

TECHNICAL MEMORANDUM

DATE: JANUARY 2018
TO: MURRAY CHOWN
FROM: CARA RUDDLE
RE: BYRON / RAVENHILL AVENUE REZONING

Novatech has been retained to review the adequacy of existing services for the re-zoning of the existing properties 556-576 Byron Avenue, 436-446 Roosevelt Avenue and 411-425 Ravenhill Avenue within the City of Ottawa. Refer to **Figure 1** – Key plan for the site location. The subject site consists of 8 existing lots with a total area of approximately 0.489 ha. Currently, seven of the eight lots are developed with residential dwellings and a commercial development (Westboro Dental Center). Refer to **Figure 2** – Existing Conditions. The rezoning would allow for the severance of 8 existing lots in half to create 16 lots for the construction of 16 low-rise residential apartment buildings. Each building would be limited to 3 storeys and a maximum of 4 units with an approximate footprint of 1500sqft. Refer to **Figure 3** – Potential Development Plan.

This technical memorandum is being submitted in support of a rezoning application. The memo will review the water, sanitary and storm servicing requirements for the potential development of 16 low-rise apartment buildings and will provide an analysis on the existing infrastructure surrounding the site to ensure there is adequate capacity.

Water Servicing

There is an existing public 150mm diameter watermain within the Byron, Roosevelt and Ravenhill Avenue right-of-way's. The existing 150mm diameter watermain currently services the existing residential and commercial developments on the subject site. It is proposed to service the potential 16 low-rise apartment buildings directly from the existing watermain along Byron and Ravenhill Avenue. Refer to **Figure 4** – Existing Services Figure. The water demands for the potential development were calculated and provided to the City to obtain boundary conditions to confirm serviceability. The domestic water demand calculations are based on a theoretical population for the potential development based on criteria provided in the City of Ottawa Water Design Guidelines. The required fire flow was calculated using the Fire Underwriter's Survey method and is based on a 3-storey above ground wood frame construction. The water demand calculations, boundary conditions and hydraulic analysis calculation for the existing public infrastructure are provided in **Appendix A** for reference. The results of the hydraulic analysis are summarized below in **Table 1**.



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Website www.novatech-eng.com

KEY PLAN

CITY OF OTTAWA

BYRON/RAVENHILL
REZONING

DATE
DEC 2017

JOB
116168

FIGURE
FIG 1

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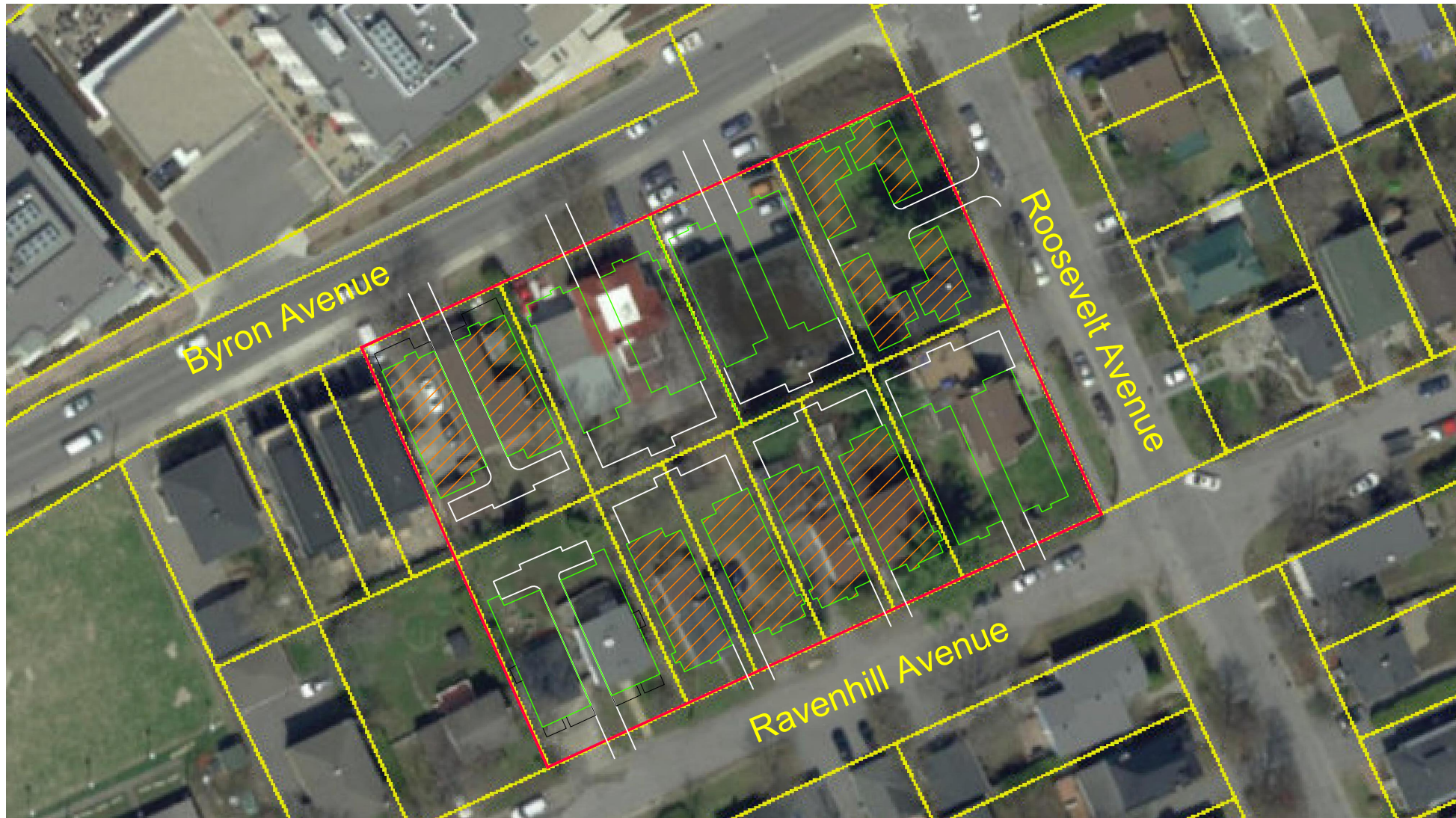
BYRON/RAVENHILL REZONING

