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Brown Lands

Serviceability and Conceptual Stormwater Management Report

Prepared for: Strathburn Almonte Regional Inc.

Engineering excellence. Planning progress. Liveable landscapes.

SERVICEABILITY AND CONCEPTUAL STORMWATER MANAGEMENT REPORT

BROWN LANDS

Municipality of Mississippi Mills, Ontario

Prepared For:

Strathburn Almonte Regional Inc.

Prepared By:

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

February 2023
Revised February 2024

Novatech File: 118178
Ref: R-2023-016

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February 13, 2024

Koren Lam, MSc., Senior Planner
County of Lanark
Planning Department
99 Christie Lake Road
Perth, Ontario
K7H 3C6

Melanie Knight, MCIP RPP, Acting Director
Municipality of Mississippi Mills
Development Services and Engineering
3131 Old Perth Road, Box 400
Almonte, Ontario
K0A 1A0

Reference: Brown Lands
Serviceability and Conceptual Stormwater Management Report
Our File No.: 118178

Please find enclosed the revised report entitled "Serviceability and Conceptual Stormwater Management Report" dated February 13, 2024, prepared for the proposed Brown Lands residential development.

The report outlines the preliminary servicing design for the proposed development with respect to water distribution, sanitary servicing, and stormwater drainage as well as a preliminary approach to stormwater management.

This report is submitted in support of an application for a Draft Plan of Subdivision and has been revised to reflect comments received in response to the previous submission.

If you require any additional information, please contact the undersigned.

Yours truly,

NOVATECH

Trevor McKay, P.Eng.
Project Manager

cc: Evan Garfinkel, Regional Group

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

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1.0 INTRODUCTION

1.1 Purpose

Novatech has been retained to prepare a serviceability and conceptual stormwater management report in support of an application for Draft Plan of Subdivision for lands located within the urban boundary of the ward of Almonte. The project is being advanced by Strathburn Almonte Regional Inc. (c/o Regional Group).

This report outlines the conceptual servicing design for the Brown Lands residential development (Subject Site) with respect to water distribution, sanitary servicing, storm drainage, and approach to stormwater management.

1.2 Site Location and Description

The Subject Site is a parcel approximately 17ha in size and is situated at the northwestern quadrant of Almonte, within the urban boundary, and fronts the north side of Strathburn Street and east side of County Road 29. Refer to **Figure 1** - Key Plan for the site location.

The Subject Site is an irregularly shaped parcel that is bound by County Road 29 to the west, Strathburn Street to the southwest, residential properties to the southeast, undeveloped lands owned by the Municipality of Mississippi Mills to the east, and agricultural use (cultivation and pasture) lands to the north which are owned by the proponent, Strathburn Almonte Regional Inc.

1.3 Existing Conditions and Topography

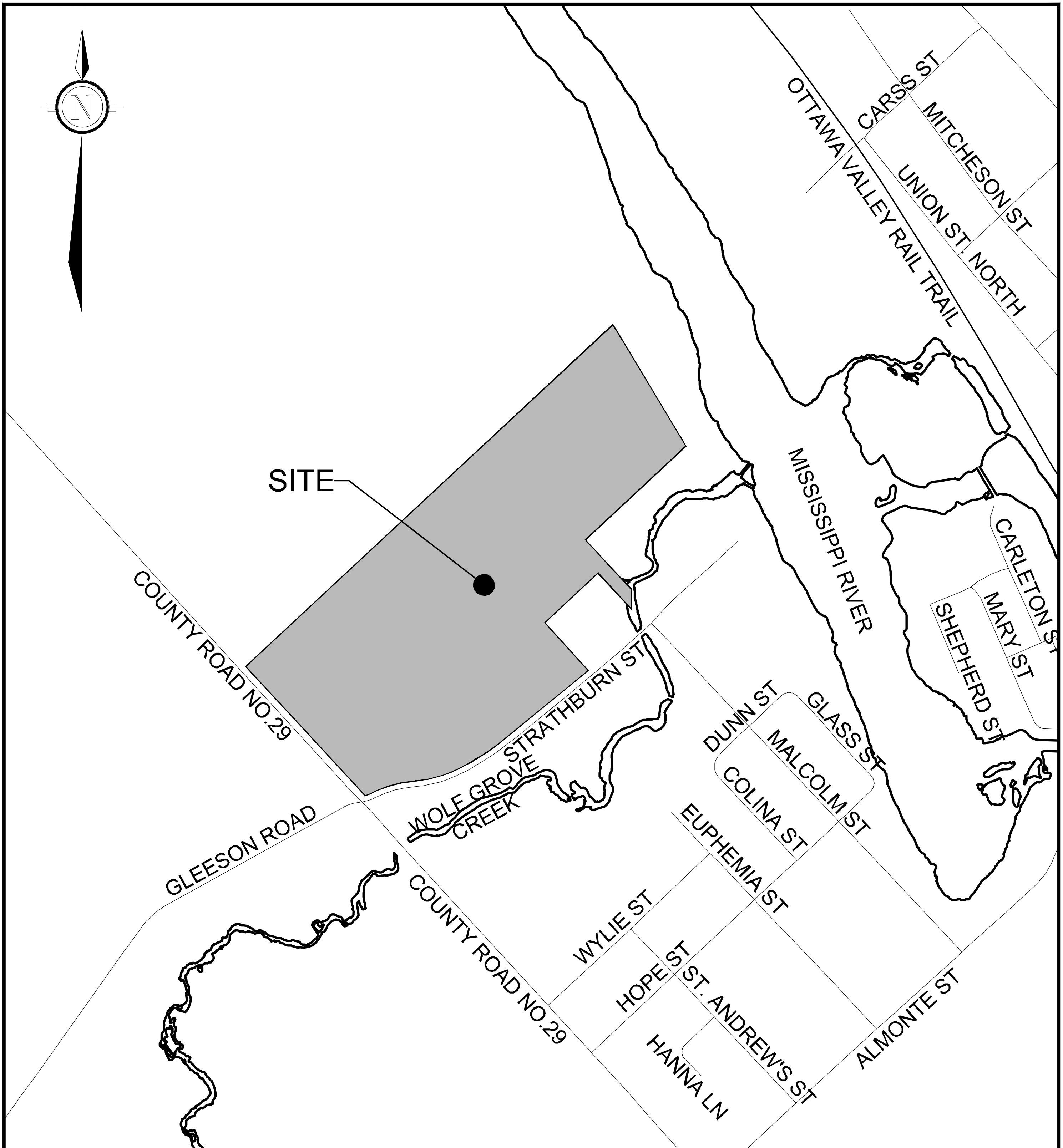
Currently, the western portion of the Subject Site is occupied by fields used for cultivation, while there are three (3) unused grain silos and a small structure at the east end of the site associated with a previous agricultural use, all of which are to be removed. Additionally, a portion of the Almonte Riverside Trail currently traverses the site from Strathburn Street to the Municipality-owned lands to the east where it then extends northward alongside the Mississippi River. A local wetland area is also present on the Subject Site, which generally extends across the central and northeastern portions of the site. The remainder of the lands are undeveloped and generally consist of open field areas with sparsely populated trees and vegetation, with the eastern areas of the site used for livestock grazing. Refer to **Figure 2** - Existing Conditions for an aerial image of the site.

The topography of the Subject Site is characterized by varying degrees of light-to-moderate sloping wherein the overall gradient of the property generally slopes downwards in a southeasterly direction. The most significant change in elevation occurs at a slope formation on the central portion of the site where the elevation drops from approximately 122 m above sea level to 112 m above sea level, and generally divides the property into a northwest highland area and a southeast lowland area. Part of an existing wetland is present on site, composed of two tributaries which feed into Wolf Grove Creek to the south of the Subject Site.

1.4 Proposed Development

The proposed development of the Subject Site consists of a residential subdivision consisting of 143 single units, 18 semi-detached units, and 74 townhomes.

The development will include seven (7) new roadways. Connections will be made to County Road 29 on the west side of the site and to Strathburn Street to the south and will provide for two



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

MUNICIPALITY of MISSISSIPPI MILLS
BROWN LANDS

KEY PLAN

SCALE		
N.T.S		
DATE FEB 2024	JOB 118178	FIGURE FIGURE 1

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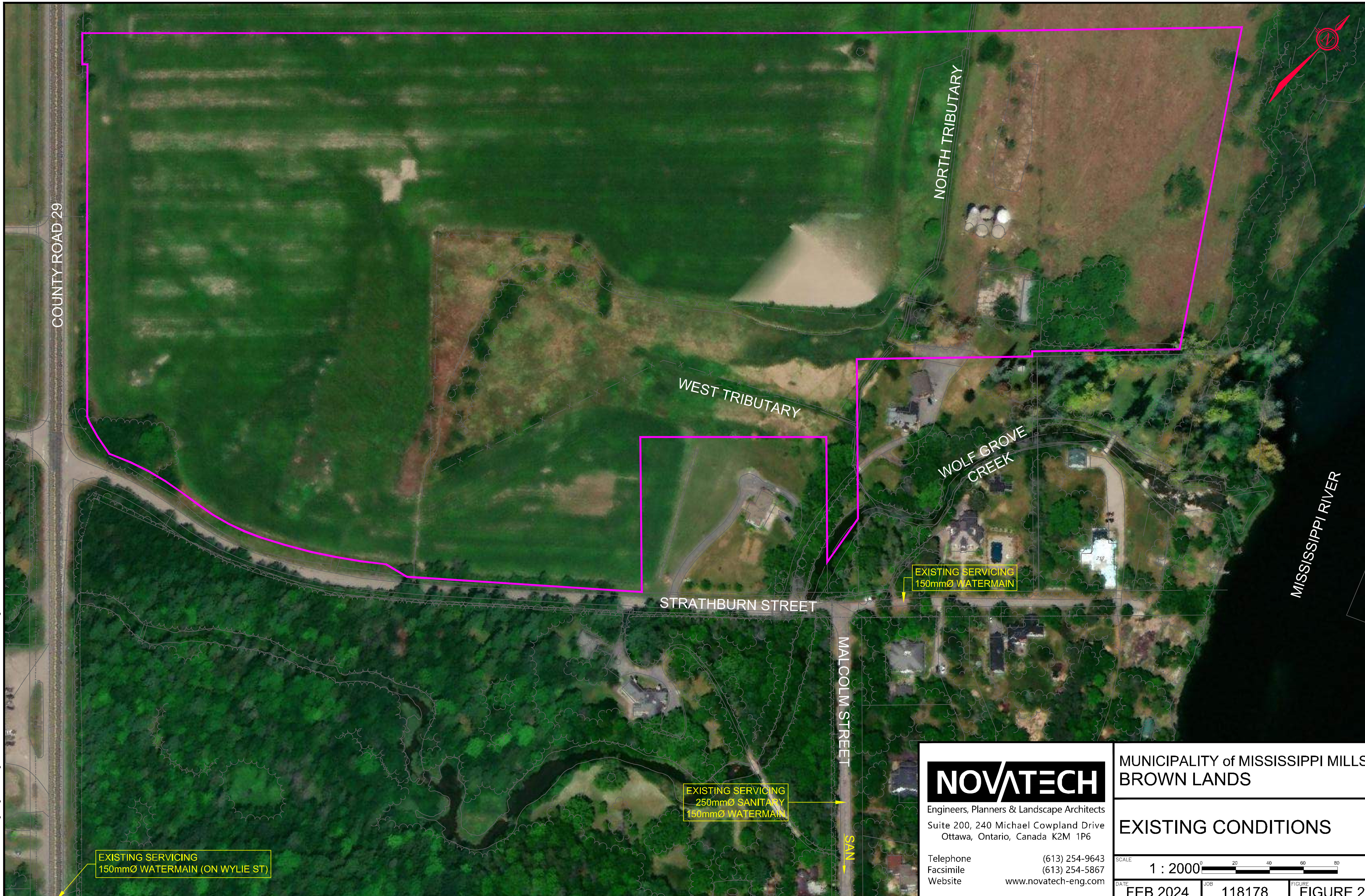

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6

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

MUNICIPALITY of MISSISSIPPI MILLS
BROWN LANDS

EXISTING CONDITIONS

SCALE 1 : 2000

DATE FEB 2024 | JOB 118178 | FIGURE FIGURE 2

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roadway stubs to allow future development of the lands to the north. Refer to **Figure 3** - Concept Plan for the proposed layout.

The Subject Site will be serviced from a combination of new and existing municipal infrastructure. Water distribution will be provided from the proposed 250mm dia. watermain extension on County Road 29 and the proposed 300mm dia. watermain crossing of the Mississippi River. Sanitary sewer servicing will be provided by on-site gravity sewers connected to a proposed on-site pump station outletting to an existing 250mm dia. sanitary sewer on Malcolm Street.

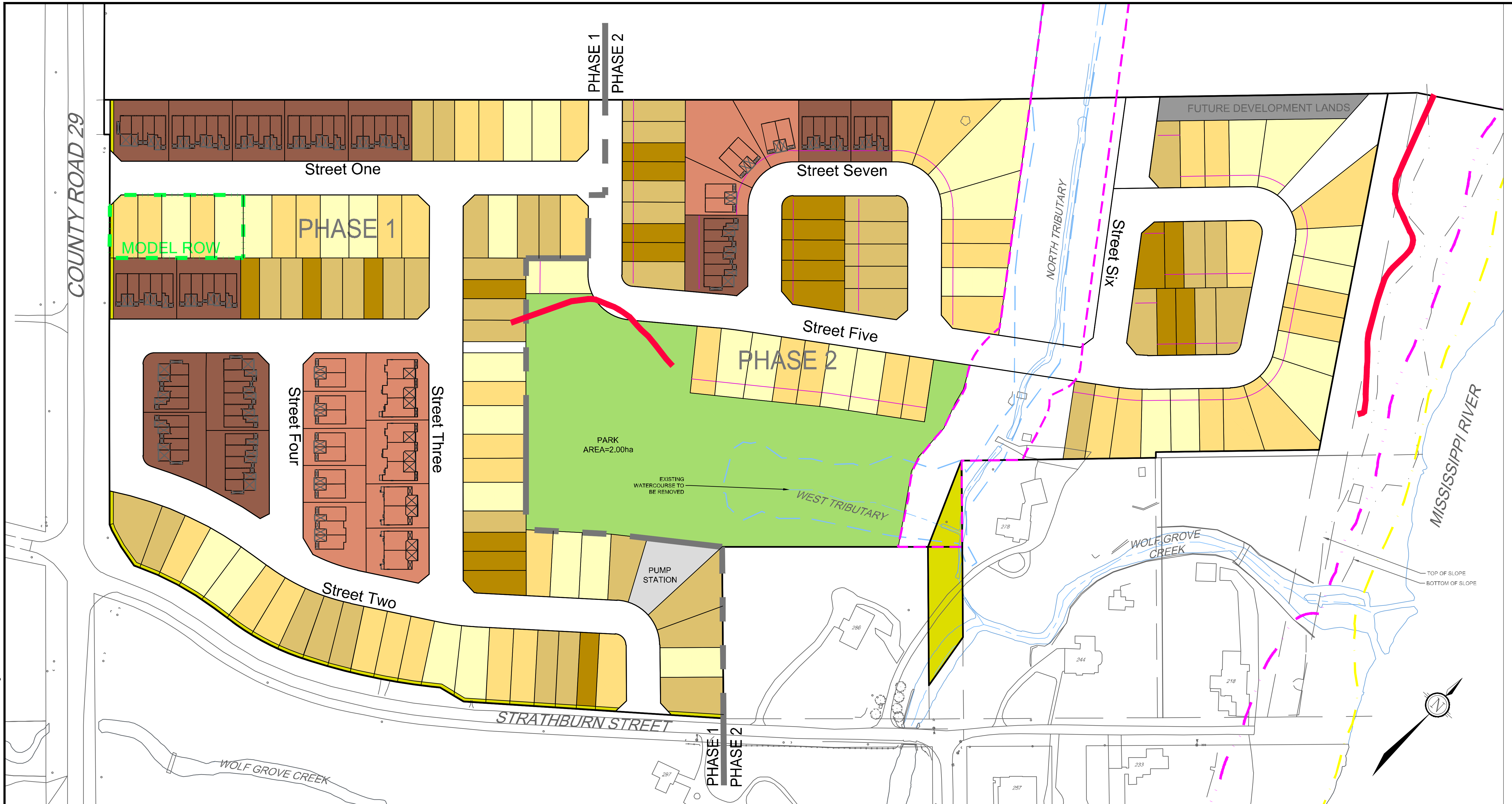
Stormwater from the Subject Site will be conveyed with gravity sewers directly to the Mississippi River via an outlet located at the northeast corner of the site.

Refer to **Figure 4** - On-Site Conceptual Servicing Layout and **Figure 5** - Off-Site Conceptual Servicing Layout for the conceptual servicing layouts of the Subject Site.

1.5 Geotechnical Investigation

Paterson Group conducted geotechnical investigations in support of the Brown Lands residential development. An investigation for the on-site development was completed through 2 separate field mobilizations (May 2022 & November 2022). A total of seventeen (17) boreholes, five (5) probeholes and two (2) hand-auger holes were advanced to a maximum depth of 10.2m. The principal findings of Paterson Group's geotechnical investigation for the on-site works are as follows:

- The site's existing ground surface on the western portion of the site slopes down from west to east between approximate geodetic elevations 124m to 112m.
- The eastern portion of the site is relatively flat.
- The slope of the site varies from 3H:1V to 10H:1V throughout the central portion of the site.
- Bedrock outcroppings were observed at the existing ground surface on the eastern half of the Subject Site.
- Subsurface conditions on the western side of the site (west of the North Tributary) were generally observed to consist of topsoil underlain by silty clay and/or glacial till.
- Subsurface conditions in the test holes on the eastern side of the site (east of the North Tributary) were generally observed to consist of topsoil, underlain by fill in the test holes located towards the south.
- Practical refusal to excavation on bedrock was encountered in all boreholes, hand auger-holes and probeholes at approximate depths ranging between 0.20m and 18.8m. The depth to bedrock on the eastern portion of the site ranged from 0.20m to 5.33m.
- The site is subjected to grade raise restrictions on the western portion of the site due to either the presence of a sensitive silty clay layer or the presence of existing slopes. The recommended permissible grade raises include:
    - 0m along the northern edge of the proposed park;
    - Up to 1m on the northwestern side of the wetland; and
    - 3.0m on the western portion of the site.



LEGEND:

33'	SINGLES
37'	SINGLES
42'	SINGLES
50'	SINGLES
	BUNGALOW TOWNHOMES/SEMI-DETACHED
	TWO-STOREY TOWNHOME
	PARK
	PUMP STATION
	FUTURE DEVELOPMENT LANDS
	LANDS TO BE TRANSFERRED TO ADJACENT PROPERTY OWNER

MVCA REGULATION LIMIT
SETBACK TO WATERCOURSE
LIMIT OF HAZARD LANDS (GEOTECHNICAL)
WETLAND LIMIT
EXISTING WATERCOURSE
MVCA 1:100 YEAR FLOODPLAIN LIMIT
PHASE LINE

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

MUNICIPALITY of MISSISSIPPI MILLS
BROWN LANDS

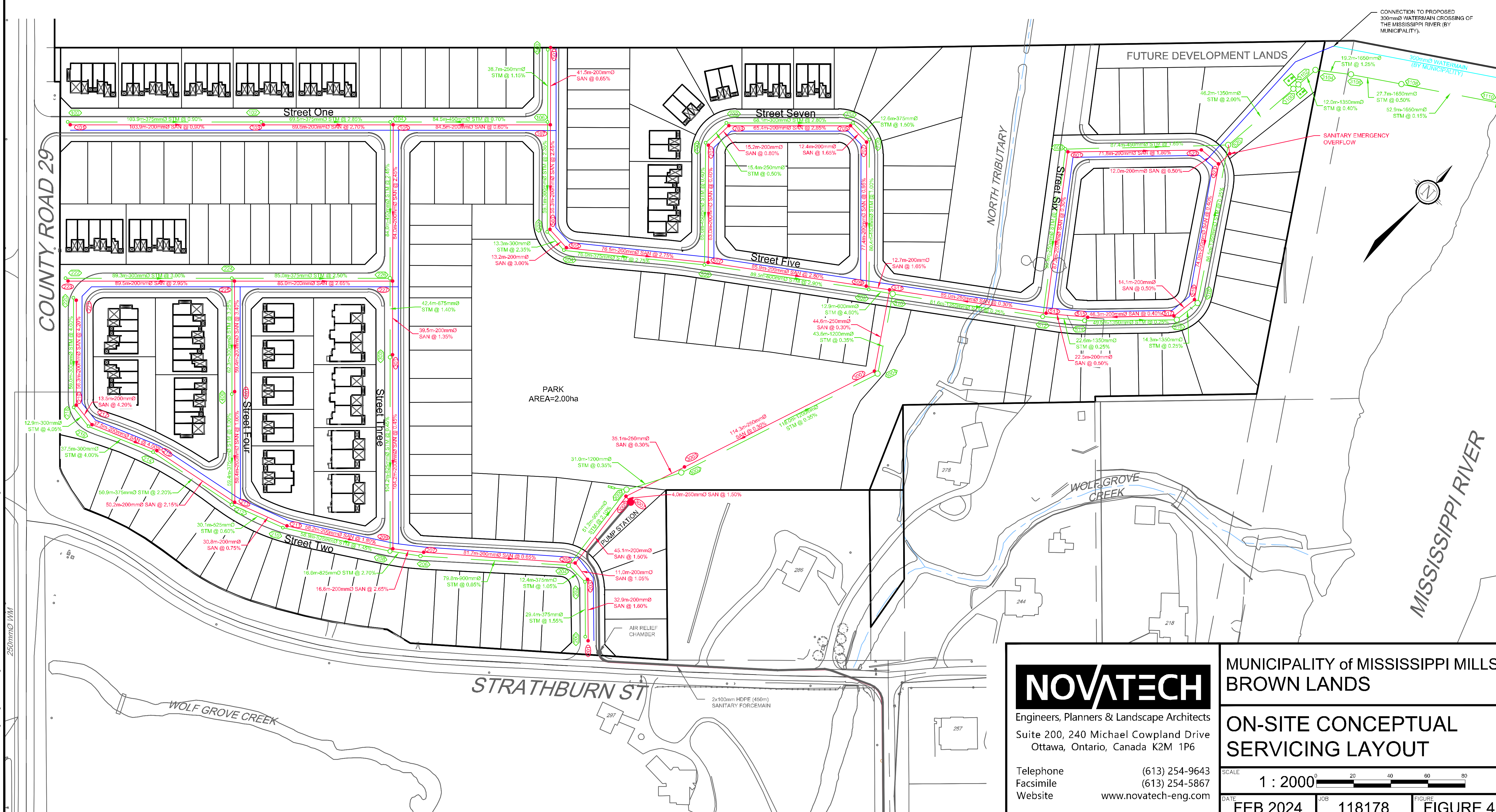
CONCEPT PLAN

SCALE 1 : 2000 (0 20 40 60 80)

DATE FEB 2024 | JOB 118178 | FIGURE FIGURE 3

LEGEND

(blue line)	CONCEPTUAL ON-SITE WATERMAIN
(cyan line)	OFF-SITE FUTURE WATERMAIN (BY MUNICIPALITY)
(dashed green line)	CONCEPTUAL ON-SITE STORM SEWER
STM MH	CONCEPTUAL ON-SITE STORM MAINTENANCE HOLE
(red line)	CONCEPTUAL ON-SITE SANITARY SEWER
SAN MH	CONCEPTUAL ON-SITE SANITARY MAINTENANCE HOLE



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

MUNICIPALITY of MISSISSIPPI MILLS
BROWN LANDS

ON-SITE CONCEPTUAL SERVICING LAYOUT

SCALE 1 : 2000

DATE FEB 2024 | JOB 118178 | FIGURE FIGURE 4

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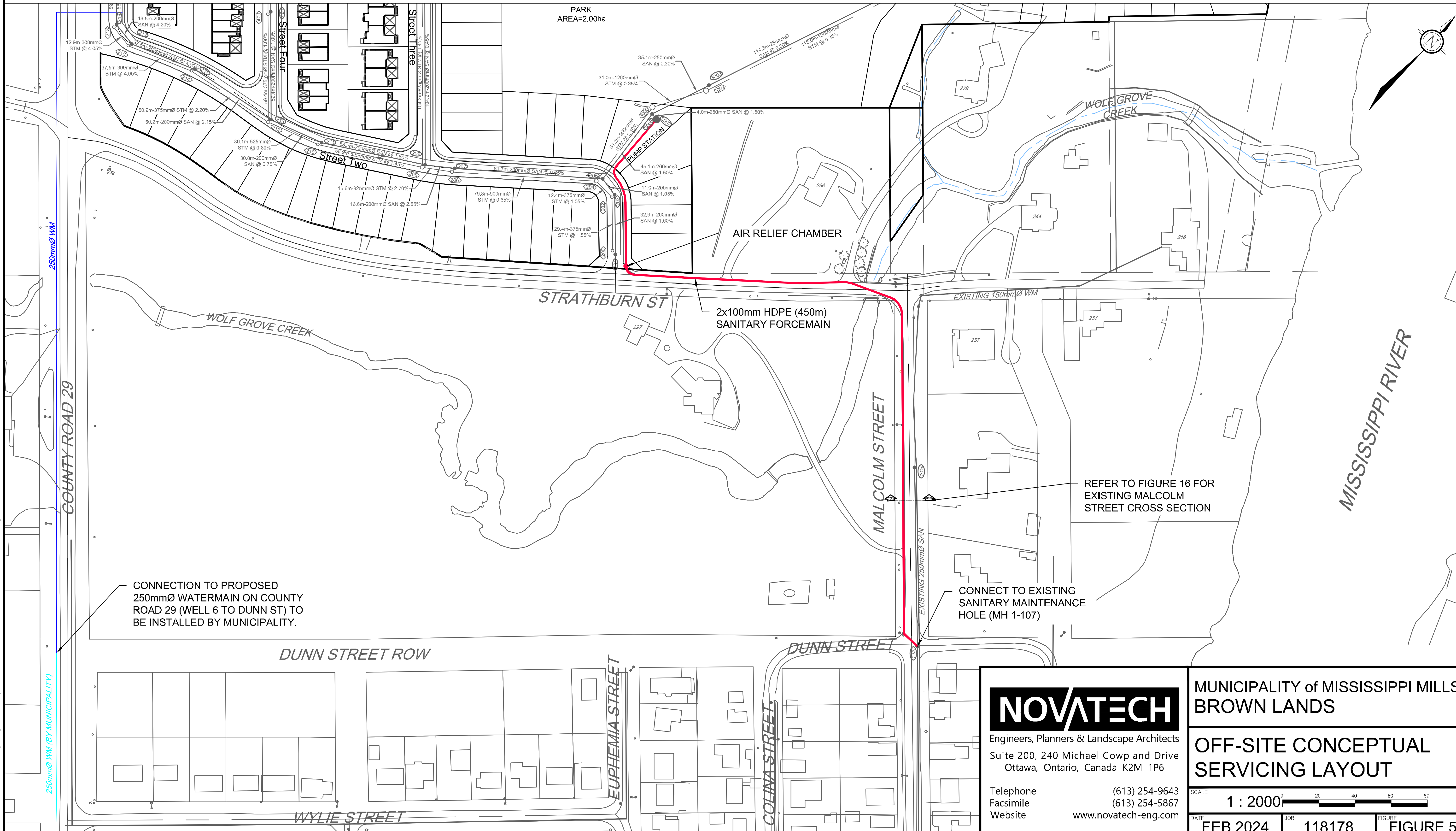
LEGEND

- CONCEPTUAL OFF-SITE-SITE WATERMAIN
- OFF-SITE-SITE FUTURE WATERMAIN (BY MUNICIPALITY)
- CONCEPTUAL OFF-SITE SANITARY FORCEMAIN



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

MUNICIPALITY of MISSISSIPPI MILLS
BROWN LANDS

OFF-SITE CONCEPTUAL SERVICING LAYOUT

SCALE 1 : 2000 (0 20 40 60 80)

DATE	JOB	FIGURE
FEB 2024	118178	FIGURE 5

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- Refer to *Geotechnical Investigation – Proposed Residential Development – Brown Lands – County Road 29 and Strathburn Street - Almonte, Ontario, prepared by Paterson Group Inc. dated January 25, 2023 (PG6260-2, Revision 1)* for complete details and recommendations.

A second investigation was completed to assess the areas where there are off-site servicing requirements associated with the proposed development. This investigation was completed in December 2022 and consisted of eight (8) boreholes advanced to a maximum depth of 5.1m. The principal findings of Paterson Group's geotechnical investigation for the off-site works are as follows:

- The off-site existing ground surface consists of paved (asphalt) roads with gravel shoulders, generally observed to be in good to fair condition.
- Two water crossings along County Road 29 and one water crossing along Strathburn Street were observed below the road surface, facilitated via culverts.
- The off-site existing ground surface generally slopes from the southwest downward to the northeast from approximate geodetic elevations 125m to 112m.
- The subsurface profile along County Road 29 consists of fill underlain by hard to very stiff, brown silty clay or glacial till.
- The subsurface profile along Strathburn Street generally consists of fill over hard to very stiff, brown silty clay.
- The subsurface profile along Malcolm Street generally consists of crushed stone with sand and gravel underlain by a deposit of hard, brown silty clay. A layer of silty sand was observed below the silty clay layer and was further underlain by glacial till.
- Practical refusal to excavation on bedrock was encountered in boreholes BH-R01-22, BH-R05-22 and BH-R08-22 at depths of 3.6m, 3.9m and 1.6m, respectively.
- Based on the field observations and soil samples, the long-term groundwater table is expected to be located at a greater depth than the test holes advanced in this investigation but could be subject to seasonal fluctuations.
- The off-site area is suitable for the proposed municipal service installation and subsequent road reconstruction.
- Due to the presence of the silty clay deposit, the reconstruction of the roadway will be subject to a grade raise restriction of 3m above the existing roadway surface elevation.
- Bedrock removal may be required depending on municipal servicing depths, which may be possible by hoe-ramming.
- Refer to *Geotechnical Investigation – Proposed Off-Site Services, County Road No. 29, Strathburn Street and Malcolm Street, Almonte Ontario, prepared by Paterson Group Inc. dated January 25, 2023 (PG6260-LET.01, Revision 1)* for complete details and recommendations.

1.6 Additional Reports

This report provides information on the considerations and approach by which Novatech has designed and evaluated the proposed servicing for the Brown Lands residential development. This report should be read in conjunction with the following:

- Geotechnical Investigation, Proposed Residential Development, Brown Lands - County Road No. 29 and Strathburn Street, Almonte, Ontario, Report: PG6260-2 Revision 1 dated January 25, 2023, prepared by Paterson Group.
- Geotechnical Investigation – Proposed Off-Site Services, County Road No. 29, Strathburn Street and Malcolm Street, Almonte Ontario, Report: PG6260-LET.01 Revision 1 dated January 25, 2023, prepared by Paterson Group Inc.
- Environmental Impact Statement, Brown Lands, Almonte, Ontario, Project #140876, Revision 1, dated February 2024, prepared by Arcadis.
- Planning Rationale in Support of Draft Plan of Subdivision and Zoning By-law Amendment Applications, Brown Lands, Almonte, Ontario, Ref: R-2023-002, dated February 10, 2023, revised February 2024, prepared by Novatech.
- Brown Lands, Almonte, Ontario, Traffic Impact Study, Ref: R-2023-002, dated February 10, 2023, revised February 2024, prepared by Novatech.
- Master Plan Update Report - FINAL, Municipality of Mississippi Mills Almonte Ward, Mississippi Mills, Ontario, Report: 27456-01 dated February 2018, prepared by J.L. Richards & Associates Limited.

2.0 STORMWATER MANAGEMENT

The proposed storm servicing and stormwater management strategy for the Brown Lands residential development has been conceptually designed in consultation with the Municipality of Mississippi Mills and the Mississippi Valley Conservation Authority (MVCA).

2.1 Existing Drainage Conditions

Under existing conditions, storm runoff from the proposed development generally flows towards two outlets: Wolf Grove Creek and the Mississippi River. Refer to **Figure 2** - Existing Conditions Plan.

There is an unnamed tributary (North Tributary) of Wolf Grove Creek that flows southward through the site towards Wolf Grove Greek, as well as a small watercourse (West Tributary) that flows eastward to Wolf Grove Creek through the low-lying area in the central part of the site. Both tributaries are also considered wetlands.

Land Use

The lands west of the North Tributary are cultivated for agricultural uses, while the lands east of the tributary are mainly open fields with some small stands of trees and were previously used for livestock grazing. There are three unused grain silos and a small structure to the east of the tributary.

Topography

The portion of the site that is east of the North Tributary is gently sloped in an easterly direction towards the Mississippi River. There is a steep embankment to the east of the site along the Mississippi River within the municipally owned lands. The remainder of the site is gently sloped to the east and south to Wolf Grove Creek, whether via the North and West Tributaries, flowing directly into the creek or by a culvert in the southwest corner of the site that crosses under Strathburn Street and ultimately outlets to the creek. There are steep embankments along the north and west side of the West Tributary.

2.2 Stormwater Management Criteria

The Subject Site is located within the jurisdiction of the Mississippi Valley Conservation Authority (MVCA). The stormwater management criteria for the development are based on the requirements of the MVCA, and the City of Ottawa Sewer Design Guidelines (October 2012) and associated Technical Bulletins.

2.2.1 Minor System (Storm Sewers)

- Storm sewers are to be designed using the Rational Method and sized for the 5-year storm event;
- Inlet control devices (ICDs) are to be installed in road and rear yard catchbasins to control inflows to the storm sewers;
- Ensure that the 100-year hydraulic grade line in the storm sewer is at least 0.3m below the underside of footing (USF) elevations for the proposed development.

2.2.2 Major System (Overland Flow)

- Overland flows are to be confined within the right-of-way and/or defined drainage easements for all storms up to and including the 1:100-year event;
- Maximum depth of flow (static + dynamic) on local and collector streets shall not exceed 0.35m 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 receiving watercourses. There must be at least 15cm of vertical clearance between the spill elevation on the street and the ground elevation at the front of the building envelope that is in the proximity of the flow route or ponding area;
- The product of the 100-year flow depth (m) and flow velocity (m/s) within the right-of-way shall not exceed 0.60;
- Furthermore, provide 30cm of vertical clearance between the spill elevation and the ground elevation at the rear of the building envelope.

2.2.3 Water Quality Control

- Provide a *'Enhanced'* (80% long-term total suspended solids removal) level of quality control.

2.2.4 Water Quantity Control

- Quantity control of storm runoff to pre-development levels to the Mississippi River is not required as it is a large watercourse and will not be impacted by the runoff from the development;
- Provide sufficient flow to the North Tributary to maintain ecological function under post-development conditions;
- Confirm that post-development flows will have no adverse impact on Wolf Grove Creek;
- Confirm that all post-development runoff can be safely conveyed to the Mississippi River for all design storms up to and including the 100-year event;
- Implement lot level and conveyance Best Management Practices to promote infiltration and treatment of storm runoff.

2.3 Proposed Storm Servicing Design

Storm servicing for the subdivision will be provided using a dual drainage system; runoff from frequent events will be conveyed by gravity sewers (minor system), while flows from large storm events that exceed the capacity of the minor system will be conveyed along defined overland flow routes (major system). Refer to **Figure 6** - Post-Development Storm Drainage Area Plan for the preliminary storm sewer layout.

The minor and major storm systems will outlet to the Mississippi River across the adjacent municipally owned lands.

Quantity control is not required for the site for runoff that is directed to the Mississippi River. To prevent erosion of the banks riverbanks and to maintain flows to the wetland, direct runoff to the North Tributary and the Mississippi River will be maintained as close to pre-development levels as possible.

An “Enhanced” level of water quality control (80% long-term TSS removal) will be provided at the outlet by offline water quality treatment units before discharging to the Mississippi River. Detailed sizing of the treatment units will be completed at detailed design.

2.3.1 Storm Sewers (Minor System)

The proposed storm sewers servicing the development have generally been designed to convey peak flows associated with a 5-year return period. The topography of the site is quite varied with the proposed centreline of road roughly following the existing topography resulting in road grades between 0.5% and 5%, with many of the road grades falling in the 3-4% range. As such, the majority of the road catchbasins are on-grade (i.e. not located in sags) and may not be able to fully capture the 5-year storm flows and some by-passing is to be expected.

There will be two low points on the site that will have catchbasins designed to capture the 100-year runoff and convey it in the storm sewers so there are no major system flows leaving the site for events up to and including the 100-year event. These low points will be located within the pumping station or park block (connected to MH3000) and between MH518 and 3104 (location to be determined at detailed design). This is to prevent erosion within the park block, along the North Tributary and along the Mississippi River embankment from surface flows in larger storm events. The storm sewers downstream of these low points have been designed to accommodate the 100-year flows from the site.

LEGEND

2-02 — AREA ID

0.10 — CATCHMENT AREA

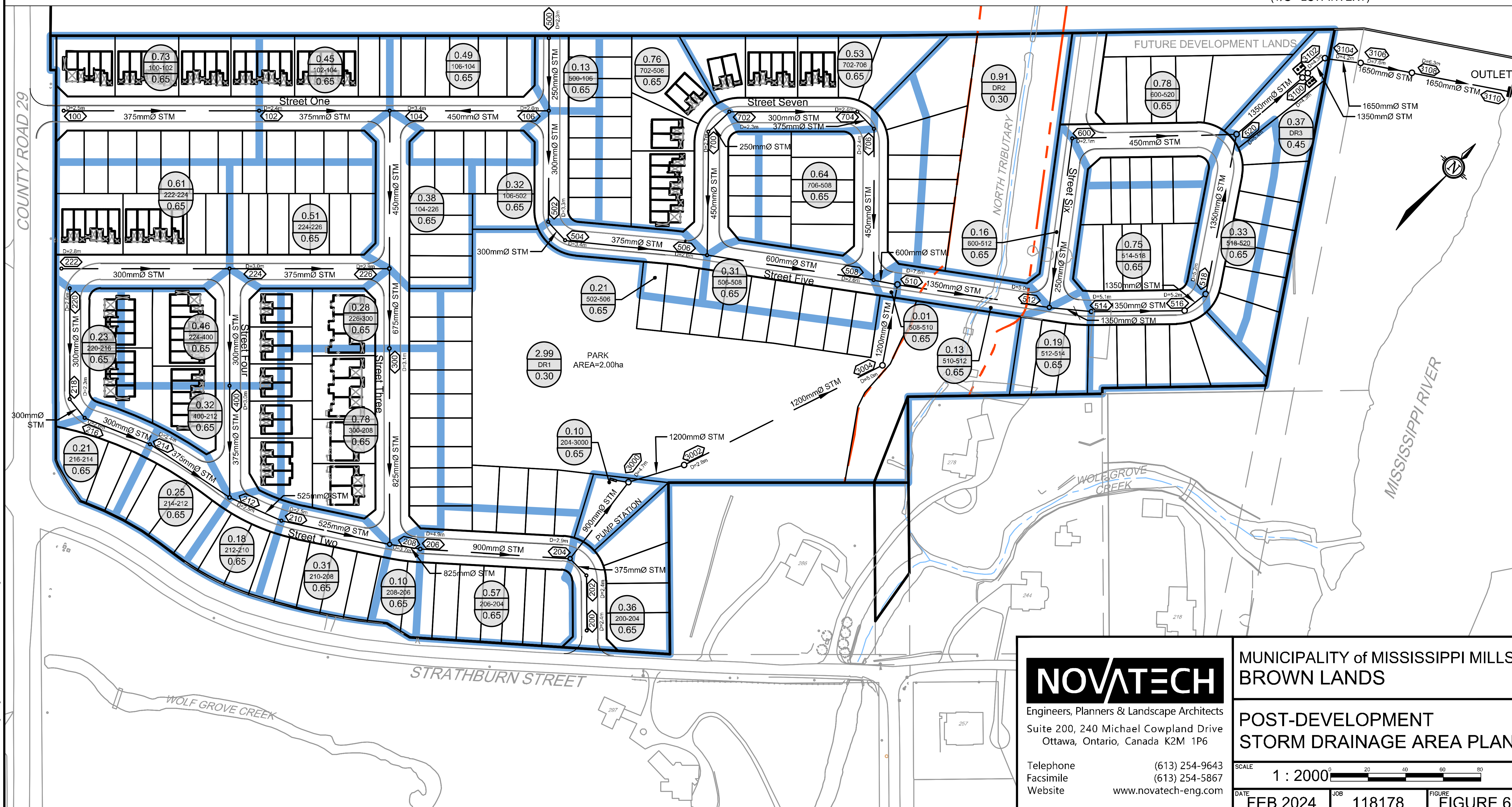
116-114 — MAINTENANCE HOLE TO MAINTENANCE HOLE

0.65 — RUNOFF COEFFICIENT

DRAINAGE AREA BOUNDARY

100 — PROPOSED STORM SEWER

D=4.4m — APPROXIMATE DEPTH OF MAINTENANCE HOLE (T/G - LOW INVERT)



MUNICIPALITY of MISSISSIPPI MILLS
BROWN LANDS

POST-DEVELOPMENT
STORM DRAINAGE AREA PLAN

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

SCALE 1 : 2000

DATE FEB 2024 | JOB 118178 | FIGURE FIGURE 6

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Due to the topography of the site, velocities in multiple sewer segments will exceed 3.0m/s and will require review during the detailed design stage to determine if provisions are required to protect against jarring or movement (per section 6.1.2.1 of the City of Ottawa Sewer Design Guidelines). Flows will not exceed the maximum allowable velocity of 6m/s, even during 100-year flows. In addition, sewers will be designed to minimize the depth of sewer wherever possible. A preliminary maintenance hole information summary table has been provided in Appendix B. Further analysis and refinement of the sewer design will be completed at detailed design.

The minor system flows will be directed through offline water quality treatment units before discharging to the storm sewer outlet to Mississippi River, located at the northeast corner of the site.

The storm sewer outlet to the Mississippi River has been designed to accommodate future flows from lands to the north of the site should they be developed in the future.

Refer to **Figure 6** - Post-Development Storm Drainage Area Plan and the Storm Sewer Design Sheet provided in **Appendix B** for details.

<u>Storm Sewer Design Criteria</u>

The following is the storm sewer design criteria were used:

- Rational Method (Q) = 2.78CIA, where
    - Q = peak flow (L/s)
    - C = runoff coefficient
        - C = 0.65
    - I = rainfall intensity for a 5-year and 100-year return period (mm/hr)
        - I_{5yr} = 998.071 / [(Tc(min) + 6.053)]$^{0.814}$
        - I_{100yr} = 1735.688 / [(Tc(min) + 6.014)]$^{0.820}$
    - A = site area (ha)
- Minimum Pipe Size = 250 mm; Minimum / Maximum Full Flow Velocity = 0.8 m/s / 3.0 m/s

<u>Inlet Control Devices</u>

Inlet control devices (ICDs) are to be installed in all catchbasins to limit inflows to the minor system capacity (5-year storm event), except where the 100-year is being captured. Rear yard catch basins will be connected in series with an ICD installed at the outlet of the most downstream structure. Exact ICD sizes and catchbasin locations will be determined during the detailed design stage.

<u>Foundation Drains</u>

Foundation drains surrounding the dwellings would be connected to the storm sewers. Based on the preliminary review of the hydraulic grade line, it is anticipated that sump pumps will not be required to drain the foundations. Should sump pumps be required, they would connect to the storm sewer and would include backwater valves to prevent basement flooding in heavy rain events. The requirement for sump pumps will be confirmed as part of detailed design.

2.3.2 Major System Drainage

During detailed design, the site will be graded to provide an overland flow route following the proposed roadway network. As described in Section 2.3.1, the major system flows for storms up to and including the 100-year event will be captured and conveyed in the storm sewers to the Mississippi River. Major system overland flows down the embankment will only occur during storm events that exceed the 100-year storm. Flows greater than the 100-year event from Phase 1 will be directed through the pumping station block and park block to the North Tributary. Flows greater than the 100-year event from Phase 2 will be directed overland to the Mississippi River at the minor system outlet location. Refer to **Figure 7** - Conceptual Grading Plan for the preliminary macro grading plan.

2.3.3 Quality Control

Water quality treatment will be required before discharging to the Mississippi River. This will be provided by water quality treatment units located within the proposed servicing block in the northeast corner of the site, immediately upstream of the storm sewer outlet. Oil and grit separator (OGS) units will be provided to achieve 80% long-term TSS removal. Preliminary sizing of the OGS units has indicated that a Vortechs VX 1100 and a VX 16000 or equivalents will be required in parallel to provide the required level of treatment. Refer to **Appendix B** for preliminary sizing information. Further analysis will be completed at detailed design.

2.3.4 Quantity Control

The proposed development is located at the downstream end of the Wolf Grove Creek Subwatershed and adjacent to the Mississippi River. Peak flow control should not be required to mitigate any adverse impacts to the Mississippi River associated with the development. Based on limited flow data and reports of creek bank overtopping in large storm events, flows to Wolf Grove Creek (via the North Tributary) will be limited to pre-development flows or lower.

Mississippi River (Minor System Outlet)

The Mississippi River is a large watercourse and will not be impacted by the runoff from the development. The additional runoff volume and peak flows associated with development are negligible compared to the total flow in the watercourse. The rear yard areas draining directly to the Mississippi River are smaller than the pre-development area and there will not be any increase in peak flow or erosion potential down the embankment. The storm sewer outlet will be designed to convey flows from storms up to and including the 100-year event in the pipe and will outlet to the Mississippi River at the base of the embankment. Erosion protection will be provided at the outfall using riprap and other energy dissipation measures as required to be determined at detailed design.

Existing North Tributary/Wetland

Uncontrolled direct runoff (overland flow) to the North Tributary/wetland will be provided from adjacent soft surfaced areas (park lands and rear yards) to maintain flows to the wetland. Flows will be maintained as close to pre-development flows as possible.

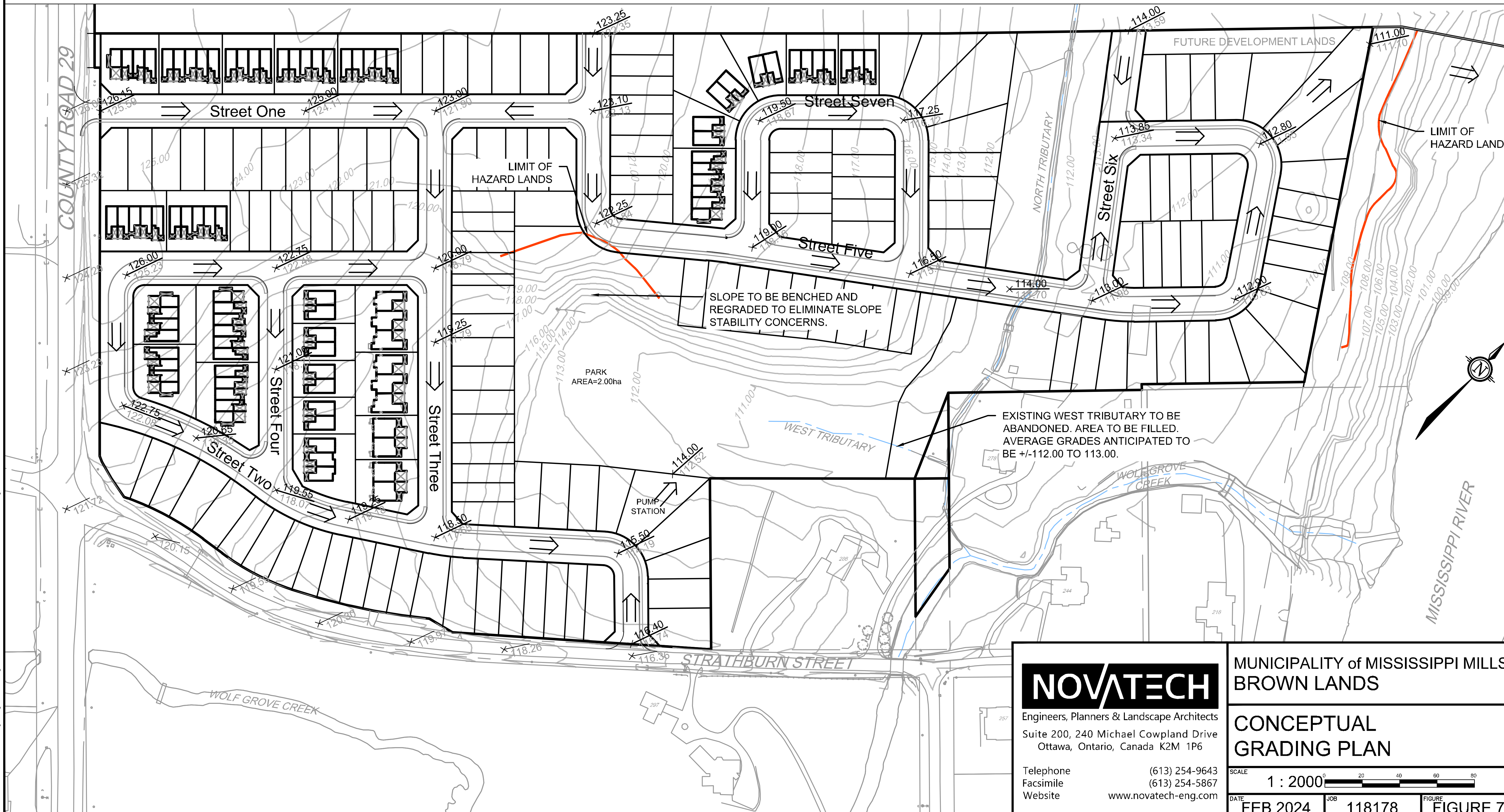
2.3.5 Best Management Practices and Low Impact Development

The proposed development will use the following stormwater best management practices (BMPs) and low impact development (LID) techniques to mitigate the reduction in groundwater infiltration/recharge resulting from development:

- Rear yard CB leads will use perforated pipes to promote infiltration of runoff from rear yard areas.

LEGEND

89.24 / 88.59	EXISTING GRADE
⟸	MAJOR OVERLAND (EMERGENCY) FLOW DIRECTION
100.00	EXISTING CONTOUR AND ELEVATION
(red line)	LIMIT OF HAZARD LANDS (SLOPE STABILITY SETBACK)



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

MUNICIPALITY of MISSISSIPPI MILLS
BROWN LANDS

CONCEPTUAL GRADING PLAN

SCALE 1 : 2000

DATE FEB 2024 | JOB 118178 | FIGURE FIGURE 7

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- Where feasible, eavestrough downspouts and roof leaders discharging to the ground surface should be directed to rear yard or grassed areas.

By implementing stormwater management BMPs and LIDs as part of the storm drainage design, the impacts of development on the hydrologic cycle can be reduced. Infiltration of clean runoff will improve the performance of the proposed OGS units. At the conceptual design stage, the use of BMPs and LIDs have not been included in the SWM calculations to provide a conservative estimate of the runoff volumes and storage requirements. The implementation of BMPs and LIDs will be reviewed further during the detailed design process.

2.4 Preliminary SWM Modeling

The performance of the proposed storm drainage system for the Brown Lands residential development was evaluated using the dual drainage PCSWMM hydrologic/hydraulic model.

Pre-Development Modelling

A pre-development model of the Brown Lands residential development was completed using PCSWMM and is based on the existing conditions of the site. The purpose of this model was to determine the pre-development runoff from the site to the wetlands/tributaries and ensure that post-development conditions will not negatively impact these areas and to provide targets for the base flows to be maintained to the wetlands. The runoff to the Mississippi River in pre-development was also evaluated to ensure that the post-development runoff from the rear yards of lots backing onto the embankment along the river will be similar to pre-development so that there will be no increase in erosion potential.

Post-Development Modelling

A post-development model of the proposed subdivision was created using PCSWMM and includes the roadways (major system), storm sewers (minor system), and outlet to the Mississippi River. The post-development model was used to:

- Simulate major and minor system runoff from the site; and
- Determine the storm sewer hydraulic grade line for the 100-year storm event.

Model parameters and schematics for both pre- and post-development models have been provided in **Appendix B**.

2.4.1 Design Storms

The hydrologic analysis was completed using the following synthetic design storms and historical storms. The IDF parameters used to generate the Chicago design storms were taken from the *Ottawa Design Guidelines - Sewer* (October 2012).

Chicago Distribution:
25mm 4-hour Event (Water Quality)
2-year 3-hour Event
2-year 3-hour Event
100-year 3-hour Event

SCS Distribution:
2-year 12-hour Event
2-year 12-hour Event
100-year 12-hour Event

The 3-hour Chicago distribution was found to be the critical design storm as it generated the highest peak flows and the highest HGL elevations.

2.4.2 Model Parameters

Storm Drainage Areas

For the pre-development model, the hydrologic parameters for each subcatchment were developed based on **Figure 8** - Pre-Development Storm Drainage Area Plan. The subcatchment boundaries have been developed based on the existing topography obtained from a site survey and the Digital Raster Acquisition Project Eastern Ontario (DRAPE) 2014 elevation data. Pre-development parameters were determined using aerial imagery and land use of the subcatchments. **Table 2.1** provides a summary of the pre-development model parameters, with further detail provided in **Appendix B**.

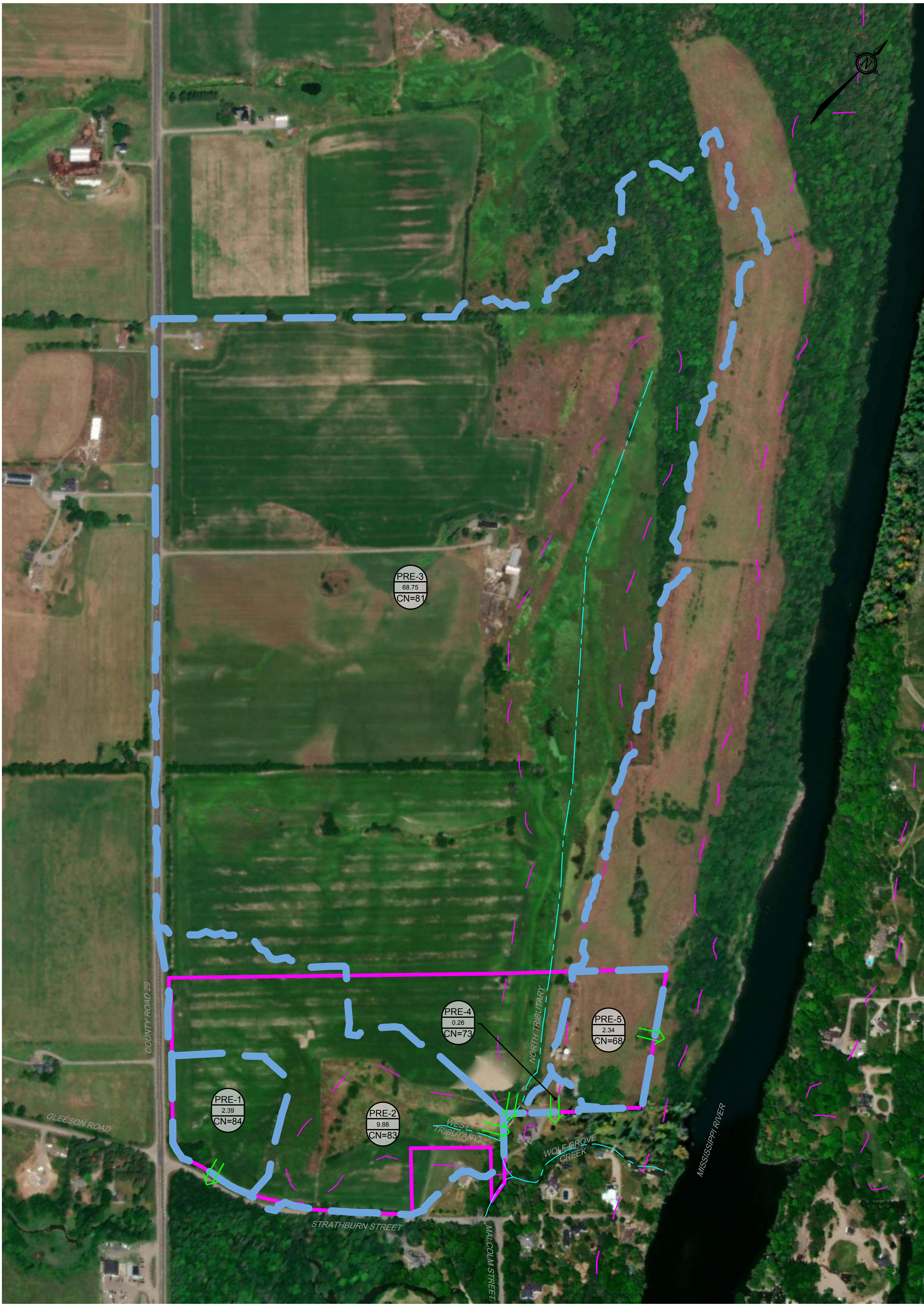
Table 2.1: Pre-Development Model Parameters

Area ID	Catchment Area (ha)	Flow Length (m)	Time of Concentration (min)	Weighted Curve Number	Weighted IA	Average Slope (%)
PRE-1	2.39	160	15	84	4.8	3.2%
PRE-2	9.88	530	17	83	5.2	2.9%
PRE-3	68.77	1255	48	81	6.1	1.5%
PRE-4	0.26	50	15	73	9.3	1.5%
PRE-5	2.34	130	15	68	11.9	2.0%

For the post-development model, the site has been divided into subcatchments based on the both the proposed land use and on a maintenance hole-to-maintenance hole basis. The subcatchments also correspond to the areas used in the Storm Sewer Design Sheet (**Appendix B**). The hydrologic parameters for each subcatchment were developed based on **Figure 6** - Post-Development Storm Drainage Area Plan. An overview of the modeling parameters is provided in **Table 2.2** and **Table 2.3**. Off-site drainage information with further detail provided can be found in **Appendix B**.

Table 2.2: Post-Development Model Parameters

Area ID	Catchment Area (ha)	Runoff Coefficient (C)	Percent Impervious (%)	No Depression (%)	Flow Path Length (m)	Equivalent Width (m)	Average Slope (%)
100-102	0.730	0.65	64.3%	40%	34	215	2.0%
102-104	0.450	0.65	64.3%	40%	32	139	2.0%
104-226	0.380	0.65	64.3%	40%	50	76	2.0%
106-104	0.490	0.65	64.3%	40%	30	164	2.0%
106-502	0.320	0.65	64.3%	40%	29	112	2.0%
200-204	0.360	0.65	64.3%	40%	75	48	2.0%
204-3000	0.100	0.65	64.3%	40%	43	23	2.0%
206-204	0.570	0.65	64.3%	40%	36	160	2.0%
208-206	0.100	0.65	64.3%	40%	59	17	2.0%
210-208	0.310	0.65	64.3%	40%	53	59	2.0%
212-210	0.180	0.65	64.3%	40%	58	31	2.0%
214-212	0.250	0.65	64.3%	40%	50	50	2.0%



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LEGEND

- PRE-1 — AREA ID
- 2.39 — AREA (HA.)
- CN=84 — SCS CURVE NUMBER
- PRE-DEVELOPMENT DRAINAGE AREA BOUNDARY
- FLOW DIRECTION
- PROPERTY LIMIT
- MVCA REGULATION LIMITS
- EXISTING WATERCOURSE

MUNICIPALITY of MISSISSIPPI MILLS
BROWN LANDS

PRE-DEVELOPMENT STORM DRAINAGE AREA PLAN

SCALE	DATE	JOB	FIGURE
1 : 5000 (0 50 100 150 200)	FEB 2024	118178	FIGURE 8

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216-214	0.210	0.65	64.3%	40%	53	40	2.0%
220-216	0.230	0.65	64.3%	40%	32	73	2.0%
222-224	0.610	0.65	64.3%	40%	67	91	2.0%
224-226	0.510	0.65	64.3%	40%	65	78	2.0%
224-400	0.460	0.65	64.3%	40%	40	115	2.0%
226-300	0.280	0.65	64.3%	40%	37	75	2.0%
300-208	0.780	0.65	64.3%	40%	40	195	2.0%
400-212	0.320	0.65	64.3%	40%	37	87	2.0%
500-106	0.130	0.65	64.3%	40%	33	40	2.0%
502-506	0.210	0.65	64.3%	40%	23	91	2.0%
506-508	0.310	0.65	64.3%	40%	45	69	2.0%
508-510	0.010	0.65	64.3%	40%	9	11	2.0%
510-512	0.140	0.65	64.3%	40%	9	153	2.0%
512-514	0.190	0.65	64.3%	40%	73	26	2.0%
514-518	0.750	0.65	64.3%	40%	60	126	2.0%
518-520	0.330	0.65	64.3%	40%	37	89	2.0%
600-512	0.160	0.65	64.3%	40%	9	175	2.0%
600-520	0.790	0.65	64.3%	40%	33	243	2.0%
702-506	0.760	0.65	64.3%	40%	50	153	2.0%
702-706	0.530	0.65	64.3%	40%	65	81	2.0%
706-508	0.640	0.65	64.3%	40%	40	160	2.0%
DR1	2.980	0.30	14.3%	100%	107	279	2.0%
DR2	0.910	0.30	14.3%	100%	72	126	2.0%
DR3	0.350	0.45	35.7%	100%	21	164	2.0%
TOTAL:	**16.83**						

Table 2.3: Post-Development Alternate Runoff Method Subcatchments

Area ID	Catchment Area (ha)	Flow Length (m)	Time of Concentration (min)	Weighted Curve Number	Weighted IA	Average Slope (%)
EXT-1	0.986	150	15	85	4.5	1.5%
EXT-2	65.061	1255	48	81	6.1	1.5%
EXT-3	0.647	140	15	82	5.5	2.7%

Runoff Coefficient/ Impervious Values

A runoff coefficient of 0.65 was used throughout the site, except for the direct runoff and park areas. This value of 0.65 is a typical assumption for residential subdivisions at the draft plan stage. This value is representative of the anticipated distribution of hard surfaced areas (roadways, driveways, building footprints) and soft surfaced areas (boulevards, front and rear yards) based on the proposed typical roadway cross sections and residential zoning provisions. Individual runoff coefficients will be calculated for each subcatchment at the detailed design stage. Impervious (%IMP) values for each subcatchment area were calculated based on the Runoff Coefficients noted on **Figure 6** - Post-Development Storm Drainage Area Plan 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' column in **Table 2.2**.

Equivalent Width

'Equivalent Width' refers to the width of the sub-catchment flow path. This parameter is calculated as described in the City of Ottawa Sewer Design Guidelines (October 2012)*, Section 5.4.5.6.*

Major System

Since the major system has not yet been designed, the subcatchment areas are not based on a detailed grading plan. The grade drop across the site is such that it is anticipated that the minor system will consist of mostly on-grade catchbasins. During events up to and including the 5-year, storm runoff will flow uncontrolled into the minor system. The major system connections to the minor system have been determined based on a pair of City of Ottawa standard sized inlet control devices (ICDs) and sized based on the 5-year approach flow. Due to the slopes of the road, it is assumed that there will be some bypassing flows in the 5-year event.

There will be two low points on the site that will have catchbasins designed to capture the 100-year runoff and convey it in the storm sewers so there are no major system flows leaving the site for events up to and including the 100-year event. These low points will be located within the pumping station or park block (connected to MH3000) and between MH518 and 3104 (location to be determined at detailed design). This is to prevent erosion within the park block, along the North Tributary and along the Mississippi River embankment from surface flows in larger storm events. The storm sewers downstream of these low points have been designed to accommodate the 100-year flows from the site.

Major system areas will be updated based on detailed grading information at the detailed design stage.

Modeling Files / Schematic

The PCSWMM model schematics are provided in **Appendix B**. Digital copies of the modeling files and model output for all storm events are provided with the digital report submission.

2.4.3 Boundary Condition (Water Levels at Storm Outlet)

The 100-year water level at the outlet to the Mississippi River was obtained from MVCA floodplain mapping. The 100-year water level in the Mississippi River near the outlet is 101.20m. This boundary condition has been applied for the 100-year storm event. For storm events below the 100-year event, a normal boundary condition applied at the outlet (i.e. receiving watercourse water level is below the outlet pipe invert).

2.4.4 Model Results

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

Peak Flow – Major System

Table 2.4 provides a comparison of the pre-development peak flows and the post-development overland flows. The model results demonstrate that the post-development major system flows will be very similar to the pre-development levels for all storms up to and including the 100-year design event to both the Mississippi River and to the North Tributary. These flows are anticipated to be sheet flows similar to preconstruction runoff conditions and are not anticipated to be concentrated. Based on this assessment, there should be no increase in erosion potential or other adverse impacts resulting from the major system runoff to the Mississippi River and to the North Tributary. Overland flow patterns will be reviewed during the detailed drainage and grading designs to determine if erosion control measures will be necessary.

Surface flows that had previously been directed to the West Tributary and were then conveyed to the North Tributary and then to Wolf Grove Creek, have decreased. The net result of this decrease are lower total flows to Wolf Grove Creek, which is understood to provide a net benefit to the neighbouring properties due to reports of occasional high-water levels overtopping the downstream creek banks.

Table 2.4: Major System Flows

Outlet		Major System Flows (L/s) [1]			
		25mm	2yr	5yr	100yr
Mississippi River	*Pre*	6	17	43	160
	Post	20	27	51	130
	Diff	14	10	7	-30
North Tributary	*Pre*	471	909	1679	4408
	Post	466	888	1640	4325
	Diff	-5	-21	-39	-84
West Tributary / Park Lands	*Pre*	150	284	518	1349
	Post	76	110	188	513
	Diff	-74	-174	-330	-836

[1] All storm events used the 3-hour Chicago distribution, except for the 25mm event which used the 4-hour Chicago distribution.

Peak Flow – Minor System

The outlet will consist of a 1650mm diameter pipe with a headwall. The outlet will be designed to ensure no erosion or other adverse impacts to the Mississippi River. Peak flows through the minor system outlet are summarized in **Table 2.5.**

Table 2.5: Minor System Flows

Outlet	Minor System Flows (L/s) [1]			
	25mm	2yr	5yr	100yr
Mississippi River	1160	1600	2282	4254

[1] *All storm events used the 3-hour Chicago distribution, except for the 25mm event which used the 4-hour Chicago distribution.*

Peak Flow – Total

The proposed development has a total area of 16.83 ha. In pre-development conditions, 2.34 ha flows to the Mississippi River and the remaining 14.49 ha drains to Wolf Grove Creek (includes the North and West Tributaries). The drainage changes in post development conditions results in an increase the drainage area to the Mississippi River (12.94 ha) and a decrease in drainage area to Wolf Grove Creek (3.89 ha).

Under pre-development conditions, storm runoff from the site is conveyed overland to the North Tributary, West Tributary, Wolf Grove Creek, and the Mississippi River. The North and West tributaries outlet to Wolf Grove Creek just downstream of the development site and are therefore included in the overall flows to Wolf Grove Creek.

Under post-development conditions, the North Tributary and Park Lands (formerly West Tributary) will only receive direct (surface) runoff from the proposed development. Wolf Grove Creek will not receive any direct surface runoff from the development. The Mississippi River will receive both major and minor flows.

The overall pre- and post-development peak flows from the site to both watercourses has been provided in **Table 2.6** for additional clarity.

Table 2.6: Overall Flows

Outlet		Overall (Major + Minor) Flows (L/s) [1]			
		25mm	2yr	5yr	100yr
Mississippi River	*Pre*	6	17	43	160
	Post	1179	1627	2332	4385
	Diff	1174	1610	2289	4224
Wolf Grove Creek (Includes Upstream Tributaries)	*Pre*	665	1276	2349	6150
	Post	455	875	1622	4332
	Diff	-210	-401	-727	-1818

[1] *All storm events used the 3-hour Chicago distribution, except for the 25mm event which used the 4-hour Chicago distribution.*

The total pre- and post -development flow contributions to Wolf Grove Creek include the flows from the Brown Lands to the North Tributary and West Tributary/Park Land. **Table 2.6** shows there will be a decrease in the total flow to Wolf Grove Creek and an increase in total flow to the Mississippi River resulting from the proposed development.

The Mississippi River is a large watercourse and will not be impacted by the increased runoff from the development. The additional runoff volume and peak flows associated with development is negligible compared to the total flow in the watercourse.

Wolf Grove Creek is a smaller watercourse with existing dwellings located in close proximity to the watercourse. The decrease in flows to Wolf Grove Creek will not cause any negative impacts to the residences along Wolf Grove Creek.

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, the underside of footing (USF) elevations have not yet been determined. The HGL analysis will be revised at the detailed design stage to reflect the controlled inflows at each inlet to the storm sewers. As such, the HGL within the sewers during the 100-year event have been compared against the obvert of the outlet pipe and the preliminary top of grate elevation for each maintenance hole to ensure any surcharging is at an acceptable level.

Table 2.7: 100-year HGL Elevations

Manhole ID	MH Invert Elevation (m)	T/G Elevation (m)	HGL Elevation - 100-year 3-hour (m)	Min USF (m)	Surcharge Above Obvert (m)	Clearance from T/G (m)
MH100	123.57	126.11	123.57	123.87	0.00	2.54
MH102	122.64	125.01	122.86	123.16	0.00	2.15
MH104	119.65	123.00	120.02	120.32	0.00	2.98
MH106	120.50	123.10	120.59	120.89	0.00	2.51
MH200	113.75	116.12	113.75	114.05	0.00	2.37
MH202	113.26	115.68	113.26	113.56	0.00	2.42
MH204	112.60	115.49	113.22	113.52	0.00	2.27
MH206	113.18	118.04	114.15	114.45	0.07	3.89
MH208	114.76	118.49	115.23	115.53	0.00	3.26
MH210	116.81	119.29	117.14	117.44	0.00	2.15
MH212	117.03	119.55	117.45	117.75	0.00	2.10
MH214	118.30	120.67	118.46	118.76	0.00	2.21
MH216	119.87	122.50	119.99	120.29	0.00	2.51
MH218	120.72	123.05	120.72	121.02	0.00	2.33
MH220	123.11	125.66	123.11	123.41	0.00	2.55
MH222	123.20	126.00	123.20	123.50	0.00	2.80
MH224	119.80	122.80	119.99	120.29	0.00	2.81
MH226	117.16	120.05	117.61	117.91	0.00	2.44
MH300	116.15	119.24	116.84	117.14	0.00	2.40
MH3000	109.34	114.00	111.53	111.83	0.99	2.47
MH3002	109.23	113.00	111.35	111.65	0.92	1.65
MH3004	108.79	113.74	110.60	110.90	0.61	3.14
MH3100	106.49	110.80	107.89	108.19	0.05	2.91
MH3102	106.48	110.80	107.87	108.17	0.04	2.93
MH3104	105.89	110.08	106.68	106.98	0.00	3.40
MH3106	101.75	109.30	102.72	103.02	0.00	6.58
MH3108	98.48	104.76	101.53	101.83	1.40	3.23
MH400	117.77	120.79	117.98	118.28	0.00	2.81
MH500	121.00	123.25	121.00	121.30	0.00	2.25
MH502	119.08	122.34	119.29	119.59	0.00	3.05

Manhole ID	MH Invert Elevation (m)	T/G Elevation (m)	HGL Elevation - 100-year 3-hour (m)	Min USF (m)	Surcharge Above Obvert (m)	Clearance from T/G (m)
MH504	118.69	122.05	118.85	119.15	0.00	3.20
MH506	116.38	118.97	116.61	116.91	0.00	2.36
MH508	113.79	116.42	114.09	114.39	0.00	2.33
MH510	108.17	115.80	110.00	110.30	0.48	5.80
MH512	107.97	113.00	109.69	109.99	0.37	3.31
MH514	107.91	112.97	109.60	109.90	0.34	3.37
MH516	107.76	112.91	109.28	109.58	0.17	3.63
MH518	107.69	112.89	109.11	109.41	0.07	3.78
MH520	107.41	112.80	108.27	108.57	0.00	4.53
MH600	111.79	113.85	111.79	112.09	0.00	2.06
MH700	116.79	119.45	116.79	117.09	0.00	2.66
MH702	117.02	119.32	117.02	117.32	0.00	2.30
MH704	115.04	117.41	115.04	115.34	0.00	2.37
MH706	114.77	117.20	114.98	115.28	0.00	2.22
OGS1	106.49	110.80	107.88	108.18	0.42	2.92
OGS2	106.49	110.80	107.88	108.18	0.42	2.92

As shown in **Table 2.7**, the HGL elevations are generally within the pipes at all maintenance hole locations, except for the pipe runs that were sized to convey the 100-year event. Minimum USF elevations have also been determined to aid in the design of individual lots at the detailed design stage.

3.0 SANITARY SERVICING

3.1 Existing Sanitary Infrastructure & Master Plan Update Requirements

The sanitary outlet for the Subject Site is an existing 250mm sanitary sewer located within Malcolm Street, approximately 200m south on Malcolm Street and 160m east on Strathburn Street from the Subject Site. This gravity sewer ultimately conveys the flows to the Gemmill Bay Pump Station, which pumps to the Municipal Wastewater Treatment Plant (WWTP).

As per the Master Plan Update Report (MPU) (J.L. Richards and Associates, 2018) all flows from these development areas are anticipated to be directed via a force main to this existing gravity sewer system. The MPU had provided for these areas to outlet to existing MH 1-108, however subsequent discussions with the Municipality have identified that there is insufficient cover of the existing sanitary sewer at MH 1-108 and that the forcemain will need to be extended to MH 1-107 (Malcolm Street and Dunn Street). The peak flow anticipated in the MPU from this development area was 10.27L/s. The MPU anticipated that flows from this area would be pumped and would come online in the 2023-2028 time horizon.

The MPU identifies capacity issues with the collector sewer on Malcolm Street between Hope Street (MH 1-102 to MH 1-100) and Almonte Street under the full build out scenario (2037+). The MPU identifies the need for upsizing of the existing sanitary sewer in this area to accommodate the full buildout of the development areas in the northwest quadrant.

Based on a review of information provided by J.L. Richards of the existing sanitary sewer system (see **Appendix C**), there is currently approximately 58% of the peak capacity (+/-24.2L/s) available in the critical pipe run (MH 1-101 to MH 1-100). Based on the MPU (J.L. Richards, 2018) and the additional information provided, the critical pipe runs will exceed the available capacity only when all the future development lands identified to the west of County Road 29 are developed and are contributing flows to the Malcolm Street sanitary sewer. The most significant contributor to the future flow projections (apart from the subject site) are lands located to the west of County Road 29. These lands are identified in the MPU to start contributing flows under the full build out scenario (2037+), are currently not subject to any applications under the Planning Act, and it is anticipated they will not be developed until after the subject lands have been built out.

Refer to **Figure 5** – Off-Site Conceptual Servicing Layout for an illustration of the proposed sanitary connection and layout details.

3.2 Proposed Sanitary Sewer

Off-site works

The proposed off-site sanitary sewer works will consist of twin forcemains from the on-site pump station block, along Street 2, Strathburn Street and Malcolm Street to the existing sanitary maintenance hole (MH 1-107) on Malcolm Street at Dunn Street. Based on MOE criteria, a single forcemain (100mm dia. HDPE) is anticipated to be sufficient to convey the design flows, however twinning the forcemain (2 x 100mm dia. HDPE) is proposed to provide redundancy and future capacity should lands to the north of the proposed development be brought into the urban boundary.

On-site works

The proposed development is anticipated to be serviced by a combination of 200mm diameter and 250mm diameter sanitary gravity sewers. The sewage flows from the site will be directed by gravity to the pump station at the south of the site, adjacent to the proposed park. Oversizing of the sanitary sewer has been proposed from the pump station block to Street 6 to provide sufficient future capacity if Municipality expands the urban boundary to the north in the future.

In addition, sewers will be designed to minimize the depth of sewer wherever possible. A preliminary maintenance hole information summary table has been provided in Appendix C.

3.3 Design Criteria

Population and sanitary flow estimates for the proposed development have been calculated using design criteria from the MPU (J.L. Richards, 2018), comments from the Municipality and the City of Ottawa Sewer Design Guidelines (October 2012, as amended). Preliminary sanitary flow analysis of the Brown Lands residential development has been completed based on the following design criteria:

Demand Values

- Residential Demand = 350 L/cap/day
- Population Density
  - Single Unit = 3.4 persons/unit
  - Semi-detached Unit = 2.7 persons/unit
  - Townhouse Unit = 2.7 persons/unit
- Park Demand = 3700 L/ha/day

Design Parameters

- Max. Residential Peak Factor 'P.F.' = 4.0 (based on Harmon Equation)
- Harmon Correction Factor 'K' = 1.0
- Infiltration Flow Rate = 0.33 L/sec/ha
- Min. Sanitary Flow Velocity = 0.6 m/s
- Manning's Roughness Coefficient 'n' = 0.013

3.4 Sanitary Flow Analysis

The peak sanitary flow for the proposed development is **17.41L/s**. Calculated peak flows for the proposed development are summarized below in **Table 3.1**.

Table 3.1: Peak Sanitary Flows Summary

Phase	Development Condition	Population	Area (ha)	Peak Res. / Park Flow (L/s)	Peak Extran. Flow (L/s)	Peak Design Flow (L/s)
Proposed	Residential	735	14.83	11.52	4.90	16.42
	Park	-	2.00	0.33	0.66	0.99
Totals		735	16.83	11.85	5.56	17.41

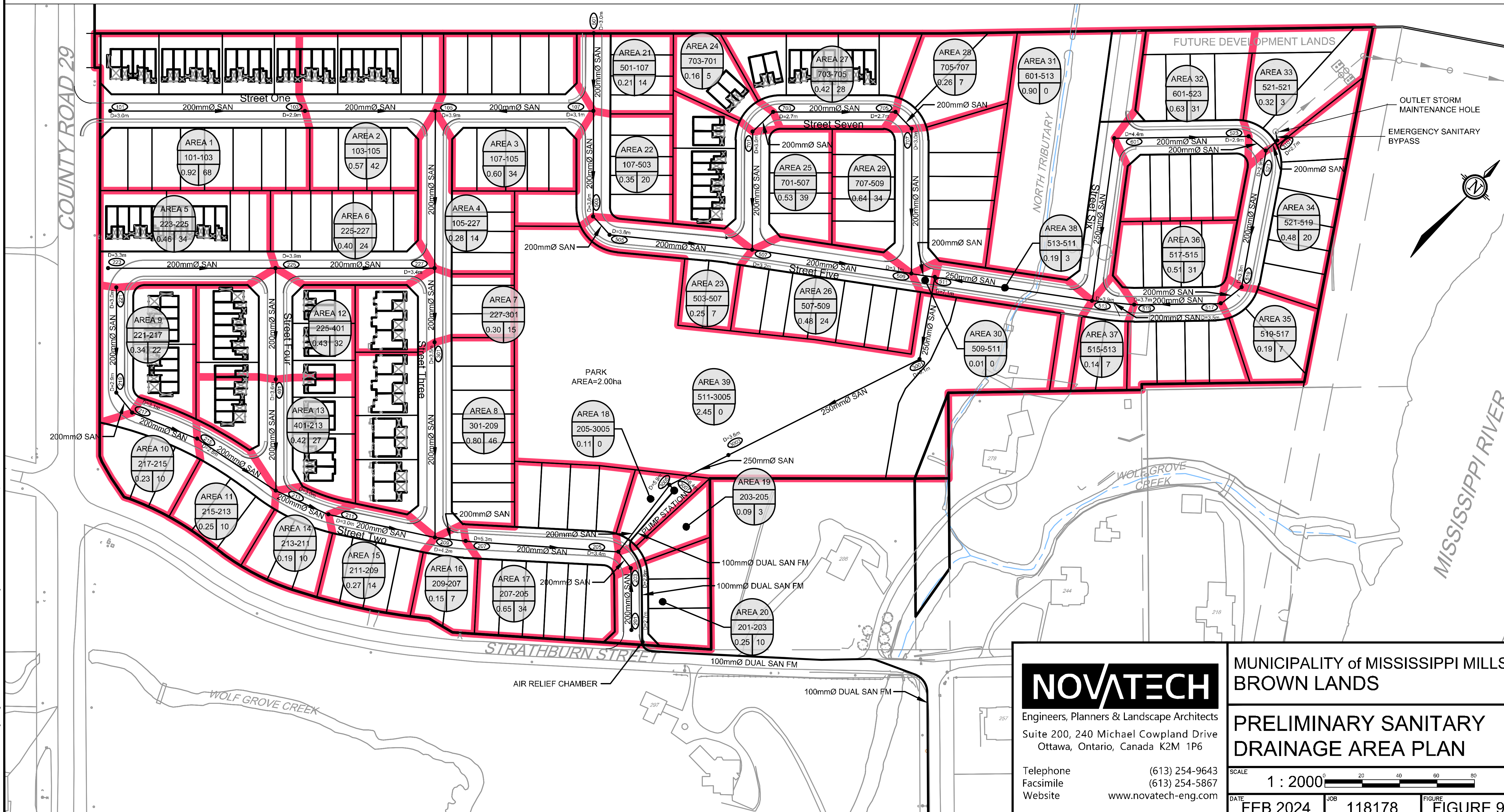
The proposed sanitary sewer network can accommodate the peak design flows calculated for proposed development. Refer to **Figure 9 -** Preliminary Sanitary Drainage Area Plan and the Sanitary Sewer Design Sheet provided in **Appendix C** for details.

Existing Infrastructure Capacity

The proposed peak sanitary sewer flows of 17.41L/s are greater than the 10.27L/s anticipated in the MPU (J.L. Richards, 2018), however, as discussed above, the critical section of the existing downstream sanitary sewer on Malcolm Street (Hope Street to Almonte Street) currently has approximately 24.2L/s of available capacity. The additional proposed flows from the development will not impact the downstream sanitary sewer in the short term, and the required municipal upgrades identified in the long term will be able to accommodate the additional 7.1L/s of additional peak flows from the proposed development.

LEGEND

- AREA ID — AREA 401
- MAINTENANCE HOLE TO MAINTENANCE HOLE — 721-719
- POPULATION — 62
- AREA (IN HECTARES) — 0.73
- SANITARY DRAINAGE AREA BOUNDARY
- PROPOSED SANITARY SEWER
- APPROXIMATE DEPTH OF MAINTENANCE HOLE (T/G - LOW INVERT) — D=4.4m



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

MUNICIPALITY of MISSISSIPPI MILLS
BROWN LANDS

PRELIMINARY SANITARY DRAINAGE AREA PLAN

SCALE 1 : 2000 (0 20 40 60 80)

DATE	JOB	FIGURE
FEB 2024	118178	FIGURE 9

SHT11X17.DWG - 279mmX432mm

M:\2018\118178\CAD\Design\Figures\SAN\118178-FIG9-SAN.dwg, SAN, Feb 12, 2024 - 12:11pm, sbennett

4.0 SANITARY PUMP STATION

The sanitary pump station will be designed for the sanitary demands as discussed in Section 3 above and will be equipped with standby power designed in accordance with the City of Ottawa Sewer Design Guidelines (October 2012, as amended).

Refer to **Figure 10** - Preliminary Sanitary Pump Station Layout, which provides a preliminary layout for the pump station block, and **Figure 11** - Preliminary Sanitary Pump Station Elevation, which provides preliminary elevations for the pump station.

The sanitary pump station will consist of numerous components outlined in the following sections which will be detailed following draft plan approval.

4.1 Wet Well

The wet well will be a prefabricated station (FRP or reinforced concrete) with pump rails, ultrasonic level controls, MultiTrode backup level control, vents, access hatches, and piping. The wet well will be designed to provide a minimum 5-minute cycle time for the pumps under ultimate flow conditions.

The wet well base will be at approximately 8.0m below finish grade to provide working volume below the inlet sewer (to be confirmed as part of detailed design). Flows from the subdivision will enter the wet well through a 250mm sanitary sewer. The wet well will include an inlet basket screen to capture any large debris which could adversely affect pumps. The wet well should be operated in a manner that minimizes retention time and solids accumulation while minimizing pump starts to 5-minute intervals.

A review will be completed during detailed design to determine if the wet well will require installation on a concrete base to provide uplift resistance.

The wet well will be sized to accommodate an additional pump in the future if the lands to the north are added to the urban boundary.

4.2 Odour Attenuation

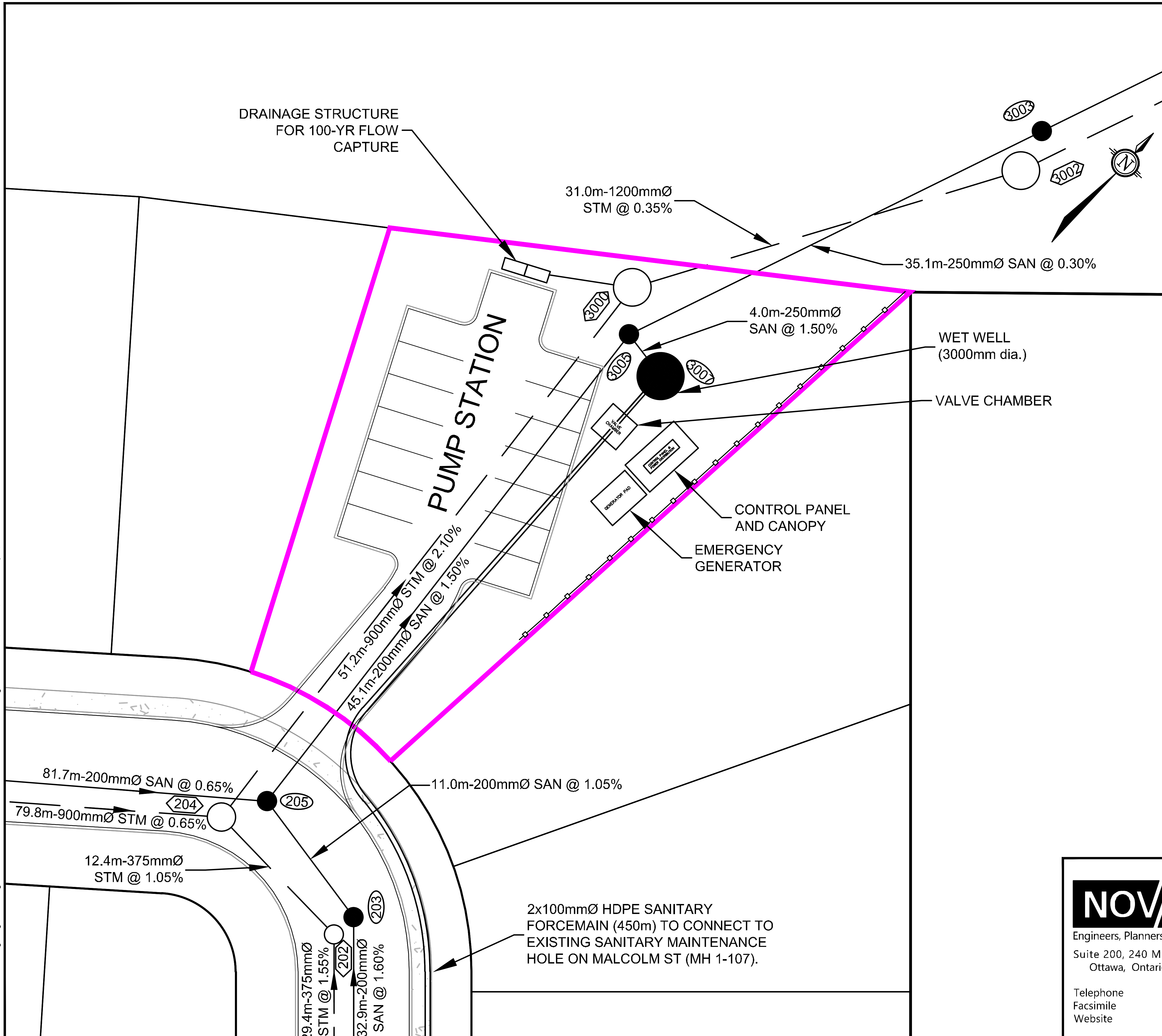
The lift station will be serving a small catchment area and is not expected to have significant odour production. Hydrogen sulphide is the primary source/indicator of odour and is present in wastewater which has had time to significantly consume dissolved oxygen. The wet well operating levels will be detailed to minimize retention. The wet well ventilation pipes will be equipped with carbon filters as another layer of protection against local odors.

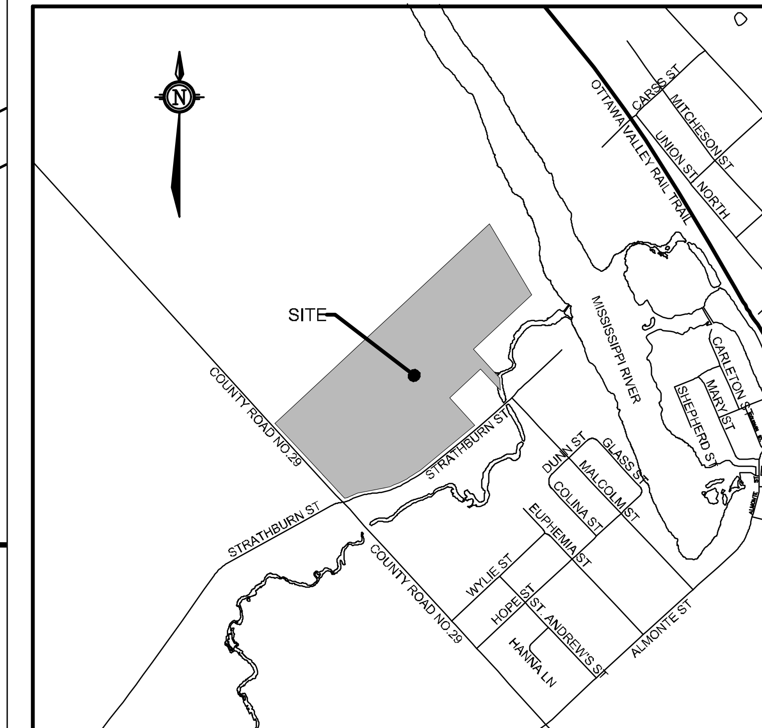
4.3 Sewage Pumps

The wet well will include two sewage pumps. One pump will be a duty pump and the second pump will be standby. The duty pump will cycle after each pump cycle. Each pump will be sized for peak flow. Pump calculations and pump selection will be provided during detailed design.

Pumps will discharge to a 450m length of twinned 100mm diameter HDPE forcemains which will outlet to the existing sanitary gravity sewer on Malcolm Street.

It is anticipated that the total dynamic heads will be approximately 25m.





LEGEND

- SANITARY PUMP STATION PROPERTY LIMITS
- 203 PROPOSED SANITARY MH & SEWER
- 204 PROPOSED STORM MH & SEWER
- PROPOSED CURB
- PRIVACY FENCING

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

MUNICIPALITY of MISSISSIPPI MILLS
BROWN LANDS

PRELIMINARY PUMP STATION LAYOUT

SCALE 1 : 300 (0 3 6 9 12)

DATE FEB 2024 | JOB 118178 | FIGURE FIGURE 10

SHT11X17.DWG - 279mmX432mm

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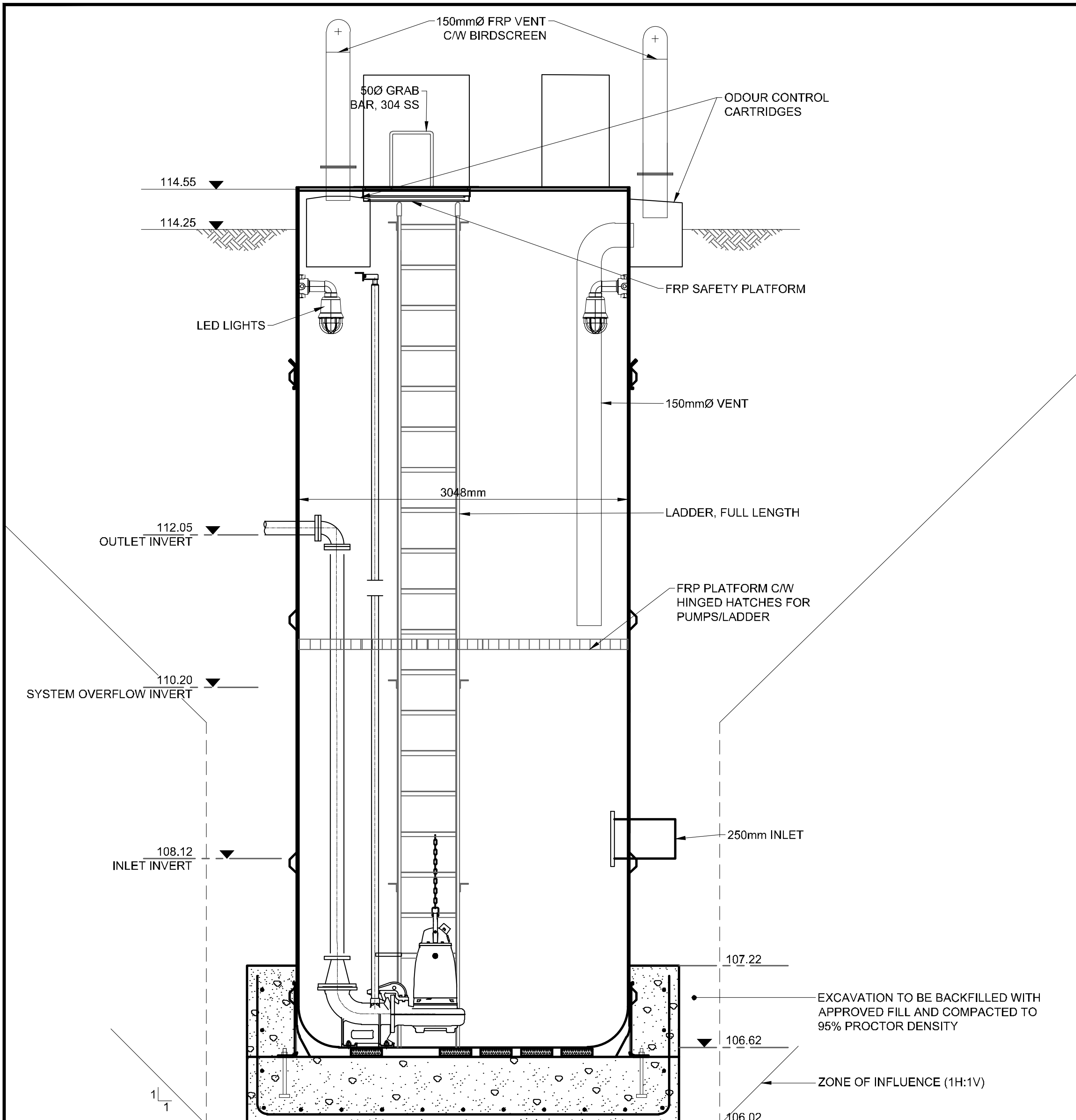

NOTE:
FIGURE PROVIDED FOR THE PURPOSE OF DEMONSTRATING PRELIMINARY ELEVATIONS. WET WELL DETAILS TO BE PROVIDED AS PART OF DETAILED DESIGN STAGE.

