
50	37.7	172.3	55.0	117.3	351.8	64.0	325.1	116.9	208.2	624.5
55	35.1	160.7	55.0	105.7	348.8	59.6	303.1	116.9	186.1	614.3
60	32.9	150.7	55.0	95.7	344.6	55.9	284.1	116.9	167.2	601.9
65	31.0	142.0	55.0	87.0	339.4	52.6	267.6	116.9	150.7	587.6
70	29.4	134.4	55.0	79.4	333.4	49.8	253.1	116.9	136.2	571.8
75	27.9	127.6	55.0	72.6	326.6	47.3	240.2	116.9	123.3	554.7
80	26.6	121.5	55.0	66.5	319.3	45.0	228.7	116.9	111.8	536.4
85	25.4	116.1	55.0	61.1	311.4	43.0	218.3	116.9	101.4	517.2
90	24.3	111.1	55.0	56.1	303.0	41.1	209.0	116.9	92.0	497.0
95	23.3	106.6	55.0	51.6	294.2	39.4	200.5	116.9	83.5	476.0
100	22.4	102.5	55.0	47.5	285.0	37.9	192.7	116.9	75.7	454.4
105	21.6	98.7	55.0	43.7	275.5	36.5	185.5	116.9	68.6	432.1
110	20.8	95.3	55.0	40.3	265.7	35.2	178.9	116.9	62.0	409.2

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

5-year $Q_{attenuated}$ 55.01 L/s **100-year $Q_{attenuated}$ 116.95 L/s**
5-year Max. Storage Required 353.3 m^3 **100-year Max. Storage Required 636.1 m^3**

Summary of Release Rates and Storage Volumes

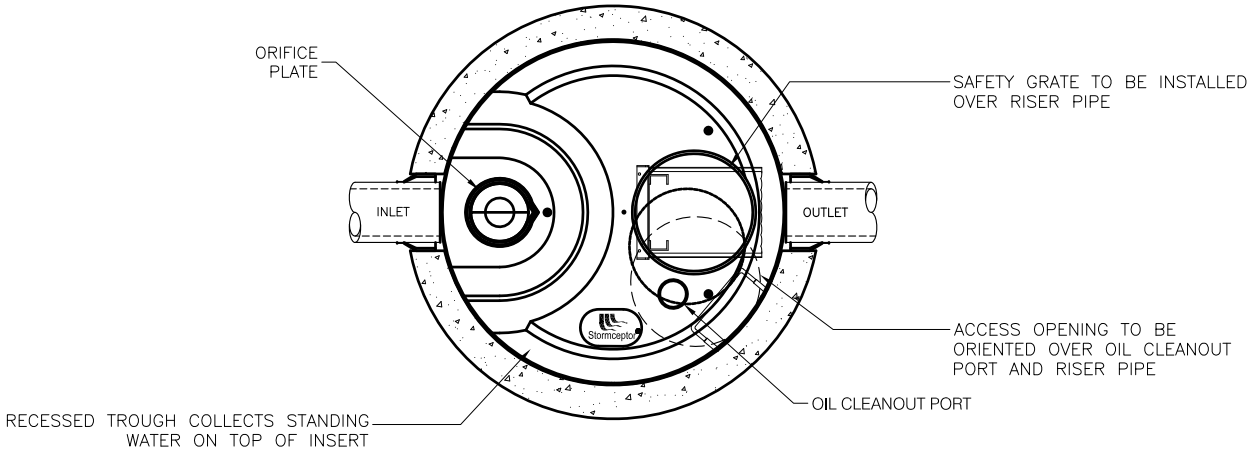
Control Area	5-Year Release Rate (L/s)	5-Year Storage (m^3)	100-Year Release Rate (L/s)	100-Year Storage (m^3)
Unattenuated Areas	7.5	0.0	16.1	0.0
Residential Areas	49.7	245.0	105.6	521.8
Total Residential	**57.3**	**245.0**	**121.7**	**521.8**
Commercial Areas	55.0	353.3	116.9	636.1
Total Comm + Res	**112.3**	**598.4**	**238.7**	**1157.9**