EXISTING CONDITIONS

SCALE 1 : 500 0 5 10 15 20

DATE DEC 2017 JOB 116168 FIGURE FIG 2

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Units Under
Construction

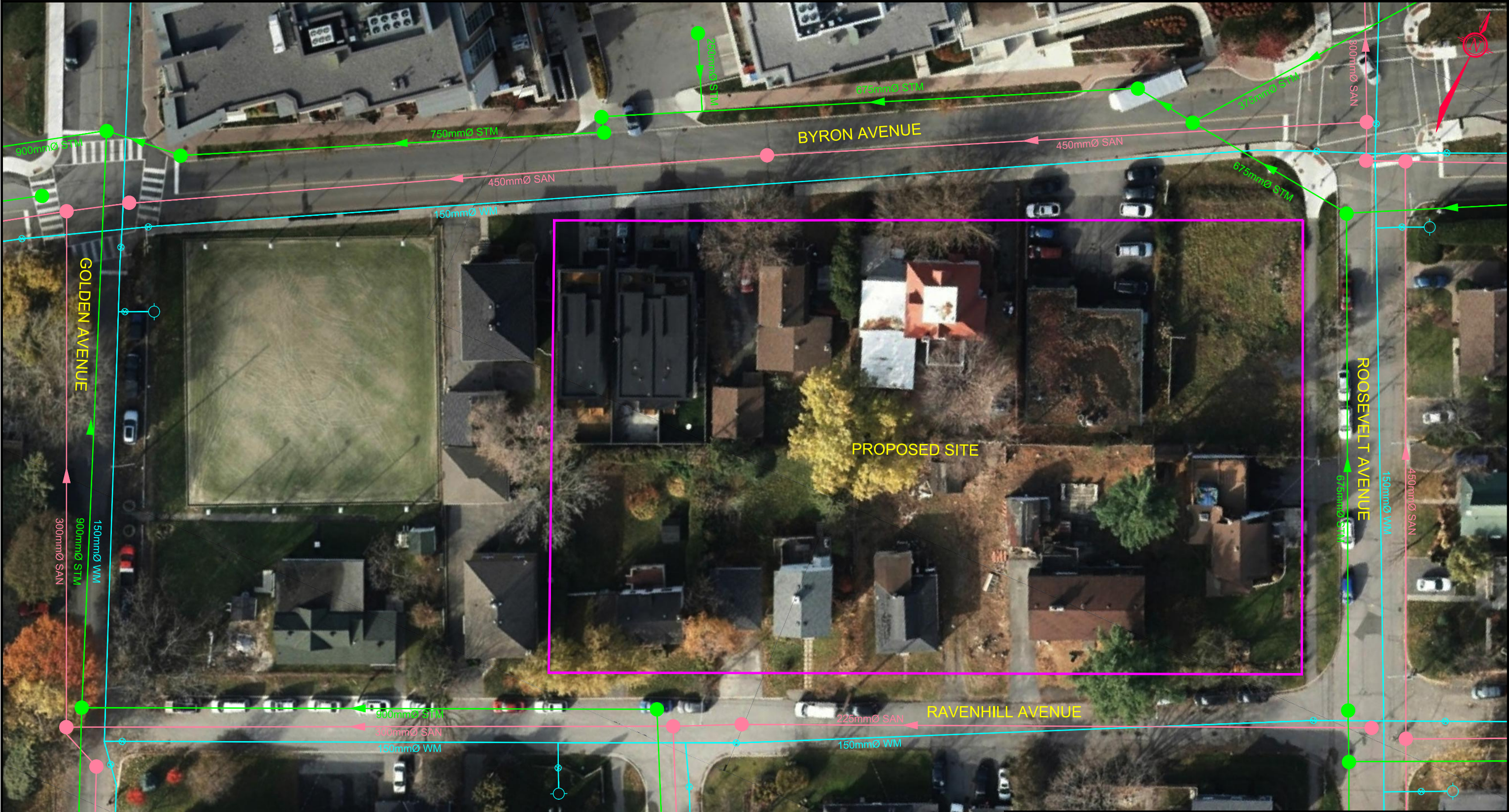
City of Ottawa
BYRON & RAVENHILL

POTENTIAL DEVELOPMENT PLAN

SCALE 1 : 750 0 10 20 30

| | | |
|-------------------|---------------|-----------------|
| DATE FEB, 2018 | JOB 116168 | FIGURE FIG 3 |
|-------------------|---------------|-----------------|

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LEGEND

EXISTING SANITARY SEWER AND MANHOLE WITH DIRECTION OF FLOW

EXISTING STORM SEWER AND MANHOLE WITH DIRECTION OF FLOW

EXISTING WATERMAIN

EXISTING VALVE AND HYDRANT

NOVATECH

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**BYRON/RAVENHILL
REZONING**

EXISTING SERVICES PLAN

SCALE 1 : 500

DATE DEC 2017

JOB 116168

FIGURE FIG 4

CUT111V17 DWG 270mm X 122mm

Table1: Water Analysis Results Summary

| Condition | Street | Demand (L/s) | Min/Max Allowable Operating Pressures (psi) | Limits of Design Operating Pressures (psi) |
|---|-------------------|--------------|---|--|
| High Pressure | Ravenhill / Byron | 0.55 | 80psi (Max) | 67.3 |
| Maximum Daily Demand and <i>Fire Flow</i> | Ravenhill | 152.46 | 20psi (Min) | 24.5 |
| | Byron | 152.46 | | 23.3 |
| Peak Hour | Ravenhill / Byron | 3.72 | 40psi (Min) | 58.0 |

The results of the water analysis show there is adequate flow and pressure in the existing 150mm watermain in Byron Avenue and Ravenhill Avenue to meet the required domestic demands and pressures for fire flow.

Sanitary Servicing

There is an existing 225mm and 300mm diameter sanitary sewer in Ravenhill Avenue and a 450mm diameter sanitary sewer in Byron Avenue. The total sanitary flows from the existing development is calculated to be 2.68 L/s. It is proposed to service the potential 16 low-rise apartment buildings directly from the existing sewers in Ravenhill and Byron Avenue. Refer to **Figure 4 – Existing Services Figure**. The sanitary flows generated by the potential development are calculated to be 2.39 L/s (calculations below). There is a total decrease in sanitary flow of 0.29 L/s in the proposed condition. This is due to the City of Ottawa requirement for fully separated systems in all new developments.