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

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PRELIMINARY PUMP STATION ELEVATION

SCALE		
N.T.S.		
DATE FEB 2024	JOB 118178	FIGURE FIGURE 11

4.4 Sewage Flow Totalizer

The wet well will include an ultrasonic level transmitter to provide continuous reading of wet well levels. The OCWA Outpost will be programmed to record both incoming and pumped flow rates for each 1-hour interval based on rate of rise in wet well and number of pump cycles with associated on/ off levels.

4.5 Emergency Generator

An emergency diesel generator will provide standby power in the event of a primary power failure for the lift station. The generator will be sized to power the complete station and will include a subbase double walled diesel tank with capacity for 24-hours of operation.

4.6 Bypass Maintenance Hole

The sanitary sewer will be designed to provide for an emergency overflow to the adjacent watercourses via the on-site storm sewer in the event of a catastrophic failure of the sanitary pump station. The bypass will be designed to provide a minimum of 0.3m of clearance between the sanitary HGL and the upstream underside of footings (USFs).

Currently the bypass is proposed to be constructed at the northeast corner of the sanitary sewer system outletting to the storm sewer immediately upstream of the OGS units. Further review will be completed during detailed design and the location of the emergency bypass will be determined at that time.

Emergency overflow pipes will include a backflow preventer to provide protection against reverse flows. Ultrasonic level transmitter will be provided to monitor sewage levels and provide the PLC with level readings to allow emergency overflow volumes to be calculated based on sewage level relative to an overflow weir located at the emergency overflow pipe entrance as emergency overflow volumes will need to be reported to the MECP. A full reporting protocol and operational manual will be prepared for use by the lift station operators.

4.7 Electrical/Control Panels

The lift station will include control panels and a 3m x 3m canopy. The canopy will house the electrical and control panels. Separate panels will be provided for electrical distribution and control wiring.

4.8 Communications Feed

The lift station will include an OCWA Outpost system which will communicate by radio with the treatment plant. In addition, alarms will be dispatched by cell to a dispatch provider.

4.9 Process Control Narrative

A Process Control Narrative will be provided during detailed design. It will provide an overall summary of the pump station, its components, how its operation will be phased with development and other design components of the facility.

5.0 WATER SERVICING

5.1 Existing Watermain Infrastructure & Master Plan Update Requirements

The existing watermain infrastructure adjacent to the Subject Site is currently limited. The existing watermain includes a 150mm diameter watermain at the corner of County Road 29 and Wylie Street and a 150mm diameter watermain on Malcolm Street at Strathburn Street. Based on boundary conditions supplied by J.L. Richards (see **Appendix D**) this existing infrastructure is unsuitable to support the required water demands of the Subject Site.

The MPU (J.L. Richards, 2018) identifies the following three water distribution system upgrades to service residential development in the northwest quadrant of the Municipality where the Subject Site is situated:

- County Road 29 Looping – Wylie to Dunn Street – 250mm dia. – Short Term (2018-2022)
- County Road 29 Well 6 to Wylie Street Upgrade – 250mm dia. – Mid-Term (2023-2028)
- Mississippi River Third Crossing (and associated upgrades on east side of River) – Carss Street to Brown Lands – 300mm dia. – Mid-Term (2023-2028)

The Municipality of Mississippi Mills has indicated that these projects are proceeding as scheduled (Meeting Minutes, July 26, 2023, **Appendix A**).

The report also identifies that the County Road 29 watermain and the Mississippi River Third Crossing will operate in a separate pressure zone than the watermain servicing the existing residential units in the northwest (Malcolm Street, Wylie Street etc.). Previous correspondence from the Municipality (C. Smith, February 2022, **Appendix A**) indicated that a connection to the existing watermain on Malcolm Street at Strathburn Street would be required for the development. Based on the boundary conditions provided and that this watermain will be operating in a lower pressure zone, this connection is not required as it is not capable of providing additional flow capacity, and if provided would require a pressure reducing valve. The boundary conditions provided by J.L. Richards indicate that the County Road 29 watermain will operate at the ultimate system pressure zone from the commissioning of the watermain.

Based on the MPU (J.L. Richards, 2018), correspondence from the Municipality (C. Smith, February 2022, **Appendix A**), and further discussions with the Municipality, it is anticipated the development will operate under two distinct hydraulic conditions:

- Interim Condition – Single connection to the 250mm dia. on County Road 29 at Dunn Street (available in 2025). This condition will be able to provide sufficient pressures and flows for residential uses. It will have a limited fire flow capacity of 45L/s and lack redundancy. It is anticipated that 50 units will be developed under this condition. The watermain network will be extended to the northeast corner of the site to allow the connection to the Mississippi River prior to the development of additional units. Should the Municipality be delayed in constructing the Third River crossing, the pipe network operating under interim condition has the capacity to provide sufficient pressures and flows to allow the development of additional units. The Municipality has indicated that at least another 25 units would be permitted under this scenario should the crossing be delayed.

- Ultimate Condition – Looped connection to the 300mm dia. Mississippi River Third Crossing in the northeast corner of the site (available in 2027) and the initial connection to 250mm dia. on County Road 29 at Dunn Street. This condition will have sufficient pressures and flows for residential uses and fire flows (up to +/-148L/s) required for the proposed development, in addition to providing service redundancy with the multiple connection locations.

5.2 Proposed Watermain

The proposed development is anticipated to be serviced by a 250mm diameter backbone watermain combined with 200mm diameter, 150mm diameter and 50mm diameter distribution mains.

The backbone watermain will be extended from the southwest corner of the site (Street 2), along County Road 29 to connect to the proposed 250mm dia. watermain to be installed by the Municipality at Dunn Street. A second connection will be provided through the servicing block in the northeast corner of the site to the proposed 300mm dia. watermain (Mississippi River Third Crossing - to be installed by the Municipality) at a later stage in the development once the crossing has been constructed. The exact configuration of this connection will be determined once more details regarding the watermain river crossing location are available.

Refer to **Figure 12** - Preliminary Watermain Layout/Watermain Node Locations for the proposed watermain layout.

5.3 Design Criteria

Design criteria for the Subject Site is based on the MPU (J.L. Richards, 2018), additional comments from the Municipality, and the City of Ottawa Design Guidelines for Water Distribution (July 2010, as amended). Preliminary watermain analysis of the proposed development was completed based on the following criteria:

Demands

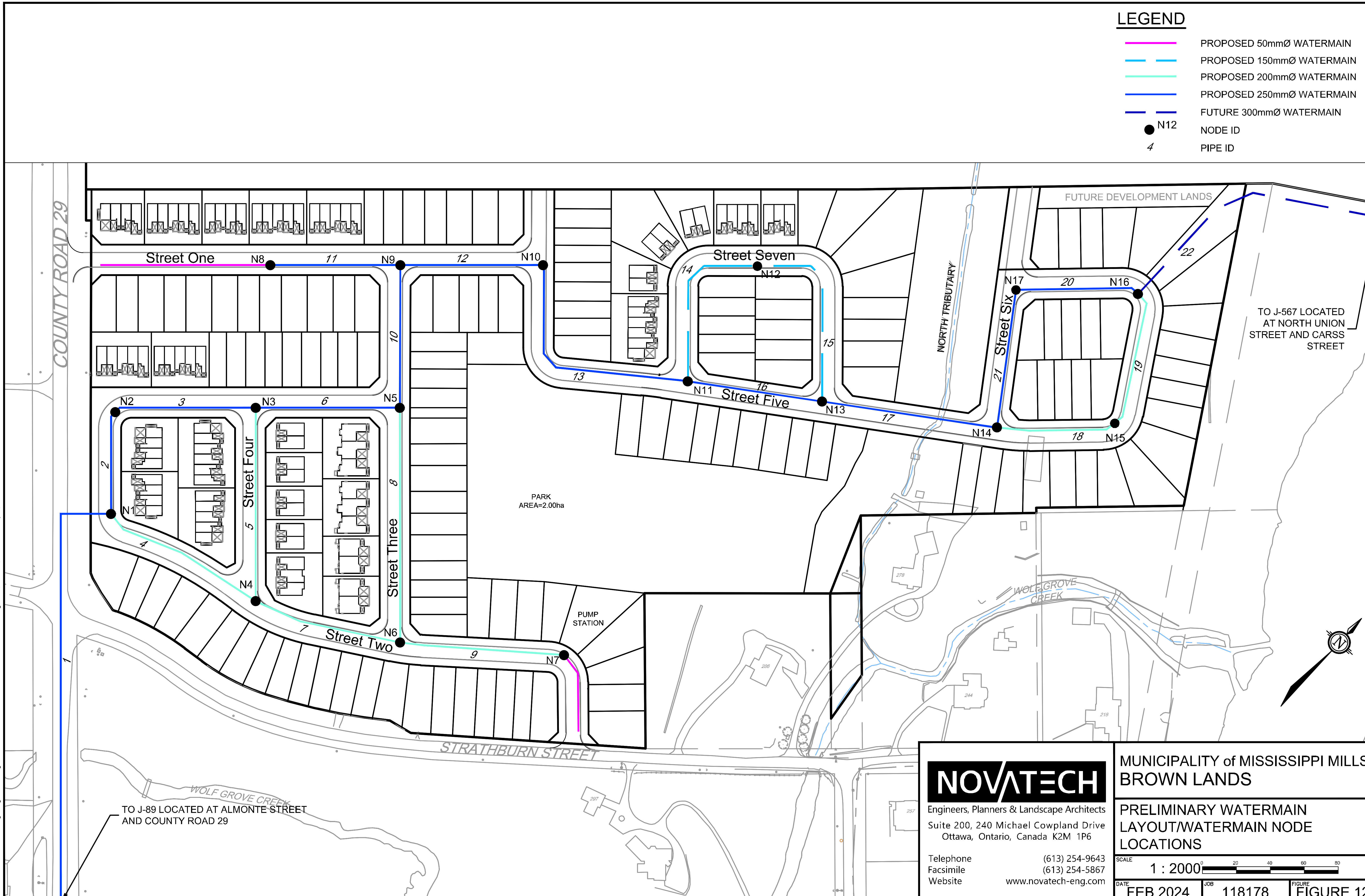
Average daily demand	=	350 L/day/cap
Single family unit density	=	3.4
Semi-Detached/Townhouse unit density	=	2.7
Apartments (Not Required)	=	2.1
Maximum Daily Demand	=	2.5 x Average Daily Demand
Peak Hour Demand	=	2.2 x Maximum Daily Demand

System Requirements

Maximum System Pressure (ROW)	<	690 kPa (100psi)
Maximum System Pressure (Services)	<	552 kPa (80psi)
Minimum System Pressure	>	276 kPa (40psi) excluding fire flows
Minimum System Pressure	>	138 kPa (20psi) including fire flows
Maximum Age	<	24 hours (on-site)

Friction Factors (C)

50mm copper/150mm PVC	=	100
200mm/250mm PVC	=	110
300mm PVC	=	120



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

MUNICIPALITY of MISSISSIPPI MILLS
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PRELIMINARY WATERMAIN LAYOUT/WATERMAIN NODE LOCATIONS

SCALE	1 : 2000		
DATE	FEB 2024	JOB 118178	FIGURE 12

SHT11X17.DWG - 279mmX432mm

Fire Flow Demands

The Municipality has indicated that the Fire Underwriters Survey (FUS) method is to be used to determine the required fire flow demands for the watermain analysis under ultimate service conditions. The Municipality will accept use of the Ontario Building Code (OBC) method to determine the required fire flow demands for interim servicing requirements, as confirmed in the meeting with the Municipality (Meeting Minutes, July 26, 2023, **Appendix A**).

Fire flow demands were calculated for the proposed building types and zoning setbacks using both the Ontario Building Code (OBC, 2012) method and the Fire Underwriters Survey (FUS, 2020) simple method and included in a memorandum to the Municipality (Water Servicing – Buildout Timing and Fire Flow Requirements, Revision 1, February 13, 2024, **Appendix D**). The required fire flows from both calculation methods can be found in **Table 5.1**.

Table 5.1: OBC and FUS Required Fire Flows (Typical Wood Frame Construction)[1]

Unit Size (Largest EQ Homes 2023 Unit)	OBC Required Fire Flow (L/s)	FUS Simple Method (L/s)[2]
Two-Storey Single (33’)	45	133
Two-Storey Single (37’)	45	133
Two-Storey Single (42’)	45	133
One-Storey Single (50’)	45	133
Two-Storey Single (50’)	45	133
2-Unit Bungalow Townhome	60[3]	67
3-Unit Bungalow Townhome	105[3]	133
4-Unit Two-Storey Townhome	105[3]	133
5-Unit Two-Storey Townhome	105[3]	133
6-Unit Two-Storey Townhome	150[3]	133

1. *Fire flow calculations for all units are based on maximum total interior footprint area (including exterior and interior wall areas, excluding porches).*
2. *As per Table 7 & Table 8 (FUS 2020). Exposure distances are 2.4m (<3m) for singles and 3m (3-10m) for townhomes.*
3. *Fire flows for all townhome units can be reduced to 45L/s by incorporating 2-hr firewall(s) into the blocks (Table 5.2).*

Per **Table 5.1**, the OBC fire flow demand for the proposed townhome unit types exceeds the supply that is available under interim servicing conditions (45L/s). A review was completed on the impacts of providing 2-hour rated internal firewalls between townhome units. The results are summarized in **Table 5.2**.

Table 5.2: OBC Required Fire Flow For Townhome Units with 2-hour Internal Firewalls

Unit Size (Largest EQ Homes 2023 Unit)	OBC Required Fire Flows (L/s)	
	1 - 2hr Internal Firewall	2 - 2hr Internal Firewalls
2-Unit Bungalow Townhome	45	Not Required
3-Unit Bungalow Townhome	60	45
4-Unit Two-Storey Townhome	45	Not Required
5-Unit Two-Storey Townhome	60	45
6-Unit Two-Storey Townhome	75	45

The fire flow available under interim servicing conditions (45L/s) is adequate to meet the demand for all single unit product types proposed for this development. In addition, all proposed townhome units can be accommodated if 2-hour firewalls are provided should the builder wish to proceed with the construction of townhome units prior to the completion of the third river crossing. Fire flow calculations can be found in **Appendix D**.

Under ultimate servicing conditions the available fire flow (+/-148L/s) is sufficient to meet the required FUS demand (133L/s).

5.4 Hydraulic Analysis

The hydraulic modelling software EPANET (v2.2) was used to analyze the performance of the proposed watermain configuration for three (3) theoretical conditions:

- Maximum HGL (Average Day)
- Peak Hour
- Maximum Day + Fire Flow Demand

The hydraulic model is based on the boundary conditions provided by J.L. Richards & Associates Limited (2022). Where required, the boundary conditions were interpolated to provide approximated system pressures under different demand scenarios. The system was modelled for each of the 2 proposed scenarios, an interim condition based on a single off-site connection to the 250mm dia. watermain on County Road 29 and an ultimate condition based on two off-site connections, one to the 250mm dia. watermain on County Road 29 and the second to the 300mm dia. Mississippi River Third Crossing. All analyses were completed under a full build out scenario. Refer to **Figure 12** - Preliminary Watermain Layout/Watermain Node Locations for a schematic representation of the hydraulic network and depicts the node and pipe numbers used in the model. Refer to **Appendix D** for the boundary conditions, hydraulic demands, and modeling results.

Phased hydraulic analyses will be completed at detailed design as required.

5.4.1 Interim Conditions

The hydraulic analysis of the proposed watermain network under interim conditions with a single off-site connection to the 250mm dia. watermain on County Road 29 was completed. The modeled fire flow demands were limited to 45L/s due to existing system constraints under this scenario. The results are presented in **Table 5.3**.

Table 5.3: Hydraulic Analysis Summary – Interim Conditions

Condition	Demand (L/s)	Min/Max Allowable Pressure (kPa/psi)	Min/Max Operating Pressure (kPa/psi)	Max. Age (hrs)
Maximum HGL (Avg. Day)	2.98	ROW - 689.5/100 (Max) Private - 551.6/80 (Max)	641.7/93.07 (Max)	36.8
Peak Hour	16.37	275.8/40.0 (Min)	466.7/67.69 (Min)	N/A
Max. Day Demand (& 45L/s Fire Flow)[1]	52.44	137.9/20.0 (Min)	158.3/22.96 (Min)	N/A

1. Fire Flow demand has been capped at 45L/s under the interim scenario due to existing system limitations.

Based on the analysis, the maximum pressure will exceed the allowable limit for private services. Pressure reducing valves will be required on an individual unit basis with the exact limits to be determined at detailed design. The maximum age of the water on-site will exceed the allowable (24hrs max.) in the eastern areas of the development. As these areas will be the last to be developed, the requirement for mitigation (flushing hydrants etc.) will be reviewed during detailed design based on phasing and the timing of the ultimate connection. Minimum system pressures under peak hour demands and during the critical fire flow event (45L/s) exceed the minimum requirements. Complete analysis results are provided in **Appendix D.**

Conclusion

While the proposed system lacks redundancy of the backbone watermain under the interim condition, the proposed configuration meets regulatory requirements. The Municipality currently has several existing developments which have a single backbone watermain, at least one of which is in a permanent situation (White Tail Ridge).

The development phasing will provide on-site looping of the watermain under interim conditions. Although the interim hydraulic modelling has been completed for full development build out, it is estimated that development would take place over the 4 years, meaning that only 50% of the development would likely be completed by the time that the third river crossing is completed (2027).

Under the interim conditions, only 45L/s of fire flows are anticipated to be available through the municipal water system. Servicing of proposed townhome units can be accommodated if 2-hour firewalls are constructed in the units as per **Table 5.2** to limit the required fire demand to 45L/s**,** should the builder wish to proceed with occupancy of townhome units prior to the completion of the Mississippi River Third Crossing (ultimate condition).

The development can be adequately serviced on an interim basis with a single feed watermain, provided that the 250mm diameter watermain is installed by the Municipality from Well 6 along County Road 29 to Dunn Street as planned.

5.4.2 Ultimate Conditions

The hydraulic analysis of the proposed watermain network under ultimate conditions with two off-site connections, one to the 250mm dia. watermain on County Road 29 and the second to the 300mm dia. Mississippi River Third Crossing, was completed. The results are presented in **Table 5.4**.

Table 5.4: Hydraulic Analysis Summary – Ultimate Conditions

Condition	Demand (L/s)	Min/Max Allowable Pressure (kPa/psi)	Min/Max Operating Pressure (kPa/psi)	Max. Age (hrs)
Maximum HGL (Avg. Day)	2.98	ROW - 689.5/100 (Max) Private - 551.6/80 (Max)	654.8/94.97 (Max)	8.2
Peak Hour	16.37	275.8/40.0 (Min)	510.8/74.08 (Min)	N/A
Max. Day Demand (& 133L/s Fire Flow)[1]	140.44	137.9/20.0 (Min)	181.9/26.38 (Min)	N/A

1. *Fire Flow demand is based on Fire Underwriters Survey (FUS 2020) Simple Method calculations.*

Based on the analysis, the maximum pressure will exceed the allowable limit for private services (80psi). Pressure reducing valves will be required on an individual unit basis with the exact limits to be determined at detailed design. Minimum system pressures under peak hour demands and during the critical fire flow event (up to and including 133L/s) exceed the minimum requirements. Complete analysis results are provided in **Appendix D.**

Conclusion

The development can ultimately be adequately serviced provided that the 250mm diameter watermain is installed from Well 6 along County Road 29 to Dunn Street and the Third Mississippi River Crossing and associated upgrades are completed as planned by the Municipality.

6.0 UTILITY INFRASTRUCTURE

The development will be serviced by 4-party joint utility trenches containing hydro (Ottawa River Power Corporation), communications (Bell, Rogers and Cogeco), gas (Enbridge), and streetlighting as per the proposed 18.0m standard right-of-way cross-sections (**Figure 13** - Typical Road Cross Section - Sidewalk One Side and **Figure 14** - Typical Road Cross Section - Sidewalk Both Sides). Engagement with the respective utility companies will be undertaken following the draft plan of subdivision approval process.

7.0 PHASING

The Brown Lands residential development is anticipated to be constructed in multiple phases, commencing in the southwestern portion of the site (Street 2, Strathburn Street to Country Road 29), and advancing to the north and then east. Phase 1 of the development comprises the western half of the site and will include Streets One, Two, Three and Four. Phase 2 of the development will include Streets Five, Six and Seven and the park block. Each phase may be constructed in multiple subphases, depending on servicing and market factors.

8.0 ROADWAYS

On-Site Roadways

The internal subdivision roads will be constructed in accordance with the typical road cross-sections as shown in **Figure 13** - Typical Road Cross Section - Sidewalk One Side and **Figure 14** - Typical Road Cross Section - Sidewalk Both Sides. All roads will have an 18-metre right-of-way with an 8.5-metre asphalt width and curbs. Refer to **Figure 15** - Network and Pathways Plan for sidewalk locations. Preliminary grading for the Subject Site is shown on **Figure 7 –** Conceptual Grading Plan.

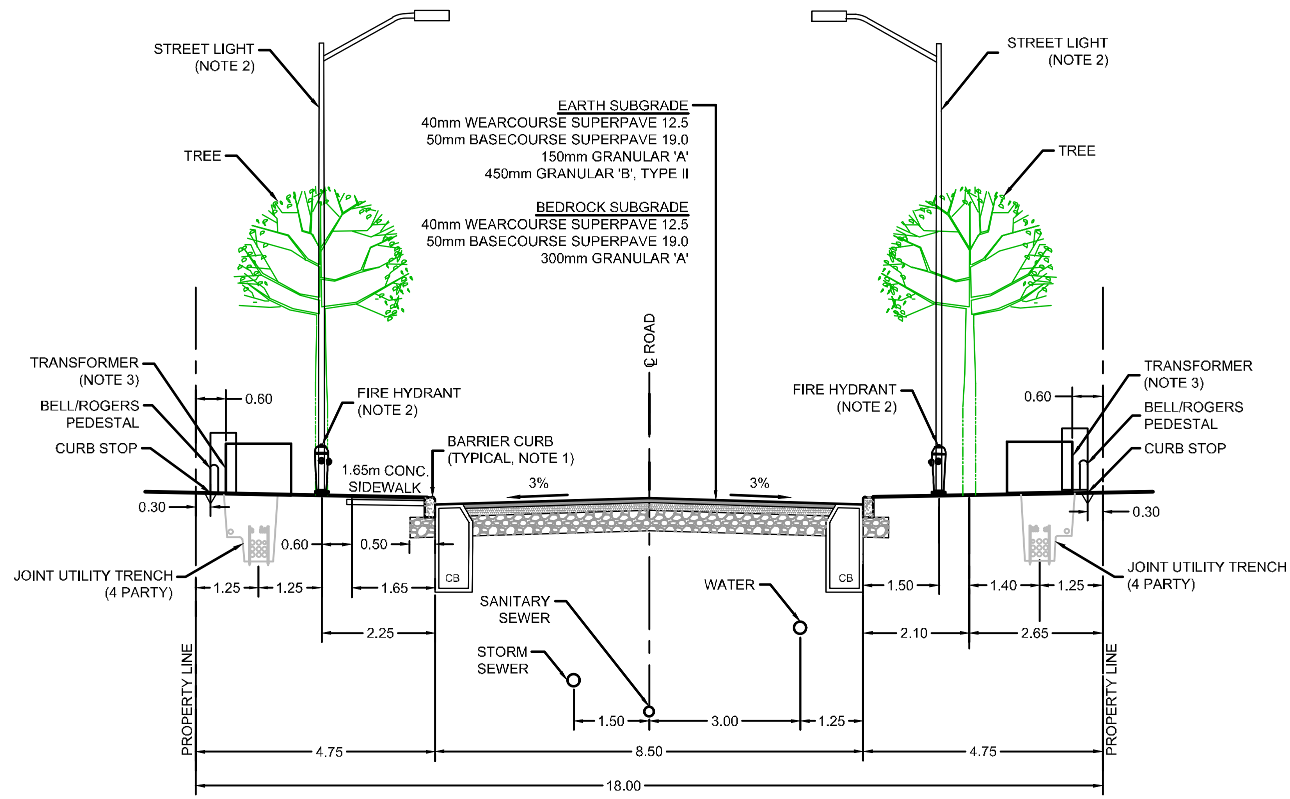
Existing Roadways (County Road 29, Strathburn Street and Malcom Street)

Any disturbances to County Road 29, Strathburn Street or Malcolm Street to facilitate the installation of required infrastructure (watermain and sanitary forcemain) are anticipated to be reinstated back to existing conditions.

As detailed in the Traffic Impact Study (Novatech, 2024), a northbound left turn taper on County Road 29 at Street One is anticipated.

It is anticipated that the 250mm dia. watermain required on County Road 29 will be constructed on the west shoulder of the roadway to mitigate traffic impacts.

It is anticipated that the 360m of sanitary forcemain proposed to be installed along Strathburn Street and Malcolm Street will be constructed along the north shoulder of Strathburn Street, cross under the existing box culvert via trenchless installation and then continue along the west shoulder of Malcolm Street. Refer to **Figure 16 –** Existing Road Cross Section – Malcolm Street for the proposed location of the sanitary forcemain within the right-of-way.



NOTES:

1. MOUNTABLE CURB TO BE INSTALLED IN FRONT OF TOWNS. TRANSITION LOCATIONS TO BE NOTED ON GRADING PLANS.
2. FIRE HYDRANTS TO BE LOCATED ON WATERMAIN SIDE OF STREET. STREET LIGHTS TO BE ON OPPOSITE SIDE.
3. TRANSFORMERS TO BE LOCATED ON THE OPPOSITE SIDE OF THE SIDEWALK WHEREVER POSSIBLE.

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

MUNICIPALITY of MISSISSIPPI MILLS
BROWN LANDS

TYPICAL ROAD CROSS SECTION - SIDEWALK ONE SIDE

SCALE 1 : 150 (0 2 4 6)

DATE FEB 2024 | JOB 118178 | FIGURE FIGURE 13

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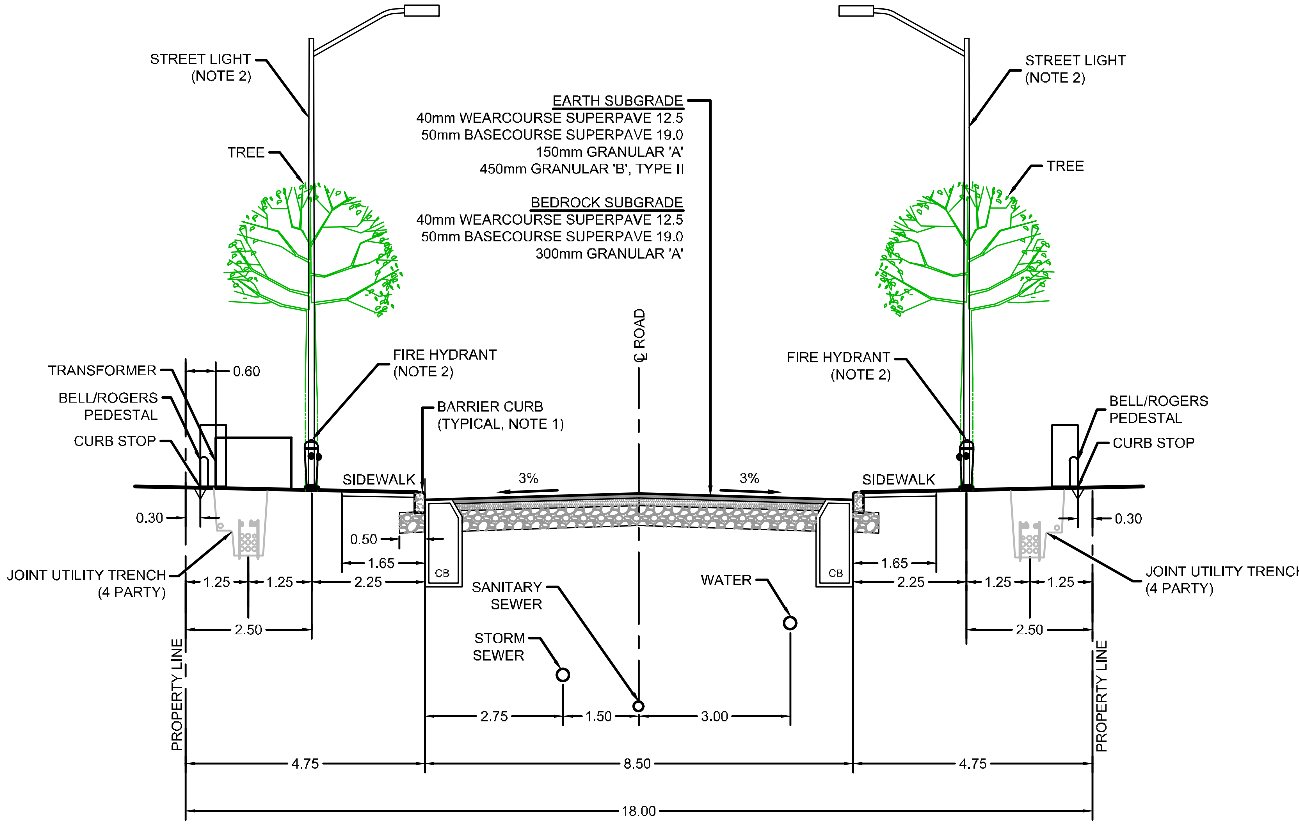

NOTES:

1. MOUNTABLE CURB TO BE INSTALLED IN FRONT OF TOWNS. TRANSITION LOCATIONS TO BE NOTED ON GRADING PLANS.
2. FIRE HYDRANTS TO BE LOCATED ON WATERMAIN SIDE OF STREET. STREET LIGHTS TO BE ON OPPOSITE SIDE.

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

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Facsimile (613) 254-5867
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MUNICIPALITY of MISSISSIPPI MILLS
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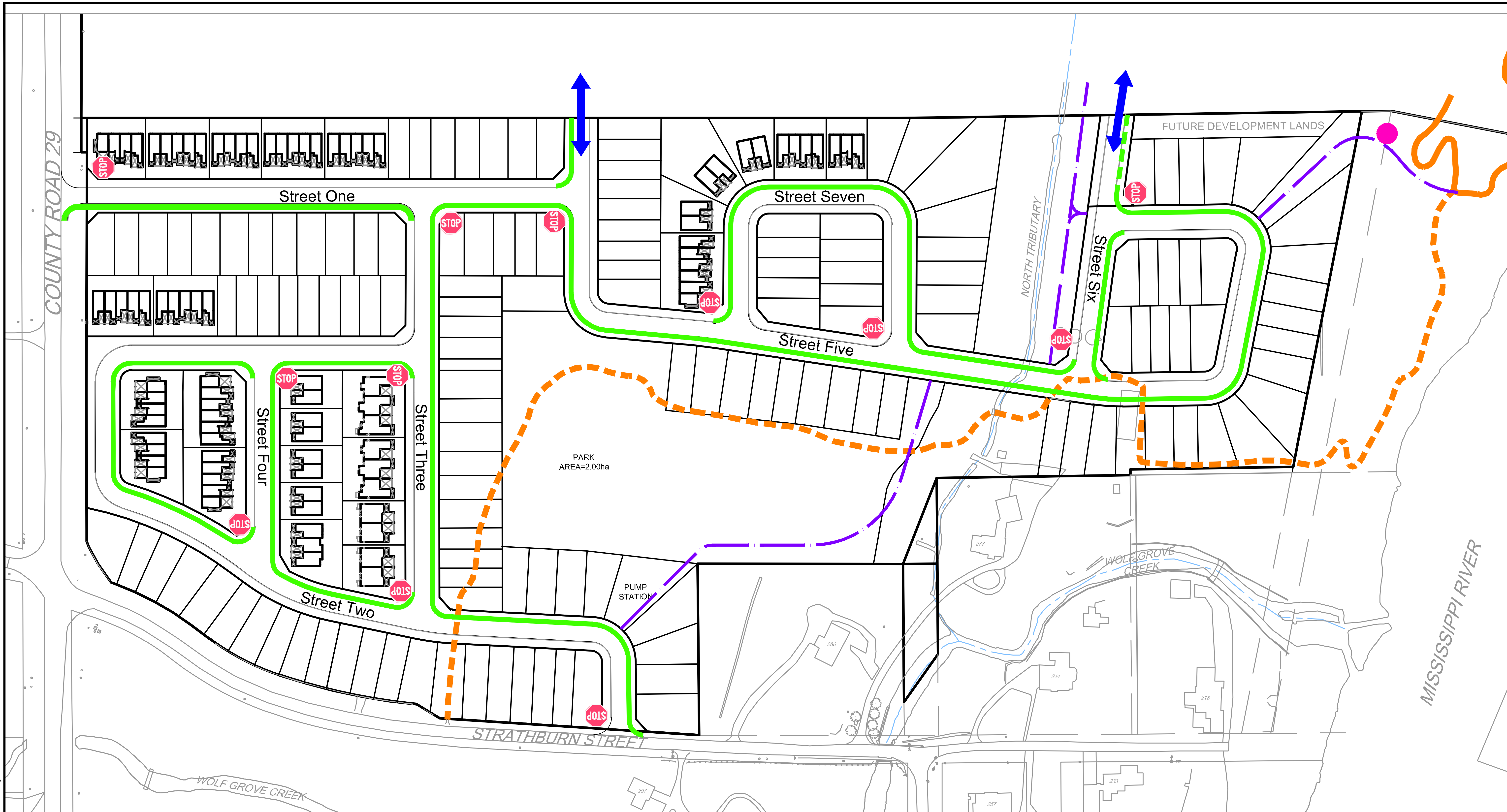
TYPICAL ROAD CROSS SECTION - SIDEWALK BOTH SIDES

SCALE 1 : 150 (0 2 4 6)

DATE FEB 2024 | JOB 118178 | FIGURE FIGURE 14



LEGEND

PROPOSED CONCRETE SIDEWALK	PROPOSED STONE DUST PATHWAY / MAINTENANCE ACCESS ROAD
PROPOSED FUTURE CONCRETE SIDEWALK	POTENTIAL RIVER LOOKOUT
EXISTING MOUNTAIN BIKE TRAIL (TO REMAIN)	VEHICLE CONNECTIONS TO FUTURE DEVELOPMENT LANDS
EXISTING MOUNTAIN BIKE TRAIL (TO BE ABANDONED/REMOVED)	PROPOSED STOP SIGNS

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

MUNICIPALITY of MISSISSIPPI MILLS
BROWN LANDS

NETWORK AND PATHWAYS PLAN

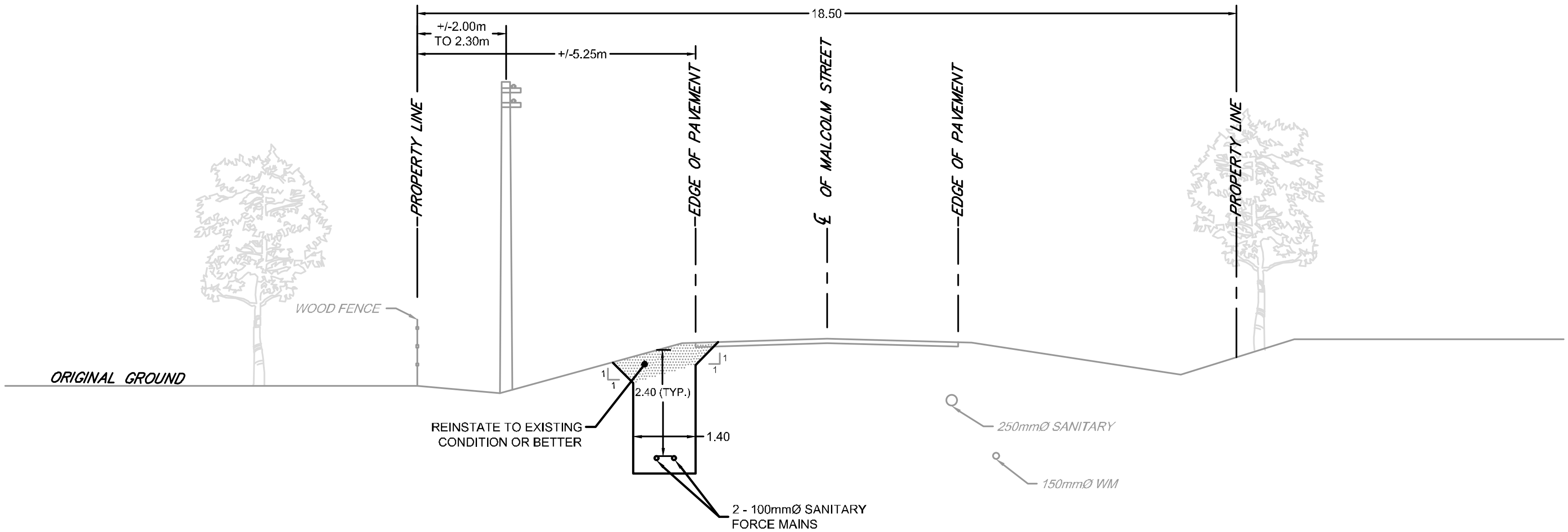
SCALE 1 : 2000 (0 20 40 60 80)

DATE FEB 2024 | JOB 118178 | FIGURE FIGURE 15

SHT11X17.DWG - 279mmX432mm

M:\2018\118178\CAD\Design\Figures\Traffic\118178-NPP.dwg, FIG16-NPP, Feb 20, 2024 - 11:35am, sbennett

EXISTING MALCOLM STREET CROSS SECTION



NOTES:

1. ALL DISTURBED AREAS TO BE REINSTATED TO EXISTING CONDITIONS OR BETTER.
2. SANITARY FORCEMAIN TO BE INSTALLED WITH 2.4m COVER TO FINISHED GRADE OR PROVIDE INSULATION AS REQUIRED FOR EQUIVALENT THERMAL PROTECTION.

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MUNICIPALITY of MISSISSIPPI MILLS
BROWN LANDS

EXISTING ROAD CROSS SECTION - MALCOLM STREET

SCALE 1 : 150 (0 2 4 6)

DATE FEB 2024 | JOB 118178 | FIGURE FIGURE 16

9.0 EROSION AND SEDIMENT CONTROL

9.1 Temporary Measures

The following 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).

To mitigate erosion and to prevent sediment from entering the storm sewer system, temporary erosion and sediment control measures will be implemented on-site during construction in accordance with the Best Management Practices for Erosion and Sediment Control. This includes the following temporary measures:

- Sediment control bags will be placed under the grates of on-site and nearby catchbasins and maintenance holes and will remain in place until vegetation has been established and construction is completed;
- Silt fencing will be placed around the construction limits;
- Straw bale barriers and/or rock flow check dams will be placed within any drainage ditches until vegetation has been established and construction is completed;
- Street sweeping and cleaning will be performed as required to suppress dust and to provide safe and clean roadways adjacent to the construction site;
- Minimize the extent of exposed soil during construction and re-establish vegetation as soon as possible; and
- After construction is complete, all sewers are to be inspected and cleaned.

The proposed temporary erosion and sediment control measures would be implemented prior to construction, remain in place throughout each phase of construction, and should be inspected regularly. No control measure is to be permanently removed without prior authorization from the Engineer.

9.2 Permanent Measures

The following will provide permanent erosion and sediment control measures:

- Grass swales along the rear and side yard property lines.
- The oil and grit separator units will be designed to provide quality control for stormwater runoff prior to entering the surrounding watercourses.
- Rear yard drainage systems will be designed with a perforated pipe and clear stone surround to promote infiltration.
- Locations of major system flows will be reviewed during detailed design and appropriate erosion control measures will be implemented for those locations.
- Slopes on finished lot grades will be minimized where possible to slow the runoff of water.

10.0 CONCLUSIONS AND RECOMMENDATIONS

This report has been prepared in support of a draft plan of subdivision application for the proposed Brown Lands residential development.

- Stormwater runoff from the site will be captured by an on-site storm sewer system via a series of rear-yard swales and roadside catchbasins.
- Storm servicing for the subdivision will be provided using a dual drainage system; runoff from frequent events will be conveyed by gravity sewers (minor system), while flows from large storm events that exceed the capacity of the minor system will be conveyed along defined overland flow routes (major system).
- The minor system will direct runoff directly to the Mississippi River through an outlet located at the northeast corner of the site.
- The major system flows from Phase 1 will be directed to the North Tributary through the park block, and ultimately outlet to the Mississippi River. The major system flows from Phase 2 will be directed to the Mississippi River through a servicing block at the northeast corner of the site.
- Quality control of stormwater runoff will be provided by oil and grit separators, positioned upstream of the stormwater outlet.
- The development will be serviced by gravity sanitary sewers flowing to an on-site pumping station. Flows will be conveyed via a forcemain outletting to the existing sanitary sewer on Malcolm Street.
- Under interim hydraulic conditions, the development can be adequately serviced by a single watermain connection to the proposed 250m watermain on County Road 29 based on Ontario Building Code (OBC) fire flow demands. Pressure reducing valves will be required for some units within the development. The fire flows required by the proposed townhome units can be accommodated by incorporating 2-hour firewall(s) between some townhome units should the builder wish to proceed with occupancy of the units prior to the completion of the Mississippi River Third Crossing. Further assessment at detailed design will be required to determine phasing and mitigation requirements related to water age.
- Under ultimate hydraulic conditions, the proposed watermain network can adequately service the development based on Fire Underwriters Survey (FUS) fire flow demands. Pressure reducing valves will be required for some units within the development. Two off-site connections will be provided. The first to the proposed 250m watermain upgrade on County Road 29 at Dunn Street and the second to the proposed 300mm dia. Mississippi River Third Crossing.
- The development will be serviced by hydro, communication, gas and streetlights as per the proposed standard right-of-way cross-sections.
- The roadways will consist of typical 18.0m cross sections.
- Temporary and permanent erosion and sediment control measures will be provided.

NOVATECH

Prepared by:

Samantha Bennett, M.A.Sc., E.I.T.
Project Coordinator | Land Development

Prepared by:

Melanie Schroeder, P.Eng.
Project Engineer | Water Resources

Reviewed by:

Trevor McKay, P.Eng.
Project Manager | Land Development

APPENDIX A

CORRESPONDENCE

Meeting Minutes – Brown Lands – Almonte, by Evan Garfinkel, Regional, July 26, 2023, 4 Pages

Water and Wastewater Calculation Factors, Email from David Shen, Municipality of Mississippi Mills, January 31, 2023, 2 Pages

Mills Extension Watermain Boundary Condition Request, Email from David Shen, Municipality of Mississippi Mills, January 31, 2023, 4 Pages

Brown Lands – Pre-consultation Notes – Clarification Request / Response, Email from Trevor McKay, Novatech, November 22, 2022, 2 Pages

Pre-Consultation Meeting Notes, by Julie Stewart, County of Lanark, received November 4, 2022, 2 Pages

Brown – Strathburn Lands – Review of Concept Plan 5, Letter by Melanie Knight, Municipality of Mississippi Mills, October 24, 2022, 5 Pages

Plans of Subdivision Pre-Consultation Checklist – Brown Lands, Lanark County, received December 13, 2022, 2 Pages

Servicing Requirements for the Development Area known as the Brown Lands, Memorandum by Cory Smith, Municipality of Mississippi Mills, February 10, 2022, 2 Pages

MEETING MINUTES

Re: Brown Lands - Almonte

Meeting Date: July 26, 2023

In Attendance:
Evan Garfinkel ("EG"), Regional Group
Trevor McKay ("TM"), Novatech
David Shen ("DS"), Mississippi Mills
Ken Kelly ("KK"), Mississippi Mills
Cory Smith ("CS"), Mississippi Mills
Melanie Riddell ("MR"), Novatech
John Riddell ("JR"), Novatech
Melanie Knight ("MK"), Mississippi Mills
Luke Harrington ("LH") Mississippi Mills

Meeting Minutes:

1. **Water Servicing:**

   Timing of Municipal Infrastructure Projects
   - EG noted that Regional Group had proceeded with the development application with the understanding that the Municipality's capital works projects would follow the timeline outlined in a Memorandum provided by Staff in February 2022 following pre-consultation. EG explained that Staff had recently provided uncertainty around the timing of capital works projects related to the Brown Lands and requested clarification.
   - JR noted the importance of the capital works projects, not only for the Brown Lands, but also to solve the Municipality's existing watermain looping and redundancy issues.
   - KK confirmed that the Municipality is on schedule with the timelines provided in Staff's February 2022 memorandum.
     - For the Water Crossing, KK confirmed that the EA would proceed in 2024, with detailed design in 2025, and construction in 2026/2027.
     - DS noted that Staff have reached out to Enbridge to explore the possibility of a joint EA, which could potentially expedite the project timeline.
     - For the CR29 watermain extension, KK noted that the Municipality anticipates tendering the project in 2024, with construction commencing in 2024/2025.
     - JR asked if the CR29 extension from Dunn to the Brown Lands was DC eligible***, KK/DS noted that they would have to explore this further.***

   Fire Flows (OBC/FUS) and Interim Conditions.
   - JR explained that the intent of the proposed interim water servicing solution was to have a dry pond/storage facility to allow for adequate OBC fire flows for townhomes. JR referenced that this is a common approach in rural areas and was also used for the Shadow Ridge subdivision in Ottawa, as well as numerous industrial and commercial developments.
   - JR noted that Novatech's model demonstrated that fire supply for single detached units in the interim (with the CR29 connection) was sufficient to meet OBC.

- EG re-iterated the importance of finding an interim solution to allow the Brown Lands development to move forward, which would also allow the town to start collecting DCs prior to construction of the watermain crossing.
- JR also clarified that allowing for the development on interim condition would also help the Municipality ensure that the connection on the west side of the river could happen in a more efficient fashion if development was existing.
- TM clarified for the Chief Building Official (who briefly attended the meeting) that the interim solution would have regular municipal hydrants set up providing fire flows up to 45L/s (sufficient OBC required fire flows for single units) with a secondary dry hydrant(s) connected to a reservoir (pond) to provide additional fire flows above 45L/s (required for townhomes based on OBC calculations). TM also noted that if the Municipality would allow for the interim solution, Novatech could explore lotting townhouses in a separate/isolated area from the singles in the interim solution.
- The CBO noted that he still was not in favour of the interim solution due to operational concerns, however, did confirm he was willing to discuss the matter internally once more given that he was provided some additional clarification of the interim solution

- Towards the end of the meeting, DS noted that based on an email from JLR he was not in agreement with Novatech's assertion that the Brown Lands development could meet OBC Fire Flows for singles (45L/s) in the interim condition.
  - JR/TM noted that their calculations were based on 1) boundary conditions received from JL Richards; and 2) assumption that CR29 was in service at the time.
  - DS noted that he had not sent the Novatech report to JLR nor had he confirmed these assumptions with JLR.
  - ***ACTION: JR requested that DS review the fire flow assumptions to confirm that OBC was being met for singles in the interim with County Road 29 connection.***
  - ***Post meeting additional information provided to aid with this review:***
    - ***The Serviceability and Conceptual Stormwater Management Report prepared by Novatech dated February 2023 includes (in Appendix D and discussed in section 5.4.1) correspondence from JLR dated August 17, 2022 indicating that under Scenario 2 (extension of the 250mm watermain along CR29), the system could meet max day plus fire flow of 45L/s. The OBC fire flow calculations (included in Appendix D and discussed Section 5.3, the proposed singles require an OBD fire flow of 45L/s for the 33ft, 37ft, 42ft and 50ft(bungalows), and of 60L/s for the 50ft 2-storey. Upon a detailed review the calculations and the models that will be for sale, the 50ft 2-storey units require an OBC foreflow of 45L/s.***
- *DS noted that there was an simple method for FUS calculations not used by the City of Ottawa, however it would be acceptable to the Municipality. Novatech to review the impact to the development. TM noted that previous calculations using the FUS long form method as per the City of Ottawa generated fire flow requirements of 150L/s and higher, which is greater then the 145L/s that JL Richards reported would be available under the ultimate water servicing configuration for the site.*
  - ***Post meeting question on the simple method – is a maximum fire flow being considered under this method?***
- ***DS noted that the Municipality was of the opinion that the proposed watermain for the development needed to meet OBC fire flow requirements for the interim condition and FUS***

requirements in the ultimate condition, provided the municipal system could supply the required flow.

2. **Sanitary Servicing:**

   Proposed on-site solutions (Request feedback from MM on alternate solutions presented in meeting with MVCA)

   - CS noted his concern with the proposed sanitary options presented by Novatech. CS noted that the depth of the sewer under a wetland still posed a concern for Staff and that none of the options presented appeared suitable.
   - TM discussed the possibility of a directional drill under the wetland that was mentioned in the joint MVCA/MM comment response letter.
   - KK mentioned that a second pump station was likely not feasible for the Municipality to maintain.
   - LH/CS requested more information about the constructability and maintenance of a directionally drilled sanitary sewer.
   - EG noted that there is no interest from the MVCA, MMLT, or Municipality for owning the west tributary wetland and noted that there is limited value in maintaining this particular wetland.
   - TM noted that if the MVCA was in agreement with filling in the wetland, the alignment of the sanitary sewer could be under the west tributary and therefore the slope/depth of the sanitary sewer could be greatly reduced and would appear to eliminate the municipalities concerns.
   - LH/CS that this solution was more desirable to the Municipality from a servicing perspective but would not comment further unless the MVCA would approve the filling in of the wetland.
   - ***ACTION: Regional to discuss wetland limits with MVCA. Should MVCA not be in agreement with the approach, Novatech to prepare a Memorandum regarding feasibility/constructability of a directionally drilled sanitary sewer.***

   Forcemain to Malcolm & Dunn Street

   - CS/LH requested that Regional relay the Malcolm Street gravity sanitary line from Strathburn to existing mid block MH between Hope St and Dunn St.
   - MR noted that from a development perspective (and per the MSS), Regional can service the site with a sanitary forcemain connecting to the existing MH at Malcolm Street and Dunn Street.
   - MR noted that Regional would be willing to discuss the relay of the existing gravity sanitary line for the full length requested by the Municipality, however the developers cost responsibility would be limited to the costs of the forcemain installation from Strathburn to Dunn and any costs in excess of those costs (to relay the gravity sewer would be the cost of the Municipality.
   - JR noted that Regional would be willing to explore a FEA for the work but would need clarity on the timeline for cost recovery. CS to review DC By-law and provide response.
   - DS & CS both noted that the town wanted a sidewalk on Malcolm Street (Dunn Street to Strathburn). MR noted this was not a developer responsibility but could be included in a front-ending agreement.

3. **Strathburn Rd Modification Proposal**

   - EG requested an update on Staff's review of the Strathburn Road modification figure that was submitted to Staff on May 31 in response to Draft Plan Comments.
   - DS and LH noted that Staff would be providing a technical response but were not in a position to comment yet.

- ***ACTION: Staff to provide their technical response to the Strathburn modification.***
- ***Post meeting update: Comments have been received and are being reviewed.***

4. Land Ownership of Open Space / Wetland parcel

- NOTE: Time did not allow for discussion of this item, however in previous conversations with Staff, MK noted that the City remains interested in maintaining the pathway connection to the River Trail.
- NOTE: Discussions with MVCA may alter parkland

5. General Comment Clarification (MVCA – SWM, etc.)

- NOTE: Time did not allow for discussion of this item, however Regional/Novatech request a response to TM's June 19 e-mail in which a number of clarifications were requested on the Municipality's technical engineering comments.
- ***ACTION: Staff to provide a response to TM's June 19 e-mail.***

From: David Shen <dshen@mississippimills.ca>
Sent: Tuesday, January 31, 2023 11:34 AM
To: Drew Blair
Cc: Trevor McKay; Melanie Riddell; Mark Bowen
Subject: RE: Water and Wastewater Calculation Factors

See my response highlighted below.

Hello David,

We are currently working on a few projects in Mississippi Mills and would like to confirm some items for our water and wastewater calculations moving forward:

1. What are the accepted population density values for different types of dwelling units to be used for water and wastewater calculations? For Mill Run, the densities utilized were: 3.8 persons/unit for singles, 3.8 persons/unit for semi's, 3.5 persons/unit for towns and 3.0 persons/unit for apartments but this project was started in 2010. The City of Ottawa uses 3.4 persons/unit for singles and 2.7 persons/unit for semis/towns and 2-bedroom apartment average at 2.1 persons/unit. Would these lower population densities be acceptable to use?

Yes use the City of Ottawa Table 4.2, your numbers above are good.

2. From the 2018 Water and Wastewater Master Plan Update Report for MM, the average residential daily flow was set to 350 L/capita/day. Does this value still apply and for both water and wastewater calculations?

Yes 350 l/cap/d

3. The correction factor (K) for the Harmon Formula Peaking Factor is assumed to be 1.0 however the City of Ottawa has revised the residential correction factor to be 0.8 in 2018. Will the municipality consider using this correction factor?

Yes you can see k=0.8, please attach the COO 2018 guideline addendum for reference since some of our staff might not be aware of the change.

4. Under a separate submission (attached), we have recommended using OBC calculations to determine the water demand for fire flows versus using the FUS method. The OBC calculations provided fire flow demands that appear in-line with the 2018 Master Plan Update values. Can you please confirm that using OBC for fire flows is acceptable.

Answered in an early email.

Please let us know. We're happy to discuss further.

Thanks,

Drew

Drew Blair, P.Eng., Senior Project Manager | Land Development Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 236 | Fax: 613.254.5867

From: David Shen <dshen@mississippimills.ca>
Sent: Tuesday, January 31, 2023 8:40 AM
To: Mark Bowen <M.Bowen@novatech-eng.com>
Cc: Drew Blair <D.Blair@novatech-eng.com>; Billy McEwen <b.mcewen@novatech-eng.com>; Robert Smith <smithr@mississippimills.ca>; Melanie Riddell <m.riddell@novatech-eng.com>
Subject: RE: Mills Extension Watermain Boundary Condition Request

Sorry for the delay.

Again, to me it is a question of being consistent vs considering history. Within the Municipality, we have had some debates as well.

For consistence, we will treat your FUS calculation result as an official calculation result of fire flow in your submission, because it is what the guideline says so (you know we mostly follow the City of Ottawa) and what other consultants use.

However, when we ask J.L.Richards (our water/wastewater models keeper) to do modelling check, we will consider a loose criterion (such as using OBC method) regarding any engineering judgement on capacity constraints and capital project requirement.

I used to do infrastructure planning and design. I believe this is an appropriate decision. If you have question, please let me know.

Thanks!
David Shen

From: Mark Bowen <M.Bowen@novatech-eng.com>
Sent: January 12, 2023 9:57 AM
To: David Shen <dshen@mississippimills.ca>
Cc: Drew Blair <D.Blair@novatech-eng.com>; Billy McEwen <b.mcewen@novatech-eng.com>; Robert Smith <smithr@mississippimills.ca>; Melanie Riddell <m.riddell@novatech-eng.com>
Subject: RE: Mills Extension Watermain Boundary Condition Request

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hi David,

Did you have any questions or concerns about the memo included in the previous email? Do you know when do you expect to complete your review? We are early in the process so there is no rush; we are just following up.

Mark Bowen, B. Eng
Project Manager – Land Development Engineering

NOVATECH
Engineers, Planners & Landscape Architects

240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 231 | Fax: 613.254.5867

From: Mark Bowen
Sent: Wednesday, January 4, 2023 8:41 AM
To: David Shen <dshen@mississippimills.ca>
Cc: Drew Blair <D.Blair@novatech-eng.com>; Billy McEwen <b.mcewen@novatech-eng.com>; Robert Smith <smithr@mississippimills.ca>; Melanie Riddell <m.riddell@novatech-eng.com>
Subject: RE: Mills Extension Watermain Boundary Condition Request

Hi David,

Happy new year. Attached is a memo outlining Novatech's option to consider the OBC fire flow calculations.

Mark Bowen, B. Eng
Project Manager – Land Development Engineering

NOVATECH
Engineers, Planners & Landscape Architects

240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 231 | Fax: 613.254.5867

From: David Shen <dshen@mississippimills.ca>
Sent: Monday, December 19, 2022 10:21 AM
To: Mark Bowen <M.Bowen@novatech-eng.com>
Cc: Drew Blair <D.Blair@novatech-eng.com>; Billy McEwen <b.mcewen@novatech-eng.com>; Robert Smith <smithr@mississippimills.ca>
Subject: RE: Mills Extension Watermain Boundary Condition Request

This is a tricky question to me because I need balance the history and correctness.

Other consultants, nowadays dealing with Mississippi Mills, use Fire Underwriters Survey (FUS) method, which is a sounder method, what I prefer, and what I will request down the road.

The OBC method is allowed sometimes, for infill/intensification cases. But your case is a "greenfield" one.

I would suggest, if the results between FUS method and OBC method are somewhat close, why not use FUS method. The tricky thing is that if the result of the OBC method is significantly lower than that of FUS method, you need let me know. We may have to do a deep dive.

Thanks!

David Shen, P.Eng.
Director, Development Services and Engineering
Municipality of Mississippi Mills
dshen@mississippimills.ca
613-880-5996
Website: www.mississippimills.ca

From: Mark Bowen <M.Bowen@novatech-eng.com>
Sent: December 19, 2022 9:48 AM
To: David Shen <dshen@mississippimills.ca>
Cc: Drew Blair <D.Blair@novatech-eng.com>; Billy McEwen <b.mcewen@novatech-eng.com>; Cory Smith <csmith@mississippimills.ca>
Subject: RE: Mills Extension Watermain Boundary Condition Request

Hi David,

Can you please confirm if the Ontario Building Code (OBC) should be used to confirm the required fire flows in the next phase of the Mill Run development. The OBC was used to calculate fire flows in all previous phases. We are preparing the requested information and will provide once confirmed.

Mark Bowen, B. Eng
Project Manager – Land Development Engineering

NOVATECH
Engineers, Planners & Landscape Architects

240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 231 | Fax: 613.254.5867

From: David Shen <dshen@mississippimills.ca>
Sent: Friday, December 16, 2022 11:25 AM
To: Mark Bowen <M.Bowen@novatech-eng.com>
Cc: Drew Blair <D.Blair@novatech-eng.com>; Billy McEwen <b.mcewen@novatech-eng.com>; Cory Smith <csmith@mississippimills.ca>
Subject: RE: Mills Extension Watermain Boundary Condition Request

Good morning,

I attended the pre-consultation meeting regarding this development. Assuming you already knew our regular practice, I may repeat here if you don't mind.

Step 1, you submit calculations to me. Water/Wastewater only:

For water, ADD, MDD, PHD, FF calculations, proposed connection description, proposed looping consideration.
For wastewater, Peak flow, proposed connection description, connection elevation.
Using City of Ottawa design parameters.

You will need submit your calculation sheets.

Note that your proposed units and density number are at very conceptual level. If you change these numbers in your planning application, I reserve a right to ask you redo the calculation if I deem there is noticeable flow impact .

Step 2, Once I review/approve the calculations, we can do the second step. The second step is using the approved calculation results as inputs to check the system capacity and performance in the Municipal water/wastewater models. Since J.L.Richards helps the Municipality keep/maintain/update the models, you will pay J.L.Richards to do this step.

I will also review stormwater and traffic reports either at this stage or at application stage.

Also for this Mill Run development, how many further phases in the future? (I can see potential future 9 on your figure). I understand it will depend on development plans and land purchase. However for infrastructure planning purpose, I need see your overall development plan with phasing and capacity in a systematic way, not requesting servicing capacities piece by piece, as it may mess up our potential capital project scoping and looping redundancy consideration.

Thanks!

David Shen, P.Eng.
Director, Development Services and Engineering
Municipality of Mississippi Mills
dshen@mississippimills.ca
613-880-5996
Website: www.mississippimills.ca

From:	Trevor McKay
Sent:	Tuesday, November 22, 2022 10:41 AM
To:	jstewart@lanarkcounty.ca
Cc:	Ken Kelly; mknight@mississippimills.ca; Cory Smith (csmith@mississippimills.ca); dreid@mvc.on.ca; Steve Pentz; Melanie Riddell; John Riddell
Subject:	Brown Lands - Pre-consultation Notes - Clarification Request / Response
Attachments:	Pre-Consultation Meeting Notes September 19 2022 Brown Lands.pdf; MM Comments to County - Brown-Strathburn Lands.pdf

Julie,

Thank you very much for preparing and circulating the attached pre-consultation minutes for the property on the north east corner of County Road 29 and Strathburn Road, currently being referred to as the Brown Lands.

After discussion with our client, we have prepared the following comments/requests for clarification regarding the notes provided.

Pre-consultation Meeting Notes September 19, 2022 Brown Lands – County of Lanark

- No issues/comments

MM Comments to County – Municipality of Mississippi Mills

1. Comment 1 – We are requesting clarification to this comment, specifically the use of the phrase "… as opposed to ***any*** noise mitigation measures". It was our understanding from the meeting that noise mitigation measures would be allowed provided they were reasonable (typically 2.5m max height noise walls are allowable), otherwise a window street may need to be explored.
2. Comments 2, 3, 8 and 9 – Please note that we believe further discussion is required between the developer and the municipality regarding future land ownership and the location and routing of the existing bike trail.
3. Comment 10 – We are requesting further discussion/clarification on the provided servicing comments.
    a. At no time has the developer indicated that 2 pump stations were being considered. Currently it is anticipated that the development will be serviced with one sanitary pump station.
    b. Please clarify the comment that servicing is to remain outside the limits of any defined wetland. Our interpretation and intent is that some servicing will be provided outside of the defined wetland limits but within the development setback limits.
    c. We would like to reserve the right to review the OGS location requirements during the draft plan process (and possibly during detailed design) – specifically if the opportunity presents to locate the OGS within the ROW *but* outside of the roadway limits (traveled portion).

Finally, a formal list of required reports and studies was not included with these meeting notes. Are you able to provide a list of the required studies?

Thank you to everyone for your time and input during the pre-consultation meeting. We are looking forward to working with everyone on this exciting project.

Trevor McKay, B.Eng., E.I.T., Project Manager | Land Development Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 291 | Cell: 613.263.9113

From: Julie Stewart <jstewart@lanarkcounty.ca>
Date: November 4, 2022 at 10:38:57 AM EDT
To: "Evan Garfinkel (egarfinkel@regionalgroup.com)" <egarfinkel@regionalgroup.com>, John Riddell <j.riddell@novatech-eng.com>, Melanie Riddell <m.riddell@novatech-eng.com>, Steve Pentz <s.pentz@novatech-eng.com>, Ken Kelly <kkelly@mississippimills.ca>, Melanie Knight <mknight@mississippimills.ca>, Cory Smith <csmith@mississippimills.ca>, dreid@mvc.on.ca
Subject: Brown Lands

Please see the attached pre-consultation meeting notes and comments from the Municipality of Mississippi Mills.

Any questions, please advise.

Thank you,
Julie

Julie Stewart, MCIP RPP
County Planner
99 Christie Lake Road
Perth, ON K7H 3C6
(613)267-4200 ext. 1520
jstewart@lanarkcounty.ca
www.lanarkcounty.ca

Pre-Consultation Meeting Notes
Virtual zoom meeting – September 19, 2022
Prepared By: Julie Stewart

In Attendance
Evan Garfinkel – Regional Group
John Riddell – Regional Group
Melanie Riddell – Regional Group
Erin O'Connor
Steve Pentz – Planner, Novatech
Trevor McKay – Engineer, Novatech
Alex Zeller -
Diane Reid – Planner, MVCA
Kelly Stiles - Biologist, MVCA
Ken Kelly – CAO, Mississippi Mills
Cory Smith – Public Works, Mississippi Mills
Melanie Knight – Senior Planner, Mississippi Mills
Julie Stewart – County Planner, County of Lanark

Steve Pentz provided an overview of the proposed conceptual plan.
Propose a low-medium density development, singles with different lot sizes, semi-s and town's.
An existing mountain bike trail through the site to the Mississippi River is proposed to be maintained.

The site has previously been used for agricultural uses.

MVCA
Diane Reid noted that there had bene a pre-consultation meeting with the Conservation Authority and the Township a few months ago

Diane noted that the key element is the ENvironmentla Impact Assessment, to assess and refine the boundary, the boundary needs to be understood firs.
The subdivision will have an impact on the wetland.

Water balance – need to understand input, a water balance may be necessary but not sure yet.

There can not be a change on the impact to the wetlands.

- 30m setback for lots
- Watercourse – there is an established creek to the Mississippi River
- Understand there are no plans to alter the creek.
- There may or may not need to be a fisheries assessment
- May or may not need to be a Headwater Drainage Assessment

Stormwater Management – enhanced level quantity control. Permits may be required for outlet.

Kelly has fish information which can be shared with the consultants.

Please refer to the attached comments from the Municipality of Mississippi Mills, dated October 24, 2022.

CORPORATION OF THE MUNICIPALITY OF MISSISSIPPI MILLS
3131 OLD PERTH ROAD · PO BOX 400 · RR 2 · ALMONTE ON · K0A 1A0

PHONE: 613-256-2064
FAX:613-256-4887
WEBSITE: www.mississippimills.ca

October 24, 2022

Julie Stewart
County Planner
jstewart@lanarkcounty.ca

Dear Ms. Stewart:

RE: BROWN – STRATHBURN LANDS
REVIEW OF CONCEPT PLAN 5
FILE: TBD

Please see attached the Planning and Engineering comments regarding the Brown-Strathburn Lands – Concept Plan for Plan of Subdivision. Comments on the submitted Concept Plan relating to the below are also provided.

Planning

Planning Comments:

1. Noise Study is required for the adjacency of County Road 29. As noted, staff prefer a window street as opposed to any noise mitigation measures such as a noise wall along County Road 29.

2. Transportation Study (Multi-modal) is required. Some specific issues to be addressed:
    - Access to the existing mountain biking trails along the Mississippi River (see notes below)

3. Wetland – EIS :
    - It is noted that an EIS is required to evaluate the wetland on the subject lands and may impact the design/layout of the subdivision.
    - Staff note that the Municipality does not wish to receive any lands which are evaluated as wetlands.

4. Density - The applicant has indicated that the proposed density is approximately 15 units per hectare. Staff note that this density is notable less than the average density of 25 units per hectare as part of Official Plan Amendment 22. The applicant is encouraged to examine design solutions that increase the overall density of the subdivision and note that the 70/30 ratio of low density residential to medium density residential has recently been updated as part of Official Plan Amendment 22 to

60/40. The applicant should confirm that the proposed development meets this new housing ratio target as during the meeting it was communicated that the ratio is currently 66/34.

5. Design of Subdivision:
    - The remnant triangular shaped property fronting onto Strathburn Street needs to be resolved in terms of uses and intent of the land. Further discussions should occur as the design of the subdivision evolves.
    - As County Road 29 is a County Road, confirmation with the County should be obtained regarding the proposed intersection along County Road 29.

6. FYI – Any road stubs to the lands to the north will be Blocks to be conveyed to the Municipality

7. FYI - Any Blocks for future road connections and Parkland will require appropriate signage (ie. 'future street connection' and 'future park location')

Parks Comments (including mountain bike trail):

8. The available parkland in the area is currently limited and so parkland conveyance should be included as part of the Concept Plan once the boundaries of the wetland are defined. Please note that the Municipality will not accept parkland conveyance that is within any defined wetland.

9. With respect to the existing mountain biking trail, the following comments are provided:
    - The Municipality prefers that mountain biking access be located at the northeast portion of the subdivision and not as currently planned with a mountain biking trail traversing the subdivision. The Municipality would be agreeable, as part of the conveyance of parkland, that the area of parkland provided be a parking lot for public access to a future mountain biking trailhead and so the location of parkland should be aligned with a trailhead location.
    - It is also noted that access to a trailhead can be accommodated by on-road cycling and a separate trail traversing the subdivision is not required nor desired by the Municipality.
    - Alternatively, it is the Municipality's understanding that the lands to the immediate north, outside of the current urban boundary, are also owned by the applicant. Consideration should be given to locating a trailhead for mountain biking on the applicant's lands to the north.

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Engineering

The applicant has met directly with Mississippi Mills Public Works staff regarding the engineering requirements for the proposed subdivision. Some preliminary comments are also noted below:

10. Servicing – the preference of the Municipality is that any servicing remain outside of the limits of any defined wetland.
    - Full servicing capacity will need to be obtained in the future once the river crossing infrastructure improvements are in place. Two pump stations will be required, one in Phase 1 and one in Phase 2.
    - The existing capacity to service any part of the lands is limited until the infrastructure improvements have taken place
    - 18 metre right of way cross section is preferred (similar to Mill Run subdivision)
    - Oil grit separators will be required and are to be located within a Block on the plan, not in a right of way (travelled portion of a right of way).
    - There is a forcemain down Strathburn connecting to Malcolm

11. Coming out of the EIS mentioned above in the Planning Comments, the boundary of stormwater catchment and drainage pattern will need to be reviewed.
    - A stormwater management report will be required to establish pre- and post-hydrologic conditions. The Municipality understands the MVCA will review floodplain, regulated area, setback and other environmental and engineering requirements. The Municipality will review the stormwater minor system and gradings design within the subdivision.
    - It is assumed that all the future stormwater/drainage will be toward west boundary to Mississippi River. If it is not the case, The County shall be engaged to review and approve any flow toward the County Road 29 ditch.
    - The developer will obtain advice from MVCA or municipality to meet DFO requirement. The construction is subject to the Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses and a permit is required. Erosion and sediment control will be required in design and for construction activities.

12. A geotechnical analysis is required for slope stability.

13. The transportation study mentioned in the Planning Comments will need address traffic impact, any need of road widening and intersection improvements.

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I trust the above will assist you. If you have any further questions regarding this matter, please feel free to contact me at your convenience.

Respectfully yours,

Melanie Knight, MCIP, RPP
Senior Planner
Municipality of Mississippi Mills

Brown Properties Almonte		
	Area	
	Ha	Acres
Gross Area	16.77	41.44
Net Developable	13.73	33.93
	Saleable Frontage	
	m	ft
Low Density	2510.35	8236.03
Total Frontage	2510.35	8236.03
Road Lengths:		
	m	ft
18m ROW	1931.39	6336.56
Total Road Lengths	1931.39	6336.56

Unit Breakdown

Lot Type	Proposed		Preferred % of Total (EQ)
	# Units	% of Total	
31'	22	10%	10%
35'	34	16%	15%
42'	48	22%	20%
50'	40	18%	20%
Bungalow Townhomes	33	15%	15%
Two-Storey Townhomes	42	19%	20%
Total	**219**	**100%**	**100%**

ZONING SETBACK ASSUMPTIONS:
BASED ON R3 - "EXEMPTION" (SEE MILL RUN)

Front Yard:	6.0m
Rear Yard:	7.5m
Interior Side Yard:	1.2m
Exterior Side Yard:	3.0m

SOURCE REFERENCE:
Legal & Topographic Information: *Town Mapping Town of Almonte / 2008 / MTM Zone 9, NAD83 (ORIG)*

LEGEND:
- 31' SINGLES
- 35' SINGLES
- 42' SINGLES
- 50' SINGLES
- BUNGALOW TOWNHOMES
- TWO-STOREY TOWNHOMES
- MVCA NON-EVALUATED WETLAND
- MVCA REGULATION LIMIT
- 30m WETLAND SETBACK
- OPEN WATER LIMITS

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
1.	ISSUED FOR DISCUSSION	SEPT 8/22	TJM

SCALE: 1:1000 (A1) / 1:2000 (11x17)

DESIGN XXX · CHECKED XXX · DRAWN XXX · CHECKED XXX · APPROVED XXX

FOR REVIEW ONLY

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

TOWN of ALMONTE
BROWN PROPERTIES

DRAWING NAME
CONCEPT PLAN 5

PROJECT No. 118178-00
REV: REV #1
DRAWING No. 118178-CP5

M:\2018\118178\CAD\Planning\Concept Plans\118178-CP5.dwg, Concept Plan - Dual Scale - A1, Sep 07, 2022 - 11:19am, sbennett

LANARK COUNTY

PLANS OF SUBDIVISION

PRE-CONSULTATION – checklist Brown lands

Report	Comments	Required Yes/No
Planning Rationale	Include justification Must have regard for PPS Lanark County Official Plan compatibility Local Official Plan compatibility	Yes Yes Yes Yes
Hydrogeological Study, Terrain Analysis	Availability and suitability of water and waste water MOE – D-5-4 Guidelines MOE – D-5-5 Guidelines ODWSOG Checklist Summary & Sign-off	
Environment Impact Study	SAR & Significant Habitat Wetlands Organic Soils Natural Heritage Features & Systems Significant Wetlands Significant Woodlands Significant Valleylands Significant Wildlife ANSI Fish Habitat	Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes
Servicing Options Statement	Guidelines – MOE D-5-3	Yes
Stormwater Drainage Plan	Guidelines - MOE-2003 / MNR-2001 Checklist Summary & Sign-off	Yes
Grading Plan	Sloping land within lot to direct flow of surface water away from foundations & abutting properties.	Yes

LANARK COUNTY

PLANS OF SUBDIVISION

PRE-CONSULTATION – checklist Brown lands

Report	Comments	Required Yes/No
Sediment and Erosion Control Hazardous Sites	Flooding, erosion hazard Slope and Soil Stability Organic Soils Karst Topography	Yes Yes Yes
Archeological Investigation	Standards & Guidelines 2011	Yes
Tree Preservation Plan or Tree Conservation Plan	Check with local municipality	
Other	See attached	
Draft Plan	To include: Planning Act 50(17) Ont. Reg. 544/06 Lot and block configuration Compatibility with adjacent uses Road access, street layout & Pedestrian amenities Parks & Open Space amenities Easement and right-of-way requirements	Yes

Mississippi Mills

The Corporation of the
Municipality of Mississippi Mills

Municipal Office
3131 Old Perth Road
RR2, P.O. Box 400
Almonte, ON
K0A 1A0

Tel: (613) 256-2064
Fax: (613) 256-4887

February 10, 2022

Memo

By: Cory Smith, A/Director of Public Works

Re: Servicing requirements for the development area known as the Brown Lands

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This memo has been prepared as a general overview of servicing requirements for the development area know as the Brown Lands. This memo is based on information in the Water and Wastewater master plan. Additional works may be required based on the density of the development and other changes to the existing system.

The requirements for water servicing provide limitations. At this time no servicing is extended to these lands. In order for full servicing of these lands it is anticipated that there will be three service connections for the water. There will be a connection along County Road 29, a connection along Malcolm Street and a connection along the northeast boundary along the Mississippi River where the Municipality will be installing a third river crossing for the water system. It would be the developer's responsibility to extend water mains to Along County Road 29 from the development to Dunn Street. The developer would also be responsible to extend watermains on Malcolm Street from the development to Dunn Street.

The water and Wastewater Master Plan also identifies works required to upgrade or expand our existing system that the Municipality will be completing. These works include upgrades on the water system along County Road 29 between Well 6 and Dunn Street. These works are scheduled as mid term works with an expected completion date of 2025. A third River Crossing is expected to be in place by 2027 and creation of Pressure zone 2 is expected to be completed by 2027 as well. The timing of these works are expected to be refined during our update of the water and waste water master plan in 2022. It should be noted that appropriate hydraulic modeling would still be required for the development lands which may determine additional requirements.

The requirements for wastewater servicing is anticipated to be through a pump station and force main that would be extended by the developer from the development to connect to the existing sanitary main at the intersection of Malcolm and Dunn Street. For full build out of the proposed lands, upgrades to the sanitary main on Malcolm would be required. The timing of these works is subject to the timing of buildout of the subdivision but is currently in the long term/buildout timeline for our water and wastewater master plan with a timeline of beyond 2028 for construction. Modeling would be required to determine if there is capacity for partial phasing of the subdivision. In addition, upgrades to the Gemmill's Bay Pump station may be required. This is currently dependent on the density of the proposed development and timing of other developments coming online and will be further reviewed in the update of the water and wastewater master plan. Once again modeling specific to the proposed development will provide clarity on this issue.

Dates and timelines of in this memo are subject to change based on future updates to our master plans and approved budgetary funding.

Cory Smith
A/Director of Roads and Public Works
Mississippi Mills
613 256-2064 ext. 229.

APPENDIX B

STORM DRAINAGE & STORMWATER MANAGEMENT

Storm Sewer Design Sheet, Novatech, February 13, 2024, 2 Pages

Preliminary Storm Maintenance Hole Information, February 13, 2024, 2 pages

Preliminary Vortech Sizing Information, supplied by Echelon Environmental, February 6, 2024, 6 Pages

Stormwater Design Model Parameters, Novatech, February 2024, 11 Pages

PCSWMM Model Schematics, Novatech, February 2024, 7 Pages

Pre-Development PCSWMM Model Output, Novatech, February 2024, 2 Pages

Post-Development PCSWMM Model Output, Novatech, February 2024, 17 Pages

STORM SEWER DESIGN SHEET (5YR)

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: 118178-FIG-STM

Storm Design Event = 5 Year

Legend: Design Input by User
As-Built Input by User
Cumulative Cell
Calculated Design Cell Output
Calculated Uncontrolled Peak Flow Cell Output
Design Input Restricted Peak Flow Cell

Reference: City of Ottawa - Sewer Design Guidelines (2012 and TBs)
MOE - Design Guidelines for Sewage Works (2008)

Location				Flow							Design Capacity								
											Proposed Sewer Pipe Sizing / Design								
Street	Area ID	From MH	To MH	Area A (ha.)	Runoff Coefficient C	Indivi. 2.78 AC	Accum. 2.78 AC	Time of Conc. Tc (min.)	Rain Intensity I (mm/hr)	Total Uncontrolled Peak Flow Q (L/s)	Pipe Length (m)	Pipe Size (mm) and Material	Pipe ID Actual (m)	Roughness n	Design Grade So (%)	Capacity Qfull (L/s)	Full Flow Velocity (m/s)	Time of Flow (min.)	Q / Qfull
Street One	100-102	100	102	0.73	0.65	1.32	1.32	10.00	104.19	137.4	103.9	375 PVC	0.381	0.013	0.90	173.5	1.52	1.14	79.2%
Street One	102-104	102	104	0.45	0.65	0.81	2.13	11.14	98.54	210.1	69.5	375 PVC	0.381	0.013	2.85	308.8	2.71	0.43	68.0%
Street One	106-104	106	104	0.49	0.65	0.89	0.89	0.89	206.24	182.6	84.5	450 PVC	0.4572	0.013	0.70	248.9	1.52	0.93	73.4%
Street Three	104-226	104	226	0.38	0.65	0.69	3.70	11.57	96.59	357.8	84.0	450 PVC	0.4572	0.013	2.45	465.6	2.84	0.49	76.9%
Street Two	222-224	222	224	0.61	0.65	1.10	1.10	10.00	104.19	114.8	89.3	300 PVC	0.3048	0.013	3.00	174.7	2.39	0.62	65.7%
Street Two	224-226	224	226	0.51	0.65	0.92	2.02	10.62	101.02	204.4	85.0	375 PVC	0.381	0.013	2.50	289.2	2.54	0.56	70.7%
Street Three	226-300	226	300	0.28	0.65	0.51	6.23	12.06	94.44	588.8	42.4	675 CONC	0.6858	0.013	1.40	1037.6	2.81	0.25	56.7%
Street Three	300-208	300	208	0.78	0.65	1.41	7.64	12.31	93.39	713.8	104.2	825 CONC	0.8382	0.013	0.45	1004.6	1.82	0.95	71.1%
Street Two	220-216	220	218	0.23	0.65	0.42	0.42	10.00	104.19	43.3	59.0	300 PVC	0.3048	0.013	4.00	201.8	2.77	0.36	21.5%
Street Two		218	216	0.00	0.00	0.00	0.42	10.36	102.35	42.5	12.9	300 PVC	0.3048	0.013	4.05	203.0	2.78	0.08	21.0%
Street Two	216-214	216	214	0.21	0.65	0.38	0.80	10.43	101.96	81.1	37.5	300 PVC	0.3048	0.013	4.00	201.8	2.77	0.23	40.2%
Street Two	214-212	214	212	0.25	0.65	0.45	1.25	10.66	100.84	125.7	50.9	375 PVC	0.381	0.013	2.20	271.3	2.38	0.36	46.3%
Street Four	224-400	224	400	0.46	0.65	0.83	0.83	10.00	104.19	86.6	62.3	300 PVC	0.3048	0.013	3.25	181.9	2.49	0.42	47.6%
Street Four	400-212	400	212	0.32	0.65	0.58	1.41	10.42	102.04	143.8	59.4	375 PVC	0.381	0.013	1.00	182.9	1.60	0.62	78.6%
Street Two	212-210	212	210	0.18	0.65	0.33	2.98	11.03	99.03	295.3	30.1	525 CONC	0.5334	0.013	0.60	347.5	1.56	0.32	85.0%
Street Two	210-208	210	208	0.31	0.65	0.56	3.54	11.36	97.54	345.4	58.9	525 CONC	0.5334	0.013	1.45	540.3	2.42	0.41	63.9%
Street Two	208-206	208	206	0.10	0.65	0.18	11.37	13.26	89.62	1018.6	16.6	825 CONC	0.8382	0.013	2.70	2460.6	4.46	0.06	41.4%
Street Two	206-204	206	204	0.57	0.65	1.03	12.40	13.33	89.38	1108.0	79.8	900 CONC	0.9144	0.013	0.65	1522.6	2.32	0.57	72.8%
Street Two	200-204	200	202	0.36	0.65	0.65	0.65	10.00	104.19	67.8	29.4	375 PVC	0.381	0.013	1.55	227.7	2.00	0.25	29.8%
Street Two		202	204	0.00	0.00	0.00	0.65	10.25	102.91	66.9	12.4	375 PVC	0.381	0.013	1.05	187.4	1.64	0.13	35.7%
-	204-3000	204	3000	0.10	0.65	0.18	13.23	13.90	87.29	1154.6	51.2	900 CONC	0.9144	0.013	2.10	2736.8	4.17	0.20	42.2%
-	DR1	3000	3002	0.00	0.30	0.00	13.23	14.11	86.56	1145.0	31.0	1200 CONC	1.2192	0.013	0.35	2406.2	2.06	0.25	47.6%
-		3002	3004	0.00	0.00	0.00	13.23	14.36	85.70	1133.5	118.0	1200 CONC	1.2192	0.013	0.35	2406.2	2.06	0.95	47.1%
-		3004	510	0.00	0.00	0.00	13.23	15.31	82.57	1092.2	43.6	1200 CONC	1.2192	0.013	0.35	2406.2	2.06	0.35	45.4%
Street Five	500-106	500	106	0.13	0.65	0.23	0.23	10.00	104.19	24.5	38.7	250 PVC	0.254	0.013	1.15	66.5	1.31	0.49	36.8%
Street Five	106-502	106	502	0.32	0.65	0.58	0.81	10.49	101.67	82.7	59.1	300 PVC	0.3048	0.013	2.35	154.6	2.12	0.46	53.5%
Street Five	502-506	502	504	0.21	0.65	0.38	1.19	10.96	99.40	118.5	13.3	300 PVC	0.3048	0.013	2.35	154.6	2.12	0.10	76.7%
Street Five		504	506	0.00	0.00	0.00	1.19	11.06	98.91	118.0	76.0	375 PVC	0.381	0.013	2.75	303.3	2.66	0.48	38.9%
Street Seven	702-506	702	700	0.00	0.00	0.00	0.00	10.00	104.19	0.0	15.4	250 PVC	0.254	0.013	0.50	43.9	0.87	0.30	0.0%
Street Seven		700	506	0.76	0.65	1.37	1.37	10.30	102.65	141.0	65.6	450 PVC	0.4572	0.013	0.40	188.1	1.15	0.95	74.9%
Street Five	506-508	506	508	0.31	0.65	0.56	3.13	11.54	96.72	302.4	89.5	600 CONC	0.6096	0.013	2.90	1090.8	3.74	0.40	27.7%
Street Seven	702-706	702	704	0.53	0.65	0.96	0.96	10.00	104.19	99.8	68.1	300 PVC	0.3048	0.013	2.80	168.8	2.31	0.49	59.1%

STORM SEWER DESIGN SHEET (5YR)

NOVATECH
Engineers, Planners & Landscape Architects

Location				Flow							Design Capacity								
											Proposed Sewer Pipe Sizing / Design								
Street	Area ID	From MH	To MH	Area A (ha.)	Runoff Coefficient C	Indivi. 2.78 AC	Accum. 2.78 AC	Time of Conc. Tc (min.)	Rain Intensity I (mm/hr)	Total Uncontrolled Peak Flow Q (L/s)	Pipe Length (m)	Pipe Size (mm) and Material	Pipe ID Actual (m)	Roughness n	Design Grade So (%)	Capacity Qfull (L/s)	Full Flow Velocity (m/s)	Time of Flow (min.)	Q / Qfull
Street Seven		704	706	0.00	0.00	0.00	0.96	10.49	101.67	97.4	12.6	375 PVC	0.381	0.013	1.50	224.0	1.96	0.11	43.5%
Street Seven	706-508	706	508	0.64	0.65	1.16	2.11	10.60	101.14	213.8	80.4	450 PVC	0.4572	0.013	1.00	297.4	1.81	0.74	71.9%
Street Five	508-510	508	510	0.01	0.65	0.02	5.26	11.94	94.97	499.4	12.9	600 CONC	0.6096	0.013	4.60	1373.8	4.71	0.05	36.3%
Street Five	510-512	510	512	0.13	0.65	0.23	18.72	15.66	81.48	1525.3	81.6	1350 CONC	1.3716	0.013	0.25	2784.1	1.88	0.72	54.8%
Street Six	600-512	600	512	0.16	0.65	0.29	0.29	10.00	104.19	30.1	90.8	250 PVC	0.254	0.013	1.35	72.1	1.42	1.06	41.8%
Street Five	512-514	512	514	0.19	0.65	0.34	19.35	16.38	79.34	1535.4	22.6	1350 CONC	1.3716	0.013	0.25	2784.1	1.88	0.20	55.1%
Street Five	514-518	514	516	0.75	0.65	1.36	20.71	16.58	78.77	1631.1	49.5	1350 CONC	1.3716	0.013	0.25	2784.1	1.88	0.44	58.6%
Street Five		516	518	0.00	0.00	0.00	20.71	17.02	77.55	1605.9	14.3	1350 CONC	1.3716	0.013	0.25	2784.1	1.88	0.13	57.7%
Street Five	518-520	518	520	0.33	0.65	0.60	21.30	17.15	77.20	1644.8	86.5	1350 CONC	1.3716	0.013	0.25	2784.1	1.88	0.77	59.1%
Street Five	600-520	600	520	0.78	0.65	1.41	1.41	10.00	104.19	146.9	87.4	450 PVC	0.4572	0.013	1.65	382.1	2.33	0.63	38.4%
-	DR3	520	3100	0.00	0.45	0.00	22.71	17.91	75.19	1707.9	46.2	1350 CONC	1.3716	0.013	2.00	7874.6	5.33	0.14	21.7%
-		3100	3102	0.00	0.00	0.00	22.71	18.06	74.82	1699.5	3.7	1350 CONC	1.3716	0.013	0.40	3521.6	2.38	0.03	48.3%
-		3102	3104	0.00	0.00	0.00	22.71	18.08	74.76	1698.1	12.0	1350 CONC	1.3716	0.013	0.40	3521.6	2.38	0.08	48.2%
-		3104	3106	0.00	0.00	0.00	22.71	18.08	74.76	1698.1	19.2	1650 CONC	1.6764	0.013	1.25	10630.9	4.82	0.07	16.0%
-		3106	3108	0.00	0.00	0.00	22.71	18.15	74.59	1694.3	27.7	1650 CONC	1.6764	0.013	0.50	6723.5	3.05	0.15	25.2%
-		3108	3110	0.00	0.00	0.00	22.71	18.30	74.21	1685.7	52.9	1650 CONC	1.6764	0.013	0.15	3682.6	1.67	0.53	45.8%
OUTLET								18.83											
Totals				**12.57**							**2541.8**								

Demand Equation / Parameters

1. Q = 2.78 ACI

Definitions

Q = Peak flow in litres per second (L/s)
A = Area in hectares (ha)
C = Weighted runoff coefficient (increased by 25% for 100-year)
I = Rainfall intensity in millimeters per hour (mm/hr)

Rainfall intensity is based on City of Ottawa IDF data presented in the City of Ottawa - Sewer Design Guidelines

Capacity Equation

Q full = $1000*(1/n)*A_p*R^{2/3}*So^{0.5}$

Definitions

Q full = Capacity (L/s)
n = Manning coefficient of roughness (0.013)
A_p = Pipe flow area (m^2)
R = Hydraulic Radius of wetted area (dia./4 for full pipes)
So = Pipe slope/gradient

LICENSED PROFESSIONAL ENGINEER
T. J. MCKAY
100195434
February 13, 2024
PROVINCE OF ONTARIO

NOVATECH
M:\2018\118178\DATA\Calculations\Sewer Calcs\STM\20240213-118178-STM.xlsx

BROWN LANDS

PROJECT NUMBER 118178
DATE: 13/02/2024

PRELIMINARY STORM MAINTENANCE HOLE INFORMATION

Structure ID	Maintenance Hole Diameter (mm)	T/G Elevation (m)	Invert Information (m)	
100	1200	126.10	INV.NE	123.57
102	1200	125.01	INV.SW	122.64
			INV.NE	122.64
104	1200	123.00	INV.SW	120.66
			INV.NE	120.24
			INV.SE	119.65
106	1200	123.10	INV.SW	120.83
			INV.NW	120.55
			INV.SE	120.50
200	1200	116.12	INV.NW	113.75
202	1200	115.68	INV.W	113.26
			INV.SE	113.29
204	1800	115.49	INV.SW	112.66
			INV.E	113.12
			INV.N	112.60
206	1500	118.04	INV.SW	114.32
			INV.NE	113.18
208	1800	118.49	INV.NW	115.68
			INV.SW	115.96
			INV.NE	114.76
210	1200	119.29	INV.W	116.84
			INV.NE	116.81
212	1500	119.55	INV.W	117.18
			INV.E	117.02
			INV.NW	117.18
214	1200	120.67	INV.W	118.37
			INV.E	118.30
216	1200	122.50	INV.W	120.20
			INV.E	119.87
218	1200	123.05	INV.NW	120.75
			INV.E	120.72
220	1200	125.66	INV.SE	123.11
222	1200	126.00	INV.NE	123.20
224	1200	122.80	INV.NE	119.80
			INV.SW	120.52
			INV.SE	120.52
226	1500	120.05	INV.NW	117.59
			INV.SE	117.16
			INV.SW	117.68
300	1500	119.24	INV.NW	116.56
			INV.SE	116.14
400	1200	120.79	INV.NW	118.50
			INV.SE	117.77
500	1200	123.25	INV.SE	121.00
502	1200	122.34	INV.NW	119.11
			INV.E	119.08
504	1200	122.05	INV.W	118.77
			INV.NE	118.69
506	1200	118.97	INV.NW	116.53
			INV.NE	116.38
			INV.SW	116.60

BROWN LANDS

PROJECT NUMBER 118178
DATE: 13/02/2024

PRELIMINARY STORM MAINTENANCE HOLE INFORMATION

Structure ID	Maintenance Hole Diameter (mm)	T/G Elevation (m)	Invert Information (m)	
508	1200	116.42	INV.NW	113.97
			INV.SW	113.79
			INV.NE	113.79
510	2400	115.80	INV.SW	113.19
			INV.NE	108.17
			INV.SE	108.64
512	1800	113.00	INV.SW	107.97
			INV.NE	107.97
			INV.NW	110.77
514	1800	112.97	INV.SW	107.91
			INV.NE	107.91
516	2400	112.91	INV.SW	107.79
			INV.N	107.76
518	2400	112.89	INV.S	107.72
			INV.NW	107.69
520	2400	112.80	INV.SE	107.47
			INV.SW	110.34
			INV.N	107.41
600	1200	113.85	INV.NE	111.79
			INV.SE	112.00
700	1200	119.45	INV.N	116.99
			INV.SE	116.79
702	1200	119.32	INV.NE	117.02
			INV.S	117.07
704	1200	117.41	INV.SW	115.11
			INV.E	115.04
706	1200	117.20	INV.W	114.85
			INV.SE	114.77
3000	2400	114.00	INV.S	111.52
			INV.NE	109.34
			INV.SW	112.00
3002	2400	112.00	INV.SW	109.23
			INV.N	109.23
3004	2400	113.74	INV.S	108.82
			INV.NW	108.79
3100	3000	110.80	INV.S	106.49
			INV.N	106.49
3102	3000	110.80	INV.S	106.48
			INV.N	106.48
3104	3000	110.08	INV.S	106.43
			INV.NE	105.89
3106	3000	109.30	INV.SW	105.65
			INV.NE	101.74
3108	3000	104.76	INV.SW	101.61
			INV.NE	98.48
3110 (HEADWALL)	-	-	INV.SW	98.40

From: Shane <shane@echelonenvironmental.ca>
Sent: Tuesday, February 6, 2024 4:04 PM
To: Trevor McKay; Melanie Schroeder
Subject: RE: Brown Lands (Mississippi Mills, Ontario) - Vortech Sizing Request
Attachments: Vortechs Parallel with Vaults.pdf; VX TSSR - Brown Lands, Mississipi Mills VX11000.pdf; VX TSSR - Brown Lands, Mississipi Mills VX16000.pdf

Hello Trevor,

Sorry for the delay,

Please see attached Sizing reports, a VX 11000 & VX 16000 in parallel would be required to achieve 80% TSS removal.

Shane Jensen
Project Manager
416-460-6328

From: Trevor McKay <t.mcKay@novatech-eng.com>
Sent: Tuesday, February 06, 2024 9:39 AM
To: Shane <shane@echelonenvironmental.ca>; Melanie Schroeder <m.schroeder@novatech-eng.com>
Subject: RE: Brown Lands (Mississippi Mills, Ontario) - Vortech Sizing Request

Shane,

Just following up on timing for the Vortech sizing request. We are trying to finalize our preliminary design submission and are waiting on this information to finalize.

Thank you,

Trevor McKay, P.Eng., Project Manager | Land Development Engineering
NOVATECH
Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 291 | Cell: 613.263.9113

VORTECHS SYSTEM® ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON AN AVERAGE PARTICLE SIZE OF TYPICAL MICRONS
Brown Lands
Mississipi Mills
VORTECHS 11000 OFF-LINE

Design Ratio[1] = (6.24 hectares) x (0.65) x (2.775) / (7.3 m2) = 1.53

Bypass occurs at an elevation of 107.16m (at approximately 10 l/s/m2)

Rainfall Intensity mm/hr	Operating Rate[2] % of capacity	Flow Treated (l/s)	% Total Rainfall Volume[3]	Rmvl. Effcy[4] (%)	Rel. Effcy (%)
0.5	1.1	5.6	9.2%	98.0%	9.0%
1.0	2.3	11.2	10.6%	98.0%	10.4%
1.5	3.4	16.8	9.9%	98.0%	9.7%
2.0	4.5	22.4	8.4%	98.0%	8.2%
2.5	5.6	28.0	7.7%	98.0%	7.5%
3.0	6.8	33.5	5.9%	98.0%	5.8%
3.5	7.9	39.1	4.4%	97.6%	4.3%
4.0	9.0	44.7	4.7%	96.3%	4.5%
4.5	10.2	50.3	3.3%	96.0%	3.2%
5.0	11.3	55.9	3.0%	95.3%	2.9%
6.0	13.5	67.1	5.4%	93.8%	5.1%
7.0	15.8	78.3	4.3%	91.8%	4.0%
8.0	18.0	89.4	3.6%	88.8%	3.2%
9.0	20.3	100.6	2.8%	87.3%	2.4%
10.0	22.6	111.8	2.1%	86.1%	1.8%
15.0	33.8	167.7	4.6%	80.4%	3.7%
20.0	45.1	223.6	2.5%	69.9%	1.7%
25.0	56.4	279.5	0.7%	60.8%	0.4%
30.0	67.7	335.4	0.3%	52.0%	0.1%
35.0	79.0	391.3	0.2%	38.2%	0.1%
40.0	90.2	447.2	0.2%	18.2%	0.0%
					87.9%

Predicted Annual Runoff Volume Treated=	93.5%
Assumed removal efficiency for bypassed flows =	0.0%
Estimated reduction in efficiency[5] =	0.0%
Predicted Net Annual Load Removal Efficiency =	**88%**

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 42 years of hourly rainfall data from Canadian Station 6105976, Ottawa CDA, ON

4 - Based on Contech Construction Products laboratory verified removal of an average particle size of TYPICAL microns (see Technical Bulletin #1).

