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Bridlewood 3
866, 898 Eagleson Road and 1335, 1365 Terry Fox Drive

Site Serviceability and Stormwater Management Report

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SITE SERVICEABILITY AND STORMWATER MANAGEMENT REPORT

Prepared for:

Claridge Homes (Bridlewood Trails Phase 3) Inc.

Prepared By:

NOVATECH
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario
K2M 1P6

January 11, 2019
Revised: May 24, 2019

Novatech File: 117153
Report Ref: R-2019-010

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May 24, 2019

City of Ottawa
Planning, Infrastructure and Economic Development Department
Planning Services Branch
110 Laurier Ave. West, 4th Floor
Ottawa, Ontario
K1P 1J1

Attention: **Mr. Don Herweyer, Manager of Development Review South**

Reference: **Bridlewood 3 – 866, 898 Eagleson Road and 1335, 1365 Terry Fox Drive**
Site Serviceability and Stormwater Management Report
Novatech File No.: 117153

Novatech has prepared this revised Site Serviceability and Stormwater Management Report on behalf of Claridge Homes (Bridlewood Trails Phase 3) Inc. to support a Draft Plan of Subdivision application and Zoning By-law Amendment for lands municipally known as 866, 898 Eagleson Road and 1335, 1365 Terry Fox Drive, Ottawa, Ontario.

Claridge Homes is proposing to develop a residential subdivision with 394 units: 47 single houses, 227 townhouses and 120 back-to-back townhouses. Two parks are proposed; a 1.03 ha park at the northwest corner which will expand on the existing park, and a 0.53 ha parkette south of the proposed development.

The report will address how Bridlewood 3 will be serviced with sanitary sewer, watermain, storm sewers, and stormwater management.

Should you have any questions or comments, please do not hesitate to contact us.

Sincerely,

NOVATECH

Marc St. Pierre
Senior Project Manager

c.c. Shawn Malhotra, Claridge Homes

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ENCLOSED CD

- Report (pdf)
- Drawings (pdf)
- PCSWMM Packaged Model Files

1.0 INTRODUCTION

Novatech has been retained by Claridge Homes (Bridlewood Trails Phase 3) Inc. to prepare this revised Site Serviceability and Stormwater Management Report in support of a Draft Plan of Subdivision and Zoning By-law Amendment (ZBLA) to allow for the development of the lands shown on **Figure 1** – Site Location known as 866, 898 Eagleson Road and 1335, 1365 Terry Fox Drive in Ward 23, Kanata South, herein called the 'Subject Site'.

This report outlines the servicing and proposed storm drainage and stormwater management strategy for the site.

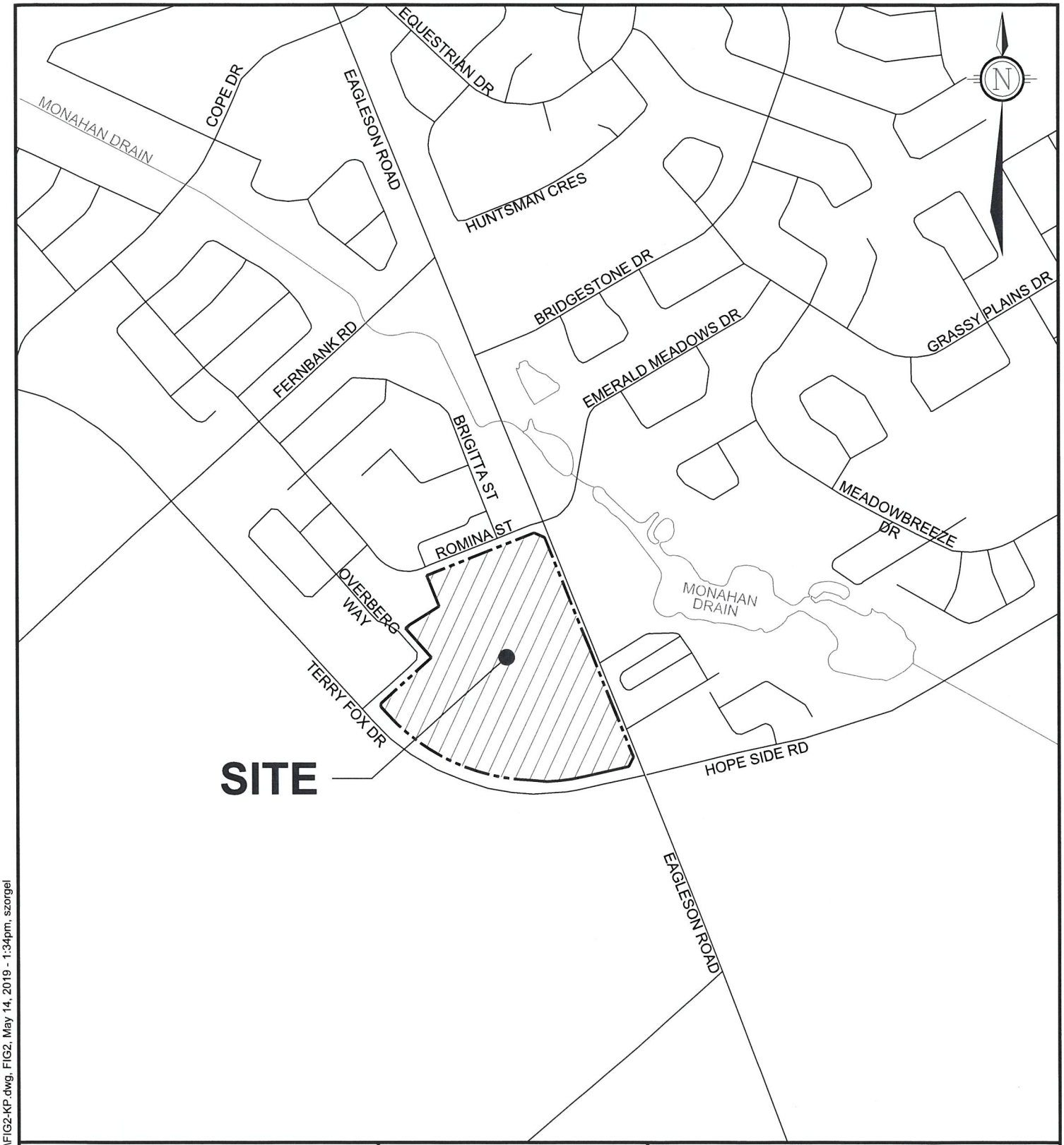
1.1 Background

The Subject Site is located at the corner of Eagleson Road and Terry Fox Drive as shown on **Figure 1** – Site Location: 866, 898 Eagleson Road and 1335, 1365 Terry Fox Drive.

Figure 1 – Site Location: 866, 898 Eagleson Road and 1335, 1365 Terry Fox Drive (Image Source: Google Maps, 2019)

The Subject Site is approximately 13.8 hectares in area and is bounded by Terry Fox Drive to the west and south, Romina Street and Overberg Way to the north, and Eagleson Road to the east. Refer to **Figure 2** – Key Plan.

The Subject Site has approximately 450 metres of frontage along Eagleson Road and approximately 510 metres of frontage along Terry Fox Drive. The topography is generally flat with a gentle slope from the southwest to the northeast towards Eagleson Road.



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CITY OF OTTAWA
866 EAGLESON ROAD
BRIDLEWOOD 3

KEY PLAN

1 : 10000 0 100 200 300 400

MAY 2019	117153	FIG2-KP

SHT8X11.DWG - 216mmx279mm

M:\2017\117153\CAD\Design\Figures\Design Brief\FIG2-KP.dwg, FIG2, May 14, 2019 - 1:34pm, szorgel

1.2 Existing / Planned Adjacent Land Uses

The Subject Site is undeveloped and consists of former farmland that has recently been overgrown by trees and grasses. The following describes the land uses adjacent to the Subject Site shown in **Figure 2** – Key Plan:

North: Residential lands known as Bridlewood Trails Phase 1 developed by Claridge containing a mix of low to medium-density developments abut the Subject Site.

East: The City of Ottawa owns and operates the Monahan Drain Stormwater Facility on the east side of Eagleson Road. These lands are also used as open space for the enjoyment of residents. Residential development has been constructed by Glenview Homes and Minto Communities immediately opposite of the Subject Site.

South and West: Across Terry Fox Drive, all lands are designated Agriculture Resource Area in the *Official Plan* and are used for such.

The proposed development of the Subject Site is as a residential subdivision, as shown on **Figure 3** – Concept Plan. The proposed residential subdivision will consist of a total of three hundred ninety four (394) units: fourty-seven (47) single houses, two hundred twenty-seven (227) townhouses and one hundred twenty (120) back-to-back townhouses.

1.3 Additional Reports

This report provides information on the considerations and approach by which Novatech has designed and evaluated the proposed servicing for the Bridlewood 3 Subdivision lands at 866 Eagleson Road. This report should be read in conjunction with the following:

- *Bridlewood 3, 866, 898 Eagleson Road and 1335, 1365 Terry Fox Drive, Ottawa, ON, Planning Rationale and Integrated Environmental Review, completed by Novatech, Ref. No.: R-2018-163, dated January 11, 2019;*
- *Bridlewood 3, 866, 898 Eagleson Road and 1335, 1365 Terry Fox Drive, Noise Impact Feasibility Report, completed by Novatech, Ref. No.: R-2019-011, dated May 24, 2019;*
- *Bridlewood 3, 866, 898 Eagleson Road and 1335, 1365 Terry Fox Drive, Traffic Impact Assessment, completed by Novatech, Ref. No.: R-2018-056, dated May 24, 2019;*
- *Bridlewood Trails Design Brief, completed by Novatech, Ref. No.: R-2006-134, dated June 16th, 2006;*
- *Bridlewood Trails Stormwater Management Report, completed by Novatech, Ref. No.: R-2006-037, dated September 13, 2006;*
- *Bridlewood Trails Phase 2 Design Brief, completed by Novatech, Ref. No.: R-2011-113, dated September 26, 2013;*
- *Bridlewood Trails Phase 2 Stormwater Management Report, completed by Novatech, Ref. No.: R-2011-118, dated June 7, 2013;*
- *Block 14 (Bridlewood Trails - Phase 2) Servicing Design Brief, completed by Novatech, Ref. No.: R-2015-079, dated January 18, 2019;*
- *Block 14 (Bridlewood Trails - Phase 2) Stormwater Management Report, completed by Novatech, Ref. No.: R-2018-045, dated January 18, 2019;*
- *Geotechnical Investigation, Proposed Residential Development, Eagleson Road at Terry Fox Drive – Ottawa, dated October 25, 2018 (Report No. PG3411-2).*

EAGLESON ROAD

BRIDLEWOOD TRAILS RETIREMENT COMMUNITY

BRIGITTA STREET

BRIDLEWOOD TRAILS PHASE 1

ROMINA STREET

STREET 3

STREET 4

STREET 3

STREET 5

STREET 5

STREET 2

STREET 2

STREET 2

STREET 6

STREET 1

STREET 8

STREET 1

STREET 7

STREET 1

OVERBERG WAY

OVERBERG WAY

TERRY FOX DRIVE

BLOCK 48

BLOCK 58

BLOCK 57

BLOCK 60

BLOCK 61

BLOCK 62

BLOCK 63

BLOCK 64

BLOCK 66

BLOCK 65

BLOCK 67

BLOCK 68

BLOCK 72

BLOCK 71

BLOCK 70

BLOCK 50

BLOCK 51

BLOCK 52

BLOCK 49

BLOCK 48

BLOCK 21

BLOCK 23

BLOCK 54

BLOCK 53

PARK BLOCK 22

PARK BLOCK 69

EXISTING PARK LANDS

BRIDLEWOOD TRAILS PHASE 2

BLOCK 14 - BRIDLEWOOD TRAILS PHASE 2

N

LEGEND

SITE BOUNDARY

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BRIDLEWOOD 3

CONCEPT PLAN

1 : 2000 0 20 40 60 80

MAY 2019	117153	FIG3-CP

M:\2017\117153\CAD\Design\Figures\Design Brief\FIG3-CP.dwg, FIG3-CP, May 14, 2019 - 1:46pm, szorgel

2.0 EXISTING CONDITIONS

2.1 Topography & Drainage

The Subject Site is undeveloped and consists of former farmland that has recently been overgrown by trees and grasses. Access to the site is currently provided off Romina Street and Terry Fox Drive via private gravel entrances. Refer to **Figure 4** – Existing Conditions Plan.

The site has a gentle slope from southwest to northeast with most overland flow being directed to the ditch along the side of Eagleson Road that outlets to the existing Monahan Drain.

There is an existing drainage ditch which crosses the site from west to east. The existing ditch was formerly known as the Monahan Drain Branch "A", which has been previously abandoned. This ditch previously captured drainage from lands to the west of Terry Fox Drive. The upstream system was supposed to be completely isolated during the widening of Terry Fox Drive in 2005 and currently serves to drain portions of the Subject Site. Refer to **Appendix A** for correspondence.

2.2 Subsurface Conditions

Paterson Group Inc. completed two (2) previous geotechnical investigations in support of development of the Subject Site. The first geotechnical investigation was as follows:

- *Preliminary Geotechnical Investigation, Eagleson Road at Terry Fox Drive Extension, Ottawa Ontario, dated September 8, 2006 (Report No. PG0881).* The fieldwork for this investigation was carried out in September 2006.

A second geotechnical investigation was conducted for previously proposed commercial lands which comprise part of the current development, and is as follows:

- *Geotechnical Investigation, Proposed Commercial Development, Eagleson Road – Ottawa, dated February 5, 2015 (Report No. PG3411-1).* The fieldwork for this investigation was carried out on January 15th, 2015.

The latest geotechnical investigation was conducted for the currently proposed residential development and is as follows:

- *Geotechnical Investigation, Proposed Residential Development, Eagleson Road at Terry Fox Drive – Ottawa, dated October 25, 2018 (Report No. PG3411-2).* The fieldwork for this investigation was carried out on September 7th and September 12th, 2018.

The principal findings of the Geotechnical Investigations are as follows:

- The latest work consisted of advancing three (3) boreholes to a maximum depth of 6.4m below ground surface and seven (7) test pits to a maximum depth of 2.4m below ground surface.
- The existing soil profile consists of having a layer of topsoil overlying a loose to very loose silty sand/sandy silt layer mixed with some clay followed by stiff to firm silty clay crust.
- Bedrock is expected to range from 25m-50m below grade.
- Groundwater is expected to range from 1.5m to 2.5m based on observations.
- There is an estimated permissible grade raise restriction of 1.0m to 1.2m for lot grading at the residential buildings and 1.7m to 1.9m for the proposed roadways. Based on a line bisecting the lands from north to south, the lands to the west have the 1.2m lot / 1.9m roadway restrictions.

The report provides engineering guidelines based on Paterson Group's interpretation of the borehole information and project requirements. Refer to the above-noted reports for complete details.

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CITY OF OTTAWA
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BRIDLEWOOD 3

EXISTING CONDITIONS

1 : 2000 (0, 20, 40, 60, 80)

MAY 2019	117153	FIG4-EX

SHT11X17 PLOT: 279mmX432mm

M:\2017\117153\CAD\Design\Figures\Design Brief\117153-FIG4.dwg, FIG 4 EX, May 14, 2019 - 1:58pm, szorgel

3.0 SANITARY SERVICING

3.1 Previous Studies

The Subject Site is located upstream of Phase 1 of the Bridlewood Trails Subdivision. The *Bridlewood Trails Design Brief, Prepared by Novatech, dated June 20th, 2006,* calculated the sanitary flows to outlet to Brigitta Street at Romina Street intersection. Sanitary flows in this original report were calculated to be 27.68L/s to outlet to the sanitary sewers on Brigitta Street. Refer to **Appendix B** for excerpts.

3.2 Existing Sanitary Sewer System for the Subject Site

Currently, there is an existing 375mm sanitary sewer along Brigitta Street to the north of the Subject Site. The sanitary sewer along Brigitta Street currently services the existing Bridlewood Trails Phase 1 subdivision and the Bridlewood Trails Retirement Community building. The Brigitta Street sewer ultimately outlets to the Hazeldean Pump Station via the sanitary pipe system in Fernbank Road, Eagleson Road, and Ackerson Road and through the Trailwest Subdivision. As mentioned above, the sanitary flows from the Subject Site have been accounted for within the existing sanitary sewer.

The emergency overflow outlet elevation for the Hazeldean Pump Station has been identified as 95.30m. All underside of footing (USF) elevations will be set at or above the overflow elevation. Please see **Appendix A** for correspondence.

3.3 Proposed Sanitary Sewer Outlet

Sanitary flows from the Subject Site are accounted for and will outlet directly to the 375mm sanitary sewer at Brigitta Street and Romina Street intersection. The proposed outlet is consistent with the approved *Design Brief* (Novatech, June 2006) as part of the subdivision approval for Bridlewood Trails Phase 1.

The proposed development can be serviced with a 375mm, 300mm, 250mm and 200mm sanitary sewer system. The proposed sanitary layout can be seen on **Figure 5** – Proposed Sanitary Layout.

3.4 Design Criteria

Sanitary sewers, for the proposed development, are designed based on criteria established by the City of Ottawa in the following documents:

- Section 4.0 of the City of Ottawa Sewer Design Guidelines (October 2012).
- Technical Bulletin ISTB-2018-01 from the City of Ottawa regarding new sanitary design parameters. Design parameters from this technical bulletin will supersede values within the Sewer Design Guidelines (2012).

The resulting design parameters are summarized as follows:

Commercial/Institutional flows = 28,000 L/ha/day
Industrial flows = 35,000 L/ha/day
Population Flow = 280 L/capita/day
Infiltration = 0.33 L/s/ha
Single Family Home = 3.4 persons per unit
Townhouse = 2.7 persons per unit
Back-to-Back Townhouse = 2.7 persons per unit

EAGLESON ROAD

BRIDLEWOOD TRAILS RETIREMENT COMMUNITY

BRIGITTA STREET

375mmØ

BRIDLEWOOD TRAILS PHASE 1

ROMINA STREET

STREET 1

STREET 2

STREET 3

STREET 4

STREET 5

STREET 6

STREET 7

STREET 8

EXISTING PARK LANDS

BRIDLEWOOD TRAILS PHASE 2

OVERBERG WAY

BLOCK 14 - BRIDLEWOOD TRAILS PHASE 2

TERRY FOX DRIVE

200mmØ

250mmØ

300mmØ

A1	A1-A3	0.51	59.4
A2	A2-A3	0.80	89.1
A3	A3-A7	0.22	27.0
A4	A4-A5	0.15	10.2
A5	A5-A6	0.89	23.8
A6	A6-A7	0.62	45.9
A7	A7-A13	0.06	0.0
A8	A8-A9	0.04	5.4
A9	A9-A13	0.56	70.2
A10	A10-A11	0.22	13.6
A11	A11-A12	0.13	6.8
A12	A12-A13	1.13	85.0
A13	A13-A18	0.30	21.6
A14	A14-A15	0.27	21.6
A15	A15-A18	0.72	64.8
A16	A16-A17	0.34	20.4
A17	A17-A18	1.58	137.7
A18	A18-A23	0.49	43.2
A19	A19-A20	0.09	5.4
A20	A20-A23	0.56	67.5
A21	A21-A22	0.65	43.2
A22	A22-A23	1.62	37.8*
A23	A23-A25	0.17	13.5
A24	A24-A25	0.54	75.6
A25	A25-A27	0.21	19.9
A26	A26-A27	0.17	13.5
A27	A27-A29	0.30	35.1
A28	A28-A29	0.39	40.5
A29	A29-EX	0.04	0

LEGEND

- SITE BOUNDARY
- PROPOSED SANITARY SEWER C/W FLOW DIRECTION
- EXISTING SANITARY SEWER C/W FLOW DIRECTION
- SANITARY DRAINAGE AREA BOUNDARY

AREA 1 / A1-A3 / 0.51 / 59.4

- AREA ID
- MANHOLE TO MANHOLE
- POPULATION EQUIVALENT
- AREA IN HECTARES

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PROPOSED SANITARY LAYOUT

1 : 2000 (0 20 40 60 80)

MAY 2019 | 117153 | FIG5-SAN

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Maximum Residential Peak Factor = 4.0
Harmon Correction Factor = 0.8
Industrial/Commercial/Institutional Peak Factor
= 1.0, if area is <20% of total contributing area
= 1.5, if area is >20% of total contributing area
Industrial Peaking Factor: As per Appendix 4-B of the City of Ottawa Sewer Design Guidelines
Minimum velocity = 0.6m/s
Manning's n = 0.013

3.5 Proposed Sanitary Sewer System

The calculated peak sanitary design flow for the development is 16.06 L/s. This represents a net reduction of approximately 40% in sanitary flows to the existing Brigitta Street sanitary sewer that was accounted for from the Bridlewood Trails Phase 1 design.

For detailed calculations refer to the Sanitary Sewer Design Sheet located in **Appendix B** and **Figure 5** – Proposed Sanitary Layout for sanitary drainage areas.

The reduced flows are based on 2 primary factors:

1) During the design of Bridlewood Trails Phase 2, a portion of the lands which had been accounted for as part of the original enterprise lands outletting to the existing Brigitta Street sanitary sewer system were redirected through the Bridlewood Trails Phase 2 lands. The areas in question are the proposed residential lands south of Tulum Crescent, that also includes the Block 14 residential development. This resulted in a sanitary flow reduction of approximately 2.82 L/s. Refer to excerpts from *Bridlewood Trails Phase 2 Design Brief by Novatech dated September 26, 2013* in **Appendix B**.

2) Secondly, the initial calculations in *Bridlewood Trails Design Brief,* were based on commercial, mixed use and light industrial land uses using an average flow per gross hectare (ha) of 35,000 L/gross ha/day for light industrial and 50,000 L/gross ha/day for mixed-use and commercial use having a total area of 16.0 ha. A peaking factor (3.9) was applied to the light industrial areas. The change of land use to residential, reduced drainage area of 13.8ha and corresponding reduction in residential design flows based on City of Ottawa Technical Bulletin ISTB-2018-01, results in an additional reduction in the design flows of approximately 8.78 L/s.

As mentioned, the proposed sanitary flows directed to the Brigitta Street sanitary sewer will be significantly less than previously calculated.

<u>Outlet to Brigitta Street Trunk Sewer</u>

Proposed sanitary flows outletting to the Brigitta Street sanitary sewer versus the calculated sanitary flows from the previous Bridlewood Trails Phase 1 Design Brief are listed in **Table 3.1.**

Table 3.1: Sanitary Flow Summary Outletting to Brigitta Street

Development Condition	Population	Area (ha)	Peak Flow (L/s)	Peak Ext. Flow (L/s)	Peak Design Flow (L/s)
Bridlewood Trails Phase 1 Approved Design Calculation (Business Park)*					
Mixed Use		1.40	1.22	0.39	**1.61**
Light Industrial		12.50	19.75	3.50	**23.25**
Commercial		2.46	2.14	0.69	**2.82**
2006 Design Totals		**16.36**	**23.11**	**4.58**	**27.68**
Bridlewood 3 Design Calculation (Residential)					
Residential**	394	13.8	11.51	4.55	**16.06**
Net Reduction		**2.56ha**	**11.57L/s**	**0.03L/s**	**11.62L/s**

**Based on Bridlewood Trails Design Brief, Prepared by Novatech, dated June 20th, 2006.*
***Includes parkland contribution (area and sanitary peak flows).*

The total proposed sanitary flow directed to the existing 375mm sanitary sewer on Brigitta Street from the Subject Site is 16.06 L/s, which represents an approximate 40% decrease in sanitary flows compared to the calculated flows in the original *Bridlewood Trails Design Brief* of 27.68 L/s. This indicates there will be adequate capacity in the Brigitta Street sanitary sewers to accommodate the proposed development.

For design sheet, drainage plans and design parameters from the *Bridlewood Trails Phase 1 Design Brief and Bridlewood Trails Phase 2 Design Brief*, refer to excerpts in **Appendix B**.

The underside of footing elevations are governed by an emergency overflow elevation at the Hazeldean pump station of 95.30m. All USF elevations will have a minimum elevation of 95.30m.

3.6 Deviations

The site is subject to grade raise restrictions. The sanitary sewer outlet elevation is fixed based on the as-built elevations of the sanitary sewer on Brigitta Street.

In order to limit the overall grade raise and avoid crossing conflicts with the proposed storm sewer, it is proposed that the local sewers be oversized where possible to allow a lower pipe slope.

All flow velocities have been calculated to exceed the minimum full flow velocity (0.6 m/s) specified in the City of Ottawa Sewer Design Guidelines. The peak flow depth to diameter ratio has also been calculated for all pipes larger than 200mm diameter. Refer to the Sanitary Sewer Design Sheet located in **Appendix B.** The sanitary sewers have been designed in accordance with the City of Ottawa Sewer Design Guidelines to achieve self cleansing velocities with a peak flow depth to diameter ratio of 0.3 or greater for sewers 250mm diameter and larger.

4.0 WATERMAIN

4.1 Proposed Watermain System

A preliminary hydraulic analysis was performed for the Bridlewood 3 lands. It is proposed to service the Subject Site with 200mm watermain and localized 50mm with two connections to the existing watermains. The first connection will be made to the 300mm watermain on Romina Street at the northern servicing Block 2 at Brigitta Street. The second connection will be made to the 200mm watermain on Overberg Way in the northwest corner of the site. **Figure 6** – Proposed Watermain Layout highlights the proposed works and connection points. All existing watermain boundary conditions were provided by the City of Ottawa and are included in **Appendix C**.

4.2 Design Criteria

Fire flow demands have been calculated as per the Fire Underwriter's Survey (FUS) and are included in **Appendix C**. As per the City of Ottawa's technical bulletin ISTB-2014-02 (Revisions to Ottawa Design Guidelines – Water), the majority of the standard townhouse fireflows have been capped at 10,000 L/min (167L/s), however back-to-back towns range from 217L/s to 283L/s and single units range from 167L/s to 250L/s. Watermain analysis was completed based on the following criteria:

Demands:

- Single Density — 3.4 persons/unit
- Townhouse Density — 2.7 persons/unit
- Back-to-Back Density — 2.7 persons/unit
- Average Daily Demand — 350 L/capita/day
- Max. Daily Demand — 2.5 x Average Daily Demand
- Peak Hour Demand — 2.2 x Maximum Daily Demand
- Fire Flow Demand — Fire Underwriters Survey

System Requirements:

- Max. Pressure (Unoccupied Areas) — 690 kPa (100 psi)
- Max. Pressure (Occupied Areas) — 552 kPa (80 psi)
- Min. Pressure — 276 kPa (40 psi) excluding fire flows
- Min. Pressure (Fire) — 138 kPa (20 psi) including fire flows
- Max. Age (Quality) — 192 hours (onsite)

Friction Factors:

Watermain Size	C-Factor
50mm	100
200 mm	110
300 mm	120 (existing on Romina Street for fireflow purposes)

EAGLESON ROAD

BRIDLEWOOD TRAILS RETIREMENT COMMUNITY

BRIGITTA STREET

CONNECT TO EXISTING 300mmØ WATERMAIN T/WM=94.20

BRIDLEWOOD TRAILS PHASE 1

ROMINA STREET

STREET 3

STREET 4

STREET 3

STREET 5

STREET 5

STREET 2

STREET 2

STREET 1

STREET 6

STREET 1

STREET 8

STREET 1

STREET 1

STREET 7

OVERBERG WAY

OVERBERG WAY

EXISTING PARK LANDS

CONNECT TO EXISTING 200mmØ WATERMAIN T/WM=95.26

BRIDLEWOOD TRAILS PHASE 2

BLOCK 14 - BRIDLEWOOD TRAILS PHASE 2

TERRY FOX DRIVE

200mmØ

50mmØ

LEGEND

SITE BOUNDARY

PROPOSED WATERMAIN

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BRIDLEWOOD 3

PROPOSED WATERMAIN LAYOUT

1 : 2000 (0, 20, 40, 60, 80)

MAY 2019	117153	FIG6-WM

M:\2017\117153\CAD\Design\Figures\Design Brief\117153-DESIGN_FIGS.dwg, WM, May 23, 2019 - 9:09am, szorgel

Hydraulic modelling of the Subject Site was completed using EPANET 2.0. EPANET is public domain software capable of modeling municipal water distribution systems by performing simulations of the water movement within a pressurized system. EPANET utilized the Hazen-Williams equation to predict the performance of the proposed watermain and considered the following input parameters: water demand, pipe length, pipe diameter, pipe roughness, and pipe elevation.

4.3 Hydraulic Analysis

Table 4.1 summarizes the watermain operating conditions during the high pressure, maximum daily demand and fire flow, and peak hour demands. Results of the hydraulic analysis are included in **Appendix C**. Refer to **Figure WM** – Proposed Watermain Node Network, provided in **Appendix C**, for details about the node and pipe network.

Table 4.1: Water Demand Summary

Condition	Demand (L/s)	Fire Flow (L/s)	Allowable Max/Min Pressure (kPa/psi)	Max/Min Pressure (kPa/psi)	Time (hours)
High Pressure	4.44	N/A	552/80 (Max)	634.5/92.60	19.3
Maximum Daily Demand	11.11	283 (Max FF)	138/20 (Min)	247.9/35.95 (FF=217L/s)	N/A
Peak Hour	24.43	N/A	276/40 (Min)	572.7/83.1	N/A

The analysis confirms the proposed watermain can service the Subject Site under all operating conditions. It is noted that pressure in the main is greater than 552 kPa/80psi during the high pressure and peak hour condition for all the lots and blocks, therefore the use of pressure reducing values will be considered during detailed design.

A copy of the boundary conditions provided by the City of Ottawa, fire flow calculations, detailed hydraulic analysis results, and watermain layout figure are included in **Appendix C**.

4.4 Deviations

The watermain has been located on the side of the street that is most favorable to crossings between the sanitary and storm sewer.

The site is subject to grade raise restrictions. The sanitary and storm sewer outlet elevations are fixed based on the as-built elevations of the sanitary and storm sewer on Brigitta Street. In order to limit the overall grade raise and avoid crossing conflicts between the proposed sewers, it is proposed that the local sewers be oversized where possible to allow a lower pipe slope. Additionally, the depth of sewers can be limited by sanitary sewers crossing under upstream pipes rather than downstream (larger pipe sizes) at intersections. Therefore, the watermain has been located on the side of the street that improves crossings and clearances between the sanitary and storm sewer.

5.0 STORM SEWER SYSTEM AND STORMWATER MANAGEMENT

The Subject Site is located within the catchment of the Monahan Drain, and will outlet to Cell 2 of the Monahan Drain Constructed Wetlands Stormwater Management (SWM) Facility.

5.1 Existing Conditions

Under existing conditions, storm runoff from the majority of the site flows overland from the southwest corner of the site to the northeast corner. Runoff from the site crosses Eagleson Road (just south of Romina Street) via a culvert, into the Wetland Cell (Cell 4) of the Monahan Drain Constructed Wetlands. Refer to **Figure 4** – Existing Conditions Plan.

A small amount of storm runoff is directed towards the roadside ditch along the east side of Terry Fox Drive, which ultimately outlets to the Wetland Cell (Cell 4). Some of the runoff through this ditch is then being directed through an abandoned branch of the Monahan Drain. Under ultimate conditions, flows through this ditch will be completely blocked at the Bridlewood 3 property line and the City of Ottawa will redirect the roadside drainage as required within the City of Ottawa right-of-way. Refer to **Appendix A** for the related correspondence.

5.2 25 Overberg Way (Block 14) Outlet

Interim Conditions

Located to the west of the site is the proposed 25 Overberg Way (Block 14) residential development. Refer to **Figure 1** – Site Location. Construction of the Block 14 lands will be completed before construction of Bridlewood 3 begins. Under interim conditions, storm runoff from Block 14 will outlet to a temporary outlet ditch which cuts through the subject site. The temporary outlet ditch has been sized to convey the 100-year outflows from the Block 14 development, as well as the small 1.07 ha drainage area of the subject site that is tributary to the ditch. Refer to **Figure 7** – Proposed Storm Layout for the location of the interim ditch, and to the *Block 14 (Bridlewood Trails - Phase 2) Stormwater Management Report, by Novatech, dated September 19, 2018* for further details.

Ultimate Conditions

Under ultimate conditions, storm runoff from Block 14 (and a portion of Bridlewood Trails Phase 2) will be directed through storm sewers in Overberg Way, and into the storm sewers of the subject site. The existing storm sewer located on Overberg Way south of the Block 14 storm sewer outlet will be removed and reinstalled with the existing right of way drainage (minor system) being directed to the new storm sewer system.

5.3 Stormwater Management Criteria

The subject site is located within the Monahan Drain catchment, which is located within the Jock River subwatershed, which falls under the jurisdiction of the Rideau Valley Conservation Authority. The stormwater management criteria used in the design of Subject Site has been adapted from the *Bridlewood Trails Phase 2 Stormwater Management Report, by Novatech, June 7, 2013* and the City of Ottawa Sewer Design Guidelines (October 2012). Technical Bulletins PIEDTB-2016-01, ISTB-2018-01, ISTB-2018-02, and ISTB-2018-03 were also consulted in the development of the criteria.

EAGLESON ROAD

BRIDLEWOOD TRAILS RETIREMENT COMMUNITY

BRIGITTA STREET

375mmØ

1095x1730mmØ

975x1535mmØ

REMOVE EXISTING HEADWALL AND CONNECT TO EXISTING 975x1535mmØ STM CAP INV.=93.75

BRIDLEWOOD TRAILS PHASE 1

ROMINA STREET

EXISTING STORM OUTLET SERVICING 25 OVERBERG WAY (BLOCK 14) TO BE ABANDONED AND BACKFILLED

EXISTING PARK LANDS

CONNECT TO EXISTING STORM

BRIDLEWOOD TRAILS PHASE 2

OVERBERG WAY

REMOVE AND RELAY EXISTING STORM SEWER TO SERVICE 25 OVERBERG WAY (BLOCK 14)

REMOVE AND RELAY EXISTING STORM SEWER

TERRY FOX DRIVE

STREET 1

STREET 2

STREET 3

STREET 4

STREET 5

STREET 6

STREET 7

STREET 8

BERG WAY

A1A	0.22 ha	0.65
A1B	0.24 ha	0.65
A2A	0.29 ha	0.65
A2B	0.39 ha	0.65
A3	0.61 ha	0.65
A4	0.33 ha	0.65
A5A	1.03 ha	0.45
A5B	0.14 ha	0.65
A6	0.09 ha	0.65
A7	0.49 ha	0.65
A8A	0.29 ha	0.65
A8B	0.66 ha	0.62
A9	0.22 ha	0.65
A10	0.55 ha	0.65
A11A	0.14 ha	0.65
A11B	0.48 ha	0.65
A12A	0.30 ha	0.65
A12B	0.37 ha	0.65
A13A	0.32 ha	0.65
A13B	0.84 ha	0.65
A14	0.28 ha	0.65
A15	0.92 ha	0.65
A16	0.19 ha	0.65
A17	0.43 ha	0.65
A18	0.10 ha	0.65
A19	0.22 ha	0.65
A20	1.86 ha	0.41
A21	0.12 ha	0.65
A22	0.49 ha	0.65
A23	0.14 ha	0.65
A24	0.32 ha	0.65
A25	0.26 ha	0.65
A26	0.26 ha	0.65
A27	0.20 ha	0.65
BLK14	0.63 ha	0.83
U1	0.15 ha	0.65

LEGEND

- SITE BOUNDARY
- PROPOSED STORM SEWER C/W FLOW DIRECTION
- EXISTING STORM SEWER C/W FLOW DIRECTION
- A1A 0.22ha 0.65 — AREA IDENTIFICATION; DRAINAGE AREA (hectares); RUN-OFF COEFFICIENT

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CITY OF OTTAWA
866 EAGLESON ROAD
BRIDLEWOOD 3

PROPOSED STORM LAYOUT

1 : 2000 (0, 20, 40, 60, 80)

MAY 2019 | 117153 | FIG7-STM

5.3.1 Minor System (Storm Sewers)

- Storm sewers are to be designed using the Rational Method for a 1:2-year return period;
- Inlet control devices (ICDs) are to be used to control inflows to the storm sewers;
- The allowable release rate to the downstream storm system at Brigitta Street is 1853 L/s, as determined in the *Bridlewood Trails Phase 1 Stormwater Management Report, by Novatech, September 13, 2006*;
- Ensure that the 100-year hydraulic grade line in the storm sewer is at least 0.3 m below the underside of footing (USF) elevations for both existing and proposed development.

5.3.2 Major System

- Maximum depth of flow (static + dynamic) on local and collector streets shall not exceed 0.35 m during the 100-year event. The depth of flow may extend 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;
- Runoff that exceeds the available storage in the right-of-way will be conveyed overland along defined major system flow routes towards the proposed major system outlet to the SWM Facility. There must be at least 15cm of vertical clearance between the spill elevation on the street and the ground elevation at the building envelope that is in the proximity of the flow route or ponding area;
- Although rear yard storage cannot be accounted for in computer modelling, the effect of flow attenuation can be accounted for by assuming a constant slope ditch/swale draining to the street with the following geometry:
    - A minimum slope of 1.5%;
    - A depth ranging between 150mm (min) and 600mm (max); and
    - Maximum side slopes of 3H:1V.
- The product of the 100-year flow depth (m) on street and flow velocity (m/s) shall not exceed 0.60;

5.3.3 Water Quality / Quantity Control

- Storm runoff will be directed to Cell 2 of the Monahan Drain Constructed Wetlands, which has been designed to provide quantity control for the proposed development.
- Quality control will be provided by the Chamber B Vortechnics Model 1827 CIP unit located at the southern storm outfall to Cell 2 of the Monahan Drain Constructed Wetlands, which has been designed to provide an *Enhanced* (80% long-term TSS removal) level of water quality control.

5.4 Storm Servicing Design

Storm servicing for the subject development will be provided using a dual drainage system: Runoff from frequent events will be conveyed by storm sewers (minor system), while flows from large storm events which exceed the capacity of the minor system will be conveyed overland along defined overland flow routes (major system).

5.4.1 Minor System (Storm Sewers)

The storm sewers comprising the minor system have been designed in accordance with Technical Bulletin PIEDTB-2016-01 (September 2016). Storm sewer design sheets are provided in **Appendix D**.

The design criteria used to size the storm sewers are summarized in **Table 5.1**.

Table 5.1: Storm Sewer Design Parameters

Parameter	Design Criteria
Local Roads	2 Year Return Period
Storm Sewer Design	Rational Method / PCSWMM
IDF Rainfall Data	Ottawa Sewer Design Guidelines
Initial Time of Concentration (T_c)	10 min
Minimum Velocity	0.8 m/s
Maximum Velocity	3.0 m/s
Minimum Diameter	250 mm

Allowable Release Rate

The allowable release rate to the Brigittia Street storm sewer (1853 L/s) was determined in the *Bridlewood Trails Phase 2 Stormwater Management Report*.

In addition to the storm runoff from the subject site, the maximum peak flow at the connection to the sewer at Brigitta Street includes storm runoff from a portion of the Bridlewood Trails Phase 2 development, and the Block 14 development. Refer to the storm sewer design sheets, Storm Drainage Area Plan for Phase 1 (103031-STM), and supporting documentation has been provided in **Appendix D**.

Inlet Control Devices

Inflows to the storm sewers will be controlled using inlet control devices (ICDs) sized to ensure no ponding in the right-of-ways during the 2-year event.

5.4.2 Major System (Overland Flow)

The major system design will conform to the design standards outlined in the Ottawa Sewer Design Guidelines (October 2012) and Technical Bulletin PIEDTB-2016-01 (September 2016). During detailed design, the right-of-way will be graded to provide sufficient storage to contain the major system runoff from storm events exceeding the minor system capacity for all storms up to and including the 100-year design event. The site will be graded to provide an engineered overland flow route for large, infrequent storms, or in the event that the storm sewer system becomes obstructed, with the majority of major system flows routed to the Monahan Drain Cell 2.

Infiltration Best Management Practices

Infiltration of surface runoff will be accomplished using lot level and conveyance controls. The most suitable practices for groundwater infiltration include:

- Infiltration of runoff captured by rear yard catchbasins;
- Direct roof leaders to rear yard areas;
- Infiltration trenches underlying drainage swales in park areas;
- The use of fine sandy loam topsoil in parks and on residential lawns.

By implementing infiltration Best Management Practices as part of the storm drainage design for the subject site, the impacts of development on the hydrologic cycle can be considerably reduced.