Campanale Homes
5 Orchard Drive
Stormwater Calculation Sheet

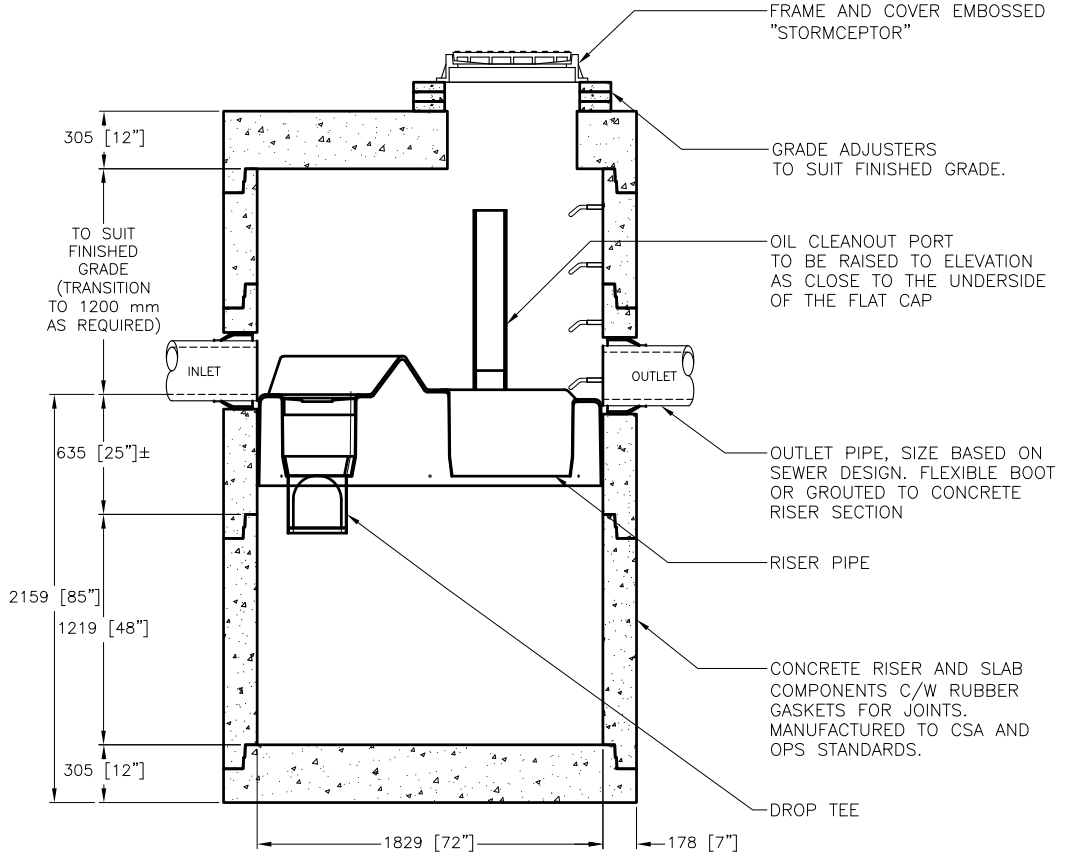
Area ID	Up	Down	Area	C	Indiv AxC	Acc AxC	T_C	I	Q	DIA	Slope	Length	$A_{hydraulic}$	R	Velocity	Qcap	Time Flow	Q / Q full
			(ha)	(-)			(min)	(mm/hr)	(L/s)	(mm)	(%)	(m)	(m^2)	(m)	(m/s)	(L/s)	(min)	(-)
A1	STM101	STM102	0.89	0.60	0.53	0.53	10.00	104.19	154.55	450.00	0.70	89.50	0.16	0.11	1.50	238.54	0.99	0.65
EX2			0.33	0.34	0.11	0.11												
A2	STM102	STM103	0.48	0.65	0.31	0.96	10.99	99.22	264.08	525.00	0.73	61.50	0.22	0.13	1.70	367.45	0.60	0.72
EX3			0.22	0.33	0.07	0.07												
A3	STM103	STM104	0.65	0.65	0.42	1.45	11.60	96.45	389.35	525.00	1.16	90.00	0.22	0.13	2.14	463.19	0.70	0.84
	STM104	STM105	0.00	0.00	0.00	1.45	12.30	93.44	377.20	525.00	1.16	8.20	0.22	0.13	2.14	463.19	0.06	0.81
	STM105	STM106	0.00	0.00	0.00	1.45	12.36	93.17	105.60	675.00	0.20	41.00	0.36	0.17	1.05	375.92	0.65	0.28
A4	FUT/OGS	STM106	1.83	0.84	1.54	1.54	10.00	104.19	116.95	675.00	0.20	9.40	0.36	0.17	1.05	375.92	0.15	0.31
	STM106	STM107	0.00	0.00	0.00	2.99	23.16	64.00	222.54	675.00	0.20	26.00	0.36	0.17	1.05	375.92	0.41	0.59
	STM107	EX STM MH	0.00	0.00	0.00	2.99	23.58	63.27	222.54	675.00	0.20	56.00	0.36	0.17	1.05	375.92	0.89	0.59

