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# FUNCTIONAL SERVICING REPORT

*FOR*

# BARRHAVEN CONSERVANCY EAST INC.

# PHASE 1

CITY OF OTTAWA

**PROJECT NO.: 17-891**

**JULY 18, 2018**
**3RD SUBMISSION**

# FUNCTIONAL SERVICING REPORT
# FOR
# BARRHAVEN CONSERVANCY EAST INC.
# PHASE 1

## PROJECT NO: 17-891

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# 1.0 INTRODUCTION

David Schaeffer Engineering Limited (DSEL) has been retained to prepare a Functional Servicing Report (FSR) in support of the Draft Plan of Subdivision application for the Barrhaven Conservancy Phase 1 development on behalf of Barrhaven Conservancy East Inc. (BCE).

Phase 1 is located within the City of Ottawa urban boundary in the Barrhaven ward and is designated as General Urban. As illustrated in ***Figure 1***, the subject property is located north of the Jock River, east of Borrisokane Road, west of Greenbank Road, and south of Strandherd Drive. It is under the jurisdiction of the Rideau Valley Conservation Authority (RVCA). The subject property measures approximately 9.3 ha and is legally described as part of Concession 3, Lot 14.

Phase 1 is currently zoned Development Reserve (DR) Zone. The proposed subdivision plan (***Appendix A***) would allow for the development of a mix of detached singles, rear lane townhomes and park blocks. It also includes a road network featuring 16.5 m right-of-way (ROW) local roads and 8.5 m ROW lanes. The schedule of land use is provided.

The objective of this report is to provide sufficient detail to demonstrate that the development of Phase 1 is supported by municipal services and conforms to applicable standards.

## 1.1 Existing Conditions

The subject property is relatively flat with the existing elevations ranging from 92 m in the north east to 91 m in the south. The existing topography characterized in the available City of Ottawa base mapping indicates that all flows from the subject property are ultimately conveyed south to the Jock River by way of the Fraser-Clarke Watercourse. The Fraser-Clarke Watercourse runs along the south west of the subject property to the Jock River and the existing Kennedy-Burnett SWM Facility is located to the east of the subject property.

The subject property is within the Jock River watershed and is under the jurisdiction of the RVCA.

A portion of the subject property is currently within the Jock River regulatory flood plain and permits will be required from the RVCA to complete work within this boundary.

## 1.2 Required Permits / Approvals

The City of Ottawa must approve detailed engineering design drawings and reports prior to construction of the municipal infrastructure identified in this report. This is expected to occur as part of the Plan of Subdivision application process.

The additional approvals and permits listed in ***Table 1*** are expected to be required prior to construction of the municipal infrastructure detailed herein. Please note that other permits and approvals may be required, as detailed in the other studies submitted as part of the Plan of Subdivision application.

**Table 1: Required Permits/Approvals**

| Agency | Permit/Approval Required | Trigger | Remarks |
|---|---|---|---|
| MOECC | Environmental Compliance Approval | Construction of new sanitary and storm sewers throughout the subdivision and new oil and grit separator (OGS). | The MOECC will review the sanitary and storm sewer design through the City of Ottawa transfer of review process. |
| MOECC | Permit to Take Water | Construction of proposed land uses (e.g. basements for residential homes) and services. | Pumping of groundwater may be required during construction, given groundwater conditions and proposed land uses and on-site/off-site municipal infrastructure. |
| City of Ottawa | MOE Form 1 – Record of Watermains Authorized as a Future Alteration. | Construction of watermains throughout the subdivision | The City of Ottawa will review the watermains on behalf of the MOECC through the Form 1 – Record of Watermains Authorized as a Future Alteration. |
| RVCA | Outlets to Jock River, Alteration to Municipal Drains / Watercourse | Connections to the Jock River and/or modifications to the Fraser-Clarke Watercourse | The RVCA will review applications submitted for new outlets to the Jock River from the proposed OGS. The RVCA will review applications submitted for any modifications to the Fraser-Clarke Watercourse. |
| RVCA | Permit to work in the regulatory floodplain | Construction within the regulatory floodline | The RVCA will review applications submitted for work within the regulatory floodline of the Jock River. |

## 1.3 Pre-Consultation

The following provides a summary of the pre-consultation meetings:

### 1.3.1 City of Ottawa

Pre-consultation with the City of Ottawa has been on-going and additional meetings will be forthcoming.

### 1.3.2 Ministry of the Environment and Climate Change (MOECC)

Pre-consultation with the MOECC will be forthcoming, including confirmation of the required approvals.

### 1.3.3 Rideau Valley Conservation Authority (RVCA)

Pre-consultation with the RVCA has been on-going and will continue, including confirmation of the required approvals.

# 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, Revisions to Ottawa Design Guidelines - Sewer
    City of Ottawa, February 5, 2014.
    (ISDTB-2014-01)
  - Technical Bulletin PIEDTB-2016-01, Revisions to Ottawa Design Guidelines – Sewer
    City of Ottawa, September 6, 2016.
    (PIEDTB-2016-01)
  - Technical Bulletin PIEDTB-2018-01, Revisions to Ottawa Design Guidelines – Sewer
    City of Ottawa, March 21, 2018.
    (ISTB Sewer-2018-01)
  - Technical Bulletin ISDTB-2018-04
    City of Ottawa, June 27, 2018.
    *(*ISDTB-2018-04*) re Sump Pumps*
- Ottawa Design Guidelines – Water Distribution
  City of Ottawa, July 2010.
  *(Water Supply Guidelines)*
  - Technical Bulletin ISD-2010-2
    City of Ottawa, December 15, 2010.
    *(*ISDTB-2010-2*)*
  - Technical Bulletin ISDTB-2014-02
    City of Ottawa, May 27, 2014.
    *(*ISDTB-2014-02*)*
  - Technical Bulletin ISDTB-2018-02
    City of Ottawa, March 21, 2018.
    *(*ISDTB-2018-02*)*

- Design Guidelines for Sewage Works,
  Ministry of the Environment, 2008.
  *(MOECC* Design Guidelines*)*
- Stormwater Planning and Design Manual,
  Ministry of the Environment, March 2003.
  *(SWMP Design Manual)*
- City of Ottawa Official Plan,
  adopted by Council 2003.
  *(Official Plan)*
- City of Ottawa Secondary Plan – Former Nepean – South Nepean Urban Area – Areas 9 and 10,
  Adopted by Council 2003.
  *(Secondary Plan)*
- Erosion & Sediment Control Guidelines for Urban Construction,
  Greater Golden Horseshoe Area Conservation Authorities, December 2006
  *(E&S Guidelines)*
- South Nepean Collector (SNC) Sewer Phase 2 – Strandherd Drive to Jockvale Road Drawings
  City of Ottawa, December 2016
- South Nepean Collector (SNC) Wastewater Servicing Study and Functional Design Report
  Dillon Consulting, October 2003
  *(Dillon SNC Report)*
- South Nepean Collector: Phase 2 Hydraulics Review / Assessment Technical Memorandum
  Novatech, August 2015
  *(Novatech SNC Memo)*
- Infrastructure Master Plan
  City of Ottawa, November 2013
  *(IMP)*
- Servicing Brief, Minto Communities Inc Clarke Lands
  JL Richards, March 2016
  *(Clarke Lands Report)*
- Kennedy-Burnett Stormwater Management Facility Project File and Functional Design Report
  CH2M Hill, February 2017
  *(CH2M Hill Kennedy-Burnett SWM Facility Report)*
- Kennedy-Burnett Potable Water Master Servicing Study
  Stantec, April 2014

- Jock River Flood Risk Map No. *2*
  RVCA, July 2005
- Jock River Reach One Subwatershed Study
  Stantec, 2007
  *(Jock River SWS)*

## 3.0 WATER SUPPLY SERVICING

### 3.1 Existing Water Supply Services

The subject property is located adjacent to the City of Ottawa's Pressure Zone (PZ) 3SW (previously known as PZ BARR). Once operational, PZ SUC is planned to service the land found to the east of the subject property, as well as south of the Jock River.

The City of Ottawa has recently started reconfiguring the pressure zones servicing Barrhaven and the South Urban Community (SUC) in order to improve reliability and efficiency and to increase pumping capacity to accommodate for future growth in the area. There are three pumping stations servicing Zone 3SW and Zone SUC: Fallowfield Road Pumping Station (FRPS), Barrhaven Pumping Station (BPS) and the Ottawa South Pumping Station (OSPS).

Future watermains in the vicinity of the Phase 1 property have been identified at the following locations:

- A 400 mm diameter watermain along Strandherd Drive, which was identified in the City of Ottawa's Infrastructure Master Plan (IMP) dated November 2013 to extend from Fallowfield Road to Greenbank Road. This watermain has been constructed from Fallowfield Road to Kennevale Drive; however, the section from Kennevale Drive to Greenbank Road is still to be constructed. Construction is expected to commence in 2019.
- A 300 mm diameter watermain will extend from the Strandherd Drive watermain along the future North-South Chapman Mills Drive extension as shown on Drawing CS1 – Conceptual Site Servicing Drawing for the Minto Clarke Lands by JL Richards. This figure is enclosed in ***Appendix B***.
- 300mm SUC watermain within a future local road to the east of Greenbank Road.

As noted in the ***Servicing Brief for the Minto Communities Inc Clarke Lands*** by JL Richards in the March 2016 ***(Clarke Lands Report)***, in advance of the commissioning of the Strandherd 400 mm diameter watermain, it is anticipated that interim water servicing for the Clarke Lands can be provided by connections to existing local watermains (existing 300 mm on Tartan Drive, existing 250 mm diameter watermain stub on Fraser Fields Way and three connections to the existing 200 mm diameter watermain on Waterlily Way.

## 3.2 Water Supply Servicing Design

It is proposed that the subject property be connected to the future 300 mm diameter watermain on the future North-South Chapman Mills Extension. In the future, a second connection will be made to a 300 mm diameter watermain within a future local road in the subdivision development to the north of the subject property. The proposed water servicing is depicted in ***Figure 3***.
It is anticipated that this feed to Phase 1 will satisfy the City's objective minimum pressure of 40 psi during peak hour demand and achieve a typical planning level fire flow value of 10,000 L/min or greater. At the time of detailed design, detailed hydraulic modelling will be undertaken to verify that the proposed on-site and off-site watermains are in conformance with the City's ***Water Supply Guidelines***.

As detailed designs progress, timing, alignment, and sizing of local watermains will be confirmed. The local watermain network will be sized to meet maximum hour and maximum day plus fire flow demands, with consideration given to proposed phasing plans. ***Table 2*** summarizes the Water Supply Design Criteria to be employed in the design of the watermain network. Fire flow requirements are to be confirmed in accordance with Local Guidelines (Fire Underwriters Survey), City of Ottawa Water Supply Guidelines, and the Ontario Building Code, upon development of detailed concepts for the detached singles, townhomes, and parks.

**Table 2: Water Supply Design Criteria**

| Design Parameter | Value |
|---|---|
| ***Extracted from Section 4: Ottawa Design Guidelines, Water Distribution (July 2010)*** | |
| Residential – Detached Single | 3.4 p/unit |
| Residential – Townhome/ Semi | 2.7 p/unit |
| Residential – Apartment | 1.8 p/unit |
| 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 480kPa |
| During fire flow operating pressure must not drop below | 140 kPa |
| ***Stantec Hydraulic Analysis, Stantec, July 20, 2017 for Population Exceeding 3000 Persons*** | |
| Residential – Detached Single | 180 L/cap/day |
| Residential – Rear Lane Town | 198 L/cap/day |
| Residential – Back-to-Back | 198 L/cap/day |
| Outdoor Water Demand | 1049 L/unit/day (single detached) |
| Basic Day | Population x Demand |
| Max Day | Basic Day + Outdoor Water Demand |

To support the future development of a hydraulic analysis for the subdivision, boundary conditions are expected to be provided by the City of Ottawa for the preliminary water demands.

## 3.3 Water Supply Conclusion

For Phase 1 servicing, it is proposed that a connection is made to a future 300 mm diameter watermain along the future North-South Chapman Mills Extension, along with a future 300 mm diameter watermain connection through the subdivision development to the north. It is anticipated that these feeds will satisfy the City's objective minimum pressure of 40 psi during peak hour demand and achieve a typical planning level fire flow value of 10,000 L/min or greater. At the time of detailed design, detailed hydraulic modelling will be undertaken to verify that the proposed water servicing is in conformance with all relevant City and MOECC Guidelines and Policies.

# 4.0 WASTEWATER SERVICING

## 4.1 Existing Wastewater Services

Per the ***South Nepean Collector (SNC) Wastewater Servicing Study and Functional Design Report*** by Dillon in October 2003 ***(Dillon SNC Report)***, the subject lands are tributary to the South Nepean Collector (SNC) sewer as urban development land.

The SNC sewer operates north of the subject property within Strandherd Drive prior to travelling south down a future collector road then travelling east within the future Chapman Mills Drive ROW. The location of the SNC sewer is shown on ***Figure 4***.

The SNC was designed to be constructed in three phases. Phase 1 of the SNC was completed in 2005, terminating at a 2400 mm maintenance hole located east of Longfields Drive, north of Bren-Maur Road. Phase 2 was recently extended to Strandherd Drive via the proposed extension of Chapman Mills Drive from its previous termination. Phase 3 will extend the trunk sewer along Strandherd Drive to the intersection of Maravista Drive. A portion of Phase 3 from Kennevale Drive to Maravista Drive has been constructed. The wastewater is ultimately conveyed to the intersection of Jockvale Road and Longfields Drive where it then passes underneath the Jock River.

The ***South Nepean Collector Phase 2: Hydraulics Review / Assessment*** memo was prepared by Novatech Engineering Consultants on August 20, 2015 ***(Novatech SNC Memo)*** to provide an update to the sanitary design flows for Phase 2 of the South Nepean Collector, as previously documented in the ***South Nepean Collector (SNC) – Functional Design Report and Update*** by Dillon in 2012 ***(Dillon SNC Report and Update)***.

## 4.2 Wastewater Design

Phase 1 is planned to be serviced by an internal gravity sanitary sewer system that is to generally follow the local road network. The wastewater servicing plan can be seen in ***Figure 4***. As detailed designs progress, alignment and sizing of local sanitary sewers will be confirmed and servicing easements added if required, which may trigger minor amendments to the proposed fabric in the concept plan.

The proposed wastewater servicing design proposes to tie into the adjacent SNC sanitary sewer, located in easements, within the Future Chapman Mills Drive (SANMH 15). The ***Novatech SNC Memo*** notes that a full flow capacity of 900.5 L/s for a 900 mm diameter sewer at 0.10% exists downstream of the proposed tie-in with the SNC trunk. A peak design flow of 634.2 L/s was anticipated, leaving the SNC with 30% (266.3 L/s) residual capacity. The ***Novatech SNC Memo*** is contained in ***Appendix C***.

A total of 8.4 ha is proposed to drain through the subject property into the SNC trunk sewer from the subject property. The sanitary drainage area plan and design sheet are enclosed in ***Appendix D.***

Applying the City of Ottawa's wastewater design criteria to the development concept, the estimated peak sanitary flow from Phase 1 is 13.31 L/s. The sanitary drainage area plan and design sheet are enclosed in ***Appendix D***. The addition of Phase 1 peak flows to the peak design flows from the ***Novatech SNC Memo*** results in an updated peak flow of 647.51 L/s downstream of SANMH 8 in the SNC sanitary sewer. With the inclusion of the subject property, the SNC sanitary sewer would be at 72% capacity, and can adequately handle the entirety of the Barrhaven Conservancy's proposed sanitary flows.

***Table 3*** summarizes the City design guidelines and criteria applied in the preliminary sanitary design information above and detailed in ***Appendix D***.

**Table 3: Wastewater Design Criteria**

| Design Parameter | Value |
|---|---|
| **Current Design Guidelines** | |
| Residential - Single Family | 3.4 p/unit |
| Residential – Townhome/ Semi | 2.7 p/unit |
| Residential – Apartment | 1.8 p/unit |
| Average Daily Demand | 280 L/d/per |
| Peaking Factor | Harmon's Peaking Factor. Max 4.0, Min 2.0 |
| Commercial / Institutional Flows | 28,000 L/ha/day |
| Commercial / Institutional Peak Factor | 1.5 |
| Infiltration and Inflow Allowance | 0.32 L/s/ha |
| Park Flows | 28,000 L/ha/d |
| Park Peaking Factor | 1.0 |
| Sanitary sewers are to be sized employing the Manning's Equation | $Q = \frac{1}{n} AR^{2/3} S^{1/2}$ |
| Minimum Sewer Size | 200 mm diameter |
| Minimum Manning's 'n' | 0.013 |
| Minimum Depth of Cover | 2.5 m from crown of sewer to grade |
| Minimum Full Flowing Velocity | 0.6 m/s |
| Maximum Full Flowing Velocity | 3.0 m/s |
| *Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012, and recent residential subdivisions in City of Ottawa.* | |
| **Operational Parameters on Monitoring Data** ***(Example Only, Values to be Reviewed on Case-by-Case Basis with City of Ottawa)*** | |
| Average Daily Demand | 300 L/d/per |
| Harmon – Correction Factor | 0.4 to 0.6 |
| Institutional / Industrial Flows | 10,000 L/ha/day |
| Commercial Flows | 17,000 L/ha/day |
| Commercial / Institutional Peak Factor | 1 (non-coincident peak) |
| *Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012, and recent residential subdivisions in City of Ottawa.* | |

## 4.3 Wastewater Servicing Conclusion

The subject property will be serviced by local sanitary sewers and the adjacent SNC sanitary sewer as defined in previous reports. This FSR proposes the expansion of the drainage areas from the ***Novatech SNC Memo*** to include Phase 1. There is significant residual capacity in the downstream SNC, providing sufficient capacity for the peak sanitary flows from Phase 1.

Residual capacity exists downstream in the SNC after the addition of the Phase 1 wastewater flows to the SNC sanitary sewer; therefore, the proposed servicing does not have a negative impact on neighboring landowners.

# 5.0 STORMWATER CONVEYANCE

## 5.1 Existing Stormwater Drainage

The subject property is within the Jock River watershed. Per the existing topography characterized in available City of Ottawa base mapping, all flows from Phase 1 are ultimately conveyed to the Jock River by the Fraser-Clarke Watercourse to the Jock River.

A portion of the subject property is currently within the Jock River regulatory flood plain and permits will be required from the RVCA to complete work within this boundary.

## 5.2 Proposed Stormwater Management Strategy

This FSR proposes to have stormwater flows conveyed through Phase 1 by way of an underground sewer network. The stormwater runoff will be treated to provide an Enhanced Level of Protection (80% TSS removal) before ultimately being released into the Jock River as per the ***Jock River Reach One Subwatershed Study*** prepared by Stantec in 2007 ***(Jock River SWS)***. The proposed stormwater management design is shown on ***Figure 5***.

The stormwater management design consists of:

- A storm sewer system designed to capture at least the minimum design capture events required under PIETB-2016-01;
- One (1) on-site oil/grit separator (OGS) designed to provide an Enhanced Level of Protection per MOECC guidelines, via treatment of the stormwater captured by the storm sewer network;
- An on-site road network designed to maximize the available storage in the on-site road network for the 100-year design event, where possible, with controlled release of stormwater to the minor storm system; and,
- An overland flow route designed to safely convey stormwater runoff flows in excess of the on-site road storage.

Quantity control is not required for the Jock River; however, the quantity of stormwater runoff exiting from the subject property is to be minimized by optimizing on-site storage in the sags of the proposed road network, which in turn minimizes the size of downstream storm sewer infrastructure.

Erosion control targets for the Fraser-Clarke Watercourse will be provided by the fluvial engineer and adhered to in the design.

## 5.3 Post-Development Stormwater Management Targets

Stormwater management requirements for the proposed alternative Stormwater management scheme have been adopted from the ***Jock River SWS***, ***City Standards***, and the ***MOECC SWMP Manual***.

Given the general criteria mentioned above, the following specific standards are expected to be required for stormwater management within the subject property:

- Enhanced quality treatment will be provided for stormwater runoff from the subject property, corresponding to a long-term average Total Suspended Solid removal efficiency of 80%, as defined by the MOECC prescribed treatment levels.
- Downstream receiving watercourses will be assessed for responses to planned stormwater management outflows, and stabilization mitigation measures will be planned as required.
- Downstream receiving drainage features, culverts, and sewers will be assessed for responses to planned stormwater management outflows, and infrastructure rehabilitation, re-grading or capacity improvement measures will be planned as required.
- Storm sewers on local roads are to be designed to provide at least a 2-year level of service without any ponding per the City's latest Technical Bulletin PIEDTB-2016-01.
- Storm sewers on collector roads are to be designed to provide at least a 5-year level of service without any ponding per the City's latest Technical Bulletin PIEDTB-2016-01.
- For less frequent storms (i.e. larger than 2-year or 5-year), the minor system sewer capture will be restricted with the use of inlet control devices to prevent excessive hydraulic surcharges.
- Under full flow conditions, the allowable velocity in storm sewers is to be no less than 0.80 m/s and no greater than 6.0 m/s.
- For the 100-year storm and for all roads, the maximum depth of water (static and/or dynamic) on streets, rearyards, public space and parking areas shall not exceed 0.35 m at the gutter.
- The major system shall be designed with sufficient capacity to allow the excess runoff of a 100-year storm to be conveyed within the public ROW or adjacent to the right-of-way provided that the water level must not touch any part of the building envelope, must remain below all building openings during the stress test event (100-year + 20%), and must maintain 15 cm vertical clearance between spill elevation on the street and the ground elevation at the nearest building envelope.

- Flow across road intersections shall not be permitted for minor storms (generally 5-year or less).
- When catchbasins are installed in rear yards, safe overland flow routes are to be provided to allow the release of excess flows from such areas. A minimum of 30 cm of vertical clearance is required between the rear yard spill elevation and the ground elevation at the adjacent building envelope.
- The product of the maximum flow depths on streets and maximum flow velocity must be less than 0.60 $m^2$/s on all roads.