5.4.3 SWM Facility – Monahan Drain Constructed Wetlands Cell 2

The existing Chamber B Vortechs Model 1827 CIP immediately upstream the southern outlet to Cell 2 of the Monahan Drain Constructed Wetlands has been designed to provide water quality control for a portion of Bridlewood Trails Phases 1 and 2, all of Block 14, and all of the Subject Site. The proposed development does not exceed the originally allocated drainage area and runoff coefficient for the Subject Site used to size the Vortechs unit.

Surface storage will be provided within the road sags. Stormwater will pond during infrequent (>2-year) storm events, with no surface ponding during the 2-year event. The Monahan Drain Constructed Wetlands has been designed to accommodate post-development runoff from the Subject Site.

5.5 Hydrologic & Hydraulic Modeling (PCSWMM)

The *City of Ottawa Sewer Design Guidelines* (October 2012) require hydrologic modeling for all dual drainage systems. The performance of the proposed storm drainage system for the subject site was evaluated using the PCSWMM hydrologic/hydraulic model.

The PCSWMM model is a semi-lumped model that represents both the minor and major system flows from the development. The results of the analysis were used to:

- Simulate major and minor system runoff from the site;
- Determine the storm sewer hydraulic grade line for the 100-year storm event;
- Ensure the allowable release rate to the downstream storm system at Brigitta Street (1853 L/s) is not being exceeded.

5.5.1 Design Storms

The hydrologic analysis was completed using the following synthetic design storms and historical storms. The IDF parameters used to generate the design storms were taken from the *Ottawa Design Guidelines – Sewer* (November 2004).

4 Hour Chicago Storms:
2-year 4hr Chicago storm
5-year 4hr Chicago storm
100-year 4hr Chicago storm
100-year 4hr +20% Chicago storm

12 Hour SCS Type II Storms:
2-year 12hr SCS Type II storm
5-year 12hr SCS Type II storm
100-year 12hr SCS Type II storm

The 4-hour Chicago distribution generates the highest peak flows for both the minor and major systems and was determined to be the critical storm distribution for the design of the storm drainage system.

The proposed drainage system has also been stress tested using a 4-hour Chicago design storm that has a 20% higher intensity and total volume compared to the 100-year event.

5.5.2 Model Parameters

The catchment areas for the subject site are shown on **Figure 7**. For modeling purposes at this design stage, the subcatchment areas have been discretized as semi-lumped areas and do not represent each individual sewer section. At the detailed design stage, the catchment areas will be refined to reflect the areas tributary to each inlet of the sewer system.

The hydrologic parameters for each lumped subcatchment were developed based on the Concept Plan (**Figure 3**) and the Stormwater Management Plan specified above. An overview of the modeling parameters is provided in **Table 5.2**.

Table 5.2: Model Parameters

Area ID	Catchment Area (ha)	Runoff Coefficient (C)	Percent Impervious (%)	No Depression (%)	Equivalent Width (m)	Average Slope (%)
B3-01	1.50	0.51	44%	30%	213.5	0.5%
B3-02	1.75	0.65	64%	40%	393.3	0.5%
B3-03	1.26	0.65	64%	40%	283.5	0.5%
B3-04	0.49	0.65	64%	40%	110.7	0.5%
B3-05	1.83	0.65	64%	40%	411.5	0.5%
B3-06	1.17	0.65	64%	40%	240.0	0.5%
B3-07	1.09	0.65	64%	40%	245.3	0.5%
B3-08	1.86	0.41	30%	40%	280.0	0.5%
B3-09	1.20	0.65	64%	40%	270.5	0.5%
B3-10	0.63	0.65	64%	40%	141.8	0.5%
B3-11	0.46	0.65	64%	40%	104.0	0.5%
B3-12	0.72	0.65	64%	40%	162.0	0.5%
TOTAL:	**13.95**					

Runoff Coefficient/ Impervious Values

Impervious (%IMP) values for each subcatchment area were calculated based on the Runoff Coefficients noted on **Figure 7** using the equation:

$$\%IMP = \frac{(C - 0.2)}{0.7}$$

Depression Storage

The default values for depression storage in the City of Ottawa were used for all catchments.

- Depression Storage (pervious areas): 4.67 mm
- Depression Storage (impervious areas): 1.57 mm

Residential rooftops are assumed to provide no depression storage and all rainfall is converted to runoff. The percentage of rooftop area to total impervious area is represented by the 'no depression storage' column in **Table 5.2**.

Equivalent Width

'Equivalent Width' refers to the width of the subcatchment flow path. For some areas, this parameter is calculated as described in the *Sewer Design Guidelines, October 2012, Section 5.4.5.6*. Since some of the smaller subcatchment areas have been lumped into larger areas, a value of 225m per ha has been used for these areas.

Infiltration

Infiltration losses for all catchment areas were modeled using Horton's infiltration equation, which defines the infiltration capacity of the soil over the duration of a precipitation event using a decay function that ranges from an initial maximum infiltration rate to a minimum rate as the storm progresses. The default values for the City of Ottawa were used for all catchments.

Horton's Equation:
$f(t) = f_c + (f_o - f_c)e^{-k(t)}$

Initial infiltration rate: f_o = 76.2 mm/hr
Final infiltration rate: f_c = 13.2 mm/hr
Decay Coefficient: k = 4.14/hr

Depression Storage

The default values for depression storage in the City of Ottawa were used for all catchments.

- Depression Storage (pervious areas): 4.67 mm
- Depression Storage (impervious areas): 1.57 mm

Residential rooftops are assumed to provide no depression storage and all rainfall is converted to runoff.

Major System Storage

Since the major system has not yet been fully designed, major system storage is represented in the PCSWMM model using storage nodes. The required storage volumes are based on containing the runoff from the 100-year event within road sags (max depth of 0.35m) with no cascading overland flow. Runoff from up to the 2-year storm event flows uncontrolled to the storm sewers, and storage is provided for larger storm events.

The required major system storage volumes are provided in **Section 5.4.3 "Model Results"** – refer to **Table 5.5**.

Outlet Boundary Conditions

A boundary condition water level of 94.55 m has been applied to the model outlet. This is intended to mimic the 100-year water level in Cell 2. Refer to **Appendix A** for relevant correspondence.

5.5.3 Model Results

The results of the PCSWMM model are summarized in the following sections.

The PCSWMM model schematics are provided in **Appendix D**. Digital copies of the modeling files and model output for all storm events are provided on the enclosed CD.

Peak Flows

Surface storage will be provided within the road sags to provide some attenuation of storm runoff. Stormwater will pond during infrequent (>2-year) storm events, with no surface ponding during the 2-year event.

The Monahan Drain Constructed Wetlands and the Phase 1 storm sewers in Brigitta Street have been designed to accommodate post-development runoff from the subject site, up to a maximum release rate of 1853L/s at the connection to the Brigitta Street storm sewer.

Table 5.3: Peak Flows (L/s)

Storm Distribution->	**4hr Chicago**					**12hr SCS**		
Return Period->	**25mm**	**2yr**	**5yr**	**100yr**	**100yr +20%**	**2yr**	**5yr**	**100yr**
MH 122 (Bridlewood Ph1) *(Intersection of Romina & Brigitta)*	1088	1421	1672	1959	1982	854	1209	1871
Max. Allowable	***1853 L/s***							

Note that the peak flow during the 100-year storm events is exceeding the maximum peak flow, as determined in the design of Cell 2 and the Bridlewood Trails Phase 1 development.

While the peak flow is higher than what was originally anticipated, the runoff volume from the site has decreased from the 1,071 m^3 (from the original Bridlewood Trails Phase 1 SWMHYMO model) to 843 m^3 reported by the PCSWMM model. At the detailed design stage, detailed outflow hydrographs will be produced by the PCSWMM model, which can be input into the Monahan Drain model to ensure there will be no negative impact on the Drain.

It should also be noted that proposed development has changed from a commercial/ mixed use development, to a fully residential development. The residential development precludes the use of underground storage units, which could have been used in a commercial development to provide further storage and attenuation of peak flows to the receiving sewer system. Also, the system has been designed to ensure there is no ponding in the right-of-ways, which has dictated the sizing of the ICDs. While the size of the ICDs could be reduced to reduce peak flows, this would result in ponding during the 2-year event. At the detailed design stage, the major system storage available and ICD sizes at individual catchbasins will be determined, which may result in a decrease in peak flows to the receiving sewer system.

Hydraulic Grade Line

The PCSWMM model was used to evaluate the 100-year hydraulic grade line (HGL) elevations within the proposed storm sewers. As the design is only at the draft plan stage, underside of footing (USF) elevations have not yet been finalized. The HGL analysis will be revised at the detailed design stage to reflect the controlled inflows at each inlet to the storm sewers. Pipe sizes and building elevations will be adjusted accordingly to ensure the 100-year HGL will be at least 0.30m below the design USF elevations. HGL elevations for the 100-year+20% storm event have been provided in **Appendix D** for reference.

The model indicates that there will be some surcharging of the sewers during the 100-year event.

Table 5.4: 100-year HGL Elevations (m)

Manhole ID	MH Invert Elevation (m)	T/G Elevation (m)	HGL Elevation 100yr4hr (m)	Highest Pipe Obvert @ MH (m)	WL Above Obvert (100yr) (m)
MH100	94.83	96.93	95.09	95.13	-0.04
MH102	94.00	96.93	95.09	95.04	0.05
MH104	94.12	97.06	95.37	95.10	0.27
MH106	94.19	97.12	95.49	95.17	0.32
MH108	94.31	97.23	95.57	95.39	0.18
MH110	94.52	97.41	95.60	95.51	0.09
MH112	94.60	97.48	95.61	95.58	0.03
MH114	95.17	97.51	95.61	95.70	-0.09
MH116	95.29	97.89	95.61	95.82	-0.21
MH118	95.58	97.90	95.61	95.91	-0.30
MH122	95.73	97.74	95.73	96.03	-0.30
MH124	95.97	98.16	95.97	96.35	-0.38
MH126	95.77	98.05	95.77	96.07	-0.30
MH128	95.47	97.93	95.60	96.19	-0.59
MH130	95.71	97.71	95.71	96.01	-0.30
MH132	95.40	97.52	95.57	95.85	-0.28
MH134	95.33	97.54	95.57	95.81	-0.24
MH136	95.01	97.37	95.57	95.69	-0.12
MH138	94.96	97.27	95.57	95.52	0.05
MH140	94.84	97.08	95.57	95.44	0.13

Manhole ID	MH Invert Elevation (m)	T/G Elevation (m)	HGL Elevation 100yr4hr (m)	Highest Pipe Obvert @ MH (m)	WL Above Obvert (100yr) (m)
MH200	95.41	97.70	95.61	95.88	-0.27
MH202	95.68	97.94	95.68	96.06	-0.38
MH204	95.90	98.24	95.90	96.27	-0.37
MH206	95.81	97.87	95.81	96.22	-0.41
MH208	95.40	97.57	95.61	95.85	-0.24
MH210	95.34	97.58	95.61	95.82	-0.21
MH212	95.03	97.58	95.61	95.70	-0.09
MH300	93.84	97.30	94.71	94.88	-0.17
MH302	94.71	97.52	94.71	95.04	-0.33
MH304	94.78	97.45	94.78	95.08	-0.30
MH306	95.03	97.40	95.49	95.48	0.01
MH308	94.98	97.44	95.49	95.46	0.03
MH400	95.06	97.70	95.37	95.44	-0.07
MH500	95.11	97.37	95.57	95.59	-0.02
MH502	95.17	97.44	95.57	95.62	-0.05
MH504	95.39	97.68	95.60	95.87	-0.27
MH506	95.33	97.63	95.60	95.81	-0.21
MH600	95.56	97.36	95.56	95.81	-0.25
MH602	95.33	97.70	95.54	95.63	-0.09
MH604	94.92	97.50	95.54	95.45	0.09
MH606	94.44	97.61	95.54	95.34	0.20
MH608	94.40	97.28	95.53	95.30	0.23
MH700	94.56	97.45	95.56	95.16	0.40
MH800	95.42	97.66	95.60	95.87	-0.27
MH802	95.33	97.67	95.60	95.78	-0.18
MH804	95.17	97.49	95.60	95.70	-0.10
MH806	95.13	97.54	95.60	95.66	-0.06
MH818	95.91	98.06	95.91	96.21	-0.30

Major System Storage

The storage required in the right-of-way has been evaluated on a per-hectare basis for each subcatchment. Refer to **Table 5.5**.

Table 5.5: Major System Storage

Drainage Area ID	Area (ha)	Storage Required (m3)	
		Total Volume (m^3)	Per Hectare Volume (m^3/ha)
B3-01	1.50	154	103
B3-02	1.75	221	126
B3-03	1.26	158	125
B3-04	0.49	63	127
B3-05	1.83	231	126
B3-06	1.17	143	123
B3-07	1.09	137	126
B3-08	1.86	205	110
B3-09	1.20	151	126
B3-10	0.63	79	126
B3-11	0.46	55	120
B3-12	0.72	91	126

The required major system storage volumes are generally larger than the values documented in the *Bridlewood Trails Phase 1 Stormwater Management Report* (90m^3/ha). However, Technical Bulletin PIEDTB-2016-01 (September 2016) has increased the allowable ponding depths in the right-of-way from 0.30m to 0.35m and ponding during the 5-year storm event is allowed, which represents a significant increase in the maximum storage volumes that can be provided.

The major system storage volumes will be reassessed at the detailed design stage to ensure the appropriate major system storage is provided.

5.6 Deviations

The site is subject to grade raise restrictions. The storm sewer outlet elevation is fixed based on the as-built elevations of the storm sewer on Brigitta Street.

In order to limit the overall grade-raise and reduce the amount of lightweight fill required for the site, two deviations from the City of Ottawa Sewer Design Guidelines are anticipated to be required:

1. The oversizing of the local sewers to allow a lower pipe slope;
2. Maintain a reduced cover on the storm sewers;
    - The average minimum cover from the proposed centerline elevations to the storm sewer obvert is 1.85m;
    - Localized insulation will be installed as required to meet the 2.0m thermal equivalent recommended by the City of Ottawa Sewer Design Guidelines.

6.0 TRAFFIC IMPACT BRIEF

An analysis of the effect from the proposed Bridlewood 3 development on the existing traffic patterns has been performed and detailed in the report, *Bridlewood 3 866, 898 Eagleson Road and 1335, 1365 Terry Fox Drive, Traffic Impact Assessment, completed by Novatech, Ref. No.: R-2018-056, dated May 24, 2019;* and is submitted under a separate cover. Please refer to this report for more details.

7.0 ROADWAYS

7.1 Proposed Road Infrastructure

The proposed development will consist of local roadways with 14.5m and 16.5m right of ways (ROW) for single loaded roadways (window streets) and 18.0m right of ways for dual loaded streets. The proposed cross sections will conform to City of Ottawa Standards. Refer to **Figure 8** – 14.5m Road Allowance and **City of Ottawa Standard Drawing ROW-16.5JT & City of Ottawa Standard Drawing ROW-18JT** for proposed typical cross sections.

7.2 Deviations

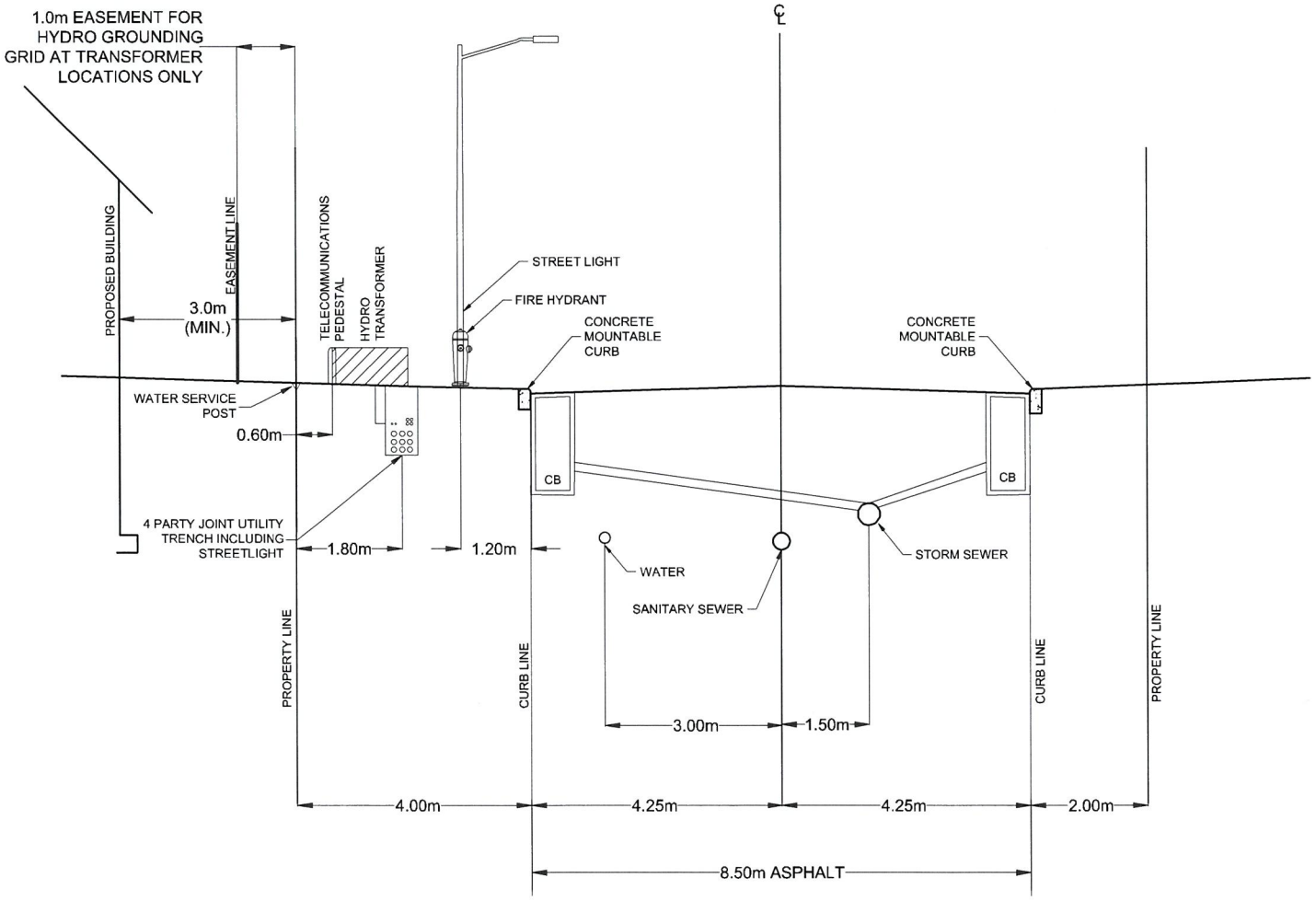
Preliminary grading analysis of the site has indicated that the road elevations are anticipated to exceed the grade raise restrictions recommended in the geotechnical report in some areas. Site grading has been set to minimum overland flow requirements and is dictated by the storm sewer elevations. Mitigation measures will be determined with the Geotechnical Engineer during detailed design. These measures are anticipated to include the use of preloading and lightweight fill. Areas that are in exceedance of the grade raise restrictions are identified on the Preliminary Grading Plan (Drawing **117153-GR**).

8.0 NOISE CONTROL

The analysis of the roadway traffic along Terry Fox Drive, Eagleson Road and Romina Street indicates that the City of Ottawa's criteria for residential noise will be exceeded, primarily for units in close proximity to the noise sources. Attenuation measures are required and they may include the installation of a noise barrier, central air conditioning, forced air ventilation and/or a notice may be placed on title with regards to the noise levels to be expected. The detailed results are included in the Noise Impact Feasibility Study and is submitted under a separate cover. Refer to *Bridlewood 3, 866, 898 Eagleson Road and 1335, 1365 Terry Fox Drive, Noise Impact Feasibility Report, completed by Novatech, Ref. No.: R-2019-011, dated May 24, 2019* for more details.

9.0 UTILITIES

The development will be serviced by hydro, phone, gas and cable, which will be constructed in a four-party trench, as per the City and utility standard right-of-way cross-sections. During detailed design, the works will be coordinated with local utility companies. Canada Post will service the site with community mailboxes. Site lighting will be provided along roadways, sidewalks and walkways as per City standards.



RESIDENTIAL ROAD 14.5m TYPICAL SECTION
N.T.S.

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6

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

CITY OF OTTAWA
866 EAGLESON ROAD
BRIDLEWOOD 3

14.5m ROAD ALLOWANCE

SCALE

DATE	JOB	FIGURE
MAY 2019	117153	FIG8-XS

SHT8X11.DWG - 216mmx279mm

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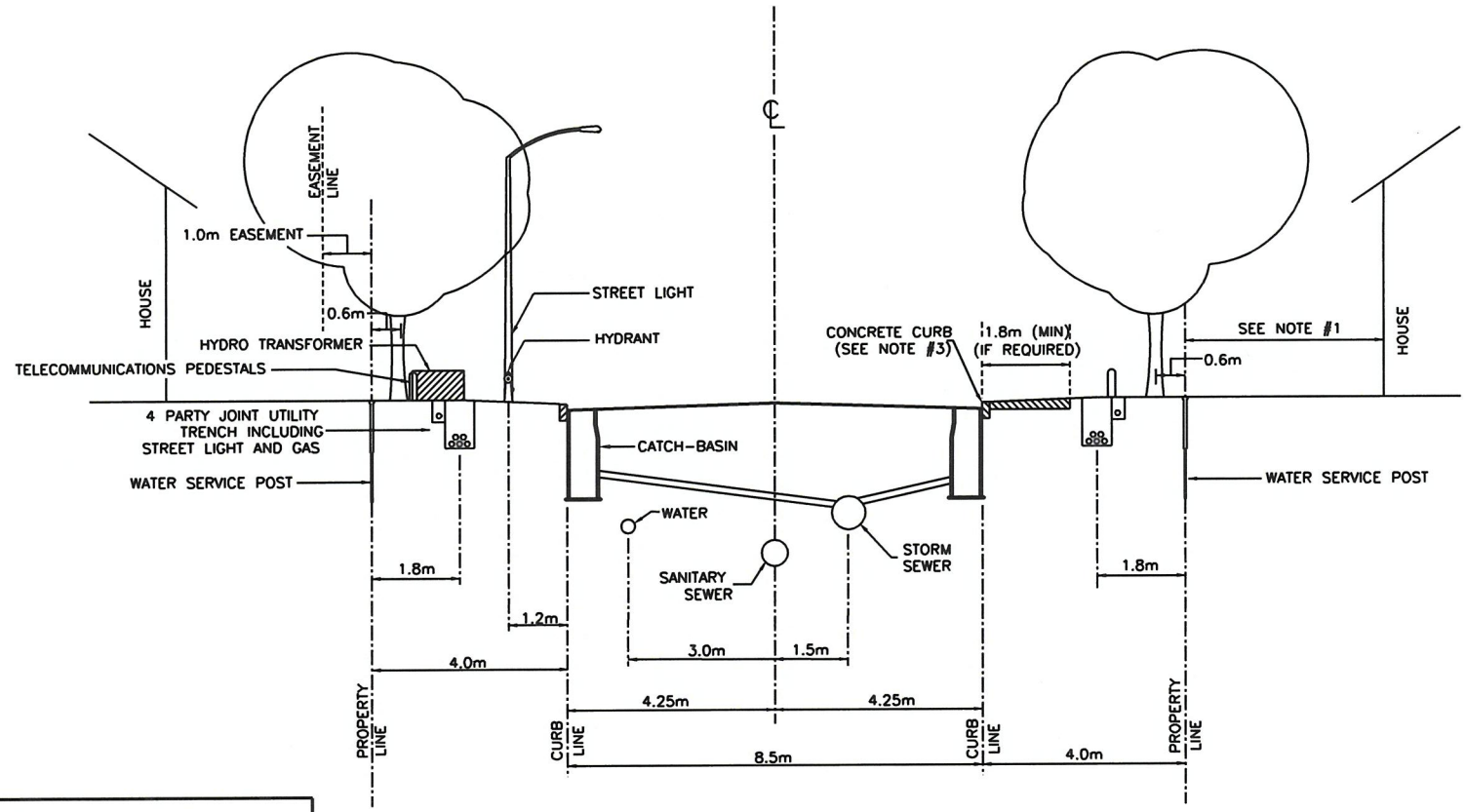


SECTION

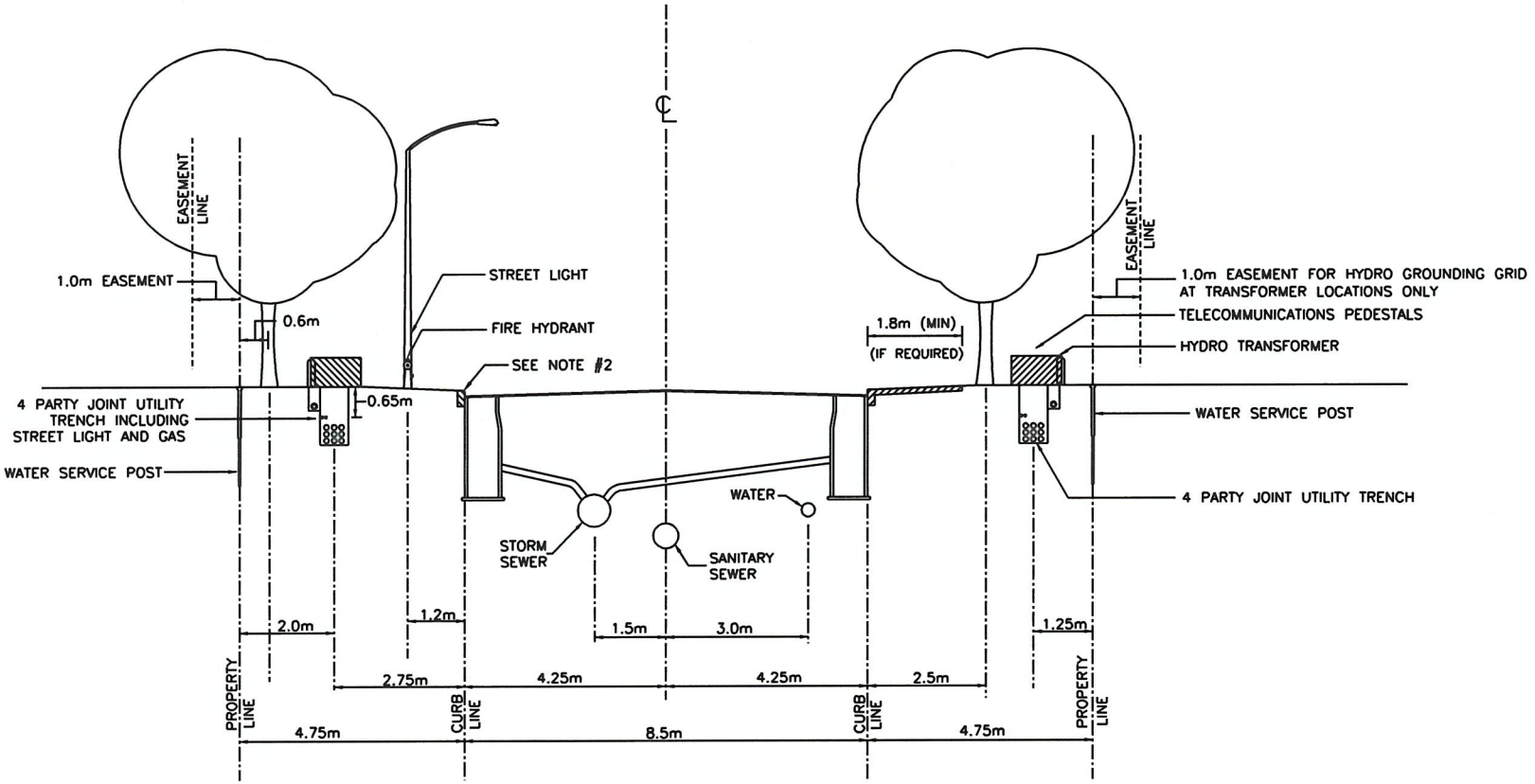
NOTES:

1. 16.5 METRE RIGHT-OF-WAY WILL ONLY BE USED WHERE A MINIMUM SEPARATION OF 3.0m IS PROVIDED FROM A BUILDING STRUCTURE TO THE R.O.W. LIMIT. THIS 3.0m AREA IS TO BE CLEAR AND UNENCUMBERED OF ANY SUBSURFACE ENCROACHMENTS.
2. REFERENCE STANDARD NOTES ROAD ALLOWANCE (DGN:ROW-NOTES).
3. CONCRETE CURBS MAY BE BARRIER TYPE OR MOUNTABLE TYPE.CATCH BASIN TYPE WILL SUIT CURB DESIGN. SEE SEWER DESIGN GUIDELINES FOR CATCH BASIN PREFERENCE.
4. SIDEWALKS (IF REQUIRED) AND HYDRO TRANSFORMERS ARE TO BE LOCATED ON OPPOSITE SIDES OF THE STREET. THE HYDRO TRANSFORMERS ARE TO BE PLACED ON THE OUTSIDE PORTION OF THE STREET ON CRESCENTS AND CURVED ROADWAYS.
5. STREET LIGHTS AND SIDEWALKS ARE TO BE LOCATED ON OPPOSITE SIDES OF THE R.O.W.
6. TREES WILL NOT BE PLACED ON LOTS THAT HAVE A HYDRO TRANSFORMER. WHERE TREES ARE PERMITTED, THE PLACEMENT AND SPECIES OF TREES WILL BE DETERMINED ON A SITE-BY-SITE BASIS AND BE INCORPORATED IN THE LANDSCAPING PLAN.
7. FOR SINGLE LOADED ROAD, BOULEVARD WITH NO HOUSING MAY BE REDUCED TO A MINIMUM 1.5m.

Ottawa

RESIDENTIAL ROAD
16.5m ROAD ALLOWANCE
4 PARTY JOINT USE TRENCH

DATE:	-
REV. DATE:	MARCH 2009
DWG. No.:	ROW-16.5JT



SECTION

NOTES:

1. REFERENCE STANDARD NOTES ROAD ALLOWANCE (DGN:ROW-NOTES)
2. CONCRETE CURBS MAY BE BARRIER TYPE OR MOUNTABLE TYPE, CATCH BASIN TYPE WILL SUIT CURB DESIGN. SEE SEWER DESIGN GUIDELINES FOR CATCH BASIN PREFERENCE.
3. AT CATCH BASIN AND HYDRANT LOCATIONS THE GAS MAIN SHALL HAVE A MINIMUM 0.6m CLEARANCE FROM STRUCTURES.
4. HYDRO TRANSFORMERS AND SIDEWALKS ARE TO BE LOCATED ON OPPOSITE SIDE OF THE ROW WHENEVER POSSIBLE. REQUIREMENT FOR PROTECTIVE BOLLARDS AT TRANSFORMERS SHALL BE DETERMINED BY HYDRO ON A CASE BY CASE BASIS.
5. STREET LIGHTS AND SIDEWALKS ARE TO BE LOCATED ON OPPOSITE SIDES OF THE ROW.

Ottawa

RESIDENTIAL ROAD
18.0m ROAD ALLOWANCE
4 PARTY JOINT USE TRENCH

DATE:	-
REV. DATE:	MARCH 2009
DWG. No.:	ROW-18JT

10.0 EROSION AND SEDIMENT CONTROL

Erosion and sediment control measures will be implemented during construction in accordance with the "Guidelines on Erosion and Sediment Control for Urban Construction Sites" (Government of Ontario, May 1987). An Erosion and Sediment Control Plan will be prepared as part of the detailed design.

Typical erosion and sediment control measures recommended include, but are not limited to, the use of silt fences around perimeter of site (OPSD 219.110), catch basin inserts under catch basin/maintenance hole lids, heavy duty silt fence barrier (OPSD 219.130), straw bale check dams (OPSD 219.180), rock check dams (219.210 or OPSD 219.211), riprap (OPSS 511), mud mats, silt bags for dewatering operations, topsoil and sod to disturbed areas and natural grassed waterways. Dewatering and sediment control techniques will be developed for the individual situations based on the above guidelines and utilizing typical measures to ensure erosion and sediment control is controlled in an acceptable manner and there is no negative impact to adjacent Lands, water bodies or water treatment/conveyance facilities.

It will be the responsibility of the Contractor to submit a detailed construction schedule and appropriate staging, dewatering and erosion and sediment control plans to the Contract Administrator for review and approval prior to the commencement of work. A copy of the City of Ottawa Special Provision F-1005 is included in **Appendix E** which will become part of any contract and which outlines the contractual requirements which includes preparation of a detailed erosion and sediment control plan.

General Erosion and Sediment Control Measures

- All erosion and sediment control measures are to be installed to the satisfaction of the engineer, the municipality and the conservation authority prior to undertaking any site alterations (filling, grading, removal of vegetation, etc.) and remain present during all phases of site preparation and construction.
- A qualified inspector, provided by the owner, should conduct daily visits during construction to ensure that the contractor is working in accordance with the design drawings and that mitigation measures are being implemented as specified.
    - A light duty silt fence barrier is to be installed in the locations shown on the Erosion and Sediment Control Plan.
    - Rock check dams and/or straw bales are to be installed in drainage ditches.
    - Catch basin inserts are to be placed under the grates of all proposed and existing catchbasins and structures.
    - After complete build-out, all sewers are to be inspected and cleaned and all sediment and construction fencing is to be removed.
- The contractor shall ensure that proper dust control is provided with the application of water (and if required, calcium chloride) during dry periods.
- The contractor shall immediately report to the engineer or inspector any accidental discharges of sediment material into any ditch or sewer system. Appropriate response measures shall be carried out by the contractor without delay.

The contractor acknowledges that failure to implement erosion and sediment control measures may result in penalties imposed by any applicable regulatory agency.

11.0 CONCLUSIONS AND RECOMMENDATIONS

Sanitary Servicing

The analysis of the proposed sanitary servicing confirms the following:

- It is proposed that the Subject Site will outlet directly to the 375mm sanitary sewer along Brigitta Street. The proposed outlet is consistent with the approved *Bridlewood Trails Design Brief dated June 2006 by Novatech.*
- The proposed development can be serviced with 375mm, 300mm, 250mm and 200mm sanitary sewer system.
- The total proposed sanitary flow from the Subject Site is 16.06 L/s, which represents an approximate 40% decrease in sanitary flows compared to the calculated flows in the *Bridlewood Trails Design Brief dated June 2006 by Novatech* (27.68 L/s).
- The proposed sanitary sewers have adequate capacity to accommodate the peak sanitary flow.
- Underside of footing elevations (USFs) shall be a minimum of 95.30m, which is the emergency overflow elevation at the downstream Pump Station.

Watermain

The analysis of the proposed watermain network confirms the following:

- It is proposed to service the Subject Site with 50mm and 200mm pipe with two connections to the existing watermain. The first connection will be made to the 300mm watermain stub at Block 2 and Romina Street. The second connection will be made to the 200mm watermain on Overberg Way in the northwest corner of the site.
- The analysis confirms the proposed watermain can service the Subject Site under all operating conditions.
- It is noted that pressure in the main is greater than 552 kPa/80psi during the high pressure and peak hour condition for all the lots and blocks, therefore the use of pressure reducing values will be considered during detailed design.

Stormwater Management

The following provides a summary of the storm sewer and stormwater management system:

- Allowable release rate for the site is 1,853 L/s, based on the Bridlewood Trails Phase 1 SWM Report.
- Proposed storm sewer system will convey stormwater to existing MH122 on Brigitta Street.
    - Storm sewers (minor system) have been designed to convey the uncontrolled 2-year peak flow using the Rational Method.
    - Inflows to the minor system will be controlled using inlet control devices (ICDs).
    - A minimum clearance of 0.30m will be provided between the 100-year hydraulic grade line (HGL) and the designed underside of footing elevations.
- Roads graded in a saw-toothed pattern to provide surface stormwater storage during infrequent (>2-year) storm events. No surface ponding during a 2-year storm event.
    - The major overland flow route for the site is Brigitta Street / Monahan Drain.

- Ponding depths will not exceed 0.35m for all storms up to and including the 100-year event.

Roadways

- Roadway elevations will exceed grade raise restrictions in some areas and mitigation measures will be considered during detail design, including the use of preloading and light weight fill.

Noise

- Noise attenuation measures are required and they may include the installation of a noise barrier, central air conditioning, forced air ventilation and/or a notice may be placed on title with regards to the noise levels to be expected.

Erosion and Sediment control

- Erosion and sediment control measures (i.e. filter fabric, silt fences, etc.) will be implemented prior to construction and are to remain in place until vegetation is established.
- An Erosion and Sediment Control Plan will be prepared during detailed design to ensure erosion and sediment control is controlled in an acceptable manner and there is no negative impact to adjacent lands, water bodies or water treatment/conveyance facilities.

12.0 CLOSURE

The preceding report is respectfully submitted for review and approval. Please contact the undersigned should you have questions or require additional information.

NOVATECH

Prepared by:

Steve Zorgel, P.Eng.
Project Coordinator, Engineering

Kallie Auld, P. Eng.
Project Coordinator, Water Resources

Reviewed by:

Drew Blair, P. Eng.
Project Manager, Engineering

Michael Petepiece, P. Eng.
Senior Project Manager, Water Resources

Appendix A
Correspondence

Steve Zorgel

From: McCreight, Laurel <Laurel.McCreight@ottawa.ca>
Sent: Tuesday, April 24, 2018 10:50 AM
To: Teresa Thomas
Cc: Greg Winters
Subject: Pre-Consultation Follow-up: 866 Eagleson
Attachments: Plan & Study List.pdf

Hi Teresa,

Please refer to the below regarding the Pre-Consultation Meeting held on Thursday April 19th, 2018 for the property at 866 Eagelson for a townhouse development. I have also attached the Plans & Study List.

General

- Part of the lands were redesignated to General Urban as part of OPA 180
- Two phase townhome development
  - Area 1: 176 towns
  - Area 2: 59 towns & 36 flats
- Integrate road pattern into existing road pattern and park
- Plan of Subdivision and Zoning applications

Planning

- Discussion regarding AM designation, its history and what it means for the development
- The City will be looking for more density along the arterial road in Phase 1 (Eagelson)
- Streetscape of Romina will be play an important role
  - Cross-section will change by introducing driveways fronting Romina
- Diversifying product type based on redesignation

Transportation

- Important intersection is Eagleson and Romina
  - How will this function if driveways are introduced so close to the intersection?
  - Signals? Roundabout?
  - Councillor is interested in signals
- Overberg and Terry Fox is on the DC List
- TIA process to be followed
- Avoid noise walls where possible
- Noise Study requires
- For transportation related questions please contact rosanna.baggs@ottawa.ca

Engineering

- Run-off coefficient is 0.6
- TSS removal of 80% required
- Pipes are currently sized for proposed development
- Required to address quality and quantity requirements as set through the RCVA
- For transportation related questions please contact santhosh.kuruvilla@ottawa.ca

Forestry

- Permit required for any trees greater than 10 cm in diameter

- Tree and butternut survey required
- Please contact mark.richardson@ottawa.ca and he will meet the consultant on site

Parks

- The location of the proposed park is logical as it integrates with the existing park
- The City will be looking for the full amount of parkland and not cash-in-lieu
- Developer built park; can opt out and provide money instead
- Park shall be built within two years of registration
- Park must be positively surface drained

RVCA

- The site is outletting directly into a SWM pond
- Please demonstrate that water quality protection is being provided to an enhanced level (80%) in the servicing report
- LID are encouraged where possible to maximize on site infiltration where possible

Please do not hesitate to contact me with any questions.

Regards,
Laurel

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

City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 16587
ottawa.ca/planning / ottawa.ca/urbanisme

Steve Zorgel

From: McCreight, Laurel <Laurel.McCreight@ottawa.ca>
Sent: Tuesday, October 9, 2018 8:46 AM
To: Robert Tran; 'Vincent Denomme'
Subject: FW: 866 Eagleson Road - Claridge Subdivision - Pre Con Eng Notes

Follow Up Flag: Follow up
Flag Status: Completed

Hi Robert and Vincent,

Please see the below regarding engineering.