100-Year total attenuated flow used to determine pipe sizes

DRAWING NOT TO BE USED FOR CONSTRUCTION



PLAN VIEW



SECTION VIEW

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STC 1000
STANDARD MODEL

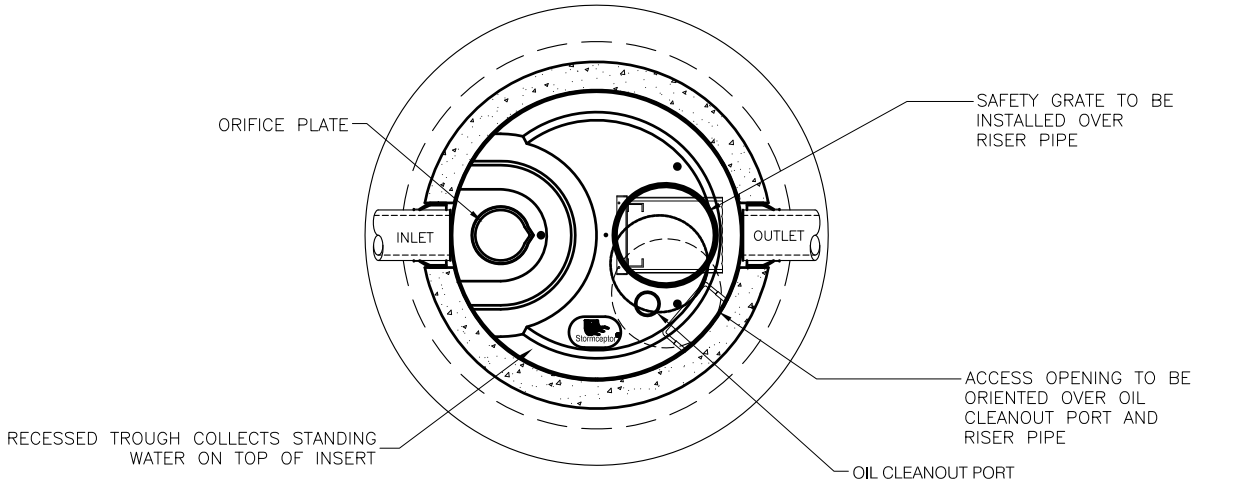
####

REV #	DATE	REVISION DESCRIPTION	BY