Existing Development Flows

Number of Existing Single-Family Units = 10 units
 Population = 10 units x 3.4 people/unit = 34 people
 Residential Peaking Factor = 4 (Harmon Formula)
 Domestic Sanitary Flow = (280L/person/day x 34 people) / 86400 sec/day x 4 = 0.44 L/s

Institutional Area = 0.06ha
 Institutional Peaking Factor = 1.5
 Domestic Sanitary Flow = (50000L/ha/day x 0.06ha) / 86400 sec/day x 1.5 = 0.05 L/s

Foundation drain allowance for unseparated systems = 3 L/s/ha
 Site Drainage Area = 0.73 ha
 Foundation Drainage = 3 L/s/ha x 0.73 ha = 2.19 L/s

Total Existing Sanitary Flow = 0.44 + 0.05 + 2.19 = **2.68 L/s**

Potential Development Flows

Number of 2 Bedroom Units = 16 buildings x 4 units/building = 64 units
 Population = 64 units x 2.1 people/unit = 135 people
 Residential Peaking Factor = 4 (Harmon Formula)
 Domestic Sanitary Flow = (350L/person/day x 135 people) / 86400 sec/day x 4 = 2.19 L/s

Extraneous flow allowance = 0.28 L/s/ha

Site Drainage Area = 0.73ha

Extraneous Flow = 0.28 L/s/ha x 0.73ha = 0.20 L/s

Total Potential Development Sanitary Flow = 2.19 + 0.20 = **2.39 L/s**

A downstream analysis of the 525mm diameter sanitary trunk sewer to the west of the Byron and Golden Avenue intersection was completed to confirm the capacity in the existing sanitary system. The sanitary sewer design sheets for the existing and proposed conditions and drainage area figures are provided in **Appendix B** for reference.

A review of the downstream analysis, in the existing condition, shows that the one section of the 300mm diameter sanitary sewer in Ravenhill Avenue is at capacity (99.8% full). The remainder of the sanitary sewer system has excess capacity. The total peak design flows are not likely indicative of the actual flows since the flows generated in the spreadsheets assume that the entire drainage area is serviced by a non-separated system. As per the City of Ottawa Sewer Design Guidelines the sanitary analysis incorporates a 3.0 L/s/ha foundation drain allowance for existing developments where there is potential for partially separated systems.

In the proposed condition, the total peak design flow to the 300mm diameter sewer in Ravenhill Avenue is reduced by 0.29 L/s since the potential development will require a separated foundation drain system. Therefore, since the potential development decreases the flows from the existing condition, there are no concerns that the potential development flows will have any adverse effects on the existing infrastructure.

Storm Servicing & Stormwater Management

There is an existing 675mm diameter storm sewer along the north side of the Byron Avenue and an existing 900mm diameter storm sewer along Ravenhill Avenue to the west of the potential development. There is no existing storm sewer in Ravenhill Avenue fronting the potential development. Refer to **Figure 4 – Existing Services Figure**. The potential development foundation drainage is required to have full separation from the sanitary system. This will require all new development in the Ravenhill area to utilize sump pumps to the surface for foundation drainage.

Through the site plan approval process stormwater management will be required on a site by site basis. Quality control requirements should be confirmed with the Conservation Authority during detailed design. Quantity control will be required to meet pre-development conditions for the site.

Conclusion

Based on the foregoing, the existing sanitary sewer and watermain infrastructure have capacity to service the potential development. Stormwater management, including quantity and quality control of stormwater will be required on a site by site basis. Quantity control will ensure that storm flows from each site will not exceed existing conditions. The existing storm sewer system will have adequate capacity to service the potential development.

NOVATECH

Prepared by:



Matthew Hrehoriak, EIT

Reviewed by:

Cara Ruddle, P.Eng.
Senior Project Manager**List of Appendices:**

Appendix A: Water Calculations
Appendix B: Sanitary Calculations

APPENDIX A

Water Calculations

| Table 1 Water Demand | | | | | | |
|---------------------------------|-------------------------------|------------|-----------------------------|---------------------------------|-----------------------|------------------|
| Node | Residential Population | | | Residential Demand (L/s) | | |
| | Units | | Total Population | Avg Day | Max. Daily | Peak Hour |
| | Units | POP | | | | |
| Proposed Development | 64 | 135 | 135 | 0.55 | 2.46 | 3.72 |
| Total Pop | 64 | 135 | 135 | 0.55 | 2.46 | 3.72 |

Design Parameters:

| | | |
|---|-----|----------|
| - 2 Bed Apartment | 2.1 | pop/unit |
| <u>Section 4.0 Ottawa Sewer Design Guidelines</u> | | |
| - Average Domestic Flow | 350 | L/day |
| Peaking Factors: Table 3-3 Moe Guideline | | |
| <u>Max. Daily Demand:</u> | | |
| - Residential | 4.5 | |
| <u>Peak Hourly Demand:</u> | | |
| - Residential | 6.8 | |

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines



Novatech #: 116168

Project Name: Byron / Ravenhill Avenue

Date: Nov 2/17

Input By: Matt Hrehoriak

Legend

Input by User

No Information or Input Required

Building Description: 3 Storey above ground 4 Unit apartment

| Step | | Choose | Multiplier Options | Value Used | Total Fire Flow (L/min) | |
|---------------------------------|--|--|--------------------|----------------|-------------------------|-------|
| Required Fire Flow | | | | | | |
| 1 | Construction Material | | | | | |
| | Coefficient related to type of construction C | Wood frame | Yes | 1.5 | 1.5 | |
| | | Ordinary construction | | 1 | | |
| | | Non-combustible construction | | 0.8 | | |
| | | Fire resistive construction (< 3 hrs) | | 0.7 | | |
| | | Fire resistive construction (> 3 hrs) | | 0.6 | | |
| 2 | Floor Area | | | | | |
| | A | Gross Floor Area (m ²) | 140 | | | |
| | | Number of Floors/Storeys | 3 | | | |
| | | Area of structure considered (m ²) | | | 420 | |
| F | Base fire flow without reductions | | | | 7,000 | |
| | F = 220 C (A)^{0.5} | | | | | |
| Reductions or Surcharges | | | | | | |
| 3 | Occupancy hazard reduction or surcharge | | | | | |
| | (1) | Non-combustible | Yes | -25% | -25% | 5,250 |
| | | Limited combustible | | -15% | | |
| | | Combustible | | 0% | | |
| | | Free burning | | 15% | | |
| | | Rapid burning | | 25% | | |
| 4 | Sprinkler Reduction | | | | | |
| | (2) | Adequately Designed System (NFPA 13) | No | -30% | | 0 |
| | | Standard Water Supply | No | -10% | | |
| | | Fully Supervised System | No | -10% | | |
| | | Cumulative Total | | | | |
| 5 | Exposure surcharge (cumulative (%)) | | | | | |
| | (3) | North Side | 10.1 - 20 m | | 15% | 3,938 |
| | | East Side | 0 - 3 m | | 25% | |
| | | South Side | 20.1 - 30 m | | 10% | |
| | | West Side | 0 - 3 m | | 25% | |
| | | Cumulative Total | | | 75% | |
| (1) + (2) + (3) | Total Required fire Flow, rounded to nearest 1000L/min | | | L/min | 9,000 | |
| | (2,000 L/min < Fire Flow < 45,000 L/min) | | | or | L/s | 150 |
| | | | | or | USGPM | 2,378 |
| | Required Duration of Fire Flow (hours) | | | Hours | 2 | |
| | Required Volume of Fire Flow (m ³) | | | m ³ | 1080 | |

