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SITE SERVICING AND STORMWATER MANAGEMENT REPORT

FOR

CAIVAN GREENBANK NORTH INC.
3713 BORRISOKANE ROAD

CITY OF OTTAWA

PROJECT NO.: 19-1134

JANUARY 2021 – REV. 9

SITE SERVICING AND STORMWATER MANAGEMENT REPORT
FOR
3713 BORRISOKANE ROAD

CAIVAN GREENBANK NORTH INC.

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1.0 INTRODUCTION

David Schaeffer Engineering Limited (DSEL) has been retained by Caivan Greenbank North Inc. to prepare a Site Servicing and Stormwater Management report in support of a site plan revision application for Site Plan Control (SPC) at 3713 Borrisokane Road.

The subject property is located within the City of Ottawa, Rideau-Goulbourn Ward. As illustrated in ***Figure 1***, the subject property is located approximately 500 m south of the intersection of Borrisokane Road and Cambrian Road. Comprised of a single parcel of land, the subject property measures approximately ***7.4 ha*** and is zoned Rural General Industrial.

Figure 1: Site Location

The proposed SPC would allow for the development of a 1-storey assembly plant and a 2-storey administration building. The development includes surface parking areas and drive aisles with access from both Borrisokane Road and the future roadway located south of the subject site, herein referred to as Haiku Street. The development will include a ***9380 m²*** assembly plant and a ***2456 m²*** administration building. In addition, the site contains an ***8251 m2*** storage yard. A copy of the Site Plan is included in ***Drawings/Figures***.

The subject site is bound by a future Storm water management pond to the north, future residential subdivisions to the east and southeast, and a future municipal roadway to the south. The Stormwater management pond and subdivision to the southeast were submitted to the City under City Application No. D07-16-19-0005 (***The Ridge Subdivision Servicing Design***).

Permission to expand the City's Public Service Area onto the subject property was approved as part of Official Plan Amendment # 243.

As part of The Ridge application review process, the Master Servicing Study (***MSS***) for the Barrhaven South Urban Expansion Area (May, 2018) was updated to reflect the preferred servicing alternative for ***The Ridge***. The aforementioned ***MSS*** addendum prepared by JL Richards (August, 2020) was also updated to include the subject site as part of the PSA and to include the proposed high-level municipal servicing strategy.

Revision 6 of the *Site Servicing and Stormwater Management report – 3713 Borrisokane Road* was submitted to City staff (July, 2020), demonstrating that the development could be supported by rural services. The design drawings and reports have since been approved and the assembly plant construction has commenced.

The objective of this report is to provide sufficient detail to demonstrate that the ultimate development adheres to the PSA extension application and is supported by ***The Ridge Subdivision Servicing Design***.

1.1 Existing Conditions

The existing site includes a rock quarry with vegetated areas and piles of fill. The elevations range between 110.82 m and 99.60 m, with a minimal grade change of approximately 0.50% from the Southeast to the Northwest corner of the property. Stormwater runoff is currently directed towards the existing roadside ditch along Borrisokane Road.

Municipal services are required to be installed and in service at the time of construction, in accordance with D07-16-19-0005. Sewer and watermain layout, collected from ***The Ridge Subdivision Servicing Design***, indicates that the following services will exist within the future municipal right-of-ways:

Haiku Street (South of Subject Site)

- 300 mm diameter PVC watermain;
- 200 mm diameter PVC sanitary sewer tributary to the trunk sewer within Cambrian Road; and
- 1500 mm diameter concrete storm sewer tributary to the Drummond Pond.

Drummond Pond (North of Subject Site)

- 2250 mm diameter concrete storm sewer tributary to the Drummond Pond; and the
- Drummond Pond.

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.

As noted in *Section 1.0*, the development proposes a warehouse with an outdoor storage yard. As a result, in addition to the industrial designation of the subject site, the development will carry out light industrial activities. Ontario Water Resources Act (OWRA) s.53 approval is required from the Ministry of the Environment, Conservation and Parks (MECP) for sanitary and stormwater discharge in the form of an Environmental Compliance Application (ECA) under the Direct Submission process.

OWRA s.53 approval in the form of an ECA under the Transfer of Review process (ECA Approval Number 1799-BTHJMX) was obtained for the construction of the storm and sanitary sewers within the Ridge subdivision. Approval was received on September 18th, 2020. Refer to ***Appendix A*** for the approval letter.

OWRA s.53 approval in the form of an ECA under the Transfer of Review process (ECA Approval Number 9590-BTHKN4) was obtained for the construction of the Drummond Pond and for the oil/grit separator located at the inlet of the pond. Approval was received on September 18th, 2020. Refer to ***Appendix A*** for the approval letter.

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 ISDTB-2014-01**
    City of Ottawa, February 5, 2014.
    (*ISDTB-2014-01*)
  - **Technical Bulletin PIEDTB-2016-01**
    City of Ottawa, September 6, 2016.
    (*PIEDTB-2016-01*)
  - **Technical Bulletin ISTB-2018-01**
    City of Ottawa, March 21, 2018.
    (*ISTB-2018-01*)
  - **Technical Bulletin ISTB-2018-03**
    City of Ottawa, March 21, 2018.
    (*ISTB-2018-03*)
  - **Technical Bulletin ISTB-2019-01**
    City of Ottawa, January, 2019.
    (*ISTB-2019-01*)
  - **Technical Bulletin ISTB-2019-02**
    City of Ottawa, July 8, 2019.
    (*ISTB-2019-02*)
- **Ottawa Design Guidelines – Water Distribution**
  City of Ottawa, July 2010.
  (Water Supply Guidelines)
  - **Technical Bulletin ISD-2010-2**
    City of Ottawa, December 15, 2010.
    (*ISD-2010-2*)
  - **Technical Bulletin ISDTB-2014-02**
    City of Ottawa, May 27, 2014.
    (*ISDTB-2014-02*)

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

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

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

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

- **Geotechnical Investigation**
  Paterson Group, PG5155-1, Rev. 1, February 10, 2020.
  (Geotechnical Report)

- **Geotechnical Memo – Groundwater Field Investigation**
  Paterson Group, PG5155-MEMO.04, Rev. 1, May 20, 2020.

- **Response to Site Plan Comments**
  Paterson Group, PE4810-LET.02, April 22, 2020.

- **Geotechnical Memo – Subsoil Infiltration Review**
  Paterson Group, PG5155-MEMO.05, Rev. 1, July 10, 2020.

- **Geotechnical Memo – Hydrogeological Review – Municipal Services**
  Paterson Group, PG3959-MEMO.03, September 21, 2020.

- **Master Servicing Study – Barrhaven South Urban Expansion Area**
  J.L. Richards & Associates Limited, Revision 2, May 2018.
  (BSUEA MSS)

- **Design Brief for The Ridge (Brazeau Lands)**
  David Schaeffer Engineering Ltd., 18-1030, Rev. 4, July 27, 2020.
  (The Ridge Subdivision Servicing Design)

- **Hydraulic Capacity and Modeling Analysis (Brazeau Lands)**
  GeoAdvice Engineering Inc., 2019-091-DSE, July 28, 2020.
  (Water Modeling Analysis)

3.0 WATER SUPPLY SERVICING

3.1 Existing Water Supply Services

The subject property will lie within the City of Ottawa BARR pressure zone, as shown by the Pressure Zone map in ***Appendix B***. As per ***The Ridge Subdivision Servicing Design***, a 300 mm diameter watermain is proposed within the Haiku Street right-of-way. The Haiku Street watermain is required to be installed and in-service to support the proposed development. Refer to *Plan and Profile of Haiku Street*, included in ***Drawings/Figures,*** for further details.

3.2 Water Supply Servicing Design

It is proposed to service the development by connecting to the 300 mm diameter watermain within Haiku Street via a 200 mm diameter service connection. Two fire hydrants are proposed within the subject site, one for the assembly plant (FH1) and one for the administration building (FH2). Refer to drawing ***SSP-1*** and ***SSP-2*** for a detailed servicing layout.

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

Table 1
Water Supply Design Criteria

Design Parameter	Value
Water Closets & Lavatories	150 L/fixture/hour
Sinks & Drinking Fountains	375 L/fixture/hour
Showers	575 L/fixture/hour
Office Space	75 L/9.3m^2/day
Commercial Maximum Daily Demand	1.5 x avg. day
Commercial Maximum Hour Demand	1.8 x max. day
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, below, summarizes the estimated water supply demand and boundary conditions for the proposed development based on the ***Water Supply Guidelines***.

Table 2
Water Demand and Boundary Conditions
Proposed Conditions

Design Parameter	Estimated Demand[1] (L/min)	Boundary Condition[2] (m H_2O / kPa)	
Average Daily Demand	33.9	156	533.0
Max Day + Fire Flow	50.8 + 2,294 = 2,344.8	138.5	361.3
Peak Hour	91.5	135	327.0

1) Water demand calculation per ***Water Supply Guidelines***. See ***Appendix B*** for detailed calculations.
2) Boundary conditions extracted from the ***Water Modeling Analysis*** prepared by GeoAdvice and included in ***Appendix B***; assumed ground elevation 101.7m. See ***Appendix B.***

As indicated by ***Table 2,*** above, the average daily demand is estimated to be 33.9 L/s (48.8 m^3/day). In accordance with City of Ottawa technical bulletin ISDTB-2014-02, redundant service connections are required when estimated average daily flows are greater than 50 m^3/day. Therefore, a looped watermain connection is not required.

Based in correspondence with Lowe Fire Protection Inc., the fire flow demand was estimated as ***2,294 L/min*** (606 US gpm) for the assembly plant. Please refer to ***Appendix B*** for detailed calculations and correspondence with Lowe Fire Protection Inc.

In order to determine pressures for the development, the *Water Modeling Analysis* prepared by GeoAdvice for ***The Ridge Subdivision Servicing Design*** (July, 2020) was utilized. As shown by ***Table 2,*** above, the minimum and maximum pressures fall within the required range identified in ***Table 1***. Boundary condition results and associated water model are included in ***Appendix B***.

3.3 Water EPANet Model

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 Ridge Subdivision Servicing Design***, and the corresponding hydraulic model *Water Modeling Analysis.*

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 the administrative building, as well as, the pressures the watermain will provide to fire hydrants during fire flow conditions.

Table 3, below, summarizes the model results. ***Appendix B*** contains output reports and model schematics for each scenario.

Table 3
Model Simulation Output Summary

Location	Average Day (kPa)	Maximum Day + Fire Flow (kPa)	Peak Hour (kPa)
B1	549.9	372.2	343.9
B2	543.5	364.1	337.5
FH1	549.9	372.7	343.9
FH2	547.4	352.8	341.4
N1	556.5	381.1	350.5
N3	552.0	374.7	346.0
N4	552.0	374.3	346.0
N5	547.9	368.6	341.9
N6	547.2	367.2	341.2
N7	553.8	377.3	347.8

Results from modelling of the internal watermain indicate pressures will be within allowable pressure ranges at all points within the system. A pressure check should be completed during construction to determine whether pressure reducing valves are required.

3.4 Water Supply Conclusion

The subject property will lie within the City of Ottawa BARR pressure zone. As per ***The Ridge Subdivision Servicing Design***, a 300 mm diameter watermain will be available within the Haiku Street right-of-way to service the development.

In order to determine pressures for the development, the water model prepared for ***The Ridge Subdivision Servicing Design*** was utilized to establish boundary conditions. Based on the EPANET model, pressures fall within the required pressure range specified in the ***Water Supply Guidelines***.

In accordance with City of Ottawa technical bulletin ISDTB-2014-02, redundant service connections are required when estimated average daily flows are greater than 50 m^3/day. The development calculates an average daily demand of 48.8 m^3/day therefore, a looped watermain connection is not required.

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 will lie within the Cambrian Road trunk collection area. As per ***The Ridge Subdivision Servicing Design,*** a 200 mm diameter sanitary sewer is proposed within Haiku Street, located south of the subject site. The Haiku Street sanitary sewer is required to be installed and in-service to support the proposed development. Refer to *Plan and Profile of Haiku Street*, included in ***Drawings/Figures,*** for further details.

4.2 Wastewater Design

It is proposed that the development will be serviced by connecting to the 200 mm diameter sanitary sewer within Haiku Street via a network of 200 mm diameter sanitary sewers. As indicated by the *Sanitary Drainage Plan* included in ***Appendix C***, ***The Ridge Subdivision Servicing Design*** contemplated that flows from the subject site would be conveyed to SAN CTRL MH5A.

Table 4, below***,*** summarizes the ***City Standards*** employed in the design of the proposed wastewater sewer system.

Table 4
Wastewater Design Criteria

Design Parameter	Value
Water Closets*	150.0 L/fixture/hour
Lavatories*	150.0 L/fixture/hour
Mop Sink	375 L/fixture/day
Drinking Fountains*	375 L/fixture/day
Infiltration and Inflow Allowance	0.05 L/s/ha (Dry Weather) 0.28 L/s/ha (Wet Weather) 0.33 L/s/ha (Total)
Office Space	75 L/9.3m^2/day
Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} A R^{2/3} S^{1/2}$
Minimum Sewer Size	200 mm diameter
Minimum Manning's 'n'	0.013
Minimum Depth of Cover	2.5 m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6 m/s
Maximum Full Flowing Velocity	3.0 m/s
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012. **assuming a 12 hour commercial operation*	

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

Table 5
Summary of Estimated Peak Wastewater Flow

Design Parameter	Total Flow (L/s)
Estimated Average Dry Weather Flow	0.93
Estimated Peak Dry Weather Flow	1.21
Estimated Average Wet Weather Flow	2.99
Estimated Peak Wet Weather Flow	**3.27**

The estimated sanitary flow based on the ***Site Plan,*** included in ***Drawings/Figures,*** results in a peak wet weather flow of ***3.27 L/s***.

In order to assess the available capacity, ***The Ridge Subdivision Servicing Design*** was reviewed for the future sanitary sewers located downstream of the subject property. The analysis was conducted from the site to the 375 mm diameter sewer within Expansion Road, as shown by the sanitary drainage plan included in ***Appendix C***.

The subject site was considered in ***The Ridge Subdivision Servicing Design*** as ***7.4 ha*** of commercial land with a contributing flow of ***4.84 L/s***. The proposed development estimates a peak wet weather flow of ***3.27 L/s***. Therefore, the estimated peak flow is ***1.57 L/s*** less than the previous estimate for the site. As a result, the sanitary sewer within Haiku Street has sufficient capacity to accommodate the proposed development.

4.3 Wastewater Servicing Conclusions

The site will be tributary to the Cambrian Road trunk collection area. It is proposed to discharge wastewater to the 200 mm diameter Haiku Street sanitary sewer via a network of 200 mm diameter sanitary sewers. The Haiku Street sanitary sewer is required to be installed and in-service to support the proposed development.

Based on ***The Ridge Subdivision Servicing Design***, the municipal sanitary sewer network has sufficient capacity to accommodate the estimated ***3.27 L/s*** peak wet weather flow from the proposed development.

5.0 STORMWATER MANAGEMENT

5.1 Existing Stormwater Services

In accordance with the ***BSUEA MSS***, stormwater runoff from the subject property is tributary to the existing Borrisokane roadside ditch, located within the Jock River sub-watershed. As such, approvals for proposed development within this area are under the approval authority of the City of Ottawa.

Based on the ***BSUEA MSS***, areas A5 (12.7 ha) and A8 (42.2 ha) are tributary to the existing Borrisokane roadside ditch. The ***BSUEA MSS*** estimated that ***1,300 L/s*** of stormwater runoff from the Brazeau and Drummond Extraction Areas was tributary to the Borrisokane Road ditch during the 1:100 year event. The analysis had assumed site topography and land cover prior to the extraction works. Refer to ***Appendix D*** for the *SWMHYMO Site Drainage Plan*, included in both the ***BSUEA MSS*** and ***Appendix D***, for an illustration of the local drainage boundaries.

The subject site occupies ***7.35 ha*** of areas A5 and A8, therefore the site's prorate share of the target release rate is ***174 L/s***.

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 Jock River Subwatershed, and is subject to review by the Rideau Valley Conservation Authority (RVCA).

5.2 Post-development Stormwater Management Target

The stormwater management will be required to adhere to the following design criteria:

- Attenuate all storms up to and including the City of Ottawa 100-year design event on site;
- Incorporate Low Impact Development measures (LIDs); and
- Meet the quality control target of 80% TSS removal as per the Jock River Reach One Subwatershed Study (Stantec, 2007); and,

As per the ***BSUEA MSS***, the pre-development release rate for the subject site is ***174 L/s*** during a 1:100 year event. Note that a majority of Areas 5 and A8 do not contribute runoff to the Borrisokane roadside ditch due to extraction activities. Therefore, based on coordination with City staff, the release rate from the site is proposed to be ***210.4 L/s*** on an interim basis.

5.3 Proposed Stormwater Management System

To meet the stormwater objectives the proposed development will utilize surface storage.

Runoff collected along the western side of the subject site (U1) will flow to overland towards the existing Borrisokane Road ditch. Once collected within the Borrisokane roadside ditch, stormwater will be conveyed approximately 1 km downstream towards the Jock River. Stormwater runoff within U1 is predominately landscaped areas. Quality controls will be provided via the existing Borrisokane ditch. Refer to drawing ***STM-1***, accompanying this report, for a detailed drainage plan.

Runoff collected along the southern side of the subject site (U2) will flow overland south of the subject site. Stormwater within this area is considered clean as it is landscaping drainage. Pre-treatment is not anticipated to be required. Refer to drawing ***STM-1***, accompanying this report, for a detailed drainage plan.

Uncontrolled areas, as shown by drawing ***STM-1*** provided along with this report, will be released uncontrolled to municipal right-of-ways and will be compensated for in areas with flow attenuation controls. The proposed major system will ultimately be the Borrisokane Road ditch system. As noted by ***Table 1,*** below, the unattenuated flow rate during a 100-year storm event is estimated to be ***58.2 L/s***. The remainder of the site will control stormwater to a rate of ***152.2 L/s***. Refer to the stormwater calculations included in ***Appendix D*** for further details.

Stormwater runoff from the development is proposed to be collected via an internal storm sewer network and conveyed to a stormwater storage area located within the eastern portion of the site. Based on coordination with City staff, the controlled release rate is proposed to be reduced by half to account for the change in head, resulting in an allowable release rate of ***75.9 L/s***. It is calculated that ***3,290.1 m^3*** of stormwater is required. Refer to drawing ***GP-1*** and ***GP-2***, accompanying this report, and detailed calculations located in ***Appendix D*** for further details.

Stormwater runoff collected from parking areas, storage yard, and drive aisles will be conveyed via the internal storm sewer network to a *Hydroworks HS 8* oil/grit separator (OGS) or an approved equivalent prior to discharging into the stormwater storage area. Refer to ***Appendix D*** for detailed sizing report.

Stormwater runoff collected from the assembly building rooftop and foundation will be conveyed to an infiltration system. The infiltration system was sized to store ***91.4 m^3*** of runoff prior to overflowing into the stormwater management pond. The infiltration system was designed to include a 450 mm perforated pipe surrounded by 25 mm clearstone in a 1.2 m wide trench, with 0.2 m of stone above and below the pipe. The system, complete with clearstone surrounding, will act as a soakaway pit. Refer to drawing ***GP-2*** and ***SSP-1***, accompanying this report, for further details.

Stormwater runoff collected from landscaped areas will be conveyed directly to the stormwater storage area.

JFSA prepared an analysis of 39 years rainfall data to assess the amount of infiltration between the existing and post-development site conditions. The existing site was estimated to infiltrate 81.7 mm annually over the 39 years of historical storms. The proposed condition, including infiltration in the landscape areas and the proposed soak away pit was estimated to infiltrate 65.8 mm annually. Note that the analysis did not consider any infiltration on the developed lands (higher impervious areas) within the site, and the soak away trench infiltration value (30mm) was reduced by a factor of 2.5 and only considered the bottom of the trench as permeable.

The stormwater is attenuated in the storage area via a ***251 mm ICD*** located in the north invert at maintenance structure (STM MH 204). The ICD will be protected against blockage with a Brentwood Storm Shield goss trap or approved equivalent.

Stormwater will be conveyed from the storage area to the inlet of the Drummond Stormwater Management pond via a ***600 mm*** diameter storm sewer. The Drummond SWM facility discharges to the Borrisokane Road side ditch north of Cambrian Road, where runoff is ultimately conveyed to the Jock River. Refer to detailed drawings, accompanying this report, for further details.

The stormwater management strategy contemplates the Phase II conditions to size the storage area for the future development without the need for modifications to the facility during Phase 2. Refer to drawing ***STM-1*** for a Phase II drainage plan. ***Table 6,*** below, summarizes post-development flow rates for the contemplated ultimate development.

Table 6
Stormwater Flow Rate Summary

Control Area	5-Year Release Rate	5-Year Storage	100-Year Release Rate	100-Year Required Storage	100-Year Available Storage
	(L/s)	(m^3)	(L/s)	(m^3)	(m^3)
Unattenuated Areas (U1 & U2)	27.2	0.0	58.2	0.0	0.0
Attenuated Areas (L1, L2, CB12, CB8, STM100, STM101, STM200, STM202, BLDG A, BLDG B)	117.5	1362.4	151.9	3290.1	3295.2
Total	**144.8**	**1362.4**	**210.0**	**3290.1**	**3295.2**

It was estimated that approximately ***3,290.1 m^3*** of storage is required to meet the established allowable release rates outlined in Section 5.2. Storage calculations are contained within ***Appendix D***.

5.4 Stormwater Management System Maintenance/Best Management Practices

The following maintenance and best management practices will be implemented for the proposed development:

- Building rooftop runoff from BLDG B to be directed to the LID system in an effort to separate clean roof runoff from general parking lot drainage;
- Regular maintenance of the site stormwater management system, including annual cleaning of the ICD, inlets, outlets, and limiting the use of salt, sand and gravel in parking lots during the winter months, in addition to spring sweeping of parking areas;
- Recommend that grit be used rather than sodium de-icing solutions during winter months; and
- Any material storage (if required) on-site is to be provide adequate protection to ensure any spills do not enter the stormwater storage system.

5.5 Stormwater Servicing Conclusions

Stormwater runoff from the development is proposed to be collected via an internal storm sewer network and conveyed to the inlet of the Drummond Stormwater Management pond via a ***600 mm*** diameter storm sewer.

Based on coordination with City staff, post development stormwater runoff will be restricted to a release rate of ***210.4 L/s***. The estimated flow rate generated from the subject site during a 100-year storm event is ***210.0 L/s***, achieved by the use of a stormwater storage area. ***3,290.1 m^3*** of stormwater is required to be retained on-site.

Stormwater runoff collected from storage yards, parking areas, and drive aisles will be conveyed via the internal storm sewer network towards the storage area. As depicted by drawing ***SSP-1***, stormwater quality controls to an enhanced level of treatment will be achieved with the use of a *Hydroworks HS 8 OGS* or an approved equivalent. Remainder of stormwater runoff is considered clean and therefore is not anticipated to require additional quality measures.

Stormwater runoff collected from the assembly building rooftop and foundation will be conveyed to an infiltration system. The infiltration system was sized to store ***91.4 m^3*** of runoff prior to overflowing into the stormwater management pond. The infiltration system was designed to include a 450 mm perforated pipe surrounded by 25 mm clearstone in a 1.2 m wide trench, with 0.2 m of stone above and below the pipe. The system, complete with clearstone surrounding, will act as a soakaway pit.

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. During construction the extent of erosion losses is exaggerated due to the removal of vegetation and the top layer of soil becoming 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; and
- Establish material stockpiles away from watercourses, so that barriers and filters may be installed.

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

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

8.0 CONCLUSION AND RECOMMENDATIONS

David Schaeffer Engineering Ltd. (DSEL) has been retained by Caivan Greenbank North Inc. to prepare a Site Servicing and Stormwater Management Report in support of the application for a Site Plan Control (SPC) at 3713 Borrisokane Road. The preceding report outlines the following:

- Based on ***The Ridge Subdivision Servicing Design***, the municipal water infrastructure is capable of providing the development with water within the City's required pressure range;
- Based in correspondence with Lowe Fire Protection Inc., the fire flow demand was estimated as ***2,294 L/min*** (606 US gpm) for the assembly plant;
- In accordance with City of Ottawa technical bulletin ISDTB-2014-02, redundant service connections are required when estimated average daily flows are greater than 50 m^3/day. The development calculates an average daily demand of 48.8 m^3/day therefore, a looped watermain connection is not required;
- The development is estimated to have a peak wet weather flow of ***3.27 L/s***; Based on ***The Ridge Subdivision Servicing Design*** sanitary sewer design sheets, the municipal infrastructure has sufficient capacity to support the development;
- Post development stormwater runoff will be restricted to a release rate of ***210.4 L/s***, based on the ***BSUEA MSS*** and coordination with City staff. Stormwater storage will be provided by the use of a depressed storage area;
- Stormwater runoff from the development is proposed to be collected via an internal storm sewer network and conveyed to the Drummond Stormwater pond. In order to control stormwater to the established release rate, ***3,290.1 m^3*** of stormwater is required;
- Stormwater runoff collected from the assembly building rooftop and foundation will be conveyed to an infiltration system. The infiltration system was sized to store ***91.4 m^3*** of runoff prior to overflowing into the stormwater management pond; and
- Stormwater quality controls to an enhanced level of treatment will be achieved with the use of a *Hydroworks HS 8* or an approved equivalent and the existing Borrisokane roadside ditch.

Prepared by,
David Schaeffer Engineering Ltd.

Per: Adam D. Fobert, P.Eng.

z:\projects\19-1134_abic_caivan\b_design\b3_reports\b3-2_servicing (dsel)\2020-12-17_sub6_full-serv\spa-2021-01-11_1134_adf.docx

APPENDIX A

Pre-Consultation

DEVELOPMENT SERVICING STUDY CHECKLIST

19-1134 21/05/2020

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

To: Hugo Lalonde
Subject: RE: ABIC pre-consult

From: Moore, Sean <Sean.Moore@ottawa.ca>
Sent: October-30-19 2:20 PM
To: Julie Carrara <carrara@fotenn.com>; Frank Cairo <frank.cairo@caivan.com>
Cc: Shillington, Jeffrey <jeff.shillington@ottawa.ca>; Rehman, Sami <Sami.Rehman@ottawa.ca>; Xu, Lily <Lily.Xu@ottawa.ca>; Giampa, Mike <Mike.Giampa@ottawa.ca>
Subject: 3713 Borrisokane Road

Hi Julie,

Concerning the September 30th 2019 preconsultation meeting for 3713 Borrisokane Road please find below the submission requirements for the proposed Site Plan Control, Zoning By-law Amendment and Official Plan Amendment applications. Let me know if you have any questions/clarifications.

Zoned: ME2
Official Plan Designation: 'Mineral Aggregate Resource' Area

The project: A proposal at 3713 Borrisokane for a 125,000 s.f advanced manufacturing building and visitor experience centre. It is understood that the application will now come forward on private services (private water and private wastewater).

List of required Plans/Reports with your application:

Required Plans:
- Site Plan (3 copies)
- Landscape Plan (3 copies)
- Grading Plan (3 copies)
- Site Servicing Plan (3 copies)
- Survey Plan (2 copies)
- Architectural Elevation Plans (3 copies)
- Erosion and Sediment Control Plan (3 copies)
- Roadway Modification (if required through the TIA)

Required Reports:
- Planning Rationale, with Integrated Environmental Review (3 copies)
- Hydrogeological Report and Terrain Analysis (3 copies)]
- Groundwater Impact Assessment – concerning Kars Esker
- Stormwater Management Report (3 copies)
- Transportation Impact Assessment (3 copies)
- Detailed Noise Control Study (3 copies) – impact on adjacent residential / urban boundary lands
- Geotechnical Study (3 copies)
- Phase 1 ESA (3 copies) – to conformity with OReg 153/04
- Environmental Impact Statement (2 copies)

- Tree Conservation Report (3 copies) – if trees are identified on the site
- Confirmation from the MNR the Sand and Gravel resource has been depleted and/or the resource is not suitable for exploitation.

All required plans & reports are to be provided in digital format (.pdf) at application submission in addition to any required hard copies.

Site Plan Control Fee: $32,106.89
Complex (Manager Approval)
Conservation Authority Fee $995

Zoning By-law amendment Fee: $16,960.99
Complex (Manager Approval)
Conservation Authority Fee $370

Official Plan amendment Fee: $20,760.99
Complex (Manager Approval)
Conservation Authority Fee $735

Planning Policy Comments:

- The current Official Plan designation is 'Mineral Aggregate Resources' area (Section 3.7.4) and the lands are located in the Rural Area of the Official Plan. Section 3.7.4, policy 15 states that:

  "Where the sand, gravel or bedrock mineral aggregate resources of a property have been fully extracted, the site fully rehabilitated and an aggregate license surrendered, the property may be used for other purposes. Under this circumstance the City will not require the proponent to amend the Official Plan; instead the Plan will be amended to accurately reflect the new use at the time of the next comprehensive Official Plan update or through a general Official Plan amendment"

  However,

- Section 3.7.4, policy 17 states:

  In Sand and Gravel Resource Areas where it is shown that resources are depleted or not suitable for exploitation, the property may be used for purposes listed in Section 3.7.3 or additional new uses as follows: [Ministerial Modification 28, November 10, 2003] [Amendment #150, December 21, 2017]

  a. If the lands are predominantly surrounded by an Agriculture Resource designation, the uses identified in Section 3.7.3 for Agricultural Resource Areas may be permitted. Where a pit license has been surrendered and the pit was located on prime agricultural lands, the site will be rehabilitated for productive agricultural use except where extraction has occurred below the water table; or if the lands are predominantly surrounded by designations other than Agricultural Resource, the uses in Section 3.7.2 for the General Rural Area, including farming, may be permitted

- If the use was a 'General Rural' or 'Agricultural' use, suitable to those applicable designations no applicant driven OPA would be required. However, when we examine the policies of

Sections 3.7.2 and 3.7.3, it is apparent that the proposed office and industrial use are more suited to for the Rural Employment Area (3.7.5). At this time in the City's new OP review we are not in a position to recommend any new Rural Employment Area's, but would suggest a proponent driven OPA to Section 3.7.2 for a site specific policy at 3713 Borrisokane.

- It is our opinion that because an exception policy is required for Section 3.7.2 to permit this type of use, we can not rely on Policy 15 (Section 3.7.4). Therefore an Official Plan Amendment is required to bring in this special policy to the General Rural Area Section.

Environmental Comments:

- An EIS will be required as outlined in OP Section 4.7.8. The requirements are outlined in the EIS guidelines: https://documents.ottawa.ca/sites/documents/files/documents/eis_guidelines2015_en.pdf
- There are species at risk identified on the property and within the vicinity. The EIS should also address significant woodlands and other natural features on the subject property. For Site Plan Control, a Tree Conservation Report (TCR) is required, which can be combined with the EIS to reduce duplications.

  TCR guidelines are : https://ottawa.ca/en/living-ottawa/environment/trees-and-forests/tree-protection#tree-conservation-report-guidelines

- We will require a Groundwater Impact Assessment to understand development impacts on the Kars Esker and potential for interfering with the groundwater regime

Engineering Comments:

- The Stormwater Management Report will need to outline the drainage area, storm sewer design and outlet. Including quality and quantity criteria

Transportation Comments:

- We will require confirmation on how private development will be permitted to front onto the Borrisokane Road (MTO corridor). This property will need 'public street' frontage, and we should discuss how we are resolving this segment of MTO service corridor/road (do we deal with this through the Zoning By-law Amendment?)

Regards,

Sean Moore MCIP, RPP
Planner III | Urbaniste III
Development Review (South Services) | Examen des projets d'aménagement (services sud)
Planning, Infrastructure and Economic Development | Services de planification, d'infrastructure et de développement économique

City of Ottawa | Ville d'Ottawa
☎ 613.580.2424 ext./poste 16481
ottawa.ca/planning / ottawa.ca/urbanisme

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Alison Gosling

To: Hugo Lalonde
Subject: RE: 3713 Borrisokane Road - rural servicing

From: Hugo Lalonde <hugo.lalonde@caivan.com>
Sent: April 14, 2020 1:27 PM
To: Alison Gosling <AGosling@dsel.ca>; Adam Fobert <AFobert@dsel.ca>; Steve Pichette <SPichette@dsel.ca>
Subject: FW: 3713 Borrisokane Road - rural servicing

See below and attached from City on pre-infiltration treatment. Other than typical parking lot run off there is no anticipated pollutants associated with this use.

Thanks

HUGO LALONDE
Director, Land Development
2934 Baseline Road, Suite 302
Ottawa, ON K2H 1B2
C: 613-295-5082 O: 613-518-1864 ext. 503

CAIVAN
COMMUNITIES

From: Moore, Sean <Sean.Moore@ottawa.ca>
Sent: Tuesday, April 14, 2020 1:20 PM
To: Hugo Lalonde <hugo.lalonde@caivan.com>
Subject: FW: 3713 Borrisokane Road - rural servicing

Hi Hugo,

Please find below some comments from John Bougadis with a related attachment

Sean

"Pretreatment off runoff in pollution hot spots and parking lots will be required prior to infiltration (see highlighted text in attached PDF)."

From: Moore, Sean <Sean.Moore@ottawa.ca>
Sent: April 09, 2020 16:39
To: hugo.lalonde@caivan.com; Michael Killam <mkillam@patersongroup.ca>; spichette@dsel.ca
Cc: Kearney, Michel <Michel.Kearney@ottawa.ca>; Nielsen, Gen <Gen.Nielsen@ottawa.ca>; Bougadis, John <John.Bougadis@ottawa.ca>; Rogers, Christopher <Christopher.Rogers@ottawa.ca>; Xu, Lily <Lily.Xu@ottawa.ca>;

Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Subject: 3713 Borrisokane Road - rural servicing

Hugo,

Please find a key summary of todays meeting. Please advise if you have any questions with the information provided.

There are 4 steps to rural servicing of this property:

1. Septic tank detail is required to understand or confirm that the tanks are above the water and will not draw water
2. The private well has been addressed through the Hydrogeological Report and no interaction with the leachate plume is expected. It is thought that the water feeding the leaching beds is good for infiltration
3. The on-site stormwater facility will be an infiltration pond. This will be independent of the suburban SWM facility to the immediate north. We will need to confirm that the bottom of this infiltration facility does no go deeper than the ground water table
4. An ECA would be required for full build-out of the site (both office and manufacturing facility). This is because the site would have over 10,000 l/day going to the septic system. An ECA could take 8-10 months as a direct submission to the Ministry. There are two ways of dealing with this:
    A. The City could require the applicant to preconsult with the Ministry now and approve a site plan that deals with the full build-out so we do not piecemeal the ECA requirement. OR
    B. The City could use a 2 phased approach to the site plan approval process. Phase 1 approval could illustrate the manufacturing facility and the private septic servicing to accommodate that facility. A phase 2 site plan would be required at a later date to come forward with the office and the remainder of the private septic servicing. This means that the site can proceed without the 8-10 month delay and Ministry approval. We could approve an overall Master Site Plan where the office is ghosted out such that we have an idea of what will come forward as a future site plan.

- Note 1: Site Plan would only proceed if it can be demonstrated that the site does not have any potential impact on the plume (by staying above the water table).
- Note 2: There is a process for an expedited ECA that could be discussed with Jeff Shillington.

The next submission is expected mid to end of next week from Caivan.

Regards,

Sean Moore
Senior Planner
City of Ottawa
Planning, Infrastructure and Economic Development Dept.

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Table 2.8.1 Types of stormwater source areas, typical runoff characteristics and opportunities for treatment and use

Stormwater Source Area	Runoff Characteristics	Opportunities	Principles
Foundation drains, slab underdrains, road or parking lot underdrains	Relatively clean, cool water.	Suitable for infiltration or direct discharge to receiving watercourses.	Should not be directed to stormwater management facility that receives road or parking lot runoff.
Roof drains, roof terrace area drains, overflow from green roofs	Moderately clean water, contaminants may include asphalt granules, low levels of hydrocarbons and metals from decomposition of roofing materials, animal droppings, natural organic matter and fall out from airborne pollutants, potentially warm water.	- Infiltration; - Filtration; - Harvesting with rain barrels or cisterns and use for non-potable purposes (*e.g.*, irrigation, toilet flushing) after pretreatment; - Attenuation and treatment in wet pond or wetland detention facility.	Runoff should be treated with a sedimentation and/or filtration practice prior to infiltration. Where possible, runoff should not be directed to end-of-pipe facilities to capitalize on potential for infiltration or harvesting. Flow moderation (quantity control) prior to discharge to receiving watercourse is required.
Low and medium traffic roads and parking lots, driveways, pedestrian plazas, walkways	Moderately clean water, contaminants may include low levels of sediment, de-icing salt constituents, hydrocarbons, metals and natural organic matter. Typically warm water.	- Infiltration after pretreatment; - Filtration after pre-treatment; - Harvesting with cisterns or permeable pavement reservoirs and use for outdoor non-potable purposes (*e.g.*, vehicle washing, irrigation) after pretreatment; - Attenuation and treatment in wet pond or wetland detention facility.	Runoff should be treated with a sedimentation and/or filtration practice prior to infiltration. Flow moderation (quantity control) prior to discharge to receiving watercourse is required. Water quality should be tested prior to use for non-potable purposes.
High traffic roads and parking lots	Potential for high levels of contamination with sediment, de-icing salt constituents hydrocarbons and metals. Typically warm water.	- Filtration after sedimentation pre-treatment; - Attenuation and treatment in wet pond or wetland detention facility; - Infiltration after pretreatment only where groundwater uses are limited.	Runoff should be treated with a sedimentation and/or filtration pretreatment practice prior to infiltration.
Pollution hot spots* such as vehicle fueling, servicing or demolition areas, outdoor storage and handling areas for hazardous materials, some heavy industry sites	Potential for high levels of contamination with sediment, de-icing salt constituents, hydrocarbons, metals, and other toxicants.	- Attenuation and treatment in wet pond, wetland or hybrid detention facility; - Potential requirement for sedimentation pretreatment; - Infiltration and harvesting practices not recommended.	Runoff from these sources should not be infiltrated or used for irrigation. Spill containment or mitigation devices recommended contingent on size of storage facilities.

* *Pollution hot spots* are areas where certain land uses or activities have the potential to generate highly contaminated runoff (*e.g.*, vehicle fuelling, service or demolition areas, outdoor storage and handling areas for hazardous materials and some heavy industry sites).

Ontario

Ministry of the Environment, Conservation and Parks
Ministère de l'Environnement, de la Protection de la nature et des Parcs

ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 1799-BTHJMX
Issue Date: September 18, 2020

Caivan Greenbank Development Corporation
2934 Baseline Road, Suite 302
Ottawa, Ontario
K2H 1B2

Site Location: The Ridge Subdivision
Part of Lots 8 to 9, Concession 3 (Rideau Front)
City of Ottawa, Ontario

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

the establishment of wastewater infrastructure Works located in the City of Ottawa , consisting of the following:

- **sanitary sewers** on Elevation Road (from approximately 24 metres south of Eminence Street to Haiku Street), Obsidian Street (from approximately 14 metres south of Epoch Street to Future Street north of Haiku Street), Sturnidae Street (from approximately 11 metres east of Travertine Way to Elevation Road), Chillerton Drive (from Elevation Road to approximately 35 metres west of Obsidian Street), Haiku Street (from approximately 175 metres west of Expansion Road and Travertine Way to Obsidian Street), Haiku Street (High Level Sewer) (from approximately 7 metres east of Elevation Road to Elevation Road), Haiku Street (High Level Sewer) (from approximately 12 metres east of Elevation Road to Obsidian Street), Montology Way (from Travertine Way to approximately 13 metres north of Sturnidae Street), Travertine Way (from Sturnidae Street to Haiku Street), Foundation Lane (from Appalachian Circle to Travertine Way), Appalachian Circle (from the west leg of Rugosa Street to the west leg of Rugosa Street), Rugosa Street (from the west leg approximately 218 metres east of Appalachian Circle to the east leg at Appalachian Circle), Focality Crescent (from the west leg approximately 265 metres east of Haiku Street to the east leg at Haiku Street), Canadensis Lane (from approximately 13 metres north of Epoch Street to Chillerton Drive), Surface Lane (from approximately 14 metres north of Epoch Street to Chillerton Drive), Epoch Street (from Elevation Road to approximately 14 metres west of Obsidian Street), Eminence Street (from Elevation Road to approximately 13 metres west of Obsidian Street), Expansion Road (from Haiku Street to Future Street), Future Street (off of Obsidian Street) (from Obsidian Street to Future Greenbank Road), and Future Greenbank Road (from Future Street to Cambrian Road), discharging to existing sewers, located approximately 15 metres south of Cambrian Road; and

- **storm sewers** on Elevation Road (from approximately 23 metres south of Eminence Street to Haiku Street), Obsidian Street (from 10 metres south of Epoch Street to Haikue Street), Sturnidae Street (from approximately 12 metres east of Travertine Way to approximately 33 metres west of Elevation Road), Chillerton Drive (from Elevation Road to approximately 32 metres west of Obsidian Street), Haiku Street (from 175 metres west of Expansion Road and Travertine Way to Obsidian Street), Montology Way (from Travertine Way to Sturnidae Street), Travertine Way (from Sturnidae Street to Haiku Street), Foundation Lane (from Appalachian Circle to Travertine Way), Appalachian Circle (from the west leg of Rugosa Street to the west leg of Rugosa Street), Rugosa Street (from the west leg of Appalachian Circle to approximately 30 metres west of Elevation Road), Focality Crescent (from the west leg approximately 265 metres east of Haiku Street to the east leg at Haiku Street), Canadensis Lane (from approximately 15 metres north of Epoch Street to Chillerton Drive), Surface Lane (from approximately 13 metres north of Epoch Street to Chillerton Drive), Epoch Street (from Elevation Road to approximately 13 metres west of Obsidian Street), Eminence Street (from Elevation Road to 14 metres west of Obsidian Street), Expansion Road (from Haiku Street to Future Street), Future Street (from approximately 16 metres south of Expansion Road to Expansion Road), Stormwater Block 197 (from Expansion Road to Pond Headwall located approximately 46 metres west of Explansion Road), discharging to a dry pond, located between Expansion Road and Borrisokane Road;

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

all in accordance with the submitted application and supporting documents listed in Schedule "A" forming part of this approval.

For the purpose of this environmental compliance approval, the following definitions apply:

DEFINITIONS

1. "Approval" means this entire document and any schedules attached to it, and the application;

2. "Director" means a person appointed by the Minister pursuant to section 5 of the EPA for the purposes of Part II.1 of the EPA;

3. "District Manager" means the District Manager of the appropriate local District Office of the Ministry, where the Works are geographically located;

4. "EPA" means the *Environmental Protection Act,* R.S.O. 1990, c.E.19, as amended;

5. "Ministry" means the ministry of the government of Ontario responsible for the EPA and OWRA and includes all officials, employees or other persons acting on its behalf;

6. "Owner" means Caivan Greenbank Development Corporation, and includes its successors and assignees;

7. "OWRA" means the Ontario Water Resources Act, R.S.O. 1990, c. O.40, as amended;

8. "Works" means the sewage Works described in the Owner's application, and this Approval.

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

TERMS AND CONDITIONS

1. GENERAL CONDITIONS

1. The Owner shall ensure that any person authorized to carry out work on or operate any aspect of the Works is notified of this Approval and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

2. Except as otherwise provided by these Conditions, the Owner shall design, build, install, operate and maintain the Works in accordance with the description given in this Approval, and the application for approval of the Works.

3. Where there is a conflict between a provision of any document in the schedule referred to in this Approval and the conditions of this Approval, the conditions in this Approval shall take precedence, and where there is a conflict between the documents in the schedule, the document bearing the most recent date shall prevail.

4. Where there is a conflict between the documents listed in Schedule "A" and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

5. The conditions of this Approval are severable. If any condition of this Approval, or the application of any requirement of this Approval to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this Approval shall not be affected thereby.

2. EXPIRY OF APPROVAL

1. This Approval will cease to apply to those parts of the Works which have not been constructed within five (5) years of the date of this Approval.

2. In the event that completion and commissioning of any portion of the Works is anticipated to be delayed beyond the specified expiry period, the Owner shall submit an application of extension to the expiry period, at least twelve (12) months prior to the end of the period. The application for extension shall include the reason(s) for the delay, whether there is any design change(s) and a review of whether the standards applicable at the time of Approval of the Works are still applicable at the time of request for extension,

to ensure the ongoing protection of the environment.

3. CHANGE OF OWNER

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

    a. change of Owner;

    b. change of address of the Owner;

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

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

2. In the event of any change in ownership of the Works, other than a change to a successor municipality, the Owner shall notify in writing the succeeding owner of the existence of this Approval, and a copy of such notice shall be forwarded to the District Manager and the Director.

3. The Owner shall ensure that all communications made pursuant to this condition refer to the number at the top of this Approval.

4. OPERATION AND MAINTENANCE

1. If applicable, any proposed storm sewers or other stormwater conveyance in this Approval can be constructed but not operated until the proposed stormwater management facilities in this Approval or any other Approval that are designed to service the storm sewers or other stormwater conveyance are in operation.

Schedule "A"

1. Application for Environmental Compliance Approval, dated August 6, 2020, received on August 14, 2020, submitted by Caivan Greenbank Development Corporation;

2. Transfer of Review Letter of Recommendation, dated August 14, 2020 and signed by Jeff Shillington, P.Eng., Program Manager, Development Review, City of Ottawa;

    a. Final Plans and Specifications prepared by David Schaeffer Engineering Ltd.

    b. Pipe Data Form - Watermain, Storm Sewer, Sanitary Sewer, and Forcemain Design Supplement to Application for Approval for Water and Sewage Works.

    c. Hydraulic Design Sheets prepared by David Schaeffer Engineering Ltd.

3. Email dated September 11, 2020 from John Sevigny, Senior Project Manager, Development Review, Suburban Services, City of Ottawa.

4. Email dated September 17, 2020 from Jeff Shillington, Senior Project Manager, Development Review, City of Ottawa.

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

REASONS:

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

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

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

4. Condition 4 is included to prevent the operation of stormwater pipes and other conveyance until such time that their required associated stormwater management Works are also constructed.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

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

The Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;
6. The municipality or municipalities within which the project is to be engaged in.

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

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal

The Director appointed for the purposes of
Part II.1 of the Environmental Protection Act
Ministry of the Environment,

655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

Conservation and Parks
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 18th day of September, 2020

A. Ahmed

Aziz Ahmed, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

NM/

c: District Manager, MECP Ottawa
City Clerk, City of Ottawa (D07-16-19-0005)
Jeff Shillington, P.Eng., Program Manager, Development Review, City of Ottawa
John Sevigny, Senior Project Manager, Development Review, Suburban Services, City of Ottawa
Kevin Murphy, David Schaeffer Engineering Ltd.

Ontario

Ministry of the Environment, Conservation and Parks
Ministère de l'Environnement, de la Protection de la nature et des Parcs

ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 9590-BTHKN4
Issue Date: September 18, 2020

Caivan Greenbank Development Corporation
2934 Baseline Road, Suite 302
Ottawa, Ontario
K2H 1B2

Site Location: The Ridge Subdivision
Part of Lots 8 and 9, Concession 3 (Rideau Front)
City of Ottawa, Ontario

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

the establishment of stormwater management Works to serve the Ridge Subdivision, located in the City of Ottawa, consisting of the following:

- **oil and grit separator (catchment area 71.75 hectares):** two (2) oil and grit separators, Model CDS MPMSU5668_10 or Equivalent Equipment, located in Block 198 approximately 33 metres west of Expansion Road, providing Enhanced Level of protection, having a sediment storage capacity of 8,896 litres, an oil storage capacity of 4,435 litres, a total storage volume of approximately 25,960 litres, and a maximum treatment rate of 530 litres per second, receiving inflow from the 750 millimetre diameter storm sewers from MH 400 for oil and grit separator 1, and from MH 500 for oil and grit separator 2, discharging via a 750 millimetre diameter storm back to MH 400 and MH 500, to proposed stormwater dry pond, on Block 198 between Expansion Road and Borrisokane Road, and

the establishment of stormwater management Works to serve the Ridge Subdivision, located in the City of Ottawa, for the collection, transmission, treatment and disposal of stormwater runoff from a total catchment area of 71.75 hectares, to provide Enhanced Level water quality protection via the oil and grit separator units, and to attenuate post-development peak flows to allowable peak flows for all storm events up to and including the 100-year storm event, discharging to existing ditches located on the west side of Borrisokane Road at Cambrian Road and ultimately to the Jock River, consisting of the following:

- **stormwater management facility (catchment area 71.75 hectares):** one (1) dry pond, having a maximum available storage volume of 26,880 cubic metres and a maximum depth of 0.88 metres, complete with one (1) inlet structure, consisting of two (2) 2,250 millimetre diameter storm sewers, one (1) emergency overflow weir and riprap-lined spillway, and one (1) outlet structure, consisting of a 900

millimetre diameter storm outlet pipe equipped with a 675 millimetre diameter vertical circular orifice, allowing a maximum discharge of 1,300 litres per second under the 100-year storm event to proposed pond outfall sewers on Borrisokane Road to existing ditches located at Borrisokane Road at Cambrian Road and ultimately to the Jock River;

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

all in accordance with the submitted application and supporting documents listed in Schedule "A" forming part of this Approval.

For the purpose of this environmental compliance approval, the following definitions apply:

Definitions:

1. "Approval" means this entire document and any schedules attached to it, and the application;

2. "Director" means a person appointed by the Minister pursuant to section 5 of the EPA for the purposes of Part II.1 of the EPA;

3. "District Manager" means the District Manager of the appropriate local District Office of the Ministry, where the Works are geographically located;

4. "EPA" means the *Environmental Protection Act,* R.S.O. 1990, c.E.19, as amended;

5. "Equivalent Equipment" means a substituted equipment or like-for-like equipment that meets the required quality and performance standards of the approved named equipment.

6. "Ministry" means the ministry of the government of Ontario responsible for the EPA and OWRA and includes all officials, employees or other persons acting on its behalf;

7. "Owner" means Caivan Greenbank Development Corporation, and includes its successors and assignees;

8. "OWRA" means the *Ontario Water Resources Act, R.S.O. 1990, c. O.40* , as amended;

9. "Works" means the sewage Works described in the Owner's application, and this Approval.

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

TERMS AND CONDITIONS

1. GENERAL CONDITIONS

1. The Owner shall ensure that any person authorized to carry out work on or operate any aspect of the Works is notified of this Approval and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

2. Except as otherwise provided by these Conditions, the Owner shall design, build, install, operate and maintain the Works in accordance with the description given in this Approval, and the application for approval of the Works.

3. Where there is a conflict between a provision of any document in the schedule referred to in this Approval and the conditions of this Approval, the conditions in this Approval shall take precedence, and where there is a conflict between the documents in the schedule, the document bearing the most recent date shall prevail.

4. Where there is a conflict between the documents listed in Schedule "A" and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

5. The conditions of this Approval are severable. If any condition of this Approval, or the application of any requirement of this Approval to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this Approval shall not be affected thereby.

2. EXPIRY OF APPROVAL

1. This Approval will cease to apply to those parts of the Works which have not been constructed within five (5) years of the date of this Approval.

2. In the event that completion and commissioning of any portion of the Works is anticipated to be delayed beyond the specified expiry period, the Owner shall submit an application of extension to the expiry period, at least twelve (12) months prior to the end of the period. The application for extension shall include the reason(s) for the delay, whether there is any design change(s) and a review of whether the standards applicable at the time of Approval of the Works are still applicable at the time of request for extension, to ensure the ongoing protection of the environment.

3. CHANGE OF OWNER

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

    a. change of Owner;

b. change of address of the Owner;

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

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

2. In the event of any change in ownership of the Works, other than a change to a successor municipality, the Owner shall notify in writing the succeeding owner of the existence of this Approval, and a copy of such notice shall be forwarded to the District Manager and the Director.

3. The Owner shall ensure that all communications made pursuant to this condition refer to the number at the top of this Approval.

4. OPERATION AND MAINTENANCE

1. If applicable, any proposed storm sewers or other stormwater conveyance in this Approval can be constructed but not operated until the proposed stormwater management facilities in this Approval or any other Approval that are designed to service the storm sewers or other stormwater conveyance are in operation.

2. The Owner shall make all necessary investigations, take all necessary steps and obtain all necessary approvals so as to ensure that the physical structure, siting and operations of the Works do not constitute a safety or health hazard to the general public.

3. The Owner shall undertake an inspection of the condition of the Works, at least once a year, and undertake any necessary cleaning and maintenance to ensure that sediment, debris and excessive decaying vegetation are removed from the Works to prevent the excessive build-up of sediment, oil/grit, debris and/or decaying vegetation, to avoid reduction of the capacity and/or permeability of the Works, as applicable. The Owner shall also regularly inspect and clean out the inlet to and outlet from the Works to ensure that these are not obstructed.

4. The Owner shall construct, operate and maintain the Works with the objective that the effluent from the Works is essentially free of floating and settleable solids and does not contain oil or any other substance in amounts sufficient to create a visible film, sheen, foam or discoloration on the receiving waters.

5. The Owner shall maintain a logbook to record the results of these inspections and any cleaning and maintenance operations undertaken, and shall keep the logbook at the

Owner's administrative office for inspection by the Ministry. The logbook shall include the following:

a. the name of the Works; and

b. the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed and method of clean-out of the Works.