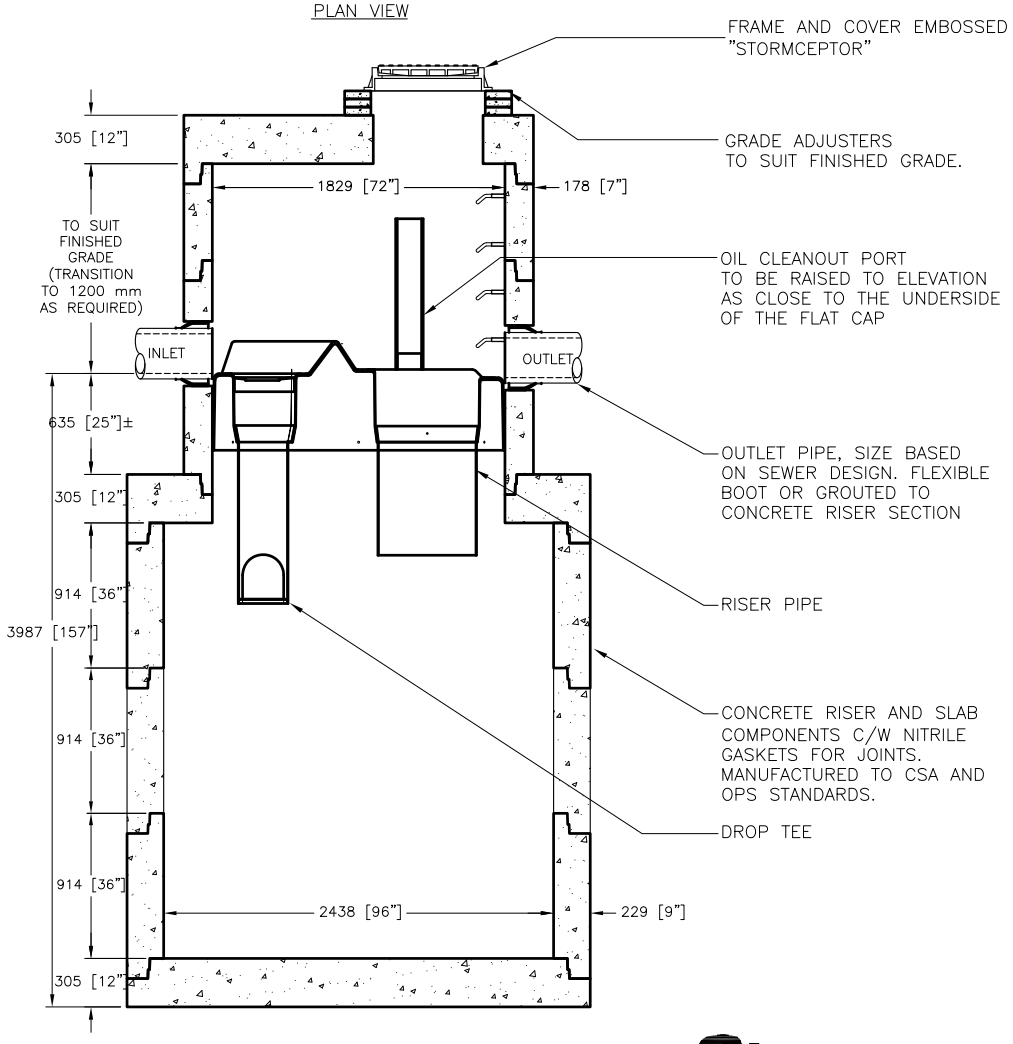
SHEET NUMBER 1 OF 1

DATE:######## | SCALE: 40 | PROJECT No.: ##### | DRAWN: ### | CHECKED: ###

DRAWING NOT TO BE USED FOR CONSTRUCTION



PLAN VIEW



SECTION VIEW

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866-740-3318 410-796-5505 866-376-8511 FAX