### 5.3.1 Quality Control

Per the ***MOECC SWMP Design Guidelines***, prior to discharge to the Jock River, quality treatment of stormwater runoff from the subject property is to be provided to meet the MOECC Enhanced Protection criteria by:

- Capturing and treating at least 90% of the runoff volume that occurs for the site on a long-term average basis [treatment volume efficiency must be calculated without bypass – e.g. for 100% of the total runoff volume for all the storm events that occur for the site on a long-term average basis]; and
- Capturing a minimum of 80% of the annual total suspended solids (TSS) load on a long-term average basis [suspended solids removal efficiency must be calculated based on 100% of the total runoff volume for all the storm events that occur for the site on a long-term average basis].

### 5.3.2 Quantity Control

As noted in the ***Jock River SWS***, quantity control is not required for the Jock River; however, based on past reports, the limited capacity of the tributaries to the north of the Jock River may require that the stormwater management facilities provide a storage volume for quantity control.

Some quantity control will be provided by erosion storage, as erosion thresholds for the Fraser-Clarke Watercourse will be respected.

## 5.4 Stormwater Management Design

The stormwater runoff from Phase 1 is proposed to be treated by an oil and grit separator (OGS) unit to meet MOECC Enhanced Level of Protection criteria. The location of the OGS system is shown in ***Figure 5***. To ensure that the OGS unit is not submerged, the invert of the unit is set at the normal water level (89.87m) that was previously documented in CH2M's final report for the "Kennedy-Burnett Stormwater Management Facility Project File and Functional Design Report" (Feb 17, 2017). The excerpt of Novatech's "Option 4" for the "Kennedy-Burnett SWMP Servicing Options" is provided in ***Appendix E*** for reference.

By way of an MOECC Certificate of Technology Assessment and manufacturer's design report, the OGS unit must prove that compliance with Enhanced Level of Protection requirements, given the specific drainage area parameters below:

- Total Drainage Area to be Treated by Oil/Grit Separator east of Fraser-Clarke Watercourse: ~10.1 ha;
- Average Imperviousness of Area to be Treated by on-site OGS east of Fraser-Clarke Watercourse: 64%; and,
- Predicted 100-year peak flows through unit east of Fraser-Clarke Watercourse: 0.968 $m^3$/s (***Section 5.5***).

## 5.5 Proposed Minor System

Phase 1 is expected to be serviced by an internal gravity storm sewer system that is to generally follow the local road network and proposed servicing easements. The drainage will be conveyed within the underground piped sewer system to an OGS unit prior to discharge.

Street catchbasins will collect drainage from the streets and front yards, while rear yard catchbasins will capture drainage from backyards. Perforated catch basin leads will be provided in rear yards, except the last segment where it connects to the right-of-way which will be solid pipe, per current City standards.

The preliminary rational method design of the minor system captures drainage for storm events up to and including the 2-year (local) and 5-year (collector) event, assuming the use of inlet control devices (ICD) for all catchbasins within the subject property. ***Table 4*** summarizes the standards that will be employed in the detailed design of the storm sewer network, meeting the requirements in ***Section 5.3***. The drainage areas are found in ***Figure 5*** and rational method design sheet is provided in ***Appendix E***.

The peak design flows are calculated based on an average predicted runoff coefficient (C-value) of 0.67 and 0.75 for the development areas and 0.25 for the grassed areas. As detailed design progresses, the runoff coefficients will be refined to reflect the proposed building envelopes, driveways and other details.

As detailed design progresses, alignment and sizing of local storm sewers will be confirmed and servicing easements would be added as required, which may trigger minor amendments to the proposed lot fabric in the concept plan. Specifically, the sizing of storm sewers is subject to change based on the Hydraulic Grade Line (HGL) analysis (***Section 5.6***) and the major system design (***Section 5.7***).

The proposed trunk through Phase 1 varies in size from 750 mm to 1200 mm diameter, discharging to an OGS, which discharges to the Fraser-Clarke Watercourse and the Jock River. The peak flow from Phase 1 to the OGS is 882 L/s as shown on the rational method design sheet, enclosed in ***Appendix E***.

## Table 4: Storm Sewer Design Criteria

| Design Parameter | Value |
|---|---|
| Minor System Design Return Period | 1:2 year (PIEDTB-2016-01) for local roads, without ponding<br>1:5 year (PIEDTB-2016-01) for collector roads, without ponding |
| Major System Design Return Period | 1:100 year |
| Intensity Duration Frequency Curve (IDF)<br>2-year storm event:<br>A=732.951 \| B=6.199 \| C=0.810<br>5-year storm event:<br>A = 998.071 \| B = 6.053 \| C = 0.814 | $i = \frac{A}{(t_c + B)^C}$ |
| Minimum Time of Concentration | 10 minutes |
| Rational Method | $Q = CiA$ |
| Storm sewers are to be sized employing the Manning's Equation | $Q = \frac{1}{n} A R^{2/3} S^{1/2}$ |
| Runoff coefficient for paved and roof areas | 0.9 |
| Runoff coefficient for landscaped areas | 0.2 |
| Minimum Sewer Size | 250 mm diameter |
| Minimum Manning's 'n' for pipe flow | 0.013 |
| Minimum Depth of Cover | 1.5 m from crown of sewer to grade |
| Minimum Full Flowing Velocity | 0.8 m/s |
| Maximum Full Flowing Velocity | 6.0 m/s |
| Clearance from 100-Year Hydraulic Grade Line to Building Opening | 0.30 m |
| Max. Allowable Flow Depth on Municipal Roads | 35 cm above gutter (PIEDTB-2016-01) |
| Extent of Major System | To be contained within the municipal right-of-way or adjacent to the right-of-way provided that the water level must not touch any part of the building envelope and must remain below the lowest building opening during the stress test event (100-year + 20%) and 15cm vertical clearance is maintained between spill elevation on the street and the ground elevation at the nearest building envelope (PIEDTB-2016-01) |
| Stormwater Management Model | DDSWMM (release 2.1), SWMHYMO (v. 5.02) and XPSWMM (v. 10) |
| Model Parameters | Fo = 76.2 mm/hr, Fc = 13.2 mm/hr, DCAY = 4.14/hr, D.Stor.Imp. = 1.57 mm, D.Stor.Per. = 4.67 mm |
| Imperviousness | Based on runoff coefficient (C) where<br>Percent Imperviousness = (C - 0.2) / 0.7 x 100%. |
| Design Storms | Chicago 3-hour Design Storms and 24-hour SCS Type II Design Storms. Maximum intensity averaged over 10 minutes. |
| Historical Events | July 1st, 1979, August 4th, 1988 and August 8th, 1996 |
| Climate Change Street Test | 20% increase in the 100-year, 3-hour Chicago storm |

*Extracted from City of Ottawa Sewer Design Guidelines, October 2012, and ISSU, and based on recent residential subdivisions in City of Ottawa.*

## 5.6 Hydraulic Grade Line Analysis

A detailed hydraulic gradeline (HGL) modelling analysis will be completed for the proposed system at the detailed design level, based on the 100-year 3-hour Chicago, 12-hour SCS, and 24-hour SCS design storms, including historical design storms and the climate change stress test, as required. Detailed grading design and storm sewer design will be modified as required to achieve the freeboard requirements set out in ***Section 5.3*** (per PIEDTB-2016-01).

## 5.7 Proposed Major System

Major system conveyance, or overland flow (OLF), will be provided to accommodate flows in excess of the minor system capacity. OLF is accommodated by generally storing stormwater up to the 100-year design event in road sags then routing additional surface flow along the road network and service easements towards the proposed drainage features to the Jock River, as shown in ***Figure 5****.* A composite servicing plan is shown on ***Figure 6***.

The grading design described in ***Section 5.8*** and shown in ***Figure 7*** will include a saw-toothed-road design with 0.10% minimum grade from highpoint to highpoint, in order to maximize available surface storage for management of flows up to the 100-year design event where possible.

The Fraser-Clarke Watercourse, downstream of the OGS unit, will be designed to prevent erosion and sediment transport.

Given the elements above and the minor storm system described in ***Section 5.5***, the proposed drainage systems are expected to safely capture and convey all storms up to and including the 100-year event, in accordance with the requirements of the City standards.

The overland flows from Phase 1 are conveyed along the road to the Fraser-Clarke Watercourse.

## 5.8 Proposed Grading and Foundation Drainage

A site grading scheme has been developed to optimize earthworks and provide major system conveyance to the receiving outlets, which eventually outlet to the existing Jock River drainage network, while tying into existing roads adjacent to the site. The proposed grading plan can be seen in ***Figure 7***.

The following additional grading criteria and guidelines will be applied to detailed design, per ***City of Ottawa Guidelines***:

- Driveway slopes will have a maximum slope of 6%;

- Grading in grassed/landscaped areas to range from 2% to 3:1, with terracing required for slopes larger than 7%;
- Swales are to be 0.15 m deep with 3:1 side slopes unless otherwise indicated on the drawings; and,
- Perforated pipe will be required for drainage swales if they are less than 1.5% in slope.

The geotechnical analysis of the site, published under separate cover in support of the development applications, provides additional information about the suitability of the site for the proposed services and grading scheme. Grade raise restriction of 1.8m in roadways and 1.6m within residential lots have been identified. At the time of detailed design, detailed review and signoff by a licensed Geotechnical Engineer will be required.

### 5.8.1 Sump Pumps

Due to the grade raise restrictions and the proposed storm and sanitary drainage constraints, the road centerline elevations and depth sewers do not allow for standard basements with gravity foundation drainage connections to the storm sewer system. As such, sump pumps are proposed to be installed for all units within residential blocks and lots.

A memo has been prepared by Golder to confirm the suitability of implementing sump pumps for the proposed development.

## 5.9 Infiltration

The following Low Impact Development techniques should be considered for implementation, where possible, as part of detailed design:

- Rear-yard swales should be designed with minimum grades where possible, to promote infiltration;
- Rear-yard catchbasin leads should be perforated (except for the last segment connecting to the storm sewer within the right-of-way), to promote infiltration; and,
- Where eavestroughs are provided on residential units, they are to be directed to landscaped surfaces, to promote infiltration.

Furthermore, the following techniques can be examined as part of detailed landscaping design of the park block:

- Amended topsoil (minimum 300 mm thick) can be considered for use; and,
- Micro-grading can be considered to promote infiltration.

## 5.10 Stormwater Servicing Conclusions

The stormwater runoff is designed to be captured by an internal gravity sewer system that is to convey flows to an OGS unit for quality control treatment prior to release to the Fraser-Clarke Watercourse. An Enhanced Level of Protection will be provided for stormwater runoff from the subject property before being discharged to the Jock River. Quantity control is not required for the Jock River. Notwithstanding, some quantity control by means of erosion storage will be included.

A detailed Hydraulic Grade Line (HGL) modelling analysis will be completed for the proposed system at the detailed design level.

# 6.0 UTILITIES

Utility services extending to the site may require connections to multiple existing infrastructure points: consultation with Enbridge gas, Hydro Ottawa, Rogers, and Bell is required as part of the development process to confirm the servicing plan for the subject lands.

## 7.0 EROSION AND SEDIMENT CONTROL

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

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

The following specific 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 leaving the site and entering existing watercourses, and clean and maintain throughout construction.
- Install catchbasin inserts during construction to protect from silt entering the storm sewer system.
- Install mud mat in order to prevent mud tracking onto adjacent roads.
- No refueling or cleaning of equipment near existing watercourses.
- No material stockpiles within 30 m of existing watercourses, unless otherwise permitted by RVCA and City of Ottawa.
- Provide sediment traps and basins during dewatering.
- Plan construction at proper time to avoid flooding.
- The Contractor will, at every rainfall, complete inspections and guarantee proper performance.
- Erosion and sediment control will remain in place until the working areas have been stabilized and re-vegetated.

## 8.0 CONCLUSION AND RECOMMENDATIONS

This Functional Servicing Study provides details for the planned on-site municipal services for Phase 1 and demonstrates that adequate municipal infrastructure capacity is expected to be available for the planned development of the subject property.

- Phase 1 water servicing is proposed to be connected to the City’s Zone 3SW watermain network to the north, and it is anticipated that this feed will satisfy the City’s objective minimum pressure of 40 psi during peak hour demand and achieve a typical planning level fire flow value of 10,000 L/min or greater. At the time of detailed design, detailed hydraulic modelling will be undertaken to verify that the proposed on-site and off-site watermains are in conformance with applicable guidelines;

- Sanitary service is to be provided to the subject property via the adjacent existing South Nepean Collector (SNC) trunk sanitary sewer. There is sufficient residual capacity in the SNC for the Phase 1 flows, external future residential, commercial and community park flows;

- Stormwater service is to be provided by capturing stormwater runoff by an internal gravity sewer system that will convey flows to an OGS unit for quality control treatment. An Enhanced Level of Protection will be provided for stormwater runoff from Phase 1 before being discharged to the Jock River via the Fraser-Clarke Watercourse. Quantity control is not required for the Jock River. Notwithstanding, some quantity control by means of erosion storage will be included;

- A portion of the subject property is currently within the Jock River regulatory flood plain and permits will be required from the RVCA prior to work commencing within this area;

- A detailed Hydraulic Grade Line (HGL) modelling analysis will be completed for the proposed system at the detailed design level;

- Sump pumps are proposed to be installed for all units within residential blocks and lots;

- Low Impact development techniques will be reviewed and implemented, where feasible, to promote infiltration of stormwater;

- Erosion and sediment control measures will be implemented and maintained throughout construction. The Jock River and the Fraser-Clarke Watercourse will be protected from any negative impacts from construction;

- The proposed servicing and grading plans are expected to meet all City, RVCA, and MOECC requirements as set out in background studies and current standards;
- Prior to detailed design of the infrastructure presented in this report, this FSR will require approval under the Planning Act as supporting information for the Plan of Subdivision application. Project-specific approvals are also expected to be required for the infrastructure presented in this report from the City of Ottawa, Ministry of Environment and Climate Change, and Rideau Valley Conservation Authority, among other agencies.

Prepared by,
**David Schaeffer Engineering Ltd.**

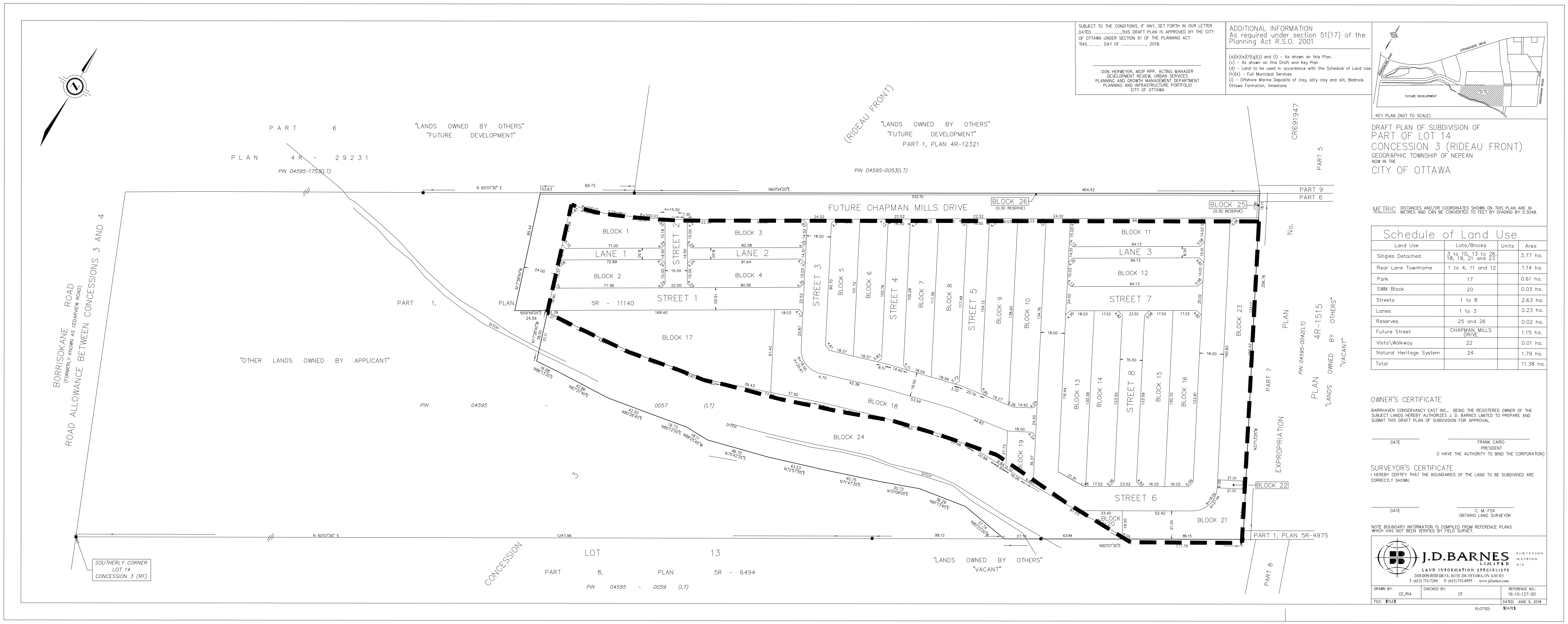

Per: Kevin L. Murphy, P.Eng.

**David Schaeffer Engineering Ltd.**

Per: Matt Wingate, P.Eng.


2018-07-18_Ph1_FSR_klm_3rd_Submission.doc

# APPENDIX A




| Schedule of Land Use | | | |
|---|---|---|---|
| Land Use | Lots/Blocks | Units | Area |
| Singles Detached | 3 to 10, 13 to 26, 18, 19, 21 and 23 | | 3.77 ha. |
| Rear Lane Townhome | 1 to 4, 11 and 12 | | 1.14 ha. |
| Park | 17 | | 0.61 ha. |
| SWM Block | 20 | | 0.03 ha. |
| Streets | 1 to 8 | | 2.63 ha. |
| Lanes | 1 to 3 | | 0.23 ha. |
| Reserves | 25 and 26 | | 0.02 ha. |
| Future Street | CHAPMAN MILLS DRIVE | | 1.15 ha. |
| Vista\Walkway | 22 | | 0.01 ha. |
| Natural Heritage System | 24 | | 1.79 ha. |
| Total | | | 11.38 ha. |

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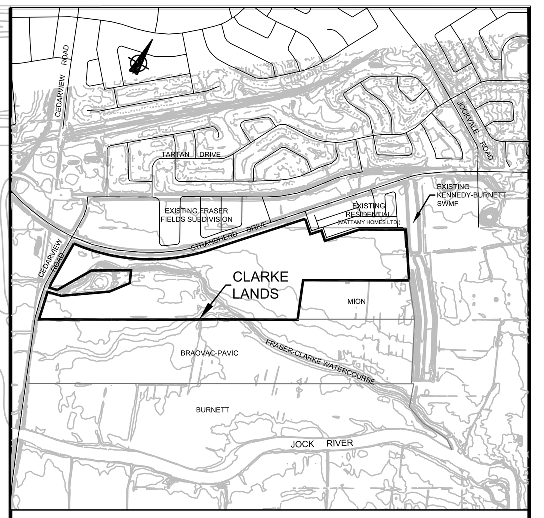
# BARRHAVEN CONSERVANCY PHASE 1
# SUBDIVISION PLAN
# CITY OF OTTAWA

| | |
|---|---|
| PROJECT No.: | 16-891 |
| SCALE: | 1:3000 |
| DATE: | JULY 2018 |
| FIGURE: | 2 |

# APPENDIX B


KEY PLAN (N.T.S)

LEGEND:

CONCEPTUAL STORM SEWER
CONCEPTUAL SANITARY SEWER
CONCEPTUAL WATERMAIN

| No. | ISSUE / REVISION | DD/MM/YY |
|---|---|---|
| 1 | ISSUED FOR SERVICING BRIEF | 28/03/16 |



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

SCALE: 1:1500

CLIENT:
MINTO COMMUNITIES INC.
200-180 KENT STREET
OTTAWA, ON
K1P 0B6

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

CONSULTANT:

PROJECT NORTH

PROFESSIONAL STAMP

PROJECT:
MINTO COMMUNITIES INC.
CLARKE LANDS

4005 STRANDHERD DRIVE

DRAWING:
CONCEPTUAL SITE SERVICING

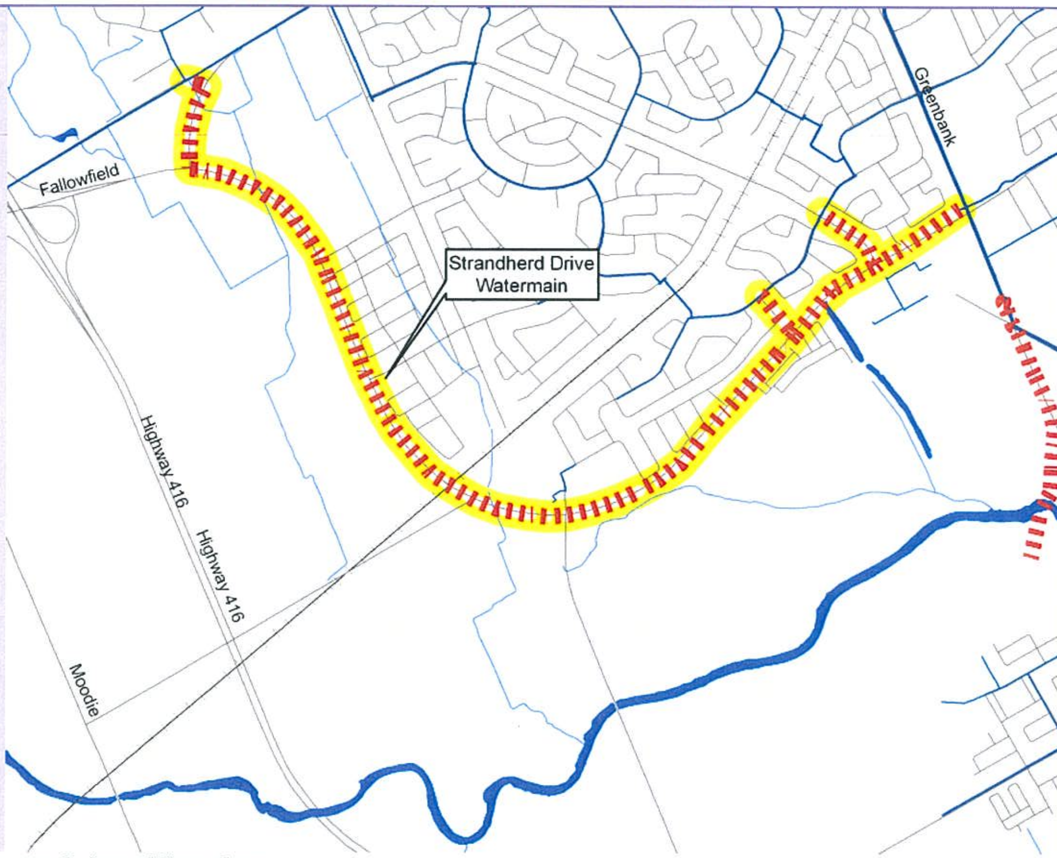
DESIGN: HM
DRAWN: TB
CHECKED: LD
JLR #: 24051

DRAWING #: CS1

PLOT DATE: March 29, 2016 10:45:05 AM

File Location: P:\24000\24051 LD Minto Clarke\24051 C CONCEPTUAL CS1.dwg

# Strandherd Drive Watermain




**Scope and Justification**

Construct 406 mm watermain along Fallowfield/Strandherd from Fallowfield/O'Keefe to Greenbank, including various connections to existing distribution system. This project is needed to support growth in the Barrhaven area north of the Jock River.