6. The Owner shall prepare an operations manual prior to the commencement of operation of the Works that includes, but is not necessarily limited to, the following information:

   a. operating and maintenance procedures for routine operation of the Works;

   b. inspection programs, including frequency of inspection, for the Works and the methods or tests employed to detect when maintenance is necessary;

   c. repair and maintenance programs, including the frequency of repair and maintenance for the Works;

   d. contingency plans and procedures for dealing with potential spills and any other abnormal situations and for notifying the District Manager; and

   e. procedures for receiving, responding and recording public complaints, including recording any follow-up actions taken.

7. The Owner shall maintain the operations manual current and retain a copy at the Owner's administrative office for the operational life of the Works. Upon request, the Owner shall make the manual available to Ministry staff.

5. TEMPORARY EROSION AND SEDIMENT CONTROL

1. The Owner shall install and maintain temporary sediment and erosion control measures during construction and conduct inspections once every two (2) weeks and after each significant storm event (a significant storm event is defined as a minimum of 25 mm of rain in any 24 hours period). The inspections and maintenance of the temporary sediment and erosion control measures shall continue until they are no longer required and at which time they shall be removed and all disturbed areas reinstated properly.

2. The Owner shall maintain records of inspections and maintenance which shall be made available for inspection by the Ministry, upon request. The record shall include the name of the inspector, date of inspection, and the remedial measures, if any, undertaken to maintain the temporary sediment and erosion control measures

6. REPORTING

1. One (1) week prior to the start-up of the operation of the Works, the Owner shall notify the District Manager (in writing) of the pending start-up date.

2. The Owner shall, upon request, make all reports, manuals, plans, records, data, procedures and supporting documentation available to Ministry staff.

3. The Owner shall prepare a performance report within ninety (90) days following the end of the period being reported upon, and submit the report(s) to the District Manager when requested. The first such report shall cover the first annual period following the commencement of operation of the Works and subsequent reports shall be prepared to cover successive annual periods following thereafter. The reports shall contain, but shall not be limited to, the following information:

    a. a description of any operating problems encountered and corrective actions taken;

    b. a summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the Works, including an estimate of the quantity of any materials removed from the Works;

    c. a summary of any complaints received during the reporting period and any steps taken to address the complaints;

    d. a summary of all spill or abnormal discharge events; and

    e. any other information the District Manager requires from time to time.

7. RECORD KEEPING

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

Schedule "A"

1. Application for Environmental Compliance Approval, dated August 6, 2020, received on August 14, 2020, submitted by Caivan Greenbank Development Corporation;

2. Transfer of Review Letter of Recommendation, dated August 14, 2020 and signed by Jeff Shillington, P.Eng., Project Manager, Development Review, City of Ottawa, including the following supporting documents:

    a. Final Plans and Specifications prepared by David Schaeffer Engineering Ltd.

    b. Pipe Data Form - Watermain, Storm Sewer, Sanitary Sewer, and Forcemain Design Supplement to Application for Approval for Water and Sewage Works.

    c. Stormwater Management Report prepared by David Schaeffer Engineering Ltd.

    d. Design brief, calculations and specifications prepared by David Schaeffer Engineering Ltd.

3. Email received on September 11, 2020, from John Sevigny, Senior Project Manger, Development Review, City of Ottawa.

4. Email received on September 17, 2020, from Jeff Shillington, Senior Project Manager, Development Review, City of Ottawa.

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

Reasons:

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

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

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

4. Condition 4 is included as regular inspection and necessary removal of sediment and excessive decaying vegetation from the Works are required to mitigate the impact of sediment, debris and/or decaying vegetation on the treatment capacity of the Works. The Condition also ensures that adequate storage is maintained in the Works at all times as required by the design. Furthermore, this Condition is included to ensure that the Works are operated and maintained to function as designed.

5. Condition 5 is included as installation, regular inspection and maintenance of the temporary sediment and erosion control measures is required to mitigate the impact on the downstream receiving watercourse during construction until they are no longer required.

6. Condition 6 is included to provide a performance record for future references, to ensure that the Ministry is made aware of problems as they arise, and to provide a compliance record for all the terms and conditions outlined in this Approval, so that the Ministry can work with the Owner in resolving any problems in a timely manner.

7. Condition 7 is included to require that all records are retained for a sufficient time period to adequately evaluate the long-term operation and maintenance of the Works.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

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

The Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;
6. The municipality or municipalities within which the project is to be engaged in.

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

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of
Part II.1 of the Environmental Protection Act
Ministry of the Environment,
Conservation and Parks
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 18th day of September, 2020

A. Ahmed

Aziz Ahmed, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

NM/
c: District Manager, MECP Ottawa
City Clerk, City of Ottawa (File No. D07-16-19-0005)
Jeff Shillington, P.Eng., Project Manager, Development Review, City of Ottawa.
John Sevigny, Senior Project Manger, Development Review, City of Ottawa.
Kevin Murphy, David Schaeffer Engineering Ltd

APPENDIX B

Water Supply

3713 Borrisokane Road
Proposed Site Conditions

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

Domestic Demand

Institutional / Commercial / Industrial Demand

				Avg. Daily		Max Day		Peak Hour	
Property Type	**Unit Rate**		**Units**	**m^3/d**	**L/min**	**m^3/d**	**L/min**	**m^3/d**	**L/min**
Water Closets	150.0	L/fixture/hour	8	9.60	6.7	14.4	10.0	25.9	18.0
Lavatories	150.0	L/fixture/hour	8	9.60	6.7	14.4	10.0	25.9	18.0
Kitchen Sinks	375	L/fixture/day	-	0.00	0.0	0.0	0.0	0.0	0.0
Showers	575	L/fixture/hour	-	0.00	0.0	0.0	0.0	0.0	0.0
Mop Sink	375	L/fixture/day	1	1.13	0.8	1.7	1.2	3.0	2.1
Drinking Fountains	375	L/fixture/day	2	2.25	1.6	3.4	2.3	6.1	4.2
Office Space	75	$L/9.3m^2/d$	3,250	26.21	18.2	39.3	27.3	70.8	49.1
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		48.8	33.9	73.2	50.8	131.7	91.5
		Total Demand		**48.8**	**33.9**	**73.2**	**50.8**	**131.7**	**91.5**

Note1: Estimated number of people = 1 person per 9.3 m2
Note 2: Operational Hours = 8 hours/day

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	0.6
Standard tee - flow through	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 (kPa)	Max Day + Fire Flow (Fire Flow at Critical Node) (kPa)	Max Day + Fire Flow (Fire Flow at Node) (kPa)	Peak Hour (kPa)
FH1	549.9	372.7	352.8	343.9
FH2	547.4	352.8	348.2	341.4

Location	Average Day (kPa)	Max Day + Fire Flow (kPa)	Peak Hour (kPa)
B1	549.9	372.2	343.9
B2	543.5	364.1	337.5
FH1	549.9	372.7	343.9
FH2	547.4	352.8	341.4
N1	556.5	381.1	350.5
N3	552.0	374.7	346.0
N4	552.0	374.3	346.0
N5	547.9	368.6	341.9
N6	547.2	367.2	341.2
N7	553.8	377.3	347.8

Adjusted Pressures at Building FFE

Location	Average Day (kPa)	Max Day + Fire Flow (kPa)	Peak Hour (kPa)
B1	525.9	348.3	320.1
B2	519.4	340.3	313.6

Boundary Conditions Unit Conversion (Dundonald Drive)

Grnd Elev	101.7		
	m H_2O	**PSI**	**kPa**
Avg. Day	**156**	77.3	533.0
Peak Hour	**135**	47.4	327.0
Max Day + FF (@10,000 L/min)	**138.5**	52.4	361.3

*Pressures derived from The Ridge Subdivison Design - GeoAdvice water model

```
[TITLE]


[JUNCTIONS]
;ID                  Elev            Demand          Pattern
 N1                  99.27           0                                ;
 N3                  99.73           0                                ;
 FH1                 99.94           0                                ;
 N4                  99.73           0                                ;
 B1                  99.94           15.7                             ;
 N5                  100.15          0                                ;
 B2                  100.60          18.2                             ;
 FH2                 100.20          0                                ;
 N6                  100.22          0                                ;
 N7                  99.55           0                                ;

[RESERVOIRS]
;ID                  Head            Pattern
 R1                  156.0                           ;

[TANKS]
;ID                  Elevation       InitLevel       MinLevel        MaxLevel
        Diameter        MinVol          VolCurve

[PIPES]
;ID                  Node1                   Node2                   Length
        Diameter        Roughness       MinorLoss       Status
 HaikuSt1            N1                      R1                      152
        300             110             5.4             Open    ;
 P3                  N3                      FH1                     16.7
        150             110             5.9             Open    ;
 P4                  N4                      N3                      18.77
        200             110             0.6             Open    ;
 P5                  N4                      B1                      20
        150             100             1.8             Open    ;
 P6                  N5                      N4                      79.15
        200             110             0.6             Open    ;
 P7                  B2                      N5                      3.3
        150             100             1.8             Open    ;
 P9                  FH2                     N6                      3.3
        150             110             5.9             Open    ;
 P10                 N6                      N7                      51.7
        200             110             5.2             Open    ;
 P2                  N1                      N3                      65.4
        200             100             1.6             Open    ;
 P8                  N6                      N5                      21.6
        200             100             1.6             Open    ;
 HaikuSt2            N7                      N1                      163
        300             110             2.4             Open    ;
```

```
[PUMPS]
;ID                      Node1                   Node2                   Parameters

[VALVES]
;ID                      Node1                   Node2                   Diameter
        Type    Setting         MinorLoss

[TAGS]

[DEMANDS]
;Junction                Demand          Pattern                 Category

[STATUS]
;ID                      Status/Setting

[PATTERNS]
;ID                      Multipliers

[CURVES]
;ID                      X-Value         Y-Value

[CONTROLS]

[RULES]

[ENERGY]
 Global Efficiency      75
 Global Price           0
 Demand Charge          0

[EMITTERS]
;Junction                Coefficient

[QUALITY]
;Node                    InitQual

[SOURCES]
;Node                    Type            Quality         Pattern

[REACTIONS]
;Type           Pipe/Tank               Coefficient


[REACTIONS]
 Order Bulk             1
 Order Tank             1
 Order Wall             1
 Global Bulk            0
 Global Wall            0
 Limiting Potential     0
```

```
 Roughness Correlation  0

[MIXING]
;Tank                   Model

[TIMES]
 Duration               0
 Hydraulic Timestep     1:00
 Quality Timestep       0:05
 Pattern Timestep       1:00
 Pattern Start          0:00
 Report Timestep        1:00
 Report Start           0:00
 Start ClockTime        12 am
 Statistic              None

[REPORT]
 Status                 No
 Summary                No
 Page                   0

[OPTIONS]
 Units                  LPM
 Headloss               H-W
 Specific Gravity       1
 Viscosity              1
 Trials                 40
 Accuracy               0.001
 CHECKFREQ              2
 MAXCHECK               10
 DAMPLIMIT              0
 Unbalanced             Continue 10
 Pattern                1
 Demand Multiplier      1.0
 Emitter Exponent       0.5
 Quality                None mg/L
 Diffusivity            1
 Tolerance              0.01

[COORDINATES]
;Node                   X-Coord                 Y-Coord
 N1                     9018.95                 2898.55
 N3                     7248.02                 4156.29
 FH1                    7261.11                 4522.22
 N4                     6053.51                 4158.31
 B1                     6050.00                 5311.11
 N5                     4414.72                 4158.31
 B2                     4405.44                 4575.31
 FH2                    1936.58                 4065.69
 N6                     2695.36                 4065.69
```

```
 N7                     2718.01                2967.16
 R1                     9018.95                2017.84

[VERTICES]
;Link                   X-Coord                Y-Coord
 P2                     8992.07                3737.26
 P2                     8607.02                4065.69
 P2                     7315.97                4144.96

[LABELS]
;X-Coord           Y-Coord          Label & Anchor Node
 4372.22          1200.00          "HYDRAULIC CAPACITY AND MODELING ANALYSIS -
BRAZEAU LANDS (NODE J-33 and J34)"
 5783.74          1986.03          "MHD 156.0 m"
 5800.72          1737.02          "PHD 135.0 m"
 5529.07          1476.69          "MXD FF (10,000 L/min) 138.5 m"
 6817.67          5028.31          "FIRE FLOW REQUIRED 600 US GPM (2730 L/min)"

 1194.44          4988.89          "FIRE FLOW REQUIRED 600 US GPM (2730 L/min)"


[BACKDROP]
 DIMENSIONS             0.00                   0.00                   10000.00
        10000.00
 UNITS                  None
 FILE
 OFFSET                 0.00                   0.00

[END]
```

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

Input File: 2020-09-18_1134.net
```

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
HaikuSt1	N1	R1	152	300
P3	N3	FH1	16.7	150
P4	N4	N3	18.77	200
P5	N4	B1	20	150
P6	N5	N4	79.15	200
P7	B2	N5	3.3	150
P9	FH2	N6	3.3	150
P10	N6	N7	51.7	200
P2	N1	N3	65.4	200
P8	N6	N5	21.6	200
HaikuSt2	N7	N1	163	300

Node Results:

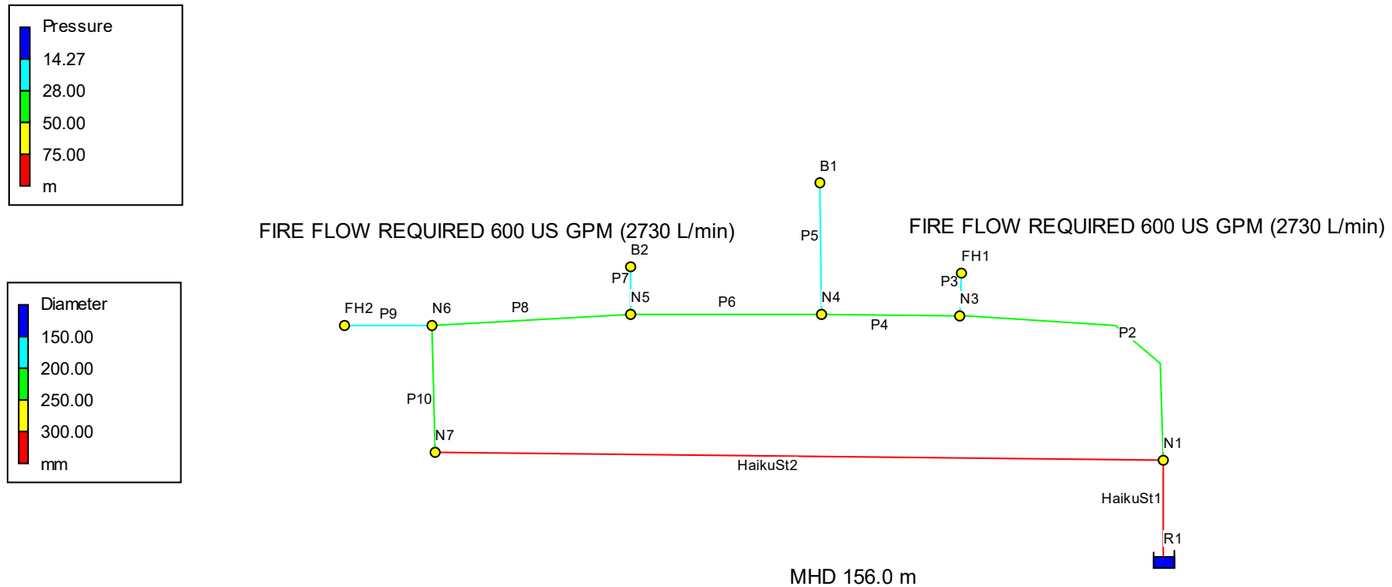
Node ID	Demand LPM	Head m	Pressure m	Quality	
N1	0.00	156.00	56.73	0.00	
N3	0.00	156.00	56.27	0.00	
FH1	0.00	156.00	56.06	0.00	
N4	0.00	156.00	56.27	0.00	
B1	15.70	156.00	56.06	0.00	
N5	0.00	156.00	55.85	0.00	
B2	18.20	156.00	55.40	0.00	
FH2	0.00	156.00	55.80	0.00	
N6	0.00	156.00	55.78	0.00	
N7	0.00	156.00	56.45	0.00	
R1	-33.90	156.00	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
HaikuSt1	-33.90	0.01	0.00	Open
P3	0.00	0.00	0.00	Open
P4	-17.71	0.01	0.00	Open
P5	15.70	0.01	0.01	Open
P6	-2.01	0.00	0.00	Open
P7	-18.20	0.02	0.01	Open
P9	0.00	0.00	0.00	Open
P10	-16.19	0.01	0.00	Open
P2	17.71	0.01	0.00	Open
P8	16.19	0.01	0.00	Open
HaikuSt2	-16.19	0.00	0.00	Open

3713 BORRISOKANE ROAD - AVERAGE DAY DEMAND

Day 1, 12:00 AM



MHD 156.0 m

PHD 135.0 m

MXD FF (10,000 L/min) 138.5 m

HYDRAULIC CAPACITY AND MODELING ANALYSIS - BRAZEAU LANDS (NODE J-33 and J34)

```
[TITLE]


[JUNCTIONS]
;ID                  Elev            Demand          Pattern
 N1                  99.27           0                                ;
 N3                  99.73           0                                ;
 FH1                 99.94           0                                ;
 N4                  99.73           0                                ;
 B1                  99.94           23.5                             ;
 N5                  100.15          0                                ;
 B2                  100.60          27.3                             ;
 FH2                 100.20          2294                             ;
 N6                  100.22          0                                ;
 N7                  99.55           0                                ;

[RESERVOIRS]
;ID                  Head            Pattern
 R1                  138.5                                ;

[TANKS]
;ID                  Elevation       InitLevel       MinLevel        MaxLevel
        Diameter        MinVol          VolCurve

[PIPES]
;ID                  Node1                   Node2                   Length
        Diameter        Roughness       MinorLoss       Status
 HaikuSt1            N1                      R1                      194
        300             110             5.4             Open    ;
 P3                  N3                      FH1                     16.7
        150             100             5.9             Open    ;
 P4                  N4                      N3                      18.77
        200             110             0.6             Open    ;
 P5                  N4                      B1                      20
        150             100             1.8             Open    ;
 P6                  N5                      N4                      79.15
        200             110             0.6             Open    ;
 P7                  B2                      N5                      3.3
        150             100             1.8             Open    ;
 P9                  FH2                     N6                      3.3
        152             100             5.9             Open    ;
 P10                 N6                      N7                      51.7
        200             110             5.2             Open    ;
 P2                  N1                      N3                      65.4
        200             100             1.6             Open    ;
 P8                  N6                      N5                      21.6
        200             100             1.6             Open    ;
 HaikuSt2            N7                      N1                      163
        300             110             2.4             Open    ;
```

```
[PUMPS]
;ID                      Node1                   Node2                   Parameters

[VALVES]
;ID                      Node1                   Node2                   Diameter
        Type    Setting         MinorLoss

[TAGS]

[DEMANDS]
;Junction                Demand          Pattern                 Category

[STATUS]
;ID                      Status/Setting

[PATTERNS]
;ID                      Multipliers

[CURVES]
;ID                      X-Value         Y-Value

[CONTROLS]

[RULES]

[ENERGY]
 Global Efficiency      75
 Global Price           0
 Demand Charge          0

[EMITTERS]
;Junction                Coefficient

[QUALITY]
;Node                    InitQual

[SOURCES]
;Node                    Type            Quality         Pattern

[REACTIONS]
;Type           Pipe/Tank               Coefficient


[REACTIONS]
 Order Bulk             1
 Order Tank             1
 Order Wall             1
 Global Bulk            0
 Global Wall            0
 Limiting Potential     0
```

```
 Roughness Correlation  0

[MIXING]
;Tank                   Model

[TIMES]
 Duration               0
 Hydraulic Timestep     1:00
 Quality Timestep       0:05
 Pattern Timestep       1:00
 Pattern Start          0:00
 Report Timestep        1:00
 Report Start           0:00
 Start ClockTime        12 am
 Statistic              None

[REPORT]
 Status                 No
 Summary                No
 Page                   0

[OPTIONS]
 Units                  LPM
 Headloss               H-W
 Specific Gravity       1
 Viscosity              1
 Trials                 40
 Accuracy               0.001
 CHECKFREQ              2
 MAXCHECK               10
 DAMPLIMIT              0
 Unbalanced             Continue 10
 Pattern                1
 Demand Multiplier      1.0
 Emitter Exponent       0.5
 Quality                None mg/L
 Diffusivity            1
 Tolerance              0.01

[COORDINATES]
;Node                   X-Coord                 Y-Coord
 N1                     9018.95                 2898.55
 N3                     7248.02                 4156.29
 FH1                    7261.11                 4522.22
 N4                     6053.51                 4158.31
 B1                     6050.00                 5311.11
 N5                     4414.72                 4158.31
 B2                     4405.44                 4575.31
 FH2                    1936.58                 4065.69
 N6                     2695.36                 4065.69
```

```
 N7                     2718.01                2967.16
 R1                     9018.95                2017.84

[VERTICES]
;Link                   X-Coord                Y-Coord
 P2                     8992.07                3737.26
 P2                     8607.02                4065.69
 P2                     7315.97                4144.96

[LABELS]
;X-Coord           Y-Coord          Label & Anchor Node
 3705.56          1222.22          "HYDRAULIC CAPACITY AND MODELING ANALYSIS -
BRAZEAU LANDS (NODE J-33 and J-34)"
 5783.74          1986.03          "MHD 156.0 m"
 5800.72          1737.02          "PHD 135.0 m"
 5529.07          1476.69          "MXD FF (10,000 L/min) 138.5 m"
 7933.67          5034.01          "FIRE FLOW REQUIRED 606 US GPM (2294 L/min)"

 8.50             5170.07          "FIRE FLOW REQUIRED 606 US GPM (2294 L/min)"


[BACKDROP]
 DIMENSIONS             0.00                   0.00                   10000.00
        10000.00
 UNITS                  None
 FILE
 OFFSET                 0.00                   0.00

[END]
```

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

Input File: 2020-09-10_1134 -FIRE.net
```

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
HaikuSt1	N1	R1	194	300
P3	N3	FH1	16.7	150
P4	N4	N3	18.77	200
P5	N4	B1	20	150
P6	N5	N4	79.15	200
P7	B2	N5	3.3	150
P9	FH2	N6	3.3	152
P10	N6	N7	51.7	200
P2	N1	N3	65.4	200
P8	N6	N5	21.6	200
HaikuSt2	N7	N1	163	300

Node Results:

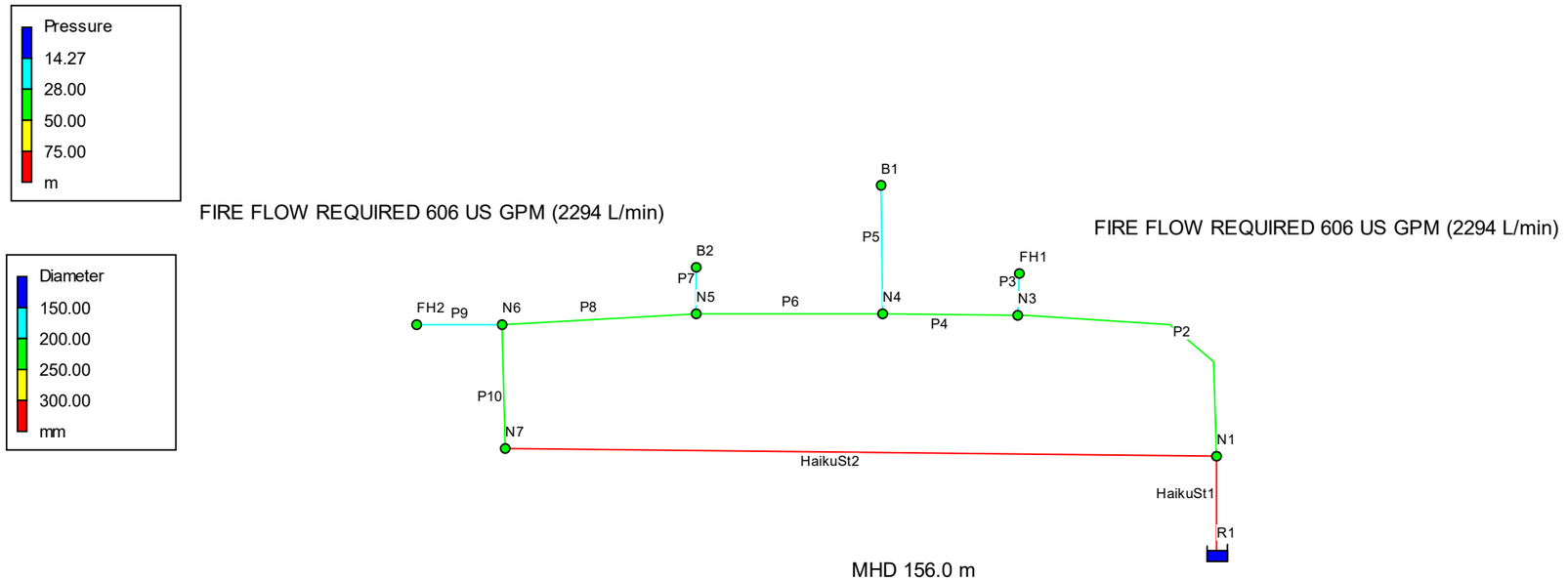
Node ID	Demand LPM	Head m	Pressure m	Quality	
N1	0.00	138.12	38.85	0.00	
N3	0.00	137.93	38.20	0.00	
FH1	0.00	137.93	37.99	0.00	
N4	0.00	137.88	38.15	0.00	
B1	23.50	137.88	37.94	0.00	
N5	0.00	137.72	37.57	0.00	
B2	27.30	137.72	37.12	0.00	
FH2	2294.00	136.16	35.96	0.00	
N6	0.00	137.65	37.43	0.00	
N7	0.00	138.01	38.46	0.00	
R1	-2344.80	138.50	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPM	Velocity m/s	Unit Headloss m/km	Status
HaikuSt1	-2344.80	0.55	1.97	Open
P3	0.00	0.00	0.00	Open
P4	-957.54	0.51	2.53	Open
P5	23.50	0.02	0.01	Open
P6	-934.04	0.50	2.11	Open
P7	-27.30	0.03	0.03	Open
P9	-2294.00	2.11	452.62	Open
P10	-1387.26	0.74	6.96	Open
P2	957.54	0.51	2.84	Open
P8	-906.74	0.48	3.15	Open
HaikuSt2	-1387.26	0.33	0.66	Open

3713 BORRISOKANE ROAD - MAX DAY + FF DEMAND

Day 1, 12:00 AM



MHD 156.0 m

PHD 135.0 m

MXD FF (10,000 L/min) 138.5 m

HYDRAULIC CAPACITY AND MODELING ANALYSIS - BRAZEAU LANDS (NODE J-33 and J-34)

```
[TITLE]


[JUNCTIONS]
;ID                  Elev            Demand          Pattern
 N1                  99.27           0                                ;
 N3                  99.73           0                                ;
 FH1                 99.94           0                                ;
 N4                  99.73           0                                ;
 B1                  99.94           42.3                             ;
 N5                  100.15          0                                ;
 B2                  100.60          49.1                             ;
 FH2                 100.20          0                                ;
 N6                  100.22          0                                ;
 N7                  99.55           0                                ;

[RESERVOIRS]
;ID                  Head            Pattern
 R1                  135                                      ;

[TANKS]
;ID                  Elevation       InitLevel       MinLevel        MaxLevel
        Diameter        MinVol          VolCurve

[PIPES]
;ID                  Node1                   Node2                   Length
        Diameter        Roughness       MinorLoss       Status
 HaikuSt1            N1                      R1                      152
        300             110             5.4             Open    ;
 P3                  N3                      FH1                     16.7
        150             100             5.9             Open    ;
 P4                  N4                      N3                      18.77
        200             110             0.6             Open    ;
 P5                  N4                      B1                      20
        150             100             1.8             Open    ;
 P6                  N5                      N4                      79.15
        200             110             0.6             Open    ;
 P7                  B2                      N5                      3.3
        150             100             1.8             Open    ;
 P9                  FH2                     N6                      3.3
        150             100             5.9             Open    ;
 P10                 N6                      N7                      51.7
        200             110             5.2             Open    ;
 P2                  N1                      N3                      65.4
        200             100             1.6             Open    ;
 P8                  N6                      N5                      21.6
        200             100             1.6             Open    ;
 HaikuSt2            N1                      N7                      163
        300             110             2.5             Open    ;
```

```
[PUMPS]
;ID                      Node1                   Node2                   Parameters

[VALVES]
;ID                      Node1                   Node2                   Diameter
        Type    Setting         MinorLoss

[TAGS]

[DEMANDS]
;Junction                Demand          Pattern                 Category

[STATUS]
;ID                      Status/Setting

[PATTERNS]
;ID                      Multipliers

[CURVES]
;ID                      X-Value         Y-Value

[CONTROLS]

[RULES]

[ENERGY]
 Global Efficiency      75
 Global Price           0
 Demand Charge          0

[EMITTERS]
;Junction                Coefficient

[QUALITY]
;Node                    InitQual

[SOURCES]
;Node                    Type            Quality         Pattern

[REACTIONS]
;Type           Pipe/Tank               Coefficient


[REACTIONS]
 Order Bulk             1
 Order Tank             1
 Order Wall             1
 Global Bulk            0
 Global Wall            0
 Limiting Potential     0
```

```
 Roughness Correlation  0

[MIXING]
;Tank                   Model

[TIMES]
 Duration               0
 Hydraulic Timestep     1:00
 Quality Timestep       0:05
 Pattern Timestep       1:00
 Pattern Start          0:00
 Report Timestep        1:00
 Report Start           0:00
 Start ClockTime        12 am
 Statistic              None

[REPORT]
 Status                 No
 Summary                No
 Page                   0

[OPTIONS]
 Units                  LPM
 Headloss               H-W
 Specific Gravity       1
 Viscosity              1
 Trials                 40
 Accuracy               0.001
 CHECKFREQ              2
 MAXCHECK               10
 DAMPLIMIT              0
 Unbalanced             Continue 10
 Pattern                1
 Demand Multiplier      1.0
 Emitter Exponent       0.5
 Quality                None mg/L
 Diffusivity            1
 Tolerance              0.01

[COORDINATES]
;Node                   X-Coord                 Y-Coord
 N1                     9018.95                 2898.55
 N3                     7248.02                 4156.29
 FH1                    7261.11                 4522.22
 N4                     6053.51                 4158.31
 B1                     6050.00                 5311.11
 N5                     4414.72                 4158.31
 B2                     4405.44                 4575.31
 FH2                    1936.58                 4065.69
 N6                     2695.36                 4065.69
```

```
 N7                     2718.01                2967.16
 R1                     9018.95                2017.84

[VERTICES]
;Link                   X-Coord                Y-Coord
 P2                     8992.07                3737.26
 P2                     8607.02                4065.69
 P2                     7315.97                4144.96

[LABELS]
;X-Coord           Y-Coord          Label & Anchor Node
 4183.33          1288.89          "HYDRAULIC CAPACITY AND MODELING ANALYSIS -
BRAZEAU LANDS (NODE J-33 and J34)"
 5783.74          1986.03          "MHD 156.0 m"
 5800.72          1737.02          "PHD 135.0 m"
 5529.07          1476.69          "MXD FF (10,000 L/min) 138.5 m"
 6817.67          5028.31          "FIRE FLOW REQUIRED 606 US GPM (2294 L/min)"

 805.56           5066.67          "FIRE FLOW REQUIRED 606 US GPM (2294 L/min)"


[BACKDROP]
 DIMENSIONS             0.00                   0.00                   10000.00
        10000.00
 UNITS                  None
 FILE
 OFFSET                 0.00                   0.00

[END]
```