STC 3000
STANDARD MODEL
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REV #	DATE	REVISION DESCRIPTION	BY

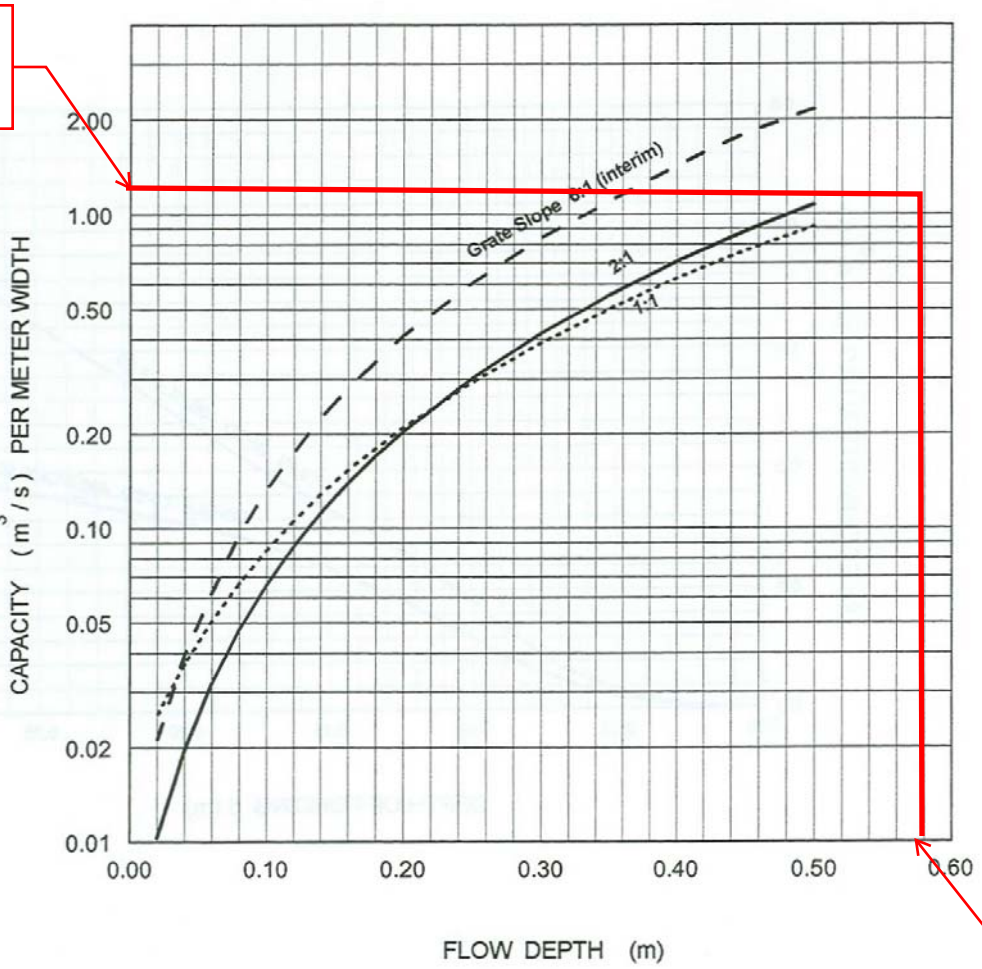
SHEET NUMBER 1 OF 1

DATE:######## | SCALE: 50 | PROJECT No.: ##### | DRAWN: ### | CHECKED: ###

\\AD.CONTECH-CPI.COM\ROOT\CORPORATE\MARKETING\IMBRIUM\CAD & PDF\STORMCEPTOR\CANADIAN\STC 3000.DWG 8/8/2016 10:11 AM

Design Chart 4.20: Ditch Inlet Capacity

CAPTURE RATE > 1000 L/S
MULTIPLY BY 2 TO ACCOUNT
FOR 600mm X 1200mm
CAPTURE RATE > 2000 L/S



Notes:

1. Curves apply to grate Type 403.01, but may be used for straight - bar inlets without significant loss of accuracy.
2. Capacities given by curves are for unobstructed grates only. For design use working capacity ≯ 0.5 x unobstructed capacity.
3. Capacities of grates operating in high velocity flows are less than indicated.

DICB 1
PONDING DEPTH=0.59m

DRAWINGS / FIGURES

LEGEND:

———	EXISTING WATERMAIN
———	EXISTING SANITARY SEWER
— — —	EXISTING STORM SEWER
— BELL — BELL —	EXISTING BELL LINE
— GAS — GAS —	EXISTING GAS LINE
— HYDRO —	EXISTING HYDRO LINE
— O/H HYDRO —	EXISTING OVERHEAD HYDRO LINE
—·—·—	PROPERTY LINE
⇨	EXISTING OVERLAND FLOW DIRECTION

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Fax. (613) 836-7183
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EXISTING CONDITIONS
5 ORCHARD DRIVE

PROJECT No.:	18-1006
SCALE:	1:500
DATE:	JUNE 2018
DRAWING No.	EX-1
SHEET NO.	1 OF 6

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HAZELDEAN ROAD

FUTURE COMMERCIAL BLOCK
STORMWATER MANAGEMENT PROVIDED BY
ROOFTOP/UNDERGROUND STORAGE TO CONTROL TO THE
PRE-DEVELOPMENT FLOW RATE