**Timing**

2013 – 2018: Construct feedermain

**Action Item Funding**

Construction Cost Estimate = $4.2M
Capital Cost Estimate = $6.6M (90% Development Charges, 10% Rate)
**including construction cost, engineering, city internal costs and contingency allowance.*

**EA Requirements and Consultation**

This is a Schedule 'A' project – No consultation required prior to implementation.

**Follow Up Actions**

Coordinate project with development, and South Nepean Collector Sewer where appropriate. Finalize alignment as part of detailed planning and design process.

# APPENDIX C

NOVATECH

Engineers, Planners & Landscape Architects

**Engineering**

- Land / Site Development
- Municipal Infrastructure
- Environmental / Water Resources
- Traffic/ Transportation
- Structural
- Recreational

**Planning**

- Land/Site Development
- Planning Application Management
- Municipal Planning Documents & Studies
- Expert Witness (OMB)
- Wireless Industry

**Landscape Architecture**

- Urban Design & Streetscapes
- Recreation & Parks Planning
- Environmental Restoration
- Sustainable Design

32 Years

# South Nepean Collector: Phase 2

## Hydraulics Review / Assessment

## Technical Memorandum

Prepared for the City of Ottawa

Engineering excellence. Planning precision. Inspired landscapes.

Engineers, Planners & Landscape Architects

# MEMORANDUM

**DATE:** AUGUST 20, 2015

**TO:** JONATHAN KNOYLE – CITY OF OTTAWA

**FROM:** CONRAD STANG / MIKE PETEPIECE – NOVATECH

**RE:** SOUTH NEPEAN COLLECTOR PHASE 2: HYDRAULICS REVIEW / ASSESSMENT

**CC:** EDSON DONNELLY – NOVATECH

## 1.0 PURPOSE

This memorandum provides an update to the sanitary design flows for Phase 2 of the South Nepean Collector, as previously documented in the *South Nepean Collector (SNC) – Functional Design Report and Update* (Dillon, 2012).

Sanitary design flows have been estimated for both current-day operational flows and future development peak design flows, based on the latest available planning information for the vacant lands within the SNC sewershed.

## 2.0 BACKGROUND

In January 1998, the Master Servicing Study for the South Nepean Urban Area provided a conceptual plan for water, wastewater and stormwater infrastructure. The preferred alternative for wastewater servicing was an east/west trunk sewer alignment that was to be completed in several phases. The proposed sanitary trunk sewer was initially called the Jock River Collector, but was renamed the South Nepean Collector during the original functional design study completed in 2003.

Phase 1 of the South Nepean Collector was completed in 2005 and currently terminates at a 2400mm maintenance hole located east of Longfields Drive, north of Bren-Maur Road. Phase 2 will extend the trunk sewer to Strandherd Drive at the intersection of the proposed transitway along the proposed extension to Chapman Mills Drive. Phase 3 will extend the trunk sewer along Strandherd Drive to the intersection of Maravista Drive.

## 3.0 REVIEW OF FUNCTIONAL DESIGN REPORT HYDRAULIC ASSESSMENT

### 3.1 Design Parameters

The sanitary design flow were calculated using the parameters from the City of Ottawa Sewer Design Guidelines (October 2012), and are summarized in **Table 1** and **Table 2**. The design parameters are consistent with those used in the Dillon (2012) report.



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**Table 1: Peak Design Flow Parameters**

| Land Use | Average Daily Flow | Peaking Factor | Peak Extraneous Flows |
|---|---|---|---|
| Residential | 350 L/cap/day | Harmon Equation, K=1 (2.0 min – 4.0 max) | 0.28 L/s/ha |
| Commercial | 50,000 L/ha/day | 1.5 | |
| Institutional | 50,000 L/ha/day | 1.5 | |
| Other* | 0 L/ha/day | N/A | |

**Open Space, Arterial ROW, SWM Blocks, etc. with no sanitary flow contribution (extraneous flow only)*

**Table 2: Operational Design Flow Parameters**

| Land Use | Average Daily Flow | Peaking Factor | Peak Extraneous Flows |
|---|---|---|---|
| Residential | 300 L/cap/day | Harmon Equation, K=0.6 (1.2 min – 2.4 max) | Dry weather<br>0.05-0.08 L/s/ha<br>Wet Weather<br>0.15 - 0.20 L/s/ha (typical events)<br>0.28 L/s/ha (large/annual events)<br>0.30 - 0.50 L/s/ha (extreme events) |
| Commercial | 17,000 L/ha/day | 1.0 (non-coincident peak) | |
| Institutional | 10,000 L/ha/day | 1.0 (non-coincident peak) | |

**There are no industrial areas identified within the tributary area.*

Harmon Equation $= 1 + \frac{14}{4+\left(\frac{P}{1000}\right)^{\frac{1}{2}}} \times K$

Where:

P = Population

K = Correction Factor:

- Peak Flow = 1
- Operational = between 0.4 to 0.6 (0.6 used)

### 3.2 Land Use Designations & Population Estimates

The 2012 Functional Design Report (Dillon) used information from the Vacant Urban Residential Lands (VURL) database, provided by the City of Ottawa, with guidance on unit counts and population densities provided by a Technical Advisory Committee (TAC) and information from developers and existing construction projects.

For the updated analysis, population densities and unit counts for future residential development are based on the current concept plans for these areas, and are presented in **Table 3**.



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**Table 3: Residential Land Use Population Densities**

| Residential Land Use | Units per ha | Persons per Unit | Persons per ha |
|---|---|---|---|
| Low Density (singles and semis) | 26 – 28 (28 used) | 2.7 – 3.4 (3.4 used) | 95.2 |
| Medium Density (row/townhouse) | 50 – 60 (60 used) | 2.7 | 162.0 |
| High Density (apartments) | 60 – 75 (75 used) | 1.8 | 135.0 |

The land use designations shown in **Table 4** have been applied for the areas within Phases 2 and 3 of the SNC (Node 70 to 130). The sewershed areas and land use designations were delineated using aerial photos (existing development) and conceptual site plans (future development).

**Table 4: Land Use Designations**

| Land Use Designation | |
|---|---|
| **Secondary Plan** | **SNC Design** |
| Residential | Residential (Low / Medium / High Density) |
| Institutional / Office | Institutional |
| Commercial | Commercial |
| Recreational | |
| Business Park | |
| Prestige Business Park | |
| Park/Open Space Area | Other* |
| Ex. Snow Disposal Facility (future commercial) | |
| Stormwater Management Facility | |
| Conservation Lands | |
| Arterial Right-of-Ways | |

** No sanitary flow contribution - extraneous flows (inflow/infiltration) only.*

### 3.3 Sanitary Flow Allocations & Drainage Area Plans

The updated sanitary flow allocations for Phases 2 and 3 of the SNC are provided in **Table 5**. The corresponding sanitary drainage area plan is provided as **Figure 1**.

The updated Sanitary Drainage Area Plan (Novatech, 2015) includes two areas not included in the Dillon (2012) analysis:

1) The area adjacent to the west side of the existing Kennedy-Burnett Stormwater Management Facility (SWMF) north of the Fraser-Clarke Drain. This area is proposed to be developed with low density residential units unless there is a need to expand the existing Kennedy-Burnett SWMF within these lands.

2) The golf driving range at the current end of Jockvale Road (south) and area adjacent the golf driving range which are proposed to be developed into medium and high residential units, respectively.



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A comparison of the overall residential population estimate and sewershed area for Phases 2 and 3 of the SNC is provided in **Table 6**. For reference, the flow allocations, design sheets, and sanitary drainage area plan from Dillon (2012) are attached.

**Table 6: Comparison of Population Estimates and Areas**

| Existing / Future | Estimated Population / Area | Dillion (2012) | Novatech (2015) |
|---|---|---|---|
| Existing | Estimated Population | 3,069 persons | 6,944 persons |
| | Gross Residential Area | 125.7 ha | 60.09 ha |
| | Gross Commercial / Institutional Area | 62.4 ha | 64.37 ha |
| | *Total Sewershed Area* | 188.1 ha (1) | 124.5 ha |
| Future (full service) | Estimated Population | 27,137 persons | 27,312 persons |
| | Gross Residential Area | 229.4 ha | 248.48 ha |
| | Gross Commercial / Institutional Area | 225.3 ha | 228.82 ha |
| | *Total Sewershed Area* | 454.7 ha | 477.3 ha |

*(1) The Dillon (2012) report included the snow disposal facility (10C = 16.56 ha), area currently serviced by the Jockvale pumping station (11B = 33.77), and the existing golf driving range (8B = 5.86 ha) as part of the existing SNC sewershed. The Novatech (2015) analysis does not consider these areas to be part of the existing sewershed.*

*Snow Disposal Facility*

In both the Dillon (2012) and Novatech (2015) analysis, it is assumed that the snow dump facility at the Stranderd Drive and McKenna Casey Drive will ultimately be re-zoned for commercial development.

## 4.0 SANITARY DESIGN FLOWS

The sanitary sewer design sheets from the Dillon (2012) analysis and Novatech (2015) analysis are attached to this technical memorandum. The estimated sanitary design flows from Phases 2 and 3 of the SNC (entering Node 70) are as follows:

*Present-Day Operational Design Flows (Theoretical)*

- Dillon (2012) = 56.0 L/s
- Novatech (2015) = 72.5 L/s

*Future Peak Design Flows*

- Dillon (2012) = 603.9 L/s
- Novatech (2015) = 634.2 L/s

An increase in the serviced area, in addition to changes to the proposed land use and population densities in the sewershed, results in a higher design flow. The updated functional design flows presented in this memorandum are slightly higher than those presented in the Dillon (2012) report. However, they do not exceed the available capacity of the existing downstream sewer (Phase 1).

The outlet for Phase 2 of the SNC is the existing 1050mm outlet pipe at the 2400mm maintenance hole (Node 70) located east of Longfields Drive, north of Bren-Maur Road. Given a minimum design slope of 0.10%, this sanitary trunk sewer would have a full flow capacity of 900.5 L/s.



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Based on the attached sanitary sewer design for Phases 1, 2 and 3 (Dillion, 2003), the estimated total peak flow from Phases 2 and 3 is 631.4 L/s. Therefore, based on the updated future peak design flow being 634.2 L/s (Novatech, 2015), the 1050mm sanitary sewer would be at 70% capacity.

**ATTACHMENTS:**

- Figure 1: Sanitary Drainage Areas and Land Use – Novatech (2015)
- Sanitary Sewer Design Sheets (Updated) - Novatech (2015)

*Excerpts from Dillion (2012)*

- Figure 1: Existing Sanitary Network and Collection Areas – Dillion (2012)
- Table 5.1: Allocation of Commercial / Institutional and Residential Demands to SNC by Collection Area – Dillion (2012)
- Sanitary Sewer Design Sheets – Dillon (2012)
- Sanitary Sewer Design Sheets – Dillion (2003)



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**Table 5: Updated Allocation of Commercial, Institutional and Residential Demands to Phases 2 & 3 (Nodes 70 – 130) of the SNC by Collection Area (Novatech, 2015)**

| Collection Area | Upstream Node | Existing / Proposed Development | Existing / Proposed Land Use | Area (ha) | Estimated Number of Residential Units | Population Density (persons / ha) | Comment | Reference |
|---|---|---|---|---|---|---|---|---|
| A1 | 130 | Proposed | Commercial | 12.80 | - | - | O'Keefe Court – Conceptual site plan shows proposed commercial. | Conceptual Plans for O'Keefe Court |
| A2-A | 130 | Proposed | Commercial | 85.18 | - | - | CitiGate – Analysis uses same approach as the design for CitiGate. | Detailed Servicing and SWM Report (Phase 1) (Novatech, 2014) |
| A2-B | 130 | Proposed | Commercial | 32.46 | - | - | | |
| A2-C | 120 | Proposed | Commercial (ex. Snow dump) | 15.25 | - | - | Existing snow dump facility assumed to be future commercial. | Functional Design Report and Update – SNC Phase 2 and 3 (Dillon, 2012) |
| A3-A | 130 | Proposed | Low Density Residential | 16.48 | 461 | 95.2 | Havencrest – Existing single family units. | Havencrest Design Report (IBI, 2013) |
| A3-B | 130 | Existing | Institutional | 10.30 | - | - | Cedarview Middle School and Cedarview Alliance Church. | Aerial Photos / Site Visits |
| A3-C | 130 | Existing | Medium Density Residential | 5.19 | 311 | 162 | Existing townhouse units. | |
| A3-D | 130 | Existing | Commercial | 0.58 | - | - | Existing commercial buildings. | |
| A3-E | 130 | Existing | Low Density Residential | 35.68 | 999 | 95.2 | Existing single family units. | |
| A3-F | 130 | Existing | Medium Density Residential | 8.26 | 496 | 162.0 | Existing townhouse units. | |
| A3-G | 130 | Existing | Institutional | 0.90 | - | - | Ottawa Torah Centre Chibad. | |
| A3-H | 120 | Existing | Low Density Residential | 6.09 | 171 | 95.2 | Existing single family units. | |
| A4 | 130 | Existing | Low Density Residential | 34.44 | 964 | 95.2 | Existing single family units currently serviced by Jockvale pump station; to be redirected to SNC. | Functional Design Report and Update – SNC Phase 2 and 3 (Dillon, 2012); based on 2011 Census. |
| A5 | 110 | Proposed | Commercial | 17.72 | - | - | Proposed commercial south of McKenna Casey Drive. | Site Visits |
| A6-A | 100 | Proposed | Institutional | 20.70 | - | - | Proposed school site on Minto property. | Conceptual Plan for Lands Adjacent the Kennedy-Burnett SWMF provided by Minto (2015) |
| A6-B | 90 | Existing | Medium Density Residential | 4.87 | 292 | 162.0 | Existing townhouse units. | Aerial Photos / Site Visits |
| A6-C | 90 | Proposed | Low Density Residential | 10.11 | 283 | 95.2 | Proposed single family units on lands owned by Minto. | Conceptual Plans for Lands Adjacent the Kennedy-Burnett SWMF provided by land owners. |
| A6-D | 90 | Proposed | Low Density Residential | 5.59 | 157 | 95.2 | Proposed single family units on lands owned by Mion. | |
| A6-E | 90 | Proposed | Low Density Residential | 7.24 | 203 | 95.2 | Proposed single family units on lands owned by Pavic / Braovac. | |
| A7-A | 80 | Existing | Commercial | 13.62 | - | - | Existing large retail stores (commercial). | Aerial Photos |
| A7-B | 80 | Proposed | High Density Residential | 11.01 | 826 | 135.0 | Proposed high density units on lands owned by Richcraft / Trinity. | Conceptual Plans for Lands Adjacent the Kennedy-Burnett SWMF provided by land owners. |
| A7-C | 80 | Proposed | Medium Density Residential | 6.97 | 418 | 162.0 | Proposed Medium density units on lands owned by Mion. | |
| A7-D | 80 | Proposed | Medium Density Residential | 11.74 | 704 | 162.0 | Proposed Medium density units on lands owned by Caivan. | |
| A7-E1/E2 | 80 | Proposed | Medium Density Residential | 9.24 | 554 | 162.0 | Proposed Medium density units on lands owned by Claridge. | |
| A8-A | 80 | Existing | Commercial | 28.45 | - | - | Existing Barrhaven Market Place (commercial). | Aerial Photos / Site Visits |
| A8-B | 80 | Proposed | High Density Residential | 39.34 | 2951 | 135.0 | Future development similar to Ampersands development. | Site Visits |
| A8-C | 80 | Existing | Institutional | 10.52 | - | - | Existing St. Joseph High School. | Aerial Photos / Site Visits |
| A8-D | 80 | Proposed | Low Density Residential | 16.87 | 1012 | 162.0 | Proposed 600 low density residential units. | Functional Design Report and Update – SNC Phase 2 and 3 (Dillon, 2012) |



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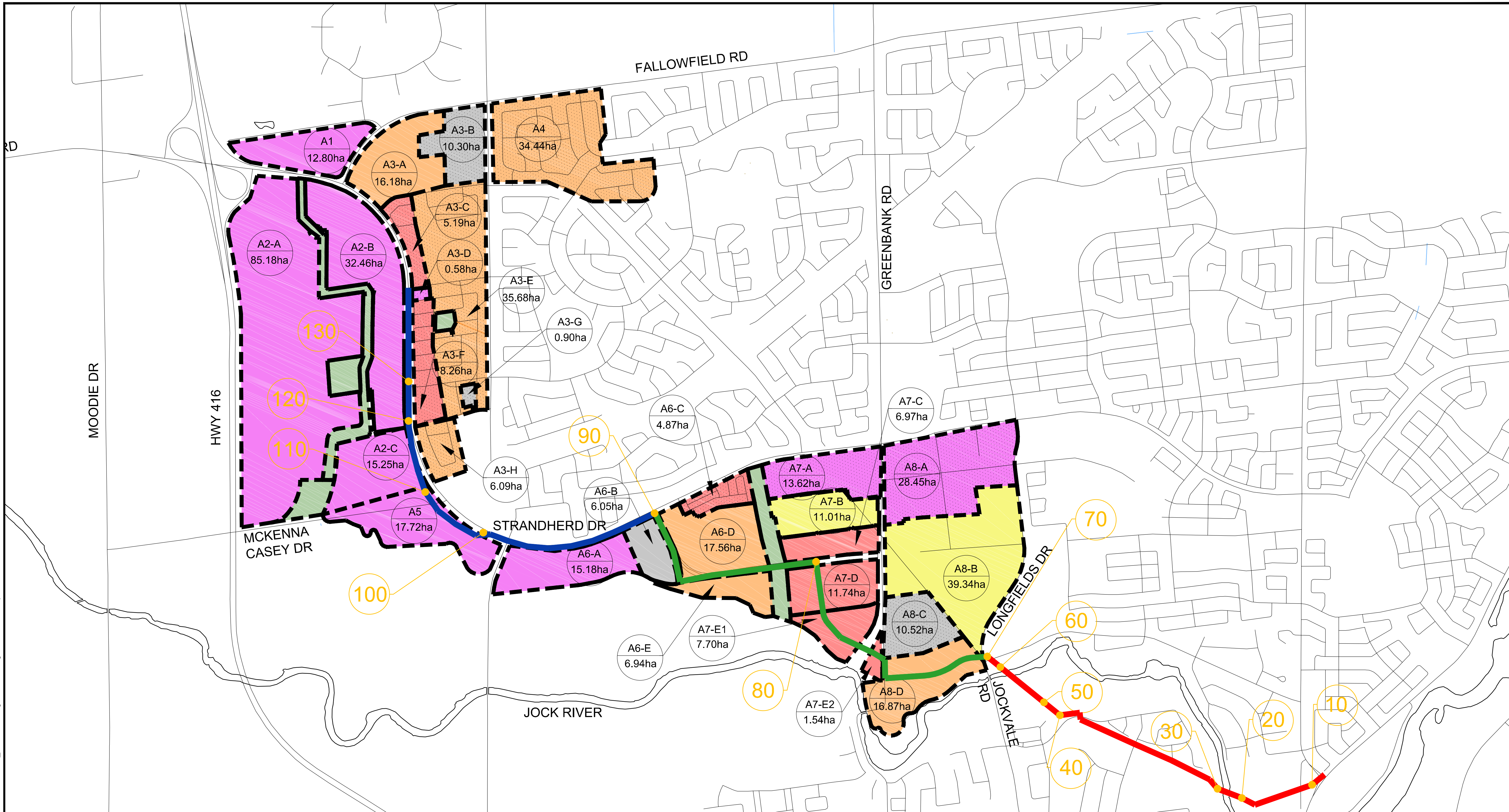


## LEGEND

- EXISTING / PROPOSED HIGH DENSITY RESIDENTIAL
- EXISTING / PROPOSED MEDIUM DENSITY RESIDENTIAL
- EXISTING / PROPOSED LOW DENSITY RESIDENTIAL
- EXISTING / PROPOSED COMMERCIAL
- EXISTING / PROPOSED INSTITUTIONAL
- OTHER LANDS (OPEN SPACE, PARKS, AND SWMFS)
- SOUTH NEPEAN COLLECTOR PHASE 1
- SOUTH NEPEAN COLLECTOR PHASE 2
- SOUTH NEPEAN COLLECTOR PHASE 3
- 80 SOUTH NEPEAN COLLECTOR NODE ID