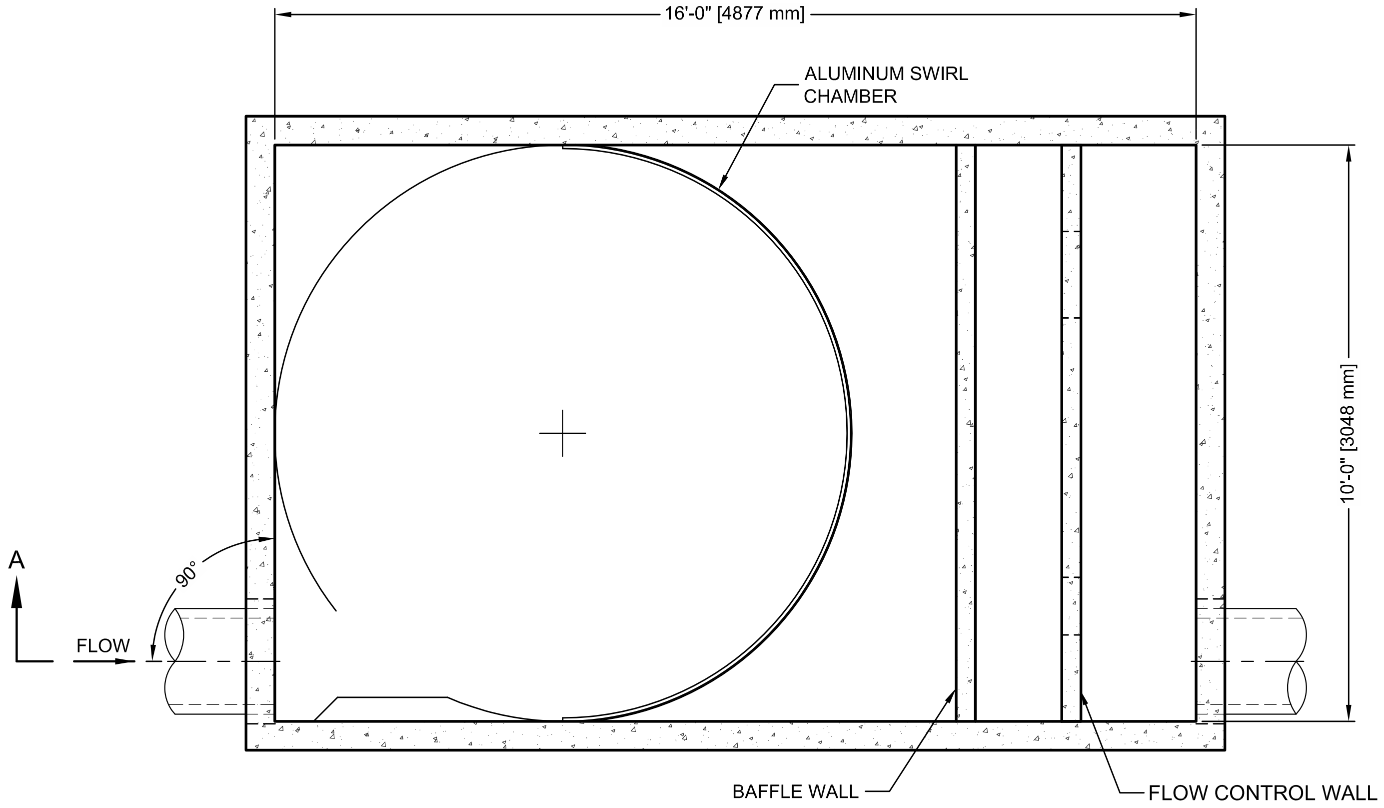
5- Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Calculated by:	NP	26-JAN-24	Checked by:

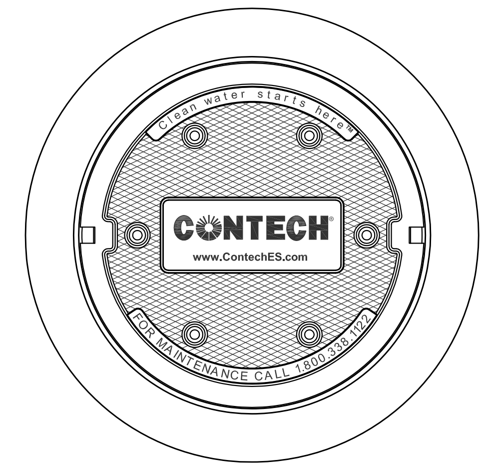
VORTECHS 11000 DESIGN NOTES

VORTECHS 11000 RATED TREATMENT CAPACITY IS 17.5 CFS, OR PER LOCAL REGULATIONS. IF THE SITE CONDITIONS EXCEED RATED TREATMENT CAPACITY, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD INLET/OUTLET CONFIGURATION IS SHOWN. FOR OTHER CONFIGURATION OPTIONS , PLEASE CONTACT YOUR CONTECH CONSTRUCTION PRODUCTS REPRESENTATIVE. www.ContechES.com



SECTION B-B



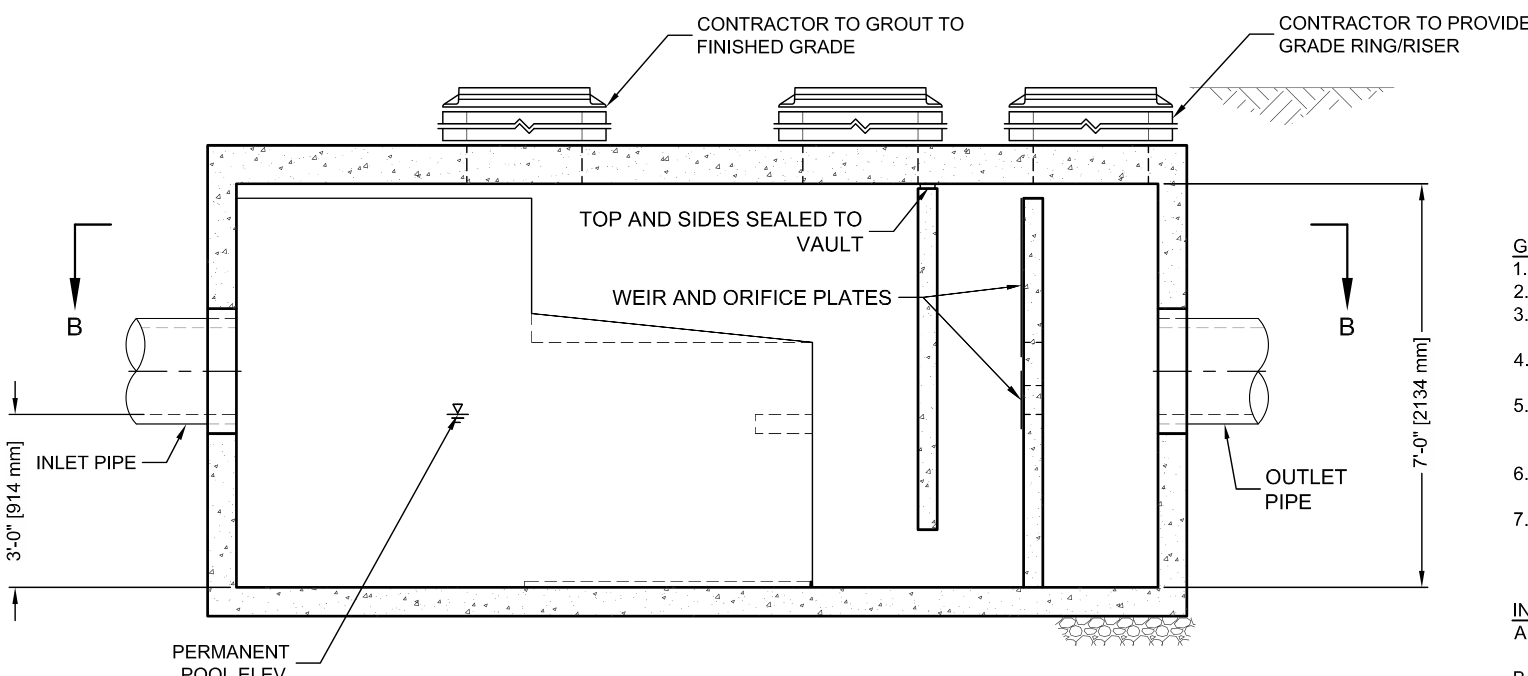
FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			*
WATER QUALITY FLOW RATE (CFS)			*
PEAK FLOW RATE (CFS)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD



SECTION A-A

GENERAL NOTES
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2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
4. VORTECHS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET AASHTO M306 LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. INLET PIPE(S) MUST BE PERPEDICULAR TO THE VAULT AND AT THE CORNER TO INTRODUCE THE FLOW TANGENTIALLY TO THE SWIRL CHAMBER. DUAL INLETS NOT TO HAVE OPPOSING TANGENTIAL FLOW DIRECTIONS.
7. OUTLET PIPE(S) MUST BE DOWN STREAM OF THE FLOW CONTROL BAFFLE AND MAY BE LOCATED ON THE SIDE OR END OF THE VAULT. THE FLOW CONTROL WALL MAY BE TURNED TO ACCOMODATE OUTLET PIPE KNOCKOUTS ON THE SIDE OF THE VAULT.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE VORTSENTRY HS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

Vortechs®
THIS PRODUCT MAY BE PROTECTED BY THE FOLLOWING U.S. PATENT: 5,759,415; RELATED FOREIGN PATENTS.

CONTECH®
ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

VORTECHS 11000
STANDARD DETAIL

I:\COMMON\CAD\TREATMENT\20 VORTECHS\40 STANDARD DRAWINGS\DWG\VX-11000-DTL.DWG 8/6/2014 2:28 PM

VORTECHS SYSTEM® ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON AN AVERAGE PARTICLE SIZE OF TYPICAL MICRONS

Brown Lands

Mississipi Mills

VORTECHS 16000 OFF-LINE

Design Ratio[1] = (9.36 hectares) x (0.65) x (2.775) / (10.5 m2) = 1.6

Bypass occurs at an elevation of 351.5' (at approximately 9 l/s/m2)

Rainfall Intensity mm/hr	Operating Rate[2] % of capacity	Flow Treated (l/s)	% Total Rainfall Volume[3]	Rmvl. Effcy[4] (%)	Rel. Effcy (%)
0.5	1.2	8.3	9.2%	98.0%	9.0%
1.0	2.3	16.6	10.6%	98.0%	10.4%
1.5	3.5	24.9	9.9%	98.0%	9.7%
2.0	4.7	33.2	8.4%	98.0%	8.2%
2.5	5.9	41.5	7.7%	98.0%	7.5%
3.0	7.0	49.8	5.9%	97.6%	5.8%
3.5	8.2	58.1	4.4%	96.9%	4.2%
4.0	9.4	66.5	4.7%	96.3%	4.5%
4.5	10.6	74.8	3.3%	96.0%	3.2%
5.0	11.7	83.1	3.0%	95.3%	2.9%
6.0	14.1	99.7	5.4%	92.8%	5.0%
7.0	16.4	116.3	4.3%	90.6%	3.9%
8.0	18.8	132.9	3.1%	88.8%	2.7%
9.0	21.1	149.5	2.4%	86.8%	2.1%
10.0	23.5	166.1	1.6%	85.7%	1.4%
15.0	35.2	249.2	3.7%	79.4%	3.0%
20.0	46.9	332.3	1.8%	69.0%	1.3%
25.0	58.7	415.3	0.5%	59.3%	0.3%
30.0	70.4	498.4	0.2%	48.9%	0.1%
35.0	82.1	581.5	0.1%	32.0%	0.0%
40.0	93.9	664.5	0.2%	14.4%	0.0%
0.0	0.0	0.0	0.0%	100.0%	0.0%
0.0	0.0	0.0	0.0%	100.0%	0.0%
0.0	0.0	0.0	0.0%	100.0%	0.0%
					85.3%

% rain falling at >0 mm/hr or bypassing treatment =	90.5%
Assumed removal efficiency for bypassed flows =	0.0%
Estimated reduction in efficiency[5] =	0.0%
Predicted Net Annual Load Removal Efficiency =	**85%**

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/m².

3 - Based on 42 years of hourly rainfall data from Canadian Station 6105976, Ottawa CDA, ON

4 - Based on Contech Construction Products laboratory verified removal of an average particle size of TYPICAL microns (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:	NP	26-JAN-24	Checked by:	JK

VORTECHS 16000 DESIGN NOTES

VORTECHS 16000 RATED TREATMENT CAPACITY IS 25 CFS, OR PER LOCAL REGULATIONS. IF THE SITE CONDITIONS EXCEED RATED TREATMENT CAPACITY, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

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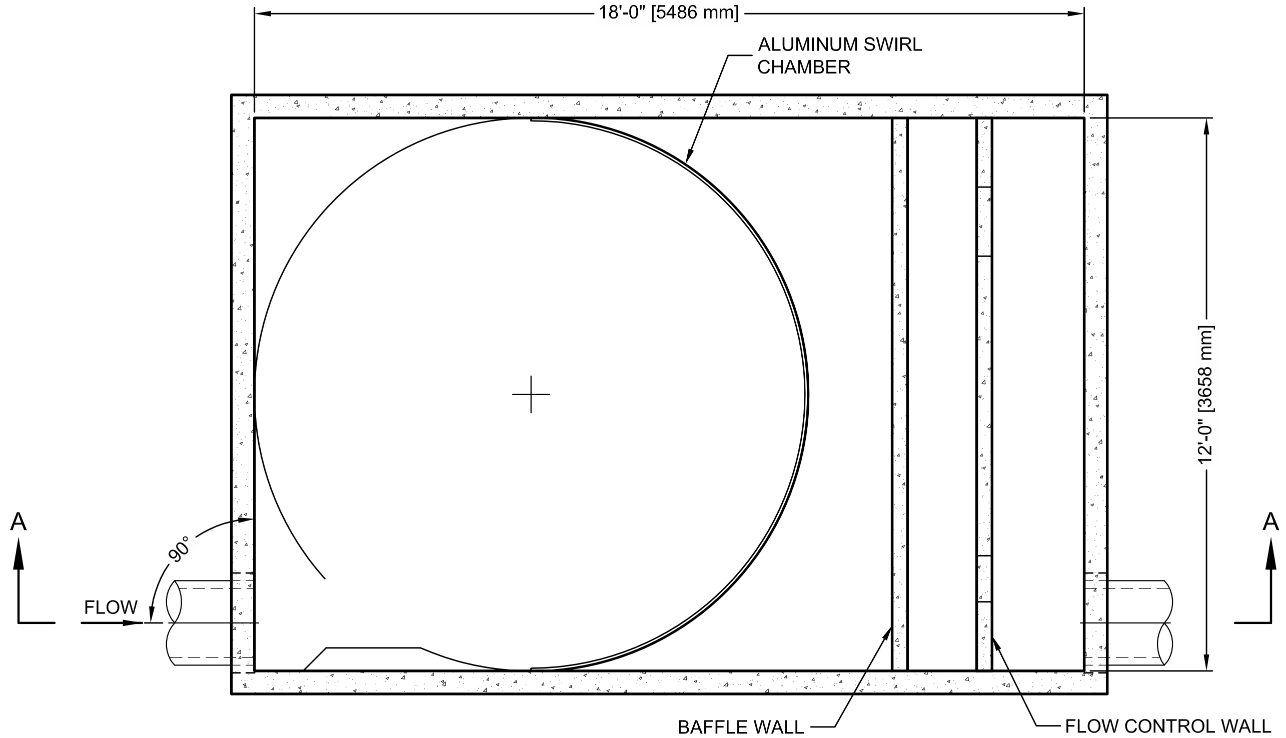
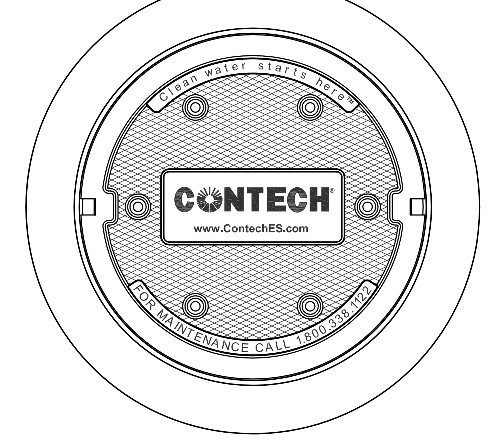


SECTION B-B



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*
WATER QUALITY FLOW RATE (CFS)	*
PEAK FLOW RATE (CFS)	*
RETURN PERIOD OF PEAK FLOW (YRS)	*

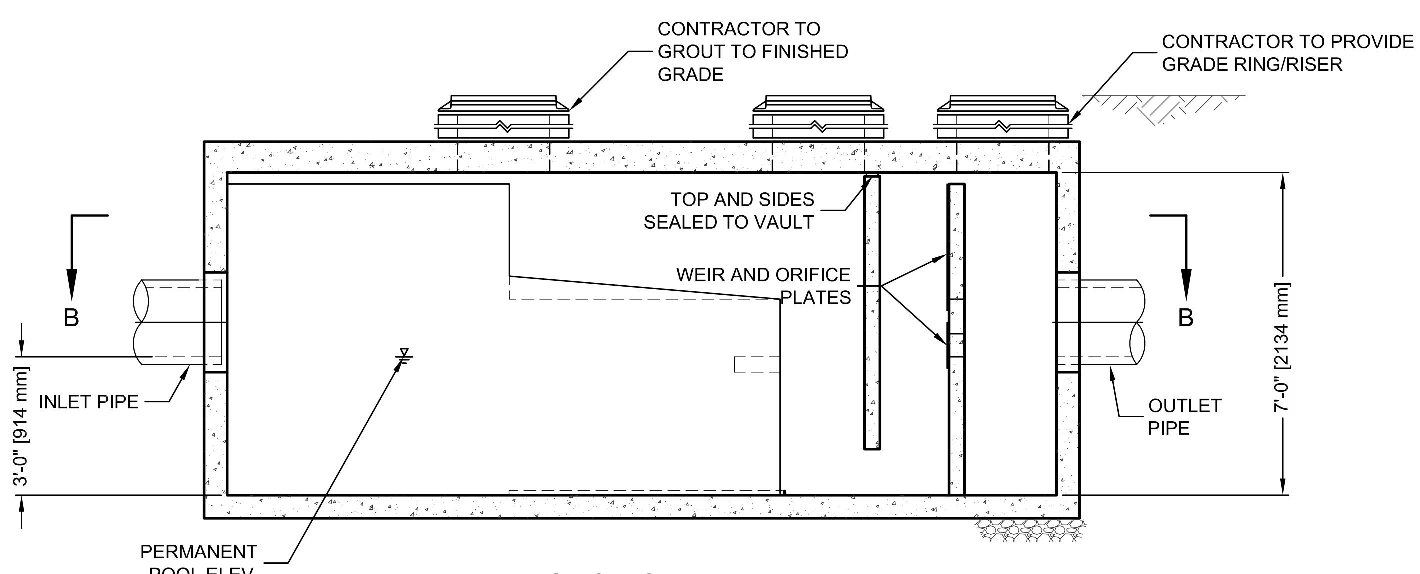
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD



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Vortechs®

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800-338-1122 513-645-7000 513-645-7993 FAX

VORTECHS 16000
STANDARD DETAIL

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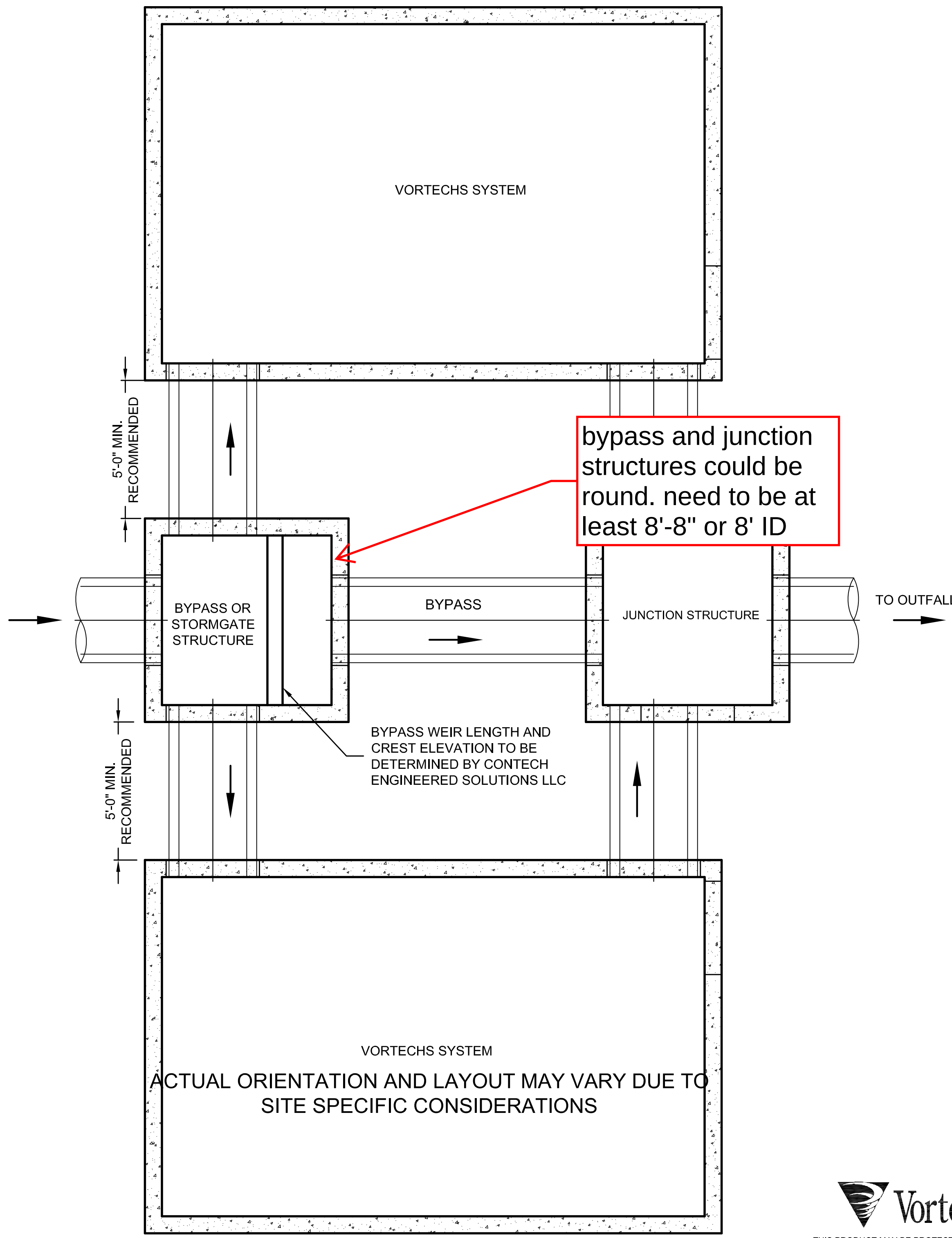
- BYPASS AND JUNCTION STRUCTURES MAY OR MAY NOT BE SUPPLIED BY CONTECH -



Vortechs®

THIS PRODUCT MAY BE PROTECTED BY THE FOLLOWING U.S. PATENT: 5,759,415; RELATED FOREIGN PATENTS.

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www.ContechES.com
11835 NE Glenn Widing Drive, Portland, OR 97220
800-548-4667 503-240-3393 800-561-1271 FAX

TYPICAL BYPASS LAYOUT
VORTECHS® STORMWATER TREATMENT SYSTEM

DATE:3/25/15	SCALE: NONE	PROJECT No.:TYPVXBPLOS	SEQ. No.: N/A	DRAWN: SDS	CHECKED: ---

I:\STORMWATER\COMMOPS\20 VORTECHS\40 STANDARD DRAWINGS\BYPASS\DWG\VORTECHS PARALLEL WITH VAULTS - SDS 03-25-2015.DWG 3/25/2015 8:38 AM

Curve Number & Initial Abstraction

Area ID	Catchment Area (ha)	Land use		Soil Type			CN	S (mm)	IA (mm)
PRE-1	2.393	Impervious	0.0%	-	0%	98	**84**	48	4.8
		Row Crop	90.2%	B	0%	75			
				D	100%	85			
		Grass / Pasture	0.6%	B	0%	61			
				D	100%	80			
		Woods	9.2%	B	0%	55			
				D	100%	77			
		Wetland	0.0%	B	0%	56			
				D	0%	77			
PRE-2	9.881	Impervious	0.9%	-	100%	98	**83**	52	5.2
		Row Crop	67.1%	B	0%	75			
				D	100%	85			
		Grass / Pasture	16.8%	B	0%	61			
				D	100%	80			
		Woods	3.1%	B	0%	55			
				D	100%	77			
		Wetland	12.1%	B	0%	56			
				D	100%	77			
PRE-3	68.766	Impervious	2.4%	-	100%	98	**81**	61	6.1
		Row Crop	60.2%	B	0%	75			
				D	100%	85			
		Grass / Pasture	17.4%	B	25%	61			
				D	75%	80			
		Woods	11.4%	B	55%	55			
				D	45%	77			
		Wetland	8.6%	B	0%	56			
				D	100%	77			
PRE-4	0.261	Impervious	18.4%	-	100%	98	**73**	93	9.3
		Row Crop	0.0%	B	0%	75			
				D	0%	85			
		Grass / Pasture	57.4%	B	57%	61			
				D	43%	80			
		Woods	16.1%	B	91%	55			
				D	9%	77			
		Wetland	8.1%	B	0%	56			
				D	100%	77			
PRE-5	2.343	Impervious	2.1%	-	100%	98	**68**	119	11.9
		Row Crop	0.0%	B	0%	75			
				D	0%	85			
		Grass / Pasture	85.1%	B	57%	61			
				D	43%	80			
		Woods	12.8%	B	91%	55			
				D	9%	77			
		Wetland	0.0%	B	0%	56			
				D	0%	77			

Time of Concentration (Upland's Method)

Area ID	Catchment Area (ha)	% Imperv.	Runoff Coefficient	Overland Flow				Shallow Concentrated Flow				Open Channel Flow				Overall		
				Length (m)	Slope (%)	Velocity (m/s)	Travel Time (min)	Length (m)	Slope (%)	Velocity (m/s)	Travel Time (min)	Length (m)	Slope (%)	Velocity (m/s)	Travel Time (min)	Time of Concentration (min)	Min. Time of Concentration (min)	Time to Peak (min)
PRE-1	2.393	0.0%	0.20	50	5.9%	0.38	2	110	2.0%	0.63	3	0	-	-	0	5	15	3
PRE-2	9.881	0.9%	0.21	50	1.0%	0.16	5	280	4.5%	0.96	5	200	1.1%	0.48	7	17	17	11
PRE-3	68.766	2.4%	0.22	50	1.3%	0.17	5	525	2.8%	0.77	11	680	0.6%	0.36	31	48	48	32
PRE-4	0.261	18.4%	0.33	50	1.5%	0.18	5	0	-	-	0	0	-	-	0	5	15	3
PRE-5	2.343	2.1%	0.21	50	1.5%	0.18	5	80	2.3%	0.70	2	0	-	-	0	7	15	4

*Add overland flow & shallow concentrated flow travel time + creek flow travel time through subcatchment

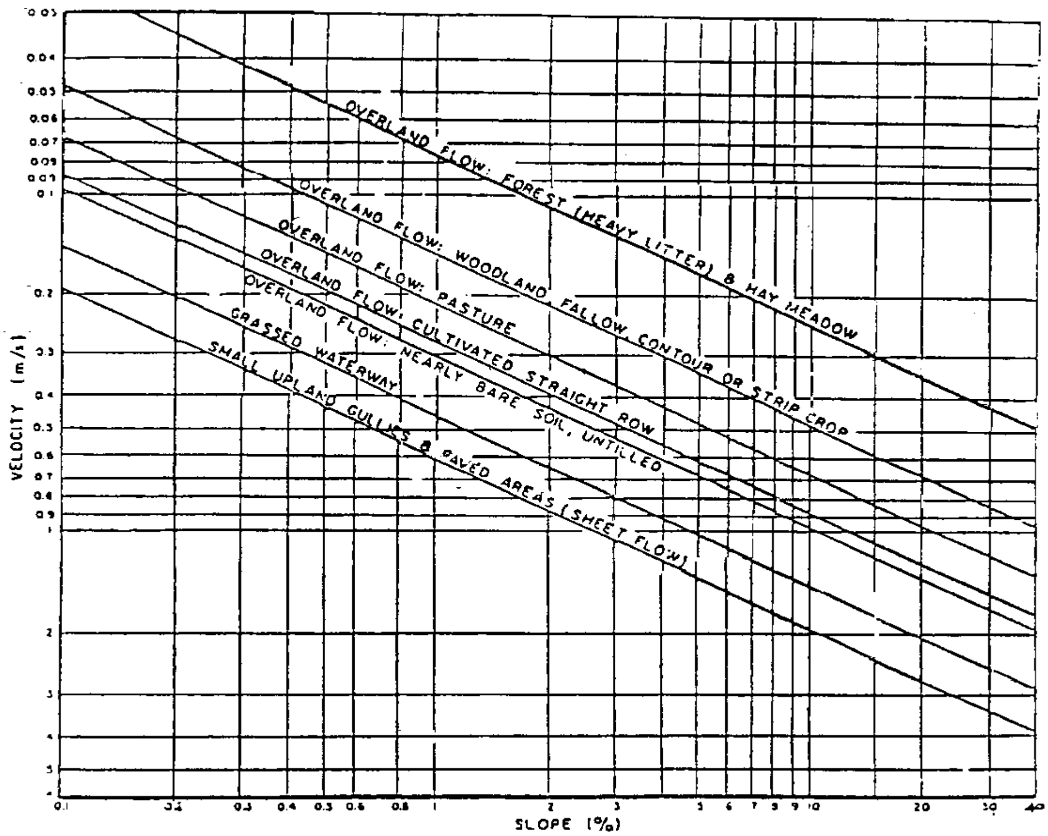


Figure A.5.2: Upland Method for Estimating Time of Concentration (SCS National Engineering Handbook, 1971)

Brown Lands (118178)
Post-Development Model Parameters

Area ID	Catchment Area (ha)	Runoff Coefficient (C)	Percent Impervious (%)	No Depression (%)	Flow Path Length (m)	Equivalent Width (m)	Average Slope (%)
100-102	0.730	0.65	64.3%	40%	34	215	2.0%
102-104	0.450	0.65	64.3%	40%	32	139	2.0%
104-226	0.380	0.65	64.3%	40%	50	76	2.0%
106-104	0.490	0.65	64.3%	40%	30	164	2.0%
106-502	0.320	0.65	64.3%	40%	29	112	2.0%
200-204	0.360	0.65	64.3%	40%	75	48	2.0%
204-3000	0.100	0.65	64.3%	40%	43	23	2.0%
206-204	0.570	0.65	64.3%	40%	36	160	2.0%
208-206	0.100	0.65	64.3%	40%	59	17	2.0%
210-208	0.310	0.65	64.3%	40%	53	59	2.0%
212-210	0.180	0.65	64.3%	40%	58	31	2.0%
214-212	0.250	0.65	64.3%	40%	50	50	2.0%
216-214	0.210	0.65	64.3%	40%	53	40	2.0%
220-216	0.230	0.65	64.3%	40%	32	73	2.0%
222-224	0.610	0.65	64.3%	40%	67	91	2.0%
224-226	0.510	0.65	64.3%	40%	65	78	2.0%
224-400	0.460	0.65	64.3%	40%	40	115	2.0%
226-300	0.280	0.65	64.3%	40%	37	75	2.0%
300-208	0.780	0.65	64.3%	40%	40	195	2.0%
400-212	0.320	0.65	64.3%	40%	37	87	2.0%
500-106	0.130	0.65	64.3%	40%	33	40	2.0%
502-506	0.210	0.65	64.3%	40%	23	91	2.0%
506-508	0.310	0.65	64.3%	40%	45	69	2.0%
508-510	0.010	0.65	64.3%	40%	9	11	2.0%
510-512	0.140	0.65	64.3%	40%	9	153	2.0%
512-514	0.190	0.65	64.3%	40%	73	26	2.0%
514-518	0.750	0.65	64.3%	40%	60	126	2.0%
518-520	0.330	0.65	64.3%	40%	37	89	2.0%
600-512	0.160	0.65	64.3%	40%	9	175	2.0%
600-520	0.790	0.65	64.3%	40%	33	243	2.0%
702-506	0.760	0.65	64.3%	40%	50	153	2.0%
702-706	0.530	0.65	64.3%	40%	65	81	2.0%
706-508	0.640	0.65	64.3%	40%	40	160	2.0%
DR1	2.980	0.30	14.3%	100%	107	279	2.0%
DR2	0.910	0.30	14.3%	100%	72	126	2.0%
DR3	0.350	0.45	35.7%	100%	21	164	2.0%
TOTAL:	**16.83**						

Brown Lands (118178)
Post-Development Offsite Model Parameters

NOVATECH
Engineers, Planners & Landscape Architects

Curve Number & Initial Abstraction

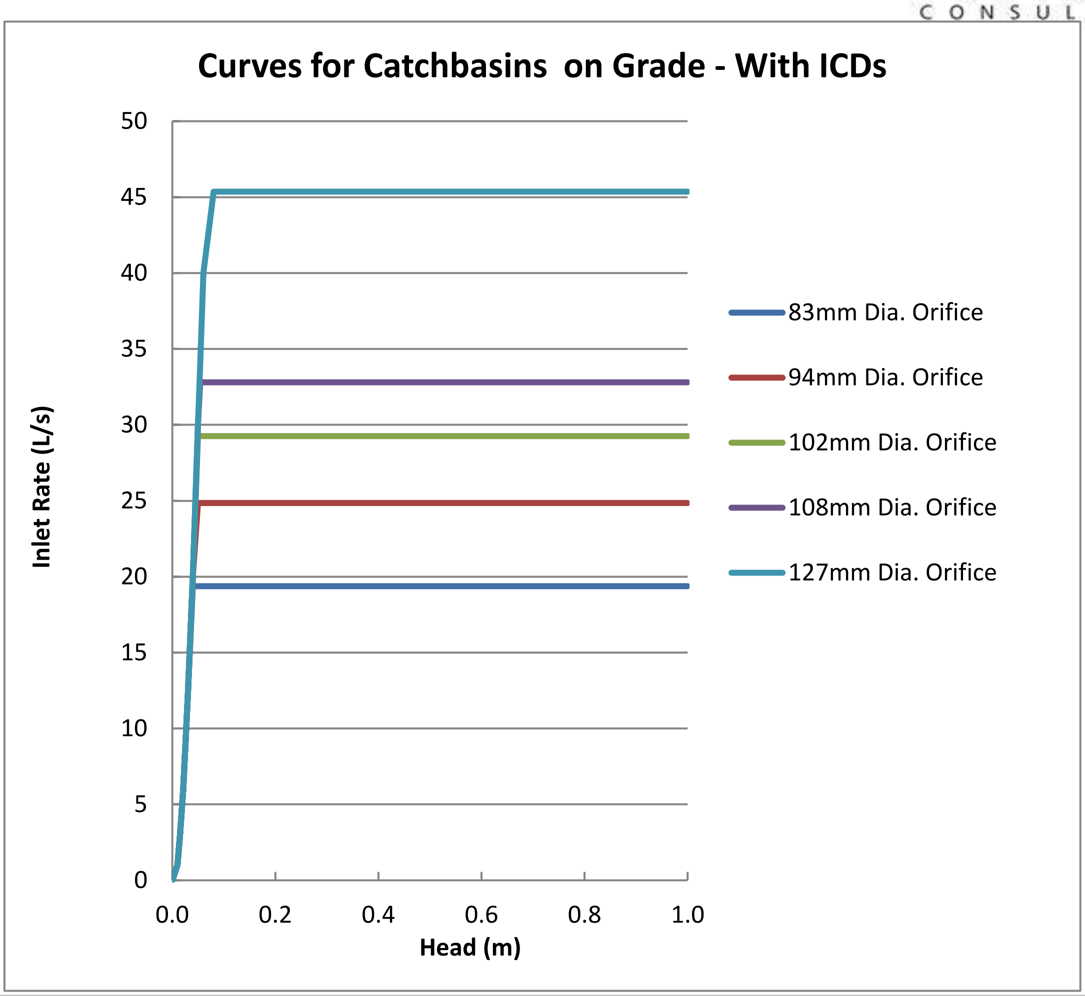
Area ID	Catchment Area (ha)	Land use		Soil Type			CN	S (mm)	IA (mm)
EXT-1	0.986	Impervious	2.6%	-	100%	98	**85**	45	4.5
		Row Crop	90.8%	B	0%	75			
				D	100%	85			
		Grass / Pasture	0.0%	B	0%	61			
				D	0%	80			
		Woods	6.6%	B	0%	55			
				D	100%	77			
		Wetland	0.0%	B	0%	56			
				D	0%	77			
EXT-2	65.061	Impervious	2.6%	-	100%	98	**81**	61	6.1
		Row Crop	59.4%	B	0%	75			
				D	100%	85			
		Grass / Pasture	17.7%	B	24%	61			
				D	76%	80			
		Woods	12.1%	B	55%	55			
				D	45%	77			
		Wetland	8.2%	B	0%	56			
				D	100%	77			
EXT-3	0.647	Impervious	7.3%	-	100%	98	**82**	55	5.5
		Row Crop	29.2%	B	0%	75			
				D	100%	85			
		Grass / Pasture	46.5%	B	0%	61			
				D	100%	80			
		Woods	9.3%	B	0%	55			
				D	100%	77			
		Wetland	7.7%	B	0%	56			
				D	100%	77			

Time of Concentration (Upland's Method)

Area ID	Catchment Area (ha)	% Imperv.	Runoff Coefficient	Overland Flow				Shallow Concentrated Flow				Open Channel Flow				Overall		
				Length (m)	Slope (%)	Velocity (m/s)	Travel Time (min)	Length (m)	Slope (%)	Velocity (m/s)	Travel Time (min)	Length (m)	Slope (%)	Velocity (m/s)	Travel Time (min)	Time of Concentration (min)	Min. Time of Concentration (min)	Time to Peak (min)
EXT-1	0.986	2.6%	0.22	50	1.8%	0.20	4	100	1.4%	0.32	5	0	-	-	0	9	15	6
EXT-2*	65.061	2.6%	0.22	50	1.3%	0.17	5	525	2.8%	0.77	11	680	0.6%	0.36	31	48	48	32
EXT-3	0.647	7.3%	0.25	50	2.9%	0.25	3	90	2.6%	0.72	2	0	-	-	0	5	15	4

*Add overland flow & shallow concentrated flow travel time + creek flow travel time through subcatchment

Brown Lands (118178)
Major Flow



Curb Inlet Catchbasins on Continuous Grade

Depth vs. Captured Flow Curve

A standard depth vs. captured flow curve for catch basins on a continuous grade was provided to Novatech by City staff for use in a dual-drainage model of an existing residential neighbourhood. This standard curve was derived using the inlet curves in Appendix 7A of the Ottawa Sewer Design Guidelines.

Novatech reviewed the methodology used to create this standard curve (described below) and determined that it was suitable for general use in other dual-drainage models.

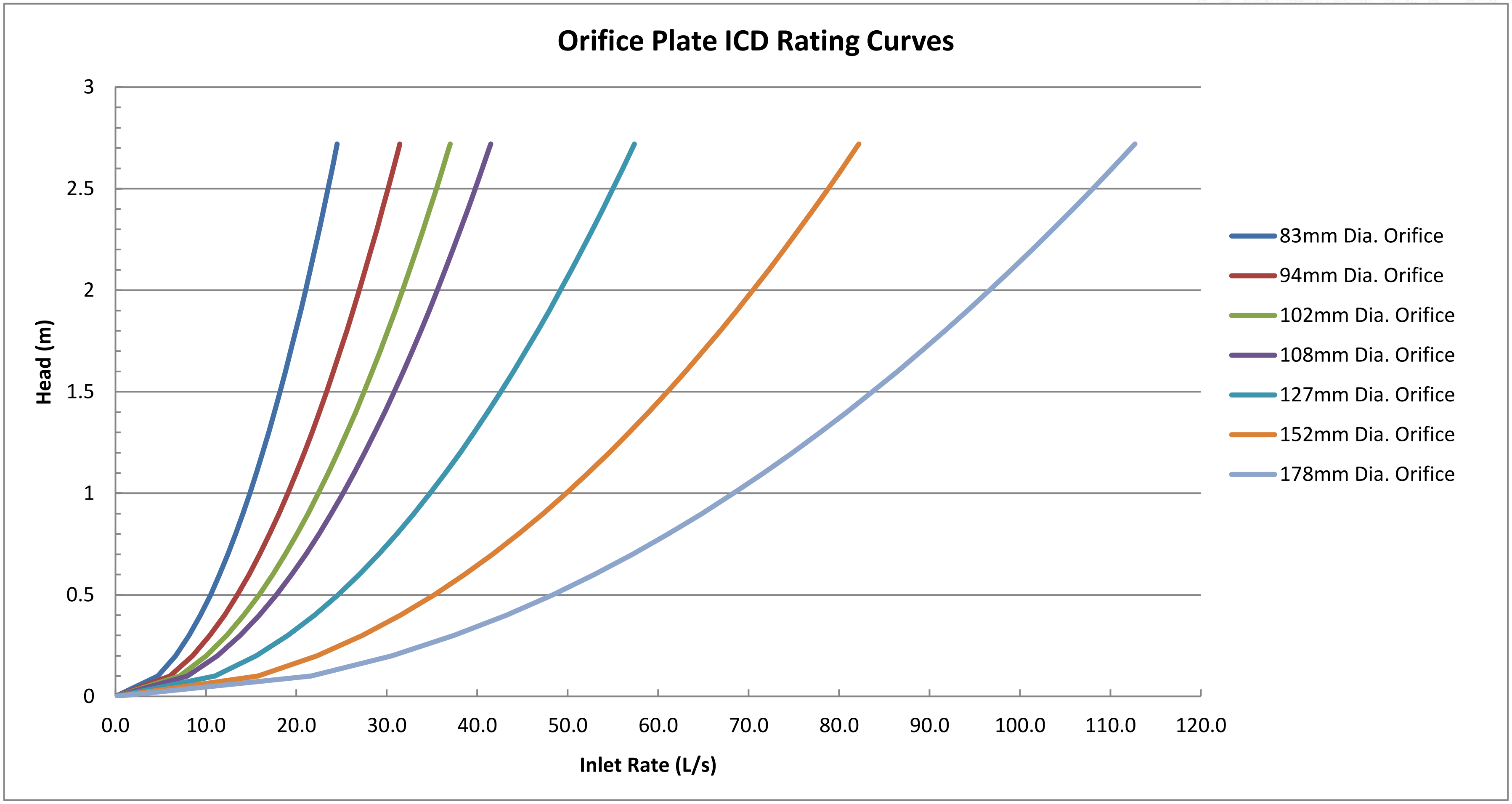
- MTO Design Chart 4.04 provides the relationship between the gutter flow rate (Q_t) and flow spread (T) for Barrier Curb.
- MTO Design Chart 4.12 provides the relationship between flow spread (T) and flow depth (D).
- The relationship between the gutter flow rate (Q_t) and flow depth (D) was determined for different road slopes using the above charts and Manning's equation (refer to pages 58-60 of the MTO Drainage Management Manual – Part 2);
- The relationship between approach flow (Q_t) and captured flow (Q_c) was determined for different road slopes using the design chart for Barrier Curb with Gutter (Appendix 7-A.2).
- Using the above information, a family of curves was developed to characterize the relationship between flow depth and captured flow for curb inlet catchbasins on different road slopes. The results of this exercise can be summarized as follows:
    - For a given flow depth, the gutter flow rate (Q_t) increases as the road slope increases.
    - The capture efficiency (Q_c) of curb inlet catchbasins decrease as the road slope increases.
    - The net result is that the relationship between flow depth and capture rate is largely independent of road slope: While approach flow vs. captured flow (Q_t vs. Q_c) varies significantly with road grade, flow depth vs. captured flow (D vs. Q_c) does not.

Since there was very little difference in the flow depth vs. captured flow curves for different road slopes, this family of curves was averaged to create a single standard curve for use in dual-drainage models.

Inlet Control Devices

The standard depth vs. capture flow curve was modified to account for the installation of ICDs in curb inlet catchbasins on continuous grade. Separate inlet curves were created for each standard ICD orifice size by capping the inlet rate on the depth vs. capture flow curve at the maximum flow rate through the ICD at a head of 1.2m (depth from centerline of CB lead to top of CICB frame).

Brown Lands (118178)
Major Flow



Brown Lands (118178)
HGL Elevations

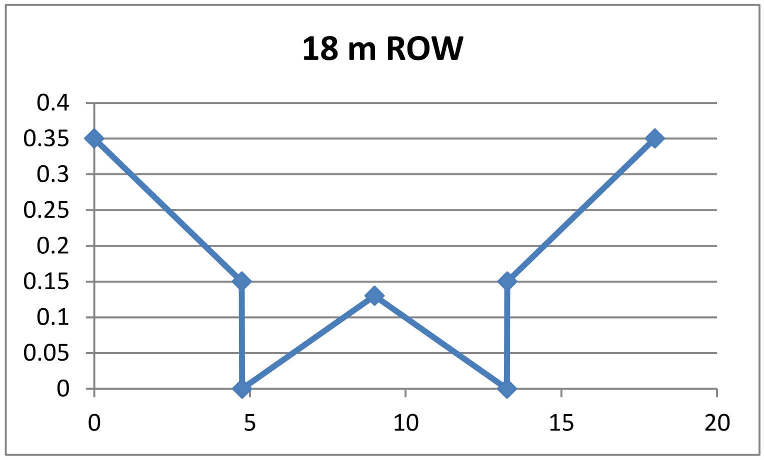
Manhole ID	Pipe / MH / USF Information				HGL Information[1]		Surcharge Depth		Clearance to T/G		Minimum USF Elevation
	D/S Pipe Size (mm)	D/S Pipe Invert Elev. (m)	D/S Pipe Obvert Elev. (m)	MH T/G Elev. (m)	100-year (m)	100-year (+20%) (m)	100-year (m)	100-year (+20%) (m)	100-year (m)	100-year (+20%) (m)	(m)
MH100	375	123.57	123.95	126.11	123.57	123.57	0.00	0.00	2.54	2.54	123.87
MH102	375	122.64	123.02	125.01	122.86	122.87	0.00	0.00	2.15	2.14	123.16
MH104	450	119.65	120.10	123.00	120.02	120.03	0.00	0.00	2.98	2.97	120.32
MH106	300	120.50	120.80	123.10	120.59	120.60	0.00	0.00	2.51	2.50	120.89
MH200	375	113.75	114.13	116.12	113.75	113.75	0.00	0.00	2.37	2.37	114.05
MH202	375	113.26	113.64	115.68	113.26	113.26	0.00	0.00	2.42	2.42	113.56
MH204	900	112.60	113.50	115.49	113.22	113.23	0.00	0.00	2.27	2.26	113.52
MH206	900	113.18	114.08	118.04	114.15	114.17	0.07	0.09	3.89	3.87	114.45
MH208	825	114.76	115.59	118.49	115.23	115.23	0.00	0.00	3.26	3.26	115.53
MH210	525	116.81	117.34	119.29	117.14	117.15	0.00	0.00	2.15	2.14	117.44
MH212	525	117.03	117.56	119.55	117.45	117.46	0.00	0.00	2.10	2.09	117.75
MH214	375	118.30	118.68	120.67	118.46	118.48	0.00	0.00	2.21	2.19	118.76
MH216	300	119.87	120.17	122.50	119.99	120.00	0.00	0.00	2.51	2.50	120.29
MH218	300	120.72	121.02	123.05	120.72	120.72	0.00	0.00	2.33	2.33	121.02
MH220	300	123.11	123.41	125.66	123.11	123.11	0.00	0.00	2.55	2.55	123.41
MH222	300	123.20	123.50	126.00	123.20	123.20	0.00	0.00	2.80	2.80	123.50
MH224	375	119.80	120.18	122.80	119.99	119.99	0.00	0.00	2.81	2.81	120.29
MH226	675	117.16	117.84	120.05	117.61	117.61	0.00	0.00	2.44	2.44	117.91
MH300	825	116.15	116.98	119.24	116.84	116.85	0.00	0.00	2.40	2.39	117.14
MH3000	1200	109.34	110.54	114.00	111.53	112.39	0.99	1.85	2.47	1.61	111.83
MH3002	1200	109.23	110.43	113.00	111.35	112.16	0.92	1.73	1.65	0.84	111.65
MH3004	1200	108.79	109.99	113.74	110.60	111.16	0.61	1.17	3.14	2.58	110.90
MH3100	1350	106.49	107.84	110.80	107.89	108.01	0.05	0.17	2.91	2.79	108.19
MH3102	1350	106.48	107.83	110.80	107.87	107.98	0.04	0.15	2.93	2.82	108.17
MH3104	1650	105.89	107.54	110.08	106.68	106.74	0.00	0.00	3.40	3.34	106.98
MH3106	1650	101.75	103.40	109.30	102.72	102.81	0.00	0.00	6.58	6.49	103.02
MH3108	1650	98.48	100.13	104.76	101.53	101.61	1.40	1.48	3.23	3.15	101.83
MH400	375	117.77	118.15	120.79	117.98	117.98	0.00	0.00	2.81	2.81	118.28
MH500	250	121.00	121.25	123.25	121.00	121.00	0.00	0.00	2.25	2.25	121.30
MH502	300	119.08	119.38	122.34	119.29	119.30	0.00	0.00	3.05	3.04	119.59
MH504	375	118.69	119.07	122.05	118.85	118.85	0.00	0.00	3.20	3.20	119.15
MH506	600	116.38	116.98	118.97	116.61	116.62	0.00	0.00	2.36	2.35	116.91
MH508	600	113.79	114.39	116.42	114.09	114.09	0.00	0.00	2.33	2.33	114.39
MH510	1350	108.17	109.52	115.80	110.00	110.38	0.48	0.86	5.80	5.42	110.30
MH512	1350	107.97	109.32	113.00	109.69	109.99	0.37	0.67	3.31	3.01	109.99
MH514	1350	107.91	109.26	112.97	109.60	109.87	0.34	0.61	3.37	3.10	109.90
MH516	1350	107.76	109.11	112.91	109.28	109.48	0.17	0.37	3.63	3.43	109.58
MH518	1350	107.69	109.04	112.89	109.11	109.26	0.07	0.22	3.78	3.63	109.41
MH520	1350	107.41	108.76	112.80	108.27	108.40	0.00	0.00	4.53	4.40	108.57
MH600	450	111.79	112.24	113.85	111.79	111.79	0.00	0.00	2.06	2.06	112.09
MH700	450	116.79	117.24	119.45	116.79	116.79	0.00	0.00	2.66	2.66	117.09
MH702	300	117.02	117.32	119.32	117.02	117.02	0.00	0.00	2.30	2.30	117.32
MH704	375	115.04	115.42	117.41	115.04	115.04	0.00	0.00	2.37	2.37	115.34
MH706	450	114.77	115.22	117.20	114.98	114.98	0.00	0.00	2.22	2.22	115.28
OGS1	975	106.49	107.47	110.80	107.88	108.00	0.42	0.54	2.92	2.80	108.18
OGS2	975	106.49	107.47	110.80	107.88	108.00	0.42	0.54	2.92	2.80	108.18

[1] *PCSWMM Results from 100-year 3-hour Chicago Storm Event*

Brown Lands (118178)
Roadway Cross-Sections

18m - ROW

Station (m)	Elevation (m)
0	0.35
4.74	0.15
4.75	0
9	0.13
13.25	0
13.26	0.15
18	0.35



Brown Lands (118178)
Design Storm Time Series Data
Chicago Design Storms

C25mm-4.stm			C2-3.stm			C5-3.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	1.51		0:10	2.81		0:10	3.68
0:20	1.75		0:20	3.5		0:20	4.58
0:30	2.07		0:30	4.69		0:30	6.15
0:40	2.58		0:40	7.3		0:40	9.61
0:50	3.46		0:50	18.21		0:50	24.17
1:00	5.39		1:00	76.81		1:00	104.19
1:10	13.44		1:10	24.08		1:10	32.04
1:20	56.67		1:20	12.36		1:20	16.34
1:30	17.77		1:30	8.32		1:30	10.96
1:40	9.12		1:40	6.3		1:40	8.29
1:50	6.14		1:50	5.09		1:50	6.69
2:00	4.65		2:00	4.29		2:00	5.63
2:10	3.76		2:10	3.72		2:10	4.87
2:20	3.17		2:20	3.29		2:20	4.3
2:30	2.74		2:30	2.95		2:30	3.86
2:40	2.43		2:40	2.68		2:40	3.51
2:50	2.18		2:50	2.46		2:50	3.22
3:00	1.98		3:00	2.28		3:00	2.98
3:10	1.81						
3:20	1.68						
3:30	1.56						
3:40	1.47						
3:50	1.38						
4:00	1.31						

Brown Lands (118178)
Design Storm Time Series Data
Chicago Design Storms

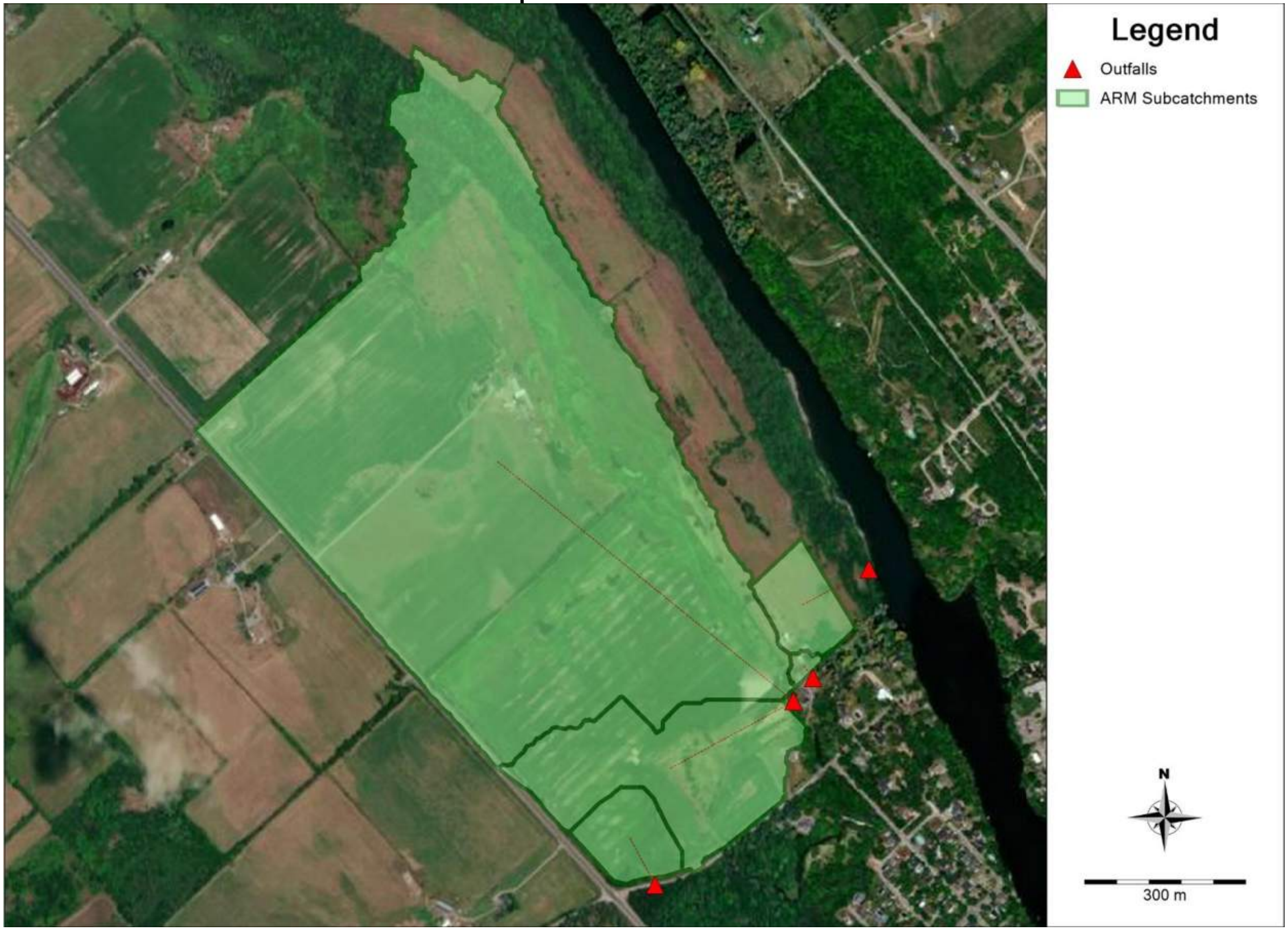
C100-3.stm		C100-3+20%.stm	
Duration	Intensity	Duration	Intensity
min	mm/hr	min	mm/hr
0:00	0	0:00	0
0:10	6.05	0:10	6:14
0:20	7.54	0:20	9.05
0:30	10.16	0:30	12.19
0:40	15.97	0:40	19.16
0:50	40.65	0:50	48.78
1:00	178.56	1:00	214.27
1:10	54.05	1:10	64.86
1:20	27.32	1:20	32.78
1:30	18.24	1:30	21.89
1:40	13.74	1:40	16.49
1:50	11.06	1:50	13.27
2:00	9.29	2:00	11.15
2:10	8.02	2:10	9.62
2:20	7.08	2:20	8.5
2:30	6.35	2:30	7.62
2:40	5.76	2:40	6.91
2:50	5.28	2:50	6.34
3:00	4.88	3:00	5.86

Brown Lands (118178)
Design Storm Time Series Data
SCS Design Storms

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

Brown Lands (118178)
PCSWMM Model Schematics

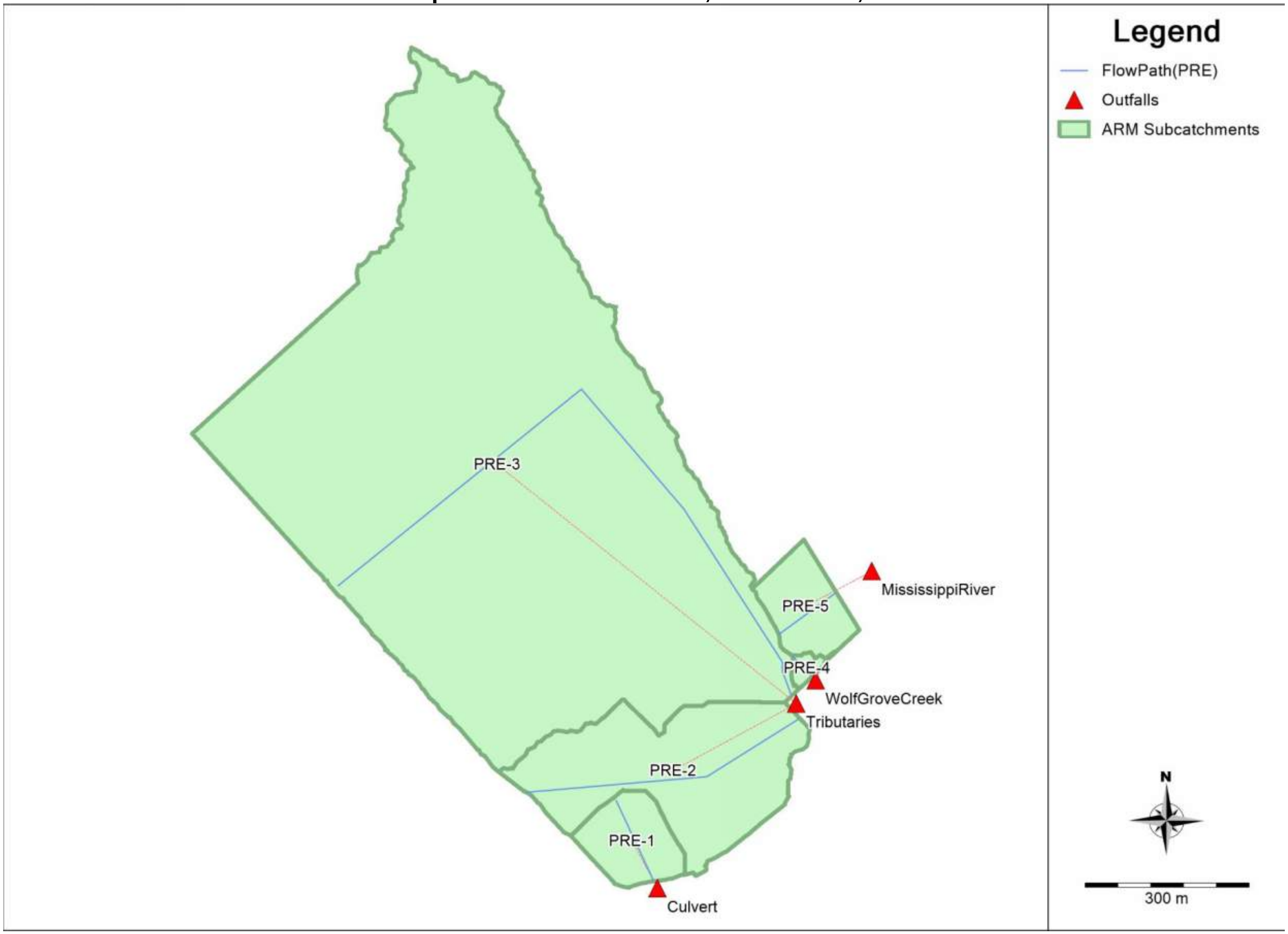
Pre-Development – Overall Model Schematic



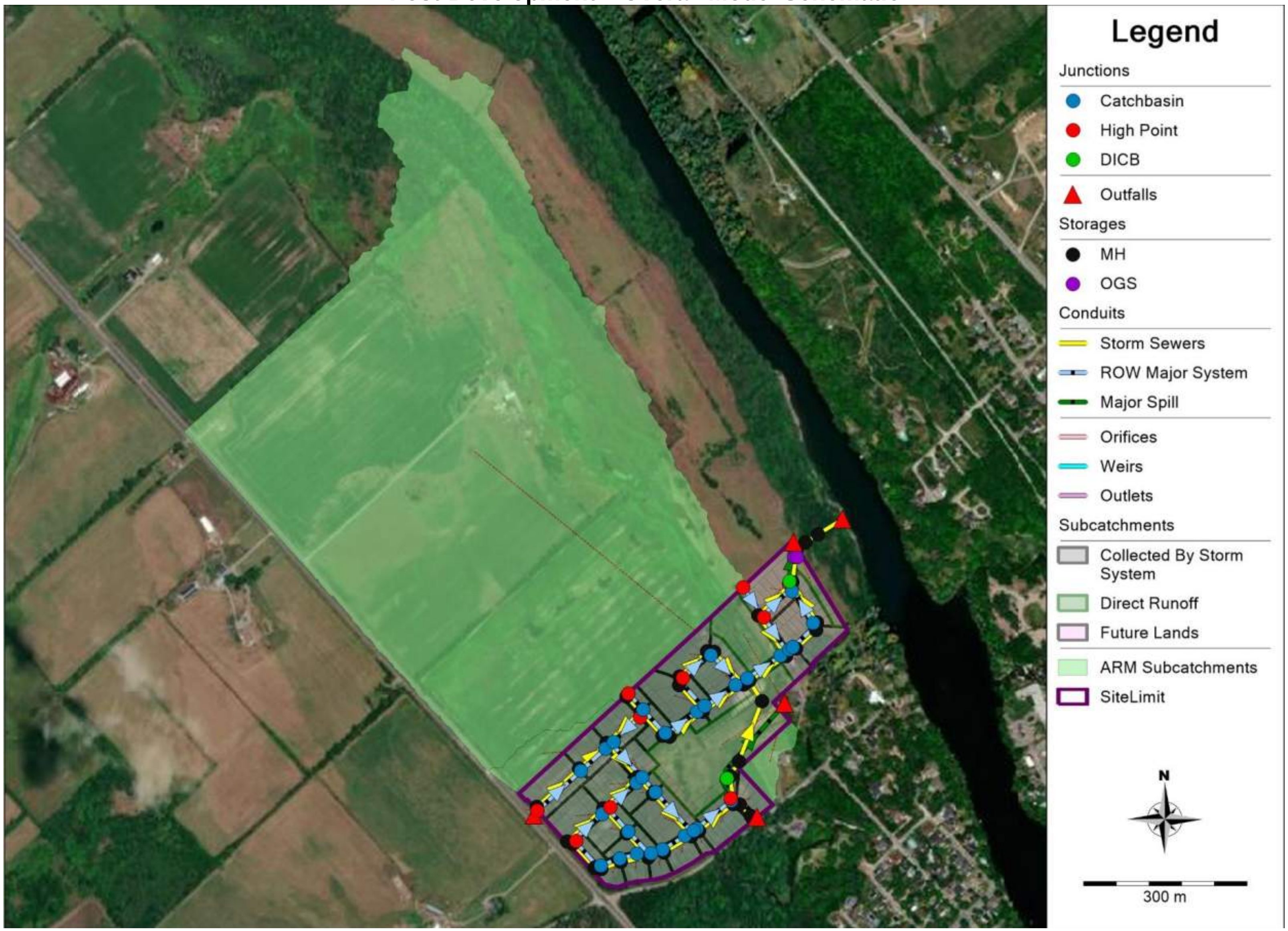
Date: 2024-02-12
M:\2018\118178\DATA\Calculations\Sewer Calcs\SWM\118178-PCSWMM Model Schematics-Rev1.docx

Brown Lands (118178)
PCSWMM Model Schematics

Pre-Development – Subcatchments, Flow Widths, & Outfalls

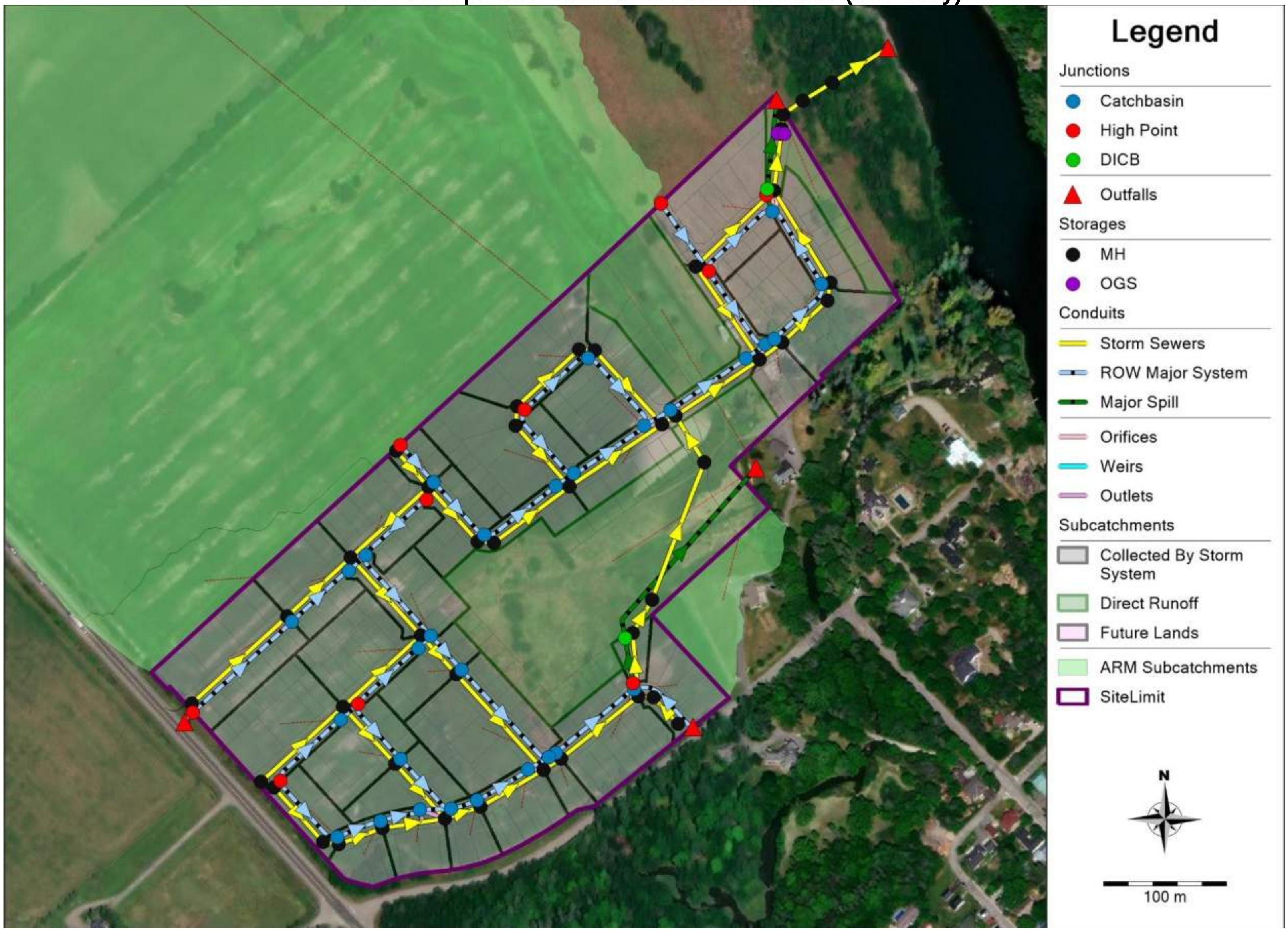


Post-Development – Overall Model Schematic



Brown Lands (118178)
PCSWMM Model Schematics

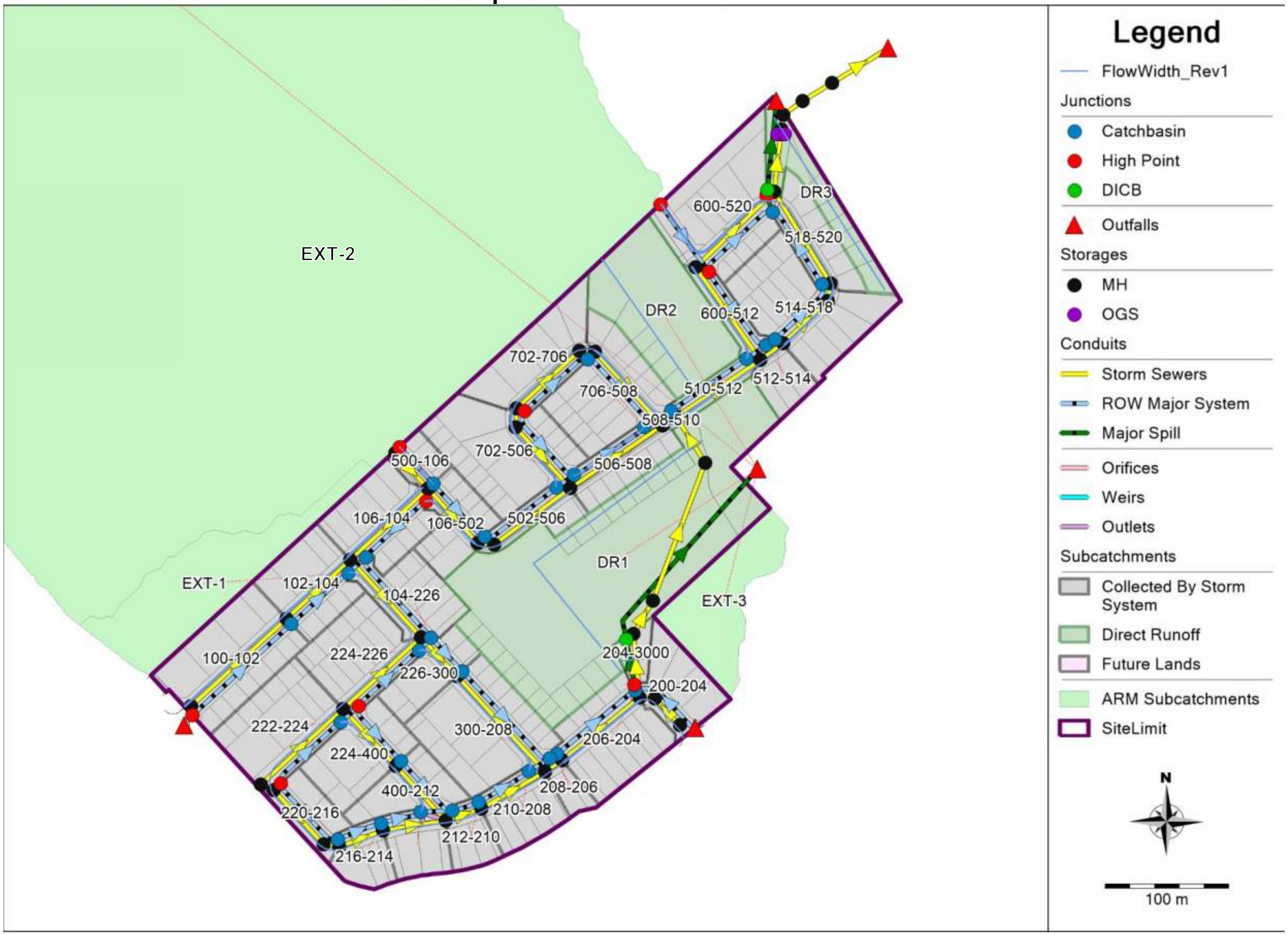
Post-Development – Overall Model Schematic (Site Only)



Date: 2024-02-12
M:\2018\118178\DATA\Calculations\Sewer Calcs\SWM\118178-PCSWMM Model Schematics-Rev1.docx

Brown Lands (118178)
PCSWMM Model Schematics

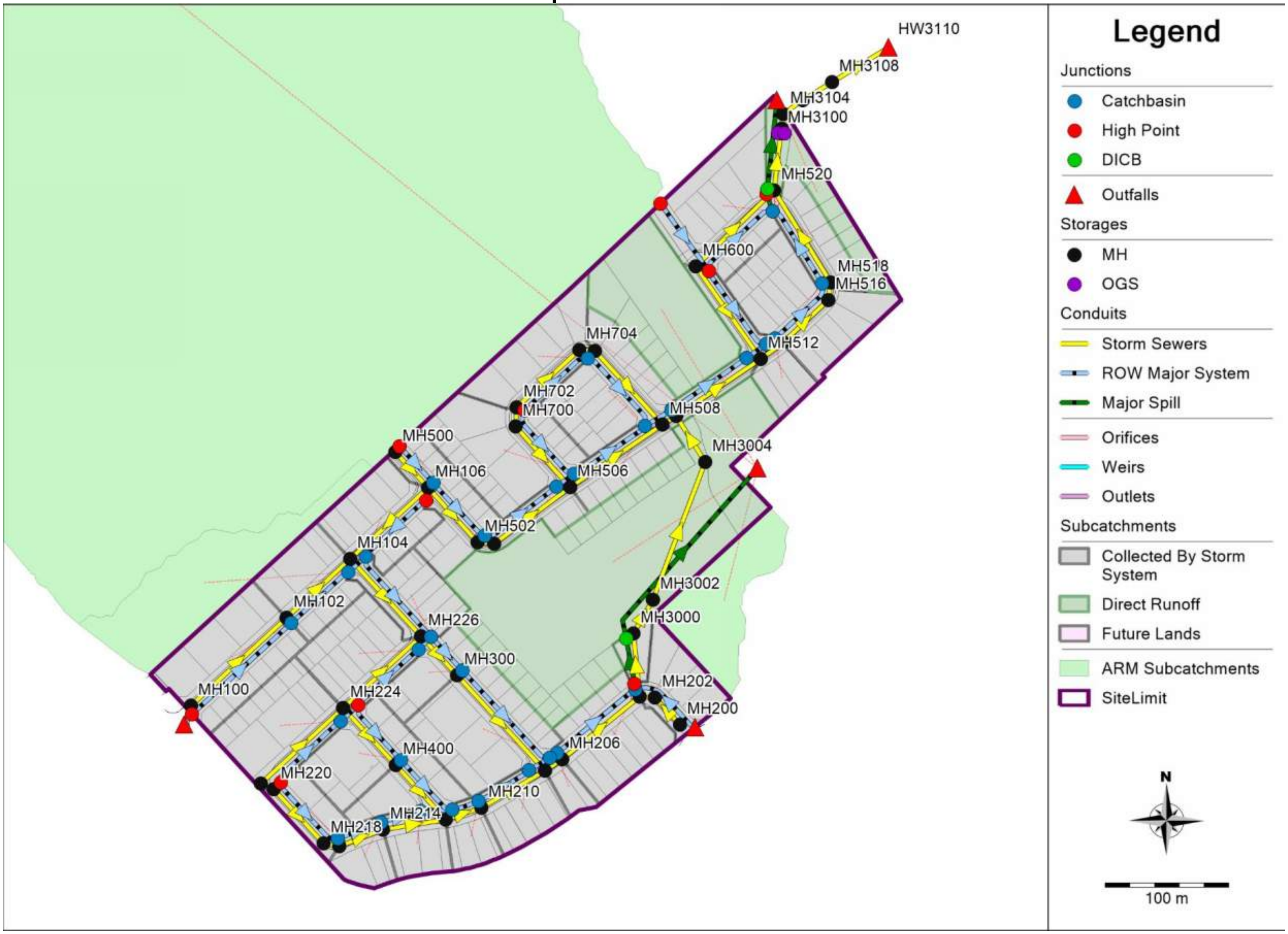
Post-Development – Subcatchments & Flow Widths



Date: 2024-02-12
M:\2018\118178\DATA\Calculations\Sewer Calcs\SWM\118178-PCSWMM Model Schematics-Rev1.docx

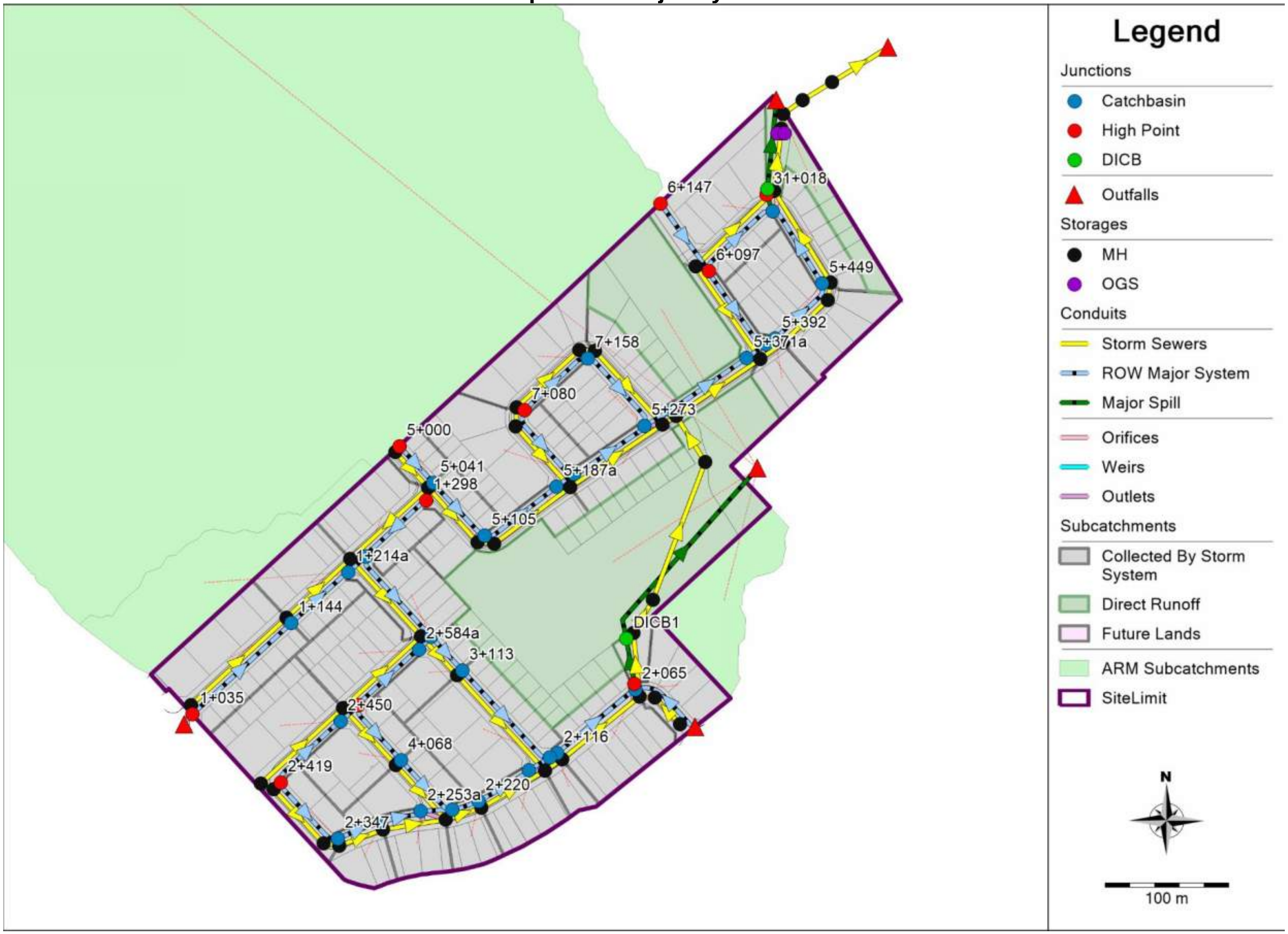
Brown Lands (118178)
PCSWMM Model Schematics

Post-Development – Manholes & Outfalls



Date: 2024-02-12
M:\2018\118178\DATA\Calculations\Sewer Calcs\SWM\118178-PCSWMM Model Schematics-Rev1.docx

Post-Development – Major System Junctions



Brown Lands (118178)
Pre-Development PCSWMM Model Output (100-year 3-hour Chicago)

```
ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM VERSION 7.5.3406
---------------------------------------------------------

This is a new version of ARM - your feedback and suggestions are solicited.
Create a ticket, post on the PCSWMM feature request forum, or email us directly!

Simulation start time:                 09/21/2022 00:00:00
Simulation end time:                   09/22/2022 00:00:00
Runoff wet weather time steps:         300 seconds
Report time steps:                     60 seconds
Number of data points:                 1441


******************************
Unit Hydrographs Runoff Method
******************************
```

Subcatchment	Runoff Method	Raingage	Area (ha)	Time of Concentration (min)	Time to Peak (min)	Time after Peak (min)	Peak UH Flow (m³/s/mm)	UH Depth (mm)
PRE-5	Nash IUH	Raingage	2.343	15	10	65	0.02114	0.996
PRE-4	Nash IUH	Raingage	0.261	15	10	50	0.00235	0.995
PRE-3	Nash IUH	Raingage	68.766	48	32	233	0.19388	1
PRE-2	Nash IUH	Raingage	9.881	17	11.33	83.67	0.07866	0.998
PRE-1	Nash IUH	Raingage	2.393	15	10	65	0.02159	0.996

```
******************
ARM Runoff Summary
******************
```

Subcatchment	Total Precip (mm)	Total Losses (mm)	Total Runoff (mm)	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff (fraction)
PRE-5	71.667	51.744	19.842	0.465	160.387	0.277
PRE-4	71.667	46.783	24.755	0.065	23.576	0.345
PRE-3	71.667	37.315	34.348	23.62	4408.315	0.479
PRE-2	71.667	34.383	37.193	3.675	1348.874	0.519
PRE-1	71.667	32.871	38.642	0.925	368.92	0.539

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------


*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 0
Number of nodes ........... 4
Number of links ........... 0
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
```

Name	Data Source	Data Type	Recording Interval
Raingage	03-C100yr-3hr	INTENSITY	10 min.

```
************
Node Summary
************
                                        Invert      Max.    Ponded    External
```

Brown Lands (118178)
Pre-Development PCSWMM Model Output (100-year 3-hour Chicago)

```
Name                 Type                Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
Culvert              OUTFALL              0.00      0.00       0.0
MississippiRiver     OUTFALL              0.00      0.00       0.0
Tributaries          OUTFALL              0.00      0.00       0.0
WolfGroveCreek       OUTFALL              0.00      0.00       0.0


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

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Surcharge Method ......... EXTRAN
Starting Date ............ 09/21/2022 00:00:00
Ending Date .............. 09/22/2022 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.000         0.000
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         2.875        28.751
External Outflow .........         2.875        28.751
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.000


Analysis begun on:  Wed Feb  8 14:27:53 2023
Analysis ended on:  Wed Feb  8 14:27:53 2023
Total elapsed time: < 1 sec
```

Brown Lands (118178)
Post-Development PCSWMM Model Output (100-year 3-hour Chicago)

```
ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM VERSION 7.6.3620
---------------------------------------------------------

This is a new version of ARM - your feedback and suggestions are solicited.
Create a ticket, post on the PCSWMM feature request forum, or email us directly!

Simulation start time:              09/21/2022 00:00:00
Simulation end time:                09/22/2022 00:00:00
Runoff wet weather time steps:      300 seconds
Report time steps:                  60 seconds
Number of data points:              1441


******************************
Unit Hydrographs Runoff Method
******************************
```

Subcatchment	Runoff Method	Raingage	Area (ha)	Time of Concentration (min)	Time to Peak (min)	Time after Peak (min)	Peak UH Flow (m³/s/mm)	UH Depth (mm)
EXT-2	Nash IUH	Raingage	65.061	48	32	233	0.18344	1
EXT-3	Nash IUH	Raingage	0.647	15	10	55	0.00584	0.996
EXT-1	Nash IUH	Raingage	0.986	15	10	60	0.0089	0.996

```
******************
ARM Runoff Summary
******************
```

Subcatchment	Total Precip (mm)	Total Losses (mm)	Total Runoff (mm)	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff (fraction)
EXT-2	71.667	37.315	34.352	22.35	4170.802	0.479
EXT-3	71.667	35.758	35.75	0.231	91.012	0.499
EXT-1	71.667	31.383	40.122	0.396	158.906	0.56

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.3)
------------------------------------------------------------

Boundary at Mississppi = 101.2m (100yr)
WARNING 04: minimum elevation drop used for Conduit MH3100-OGS1
WARNING 04: minimum elevation drop used for Conduit MH3100-OGS2
WARNING 04: minimum elevation drop used for Conduit Street1-D
WARNING 04: minimum elevation drop used for Conduit Street1-F
WARNING 04: minimum elevation drop used for Conduit Street2-D
WARNING 04: minimum elevation drop used for Conduit Street2-G
WARNING 04: minimum elevation drop used for Conduit Street2-L
WARNING 04: minimum elevation drop used for Conduit Street2-N
WARNING 04: minimum elevation drop used for Conduit Street5-D
WARNING 04: minimum elevation drop used for Conduit Street5-H
WARNING 02: maximum depth increased for Node DICB1

*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 36
Number of nodes ........... 92
Number of links ........... 160
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
```

Name	Data Source	Data Type	Recording Interval
Raingage	03-C100yr-3hr	INTENSITY	10 min.