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

Input File: 2020-09-18_1134 -PEAK.net
```

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
HaikuSt1	N1	R1	152	300
P3	N3	FH1	16.7	150
P4	N4	N3	18.77	200
P5	N4	B1	20	150
P6	N5	N4	79.15	200
P7	B2	N5	3.3	150
P9	FH2	N6	3.3	150
P10	N6	N7	51.7	200
P2	N1	N3	65.4	200
P8	N6	N5	21.6	200
HaikuSt2	N1	N7	163	300

Node Results:

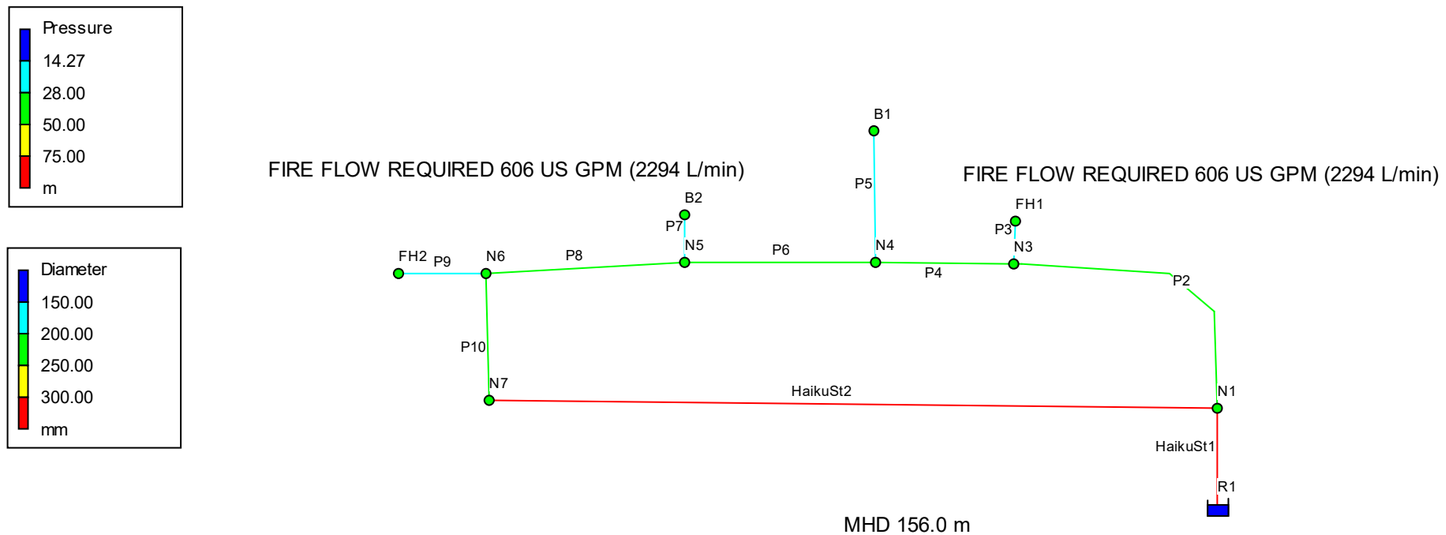
Node ID	Demand LPM	Head m	Pressure m	Quality	
N1	0.00	135.00	35.73	0.00	
N3	0.00	135.00	35.27	0.00	
FH1	0.00	135.00	35.06	0.00	
N4	0.00	135.00	35.27	0.00	
B1	42.30	135.00	35.06	0.00	
N5	0.00	135.00	34.85	0.00	
B2	49.10	135.00	34.40	0.00	
FH2	0.00	135.00	34.80	0.00	
N6	0.00	135.00	34.78	0.00	
N7	0.00	135.00	35.45	0.00	
R1	-91.40	135.00	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
HaikuSt1	-91.40	0.02	0.00	Open
P3	0.00	0.00	0.00	Open
P4	-47.97	0.03	0.01	Open
P5	42.30	0.04	0.04	Open
P6	-5.67	0.00	0.00	Open
P7	-49.10	0.05	0.10	Open
P9	0.00	0.00	0.00	Open
P10	-43.43	0.02	0.01	Open
P2	47.97	0.03	0.01	Open
P8	43.43	0.02	0.01	Open
HaikuSt2	43.43	0.01	0.00	Open

3713 BORRISOKANE ROAD - PEAK HOUR DEMAND

Day 1, 12:00 AM



MHD 156.0 m

PHD 135.0 m

MXD FF (10,000 L/min) 138.5 m

HYDRAULIC CAPACITY AND MODELING ANALYSIS - BRAZEAU LANDS (NODE J-33 and J34)

LOWE FIRE PROTECTION INC.

Mike VanAsseldonk
101-2435 Holly Lane
Ottawa, Ontario K1V 7P2

Telephone: 613-739-5693 (739-LOWE)
Fax: 613-739-2922

June 10, 20120

B.B.S. Construction (Ontario) Ltd

ATT: **Pete Van Grootheest**

ABIC
3713 Borrisokane Road
Ottawa, Ontario

Dear Sir:

Please find below our response to "Building Services" items 2 & 5 for the above referenced project.

RESPONSE TO BUILDING SERVICES INQUIRY 2

- Calculation used to determine the amount of water required for both fire fighting and fire suppression: Sprinkler system design is Ordinary Hazard Group #2 as per NFPA 13, 2013.
- Sprinkler system 0.20 gpm/sqft X 1500sqft = 300gpm
- Outside hoses for fire fighting = 250gpm
- Total GPM is 300gpm sprinkler + 250gpm hoses = 550gpm + 10% = **606gpm**
- TOTAL VOLUME is 606gpm X 90 minutes = 54,540.00 gallons

RESPONSE TO BUILDING SERVICES INQUIRY 5

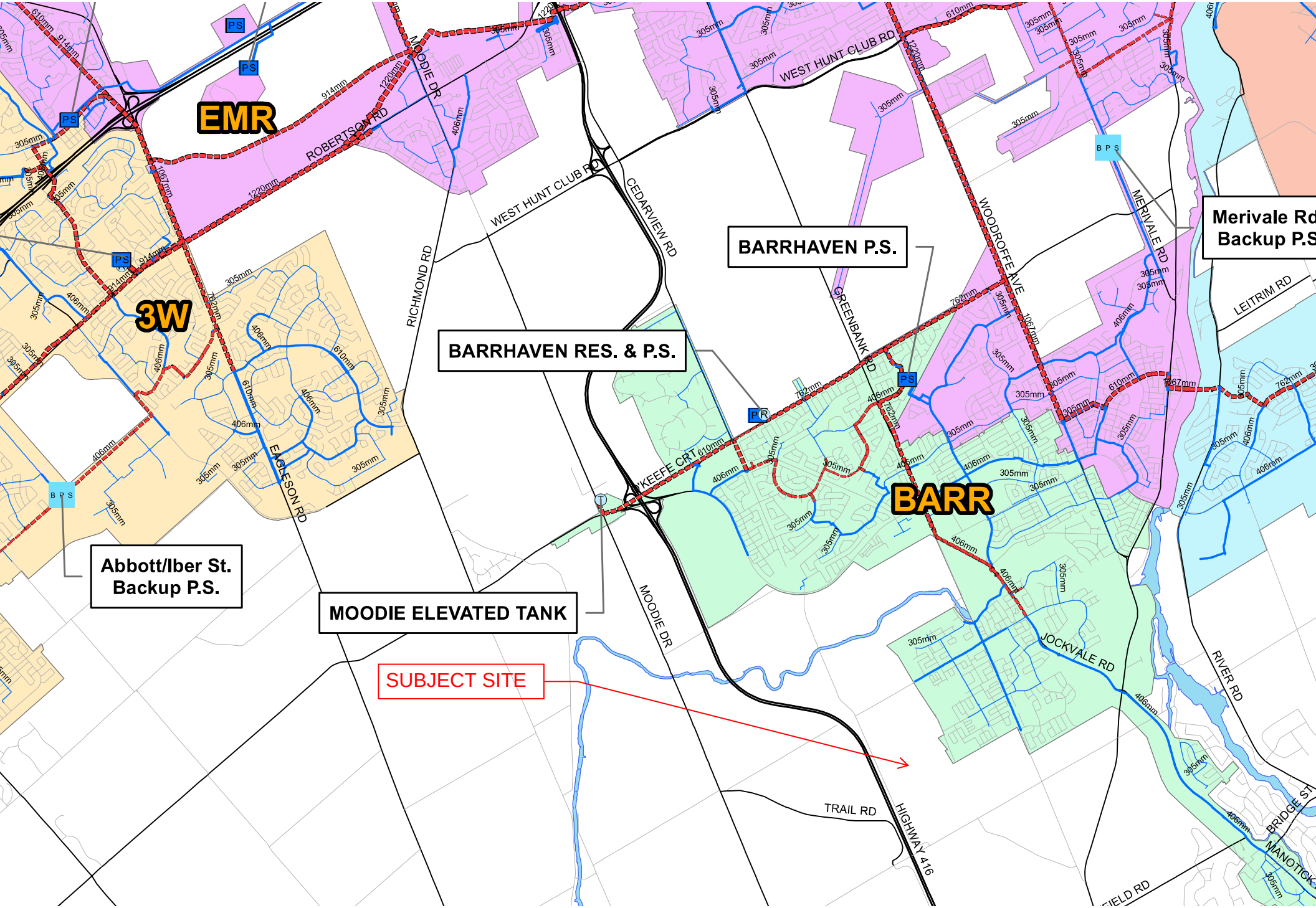
- The sprinkler system design as per NFPA 13, 2013 based on Ordinary Hazard Group 2 with a design density of 0.20 gpm/sqft over 1500 sqft will provide adequate protection of both raw materials and stored materials not exceeding 12' in height

Response to inquiry letter reviewed by R. Goubko of RSG Engineering Inc.

Yours truly,
Lowe Fire Protection Inc.

Mike VanAsseldonk

City of Ottawa - Water Distribution System



Hydraulic Capacity and Modeling Analysis Brazeau Lands

Final Report

Prepared for:
David Schaeffer Engineering Ltd.
120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

Prepared by:
GeoAdvice Engineering Inc.
Unit 203, 2502 St. John's Street
Port Moody, BC V3H 2B4

Submission Date: July 28, 2020

Contact: Mr. Werner de Schaetzen, Ph.D., P.Eng.
Project: 2019-091-DSE

Document History and Version Control

Revision No.	Date	Document Description	Revised By	Reviewed By
R0	November 7, 2019	Draft	Ben Loewen	Werner de Schaetzen
R1	December 20, 2019	Final	Ben Loewen	Werner de Schaetzen
R2	June 10, 2020	Updated Draft	Ferdinand de Schoutheete	Werner de Schaetzen
R3	July 28, 2020	Final	Ferdinand de Schoutheete	Werner de Schaetzen

Contents

1 Introduction

GeoAdvice Engineering Inc. ("GeoAdvice") was retained by David Schaeffer Engineering Ltd. ("DSEL") to size the proposed water main network for the Brazeau Lands development ("Development") in the City of Ottawa, ON ("City").

Under existing conditions, the development will be serviced by the Barrhaven pressure zone; however, in the future, it will be serviced by pressure zone 3C.

There are 347 single detached dwellings, 279 traditional townhomes and 1 park serviced as part of the development.

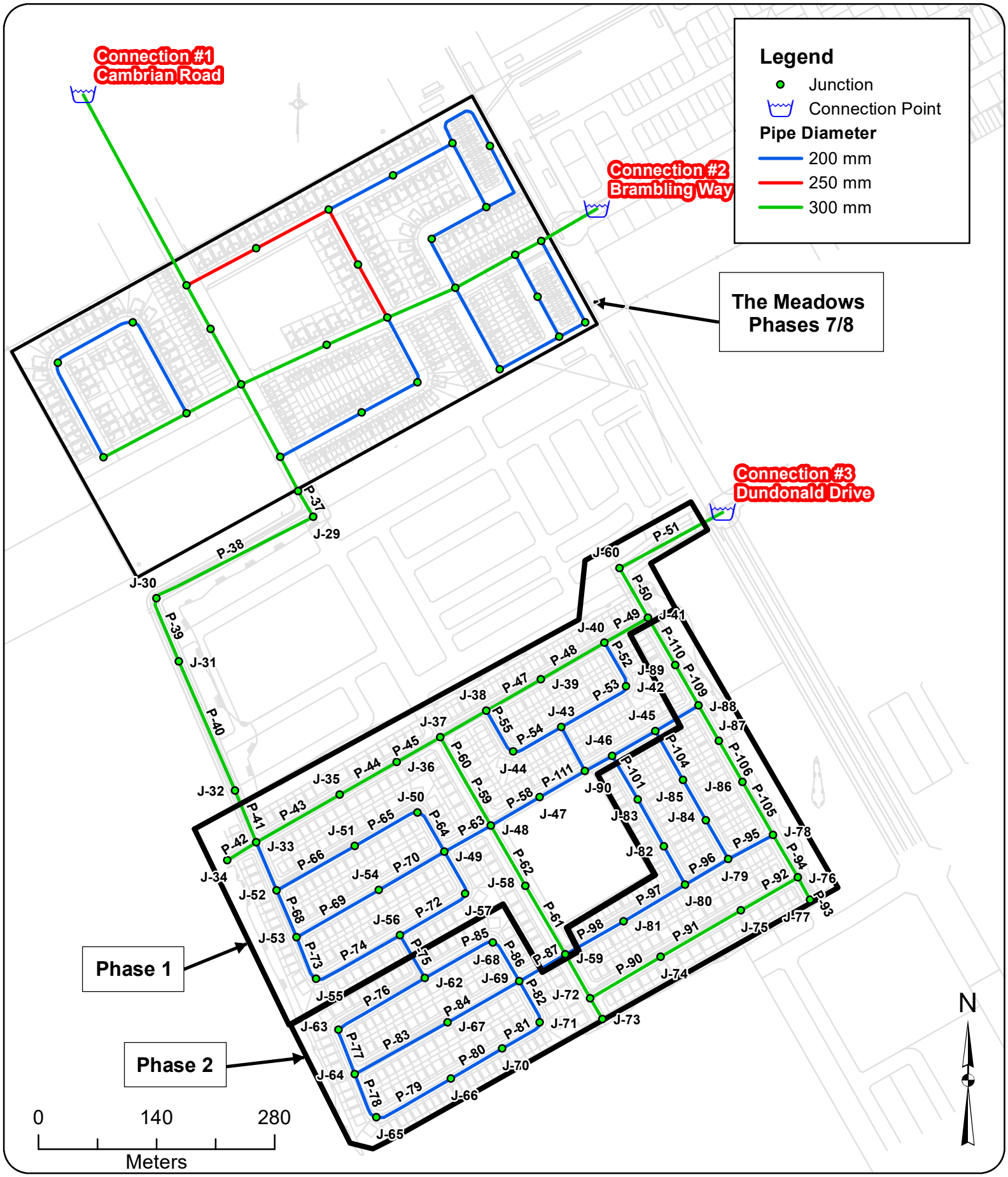
The Brazeau Lands development will have three (3) connections to the City water distribution system:

- Connection 1: Apolune Street and Cambrian Road;
- Connection 2: Jackdaw Avenue and Future Greenbank Road; and
- Connection 3: Dundonald Drive and Future Greenbank Road.

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

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

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



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis of the Brazeau Lands**
Client: **David Schaeffer Engineering Ltd.**
Date: **June 2020**
Created by: **BL**
Reviewed by: **WdS**

Brazeau Lands Site Layout and Connection Points

Figure 1.1

2 Modeling Considerations

2.1 Water Main Configuration

The water main network was modeled based on the drawing prepared by DSEL (1030_Gen_Rev4.dwg) and provided to GeoAdvice on June 2nd, 2020.

2.2 Elevations

Elevations of the modeled junctions were assigned according to a site grading plan prepared by DSEL (1030_Grad_Rev4.dwg) and provided to GeoAdvice on June 2nd, 2020.

2.3 Consumer Demands

Demand factors used for this analysis were taken according to the City of Ottawa 2010 Design Guidelines *Table 4.2 Consumption Rate for Subdivisions of 501 to 3,000 Persons*. Population densities were assigned according to *Table 4.1 Per Unit Populations* from the City of Ottawa Design Guidelines. A summary of these tables highlighting relevant data for this development is shown in **Table 2.1** below.

Table 2.1: City of Ottawa Demand Factors

Demand Type	Amount	Units
Average Day Demand		
Residential	350	L/c/d
Park	28,000	L/ha/d
Maximum Daily Demand		
Residential	2.5 x avg. day	L/c/d
Park	1.5 x avg. day	L/ha/d
Peak Hour Demand		
Residential	2.2 x max. day	L/c/d
Park	1.8 x max. day	L/ha/d
Minimum Hour Demand		
Residential	0.5 x avg. day	L/c/d
Park	0.5 x avg. day	L/ha/d

Table 2.2 and **Table 2.4** summarize the residential water demand calculations for the Brazeau Lands development.

Table 2.2: Development Population and Demand Calculations – Phase 1

Dwelling Type	Number of Units	Persons Per Unit*	Population	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)	Minimum Hour Demand (L/s)
Single Detached	172	3.4	585	2.37	5.92	13.03	1.18
Traditional Townhome	133	2.7	360	1.46	3.65	8.02	0.73

***City of Ottawa Design Guidelines**

Table 2.3: Development Population and Demand Calculations – Phases 1&2

Dwelling Type	Number of Units	Persons Per Unit*	Population	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)	Minimum Hour Demand (L/s)
Single Detached	347	3.4	1,180	4.78	11.95	26.29	2.39
Traditional Townhome	279	2.7	754	3.05	7.64	16.80	1.53

***City of Ottawa Design Guidelines**

Table 2.6 summarizes the non-residential water demand calculations for the Brazeau Lands development (included in both Phase 1 and Phases 1&2).

Table 2.4: Non-Residential Demand Calculations

Land Use Type	Area (ha)	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)	Minimum Hour Demand (L/s)
Park	1.72	0.56	0.84	1.51	0.28

Table 2.5 summarizes the demands for the Meadows Phases 7/8 subdivision development located north of the Brazeau Lands and downstream of Connections 1 and 2 (accounted for in the HGLs provided by the City in the boundary conditions request).

Table 2.5: The Meadows Phases 7/8

Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)	Minimum Hour Demand (L/s)
6.20	13.50	28.50	3.10

Demands were grouped into demand polygons then uniformly distributed to the model nodes located within each polygon. Detailed calculations of demands as well as the illustrated allocation areas are shown in **Appendix A**.

2.4 Fire Flow Demand

Fire flow calculations were completed for all dwelling types in accordance with the Fire Underwriters Survey's (FUS) Water Supply for Public Fire Protection Guideline (1999) and City of Ottawa Technical Bulletin ISTB-2018-02 as summarized in **Appendix B**.

All the single detached dwellings have a minimum separation of 10 m between the backs of adjacent units and are, therefore, subject to the 10,000 L/min (167 L/s) cap outlined in City of Ottawa Technical Bulletin ISDTB-2014-02.

Most of the traditional townhouse dwellings comply with the City of Ottawa Technical Bulletin ISDTB-2014-02 and are, therefore, subject to the 10,000 L/min (167 L/s) cap.

The traditional townhouse dwellings located on Blocks 168 and 384 do not have a minimum separation of 10 m between the backs of adjacent units and therefore do not comply with the provisions under the City of Ottawa Technical Bulletin ISDTB-2014-02. The required fire flow for those blocks were calculated to be 167 L/s based on the Fire Underwriters Survey's (FUS) Water Supply for Public Fire Protection Guideline (1999). The agreement of this calculation with the City of Ottawa cap of 167 L/s is purely coincidental.

At this time, there is not enough information available to calculate the required fire flow of the park. As such, a required fire flow of 250 L/s was assumed for the park. This is a typical, conservative value for similar land use.

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

Detailed FUS fire flow calculations as well as the illustrated spatial allocation of the required fire flows are shown in **Appendix B**.

2.5 Boundary Conditions

The boundary conditions were provided by the City of Ottawa in the form of Hydraulic Grade Line (HGL) at the following locations:

- Connection 1: Apolune Street and Cambrian Road;
- Connection 2: Jackdaw Avenue and Future Greenbank Road; and
- Connection 3: Dundonald Drive and Future Greenbank Road.

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

Boundary conditions were provided for Peak Hour, Maximum Day plus Fire and Minimum Hour (high pressure check) conditions.

Under existing conditions, the Brazeau Lands development will be serviced by the Barrhaven pressure zone; however, in the future, it will be serviced by pressure zone 3C. As such, boundary conditions were provided under the existing and future pressure zone configurations.

In total, two (2) sets of boundary conditions were provided by the City and can be found in **Appendix C**.

The boundary conditions for the existing pressure zone configuration are more conservative. As such, the results presented in this report are based on the boundary conditions for the existing pressure zone configuration.

Table 2.6 summarizes the boundary conditions used to size the Brazeau Lands water network.

Table 2.6: Existing Boundary Conditions

Condition	Connection 1 HGL (m)	Connection 2 HGL (m)	Connection 3 HGL (m)
Min Hour (max. pressure)	156.4	156.4	156.4
Peak Hour (min. pressure)	135.7	135.6	135.7
Max Day + Fire Flow (167 L/s)	144.0	141.2	142.0
Max Day + Fire Flow (250 L/s)	135.4	129.9	131.5

3 Hydraulic Capacity Design Criteria

3.1 Pipe Characteristics

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

Table 3.1: Model Pipe Characteristics

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

3.2 Pressure Requirements

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

Table 3.2: Pressure Requirements

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

4 Hydraulic Capacity Analysis

The proposed water mains within the development were sized to the minimum diameter which would satisfy the greater of maximum day plus fire and peak hour demand. Modeling was carried out for minimum hour, peak hour and maximum day plus fire flow using InfoWater. Only the existing pressure zone configuration was analyzed, since the boundary conditions are more conservative.

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

4.1 Development Pressure Analysis

Modeled service pressures for the development are summarized in **Table 4.1** below.

Table 4.1: Summary of the Brazeau Lands Available Service Pressures

Phase	Minimum Hour Demand Maximum Pressure	Peak Hour Demand Minimum Pressure
Phase 1	538 kPa (78 psi)	290 kPa (42 psi)
Phases 1&2	538 kPa (78 psi)	**262 kPa (38 psi)**

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

Low pressures are predicted at junctions J-66, J-70, J-71, J-72, J-73, J-74, J-75, J-76 and J-77 under peak hour demand. Those low pressures are due to high elevations in the southern part of the Brazeau Lands development and are within 5% of the minimum allowable pressure of 276 kPa (40 psi). The future Zone 3C boundary conditions will provide an additional head of about seven (7) meters at each connection point, and will thus resolve the low PHD pressures at the southern part of the Brazeau Lands development.

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

4.2 Development Fire Flow Analysis

A summary of the minimum available fire flows in the Brazeau Lands development is shown below in **Table 4.2**.

Table 4.2: Summary of the Brazeau Lands Minimum Available Fire Flows

Phase	Required Fire Flow	Minimum Available Flow	Junction ID
Phase 1	167 L/s	177 L/s	J-45
	250 L/s	249 L/s	J-47
Phases 1&2	167 L/s	194 L/s	J-66
	250 L/s	269 L/s	J-47

As shown in the table above, the available fire flow is greater than the required fire flow under both Phase 1 and Phases 1&2 conditions.

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

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

Phase	Maximum Residual Pressure	Average Residual Pressure	Minimum Residual Pressure
Phase 1	365 kPa (53 psi)	296 kPa (43 psi)	140 kPa (20 psi)
Phases 1&2	365 kPa (53 psi)	296 kPa (43 psi)	159 kPa (23 psi)

There is sufficient residual pressure at all the junctions within the Brazeau Lands development.

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

5 Other Servicing Considerations

5.1 Water Supply Security

The City of Ottawa Design Guidelines allow single feed systems for developments up to a total average day demand of 50 m^3/day and require two (2) feeds if the development exceeds 50 m^3/day for supply security, according to Technical Bulletin ISDTB-2014-02.

The Brazeau Lands services a total average day demand of 725 m^3/day; as such, two (2) feeds are required.

5.2 Valves

No comment has been made in this technical memorandum with respect to exact placement of isolation valves within the distribution network for the Brazeau Lands other than to summarize the City of Ottawa Design Guidelines for number, location, and spacing of isolation valves:

- Tee intersection – two (2) valves
- Cross intersection – three (3) valves
- Valves shall be located 2 m away from the intersection
- 300 m spacing for 150 mm to 400 mm diameter valves
- Gate valves for 100 mm to 300 mm diameter mains
- Butterfly valves for 400 mm and larger diameter mains

Drain valves are not strictly required under the City of Ottawa Design Guidelines for water mains under 600 mm in diameter. The Guidelines indicate that “small diameter water mains shall be drained through hydrant via pumping if needed.”

Air valves are not strictly required under the City of Ottawa Design Guidelines for water mains up to and including 400 mm in diameter. The Guidelines indicate that air removal “can be accomplished by the strategic positioning of hydrant at the high points to remove the air or by installing or utilizing available 50 mm chlorination nozzles in 300 mm and 400 mm chambers.”

The detailed engineering drawings for the Brazeau Lands are expected to identify valves in accordance with the requirements noted above.

5.3 Hydrants

No comment has been made in this technical memorandum with respect to exact placement of hydrants within the distribution network for the Brazeau Lands other than to summarize the City of Ottawa Design Guidelines for maximum hydrant spacing:

- 125 m for single family unit residential areas on lots where frontage at the street line is 15 m or longer
- 110 m for single family unit residential areas on lots where frontage at the street line is less than 15 m and for residential areas zoned for row housing, doubles or duplexes
- 90 m for institutional, commercial, industrial, apartments and high-density areas

The detailed engineering drawings for the Brazeau Lands development are expected to identify hydrants in accordance with the requirements noted above.

6 Conclusions

The hydraulic capacity and modeling analysis of Phase 1 of the Brazeau Lands development yielded the following conclusions:

- The proposed water main network can deliver all domestic flows, with service pressures expected to range between 290 kPa (42 psi) and 538 kPa (78 psi).
- The proposed water main network is able to deliver fire flows to all junctions.
- Hydraulic modeling was only completed for the existing pressure zone configuration since the boundary conditions are more conservative.

The hydraulic capacity and modeling analysis of Phases 1&2 of the Brazeau Lands development yielded the following conclusions:

- The proposed water main network can deliver all domestic flows except for junctions J-66, J-70, J-71, J-72, J-73, J-74, J-75, J-76 and J-77, with service pressures expected to range between 262 kPa (38 psi) and 538 kPa (78 psi).
- The junctions with low pressures are due to high elevations in the southern part of the Brazeau Lands development and are within 5% of the minimum allowable pressure of 276 kPa (40 psi).
- The future Zone 3C boundary conditions will provide an additional head of about seven (7) meters at each connection point, and will thus resolve the low PHD pressures at the southern part of the Brazeau Lands development.
- The proposed water main network is able to deliver fire flows to all junctions.
- Hydraulic modeling was only completed for the existing pressure zone configuration since the boundary conditions are more conservative.

Submission

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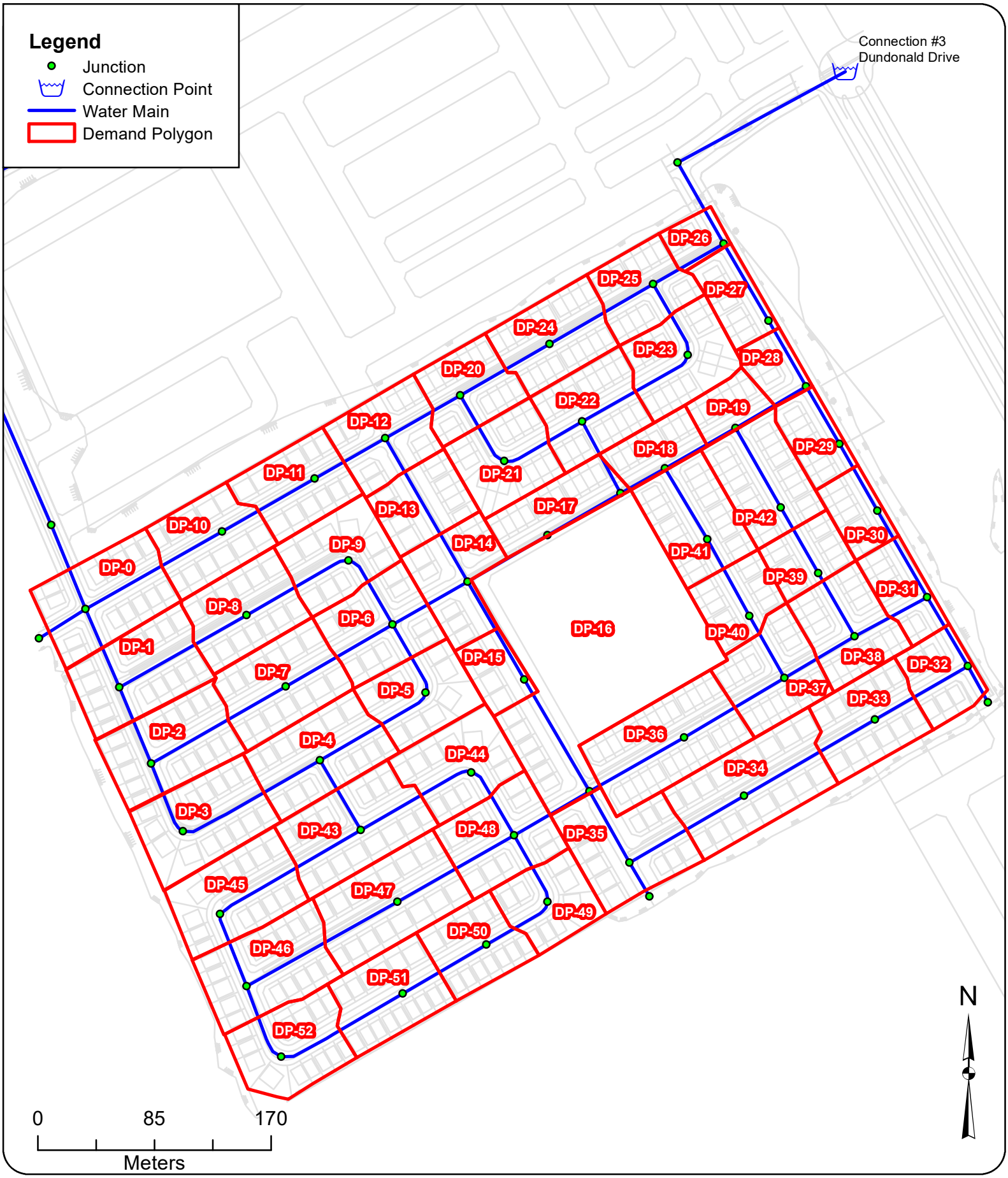
Appendix A Domestic Water Demand Calculations and Allocation



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis of the Brazeau Lands**
Client: **David Schaeffer Engineering Ltd.**
Date: **June 2020**
Created by: **BL**
Reviewed by: **WdS**

Demand Allocation Phases 1&2

Figure A.1

Consumer Water Demands

Phase 1 Residential Demands

Dwelling Type	Number of Units	Population **		Average Day Demand			Max Day 2.5 x Avg. Day (L/s)	Fire Flow (L/s)	Peak Hour 2.2 x Max Day (L/s)	Min Hour 0.5 x Avg. Day (L/s)
		Persons per Unit	Population Per Dwelling Type	(L/c/d)	(L/d)	(L/s)				
Single Detached	172	3.4	585	350	204,750	2.37	5.92	167*	13.03	1.18
Traditional Townhome	133	2.7	360		126,000	1.46	3.65	167*	8.02	0.73
Subtotal	**305**		**945**		**330,750**	**3.83**	**9.57**		**21.05**	**1.91**

Phases 1&2 Residential Demands

Dwelling Type	Number of Units	Population **		Average Day Demand			Max Day 2.5 x Avg. Day (L/s)	Fire Flow (L/s)	Peak Hour 2.2 x Max Day (L/s)	Min Hour 0.5 x Avg. Day (L/s)
		Persons per Unit	Population Per Dwelling Type	(L/c/d)	(L/d)	(L/s)				
Single Detached	347	3.4	1,180	350	413,000	4.78	11.95	167*	26.29	2.39
Traditional Townhome	279	2.7	754		263,900	3.05	7.64	167*	16.80	1.53
Subtotal	**626**		**1,934**		**676,900**	**7.83**	**19.59**		**43.09**	**3.92**

Non Residential Demands

Property Type	Area (ha)		Average Day Demand			Max Day 1.5 x Avg. Day (L/s)	Fire Flow (L/s)	Peak Hour 1.8 x Max Day (L/s)	Min Hour 0.5 x Avg. Day (L/s)
			** (L/ha/d)	(L/d)	(L/s)				
Park w/ Splash Pad	1.72		28,000	48,160	0.56	0.84	250**	1.51	0.28
Subtotal	**1.72**			**48,160**	**0.56**	**0.84**		**1.51**	**0.28**

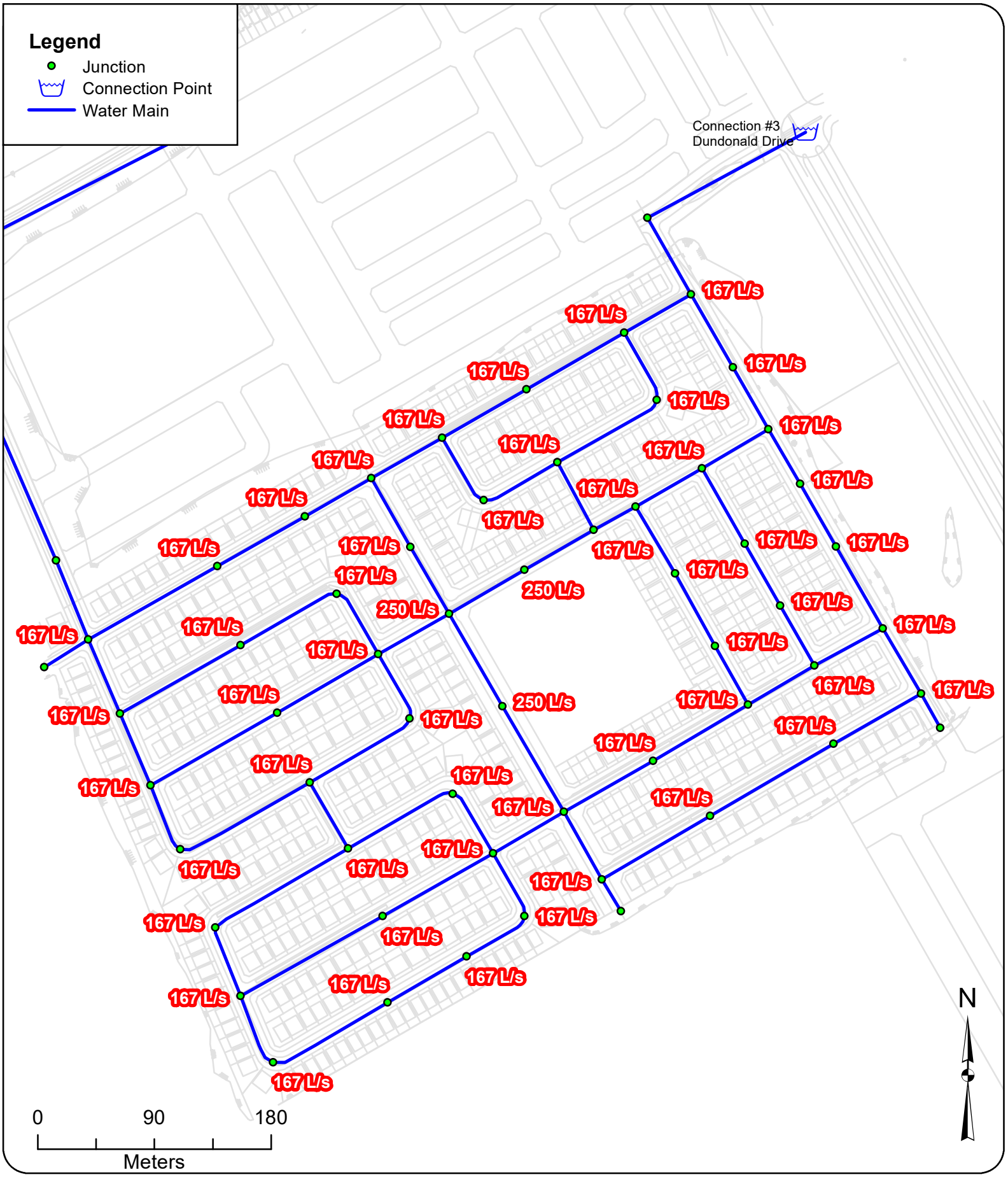
The Meadows Phases 7/8		**ADD (L/s)**	**MDD (L/s)**	**PHD (L/s)**	**MHD (L/s)**
Total Demand:		**6.20**	**13.50**	**28.50**	**3.10**

		ADD (L/s)	**MDD (L/s)**	**PHD (L/s)**	**MHD (L/s)**
Without the Meadows Phases 7/8 Demands	Phase 1	**4.39**	**10.41**	**22.56**	**2.19**
	Phases 1&2	**8.39**	**20.42**	**44.59**	**4.20**
With the Meadows Phases 7/8 Demands	Phase 1	**10.59**	**23.91**	**51.06**	**5.29**
	Phases 1&2	**14.59**	**33.92**	**73.09**	**7.30**

*Based on FUS fire flow calculation

**Assumed based on similar information from previously completed projects, as agreed upon with DSEL

Appendix B FUS Fire Flow Calculations and Allocation



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis of the Brazeau Lands**
Client: **David Schaeffer Engineering Ltd.**
Date: **June 2020**
Created by: **BL**
Reviewed by: **WdS**

Required Fire Flow Phases 1&2

Figure B.1

FUS Required Fire Flow Calculation

Client: David Schaeffer Engineering Ltd.
Project: 2019-091-DSE
Development: Brazeau Lands — Blocks 300-313, Single Detached
Zoning: Multi Family Residential
Date: November 6, 2019

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

A. Type of Construction: Wood Frame Construction

B. Ground Floor Area: 1927 m^2

Note: ground floor area based on drawing provided to GeoAdvice on September 12, 2019.

C. Number of Storeys: 2

Note: all buildings, including adjacent buildings, assumed to be 2 storeys.

Note: The single detached dwellings are separated by less than 3 m; therefore, they must be considered as one fire area. The combined area of 14 units is considered in this calculation.

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

C: Coefficient related to the type of construction — **C =** 1.5

A: Effective area — **A =** 3854 m^2 (Combined area of 14 units)

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

F = 20,486 L/min **D = 20,000 L/min***

E. Occupancy

Occupancy content hazard: Limited Combustible — -15 % of **D** **-3,000 L/min** **E = 17,000 L/min**

F. Sprinkler Protection

Automatic sprinkler protection: None — 0 % of **E** **0 L/min** **F = 17,000 L/min**

G. Exposures

Side	Separation Distance	Length-Height Factor - Adjacent Structure	Construction Type - Adjacent Structure	Exposure
West	20.1 to 30 m	0-30 m-storeys	Wood Frame or Non-Combustible	8%
East	20.1 to 30 m	0-30 m-storeys	Wood Frame or Non-Combustible	8%
North	10.1 to 20 m	Over 120 m-storeys	Wood Frame or Non-Combustible	15%
South	20.1 to 30 m	Over 120 m-storeys	Wood Frame or Non-Combustible	10%
			Total	**41%**

% of **E** **+ 6,970 L/min** **G = 23,970 L/min**

H. Wood Shake Charge — No — **0 L/min** **H = 23,970 L/min**

For wood shingle or shake roofs

The required fire flow exceeds the cap in the City of Ottawa Technical Bulletin ISDTB-2014-02 4.2. The single detached dwellings comply with the provisions of the Bulletin; therefore, the required fire flow is:

Total Fire Flow Required	**10,000**	**L/min***
	167	**L/s**
Required Duration of Fire Flow	**2**	**Hrs**
Required Volume of Fire Flow	**1,200**	**m^3**

*Rounded to the nearest 1,000 L/min

The Total Required Fire Flow for the Brazeau Lands development should be reviewed when drawings and site plans have been finalized. The Total Required Fire Flow may be reduced or increased depending on area, construction, occupancy, exposures, and level of sprinkler protection. If any of these items change the Total Required Fire Flow should be reviewed to determine the impact.

Consideration should be given for fire prevention during construction phases as the required fire flows during construction of buildings is substantially higher than after the buildings are occupied. This is due to exposed framing and inactive sprinkler systems. Fires starting in unprotected portion of buildings quickly become too strong for sprinkler systems in protected portion of buildings. As such, special precautions should be taken any time construction is occurring.

* The amount and rate of water application required in firefighting to confine and control the fires possible in a building or group of buildings which comprise essentially the same fire area by virtue of immediate exposure.

** Rounded to the nearest 1,000 L/min

Notes to calculations

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

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

Sprinkler Protection	Factor	Unit
None	0	%
Automatic	-30	%
Automatic + Standard Supply	-40	%
Fully Supervised	-50	%
Fully Supervised + Fire Resistive	-70	%

Zoning
Single Family Residential
Multi Family Residential
Commercial
Institutional
Industrial

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

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

Notes to calculations

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

Brazeau Lands - FUS Required Fire Flow Summary

Brazeau Lands	
Type of Construction	Wood Frame Construction
Construction Coefficient	1.5
Effective Total Area (m^2)	3,854
Required Fire Flow (L/min)	20,000
Occupancy Charge	-15
Sprinkler Protection Reduction	0
Exposure (%)	
North (%)	8%
East (%)	8%
South (%)	15%
West (%)	10%
Total Exposure (%)	41%
Wood Shake Charge (L/min)	0
Total Required Fire Flow (L/min)	10,000
Total Required Fire Flow (L/s)	167

FUS Required Fire Flow Calculation

Client: David Schaeffer Engineering Ltd.
Project: 2019-091-DSE
Development: Brazeau Lands — Blocks 173, Traditional Townhouse
Zoning: Multi Family Residential
Date: November 6, 2019

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

A. Type of Construction: Wood Frame Construction

B. Ground Floor Area: 474 m^2

Note: ground floor area based on drawing provided to GeoAdvice on September 12, 2019.

C. Number of Storeys: 2

Note: all buildings, including adjacent buildings, assumed to be 2 storeys.

Note: The townhouse dwellings are separated by less than 3 m; therefore, they must be considered as one fire area. The combined area of 5 units is considered in this calculation.

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

C: Coefficient related to the type of construction — **C =** 1.5

A: Effective area — **A =** 947 m^2 (Combined area of 5 units)

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

F = 10,156 L/min **D = 10,000 L/min***

E. Occupancy

Occupancy content hazard	Limited Combustible	-15	% of **D**	**-1,500**	**L/min**	**E = 8,500 L/min**

F. Sprinkler Protection

Automatic sprinkler protection	None	0	% of **E**	**0**	**L/min**	**F = 8,500 L/min**

G. Exposures

Side	Separation Distance	Length-Height Factor - Adjacent Structure	Construction Type - Adjacent Structure	Exposure
West	3.1 to 10 m	0-30 m-storeys	Wood Frame or Non-Combustible	17%
East	3.1 to 10 m	0-30 m-storeys	Wood Frame or Non-Combustible	17%
North	10.1 to 20 m	61-90 m-storeys	Wood Frame or Non-Combustible	14%
South	20.1 to 30 m	31-60 m-storeys	Wood Frame or Non-Combustible	8%
			Total	**56%**

% of **E** **+ 4,760 L/min** **G = 13,260 L/min**

H. Wood Shake Charge — No — **0 L/min** **H = 13,260 L/min**

For wood shingle or shake roofs

The required fire flow exceeds the cap in the City of Ottawa Technical Bulletin ISDTB-2014-02 4.2. The townhouse dwellings comply with the provisions of the Bulletin; therefore, the required fire flow is:

Total Fire Flow Required	**10,000**	**L/min***
	167	**L/s**
Required Duration of Fire Flow	**2**	**Hrs**
Required Volume of Fire Flow	**1,200**	**m^3**

*Rounded to the nearest 1,000 L/min