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| Website | www.novatech-eng.com |

# SOUTH NEPEAN COLLECTOR SEWER

## SANITARY DRAINAGE AREAS AND LAND USE

| SCALE | | |
|---|---|---|
| 1:20 000 | | |
| DATE AUG 2015 | JOB 115075 | FIGURE FIG. 1 |

M:\2015\115075\CAD\Design\Figures\DSK\DSK08\DSK08_SANArea\DSK08_SANArea.dwg, DSK08, Aug 20, 2015 - 1:32pm, nsmit

SHT11X17.DWG - 279mmX432mm

PROJECT #: 115075
DESIGNED BY: CMS
CHECKED BY: MJP
DATE: August 20, 2015

# SANITARY SEWER DESIGN SHEET

## South Nepean Collector - Phase 2 & 3

*Theoretical Current Operational Peak Wastewater Flow*

NOVATECH
Engineers, Planners & Landscape Architects

| Location | | | Areas | | | | Population | | | | Individual Design Flows | | | Cumulative Design Flows | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Area I.D. | Existing Land Use | Upstream Node | Gross Commercial Area (ha) | Gross Institutional Area (ha) | Gross Residential Area (ha) | Total Gross Area (ha) | Residential Popultation Density (people / ha) | Individual Residential Population | Cumulative Residential Population | Residential Peaking Factor (Harmon Eqn[1]) | Commercial Peak Flow Rate[2] (17,000 L/ha/d) (L/s) | Institutional Peak Flow Rate[2] (10,000 L/ha/d) (L/s) | Infiltration / Inflow Rate (0.05 L/s/ha) (L/s) | Commercial (L/s) | Institutional (L/s) | Infiltration / Inflow (L/s) | Residential Peak Flow Rate (300 L/cap/d) (L/s) | Cumulative Peak Design Flow (L/s) |
| A1 | Open Space | 130 | | | | 0.00 | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| A2-A | Open Space | 130 | | | | 0.00 | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| A2-B | Open Space | 130 | | | | 0.00 | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| A3-A | Open Space | 130 | | | | 0.00 | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| A3-B | Institutional | 130 | | 10.30 | | 10.30 | | | | | 0.0 | 1.2 | 0.5 | 0.0 | 1.2 | 0.5 | 0.0 | 1.7 |
| A3-C | Medium Density Residential | 130 | | | 5.19 | 5.19 | 162.0 | 841 | 841 | 2.71 | 0.0 | 0.0 | 0.3 | 0.0 | 1.2 | 0.8 | 7.9 | 9.9 |
| A3-D | Commercial | 130 | 0.58 | | | 0.58 | | | 841 | 2.71 | 0.1 | 0.0 | 0.0 | 0.1 | 1.2 | 0.8 | 7.9 | 10.0 |
| A3-E | Low Density Residential | 130 | | | 35.68 | 35.68 | 95.2 | 3397 | 4238 | 2.39 | 0.0 | 0.0 | 1.8 | 0.1 | 1.2 | 2.6 | 35.1 | 39.0 |
| A3-F | Medium Density Residential | 130 | | | 8.26 | 8.26 | 162 | 1338 | 5576 | 2.32 | 0.0 | 0.0 | 0.4 | 0.1 | 1.2 | 3.0 | 44.9 | 49.2 |
| A3-G | Institutional | 130 | | 0.90 | | 0.90 | | | 5576 | 2.32 | 0.0 | 0.1 | 0.0 | 0.1 | 1.3 | 3.0 | 44.9 | 49.4 |
| A4 | Low Density Residential* | 130 | | | | 0.00 | | | 5576 | 2.32 | 0.0 | 0.0 | 0.0 | 0.1 | 1.3 | 3.0 | 44.9 | 49.4 |
| A2-C | Snow Dump Facility | 120 | | | | 0.00 | | | 5576 | 2.32 | 0.0 | 0.0 | 0.0 | 0.1 | 1.3 | 3.0 | 44.9 | 49.4 |
| A3-H | Low Density Residential | 120 | | | 6.09 | 6.09 | 95.2 | 580 | 6155 | 2.30 | 0.0 | 0.0 | 0.3 | 0.1 | 1.3 | 3.4 | 49.1 | 53.8 |
| A5 | Open Space | 110 | | | | 0.00 | | | 6155 | 2.30 | 0.0 | 0.0 | 0.0 | 0.1 | 1.3 | 3.4 | 49.1 | 53.8 |
| A6-A | Open Space | 100 | | | | 0.00 | | | 6155 | 2.30 | 0.0 | 0.0 | 0.0 | 0.1 | 1.3 | 3.4 | 49.1 | 53.8 |
| A6-B | Open Space | 100 | | | | 0.00 | | | 6155 | 2.30 | 0.0 | 0.0 | 0.0 | 0.1 | 1.3 | 3.4 | 49.1 | 53.8 |
| A6-C | Medium Density Residential | 90 | | | 4.87 | 4.87 | 162.0 | 789 | 6944 | 2.27 | 0.0 | 0.0 | 0.2 | 0.1 | 1.3 | 3.6 | 54.6 | 59.6 |
| A6-D | Open Space | 90 | | | | 0.00 | | | 6944 | 2.27 | 0.0 | 0.0 | 0.0 | 0.1 | 1.3 | 3.6 | 54.6 | 59.6 |
| A6-E | Open Space | 90 | | | | 0.00 | | | 6944 | 2.27 | 0.0 | 0.0 | 0.0 | 0.1 | 1.3 | 3.6 | 54.6 | 59.6 |
| A7-A | Commercial | 90 | 13.62 | | | 13.62 | | | 6944 | 2.27 | 2.7 | 0.0 | 0.7 | 2.8 | 1.3 | 4.3 | 54.6 | 63.0 |
| A7-B | Open Space | 90 | | | | 0.00 | | | 6944 | 2.27 | 0.0 | 0.0 | 0.0 | 2.8 | 1.3 | 4.3 | 54.6 | 63.0 |
| A7-C | Open Space | 90 | | | | 0.00 | | | 6944 | 2.27 | 0.0 | 0.0 | 0.0 | 2.8 | 1.3 | 4.3 | 54.6 | 63.0 |
| A7-D | Open Space | 90 | | | | 0.00 | | | 6944 | 2.27 | 0.0 | 0.0 | 0.0 | 2.8 | 1.3 | 4.3 | 54.6 | 63.0 |
| A7-E1/E2 | Open Space | 90 | | | | 0.00 | | | 6944 | 2.27 | 0.0 | 0.0 | 0.0 | 2.8 | 1.3 | 4.3 | 54.6 | 63.0 |
| A8-A | Commercial | 80 | 28.45 | | | 28.45 | | | 6944 | 2.27 | 5.6 | 0.0 | 1.4 | 8.4 | 1.3 | 5.7 | 54.6 | 70.0 |
| A8-B | Open Space | 80 | | | | 0.00 | | | 6944 | 2.27 | 0.0 | 0.0 | 0.0 | 8.4 | 1.3 | 5.7 | 54.6 | 70.0 |
| A8-C | Institutional | 80 | | 10.52 | | 10.52 | | | 6944 | 2.27 | 0.0 | 1.2 | 0.5 | 8.4 | 2.5 | 6.2 | 54.6 | 71.8 |
| A8-D | Open Space | 80 | | | | 0.00 | | | 6944 | 2.27 | 0.0 | 0.0 | 0.0 | 8.4 | 2.5 | 6.2 | 54.6 | 71.8 |
| ROW Along SNC Sewer Alignment | - | 80 | | | | 14.34 | | | 6944 | 2.27 | 0.0 | 0.0 | 0.7 | 8.4 | 2.5 | 6.9 | 54.6 | 72.5 |
| ***TOTAL*** | | ***80*** | ***42.65*** | ***21.72*** | ***60.09*** | ***138.80*** | ***-*** | ***6944*** | ***6944*** | ***2.27*** | ***8.4*** | ***2.5*** | ***6.9*** | ***8.4*** | ***2.5*** | ***6.9*** | ***54.6*** | ***72.5*** |

| Residential Land Use | Population Density (Units / ha) | Persons per Unit | Persons per ha |
|---|---|---|---|
| Low Density (singles and semis) | 26 – 28 (28 used) | 2.7 – 3.4 (3.4 used) | 95.2 |
| Medium Density (row/townhouse) | 50 – 60 (60 used) | 2.7 | 162.0 |
| High Density (apartments) | 60 – 75 (75 used) | 1.8 | 135.0 |

Notes:

1. Harmon Equation = 1 + [14 / (4+(P/1000)$^{1/2}$)] x K

Where: P = population; K = correction factor = 0.6

2. Instituional / Commercial Peaking Factor = 1.0

Reported Design Flows / Assumptions:

1. Area A4: Existing single family units currently serviced by Jockvale pump station; currently not directed to SNC

## SANITARY SEWER DESIGN SHEET

PROJECT #: 115075
DESIGNED BY: CMS
CHECKED BY: MJP
DATE: August 20, 2015

### South Nepean Collector - Phase 2 & 3

*Theoretical Future Full Service Peak Wastewater Flow*

NOVATECH
Engineers, Planners & Landscape Architects

| Location | | | Areas | | | | Population | | | | Individual Design Flows | | | Cumulative Design Flows | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Area I.D.** | **Existing / Proposed Land Use** | **Upstream Node** | **Gross Commercial Area (ha)** | **Gross Institutional Area (ha)** | **Gross Residential Area (ha)** | **Total Gross Area (ha)** | **Residential Popultation Density (people / ha)** | **Individual Residential Population** | **Cumulative Residential Population** | **Residential Peaking Factor (Harmon Eqn[1])** | **Commercial Peak Flow Rate[2] (50,000 L/ha/d) (L/s)** | **Institutional Peak Flow Rate[2] (50,000 L/ha/d) (L/s)** | **Infiltration / Inflow Rate (0.28 L/s/ha) (L/s)** | **Commercial (L/s)** | **Institutional (L/s)** | **Infiltration / Inflow (L/s)** | **Residential Peak Flow Rate (350 L/cap/d) (L/s)** | **Cumulative Peak Design Flow (L/s)** |
| A1 | Commercial | 130 | 12.80 | | | 12.80 | | | | | 11.1 | 0.0 | 3.6 | 11.1 | 0.0 | 3.6 | 0.0 | 14.7 |
| A2-A | Commercial | 130 | 85.18 | | | 85.18 | | | | | 73.9 | 0.0 | 23.9 | 85.1 | 0.0 | 27.4 | 0.0 | 112.5 |
| A2-B | Commercial | 130 | 32.46 | | | 32.46 | | | | | 28.2 | 0.0 | 9.1 | 113.2 | 0.0 | 36.5 | 0.0 | 149.8 |
| A3-A | Low Density Residential | 130 | | | 16.18 | 16.18 | 95.2 | 1540 | 1540 | 3.67 | 0.0 | 0.0 | 4.5 | 113.2 | 0.0 | 41.1 | 22.9 | 177.2 |
| A3-B | Institutional | 130 | | 10.30 | | 10.30 | | | 1540 | 3.67 | 0.0 | 8.9 | 2.9 | 113.2 | 8.9 | 43.9 | 22.9 | 189.0 |
| A3-C | Medium Density Residential | 130 | | | 5.19 | 5.19 | 162.0 | 841 | 2381 | 3.53 | 0.0 | 0.0 | 1.5 | 113.2 | 8.9 | 45.4 | 34.0 | 201.6 |
| A3-D | Commercial | 130 | 0.58 | | | 0.58 | | | 2381 | 3.53 | 0.5 | 0.0 | 0.2 | 113.7 | 8.9 | 45.6 | 34.0 | 202.2 |
| A3-E | Low Density Residential | 130 | | | 35.68 | 35.68 | 95.2 | 3397 | 5778 | 3.19 | 0.0 | 0.0 | 10.0 | 113.7 | 8.9 | 55.5 | 74.6 | 252.8 |
| A3-F | Medium Density Residential | 130 | | | 8.26 | 8.26 | 162 | 1338 | 7116 | 3.10 | 0.0 | 0.0 | 2.3 | 113.7 | 8.9 | 57.9 | 89.4 | 269.9 |
| A3-G | Institutional | 130 | | 0.90 | | 0.90 | | | 7116 | 3.10 | 0.0 | 0.8 | 0.3 | 113.7 | 9.7 | 58.1 | 89.4 | 270.9 |
| A4 | Low Density Residential | 130 | | | 34.44 | 34.44 | 95.2 | 3279 | 10395 | 2.94 | 0.0 | 0.0 | 9.6 | 113.7 | 9.7 | 67.8 | 123.7 | 314.9 |
| A2-C | Commercial (ex. snow dump) | 120 | 15.25 | | | 15.25 | | | 10395 | 2.94 | 13.2 | 0.0 | 4.3 | 127.0 | 9.7 | 72.0 | 123.7 | 332.4 |
| A3-H | Low Density Residential | 120 | | | 6.09 | 6.09 | 95.2 | 580 | 10974 | 2.91 | 0.0 | 0.0 | 1.7 | 127.0 | 9.7 | 73.7 | 129.6 | 340.0 |
| A5 | Commercial | 110 | 17.72 | | | 17.72 | | | 10974 | 2.91 | 15.4 | 0.0 | 5.0 | 142.4 | 9.7 | 78.7 | 129.6 | 360.3 |
| A6-A | Commercial | 100 | 15.18 | | | 15.18 | | | 10974 | 2.91 | 13.2 | 0.0 | 4.3 | 155.5 | 9.7 | 82.9 | 129.6 | 377.8 |
| A6-B | Institutional | 100 | | 6.05 | | 6.05 | | | 10974 | 2.91 | 0.0 | 5.3 | 1.7 | 155.5 | 15.0 | 84.6 | 129.6 | 384.7 |
| A6-C | Medium Density Residential | 90 | | | 4.87 | 4.87 | 162.0 | 789 | 11763 | 2.88 | 0.0 | 0.0 | 1.4 | 155.5 | 15.0 | 86.0 | 137.4 | 393.9 |
| A6-D | Low Density Residential | 90 | | | 17.56 | 17.56 | 95.2 | 1672 | 13435 | 2.83 | 0.0 | 0.0 | 4.9 | 155.5 | 15.0 | 90.9 | 153.8 | 415.2 |
| A6-E | Low Density Residential | 90 | | | 6.94 | 6.94 | 95.2 | 661 | 14096 | 2.81 | 0.0 | 0.0 | 1.9 | 155.5 | 15.0 | 92.9 | 160.2 | 423.6 |
| A7-A | Commercial | 90 | 13.62 | | | 13.62 | | | 14096 | 2.81 | 11.8 | 0.0 | 3.8 | 167.4 | 15.0 | 96.7 | 160.2 | 439.2 |
| A7-B | High Density Residential | 90 | | | 11.01 | 11.01 | 135.0 | 1486 | 15582 | 2.76 | 0.0 | 0.0 | 3.1 | 167.4 | 15.0 | 99.8 | 174.3 | 456.4 |
| A7-C | Medium Density Residential | 90 | | | 6.97 | 6.97 | 162.0 | 1129 | 16711 | 2.73 | 0.0 | 0.0 | 2.0 | 167.4 | 15.0 | 101.7 | 184.9 | 468.9 |
| A7-D | Medium Density Residential | 90 | | | 11.74 | 11.74 | 162.0 | 1902 | 18613 | 2.68 | 0.0 | 0.0 | 3.3 | 167.4 | 15.0 | 105.0 | 202.4 | 489.7 |
| A7-E1/E2 | Medium Density Residential | 90 | | | 9.24 | 9.24 | 162.0 | 1497 | 20110 | 2.65 | 0.0 | 0.0 | 2.6 | 167.4 | 15.0 | 107.6 | 215.9 | 505.8 |
| A8-A | Commercial | 80 | 28.45 | | | 28.45 | | | 20110 | 2.65 | 24.7 | 0.0 | 8.0 | 192.0 | 15.0 | 115.5 | 215.9 | 538.5 |
| A8-B | High Density Residential | 80 | | | 39.34 | 39.34 | 135.0 | 5311 | 25421 | 2.55 | 0.0 | 0.0 | 11.0 | 192.0 | 15.0 | 126.6 | 262.4 | 596.0 |
| A8-C | Institutional | 80 | | 10.52 | | 10.52 | | | 25421 | 2.55 | 0.0 | 9.1 | 2.9 | 192.0 | 24.1 | 129.5 | 262.4 | 608.1 |
| A8-D | Low Density Residential | 80 | | | 16.87 | 16.87 | 120.9 | 2040 | 27461 | 2.52 | 0.0 | 0.0 | 4.7 | 192.0 | 24.1 | 134.2 | 279.8 | 630.2 |
| ROW Along SNC Sewer Alignment | - | 80 | | | | 14.34 | | | 27461 | 2.52 | 0.0 | 0.0 | 4.0 | 192.0 | 24.1 | 138.2 | 279.8 | 634.2 |
| ***TOTAL*** | | ***80*** | ***221.24*** | ***27.77*** | ***230.38*** | ***493.73*** | ***-*** | ***27461*** | ***27461*** | ***2.52*** | ***192.0*** | ***24.1*** | ***134.2*** | ***192.0*** | ***24.1*** | ***138.2*** | ***279.8*** | ***634.2*** |

| Residential Land Use | Population Density (Units / ha) | Persons per Unit | Persons per ha |
|---|---|---|---|
| Low Density (singles and semis) | 26 – 28 (28 used) | 2.7 – 3.4 (3.4 used) | 95.2 |
| Medium Density (row/townhouse) | 50 – 60 (60 used) | 2.7 | 162.0 |
| High Density (apartments) | 60 – 75 (75 used) | 1.8 | 135.0 |

<u>Notes:</u>

1. Harmon Equation = $1 + [14 / (4+(P/1000)^{1/2})] \times K$

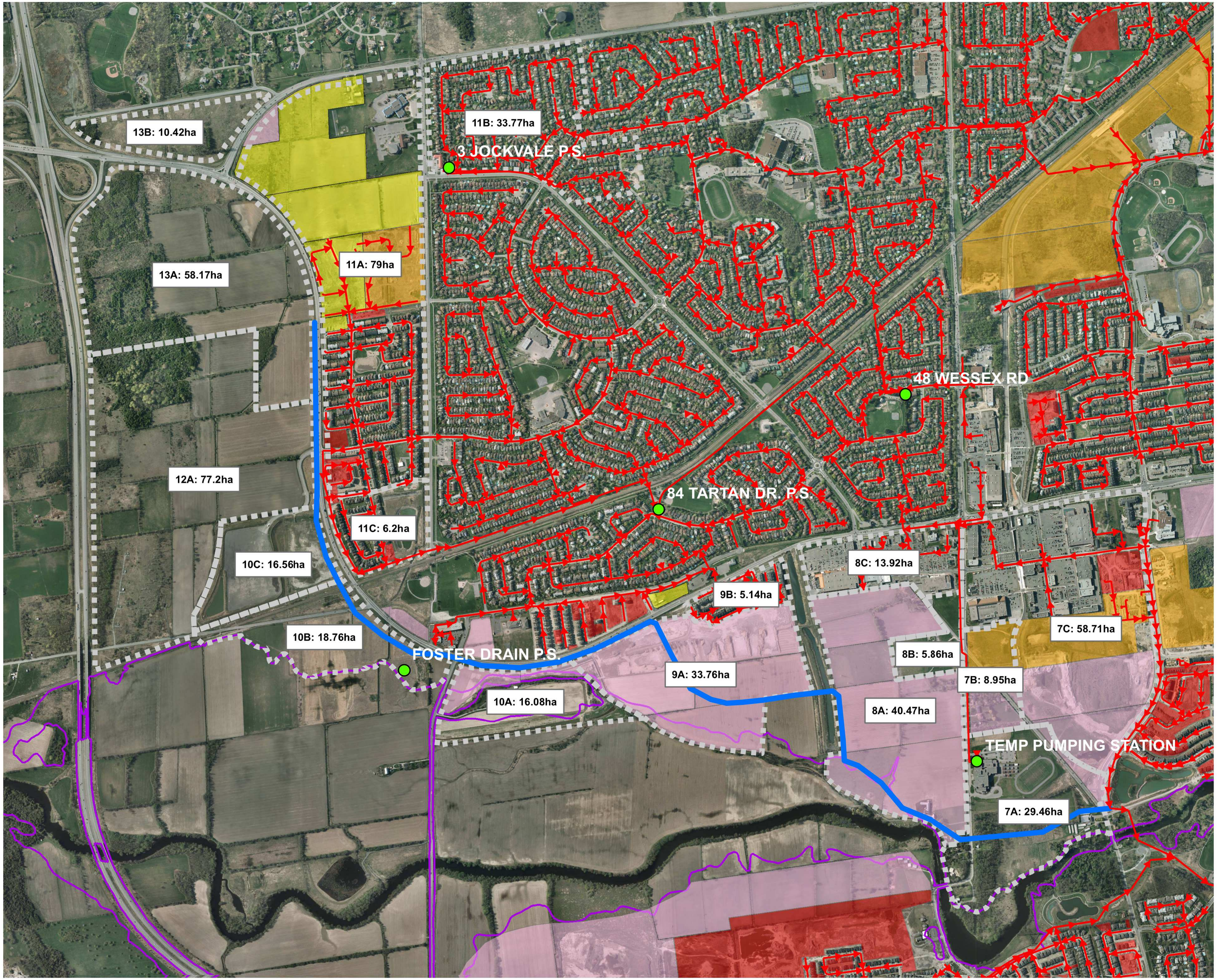
Where: P = population; K = correction factor = 1.0

