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SERVICING AND STORMWATER MANAGEMENT

FOR

GREATWISE DEVELOPMENTS 2710 DRAPER AVENUE – FRESH TOWNS - PHASE 3-1

CITY OF OTTAWA

PROJECT NO.: 17-927
DEVELOPMENT FILE NO.: D07-12-17-0076

AUGUST 2018 – REV 8

SERVICING AND STORMWATER MANAGEMENT
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1.0 INTRODUCTION

David Schaeffer Engineering Limited (DSEL) has been retained by Greatwise Developments to prepare a Servicing and Stormwater Management report in support of the application for a Site Plan Control (SPC) for the Phase 3-1 development at 2710 Draper Avenue.

The subject property is located within the City of Ottawa urban boundary, lot 19, concession 2 in Ward 8 -College. As illustrated in ***Figure 1***, the site is bound by Morrison Drive to the west and Draper Avenue to the north, and an existing residential development to the east. Phase 3 of the development will occupy ***1.3 ha*** of the property and is zoned High Density Residential [R5A].

Figure 1: Site Location

The existing SPC for 2781 Baseline Road allowed for the Phase 1 and Phase 2 developments, Building E and Building F, respectively. Building E has been constructed and is now part of OC1791074.

The proposed SPC for Phase 3 would allow for the development of 86 slab on grade townhome units, ***32 units*** in Phase 3-1, ***54 units*** in Phase 3-2, and a communal park space. A copy of the Site Plan is included in ***Drawings/Figures***.

The objective of this report is to provide sufficient detail to demonstrate that the existing municipal services provide sufficient capacity to support the SPC for the proposed Phase 3-1 development at 2710 Draper Avenue.

1.1 Existing Conditions

The site is currently developed as residential and consists of 4 townhome buildings (84 units) and a retail office. The existing buildings are serviced by separate water and sewer services off of municipal mains along Morrison Drive and Draper Avenue.

The existing on-site storm and sanitary sewers which service the existing buildings are to be abandoned and capped at the property line. Existing on-site water services are to be blanked at the main. Refer to drawing EX-1 for further details on existing services to be removed. A Topographical plan is also included in ***Drawings/Figures*** to demonstrate existing on-site easements.

Storm and sanitary sewers supporting 2702 Draper Avenue encroach into the subject property. The existing services are not within an easement. The developer is working with the adjacent land owner to coordinate an easement or relocation during the next phase of development.

The existing site grades range from approximately 73.13 m to 75.31 m from the northeast to the southwest corner of the property, which results in a grade change of approximately 2.18 m.

Sewer and watermain mapping collected from the City of Ottawa indicate that the following services exist across the property frontages, within the adjacent municipal right-of-ways:

Draper Avenue

- 200 mm diameter CI watermain
- 450 mm diameter concrete storm sewer tributary to Ottawa Central sub-watershed
- 225 mm diameter concrete sanitary sewer tributary to the Pinecrest Collector

Morrison Drive

- 200 mm diameter CI watermain

- 300 mm diameter storm sewer, within Morrison Drive, tributary to Ottawa Central sub-watershed
- 300 mm diameter storm sewer, within the subject site, tributary to Ottawa Central sub-watershed
- 225 mm diameter concrete sanitary sewer, within Morrison Drive, tributary to the Pinecrest Collector
- 200 mm diameter concrete sanitary sewer, within the subject site, tributary to the Pinecrest Collector

1.2 Required Permits / Approvals

The proposed development is subject to the site plan control approval process. The City of Ottawa must approve the engineering design drawings and reports prior to the issuance of site plan control.

Based on coordination with the City of Ottawa, an Environmental Compliance Application (ECA) would not be required for the proposed development during the Site Plan Control process. When the properties are subdivided through Part Lot Control, an ECA will be required.

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

1.3 Pre-consultation

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

2.0 GUIDELINES, PREVIOUS STUDIES, AND REPORTS

2.1 Existing Studies, Guidelines, and Reports

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

- **Ottawa Sewer Design Guidelines**
  City of Ottawa, *SDG002*, October 2012
  (City Standards)

  - **Technical Bulletin ISTB-2018-01**
    City of Ottawa, March 21, 2018.
    (*ISTB-2018-01*)

  - **Technical Bulletin ISTB-2018-04**
    City of Ottawa, June 27, 2018.
    (*ISTB-2018-04*)

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

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

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

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

- **Design Guidelines for Sewage Works**
  Ministry of the Environment, 2008.
  (MOE* Design Guidelines*)

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

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

- **Morrison Court Development Wastewater Servicing Study**
  Novatech Engineering Consultants Ltd., January 2009.
  (Existing Wastewater Study)

- **Geotechnical Investigation, Residential Development, 2710 Draper Avenue, Ottawa, Ontario**
  Paterson Group, Inc., PG1630-3 – Revision 4, May 28, 2018.
  (Geotechnical Investigation)

- **Functional Servicing and Stormwater Management Brief in support of Site Plan Amendment for 2781 Baseline Road**
  David Schaeffer Engineering Ltd., April 2016.
  (Previously Approved Brief)

3.0 WATER SUPPLY SERVICING

3.1 Existing Water Supply Services

The subject property lies within the City of Ottawa 1W pressure zone, as shown by the Pressure Zone Map in ***Appendix B***. Potable water is available to the Phase 3 development via an existing 200 mm CI watermain on Morrison Drive and an existing 200 mm CI watermain on Draper Avenue.

3.2 Water Supply Servicing Design

It is proposed that the development will have an internal watermain network with a connection to the existing 200 mm diameter watermain within Draper Avenue and two connections to the existing 200 mm diameter watermain within Morrison Drive. Townhomes fronting Draper Avenue, Block 1, 2, and 6 will have independent connections to the existing infrastructure within the Draper Avenue right-of-way via 19mm diameter service laterals. The remaining Blocks will have connections to the internal watermain via 19mm diameter service laterals.

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

Table 1
Water Supply Design Criteria

Design Parameter	Value
Residential Townhome	2.7 P/unit
Residential 1 Bedroom Apartment	1.4 P/unit
Residential 2 Bedroom Apartment	2.1 P/unit
Residential Average Daily Demand	350 L/d/P
Residential Maximum Daily Demand	3.6 x Average Daily *
Residential Maximum Hourly	5.4 x Average Daily *
Minimum Watermain Size	150 mm diameter
Minimum Depth of Cover	2.4 m from top of watermain to finished grade
During normal operating conditions desired operating pressure is within	350 kPa and 480 kPa
During normal operating conditions pressure must not drop below	275 kPa
During normal operating conditions pressure must not exceed	552 kPa
During fire flow operating pressure must not drop below	140 kPa

Daily average based on Appendix 4-A from* ***Water Supply Guidelines*
*** Residential Max. Daily and Max. Hourly peaking factors per MOE Guidelines for Drinking-Water Systems Table 3-3 for 0 to 500 persons.*
-Table updated to reflect ISD-2010-2

Table 2 and ***Table 3*** summarizes the water supply demand and boundary conditions for the proposed development based on the ***Water Supply Guidelines***.

Table 2
Water Demand
Proposed Site Conditions – Phase 3-1

Design Parameter	Anticipated Demand[1] (L/min)	Boundary Condition[2] Connection 1 (Morrison Drive) (m H_2O / kPa)	Boundary Condition[2] Connection 2 (Draper Avenue) (m H_2O / kPa)
Average Daily Demand	21.1	45.8 / 449.3	45.5 / 446.6
Max Day + Fire Flow	76.1 + 10,000 = 10,076.1	14,100 L/min @ 140 kPa	12,600 L/min @ 140 kPa
Peak Hour	114.2	34.1 / 334.5	33.8 / 331.9

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 71.9m and 72.17m for Connection 1 and 2, respectively. See ***Appendix B.***

Table 3
Water Demand
Proposed Site Conditions – Phase 3-1 & Phase 3-2

Design Parameter	Anticipated Demand[1] (L/min)	Boundary Condition[2] Connection 1 (Morrison Drive) (m H_2O / kPa)	Boundary Condition[2] Connection 2 (Draper Avenue) (m H_2O / kPa)
Average Daily Demand	56.6	45.8 / 449.3	45.5 / 446.6
Max Day + Fire Flow	203.9 + 11,000 = 11,203.9	14,100 L/min @ 140 kPa	12,600 L/min @ 140 kPa
Peak Hour	305.8	34.1 / 334.5	33.8 / 331.9

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 71.9m and 72.17m for Connection 1 and 2, respectively. See ***Appendix B.***

Fire flow requirements are to be determined in accordance with City of Ottawa ***Water Supply Guidelines***, and the Ontario Building Code.

Fire flow requirements were estimated per City of Ottawa Technical Bulletin ***ISTB-2018-02***. The following parameters were established by Roderick Lahey Architects:

- Type of construction – Non-Combustible Construction
- Occupancy type – Combustible
- Sprinkler Protection – Non-Sprinkler System

Table 4 summarizes the estimated fire flow demands based on the FUS method and summarizes the available fire hydrants within 90 meters of each block. Detailed calculations can be found in ***Appendix B***.

Table 4
FUS Estimated Fire Flow Summary

Phase	Anticipated Demand (L/min)	Fire Hydrants within 90 Meters
Block 1	9,000	FH1, FH4, FH5
Block 2	10,000	FH1, FH2, FH4
Block 3	8,000	FH1, FH2, FH4, FH5
Block 4	9,000	FH1, FH2, FH4
Block 5	10,000	FH1, FH2, FH5
Block 6	11,000	FH1, FH2, FH3
Block 7	9,000	FH1, FH2, FH3
Block 8	9,000	FH1, FH2
Block 9	8,000	FH1, FH2, FH3
Block 10	8,000	FH1, FH2, FH3
Block 11	7,000	FH1, FH2, FH3
Block 12	9,000	FH1, FH2, FH4, FH5

The above assumptions result in a maximum fire flow of approximately ***11,000 L/min***, actual building materials selected will affect the estimated flow. Based on ***Table 4***, a minimum of two fire hydrants are available to support each block. Hydrant locates are identified on drawing ***SSP-1***.

The City of Ottawa was contacted to obtain boundary conditions associated with the estimated water demand as indicated in the boundary request correspondence included in ***Appendix B***.

The City provided both the anticipated minimum and maximum water pressures, as well as, the estimated water pressure during fire flow demand as indicated by the correspondence in ***Appendix B***. The minimum and maximum pressures fall within the required range identified in ***Table 1***.

Based on boundary conditions provided by the City a maximum ***12,600 L/min*** is available from Draper Avenue and ***14,100 L/min*** is available from Morrison Drive.

3.3 EPANet Water Modelling

EPANet was utilized to determine pipe sizing and the availability of pressures throughout the system during average day demand, max day plus fire flow, and peak hour demands. The static model determines pressures based on the available head obtained from the boundary conditions provided by the City of Ottawa, as indicated in ***Table 2*** and ***Table 3***.

The model utilizes the Hazen-Williams equation to determine pressure drop, while the pipe properties, including friction factors, have been selected in accordance with Table 4.4 of the ***Water Supply Guidelines***. The model was prepared to assess the available pressure at the finished first floor of each building, as well as, the pressures the watermain provides to fire hydrants during fire flow conditions.

For the purposes of providing sufficient fire flow, ***7,000 L/min*** for a total of ***14,000 L/min*** was modelled at the proposed fire hydrants during Phase 3-1 conditions, and ***7,000 L/min*** for a total of ***14,000 L/min*** was modelled at the proposed fire hydrants during the Phase 3 conditions.

Table 5 summarizes the model results. ***Appendix B*** contains output reports and model schematics for each scenario.

Table 5: Model Simulation Output Summary – Phase 3-1

Location	Average Day (kPa)	Max Day + Fire Flow (kPa)	Peak Hour (kPa)
4	464.3	402.9	344.3
5	454.4	395.2	339.6
7	457.9	397.6	336.1
9	462.0	425.9	347.2
10	460.5	412.4	345.7
11	459.1	422.7	343.8
12	457.6	409.4	342.4
13	456.0	394.7	341.2
14	451.6	411.6	336.3
15	449.5	395.1	334.2
16	447.3	378.3	332.6
17	458.6	397.3	343.8
18	454.4	414.7	339.6
19	452.4	398.4	337.7
20	455.7	386.3	341.0
21	451.2	411.4	336.4
22	449.9	395.8	335.1
23	447.5	378.5	332.8
24	457.2	401.0	342.5
26	458.5	422.0	343.0
27	457.2	408.8	341.7
28	455.2	393.9	340.4
29	454.3	392.1	339.5
FHYD1	462.1	357.2	345.3
FHYD2	453.7	337.9	338.9

† indicates pressures exceeded required pressure values as outlined in ***Table 1***

Based on the EPANET model, pressures during average day, max day + fire flow and peak hour, and peak hour respect the requirements of the ***Water Supply Guidelines***. As demonstrated in ***Table 5***, the local fire hydrants can provide the each block with the required fire flows indicated in ***Table 4.***

Table 6 summarizes the water age model results. ***Appendix B*** contains output reports and model schematics for each scenario.

Table 6: Model Simulation Output – Water Age Summary – Phase 3

Location	Average Day (hr)	Max Day + Fire Flow (hr)	Peak Hour (hr)
P1	1.0-3.0	0-0.25	0-0.25
P2	0.50-0.75	0-0.25	0-0.25
P3	1.0-3.0	0-0.25	0.25-0.50
P4	1.0-3.0	0-0.25	1.0-3.0
P5	1.0-3.0	0-0.25	0.25-0.50
P8	1.0-3.0	0-0.25	0-0.25
P9	1.0-3.0	0-0.25	0.50-0.75
P10	1.0-3.0	0-0.25	0.25-0.50
P11	1.0-3.0	0-0.25	1.0-3.0
P12	1.0-3.0	0-0.25	0.25-0.50
P13	1.0-3.0	0-0.25	1.0-3.0
P14	1.0-3.0	0-0.25	0.50-0.75
P15	1.0-3.0	0-0.25	0-0.25
P16	0.25-0.50	0-0.25	0-0.25
P17	0.25-0.50	0-0.25	0-0.25
P18	1.0-3.0	0-0.25	0.25-0.50
P19	1.0-3.0	0-0.25	1.0-3.0
P20	1.0-3.0	0.25-0.50	0.75-1.0
P21	0.75-1.00	0-0.25	0-0.25
P22	1.0-3.0	0-0.25	0.25-0.50
P23	1.0-3.0	0.25-0.50	1.0-3.0
P24	0.75-1.00	0-0.25	0-0.25
P25	1.0-3.0	0-0.25	0.50-0.75
P26	1.0-3.0	0.25-0.50	1.0-3.0
P27	1.0-3.0	0-0.25	0.75-1.0
P28	1.0-3.0	0.25-0.50	1.0-3.0
P29	1.0-3.0	0.25-0.50	0.50-0.75

As demonstrated by ***Table 6***, water age within the proposed system does not exceed 3 hours. The model indicates that pressure within the watermain network are within ***City Standards***.

3.4 Water Supply Conclusion

The FUS assumptions result in an estimated fire flow of approximately ***10,000 L/min*** during Phase 3-1 conditions and ***11,000 L/min*** during Phase 3 conditions. The proposed average day water supply demand for the Phase 3 development based on the site plan is calculated to be ***56.6 L/min***.

Based on the EPANET model, pressures during average day, max day + fire flow and peak hour, and peak hour respect the requirements of the ***Water Supply Guidelines*** and the proposed hydrants can provide each block with their require fire flows.

The proposed water supply design conforms to all relevant City Guidelines and Policies.

4.0 WASTEWATER SERVICING

4.1 Existing Wastewater Services

The subject site lies within the Pinecrest Collector Sewer catchment area, as shown by the City sewer mapping included in ***Appendix C***. An existing 225 mm diameter sanitary sewer within Draper Avenue and a 225 mm and a 200 mm diameter sanitary sewer within Morrison Drive are available to service the proposed development.

The existing site consists of residential units contributing wastewater to the local Draper Avenue and Morrison Drive sewer system. The sanitary sewers are tributary to the Pinecrest Trunk Collector sewer approximately 1.4 km downstream of the site.

An assessment of the existing Morrison drive sanitary sewer capacity was conducted for the Phase 1 and Phase 2 developments; the analysis identified that there is an available capacity of ***8.0 L/s***. Refer to Section 4.3 for further discussion.

Table 7 demonstrates the estimated peak flow from the existing development including the Phase 1 development. See ***Appendix C*** for associated calculations.

Table 7
Summary of Existing Peak Wastewater Flow

Design Parameter	Total Flow (L/s)
Estimated Average Dry Weather Flow	1.45
Estimated Peak Dry Weather Flow	5.89
Estimated Peak Wet Weather Flow	6.59

4.2 Wastewater Design

It is proposed that the development will have an internal sanitary sewer network with a connection to the existing 225 mm diameter sanitary sewer within Draper Avenue. Townhomes fronting Draper Avenue, Block 1, 2, and 6, will have independent connections to the existing 225 mm diameter sanitary sewer within Draper Avenue via 135 mm diameter service laterals. The remaining Blocks will have connections to the internal network via 135 mm diameter service laterals. Sanitary calculation sheet employed in the design of the internal network is included in ***Appendix C***.

Table 8 summarizes the ***City Standards*** employed in the design of the proposed wastewater sewer system.

Table 8
Wastewater Design Criteria

Design Parameter	Value
Residential Townhome	2.7 P/unit
Residential 1 Bedroom Apartment	1.4 P/unit
Residential 2 Bedroom Apartment	2.1 P/unit
Average Daily Demand	280 L/d/per
Peaking Factor	Harmon's Peaking Factor. Max 4.0, Min 2.0 Harmon's Correction Factor 0.8
Infiltration and Inflow Allowance	0.05 L/s/ha (Dry Weather) 0.28 L/s/ha (Wet Weather) 0.33 L/s/ha (Total)
Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} A R^{2/3} S^{1/2}$
Minimum Sewer Size (Inside Greenbelt)	250 mm diameter
Minimum Manning's 'n'	0.013
Minimum Depth of Cover	2.5m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6m/s
Maximum Full Flowing Velocity	3.0m/s
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012 *Please note that the residential average daily flow uses 280 L/person/d in line with proposed updates to City Design Guidelines.	

Table 9 and ***10*** demonstrate the estimated peak flow from the proposed development. See ***Appendix C*** for associated calculations.

Table 9
Summary of Estimated Peak Wastewater Flow – Phase III

Design Parameter	Total Flow (L/s)
Estimated Average Dry Weather Flow	0.76
Estimated Peak Dry Weather Flow	2.71
Estimated Peak Wet Weather Flow	3.15

Table 10
Summary of Estimated Peak Wastewater Flow – Ultimate

Design Parameter	Total Flow (L/s)
Estimated Average Dry Weather Flow	1.70
Estimated Peak Dry Weather Flow	5.67
Estimated Peak Wet Weather Flow	6.38

DSEL estimated the peak wet weather flow based on the development statistics provided by Roderick Lahey Architect Inc. As a result, the development proposes to decrease the peak wet weather flow from the site by ***0.21 L/s***.

4.3 Morrison Drive Sanitary Sewer Hydraulic Grade Line Assessment

A preliminary assessment of the existing Morrison drive sanitary sewer capacity was conducted by Novatech. This analysis is provided in ***Appendix C*** in the report *Morrison Court Development Wastewater Servicing* Study dated January 26, 2009. The Novatech study used GIS data provided by the City to model the existing sewer network. Their study found that under existing conditions, the minimum freeboard between the hydraulic grade line (HGL) and the lowest connected underside of footing (USF) elevation was **0.33 m**.

To support this study, J.F. Sabourin and Associates (JFSA) was retained by Greatwise to re-create the Novatech model of the Morrison Drive sanitary sewer under both existing and proposed Phase 1 and Phase 2 conditions. JFSA recreated the Novatech model using XPSWMM, while Novatech had previously used H2OMAP Sewer/Pro. It was, therefore, anticipated that JFSA would arrive at slightly different results than Novatech when modelling the same system. In the JFSA model it was found that the minimum freeboard was **0.37 m**.

To verify existing sanitary pipe inverts and sizes, Stantec Geomatics Ltd. (Stantec) was retained by Greatwise to conduct a field survey along the Morrison Drive sewer. Several differences were present between the existing conditions data provided by Novatech and the survey performed by Stantec. When the surveyed data was input into the model it was found that the minimum freeboard was **0.48m**.

In proposed Phase 1 and Phase 2 scenarios, it was found that the minimum freeboard between the HGL and the lowest connected USF was **0.44 m**. This is greater than the City of Ottawa's minimum allowable value of 0.30 m. An email report from JFSA, as well as, detailed modeling information is provided in ***Appendix C***.

Based on the previous HGL assessment and the email from JFSA dated January 21, 2013, included in the ***Appendix C***, an available capacity of ***8.0 L/s*** was identified. As a result, no changes to the downstream sanitary network are required at this time. As indicated by ***Table 5*** and the ultimate condition sanitary calculation sheet included in ***Appendix C***, there is sufficient capacity to support the proposed ultimate development.

4.4 Wastewater Servicing Conclusions

The site is tributary to the Pinecrest Trunk Collector sewer; based on the sanitary analysis provided by JFSA, sufficient capacity is available to accommodate the estimated ***6.38 L/s*** peak wet weather flow from the proposed ultimate development.

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

5.0 STORMWATER MANAGEMENT

5.1 Existing Stormwater Services

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

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

The existing site is serviced by two existing catchbasins. One system outlets to the existing 300 mm diameter storm sewer located within the Morrison Drive right-of-way. The second catchbasin system discharges to the existing storm sewer located along the East side of the property, ultimately outletting to the existing 450 mm diameter storm sewer located within the Draper Avenue right-of-way. Drainage is routed north along Morrison Drive, then west to the outlet at a tributary to Graham Creek, approximately 1.5 km from the site.

In an effort to select the appropriate method in which time of concentration is calculated two methods were analyzed: the Airport Method and the SCS Method. The Airport Method is intended for developments that are primarily flat and asphalt. The SCS Method is intended for small urban basins under 2000 acres. Calculated time of concentrations are summarized in ***Table 11***.

Table 11
Summary of Calculated Time of Concentration

Area	Time of Concentration (min)
Airport Method	12.6
SCS Method	5.3

It was assumed that the existing development contained no stormwater management controls for flow attenuation. Based on the time of concentration analysis, the Airport Method is utilized due to the type of development and to provide a conservative estimate of existing peak storm flow rates. The estimated pre-development peak flows for the 2, 5, and 100-year are summarized in ***Table 12***:

Table 12
Summary of Existing Peak Storm Flow Rates

City of Ottawa Design Storm	Estimated Peak Flow Rate (L/s)
2-year	141.4
5-year	191.6
100-year	409.9

5.2 Post-development Stormwater Management Target

Stormwater management requirements for the proposed development were established using the City of Ottawa standards, where the proposed development is required to:

- Meet an allowable release rate based on a Rational Method Coefficient of 0.50, employing the City of Ottawa IDF parameters for a 2-year storm with a calculated time of concentration greater than or equal to 10 minutes.
- Attenuate all storms up to and including the City of Ottawa 100-year design event on site.
- Provide quality controls to an enhanced level of treatment due to the site's distance from the outlet and the current Site Plan; correspondence with the RVCA is included in ***Appendix A***.

Based on the above the allowable release rate for the proposed development is ***126.3 L/s***.

5.3 EPASWMM Stormwater Analysis

5.3.1 Model Selection

The hydrology and hydraulics of the proposed stormwater management system were analyzed in EPASWMM using the Dynamic Wave Routing Model. This method best analyzes stormwater systems with respect to pressure flow and backwater impacts.

A model schematic and output files are included in ***Appendix D***.

5.3.2 Model Assumptions

The following assumptions were made in the preparation for the EPASWMM model:

- Hydrology
  - Initial abstraction parameters per City of Ottawa standards.
  - Horton's infiltration for soil loss, per City guidelines.
  - Estimated % impervious area assuming limited vegetation / effective perviousness.
  - Sub-catchment width measured as perpendicular area to catch basins for longest distance of travel.
- Hydraulics
  - Storage Nodes represent both surface and subsurface components. Each node is assigned an invert elevation that corresponds with the tributary catch basin.
  - "Regular" Node represent either connections to the sewer main or strategic maintenance hole locations. Not all structures have been included in model.
  - All conduits have been assigned a Mannings n = 0.013.
  - Orifices are all side mounted circular and have a 0.61 discharge coefficient.

Table 13 summarizes the storage volumes within each subcatchment.

Table 13
Available Subcatchment Storage Volumes

Catchment ID	Outlet	Above Ground Storage (m^3)	Underground Storage (m^3)
A1	MH4	-	-
A2	MH2	-	-
A3	MH3	-	-
A4	UG3	-	41.6
A5	MH5	-	-
A6	MH6	-	-
A7	MH7	-	-
A8	MH7	-	-
-	UG2	-	209.3
PARK	UG1	-	198.1
*No storage accounted for in rear yard systems.			

Table 14 summarizes the assumptions made for the EPASWMM model.

Table 14
Drainage Area Summary

Catchment ID	Outlet	Total Area (ha)	Percent Impervious (%)	Width (m)	Percent Slope (%)
A1	MH1	0.25	71	27	2.0
A2	MH2	0.26	71	66.6	2.0
A3	MH3	0.07	71	60	2.0
A4	UG3	0.08	71	33	2.0
A5	MH5	0.19	71	65	2.0
A6	MH6	0.19	71	63	2.0
A7	MH7	0.10	71	34	2.0
PARK	UG1	0.05	42.9	21	4.0
U1	-	0.16	71	120	5.0

5.4 Proposed Minor Stormwater Management System

The proposed stormwater management system will include private catch basin and storm sewer system with three underground storage units to achieve the target release rates. The stormwater management design consists of a private storm sewer system with a connection to the existing 450 mm diameter storm sewer within the Draper Avenue right-of-way.

Townhomes fronting Draper Avenue, Block 1 and 2, will have independent connections to the existing 450 mm diameter storm sewer within Draper Avenue via 100 mm diameter service laterals. The remaining Blocks will have connections to the internal network via 100 mm diameter service laterals.

Area A1, shown by drawing ***SWM-1***, is tributary to the internal storm sewers connecting to Draper Avenue. ***449.0 m^3*** of underground storage is provided via Brentwood ST-36 storage systems or an approved equivalent storage system and will be attenuated by a ***144 mm Plug Style ICD*** at the outlet side of MH8. MH 9 at the connection to the municipal sewer will be equipped with a Checkmate Ultraflex inline backwater valve to prevent stormwater from the municipal system from entering the private stormwater management system.

Table 15
Summary of Storm Structure ICD

Structure ID	ICD Size (mm)	Style	Design Head (m)	Design Flow (100-year) (L/s)
MH8	144	PLUG	1.81	53.97

To meet stormwater quality criteria specified by RVCA, an oil/grit separator will be installed downstream of all catch basins, as shown by drawing ***SSP-1***. Based on Stormceptor sizing, a Stormceptor ***OSR 750*** will provide an enhanced level of quality control (80% TSS removal) in accordance with the RVCA requirement. Stormceptor sizing has been included in ***Appendix D***.

Table 16 summarizes each sub-catchment. ***Appendix D*** contains a detailed outline of available storage and inlet controls.

Table 16
Drainage Area Storage Volume Analysis 100-Year 6-Hour Storm

Catchment ID	Structure ID	Required Volume (1000 m^3)	Available Percent Full (%)	Maximum Outflow (L/s)
A1/A3/A4	UG3	0.032	90	62.72
PARK	UG1	0.144	73	14.89
A7	UG2	0.195	98	14.62

Table 17 summarizes the results of the EPASWMM model at the outfall. Model input and output summary is included in ***Appendix D***.

Table 17
Summary of Storage and Peak Flow Rates for the 5 and 100-Year Storm Distribution

Outfall Node	5-Year (L/s)	100-Year (L/s)
System	**24.0**	**125.4**

Based on the EPASWMM analysis, the site is capable of attenuating to the established release rate of ***126.3 L/s***. A model schematic and output files are included in ***Appendix D***.

Table 18 summarizes the relevant ***City Standards*** employed in the design of the proposed storm sewer system referred to as the minor system.

Table 18
Storm Sewer Design Criteria

Design Parameter	Value
Intensity Duration Frequency Curve (IDF) 5-year storm event. A = 998.071 B = 6.053 C = 0.814	$i = \frac{A}{(t_c + B)^C}$
Minimum Time of Concentration	10 minutes
Rational Method	$Q = CiA$
Runoff coefficient for paved and roof areas	0.9
Runoff coefficient for landscaped areas	0.2
Storm sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} AR^{2/3} S^{1/2}$
Minimum Sewer Size	250 mm diameter
Minimum Manning's 'n'	0.013
Service Lateral Size	100 mm dia PVC SDR 28 with a minimum slope of 1.0%
Minimum Depth of Cover	2.0 m from crown of sewer to grade
Minimum Full Flowing Velocity	0.8 m/s
Maximum Full Flowing Velocity	3.0 m/s
Additional Considerations	Storm sewer maintenance holes serving sewers 900 mm diameter and less shall be constructed with 300 mm deep sumps. Maintenance holes for storm sewers greater than 900 mm must be benched.

Extracted from Sections 5 and 6 of the City of Ottawa Sewer Design Guidelines, November 2004.

5.4.1 Hydraulic Grade Line Analysis

A Hydraulic Grade Line (HGL) analysis was completed using EPASWMM. The minimum freeboard between the slab elevation and the HGL will be 0.30 m. The 100-year 6-Hour Chicago storm event yielded the highest peak flows and was, therefore, used in the HGL analysis.

Table 19 below summarizes modeled results of selected nodes that resulted in the smallest difference between slab elevation and HGL. Full model results can be seen in ***Appendix D.***

Table 19
Hydraulic Grade Line Analysis 100-Year 6-Hour Storm

Node ID	Building ID	Building Slab Elevation (m)	Maximum HGL (m)	Freeboard (m)
MH5	BLOCK 1	73.07	71.96	1.11
	BLOCK 3	73.77		1.81
MH6	BLOCK 2	73.07	71.96	1.11
	BLOCK 4	73.97		2.01

5.5 Proposed Major System Flow

During storms in excess of the 100-year event or if catchbasins/manholes become blocked, stormwater runoff will spill towards the private right-of-ways. Stormwater from private right-of-ways will flow overland towards the municipal infrastructure within the Draper Avenue right-of-way and ultimately to Graham Creek, approximately 1.5 km downstream. During a stress test event, stormwater is estimated to ponding on Draper Avenue to 72.17 m, therefore will spill towards the municipal ROWs without touching proposed building envelopes.

5.6 Catchbasin Capture Analysis

In order to demonstrate that the catchbasin system is capable of collecting stormwater during a 100-year storm event, a catchbasin capture analysis was prepared utilizing *Table 4.19* of the ***MTO Drainage Manual*** for catchbasin capture and the orifice equation per ***City Standards*** for calculating catchbasin lead capture. The lower of the catchbasin capture or catchbasin lead capture was used to determine the capture at incremental heads, refer to ***Appendix D*** for the stage-discharge curve for single and twin CB and a 250 mm lead used in the analysis.

Subcatchment runoff directed towards the catchbasin system was designed via EPASWMM. Refer to *Section 5.3* and *Section 5.4* for further details.

Table 20 below summarizes the estimated runoff for each catchment area versus the estimated catchbasin lead capacity.

Table 20
Catchbasin Capture Analysis

Catchment ID	Structure ID	Estimated Catchment Runoff (L/s)	Estimated Catchbasin Capacity (L/s)
A1/A3	CB6, CB7, CB8, CB19, CB20	138.2	186
A2	CB16, CB17, CB18	118.1	140
A4/A7	CB1, CB2, CB3, CB4, CB5	83.7	148
A5	CB9, CB10, CB11	88.0	128
A6	CB12, CB13, CB14, CB15	87.8	96

As demonstrated by ***Table 20***, the proposed catchbasin system is capable of collecting stormwater runoff during a 100-year storm event.

5.7 Stormwater Servicing Conclusions

Post development stormwater runoff will be required to be restricted to the allowable target release rate for storm events up to and including the 100-year storm in accordance with City of Ottawa ***City Standards***. The post-development allowable release rate was calculated as ***126.3 L/s*** based on consultation with the City of Ottawa; ***449 m^3*** of underground storage will be provided to meet this release rate.

Based on consultation with the RVCA, stormwater quality controls to an enhanced level of treatment are required.

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 or an approved equivalent 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 by Greatwise Developments to prepare a Servicing and Stormwater Management report in support of the application for a Site Plan Control (SPC) for the Phase 3-1 development at 2710 Draper Avenue. 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;
- The FUS method for estimating fire flow indicated ***10,000 L/min*** is required for the Phase 3-1 development and ***11,000 L/min*** is required for the Phase 3 development,
- The proposed ultimate development is anticipated to have a peak wet weather flow of ***6.38 L/s***; Based on the sanitary analysis prepared by JFSA, the existing municipal sewer infrastructure has sufficient capacity to support the development;
- Based on consultation with the City of Ottawa, the proposed development will be required to attenuate post development flows to an equivalent release rate of ***126.3 L/s*** for all storms up to and including the 100-year storm event;
- Stormwater objectives will be met through storm water retention via subsurface storage, ***449 m^3*** underground storage system will be provided to attenuate flow to the established release rate above;
- Based on consultation with the RVCA, stormwater quality controls to an enhanced level of treatment are required, a Stormceptor has been provided to meet this requirement.

Prepared by,
David Schaeffer Engineering Ltd.

Per: Alison J. Gosling, EIT.

Reviewed by,
David Schaeffer Engineering Ltd.

LICENSED PROFESSIONAL ENGINEER
A. D. FOBERT
100090626
2018-08-08
PROVINCE OF ONTARIO
JOB# 17-927

Per: Adam D. Fobert, P. Eng.

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APPENDIX A

Pre-Consultation

DEVELOPMENT SERVICING STUDY CHECKLIST

17-927 01/06/2017

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 7.0
☐	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

Alison Gosling

From: Jamie Batchelor <jamie.batchelor@rvca.ca>
Sent: Wednesday, October 18, 2017 11:49 AM
To: Alison Gosling
Subject: RE: 2710 Draper Avenue - RVCA

Hi Alison,

Thanks for providing the information and for the clarification on the stages. While there is no surface parking proposed in the traditional sense of a large parking lot, there are several driveways proposed which would be utilized for parking and the construction of new streets. Therefore the Conservation Authority would still advise the proponent that onsite water quality treatment of 80% TSS removal should be the water quality target for this site.

From: Alison Gosling [mailto:AGosling@dsel.ca]
Sent: Wednesday, October 18, 2017 10:35 AM
To: Jamie Batchelor <jamie.batchelor@rvca.ca>
Subject: RE: 2710 Draper Avenue - RVCA

Good morning Jamie,

As discussed, phase III of the development includes 91 townhome units and a community park post-development, with no proposed surface parking. The subject site contains 84 townhome pre-development, with surface parking.

Stormwater in the post-development will be runoff from rooftops and landscaped areas. It is not proposed to have surface ponding within the private streets.

Please note that Phase III will be independently serviced and not connected to the services within Phase I and Phase II.

Can you provide an updated recommendation regarding quality controls?

Thank you,

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

DSEL
david schaeffer engineering ltd.

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

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

From: Jamie Batchelor [mailto:jamie.batchelor@rvca.ca]
Sent: Wednesday, June 21, 2017 2:19 PM
To: Alison Gosling <AGosling@dsel.ca>
Subject: RE: 2710 Draper Avenue - RVCA

Good Afternoon Alison,

Given that the site outlets to an existing storm sewer approximately 1.5 km to Graham Creek and there is no municipal facility which provides water quality treatment for the Stormwater entering the watercourse, we would advise the proponent that onsite water quality treatment of 80% TSS removal should be the water quality target for this site.

From: Alison Gosling [mailto:AGosling@dsel.ca]
Sent: Thursday, June 15, 2017 9:53 AM
To: Jamie Batchelor <jamie.batchelor@rvca.ca>
Subject: 2710 Draper Avenue - RVCA

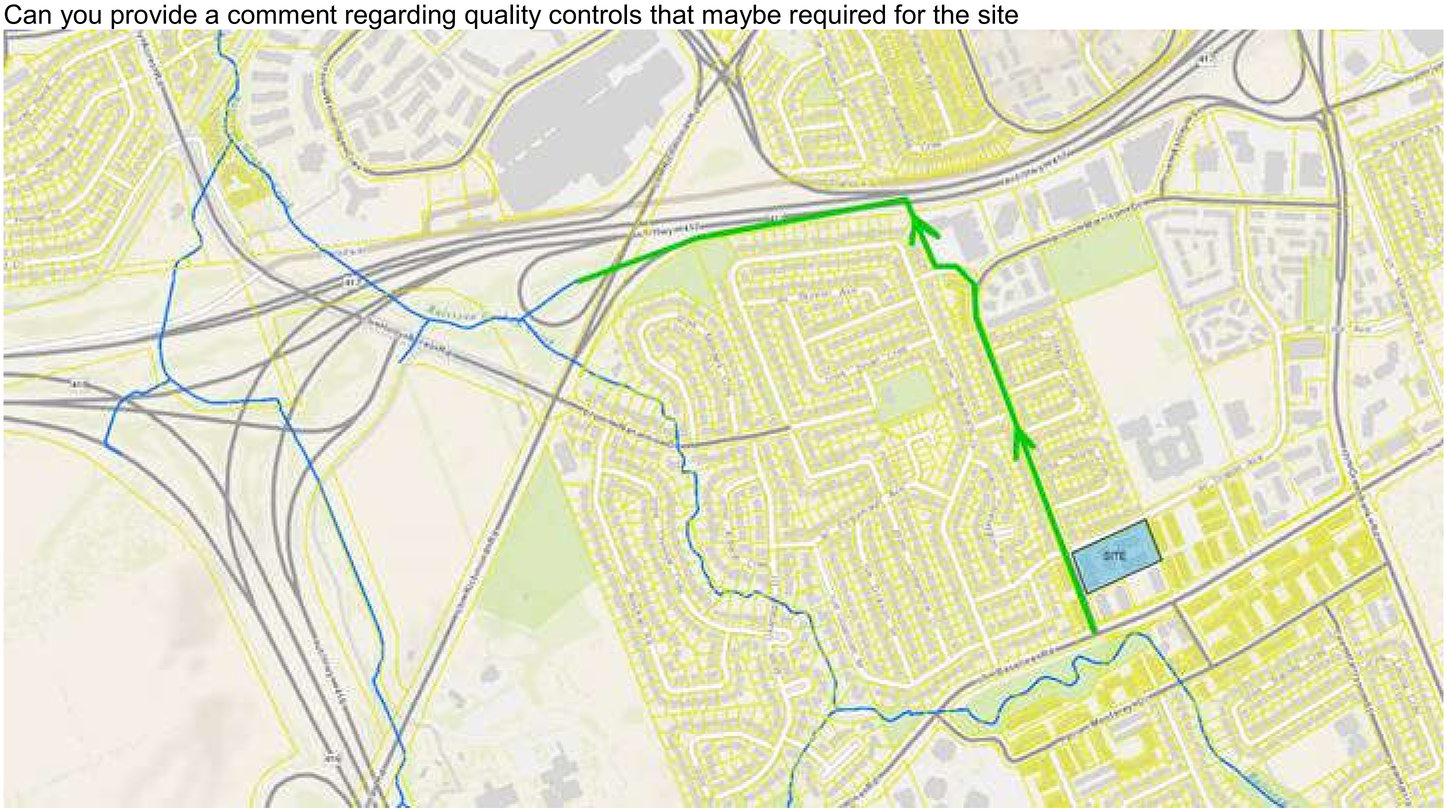
Good morning Jamie,

We wanted to touch base with you regarding a development we are working on located at 2710 Draper Avenue.