The Total Required Fire Flow for the Brazeau Lands development should be reviewed when drawings and site plans have been finalized. The Total Required Fire Flow may be reduced or increased depending on area, construction, occupancy, exposures, and level of sprinkler protection. If any of these items change the Total Required Fire Flow should be reviewed to determine the impact.

Consideration should be given for fire prevention during construction phases as the required fire flows during construction of buildings is substantially higher than after the buildings are occupied. This is due to exposed framing and inactive sprinkler systems. Fires starting in unprotected portion of buildings quickly become too strong for sprinkler systems in protected portion of buildings. As such, special precautions should be taken any time construction is occurring.

* The amount and rate of water application required in firefighting to confine and control the fires possible in a building or group of buildings which comprise essentially the same fire area by virtue of immediate exposure.

** Rounded to the nearest 1,000 L/min

Notes to calculations

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

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

Sprinkler Protection	Factor	Unit
None	0	%
Automatic	-30	%
Automatic + Standard Supply	-40	%
Fully Supervised	-50	%
Fully Supervised + Fire Resistive	-70	%

Zoning
Single Family Residential
Multi Family Residential
Commercial
Institutional
Industrial

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

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

Notes to calculations

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

Brazeau Lands - FUS Required Fire Flow Summary

Brazeau Lands	
Type of Construction	Wood Frame Construction
Construction Coefficient	1.5
Effective Total Area (m^2)	947
Required Fire Flow (L/min)	10,000
Occupancy Charge	-15
Sprinkler Protection Reduction	0
Exposure (%)	
North (%)	17%
East (%)	17%
South (%)	14%
West (%)	8%
Total Exposure (%)	56%
Wood Shake Charge (L/min)	0
Total Required Fire Flow (L/min)	10,000
Total Required Fire Flow (L/s)	167

FUS Required Fire Flow Calculation

Client: David Schaeffer Engineering Ltd.
Project: 2019-091-DSE
Development: Brazeau Lands
Zoning: Multi Family Residential — Blocks 384, Traditional Townhouse
Date: November 6, 2019

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

A. Type of Construction: Wood Frame Construction

B. Ground Floor Area: 380 m^2

Note: ground floor area based on drawing provided to GeoAdvice on September 12, 2019.

C. Number of Storeys: 2

Note: all buildings, including adjacent buildings, assumed to be 2 storeys.

Note: The townhouse dwellings are separated by less than 3 m; therefore, they must be considered as one fire area. The combined area of 4 units is considered in this calculation.

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

C: Coefficient related to the type of construction — **C =** 1.5

A: Effective area — **A =** 760 m^2 (Combined area of 4 units)

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

F = 9,095 L/min **D = 9,000 L/min***

E. Occupancy

Occupancy content hazard: Limited Combustible — -15 % of **D** **-1,350 L/min** **E = 7,650 L/min**

F. Sprinkler Protection

Automatic sprinkler protection: None — 0 % of **E** **0 L/min** **F = 7,650 L/min**

G. Exposures

Side	Separation Distance	Length-Height Factor - Adjacent Structure	Construction Type - Adjacent Structure	Exposure
West	10.1 to 20 m	0-30 m-storeys	Wood Frame or Non-Combustible	12%
East	Beyond 45 m	0-30 m-storeys	Wood Frame or Non-Combustible	0%
North	3.1 to 10 m	0-30 m-storeys	Wood Frame or Non-Combustible	17%
South	20.1 to 30 m	0-30 m-storeys	Wood Frame or Non-Combustible	8%
			Total	**37%**

% of **E** **+ 2,831 L/min** **G = 10,481 L/min**

H. Wood Shake Charge — No — **0 L/min** **H = 10,481 L/min**

For wood shingle or shake roofs

The required fire flow exceeds the cap in the City of Ottawa Technical Bulletin ISDTB-2014-02 4.2. The townhouse dwellings **do not** comply with the provisions of the Bulletin; therefore, the required fire flow is:

Total Fire Flow Required	**10,000**	**L/min***
	167	**L/s**
Required Duration of Fire Flow	**2**	**Hrs**
Required Volume of Fire Flow	**1,200**	**m^3**

*Rounded to the nearest 1,000 L/min

The Total Required Fire Flow for the Brazeau Lands development should be reviewed when drawings and site plans have been finalized. The Total Required Fire Flow may be reduced or increased depending on area, construction, occupancy, exposures, and level of sprinkler protection. If any of these items change the Total Required Fire Flow should be reviewed to determine the impact.

Consideration should be given for fire prevention during construction phases as the required fire flows during construction of buildings is substantially higher than after the buildings are occupied. This is due to exposed framing and inactive sprinkler systems. Fires starting in unprotected portion of buildings quickly become too strong for sprinkler systems in protected portion of buildings. As such, special precautions should be taken any time construction is occurring.

* The amount and rate of water application required in firefighting to confine and control the fires possible in a building or group of buildings which comprise essentially the same fire area by virtue of immediate exposure.

** Rounded to the nearest 1,000 L/min

Notes to calculations

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

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

Sprinkler Protection	Factor	Unit
None	0	%
Automatic	-30	%
Automatic + Standard Supply	-40	%
Fully Supervised	-50	%
Fully Supervised + Fire Resistive	-70	%

Zoning
Single Family Residential
Multi Family Residential
Commercial
Institutional
Industrial

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

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

Notes to calculations

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

Brazeau Lands - FUS Required Fire Flow Summary

Brazeau Lands	
Type of Construction	Wood Frame Construction
Construction Coefficient	1.5
Effective Total Area (m^2)	760
Required Fire Flow (L/min)	9,000
Occupancy Charge	-15
Sprinkler Protection Reduction	0
Exposure (%)	
North (%)	12%
East (%)	0%
South (%)	17%
West (%)	8%
Total Exposure (%)	37%
Wood Shake Charge (L/min)	0
Total Required Fire Flow (L/min)	10,000
Total Required Fire Flow (L/s)	167

FUS Required Fire Flow Calculation

Client: David Schaeffer Engineering Ltd.
Project: 2019-091-DSE
Development: Brazeau Lands
Zoning: Multi Family Residential — Blocks 168, Traditional Townhouse
Date: November 6, 2019

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

A. Type of Construction: Wood Frame Construction

B. Ground Floor Area: 380 m^2

Note: ground floor area based on drawing provided to GeoAdvice on September 12, 2019.

C. Number of Storeys: 2

Note: all buildings, including adjacent buildings, assumed to be 2 storeys.

Note: The townhouse dwellings are separated by less than 3 m; therefore, they must be considered as one fire area. The combined area of 4 units is considered in this calculation.

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

C: Coefficient related to the type of construction — **C =** 1.5

A: Effective area — **A =** 760 m^2 (Combined area of 4 units)

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

F = 9,095 L/min **D = 9,000 L/min***

E. Occupancy

Occupancy content hazard: Limited Combustible — -15 % of **D** **-1,350 L/min** **E = 7,650 L/min**

F. Sprinkler Protection

Automatic sprinkler protection: None — 0 % of **E** **0 L/min** **F = 7,650 L/min**

G. Exposures

Side	Separation Distance	Length-Height Factor - Adjacent Structure	Construction Type - Adjacent Structure	Exposure
West	30.1 to 45 m	0-30 m-storeys	Wood Frame or Non-Combustible	5%
East	10.1 to 20 m	0-30 m-storeys	Wood Frame or Non-Combustible	12%
North	3.1 to 10 m	0-30 m-storeys	Wood Frame or Non-Combustible	17%
South	Beyond 45 m	31-60 m-storeys	Wood Frame or Non-Combustible	0%
			Total	**34%**

% of **E** **+ 2,601 L/min** **G = 10,251 L/min**

H. Wood Shake Charge No — **0 L/min** **H = 10,251 L/min**

For wood shingle or shake roofs

The required fire flow exceeds the cap in the City of Ottawa Technical Bulletin ISDTB-2014-02 4.2. The townhouse dwellings **do not** comply with the provisions of the Bulletin; therefore, the required fire flow is:

Total Fire Flow Required	**10,000**	**L/min***
	167	**L/s**
Required Duration of Fire Flow	**2**	**Hrs**
Required Volume of Fire Flow	**1,200**	**m^3**

*Rounded to the nearest 1,000 L/min

The Total Required Fire Flow for the Brazeau Lands development should be reviewed when drawings and site plans have been finalized. The Total Required Fire Flow may be reduced or increased depending on area, construction, occupancy, exposures, and level of sprinkler protection. If any of these items change the Total Required Fire Flow should be reviewed to determine the impact.

Consideration should be given for fire prevention during construction phases as the required fire flows during construction of buildings is substantially higher than after the buildings are occupied. This is due to exposed framing and inactive sprinkler systems. Fires starting in unprotected portion of buildings quickly become too strong for sprinkler systems in protected portion of buildings. As such, special precautions should be taken any time construction is occurring.

* The amount and rate of water application required in firefighting to confine and control the fires possible in a building or group of buildings which comprise essentially the same fire area by virtue of immediate exposure.

** Rounded to the nearest 1,000 L/min

Notes to calculations

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

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

Sprinkler Protection	Factor	Unit
None	0	%
Automatic	-30	%
Automatic + Standard Supply	-40	%
Fully Supervised	-50	%
Fully Supervised + Fire Resistive	-70	%

Zoning
Single Family Residential
Multi Family Residential
Commercial
Institutional
Industrial

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

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

Notes to calculations

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

Brazeau Lands - FUS Required Fire Flow Summary

Brazeau Lands	
Type of Construction	Wood Frame Construction
Construction Coefficient	1.5
Effective Total Area (m^2)	760
Required Fire Flow (L/min)	9,000
Occupancy Charge	-15
Sprinkler Protection Reduction	0
Exposure (%)	
North (%)	5%
East (%)	12%
South (%)	17%
West (%)	0%
Total Exposure (%)	34%
Wood Shake Charge (L/min)	0
Total Required Fire Flow (L/min)	10,000
Total Required Fire Flow (L/s)	167

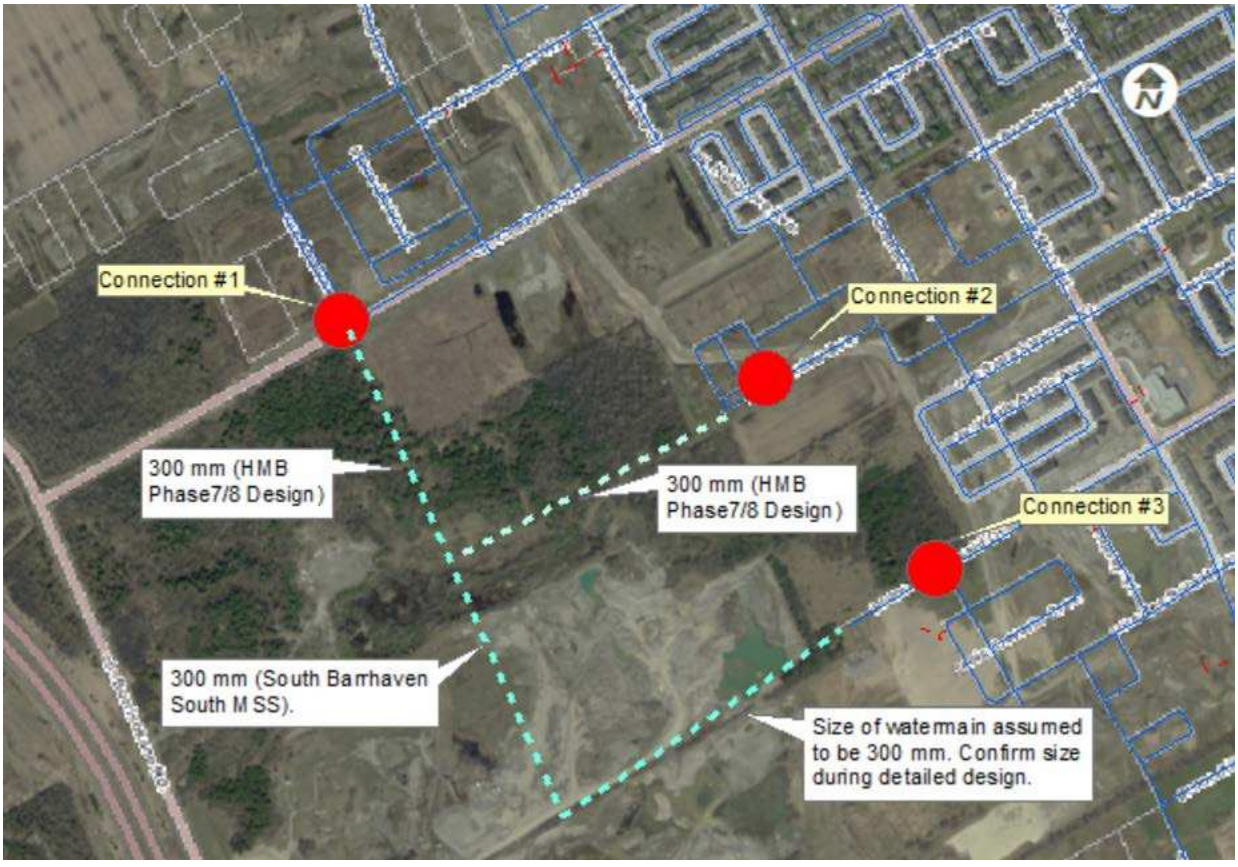
Appendix C Boundary Conditions

Boundary Conditions for HMB Phases 7 and 8 and Brazeau Lands

Information Provided:
Date provided: September 2019

Scenario	Demand	
	L/min	L/s
Average Daily Demand	846	14.10
Maximum Daily Demand	1961	32.69
Peak Hour	4224	70.40
Fire Flow Demand #1	10000	166.67
Fire Flow Demand #2	15000	250.00
Fire Flow Demand #3	17000	283.33

Location:



Results

Connection 1 - Cambrian Road

Demand Scenario	Existing Barrhaven PZ		Future Zone 3C	
	Head (m)	Pressure[1] (psi)	Head (m)	Pressure[1] (psi)
Maximum HGL	156.4	102.9	147.7	77.3
Peak Hour	135.7	60.4	142.8	70.4
Max Day plus Fire (#1)	144.0	72.2	140.0	66.4
Max Day plus Fire (#2)	135.4	59.9	134.9	59.2
Max Day plus Fire (#3)	133.7	57.4	132.5	55.7

[1] Ground Elevation = 93.3 m

Connection 2 - Brambling Way

Demand Scenario	Existing Barrhaven PZ		Future Zone 3C	
	Head (m)	Pressure[1] (psi)	Head (m)	Pressure[1] (psi)
Maximum HGL	156.4	100.1	147.7	74.6
Peak Hour	135.6	57.4	142.7	67.5
Max Day plus Fire (#1)	141.2	65.4	139.9	63.5
Max Day plus Fire (#2)	129.9	49.4	134.6	56.0
Max Day plus Fire (#3)	126.6	44.7	132.1	52.4

[1] Ground Elevation = 95.2 m

Connection 3 - Dundonald Drive

Demand Scenario	Existing Barrhaven PZ		Future Zone 3C	
	Head (m)	Pressure[1] (psi)	Head (m)	Pressure[1] (psi)
Maximum HGL	156.4	86.5	147.7	61.0
Peak Hour	135.7	43.9	142.6	53.7
Max Day plus Fire (#1)	142.0	52.9	138.6	48.1
Max Day plus Fire (#2)	131.5	38.0	132.2	38.9
Max Day plus Fire (#3)	128.7	34.0	128.9	34.3

[1] Ground Elevation = 104.8 m

Notes:

1) As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:
   a) If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.

b) Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

2) A third pump was turned on during all fire simulations under Existing Barrhaven Pressure.
3) Future pipes were added to the water model as shown in the figure above.

Disclaimer

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

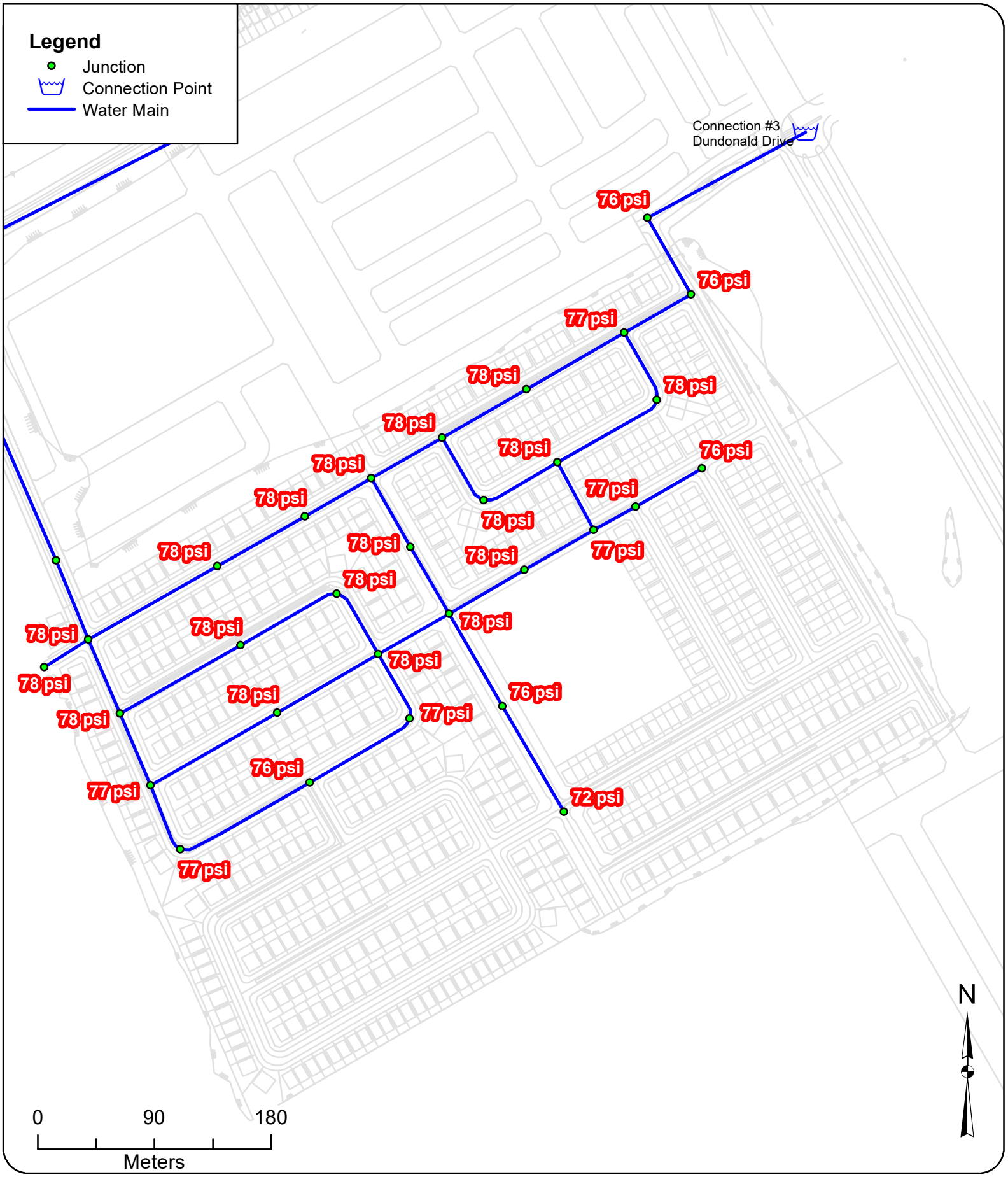
Appendix D Pipe and Junction Model Inputs

Model Inputs - Phases 1 and 2

ID	From	To	Length (m)	Diameter (mm)	Roughness ()
P-100	J-82	J-83	63.79	204	110
P-101	J-83	J-46	60.03	204	110
P-102	J-79	J-84	53.32	204	110
P-103	J-84	J-85	55.04	204	110
P-104	J-85	J-45	66.63	204	110
P-105	J-78	J-86	72.81	297	120
P-106	J-86	J-87	55.90	297	120
P-107	J-87	J-88	48.49	297	120
P-108	J-45	J-88	59.54	204	110
P-109	J-88	J-89	55.04	297	120
P-110	J-89	J-41	65.11	297	120
P-111	J-90	J-47	61.51	204	110
P-112	J-43	J-90	59.19	204	110
P-42	J-33	J-34	40.11	297	120
P-43	J-33	J-35	114.35	297	120
P-44	J-35	J-36	77.83	297	120
P-45	J-36	J-37	59.20	297	120
P-46	J-37	J-38	62.88	297	120
P-47	J-38	J-39	74.92	297	120
P-48	J-39	J-40	87.18	297	120
P-49	J-40	J-41	59.39	297	120
P-50	J-41	J-60	67.93	297	120
P-51	J-60	CONNECTION_3	138.92	297	120
P-52	J-40	J-42	58.39	204	110
P-53	J-42	J-43	83.72	204	110
P-54	J-43	J-44	72.67	204	110
P-55	J-44	J-38	58.67	204	110
P-56	J-45	J-46	59.20	204	110
P-57	J-46	J-90	81.24	204	110
P-58	J-47	J-48	84.62	204	110
P-59	J-48	J-61	59.65	297	120
P-60	J-61	J-37	60.99	297	120
P-61	J-59	J-58	94.07	297	120
P-62	J-58	J-48	82.47	297	120
P-63	J-48	J-49	63.07	204	110
P-64	J-49	J-50	57.71	204	110
P-65	J-50	J-51	84.62	204	110
P-66	J-51	J-52	106.76	204	110
P-67	J-33	J-52	62.05	204	110
P-68	J-52	J-53	60.2	204	110
P-69	J-53	J-54	112.78	204	110
P-70	J-54	J-49	90	204	110
P-71	J-49	J-57	56.32	204	110
P-72	J-57	J-56	92.28	204	110
P-73	J-53	J-55	55.27	204	110
P-74	J-55	J-56	113.38	204	110
P-75	J-56	J-62	58.69	204	110
P-76	J-62	J-63	119.4	204	110
P-77	J-63	J-64	56.35	204	110
P-78	J-64	J-65	58.6	204	110
P-79	J-65	J-66	100.76	204	110
P-80	J-66	J-70	70.42	204	110
P-81	J-70	J-71	55.7	204	110
P-82	J-71	J-69	54.8	204	110
P-83	J-64	J-67	125.85	204	110
P-84	J-67	J-69	97.99	204	110
P-85	J-62	J-68	92.12	204	110
P-86	J-68	J-69	56.42	204	110
P-87	J-69	J-59	63.46	204	110
P-88	J-59	J-72	59.77	297	120
P-89	J-72	J-73	28.67	297	120
P-90	J-72	J-74	96.85	297	120
P-91	J-74	J-75	110.13	297	120
P-92	J-75	J-76	78.16	297	120
P-93	J-77	J-76	30.34	297	120
P-94	J-76	J-78	58.2	297	120
P-95	J-78	J-79	59.97	204	110
P-96	J-79	J-80	59.39	204	110
P-97	J-80	J-81	85.15	204	110
P-98	J-81	J-59	79.25	204	110
P-99	J-80	J-82	51.74	204	110

ID	Elevation (m)	ADD (L/s)
J-33	101.29	0.18
J-34	101.41	0.00
J-35	101.33	0.16
J-36	101.25	0.16
J-37	101.64	0.06
J-38	101.46	0.14
J-39	101.83	0.20
J-40	101.96	0.14
J-41	102.65	0.04
J-42	101.87	0.16
J-43	101.72	0.18
J-44	101.59	0.16
J-45	103.27	0.06
J-46	102.38	0.08
J-47	101.77	0.12
J-48	101.83	0.06
J-49	101.74	0.14
J-50	101.40	0.12
J-51	101.41	0.18
J-52	101.35	0.20
J-53	102.22	0.20
J-54	101.87	0.20
J-55	102.52	0.20
J-56	103.00	0.20
J-57	102.46	0.12
J-58	102.95	0.06
J-59	105.68	0.64
J-60	102.80	0.00
J-61	101.51	0.06
J-62	104.21	0.00
J-63	106.39	0.20
J-64	106.74	0.20
J-65	107.17	0.20
J-66	107.78	0.18
J-67	106.62	0.20
J-68	106.00	0.22
J-69	107.07	0.14
J-70	108.43	0.14
J-71	108.62	0.16
J-72	107.85	0.12
J-73	108.47	0.16
J-74	107.68	0.00
J-75	108.00	0.24
J-76	108.27	0.16
J-77	108.93	0.08
J-78	106.17	0.00
J-79	105.57	0.06
J-80	105.54	0.18
J-81	105.54	0.18
J-82	104.30	0.28
J-83	103.10	0.12
J-84	104.73	0.20
J-85	103.68	0.12
J-86	105.81	0.20
J-87	105.51	0.08
J-88	104.78	0.08
J-89	103.69	0.04
J-90	102.07	0.08

Appendix E MHD and PHD Model Results



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis of the Brazeau lands**
Client: **David Schaeffer Engineering Ltd.**
Date: **June 2020**
Created by: **BL**
Reviewed by: **WdS**

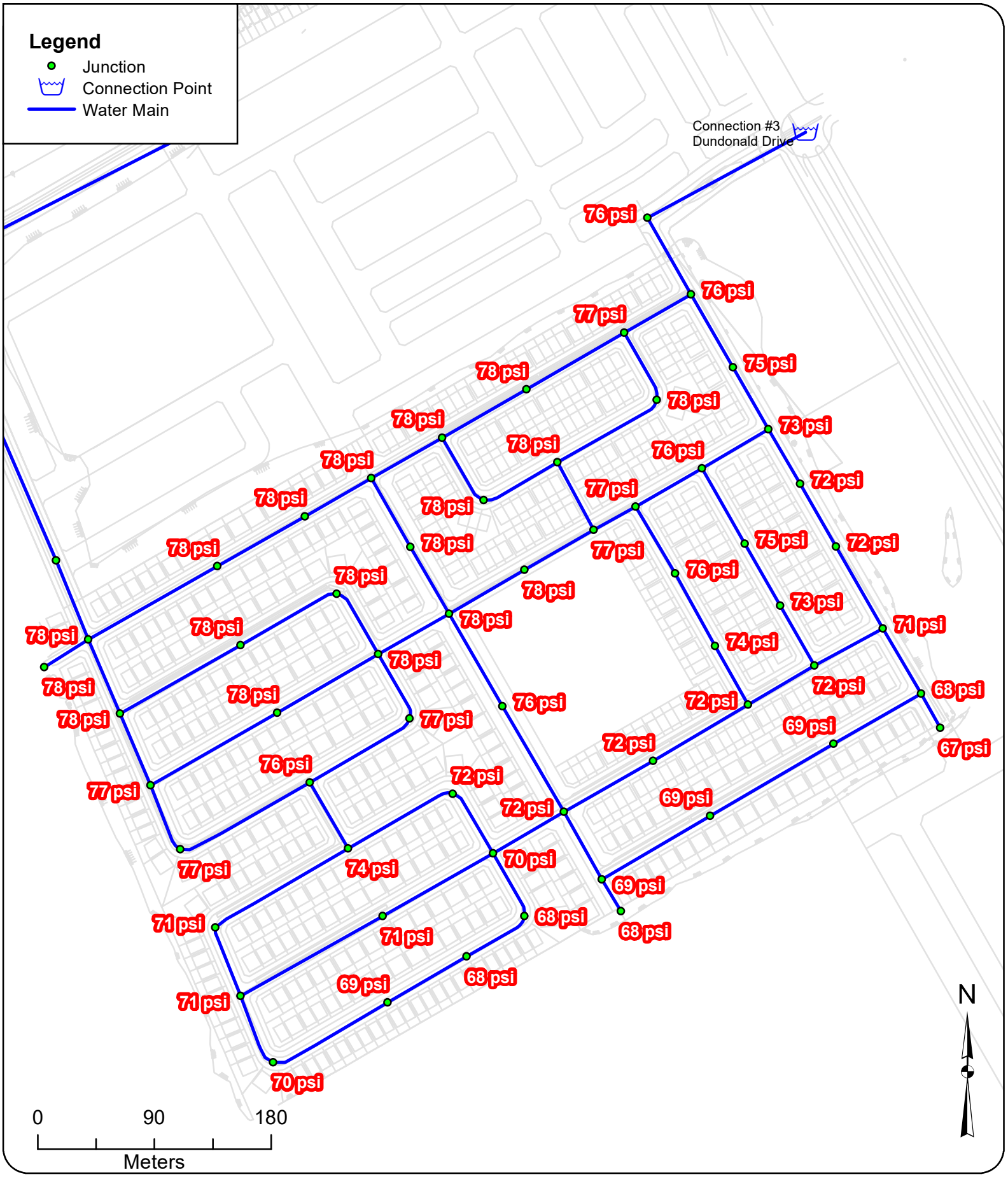
MHD Pressure Results - Phase 1

Figure E.1

Minimum Hour Demand Modeling Results - Phase 1

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/km)
P-42	J-33	J-34	40.11	297	120	0.00	0.00	0.00	0.00
P-43	J-33	J-35	114.35	297	120	-0.09	0.00	0.00	0.00
P-44	J-35	J-36	77.83	297	120	-0.16	0.00	0.00	0.00
P-45	J-36	J-37	59.20	297	120	-0.25	0.00	0.00	0.00
P-46	J-37	J-38	62.88	297	120	-0.88	0.01	0.00	0.00
P-47	J-38	J-39	74.92	297	120	-1.05	0.02	0.00	0.00
P-48	J-39	J-40	87.18	297	120	-1.15	0.02	0.00	0.00
P-49	J-40	J-41	59.39	297	120	-1.68	0.02	0.00	0.00
P-50	J-41	J-60	67.93	297	120	-1.69	0.02	0.00	0.00
P-51	J-60	CONNECTION_3	138.92	297	120	-1.69	0.02	0.00	0.00
P-52	J-40	J-42	58.39	204	110	0.45	0.01	0.00	0.00
P-53	J-42	J-43	91.90	204	110	0.37	0.01	0.00	0.00
P-54	J-43	J-44	64.49	204	110	-0.02	0.00	0.00	0.00
P-55	J-44	J-38	58.67	204	110	-0.10	0.00	0.00	0.00
P-56	J-45	J-46	59.20	204	110	-0.03	0.00	0.00	0.00
P-57	J-46	J-90	37.06	204	110	-0.08	0.00	0.00	0.00
P-58	J-47	J-48	67.31	204	110	0.16	0.00	0.00	0.00
P-59	J-48	J-61	59.65	297	120	-0.58	0.01	0.00	0.00
P-60	J-61	J-37	60.99	297	120	-0.61	0.01	0.00	0.00
P-61	J-59	J-58	94.07	297	120	-0.32	0.00	0.00	0.00
P-62	J-58	J-48	82.47	297	120	-0.35	0.01	0.00	0.00
P-63	J-48	J-49	63.07	204	110	0.36	0.01	0.00	0.00
P-64	J-49	J-50	57.71	204	110	0.04	0.00	0.00	0.00
P-65	J-50	J-51	84.62	204	110	-0.02	0.00	0.00	0.00
P-66	J-51	J-52	106.76	204	110	-0.11	0.00	0.00	0.00
P-67	J-33	J-52	62.05	204	110	0.42	0.01	0.00	0.00
P-68	J-52	J-53	60.20	204	110	0.21	0.01	0.00	0.00
P-69	J-53	J-54	112.78	204	110	-0.01	0.00	0.00	0.00
P-70	J-54	J-49	90.00	204	110	-0.10	0.00	0.00	0.00
P-71	J-49	J-57	56.32	204	110	0.14	0.00	0.00	0.00
P-72	J-57	J-56	92.28	204	110	0.08	0.00	0.00	0.00
P-73	J-53	J-55	55.27	204	110	0.12	0.00	0.00	0.00
P-74	J-55	J-56	113.38	204	110	0.02	0.00	0.00	0.00
P-111	J-90	J-47	61.51	204	110	0.22	0.01	0.00	0.00
P-112	J-43	J-90	59.19	204	110	0.30	0.01	0.00	0.00

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J-33	0.09	101.29	156	78
J-34	0.00	101.41	156	78
J-35	0.08	101.33	156	78
J-36	0.08	101.25	156	78
J-37	0.03	101.64	156	78
J-38	0.07	101.46	156	78
J-39	0.10	101.83	156	78
J-40	0.07	101.96	156	77
J-41	0.02	102.65	156	76
J-42	0.08	101.87	156	78
J-43	0.09	101.72	156	78
J-44	0.08	101.59	156	78
J-45	0.03	103.27	156	76
J-46	0.04	102.38	156	77
J-47	0.06	101.77	156	78
J-48	0.03	101.83	156	78
J-49	0.07	101.74	156	78
J-50	0.06	101.40	156	78
J-51	0.09	101.41	156	78
J-52	0.10	101.35	156	78
J-53	0.10	102.22	156	77
J-54	0.10	101.87	156	78
J-55	0.10	102.52	156	77
J-56	0.10	103.00	156	76
J-57	0.06	102.46	156	77
J-58	0.03	102.95	156	76
J-59	0.32	105.68	156	72
J-60	0.00	102.80	156	76
J-61	0.03	101.51	156	78
J-90	0.00	102.07	156	77



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis of the Brazeau Lands**
Client: **David Schaeffer Engineering Ltd.**
Date: **June 2020**
Created by: **BL**
Reviewed by: **WdS**

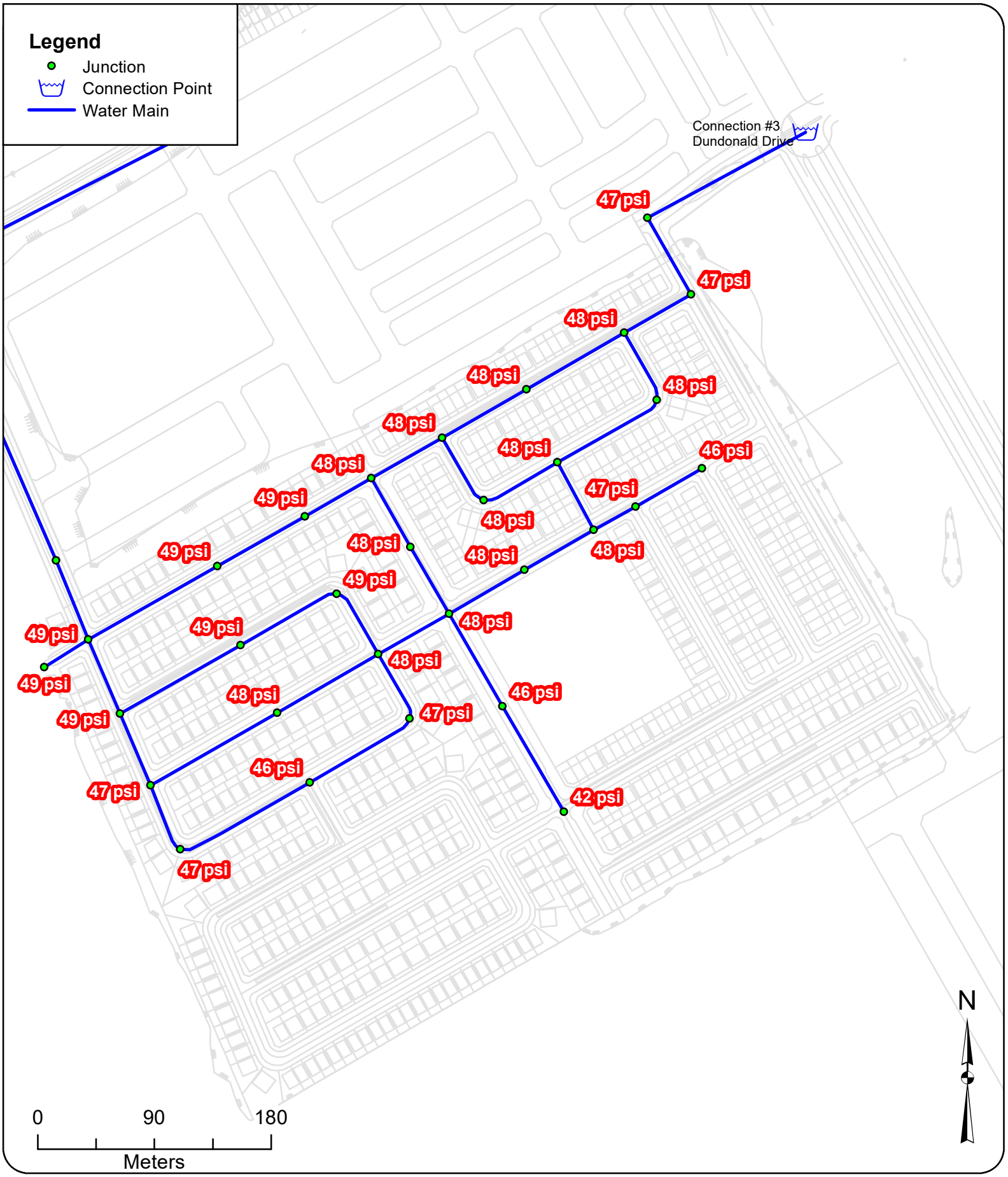
MHD Pressure Results - Phases 1&2

Figure E.2

Minimum Hour Demand Modeling Results - Phases 1 and 2

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/km)
P-42	J-33	J-34	40.11	297	120	0.00	0.00	0.00	0.00
P-43	J-33	J-35	114.35	297	120	0.35	0.01	0.00	0.00
P-44	J-35	J-36	77.83	297	120	0.28	0.00	0.00	0.00
P-45	J-36	J-37	59.20	297	120	0.20	0.00	0.00	0.00
P-46	J-37	J-38	62.88	297	120	-0.73	0.01	0.00	0.00
P-47	J-38	J-39	74.92	297	120	-0.95	0.01	0.00	0.00
P-48	J-39	J-40	87.18	297	120	-1.05	0.02	0.00	0.00
P-49	J-40	J-41	59.39	297	120	-1.56	0.02	0.00	0.00
P-50	J-41	J-60	67.93	297	120	-3.05	0.04	0.00	0.01
P-51	J-60	CONNECTION_3	138.92	297	120	-3.05	0.04	0.00	0.01
P-52	J-40	J-42	58.39	204	110	0.44	0.01	0.00	0.00
P-53	J-42	J-43	83.72	204	110	0.35	0.01	0.00	0.00
P-54	J-43	J-44	72.67	204	110	-0.07	0.00	0.00	0.00
P-55	J-44	J-38	58.67	204	110	-0.15	0.00	0.00	0.00
P-56	J-45	J-46	59.20	204	110	0.21	0.01	0.00	0.00
P-57	J-46	J-90	81.24	204	110	-0.10	0.00	0.00	0.00
P-58	J-47	J-48	84.62	204	110	0.18	0.01	0.00	0.00
P-59	J-48	J-61	59.65	297	120	-0.87	0.01	0.00	0.00
P-60	J-61	J-37	60.99	297	120	-0.90	0.01	0.00	0.00
P-61	J-59	J-58	94.07	297	120	-0.53	0.01	0.00	0.00
P-62	J-58	J-48	82.47	297	120	-0.56	0.01	0.00	0.00
P-63	J-48	J-49	63.07	204	110	0.45	0.01	0.00	0.00
P-64	J-49	J-50	57.71	204	110	-0.03	0.00	0.00	0.00
P-65	J-50	J-51	84.62	204	110	-0.09	0.00	0.00	0.00
P-66	J-51	J-52	106.76	204	110	-0.18	0.01	0.00	0.00
P-67	J-33	J-52	62.05	204	110	0.62	0.02	0.00	0.00
P-68	J-52	J-53	60.20	204	110	0.33	0.01	0.00	0.00
P-69	J-53	J-54	112.78	204	110	-0.03	0.00	0.00	0.00
P-70	J-54	J-49	90.00	204	110	-0.13	0.00	0.00	0.00
P-71	J-49	J-57	56.32	204	110	0.28	0.01	0.00	0.00
P-72	J-57	J-56	92.28	204	110	0.22	0.01	0.00	0.00
P-73	J-53	J-55	55.27	204	110	0.26	0.01	0.00	0.00
P-74	J-55	J-56	113.38	204	110	0.17	0.01	0.00	0.00
P-111	J-90	J-47	61.51	204	110	0.24	0.01	0.00	0.00
P-112	J-43	J-90	59.19	204	110	0.33	0.01	0.00	0.00
P-75	J-56	J-62	58.69	204	110	0.29	0.01	0.00	0.00
P-76	J-62	J-63	119.4	204	110	0.19	0.01	0.00	0.00
P-77	J-63	J-64	56.35	204	110	0.10	0.00	0.00	0.00
P-78	J-64	J-65	58.6	204	110	0.09	0.00	0.00	0.00
P-79	J-65	J-66	100.76	204	110	0.00	0.00	0.00	0.00
P-80	J-66	J-70	70.42	204	110	-0.10	0.00	0.00	0.00
P-81	J-70	J-71	55.7	204	110	-0.18	0.01	0.00	0.00
P-82	J-71	J-69	54.8	204	110	-0.24	0.01	0.00	0.00
P-83	J-64	J-67	125.85	204	110	-0.09	0.00	0.00	0.00
P-84	J-67	J-69	97.99	204	110	-0.20	0.01	0.00	0.00
P-85	J-62	J-68	92.12	204	110	0.00	0.00	0.00	0.00
P-86	J-68	J-69	56.42	204	110	-0.07	0.00	0.00	0.00
P-87	J-69	J-59	63.46	204	110	-0.59	0.02	0.00	0.00
P-88	J-59	J-72	59.77	297	120	-0.29	0.00	0.00	0.00
P-89	J-72	J-73	28.67	297	120	0.00	0.00	0.00	0.00
P-90	J-72	J-74	96.85	297	120	-0.37	0.01	0.00	0.00
P-91	J-74	J-75	110.13	297	120	-0.49	0.01	0.00	0.00
P-92	J-75	J-76	78.16	297	120	-0.57	0.01	0.00	0.00
P-93	J-77	J-76	30.34	297	120	0.00	0.00	0.00	0.00
P-94	J-76	J-78	58.2	297	120	-0.61	0.01	0.00	0.00
P-95	J-78	J-79	59.97	204	110	0.21	0.01	0.00	0.00
P-96	J-79	J-80	59.39	204	110	0.22	0.01	0.00	0.00
P-97	J-80	J-81	85.15	204	110	0.23	0.01	0.00	0.00
P-98	J-81	J-59	79.25	204	110	0.09	0.00	0.00	0.00
P-99	J-80	J-82	51.74	204	110	-0.10	0.00	0.00	0.00
P-100	J-82	J-83	63.79	204	110	-0.16	0.00	0.00	0.00
P-101	J-83	J-46	60.03	204	110	-0.26	0.01	0.00	0.00
P-102	J-79	J-84	53.32	204	110	-0.09	0.00	0.00	0.00
P-103	J-84	J-85	55.04	204	110	-0.15	0.00	0.00	0.00
P-104	J-85	J-45	66.63	204	110	-0.25	0.01	0.00	0.00
P-105	J-78	J-86	72.81	297	120	-0.86	0.01	0.00	0.00
P-106	J-86	J-87	55.9	297	120	-0.89	0.01	0.00	0.00
P-107	J-87	J-88	48.49	297	120	-0.93	0.01	0.00	0.00
P-108	J-45	J-88	59.54	204	110	-0.49	0.01	0.00	0.00
P-109	J-88	J-89	55.04	297	120	-1.44	0.02	0.00	0.00
P-110	J-89	J-41	65.11	297	120	-1.48	0.02	0.00	0.00

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J-33	0.09	101.29	156	78
J-34	0.00	101.41	156	78
J-35	0.08	101.33	156	78
J-36	0.08	101.25	156	78
J-37	0.03	101.64	156	78
J-38	0.07	101.46	156	78
J-39	0.10	101.83	156	78
J-40	0.07	101.96	156	77
J-41	0.02	102.65	156	76
J-42	0.08	101.87	156	78
J-43	0.09	101.72	156	78
J-44	0.08	101.59	156	78
J-45	0.03	103.27	156	76
J-46	0.04	102.38	156	77
J-47	0.06	101.77	156	78
J-48	0.03	101.83	156	78
J-49	0.07	101.74	156	78
J-50	0.06	101.40	156	78
J-51	0.09	101.41	156	78
J-52	0.10	101.35	156	78
J-53	0.10	102.22	156	77
J-54	0.10	101.87	156	78
J-55	0.10	102.52	156	77
J-56	0.10	103.00	156	76
J-57	0.06	102.46	156	77
J-58	0.03	102.95	156	76
J-59	0.32	105.68	156	72
J-60	0.00	102.80	156	76
J-61	0.03	101.51	156	78
J-90	0.00	102.07	156	77
J-62	0.10	104.21	156	74
J-63	0.10	106.39	156	71
J-64	0.10	106.74	156	71
J-65	0.09	107.17	156	70
J-66	0.10	107.78	156	69
J-67	0.11	106.62	156	71
J-68	0.07	106.00	156	72
J-69	0.07	107.07	156	70
J-70	0.08	108.43	156	68
J-71	0.06	108.62	156	68
J-72	0.08	107.85	156	69
J-73	0.00	108.47	156	68
J-74	0.12	107.68	156	69
J-75	0.08	108.00	156	69
J-76	0.04	108.27	156	68
J-77	0.00	108.93	156	67
J-78	0.03	106.17	156	71
J-79	0.09	105.57	156	72
J-80	0.09	105.54	156	72
J-81	0.14	105.54	156	72
J-82	0.06	104.30	156	74
J-83	0.10	103.10	156	76
J-84	0.06	104.73	156	73
J-85	0.10	103.68	156	75
J-86	0.04	105.81	156	72
J-87	0.04	105.51	156	72
J-88	0.02	104.78	156	73
J-89	0.04	103.69	156	75



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis of the Brazeau Lands**
Client: **David Schaeffer Engineering Ltd.**
Date: **June 2020**
Created by: **BL**
Reviewed by: **WdS**

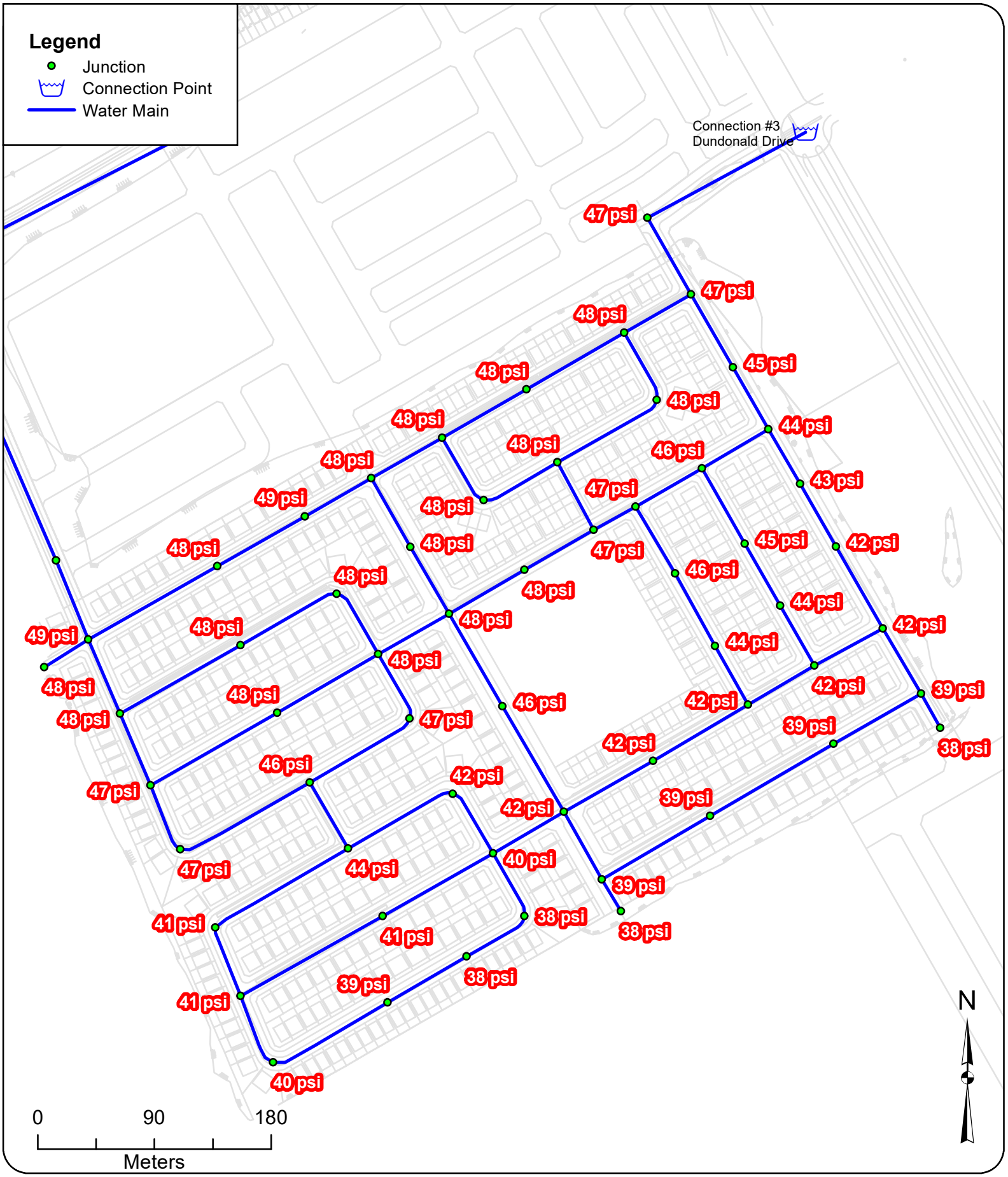
PHD Pressure Results - Phase 1

Figure E.3

Peak Hour Demand Modeling Results - Phase 1

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/km)
P-42	J-33	J-34	40.11	297	120	0.00	0.00	0.00	0.00
P-43	J-33	J-35	114.35	297	120	-2.53	0.04	0.00	0.01
P-44	J-35	J-36	77.83	297	120	-3.36	0.05	0.00	0.01
P-45	J-36	J-37	59.20	297	120	-4.27	0.06	0.00	0.02
P-46	J-37	J-38	62.88	297	120	-10.16	0.15	0.01	0.11
P-47	J-38	J-39	74.92	297	120	-11.85	0.17	0.01	0.15
P-48	J-39	J-40	87.18	297	120	-13.00	0.19	0.02	0.18
P-49	J-40	J-41	59.39	297	120	-18.81	0.27	0.02	0.35
P-50	J-41	J-60	67.93	297	120	-18.99	0.27	0.02	0.36
P-51	J-60	CONNECTION_3	138.92	297	120	-18.99	0.27	0.05	0.36
P-52	J-40	J-42	58.39	204	110	5.02	0.15	0.01	0.23
P-53	J-42	J-43	91.90	204	110	4.12	0.13	0.01	0.16
P-54	J-43	J-44	64.49	204	110	-0.06	0.00	0.00	0.00
P-55	J-44	J-38	58.67	204	110	-0.91	0.03	0.00	0.01
P-56	J-45	J-46	59.20	204	110	-0.36	0.01	0.00	0.00
P-57	J-46	J-90	37.06	204	110	-0.84	0.03	0.00	0.01
P-58	J-47	J-48	67.31	204	110	1.65	0.05	0.00	0.03
P-59	J-48	J-61	59.65	297	120	-5.28	0.08	0.00	0.03
P-60	J-61	J-37	60.99	297	120	-5.59	0.08	0.00	0.04
P-61	J-59	J-58	94.07	297	120	-1.96	0.03	0.00	0.01
P-62	J-58	J-48	82.47	297	120	-2.26	0.03	0.00	0.01
P-63	J-48	J-49	63.07	204	110	4.29	0.13	0.01	0.17
P-64	J-49	J-50	57.71	204	110	0.63	0.02	0.00	0.00
P-65	J-50	J-51	84.62	204	110	-0.06	0.00	0.00	0.00
P-66	J-51	J-52	106.76	204	110	-1.04	0.03	0.00	0.01
P-67	J-33	J-52	62.05	204	110	4.28	0.13	0.01	0.17
P-68	J-52	J-53	60.20	204	110	2.10	0.06	0.00	0.04
P-69	J-53	J-54	112.78	204	110	-0.21	0.01	0.00	0.00
P-70	J-54	J-49	90.00	204	110	-1.27	0.04	0.00	0.02
P-71	J-49	J-57	56.32	204	110	1.63	0.05	0.00	0.03
P-72	J-57	J-56	92.28	204	110	0.95	0.03	0.00	0.01
P-73	J-53	J-55	55.27	204	110	1.17	0.04	0.00	0.02
P-74	J-55	J-56	113.38	204	110	0.11	0.00	0.00	0.00
P-111	J-90	J-47	61.51	204	110	2.31	0.07	0.00	0.05
P-112	J-43	J-90	59.19	204	110	3.16	0.10	0.01	0.10

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J-33	0.99	101.29	136	49
J-34	0.00	101.41	136	49
J-35	0.83	101.33	136	49
J-36	0.91	101.25	136	49
J-37	0.30	101.64	136	48
J-38	0.78	101.46	136	49
J-39	1.15	101.83	136	48
J-40	0.78	101.96	136	48
J-41	0.18	102.65	136	47
J-42	0.90	101.87	136	48
J-43	1.02	101.72	136	48
J-44	0.84	101.59	136	48
J-45	0.36	103.27	136	46
J-46	0.48	102.38	136	47
J-47	0.66	101.77	136	48
J-48	0.38	101.83	136	48
J-49	0.76	101.74	136	48
J-50	0.68	101.40	136	49
J-51	0.99	101.41	136	49
J-52	1.14	101.35	136	49
J-53	1.14	102.22	136	47
J-54	1.06	101.87	136	48
J-55	1.06	102.52	136	47