2. Instituional / Commercial Peaking Factor = 1.5

<u>Reported Design Flows / Assumptions:</u>

1. Area A4: Existing single family units currently serviced by Jockvale pump station to be redirected to SNC

2. Area A8-D: proposed 600 medium density residential units




Ottawa

**City of Ottawa**
South Nepean Collector

**Figure 01**
Existing Sanitary Network and Collection Areas

Pump Station
Existing Sanitary Main (With Flow Direction)
Proposed Alignment for South Nepean Collector
Collection Area

**DEVELOPMENT STATUS**

Registered
Draft Approved
Pending
No Plan
Floodplain

NOT TO SCALE

MAP DRAWING INFORMATION:
DATA PROVIDED BY THE CITY OF OTTAWA

MAP CREATED BY: BC
MAP CHECKED BY: MBM
MAP PROJECTION: NO PROJECTION

FILE LOCATION: \\Dillon.ca\dillon_dfs\Ottawa\Ottawa CA\CAD\2011\115681\Design_GIS\MXD\Figure01c_ExistingSanitaryNetwork.mxd

DILLON CONSULTING

PROJECT: 11-5681
STATUS: FINAL
DATE: 18/07/12

**Table 5.1: Allocation of Commercial/Institutional and Residential Demands to SNC by Collection Area**

| Collection Area | Discharging Node | Estimated from GIS | | | City of Ottawa VURL Data | | | Other Space [1] (ha) | Population (PE) | Residential Density (PE/net ha) | Comments | Additional Source(s) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Gross Institutional/Commercial (ha) | Gross Residential (ha) | Gross Area (ha) | Net Residential (ha) | Units (#) | Unit Density (#/ha) | | | | | |
| 7A | 70 | 13.5 | 7.4 | 29.5 | 4.0 | 605 | 0.3 | 9.1 | 1637 | 4.25 | Flow calculations include St Joseph H.S. Pump Station firm capacity of 7.0 L/s Additional 600 units (TAC) | 3.4ppu (TAC) |
| 7B | | 0.0 | 9.24 | 9.24 | 6.23 | 1474 | 136.7 | 3.0 | 3321 | 638.8 | Population from split VURL allocated by area. VURL parcel id 323 - inconsistency between net and gross reported area. | 2.7ppu (TAC) |
| 8A | | 0.0 | 40.0 | 40.0 | 24.1 | 4462 | 185.1 | 15.9 | 12047.4 | 499.9 | | 2.7ppu (TAC) |
| 8B | | 5.9 | 0.0 | 5.9 | 0.0 | 0 | 0 | 0.0 | | | Future Commercial area | |
| 8C | | 13.9 | 0.0 | 13.9 | 0.0 | 0 | 0 | 0.0 | | | Commercial area includes Home Depot | |
| 9A | 80 | 0.0 | 33.8 | 33.8 | 18.6 | 635 | 34.1 | 15.2 | 2210 | 116.2 | | 3.4ppu (TAC) |
| 10A | 90 | 0.0 | 16.1 | 16.1 | 9.7 | 451 | 28.0 | 6.4 | 1533.4 | 158.0 | Assume net population = 60% gross. | 3.4ppu (TAC) |
| 10B | 100 | 18.8 | 0.0 | 35.3 | 0.0 | 0 | 0 | 16.5 | | | Allocated as potential future I/C use as directed by TAC | |
| 10C | 110 | 16.6 | 0.0 | 35.3 | 0.0 | 0 | 0 | 18.7 | | | Area includes current Municipal Snow Dump. Flow allowance is made for potential future I/C use | |
| 11C | | 0.0 | 6.2 | 6.2 | Note 2 | | | 2.5 | 306 | 82.7 | This area is south of '11 block' in the existing development | From IBI Apr 2010 Report Figure 1 |
| 11A | 120 | 12.5 | 66.5 | 79.0 | | | | 26.6 | 3923 | 98.3 | Institutional includes 4.38ha church site and 6.89 ha institution at northeast corner, as well and Claridge Commercial (0.56ha) and DCR/Phoenix Commercial (0.64ha) | From IBI Apr2010 Report Figure 1 |
| 11B | | 0.0 | 37.0 | 37.0 | | | | 14.8 | 1550 | 69.8 | Presently serviced by Jockvale pump station; to be redirected to SNC. | Estimated from 2011 Census Block data |
| 12A | | 77.2 | 0.0 | 77.2 | | | | 0.0 | | | Allow sanitary peak flow 79.0 L/s | Novatech, Employment Lands Report, Revised Jan 2012 |
| 13A | 130 | 58.5 | 0.0 | 58.5 | | | | 0.0 | | | Allow sanitary peak flow 62.8 L/s plus Collection Area 13B, total 82.2 L/s | |
| 13B | | 12.5 | 0.0 | 12.5 | | | | 0.0 | | | Allow sanitary peak flow 19.4 L/s; gravity discharge to Collection Area 13A | IBI/Novatech |

Notes:
1. Other space includes other residential space accounting for the difference between gross area (measured with GIS) and net area (provided in VURL data), such as sidewalks, roads, greenspace, etc.
2. Collection Area 11A and 11B population and land use as identified under Additional Source(s). Other space reported as 60% of gross residential area, consistent with VURL average.

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2012 Operational current day

# CITY OF OTTAWA
## SOUTH NEPEAN COLLECTOR SEWER
### SANITARY SEWER DESIGN SHEET - Operational Service (Average Flow Design Parameters)



| TRIBUTARY AREA | Design Factors | LOCATION FROM | LOCATION TO | AREA (ha) Gross ICI | Net ICI | Other ICI space (Green, Sidewalks, roads) | Gross RESIDENTIAL Area | Net Residential Area | Other Res (Green, Sidewalks, roads) | TOTAL AREA (Gross ICI plus Gross Residential) | INDIVIDUAL POP | DENSITY (po./ha.) | CUMULATIVE POP | AREA (ha.) | RESIDENTIAL PEAKING FACTOR | RESIDENT. FLOW (L/s) | COMMERCIAL & INSTITUTION PEAKING FACTOR | CUM. AREA | I.C.I. FLOW (l/s) | INFIL. INFLOW Q(p) (L/s) | PEAK DESIGN FLOW Q(d) (L/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13A | 1 | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | | 0 | 0.0 | 4.50 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 13B | 1 | | Node 130 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | | 0 | 0.0 | 4.50 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 12A | 1 | Node 130 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | | 0 | 0.0 | 4.50 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 11A | 1 | | | 12.5 | 9.4 | 3.1 | 66.5 | 8.0 | 58.5 | 79.0 | 1196 | 148.76 | 1196 | 79.0 | 3.75 | 15.57 | 1.00 | 12.50 | 2.00 | 3.95 | 21.52 |
| 11B | 1 | | Node 120 | 0.0 | 0.0 | 0.0 | 37.0 | 22.2 | 14.8 | 37.0 | 1550 | 69.82 | 2746 | 116.0 | 3.47 | 33.13 | 1.00 | 12.50 | 2.00 | 5.80 | 40.93 |
| 11C | 1 | Node 120 | | 0.0 | 0.0 | 0.0 | 6.2 | 3.7 | 2.5 | 6.2 | 306 | 82.26 | 3052 | 122.2 | 3.44 | 36.41 | 1.00 | 12.50 | 2.00 | 6.11 | 44.52 |
| 10C | 1 | | Node 110 | 16.6 | 12.5 | 4.2 | 0.0 | 0.0 | 0.0 | 16.6 | 0 | | 3052 | 138.8 | 3.44 | 36.41 | 1.00 | 29.10 | 4.66 | 6.94 | 48.01 |
| 10B | 1 | Node 110 | Node 100 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | | 3052 | 138.8 | 3.44 | 36.41 | 1.00 | 29.10 | 4.66 | 6.94 | 48.01 |
| 10A | 1 | Node 100 | Node 90 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | | 3052 | 138.8 | 3.44 | 36.41 | 1.00 | 29.10 | 4.66 | 6.94 | 48.01 |
| 9A | 1 | Node 90 | Node 80 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | | 3052 | 138.8 | 3.44 | 36.41 | 1.00 | 29.10 | 4.66 | 6.94 | 48.01 |
| 8A | 1 | Node 80 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | | 3052 | 138.8 | 3.44 | 36.41 | 1.00 | 29.10 | 4.66 | 6.94 | 48.01 |
| 8B | 1 | | | 5.9 | 4.4 | 1.5 | 0.0 | 0.0 | 0.0 | 5.9 | 0 | | 3052 | 144.7 | 3.44 | 36.41 | 1.00 | 35.00 | 5.60 | 7.24 | 49.25 |
| 8C | 1 | | | 13.9 | 10.4 | 3.5 | 0.0 | 0.0 | 0.0 | 13.9 | 0 | | 3052 | 158.6 | 3.44 | 36.41 | 1.00 | 48.90 | 7.82 | 7.93 | 52.17 |
| 7A | 1 | | | 13.5 | 10.1 | 3.4 | 16.0 | 1.4 | 14.6 | 29.5 | 17 | 12.14 | 3069 | 188.1 | 3.43 | 36.59 | 1.00 | 62.40 | 9.98 | 9.41 | 55.93 |
| 7B | 1 | | Node 70 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | | 3069 | 188.1 | 3.43 | 36.59 | 1.00 | 62.40 | 9.98 | 9.41 | 55.93 |
| | | | | | | | | | | 188.1 | | | | | | | | | | | |

| TRIBUTARY AREA | LENGTH (m) | GROUND ELEVATION (m) | DEPTH OF COVER (m) | PIPE SIZE (m) | INVERT 1 (m) | INVERT 2 (m) | PIPE TYPE | GRADE | CAPACITY (L/s) | Q(d)/Q(c) | VELOCITY at capacity (m/s) | OPERATIONAL DESIGN DEPTH (m) | VELOCITY (m/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13A | | | | | | | | | | | | | |
| 13B | | 95.14 | 5.43 | 0.750 | | 88.96 | | | | | | | |
| 12A | | | | | | | | | | | | | |
| 11A | | | | | | | | | | | | | |
| 11B | 531.89 | 93.60 | 4.42 | 0.750 | 88.96 | 88.43 | Conc. | 0.10% | 353.24 | 0.13 | 0.80 | 0.20 | 0.58 |
| 11C | | | | | | | | | | | | | |
| 10C | 497.82 | 93.44 | 4.76 | 0.750 | 88.43 | 87.93 | Conc. | 0.10% | 353.24 | 0.14 | 0.80 | 0.20 | 0.58 |
| 10B | 603.17 | 93.03 | 4.95 | 0.750 | 87.93 | 87.33 | Conc. | 0.10% | 353.24 | 0.14 | 0.80 | 0.20 | 0.58 |
| 10A | 430.49 | 93.75 | 6.03 | 0.825 | 87.33 | 86.90 | Conc. | 0.10% | 455.17 | 0.11 | 0.85 | 0.21 | 0.61 |
| 9A | 1268.65 | 92.37 | 5.84 | 0.900 | 86.90 | 85.63 | Conc. | 0.10% | 573.71 | 0.08 | 0.90 | 0.18 | 0.56 |
| 8A | | | | | | | | | | | | | |
| 8B | | | | | | | | | | | | | |
| 8C | | | | | | | | | | | | | |
| 7A | | | | | | | | | | | | | |
| 7B | 1448.98 | 91.24 | 6.01 | 1.050 | 85.63 | 84.18 | Conc. | 0.10% | 864.51 | 0.06 | 1.00 | 0.18 | 0.56 |

**DEFAULTS**

| | | |
|---|---|---|
| q=AVERAGE DAILY FLOW | 300 | L/CAP.D |
| I=UNIT OF PEAK EXTR.FLOW | 0.050 | L/Ha.s |
| Mannings 'n' | 0.013 | |
| q=AVERAGE COMMERCIAL AND INSTITUTIONAL | 0.16 | L/Ha.s |

| | |
|---|---|
| DESIGN | DJG |
| CHECKED | |
| TODAY: | 7/18/2012 |

DILLON CONSULTING

Project 11-5681

# CITY OF OTTAWA



## SOUTH NEPEAN COLLECTOR SEWER

## SANITARY SEWER DESIGN SHEET - Full Service (Peak Flow Design Parameters)



| TRIBUTARY AREA | Design Factors | LOCATION FROM | LOCATION TO | AREA (ha) Gross ICI | Net ICI | Other ICI space (Green, Sidewalks, roads) | Gross RESIDENTIAL Area | Net Residential Area | Other Res (Sidewalks, roads) | TOTAL AREA (Gross ICI plus Gross Residential) | INDIVIDUAL POP | DENSITY (pers/net ha.) | CUMULATIVE POP | Total I/C and Res AREA (ha.) | RESIDENTIAL PEAKING FACTOR | RESIDENT. FLOW (L/s) | COMMERCIAL & INSTITUTION PEAKING FACTOR | I/C CUM. AREA | I/C FLOW (l/s) | INFIL. INFLOW Q(p) (L/s) | PEAK DESIGN FLOW Q(d) (L/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13A | 1 | | | 58.5 | 43.9 | 14.6 | 0.0 | 0.0 | 0.0 | 58.5 | 0 | | 0 | 58.5 | 4.50 | 0.00 | 1.50 | 58.50 | 50.90 | 16.38 | 67.28 |
| 13B | 1 | | Node 130 | 12.5 | 9.4 | 3.1 | 0.0 | 0.0 | 0.0 | 12.5 | 0 | | 0 | 71.0 | 4.50 | 0.00 | 1.50 | 71.00 | 61.77 | 19.88 | 81.65 |
| 12A | 1 | Node 130 | | 77.2 | 57.9 | 19.3 | 0.0 | 0.0 | 0.0 | 77.2 | 0 | | 0 | 148.2 | 4.50 | 0.00 | 1.50 | 148.20 | 128.93 | 41.50 | 170.43 |
| 11A | 1 | | | 12.5 | 9.4 | 3.1 | 66.5 | 39.9 | 26.6 | 79.0 | 3923 | 98.32 | 3923 | 227.2 | 3.34 | 53.09 | 1.50 | 160.70 | 139.81 | 63.62 | 256.52 |
| 11B | 1 | | Node 120 | 0.0 | 0.0 | 0.0 | 37.0 | 22.2 | 14.8 | 37.0 | 1550 | 69.82 | 5473 | 264.2 | 3.21 | 71.13 | 1.50 | 160.70 | 139.81 | 73.98 | 284.92 |
| 11C | | Node 120 | | 0.0 | 0.0 | 0.0 | 6.2 | 3.7 | 2.5 | 6.2 | 306 | 82.26 | 5779 | 270.4 | 3.19 | 74.59 | 1.50 | 160.70 | 139.81 | 75.71 | 290.11 |
| 10C | 1 | | Node 110 | 16.6 | 12.5 | 4.2 | 0.0 | 0.0 | 0.0 | 16.6 | 0 | | 5779 | 287.0 | 3.19 | 74.59 | 1.50 | 177.30 | 154.25 | 80.36 | 309.20 |
| 10B | 1 | Node 110 | Node 100 | 18.8 | 14.1 | 4.7 | 0.0 | 0.0 | 0.0 | 18.8 | 0 | | 5779 | 305.8 | 3.19 | 74.59 | 1.50 | 196.10 | 170.61 | 85.62 | 330.82 |
| 10A | 1 | Node 100 | Node 90 | 0.0 | 0.0 | 0.0 | 16.1 | 9.7 | 6.4 | 16.1 | 1533 | 158.04 | 7312 | 321.9 | 3.09 | 91.48 | 1.50 | 196.10 | 170.61 | 90.13 | 352.22 |
| 9A | 1 | Node 90 | Node 80 | 0.0 | 0.0 | 0.0 | 33.8 | 18.6 | 15.2 | 33.8 | 2161 | 116.18 | 9473 | 355.7 | 2.98 | 114.28 | 1.50 | 196.10 | 170.61 | 99.60 | 384.48 |
| 8A | 1 | Node 80 | | 0.0 | 0.0 | 0.0 | 40.0 | 24.1 | 15.9 | 40.0 | 12047 | 499.88 | 21520 | 395.7 | 2.62 | 228.45 | 1.50 | 196.10 | 170.61 | 110.80 | 509.85 |
| 8B | 1 | | | 5.9 | 4.4 | 1.5 | 0.0 | 0.0 | 0.0 | 5.9 | 0 | | 21520 | 401.6 | 2.62 | 228.45 | 1.50 | 202.00 | 175.74 | 112.45 | 516.64 |
| 8C | 1 | | | 13.9 | 10.4 | 3.5 | 0.0 | 0.0 | 0.0 | 13.9 | 0 | | 21520 | 415.5 | 2.62 | 228.45 | 1.50 | 215.90 | 187.83 | 116.34 | 532.62 |
| 7A | 1 | | | 13.5 | 10.1 | 3.4 | 16.5 | 5.2 | 11.3 | 30.0 | 1637 | 314.81 | 23157 | 445.5 | 2.59 | 242.84 | 1.50 | 229.40 | 199.58 | 124.74 | 567.16 |
| 7B | 1 | | Node 70 | 0.0 | 0.0 | 0.0 | 9.2 | 6.2 | 3.0 | 9.2 | 3980 | 638.84 | 27137 | 454.7 | 2.52 | 277.05 | 1.50 | 229.40 | 199.58 | 127.32 | 603.94 |
| | | | | | | | 225.3 | 129.7 | | 454.7 | 27,137.0 | | | | | | | | | | |

| TRIBUTARY AREA | LENGTH (m) | GROUND ELEVATION (m) | DEPTH OF COVER (m) | PIPE SIZE (m) | INVERT 1 (m) | INVERT 2 (m) | PROPOSED SEWER PIPE TYPE | GRADE | CAPACITY (L/s) | Q(d)/Q(c) | VELOCITY at capacity (m/s) | PEAK DESIGN DEPTH (m) | VELOCITY (m/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13A | | | | | | | | | | | | | |
| 13B | | 95.14 | 5.43 | 0.750 | | 88.96 | | | | | | | |
| 12A | | | | | | | | | | | | | |
| 11A | | | | | | | | | | | | | |
| 11B | 531.89 | 93.60 | 4.42 | 0.750 | 88.96 | 88.43 | Conc. | 0.10% | 353.24 | 0.81 | 0.80 | 0.53 | 0.90 |
| 11C | | | | | | | | | | | | | |
| 10C | 497.82 | 93.44 | 4.76 | 0.750 | 88.43 | 87.93 | Conc. | 0.10% | 353.24 | 0.88 | 0.80 | 0.55 | 0.91 |
| 10B | 603.17 | 93.03 | 4.95 | 0.750 | 87.93 | 87.33 | Conc. | 0.10% | 353.24 | 0.94 | 0.80 | 0.58 | 0.92 |
| 10A | 430.49 | 93.75 | 6.03 | 0.825 | 87.33 | 86.90 | Conc. | 0.10% | 455.17 | 0.77 | 0.85 | 0.55 | 0.95 |
| 9A | 1268.65 | 92.37 | 5.84 | 0.900 | 86.90 | 85.63 | Conc. | 0.10% | 573.71 | 0.67 | 0.90 | 0.55 | 0.97 |
| 8A | | | | | | | | | | | | | |
| 8B | | | | | | | | | | | | | |
| 8C | | | | | | | | | | | | | |
| 7A | | | | | | | | | | | | | |
| 7B | 1448.98 | 91.24 | 6.01 | 1.050 | 85.63 | 84.18 | Conc. | 0.10% | 864.51 | 0.70 | 1.00 | 0.64 | 1.07 |
| | 4,781.0 | | | | | | | | | | | | |

**DEFAULTS**

| | | |
|---|---|---|
| q=AVERAGE DAILY FLOW | 350 | L/CAP.D |
| I=UNIT OF PEAK EXTR.FLOW | 0.280 | L/Ha.s |
| Mannings 'n' | 0.013 | |
| q=AVERAGE COMMERCIAL AND INSTITUTIONAL | 0.58 | L/Ha.s |