Matthew Hrehoriak

From: Wu, John <John.Wu@ottawa.ca>
Sent: November-16-17 9:01 AM
To: Matthew Hrehoriak
Subject: RE: Byron Ravenhill Avenue Watermain Boundary Condition Request
Attachments: 116168 - WM-FIG 1 - Marked Up PDF.pdf

Here is the result:

******The following information may be passed on to the consultant, but do NOT forward this e-mail directly.******

The following are boundary conditions, HGL, for hydraulic analysis at 556-576 Byron, 436-446 Roosevelt, and 411-425 Ravenhill (zone 1W) assumed to be connected to the 152 mm on Byron, 152 mm on Roosevelt, and 152 mm on Ravenhill (see attached PDF for location).

Minimum HGL = 108.8 m (All connections)
Maximum HGL = 115.3 m (All connections)
Max Day + Fire Flow = 85.9 m (Connection 1)
Max Day + Fire Flow = 83.9 m (Connection 2)
Max Day + Fire Flow = 83.7 m (Connection 3)

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

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

John

From: Matthew Hrehoriak [mailto:m.hrehoriak@novatech-eng.com]
Sent: Monday, November 06, 2017 9:10 AM
To: Wu, John <John.Wu@ottawa.ca>
Cc: Cara Ruddle <c.ruddle@novatech-eng.com>
Subject: Byron Ravenhill Avenue Watermain Boundary Condition Request

Hi John,

Please find below water demand information for the proposed development at the existing 556-576 Byron Ave (even only), 436 & 446 Roosevelt Ave and 411-425 Ravenhill Ave (odd only) properties. Also, attached is a key plan showing the site location. Please provide boundary conditions for the existing watermain infrastructure highlighted on the attached plan so we can confirm the existing infrastructure has capacity for the proposed development.

Water Demands proposed development:

AVG DAY = 0.55L/s

MAX DAY = 2.46L/s

PEAK HOUR = 3.72L/s

MAX DAY + FIRE = 152.46L/s

Thanks.

Matthew Hrehoriak, B.Eng., EIT

NOVATECH Engineers, Planners & Landscape Architects

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CALCULATED WATER DEMANDS:

PROPOSED DEVELOPMENT (16-4UNIT APRTMENT BUILDINGS)

| | |
|------------------|-------------|
| AVERAGE DAY = | 0.550 L/s |
| MAXIMUM DAY = | 2.460 L/s |
| PEAK HOUR = | 3.720 L/s |
| MAX DAY + FIRE = | 152.460 L/s |

CITY OF OTTAWA BOUNDARY CONDITIONS:

BOUNDARY CONDITIONS BASED ON (ZONE 1W) CONNECTION TO 150mm DIA. WATERMAIN ON BYRON AVE.

| | |
|------------------|---------|
| MINIMUM HGL = | 108.8 m |
| MAXIMUM HGL = | 115.3 m |
| MAX DAY + FIRE = | 85.9 m |

BOUNDARY CONDITIONS BASED ON (ZONE 1W) CONNECTION TO 150mm DIA. WATERMAIN ON RAVENHILL AVE.

| | |
|------------------|---------|
| MINIMUM HGL = | 108.8 m |
| MAXIMUM HGL = | 115.3 m |
| MAX DAY + FIRE = | 83.7 m |

WATERMAIN ANALYSIS:

BYRON AVE WATERMAIN CONNECTIONS

AVERAGE GROUND ELEVATION = 68.0 m
APROX BYRON HYDRANT ELEV = 69.5 m

HIGH PRESSURE TEST = MAX HGL - AVG GROUND ELEV x 1.42197 PSI/m < 80 PSI
HIGH PRESSURE = 67.3 PSI

LOW PRESSURE TEST = MIN HGL - AVG GROUND ELEV x 1.42197 PSI/m > 40 PSI
LOW PRESSURE = 58.0 PSI

MAX DAY + FIRE TEST = MAX DAY + FIRE - AVG GROUND ELEV x 1.42197 PSI/m > 20 PSI
LOW PRESSURE = 23.3 PSI

RAVENHILL AVE WATERMAIN CONNECTIONS

AVERAGE GROUND ELEVATION = 68.0 m
APROX RAVENHILL HYDRANT ELEV = 66.5 m

HIGH PRESSURE TEST = MAX HGL - AVG GROUND ELEV x 1.42197 PSI/m < 80 PSI
HIGH PRESSURE = 67.3 PSI

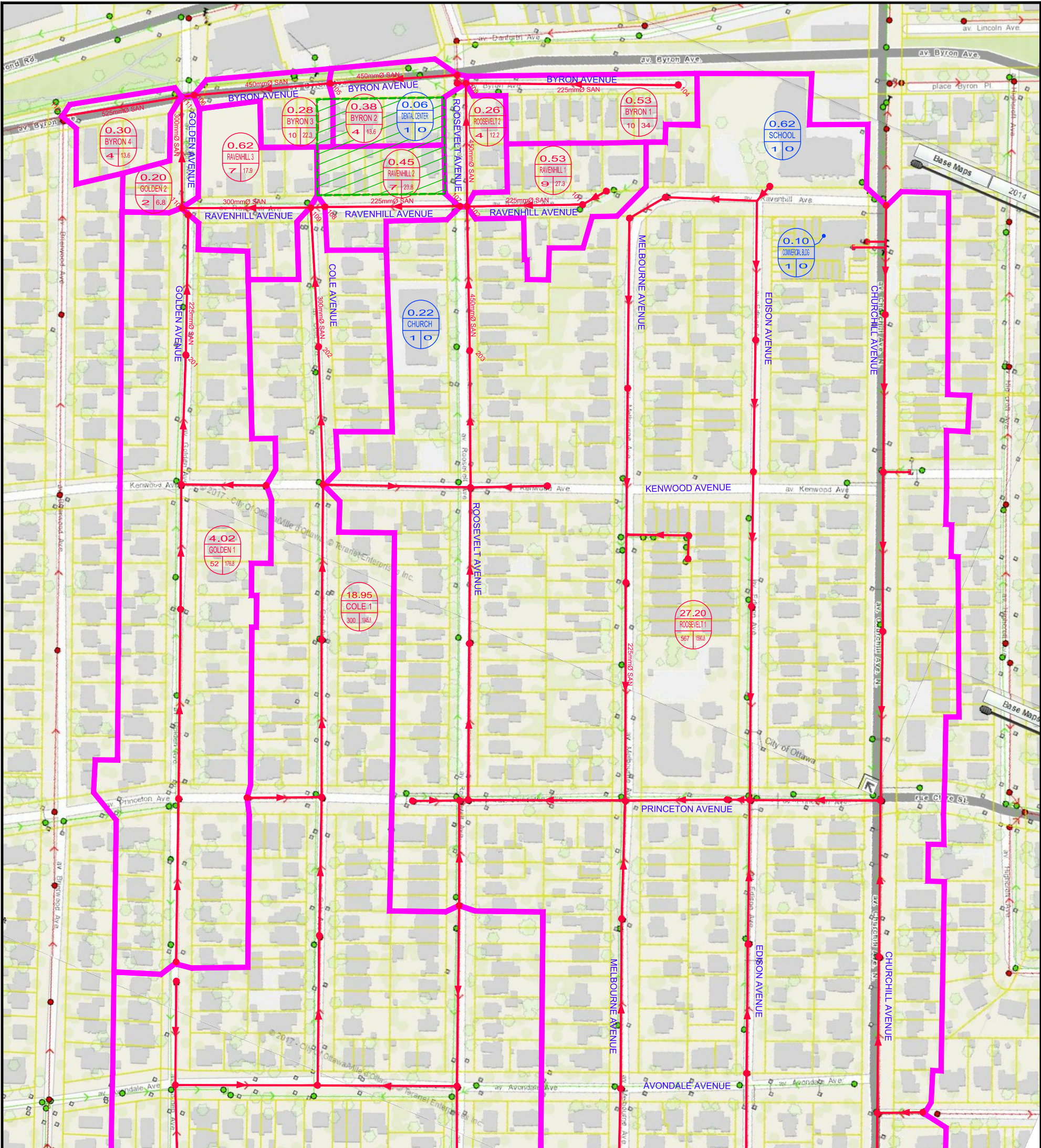
LOW PRESSURE TEST = MIN HGL - AVG GROUND ELEV x 1.42197 PSI/m > 40 PSI
LOW PRESSURE = 58.0 PSI

MAX DAY + FIRE TEST = MAX DAY + FIRE - AVG GROUND ELEV x 1.42197 PSI/m > 20 PSI
LOW PRESSURE = 24.5 PSI

THE EXISTING 150mm DIAMETER WATERMAIN IN BYRON AND RAVENHILL AVENUE PASSES ALL THREE ANALYSIS TESTS, THEREFORE THERE IS CAPACITY IN THE EXISTING INFRASTRUCTURE FOR THE PROPOSED ADDITION.

APPENDIX B

Sanitary Calculations



LEGEND

- 18.95

COLE 1

300 1063

DRAINAGE AREA (ha)
DRAINAGE AREA IDENTIFIER
RESIDENTIAL # UNITS / POPULATION
- 2.04

COMMUNITY CENTRE

1 0

INSTITUTIONAL / COMMERCIAL DEVELOPED AREA (ha)
DEVELOPMENT TYPE
UNITS / POPULATION
- SANITARY SEWER c/w MANHOLE AND FLOW DIRECTION
- DRAINAGE AREA BOUNDARY
- SUBJECT SITE BOUNDARY

CONTINUED ON SANITARY DRAINAGE PLAN 2



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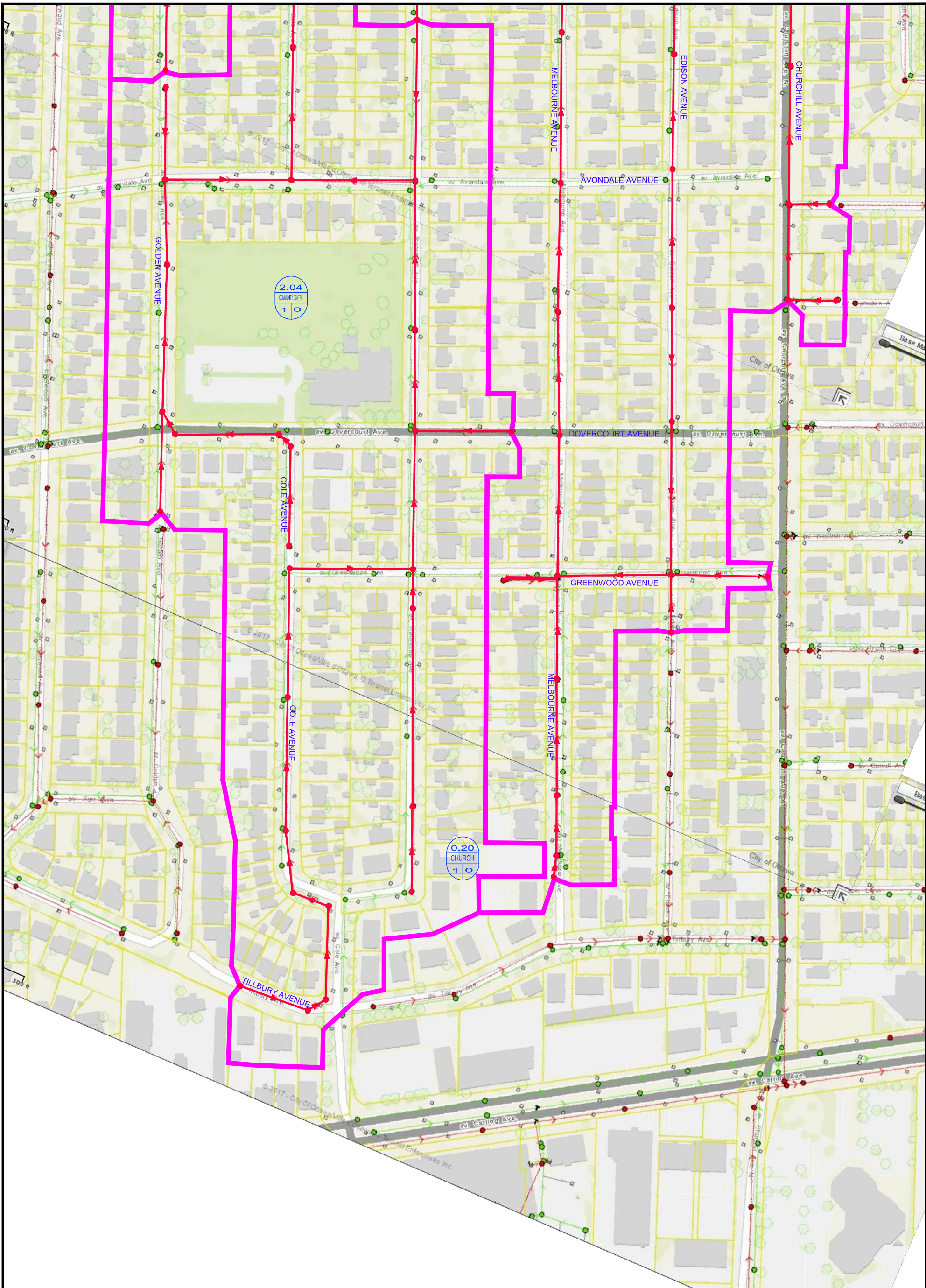
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com