Brown Lands (118178)
Post-Development PCSWMM Model Output (100-year 3-hour Chicago)

```
********************
Subcatchment Summary
********************
Name                         Area     Width   %Imperv    %Slope Rain Gage            Outlet
-------------------------------------------------------------------------------------------------------------
100-102                      0.73    215.00     64.30    2.0000 Raingage             1+144
102-104                      0.45    139.00     64.30    2.0000 Raingage             1+214a
104-226                      0.38     76.00     64.30    2.0000 Raingage             3+153b
106-104                      0.49    164.00     64.30    2.0000 Raingage             1+214b
106-502                      0.32    112.00     64.30    2.0000 Raingage             5+105
200-204                      0.36     48.00     64.30    2.0000 Raingage             2+065
204-3000                     0.10     23.00     64.30    2.0000 Raingage             DICB1
206-204                      0.57    160.00     64.30    2.0000 Raingage             2+065
208-206                      0.10     17.00     64.30    2.0000 Raingage             2+116
210-208                      0.31     59.00     64.30    2.0000 Raingage             2+163a
212-210                      0.18     31.00     64.30    2.0000 Raingage             2+220
214-212                      0.25     50.00     64.30    2.0000 Raingage             2+253a
216-214                      0.21     40.00     64.30    2.0000 Raingage             2+304
220-216                      0.23     73.00     64.30    2.0000 Raingage             2+347
222-224                      0.61     91.00     64.30    2.0000 Raingage             2+450
224-226                      0.51     78.00     64.30    2.0000 Raingage             2+584a
224-400                      0.46    115.00     64.30    2.0000 Raingage             4+068
226-300                      0.28     75.00     64.30    2.0000 Raingage             3+113
300-208                      0.78    195.00     64.30    2.0000 Raingage             2+163b
400-212                      0.32     87.00     64.30    2.0000 Raingage             2+253b
500-106                      0.13     40.00     64.30    2.0000 Raingage             5+041
502-506                      0.21     91.00     64.30    2.0000 Raingage             5+187a
506-508                      0.31     69.00     64.30    2.0000 Raingage             5+273
508-510                      0.01     11.00     64.30    2.0000 Raingage             5+275
510-512                      0.14    153.00     64.30    2.0000 Raingage             5+371a
512-514                      0.19     26.00     64.30    2.0000 Raingage             5+392
514-518                      0.75    126.00     64.30    2.0000 Raingage             5+449
518-520                      0.33     89.00     64.30    2.0000 Raingage             5+531
600-512                      0.16    175.00     64.30    2.0000 Raingage             5+371b
600-520                      0.79    243.00     64.30    2.0000 Raingage             5+531
702-506                      0.76    153.00     64.30    2.0000 Raingage             5+187b
702-706                      0.53     81.00     64.30    2.0000 Raingage             7+158
706-508                      0.64    160.00     64.30    2.0000 Raingage             5+273
DR1                          2.98    279.00     14.30    2.0000 Raingage             Tributaries
```

```
DR2                          0.91    126.00     14.30    2.0000 Raingage             Tributaries
DR3                          0.35    164.00     35.70    2.0000 Raingage             31+0102


************
Node Summary
************
                                         Invert      Max.    Ponded    External
Name                     Type             Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
1+035                    JUNCTION        126.15      0.35       0.0
1+144                    JUNCTION        125.00      0.35       0.0
1+214a                   JUNCTION        123.00      0.35       0.0
1+214b                   JUNCTION        123.00      0.35       0.0
1+298                    JUNCTION        123.10      0.35       0.0
2+065                    JUNCTION        114.10      1.75       0.0
2+116                    JUNCTION        118.04      0.35       0.0
2+163a                   JUNCTION        118.50      0.35       0.0
2+163b                   JUNCTION        118.50      0.35       0.0
2+220                    JUNCTION        119.25      0.35       0.0
2+253a                   JUNCTION        119.55      0.35       0.0
2+253b                   JUNCTION        119.55      0.35       0.0
2+304                    JUNCTION        120.65      0.35       0.0
2+347                    JUNCTION        122.75      0.35       0.0
2+419                    JUNCTION        126.00      0.35       0.0
2+450                    JUNCTION        122.75      0.35       0.0
2+495b                   JUNCTION        122.75      0.35       0.0
2+584a                   JUNCTION        120.00      0.35       0.0
3+113                    JUNCTION        119.25      0.35       0.0
3+153b                   JUNCTION        120.00      0.35       0.0
30+000                   JUNCTION        115.65      0.35       0.0
31+018                   JUNCTION        112.95      0.35       0.0
4+068                    JUNCTION        120.79      0.35       0.0
5+000                    JUNCTION        123.25      0.35       0.0
5+041                    JUNCTION        123.10      0.35       0.0
5+105                    JUNCTION        122.25      0.35       0.0
5+187a                   JUNCTION        119.00      0.35       0.0
5+187b                   JUNCTION        119.00      0.35       0.0
5+273                    JUNCTION        116.50      0.35       0.0
5+275                    JUNCTION        115.80      0.35       0.0
5+371a                   JUNCTION        113.00      0.35       0.0
```

5+371b	JUNCTION	113.00	0.35	0.0
5+392	JUNCTION	112.97	0.35	0.0
5+449	JUNCTION	112.90	0.35	0.0
5+531	JUNCTION	111.40	1.75	0.0
6+097	JUNCTION	113.85	0.35	0.0
6+147	JUNCTION	114.00	0.35	0.0
7+080	JUNCTION	119.50	0.35	0.0
7+158	JUNCTION	117.25	0.35	0.0
DICB1	JUNCTION	111.83	2.52	0.0
DICB2	JUNCTION	110.78	2.37	0.0
1+024	OUTFALL	125.84	0.35	0.0
2+007	OUTFALL	116.36	0.35	0.0
31+0102	OUTFALL	109.30	0.35	0.0
HW3110	OUTFALL	98.40	1.65	0.0
Tributaries	OUTFALL	111.00	0.35	0.0
MH100	STORAGE	123.57	2.54	0.0
MH102	STORAGE	122.64	2.37	0.0
MH104	STORAGE	119.65	3.35	0.0
MH106	STORAGE	120.50	2.60	0.0
MH200	STORAGE	113.75	2.37	0.0
MH202	STORAGE	113.26	2.42	0.0
MH204	STORAGE	112.60	2.89	0.0
MH206	STORAGE	113.18	4.86	0.0
MH208	STORAGE	114.76	3.73	0.0
MH210	STORAGE	116.81	2.48	0.0
MH212	STORAGE	117.03	2.52	0.0
MH214	STORAGE	118.30	2.37	0.0
MH216	STORAGE	119.87	2.63	0.0
MH218	STORAGE	120.72	2.33	0.0
MH220	STORAGE	123.11	2.55	0.0
MH222	STORAGE	123.20	2.80	0.0
MH224	STORAGE	119.80	3.00	0.0
MH226	STORAGE	117.16	2.89	0.0
MH300	STORAGE	116.15	3.09	0.0
MH3000	STORAGE	109.34	4.66	0.0
MH3002	STORAGE	109.23	3.77	0.0
MH3004	STORAGE	108.79	4.95	0.0
MH3100	STORAGE	106.49	4.31	0.0
MH3102	STORAGE	106.48	4.32	0.0
MH3104	STORAGE	105.89	4.19	0.0
MH3106	STORAGE	101.75	7.55	0.0
MH3108	STORAGE	98.48	6.28	0.0
MH400	STORAGE	117.77	3.02	0.0
MH500	STORAGE	121.00	2.25	0.0
MH502	STORAGE	119.08	3.26	0.0
MH504	STORAGE	118.69	3.36	0.0
MH506	STORAGE	116.38	2.59	0.0
MH508	STORAGE	113.79	2.63	0.0
MH510	STORAGE	108.17	7.63	0.0
MH512	STORAGE	107.97	5.03	0.0
MH514	STORAGE	107.91	5.06	0.0
MH516	STORAGE	107.76	5.15	0.0
MH518	STORAGE	107.69	5.20	0.0
MH520	STORAGE	107.41	5.39	0.0
MH600	STORAGE	111.79	2.06	0.0
MH700	STORAGE	116.79	2.66	0.0
MH702	STORAGE	117.02	2.30	0.0
MH704	STORAGE	115.04	2.37	0.0
MH706	STORAGE	114.77	2.43	0.0
OGS1	STORAGE	106.49	4.31	0.0
OGS2	STORAGE	106.49	4.31	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
DICB-Ph1	DICB1	MH3000	CONDUIT	7.6	0.2632	0.0130
DICB-Ph2	DICB2	MH520	CONDUIT	5.0	0.2000	0.0130
Easement-30a	30+000	2+065	CONDUIT	5.0	3.0014	0.0130
Easement-30b	30+000	DICB1	CONDUIT	36.9	4.4760	0.0150
Easement-30c	DICB1	Tributaries	CONDUIT	150.0	2.0004	0.0350
Easement-31a	31+018	5+531	CONDUIT	5.0	3.0014	0.0150
Easement-31b	31+018	DICB2	CONDUIT	5.0	3.0014	0.0150
Easement-31c	DICB2	31+0102	CONDUIT	71.9	4.8736	0.0150
MH100-102	MH100	MH102	CONDUIT	103.9	0.8951	0.0130
MH102-104	MH102	MH104	CONDUIT	69.5	2.8501	0.0130
MH104-226	MH104	MH226	CONDUIT	84.0	2.4531	0.0130
MH106-104	MH106	MH104	CONDUIT	84.5	0.6982	0.0130
MH106-502	MH106	MH502	CONDUIT	59.1	2.3526	0.0130
MH200-202	MH200	MH202	CONDUIT	29.4	1.5648	0.0130

Brown Lands (118178)
Post-Development PCSWMM Model Output (100-year 3-hour Chicago)

MH202-204	MH202	MH204	CONDUIT	12.4	1.0484	0.0130
MH204-3000	MH204	MH3000	CONDUIT	51.2	2.0903	0.0130
MH206-204	MH206	MH204	CONDUIT	79.8	0.6516	0.0130
MH208-206	MH208	MH206	CONDUIT	16.6	2.6515	0.0130
MH210-208	MH210	MH208	CONDUIT	58.9	1.4433	0.0130
MH212-210	MH212	MH210	CONDUIT	30.1	0.6312	0.0130
MH214-212	MH214	MH212	CONDUIT	50.9	2.2009	0.0130
MH216-214	MH216	MH214	CONDUIT	37.5	4.0032	0.0130
MH218-216	MH218	MH216	CONDUIT	12.9	4.0343	0.0130
MH220-218	MH220	MH218	CONDUIT	59.0	4.0032	0.0130
MH222-224	MH222	MH224	CONDUIT	89.4	2.9991	0.0130
MH224-226	MH224	MH226	CONDUIT	85.0	2.4949	0.0130
MH224-400	MH224	MH400	CONDUIT	62.3	3.2441	0.0130
MH226-300	MH226	MH300	CONDUIT	42.4	1.3916	0.0130
MH3000-3002	MH3000	MH3002	CONDUIT	31.0	0.3548	0.0130
MH300-208	MH300	MH208	CONDUIT	104.2	0.4511	0.0130
MH3002-3004	MH3002	MH3004	CONDUIT	118.0	0.3475	0.0130
MH3004-510	MH3004	MH510	CONDUIT	43.6	0.3440	0.0130
MH3100-OGS1	MH3100	OGS1	CONDUIT	2.0	0.0152	0.0130
MH3100-OGS2	MH3100	OGS2	CONDUIT	2.0	0.0152	0.0130
MH3102-3104	MH3102	MH3104	CONDUIT	12.0	0.4167	0.0130
MH3104-3106	MH3104	MH3106	CONDUIT	19.2	1.2501	0.0130
MH3106-3108	MH3106	MH3108	CONDUIT	27.7	0.5054	0.0130
MH3108-3110	MH3108	HW3110	CONDUIT	52.9	0.1512	0.0130
MH400-212	MH400	MH212	CONDUIT	59.4	0.9933	0.0130
MH500-106	MH500	MH106	CONDUIT	38.7	1.1629	0.0130
MH502-504	MH502	MH504	CONDUIT	13.3	2.3315	0.0130
MH504-506	MH504	MH506	CONDUIT	76.0	2.7379	0.0130
MH506-508	MH506	MH508	CONDUIT	89.5	2.8951	0.0130
MH508-510	MH508	MH510	CONDUIT	13.0	4.5431	0.0130
MH510-512	MH510	MH512	CONDUIT	81.6	0.2451	0.0130
MH512-514	MH512	MH514	CONDUIT	22.6	0.2655	0.0130
MH514-516	MH514	MH516	CONDUIT	49.5	0.2424	0.0130
MH516-518	MH516	MH518	CONDUIT	14.3	0.2797	0.0130
MH518-520	MH518	MH520	CONDUIT	86.5	0.2543	0.0130
MH520-3100	MH520	MH3100	CONDUIT	46.2	1.9917	0.0130
MH600-512	MH600	MH512	CONDUIT	90.8	1.3547	0.0130
MH600-520	MH600	MH520	CONDUIT	87.4	1.6593	0.0130
MH700-506	MH700	MH506	CONDUIT	65.6	0.3963	0.0130
MH702-700	MH702	MH700	CONDUIT	15.4	0.5195	0.0130
MH702-704	MH702	MH704	CONDUIT	68.1	2.8058	0.0130
MH704-706	MH704	MH706	CONDUIT	12.6	1.5081	0.0130
MH706-508	MH706	MH508	CONDUIT	80.4	0.9951	0.0130
OGS1-MH3102	OGS1	MH3102	CONDUIT	2.0	0.5000	0.0130
OGS2-MH3102	OGS2	MH3102	CONDUIT	2.0	0.5000	0.0130
Street1-A	1+035	1+024	CONDUIT	10.7	2.8984	0.0150
Street1-B	1+035	1+144	CONDUIT	108.1	1.0639	0.0150
Street1-C	1+144	1+214a	CONDUIT	61.3	3.2644	0.0150
Street1-D	1+214a	1+214b	CONDUIT	18.7	0.0016	0.0150
Street1-E	1+298	1+214b	CONDUIT	66.5	0.1504	0.0150
Street1-F	1+298	5+041	CONDUIT	3.0	0.0102	0.0150
Street2-A	2+007	2+065	CONDUIT	60.8	1.4146	0.0150
Street2-B	2+116	2+065	CONDUIT	81.1	3.1335	0.0150
Street2-C	2+163b	2+116	CONDUIT	6.7	6.8819	0.0150
Street2-D	2+163a	2+163b	CONDUIT	19.4	0.0016	0.0150
Street2-E	2+220	2+163a	CONDUIT	47.8	1.5692	0.0150
Street2-F	2+253b	2+220	CONDUIT	22.1	1.3576	0.0150
Street2-G	2+253a	2+253b	CONDUIT	25.6	0.0012	0.0150
Street2-H	2+304	2+253a	CONDUIT	33.3	3.3051	0.0150
Street2-I	2+347	2+304	CONDUIT	37.0	5.6848	0.0150
Street2-J	2+419	2+347	CONDUIT	66.4	4.9005	0.0150
Street2-K	2+419	2+450	CONDUIT	70.3	4.6280	0.0150
Street2-L	2+450	2+495b	CONDUIT	19.1	0.0016	0.0150
Street2-M	2+495b	2+584a	CONDUIT	66.2	4.1577	0.0150
Street2-N	2+584a	3+153b	CONDUIT	3.0	0.0102	0.0150
Street3-A	3+113	2+163b	CONDUIT	100.4	0.7470	0.0150
Street3-B	3+153b	3+113	CONDUIT	36.7	2.0440	0.0150
Street3-C	1+214b	3+153b	CONDUIT	84.6	3.5483	0.0150
Street4-A	4+068	2+253b	CONDUIT	58.3	2.1274	0.0150
Street4-B	2+495b	4+068	CONDUIT	57.3	3.4226	0.0150
Street5-A	5+000	5+041	CONDUIT	39.9	0.3759	0.0150
Street5-B	5+041	5+105	CONDUIT	59.1	1.4384	0.0150
Street5-C	5+105	5+187a	CONDUIT	70.8	4.5952	0.0150
Street5-D	5+187a	5+187b	CONDUIT	17.6	0.0017	0.0150
Street5-E	5+187b	5+273	CONDUIT	68.9	3.6308	0.0150
Street5-F	5+273	5+275	CONDUIT	24.8	2.8237	0.0150
Street5-G	5+275	5+371a	CONDUIT	73.5	3.8123	0.0150
Street5-H	5+371a	5+371b	CONDUIT	19.2	0.0016	0.0150
Street5-I	5+371b	5+392	CONDUIT	8.6	0.3488	0.0150
Street5-J	5+392	5+449	CONDUIT	60.9	0.1149	0.0150
Street5-K	5+449	5+531	CONDUIT	71.2	0.1404	0.0150
Street5-L	6+097	5+531	CONDUIT	73.2	1.4346	0.0150

Street6-A	6+097	5+371b	CONDUIT	76.1	1.1170	0.0150
Street6-B	6+147	6+097	CONDUIT	66.6	0.2252	0.0150
Street7-A	7+080	5+187b	CONDUIT	69.5	0.7194	0.0150
Street7-B	7+080	7+158	CONDUIT	66.9	3.3651	0.0150
Street7-C	7+158	5+273	CONDUIT	73.6	1.0191	0.0150
OR1	2+065	MH204	ORIFICE			
OR2	2+065	MH204	ORIFICE			
OR3	5+531	MH520	ORIFICE			
OR4	5+531	MH520	ORIFICE			
MH3100-3102	MH3100	MH3102	WEIR			
OL01	2+116	MH206	OUTLET			
OL02	2+116	MH206	OUTLET			
OL03	2+163b	MH208	OUTLET			
OL04	2+163b	MH208	OUTLET			
OL05	2+163a	MH208	OUTLET			
OL06	2+163a	MH208	OUTLET			
OL07	2+220	MH210	OUTLET			
OL08	2+220	MH210	OUTLET			
OL09	2+253b	MH212	OUTLET			
OL10	2+253b	MH212	OUTLET			
OL11	2+253a	MH212	OUTLET			
OL12	2+253a	MH212	OUTLET			
OL13	2+304	MH214	OUTLET			
OL14	2+304	MH214	OUTLET			
OL15	2+347	MH216	OUTLET			
OL16	2+347	MH216	OUTLET			
OL17	2+450	MH224	OUTLET			
OL18	2+450	MH224	OUTLET			
OL19	2+584a	MH226	OUTLET			
OL20	2+584a	MH226	OUTLET			
OL21	3+153b	MH226	OUTLET			
OL22	3+153b	MH226	OUTLET			
OL23	3+113	MH300	OUTLET			
OL24	3+113	MH300	OUTLET			
OL25	4+068	MH400	OUTLET			
OL26	4+068	MH400	OUTLET			
OL27	1+144	MH102	OUTLET			
OL28	1+144	MH102	OUTLET			
OL29	1+214a	MH104	OUTLET			
OL30	1+214a	MH104	OUTLET			
OL31	1+214b	MH104	OUTLET			
OL32	1+214b	MH104	OUTLET			
OL33	5+041	MH106	OUTLET			
OL34	5+041	MH106	OUTLET			
OL35	5+105	MH502	OUTLET			
OL36	5+105	MH502	OUTLET			
OL37	5+187a	MH506	OUTLET			
OL38	5+187a	MH506	OUTLET			
OL39	5+187b	MH506	OUTLET			
OL40	5+187b	MH506	OUTLET			
OL41	5+273	MH508	OUTLET			
OL42	5+273	MH508	OUTLET			
OL43	7+158	MH706	OUTLET			
OL44	7+158	MH706	OUTLET			
OL45	5+275	MH510	OUTLET			
OL46	5+275	MH510	OUTLET			
OL47	5+371a	MH512	OUTLET			
OL48	5+371a	MH512	OUTLET			
OL49	5+371b	MH512	OUTLET			
OL50	5+371b	MH512	OUTLET			
OL51	5+392	MH514	OUTLET			
OL52	5+392	MH514	OUTLET			
OL53	5+449	MH518	OUTLET			
OL54	5+449	MH518	OUTLET			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
DICB-Ph1	CIRCULAR	0.45	0.16	0.11	0.45	1	146.27
DICB-Ph2	CIRCULAR	0.30	0.07	0.07	0.30	1	43.25
Easement-30a	RECT_OPEN	0.35	1.05	0.28	3.00	1	6043.04
Easement-30b	RECT_OPEN	0.35	1.05	0.28	3.00	1	6395.81
Easement-30c	RECT_OPEN	0.35	3.50	0.33	10.00	1	6714.92
Easement-31a	RECT_OPEN	0.35	1.05	0.28	3.00	1	5237.30
Easement-31b	RECT_OPEN	0.35	1.05	0.28	3.00	1	5237.30
Easement-31c	RECT_OPEN	0.35	1.05	0.28	3.00	1	6673.85
MH100-102	CIRCULAR	0.38	0.11	0.09	0.38	1	165.89
MH102-104	CIRCULAR	0.38	0.11	0.09	0.38	1	296.01

Brown Lands (118178)
Post-Development PCSWMM Model Output (100-year 3-hour Chicago)

MH104-226	CIRCULAR	0.45	0.16	0.11	0.45	1	446.57
MH106-104	CIRCULAR	0.45	0.16	0.11	0.45	1	238.25
MH106-502	CIRCULAR	0.30	0.07	0.07	0.30	1	148.33
MH200-202	CIRCULAR	0.38	0.11	0.09	0.38	1	219.34
MH202-204	CIRCULAR	0.38	0.11	0.09	0.38	1	179.54
MH204-3000	CIRCULAR	0.90	0.64	0.23	0.90	1	2617.48
MH206-204	CIRCULAR	0.90	0.64	0.23	0.90	1	1461.45
MH208-206	CIRCULAR	0.82	0.53	0.21	0.82	1	2337.54
MH210-208	CIRCULAR	0.53	0.22	0.13	0.53	1	516.69
MH212-210	CIRCULAR	0.53	0.22	0.13	0.53	1	341.71
MH214-212	CIRCULAR	0.38	0.11	0.09	0.38	1	260.13
MH216-214	CIRCULAR	0.30	0.07	0.07	0.30	1	193.49
MH218-216	CIRCULAR	0.30	0.07	0.07	0.30	1	194.24
MH220-218	CIRCULAR	0.30	0.07	0.07	0.30	1	193.49
MH222-224	CIRCULAR	0.30	0.07	0.07	0.30	1	167.48
MH224-226	CIRCULAR	0.38	0.11	0.09	0.38	1	276.95
MH224-400	CIRCULAR	0.30	0.07	0.07	0.30	1	174.18
MH226-300	CIRCULAR	0.68	0.36	0.17	0.68	1	991.68
MH3000-3002	CIRCULAR	1.20	1.13	0.30	1.20	1	2322.56
MH300-208	CIRCULAR	0.82	0.53	0.21	0.82	1	964.11
MH3002-3004	CIRCULAR	1.20	1.13	0.30	1.20	1	2298.27
MH3004-510	CIRCULAR	1.20	1.13	0.30	1.20	1	2286.93
MH3100-OGS1	CIRCULAR	0.97	0.75	0.24	0.97	1	276.68
MH3100-OGS2	CIRCULAR	0.97	0.75	0.24	0.97	1	276.68
MH3102-3104	CIRCULAR	1.35	1.43	0.34	1.35	1	3445.50
MH3104-3106	CIRCULAR	1.65	2.14	0.41	1.65	1	10191.27
MH3106-3108	CIRCULAR	1.65	2.14	0.41	1.65	1	6480.13
MH3108-3110	CIRCULAR	1.65	2.14	0.41	1.65	1	3544.65
MH400-212	CIRCULAR	0.38	0.11	0.09	0.38	1	174.75
MH500-106	CIRCULAR	0.25	0.05	0.06	0.25	1	64.13
MH502-504	CIRCULAR	0.30	0.07	0.07	0.30	1	147.66
MH504-506	CIRCULAR	0.38	0.11	0.09	0.38	1	290.13
MH506-508	CIRCULAR	0.60	0.28	0.15	0.60	1	1044.80
MH508-510	CIRCULAR	0.60	0.28	0.15	0.60	1	1308.82
MH510-512	CIRCULAR	1.35	1.43	0.34	1.35	1	2642.57
MH512-514	CIRCULAR	1.35	1.43	0.34	1.35	1	2750.29
MH514-516	CIRCULAR	1.35	1.43	0.34	1.35	1	2628.12
MH516-518	CIRCULAR	1.35	1.43	0.34	1.35	1	2823.05
MH518-520	CIRCULAR	1.35	1.43	0.34	1.35	1	2691.91
MH520-3100	CIRCULAR	1.35	1.43	0.34	1.35	1	7533.07
MH600-512	CIRCULAR	0.25	0.05	0.06	0.25	1	69.22

MH600-520	CIRCULAR	0.45	0.16	0.11	0.45	1	367.27
MH700-506	CIRCULAR	0.45	0.16	0.11	0.45	1	179.50
MH702-700	CIRCULAR	0.25	0.05	0.06	0.25	1	42.86
MH702-704	CIRCULAR	0.30	0.07	0.07	0.30	1	161.99
MH704-706	CIRCULAR	0.38	0.11	0.09	0.38	1	215.33
MH706-508	CIRCULAR	0.45	0.16	0.11	0.45	1	284.42
OGS1-MH3102	CIRCULAR	0.97	0.75	0.24	0.97	1	1584.77
OGS2-MH3102	CIRCULAR	0.97	0.75	0.24	0.97	1	1584.77
Street1-A	18mROW	0.35	3.38	0.19	18.00	1	12634.77
Street1-B	18mROW	0.35	3.38	0.19	18.00	1	7654.83
Street1-C	18mROW	0.35	3.38	0.19	18.00	1	13408.73
Street1-D	18mROW	0.35	3.38	0.19	18.00	1	299.62
Street1-E	18mROW	0.35	3.38	0.19	18.00	1	2877.91
Street1-F	18mROW	0.35	3.38	0.19	18.00	1	748.06
Street2-A	18mROW	0.35	3.38	0.19	18.00	1	8826.87
Street2-B	18mROW	0.35	3.38	0.19	18.00	1	13137.13
Street2-C	18mROW	0.35	3.38	0.19	18.00	1	19468.92
Street2-D	18mROW	0.35	3.38	0.19	18.00	1	294.17
Street2-E	18mROW	0.35	3.38	0.19	18.00	1	9296.74
Street2-F	18mROW	0.35	3.38	0.19	18.00	1	8647.13
Street2-G	18mROW	0.35	3.38	0.19	18.00	1	256.08
Street2-H	18mROW	0.35	3.38	0.19	18.00	1	13492.12
Street2-I	18mROW	0.35	3.38	0.19	18.00	1	17694.83
Street2-J	18mROW	0.35	3.38	0.19	18.00	1	16428.78
Street2-K	18mROW	0.35	3.38	0.19	18.00	1	15965.54
Street2-L	18mROW	0.35	3.38	0.19	18.00	1	296.47
Street2-M	18mROW	0.35	3.38	0.19	18.00	1	15132.55
Street2-N	18mROW	0.35	3.38	0.19	18.00	1	748.06
Street3-A	18mROW	0.35	3.38	0.19	18.00	1	6414.42
Street3-B	18mROW	0.35	3.38	0.19	18.00	1	10610.37
Street3-C	18mROW	0.35	3.38	0.19	18.00	1	13979.75
Street4-A	18mROW	0.35	3.38	0.19	18.00	1	10824.63
Street4-B	18mROW	0.35	3.38	0.19	18.00	1	13729.83
Street5-A	18mROW	0.35	3.38	0.19	18.00	1	4550.38
Street5-B	18mROW	0.35	3.38	0.19	18.00	1	8900.73
Street5-C	18mROW	0.35	3.38	0.19	18.00	1	15908.95
Street5-D	18mROW	0.35	3.38	0.19	18.00	1	308.84
Street5-E	18mROW	0.35	3.38	0.19	18.00	1	14141.35
Street5-F	18mROW	0.35	3.38	0.19	18.00	1	12470.88
Street5-G	18mROW	0.35	3.38	0.19	18.00	1	14490.40
Street5-H	18mROW	0.35	3.38	0.19	18.00	1	295.70

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Street5-I        18mROW              0.35      3.38     0.19    18.00        1  4383.29
Street5-J        18mROW              0.35      3.38     0.19    18.00        1  2516.10
Street5-K        18mROW              0.35      3.38     0.19    18.00        1  2781.30
Street5-L        18mROW              0.35      3.38     0.19    18.00        1  8888.92
Street6-A        18mROW              0.35      3.38     0.19    18.00        1  7843.65
Street6-B        18mROW              0.35      3.38     0.19    18.00        1  3522.06
Street7-A        18mROW              0.35      3.38     0.19    18.00        1  6294.85
Street7-B        18mROW              0.35      3.38     0.19    18.00        1 13614.09
Street7-C        18mROW              0.35      3.38     0.19    18.00        1  7491.87


****************
Transect Summary
****************

Transect 18mROW
Area:
            0.0005     0.0019     0.0043     0.0076     0.0119
            0.0171     0.0233     0.0304     0.0385     0.0475
            0.0575     0.0685     0.0804     0.0932     0.1070
            0.1217     0.1374     0.1541     0.1716     0.1892
            0.2069     0.2247     0.2431     0.2622     0.2819
            0.3024     0.3236     0.3454     0.3679     0.3911
            0.4151     0.4397     0.4649     0.4909     0.5176
            0.5449     0.5729     0.6017     0.6311     0.6612
            0.6920     0.7234     0.7556     0.7884     0.8220
            0.8562     0.8911     0.9267     0.9630     1.0000
Hrad:
            0.0179     0.0358     0.0537     0.0716     0.0895
            0.1074     0.1252     0.1431     0.1610     0.1789
            0.1968     0.2147     0.2326     0.2505     0.2684
            0.2863     0.3042     0.3221     0.3474     0.3825
            0.4176     0.4526     0.4862     0.5180     0.5481
            0.5768     0.6040     0.6300     0.6547     0.6783
            0.7008     0.7223     0.7430     0.7628     0.7818
            0.8000     0.8176     0.8345     0.8508     0.8666
            0.8818     0.8966     0.9109     0.9247     0.9381
            0.9512     0.9639     0.9762     0.9883     1.0000
Width:
            0.0255     0.0510     0.0764     0.1019     0.1274
            0.1529     0.1784     0.2038     0.2293     0.2548
            0.2803     0.3058     0.3312     0.3567     0.3822
            0.4077     0.4331     0.4586     0.4732     0.4733
            0.4733     0.4839     0.5023     0.5207     0.5392
            0.5576     0.5760     0.5945     0.6129     0.6313
            0.6498     0.6682     0.6866     0.7051     0.7235
            0.7419     0.7604     0.7788     0.7972     0.8157
            0.8341     0.8525     0.8710     0.8894     0.9078
            0.9263     0.9447     0.9631     0.9816     1.0000


****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 09/21/2022 00:00:00
Ending Date .............. 09/22/2022 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 2.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 8
Head Tolerance ........... 0.001500 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
```

Brown Lands (118178)
Post-Development PCSWMM Model Output (100-year 3-hour Chicago)

```
  Total Precipitation ......         1.206        71.667
  Evaporation Loss .........         0.000         0.000
  Infiltration Loss ........         0.380        22.561
  Surface Runoff ...........         0.828        49.227
  Final Storage ............         0.008         0.453
  Continuity Error (%) .....        -0.803


  **************************        Volume        Volume
  Flow Routing Continuity        hectare-m      10^6 ltr
  **************************     ---------     ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......         0.829         8.288
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         2.298        22.976
  External Outflow .........         3.127        31.268
  Flooding Loss ............         0.000         0.000
  Evaporation Loss .........         0.000         0.000
  Exfiltration Loss ........         0.000         0.000
  Initial Stored Volume ....         0.013         0.125
  Final Stored Volume ......         0.013         0.126
  Continuity Error (%) .....        -0.015


  ***************************
  Time-Step Critical Elements
  ***************************
  Link MH3100-OGS1 (25.65%)
  Link OGS1-MH3102 (4.39%)


  ********************************
  Highest Flow Instability Indexes
  ********************************
  Link OGS1-MH3102 (1)
  Link OGS2-MH3102 (1)
  Link MH3100-OGS1 (1)
  Link MH3100-OGS2 (1)
  Link MH3100-3102 (1)
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  *********************************
  Most Frequent Nonconverging Nodes
  *********************************
  Convergence obtained at all time steps.


  *************************
  Routing Time Step Summary
  *************************
  Minimum Time Step           :     0.50 sec
  Average Time Step           :     1.62 sec
  Maximum Time Step           :     2.00 sec
  % of Time in Steady State   :     0.00
  Average Iterations per Step :     2.01
  % of Steps Not Converging   :     0.00
  Time Step Frequencies       :
      2.000 -  1.516 sec      :    70.07 %
      1.516 -  1.149 sec      :     2.52 %
      1.149 -  0.871 sec      :     2.81 %
      0.871 -  0.660 sec      :    12.74 %
      0.660 -  0.500 sec      :    11.87 %