The stormwater collected from the site travels approximately 1.5 km to Graham Creek tributary to the Ottawa River.

The development proposes to construct a thirteen townhome blocks and a community park. The development will discharge stormwater to the existing 450 mm diameter storm sewer within Draper Avenue.

Can you provide a comment regarding quality controls that maybe required for the site



Thank you,

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

DSEL
david schaeffer engineering ltd.

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

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

Alison Gosling

From: Alison Gosling
Sent: Tuesday, October 24, 2017 11:55 AM
To: moeccottawasewage@ontario.ca
Cc: 'Diamond, Emily (MOECC)'
Subject: 2710 Draper Avenue - ECA Requirement

Good afternoon,

We wanted to touch base with you regarding a proposed Phase III development at 2710 Draper Avenue.

The existing 1.3 ha site currently consists of a 84 townhome units and is zoned Residential. The development proposes to construct a 91 townhome units and a community park.

It appears that the existing stormwater management system currently directs flow towards the municipal infrastructure within Draper Avenue and Morrison Drive. Proposed stormwater controls will use subsurface storage to attenuate the release rate to City of Ottawa requirements.

As the proposed sewage works does not discharge to a combined sewer system, and is not proposed to be used for industrial purposes, it is assumed this falls within the exemption requirements set out in Ontario Regulation 525/98 as part of the Ontario Water Resources Act.

I hope you could comment on our assumption that this property would be exempt from requiring an ECA. Please feel free to call to discuss further.

Thank you,

Alison Gosling, E.I.T.

Project Coordinator / Junior Designer

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fax: (613) 836-7183
email: agosling@dsel.ca

APPENDIX B

Water Supply

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		0
Semi-detached	2.7		0
Townhouse	2.7	84	227
Apartment			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	227	79.5	55.2	286.0	198.6	429.0	297.9

Institutional / Commercial / Industrial Demand

Property Type	Unit Rate		Units	Avg. Daily m^3/d	Avg. Daily L/min	Max Day m^3/d	Max Day L/min	Peak Hour m^3/d	Peak Hour L/min
Commercial floor space	2.5	$L/m^2/d$		0.00	0.0	0.0	0.0	0.0	0.0
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	0.0	0.0	0.0	0.0	0.0	0.0
			Total Demand	**79.5**	**55.2**	**286.0**	**198.6**	**429.0**	**297.9**

2710 Draper Avenue

Proposed Site Conditions - Phase III-I

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		0
Semi-detached	2.7		0
Townhouse	2.7	32	87
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	87	30.5	21.1	109.6	76.1	164.4	114.2

Institutional / Commercial / Industrial Demand

Property Type	Unit Rate		Units	Avg. Daily m^3/d	Avg. Daily L/min	Max Day m^3/d	Max Day L/min	Peak Hour m^3/d	Peak Hour L/min
Commercial floor space	2.5	$L/m^2/d$		0.00	0.0	0.0	0.0	0.0	0.0
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	0.0	0.0	0.0	0.0	0.0	0.0
			Total Demand	**30.5**	**21.1**	**109.6**	**76.1**	**164.4**	**114.2**

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		0
Semi-detached	2.7		0
Townhouse	2.7	86	233
Apartment			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	233	81.6	56.6	293.6	203.9	440.4	305.8

Institutional / Commercial / Industrial Demand

Property Type	Unit Rate		Units	Avg. Daily m^3/d	Avg. Daily L/min	Max Day m^3/d	Max Day L/min	Peak Hour m^3/d	Peak Hour L/min
Commercial floor space	2.5	$L/m^2/d$		0.00	0.0	0.0	0.0	0.0	0.0
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				0.0	0.0	0.0	0.0	0.0	0.0
Total Demand				**81.6**	**56.6**	**293.6**	**203.9**	**440.4**	**305.8**

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Non-Combustible Construction

C	0.8		*Type of Construction Coefficient per FUS Part II, Section 1*
A	1140.4	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	5943.5 L/min	
	6000.0 L/min	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Combustible 0%

Fire Flow	**6000.0 L/min**

3. Reduction for Sprinkler Protection

Non-Sprinklered 0%

Reduction	**0 L/min**

4. Increase for Separation Distance

	Cons. of Exposed Wall	S.D	Lw	Ha	LH	EC
N	Wood Frame	20.1m-30m	10	1	10	8%
S	Non-Combustible	10.1m-20m	35	3	105	15%
E	Non-Combustible	0m-3m	13.3	3	40	23%
W	Wood Frame	30.1m-45m	12	3	36	5%
		% Increase				**51%** *value not to exceed 75%*

Increase	**3060.0 L/min**

Lw = Length of the Exposed Wall (of the ajacent structure)
Ha = number of storeys of the adjacent structure (maximum 5 stories)
LH = Length-height factor of exposed wall. Value rounded up.
EC = Exposure Charge

Total Fire Flow

Fire Flow	9060.0 L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	9000.0 L/min	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by Roderick Lahey Architects.
-Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Non-Combustible Construction

C	0.8		*Type of Construction Coefficient per FUS Part II, Section 1*
A	1208.4	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	6118.1 L/min	
	6000.0 L/min	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Combustible 0%

Fire Flow	**6000.0 L/min**

3. Reduction for Sprinkler Protection

Non-Sprinklered 0%

Reduction	**0 L/min**

4. Increase for Separation Distance

	Cons. of Exposed Wall	S.D	Lw	Ha	LH	EC
N	Wood Frame	20.1m-30m	12	1	12	8%
S	Non-Combustible	20.1m-30m	35	3	105	10%
E	Non-Combustible	0m-3m	13	3	39	23%
W	Non-Combustible	0m-3m	13	3	39	23%
		% Increase				**64%** *value not to exceed 75%*

Increase	**3840.0 L/min**

Lw = Length of the Exposed Wall (of the ajacent structure)
Ha = number of storeys of the adjacent structure (maximum 5 stories)
LH = Length-height factor of exposed wall. Value rounded up.
EC = Exposure Charge

Total Fire Flow

Fire Flow	9840.0 L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	10000.0 L/min	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provide(Roderick Lahey Architects.
-Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$$F = 220C\sqrt{A}$$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Non-Combustible Construction

C	0.8		*Type of Construction Coefficient per FUS Part II, Section 1*
A	1075.2	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	5771.1	L/min	
	6000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Combustible 0%

Fire Flow	**6000.0**	**L/min**

3. Reduction for Sprinkler Protection

Non-Sprinklered 0%

Reduction	**0**	**L/min**

4. Increase for Separation Distance

	Cons. of Exposed Wall	**S.D**	**Lw**	**Ha**	**LH**	**EC**
N	Non-Combustible	20.1m-30m	43	3	129	10%
S	Non-Combustible	20.1m-30m	54	3	162	10%
E	Non-Combustible	3.1m-10m	13.3	3	40	18%
W	Wood Frame	>45m	0	1	0	0%
		% Increase				**38%** *value not to exceed 75%*

Increase	**2280.0**	**L/min**

Lw = Length of the Exposed Wall (of the ajacent structure)
Ha = number of storeys of the adjacent structure (maximum 5 stories)
LH = Length-height factor of exposed wall. Value rounded up.
EC = Exposure Charge

Total Fire Flow

Fire Flow	8280.0	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	8000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provide(Roderick Lahey Architects.
-Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey
Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Non-Combustible Construction

C 0.8 *Type of Construction Coefficient per FUS Part II, Section 1*
A 1075.2 m^2 *Total floor area based on FUS Part II section 1*

Fire Flow	5771.1 L/min	
	6000.0 L/min	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Combustible 0%

Fire Flow	**6000.0 L/min**

3. Reduction for Sprinkler Protection

Non-Sprinklered 0%

Reduction	**0 L/min**

4. Increase for Separation Distance

	Cons. of Exposed Wall	S.D	Lw	Ha	LH	EC
N	Non-Combustible	20.1m-30m	35	3	105	10%
S	Non-Combustible	20.1m-30m	52	3	156	10%
E	Ordinary - Unprotected Openings	3.1m-10m	13.3	3	40	16%
W	Ordinary - Unprotected Openings	3.1m-10m	13.3	3	40	16%
		% Increase				**52%** *value not to exceed 75%*

Increase	**3120.0 L/min**

Lw = Length of the Exposed Wall (of the ajacent structure)
Ha = number of storeys of the adjacent structure (maximum 5 stories)
LH = Length-height factor of exposed wall. Value rounded up.
EC = Exposure Charge

Total Fire Flow

Fire Flow	9120.0 L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	9000.0 L/min	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provide(Roderick Lahey Architects.
-Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Non-Combustible Construction

C	0.8		*Type of Construction Coefficient per FUS Part II, Section 1*
A	1086.6	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	5801.6	L/min	
	6000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Combustible 0%

Fire Flow	**6000.0**	**L/min**

3. Reduction for Sprinkler Protection

Non-Sprinklered 0%

Reduction	**0**	**L/min**

4. Increase for Separation Distance

	Cons. of Exposed Wall	**S.D**	**Lw**	**Ha**	**LH**	**EC**
N	Non-Combustible	20.1m-30m	43	3	129	10%
S	Non-Combustible	30.1m-45m	88	3	264	5%
E	Non-Combustible	0m-3m	13.3	3	40	23%
W	Non-Combustible	0m-3m	13.3	3	40	23%
		% Increase				**61%** *value not to exceed 75%*

Increase	**3660.0**	**L/min**

Lw = Length of the Exposed Wall (of the ajacent structure)
Ha = number of storeys of the adjacent structure (maximum 5 stories)
LH = Length-height factor of exposed wall. Value rounded up.
EC = Exposure Charge

Total Fire Flow

Fire Flow	9660.0	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	10000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provide(Roderick Lahey Architects.
-Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey
Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Non-Combustible Construction

C	0.8		*Type of Construction Coefficient per FUS Part II, Section 1*
A	1647.8	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	7144.4	L/min	
	7000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Combustible 0%

Fire Flow **7000.0 L/min**

3. Reduction for Sprinkler Protection

Non-Sprinklered 0%

Reduction **0 L/min**

4. Increase for Separation Distance

	Cons. of Exposed Wall	S.D	Lw	Ha	LH	EC
N	Wood Frame	30.1m-45m	33.5	1	34	5%
S	Non-Combustible	10.1m-20m	119	3	357	15%
E	Non-Combustible	10.1m-20m	45	3	135	15%
W	Non-Combustible	0m-3m	143	3	429	25%
		% Increase				**60%** *value not to exceed 75%*

Increase **4200.0 L/min**

Lw = Length of the Exposed Wall
Ha = number of storeys of the adjacent structure (maximum 5 stories)
LH = Length-height factor of exposed wall. Value rounded up.
EC = Exposure Charge

Total Fire Flow

Fire Flow	11200.0	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	11000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provide(Roderick Lahey Architects.
-Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Non-Combustible Construction

C	0.8		*Type of Construction Coefficient per FUS Part II, Section 1*
A	1328.3	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	6414.5 L/min	
	6000.0 L/min	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Combustible	0%
Fire Flow	**6000.0 L/min**

3. Reduction for Sprinkler Protection

Non-Sprinklered	0%
Reduction	**0 L/min**

4. Increase for Separation Distance

	Cons. of Exposed Wall	S.D	Lw	Ha	LH	EC
N	Wood Frame	20.1m-30m	43	0	0	8%
S	Non-Combustible	10.1m-20m	35	0	0	12%
E	Non-Combustible	10.1m-20m	13.3	0	0	12%
W	Non-Combustible	3.1m-10m	13.3	0	0	17%
		% Increase				**49%** *value not to exceed 75%*

Increase	**2940.0 L/min**

Lw = Length of the Exposed Wall (of the ajacent structure)
Ha = number of storeys of the adjacent structure (maximum 5 stories)
LH = Length-height factor of exposed wall. Value rounded up.
EC = Exposure Charge

Total Fire Flow

Fire Flow	8940.0 L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	9000.0 L/min	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provide(Roderick Lahey Architects.
-Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Non-Combustible Construction

C	0.8		*Type of Construction Coefficient per FUS Part II, Section 1*
A	1086.6	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	5801.6	L/min	
	6000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Combustible	0%
Fire Flow	**6000.0 L/min**

3. Reduction for Sprinkler Protection

Non-Sprinklered	0%
Reduction	**0 L/min**

4. Increase for Separation Distance

	Cons. of Exposed Wall	S.D	Lw	Ha	LH	EC
N	Non-Combustible	20.1m-30m	43	3	129	10%
S	Ordinary - Unprotected Openings	20.1m-30m	88	3	264	10%
E	Non-Combustible	10.1m-20m	45	3	135	15%
W	Non-Combustible	0m-3m	12	3	36	23%
		% Increase				**58%** *value not to exceed 75%*

Increase	**3480.0 L/min**

Lw = Length of the Exposed Wall (of the ajacent structure)
Ha = number of storeys of the adjacent structure (maximum 5 stories)
LH = Length-height factor of exposed wall. Value rounded up.
EC = Exposure Charge

Total Fire Flow

Fire Flow	9480.0	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	9000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provide(Roderick Lahey Architects.
-Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Non-Combustible Construction

C	0.8		*Type of Construction Coefficient per FUS Part II, Section 1*
A	765.3	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	4868.9 L/min	
	5000.0 L/min	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Combustible 0%

Fire Flow **5000.0 L/min**

3. Reduction for Sprinkler Protection

Non-Sprinklered 0%

Reduction **0 L/min**

4. Increase for Separation Distance

	Cons. of Exposed Wall	S.D	Lw	Ha	LH	EC
N	Wood Frame	20.1m-30m	10	1	10	8%
S	Non-Combustible	3.1m-10m	13	3	39	18%
E	Wood Frame	3.1m-10m	35	1	35	18%
W	Non-Combustible	20.1m-30m	14	3	42	8%
		% Increase				**52%** *value not to exceed 75%*

Increase **2600.0 L/min**

Lw = Length of the Exposed Wall (of the ajacent structure)
Ha = number of storeys of the adjacent structure (maximum 5 stories)
LH = Length-height factor of exposed wall. Value rounded up.
EC = Exposure Charge

Total Fire Flow

Fire Flow	7600.0 L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	8000.0 L/min	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provide(Roderick Lahey Architects.
-Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Non-Combustible Construction

C	0.8		*Type of Construction Coefficient per FUS Part II, Section 1*
A	765.3	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	4868.9 L/min	
	5000.0 L/min	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Combustible	0%
Fire Flow	**5000.0 L/min**

3. Reduction for Sprinkler Protection

Non-Sprinklered	0%
Reduction	**0 L/min**

4. Increase for Separation Distance

	Cons. of Exposed Wall	S.D	Lw	Ha	LH	EC
N	Non-Combustible	3.1m-10m	13.3	3	40	18%
S	Non-Combustible	3.1m-10m	13.3	3	40	18%
E	Non-Combustible	3.1m-10m	40	3	120	20%
W	Non-Combustible	10.1m-20m	13.3	3	40	13%
		% Increase				**69%** *value not to exceed 75%*

Increase	**3450.0 L/min**

Lw = Length of the Exposed Wall (of the ajacent structure)
Ha = number of storeys of the adjacent structure (maximum 5 stories)
LH = Length-height factor of exposed wall. Value rounded up.
EC = Exposure Charge

Total Fire Flow

Fire Flow	8450.0 L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	8000.0 L/min	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provide(Roderick Lahey Architects.
-Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey
Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Non-Combustible Construction

C	0.8		*Type of Construction Coefficient per FUS Part II, Section 1*
A	756.9	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	4842.1 L/min	
	5000.0 L/min	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Combustible	0%
Fire Flow	**5000.0 L/min**

3. Reduction for Sprinkler Protection

Non-Sprinklered	0%
Reduction	**0 L/min**

4. Increase for Separation Distance

	Cons. of Exposed Wall	S.D	Lw	Ha	LH	EC
N	Non-Combustible	20.1m-30m	13.3	3	40	8%
S	Ordinary - Unprotected Openings	3.1m-10m	88	4	352	19%
E	Wood Frame	10.1m-20m	40	3	120	15%
W	Non-Combustible	30.1m-45m	13.3	3	40	5%
		% Increase				**47%** *value not to exceed 75%*

Increase	**2350.0 L/min**

Lw = Length of the Exposed Wall (of the ajacent structure)
Ha = number of storeys of the adjacent structure (maximum 5 stories)
LH = Length-height factor of exposed wall. Value rounded up.
EC = Exposure Charge

Total Fire Flow

Fire Flow	7350.0 L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	7000.0 L/min	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provide(Roderick Lahey Architects.
-Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Non-Combustible Construction

C	0.8		*Type of Construction Coefficient per FUS Part II, Section 1*
A	1086.0	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	5800.0 L/min	
	6000.0 L/min	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Combustible	0%
Fire Flow	**6000.0 L/min**

3. Reduction for Sprinkler Protection

Non-Sprinklered	0%
Reduction	**0 L/min**

4. Increase for Separation Distance

	Cons. of Exposed Wall	S.D	Lw	Ha	LH	EC
N	Non-Combustible	20.1m-30m	13.3	3	40	8%
S	Ordinary - Unprotected Openings	10.1m-20m	88	4	352	15%
E	Non-Combustible	0m-3m	40	3	120	25%
W	Wood Frame	30.1m-45m	13.3	3	40	5%
		% Increase				**53%** *value not to exceed 75%*

Increase	**3180.0 L/min**

Lw = Length of the Exposed Wall (of the ajacent structure)
Ha = number of storeys of the adjacent structure (maximum 5 stories)
LH = Length-height factor of exposed wall. Value rounded up.
EC = Exposure Charge

Total Fire Flow

Fire Flow	9180.0 L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	9000.0 L/min	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provide(Roderick Lahey Architects.
-Calculations based on Fire Underwriters Survey - Part II

Boundary Conditions Unit Conversion

Connection 1 (Morrison Drive)

	Height (m)	Elevation (m)	m H_2O	PSI	kPa
Avg. DD	117.7	71.9	45.8	65.2	449.3
Fire Flow			0.0	0.0	0.0
Peak Hour	106.0	71.9	34.1	48.5	334.5

	L/s	L/min
Fire Flow @ 140kPa	235	14100

Connection 2 (Draper Avenue)

	Height (m)	Elevation (m)	m H_2O	PSI	kPa
Avg. DD	117.7	72.2	45.5	64.8	446.6
Fire Flow			0.0	0.0	0.0
Peak Hour	106.0	72.2	33.8	48.1	331.9

	L/s	L/min
Fire Flow @ 140kPa	210	12600

Minor Loss Coefficients

Fitting	Loss Coefficient
Globe valve, fully open	10
Angle valve, fully open	5
Swing check valve, fully open	2.5
Gate valve, fully open	0.2
Short-radius elbow	0.9
Medium-radius elbow	0.8
Long-radius elbow	0.6
45 degree elbow	0.4
Closed return bend	2.2
Standard tee - flow through run	0.6
Standard tee - flow through branch	1.8
Square Entrance	0.5
Exit	1

*Minor loss coefficients based on EPANET 2 USERS MANUAL, dated September 2000

Pipe Diameter vs. "C" Factor

Pipe Diameter (m)	C-Factor
150	100
200 to 250	110
300 to 600	120
Over 600	130

Node Pressures

Kpa	Pressure (kPa)	Pressure (m H20)
Max	552	56.3
Rec Max	480	49.0
Rec Min	350	35.7
Min	275	28.1

Location	Average Day (L/min)	Max Day + Fire Flow (L/min)	Peak Hour (L/min)
4	0.0	0.0	0.0
5	0.0	0.0	0.0
7	4.0	14.3	21.4
9	4.0	14.3	21.4
10	0.7	2.4	3.6
11	0.7	2.4	3.6
12	0.0	0.0	0.0
13	0.7	2.4	3.6
14	0.7	2.4	3.6
15	0.0	0.0	0.0
16	0.0	0.0	0.0
17	2.0	7.1	10.7
18	2.0	7.1	10.7
19	0.0	0.0	0.0
20	0.0	0.0	0.0
21	0.0	0.0	0.0
22	0.0	0.0	0.0
23	0.0	0.0	0.0
24	0.7	2.4	3.6
26	0.7	2.4	3.6
27	0.0	0.0	0.0
28	0.0	0.0	0.0
29	0.0	0.0	0.0
FHYD1	0.0	7000	0.0
FHYD2	0.0	7000	0.0

Location	Average Day (kPa)	Max Day + Fire Flow (kPa)	Peak Hour (kPa)
4	464.3	402.9	344.3
5	454.4	395.2	339.6
7	457.9	397.6	336.1
9	462.0	425.9	347.2
10	460.5	412.4	345.7
11	459.1	422.7	343.8
12	457.6	409.4	342.4
13	456.0	394.7	341.2
14	451.6	411.6	336.3
15	449.5	395.1	334.2
16	447.3	378.3	332.6
17	458.6	397.3	343.8
18	454.4	414.7	339.6
19	452.4	398.4	337.7
20	455.7	386.3	341.0
21	451.2	411.4	336.4
22	449.9	395.8	335.1
23	447.5	378.5	332.8
24	457.2	401.0	342.5
26	458.5	422.0	343.0
27	457.2	408.8	341.7
28	455.2	393.9	340.4
29	454.3	392.1	339.5
FHYD1	462.1	357.2	345.3
FHYD2	453.7	337.9	338.9

Minor Loss Coefficients

Fitting	Loss Coefficient
Globe valve, fully open	10
Angle valve, fully open	5
Swing check valve, fully open	2.5
Gate valve, fully open	0.2
Short-radius elbow	0.9
Medium-radius elbow	0.8
Long-radius elbow	0.6
45 degree elbow	0.4
Closed return bend	2.2
Standard tee - flow through run	0.6
Standard tee - flow through branch	1.8
Square Entrance	0.5
Exit	1

*Minor loss coefficients based on EPANET 2 USERS MANUAL, dated September 2000

Pipe Diameter vs. "C" Factor

Pipe Diameter (m)	C-Factor
150	100
200 to 250	110
300 to 600	120
Over 600	130

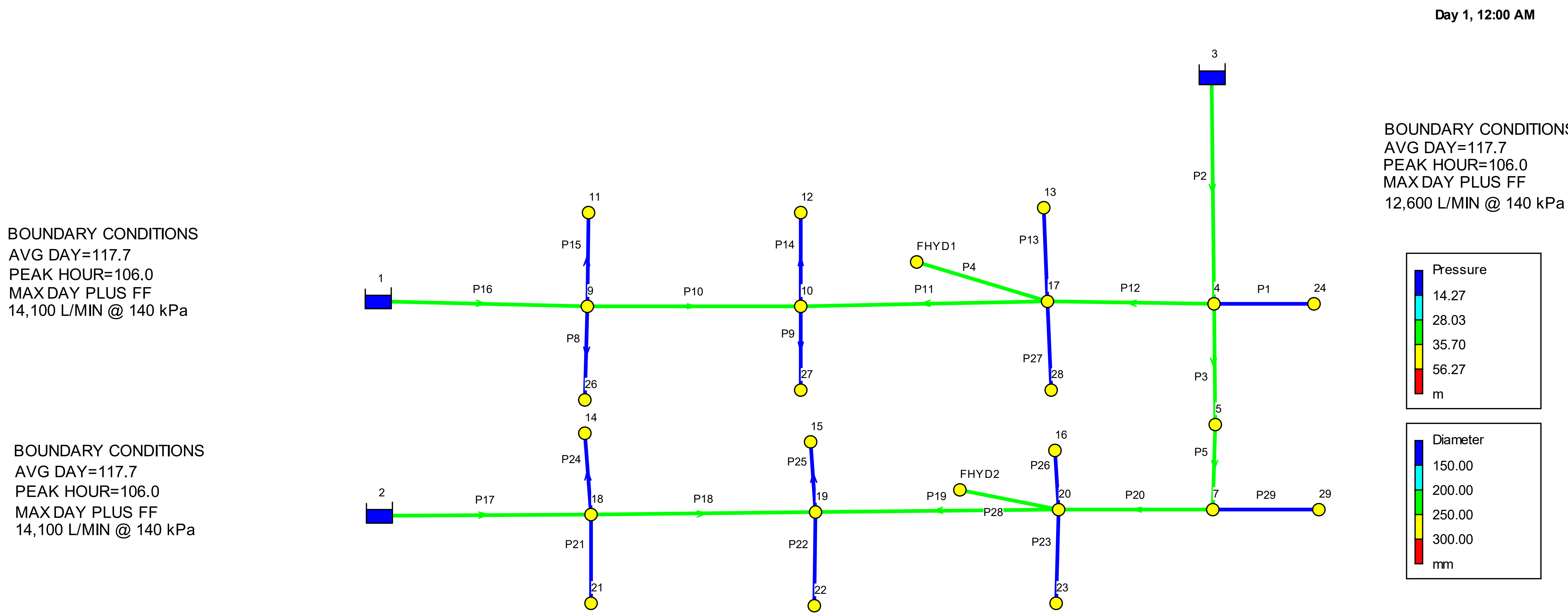
Node Pressures

Kpa	Pressure (kPa)	Pressure (m H20)
Max	552	56.3
Rec Max	480	49.0
Rec Min	350	35.7
Min	275	28.1

Location	Average Day (L/min)	Max Day + Fire Flow (L/min)	Peak Hour (L/min)
4	2.0	7.1	10.7
5	0.0	0.0	0.0
7	2.0	7.1	10.7
9	4.0	14.2	21.3
10	4.0	14.2	21.3
11	0.7	2.4	3.6
12	0.7	2.4	3.6
13	0.7	2.4	3.6
14	0.7	2.4	3.6
15	0.7	2.4	3.6
16	0.7	2.4	3.6
17	5.9	21.3	32.0
18	6.6	23.7	35.6
19	6.6	23.7	35.6
20	7.2	26.1	39.1
21	0.7	2.4	3.6
22	0.7	2.4	3.6
23	0.7	2.4	3.6
24	0.7	2.4	3.6
26	0.7	2.4	3.6
27	0.7	2.4	3.6
28	0.7	2.4	3.6
29	0.7	2.4	3.6
FHYD1	0.0	7000.0	0.0
FHYD2	0.0	7000.0	0.0

Location	Average Day (kPa)	Max Day + Fire Flow (kPa)	Peak Hour (kPa)
4	459.1	402.5	344.3
5	454.4	394.7	339.6
7	457.9	395.1	343.2
9	462.0	425.7	347.2
10	460.5	412.1	345.7
11	459.1	422.6	343.8
12	457.6	409.1	342.4
13	456.0	394.1	340.7
14	451.6	411.2	336.3
15	449.5	394.6	334.2
16	447.3	377.4	332.1
17	458.6	396.9	343.8
18	454.4	414.3	339.6
19	452.4	397.8	337.7
20	455.9	386.1	341.1
21	451.2	410.6	335.5
22	447.5	394.9	334.2
23	457.2	377.4	331.9
24	458.5	400.3	341.9
26	457.2	421.8	343.0
27	455.2	408.5	341.6
28	454.3	393.1	339.5
29	459.1	391.3	338.9
FHYD1	453.7	355.7	344.3
FHYD2	450.1	340.8	338.9

2710 DRAPER AVENUE PHASE III-I - AVERAGE DAY DEMAND



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

Input File: 2018-08-07_ph3-1_avg.net

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
P2	4	3	34.8	200
P3	4	5	18.7	200
P4	17	FHYD1	1.2	200
P5	5	7	14.2	200
P10	9	10	35.1	200
P11	10	17	39.7	200
P12	17	4	24.7	200
P13	17	13	6.1	19
P14	10	12	6.1	19
P15	9	11	6.1	19
P16	9	1	29.3	200
P17	2	18	33.3	200
P18	18	19	36.4	200
P19	19	20	38.4	200
P20	20	7	45.4	200
P21	18	21	10.8	19
P22	19	22	10.8	19
P23	20	23	10.8	19
P24	18	14	6.1	19
P25	19	15	6.1	19
P26	20	16	6.1	19
P1	4	24	6.7	19
P8	9	26	10.6	19
P9	10	27	10.6	19
P27	17	28	10.6	19
P28	FHYD2	20	3	200
P29	7	29	6.7	19

Page 2

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality hours	
4	0.00	117.70	47.33	0.00	
5	0.00	117.70	46.32	0.00	
FHYD1	0.00	117.70	47.10	0.00	
7	0.00	117.70	46.68	0.00	
9	3.95	117.70	47.09	0.00	
10	3.95	117.70	46.94	0.00	
11	0.66	117.70	46.80	0.00	
12	0.66	117.70	46.65	0.00	
13	0.00	117.70	46.48	0.00	
14	0.66	117.70	46.03	0.00	
15	0.66	117.70	45.82	0.00	
16	0.00	117.70	45.60	0.00	
17	0.00	117.70	46.75	0.00	
18	1.97	117.70	46.32	0.00	
19	1.97	117.70	46.12	0.00	
20	0.00	117.70	46.45	0.00	
21	0.00	117.70	45.99	0.00	
22	0.00	117.70	45.86	0.00	
23	0.00	117.70	45.62	0.00	
24	0.00	117.70	46.61	0.00	
26	0.66	117.70	46.74	0.00	
27	0.66	117.70	46.61	0.00	
28	0.00	117.70	46.40	0.00	
FHYD2	0.00	117.70	46.25	0.00	
29	0.00	117.70	46.31	0.00	
1	-6.97	117.70	0.00	0.00	Reservoir
2	-4.48	117.70	0.00	0.00	Reservoir
3	-4.35	117.70	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPM	Velocity m/s	Unit Headloss m/km	Status
P2	-4.35	0.00	0.00	Open
P3	0.78	0.00	0.00	Open
P4	0.00	0.00	0.00	Open
P5	0.78	0.00	0.00	Open
P10	1.70	0.00	0.00	Open
P11	-3.57	0.00	0.00	Open
P12	-3.57	0.00	0.00	Open
P13	0.00	0.00	0.00	Open
P14	0.66	0.04	0.36	Open

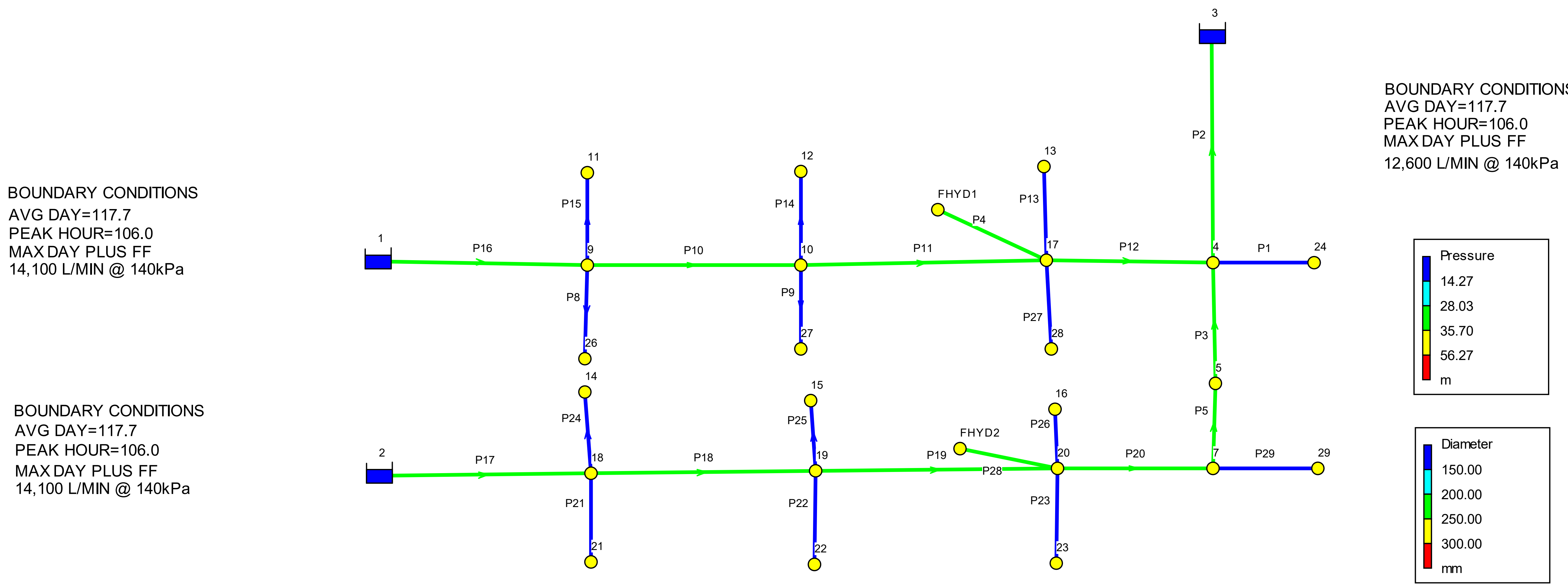
P15	0.66	0.04	0.36	Open
P16	-6.97	0.00	0.00	Open
P17	4.48	0.00	0.00	Open
P18	1.85	0.00	0.00	Open

Page 3
Link Results: (continued)

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
P19	-0.78	0.00	0.00	Open
P20	-0.78	0.00	0.00	Open
P21	0.00	0.00	0.00	Open
P22	0.00	0.00	0.00	Open
P23	0.00	0.00	0.00	Open
P24	0.66	0.04	0.36	Open
P25	0.66	0.04	0.36	Open
P26	0.00	0.00	0.00	Open
P1	0.00	0.00	0.00	Open
P8	0.66	0.04	0.35	Open
P9	0.66	0.04	0.35	Open
P27	0.00	0.00	0.00	Open
P28	0.00	0.00	0.00	Open
P29	0.00	0.00	0.00	Open

2710 DRAPER AVENUE PHASE III-I - MAX DAY + FIRE FLOW DEMAND

Day 1, 12:00 AM



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

Input File: 2018-08-07_ph3-1_max.net

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
P2	4	3	34.8	200
P3	4	5	18.7	200
P4	17	FHYD1	1.2	200
P5	5	7	14.2	200
P10	9	10	35.1	200
P11	10	17	39.7	200
P12	17	4	24.7	200
P13	17	13	6.1	19
P14	10	12	6.1	19
P15	9	11	6.1	19
P16	9	1	29.3	200
P17	2	18	33.3	200
P18	18	19	36.4	200
P19	19	20	38.4	200
P20	20	7	45	200
P21	18	21	10.8	19
P22	19	22	10.8	19
P23	20	23	10.8	19
P24	18	14	6.1	19
P25	19	15	6.1	19
P26	20	16	6.1	19
P1	4	24	6.7	19
P8	9	26	10.6	19
P9	10	27	10.6	19
P27	17	28	10.6	19
P28	FHYD2	20	3	200
P29	7	29	6.7	19

Page 2

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality hours	
4	0.00	111.97	41.07	0.00	
5	0.00	111.67	40.29	0.00	
FHYD1	7000.00	107.21	36.41	0.00	
7	0.00	111.36	40.53	0.00	
9	14.22	114.02	43.41	0.00	
10	14.22	112.80	42.04	0.00	
11	2.37	113.99	43.09	0.00	
12	2.37	112.78	41.73	0.00	
13	0.00	111.45	40.23	0.00	
14	2.37	113.63	41.96	0.00	
15	2.37	112.16	40.28	0.00	
16	0.00	110.66	38.56	0.00	
17	0.00	111.45	40.50	0.00	
18	7.11	113.65	42.27	0.00	
19	7.11	112.19	40.61	0.00	
20	0.00	110.66	39.38	0.00	
21	0.00	113.65	41.94	0.00	
22	0.00	112.19	40.35	0.00	
23	0.00	110.66	38.58	0.00	
24	0.00	111.97	40.88	0.00	
26	2.37	113.98	43.02	0.00	
27	2.37	112.76	41.67	0.00	
28	0.00	111.45	40.15	0.00	
FHYD2	7000.00	106.26	34.44	0.00	
29	0.00	111.36	39.97	0.00	
1	-4080.46	115.40	0.00	0.00	Reservoir
2	-4416.38	115.40	0.00	0.00	Reservoir
3	-5560.04	115.30	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPM	Velocity m/s	Unit Headloss m/km	Status
P2	-5560.04	2.95	95.56	Open
P3	2602.58	1.38	16.55	Open
P4	7000.00	3.71	3537.92	Open
P5	2602.58	1.38	21.64	Open
P10	4061.50	2.15	34.68	Open
P11	4042.54	2.14	33.91	Open
P12	-2957.46	1.57	21.09	Open
P13	0.00	0.00	0.00	Open
P14	2.37	0.14	3.90	Open