Regards,
Laurel

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

City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 16587
ottawa.ca/planning / ottawa.ca/urbanisme

From: Schaeffer, Gabrielle
Sent: Friday, October 05, 2018 4:42 PM
To: McCreight, Laurel
Subject: 866 Eagleson Road - Claridge Subdivision - Pre Con Eng Notes

Hi Laurel,

Please add these notes to your letter back to the applicant:

1. The applicant indicated sump pumps may be required near the SE area of their development. If sump pumps intend to be used, please ensure items identified in Technical Bulletin ISTB-2018-04, dated June 27, 2018, are addressed and included in the SWM/Servicing report.
2. The applicant indicated slab-on-grade units may also be pursued. If so, please ensure plans indicate which ones.
3. The applicant indicated grade raise is expected to be between 1 – 2.5m. Lightweight fill is expected for some dwellings. Please ensure plans clearly indicate where light weight fill is expected to be used.
4. The Bridlewood Trails SWM/Servicing reports are to be utilized as requirement guides for this area. Please note that drawing 103031-STM indicates the pipe's permissible flow from this development area is 1,853 L/s.
5. Since the development at 25 Overberg Drive has been redirected to this outlet since the original documents were prepared, flows from 25 Overberg Dr. are to be included as part of the 1,853 L/s flow.
6. Please ensure discussion on how drainage from 25 Overberg will be dealt with through this subdivision. (i.e. servicing block or through the Overberg ROW) Currently, we are in talks with other City departments to

determine which type of connection is preferred. A permanent storm system through the proposed park will not be accepted.

7. Monahan Branch A Drain is located on-site. Although not discussed at the pre-consultation meeting, requirements relating to this drain may apply. We have reached out to other City departments concerning their requirements regarding this development and this Municipal Drain branch.
8. When requesting WAT boundary conditions, please provide the following: (a) Location of WM connections on plan or map, (b) draft subdivision plan (c) brief description of the type of developments proposed, (d) the max fire flow required (as per FUS, 1999) complete with supporting calculations, (e) average daily demand (L/s) complete with supporting calculations (f) maximum daily demand (L/s) complete with supporting calculations, (g) maximum hourly daily demand (L/s) complete with supporting calculations.
9. HGL analyses will need to be completed ensuring no impact to the proposed dwellings nor existing downstream dwellings.
10. The Monahan Drain Sensitivity Analysis Study is currently being completed by the City of Ottawa. Preliminary results show an increase in Cell 2 water levels from JFSA's 2014 model. SWM requirements for developments may change as a result of this study, including the possibility of limiting development imperviousness to ensure runoff volumes do not increase. However, the exact SWM requirement changes at this time are unknown and being worked on. We will inform you of any changes as soon as possible. Please direct all questions to Development Review and not to the City's modeling consultant.

Gabrielle Schaeffer, P.Eng
Project Manager - Infrastructure Approvals

City of Ottawa
Development Review - West Branch
Planning, Infrastructure and Economic Development Department
110 Laurier Ave., 4th Floor East;
Ottawa ON K1P 1J1
Mail Code 01-14
Tel: 613-580-2424 x 22517
Fax: 613-560-6006

Steve Zorgel

From: McCreight, Laurel <Laurel.McCreight@ottawa.ca>
Sent: Tuesday, February 13, 2018 4:02 PM
To: Greg Winters
Cc: Eric Bays; Marc St.Pierre; jim.burghout@claridgehomes.com; John Riddell
Subject: Pre-Consultation Follow-Up: 1039 Terry Fox & 5331 Fernbank
Attachments: Plan & Study List.pdf

Follow Up Flag: Follow up
Flag Status: Completed

Hi Greg,

Please refer to the below regarding our Pre-Consultation Meeting on Tuesday February 6th, 2018 on 1039 Terry Fox Drive and 5331 Fernbank Road. I have also attached the Plans & Study List.

General

- Subdivision development for 72 walk-up apartment units with a height of 3-storeys, consisting of 4 units on each storey and 182 townhouses
- Right-in / Right-out onto Terry Fox, as per the Councillor's request
- Idea of conveying Monahan Drain corridor as a block to the City, thereby creating a natural severance
    - Create an R-Plan to convey block to the City
- Zoning already in place for subdivision
- Holding can be lifted after draft approval
- Addressing and Signs has confirmed that 1039 Terry Fox and 5331 Fernbank will be used with the application

Planning/Urban Design

- The Official Plan designation is now General Urban
    - An increased product diversity can be attained with the designation change as singles and semi detached units are now permitted
- Please consider increasing the amount of park land with the land allocated to large deep lots in the Northwest corner abutting the Monahan Drain

Engineering

- Please establish the residential underside of footings to carry out a hydraulic grade line analysis of the sanitary sewer system. Please use the emergency overflow elevation for the Hazeldean Pumping Station of 95.30m to establish USF elevations in accordance with the Ottawa Sewer Design Guidelines. Please account for grade raise restrictions when completing the analysis.
- The geotechnical report is to look at grade raise restrictions and all current trees in sensitive clay soils. Geotechnical guideline requirements must be implemented. Refer to the Tree Planting in Sensitive Marine Clay Soils 2017 Guidelines.
- The applicant will be required to assess the hydraulic impact on the Monahan Drain against the controlling 100 year elevation of 95.30 metres at the Hazeldean Pump Station overflow outlet location into the Didsbury ditch. Please include all post-development Van Gaal Lands in the hydraulic assessment.
- The applicant is responsible to provide any required stormwater mitigation measures for this specific development. Mitigation measures will need to be handled via on-site stormwater management, which may affect the proposed layout.

Steve Zorgel

From: Eric Lalande <eric.lalande@rvca.ca>
Sent: Friday, July 6, 2018 2:34 PM
To: Greg Winters; Teresa Thomas
Subject: RE: 866 Eagleson and Terry Fox: Drainage Feature

Hi Greg,

I'm a little confused. I believe at our last meeting (at the City), I indicated a HDFA is not required. As we were provided clarification that the system has been completely isolated from the Terry Fox Extension back in 2005 and that the catchment area for lands east of Terry Fox was considered limited to the sites directly adjacent (primarily). At this point, we would be relying on stormwater management plans to demonstrate that drainage isn't being affected for the lots between 866 Eagleson and terry fox that have been using the ditch for drainage purposes, and how the site would be providing appropriate SWM controls for quantity and quality.

Sorry if there was any outstanding confusion on this point. Let me know if there are any discussions required at this point.

Thanks,

Eric Lalande, MCIP, RPP
Planner, Rideau Valley Conservation Authority
613-692-3571 x1137

From: Greg Winters
Sent: Friday, July 06, 2018 11:45 AM
To: Teresa Thomas ; Eric Lalande
Subject: RE: 866 Eagleson and Terry Fox: Drainage Feature

Hi Eric

Can we schedule a time to discuss Teresa's submission below. We would like to get a better understanding on why a headwater assessment would be required for something that appears to be largely a roadside ditch.
It will greatly help our understanding of the process going forward.

Greg Winters, MCIP, RPP, Senior Project Manager | Planning & Development
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 241 | Cell: 613.261.4990 | Fax: 613.254.5867

From: Teresa Thomas
Sent: Thursday, June 28, 2018 11:42 AM
To: Eric Lalande <eric.lalande@rvca.ca>
Cc: Greg Winters <G.Winters@novatech-eng.com>
Subject: 866 Eagleson and Terry Fox: Drainage Feature

Good morning Eric

It was nice to meet you in person at the Committee of Adjustment in May.

I'm working with Greg Winters on the proposed re-zoning and subdivision at 866 Eagleson Road and Terry Fox. A sketch of the Concept Area is attached for quick reference. The City Planner, Laurel McCreight, has asked us to connect with you directly regarding the state of the drainage feature on the property.

Please review the attached letter regarding the location and state of the drainage feature in question, as well as information from City of Ottawa engineering reports on the Monahan Drain. We await your response.

Thank you

Teresa Thomas, MCIP RPP | Project Planner
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 | Fax: 613.254.5867

NOVATECH
Engineers, Planners & Landscape Architects

28 June 2018

Eric Lalande, Planner
Rideau Valley Conservation Authority
PO Box 599,
3889 Rideau Valley Drive,
Manotick, Ontario, K4M 1A5

Attention: Eric Lalande

Dear Mr. Lalande:

Reference: 866 Eagleson and Terry Fox
Farm Ditch/Headwater Discussion for Zoning Amendment and Subdivision
Our File No. 117153

A pre-application meeting regarding the above-noted project was held at City Hall on April 19th, 2018. The City Planner, Laurel McCreight, has asked us to connect with you directly regarding the state of the ditch on the property. The Planner questioned if it is a headwater.

Figures 1-5 show this ditch. The ditch was formerly part of the Monahan Municipal Drain that drained water from properties west of Terry Fox Drive.

Figures 6 and 7 show the property west of Terry Fox Drive. Waters from properties west of Terry Fox Drive now drain along the west and south side of Terry Fox Drive to the Monahan Drain. The ditch on the Subject Site is still shown as a watercourse on RVCA mapping yet it flows from the Subject Site (only) to the roadside ditch on Eagleson Road, through a culvert under Eagleson Road and then into the Monahan Drain.

Figures 8 and 9 are taken from the report to the City of Ottawa called *Engineer's Report, Monahan Creek Municipal Drain, Modifications and Improvements*, by Robinson Consultants, dated July 2003. These figures show that waters that once flowed into the Monahan Drain have since been cut off west of Terry Fox Drive. Regarding the portion of Branch A on the Subject Site, the Report states, "*The section of Branch A (west) of Terry Fox Drive will be intercepted by the Terry Fox Branch. The portion of Branch A downstream (east) of Terry Fox Drive to Station 1+821 at the Main Drain will continue to drain to the Constructed Wetland downstream of Eagleson Road*" (Section 5.6). It should be noted that any redevelopment of the Subject Site will ensure site drainage is contained and directed to the storm facility situated on Briggita Street.

Novatech questions the requirement for a Headwater Assessment for a feature that is not a part of a Natural Feature, conveys only roadside water from one site, and outlets to a City of Ottawa roadside ditch, through a culvert, and ultimately into to a City stormwater facility as seen in Figure 10. We acknowledge that a permit may be required from the RVCA to develop the lands but

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Engineers, Planners & Landscape Architects

question the value of a Headwater Assessment in this case. The cost to complete such a study is not insignificant and may affect the timing of approvals.

Please review this request for clarification on the matter. We do not wish to engage in a Headwater Drainage Feature Assessment if is not logically conceivable, as determined by the RVCA, that the Subject Site contains a headwater.

Greg Winters, Senior Project Manager, Novatech is available should you wish to discuss by phone.

Kind regards,

Teresa Thomas, MCIP RPP
Project Planner
NOVATECH

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

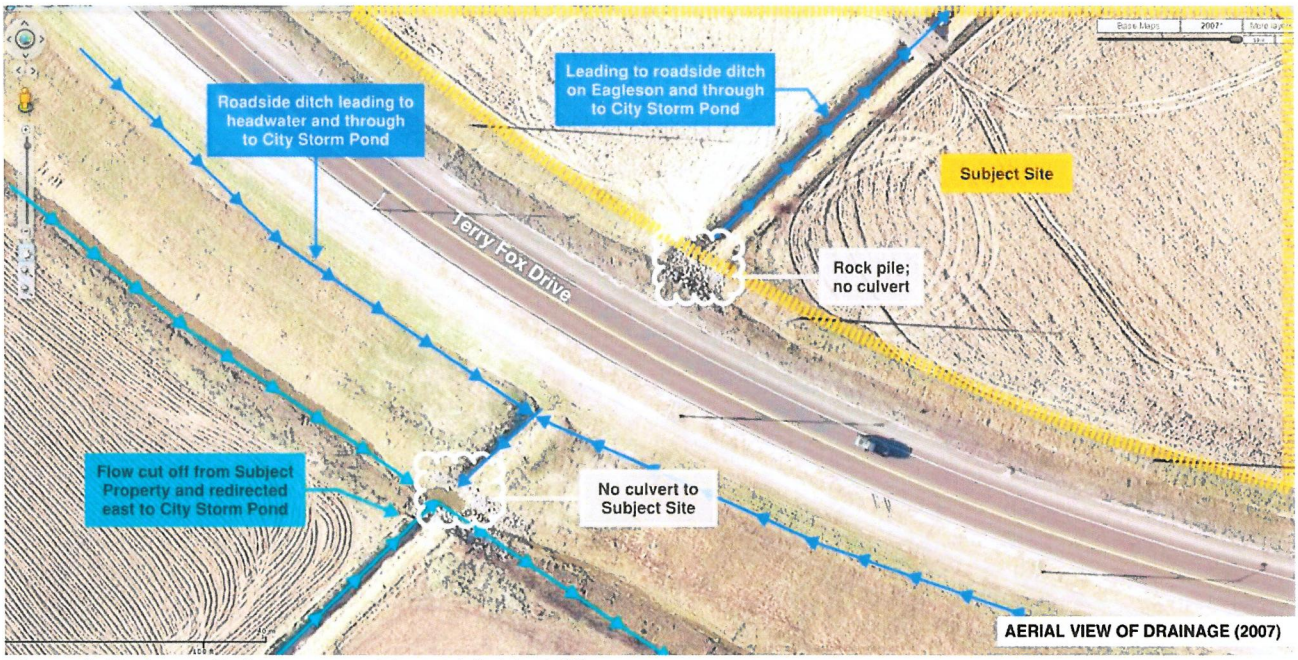

Figure 1: Drainage Patterns on and Around Subject Site

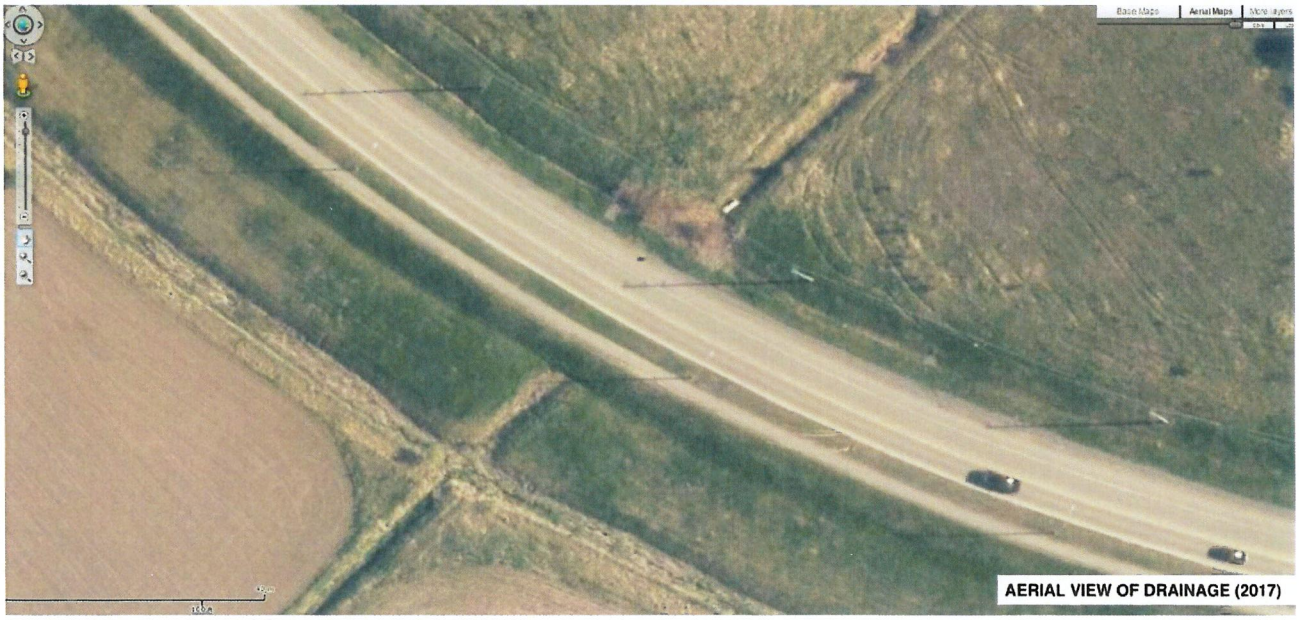

Figure 2: Aerial View of Subject Drainage 2017

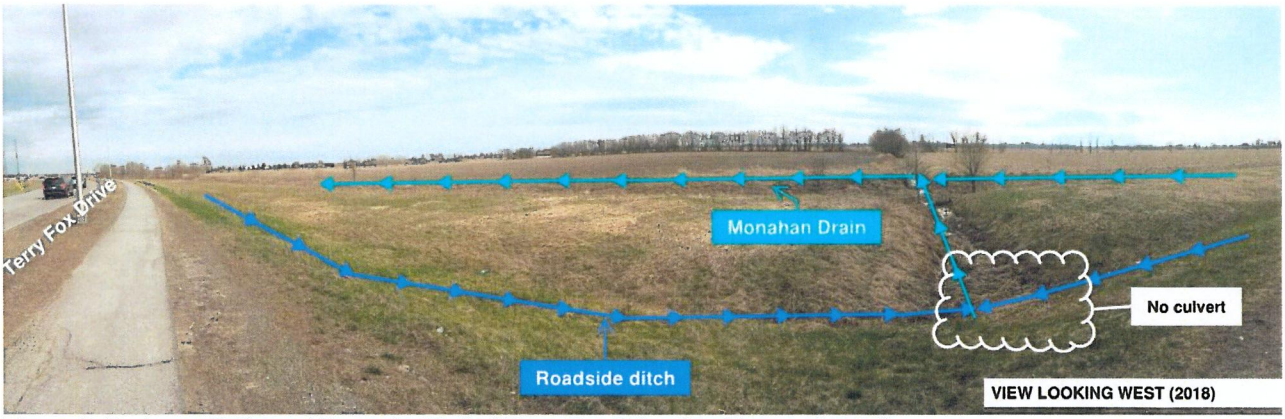

Figure 3: Drainage Pattern at Property West of Terry Fox Drive (Looking southwest)

Figures Key

Figure 4: Farm Ditch on Subject Site

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Figure 5: Rock Pile at End of Farm Ditch on Subject Site at Terry Fox (Looking West)

Figure 6: End of Drainage Feature on Property West of Terry Fox Drive, at Terry Fox Drive (Looking North)

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Figure 7: End of Drainage Feature on Property West of Terry Fox Drive, at Terry Fox Drive (Looking east)

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

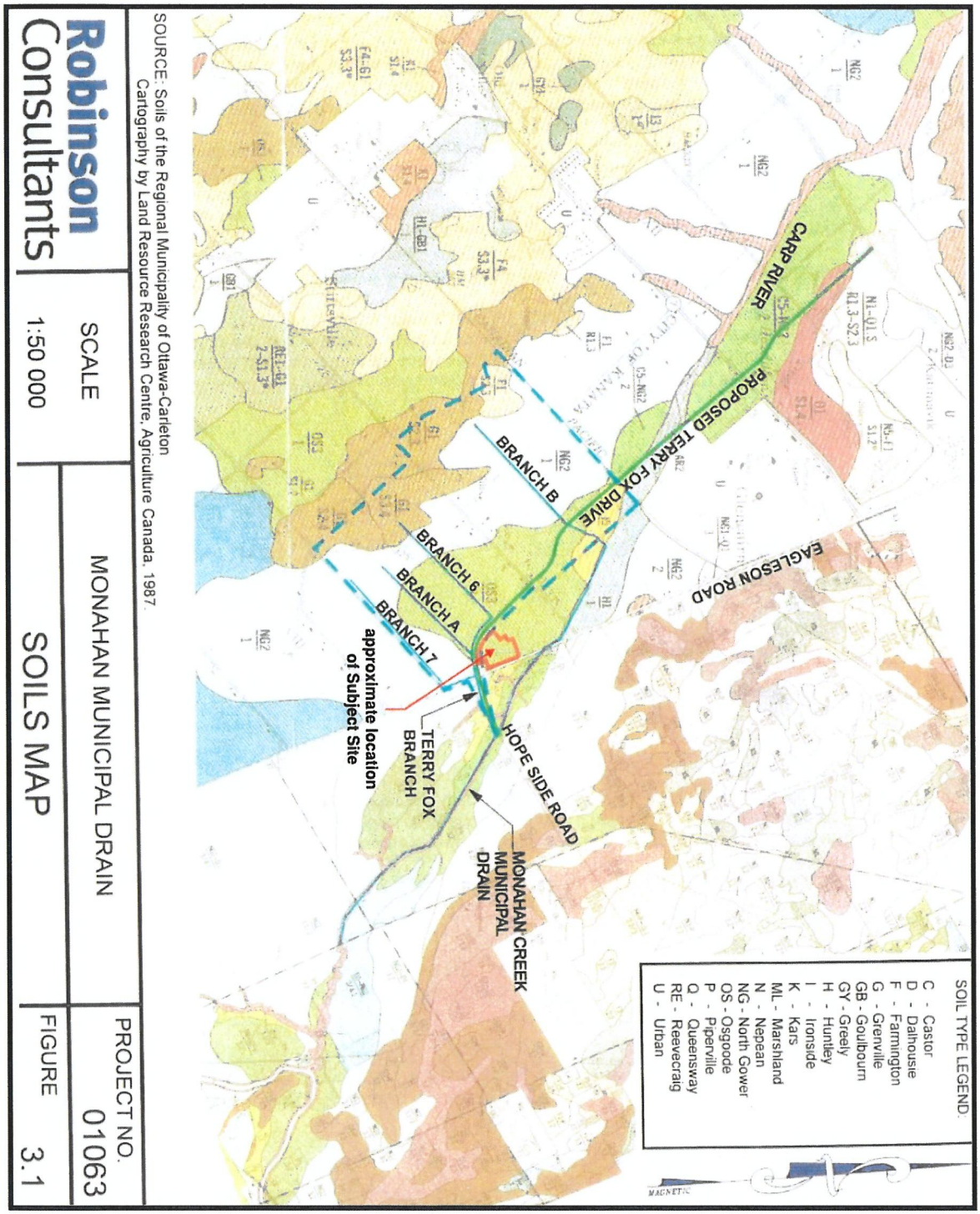


Figure 8: Soils Map Showing Branch 'A' Cutoff, Figure 3.1 from Monahan Creek Municipal Drain Report (2003)

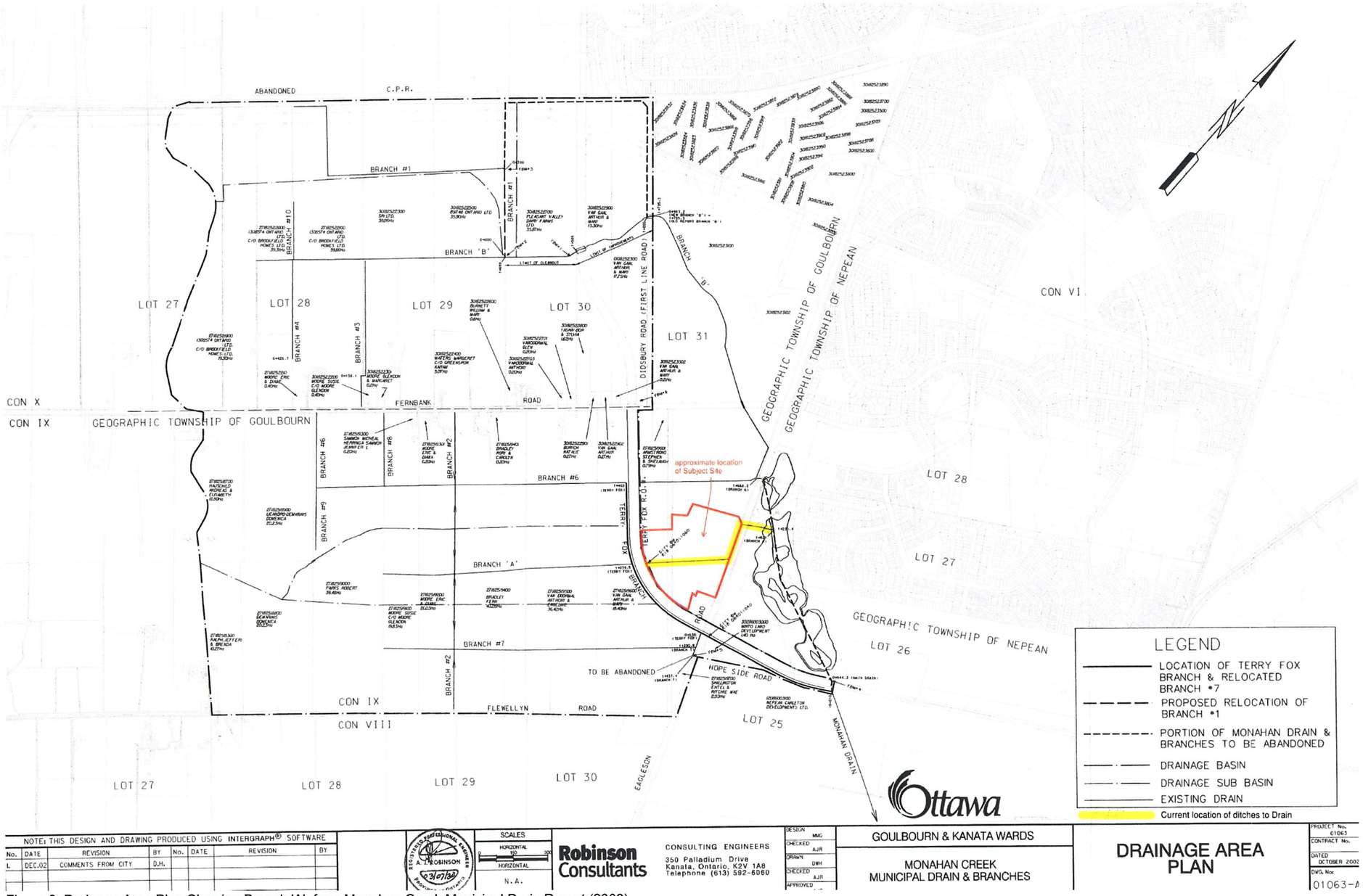


Figure 9: Drainage Area Plan Showing Branch 'A', from Monahan Creek Municipal Drain Report (2003)

Figure 10: Roadside Ditch West of Eagleson, East of Subject Site (Looking North)

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

Kallie Auld

From: Schaeffer, Gabrielle <gabrielle.schaeffer@Ottawa.ca>
Sent: Tuesday, January 08, 2019 1:32 PM
To: Kallie Auld
Cc: Mike Petepiece
Subject: RE: Claridge DIR Lands/ Monahan Drain Cell 2 boundary conditions

Hi Kallie,

I was confusing the 1039 Terry Fox Drive Claridge file for this one.

The preliminary results of JFSA's study indicates the HWL at WL3 (US Side of Eagleson, Cell 2) is expected to be 94.55.

Regards,
Gabrielle

From: Schaeffer, Gabrielle
Sent: Monday, January 07, 2019 10:52 AM
To: 'Kallie Auld' <k.auld@novatech-eng.com>
Cc: Mike Petepiece <m.petepiece@novatech-eng.com>
Subject: RE: Claridge DIR Lands/ Monahan Drain Cell 2 boundary conditions

Hi Kallie,

The report is not finalized, however, I believe I provided a preliminary HWL to use in my comments.

Regards,
Gabrielle

From: Kallie Auld <k.auld@novatech-eng.com>
Sent: Friday, January 04, 2019 4:03 PM
To: Schaeffer, Gabrielle <gabrielle.schaeffer@Ottawa.ca>
Cc: Mike Petepiece <m.petepiece@novatech-eng.com>
Subject: Claridge DIR Lands/ Monahan Drain Cell 2 boundary conditions

Good afternoon Gabrielle,

I am currently working on the PCSWMM model for the Claridge DIR Lands at 866 Eagleson Road and I wanted to touch base with you about the downstream boundary conditions for the Monahan Drain Cell 2 dry pond. My understanding is that JFSA has completed a report with this information, and there may have been some changes to the pond water levels during various storm events. Could you forward me this information/ report?

Thanks very much,

Kallie Auld, P.Eng., Project Coordinator | Water Resources
NOVATECH Engineers, Planners & Landscape Architects

Appendix B

Sanitary Design Sheets &
Excerpts from Relevant Reports

SANITARY SEWER DESIGN SHEET
BRIDLEWOOD 3
Developer: Claridge Homes

NOVATECH
Engineers, Planners & Landscape Architects

PROJECT # : 117153
DESIGNED BY : TJM/SAZ
CHECKED BY : DDB
DATE PREPARED : 11-Jan-19
DATE PREPARED : 17-May-19

LOCATION				RESIDENTIAL									PARK			INFILTRATION			FLOW	PROPOSED SEWER								
				INDIVIDUAL					CUMULATIVE																			
STREET	FROM AREA	TO AREA	Area	Single Units	Townhouse Units	Back-to-Back Units	Population (in 1000's)	AREA (ha.)	Population (in 1000's)	AREA (ha.)	PEAK FACTOR M	POPULATION FLOW Qr(p) (L/s)	AREA (ha.)	Accu. AREA (ha.)	PARK FLOW Qc(p) (L/s)	Total Area (ha.)	Accu. Total AREA (ha.)	PEAK EXTRAN. FLOW Q(i) (L/s)	PEAK DESIGN FLOW Q(d) (L/s)	LENGTH (m)	PIPE SIZE (mm)	PIPE ID (mm)	TYPE OF PIPE	GRADE %	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	Qpeak/ Qcap	d/ D_{full}
Street 2	A1	A3	A1			22	0.0594	0.51	0.059	0.51	3.6	0.70		0.00	0.00			0.17	0.87	158.7	200	203.20	DR 35	0.35	20.2	0.62	4.3%	0.12
Street 2	A2	A3	A2		18	15	0.0891	0.80	0.089	0.80	3.6	1.04		0.00	0.00			0.26	1.31	127.1	200	203.20	DR 35	0.35	20.2	0.62	6.4%	0.16
Street 2	A3	A7	A3			10	0.0270	0.22	0.176	1.53	3.5	2.01		0.00	0.00			0.50	2.52	79.8	200	203.20	DR 35	0.35	20.2	0.62	12.4%	0.23
Street 1	A4	A5	A4	3			0.0102	0.15	0.010	0.15	3.7	0.12		0.00	0.00			0.05	0.17	36.6	200	203.20	DR 35	0.65	27.6	0.85	0.6%	0.00
Street 1	A5	A6	A5	7			0.0238	0.36	0.034	0.51	3.7	0.41	0.53	0.53	0.02			0.34	0.77	78.5	200	203.20	DR 35	0.35	20.2	0.62	3.8%	0.12
Street 1	A6	A7	A6		17		0.0459	0.62	0.080	1.13	3.6	0.94		0.53	0.02			0.55	1.51	119.1	200	203.20	DR 35	0.35	20.2	0.62	7.4%	0.19
Street 1	A7	A13	A7				0.0000	0.06	0.255	2.72	3.5	2.89		0.53	0.02			1.07	3.98	44.0	200	203.20	DR 35	0.35	20.2	0.62	19.7%	0.30
Street 5	A8	A9	A8			2	0.0054	0.04	0.005	0.04	3.7	0.07		0.00	0.00			0.01	0.08	9.9	200	203.20	DR 35	0.65	27.6	0.85	0.3%	0.00
Street 5	A9	A13	A9		11	15	0.0702	0.56	0.076	0.60	3.6	0.89		0.00	0.00			0.20	1.08	116.0	200	203.20	DR 35	0.35	20.2	0.62	5.4%	0.16
Street 1	A10	A11	A10	4			0.0136	0.22	0.014	0.22	3.7	0.16		0.00	0.00			0.07	0.24	47.5	200	203.20	DR 35	0.65	27.6	0.85	0.9%	0.00
Street 1	A11	A12	A11	2			0.0068	0.13	0.020	0.35	3.7	0.24		0.00	0.00			0.12	0.36	37.0	200	203.20	DR 35	0.35	20.2	0.62	1.8%	0.08
Street 8	A12	A13	A12	25			0.0850	1.13	0.105	1.48	3.6	1.23		0.00	0.00			0.49	1.71	193.9	200	203.20	DR 35	0.35	20.2	0.62	8.5%	0.19
Street 1	A13	A18	A13		8		0.0216	0.30	0.458	5.10	3.4	5.04		0.53	0.02			1.86	6.92	78.0	250	254.00	DR 35	0.25	31.0	0.61	22.3%	0.30
Street 5	A14	A15	A14		8		0.0216	0.27	0.022	0.27	3.7	0.26		0.00	0.00			0.09	0.35	63.9	200	203.20	DR 35	0.65	27.6	0.85	1.3%	0.08
Street 5	A15	A18	A15		24		0.0648	0.72	0.086	0.99	3.6	1.01		0.00	0.00			0.33	1.34	125.8	200	203.20	DR 35	0.35	20.2	0.62	6.6%	0.16
Street 1	A16	A17	A16	6			0.0204	0.34	0.020	0.34	3.7	0.24		0.00	0.00			0.11	0.36	82.7	200	203.20	DR 35	0.65	27.6	0.85	1.3%	0.08
Street 1	A17	A18	A17		51		0.1377	1.58	0.158	1.92	3.5	1.82		0.00	0.00			0.63	2.45	249.5	200	203.20	DR 35	0.35	20.2	0.62	12.1%	0.23
Street 1	A18	A23	A18		16		0.0432	0.49	0.746	8.50	3.3	7.98		0.53	0.02			2.98	10.98	78.0	250	254.00	DR 35	0.25	31.0	0.61	35.4%	0.41
Street 3	A19	A20	A19		2		0.0054	0.09	0.005	0.09	3.7	0.07		0.00	0.00			0.03	0.10	9.9	200	203.20	DR 35	0.65	27.6	0.85	0.3%	0.00
Street 3	A20	A23	A20		11	14	0.0675	0.56	0.073	0.65	3.6	0.86		0.00	0.00			0.21	1.07	115.7	200	203.20	DR 35	0.50	24.2	0.75	4.4%	0.12
Overberg Way	A21	A22	A21		16		0.0432	0.65	0.043	0.65	3.7	0.51		0.00	0.00			0.21	0.73	118.3	200	203.20	DR 35	0.65	27.6	0.85	2.6%	0.08
Street 6	A22	A23	A22		14		0.0378	0.59	0.081	1.24	3.6	0.95	1.03	1.03	0.04			0.75	1.74	160.1	200	203.20	DR 35	0.35	20.2	0.62	8.6%	0.19
Street 1	A23	A25	A23		5		0.0135	0.17	0.913	10.56	3.3	9.65		1.56	0.07			4.00	13.71	44.0	300	304.80	DR 35	0.20	45.1	0.62	30.4%	0.38
Street 4	A24	A25	A24			28	0.0756	0.54	0.076	0.54	3.6	0.89		0.00	0.00			0.18	1.07	115.4	200	203.20	DR 35	0.50	24.2	0.75	4.4%	0.12
Street 1	A25	A27	A25		7		0.0189	0.21	1.008	11.31	3.2	10.57		1.56	0.07			4.25	14.89	44.0	300	304.80	DR 35	0.20	45.1	0.62	33.0%	0.38
Street 1	A26	A27	A26		5		0.0135	0.17	0.014	0.17	3.7	0.16		0.00	0.00			0.06	0.22	37.1	200	203.20	DR 35	0.65	27.6	0.85	0.8%	0.00
Street 3	A27	A29	A27		6	7	0.0351	0.30	1.056	11.78	3.2	11.05		1.56	0.07			4.40	15.52	60.2	300	304.80	DR 35	0.20	45.1	0.62	34.4%	0.41
Street 3	A28	A29	A28		8	7	0.0405	0.39	0.041	0.39	3.7	0.48		0.00	0.00			0.13	0.61	65.4	200	203.20	DR 35	0.65	27.6	0.85	2.2%	0.08
Easement	A29	EX.	A28	0	0	0	0.0000	0.04	1.097	12.21	3.2	11.44		1.56	0.07			4.54	16.05	48.0	375	381.00	DR 35	0.15	70.8	0.62	22.7%	0.30

Notes:
1. Q(d) = Qr(p) + Q(i) + Qc(p)
2. Q(i) = 0.33 L/sec/ha
3. Qr(p) = (PxqxM/86,400)
3. Qc(p) = (A*q*Pf)/86,400

Definitions: Definitions: Definitions:
Q(d) = Design Q(d) = Design Q(d) = Design Flow (L/sec)
Qr(p) = Popul: Qr(p) = Popul: Qr(p) = Population Flow (L/sec), Residential
Q(i) = Extran: Q(i) = Extran: Q(i) = Extraneous Flow (L/sec)
Qc(p) = Popul Qc(p) = Popul Qc(p) = Population Flow (L/sec), Commercial/Institutional/Park

P = Population (3.4 persons per single unit, 2.7 persons per townhouse unit, 2.7 persons per back-to-back unit)
q = Average per capita flow = 280 L/cap/day - Residential
q = Average per gross ha. flow = 3700 L/gross ha/day - Park (20L/day/person, 185 persons/ha - as per Appendix 4-A of the City of Ottawa Sewer Design Guidelines)
M = Harmon Formula (maximum of 4.0)
Min pipe size 200mm @ min. slope 0.32%
Mannings n = 0.013
Pf = Peak factor (Commercial/Institional/Park) = 1.0 (less than 20% of total contributing areas), 1.5 (if area is 20% or greater of total contributing area)

SANITARY SEWER DESIGN SHEET

PROJECT #: 103031-1
DESIGNED BY : MSP
CHECKED BY : RSC

PROJECT: **Bridelwood Trails**
DEVELOPER: **Claridge Homes**

DATE: 22-Sep-05
REV.: 12-Jun-06

LOCATION			INDIVIDUAL			CUMULATIVE		PEAK FACTOR M	POPULATION FLOW	PEAK EXTRAN.	PEAK DESIGN	PROPOSED SEWER							
STREET	FROM MH	TO MH	Units	Population (in 1000's)	AREA (ha.)	Population (in 1000's)	AREA (ha.)		Q (p) (L/s)	FLOW Q(i) (L/s)	FLOW Q (d) (L/s)	LENGTH (m)	PIPE SIZE (mm)	PIPE ID (mm)	TYPE OF PIPE	GRADE %	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	Qpeak/ Qcap
Residential																			
Romina Street	101	103	6	0.016	0.24	0.016	0.240	4.0	0.26	0.07	0.33	31.8	250	251.46	DR 35	0.24	29.6	0.60	0.01
Romina Street	109	107	24	0.065	0.76	0.065	0.760	4.0	1.05	0.21	1.26	90.2	250	251.46	DR 35	0.24	29.6	0.60	0.04
Future Street B	901	903	18	0.049	0.60	0.049	0.600	4.0	0.79	0.17	0.96	64.3	250	251.46	DR 35	0.65	48.7	0.98	0.02
Future Street B	903	Cap	6	0.016	0.32	0.065	0.917	4.0	1.05	0.26	1.31	27.6	250	251.46	DR 35	0.24	29.6	0.60	0.04
Future Street B	Cap	107	0	0.000	0.07	0.065	0.987	4.0	1.05	0.28	1.33	44.7	250	251.46	DR 35	0.24	29.6	0.60	0.04
Romina Street	107	105	7	0.019	0.34	0.149	2.084	4.0	2.41	0.58	2.99	74.0	250	251.46	DR 35	0.24	29.6	0.60	0.10
Future Street A	803	805	2	0.005	0.10	0.005	0.100	4.0	0.09	0.03	0.12	10.9	250	251.46	DR 35	0.65	48.7	0.98	0.00
Future Street A	805	807	11	0.030	0.46	0.035	0.560	4.0	0.57	0.16	0.73	81.3	250	251.46	DR 35	0.24	29.6	0.60	0.02
Future Street A	807	809	9	0.024	0.43	0.059	0.990	4.0	0.96	0.28	1.24	81.4	250	251.46	DR 35	0.24	29.6	0.60	0.04
Future Street A	809	811	0	0.000	0.04	0.059	1.030	4.0	0.96	0.29	1.25	10.6	250	251.46	DR 35	0.24	29.6	0.60	0.04
Future Commercial					0.75		0.700	1.5	0.61	0.20	0.80		250	251.46	DR 35	0.24	29.6	0.60	0.03
Future Street A	811	813	14	0.038	0.44	0.097	1.465	4.0	1.58	0.41	2.79	85.8	250	251.46	DR 35	0.24	29.6	0.60	0.09
Future Street A	813	Cap	8	0.022	0.34	0.119	1.805	4.0	1.93	0.51	3.23	41.2	250	251.46	DR 35	0.24	29.6	0.60	0.11
Future Street A	Cap	105	0	0.000	0.07	0.119	1.875	4.0	1.93	0.53	3.25	44.7	250	251.46	DR 35	0.24	29.6	0.60	0.11
Romina Street	105	103	8	0.022	0.36	0.289	4.319	4.0	4.68	1.21	5.89	74.0	250	251.46	DR 35	0.24	29.6	0.60	0.20
Brigitta Street	103	201	21	0.057	0.58	0.362	5.136	4.0	5.86	1.44	7.30	85.4	250	251.46	DR 35	0.24	29.6	0.60	0.25
Brigitta Street	201	203	26	0.070	0.73	0.432	5.866	4.0	7.00	1.64	8.64	93.0	250	251.46	DR 35	0.24	29.6	0.60	0.29
Brigitta Street	203	205	1	0.003	0.04	0.435	5.906	4.0	7.04	1.65	8.70	6.9	250	251.46	DR 35	0.24	29.6	0.60	0.29
Brigitta Street	205	1001	1	0.003	0.08	0.437	5.986	4.0	7.09	1.68	8.76	6.9	250	251.46	DR 35	0.24	29.6	0.60	0.30
Business Park																			
Mixed Use					1.40		1.400	1.5	1.22	0.39	1.61		250	251.46	DR 35	0.30	33.1	0.67	0.05
Light Industrial					12.50		12.500	3.9	19.75	3.50	23.25		250	251.46	DR 35	0.30	33.1	0.67	0.70
Commercial					2.46		2.460	1.5	2.14	0.69	2.82		250	251.46	DR 35	0.30	33.1	0.67	0.09
											27.68								
Brigitta Street	115	217	0	0.000	0.09	0.000	0.090	4.0	0.00	0.03	27.71	51.3	375	366.42	DR 35	0.15	62.8	0.60	0.44
Future Residential	FUT	217	60	0.162	0.79	0.162	0.790	4.0	2.63	0.22	2.85	9.0	250	251.46	DR 35	0.24	29.6	0.60	0.10
Artesa Private	701	703	12	0.032	0.24	0.032	0.240	4.0	0.53	0.07	0.59	37.0	250	251.46	DR 35	0.65	48.7	0.98	0.01
Artesa Private	703	705	60	0.162	0.92	0.194	1.160	4.0	3.15	0.32	3.47	85.8	250	251.46	DR 35	0.24	29.6	0.60	0.12
Artesa Private	705	707	12	0.032	0.20	0.227	1.360	4.0	3.68	0.38	4.06	23.8	250	251.46	DR 35	0.24	29.6	0.60	0.14
Artesa Private	707	217	12	0.032	0.17	0.259	1.530	4.0	4.20	0.43	4.63	30.0	250	251.46	DR 35	0.24	29.6	0.60	0.16
Brigitta Street	217	215	0	0.000	0.17	0.421	2.410	4.0	6.83	0.67	35.18	95.5	375	366.42	DR 35	0.15	62.8	0.60	0.56