J-56	1.06	103.00	136	46
J-57	0.68	102.46	136	47
J-58	0.30	102.95	136	46
J-59	1.96	105.68	136	42
J-60	0.00	102.80	136	47
J-61	0.30	101.51	136	48
J-90	0.00	102.07	136	48



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis of the Brazeau Lands**
Client: **David Schaeffer Engineering Ltd.**
Date: **June 2020**
Created by: **BL**
Reviewed by: **WdS**

PHD Pressure Results - Phases 1&2

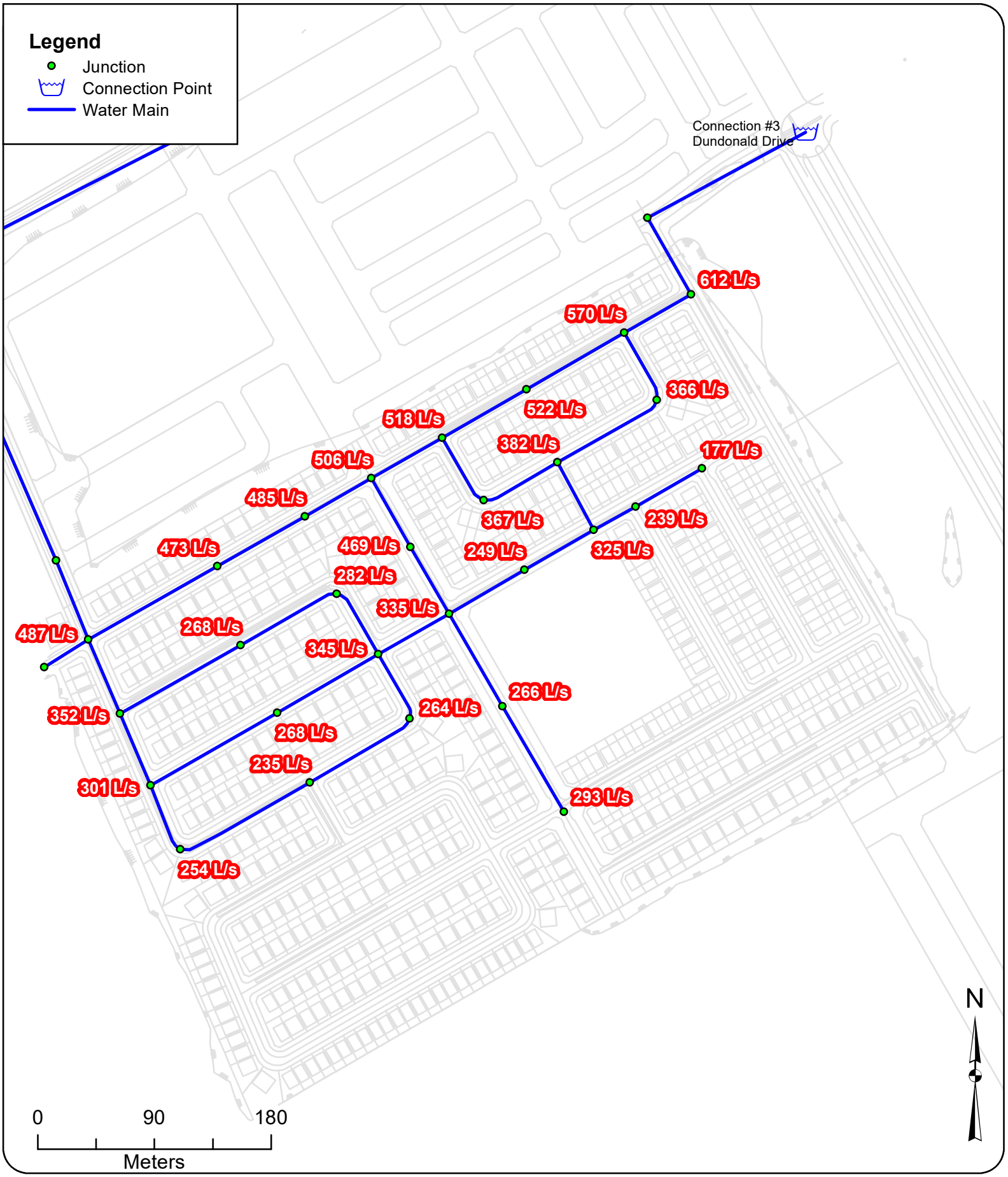
Figure E.4

Peak Hour Demand Modeling Results -Phases 1 and 2

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/km)
P-42	J-33	J-34	40.11	297	120	0.00	0.00	0.00	0.00
P-43	J-33	J-35	114.35	297	120	3.16	0.05	0.00	0.01
P-44	J-35	J-36	77.83	297	120	2.33	0.03	0.00	0.01
P-45	J-36	J-37	59.20	297	120	1.42	0.02	0.00	0.00
P-46	J-37	J-38	62.88	297	120	-8.04	0.12	0.00	0.07
P-47	J-38	J-39	74.92	297	120	-10.35	0.15	0.01	0.12
P-48	J-39	J-40	87.18	297	120	-11.49	0.17	0.01	0.14
P-49	J-40	J-41	59.39	297	120	-17.00	0.25	0.02	0.29
P-50	J-41	J-60	67.93	297	120	-33.05	0.48	0.07	1.01
P-51	J-60	CONNECTION_3	138.92	297	120	-33.05	0.48	0.14	1.01
P-52	J-40	J-42	58.39	204	110	4.72	0.14	0.01	0.20
P-53	J-42	J-43	83.72	204	110	3.82	0.12	0.01	0.14
P-54	J-43	J-44	72.67	204	110	-0.68	0.02	0.00	0.01
P-55	J-44	J-38	58.67	204	110	-1.52	0.05	0.00	0.02
P-56	J-45	J-46	59.20	204	110	2.27	0.07	0.00	0.05
P-57	J-46	J-90	81.24	204	110	-0.92	0.03	0.00	0.01
P-58	J-47	J-48	84.62	204	110	1.88	0.06	0.00	0.04
P-59	J-48	J-61	59.65	297	120	-8.86	0.13	0.01	0.09
P-60	J-61	J-37	60.99	297	120	-9.16	0.13	0.01	0.09
P-61	J-59	J-58	94.07	297	120	-4.98	0.07	0.00	0.03
P-62	J-58	J-48	82.47	297	120	-5.28	0.08	0.00	0.03
P-63	J-48	J-49	63.07	204	110	5.08	0.16	0.01	0.23
P-64	J-49	J-50	57.71	204	110	-0.22	0.01	0.00	0.00
P-65	J-50	J-51	84.62	204	110	-0.90	0.03	0.00	0.01
P-66	J-51	J-52	106.76	204	110	-1.89	0.06	0.00	0.04
P-67	J-33	J-52	62.05	204	110	6.57	0.20	0.02	0.37
P-68	J-52	J-53	60.20	204	110	3.54	0.11	0.01	0.12
P-69	J-53	J-54	112.78	204	110	-0.41	0.01	0.00	0.00
P-70	J-54	J-49	90.00	204	110	-1.48	0.05	0.00	0.02
P-71	J-49	J-57	56.32	204	110	3.06	0.09	0.01	0.09
P-72	J-57	J-56	92.28	204	110	2.38	0.07	0.01	0.06
P-73	J-53	J-55	55.27	204	110	2.82	0.09	0.00	0.08
P-74	J-55	J-56	113.38	204	110	1.76	0.05	0.00	0.03
P-111	J-90	J-47	61.51	204	110	2.55	0.08	0.00	0.06
P-112	J-43	J-90	59.19	204	110	3.47	0.11	0.01	0.11
P-75	J-56	J-62	58.69	204	110	3.08	0.09	0.01	0.09
P-76	J-62	J-63	119.4	204	110	2.11	0.06	0.01	0.05
P-77	J-63	J-64	56.35	204	110	1.05	0.03	0.00	0.01
P-78	J-64	J-65	58.6	204	110	0.97	0.03	0.00	0.01
P-79	J-65	J-66	100.76	204	110	-0.01	0.00	0.00	0.00
P-80	J-66	J-70	70.42	204	110	-1.15	0.04	0.00	0.01
P-81	J-70	J-71	55.7	204	110	-2.06	0.06	0.00	0.04
P-82	J-71	J-69	54.8	204	110	-2.67	0.08	0.00	0.07
P-83	J-64	J-67	125.85	204	110	-1.06	0.03	0.00	0.01
P-84	J-67	J-69	97.99	204	110	-2.27	0.07	0.01	0.05
P-85	J-62	J-68	92.12	204	110	-0.17	0.01	0.00	0.00
P-86	J-68	J-69	56.42	204	110	-0.93	0.03	0.00	0.01
P-87	J-69	J-59	63.46	204	110	-6.63	0.20	0.02	0.38
P-88	J-59	J-72	59.77	297	120	-2.83	0.04	0.00	0.01
P-89	J-72	J-73	28.67	297	120	0.00	0.00	0.00	0.00
P-90	J-72	J-74	96.85	297	120	-3.74	0.05	0.00	0.02
P-91	J-74	J-75	110.13	297	120	-5.03	0.07	0.00	0.03
P-92	J-75	J-76	78.16	297	120	-5.93	0.09	0.00	0.04
P-93	J-77	J-76	30.34	297	120	0.00	0.00	0.00	0.00
P-94	J-76	J-78	58.2	297	120	-6.39	0.09	0.00	0.05
P-95	J-78	J-79	59.97	204	110	2.36	0.07	0.00	0.06
P-96	J-79	J-80	59.39	204	110	2.34	0.07	0.00	0.05
P-97	J-80	J-81	85.15	204	110	2.34	0.07	0.00	0.05
P-98	J-81	J-59	79.25	204	110	0.78	0.02	0.00	0.01
P-99	J-80	J-82	51.74	204	110	-0.96	0.03	0.00	0.01
P-100	J-82	J-83	63.79	204	110	-1.63	0.05	0.00	0.03
P-101	J-83	J-46	60.03	204	110	-2.71	0.08	0.00	0.07
P-102	J-79	J-84	53.32	204	110	-0.94	0.03	0.00	0.01
P-103	J-84	J-85	55.04	204	110	-1.54	0.05	0.00	0.03
P-104	J-85	J-45	66.63	204	110	-2.62	0.08	0.00	0.07
P-105	J-78	J-86	72.81	297	120	-9.11	0.13	0.01	0.09
P-106	J-86	J-87	55.9	297	120	-9.53	0.14	0.01	0.10
P-107	J-87	J-88	48.49	297	120	-9.95	0.14	0.01	0.11
P-108	J-45	J-88	59.54	204	110	-5.25	0.16	0.01	0.24
P-109	J-88	J-89	55.04	297	120	-15.45	0.22	0.01	0.25
P-110	J-89	J-41	65.11	297	120	-15.87	0.23	0.02	0.26

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J-33	0.99	101.29	135	49
J-34	0.00	101.41	135	48
J-35	0.83	101.33	135	49
J-36	0.91	101.25	135	49
J-37	0.30	101.64	135	48
J-38	0.78	101.46	135	48
J-39	1.15	101.83	135	48
J-40	0.78	101.96	135	48
J-41	0.18	102.65	135	47
J-42	0.90	101.87	135	48
J-43	1.02	101.72	135	48
J-44	0.84	101.59	135	48
J-45	0.36	103.27	135	46
J-46	0.48	102.38	135	47
J-47	0.66	101.77	135	48
J-48	0.38	101.83	135	48
J-49	0.76	101.74	135	48
J-50	0.68	101.40	135	48
J-51	0.99	101.41	135	48
J-52	1.14	101.35	135	48
J-53	1.14	102.22	135	47
J-54	1.06	101.87	135	48
J-55	1.06	102.52	135	47
J-56	1.06	103.00	135	46
J-57	0.68	102.46	135	47
J-58	0.30	102.95	135	46
J-59	1.96	105.68	135	42
J-60	0.00	102.80	136	47
J-61	0.30	101.51	135	48
J-90	0.00	102.07	135	47
J-62	1.14	104.21	135	44
J-63	1.06	106.39	135	41
J-64	1.14	106.74	135	41
J-65	0.98	107.17	135	40
J-66	1.14	107.78	135	39
J-67	1.21	106.62	135	41
J-68	0.76	106.00	135	42
J-69	0.76	107.07	135	40
J-70	0.91	108.43	135	38
J-71	0.61	108.62	135	38
J-72	0.91	107.85	135	39
J-73	0.00	108.47	135	38
J-74	1.29	107.68	135	39
J-75	0.91	108.00	135	39
J-76	0.45	108.27	135	39
J-77	0.00	108.93	135	38
J-78	0.36	106.17	135	42
J-79	0.96	105.57	135	42
J-80	0.96	105.54	135	43
J-81	1.56	105.54	135	42
J-82	0.66	104.30	135	44
J-83	1.08	103.10	135	46
J-84	0.60	104.73	135	44
J-85	1.08	103.68	135	45
J-86	0.42	105.81	135	42
J-87	0.42	105.51	135	43
J-88	0.24	104.78	135	44
J-89	0.42	103.69	135	45

Appendix F MDD+FF Model Results

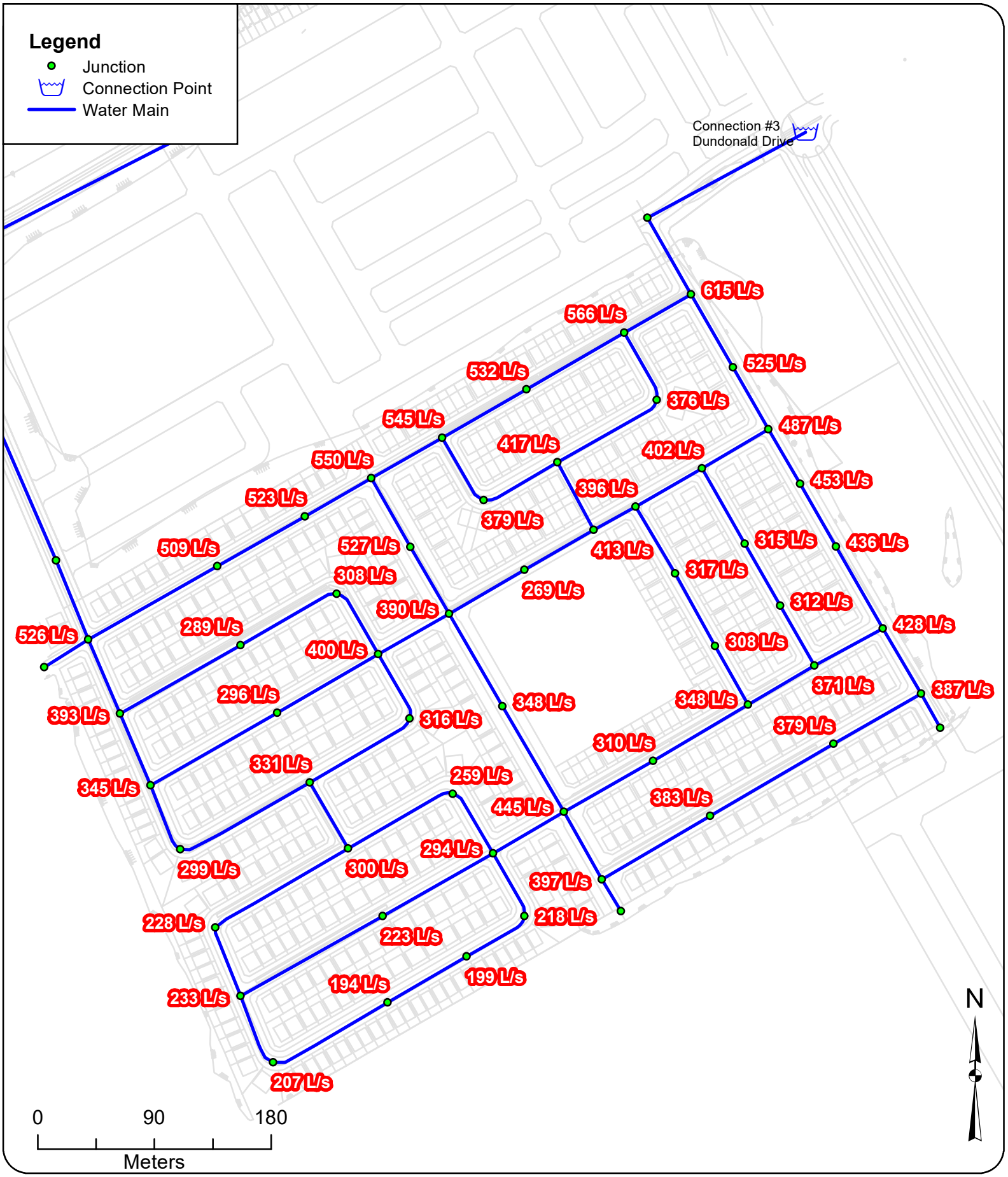


GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis of the Brazeau Lands**
Client: **David Schaeffer Engineering Ltd.**
Date: **June 2020**
Created by: **BL**
Reviewed by: **WdS**

Available Fire Flow @ 20 psi - Phase 1

Figure F.1



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Client: **David Schaeffer Engineering Ltd.**
Date: **June 2020**
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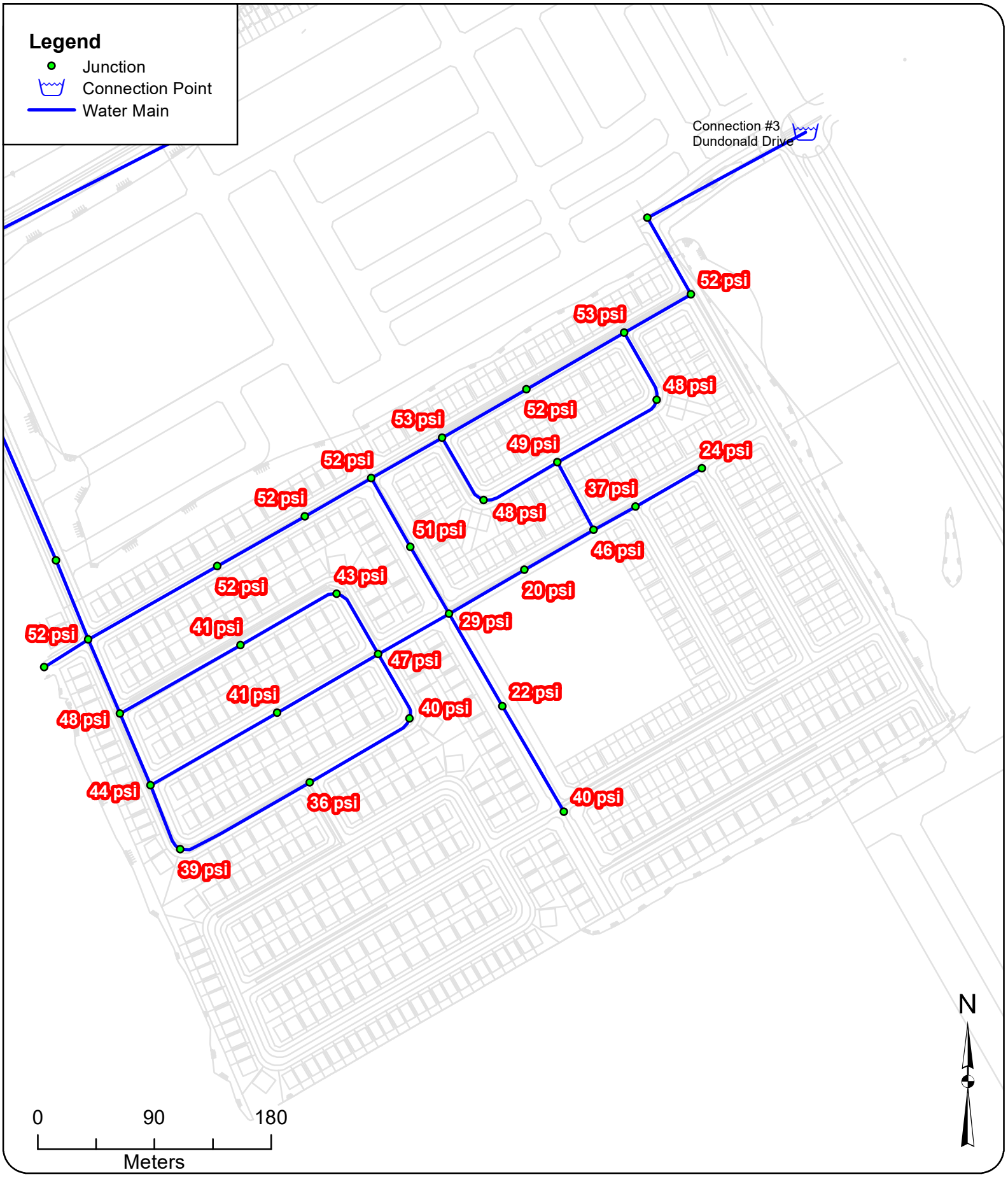
Reviewed by: **WdS**

Available Fire Flow @ 20 psi - Phases 1&2

Figure F.2

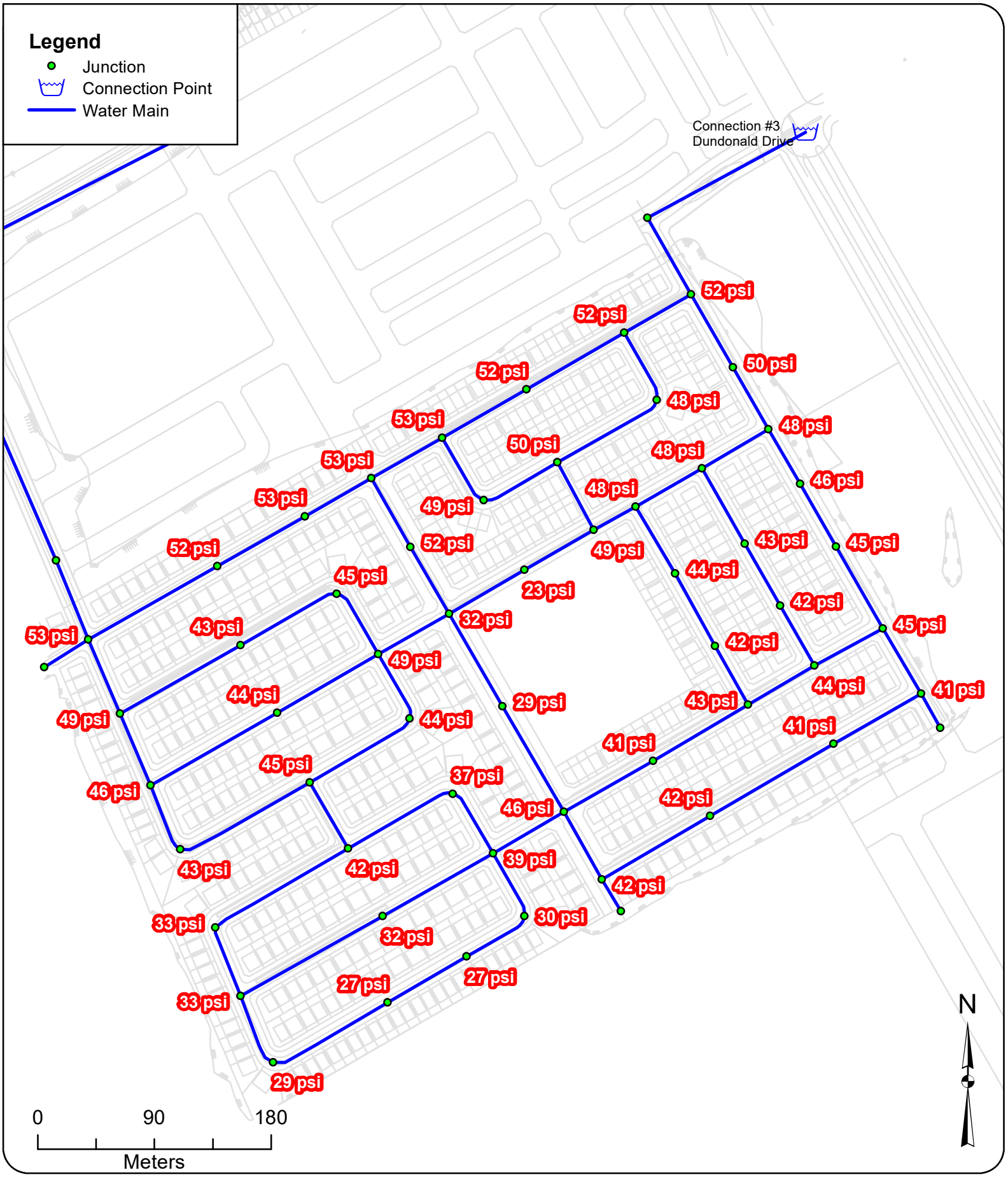


GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis of the Brazeau Lands**
Client: **David Schaeffer Engineering Ltd.**
Date: **June 2020**
Created by: **BL**
Reviewed by: **WdS**

Residual Pressure @ Required Fire Flow - Phase 1

Figure F.3



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis of the Brazeau Lands**
Client: **David Schaeffer Engineering Ltd.**
Date: **June 2020**
Created by: **BL**
Reviewed by: **WdS**

Residual Pressure @ Required Fire Flow - Phases 1&2

Figure F.4

Fire Flow Modeling Results - Phase 1

ID	Static Demand (L/s)	Fire-Flow Demand (L/s)	Residual Pressure (psi)	Available Flow at Hydrant (L/s)	Available Flow Pressure (psi)
J-33	0.45	167	52	487	20
J-35	0.38	167	52	473	20
J-36	0.41	167	52	485	20
J-37	0.14	167	52	506	20
J-38	0.36	167	53	518	20
J-39	0.52	167	52	522	20
J-40	0.36	167	53	570	20
J-41	0.08	167	52	612	20
J-42	0.41	167	48	366	20
J-43	0.47	167	49	382	20
J-44	0.38	167	48	367	20
J-45	0.16	167	24	177	20
J-46	0.22	167	37	239	20
J-49	0.34	167	47	345	20
J-50	0.31	167	43	282	20
J-51	0.45	167	41	268	20
J-52	0.52	167	48	352	20
J-53	0.52	167	44	301	20
J-54	0.48	167	41	268	20
J-55	0.48	167	39	254	20
J-56	0.48	167	36	235	20
J-57	0.31	167	40	264	20
J-59	1.04	167	40	293	20
J-61	0.14	167	51	469	20
J-90	0.00	167	46	325	20
J-47	0.30	250	20	249	20
J-48	0.17	250	29	335	20
J-58	0.14	250	22	266	20

Fire Flow Modeling Results - Phases 1 and 2

ID	Static Demand (L/s)	Fire-Flow Demand (L/s)	Residual Pressure (psi)	Available Flow at Hydrant (L/s)	Available Flow Pressure (psi)
J-33	0.45	167	53	526	20
J-35	0.38	167	52	509	20
J-36	0.41	167	53	523	20
J-37	0.14	167	53	550	20
J-38	0.36	167	53	545	20
J-39	0.52	167	52	532	20
J-40	0.36	167	52	566	20
J-41	0.08	167	52	615	20
J-42	0.41	167	48	376	20
J-43	0.47	167	50	417	20
J-44	0.38	167	49	379	20
J-45	0.16	167	48	402	20
J-46	0.22	167	48	396	20
J-49	0.34	167	49	400	20
J-50	0.31	167	45	308	20
J-51	0.45	167	43	289	20
J-52	0.52	167	49	393	20
J-53	0.52	167	46	345	20
J-54	0.48	167	44	296	20
J-55	0.48	167	43	299	20
J-56	0.48	167	45	331	20
J-57	0.31	167	44	316	20
J-59	1.04	167	46	445	20
J-61	0.14	167	52	527	20
J-62	0.52	167	42	300	20
J-63	0.48	167	33	228	20
J-64	0.52	167	33	233	20
J-65	0.45	167	29	207	20
J-66	0.52	167	27	194	20
J-67	0.55	167	32	223	20
J-68	0.34	167	37	259	20
J-69	0.34	167	39	294	20
J-70	0.41	167	27	199	20
J-71	0.28	167	30	218	20
J-72	0.41	167	42	397	20
J-74	0.58	167	42	383	20
J-75	0.41	167	41	379	20
J-76	0.21	167	41	387	20
J-78	0.16	167	45	428	20
J-79	0.44	167	44	371	20
J-80	0.44	167	43	349	20
J-81	0.71	167	41	310	20
J-82	0.30	167	42	308	20
J-83	0.49	167	44	317	20
J-84	0.27	167	42	312	20
J-85	0.49	167	43	315	20
J-86	0.19	167	45	436	20
J-87	0.19	167	46	453	20
J-88	0.11	167	48	487	20
J-89	0.19	167	50	525	20
J-90	0.00	167	49	413	20
J-47	0.30	250	23	269	20
J-48	0.17	250	32	390	20
J-58	0.14	250	29	348	20

Design Brief for Caivan Communities
The Ridge (Brazeau Lands)
David Schaeffer Engineering Ltd.

DSEL No. 18-1030
October 4, 2019 Rev1

Charlotte Kelly

From: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Sent: October 3, 2019 8:44 AM
To: Anthony Temelini; Kevin Murphy
Subject: FW: Bc for the Meadows - Phase 7/8 and Brazeau
Attachments: HMB5_Brazeau_Boundary Conditions_April262017.docx

Anthony/Kevin,

Please see the boundary conditions for the Meadows Phase 7/8 and the Brazeau Lands.

Let me know if you require anything further.

Regards,

Jeff Shillington, P.Eng.
Project Manager, Development Review, South Branch
Planning, Infrastructure and Economic Development
City of Ottawa
tel: 580-2424 x 16960
email: jeff.shillington@ottawa.ca

From: Bougadis, John <John.Bougadis@ottawa.ca>
Sent: October 02, 2019 6:15 PM
To: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Subject: Bc for the Meadows - Phase 7/8 and Brazeau

Hi Jeff,

The attached BC is for the Meadows Phase 7 and 8 and the Brazeau lands.

Let me know if you have any questions.

John
X14990

From: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Sent: September 23, 2019 9:53 AM
To: Bougadis, John <John.Bougadis@ottawa.ca>
Subject: FW: The Meadows - Phase 7/8 Boundary Condition Request

John,

Please see the request below for BC's. Let me know if you need additional information.

Jeff

From: Anthony Temelini <ATemelini@dsel.ca>
Sent: September 12, 2019 1:40 PM
To: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Cc: Matt Wingate <MWingate@dsel.ca>
Subject: The Meadows - Phase 7/8 Boundary Condition Request

Hi Jeff,

Please see attached for the updated boundary condition request for the Meadows – Phase 7/8. Note that we require the boundary conditions for the latest fire flow requirements in order to compare modelling results with the assumptions made in the latest watermain report.

Can you please forward the request to the appropriate contact and let us know when we can expect to receive the boundary conditions?

Please let me know if you have any questions.

Thank you,

Anthony Temelini, P.Eng.
Junior Project Manager

DSEL
david schaeffer engineering ltd.

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

phone: (613) 836-0856 ext.524
email: atemelini@dsel.ca

'

'

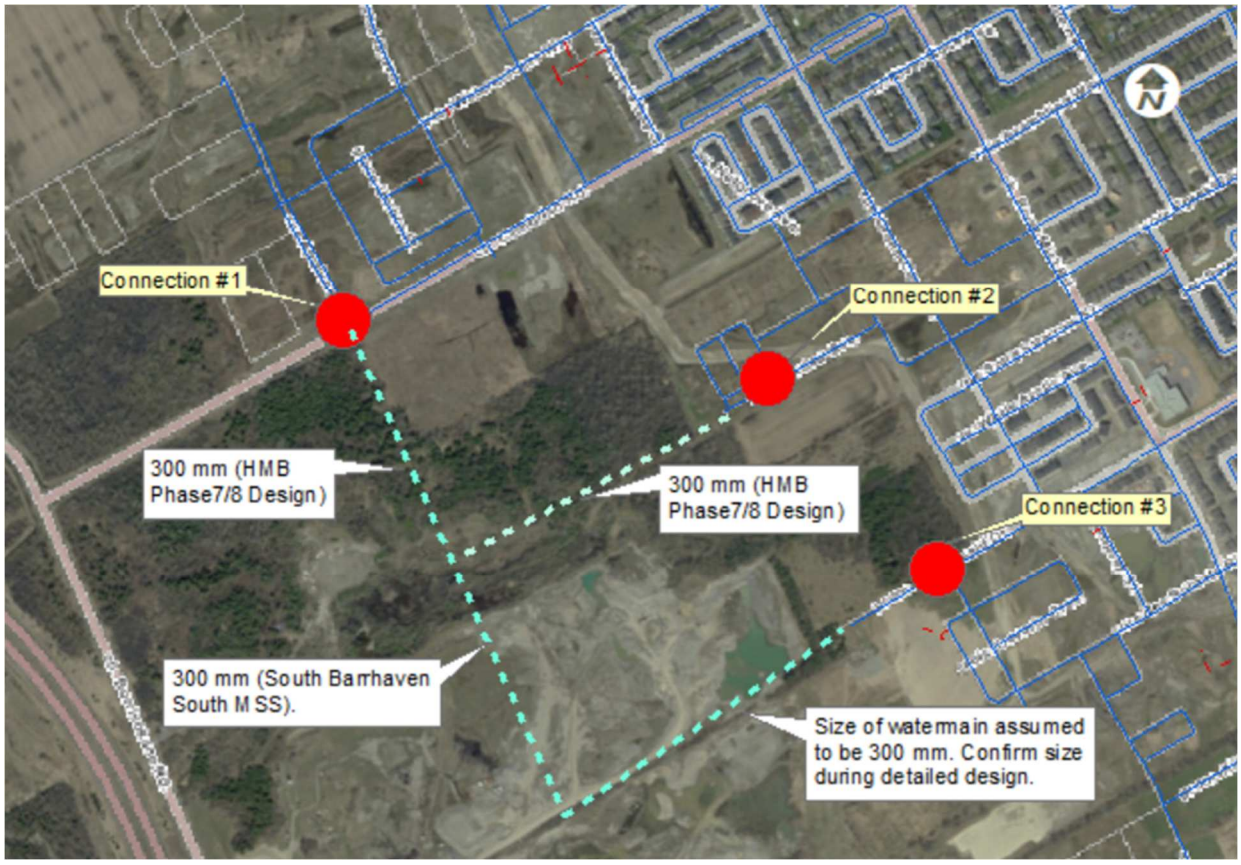
Boundary Conditions for HMB Phases 7 and 8 and Brazeau Lands

Information Provided:

Date provided: September 2019

Scenario	Demand	
	L/min	L/s
Average Daily Demand	846	14.10
Maximum Daily Demand	1961	32.69
Peak Hour	4224	70.40
Fire Flow Demand #1	10000	166.67
Fire Flow Demand #2	15000	250.00
Fire Flow Demand #3	17000	283.33

Location:



Results

Connection 1 - Cambrian Road

Demand Scenario	Existing Barrhaven PZ		Future Zone 3C	
	Head (m)	Pressure[1] (psi)	Head (m)	Pressure[1] (psi)
Maximum HGL	156.4	102.9	147.7	77.3
Peak Hour	135.7	60.4	142.8	70.4
Max Day plus Fire (#1)	144.0	72.2	140.0	66.4
Max Day plus Fire (#2)	135.4	59.9	134.9	59.2
Max Day plus Fire (#3)	133.7	57.4	132.5	55.7

[1] Ground Elevation = 93.3 m

Connection 2 - Brambling Way

Demand Scenario	Existing Barrhaven PZ		Future Zone 3C	
	Head (m)	Pressure[1] (psi)	Head (m)	Pressure[1] (psi)
Maximum HGL	156.4	100.1	147.7	74.6
Peak Hour	135.6	57.4	142.7	67.5
Max Day plus Fire (#1)	141.2	65.4	135.8	57.7
Max Day plus Fire (#2)	129.9	49.4	126.3	44.3
Max Day plus Fire (#3)	126.6	44.7	121.8	37.8

[1] Ground Elevation = 95.2 m

Connection 3 - Dundonald Drive

Demand Scenario	Existing Barrhaven PZ		Future Zone 3C	
	Head (m)	Pressure[1] (psi)	Head (m)	Pressure[1] (psi)
Maximum HGL	156.4	86.5	147.7	61.0
Peak Hour	135.7	43.9	142.6	53.7
Max Day plus Fire (#1)	142.0	52.9	133.0	40.0
Max Day plus Fire (#2)	131.5	38.0	120.6	22.5
Max Day plus Fire (#3)	128.7	34.0	114.7	14.0

[1] Ground Elevation = 104.8 m

Notes:

1) As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:
   a) If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.

b) Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

2) A third pump was turned on during all fire simulations under Existing Barrhaven Pressure.
3) Future pipes were added to the water model as shown in the figure above.

Disclaimer

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

APPENDIX C

Wastewater Collection

Caivan
3713 Borrisokane Road
Propsed Site Conditions

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

Site Area 7.350 **ha**

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	**0.37 L/s**
Infiltration / Inflow (Wet)	**2.06 L/s**
Infiltration / Inflow (Total)	**2.43 L/s**

Institutional / Commercial / Industrial Contributions

Property Type	**Unit Rate**		**No. of Units**	**Avg Wastewater (L/s)**
Water Closets*	150.0	L/fixture/hour	8	0.11
Lavatories*	150.0	L/fixture/hour	8	0.11
Kitchen Sinks	375	L/fixture/day		0.00
Showers*	575	L/fixture/hour		0.00
Mop Sink	375	L/fixture/day	1	0.013
Drinking Fountains*	375	L/fixture/day	2	0.026
Office Space	75	L/9.3m2/d	3,250.00	0.30
Industrial - Heavy**	55,000	L/gross ha/d		0.00
			Average I/C/I Flow	**0.56**
			Peak Institutional / Commercial Flow	0.85
			Peak Industrial Flow**	0.00
			Peak I/C/I Flow	**0.85**

** assuming a 12 hour commercial operation*

*** peak industrial flow per City of Ottawa Sewer Design Guidelines Appendix 4B (Peaking Factor of 4.4)*

Total Estimated Average Dry Weather Flow Rate	**0.93 L/s**
Total Estimated Peak Dry Weather Flow Rate	**1.21 L/s**
Total Estimated Peak Wet Weather Flow Rate	**3.27 L/s**

SANITARY SEWER CALCULATION SHEET

CLIENT: **Caivan**
LOCATION: **3713 Borrisokane Road**
FILE REF: **19-1134**
DATE: **17-Sep-20**

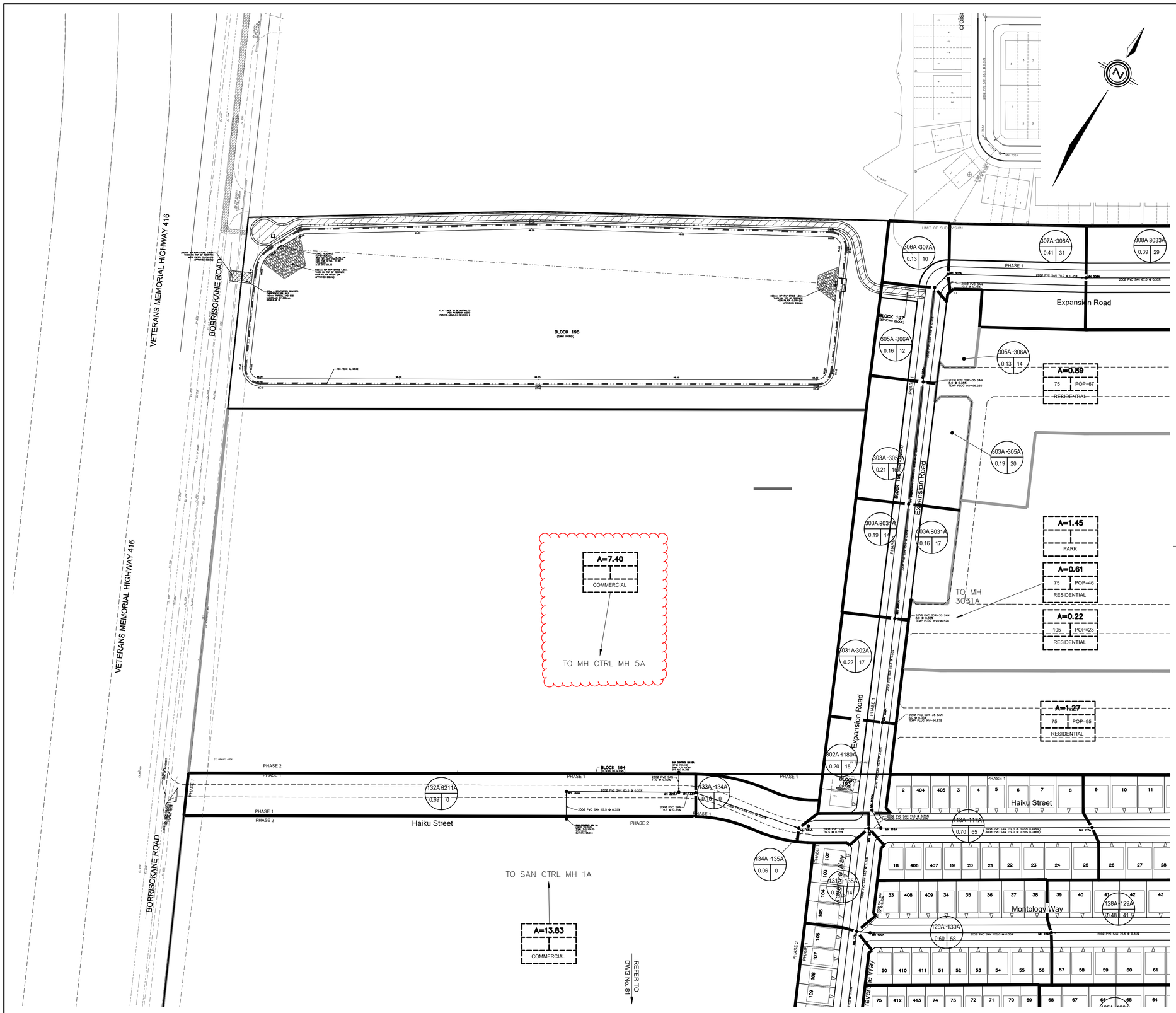
DESIGN PARAMETERS

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

Location			Commercial		Institutional		Industrial			Infiltration				Pipe Data							
Area ID	Up	Down	Area	Accu. Area	Area	Accu. Area	Area	Accu. Area	Q_{C+I+I}	Total Area	Accu. Area	Infiltration Flow	Total Flow	DIA	Slope	Length	$A_{hydraulic}$	R	Velocity	Q_{cap}	Q / Q full
			(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(ha)	(ha)	(L/s)	(L/s)	(mm)	(%)	(m)	(m^2)	(m)	(m/s)	(L/s)	(-)
	SANMH 3	SAN.MH2	0.325	0.33		0.00	7.35	7.35	0.85	7.675	7.675	2.149	3.27	200	0.35	134.7	0.031	0.050	0.62	19.4	0.17
	SAN.MH2	FUT. SAN MH		0.33		0.00		7.35	0.85	0.000	7.675	2.149	3.27	200	3.50	31.2	0.031	0.050	1.95	61.4	0.05
	FUT. SAN MH	MH 3211A		0.33		0.00		7.35	0.85	0.000	7.675	2.149	3.27	200	0.50	11.0	0.031	0.050	0.74	23.2	0.14

Design Brief for Caivan Communities
The Ridge (Brazeau Lands)
David Schaeffer Engineering Ltd.

DSEL No. 18-1030
April 29, 2020 Rev4



LEGEND

- SANITARY DRAINAGE BOUNDARY
- SANITARY SUB–DRAINAGE BOUNDARY
- SANITARY DRAINAGE BOUNDARY (OTHER PHASES)
- UPSTREAM MH TO DOWNSTREAM MH — 43A - 44A
- AREA IN HECTARES — 0.78
- DENOTES PARK — 61
- POPULATION
- UPSTREAM MH TO DOWNSTREAM MH (OTHER PHASES) — 309A-310A
- AREA IN HECTARES (OTHER PHASES) — 12.95
- POPULATION (OTHER PHASES) — 1102
- EXTERNAL AREA IN HECTARES — A=53.63
- EXTERNAL POPULATION — 107
- DENSITY (PERSONS/HECTARE) — POP=5739
- EXTERNAL LAND USE — RESIDENTIAL
- MAINTENANCE HOLE — 200mmø SAN MH202A
- CAP

NOT FOR CONSTRUCTION

No.	BY	DATE	DESCRIPTION
6	A.D.F.	20–07–27	5TH SUBMISSION
5	A.D.F.	20–06–15	4TH SUBMISSION
4	A.D.F.	20–04–24	3RD SUBMISSION
3	A.D.F.	19–12–23	2ND SUBMISSION
2	A.D.F.	19–10–04	1ST SUBMISSION

TOPOGRAPHIC INFORMATION
JD BARNES LIMITED PROJECT NUMBER 18–10–145–00 SURVEY DATED JULY 26, 2019

LEGAL INFORMATION
CALCULATED M–PLAN PROVIDED BY JD BARNES LTD, PROJECT 18–10–145–00, DATED APRIL 6, 2020

BENCH MARK No. 001196403710
ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM AND ARE DERIVED FROM THE MUNICIPALITY BENCHMARK No. 001196403710 HAVING A PUBLISHED ELEVATION OF 91.724 METERS.

CAIVAN COMMUNITIES

THE RIDGE PHASE 1

DSEL
david schaeffer engineering ltd
120 Iber Road Unit 103
Stittsville, Ontario, K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

LICENSED PROFESSIONAL ENGINEER A. D. FOBERT 100090628 2020-07-27 PROVINCE OF ONTARIO

Ottawa CITY OF OTTAWA

SANITARY DRAINAGE PLAN

DRAWN BY: G.G.G.	CHECKED BY: A.D.F.	PROJECT No.	
DESIGNED BY: C.M.K.	CHECKED BY: A.D.F.	18–1030	
SCALE: HORIZ. 1:1000 (0 10 20 30 40)		SHEET No. 84	

CITY FILE No. D07-16-19-0005 CITY PLAN No. 17803

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION									COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	UNITS Singles	UNITS Townhouse	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
			0.19				20	0.19	20				0.00		0.00		0.00		0.19	0.19									
	303A	305A	0.21				16	0.40	36	3.67	0.43		0.00		0.00		0.00	0.00	0.21	0.40	0.13	0.56	69.5	200	2.45	51.34	0.01	1.63	0.52
Contribution From Drummond Future Road, Pipe 1305A - 305A								0.89	67				0.00		0.00		0.00		0.89	1.29									
			0.13				14	1.42	117				0.00		0.00		0.00		0.13	1.42									
	305A	306A	0.16				12	1.58	129	3.57	1.49		0.00		0.00		0.00	0.00	0.16	1.58	0.52	2.01	53.5	200	0.35	19.40	0.10	0.62	0.40
	306A	307A	0.13				10	1.71	139	3.56	1.60		0.00		0.00		0.00	0.00	0.13	1.71	0.56	2.17	10.5	200	0.35	19.40	0.11	0.62	0.41
	307A	308A	0.41				31	2.12	170	3.54	1.95		0.00		0.00		0.00	0.00	0.41	2.12	0.70	2.65	78.0	200	0.35	19.40	0.14	0.62	0.43
	308A	3033A	0.39				29	2.51	199	3.52	2.27		0.00		0.00		0.00	0.00	0.39	2.51	0.83	3.10	67.0	200	0.35	19.40	0.16	0.62	0.45
	3033A	310A	0.31				23	2.82	222	3.50	2.52		0.00		0.00		0.00	0.00	0.31	2.82	0.93	3.45	62.0	200	0.40	20.74	0.17	0.66	0.49
Contribution From Drummond Future Road, Pipe 309A - 310A								7.24	713.00				0.00		0.00		0.00		0.00	7.24									
			0.07				5	10.13	940				0.00		0.00		0.00		0.07	10.13									
	310A	1311A	1.22				128	11.35	1068	3.23	11.16		0.00		0.00		0.00	0.00	1.22	11.35	3.75	14.91	111.5	250	0.25	29.73	0.50	0.61	0.61
	1311A	1312A						11.35	1068	3.23	11.16		0.00		0.00		0.00	0.00	0.00	11.35	3.75	14.91	111.0	250	0.25	29.73	0.50	0.61	0.61
	1312A	1313A	4.04				424	15.39	1492	3.14	15.21		0.00		0.00		0.00	0.00	4.04	15.39	5.08	20.29	108.5	250	0.25	29.73	0.68	0.61	0.65
	1313A	405A						15.39	1492	3.14	15.21		0.00		0.00		0.00	0.00	0.00	15.39	5.08	20.29	89.0	250	0.25	29.73	0.68	0.61	0.65
To Future Greenbank Road, Pipe 405A - 406A								15.39	1492				0.00		0.00		0.00			15.39									
Drummond Commercial																													
	1321A	3211A						0.00				7.40	7.40		0.00		0.00	2.40	7.40	7.40	2.44	4.84	11.0	200	0.50	23.19	0.21	0.74	0.58
To Haiku Street, Pipe 3211A - 133A								0.00	0				7.40		0.00		0.00			7.40									
Brazeau Commercial																													
	Ctrl 1A	132A						0.00				13.83	13.83		0.00		0.00	4.48	13.83	13.83	4.56	9.05	15.5	200	0.35	19.40	0.47	0.62	0.60
To Haiku Street, Pipe 132A - 3211A								0.00	0				13.83		0.00		0.00			13.83									
Haiku Street																													
Contribution From Brazeau Commercial, Pipe 1A - 132A								0.00	0				13.83		0.00		0.00		13.83	13.83									
	132A	3211A	0.69				0	0.69	0				13.83		0.00		0.00	4.48	0.69	14.52	4.79	9.27	63.5	200	0.35	19.40	0.48	0.62	0.61
Contribution From Drummond Commercial, Pipe 1321A - 3211A								0.00	0				7.40		0.00		0.00		7.40	21.92									
	3211A	133A						0.69	0				21.23		0.00		0.00	6.88	0.00	21.92	7.23	14.11	9.5	200	0.35	19.40	0.73	0.62	0.67
	133A	134A	0.16				0	0.85	0				21.23		0.00		0.00	6.88	0.16	22.08	7.29	14.17	61.5	200	0.35	19.40	0.73	0.62	0.67
	134A	135A	0.06				0	0.91	0				21.23		0.00		0.00	6.88	0.06	22.14	7.31	14.19	39.5	200	0.35	19.40	0.73	0.62	0.67
To Haiku Street, Pipe 135A - 118A								0.91	0				21.23		0.00		0.00			22.14									
Montology Way																													
	1260A	127A	0.24	3	3		11	0.24	11	3.73	0.13		0.00		0.00		0.00	0.00	0.24	0.24	0.08	0.21	37.5	200	0.65	26.44	0.01	0.84	0.24
	127A	128A	0.13	2	2		7	0.37	18	3.71	0.22		0.00		0.00		0.00	0.00	0.13	0.37	0.12	0.34	12.5	200	0.35	19.40	0.02	0.62	0.23
	128A	129A	0.48	12	12		41	0.85	59	3.64	0.70		0.00		0.00		0.00	0.00	0.48	0.85	0.28	0.98	76.5	200	0.35	19.40	0.05	0.62	0.32
	129A	130A	0.60	17	17		58	1.45	117	3.58	1.36		0.00		0.00		0.00	0.00	0.60	1.45	0.48	1.84	102.0	200	0.35	19.40	0.09	0.62	0.39
	130A	131A						1.45	117	3.58	1.36		0.00		0.00		0.00	0.00	0.00	1.45	0.48	1.84	7.5	200	0.35	19.40	0.09	0.62	0.39
To Montology Way, Pipe 131A - 135A								1.45	117				0.00		0.00		0.00			1.45									
Rugosa Street																													
	211A	204A	0.49	12	12		41	0.49	41	3.67	0.49		0.00		0.00		0.00	0.00	0.49	0.49	0.16	0.65	89.0	200	0.80	29.34	0.02	0.93	0.37
	204A	205A	0.74	19	19		65	1.23	106	3.59	1.23		0.00		0.00		0.00	0.00	0.74	1.23	0.41	1.64	120.0	200	0.35	19.40	0.08	0.62	0.37
	205A	206A						1.23	106	3.59	1.23		0.00		0.00		0.00	0.00	0.00	1.23	0.41	1.64	13.5	200	0.35	19.40	0.08	0.62	0.37
To Appalachian Circle, Pipe 206A - 207A								1.23	106				0.00		0.00		0.00			1.23									

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha		
Average Daily Flow =	280	l/p/day			Industrial Peak Factor = as per MOE Graph	
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Extraneous Flow =	0.330 L/s/ha
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Minimum Velocity =	0.600 m/s
Max Res. Peak Factor =	3.80				Manning's n = (Conc)	0.013 (Pvc) 0.013
Commercial/Inst./Park Peak Factor =	1.00				Townhouse coeff=	2.7
Institutional =	0.32	l/s/Ha			Single house coeff=	3.4

Designed: SLM

Checked: ADF

Dwg. Reference:
Sanitary Drainage Plan, Dwgs. No. 80-83

PROJECT: **Ciavan Communities - Brazeau Phase 1**

LOCATION: **City of Ottawa**

File Ref: 18-1030

Date: **27 Jul 2020**

Sheet No. 3 of 6

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION									COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	UNITS Singles	UNITS Townhouse	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
Appalachian Circle																													
	209A	210A	0.08	1	1		4	0.08	4	3.76	0.05		0.00		0.00		0.00	0.00	0.08	0.08	0.03	0.08	12.5	200	2.95	56.33	0.00	1.79	0.29
	210A	211A	0.20	4	4		14	0.28	18	3.71	0.22		0.00		0.00		0.00	0.00	0.20	0.28	0.09	0.31	50.5	200	3.80	63.94	0.00	2.04	0.52
	211A	212A	0.19	4	4		14	0.47	32	3.68	0.38		0.00		0.00		0.00	0.00	0.19	0.47	0.16	0.54	50.0	200	0.45	22.00	0.02	0.70	0.29
	212A	213A	0.09	1	1		4	0.56	36	3.67	0.43		0.00		0.00		0.00	0.00	0.09	0.56	0.18	0.61	12.5	200	1.55	40.83	0.02	1.30	0.47
	213A	214A	0.53	14	14		48	1.09	84	3.61	0.98		0.00		0.00		0.00	0.00	0.53	1.09	0.36	1.34	86.5	200	2.35	50.28	0.03	1.60	0.68
To Foundation Lane, Pipe 214A - 119A								1.09	84				0.00		0.00		0.00			1.09									
	209A	201A	0.58	18	18		62	0.58	62	3.64	0.73		0.00		0.00		0.00	0.00	0.58	0.58	0.19	0.92	93.5	200	0.65	26.44	0.03	0.84	0.39
	201A	202A	0.69	22	22		75	1.27	137	3.56	1.58		0.00		0.00		0.00	0.00	0.69	1.27	0.42	2.00	116.5	200	0.95	31.97	0.06	1.02	0.56
	202A	203A	0.18	3	3		11	1.45	148	3.55	1.70		0.00		0.00		0.00	0.00	0.18	1.45	0.48	2.18	13.5	200	0.80	29.34	0.07	0.93	0.54
	203A	206A	0.17	4	4		14	1.62	162	3.54	1.86		0.00		0.00		0.00	0.00	0.17	1.62	0.53	2.40	50.5	200	1.10	34.40	0.07	1.09	0.62
Contribution From Rugosa Street, Pipe 205A - 206A								1.23	106				0.00		0.00		0.00		1.23	2.85									
	206A	207A	0.20	5	5		17	3.05	285	3.47	3.21		0.00		0.00		0.00	0.00	0.20	3.05	1.01	4.21	50.5	200	0.35	19.40	0.22	0.62	0.49
	207A	208A	0.12	2	2		7	3.17	292	3.47	3.28		0.00		0.00		0.00	0.00	0.12	3.17	1.05	4.33	12.0	200	0.35	19.40	0.22	0.62	0.50
	208A	214A	0.65	18	18		62	3.82	354	3.44	3.94		0.00		0.00		0.00	0.00	0.65	3.82	1.26	5.20	112.5	200	1.90	45.21	0.12	1.44	0.95
To Unknown Road1 - 07, Pipe 214A - 119A								3.82	354				0.00		0.00		0.00			3.82									
Foundation Lane																													
Contribution From Appalachian Circle, Pipe 208A - 214A								3.82	354				0.00		0.00		0.00		3.82	3.82									
Contribution From Appalachian Circle, Pipe 213A - 214A								1.09	84				0.00		0.00		0.00		1.09	4.91									
	214A	119A	0.08				0	4.99	438	3.40	4.83		0.00		0.00		0.00	0.00	0.08	4.99	1.65	6.48	59.0	200	0.35	19.40	0.33	0.62	0.55
To Montology Way, Pipe 119A - 120A								4.99	438				0.00		0.00		0.00			4.99									
Travertine Way																													
	119A	122A	0.52	13	13		45	0.52	45	3.66	0.53		0.00		0.00		0.00	0.00	0.52	0.52	0.17	0.71	86.5	200	0.65	26.44	0.03	0.84	0.36
	122A	123A	0.09	1	1		4	0.61	49	3.65	0.58		0.00		0.00		0.00	0.00	0.09	0.61	0.20	0.78	12.5	200	1.50	40.17	0.02	1.28	0.50
	123A	126A	0.20	4	4		14	0.81	63	3.63	0.74		0.00		0.00		0.00	0.00	0.20	0.81	0.27	1.01	50.0	200	3.20	58.67	0.02	1.87	0.70
To Sturnidae Street, Pipe 126A - 106A								0.81	63				0.00		0.00		0.00			0.81									
Contribution From Foundation Lane, Pipe 214A - 119A								4.99	438				0.00		0.00		0.00		4.99	4.99									
	119A	120A	0.60	17	17		58	5.59	496	3.38	5.43		0.00		0.00		0.00	0.00	0.60	5.59	1.84	7.28	103.5	200	0.35	19.40	0.38	0.62	0.57
	120A	121A	0.14	2	2		7	5.73	503	3.38	5.51		0.00		0.00		0.00	0.00	0.14	5.73	1.89	7.40	13.5	200	0.35	19.40	0.38	0.62	0.57
	121A	131A	0.43	10	10		34	6.16	537	3.37	5.86		0.00		0.00		0.00	0.00	0.43	6.16	2.03	7.89	110.0	200	0.90	31.12	0.25	0.99	0.82
Contribution From Montology Way, Pipe 130A - 131A								1.45	117				0.00		0.00		0.00		1.45	7.61									
	131A	135A	0.19	4	4		14	7.80	668	3.32	7.20		0.00		0.00		0.00	0.00	0.19	7.80	2.57	9.77	58.5	200	0.35	19.40	0.50	0.62	0.62
To Haiku Street, Pipe 135A - 118A								7.80	668				0.00		0.00		0.00			7.80									
Haiku Street																													
Contribution From Montology Way, Pipe 131A - 135A								7.80	668				0.00		0.00		0.00		7.80	7.80									
Contribution From Haiku Street, Pipe 134A - 135A								0.91	0				21.23		0.00		0.00		22.14	29.94									
	135A	118A						8.71	668	3.32	7.20		21.23		0.00		0.00	6.88	0.00	29.94	9.88	23.96	6.5	250	0.25	29.73	0.81	0.61	0.67
Contribution From Expansion Road, Pipe 1180A - 118A								2.87	227				0.00		0.00		1.45		4.32	34.26									
	118A	117A						11.58	895	3.26	9.47		21.23		0.00		1.45	7.04	0.00	29.94	9.88	26.38	119.0	300	0.20	43.25	0.61	0.61	0.64
Contribution From Haiku Street - Local Sewer, Pipe 118A - 117A								0.70	65				0.00		0.00		0.00			0.70									
	117A	116A						12.28	960	3.25	10.11		21.23		0.00		1.45	7.04	0.00	30.64	10.11	27.26	125.5	375	0.15	67.91	0.40	0.61	0.58