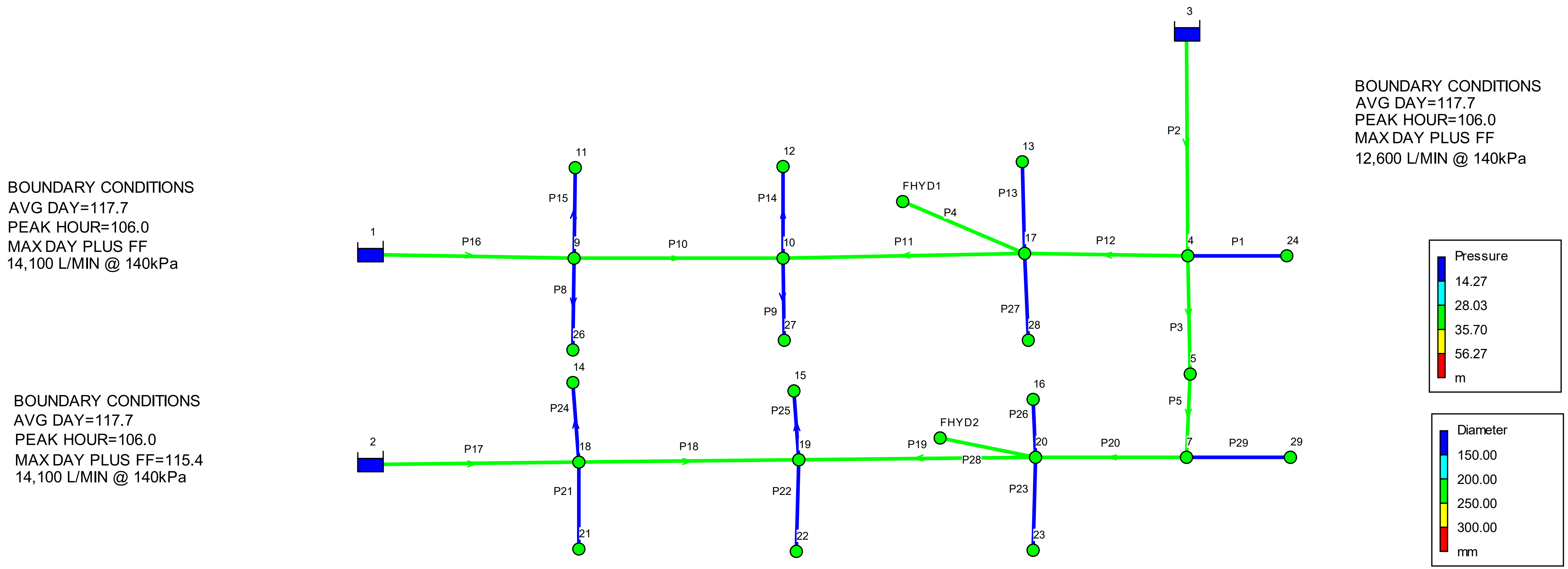
P15	2.37	0.14	3.90	Open
P16	-4080.46	2.16	47.19	Open
P17	4416.38	2.34	52.57	Open
P18	4406.90	2.34	40.22	Open

Page 3
Link Results: (continued)

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
P19	4397.42	2.33	39.82	Open
P20	-2602.58	1.38	15.59	Open
P21	0.00	0.00	0.00	Open
P22	0.00	0.00	0.00	Open
P23	0.00	0.00	0.00	Open
P24	2.37	0.14	3.90	Open
P25	2.37	0.14	3.90	Open
P26	0.00	0.00	0.00	Open
P1	0.00	0.00	0.00	Open
P8	2.37	0.14	3.76	Open
P9	2.37	0.14	3.76	Open
P27	0.00	0.00	0.00	Open
P28	-7000.00	3.71	1465.54	Open
P29	0.00	0.00	0.00	Open

2710 DRAPER AVENUE PHASE III-I - PEAK HOUR DEMAND

Day 1, 12:00 AM



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

Input File: 2018-08-07_ph3-1_peak.net

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
P2	4	3	34.8	200
P3	4	5	18.7	200
P4	17	FHYD1	1.2	200
P5	5	7	14.2	200
P10	9	10	35.1	200
P11	10	17	39.7	200
P12	17	4	24.7	200
P13	17	13	6.1	19
P14	10	12	6.1	19
P15	9	11	6.1	19
P16	9	1	29.3	200
P17	2	18	33.3	200
P18	18	19	36.4	200
P19	19	20	38.4	200
P20	20	7	45	200
P21	18	21	10.8	19
P22	19	22	10.8	19
P23	20	23	10.8	19
P24	18	14	6.1	19
P25	19	15	6.1	19
P26	20	16	6.1	19
P1	4	24	6.7	19
P8	9	26	10.6	19
P9	10	27	10.6	19
P27	17	28	10.6	19
P28	FHYD2	20	3	200
P29	7	29	6.7	19

Page 2

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality hours	
4	0.00	106.00	35.10	0.00	
5	0.00	106.00	34.62	0.00	
FHYD1	0.00	106.00	35.20	0.00	
7	0.00	106.00	34.26	0.00	
9	21.33	106.00	35.39	0.00	
10	21.33	106.00	35.24	0.00	
11	3.55	105.95	35.05	0.00	
12	3.55	105.95	34.90	0.00	
13	0.00	106.00	34.78	0.00	
14	3.55	105.95	34.28	0.00	
15	3.55	105.95	34.07	0.00	
16	0.00	106.00	33.90	0.00	
17	0.00	106.00	35.05	0.00	
18	10.66	106.00	34.62	0.00	
19	10.66	106.00	34.42	0.00	
20	0.00	106.00	34.76	0.00	
21	0.00	106.00	34.29	0.00	
22	0.00	106.00	34.16	0.00	
23	0.00	106.00	33.92	0.00	
24	0.00	106.00	34.91	0.00	
26	3.55	105.92	34.96	0.00	
27	3.55	105.92	34.83	0.00	
28	0.00	106.00	34.70	0.00	
FHYD2	0.00	106.00	34.55	0.00	
29	0.00	106.00	34.61	0.00	
1	-37.53	106.00	0.00	0.00	Reservoir
2	-24.31	106.00	0.00	0.00	Reservoir
3	-23.46	106.00	0.00	0.00	Reservoir

Link Results:

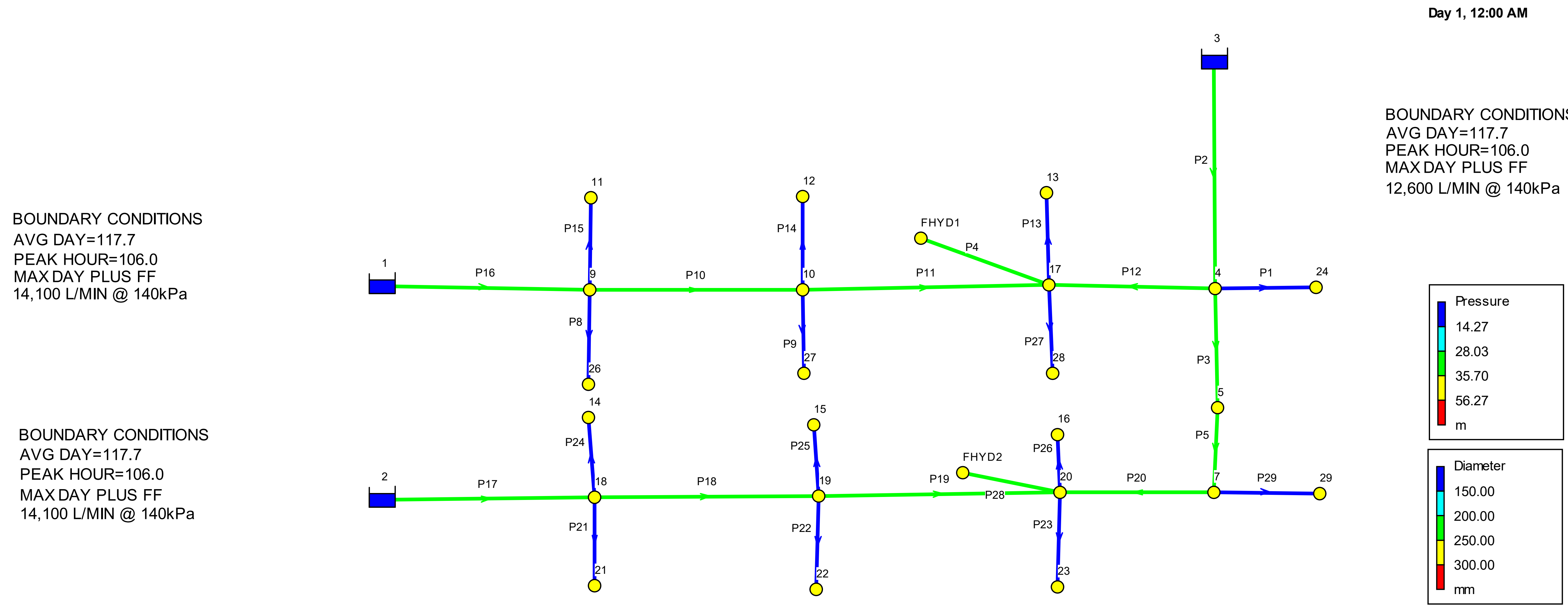
Link ID	Flow LPM	Velocity m/s	Unit Headloss m/km	Status
P2	-23.46	0.01	0.00	Open
P3	4.12	0.00	0.00	Open
P4	0.00	0.00	0.00	Open
P5	4.12	0.00	0.00	Open
P10	9.10	0.00	0.00	Open
P11	-19.33	0.01	0.00	Open
P12	-19.34	0.01	0.00	Open
P13	0.00	0.00	0.00	Open
P14	3.55	0.21	8.28	Open

P15	3.55	0.21	8.28	Open
P16	-37.53	0.02	0.01	Open
P17	24.31	0.01	0.00	Open
P18	10.09	0.01	0.00	Open

Page 3
Link Results: (continued)

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
P19	-4.12	0.00	0.00	Open
P20	-4.12	0.00	0.00	Open
P21	0.00	0.00	0.00	Open
P22	0.00	0.00	0.00	Open
P23	0.00	0.00	0.00	Open
P24	3.55	0.21	8.28	Open
P25	3.55	0.21	8.28	Open
P26	0.00	0.00	0.00	Open
P1	0.00	0.00	0.00	Open
P8	3.55	0.21	7.97	Open
P9	3.55	0.21	7.97	Open
P27	0.00	0.00	0.00	Open
P28	0.00	0.00	0.00	Open
P29	0.00	0.00	0.00	Open

2710 DRAPER AVENUE PHASE III - AVERAGE DAY DEMAND



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

Input File: 2018-08-07_ph3_avg.net

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
P2	4	3	34.8	200
P3	4	5	18.7	200
P4	17	FHYD1	1.2	200
P5	5	7	14.2	200
P10	9	10	35.1	200
P11	10	17	39.7	200
P12	17	4	24.7	200
P13	17	13	6.1	19
P14	10	12	6.1	19
P15	9	11	6.1	19
P16	9	1	29.3	200
P17	2	18	33.3	200
P18	18	19	36.4	200
P19	19	20	38.4	200
P20	20	7	45.4	200
P21	18	21	10.8	19
P22	19	22	10.8	19
P23	20	23	10.8	19
P24	18	14	6.1	19
P25	19	15	6.1	19
P26	20	16	6.1	19
P1	4	24	6.7	19
P8	9	26	10.6	19
P9	10	27	10.6	19
P27	17	28	10.6	19
P28	FHYD2	20	3	200
P29	7	29	6.7	19

Page 2

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality hours	
4	1.98	117.70	46.80	0.00	
5	0.00	117.70	46.32	0.00	
FHYD1	0.00	117.70	46.80	0.00	
7	1.98	117.70	46.68	0.00	
9	3.95	117.70	47.09	0.00	
10	3.95	117.70	46.94	0.00	
11	0.66	117.70	46.80	0.00	
12	0.66	117.70	46.65	0.00	
13	0.66	117.70	46.48	0.00	
14	0.66	117.70	46.03	0.00	
15	0.66	117.70	45.82	0.00	
16	0.66	117.70	45.60	0.00	
17	5.93	117.70	46.75	0.00	
18	6.59	117.70	46.32	0.00	
19	6.59	117.70	46.12	0.00	
20	7.24	117.70	46.47	0.00	
21	0.66	117.70	45.99	0.00	
22	0.66	117.70	45.86	0.00	
23	0.66	117.70	45.62	0.00	
24	0.66	117.70	46.61	0.00	
26	0.66	117.70	46.74	0.00	
27	0.66	117.70	46.61	0.00	
28	0.66	117.70	46.40	0.00	
FHYD2	0.00	117.70	46.25	0.00	
29	0.66	117.70	46.31	0.00	
1	-14.22	117.70	0.00	0.00	Reservoir
2	-17.82	117.70	0.00	0.00	Reservoir
3	-15.41	117.70	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
P2	-15.41	0.01	0.00	Open
P3	9.20	0.00	0.00	Open
P4	0.00	0.00	0.00	Open
P5	9.20	0.00	0.00	Open
P10	8.95	0.00	0.00	Open
P11	3.68	0.00	0.00	Open
P12	-3.57	0.00	0.00	Open
P13	0.66	0.04	0.36	Open
P14	0.66	0.04	0.36	Open

P15	0.66	0.04	0.36	Open
P16	-14.22	0.01	0.00	Open
P17	17.82	0.01	0.00	Open
P18	9.91	0.01	0.00	Open

Link Results: (continued)

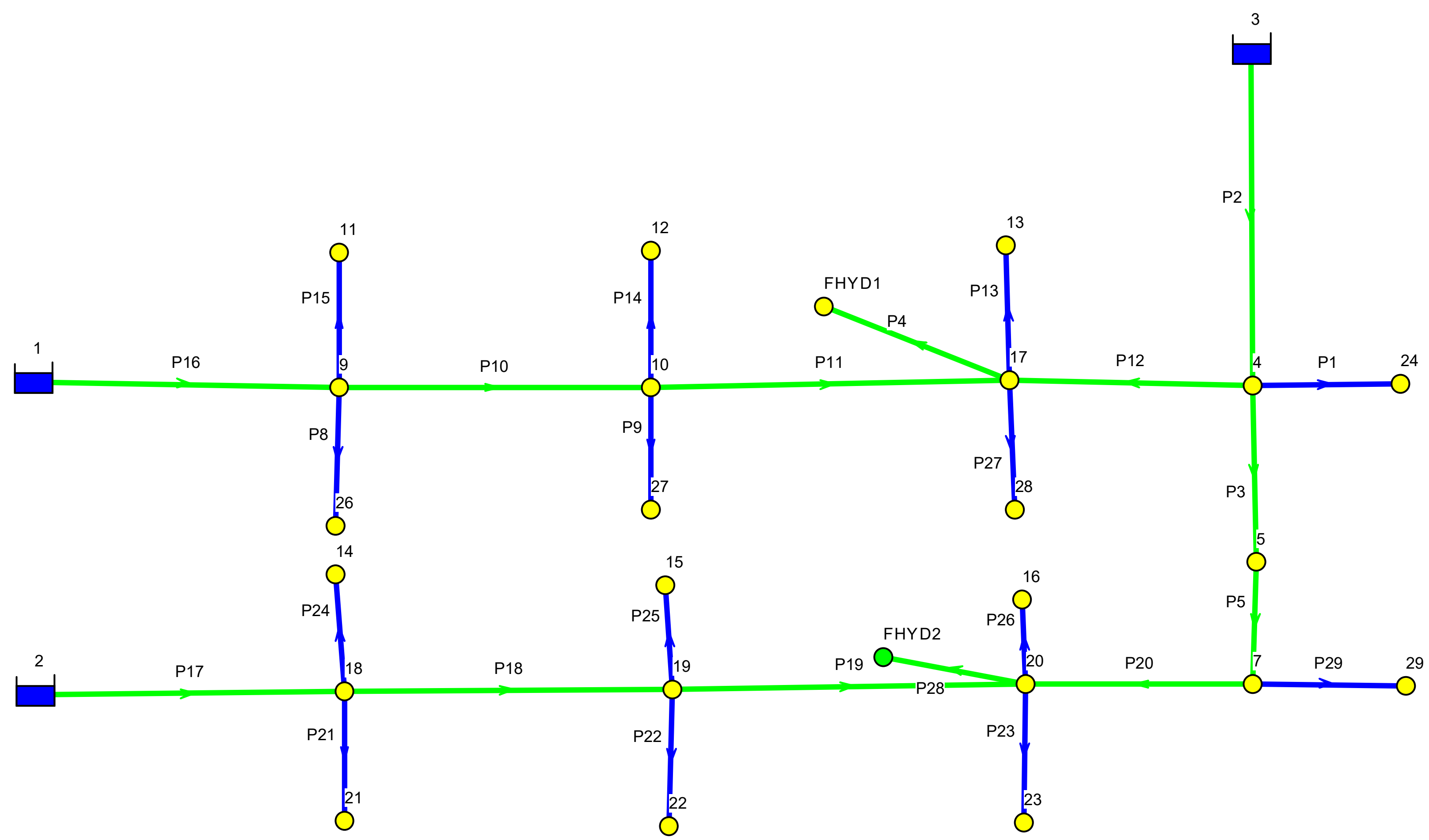
Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
P19	2.00	0.00	0.00	Open
P20	-6.56	0.00	0.00	Open
P21	0.66	0.04	0.35	Open
P22	0.66	0.04	0.35	Open
P23	0.66	0.04	0.35	Open
P24	0.66	0.04	0.36	Open
P25	0.66	0.04	0.36	Open
P26	0.66	0.04	0.36	Open
P1	0.66	0.04	0.36	Open
P8	0.66	0.04	0.35	Open
P9	0.66	0.04	0.35	Open
P27	0.66	0.04	0.35	Open
P28	0.00	0.00	0.00	Open
P29	0.66	0.04	0.36	Open

2710 DRAPER AVENUE PHASE III - MAX DAY + FIRE FLOW DEMAND

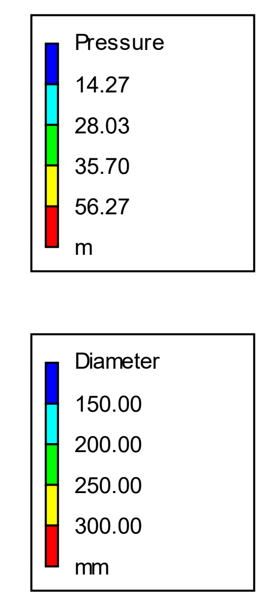
Day 1, 12:00 AM

BOUNDARY CONDITIONS
AVG DAY=117.7
PEAK HOUR=106.0
MAX DAY PLUS FF
14,100 L/MIN @ 140kPa

BOUNDARY CONDITIONS
AVG DAY=117.7
PEAK HOUR=106.0
MAX DAY PLUS FF
14,100 L/MIN @ 140kPa



BOUNDARY CONDITIONS
AVG DAY=117.7
PEAK HOUR=106.0
MAX DAY PLUS FF
12,600 L/MIN @ 140kPa



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Page 1                                    2018-08-08 11:11:40 AM
**********************************************************************
*                             E P A N E T                            *
*                     Hydraulic and Water Quality                    *
*                     Analysis for Pipe Networks                     *
*                             Version 2.0                            *
**********************************************************************