SANITARY SEWER DESIGN SHEET

PROJECT #: 103031-1
DESIGNED BY : MSP
CHECKED BY : RSC

PROJECT: **Bridelwood Trails**
DEVELOPER: **Claridge Homes**

DATE: 22-Sep-05
REV.: 12-Jun-06

LOCATION			INDIVIDUAL			CUMULATIVE		PEAK FACTOR M	POPULATION FLOW	PEAK EXTRAN.	PEAK DESIGN	PROPOSED SEWER							
STREET	FROM MH	TO MH	Units	Population (in 1000's)	AREA (ha.)	Population (in 1000's)	AREA (ha.)		Q (p) (L/s)	FLOW Q(i) (L/s)	FLOW Q (d) (L/s)	LENGTH (m)	PIPE SIZE (mm)	PIPE ID (mm)	TYPE OF PIPE	GRADE %	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	Qpeak/ Qcap
Amici Terrace	501	503	21	0.057	0.60	0.057	0.600	4.0	0.92	0.17	1.09	67.6	250	251.46	DR 35	0.24	29.6	0.60	0.04
Amici Terrace	503	505	2	0.005	0.06	0.062	0.660	4.0	1.01	0.18	1.19	9.0	250	251.46	DR 35	0.24	29.6	0.60	0.04
Amici Terrace	505	215	16	0.043	0.55	0.105	1.210	4.0	1.71	0.34	2.05	89.6	250	251.46	DR 35	0.24	29.6	0.60	0.07
Brigitta Street	215	213	12	0.032	0.43	0.559	4.050	3.9	8.94	1.13	37.75	102.4	375	366.42	DR 35	0.15	62.8	0.60	0.60
Brigitta Street	213	211	1	0.003	0.08	0.562	4.125	3.9	8.98	1.16	37.82	24.5	375	366.42	DR 35	0.15	62.8	0.60	0.60
Romina Street	113	111	4	0.011	0.18	0.011	0.180	4.0	0.18	0.05	0.23	37.8	250	251.46	DR 35	0.65	48.7	0.98	0.00
Future Street C	803	801	19	0.051	0.55	0.051	0.550	4.0	0.83	0.15	0.99	84.0	250	251.46	DR 35	0.65	48.7	0.98	0.02
Future Street C	801	Cap	10	0.027	0.44	0.078	0.990	4.0	1.27	0.28	1.55	39.2	250	251.46	DR 35	0.24	29.6	0.60	0.05
Future Street C	Cap	111	0	0.000	0.07	0.078	1.060	4.0	1.27	0.30	1.57	44.7	250	251.46	DR 35	0.24	29.6	0.60	0.05
Arrita Terrace	111	603	9	0.024	0.29	0.113	1.530	4.0	1.84	0.43	2.27	71.5	250	251.46	DR 35	0.24	29.6	0.60	0.08
Arrita Terrace	603	605	3	0.008	0.11	0.122	1.640	4.0	1.97	0.46	2.43	7.9	250	251.46	DR 35	0.24	29.6	0.60	0.08
Arrita Terrace	605	403	26	0.070	0.69	0.192	2.330	4.0	3.11	0.65	3.76	98.2	250	251.46	DR 35	0.24	29.6	0.60	0.13
Lokoya Street	401	403	9	0.024	0.30	0.024	0.295	4.0	0.39	0.08	0.48	65.0	250	251.46	DR 35	0.65	48.7	0.98	0.01
Lokoya Street	403	405	12	0.032	0.35	0.248	2.975	4.0	4.03	0.83	4.86	74.0	250	251.46	DR 35	0.24	29.6	0.60	0.16
Lokoya Street	405	407	12	0.032	0.36	0.281	3.335	4.0	4.55	0.93	5.48	61.6	250	251.46	DR 35	0.24	29.6	0.60	0.19
Lokoya Street	407	211	6	0.016	0.27	0.297	3.605	4.0	4.81	1.01	5.82	61.6	250	251.46	DR 35	0.24	29.6	0.60	0.20
Brigitta Street	211	209	6	0.016	0.24	0.875	7.970	3.8	13.60	2.23	43.51	59.2	375	366.42	DR 35	0.15	62.8	0.60	0.69
Brigitta Street	209	207	4	0.011	0.20	0.886	8.170	3.8	13.75	2.29	43.72	60.5	375	366.42	DR 35	0.15	62.8	0.60	0.70
Opus Street	301	303	26	0.070	0.68	0.070	0.680	4.0	1.14	0.19	1.33	91.5	250	251.46	DR 35	0.65	48.7	0.98	0.03
Opus Street	303	305	26	0.070	0.67	0.140	1.350	4.0	2.28	0.38	2.65	94.5	250	251.46	DR 35	0.24	29.6	0.60	0.09
Opus Street	305	307	2	0.005	0.09	0.146	1.440	4.0	2.36	0.40	2.77	6.9	250	251.46	DR 35	0.24	29.6	0.60	0.09
Opus Street	307	207	0	0.000	0.04	0.146	1.480	4.0	2.36	0.41	2.78	35.8	250	251.46	DR 35	0.24	29.6	0.60	0.09
Brigitta Street	207	1001	5	0.014	0.23	1.045	9.882	3.8	16.03	2.77	46.48	61.4	375	366.42	DR 35	0.15	62.8	0.60	0.74
Easement	1001	1003	0	0.000	0.01	1.482	15.878	3.7	22.12	4.45	54.24	16.8	450	447.87	DR 35	0.11	93.8	0.60	0.58
Easement	1003	1005	0	0.000	0.07	1.482	15.948	3.7	22.12	4.47	54.26	80.1	450	447.87	DR 35	0.11	93.8	0.60	0.58
FernBank Road	1005	1007	0	0.000	0.10	1.482	16.048	3.7	22.12	4.49	54.29	98.2	450	447.87	DR 35	0.11	93.8	0.60	0.58
FernBank Road	1007	1009	0	0.000	0.09	1.482	16.138	3.7	22.12	4.52	54.34	98.2	450	447.87	DR 35	0.11	93.8	0.60	0.58
FernBank Road	1009	1011	0	0.000	0.10	1.482	16.238	3.7	22.12	4.55	26.66	115.8	450	447.87	DR 35	0.11	93.8	0.60	0.28
FernBank Road	1011	1013	0	0.000	0.10	1.482	16.338	3.7	22.12	4.57	29.54	115.8	450	447.87	DR 35	0.11	93.8	0.60	0.31
Easement	1013	1015	0	0.000	0.19	1.482	16.528	3.7	22.12	4.63	26.74	77.0	450	447.87	DR 35	0.11	93.8	0.60	0.29
Easement	1015	1017	0	0.000	0.22	1.482	16.748	3.7	22.12	4.69	27.40	83.6	450	447.87	DR 35	0.11	93.8	0.60	0.29
Easement	1017	1019	0	0.000	0.24	1.482	16.988	3.7	22.12	4.76	30.35	65.3	450	447.87	DR 35	0.11	93.8	0.60	0.32
Easement	1019	1021	0	0.000	0.19	1.482	17.178	3.7	22.12	4.81	30.98	65.3	450	447.87	DR 35	0.11	93.8	0.60	0.33

SANITARY SEWER DESIGN SHEET

PROJECT #: 103031-1
DESIGNED BY : MSP
CHECKED BY : RSC

PROJECT: **Bridelwood Trails**
DEVELOPER: **Claridge Homes**

DATE: 22-Sep-05
REV.: 12-Jun-06

LOCATION			INDIVIDUAL			CUMULATIVE		PEAK FACTOR M	POPULATION FLOW	PEAK EXTRAN.	PEAK DESIGN	PROPOSED SEWER							
STREET	FROM MH	TO MH	Units	Population (in 1000's)	AREA (ha.)	Population (in 1000's)	AREA (ha.)		Q (p) (L/s)	FLOW Q(i) (L/s)	FLOW Q (d) (L/s)	LENGTH (m)	PIPE SIZE (mm)	PIPE ID (mm)	TYPE OF PIPE	GRADE %	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	Qpeak/ Qcap
Easement	1021	1023	0	0.000		1.482	17.178	3.7	22.12	4.81	31.56	35.2	450	447.87	DR 35	0.11	93.8	0.60	0.34
Easement	1023	SG01000	0	0.000		1.482	17.178	3.7	22.12	4.81	26.93	2.5	450	447.87	DR 35	0.11	93.8	0.60	0.29

Notes:

1. Q(d) = Q(p) + Q(i) , where Q(d) = Design Flow (L/sec)
   Q(p) = Population Flow (L/sec)
   Q(i) = Extraneous Flow (L/sec)

2. Q(i) = 0.28 L/sec/ha

3. Q(p) = (PxqxM/86,400), where
   P = Population (2.7 persons per Townhouse unit)
   q = Average per capita flow = 350 L/cap/day - Residential
   q = Average per gross ha. flow = 35000 L/gross ha/day - Light industrial
   q = Average per gross ha. flow = 50000 L/gross ha/day - Commercial/Mixed use
   M = Harmon Formula (maximum of 4.0)
   Min pipe size 200mm @ min. slope 0.32%

LEGEND

- 2.02 / 101-103 / 12 / 2 — AREA IN HECTARES; MANHOLE TO MANHOLE; POPULATION EQUIVALENT; NUMBER OF UNITS
- SANITARY DRAINAGE AREA BOUNDARY
- DIRECTION OF FLOW
- MH 101 — PROPOSED SANITARY SEWER AND MANHOLE

PROPOSED DEVELOPMENT (BY OTHERS)

EAGLESON ROAD

BRIGITTA STREET

GULF STREET

LAQUITA STREET

ROBIN STREET

ARIKA TERRACE

ARIKA PRIVATE

STREET A

STREET B

STREET C

FUTURE DEVELOPMENTS PEAK DESIGN FLOW=2.55 L/S

FUTURE DEVELOPMENTS PEAK DESIGN FLOW=27.66 L/S

FUTURE DEVELOPMENTS PEAK DESIGN FLOW=3.25 L/S

FUTURE DEVELOPMENTS PEAK DESIGN FLOW=1.33 L/S

FUTURE DEVELOPMENTS PEAK DESIGN FLOW=1.57 L/S

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
2	REVISED AS PER CITY COMMENTS	JUN 16/06	MSP
1	ISSUED FOR CITY REVIEW	FEB 27/06	MSP

REGISTERED PROFESSIONAL ENGINEER — J.G. RIDDELL — PROVINCE OF ONTARIO

LICENCED PROFESSIONAL ENGINEER — R.S. CEDRYK — PROVINCE OF ONTARIO

NOVATECH ENGINEERING CONSULTANTS LTD.
CONSULTING ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email novatech@novatech-eng.com

DESIGN	MSP/CAH
CHECKED	RSC
DRAWN	KLM
CHECKED	MSP/CAH
APPROVED	RSC

SCALE 1:1000

CITY OF OTTAWA

BRIDLEWOOD TRAILS

SANITARY DRAINAGE AREA PLAN

PROJECT No. 103031

DATE SEPTEMBER 2006

DRAWING No. 103031-SAN

NOVATECH
ENGINEERING
CONSULTANTS LTD.

PROJECT #: 106121
DESIGNED BY : JPB
CHECKED BY : DDB

SANITARY SEWER DESIGN SHEET

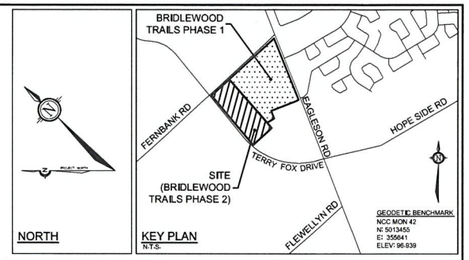
PROJECT: **Bridlewood Trails - Phase 2**
DEVELOPER: **Claridge Homes**

Date: 23-Jan-12
Revised: 29-Feb-12
Revised: 08-May-12
Revised: 30-Nov-12
Revised: 29-Mar-13
Revised: 06-Jun-13
Revised: 15-Jul-13
Revised: 08-Aug-13

LOCATION				INDIVIDUAL				CUMULATIVE						PROPOSED SEWER								
STREET	FROM MH	TO MH	Area	Apartment Units	Townhouse Units	Population (in 1000's)	AREA (ha.)	Population (in 1000's)	AREA (ha.)	PEAK FACTOR M	POPULATION FLOW Q(p) (L/s)	PEAK EXTRAN. FLOW Q(i) (L/s)	PEAK DESIGN FLOW Q(d) (L/s)	LENGTH (m)	PIPE SIZE (mm)	PIPE ID (mm)	TYPE OF PIPE	GRADE %	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	Qpeak/ Qcap	d/ D_{full}
BRIDLEWOOD PH. 2																						
RIOJA STREET	101	103	1		31	0.084	0.760	0.084	0.760	4.0	1.36	0.21	1.57	104.8	200	203.20	DR 35	0.32	19.4	0.60	8%	0.19
RIOJA STREET	103	105	2		23	0.062	0.550	0.146	1.310	4.0	2.36	0.37	2.73	71.9	200	203.20	DR 35	0.32	19.4	0.60	14%	0.25
RIOJA STREET	105	107	3		18	0.049	0.470	0.194	1.780	4.0	3.15	0.50	3.65	72.0	200	203.20	DR 35	0.32	19.4	0.60	19%	0.29
OVERBERG WAY	109	107	4		3	0.008	0.220	0.008	0.220	4.0	0.13	0.06	0.19	17.1	200	203.20	DR 35	0.65	27.6	0.85	1%	0.00
OVERBERG WAY	107	117	5		9	0.024	0.280	0.227	2.280	4.0	3.68	0.64	4.31	73.0	200	203.20	DR 35	0.32	19.4	0.60	22%	0.30
OVERBERG WAY	111	113	6		12	0.032	0.390	0.032	0.390	4.0	0.53	0.11	0.63	82.3	200	203.20	DR 35	0.32	19.4	0.60	3%	0.12
OVERBERG WAY	113	115	7		1	0.003	0.070	0.035	0.460	4.0	0.57	0.13	0.70	11.0	200	203.20	DR 35	0.32	19.4	0.60	4%	0.12
OVERBERG WAY	115	117	8		10	0.027	0.290	0.062	0.750	4.0	1.01	0.21	1.22	61.2	200	203.20	DR 35	0.32	19.4	0.60	6%	0.16
OVERBERG WAY	117	119	9		8	0.022	0.220	0.311	3.250	4.0	5.03	0.91	5.94	37.2	250	254.00	DR 35	0.24	30.4	0.60	20%	0.30
OVERBERG WAY	121	119	10		18	0.049	0.450	0.049	0.450	4.0	0.79	0.13	0.91	66.0	200	203.20	DR 35	0.32	19.4	0.60	5%	0.12
OPUS STREET	119	EX 105	11		0	0.000	0.120	0.359	3.820	4.0	5.82	1.07	6.89	81.4	250	254.00	DR 35	0.24	30.4	0.60	23%	0.30
OVERBERG WAY	CAP	133	13	72		0.151	0.930	0.151	0.930	4.0	2.45	0.26	2.71	9.0	200	203.20	DR 35	0.32	19.4	0.60	14%	0.25
OVERBERG WAY	133	131	14		0	0.000	0.370	0.151	1.300	4.0	2.45	0.36	2.81	17.6	200	203.20	DR 35	0.32	19.4	0.60	15%	0.25
OVERBERG WAY	131	129	15		0	0.000	0.070	0.151	1.370	4.0	2.45	0.38	2.83	38.0	200	203.20	DR 35	0.32	19.4	0.60	15%	0.25
TULUM CRESCENT	139	137	16		11	0.030	0.510	0.030	0.510	4.0	0.48	0.14	0.62	80.8	200	203.20	DR 35	0.32	19.4	0.60	3%	0.12
TULUM CRESCENT	137	129	17		0	0.000	0.010	0.030	0.520	4.0	0.48	0.15	0.63	7.8	200	203.20	DR 35	0.32	19.4	0.60	3%	0.12
OVERBERG WAY	129	127	19		0	0.000	0.030	0.181	1.920	4.0	2.93	0.54	3.47	19.1	200	203.20	DR 35	0.32	19.4	0.60	18%	0.29
PARKLAND	143	127	18		0		1.030		1.030	1.5	0.13	0.29	0.42	11.0	150	152.40	DR 35	1.00	15.9	0.87	3%	0.08
OVERBERG WAY	127	125	20		0	0.000	0.090	0.181	3.040	4.0	2.93	0.85	4.20	53.2	200	203.20	DR 35	0.32	19.4	0.60	22%	0.30
TULUM CRESCENT	141	125	21		11	0.030	0.430	0.030	0.430	4.0	0.48	0.12	0.60	91.0	200	203.20	DR 35	0.32	19.4	0.60	3%	0.08
OVERBERG WAY	125	123	22		9	0.024	0.250	0.235	3.720	4.0	3.81	1.04	5.27	44.4	200	203.20	DR 35	0.32	19.4	0.60	27%	0.34
OVERBERG WAY	121	123	23		32	0.086	0.780	0.086	0.780	4.0	1.40	0.22	1.62	111.7	200	203.20	DR 35	0.32	19.4	0.60	8%	0.19
ARRITA TERRACE	123	EX 109	24		0	0.000	0.120	0.321	4.620	4.0	5.21	1.29	6.92	79.9	250	254.00	DR 35	0.25	31.0	0.61	22%	0.30

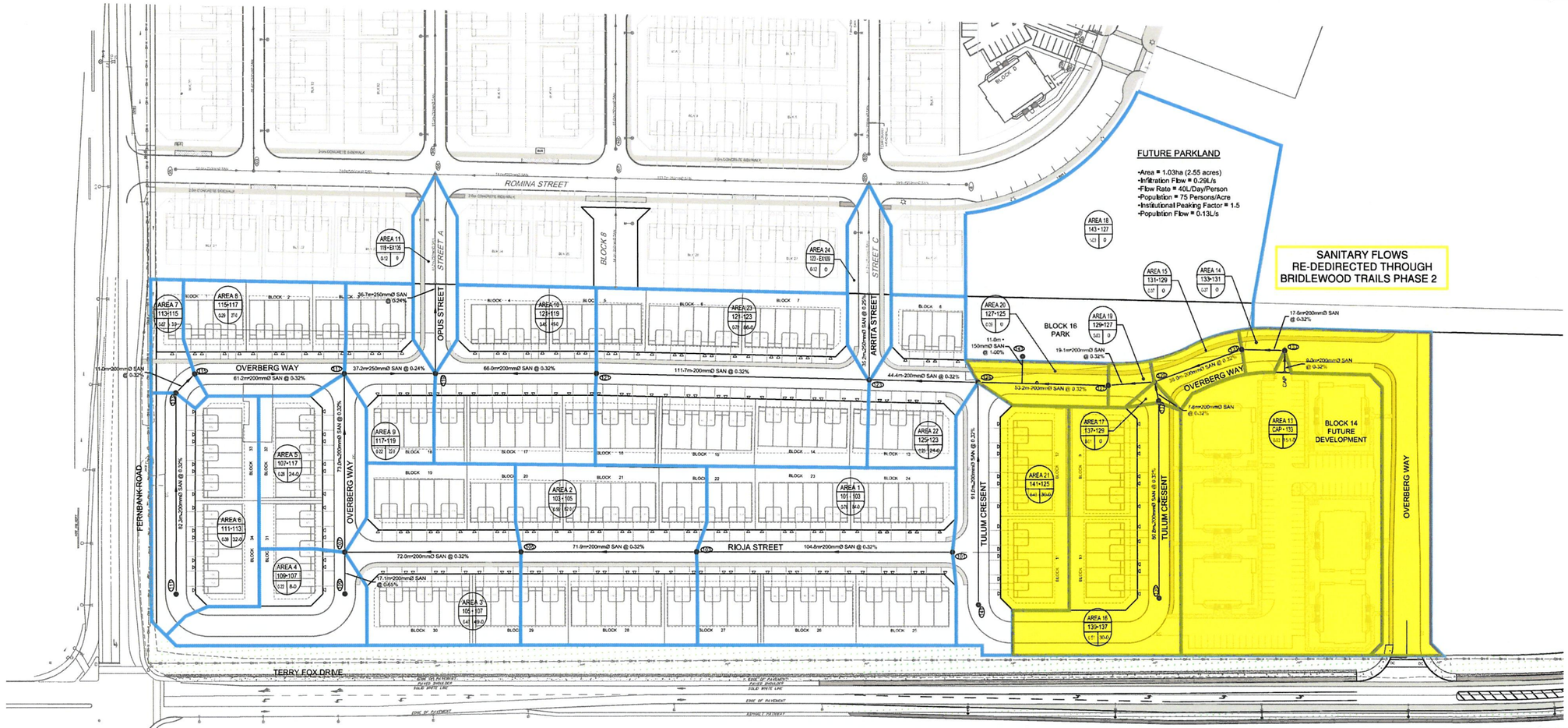
Notes:

1. Q(d) = Q(p) + Q(i) , where
   - Q(d) = Design Flow (L/sec)
   - Q(p) = Population Flow (L/sec)
   - Q(i) = Extraneous Flow (L/sec)
2. Q(i) = 0.28 L/sec/ha
3. Q(p) = (PxqxM/86,400), where
   - P = Population (2.7 persons per Townhouse unit)
   - P = Population (2.1 persons per 2 Bedroom Apartment unit)
   - q = Average per capita flow = 350 L/cap/day - Residential
   - q = Average per gross ha. flow = 35000 L/gross ha/day - Light industrial
   - q = Average per gross ha. flow = 50000 L/gross ha/day - Commercial/institutional
   - M = Harmon Formula (maximum of 4.0)
   - Min pipe size 250mm @ min. slope 0.24%



LEGEND

- AREA 1 / 815+813 / 347 / 185.1 — AREA ID; MANHOLE TO MANHOLE; POPULATION EQUIVALENT; AREA IN HECTARES
- SANITARY DRAINAGE AREA BOUNDARY
- PROPOSED SANITARY SEWER AND MANHOLE
- PROPOSED SANITARY SEWER WITH DIRECTION OF FLOW
- EXISTING SANITARY SEWER AND MANHOLE
- EXISTING SANITARY SEWER WITH DIRECTION OF FLOW



REVIEWED BY DEVELOPMENT REVIEW BRANCH
Signed _____
Date _____ 2013
Plan Number _____

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

CLARIDGE HOMES
210 Gladstone Avenue, Suite 2001
Ottawa, Ontario K2P 0Y6
Tel: (613) 233 6030
Fax: (613) 233 8290

No.	REVISION	DATE	BY
7.	ISSUED FOR CITY OF OTTAWA REVIEW	SEPT 27/13	MSP
6.	ISSUED FOR MINISTRY OF THE ENVIRONMENT APPROVAL	AUG 15/13	MSP
5.	ISSUED FOR CITY OF OTTAWA REVIEW	JULY 15/13	MSP
4.	ISSUED FOR CITY OF OTTAWA REVIEW	JUNE 7/13	MSP
3.	ISSUED FOR CITY OF OTTAWA REVIEW	NOV 30/12	MSP
2.	ISSUED FOR CITY OF OTTAWA REVIEW	MAY 9/12	MSP
1.	ISSUED FOR CITY OF OTTAWA REVIEW	JULY 22/11	MSP

SCALE 1:750 (1:750 0 10 20 30)

DESIGN: JPB
CHECKED: DDB
DRAWN: JPB
CHECKED: MSP
APPROVED: JGR

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER — D.D. BLAIR 100122737 — PROVINCE OF ONTARIO

REGISTERED PROFESSIONAL ENGINEER — J.G. RIDDELL — PROVINCE OF ONTARIO

NOVATECH ENGINEERING CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
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LOCATION
CITY of OTTAWA
BRIDLEWOOD TRAILS - PHASE 2

DRAWING NAME
SANITARY DRAINAGE AREAS PLAN

PROJECT No: 106121
REV: REV # 7
DRAWING No: 106121-SAN

M:\2006\106121\CAD\Sales\jpb\2012\October • Draft Plan\106121-SAN.dwg, PLANSET, Sep 30, 2013 - 3:50pm, jpbaron

Appendix C

Watermain Boundary Conditions,
FUS Calculations, &
Modelling Results

BOUNDARY CONDITIONS

Boundary Conditions For: 866 Eagleson Road

Date of Boundary Conditions: 2018-Dec-18

Provided Information:

Scenario	Demand	
	L/min	L/s
Average Daily Demand	157	4.5
Maximum Daily Demand	391	11.2
Peak Hour	859	24.6
Fire Flow #1 Demand	10,000	166.7
Fire Flow #2 Demand	13,000	216.7
Fire Flow #3 Demand	17,000	283.0
Fire Flow #4 Demand	19,000	317.0

Number Of Connections: 2

Location:

BOUNDARY CONDITIONS

Results:

Connection #: 2

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.7	91.4
Peak Hour	156.5	83.9
Max Day Plus Fire (10,000) L/min	156.6	85.4
Max Day Plus Fire (13,000) L/min	155.4	83.7
Max Day Plus Fire (17,000) L/min	153.2	80.5
Max Day Plus Fire (19,000) L/min	152.1	78.9

[1]Elevation: **96.58 m**

Connection #: 1

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.8	92.6
Peak Hour	156.7	85.4
Max Day Plus Fire (10,000) L/min	156.6	85.4
Max Day Plus Fire (13,000) L/min	155.4	83.7
Max Day Plus Fire (17,000) L/min	153.2	80.4
Max Day Plus Fire (19,000) L/min	152.1	78.9

[1]Elevation: **97.47 m**

Notes:

1) As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:

a) If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.

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

2) Connection 1 and 2 must be looped with a watermain network of minimum 200 mm size pipe as shown on Connection Location Figure

Disclaimer

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

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 117153
Project Name: Bridlewood 3
Date: 8/5/2019
Input By: Steve Zorgel
Reviewed By: Drew Blair

Legend
No Information or Input Required

Building Description: Back to Back Towns - Entire Area
Wood frame
Note - <2.4m separation between adjacent back to back - taken as one area to FW in ctr of Ctr unit

Step			Input	Multiplier Options	Value Used	Total Fire Flow (L/min)
Base 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	Building Footprint (m^2)	944			
		Number of Floors/Storeys	2			
		Area of structure considered (m^2)			1,888	
	F	**Base fire flow without reductions**				**14,000**
		$F = 220\ C\ (A)^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**					
	(1)	Non-combustible		-25%	-15%	**11,900**
		Limited combustible	Yes	-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	**0%**	
5	**Exposure Surcharge (cumulative %)**					
	(3)	North Side	20.1 - 30 m		10%	**4,760**
		East Side	2Hr Fire Wall		10%	
		South Side	20.1 - 30 m		10%	
		West Side	20.1 - 30 m		10%	
				Cumulative Total	**40%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**17,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**283**
				or	USGPM	4,491
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	3.5
		Required Volume of Fire Flow (m^3)			m^3	3570

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 117153
Project Name: Bridlewood 3
Date: 8/5/2019
Input By: Steve Zorgel
Reviewed By: Drew Blair

Legend: No Information or Input Required

Building Description: Back to Back Towns - Entire Area
Wood frame
Note - <2.4m separation between adjacent back to back - taken as one area to FW in ctr of Ctr unit

Step			Input	Multiplier Options	Value Used	Total Fire Flow (L/min)
Base 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	Building Footprint (m^2)	688			
		Number of Floors/Storeys	2			
		Area of structure considered (m^2)			**1,376**	
	F	**Base fire flow without reductions**				**12,000**
		$F = 220\ C\ (A)^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**					
	(1)	Non-combustible		-25%	-15%	**10,200**
		Limited combustible	Yes	-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	**0%**	
5	**Exposure Surcharge (cumulative %)**					
	(3)	North Side	2Hr Fire Wall		10%	**3,060**
		East Side	> 45.1m		0%	
		South Side	2Hr Fire Wall		10%	
		West Side	20.1 - 30 m		10%	
				Cumulative Total	**30%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**13,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**217**
				or	USGPM	3,435
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2.5
		Required Volume of Fire Flow (m^3)			m^3	1950

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 117153
Project Name: Bridlewood 3
Date: 8/5/2019
Input By: Steve Zorgel
Reviewed By: Drew Blair

Legend: No Information or Input Required

Building Description: Back to Back Towns - Entire Area
Wood frame
Note - <2.4m separation between adjacent back to back - taken as one area to FW in ctr of Ctr unit

Step			Input	Multiplier Options	Value Used	Total Fire Flow (L/min)
Base 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	Building Footprint (m^2)	816			
		Number of Floors/Storeys	2			
		Area of structure considered (m^2)			1,632	
	F	**Base fire flow without reductions**				13,000
		$F = 220\ C\ (A)^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**					
	(1)	Non-combustible		-25%	-15%	11,050
		Limited combustible	Yes	-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	0%	
5	**Exposure Surcharge (cumulative %)**					
	(3)	North Side	20.1 - 30 m		10%	4,420
		East Side	2Hr Fire Wall		10%	
		South Side	20.1 - 30 m		10%	
		West Side	2Hr Fire Wall		10%	
				Cumulative Total	40%	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			L/min	15,000
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	250
				or	USGPM	3,963
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	3
		Required Volume of Fire Flow (m^3)			m^3	2700

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 117153
Project Name: Bridlewood 3
Date: 8/5/2019
Input By: Steve Zorgel
Reviewed By: Drew Blair

Legend: No Information or Input Required

Building Description: Towns 137-140 - Entire Area
Wood frame
Note - less then 10m from back to adjacent towns

Step			Input	Multiplier Options	Value Used	Total Fire Flow (L/min)
Base 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	Building Footprint (m^2)	395			
		Number of Floors/Storeys	2			
		Area of structure considered (m^2)			**790**	
	F	**Base fire flow without reductions**				**9,000**
		F = 220 C (A)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**					
	(1)	Non-combustible		-25%	-15%	**7,650**
		Limited combustible	Yes	-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	**0%**	
5	**Exposure Surcharge (cumulative %)**					
	(3)	North Side	20.1 - 30 m		10%	**4,590**
		East Side	3.1 - 10 m		20%	
		South Side	3.1 - 10 m		20%	
		West Side	20.1 - 30 m		10%	
				Cumulative Total	**60%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**12,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**200**
				or	USGPM	3,170
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2.5
		Required Volume of Fire Flow (m^3)			m^3	1800

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 117153
Project Name: Bridlewood 3
Date: 8/5/2019
Input By: Steve Zorgel
Reviewed By: Drew Blair

Legend
No Information or Input Required

Building Description: Towns 214-217 - Entire Area
Wood frame
Note - less then 10m from back to adjacent towns

Step			Input	Multiplier Options	Value Used	Total Fire Flow (L/min)
Base 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	Building Footprint (m^2)	395			
		Number of Floors/Storeys	2			
		Area of structure considered (m^2)			**790**	
	F	**Base fire flow without reductions**				**9,000**
		F = 220 C (A)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**					
	(1)	Non-combustible		-25%	-15%	**7,650**
		Limited combustible	Yes	-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	**0%**	
5	**Exposure Surcharge (cumulative %)**					
	(3)	North Side	> 45.1m		0%	**3,825**
		East Side	3.1 - 10 m		20%	
		South Side	3.1 - 10 m		20%	
		West Side	20.1 - 30 m		10%	
				Cumulative Total	**50%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**11,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**183**
				or	USGPM	2,906
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2
		Required Volume of Fire Flow (m^3)			m^3	1320

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 117153
Project Name: Bridlewood 3
Date: 8/5/2019
Input By: Steve Zorgel
Reviewed By: Drew Blair

Legend
No Information or Input Required

Building Description: Singles (Group of 6) - Lot 42-47
Wood frame

Step			Input	Multiplier Options	Value Used	Total Fire Flow (L/min)
Base 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	Building Footprint (m^2)	780			
		Number of Floors/Storeys	2			
		Area of structure considered (m^2)			1,560	
	F	**Base fire flow without reductions**				13,000
		F = 220 C (A)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**					
	(1)	Non-combustible		-25%	-15%	11,050
		Limited combustible	Yes	-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	0%	
5	**Exposure Surcharge (cumulative %)**					
	(3)	North Side	3.1 - 10 m		20%	4,420
		East Side	20.1 - 30 m		10%	
		South Side	> 45.1m		0%	
		West Side	20.1 - 30 m		10%	
				Cumulative Total	40%	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			L/min	15,000
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	250
				or	USGPM	3,963
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	3
		Required Volume of Fire Flow (m^3)			m^3	2700

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 117153
Project Name: Bridlewood 3
Date: 8/5/2019
Input By: Steve Zorgel
Reviewed By: Drew Blair

Legend: No Information or Input Required

Building Description: Singles (Group of 4) Lot 13-16
Wood frame

Step			Input	Multiplier Options	Value Used	Total Fire Flow (L/min)
Base 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	Building Footprint (m^2)	520			
		Number of Floors/Storeys	2			
		Area of structure considered (m^2)			**1,040**	
	F	**Base fire flow without reductions**				**11,000**
		F = 220 C $(A)^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**					
	(1)	Non-combustible		-25%	-15%	**9,350**
		Limited combustible	Yes	-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	**0%**	
5	**Exposure Surcharge (cumulative %)**					
	(3)	North Side	3.1 - 10 m		20%	**4,675**
		East Side	3.1 - 10 m		20%	
		South Side	> 45.1m		0%	
		West Side	20.1 - 30 m		10%	
				Cumulative Total	**50%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**14,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**233**
				or	USGPM	3,699
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	3
		Required Volume of Fire Flow (m^3)			m^3	2520

Population and Consumption Rate Calculations

Node	Number of Single Units	Number of Townhouse Units	Number of Back to Back Town Units	Population	Consumption Rates (L/s)		
					Average Daily	Maximum Daily	Maximum Hourly
R1				0.0	0.00	0.00	0.00
R2				0.0	0.00	0.00	0.00
N1		2		5.4	0.02	0.05	0.12
N2		8		21.6	0.09	0.22	0.48
N3		10		27.0	0.11	0.27	0.60
N4		10		27.0	0.11	0.27	0.60
N5				0.0	0.00	0.00	0.00
N6		19		51.3	0.21	0.52	1.14
N7		11		29.7	0.12	0.30	0.66
N8		17		45.9	0.19	0.46	1.02
N9	4	4		24.4	0.10	0.25	0.54
N10	2			6.8	0.03	0.07	0.15
N11	4			13.6	0.06	0.14	0.30
N12	10			34.0	0.14	0.34	0.76
N13	13			44.2	0.18	0.45	0.98
N14	6			20.4	0.08	0.21	0.45
N15	6			20.4	0.08	0.21	0.45
N16		7		18.9	0.08	0.19	0.42
N17		7		18.9	0.08	0.19	0.42
N18		6	5	29.7	0.12	0.30	0.66
N19			7	18.9	0.08	0.19	0.42
N20			12	32.4	0.13	0.33	0.72
N21		2	8	27.0	0.11	0.27	0.60
N22		10	8	48.6	0.20	0.49	1.08
N23			6	16.2	0.07	0.16	0.36
N24		3	1	10.8	0.04	0.11	0.24
N25	2	5	6	36.5	0.15	0.37	0.81
N26		5		13.5	0.05	0.14	0.30
N27		10	11	56.7	0.23	0.57	1.26
N28		23		62.1	0.25	0.63	1.38
N29		8		21.6	0.09	0.22	0.48
N30		10		27.0	0.11	0.27	0.60
N31		6	3	24.3	0.10	0.25	0.54
N32		4		10.8	0.04	0.11	0.24
N33		4	12	43.2	0.18	0.44	0.96
N34		11	11	59.4	0.24	0.60	1.32
N35		2		5.4	0.02	0.05	0.12
N36			16	43.2	0.18	0.44	0.96
N37		4	3	18.9	0.08	0.19	0.42
N38		6	7	35.1	0.14	0.36	0.78
N39		4	4	21.6	0.09	0.22	0.48
N40		6		16.2	0.07	0.16	0.36
N41		3		8.1	0.03	0.08	0.18
N42				0.0	0.00	0.00	0.00
N43				0.0	0.00	0.00	0.00
N44				0.0	0.00	0.00	0.00
Total	**47**	**227**	**120**	**1096.7**	**4.44**	**11.11**	**24.43**

Water Demand Parameters

Singles	3.4	persons/unit
Towns (traditional, back to back)	2.7	persons/unit
Residential Demand	350	L/c/day
Residential Max Day	2.5	x Avg Day
Residential Peak Hour	2.2	x Max Day
Town Fire Flow (cap)	167	L/s
Town Fire Flow (no cap) - see plan for locations	183, 200	L/s
Back to Back Town - see plan for locations	217, 250, 283	L/s
Singles (cap)	167	L/s
Singles (no cap) - see plan for locations	233, 250	L/s

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi	Age hours
Resvr R1	161.80	-11.19	161.80	0.00	0.00	0.00	0.0
Resvr R2	161.70	6.71	161.70	0.00	0.00	0.00	0.0
Junc N1	97.60	0.02	161.79	64.19	0.00	0.00	8.0
Junc N2	97.98	0.09	161.79	63.81	625.98	90.79	7.1
Junc N3	97.62	0.11	161.79	64.17	629.51	91.30	0.1
Junc N4	97.40	0.11	161.77	64.37	631.47	91.59	0.2
Junc N5	97.43	0.00	161.78	64.35	631.27	91.56	0.2
Junc N6	97.30	0.21	161.76	64.46	632.35	91.71	0.4
Junc N7	97.45	0.12	161.76	64.31	630.88	91.50	0.3
Junc N8	97.50	0.19	161.76	64.26	630.39	91.43	0.4
Junc N9	97.75	0.10	161.76	64.01	627.94	91.07	0.8
Junc N10	98.00	0.03	161.75	63.75	625.39	90.70	1.1
Junc N11	97.80	0.06	161.75	63.95	627.35	90.99	1.6
Junc N12	97.65	0.14	161.75	64.10	628.82	91.20	2.2
Junc N13	97.85	0.18	161.75	63.90	626.86	90.92	1.2
Junc N14	98.10	0.08	161.75	63.65	624.41	90.56	1.9
Junc N15	97.65	0.08	161.75	64.10	628.82	91.20	2.7
Junc N16	97.55	0.08	161.75	64.20	629.80	91.35	4.9
Junc N17	97.85	0.08	161.75	63.90	626.86	90.92	3.1
Junc N18	97.95	0.12	161.75	63.80	625.88	90.78	5.5
Junc N19	98.00	0.08	161.75	63.75	625.39	90.70	8.4
Junc N20	97.65	0.13	161.75	64.10	628.82	91.20	19.3
Junc N21	97.65	0.11	161.75	64.10	628.82	91.20	9.0
Junc N22	97.70	0.20	161.75	64.05	628.33	91.13	12.3
Junc N23	97.60	0.07	161.75	64.15	629.31	91.27	7.7
Junc N24	97.55	0.04	161.75	64.20	629.80	91.35	6.6
Junc N25	97.50	0.15	161.75	64.25	630.29	91.42	2.9
Junc N26	97.45	0.05	161.75	64.30	630.78	91.49	3.4
Junc N27	97.65	0.23	161.75	64.10	628.82	91.20	6.6
Junc N28	97.30	0.25	161.75	64.45	632.25	91.70	9.1
Junc N29	97.30	0.09	161.75	64.45	632.25	91.70	1.0
Junc N30	97.25	0.11	161.75	64.50	632.75	91.77	1.1
Junc N31	97.07	0.10	161.75	64.68	634.51	92.03	0.7
Junc N32	97.00	0.04	161.74	64.74	635.10	92.11	0.8
Junc N33	97.15	0.18	161.74	64.59	633.63	91.90	0.8
Junc N34	97.35	0.24	161.74	64.39	631.67	91.62	0.9
Junc N35	97.70	0.02	161.73	64.03	628.13	91.10	1.4
Junc N36	97.60	0.18	161.73	64.13	629.12	91.25	1.7
Junc N37	97.60	0.08	161.73	64.13	629.12	91.25	1.5
Junc N38	97.35	0.14	161.72	64.37	631.47	91.59	1.4
Junc N39	96.95	0.09	161.73	64.78	635.49	92.17	1.0
Junc N40	97.00	0.07	161.73	64.73	635.00	92.10	1.0
Junc N41	96.65	0.03	161.73	65.08	638.43	92.60	1.6