BYRON/RAVENHILL
REZONING

SANITARY DRAINAGE
PLAN 1

| | | | |
|--------|----------|-----|--------|
| SCALE | 1 : 2500 | | |
| DATE | NOV 2017 | JOB | 116168 |
| FIGURE | A1 | | |



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BYRON/RAVENHILL
REZONING

SANITARY DRAINAGE
PLAN 2

SCALE 1 : 2500
DATE NOV 2017 JOB 116168 FIGURE A2

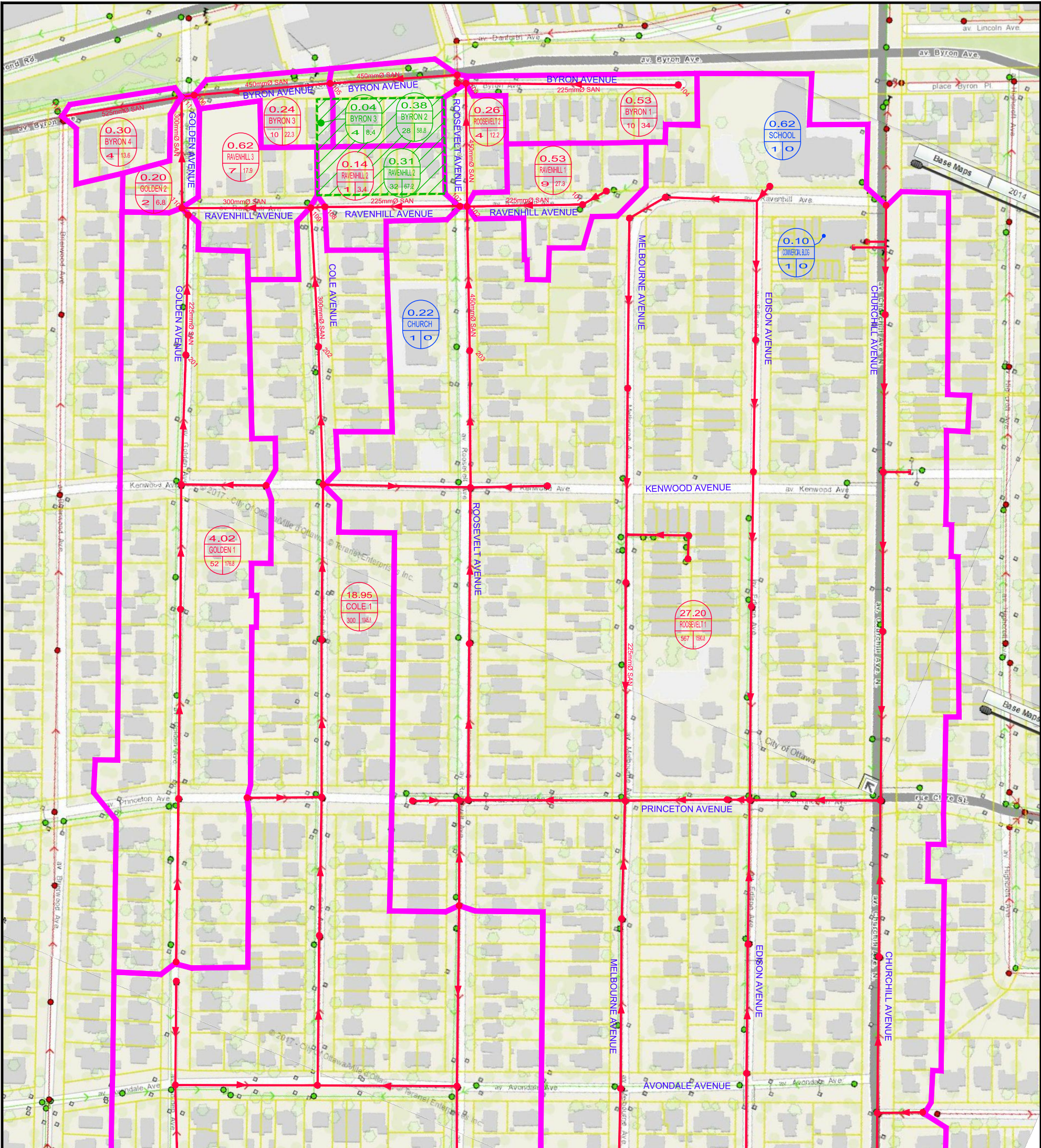
Existing Condition Sanitary Flows

| Location | | | Residential | | Institutional | | Cumulative | | Peak Factor | | Institutional | | Residential | Infiltration | | Foundation | | Peak Design Flow (l/s) | PIPE | | | | | |
|-----------------|------|-----|-------------|-----------|---------------|-----------------|------------|-----------|-----------------|-------------------|-----------------|-----------------|-----------------|--------------------|------------------|-------------------|------------------|------------------------|-----------|-----------|------------|----------------|----------------------|-------------------------|
| Street / Area | From | To | Population | Area (ha) | Area (ha) | Accu. Area (ha) | Pop. | Area (ha) | Res Peak Factor | Insti Peak Factor | Peak Flow (l/s) | Accu. Peak Flow | Peak Flow (l/s) | Infilt. Flow (l/s) | Accu Infil. Flow | Found. Flow (l/s) | Accu Found. Flow | | Size (mm) | Slope (%) | Length (m) | Capacity (l/s) | Full Flow Vel. (m/s) | Q/Q _{full} (%) |
| Roosevelt Ave 1 | 203 | 102 | 1590.8 | 27.20 | 0.94 | 0.94 | 1590.8 | 27.20 | 3.7 | 1.5 | 0.8 | 0.8 | 18.87 | | | 81.60 | 81.60 | 101.29 | 450 | 0.84 | 129.3 | 261.1 | 1.64 | 38.8% |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| Ravenhill Ave 1 | 101 | 102 | 27.3 | 0.53 | | | 27.3 | 0.53 | 4.0 | 1.5 | 0.0 | 0.0 | 0.35 | | | 1.59 | 1.59 | 1.94 | 225 | 1.68 | 72.9 | 58.1 | 1.46 | 3.3% |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| Roosevelt Ave 2 | 102 | 103 | 12.2 | 0.26 | | | 1630.3 | 27.99 | 3.7 | 1.5 | 0.0 | 0.8 | 19.30 | | | 0.78 | 83.97 | 104.09 | 450 | 1.18 | 110.3 | 309.5 | 1.95 | 33.6% |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| Byron Ave 1 | 104 | 103 | 34.0 | 0.53 | | | 34.0 | 0.53 | 4.0 | 1.5 | 0.0 | 0.0 | 0.44 | | | 1.59 | 1.59 | 2.03 | 225 | 0.50 | 190.3 | 31.7 | 0.80 | 6.4% |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| Byron Ave 2 | 103 | 105 | 13.6 | 0.38 | 0.06 | 0.06 | 1677.9 | 28.90 | 3.6 | 1.5 | 0.1 | 0.9 | 19.81 | | | 1.14 | 86.70 | 107.38 | 450 | 1.68 | 114.5 | 369.3 | 2.32 | 29.1% |