DILLON CONSULTING

Project 11-5681

| | |
|---|---|
| DESIGN | DJG |
| CHECKED | |
| TODAY: | 7/18/2012 |

# CITY OF OTTAWA
## JOCK RIVER COLLECTOR SEWER
### SANITARY SEWER DESIGN SHEET - Full Service (Including Manotick)



| DESCRIPTION | Design Factors | LOCATION FROM | TO | AREA (ha) COM & INSTITUTION | INDUSTRIAL | RESIDENTIAL | GREEN SPACE | TOTAL AREA | INDIVIDUAL POP | DENSITY (po./ha.) | CUMULATIVE RESIDENTIAL POP | AREA (ha.) | PEAKING FACTOR | RESIDENT. FLOW (L/s) | COMMERCIAL & INSTITUTION PEAKING FACTOR | CUM. AREA | I.C.I. FLOW (l/s) | INFIL. INFLOW Q(p) (L/s) | PEAK DESIGN FLOW Q(d) (L/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jockvale PS | 1 | PS | Node 130 | 0 | | 36.7 | | 36.7 | 1530 | 41.69 | 1,530.0 | 36.7 | 3.673 | 22.767 | 1.50 | 0.00 | 0 | 10.276 | 33.043 |
| Area 1 | 1 | Node 130 | Node 120 | 142.2 | | 65.57 | | 207.8 | 3430 | 52.31 | 4,960.0 | 244.5 | 3.248 | 65.265 | 1.50 | 142.20 | 123.714 | 68.452 | 257.431 |
| Area 2 | 1 | Node 120 | Node 110 | 25.4 | | 7.1 | | 32.5 | 380 | 53.52 | 5,340.0 | 277.0 | 3.218 | 69.620 | 1.50 | 167.60 | 145.812 | 77.552 | 292.984 |
| Area 3 | 1 | Node 110 | Node 100 | 13.7 | | 0 | 4.9 | 18.6 | | | 5,340.0 | 295.6 | 3.218 | 69.620 | 1.50 | 181.30 | 157.731 | 82.760 | 310.111 |
| Area 4 | 1 | Node 100 | Node 90 | 7.7 | | 21.7 | 1.4 | 30.8 | 980 | 45.16 | 6,320.0 | 326.4 | 3.149 | 80.626 | 1.50 | 189.00 | 164.43 | 91.384 | 336.440 |
| Area 5 | 1 | Node 90 | Node 80 | 4.5 | | 42.2 | 9.3 | 56.0 | 1800 | 42.65 | 8,120.0 | 382.4 | 3.044 | 100.125 | 1.50 | 193.50 | 168.345 | 107.064 | 375.534 |
| Area 6 | 1 | Node 80 | Node 70 | 46.8 | | 51 | 13.1 | 110.9 | 4600 | 90.20 | 12,720.0 | 493.3 | 2.850 | 146.867 | 1.50 | 240.30 | 209.061 | 138.116 | 494.044 |
| Area 7 | 1 | Node 70 | Node 60 | 16 | | 123.9 | 10.1 | 150.0 | 8780 | 70.86 | 21,500.0 | 643.3 | 2.621 | 228.273 | 1.50 | 256.30 | 222.981 | 180.116 | 631.370 |
| Crossing | 1 | Node 60 | Node 50 | | | | | 0.0 | | | 21,500.0 | 643.3 | 2.621 | 228.273 | 1.50 | 256.30 | 222.981 | 180.116 | 631.370 |
| Area 8 | 1 | Node 50 | Node 40 | 20 | | 306.0 | 34 | 360.0 | 25000 | 81.70 | 46,500.0 | 1,003.3 | 2.294 | 432.118 | 1.50 | 276.30 | 240.381 | 280.916 | 953.415 |
| Area 9 | 1 | Node 40 | Node 30 | 12.9 | | 192.4 | 7.7 | 213.0 | 12390 | 64.40 | 58,890.0 | 1,216.3 | 2.199 | 524.650 | 1.50 | 289.20 | 251.604 | 340.556 | 1,116.810 |
| Manotick | 1 | | Node 30 | 35.7 | | 571 | | 606.7 | 8535 | 14.95 | 67,425.0 | 1,823.0 | 2.146 | 586.276 | 1.50 | 324.90 | 282.663 | 510.432 | 1,379.371 |
| Syphon | 1 | Node 30 | Node 20 | 0 | | 0 | 0 | 0.0 | 0 | | 67,425.0 | 1,823.0 | 2.146 | 586.276 | 1.50 | 324.90 | 282.663 | 510.432 | 1,379.371 |
| Area 10 | 1 | Node 20 | Node 10 | | | 52.8 | 14.7 | 67.5 | 600 | 11.36 | 68,025.0 | 1,890.5 | 2.143 | 590.553 | 1.50 | 324.90 | 282.663 | 529.332 | 1,402.548 |

| DESCRIPTION | LENGTH (m) | PIPE SIZE (m) | INVERT 1 (m) | INVERT 2 (m) | PROPOSED SEWER PIPE TYPE | GRADE | CAPACITY (L/s) | Q(p)/Q(c) | VELOCITY (m/s) | PEAK DESIGN DEPTH (m) | VELOCITY (m/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Jockvale PS | | | | | | | | | | | |
| Area 1 | 102.23 | 0.750 | 89.000 | 88.898 | Conc. | 0.10% | 353.24 | 0.73 | 0.80 | - | 0.51 |
| Area 2 | 246.80 | 0.750 | 88.898 | 88.651 | Conc. | 0.10% | 353.24 | 0.83 | 0.80 | - | 0.56 |
| Area 3 | 330.40 | 0.750 | 88.651 | 88.321 | | 0.10% | 353.24 | 0.88 | 0.80 | | |
| Area 4 | 1,022.50 | 0.750 | 88.321 | 87.298 | Conc. | 0.10% | 353.24 | 0.95 | 0.80 | - | 0.80 |
| Area 5 | 935.59 | 0.825 | 87.298 | 86.362 | Conc. | 0.10% | 455.17 | 0.83 | 0.85 | - | 0.60 |
| Area 6 | 1,424.25 | 0.900 | 86.362 | 84.938 | | 0.10% | 573.71 | 0.86 | 0.90 | | |
| Area 7 | 79.41 | 1.050 | 84.938 | 84.859 | Conc. | 0.10% | 864.51 | 0.73 | 1.00 | - | 0.64 |
| Crossing | 79.41 | 1.050 | 83.400 | 83.321 | Conc. | 0.10% | 864.51 | 0.73 | 1.00 | - | 0.64 |
| Area 8 | 152.76 | 1.200 | 83.321 | 83.168 | Conc. | 0.10% | 1,233.19 | 0.77 | 1.09 | - | 0.73 |
| Area 9 | 978.95 | 1.200 | 83.168 | 82.189 | Conc. | 0.10% | 1,233.19 | 0.91 | 1.09 | - | 0.85 |
| Manotick | | | | | | | | | | | |
| Syphon | 978.95 | 1.350 | 82.189 | 81.300 | Conc. | 0.10% | 1,686.93 | 0.82 | 1.18 | - | 0.82 |
| Area 10 | 482.92 | 1.350 | 81.300 | 80.817 | Conc. | 0.10% | 1,686.93 | 0.83 | 1.18 | - | 0.82 |

**DEFAULTS**

| | | |
|---|---|---|
| q=AVERAGE DAILY FLOW | 350 | L/CAP.D |
| I=UNIT OF PEAK EXTR.FLOW | 0.280 | L/Ha.S |
| Mannings 'n' | 0.013 | |
| q=AVERAGE COMMERCIAL AND INSTITUTIONAL | 0.58 | L/Ha.S |

DILLON CONSULTING

| | |
|---|---|
| DESIGN | CJR |
| CHECKED | 21-JAN. 03 |
| TODAY: | 10/28/2003 |

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Project 02-1019

021019-design-v3.xls | operational-Manotick

# CITY OF OTTAWA
## JOCK RIVER COLLECTOR SEWER
## SANITARY SEWER DESIGN SHEET - Full Service Operational Flows

Sheet 1 of 1

| DESCRIPTION | Design Factors | LOCATION FROM | TO | AREA (ha) COM & INSTITUTION | INDUSTRIAL | RESIDENTIAL | GREEN SPACE | TOTAL AREA | INDIVIDUAL POP | DENSITY (po./ha.) | CUMULATIVE RESIDENTIAL POP | AREA (ha.) | PEAKING FACTOR | RESIDENT. FLOW (L/s) | COMMERCIAL & INSTITUTION PEAKING FACTOR | CUM. AREA | I.C.I. FLOW (l/s) | INFIL. INFLOW Q(p) (L/s) | PEAK DESIGN FLOW Q(d) (L/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jockvale PS | 1 | PS | Node 130 | 0 | | 36.7 | | 36.7 | 1530 | 41.69 | 1,530.0 | 36.7 | 2.604 | 13.834 | 1.00 | 0.00 | 0 | 1.835 | 15.669 |
| Area 1 | 1 | Node 130 | Node 120 | 142.2 | | 65.57 | | 207.8 | 3430 | 52.31 | 4,960.0 | 244.5 | 2.349 | 40.454 | 1.00 | 142.20 | 22.21875 | 12.224 | 74.896 |
| Area 2 | 1 | Node 120 | Node 110 | 25.4 | | 7.1 | | 32.5 | 380 | 53.52 | 5,340.0 | 277.0 | 2.331 | 43.221 | 1.00 | 167.60 | 26.1875 | 13.849 | 83.257 |
| Area 3 | 1 | Node 110 | Node 100 | 13.7 | | 0 | 4.9 | 18.6 | | | 5,340.0 | 295.6 | 2.331 | 43.221 | 1.00 | 181.30 | 28.32813 | 14.779 | 86.328 |
| Area 4 | 1 | Node 100 | Node 90 | 7.7 | | 21.7 | 1.4 | 30.8 | 980 | 45.16 | 6,320.0 | 326.4 | 2.290 | 50.243 | 1.00 | 189.00 | 29.53125 | 16.319 | 96.092 |
| Area 5 | 1 | Node 90 | Node 80 | 4.5 | | 42.2 | 9.3 | 56.0 | 1800 | 42.65 | 8,120.0 | 382.4 | 2.226 | 62.771 | 1.00 | 193.50 | 30.23438 | 19.119 | 112.124 |
| Area 6 | 1 | Node 80 | Node 70 | 46.8 | | 51 | 13.1 | 110.9 | 4600 | 90.20 | 12,720.0 | 493.3 | 2.110 | 93.199 | 1.00 | 240.30 | 37.54688 | 24.664 | 155.409 |
| Area 7 | 1 | Node 70 | Node 60 | 16 | | 123.9 | 10.1 | 150.0 | 8780 | 70.86 | 21,500.0 | 643.3 | 1.973 | 147.259 | 1.00 | 256.30 | 40.04688 | 32.164 | 219.469 |
| Crossing | 1 | Node 60 | Node 50 | | | | | 0.0 | | | 21,500.0 | 643.3 | 1.973 | 147.259 | 1.00 | 256.30 | 40.04688 | 32.164 | 219.469 |
| Area 8 | 1 | Node 50 | Node 40 | 20 | | 306.0 | 34 | 360.0 | 25000 | 81.70 | 46,500.0 | 1,003.3 | 1.776 | 286.815 | 1.00 | 276.30 | 43.17188 | 50.164 | 380.151 |
| Area 9 | 1 | Node 40 | Node 30 | 12.9 | | 192.4 | 7.7 | 213.0 | 12390 | 64.40 | 58,890.0 | 1,216.3 | 1.720 | 351.612 | 1.00 | 289.20 | 45.1875 | 60.814 | 457.613 |
| Manotick | 1 | | Node 30 | 35.7 | | 571 | | 606.7 | 8535 | 14.95 | 67,425.0 | 1,823.0 | 1.688 | 395.159 | 1.00 | 324.90 | 50.76563 | 91.149 | 537.074 |
| Syphon | 1 | Node 30 | Node 20 | 0 | | 0 | 0 | 0.0 | 0 | | 67,425.0 | 1,823.0 | 1.688 | 395.159 | 1.00 | 324.90 | 50.76563 | 91.149 | 537.074 |
| Area 10 | 1 | Node 20 | Node 10 | | | 52.8 | 14.7 | 67.5 | 600 | 11.36 | 68,025.0 | 1,890.5 | 1.686 | 398.192 | 1.00 | 324.90 | 50.766 | 94.524 | 543.481 |
| | | | | | | | | 1890.5 | | | | | | | | | | | |

| DESCRIPTION | PROPOSED SEWER LENGTH (m) | PIPE SIZE (m) | INVERT 1 (m) | INVERT 2 (m) | PIPE TYPE | GRADE | CAPACITY (L/s) | Q(p)/Q(c) | PEAK DESIGN VELOCITY (m/s) | DEPTH (m) | VELOCITY (m/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Jockvale PS | | | | | | | | | | | |
| Area 1 | 102.23 | 0.750 | 89.000 | 88.898 | Conc. | 0.10% | 353.24 | 0.21 | 0.80 | - | 0.27 |
| Area 2 | 246.80 | 0.750 | 88.898 | 88.651 | Conc. | 0.10% | 353.24 | 0.24 | 0.80 | - | 0.27 |
| Area 3 | 330.40 | 0.750 | 88.651 | 88.321 | | 0.10% | 353.24 | 0.24 | 0.80 | | |
| Area 4 | 1,022.50 | 0.750 | 88.321 | 87.298 | Conc. | 0.10% | 353.24 | 0.27 | 0.80 | - | 0.30 |
| Area 5 | 935.59 | 0.825 | 87.298 | 86.362 | Conc. | 0.10% | 455.17 | 0.25 | 0.85 | - | 0.29 |
| Area 6 | 1,424.25 | 0.900 | 86.362 | 84.938 | | 0.10% | 573.71 | 0.27 | 0.90 | | |
| Area 7 | 79.41 | 1.050 | 84.938 | 84.859 | Conc. | 0.10% | 864.51 | 0.25 | 1.00 | - | 0.37 |
| Crossing | 79.41 | 1.050 | 83.400 | 83.321 | Conc. | 0.10% | 864.51 | 0.25 | 1.00 | - | 0.37 |
| Area 8 | 152.76 | 1.200 | 83.321 | 83.168 | Conc. | 0.10% | 1,233.19 | 0.31 | 1.09 | - | 0.45 |
| Area 9 | 978.95 | 1.200 | 83.168 | 82.189 | Conc. | 0.10% | 1,233.19 | 0.37 | 1.09 | - | 0.48 |
| Manotick | | | | | | | | | | | |
| Syphon | 978.95 | 1.200 | 82.189 | 81.300 | Conc. | 0.10% | 1,233.19 | 0.44 | 1.09 | - | 0.51 |
| Area 10 | 482.92 | 1.350 | 81.300 | 80.817 | Conc. | 0.10% | 1,686.93 | 0.32 | 1.18 | - | 0.48 |

**DEFAULTS**

| | | |
|---|---|---|
| q=AVERAGE DAILY FLOW | 300 | L/CAP.D |
| I=UNIT OF PEAK EXTR.FLOW | 0.050 | L/Ha.S |
| Mannings 'n' | 0.013 | |
| q=AVERAGE COMMERCIAL AND INSTITUTIONAL | 0.16 | L/Ha.S |

DILLON CONSULTING

| | |
|---|---|
| DESIGN | CJR |
| CHECKED | 21-JAN. 03 |
| TODAY: | 10/28/2003 |

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Project 02-1019

# APPENDIX D

# 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 | 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) |
| **SANITARY TRUNK** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 1.27 | | 127 | 1.27 | 127 | | | | 0.00 | | 0.00 | 0.62 | 0.62 | | 1.89 | 1.89 | | | | | | | | | |
| | 110A | 111A | 0.43 | | 37 | 1.70 | 164 | 3.5 | 1.88 | | 0.00 | | 0.00 | | 0.62 | 0.07 | 0.43 | 2.32 | 0.66 | 2.61 | 38.5 | 250 | 0.25 | 29.73 | 0.09 | 0.61 | 0.37 |
| | 111A | 112A | 0.13 | | 12 | 1.83 | 176 | 3.5 | 2.02 | | 0.00 | | 0.00 | | 0.62 | 0.07 | 0.13 | 2.45 | 0.70 | 2.78 | 10.5 | 250 | 0.25 | 29.73 | 0.09 | 0.61 | 0.38 |
| | 112A | 114A | 0.20 | | 17 | 2.03 | 193 | 3.5 | 2.20 | | 0.00 | | 0.00 | | 0.62 | 0.07 | 0.20 | 2.65 | 0.76 | 3.03 | 53.5 | 250 | 0.25 | 29.73 | 0.10 | 0.61 | 0.39 |
| | 114A | 117A | 0.87 | | 74 | 2.90 | 267 | 3.5 | 3.01 | | 0.00 | | 0.00 | | 0.62 | 0.07 | 0.87 | 3.52 | 1.01 | 4.08 | 60.5 | 250 | 0.25 | 29.73 | 0.14 | 0.61 | 0.42 |
| | 117A | 118A | 0.90 | | 77 | 3.80 | 344 | 3.4 | 3.84 | | 0.00 | | 0.00 | | 0.62 | 0.07 | 0.90 | 4.42 | 1.26 | 5.17 | 34.0 | 250 | 0.25 | 29.73 | 0.17 | 0.61 | 0.45 |
| | 118A | 119A | 0.04 | | 4 | 3.84 | 348 | 3.4 | 3.88 | | 0.00 | | 0.00 | | 0.62 | 0.07 | 0.04 | 4.46 | 1.28 | 5.22 | 27.0 | 250 | 0.25 | 29.73 | 0.18 | 0.61 | 0.45 |
| | 119A | 120A | 0.74 | | 63 | 4.58 | 411 | 3.4 | 4.55 | | 0.00 | | 0.00 | | 0.62 | 0.07 | 0.74 | 5.20 | 1.49 | 6.10 | 90.5 | 250 | 0.25 | 29.73 | 0.21 | 0.61 | 0.47 |
| | | | 0.22 | | 20 | 4.80 | 431 | | | | 0.00 | | 0.00 | | 0.62 | | 0.22 | 5.42 | | | | | | | | | |
| | 120A | 121A | 0.50 | | 50 | 5.30 | 481 | 3.4 | 5.28 | | 0.00 | | 0.00 | | 0.62 | 0.07 | 0.50 | 5.92 | 1.69 | 7.04 | 59.5 | 250 | 0.25 | 29.73 | 0.24 | 0.61 | 0.50 |
| | 121A | 130A | 0.21 | | 21 | 5.51 | 502 | 3.4 | 5.50 | | 0.00 | | 0.00 | | 0.62 | 0.07 | 0.21 | 6.13 | 1.75 | 7.32 | 59.5 | 250 | 0.25 | 29.73 | 0.25 | 0.61 | 0.50 |
| | 130A | 131A | 2.29 | | 188 | 7.80 | 690 | 3.3 | 7.42 | | 0.00 | | 0.00 | | 0.62 | 0.07 | 2.29 | 8.42 | 2.41 | 9.90 | 57.0 | 250 | 0.25 | 29.73 | 0.33 | 0.61 | 0.54 |
| | 131A | 132A | | | | 7.80 | 690 | 3.3 | 7.42 | | 0.00 | | 0.00 | | 0.62 | 0.07 | 0.00 | 8.42 | 2.41 | 9.90 | 15.0 | 250 | 0.25 | 29.73 | 0.33 | 0.61 | 0.54 |
| | 132A | 133A | | | | 7.80 | 690 | 3.3 | 7.42 | | 0.00 | | 0.00 | | 0.62 | 0.07 | 0.00 | 8.42 | 2.41 | 9.90 | 12.5 | 250 | 0.25 | 29.73 | 0.33 | 0.61 | 0.54 |
| To Phase 2 Sanitary Trunk By Others | | | | | | 7.80 | 690 | | | | | | | | 0.62 | | | 8.42 | | 9.90 | | | | | | | |

NOTE: UNITS FRONTING FUTURE CHAPMAN MILLS DRIVE EXTENSION TO CONNECT TO SANITARY TRUNK BY OTHERS. DRAINAGE AREAS CONSIDERED IN SANITARY TRUNK SIZING.

DESIGN PARAMETERS

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Park Flow = | 9300 | L/ha/da | 0.10764 | l/s/Ha | Harmon's Correction Factor | 0.800 | | |
| 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 = | 0.286 | L/s/ha | |
| Industrial Flow = | 35000 | L/ha/da | 0.40509 | l/s/Ha | Minimum Velocity = | 0.600 | m/s | |
| Max Res. Peak Factor = | 4.00 | | | | Manning's n = (Conc) | 0.013 | (Pvc) | 0.013 |
| Commercial/Inst./Park Peak Factor = | 1.00 | | | | Townhouse coeff= | 100 | ppHa | |
| Institutional = | 0.32 | l/s/Ha | | | Single house coeff= | 85 | ppHa | |

| | | | |
|---|---|---|---|
| Designed: R.Y. | PROJECT: **Conservancy Phase 1** | | |
| Checked: V.C. | LOCATION: **City of Ottawa** | | |
| Dwg. Reference: Sanitary Drainage Plan, Fig. No. 4 | File Ref: 16-891 | Date: **17 Jul 2018** | Sheet No. 1 of 1 |