Maximum Pressure
Maximum Age

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	32.00	50	100	-0.02	0.01	0.01	0.082
Pipe P2	89.00	200	110	-0.11	0.00	0.00	0.067
Pipe P3	10.00	200	110	-11.19	0.36	1.09	0.034
Pipe P4	80.00	200	110	5.32	0.17	0.28	0.038
Pipe P5	80.00	200	110	5.21	0.17	0.27	0.038
Pipe P6	15.00	200	110	5.65	0.18	0.31	0.037
Pipe P7	64.00	200	110	5.65	0.18	0.31	0.037
Pipe P8	58.00	200	110	3.14	0.10	0.10	0.041
Pipe P9	75.00	200	110	2.93	0.09	0.09	0.041
Pipe P10	39.00	200	110	2.39	0.08	0.06	0.042
Pipe P11	100.00	200	110	2.20	0.07	0.05	0.043
Pipe P12	62.00	200	110	2.10	0.07	0.05	0.043
Pipe P13	62.00	200	110	0.99	0.03	0.01	0.048
Pipe P14	60.00	200	110	0.93	0.03	0.01	0.049
Pipe P15	69.00	200	110	0.79	0.03	0.01	0.051
Pipe P16	10.00	200	110	1.08	0.03	0.01	0.049
Pipe P17	79.00	200	110	0.90	0.03	0.01	0.049
Pipe P18	75.00	200	110	0.82	0.03	0.01	0.049
Pipe P19	33.00	200	110	0.74	0.02	0.01	0.051
Pipe P20	59.00	200	110	0.29	0.01	0.00	0.044
Pipe P21	103.00	200	110	0.38	0.01	0.00	0.054
Pipe P22	76.00	200	110	0.12	0.00	0.00	0.062
Pipe P23	45.00	200	110	0.13	0.00	0.00	0.089
Pipe P24	106.00	200	110	0.05	0.00	0.00	0.000
Pipe P25	51.00	200	110	-0.08	0.00	0.00	0.000
Pipe P26	50.00	200	110	0.08	0.00	0.00	0.000
Pipe P27	39.00	200	110	-0.26	0.01	0.00	0.080
Pipe P28	41.00	200	110	-0.33	0.01	0.00	0.048
Pipe P29	67.00	200	110	0.21	0.01	0.00	0.075
Pipe P30	44.00	200	110	-0.17	0.01	0.00	0.060
Pipe P31	12.00	200	110	0.21	0.01	0.00	0.000
Pipe P32	110.00	200	110	0.26	0.01	0.00	0.057
Pipe P33	110.00	200	110	0.03	0.00	0.00	0.000
Pipe P34	102.00	200	110	-0.22	0.01	0.00	0.059
Pipe P35	78.00	200	110	-0.16	0.01	0.00	0.073
Pipe P36	12.00	200	110	2.78	0.09	0.08	0.042
Pipe P37	66.00	200	110	2.67	0.09	0.08	0.042
Pipe P38	32.00	200	110	4.98	0.16	0.24	0.038
Pipe P39	12.00	200	110	4.94	0.16	0.24	0.038
Pipe P40	67.00	200	110	2.80	0.09	0.08	0.041
Pipe P41	95.00	200	110	2.56	0.08	0.07	0.042
Pipe P42	13.00	200	110	-0.89	0.03	0.01	0.049
Pipe P43	110.00	200	110	-1.07	0.03	0.01	0.048
Pipe P44	43.00	200	110	3.43	0.11	0.12	0.040
Pipe P45	59.00	200	110	3.35	0.11	0.12	0.040
Pipe P46	50.00	200	110	6.71	0.21	0.42	0.036
Pipe P47	48.00	200	110	-3.50	0.11	0.13	0.040
Pipe P48	12.00	200	110	-3.59	0.11	0.13	0.040
Pipe P49	44.00	200	110	-3.69	0.12	0.14	0.040
Pipe P50	36.00	50	100	0.03	0.02	0.02	0.083

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	156.70	-24.63	156.70	0.00	0.00	0.00
Resvr R2	156.50	0.27	156.50	0.00	0.00	0.00
Junc N1	97.60	0.12	156.64	59.04	579.18	84.00
Junc N2	97.98	0.48	156.65	58.67	575.55	83.48
Junc N3	97.62	0.60	156.65	59.03	579.08	83.99
Junc N4	97.40	0.60	156.58	59.18	580.56	84.20
Junc N5	97.43	0.00	156.63	59.20	580.75	84.23
Junc N6	97.30	1.14	156.52	59.22	580.95	84.26
Junc N7	97.45	0.66	156.54	59.09	579.67	84.07
Junc N8	97.50	1.02	156.52	59.02	578.99	83.97
Junc N9	97.75	0.54	156.50	58.75	576.34	83.59
Junc N10	98.00	0.15	156.49	58.49	573.79	83.22
Junc N11	97.80	0.30	156.49	58.69	575.75	83.51
Junc N12	97.65	0.76	156.48	58.83	577.12	83.70
Junc N13	97.85	0.98	156.49	58.64	575.26	83.43
Junc N14	98.10	0.45	156.48	58.38	572.71	83.06
Junc N15	97.65	0.45	156.48	58.83	577.12	83.70
Junc N16	97.55	0.42	156.48	58.93	578.10	83.85
Junc N17	97.85	0.42	156.48	58.63	575.16	83.42
Junc N18	97.95	0.66	156.47	58.52	574.08	83.26
Junc N19	98.00	0.42	156.47	58.47	573.59	83.19
Junc N20	97.65	0.72	156.47	58.82	577.02	83.69
Junc N21	97.65	0.60	156.47	58.82	577.02	83.69
Junc N22	97.70	1.08	156.47	58.77	576.53	83.62
Junc N23	97.60	0.36	156.48	58.88	577.61	83.78
Junc N24	97.55	0.24	156.48	58.93	578.10	83.85
Junc N25	97.50	0.81	156.48	58.98	578.59	83.92
Junc N26	97.45	0.30	156.49	59.04	579.18	84.00
Junc N27	97.65	1.26	156.48	58.83	577.12	83.70
Junc N28	97.30	1.38	156.49	59.19	580.65	84.22
Junc N29	97.30	0.48	156.50	59.20	580.75	84.23
Junc N30	97.25	0.60	156.50	59.25	581.24	84.30
Junc N31	97.07	0.54	156.51	59.44	583.11	84.57
Junc N32	97.00	0.24	156.50	59.50	583.70	84.66
Junc N33	97.15	0.96	156.50	59.35	582.22	84.44
Junc N34	97.35	1.32	156.50	59.15	580.26	84.16
Junc N35	97.70	0.12	156.50	58.80	576.83	83.66
Junc N36	97.60	0.96	156.50	58.90	577.81	83.80
Junc N37	97.60	0.42	156.50	58.90	577.81	83.80
Junc N38	97.35	0.78	156.50	59.15	580.26	84.16
Junc N39	96.95	0.48	156.50	59.55	584.19	84.73
Junc N40	97.00	0.36	156.50	59.50	583.70	84.66
Junc N41	96.65	0.18	156.48	59.83	586.93	85.13

Minimum Pressure

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	32.00	50	100	-0.12	0.06	0.25	0.066
Pipe P2	89.00	200	110	-0.60	0.02	0.00	0.052
Pipe P3	10.00	200	110	-24.63	0.78	4.71	0.030
Pipe P4	80.00	200	110	10.44	0.33	0.96	0.034
Pipe P5	80.00	200	110	9.84	0.31	0.86	0.034
Pipe P6	15.00	200	110	12.99	0.41	1.44	0.033
Pipe P7	64.00	200	110	12.99	0.41	1.44	0.033
Pipe P8	58.00	200	110	6.19	0.20	0.36	0.037
Pipe P9	75.00	200	110	5.05	0.16	0.25	0.038
Pipe P10	39.00	200	110	6.15	0.20	0.36	0.037
Pipe P11	100.00	200	110	5.13	0.16	0.26	0.038
Pipe P12	62.00	200	110	4.59	0.15	0.21	0.039
Pipe P13	62.00	200	110	1.22	0.04	0.02	0.047
Pipe P14	60.00	200	110	0.92	0.03	0.01	0.049
Pipe P15	69.00	200	110	0.16	0.01	0.00	0.079
Pipe P16	10.00	200	110	3.21	0.10	0.11	0.040
Pipe P17	79.00	200	110	2.23	0.07	0.06	0.043
Pipe P18	75.00	200	110	1.78	0.06	0.04	0.044
Pipe P19	33.00	200	110	1.33	0.04	0.02	0.047
Pipe P20	59.00	200	110	-0.64	0.02	0.01	0.051
Pipe P21	103.00	200	110	1.55	0.05	0.03	0.045
Pipe P22	76.00	200	110	0.40	0.01	0.00	0.059
Pipe P23	45.00	200	110	0.49	0.02	0.00	0.054
Pipe P24	106.00	200	110	0.07	0.00	0.00	0.142
Pipe P25	51.00	200	110	-0.65	0.02	0.01	0.050
Pipe P26	50.00	200	110	0.68	0.02	0.01	0.050
Pipe P27	39.00	200	110	-1.93	0.06	0.04	0.044
Pipe P28	41.00	200	110	-2.29	0.07	0.06	0.043
Pipe P29	67.00	200	110	-1.06	0.03	0.01	0.048
Pipe P30	44.00	200	110	-3.59	0.11	0.13	0.040
Pipe P31	12.00	200	110	-3.75	0.12	0.14	0.040
Pipe P32	110.00	200	110	-0.48	0.02	0.00	0.056
Pipe P33	110.00	200	110	-1.74	0.06	0.03	0.044
Pipe P34	102.00	200	110	-3.12	0.10	0.10	0.041
Pipe P35	78.00	200	110	4.05	0.13	0.17	0.039
Pipe P36	12.00	200	110	-2.61	0.08	0.07	0.042
Pipe P37	66.00	200	110	-3.21	0.10	0.11	0.041
Pipe P38	32.00	200	110	3.55	0.11	0.13	0.040
Pipe P39	12.00	200	110	3.31	0.11	0.11	0.041
Pipe P40	67.00	200	110	2.54	0.08	0.07	0.042
Pipe P41	95.00	200	110	1.22	0.04	0.02	0.047
Pipe P42	13.00	200	110	0.17	0.01	0.00	0.000
Pipe P43	110.00	200	110	-0.79	0.03	0.01	0.050
Pipe P44	43.00	200	110	0.94	0.03	0.01	0.048
Pipe P45	59.00	200	110	0.52	0.02	0.00	0.055
Pipe P46	50.00	200	110	0.27	0.01	0.00	0.059
Pipe P47	48.00	200	110	-0.53	0.02	0.00	0.053
Pipe P48	12.00	200	110	-1.01	0.03	0.01	0.047
Pipe P49	44.00	200	110	-1.55	0.05	0.03	0.045
Pipe P50	36.00	50	100	0.18	0.09	0.53	0.062

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	153.20	-142.70	153.20	0.00	0.00	0.00
Resvr R2	153.20	-35.39	153.20	0.00	0.00	0.00
Junc N1	97.60	0.05	146.98	49.38	484.42	70.26
Junc N2	97.98	95.22	146.98	49.00	480.69	69.72
Junc N3	97.62	0.27	152.11	54.49	534.55	77.53
Junc N4	97.40	0.27	152.21	54.81	537.69	77.98
Junc N5	97.43	63.33	151.85	54.42	533.86	77.43
Junc N6	97.30	0.52	151.99	54.69	536.51	77.81
Junc N7	97.45	0.30	151.94	54.49	534.55	77.53
Junc N8	97.50	0.46	151.95	54.45	534.15	77.47
Junc N9	97.75	0.25	151.97	54.22	531.90	77.15
Junc N10	98.00	0.07	151.99	53.99	529.64	76.82
Junc N11	97.80	0.14	152.00	54.20	531.70	77.12
Junc N12	97.65	0.34	152.00	54.35	533.17	77.33
Junc N13	97.85	0.45	151.99	54.14	531.11	77.03
Junc N14	98.10	0.21	151.99	53.89	528.66	76.68
Junc N15	97.65	0.21	152.00	54.35	533.17	77.33
Junc N16	97.55	0.19	152.00	54.45	534.15	77.47
Junc N17	97.85	0.19	152.00	54.15	531.21	77.05
Junc N18	97.95	0.30	152.00	54.05	530.23	76.90
Junc N19	98.00	0.19	152.00	54.00	529.74	76.83
Junc N20	97.65	0.33	152.00	54.35	533.17	77.33
Junc N21	97.65	0.27	152.00	54.35	533.17	77.33
Junc N22	97.70	0.49	152.00	54.30	532.68	77.26
Junc N23	97.60	0.16	152.00	54.40	533.66	77.40
Junc N24	97.55	0.11	152.00	54.45	534.15	77.47
Junc N25	97.50	0.37	152.01	54.51	534.74	77.56
Junc N26	97.45	0.14	152.02	54.57	535.33	77.64
Junc N27	97.65	0.57	152.02	54.37	533.37	77.36
Junc N28	97.30	0.63	152.03	54.73	536.90	77.87
Junc N29	97.30	0.22	152.05	54.75	537.10	77.90
Junc N30	97.25	0.27	152.09	54.84	537.98	78.03
Junc N31	97.07	0.25	152.31	55.24	541.90	78.60
Junc N32	97.00	0.11	152.43	55.43	543.77	78.87
Junc N33	97.15	0.44	152.47	55.32	542.69	78.71
Junc N34	97.35	0.60	152.38	55.03	539.84	78.30
Junc N35	97.70	0.05	152.50	54.80	537.59	77.97
Junc N36	97.60	0.44	152.49	54.89	538.47	78.10
Junc N37	97.60	0.19	152.60	55.00	539.55	78.26
Junc N38	97.35	0.36	152.74	55.39	543.38	78.81
Junc N39	96.95	0.22	152.61	55.66	546.02	79.19
Junc N40	97.00	0.16	152.58	55.58	545.24	79.08
Junc N41	96.65	0.08	152.58	55.93	548.67	79.58
Junc N42	96.66	0.00	153.20	56.54	554.66	80.45
Junc N43	96.94	0.00	153.20	56.26	551.91	80.05
Junc N44	97.79	8.67	153.19	55.40	543.47	78.82

Minimum Pressure
Applied Fireflow (sum)

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	32.00	50	100	-0.05	0.03	0.05	0.075
Pipe P2	89.00	200	110	-95.27	3.03	57.69	0.025
Pipe P3	10.00	200	110	-134.03	4.27	108.55	0.023
Pipe P4	80.00	200	110	-11.74	0.37	1.19	0.034
Pipe P5	80.00	200	110	-12.01	0.38	1.25	0.033
Pipe P6	15.00	200	110	50.23	1.60	17.63	0.027
Pipe P7	64.00	200	110	-13.10	0.42	1.46	0.033
Pipe P8	58.00	200	110	-9.15	0.29	0.75	0.035
Pipe P9	75.00	200	110	-9.67	0.31	0.83	0.035
Pipe P10	39.00	200	110	-4.25	0.14	0.18	0.039
Pipe P11	100.00	200	110	-4.71	0.15	0.22	0.038
Pipe P12	62.00	200	110	-4.96	0.16	0.24	0.038
Pipe P13	62.00	200	110	-3.44	0.11	0.12	0.040
Pipe P14	60.00	200	110	-3.58	0.11	0.13	0.040
Pipe P15	69.00	200	110	-3.92	0.12	0.16	0.039
Pipe P16	10.00	200	110	-1.60	0.05	0.03	0.045
Pipe P17	79.00	200	110	-2.05	0.07	0.05	0.044
Pipe P18	75.00	200	110	-2.26	0.07	0.06	0.043
Pipe P19	33.00	200	110	-2.47	0.08	0.07	0.042
Pipe P20	59.00	200	110	-2.01	0.06	0.05	0.044
Pipe P21	103.00	200	110	-0.64	0.02	0.01	0.052
Pipe P22	76.00	200	110	-0.58	0.02	0.00	0.051
Pipe P23	45.00	200	110	-0.37	0.01	0.00	0.054
Pipe P24	106.00	200	110	-0.56	0.02	0.00	0.053
Pipe P25	51.00	200	110	-0.89	0.03	0.01	0.049
Pipe P26	50.00	200	110	1.07	0.03	0.01	0.048
Pipe P27	39.00	200	110	-2.22	0.07	0.05	0.043
Pipe P28	41.00	200	110	-2.38	0.08	0.06	0.043
Pipe P29	67.00	200	110	-2.20	0.07	0.05	0.043
Pipe P30	44.00	200	110	-4.70	0.15	0.22	0.038
Pipe P31	12.00	200	110	-6.34	0.20	0.38	0.037
Pipe P32	110.00	200	110	-2.64	0.08	0.08	0.042
Pipe P33	110.00	200	110	-3.21	0.10	0.11	0.041
Pipe P34	102.00	200	110	-3.84	0.12	0.15	0.040
Pipe P35	78.00	200	110	6.48	0.21	0.40	0.037
Pipe P36	12.00	200	110	-20.21	0.64	3.26	0.031
Pipe P37	66.00	200	110	-20.48	0.65	3.35	0.031
Pipe P38	32.00	200	110	-21.53	0.69	3.67	0.031
Pipe P39	12.00	200	110	-21.64	0.69	3.71	0.031
Pipe P40	67.00	200	110	-11.21	0.36	1.10	0.034
Pipe P41	95.00	200	110	-11.81	0.38	1.21	0.034
Pipe P42	13.00	200	110	5.01	0.16	0.25	0.038
Pipe P43	110.00	200	110	4.57	0.15	0.21	0.039
Pipe P44	43.00	200	110	-16.87	0.54	2.34	0.032
Pipe P45	59.00	200	110	-17.06	0.54	2.39	0.032
Pipe P46	50.00	200	110	-35.39	1.13	9.22	0.029
Pipe P47	48.00	200	110	17.98	0.57	2.63	0.032
Pipe P48	12.00	200	110	17.76	0.57	2.57	0.032
Pipe P49	44.00	200	110	17.52	0.56	2.51	0.032
Pipe P50	36.00	50	100	0.08	0.04	0.12	0.070
Pipe P51	9.00	300	120	0.00	0.00	0.00	0.000
Pipe P52	99.00	300	120	0.00	0.00	0.00	0.000
Pipe P53	10.00	200	110	8.67	0.28	0.68	0.035

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	153.20	-181.43	153.20	0.00	0.00	0.00
Resvr R2	153.20	-79.65	153.20	0.00	0.00	0.00
Junc N1	97.60	0.05	151.30	53.70	526.80	76.41
Junc N2	97.98	0.22	151.30	53.32	523.07	75.86
Junc N3	97.62	0.27	151.30	53.68	526.60	76.38
Junc N4	97.40	0.27	150.20	52.80	517.97	75.12
Junc N5	97.43	0.00	149.60	52.17	511.79	74.23
Junc N6	97.30	0.52	142.28	44.98	441.25	64.00
Junc N7	97.45	0.30	142.36	44.91	440.57	63.90
Junc N8	97.50	28.79	138.65	41.15	403.68	58.55
Junc N9	97.75	95.25	132.79	35.04	343.74	49.86
Junc N10	98.00	0.07	132.79	34.79	341.29	49.50
Junc N11	97.80	63.47	132.88	35.08	344.13	49.91
Junc N12	97.65	0.34	135.16	37.51	367.97	53.37
Junc N13	97.85	63.78	132.78	34.93	342.66	49.70
Junc N14	98.10	0.21	134.17	36.07	353.85	51.32
Junc N15	97.65	0.21	135.51	37.86	371.41	53.87
Junc N16	97.55	0.19	136.50	38.95	382.10	55.42
Junc N17	97.85	0.19	136.11	38.26	375.33	54.44
Junc N18	97.95	0.30	136.47	38.52	377.88	54.81
Junc N19	98.00	0.19	136.51	38.51	377.78	54.79
Junc N20	97.65	0.33	136.59	38.94	382.00	55.40
Junc N21	97.65	0.27	136.63	38.98	382.39	55.46
Junc N22	97.70	0.49	136.57	38.87	381.31	55.31
Junc N23	97.60	0.16	136.79	39.19	384.45	55.76
Junc N24	97.55	0.11	136.96	39.41	386.61	56.07
Junc N25	97.50	0.37	137.82	40.32	395.54	57.37
Junc N26	97.45	0.14	138.40	40.95	401.72	58.26
Junc N27	97.65	0.57	139.28	41.63	408.39	59.23
Junc N28	97.30	0.63	140.77	43.47	426.44	61.85
Junc N29	97.30	0.22	142.20	44.90	440.47	63.88
Junc N30	97.25	0.27	143.26	46.01	451.36	65.46
Junc N31	97.07	0.25	149.12	52.05	510.61	74.06
Junc N32	97.00	0.11	149.69	52.69	516.89	74.97
Junc N33	97.15	0.44	149.90	52.75	517.48	75.05
Junc N34	97.35	0.60	149.49	52.14	511.49	74.19
Junc N35	97.70	0.05	150.03	52.33	513.36	74.46
Junc N36	97.60	0.44	150.01	52.41	514.14	74.57
Junc N37	97.60	0.19	150.49	52.89	518.85	75.25
Junc N38	97.35	0.36	151.13	53.78	527.58	76.52
Junc N39	96.95	0.22	150.56	53.61	525.91	76.28
Junc N40	97.00	0.16	150.42	53.42	524.05	76.01
Junc N41	96.65	0.08	150.41	53.76	527.39	76.49
Junc N42	96.66	0.00	153.20	56.54	554.66	80.45
Junc N43	96.94	0.00	153.20	56.26	551.91	80.05
Junc N44	97.79	0.00	153.20	55.41	543.57	78.84

Minimum Pressure
Applied Fireflow (sum)

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	32.00	50	100	-0.05	0.03	0.05	0.075
Pipe P2	89.00	200	110	-0.27	0.01	0.00	0.061
Pipe P3	10.00	200	110	-181.43	5.77	190.18	0.022
Pipe P4	80.00	200	110	43.79	1.39	13.67	0.028
Pipe P5	80.00	200	110	43.52	1.39	13.52	0.028
Pipe P6	15.00	200	110	137.09	4.36	113.19	0.023
Pipe P7	64.00	200	110	137.09	4.36	113.19	0.023
Pipe P8	58.00	200	110	11.97	0.38	1.24	0.033
Pipe P9	75.00	200	110	11.45	0.36	1.14	0.034
Pipe P10	39.00	200	110	124.82	3.97	95.14	0.024
Pipe P11	100.00	200	110	96.03	3.06	58.54	0.025
Pipe P12	62.00	200	110	0.78	0.02	0.01	0.051
Pipe P13	62.00	200	110	-12.72	0.40	1.38	0.033
Pipe P14	60.00	200	110	-76.19	2.43	38.13	0.025
Pipe P15	69.00	200	110	-76.53	2.44	38.45	0.025
Pipe P16	10.00	200	110	13.42	0.43	1.53	0.033
Pipe P17	79.00	200	110	-50.36	1.60	17.71	0.027
Pipe P18	75.00	200	110	-50.57	1.61	17.85	0.027
Pipe P19	33.00	200	110	-50.78	1.62	17.99	0.027
Pipe P20	59.00	200	110	-29.87	0.95	6.73	0.029
Pipe P21	103.00	200	110	-21.10	0.67	3.54	0.031
Pipe P22	76.00	200	110	-12.10	0.39	1.26	0.033
Pipe P23	45.00	200	110	-9.30	0.30	0.78	0.035
Pipe P24	106.00	200	110	-9.49	0.30	0.80	0.035
Pipe P25	51.00	200	110	-9.82	0.31	0.86	0.034
Pipe P26	50.00	200	110	12.59	0.40	1.36	0.033
Pipe P27	39.00	200	110	-22.68	0.72	4.04	0.030
Pipe P28	41.00	200	110	-22.84	0.73	4.09	0.030
Pipe P29	67.00	200	110	-30.06	0.96	6.81	0.029
Pipe P30	44.00	200	110	-53.01	1.69	19.48	0.027
Pipe P31	12.00	200	110	-86.80	2.76	48.56	0.025
Pipe P32	110.00	200	110	-43.10	1.37	13.28	0.028
Pipe P33	110.00	200	110	-43.67	1.39	13.60	0.028
Pipe P34	102.00	200	110	-44.30	1.41	13.97	0.028
Pipe P35	78.00	200	110	86.94	2.77	48.70	0.025
Pipe P36	12.00	200	110	-120.01	3.82	88.46	0.024
Pipe P37	66.00	200	110	-120.28	3.83	88.83	0.024
Pipe P38	32.00	200	110	-50.35	1.60	17.71	0.027
Pipe P39	12.00	200	110	-50.46	1.61	17.78	0.027
Pipe P40	67.00	200	110	-26.65	0.85	5.45	0.030
Pipe P41	95.00	200	110	-27.25	0.87	5.68	0.030
Pipe P42	13.00	200	110	11.15	0.35	1.08	0.034
Pipe P43	110.00	200	110	10.71	0.34	1.01	0.034
Pipe P44	43.00	200	110	-38.45	1.22	10.75	0.028
Pipe P45	59.00	200	110	-38.64	1.23	10.85	0.028
Pipe P46	50.00	200	110	-79.65	2.54	41.41	0.025
Pipe P47	48.00	200	110	40.65	1.29	11.92	0.028
Pipe P48	12.00	200	110	40.43	1.29	11.80	0.028
Pipe P49	44.00	200	110	40.19	1.28	11.67	0.028
Pipe P50	36.00	50	100	0.08	0.04	0.12	0.070
Pipe P51	9.00	300	120	0.00	0.00	0.00	0.000
Pipe P52	99.00	300	120	0.00	0.00	0.00	0.000
Pipe P53	10.00	200	110	0.00	0.00	0.00	0.000

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	153.20	-168.37	153.20	0.00	0.00	0.00
Resvr R2	153.20	-75.71	153.20	0.00	0.00	0.00
Junc N1	97.60	0.05	151.54	53.94	529.15	76.75
Junc N2	97.98	0.22	151.54	53.56	525.42	76.21
Junc N3	97.62	0.27	151.54	53.92	528.96	76.72
Junc N4	97.40	0.27	150.51	53.11	521.01	75.57
Junc N5	97.43	0.00	150.10	52.67	516.69	74.94
Junc N6	97.30	0.52	143.59	46.29	454.10	65.86
Junc N7	97.45	0.30	143.96	46.51	456.26	66.18
Junc N8	97.50	0.46	141.68	44.18	433.41	62.86
Junc N9	97.75	11.58	135.89	38.14	374.15	54.27
Junc N10	98.00	0.07	133.06	35.06	343.94	49.88
Junc N11	97.80	63.47	133.14	35.34	346.69	50.28
Junc N12	97.65	0.34	135.38	37.73	370.13	53.68
Junc N13	97.85	95.45	132.48	34.63	339.72	49.27
Junc N14	98.10	63.54	132.48	34.38	337.27	48.92
Junc N15	97.65	0.21	134.51	36.86	361.60	52.45
Junc N16	97.55	0.19	136.01	38.46	377.29	54.72
Junc N17	97.85	0.19	135.41	37.56	368.46	53.44
Junc N18	97.95	0.30	135.97	38.02	372.98	54.10
Junc N19	98.00	0.19	136.02	38.02	372.98	54.10
Junc N20	97.65	0.33	136.15	38.50	377.69	54.78
Junc N21	97.65	0.27	136.21	38.56	378.27	54.86
Junc N22	97.70	0.49	136.11	38.41	376.80	54.65
Junc N23	97.60	0.16	136.45	38.85	381.12	55.28
Junc N24	97.55	0.11	136.70	39.15	384.06	55.70
Junc N25	97.50	0.37	137.98	40.47	397.01	57.58
Junc N26	97.45	0.14	138.66	41.21	404.27	58.63
Junc N27	97.65	0.57	139.69	42.04	412.41	59.82
Junc N28	97.30	0.63	141.45	44.15	433.11	62.82
Junc N29	97.30	0.22	143.12	45.82	449.49	65.19
Junc N30	97.25	0.27	144.10	46.85	459.60	66.66
Junc N31	97.07	0.25	149.49	52.42	514.24	74.58
Junc N32	97.00	0.11	150.01	53.01	520.03	75.42
Junc N33	97.15	0.44	150.20	53.05	520.42	75.48
Junc N34	97.35	0.60	149.82	52.47	514.73	74.66
Junc N35	97.70	0.05	150.31	52.61	516.10	74.85
Junc N36	97.60	0.44	150.30	52.70	516.99	74.98
Junc N37	97.60	0.19	150.73	53.13	521.21	75.59
Junc N38	97.35	0.36	151.32	53.97	529.45	76.79
Junc N39	96.95	0.22	150.80	53.85	528.27	76.62
Junc N40	97.00	0.16	150.67	53.67	526.50	76.36
Junc N41	96.65	0.08	150.66	54.01	529.84	76.85
Junc N42	96.66	0.00	153.20	56.54	554.66	80.45
Junc N43	96.94	0.00	153.20	56.26	551.91	80.05
Junc N44	97.79	0.00	153.20	55.41	543.57	78.84

Minimum Pressure
Applied Fireflow (sum)

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	32.00	50	100	-0.05	0.03	0.05	0.075
Pipe P2	89.00	200	110	-0.27	0.01	0.00	0.061
Pipe P3	10.00	200	110	-168.37	5.36	165.62	0.023
Pipe P4	80.00	200	110	42.44	1.35	12.90	0.028
Pipe P5	80.00	200	110	42.17	1.34	12.75	0.028
Pipe P6	15.00	200	110	125.40	3.99	95.96	0.024
Pipe P7	64.00	200	110	125.40	3.99	95.96	0.024
Pipe P8	58.00	200	110	29.16	0.93	6.44	0.029
Pipe P9	75.00	200	110	28.64	0.91	6.23	0.029
Pipe P10	39.00	200	110	95.94	3.05	58.44	0.025
Pipe P11	100.00	200	110	95.48	3.04	57.92	0.025
Pipe P12	62.00	200	110	83.90	2.67	45.59	0.025
Pipe P13	62.00	200	110	-11.83	0.38	1.21	0.034
Pipe P14	60.00	200	110	-75.30	2.40	37.31	0.025
Pipe P15	69.00	200	110	-75.64	2.41	37.63	0.025
Pipe P16	10.00	200	110	95.66	3.04	58.13	0.025
Pipe P17	79.00	200	110	0.21	0.01	0.00	0.052
Pipe P18	75.00	200	110	-63.33	2.02	27.08	0.026
Pipe P19	33.00	200	110	-63.54	2.02	27.25	0.026
Pipe P20	59.00	200	110	-37.25	1.19	10.14	0.028
Pipe P21	103.00	200	110	-26.48	0.84	5.39	0.030
Pipe P22	76.00	200	110	-15.13	0.48	1.91	0.032
Pipe P23	45.00	200	110	-11.65	0.37	1.18	0.034
Pipe P24	106.00	200	110	-11.84	0.38	1.21	0.034
Pipe P25	51.00	200	110	-12.17	0.39	1.28	0.033
Pipe P26	50.00	200	110	15.62	0.50	2.03	0.032
Pipe P27	39.00	200	110	-28.06	0.89	6.00	0.030
Pipe P28	41.00	200	110	-28.22	0.90	6.06	0.029
Pipe P29	67.00	200	110	-37.44	1.19	10.23	0.028
Pipe P30	44.00	200	110	-65.77	2.09	29.04	0.026
Pipe P31	12.00	200	110	-94.71	3.01	57.06	0.025
Pipe P32	110.00	200	110	-47.07	1.50	15.63	0.027
Pipe P33	110.00	200	110	-47.64	1.52	15.98	0.027
Pipe P34	102.00	200	110	-48.27	1.54	16.38	0.027
Pipe P35	78.00	200	110	94.85	3.02	57.22	0.025
Pipe P36	12.00	200	110	-114.70	3.65	81.36	0.024
Pipe P37	66.00	200	110	-114.97	3.66	81.71	0.024
Pipe P38	32.00	200	110	-47.78	1.52	16.07	0.027
Pipe P39	12.00	200	110	-47.89	1.52	16.14	0.027
Pipe P40	67.00	200	110	-25.28	0.80	4.94	0.030
Pipe P41	95.00	200	110	-25.88	0.82	5.16	0.030
Pipe P42	13.00	200	110	10.60	0.34	0.99	0.034
Pipe P43	110.00	200	110	10.16	0.32	0.91	0.034
Pipe P44	43.00	200	110	-36.53	1.16	9.77	0.028
Pipe P45	59.00	200	110	-36.72	1.17	9.87	0.028
Pipe P46	50.00	200	110	-75.71	2.41	37.69	0.025
Pipe P47	48.00	200	110	38.63	1.23	10.84	0.028
Pipe P48	12.00	200	110	38.41	1.22	10.73	0.028
Pipe P49	44.00	200	110	38.17	1.22	10.60	0.028
Pipe P50	36.00	50	100	0.08	0.04	0.12	0.070
Pipe P51	9.00	300	120	0.00	0.00	0.00	0.000
Pipe P52	99.00	300	120	0.00	0.00	0.00	0.000
Pipe P53	10.00	200	110	0.00	0.00	0.00	0.000

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	153.20	-122.03	153.20	0.00	0.00	0.00
Resvr R2	153.20	-56.06	153.20	0.00	0.00	0.00
Junc N1	97.60	0.05	152.29	54.69	536.51	77.81
Junc N2	97.98	0.22	152.29	54.31	532.78	77.27
Junc N3	97.62	0.27	152.29	54.67	536.31	77.79
Junc N4	97.40	0.27	151.68	54.28	532.49	77.23
Junc N5	97.43	0.00	151.51	54.08	530.52	76.95
Junc N6	97.30	0.52	147.88	50.58	496.19	71.97
Junc N7	97.45	0.30	148.21	50.76	497.96	72.22
Junc N8	97.50	0.46	147.20	49.70	487.56	70.71
Junc N9	97.75	0.25	144.62	46.87	459.79	66.69
Junc N10	98.00	0.07	143.04	45.04	441.84	64.08
Junc N11	97.80	0.14	143.43	45.63	447.63	64.92
Junc N12	97.65	0.34	143.81	46.16	452.83	65.68
Junc N13	97.85	9.12	142.52	44.67	438.21	63.56
Junc N14	98.10	95.21	139.14	41.04	402.60	58.39
Junc N15	97.65	63.54	139.27	41.62	408.29	59.22
Junc N16	97.55	0.19	141.44	43.89	430.56	62.45
Junc N17	97.85	0.19	140.57	42.72	419.08	60.78
Junc N18	97.95	0.30	141.38	43.43	426.05	61.79
Junc N19	98.00	0.19	141.46	43.46	426.34	61.84
Junc N20	97.65	0.33	141.65	44.00	431.64	62.60
Junc N21	97.65	0.27	141.74	44.09	432.52	62.73
Junc N22	97.70	0.49	141.59	43.89	430.56	62.45
Junc N23	97.60	0.16	142.07	44.47	436.25	63.27
Junc N24	97.55	0.11	142.43	44.88	440.27	63.86
Junc N25	97.50	0.37	144.26	46.76	458.72	66.53
Junc N26	97.45	0.14	144.69	47.24	463.42	67.21
Junc N27	97.65	0.57	145.33	47.68	467.74	67.84
Junc N28	97.30	0.63	146.42	49.12	481.87	69.89
Junc N29	97.30	0.22	147.47	50.17	492.17	71.38
Junc N30	97.25	0.27	148.02	50.77	498.05	72.24
Junc N31	97.07	0.25	151.09	54.02	529.94	76.86
Junc N32	97.00	0.11	151.38	54.38	533.47	77.37
Junc N33	97.15	0.44	151.48	54.33	532.98	77.30
Junc N34	97.35	0.60	151.27	53.92	528.96	76.72
Junc N35	97.70	0.05	151.55	53.85	528.27	76.62
Junc N36	97.60	0.44	151.54	53.94	529.15	76.75
Junc N37	97.60	0.19	151.79	54.19	531.60	77.10
Junc N38	97.35	0.36	152.12	54.77	537.29	77.93
Junc N39	96.95	0.22	151.82	54.87	538.27	78.07
Junc N40	97.00	0.16	151.75	54.75	537.10	77.90
Junc N41	96.65	0.08	151.74	55.09	540.43	78.38
Junc N42	96.66	0.00	153.20	56.54	554.66	80.45
Junc N43	96.94	0.00	153.20	56.26	551.91	80.05
Junc N44	97.79	0.00	153.20	55.41	543.57	78.84

Minimum Pressure
Applied Fireflow (sum)

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	32.00	50	100	-0.05	0.03	0.05	0.075
Pipe P2	89.00	200	110	-0.27	0.01	0.00	0.061
Pipe P3	10.00	200	110	-122.03	3.88	91.24	0.024
Pipe P4	80.00	200	110	31.81	1.01	7.57	0.029
Pipe P5	80.00	200	110	31.54	1.00	7.45	0.029
Pipe P6	15.00	200	110	89.67	2.85	51.57	0.025
Pipe P7	64.00	200	110	89.67	2.85	51.57	0.025
Pipe P8	58.00	200	110	27.30	0.87	5.70	0.030
Pipe P9	75.00	200	110	26.78	0.85	5.50	0.030
Pipe P10	39.00	200	110	62.07	1.98	26.09	0.026
Pipe P11	100.00	200	110	61.61	1.96	25.73	0.026
Pipe P12	62.00	200	110	61.36	1.95	25.54	0.026
Pipe P13	62.00	200	110	-28.86	0.92	6.32	0.029
Pipe P14	60.00	200	110	-29.00	0.92	6.37	0.029
Pipe P15	69.00	200	110	-29.34	0.93	6.51	0.029
Pipe P16	10.00	200	110	90.15	2.87	52.08	0.025
Pipe P17	79.00	200	110	81.03	2.58	42.74	0.025
Pipe P18	75.00	200	110	-14.18	0.45	1.69	0.033
Pipe P19	33.00	200	110	-77.72	2.47	39.57	0.025
Pipe P20	59.00	200	110	-45.46	1.45	14.65	0.027
Pipe P21	103.00	200	110	-32.45	1.03	7.85	0.029
Pipe P22	76.00	200	110	-18.50	0.59	2.77	0.031
Pipe P23	45.00	200	110	-14.26	0.45	1.71	0.033
Pipe P24	106.00	200	110	-14.45	0.46	1.75	0.033
Pipe P25	51.00	200	110	-14.78	0.47	1.83	0.032
Pipe P26	50.00	200	110	18.99	0.60	2.91	0.031
Pipe P27	39.00	200	110	-34.03	1.08	8.57	0.029
Pipe P28	41.00	200	110	-34.19	1.09	8.65	0.029
Pipe P29	67.00	200	110	-45.65	1.45	14.77	0.027
Pipe P30	44.00	200	110	-79.95	2.54	41.69	0.025
Pipe P31	12.00	200	110	-73.33	2.33	35.53	0.026
Pipe P32	110.00	200	110	-36.33	1.16	9.67	0.028
Pipe P33	110.00	200	110	-36.90	1.17	9.96	0.028
Pipe P34	102.00	200	110	-37.53	1.19	10.27	0.028
Pipe P35	78.00	200	110	73.47	2.34	35.65	0.026
Pipe P36	12.00	200	110	-84.44	2.69	46.13	0.025
Pipe P37	66.00	200	110	-84.71	2.70	46.40	0.025
Pipe P38	32.00	200	110	-34.99	1.11	9.03	0.029
Pipe P39	12.00	200	110	-35.10	1.12	9.08	0.029
Pipe P40	67.00	200	110	-18.42	0.59	2.75	0.031
Pipe P41	95.00	200	110	-19.02	0.61	2.92	0.031
Pipe P42	13.00	200	110	7.88	0.25	0.57	0.036
Pipe P43	110.00	200	110	7.44	0.24	0.51	0.036
Pipe P44	43.00	200	110	-26.95	0.86	5.56	0.030
Pipe P45	59.00	200	110	-27.14	0.86	5.64	0.030
Pipe P46	50.00	200	110	-56.06	1.78	21.61	0.027
Pipe P47	48.00	200	110	28.57	0.91	6.20	0.029
Pipe P48	12.00	200	110	28.35	0.90	6.11	0.029
Pipe P49	44.00	200	110	28.11	0.89	6.02	0.030
Pipe P50	36.00	50	100	0.08	0.04	0.12	0.070
Pipe P51	9.00	300	120	0.00	0.00	0.00	0.000
Pipe P52	99.00	300	120	0.00	0.00	0.00	0.000
Pipe P53	10.00	200	110	0.00	0.00	0.00	0.000