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

  --------------------------------------------------------------------------------------------------------------------
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                            Total      Total      Total      Total     Imperv       Perv      Total        Total
Peak  Runoff
                           Precip      Runon       Evap      Infil     Runoff     Runoff     Runoff       Runoff
Runoff   Coeff
  Subcatchment                 mm         mm         mm         mm         mm         mm         mm     10^6 ltr
LPS
  --------------------------------------------------------------------------------------------------------------------
--------------
  100-102                   71.67       0.00       0.00      16.02      45.66      10.05      55.71         0.41
316.22   0.777
  102-104                   71.67       0.00       0.00      16.01      45.65      10.08      55.74         0.25
195.87   0.778
```

104-226	71.67	0.00	0.00	16.21	45.74	9.74	55.48	0.21	157.58	0.774
106-104	71.67	0.00	0.00	15.98	45.64	10.14	55.78	0.27	214.96	0.778
106-502	71.67	0.00	0.00	15.96	45.63	10.18	55.81	0.18	140.97	0.779
200-204	71.67	0.00	0.00	16.48	45.82	9.37	55.19	0.20	141.95	0.770
204-3000	71.67	0.00	0.00	16.14	45.71	9.86	55.57	0.06	42.16	0.775
206-204	71.67	0.00	0.00	16.04	45.67	10.01	55.68	0.32	245.67	0.777
208-206	71.67	0.00	0.00	16.31	45.78	9.60	55.38	0.06	40.65	0.773
210-208	71.67	0.00	0.00	16.24	45.75	9.70	55.45	0.17	127.79	0.774
212-210	71.67	0.00	0.00	16.30	45.77	9.61	55.38	0.10	73.29	0.773
214-212	71.67	0.00	0.00	16.21	45.74	9.74	55.48	0.14	103.67	0.774
216-214	71.67	0.00	0.00	16.24	45.75	9.70	55.45	0.12	86.57	0.774
220-216	71.67	0.00	0.00	16.00	45.65	10.10	55.75	0.13	100.38	0.778
222-224	71.67	0.00	0.00	16.39	45.80	9.48	55.28	0.34	243.96	0.771
224-226	71.67	0.00	0.00	16.38	45.80	9.50	55.30	0.28	204.61	0.772
224-400	71.67	0.00	0.00	16.09	45.70	9.92	55.62	0.26	195.78	0.776
226-300	71.67	0.00	0.00	16.06	45.68	9.98	55.66	0.16	120.08	0.777
300-208	71.67	0.00	0.00	16.09	45.70	9.92	55.62	0.43	331.97	0.776
400-212	71.67	0.00	0.00	16.06	45.68	9.99	55.67	0.18	137.45	0.777
500-106	71.67	0.00	0.00	16.01	45.65	10.08	55.73	0.07	56.56	0.778
502-506	71.67	0.00	0.00	15.89	45.60	10.33	55.93	0.12	94.19	0.780
506-508	71.67	0.00	0.00	16.15	45.72	9.83	55.55	0.17	130.20	0.775
508-510	71.67	0.00	0.00	15.72	45.53	10.99	56.52	0.01	4.67	0.789
510-512	71.67	0.00	0.00	15.72	45.53	10.99	56.52	0.08	65.39	0.789
512-514	71.67	0.00	0.00	16.46	45.82	9.40	55.21	0.10	75.16	0.770
514-518	71.67	0.00	0.00	16.32	45.78	9.59	55.37	0.42	304.45	0.773
518-520	71.67	0.00	0.00	16.06	45.68	9.98	55.66	0.18	141.63	0.777
600-512	71.67	0.00	0.00	15.72	45.53	10.99	56.52	0.09	74.74	0.789
600-520	71.67	0.00	0.00	16.01	45.65	10.08	55.73	0.44	343.72	0.778
702-506	71.67	0.00	0.00	16.20	45.74	9.75	55.49	0.42	315.42	0.774
702-706	71.67	0.00	0.00	16.38	45.80	9.50	55.30	0.29	212.61	0.772
706-508	71.67	0.00	0.00	16.09	45.70	9.92	55.62	0.36	272.39	0.776
DR1	71.67	0.00	0.00	43.08	10.28	18.56	28.84	0.86	421.53	0.402
DR2	71.67	0.00	0.00	41.67	10.27	20.06	30.32	0.28	153.92	0.423
DR3	71.67	0.00	0.00	28.95	25.62	17.93	43.55	0.15	130.42	0.608

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Node Depth Summary
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Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
1+035	JUNCTION	0.00	0.00	126.15	0 00:00	0.00
1+144	JUNCTION	0.01	0.06	125.06	0 01:10	0.06
1+214a	JUNCTION	0.01	0.14	123.14	0 01:10	0.14
1+214b	JUNCTION	0.01	0.08	123.08	0 01:10	0.08
1+298	JUNCTION	0.00	0.03	123.13	0 01:11	0.03
2+065	JUNCTION	0.08	1.71	115.81	0 01:11	1.71
2+116	JUNCTION	0.01	0.13	118.17	0 01:11	0.13

Brown Lands (118178)
Post-Development PCSWMM Model Output (100-year 3-hour Chicago)

2+163a	JUNCTION	0.01	0.16	118.66	0	01:11	0.16
2+163b	JUNCTION	0.01	0.11	118.61	0	01:11	0.11
2+220	JUNCTION	0.01	0.10	119.35	0	01:10	0.10
2+253a	JUNCTION	0.01	0.13	119.68	0	01:10	0.13
2+253b	JUNCTION	0.01	0.10	119.65	0	01:10	0.10
2+304	JUNCTION	0.00	0.05	120.70	0	01:10	0.05
2+347	JUNCTION	0.00	0.03	122.78	0	01:10	0.03
2+419	JUNCTION	0.00	0.00	126.00	0	00:00	0.00
2+450	JUNCTION	0.01	0.10	122.85	0	01:10	0.10
2+495b	JUNCTION	0.00	0.04	122.79	0	01:10	0.04
2+584a	JUNCTION	0.01	0.11	120.11	0	01:10	0.11
3+113	JUNCTION	0.01	0.14	119.39	0	01:11	0.14
3+153b	JUNCTION	0.01	0.11	120.11	0	01:11	0.11
30+000	JUNCTION	0.00	0.13	115.78	0	01:11	0.12
31+018	JUNCTION	0.00	0.07	113.02	0	01:14	0.07
4+068	JUNCTION	0.00	0.07	120.86	0	01:10	0.07
5+000	JUNCTION	0.00	0.00	123.25	0	00:00	0.00
5+041	JUNCTION	0.00	0.03	123.13	0	01:10	0.03
5+105	JUNCTION	0.00	0.05	122.30	0	01:10	0.05
5+187a	JUNCTION	0.01	0.12	119.12	0	01:10	0.12
5+187b	JUNCTION	0.01	0.07	119.07	0	01:10	0.07
5+273	JUNCTION	0.01	0.10	116.60	0	01:10	0.10
5+275	JUNCTION	0.00	0.09	115.89	0	01:10	0.09
5+371a	JUNCTION	0.01	0.19	113.19	0	01:11	0.19
5+371b	JUNCTION	0.01	0.15	113.15	0	01:12	0.15
5+392	JUNCTION	0.01	0.18	113.15	0	01:12	0.18
5+449	JUNCTION	0.01	0.19	113.09	0	01:13	0.19
5+531	JUNCTION	0.09	1.68	113.08	0	01:14	1.68
6+097	JUNCTION	0.00	0.00	113.85	0	00:00	0.00
6+147	JUNCTION	0.00	0.00	114.00	0	00:00	0.00
7+080	JUNCTION	0.00	0.00	119.50	0	00:00	0.00
7+158	JUNCTION	0.01	0.07	117.32	0	01:10	0.07
DICB1	JUNCTION	0.02	2.15	113.98	0	01:11	1.82
DICB2	JUNCTION	0.01	1.09	111.87	0	01:14	1.07
1+024	OUTFALL	0.00	0.00	125.84	0	00:00	0.00
2+007	OUTFALL	0.00	0.00	116.36	0	00:00	0.00
31+0102	OUTFALL	0.00	0.00	109.30	0	00:00	0.00
HW3110	OUTFALL	2.80	2.80	101.20	0	00:00	2.80
Tributaries	OUTFALL	0.00	0.00	111.00	0	00:00	0.00
MH100	STORAGE	0.00	0.00	123.57	0	00:00	0.00
MH102	STORAGE	0.02	0.22	122.86	0	01:10	0.22
MH104	STORAGE	0.04	0.37	120.02	0	01:09	0.37
MH106	STORAGE	0.01	0.09	120.59	0	01:10	0.09
MH200	STORAGE	0.00	0.00	113.75	0	00:00	0.00
MH202	STORAGE	0.00	0.00	113.26	0	00:00	0.00
MH204	STORAGE	0.06	0.62	113.22	0	01:11	0.62
MH206	STORAGE	0.08	0.97	114.15	0	01:11	0.97
MH208	STORAGE	0.05	0.47	115.23	0	01:11	0.47
MH210	STORAGE	0.03	0.33	117.14	0	01:11	0.33
MH212	STORAGE	0.04	0.42	117.45	0	01:10	0.42
MH214	STORAGE	0.02	0.16	118.46	0	01:10	0.16
MH216	STORAGE	0.01	0.12	119.99	0	01:10	0.12
MH218	STORAGE	0.00	0.00	120.72	0	00:00	0.00
MH220	STORAGE	0.00	0.00	123.11	0	00:00	0.00
MH222	STORAGE	0.00	0.00	123.20	0	00:00	0.00
MH224	STORAGE	0.02	0.19	119.99	0	01:15	0.19
MH226	STORAGE	0.05	0.45	117.61	0	01:09	0.44
MH300	STORAGE	0.07	0.69	116.84	0	01:11	0.69
MH3000	STORAGE	0.10	2.19	111.53	0	01:13	2.18
MH3002	STORAGE	0.10	2.12	111.35	0	01:13	2.12
MH3004	STORAGE	0.11	1.81	110.60	0	01:14	1.80
MH3100	STORAGE	0.12	1.40	107.89	0	01:15	1.40
MH3102	STORAGE	0.12	1.39	107.87	0	01:15	1.39
MH3104	STORAGE	0.08	0.79	106.68	0	01:15	0.79
MH3106	STORAGE	0.09	0.97	102.72	0	01:15	0.97
MH3108	STORAGE	2.73	3.05	101.53	0	01:14	3.03
MH400	STORAGE	0.02	0.21	117.98	0	01:05	0.21
MH500	STORAGE	0.00	0.00	121.00	0	00:00	0.00
MH502	STORAGE	0.02	0.21	119.29	0	01:10	0.21
MH504	STORAGE	0.02	0.16	118.85	0	01:10	0.16
MH506	STORAGE	0.02	0.23	116.61	0	01:10	0.23
MH508	STORAGE	0.03	0.30	114.09	0	01:10	0.30
MH510	STORAGE	0.11	1.83	110.00	0	01:14	1.82
MH512	STORAGE	0.12	1.72	109.69	0	01:14	1.72
MH514	STORAGE	0.12	1.69	109.60	0	01:14	1.69
MH516	STORAGE	0.12	1.52	109.28	0	01:14	1.52
MH518	STORAGE	0.12	1.42	109.11	0	01:14	1.42
MH520	STORAGE	0.07	0.86	108.27	0	01:15	0.86
MH600	STORAGE	0.00	0.00	111.79	0	00:00	0.00
MH700	STORAGE	0.00	0.00	116.79	0	00:00	0.00
MH702	STORAGE	0.00	0.00	117.02	0	00:00	0.00
MH704	STORAGE	0.00	0.00	115.04	0	00:00	0.00

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MH706              STORAGE      0.02      0.21   114.98     0  01:13         0.21
OGS1               STORAGE      0.11      1.39   107.88     0  01:15         1.39
OGS2               STORAGE      0.11      1.39   107.88     0  01:15         1.39


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Node Inflow Summary
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Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
1+035	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
1+144	JUNCTION	316.22	316.22	0	01:10	0.407	0.407	-0.245
1+214a	JUNCTION	286.02	432.35	0	01:10	0.646	0.787	0.140
1+214b	JUNCTION	214.96	453.33	0	01:10	0.273	0.444	-0.047
1+298	JUNCTION	0.00	5.44	0	01:10	0	0.00406	4.347
2+065	JUNCTION	387.62	1341.16	0	01:11	0.516	1.07	-0.174
2+116	JUNCTION	40.65	1064.49	0	01:11	0.0554	0.662	-0.195
2+163a	JUNCTION	127.79	450.43	0	01:10	0.172	0.367	0.132
2+163b	JUNCTION	331.97	1217.44	0	01:11	0.434	0.943	-0.076
2+220	JUNCTION	73.29	376.52	0	01:10	0.0997	0.291	-0.139
2+253a	JUNCTION	103.67	183.63	0	01:10	0.139	0.214	0.090
2+253b	JUNCTION	137.45	393.44	0	01:10	0.178	0.342	0.022
2+304	JUNCTION	86.57	125.94	0	01:10	0.116	0.156	-0.103
2+347	JUNCTION	100.38	100.38	0	01:10	0.128	0.128	-0.016
2+419	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
2+450	JUNCTION	243.96	243.96	0	01:10	0.337	0.337	-0.038
2+495b	JUNCTION	0.00	112.37	0	01:10	0	0.0529	0.704
2+584a	JUNCTION	204.61	259.46	0	01:10	0.282	0.319	-0.024
3+113	JUNCTION	120.08	631.32	0	01:10	0.156	0.472	0.214
3+153b	JUNCTION	157.58	613.43	0	01:10	0.211	0.488	-0.087
30+000	JUNCTION	0.00	1287.59	0	01:11	0	0.381	0.006
31+018	JUNCTION	0.00	386.16	0	01:14	0	0.241	0.000
4+068	JUNCTION	195.78	245.55	0	01:10	0.256	0.281	-0.119
5+000	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
5+041	JUNCTION	56.56	56.56	0	01:10	0.0725	0.0725	-0.015
5+105	JUNCTION	140.97	160.89	0	01:10	0.179	0.2	-0.193
5+187a	JUNCTION	94.19	172.83	0	01:10	0.117	0.186	0.251
5+187b	JUNCTION	315.42	421.57	0	01:10	0.422	0.48	-0.019
5+273	JUNCTION	402.59	731.27	0	01:10	0.528	0.793	-0.019
5+275	JUNCTION	4.67	519.70	0	01:10	0.00565	0.366	-0.407
5+371a	JUNCTION	65.39	532.56	0	01:10	0.0792	0.358	0.386
5+371b	JUNCTION	74.74	530.47	0	01:11	0.0905	0.338	0.041
5+392	JUNCTION	75.16	536.33	0	01:11	0.105	0.359	-0.378
5+449	JUNCTION	304.45	721.73	0	01:11	0.415	0.677	-0.084
5+531	JUNCTION	485.35	805.61	0	01:10	0.624	0.917	0.144
6+097	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
6+147	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
7+080	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
7+158	JUNCTION	212.61	212.61	0	01:10	0.293	0.293	-0.023
DICB1	JUNCTION	42.16	1346.81	0	01:11	0.0556	0.436	0.004
DICB2	JUNCTION	0.00	386.20	0	01:14	0	0.241	-0.001
1+024	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
2+007	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
31+0102	OUTFALL	130.42	130.42	0	01:10	0.152	0.152	0.000
HW3110	OUTFALL	0.00	4254.09	0	01:14	0	7.4	0.000
Tributaries	OUTFALL	4331.51	4331.51	0	01:50	23.7	23.7	0.000
MH100	STORAGE	0.00	0.00	0	00:00	0	0	0.000 ltr
MH102	STORAGE	0.00	162.21	0	01:10	0	0.267	0.000
MH104	STORAGE	0.00	451.26	0	01:10	0	1.11	0.004
MH106	STORAGE	0.00	30.22	0	01:10	0	0.0473	-0.017
MH200	STORAGE	0.00	0.00	0	00:00	0	0	0.000 ltr
MH202	STORAGE	0.00	0.00	0	00:00	0	0	0.000 ltr
MH204	STORAGE	0.00	1813.36	0	01:11	0	4.03	-0.000
MH206	STORAGE	0.00	1478.96	0	01:11	0	3.34	0.003
MH208	STORAGE	0.00	1440.12	0	01:11	0	3.23	-0.000
MH210	STORAGE	0.00	373.85	0	01:10	0	0.749	-0.000
MH212	STORAGE	0.00	335.55	0	01:10	0	0.652	-0.046
MH214	STORAGE	0.00	103.84	0	01:10	0	0.17	0.036
MH216	STORAGE	0.00	60.07	0	01:10	0	0.0892	0.001
MH218	STORAGE	0.00	0.00	0	00:00	0	0	0.000 ltr
MH220	STORAGE	0.00	0.00	0	00:00	0	0	0.000 ltr
MH222	STORAGE	0.00	0.00	0	00:00	0	0	0.000 ltr
MH224	STORAGE	0.00	124.10	0	01:03	0	0.285	0.002
MH226	STORAGE	0.00	764.11	0	01:09	0	1.82	0.000
MH300	STORAGE	0.00	823.05	0	01:09	0	1.97	-0.000
MH3000	STORAGE	0.00	3165.46	0	01:11	0	4.47	0.000
MH3002	STORAGE	0.00	3112.72	0	01:11	0	4.47	0.057

MH3004	STORAGE	0.00	2854.32	0	01:12	0	4.47	-0.031	
MH3100	STORAGE	0.00	4237.41	0	01:15	0	7.4	-0.001	
MH3102	STORAGE	0.00	4254.47	0	01:15	0	7.4	-0.000	
MH3104	STORAGE	0.00	4238.61	0	01:15	0	7.4	-0.000	
MH3106	STORAGE	0.00	4238.61	0	01:15	0	7.4	-0.001	
MH3108	STORAGE	0.00	4240.70	0	01:15	0	7.41	0.000	
MH400	STORAGE	0.00	99.40	0	01:05	0	0.185	0.054	
MH500	STORAGE	0.00	0.00	0	00:00	0	0	0.000	ltr
MH502	STORAGE	0.00	107.48	0	01:10	0	0.179	0.016	
MH504	STORAGE	0.00	107.40	0	01:10	0	0.179	-0.002	
MH506	STORAGE	0.00	330.32	0	01:10	0	0.597	-0.001	
MH508	STORAGE	0.00	638.39	0	01:10	0	1.25	0.001	
MH510	STORAGE	0.00	3402.08	0	01:12	0	5.81	0.003	
MH512	STORAGE	0.00	3423.51	0	01:13	0	6	-0.005	
MH514	STORAGE	0.00	3429.67	0	01:14	0	6.1	0.008	
MH516	STORAGE	0.00	3425.77	0	01:14	0	6.1	-0.023	
MH518	STORAGE	0.00	3579.43	0	01:14	0	6.48	-0.013	
MH520	STORAGE	0.00	4236.68	0	01:15	0	7.4	0.001	
MH600	STORAGE	0.00	0.00	0	00:00	0	0	0.000	ltr
MH700	STORAGE	0.00	0.00	0	00:00	0	0	0.000	ltr
MH702	STORAGE	0.00	0.00	0	00:00	0	0	0.000	ltr
MH704	STORAGE	0.00	0.00	0	00:00	0	0	0.000	ltr
MH706	STORAGE	0.00	108.20	0	01:04	0	0.218	-0.001	
OGS1	STORAGE	0.00	1733.24	0	01:15	0	3.42	0.001	
OGS2	STORAGE	0.00	1733.24	0	01:15	0	3.42	0.001	

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Node Surcharge Summary
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No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

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Storage Volume Summary
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Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days	hr:min	Maximum Outflow LPS
MH100	0.000	0.0	0.0	0.0	0.000	0.0	0	00:00	0.00
MH102	0.000	0.8	0.0	0.0	0.000	9.2	0	01:10	161.66
MH104	0.000	1.2	0.0	0.0	0.000	11.0	0	01:09	453.61
MH106	0.000	0.4	0.0	0.0	0.000	3.5	0	01:10	30.08
MH200	0.000	0.0	0.0	0.0	0.000	0.0	0	00:00	0.00
MH202	0.000	0.0	0.0	0.0	0.000	0.0	0	00:00	0.00
MH204	0.000	2.2	0.0	0.0	0.002	21.6	0	01:11	1813.44
MH206	0.000	1.7	0.0	0.0	0.002	19.9	0	01:11	1478.35
MH208	0.000	1.4	0.0	0.0	0.001	12.6	0	01:11	1440.16
MH210	0.000	1.4	0.0	0.0	0.000	13.4	0	01:11	373.80
MH212	0.000	1.6	0.0	0.0	0.001	16.7	0	01:10	335.05
MH214	0.000	0.7	0.0	0.0	0.000	6.9	0	01:10	103.72
MH216	0.000	0.4	0.0	0.0	0.000	4.4	0	01:10	59.95
MH218	0.000	0.0	0.0	0.0	0.000	0.0	0	00:00	0.00
MH220	0.000	0.0	0.0	0.0	0.000	0.0	0	00:00	0.00
MH222	0.000	0.0	0.0	0.0	0.000	0.0	0	00:00	0.00
MH224	0.000	0.7	0.0	0.0	0.000	6.3	0	01:15	124.10
MH226	0.000	1.7	0.0	0.0	0.001	15.4	0	01:09	764.45
MH300	0.000	2.3	0.0	0.0	0.001	22.3	0	01:11	819.77
MH3000	0.000	2.1	0.0	0.0	0.010	47.0	0	01:13	3112.72
MH3002	0.000	2.6	0.0	0.0	0.010	56.3	0	01:13	2854.32
MH3004	0.000	2.2	0.0	0.0	0.008	36.5	0	01:14	2734.11
MH3100	0.001	2.7	0.0	0.0	0.006	32.5	0	01:15	4244.24
MH3102	0.001	2.7	0.0	0.0	0.006	32.1	0	01:15	4238.61
MH3104	0.000	1.8	0.0	0.0	0.004	18.9	0	01:15	4238.61
MH3106	0.000	1.2	0.0	0.0	0.004	12.9	0	01:15	4240.70
MH3108	0.012	43.4	0.0	0.0	0.014	48.6	0	01:14	4254.09
MH400	0.000	0.7	0.0	0.0	0.000	7.1	0	01:05	100.03
MH500	0.000	0.0	0.0	0.0	0.000	0.0	0	00:00	0.00
MH502	0.000	0.6	0.0	0.0	0.000	6.5	0	01:10	107.40
MH504	0.000	0.5	0.0	0.0	0.000	4.7	0	01:10	107.31
MH506	0.000	0.9	0.0	0.0	0.000	8.9	0	01:10	330.19

MH508	0.000	1.2	0.0	0.0	0.000	11.2	0	01:10	638.41
MH510	0.001	1.5	0.0	0.0	0.008	24.0	0	01:14	3345.91
MH512	0.000	2.3	0.0	0.0	0.004	34.2	0	01:14	3390.87
MH514	0.000	2.4	0.0	0.0	0.004	33.4	0	01:14	3425.77
MH516	0.001	2.3	0.0	0.0	0.007	29.6	0	01:14	3423.13
MH518	0.001	2.3	0.0	0.0	0.006	27.3	0	01:14	3581.91
MH520	0.000	1.3	0.0	0.0	0.004	16.0	0	01:15	4237.41
MH600	0.000	0.0	0.0	0.0	0.000	0.0	0	00:00	0.00
MH700	0.000	0.0	0.0	0.0	0.000	0.0	0	00:00	0.00
MH702	0.000	0.0	0.0	0.0	0.000	0.0	0	00:00	0.00
MH704	0.000	0.0	0.0	0.0	0.000	0.0	0	00:00	0.00
MH706	0.000	0.9	0.0	0.0	0.000	8.5	0	01:13	108.20
OGS1	0.000	2.6	0.0	0.0	0.002	32.3	0	01:15	1732.80
OGS2	0.000	2.6	0.0	0.0	0.002	32.3	0	01:15	1732.80

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Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
1+024	0.00	0.00	0.00	0.000
2+007	0.00	0.00	0.00	0.000
31+0102	29.73	13.36	130.42	0.152
HW3110	54.54	344.16	4254.09	7.400
Tributaries	42.31	1519.75	4331.51	23.715
System	25.32	1877.27	5970.18	31.268

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Link Flow Summary
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Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
DICB-Ph1	CONDUIT	1352.50	0	01:11	8.50	9.25	1.00
DICB-Ph2	CONDUIT	386.19	0	01:14	5.46	8.93	1.00
Easement-30a	CONDUIT	1287.59	0	01:11	1.98	0.21	0.62
Easement-30b	CONDUIT	1311.94	0	01:11	3.41	0.21	0.37
Easement-30c	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
Easement-31a	CONDUIT	386.16	0	01:14	0.73	0.07	0.50
Easement-31b	CONDUIT	386.20	0	01:14	1.88	0.07	0.20
Easement-31c	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MH100-102	CONDUIT	0.00	0	00:00	0.00	0.00	0.29
MH102-104	CONDUIT	161.66	0	01:10	2.58	0.55	0.55
MH104-226	CONDUIT	453.61	0	01:09	3.24	1.02	0.89
MH106-104	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MH106-502	CONDUIT	30.08	0	01:10	0.96	0.20	0.46
MH200-202	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MH202-204	CONDUIT	0.00	0	00:00	0.00	0.00	0.13
MH204-3000	CONDUIT	1813.44	0	01:11	4.12	0.69	0.65
MH206-204	CONDUIT	1478.35	0	01:11	2.45	1.01	0.90
MH208-206	CONDUIT	1440.16	0	01:11	4.60	0.62	0.57
MH210-208	CONDUIT	373.80	0	01:11	2.60	0.72	0.63
MH212-210	CONDUIT	335.05	0	01:10	1.87	0.98	0.77
MH214-212	CONDUIT	103.72	0	01:10	1.70	0.40	0.58
MH216-214	CONDUIT	59.95	0	01:10	2.40	0.31	0.38
MH218-216	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MH220-218	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MH222-224	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MH224-226	CONDUIT	124.10	0	01:15	2.34	0.45	0.49
MH224-400	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MH226-300	CONDUIT	764.45	0	01:09	3.06	0.77	0.66
MH3000-3002	CONDUIT	3112.72	0	01:11	2.75	1.34	1.00
MH300-208	CONDUIT	819.77	0	01:11	1.91	0.85	0.75
MH3002-3004	CONDUIT	2854.32	0	01:12	2.52	1.24	1.00
MH3004-510	CONDUIT	2734.11	0	01:12	2.42	1.20	1.00
MH3100-OGS1	CONDUIT	1733.24	0	01:15	2.32	6.26	1.00
MH3100-OGS2	CONDUIT	1733.24	0	01:15	2.32	6.26	1.00
MH3102-3104	CONDUIT	4238.61	0	01:15	3.11	1.23	0.91
MH3104-3106	CONDUIT	4238.61	0	01:15	4.36	0.42	0.46
MH3106-3108	CONDUIT	4240.70	0	01:15	3.23	0.65	0.59
MH3108-3110	CONDUIT	4254.09	0	01:14	1.99	1.20	1.00
MH400-212	CONDUIT	100.03	0	01:06	1.40	0.57	0.64

Brown Lands (118178)
Post-Development PCSWMM Model Output (100-year 3-hour Chicago)

MH500-106	CONDUIT	0.00	0	00:00	0.00	0.00	0.08
MH502-504	CONDUIT	107.40	0	01:10	2.13	0.73	0.67
MH504-506	CONDUIT	107.31	0	01:11	2.43	0.37	0.42
MH506-508	CONDUIT	330.19	0	01:10	2.76	0.32	0.44
MH508-510	CONDUIT	638.41	0	01:10	4.60	0.49	0.49
MH510-512	CONDUIT	3345.91	0	01:13	2.34	1.27	1.00
MH512-514	CONDUIT	3390.87	0	01:14	2.37	1.23	1.00
MH514-516	CONDUIT	3425.77	0	01:14	2.39	1.30	1.00
MH516-518	CONDUIT	3423.13	0	01:14	2.39	1.21	1.00
MH518-520	CONDUIT	3581.91	0	01:15	2.70	1.33	0.87
MH520-3100	CONDUIT	4237.41	0	01:15	3.37	0.56	0.82
MH600-512	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MH600-520	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MH700-506	CONDUIT	0.00	0	00:00	0.00	0.00	0.09
MH702-700	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MH702-704	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MH704-706	CONDUIT	0.00	0	00:00	0.00	0.00	0.17
MH706-508	CONDUIT	108.20	0	01:13	1.59	0.38	0.44
OGS1-MH3102	CONDUIT	1732.80	0	01:15	2.32	1.09	1.00
OGS2-MH3102	CONDUIT	1732.80	0	01:15	2.32	1.09	1.00
Street1-A	CHANNEL	0.00	0	00:00	0.00	0.00	0.00
Street1-B	CHANNEL	0.00	0	00:00	0.00	0.00	0.09
Street1-C	CHANNEL	147.07	0	01:10	0.69	0.01	0.28
Street1-D	CHANNEL	247.70	0	01:10	0.62	0.83	0.31
Street1-E	CHANNEL	3.96	0	01:11	0.05	0.00	0.16
Street1-F	CHANNEL	5.44	0	01:10	0.19	0.01	0.09
Street2-A	CHANNEL	0.00	0	00:00	0.00	0.00	0.44
Street2-B	CHANNEL	1020.78	0	01:11	1.09	0.08	0.63
Street2-C	CHANNEL	1030.38	0	01:11	2.17	0.05	0.34
Street2-D	CHANNEL	379.53	0	01:11	0.61	1.29	0.40
Street2-E	CHANNEL	333.91	0	01:10	0.60	0.04	0.37
Street2-F	CHANNEL	308.55	0	01:10	1.01	0.04	0.28
Street2-G	CHANNEL	121.27	0	01:10	0.30	0.47	0.32
Street2-H	CHANNEL	80.38	0	01:10	0.46	0.01	0.25
Street2-I	CHANNEL	39.45	0	01:10	0.69	0.00	0.12
Street2-J	CHANNEL	0.00	0	00:00	0.00	0.00	0.05
Street2-K	CHANNEL	0.00	0	00:00	0.00	0.00	0.14
Street2-L	CHANNEL	112.37	0	01:10	0.69	0.38	0.20
Street2-M	CHANNEL	57.49	0	01:10	0.29	0.00	0.22
Street2-N	CHANNEL	136.34	0	01:10	0.34	0.18	0.32
Street3-A	CHANNEL	558.42	0	01:11	1.10	0.09	0.36
Street3-B	CHANNEL	524.81	0	01:11	1.06	0.05	0.35
Street3-C	CHANNEL	333.17	0	01:10	1.10	0.02	0.27
Street4-A	CHANNEL	139.40	0	01:10	0.65	0.01	0.23
Street4-B	CHANNEL	52.16	0	01:10	0.56	0.00	0.15
Street5-A	CHANNEL	0.00	0	00:00	0.00	0.00	0.05
Street5-B	CHANNEL	19.99	0	01:10	0.39	0.00	0.11
Street5-C	CHANNEL	79.36	0	01:10	0.50	0.00	0.23
Street5-D	CHANNEL	112.41	0	01:11	0.39	0.36	0.27
Street5-E	CHANNEL	237.65	0	01:10	0.93	0.02	0.25
Street5-F	CHANNEL	515.39	0	01:10	1.62	0.04	0.28
Street5-G	CHANNEL	475.04	0	01:10	0.77	0.03	0.40
Street5-H	CHANNEL	471.41	0	01:11	0.52	1.59	0.49
Street5-I	CHANNEL	478.10	0	01:12	0.56	0.11	0.47
Street5-J	CHANNEL	488.01	0	01:12	0.50	0.19	0.52
Street5-K	CHANNEL	451.92	0	01:13	0.29	0.16	0.68
Street5-L	CHANNEL	0.00	0	00:00	0.00	0.00	0.41
Street6-A	CHANNEL	0.00	0	00:00	0.00	0.00	0.22
Street6-B	CHANNEL	0.00	0	00:00	0.00	0.00	0.00
Street7-A	CHANNEL	0.00	0	00:00	0.00	0.00	0.10
Street7-B	CHANNEL	0.00	0	00:00	0.00	0.00	0.09
Street7-C	CHANNEL	96.24	0	01:10	0.41	0.01	0.24
OR1	ORIFICE	168.12	0	01:11			1.00
OR2	ORIFICE	168.12	0	01:11			1.00
OR3	ORIFICE	107.58	0	01:14			1.00
OR4	ORIFICE	166.77	0	01:14			1.00
MH3100-3102	WEIR	789.63	0	01:15			0.79
OL01	DUMMY	19.40	0	01:02			
OL02	DUMMY	19.40	0	01:02			
OL03	DUMMY	90.70	0	01:06			
OL04	DUMMY	90.70	0	01:06			
OL05	DUMMY	32.80	0	01:02			
OL06	DUMMY	32.80	0	01:02			
OL07	DUMMY	19.40	0	01:02			
OL08	DUMMY	19.40	0	01:02			
OL09	DUMMY	32.80	0	01:03			
OL10	DUMMY	45.40	0	01:06			
OL11	DUMMY	24.80	0	01:02			
OL12	DUMMY	29.30	0	01:02			
OL13	DUMMY	19.40	0	01:04			
OL14	DUMMY	24.50	0	01:10			
OL15	DUMMY	30.04	0	01:10			

OL16	DUMMY	30.04	0	01:10
OL17	DUMMY	58.50	0	01:02
OL18	DUMMY	65.60	0	01:03
OL19	DUMMY	49.70	0	01:03
OL20	DUMMY	58.50	0	01:03
OL21	DUMMY	32.80	0	01:03
OL22	DUMMY	45.40	0	01:06
OL23	DUMMY	29.30	0	01:03
OL24	DUMMY	29.30	0	01:03
OL25	DUMMY	49.70	0	01:05
OL26	DUMMY	49.70	0	01:05
OL27	DUMMY	81.10	0	01:10
OL28	DUMMY	81.10	0	01:10
OL29	DUMMY	90.70	0	01:04
OL30	DUMMY	90.70	0	01:04
OL31	DUMMY	49.70	0	01:05
OL32	DUMMY	58.50	0	01:05
OL33	DUMMY	15.11	0	01:10
OL34	DUMMY	15.11	0	01:10
OL35	DUMMY	38.70	0	01:05
OL36	DUMMY	38.70	0	01:05
OL37	DUMMY	24.80	0	01:02
OL38	DUMMY	24.80	0	01:02
OL39	DUMMY	86.85	0	01:10
OL40	DUMMY	86.85	0	01:10
OL41	DUMMY	100.00	0	01:05
OL42	DUMMY	100.00	0	01:05
OL43	DUMMY	49.70	0	01:04
OL44	DUMMY	58.50	0	01:04
OL45	DUMMY	19.40	0	01:02
OL46	DUMMY	19.40	0	01:02
OL47	DUMMY	19.40	0	01:02
OL48	DUMMY	19.40	0	01:02
OL49	DUMMY	19.40	0	01:03
OL50	DUMMY	19.40	0	01:03
OL51	DUMMY	19.40	0	01:03
OL52	DUMMY	19.40	0	01:03
OL53	DUMMY	65.60	0	01:03
OL54	DUMMY	90.70	0	01:05

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Flow Classification Summary
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Conduit	Adjusted /Actual Length	---------- Fraction of Time in Flow Class ---------- Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
DICB-Ph1	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
DICB-Ph2	1.00	0.05	0.00	0.00	0.00	0.00	0.00	0.95	0.00	0.00
Easement-30a	1.00	0.96	0.00	0.00	0.01	0.00	0.00	0.02	0.00	0.00
Easement-30b	1.00	0.96	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00
Easement-30c	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Easement-31a	1.00	0.98	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
Easement-31b	1.00	0.98	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
Easement-31c	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MH100-102	1.00	0.01	0.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MH102-104	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH104-226	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH106-104	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MH106-502	1.00	0.01	0.00	0.00	0.01	0.03	0.00	0.96	0.04	0.00
MH200-202	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MH202-204	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MH204-3000	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH206-204	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH208-206	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH210-208	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH212-210	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH214-212	1.00	0.01	0.00	0.00	0.00	0.02	0.00	0.98	0.01	0.00
MH216-214	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH218-216	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MH220-218	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MH222-224	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MH224-226	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH224-400	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MH226-300	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH3000-3002	1.00	0.01	0.00	0.00	0.98	0.01	0.00	0.00	0.86	0.00
MH300-208	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH3002-3004	1.00	0.01	0.00	0.00	0.08	0.00	0.00	0.91	0.00	0.00
MH3004-510	1.00	0.01	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00

MH3100-OGS1	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
MH3100-OGS2	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
MH3102-3104	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH3104-3106	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH3106-3108	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH3108-3110	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH400-212	1.00	0.01	0.00	0.00	0.01	0.01	0.00	0.98	0.00	0.00
MH500-106	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MH502-504	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH504-506	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH506-508	1.00	0.01	0.00	0.00	0.82	0.17	0.00	0.00	0.99	0.00
MH508-510	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH510-512	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.24	0.00
MH512-514	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.86	0.00
MH514-516	1.00	0.01	0.00	0.00	0.07	0.00	0.00	0.93	0.00	0.00
MH516-518	1.00	0.01	0.00	0.00	0.11	0.00	0.00	0.88	0.00	0.00
MH518-520	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH520-3100	1.00	0.01	0.00	0.00	0.81	0.18	0.00	0.00	0.97	0.00
MH600-512	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MH600-520	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MH700-506	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MH702-700	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MH702-704	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MH704-706	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MH706-508	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
OGS1-MH3102	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.80	0.00
OGS2-MH3102	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.80	0.00
Street1-A	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Street1-B	1.00	0.70	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Street1-C	1.00	0.67	0.03	0.00	0.26	0.04	0.00	0.00	0.98	0.00
Street1-D	1.00	0.70	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00
Street1-E	1.00	0.01	0.01	0.00	0.73	0.25	0.00	0.00	0.12	0.00
Street1-F	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
Street2-A	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Street2-B	1.00	0.73	0.00	0.00	0.01	0.00	0.00	0.25	0.01	0.00
Street2-C	1.00	0.66	0.04	0.00	0.16	0.14	0.00	0.00	0.01	0.00
Street2-D	1.00	0.62	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00
Street2-E	1.00	0.63	0.08	0.00	0.28	0.01	0.00	0.00	0.99	0.00
Street2-F	1.00	0.65	0.06	0.00	0.14	0.14	0.00	0.00	0.00	0.00
Street2-G	1.00	0.65	0.00	0.00	0.35	0.00	0.00	0.00	0.00	0.00
Street2-H	1.00	0.64	0.06	0.00	0.19	0.10	0.00	0.00	0.99	0.00
Street2-I	1.00	0.69	0.09	0.00	0.13	0.09	0.00	0.00	0.99	0.00
Street2-J	1.00	0.78	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Street2-K	1.00	0.65	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Street2-L	1.00	0.01	0.00	0.00	0.99	0.01	0.00	0.00	0.00	0.00
Street2-M	1.00	0.01	0.01	0.00	0.94	0.05	0.00	0.00	0.13	0.00
Street2-N	1.00	0.60	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00
Street3-A	1.00	0.65	0.08	0.00	0.25	0.02	0.00	0.00	0.88	0.00
Street3-B	1.00	0.62	0.03	0.00	0.20	0.14	0.00	0.00	0.08	0.00
Street3-C	1.00	0.63	0.11	0.00	0.14	0.13	0.00	0.00	0.99	0.00
Street4-A	1.00	0.66	0.07	0.00	0.19	0.08	0.00	0.00	0.99	0.00
Street4-B	1.00	0.01	0.01	0.00	0.94	0.05	0.00	0.00	0.12	0.00
Street5-A	1.00	0.76	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Street5-B	1.00	0.72	0.04	0.00	0.23	0.01	0.00	0.00	0.13	0.00
Street5-C	1.00	0.74	0.03	0.00	0.13	0.10	0.00	0.00	0.99	0.00
Street5-D	1.00	0.65	0.00	0.00	0.35	0.00	0.00	0.00	0.00	0.00
Street5-E	1.00	0.60	0.07	0.00	0.19	0.14	0.00	0.00	0.99	0.00
Street5-F	1.00	0.68	0.00	0.00	0.18	0.14	0.00	0.00	0.00	0.00
Street5-G	1.00	0.82	0.03	0.00	0.04	0.11	0.00	0.00	0.13	0.00
Street5-H	1.00	0.80	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00
Street5-I	1.00	0.69	0.13	0.00	0.18	0.00	0.00	0.00	0.96	0.00
Street5-J	1.00	0.58	0.12	0.00	0.30	0.00	0.00	0.00	0.99	0.00
Street5-K	1.00	0.63	0.00	0.00	0.02	0.00	0.00	0.35	0.01	0.00
Street5-L	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Street6-A	1.00	0.82	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Street6-B	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Street7-A	1.00	0.67	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Street7-B	1.00	0.66	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Street7-C	1.00	0.60	0.06	0.00	0.33	0.01	0.00	0.00	0.99	0.00

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Conduit Surcharge Summary
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	--------- Hours Full --------			Hours Above Full	Hours Capacity
Conduit	Both Ends	Upstream	Dnstream	Normal Flow	Limited
DICB-Ph1	0.09	0.10	0.09	0.19	0.09
DICB-Ph2	0.19	0.24	0.19	0.28	0.19

MH104-226	0.01	0.01	0.01	0.05	0.01
MH206-204	0.01	0.13	0.01	0.07	0.01
MH3000-3002	0.12	0.12	0.12	0.08	0.09
MH3002-3004	0.12	0.12	0.12	0.08	0.11
MH3004-510	0.07	0.13	0.07	0.09	0.07
MH3100-OGS1	0.27	0.27	0.27	0.84	0.27
MH3100-OGS2	0.27	0.27	0.27	0.84	0.27
MH3102-3104	0.01	0.06	0.01	0.13	0.01
MH3108-3110	24.00	24.00	24.00	0.11	0.33
MH510-512	0.10	0.11	0.11	0.12	0.09
MH512-514	0.10	0.11	0.10	0.12	0.10
MH514-516	0.08	0.10	0.08	0.15	0.08
MH516-518	0.05	0.09	0.05	0.11	0.05
MH518-520	0.01	0.06	0.01	0.16	0.01
MH520-3100	0.01	0.01	0.07	0.01	0.01
OGS1-MH3102	0.27	0.27	0.27	0.08	0.08
OGS2-MH3102	0.27	0.27	0.27	0.08	0.08
Street2-D	0.01	0.01	0.01	0.08	0.01
Street5-H	0.01	0.01	0.01	0.11	0.01

Analysis begun on: Mon Feb 12 16:19:10 2024
Analysis ended on: Mon Feb 12 16:19:13 2024
Total elapsed time: 00:00:03

APPENDIX C

SANITARY SEWER

Sanitary Sewer Design Sheet, Novatech, February 13, 2024, 2 Pages

Preliminary Sanitary Maintenance Hole Information, February 13, 2024, 2 pages

Future Wastewater Collection Requirements, Excerpt from Master Plan Update Report, Table 32, pages 31-32, J.L. Richards & Associates Limited, February 2018, 2 Pages

Wastewater System Figures, Excerpts from Master Plan Update Report, Figures 19-25, J.L. Richards & Associates Limited, February 2018, 7 Pages

Wastewater System Model Figures, J.L. Richards & Associates Limited, Received August 2022, 6 Pages

SANITARY SEWER DESIGN SHEET

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: DC
Reviewed By: TJM
Drawing Reference: 118178-FIG9-SAN

Legend: Design Input by User
As-Built Input by User
Cumulative Cell
Calculated Design Cell Output
Reference: City of Ottawa - Sewer Design Guidelines (2012 and TBs)
MOE - Design Guidelines for Sewage Works (2008)

Location				Demand														Design Capacity							
				Residential Flow											Extraneous Flow Area Method		Total Design Flow	Proposed Sewer Pipe Sizing / Design							
Street	Area ID	From MH	To MH	Singles	Semis / Towns	Apts	Park Area	Population (in 1000's)	Cumulative Population (in 1000's)	Average Pop. Flow Q(q) (L/s)	Design Peaking Factor M	Peak Design Pop. Flow Q(p) (L/s)	Res. Drainage Area (ha.)	Cumulative Res. Drainage Area (ha.)	Cumulative Extraneous Drainage Area (ha.)	Design Extraneous Flow Q(e) (L/s)	Total Peak Design Flow Q(D) (L/s)	Pipe Length (m)	Pipe Size (mm) and Material	Pipe ID Actual (m)	Roughness n	Design Grade So (%)	Capacity Qfull (L/s)	Full Flow Velocity (m/s)	Q(D) / Qfull
Street One	A1	101	103	8	15	0	0.000	0.068	0.068	0.27	4.00	1.10	0.92	0.92	0.92	0.30	1.40	103.9	200 PVC	0.203	0.013	0.90	32.5	1.00	4.3%
Street One	A2	103	105	6	8	0	0.000	0.042	0.110	0.44	4.00	1.78	0.57	1.49	1.49	0.49	2.27	69.6	200 PVC	0.203	0.013	2.70	56.2	1.73	4.0%
Street One	A3	107	105	10	0	0	0.000	0.034	0.034	0.14	4.00	0.55	0.60	0.60	0.60	0.20	0.75	84.5	200 PVC	0.203	0.013	0.60	26.5	0.82	2.8%
Street Three	A4	105	227	4	0	0	0.000	0.014	0.157	0.64	4.00	2.55	0.28	2.37	2.37	0.78	3.33	84.0	200 PVC	0.203	0.013	2.45	53.6	1.65	6.2%
Street Two	A5	223	225	2	10	0	0.000	0.034	0.034	0.14	4.00	0.55	0.46	0.46	0.46	0.15	0.70	89.5	200 PVC	0.203	0.013	2.95	58.8	1.81	1.2%
Street Two	A6	225	227	7	0	0	0.000	0.024	0.058	0.23	4.00	0.93	0.40	0.86	0.86	0.28	1.22	85.0	200 PVC	0.203	0.013	2.65	55.7	1.72	2.2%
Street Three	A7	227	301	2	3	0	0.000	0.015	0.230	0.93	4.00	3.72	0.30	3.53	3.53	1.16	4.89	39.5	200 PVC	0.203	0.013	1.35	39.8	1.23	12.3%
Street Three	A8	301	209	8	7	0	0.000	0.046	0.276	1.12	4.00	4.47	0.80	4.33	4.33	1.43	5.90	104.2	200 PVC	0.203	0.013	0.45	23.0	0.71	25.7%
Street Two	A9	221	219	0	8	0	0.000	0.022	0.022	0.09	4.00	0.35	0.34	0.34	0.34	0.11	0.46	56.3	200 PVC	0.203	0.013	4.20	70.1	2.16	0.7%
Street Two		219	217	0	0	0	0.000	0.000	0.022	0.09	4.00	0.35		0.34	0.34	0.11	0.46	13.5	200 PVC	0.203	0.013	4.20	70.1	2.16	0.7%
Street Two	A10	217	215	3	0	0	0.000	0.010	0.032	0.13	4.00	0.52	0.23	0.57	0.57	0.19	0.70	37.5	200 PVC	0.203	0.013	4.00	68.4	2.11	1.0%
Street Two	A11	215	213	3	0	0	0.000	0.010	0.042	0.17	4.00	0.68	0.25	0.82	0.82	0.27	0.95	50.2	200 PVC	0.203	0.013	2.15	50.2	1.55	1.9%
Street Four	A12	225	401	0	12	0	0.000	0.032	0.032	0.13	4.00	0.53	0.43	0.43	0.43	0.14	0.67	59.4	200 PVC	0.203	0.013	3.40	63.1	1.95	1.1%
Street Four	A13	401	213	0	10	0	0.000	0.027	0.059	0.24	4.00	0.96	0.42	0.85	0.85	0.28	1.24	59.4	200 PVC	0.203	0.013	1.00	34.2	1.06	3.6%
Street Two	A14	213	211	3	0	0	0.000	0.010	0.112	0.45	4.00	1.81	0.19	1.86	1.86	0.61	2.42	30.8	200 PVC	0.203	0.013	0.75	29.6	0.91	8.2%
Street Two	A15	211	209	4	0	0	0.000	0.014	0.125	0.51	4.00	2.03	0.27	2.13	2.13	0.70	2.73	58.2	200 PVC	0.203	0.013	1.80	45.9	1.42	6.0%
Street Two	A16	209	207	2	0	0	0.000	0.007	0.408	1.65	4.00	6.61	0.15	6.61	6.61	2.18	8.79	16.6	200 PVC	0.203	0.013	2.65	55.7	1.72	15.8%
Street Two	A17	207	205	10	0	0	0.000	0.034	0.442	1.79	4.00	7.16	0.65	7.26	7.26	2.40	9.56	81.7	200 PVC	0.203	0.013	0.65	27.6	0.85	34.6%
Street Two	A20	201	203	3	0	0	0.000	0.010	0.010	0.04	4.00	0.17	0.25	0.25	0.25	0.08	0.25	32.9	200 PVC	0.203	0.013	1.60	43.3	1.33	0.6%
Street Two	A19	203	205	1	0	0	0.000	0.003	0.014	0.06	4.00	0.22	0.09	0.34	0.34	0.11	0.33	11.0	200 PVC	0.203	0.013	1.05	35.1	1.08	0.9%
Outlet 1	A18	205	3005	0	0	0	0.000	0.000	0.456	1.85	3.99	7.37	0.11	7.71	7.71	2.54	9.92	45.1	200 PVC	0.203	0.013	1.50	41.9	1.29	23.7%
Street Five	A21	501	107	4	0	0	0.000	0.014	0.014	0.06	4.00	0.22	0.21	0.21	0.21	0.07	0.29	41.5	200 PVC	0.203	0.013	0.65	27.6	0.85	1.1%
Street Five	A22	107	503	6	0	0	0.000	0.020	0.034	0.14	4.00	0.55	0.35	0.56	0.56	0.18	0.74	56.3	200 PVC	0.203	0.013	2.45	53.6	1.65	1.4%
Street Five	A23	503	505	2	0	0	0.000	0.007	0.041	0.17	4.00	0.66	0.25	0.81	0.81	0.27	0.93	13.2	200 PVC	0.203	0.013	3.00	59.3	1.83	1.6%
Street Five		505	507	0	0	0	0.000	0.000	0.041	0.17	4.00	0.66		0.81	0.81	0.27	0.93	76.5	200 PVC	0.203	0.013	2.75	56.7	1.75	1.6%
Street Seven	A24	703	701	0	2	0	0.000	0.005	0.005	0.02	4.00	0.09	0.16	0.16	0.16	0.05	0.14	15.2	200 PVC	0.203	0.013	0.80	30.6	0.94	0.5%
Street Seven	A25	701	507	5	8	0	0.000	0.039	0.044	0.18	4.00	0.71	0.53	0.69	0.69	0.23	0.94	63.0	200 PVC	0.203	0.013	0.40	21.6	0.67	4.3%
Street Five	A26	507	509	7	0	0	0.000	0.024	0.109	0.44	4.00	1.76	0.48	1.98	1.98	0.65	2.41	85.9	200 PVC	0.203	0.013	2.80	57.3	1.77	4.2%
Street Seven	A27	703	705	1	9	0	0.000	0.028	0.028	0.11	4.00	0.45	0.42	0.42	0.42	0.14	0.59	65.4	200 PVC	0.203	0.013	2.85	57.8	1.78	1.0%
Street Seven	A28	705	707	2	0	0	0.000	0.007	0.035	0.14	4.00	0.56	0.26	0.68	0.68	0.22	0.78	12.4	200 PVC	0.203	0.013	1.65	44.0	1.36	1.8%
Street Seven	A29	707	509	10	0	0	0.000	0.034	0.069	0.28	4.00	1.11	0.64	1.32	1.32	0.44	1.55	77.4	200 PVC	0.203	0.013	0.95	33.4	1.03	4.6%
Street Five	A30	509	511	0	0	0	0.000	0.000	0.177	0.72	4.00	2.87	0.01	3.31	3.31	1.09	3.96	12.7	200 PVC	0.203	0.013	1.65	44.0	1.36	9.0%
Street Six	A31	601	513	0	0	0	0.000	0.000	0.000	0.00	4.00	0.00	0.90	0.90	0.90	0.30	0.30	87.5	250 PVC	0.254	0.013	0.30	34.0	0.67	0.9%
Street Five	A32	601	523	9	0	0	0.000	0.031	0.031	0.12	4.00	0.50	0.63	0.63	0.63	0.21	0.70	71.8	200 PVC	0.203	0.013	1.80	45.9	1.42	1.5%
Street Five	A33	523	521	1	0	0	0.000	0.003	0.034	0.14	4.00	0.55	0.32	0.95	0.95	0.31	0.86	12.0	200 PVC	0.203	0.013	0.50	24.2	0.75	3.6%
Street Five	A34	521	519	6	0	0	0.000	0.020	0.054	0.22	4.00	0.88	0.48	1.43	1.43	0.47	1.35	74.0	200 PVC	0.203	0.013	0.40	21.6	0.67	6.3%