Input File: 2018-08-07_ph3_maxv2.net
```

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
P2	4	3	34.8	200
P3	4	5	18.7	200
P4	17	FHYD1	1.2	200
P5	5	7	14.2	200
P10	9	10	35.1	200
P11	10	17	39.7	200
P12	17	4	24.7	200
P13	17	13	6.1	19
P14	10	12	6.1	19
P15	9	11	6.1	19
P16	9	1	29.3	200
P17	2	18	33.3	200
P18	18	19	36.4	200
P19	19	20	38.4	200
P20	20	7	45	200
P21	18	21	10.8	19
P22	19	22	10.8	19
P23	20	23	10.8	19
P24	18	14	6.1	19
P25	19	15	6.1	19
P26	20	16	6.1	19
P1	4	24	6.7	19
P8	9	26	10.6	19
P9	10	27	10.6	19
P27	17	28	10.6	19
P28	FHYD2	20	3	200
P29	7	29	6.7	19

Page 2

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality hours	
4	7.11	111.93	41.03	0.00	
5	0.00	111.61	40.23	0.00	
FHYD1	7000.00	107.16	36.26	0.00	
7	7.11	111.30	40.28	0.00	
9	14.22	114.00	43.39	0.00	
10	14.22	112.77	42.01	0.00	
11	2.36	113.98	43.08	0.00	
12	2.36	112.75	41.70	0.00	
13	2.36	111.39	40.17	0.00	
14	2.36	113.59	41.92	0.00	
15	2.36	112.10	40.22	0.00	
16	2.36	110.57	38.47	0.00	
17	21.34	111.41	40.46	0.00	
18	23.71	113.61	42.23	0.00	
19	23.71	112.13	40.55	0.00	
20	26.08	110.59	39.36	0.00	
21	2.36	113.57	41.86	0.00	
22	2.36	112.09	40.25	0.00	
23	2.36	110.55	38.47	0.00	
24	2.36	111.90	40.81	0.00	
26	2.36	113.96	43.00	0.00	
27	2.36	112.73	41.64	0.00	
28	2.36	111.37	40.07	0.00	
FHYD2	7000.00	106.19	34.74	0.00	
29	2.36	111.28	39.89	0.00	
1	-4104.96	115.40	0.00	0.00	Reservoir
2	-4466.90	115.40	0.00	0.00	Reservoir
3	-5598.68	115.30	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPM	Velocity m/s	Unit Headloss m/km	Status
P2	-5598.68	2.97	96.83	Open
P3	2630.23	1.40	16.88	Open
P4	7000.00	3.71	3537.92	Open
P5	2630.23	1.40	22.08	Open
P10	4086.02	2.17	35.07	Open
P11	4067.08	2.16	34.30	Open
P12	-2958.98	1.57	21.11	Open
P13	2.36	0.14	3.87	Open
P14	2.36	0.14	3.87	Open

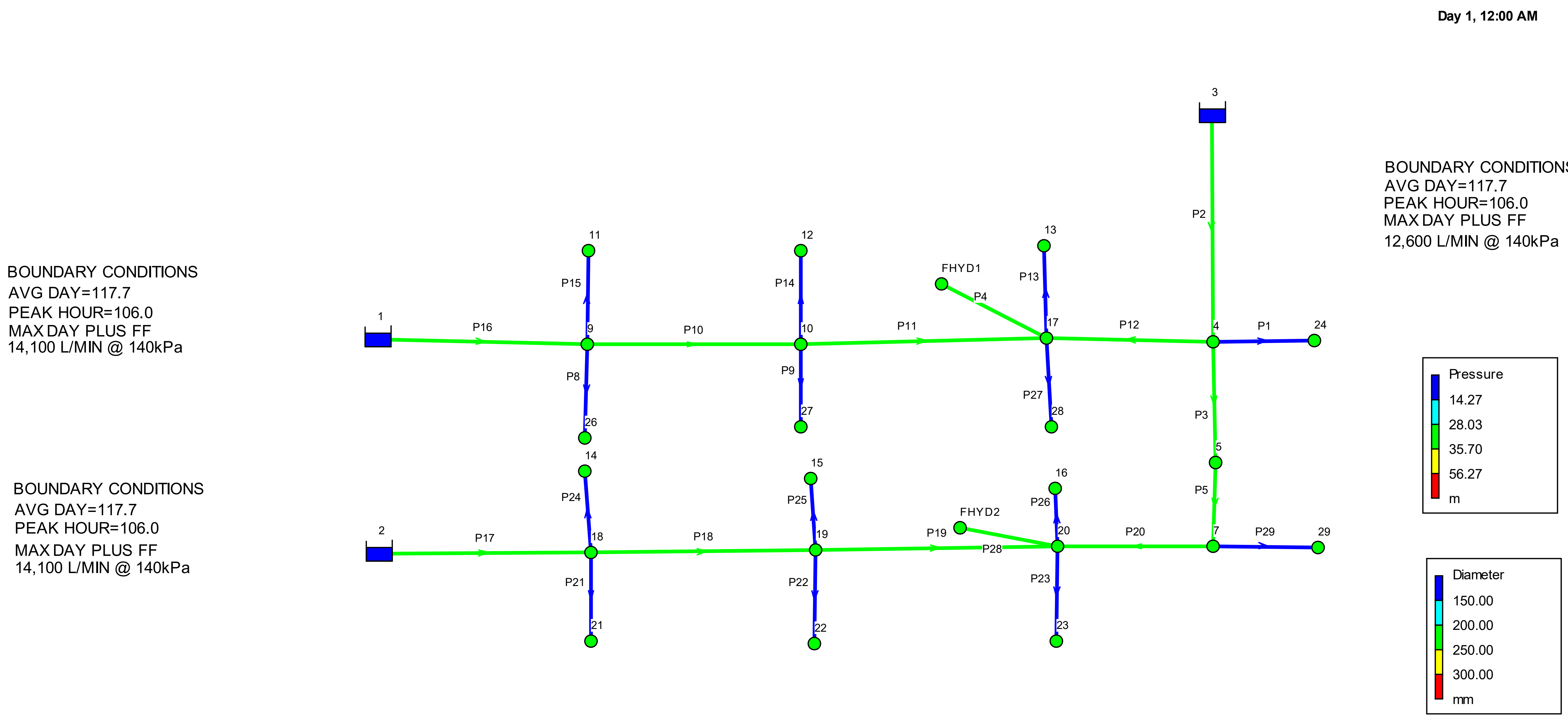
P15	2.36	0.14	3.87	Open
P16	-4104.96	2.18	47.73	Open
P17	4466.90	2.37	53.72	Open
P18	4438.47	2.35	40.76	Open

Page 3

Link Results: (continued)

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
P19	4410.04	2.34	40.04	Open
P20	-2620.76	1.39	15.80	Open
P21	2.36	0.14	3.73	Open
P22	2.36	0.14	3.73	Open
P23	2.36	0.14	3.73	Open
P24	2.36	0.14	3.87	Open
P25	2.36	0.14	3.87	Open
P26	2.36	0.14	3.87	Open
P1	2.36	0.14	3.84	Open
P8	2.36	0.14	3.73	Open
P9	2.36	0.14	3.73	Open
P27	2.36	0.14	3.73	Open
P28	-7000.00	3.71	1465.54	Open
P29	2.36	0.14	3.84	Open

2710 DRAPER AVENUE PHASE III - PEAK HOUR DEMAND



Page 1 2018-08-08 11:14:31 AM

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

Input File: 2018-08-07_ph3_peak.net

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
P2	4	3	34.8	200
P3	4	5	18.7	200
P4	17	FHYD1	1.2	200
P5	5	7	14.2	200
P10	9	10	35.1	200
P11	10	17	39.7	200
P12	17	4	24.7	200
P13	17	13	6.1	19
P14	10	12	6.1	19
P15	9	11	6.1	19
P16	9	1	29.3	200
P17	2	18	33.3	200
P18	18	19	36.4	200
P19	19	20	38.4	200
P20	20	7	45.4	200
P21	18	21	10.8	19
P22	19	22	10.8	19
P23	20	23	10.8	19
P24	18	14	6.1	19
P25	19	15	6.1	19
P26	20	16	6.1	19
P1	4	24	6.7	19
P8	9	26	10.6	19
P9	10	27	10.6	19
P27	17	28	10.6	19
P28	FHYD2	20	3	200
P29	7	29	6.7	19

Page 2

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality hours	
4	10.67	106.00	35.10	0.00	
5	0.00	106.00	34.62	0.00	
FHYD1	0.00	106.00	35.10	0.00	
7	10.67	106.00	34.98	0.00	
9	21.34	106.00	35.39	0.00	
10	21.34	106.00	35.24	0.00	
11	3.54	105.95	35.05	0.00	
12	3.54	105.95	34.90	0.00	
13	3.54	105.95	34.73	0.00	
14	3.54	105.95	34.28	0.00	
15	3.54	105.95	34.07	0.00	
16	3.54	105.95	33.85	0.00	
17	32.00	106.00	35.05	0.00	
18	35.56	106.00	34.62	0.00	
19	35.56	106.00	34.42	0.00	
20	39.12	106.00	34.77	0.00	
21	3.54	105.91	34.20	0.00	
22	3.54	105.91	34.07	0.00	
23	3.54	105.91	33.83	0.00	
24	3.54	105.94	34.85	0.00	
26	3.54	105.92	34.96	0.00	
27	3.54	105.91	34.82	0.00	
28	3.54	105.91	34.61	0.00	
FHYD2	0.00	106.00	34.55	0.00	
29	3.54	105.94	34.55	0.00	
1	-77.03	106.00	0.00	0.00	Reservoir
2	-96.23	106.00	0.00	0.00	Reservoir
3	-82.56	106.00	0.00	0.00	Reservoir

Link Results:

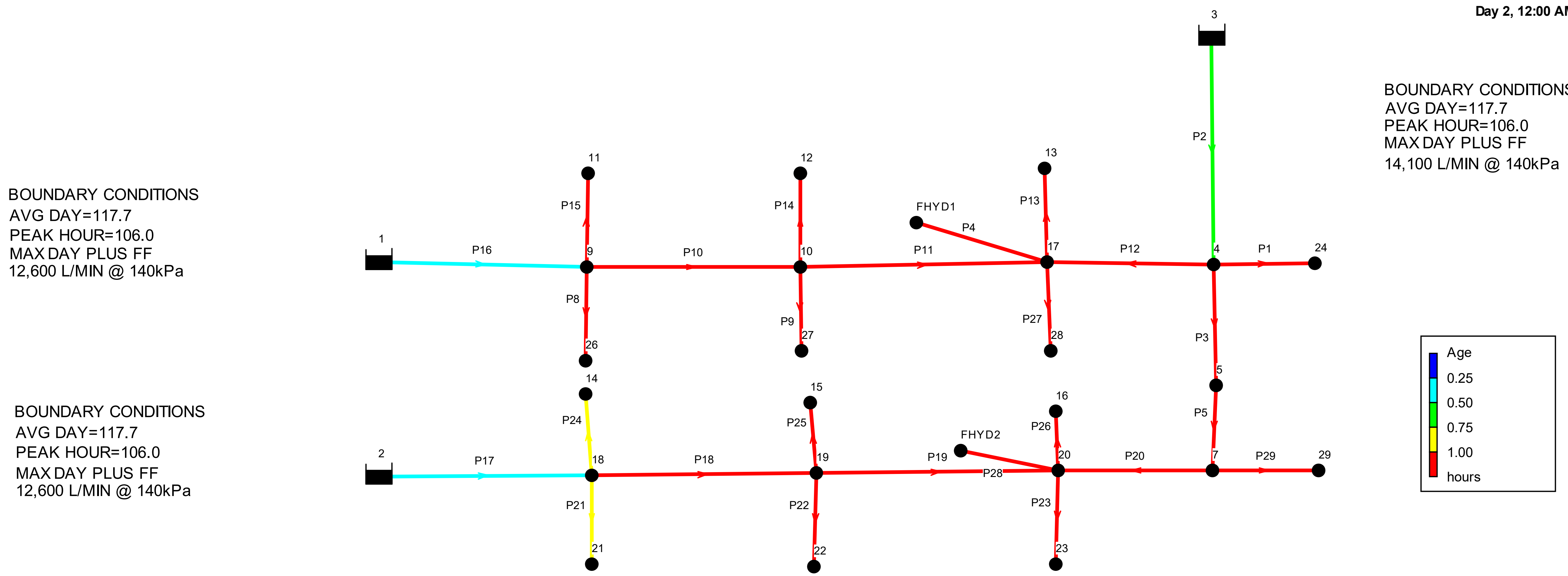
Link ID	Flow LPM	Velocity m/s	Unit Headloss m/km	Status
P2	-82.56	0.04	0.03	Open
P3	49.47	0.03	0.01	Open
P4	0.00	0.00	0.00	Open
P5	49.47	0.03	0.01	Open
P10	48.61	0.03	0.01	Open
P11	20.19	0.01	0.00	Open
P12	-18.89	0.01	0.00	Open
P13	3.54	0.21	8.24	Open
P14	3.54	0.21	8.24	Open

P15	3.54	0.21	8.24	Open
P16	-77.03	0.04	0.03	Open
P17	96.23	0.05	0.04	Open
P18	53.59	0.03	0.01	Open

Page 3
Link Results: (continued)

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
P19	10.95	0.01	0.00	Open
P20	-35.26	0.02	0.01	Open
P21	3.54	0.21	7.92	Open
P22	3.54	0.21	7.92	Open
P23	3.54	0.21	7.92	Open
P24	3.54	0.21	8.24	Open
P25	3.54	0.21	8.24	Open
P26	3.54	0.21	8.24	Open
P1	3.54	0.21	8.17	Open
P8	3.54	0.21	7.93	Open
P9	3.54	0.21	7.93	Open
P27	3.54	0.21	7.93	Open
P28	0.00	0.00	0.00	Open
P29	3.54	0.21	8.17	Open

2710 DRAPER AVENUE PHASE III - AVERAGE DAY DEMAND



2710 DRAPER AVENUE PHASE III - MAX DAY + FIRE FLOW DEMAND

Day 2, 12:00 AM

BOUNDARY CONDITIONS

AVG DAY=117.7

PEAK HOUR=106.0

MAX DAY PLUS FF

12,600 L/MIN @ 140kPa

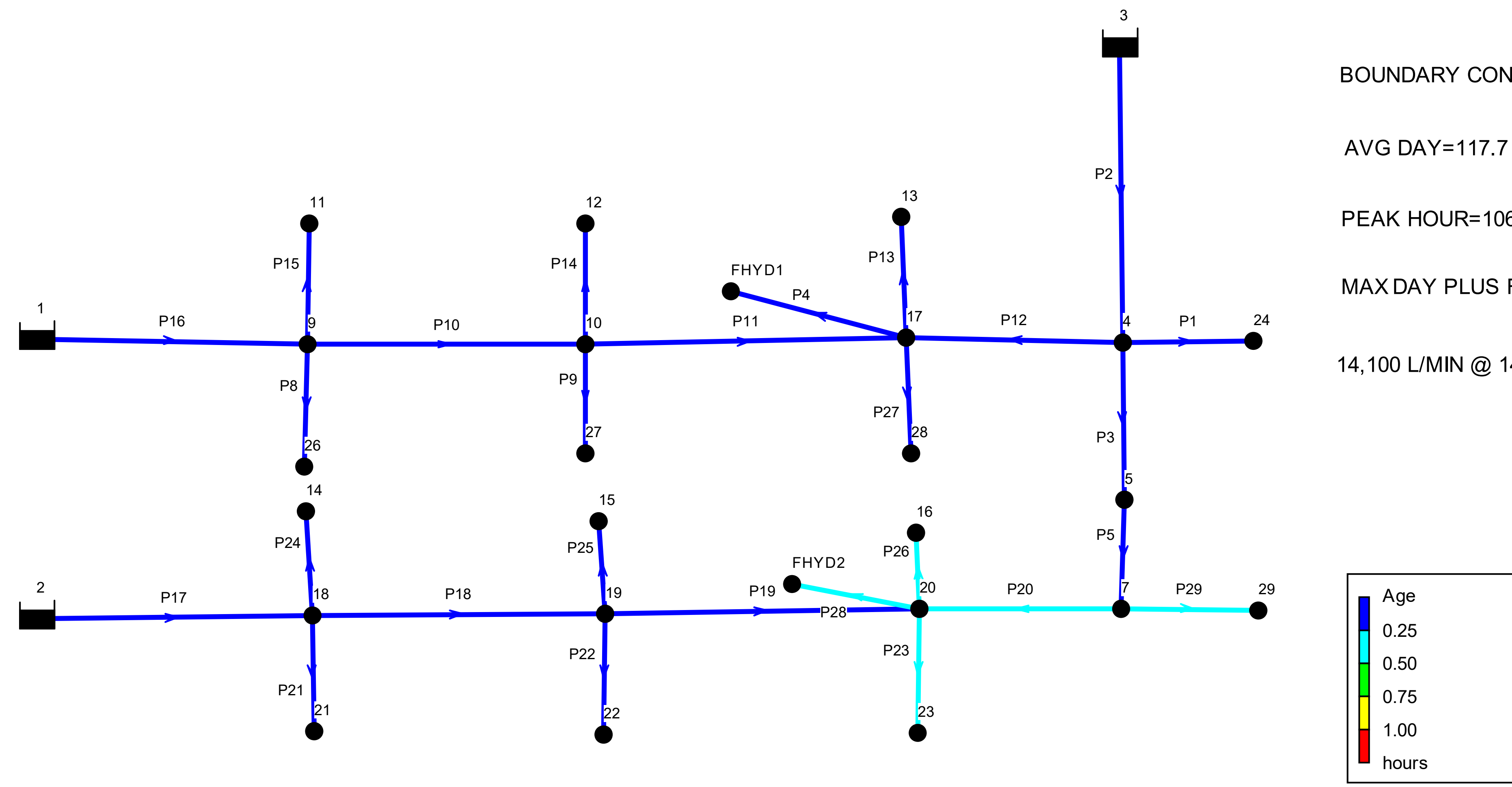
BOUNDARY CONDITIONS

AVG DAY=117.7

PEAK HOUR=106.0

MAX DAY PLUS FF

12,600 L/MIN @ 140kPa



BOUNDARY CONDITIOI

AVG DAY=117.7

PEAK HOUR=106.0

MAX DAY PLUS FF

14,100 L/MIN @ 140kPa

2710 DRAPER AVENUE PHASE III - PEAK HOUR DEMAND

Day 2, 12:00 AM

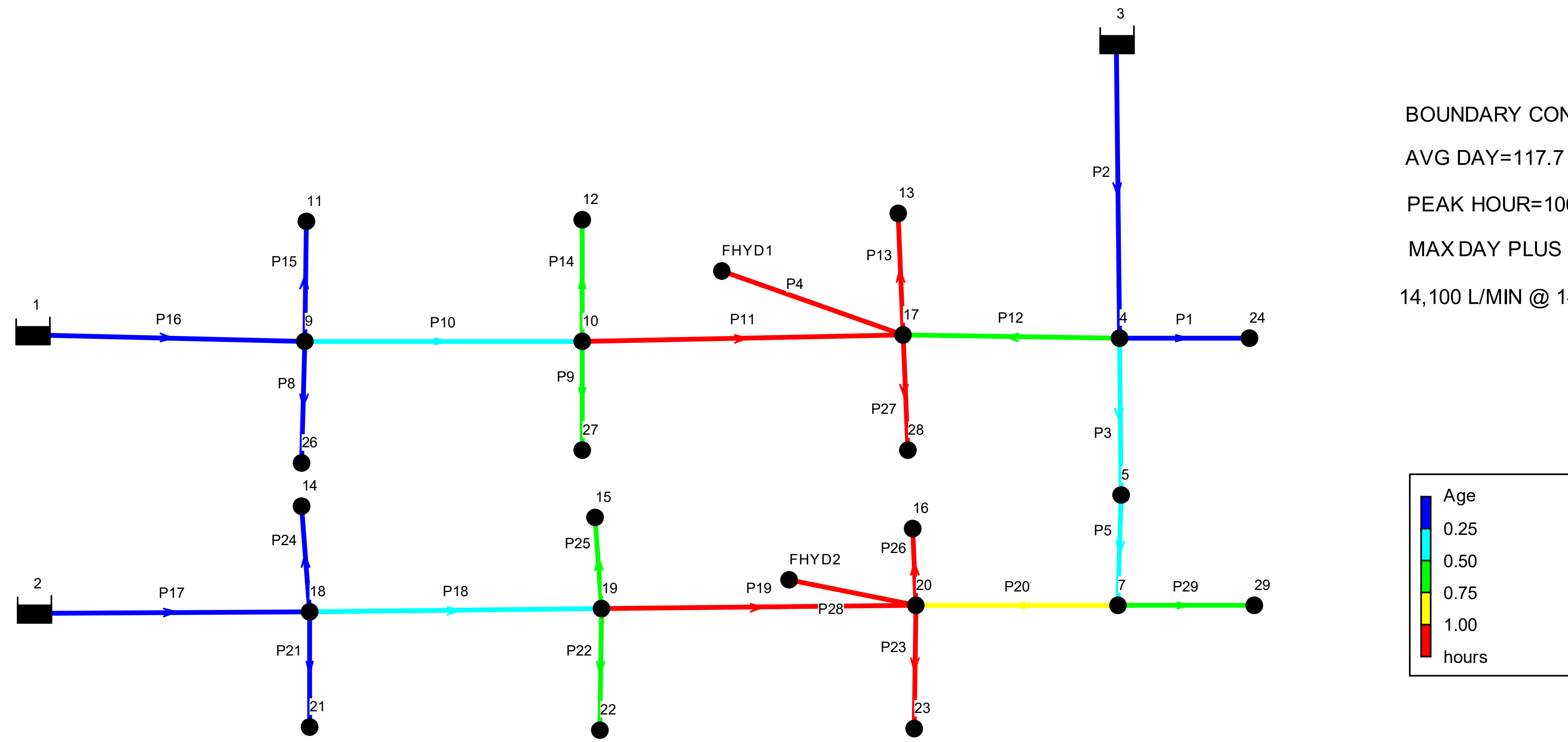
BOUNDARY CONDITIONS

AVG DAY=117.7

PEAK HOUR=106.0

MAX DAY PLUS FF

12,600 L/MIN @ 140kPa



BOUNDARY CONDITIONS

AVG DAY=117.7

PEAK HOUR=106.0

MAX DAY PLUS FF

14,100 L/MIN @ 140kPa

BOUNDARY CONDITIONS

AVG DAY=117.7

PEAK HOUR=106.0

MAX DAY PLUS FF

12,600 L/MIN @ 140kPa

Alison Gosling

From: Fraser, Mark <Mark.Fraser@ottawa.ca>
Sent: Friday, March 23, 2018 11:50 AM
To: Alison Gosling
Cc: Robert Freel
Subject: RE: 2710 Draper Avenue - Boundary Condition Request
Attachments: 2710 Draper March 2018.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Alison,

Please find below updated boundary conditions for hydraulic analysis as requested based on the REVISED water demands provided:

Proposed Development Location: **2710 Baseline Road**
Average Day = 0.98 L/s
Max Day = 3.54 L/s
Peak Hour = 5.32 L/s
Fire Flow = 20,000 L/min

Please note that the boundary conditions provided below are same for both scenarios .

City of Ottawa Boundary Conditions:

The following are boundary conditions, HGL, for hydraulic analysis at 2710 Baseline (Zone 1W) assumed to be connected to the 203mm on Draper Ave and 203mm on Morrison Drive (see attached PDF for location).

Specified Connection Point: Morrison Drive (203mm dia.) **[Connection 1]**
Minimum HGL = **106.0m**
Maximum HGL = **117.7m**
Available Flow assuming a residual of 20 psi = **235m L/s**

Specified Connection Point: Draper Ave. (203mm dia.) **[Connection 2]**
Minimum HGL = **106.0m**
Maximum HGL = **117.7m**
Available Flow assuming a residual of 20 psi = **210 L/s**

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

Please refer to City of Ottawa, *Ottawa Design Guidelines – Water Distribution*, First Edition, July 2010, WDG001 Clause 4.2.2 for watermain pressure and demand objectives.

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

If you have any questions or require any clarification please let me know.

Regards,

Mark Fraser
Project Manager, Planning Services
Development Review West Branch
City of Ottawa | Ville d'Ottawa
Planning, Infrastructure and Economic Development Department
110 Laurier Avenue West. 4th Floor, Ottawa ON, K1P 1J1
Tel:613.580.2424 ext. 27791
Fax: 613-580-2576
Mail: Code 01-14
Email: Mark.Fraser@ottawa.ca

From: Fraser, Mark
Sent: March 20, 2018 7:41 AM
To: 'Alison Gosling' <AGosling@dsel.ca>
Cc: 'Robert Freel' <RFreel@dsel.ca>
Subject: RE: 2710 Draper Avenue - Boundary Condition Request

Thank you Alison.

Please accept this email as confirmation that updated boundary conditions for hydraulic analysis for 2710 Draper Ave. have been requested from the Infrastructure Planning Unit based on the water demands provided for the subject development. Please note that it takes approximately 5-10 business days to receive and provide you with boundary conditions.

Regards,

Mark Fraser
Project Manager, Planning Services
Development Review West Branch
City of Ottawa | Ville d'Ottawa
Planning, Infrastructure and Economic Development Department
110 Laurier Avenue West. 4th Floor, Ottawa ON, K1P 1J1
Tel:613.580.2424 ext. 27791
Fax: 613-580-2576
Mail: Code 01-14
Email: Mark.Fraser@ottawa.ca

From: Alison Gosling [mailto:AGosling@dsel.ca]
Sent: March 19, 2018 4:46 PM
To: Fraser, Mark <Mark.Fraser@ottawa.ca>
Cc: Robert Freel <RFreel@dsel.ca>
Subject: 2710 Draper Avenue - Boundary Condition Request

Good afternoon Mark,

We would like to request updated water boundary conditions for 2710 Draper Avenue using the following proposed development demands:

1. Location of Service / Street Number: 2710 Draper Avenue (Phase III)

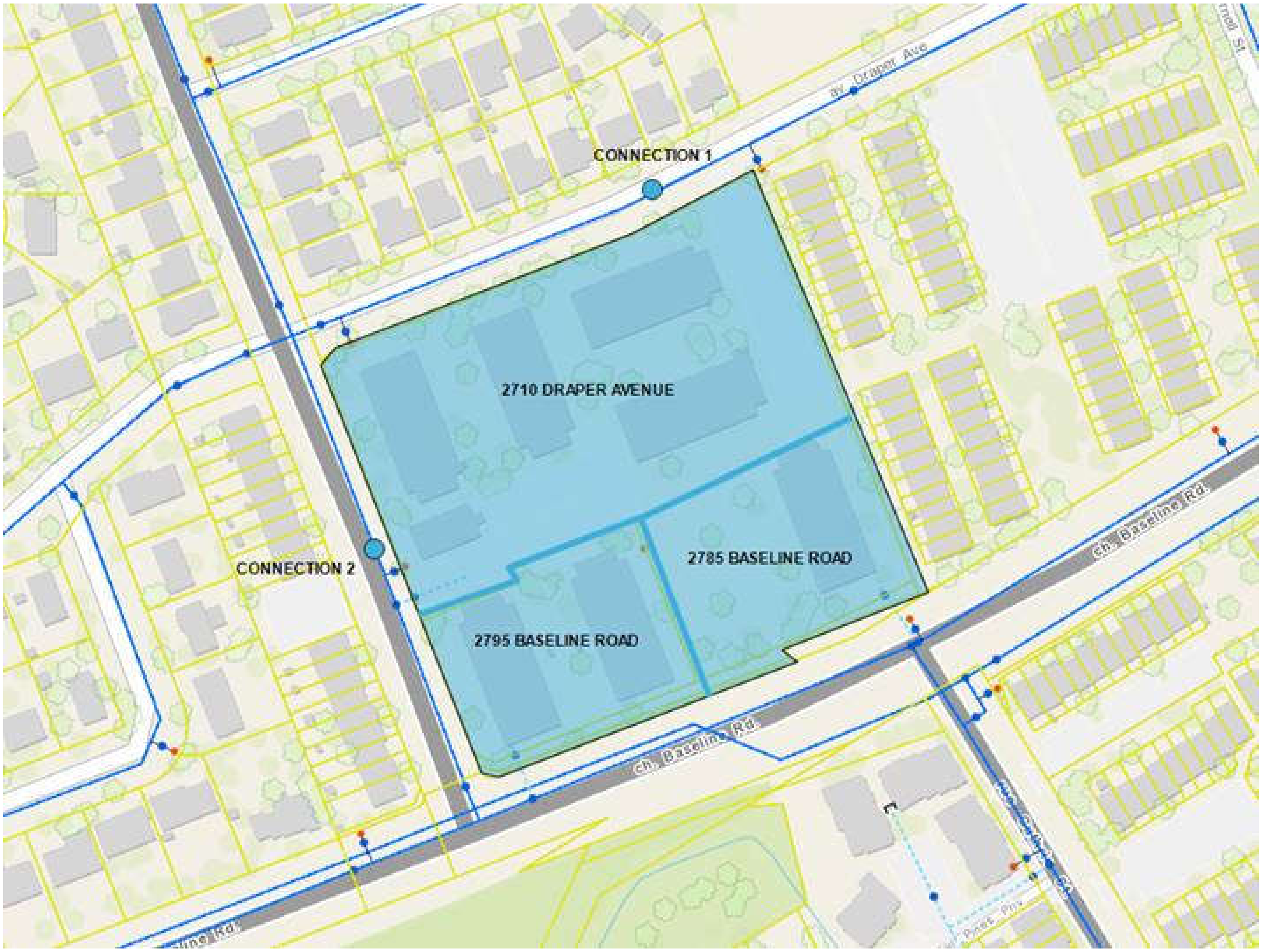
2. Type of development and the amount of fire flow required for the proposed development:

- The proposed Phased development is residential use. Phase III proposes 90 townhomes, 53 townhomes in Phase III-I and 37 townhomes in Phase III-II.
- It is anticipated that the Phase III development will have a dual connection to be serviced from the existing 203 mm diameter watermain within Morrison Drive and a connection to the existing 203mm diameter watermain within Draper Avenue, as shown by the attached map.
- Based on the parameters provided by the Architect, a maximum fire flow of 20,000 L/min is estimated for the development.

3.

Phase	III-I		III-I & III-II	
	L/min	L/s	L/min	L/s
Avg. Daily	35.0	0.58	59.1	0.98
Max Day	126.0	2.10	212.6	3.54
Peak Hour	189.0	3.15	318.9	5.32

It you have any questions please feel free to contact me.



Thank you,

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

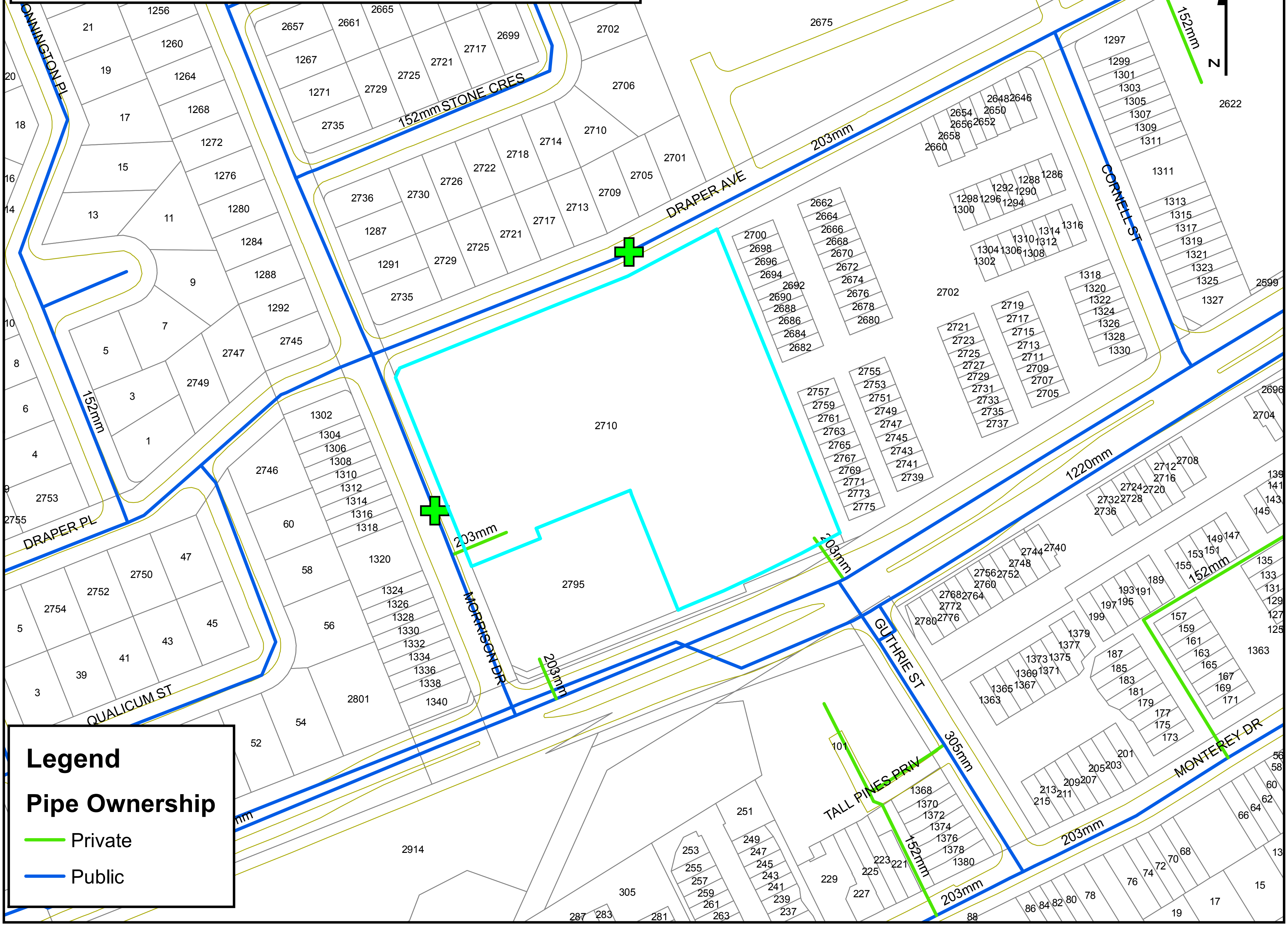
DSEL
david schaeffer engineering ltd.

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

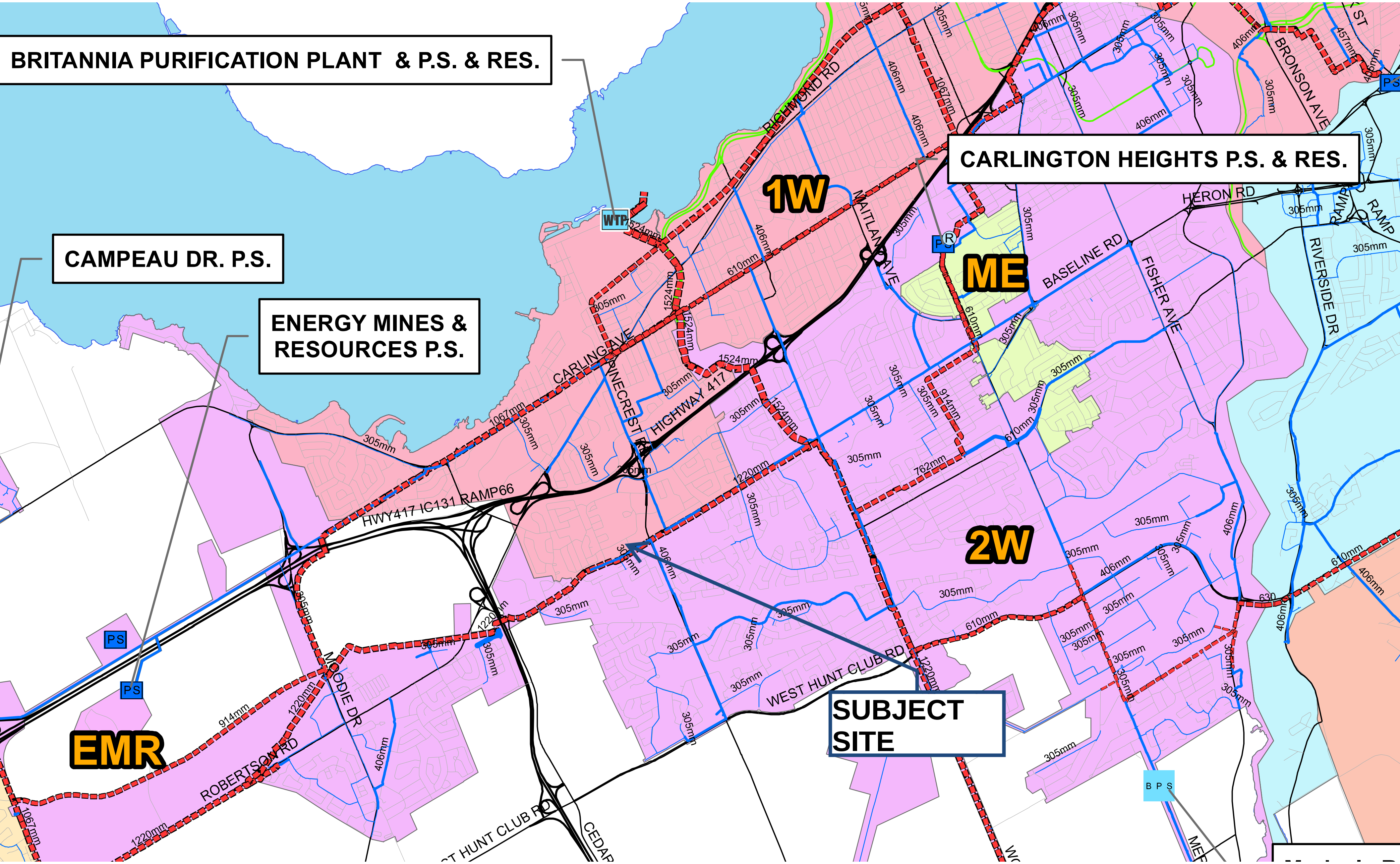
phone: (613) 836-0856 ext.542
fax: (613) 836-7183
email: agosling@dsel.ca

'

Boundary Condition for 2710 Draper



City of Ottawa - Water Distribution System



rla/architecture

June1, 2018

Mr. Steam Shen MCIP RPP
Planner II
Development Review West
City of Ottawa

Re: **Site Plan Control Application -2710 Draper Ave.**
Fourth Round Comments dated May 18, 2018
City of Ottawa File no. D07-12-17-0076

Dear Mr. Shen,

In response to **Reports: Functional Servicing and Stormwater Management Report by DSEL**, specifically Item 7, Roderick Lahey Architect offers the following proposed revisions to the plans as filed as a companion document to DSEL's comments.

With reference to **ISO's Guide for Determination of Needed Fire Flow**, we understand the following definitions are intended to support the Construction Class of a building:

A Under **Construction Materials and Assemblies**
1 a) (8) essentially defines that an assembly that has a one hour rating or better is considered not to be combustible (non-combustible).

B Under **Classification of Basic Construction Types**
2.c) **Non-Combustible (Construction Class 3)** – the class is defined as buildings with exterior walls, floors and roof of *(assemblies considered to be)*non-combustible…supported by *(assemblies considered to be)* non-combustible etc.

Together with this letter please find our proposed assemblies to satisfy the above-referenced criteria. The assemblies reference OBC SB-3 as the authority in defining the fire resistance rating. Structural and demising fire separation walls, floor and roof assemblies will be revised to have a minimum 1 hr. fire resistance rating.

It is our understanding that this proposed revision would then comply with the individual buildings in question being Classified as Construction Class 3.

Trusting the above and the attached, together with DSEL's comments regarding this matter are sufficient to satisfy compliance with City of Ottawa's comment 7.

Best Regards,

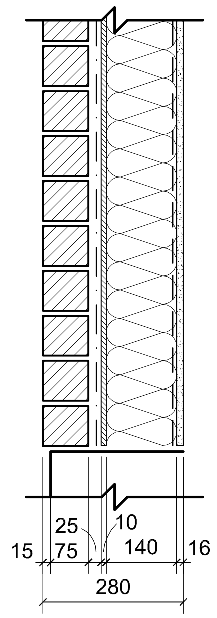
Glen Vaillancourt B.Arch.
Partner, Roderick Lahey Architect Inc.

WALL TYPE - W3

EXTERIOR BRICK WALL.
(1HR. F.R.R. AS PER OBC SB-3 EW1a R=22)

- BRAMPTON BRICK VENEER, PREMIER SIZE - BEAUPORT, REFER TO ELEVATIONS (H-79mm x D-90mm x L-257mm) c/w ADJUSTABLE UNIT TIES @ 400mm O.C. HORIZ. & 600mm O.C. VERT. & WEEPHOLES @ 600mm O.C @ BOTTOM. BLUESKIN THROUGH WALL FLASHING MIN.150mm HIGH
- 25mm AIR SPACE
- TYVEK AIR/WEATHER BARRIER - ALL JOINTS SEALED.
- 10mm OSB SHEATHING
- 140mm WOOD STUDS @400mm O.C.
- 140 mm R22 BATT INSULATION.
- 6 mil POLY VAPOUR BARRIER.
- 16mm TYPE 'X' GYPSUM BOARD, PRIME & PAINT FINISH.

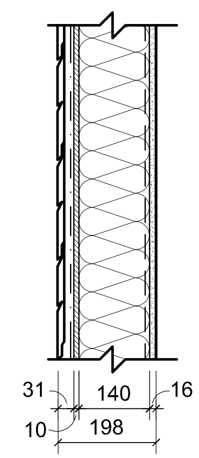
NOTE: TYPICAL 15mm OVERHANG FROM EXTERIOR FACE OF CONCRETE FOUNDATION WALLS.



WALL TYPE - W4

SAGIPER SAGIWALL
(1HR. F.R.R. AS PER OBC SB-3 EW1a R=22)

- SAGIPER SAGIWALL SIDING (KNOTTY MAPLE REF #79) c/w ALUM. TRIM PIECES
- 19mm WOOD STRAPPING
- TYVEK AIR/WEATHER BARRIER - SHINGLED AND ALL JOINTS SEALED. BLUESKIN THROUGH WALL FLASHING MIN.150mm HIGH AT BASE OF ASSEMBLY
- 10mm OSB SHEATHING
- 140mm WOOD STUDS @400mm O.C.
- 140 mm R22 BATT INSULATION
- 6 mil POLY VAPOUR BARRIER
- 16mm TYPE 'X' GYPSUM BOARD, PRIME & PAINT FINISH

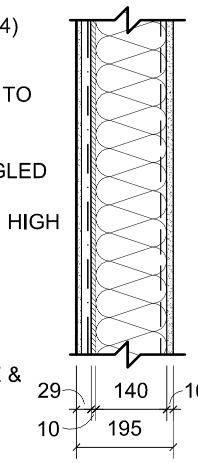


WALL TYPE - W5

W5 - HARDIE BOARD PANELS
(1HR. F.R.R. AS PER OBC SB-3 EW1a R=24)

- HARDIE BOARD PANEL SIDING (REFER TO ELEVATIONS FOR COLOR / PATTERN)
- 19mm WOOD STRAPPING
- TYVEK AIR/WEATHER BARRIER - SHINGLED AND ALL JOINTS SEALED. BLUESKIN THROUGH WALL FLASHING MIN.150mm HIGH AT BASE OF ASSEMBLY
- 10mm OSB SHEATHING
- 140mm WOOD STUDS @400mm O.C.
- 140 mm R22 BATT INSULATION
- 6 mil POLY VAPOUR BARRIER
- 16mm TYPE 'X' GYPSUM BOARD, PRIME & PAINT FINISH

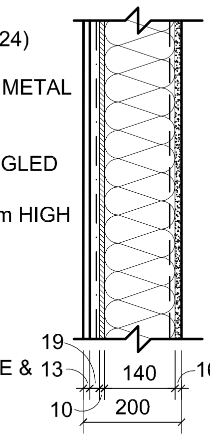
NOTE: ALL CUT JH EDGES TO BE PAINTED PRIOR TO USE. FOLLOW MANUFACTURER INSTALLATION DETAILS



WALL TYPE - W7

PAINTED METAL PANEL
(1HR. F.R.R. AS PER OBC SB-3 EW1a R=24)

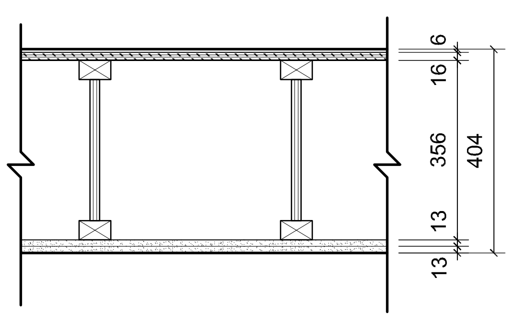
- PAINTED METAL PANEL C/W PAINTED METAL TRIM PIECES
- 19mm WOOD STRAPPING
- TYVEK AIR/WEATHER BARRIER - SHINGLED AND ALL JOINTS SEALED. BLUESKIN THROUGH WALL FLASHING MIN.150mm HIGH AT BASE OF ASSEMBLY
- 10mm OSB SHEATHING
- 140mm WOOD STUDS @400mm O.C.
- 140 mm R22 BATT INSULATION
- 6 mil POLY VAPOUR BARRIER
- 13mm TYPE 'X' GYPSUM BOARD, PRIME & PAINT FINISH



FLOOR TYPE - F3

TYPICAL FLOOR CONSTRUCTION
(1HR. F.R.R.; AS PER SB-3 TABLE 2 F4e)

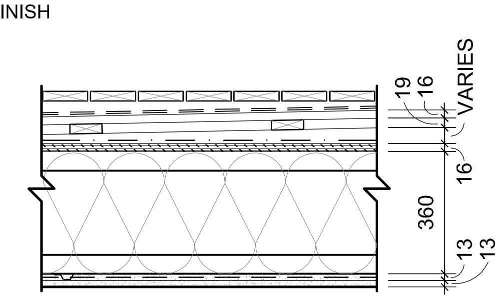
- FLOOR FINISH AS NOTED ON FLOOR PLANS
- 6mm FOAM IMPACT ISOLATION BARRIER
- 16mm OSB SHEATHING (GLUED AND SCREWED)
- 356mm PRE-ENGINEERED FLOOR JOISTS @ 400 O.C.
- 2 LAYERS - 13mm TYPE 'X' GYPSUM BOARD c/w PRIME & PAINT FINISH



ROOF TYPE - R2

FLAT ROOF w/ SLEEPERS (OBC SB-12 - R31 min)
(1HR. F.R.R.; AS PER SB-3 TABLE 2 F4e)

- PRESSURE TREATED WOOD DECKING ON SLEEPERS
- 2-PLY MODIFIED BITUMEN ROOFING SYSTEM
- 16mm CEMENT BOARD
- 19x64mm STRAPPING @ 400mm O.C.
- SLEEPERS SLOPED TO ROOF DRAINS (MIN 2%)
- BLACK BUILDING PAPER
- 16mm OSB SHEATHING (GLUED AND SCREWED) 360mm PRE-ENGINEERED FLOOR JOISTS @ 400mm O.C.
- FILL VOID WITH MINERAL FIBER BATT INSULATION
- 6mil POLY VAPOUR BARRIER
- 2 LAYERS - 13mm TYPE 'X' GYPSUM BOARD c/w PRIME & PAINT FINISH



STAMP:	ARCHITECT:	PROJECT TITLE:	DRAWN:	CHECKED:
ONTARIO ASSOCIATION OF ARCHITECTS RODERICK I. LAHEY LICENCE 4375	RODERICKLAHEY ARCHITECT INC 56 Beech Street, Ottawa, Ontario K1S 3J6 t.613.724.9932 f.613.724.1209 www.rodericklahey.ca	FRESH TOWN BLOCK 5 OTTAWA ONTARIO	EJ	GV
		SHEET TITLE: EXTERIOR WALLS & FLOOR ASSEMBLY REVISIONS	SCALE: AS SHOWN	SHEET No. ASK-10
			PROJECT No. 1733	R.000

FRESH TOWNS
MODERN URBAN LIVING

APPENDIX C

Wastewater Collection

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

Site Area			2.130	**ha**
Extraneous Flow Allowances				
		Infiltration / Inflow (Dry)	0.11	L/s
		Infiltration / Inflow (Wet)	0.60	L/s
		Infiltration / Inflow (Total)	**0.70**	**L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	Pop
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Duplex	2.3		0
Townhouse	2.7	84	227
Apartment			
Existing CCC 994 Lands (Building E)			
1 Bedroom	1.4	56	79
2 Bedroom	2.1	24	51
3 Bedroom	3.1		0
Average	1.8		0
		Total Pop	**357**
		Average Domestic Flow	**1.45 L/s**
		Peaking Factor	**4**
		Peak Domestic Flow	**5.78 L/s**

Institutional / Commercial / Industrial Contributions

Property Type	Unit Rate		No. of Units	Avg Wastewater (L/s)
Commercial floor space	5	$L/m^2/d$		0.00
Office	75	$L/9.3m^2/d$		0.00
Restaurant	125	L/seat/d		0.00
Industrial - Light	35,000	L/gross ha/d		0.00
Industrial - Heavy	55,000	L/gross ha/d		0.00
			Average I/C/I Flow	**0.00**
			Peak Institutional / Commercial Flow	0.00
			Peak Industrial Flow**	0.00
			Peak I/C/I Flow	**0.00**

Total Estimated Average Dry Weather Flow Rate	**1.45 L/s**
Total Estimated Peak Dry Weather Flow Rate	**5.89 L/s**
Total Estimated Peak Wet Weather Flow Rate	**6.59 L/s**

Residential demands, Harmon's Correction Factor, Extraneous Flow Rates and Commercial Peaking Factor established by the City of Ottawa Technical Bulletin ISTB-2018-01. Commercial demands established by City of Ottawa Sewer Design Guidelines Appendix 4A.

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

Site Area 1.33 **ha**

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	0.07	L/s
Infiltration / Inflow (Wet)	0.37	L/s
Infiltration / Inflow (Total)	**0.44**	**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	86	233
Stacked Townhouse	2.3		0
Apartment			
1 Bedroom	1.4		0
2 Bedroom	2.1		0

Total Pop	**233**	
Average Domestic Flow	**0.76**	**L/s**
Peaking Factor	**3.50**	
Peak Domestic Flow	**2.64**	**L/s**

Institutional / Commercial / Industrial Contributions

Property Type	Unit Rate		No. of Units	Avg Wastewater (L/s)
Commercial floor space*	5	$L/m^2/d$		0.00
Office	75	$L/9.3m^2/d$		0.00
Industrial - Light	35,000	L/gross ha/d		0.00
Industrial - Heavy	55,000	L/gross ha/d		0.00

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

** assuming a 12 hour commercial operation*

Total Estimated Average Dry Weather Flow Rate	**0.76**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**2.71**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**3.15**	**L/s**

Residential demands, Harmon's Correction Factor, Extraneous Flow Rates and Commercial Peaking Factor established by the City of Ottawa Technical Bulletin ISTB-2018-01. Commercial demands established by City of Ottawa Sewer Design Guidelines Appendix 4A.

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

Site Area	2.130	**ha**

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	0.11	L/s
Infiltration / Inflow (Wet)	0.60	L/s
Infiltration / Inflow (Total)	**0.70**	**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	86	233	*Phase 3 Townhomes*
Stacked Townhouse	2.3		0	
Apartment				
Existing CCC 994 Lands (Building E)				
1 Bedroom	1.4	56	79	
2 Bedroom	2.1	24	51	
Proposed Building F				
1 Bedroom	1.4	43	61	
2 Bedroom	2.1	37	78	*139 pop*

Total Pop	**502**	
Average Domestic Flow	**1.63**	**L/s**
Peaking Factor	**3.38**	
Peak Domestic Flow	**5.50**	**L/s**

Institutional / Commercial / Industrial Contributions

Property Type	**Unit Rate**		**No. of Units**	**Avg Wastewater (L/s)**
Commercial floor space*	5	$L/m^2/d$	598	0.07
Office	75	$L/9.3m^2/d$		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	**0.07**
Peak Institutional / Commercial Flow	0.07
Peak Industrial Flow**	0.00
Peak I/C/I Flow	**0.07**

** assuming a 12 hour commercial operation*

Total Estimated Average Dry Weather Flow Rate	**1.70**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**5.67**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**6.38**	**L/s**

Residential demands, Harmon's Correction Factor, Extraneous Flow Rates and Commercial Peaking Factor established by the City of Ottawa Technical Bulletin ISTB-2018-01. Commercial demands established by City of Ottawa Sewer Design Guidelines Appendix 4A.

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION: STREET	FROM M.H.	TO M.H.	RESIDENTIAL AREA AND POPULATION: AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	COMM: AREA (ha)	COMM: ACCU. AREA (ha)	INSTIT: AREA (ha)	INSTIT: ACCU. AREA (ha)	PARK: AREA (ha)	PARK: ACCU. AREA (ha)	C+I+I: PEAK FLOW (l/s)	INFILTRATION: TOTAL AREA (ha)	INFILTRATION: ACCU. AREA (ha)	INFILTRATION: INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	PIPE: DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap (%)	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
Cherry Blossom Private																											
						0.00								0.06	0.06		0.06	0.06		0.00168							
	5A	6A	0.19	13.00	35.00	0.19	35.00	4.00	0.57						0.06	0.01	0.19	0.25	0.07	0.65	56.50	250.00	0.30	32.57	0.02	0.66	0.04
	6A	7A	0.19	14.00	38.00	0.38	73.00	4.00	1.18						0.06	0.01	0.19	0.44	0.12	1.32	63.00	250.00	0.30	32.57	0.04	0.66	0.08
To Purple Martin Private, Pipe 7A - 8A						0.38	73.00								0.06			0.44		0.00							
Foliage Private																											
	2A	3A	0.26	17.00	46.00	0.26	46.00	4.00	0.75								0.26	0.26	0.07	0.82	60.00	250.00	0.30	32.57	0.03	0.66	0.06
	3A	4A	0.24	20.00	54.00	0.50	100.00	4.00	1.62								0.24	0.50	0.14	1.76	59.50	250.00	0.30	32.57	0.05	0.66	0.08
To Purple Martin Private, Pipe 4A - 70A						0.50	100.00											0.50									
Purple Martin Private																											
Contribution From Foliage Private, Pipe 3A - 4A						0.50	100.00										0.50	0.50									
	4A	70A	0.11	1.00	3.00	0.61	103.00	4.00	1.67								0.11	0.61	0.17	1.84	13.00	250.00	0.30	32.57	0.06	0.66	0.08
	70A	7A	0.05	3.00	8.00	0.66	111.00	4.00	1.80								0.05	0.66	0.18	1.98	20.00	250.00	0.30	32.57	0.06	0.66	0.08
Contribution From Cherry Blossom Private, Pipe 6A - 7A						0.38	73.00								0.06		0.44	1.10		0.00							
	7A	8A	0.09	4.00	11.00	1.13	195.00	4.00	3.16						0.06	0.01	0.09	1.19	0.33	3.50	31.00	250.00	0.30	32.57	0.11	0.66	0.09
	8A	9A				1.13	195.00	4.00	3.16						0.06	0.01	0.00	1.19	0.33	3.50	12.00	250.00	0.30	32.57	0.11	0.66	0.09

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764 l/s/Ha				
Average Daily Flow =	350	l/p/day		Industrial Peak Factor = as per MOE Graph			
Comm/Inst Flow =	50000	L/ha/da	0.5787 l/s/Ha	Extraneous Flow =		0.280	L/s/ha
Industrial Flow =	35000	L/ha/da	0.40509 l/s/Ha	Minimum Velocity =		0.600	m/s
Max Res. Peak Factor =	4.00			Manning's n =	(Conc)	0.013	(Pvc) 0.013
Commercial/Inst./Park Peak Factor	1.50			Townhouse coeff=		2.7	
Institutional =	0.58	l/s/Ha		Single house coeff=		3.4	

Designed:	PROJECT: 2710 DRAPER AVENUE - PHASE 3-1		
Checked:	LOCATION: City of Ottawa		
Dwg. Referenc 3 of 3 Sanitary Drainage Plan, Dwgs. No. SAN-1	File Ref: 17-927	Date: 2018-08-07	Sheet No. 1.000 of 1

Existing Conditions (Reproduction of Novatech Table 2.2)

City MH ID	Pipe ID	Population		Local Area (ha)						Cumulative Area (ha)	Design Flow (L/S)
		Local	Cumulative	Res.	Com.	Com. Cumul.	Inst.	Inst. Cumul.	Total		
Morrison Drive Sewer (Upper Reach)											
25698	1	113	113	1.39		0		0	1.39	1.39	1.8
25699	2	592	705	7.91		0	8.21	8.21	16.12	17.51	16.4
25700	3	71	776	1.55		0		8.21	1.55	19.06	17.8
25701	4	85	861	1.7		0		8.21	1.7	20.76	19.4
25702	5	58	919	1.05		0		8.21	1.05	21.81	20.5
25703	6	27	946	0.59		0		8.21	0.59	22.4	21.0
25704	7	160	1106	3.22		0		8.21	3.22	25.62	24.0
25706	8	43	1149	0.57		0		8.21	0.57	26.19	24.6
43673	9	162	1311	2.17	2.38	2.38		8.21	4.55	30.74	28.8
25709	10		1311	0.76	0.39	2.77		8.21	1.15	31.89	29.4
25710	11		1311	0.71	1.05	3.82		8.21	1.76	33.65	30.5
25711	12		1311	1.29	0.8	4.62		8.21	2.09	35.74	31.7
25713	13	378	1689	3.19		4.62		8.21	3.19	38.93	36.5
25715	14	2294	3983	34.61	6.5	11.12	1.39	9.6	42.5	81.43	77.2
Draper Avenue Sewer System											
	15A	38	38	1.38		0	1.47	1.47	2.85	2.85	2.0
	15B	135	173	2.2		0		1.47	2.2	5.05	4.4
	15C	230	403	0.54		0		1.47	0.54	5.59	6.9
	15D	360	763	0.84		0		1.47	0.84	6.43	10.6
	15E	905	1668	4.13		0		1.47	4.13	10.56	20.4
	15F	251	1919	2.98		0	0.5	1.97	3.48	14.04	24.3
	15G	111	2030	0.94		0	0.25	2.22	1.19	15.23	25.8
Morrison Drive Sewer (Lower Reach)											
25723	15		6013			11.12		11.82	0	96.66	100.4
25722	16		6013	0.38	1.88	13		11.82	2.26	98.92	101.4
25720	17	154	6167	2.07	0.84	13.84		11.82	2.91	101.83	104.2

Domestic Flow	300	(L/per/day)
Correction Factor Dom (Harmon Equation)	0.6	
Extraneous Flow	0.5	L/s/ha
Commercial	17000	L/ha/day
Institutional	10000	
Industrial	10000	
Peaking Factor non-res	1	

Population density

Single Family	3.4
Townhouse	2.7
Apartment Units	1.4

Phase 1 Conditions as per DSEL 2012

City MH ID	Pipe ID	Population Local	Population Cumulative	Local Area (ha) Res.	Local Area (ha) Com.	Local Area (ha) Com. Cumul.	Local Area (ha) Inst.	Local Area (ha) Inst. Cumul.	Local Area (ha) Total	Cumulative Area (ha)	Design Flow (L/S)
Morrison Drive Sewer (Upper Reach)											
25698	1	305	305	1.33	0.06	0.06		0	1.39	1.39	4.0
25699	2	592	897	7.91		0.06	8.21	8.21	16.12	17.51	20.3
25700	3	71	968	1.55		0.06		8.21	1.55	19.06	21.7
25701	4	85	1053	1.7		0.06		8.21	1.7	20.76	23.3
25702	5	58	1111	1.05		0.06		8.21	1.05	21.81	24.3
25703	6	27	1138	0.59		0.06		8.21	0.59	22.4	24.8
25704	7	160	1298	3.22		0.06		8.21	3.22	25.62	27.7
25706	8	43	1341	0.57		0.06		8.21	0.57	26.19	28.4
43673	9	162	1503	2.17	2.38	2.44		8.21	4.55	30.74	32.5
25709	10		1503	0.76	0.39	2.83		8.21	1.15	31.89	33.1
25710	11		1503	0.71	1.05	3.88		8.21	1.76	33.65	34.2
25711	12		1503	1.29	0.8	4.68		8.21	2.09	35.74	35.4
25713	13	378	1881	3.19		4.68		8.21	3.19	38.93	40.1
25715	14	2294	4175	34.61	6.5	11.18	1.39	9.6	42.5	81.43	80.5
Draper Avenue Sewer System											
	15A	38	38	1.38		0	1.47	1.47	2.85	2.85	4.5
	15B	135	173	2.2		0		1.47	2.2	5.05	6.9
	15C	230	403	0.54		0		1.47	0.54	5.59	9.2
	15D	360	763	0.84		0		1.47	0.84	6.43	12.8
	15E	905	1668	4.13		0		1.47	4.13	10.56	22.5
	15F	251	1919	2.98		0	0.5	1.97	3.48	14.04	26.3
	15G	111	2030	0.94		0	0.25	2.22	1.19	15.23	27.8
Morrison Drive Sewer (Lower Reach)											
25723	15		6205			11.18		11.82	0	96.66	103.0
25722	16		6205	0.38	1.88	13.06		11.82	2.26	98.92	104.5
25720	17	154	6359	2.07	0.84	13.9		11.82	2.91	101.83	107.2

Population increase based on Phase I proposed development, net population increase of 220.

Domestic Flow - Existing	300	(L/per/day)
Domestic Flow Proposed	350	(L/per/day)
Correction Factor Dom[1] (Harmon Equation)	0.6	
Extraneous Flow	0.5	L/s/ha
Commercial	17000	L/ha/day
Institutional	10000	
Industrial	10000	
Peaking Factor non-res	1	

[1]Correction factor for proposed buildings = 1.0

Population density

Townhouse	2.7
Apartment 1 Bedroom	1.4
Apartment 2 Bedroom	2.1
Apartment 3 Bedroom	3.1

<u>Total Population Increase</u>

Existing Townhouses 5*12 units	162	persons
Proposed	354	persons
Difference	192	
100 % will be added at Link 1	354	persons

Ultimate Proposed Conditions - as per DSEL 2012

City MH ID	Pipe ID	Population		Local Area (ha)						Cumulative Area (ha)	Design Flow (L/S)
		Local	Cumulative	Res.	Com.	Com. Cumul.	Inst.	Inst. Cumul.	Total		
Morrison Drive Sewer (Upper Reach)											
25698	1	347	347	1.33	0.06	0.06		0	1.39	1.39	4.6
25699	2	1060	1407	7.91		0.06	8.21	8.21	16.12	17.51	28.0
25700	3	71	1478	1.55		0.06		8.21	1.55	19.06	29.3
25701	4	85	1563	1.7		0.06		8.21	1.7	20.76	30.9
25702	5	58	1621	1.05		0.06		8.21	1.05	21.81	31.9
25703	6	27	1648	0.59		0.06		8.21	0.59	22.4	32.4
25704	7	160	1808	3.22		0.06		8.21	3.22	25.62	35.2
25706	8	43	1851	0.57		0.06		8.21	0.57	26.19	35.9
43673	9	162	2013	2.17	2.38	2.44		8.21	4.55	30.74	39.9
25709	10		2013	0.76	0.39	2.83		8.21	1.15	31.89	40.5
25710	11		2013	0.71	1.05	3.88		8.21	1.76	33.65	41.6
25711	12		2013	1.29	0.8	4.68		8.21	2.09	35.74	42.8
25713	13	378	2391	3.19		4.68		8.21	3.19	38.93	47.4
25715	14	2294	4685	34.61	6.5	11.18	1.39	9.6	42.5	81.43	87.1
Draper Avenue Sewer System											
	15A	38	38	1.38		0	1.47	1.47	2.85	2.85	8.6
	15B	135	173	2.2		0		1.47	2.2	5.05	10.8
	15C	230	403	0.54		0		1.47	0.54	5.59	13.0
	15D	360	763	0.84		0		1.47	0.84	6.43	16.4
	15E	905	1668	4.13		0		1.47	4.13	10.56	25.8
	15F	251	1919	2.98		0	0.5	1.97	3.48	14.04	29.6
	15G	111	2030	0.94		0	0.25	2.22	1.19	15.23	31.1
Morrison Drive Sewer (Lower Reach)											
25723	15		6715			11.18		11.82	0	96.66	109.3
25722	16		6715	0.38	1.88	13.06		11.82	2.26	98.92	110.8
25720	17	154	6869	2.07	0.84	13.9		11.82	2.91	101.83	113.5

Population increase based on proposed development, net population increase of 702, new pop = 929.

Domestic Flow - Existing	300	(L/per/day)
Domestic Flow Proposed	350	(L/per/day)
Correction Factor Dom[1] (Harmon Equation)	0.6	
Extraneous Flow	0.5	L/s/ha
Commercial	17000	L/ha/day
Institutional	10000	
Industrial	10000	
Peaking Factor non-res	1	

[1]Correction factor for proposed buildings = 1.0

Population density

Townhouse	2.7
Apartment 1 Bedroom	1.4
Apartment 2 Bedroom	2.1
Apartment 3 Bedroom	3.1

Total Population Increase

Existing Townhouses 7*12 units	227	persons
Proposed	929	persons
Difference	702	
1/3 will be added at Link 1	310	persons
2/3 will be added at Link 2	619	L/s

Phase X Conditions - Max Flow increase to not exceed 0.30 m freeboard

City MH ID	Pipe ID	Population		Local Area (ha)						Cumulative Area (ha)	Design Flow (L/S)
		Local	Cumulative	Res.	Com.	Com. Cumul.	Inst.	Inst. Cumul.	Total		
Morrison Drive Sewer (Upper Reach)											
25698	1	276	276	1.33	0.06	0.06		0	1.39	1.39	4.9
25699	2	917	1193	7.91		0.06	8.21	8.21	16.12	17.51	24.6
25700	3	71	1264	1.55		0.06		8.21	1.55	19.06	25.9
25701	4	85	1349	1.7		0.06		8.21	1.7	20.76	27.5
25702	5	58	1407	1.05		0.06		8.21	1.05	21.81	28.5
25703	6	27	1434	0.59		0.06		8.21	0.59	22.4	29.0
25704	7	160	1594	3.22		0.06		8.21	3.22	25.62	31.9
25706	8	43	1637	0.57		0.06		8.21	0.57	26.19	32.6
43673	9	162	1799	2.17	2.38	2.44		8.21	4.55	30.74	36.6
25709	10		1799	0.76	0.39	2.83		8.21	1.15	31.89	37.3
25710	11		1799	0.71	1.05	3.88		8.21	1.76	33.65	38.3
25711	12		1799	1.29	0.8	4.68		8.21	2.09	35.74	39.5
25713	13	378	2177	3.19		4.68		8.21	3.19	38.93	44.1
25715	14	2294	4471	34.61	6.5	11.18	1.39	9.6	42.5	81.43	84.2
Draper Avenue Sewer System											
	15A	38	38	1.38		0	1.47	1.47	2.85	2.85	6.6
	15B	135	173	2.2		0		1.47	2.2	5.05	8.9
	15C	230	403	0.54		0		1.47	0.54	5.59	11.1
	15D	360	763	0.84		0		1.47	0.84	6.43	14.7
	15E	905	1668	4.13		0		1.47	4.13	10.56	24.2
	15F	251	1919	2.98		0	0.5	1.97	3.48	14.04	28.0
	15G	111	2030	0.94		0	0.25	2.22	1.19	15.23	29.5
Morrison Drive Sewer (Lower Reach)											
25723	15		6501			11.18		11.82	0	96.66	106.5
25722	16		6501	0.38	1.88	13.06		11.82	2.26	98.92	108.0
25720	17	154	6655	2.07	0.84	13.9		11.82	2.91	101.83	110.7

Population increase based on JFSA XPSWMM Modelling - max allowable increase for freeboard >= 0.30 m.

Domestic Flow - Existing	300	(L/per/day)
Domestic Flow Proposed	350	(L/per/day)
Correction Factor Dom[1] (Harmon Equation)	0.6	
Extraneous Flow	0.5	L/s/ha
Commercial	17000	L/ha/day
Institutional	10000	
Industrial	10000	
Peaking Factor non-res	1	

[1]Correction factor for proposed buildings = 1.0

Population density

Townhouse	2.7
Apartment 1 Bedroom	1.4
Apartment 2 Bedroom	2.1
Apartment 3 Bedroom	3.1

Total Population Increase

Existing Townhouses 5*12 units	162	persons
Proposed New	650	persons
Difference	488	
1/3 will be added at Link 1	217	persons
2/3 will be added at Link 2	433	L/s

Table 1 - Comparison of Existing Conditions HGL results based on different Sanitary Sewer pipe layouts and Modelling Programs.

City MH ID	Underside of Footing Elevation (m)[1]	Novatech 2009 Existing Conditions[2]		XPSWMM Replica of Novatech 2009 Model[2]		XPSWMM Model with Stantec 2012 Survey data[3]	
		HGL (m)	Freeboard (m)	HGL (m)	Freeboard (m)	HGL (m)	Freeboard (m)
25697	N/A	73.87	N/A	73.77	N/A	N/A	N/A
25698	N/A	71.28	N/A	71.20	N/A	71.30	N/A
25699	N/A	68.75	N/A	68.69	N/A	69.18	N/A
25700	N/A	67.88	N/A	67.81	N/A	68.99	N/A
25701	67.50	66.07	1.43	66.00	1.50	66.07	1.43
25702	66.65	65.68	0.97	65.61	1.04	65.69	0.96
25703	66.25	65.44	0.81	65.38	0.87	65.44	0.81
25704	66.50	65.12	1.38	65.12	1.39	65.20	1.30
25704i[4]	N/A	N/A	N/A	N/A	N/A	64.95	N/A
25705	65.50	65.09	0.41	64.97	0.53	64.93	0.57
25706	65.40	65.07	0.33	64.94	0.46	64.92	0.48
25707	N/A	64.90	N/A	64.90	N/A	64.87	N/A
25708	N/A	64.85	N/A	64.82	N/A	64.74	N/A
43673	65.15	64.82	0.33	64.78	0.37	64.67	0.48
25709	67.08	64.77	2.31	64.74	2.34	64.63	2.45
25710	N/A	64.69	N/A	64.66	N/A	64.55	N/A
25711	N/A	64.59	N/A	64.57	N/A	64.46	N/A
25712	N/A	64.57	N/A	64.55	N/A	64.43	N/A
25713	N/A	64.55	N/A	64.53	N/A	64.41	N/A
25714	N/A	64.54	N/A	64.53	N/A	64.41	N/A
25715	N/A	64.54	N/A	64.52	N/A	64.40	N/A
25723	N/A	64.53	N/A	64.52	N/A	64.39	N/A
25722	N/A	64.51	N/A	64.51	N/A	64.37	N/A
25721	N/A	64.50	N/A	64.51	N/A	64.37	N/A
25720	N/A	64.49	N/A	64.50	N/A	64.36	N/A
25719	N/A	64.48	N/A	64.50	N/A	64.36	N/A

[1]Underside of footing elevation as estimated by Novatech in their January 2009 report titled *Morrison Court Development Wastewater servicing Study* .

[2]Sanitary sewer layout as per Novatech 2009 survey

[3]Sanitary sewer layout as per a survey conducted by Stantec in August 2012.

[4]During the survey conducted by Stantec in August 2012, they identified a maintenance hole between City structures 25704 and 25705. This structure is refered to as 25704i for the purposes of this study.

Note 1: Freeboard distances have only been calculated at maintenance holes where Novatech calculated/reported an underside of footing elevation. N/A in the freeboard column denotes missing USF data.