MAXIMUM DAY + FIRE FLOW DEMAND AT N16

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	153.20	-121.60	153.20	0.00	0.00	0.00
Resvr R2	153.20	-56.49	153.20	0.00	0.00	0.00
Junc N1	97.60	0.05	152.29	54.69	536.51	77.81
Junc N2	97.98	0.22	152.29	54.31	532.78	77.27
Junc N3	97.62	0.27	152.29	54.67	536.31	77.79
Junc N4	97.40	0.27	151.67	54.27	532.39	77.22
Junc N5	97.43	0.00	151.53	54.10	530.72	76.97
Junc N6	97.30	0.52	147.88	50.58	496.19	71.97
Junc N7	97.45	0.30	148.30	50.85	498.84	72.35
Junc N8	97.50	0.46	147.41	49.91	489.62	71.01
Junc N9	97.75	0.25	145.17	47.42	465.19	67.47
Junc N10	98.00	0.07	143.80	45.80	449.30	65.17
Junc N11	97.80	0.14	143.83	46.03	451.55	65.49
Junc N12	97.65	0.34	143.87	46.22	453.42	65.76
Junc N13	97.85	0.45	143.52	45.67	448.02	64.98
Junc N14	98.10	0.21	141.31	43.21	423.89	61.48
Junc N15	97.65	63.54	139.24	41.59	408.00	59.18
Junc N16	97.55	95.19	138.87	41.32	405.35	58.79
Junc N17	97.85	0.19	139.24	41.39	406.04	58.89
Junc N18	97.95	0.30	139.87	41.92	411.24	59.64
Junc N19	98.00	0.19	139.93	41.93	411.33	59.66
Junc N20	97.65	0.33	140.07	42.42	416.14	60.36
Junc N21	97.65	0.27	140.15	42.50	416.93	60.47
Junc N22	97.70	0.49	140.03	42.33	415.26	60.23
Junc N23	97.60	8.83	140.41	42.81	419.97	60.91
Junc N24	97.55	0.11	140.86	43.31	424.87	61.62
Junc N25	97.50	0.37	143.91	46.41	455.28	66.03
Junc N26	97.45	0.14	144.37	46.92	460.29	66.76
Junc N27	97.65	0.57	145.06	47.41	465.09	67.46
Junc N28	97.30	0.63	146.24	48.94	480.10	69.63
Junc N29	97.30	0.22	147.37	50.07	491.19	71.24
Junc N30	97.25	0.27	147.93	50.68	497.17	72.11
Junc N31	97.07	0.25	151.06	53.99	529.64	76.82
Junc N32	97.00	0.11	151.35	54.35	533.17	77.33
Junc N33	97.15	0.44	151.46	54.31	532.78	77.27
Junc N34	97.35	0.60	151.24	53.89	528.66	76.68
Junc N35	97.70	0.05	151.52	53.82	527.97	76.58
Junc N36	97.60	0.44	151.52	53.92	528.96	76.72
Junc N37	97.60	0.19	151.77	54.17	531.41	77.07
Junc N38	97.35	0.36	152.10	54.75	537.10	77.90
Junc N39	96.95	0.22	151.80	54.85	538.08	78.04
Junc N40	97.00	0.16	151.73	54.73	536.90	77.87
Junc N41	96.65	0.08	151.72	55.07	540.24	78.35
Junc N42	96.66	0.00	153.20	56.54	554.66	80.45
Junc N43	96.94	0.00	153.20	56.26	551.91	80.05
Junc N44	97.79	0.00	153.20	55.41	543.57	78.84

Minimum Pressure
Applied Fireflow (sum)

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	32.00	50	100	-0.05	0.03	0.05	0.075
Pipe P2	89.00	200	110	-0.27	0.01	0.00	0.061
Pipe P3	10.00	200	110	-121.60	3.87	90.65	0.024
Pipe P4	80.00	200	110	32.33	1.03	7.79	0.029
Pipe P5	80.00	200	110	32.06	1.02	7.67	0.029
Pipe P6	15.00	200	110	88.73	2.82	50.57	0.025
Pipe P7	64.00	200	110	88.73	2.82	50.57	0.025
Pipe P8	58.00	200	110	30.83	0.98	7.14	0.029
Pipe P9	75.00	200	110	30.31	0.96	6.92	0.029
Pipe P10	39.00	200	110	57.60	1.83	22.72	0.027
Pipe P11	100.00	200	110	57.14	1.82	22.38	0.027
Pipe P12	62.00	200	110	56.89	1.81	22.20	0.027
Pipe P13	62.00	200	110	-7.93	0.25	0.58	0.036
Pipe P14	60.00	200	110	-8.07	0.26	0.60	0.035
Pipe P15	69.00	200	110	-8.41	0.27	0.64	0.035
Pipe P16	10.00	200	110	64.75	2.06	28.22	0.026
Pipe P17	79.00	200	110	64.30	2.05	27.85	0.026
Pipe P18	75.00	200	110	64.09	2.04	27.69	0.026
Pipe P19	33.00	200	110	0.55	0.02	0.00	0.054
Pipe P20	59.00	200	110	28.69	0.91	6.25	0.029
Pipe P21	103.00	200	110	-28.33	0.90	6.10	0.029
Pipe P22	76.00	200	110	-16.17	0.51	2.16	0.032
Pipe P23	45.00	200	110	-12.46	0.40	1.33	0.033
Pipe P24	106.00	200	110	-12.65	0.40	1.37	0.033
Pipe P25	51.00	200	110	-12.98	0.41	1.44	0.033
Pipe P26	50.00	200	110	16.66	0.53	2.28	0.032
Pipe P27	39.00	200	110	-29.91	0.95	6.75	0.029
Pipe P28	41.00	200	110	-38.74	1.23	10.90	0.028
Pipe P29	67.00	200	110	-66.50	2.12	29.64	0.026
Pipe P30	44.00	200	110	-105.35	3.35	69.50	0.024
Pipe P31	12.00	200	110	-76.31	2.43	38.24	0.025
Pipe P32	110.00	200	110	-37.82	1.20	10.42	0.028
Pipe P33	110.00	200	110	-38.39	1.22	10.72	0.028
Pipe P34	102.00	200	110	-39.02	1.24	11.04	0.028
Pipe P35	78.00	200	110	76.45	2.43	38.37	0.025
Pipe P36	12.00	200	110	-85.38	2.72	47.09	0.025
Pipe P37	66.00	200	110	-85.65	2.73	47.36	0.025
Pipe P38	32.00	200	110	-35.27	1.12	9.16	0.029
Pipe P39	12.00	200	110	-35.38	1.13	9.21	0.029
Pipe P40	67.00	200	110	-18.57	0.59	2.79	0.031
Pipe P41	95.00	200	110	-19.17	0.61	2.96	0.031
Pipe P42	13.00	200	110	7.93	0.25	0.58	0.036
Pipe P43	110.00	200	110	7.49	0.24	0.52	0.036
Pipe P44	43.00	200	110	-27.15	0.86	5.64	0.030
Pipe P45	59.00	200	110	-27.34	0.87	5.72	0.030
Pipe P46	50.00	200	110	-56.49	1.80	21.91	0.027
Pipe P47	48.00	200	110	28.79	0.92	6.29	0.029
Pipe P48	12.00	200	110	28.57	0.91	6.20	0.029
Pipe P49	44.00	200	110	28.33	0.90	6.10	0.029
Pipe P50	36.00	50	100	0.08	0.04	0.12	0.070
Pipe P51	9.00	300	120	0.00	0.00	0.00	0.000
Pipe P52	99.00	300	120	0.00	0.00	0.00	0.000
Pipe P53	10.00	200	110	0.00	0.00	0.00	0.000

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	153.20	-155.87	153.20	0.00	0.00	0.00
Resvr R2	153.20	-72.21	153.20	0.00	0.00	0.00
Junc N1	97.60	0.05	151.76	54.16	531.31	77.06
Junc N2	97.98	0.22	151.76	53.78	527.58	76.52
Junc N3	97.62	0.27	151.76	54.14	531.11	77.03
Junc N4	97.40	0.27	150.78	53.38	523.66	75.95
Junc N5	97.43	0.00	150.56	53.13	521.21	75.59
Junc N6	97.30	0.52	144.74	47.44	465.39	67.50
Junc N7	97.45	0.30	145.42	47.97	470.59	68.25
Junc N8	97.50	0.46	144.02	46.52	456.36	66.19
Junc N9	97.75	0.25	140.49	42.74	419.28	60.81
Junc N10	98.00	0.07	138.31	40.31	395.44	57.35
Junc N11	97.80	0.14	138.31	40.51	397.40	57.64
Junc N12	97.65	0.34	138.31	40.66	398.87	57.85
Junc N13	97.85	0.45	137.96	40.11	393.48	57.07
Junc N14	98.10	0.21	135.24	37.14	364.34	52.84
Junc N15	97.65	0.21	132.67	35.02	343.55	49.83
Junc N16	97.55	0.19	132.04	34.49	338.35	49.07
Junc N17	97.85	0.19	131.55	33.70	330.60	47.95
Junc N18	97.95	95.30	124.43	26.48	259.77	37.68
Junc N19	98.00	63.52	124.26	26.26	257.61	37.36
Junc N20	97.65	0.33	125.57	27.92	273.90	39.73
Junc N21	97.65	0.27	126.21	28.56	280.17	40.64
Junc N22	97.70	59.15	124.53	26.83	263.20	38.17
Junc N23	97.60	0.16	129.33	31.73	311.27	45.15
Junc N24	97.55	0.11	132.61	35.06	343.94	49.88
Junc N25	97.50	0.37	138.31	40.81	400.35	58.07
Junc N26	97.45	0.14	139.06	41.61	408.19	59.20
Junc N27	97.65	0.57	140.18	42.53	417.22	60.51
Junc N28	97.30	0.63	142.09	44.79	439.39	63.73
Junc N29	97.30	0.22	143.89	46.59	457.05	66.29
Junc N30	97.25	0.27	144.80	47.55	466.47	67.66
Junc N31	97.07	0.25	149.81	52.74	517.38	75.04
Junc N32	97.00	0.11	150.28	53.28	522.68	75.81
Junc N33	97.15	0.44	150.45	53.30	522.87	75.84
Junc N34	97.35	0.60	150.11	52.76	517.58	75.07
Junc N35	97.70	0.05	150.56	52.86	518.56	75.21
Junc N36	97.60	0.44	150.54	52.94	519.34	75.32
Junc N37	97.60	0.19	150.94	53.34	523.27	75.89
Junc N38	97.35	0.36	151.47	54.12	530.92	77.00
Junc N39	96.95	0.22	151.00	54.05	530.23	76.90
Junc N40	97.00	0.16	150.88	53.88	528.56	76.66
Junc N41	96.65	0.08	150.87	54.22	531.90	77.15
Junc N42	96.66	0.00	153.20	56.54	554.66	80.45
Junc N43	96.94	0.00	153.20	56.26	551.91	80.05
Junc N44	97.79	0.00	153.20	55.41	543.57	78.84

Minimum Pressure
Applied Fireflow (sum)

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	32.00	50	100	-0.05	0.03	0.05	0.075
Pipe P2	89.00	200	110	-0.27	0.01	0.00	0.056
Pipe P3	10.00	200	110	-155.87	4.96	143.56	0.023
Pipe P4	80.00	200	110	41.39	1.32	12.32	0.028
Pipe P5	80.00	200	110	41.12	1.31	12.17	0.028
Pipe P6	15.00	200	110	113.94	3.63	80.35	0.024
Pipe P7	64.00	200	110	113.94	3.63	80.35	0.024
Pipe P8	58.00	200	110	40.07	1.28	11.60	0.028
Pipe P9	75.00	200	110	39.55	1.26	11.32	0.028
Pipe P10	39.00	200	110	73.57	2.34	35.74	0.026
Pipe P11	100.00	200	110	73.11	2.33	35.33	0.026
Pipe P12	62.00	200	110	72.86	2.32	35.11	0.026
Pipe P13	62.00	200	110	0.23	0.01	0.00	0.055
Pipe P14	60.00	200	110	0.09	0.00	0.00	0.076
Pipe P15	69.00	200	110	-0.25	0.01	0.00	0.058
Pipe P16	10.00	200	110	72.56	2.31	34.84	0.026
Pipe P17	79.00	200	110	72.11	2.30	34.44	0.026
Pipe P18	75.00	200	110	71.90	2.29	34.26	0.026
Pipe P19	33.00	200	110	71.69	2.28	34.07	0.026
Pipe P20	59.00	200	110	-33.55	1.07	8.35	0.029
Pipe P21	103.00	200	110	105.05	3.34	69.14	0.024
Pipe P22	76.00	200	110	-12.21	0.39	1.28	0.033
Pipe P23	45.00	200	110	21.96	0.70	3.81	0.031
Pipe P24	106.00	200	110	-41.56	1.32	12.41	0.028
Pipe P25	51.00	200	110	-41.89	1.33	12.59	0.028
Pipe P26	50.00	200	110	71.36	2.27	33.78	0.026
Pipe P27	39.00	200	110	-113.52	3.61	79.80	0.024
Pipe P28	41.00	200	110	-113.68	3.62	80.01	0.024
Pipe P29	67.00	200	110	-33.74	1.07	8.44	0.029
Pipe P30	44.00	200	110	-147.53	4.70	129.66	0.023
Pipe P31	12.00	200	110	-98.95	3.15	61.88	0.024
Pipe P32	110.00	200	110	-49.20	1.57	16.97	0.027
Pipe P33	110.00	200	110	-49.77	1.58	17.33	0.027
Pipe P34	102.00	200	110	-50.40	1.60	17.74	0.027
Pipe P35	78.00	200	110	99.09	3.15	62.04	0.024
Pipe P36	12.00	200	110	-110.16	3.51	75.49	0.024
Pipe P37	66.00	200	110	-110.43	3.52	75.83	0.024
Pipe P38	32.00	200	110	-45.51	1.45	14.68	0.027
Pipe P39	12.00	200	110	-45.62	1.45	14.75	0.027
Pipe P40	67.00	200	110	-24.06	0.77	4.51	0.030
Pipe P41	95.00	200	110	-24.66	0.78	4.72	0.030
Pipe P42	13.00	200	110	10.12	0.32	0.91	0.034
Pipe P43	110.00	200	110	9.68	0.31	0.83	0.035
Pipe P44	43.00	200	110	-34.82	1.11	8.94	0.029
Pipe P45	59.00	200	110	-35.01	1.11	9.03	0.029
Pipe P46	50.00	200	110	-72.21	2.30	34.53	0.026
Pipe P47	48.00	200	110	36.84	1.17	9.93	0.028
Pipe P48	12.00	200	110	36.62	1.17	9.82	0.028
Pipe P49	44.00	200	110	36.38	1.16	9.70	0.028
Pipe P50	36.00	50	100	0.08	0.04	0.12	0.070
Pipe P51	9.00	300	120	0.00	0.00	0.00	0.000
Pipe P52	99.00	300	120	0.00	0.00	0.00	0.000
Pipe P53	10.00	200	110	0.00	0.00	0.00	0.000

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	153.20	-155.87	153.20	0.00	0.00	0.00
Resvr R2	153.20	-72.21	153.20	0.00	0.00	0.00
Junc N1	97.60	0.05	151.76	54.16	531.31	77.06
Junc N2	97.98	0.22	151.76	53.78	527.58	76.52
Junc N3	97.62	0.27	151.76	54.14	531.11	77.03
Junc N4	97.40	0.27	150.78	53.38	523.66	75.95
Junc N5	97.43	0.00	150.56	53.13	521.21	75.59
Junc N6	97.30	0.52	144.74	47.44	465.39	67.50
Junc N7	97.45	0.30	145.42	47.97	470.59	68.25
Junc N8	97.50	0.46	144.02	46.52	456.36	66.19
Junc N9	97.75	0.25	140.49	42.74	419.28	60.81
Junc N10	98.00	0.07	138.31	40.31	395.44	57.35
Junc N11	97.80	0.14	138.31	40.51	397.40	57.64
Junc N12	97.65	0.34	138.31	40.66	398.87	57.85
Junc N13	97.85	0.45	137.97	40.12	393.58	57.08
Junc N14	98.10	0.21	135.28	37.18	364.74	52.90
Junc N15	97.65	0.21	132.74	35.09	344.23	49.93
Junc N16	97.55	0.19	132.07	34.52	338.64	49.12
Junc N17	97.85	0.19	131.63	33.78	331.38	48.06
Junc N18	97.95	63.63	124.83	26.88	263.69	38.25
Junc N19	98.00	95.19	123.27	25.27	247.90	35.95
Junc N20	97.65	58.99	123.70	26.05	255.55	37.06
Junc N21	97.65	0.27	125.91	28.26	277.23	40.21
Junc N22	97.70	0.49	125.47	27.77	272.42	39.51
Junc N23	97.60	0.16	129.15	31.55	309.51	44.89
Junc N24	97.55	0.11	132.57	35.02	343.55	49.83
Junc N25	97.50	0.37	138.31	40.81	400.35	58.07
Junc N26	97.45	0.14	139.05	41.60	408.10	59.19
Junc N27	97.65	0.57	140.18	42.53	417.22	60.51
Junc N28	97.30	0.63	142.08	44.78	439.29	63.71
Junc N29	97.30	0.22	143.89	46.59	457.05	66.29
Junc N30	97.25	0.27	144.80	47.55	466.47	67.66
Junc N31	97.07	0.25	149.81	52.74	517.38	75.04
Junc N32	97.00	0.11	150.28	53.28	522.68	75.81
Junc N33	97.15	0.44	150.45	53.30	522.87	75.84
Junc N34	97.35	0.60	150.11	52.76	517.58	75.07
Junc N35	97.70	0.05	150.56	52.86	518.56	75.21
Junc N36	97.60	0.44	150.54	52.94	519.34	75.32
Junc N37	97.60	0.19	150.94	53.34	523.27	75.89
Junc N38	97.35	0.36	151.47	54.12	530.92	77.00
Junc N39	96.95	0.22	151.00	54.05	530.23	76.90
Junc N40	97.00	0.16	150.88	53.88	528.56	76.66
Junc N41	96.65	0.08	150.87	54.22	531.90	77.15
Junc N42	96.66	0.00	153.20	56.54	554.66	80.45
Junc N43	96.94	0.00	153.20	56.26	551.91	80.05
Junc N44	97.79	0.00	153.20	55.41	543.57	78.84

Minimum Pressure
Applied Fireflow (sum)

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	32.00	50	100	-0.05	0.03	0.05	0.075
Pipe P2	89.00	200	110	-0.27	0.01	0.00	0.056
Pipe P3	10.00	200	110	-155.87	4.96	143.56	0.023
Pipe P4	80.00	200	110	41.39	1.32	12.32	0.028
Pipe P5	80.00	200	110	41.12	1.31	12.17	0.028
Pipe P6	15.00	200	110	113.94	3.63	80.35	0.024
Pipe P7	64.00	200	110	113.94	3.63	80.35	0.024
Pipe P8	58.00	200	110	40.07	1.28	11.60	0.028
Pipe P9	75.00	200	110	39.55	1.26	11.32	0.028
Pipe P10	39.00	200	110	73.57	2.34	35.74	0.026
Pipe P11	100.00	200	110	73.11	2.33	35.33	0.026
Pipe P12	62.00	200	110	72.86	2.32	35.11	0.026
Pipe P13	62.00	200	110	0.71	0.02	0.01	0.052
Pipe P14	60.00	200	110	0.57	0.02	0.00	0.052
Pipe P15	69.00	200	110	0.23	0.01	0.00	0.059
Pipe P16	10.00	200	110	72.08	2.29	34.41	0.026
Pipe P17	79.00	200	110	71.63	2.28	34.02	0.026
Pipe P18	75.00	200	110	71.42	2.27	33.83	0.026
Pipe P19	33.00	200	110	71.21	2.27	33.65	0.026
Pipe P20	59.00	200	110	-31.44	1.00	7.40	0.029
Pipe P21	103.00	200	110	102.46	3.26	66.01	0.024
Pipe P22	76.00	200	110	-33.70	1.07	8.42	0.029
Pipe P23	45.00	200	110	72.53	2.31	34.81	0.026
Pipe P24	106.00	200	110	-22.66	0.72	4.04	0.030
Pipe P25	51.00	200	110	-81.65	2.60	43.35	0.025
Pipe P26	50.00	200	110	34.19	1.09	8.65	0.029
Pipe P27	39.00	200	110	-116.11	3.70	83.21	0.024
Pipe P28	41.00	200	110	-116.27	3.70	83.42	0.024
Pipe P29	67.00	200	110	-31.63	1.01	7.49	0.029
Pipe P30	44.00	200	110	-148.01	4.71	130.45	0.023
Pipe P31	12.00	200	110	-98.95	3.15	61.88	0.024
Pipe P32	110.00	200	110	-49.20	1.57	16.97	0.027
Pipe P33	110.00	200	110	-49.77	1.58	17.33	0.027
Pipe P34	102.00	200	110	-50.40	1.60	17.74	0.027
Pipe P35	78.00	200	110	99.09	3.15	62.05	0.024
Pipe P36	12.00	200	110	-110.16	3.51	75.49	0.024
Pipe P37	66.00	200	110	-110.43	3.52	75.83	0.024
Pipe P38	32.00	200	110	-45.51	1.45	14.68	0.027
Pipe P39	12.00	200	110	-45.62	1.45	14.75	0.027
Pipe P40	67.00	200	110	-24.06	0.77	4.51	0.030
Pipe P41	95.00	200	110	-24.66	0.78	4.72	0.030
Pipe P42	13.00	200	110	10.12	0.32	0.91	0.034
Pipe P43	110.00	200	110	9.68	0.31	0.83	0.035
Pipe P44	43.00	200	110	-34.82	1.11	8.94	0.029
Pipe P45	59.00	200	110	-35.01	1.11	9.03	0.029
Pipe P46	50.00	200	110	-72.21	2.30	34.53	0.026
Pipe P47	48.00	200	110	36.84	1.17	9.93	0.028
Pipe P48	12.00	200	110	36.62	1.17	9.82	0.028
Pipe P49	44.00	200	110	36.38	1.16	9.70	0.028
Pipe P50	36.00	50	100	0.08	0.04	0.12	0.070
Pipe P51	9.00	300	120	0.00	0.00	0.00	0.000
Pipe P52	99.00	300	120	0.00	0.00	0.00	0.000
Pipe P53	10.00	200	110	0.00	0.00	0.00	0.000

MAXIMUM DAY + FIRE FLOW DEMAND AT N20

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	153.20	-166.22	153.20	0.00	0.00	0.00
Resvr R2	153.20	-77.87	153.20	0.00	0.00	0.00
Junc N1	97.60	0.05	151.58	53.98	529.54	76.80
Junc N2	97.98	0.22	151.58	53.60	525.82	76.26
Junc N3	97.62	0.27	151.58	53.96	529.35	76.78
Junc N4	97.40	0.27	150.43	53.03	520.22	75.45
Junc N5	97.43	0.00	150.24	52.81	518.07	75.14
Junc N6	97.30	0.52	143.60	46.30	454.20	65.88
Junc N7	97.45	0.30	144.52	47.07	461.76	66.97
Junc N8	97.50	0.46	143.16	45.66	447.92	64.97
Junc N9	97.75	0.25	139.70	41.95	411.53	59.69
Junc N10	98.00	0.07	137.57	39.57	388.18	56.30
Junc N11	97.80	0.14	137.32	39.52	387.69	56.23
Junc N12	97.65	0.34	137.08	39.43	386.81	56.10
Junc N13	97.85	0.45	137.39	39.54	387.89	56.26
Junc N14	98.10	0.21	136.06	37.96	372.39	54.01
Junc N15	97.65	0.21	134.81	37.16	364.54	52.87
Junc N16	97.55	0.19	134.35	36.80	361.01	52.36
Junc N17	97.85	0.19	134.26	36.41	357.18	51.80
Junc N18	97.95	0.30	131.56	33.61	329.71	47.82
Junc N19	98.00	0.19	131.12	33.12	324.91	47.12
Junc N20	97.65	95.33	130.10	32.45	318.33	46.17
Junc N21	97.65	0.27	131.31	33.66	330.20	47.89
Junc N22	97.70	43.49	131.18	33.48	328.44	47.64
Junc N23	97.60	0.16	132.85	35.25	345.80	50.15
Junc N24	97.55	0.11	134.46	36.91	362.09	52.52
Junc N25	97.50	0.37	136.82	39.32	385.73	55.95
Junc N26	97.45	0.14	137.57	40.12	393.58	57.08
Junc N27	97.65	95.57	136.11	38.46	377.29	54.72
Junc N28	97.30	0.63	139.36	42.06	412.61	59.84
Junc N29	97.30	0.22	142.43	45.13	442.73	64.21
Junc N30	97.25	0.27	143.48	46.23	453.52	65.78
Junc N31	97.07	0.25	149.29	52.22	512.28	74.30
Junc N32	97.00	0.11	149.83	52.83	518.26	75.17
Junc N33	97.15	0.44	150.04	52.89	518.85	75.25
Junc N34	97.35	0.60	149.64	52.29	512.96	74.40
Junc N35	97.70	0.05	150.16	52.46	514.63	74.64
Junc N36	97.60	0.44	150.14	52.54	515.42	74.75
Junc N37	97.60	0.19	150.60	53.00	519.93	75.41
Junc N38	97.35	0.36	151.21	53.86	528.37	76.63
Junc N39	96.95	0.22	150.67	53.72	526.99	76.43
Junc N40	97.00	0.16	150.53	53.53	525.13	76.16
Junc N41	96.65	0.08	150.53	53.88	528.56	76.66
Junc N42	96.66	0.00	153.20	56.54	554.66	80.45
Junc N43	96.94	0.00	153.20	56.26	551.91	80.05
Junc N44	97.79	0.00	153.20	55.41	543.57	78.84

Minimum Pressure
Applied Fireflow (sum)

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	32.00	50	100	-0.05	0.03	0.05	0.075
Pipe P2	89.00	200	110	-0.27	0.01	0.00	0.061
Pipe P3	10.00	200	110	-166.22	5.29	161.72	0.023
Pipe P4	80.00	200	110	45.03	1.43	14.40	0.028
Pipe P5	80.00	200	110	44.76	1.42	14.24	0.028
Pipe P6	15.00	200	110	120.65	3.84	89.35	0.024
Pipe P7	64.00	200	110	120.65	3.84	89.35	0.024
Pipe P8	58.00	200	110	47.60	1.52	15.96	0.027
Pipe P9	75.00	200	110	47.08	1.50	15.64	0.027
Pipe P10	39.00	200	110	72.76	2.32	35.01	0.026
Pipe P11	100.00	200	110	72.30	2.30	34.61	0.026
Pipe P12	62.00	200	110	72.05	2.29	34.38	0.026
Pipe P13	62.00	200	110	22.47	0.72	3.97	0.030
Pipe P14	60.00	200	110	22.33	0.71	3.93	0.031
Pipe P15	69.00	200	110	21.99	0.70	3.82	0.031
Pipe P16	10.00	200	110	49.51	1.58	17.17	0.027
Pipe P17	79.00	200	110	49.06	1.56	16.88	0.027
Pipe P18	75.00	200	110	48.85	1.55	16.74	0.027
Pipe P19	33.00	200	110	48.64	1.55	16.61	0.027
Pipe P20	59.00	200	110	-13.73	0.44	1.60	0.033
Pipe P21	103.00	200	110	62.18	1.98	26.18	0.026
Pipe P22	76.00	200	110	25.42	0.81	5.00	0.030
Pipe P23	45.00	200	110	36.46	1.16	9.74	0.028
Pipe P24	106.00	200	110	36.27	1.15	9.65	0.028
Pipe P25	51.00	200	110	-59.06	1.88	23.80	0.026
Pipe P26	50.00	200	110	18.07	0.58	2.65	0.031
Pipe P27	39.00	200	110	-77.40	2.46	39.26	0.025
Pipe P28	41.00	200	110	-77.56	2.47	39.41	0.025
Pipe P29	67.00	200	110	-13.92	0.44	1.64	0.033
Pipe P30	44.00	200	110	-91.59	2.92	53.63	0.025
Pipe P31	12.00	200	110	-99.17	3.16	62.14	0.024
Pipe P32	110.00	200	110	29.20	0.93	6.45	0.029
Pipe P33	110.00	200	110	-66.37	2.11	29.54	0.026
Pipe P34	102.00	200	110	-67.00	2.13	30.06	0.026
Pipe P35	78.00	200	110	99.31	3.16	62.30	0.024
Pipe P36	12.00	200	110	-119.46	3.80	87.71	0.024
Pipe P37	66.00	200	110	-119.73	3.81	88.08	0.024
Pipe P38	32.00	200	110	-49.19	1.57	16.96	0.027
Pipe P39	12.00	200	110	-49.30	1.57	17.03	0.027
Pipe P40	67.00	200	110	-26.03	0.83	5.22	0.030
Pipe P41	95.00	200	110	-26.63	0.85	5.44	0.030
Pipe P42	13.00	200	110	10.90	0.35	1.04	0.034
Pipe P43	110.00	200	110	10.46	0.33	0.96	0.034
Pipe P44	43.00	200	110	-37.58	1.20	10.30	0.028
Pipe P45	59.00	200	110	-37.77	1.20	10.40	0.028
Pipe P46	50.00	200	110	-77.87	2.48	39.70	0.025
Pipe P47	48.00	200	110	39.74	1.26	11.42	0.028
Pipe P48	12.00	200	110	39.52	1.26	11.31	0.028
Pipe P49	44.00	200	110	39.28	1.25	11.18	0.028
Pipe P50	36.00	50	100	0.08	0.04	0.12	0.070
Pipe P51	9.00	300	120	0.00	0.00	0.00	0.000
Pipe P52	99.00	300	120	0.00	0.00	0.00	0.000
Pipe P53	10.00	200	110	0.00	0.00	0.00	0.000

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	153.20	-177.88	153.20	0.00	0.00	0.00
Resvr R2	153.20	-83.21	153.20	0.00	0.00	0.00
Junc N1	97.60	0.05	151.36	53.76	527.39	76.49
Junc N2	97.98	0.22	151.37	53.39	523.76	75.96
Junc N3	97.62	0.27	151.37	53.75	527.29	76.48
Junc N4	97.40	0.27	150.06	52.66	516.59	74.93
Junc N5	97.43	0.00	149.84	52.41	514.14	74.57
Junc N6	97.30	0.52	142.31	45.01	441.55	64.04
Junc N7	97.45	0.30	143.35	45.90	450.28	65.31
Junc N8	97.50	0.46	141.79	44.29	434.48	63.02
Junc N9	97.75	0.25	137.82	40.07	393.09	57.01
Junc N10	98.00	0.07	135.38	37.38	366.70	53.19
Junc N11	97.80	0.14	135.11	37.31	366.01	53.09
Junc N12	97.65	0.34	134.84	37.19	364.83	52.91
Junc N13	97.85	0.45	135.18	37.33	366.21	53.11
Junc N14	98.10	0.21	133.63	35.53	348.55	50.55
Junc N15	97.65	0.21	132.17	34.52	338.64	49.12
Junc N16	97.55	0.19	131.54	33.99	333.44	48.36
Junc N17	97.85	0.19	131.53	33.68	330.40	47.92
Junc N18	97.95	0.30	129.38	31.43	308.33	44.72
Junc N19	98.00	0.19	129.26	31.26	306.66	44.48
Junc N20	97.65	0.33	128.98	31.33	307.35	44.58
Junc N21	97.65	0.27	128.86	31.21	306.17	44.41
Junc N22	97.70	60.49	128.63	30.93	303.42	44.01
Junc N23	97.60	95.16	128.87	31.27	306.76	44.49
Junc N24	97.55	0.11	131.54	33.99	333.44	48.36
Junc N25	97.50	0.37	134.55	37.05	363.46	52.72
Junc N26	97.45	0.14	135.41	37.96	372.39	54.01
Junc N27	97.65	95.57	134.00	36.35	356.59	51.72
Junc N28	97.30	0.63	137.60	40.30	395.34	57.34
Junc N29	97.30	0.22	140.99	43.69	428.60	62.16
Junc N30	97.25	0.27	142.18	44.93	440.76	63.93
Junc N31	97.07	0.25	148.78	51.71	507.28	73.57
Junc N32	97.00	0.11	149.39	52.39	513.95	74.54
Junc N33	97.15	0.44	149.62	52.47	514.73	74.66
Junc N34	97.35	0.60	149.17	51.82	508.35	73.73
Junc N35	97.70	0.05	149.76	52.06	510.71	74.07
Junc N36	97.60	0.44	149.74	52.14	511.49	74.19
Junc N37	97.60	0.19	150.26	52.66	516.59	74.93
Junc N38	97.35	0.36	150.96	53.61	525.91	76.28
Junc N39	96.95	0.22	150.34	53.39	523.76	75.96
Junc N40	97.00	0.16	150.18	53.18	521.70	75.67
Junc N41	96.65	0.08	150.18	53.53	525.13	76.16
Junc N42	96.66	0.00	153.20	56.54	554.66	80.45
Junc N43	96.94	0.00	153.20	56.26	551.91	80.05
Junc N44	97.79	0.00	153.20	55.41	543.57	78.84

Minimum Pressure
Applied Fireflow (sum)

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	32.00	50	100	-0.05	0.03	0.05	0.075
Pipe P2	89.00	200	110	-0.27	0.01	0.00	0.056
Pipe P3	10.00	200	110	-177.88	5.66	183.36	0.022
Pipe P4	80.00	200	110	48.10	1.53	16.27	0.027
Pipe P5	80.00	200	110	47.83	1.52	16.10	0.027
Pipe P6	15.00	200	110	129.24	4.11	101.48	0.024
Pipe P7	64.00	200	110	129.24	4.11	101.48	0.024
Pipe P8	58.00	200	110	50.69	1.61	17.93	0.027
Pipe P9	75.00	200	110	50.17	1.60	17.59	0.027
Pipe P10	39.00	200	110	78.25	2.49	40.07	0.025
Pipe P11	100.00	200	110	77.79	2.48	39.64	0.025
Pipe P12	62.00	200	110	77.54	2.47	39.40	0.025
Pipe P13	62.00	200	110	23.81	0.76	4.42	0.030
Pipe P14	60.00	200	110	23.67	0.75	4.37	0.030
Pipe P15	69.00	200	110	23.33	0.74	4.26	0.030
Pipe P16	10.00	200	110	53.67	1.71	19.93	0.027
Pipe P17	79.00	200	110	53.22	1.69	19.62	0.027
Pipe P18	75.00	200	110	53.01	1.69	19.48	0.027
Pipe P19	33.00	200	110	52.80	1.68	19.33	0.027
Pipe P20	59.00	200	110	-2.43	0.08	0.06	0.042
Pipe P21	103.00	200	110	55.04	1.75	20.88	0.027
Pipe P22	76.00	200	110	36.64	1.17	9.83	0.028
Pipe P23	45.00	200	110	18.10	0.58	2.66	0.031
Pipe P24	106.00	200	110	17.91	0.57	2.61	0.032
Pipe P25	51.00	200	110	17.58	0.56	2.52	0.032
Pipe P26	50.00	200	110	23.85	0.76	4.44	0.030
Pipe P27	39.00	200	110	-6.54	0.21	0.40	0.037
Pipe P28	41.00	200	110	-101.70	3.24	65.10	0.024
Pipe P29	67.00	200	110	-2.62	0.08	0.07	0.042
Pipe P30	44.00	200	110	-104.43	3.32	68.38	0.024
Pipe P31	12.00	200	110	-106.91	3.40	71.42	0.024
Pipe P32	110.00	200	110	25.44	0.81	5.00	0.030
Pipe P33	110.00	200	110	-70.13	2.23	32.71	0.026
Pipe P34	102.00	200	110	-70.76	2.25	33.26	0.026
Pipe P35	78.00	200	110	107.05	3.41	71.59	0.024
Pipe P36	12.00	200	110	-127.87	4.07	99.49	0.024
Pipe P37	66.00	200	110	-128.14	4.08	99.88	0.024
Pipe P38	32.00	200	110	-52.66	1.68	19.24	0.027
Pipe P39	12.00	200	110	-52.77	1.68	19.32	0.027
Pipe P40	67.00	200	110	-27.89	0.89	5.93	0.030
Pipe P41	95.00	200	110	-28.49	0.91	6.17	0.029
Pipe P42	13.00	200	110	11.64	0.37	1.18	0.034
Pipe P43	110.00	200	110	11.20	0.36	1.09	0.034
Pipe P44	43.00	200	110	-40.18	1.28	11.66	0.028
Pipe P45	59.00	200	110	-40.37	1.29	11.76	0.028
Pipe P46	50.00	200	110	-83.21	2.65	44.89	0.025
Pipe P47	48.00	200	110	42.47	1.35	12.92	0.028
Pipe P48	12.00	200	110	42.25	1.34	12.80	0.028
Pipe P49	44.00	200	110	42.01	1.34	12.66	0.028
Pipe P50	36.00	50	100	0.08	0.04	0.12	0.070
Pipe P51	9.00	300	120	0.00	0.00	0.00	0.000
Pipe P52	99.00	300	120	0.00	0.00	0.00	0.000
Pipe P53	10.00	200	110	0.00	0.00	0.00	0.000

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	153.20	-165.48	153.20	0.00	0.00	0.00
Resvr R2	153.20	-78.61	153.20	0.00	0.00	0.00
Junc N1	97.60	0.05	151.59	53.99	529.64	76.82
Junc N2	97.98	0.22	151.60	53.62	526.01	76.29
Junc N3	97.62	0.27	151.60	53.98	529.54	76.80
Junc N4	97.40	0.27	150.40	53.00	519.93	75.41
Junc N5	97.43	0.00	150.29	52.86	518.56	75.21
Junc N6	97.30	0.52	143.60	46.30	454.20	65.88
Junc N7	97.45	0.30	144.71	47.26	463.62	67.24
Junc N8	97.50	0.46	143.57	46.07	451.95	65.55
Junc N9	97.75	0.25	140.67	42.92	421.05	61.07
Junc N10	98.00	0.07	138.89	40.89	401.13	58.18
Junc N11	97.80	0.14	138.55	40.75	399.76	57.98
Junc N12	97.65	0.34	138.23	40.58	398.09	57.74
Junc N13	97.85	0.45	138.78	40.93	401.52	58.24
Junc N14	98.10	0.21	137.93	39.83	390.73	56.67
Junc N15	97.65	0.21	137.13	39.48	387.30	56.17
Junc N16	97.55	0.19	136.80	39.25	385.04	55.85
Junc N17	97.85	0.19	136.78	38.93	381.90	55.39
Junc N18	97.95	0.30	135.36	37.41	366.99	53.23
Junc N19	98.00	0.19	134.96	36.96	362.58	52.59
Junc N20	97.65	95.33	134.01	36.36	356.69	51.73
Junc N21	97.65	0.27	135.28	37.63	369.15	53.54
Junc N22	97.70	0.49	135.31	37.61	368.95	53.51
Junc N23	97.60	0.16	136.03	38.43	377.00	54.68
Junc N24	97.55	0.11	136.82	39.27	385.24	55.87
Junc N25	97.50	0.37	137.88	40.38	396.13	57.45
Junc N26	97.45	0.14	138.45	41.00	402.21	58.34
Junc N27	97.65	95.57	135.77	38.12	373.96	54.24
Junc N28	97.30	43.63	137.24	39.94	391.81	56.83
Junc N29	97.30	0.22	142.18	44.88	440.27	63.86
Junc N30	97.25	0.27	143.26	46.01	451.36	65.46
Junc N31	97.07	0.25	149.22	52.15	511.59	74.20
Junc N32	97.00	0.11	149.77	52.77	517.67	75.08
Junc N33	97.15	0.44	149.98	52.83	518.26	75.17
Junc N34	97.35	0.60	149.58	52.23	512.38	74.31
Junc N35	97.70	0.05	150.10	52.40	514.04	74.56
Junc N36	97.60	0.44	150.09	52.49	514.93	74.68
Junc N37	97.60	0.19	150.56	52.96	519.54	75.35
Junc N38	97.35	0.36	151.18	53.83	528.07	76.59
Junc N39	96.95	0.22	150.62	53.67	526.50	76.36
Junc N40	97.00	0.16	150.48	53.48	524.64	76.09
Junc N41	96.65	0.08	150.48	53.83	528.07	76.59
Junc N42	96.66	0.00	153.20	56.54	554.66	80.45
Junc N43	96.94	0.00	153.20	56.26	551.91	80.05
Junc N44	97.79	0.00	153.20	55.41	543.57	78.84