Street Five	A35	519	517	2	0	0	0.000	0.007	0.061	0.25	4.00	0.99	0.19	1.62	1.62	0.53	1.53	14.1	200 PVC	0.203	0.013	0.50	24.2	0.75	6.3%
Street Five	A36	517	515	9	0	0	0.000	0.031	0.092	0.37	4.00	1.49	0.51	2.13	2.13	0.70	2.19	46.3	200 PVC	0.203	0.013	0.40	21.6	0.67	10.1%
Street Five	A37	515	513	2	0	0	0.000	0.007	0.099	0.40	4.00	1.60	0.14	2.27	2.27	0.75	2.35	22.5	200 PVC	0.203	0.013	0.50	24.2	0.75	9.7%
Street Five	A38	513	511	1	0	0	0.000	0.003	0.102	0.41	4.00	1.65	0.19	3.36	3.36	1.11	2.76	85.0	250 PVC	0.254	0.013	0.30	34.0	0.67	8.1%

SANITARY SEWER DESIGN SHEET

NOVATECH
Engineers, Planners & Landscape Architects

Project Name: Brown Lands
Date: 13/02/2024
Input By: DC
Reviewed By: TJM
Drawing Reference: 118178-FIG9-SAN

As-Built Input by User
Cumulative Cell
Calculated Design Cell Output

Reference: City of Ottawa - Sewer Design Guidelines (2012 and TBs)
MOE - Design Guidelines for Sewage Works (2008)

Location				Demand														Design Capacity							
				Residential Flow											Extraneous Flow Area Method		Total Design Flow	Proposed Sewer Pipe Sizing / Design							
Street	Area ID	From MH	To MH	Singles	Semis / Towns	Apts	Park Area	Population (in 1000's)	Cumulative Population (in 1000's)	Average Pop. Flow Q(q) (L/s)	Design Peaking Factor M	Peak Design Pop. Flow Q(p) (L/s)	Res. Drainage Area (ha.)	Cumulative Res. Drainage Area (ha.)	Cumulative Extraneous Drainage Area (ha.)	Design Extraneous Flow Q(e) (L/s)	Total Peak Design Flow Q(D) (L/s)	Pipe Length (m)	Pipe Size (mm) and Material	Pipe ID Actual (m)	Roughness n	Design Grade So (%)	Capacity Qfull (L/s)	Full Flow Velocity (m/s)	Q(D) / Qfull
PARK	A39	511	3001	0	0	0	2.000	0.020	0.300	1.21	4.00	4.85	2.45	9.12	9.12	3.01	7.86	44.6	250 PVC	0.254	0.013	0.30	34.0	0.67	23.1%
PARK		3001	3003	0	0	0	0.000	0.000	0.300	1.21	4.00	4.85		9.12	9.12	3.01	7.86	114.3	250 PVC	0.254	0.013	0.30	34.0	0.67	23.1%
PARK		3003	3005	0	0	0	0.000	0.000	0.300	1.21	4.00	4.85		9.12	9.12	3.01	7.86	35.1	250 PVC	0.254	0.013	0.30	34.0	0.67	23.1%
Pump Station		3005	3007	0	0	0	0.000	0.000	0.755	3.06	3.88	11.85		16.830	16.83	5.55	17.41	4.0	250 PVC	0.254	0.013	1.50	76.0	1.50	22.9%
Totals				**143**	**92**	**0**	**2.000**	**0.755**	**0.755**	**3.06**	**3.88**	**11.85**	**16.83**	**16.83**	**16.83**	**5.55**	**17.41**	**2343.5**							

Demand Equation / Parameters

1. **Q(D) =** Q(p) + Q(ici) + Q(e)
2. **Q(p) =** (P x q x M x K / 86,400)
3. **q =** 350 L/per person/day (design)
4. **M = Harmon Formula (maximum of 4.0)**
5. **K =** 1.0 (design)
6. **Park flow is considered equivalent to a single unit / ha**
   Park Demand = 3 single unit equivalent / park ha (~ 3,600 L/ha/day)
7. **Q(ici) =** ICI Area x ICI Flow x ICI Peak
8. **Q(e) =** 0.33 L/s/ha (design)

Definitions

Q(D) = Peak Design Flow (L/s)
Q(p) = Peak Design Population Flow (L/s)
Q(q) = Average Population Flow (L/s)

	Singles	Semis / Towns	Apts
P = Residential Population =	3.4	2.7	2.1

q = Average Capita Flow
M = Harmon Formula
K = Harmon Correction Factor
Q(ici) = Industrial / Commercial / Institutional Flow (L/s)
Q(e) = Extraneous Flow (L/s)

Institutional / Commercial / Industrial	Industrial	Commercial / Institutional	
Design =	35000	28000	L/gross ha/day
ICI Peak *			
Design =	1.0	1.5	* ICI Peak = 1.0 Default, 1.5 if ICI in contributing area is >20% (design only)

Capacity Equation

Q full = $1000*(1/n)*A_p*R^{2/3}*So^{0.5}$

Definitions

Q full = Capacity (L/s)
n = Manning coefficient of roughness (0.013)
A_p = Pipe flow area (m^2)
R = Hydraulic Radius of wetted area (dia./4 for full pipes)
So = Pipe slope/gradient

BROWN LANDS

PROJECT NUMBER 118178
DATE: 13/02/2024

PRELIMINARY SANITARY MAINTENANCE HOLE INFORMATION

NOVATECH
Engineers, Planners & Landscape Architects

Structure ID	Maintenance Hole Diameter (mm)	T/G Elevation (m)	Invert Information (m)	
EX SAN MH 1-107	*1200*	*113.30*	*INV.NW*	*111.45*
			INV.SE	*111.35*
			INV.W*	111.60
101	1200	126.09	INV.NE	123.08
103	1200	125.00	INV.SW	122.14
			INV.NE	122.14
105	1200	123.00	INV.SW	120.26
			INV.NE	119.75
			INV.SE	119.15
107	1200	123.10	INV.SW	120.26
			INV.NW	120.03
			INV.SE	120.03
201	1200	116.16	INV.NW	113.45
203	1200	115.67	INV.SE	112.92
			INV.W	112.89
205	1200	115.50	INV.E	112.77
			INV.SW	112.15
			INV.N	112.09
207	1200	117.99	INV.NE	112.68
			INV.SW	113.82
209	1200	118.50	INV.NE	114.26
			INV.SW	115.26
			INV.NW	115.25
211	1200	119.27	INV.NE	116.31
			INV.W	116.34
213	1200	119.55	INV.E	116.57
			INV.W	116.76
			INV.NW	116.67
215	1200	120.63	INV.E	117.84
			INV.W	117.87
217	1200	122.45	INV.E	119.37
			INV.W	119.64
219	1200	123.09	INV.E	120.21
			INV.NW	120.24
221	1200	125.63	INV.SE	122.61
223	1200	125.99	INV.NE	122.70
225	1200	122.75	INV.SW	120.06
			INV.NE	118.91
			INV.SE	120.02
227	1200	120.00	INV.SW	116.66
			INV.SE	116.59
			INV.NW	117.09
301	1200	119.25	INV.SE	115.72
			INV.NW	116.06
401	1200	120.84	INV.SE	117.27
			INV.NW	118.00
501	1200	123.25	INV.SE	120.30
503	1200	122.35	INV.E	118.62
			INV.NW	118.65
505	1200	122.02	INV.NE	118.20
			INV.W	118.23

BROWN LANDS

PROJECT NUMBER 118178
DATE: 13/02/2024

PRELIMINARY SANITARY MAINTENANCE HOLE INFORMATION

NOVATECH
Engineers, Planners & Landscape Architects

Structure ID	Maintenance Hole Diameter (mm)	T/G Elevation (m)	Invert Information (m)	
507	1200	119.00	INV.NW	116.21
			INV.NE	115.85
			INV.SW	116.10
509	1200	116.50	INV.NW	113.46
			INV.SW	113.45
			INV.NE	113.40
511	1200	115.89	INV.SW	113.19
			INV.NE	108.89
			INV.SE	108.83
513	1200	113.00	INV.SW	109.15
			INV.NE	109.15
			INV.NW	109.21
515	1200	112.97	INV.SW	109.26
			INV.NE	109.26
517	1200	112.91	INV.SW	109.45
			INV.N	109.48
519	1200	112.89	INV.S	109.55
			INV.NW	109.58
521	1200	112.80	INV.SE	109.88
			INV.W	109.91
			INV.N	110.20
523	1200	112.89	INV.E	109.97
			INV.SW	110.00
601	1200	113.85	INV.NE	111.29
			INV.SE	109.47
701	1200	119.44	INV.N	116.49
			INV.SE	116.46
703	1200	119.30	INV.NE	116.60
			INV.S	116.60
705	1200	117.42	INV.SW	114.73
			INV.E	114.70
707	1200	117.20	INV.W	114.50
			INV.SE	114.20
3001	1200	113.77	INV.NW	108.70
			INV.S	108.67
3003	1200	111.96	INV.N	108.32
			INV.S	108.32
3005	1200	114.07	INV.N	108.21
			INV.S	111.41
			INV.E	108.15
3007	1200	114.55	INV.W	108.09
			INV.S	112.05

*Proposed forcemain connection.

Orchard View community centre, that Novatech had accounted for in the Spring Street SPS ultimate projected flow of 55.2L/s (5.97L/s was reserved for the community centre).

5.5.3 Wastewater Collection

In order to assess the wastewater collection system, the hydraulic model of major collectors within the system was updated based on current wastewater flow data. The model was configured to simulate a peak flow scenario and a discussion of the results is presented in Table 32.

Table 32: Future Wastewater Collection Requirements

Study Period	Peak Wastewater Flows			
Existing	Reference Figure 19			
	Street	Length (m)	Diameter (mm)	Capacity (%)
	Easement (Between Clyde St. and Martin St.)	60.0	300	156
Short-Term (2018 – 2022)	Reference Figure 20			
	Street	Length (m)	Diameter (mm)	Capacity (%)
	State Street	96.8	300	91
	Martin Street N	41.3	225	94
	Little Bridge	10.6	450	121
	Ottawa Street	475.3	300	108 to 134
	Easement (Between Clyde St. and Martin St.)	60.0	300	201
Mid-Term (2023 – 2027)	Reference Figure 21			
	Street	Length (m)	Diameter (mm)	Capacity (%)
	State Street	96.8	300	92
	Martin Street N	41.3	225	95
	Ottawa Street	104	300	104
	Little Bridge	10.6	450	136
	Ottawa Street	475.3	300	131 to 163
	Easement (Between Clyde St. and Martin St.)	60.0	300	202
Long-Term (2028 - 2037)	Reference Figure 22			
	Street	Length (m)	Diameter (mm)	Capacity (%)
	State Street	96.8	300	92
	Martin Street N	41.3	225	95
	Union Street	145	225	92 to 98
	Ottawa Street	104	300	110
	Little Bridge	10.6	450	146
	Ottawa Street	475.3	300	139 to 173
	Easement (Between Clyde St. and Martin St.)	60.0	300	202

Build-Out (2037+)	Reference Figure 23			
	Street	Length (m)	Diameter (mm)	Capacity (%)
	State Street	96.8	300	92
	Martin Street N	41.3	225	95
	Martin Street N	15.7	300	109
	Martin Street N	26.8	450	115
	Mill Street	28.5	525	96
	Union Street	145	225	92 to 98
	Little Bridge	10.6	450	188
	Ottawa Street	760.5	300	110 to 249
	Easement (Between Clyde St. and Martin St.)	60.0	300	202
	Malcolm Street	166.7	300	111 to 120
	Ann Street	258.4	200	71 to 136
	Country Street	478.6	225 to 250	79 to 136

5.6 Wastewater Treatment Servicing Strategies

As previously noted, the existing rated capacity of the WWTP is sufficient to service the Almonte Ward over the updated long term planning period (i.e., the next 20 years). This is consistent with the 2012 Master Plan report. As such, no alternate servicing strategies were identified. It is noted that an expansion would ultimately be required beyond the long-term planning period.

5.7 Wastewater Pumping Servicing Strategies

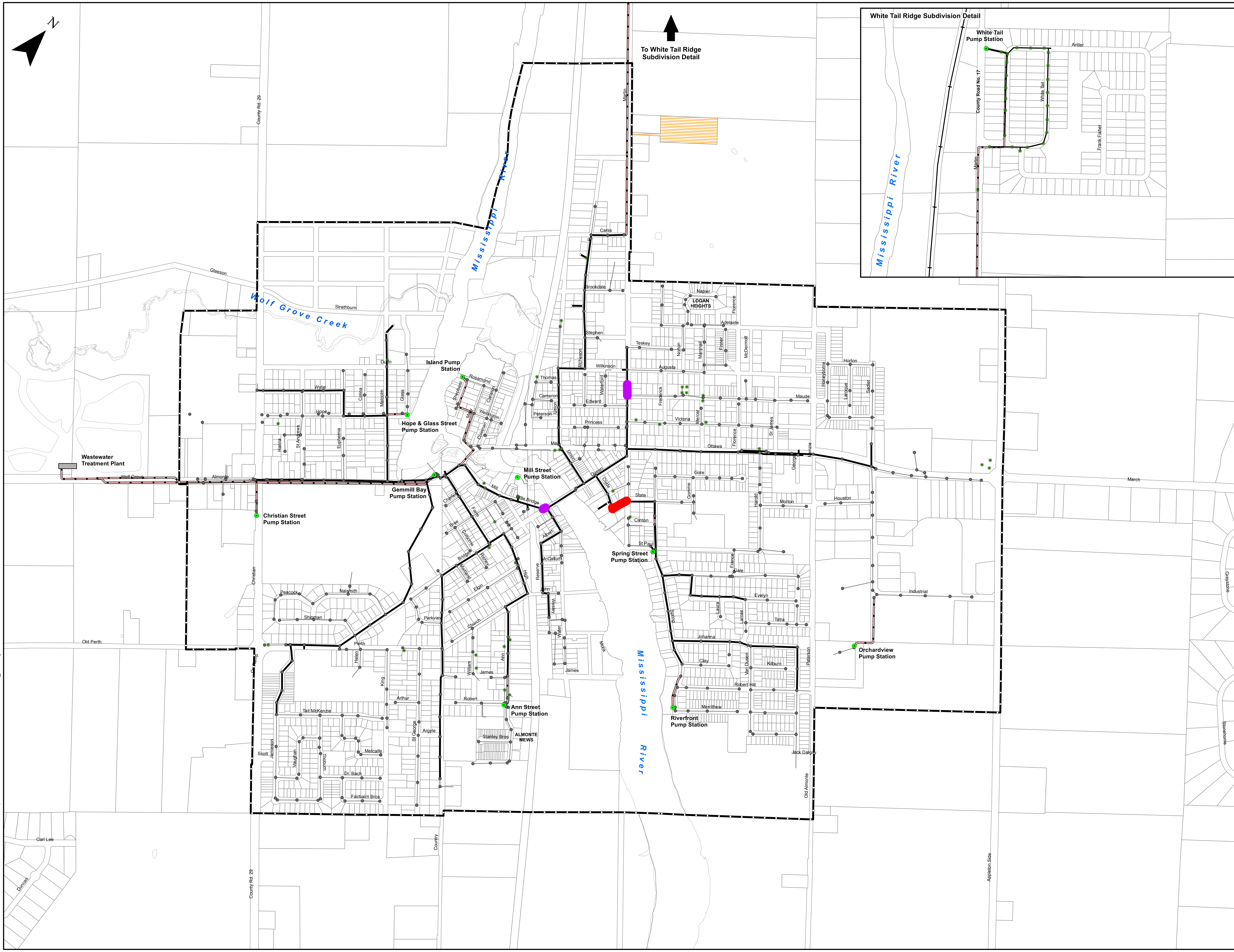
As outlined in previous Sections, the Gemmill's Bay SPS and the Spring Street SPS will require additional capacity over the short and mid-term planning periods.

5.7.1 Gemmill's Bay SPS

Given recent bypass events at the Gemmill's Bay SPS, it is likely that the pump station is already operating at or near its existing firm capacity, suggesting a capacity upgrade may be required in the immediate or short-term timeframe. Based on projected peak flows, and a design capacity of 326L/s, a long-term deficit of 48L/s is predicted. It is noted that this deficit may be higher than this, as it is suspected that the actual firm capacity of the station is less than 326L/s, which is equal to the summation of the individual capacity of two pumps. It is recommended that the station be upgraded to ultimately meet the long-term deficit of 48L/s (or higher). Since bypass volumes are not measured, and the firm capacity of the station is unknown, it is recommended that additional flow monitoring and a preliminary pump capacity investigation be completed to better define the station's long-term requirements. A preliminary opinion of probable cost to upgrade the pumping system only (i.e., replace existing pumps with higher capacity pumps) at Gemmill's Bay SPS is $500,000. Additional costing requirements to include the full extent of required upgrades (e.g., new/upgraded wet well, screening upgrades, building expansion and/or new building) to be confirmed during the associated Class EA.

5.7.2 Spring Street SPS

As previously noted, a short-term capacity deficit of 13.5L/s is predicted for the Spring Street SPS, which corresponds to the completion of Phase 5 of the Riverfront Estates project. Since



Sanitary Sewer
- Over Capacity
- 90 to 100% Capacity
- Trunk Sewer Functioning Properly

Infrastructure
- Cleanout
- Sanitary Manhole
- Private Forecmain
- Forcemain
- Existing Sewers

Land Use
- Almonte Ward Limits
- Existing Lots
- Closed Waste Disposal Site

No.	ISSUE / REVISION	DD/MM/YY

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

SCALE: 0 50 100 200 300 400 Meters

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MISSISSIPPI MILLS, ONTARIO

DRAWING:

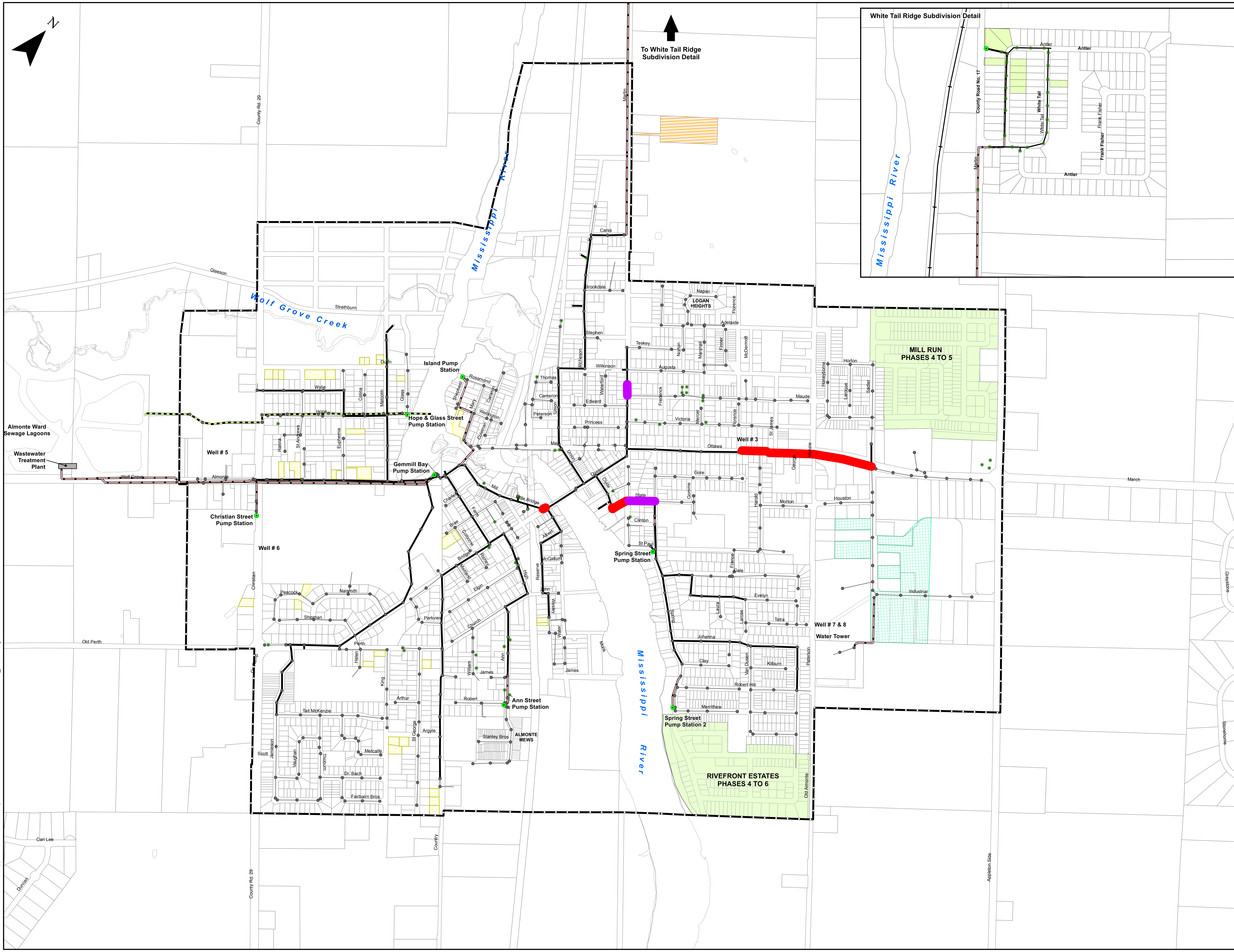
ALMONTE WARD WASTEWATER SYSTEM EXISTING

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 19**

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 AlmonteGrowth Ex_Sanitary.mxd

PLOT DATE: January 5, 2018 10:08:58 AM



Sanitary Sewer

- Over Capacity
- 90 to 100% Capacity
- Trunk Sewer Functioning Properly

Infrastructure

- Pumping Station
- Cleanout
- Sanitary Manhole
- Lagoon Outfall
- Private Forecmain
- Forcemain
- Existing Sewers

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Subdivision
- Business Park (9.0 ha)
- Residential - Infill (3.8 ha)

No.	ISSUE / REVISION	DD/MM/YY

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MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WASTEWATER SYSTEM 0 TO 5 YEARS (2018 TO 2022)

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 20**

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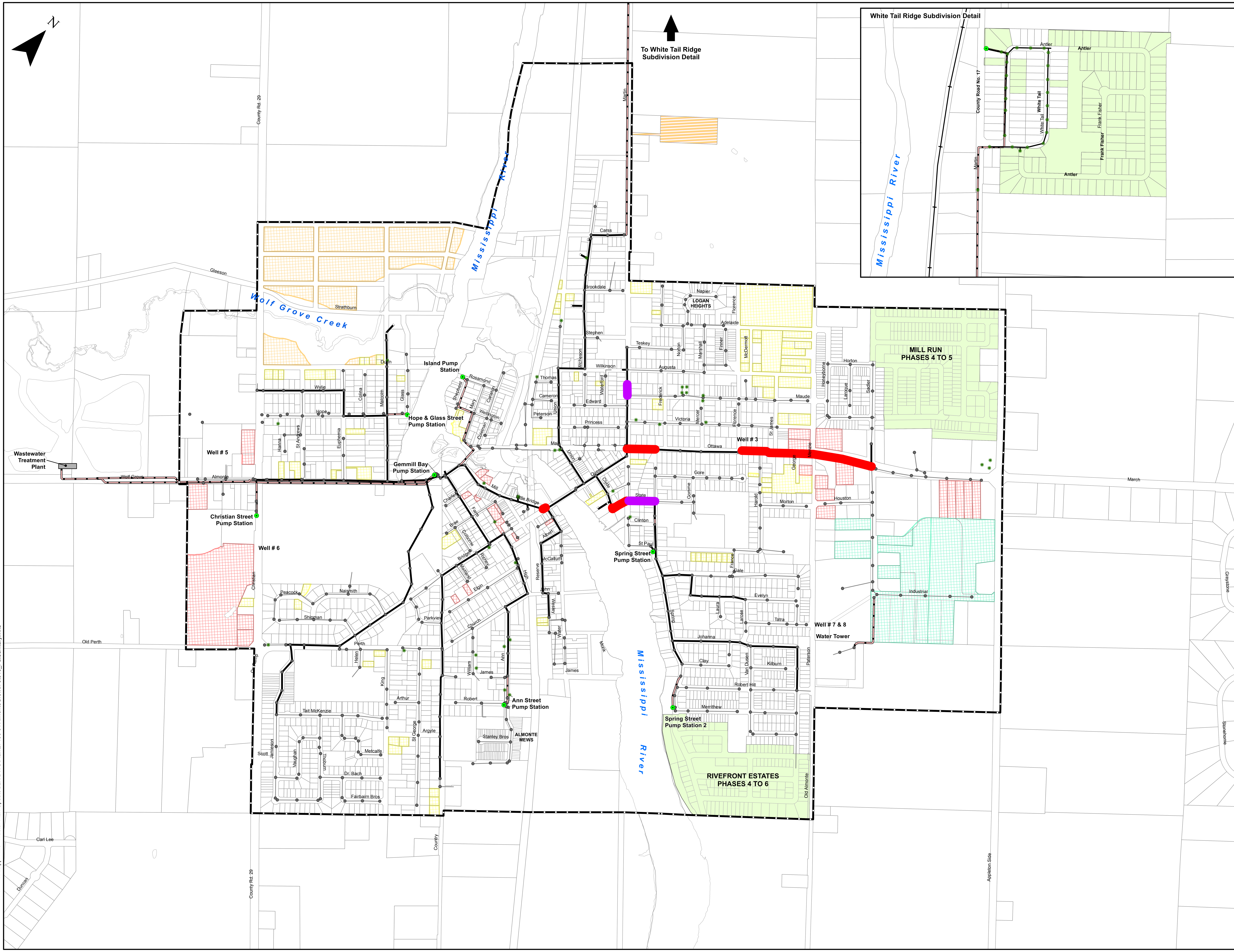

Sanitary Sewer

- Over Capacity
- 90 to 100% Capacity
- Trunk Sewer Functioning Properly

Infrastructure

- Pumping Station
- Cleanout
- Sanitary Manhole
- Private Forecmain
- Forcemain
- Existing Sewers

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Business Park (17.0 ha)
- Commercial (15.6 ha)
- Residential - Geenfield (14.2 ha)
- Residential - Infill (16.0 ha)

No.	ISSUE / REVISION	DD/MM/YY

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ALMONTE WARD WASTEWATER SYSTEM 5 TO 10 YEARS (2023 TO 2028)

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 21**

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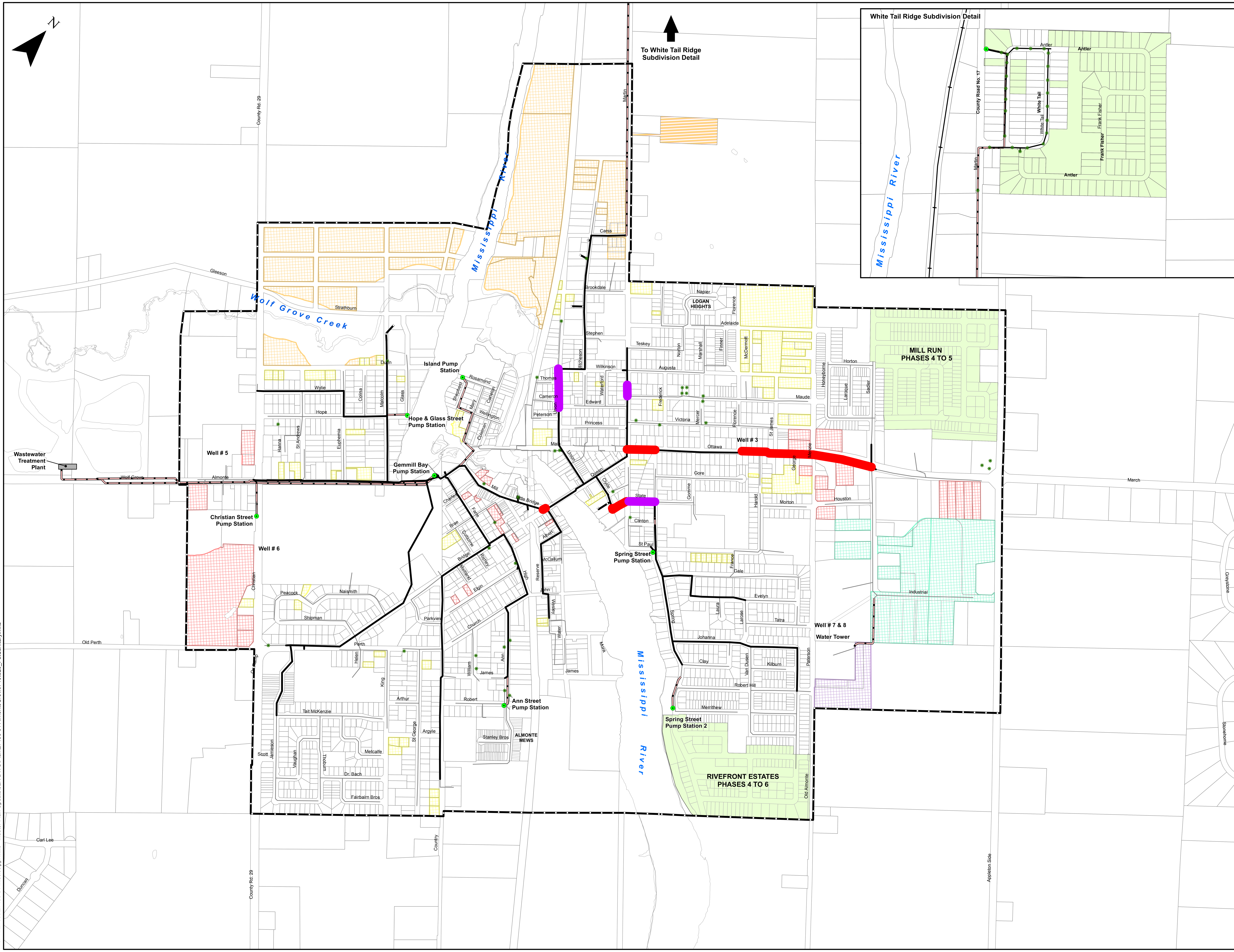

Sanitary Sewer

- Over Capacity
- 90 to 100% Capacity
- Trunk Sewer Functioning Properly

Infrastructure

- Pumping Station
- Cleanout
- Sanitary Manhole
- Private Forecmain
- Forcemain
- Existing Sewers

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Business Park (17.0 ha)
- Community Facility (3.1 ha)
- Commercial (15.6 ha)
- Residential - Geenfield (34.2 ha)
- Residential - Infill (16.0 ha)

No.	ISSUE / REVISION	DD/MM/YY

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MISSISSIPPI MILLS, ONTARIO

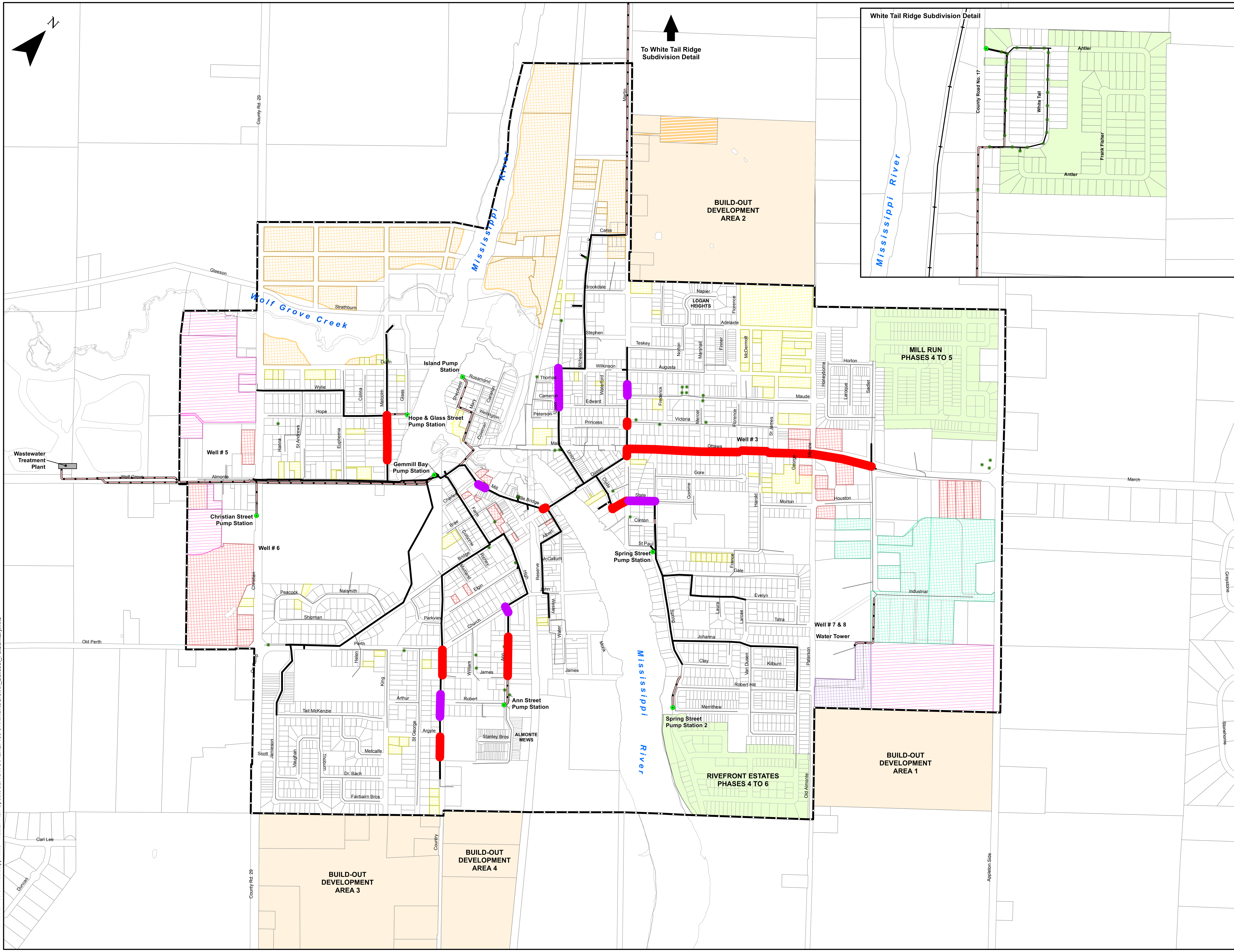
DRAWING:

ALMONTE WARD GROWTH WASTEWATER SYSTEM 10 TO 20 YEARS (2029 TO 2037)

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01
DRAWING #: **FIGURE 22**

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 AlmonteGrowth 10to20_FutSanitary.mxd

PLOT DATE: January 5, 2018 10:24:52 AM



Sanitary Sewer
- Over Capacity
- 90 to 100% Capacity
- Trunk Sewer Functioning Properly

Infrastructure
- Pumping Station
- Cleanout
- Sanitary Manhole
- Private Forecmain
- Forcemain
- Existing Sewers

Land Use
- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Build Out
- Business Park (17.0 ha)
- Community Facility (3.1 ha)
- Commercial (15.6 ha)
- Industrial (24.1 ha)
- Residential - Geenfield (34.2 ha)
- Residential - Infill (16.0 ha)

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ALMONTE WARD GROWTH WASTEWATER SYSTEM BUILD-OUT (2037+)

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 23**

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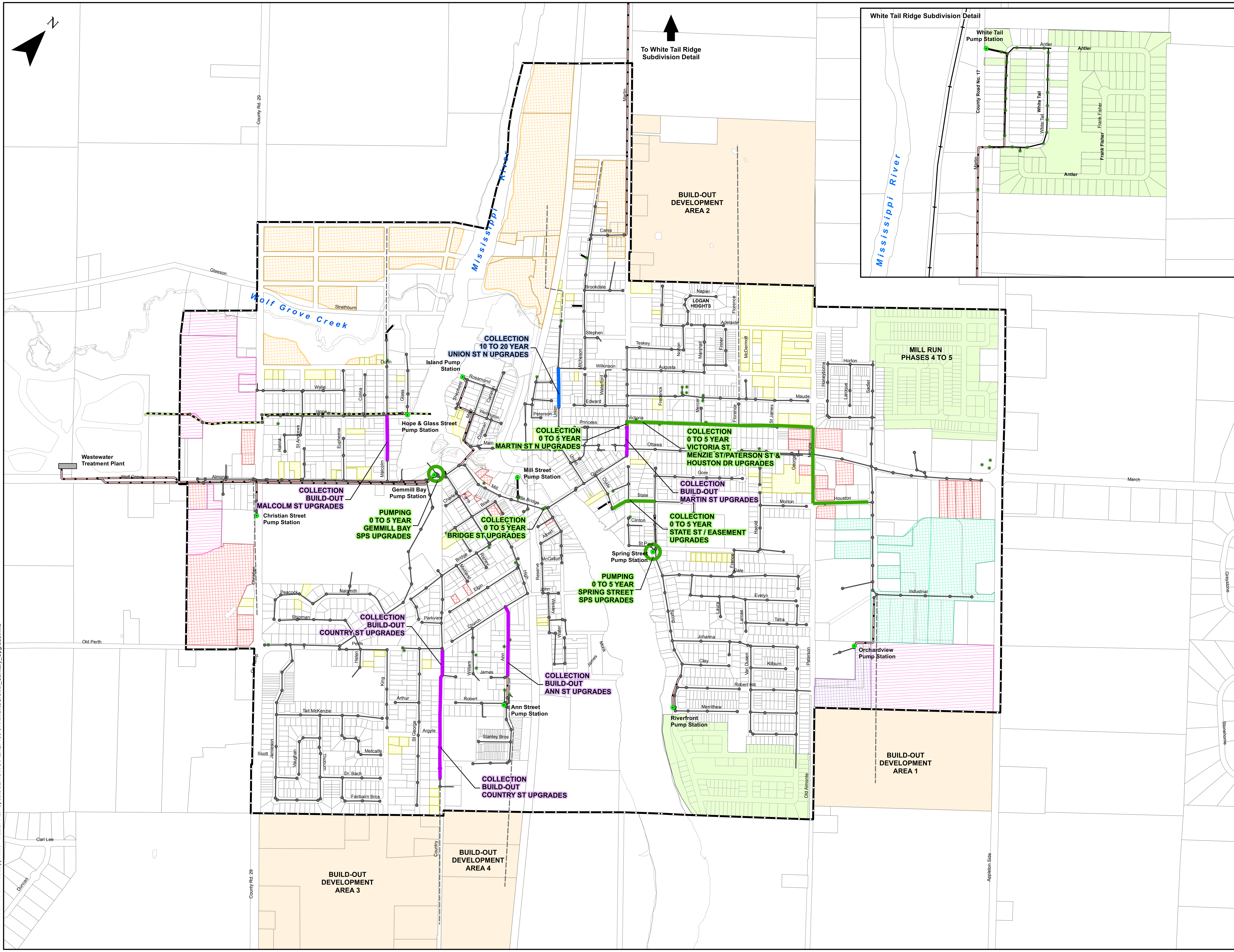

Sanitary Sewer Upgrades

- 0 to 5 Years
- 10 to 20 Years
- Build-out
- Future Servicing

Infrastructure

- Pumping Station
- Cleanout
- Sanitary Manhole
- Lagoon Outfall
- Sanitary Sewer
- Private Forecmain
- Forcemain

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Registered Subdivision
- Build Out
- Business Park (17.0 ha)
- Community Facility (3.1 ha)
- Commercial (15.6 ha)
- Industrial (24.1 ha)
- Residential - Geenfield (34.2 ha)
- Residential - Infill (16.0 ha)

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MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WASTEWATER SERVICING STRATEGIES

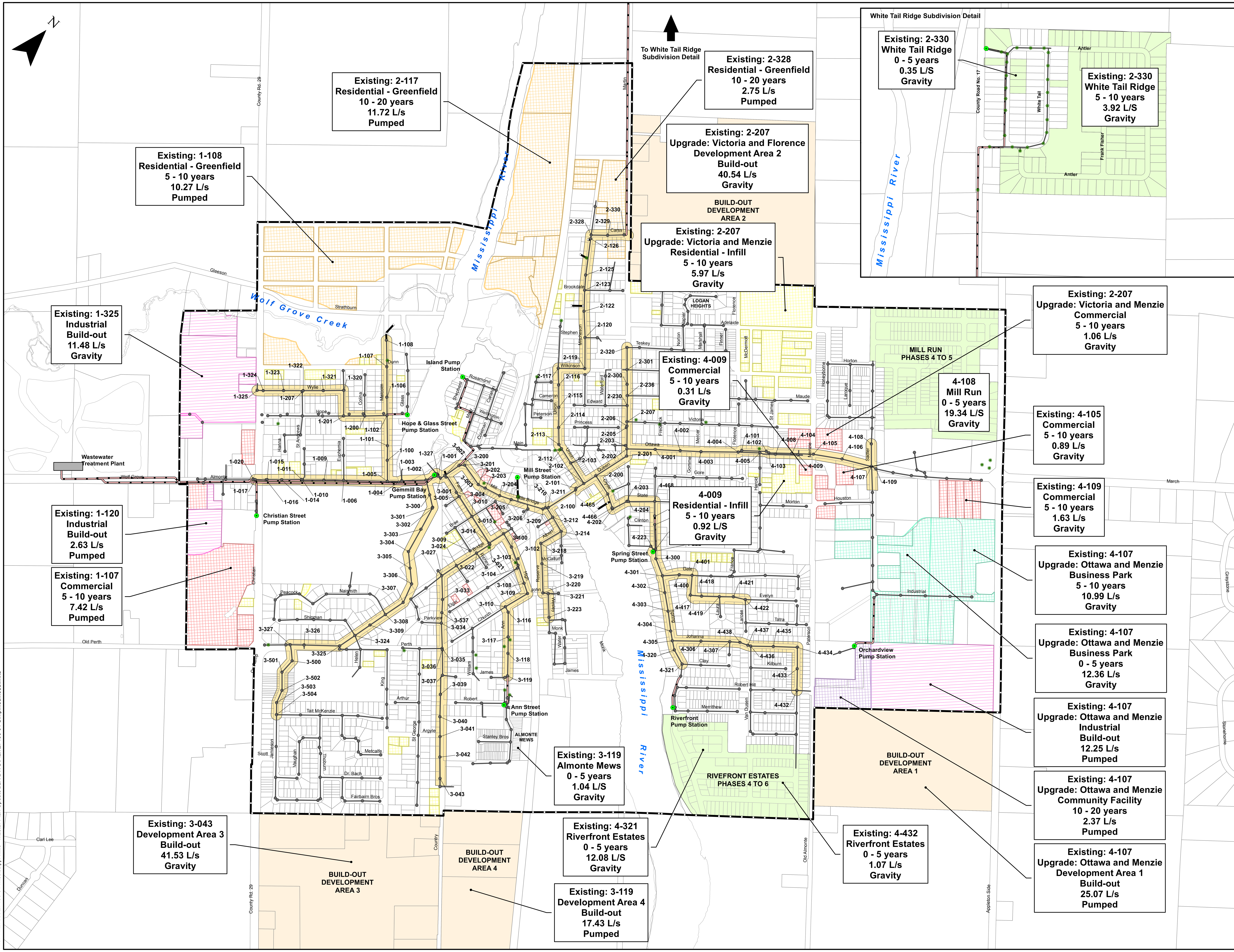
DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #:

FIGURE 24

PLOT DATE: January 5, 2018 10:29:59 AM

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 AlmonteGrowth_Sanitary_Upgrade.mxd



Infrastructure

- 4-102 Manhole ID
- Pumping Station
- Cleanout
- Sanitary Manhole
- Sanitary Sewer
- Private Forcemain
- Forcemain
- Sanitary Trunk Sewers

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Registered Subdivision
- Build Out
- Business Park (17.0 ha)
- Community Facility (3.1 ha)
- Commercial (15.6 ha)
- Industrial (24.1 ha)
- Residential - Geenfield (34.2 ha)
- Residential - Infill (16.0 ha)

Existing: 4-109 — Manhole ID
Upgrade : Ottawa and Menzie — Intersection
Commercial — Development Name or Type
5 - 10 years — Development Timeline
1.63 L/s — Estimated Park Flow
Gravity — Anticipated Future Trunk Servicing

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MISSISSIPPI MILLS, ONTARIO

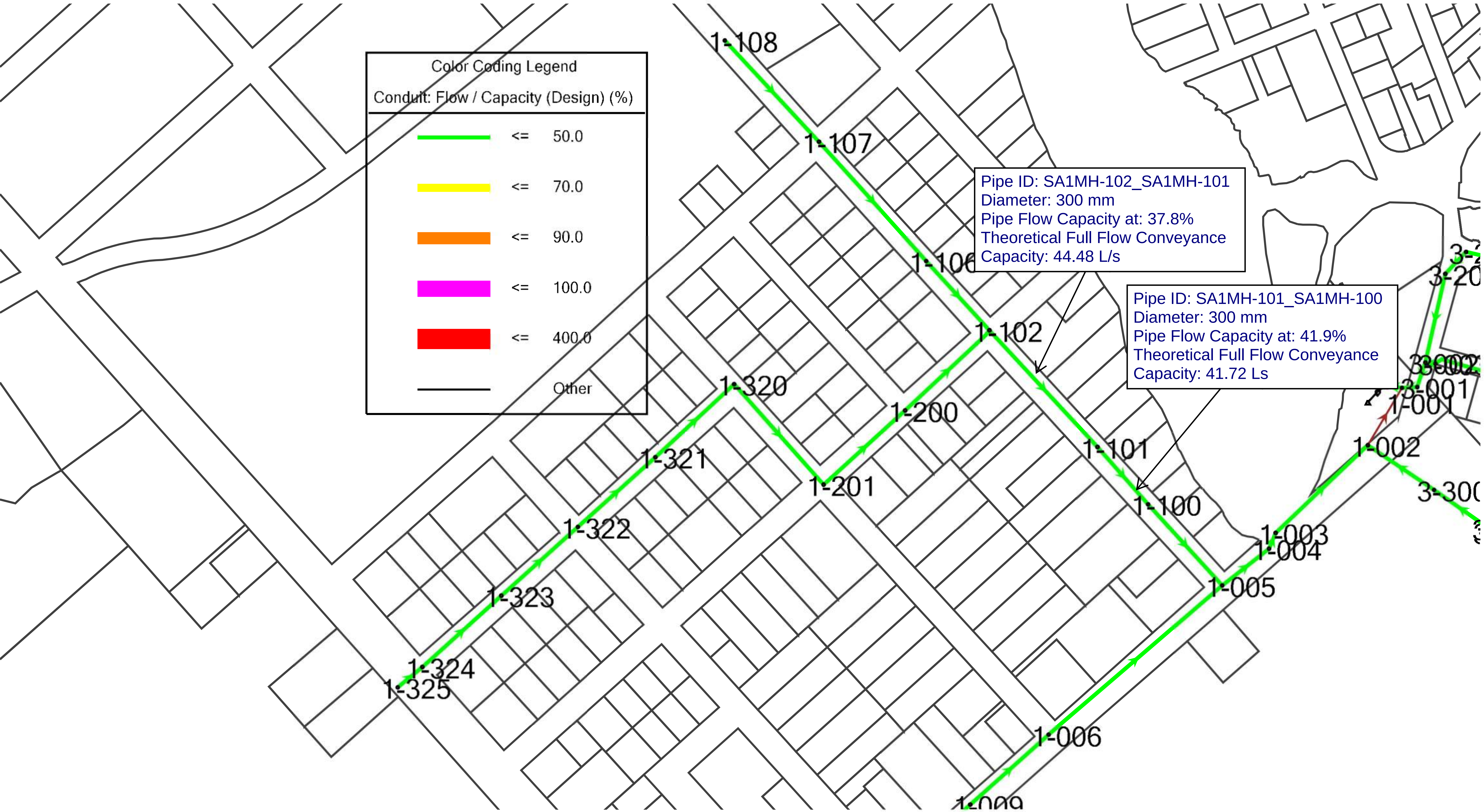
DRAWING:
WASTEWATER HYDRAULIC MODEL DEMAND ALLOCATION

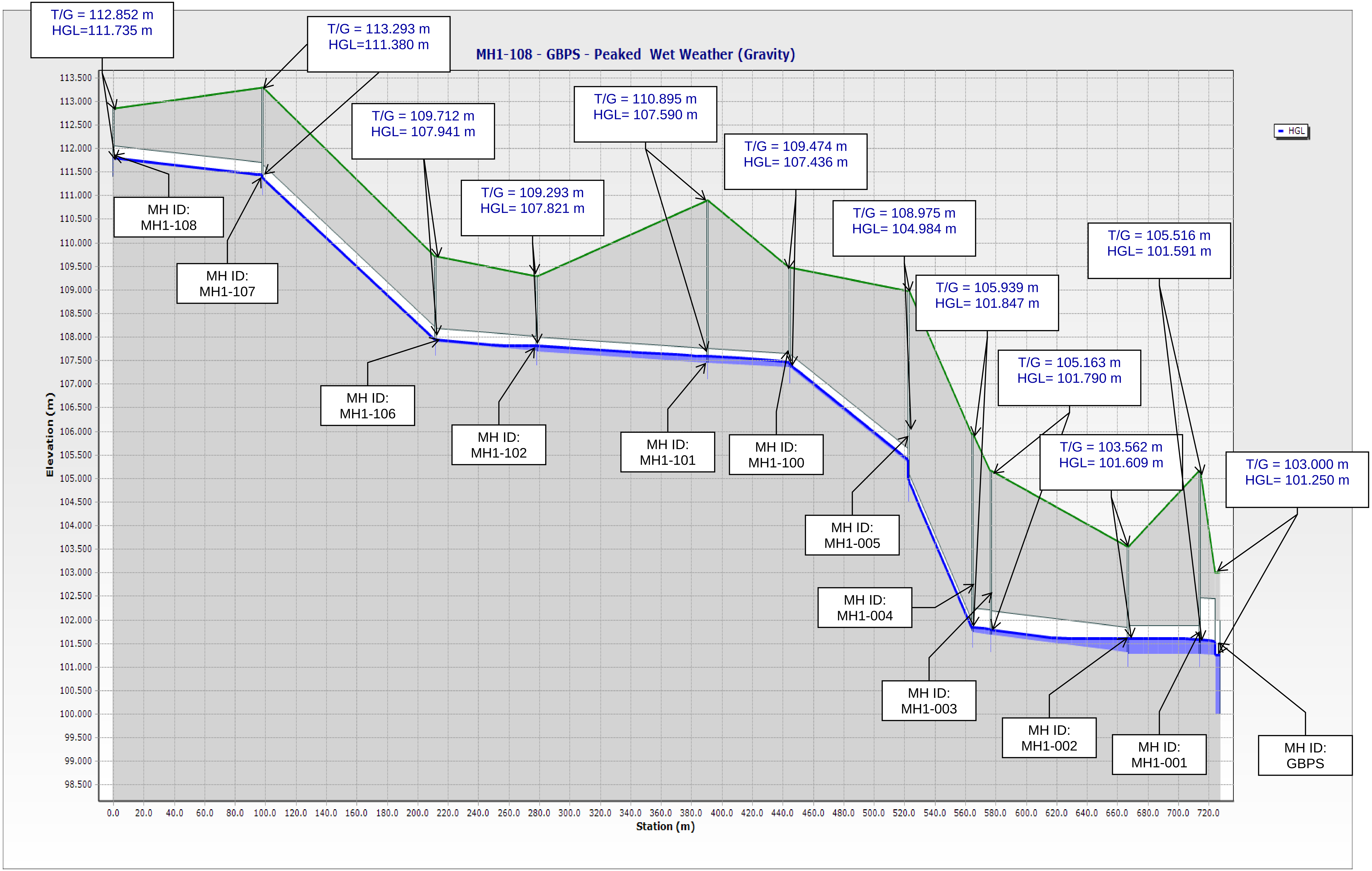
DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01
DRAWING #: **FIGURE 25**

PLOT DATE: January 5, 2018 10:32:24 AM

Mississippi Mills Master Plan Update 2017.stsw

Active Scenario: Peaked Wet Weather (Gravity)




MH1-108 - GBPS - Peaked Wet Weather (Gravity)
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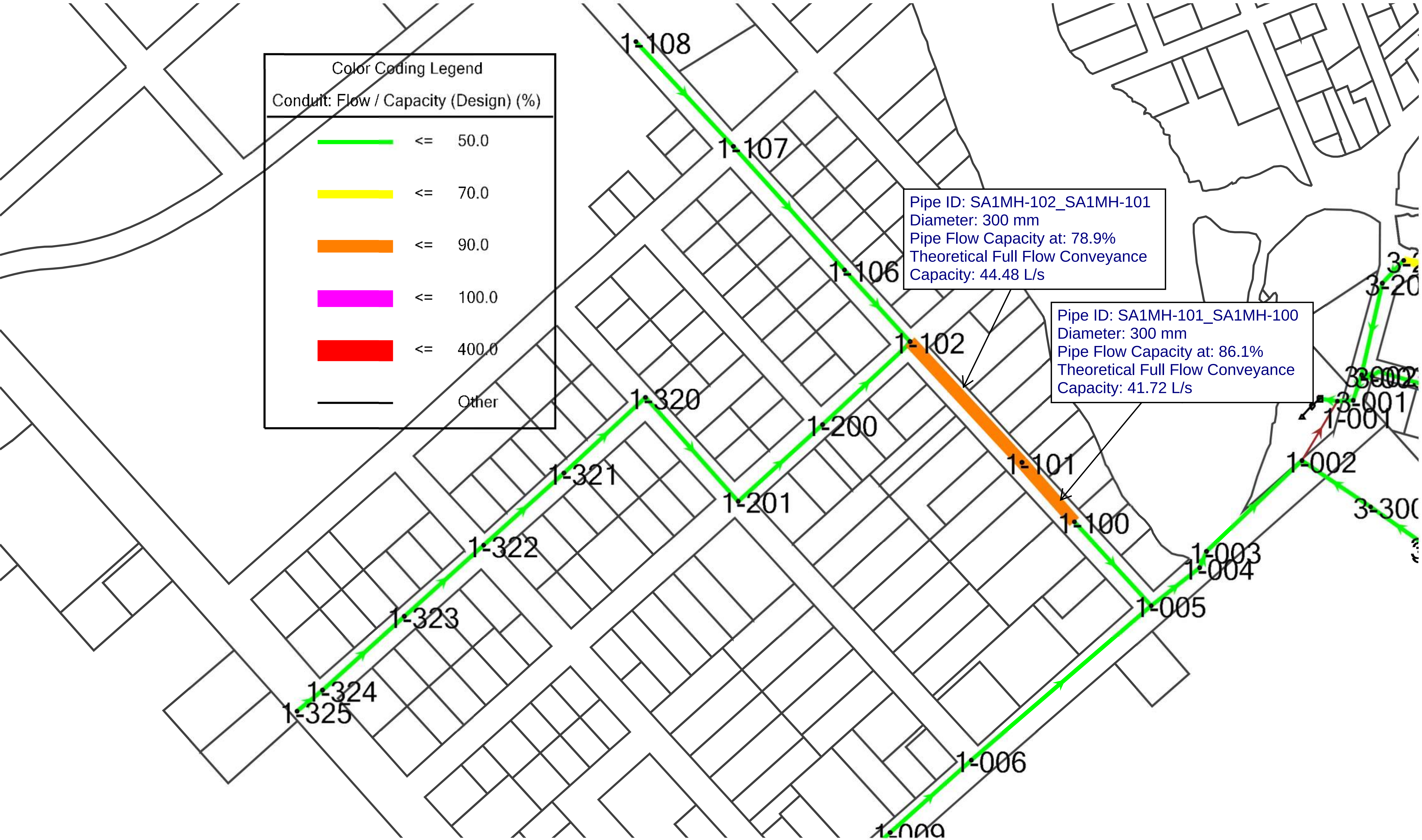
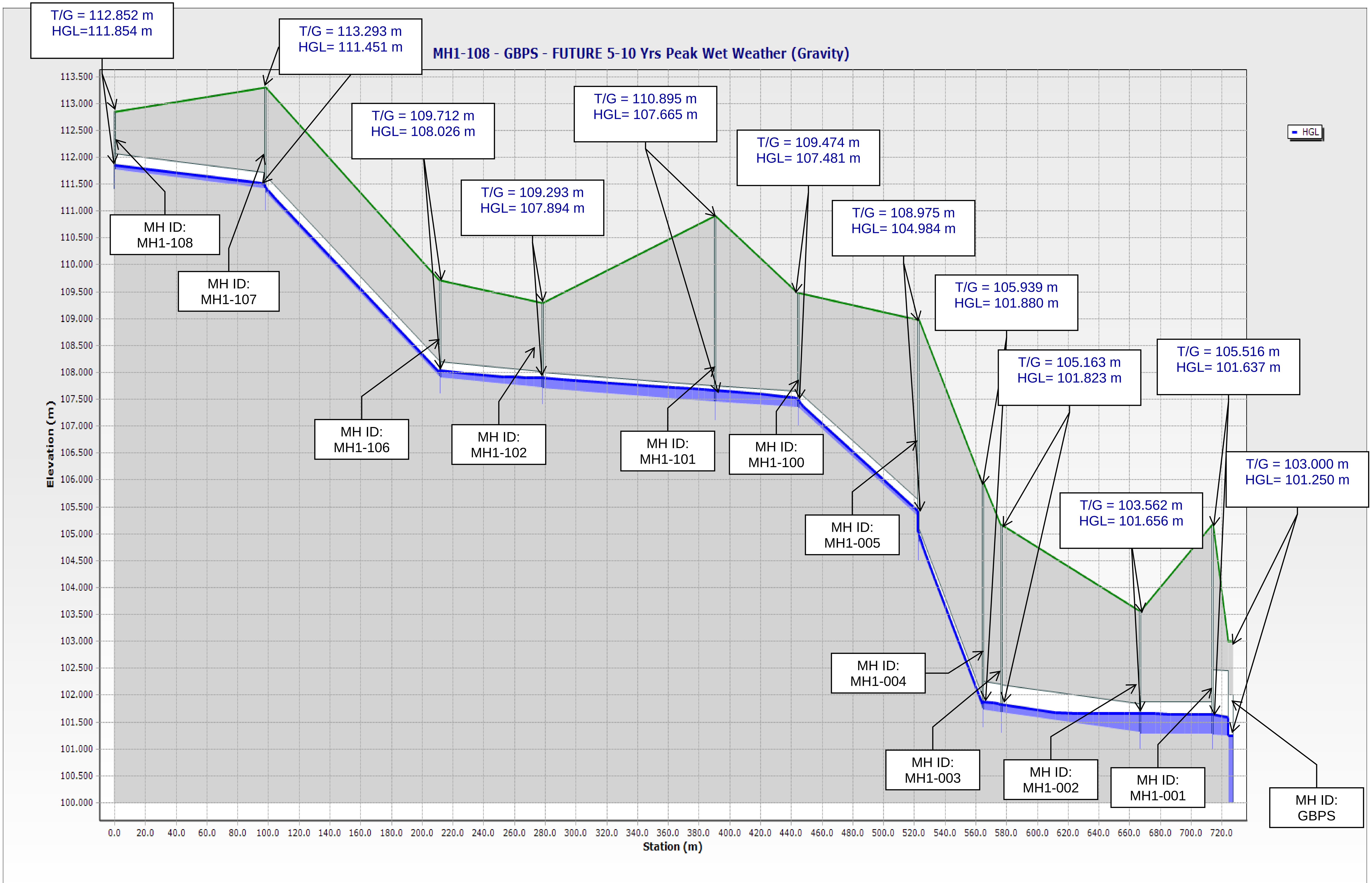
T/G = 113.293 m
HGL=111.380 m
T/G = 109.712 m
HGL= 107.941 m
T/G = 109.293 m
HGL= 107.821 m
T/G = 110.895 m
HGL= 107.590 m
T/G = 109.474 m
HGL= 107.436 m
T/G = 108.975 m
HGL= 104.984 m
T/G = 105.939 m
HGL= 101.847 m
T/G = 105.516 m
HGL= 101.591 m
T/G = 105.163 m
HGL= 101.790 m
T/G = 103.562 m
HGL= 101.609 m
T/G = 103.000 m
HGL= 101.250 m
MH ID:
MH1-108
MH ID:
MH1-107
MH ID:
MH1-106
MH ID:
MH1-102
MH ID:
MH1-101
MH ID:
MH1-100
MH ID:
MH1-005
MH ID:
MH1-004
MH ID:
MH1-003
MH ID:
MH1-002
MH ID:
MH1-001
MH ID:
GBPS
HGL
Elevation (m)
Station (m)

Mississippi Mills Master Plan Update 2017.stsw

Active Scenario: FUTURE 5-10 Yrs Peak Wet Weather (Gravity)





MH1-108 - GBPS - FUTURE 5-10 Yrs Peak Wet Weather (Gravity)
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T/G = 109.712 m
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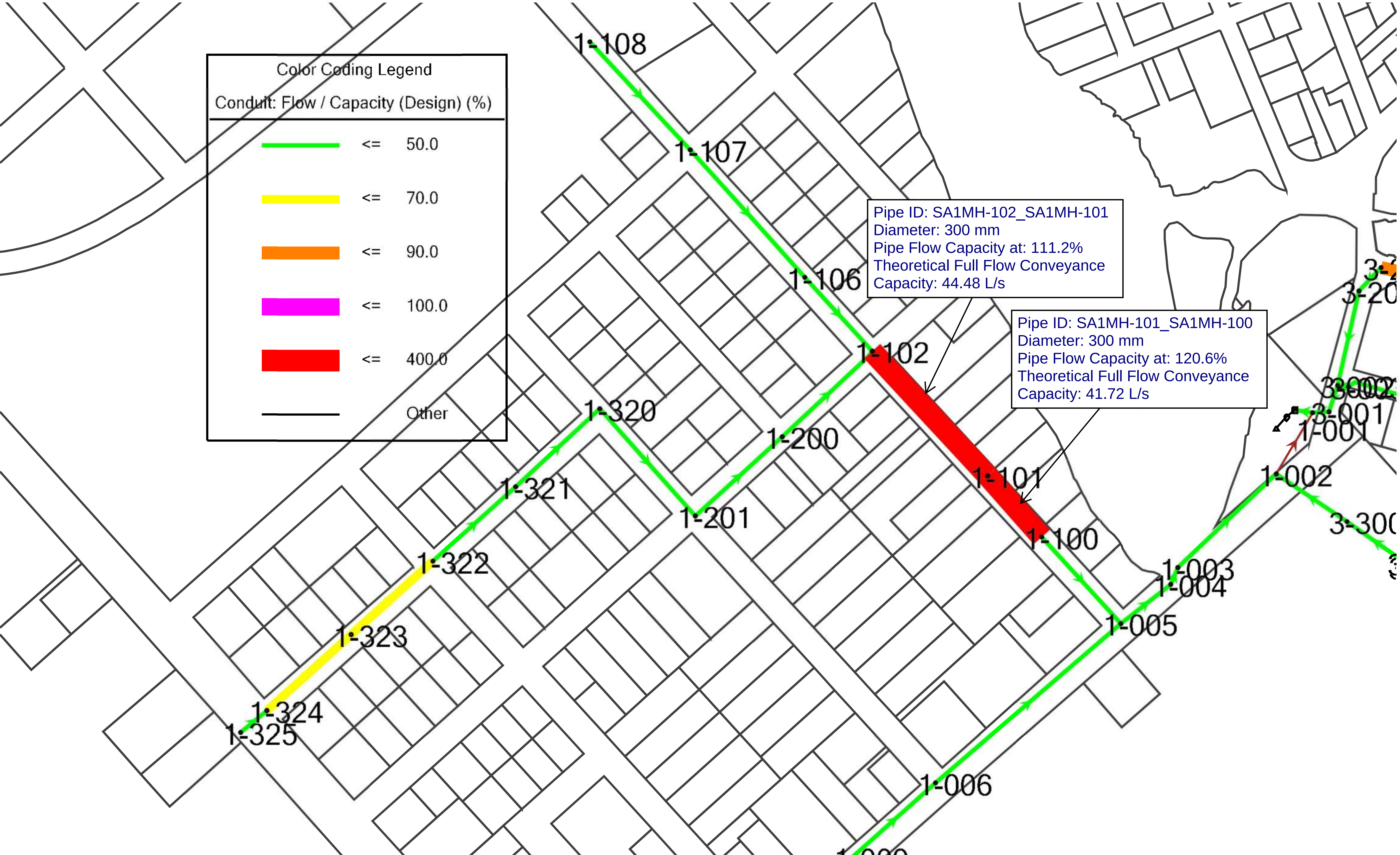
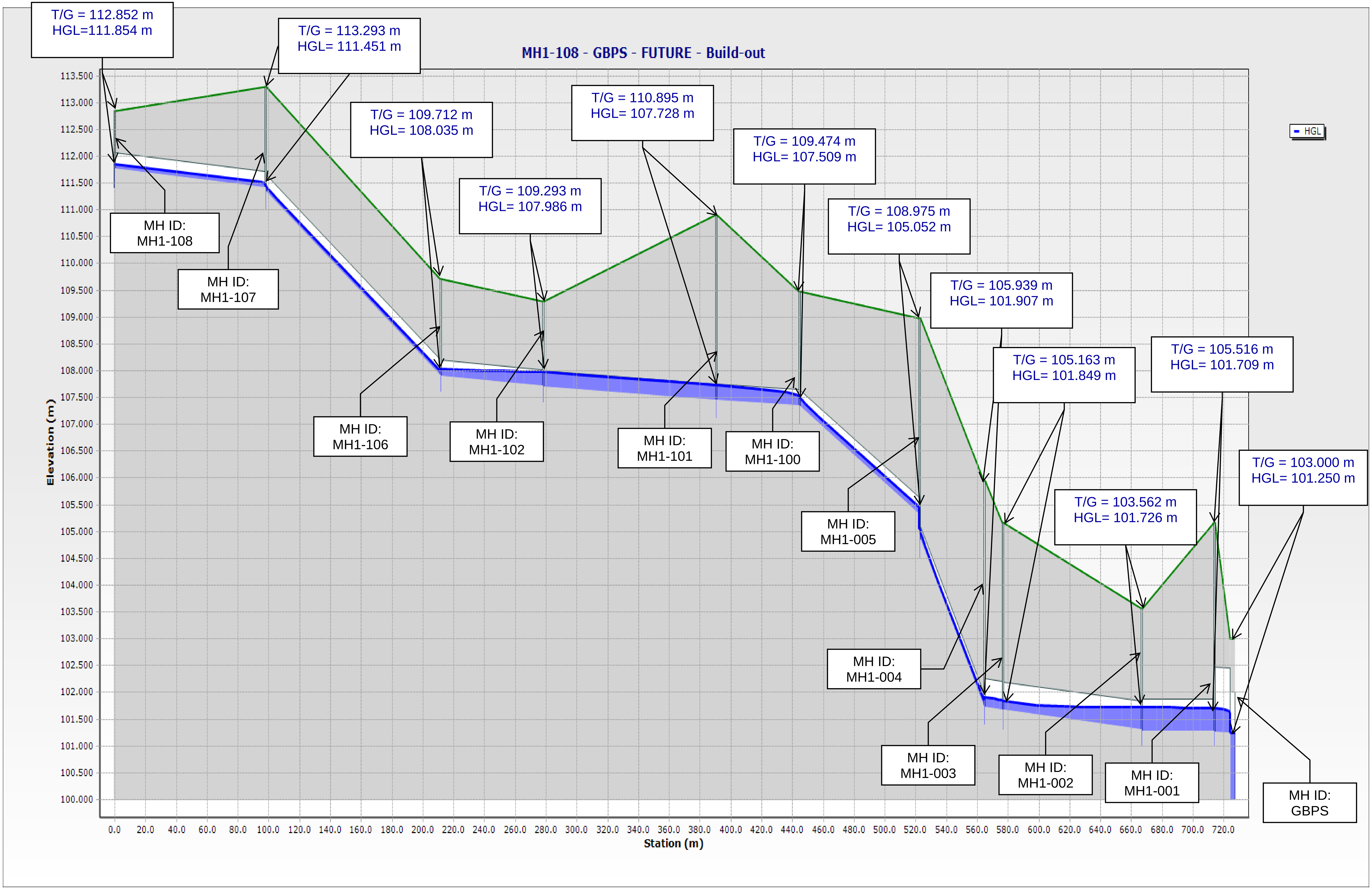
T/G = 109.293 m
HGL= 107.894 m
T/G = 110.895 m
HGL= 107.665 m
T/G = 109.474 m
HGL= 107.481 m
T/G = 108.975 m
HGL= 104.984 m
T/G = 105.939 m
HGL= 101.880 m
T/G = 105.163 m
HGL= 101.823 m
T/G = 105.516 m
HGL= 101.637 m
T/G = 103.000 m
HGL= 101.250 m
T/G = 103.562 m
HGL= 101.656 m
MH ID: MH1-108
MH ID: MH1-107
MH ID: MH1-106
MH ID: MH1-102
MH ID: MH1-101
MH ID: MH1-100
MH ID: MH1-005
MH ID: MH1-004
MH ID: MH1-003
MH ID: MH1-002
MH ID: MH1-001
MH ID: GBPS
HGL
Elevation (m)
Station (m)

Mississippi Mills Master Plan Update 2017.stsw

Active Scenario: FUTURE - Build-out





MH1-108 - GBPS - FUTURE - Build-out
T/G = 112.852 m
HGL=111.854 m
T/G = 113.293 m
HGL= 111.451 m
T/G = 109.712 m
HGL= 108.035 m
T/G = 109.293 m
HGL= 107.986 m
T/G = 110.895 m
HGL= 107.728 m
T/G = 109.474 m
HGL= 107.509 m
T/G = 108.975 m
HGL= 105.052 m
T/G = 105.939 m
HGL= 101.907 m
T/G = 105.163 m
HGL= 101.849 m
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HGL= 101.709 m
T/G = 103.000 m
HGL= 101.250 m
T/G = 103.562 m
HGL= 101.726 m
MH ID: MH1-108
MH ID: MH1-107
MH ID: MH1-106
MH ID: MH1-102
MH ID: MH1-101
MH ID: MH1-100
MH ID: MH1-005
MH ID: MH1-004
MH ID: MH1-003
MH ID: MH1-002
MH ID: MH1-001
MH ID: GBPS
HGL
Elevation (m)
Station (m)

APPENDIX D

WATERMAIN

Almonte - Updated Hydraulic Boundary Conditions and Truck Sewer Capacity, Email from Mark Buchanan, J.L. Richards & Associates, August 17, 2022, 34 Pages

Re: Almonte - Updated Hydraulic Boundary Conditions and Truck Sewer Capacity, Email from Mahad Musse, J.L. Richards & Associates, February 2, 2023, 32 Pages

Watermain Boundary Conditions Equations, Novatech, February 13, 2024, 2 Pages

Water Servicing – Buildout Timing and Fire Flow Requirements, Brown Lands – Revision 1, Memorandum by Melanie Riddell and Trevor McKay, Novatech, December 22, 2023 (revised February 13, 2024), 32 Pages

Watermain Demand Sheet & Hydraulic Analysis Results – Single Connection, Novatech, February 13, 2024, 20 Pages

Watermain Demand Sheet & Hydraulic Analysis Results – Dual Connection, Novatech, February 13, 2024, 20 Pages

Water Distribution Servicing Strategies, Excerpt from Master Plan Update Report, pages 19-20, J.L. Richards & Associates Limited, February 2018, 2 Pages

Water System Figures, Excerpts from Master Plan Update Report, Figures 7-17, J.L. Richards & Associates Limited, February 2018, 11 Pages

Trevor McKay

From: Mark Buchanan <mbuchanan@jlrichards.ca>
Sent: Wednesday, August 17, 2022 8:49 AM
To: Trevor McKay
Cc: Melanie Riddell; Cory Smith; Annie Williams; Mahad Musse
Subject: Almonte - Updated Hydraulic Boundary Conditions and Trunk Sewer Capacity
Attachments: Attachment 1 - Brown Lands BC Results.pdf; Pages from ALMONTE Master Plan Update Report_Final_02.pdf; Attachment No. 2 - Wastewater Model Outputs.pdf

Hello Trevor,

Further to my voicemail, we updated the below summary email (Table 2) consistent with the attached the hydraulic boundary conditions for the water distribution system scenarios and the theoretical conveyance capacity of the critical downstream sanitary sewers.

Water Distribution System

The boundary conditions below are for the following three scenarios, as requested by the Developer's Engineer:

1) Scenario 1 Boundary Conditions – Existing Conditions:
- 2 Connections: Boundary conditions to be provided at County Road 29 / Wylie Street, and at Malcolm / Strathburn.
- Existing Conditions: MaxDay+FF, Peak Hour under Year 1 demands only. JLR to confirm existing available fire flow.

2) Scenario 2 Boundary Conditions – 250 mm Upgrade Along County Road 29:
- 1 Connection: Boundary conditions to be provided at County Road 29 / Wylie Street.
- 250mm Watermain Upgrade along County Road 29 (full length from Well #6 to Wylie Street): Average Day, MaxDay+FF, Peak Hour under all 4 Years' demands. If not feasible, will note as such.

3) Scenario 3 Boundary Conditions – 250 mm Upgrade Along County Road 29 and 300 mm Mississippi River Crossing:
- 2 Connections: Boundary conditions to be provided at County Road 29 / Wylie Street, and at Carss Street on the east side of the river.
- 250mm Watermain Upgrade along County Road 29 AND 300mm Mississippi River Crossing: Average Day, MaxDay+FF, Peak Hour under all 4 Years' demands. If not feasible, will note as such.

The proposed development located on the Brown Lands within the Municipality of Mississippi Mills (Municipality), was simulated using the Municipality's existing hydraulic water model (2017) to determine hydraulic boundary conditions based on theoretical water demands and fire flows provided by the Developer's Engineer (refer to attached). The 300 mm diameter watermain upgrade on Victoria Street between Martin Street North and Menzie Street was included in the model. Table 1 summarizes the theoretical water demands that were included in the model at junction node J-573. It is noted that a hydraulic boundary conditions for maximum day + fire flow could only be provided for Year 1 of Max Daily + FF1 (45L/s) under existing conditions and only under Year 1-4 of Max Daily + FF1 (45 L/s) for the 250 mm upgrade along County Road 29.

Table 1: Theoretical Water Demands

	High Pressure	Max Daily + FF1 (45L/s)	Max Daily + FF2 (75L/s)	Peak Hour
Year 1	0.99	46.98	76.98	4.35
Year 2	1.98	48.96	78.96	8.71
Year 3	2.97	50.94	80.94	13.06
Year 4	4.11	53.23	83.23	18.10

The hydraulic boundary conditions have been generated at the connection points noted above with results summarized in Table 2 to Table 4 (refer to Attachment 1 for WaterCAD model outputs). Connection points are labelled in the model as follows:

- Junction nodes J-477 and J-556 for Scenario 1;
- Junction nodes J-89 for Scenario 2; and
- Junction nodes J-89 and J-567 for Scenario 3.

The maximum day + fire flow and peak hour scenarios assume a maximum elevated tank level of 180.00m with all well pumps on and the new booster PUMP-A turned off. The average day scenario assumes all pumps are turned off. Demands were placed within the Brown Lands on junction node J-573, the elevation of this node was approximated as 117.44 m based on the surrounding elevations found within the model and information from Google Earth.

Table 2: Scenario 1 Boundary Conditions – Existing Conditions

Demand Case	Connection at County Road 29 / Wylie Street (J-477, Elev. 119.00m)		Connection at Malcolm / Strathburn (J-556, Elev. 113.14m)	
	Pressure (kPa)	HGL (m)	Pressure (kPa)	HGL (m)
Year 1 – Max Daily + Fire Flow Available (39.63 L/s)	185	137.92	236	137.29
Year 1 - Peak Hour (4.35 L/s)	380	157.79	437	157.78

Table 3: Scenario 2 Boundary Conditions – 250 mm Upgrade Along County Road 29

Demand Case	Connection at County Road 29 / Almonte Street (J-89, Elev. 124.46m)	
	Pressure (kPa)	HGL (m)
Year 1 – Average Day Demand	532	178.86
Year 2 – Average Day Demand	530	178.60
Year 3 – Average Day Demand	527	178.31
Year 4 – Average Day Demand	523	177.93
Year 1 - Max Daily + FF1 (46.98 L/s)	301	155.22
Year 2 - Max Daily + FF1 (48.96 L/s)	278	152.92
Year 3 - Max Daily + FF1 (50.94 L/s)	255	150.52
Year 4 - Max Daily + FF1 (53.23 L/s)	227	147.64
Year 1 – Peak Hour	531	178.76
Year 2 – Peak Hour	517	177.26
Year 3 – Peak Hour	501	175.67
Year 4 – Peak Hour	479	173.42

Table 4: Scenario 3 Boundary Conditions – 250 mm Upgrade Along County Road 29 and 300 mm Mississippi River Crossing

Demand Case	Connection at County Road 29 / Almonte Street (J-89, Elev. 124.46m)		Connection at Union Street N. / Carss Street (J-567, Elev. 132.80)	
	Pressure (kPa)	HGL (m)	Pressure (kPa)	HGL (m)
Year 1 – Average Day Demand	540	179.61	459	179.69

Year 2 – Average Day Demand	**539**	**179.56**	**458**	**179.65**
Year 3 – Average Day Demand	**539**	**179.51**	**458**	**179.61**
Year 4 – Average Day Demand	**538**	**179.46**	**458**	**179.56**
Year 1 - Max Daily + FF1 (46.98 L/s)	**510**	**176.56**	**432**	**176.98**
Year 2 - Max Daily + FF1 (48.96 L/s)	**507**	**176.30**	**430**	**176.76**
Year 3 - Max Daily + FF1 (50.94 L/s)	**505**	**176.03**	**428**	**176.55**
Year 4 - Max Daily + FF1 (53.23 L/s)	**502**	**175.71**	**426**	**176.28**
Year 1 - Max Daily + FF2 (76.98 L/s)	**461**	**171.62**	**394**	**173.02**
Year 2 - Max Daily + FF1 (78.96 L/s)	**458**	**171.22**	**390**	**172.70**
Year 3 - Max Daily + FF1 (80.94 L/s)	**454**	**170.80**	**387**	**172.38**
Year 4 - Max Daily + FF1 (83.23 L/s)	**449**	**170.32**	**384**	**172.00**
Year 1 – Peak Hour	**535**	**179.13**	**453**	**179.10**
Year 2 – Peak Hour	**532**	**178.84**	**450**	**178.83**
Year 3 – Peak Hour	**529**	**178.48**	**447**	**178.52**
Year 4 – Peak Hour	**524**	**178.00**	**444**	**178.12**

Trunk Wastewater Model Outputs

Trunk wastewater model outputs were generated for the proposed development area from the existing Master Plan that included an expected peak flow of 10.27 L/s connected at MH 1-108 (refer to attached master plan Figure 25). The model results of the critical sewers sections and corresponding HGL profile are attached for the following scenarios.

1) Existing Conditions
2) Future Development 5-10 years, that includes the proposed development area
3) Building that includes the proposed development and commercial areas as shown on the attached Master Plan Report Figure 25.

Note that the foregoing model results are for current conditions and are based on computer model simulation. We have not reviewed the adequacy of the domestic demand nor the fire flow requirements for the proposed development, which remains the responsibility of the Developer's Engineer.

Disclaimer: The model results are based on current simulated operation of the Municipality's water distribution system and sewer collection system. The computer model simulations are based on the best information available at this time. The operation of the systems can change on a regular basis, resulting in a variation in the boundary conditions. It is further noted that the operational characteristics of the water supply and wastewater collection systems and physical properties of the watermains and sewers can change and/or deteriorate over time. These changes may affect the supply and collection characteristics of the systems and the assumptions made in developing the models, which in turn could lead to variations in the simulation results. This should be considered by any third party undertaking simulation of system upgrades.

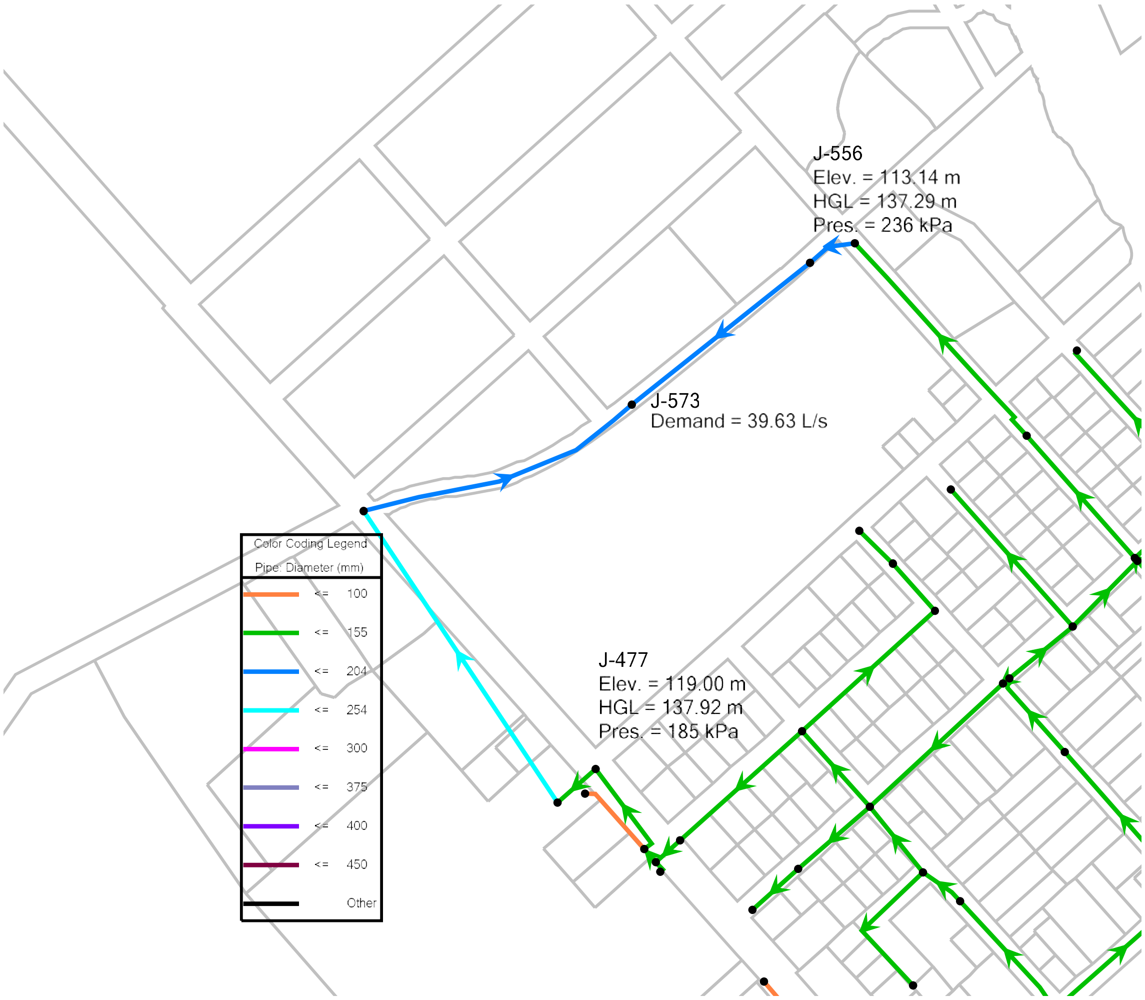
Should have any questions or require anything further, please do not hesitate to contact us.
Regards,

Mark Buchanan, P.Eng.

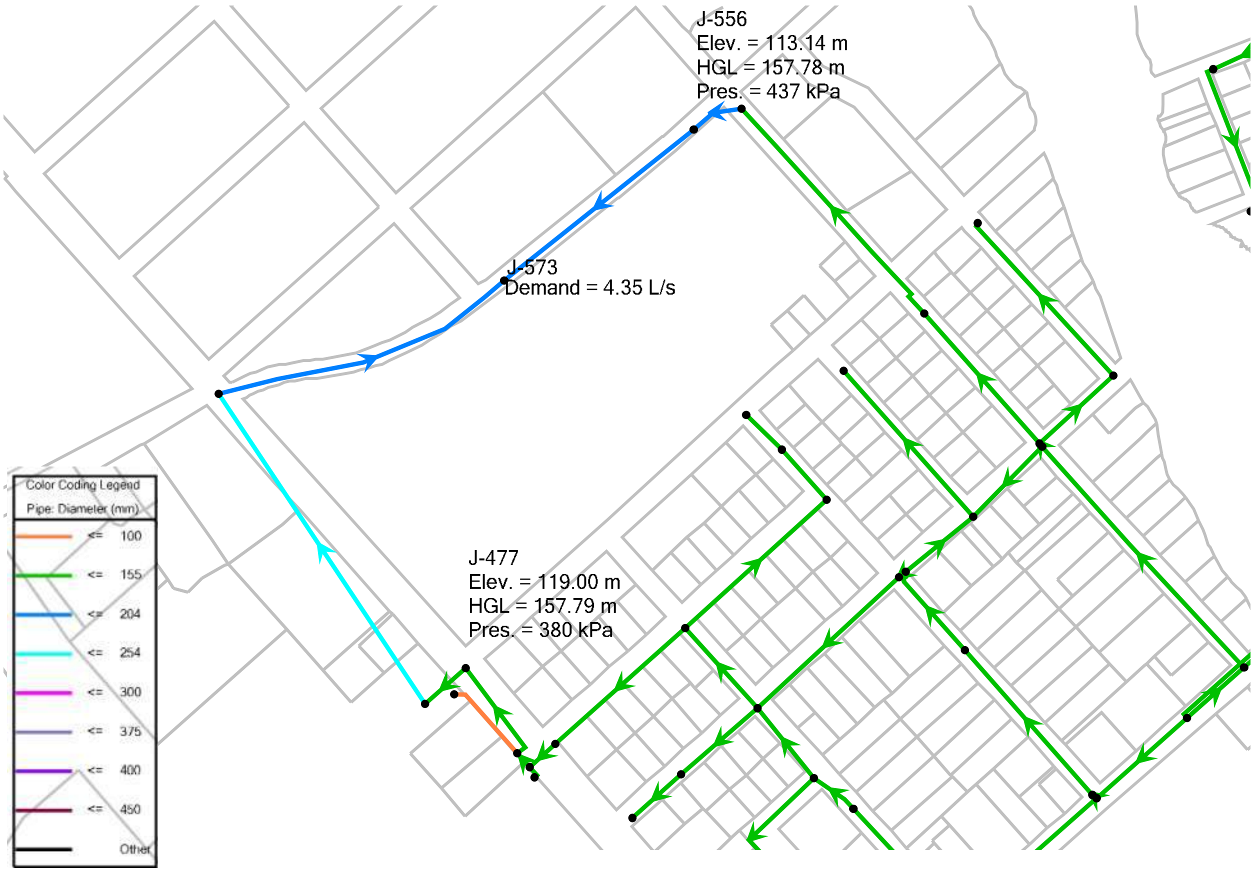
Associate
Senior Civil Engineer

J.L. Richards & Associates Limited
1000-343 Preston Street, Ottawa, ON K1S 1N4
Direct: 343-804-5349

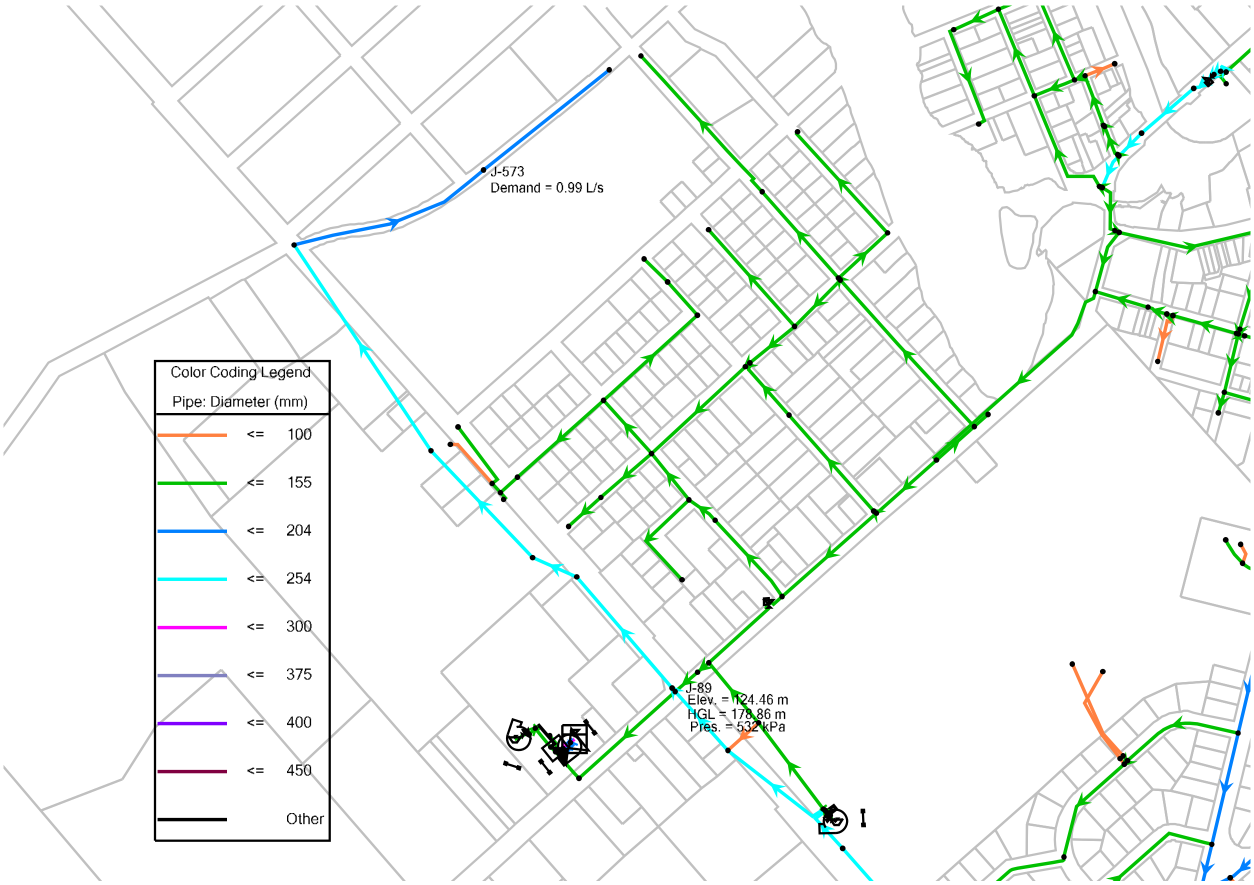
Brown Lands Boundary Condition
Existing Conditions
MDD (Year 1)



Brown Lands Boundary Condition
Existing Conditions
PHD (Yr 1)



Brown Lands Boundary Condition
250 mm Upgrade Along County Road 29
ADD (Yr 1)



Brown Lands Boundary Condition
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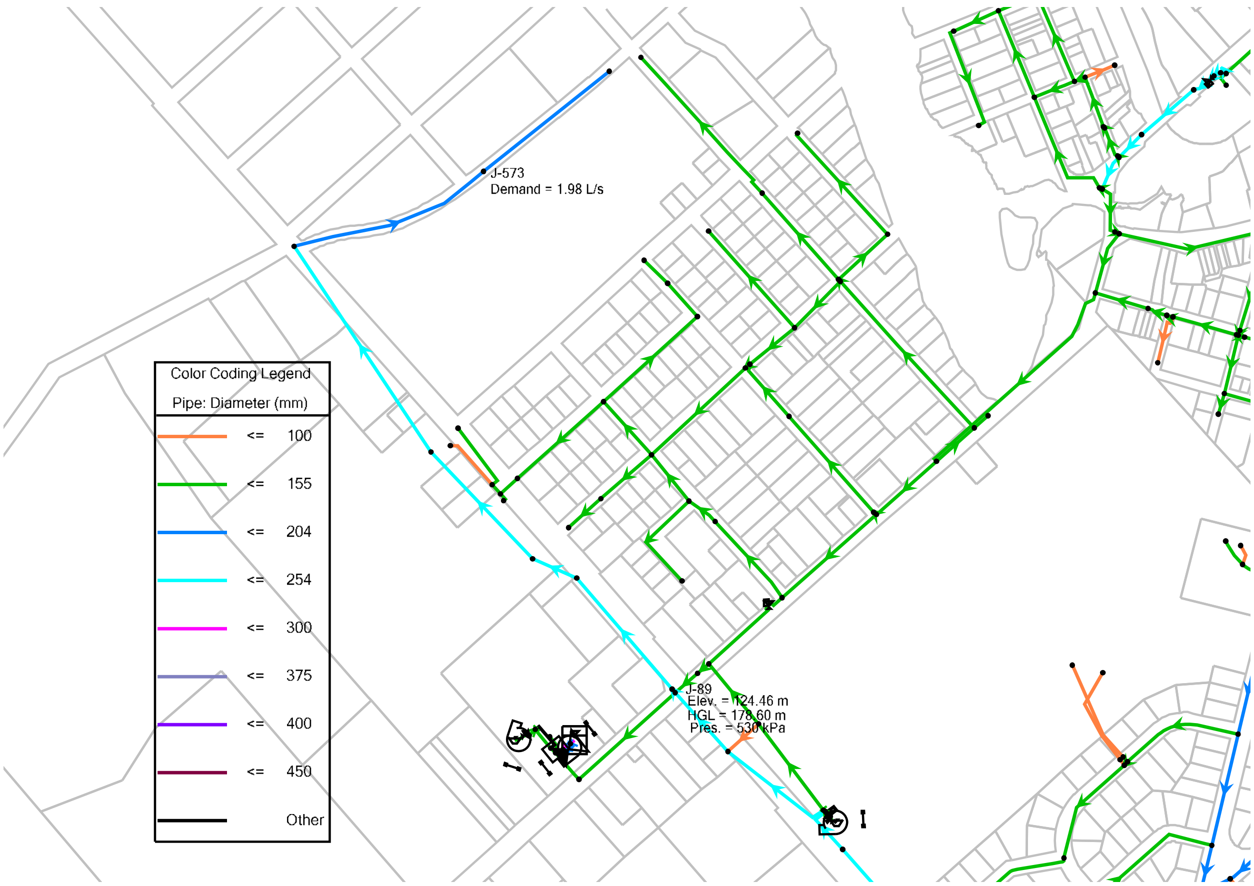
ADD (Yr 2)



Brown Lands Boundary Condition
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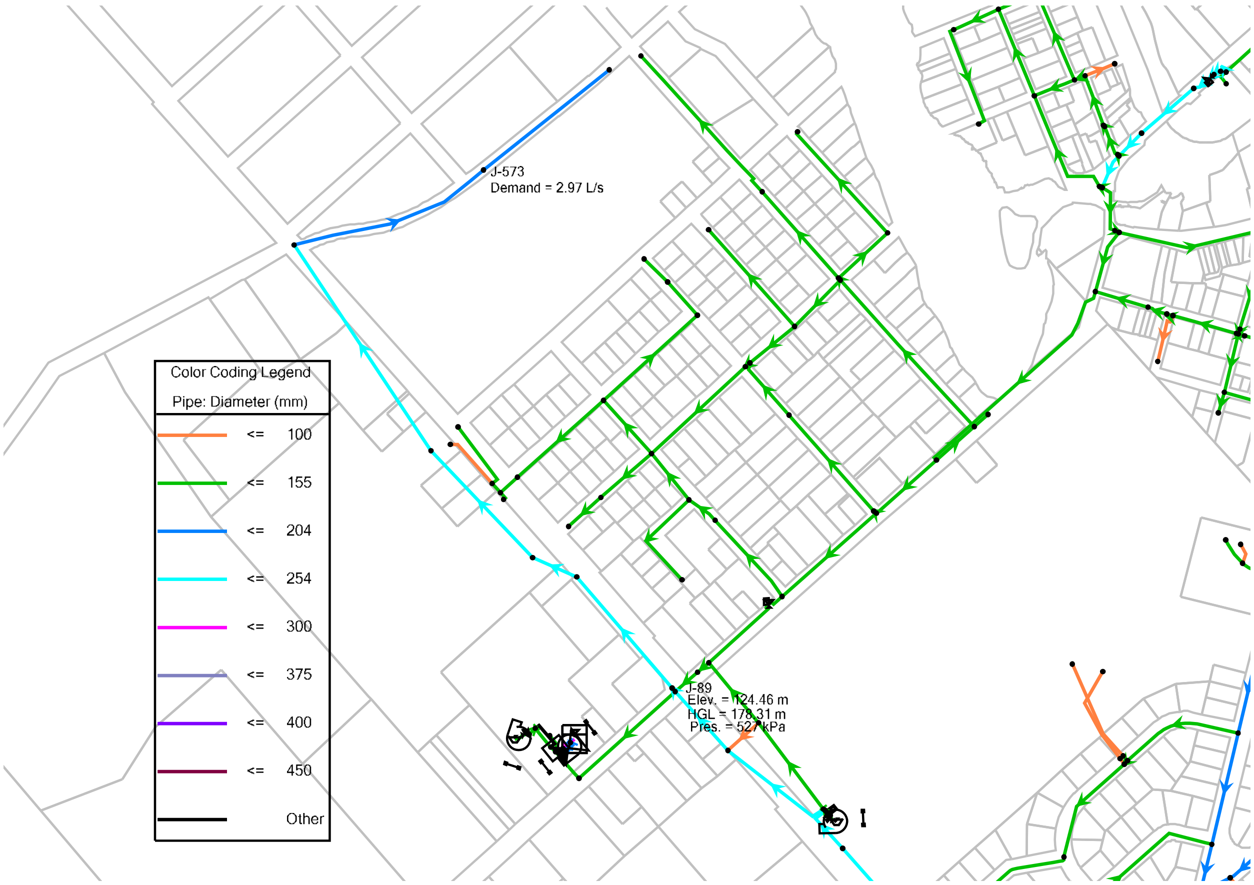
ADD (Yr 3)



Brown Lands Boundary Condition
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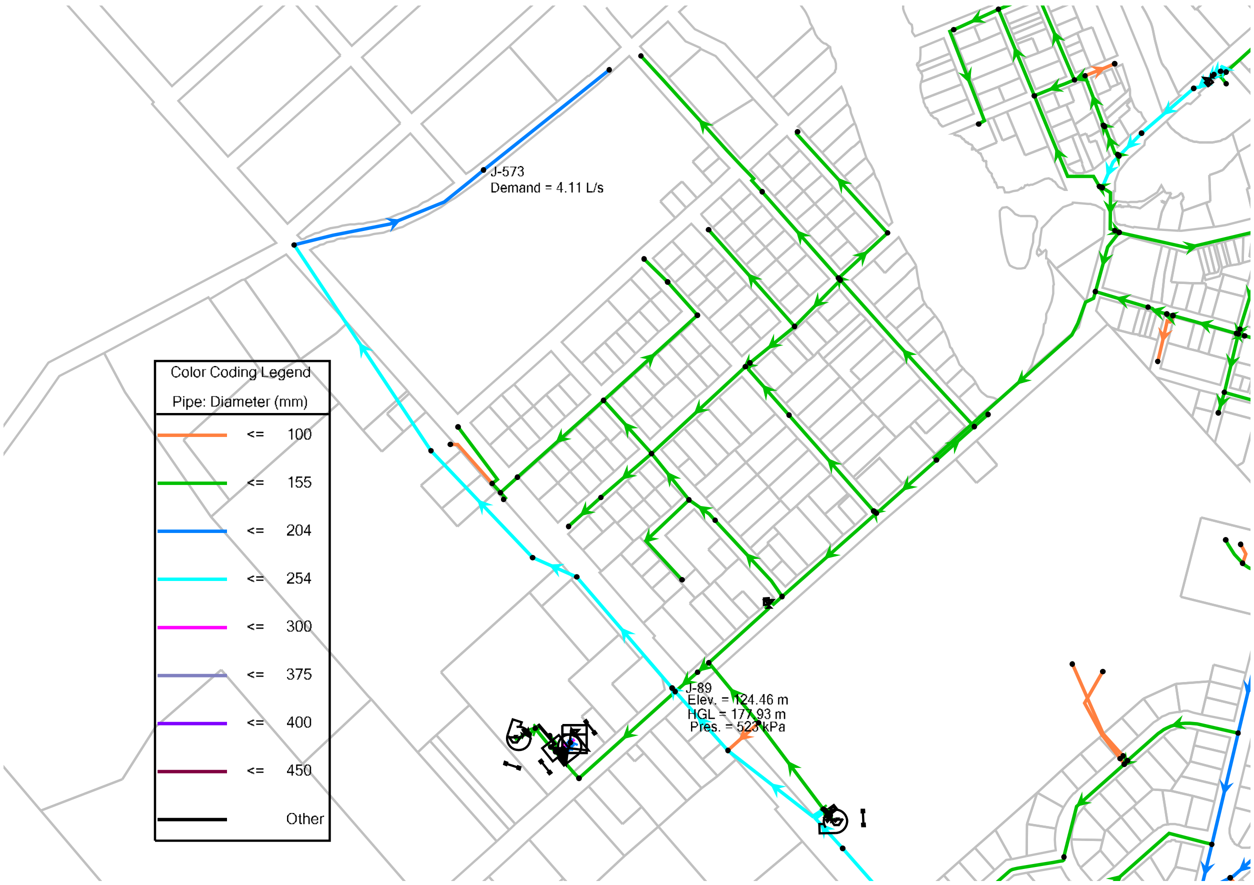
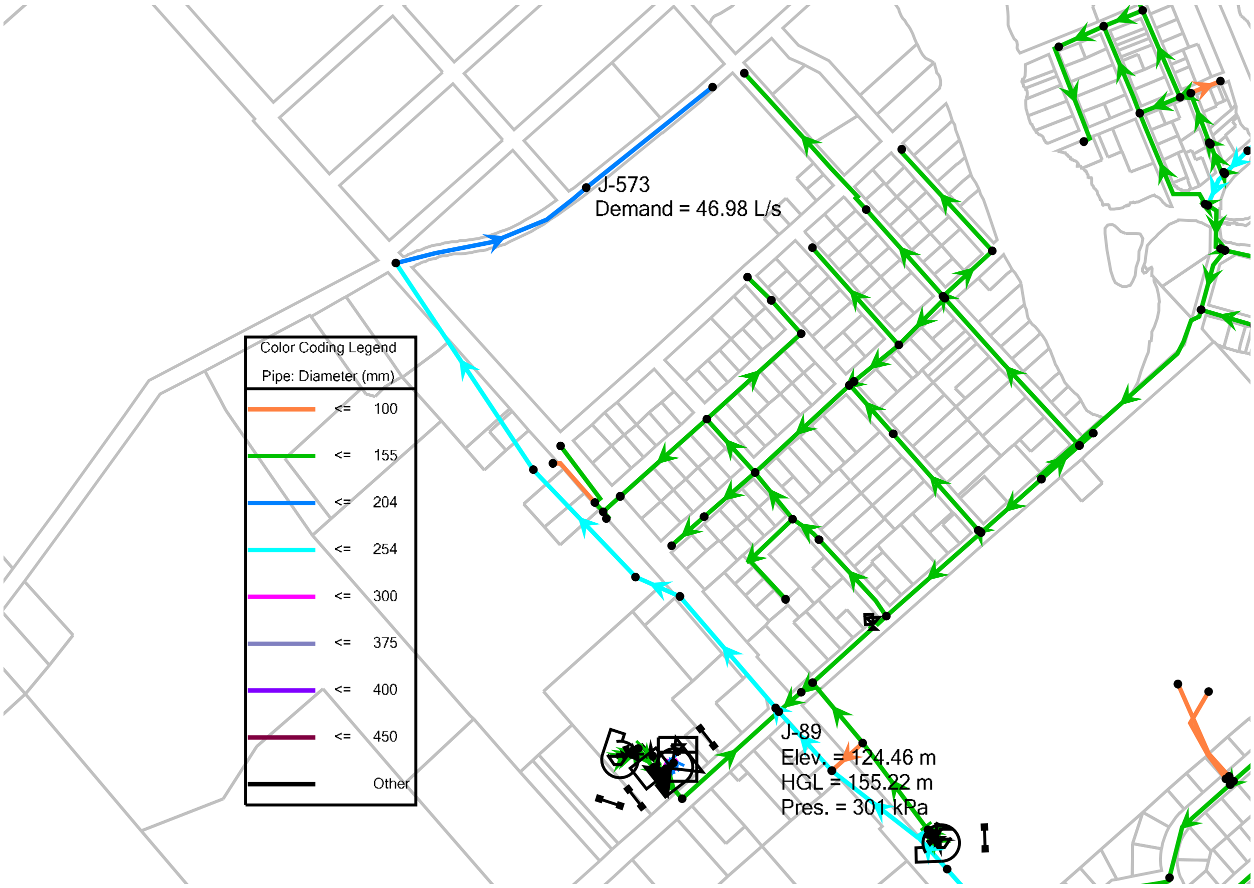
ADD (Yr 4)



Brown Lands Boundary Condition
250 mm Upgrade Along County Road 29
MDD+FF (Yr 1)



Brown Lands Boundary Condition
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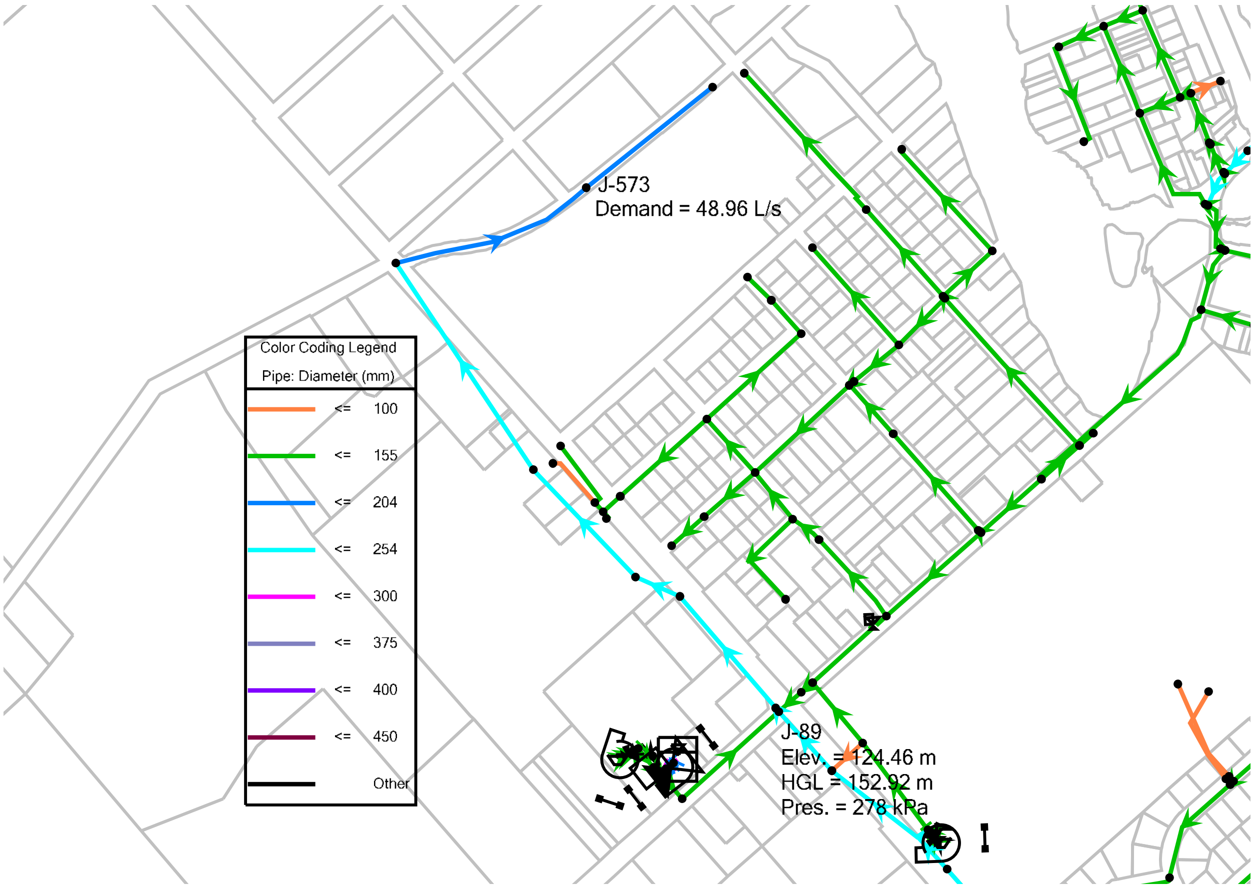
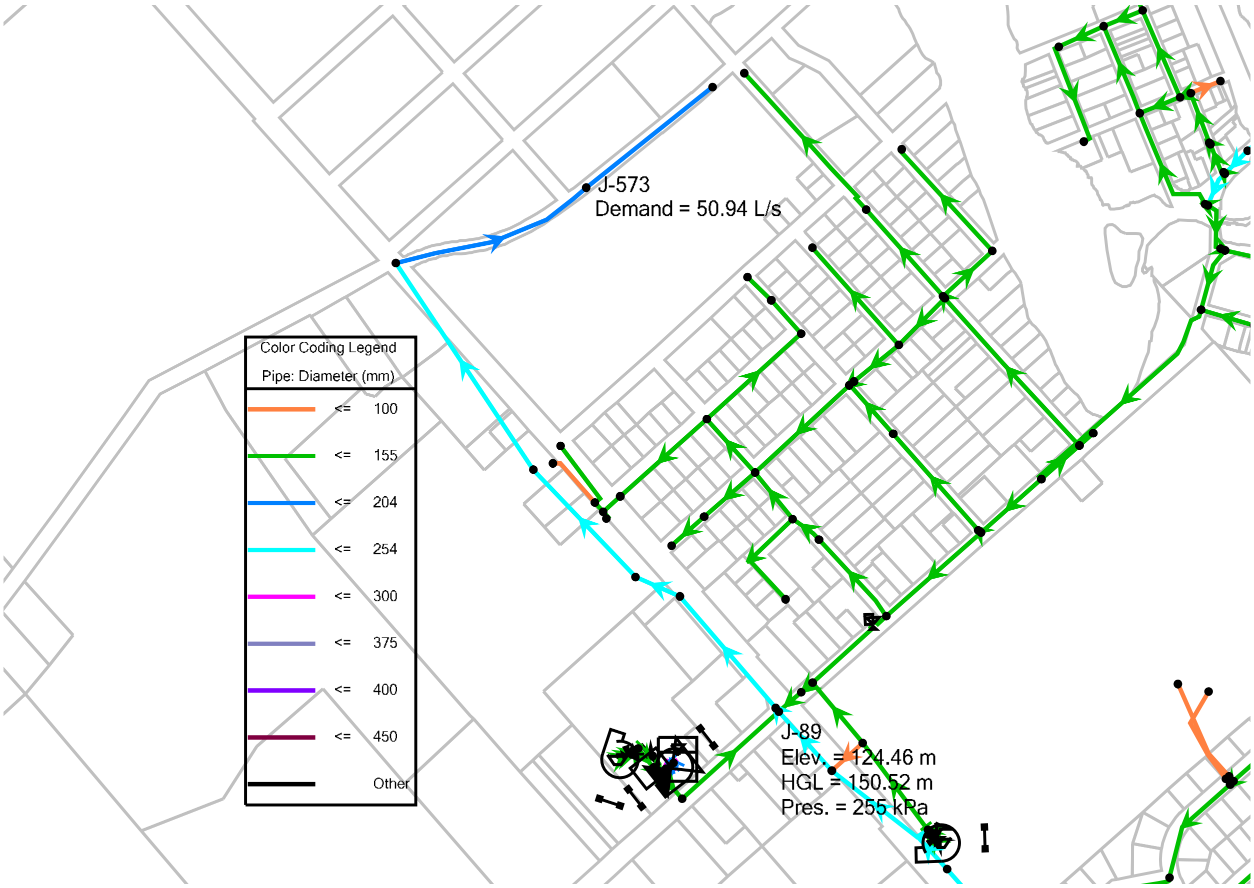


Brown Lands Boundary Condition
250 mm Upgrade Along County Road 29
MDD+FF (Yr 3)



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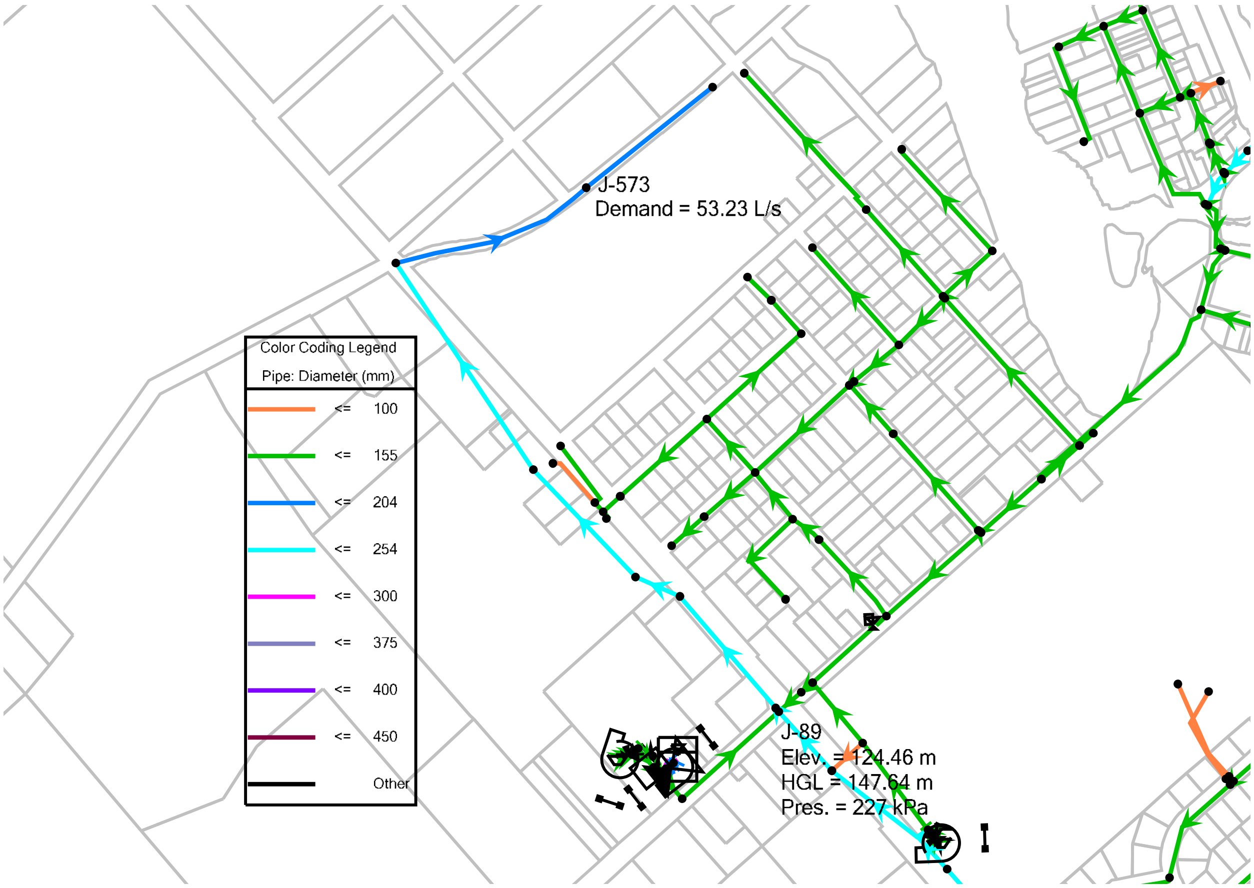
MDD+FF (Yr 4)



Brown Lands Boundary Condition
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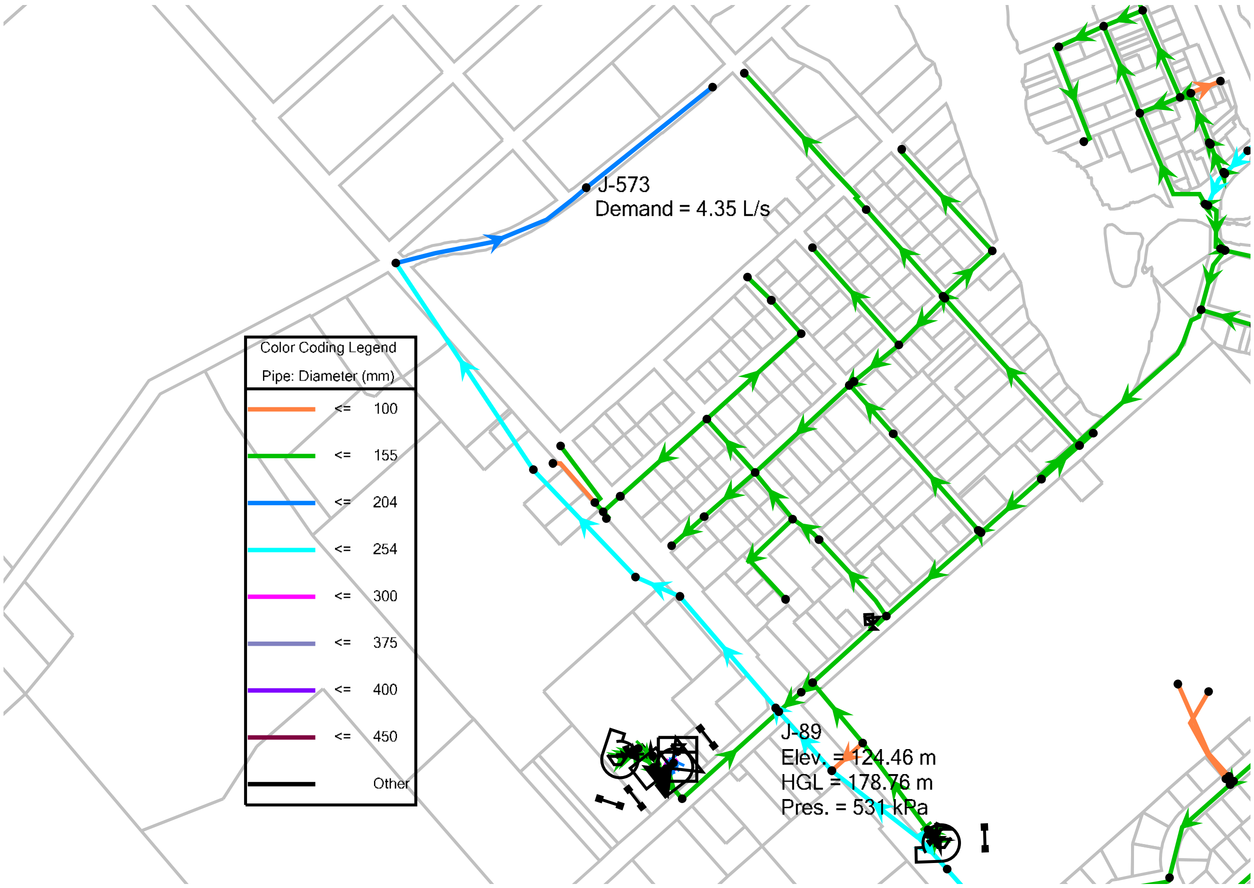
PHD (Yr 1)



Brown Lands Boundary Condition
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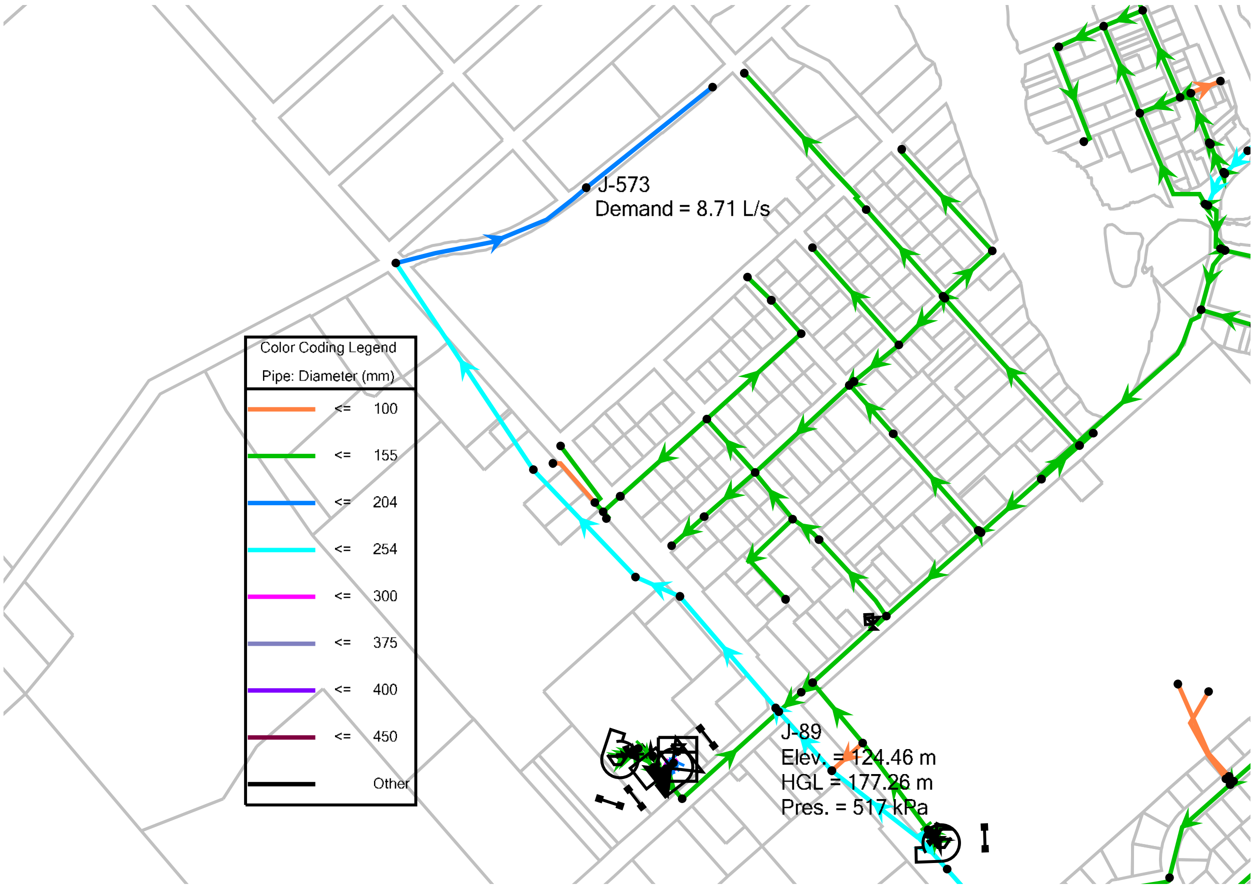
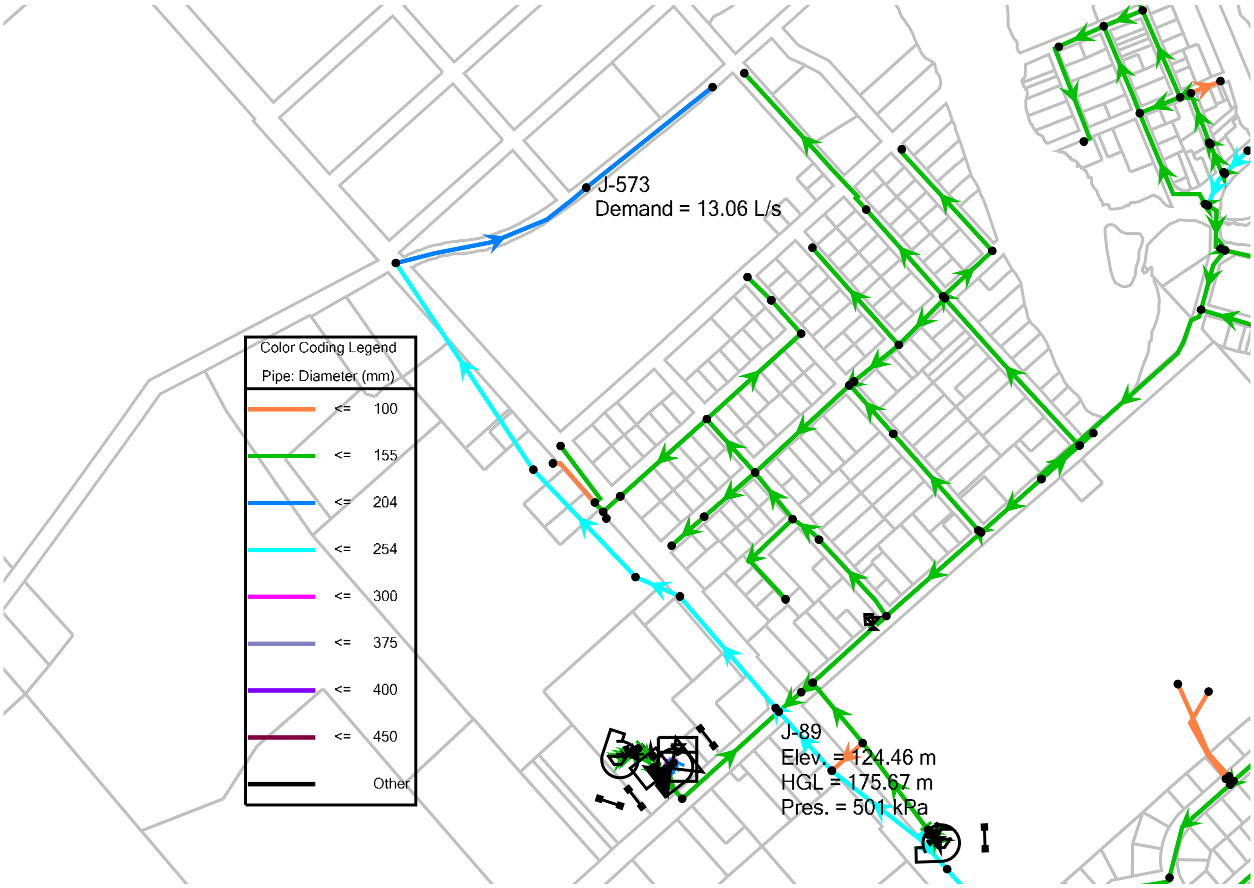
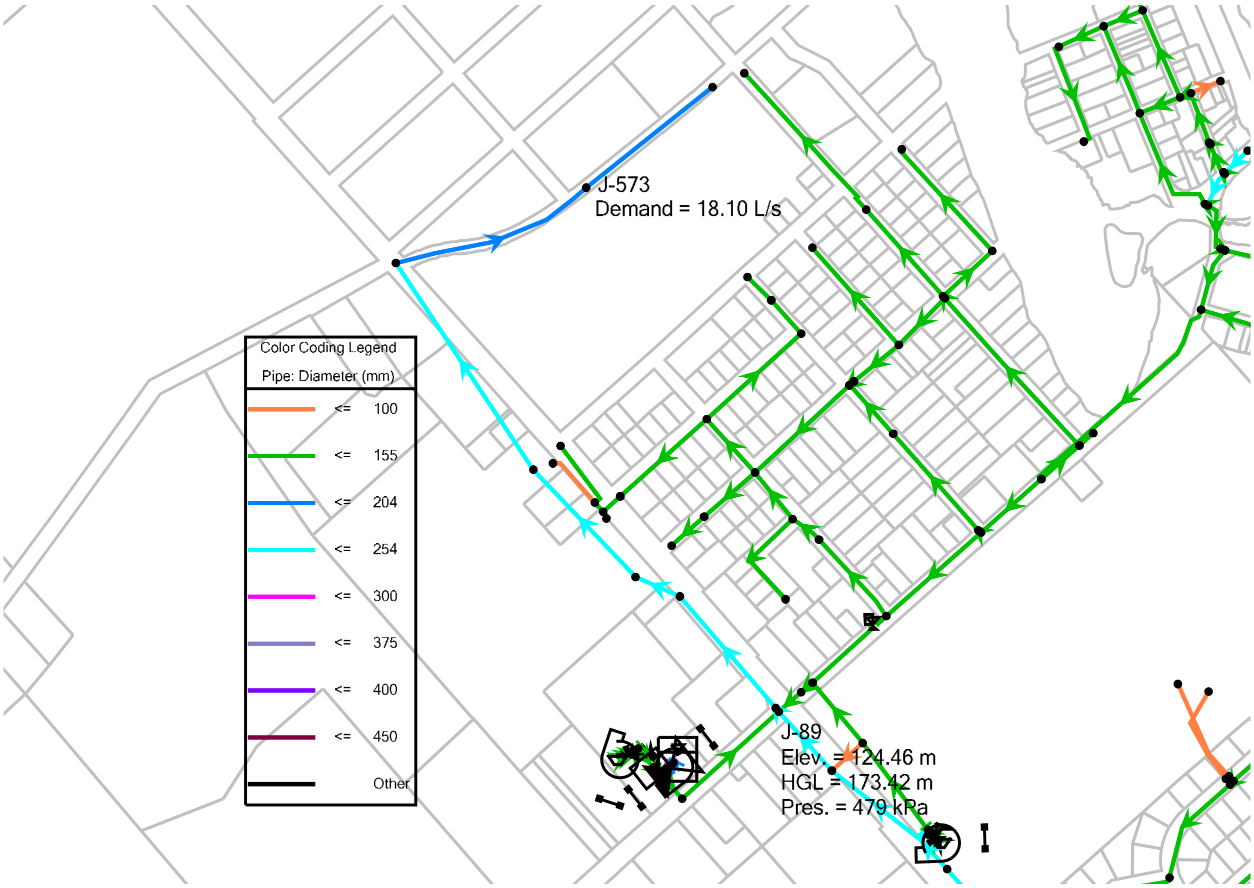
PHD (Yr 2)



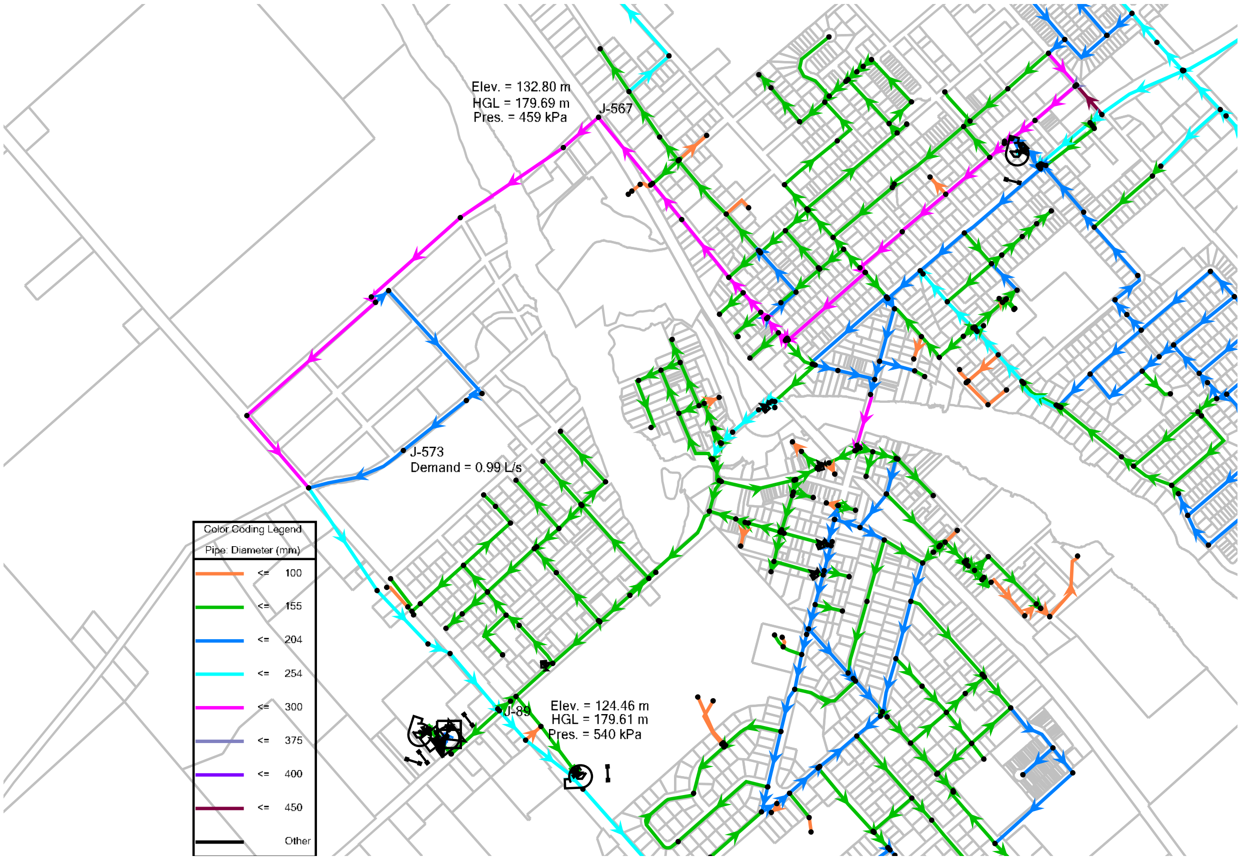
Brown Lands Boundary Condition
250 mm Upgrade Along County Road 29
PHD (Yr 3)



Brown Lands Boundary Condition
250 mm Upgrade Along County Road 29
PHD (Yr 4)



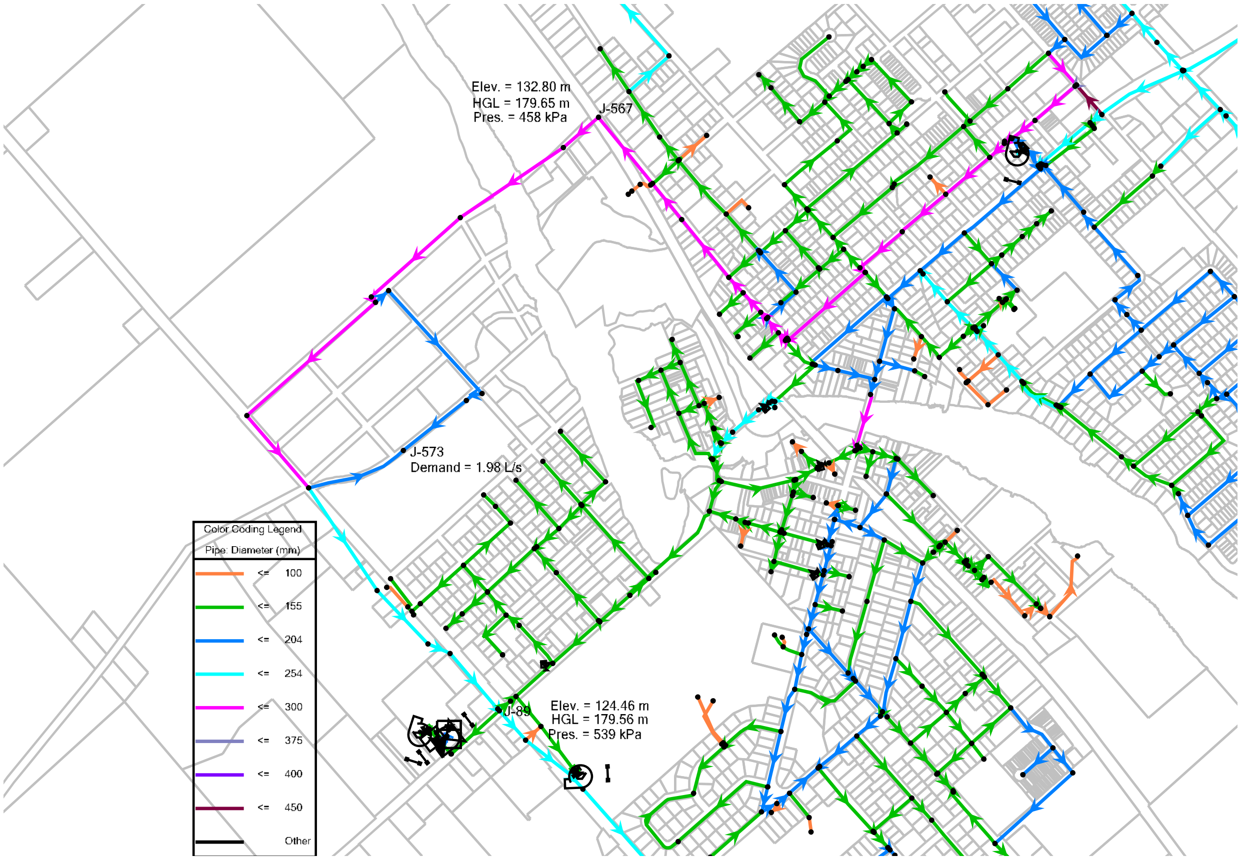
Brown Lands Boundary Condition
250 mm Upgrade Along County Road 29 and 300 mm Mississippi River Crossing
ADD (Yr 1)



Brown Lands Boundary Condition

250 mm Upgrade Along County Road 29 and 300 mm Mississippi River Crossing

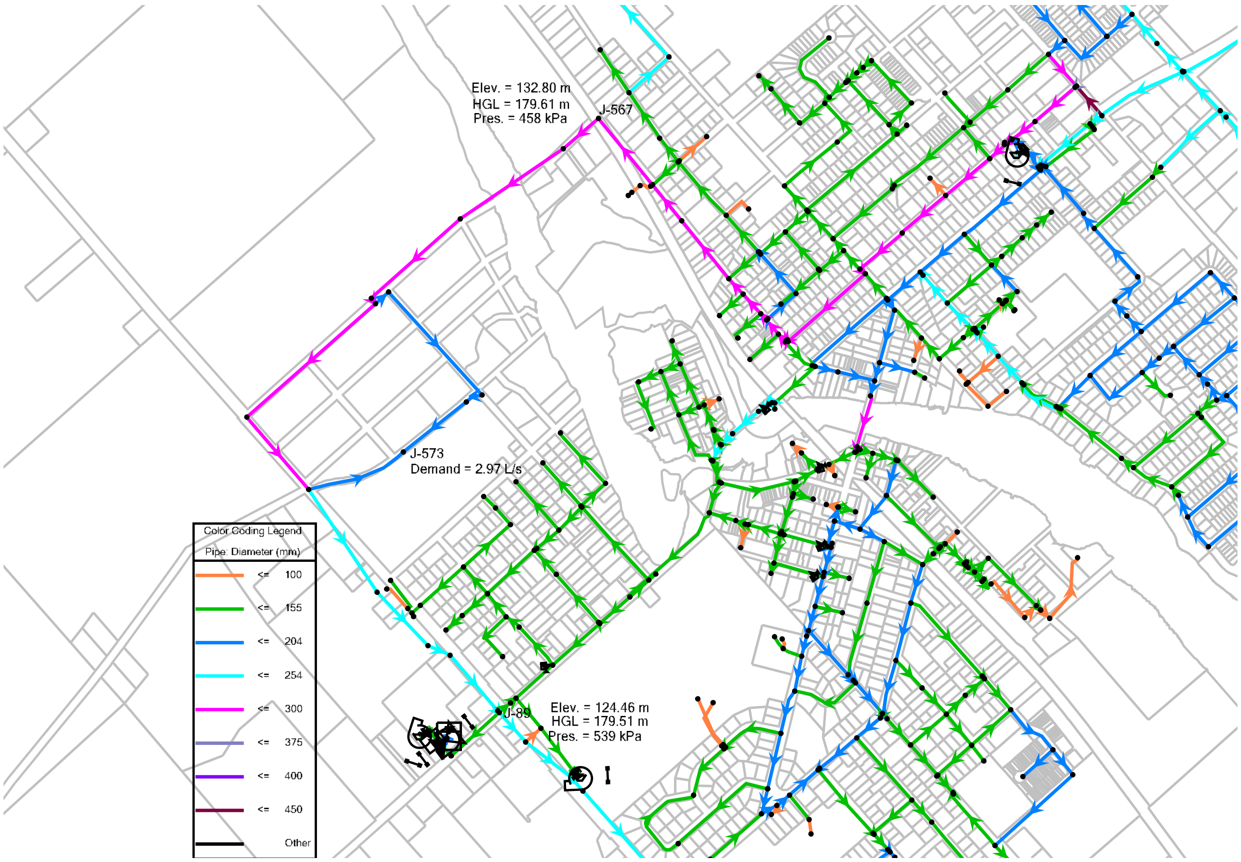
ADD (Yr 2)



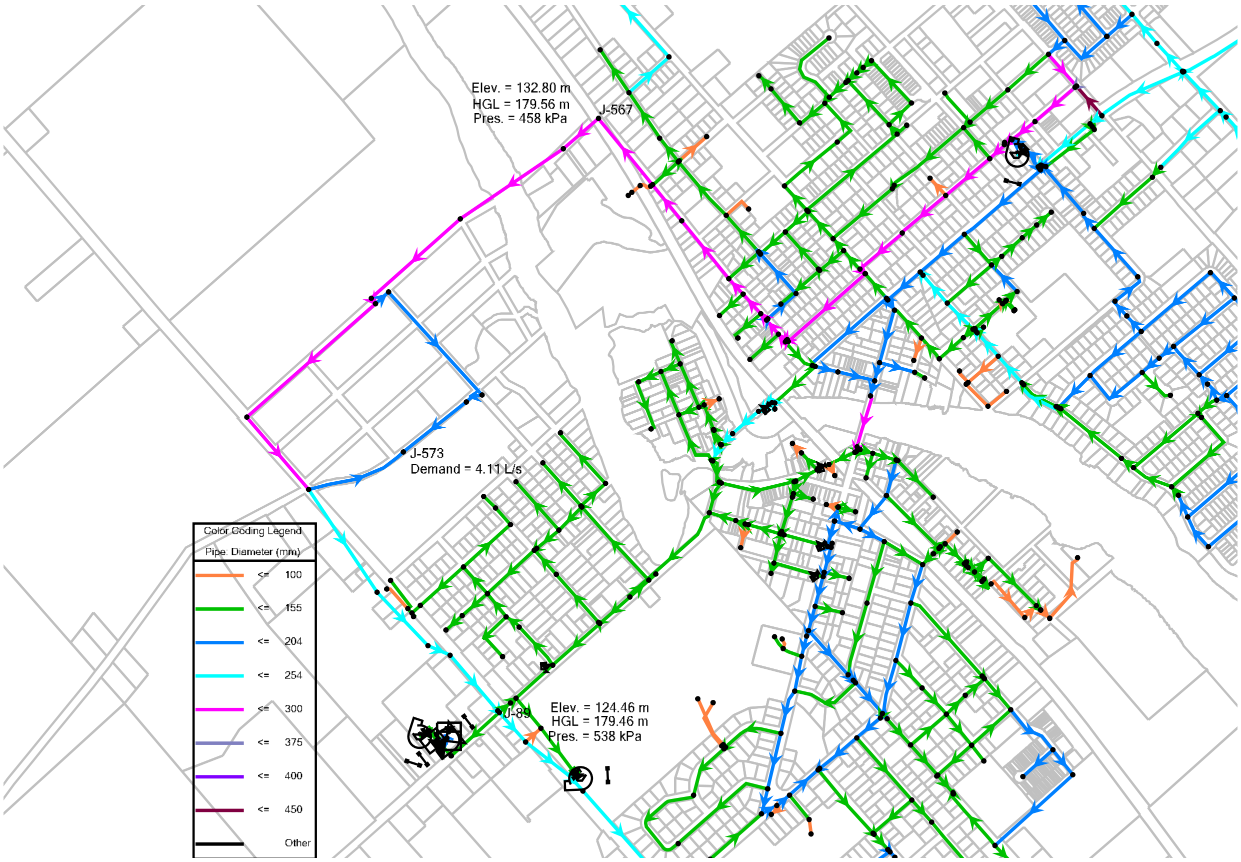
Brown Lands Boundary Condition

250 mm Upgrade Along County Road 29 and 300 mm Mississippi River Crossing

ADD (Yr 3)



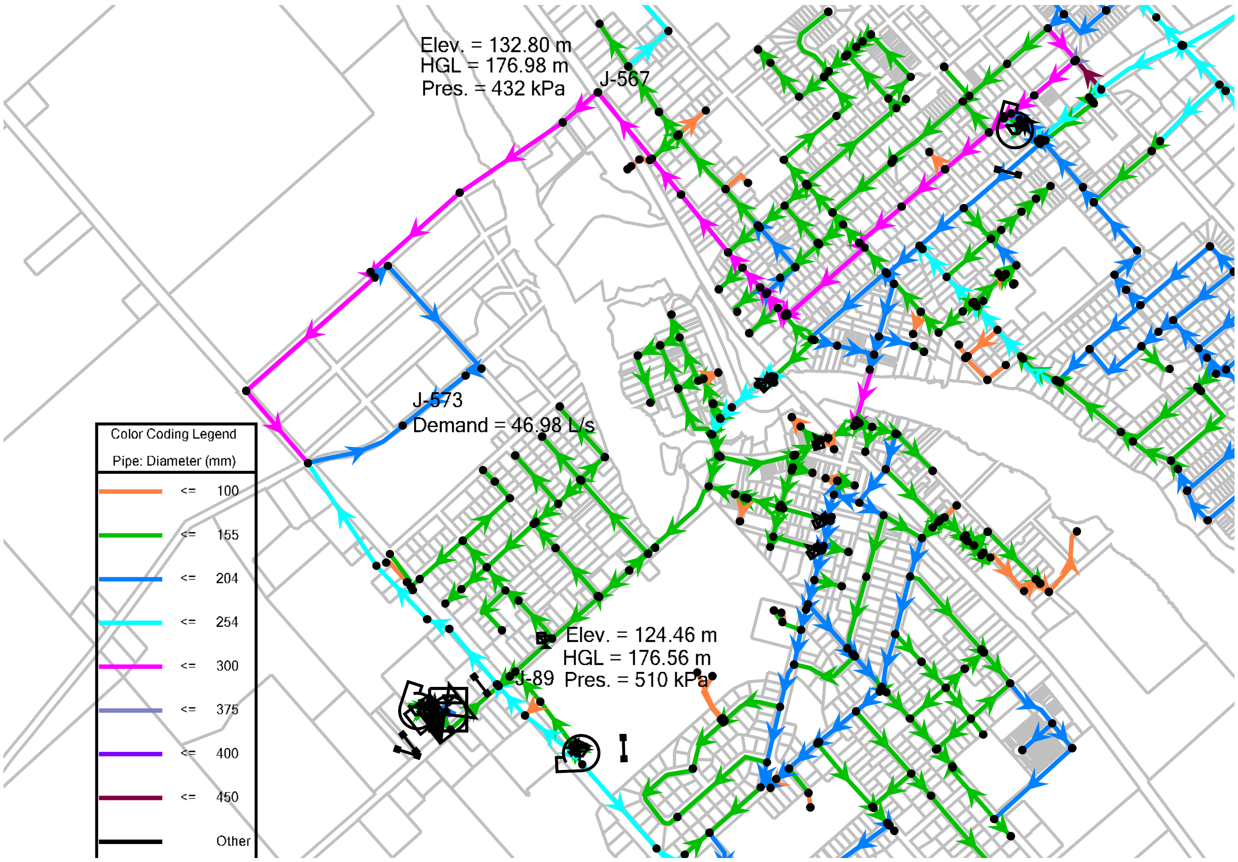
Brown Lands Boundary Condition
250 mm Upgrade Along County Road 29 and 300 mm Mississippi River Crossing
ADD (Yr 4)



Brown Lands Boundary Condition

250 mm Upgrade Along County Road 29 and 300 mm Mississippi River Crossing

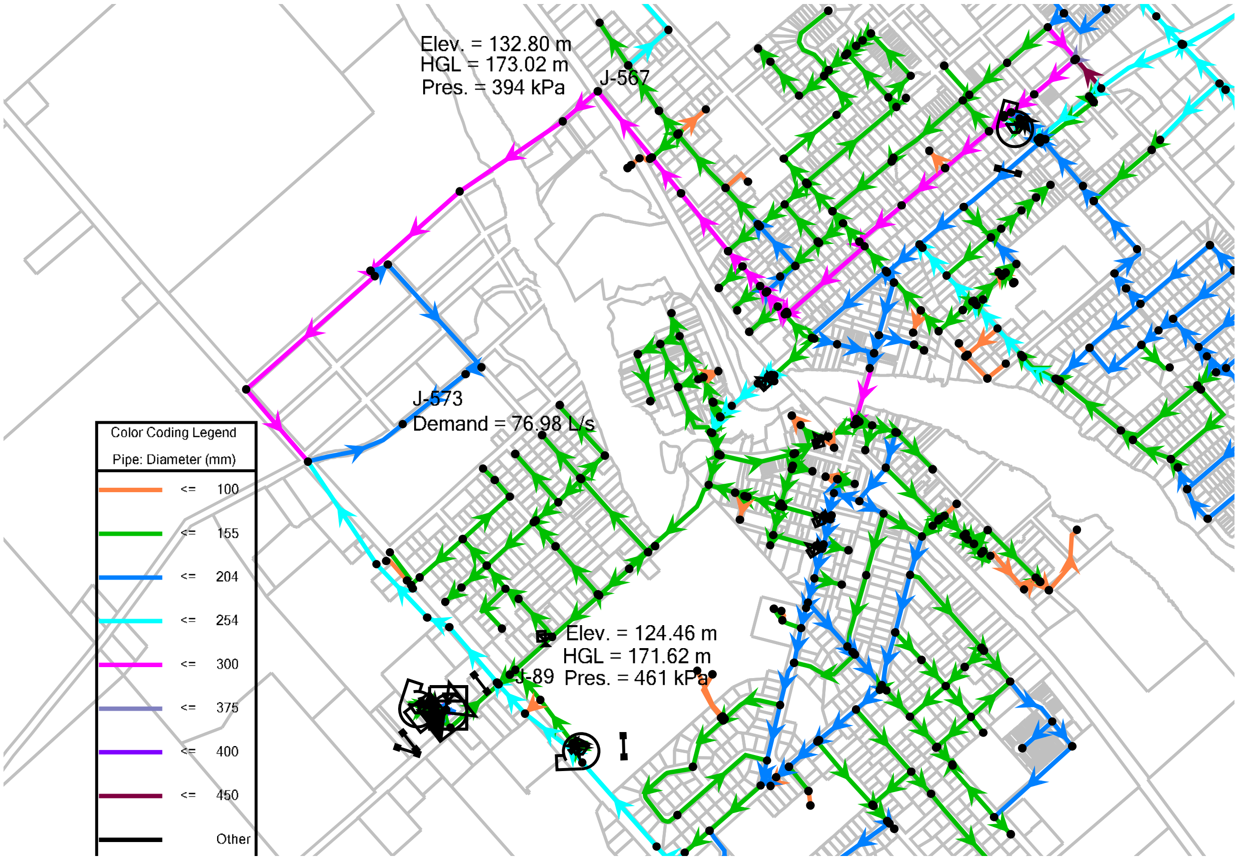
MDD+FF (Year 1, RFF=45 L/s)



Brown Lands Boundary Condition

250 mm Upgrade Along County Road 29 and 300 mm Mississippi River Crossing

MDD+FF (Year 1, RFF=75 L/s)



Brown Lands Boundary Condition
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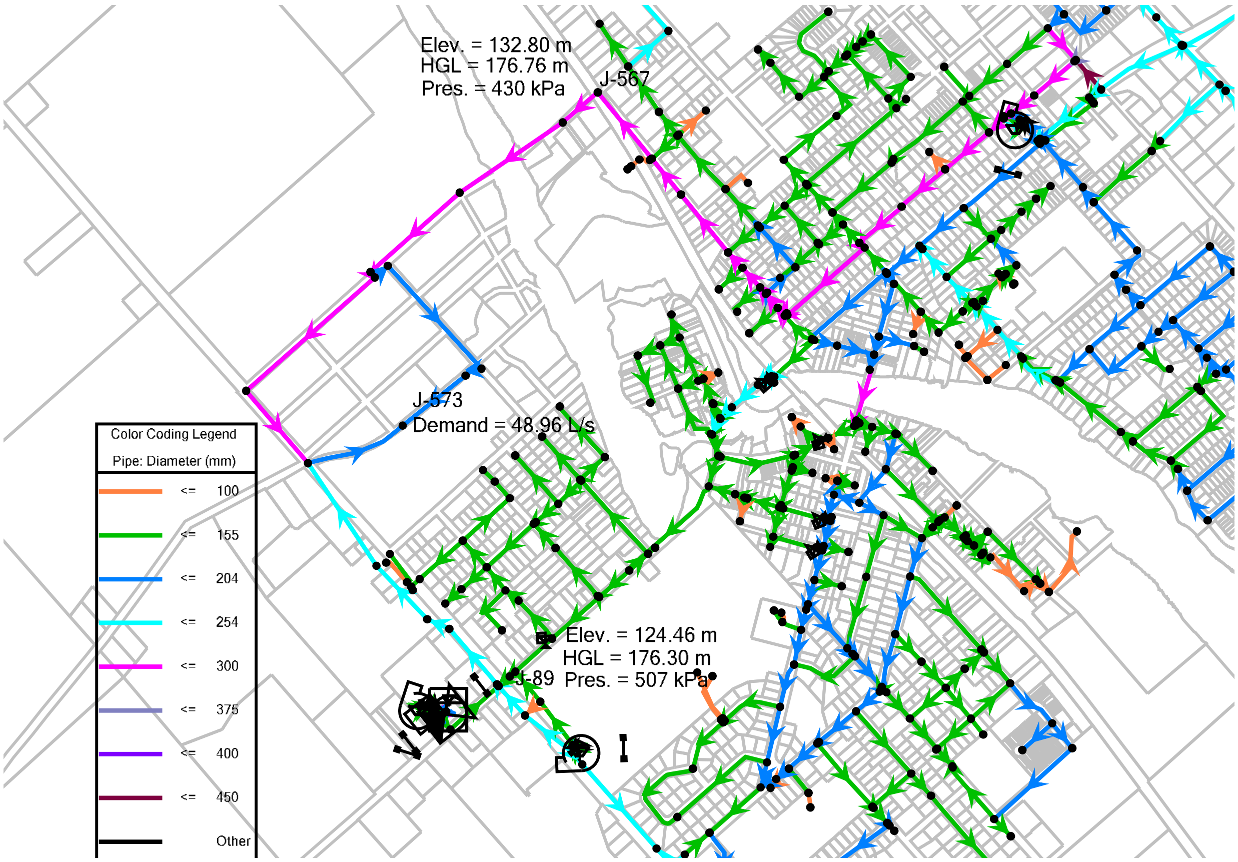
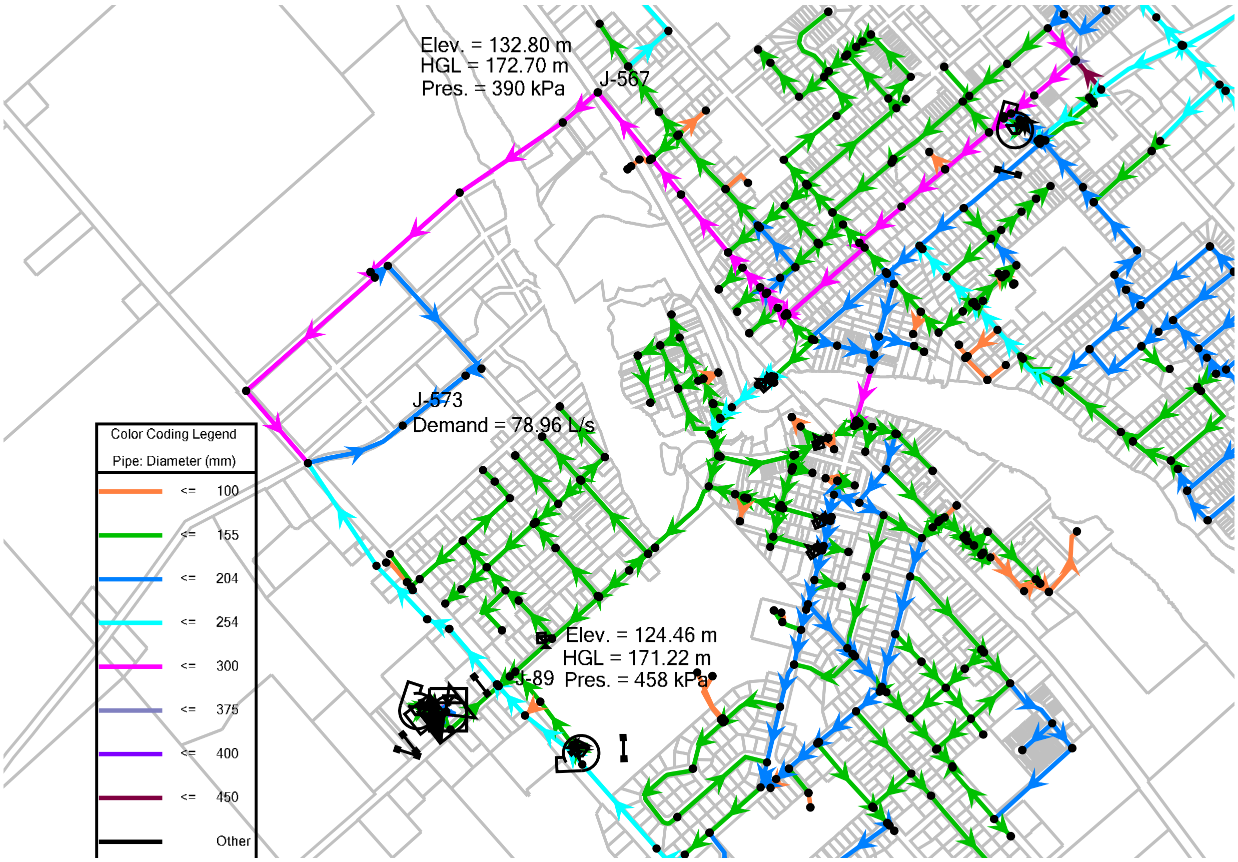
MDD+FF (Year 2, RFF=45 L/s)



Brown Lands Boundary Condition

250 mm Upgrade Along County Road 29 and 300 mm Mississippi River Crossing

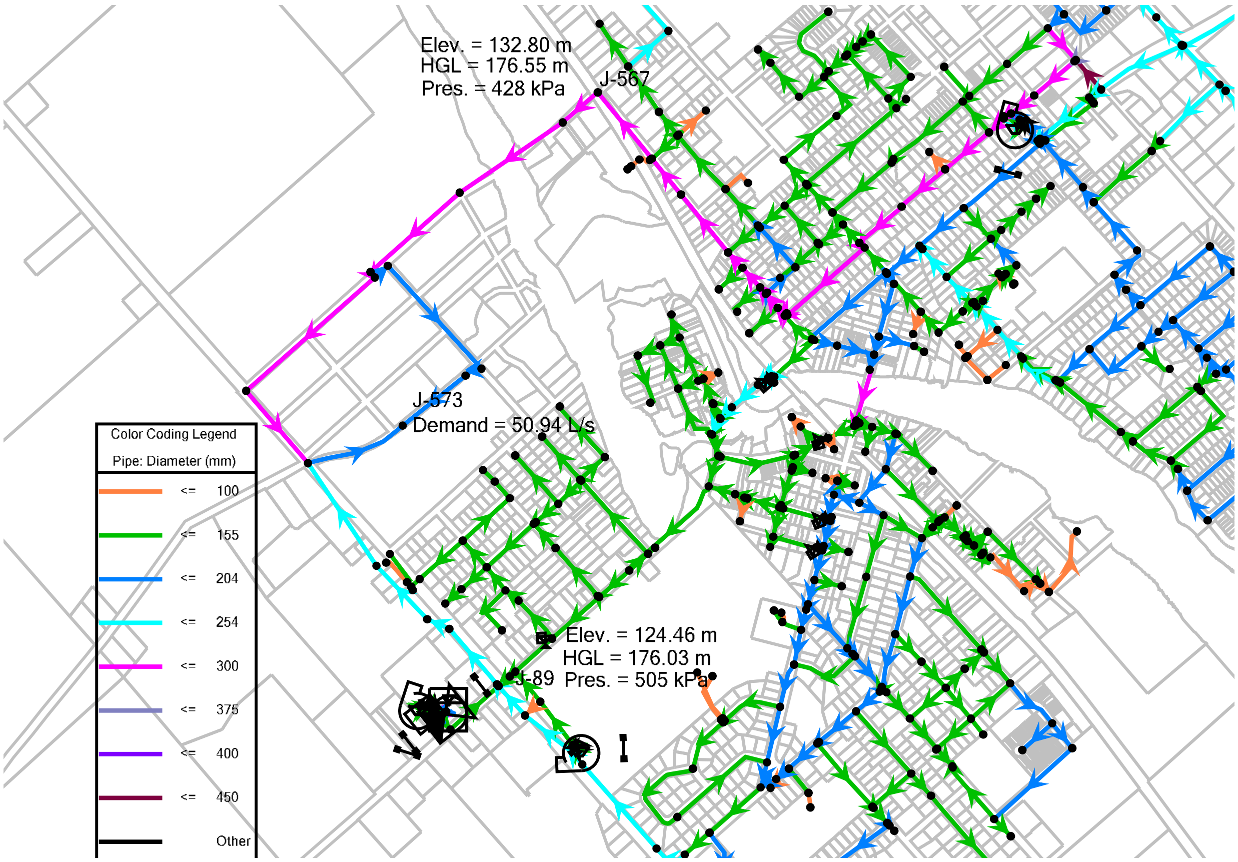
MDD+FF (Year 2, RFF=75 L/s)



Brown Lands Boundary Condition

250 mm Upgrade Along County Road 29 and 300 mm Mississippi River Crossing

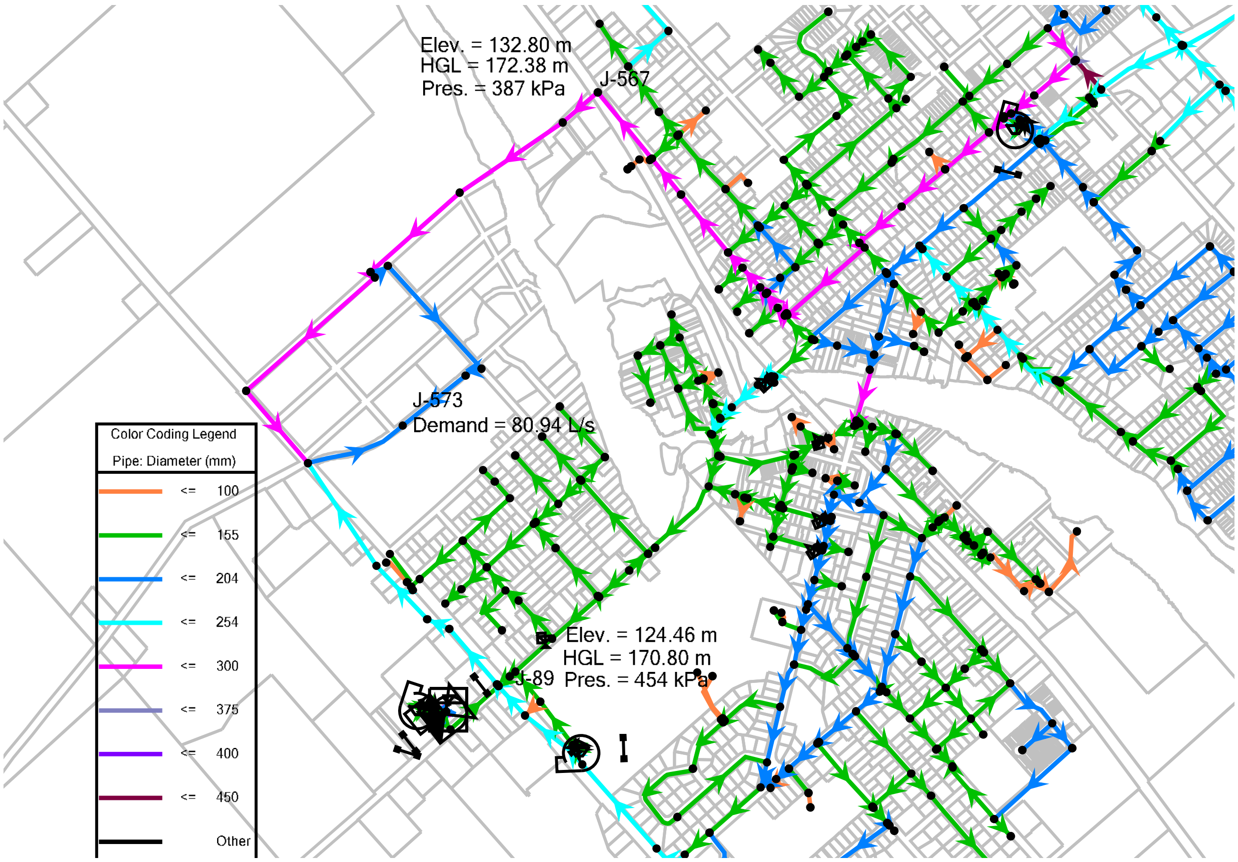
MDD+FF (Year 3, RFF=45 L/s)



Brown Lands Boundary Condition

250 mm Upgrade Along County Road 29 and 300 mm Mississippi River Crossing

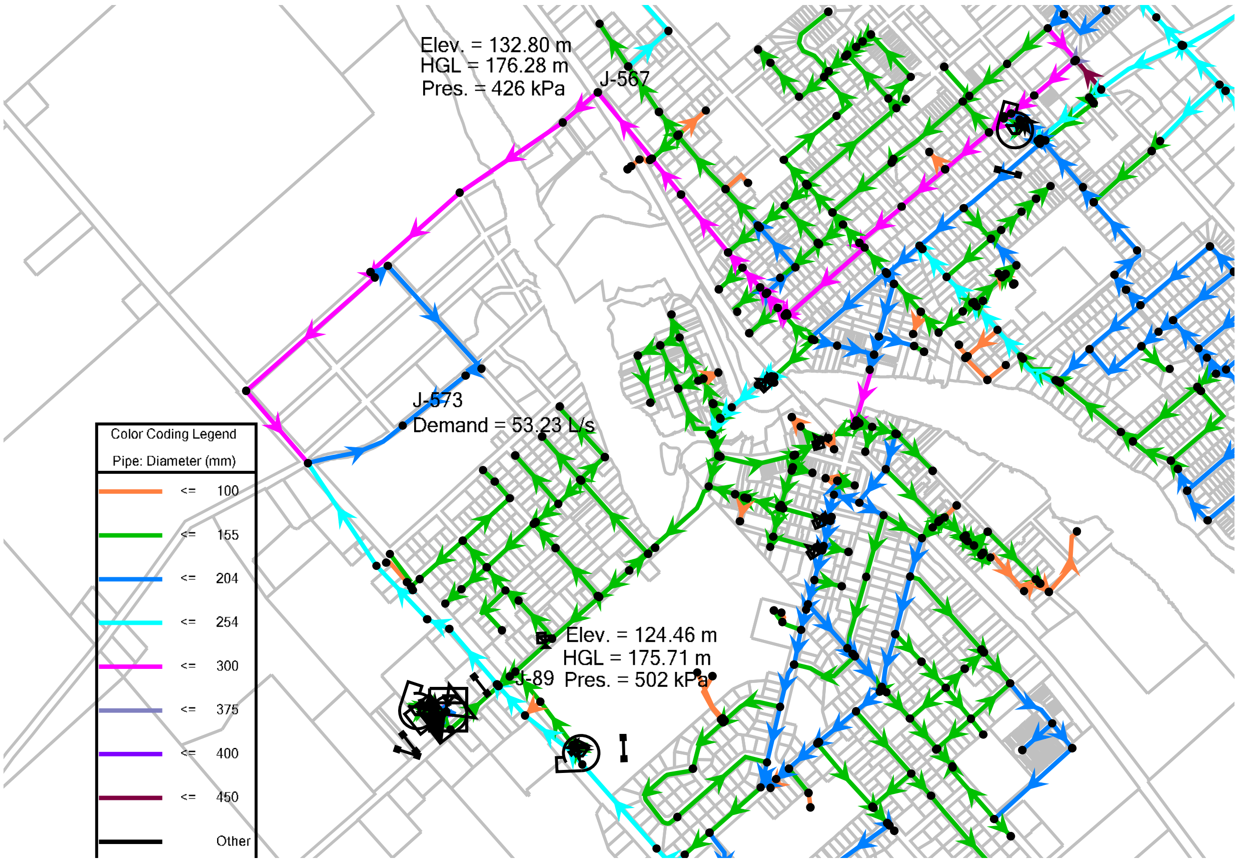
MDD+FF (Year 3, RFF=75 L/s)



Brown Lands Boundary Condition

250 mm Upgrade Along County Road 29 and 300 mm Mississippi River Crossing

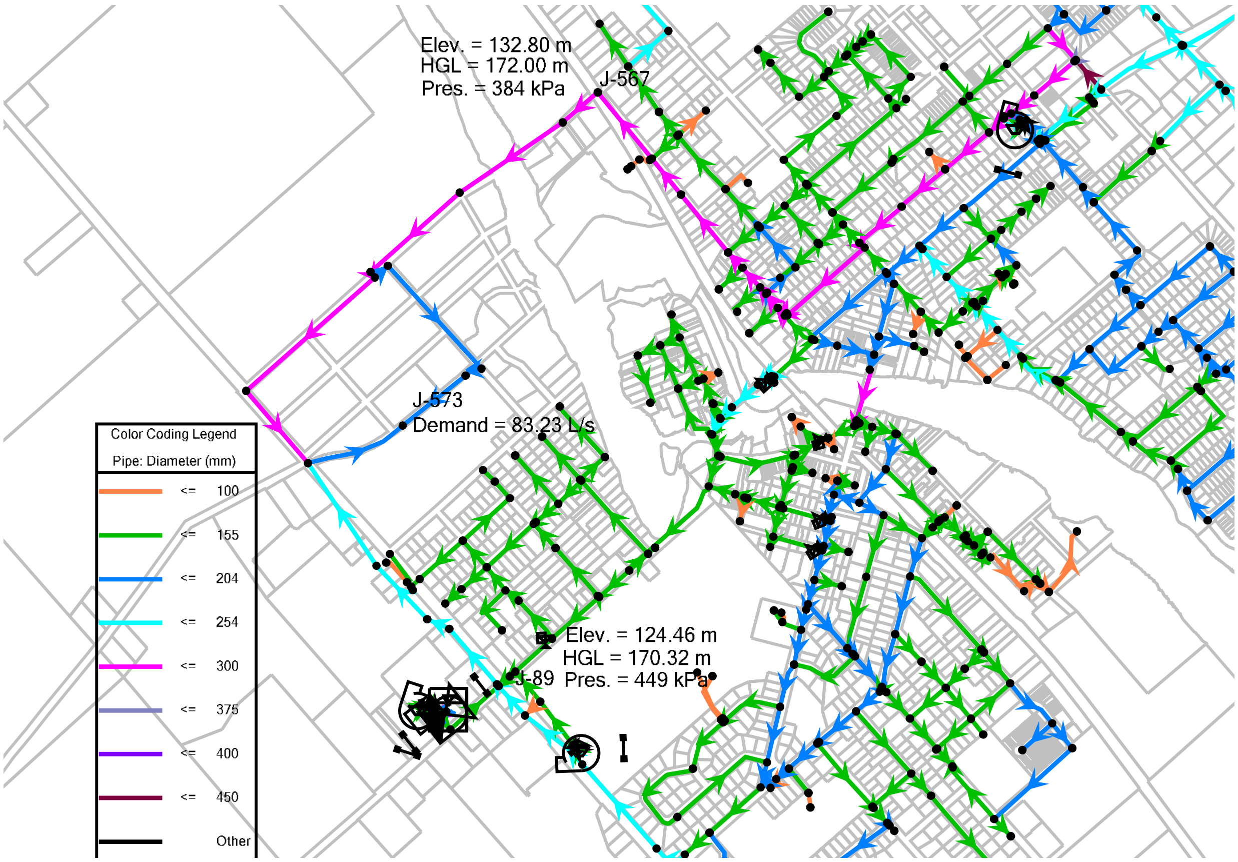
MDD+FF (Year 4, RFF=45 L/s)



Brown Lands Boundary Condition

250 mm Upgrade Along County Road 29 and 300 mm Mississippi River Crossing

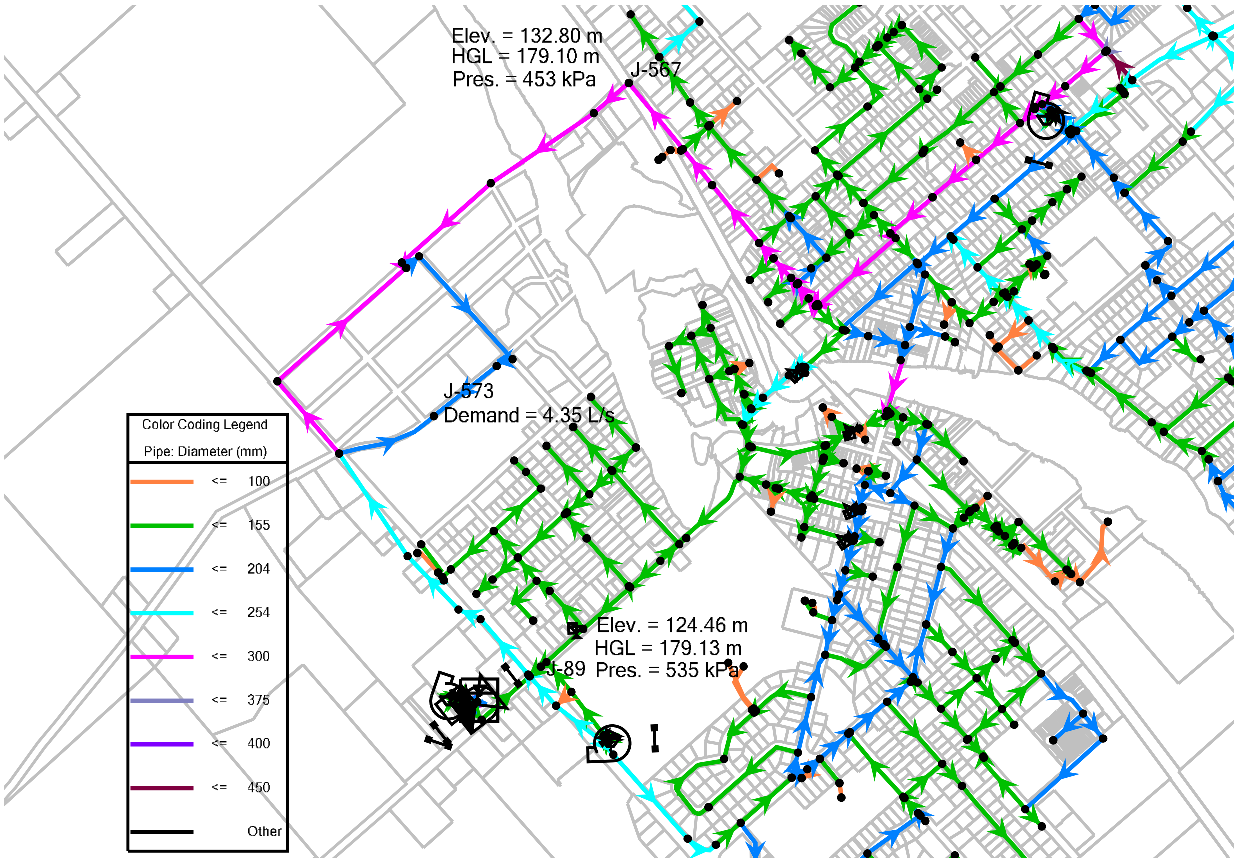
MDD+FF (Year 4, RFF=75 L/s)



Brown Lands Boundary Condition

250 mm Upgrade Along County Road 29 and 300 mm Mississippi River Crossing

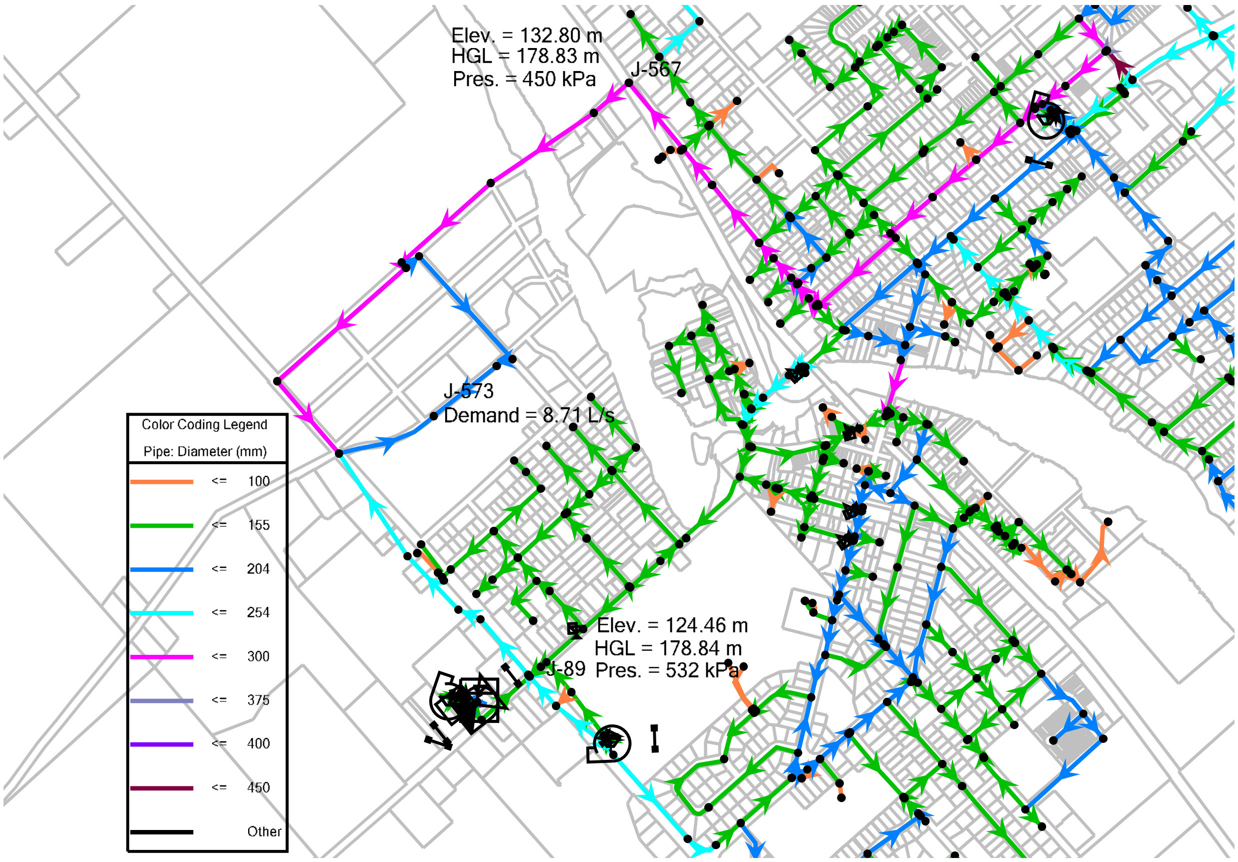
PHD (Year 1)



Brown Lands Boundary Condition

250 mm Upgrade Along County Road 29 and 300 mm Mississippi River Crossing

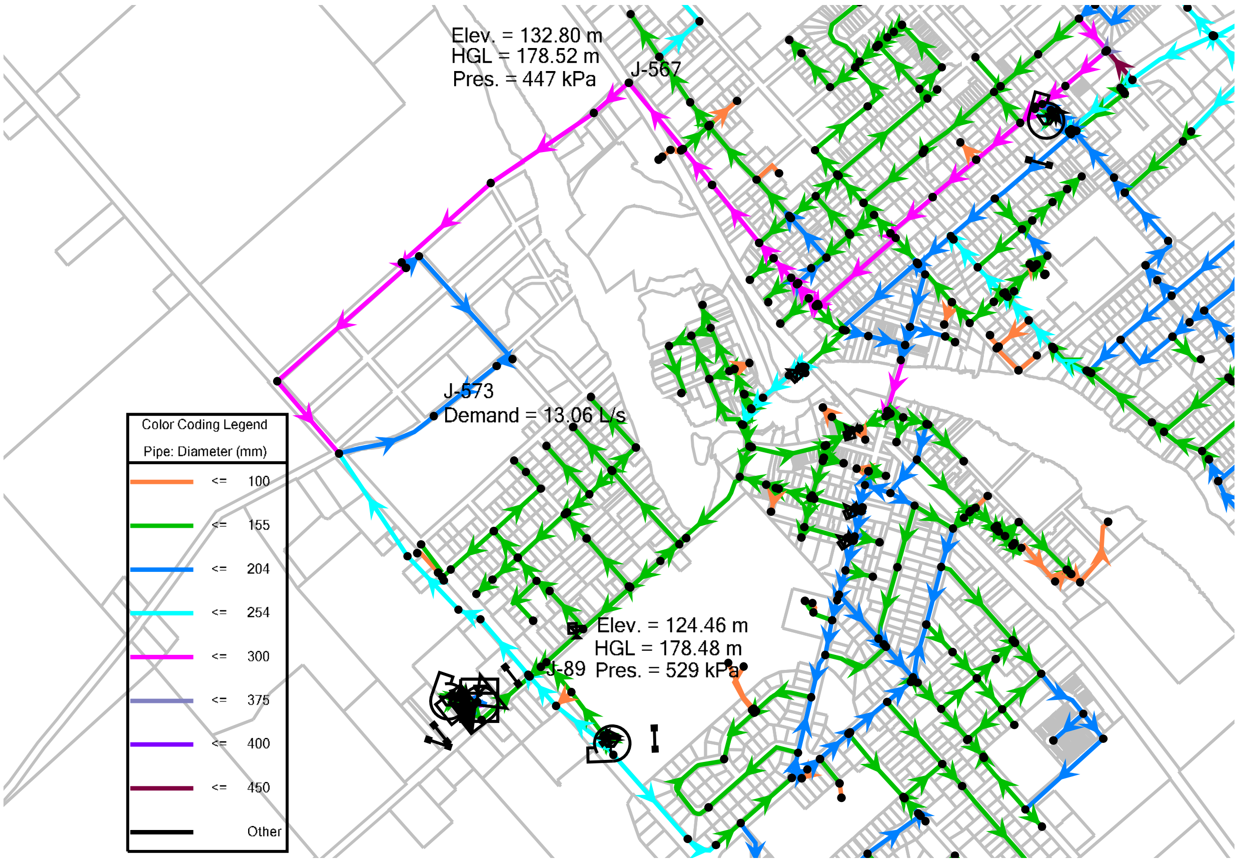
PHD (Year 2)



Brown Lands Boundary Condition

250 mm Upgrade Along County Road 29 and 300 mm Mississippi River Crossing

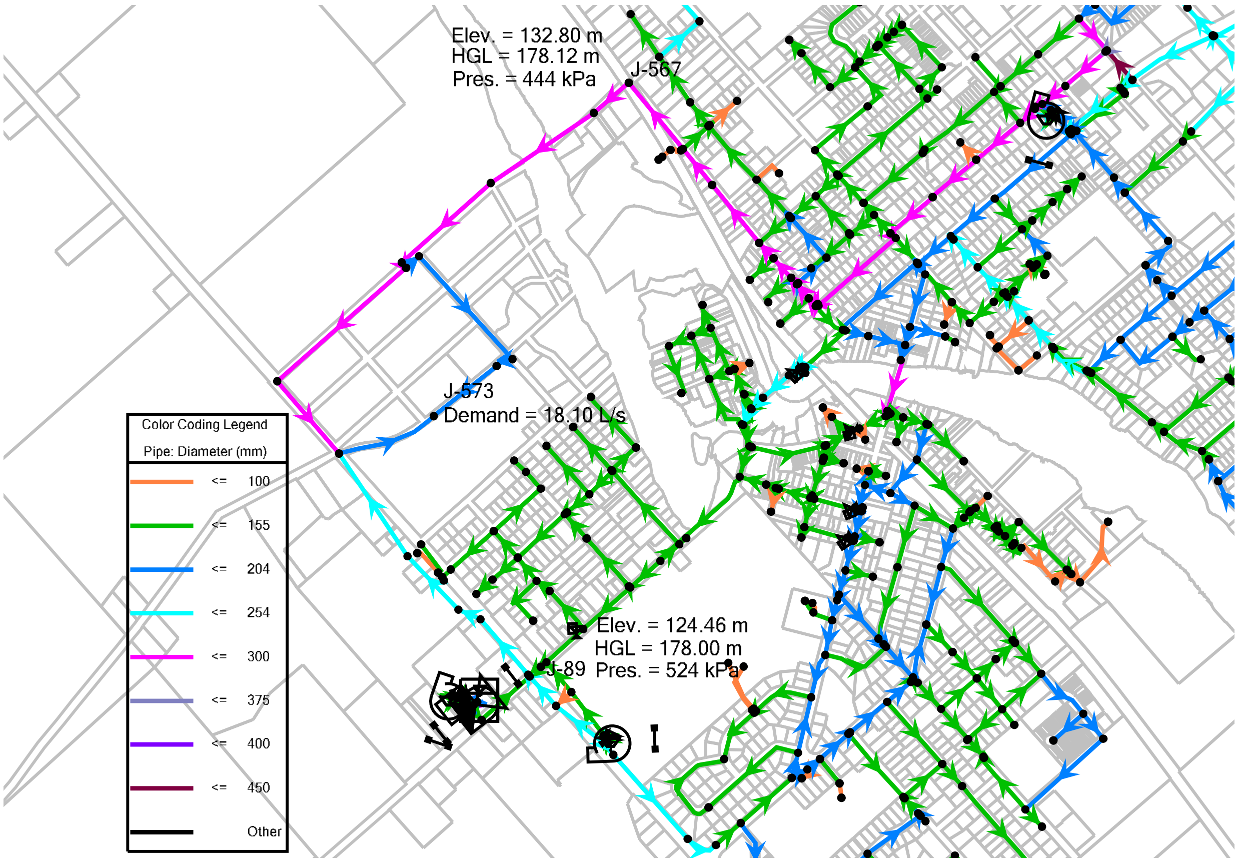
PHD (Year 3)



Brown Lands Boundary Condition

250 mm Upgrade Along County Road 29 and 300 mm Mississippi River Crossing

PHD **(Year** 4**)**



From:	Mahad Musse <mmusse@jlrichards.ca>
Sent:	Thursday, February 2, 2023 4:29 PM
To:	Trevor McKay
Cc:	Melanie Riddell; 'Evan Garfinkel'; 'David Shen'; 'Cory Smith'; Annie Williams; Mark Buchanan
Subject:	RE: Almonte - Updated Hydraulic Boundary Conditions and Trunk Sewer Capacity
Attachments:	Attachment 1 - Brown Lands BC Results - Jan2023.pdf

Good Afternoon Trevor,

Please find attached the requested hydraulic boundary conditions for the following two (2) revised scenarios, as requested by the Developer's Engineer:

1) Revised Scenario 2 Boundary Conditions – 300 mm Upgrade Along County Road 29 (from Well 6 to Strathburn Street):
- 1 Connection: Boundary conditions to be provided at County Road 29 / Wylie Street.
- 300mm Watermain Upgrade along County Road 29 (full length from Well #6 to Strathburn Street): Average Day and Max Day + FF under all 4 Years' demands. If not feasible, will note as such below.

2) Revised Scenario 3 Boundary Conditions – 300 mm Upgrade Along County Road 29 (from Well 6 to Strathburn Street) and 300 mm Mississippi River Crossing:
- 2 Connections: Boundary conditions to be provided at County Road 29 / Wylie Street, and at Carss Street on the east side of the river.
- 300mm Watermain Upgrade along County Road 29 (full length from Well #6 to Strathburn Street) AND 300mm Mississippi River Crossing: Average Day and Max Day + FF under all 4 Years' demands. If not feasible, will note as such.

The proposed development located on the Brown Lands within the Municipality of Mississippi Mills (Municipality), was simulated using the Municipality's existing hydraulic water model (2017) to determine hydraulic boundary conditions based on theoretical water demands and fire flows provided by the Developer's Engineer (refer to attached). The 300 mm diameter watermain upgrade on Victoria Street between Martin Street North and Menzie Street was included in the model.

Table 1 summarizes the theoretical water demands that were included in the model at junction node J-573. As an addition request by the developer, a fire flow requirement (Max Daily + FF3) of 150 L/s was modelled. It is noted that hydraulic boundary conditions for maximum day + fire flow under the revised Scenario 2 could only be provided for Year 1 to 4 of Max Daily + FF1 (45 L/s). Furthermore, results the Max Daily + FF3 (150 L/s) for the revised Scenario 3 could only be provided for Years 1 and 2. Results for the maximum available fire flow are provided in Table 2.

Table 1: Theoretical Water Demands

	High Pressure	Max Daily + FF1 (45L/s)	Max Daily + FF2 (75L/s)	Max Daily + FF3 (150 L/s)	Peak Hour
Year 1	0.99	46.98	76.98	151.98	4.35
Year 2	1.98	48.96	78.96	153.96	8.71
Year 3	2.97	50.94	80.94	155.94	13.06
Year 4	4.11	53.23	83.23	158.23	18.10

The hydraulic boundary conditions have been generated at the connection points noted above with results summarized in Table 2 and Table 3 (refer to Attachment 1 for WaterCAD model outputs). Connection points are labelled in the model as follows:

- Junction nodes J-89 for Revised Scenario 2; and
- Junction nodes J-89 and J-567 for Revised Scenario 3.

The maximum day + fire flow and peak hour scenarios assume a maximum elevated tank level of 180.00m with all well pumps on and the new booster PUMP-A turned off. The average day scenario assumes all pumps are turned off. Demands were placed within the Brown Lands on junction node J-573, the elevation of this node was approximated as 117.44 m based on the surrounding elevations found within the model and information from Google Earth.

Table 2: Revised Scenario 2 Boundary Conditions – 300 mm Upgrade Along County Road 29 (from Well 6 to Strathburn)

Demand Case	Connection at County Road 29 / Almonte Street (J-89, Elev. 124.46m)	
	Pressure (kPa)	HGL (m)
Year 1 – Average Day Demand	532	178.87
Year 2 – Average Day Demand	530	178.61
Year 3 – Average Day Demand	527	178.32
Year 4 – Average Day Demand	523	177.95
Year 1 - Max Daily + FF1 (46.98 L/s)	306	155.69
Year 2 - Max Daily + FF1 (48.96 L/s)	283	153.43
Year 3 - Max Daily + FF1 (50.94 L/s)	260	151.07
Year 4 - Max Daily + FF1 (53.23 L/s)	233	148.23
Year 1 - Max Daily + Avail. FF (58.98 L/s)	157	140.56
Year 2 - Max Daily + Avail. FF (58.96 L/s)	158	140.58
Year 3 - Max Daily + Avail. FF (58.94 L/s)	158	140.61
Year 4 - Max Daily + Avail. FF (58.23 L/s)	168	141.60

Table 3: Revised Scenario 3 Boundary Conditions – 300 mm Upgrade Along County Road 29 (from Well 6 to Strathburn) and 300 mm Mississippi River Crossing

Demand Case	Connection at County Road 29 / Almonte Street (J-89, Elev. 124.46m)		Connection at Union Street N. / Carss Street (J-567, Elev. 132.80)	