891_San2_Ph1.xlsx

# APPENDIX E

## STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Arterial Roads Return Frequency = 10 years

Manning 0.013

Ottawa

| LOCATION | | | AREA (Ha) 2 YEAR | | | | 5 YEAR | | | | 10 YEAR | | | | 100 YEAR | | | | FLOW | | | | | | SEWER DATA | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | From Node | To Node | AREA (Ha) | R | Indiv. 2.78 AC | Accum. 2.78 AC | AREA (Ha) | R | Indiv. 2.78 AC | Accum. 2.78 AC | AREA (Ha) | R | Indiv. 2.78 AC | Accum. 2.78 AC | AREA (Ha) | R | Indiv. 2.78 AC | Accum. 2.78 AC | Time of Conc. (min) | Intensity 2 Year (mm/h) | Intensity 5 Year (mm/h) | Intensity 10 Year (mm/h) | Intensity 100 Year (mm/h) | Peak Flow Q (l/s) | DIA. (mm) (actual) | DIA. (mm) (nominal) | TYPE | SLOPE (%) | LENGTH (m) | CAPACITY (l/s) | VELOCITY (m/s) | TIME OF FLOW (min.) | RATIO Q/Q full |
| **STM TRUNK** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 0.62 | 0.40 | 0.69 | 0.69 | 0.12 | 0.85 | 0.28 | 0.28 | | | 0.00 | 0.00 | | | 0.00 | 0.00 | 14.33 | | | | | | | | | | | | | | |
| | | | 0.45 | 0.67 | 0.84 | 1.53 | 0.13 | 0.85 | 0.31 | 0.59 | | | 0.00 | 0.00 | | | 0.00 | 0.00 | | | | | | | | | | | | | | | |
| | 120 | 121 | 1.26 | 0.80 | 2.80 | 4.33 | | | 0.00 | 0.59 | | | 0.00 | 0.00 | | | 0.00 | 0.00 | 14.33 | 63.39 | 85.78 | 100.46 | 146.72 | 325 | 750 | 750 | CONC | 0.14 | 36.0 | 417 | 0.94 | 0.64 | 0.78 |
| | 121 | 122 | 0.09 | 0.67 | 0.17 | 4.50 | | | 0.00 | 0.59 | | | 0.00 | 0.00 | | | 0.00 | 0.00 | 14.97 | 61.84 | 83.66 | 97.97 | 143.06 | 328 | 750 | 750 | CONC | 0.14 | 13.0 | 417 | 0.94 | 0.23 | 0.79 |
| | 122 | 123TEE | 0.23 | 0.67 | 0.43 | 4.93 | | | 0.00 | 0.59 | | | 0.00 | 0.00 | | | 0.00 | 0.00 | 15.20 | 61.30 | 82.92 | 97.10 | 141.79 | 351 | 825 | 825 | CONC | 0.15 | 60.5 | 556 | 1.04 | 0.97 | 0.63 |
| | | | 0.00 | 0.00 | 0.00 | 4.93 | | | 0.00 | 0.59 | | | 0.00 | 0.00 | | | 0.00 | 0.00 | 11.99 | | | | | | | | | | | | | | |
| | 123TEE | 124TEE | 0.87 | 0.67 | 1.62 | 6.55 | | | 0.00 | 0.59 | | | 0.00 | 0.00 | | | 0.00 | 0.00 | 16.17 | 59.14 | 79.96 | 93.62 | 136.69 | 434 | 825 | 825 | CONC | 0.15 | 60.5 | 556 | 1.04 | 0.97 | 0.78 |
| | | | 0.00 | 0.00 | 0.00 | 6.55 | | | 0.00 | 0.59 | | | 0.00 | 0.00 | | | 0.00 | 0.00 | 12.51 | | | | | | | | | | | | | | |
| | 124TEE | 125TEE | 0.88 | 0.67 | 1.64 | 8.19 | | | 0.00 | 0.59 | | | 0.00 | 0.00 | | | 0.00 | 0.00 | 17.14 | 57.14 | 77.23 | 90.41 | 131.98 | 513 | 900 | 900 | CONC | 0.15 | 28.5 | 701 | 1.10 | 0.43 | 0.73 |
| | 125TEE | 126 | 0.04 | 0.67 | 0.07 | 8.26 | | | 0.00 | 0.59 | | | 0.00 | 0.00 | | | 0.00 | 0.00 | 17.57 | 56.30 | 76.08 | 89.06 | 130.00 | 510 | 900 | 900 | CONC | 0.15 | 23.5 | 701 | 1.10 | 0.36 | 0.73 |
| | | | 0.73 | 0.80 | 1.62 | 9.88 | | | 0.00 | 0.59 | | | 0.00 | 0.00 | | | 0.00 | 0.00 | 14.91 | | | | | | | | | | | | | | |
| | 126 | 127TEE | 0.94 | 0.67 | 1.75 | 11.63 | | | 0.00 | 0.59 | | | 0.00 | 0.00 | | | 0.00 | 0.00 | 17.92 | 55.63 | 75.16 | 87.98 | 128.41 | 692 | 1050 | 1050 | CONC | 0.10 | 35.5 | 864 | 1.00 | 0.59 | 0.80 |
| | 127TEE | 128TEE | 0.01 | 0.67 | 0.02 | 11.65 | | | 0.00 | 0.59 | | | 0.00 | 0.00 | | | 0.00 | 0.00 | 18.52 | 54.54 | 73.68 | 86.24 | 125.86 | 679 | 1050 | 1050 | CONC | 0.10 | 10.5 | 864 | 1.00 | 0.18 | 0.79 |
| | 128TEE | 129TEE | 0.05 | 0.67 | 0.09 | 11.75 | | | 0.00 | 0.59 | | | 0.00 | 0.00 | | | 0.00 | 0.00 | 18.69 | 54.23 | 73.26 | 85.74 | 125.13 | 680 | 1050 | 1050 | CONC | 0.10 | 27.0 | 864 | 1.00 | 0.45 | 0.79 |
| | 129TEE | 131 | 0.05 | 0.67 | 0.09 | 11.84 | | | 0.00 | 0.59 | | | 0.00 | 0.00 | | | 0.00 | 0.00 | 19.14 | 53.45 | 72.19 | 84.48 | 123.28 | 675 | 1050 | 1050 | CONC | 0.10 | 29.0 | 864 | 1.00 | 0.48 | 0.78 |
| | | | 0.00 | 0.00 | 0.00 | 11.84 | | | 0.00 | 0.59 | | | 0.00 | 0.00 | | | 0.00 | 0.00 | 15.10 | | | | | | | | | | | | | | |
| | 131 | OGS | 2.21 | 0.67 | 4.12 | 15.96 | | | 0.00 | 0.59 | | | 0.00 | 0.00 | | | 0.00 | 0.00 | 19.63 | 52.64 | 71.08 | 83.18 | 121.37 | 882 | 1200 | 1200 | CONC | 0.10 | 21.5 | 1233 | 1.09 | 0.33 | 0.72 |
| **To OGS** | | | | | | 15.96 | | | | 0.59 | | | | 0.00 | | | | 0.00 | 19.96 | | | | | 882 | | | | | | | | | |

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

| Designed: R.B. | PROJECT: Conservancy Phase 1 | | |
|---|---|---|---|
| Checked: V.C. | LOCATION: City of Ottawa | | |
| Fig. Reference: 5 | File Ref: 16-891 | Date: 17 Jul 2018 | Sheet No. SHEET 1 OF 1 |

FINAL REPORT

# Kennedy-Burnett Stormwater Management Facility Project File and Functional Design Report

*Prepared for*

City of Ottawa

February 17, 2017

CH2M Hill Canada Ltd.
1101 Prince of Wales Drive
Suite 330
Ottawa, ON K2C 3W7

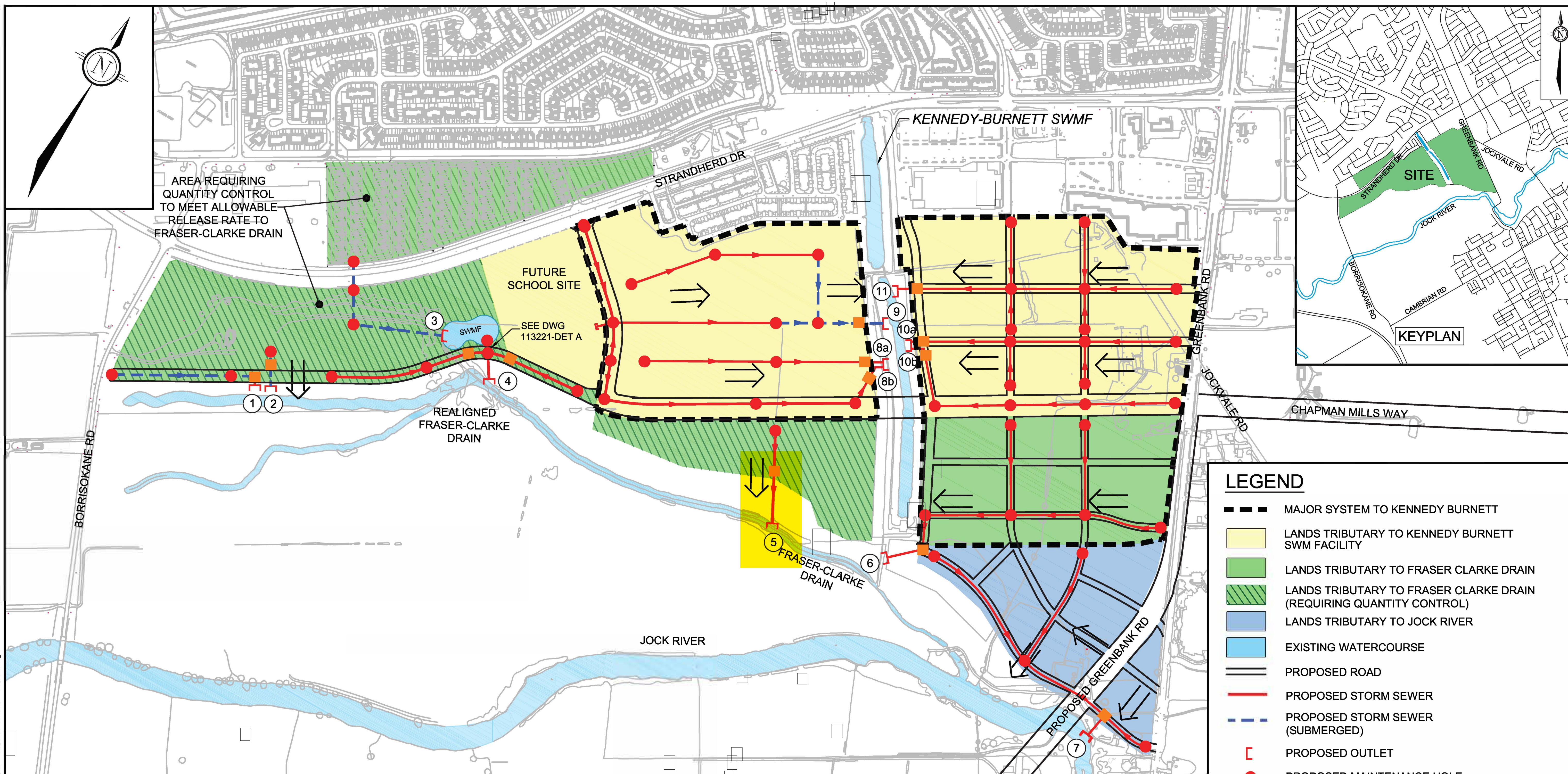
- Construction of a new SWM facility adjacent to the K-B pond;
- Construction of a new SWM facility east of Greenbank Road;
- Expansion of the existing K-B pond;
- Hydrodynamic separators for new development.

The report recommended the use of hydrodynamic separators (HDS) to provide stormwater quality treatment for all new development south of Strandherd Drive, as this approach provides flexibility for the various developers by providing independent storm outlets, and does not require expansion of the existing Kennedy-Burnett (K-B) SWM Facility to accommodate new development.

Feedback from the City's technical advisory committee included that regardless of whether new developments are directed to the pond, the existing Kennedy-Burnett SWMF requires expansion to improve the existing catchment area level of treatment. In addition, MOECC and City staff expressed concerns relating to HDS performance when servicing large areas while operating under continuously submerged conditions. Based on feedback received, Novatech's final servicing evaluation included the following four servicing options:

- Option 1: Trunk Storm Sewers to Expanded K-B SWM Facility;
- Option 2: Storm Sewer Outfalls to Fraser-Clarke Drain/Jock River;
- Option 3: Adjacent Lands to K-B Pond/New Pond for Fraser Fields and Clarke Residential Lands/ Hydrodynamic Separators for Remaining Areas;
- Option 4: Same as Option 3, Plus Hydrodynamic Separators at Outfalls to K-B Pond.

A technical evaluation of the storm sewer options was completed in collaboration with City stakeholders and land owners/developers, detailed in Appendix A. The primary storm servicing constraint in the servicing area was defined as the relatively low elevation of the site combined with geotechnical grade raise restrictions. Key factors influencing the grade raise requirements are the 100-year hydraulic grade line (for areas with foundation drains) and the required cover over the proposed storm sewers. Other factors weighing into the analysis include the extent of submerged sewers, land requirements for stormwater infrastructure, costs (capital, maintenance, life cycle), and flexibility for development. Based on the evaluation, Option 4 was the recommended alternative. Option 4 provides good flexibility for future development by providing a storm servicing solution that is largely independent of the planned expansion of the Kennedy-Burnett Pond. Details of the technical evaluation, and additional advantages and disadvantages of the recommended option are provided in Appendix A. Figure 5-1 form the Novatech report illustrates the proposed servicing option drainage plan.




| OUTLET | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | WATER COURSE | DRAINAGE AREA | NWL | PIPE INVERT | PIPE SIZE | PEAK FLOW *CONTROLLED | SUBMERGED SEWERS | DEPTH TO OBVERT | MAX GRADE RAISE | STM HGL (D/S - U/S) |
| 1 | FRASER-CLARKE DRAIN | 0.97 ha | 90.25 | 90.15 | 600mm | 28 L/s* | 75m | 1.5m | 1.1m | 91.75m - 92.30m |
| 2 | FRASER-CLARKE DRAIN | 5.34 ha | 90.25 | 89.85 | 965 x 1525mm ELLIPTICAL | 187 L/s* | 400m | 1.5m | 0.9m | 91.75m - 92.20m |
| 3 | MINTO SWM POND | 14.64 ha | 90.00 | 89.81 | 1220mm x 1930mm ELLIPTICAL | 1,785 L/S | 195m | 1.5m | 0.8m | 91.65m - 92.23m |
| 4 | FRASER-CLARKE DRAIN | 1.29 ha + 14.64 ha | 89.90 | 89.90 | 1050mm | 692 L/S* | 0m | 1.5m | 1.0m | 91.65m - 92.25m |
| 5 | FRASER-CLARKE DRAIN | 6.49 ha | 89.87 | 89.87 | 965 x 1525mm ELLIPTICAL | 363 L/S* | 0m | 1.8m | 0.9m | 91.65m - 92.00m |
| 6 | FRASER-CLARKE DRAIN | 11.83 ha | 89.90 | 89.90 | 1220mm x 1930mm ELLIPTICAL | 1,649 L/S | 0m | 1.8m | 0.8m | 91.75m - 92.65m |
| 7 | JOCK RIVER | 9.24 ha | 89.20 | 89.20 | 965 x 1525mm ELLIPTICAL | 1,252 L/S | 0m | 1.8m | 0.1m | 91.60m - 92.45m |
| 8A | KENNEDY-BURNETT SWMF | 6.58 ha | 90.20 | 90.20 | 1050mm | 915 L/S | 0m | 1.5m | 0.9m | 91.80m - 92.80m |
| 8B | KENNEDY-BURNETT SWMF | 2.44 ha | 90.20 | 90.20 | 825mm | 444 L/S | 0m | 1.8m | 0.9m | 91.80m - 92.76m |
| 9 | KENNEDY-BURNETT SWMF | 15.49 ha | 90.20 | 90.00 | 1220mm x 1930mm ELLIPTICAL | 2,034 L/S | 200m | 1.5m | 1.2m | 91.90m - 93.18m |
| 10A | KENNEDY-BURNETT SWMF | 6.68 ha | 90.20 | 90.20 | 1050mm | 928 L/S | 0m | 2.0m | 0m | 91.80m - 92.80m |
| 10B | KENNEDY-BURNETT SWMF | 2.07 ha | 90.20 | 90.20 | 825 mm | 365 L/S | 0m | 2.0m | 0m | 91.80m - 92.78m |
| 11 | KENNEDY-BURNETT SWMF | 10.90 ha | 90.20 | 90.20 | 1220mm x 1930mm ELLIPTICAL | 1,892 L/S | 0m | 1.8m | 0.3m | 91.90m - 92.78m |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Website www.novatech-eng.com


# KENNEDY-BURNETT SWMF SERVICING OPTIONS

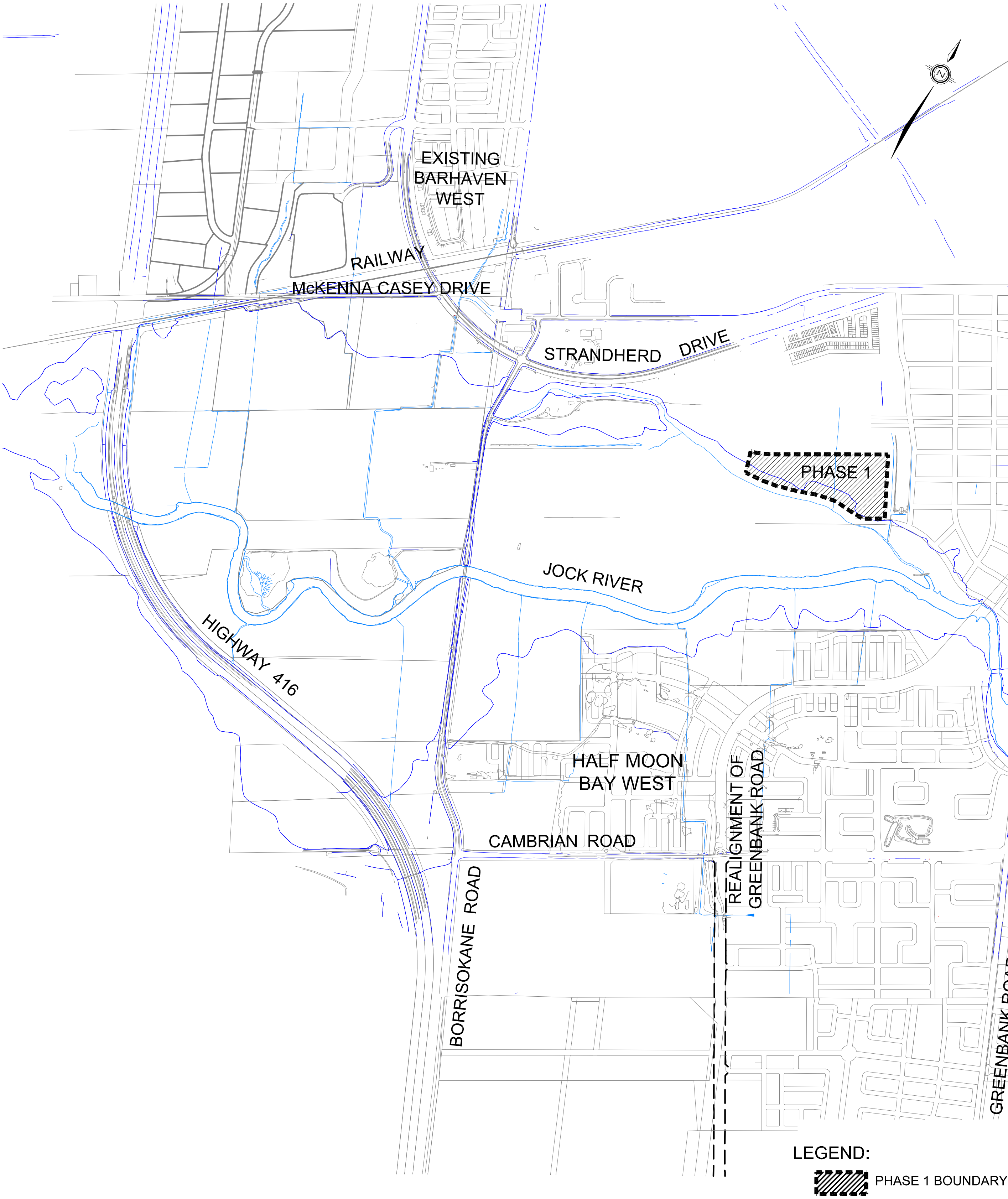
## OPTION 4: HYBRID EXPANDED K-B SWIMF / HDS UNITS

SCALE 1 : 7500

DATE JAN 2017 | JOB 113221 | FIGURE FIG 5-1

M:\2013\113221\CAD\Design\Figures\SWM\113221-FIGs 5-6.dwg, FIG-6, Jan 30, 2017 - 10:27am, cstang

## *DRAWINGS / FIGURES*

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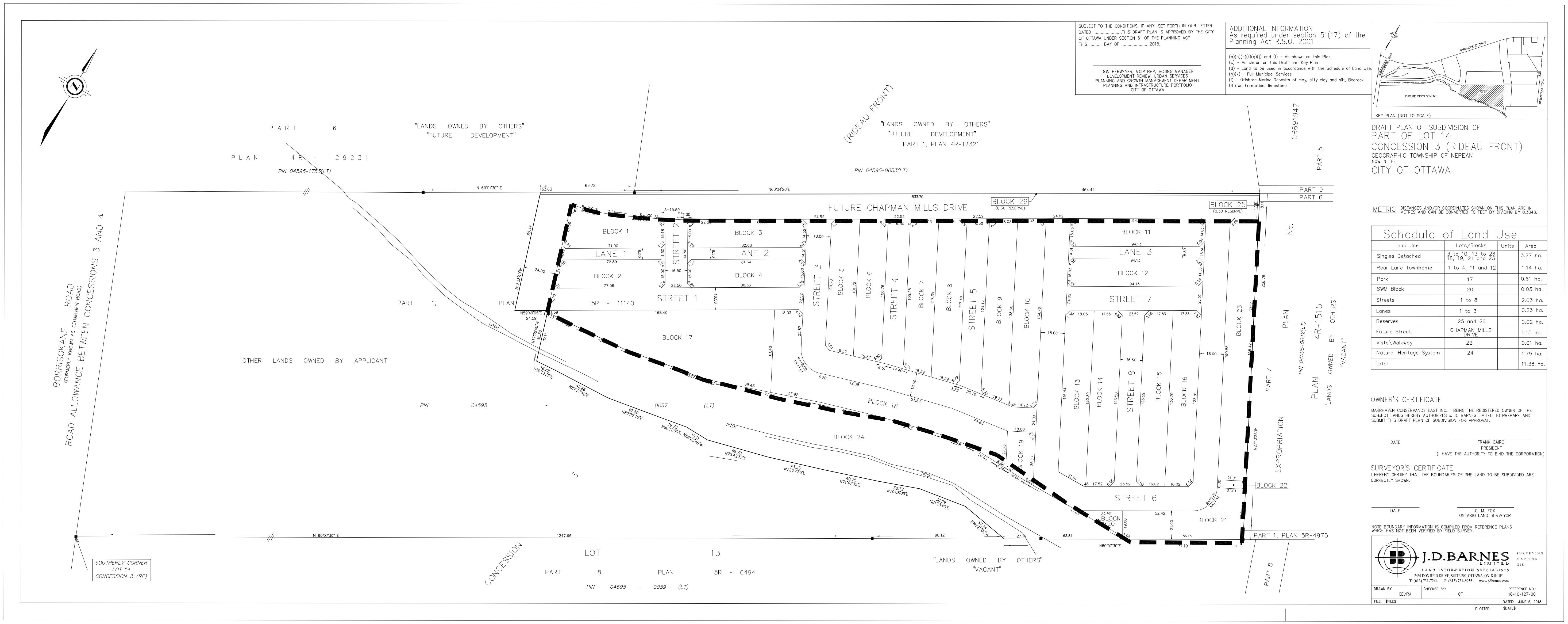
FAX: (613) 836-7183
www.DSEL.ca