BLOCK 21

BLOCK 8 | BLOCK 9 | BLOCK 10 | BLOCK 11 | BLOCK 12 | BLOCK 13

BLOCK 19 | BLOCK 18 | BLOCK 17 | BLOCK 16 | BLOCK 15 | BLOCK 14

CLOVERLOFT COURT

ORCHARD DRIVE

FRINGEWOOD DRIVE

POOLE CREEK

PROPOSED LOW IMPACT DEVELOPMENT (LID) PRACTICE INFILTRATION STORM CHAMBERS

BLOCKS REQUIRE SUMP PUMP

9.4m-675mmø STM @ 0.2%
OIL/GRIT SEPARATOR

3.9m-675mmø STM @ 0.2%

STORM STUB TO FUTURE COMMERCIAL DEVELOPMENT OBV.=102.86

SANITARY STUB TO FUTURE COMMERCIAL DEVELOPMENT OBV.=101.81

WATER STUB TOFUTURE COMMERCIAL DEVELOPMENT

200mmø WATERMAIN

PROPOSED DITCH IN FRINGEWOOD ROW TO DIRECT EXTERNAL DRAINAGE TO EX. DICB 2

EX. 250mm SANITARY CAP
EX. INV=100.93
INVERT TO BE CONFIRMED BY CONTRACTOR PRIOR TO CONSTRUCTION AND NOTIFY ENGINEER OF ANY DISCREPANCIES FROM SHOWN

200x200 TEE CONNECTION TO EXISTING 200mmø WATERMAIN BY CITY FORCES. EXCAVATION AND REINSTATEMENT BY SITE SERVICING CONTRACTOR.

FUTURE SANITARY SEWER CURRENTLY UNDER DESIGN BY OTHERS, PROPOSED 250mm SANITARY @ 0.96%
PROPOSED SANITARY SEWER CONSTRUCTION START MAY 2019 END NOVEMBER 2019
PER NOVATECH REPORT

PROPOSED CULVERT

EXISTING FRINGEWOOD SANITARY PUMP STATION

EX. SAN MH
INV=102.29

89.5m-450mmø STM @ 0.7%
117.5m-200mmø SAN @ 0.7%

61.5m-525mmø STM @ 0.7%

90.0m-525mmø STM @ 1.2%
118.5m-200mmø SAN @ 1.9%

STM101 | STM102 | STM103 | STM104 | STM105
SAN101 | SAN102 | SAN103 | SAN104

OIL/GRIT SEPARATOR

FH

LEGEND:

- PROPOSED WATERMAIN
- FUTURE SANITARY SEWER
- PROPOSED SANITARY SEWER
- PROPOSED STORM SEWER
- PROPOSED CATCH BASIN
- PROPOSED STORM MAINTENANCE HOLE
- PROPOSED STORM MAINTENANCE HOLE
- PROPOSED SANITARY MAINTENANCE HOLE
- FUTURE SANITARY MAINTENANCE HOLE
- CONTEMPLATED STORAGE CHAMBER
- CONTEMPLATED FIRE HYDRANT
- CONTEMPLATED VALVE & BOX
- BLOCKS REQUIRING SUMP PUMP
- CONTEMPLATED SANITARY TOP OF GRATE/ CONTEMPLATED SANITARY OBVERT
- CONTEMPLATED STORM TOP OF GRATE/ CONTEMPLATED STORM OBVERT
- FUTURE SANITARY TOP OF GRATE/ FUTURE SANITARY OBVERT
- CONTEMPLATED SWALE
- PROPERTY LINE

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CONCEPTUAL SERVICING
5 ORCHARD DRIVE

PROJECT No.:	18-1006
SCALE:	1:500
DATE:	JUNE 2018
DRAWING No.	CSP-1
SHEET NO.	2 OF 6

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HAZELDEAN ROAD

SWEETNAM DR

POOLE CREEK

ORCHARD DRIVE

FRINGEWOOD DRIVE

CLOVERLOFT COURT

BLOCK 21

BLOCK 8 | BLOCK 9 | BLOCK 10 | BLOCK 11 | BLOCK 12 | BLOCK 13

BLOCK 7 | BLOCK 18 | BLOCK 17 | BLOCK 16 | BLOCK 15 | BLOCK 14

JOB BENCHMARK
BRASS CAP IN CONCRETE CULVERT
MON. No. BM-1
Elev.=106.01

TEMPORARY TERRACING TO FUTURE BLOCK

6.0m PERMANENT WATERMAIN EASEMENT

PROPOSED BERM PER MVCA CORRESPONDENCE DATED 01-09-2018
MIN TOP OF BERM = 107.5

PROPOSED DITCH IN FRINGEWOOD ROW TO DIRECT EXTERNAL DRAINAGE TO EX. DICB 2

PROPOSED CULVERT

LEGEND:

- 104.46 / 104.46 — PROPOSED/EXISTING SPOT ELEVATION
- 104.41 × — PROPOSED SPOT ELEVATION
- 0.5% — PROPOSED SLOPE
- EXISTING OVERLAND FLOW DIRECTION
- PROPOSED OVERLAND FLOW DIRECTION
- CONTEMPLATED SWALE
- PROPERTY LINE
- TERRACING

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CONCEPTUAL GRADING PLAN
5 ORCHARD DRIVE

PROJECT No.:	18-1006
SCALE:	1:500
DATE:	JUNE 2018
DRAWING No.	CGP-1
SHEET NO.	3 OF 6

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EX1
0.552
0.80

ASSUME MINOR SYSTEM FLOW FROM EX-1
CAPTURED IN HAZELDEAN STORM SEWER

HAZELDEAN ROAD

EX4
0.242
0.80

DICB 2
0.779
0.23

U1
0.164
0.34

DICB 1
3.031
0.24

SWEETNAM DR

POOLE CREEK

ORCHARD DRIVE

FRINGEWOOD DRIVE

CLOVERLOFT COURT

EX2
0.334
0.36

EX3
0.119
0.33

EX5
3.549
0.45

CLOVERLOFT COURT

EXISTING FRINGEWOOD SANITARY PUMP STATION

LEGEND:

EXISTING DRAINAGE AREA

PROPERTY LINE

DICB 1 / 2.957 / 0.24 — AREA ID / AREA (HA) / RUNOFF COEFFICIENT

EXISTING OVERLAND FLOW DIRECTION

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EXISTING STORMWATER DRAINAGE PLAN
5 ORCHARD DRIVE

PROJECT No.:	18-1006
SCALE:	1:750
DATE:	JUNE 2018
DRAWING No.	EX-SWM-1
SHEET NO.	4 OF 6

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HAZELDEAN ROAD

EX1
0.552
0.80

ASSUME MINOR SYSTEM FLOW FROM EX-1 CAPTURED IN HAZELDEAN STORM SEWER

EX4
0.242
0.80

FUTURE COMMERCIAL BLOCK
STORMWATER MANAGEMENT PROVIDED BY ROOFTOP/UNDERGROUND STORAGE TO CONTROL TO THE PRE-DEVELOPMENT FLOW RATE

BLOCK ~~A4~~ 21
1.83
0.90

PROPOSED DITCH IN FRINGEWOOD ROW TO DIRECT EXTERNAL DRAINAGE TO EX. DICB 2

9.4m-675mmø STM @ 0.2%
OIL/GRIT SEPARATOR
3.9m-675mmø STM @ 0.2%
STORM STUB TO FUTURE COMMERCIAL DEVELOPMENT OBV.=102.86

BLOCKS REQUIRE SUMP PUMP

PROPOSED LOW IMPACT DEVELOPMENT (LID) PRACTICE INFILTRATION STORM CHAMBERS

89.5m-450mmø STM @ 0.7%
61.5m-525mmø STM @ 0.7%
90.0m-525mmø STM @ 1.2%
OIL/GRIT SEPARATOR

PROPOSED CULVERT

U1
0.13
0.28

A1
0.89
0.60

A2
0.48
0.65

A3
0.65
0.65

EX2
0.33
0.34

EX3
0.22
0.33

EX5
3.549
0.45

POOLE CREEK

ORCHARD DRIVE

FRINGEWOOD DRIVE

CLOVERLOFT COURT

EXISTING FRINGEWOOD SANITARY PUMP STATION

AREA EX5 DRAINS SOUTH OF Ex. SANITARY PUMP STATION

LEGEND:

- PROPOSED DRAINAGE BOUNDARY
- PROPOSED STORM SEWER
- PROPERTY LINE
- CONTEMPLATED SWALE
- PROPOSED CATCH BASIN
- PROPOSED STORM MAINTENANCE HOLE
- PROPOSED STORM MAINTENANCE HOLE
- BLOCKS REQUIRING SUMP PUMP
- CONTEMPLATED STORAGE CHAMBER
- A1 / 0.83 / 0.90 — AREA ID / AREA (HA) / RUNOFF COEFFICIENT
- EXISTING OVERLAND FLOW DIRECTION
- 107.99TG / 105.00OBV — CONTEMPLATED STORM MH TOP OF GRATE/ CONTEMPLATED STORM OBVERT