	Pressure (kPa)	HGL (m)	Pressure (kPa)	HGL (m)
Year 1 – Average Day Demand	540	179.63	459	179.68
Year 2 – Average Day Demand	539	179.58	458	179.65

Year 3 – Average Day Demand	539	179.53	458	179.61
Year 4 – Average Day Demand	538	179.47	458	179.56
Year 1 - Max Daily + FF1 (46.98 L/s)	508	176.40	433	177.01
Year 2 - Max Daily + FF1 (48.96 L/s)	506	176.13	431	176.80
Year 3 - Max Daily + FF1 (50.94 L/s)	503	175.85	429	176.59
Year 4 - Max Daily + FF1 (53.23 L/s)	500	175.51	426	176.33
Year 1 - Max Daily + FF2 (76.98 L/s)	458	171.25	394	173.09
Year 2 - Max Daily + FF2 (78.96 L/s)	454	170.84	391	172.77
Year 3 - Max Daily + FF2 (80.94 L/s)	450	170.41	388	172.45
Year 4 - Max Daily + FF2 (83.23 L/s)	445	169.91	384	172.08
Year 1 - Max Daily + FF3 (151.98 L/s)	242	149.24	235	156.78
Year 2 - Max Daily + FF3 (153.96 L/s)	235	148.49	229	156.23
Year 3 - Max Daily + FF3 (154.94 L/s)	231	148.12	227	155.96
Year 4 - Max Daily + FF3 (155.23 L/s)	230	148.01	226	155.88

Based on the foregoing results, 150 L/s fire flow target is not available under scenario 2. In scenario 3, 150 L/s is expected under maximum day demand under Years 1 and 2 but limited to 149 L/s in Year 3 and 147 L/s in Year 4 while maintaining 140 kPa in the water distribution system.

Note that the foregoing model results are for current conditions and are based on computer model simulation. We have not reviewed the adequacy of the domestic demand nor the fire flow requirements for the proposed development, which remains the responsibility of the Developer's Engineer.

Disclaimer: The model results are based on current simulated operation of the Town's water distribution system. The computer model simulation is based on the best information available at this time. The operation of the water distribution system can change on a regular basis, resulting in a variation in the boundary conditions. It is further noted that the operational characteristics of the water supply system and physical properties of the watermains can change and/or deteriorate over time. These changes may affect the supply characteristics of the system and the assumptions made in developing the model, which in turn could lead to variations in the simulation results. This should be considered by any third party undertaking simulation of system upgrades.

Please do not hesitate to contact us should you have any questions regarding the foregoing.

Best regards,
Mahad

Mahad Musse, EIT
Civil Engineering Intern

J.L. Richards & Associates Limited
1000-343 Preston Street, Ottawa, ON K1S 1N4
Direct: 343-633-1501

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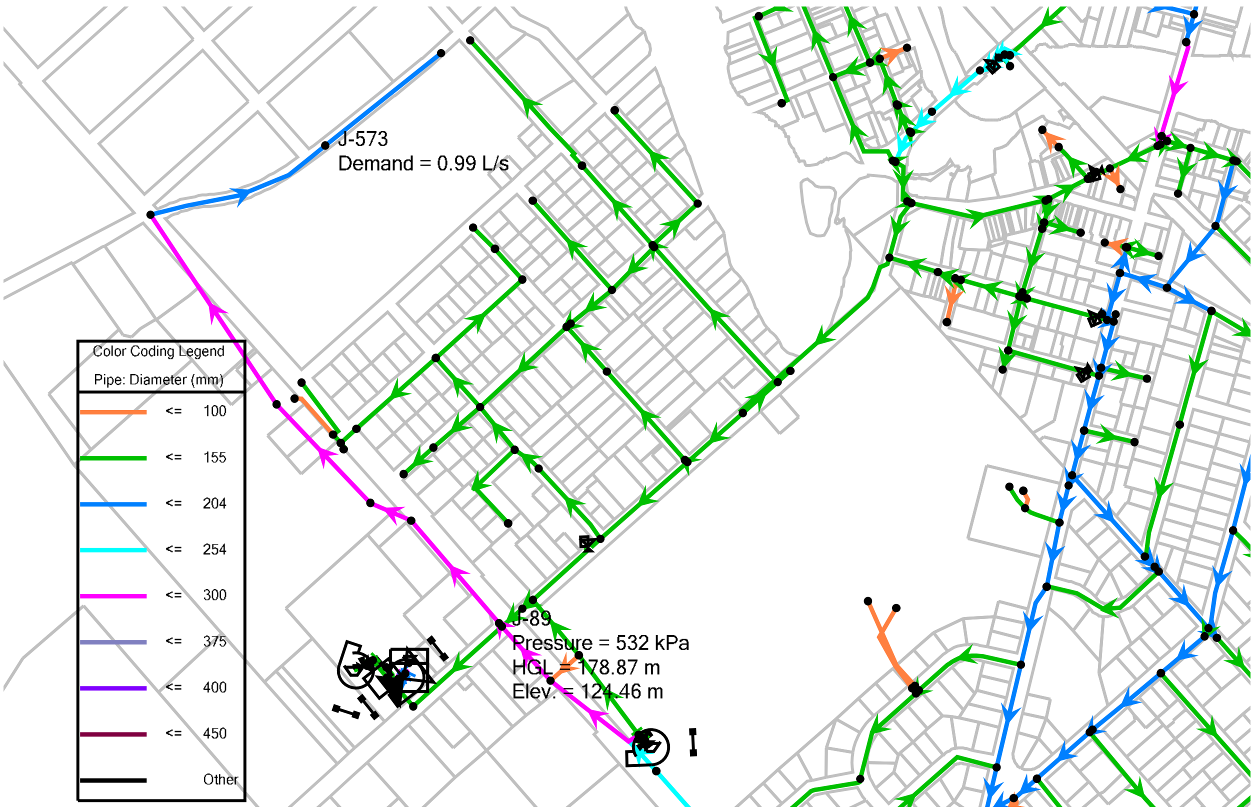
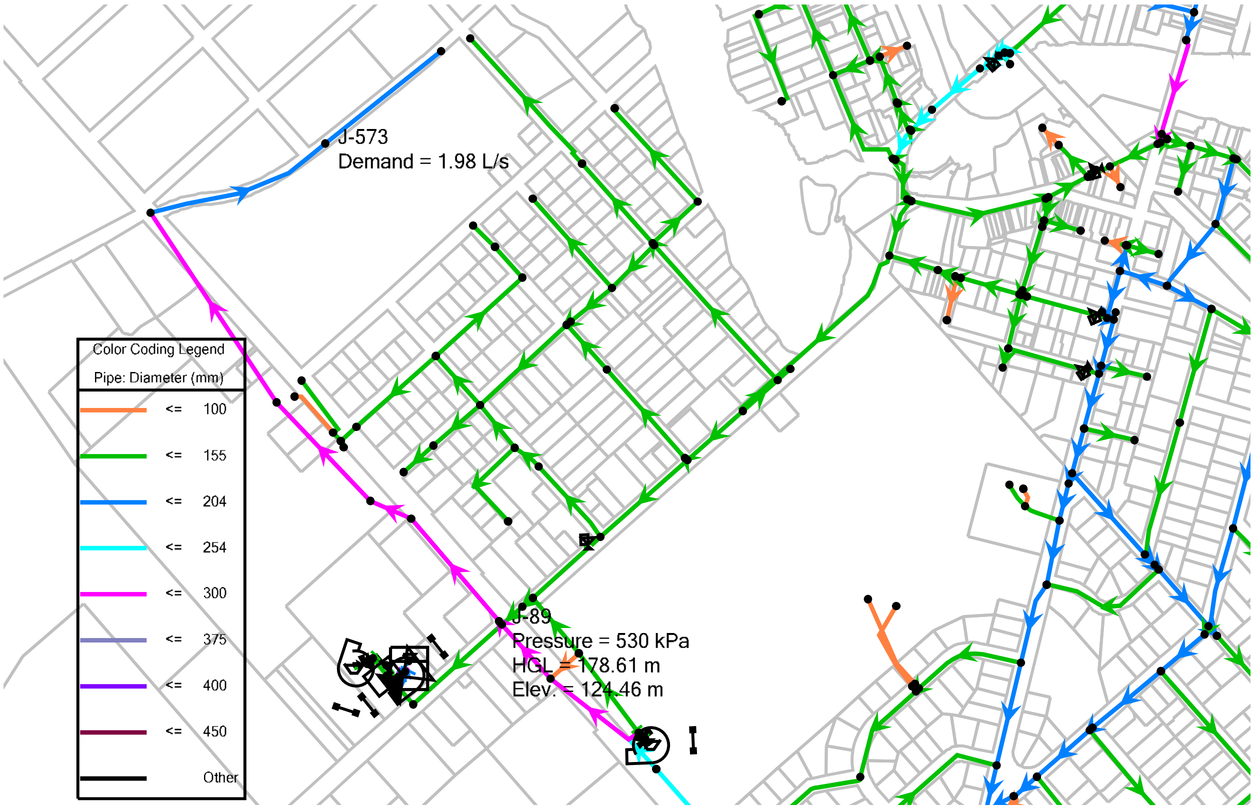
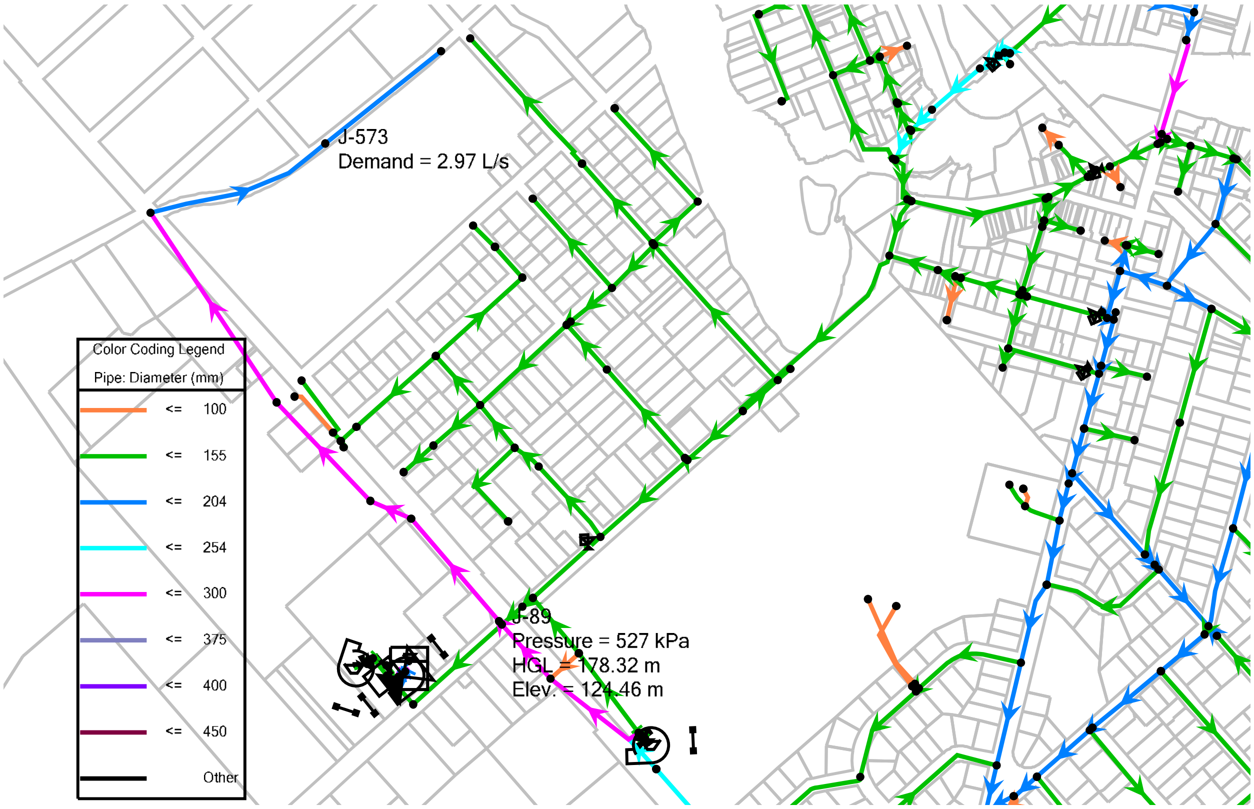
Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
ADD (Year 1)



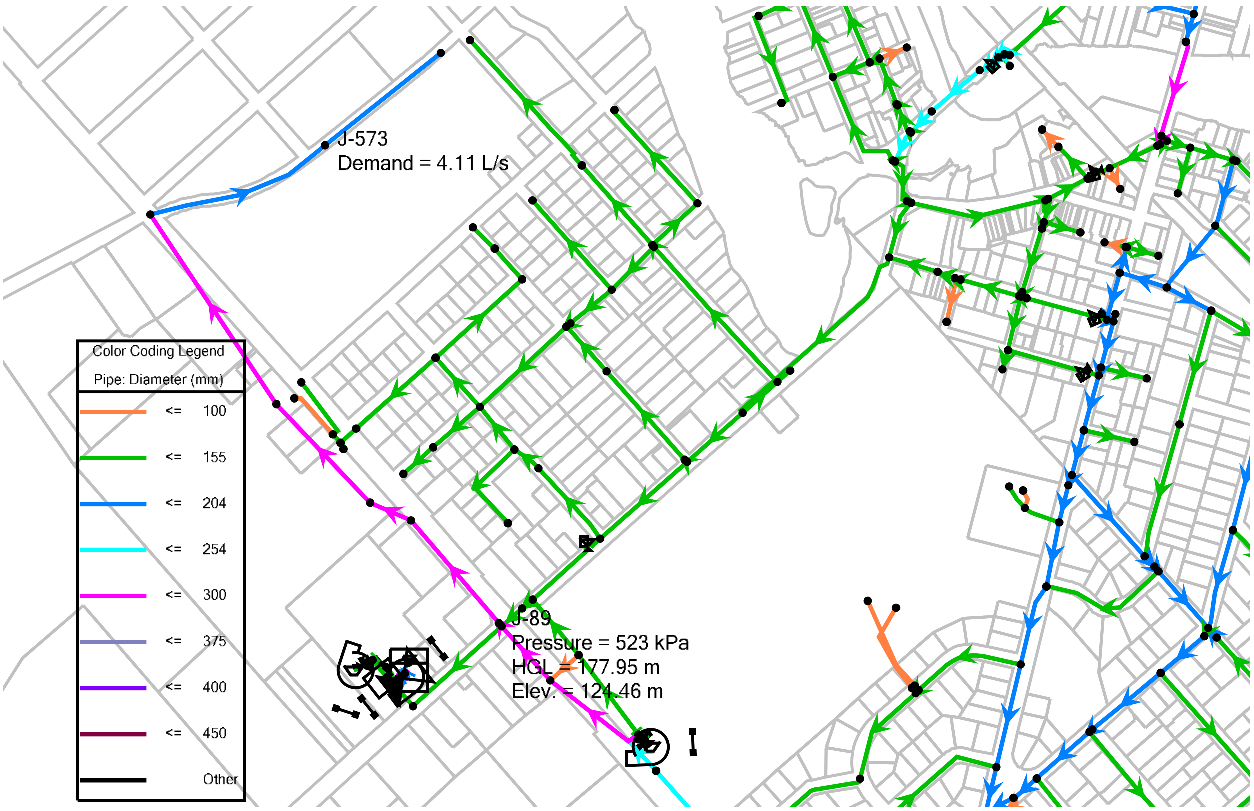
Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
ADD (Year 2)



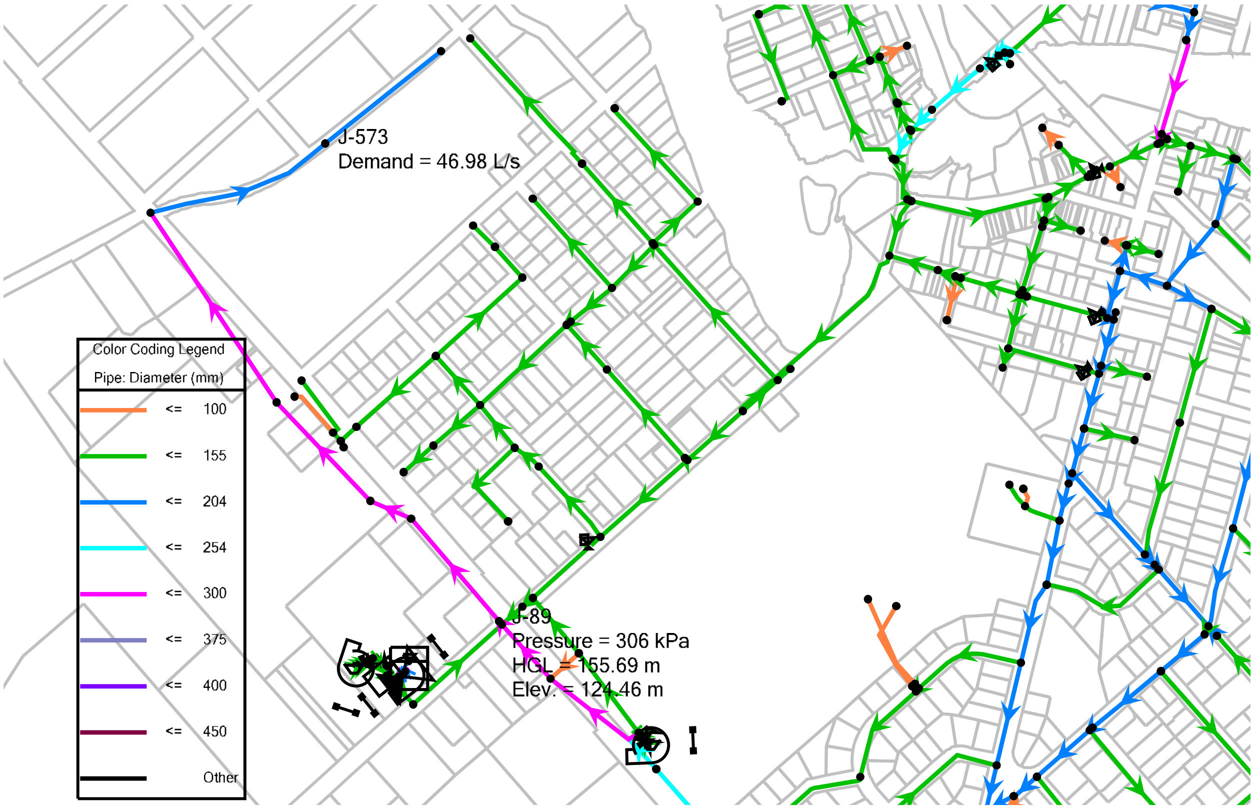
Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
ADD (Year 3)



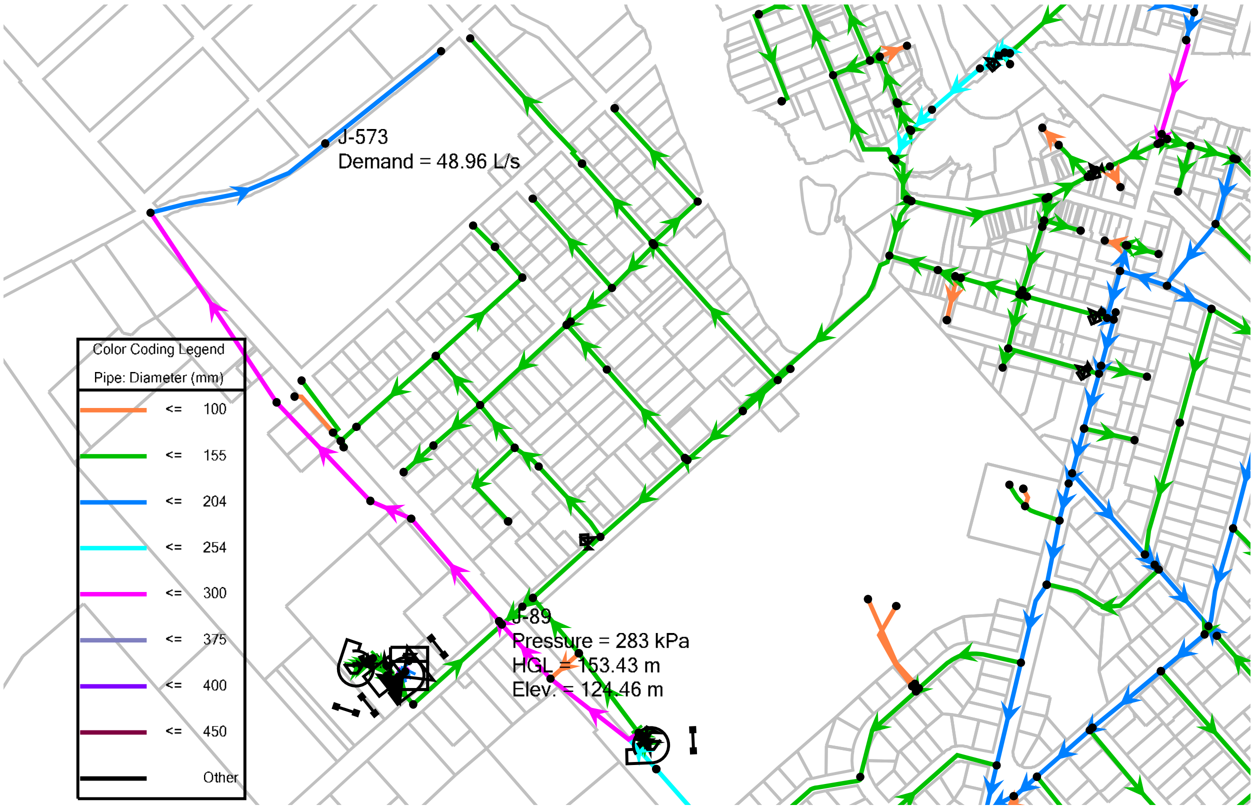
Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
ADD (Year 4)



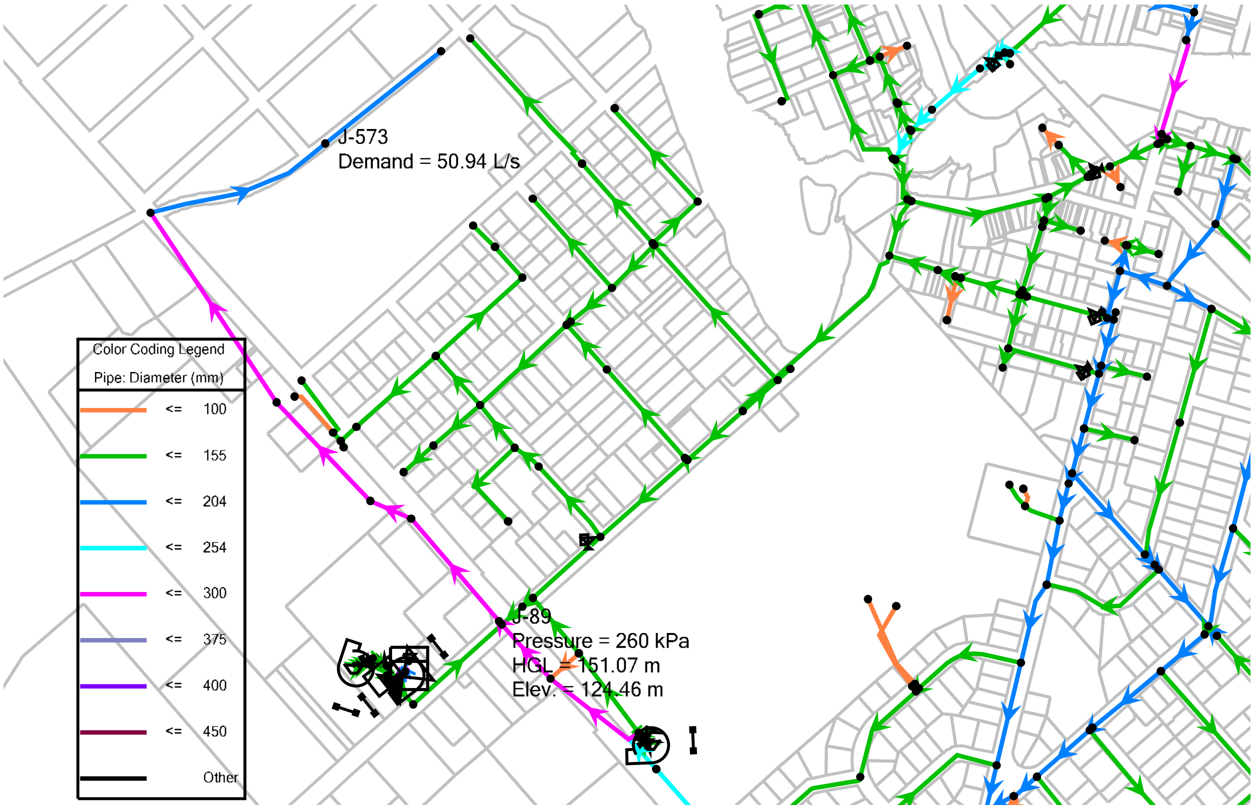
Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
MDD+FF (RFF = 45 L/s, Year 1)



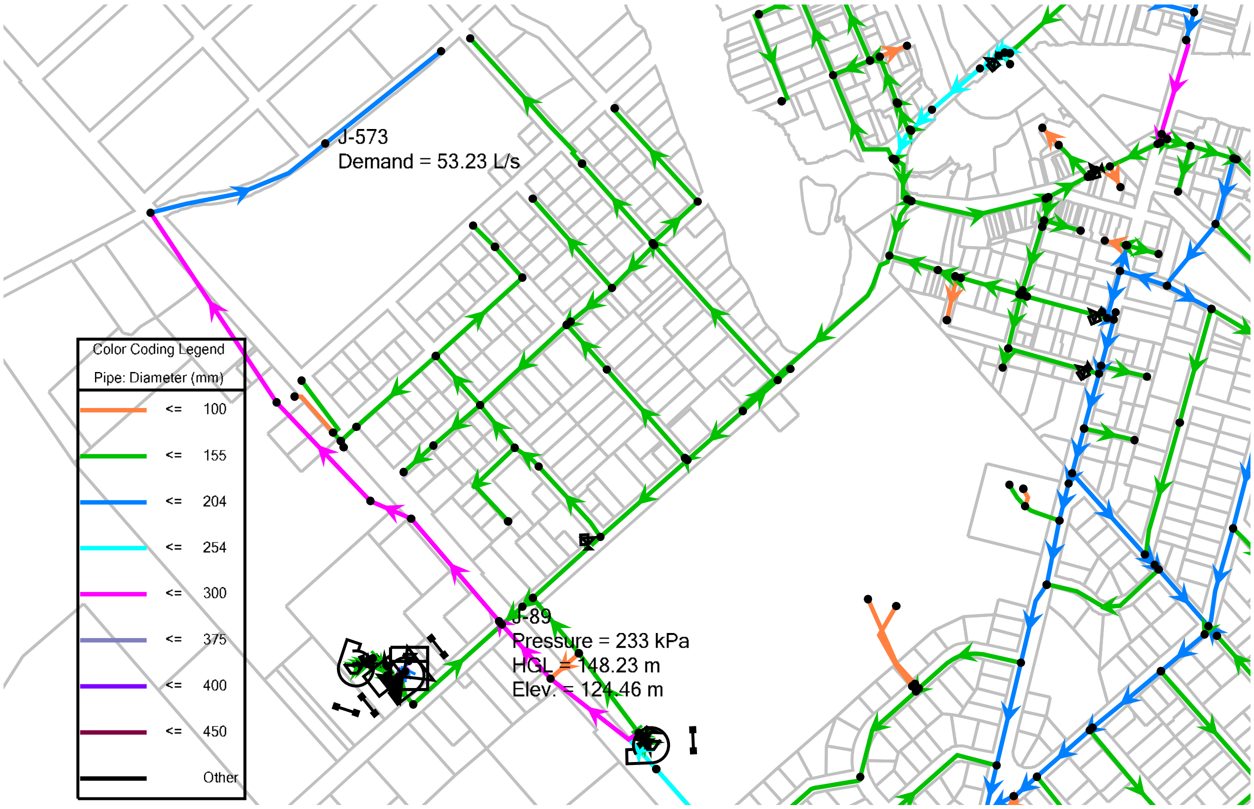
Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
MDD+FF (RFF = 45 L/s, Year 2)



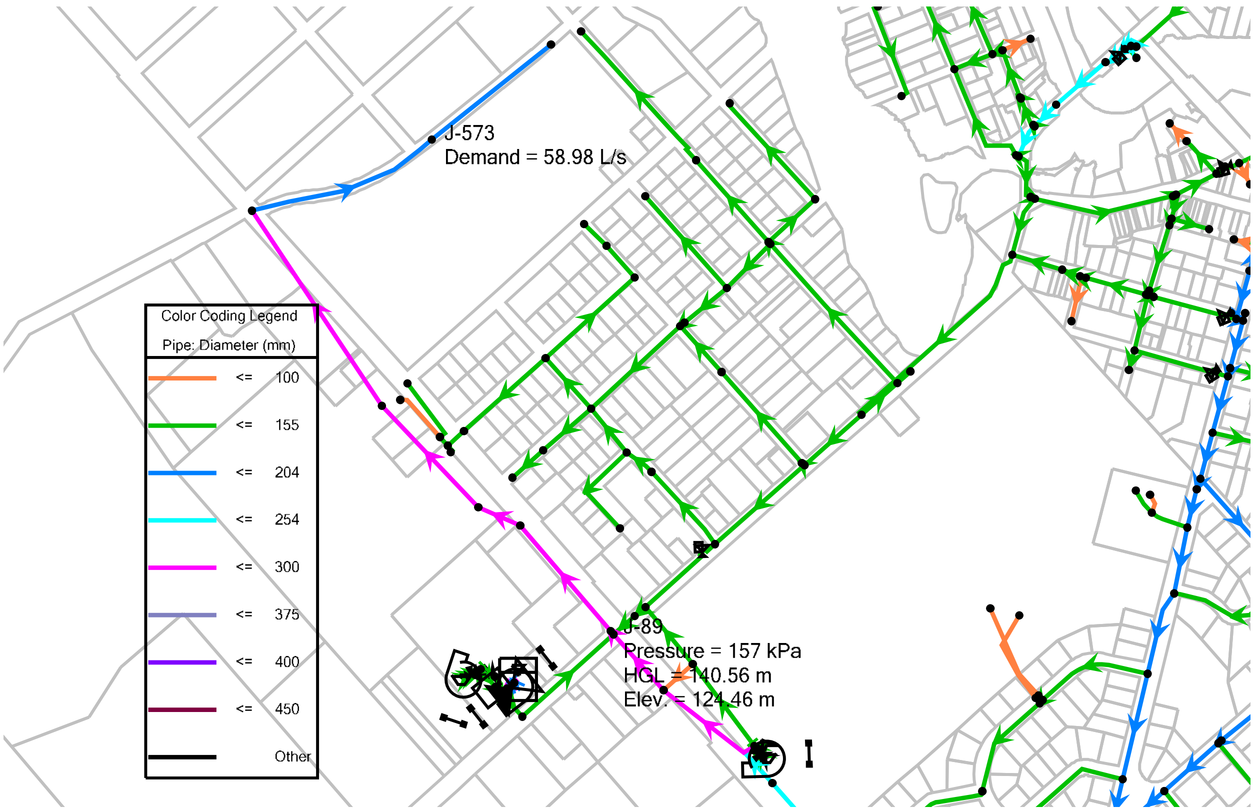
Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
MDD+FF (RFF = 45 L/s, Year 3)



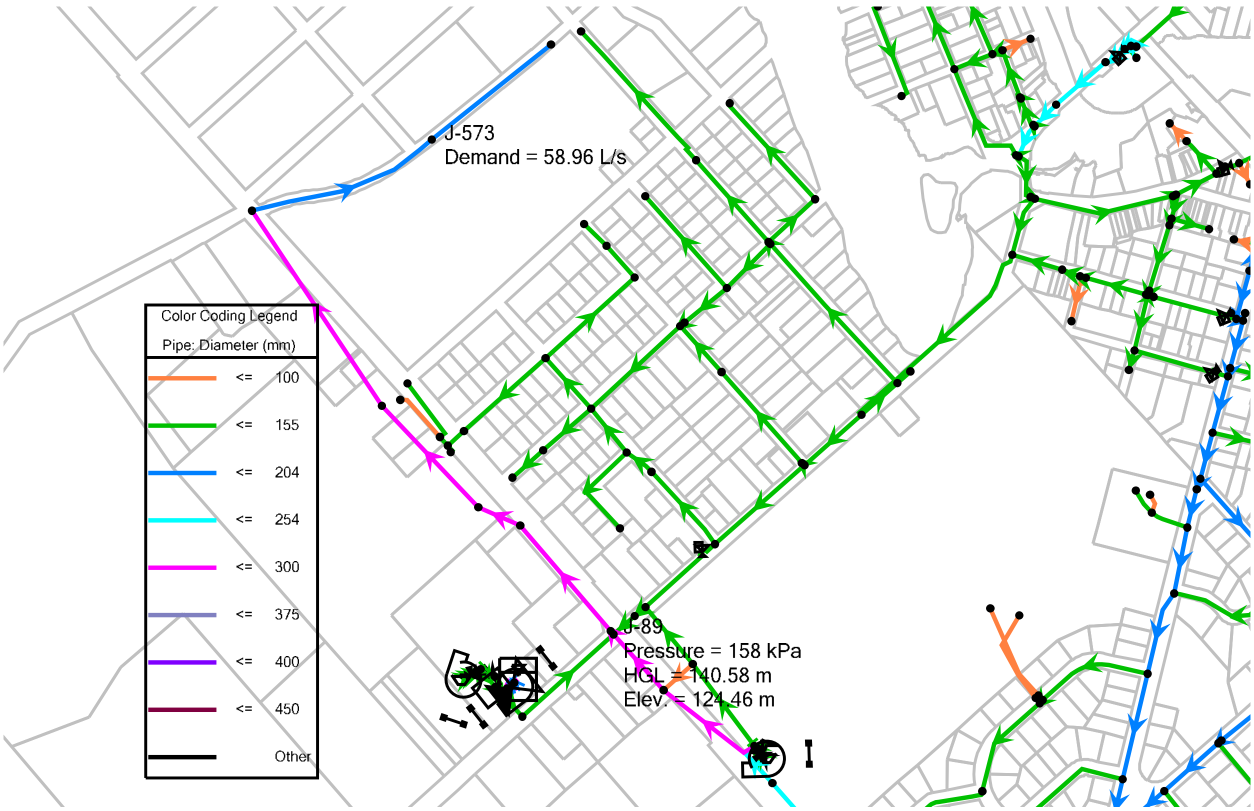
Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
MDD+FF (RFF = 45 L/s, Year 4)



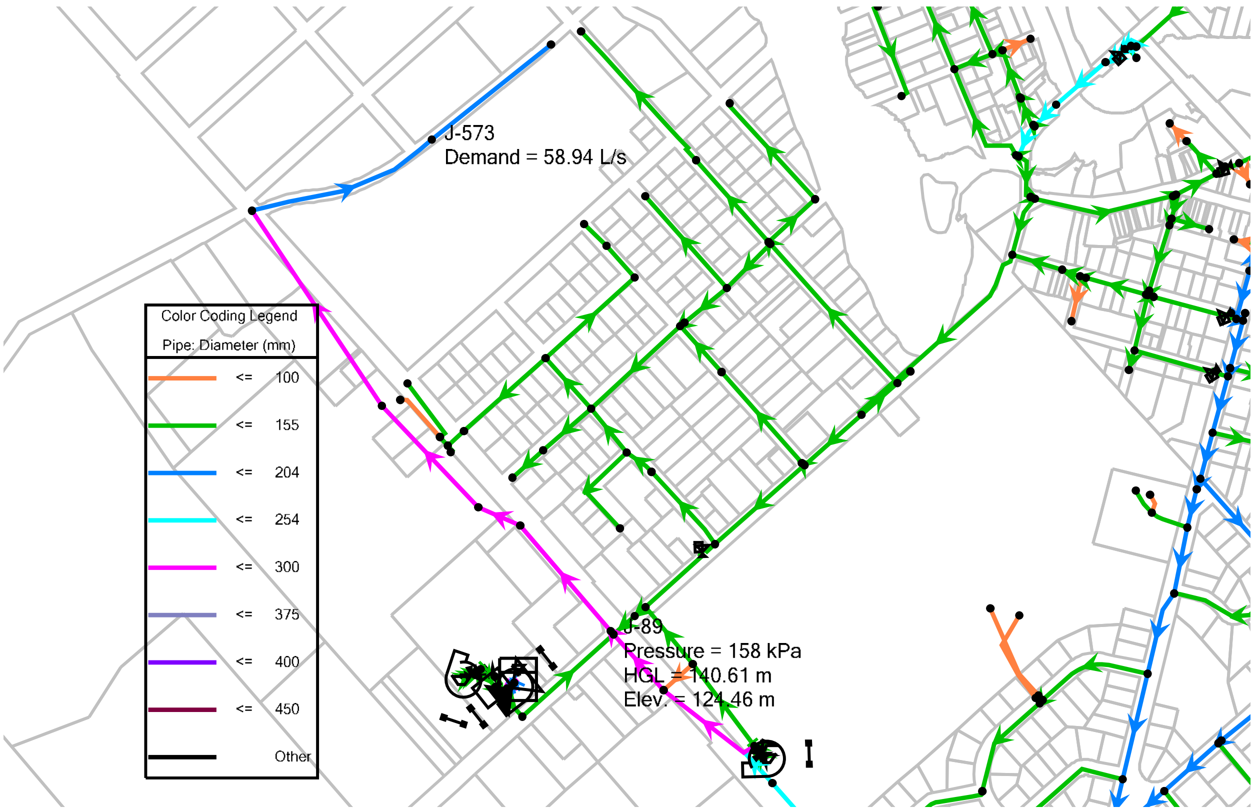
Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
MDD+FF (FF= 57 L/s, Year 1)



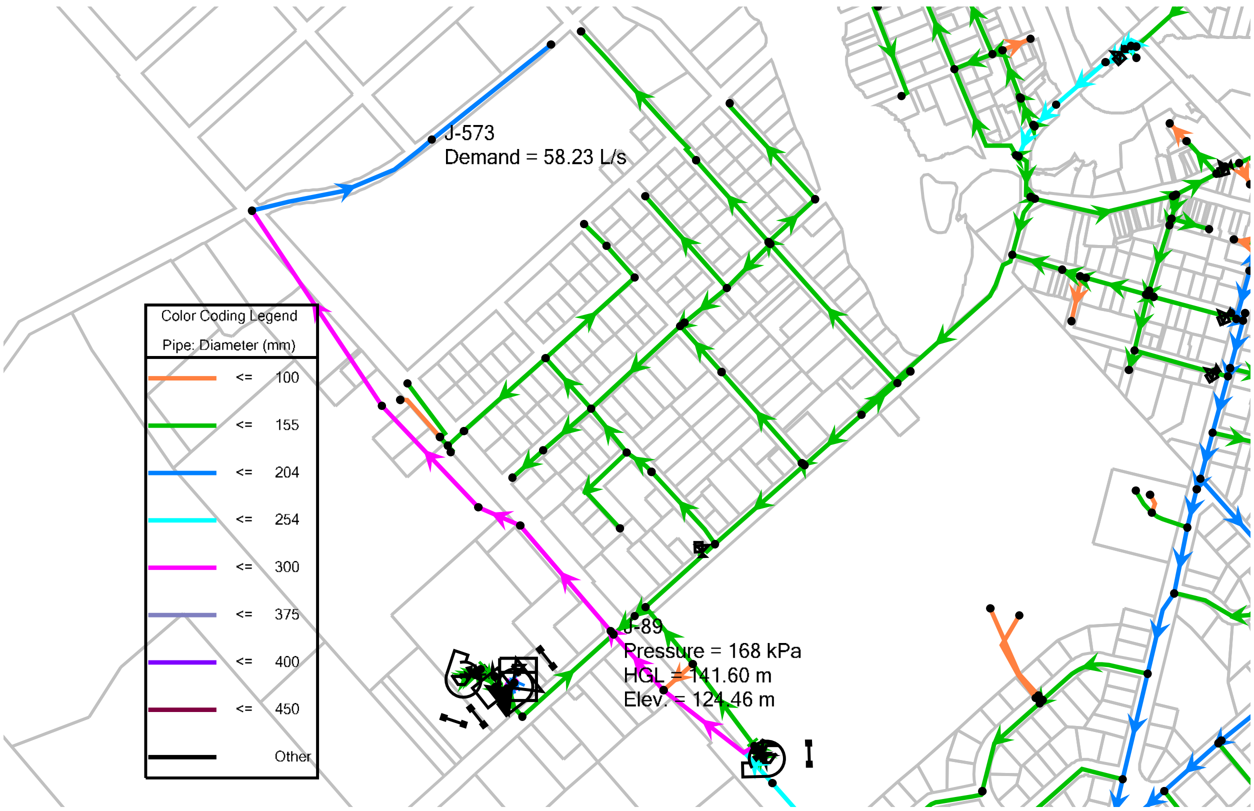
Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
MDD+FF (FF= 55 L/s, Year 2)



Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
MDD+FF (FF= 53 L/s, Year 3)



Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
MDD+FF (FF= 50 L/s, Year 4)

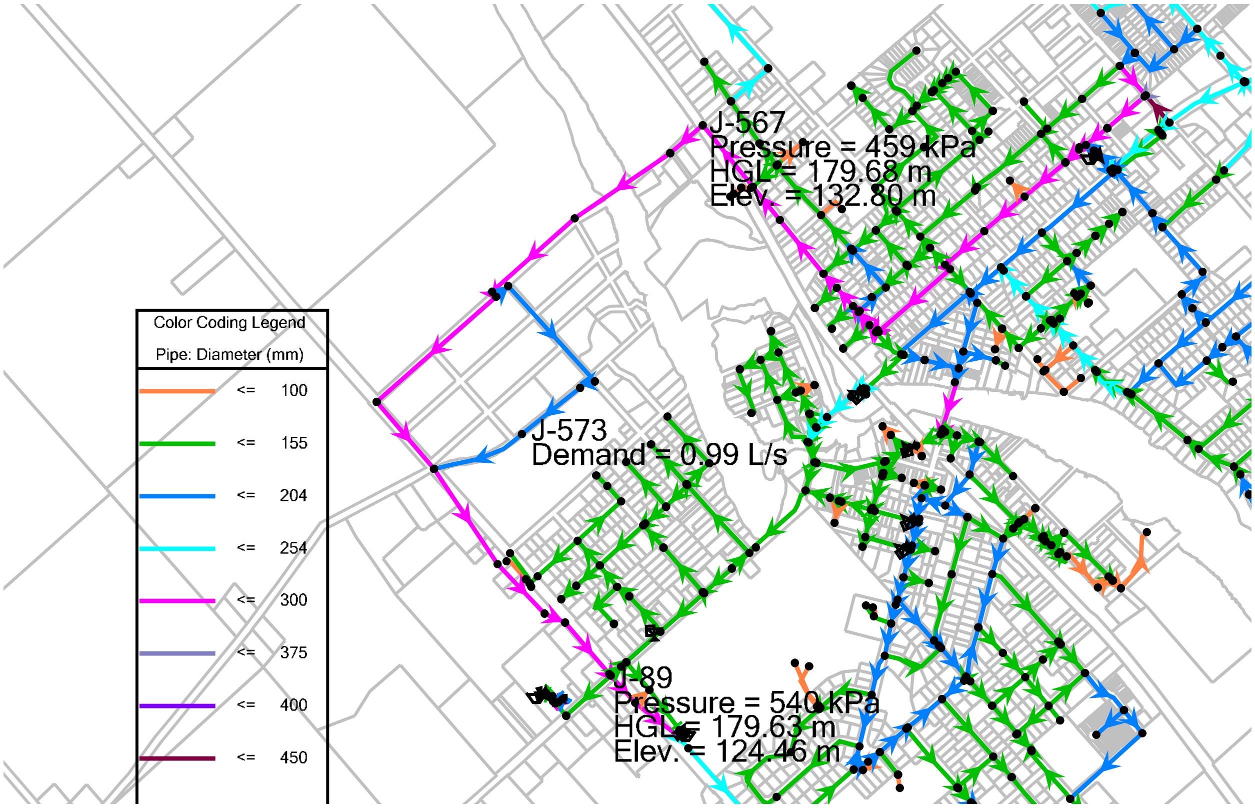


Brown Lands Boundary Condition (Jan 2023)

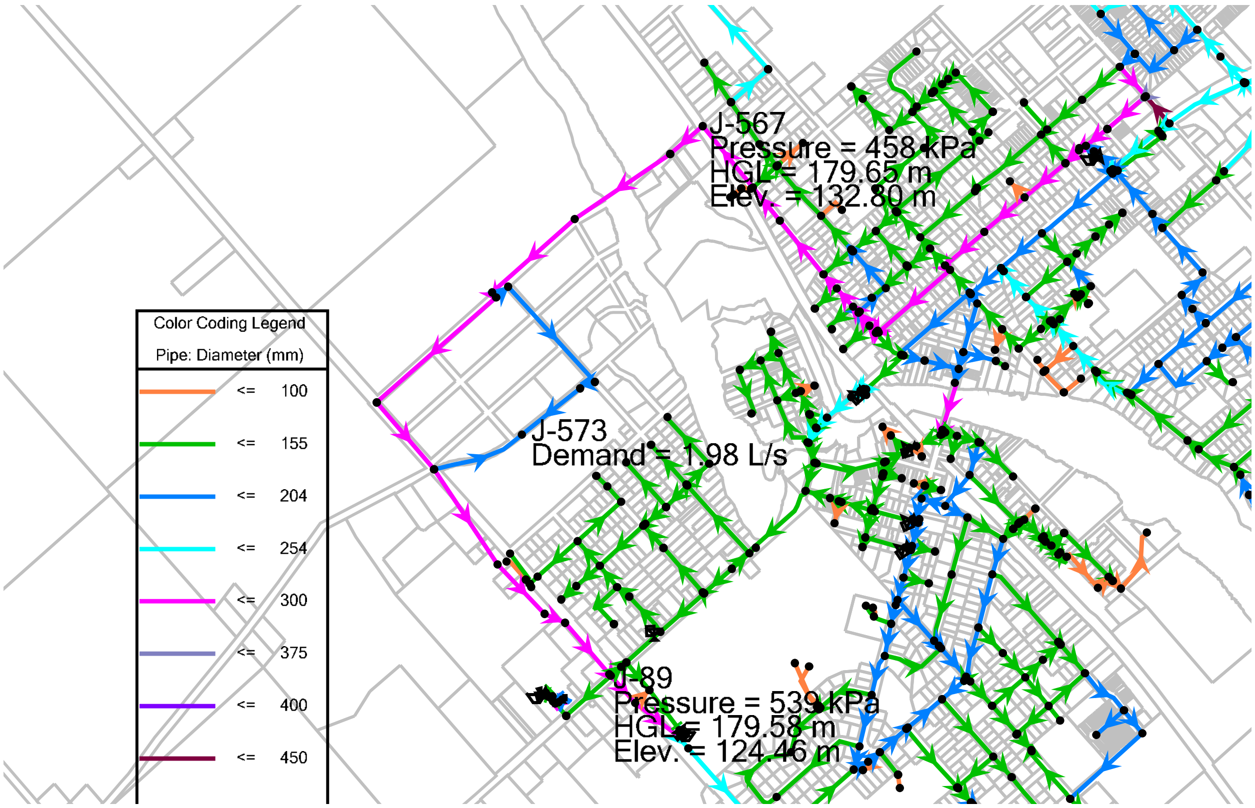
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)

300mm Mississippi River Crossing

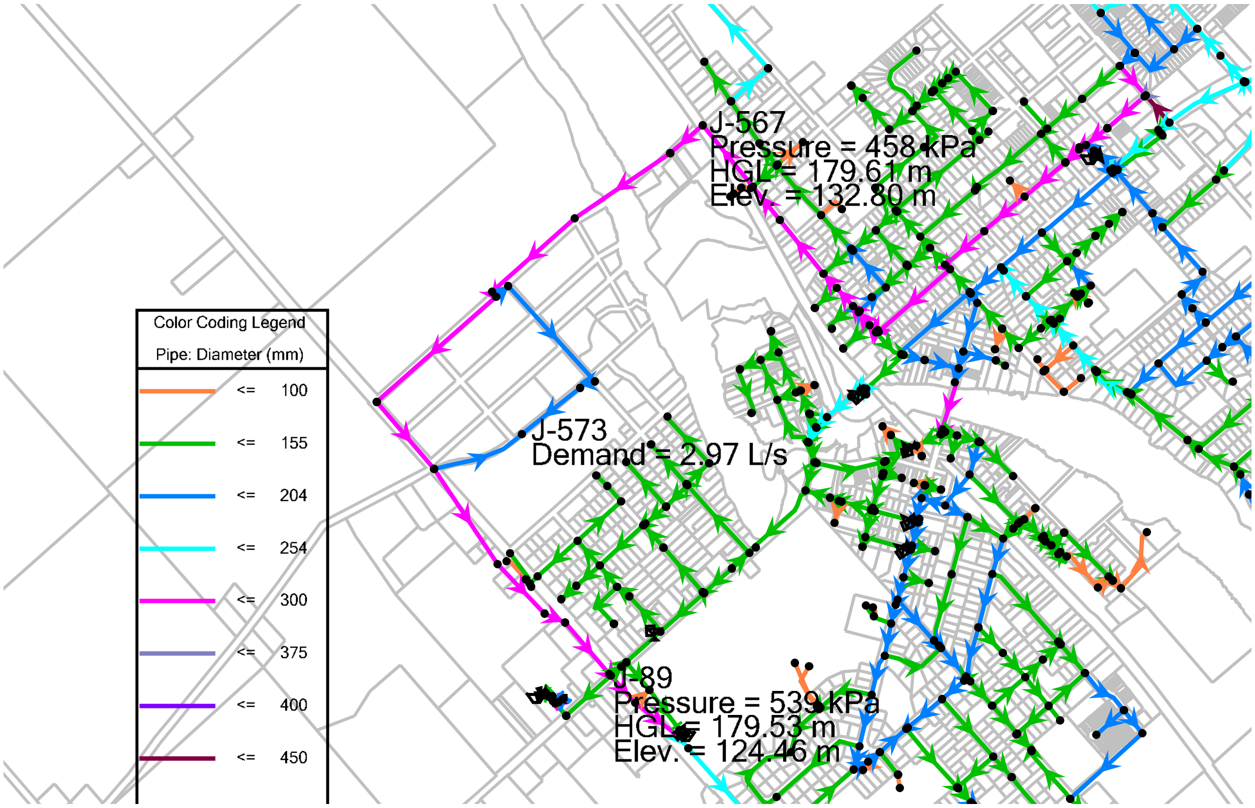
ADD (Year 1)



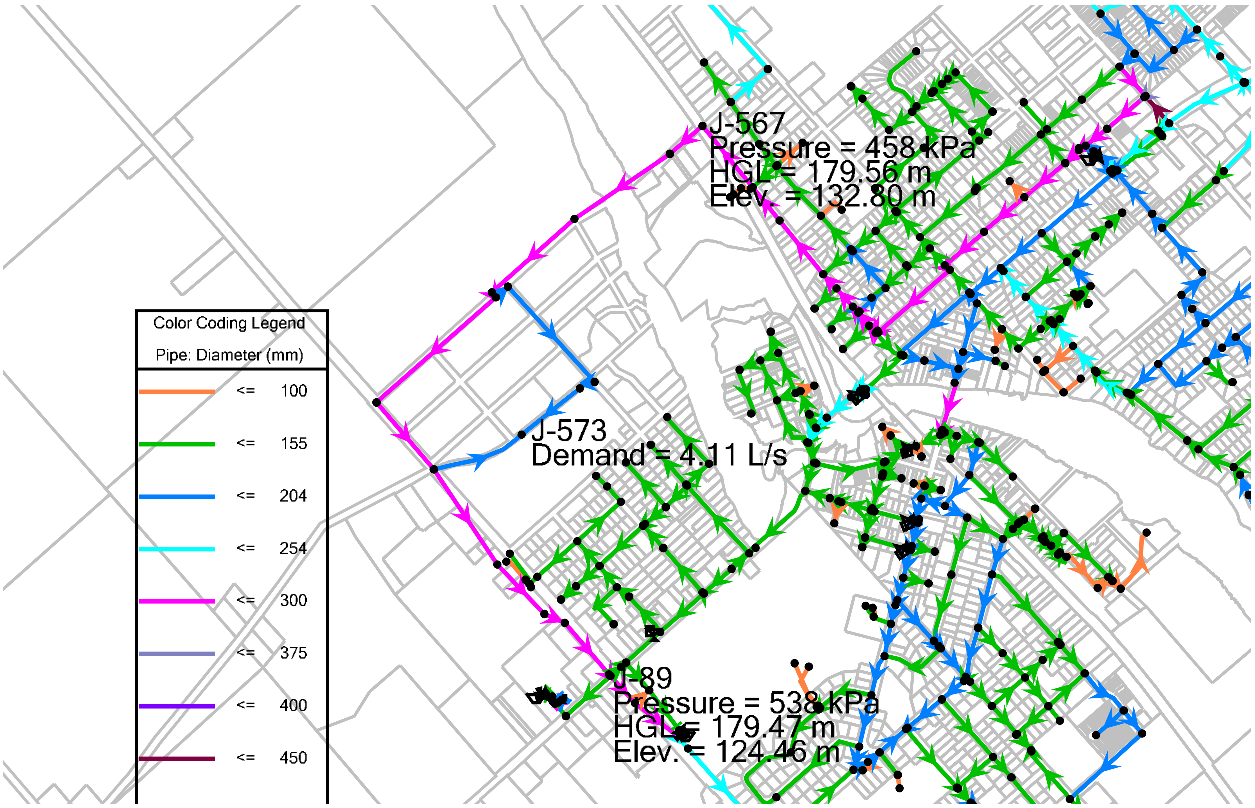
Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
300mm Mississippi River Crossing
ADD (Year 2)



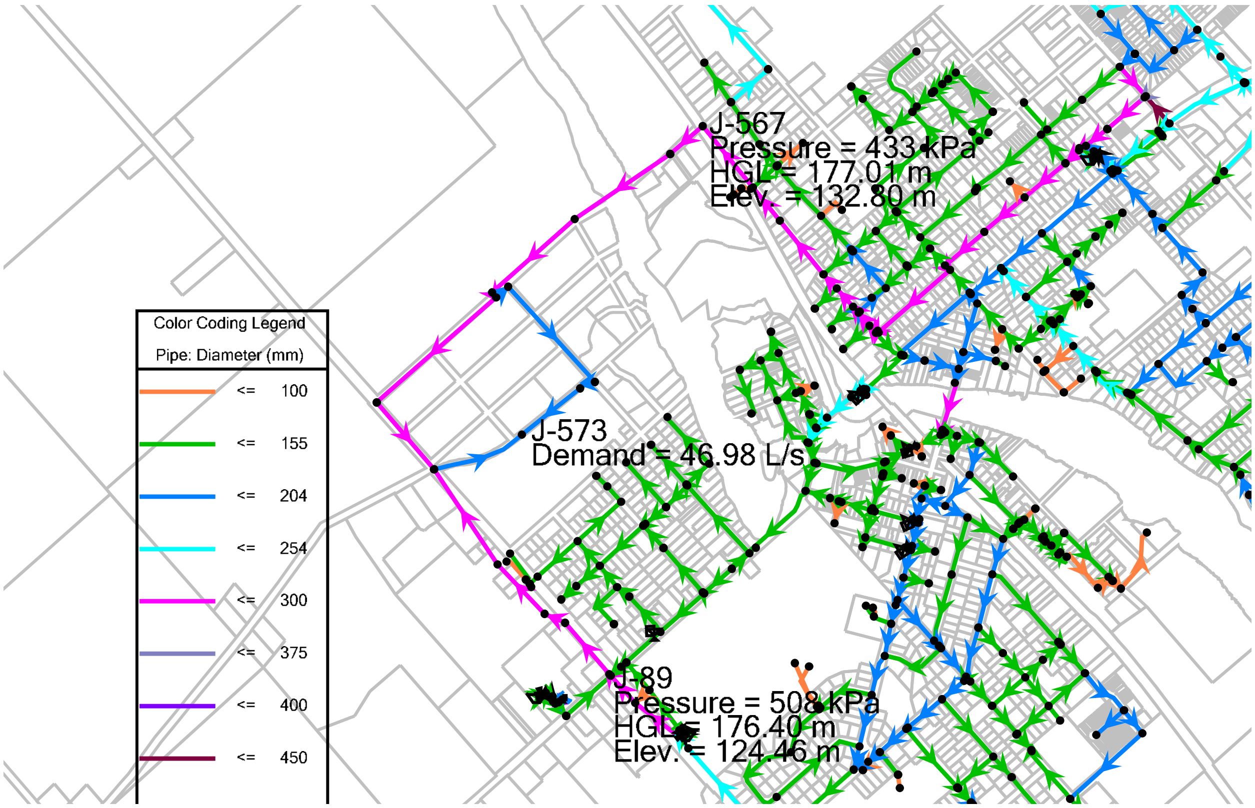
Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
300mm Mississippi River Crossing
ADD (Year 3)



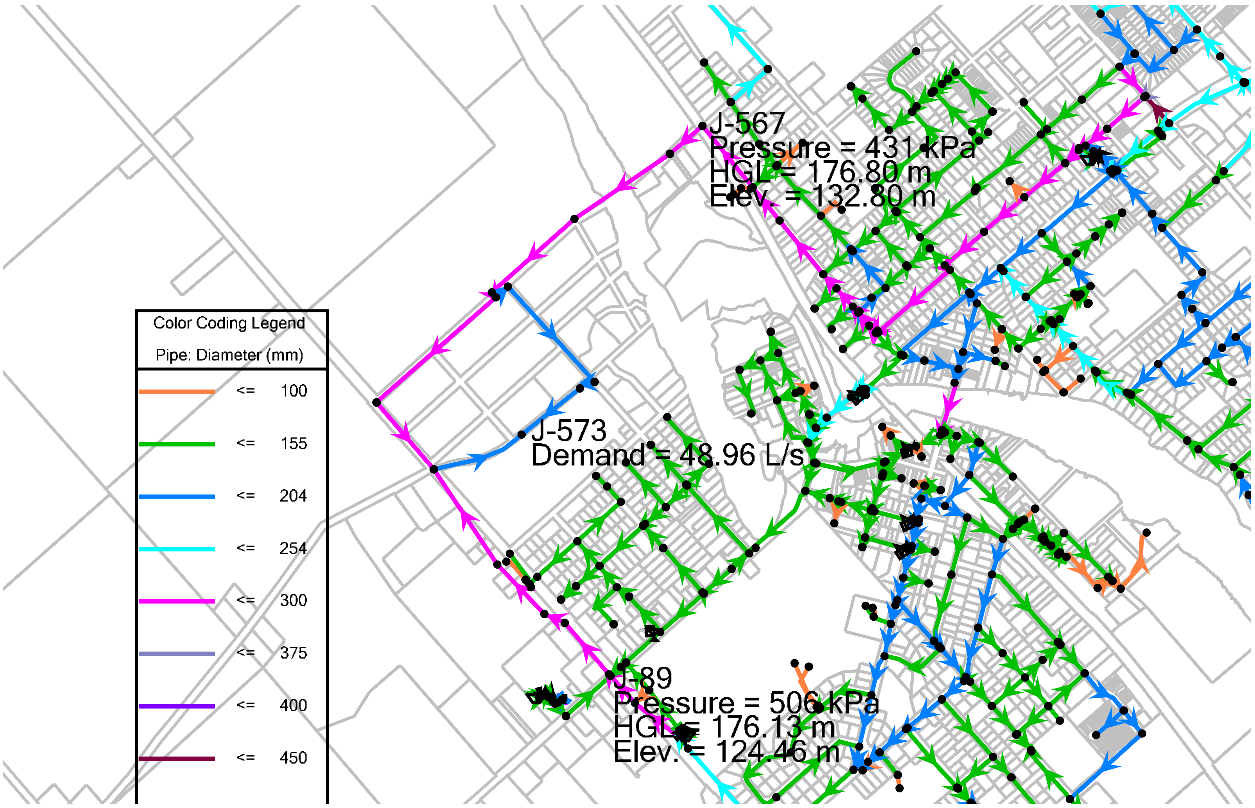
Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
300mm Mississippi River Crossing
ADD (Year 4)



Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
300mm Mississippi River Crossing
MDD+FF (RFF = 45 L/s, Year 1)



Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
300mm Mississippi River Crossing
MDD+FF (RFF = 45 L/s, Year 2)

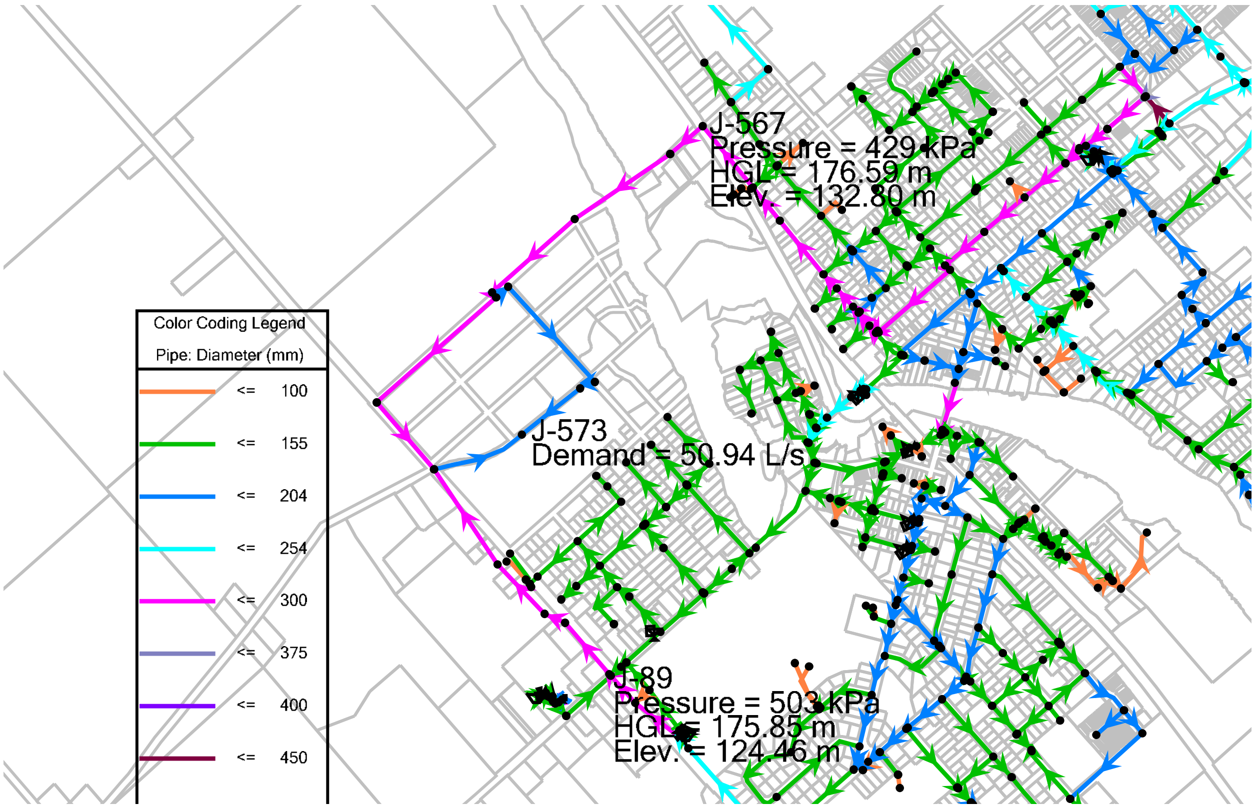


Brown Lands Boundary Condition (Jan 2023)

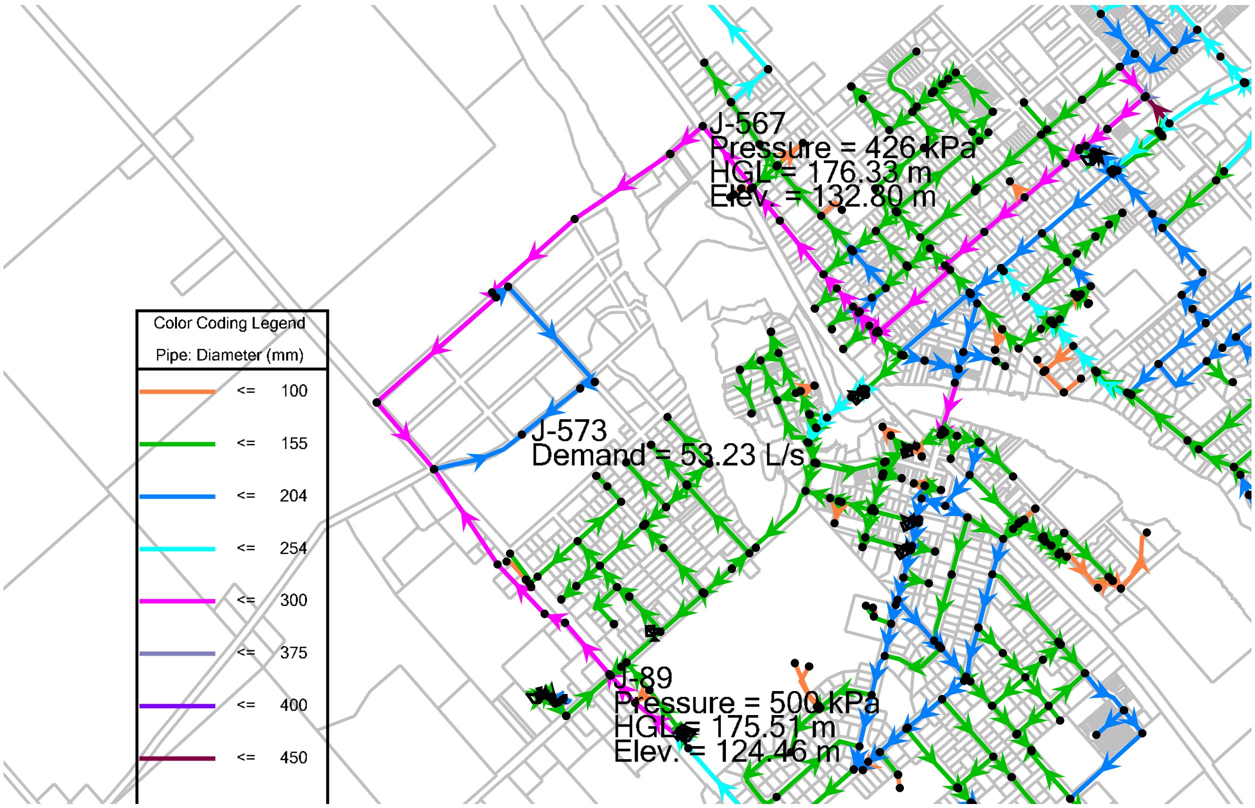
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)

300mm Mississippi River Crossing

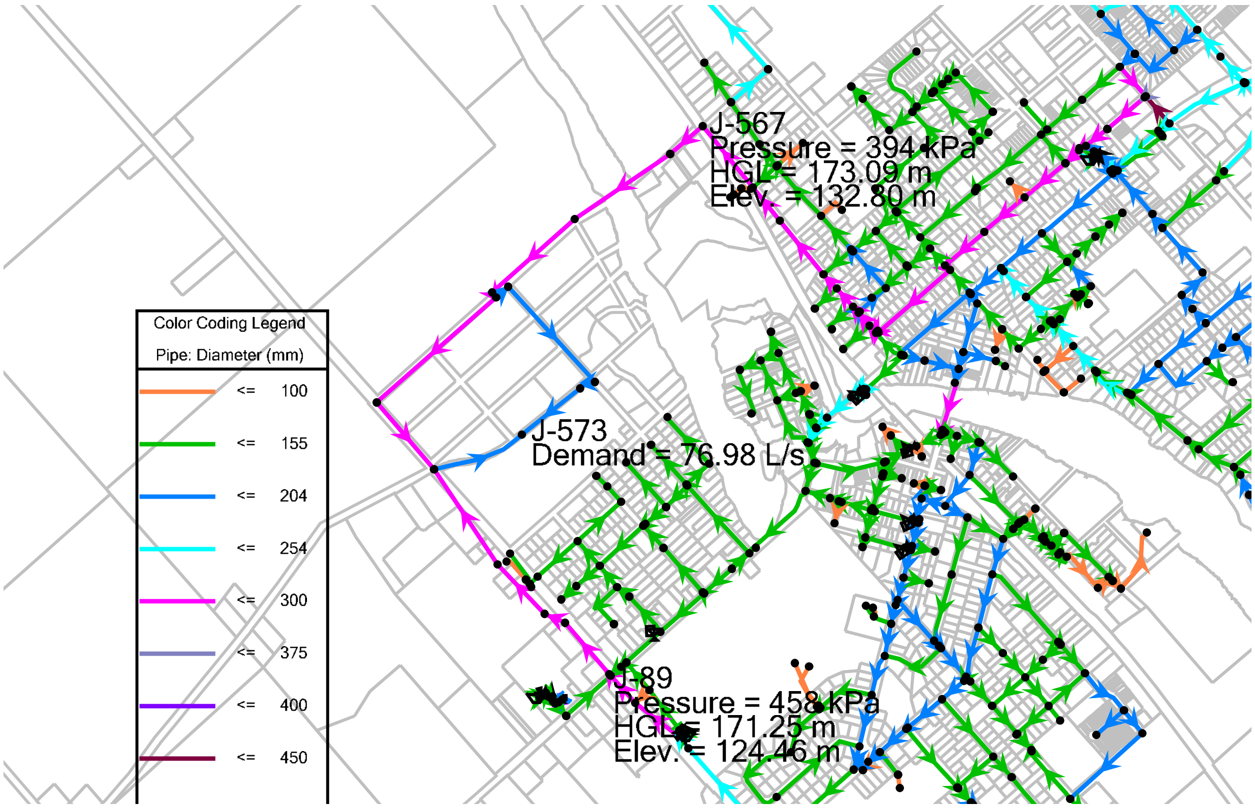
MDD+FF (RFF = 45 L/s, Year 3)



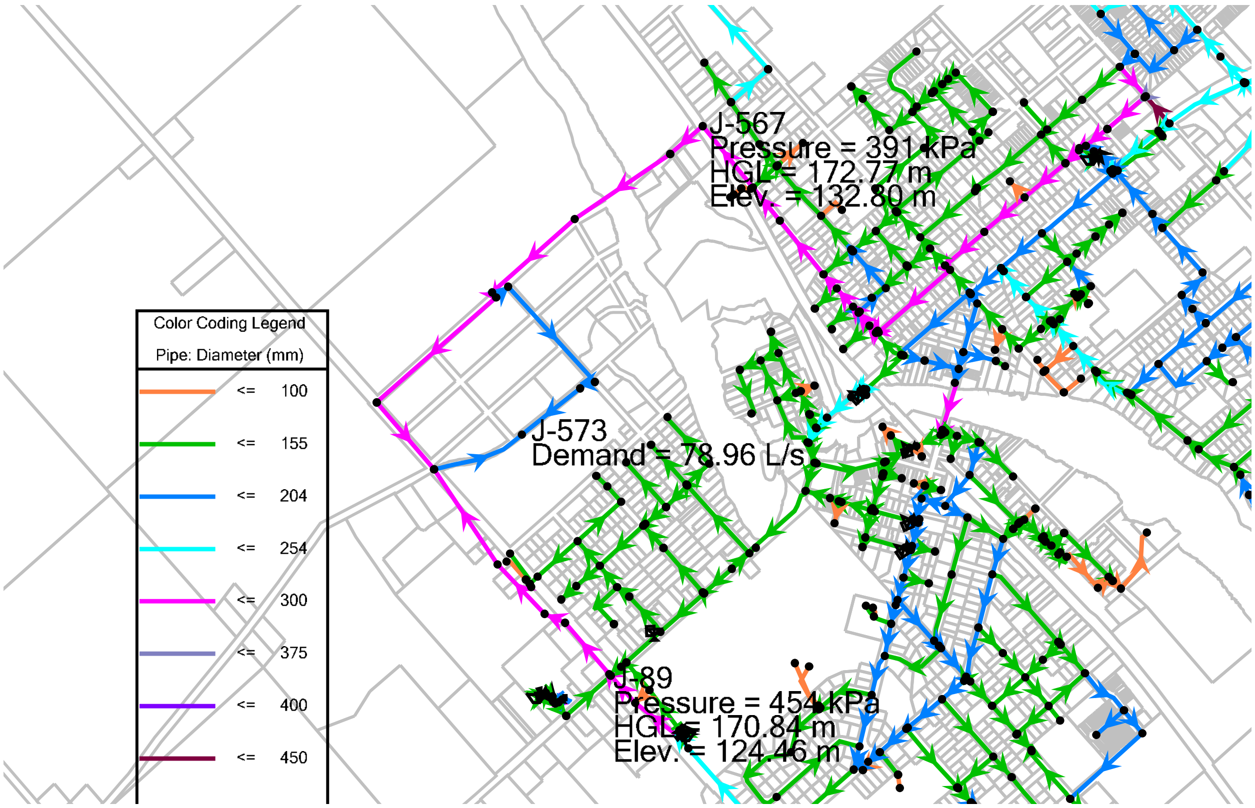
Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
300mm Mississippi River Crossing
MDD+FF (RFF = 45 L/s, Year 4)



Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
300mm Mississippi River Crossing
MDD+FF (RFF = 75 L/s, Year 1)



Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
300mm Mississippi River Crossing
MDD+FF (RFF = 75 L/s, Year 2)

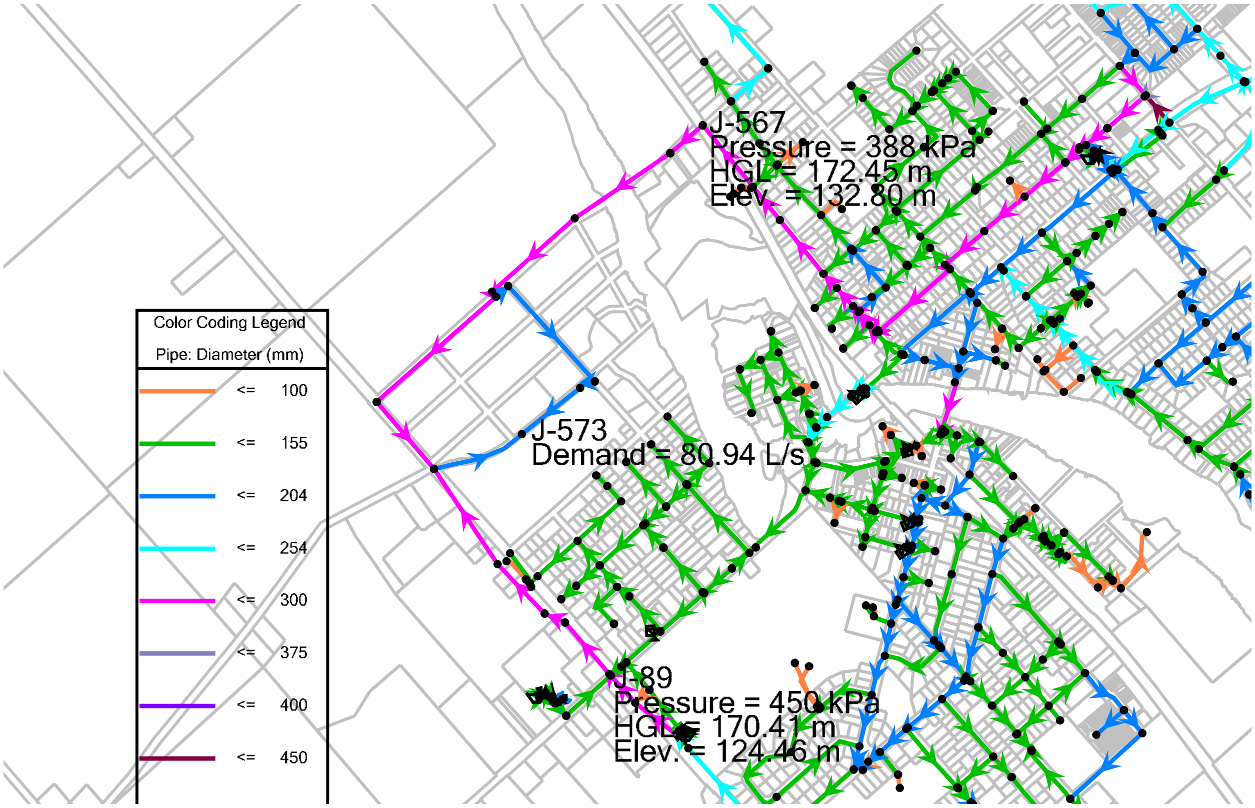


Brown Lands Boundary Condition (Jan 2023)

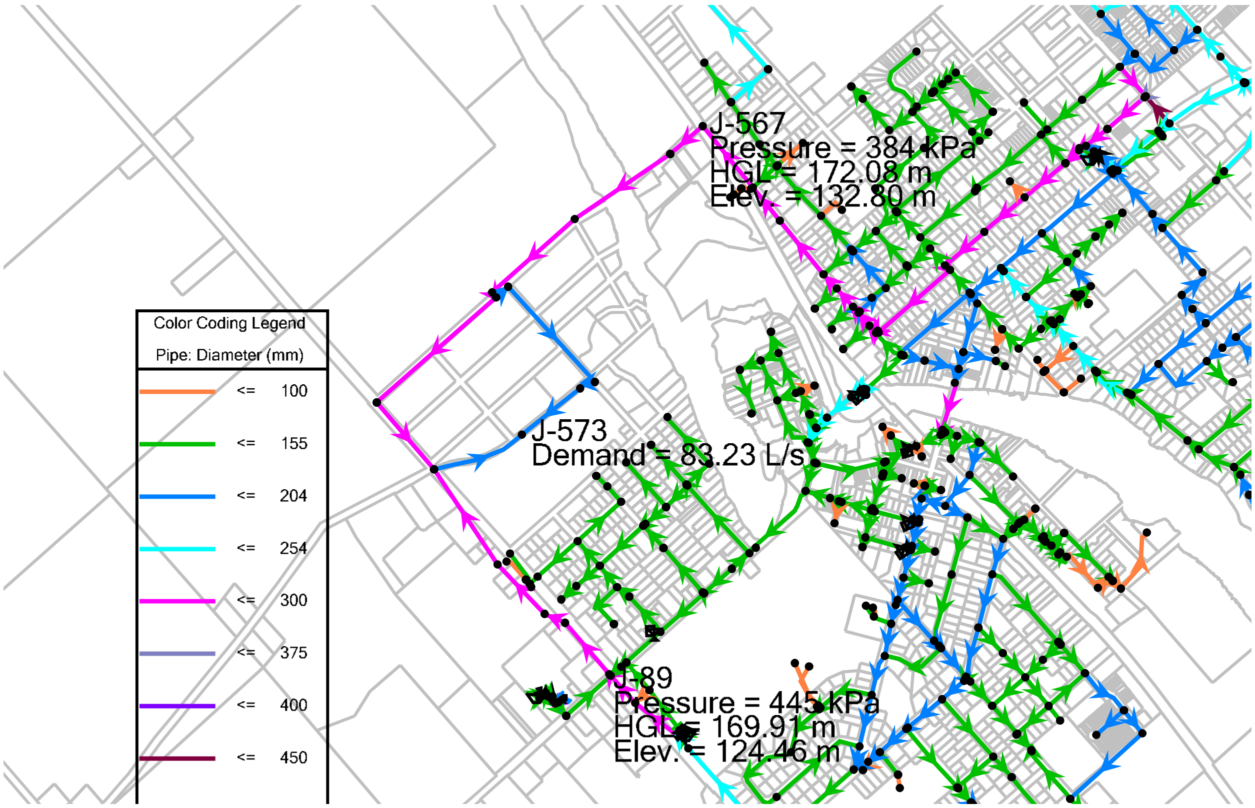
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)

300mm Mississippi River Crossing

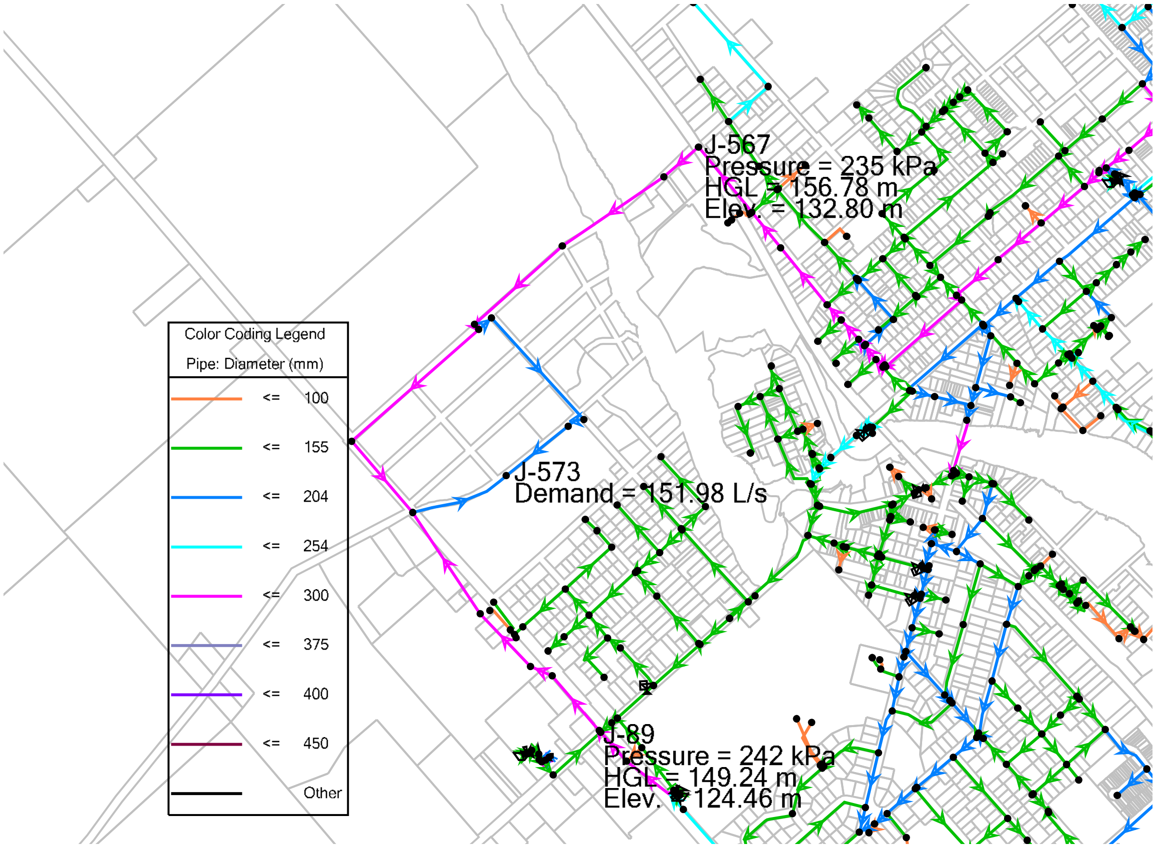
MDD+FF (RFF = 75 L/s, Year 3)



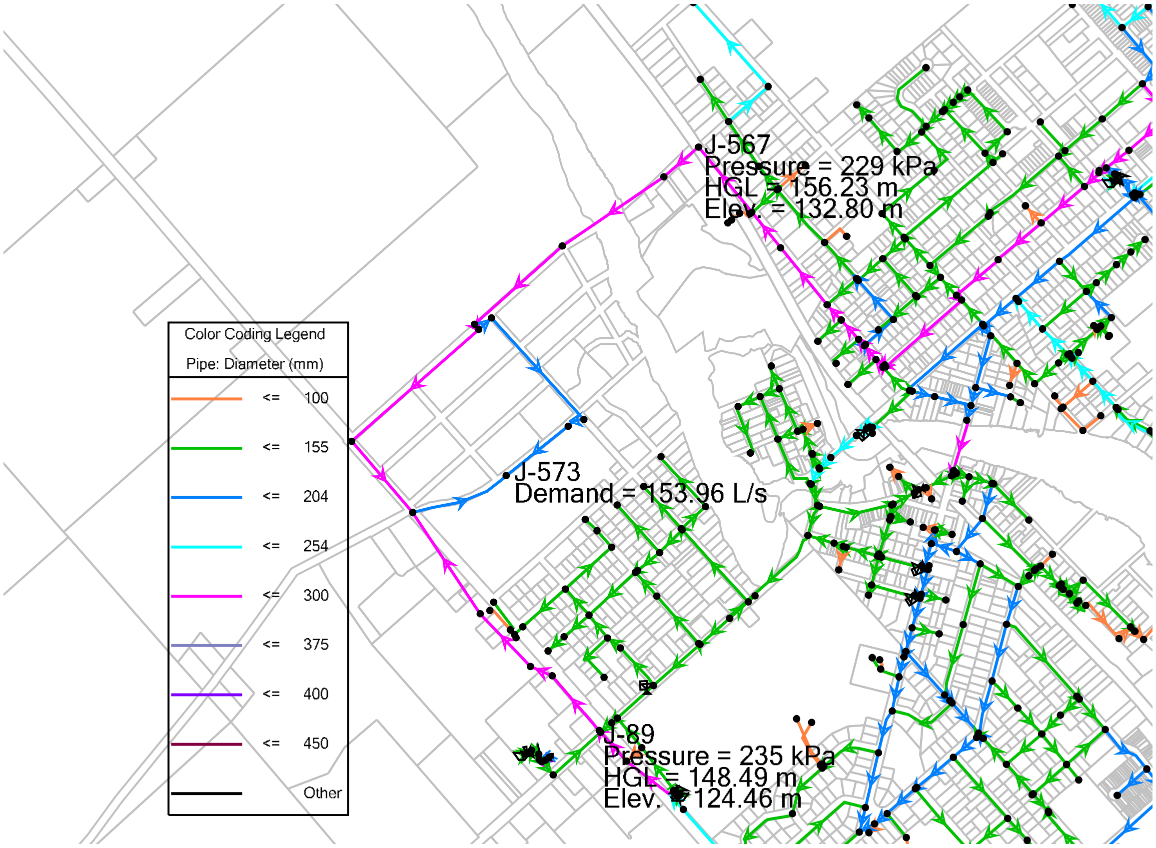
Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
300mm Mississippi River Crossing
MDD+FF (RFF = 75 L/s, Year 4)



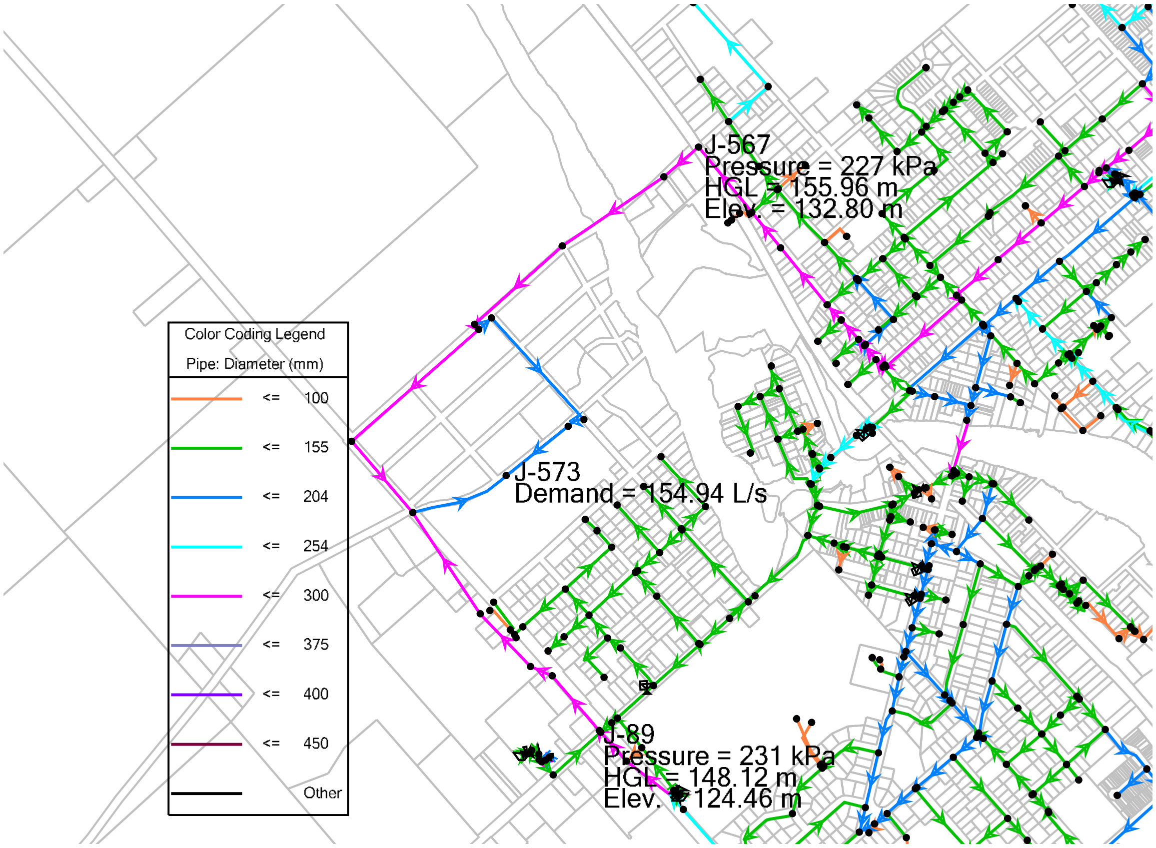
Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
300mm Mississippi River Crossing
MDD+FF (RFF = 150 L/s, Year 1)



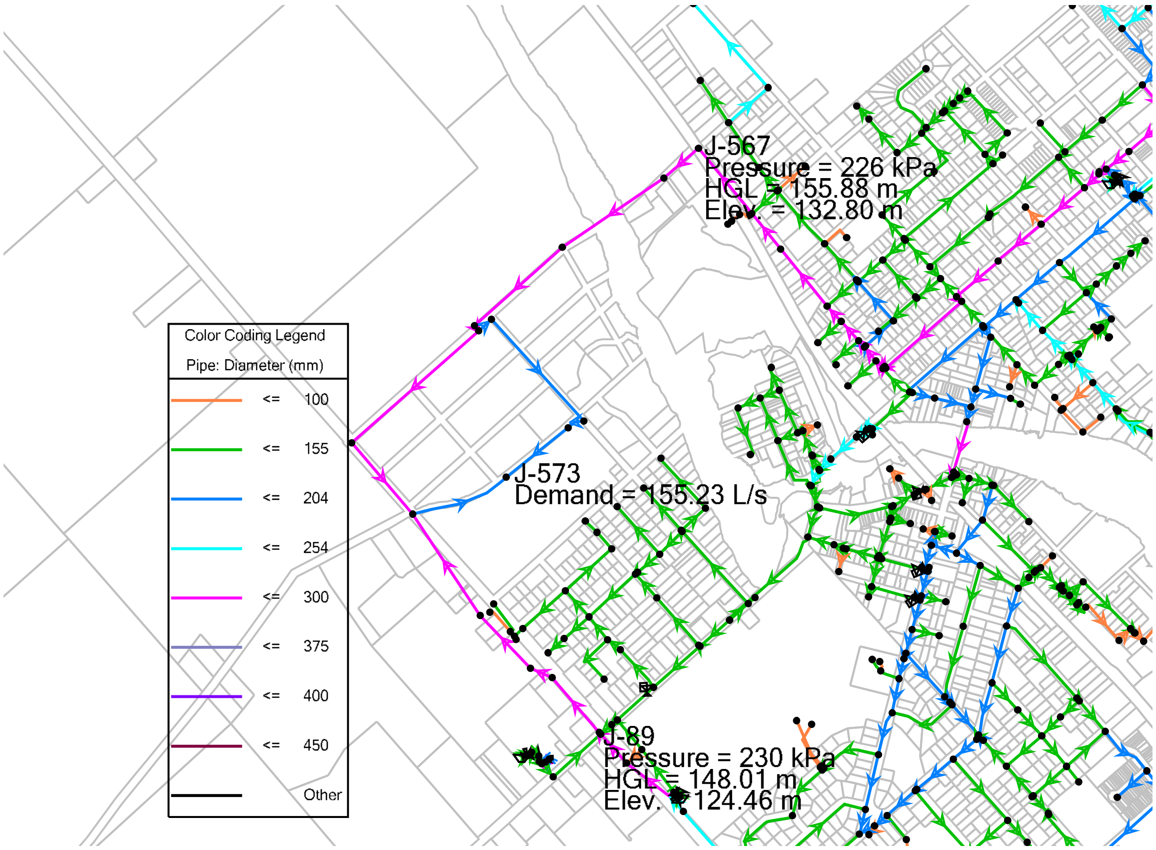
Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
300mm Mississippi River Crossing
MDD+FF (RFF = 150 L/s, Year 2)



Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
300mm Mississippi River Crossing
MDD+FF (FF = 149 L/s, Year 3)



Brown Lands Boundary Condition (Jan 2023)
300mm Upgrade Along County Road 29 (from Well 6 to Strathburn)
300mm Mississippi River Crossing
MDD+FF (FF = 147 L/s, Year 4)



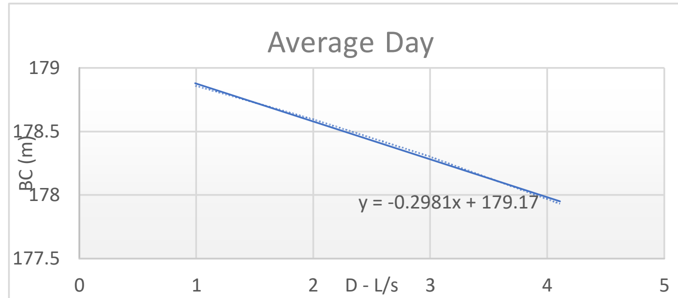
WATERMAIN BOUNDARY CONDITIONS EQUATIONS
Single Connection (250mm dia. - County Road 29)

Adjusted Boundary Conditions

**Boundary Conditions provided by JL Richards & Associates on August 17, 2022*

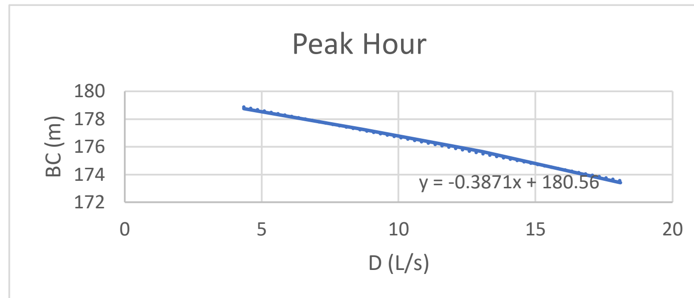
Average Day

Theoretical Demand - D (L/s)	Boundary Condition - BC (@ J-89)* (m)
0.99	*178.86*
1.98	*178.6*
2.97	*178.31*
4.11	*177.93*
Boundary Condition Formula (Approximation):	BC=-0.2981D+179.17



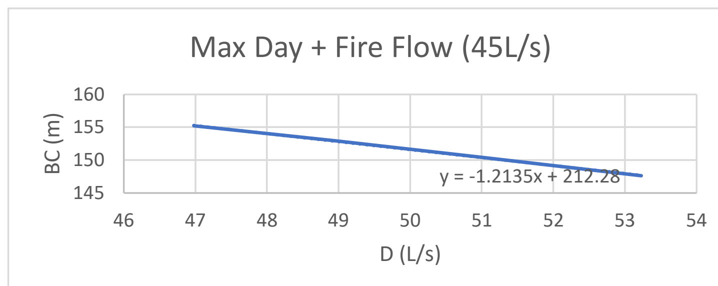
Peak Hour

Theoretical Demand - D (L/s)	Boundary Condition - BC (@ J-89)* (m)
4.35	*178.76*
8.71	*177.26*
13.06	*175.67*
18.1	*173.42*
Boundary Condition Formula (Approximation):	BC=-0.3871D+180.56



Max Day + Fire Flow (45L/s)

Theoretical Demand - D (L/s)	Boundary Condition - BC (@ J-89)* (m)
46.98	*155.22*
48.96	*152.92*
50.94	*150.52*
53.23	*147.64*
Boundary Condition Formula (Approximation):	BC=-1.2135D+212.28



Calculated Boundary Conditions Based on Draft Plan Demands (February 13, 2024)

Condition	Theoretical Demand - D (L/s)	Boundary Condition - BC (@ J-89) (m)
Average Day Demand	2.98	178.28
Peak Hour	16.37	174.22
Max Day + Fire Flow (45L/s)	52.44	148.64

WATERMAIN BOUNDARY CONDITIONS EQUATIONS

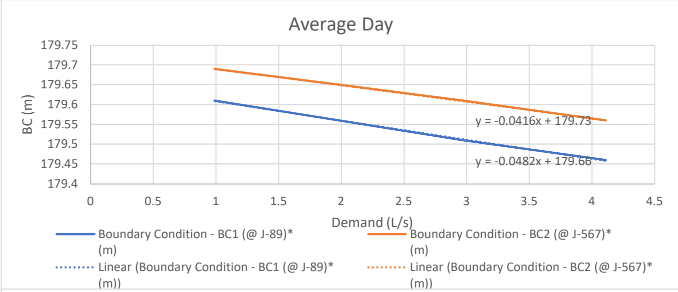
Dual Connection (250mm dia. - County Road 29 and 300mm dia. - Mississippi River Crossing)

Adjusted Boundary Conditions

**Boundary Conditions provided by JL Richards & Associates on August 17, 2022*

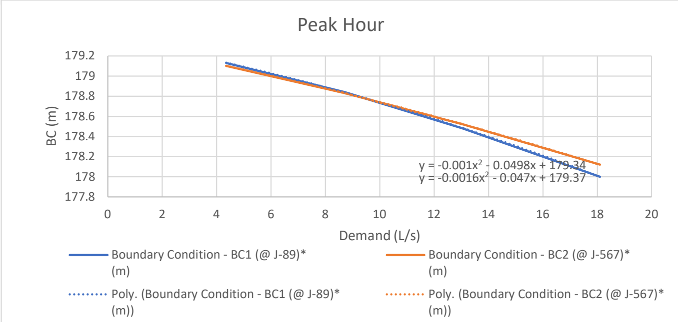
Average Day

Theoretical Demand - D (L/s)	Boundary Condition - BC1 (@ J-89)* (m)	Boundary Condition - BC2 (@ J-567)* (m)
0.99	*179.61*	*179.69*
1.98	*179.56*	*179.65*
2.97	*179.51*	*179.61*
4.11	*179.46*	*179.56*
Boundary Condition Formula (Approximation):	BC1 = -0.0482D+179.68	BC2 = -0.0416D+179.73



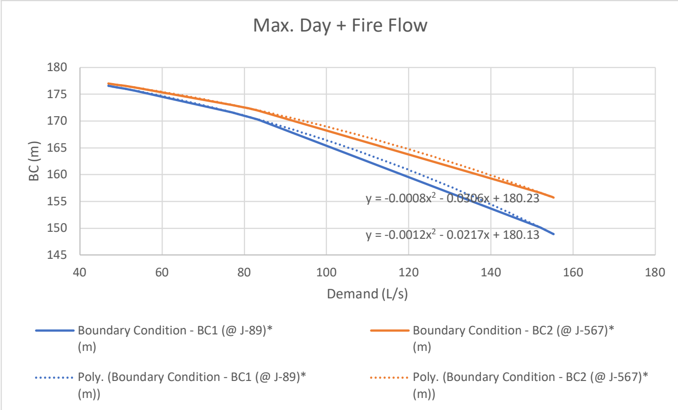
Peak Hour

Theoretical Demand - D (L/s)	Boundary Condition - BC1 (@ J-89)* (m)	Boundary Condition - BC2 (@ J-567)* (m)
4.35	*179.13*	*179.1*
8.71	*178.84*	*178.83*
13.06	*178.48*	*178.52*
18.1	*178*	*178.12*
Boundary Condition Formula (Approximation):	$BC1 = -0.0016D^2-0.047D+179.37$	$BC2 = -0.001D^2-0.0498D+179.34$



Max Day + Fire Flow (45L/s & 75L/s)

Theoretical Demand - D (L/s)	Boundary Condition - BC1 (@ J-89)* (m)	Boundary Condition - BC2 (@ J-567)* (m)
46.98	*176.56*	*176.98*
48.96	*176.3*	*176.76*
50.94	*176.03*	*176.55*
53.23	*175.71*	*176.28*
76.98	*171.62*	*173.02*
78.96	*171.22*	*172.7*
80.94	*170.8*	*172.38*
83.23	*170.32*	*172*
151.98	*150.13*	*156.63*
153.96	*149.40*	*156.08*
154.94	*149.03*	*155.81*
155.23	*148.93*	*155.73*
Boundary Condition Formula (Approximation):	$BC1 = -0.0012D^2-0.0217D+180.13$	$BC2 = -0.0008D^2-0.0306D+180.23$



Calculated Boundary Conditions Based on Draft Plan Demands (February 13, 2024)

Condition	Theoretical Demand - D (L/s)	Boundary Condition - BC1 (@ J-89) (m)	Boundary Condition - BC2 (@ J-567) (m)
Average Day Demand	2.98	179.52	179.61
Peak Hour	16.37	178.17	178.26
Max Day + Fire Flow (133L/s)	140.44	153.41	160.15

Extrapolated Values Based on Boundary Conditions provided by JL Richards for a 300mm dia. Pipe on Cty Rd 29 (February 1, 2023)

M E M O R A N D U M

DATE: DECEMBER 22, 2023, REVISION: FEBRUARY 13, 2024

TO: MELANIE KNIGHT; CORY SMITH; KEN KELLY

FROM: MELANIE RIDDELL; TREVOR MCKAY

RE: WATER SERVICING – BUILDOUT TIMING AND FIRE FLOW REQUIREMENTS
BROWN LANDS – REVISION 1
118178

CC: EVAN GARFINKEL; JOHN RIDDELL

ATTACHMENT: APPENDIX A – OBC FIRE FLOW CALCULATIONS & FIGURES, 25 PAGES
APPENDIX B – WATER SUPPLY FOR PUBLIC FIRE PROTECTION, FIRE UNDERWRITERS SURVEY, 2020; EXCERPT – PAGES 33 & 34

Further to previous discussions, this memorandum is being provided to demonstrate the viability the interim water servicing strategy (a single feeder main on County Road 29) until the Mississippi River third crossing is completed. Municipality of Mississippi Mills staff have identified two areas of concern with the proposed interim servicing proposal; the number of units that will be allowed to be occupied on a single watermain feed, and the limited fire flow available with the single watermain feed.

Number of Units Allowable under the Interim condition

The anticipated schedule for the project is to commence site servicing work in spring/summer 2025 followed by housing construction starting in fall 2025. First occupancies would be summer/fall 2026, with an estimated 25 units closing in 2026. Current project estimates are the construction of 40-50 units/year for the remainder of the project. Based on the above schedule it is anticipated that there will be approximately 75 occupied units at the end of 2027, with an additional 40-50 units under construction.

This aligns with the provided schedules from the Municipality of Mississippi Mills which have indicated that the County Road 29 watermain will be constructed in 2024/2025 and the Mississippi River third crossing will be constructed in 2026/2027. Based on the above timelines, there could be up to 75 occupied units serviced from a single watermain feed prior to the scheduled completion of the Mississippi River third crossing.

There is no policy or design standard which provides an upper limit on the number of units that can be serviced from a single watermain feed. The Ontario Ministry of the Environment, Conservation and Parks requires only that "where dead end watermains can not be avoided, they shall be designed with a means to provide adequate flushing" (Section 5.1, Watermain Design Criteria for Future Alterations Authorized Under a Drinking Water Works Permit, June 2012). Current industry guidelines for servicing from a single watermain feed are to permit up to 50 units on a permanent basis or up to 75 unit on a temporary basis (Section 4.3.1, City of Ottawa Design Guidelines – Water Distribution, July 2010). The City of Ottawa has permitted exemptions to the above guidelines and allowed up to 200 units to be serviced from a single feeder main on a temporary basis (Kanata North Urban

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Expansion Area). In addition, the entire village of Manotick was serviced with a single backbone watermain feed until as recently as 2022.

The reason for implementing a limit on the number of units that can be serviced from a single watermain is to limit the risk of a large service outage if something happens to that watermain. Generally, the risk of watermain failure increases with the age of the infrastructure. In this situation the backbone watermain (County Road 29) will have been constructed immediately in advance from the water supply (Well 6) and present a very low risk of failure.

It is our opinion that permitting 75 units to be occupied prior to the end of 2027 supplied by a single offsite watermain feed is reasonable and in accordance with current industry guidelines. There is also precedence to permit additional units to be occupied while supplied by a single watermain should the completion of Mississippi River third crossing be delayed beyond 2027.

Fire flow Requirements

The Municipality has indicated that the Fire Underwriters Survey (FUS) method is to be used to determine the required fire flow demand for the watermain analysis under ultimate servicing conditions. The Municipality will accept use of the Ontario Building Code (OBC) method to determine the required fire flow demands for interim servicing requirements, as confirmed in the meeting on July 26, 2023.

The Municipality's Engineer (J.L. Richards) has indicated that fire flows of 45L/s can be supplied under interim servicing conditions (single feeder main on County Road 29) and that fire flows up to 150L/s are available in the ultimate servicing condition (County Road 29 feeder main looped to Mississippi River third crossing feeder main).

A detailed review of the units anticipated to be offered for sale on this project by the builder (EQ Homes) has been completed to demonstrate that the fire flow demands for the proposed unit types can be meet under both servicing scenarios. The results of the fire flow determination methods (OBC & FUS) for the proposed typical wood frame residential units are summarized in **Table 1**. Fire flow calculation and figures for the OBC fire flow calculations can be found in Appendix A. FUS tables can be found in Appendix B. Several of the results are slightly lower than presented in the initial draft plan of subdivision application. This is due to standard general assumptions that were made for the initial submission that have been refined in more detail. The updated results will be used in the forthcoming draft plan of subdivision resubmission.

Table 1: OBC and FUS Required Fire Flows (Typical Wood Frame Construction)[1]

Unit Size (Largest EQ Homes 2023 Unit)	OBC Required Fire Flow (L/s)	FUS Simple Method (L/s)[2]
Two-Storey Single (33')	45	133
Two-Storey Single (37')	45	133
Two-Storey Single (42')	45	133
One-Storey Single (50')	45	133
Two-Storey Single (50')	45	133

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2-Unit Bungalow Townhome	60[3]	67
3-Unit Bungalow Townhome	105[3]	133
4-Unit Two-Storey Townhome	105[3]	133
5-Unit Two-Storey Townhome	105[3]	133
6-Unit Two-Storey Townhome	150[3]	133

1. Fire flow calculations for all units are based on maximum total interior footprint area (including exterior and interior wall areas, excluding porches).
2. As per Table 7 & Table 8 (FUS 2020). Exposure distances are 2.4m (<3m) for singles and 3m (3-10m) for townhomes.
3. Fire flows for all townhome units can be reduced to 45L/s by incorporating 2-hr firewall(s) into the blocks (Table 2).

The fire flow demand for the proposed townhome unit types exceeds the supply that is available under interim servicing conditions. A review was completed on the impacts of providing 2-hour rated internal firewalls between townhome units. The results are summarized in Table 2.

Table 2: OBC Required Fire Flow for Townhome Units with 2-hour Internal Firewalls

Unit Size (Largest EQ Homes 2023 Unit)	OBC Required Fire Flows (L/s)	
	1 - 2hr Internal Firewall	2 - 2hr Internal Firewalls
2-Unit Bungalow Townhome	45	Not Required
3-Unit Bungalow Townhome	60	45
4-Unit Two-Storey Townhome	45	Not Required
5-Unit Two-Storey Townhome	60	45
6-Unit Two-Storey Townhome	75	45

The fire flow available under interim servicing conditions (45L/s) is adequate to meet the demand for all single unit product types proposed for this development. In addition, all proposed townhome units can be accommodated if there are 2-hour firewalls provided between every bungalow townhome unit and every second two-story townhome unit should the builder wish to proceed with occupancy of townhome units prior to the completion of the third river crossing.

Under ultimate servicing conditions the available fire flow (+/-150L/s) is sufficient to meet the required demand (133L/s).

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APPENDIX A

OBC FIRE FLOW CALCULATIONS & FIGURES

OBC Water Supply for Firefighting Calculation

Based on OBC 2012 (Div. B, Article 3.2.5.7)

References: Ontario Fire Marshal - OBC Fire Fighting Water Supply
Ontario Building Code 2012, Appendix A, Vol 2., A-3.2.5.7

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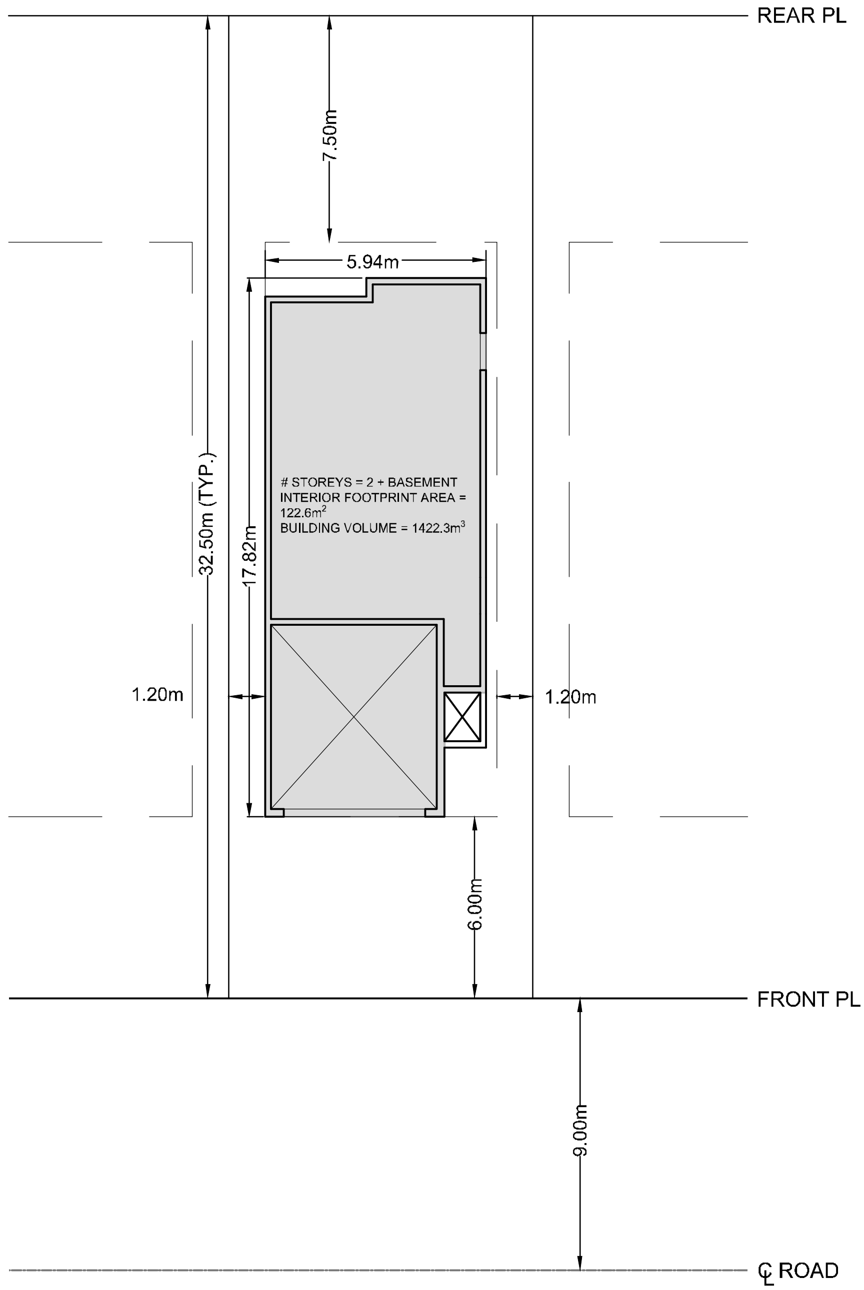
Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay

Legend
Input by User
No Input Required

Building Description: Single detached home, 2-storey, 33' Unit - "Charlotte", See Figure FF-1

Unsprinklered

Step		Calculation Inputs		Calculation Notes		Value
	Minimum Fire Protection Water Supply Volume					
1	**Water Supply Coefficient**					
	Building Classification =	C		From Table 3.1.2.1		
	Water Supply Coefficient - K =			From Table 1 (A3.2.5.7)		23
2	**Total Building Volume**					
	# Floors (Incl. Basement)	3				
	Interior Building Area - A	122.6	m^2			
	Effective Building Height - H	11.6	m			
	Total Building Volume - V =			A * H		**1422.3 m³**
3	**Spatial Coefficient Value**					
	Exposure Distances: (Exterior building face to property/lot line, to street centre, or to mid-point between proposed building and another building on same lot)			**Spatial Coefficients:** From Figure 1 (Spatial Coefficient vs Exposure Distance)		
	North	7.50	m	Sside 1 =	**0.25**	
	East	1.20	m	Sside 2 =	**0.50**	
	South	15.00	m	Sside 3 =	**0.00**	
	West	1.20	m	Sside 4 =	**0.50**	
	Total of Spacial Coefficient Values - S-Tot as obtained from the formula =			1.0 + (Sside 1 + Sside 2 + Sside 3 + Sside 4) (Max. value = 2.0)		**2.00**
4	**Minimum Fire Protection Water Supply Volume**					
	Q =			$K * V * S_{Tot}$		**65,425 L**
	Required Minimum Water Supply Flow Rate					
5	Minimum Water Supply Flow Rate =			From Table 2 (For water supply from a municipal or industrial water supply system, min. pressure is 140 kPa)		**2,700 L/min** or **45 L/s**
	Minimum Fire Protection Water Supply Volume for 30 minutes					
6	Q =			= Minimum Water Supply Flow Rate (L/min) * 30 minutes		**81,000 L**
	Required Fire Protection Water Supply Volume					
7	Q =			Highest volume out of (4) and (6)		**81,000 L**
Notes						



LEGEND:

INTERIOR FOOTPRINT AREA

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

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BROWN LANDS

FIRE FLOW CALCULATION FIGURE
LARGEST 33' UNIT ("CHARLOTTE")

SCALE		
1 : 250		
DATE: OCT 2023	JOB: 118178	FIGURE: FF-1

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OBC Water Supply for Firefighting Calculation

Based on OBC 2012 (Div. B, Article 3.2.5.7)

References: Ontario Fire Marshal - OBC Fire Fighting Water Supply
Ontario Building Code 2012, Appendix A, Vol 2., A-3.2.5.7

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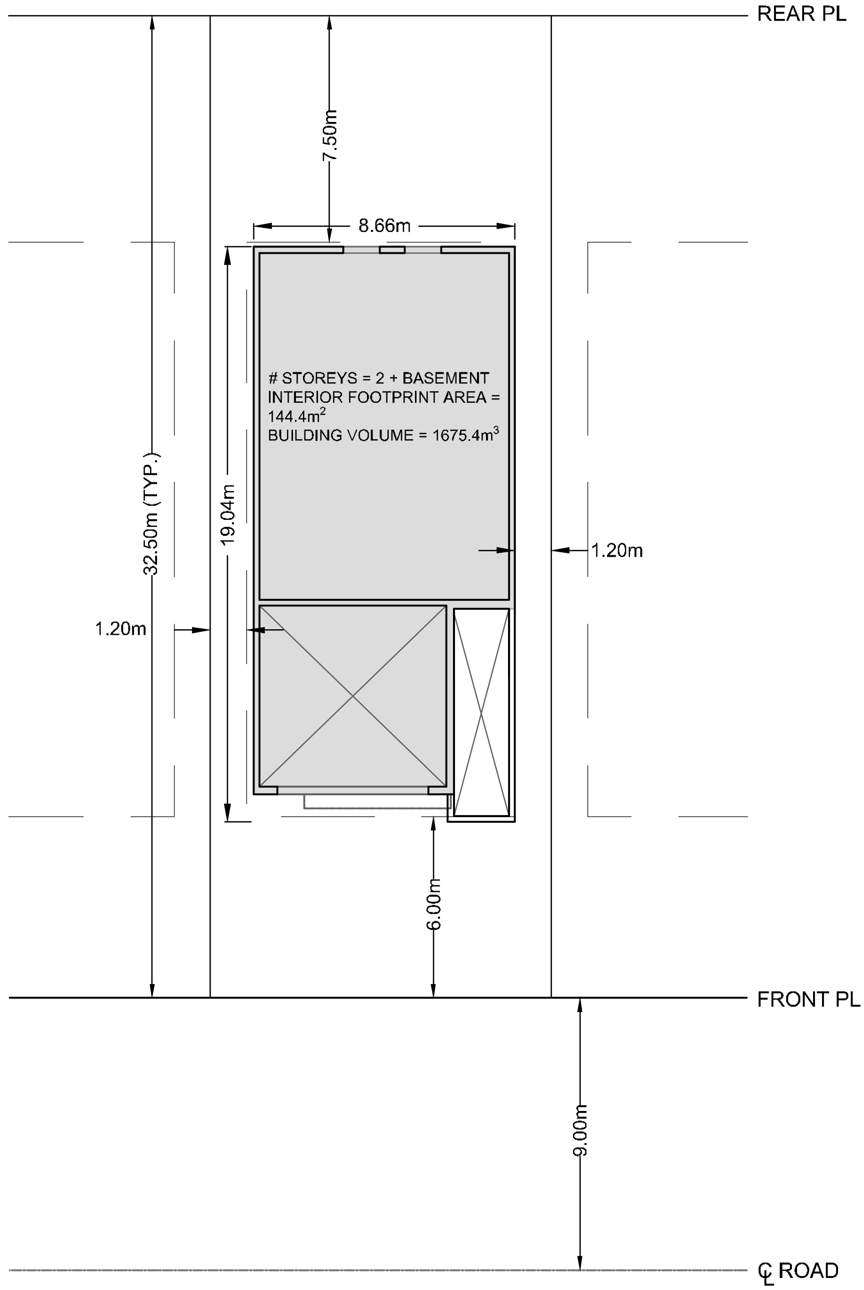
Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay

Legend
Input by User
No Input Required

Building Description: Single detached home, 2-storey, 37' Unit - "Piper", See Figure FF-2

Unsprinklered

Step		Calculation Inputs		Calculation Notes	Value
	Minimum Fire Protection Water Supply Volume				
1	**Water Supply Coefficient**				
	Building Classification =	C		From Table 3.1.2.1	
	Water Supply Coefficient - K =			From Table 1 (A3.2.5.7)	**23**
2	**Total Building Volume**				
	# Floors (Incl. Basement)	3			
	Interior Building Area - A	144.4	m^2		
	Effective Building Height - H	11.6	m		
	Total Building Volume - V =			A * H	**1675.4 m³**
3	**Spatial Coefficient Value**				
	Exposure Distances: (Exterior building face to property/lot line, to street centre, or to mid-point between proposed building and another building on same lot)			**Spatial Coefficients:** From Figure 1 (Spatial Coefficient vs Exposure Distance)	
	North	7.50	m	Sside 1 = **0.25**	
	East	1.20	m	Sside 2 = **0.50**	
	South	15.00	m	Sside 3 = **0.00**	
	West	1.20	m	Sside 4 = **0.50**	
	Total of Spacial Coefficient Values - S-Tot as obtained from the formula =			1.0 + (Sside 1 + Sside 2 + Sside 3 + Sside 4) (Max. value = 2.0)	**2.00**
4	**Minimum Fire Protection Water Supply Volume**				
	Q =			$K * V * S_{Tot}$	**77,067 L**
	Required Minimum Water Supply Flow Rate				
5	**Minimum Water Supply Flow Rate =**			From Table 2 (For water supply from a municipal or industrial water supply system, min. pressure is 140 kPa)	**2,700 L/min** or **45 L/s**
	Minimum Fire Protection Water Supply Volume for 30 minutes				
6	**Q =**			= Minimum Water Supply Flow Rate (L/min) * 30 minutes	**81,000 L**
	Required Fire Protection Water Supply Volume				
7	**Q =**			Highest volume out of (4) and (6)	**81,000 L**
Notes					



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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

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BROWN LANDS

FIRE FLOW CALCULATION FIGURE LARGEST 37' UNIT ("PIPER 'C'")

SCALE	DATE	JOB	FIGURE
1 : 250	OCT 2023	118178	FF-2

OBC Water Supply for Firefighting Calculation

Based on OBC 2012 (Div. B, Article 3.2.5.7)

References: Ontario Fire Marshal - OBC Fire Fighting Water Supply
Ontario Building Code 2012, Appendix A, Vol 2., A-3.2.5.7

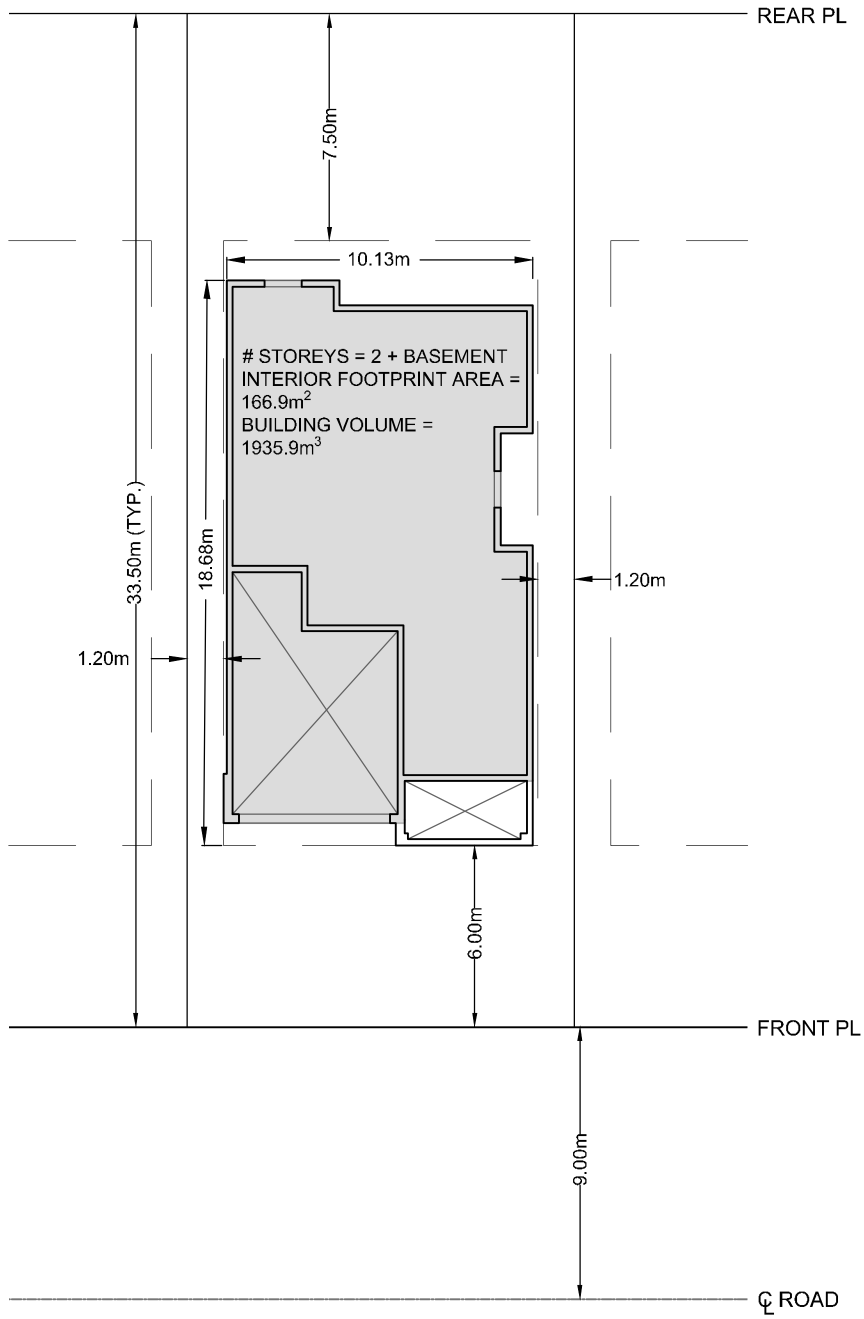
Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay

Legend
Input by User
No Input Required

Building Description: Single detached home, 2-storey, 42' Unit - "Oliver", See Figure FF-3

Unsprinklered

Step		Calculation Inputs		Calculation Notes		Value
	Minimum Fire Protection Water Supply Volume					
1	**Water Supply Coefficient**					
	Building Classification =	C		From Table 3.1.2.1		
	Water Supply Coefficient - K =			From Table 1 (A3.2.5.7)		23
2	**Total Building Volume**					
	# Floors (Incl. Basement)	3				
	Interior Building Area - A	166.9	m^2			
	Effective Building Height - H	11.6	m			
	Total Building Volume - V =			A * H		**1935.9 m³**
3	**Spatial Coefficient Value**					
	Exposure Distances: (Exterior building face to property/lot line, to street centre, or to mid-point between proposed building and another building on same lot)			**Spatial Coefficients:** From Figure 1 (Spatial Coefficient vs Exposure Distance)		
	North	7.50	m	Sside 1 =	**0.25**	
	East	1.20	m	Sside 2 =	**0.50**	
	South	15.00	m	Sside 3 =	**0.00**	
	West	1.20	m	Sside 4 =	**0.50**	
	Total of Spacial Coefficient Values - S-Tot as obtained from the formula =			1.0 + (Sside 1 + Sside 2 + Sside 3 + Sside 4) (Max. value = 2.0)		**2.00**
4	**Minimum Fire Protection Water Supply Volume**					
	Q =			$K * V * S_{Tot}$		**89,052 L**
	Required Minimum Water Supply Flow Rate					
5	Minimum Water Supply Flow Rate =			From Table 2 (For water supply from a municipal or industrial water supply system, min. pressure is 140 kPa)		**2,700 L/min** or **45 L/s**
	Minimum Fire Protection Water Supply Volume for 30 minutes					
6	**Q =**			= Minimum Water Supply Flow Rate (L/min) * 30 minutes		**81,000 L**
	Required Fire Protection Water Supply Volume					
7	**Q =**			Highest volume out of (4) and (6)		**89,052 L**
Notes						



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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

MUNICIPALITY of MISSISSIPPI MILLS
BROWN LANDS

FIRE FLOW CALCULATION FIGURE
LARGEST 42' UNIT ("OLIVER")

SCALE	DATE	JOB	FIGURE
1 : 250	OCT 2023	118178	FF-3

OBC Water Supply for Firefighting Calculation

Based on OBC 2012 (Div. B, Article 3.2.5.7)

References: Ontario Fire Marshal - OBC Fire Fighting Water Supply
Ontario Building Code 2012, Appendix A, Vol 2., A-3.2.5.7

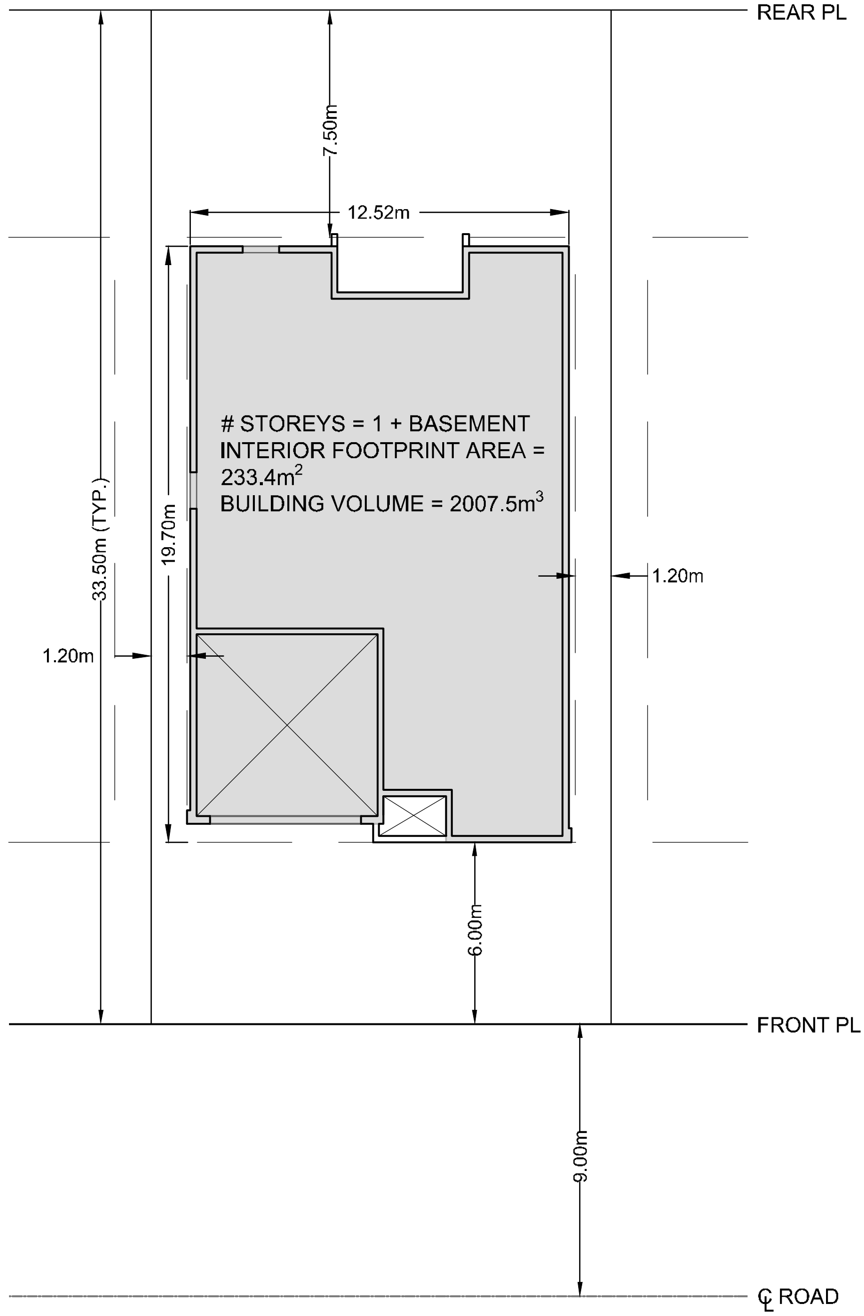
Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay

Legend
Input by User
No Input Required

Building Description: Single detached home, 1-storey, 50' Unit Bungalow - "Willow", See Figure FF-4

Unsprinklered

Step		Calculation Inputs		Calculation Notes	Value
	Minimum Fire Protection Water Supply Volume				
1	**Water Supply Coefficient**				
	Building Classification =	C		From Table 3.1.2.1	
	Water Supply Coefficient - K =			From Table 1 (A3.2.5.7)	23
2	**Total Building Volume**				
	# Floors (Incl. Basement)	2			
	Interior Building Area - A	233.4	m^2		
	Effective Building Height - H	8.6	m		
	Total Building Volume - V =			A * H	**2007.5 m^3**
3	**Spatial Coefficient Value**				
	Exposure Distances: (Exterior building face to property/lot line, to street centre, or to mid-point between proposed building and another building on same lot)			**Spatial Coefficients:** From Figure 1 (Spatial Coefficient vs Exposure Distance)	
	North	7.50	m	Sside 1 = **0.25**	
	East	1.20	m	Sside 2 = **0.50**	
	South	15.00	m	Sside 3 = **0.00**	
	West	1.20	m	Sside 4 = **0.50**	
	Total of Spacial Coefficient Values - S-Tot as obtained from the formula =			1.0 + (Sside 1 + Sside 2 + Sside 3 + Sside 4) (Max. value = 2.0)	**2.00**
4	**Minimum Fire Protection Water Supply Volume**				
	Q =			$K * V * S_{Tot}$	**92,343 L**
	Required Minimum Water Supply Flow Rate				
5	Minimum Water Supply Flow Rate =			From Table 2 (For water supply from a municipal or industrial water supply system, min. pressure is 140 kPa)	**2,700 L/min** or **45 L/s**
	Minimum Fire Protection Water Supply Volume for 30 minutes				
6	Q =			= Minimum Water Supply Flow Rate (L/min) * 30 minutes	**81,000 L**
	Required Fire Protection Water Supply Volume				
7	Q =			Highest volume out of (4) and (6)	**92,343 L**
Notes					



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Engineers, Planners & Landscape Architects
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Ottawa, Ontario, Canada K2M 1P6

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

MUNICIPALITY of MISSISSIPPI MILLS
BROWN LANDS

FIRE FLOW CALCULATION FIGURE
LARGEST 50' BUNGALOW UNIT
("WILLOW")

SCALE 1 : 250 (0 2 4 6 8 10)

DATE OCT 2023 | JOB 118178 | FIGURE FF-4

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OBC Water Supply for Firefighting Calculation

Based on OBC 2012 (Div. B, Article 3.2.5.7)

References: Ontario Fire Marshal - OBC Fire Fighting Water Supply
Ontario Building Code 2012, Appendix A, Vol 2., A-3.2.5.7

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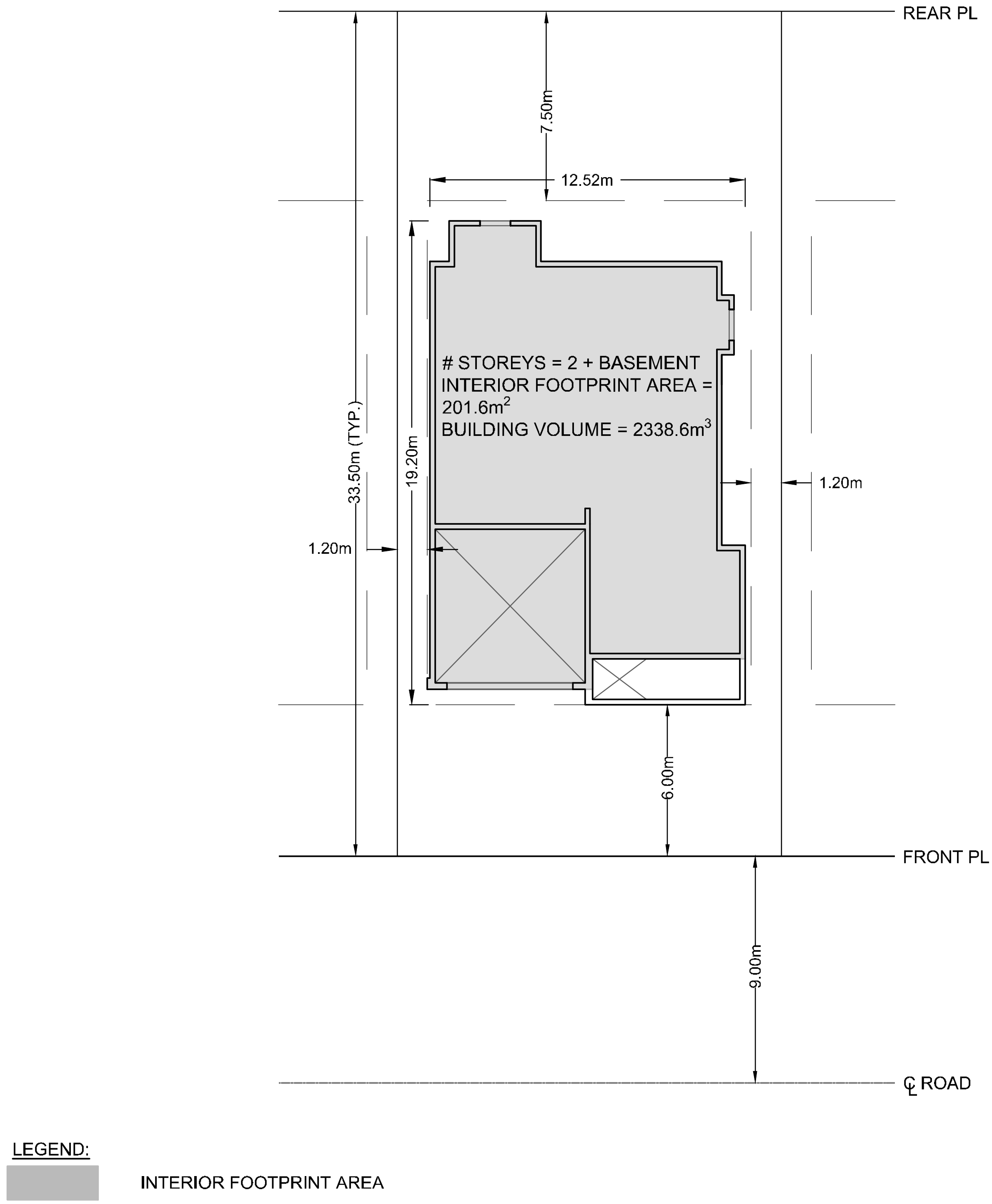
Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay

Legend
Input by User
No Input Required

Building Description: Single detached home, 2-storey, 50' Unit Two Storey - "Colton", See Figure FF-5

Unsprinklered

Step		Calculation Inputs		Calculation Notes	Value
	Minimum Fire Protection Water Supply Volume				
1	**Water Supply Coefficient**				
	Building Classification =	C		From Table 3.1.2.1	
	Water Supply Coefficient - K =			From Table 1 (A3.2.5.7)	**23**
2	**Total Building Volume**				
	# Floors (Incl. Basement)	3			
	Interior Building Area - A	201.6	m^2		
	Effective Building Height - H	11.6	m		
	Total Building Volume - V =			A * H	**2338.6 m³**
3	**Spatial Coefficient Value**				
	Exposure Distances: (Exterior building face to property/lot line, to street centre, or to mid-point between proposed building and another building on same lot)			**Spatial Coefficients:** From Figure 1 (Spatial Coefficient vs Exposure Distance)	
	North	7.50	m	Sside 1 = **0.25**	
	East	1.20	m	Sside 2 = **0.50**	
	South	15.00	m	Sside 3 = **0.00**	
	West	1.20	m	Sside 4 = **0.50**	
	Total of Spacial Coefficient Values - S-Tot as obtained from the formula =			1.0 + (Sside 1 + Sside 2 + Sside 3 + Sside 4) (Max. value = 2.0)	**2.00**
4	**Minimum Fire Protection Water Supply Volume**				
	Q =			$K * V * S_{Tot}$	**107,577 L**
	Required Minimum Water Supply Flow Rate				
5	**Minimum Water Supply Flow Rate =**			From Table 2 (For water supply from a municipal or industrial water supply system, min. pressure is 140 kPa)	**2,700 L/min** or **45 L/s**
	Minimum Fire Protection Water Supply Volume for 30 minutes				
6	**Q =**			= Minimum Water Supply Flow Rate (L/min) * 30 minutes	**81,000 L**
	Required Fire Protection Water Supply Volume				
7	**Q =**			Highest volume out of (4) and (6)	**107,577 L**
Notes					



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Engineers, Planners & Landscape Architects
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Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

MUNICIPALITY of MISSISSIPPI MILLS
BROWN LANDS

FIRE FLOW CALCULATION FIGURE
LARGEST 50' TWO STOREY UNIT
("COLTON")

SCALE 1 : 250

DATE	JOB	FIGURE
OCT 2023	118178	FF-5

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SHT8X11.DWG - 216mmx279mm

OBC Water Supply for Firefighting Calculation

Based on OBC 2012 (Div. B, Article 3.2.5.7)

References: Ontario Fire Marshal - OBC Fire Fighting Water Supply
Ontario Building Code 2012, Appendix A, Vol 2., A-3.2.5.7

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay

Legend
Input by User
No Input Required

Building Description: Bungalow Townhome, 2-Unit Block (Semi-Detached), See Figure FF-6

Unsprinklered

Step		Calculation Inputs		Calculation Notes	Value
	Minimum Fire Protection Water Supply Volume				
1	**Water Supply Coefficient**				
	Building Classification =	C		From Table 3.1.2.1	
	Water Supply Coefficient - K =			From Table 1 (A3.2.5.7)	23
2	**Total Building Volume**				
	# Floors (Incl. Basement)	2			
	Interior Building Area - A	323.0	m^2		
	Effective Building Height - H	8.6	m		
	Total Building Volume - V =			A * H	2777.4 m^3
3	**Spatial Coefficient Value**				
	Exposure Distances: (Exterior building face to property/lot line, to street centre, or to mid-point between proposed building and another building on same lot)			**Spatial Coefficients:** From Figure 1 (Spatial Coefficient vs Exposure Distance)	
	North	7.50	m	Sside 1 = 0.25	
	East	1.20	m	Sside 2 = 0.50	
	South	15.00	m	Sside 3 = 0.00	
	West	1.20	m	Sside 4 = 0.50	
	Total of Spacial Coefficient Values - S-Tot as obtained from the formula =			1.0 + (Sside 1 + Sside 2 + Sside 3 + Sside 4) (Max. value = 2.0)	2.00
4	**Minimum Fire Protection Water Supply Volume**				
	Q =			$K * V * S_{Tot}$	127,759 L
	Required Minimum Water Supply Flow Rate				
5	Minimum Water Supply Flow Rate =			From Table 2 (For water supply from a municipal or industrial water supply system, min. pressure is 140 kPa)	3,600 L/min or 60 L/s
	Minimum Fire Protection Water Supply Volume for 30 minutes				
6	Q =			= Minimum Water Supply Flow Rate (L/min) * 30 minutes	108,000 L
	Required Fire Protection Water Supply Volume				
7	Q =			Highest volume out of (4) and (6)	127,759 L
Notes					

OBC Water Supply for Firefighting Calculation

Based on OBC 2012 (Div. B, Article 3.2.5.7)

References: Ontario Fire Marshal - OBC Fire Fighting Water Supply
Ontario Building Code 2012, Appendix A, Vol 2., A-3.2.5.7

NOVATECH
Engineers, Planners & Landscape Architects

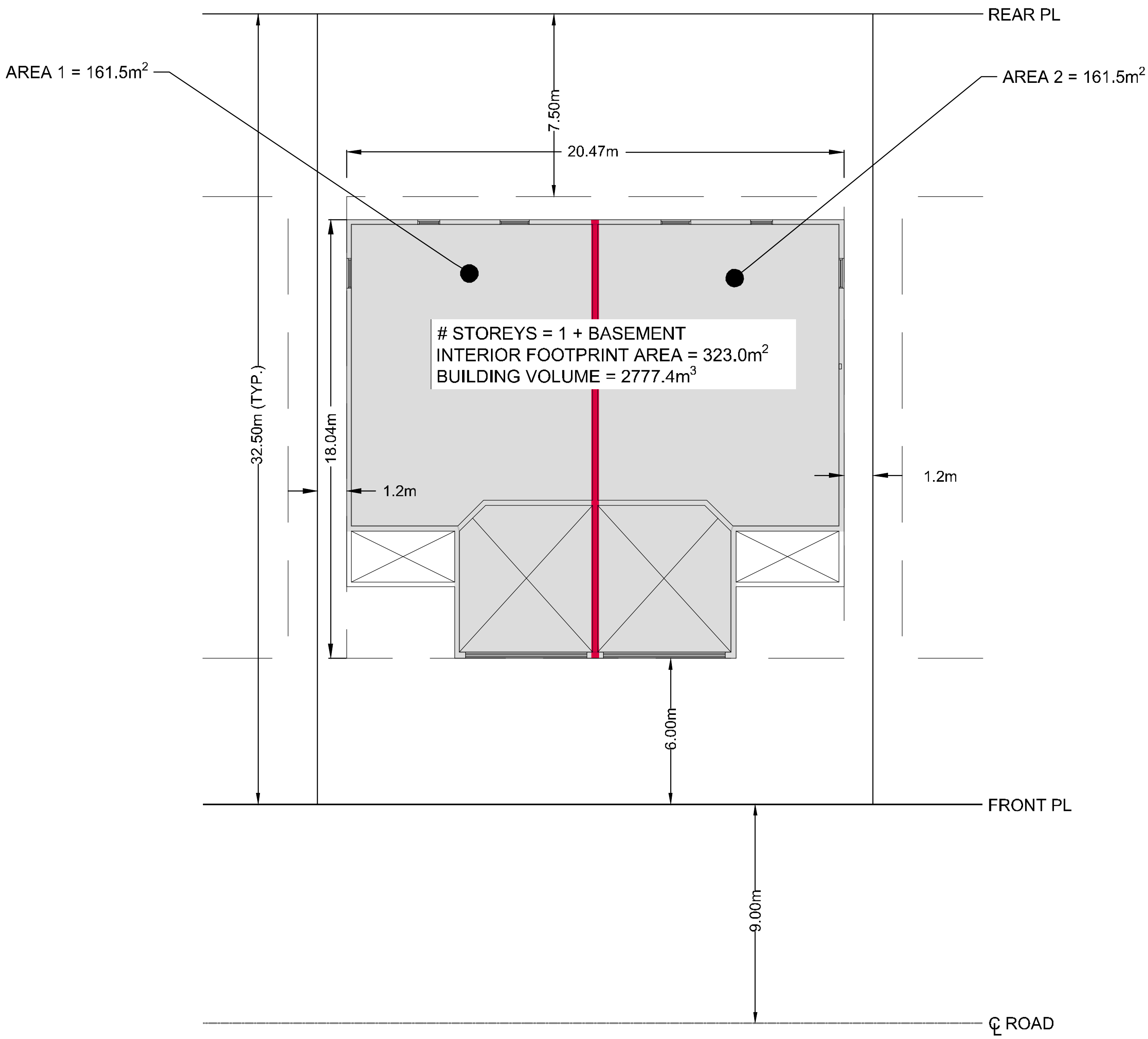
Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay

Legend
Input by User
No Input Required

Building Description: Bungalow Townhome, 2-Unit Block (Semi-Detached), with 1-2hr firewall, See Figure FF-6

Unsprinklered

Step		Calculation Inputs		Calculation Notes	Value
	Minimum Fire Protection Water Supply Volume				
1	**Water Supply Coefficient**				
	Building Classification =	C		From Table 3.1.2.1	
	Water Supply Coefficient - K =			From Table 1 (A3.2.5.7)	**23**
2	**Total Building Volume**				
	# Floors (Incl. Basement)	2			
	Interior Building Area 1 - A	161.5	m^2		
	Effective Building Height - H	8.6	m		
	Total Building Volume - V =			A * H	**1388.7 m³**
3	**Spatial Coefficient Value**				
	Exposure Distances: (Exterior building face to property/lot line, to street centre, or to mid-point between proposed building and another building on same lot)			**Spatial Coefficients:** From Figure 1 (Spatial Coefficient vs Exposure Distance)	
	North	7.50	m	Sside 1 = **0.25**	
	East	1.20	m	Sside 2 = **0.50**	
	South	15.00	m	Sside 3 = **0.00**	
	West	2-hr FW	m	Sside 4 = **0.00**	
	Total of Spacial Coefficient Values - S-Tot as obtained from the formula =			1.0 + (Sside 1 + Sside 2 + Sside 3 + Sside 4) (Max. value = 2.0)	**1.75**
4	**Minimum Fire Protection Water Supply Volume**				
	Q =			K * V * S_{Tot}	**55,895 L**
	Required Minimum Water Supply Flow Rate				
5	**Minimum Water Supply Flow Rate =**			From Table 2 (For water supply from a municipal or industrial water supply system, min. pressure is 140 kPa)	**2,700 L/min** or **45 L/s**
	Minimum Fire Protection Water Supply Volume for 30 minutes				
6	**Q =**			= Minimum Water Supply Flow Rate (L/min) * 30 minutes	**81,000 L**
	Required Fire Protection Water Supply Volume				
7	**Q =**			Highest volume out of (4) and (6)	**81,000 L**
Notes					



LEGEND:

INTERIOR FOOTPRINT AREA

OPTIONAL 2-HR FIREWALL

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

MUNICIPALITY of MISSISSIPPI MILLS

BROWN LANDS

FIRE FLOW CALCULATION FIGURE
2-UNIT BUNGALOW TOWNHOME

SCALE	DATE	JOB	FIGURE
1 : 250	OCT 2023	118178	FF-6

OBC Water Supply for Firefighting Calculation

Based on OBC 2012 (Div. B, Article 3.2.5.7)

References: Ontario Fire Marshal - OBC Fire Fighting Water Supply
Ontario Building Code 2012, Appendix A, Vol 2., A-3.2.5.7

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay

Legend
Input by User
No Input Required

Building Description: Bungalow Townhome, 3-Unit Block, See Figure FF-7

Unsprinklered

Step		Calculation Inputs		Calculation Notes	Value
	Minimum Fire Protection Water Supply Volume				
1	**Water Supply Coefficient**				
	Building Classification =	C		From Table 3.1.2.1	
	Water Supply Coefficient - K =			From Table 1 (A3.2.5.7)	**23**
2	**Total Building Volume**				
	# Floors (Incl. Basement)	2			
	Interior Building Area - A	491.0	m^2		
	Effective Building Height - H	8.6	m		
	Total Building Volume - V =			A * H	**4222.3 m³**
3	**Spatial Coefficient Value**				
	Exposure Distances: (Exterior building face to property/lot line, to street centre, or to mid-point between proposed building and another building on same lot)			**Spatial Coefficients:** From Figure 1 (Spatial Coefficient vs Exposure Distance)	
	North	7.50	m	Sside 1 = **0.25**	
	East	1.50	m	Sside 2 = **0.50**	
	South	15.00	m	Sside 3 = **0.00**	
	West	1.50	m	Sside 4 = **0.50**	
	Total of Spacial Coefficient Values - S-Tot as obtained from the formula =			1.0 + (Sside 1 + Sside 2 + Sside 3 + Sside 4) (Max. value = 2.0)	**2.00**
4	**Minimum Fire Protection Water Supply Volume**				
	Q =			$K * V * S_{Tot}$	**194,224 L**
	Required Minimum Water Supply Flow Rate				
5	**Minimum Water Supply Flow Rate =**			From Table 2 (For water supply from a municipal or industrial water supply system, min. pressure is 140 kPa)	**6,300 L/min** or **105 L/s**
	Minimum Fire Protection Water Supply Volume for 30 minutes				
6	**Q =**			= Minimum Water Supply Flow Rate (L/min) * 30 minutes	**189,000 L**
	Required Fire Protection Water Supply Volume				
7	**Q =**			Highest volume out of (4) and (6)	**194,224 L**
Notes					

OBC Water Supply for Firefighting Calculation

Based on OBC 2012 (Div. B, Article 3.2.5.7)

References: Ontario Fire Marshal - OBC Fire Fighting Water Supply
Ontario Building Code 2012, Appendix A, Vol 2., A-3.2.5.7

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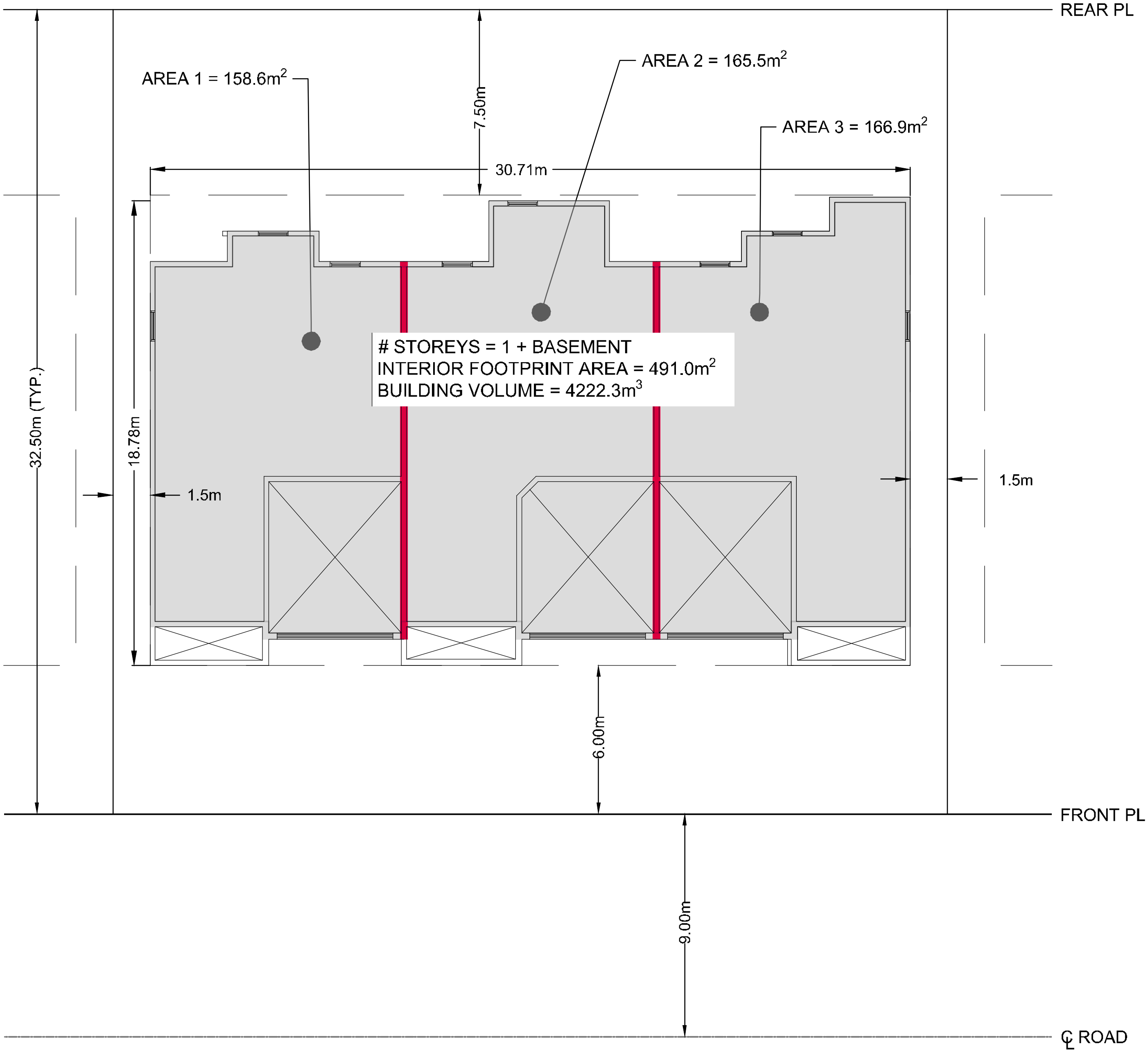
Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay

Legend
Input by User
No Input Required