Minimum Pressure
Applied Fireflow (sum)

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	32.00	50	100	-0.05	0.03	0.05	0.075
Pipe P2	89.00	200	110	-0.27	0.01	0.00	0.061
Pipe P3	10.00	200	110	-165.48	5.27	160.39	0.023
Pipe P4	80.00	200	110	45.90	1.46	14.92	0.027
Pipe P5	80.00	200	110	45.63	1.45	14.76	0.027
Pipe P6	15.00	200	110	119.04	3.79	87.15	0.024
Pipe P7	64.00	200	110	119.04	3.79	87.15	0.024
Pipe P8	58.00	200	110	52.60	1.67	19.20	0.027
Pipe P9	75.00	200	110	52.08	1.66	18.85	0.027
Pipe P10	39.00	200	110	66.15	2.11	29.35	0.026
Pipe P11	100.00	200	110	65.69	2.09	28.97	0.026
Pipe P12	62.00	200	110	65.44	2.08	28.77	0.026
Pipe P13	62.00	200	110	26.44	0.84	5.37	0.030
Pipe P14	60.00	200	110	26.30	0.84	5.32	0.030
Pipe P15	69.00	200	110	25.96	0.83	5.19	0.030
Pipe P16	10.00	200	110	38.93	1.24	10.99	0.028
Pipe P17	79.00	200	110	38.48	1.22	10.76	0.028
Pipe P18	75.00	200	110	38.27	1.22	10.65	0.028
Pipe P19	33.00	200	110	38.06	1.21	10.54	0.028
Pipe P20	59.00	200	110	-6.06	0.19	0.35	0.037
Pipe P21	103.00	200	110	43.92	1.40	13.75	0.028
Pipe P22	76.00	200	110	8.64	0.28	0.68	0.035
Pipe P23	45.00	200	110	34.98	1.11	9.02	0.029
Pipe P24	106.00	200	110	34.79	1.11	8.93	0.029
Pipe P25	51.00	200	110	-60.54	1.93	24.91	0.026
Pipe P26	50.00	200	110	-8.15	0.26	0.61	0.035
Pipe P27	39.00	200	110	-52.66	1.68	19.24	0.027
Pipe P28	41.00	200	110	-52.82	1.68	19.35	0.027
Pipe P29	67.00	200	110	-6.25	0.20	0.37	0.037
Pipe P30	44.00	200	110	-59.17	1.88	23.88	0.026
Pipe P31	12.00	200	110	-86.03	2.74	47.75	0.025
Pipe P32	110.00	200	110	52.44	1.67	19.10	0.027
Pipe P33	110.00	200	110	-43.13	1.37	13.29	0.028
Pipe P34	102.00	200	110	-86.76	2.76	48.50	0.025
Pipe P35	78.00	200	110	86.17	2.74	47.90	0.025
Pipe P36	12.00	200	110	-121.07	3.85	89.91	0.024
Pipe P37	66.00	200	110	-121.34	3.86	90.28	0.024
Pipe P38	32.00	200	110	-49.67	1.58	17.27	0.027
Pipe P39	12.00	200	110	-49.78	1.58	17.34	0.027
Pipe P40	67.00	200	110	-26.29	0.84	5.31	0.030
Pipe P41	95.00	200	110	-26.89	0.86	5.54	0.030
Pipe P42	13.00	200	110	11.00	0.35	1.06	0.034
Pipe P43	110.00	200	110	10.56	0.34	0.98	0.034
Pipe P44	43.00	200	110	-37.94	1.21	10.48	0.028
Pipe P45	59.00	200	110	-38.13	1.21	10.58	0.028
Pipe P46	50.00	200	110	-78.61	2.50	40.41	0.025
Pipe P47	48.00	200	110	40.12	1.28	11.63	0.028
Pipe P48	12.00	200	110	39.90	1.27	11.51	0.028
Pipe P49	44.00	200	110	39.66	1.26	11.38	0.028
Pipe P50	36.00	50	100	0.08	0.04	0.12	0.070
Pipe P51	9.00	300	120	0.00	0.00	0.00	0.000
Pipe P52	99.00	300	120	0.00	0.00	0.00	0.000
Pipe P53	10.00	200	110	0.00	0.00	0.00	0.000

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	153.20	-139.90	153.20	0.00	0.00	0.00
Resvr R2	153.20	-71.19	153.20	0.00	0.00	0.00
Junc N1	97.60	0.05	152.02	54.42	533.86	77.43
Junc N2	97.98	0.22	152.02	54.04	530.13	76.89
Junc N3	97.62	0.27	152.02	54.40	533.66	77.40
Junc N4	97.40	0.27	150.95	53.55	525.33	76.19
Junc N5	97.43	0.00	151.15	53.72	526.99	76.43
Junc N6	97.30	0.52	146.25	48.95	480.20	69.65
Junc N7	97.45	0.30	147.40	49.95	490.01	71.07
Junc N8	97.50	0.46	146.90	49.40	484.61	70.29
Junc N9	97.75	0.25	145.64	47.89	469.80	68.14
Junc N10	98.00	0.07	144.88	46.88	459.89	66.70
Junc N11	97.80	0.14	144.63	46.83	459.40	66.63
Junc N12	97.65	0.34	144.39	46.74	458.52	66.50
Junc N13	97.85	0.45	144.85	47.00	461.07	66.87
Junc N14	98.10	0.21	144.63	46.53	456.46	66.20
Junc N15	97.65	0.21	144.42	46.77	458.81	66.55
Junc N16	97.55	0.19	144.28	46.73	458.42	66.49
Junc N17	97.85	0.19	144.33	46.48	455.97	66.13
Junc N18	97.95	0.30	144.27	46.32	454.40	65.91
Junc N19	98.00	0.19	144.27	46.27	453.91	65.83
Junc N20	97.65	0.33	144.26	46.61	457.24	66.32
Junc N21	97.65	0.27	144.25	46.60	457.15	66.30
Junc N22	97.70	0.49	144.26	46.56	456.75	66.25
Junc N23	97.60	0.16	144.24	46.64	457.54	66.36
Junc N24	97.55	0.11	144.22	46.67	457.83	66.40
Junc N25	97.50	0.37	144.13	46.63	457.44	66.35
Junc N26	97.45	63.47	144.06	46.61	457.24	66.32
Junc N27	97.65	0.57	144.04	46.39	455.09	66.00
Junc N28	97.30	42.30	143.96	46.66	457.73	66.39
Junc N29	97.30	0.22	144.79	47.49	465.88	67.57
Junc N30	97.25	95.27	144.81	47.56	466.56	67.67
Junc N31	97.07	0.25	149.89	52.82	518.16	75.15
Junc N32	97.00	0.11	150.35	53.35	523.36	75.91
Junc N33	97.15	0.44	150.52	53.37	523.56	75.94
Junc N34	97.35	0.60	150.19	52.84	518.36	75.18
Junc N35	97.70	0.05	150.62	52.92	519.15	75.30
Junc N36	97.60	0.44	150.61	53.01	520.03	75.42
Junc N37	97.60	0.19	151.00	53.40	523.85	75.98
Junc N38	97.35	0.36	151.52	54.17	531.41	77.07
Junc N39	96.95	0.22	151.05	54.10	530.72	76.97
Junc N40	97.00	0.16	150.94	53.94	529.15	76.75
Junc N41	96.65	0.08	150.94	54.29	532.58	77.24
Junc N42	96.66	0.00	153.20	56.54	554.66	80.45
Junc N43	96.94	0.00	153.20	56.26	551.91	80.05
Junc N44	97.79	0.00	153.20	55.41	543.57	78.84

Minimum Pressure
Applied Fireflow (sum)

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	32.00	50	100	-0.05	0.03	0.05	0.075
Pipe P2	89.00	200	110	-0.27	0.01	0.00	0.056
Pipe P3	10.00	200	110	-139.90	4.45	117.52	0.023
Pipe P4	80.00	200	110	43.30	1.38	13.39	0.028
Pipe P5	80.00	200	110	43.03	1.37	13.24	0.028
Pipe P6	15.00	200	110	96.06	3.06	58.57	0.025
Pipe P7	64.00	200	110	96.06	3.06	58.57	0.025
Pipe P8	58.00	200	110	53.50	1.70	19.82	0.027
Pipe P9	75.00	200	110	52.98	1.69	19.46	0.027
Pipe P10	39.00	200	110	42.25	1.34	12.80	0.028
Pipe P11	100.00	200	110	41.79	1.33	12.54	0.028
Pipe P12	62.00	200	110	41.54	1.32	12.40	0.028
Pipe P13	62.00	200	110	22.46	0.71	3.97	0.030
Pipe P14	60.00	200	110	22.32	0.71	3.93	0.031
Pipe P15	69.00	200	110	21.98	0.70	3.82	0.031
Pipe P16	10.00	200	110	19.01	0.61	2.92	0.031
Pipe P17	79.00	200	110	18.56	0.59	2.79	0.031
Pipe P18	75.00	200	110	18.35	0.58	2.73	0.031
Pipe P19	33.00	200	110	18.14	0.58	2.67	0.031
Pipe P20	59.00	200	110	10.03	0.32	0.89	0.034
Pipe P21	103.00	200	110	7.92	0.25	0.58	0.036
Pipe P22	76.00	200	110	4.25	0.14	0.18	0.039
Pipe P23	45.00	200	110	3.37	0.11	0.12	0.040
Pipe P24	106.00	200	110	3.18	0.10	0.11	0.041
Pipe P25	51.00	200	110	2.85	0.09	0.09	0.041
Pipe P26	50.00	200	110	-3.76	0.12	0.14	0.040
Pipe P27	39.00	200	110	6.34	0.20	0.38	0.037
Pipe P28	41.00	200	110	6.18	0.20	0.36	0.037
Pipe P29	67.00	200	110	9.84	0.31	0.86	0.034
Pipe P30	44.00	200	110	15.91	0.51	2.10	0.032
Pipe P31	12.00	200	110	27.81	0.89	5.90	0.030
Pipe P32	110.00	200	110	9.71	0.31	0.84	0.035
Pipe P33	110.00	200	110	9.14	0.29	0.75	0.035
Pipe P34	102.00	200	110	-33.16	1.06	8.17	0.029
Pipe P35	78.00	200	110	35.66	1.14	9.35	0.028
Pipe P36	12.00	200	110	-16.05	0.51	2.13	0.032
Pipe P37	66.00	200	110	-111.32	3.54	76.97	0.024
Pipe P38	32.00	200	110	-44.84	1.43	14.29	0.028
Pipe P39	12.00	200	110	-44.95	1.43	14.35	0.028
Pipe P40	67.00	200	110	-23.70	0.75	4.39	0.030
Pipe P41	95.00	200	110	-24.30	0.77	4.59	0.030
Pipe P42	13.00	200	110	9.97	0.32	0.88	0.034
Pipe P43	110.00	200	110	9.53	0.30	0.81	0.035
Pipe P44	43.00	200	110	-34.32	1.09	8.71	0.029
Pipe P45	59.00	200	110	-34.51	1.10	8.80	0.029
Pipe P46	50.00	200	110	-71.19	2.27	33.63	0.026
Pipe P47	48.00	200	110	36.32	1.16	9.67	0.028
Pipe P48	12.00	200	110	36.10	1.15	9.56	0.028
Pipe P49	44.00	200	110	35.86	1.14	9.44	0.028
Pipe P50	36.00	50	100	0.08	0.04	0.12	0.070
Pipe P51	9.00	300	120	0.00	0.00	0.00	0.000
Pipe P52	99.00	300	120	0.00	0.00	0.00	0.000
Pipe P53	10.00	200	110	0.00	0.00	0.00	0.000

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	153.20	-146.38	153.20	0.00	0.00	0.00
Resvr R2	153.20	-147.71	153.20	0.00	0.00	0.00
Junc N1	97.60	0.05	151.92	54.32	532.88	77.29
Junc N2	97.98	0.22	151.92	53.94	529.15	76.75
Junc N3	97.62	0.27	151.92	54.30	532.68	77.26
Junc N4	97.40	0.27	148.84	51.44	504.63	73.19
Junc N5	97.43	0.00	151.44	54.01	529.84	76.85
Junc N6	97.30	0.52	148.69	51.39	504.14	73.12
Junc N7	97.45	0.30	149.40	51.95	509.63	73.92
Junc N8	97.50	0.46	149.18	51.68	506.98	73.53
Junc N9	97.75	0.25	148.62	50.87	499.03	72.38
Junc N10	98.00	0.07	148.27	50.27	493.15	71.53
Junc N11	97.80	0.14	148.17	50.37	494.13	71.67
Junc N12	97.65	0.34	148.07	50.42	494.62	71.74
Junc N13	97.85	0.45	148.26	50.41	494.52	71.72
Junc N14	98.10	0.21	148.16	50.06	491.09	71.23
Junc N15	97.65	0.21	148.07	50.42	494.62	71.74
Junc N16	97.55	0.19	148.01	50.46	495.01	71.80
Junc N17	97.85	0.19	148.03	50.18	492.27	71.40
Junc N18	97.95	0.30	148.01	50.06	491.09	71.23
Junc N19	98.00	0.19	148.00	50.00	490.50	71.14
Junc N20	97.65	0.33	148.00	50.35	493.93	71.64
Junc N21	97.65	0.27	148.00	50.35	493.93	71.64
Junc N22	97.70	0.49	148.00	50.30	493.44	71.57
Junc N23	97.60	0.16	147.99	50.39	494.33	71.70
Junc N24	97.55	0.11	147.99	50.44	494.82	71.77
Junc N25	97.50	0.37	147.95	50.45	494.91	71.78
Junc N26	97.45	0.14	147.93	50.48	495.21	71.82
Junc N27	97.65	0.57	147.89	50.24	492.85	71.48
Junc N28	97.30	0.63	147.83	50.53	495.70	71.90
Junc N29	97.30	0.22	147.79	50.49	495.31	71.84
Junc N30	97.25	0.27	147.48	50.23	492.76	71.47
Junc N31	97.07	0.25	145.77	48.70	477.75	69.29
Junc N32	97.00	29.78	145.24	48.24	473.23	68.64
Junc N33	97.15	0.44	145.21	48.06	471.47	68.38
Junc N34	97.35	95.60	142.33	44.98	441.25	64.00
Junc N35	97.70	0.05	142.36	44.66	438.11	63.54
Junc N36	97.60	95.44	142.26	44.66	438.11	63.54
Junc N37	97.60	63.52	142.83	45.23	443.71	64.35
Junc N38	97.35	0.36	146.70	49.35	484.12	70.22
Junc N39	96.95	0.22	146.01	49.06	481.28	69.80
Junc N40	97.00	0.16	145.83	48.83	479.02	69.48
Junc N41	96.65	0.08	145.83	49.18	482.46	69.97
Junc N42	96.66	0.00	153.20	56.54	554.66	80.45
Junc N43	96.94	0.00	153.20	56.26	551.91	80.05
Junc N44	97.79	0.00	153.20	55.41	543.57	78.84

Minimum Pressure
Applied Fireflow (sum)

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	32.00	50	100	-0.05	0.03	0.05	0.075
Pipe P2	89.00	200	110	-0.27	0.01	0.00	0.061
Pipe P3	10.00	200	110	-146.38	4.66	127.79	0.023
Pipe P4	80.00	200	110	76.67	2.44	38.58	0.025
Pipe P5	80.00	200	110	76.40	2.43	38.33	0.025
Pipe P6	15.00	200	110	69.17	2.20	31.89	0.026
Pipe P7	64.00	200	110	69.17	2.20	31.89	0.026
Pipe P8	58.00	200	110	41.33	1.32	12.29	0.028
Pipe P9	75.00	200	110	40.81	1.30	12.00	0.028
Pipe P10	39.00	200	110	27.54	0.88	5.79	0.030
Pipe P11	100.00	200	110	27.08	0.86	5.61	0.030
Pipe P12	62.00	200	110	26.83	0.85	5.52	0.030
Pipe P13	62.00	200	110	14.31	0.46	1.72	0.033
Pipe P14	60.00	200	110	14.17	0.45	1.69	0.033
Pipe P15	69.00	200	110	13.83	0.44	1.62	0.033
Pipe P16	10.00	200	110	12.45	0.40	1.33	0.033
Pipe P17	79.00	200	110	12.00	0.38	1.24	0.033
Pipe P18	75.00	200	110	11.79	0.38	1.20	0.034
Pipe P19	33.00	200	110	11.58	0.37	1.16	0.034
Pipe P20	59.00	200	110	6.24	0.20	0.37	0.037
Pipe P21	103.00	200	110	5.14	0.16	0.26	0.038
Pipe P22	76.00	200	110	2.68	0.09	0.08	0.042
Pipe P23	45.00	200	110	2.16	0.07	0.05	0.043
Pipe P24	106.00	200	110	1.97	0.06	0.04	0.044
Pipe P25	51.00	200	110	1.64	0.05	0.03	0.045
Pipe P26	50.00	200	110	-2.19	0.07	0.05	0.043
Pipe P27	39.00	200	110	3.56	0.11	0.13	0.040
Pipe P28	41.00	200	110	3.40	0.11	0.12	0.040
Pipe P29	67.00	200	110	6.05	0.19	0.35	0.037
Pipe P30	44.00	200	110	9.35	0.30	0.78	0.035
Pipe P31	12.00	200	110	14.85	0.47	1.84	0.032
Pipe P32	110.00	200	110	7.96	0.25	0.58	0.036
Pipe P33	110.00	200	110	7.39	0.24	0.51	0.036
Pipe P34	102.00	200	110	6.76	0.22	0.43	0.036
Pipe P35	78.00	200	110	-14.71	0.47	1.81	0.032
Pipe P36	12.00	200	110	62.06	1.98	26.08	0.026
Pipe P37	66.00	200	110	61.79	1.97	25.87	0.026
Pipe P38	32.00	200	110	48.46	1.54	16.50	0.027
Pipe P39	12.00	200	110	18.68	0.59	2.82	0.031
Pipe P40	67.00	200	110	89.48	2.85	51.36	0.025
Pipe P41	95.00	200	110	-6.12	0.19	0.36	0.037
Pipe P42	13.00	200	110	32.47	1.03	7.86	0.029
Pipe P43	110.00	200	110	-62.97	2.00	26.80	0.026
Pipe P44	43.00	200	110	-38.64	1.23	10.84	0.028
Pipe P45	59.00	200	110	-102.16	3.25	65.65	0.024
Pipe P46	50.00	200	110	-147.71	4.70	129.96	0.023
Pipe P47	48.00	200	110	45.19	1.44	14.50	0.028
Pipe P48	12.00	200	110	44.97	1.43	14.37	0.028
Pipe P49	44.00	200	110	44.73	1.42	14.22	0.028
Pipe P50	36.00	50	100	0.08	0.04	0.12	0.070
Pipe P51	9.00	300	120	0.00	0.00	0.00	0.000
Pipe P52	99.00	300	120	0.00	0.00	0.00	0.000
Pipe P53	10.00	200	110	0.00	0.00	0.00	0.000

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	153.20	-140.26	153.20	0.00	0.00	0.00
Resvr R2	153.20	-153.83	153.20	0.00	0.00	0.00
Junc N1	97.60	0.05	152.02	54.42	533.86	77.43
Junc N2	97.98	0.22	152.02	54.04	530.13	76.89
Junc N3	97.62	0.27	152.02	54.40	533.66	77.40
Junc N4	97.40	0.27	149.17	51.77	507.86	73.66
Junc N5	97.43	0.00	151.58	54.15	531.21	77.05
Junc N6	97.30	0.52	149.03	51.73	507.47	73.60
Junc N7	97.45	0.30	149.69	52.24	512.47	74.33
Junc N8	97.50	0.46	149.48	51.98	509.92	73.96
Junc N9	97.75	0.25	148.96	51.21	502.37	72.86
Junc N10	98.00	0.07	148.64	50.64	496.78	72.05
Junc N11	97.80	0.14	148.54	50.74	497.76	72.19
Junc N12	97.65	0.34	148.45	50.80	498.35	72.28
Junc N13	97.85	0.45	148.63	50.78	498.15	72.25
Junc N14	98.10	0.21	148.54	50.44	494.82	71.77
Junc N15	97.65	0.21	148.46	50.81	498.45	72.29
Junc N16	97.55	0.19	148.40	50.85	498.84	72.35
Junc N17	97.85	0.19	148.42	50.57	496.09	71.95
Junc N18	97.95	0.30	148.40	50.45	494.91	71.78
Junc N19	98.00	0.19	148.39	50.39	494.33	71.70
Junc N20	97.65	0.33	148.39	50.74	497.76	72.19
Junc N21	97.65	0.27	148.39	50.74	497.76	72.19
Junc N22	97.70	0.49	148.39	50.69	497.27	72.12
Junc N23	97.60	0.16	148.38	50.78	498.15	72.25
Junc N24	97.55	0.11	148.38	50.83	498.64	72.32
Junc N25	97.50	0.37	148.35	50.85	498.84	72.35
Junc N26	97.45	0.14	148.33	50.88	499.13	72.39
Junc N27	97.65	0.57	148.29	50.64	496.78	72.05
Junc N28	97.30	0.63	148.24	50.94	499.72	72.48
Junc N29	97.30	0.22	148.20	50.90	499.33	72.42
Junc N30	97.25	0.27	147.91	50.66	496.97	72.08
Junc N31	97.07	0.25	146.35	49.28	483.44	70.12
Junc N32	97.00	29.78	145.05	48.05	471.37	68.37
Junc N33	97.15	0.44	144.85	47.70	467.94	67.87
Junc N34	97.35	0.60	145.03	47.68	467.74	67.84
Junc N35	97.70	0.05	143.20	45.50	446.36	64.74
Junc N36	97.60	95.44	143.01	45.41	445.47	64.61
Junc N37	97.60	95.19	143.19	45.59	447.24	64.87
Junc N38	97.35	0.36	146.19	48.84	479.12	69.49
Junc N39	96.95	63.55	144.85	47.90	469.90	68.15
Junc N40	97.00	0.16	144.85	47.85	469.41	68.08
Junc N41	96.65	0.08	144.85	48.20	472.84	68.58
Junc N42	96.66	0.00	153.20	56.54	554.66	80.45
Junc N43	96.94	0.00	153.20	56.26	551.91	80.05
Junc N44	97.79	0.00	153.20	55.41	543.57	78.84

Minimum Pressure
Applied Fireflow (sum)

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	32.00	50	100	-0.05	0.03	0.05	0.075
Pipe P2	89.00	200	110	-0.27	0.01	0.00	0.061
Pipe P3	10.00	200	110	-140.26	4.46	118.08	0.023
Pipe P4	80.00	200	110	73.38	2.34	35.57	0.026
Pipe P5	80.00	200	110	73.11	2.33	35.33	0.026
Pipe P6	15.00	200	110	66.34	2.11	29.51	0.026
Pipe P7	64.00	200	110	66.34	2.11	29.51	0.026
Pipe P8	58.00	200	110	39.60	1.26	11.35	0.028
Pipe P9	75.00	200	110	39.08	1.24	11.08	0.028
Pipe P10	39.00	200	110	26.43	0.84	5.37	0.030
Pipe P11	100.00	200	110	25.97	0.83	5.20	0.030
Pipe P12	62.00	200	110	25.72	0.82	5.10	0.030
Pipe P13	62.00	200	110	13.70	0.44	1.59	0.033
Pipe P14	60.00	200	110	13.56	0.43	1.56	0.033
Pipe P15	69.00	200	110	13.22	0.42	1.49	0.033
Pipe P16	10.00	200	110	11.95	0.38	1.23	0.033
Pipe P17	79.00	200	110	11.50	0.37	1.15	0.034
Pipe P18	75.00	200	110	11.29	0.36	1.11	0.034
Pipe P19	33.00	200	110	11.08	0.35	1.07	0.034
Pipe P20	59.00	200	110	5.96	0.19	0.34	0.037
Pipe P21	103.00	200	110	4.94	0.16	0.24	0.038
Pipe P22	76.00	200	110	2.57	0.08	0.07	0.042
Pipe P23	45.00	200	110	2.07	0.07	0.05	0.043
Pipe P24	106.00	200	110	1.88	0.06	0.04	0.044
Pipe P25	51.00	200	110	1.55	0.05	0.03	0.045
Pipe P26	50.00	200	110	-2.08	0.07	0.05	0.043
Pipe P27	39.00	200	110	3.36	0.11	0.12	0.040
Pipe P28	41.00	200	110	3.20	0.10	0.11	0.041
Pipe P29	67.00	200	110	5.77	0.18	0.32	0.037
Pipe P30	44.00	200	110	8.85	0.28	0.71	0.035
Pipe P31	12.00	200	110	14.11	0.45	1.68	0.033
Pipe P32	110.00	200	110	7.59	0.24	0.53	0.036
Pipe P33	110.00	200	110	7.02	0.22	0.46	0.036
Pipe P34	102.00	200	110	6.39	0.20	0.39	0.037
Pipe P35	78.00	200	110	-13.97	0.44	1.65	0.033
Pipe P36	12.00	200	110	59.23	1.89	23.92	0.026
Pipe P37	66.00	200	110	58.96	1.88	23.72	0.026
Pipe P38	32.00	200	110	78.58	2.50	40.38	0.025
Pipe P39	12.00	200	110	48.80	1.55	16.71	0.027
Pipe P40	67.00	200	110	53.24	1.69	19.64	0.027
Pipe P41	95.00	200	110	52.64	1.68	19.23	0.027
Pipe P42	13.00	200	110	46.49	1.48	15.28	0.027
Pipe P43	110.00	200	110	-48.95	1.56	16.81	0.027
Pipe P44	43.00	200	110	6.10	0.19	0.36	0.037
Pipe P45	59.00	200	110	-89.09	2.84	50.95	0.025
Pipe P46	50.00	200	110	-153.83	4.90	140.11	0.023
Pipe P47	48.00	200	110	64.38	2.05	27.92	0.026
Pipe P48	12.00	200	110	0.83	0.03	0.01	0.047
Pipe P49	44.00	200	110	0.59	0.02	0.00	0.053
Pipe P50	36.00	50	100	0.08	0.04	0.12	0.070
Pipe P51	9.00	300	120	0.00	0.00	0.00	0.000
Pipe P52	99.00	300	120	0.00	0.00	0.00	0.000
Pipe P53	10.00	200	110	0.00	0.00	0.00	0.000

MAXIMUM DAY + FIRE FLOW DEMAND SUMMARY

Maximum day plus fire flow demand was modeled for each node.
The following is a summary of the minimum pressures that occurred for each operating condition.

	Demand (L/s)			Minimum Pressure			
Fire at Junction	Maximum Daily	Fire Flow	Max Day + Fire	(m)	kPa	psi	Node
N2	0.22	167.00	167.22	49.00	480.69	69.72	N2
N9	0.25	250.00	250.25	34.79	341.29	49.50	N10
N13	0.45	233.00	233.45	34.38	337.27	48.92	N14
N14	0.21	167.00	167.21	41.04	402.60	58.39	N14
N16	0.19	167.00	167.19	41.32	405.35	58.79	N16
N18	0.30	217.00	217.30	26.26	257.61	37.36	N19
N19	0.19	217.00	217.19	25.27	247.90	35.95	N19
N20	0.33	233.00	233.33	33.12	324.91	47.12	N19
N23	0.16	250.00	250.16	30.93	303.42	44.01	N22
N27	0.57	233.00	233.57	36.36	356.69	51.73	N20
N30	0.27	200.00	200.27	46.27	453.91	65.83	N19
N36	0.44	283.00	283.44	44.66	438.11	63.54	N35/N36
N37	0.19	283.00	283.19	45.41	445.47	64.61	N36

EAGLESON ROAD

BRIDLEWOOD TRAILS RETIREMENT COMMUNITY

BRIGITTA STREET

CONNECTION TO EXISTING
300mmØ WATERMAIN
T/WM= 94.20 (AS-BUILT)

BRIDLEWOOD TRAILS PHASE 1

300mmØ WM

ROMINA STREET

EXISTING PARK LANDS

CONNECTION TO EXISTING
200mmØ WATERMAIN
T/WM=95.26 (AS-BUILT)

200mmØ WM

BRIDLEWOOD TRAILS PHASE 2

BLOCK 14 - BRIDLEWOOD TRAILS PHASE 2

OVERBERG WAY

TERRY FOX DRIVE

STREET 1

STREET 2

STREET 3

STREET 4

STREET 5

STREET 6

STREET 7

STREET 8

R1

R2

LEGEND

- SITE BOUNDARY
- P5 — PROPOSED 200mm WATERMAIN
- P5 — PROPOSED 50mm WATERMAIN
- P5 — EXISTING WATERMAIN
- 1 — PROPOSED NODE AND ID NUMBER
- 1 / R1 — EXISTING HYDRANT NODE AND ID NUMBER
- EXISTING RESERVOIR AND ID NUMBER
- 183L/s — FIREFLOWS THAT CANNOT BE CAPPED AS PER TECHNICAL BULLETIN ISDTB-2014-02
- FIREBREAK (2 HR RATING) REQUIRED BASED ON BUILDING AREA

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CITY OF OTTAWA
866 EAGLESON ROAD
BRIDLEWOOD 3

PROPOSED WATERMAIN LAYOUT AND NODES

1 : 2000 (0 20 40 60 80)

MAY 2019 | 117153 | FIG-WM

M:\2017\117153\CAD\Design\Figures\Hydraulic\Node Network.dwg, WM, May 14, 2019 - 2:39pm, szorgel

Appendix D

STM Design Sheets, SWM Excerpts &
PCSWMM Modelling Info

Bridlewood 3, 866 Eagleson
Claridge Homes
Project No.: 117153

STORM SEWER DESIGN SHEET
BRIDLEWOOD 3
FLOW RATES BASED ON RATIONAL METHOD

NOVATECH
Engineers, Planners & Landscape Architects

LOCATION				AREA (ha)			FLOW							TOTAL FLOW	SEWER DATA								
Street	Catchment ID	From AREA	To AREA	Area (ha)	C	AC (ha)	Indiv 2.78 AC	Accum 2.78 AC	Time of Concentration	Rainfall Intensity 2 Year (mm/hr)	Rainfall Intensity 5 Year (mm/hr)	Rainfall Intensity 10 Year (mm/hr)	Peak Flow (L/s)	Total Peak Flow, Q (L/s)	Dia. (m) Actual	Dia. (mm)	Type	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Flow Time (min)	Ratio Q/Q full
Street 2	1A	A1A	A1B	0.22	0.65	0.14	0.398	0.398	10.00	76.81			31	31	0.381	375	PVC	0.29	138.2	98.4	0.86	2.67	31%
						0.00	0.000	0.000	10.00														
						0.00	0.000	0.000	10.00														
Street 2	1B	A1B	A3	0.24	0.65	0.16	0.434	0.831	12.67	67.88			56	56	0.457	450	Conc	0.25	46.4	148.6	0.91	0.85	38%
						0.00	0.000	0.000	12.67														
						0.00	0.000	0.000	12.67														
									13.52														
Street 2	2A	A2A	A2B	0.29	0.65	0.19	0.524	0.524	10.00	76.81			40	40	0.381	375	PVC	0.28	65.0	96.7	0.85	1.28	42%
						0.00	0.000	0.000	10.00														
						0.00	0.000	0.000	10.00														
Street 2	2B	A2B	A3	0.39	0.65	0.25	0.705	1.229	11.28	72.23			89	89	0.457	450	Conc	0.23	66.1	142.5	0.87	1.27	62%
						0.00	0.000	0.000	11.28														
						0.00	0.000	0.000	11.28														
									12.55														
Street 2	3	A3	A6	0.61	0.65	0.40	1.102	3.162	13.52	65.49			207	207	0.686	675	Conc	0.15	83.8	339.4	0.92	1.52	61%
						0.00	0.000	0.000	13.52														
						0.00	0.000	0.000	13.52														
									15.04														
Street 1	4	A4	A5A	0.33	0.65	0.21	0.596	0.596	10.00	76.81			46	46	0.305	300	PVC	0.38	126.3	62.1	0.85	2.47	74%
						0.00	0.000	0.000	10.00														
						0.00	0.000	0.000	10.00														
Street 1	5A	A5A	A5B	1.03	0.45	0.46	1.289	1.885	12.47	68.46			129	129	0.533	525	Conc	0.21	56.7	205.5	0.92	1.03	63%
						0.00	0.000	0.000	12.47														
						0.00	0.000	0.000	12.47														
Street 1	5B	A5B	A6	0.14	0.65	0.09	0.253	2.138	13.50	65.55			140	140	0.533	525	Conc	0.23	52.7	215.0	0.96	0.91	65%
						0.00	0.000	0.000	13.50														
						0.00	0.000	0.000	13.50														
									14.41														
Street 1	6	A6	A10	0.09	0.65	0.06	0.163	5.463	15.04	61.67			337	337	1.219	1200	Conc	0.15	40.0	1,574.6	1.35	0.49	21%
						0.00	0.000	0.000	15.04														
						0.00	0.000	0.000	15.04														
									15.54														
Street 5	7	A7	A10	0.49	0.65	0.32	0.885	0.885	10.00	76.81			68	68	0.457	450	Conc	0.23	130.4	142.5	0.87	2.50	48%
						0.00	0.000	0.000	10.00														
						0.00	0.000	0.000	10.00														
									12.50														

Bridlewood 3, 866 Eagleson
Claridge Homes
Project No.: 117153

STORM SEWER DESIGN SHEET
BRIDLEWOOD 3
FLOW RATES BASED ON RATIONAL METHOD

NOVATECH
Engineers, Planners & Landscape Architects

LOCATION				AREA (ha)			FLOW							TOTAL FLOW	SEWER DATA								
Street	Catchment ID	From AREA	To AREA	Area (ha)	C	AC (ha)	Indiv 2.78 AC	Accum 2.78 AC	Time of Concentration	Rainfall Intensity 2 Year (mm/hr)	Rainfall Intensity 5 Year (mm/hr)	Rainfall Intensity 10 Year (mm/hr)	Peak Flow (L/s)	Total Peak Flow, Q (L/s)	Dia. (m) Actual	Dia. (mm)	Type	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Flow Time (min)	Ratio Q/Q full
Street 1	**8A**	A8A	A8B	0.29	0.65	0.19	0.524	0.524	10.00	76.81			40	40	0.305	300	PVC	0.40	85.1	63.7	0.87	1.62	63%
						0.00	0.000	0.000	10.00														
						0.00	0.000	0.000	10.00														
Street 8	**8B**	A8B	A9	0.66	0.62	0.41	1.138	1.662	11.62	71.09			118	118	0.457	450	Conc	0.23	93.0	142.5	0.87	1.79	83%
						0.00	0.000	0.000	11.62														
						0.00	0.000	0.000	11.62														
Street 8	**9**	A9	A10	0.22	0.65	0.14	0.398	2.059	13.41	65.80			135	135	0.533	525	Conc	0.20	99.1	200.5	0.90	1.84	68%
						0.00	0.000	0.000	13.41														
						0.00	0.000	0.000	13.41														
									15.25														
Street 1	**10**	A10	A14	0.55	0.65	0.36	0.994	9.401	15.54	60.53			569	569	1.219	1200	Conc	0.13	82.0	1,465.9	1.26	1.09	39%
						0.00	0.000	0.000	15.54														
						0.00	0.000	0.000	15.54														
									16.63														
Street 5	**11A**	A11A	A11B	0.14	0.65	0.09	0.253	0.253	10.00	76.81			19	19	0.305	300	PVC	0.38	65.9	62.1	0.85	1.29	31%
						0.00	0.000	0.000	10.00														
						0.00	0.000	0.000	10.00														
Street 5	**11B**	A11B	A14	0.48	0.65	0.31	0.867	1.120	11.29	72.18			81	81	0.457	450	Conc	0.23	130.3	142.5	0.87	2.50	57%
						0.00	0.000	0.000	11.29														
						0.00	0.000	0.000	11.29														
									13.79														
Street 1	**12A**	A12A	A12B	0.30	0.65	0.20	0.542	0.542	10.00	76.81			42	42	0.305	300	PVC	0.38	85.8	62.1	0.85	1.68	67%
						0.00	0.000	0.000	10.00														
						0.00	0.000	0.000	10.00														
Street 1	**12B**	A12B	A13A	0.37	0.65	0.24	0.669	1.211	11.68	70.91			86	86	0.457	450	Conc	0.23	121.7	142.5	0.87	2.34	60%
						0.00	0.000	0.000	11.68														
						0.00	0.000	0.000	11.68														
Street 1	**13A**	A13A	A13B	0.32	0.65	0.21	0.578	1.789	14.02	64.19			115	115	0.533	525	Conc	0.20	34.3	200.5	0.90	0.64	57%
						0.00	0.000	0.000	14.02														
						0.00	0.000	0.000	14.02														
Street 1	**13B**	A13B	A14	0.84	0.65	0.55	1.518	3.307	14.65	62.60			207	207	0.610	600	Conc	0.16	95.3	256.1	0.88	1.81	81%
						0.00	0.000	0.000	14.65														
						0.00	0.000	0.000	14.65														
									16.46														
Street 1	**14**	A14	A21	0.28	0.65	0.18	0.506	14.334	16.63	58.18			834	834	1.219	1200	Conc	0.15	78.0	1,574.6	1.35	0.96	53%
						0.00	0.000	0.000	16.63														
						0.00	0.000	0.000	16.63														
									17.59														
Street 3	**15**	A15	A21	0.92	0.65	0.60	1.662	1.662	10.00	76.81			128	128	0.457	450	Conc	0.23	124.2	142.5	0.87	2.38	90%
						0.00	0.000	0.000	10.00														
						0.00	0.000	0.000	10.00														
									12.38														