Contribution From Elevation Road, Pipe 106A - 116A								9.65	817				0.00		0.00		1.72		11.37	42.01									
	116A	1160A						21.93	1777	3.10	17.85		21.23		0.00		3.17	7.22	0.00	42.01	13.86	38.94	17.0	375	0.15	67.91	0.57	0.61	0.63
To Haiku Street, Pipe 1160A - 1150A								21.93	1777				21.23		0.00		3.17			42.01									

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha			
Average Daily Flow =	280	l/p/day			Industrial Peak Factor = as per MOE Graph		
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Extraneous Flow =	0.330	L/s/ha
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Minimum Velocity =	0.600	m/s
Max Res. Peak Factor =	3.80				Manning's n = (Conc)	0.013 (Pvc)	0.013
Commercial/Inst./Park Peak Factor =	1.00				Townhouse coeff=	2.7	
Institutional =	0.32	l/s/Ha			Single house coeff=	3.4	

Designed: SLM

Checked: ADF

Dwg. Reference:

Sanitary Drainage Plan, Dwgs. No. 80-83

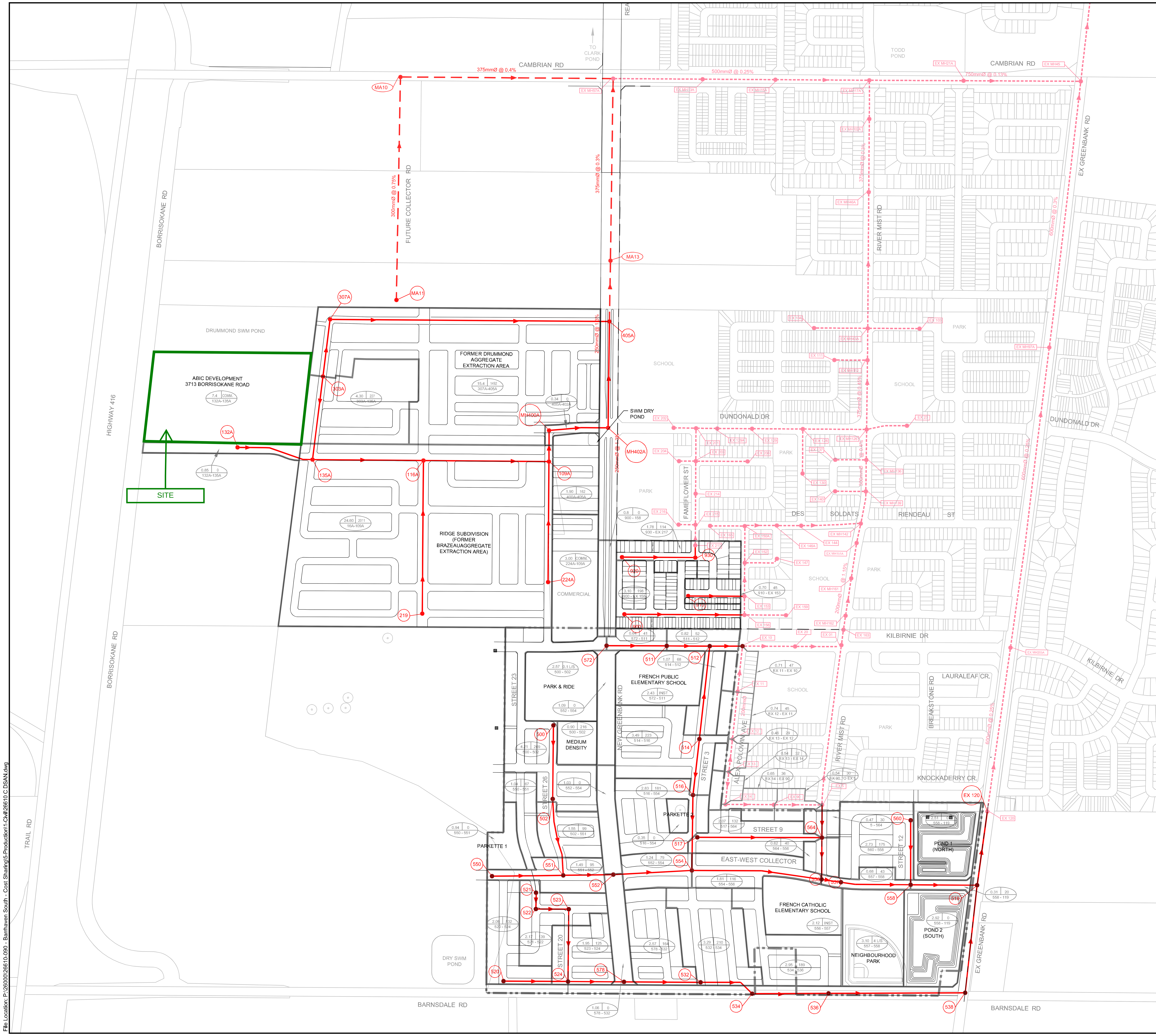
PROJECT: **Ciavan Communities - Brazeau Phase 1**

LOCATION: **City of Ottawa**

File Ref: 18-1030

Date: **27 Jul 2020**

Sheet No. 4 of 6



SANITARY SEWERS

M.H. #		SEWER DATA			Upstream	Downstream
		DIA.	SLOPE	LENGTH	Obvert	Obvert
FROM	TO	mm	%	m		
572	511	200	2.87	136.50	102.79	98.88
511	512	200	0.80	97.52	98.88	98.10
514	512	200	0.74	212.06	99.67	98.10
512	10 (ex.)	200	1.60	74.41	98.10	96.91
514	516	200	0.35	127.86	102.70	102.25
516	554	200	0.35	170.90	102.25	101.65
500	502	200	0.35	174.02	105.03	104.42
502	551	200	0.89	168.60	104.42	102.92
550	551	200	0.35	161.54	103.20	102.63
551	552	200	0.35	113.56	102.63	102.24
552	554	200	0.35	178.26	102.24	101.61
554	556	250	0.33	295.67	101.61	100.64
517	564	200	0.58	282.43	102.10	100.45
13 (ex.)	14 (ex.)	200	0.67	74.56	102.55	102.05
14 (ex.)	90 (ex.)	200	0.94	112.06	102.00	101.95
90 (ex.)	5 (ex.)	200	0.35	108.16	100.95	100.57
5 (ex.)	564	200	0.35	74.22	100.30	100.04
564	556	200	0.35	94.59	100.04	99.71
556	557	250	1.39	44.25	99.71	99.09
557	558	250	1.39	158.35	99.09	96.89
560	558	200	0.35	142.27	95.32	94.82
558	119	375	0.18	150.71	93.71	93.43
521	522	200	1.50	37.09	102.18	101.62
522	523	200	0.80	73.27	101.62	101.04
523	524	200	0.35	164.00	101.04	100.46
520	524	300	0.20	146.25	98.40	98.11
524	578	300	0.20	126.92	98.11	97.85
578	532	300	0.20	173.72	97.85	97.51
532	534	300	0.20	127.45	97.51	97.25
534	536	450	0.20	173.27	95.50	95.15
536	538	450	0.20	309.73	95.15	94.53
538	119	525	0.15	245.34	93.80	93.43
119	120 (ex.)	600	0.15	168.66	93.43	93.17
900	158 (ex.)	200	0.35	280.00	97.23	97.13
910	153 (ex.)	200	0.35	130.00	96.70	96.65
920	930	200	0.35	165.00	97.42	97.36
930	217 (ex.)	200	0.35	40.00	97.36	97.24
MA 11	MA 10	300	0.75	482.10	95.00	91.38
MA13	MH57A	375	0.30	413.10	90.77	89.53
MA 10	MH57A	375	0.41	449.70	91.38	89.53
Former Brazeau and Drummond Aggregate Extraction Areas					Highest obverts per each connection	
132A	135A	200			97.13	96.43
303A	135A	200			98.15	96.43
135A	116A	250			96.16	95.52
219	116A	200			104.74	95.47
116A	109A	200			95.47	98.00
224A	109A	200			103.00	98.90
109A	400A	375			99.08	94.88
400A	402A	375			94.94	94.59
402A	405A	375			94.59	96.21
303A	307A	200			98.15	96.09
307A	405A	200			96.03	96.21

LEGEND

- PROPOSED SANITARY, PER 2018 BSUEA MSS
- FUTURE SANITARY, PER 2014 BS MSS
- EXISTING SANITARY
- DRAINAGE BOUNDARY
- LIMIT OF STUDY AREA FOR BSUEA
- 0.23 | 5 / 41-32: AREA IN HECTARES; POPULATION; PIPE REACH UPSTREAM MAINTENANCE HOLE TO DOWNSTREAM MAINTENANCE HOLE
- COMM: COMMERCIAL
- INST: INSTITUTIONAL
- VARIES: SEE DESIGN SHEET FOR CONTRIBUTING FLOWS

No.	ISSUE / REVISION	DD/MM/YY
6	REVISED FOR ADDENDUM NO. 1	06/08/20
5	REVISED & ISSUED W/ MSS ADDENDUM #1	30/07/20
4	ISSUED FOR PLANNING COMMITTEE APPROVAL	04/05/18
3	ADDRESS COMMENTS, RE-ISSUE BSUEA MSS 2ND SUBMISSION	26/02/18
2	ISSUED AS PART OF DRAFT MSS	20/09/17
1	ISSUED FOR PRE-TAC WORKING MEETING	31/08/17

VERIFY SHEET SIZE AND SCALES. BAR TO THE RIGHT IS 25mm IF THIS IS A FULL SIZE DRAWING. 0 25mm

SCALE: 1:4,000

CLIENT:

CONSULTANT: www.jlrichards.ca

J.L.Richards ENGINEERS · ARCHITECTS · PLANNERS

CONSULTANT:

PROFESSIONAL STAMP

PROJECT NORTH

PROJECT:

BARRHAVEN SOUTH URBAN EXPANSION AREA (BSUEA)

DRAWING:

MASTER SANITARY DRAINAGE AREA

DESIGN: JW/AT

DRAWN: CJM/TB

CHECKED: LD

JLR #: 26610-009

DRAWING #: MSAN

PLOT DATE: Thursday, August 6, 2020 5:24:14 PM

File Location: P:\26000\26610-090 - Barrhaven South - Cost Sharing\5-Production\1-Civil\26610 C DSAN.dwg

APPENDIX D

Stormwater Management

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

Target Flow Rate

Q 210.4 L/s

Estimated Post Development Peak Flow from Unattenuated Areas

Area ID **U1+U2**
Total Area 0.268 ha
C 0.45 Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}* (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
15.5	82.0	27.2	27.2	0.0	0.0	140.2	58.2	58.2	0.0	0.0

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

Estimated Post Development Peak Flow from Attenuated Areas

Q (total - uncontrolled) 152.2 L/s

Area ID **STM200, CB12, STM100, STM101, CB8, L2, BUILDA BUILDB, L1**
Stage Attenuated Areas Storage Summary

		Surface Storage			Surface and Subsurface Storage		
	Stage (m)	Ponding (m^2)	h_o (m)	delta d (m)	V* (m^3)	V_{acc}** (m^3)	$Q_{release}$† (L/s)
Orifice INV	98.10		0.00			0.0	0.0
Headwall INV	98.48	0	0.38	0.38	0.1	0.1	67.4
0.02m Ponding	98.50	20	0.40	0.02	0.2	0.2	70.0
0.12m Ponding	98.60	792	0.50	0.10	31.3	31.5	81.8
0.22m Ponding	98.70	2862.0	0.60	0.10	172.0	203.5	92.1
0.52m Ponding	99.00	3059.1	0.90	0.30	888.0	1091.5	117.7
0.62m Ponding	99.10	3124.4	1.00	0.10	309.2	1400.6	125.0
0.92m Ponding	99.40	3323.8	1.30	0.30	927.5	2328.2	144.9
1.22m Ponding	99.70	3528.3	1.60	0.30	967.1	3295.2	162.3

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate calculated from orifice equation

ICD SIZING CALCULATION

Orifice Location **STM MH 204** **Dia** 251
Total Area 7.079 ha (ALL ATT)
C 0.65 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
50	37.7	479.5	117.5	362.0	1086.0	64.0	1018.1	151.9	866.3	2598.9
60	32.9	419.6	117.5	302.0	1087.3	55.9	889.8	151.9	738.0	2656.7
70	29.4	374.1	117.5	256.5	1077.5	49.8	792.6	151.9	640.8	2691.3
80	26.6	338.3	117.5	220.8	1059.6	45.0	716.3	151.9	564.4	2709.1
90	24.3	309.3	117.5	191.8	1035.7	41.1	654.5	151.9	502.6	2714.2
100	22.4	285.4	117.5	167.8	1007.0	37.9	603.4	151.9	451.6	2709.3
110	20.8	265.2	117.5	147.7	974.5	35.2	560.4	151.9	408.6	2696.5
120	19.5	247.9	117.5	130.4	938.9	32.9	523.7	151.9	371.8	2677.1
130	18.3	233.0	117.5	115.5	900.6	30.9	491.9	151.9	340.0	2652.3
140	17.3	219.9	117.5	102.4	860.1	29.2	464.1	151.9	312.2	2622.8
150	16.4	208.4	117.5	90.8	817.6	27.6	439.6	151.9	287.7	2589.3
160	15.6	198.1	117.5	80.6	773.5	26.2	417.7	151.9	265.9	2552.3
170	14.8	188.9	117.5	71.4	727.9	25.0	398.2	151.9	246.3	2512.3
180	14.2	180.6	117.5	63.1	681.0	23.9	380.5	151.9	228.7	2469.6
190	13.6	173.1	117.5	55.5	632.9	22.9	364.5	151.9	212.7	2424.5
200	13.0	166.2	117.5	48.7	583.8	22.0	350.0	151.9	198.1	2377.2
210	12.6	159.9	117.5	42.4	533.8	21.1	336.6	151.9	184.8	2328.0
220	12.1	154.1	117.5	36.6	482.9	20.4	324.4	151.9	172.5	2277.0
230	11.7	148.8	117.5	31.2	431.2	19.7	313.0	151.9	161.2	2224.3
240	11.3	143.8	117.5	26.3	378.8	19.0	302.6	151.9	150.7	2170.2
250	10.9	139.3	117.5	21.7	325.7	18.4	292.8	151.9	141.0	2114.8

5-year $Q_{attenuated}$ **117.54 L/s**
5-year Max. Storage Required **1087.3 m^3**
Est. 5-year Storage Elevation **99.00 m**

100-year $Q_{attenuated}$ **151.86 L/s**
100-year Max. Storage Required **2714.2 m^3**
Est. 100-year Storage Elevation **99.52 m**

REQUIRED VOLUME CALCULATION

Orifice Location **STM MH 204**
Total Area 7.079 ha (ALL ATT)
C 0.65 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
50	37.7	479.5	58.8	420.8	1262.3	64.0	1018.1	75.9	942.2	2826.6
60	32.9	419.6	58.8	360.8	1298.9	55.9	889.8	75.9	813.9	2930.1
70	29.4	374.1	58.8	315.3	1324.3	49.8	792.6	75.9	716.7	3010.2
80	26.6	338.3	58.8	279.5	1341.7	45.0	716.3	75.9	640.3	3073.5
90	24.3	309.3	58.8	250.6	1353.0	41.1	654.5	75.9	578.6	3124.2
100	22.4	285.4	58.8	226.6	1359.6	37.9	603.4	75.9	527.5	3164.9
110	20.8	265.2	58.8	206.4	1362.4	35.2	560.4	75.9	484.5	3197.6
120	19.5	247.9	58.8	189.2	1362.0	32.9	523.7	75.9	447.8	3223.8
130	18.3	233.0	58.8	174.2	1359.0	30.9	491.9	75.9	416.0	3244.5
140	17.3	219.9	58.8	161.2	1353.7	29.2	464.1	75.9	388.2	3260.6
150	16.4	208.4	58.8	149.6	1346.5	27.6	439.6	75.9	363.6	3272.7
160	15.6	198.1	58.8	139.3	1337.7	26.2	417.7	75.9	341.8	3281.3
170	14.8	188.9	58.8	130.1	1327.4	25.0	398.2	75.9	322.2	3286.8
180	14.2	180.6	58.8	121.8	1315.7	23.9	380.5	75.9	304.6	3289.6
190	13.6	173.1	58.8	114.3	1302.9	22.9	364.5	75.9	288.6	3290.1
200	13.0	166.2	58.8	107.4	1289.1	22.0	350.0	75.9	274.0	3288.4
210	12.6	159.9	58.8	101.1	1274.3	21.1	336.6	75.9	260.7	3284.7
220	12.1	154.1	58.8	95.4	1258.7	20.4	324.4	75.9	248.4	3279.2
230	11.7	148.8	58.8	90.0	1242.2	19.7	313.0	75.9	237.1	3272.2
240	11.3	143.8	58.8	85.1	1225.1	19.0	302.6	75.9	226.6	3263.6
250	10.9	139.3	58.8	80.5	1207.3	18.4	292.8	75.9	216.9	3253.7

5-year $Q_{attenuated}$ **58.77 L/s** **100-year $Q_{attenuated}$** **75.93 L/s**
5-year Max. Storage Required **1362.4 m^3** **100-year Max. Storage Required** **3290.1 m^3**

Summary of Release Rates and Storage Volumes

Control Area	5-Year Release Rate (L/s)	5-Year Required Storage (m^3)	100-Year Release Rate (L/s)	100-Year Required Storage (m^3)	100-Year Available Storage (m^3)
Unattenuated Areas (U1+U2)	27.2	0.0	58.2	0.0	0.0
Attenutated Areas	117.5	1362.4	151.9	3290.1	3295.2
Total	**144.8**	**1362.4**	**210.0**	**3290.1**	**3295.2**

STORAGE SUMMARY
ABIC -BUILDING/FOUNDATION DRAINAGE
STORAGE VOLUME AVAILABLE BELOW OVERFLOW

Total Site		
Rainfall (mm)	**Drainage Area (sq.m)**	**Volume of 10mm (cu.m)**
10	11840	118.4

ID	**STM301**
Structure Dia./Area (mm/mm^2)	1200
Max Ponding	99.70
INV	98.76
Depth	0.94
$V_{structure}$ (m^3)	1.1

ID	**450mm**	**CLEAR STONE**
Storage Pipe Dia (mm)	450	0.45
L (m)	218.7	170.2
V_{sewer} (m^3)	34.8	55.5

*Clear Stone Void Ratio of 40%

Total Subsurface Storage (m^3) 91.4

Storm Sewer Calculation Sheet
Ultimate - Phase II Conditions
2 Year Storm Event

										Sewer Data								
Area ID	**Up**	**Down**	**Area**	**C**	**Indiv AxC**	**Acc AxC**	**T_C**	**i_{2YR}**	**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)	(-)
CB12	CB12	STM100	0.214	0.41	0.09	0.09	10.0	76.8	18.9	200	1.00	59.6	0.031	0.050	1.04	32.8	1.0	0.58
STM100	STM100	STM101	0.775	0.73	0.57	0.66	11.0	73.3	133.5	525	0.20	113.9	0.216	0.131	0.89	192.3	2.1	0.69
STM101	STM101	STM101B	1.538	0.78	1.20	1.85	13.1	66.7	343.6	600	0.40	101.5	0.283	0.150	1.37	388.3	1.2	0.88
	STM101B	STM102				1.85	14.3	63.4	326.8	600	0.40	27.4	0.283	0.150	1.37	388.3	0.3	0.84
							14.7											
BLDG A			0.244	0.90	0.22	0.22												
STM200	STM200	STM201	0.427	0.70	0.30	0.52	10.0	76.8	110.4	450	0.25	35.9	0.159	0.113	0.90	142.6	0.7	0.77
STM202	STM201	STM203	0.411	0.84	0.35	0.86	10.7	74.3	178.5	525	0.20	157.5	0.216	0.131	0.89	192.3	3.0	0.93
CB8	STM203	STM102	0.426	0.90	0.38	1.25	13.6	65.2	226.0	525	0.30	25.6	0.216	0.131	1.09	235.6	0.4	0.96
							14.0											
	STM102	OGS				3.10	14.7	62.6	539.5	600	1.30	1.5	0.283	0.150	2.48	700.1	0.0	0.77
	OGS	SWM AREA				3.10	14.7	62.6	539.3	675	0.50	83.4	0.358	0.169	1.66	594.4	0.8	0.91
							15.5											

CB12				**STM100**					**STM101**					**STM200**			
	Imp.	Perv.	Total		Imp.	Perv.	Total			Imp.	Perv.	Total			Imp.	Perv.	Total
Area	0.065	0.149	0.214	Area	0.588	0.187	0.775		Area	1.274	0.264	1.538		Area	0.304	0.123	0.427
C	0.9	0.2	0.41	C	0.9	0.2	0.73		C	0.9	0.2	0.78		C	0.9	0.2	0.70

STM202				**CB8**					**BLDG A**					**BLDG B**			
	Imp.	Perv.	Total		Imp.	Perv.	Gravel			Imp.	Perv.	Total			Imp.	Perv.	Total
Area	0.378	0.033	0.411	Area	0.426	0.000	0.426		Area	0.244	0.000	0.244		Area	0.938	0.000	0.938
C	0.9	0.2	0.84	C	0.9	0.2	0.90		C	0.9	0.2	0.90		C	0.9	0.2	0.90

U1				**U2**					**L1**					**L2**			
	Imp.	Perv.	Total		Imp.	Perv.	Total			Imp.	Perv.	Total			Imp.	Perv.	Total
Area	0.090	0.105	0.196	Area	0.004	0.068	0.072		Area	0.000	0.981	0.981		Area	0.353	0.772	1.124
C	0.9	0.2	0.52	C	0.9	0.2	0.24		C	0.9	0.2	0.20		C	0.9	0.2	0.42

PARKING				**ALL ATT**					**U1 + U2**								
	Imp.	Perv.	Total		Imp.	Perv.	Total			Imp.	Perv.	Total					
Area	3.279	0.608	4.036	Area	4.570	2.361	7.079		Area	0.094	0.174	0.268					
C	0.9	0.2	0.76	C	0.9	0.2	0.65		C	0.9	0.2	0.45					

Hydroworks Sizing Summary

3713 Borrisokane Rd-OGS 1A
Ottawa, Ontario

01-04-2021

Recommended Size: HS 8

A HydroStorm HS 8 is recommended to provide 80 % annual TSS removal based on a drainage area of 4.036 (ha) with an imperviousness of 80 % and Ottawa CDA, Ontario rainfall for the OK110 particle size distribution.

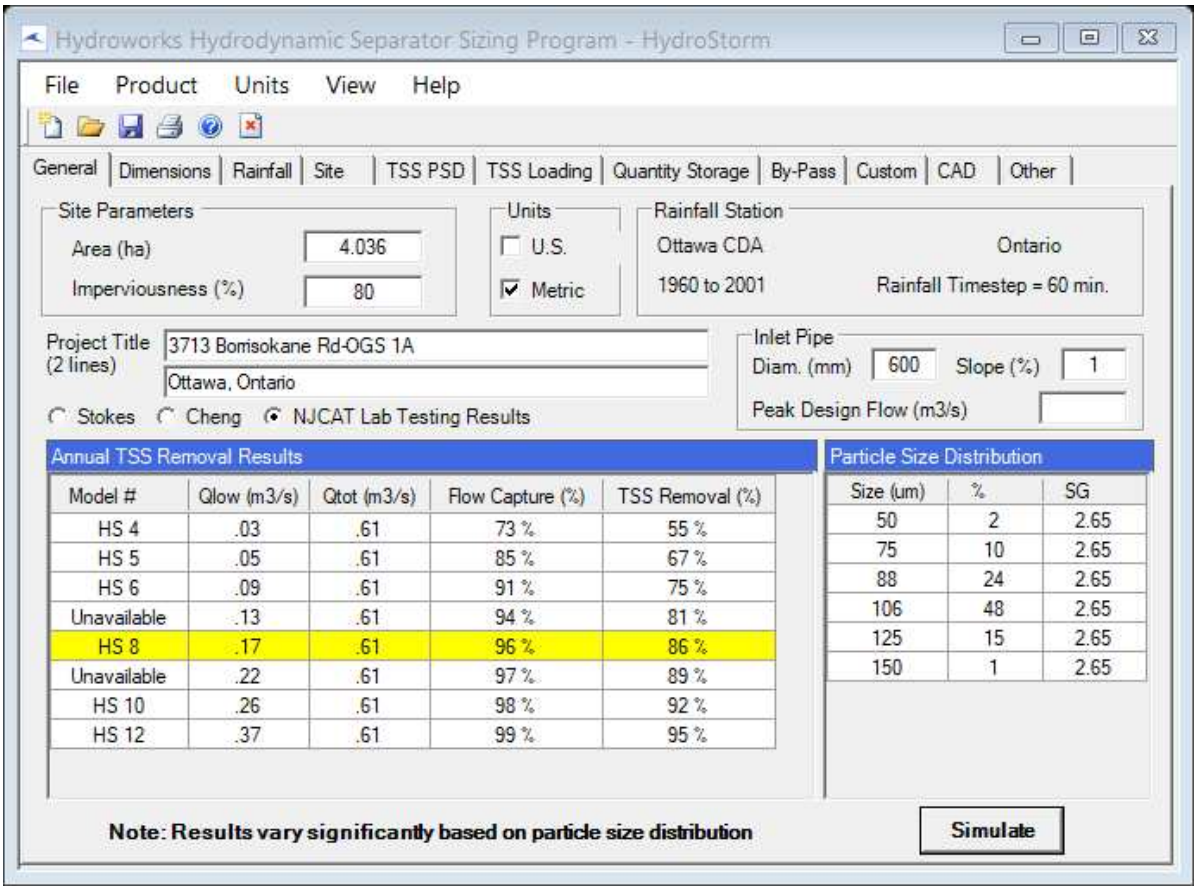
The recommended HydroStorm HS 8 treats 96 % of the annual runoff and provides 86 % annual TSS removal for the Ottawa CDA rainfall records and OK110 particle size distribution.

The HydroStorm has a headloss coefficient (K) of 1.04. Since a peak flow was not specified, headloss was calculated using the full pipe flow of .61 (m3/s) for the given 600 (mm) pipe diameter at 1% slope. The headloss was calculated to be 250 (mm) based on a flow depth of 600 (mm) (full pipe flow).

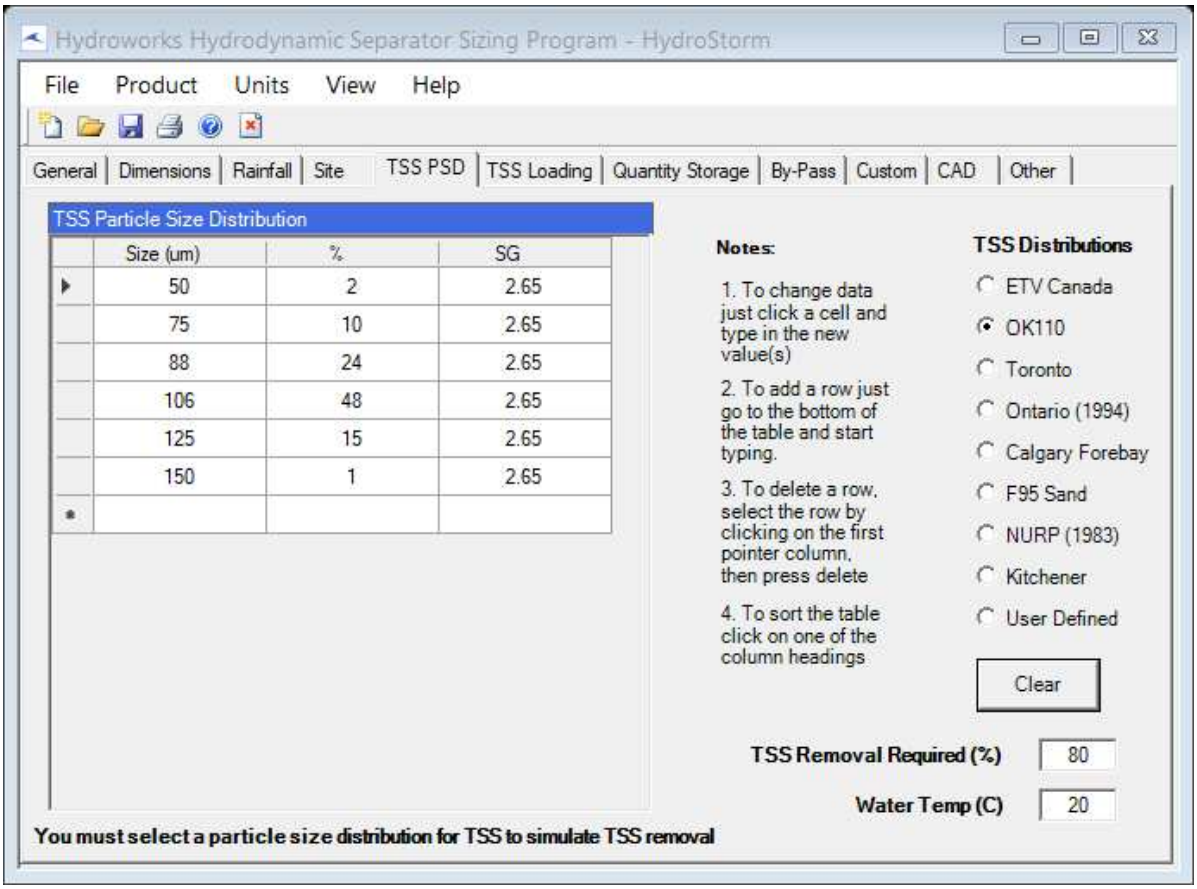
This summary report provides the main parameters that were used for sizing. These parameters are shown on the summary tables and graphs provided in this report.

If you have any questions regarding this sizing summary please do not hesitate to contact Hydroworks at 888-290-7900 or email us at support@hydroworks.com.

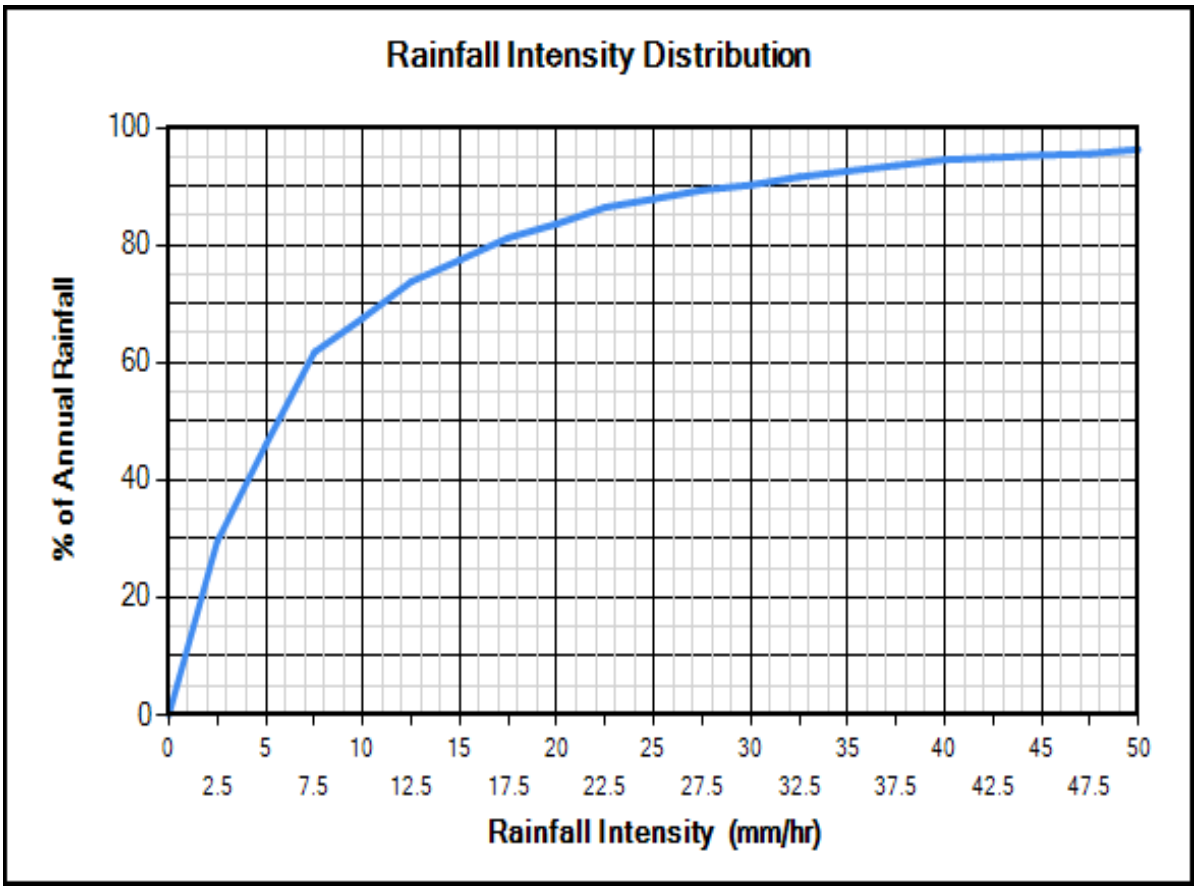
TSS Removal Sizing Summary



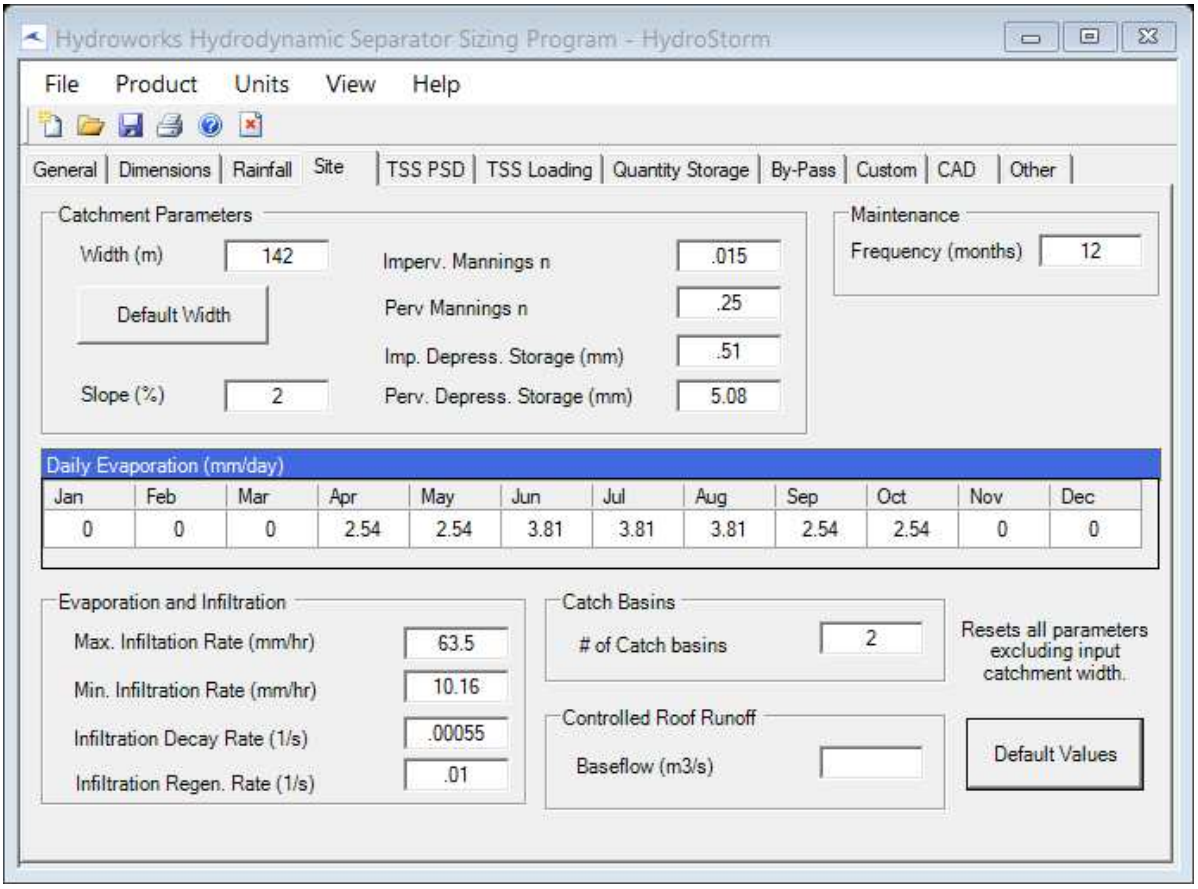
TSS Particle Size Distribution



Rainfall Station - Ottawa CDA, Ontario(1960 to 2001)



Site Physical Characteristics



Dimensions And Capacities

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units View Help

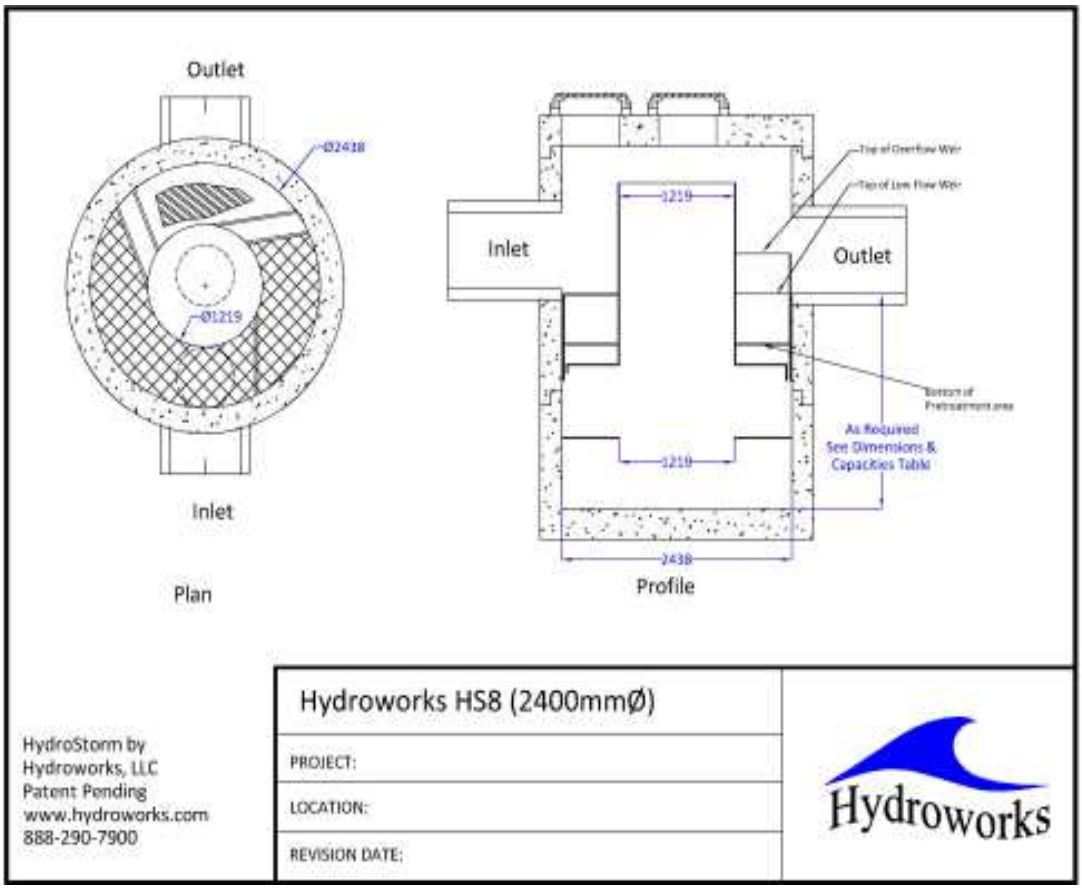
General | Dimensions | Rainfall | Site | TSS PSD | TSS Loading | Quantity Storage | By-Pass | Custom | CAD | Other

Dimensions and Capacities

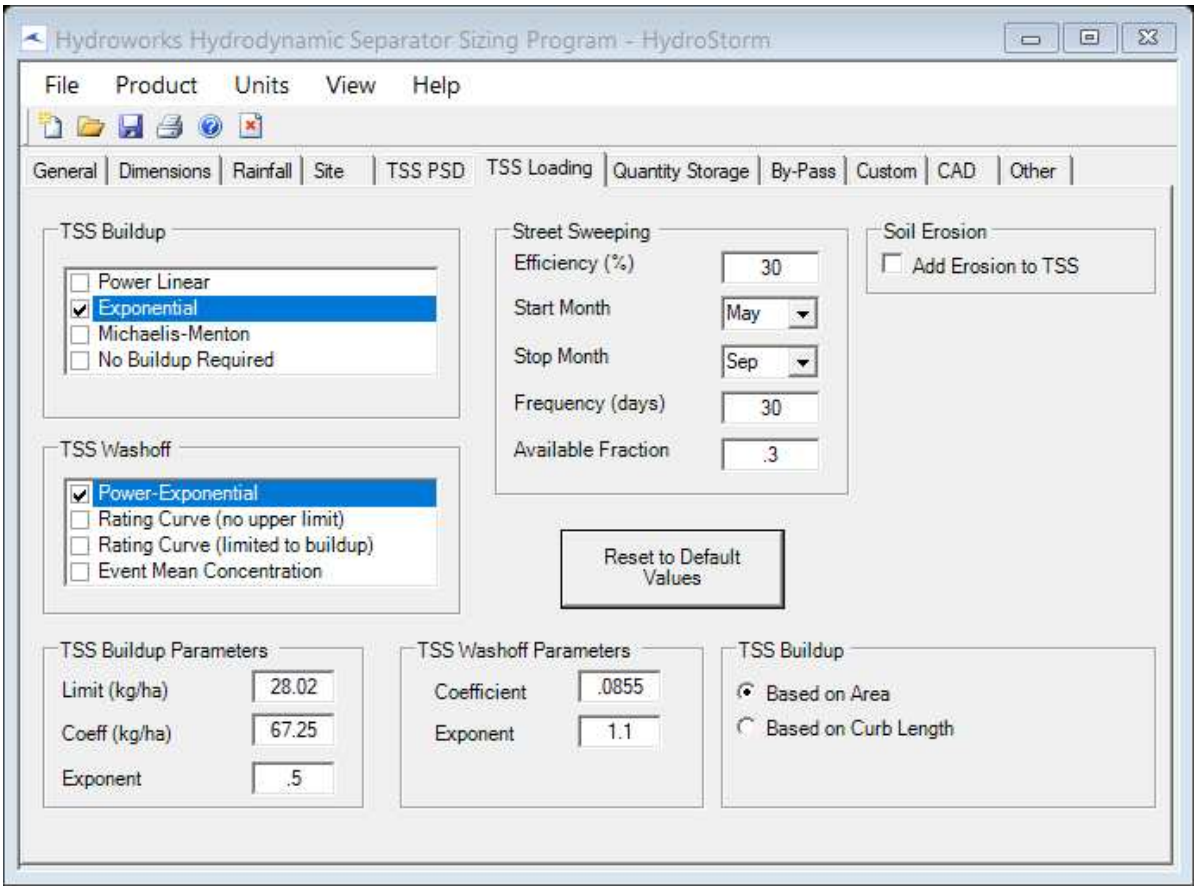
Model	Diam. (m)	Depth (m)	Float. Vol. (L)	Sediment Vol. (m3)	Total Vol. (m3)
HS 4	1.22	1.22	381	0.9	1.4
HS 5	1.52	1.52	642	1.8	2.8
HS 6	1.83	1.83	1041	3.2	4.8
HS 7	2.13	1.98	1575	4.6	7.1
HS 8	2.44	2.13	2354	6.3	10
HS 9	2.74	2.44	3242	9.3	14.4
HS 10	3.05	2.74	4327	13.2	20
HS 12	3.66	3.35	7164	23.8	35.2

Depth = Depth from outlet invert to inside bottom of tank

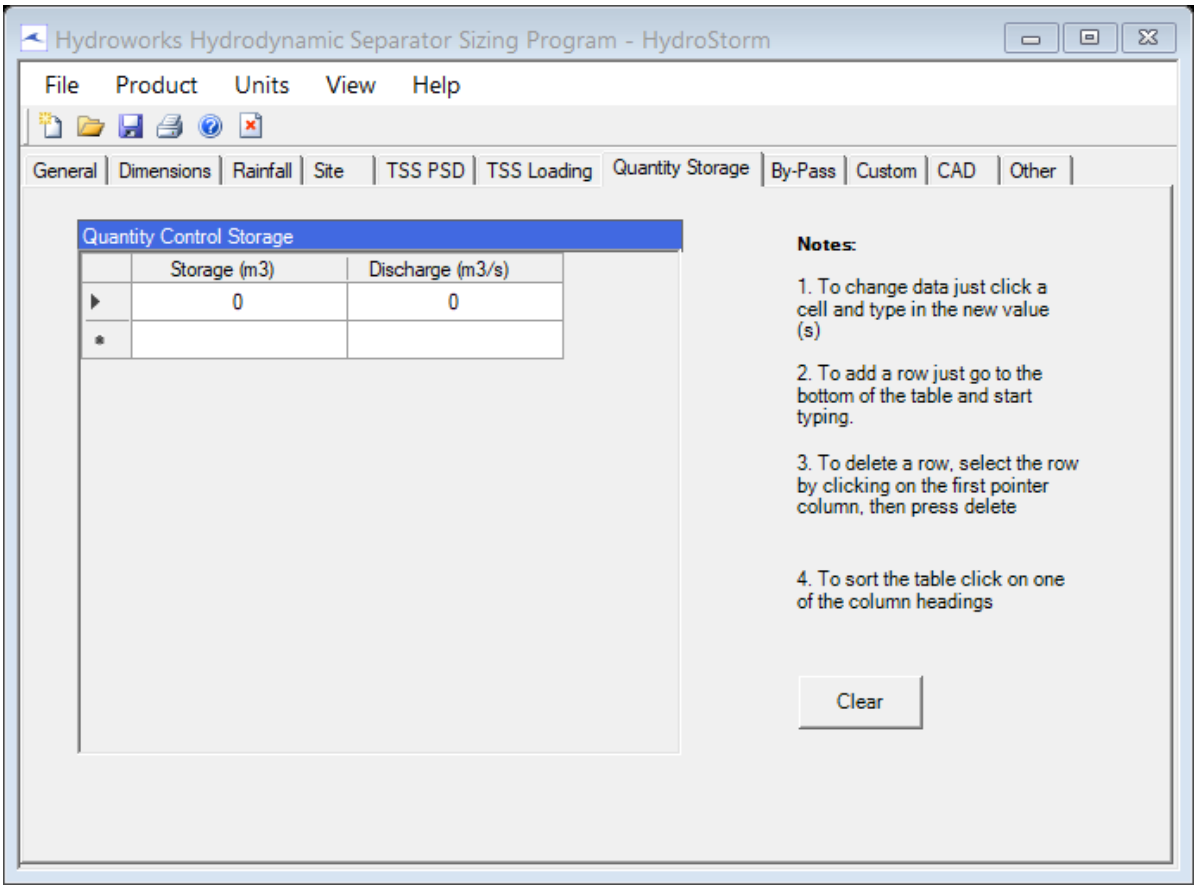
Generic HS 8 CAD Drawing



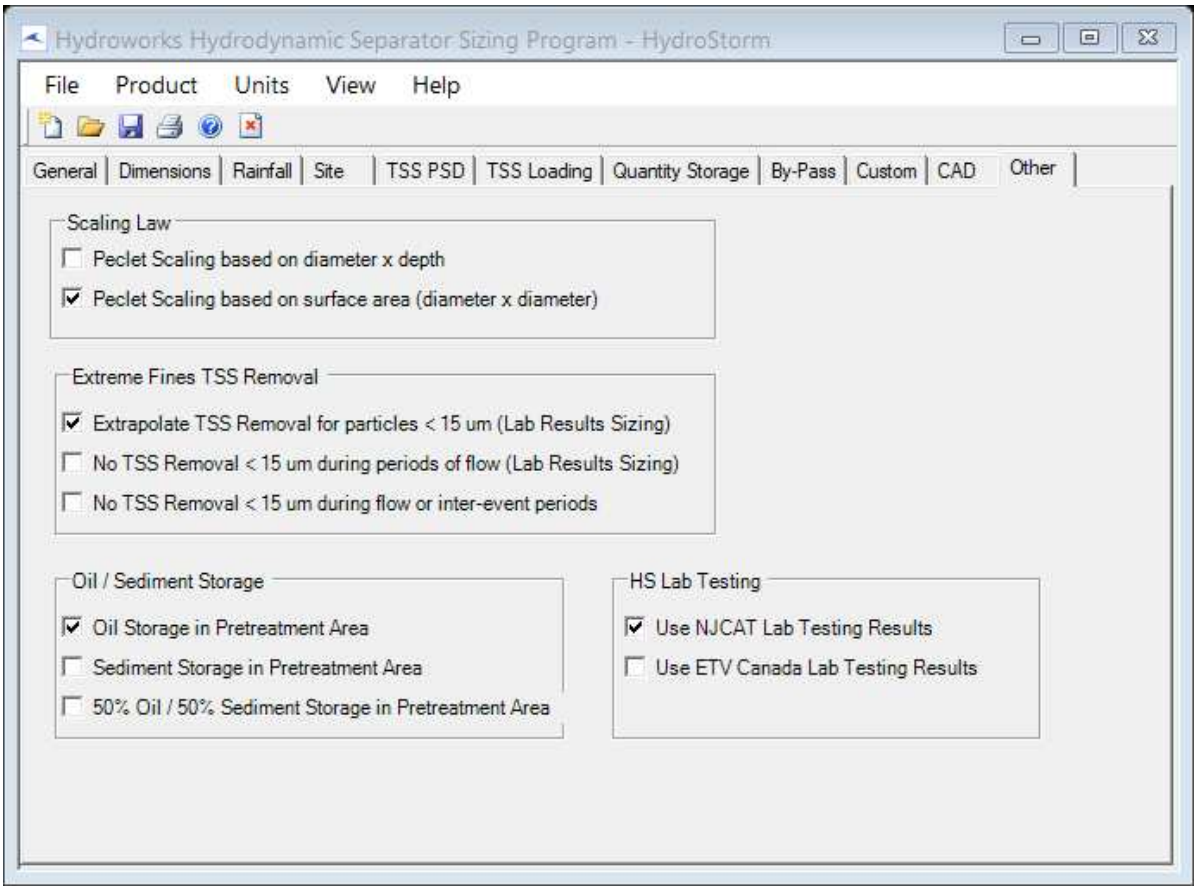
TSS Buildup And Washoff

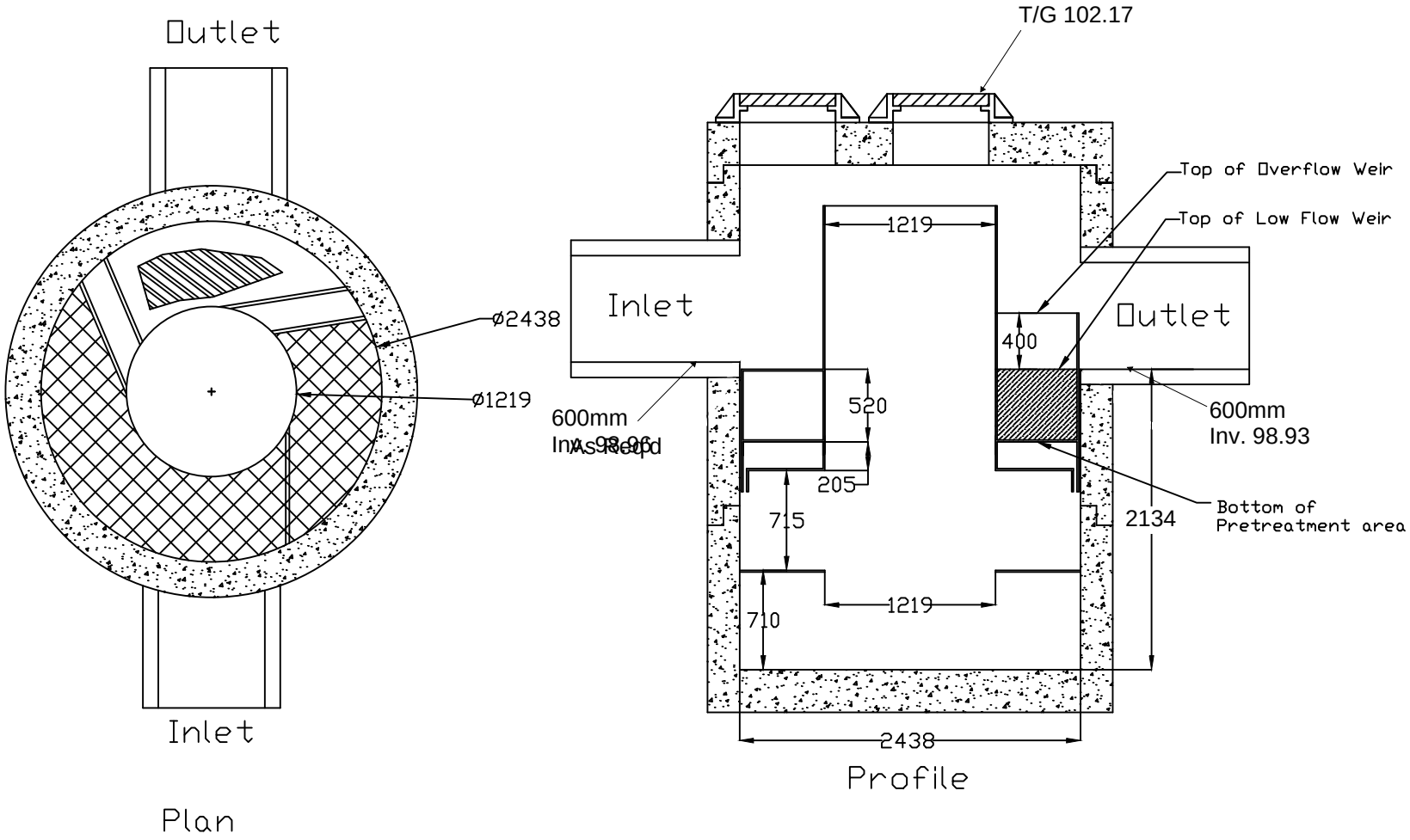


Upstream Quantity Storage



Other Parameters





Canadian Infrastructure Products
www.c-i-p.ca
519-212-9161

HydroStorm by Hydroworks, LLC
Patent Pending
www.hydroworks.com
888-290-7900

Hydroworks HS8 (2400mmØ)

PROJECT: 3713 Borrisokane Road

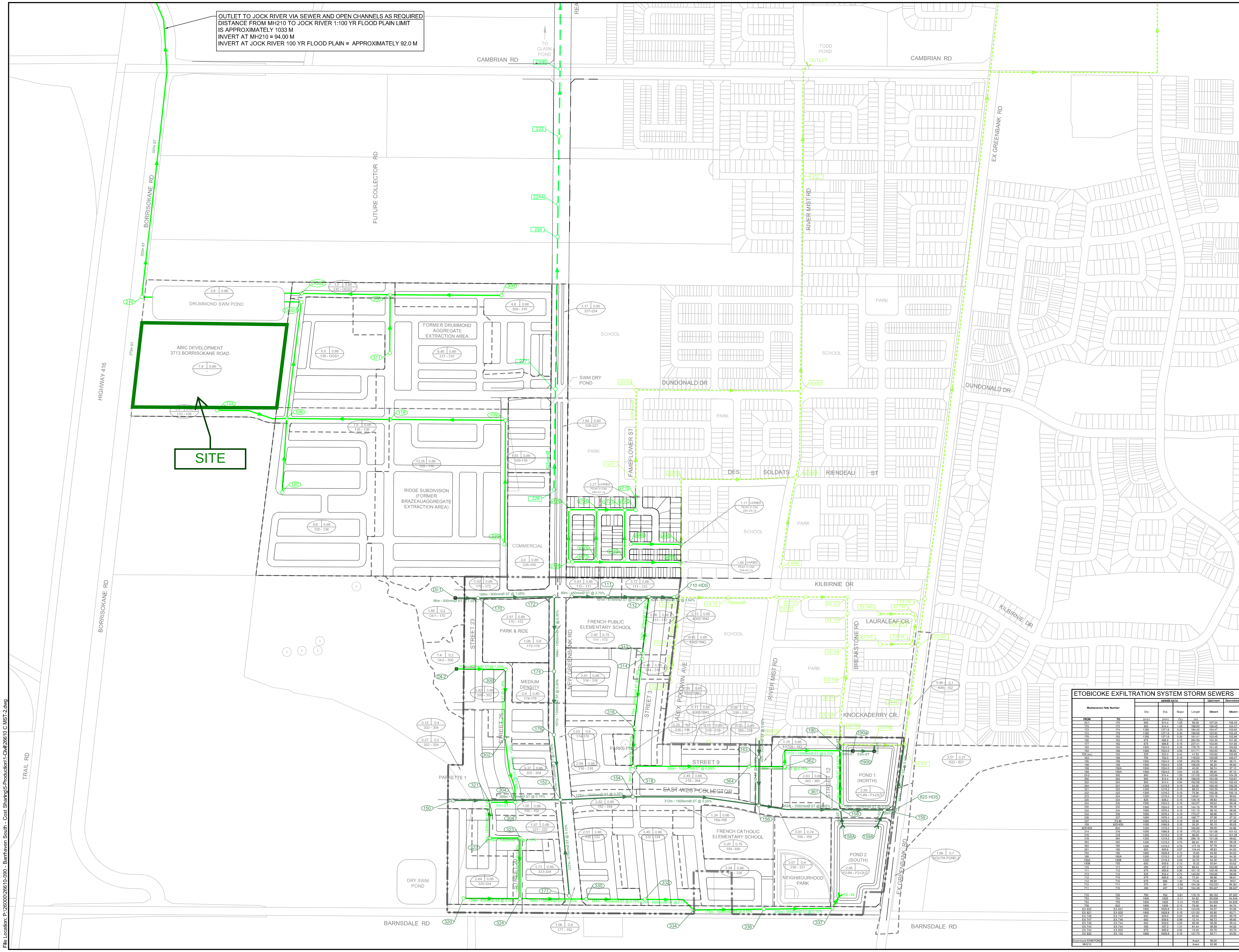
LOCATION: Ottawa, Ontario

REVISION DATE: January 4, 2021

Hydroworks

Barrhaven South Urban Expansion Area Excerpts
J.L. Richards & Associates Limited

JLR No. 26610
May 4, 2018 Rev2



ETOBICOKE EXFILTRATION SYSTEM STORM SEWERS

Maintenance Hole Number		SEWER DATA				Upstream	Downstream
		Dia	Dia.	Slope	Length	Obvert	Obvert
FROM	TO	(mm)	(mm)	(%)	(m)		
DI-1	170	900	914.4	1.05	56.09	107.04	106.45
170	172	900	914.4	1.05	188.50	106.45	104.47
172	174	1350	1371.6	0.30	184.40	104.47	103.92
174	176	1350	1371.6	0.30	156.69	103.92	103.45
176	152	1350	1371.6	0.30	161.41	103.45	102.96
150	152	675	685.8	0.15	264.59	102.30	101.90
177	152	675	685.8	0.15	237.41	102.00	101.65
152	154	1500	1524.0	0.35	178.75	101.45	100.82
154	156	1500	1524.0	0.55	311.71	100.53	98.82
705 (ex.)	163	525	533.4	0.42	41.53	100.82	100.65
163	156	750	762.0	0.15	118.53	100.65	100.47
156	158	1500	1524.0	0.55	202.56	97.86	96.74
158	159	1500	1524.0	0.55	108.09	96.20	95.60
158	158A	1500	1524.0	0.95	40.00	96.74	97.13
159	159A	1500	1524.0	3.54	43.00	95.60	97.13
DI-2	300	900	914.4	1.05	121.05	105.66	104.39
300	302	900	914.4	0.35	168.09	104.39	103.81
302	304	900	914.4	0.94	162.58	102.02	100.49
304	321	1200	1219.2	0.15	63.30	100.49	100.39
321	322	1200	1219.2	0.15	88.23	100.39	100.26
322	323	1200	1219.2	0.15	75.36	100.26	100.15
323	324	1200	1219.2	0.35	149.81	100.15	99.62
320	324	825	838.2	0.15	139.15	99.83	99.62
324	330	1500	1524.0	0.15	163.57	99.62	99.38
330	332	1500	1524.0	0.15	144.16	99.38	99.16
332	334	1650	1676.4	0.15	131.10	99.16	98.96
334	336	1650	1676.4	0.15	173.27	98.96	98.70
336	337	1650	1676.4	0.15	168.77	97.58	97.33
337	P2-IN	1650	1676.4	0.15	35.99	97.33	97.28
159	825HDS	1050	1066.8	0.35	26.20	95.15	95.05
825HDS	822	1200	1219.2	0.12	160.80	95.05	94.86
314	316	1050	1066.8	0.15	170.20	101.68	101.43
316	318	1200	1219.2	0.15	96.00	101.43	101.28
318	364	1200	1219.2	0.58	286.18	101.28	99.62
364	362	1200	1219.2	0.70	88.24	99.10	98.48
362	190	1200	1219.2	0.70	177.70	97.78	96.54
361	190	600	609.6	0.67	134.44	95.83	94.93
754	190	1800	1828.8	0.13	15.00	94.95	94.93
190	190A	1200	1219.2	0.07	30.00	94.32	94.30
190A	190B	1200	1219.2	0.09	52.70	94.30	94.25
190B	755	600	609.6	0.13	15.32	93.64	93.62
110	111	450	457.2	2.70	89.42	102.90	100.49
111	112	675	685.8	0.90	101.15	100.49	99.58
313	112	525	533.4	0.74	140.00	100.60	99.56
112	710	675	685.8	1.30	73.34	99.56	98.61
112	710	675	686	1.30	73.34	99.56	98.61
712	711	375	381	2.56	104.28	102.031	99.361
711	710	450	457	1.32	104.38	99.407	98.027
710	720	750	762	0.61	115.19	98.102	97.397
753	754	1800	1829	0.11	54.92	95.008	94.949
754	755	1800	1829	0.13	76.85	94.939	94.839
755	822	1800	1829	0.13	79.46	94.84	94.74
EX. 822	EX. 821	1800	1828.8	0.14	123.06	94.07	93.90
EX. 821	EX. 820	1800	1828.8	0.15	121.92	93.90	93.71
EX. 748	EX. 747	600	609.6	0.20	83.06	95.95	95.79
EX. 747	EX. 746	600	609.6	0.99	12.14	95.72	95.60
EX. 746	EX. 744	600	609.6	0.20	69.38	95.58	95.44
EX. 743	EX. 744	450	457.2	1.31	81.44	95.59	94.52
EX. 744	EX. 820	675	685.8	0.52	12.40	93.76	93.70
EX. 820	EX. 102	1800	1828.8	0.16	121.70	93.71	93.52
Drummond SWM POND					Invert	96.00	
MH210					Invert	93.98	

LEGEND

- PROPOSED STORM (EES SYSTEM), PER 2018 BSUEA MSS
- PROPOSED STORM (CONVENTIONAL), PER 2018 BSUEA MSS
- FUTURE STORM, PER 2014 BS MSS
- EXISTING STORM
- DRAINAGE BOUNDARY
- LIMIT OF STUDY AREA FOR BSUEA
- 710 HDS — HYDROLOGY DYNAMIC SEPARATOR
- AREA IN HECTARES*
- RUNOFF COEFFICIENT*
- PIPE REACH UPSTREAM MAINTENANCE HOLE TO DOWNSTREAM MAINTENANCE HOLE

* IF RED. AREAS DESIGNATED AS COMMERCIAL, SCHOOLS OR PARKS

NOTE:

ROADWAYS WITHIN A DRAINAGE AREA WHICH IS TRIBUTARY TO AN EES SEWER, ARE TO BE DESIGNED WITH EES SEWERS. CONVERSELY, ROADWAYS WITHIN A DRAINAGE AREA WHICH IS TRIBUTARY TO A CONVENTIONAL SEWER, ARE TO BE DESIGNED WITH CONVENTIONAL SEWERS.

No.	ISSUE / REVISION	DD/MM/YY
5	REVISED FOR ADDENDUM NO. 1	06/08/20
4	ISSUED FOR PLANNING COMMITTEE APPROVAL	04/05/18
3	ADDRESS COMMENTS, RE-ISSUE BSUEA MSS 2ND SUBMISSION	26/02/18
2	ISSUED AS PART OF DRAFT MSS	20/09/17
1	ISSUED FOR PRE-TAC WORKING MEETING	31/08/17

VERIFY SHEET SIZE AND SCALES. BAR TO THE RIGHT IS 25mm IF THIS IS A FULL SIZE DRAWING. 0 25mm

SCALE: 1:4000

CLIENT:

CONSULTANT: www.jlrichards.ca

J.L.Richards ENGINEERS · ARCHITECTS · PLANNERS

CONSULTANT:

PROFESSIONAL STAMP

PROJECT NORTH

PROJECT: BARRHAVEN SOUTH URBAN EXPANSION AREA (BSUEA)

DRAWING: MASTER STORM DRAINAGE PLAN EES

DESIGN: JW

DRAWN: CJM

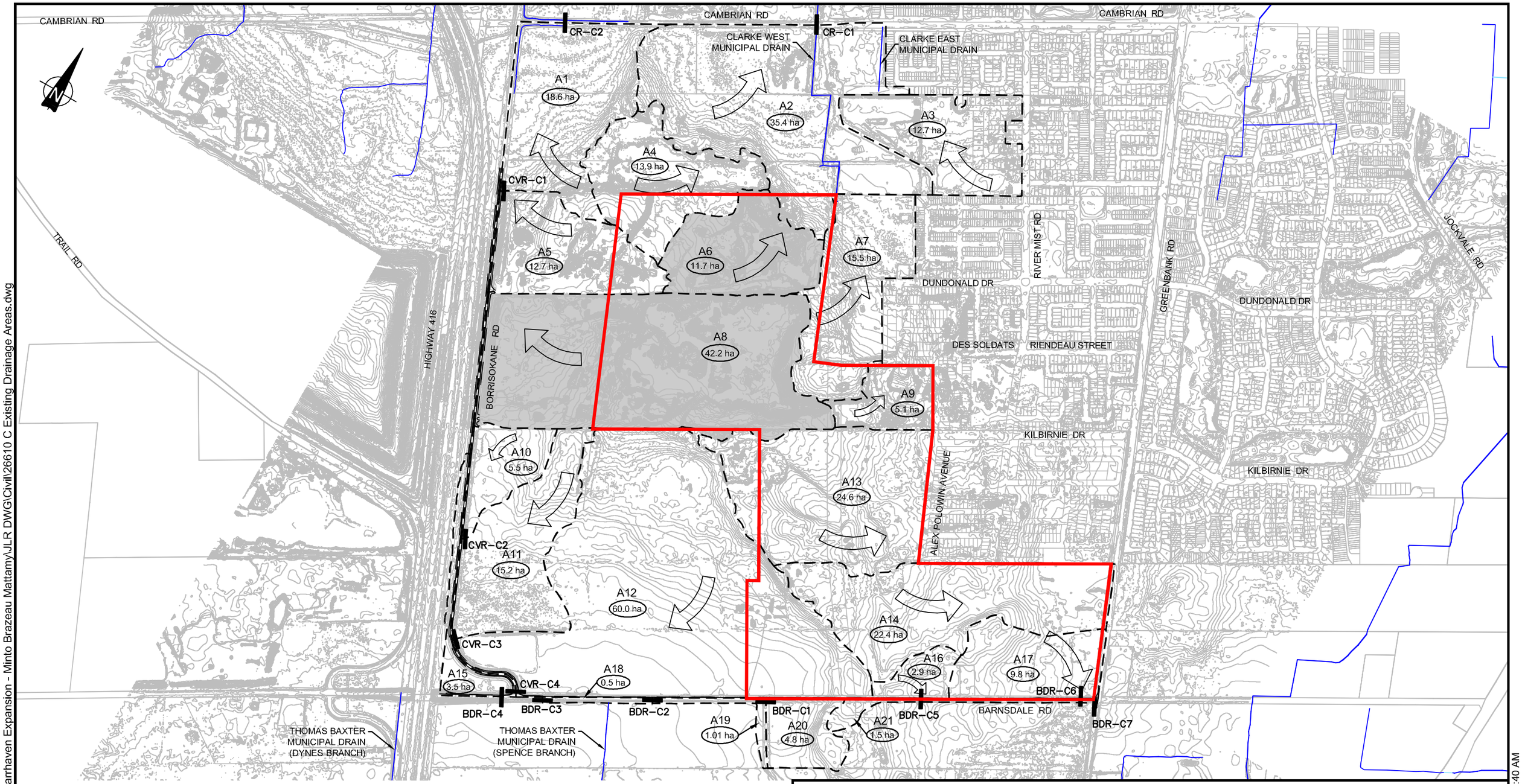
CHECKED: LD

JLR #: 26610

DRAWING #: MST-2

PLOT DATE: Tuesday, August 25, 2020 11:55:06 AM

File Location: P:\26000\26610-090 - Barrhaven South - Cost Sharing\5-Production\1-Civil\26610 C MST-2.dwg



LEGEND

- URBAN EXPANSION STUDY AREA
- SUBCATCHMENT AREA BOUNDARY
- SURFACE FLOW DIRECTION
- WATERCOURSE
- AGGREGATE EXTRACTION AREA
- CDR — CEDARVIEW ROAD CULVERTS
- CR — CAMBRIAN ROAD CULVERTS
- BDR — BARNSDALE ROAD CULVERTS

PROJECT:

BARRHAVEN SOUTH URBAN EXPANSION AREA

OTTAWA, ONTARIO

DRAWING:

SWMHYMO SITE DRAINAGE PLAN

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS
www.jlrichards.ca

DESIGN: BP
DRAWN: TB
CHECKED: BP

JLR NO: 26610
DRAWING NO.: FIGURE 5-2

File Location: R:\26000\26610 - Barrhaven Expansion - Minto Brazeau Mattamy\JLR DWG\Civil\26610 C Existing Drainage Areas.dwg

PLOT DATE: January 26, 2017 9:24:40 AM

APPENDIX E

Supporting Documentation

paterson group

Consulting Engineers

154 Colonnade Road South
Ottawa, Ontario
Canada, K2E 7J5
Tel: (613) 226-7381
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Geotechnical Engineering
Environmental Engineering
Hydrogeology
Geological Engineering
Materials Testing
Building Science
Archaeological Services

www.patersongroup.ca

April 22, 2020
File: PE4810-LET.02

Caivan Communities
2934 Baseline Road, Suite 204
Ottawa, Ontario
K2H 1B2

Attention: **Mr. Hugo Lalonde**

Subject: **Response to Site Plan Comments**
City File No. D01-01-20-0001, D02-02-20-0002, D07-12-20-0002
Re: Environmental Comments – 3713 Borisokane Road, Ottawa

Dear Sir,

Paterson Group (Paterson) have prepared this letter in response to the Environmental Comments issued by the City of Ottawa (City), with regards to the proposed development of 3713 Borisokane Road. More specifically, this letter addresses Comment 1 and the potential for leachate-related groundwater impacts.

Comment 1

The site is located approximately 150 m east and down-gradient of the Trail Rd landfill. The phase one ESA has not considered the landfill as a potentially contaminating activity impacting the site given its distance, and thus, the phase two ESA has not tested groundwater for leachate-related parameter.

Response

The Report for the 2018 Monitoring and Operating Program for the Trail Road Landfill Site, prepared by Dillon Consulting and dated May 2019, was reviewed by Paterson as part of the Phase I ESA, the findings of which are discussed below.

Groundwater Leachate-Related Parameters

The Trail Road Landfill Site and surrounding lands are situated on a northwest-southeast trending ridge of glacially deposited sand and gravel. A deep sand and gravel aquifer is present beneath the entire site, while a shallow sand aquifer is present above a discontinuous clay layer, which has an influence over the local hydrogeology and thereby landfill leachate groundwater influences in the area.

The groundwater flow beneath the eastern portion of the landfill site generally flows to the northwest, towards the dewatering pond, in both the shallow and deep aquifers. The landfill site is therefore oriented down-gradient relative to the subject property.

Based on analytical testing completed as part of the 2018 monitoring program, no volatile organic compounds (VOC) were detected in the shallow aquifer Monitoring Well M8B-2 (situated along the east side of Borisokane Road immediately west of the subject property). While alkalinity and dissolved organic carbon (DOC) parameters were considered to be slightly elevated relative to previous monitoring events, the groundwater at this location was not considered to have been impaired by landfill leachate.

Upper to mid deep aquifer Monitoring Wells M180-1, M79-1 and M8B-1, situated along the east side of Borisokane Road immediately southwest, west and northwest of the subject property, were also sampled as part of the 2018 monitoring program. Several leachate indicator parameter concentrations at each of the monitoring well locations were elevated when compared to reference values, including chloride, calcium, alkalinity and hardness. These parameters were considered to be associated with the use of road salt and not representative of leachate impacts.

No VOC concentrations were identified in monitoring wells M79-1 and M8B-1, while a concentration of m/p-xylene (0.8µg/L) was identified at M180-1, southwest of the subject property. The identified concentration is well below the Ministry of the Environment, Conservation and Parks (MECP) Table 3 concentration of 4,200 µg/L. As noted previously, Dillon identified no interpreted landfill leachate impairment at these locations. Paterson concurs with the opinion presented by Dillon; in our opinion the trace xylene concentration identified is associated with vehicular traffic along Highway No. 416.

Based on the separation distance and down-gradient orientation of the Trail Road Landfill Site relative to the subject property, in combination with the findings of the 2018 Monitoring and Operating Program prepared by Dillon, **it is our opinion that the Trail Road Landfill Site has not impacted the subject property and therefore does not represent an area of potential environmental concern on the subject land.** The findings of the Phase I and Phase II ESA reports prepared by Paterson are considered to satisfy O.Reg.153/04 for the purpose of filing a Record of Site Condition.

We trust this information satisfies your requirements.

Paterson Group Inc.

Karyn Munch, P.Eng. QP$_{ESA}$

Mark D'Arcy, P.Eng. QP$_{ESA}$

Report Distribution:

- ❑ Caivan Communities
- ❑ City of Ottawa

patersongroup **memorandum**

consulting engineers

re: **Groundwater Field Investigation**
Proposed Warehouse Complex - 3713 Borrisokane Road - Ottawa

to: Caivan Greenbank North Inc. - **Mr. Hugo Lalonde** - hugo.lalonde@caivan.com

date: May 20, 2020

file: PG5155-MEMO.04 Revision 1

Further to your request, Paterson Group (Paterson) has prepared the following memorandum to provide an overview of the field program to delineate the groundwater elevations at the east side of the subject site. The current memorandum should be read in conjunction with Paterson report PG5155-1 Revision 1, dated February 10, 2020.

Background

It is understood that an infiltration pond is proposed for the subject site as shown on Paterson Drawing PG5016-1 Rev.3 - Test Hole Location Plan. The infiltration gallery is proposed to be placed in proximity to the northeast corner of the site. It is our understanding that the base elevation of the proposed infiltration gallery will be at 97.5 m asl. A field program consisting of test pits left open for 48 hours was completed in the east end of the subject site that extended to a maximum depth of 9 m below ground surface. Additional test pits were completed south of the proposed infiltration pond to delineate further groundwater conditions.

Field Investigation

The majority of the area consists of a silty clay fill material with sand, gravel, and cobbles or a silty sand fill material with clay, gravel and cobbles. The intermixed fill has led to various perched groundwater conditions in the shallow fill material. In order to review the groundwater conditions, eleven test holes were extended to approximately 96 to 99 m asl. See attached Paterson Soil Profile and Test Data sheets for specific profiles at each location. The test hole locations can be found on the attached Paterson Drawing PG5016-1 Rev. 3 - Test Hole Location Plan.