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PROPOSED STORMWATER DRAINAGE PLAN 5 ORCHARD DRIVE

PROJECT No.:	18-1006
SCALE:	1:500
DATE:	JUNE 2018
DRAWING No.	SWM-1
SHEET NO.	5 OF 6

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HAZELDEAN ROAD

EX. SAN MH E.INV=101.12

EX. SAN MH E.INV=101.39

EX. 150mmø SAN FORCEMAIN

EX. 675mmø SAN

EX. 150mmø SAN FORCEMAIN

EX. 675mmø SAN

EX. 150mmø SAN

EX. 150mmø SAN

EX. SAN MH E.INV=100.67

EX. 675mmø SAN

EX. SAN MH E.INV=100.19

EX. SAN MH E.INV=99.97

EX. 675mmø SAN

EX. 26m - 250mm SAN @ 0.70%

EX. 250mm SANITARY CAP EX. INV=100.93 - INVERT TO BE CONFIRMED BY CONTRACTOR PRIOR TO CONSTRUCTION AND NOTIFY ENGINEER OF ANY DISCREPANCIES FROM SHOWN

SAN3
1.828
COMM

BLOCK 21

SAN1
1.298
111

SAN2
0.848
95

BLOCK 1 BLOCK 2 BLOCK 3 BLOCK 4 BLOCK 5 BLOCK 6 BLOCK 7 BLOCK 8 BLOCK 9 BLOCK 10 BLOCK 11 BLOCK 12 BLOCK 13 BLOCK 14 BLOCK 15 BLOCK 16 BLOCK 17 BLOCK 18 BLOCK 19 BLOCK 20

SAN101 — 117.5m–200mmø SAN @ 0.7% — SAN102 — 118.5m–200mmø SAN @ 1.9% — FUT. SAN103

SANITARY STUB TO FUTURE COMMERCIAL DEVELOPMENT OBV.=101.81

FUT. SAN104 — 14.2m–200mmø SAN @ 2.0%

37.0m–250mmø SAN @ 0.18%

31.5m–250mmø SAN @ 0.98%

26.7m–250mmø SAN @ 0.96%

FUTURE SANITARY SEWER CURRENTLY UNDER DESIGN BY OTHERS, PROPOSED 250mm SANITARY @ 0.96% PROPOSED SANITARY SEWER CONSTRUCTION START MAY 2019 END NOVEMBER 2019 PER NOVATECH REPORT

POOLE CREEK

ORCHARD DRIVE

FRINGEWOOD DRIVE

CLOVERLOFT COURT

EX. SAN MH NE.INV=106.61

EX. SAN MH SW.INV=104.24 NE.INV=104.25

EX. 250mmø SAN

EX. SAN MH SW.INV=103.18 SE.INV=103.21

EX. 250mmø SAN

EX. 250mmø SAN

EX. SAN MH INV=102.41

EX. 38m–250mmø SAN @ 0.4%

EX. 75mmø SAN FORCEMAIN

EXISTING FRINGEWOOD SANITARY PUMP STATION

EX. SAN MH INV=102.29

LEGEND:

- SANITARY DRAINAGE BOUNDARY
- PROPERTY LINE
- PROPOSED SANITARY SEWER
- SAN1 / 1.298 / 0.90 — AREA ID / AREA / POPULATION
- PROPOSED SANITARY MAINTENANCE HOLE
- FUTURE SANITARY SEWER
- 101.99TG 104.80OBV — FUTURE SANITARY MH TOP OF GRATE/ FUTURE SANITARY OBVERT
- FUTURE SANITARY MAINTENANCE HOLE
- 101.99TG 104.80OBV — CONTEMPLATED SANITARY MH TOP OF GRATE/ CONTEMPLATED SANITARY OBVERT

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PROPOSED SANITARY DRAINAGE PLAN 5 ORCHARD DRIVE

PROJECT No.:	18-1006
SCALE:	1:500
DATE:	JUNE 2018
DRAWING No.	SAN-1
SHEET NO.	6 OF 6

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