BARRHAVEN CONSERVANCY
PHASE 1

# KEY PLAN

CITY OF OTTAWA

| | |
|---|---|
| DATE: | JULY 2018 |
| SCALE: | 1:20000 |
| PROJECT No.: | 16-891 |
| FIGURE: | 1 |




Schedule of Land Use

| Land Use | Lots/Blocks | Units | Area |
|---|---|---|---|
| Singles Detached | 3 to 10, 13 to 26, 18, 19, 21 and 23 | | 3.77 ha. |
| Rear Lane Townhome | 1 to 4, 11 and 12 | | 1.14 ha. |
| Park | 17 | | 0.61 ha. |
| SWM Block | 20 | | 0.03 ha. |
| Streets | 1 to 8 | | 2.63 ha. |
| Lanes | 1 to 3 | | 0.23 ha. |
| Reserves | 25 and 26 | | 0.02 ha. |
| Future Street | CHAPMAN MILLS DRIVE | | 1.15 ha. |
| Vista\Walkway | 22 | | 0.01 ha. |
| Natural Heritage System | 24 | | 1.79 ha. |
| Total | | | 11.38 ha. |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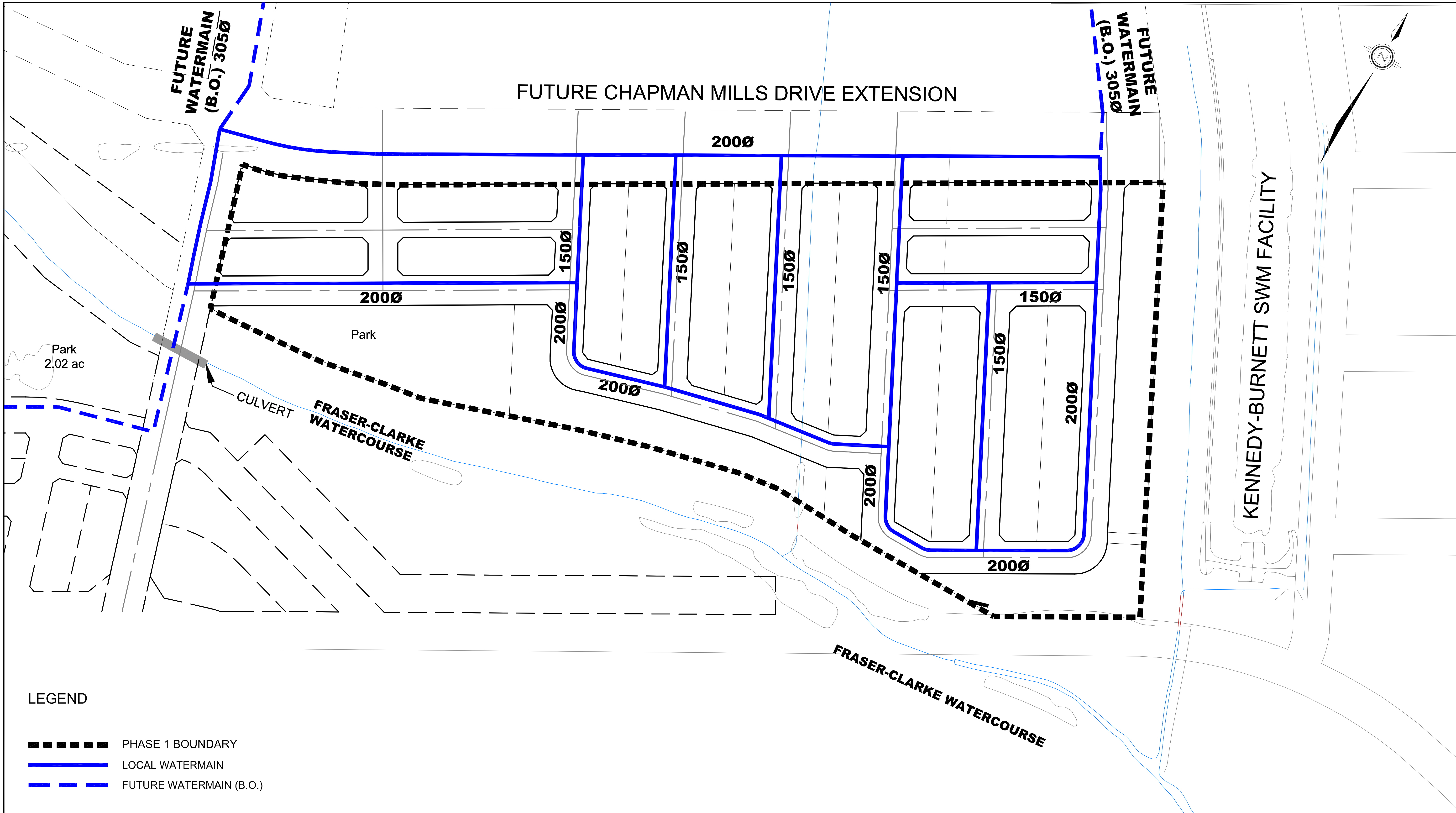
# BARRHAVEN CONSERVANCY PHASE 1
# SUBDIVISION PLAN
# CITY OF OTTAWA

| | |
|---|---|
| PROJECT No.: | 16-891 |
| SCALE: | 1:3000 |
| DATE: | JULY 2018 |
| FIGURE: | 2 |

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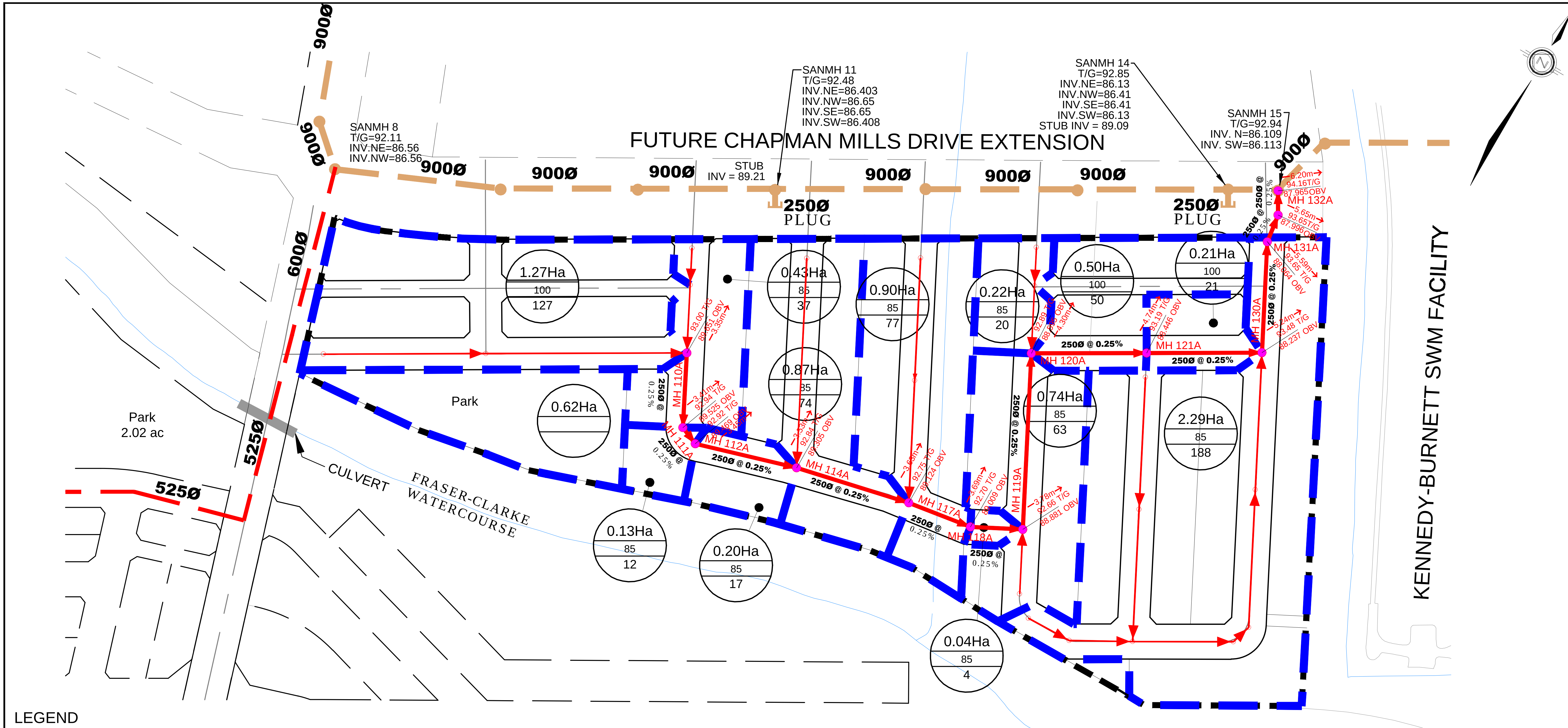
BARRHAVEN CONSERVANCY PHASE 1
WATERMAIN SERVICING PLAN
CITY OF OTTAWA

| | |
|---|---|
| PROJECT No.: | 16-891 |
| SCALE: | 1:2000 |
| DATE: | JULY 2018 |
| FIGURE: | 3 |




LEGEND

- PHASE 1 BOUNDARY
- SANITARY TRIBUTARY BOUNDARY
- SANITARY TRUNK
- PROPOSED SANITARY MANHOLE
- LOCAL SANITARY SEWER
- FUTURE SANITARY TRUNK (BY OTHERS)
- PHASE 2 SANITARY TRUNK (AS PER NOVATECH, JUNE 2017)
- PROPOSED SANITARY MANHOLE (BY OTHERS)

| | |
|---|---|
| 8.4Ha | SANITARY DRAINAGE AREA |
| 70 | POPULATION PER HECTARE |
| 588 | TOTAL POPULATION |

NOTE:
UNITS FRONTING FUTURE CHAPMAN MILLS DRIVE EXTENSION TO CONNECT TO SANITARY TRUNK BY OTHERS. DRAINAGE AREAS CONSIDERED IN SANITARY TRUNK SIZING.

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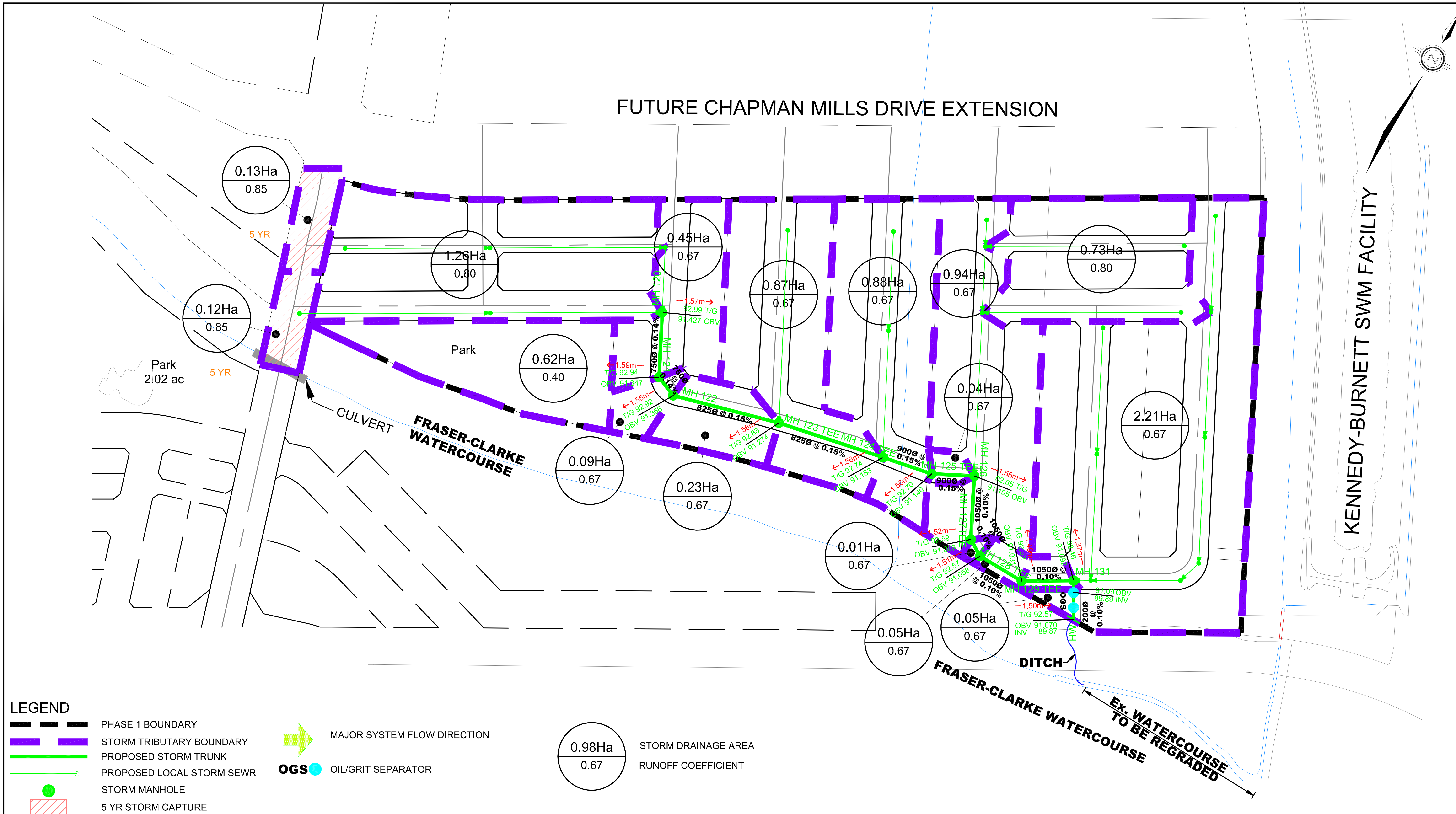
# BARRHAVEN CONSERVANCY PHASE 1
# SANITARY SERVICING PLAN
# CITY OF OTTAWA

| | |
|---|---|
| PROJECT No.: | 16-891 |
| SCALE: | 1:2000 |
| DATE: | JULY 2018 |
| FIGURE: | 4 |

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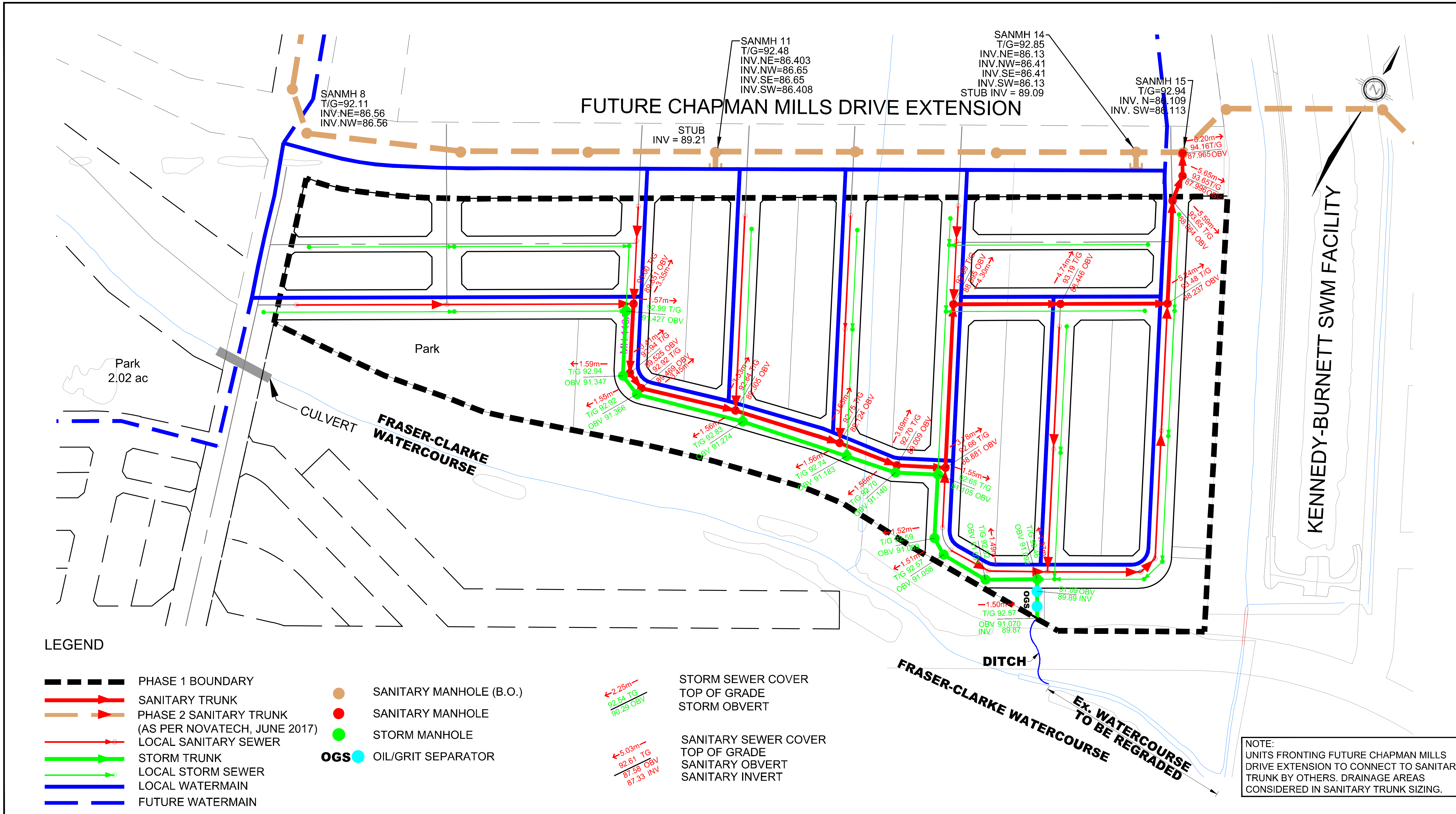
BARRHAVEN CONSERVANCY PHASE 1
STORM SERVICING PLAN
CITY OF OTTAWA

| | |
|---|---|
| PROJECT No.: | 16-891 |
| SCALE: | 1:2000 |
| DATE: | JULY 2018 |
| FIGURE: | 5 |





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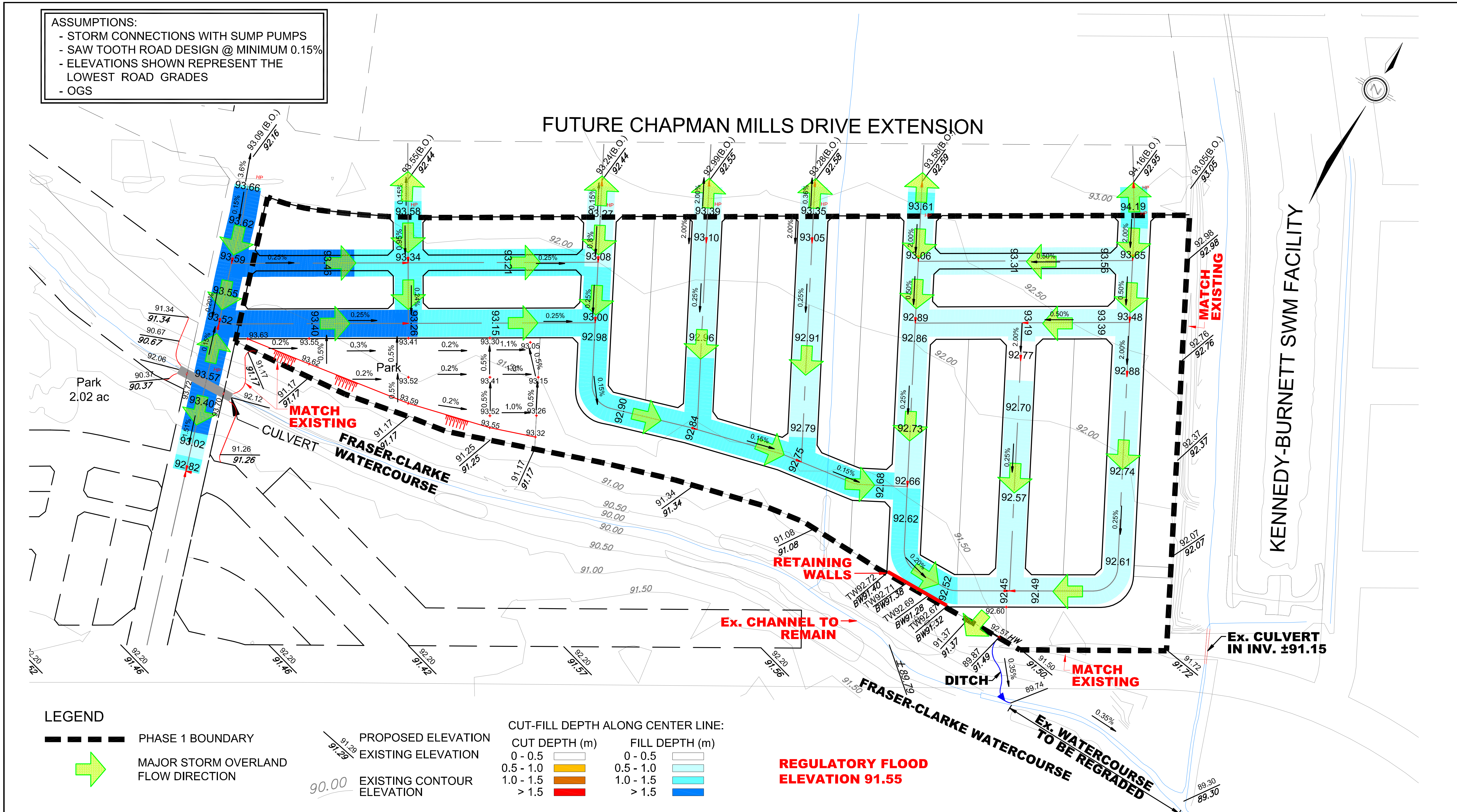
BARRHAVEN CONSERVANCY PHASE 1

COMPOSITE SERVICING PLAN

CITY OF OTTAWA

| | |
|---|---|
| PROJECT No.: | 16-891 |
| SCALE: | 1:2000 |
| DATE: | JULY 2018 |
| FIGURE: | 6 |

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BARRHAVEN CONSERVANCY PHASE 1

PRELIMINARY GRADING PLAN

CITY OF OTTAWA

| | |
|---|---|
| PROJECT No.: | 16-891 |
| SCALE: | 1:2000 |
| DATE: | JULY 2018 |
| FIGURE: | 7 |