Note 2: Hydraulic Gradeline elevations have not been calculated at all location in each model due to data gaps. N/A in the HGL column denotes missing pipe data for that particular model.

Table 2 - Existing Conditions, Phase 1 and Phase X Hydraulic Gradeline Results

City MH ID	Underside of Footing Elevation (m)[1]	Novatech 2009 Existing Conditions[2]		XPSWMM Model Existing Condition[3]		XPSWMM Proposed Phase I Condition[3]		XPSWMM Proposed Phase X Condition[4]	
		HGL (m)	Freeboard (m)	HGL (m)	Freeboard (m)	HGL (m)	Freeboard (m)	HGL (m)	Freeboard (m)
25697	N/A	73.87	N/A	N/A	N/A	N/A	N/A	N/A	N/A
25698	N/A	71.28	N/A	71.30	N/A	71.32	N/A	71.32	N/A
25699	N/A	68.75	N/A	69.18	N/A	69.27	N/A	69.38	N/A
25700	N/A	67.88	N/A	68.99	N/A	69.00	N/A	69.00	N/A
25701	67.50	66.07	1.43	66.07	1.43	66.09	1.41	66.11	1.39
25702	66.65	65.68	0.97	65.69	0.96	65.71	0.94	65.73	0.92
25703	66.25	65.44	0.81	65.44	0.81	65.47	0.78	65.49	0.76
25704	66.50	65.12	1.38	65.20	1.30	65.21	1.29	65.23	1.27
25704i[5]	N/A	N/A	N/A	64.95	N/A	64.97	N/A	65.03	N/A
25705	65.50	65.09	0.41	64.93	0.57	64.96	0.54	65.04	0.47
25706	65.40	65.07	0.33	64.92	0.48	64.94	0.46	65.02	0.39
25707	N/A	64.9	N/A	64.87	N/A	64.89	N/A	64.96	N/A
25708	N/A	64.85	N/A	64.74	N/A	64.80	N/A	64.90	N/A
43673	65.15	64.82	0.33	64.67	0.48	64.75	0.40	64.84	0.31
25709	67.08	64.77	2.31	64.63	2.45	64.70	2.38	64.77	2.31
25710	N/A	64.69	N/A	64.55	N/A	64.59	N/A	64.64	N/A
25711	N/A	64.59	N/A	64.46	N/A	64.47	N/A	64.49	N/A
25712	N/A	64.57	N/A	64.43	N/A	64.44	N/A	64.46	N/A
25713	N/A	64.55	N/A	64.41	N/A	64.42	N/A	64.43	N/A
25714	N/A	64.54	N/A	64.41	N/A	64.41	N/A	64.42	N/A
25715	N/A	64.54	N/A	64.40	N/A	64.41	N/A	64.42	N/A
25723	N/A	64.53	N/A	64.39	N/A	64.39	N/A	64.40	N/A
25722	N/A	64.51	N/A	64.37	N/A	64.37	N/A	64.38	N/A
25721	N/A	64.50	N/A	64.37	N/A	64.37	N/A	64.37	N/A
25720	N/A	64.49	N/A	64.36	N/A	64.36	N/A	64.36	N/A
25719	N/A	64.48	N/A	64.36	N/A	64.36	N/A	64.36	N/A

[1]Underside of footing elevation as estimated by Novatech in their January 2009 report titled *Morrison Court Development Wastewater servicing Study* .

[2]Sanitary sewer layout as per Novatech 2009 survey

[3]Sanitary sewer layout as per a survey conducted by Stantec in August 2012.

[4]Phase X condition is a test case to determine the maximum sanitary flow increase from the proposed development that will result in a minimum freeboard of no less than 0.30 m. Modelled flow increase = 8 L/s.

[5]During the survey conducted by Stantec in August 2012, they identified a maintenance hole between City structures 25704 and 25705. This structure is refered to as 25704i for the purposes of this study.

Note 1: Freeboard distances have only been calculated at maintenance holes where Novatech calculated/reported an underside of footing elevation. N/A in the freeboard column denotes missing USF data.

Note 2: Hydraulic Gradeline elevations have not been calculated at all location in each model due to data gaps. N/A in the HGL column denotes missing pipe data for that particular model.

Alison Gosling

From:	C. Brennan <cbrennan@jfsa.com>
Sent:	January-21-13 2:51 PM
To:	'natan'; 'Andrew Finnson'
Cc:	'J.F. Sabourin'; 'Lloyd Phillips'
Subject:	RE: Morrison Drive MH's
Attachments:	20130114 - Hydraulic Gradeline Results + Sanitary Design.pdf
Follow Up Flag:	Follow up
Flag Status:	Flagged

Hello Andrew,

As requested by your office and Greatwise Developments Corporation (Greatwise), J.F. Sabourin and Associates Inc. (JFSA) have completed our hydraulic analysis of the existing Morrison Drive sanitary sewer system. This analysis is meant to augment the findings that JFSA provided to Greatwise in August 2012. During the previous analysis it was determined that the existing sanitary sewer along Morrison Drive had sufficient capacity to convey the sanitary flow increases from Phase I of the proposed Morrison Court development while maintaining a freeboard of greater than 0.30 m at the critical location, MHSA43673. The current analysis has been undertaken to determine the maximum peak sanitary flow increase from the proposed development that would still result in a freeboard of greater than 0.30 m along the existing Morrison Drive sanitary sewer.

JFSA updated the sanitary sewer design calculations and XPSWMM model of the existing sanitary sewer to determine the maximum flow increase that would meet the 0.30 m freeboard criterion. Based on that analysis it was determined that an overall peak sanitary flow increase of **8 L/s** will result in a freeboard of 0.31 m at the critical location, MHSA43673, along the existing sanitary sewer. Please refer to the Hydraulic Gradeline Results and Sanitary Design sheets attached, these results supersede the tables that were submitted in August 2012. As is illustrated in the sanitary design table for Phase X, the scenario that was used to arrive at the max allowable peak flow increase of 8 L/s is a new development with a population of 650 replacing five (5) of the existing townhouses (population of 162) for a net population increase of 488. Please note that the freeboard calculations are based on the hydraulic gradeline results from JFSA's XPSWMM model and the underside of footing determinations made by Novatech in their January 26, 2009 report titled *Morrison Court Development Wastewater Servicing Study.*

Please contact me if you have any questions or comments,
Kind Regards

Colin Brennan, B.A.Sc.
Water Resources EIT

JFSA Water Resources and Environmental Consultants

J.F. Sabourin and Associates Inc.
52 Springbrook Drive , Ottawa , ON K2S 1B9
tel.: 613.836.3884 ext. 224, fax: 613.836.0332, www.jfsa.com

From: natan [mailto:natan@gsregalgroup.com]
Sent: Tuesday, January 08, 2013 3:21 PM
To: 'Andrew Finnson'

Cc: 'J.F. Sabourin'; 'Lloyd Phillips'; cbrennan@jfsa.com
Subject: RE: Morrison Drive MH's

Andrew
Can we start with a conference call on Thursday Jan 10th
I recommend for Colin, you, Lloyd and me to be there.
Do we need James!
If the time is acceptable to all I will send the conference access info to ALL
Regards
Natan

From: Andrew Finnson [mailto:afinnson@dsel.ca]
Sent: January-08-13 1:43 PM
To: cbrennan@jfsa.com; 'natan'
Cc: 'J.F. Sabourin'; 'Lloyd Phillips'
Subject: RE: Morrison Drive MH's

Hi Natan,
Colin's email below states that they would like to have a meeting to discuss the sanitary analysis and make sure that we're all on the same page. Can you suggest a time that would work for you so we can try to set something up?

Thanks,

Andrew Finnson, P.Eng.

DSEL
david schaeffer engineering ltd

phone: (613) 836-0856 ext 229
cell: (613) 222-4957
e-mail: afinnson@DSEL.ca

From: C. Brennan [mailto:cbrennan@jfsa.com]
Sent: Tuesday, December 18, 2012 7:00 PM
To: 'Andrew Finnson'
Cc: 'J.F. Sabourin'; 'natan'; 'Lloyd Phillips'
Subject: RE: Morrison Drive MH's

Hello Andrew,

We can perform such an analysis. It would involve additional work in comparison to the quote provided below and we would like to have a brief meeting with the team to confirm the conclusions that can be drawn from such an analysis and how the project could progress from there. To perform the aforementioned our fee would be $1,250 + tax. A meeting with the City may be required to confirm that our approach will be acceptable to them, which would be charged at our standard hourly rates.

Kind Regards,
Colin

Colin Brennan, B.A.Sc.
Water Resources EIT

J.F. Sabourin and Associates Inc.
52 Springbrook Drive , Ottawa , ON   K2S 1B9
tel.: 613.836.3884 ext. 224, fax: 613.836.0332, **www.jfsa.com**

From: Andrew Finnson [mailto:afinnson@dsel.ca]
Sent: Thursday, December 13, 2012 9:56 AM
To: cbrennan@jfsa.com
Cc: 'J.F. Sabourin'; 'natan'; 'Lloyd Phillips'
Subject: RE: Morrison Drive MH's

Hi Colin,
I've discussed this with Natan at Greatwise and what they'd like to see (since we're looking at this again) is a maximum number of units, or maximum population that could be accommodated without the need for a downstream upgrade. This analysis should show that the additional units can be accommodated, as well as give a bit of a buffer in the event that there are any site plan changes. Are you able to complete this analysis for the fee quoted below or would additional fees be required to complete this type of analysis?

Thanks,

Andrew Finnson, P.Eng.

DSEL
david schaeffer engineering ltd

phone: (613) 836-0856 ext 229
cell: (613) 222-4957
e-mail: afinnson@DSEL.ca

From: C. Brennan [mailto:cbrennan@jfsa.com]
Sent: Wednesday, December 12, 2012 3:14 PM
To: 'Andrew Finnson'
Cc: 'J.F. Sabourin'
Subject: RE: Morrison Drive MH's

Hi Andrew,

I can introduce that flow increase into our hydraulic model and confirm if Phase I can still go ahead without improving the existing sanitary sewer system. It will take about a half day to update everything and respond via email. To perform this check our fee would be $ 500.

Let me know if you would like me to proceed.

Colin

From: Andrew Finnson [mailto:afinnson@dsel.ca]
Sent: Monday, December 10, 2012 11:11 AM

To: cbrennan@jfsa.com
Subject: RE: Morrison Drive MH's

Hi Colin,
I've been told that they are making some minor adjustments to unit counts for the Greatwise - Morrison Drive development. Basically they are converting 5 - 2 bedroom units to 10 – 1 bedroom units. They have asked me to confirm that this will still work without upgrading the downstream sewer. Are you able to confirm that this should still work?

Give me a call if you have any questions.

Thanks,

Andrew Finnson, P.Eng.

DSEL
david schaeffer engineering ltd

phone: (613) 836-0856 ext 229
cell: (613) 222-4957
e-mail: afinnson@DSEL.ca

From: C. Brennan [mailto:cbrennan@jfsa.com]
Sent: Friday, August 24, 2012 11:07 AM
To: 'Andrew Finnson'
Cc: jfsabourin@jfsa.com
Subject: RE: Morrison Drive MH's

Hi Andrew,

As requested, we have assessed the HGL elevations along the Morrison Drive sanitary sewer under ultimate (Phase I and II) flow conditions. Sanitary flows are based on Novatech's 2009 design, with a peak flow of 112.4 L/s at the downstream end of the system. The minimum freeboard for this condition at MHSA43673 is 0.26 m, less than the City's minimum allowable freeboard of 0.30 m.

Regards,

Colin

From: Andrew Finnson [mailto:afinnson@dsel.ca]
Sent: Friday, August 24, 2012 9:19 AM
To: cbrennan@jfsa.com
Subject: RE: Morrison Drive MH's

Colin,
The latest sanitary design sheets are attached. The ultimate flow from the site is 12.08 L/s.

Thanks,
Andrew

From: C. Brennan [mailto:cbrennan@jfsa.com]
Sent: Wednesday, August 22, 2012 2:27 PM
To: 'Andrew Finnson'
Cc: 'J.F. Sabourin'
Subject: RE: Morrison Drive MH's

Hello Andrew,

As requested by your office, on behalf of Greatwise Developments Corporation, J.F. Sabourin and Associates Inc. (JFSA) have completed our modelling exercise along the Morrison Drive sanitary sewer line under both existing and proposed phase I development conditions. A preliminary assessment of the sanitary sewer capacity was previously undertaken by Novatech Engineering Consultants Ltd. (Novatech) as described in their January 26, 2009 report titled *Morrison Court Development Wastewater Servicing Study*. In that study, Novatech found that at the most critical location, MHSA43673, the existing freeboard between the Hydraulic Gradeline (HGL) in the sanitary sewer system and the lowest connected underside of footing (USF) elevation is 0.33 m. Novatech also assessed the HGL within the system under proposed development flows whereby seven (7) 12-unit townhomes (population of 223) would be replaced with a new development having a total population of 929 (representing a population increase of 702 persons). Novatech found that the peak flow at the Pinecrest Trunk confluence would increase from 104.2 L/s under existing conditions to 112.4 L/s under proposed conditions. They found that this flow increase resulted in increased HGL elevations such that, the minimum freeboard at MHSA43673 would be reduced to 0.12 m. Novatech therefore concluded that the existing system does not have adequate capacity for the entire proposed development and recommended increasing the diameter of 423 m of pipe between MHSA25705 and MHSA25711 to 375 mm at 0.14% slope, which would provide a minimum freeboard of 0.41 m.

JFSA conducted our modelling of the sanitary sewer system using XPSWMM version 10.6, while Novatech had previously used H2OMAP Sewer/Pro. It is therefore anticipated that JFSA will arrive at slightly different results than Novatech when modelling the same system. Table 1, attached, indicates that at MHSA43673 where Novatech modelled a freeboard of 0.33 m, the JFSA XPSWMM model indicates that there is a 0.37 m freeboard. Previous modelling was based on a survey conducted by Novatech during the work for their January 2009 report. Pipe lengths and dimensions from the Novatech survey and As Built plans agree with one another and have been taken as correct in JFSA's work. The sanitary pipe inverts were verified/confirmed however, using the results from a field survey conducted by Stantec Consulting Ltd. in August 2012. It is important to note that Stantec located a maintenance hole between MHSA25704 and MHSA25705, this maintenance hole has been included in JFSA's models and labelled as 25704i for the purposes of this work. Furthermore,Stantec's structure SMH2 (correlates to city MHSA25697) was not included in the JFSA modelling as: 1) the measured invert does not agree well with the As Built data and 2) that pipe is upstream of the proposed site and lowest freeboard locations. Similarly, Stantec structures SMH38, SMH39 and SMH40 appear to be a parallel sanitary line to the Morrison sewer and do not appear to have City structure ID's, therefore, JFSA was instructed by DSEL to neglect these three (3) structures as noted in the correspondence below. A graph demonstrating the Morrison Drive sanitary sewer invert elevation as per the: Novatech 2009 survey, Stantec 2012 survey and As Built plans is attached for reference, note that the first node is MHSA25698 and the final node is MHSA25759. The final two columns of attached Table 1 provide JFSA's modelling results under existing flow conditions based on the Stantec surveyed inverts. In updating the XPSWMM model to reflect the Stantec 2012 survey rather than the Novatech 2009 survey the modelled HGL elevations were reduced, such that, the minimum freeboard at MHSA43673 based on JFSA's model is 0.49 m. This freeboard is above the minimum allowable freeboard of 0.30 m as per the *City of Ottawa Sewer Design Guidelines* (November 2004).

JFSA was retained to assess the HGL elevations under the currently proposed Phase I development conditions rather than ultimate development conditions. The proposed Phase I construction will result in the demolition of four (4) existing townhouse buildings and the construction of three (3) 4-storey buildings two of which are for residential use while one is to be mixed use commercial/residential. The net impact of the proposed Phase I development is a population increase of 220 persons (350 - 130) and 600 m^2 of Commercial floor space (equivalent to 10L/s of sanitary flow), which results in a peak flow at the confluence with the Pinecrest trunk sewer of 106.2 L/s. Sanitary flow sheets are attached for both existing and Phase I development conditions. Table 2, attached, provides a comparison the HGL results from the Novatech 2009 existing modelling, the JFSA XPSWMM existing modelling and the JFSA XPSWMM modelling for proposed Phase I flow conditions. The minimum freeboard calculated along the existing Morrison Drive sanitary sewer under Phase I flows was 0.44 m, which occurs at MHSA43673. Therefore, based on the JFSA XPSWMM model, and the Novatech 2009 USF elevations, the minimum freeboard under Phase I development flows will be 0.44 m, which is greater than the City of Ottawa's minimum allowable value of 0.30 m.

Please contact myself if you have any questions or comments.
Kind Regards,

Colin Brennan, B.A.Sc.
Water Resources EIT

J.F. Sabourin and Associates Inc.
52 Springbrook Drive , Ottawa , ON   K2S 1B9
tel.: 613.836.3884 ext. 224, fax: 613.836.0332, **www.jfsa.com**

From: Andrew Finnson [mailto:afinnson@dsel.ca]
Sent: Wednesday, August 22, 2012 10:13 AM
To: cbrennan@jfsa.com
Subject: RE: Morrison Drive MH's

Colin,
Jamie at Stantec has confirmed that it is in fact a typo. It's 1 metre high. The actual invert is 64.53.

Andrew

From: Andrew Finnson [mailto:afinnson@dsel.ca]
Sent: Wednesday, August 22, 2012 10:02 AM
To: 'cbrennan@jfsa.com'
Subject: RE: Morrison Drive MH's

Colin,
I've left a message with Jamie. Please proceed. I'll make sure we get confirmation from him asap.

Thanks,
Andrew

From: C. Brennan [mailto:cbrennan@jfsa.com]
Sent: Wednesday, August 22, 2012 8:32 AM
To: 'Andrew Finnson'
Subject: RE: Morrison Drive MH's

Thanks Andrew.

Colin

From: Andrew Finnson [mailto:afinnson@dsel.ca]
Sent: Wednesday, August 22, 2012 8:29 AM
To: cbrennan@jfsa.com
Subject: RE: Morrison Drive MH's

Hi Colin,
Your assumptions below are correct. 3 townhouse buildings will remain in Phase I and 4 will be demolished.

Thanks,
Andrew

From: C. Brennan [mailto:cbrennan@jfsa.com]
Sent: Wednesday, August 22, 2012 8:25 AM
To: 'Andrew Finnson'
Subject: RE: Morrison Drive MH's

Hi Andrew,

No problem including the new Phase 1 population numbers. Just to confirm though, from the in-progress base plan I received from you it seems like Phase 1 construction will replace four (4) of the existing Townhouses (4*12units*2.7 = 130 persons). Will the other three (3) existing townhouses remain during Phase 1 (3*12*2.7=97 persons), is this correct?

I am assuming that the proposed Phase 1 buildings will contribute flow from 350 persons which replaces flow from 130 persons, representing a net increase of 220 persons for Phase I.

Colin

From: Andrew Finnson [mailto:afinnson@dsel.ca]
Sent: Tuesday, August 21, 2012 9:29 AM
To: cbrennan@jfsa.com
Subject: RE: Morrison Drive MH's

Hi Colin,
We've just received a new plan with minor revisions to the unit counts for phase 1, and therefore minor revisions to the sanitary flow. If it's possible to revise the flows to match the updated plan without causing you further delay please do so, otherwise please proceed with the previous numbers you have.

Thanks,
Andrew

From: C. Brennan [mailto:cbrennan@jfsa.com]
Sent: Tuesday, August 21, 2012 9:31 AM
To: 'Andrew Finnson'
Cc: jfsabourin@jfsa.com; spichette@dsel.ca
Subject: RE: Morrison Drive MH's

Hi Andrew,

I am currently running various modelling scenarios for Monahan to respond to the RVCA letter from Bruce Reid. Therefore, I will not be able to provide the Sanitary modelling results to you today. Sorry for the delay, I will plan to return to that file first thing tomorrow morning.

Regards,
Colin

From: Andrew Finnson [mailto:afinnson@dsel.ca]
Sent: Tuesday, August 21, 2012 8:17 AM
To: cbrennan@jfsa.com
Subject: RE: Morrison Drive MH's

Hi Colin,
Do you have something you can send me today? I need to get this incorporated into a report which needs to be submitted to the client tomorrow.

Thanks,
Andrew

From: C. Brennan [mailto:cbrennan@jfsa.com]
Sent: Friday, August 17, 2012 1:09 PM
To: 'Andrew Finnson'
Cc: 'J.F. Sabourin'
Subject: RE: Morrison Drive MH's

Hi Andrew,

I've just come across another discrepancy. Where Stantec picks up three (3) sanitary manholes, SMH25, SMH26 and SMH27, the Novatech drawings and model only show two manholes (25705 and 25706). I'm inclined to trust the Stantec survey and add another manhole and pipe (approx. 17 m long) to the model.

Could you please check with Stantec and advise if the above assumption should be used or not.

Regards,
Colin

From: Andrew Finnson [mailto:afinnson@dsel.ca]
Sent: Friday, August 17, 2012 11:20 AM
To: cbrennan@jfsa.com
Cc: 'J.F. Sabourin'
Subject: RE: Morrison Drive MH's

Hi Colin,
I will follow up with Stantec but according to the as-builts the below assumptions are correct. Please proceed on that basis.

Thanks,
Andrew

From: C. Brennan [mailto:cbrennan@jfsa.com]
Sent: Friday, August 17, 2012 11:21 AM
To: 'Andrew Finnson'
Cc: 'J.F. Sabourin'
Subject: RE: Morrison Drive MH's

Hi Andrew,

As a follow-up to our phone conversation I would like to confirm the assumptions that I am to make with respect to the sanitary survey data prepared by Stantec.

1. Due to a discrepancy between the new and old inverts at SMH2 (25697) and the second south invert at SMH4 (25698), JFSA will only model from SMH4 (25698) downstream pending clarification from DSEL/Stantec.
2. The following three (3) manholes seem to be a parallel line which are not noted on the As Built drawings in DSEL's possession, SMH 38, SMH 39 and SMH 40. Therefore these manholes will be neglected in our analysis. We are under the assumption that SMH37 corresponds to the City MH 25711 and SMH41 corresponds to City MH 25712 and that these two manholes are connected by a 63.5 m long 375 mm diameter concrete sanitary pipe.
3. There is a discrepancy from SMH37 to SMH49 with respect to pipe sizes. The sizes recorded by Stantec will be neglected in favour of the sizes included in DSEL's EPA SWMM model, which are based on the As Built Drawings. Pipe diameters to be used are as follows:
   SMH37 (25711) to SMH44 (25715) - 375 mm concrete
   SMH44 (25715) to SMH49 (25719 - 600 mm concrete
4. Except as noted above, the pipe inverts and top of grate elevations recorded by Stantec will be taken as correct and used in all subsequent hydraulic (XPSWMM) modelling.

Please advise if any of the preceding assumptions are incorrect, or if clarification is provided by Stantec.

Regards,
Colin

Colin Brennan, B.A.Sc.
Water Resources EIT

JFSA Water Resources and Environmental Consultants

J.F. Sabourin and Associates Inc.
52 Springbrook Drive , Ottawa , ON K2S 1B9
tel.: 613.836.3884 ext. 224, fax: 613.836.0332, **www.jfsa.com**

From: C. Brennan [mailto:cbrennan@jfsa.com]
Sent: Friday, August 17, 2012 10:05 AM
To: 'Andrew Finnson'
Cc: 'J.F. Sabourin'
Subject: RE: Morrison Drive MH's

Hi Andrew,

I've been reviewing the Stantec Storm and Sanitary manhole survey and would like a few clarifications.

specifically:

1. there two (2) pipes coming into the South side of Structure 4. What is the second pipe, and which one represents the main sewer line.
2. There are more sanitary manholes in the NE portion of Morrison Road than recorded by Novatech. STM 38, 39 and 40 all seem like additions.
3. Several pipe size and invert comments are included on the attached drawing as well.

I have attached a CAD Drawing with City Structure labels included where I believe they may apply, I will call to discuss.

Colin

From: Andrew Finnson [mailto:afinnson@dsel.ca]
Sent: Monday, August 13, 2012 2:30 PM
To: cbrennan@jfsa.com
Subject: FW: Morrison Drive MH's

Colin,
See the attached survey from Stantec.
If anything is unclear let me know.

Thanks,
Andrew

From: Leslie, Jamie [mailto:Jamie.Leslie@stantec.com]
Sent: Monday, August 13, 2012 2:24 PM
To: Andrew Finnson
Subject: RE: Morrison Drive MH's

Hi Andrew,

Sorry for the delay. Here is the CAD file for our MH pickup and invert measurements. Let me know if you have any questions. Thank you.

Jamie Leslie, OLS, OLIP, EIT
Project Manager
Stantec Geomatics Ltd.
1505 Laperriere Avenue
Ottawa ON K1Z 7T1
Ph: (613) 722-4420 Ext. 592
Fx: (613) 722-2799
Jamie.Leslie@stantec.com
stantec.com

From: Andrew Finnson [mailto:afinnson@dsel.ca]
Sent: Friday, August 10, 2012 11:08 AM
To: Leslie, Jamie
Subject: RE: Morrison Drive MH's

Monday morning is fine Jamie. Have a good weekend.

Thanks,
Andrew

From: Leslie, Jamie [mailto:Jamie.Leslie@stantec.com]
Sent: Friday, August 10, 2012 11:10 AM
To: Andrew Finnson (afinnson@dsel.ca)
Subject: Morrison Drive MH's

Hi Andrew,

I just wanted to update you on the status of the Morrison Drive MH pickup. We are finalizing the CAD file now. I do have to step out shortly for a meeting this afternoon. I'm not sure if I will return to the office this afternoon. Unless you require this information later this afternoon, I will forward you the drawing first thing Monday morning. If you do require it, I will have it sent to you by my CAD person when it is finished. Let me know your thoughts. Thank you.

Jamie Leslie, OLS, OLIP, EIT
Project Manager
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1505 Laperriere Avenue
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Jamie.Leslie@stantec.com
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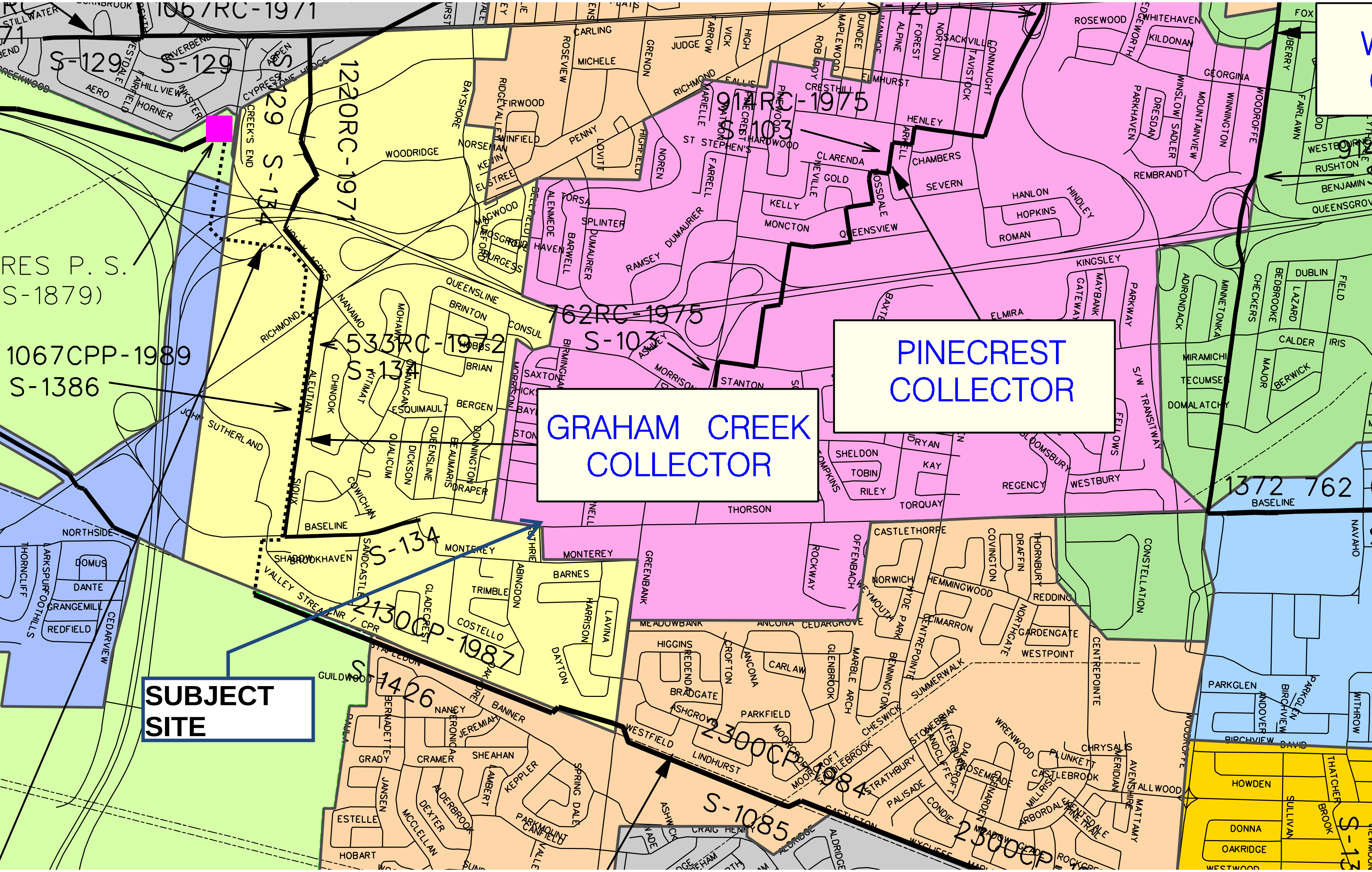
TRUNK SANITARY SEWERS & COLLECTION AREAS



APPENDIX D

Stormwater Management

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

1) Time of Concentration per Federal Aviation Administration

Existing Drainage Charateristics From Internal Site

Area	1.331	ha
C	0.56	Rational Method runoff coefficient
L	101.6	m
Up Elev	75.85	m
Dn Elev	73	m
Slope	2.8	%

5-Year	Imp.	Perv.	Total
Area	0.686	0.645	1.331
C	0.9	0.2	0.56

100-Year	Imp.	Perv.	Total
Area	0.686	0.645	1.331
C	1.00	0.25	0.64

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

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

Tc 12.6 min

2) Time of Concentration per SCS Method

Existing Drainage Charateristics From Internal Site

Area	1.331	ha
L	101.6	m
Up Elev	75.85	m
Dn Elev	73	m
Slope	2.8	%
CN (-)	91.0	

$$t_c = \frac{100L^{0.8}\left[\left(\frac{1000}{CN}\right) - 9\right]^{0.7}}{1900S^{0.5}}$$

L, length in ft
CN, SCS runoff curve number
S, average watershed slope in (%)

Tc 5.3 min

3) Estimated Peak Flow (Airport Method)

	2-year	5-year	100-year	
i	68.2	92.4	158.1	mm/hr
Q	141.4	191.6	409.9	L/s

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)

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

Target Flow Rate

Area	1.33	ha
C	0.50	Rational Method runoff coefficient
t_c	12.6	min

	2-year	
i	68.2	mm/hr
Q	126.3	L/s

Greatwise Developments
2710 Draper Avenue - Phase 3-1
Storm Sewer Calculation Sheet - 5-Year Storm Event

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
										Sewer Data								
			(ha)	(-)			(min)	(mm/hr)	(L/s)	(mm)	(%)	(m)	(m^2)	(m)	(m/s)	(L/s)	(min)	(-)
Cherry Blossom Private			0.05	0.50	0.03	0.03	10.0	104.2	7.2	300	1.00	3.5	0.071	0.075	1.37	96.7	0.0	0.07
	MH 5	MH 6	0.19	0.75	0.14	0.17	10.0	104.0	48.4	600	0.14	60.5	0.283	0.150	0.81	229.7	1.2	0.21
	MH 6	MH 7	0.19	0.75	0.14	0.31	11.3	97.9	84.3	675	0.15	63.0	0.358	0.169	0.91	325.6	1.2	0.26
							12.4											
Foliage Private	MH 2	MH 3	0.26	0.75	0.20	0.20	10.0	104.2	56.4	600	0.16	60.5	0.283	0.150	0.87	245.6	1.2	0.23
	MH 3	MH 4	0.07	0.75	0.05	0.25	11.2	98.4	67.7	600	0.16	59.5	0.283	0.150	0.87	245.6	1.1	0.28
							12.3											
Purple Martin Private	MH 4	MH70	0.25	0.75	0.19	0.44	12.3	93.4	112.9	600	0.14	13.0	0.283	0.150	0.81	229.7	0.3	0.49
	MH70	MH7	0.08	0.75	0.06	0.50	12.6	92.3	127.0	600	0.14	20.0	0.283	0.150	0.81	229.7	0.4	0.55
							13.0											
	MH 7	MH 8	0.10	0.75	0.08	0.88	13.0	90.7	221.7	675	0.15	31.0	0.358	0.169	0.91	325.6	0.6	0.68
	MH 8	OGS			0.00	0.88	13.5	88.6	170.7	600	0.15	2.0	0.283	0.150	0.84	237.8	0.0	0.72
	OGS	MH 9			0.00	0.88	13.6	88.4	170.7	600	0.13	15.5	0.283	0.150	0.78	221.4	0.3	0.77
							13.9											

Greatwise Developments
2710 Draper Avenue - Phase 3-1
Storm Sewer Calculation Sheet - 2-Year Storm Event

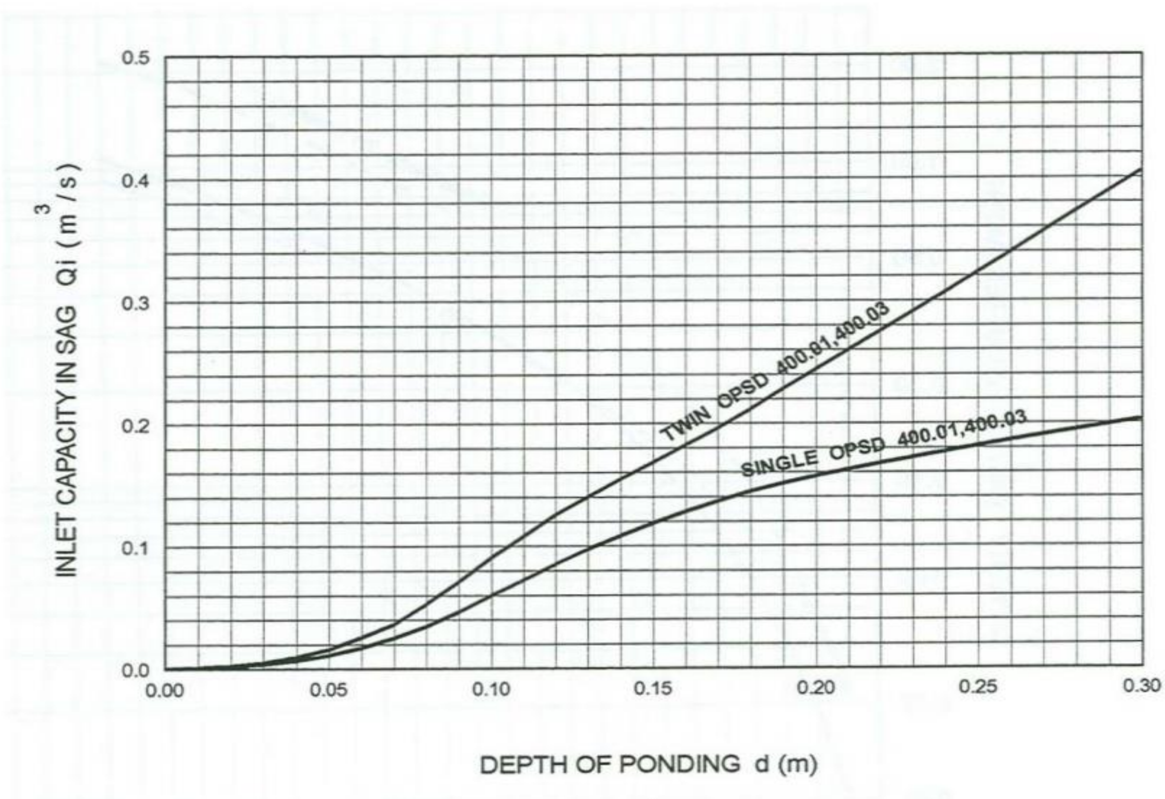
										Sewer Data								
Area ID	**Up**	**Down**	**Area**	**C**	**Indiv AxC**	**Acc AxC**	**T_C**	**I**	**Q**	**DIA**	**Slope**	**Length**	**$A_{hydraulic}$**	**R**	**Velocity**	**Qcap**	**Time Flow**	**Q / Q full**
			(ha)	**(-)**			**(min)**	**(mm/hr)**	**(L/s)**	**(mm)**	**(%)**	**(m)**	**(m^2)**	**(m)**	**(m/s)**	**(L/s)**	**(min)**	**(-)**
Cherry Blossom Private			0.05	0.50	0.03	0.03	10.0	76.8	5.3	300	1.00	3.5	0.071	0.075	1.37	96.7	0.0	0.06
	MH 5	MH 6	0.19	0.75	0.14	0.17	10.0	76.6	35.7	600	0.14	60.5	0.283	0.150	0.81	229.7	1.2	0.16
	MH 6	MH 7	0.19	0.75	0.14	0.31	11.3	72.2	62.2	675	0.15	63.0	0.358	0.169	0.91	325.6	1.2	0.19
							12.4											
Foliage Private	MH 2	MH 3	0.26	0.75	0.20	0.20	10.0	76.8	41.6	600	0.16	60.5	0.283	0.150	0.87	245.6	1.2	0.17
	MH 3	MH 4	0.07	0.75	0.05	0.25	11.2	72.6	49.9	600	0.16	59.5	0.283	0.150	0.87	245.6	1.1	0.20
							12.3											
Purple Martin Private	MH 4	MH70	0.25	0.75	0.19	0.44	12.3	69.0	83.3	600	0.14	13.0	0.283	0.150	0.81	229.7	0.3	0.36
	MH70	MH7	0.08	0.75	0.06	0.50	12.6	68.2	93.7	600	0.14	20.0	0.283	0.150	0.81	229.7	0.4	0.41
							13.0											
	MH 7	MH 8	0.10	0.75	0.08	0.88	13.0	67.0	163.7	675	0.15	31.0	0.358	0.169	0.91	325.6	0.6	0.50
	MH 8	OGS			0.00	0.88	13.5	65.4	170.7	600	0.15	2.0	0.283	0.150	0.84	237.8	0.0	0.72
	OGS	MH 9			0.00	0.88	13.6	65.3	170.7	600	0.13	15.5	0.283	0.150	0.78	221.4	0.3	0.77
							13.9											

CB Grate CB Lead Capture
on Constant Grade

Depth of Flow (m)	Single CB Flow (L/s)	Twin CB Flow (L/s)	CB Lead Head (m)	250mm CB Lead Flow (L/s)*		Single CB Discharge (L/s)	Twin CB Discharge (L/s)
0	0	0	1.5	162		0	0
0.01	1	1	1.51	163		1	1
0.02	2	3	1.52	164		2	3
0.03	4	5	1.53	164		4	5
0.04	7	9	1.54	165		7	9
0.05	12	16	1.55	165		12	16
0.06	18	27	1.56	166		18	27
0.07	23	36	1.57	166		23	36
0.08	36	54	1.58	167		36	54
0.09	42	71	1.59	167		42	71
0.1	61	91	1.6	168		61	91
0.11	73	109	1.61	168		73	109
0.12	85	127	1.62	169		85	127
0.13	99	140	1.63	169		99	140
0.14	109	155	1.64	170		109	155
0.15	120	169	1.65	170		120	169
0.16	129	183	1.66	171		129	171
0.17	136	196	1.67	171		136	171
0.18	145	211	1.68	172		145	172
0.19	150	228	1.69	172		150	172
0.2	156	243	1.7	173		156	173
0.21	161	259	1.71	173		161	173
0.22	167	275	1.72	174		167	174
0.23	172	291	1.73	174		172	174
0.24	176	307	1.74	175		175	175
0.25	181	322	1.75	175		175	175
0.26	186	337	1.76	176		176	176
0.27	189	354	1.77	176		176	176
0.28	194	371	1.78	177		177	177
0.29	199	387	1.79	177		177	177
0.3	202	403	1.8	178		178	178

* CB Grate Flow calculated using Table 4.19 of the MTO Drainage Management Manual, 1997
**CB Lead Flow calculated per the orifice equation Q = C * A * sqrt(2 * g * H)

Design Chart 4.19: Inlet Capacity at Road Sag

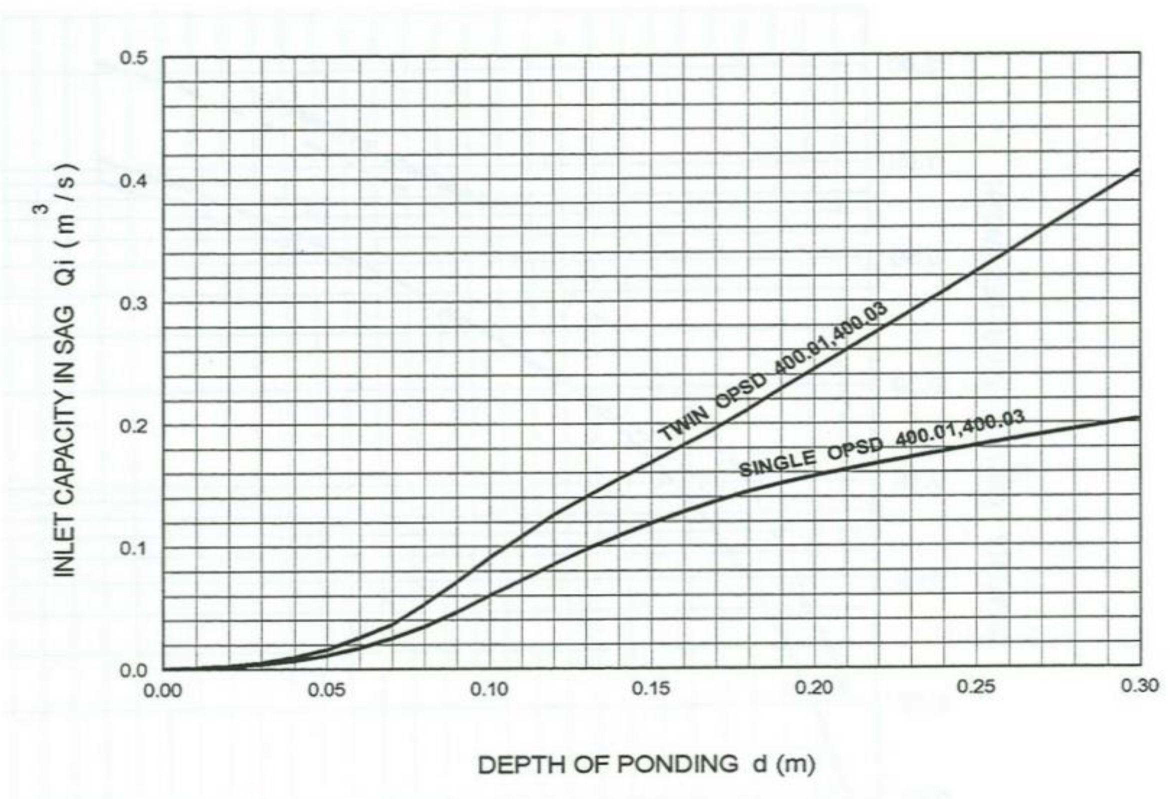


CB Curb Inlet CB Lead Capture
on Constant Grade

Depth of Flow (m)	Single CB Flow (L/s)	Twin CB Flow (L/s)	CB Lead Head (m)	250mm CB Lead Flow (L/s)*		Single CB Discharge (L/s)	Twin CB Discharge (L/s)
0	0	0	1.5	162		0	0
0.01	1	2	1.51	163		1	2
0.02	3	6	1.52	164		3	6
0.03	6	12	1.53	164		6	12
0.04	9	18	1.54	165		9	18
0.05	13	26	1.55	165		13	26
0.06	17	34	1.56	166		17	34
0.07	22	44	1.57	166		22	44
0.08	26	52	1.58	167		26	52
0.09	32	64	1.59	167		32	64
0.1	37	74	1.6	168		37	74
0.11	43	86	1.61	168		43	86
0.12	49	98	1.62	169		49	98
0.13	62	124	1.63	169		62	124
0.14	67	134	1.64	170		67	134
0.15	71	142	1.65	170		71	142
0.16	75	150	1.66	171		75	150
0.17	79	158	1.67	171		79	158
0.18	83	166	1.68	172		83	166
0.19	86	172	1.69	172		86	172
0.2	89	178	1.7	173		89	173
0.21	93	186	1.71	173		93	173
0.22	96	192	1.72	174		96	174
0.23	99	198	1.73	174		99	174
0.24	102	204	1.74	175		102	175
0.25	105	210	1.75	175		105	175
0.26	107	214	1.76	176		107	176
0.27	11	220	1.77	176		11	176
0.28	113	226	1.78	177		113	177
0.29	115	230	1.79	177		115	177
0.3	118	236	1.8	178		118	178

* As per Qweir=CLH^(3/2) where C=1.8, and Qorifice=CA*(2gh)^(0.5) where C=0.65 for a 13cm high x 65cm wide side inlet

Design Chart 4.19: Inlet Capacity at Road Sag



Area A1 and A3/MH3 and 4
Stage-Discharge Curve

Stage	Depth CB8 (m)	Flow CB8 (L/s)	Flow CB6/7 (L/s)	Total Flow (L/s)
73.28	0	0	0	0
73.29	0.01	1	1	3
73.30	0.02	3	3	9
73.31	0.03	6	6	18
73.32	0.04	9	9	27
73.33	0.05	13	13	39
73.34	0.06	17	17	51
73.35	0.07	22	22	66
73.36	0.08	26	26	78
73.37	0.09	32	32	96
73.38	0.10	37	37	111
73.39	0.11	43	43	129
73.40	0.12	49	49	147
73.41	0.13	62	62	186

Area A2/MH2
Stage-Discharge Curve

Stage	Depth CB16 (m)	Flow CB16 (L/s)	Total Flow (L/s)
74.02	0	0	0
74.03	0.01	1	1
74.04	0.02	2	2
74.05	0.03	4	4
74.06	0.04	7	7
74.07	0.05	12	12

Stage	Depth CB17/18 (m)	Flow CB17/18 (L/s)	Total Flow (L/s)
73.59	0	0	0
73.60	0.01	2	4
73.61	0.02	6	12
73.62	0.03	12	24
73.63	0.04	18	36
73.64	0.05	26	52
73.65	0.06	34	68
73.66	0.07	44	88
73.67	0.08	52	104
73.68	0.09	64	128

Area A5/MH5
Stage-Discharge Curve

Stage	Depth CB10/11 (m)	Flow CB10/11 (L/s)	Total Flow (L/s)
72.74	0	0	0
72.75	0.01	2	4
72.76	0.02	6	12
72.77	0.03	12	24
72.78	0.04	18	36
72.79	0.05	26	52
72.80	0.06	34	68
72.81	0.07	44	88
72.82	0.08	52	104
72.83	0.09	64	128

Area A6/MH6
Stage-Discharge Curve

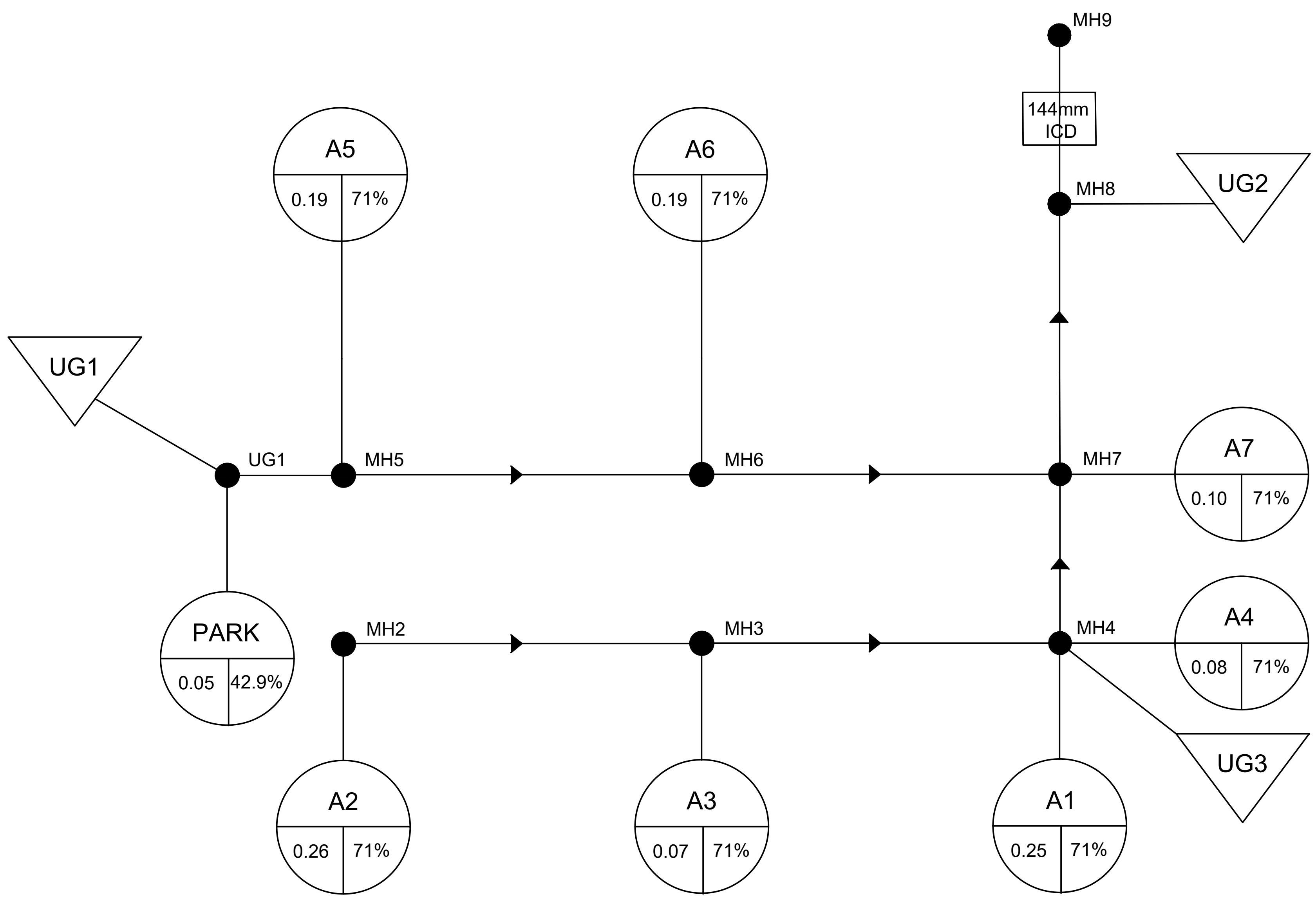
Stage	Depth CB12/13 (m)	Flow CB12/13 (L/s)	Total Flow (L/s)
72.74	0	0	0
72.75	0.01	2	4
72.76	0.02	6	12
72.77	0.03	12	24
72.78	0.04	18	36
72.79	0.05	26	52

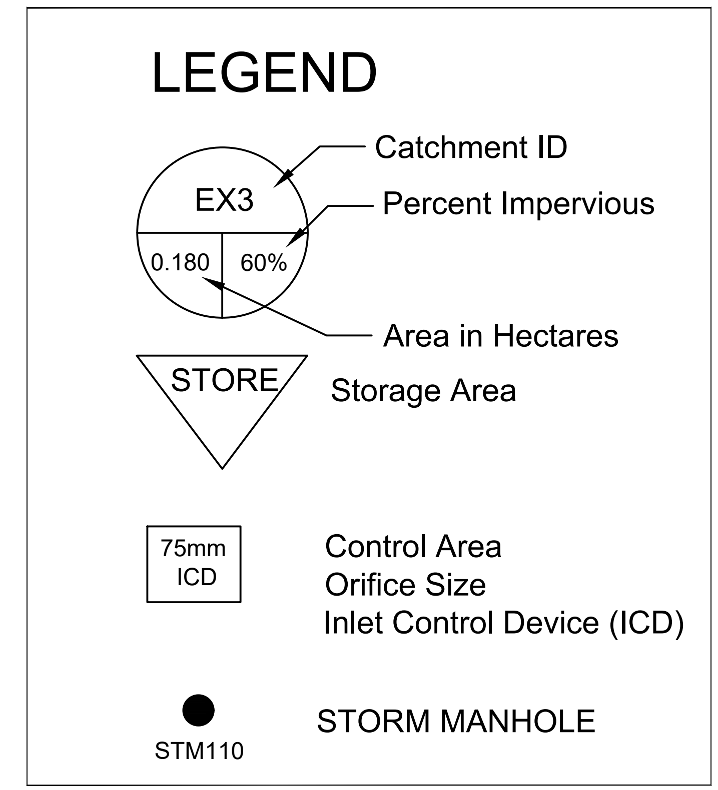
Stage	Depth CB14/15 (m)	Flow CB14/15 (L/s)	Total Flow (L/s)
72.72	0	0	0
72.73	0.01	1	2
72.74	0.02	3	6
72.75	0.03	6	12
72.76	0.04	9	18
72.77	0.05	13	26
72.78	0.06	17	34
72.79	0.07	22	44

Area A4 and A7/UG3 and MH7
Stage-Discharge Curve

Stage	Depth CB1/2 (m)	Flow CB1/2 (L/s)	Total Flow (L/s)
72.16	0	0	0
72.17	0.01	2	4
72.18	0.02	6	12
72.19	0.03	12	24
72.20	0.04	18	36
72.21	0.05	26	52
72.22	0.06	34	68
72.23	0.07	44	88
72.24	0.08	52	104
72.25	0.09	64	128
72.26	0.10	74	148

FIGURE 1 - HYDROLOGIC MODEL SCHEMATIC