| Byron Ave 3 | 105 | 106 | 22.3 | 0.28 | | | 1700.2 | 29.28 | 3.6 | 1.5 | 0.0 | 0.9 | 20.05 | | | 0.84 | 87.54 | 108.46 | 450 | 1.18 | 122.2 | 309.5 | 1.95 | 35.0% |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| Ravenhill Ave 2 | 107 | 108 | 23.8 | 0.45 | | | 23.8 | 0.45 | 4.0 | 1.5 | 0.0 | 0.0 | 0.31 | | | 1.35 | 1.35 | 1.66 | 225 | 3.10 | 121.2 | 79.0 | 1.99 | 2.1% |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| Cole Ave 1 | 202 | 109 | 1045.8 | 18.95 | 2.24 | 2.24 | 1045.8 | 18.95 | 3.8 | 1.5 | 1.9 | 1.9 | 12.84 | | | 56.85 | 56.85 | 71.63 | 300 | 1.40 | 124.8 | 114.3 | 1.62 | 62.7% |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| Ravenhill Ave 3 | 109 | 110 | 17.9 | 0.62 | | | 1087.5 | 20.02 | 3.8 | 1.5 | 0.0 | 1.9 | 13.31 | | | 1.86 | 60.06 | 75.31 | 300 | 0.61 | 80.9 | 75.5 | 1.07 | 99.8% |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| Golden Ave 1 | 201 | 110 | 176.8 | 4.02 | | | 176.8 | 4.02 | 4.0 | 1.5 | 0.0 | 0.0 | 2.29 | | | 12.06 | 12.06 | 14.35 | 300 | 0.61 | 88.0 | 75.5 | 1.07 | 19.0% |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| Golden Ave 2 | 110 | 111 | 6.8 | 0.20 | | | 1271.1 | 24.24 | 3.7 | 1.5 | 0.0 | 1.9 | 15.37 | | | 0.60 | 72.72 | 90.03 | 300 | 1.20 | 70.0 | 105.8 | 1.50 | 85.1% |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| Byron TRUNK | 111 | 112 | 13.6 | 0.30 | | | 2984.9 | 53.8 | 3.4 | 1.5 | 0.0 | 2.8 | 33.32 | | | 0.90 | 161.16 | 197.29 | 525 | 0.30 | 75.0 | 235.4 | 1.09 | 83.8% |

Design Parameters

| | | |
|---|-----------------|--------------|
| Single Family | 3.4 | persons/unit |
| Average Apartments | 1.8 | persons/unit |
| Section 4.0 Ottawa Sewer Design Guidelines | | |
| - Average Domestic Flow Existing Development | 280 | l/person/day |
| - Average Domestic Flow Proposed Development | 350 | l/person/day |
| - Institutional / Commercial Flow | 50000 | l/ha/day |
| - Extraneous Flows (Only used in separated systems) | 0.28 | l/ha/day |
| - Foundation Drain Allowance | 3.0 | l/ha/day |
| Residential Peaking Factor | Harmon Equation | |
| Institutional / Commercial Peaking Factor | 1.5 | |

Notes: Used the Average Apt./Persons Per Unit Value of 1.8 when determining the apartment populations.
The number of units in an apartment buildings are assumed values.
Pipe information taken from Geo Ottawa
0.28L/s/ha Infiltration Allowance accounted for in 3 L/s/ha foundation drainage allowance



LEGEND

- 18.95

COLE 1

300 1063

EXISTING DRAINAGE AREA (ha)
DRAINAGE AREA IDENTIFIER
RESIDENTIAL # UNITS / POPULATION
- 2.04

COMMUNITY CENTRE

1 0

INSTITUTIONAL / COMMERCIAL DEVELOPED AREA (ha)
DEVELOPMENT TYPE
UNITS / POPULATION
- SANITARY SEWER c/w MANHOLE AND FLOW DIRECTION
- DRAINAGE AREA BOUNDARY
- 18.95

COLE 1

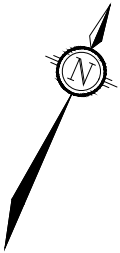
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PROPOSED DRAINAGE AREA (ha)
DRAINAGE AREA IDENTIFIER
RESIDENTIAL # UNITS / POPULATION
- SUBJECT SITE BOUNDARY