STORM SEWER DESIGN SHEET
BRIDLEWOOD 3
FLOW RATES BASED ON RATIONAL METHOD

NOVATECH
Engineers, Planners & Landscape Architects

LOCATION				AREA (ha)			FLOW							TOTAL FLOW	SEWER DATA							
Street	Catchment ID	From AREA	To AREA	Area (ha)	C	AC (ha)	Indiv 2.78 AC	Accum 2.78 AC	Time of Concentration	Rainfall Intensity 2 Year (mm/hr)	Rainfall Intensity 5 Year (mm/hr)	Rainfall Intensity 10 Year (mm/hr)	Peak Flow (L/s)	Total Peak Flow, Q (L/s)	Dia. (m) Actual	Dia. (mm)	Type	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Flow Time (min)	Ratio Q/Q full
Overberg Way	U1	U1	A16	0.15	0.65	0.10	0.271	0.271	10.00	76.81			21	21	0.254	250	PVC	0.45	39.6	41.6	0.82	0.80	50%
						0.00	0.000	0.000	10.00														
						0.00	0.000	0.000	10.00														
Overberg Way	16	A16	A17	0.19	0.65	0.12	0.343	0.614	10.80	73.85			45	45	0.305	300	PVC	0.40	45.2	63.7	0.87	0.86	71%
						0.00	0.000	0.000	10.80														
						0.00	0.000	0.000	10.80														
Overberg Way	17	A17	A20	0.43	0.65	0.28	0.777	1.391	11.67	70.95			99	99	0.533	525	Conc	0.25	40.2	224.2	1.00	0.67	44%
						0.00	0.000	0.000	11.67														
						0.00	0.000	0.000	11.67														
									12.33														
PRIVATE BLOCK 14*	BLK 14	BLK 14	A18			0.00	0.000	0.000	13.69														
				0.63	0.83	0.52	1.454	1.454	13.69		88.04		128	128	0.533	525	Conc	0.19	11.4	195.4	0.87	0.22	65%
						0.00	0.000	0.000	13.69														
Overberg Way	18	A18	A20	0.10	0.65	0.07	0.181	0.181	13.91	64.47			12	139	0.610	600	Conc	0.15	43.9	247.9	0.85	0.86	56%
						0.00	0.000	1.454	13.91		87.26		127										
						0.00	0.000	0.000	13.91														
									14.77														
Street 7	19	A19	A20	0.22	0.65	0.14	0.398	0.398	10.00	76.81			31	31	0.254	250	PVC	0.45	79.0	41.6	0.82	1.60	73%
						0.00	0.000	0.000	10.00														
						0.00	0.000	0.000	10.00														
									11.60														
Street 6	20	A20	A21	1.86	0.41	0.76	2.120	4.090	14.77	62.32			255	377	0.914	900	Conc	0.10	156.9	596.9	0.91	2.88	63%
						0.00	0.000	1.454	14.77		84.31		123										
						0.00	0.000	0.000	14.77														
									17.65														
Street 1	21	A21	A23	0.12	0.65	0.08	0.217	20.303	17.65	56.16			1,140	1,250	1.219	1200	Conc	0.15	44.0	1,574.6	1.35	0.54	79%
						0.00	0.000	1.454	17.65		75.88		110										
						0.00	0.000	0.000	17.65														
									18.19														
Street 4	22	A22	A23	0.49	0.65	0.32	0.885	0.885	10.00	76.81			68	68	0.381	375	PVC	0.28	120.0	96.7	0.85	2.36	70%
						0.00	0.000	0.000	10.00														
						0.00	0.000	0.000	10.00														
									12.36														
Street 1	23	A23	A25	0.14	0.65	0.09	0.253	21.442	18.19	55.14			1,182	1,291	1.219	1200	Conc	0.15	40.0	1,574.6	1.35	0.49	82%
						0.00	0.000	1.454	18.19		74.49		108										
						0.00	0.000	0.000	18.19														
									18.68														
Street 1	24	A24	A25	0.32	0.65	0.21	0.578	0.578	10.00	76.81			44	44	0.305	300	PVC	0.38	41.1	62.1	0.85	0.80	71%
						0.00	0.000	0.000	10.00														
						0.00	0.000	0.000	10.00														
									10.80														

Bridlewood 3, 866 Eagleson
Claridge Homes
Project No.: 117153

STORM SEWER DESIGN SHEET
BRIDLEWOOD 3
FLOW RATES BASED ON RATIONAL METHOD

NOVATECH
Engineers, Planners & Landscape Architects

LOCATION				AREA (ha)			FLOW							TOTAL FLOW	SEWER DATA								
Street	Catchment ID	From AREA	To AREA	Area (ha)	C	AC (ha)	Indiv 2.78 AC	Accum 2.78 AC	Time of Concentration	Rainfall Intensity 2 Year (mm/hr)	Rainfall Intensity 5 Year (mm/hr)	Rainfall Intensity 10 Year (mm/hr)	Peak Flow (L/s)	Total Peak Flow, Q (L/s)	Dia. (m) Actual	Dia. (mm)	Type	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Flow Time (min)	Ratio Q/Q full
Street 3	**25**	A25	A27	0.26	0.65	0.17	0.470	22.490	18.68	54.25			1,220	1,327	1.219	1200	Conc	0.15	63.6	1,574.6	1.35	0.79	84%
						0.00	0.000	1.454	18.68		73.28		107										
						0.00	0.000	0.000	18.68														
									19.47														
Street 3	**26**	A26	A27	0.26	0.65	0.17	0.470	0.470	10.00	76.81			36	36	0.305	300	PVC	0.38	60.5	62.1	0.85	1.18	58%
						0.00	0.000	0.000	10.00														
						0.00	0.000	0.000	10.00														
									11.18														
Block 58	**A27**	A27	EX Stub	0.20	0.65	0.13	0.361	23.321	19.47	52.90			1,234	1,338	1.219	1200	Conc	0.25	36.3	2,032.8	1.74	0.35	66%
						0.00	0.000	1.454	19.47		71.44		104										
						0.00	0.000	0.000	19.47														
									19.82														

Q = 2.78 AIC, where
Q = Peak Flow in Litres per Second (L/s)
C = Runoff Coefficient
A = Area in hectares (ha)
I = Rainfall Intensity (mm/hr)

Consultant:	**Novatech**
Date:	January 11, 2019
Revised:	May 17, 2019
Design By:	Trevor McKay
Client:	**Dwg. Reference:** / **Checked By:**
Claridge Homes	FIG7-STM (Design Brief) / DDB

Legend:

*	Areas/Runoff Coefficients/Time of Concentration based on detailed storm design sheet and drawing (114013-STM)
10.00	Storm sewers designed to the 2 year event (without ponding) for local roads
10.00	Storm sewers designed to the 5 year event (without ponding) for collector roads
10.00	Storm sewers designed to the 10 year event (without ponding) for arterial roads

Bridlewood 3
Post-Development Model Parameters

NOVATECH
Engineers, Planners & Landscape Architects

Area ID	Catchment Area (ha)	Runoff Coefficient (C)	Percent Impervious (%)	No Depression (%)	Equivalent Width (m)	Average Slope (%)
B3-01	1.50	0.51	44%	30%	213.5	0.5%
B3-02	1.75	0.65	64%	40%	393.3	0.5%
B3-03	1.26	0.65	64%	40%	283.5	0.5%
B3-04	0.49	0.65	64%	40%	110.7	0.5%
B3-05	1.83	0.65	64%	40%	411.5	0.5%
B3-06	1.17	0.65	64%	40%	240.0	0.5%
B3-07	1.09	0.65	64%	40%	245.3	0.5%
B3-08	1.86	0.41	30%	40%	280.0	0.5%
B3-09	1.20	0.65	64%	40%	270.5	0.5%
B3-10	0.63	0.65	64%	40%	141.8	0.5%
B3-11	0.46	0.65	64%	40%	104.0	0.5%
B3-12	0.72	0.65	64%	40%	162.0	0.5%
TOTAL:	**13.95**					

Bridlewood 3
Overall Model Schematic

NOVATECH
Engineers, Planners & Landscape Architects

Legend

Junctions
- Visible
- Manholes
- Catchbasins
- High Points
- Rear Yard Catchbasins
- Rear Yard High Points
- Outfalls
- Storages

Conduits
- Visible
- Roadways
- Rear-Yard Swales
- Storm Network (Ph2, B14)
- Storm Network (Bridlewood 3)
- Orifices

Subcatchments
- Visible
- Phase 1
- Phase 2
- Block 14
- Bridlewood 3

- Roads

N

100 m

5/16/2019
PREPARED BY: NOVATECH

M:\2017\117153\DATA\Calculations\Sewer Calcs\SWM\117153-ModelParams_R1.xlsx

Bridlewood 3
HGL Elevations

NOVATECH
Engineers, Planners & Landscape Architects

Manhole ID	MH Invert Elevation (m)	T/G Elevation (m)	HGL Elevation 100yr4hr (m)	HGL Elevation 100yr4hr+20% (m)	Highest Pipe Obvert @ MH (m)	WL Above Obvert (100yr) (m)	WL Above Obvert (100yr+20%) (m)	WL Below T/G (100yr) (m)	WL Below T/G (100yr+20%) (m)
MH100	94.83	96.93	95.09	95.10	95.13	-0.04	-0.03	1.84	1.83
MH102	94.00	96.93	95.09	95.10	95.04	0.05	0.06	1.84	1.83
MH104	94.12	97.06	95.37	95.38	95.10	0.27	0.28	1.69	1.68
MH106	94.19	97.12	95.49	95.51	95.17	0.32	0.34	1.63	1.61
MH108	94.31	97.23	95.57	95.59	95.39	0.18	0.20	1.66	1.64
MH110	94.52	97.41	95.60	95.62	95.51	0.09	0.11	1.81	1.79
MH112	94.60	97.48	95.61	95.63	95.58	0.03	0.05	1.87	1.85
MH114	95.17	97.51	95.61	95.63	95.70	-0.09	-0.07	1.90	1.88
MH116	95.29	97.89	95.61	95.63	95.82	-0.21	-0.19	2.28	2.26
MH118	95.58	97.90	95.61	95.63	95.91	-0.30	-0.28	2.29	2.27
MH122	95.73	97.74	95.73	95.73	96.03	-0.30	-0.30	2.01	2.01
MH124	95.97	98.16	95.97	95.97	96.35	-0.38	-0.38	2.19	2.19
MH126	95.77	98.05	95.77	95.77	96.07	-0.30	-0.30	2.28	2.28
MH128	95.47	97.93	95.60	95.62	96.19	-0.59	-0.57	2.33	2.31
MH130	95.71	97.71	95.71	95.71	96.01	-0.30	-0.30	2.00	2.00
MH132	95.40	97.52	95.57	95.59	95.85	-0.28	-0.26	1.95	1.93
MH134	95.33	97.54	95.57	95.59	95.81	-0.24	-0.22	1.97	1.95
MH136	95.01	97.37	95.57	95.59	95.69	-0.12	-0.10	1.80	1.78
MH138	94.96	97.27	95.57	95.59	95.52	0.05	0.07	1.70	1.68
MH140	94.84	97.08	95.57	95.59	95.44	0.13	0.15	1.51	1.49
MH200	95.41	97.70	95.61	95.63	95.88	-0.27	-0.25	2.09	2.07
MH202	95.68	97.94	95.68	95.68	96.06	-0.38	-0.38	2.26	2.26
MH204	95.90	98.24	95.90	95.90	96.27	-0.37	-0.37	2.34	2.34
MH206	95.81	97.87	95.81	95.81	96.22	-0.41	-0.41	2.06	2.06
MH208	95.40	97.57	95.61	95.63	95.85	-0.24	-0.22	1.96	1.94
MH210	95.34	97.58	95.61	95.63	95.82	-0.21	-0.19	1.97	1.95
MH212	95.03	97.58	95.61	95.63	95.70	-0.09	-0.07	1.97	1.95
MH300	93.84	97.30	94.71	94.72	94.88	-0.17	-0.16	2.59	2.58
MH302	94.71	97.52	94.71	94.72	95.04	-0.33	-0.32	2.81	2.80
MH304	94.78	97.45	94.78	94.78	95.08	-0.30	-0.30	2.67	2.67
MH306	95.03	97.40	95.49	95.52	95.48	0.01	0.04	1.91	1.88
MH308	94.98	97.44	95.49	95.52	95.46	0.03	0.06	1.95	1.92
MH400	95.06	97.70	95.37	95.38	95.44	-0.07	-0.06	2.33	2.32
MH500	95.11	97.37	95.57	95.59	95.59	-0.02	0.00	1.80	1.78
MH502	95.17	97.44	95.57	95.59	95.62	-0.05	-0.03	1.87	1.85
MH504	95.39	97.68	95.60	95.62	95.87	-0.27	-0.25	2.08	2.06
MH506	95.33	97.63	95.60	95.62	95.81	-0.21	-0.19	2.03	2.01
MH600	95.56	97.36	95.56	95.56	95.81	-0.25	-0.25	1.80	1.80
MH602	95.33	97.70	95.54	95.56	95.63	-0.09	-0.07	2.16	2.14
MH604	94.92	97.50	95.54	95.56	95.45	0.09	0.11	1.96	1.94
MH606	94.44	97.61	95.54	95.56	95.34	0.20	0.22	2.07	2.05
MH608	94.40	97.28	95.53	95.55	95.30	0.23	0.25	1.75	1.73
MH700	94.56	97.45	95.56	95.59	95.16	0.40	0.43	1.89	1.86

Bridlewood 3
HGL Elevations

NOVATECH
Engineers, Planners & Landscape Architects

Manhole ID	MH Invert Elevation (m)	T/G Elevation (m)	HGL Elevation 100yr4hr (m)	HGL Elevation 100yr4hr+20% (m)	Highest Pipe Obvert @ MH (m)	WL Above Obvert (100yr) (m)	WL Above Obvert (100yr+20%) (m)	WL Below T/G (100yr) (m)	WL Below T/G (100yr+20%) (m)
MH800	95.42	97.66	95.60	95.62	95.87	-0.27	-0.25	2.06	2.04
MH802	95.33	97.67	95.60	95.62	95.78	-0.18	-0.16	2.07	2.05
MH804	95.17	97.49	95.60	95.62	95.70	-0.10	-0.08	1.89	1.87
MH806	95.13	97.54	95.60	95.62	95.66	-0.06	-0.04	1.94	1.92
MH818	95.91	98.06	95.91	95.91	96.21	-0.30	-0.30	2.15	2.15

STORM SEWER DESIGN SHEET

5yr Design Event

PROJECT #: 103031-1
DESIGNED BY : -
CHECKED BY : -

PROJECT: **BRIDLEWOOD TRAILS**
DEVELOPER: **CLARIDGE HOMES**

DATE: 26-Sep-05
REV.: 16-May-19

*****DESIGN SHEET UPDATED WITH NEW FLOWS FROM B3*****

LOCATION			AREA (ha)	AREA (ha)		INDIV	ACCUM	TIME OF	RAINFALL	PEAK FLOW	PROPOSED SEWER								
STREET	FROM M.H.	TO M.H.	R= 0.50	R= 0.60	R= 0.65	2.78 AR	2.78 AR	CONC (min)	INTENSITY (mm/hr)	Q (l/s)	TYPE OF PIPE	PIPE SIZE (mm)	PIPE ID (mm)	GRADE %	LENGTH (m)	CAPACITY (L/s)	FULL FLOW VELOCITY	TIME OF FLOW (min)	
Romina St.	114	112		0.320		0.53	0.53	10.00	104	**55.6**	DR 35	375	366	0.34	27.7	96.1	0.91	0.51	57.86%
Romina St.	112	110					0.53	10.51	102	**54.2**	DR 35	375	366	0.34	34.8	96.1	0.91	0.64	56.42%
Street C	Future Development	CAP		0.810			1.35	16.74	78	**105.8**	CONC	525	533	0.20	37.7	200.2	0.90	0.70	52.85%
Street C	Cap	110		0.140		0.23	1.58	17.53	76	**120.7**	CONC	525	533	0.20	51.0	200.2	0.90	0.95	60.29%
								18.47											
Arrita Terr.	110	602		0.390		0.65	2.77	18.47	74	**204.3**	CONC	600	610	0.20	71.3	287.0	0.98	1.21	71.19%
Arrita Terr.	602	604					2.77	19.68	71	**196.5**	CONC	600	610	0.20	8.1	287.0	0.98	0.14	68.46%
Arrita Terr.	604	402		0.880		1.47	4.24	19.82	71	**299.3**	CONC	675	685	0.20	101.1	391.0	1.06	1.59	76.55%
Lokoya St.	400	402		0.290		0.48	0.48	10.00	104	**50.4**	DR 35	375	366	0.25	65.0	82.4	0.78	1.39	61.15%
Lokoya St.	402	404		0.280		0.47	5.19	19.82	71	**366.5**	CONC	825	838	0.15	74.0	580.0	1.05	1.17	63.19%
								21.00											
Amici Terr.	404	502		0.350		0.58	5.77	21.00	68	**393.2**	CONC	825	838	0.15	81.6	580.0	1.05	1.29	67.80%
Amici Terr.	502	504					5.77	22.29	66	**378.6**	CONC	825	838	0.15	9.4	580.0	1.05	0.15	65.27%
Amici Terr.	504	218		0.990		1.65	7.42	22.44	65	**484.8**	CONC	825	838	0.15	89.8	580.0	1.05	1.42	83.59%
								23.86											
Brigitta St.	216	218		0.520		0.87	0.87	15.00	84	**72.5**	DR 35	375	366	0.20	101.1	73.7	0.70	2.41	98.31%
								17.41											
Commercial	Future Development	122					25.09	16.82	78	**1959.2**	CONC	1200	1219	0.25	13.7	2032.8	1.74	0.13	96.38%
								16.95							81.0				
Romina St.	118	120		0.250		0.42	0.42	10.00	104	**43.4**	DR 35	300	299	0.35	75.0	56.9	0.81	1.55	76.38%
Romina St.	120	122		0.300		0.50	0.92	11.55	97	**88.7**	DR 35	375	366	0.35	74.8	97.5	0.92	1.35	90.95%
								12.90											
Romina St.	124	122		0.209		0.35	0.35	10.00	104	**36.3**	DR 35	300	299	0.43	53.5	63.1	0.90	1.00	57.61%
								11.00											
Brigitta St.-(EP)	122	220					26.35	16.95	78	**2048.5**	CONC	1200	1219	0.25	53.4	2032.8	1.74	0.51	100.77%
								17.46											
Residential	Future Development	220		0.090		0.15	1.78	13.44	89	**158.8**	CONC	600	610	0.20	10.5	287.0	0.98	0.18	55.32%
								13.62											
Residential	Future Development	220		0.240		0.40	0.40	10.00	104	**41.7**	DR 35	450	448	0.20	7.5	125.9	0.80	0.16	33.13%
								10.16											
Brigitta St.-(EP)	220	218		0.150		0.25	28.79	17.46	76	**2198.2**	CONC	1350	1372	0.30	94.9	3052.2	2.06	0.77	72.02%
								18.23											
Outlet-(EP)	218	**Vortechs B**					37.08	18.23	74	**2758.3**	CONC	1500	1524	0.20	20.0	3298.0	1.81	0.18	83.64%

VORTECHS SYSTEM® ESTIMATED FLOW CALCULATIONS

Bridlewood Trails - Area 4B

Ottawa, ON

1827CIP

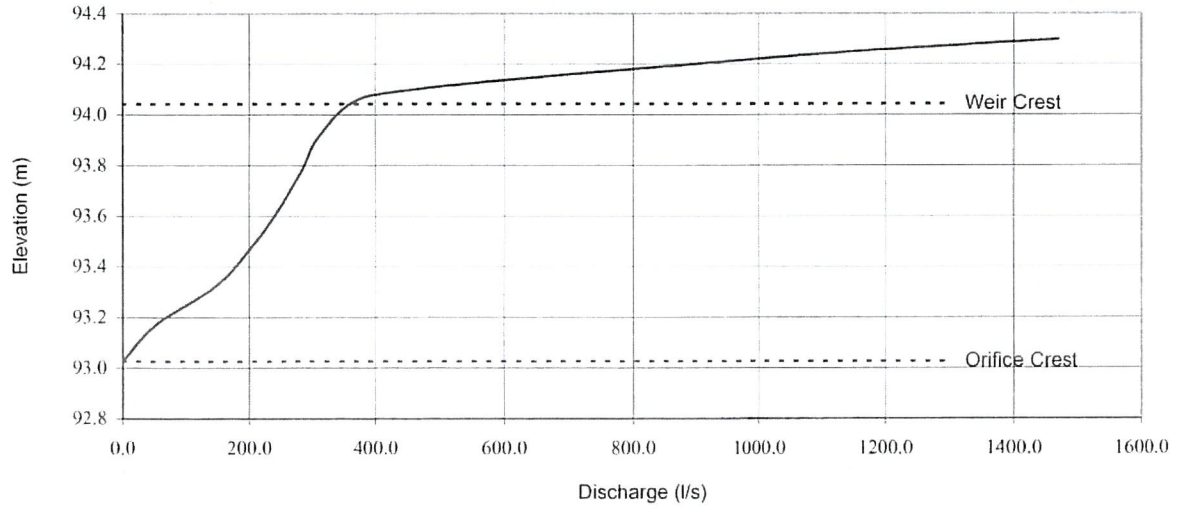
System 4B

Orifice	Weir
Cd = 308	Cd = 1861
A (m^2) = 0.145	Weir Crest Length (m) = 4.596
Crest Elevation (m) = 93.03	Crest Elevation (m) = 94.04

Head (m)	Elevation (m)	Orifice Flow (l/s)	Weir Flow (l/s)	Total Flow (l/s)
0.00	93.03	0.00	0.00	0.00
0.15	93.18	55.00	0.00	55.00
0.30	93.33	149.56	0.00	149.56
0.45	93.48	204.22	0.00	204.22
0.60	93.63	247.08	0.00	247.08
0.75	93.78	283.53	0.00	283.53
0.90	93.93	315.80	0.00	315.80
1.05	94.08	345.06	49.78	394.84
1.20	94.23	372.03	659.29	1031.33
1.27	94.30	384.32	1085.78	1470.09

Calculated by: JAK 9/22/2006 | Checked by:

Vortechs™ System
Stage Discharge Curve



VORTECHS SYSTEM® ESTIMATED NET ANNUAL TSS REMOVAL EFFICIENCY

Bridlewood Trails - Area 4B
Ottawa, ON
1827CIP
System 4B
Peak Treatment Capacity = 1600 l/s

CONTECH STORMWATER SOLUTIONS

Design Ratio[1] = $\frac{(25 \text{ hectares}) \times (0.65) \times (2.775)}{(23.7 \text{ m2})}$ = 1.9

Rainfall Intensity mm/hr	Operating Rate[2] % of capacity	Flow Treated (l/s)	% Total Rainfall Volume[3]	Rmvl. Effcy[4] (%)	Rel. Effcy (%)
0.5	1.4	22.7	10.7%	98.0%	10.5%
1.0	2.8	45.3	9.3%	98.0%	9.1%
1.5	4.2	68.0	10.3%	98.0%	10.1%
2.0	5.7	90.6	8.6%	98.0%	8.4%
2.5	7.1	113.3	6.7%	97.6%	6.6%
3.0	8.5	135.9	5.8%	96.9%	5.6%
3.6	9.9	158.6	5.0%	96.3%	4.8%
4.1	11.3	181.3	4.4%	95.3%	4.2%
4.6	12.7	203.9	2.3%	94.7%	2.2%
5.1	14.2	226.6	4.2%	92.8%	3.9%
6.4	17.7	283.2	7.4%	89.9%	6.6%
7.6	21.2	339.9	4.0%	86.8%	3.5%
8.9	24.8	396.5	3.5%	85.3%	3.0%
10.2	28.3	453.1	1.8%	83.1%	1.5%
11.4	31.9	509.8	3.8%	81.7%	3.1%
12.7	35.4	566.4	1.4%	79.4%	1.1%
19.1	53.1	849.6	5.2%	62.1%	3.2%
25.4	70.8	1132.9	2.4%	48.9%	1.2%
38.1	106.2	1699.3	2.3%	0.0%	0.0%
					88.6%
				% rain falling at >38.1 mm/hr =	0.8%
				Assumed Removal Efficiency of remaining % =	0.0%
				Removal Efficiency Adjustment[5] =	6.5%
				Net Annual TSS Removal Efficiency =	**82%**

1 - Design Ratio = (Total Drainage Area) x (Runoff Coefficient) x (Rational Method Conversion) / Grit Chamber Area
- The Total Drainage Area and Runoff Coefficient are specified by the site engineer.
- The rational method conversion based on the units in the above equation is 2.775.

2 - Operating Rate (% of capacity) = percentage of peak operating rate of 68 l/s/m^2.

3 - Based on 10 years of rainfall data from Canadian Station 6105976, Ottawa CDA, ON

4 - Based on Vortechnics laboratory verified removal of typical particle gradation (see Technical Bulletin #1).

5- Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Calculated by: JAK 9/22/2006	Checked by:

Bridlewood 3
Design Storm Time Series Data
4-hour Chicago Design Storms

NOVATECH
Engineers, Planners & Landscape Architects

C25mm-4.stm		C2-4.stm		C5-4.stm	
Duration	Intensity	Duration	Intensity	Duration	Intensity
min	mm/hr	min	mm/hr	min	mm/hr
0:00	0	0:00	0	0:00	0
0:10	1.34	0:10	1.98	0:10	2.49
0:20	1.49	0:20	2.23	0:20	2.77
0:30	1.69	0:30	2.58	0:30	3.14
0:40	1.96	0:40	3.06	0:40	3.62
0:50	2.33	0:50	3.81	0:50	4.31
1:00	2.91	1:00	5.1	1:00	5.37
1:10	3.91	1:10	7.91	1:10	7.19
1:20	6.1	1:20	19.04	1:20	11.14
1:30	14.53	1:30	76.81	1:30	26.25
1:40	58.72	1:40	23.64	1:40	104.19
1:50	17.11	1:50	11.91	1:50	30.86
2:00	8.32	2:00	7.98	2:00	15.15
2:10	5.5	2:10	6.03	2:10	10.07
2:20	4.13	2:20	4.87	2:20	7.58
2:30	3.32	2:30	4.1	2:30	6.11
2:40	2.79	2:40	3.55	2:40	5.14
2:50	2.41	2:50	3.14	2:50	4.45
3:00	2.12	3:00	2.82	3:00	3.93
3:10	1.9	3:10	2.57	3:10	3.53
3:20	1.73	3:20	2.35	3:20	3.21
3:30	1.58	3:30	2.18	3:30	2.94
3:40	1.46	3:40	2.03	3:40	2.72
3:50	1.36	3:50	1.9	3:50	2.53
4:00	1.27	4:00	1.79	4:00	2.37

Bridlewood 3
Design Storm Time Series Data
4-hour Chicago Design Storms

NOVATECH
Engineers, Planners & Landscape Architects

C100-4.stm		C100-4+20%.stm	
Duration	Intensity	Duration	Intensity
min	mm/hr	min	mm/hr
0:00	0	0:00	0
0:10	4.07	0:10	4.88
0:20	4.54	0:20	5.45
0:30	5.14	0:40	7.14
0:40	5.95	0:50	8.51
0:50	7.09	1:00	10.62
1:00	8.85	1:10	14.28
1:10	11.9	1:20	22.25
1:20	18.54	1:30	53.03
1:30	44.19	1:40	214.27
1:40	178.56	1:50	62.45
1:50	52.04	2:00	30.37
2:00	25.31	2:10	20.08
2:10	16.73	2:20	15.07
2:20	12.56	2:30	12.11
2:30	10.09	2:40	10.16
2:40	8.47	2:50	8.78
2:50	7.32	3:00	7.75
3:00	6.46	3:10	6.95
3:10	5.79	3:20	6.3
3:20	5.25	3:30	5.78
3:30	4.82	3:40	5.34
3:40	4.45	3:50	4.97
3:50	4.14	4:00	4.66
4:00	3.88		

Bridlewood 3
Design Storm Time Series Data
SCS Design Storms

NOVATECH
Engineers, Planners & Landscape Architects

S2-12.stm		S5-12.stm		S100-12.stm	
Duration	Intensity	Duration	Intensity	Duration	Intensity
min	mm/hr	min	mm/hr	min	mm/hr
0:00	0.00	0:00	0	0:00	0
0:30	1.27	0:30	1.69	0:30	2.82
1:00	0.59	1:00	0.79	1:00	1.31
1:30	1.10	1:30	1.46	1:30	2.44
2:00	1.10	2:00	1.46	2:00	2.44
2:30	1.44	2:30	1.91	2:30	3.19
3:00	1.27	3:00	1.69	3:00	2.82
3:30	1.69	3:30	2.25	3:30	3.76
4:00	1.69	4:00	2.25	4:00	3.76
4:30	2.29	4:30	3.03	4:30	5.07
5:00	2.88	5:00	3.82	5:00	6.39
5:30	4.57	5:30	6.07	5:30	10.14
6:00	36.24	6:00	48.08	6:00	80.38
6:30	9.23	6:30	12.25	6:30	20.47
7:00	4.06	7:00	5.39	7:00	9.01
7:30	2.71	7:30	3.59	7:30	6.01
8:00	2.37	8:00	3.15	8:00	5.26
8:30	1.86	8:30	2.47	8:30	4.13
9:00	1.95	9:00	2.58	9:00	4.32
9:30	1.27	9:30	1.69	9:30	2.82
10:00	1.02	10:00	1.35	10:00	2.25
10:30	1.44	10:30	1.91	10:30	3.19
11:00	0.93	11:00	1.24	11:00	2.07
11:30	0.85	11:30	1.12	11:30	1.88
12:00	0.85	12:00	1.12	12:00	1.88

Bridlewood 3
Design Storm Time Series Data
SCS Design Storms

NOVATECH
Engineers, Planners & Landscape Architects

S2-24.stm		S5-24.stm		S100-24.stm	
Duration	Intensity	Duration	Intensity	Duration	Intensity
min	mm/hr	min	mm/hr	min	mm/hr
0:00	0	0:00	0	0:00	0
1:00	0.72	1:00	0.44	1:00	0.6
2:00	0.34	2:00	0.44	2:00	0.75
3:00	0.63	3:00	0.81	3:00	1.39
4:00	0.63	4:00	0.81	4:00	1.39
5:00	0.81	5:00	1.06	5:00	1.81
6:00	0.72	6:00	0.94	6:00	1.6
7:00	0.96	7:00	1.25	7:00	2.13
8:00	0.96	8:00	1.25	8:00	2.13
9:00	1.3	9:00	1.68	9:00	2.88
10:00	1.63	10:00	2.12	10:00	3.63
11:00	2.59	11:00	3.37	11:00	5.76
12:00	20.55	12:00	26.71	12:00	45.69
13:00	5.23	13:00	6.8	13:00	11.64
14:00	2.3	14:00	2.99	14:00	5.12
15:00	1.54	15:00	2	15:00	3.42
16:00	1.34	16:00	1.75	16:00	2.99
17:00	1.06	17:00	1.37	17:00	2.35
18:00	1.11	18:00	1.44	18:00	2.46
19:00	0.72	19:00	0.94	19:00	1.6
20:00	0.58	20:00	0.75	20:00	1.28
21:00	0.81	21:00	1.06	21:00	1.81
22:00	0.53	22:00	0.68	22:00	1.17
23:00	0.48	23:00	0.63	23:00	1.07
0:00	0.48	0:00	0.63	0:00	1.07

Appendix E

Erosion and Sediment Control, F-1005

EROSION AND SEDIMENT CONTROL

General

The Contractor acknowledges that surface erosion and sediment runoff resulting from his construction operations has potential to cause a detrimental impact to any downstream watercourse or sewer, and that all construction operations that may impact upon water quality shall be carried out in a manner that strictly meets the requirements of all applicable legislation and regulations.

As such, the Contractor shall be responsible for carrying out his operations, and supplying and installing any appropriate control measures, so as to prevent sediment laden runoff from entering any sewer or watercourse within or downstream of the Working Area.

The Contractor acknowledges that no one measure is likely to be 100% effective for erosion protection and controlling sediment runoff and discharges from the site. Therefore, where necessary the Contractor shall implement sequential measures arranged in such a manner as to mitigate sediment release from the construction operations and achieve specific maximum permitted criteria where applicable. Suggested on-site measures may include, but shall not be limited to, the following methods: sediment ponds, filter bags, pump filters, settling tanks, silt fences, straw bales, filter cloths, catch basin filters, check dams and/or berms, or other recognized technologies and methods available at the time of construction. Specific measures shall be installed in accordance with the requirements of OPSS 805 where appropriate, or in accordance with manufacturer's recommendations.

Where, in the opinion of the Contract Administrator or Regulatory Agency, the installed control measures fail to perform adequately, the Contractor shall supply and install additional or alternative measures as directed by the Contract Administrator or Regulatory Agency. As such, the Contractor shall have additional control materials on site at all times which are easily accessible and may be implemented by him at a moment's notice.

Before commencing the Work, the Contractor shall submit to the Contract Administrator six copies of a detailed Erosion and Sediment Control Plan (ESCP). The ESCP will consist of a written description and detailed drawings indicating the on-site activities and measures to be used to control erosion and sediment movement for each step of the Work.

Contractor's Responsibilities

The Contractor shall ensure that all workers, including sub-contractors, in the Working Area are aware of the importance of the erosion and sediment control measures and informed of the consequences of the failure to comply with the requirements of all Regulatory Agencies and the specifications detailed herein.

The Contractor shall periodically, and when requested by the Contract Administrator, clean out accumulated sediment deposits as required at the sediment control devices, including those deposits that may originate from outside the construction area. Accumulated sediment shall be removed in such a manner that prevents the deposition of this material into any sewer or watercourse and avoids damage to the control measure. The sediment shall be removed from the site at the Contractor's expense and managed in compliance with the requirements for excess earth material, as specified elsewhere in the Contract.

The Contractor shall immediately report to the Contract Administrator any accidental discharges of sediment material into either the watercourse or the storm sewer system. Failure to report will be constitute a breach of this specification and the Contractor may also be subject to the penalties imposed

EROSION AND SEDIMENT CONTROL

by any applicable Regulatory Agency. Appropriate response measures, including any repairs to existing control measures or the implementation of additional control measures, shall be carried out by the Contractor without delay.

The sediment control measures shall only be removed when, in the opinion of the Contract Administrator, the measure or measures, is no longer required. No control measure may be permanently removed without prior authorization from the Contract Administrator. All sediment and erosion control measures shall be removed in a manner that avoids the entry of any equipment, other than hand-held equipment, into any watercourse, and prevents the release of any sediment or debris into any sewer or watercourse within or downstream of the Working Area. All accumulated sediment shall be removed from the Working Area at the Contractor's expense and managed in compliance with the requirements for excess earth material, as specified elsewhere in the Contract.

Where, in the opinion of either the Contract Administrator or a Regulatory Agency, any of the terms specified herein have not been complied with or performed in a suitable manner, or at all, the Contract Administrator or Regulatory Agency has the right to immediately withdraw its permission to continue the work but may renew its permission upon being satisfied that the defaults or deficiencies in the performance of this specification by the Contractor have been remedied. No compensation will be owed or paid to the Contractor for the withdrawal of permission to do the work resulting from non-compliance with the requirements of this specification or the Regulatory Agencies.

In addition to any other remedy and/or penalty provided by law, where there has been default or non-compliance with any of the terms specified herein and the Contractor refuses to perform or rectify same within forty-eight (48) hours of the receipt of the written demand of the Contract Administrator to do so, the Owner is hereby entitled to enter upon the Working Area and either complete the work in conformity with the Contract or have the work done that it considers necessary to complete the Work to its intended condition, whichever, in the Owner's sole opinion, is the most reasonable course of action. The Contractor and the Owner further agree that the costs incurred for any such work shall be retained by the Owner from monies otherwise due to the Contractor, should any such monies be available.

Basis of Payment

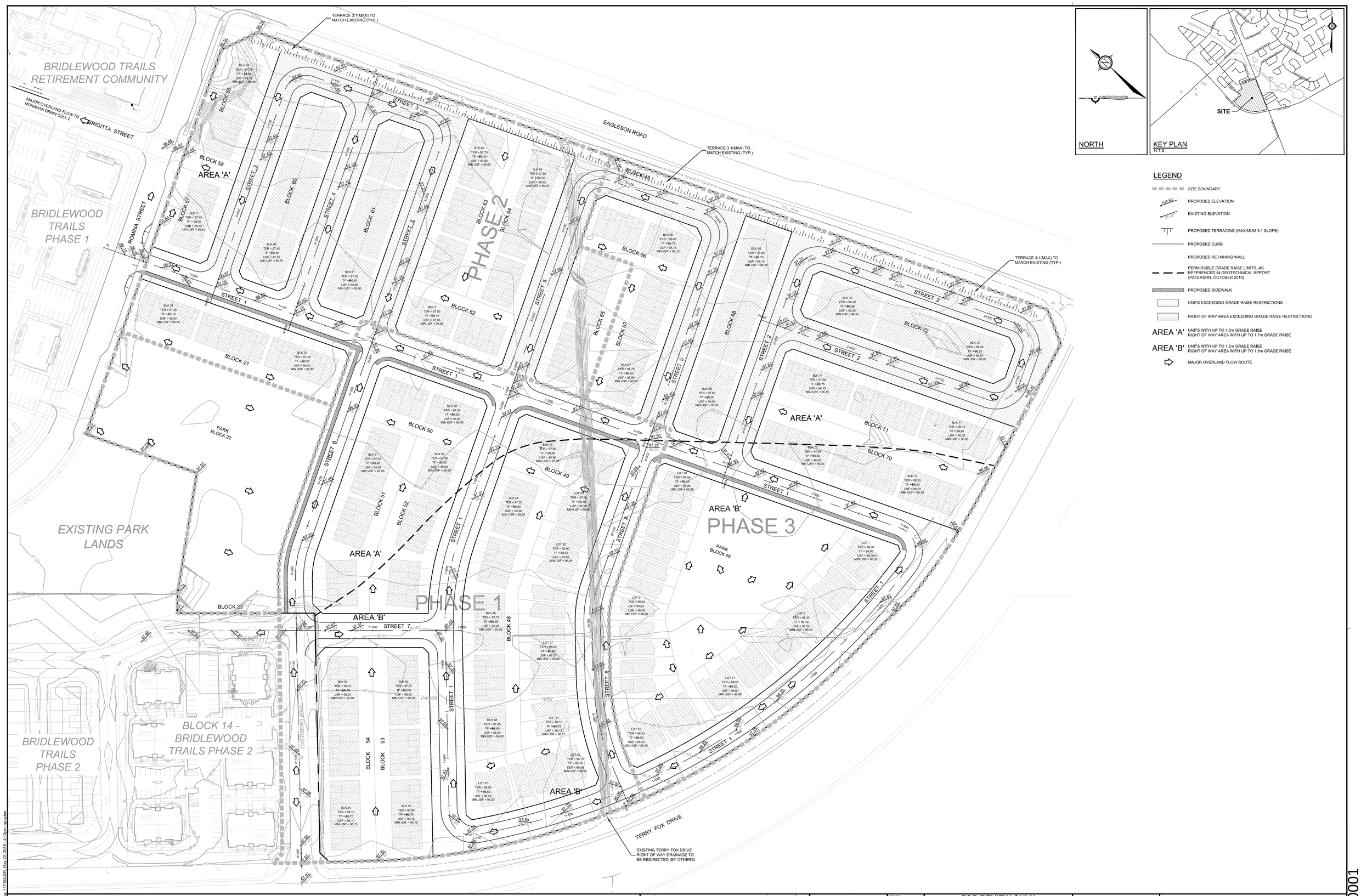
Payment at the contract Lump Sum price for the item "Erosion and Sediment Control" shall be full compensation for the plan preparation and implementation of the erosion and sediment control requirements for the site, and shall include all labour, equipment and materials to supply, construct, monitor and maintain all erosion and sediment control measures.

Payment shall be based upon the following schedule:

a) 25% upon satisfactory submission of the ESC Plan and installation of the control measures;
b) 50% pro-rated into equal payments over the term of the contract; and,
c) 25% upon successful completion and removal of the ESC Plan protection measures.

This payment schedule may only be modified as agreed upon in writing between the Contractor and the Contract Administrator.

Warrant: For work which is not in close proximity to watercourses or environmentally sensitive areas



NORTH

KEY PLAN
N.T.S.

LEGEND

- SITE BOUNDARY
- 104.62 PROPOSED ELEVATION
- 99.00 EXISTING ELEVATION
- PROPOSED TERRACING (MAXIMUM 3:1 SLOPE)
- PROPOSED CURB
- PROPOSED RETAINING WALL
- PERMISSIBLE GRADE RAISE LIMITS, AS REFERENCED IN GEOTECHNICAL REPORT (PATERSON, OCTOBER 2018)
- PROPOSED SIDEWALK
- UNITS EXCEEDING GRADE RAISE RESTRICTIONS
- RIGHT OF WAY AREA EXCEEDING GRADE RAISE RESTRICTIONS
- AREA 'A' UNITS WITH UP TO 1.0m GRADE RAISE; RIGHT OF WAY AREA WITH UP TO 1.7m GRADE RAISE
- AREA 'B' UNITS WITH UP TO 1.2m GRADE RAISE; RIGHT OF WAY AREA WITH UP TO 1.9m GRADE RAISE
- MAJOR OVERLAND FLOW ROUTE

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

PRELIMINARY
NOT FOR
CONSTRUCTION

No.	REVISION	DATE	BY
3.	REVISED AS PER CITY OF OTTAWA COMMENTS	MAY 24/19	MSP
2.	ISSUED FOR GEOTECHNICAL REVIEW	MAY 6/19	MSP
1.	ISSUED FOR DRAFT PLAN SUBMISSION	JAN11/19	MSP

SCALE 1:750 (1:750, 0 10 20 30)

DESIGN TJM
CHECKED DDB
DRAWN RBG
CHECKED TJM
APPROVED MSP

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER — D.D. BLAIR 100122737 — May 24, 2019 — PROVINCE OF ONTARIO

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LOCATION
CITY OF OTTAWA
BRIDLEWOOD 3

DRAWING NAME
PRELIMINARY GRADING PLAN

PROJECT No. 117153-00
REV REV # 3
DRAWING No. 117153-GR

D07-16-19-0001

#17847