```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option             Value
FLOW_UNITS           LPS
INFILTRATION         HORTON
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         ELEVATION
MIN_SLOPE            0
ALLOW_PONDING        YES
SKIP_STEADY_STATE    NO

START_DATE           01/01/2000
START_TIME           00:01:00
REPORT_START_DATE    01/01/2000
REPORT_START_TIME    00:01:00
END_DATE             01/02/2000
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:01:00
DRY_STEP             00:01:00
ROUTING_STEP         0:00:02

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         1.14
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0.0
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
```

```
;;-------------- --------- ------ ------ ----------
1                INTENSITY 0:10     1.0      TIMESERIES CH6H100

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope
  CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- --------
-------- -------- ----------------
A5               1                MH5              0.19     71       65       2.0
  0
PARK             1                UG1              0.05     42.9     21       4
  0
A6               1                MH6              0.19     71       63       2.0
  0
A2               1                MH2              0.26     71       66.6     2.0
  0
A3               1                MH3              0.07     71       60       2.0
  0
A1               1                MH4              0.25     71       27       2.0
  0
A4               1                UG3              0.08     71       33       2.0
  0
A7               1                MH7              0.1      71       34       2.0
  0
U1               1                1                0.16     71       120      5
  0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo
PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ----------
----------
A5               0.013      0.25       1.57       4.67       0          OUTLET
PARK             0.013      0.25       1.57       4.67       0          OUTLET
A6               0.013      0.25       1.57       4.67       0          OUTLET
A2               0.013      0.25       1.57       4.67       0          OUTLET
A3               0.013      0.25       1.57       4.67       0          OUTLET
A1               0.013      0.25       1.57       4.67       0          OUTLET
A4               0.013      0.25       1.57       4.67       0          OUTLET
A7               0.013      0.25       1.57       4.67       0          OUTLET
U1               0.013      0.25       1.57       4.67       0          OUTLET

[INFILTRATION]
;;Subcatchment   MaxRate    MinRate    Decay      DryTime    MaxInfil
;;-------------- ---------- ---------- ---------- ---------- ----------
A5               76.2       13.2       4.14       7          0
PARK             76.2       13.2       4.14       7          0
A6               76.2       13.2       4.14       7          0
```

```
A2                76.2       13.2       4.14       7          0
A3                76.2       13.2       4.14       7          0
A1                76.2       13.2       4.14       7          0
A4                76.2       13.2       4.14       7          0
A7                76.2       13.2       4.14       7          0
U1                76.2       13.2       4.14       7          0

[JUNCTIONS]
;;Name           Elevation  MaxDepth   InitDepth  SurDepth   Aponded
;;-------------- ---------- ---------- ---------- ---------- ----------
MH8              70.15      2.04       0          0          0
MH7              70.227     2.601      0          0          0
MH6              70.454     2.402      0          0          0
MH4              70.34      2.428      0          0          0
MH5              70.613     2.182      0          0          0
MH2              70.925     3.105      0          0          0
MH3              70.809     2.88       0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
1                69.89      FIXED      70.44            NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params
   N/A      Fevap    Psi      Ksat     IMD
;;-------------- -------- ---------- ----------- ----------
---------------------------- -------- --------          -------- --------
UG1              70.65    1.8        0          TABULAR    UG1
   0        0
UG2              70.19    2          0          TABULAR    UG2
   0        0
UG3              70.35    1.8        0          TABULAR    UG3
   0        0

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset
OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ----------
---------- ---------- ----------
P7-8             MH7              MH8              31.0       0.013      *
*          0          0
P2-3             MH2              MH3              60.5       0.013      *
*          0          0
P3-4             MH3              MH4              59.5       0.013      *
*          0          0
P5-6             MH5              MH6              60         0.013      *
*          0          0
```

```
P6-7             MH6              MH7              63.0       0.013      *
*          0          0
P1               MH5              UG1              3.5        0.013      *
*          0          0
P4-7             MH4              MH7              31         0.013      *
*          0          0
P2               UG2              MH8              10         0.013      *
*          0          0
P3               UG3              MH4              5          0.013      *
*          0          0

[ORIFICES]
;;Name           From Node        To Node          Type         Offset     Qcoeff
 Gated    CloseTime
;;-------------- ---------------- ---------------- ------------ ----------
---------- -------- ----------
ICD1             MH8              1                SIDE         *          0.61
 YES      0

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4
Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ----------
---------- ----------
P7-8             CIRCULAR     0.675            0          0          0          1

P2-3             CIRCULAR     0.600            0          0          0          1

P3-4             CIRCULAR     0.600            0          0          0          1

P5-6             CIRCULAR     0.6              0          0          0          1

P6-7             CIRCULAR     0.675            0          0          0          1

P1               CIRCULAR     0.3              0          0          0          1

P4-7             CIRCULAR     0.6              0          0          0          1

P2               CIRCULAR     0.45             0          0          0          1

P3               CIRCULAR     0.3              0          0          0          1

ICD1             CIRCULAR     0.144            0          0          0

[LOSSES]
;;Link           Kentry     Kexit      Kavg       Flap Gate  Seepage
;;-------------- ---------- ---------- ---------- ---------- ----------
P7-8             0.5        0.5        0          NO         0
```

```
P2-3             0.5        0.5        0          NO         0
P3-4             0.5        1.3        0          NO         0
P5-6             1.3        0.5        0          NO         0
P6-7             0.5        1.3        0          NO         0
P1               0          1.3        0          NO         0
P4-7             1.3        0.5        0          NO         0
P2               0          1.3        0          NO         0
P3               0          1.3        0          NO         0

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------

;
UG1              Storage    0          110
UG1                         0.25       110
UG1                         1.8        110
UG1                         1.81       0
;
CB               Storage    0          0
CB                          1.5        0.4
CB                          1.55       274.6
;
UG3              Storage    0          20
UG3                         0.25       20
UG3                         0.5        20
UG3                         1.8        20
UG3                         1.81       0
;
CB9              Storage    0          0.4
CB9                         1.5        0.4
CB9                         1.55       47.97
;
CB11             Storage    0          0.4
CB11                        1.5        0.4
CB11                        1.59       134.2
;
CB17             Storage    0          0.4
CB17                        1.5        0.4
CB17                        1.59       147.8
;
UG2              Storage    0          110
UG2                         1.8        110
UG2                         1.81       0
UG2                         2          0
;
100-YEAR         Tidal      0          94.81
100-YEAR                    6          94.81
```

```
100-YEAR                    12         0
100-YEAR                    24         0

[REPORT]
;;Reporting Options
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS -2500.000 0.000 12500.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
MH8              7698.962           6862.745
MH7              7702.419           5120.925
MH6              3995.366           5120.051
MH4              7681.388           3238.696
MH5              -200.084           5132.687
MH2              -225.358           3237.152
MH3              4008.003           3237.152
1                7698.962           8004.614
UG1              -1130.389          4321.767
UG2              8512.907           6857.464
UG3              8591.470           3243.547

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
A5               -194.367           6599.074
A5               121.555            6043.051
A5               -447.105           6043.051
A5               -194.367           6624.348
PARK             -1880.792          5612.890
PARK             -1564.869          5006.318
PARK             -2221.988          4993.682
PARK             -1842.881          5650.800
A6               4008.003           6560.657
```

```
A6               4374.473           5991.997
A6               3666.807           6004.634
A6               4020.640           6548.020
A2               -210.220           2461.401
A2               143.614            1753.734
A2               -589.327           1753.734
A2               -197.583           2474.038
A3               3970.093           2314.659
A3               4450.295           1632.266
A3               3603.623           1619.629
A3               3970.093           2327.296
A1               8130.936           2507.537
A1               8585.865           1787.233
A1               7701.282           1812.507
A1               8130.936           2520.174
A4               9242.879           4272.768
A4               9672.534           3704.107
A4               8863.772           3678.833
A4               9255.516           4285.405
A7               9043.078           6011.675
A7               9472.733           5341.919
A7               8727.156           5354.556
A7               9043.078           6036.948
U1               1922.915           7394.693
U1               2327.296           6788.121
U1               1581.719           6788.121
U1               1948.189           7419.966

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
1                -777.143           7405.714
```

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
--------------------------------------------------------------


*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Starting Date ............ 01/01/2000 00:01:00
Ending Date .............. 01/02/2000 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00
Routing Time Step ........ 2.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.111        82.291
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.021        15.898
Surface Runoff ...........         0.088        65.377
Final Storage ............         0.001         1.099
Continuity Error (%) .....        -0.100
```

```
**************************        Volume         Volume
Flow Routing Continuity         hectare-m      10^6 ltr
**************************      ---------      ---------
Dry Weather Inflow .......          0.000          0.000
Wet Weather Inflow .......          0.088          0.883
Groundwater Inflow .......          0.000          0.000
RDII Inflow ..............          0.000          0.000
External Inflow ..........          0.000          0.000
External Outflow .........          0.085          0.845
Flooding Loss ............          0.000          0.000
Evaporation Loss .........          0.000          0.000
Exfiltration Loss ........          0.000          0.000
Initial Stored Volume ....          0.000          0.000
Final Stored Volume ......          0.004          0.041
Continuity Error (%) .....         -0.385


***************************
Time-Step Critical Elements
***************************
Link P1 (4.90%)


********************************
Highest Flow Instability Indexes
********************************
Link ICD1 (11)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     1.96 sec
Maximum Time Step           :     2.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.02
Percent Not Converging      :     0.14


***************************
Subcatchment Runoff Summary
***************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
A5	82.29	0.00	0.00	15.27	65.99	0.13	87.99	0.802
PARK	82.29	0.00	0.00	30.14	51.57	0.03	21.20	0.627
A6	82.29	0.00	0.00	15.28	65.98	0.13	87.83	0.802
A2	82.29	0.00	0.00	15.35	65.90	0.17	118.12	0.801
A3	82.29	0.00	0.00	15.13	66.17	0.05	33.39	0.804
A1	82.29	0.00	0.00	15.75	65.47	0.16	104.84	0.796
A4	82.29	0.00	0.00	15.23	66.04	0.05	37.41	0.802
A7	82.29	0.00	0.00	15.28	65.99	0.07	46.29	0.802
U1	82.29	0.00	0.00	15.10	66.20	0.11	76.54	0.804

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
MH8	JUNCTION	0.46	1.81	71.96	0 02:25	1.81
MH7	JUNCTION	0.38	1.74	71.96	0 02:26	1.74
MH6	JUNCTION	0.18	1.51	71.96	0 02:26	1.51
MH4	JUNCTION	0.28	1.62	71.96	0 02:26	1.62
MH5	JUNCTION	0.14	1.35	71.96	0 02:26	1.35
MH2	JUNCTION	0.09	1.53	72.45	0 01:56	1.04
MH3	JUNCTION	0.10	1.23	72.04	0 01:56	1.16
1	OUTFALL	0.55	0.55	70.44	0 00:00	0.55
UG1	STORAGE	0.13	1.31	71.96	0 02:26	1.31
UG2	STORAGE	0.42	1.77	71.96	0 02:25	1.77

UG3	STORAGE	0.27	1.61	71.96	0	02:26	1.61