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BYRON/RAVENHILL
REZONING
SANITARY DRAINAGE PLAN 3
(PROPOSED DEVELOPMENT)

| | | | |
|--------|----------|-----|--------|
| SCALE | 1 : 2500 | | |
| DATE | NOV 2017 | JOB | 116168 |
| FIGURE | A3 | | |

Proposed Condition Sanitary Flows

| Location | | | Proposed Residential | | Existing Residential | | Institutional | | Cumulative | | Peak Factor | | Institutional | | Residential | Infiltration | | Foundation | | Peak | PIPE | | | | | |
|-----------------|------|-----|----------------------|-----------|----------------------|-----------|---------------|-----------------|------------|-----------|-----------------|-------------------|-----------------|-----------------|-----------------|--------------------|------------------|-------------------|------------------|-------------------|-----------|-----------|------------|----------------|----------------------|-------------------------|
| Street / Area | From | To | Population | Area (ha) | Population | Area (ha) | Area (ha) | Accu. Area (ha) | Pop. | Area (ha) | Res Peak Factor | Insti Peak Factor | Peak Flow (l/s) | Accu. Peak Flow | Peak Flow (l/s) | Infilt. Flow (l/s) | Accu Infil. Flow | Found. Flow (l/s) | Accu Found. Flow | Design Flow (l/s) | Size (mm) | Slope (%) | Length (m) | Capacity (l/s) | Full Flow Vel. (m/s) | Q/Q _{full} (%) |
| Roosevelt Ave 1 | 203 | 102 | | | 1590.8 | 27.20 | 0.94 | 0.94 | 1590.8 | 27.20 | 3.7 | 1.5 | 0.8 | 0.8 | 18.87 | | 0.00 | 81.60 | 81.60 | 101.29 | 450 | 0.84 | 129.3 | 261.1 | 1.64 | 38.8% |
| Ravenhill Ave 1 | 101 | 102 | | | 27.3 | 0.53 | | | 27.3 | 0.53 | 4.0 | 1.5 | | | 0.35 | | 0.00 | 1.59 | 1.59 | 1.94 | 225 | 1.68 | 72.9 | 58.1 | 1.46 | 3.3% |
| Roosevelt Ave 2 | 102 | 103 | | | 12.2 | 0.26 | | | 1630.3 | 27.99 | 3.7 | 1.5 | | 0.8 | 19.30 | | 0.00 | 0.78 | 83.97 | 104.09 | 450 | 1.18 | 110.3 | 309.5 | 1.95 | 33.6% |
| Byron Ave 1 | 104 | 103 | | | 34.0 | 0.53 | | | 34.0 | 0.53 | 4.0 | 1.5 | | | 0.44 | | 0.00 | 1.59 | 1.59 | 2.03 | 225 | 0.50 | 190.3 | 31.7 | 0.80 | 6.4% |
| Byron Ave 2 | 103 | 105 | 58.8 | 0.38 | 0.0 | 0.00 | 0.06 | 0.06 | 1723.1 | 28.52 | 3.6 | 1.5 | 0.1 | 0.9 | 20.47 | 0.11 | 0.11 | 0.00 | 85.56 | 107.01 | 450 | 1.68 | 114.5 | 369.3 | 2.32 | 29.0% |
| Byron Ave 3 | 105 | 106 | 8.4 | 0.04 | 22.3 | 0.24 | | | 1753.8 | 28.52 | 3.6 | 1.5 | | | 20.70 | 0.01 | 0.12 | 0.72 | 86.28 | 107.10 | 450 | 1.18 | 122.2 | 309.5 | 1.95 | 34.6% |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ravenhill Ave 2 | 107 | 108 | 67.2 | 0.31 | 3.4 | 0.14 | | | 70.6 | 0.14 | 4.0 | 1.5 | | | 1.13 | 0.09 | 0.09 | 0.42 | 0.42 | 1.64 | 225 | 3.10 | 121.2 | 79.0 | 1.99 | 2.1% |
| Cole Ave 1 | 202 | 109 | | | 1045.8 | 18.95 | 2.24 | 2.24 | 1045.8 | 18.95 | 3.8 | 1.5 | 1.9 | 1.9 | 12.84 | | 0.00 | 56.85 | 56.85 | 71.63 | 300 | 1.40 | 124.8 | 114.3 | 1.62 | 62.7% |
| Ravenhill Ave 3 | 109 | 110 | | | 17.9 | 0.62 | | | 1134.3 | 19.71 | 3.8 | 1.5 | | 1.9 | 14.04 | | 0.09 | 1.86 | 59.13 | 75.20 | 300 | 0.61 | 80.9 | 75.5 | 1.07 | 99.7% |
| Golden Ave 1 | 201 | 110 | | | 176.8 | 4.02 | | | 176.8 | 4.02 | 4.0 | 1.5 | | | 2.29 | | 0.00 | 12.06 | 12.06 | 14.35 | 300 | 0.61 | 88.0 | 75.5 | 1.07 | 19.0% |
| Golden Ave 2 | 110 | 111 | | | 6.8 | 0.20 | | | 1317.9 | 23.93 | 3.7 | 1.5 | | 1.9 | 16.09 | | 0.09 | 0.60 | 71.79 | 89.91 | 300 | 1.20 | 70.0 | 105.8 | 1.50 | 84.9% |
| Byron 4 | 111 | 112 | | | 13.6 | 0.30 | | | 3085.3 | 52.8 | 3.4 | 1.5 | | 2.8 | 34.69 | | 0.20 | 0.90 | 158.97 | 196.68 | 525 | 0.30 | 75.0 | 235.4 | 1.09 | 83.6% |

Design Parameters

| | | |
|--|-----------------|--------------|
| Single Family | 3.4 | persons/unit |
| Average Apartments | 1.8 | persons/unit |
| Section 4.0 Ottawa Sewer Design Guidelines | | |
| - Average Domestic Flow | 280 | l/person/day |
| - Average Domestic Flow Proposed Development | 350 | l/person/day |
| - Institutional / Commercial Flow | 50000 | l/ha/day |
| - Extraneous Flows | 0.28 | l/ha/day |
| - Foundation Drain Allowance | 3.0 | l/ha/day |
| Residential Peaking Factor | Harmon Equation | |
| Institutional / Commercial Peaking Factor | 1.5 | |

Notes: Used the Average Apt./Persons Per Unit Value of 1.8 when determining the apartment populations.
 The number of units in an apartment buildings are assumed values.
 Pipe information taken from Geo Ottawa

Foundation drain allowance not required for proposed developments as systems are required to be fully separated.
Foundation drain allowance replaced by extraneous flow in proposed development condition.