The test holes in proximity to the proposed infiltration pond consisted of TP74, TP75, TP76 and TP77. The test pits were excavated and allowed to remain open for 48 hours to provided stabilized groundwater elevations. It is expected that the open hole water levels provide a slightly higher groundwater elevation due to the reduced restrictions related to the removal of overburden within the test hole.

Table 1: Infiltration Pond Area Groundwater Elevations	
Test Hole	Groundwater Elevation (m asl)
TP74	98.77
TP75	97.01
TP76	Dry to 95.9
TP77	97.51

TP78 was completed in proximity to the proposed septic tankage for the sewage system. The overburden material consisted of a silty sand fill material with some gravel, cobbles, and boulders and trace clay. The test pit was dry to below the underside of the proposed sewage system tankage.

Cross sections of the area have been completed in a north-south (Section D-D') direction and an east-west (Section E-E') direction. The proposed grading and pond cross section have been included in the sections. See attached plan Paterson drawing PG5016-7 - Cross Section D-D' and E-E'.

Dewatering Review

The sewage system is located above the existing groundwater elevations and would be able to be constructed without requiring pumping activities.

The proposed infiltration pond is located within an area of perched groundwater within the low hydraulic conductivity fill material noted within the test holes, such as TP74 which encountered a higher perched groundwater condition than the adjacent test holes. The groundwater was located at a higher elevation due to a restriction to lateral flow at this location. TP76 was noted to be dry to almost 3 m below the perched groundwater measured in TP74. It is expected that the low hydraulic conductivity fill material in the area of the test holes contains limited groundwater and it is expected that pumping of groundwater will not be required to complete the construction of the proposed infiltration pond.

It should be further noted that the subject site is not considered to be suitable to promote infiltration of stormwater from the proposed development due to the presence of the underlying clay deposit and low hydraulic conductivity fill across the majority of the subject site.

We trust that this information satisfies your requirements.

Best Regards,

Paterson Group Inc.

Michael S. Killam, P.Eng.

David J. Gilbert, P.Eng.

Attachments:
- ❏ Soil Profile and Test Data
- ❏ Drawing PG5016-1 Rev.3 - Test Hole Location Plan
- ❏ Drawing PG5016-7 - Cross Section D-D' and E-E'

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Borrisokane Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5155

REMARKS

HOLE NO. TP74

BORINGS BY Excavator **DATE** May 6, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	103.77		
FILL: Brown silty clay, some sand and gravel, occasional cobbles and boulders, trace debris		G	1			1	102.77		
						2	101.77		
2.30									
FILL: Brown silty sand, some clay and gravel, occasional cobbles and boulders, trace debris		G	2			3	100.77		
						4	99.77		
5.00						5	98.77		▽
FILL: Brown silty clay, some sand and gravel, occasional cobbles and boulders, trace debris		G	3			6	97.77		
						7	96.77		
7.80									
End of Test Pit (Groundwater infiltration at 5.0m depth)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Borrisokane Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5155

REMARKS

HOLE NO. TP75

BORINGS BY Excavator **DATE** May 6, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	105.01		
FILL: Brown silty clay, some sand and gravel, occasionalt cobbles and boulders, trace debris and organics		G	1			1	104.01		
						2	103.01		
2.50									
		G	2			3	102.01		
FILL: Brown silty sand, some clay and gravel, trace debris						4	101.01		
						5	100.01		
						6	99.01		
		G	3			7	98.01		
						8	97.01		▽
9.00						9	96.01		
End of Test Pit (Groundwater infiltration at 8.0m depth)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Borrisokane Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5155

REMARKS

HOLE NO. TP76

BORINGS BY Excavator **DATE** May 6, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	103.59		
		G	1			1	102.59		
						2	101.59		
		G	2			3	100.59		
FILL: Brown silty clay, some sand and gravel, occasional cobbles and boulders, trace debris and organics						4	99.59		
						5	98.59		
		G	3			6	97.59		
						7	96.59		
7.70									
End of Test Pit									
(TP dry upon completion)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Borrisokane Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5155

REMARKS

HOLE NO. TP77

BORINGS BY Excavator **DATE** May 6, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	101.51		
FILL: Brown sandy silt, some gravel, occasional cobbles and boulders, trace debris and clay		G	1			1	100.51		
1.20									
FILL: Brown silty clay, some sand and gravel, occasional cobbles and boulders, trace debris		G	2			2	99.51		
3.90						3	98.51		
Compact, brown **SILTY SAND**		G	3			4	97.51		▽
5.60						5	96.51		
Stiff, brown **SILTY CLAY** 5.80		G	4						
End of Test Pit									
(Groundwater infiltration at 4.0m depth)									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Borrisokane Road
Ottawa, Ontario

DATUM Geodetic

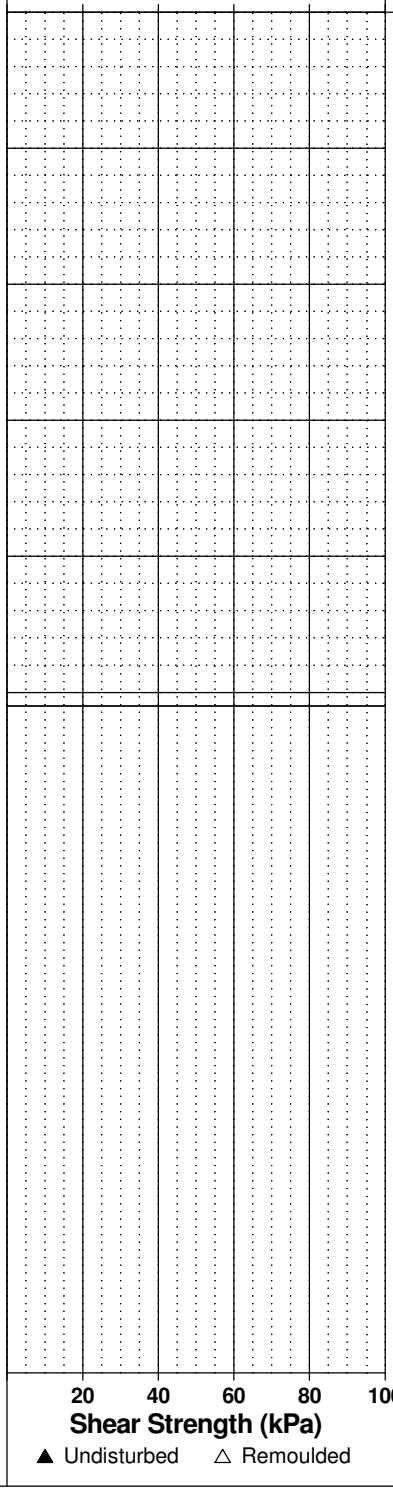
FILE NO. PG5155

REMARKS

HOLE NO. TP78

BORINGS BY Excavator **DATE** May 7, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	104.10		
		G	1			1	103.10		
FILL: Brown silty sand, some gravel, occasional cobbles and boulders, trace clay, debris and organics						2	102.10		
		G	2			3	101.10		
		G	3			4	100.10		
5.10						5	99.10		
End of Test Pit (TP dry upon completion)									



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Borrisokane Road
Ottawa, Ontario

DATUM Geodetic

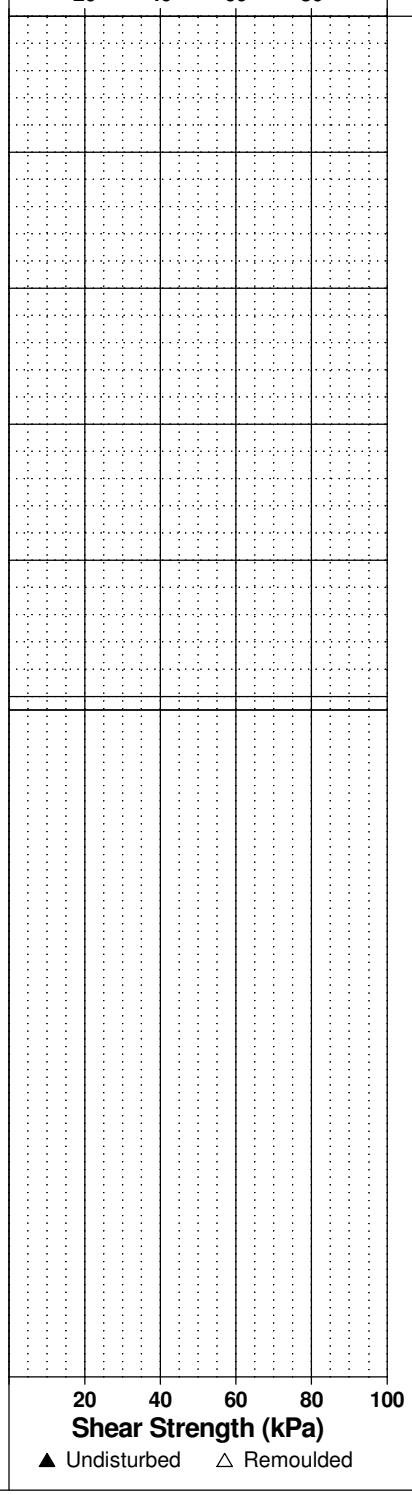
FILE NO. PG5155

REMARKS

HOLE NO. TP79

BORINGS BY Excavator **DATE** May 7, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	104.07		
FILL: Brown silty clay, some sand and gravel, occasional cobbles and boulders, trace debris and organics		G	1			1	103.07		
1.70						2	102.07		
FILL: Brown silty sand, some gravel, occasional cobbles and boulders, trace clay, debris and organics		G	2			3	101.07		▽
						4	100.07		
5.10		G	3			5	99.07		
End of Test Pit (Groundwater infiltration at 3.5m depth)									



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Borrisokane Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5155

REMARKS

HOLE NO. TP95

BORINGS BY Excavator **DATE** May 8, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	105.72		
		G	1			1	104.72		
						2	103.72		
		G	2			3	102.72		
FILL: Brown silty clay, some sand and gravel, occasional cobbles and boulders, trace debris and organics						4	101.72		
		G	3			5	100.72		
						6	99.72		
		G	4			7	98.72		
7.80									
Compact, brown **SILTY SAND**		G	5			8	97.72		▽
8.50									
End of Test Pit									
(Groundwater infiltration at 8.0m depth)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Borrisokane Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5155

REMARKS

HOLE NO. TP97

BORINGS BY Excavator **DATE** May 8, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	103.91		
FILL: Brown sandy silt, some clay and gravel, occasional cobbles and boulders, trace debris and organics		G	1			1	102.91		
1.20									
		G	2			2	101.91		
		G	3			3	100.91		
FILL: Brown silty clay, some sand and gravel, occasional cobbles and boulders, trace debris and organics						4	99.91		
		G	4			5	98.91		
6.70						6	97.91		▽
Compact, brown **SILTY SAND**		G	5						
7.00						7	96.91		
End of Test Pit									
(Groundwater infiltration at 6.0m depth)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Borrisokane Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5155

REMARKS

HOLE NO. TP98

BORINGS BY Excavator **DATE** May 8, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	103.97		
		G	1			1	102.97		
FILL: Brown sandy silt, occasional cobbles and boulders, trace clay, gravel and organics		G	2			2	101.97		
		G	3			3	100.97		
						4	99.97		
						5	98.97		
6.00						6	97.97		
FILL: Brown silty clay, some sand and gravel, occasional cobbles and boulders, trace debris and organics		G	4			7	96.97		
8.00		G	5			8	95.97		
End of Test Pit (TP dry upon completion)									

Shear Strength (kPa) 20 40 60 80 100
▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Borrisokane Road
Ottawa, Ontario

DATUM Geodetic

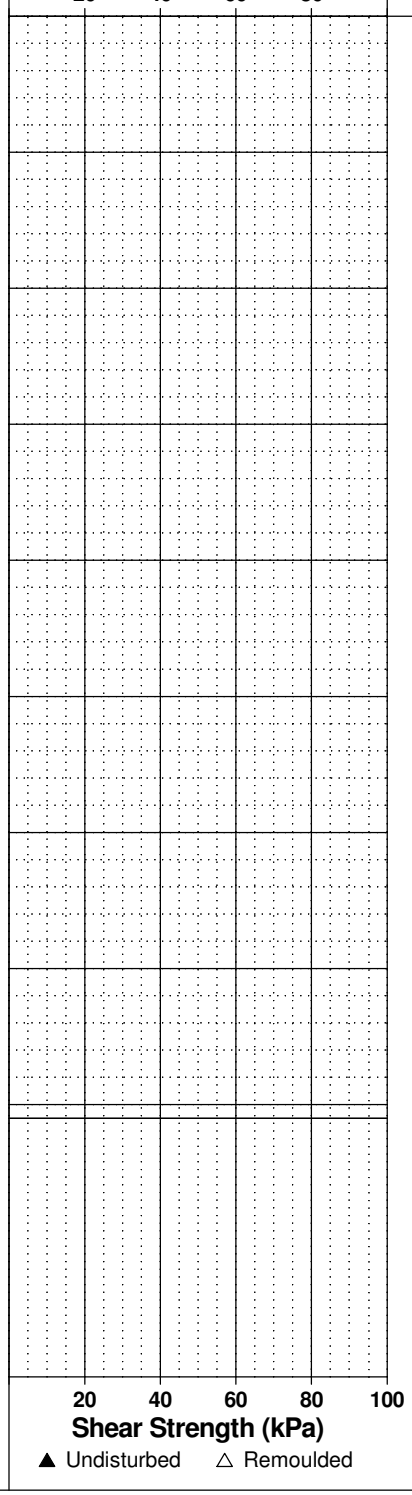
FILE NO. PG5155

REMARKS

HOLE NO. TP99

BORINGS BY Excavator **DATE** May 8, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	104.15		
		G	1			1	103.15		
						2	102.15		
		G	2			3	101.15		
FILL: Brown silty clay, some sand and gravel, occasional cobbles and boulders, trace debris and organics		G	3			4	100.15		
						5	99.15		
		G	4			6	98.15		▽
		G	5			7	97.15		
8.10						8	96.15		
End of Test Pit (Groundwater infiltration at 6.0m depth)									



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Borrisokane Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5155

REMARKS

HOLE NO. TP100

BORINGS BY Excavator **DATE** May 1, 1985

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	103.01		
		G	1			1	102.01		
FILL: Brown silty clay, some sand and gravel, occasional cobbles and boulders, trace debris and organics		G	2			2	101.01		
		G	3			3	100.01		
		G	4			4	99.01		
5.90						5	98.01		
Compact, brown **SILTY SAND**		G	5			6	97.01		▽
6.40									
End of Test Pit									
(Groundwater infiltration at 5.9m depth)									

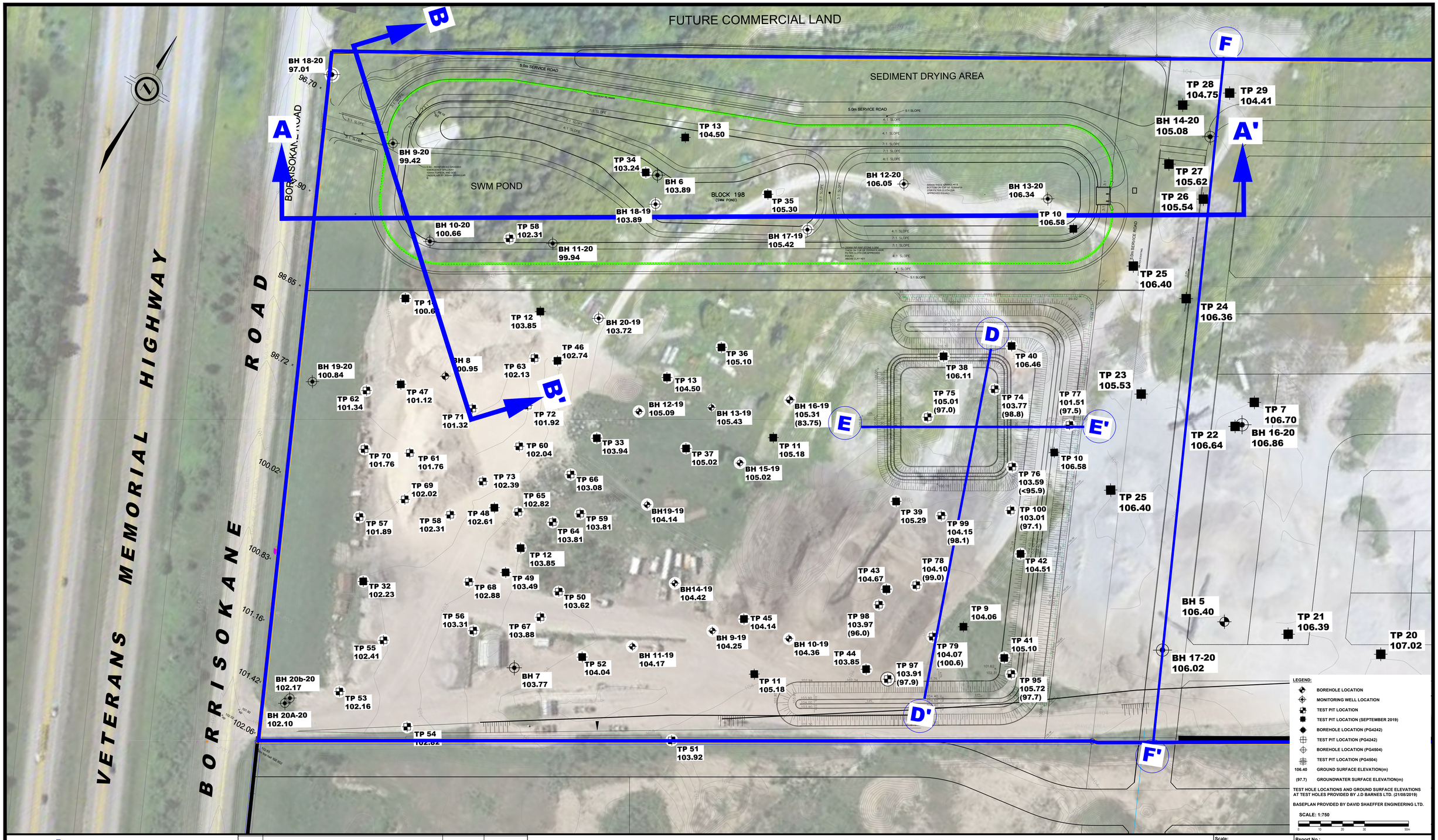
Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded



LEGEND:

- BOREHOLE LOCATION
- MONITORING WELL LOCATION
- TEST PIT LOCATION
- TEST PIT LOCATION (SEPTEMBER 2019)
- BOREHOLE LOCATION (PG4242)
- TEST PIT LOCATION (PG4242)
- BOREHOLE LOCATION (PG4504)
- TEST PIT LOCATION (PG4504)
- 106.40 GROUND SURFACE ELEVATION(m)
- (97.7) GROUNDWATER SURFACE ELEVATION(m)

TEST HOLE LOCATIONS AND GROUND SURFACE ELEVATIONS AT TEST HOLES PROVIDED BY J.D BARNES LTD. (21/08/2019)

BASEPLAN PROVIDED BY DAVID SHAEFFER ENGINEERING LTD.

SCALE: 1:750

0 10 20 30 50m

patersongroup
consulting engineers

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

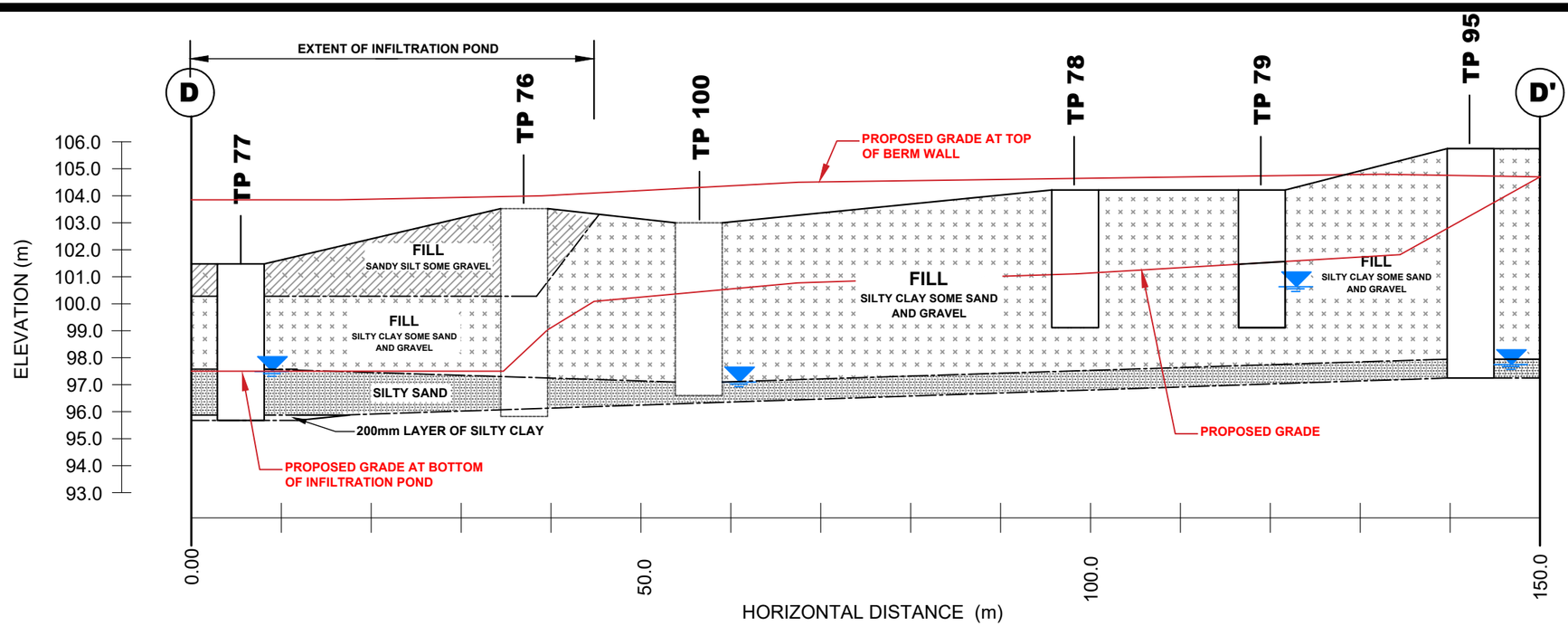
NO.	REVISIONS	DATE	INITIAL
3	LOCALIZED ABIC SITE VIEW AND CROSS SECTIONS	13/05/2020	DJG
2	TP74 TO TP 100 ADDED	11/05/2020	DJG
1	BH25-20 TO BH28-20 ADDED	23/04/2020	DJG

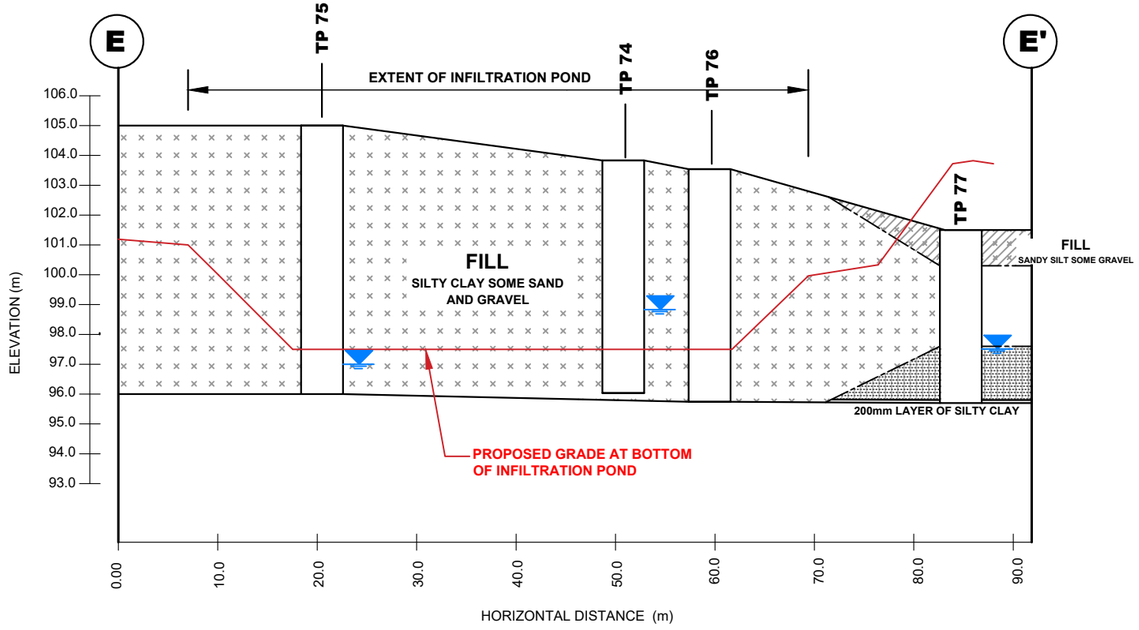
CAIVAN COMMUNITIES

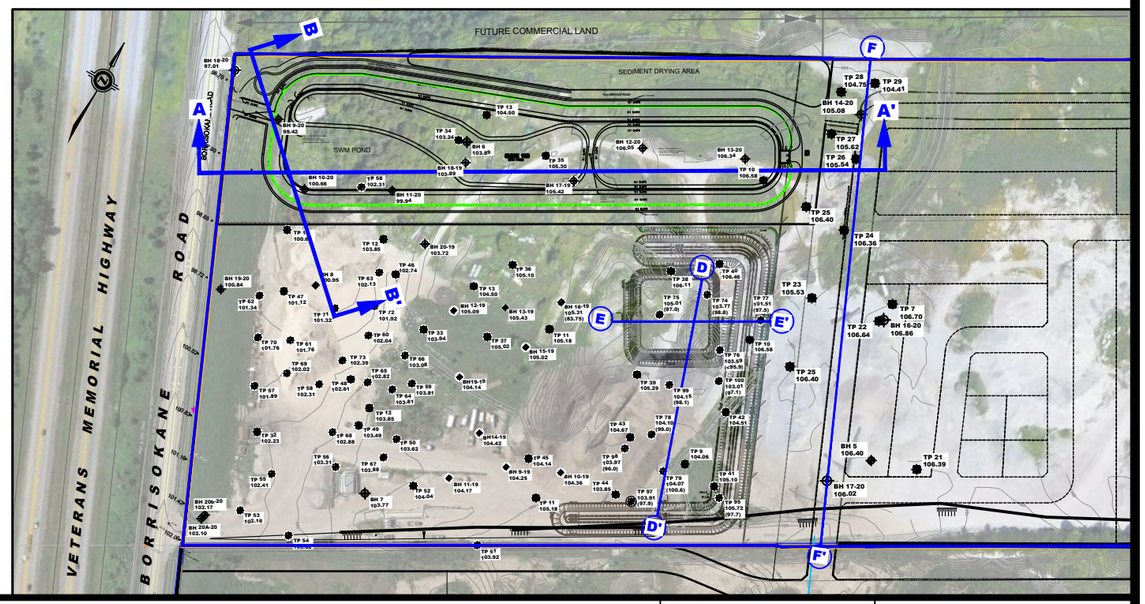
GEOTECHNICAL INVESTIGATION - PROPOSED DEVELOPMENT
BORRISOKANE ROAD - DRUMMONDS PIT

TEST HOLE LOCATION PLAN

Scale:	1:750
Drawn by:	RCG
Checked by:	MK
Approved by:	DJG
Date:	03/2020
Report No.:	PG5155-MEMO.04
Drawing No.:	PG5016-2
Revision No.:	3







patersongroup
consulting engineers

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NO.	REVISIONS	DATE	INITIAL

CAIVAN COMMUNITIES

GEOTECHNICAL INVESTIGATION - PROPOSED DEVELOPMENT
BORRISOKANE ROAD - DRUMMONDS PIT

OTTAWA, ONTARIO

Title:

CROSS SECTION D-D' AND E-E'

Scale:	V 1:200 H 1:600	Date:	05/2020
Drawn by:	RCG	Report No.:	PG5155-MEMO.04
Checked by:	MK	Dwg. No.:	PG5016-7
Approved by:	DJB	Revision No.:	

p:\geotechnical\pg50xx\pg5016 - caivan - drummonds pit - borrisokane\5016 x-sections\drawing1.dwg

patersongroup **memorandum**

consulting engineers

re: **Subsoil Infiltration Review**
Proposed Warehouse Complex - 3713 Borrisokane Road - Ottawa

to: Caivan Greenbank North Inc. - **Mr. Hugo Lalonde** - hugo.lalonde@caivan.com

date: July 10, 2020

file: PG5155-MEMO.05 Revision 1

Further to your request, Paterson Group (Paterson) has prepared the following memorandum to provide pre-development infiltration rates for the subsoils beneath the proposed development and discuss the potential for recharge to the Kars esker. The current memorandum should be read in conjunction with Paterson Report PG5155-1 Revision 1, dated February 10, 2020.

Background

It is currently understood that, as part of the proposed development, an infiltration-based strategy is being considered to manage stormwater runoff at the site via Low Impact Development measures (LID's). As part of this approach, the design includes a drainage system connected to the proposed warehouse that will collect clean roof water before directing it towards the eastern portion of the property. Within the eastern portion of the site, the collected roof water will connect to a perforated pipe section to allow for infiltration of stormwater runoff to occur. It also includes a modified storage area to retain and allow minor volumes of infiltration/evapotranspiration to occur prior to reaching the stormwater management facility which is located north of the site.

Subsoil Infiltration Values

There have been multiple geotechnical investigations carried out by Paterson at the subject site to date. The results of these investigations indicated that, in general, the subsurface profile at the test hole locations consists of a silty clay fill material with sand, gravel, and cobbles or a silty sand fill material with clay, gravel and cobbles, which was generally underlain by a native deposit of silty clay.

While the fill across the site is not homogenous, the dominant material present within the layer is silty clay. To account for the secondary materials present in the fill, a range of potential infiltration values needs to be considered. Based on the presence of silty clay with sand, gravel and cobbles, the infiltration potential is expected to range from approximately 10 to 50 mm/hr. It should be noted that these values do not consider the safety correction factor recommended for use with LID best management practices (Credit Valley, 2010). Provided the LID's are installed with a minimum 1.5 m separation from the underlying silty clay layer in a relatively homogenous material, a safety correction factor of 2.5 could be applied to the above noted infiltration rates. Dividing these rates by a factor of 2.5, the expected infiltration rate of the fill material is expected to range from 4 to 20 mm/hr.

Recharge Potential

As noted above, the surficial soils identified at the time of the geotechnical investigations consist largely of low permeability materials (silty clay). **An average infiltration rate of 30 mm/hour can be used for design calculations**. While the secondary materials present in the fill would allow for some measure of infiltration/evapotranspiration to occur, the majority of surface water is expected to flow down-gradient as sheet drainage towards the roadside ditch located along Borrisokane Road.

In order to determine the pre-development infiltration potential of the site, the Thornthwaite and Mather method (1957) and MOE Stormwater Management Planning and Design Manual (2003) were used to identify the hydrologic cycle component values. While there is no component value for clay fill with a variety of secondary materials, it is expected that the material would most closely resemble a clay loam. This information, coupled with precipitation data provided from the Ottawa airport, allowed us to determine the water surplus for the site.

The following variables were selected for our review:

- Soil Type - Clay Loam (pasture and shrub)
- Surplus - 301 mm/yr.
- Topography Factor - 0.2
- Soil Factor - 0.2
- Vegetation Factor - 0.1

The surplus was then separated into infiltration and runoff using the approach taken from MOEE (1995), which factors topography, soil type and land cover into the overall infiltration potential of the site. The result was an average annual infiltration rate of **151 mm/year**.

It should be further noted that the surface water that does infiltrate into the subsoils is expected to intercept the native silty clay deposit noted to extend across the site overlying the esker, forming a perched groundwater condition. This is corroborated by the typically elevated water levels found at the subject site in comparison to the area further east where the esker is unconfined and water levels were consistently noted to be at a lower elevation. As such, due to the relatively low infiltration potential of the surficial soils and the presence of a silty clay deposit overlying the esker, the potential for recharging the esker within the boundaries of the subject site is considered minimal.

We trust that this information satisfies your requirements.

Best Regards,

Paterson Group Inc.

Michael S. Killam, P.Eng.

Michael Laflamme, P.Geo.

re: **Hydrogeological Review - Municipal Services**
Proposed Commercial Development
3713 Borrisokane Road - Ottawa

to: Caivan Greenbank North Inc. - **Mr. Hugo Lalonde** - Hugo.Lalonde@Caivan.com

date: September 21, 2020

file: PH3959-MEMO.03

Further to your request, Paterson Group (Paterson) has prepared the following memorandum to provide a hydrogeological review of the proposed municipal services with respect to existing groundwater conditions at the subject site.

Background

The City of Ottawa (City) provided comments regarding the proposed municipal services to be installed at 3713 Borrisokane Road. It is understood that municipal services for the subject site will be considered by the City subsequent to completing a review of potential water takings associated with the servicing installation.

Municipal Servicing

Based on preliminary drawings, it is understood that municipal water supply as well as sanitary and storm sewers have been proposed for the subject site. The proposed watermain is anticipated to be installed south of the of the commercial structures, while the stormwater collected at the subject site will be directed east towards an infiltration system and/or temporary storage pond located along the east of the property. The sanitary service has been proposed south of the commercial structures and along the south property boundary towards the southeast corner of the site. **The proposed sanitary service is expected to be the deepest service installation within the subject site with an invert elevation ranging from 99.95 m at Building A to 96.99 m at a SAN MH 3211A at the first manhole located in the future City right-of-way.** The servicing drawings provided by David Schaeffer Engineering Ltd. provided a Site Servicing Plan - Drawing No. SSP-2 Rev. 8 dated September 21, 2020, as attached. The connection into MH 3211A is considered as part of the approval of the services for the adjacent subdivision.

Hydrogeological Review

A groundwater level monitoring program was conducted by Paterson between July 2019 to August 2020 as part of the geotechnical investigations completed within the subject area, and include the subject site, Phase 1/2 of the proposed residential development to the east and the stormwater management pond to the north. **Based on measured**

groundwater levels and subsoil conditions, groundwater elevations within the underlying Ottawa Valley Kars Esker are anticipated to range between 95.0 to 95.5 m.

The groundwater levels encountered within the subject site are contained within a low conductivity fill material that leads to a perched groundwater condition with an underlying discontinuous silty clay layer. The measured values in the area of the stormwater management pond and ABIC site have been measured between 95.6 to 100.65 m asl.

As the proposed municipal services will be installed above the measured groundwater level observed within the Ottawa Valley Kars Esker, it is not expected that groundwater dewatering will be required throughout the subject site. As such, the installation of municipal services within the subject site are considered to have limited hydrogeological effects.

Summary

Based on a review of the preliminary design drawings for municipal servicing for the ABIC site, the proposed municipal servicing will be above the groundwater elevations observed within the underlying Ottawa Valley Kars Esker.

We trust that this information satisfies your requirements.

Best Regards,

Paterson Group Inc.

Michael S. Killam, P.Eng.

Attachment:
- ❑ DSEL - Site Servicing Plan - Drawing No. SSP-2 Rev.8 dated 21/09/20

REFER TO SWM POND BLOCK DESIGN BY CAIVAN COMMUNITIES (D07-16-19-0005)

VETERANS MEMORIAL HIGHWAY 416

BORRISOKANE ROAD

C/L OF ASPHALT ROAD

EDGE OF ASPHALT ROAD

C/L OF DITCH

EDGE OF DITCH

PL POST

PL POLE

HYDRO

100-YEAR WL 96.735

96.00

97.40

3:1 SLOPE

LEDGE OF TREES

STM MH202 (1200)
T/L=101.24
E.INV=99.07
S.INV=99.83

156.8m–525mmø STM @ 0.2%

2.3m–250mmø CB LEAD @ 1.0% (MIN)

11.8m–500mmø CULVERT @ 1.3% PER CITY STD. S26
US.INV=98.92
DS.INV=98.77
FROST TAPERS PER OPSD 803.031

10.4m–450mmø STM @ 1.0%

CB MH201 (1200)
T/L=102.16
N.INV=99.93

CONNECT TO STM
STM INV=99.65
CB LEAD INV=99.79

CB9
T/L=102.15
N.INV=100.65

CB10
T/L=102.15
N.INV=100.65

CONNECT TO STM
STM INV=99.55
CB LEAD INV=99.69

CB11
T/L=102.15
N.INV=100.65

CONNECT TO STM
STM INV=99.47
CB LEAD INV=99.61

STM MH203 (1500)
T/L=102.25
W.INV=99.46
S.INV=99.40

10.6m–600mmø STM @ 1.2%

STM MH204 (1500)
T/L=100.01
S.INV=98.13
E.INV=98.16
N.INV=98.10

C/W 217mmø ICD
C/W BRENTWOOD STORM SHIELD OR AN APPROVED EQUIVALENT
5-YR RELEASE RATE=89.1L/s
100-YR RELEASE RATE=114.5L/s

PHASE I

PHASE II

DS

BLDG B

FFE = 103.00

WEEPING TILE SYSTEM TO BE DESIGNED BY GEOTECHNICAL ENGINEER

ROOF LEADERS TO BE CONNECTED TO WEEPING TILE SYSTEM C/W OVERFLOW PIPE AT SURFACE

DS DIRECTED TO TOP OF WALL

19.7m–150mmø WTR

24.7mm–200mmø SAN @ 1.0% (MIN)

CONNECT TO STM
STM INV=99.35
CB LEAD INV=99.49

35.7m–525mmø STM @ 0.2%

17.3m–250mmø CB LEAD @ 1.0% (MIN)
CB8
T/L=101.86
N.INV=100.36

27.6m–600mmø STM @ 1.3%

STM MH102 (1500)
T/L=102.17
S.INV=99.03
N.INV=99.33
E.INV=98.97

STM OGS (AQUASHIELD AS–7 OR AN APPROVED EQUIVALENT)
W.INV=89.97
E.INV=98.95

85.7m–600mmø PVC STM @ 0.5%

1.5m–600mmø PVC STM @ 0.7%

17.4m–250mmø CB LEAD @ 1.0% (MIN)

CONNECT TO STM
STM INV=99.14
CB LEAD INV=99.67

CB7
T/L=101.86
N.INV=100.36

CONNECT TO STM
STM INV=99.25
CB LEAD INV=99.51

156.5m–450mmø STM @ 1.4%

STM MH300 (1200)
T/L=102.84
E.INV=101.00

33.8m–250mmø CB LEAD @ 2.0%

CONNECT TO STM
STM INV=99.29
CB LEAD INV=99.55

33.8m–250mmø CB LEAD @ 2.0%

CB17 & CB18
T/L=101.70
E.INV=100.20 C/W BACKWATER VALVE

CONNECT TO STM
STM INV=99.31
CB LEAD INV=99.57

END CROSSING STM
FND INV=100.51
STM OBV=99.74

CB6
T/L=101.86
N.INV=100.36

17.5m–250mmø CB LEAD @ 1.0% (MIN)

130.5m–525mmø STM @ 0.4%

CONNECT TO STM
STM INV=99.48
CB LEAD INV=99.74

STM MH101 (1500)
T/L=102.09
W.INV=99.61
N.INV=99.55

SAN MH 2 (1200)
W.INV=99.48
S.INV=98.88

4.3m–250mmø CB LEAD @ 1.0% (MIN)

CB15
T/L=101.86
N.INV=100.36

8.3mm–135mmø SAN @ 1.0% (MIN)

3.3m–150mmø WTR

150mmø VB

150mmø HYDRANT LEAD

CONNECT TO STM
STM INV=99.83
CB LEAD INV=99.97

CB5
T/L=102.00
N.INV=100.50

17.7m–250mmø CB LEAD @ 1.0% (MIN)

SIAMESE CONNECTION

CONNECT TO STM
STM INV=99.69
CB LEAD INV=99.85

CONNECT TO STM
STM INV=99.64
CB LEAD INV=99.78

200mmø WATERMAIN

SAN MH 3 (1200)
N.INV=100.22
E.INV=99.95

134.7m–200mmø SAN @ 0.35%

113.9m–525mmø STM @ 0.2%

200x150 REDUCER

200x200x200 TEE

50.1m–200mmø CB LEAD @ 1.0%

CB12
T/L=101.96
N.INV=100.46

STM MH100 (1200)
T/L=102.10
W.INV=99.87
E.INV=99.84

17.3m–200mmø CB LEAD @ 1.0% (MIN)

CB1
T/L=101.86
N.INV=100.36

CONNECT TO STM
STM INV=99.76
CB LEAD INV=99.90

CB2
T/L=101.86
N.INV=100.36

11.9m–200mmø CB LEAD @ 1.0% (MIN)

CB3
T/L=101.86
N.INV=100.36

CB4
T/L=101.86
N.INV=100.36

FUT. SAN MH
T/G=101.62
N.INV=97.78
S.INV=97.18

WATER CONNECTION TO FUT. 200ø STUB PER CITY FORCES

19.6m–500mmø CULVERT @ 0.3% PER CITY STD. S26
FROST TAPERS PER OPSD 803.031
US.INV=100.84
DS.INV=100.78

(0.30m RESERVE)

SAN CONTROL MH 5A (OPSD 701.010)
TEMP. T/G 102.79 INSULATE PER MOE
OUT INV. 97.117

51.2m–200mmø SAN @ 3.5%

200mmø WATERMAIN

TEMP. 200ø WM PLUG T/P=99.62

200ø PVC SAN 11.0 @ 0.50%

MH 3211A
TEMP. 300ø WM PLUG
T/P=99.183

300ø PVC STM 10.0 @ 0.60%
MH 133

1500ø CONC STM 77.0 @ 0.15%

200ø PVC SAN 19.0 @ 0.35%

200ø PVC SAN 73.0 @ 0.35%

300mmø WATERMAIN

300ø PVC WATERMAIN

200ø PVC WATERMAIN

200ø PVC SAN 15.5 @ 0.35%

200ø V&B

TEMP. 200ø WM PLUG T/P=99.185

SAN CONTROL MH 1A (OPSD 701.010)
TEMP. T/G 100.75
T/C 101.31
OUT INV. 97.012

FUT. SAN MH
N.INV=97.05
E.INV=96.99

CONNECTION TO 300mmø WATERMAIN STUB BY CITY FORCES. EXCAVATION AND REINSTATEMENT BY SITE SERVICING CONTRACTOR.

300mmø PLUG
T/P=99.55

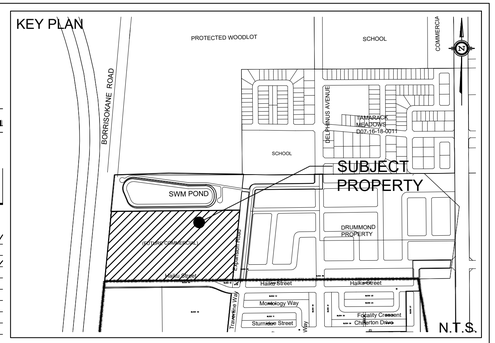
200x300mm DIA WATER CONNECTION

EDGE OF PAVEMENT

Haiku Street

REFER TO HAIKU STREET DESIGN BY CAIVAN COMMUNITIES (D07-16-19-0005)

KEY PLAN



LEGEND

- PROPERTY LINE
- PROPOSED WATERMAIN
- PROPOSED SANITARY SEWER
- PROPOSED STORM SEWER
- PROPOSED PERFORATED SUBDRAIN
- VB PROPOSED VALVE BOX
- PROPOSED FIRE HYDRANT
- PROPOSED SIAMESE CONNECTION
- RM PROPOSED REMOTE WATER METER
- M PROPOSED WATER METER
- PROPOSED STORM MANHOLE
- PROPOSED SANITARY MANHOLE
- PROPOSED CATCH BASIN
- PROPOSED CB "I" OR CB "L"

REFER TO SERVICING PLAN (SSP-1)

EXISTING UNDERGROUND SERVICES AND UTILITY LOCATIONS DERIVED FROM THE BEST AVAILABLE DATA, AS-CONSTRUCTED DRAWINGS, UTILITY DRAWINGS AND INFRASTRUCTURE MAPPING PROVIDED BY THE CITY OF OTTAWA.

CONTRACTOR TO CONFIRM ELEVATIONS AND LOCATIONS OF EXISTING UNDERGROUND SERVICES AND UTILITIES WITHIN THE RIGHT OF WAY PRIOR TO INSTALLATION OF SITE SERVICING INFRASTRUCTURE.

THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT THE FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.

NOT FOR CONSTRUCTION

TOPOGRAPHIC INFORMATION
TOPOGRAPHIC INFORMATION PROVIDED BY J.D. BARNES LIMITED
PROJ. NO. 18-10-145-00
DATED JULY 10, 2019

SITE PLAN INFORMATION
SITE PLAN PROVIDED BY FIGURR COLLECTIF D'ARCHITECTES
PROJ. NO.
DATED AUGUST 28, 2020

GEOTECHNICAL STUDY
GEOTECHNICAL RECOMMENDATIONS PROVIDED BY PATERSON GROUP
PROJ. NO. PG5155-1
DATED FEBRUARY 10, 2020

SITE SERVICING AND STORMWATER MANAGEMENT STUDY
SERVICING AND STORMWATER MANAGEMENT RECOMMENDATIONS PROVIDED BY DSEL
PROJ. NO. 19-1134
DATED SEPTEMBER 2020

BENCH MARK
LOCATION: CONCRETE ROAD BRIDGE OVER JOCK RIVER (N45°15'39, w75°44'06)
ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM AND ARE DERIVED FROM THE MUNICIPALITY BENCHMARK No. 001196403710 HAVING A PUBLISHED ELEVATION OF 91.724 METERS

No.	BY	YY.MM.DD	DESCRIPTION
8	A.J.G.	20.09.21	ISSUED FOR MUNICIPAL REVIEW
7	A.J.G.	20.07.17	ISSUED FOR MUNICIPAL REVIEW
6	A.J.G.	20.07.09	ISSUED FOR MUNICIPAL REVIEW
5	A.J.G.	20.06.24	ISSUED FOR MUNICIPAL REVIEW
4	A.J.G.	20.06.12	ISSUED FOR MUNICIPAL REVIEW
3	A.J.G.	20.05.28	ISSUED FOR MUNICIPAL REVIEW
2	A.J.G.	20.04.24	ISSUED FOR MUNICIPAL REVIEW
1	A.J.T.	20.01.15	ISSUED FOR MUNICIPAL REVIEW

PROJECT No. 19-1134

LICENSED PROFESSIONAL ENGINEER
A. J. GOSLING
100226726
19-1134
2020-09-21
PROVINCE OF ONTARIO

SITE SERVICING PLAN
3713 BORRISOKANE ROAD

CAIVAN GREENBANK NORTH INC.
2934 Baseline Road, Suite 302
Ottawa, Ontario, K2H 1B2
Tel. (613) 518-1864

DSEL
david schaeffer engineering ltd
SMART SUBDIVISIONS™
120 Iber Road Unit 103
Stittsville, Ontario, K2S 1E9
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Fax. (613) 836-7183
www.DSEL.ca

DRAWN BY:	A.J.G.	CHECKED BY:	R.D.F.	DRAWING NO.	SHEET NO.