```
******************
Node Inflow Summary
******************
```

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days	Time of Max Occurrence hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
MH8	JUNCTION	0.00	287.88	0	01:59	0	0.939	0.258
MH7	JUNCTION	46.29	288.84	0	01:59	0.066	0.794	0.683
MH6	JUNCTION	87.83	101.85	0	01:51	0.125	0.358	-0.099
MH4	JUNCTION	104.84	256.03	0	01:59	0.164	0.441	0.247
MH5	JUNCTION	87.99	174.91	0	01:59	0.125	0.339	-0.126
MH2	JUNCTION	118.12	118.12	0	01:59	0.171	0.171	-0.311
MH3	JUNCTION	33.39	151.38	0	01:59	0.0463	0.218	-0.089
1	OUTFALL	76.54	125.35	0	01:59	0.106	0.845	0.000
UG1	STORAGE	21.20	195.82	0	01:59	0.0258	0.15	0.017
UG2	STORAGE	0.00	238.44	0	01:59	0	0.197	0.267
UG3	STORAGE	37.41	101.97	0	01:56	0.0528	0.0605	0.136

```
*********************
Node Surcharge Summary
*********************
```

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
MH8	JUNCTION	3.96	1.135	0.230
MH7	JUNCTION	3.59	1.060	0.866
MH6	JUNCTION	2.72	0.834	0.893
MH4	JUNCTION	3.43	1.024	0.804
MH5	JUNCTION	2.44	0.750	0.832
MH2	JUNCTION	1.63	0.926	1.579
MH3	JUNCTION	1.90	0.630	1.650

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
UG1	0.014	7	0	0	0.144	73	0 02:26	14.89
UG2	0.046	23	0	0	0.195	98	0 02:25	14.62
UG3	0.005	15	0	0	0.032	90	0 02:26	62.72

****

Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
1	43.74	24.00	125.35	0.845
System	43.74	24.00	125.35	0.845

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
P7-8	CONDUIT	287.88	0 01:59	0.80	0.69	1.00
P2-3	CONDUIT	117.99	0 01:59	0.95	0.44	1.00
P3-4	CONDUIT	152.05	0 01:56	0.58	0.28	1.00
P5-6	CONDUIT	93.19	0 02:00	0.45	0.29	1.00
P6-7	CONDUIT	57.29	0 01:51	0.27	0.11	1.00
P1	CONDUIT	174.62	0 01:59	2.47	1.76	1.00
P4-7	CONDUIT	249.51	0 01:59	0.88	0.67	1.00
P2	CONDUIT	238.44	0 01:59	1.50	1.32	1.00
P3	CONDUIT	65.69	0 01:56	0.93	1.52	1.00
ICD1	ORIFICE	53.97	0 02:25			1.00

****
Flow Classification Summary
****

	Adjusted	---------- Fraction of Time in Flow Class ----------								
	/Actual		Up	Down	Sub	Sup	Up	Down	Norm	Inlet
Conduit	Length	Dry	Dry	Dry	Crit	Crit	Crit	Crit	Ltd	Ctrl

```
--------------------------------------------------------------------------------------
-
  P7-8                    1.00   0.02  0.00  0.00  0.98  0.00  0.00  0.00  0.01
0.00
  P2-3                    1.00   0.02  0.00  0.00  0.98  0.00  0.00  0.00  0.02
0.00
  P3-4                    1.00   0.02  0.27  0.00  0.71  0.00  0.00  0.00  0.81
0.00
  P5-6                    1.00   0.02  0.00  0.00  0.98  0.00  0.00  0.00  0.10
0.00
  P6-7                    1.00   0.02  0.00  0.00  0.98  0.00  0.00  0.00  0.73
0.00
  P1                      1.00   0.02  0.00  0.00  0.97  0.00  0.00  0.00  0.44
0.00
  P4-7                    1.00   0.02  0.00  0.00  0.98  0.00  0.00  0.00  0.04
0.00
  P2                      1.00   0.02  0.01  0.00  0.97  0.00  0.00  0.00  0.00
0.00
  P3                      1.00   0.02  0.00  0.00  0.98  0.00  0.00  0.00  0.00
0.00
```

****
Conduit Surcharge Summary
****

Conduit	Hours Full Both Ends	Hours Full Upstream	Hours Full Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
P7-8	3.59	3.59	3.96	0.01	0.01
P2-3	1.63	1.63	1.90	0.01	0.01
P3-4	1.90	1.90	3.43	0.01	0.01
P5-6	2.44	2.44	2.98	0.01	0.01
P6-7	2.72	2.72	3.59	0.01	0.01
P1	3.33	3.33	3.54	0.15	0.01
P4-7	3.43	3.43	3.95	0.01	0.02
P2	4.84	4.84	5.05	0.07	0.01
P3	4.80	4.80	4.85	0.03	0.04

Analysis begun on: Wed Aug 08 08:58:56 2018
Analysis ended on: Wed Aug 08 08:58:57 2018
Total elapsed time: 00:00:01

Brentwood STORMTANK Module

STORMTANK® Module Volume Calculator

Inputs

Project Name:	2710 DRAPER AVENUE - UG1		
Engineer:		Date:	
Units:	SI	Shape:	Square/Rectangle
Liner:	No	Location:	N/A
Stacking:	Double	Height:	1828.8
Stone Storage:	All	Porosity:	40%

Dimensions

Module		
Length:	21.045	m
Width:	4.122	m
Excavation		
Length:	21.645	m
Width:	4.722	m
Stone		
Leveling Bed:	0.5	m
Top Backfill:	0.3	m
Compacted Fill:	0.3	m

Results

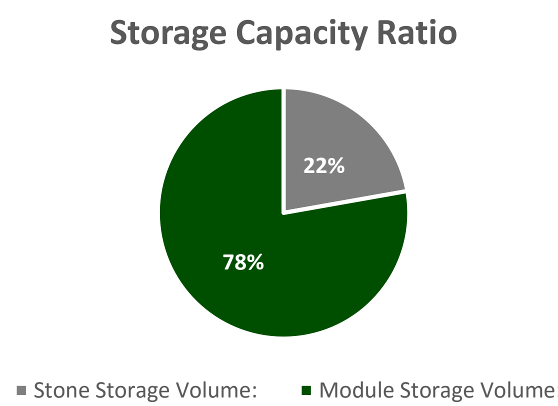
Capacity:

Stone Storage Volume:	44.02	m^3
Module Storage Volume:	154.12	m^3
Total Storage Volume:	198.13	m^3

Quantities:

Required Excavation:	299.35	m^3
Required Stone Volume:	110.04	m^3
Estimated Geotextile:	676.21	m^2
Estimated Liner:	0.00	m^2

(Estimations include 10% for scrap and overlap)

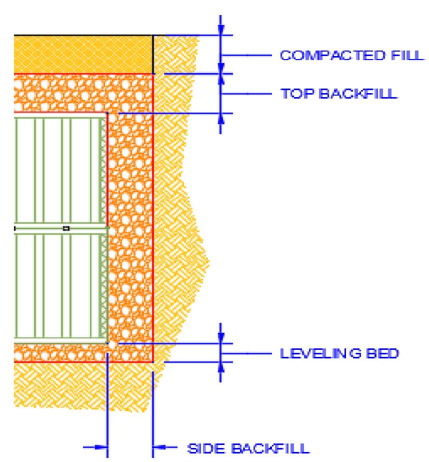


Basin Detail

Component Quantities:

	Bottom Layer	Top Layer	Total
Height	914.4	914.4	1,828.8
# of Modules	207	207	415
# of Platens	415	415	830
# of Side Panels	110	110	220
# of Columns	1,660	1,660	3,320
# of Stacking Pins	415	N/A	415

Cross-Section:



STORMTANK® Module Volume Calculator

Inputs

Project Name:	2710 DRAPER AVENUE - UG2		
Engineer:		Date:	
Units:	SI	Shape:	Square/Rectangle
Liner:	No	Location:	N/A
Stacking:	Double	Height:	1828.8
Stone Storage:	All	Porosity:	40%

Dimensions

Module		
Length:	20.13	m
Width:	4.58	m
Excavation		
Length:	20.73	m
Width:	5.18	m
Stone		
Leveling Bed:	0.5	m
Top Backfill:	0.3	m
Compacted Fill:	0.3	m

Results

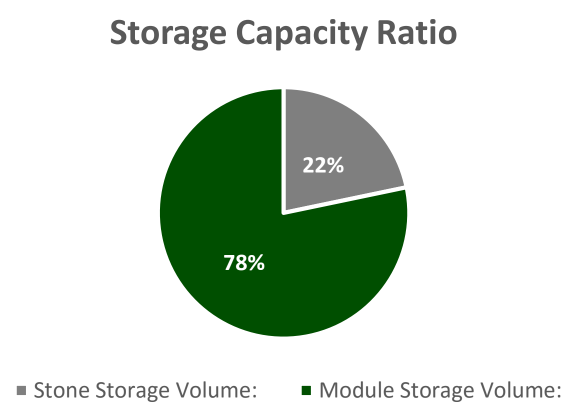
Capacity:

Stone Storage Volume:	45.47	m^3
Module Storage Volume:	163.80	m^3
Total Storage Volume:	209.27	m^3

Quantities:

Required Excavation:	314.50	m^3
Required Stone Volume:	113.68	m^3
Estimated Geotextile:	695.29	m^2
Estimated Liner:	0.00	m^2

(Estimations include 10% for scrap and overlap)

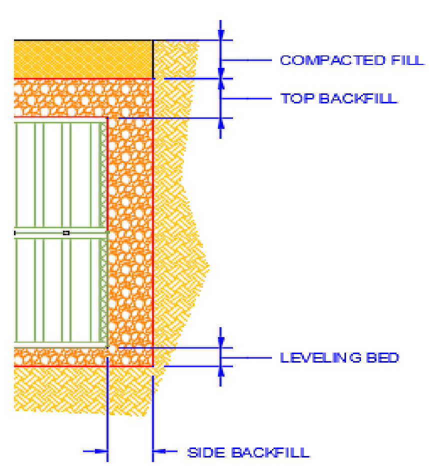


Basin Detail

Component Quantities:

	Bottom Layer	Top Layer	Total
Height	914.4	914.4	1,828.8
# of Modules	221	221	441
# of Platens	441	441	882
# of Side Panels	108	108	216
# of Columns	1,764	1,764	3,528
# of Stacking Pins	441	N/A	441

Cross-Section:



STORMTANK® Module Volume Calculator

Inputs

Project Name: 2710 DRAPER AVENUE - UG3

Engineer: ______ Date: ______

Units: SI | Shape: Square/Rectangle

Liner: No | Location: N/A

Stacking: Double | Height: 1828.8

Stone Storage: All | Porosity: 40%

Dimensions

Module
- Length: 7.32 m
- Width: 2.29 m

Excavation
- Length: 7.92 m
- Width: 2.89 m

Stone
- Leveling Bed: 0.5 m
- Top Backfill: 0.3 m
- Compacted Fill: 0.3 m

Results

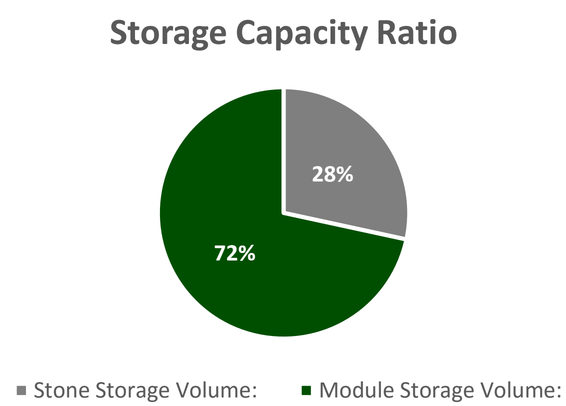
Capacity:

Stone Storage Volume:	11.81	m^3
Module Storage Volume:	29.78	m^3
Total Storage Volume:	41.59	m^3

Quantities:

Required Excavation:	67.04	m^3
Required Stone Volume:	29.51	m^3
Estimated Geotextile:	190.32	m^2
Estimated Liner:	0.00	m^2

(Estimations include 10% for scrap and overlap)

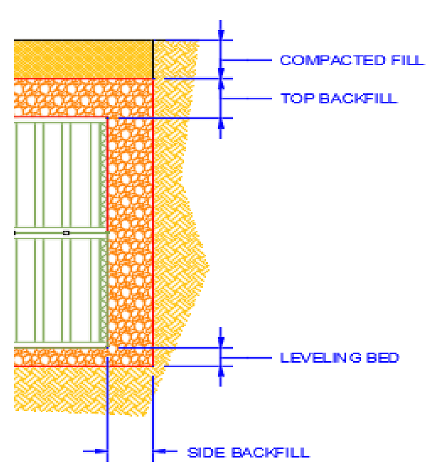


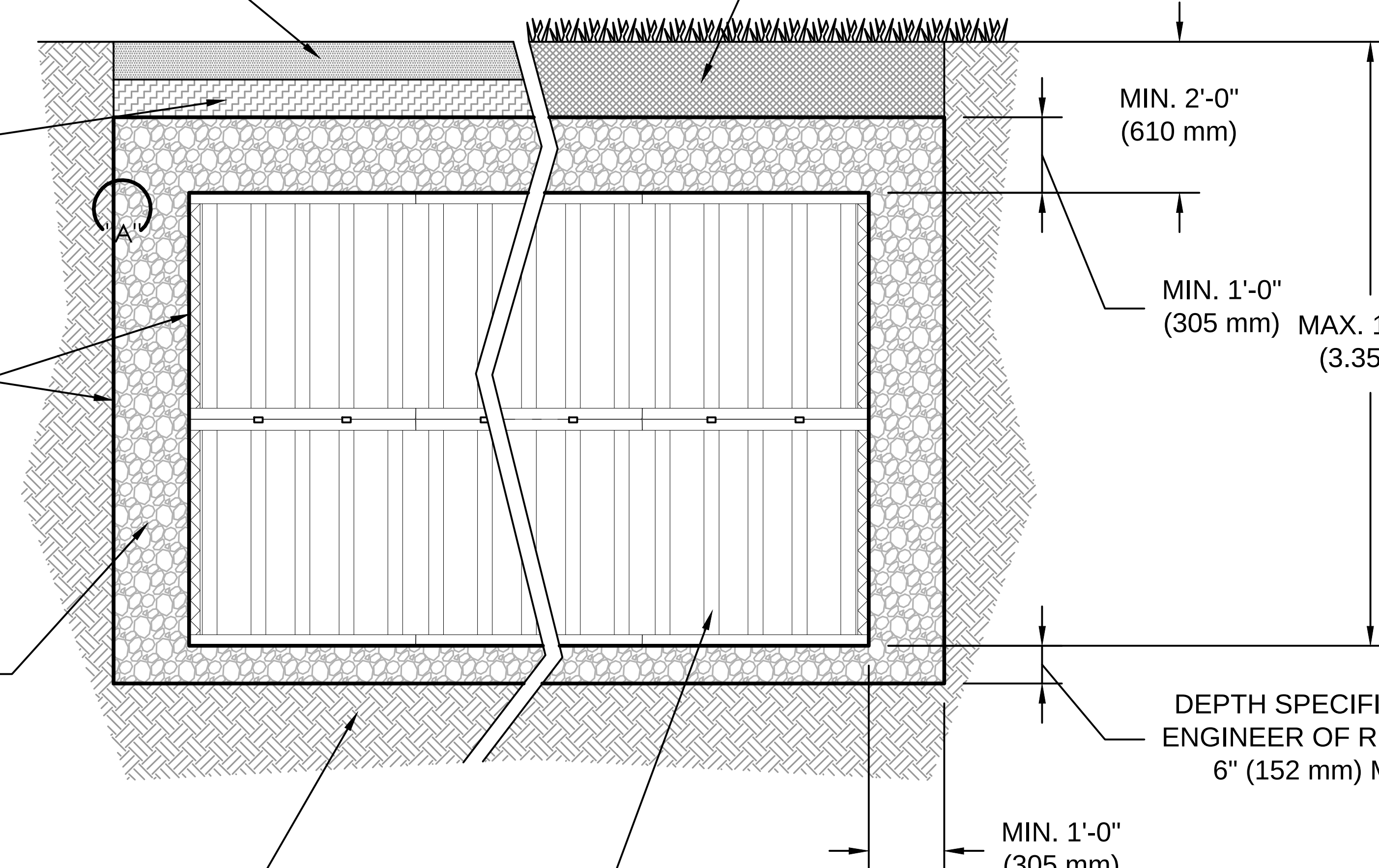
Basin Detail

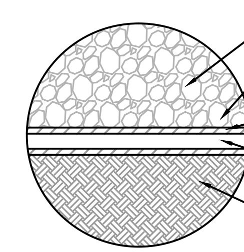
Component Quantities:

	Bottom Layer	Top Layer	Total
Height	914.4	914.4	1,828.8
# of Modules	40	40	80
# of Platens	80	80	160
# of Side Panels	42	42	84
# of Columns	321	321	641
# of Stacking Pins	80	N/A	80

Cross-Section:







DETAIL "A"

NOTES:

a. REFERENCE CURRENT INSTALLATION INSTRUCTIONS FOR PROPER INSTALLATION PRACTICES.
b. IMPERMEABLE LINER IS REQUIRED TO BE INSTALLED AROUND BOTTOM AND SIDES OF EXCAVATION ONLY

REV.	DATE	RECORD OF CHANGES	BY	APPRV.
D	11/10/14	GEOTEXTILE PRODUCT SPECIFIED	CGB	
C	9/9/13	NOTE REVISION, FORMATTING UPDATE & DWG. NO. UPDATE	JKB	JKB
B	7/6/12	FORMATTING & DWG. NO. UPDATE	JKB	FK
A	1/10/12	INITIAL RELEASE	BLL	FK

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www.brentwoodindustries.com

Project Name
TYPICAL DOUBLE STK. DETENTION BASIN CROSS-SECTION DETAIL

Title
STORMTANK®
MODULE

Drawn By		Date
B.LINE		1/10/12
Drawing No.	Sheet	Scale
STM-001-03	1 of 1	NTS

Stormceptor Oil/Grit Separator Sizing Report

Stormceptor®

FORTERRA™

Detailed Stormceptor Sizing Report – Ottawa

Project Information & Location			
Project Name	Ottawa	**Project Number**	-
City	Ottawa	**State/ Province**	Ontario
Country	Canada	**Date**	10/19/2017
Designer Information		**EOR Information (optional)**	
Name	Brandon O'Leary	**Name**	Alison Gosling
Company	Forterra	**Company**	David Schaeffer Engineering Ltd.
Phone #	905-630-0359	**Phone #**	
Email	brandon.oleary@forterrabp.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	Ottawa
Recommended Stormceptor Model	OSR 750
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	83
PSD	OK-110
Rainfall Station	OTTAWA MACDONALD-CARTIER INT'L A

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary		
OSR Model	**% TSS Removal Provided**	**% Runoff Volume Captured Provided**
OSR 300	74	88
OSR 750	83	96
OSR 2000	88	99
OSR 4000	93	100
OSR 6000	95	100
OSR 9000	95	100
OSR 14000	96	100
StormceptorMAX	Custom	Custom

Stormceptor

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.
Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology

Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:

- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour).
Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

State/Province	Ontario	**Total Number of Rainfall Events**	4819
Rainfall Station Name	OTTAWA MACDONALD-CARTIER INT'L A	**Total Rainfall (mm)**	20978.1
Station ID #	6000	**Average Annual Rainfall (mm)**	567.0
Coordinates	45°19'N, 75°40'W	**Total Evaporation (mm)**	2697.6
Elevation (ft)	370	**Total Infiltration (mm)**	4807.9
Years of Rainfall Data	37	**Total Rainfall that is Runoff (mm)**	13472.6

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Drainage Area	
Total Area (ha)	1.178
Imperviousness %	77.0

Up Stream Storage	
Storage (ha-m)	Discharge (cms)
0.000	0.000
0.000	0.077
0.010	0.089
0.020	0.100
0.026	0.106
0.031	0.112

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	90.00
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	111.50
Water Quality Flow Rate (L/s)	

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cms)	0.00000

Design Details	
Stormceptor Inlet Invert Elev (m)	
Stormceptor Outlet Invert Elev (m)	
Stormceptor Rim Elev (m)	
Normal Water Level Elevation (m)	
Pipe Diameter (mm)	
Pipe Material	
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	No

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

OK-110		
Particle Diameter (microns)	Distribution %	Specific Gravity
1.0	0.0	2.65
53.0	3.0	2.65
75.0	15.0	2.65
88.0	25.0	2.65
106.0	41.0	2.65
125.0	15.0	2.65
150.0	1.0	2.65
212.0	0.0	2.65

Site Name	Ottawa

Site Details

Drainage Area

Total Area (ha)	1.178
Imperviousness %	77.0

Surface Characteristics

Width (m)	217.00
Slope %	2
Impervious Depression Storage (mm)	1.57
Pervious Depression Storage (mm)	4.67
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency

Maintenance Frequency (months) >	12

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (mm/hr)	76.2
Min. Infiltration Rate (mm/hr)	13.2
Decay Rate (1/sec)	0.00115
Regeneration Rate (1/sec)	0.01

Evaporation

Daily Evaporation Rate (mm/day)	2.54

Dry Weather Flow

Dry Weather Flow (lps)	0

Winter Months

Winter Infiltration	0

TSS Loading Parameters

TSS Loading Function	Build Up/ Wash-off

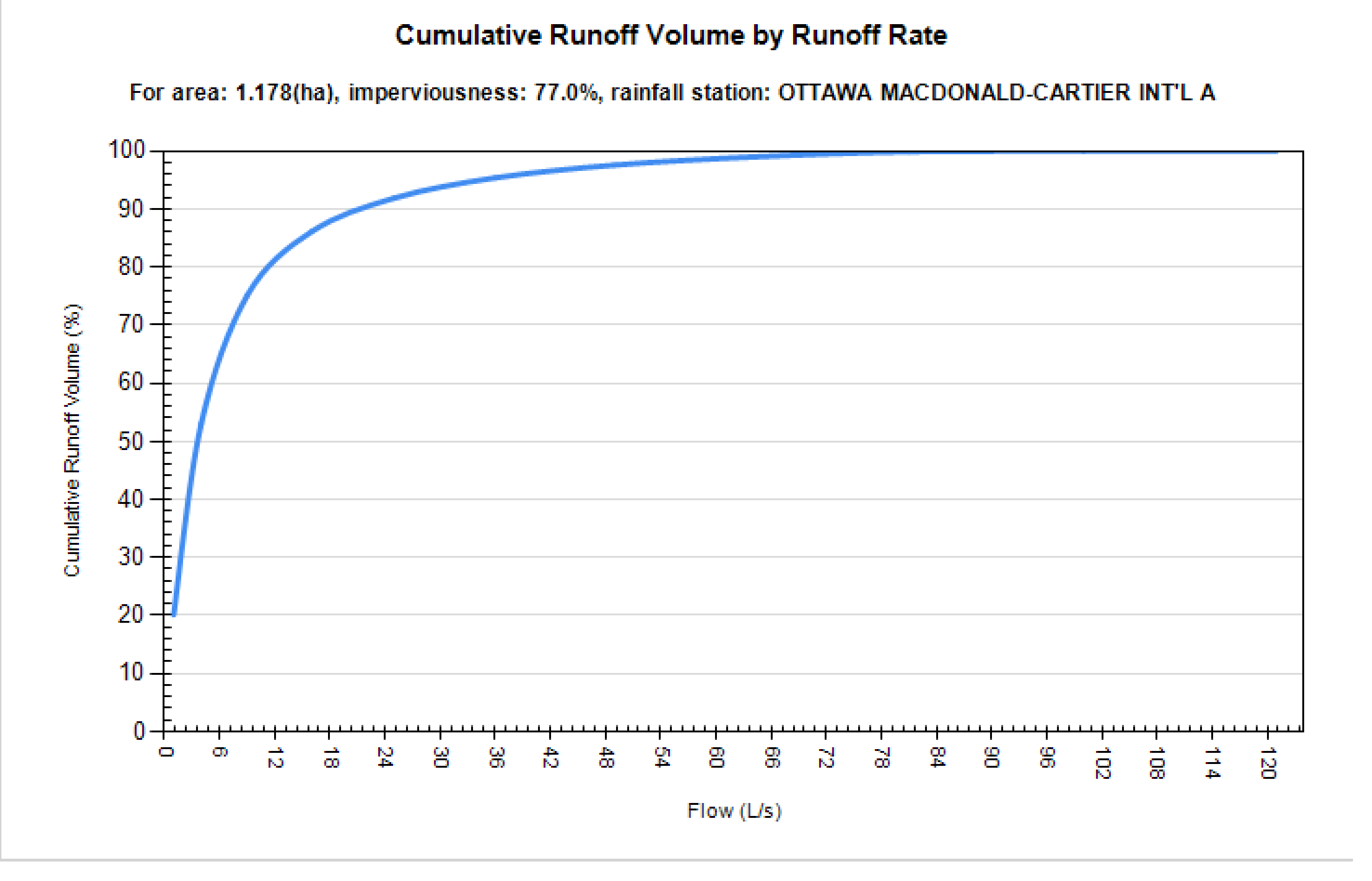
Buildup/Wash-off Parameters

Target Event Mean Conc. (EMC) mg/L	125
Exponential Buildup Power	0.40
Exponential Washoff Exponent	0.20

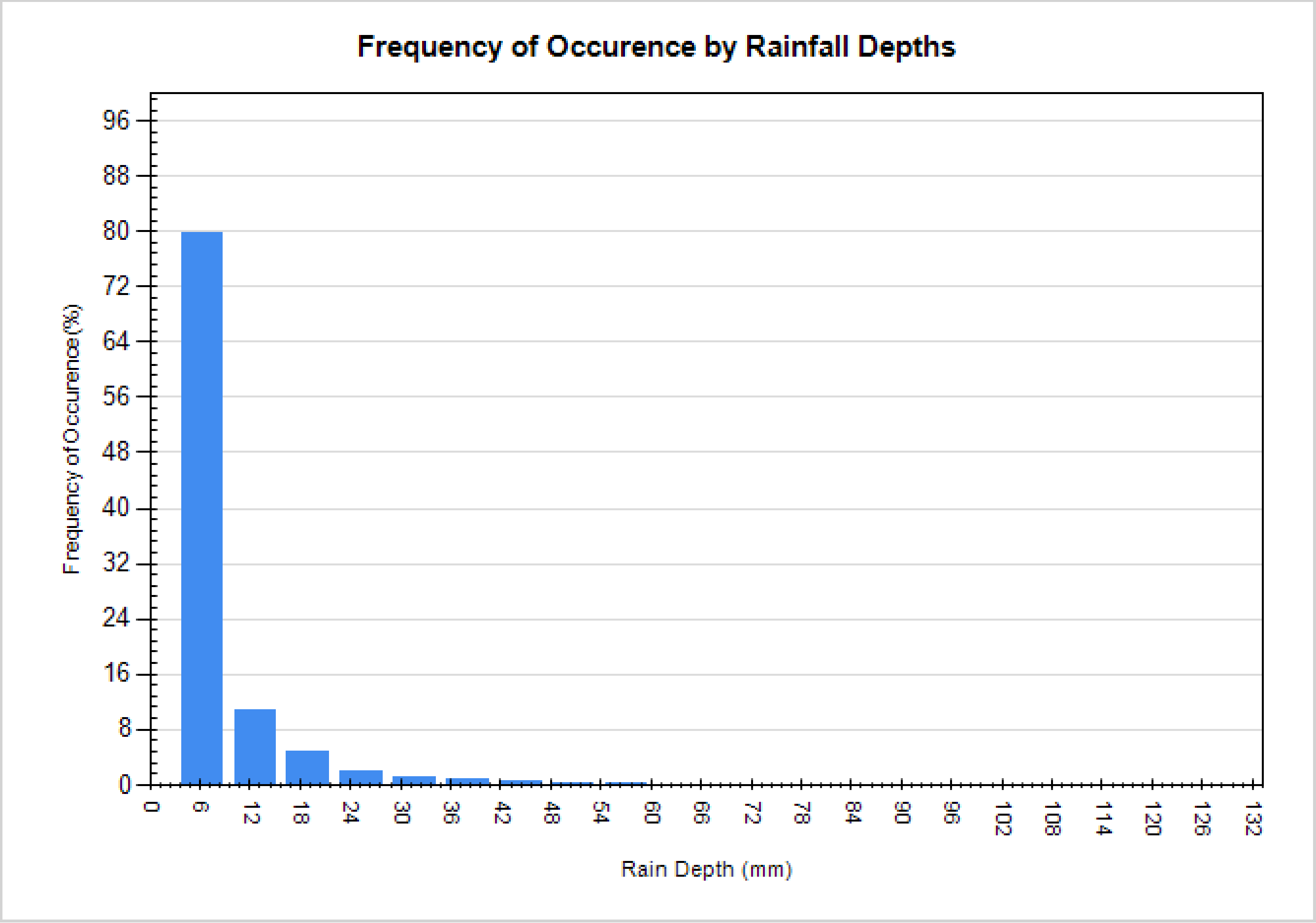
TSS Availability Parameters

Availability Constant A	0.05
Availability Factor B	0.04
Availability Exponent C	1.10
Min. Particle Size Affected by Availability (micron)	400

Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (L/s)	**Runoff Volume (m^3)**	**Volume Over (m^3)**	**Cumulative Runoff Volume (%)**
1	32235	127753	20.1
4	84873	75130	53.0
9	120228	39800	75.1
16	137700	22306	86.1
25	147049	12958	91.9
36	152664	7338	95.4
49	156146	3856	97.6
64	158406	1594	99.0
81	159903	97	99.9
100	160000	0	100.0
121	160000	0	100.0



Rainfall Event Analysis				
Rainfall Depth (mm)	No. of Events	Percentage of Total Events (%)	Total Volume (mm)	Percentage of Annual Volume (%)
6.35	3843	79.7	5885	28.1
12.70	520	10.8	4643	22.1
19.05	225	4.7	3470	16.5
25.40	98	2.0	2144	10.2
31.75	58	1.2	1639	7.8
38.10	32	0.7	1118	5.3
44.45	24	0.5	996	4.7
50.80	9	0.2	416	2.0
57.15	5	0.1	272	1.3
63.50	1	0.0	63	0.3
69.85	1	0.0	64	0.3
76.20	1	0.0	76	0.4
82.55	0	0.0	0	0.0
88.90	1	0.0	84	0.4
95.25	0	0.0	0	0.0
101.60	0	0.0	0	0.0
107.95	0	0.0	0	0.0
114.30	1	0.0	109	0.5
120.65	0	0.0	0	0.0
127.00	0	0.0	0	0.0



For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications

APPENDIX E

Supporting Documentation

patersongroup **memorandum**
consulting engineers

re: **Response to Engineering Comments**
Proposed Residential Development
2710 Draper Avenue - Ottawa

to: City of Ottawa - **Mr. Stream Shen** - Stream.Shen@Ottawa.ca
date: May 28, 2018
file: PGPG1630-MEMO.08

Further to your request and authorization, the current memorandum was prepared to respond to the City of Ottawa's forth round of engineering comments for the aforementioned site. This memorandum should be read in conjunction with our revised geotechnical Report PG1630-3 Revision 4 dated May 28, 2018.

Geotechnical Comments

Item 1

Comment: Section 6.8 *Underground Storage Chamber* states that based on a review of the Site Servicing Plan, Revision 2 dated November 17, 2017 the seasonally high groundwater table depth elevation is a minimum 1m below the bottom of the proposed underground storage system as per MOE requirements. Please review the most recent revision to the Site Servicing Plan prepared by DSEL (Revision 5) and confirm that the minimum separation is still being achieved and update section 6.8 accordingly. Section 6.8 shall reference the most recent drawing revision number prepared by DSEL used to determine the elevation of the base of the system. Please document how a base elevation of 71.15m was established. *.*

Response: Updated under Subsection 6.8 in our revised geotechnical Report PG1630-1 Revision 4, dated May 28, 2018.

Item 2

Comment: A sewer easement transferred to the owner of Building F is required to be established over the existing private 200mm dia. sanitary service and 300mm dia. storm service that crosses the subject site along Morrison Drive. Please review these private services and provide a recommended easement width.

Response: It is understood that the minimum service easement width considered adequate by the City of Ottawa is 6 m. However, a 4.5 m service easement is all that is required from a geotechnical perspective due to the method of the service installation requiring less than 4.5 m width with the use of engineered trench box. It is expected that services will be installed by “cut and cover” methods and excavations will not be left open for extended periods of time and inspected by Paterson personnel.

Item 3

Comment: Please provide an updated Grading Plan review memorandum that indicates Paterson Group has reviewed the most recent revision of the Grading Plan prepared by DSEL that verifies that there no exceedances above the recommended 1m permissible grade raise restriction and in keeping with the recommendations of the geotechnical investigation.

Response: Please refer to Appendix 3 in our revised geotechnical report for the updated grading plan review report.

We trust that this information satisfies your requirements.

Best Regards,

Paterson Group Inc.

LICENSED PROFESSIONAL ENGINEER
May 28, 2018
F. I. ABOU-SEIDO
100156744
PROVINCE OF ONTARIO

Faisal I. Abou-Seido, P.Eng.

David J. Gilbert, P.Eng.

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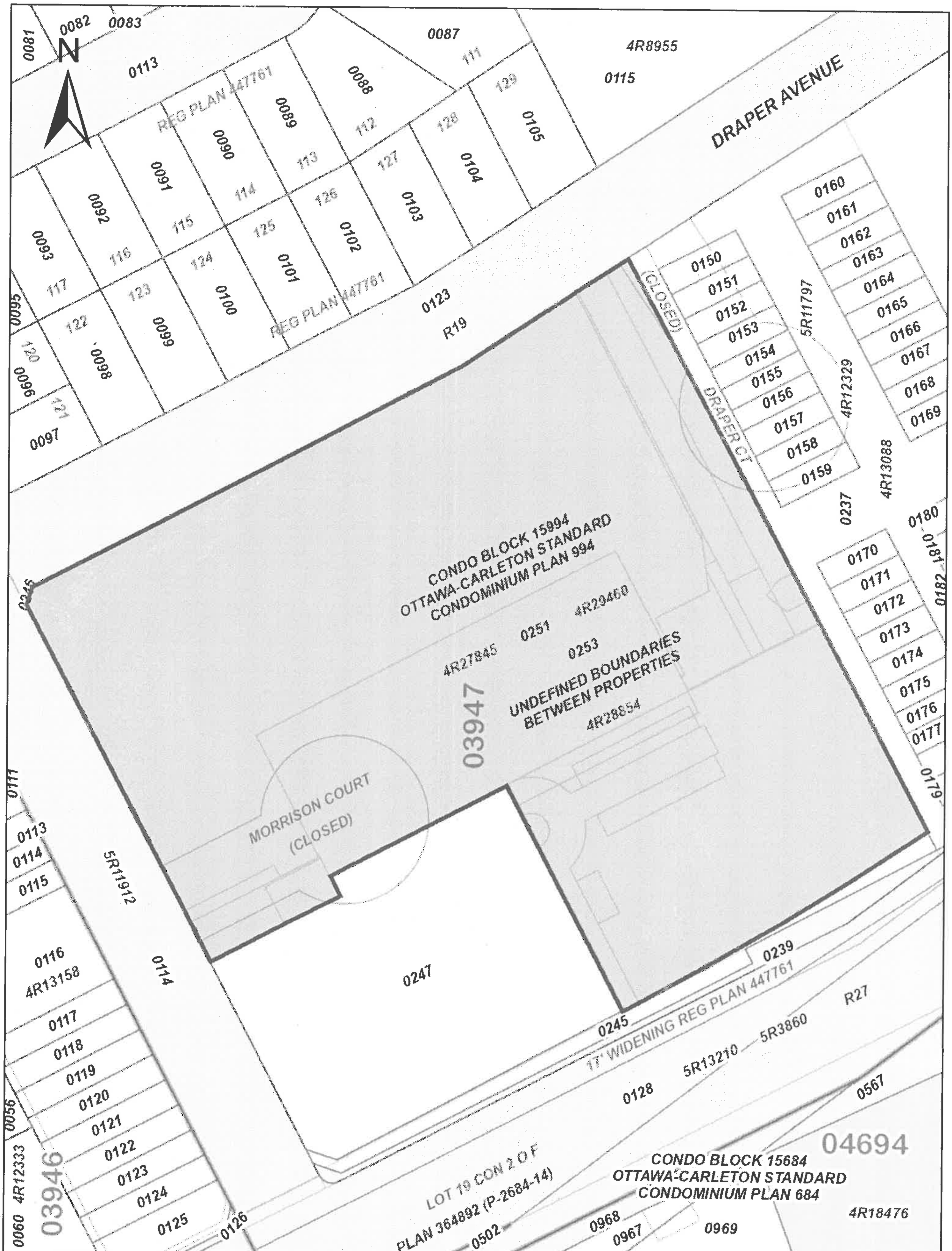


ServiceOntario

PRINTED ON 07 NOV, 2017 AT 15:55:53
FOR BRIAN MULCAHY

SCALE

0 25 Meters

PROPERTY INDEX MAP

OTTAWA-CARLETON(No. 04)

LEGEND

- FREEHOLD PROPERTY
- LEASEHOLD PROPERTY
- LIMITED INTEREST PROPERTY
- CONDOMINIUM PROPERTY
- RETIRED PIN (MAP UPDATE PENDING)
- PROPERTY NUMBER 0449
- BLOCK NUMBER 08050
- GEOGRAPHIC FABRIC
- EASEMENT

THIS IS NOT A PLAN OF SURVEY

NOTES

REVIEW THE TITLE RECORDS FOR COMPLETE PROPERTY INFORMATION AS THIS MAP MAY NOT REFLECT RECENT REGISTRATIONS

THIS MAP WAS COMPILED FROM PLANS AND DOCUMENTS RECORDED IN THE LAND REGISTRATION SYSTEM AND HAS BEEN PREPARED FOR PROPERTY INDEXING PURPOSES ONLY

FOR DIMENSIONS OF PROPERTIES BOUNDARIES SEE RECORDED PLANS AND DOCUMENTS

ONLY MAJOR EASEMENTS ARE SHOWN

REFERENCE PLANS UNDERLYING MORE RECENT REFERENCE PLANS ARE NOT ILLUSTRATED

Ontario

PROPERTY DESCRIPTION:

PART OF BLOCK G, PART OF MORRISON COURT AS CLOSED BY CR483411, PART OF DRAPER COURT AS CLOSED BY CR483411 ON PLAN 447761, BEING PARTS 1, 6, 7, 8, 9, 10, 11 AND 14 ON PLAN 4R-27845 SAVE AND EXCEPT PART 1 ON PLAN 4R-27961, SAVE AND EXCEPT PARTS 17 TO 21 ON PLAN 29460; S/T AN EASEMENT IN FAVOUR OF THE CORPORATION OF THE CITY OF OTTAWA AS IN CR448175. S/T AN EASEMENT IN FAVOUR OF OTTAWA CABLEVISION LTD AS IN N436790. S/T AN EASEMENT IN FAVOUR OF THE HYDRO-ELECTRIC COMMISSION OF THE CITY OF OTTAWA AS IN N440706. SUBJECT TO AN EASEMENT AS IN OC1706210; SUBJECT TO AN EASEMENT OVER PART 6, PLAN 4R-27845 SAVE AND EXCEPT PARTS 19 AND 20 ON PLAN 4R29460 IN FAVOUR OF PART OF BLOCK G, PART OF MORRISON COURT AS CLOSED BY CR483411 ON PLAN 447761, PARTS 2 AND 12 ON PLAN 4R-27845 AS IN OC1591626; SUBJECT TO AN EASEMENT OVER PART 6, PLAN 4R-27845 SAVE AND EXCEPT PARTS 19 AND 20 ON PLAN 4R29460 IN FAVOUR OF PART OF BLOCK G, PLAN 447761, PARTS 3 AND 13 ON PLAN 4R-27845 AS IN OC1591627; SUBJECT TO AN EASEMENT OVER PART 8, PLAN 4R-27845 IN FAVOUR OF PART OF BLOCK G, PART OF MORRISON COURT AS CLOSED BY CR483411 ON PLAN 447761, PARTS 2 AND 12 ON PLAN 4R-27845 AS IN OC1591626; SUBJECT TO AN EASEMENT OVER PART 8, PLAN 4R-27845 IN FAVOUR OF PART OF BLOCK G, PLAN 447761, PARTS 3 AND 13 ON PLAN 4R-27845 AS IN OC1591627; SUBJECT TO AN EASEMENT OVER PART 9, PLAN 4R-27845 IN FAVOUR OF PART OF BLOCK G, PART OF MORRISON COURT AS CLOSED BY CR483411 ON PLAN 447761, PARTS 2 AND 12 ON PLAN 4R-27845 AS IN OC1591626; SUBJECT TO AN EASEMENT AS IN OC1704430; SUBJECT TO AN EASEMENT AS IN OC1705029; SUBJECT TO AN EASEMENT IN GROSS OVER PARTS 1 AND 2 PLAN 4R28854 AS IN OC1706214; TOGETHER WITH AN EASEMENT OVER THE COMMON ELEMENTS OF OTTAWA-CARLETON CONDOMINIUM PLAN NO. 994 AS IN OC1791074; TOGETHER WITH AN EASEMENT OVER PART OF THE COMMON ELEMENTS OF OTTAWA-CARLETON CONDOMINIUM PLAN NO. 994, PART 13 ON PLAN 4R29460 AS IN OC1791074; TOGETHER WITH AN EASEMENT OVER PART OF THE COMMON ELEMENTS OF OTTAWA-CARLETON CONDOMINIUM PLAN NO. 994, PARTS 4, 6, 8, 9, 26 AND 27 PLAN 4R29460 AS IN OC1791074; TOGETHER WITH AN EASEMENT OVER PART OF THE COMMON ELEMENTS OF OTTAWA-CARLETON CONDOMINIUM PLAN NO. 994, PARTS 11, 12 AND 24 PLAN 4R29460 AS IN OC1791074; TOGETHER WITH AN EASEMENT OVER THE COMMON ELEMENTS OF OTTAWA-CARLETON CONDOMINIUM PLAN NO. 994 AS IN OC1791074; TOGETHER WITH AN EASEMENT OVER THE COMMON ELEMENTS OF OTTAWA-CARLETON CONDOMINIUM PLAN NO. 994 AS IN OC1791074; SUBJECT TO AN EASEMENT OVER PARTS 1, 6, 7, 8, 9, 10, 11 AND 14, PLAN 4R27845, SAVE AND EXCEPT PART 1, PLAN 4R27961, SAVE AND EXCEPT PARTS 17 TO 21, PLAN 4R29460 IN FAVOUR OF OTTAWA-CARLETON CONDOMINIUM PLAN NO. 994 AS IN OC1791074; SUBJECT TO AN EASEMENT OVER PARTS 22 AND 23, PLAN 4R29460 IN FAVOUR OF OTTAWA-CARLETON CONDOMINIUM PLAN NO. 994 AS IN OC1791074; SUBJECT TO AN EASEMENT OVER PARTS 1, 6, 7, 8, 9, 10, 11 AND 14, PLAN 4R27845, SAVE AND EXCEPT PART 1, PLAN 4R27961, SAVE AND EXCEPT PARTS 17 TO 21, PLAN 4R29460 IN FAVOUR OF OTTAWA-CARLETON CONDOMINIUM PLAN NO. 994 AS IN OC1791074; SUBJECT TO AN EASEMENT OVER PARTS 1, 6, 7, 8, 9, 10, 11 AND 14, PLAN 4R27845, SAVE AND EXCEPT PART 1, PLAN 4R27961, SAVE AND EXCEPT PARTS 17 TO 21, PLAN 4R29460 IN FAVOUR OF OTTAWA-CARLETON CONDOMINIUM PLAN NO. 994 AS IN OC1791074; SUBJECT TO AN EASEMENT OVER PARTS 1, 6, 7, 8, 9, 10, 11 AND 14, PLAN 4R27845, SAVE AND EXCEPT PART 1, PLAN 4R27961, SAVE AND EXCEPT PARTS 17 TO 21, PLAN 4R29460 IN FAVOUR OF OTTAWA-CARLETON CONDOMINIUM PLAN NO. 994 AS IN OC1791074; TOGETHER WITH AN EASEMENT OVER THE COMMON ELEMENTS OF OTTAWA-CARLETON CONDOMINIUM PLAN NO. 994 AS IN OC1791074; TOGETHER WITH AN EASEMENT OVER PART THE COMMON ELEMENTS OF OTTAWA-CARLETON CONDOMINIUM PLAN NO. 994, PARTS 18, 19 AND 20 PLAN 4R29460 AS IN OC1791074; TOGETHER WITH AN EASEMENT OVER THE COMMON ELEMENTS OF OTTAWA-CARLETON CONDOMINIUM PLAN NO. 994 AS IN OC1791074; TOGETHER WITH AN EASEMENT OVER THE COMMON ELEMENTS OF OTTAWA-CARLETON CONDOMINIUM PLAN NO. 994 AS IN OC1791074; SUBJECT TO AN EASEMENT OVER PARTS 1, 6, 7, 8, 9, 10, 11 AND 14, PLAN 4R27845, SAVE AND EXCEPT PART 1, PLAN 4R27961, SAVE AND EXCEPT PARTS 17 TO 20, PLAN 4R29460 IN FAVOUR OF OTTAWA-CARLETON CONDOMINIUM PLAN NO. 994 AS IN OC1791074; SUBJECT TO AN EASEMENT OVER PARTS 22 AND 23, PLAN 4R29460 IN FAVOUR OF OTTAWA-CARLETON CONDOMINIUM PLAN NO. 994 AS IN OC1791074; SUBJECT TO AN EASEMENT OVER PARTS 1, 6, 7, 8, 9, 10, 11 AND 14, PLAN 4R27845, SAVE AND EXCEPT PART 1, PLAN 4R27961, SAVE AND EXCEPT PARTS 17 TO 21, PLAN 4R29460 IN FAVOUR OF OTTAWA-CARLETON CONDOMINIUM PLAN NO. 994 AS IN OC1791074; SUBJECT TO AN EASEMENT OVER PARTS 1, 6, 7, 8, 9, 10, 11 AND 14, PLAN 4R27845, SAVE AND EXCEPT PART 1, PLAN 4R27961, SAVE AND EXCEPT PARTS 17 TO 21, PLAN 4R29460 IN FAVOUR OF OTTAWA-CARLETON CONDOMINIUM PLAN NO. 994 AS IN OC1791074; SUBJECT TO AN EASEMENT OVER PARTS 1, 6, 7, 8, 9, 10, 11 AND 14, PLAN 4R27845, SAVE AND EXCEPT PART 1, PLAN 4R27961, SAVE AND EXCEPT PARTS 17 TO 21, PLAN 4R29460 IN FAVOUR OF OTTAWA-CARLETON CONDOMINIUM PLAN NO. 994 AS IN OC1791074;
CITY OF OTTAWA

PROPERTY REMARKS: FOR THE PURPOSE OF THE QUALIFIER THE DATE OF REGISTRATION OF ABSOLUTE TITLE IS 2006/06/19. PLANNING ACT CONSENT IN DOCUMENT OC1591628.

ESTATE/QUALIFIER:
FEE SIMPLE
LT ABSOLUTE PLUS

RECENTLY:
DIVISION FROM 03947-0249

PIN CREATION DATE:
2016/06/14

OWNERS' NAMES
REDWOOD RESIDENCES LIMITED

CAPACITY SHARE

REG. NUM.	DATE	INSTRUMENT TYPE	AMOUNT	PARTIES FROM	PARTIES TO	CERT/ CHKD
** PRINTOUT INCLUDES ALL DOCUMENT TYPES (DELETED INSTRUMENTS NOT INCLUDED) **						
**SUBJECT TO SUBSECTION 44(1) OF THE LAND TITLES ACT, EXCEPT PARAGRAPHS 3 AND 14 AND *						
**	PROVINCIAL SUCCESSION DUTIES AND EXCEPT PARAGRAPH 11 AND ESCHEATS OR FORFEITURE **					
**	TO THE CROWN UP TO THE DATE OF REGISTRATION WITH AN ABSOLUTE TITLE. **					

NOTE: ADJOINING PROPERTIES SHOULD BE INVESTIGATED TO ASCERTAIN DESCRIPTIVE INCONSISTENCIES, IF ANY, WITH DESCRIPTION REPRESENTED FOR THIS PROPERTY.
NOTE: ENSURE THAT YOUR PRINTOUT STATES THE TOTAL NUMBER OF PAGES AND THAT YOU HAVE PICKED THEM ALL UP.

* CERTIFIED IN ACCORDANCE WITH THE LAND TITLES ACT * SUBJECT TO RESERVATIONS IN CROWN GRANT *

REG. NUM.	DATE	INSTRUMENT TYPE	AMOUNT	PARTIES FROM	PARTIES TO	CERT/ CHKD
CR448175	1962/08/23	AGREEMENT			THE CORPORATION OF THE CITY OF OTTAWA THE HYDRO ELECTRIC COMMISSION OFTHE CITY OF OTTAWA THE BELL TELEPHONE COMPANY OF CANADA	C
REMARKS: AND EASEMENT CORRECTIONS: 'PARTY: THE HYDRO ELECTRIC COMMISSION OFTHE CITY OF OTTAWA' ADDED ON 1997/11/17 BY KATHLEEN DILLABOUGH. 'PARTY: THE BELL TELEPHONE COMPANY OF CANADA' ADDED ON 1997/11/17 BY KATHLEEN DILLABOUGH.						
CR491492	1965/04/02	AGREEMENT			THE CORPORATION OF THE CITY OF OTTAWA	C
REMARKS: CR448175						
N436790	1988/05/06	TRANSFER EASEMENT			OTTAWA CABLEVISION LTD	C
N440706	1988/06/03	TRANSFER EASEMENT			THE HYDRO-ELECTRIC COMMISSION OF THE CITY OF OTTAWA	C
LT1065574	1997/08/11	NOTICE		REDWOOD RESIDENCES LIMITED		C
4R27845	2014/04/11	PLAN REFERENCE				C
OC1591628	2014/06/24	TRANSFER	$1	REDWOOD RESIDENCES LIMITED	REDWOOD RESIDENCES LIMITED	C
OC1600588	2014/07/21	NOTICE	$1	CITY OF OTTAWA	REDWOOD RESIDENCES LIMITED	C
OC1600589	2014/07/21	NOTICE	$1	CITY OF OTTAWA	REDWOOD RESIDENCES LIMITED	C
OC1600592	2014/07/21	NOTICE	$1	CITY OF OTTAWA	REDWOOD RESIDENCES LIMITED	C
4R28854	2015/07/10	PLAN REFERENCE				C
OC1704430	2015/07/24	TRANSFER EASEMENT	$1	REDWOOD RESIDENCES LIMITED	BELL CANADA	C
OC1705029	2015/07/28	TRANSFER EASEMENT	$2	REDWOOD RESIDENCES LIMITED	ENBRIDGE GAS DISTRIBUTION INC.	C
OC1706210	2015/07/30	TRANSFER EASEMENT	$1	REDWOOD RESIDENCES LIMITED	ROGERS COMMUNICATIONS INC.	C
OC1706214	2015/07/30	TRANSFER EASEMENT	$1	REDWOOD RESIDENCES LIMITED	HYDRO OTTAWA LIMITED	C
REMARKS: PARTS 1 AND 2 PLAN 4R28854						
4R29460	2016/04/11	PLAN REFERENCE				C
OC1789080	2016/05/24	NOTICE	$1	REDWOOD RESIDENCES LIMITED	REDWOOD RESIDENCES LIMITED	C
OC1790773	2016/05/30	NOTICE	$1	CITY OF OTTAWA	REDWOOD RESIDENCES LIMITED	C

NOTE: ADJOINING PROPERTIES SHOULD BE INVESTIGATED TO ASCERTAIN DESCRIPTIVE INCONSISTENCIES, IF ANY, WITH DESCRIPTION REPRESENTED FOR THIS PROPERTY.
NOTE: ENSURE THAT YOUR PRINTOUT STATES THE TOTAL NUMBER OF PAGES AND THAT YOU HAVE PICKED THEM ALL UP.

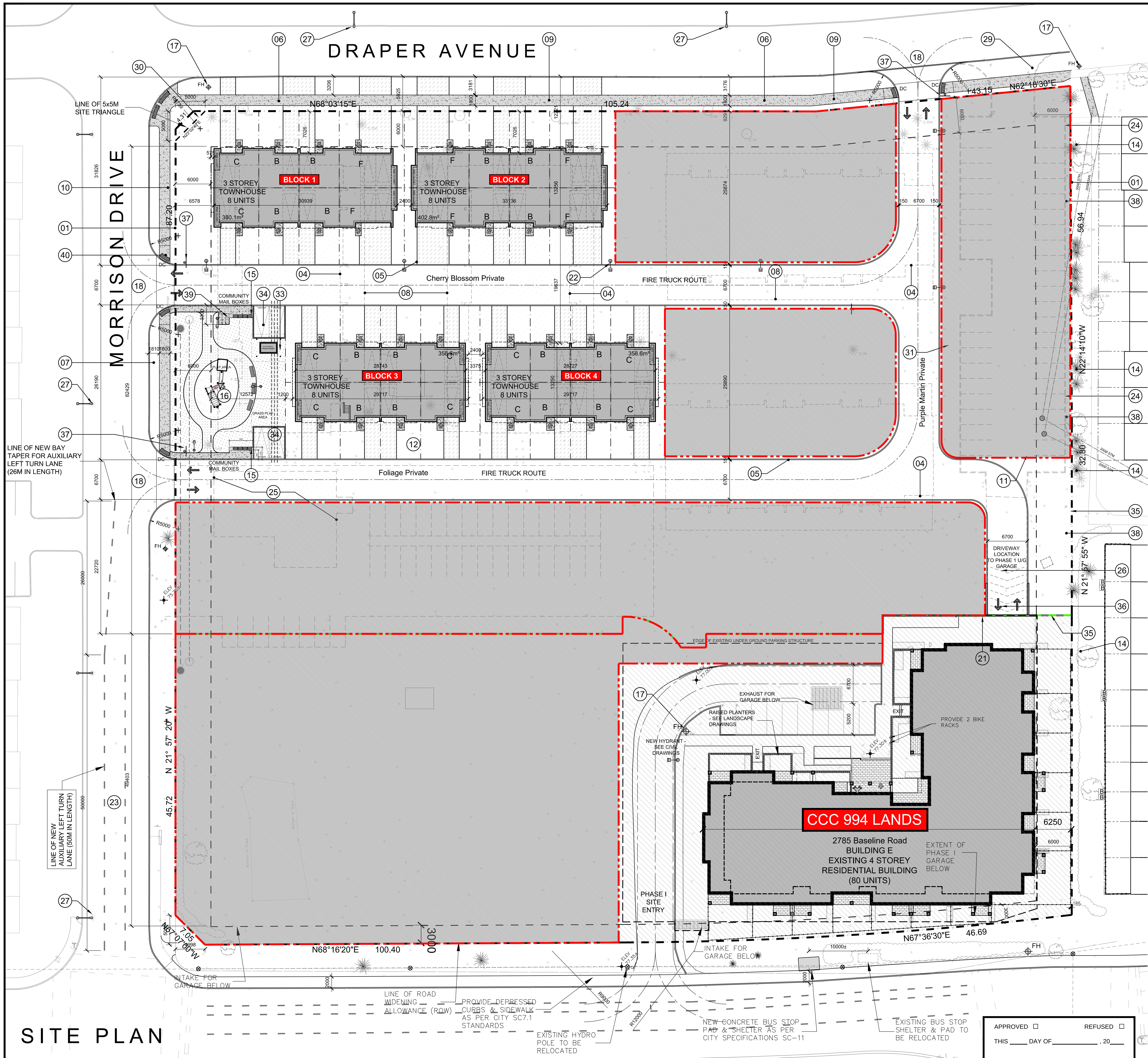
PARCEL REGISTER (ABBREVIATED) FOR PROPERTY IDENTIFIER

03947-0253 (LT)

* CERTIFIED IN ACCORDANCE WITH THE LAND TITLES ACT * SUBJECT TO RESERVATIONS IN CROWN GRANT *

REG. NUM.	DATE	INSTRUMENT TYPE	AMOUNT	PARTIES FROM	PARTIES TO	CERT/ CHKD
OC1790776	2016/05/30	NOTICE	$1	CITY OF OTTAWA	REDWOOD RESIDENCES LIMITED	C
OCCP994	2016/05/31	STANDARD CONDO PLN				C
OC1791074	2016/05/31	CONDO DECLARATION		REDWOOD RESIDENCES LIMITED		C

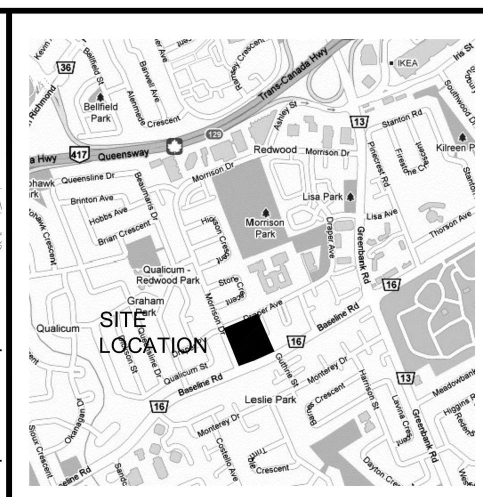
DRAWINGS / FIGURES



SITE PLAN

0m 10 20 40

SCALE 1: 300



LOCATION PLAN- NTS

NOTE:
READ THIS DRAWING IN CONJUNCTION WITH LANDSCAPE PLAN AS PREPARED BY LAROCQUE+LEVSTEK, GRADING PLAN AND SITE SERVICES PLAN AS PREPARED BY DSEL ENGINEERING CONSULTANTS LTD., AND GEOTECHNICAL INVESTIGATION AS PREPARED BY PATERSON GROUP INC..

GARBAGE AND RECYCLING WILL BE CURB SIDE BY PRIVATE CONTRACTOR

SNOW CLEARING AND STORAGE WILL BE BY PRIVATE CONTRACTOR

DRAWING NOTES

1. PROPERTY LINE (REFER TO SURVEY DRAWING FOR INTERNAL PROPERTY LINES AND PARTS)
2. 6.0M ZONING YARD SETBACK
3. FIRE TRUCK ROUTE
4. EXISTING 2 STOREY APARTMENT BUILDING TO BE REMOVED
5. 1200mm WIDE CONCRETE SIDEWALK AND CURB
6. 1800mm WIDE CITY SIDEWALK, AS PER CITY OF OTTAWA STANDARDS
7. 2000mm WIDE CITY SIDEWALK & CURB, AS PER CITY OF OTTAWA STANDARDS
8. EXISTING WOOD PRIVACY FENCE, TO BE REMOVED
9. EXISTING ASPHALT PATH TO BE REMOVED
10. EXISTING TREES TO BE REMOVED
11. RETAINING WALL WITH STEPS AS REQUIRED, SEE LANDSCAPE AND CIVIL DRAWINGS
12. PRIVATE DRIVEWAY
13. PEDESTRIAN CROSS WALK WITH DEPRESSED CURBS
14. EXISTING TREES TO REMAIN, PROTECT AS REQUIRED
15. PROPOSED COMMUNITY MAIL BOX LOCATION
16. PRIVATE PARK WITH SAND FILLED PLAY AREA
17. EXISTING FIRE HYDRANT
18. NEW ENTRY, DEPRESSED CURB AND SIDEWALK TO CITY STANDARDS SC7.1
19. PROPOSED LOT LINE
20. 2.1 TO 2.5 M HT. SOUND BARRIER
21. RETAINING WALL / EXPOSED EXTERIOR WALL OF PHASE 1 PARKING GARAGE
22. LIGHT STANDARD, EXACT LOCATION TO BE CONFIRMED BY ELECTRICAL ENGINEER
23. EXISTING BUS STOP AND BENCH TO BE REPLACED WITH CONCRETE BUS STOP PAD & SHELTER AS PER CITY SPECIFICATIONS SC-11
24. EXISTING PARKING LOT, PHASE 1 GARAGE RAMP TO THE REMOVED UNDER THIS PHASE
25. TEMPORARY SALES CENTER AND PARKING AREA TO BE REMOVED UNDER THIS PHASE
26. EXISTING PHASE 1 PARKING GARAGE ENTRY RAMP TO REMAIN
27. EXISTING CITY STREET LIGHT
28. METER CLOSETS
29. CONNECT NEW SIDEWALK TO EXISTING
30. 5.0 m x 5.0 m SIGHT TRIANGLE
31. METAL FRAMED STAIRS TO MAIN LEVEL
32. WOODEN DECK OFF MAIN LEVEL, STEPS VARY
33. HYDRO TRANSFORMER
34. VISITOR PARKING SPACE
35. RETAINING WALL, HEIGHT VARIES SEE LANDSCAPE FOR TYPE
36. EXISTING ARMOR STONE RETAINING WALL TO BE REPLACES WITH POURED CONCRETE
37. STOP SIGN (AT ALL INTERSECTIONS)
38. REAR YARD ACCESS EASEMENTS (TO BE CONFIRMED ON SURVEY DRAWING)
39. BICYCLE PARKING WITH RACK
40. TACTILE WALKING SURFACE INDICATOR, SEE CITY DETAIL SD6
41. EXISTING FIRE HYDRANT TO BE RELOCATED

APPROVED ☐ REFUSED ☐

THIS _____ DAY OF ____________ , 20____

DERRICK MOODIE
MANAGER, DEVELOPMENT REVIEW - WEST
PLANNING, INFRASTRUCTURE & ECONOMIC DEVELOPMENT DEPARTMENT, CITY OF OTTAWA

PROJECT INFORMATION

ZONING	Zoning By-Law 2008-250 R5A[1700] S247, S282	
SITE AREA INCLUDING ORIGINAL PHASES		21,252.5 sq. m. (228,760) sq. ft.
BUILDING HEIGHT	5 STOREY	18.0 M

OVERALL SITE SETBACK (PHASE 1 & 2)	PROVODED	REQUIRED
FRONT YARD SETBACK (BASELINE ROAD)	3.0 M	3.0 M
MORRISON DRIVE SETBACK	6.0 M	6.0 M
DRAPER AVENUE SETBACK	6.0 M	6.0 M
INTERIOR SIDE YARD SETBACK	6.0 M	6.0 M

PROJECT INFORMATION - PHASE 1 (TOWNHOUSE)

ZONING	Zoning By-Law 2008-250 R5A[1700] S247, S282	
SITE AREA - PHASE 1		7,692.7 sq. m. (82,804) sq. ft.
BUILDING HEIGHT	4.5 STOREY	17.0 M
FRONT YARD SETBACK (BASELINE ROAD)		3.0 M
FRONT YARD SETBACK (MORRISON DRIVE)		6.0 M
FRONT YARD SETBACK (DRAPER AVENUE)		6.0 M
INTERIOR SIDE YARD SETBACK		6.0 M

PROJECT STATISTICS - PHASE 1

BUILDING HEIGHT	3 STOREY	12.0 M
BUILDING AREA (32 UNITS)		4,169.5 sq. m. (44,880) sq. ft.
FRONT YARD SETBACK (TYPICAL)		6.0 M
CORNER YARD SETBACK (TYPICAL)		6.0 M
INTERIO YARD SETBACK (TYPICAL)		6.0 M

LOT COVERAGE

PAVED SURFACE (ROADS) =	2,459.1 sq. m.	32%
PAVED SURFACE (DRIVEWAY) =	702.8 sq. m.	9%
BUILDING FOOTPRINT =	1,500.1 sq. m.	20%
LANDSCAPE OPEN SPACE =	2,645.0 sq. m.	34%
LANDSCAPE PARK =	385.7 sq. m.	5%
TOTAL =	7,692.7 sq. m.	100.0%

BUILDING STATISTICS

		UNIT COUNT	TOTAL UNIT AREA	
TOWNHOUSE TYPE 'A' (WITH GARAGE)	1,037 sq. ft.	0	0	0
TOWNHOUSE TYPE 'B' (WITH GARAGE)	1,282 sq. ft.	16	20,512 sq. ft./	1,905.6 m²
TOWNHOUSE TYPE 'C' (WITH GARAGE)	1,439 sq. ft.	10	14,390 sq. ft./	1,336.9 m²
TOWNHOUSE TYPE 'D' (WITH GARAGE)	1,472 sq. ft.	0	0	0
TOWNHOUSE TYPE 'E' (WITH GARAGE)	1,651 sq. ft.	0	0	0
TOWNHOUSE TYPE 'F' (WITH GARAGE)	1,663 sq. ft.	6	9,978 sq. ft./	927.0 m²
TOWNHOUSE TYPE 'H' (WITH GARAGE)	2,699 sq. ft.	0	0	0
TOWNHOUSE TYPE 'K' (WITH GARAGE)	1,778 sq. ft.	0	0	0
TOTAL UNITS		32	44,880 sq. ft./	4,169.5 m²

CAR PARKING

REQUIRED

RESIDENCE	- 1.0 PER UNIT (32 UNITS)	32
VISITOR	- NOT REQUIRED	0
TOTAL		32

PROVIDED

RESIDENCE	- PRIVATE GARAGE	32
VISITOR	- PRIVATE IN DRIVEWAY	32
VISITOR	- COMMUNAL AT PARK	4
TOTAL		68

IT IS THE RESPONSIBILITY OF THE APPROPRIATE CONTRACTOR TO CHECK AND VERIFY ALL DIMENSIONS ON SITE AND TO REPORT ALL ERRORS AND/OR OMISSIONS TO THE ARCHITECT.

ALL CONTRACTORS MUST COMPLY WITH ALL PERTINENT CODES AND BY-LAWS.

THIS DRAWING MAY NOT BE USED FOR CONSTRUCTION UNTIL SIGNED BY THE ARCHITECT.

DO NOT SCALE DRAWINGS.

NOTATION SYMBOLS:

- 00 — INDICATES DRAWING NOTES, LISTED ON EACH SHEET.
- 00 — INDICATES ASSEMBLIE TYPE; REFER TO TYPICAL ASSEMBLIES SCHEDUAL.
- 00 — INDICATES WINDOW TYPE; REFER TO WINDOW ELEVATIONS AND DETAILS ON A900 SERIES.
- 000 — INDICATES DOOR TYPE; REFER TO DOOR SCHEDULE AND DETAILS ON A900 SERIES.

00 A000 A000 TITLE SCALE — DETAIL NUMBER — DETAIL REFERENCE PAGE — DETAIL CROSS REFERENCE PAGE

GENERAL NOTES:

- A. REFER TO TYPICAL ASSEMBLIES SHEET FOR WALL, PARTITION, ROOF CEILING & FLOOR TYPES.
- B. FOR DOOR TYPES AND HARDWARE REQUIREMENTS REFER TO DOOR SCHEDULE ON A900 SERIES.
- C. ALL INTERIOR DIMENSIONS ARE TAKEN FROM THE FACE OF STUD
- D. ALL EXTERIOR DIMENSIONS ARE TAKEN FROM THE FACE OF STUD
- E. ALL EXTERIOR WALLS ARE TO BE TYPE 'W1' UNLESS NOTED OTHER WISE.
- F. ALL INTERIOR PARTITIONS ARE TO BE TYPE 'P1' UNLESS NOTED OTHER WISE.
- G. ALL REINFORCED CONCRETE SUSPENDED SLABS, COLUMNS & BEAMS HAVE A MIN. FRR OF 1.5 HRS (AS DETERMINED BY OBC SB-2) UNLESS OTHERWISE STATED.

No.	DESCRIPTION	DATE
24	ISSUED FOR SPC - CITY COMMENTS 4 RESPONSE	Aug. 2, 18
23	ISSUED FOR SPC - CITY COMMENTS 4 RESPONSE	June 18, 18
22	ISSUED FOR SPC - CITY COMMENTS RESPONSE	Apr. 25, 18
21	ISSUED FOR SPC - CITY COMMENTS RESPONSE	Mar. 14,18
20	ISSUED FOR PRIVATE ROAD NAMING APPLICATION	Jan 31,18
19	ISSUED FOR PERMIT - BLOCK 1 & 2	Jan 24,18
18	ISSUED FOR SPC - PHASE 3 REVISED CONCEPT	Nov 27,17
17	ISSUED FOR SITE PLAN APPROVAL - PHASE 3	June 12,17

REVISIONS:

ARCHITECT SEAL: ONTARIO ASSOCIATION OF ARCHITECTS RODERICK LAHEY LICENCE 4375

SEAL DATE: STAMP DATE

NORTH ARROW:

CLIENT:

Greatwise DEVELOPMENTS

ARCHITECT:

rla/architecture
roderick lahey architect inc.
56 beech street, ottawa, ontario K1S 3J6
t.613.724.9932 f.613.724.1209 rlaarchitecture.ca

PROJECT TITLE:

FRESH TOWNS
2710 DRAPER AVENUE
OTTAWA ONTARIO

SHEET TITLE:

SITE PLAN - PROPOSED OVERALL

DRAWN:	CHECKED:
RV	RL
SCALE: 1:300	SHEET No. SP-1
PROJECT No. 1020	

D07-12-14-0076

PROJECT DEVELOPER	SURVEYOR	LANDSCAPE ARCHITECT	CIVIL ENGINEER
GreatWise Developments 333 Wilson Avenue Toronto, ON, M3H 1T2 Phone: (416) 630-6767 Fax: (416) 630-6304	Annis O'Sullivan Vollebekk Ltd. Ontario Land Surveyors 14 Concourse Gate, Suite 500, Nepean, Ontario K2E 7S6 Tel: (613) 727-0850 Fax: (613) 727-1079	Larocque Levstek 5871 Hugh Crescent Ottawa, (Osgoode) ON K0A 2W0 **Tel:** (613) 826-0518	David Schaeffer Engineering Ltd. 120 Iber Road, Unit 203 Stittsville . Ontario . Canada . K2S 1E9 Tel: (613) 836-0856 Fax: (613) 836-7183

SITE PLAN SYMBOLS

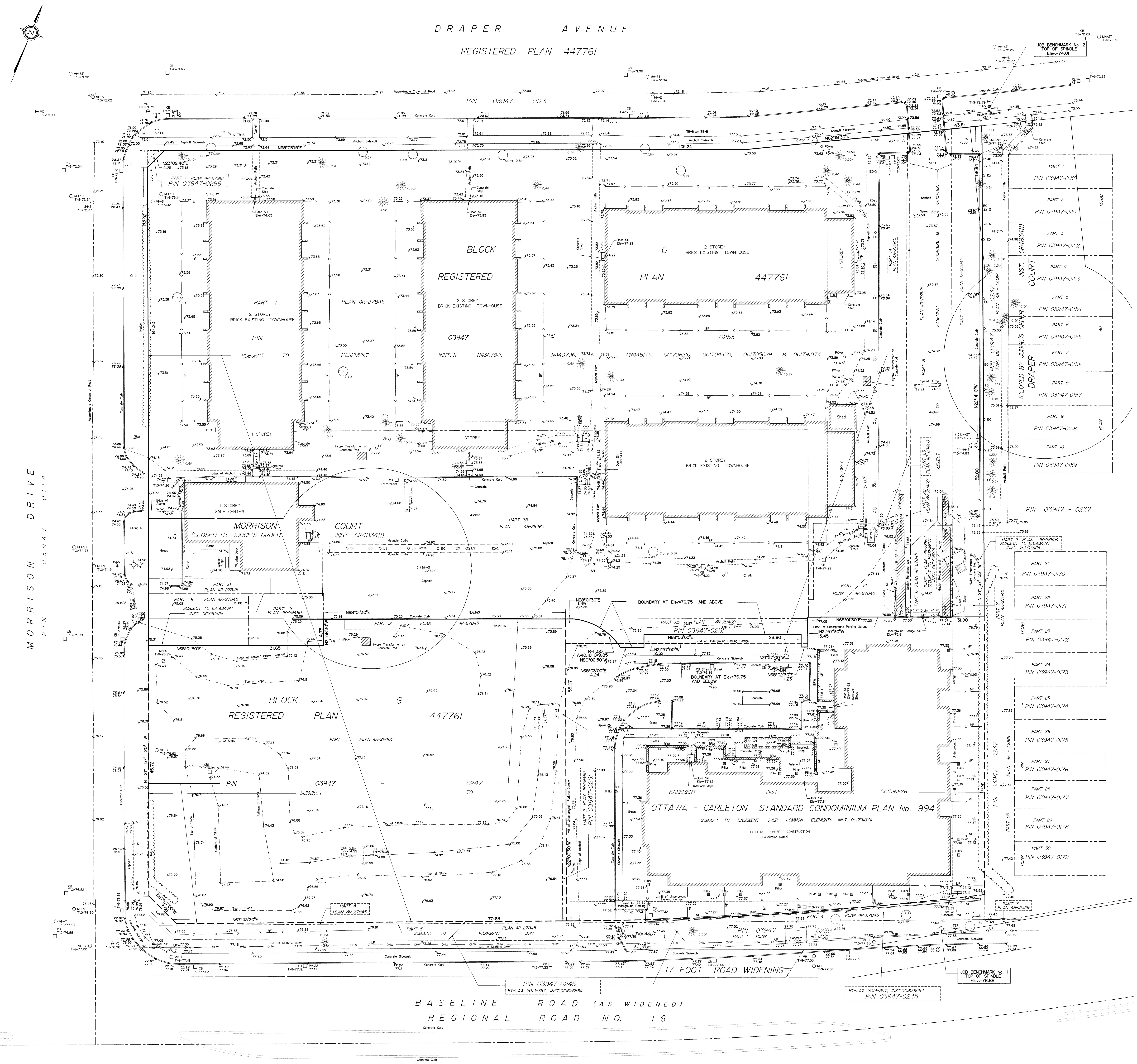
- HARD SURFACE WALKWAY
- NEW CITY CONCRETE SIDEWALK
- EXISTING CITY STREET LIGHT
- LIGHT STANDARD
- TWO WAY VEHICLE CIRCULATION
- ENTRANCE LOCATION
- BOLLARD STYLE BIKE RACK
- FH FIRE HYDRANT
- DC DEPRESSED CURB
- STOP SIGN

TOPOGRAPHICAL SKETCH OF:

MORRISON COURT & PART OF DRAPER COURT
(Closed by Judge-s Order CR483411)
PART OF BLOCK G, REGISTERED PLAN 447761
OTTAWA-CARLETON STANDARD CONDOMINIUM PLAN No. 994, CITY OF OTTAWA
Prepared by Annis, O'Sullivan, Vollebekk Ltd.
Field Work Completed May 4, 2017

PLOT DATE: Thursday, August 02, 2018

Plan No.: #17529



TOPOGRAPHICAL SKETCH OF

MORRISON COURT &
PART OF DRAPER COURT
(Closed by Judge's Order CR483411)
PART OF BLOCK G
REGISTERED PLAN 447761
AND
OTTAWA-CARLETON STANDARD CONDOMINIUM PLAN No. 994
CITY OF OTTAWA

Prepared by Annis, O'Sullivan, Vollebekk Ltd.
Field Work Completed May 4, 2017

Scale 1 : 250

10 7.5 5.0 2.5 0 5 10 Metres

Metric

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

Notes & Legend

	Denotes	
○ MH-ST	"	Maintenance Hole (Storm Sewer)
○ MH-S	"	Maintenance Hole (Sanitary)
○ MH-T	"	Maintenance Hole (Traffic)
○ MH	"	Maintenance Hole (Unidentified)
□ CB	"	Catch Basin
□ CBI	"	Catch Basin Inlet
VC	"	Valve Chamber (Watermain)
FH	"	Fire Hydrant
WV	"	Water Valve
⊗ GV	"	Gas Valve
GM	"	Gas Meter
TSP	"	Traffic Signal Post
△ S	"	Sign
CPP	"	Corrugated Plastic Pipe
T/P	"	Top of Pipe
T/G	"	Top of Grate
	"	Deciduous Tree
	"	Coniferous Tree
MF	"	Metal Fence
BF	"	Board Fence
○ UP	"	Utility Pole
○ AN	"	Anchor
○ LS	"	Light Standard
○ PO-W	"	Wood Pole
○ EO	"	Electrical Outlet
□ TB-B	"	Bell Terminal Box
Ø	"	Diameter
+ 65.00	"	Location of Elevations
+ 65.00*	"	Top of Wall Elevations
+ 65.00	"	Top of Concrete Curb Elevation
C/L	"	Centreline
———	"	Property Line
BRW	"	Brick Retaining Wall
CRW	"	Concrete Retaining Wall

BOUNDARY INFORMATION SHOWN HEREON HAS BEEN COMPILED FROM FIELD SURVEY AND EXISTING DOCUMENTS.

ELEVATION NOTES

1. Elevations shown are geodetic and are referred to the CGVD28 geodetic datum.
2. It is the responsibility of the user of this information to verify that the job benchmark has not been altered or disturbed and that it's relative elevation and description agrees with the information shown on this drawing.

UTILITY NOTES

1. This drawing cannot be accepted as acknowledging all of the utilities and it will be the responsibility of the user to contact the respective utility authorities for confirmation.
2. Only visible surface utilities were located.
3. A field location of underground plant by the pertinent utility authority is mandatory before any work involving breaking ground, probing, excavating etc.

ANNIS, O'SULLIVAN, VOLLEBEKK LTD.
14 Concourse Gate, Suite 500
Nepean, Ont. K2E 7S6
Phone: (613) 727-0850 / Fax: (613) 727-1079
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Ontario Land Surveyors

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