DESIGNED BY:	B.N.C.	CHECKED BY:	S.J.P.	SSP-2	5 of 7
SCALE:	1:500	DATE:	DECEMBER 2019		

CITY FILE No.: D07-12-20-0002 CITY PLAN No.: #18112

z:\projects\19-1134_abic_caivan\b_design\b2_drawings\b2-2_main (dsel)\spa_sub6\2020-09-21_1134_spa.dwg

Alison Gosling

Subject: RE: 1134 Caivan - ABIC: Post development infiltration

From: Jonathon Burnett <jburnett@jfsa.com>
Sent: July 17, 2020 1:05 PM
To: Adam Fobert <AFobert@dsel.ca>
Cc: Steve Pichette <SPichette@dsel.ca>; JF Sabourin <jfsabourin@jfsa.com>; Alison Gosling <AGosling@dsel.ca>
Subject: RE: 1134 Caivan - ABIC: Post development infiltration

Hi Adam,

As requested I have completed an infiltration analysis for the existing and proposed conditions for the ABIC site.

Based on Paterson's study, the existing site was found to infiltrate 151 mm/year based on an average annual total precipitation (rainfall and snowfall) of 904 mm/year. Paterson's field investigations indicated that the soils for this site would infiltrate at around 30mm/hr. Based on the above information from Paterson, I have developed an existing conditions SWMHMYO model, that approximately replicates their water budget study. Note that my analysis only considers rainfall, thus the discrepancy between total annual infiltration volumes 81.7mm, but is reflective of the percentage of rainfall infiltrated (15.8%). To obtain this I had to slightly adjust the subcatchment infiltration parameters (to match Paterson's) and initial abstraction values from City defaults to get a similar breakdown. This model was run for 39 years using historical data from the Ottawa airport, see attached the full existing conditions breakdown.

The proposed conditions SWMHYMO model was developed based on the drainage areas and soakaway trench details provided, and run for the 39 years. See attached the proposed conditions infiltration breakdown. From this analysis, it was found that the proposed site will infiltrate 65.8 mm annually, when compared to 81.7 mm annually under existing conditions. Note that this analysis does not consider any infiltration on the developed lands (higher impervious areas) within the site, and the soakaway trench infiltration value (30mm) was reduced by a factor of 2.5 and only considered the bottom of the trench as permeable.

Regards,

Jonathon Burnett, B.Eng., P.Eng
Water Resources Engineer

JFSA

52 Springbrook Drive, Ottawa ON, K2S 1B9
Tel.: 613-322-1253 | Email: jburnett@jfsa.com| Website: www.jfsa.com
Ottawa-Paris(ON)-Gatineau-Montréal-Québec

ABIC Site (7.324 ha) - Existing Conditions - Water Budget

Year	Annual Rainfall (mm)	Runoff Volume (mm)	Infiltration (mm)	Wetting Loss[1] (mm)
1967	320.0	19.2	54.8	246.1
1968	499.1	34.2	89.9	375.0
1969	417.8	23.5	52.9	341.4
1970	477.8	39.8	52.9	385.1
1971	480.9	26.7	55.5	398.7
1972	722.1	64.0	119.4	538.7
1973	618.5	50.7	131.4	436.4
1974	332.1	15.4	27.3	289.4
1975	429.5	32.2	67.8	329.5
1976	465.0	22.6	43.9	398.6
1977	532.1	33.1	71.8	427.2
1978	511.1	35.5	50.4	425.3
1979	670.0	53.7	140.1	476.2
1980	541.0	28.2	63.9	448.9
1981	817.8	80.4	190.2	547.3
1982	461.1	24.5	51.4	385.2
1983	501.5	25.8	54.7	421.0
1984	349.3	19.0	34.5	295.9
1985	456.0	25.0	76.5	354.5
1986	790.8	47.1	149.9	593.8
1987	564.5	31.2	82.2	451.1
1988	555.4	37.6	91.2	426.6
1989	458.8	24.1	67.5	367.2
1990	603.1	32.6	105.6	464.9
1991	482.2	24.9	64.9	392.4
1992	552.0	42.1	89.8	420.1
1993	556.7	28.1	47.0	481.7
1994	514.5	27.6	99.7	387.2
1995	414.8	28.6	160.3	225.9
1996	426.5	21.7	31.7	373.1
1997	332.1	17.2	19.1	295.8
1998	440.3	21.9	28.1	390.3
1999	424.4	22.3	43.7	358.4
2000	535.9	29.7	86.4	419.9
2002	550.5	52.2	117.7	380.6
2003	554.6	30.2	116.5	408.0
2004	573.3	62.1	145.9	365.3
2006	723.4	43.7	125.3	554.4
2007	550.7	28.5	82.8	439.4
Average	518.1	33.5	81.7	403.0
Percentage	100.0%	6.5%	15.8%	77.8%

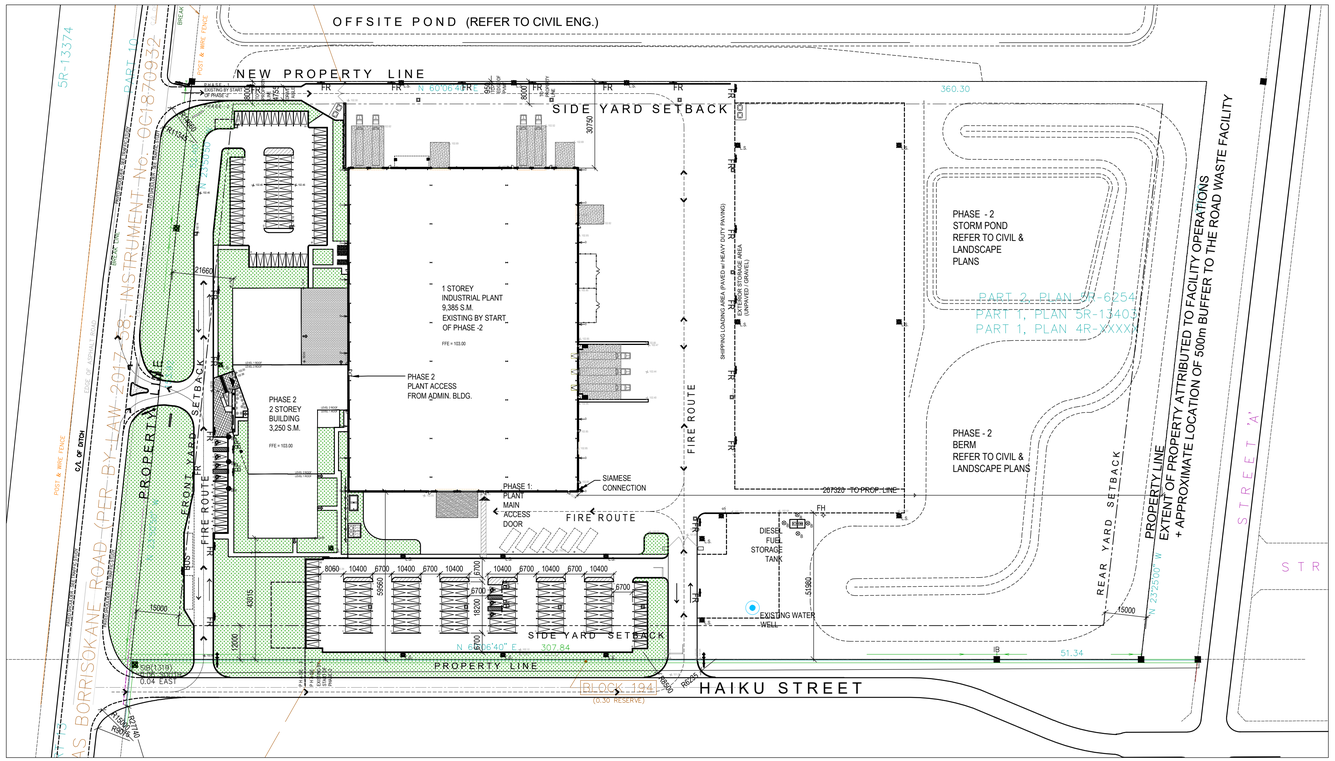
[1] Wetting Losses considered initial abstraction and evapotranspiration

ABIC Site (7.324 ha) -Proposed Conditions - Infiltration

Year	Annual Rainfall		Infiltration Volume				
			Natural Lands (2.94 ha)	Soak away Trench (0.938 ha)	Total Site[1] (7.324 ha)		
	(mm) [1]	(m^3) [2]	(m^3) [3]	(m^3) [4]	(m^3) [3]+[4]	(mm) [5]	% [5]/[1]
1967	320.0	23,437	1,610	1,449	3,058	41.8	13%
1968	499.1	36,554	2,643	2,269	4,912	67.1	13%
1969	417.8	30,600	1,556	1,853	3,410	46.6	11%
1970	477.8	34,994	1,554	2,209	3,763	51.4	11%
1971	480.9	35,221	1,631	2,306	3,937	53.8	11%
1972	722.1	52,887	3,510	3,152	6,663	91.0	13%
1973	618.5	45,299	3,863	2,682	6,545	89.4	14%
1974	332.1	24,323	804	1,717	2,520	34.4	10%
1975	429.5	31,457	1,993	1,915	3,908	53.4	12%
1976	465.0	34,057	1,291	2,297	3,587	49.0	11%
1977	532.1	38,971	2,111	2,582	4,693	64.1	12%
1978	511.1	37,433	1,481	2,588	4,069	55.6	11%
1979	670.0	49,071	4,120	2,790	6,910	94.3	14%
1980	541.0	39,623	1,878	2,755	4,634	63.3	12%
1981	817.8	59,896	5,590	3,314	8,904	121.6	15%
1982	461.1	33,771	1,512	2,495	4,007	54.7	12%
1983	501.5	36,730	1,608	2,519	4,126	56.3	11%
1984	349.3	25,583	1,014	1,688	2,703	36.9	11%
1985	456.0	33,397	2,248	2,252	4,500	61.4	13%
1986	790.8	57,918	4,406	3,515	7,922	108.2	14%
1987	564.5	41,344	2,417	2,603	5,020	68.5	12%
1988	555.4	40,677	2,680	2,431	5,111	69.8	13%
1989	458.8	33,603	1,985	2,234	4,218	57.6	13%
1990	603.1	44,171	3,105	2,706	5,811	79.3	13%
1991	482.2	35,316	1,908	2,499	4,407	60.2	12%
1992	552.0	40,428	2,641	2,434	5,075	69.3	13%
1993	556.7	40,773	1,381	2,977	4,358	59.5	11%
1994	514.5	37,682	2,932	2,219	5,151	70.3	14%
1995	414.8	30,380	4,711	1,455	6,166	84.2	20%
1996	426.5	31,237	932	2,273	3,205	43.8	10%
1997	332.1	24,323	560	1,974	2,534	34.6	10%
1998	440.3	32,248	826	2,139	2,964	40.5	9%
1999	424.4	31,083	1,285	2,142	3,427	46.8	11%
2000	535.9	39,249	2,539	2,463	5,002	68.3	13%
2002	550.5	40,319	3,459	2,364	5,823	79.5	14%
2003	554.6	40,619	3,423	2,649	6,072	82.9	15%
2004	573.3	41,988	4,290	2,155	6,445	88.0	15%
2006	723.4	52,982	3,684	3,615	7,299	99.7	14%
2007	550.7	40,333	2,435	2,544	4,978	68.0	12%
Average	518.1	37,948	2,400	2,416	4,816	65.8	13%

[1] Infiltration only considered for the natural lands and the soak away trench (3.92 ha), and does not considered any infiltration from the developed lands (3.404 ha)

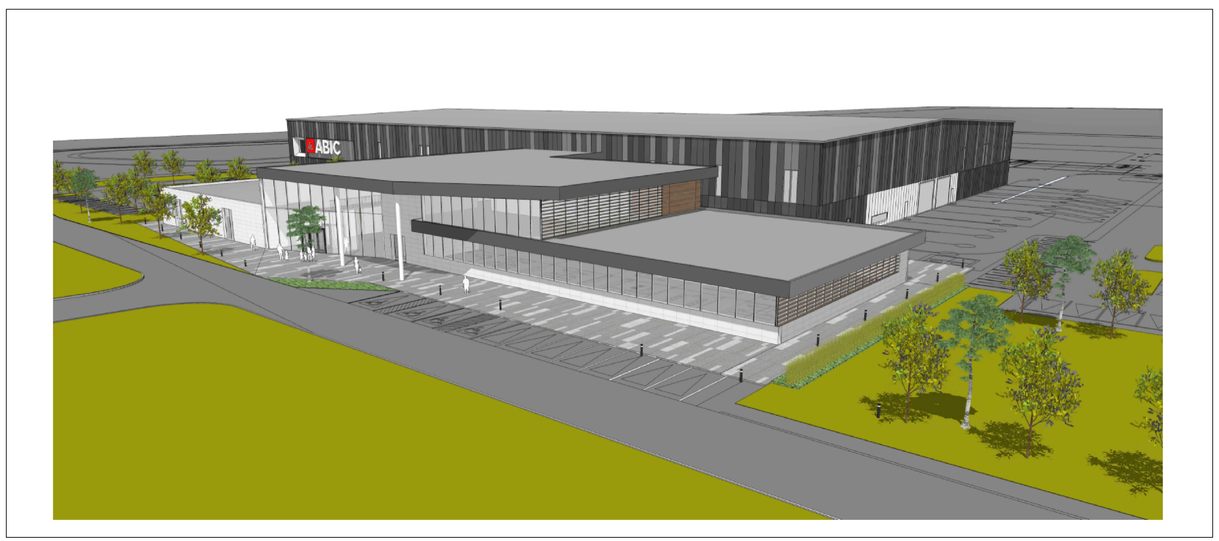
DRAWINGS / FIGURES



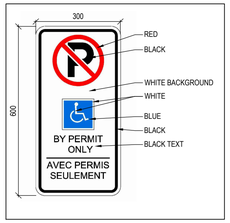
2 / A 104b — OVERALL SITE PLAN
1:1000

0' 25' 50' 100'

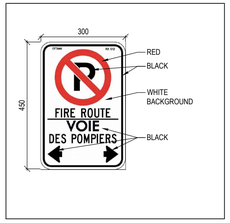
NORTH TRUE NORTH



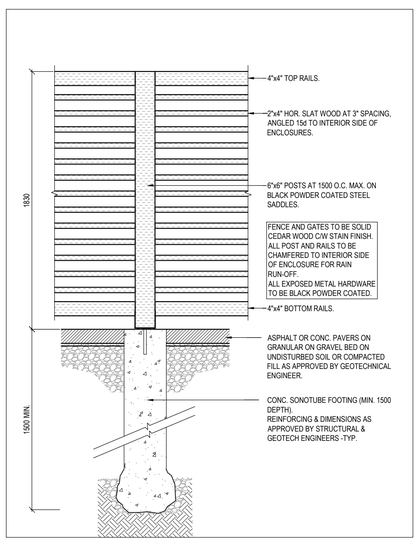
1 / A 104b — AERIAL PERSPECTIVE
N.T.S.



4 / A 104b — B/F PARKING SIGN
1:10

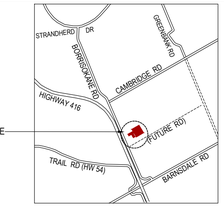


3 / A 104b — FIRE ROUTE SIGN
1:10



5 / A 104b — WOOD FENCE
1:20

KEY PLAN



PROPERTY DESCRIPTION

TWO STOREY OFFICE BUILDING & ONE STOREY ASSEMBLY PLANT	
CITY OF OTTAWA PIN NUMBER	04592 - 3357
MUNICIPAL ADDRESS	3713 BORRISOKANE RD, OTTAWA, ON

SITE INFORMATION

PROPERTY LINES BASED ON BOUNDARY SURVEY BY J.D. BARNES LTD REF# 19-10-074-00
FOR REVISED SITE BOUNDARY PLAN 4R-**32754**

LOT AREA:	73,729 m²
LOT FRONTAGE:	206.3 m (perpendicular to Borrisokane Rd.), 205.2 m (perpendicular to north boundary)
LOT DEPTH:	360.30 m

BUILDING INFORMATION

BUILDING AREA:	9,372 (Ph1) + 2,450 (Ph2): 11,822 m² (both phased buildings combined)
BUILDING FLOOR AREA (GFA):	Administration building: 3,250 m2, and Industrial Assembly Plant: 9,385 m²
PROPOSED USE:	LOW-RISE OFFICE BUILDING and ONE STOREY ASSEMBLY PLANT

ZONING TABLE — CLASSIFICATION: RG[895]-h (Rural General Industrial)

CITY OF OTTAWA ZONING BY-LAW No. 2008-250	REQUIRED	PROPOSED
MINIMUM LOT AREA	4,000m²	73,729 m2
MINIMUM LOT WIDTH	30m	206.3 m 188.2 m at front yard set back
SETBACKS	Standard for this Zoning	Phase 2
MINIMUM FRONT YARD SETBACK (at Borrisokane Rd)	15m	21.7 m (narrowest)
MINIMUM INTERIOR SIDE YARD SETBACK	8m	30.75m
MINIMUM CORNER SIDE YARD SETBACK	12m	43.0 m
MINIMUM REAR YARD SETBACK	15m	207.2 m (narrowest)
MAXIMUM BUILDING HEIGHT	15m	9.2m and 12.6m
MAXIMUM LOT COVERAGE	50%	15.2%
OUTDOOR STORAGE AREA	- - -	8,252 m2
VEHICLE PARKING REQUIREMENTS (AREA D, SCHEDULE 1A)	0.8 per 100m2 of Lt. Industr. GFA 75 required for Assembly Plant Bldg 2.4 per 100m2 of Office GFA 78 required for Administration Bldg	171 regular spaces + 7 for Visitors + 7 Barrier-free (SEE BELOW) + 2 Bus Bays
BARRIER-FREE PARKING REQ'TS City of Ottawa Part C - Section 111 O.Reg 191/11	Part C -Section 111: 5 per 400-499 O.Reg 191/11: 2 + 2% per 201-1000	7 SPACES per O.Reg 191/11: (3 type 'A' + 4 type 'B')
BICYCLE PARKING SPACES Part C-Section 111, Table 111A	N/A	18 SPACES
LOADING SPACE REQUIREMENTS Part C - Section 113, Table 113A	1 space for first 5,000 m2 plus all required spaces for GFA exceeding 5,000 m2.	12 SPACES (all oversized, accessed via Plant)

LEGEND:

- GRASS / SOFT-SCAPE (SEE LANDSCAPE PLANS)
- UNIT PAVERS (CONCRETE, STONE, ETC)
- ASPHALT PAVING
- HEAVY DUTY ASPHALT PAVING (INCL. ALL PAVING OUTSIDE OF PLANT BUILDING)
- CONCRETE
- FIRE ROUTE
- PROPERTY / LOT LINE
- FUTURE LOT LINE
- SETBACK LINE
- CHAIN LINK FENCE
- LINE OF ARCHITECTURAL CEDAR WOOD SCREEN
- DESIGNATED BUILDING ENTRANCE / EXIT
- DEPRESSED CURB
- PAINTED CROSSWALK LINES
- STANDARD PARKING SPACE
- TYPE 'A' BARRIER-FREE PARKING SPACE c/w AISLE, PAINTED MARKINGS & SIGN WHERE SHOWN
- TYPE 'B' STANDARD PARKING SPACE c/w AISLE, PAINTED MARKINGS & SIGN WHERE SHOWN
- BICYCLE PARKING (HORIZONTAL) N.T.S.
- SIGNAGE FOR FIRE ACCESS ROUTE 25M APART - MAX.
- BARRIER-FREE PARKING SIGNAGE
- SIGNAGE FOR BUS PARKING
- DIRECTIONAL SIGNAGE ONE WAY & ENTER/EXIT
- FIRE HYDRANT. REFER TO CIVIL
- CATCH BASIN
- MANHOLE
- FLOOR DRAIN
- UTILITY POLE / OVERHEAD UTILITY WIRES
- LIGHT STANDARD
- BOLLARD LIGHTING AT WALKWAYS
- BOLLARD: 6" DIA. CONC. FILLED PAINTED STEEL HSS
- BOLLARD -ELECTRIC 2 VEHICLE CHARGING- REFER TO ELEC. DWGS
- NEW TREE (REFER TO LANDSCAPE DRAWINGS)
- NEW SHRUB (REFER TO LANDSCAPE DRAWINGS)
- 00.00 EXISTING GROUND ELEVATION (TO DETERMINE EXISTING AVERAGE GRADE)
- 00.00 NEW GROUND ELEVATION REFER TO CIVIL
- NEW RIPARIAN ZONE PLANTING (REFER TO LANDSCAPE DRAWINGS)
- T.O.W. TOP OF WALL
- DOWNSPOUTS AT APPROX. 13m O.C., w/ 200mm HOR. EXTENSION FOR RUN-OFF. REFER TO CIVIL DRAWINGS FOR EXACT QUANTITIES AND LOCATIONS. PRECAST CONC. SPLASH PAD AT NON-PAVED AREAS

NOTES:

- PROPERTY LINES ARE BASED ON BOUNDARY SURVEY BY J.D. BARNES LTD. REF # 19-10-074-00.
- REFER TO CIVIL DRAWINGS FOR GRADING, STORM WATER MANAGEMENT, UTILITIES & SITE SERVICES, ROADWAY DESIGN, RETAINING WALLS, BERMS, ETC.
- LANDSCAPING INFORMATION IS SHOWN FOR REFERENCE PURPOSES ONLY. REFER TO LANDSCAPE DRAWINGS FOR TREES, PLANTINGS, LANDSCAPE SURFACE TREATMENTS AND COVERINGS, SIGNAGE MONUMENTS AT GRADE, ETC.
- DOUBLE TRAFFIC LANES (AND AISLES) TO BE A MINIMUM OF 6.7 METERS WIDE.
- REFER TO CIVIL DRAWINGS AND TRAFFIC STUDIES FOR ALL ROAD AND DRIVE CONNECTIONS TO BORRISOKANE ROAD.

No.	Date	Émis pour / Object
1	2020-04-02	COORDINATION
2	2020-04-24	SPC_PHASE-1_CITY_COMMENTS
3	2020-10-02	SITE_PLAN_CONTROL_PHASE-2
4	2020-10-15	CLIENT_REVIEW
5	2020-12-05	CLIENT_REVIEW
6	2020-12-17	SPC_PHASE_1&2_CITY_COMMENTS

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DILFO
MECHANICAL | HVAC SERVICES
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DRYCORE ELECTRIC + ÉLECTRIQUE

Engineer (Structural)
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200-1565 CARLING AVE. OTTAWA, ON K1Z 8R1 (613) 521-1333

Landscape Architect
NAK design strategies

Urban Planner
FOTENN PLANNING+DESIGN

Engineer (Civil)
DSEL david schaeffer engineering ltd

Owner
ABIC
ADVANCED BUILDING INNOVATION COMPANY

Architect — Collectif d'architectes / Architects Collective
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3550, Saint-Antoine O.
Montréal QC H4C 1A9
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fig. 2
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Ottawa ON K2P 0J4
T. 613 695-6122
www.figurr.ca
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CANADA (613) 226-8830 Fax: (613) 226-7709
www.bbsconstruction.ca

Sceau / Seal
ONTARIO ASSOCIATION OF ARCHITECTS
ROBERTO CAMPOS
LICENCE
7401

Note:
L'entrepreneur doit vérifier toutes les dimensions et informations sur le site et aviser immédiatement l'architecte de toutes erreurs ou omissions.
Contractor shall verify all information and dimensions on site and immediately report any errors or omissions to the architect.

Projet / Project
ABIC OFFICE / ASSEMBLY PLANT
3713 BORRISOKANE RD.
Ottawa, Ontario

Titre / Title
SITE INFORMATION - PHASE 1 & 2

Dessiné par / Drawn by: GB,TS	No. projet / Project number: 1944	
Vérifié par / Verified by: RC	No. dessin / Drawing number: A104	Révision / Revision: 0
Échelle / Scale: 1:250		
Date de création du dessin / Drawing creation date: 2019-09-19		

D07-12-20-0133

PHASE - 1
EXISTING BY START OF PHASE -2

PHASE - 2

NEW PROPERTY LINE

N 60°06'40" E

ENTRY /EXIT GATE

SIDE YARD SETBACK

WASTE COLLECTION (2x)
SECURE RECESSED BINS
W/ CONCRETE PAD

102.85 t/o LOW RETAINING WALL W/ 2,400 mm H. WOOD FENCE ABOVE

POURED CONCRETE DOLLY PAD (TYP.)

MONUMENT SIGN

PAINTED PVMT ISLD

SNOW STORAGE AREA

DEPRESSED CURB

66 spaces

BICYCLE PARKING (x18)

1 STOREY
INDUSTRIAL PLANT
9,385 S.M.
EXISTING BY START OF PHASE -2

FFE = 103.00

PHASE 2 OUTDOOR TERRACE AREA

PHASE 2
2 STOREY
BUILDING
3,250 S.M.

FFE = 103.00

PHASE 2
PLANT ACCESS
FROM ADMIN. BLDG.

CONC. PAVERS
AT WALKWAY AND ENTRY
STEPS AND LANDING

CONC. ACCESSIBILITY
RAMP UP & 1m L.

CANOPY
COLUMN STRUCTURE
ON RAISED CONC. BASE

LINE OF CANOPY OVERHANG

LEVEL 1 ROOF
LEVEL 2 ROOF

PHASE 1: PLANT
MAIN ACCESS DOOR

SIAMESE CONNECTION

GENERATOR
(EXHAUST AWAY
FROM BUILDING)

TRANSFORMER
PAD

SPRKLR

GALV. STEEL POST & CHAIN LINK FENCES & GATES FOR EXTERIOR EQUIPMENT SECURE STORAGE: FORK-LIFTS

LOADING AT GRADE
W/ DOCK LEVELER
(3x AT EAST SIDE)

LOW RETAINING WALL
(T.O.W. = 102.85)
REFER TO STRUCT'L DRAWINGS
W/ 1070 H. GALV. STEEL GUARD RAIL (TYP.)

DOWNSPOUTS:
REFER TO LEGEND &
TO CIVIL DRAWINGS (TYP.)

SHIPPING LOADING AREA (PAVED w/ HEAVY DUTY PAVING)

EXTERIOR STORAGE AREA
(UNPAVED / GRAVEL)

PHASE - 2
STORM POND
REFER TO CIVIL &
LANDSCAPE PLANS

FIRE ROUTE

87310 TO FIRE HYDRANT
(max 90m)

207320 TO PROP. LINE

DIESEL FUEL
STORAGE TANK

143285
TO PROPERTY LINE

ENTRY /
EXIT GATE
ON PIERS

SNOW
STORAGE
AREA

EXISTING WELL

PHASE - 2
BERM
REFER TO CIVIL &
LANDSCAPE PLANS

TRUCK ELEC.
BOLLARDS

EXTENT OF REGULAR
ASPHALT TREATMENT
AT PARKING LOT AREA

PAINTED TRAVEL PATH
FROM PARKING

PAINTED PVMT ISLD
TYP.

VISITOR PARKING
AREA (11 SPACES)
REFER TO
LEGEND ON
SHEET A104 FOR
ALL SIZES

BUS
PARKING

STOP LINE
& TRAFFIC
ISLAND

DEPRESSED
CURB

PROPERTY LINE

FRONT YARD SETBACK

PAVED SHOULDER - SEE TRAFFIC STUDY

BORRISOKANE ROAD

EDGE OF ASPHALT ROAD

BREAK LINE

PROPERTY LINE: N 60°06'40" E 307.84

SIB(1319)
N 6°06' SOUTH
0.04 EAST

BLOCK 194
(0.30 RESERVE)

HAIKU STREET

PHASE - 2
PHASE - 1
EXISTING BY
START OF
PHASE -2

0' 10' 25' 50' 100'

No.	Date	Émis pour / Object
1	2020-04-02	COORDINATION
2	2020-04-24	SPC_PH1_CITY_COMMENTS
3	2020-10-02	SITE_PLAN_CONTROL-PHASE_2
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5	2020-12-04	SITE_PLAN_REVISION_APPROVAL
6	2020-12-17	SPC_PHASE_1&2_CITY_COMMENTS

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Consulting Engineers

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DRYCORE
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Architect — Collectif d'architectes / Architects Collective

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ROBERTO CAMPOS
LICENCE
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Projet / Project

ABIC OFFICE / ASSEMBLY PLANT

3713 BORRISOKANE RD.
Ottawa, Ontario

NORTH
TRUE NORTH

Titre / Title

SITE PLAN - PHASE 1 & 2: Enlarged

Dessiné par / Drawn by: GB,TS	No. projet / Project number: 1944
Vérifié par / Verified by: RC	No. dessin / Drawing number: A105
Échelle / Scale: 1:500	Révision / Revision: 0
Date de création du dessin / Drawing creation date: 2019-09-19	

D07-12-20-0133

TOPOGRAPHIC DETAIL

PART OF LOTS 7, 8 AND 9 CONCESSION 3 (RIDEAU FRONT)

GEOGRAPHIC TOWNSHIP OF NEPEAN
NOW IN THE
CITY OF OTTAWA

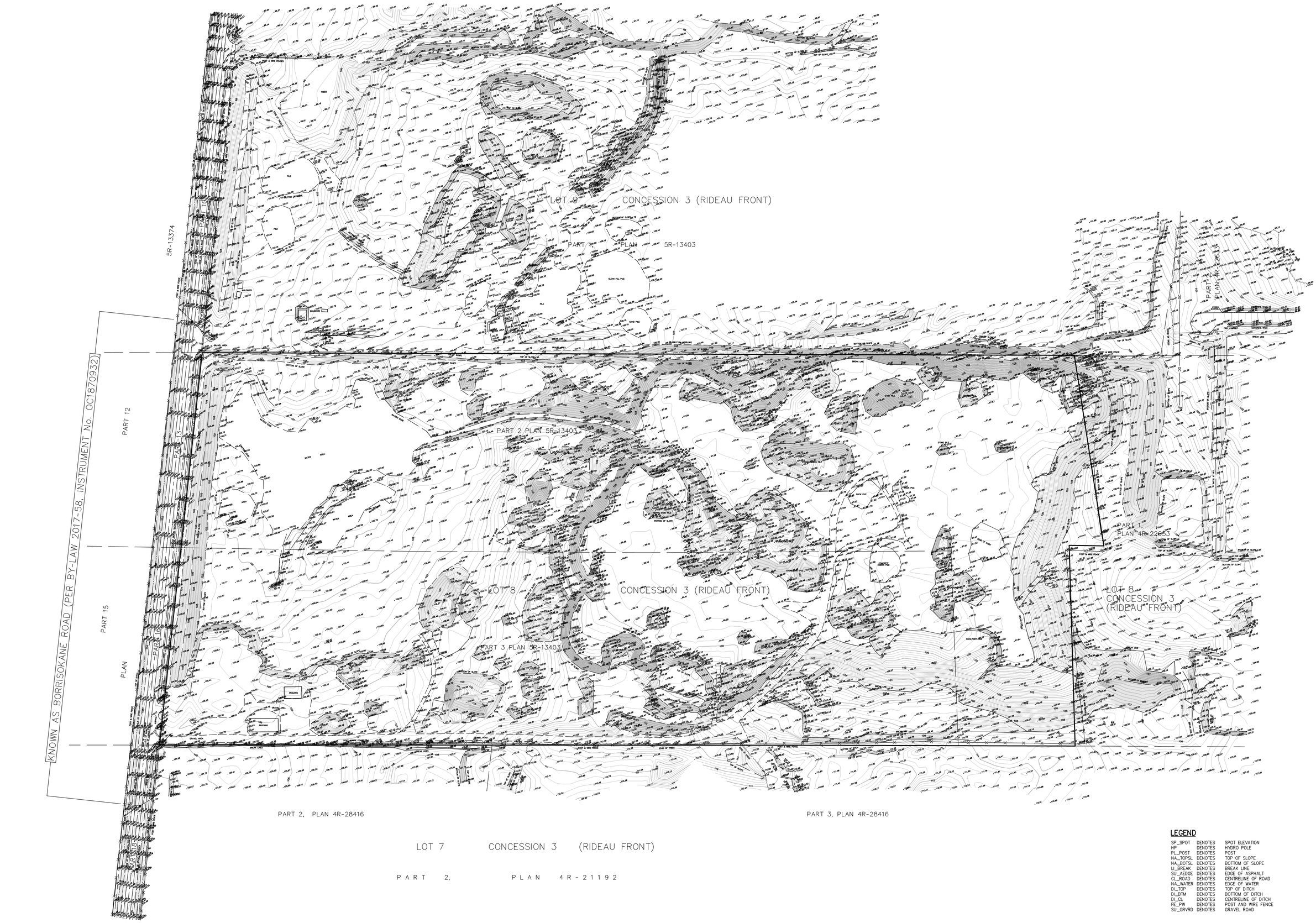
SCALE 1 : 1500
0 10 20 30 40 50 METRES

J.D. BARNES LIMITED

METRIC DISTANCES AND/OR COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

ELEVATION

ELEVATIONS ARE GEODETIC AND ARE REFERRED TO THE PUBLISHED BENCHMARK NO. 001196403710, HAVING AN ELEVATION OF 91.724 m.



LOT 7 CONCESSION 3 (RIDEAU FRONT)

PART 2, PLAN 4R-21192

LEGEND

SP_SPOT	DENOTES	SPOT ELEVATION
HP	DENOTES	HYDRO POLE
PL_POST	DENOTES	POST
NA_TOPSL	DENOTES	TOP OF SLOPE
NA_BOTSL	DENOTES	BOTTOM OF SLOPE
LI_BREAK	DENOTES	BREAK LINE
SU_AEDGE	DENOTES	EDGE OF ASPHALT
CL_ROAD	DENOTES	CENTRELINE OF ROAD
NA_WATER	DENOTES	EDGE OF WATER
DI_TOP	DENOTES	TOP OF DITCH
DI_BTM	DENOTES	BOTTOM OF DITCH
DI_CL	DENOTES	CENTRELINE OF DITCH
FE_PW	DENOTES	POST AND WIRE FENCE
SU_GRVRD	DENOTES	GRAVEL ROAD

J.D.BARNES LIMITED
SURVEYING MAPPING GIS
LAND INFORMATION SPECIALISTS
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T: (613) 731-7244 F: (613) 731-8955 www.jdbarnes.com

DRAWN BY:	CHECKED BY:	REFERENCE NO.:
NS	CF	18-10-145-00

FILE: G:\18-10-145\00\Drawing\TOPO\18-10-145-00_TOPO.dgn
PLOTTED: 7/10/2019

Revision 06/10/19

PAVEMENT DESIGN

40mm SUPERPAVE 12.5 ASPHALT CONCRETE
50mm SUPERPAVE 19.0 ASPHALT CONCRETE
150mm GRANULAR "A" CRUSH STONE
400mm GRANULAR "B" TYPE II

ANY DISTURBED AREA DURING CONSTRUCTION TO BE RESTORED TO THE ORIGINAL CONDITION OR BETTER TO THE SATISFACTION OF THE AUTHORITIES HAVING JURISDICTION

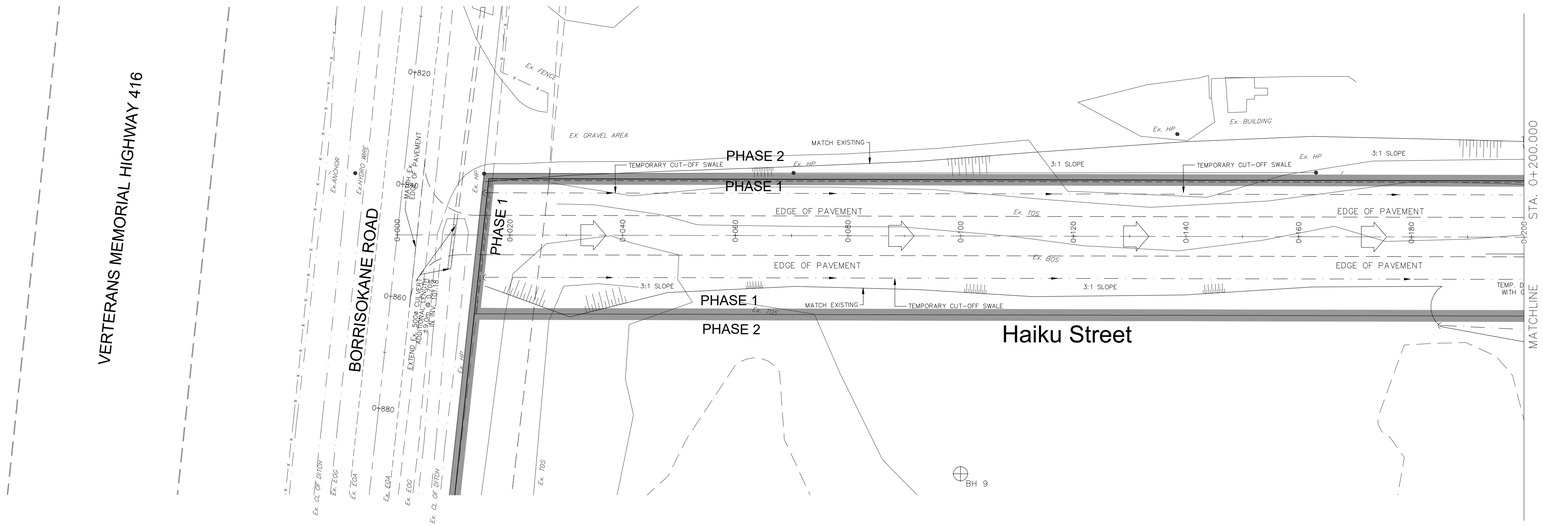
CONTRACTOR TO VERIFY THE PRECISE LOCATIONS AND INVERT ELEVATIONS OF Ex. UNDERGROUND SERVICES AND Ex. UTILITIES PRIOR TO STARTING CONSTRUCTION

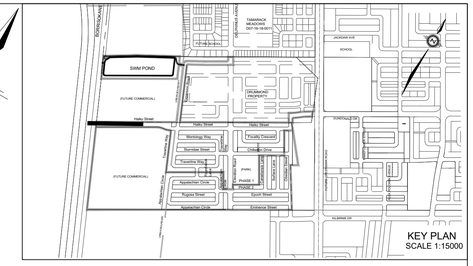
NOTE:
ALL EXISTING TREES, SHRUBS ETC. WITHIN LOTS, BLOCKS AND ROADS TO BE REMOVED, UNLESS OTHERWISE NOTED

PERMISSION REQUIRED FOR WORK ON ADJACENT LANDS

NOTE:
GEOTECHNICAL TO SPECIFY HYDRAULIC CONDUCTIVITY OF FILL MATERIAL WHERE EES IS LOCATED WITHIN FILL. HYDRAULIC CONDUCTIVITY TO BE AS HIGH AS NATIVE SANDY SOILS FILL MATERIAL IN THESE AREAS SHOULD INCLUDE A MAXIMUM OF 10% PASSING THE 75-MICRON SIEVE

NOTE:
FOR SANITARY MANHOLES, UP TO THE HIGHER OF THE PREVIOUSLY RECORDED GROUNDWATER ELEVATION OR THE GROUNDWATER ELEVATION AT THE TIME OF CONSTRUCTION, BLUESKIN WATERPROOFING MEMBRANE WRAP, OR A SIMILAR PRODUCT, SHALL BE INSTALLED AT JOINTS AS PER MANUFACTURER'S PROCEDURE





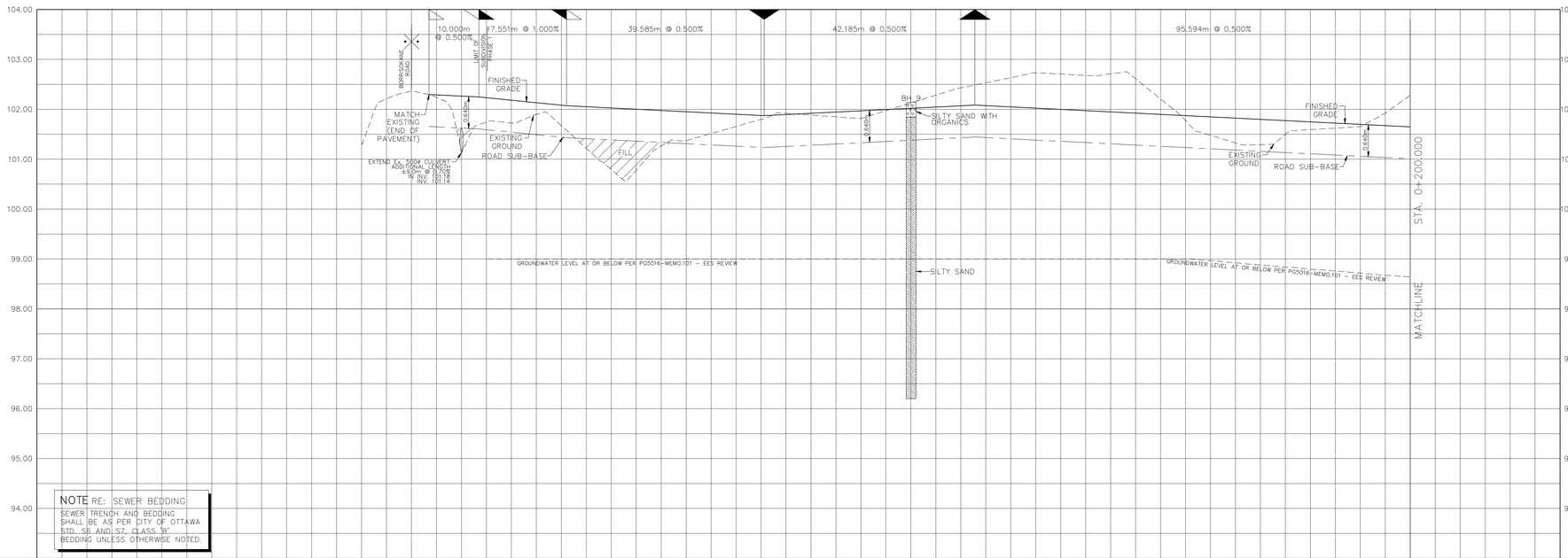
LEGEND

- CROSS
- 45° BEND
- LATERAL
- HYDRANT, VALVE & VB
- TEE
- VALVE & VC
- VALVE & VB
- 22.5° BEND
- 11.25° BEND
- REDUCER
- CAP
- SANITARY MAINTENANCE HOLE
- CAP
- STREET CATCHBASIN & LEAD
- STREET CATCHBASIN WITH CLOSED LID & LEAD
- STORM MAINTENANCE HOLE
- CURB INLET CATCHBASIN & LEAD
- CATCHBASIN/ MAINTENANCE HOLE INTERCONNECTED CATCH BASIN & LEADS
- CAP
- SINGLE SERVICE LOCATION (ST, SAN & WM)
- SINGLE SERVICE LOCATION (SAN & WM)
- SINGLE SERVICE LOCATION (ST, SAN & 25mmø PEX TUBING AWWA C-904 WM)
- SINGLE SERVICE LOCATION (ST, SAN & WM)
- TEE CATCHBASIN
- PERFORATED PIPE
- ELBOW CATCHBASIN
- DITCH AND CULVERT

- HYDRO TRANSFORMER
- STREET LIGHT STANDARD
- CONCRETE SIDEWALK
- CURB & DEPRESSED CURB
- ASPHALT SIDEWALK
- CHAINLINK FENCE (1.5m UNLESS OTHERWISE NOTED)
- NOISE BARRIER (2.5m UNLESS OTHERWISE NOTED)
- DECORATIVE FENCE (SEE LANDSCAPE DWGS FOR DETAIL)
- CONSTRUCTION FENCE
- POST AND RAIL FENCE
- PHASING LIMITS
- PROPERTY BOUNDARY
- BOREHOLE (BH)
- TEST PIT (TP)
- AUGER HOLE (AH)
- MONITORING WELL LOCATION
- CONCEPTUAL WELL LOCATION

AS PER GEOTECHNICAL REPORT

- TOP OF FOUNDATION ELEVATION
- FINISHED FLOOR ELEVATION
- UNDERSIDE OF FOOTING ELEVATION
- NUMBER OF RISERS
- UNITS REQUIRING PRESSURE REDUCING VALVES
- WALKOUT UNITS
- SLAB ON GRADE
- OVERLAND FLOW DIRECTION
- EXTERNAL OVERLAND FLOW DIRECTION
- EMERGENCY OVERLAND FLOW DIRECTION
- TACTILE WALKING SURFACE INDICATOR (AS PER CITY OF OTTAWA STD. SC6, SC7, SC7.1, SC7.2, SC7.3)
- PREVIOUS PHASES
- CLAY SEAL (REFER TO GENERAL NOTES. No. 18. ON DWG. No. 1, AND GEOTECHNICAL CONSULTANT'S SPECIFICATIONS)
- MIN. USF AS PER GEOTECHNICAL CONSULTANT'S RECOMMENDATION



NOTE RE: SEWER BEDDING
SEWER TRENCH AND BEDDING SHALL BE AS PER CITY OF OTTAWA STD. SB AND S7, CLASS 'B' BEDDING UNLESS OTHERWISE NOTED.

TOP OF WATERMAIN	
SANITARY INVERT	
STORM INVERT	
PROPOSED GRADES	102.296 102.246 102.182 102.071 102.026 101.926 101.873 101.920 102.020 102.084 102.048 101.948 101.848 101.748 101.648
CENTERLINE CHAINAGE	0+000.000 0+003.500 0+013.500 0+020.000 0+031.051 0+040.000 0+060.000 0+070.636 0+080.000 0+100.000 0+112.821 0+120.000 0+140.000 0+160.000 0+180.000 0+200.000

NOT FOR CONSTRUCTION

No.	BY	DATE	DESCRIPTION
6	A.D.F.	20-07-27	5TH SUBMISSION
5	A.D.F.	20-06-15	4TH SUBMISSION
4	A.D.F.	20-04-24	3RD SUBMISSION
3	A.D.F.	19-12-23	2ND SUBMISSION
2	A.D.F.	19-10-04	1ST SUBMISSION
1	A.D.F.	19-09-19	ISSUED FOR CLIENT REVIEW

TOPOGRAPHIC INFORMATION
JD BARNES LIMITED PROJECT NUMBER 18-10-145-00 SURVEY DATED JULY 26, 2019

LEGAL INFORMATION
CALCULATED M-PLAN PROVIDED BY JD BARNES LTD, PROJECT 18-10-145-00, DATED APRIL 6, 2020

BENCH MARK No. 001196403710
ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM AND ARE DERIVED FROM THE MUNICIPALITY BENCHMARK No. 001196403710 HAVING A PUBLISHED ELEVATION OF 91.724 METERS.

CAIVAN COMMUNITIES

THE RIDGE PHASE 1

DSEL
david schaeffer engineering ltd
120 Iber Road Unit 103
Stittsville, Ontario, K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

LICENSED PROFESSIONAL ENGINEER
A. D. FOBERT
100090626
2020-07-27
PROVINCE OF ONTARIO

Ottawa CITY OF OTTAWA

PLAN AND PROFILE OF © DSEL

Haiku Street

(STA. 0+000.000 TO STA. 0+200.000)

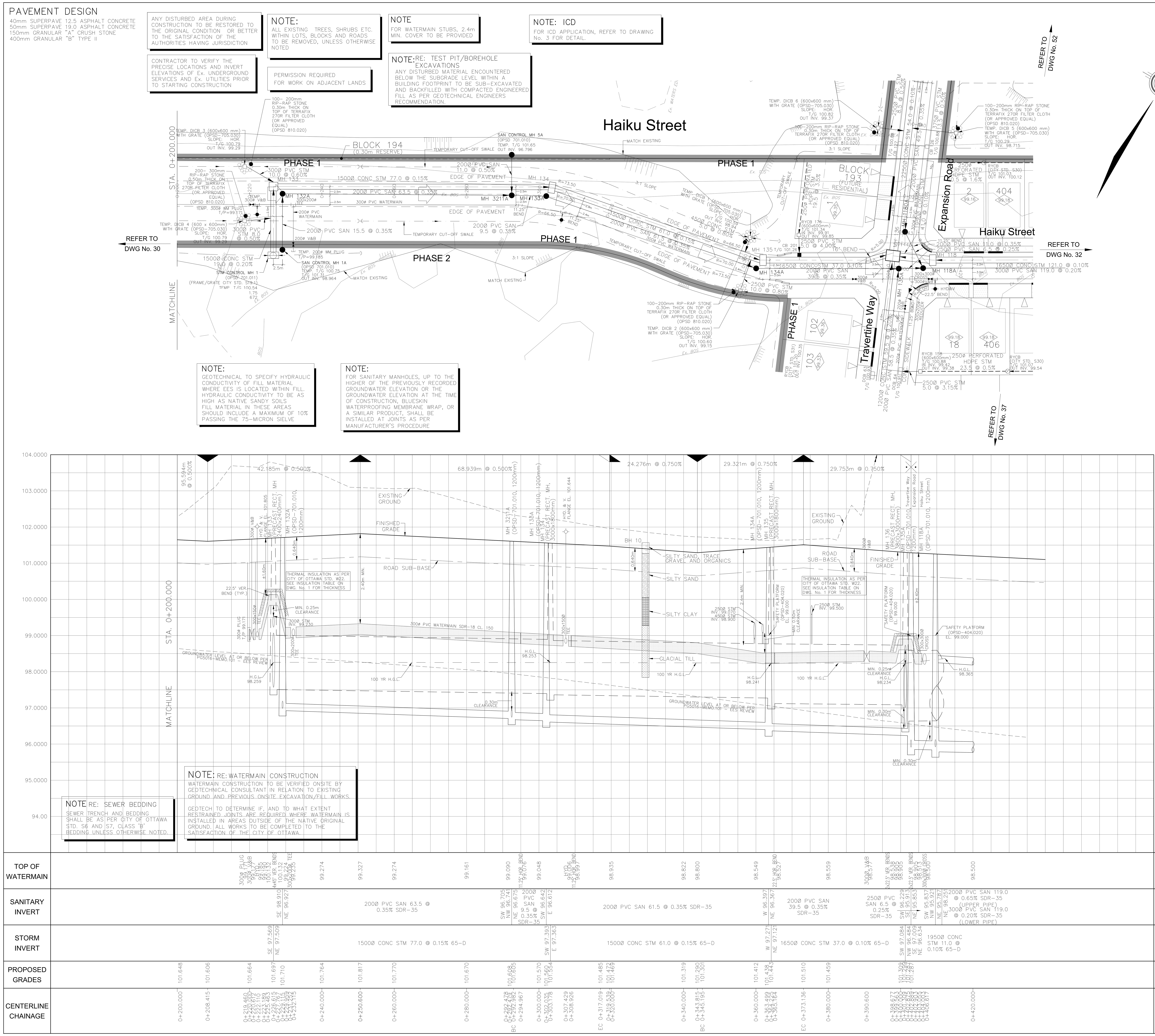
DRAWN BY:	G.G.G.	CHECKED BY:	A.D.F.
DESIGNED BY:	C.M.K.	CHECKED BY:	A.D.F.

SCALE:
VERT. 1:50 0 0.5 1.0 1.5 2.0
HORZ. 1:500 0 5 10 15 20

PROJECT No. 18-1030

SHEET No. 30

CITY PLAN No. 17803
CITY FILE No. D07-16-19-0005



PAVEMENT DESIGN
40mm SUPERPAVE 12.5 ASPHALT CONCRETE
50mm SUPERPAVE 19.0 ASPHALT CONCRETE
150mm GRANULAR "A" CRUSH STONE
400mm GRANULAR "B" TYPE II

ANY DISTURBED AREA DURING CONSTRUCTION TO BE RESTORED TO THE ORIGINAL CONDITION OR BETTER TO THE SATISFACTION OF THE AUTHORITIES HAVING JURISDICTION

CONTRACTOR TO VERIFY THE PRECISE LOCATIONS AND INVERT ELEVATIONS OF Ex. UNDERGROUND SERVICES AND Ex. UTILITIES PRIOR TO STARTING CONSTRUCTION

NOTE:
ALL EXISTING TREES, SHRUBS ETC. WITHIN LOTS, BLOCKS AND ROADS TO BE REMOVED, UNLESS OTHERWISE NOTED

PERMISSION REQUIRED FOR WORK ON ADJACENT LANDS

NOTE
FOR WATERMAIN STUBS, 2.4m MIN. COVER TO BE PROVIDED

NOTE: RE: TEST PIT/BOREHOLE EXCAVATIONS
ANY DISTURBED MATERIAL ENCOUNTERED BELOW THE SUBGRADE LEVEL WITHIN A BUILDING FOOTPRINT TO BE SUB-EXCAVATED AND BACKFILLED WITH COMPACTED ENGINEERED FILL AS PER GEOTECHNICAL ENGINEERS RECOMMENDATION.

NOTE: ICD
FOR ICD APPLICATION, REFER TO DRAWING No. 3 FOR DETAIL.

NOTE:
GEOTECHNICAL TO SPECIFY HYDRAULIC CONDUCTIVITY OF FILL MATERIAL WHERE EES IS LOCATED WITHIN FILL. HYDRAULIC CONDUCTIVITY TO BE AS HIGH AS NATIVE SANDY SOILS. FILL MATERIAL IN THESE AREAS SHOULD INCLUDE A MAXIMUM OF 10% PASSING THE 75-MICRON SIEVE

NOTE:
FOR SANITARY MANHOLES, UP TO THE HIGHER OF THE PREVIOUSLY RECORDED GROUNDWATER ELEVATION OR THE GROUNDWATER ELEVATION AT THE TIME OF CONSTRUCTION, BLUESKIN WATERPROOFING MEMBRANE WRAP, OR A SIMILAR PRODUCT, SHALL BE INSTALLED AT JOINTS AS PER MANUFACTURER'S PROCEDURE

NOTE: RE: WATERMAIN CONSTRUCTION
WATERMAIN CONSTRUCTION TO BE VERIFIED ONSITE BY GEOTECHNICAL CONSULTANT IN RELATION TO EXISTING GROUND AND PREVIOUS ONSITE EXCAVATION/FILL WORKS.
GEOTECH TO DETERMINE IF, AND TO WHAT EXTENT RESTRAINED JOINTS ARE REQUIRED WHERE WATERMAIN IS INSTALLED IN AREAS OUTSIDE OF THE NATIVE ORIGINAL GROUND. ALL WORKS TO BE COMPLETED TO THE SATISFACTION OF THE CITY OF OTTAWA.

NOTE: RE: SEWER BEDDING
SEWER TRENCH AND BEDDING SHALL BE AS PER CITY OF OTTAWA STD. S6 AND S7, CLASS 'B' BEDDING UNLESS OTHERWISE NOTED.

KEY PLAN
SCALE 1:15000

LEGEND
CROSS
45° BEND
LATERAL
HYDRANT, VALVE & VB
TEE
VALVE & VC
VALVE & VB
22.5° BEND
11.25° BEND
REDUCER
CAP
SANITARY MAINTENANCE HOLE
CAP
STREET CATCHBASIN & LEAD
STREET CATCHBASIN WITH CLOSED LID & LEAD
STORM MAINTENANCE HOLE
CURB INLET CATCHBASIN & LEAD
CATCHBASIN/ MAINTENANCE HOLE
INTERCONNECTED CATCH BASIN & LEADS
CAP
SINGLE SERVICE LOCATION (ST, SAN & WM)
SINGLE SERVICE LOCATION (SAN & WM)
SINGLE SERVICE LOCATION (ST, SAN & 25mmø PEX TUBING AWWA C-904 WM)
SINGLE SERVICE LOCATION (ST, SAN & WM)
TEE CATCHBASIN
PERFORATED PIPE
ELBOW CATCHBASIN
DITCH AND CULVERT
HYDRO TRANSFORMER
STREET LIGHT STANDARD
CONCRETE SIDEWALK
CURB & DEPRESSED CURB
ASPHALT SIDEWALK
CHAINLINK FENCE (1.5m UNLESS OTHERWISE NOTED)
NOISE BARRIER (2.5m UNLESS OTHERWISE NOTED)
DECORATIVE FENCE (SEE LANDSCAPE DWGS FOR DETAIL)
CONSTRUCTION FENCE
POST AND RAIL FENCE
PHASING LIMITS
PROPERTY BOUNDARY
BOREHOLE (BH)
TEST PIT (TP)
AUGER HOLE (AH)
MONITORING WELL LOCATION
CONCEPTUAL WELL LOCATION
AS PER GEOTECHNICAL REPORT
TOP OF FOUNDATION ELEVATION
FINISHED FLOOR ELEVATION
UNDERSIDE OF FOOTING ELEVATION
NUMBER OF RISERS
UNITS REQUIRING PRESSURE REDUCING VALVES
WALKOUT UNITS
SLAB ON GRADE
OVERLAND FLOW DIRECTION
EXTERNAL OVERLAND FLOW DIRECTION
EMERGENCY OVERLAND FLOW DIRECTION
TACTILE WALKING SURFACE INDICATOR (AS PER CITY OF OTTAWA STD. SC6, SC7, SC7.1, SC7.2, SC7.3)
PREVIOUS PHASES
CLAY SEAL (REFER TO GENERAL NOTES. No. 18. ON DWG. No. 1, AND GEOTECHNICAL CONSULTANT'S SPECIFICATIONS)
MIN. USF AS PER GEOTECHNICAL CONSULTANT'S RECOMMENDATION

NOT FOR CONSTRUCTION

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LICENSED PROFESSIONAL ENGINEER
A. D. FOBERT
100090626
2020-07-27
PROVINCE OF ONTARIO

Ottawa CITY OF OTTAWA

PLAN AND PROFILE OF

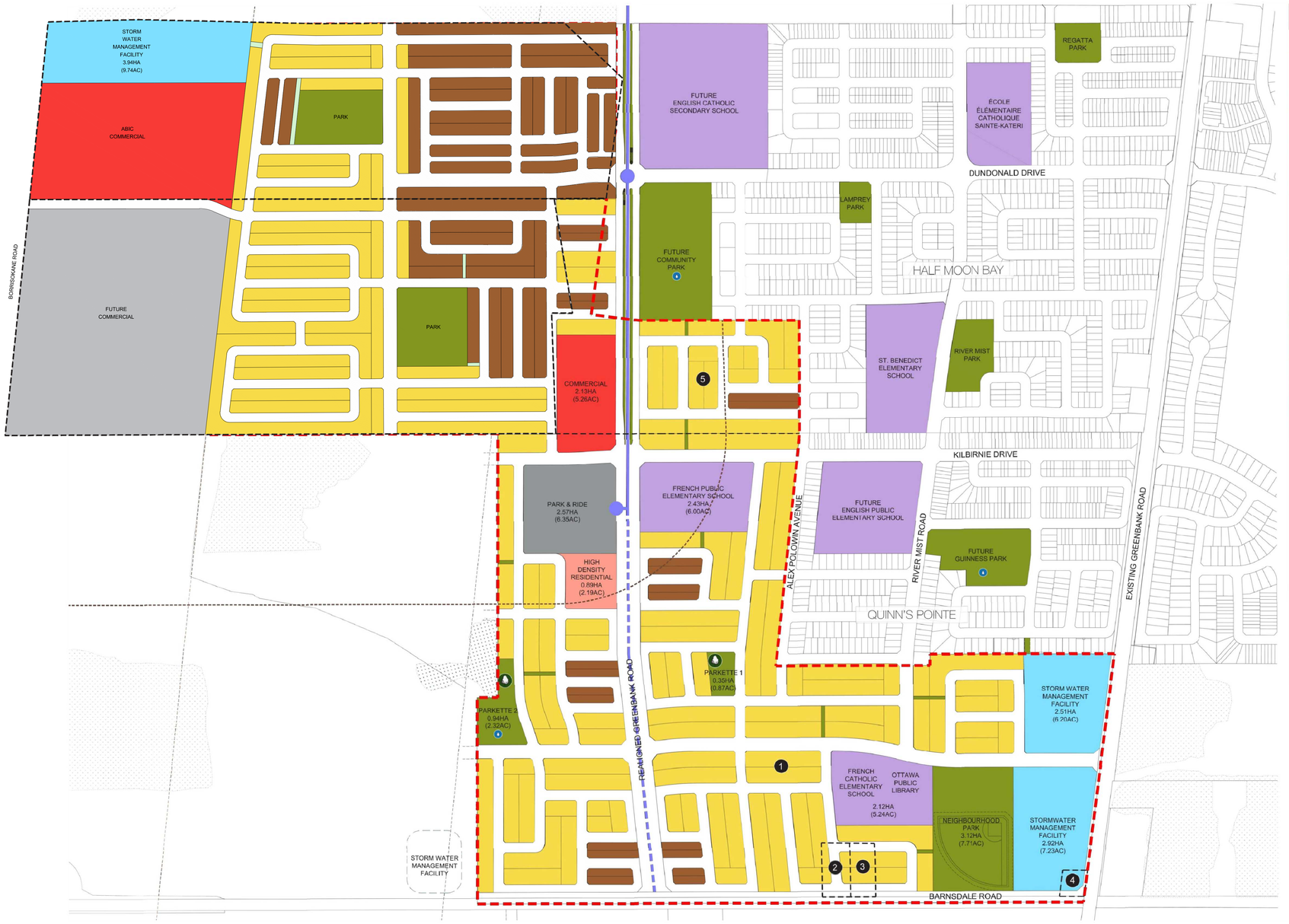
Haiku Street

(STA. 0+200.000 TO STA. 0+402.875)

DRAWN BY: G.G.G.	CHECKED BY: A.D.F.	PROJECT No. 18-1030	
DESIGNED BY: C.M.K.	CHECKED BY: A.D.F.		
SCALE: VERT. 1:50 HORZ. 1:500		SHEET No. 31	

CITY PLAN No. 17803

CITY FILE No. D07-16-19-0005



legend

- CDP Boundary
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Commercial
- Park & Ride
- Storm Water Management Facility
- School Site / Library Site
- Park
- Active Sand & Gravel Pits
- Existing Woodlot
- 300m Buffer From Pits
- 500m Landfill Buffer
- 1000m Landfill Buffer
- Possible Tree Retention
- Proposed Splash Pad
- Transit Platform
- BRT Station
- BRT Route
- BRT Route - Future Extension
- Property Ownership Boundary
- 1 Minto Lands
- 2 Moloughney Property West
- 3 Moloughney Property East
- 4 Boyle Property
- 5 Mattamy Lands
- 6 Brazeau Lands
- 7 Drummond Lands

summary

Park Land Required	3.60Ha
Parkette #1	0.35Ha
Parkette #2	0.94Ha
Neighbourhood Park	3.12Ha
Park Land Provided	4.41Ha

DRAFT

- All Units In Metric Unless Otherwise Noted.
- Base Information Obtained From Various Sources And Is Approximate.
- Schedule / Plan Information Is Conceptual And Requires Verification by Appropriate Agency.

GERRARD DESIGN

CAIVAN DRUMMOND/BRAZEAU | Ottawa, Ontario

BARRHAVEN SOUTH CDP DEMONSTRATION PLAN

JULY 13, 2020

PROJECT 1807

SCALE 1:8000