Building Description: Bungalow Townhome, 3-Unit Block, with 2-2hr firewalls, See Figure FF-7

Unsprinklered

Step		Calculation Inputs		Calculation Notes	Value
Minimum Fire Protection Water Supply Volume					
1	**Water Supply Coefficient**				
	Building Classification =	C		From Table 3.1.2.1	
	Water Supply Coefficient - K =			From Table 1 (A3.2.5.7)	**23**
2	**Total Building Volume**				
	# Floors (Incl. Basement)	2			
	Interior Building Area 2 - A	166.9	m^2		
	Effective Building Height - H	8.6	m		
	Total Building Volume - V =			A * H	**1435.3 m³**
3	**Spatial Coefficient Value**				
	Exposure Distances: (Exterior building face to property/lot line, to street centre, or to mid-point between proposed building and another building on same lot)			**Spatial Coefficients:** From Figure 1 (Spatial Coefficient vs Exposure Distance)	
	North	7.50	m	Sside 1 = **0.25**	
	East	1.50	m	Sside 2 = **0.50**	
	South	15.00	m	Sside 3 = **0.00**	
	West	2-hr FW	m	Sside 4 = **0.00**	
	Total of Spacial Coefficient Values - S-Tot as obtained from the formula =			1.0 + (Sside 1 + Sside 2 + Sside 3 + Sside 4) (Max. value = 2.0)	**1.75**
4	**Minimum Fire Protection Water Supply Volume**				
	Q =			$K * V * S_{Tot}$	**57,772 L**
Required Minimum Water Supply Flow Rate					
5	**Minimum Water Supply Flow Rate =**			From Table 2 (For water supply from a municipal or industrial water supply system, min. pressure is 140 kPa)	**2,700 L/min** or **45 L/s**
Minimum Fire Protection Water Supply Volume for 30 minutes					
6	**Q =**			= Minimum Water Supply Flow Rate (L/min) * 30 minutes	**81,000 L**
Required Fire Protection Water Supply Volume					
7	**Q =**			Highest volume out of (4) and (6)	**81,000 L**
Notes					



LEGEND:

INTERIOR FOOTPRINT AREA

OPTIONAL 2-HR FIREWALL

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

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BROWN LANDS

FIRE FLOW CALCULATION FIGURE
3-UNIT BUNGALOW TOWNHOME

SCALE 1 : 250

DATE OCT 2023 | JOB 118178 | FIGURE FF-7

SHT8X11.DWG - 216mmx279mm

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OBC Water Supply for Firefighting Calculation

Based on OBC 2012 (Div. B, Article 3.2.5.7)

References: Ontario Fire Marshal - OBC Fire Fighting Water Supply
Ontario Building Code 2012, Appendix A, Vol 2., A-3.2.5.7

NOVATECH Engineers, Planners & Landscape Architects

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay

Legend
Input by User
No Input Required

Building Description: 2-Storey Townhome, 4-Unit Block, See Figure FF-8

Unsprinklered

Step		Calculation Inputs		Calculation Notes		Value
	Minimum Fire Protection Water Supply Volume					
1	**Water Supply Coefficient**					
	Building Classification =	C		From Table 3.1.2.1		
	Water Supply Coefficient - K =			From Table 1 (A3.2.5.7)		**23**
2	**Total Building Volume**					
	# Floors (Incl. Basement)	3				
	Interior Building Area - A	395.7	m^2			
	Effective Building Height - H	11.6	m			
	Total Building Volume - V =			A * H		**4590.0 m³**
3	**Spatial Coefficient Value**					
	Exposure Distances: (Exterior building face to property/lot line, to street centre, or to mid-point between proposed building and another building on same lot)			**Spatial Coefficients:** From Figure 1 (Spatial Coefficient vs Exposure Distance)		
	North	7.50	m	Sside 1 =	**0.25**	
	East	1.50	m	Sside 2 =	**0.50**	
	South	15.00	m	Sside 3 =	**0.00**	
	West	1.50	m	Sside 4 =	**0.50**	
	Total of Spacial Coefficient Values - S-Tot as obtained from the formula =			1.0 + (Sside 1 + Sside 2 + Sside 3 + Sside 4) (Max. value = 2.0)		**2.00**
4	**Minimum Fire Protection Water Supply Volume**					
	Q =			$K * V * S_{Tot}$		**211,142 L**
	Required Minimum Water Supply Flow Rate					
5	**Minimum Water Supply Flow Rate =**			From Table 2 (For water supply from a municipal or industrial water supply system, min. pressure is 140 kPa)		**6,300 L/min** or **105 L/s**
	Minimum Fire Protection Water Supply Volume for 30 minutes					
6	**Q =**			= Minimum Water Supply Flow Rate (L/min) * 30 minutes		**189,000 L**
	Required Fire Protection Water Supply Volume					
7	**Q =**			Highest volume out of (4) and (6)		**211,142 L**
Notes						

OBC Water Supply for Firefighting Calculation

Based on OBC 2012 (Div. B, Article 3.2.5.7)

References: Ontario Fire Marshal - OBC Fire Fighting Water Supply
Ontario Building Code 2012, Appendix A, Vol 2., A-3.2.5.7

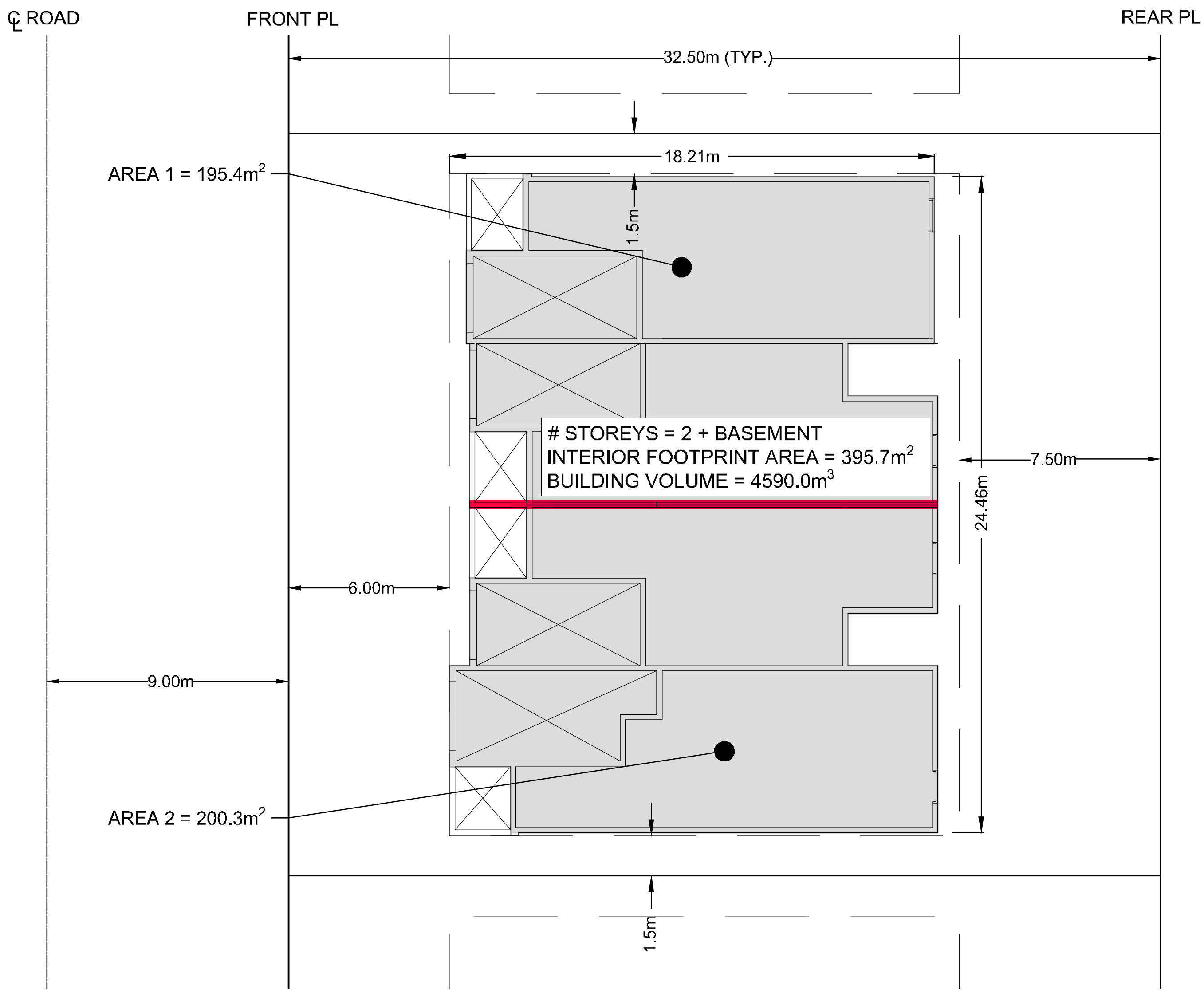
Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay

Legend
Input by User
No Input Required

Building Description: 2-Storey Townhome, 4-Unit Block, with 1-2hr firewall, See Figure FF-8

Unsprinklered

Step		Calculation Inputs		Calculation Notes	Value
	Minimum Fire Protection Water Supply Volume				
1	**Water Supply Coefficient**				
	Building Classification =	C		From Table 3.1.2.1	
	Water Supply Coefficient - K =			From Table 1 (A3.2.5.7)	**23**
2	**Total Building Volume**				
	# Floors (Incl. Basement)	3			
	Interior Building Area 2 - A	200.3	m^2		
	Effective Building Height - H	11.6	m		
	Total Building Volume - V =			A * H	**2323.5 m³**
3	**Spatial Coefficient Value**				
	Exposure Distances: (Exterior building face to property/lot line, to street centre, or to mid-point between proposed building and another building on same lot)			**Spatial Coefficients:** From Figure 1 (Spatial Coefficient vs Exposure Distance)	
	North	7.50	m	Sside 1 = **0.25**	
	East	2-hr FW	m	Sside 2 = **0.00**	
	South	15.00	m	Sside 3 = **0.00**	
	West	1.50	m	Sside 4 = **0.50**	
	Total of Spacial Coefficient Values - S-Tot as obtained from the formula =			1.0 + (Sside 1 + Sside 2 + Sside 3 + Sside 4) (Max. value = 2.0)	**1.75**
4	**Minimum Fire Protection Water Supply Volume**				
	Q =			K * V * S_{Tot}	**93,520 L**
	Required Minimum Water Supply Flow Rate				
5	**Minimum Water Supply Flow Rate =**			From Table 2 (For water supply from a municipal or industrial water supply system, min. pressure is 140 kPa)	**2,700 L/min** or **45 L/s**
	Minimum Fire Protection Water Supply Volume for 30 minutes				
6	**Q =**			= Minimum Water Supply Flow Rate (L/min) * 30 minutes	**81,000 L**
	Required Fire Protection Water Supply Volume				
7	**Q =**			Highest volume out of (4) and (6)	**93,520 L**
Notes					



LEGEND:

INTERIOR FOOTPRINT AREA

OPTIONAL 2-HR FIREWALL

NOVATECH

Engineers, Planners & Landscape Architects

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

Telephone	(613) 254-9643
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MUNICIPALITY of MISSISSIPPI MILLS

BROWN LANDS

FIRE FLOW CALCULATION FIGURE LARGEST 4-UNIT TWO-STOREY TOWNHOME

SCALE 1 : 250 (0 2 4 6 8 10)

DATE	JOB	FIGURE
OCT 2023	118178	FF-8

OBC Water Supply for Firefighting Calculation

Based on OBC 2012 (Div. B, Article 3.2.5.7)

References: Ontario Fire Marshal - OBC Fire Fighting Water Supply
Ontario Building Code 2012, Appendix A, Vol 2., A-3.2.5.7

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Engineers, Planners & Landscape Architects

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay

Legend
Input by User
No Input Required

Building Description: 2-Storey Townhome, 5-Unit Block, See Figure FF-9

Unsprinklered

Step		Calculation Inputs		Calculation Notes	Value
	Minimum Fire Protection Water Supply Volume				
1	**Water Supply Coefficient**				
	Building Classification =	C		From Table 3.1.2.1	
	Water Supply Coefficient - K =			From Table 1 (A3.2.5.7)	**23**
2	**Total Building Volume**				
	# Floors (Incl. Basement)	3			
	Interior Building Area - A	473.9	m^2		
	Effective Building Height - H	11.6	m		
	Total Building Volume - V =			A * H	**5497.1 m³**
3	**Spatial Coefficient Value**				
	Exposure Distances: (Exterior building face to property/lot line, to street centre, or to mid-point between proposed building and another building on same lot)			**Spatial Coefficients:** From Figure 1 (Spatial Coefficient vs Exposure Distance)	
	North	7.50	m	Sside 1 = **0.25**	
	East	1.50	m	Sside 2 = **0.50**	
	South	15.00	m	Sside 3 = **0.00**	
	West	1.50	m	Sside 4 = **0.50**	
	Total of Spacial Coefficient Values - S-Tot as obtained from the formula =			1.0 + (Sside 1 + Sside 2 + Sside 3 + Sside 4) (Max. value = 2.0)	**2.00**
4	**Minimum Fire Protection Water Supply Volume**				
	Q =			$K * V * S_{Tot}$	**252,865 L**
	Required Minimum Water Supply Flow Rate				
5	**Minimum Water Supply Flow Rate =**			From Table 2 (For water supply from a municipal or industrial water supply system, min. pressure is 140 kPa)	**6,300 L/min** or **105 L/s**
	Minimum Fire Protection Water Supply Volume for 30 minutes				
6	**Q =**			= Minimum Water Supply Flow Rate (L/min) * 30 minutes	**189,000 L**
	Required Fire Protection Water Supply Volume				
7	**Q =**			Highest volume out of (4) and (6)	**252,865 L**
Notes					

OBC Water Supply for Firefighting Calculation

Based on OBC 2012 (Div. B, Article 3.2.5.7)

References: Ontario Fire Marshal - OBC Fire Fighting Water Supply
Ontario Building Code 2012, Appendix A, Vol 2., A-3.2.5.7

NOVATECH
Engineers, Planners & Landscape Architects

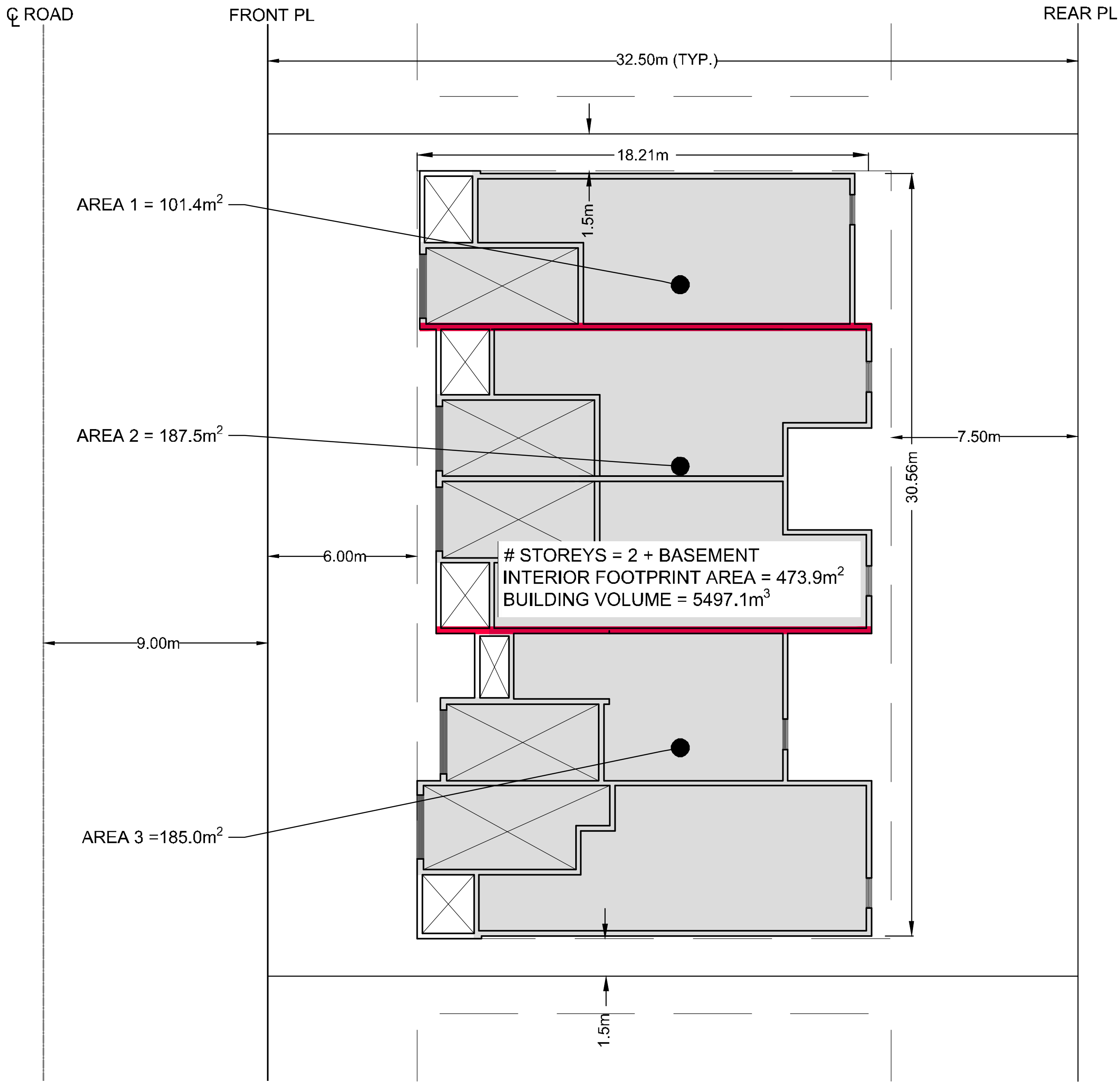
Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay

Legend
Input by User
No Input Required

Building Description: 2-Storey Townhome, 5-Unit Block, with 2-2hr firewalls, See Figure FF-9

Unsprinklered

Step		Calculation Inputs		Calculation Notes		Value
	Minimum Fire Protection Water Supply Volume					
1	**Water Supply Coefficient**					
	Building Classification =	C		From Table 3.1.2.1		
	Water Supply Coefficient - K =			From Table 1 (A3.2.5.7)		23
2	**Total Building Volume**					
	# Floors (Incl. Basement)	3				
	Interior Building Area 1 - A	187.5	m²			
	Effective Building Height - H	11.6	m			
	Total Building Volume - V =			A * H		**2175.0 m³**
3	**Spatial Coefficient Value**					
	Exposure Distances: (Exterior building face to property/lot line, to street centre, or to mid-point between proposed building and another building on same lot)			**Spatial Coefficients:** From Figure 1 (Spatial Coefficient vs Exposure Distance)		
	North	7.50	m	Sside 1 =	**0.25**	
	East	2-hr FW	m	Sside 2 =	**0.00**	
	South	15.00	m	Sside 3 =	**0.00**	
	West	1.50	m	Sside 4 =	**0.50**	
	Total of Spacial Coefficient Values - S-Tot as obtained from the formula =			1.0 + (Sside 1 + Sside 2 + Sside 3 + Sside 4) (Max. value = 2.0)		**1.75**
4	**Minimum Fire Protection Water Supply Volume**					
	Q =			$K * V * S_{Tot}$		**87,544 L**
	Required Minimum Water Supply Flow Rate					
5	Minimum Water Supply Flow Rate =			From Table 2 (For water supply from a municipal or industrial water supply system, min. pressure is 140 kPa)		**2,700 L/min** or **45 L/s**
	Minimum Fire Protection Water Supply Volume for 30 minutes					
6	**Q =**			= Minimum Water Supply Flow Rate (L/min) * 30 minutes		**81,000 L**
	Required Fire Protection Water Supply Volume					
7	**Q =**			Highest volume out of (4) and (6)		**87,544 L**
Notes						



LEGEND:

INTERIOR FOOTPRINT AREA

OPTIONAL 2-HR FIREWALL

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

MUNICIPALITY of MISSISSIPPI MILLS

BROWN LANDS

FIRE FLOW CALCULATION FIGURE
LARGEST 5-UNIT TWO-STOREY
TOWNHOME

SCALE 1 : 250 (0 2 4 6 8 10)

DATE OCT 2023 | JOB 118178 | FIGURE FF-9

OBC Water Supply for Firefighting Calculation

Based on OBC 2012 (Div. B, Article 3.2.5.7)

References: Ontario Fire Marshal - OBC Fire Fighting Water Supply
Ontario Building Code 2012, Appendix A, Vol 2., A-3.2.5.7

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay

Legend
Input by User
No Input Required

Building Description: 2-Storey Townhome, 6-Unit Block, See Figure FF-10

Unsprinklered

Step		Calculation Inputs		Calculation Notes		Value
	Minimum Fire Protection Water Supply Volume					
1	**Water Supply Coefficient**					
	Building Classification =	C		From Table 3.1.2.1		
	Water Supply Coefficient - K =			From Table 1 (A3.2.5.7)		23
2	**Total Building Volume**					
	# Floors (Incl. Basement)	3				
	Interior Building Area - A	550.9	m^2			
	Effective Building Height - H	11.6	m			
	Total Building Volume - V =			A * H		**6390.4 m³**
3	**Spatial Coefficient Value**					
	Exposure Distances: (Exterior building face to property/lot line, to street centre, or to mid-point between proposed building and another building on same lot)			**Spatial Coefficients:** From Figure 1 (Spatial Coefficient vs Exposure Distance)		
	North	7.50	m	Sside 1 =	**0.25**	
	East	1.50	m	Sside 2 =	**0.50**	
	South	15.00	m	Sside 3 =	**0.00**	
	West	1.50	m	Sside 4 =	**0.50**	
	Total of Spacial Coefficient Values - S-Tot as obtained from the formula =			1.0 + (Sside 1 + Sside 2 + Sside 3 + Sside 4) (Max. value = 2.0)		**2.00**
4	**Minimum Fire Protection Water Supply Volume**					
	Q =			$K * V * S_{Tot}$		**293,960 L**
	Required Minimum Water Supply Flow Rate					
5	Minimum Water Supply Flow Rate =			From Table 2 (For water supply from a municipal or industrial water supply system, min. pressure is 140 kPa)		**9,000 L/min** or **150 L/s**
	Minimum Fire Protection Water Supply Volume for 30 minutes					
6	**Q =**			= Minimum Water Supply Flow Rate (L/min) * 30 minutes		**270,000 L**
	Required Fire Protection Water Supply Volume					
7	**Q =**			Highest volume out of (4) and (6)		**293,960 L**
Notes						

OBC Water Supply for Firefighting Calculation

Based on OBC 2012 (Div. B, Article 3.2.5.7)

References: Ontario Fire Marshal - OBC Fire Fighting Water Supply
Ontario Building Code 2012, Appendix A, Vol 2., A-3.2.5.7

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay

Legend
Input by User
No Input Required

Building Description: 2-Storey Townhome, 6-Unit Block, with 2-2hr firewalls, See Figure FF-10

Unsprinklered

Step		Calculation Inputs		Calculation Notes		Value
	Minimum Fire Protection Water Supply Volume					
1	**Water Supply Coefficient**					
	Building Classification =	C		From Table 3.1.2.1		
	Water Supply Coefficient - K =			From Table 1 (A3.2.5.7)		**23**
2	**Total Building Volume**					
	# Floors (Incl. Basement)	3				
	Interior Building Area 1 - A	200.3	m^2			
	Effective Building Height - H	11.6	m			
	Total Building Volume - V =			A * H		**2323.5 m³**
3	**Spatial Coefficient Value**					
	Exposure Distances: (Exterior building face to property/lot line, to street centre, or to mid-point between proposed building and another building on same lot)			**Spatial Coefficients:** From Figure 1 (Spatial Coefficient vs Exposure Distance)		
	North	7.50	m	Sside 1 =	**0.25**	
	East	1.50	m	Sside 2 =	**0.50**	
	South	15.00	m	Sside 3 =	**0.00**	
	West	2-hr FW	m	Sside 4 =	**0.00**	
	Total of Spacial Coefficient Values - S-Tot as obtained from the formula =			1.0 + (Sside 1 + Sside 2 + Sside 3 + Sside 4) (Max. value = 2.0)		**1.75**
4	**Minimum Fire Protection Water Supply Volume**					
	Q =			$K * V * S_{Tot}$		**93,520 L**
	Required Minimum Water Supply Flow Rate					
5	**Minimum Water Supply Flow Rate =**			From Table 2 (For water supply from a municipal or industrial water supply system, min. pressure is 140 kPa)		**2,700 L/min** or **45 L/s**
	Minimum Fire Protection Water Supply Volume for 30 minutes					
6	**Q =**			= Minimum Water Supply Flow Rate (L/min) * 30 minutes		**81,000 L**
	Required Fire Protection Water Supply Volume					
7	**Q =**			Highest volume out of (4) and (6)		**93,520 L**
Notes						

M:\2018\118178\CAD\Design\Figures\Design Brief\Draft Plan-2ndSub\118178-EQMaxUnitFireFlowFigures.dwg, 2S-6U, Feb 05, 2024 - 11:58am, sbennett

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

MUNICIPALITY of MISSISSIPPI MILLS
BROWN LANDS

FIRE FLOW CALCULATION FIGURE
LARGEST 6-UNIT TWO-STOREY TOWNHOME

SCALE		
1 : 250		
DATE OCT 2023	JOB 118178	FIGURE FF-10

SHT8X11.DWG - 216mmx279mm

APPENDIX B

WATER SUPPLY FOR PUBLIC FIRE PROTECTION, FIRE UNDERWRITERS SURVEY, 2020; EXCERPT (PAGES 33 & 34)

Additional Items of Note

i. The required fire flow calculation guide is not expected to provide an adequate required fire flow for complex and unusual risks such as lumber yards, petroleum storage, refineries, grain elevators, and large chemical plants, but may indicate a minimum value for these hazards. Applicable industry standards and guidelines should be consulted when reviewing fire flows and emergency response needs for complex and high consequence risks.

ii. Judgment must be used for business, industrial, and other occupancies not specifically mentioned.

iii. Consideration should be given to the configuration of the building(s) being considered and accessibility by the fire department with respect to applying hose streams.

iv. Consideration should be given to carefully reviewing closely spaced, wood frame construction and the potential for fire spread beyond the building of origin. There are many risk factors that may contribute to the risk of these types of fires, one of which is spacing of structures. If the designer or the Authority Having Jurisdiction determines there to be a high potential for fire spread between closely spaced combustible buildings, the designer should consider the maximum probable fire size involvement when determining the Total Effective Area of the design fire.

v. Where wood shingle or shake roofs contribute to risk of fire spread in the subject building, an additional charge of 2,000 L/min to 4,000 L/min should be added to the required fire flow in accordance with the extent and condition of the risk.

vi. For one and two-family dwellings not exceeding two storeys in height and having Total Effective Area of not more than 450 m^2, the following short method may be used in determining a required fire flow:

Table 7 Simple Method for One and Two Family Dwellings Up To 450 sq.m

Exposure distances	Suggested Required Fire Flow (LPM) [4,5,6]	
	Wood Frame	Masonry or Brick
Less than 3m	8,000	6,000
3 to 10m	4,000	4,000
10.1 to 30m	3,000	3,000
Over 30m	2,000	2,000

[4] For sprinkler protected risks, 50% of the value from this table may be used, to a minimum required fire flow of 2,000 LPM

[5] If all exposures within 30m of subject building are sprinkler protected, a minimum required fire flow of 2,000 LPM may be used

[6] If all exposing building faces within 10m have protected openings (or blank walls) and a minimum 1 hr FRR, the required fire flow may be reduced by 2,000 LPM to a minimum of 2,000 LPM.

vii. For one and two-family dwellings not exceeding two storeys but having a Total Effective Area of more than 450 m^2, and for row housing, the following short method may be used in determining a required fire flow:

Table 8 Simple Method for One and Two Family Dwellings Exceeding 450 sq.m, and Row Housing Exposure distances

Exposure distances	Suggested Required Fire Flow [4,5,6]	
	Wood Frame	Masonry or Brick
Less than 3m	12,000	9,000
3 to 10m	8,000	8,000
10.1 to 30m	6,000	6,000
Over 30m	4,000	4,000

Note that for larger and more complex developments, a full calculation of required fire flows is recommended.

viii. Special hazards

a. In areas where there is a significant hazard of wildfires and a significant level of exposure to fuels, further investigation into adequate water supplies for public fire protection should be made and may consider alternative fire suppression strategies including, but not limited to, exterior exposure protection fire sprinkler systems, structure protection units and other methods of protection of the built environment from wildland fires in the interface areas. For further information see the National Research Council publication National Guide for Wildland-Urban Interface Fires.

b. In areas where there is a significant hazard of seismic events, consideration should be given to the need for redundancy in water supplies both for manual fire fighting and for building sprinkler systems, particularly in areas where there is a significant life safety hazard.

Water Demand Design Sheet
Interim Condition (Single Feed)

Engineers, Planners & Landscape Architects

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Calculated Cells →

Reference: Ottawa Design Guidelines - Water Distribution (2010 and TBs)
MOE Design Guidelines for Drinking-Water Systems (2008)
Fire Underwriter's Survey Guideline (2020)
Ontario Building Code, Part 3 (2012)

Small System = NO

Location	Total Water Demand												
Node	Residential Input & Average Demand							Maximum Day & Peak Hour Demand				Design Fire Demand	
								Maximum Day Demand		Peak Hour Demand		Required Fire Flow (RFF)	
	Singles	Semis / Towns	Apts (2-BR)	Apts (1-BR)	Apts (Avg)	Pop. Equiv.	Res. Average Day Flow Demand (L/s)	Res. Peaking Factor	Max Day Flow Demand (L/s)	Res. Peaking Factor	Peak Hour Flow Demand (L/s)	FUS (L/min)	Max Day + RFF (L/s)
N1	3	4				21.00	0.09	2.50	0.21	5.50	0.47	2,700	45.21
N2		14				37.80	0.15	2.50	0.38	5.50	0.84	2,700	45.38
N3	6	10				47.40	0.19	2.50	0.48	5.50	1.06	2,700	45.48
N4	7	12				56.20	0.23	2.50	0.57	5.50	1.25	2,700	45.57
N5	11	5				50.90	0.21	2.50	0.52	5.50	1.13	2,700	45.52
N6	13	5				57.70	0.23	2.50	0.58	5.50	1.29	2,700	45.58
N7	12					40.80	0.17	2.50	0.41	5.50	0.91	2,700	45.41
N8	9	18				79.20	0.32	2.50	0.80	5.50	1.76	2,700	45.80
N9	11	5				50.90	0.21	2.50	0.52	5.50	1.13	2,700	45.52
N10	14					47.60	0.19	2.50	0.48	5.50	1.06	2,700	45.48
N11	9	4				41.40	0.17	2.50	0.42	5.50	0.92	2,700	45.42
N12	9	15				71.10	0.29	2.50	0.72	5.50	1.58	2,700	45.72
N13	9					30.60	0.12	2.50	0.31	5.50	0.68	2,700	45.31
N14	8					27.20	0.11	2.50	0.28	5.50	0.61	2,700	45.28
N15	9					30.60	0.12	2.50	0.31	5.50	0.68	2,700	45.31
N16	8					27.20	0.11	2.50	0.28	5.50	0.61	2,700	45.28
N17	5					17.00	0.07	2.50	0.17	5.50	0.38	2,700	45.17
J-89						0.00	0.00	2.50	0.00	5.50	0.00		
Totals	**143**	**92**	**0**	**0**	**0**	**734.60**	**2.98**	**2.50**	**7.44**	**5.50**	**16.37**		

Demand Parameters

Residential					
Unit Type Population Equiv.	**Singles**	**Semis/ Towns**	**Apts (2-BR)**	**Apts (1-BR)**	**Apts (Avg)**
	3.4	2.7	2.1	1.4	1.8
Dailly Demand	L/per person/day				
Average Demand	350				
Basic Demand	200				

Residential Peaking Factors	**Pop.**	**Max Day (x Avg Day)**	**Peak Hour (x Avg Day)**
Large System (Default)	> 500	2.50	5.50

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Water Demand Design Sheet
Interim Condition (Single Feed)

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Maximum Pressure During Average Day (AVDY) Conditions

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (40psi - 80psi)
Acceptable w/ PRV (81psi - 100psi)
Unacceptable (< 40psi or > 100psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)	Age (hrs)
N1	122.75	0.09	178.25	55.50	79	4
N2	126.00	0.15	178.25	52.25	74	4
N3	122.75	0.19	178.25	55.50	79	5
N4	119.55	0.23	178.25	58.70	83	5
N5	120.00	0.21	178.25	58.25	83	7
N6	118.50	0.23	178.25	59.75	85	6
N7	115.50	0.17	178.25	62.75	89	9
N8	125.60	0.32	178.25	52.65	75	10
N9	123.00	0.21	178.25	55.25	79	7
N10	123.10	0.19	178.25	55.15	78	8
N11	119.00	0.17	178.25	59.25	84	10
N12	118.38	0.29	178.25	59.87	85	17
N13	116.50	0.12	178.25	61.75	88	12
N14	113.00	0.11	178.25	65.25	93	16
N15	112.90	0.12	178.25	65.35	93	21
N16	112.80	0.11	178.25	65.45	93	37
N17	113.85	0.07	178.25	64.40	92	23
J-89	178.28	-2.98	178.28	-	-	-

Water Demand Design Sheet
Interim Condition (Single Feed)

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Minimum Pressure During Peak Hour (PKHR) Conditions

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 40psi)
Unacceptable (< 40psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.47	173.62	50.87	72
N2	126.00	0.84	173.60	47.60	68
N3	122.75	1.06	173.58	50.83	72
N4	119.55	1.25	173.58	54.03	77
N5	120.00	1.13	173.56	53.56	76
N6	118.50	1.29	173.57	55.07	78
N7	115.50	0.91	173.56	58.06	83
N8	125.60	1.76	173.54	47.94	68
N9	123.00	1.13	173.54	50.54	72
N10	123.10	1.06	173.53	50.43	72
N11	119.00	0.92	173.51	54.51	78
N12	118.38	1.58	173.51	55.13	78
N13	116.50	0.68	173.51	57.01	81
N14	113.00	0.61	173.51	60.51	86
N15	112.90	0.68	173.51	60.61	86
N16	112.80	0.61	173.51	60.71	86
N17	113.85	0.38	173.51	59.66	85
J-89	174.22	-16.36	174.22	-	-

Water Demand Design Sheet
Interim Condition (Single Feed)

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Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 1

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	45.21	143.42	20.67	29
N2	126.00	0.38	143.42	17.42	25
N3	122.75	0.48	143.42	20.67	29
N4	119.55	0.57	143.42	23.87	34
N5	120.00	0.52	143.41	23.41	33
N6	118.50	0.58	143.41	24.91	35
N7	115.50	0.41	143.41	27.91	40
N8	125.60	0.80	143.41	17.81	25
N9	123.00	0.52	143.41	20.41	29
N10	123.10	0.48	143.40	20.30	29
N11	119.00	0.42	143.40	24.40	35
N12	118.38	0.72	143.40	25.02	36
N13	116.50	0.31	143.40	26.90	38
N14	113.00	0.28	143.40	30.40	43
N15	112.90	0.31	143.40	30.50	43
N16	112.80	0.28	143.40	30.60	44
N17	113.85	0.17	143.40	29.55	42
J-89	148.64	-52.44	148.64	-	-

Water Demand Design Sheet
Interim Condition (Single Feed)

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Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 2

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	143.42	20.67	29
N2	126.00	45.38	143.19	17.19	24
N3	122.75	0.48	143.20	20.45	29
N4	119.55	0.57	143.26	23.71	34
N5	120.00	0.52	143.20	23.20	33
N6	118.50	0.58	143.23	24.73	35
N7	115.50	0.41	143.23	27.73	39
N8	125.60	0.80	143.20	17.60	25
N9	123.00	0.52	143.20	20.20	29
N10	123.10	0.48	143.19	20.09	29
N11	119.00	0.42	143.19	24.19	34
N12	118.38	0.72	143.19	24.81	35
N13	116.50	0.31	143.19	26.69	38
N14	113.00	0.28	143.19	30.19	43
N15	112.90	0.31	143.19	30.29	43
N16	112.80	0.28	143.19	30.39	43
N17	113.85	0.17	143.19	29.34	42
J-89	148.64	-52.44	148.64	-	-

Water Demand Design Sheet
Interim Condition (Single Feed)

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Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 3

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	143.42	20.67	29
N2	126.00	0.38	143.24	17.24	25
N3	122.75	45.48	143.05	20.30	29
N4	119.55	0.57	143.15	23.60	34
N5	120.00	0.52	143.05	23.05	33
N6	118.50	0.58	143.10	24.60	35
N7	115.50	0.41	143.10	27.60	39
N8	125.60	0.80	143.04	17.44	25
N9	123.00	0.52	143.04	20.04	28
N10	123.10	0.48	143.04	19.94	28
N11	119.00	0.42	143.04	24.04	34
N12	118.38	0.72	143.03	24.65	35
N13	116.50	0.31	143.04	26.54	38
N14	113.00	0.28	143.03	30.03	43
N15	112.90	0.31	143.03	30.13	43
N16	112.80	0.28	143.03	30.23	43
N17	113.85	0.17	143.03	29.18	41
J-89	148.64	-52.44	148.64	-	-

Water Demand Design Sheet
Interim Condition (Single Feed)

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Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 4

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	143.42	20.67	29
N2	126.00	0.38	143.29	17.29	25
N3	122.75	0.48	143.15	20.40	29
N4	119.55	45.57	142.98	23.43	33
N5	120.00	0.52	143.11	23.11	33
N6	118.50	0.58	143.02	24.52	35
N7	115.50	0.41	143.02	27.52	39
N8	125.60	0.80	143.10	17.50	25
N9	123.00	0.52	143.10	20.10	29
N10	123.10	0.48	143.10	20.00	28
N11	119.00	0.42	143.10	24.10	34
N12	118.38	0.72	143.09	24.71	35
N13	116.50	0.31	143.09	26.59	38
N14	113.00	0.28	143.09	30.09	43
N15	112.90	0.31	143.09	30.19	43
N16	112.80	0.28	143.09	30.29	43
N17	113.85	0.17	143.09	29.24	42
J-89	148.64	-52.44	148.64	-	-

Water Demand Design Sheet
Interim Condition (Single Feed)

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Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 5

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	143.42	20.67	29
N2	126.00	0.38	143.25	17.25	25
N3	122.75	0.48	143.07	20.32	29
N4	119.55	0.57	143.11	23.56	34
N5	120.00	45.52	142.79	22.79	32
N6	118.50	0.58	142.97	24.47	35
N7	115.50	0.41	142.97	27.47	39
N8	125.60	0.80	142.78	17.18	24
N9	123.00	0.52	142.78	19.78	28
N10	123.10	0.48	142.78	19.68	28
N11	119.00	0.42	142.78	23.78	34
N12	118.38	0.72	142.78	24.40	35
N13	116.50	0.31	142.78	26.28	37
N14	113.00	0.28	142.78	29.78	42
N15	112.90	0.31	142.78	29.88	42
N16	112.80	0.28	142.78	29.98	43
N17	113.85	0.17	142.78	28.93	41
J-89	148.64	-52.44	148.64	-	-

Water Demand Design Sheet
Interim Condition (Single Feed)

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Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 6

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	143.42	20.67	29
N2	126.00	0.38	143.27	17.27	25
N3	122.75	0.48	143.10	20.35	29
N4	119.55	0.57	143.06	23.51	33
N5	120.00	0.52	142.98	22.98	33
N6	118.50	45.58	142.61	24.11	34
N7	115.50	0.41	142.61	27.11	39
N8	125.60	0.80	142.97	17.37	25
N9	123.00	0.52	142.97	19.97	28
N10	123.10	0.48	142.97	19.87	28
N11	119.00	0.42	142.96	23.96	34
N12	118.38	0.72	142.96	24.58	35
N13	116.50	0.31	142.96	26.46	38
N14	113.00	0.28	142.96	29.96	43
N15	112.90	0.31	142.96	30.06	43
N16	112.80	0.28	142.96	30.16	43
N17	113.85	0.17	142.96	29.11	41
J-89	148.64	-52.44	148.64	-	-

Water Demand Design Sheet
Interim Condition (Single Feed)

NOVATECH
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Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 7

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	143.42	20.67	29
N2	126.00	0.38	143.27	17.27	25
N3	122.75	0.48	143.10	20.35	29
N4	119.55	0.57	143.06	23.51	33
N5	120.00	0.52	142.98	22.98	33
N6	118.50	0.58	142.61	24.11	34
N7	115.50	45.41	141.28	25.78	37
N8	125.60	0.80	142.97	17.37	25
N9	123.00	0.52	142.97	19.97	28
N10	123.10	0.48	142.97	19.87	28
N11	119.00	0.42	142.96	23.96	34
N12	118.38	0.72	142.96	24.58	35
N13	116.50	0.31	142.96	26.46	38
N14	113.00	0.28	142.96	29.96	43
N15	112.90	0.31	142.96	30.06	43
N16	112.80	0.28	142.96	30.16	43
N17	113.85	0.17	142.96	29.11	41
J-89	148.64	-52.44	148.64	-	-

Water Demand Design Sheet
Interim Condition (Single Feed)

NOVATECH
Engineers, Planners & Landscape Architects

Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 8

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	143.42	20.67	29
N2	126.00	0.38	143.25	17.25	25
N3	122.75	0.48	143.07	20.32	29
N4	119.55	0.57	143.11	23.56	34
N5	120.00	0.52	142.79	22.79	32
N6	118.50	0.58	142.97	24.47	35
N7	115.50	0.41	142.97	27.47	39
N8	125.60	45.80	141.75	16.15	23
N9	123.00	0.52	142.30	19.30	27
N10	123.10	0.48	142.30	19.20	27
N11	119.00	0.42	142.30	23.30	33
N12	118.38	0.72	142.29	23.91	34
N13	116.50	0.31	142.29	25.79	37
N14	113.00	0.28	142.29	29.29	42
N15	112.90	0.31	142.29	29.39	42
N16	112.80	0.28	142.29	29.49	42
N17	113.85	0.17	142.29	28.44	40
J-89	148.64	-52.44	148.64	-	-

Water Demand Design Sheet
Interim Condition (Single Feed)

NOVATECH
Engineers, Planners & Landscape Architects

Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 9

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	143.42	20.67	29
N2	126.00	0.38	143.25	17.25	25
N3	122.75	0.48	143.07	20.32	29
N4	119.55	0.57	143.11	23.56	34
N5	120.00	0.52	142.79	22.79	32
N6	118.50	0.58	142.97	24.47	35
N7	115.50	0.41	142.97	27.47	39
N8	125.60	0.80	142.30	16.70	24
N9	123.00	45.52	142.30	19.30	27
N10	123.10	0.48	142.30	19.20	27
N11	119.00	0.42	142.30	23.30	33
N12	118.38	0.72	142.29	23.91	34
N13	116.50	0.31	142.29	25.79	37
N14	113.00	0.28	142.29	29.29	42
N15	112.90	0.31	142.29	29.39	42
N16	112.80	0.28	142.29	29.49	42
N17	113.85	0.17	142.29	28.44	40
J-89	148.64	-52.44	148.64	-	-

Water Demand Design Sheet
Interim Condition (Single Feed)

NOVATECH
Engineers, Planners & Landscape Architects

Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 10

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	143.42	20.67	29
N2	126.00	0.38	143.25	17.25	25
N3	122.75	0.48	143.07	20.32	29
N4	119.55	0.57	143.11	23.56	34
N5	120.00	0.52	142.79	22.79	32
N6	118.50	0.58	142.97	24.47	35
N7	115.50	0.41	142.97	27.47	39
N8	125.60	0.80	142.30	16.70	24
N9	123.00	0.52	142.30	19.30	27
N10	123.10	45.48	141.84	18.74	27
N11	119.00	0.42	141.83	22.83	32
N12	118.38	0.72	141.83	23.45	33
N13	116.50	0.31	141.83	25.33	36
N14	113.00	0.28	141.83	28.83	41
N15	112.90	0.31	141.83	28.93	41
N16	112.80	0.28	141.83	29.03	41
N17	113.85	0.17	141.83	27.98	40
J-89	148.64	-52.44	148.64	-	-

Water Demand Design Sheet
Interim Condition (Single Feed)

NOVATECH
Engineers, Planners & Landscape Architects

Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 11

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	143.42	20.67	29
N2	126.00	0.38	143.25	17.25	25
N3	122.75	0.48	143.07	20.32	29
N4	119.55	0.57	143.11	23.56	34
N5	120.00	0.52	142.79	22.79	32
N6	118.50	0.58	142.97	24.47	35
N7	115.50	0.41	142.97	27.47	39
N8	125.60	0.80	142.30	16.70	24
N9	123.00	0.52	142.30	19.30	27
N10	123.10	0.48	141.84	18.74	27
N11	119.00	45.42	141.06	22.06	31
N12	118.38	0.72	141.06	22.68	32
N13	116.50	0.31	141.06	24.56	35
N14	113.00	0.28	141.06	28.06	40
N15	112.90	0.31	141.06	28.16	40
N16	112.80	0.28	141.06	28.26	40
N17	113.85	0.17	141.06	27.21	39
J-89	148.64	-52.44	148.64	-	-

Water Demand Design Sheet
Interim Condition (Single Feed)

Engineers, Planners & Landscape Architects

Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 12

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	143.42	20.67	29
N2	126.00	0.38	143.25	17.25	25
N3	122.75	0.48	143.07	20.32	29
N4	119.55	0.57	143.11	23.56	34
N5	120.00	0.52	142.79	22.79	32
N6	118.50	0.58	142.97	24.47	35
N7	115.50	0.41	142.97	27.47	39
N8	125.60	0.80	142.30	16.70	24
N9	123.00	0.52	142.30	19.30	27
N10	123.10	0.48	141.84	18.74	27
N11	119.00	0.42	141.06	22.06	31
N12	118.38	45.72	139.09	20.71	29
N13	116.50	0.31	140.94	24.44	35
N14	113.00	0.28	140.94	27.94	40
N15	112.90	0.31	140.94	28.04	40
N16	112.80	0.28	140.94	28.14	40
N17	113.85	0.17	140.94	27.09	39
J-89	148.64	-52.44	148.64	-	-

Water Demand Design Sheet
Interim Condition (Single Feed)

NOVATECH
Engineers, Planners & Landscape Architects

Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 13

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	143.42	20.67	29
N2	126.00	0.38	143.25	17.25	25
N3	122.75	0.48	143.07	20.32	29
N4	119.55	0.57	143.11	23.56	34
N5	120.00	0.52	142.79	22.79	32
N6	118.50	0.58	142.97	24.47	35
N7	115.50	0.41	142.97	27.47	39
N8	125.60	0.80	142.30	16.70	24
N9	123.00	0.52	142.30	19.30	27
N10	123.10	0.48	141.84	18.74	27
N11	119.00	0.42	141.06	22.06	31
N12	118.38	0.72	140.88	22.50	32
N13	116.50	45.31	140.72	24.22	34
N14	113.00	0.28	140.72	27.72	39
N15	112.90	0.31	140.72	27.82	40
N16	112.80	0.28	140.72	27.92	40
N17	113.85	0.17	140.72	26.87	38
J-89	148.64	-52.44	148.64	-	-

Water Demand Design Sheet
Interim Condition (Single Feed)

NOVATECH
Engineers, Planners & Landscape Architects

Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 14

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	143.42	20.67	29
N2	126.00	0.38	143.25	17.25	25
N3	122.75	0.48	143.07	20.32	29
N4	119.55	0.57	143.11	23.56	34
N5	120.00	0.52	142.79	22.79	32
N6	118.50	0.58	142.97	24.47	35
N7	115.50	0.41	142.97	27.47	39
N8	125.60	0.80	142.30	16.70	24
N9	123.00	0.52	142.30	19.30	27
N10	123.10	0.48	141.84	18.74	27
N11	119.00	0.42	141.06	22.06	31
N12	118.38	0.72	140.88	22.50	32
N13	116.50	0.31	140.72	24.22	34
N14	113.00	45.28	140.22	27.22	39
N15	112.90	0.31	140.22	27.32	39
N16	112.80	0.28	140.22	27.42	39
N17	113.85	0.17	140.22	26.37	37
J-89	148.64	-52.44	148.64	-	-

Water Demand Design Sheet
Interim Condition (Single Feed)

Engineers, Planners & Landscape Architects

Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 15

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	143.42	20.67	29
N2	126.00	0.38	143.25	17.25	25
N3	122.75	0.48	143.07	20.32	29
N4	119.55	0.57	143.11	23.56	34
N5	120.00	0.52	142.79	22.79	32
N6	118.50	0.58	142.97	24.47	35
N7	115.50	0.41	142.97	27.47	39
N8	125.60	0.80	142.30	16.70	24
N9	123.00	0.52	142.30	19.30	27
N10	123.10	0.48	141.84	18.74	27
N11	119.00	0.42	141.06	22.06	31
N12	118.38	0.72	140.88	22.50	32
N13	116.50	0.31	140.72	24.22	34
N14	113.00	0.28	140.22	27.22	39
N15	112.90	45.31	139.84	26.94	38
N16	112.80	0.28	140.05	27.25	39
N17	113.85	0.17	140.13	26.28	37
J-89	148.64	-52.44	148.64	-	-

Water Demand Design Sheet
Interim Condition (Single Feed)

NOVATECH
Engineers, Planners & Landscape Architects

Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 16

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	143.42	20.67	29
N2	126.00	0.38	143.25	17.25	25
N3	122.75	0.48	143.07	20.32	29
N4	119.55	0.57	143.11	23.56	34
N5	120.00	0.52	142.79	22.79	32
N6	118.50	0.58	142.97	24.47	35
N7	115.50	0.41	142.97	27.47	39
N8	125.60	0.80	142.30	16.70	24
N9	123.00	0.52	142.30	19.30	27
N10	123.10	0.48	141.84	18.74	27
N11	119.00	0.42	141.06	22.06	31
N12	118.38	0.72	140.88	22.50	32
N13	116.50	0.31	140.72	24.22	34
N14	113.00	0.28	140.22	27.22	39
N15	112.90	0.31	140.04	27.14	39
N16	112.80	45.28	139.87	27.07	38
N17	113.85	0.17	140.03	26.18	37
J-89	148.64	-52.44	148.64	-	-

Water Demand Design Sheet
Interim Condition (Single Feed)

NOVATECH
Engineers, Planners & Landscape Architects

Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 17

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	143.42	20.67	29
N2	126.00	0.38	143.25	17.25	25
N3	122.75	0.48	143.07	20.32	29
N4	119.55	0.57	143.11	23.56	34
N5	120.00	0.52	142.79	22.79	32
N6	118.50	0.58	142.97	24.47	35
N7	115.50	0.41	142.97	27.47	39
N8	125.60	0.80	142.30	16.70	24
N9	123.00	0.52	142.30	19.30	27
N10	123.10	0.48	141.84	18.74	27
N11	119.00	0.42	141.06	22.06	31
N12	118.38	0.72	140.88	22.50	32
N13	116.50	0.31	140.72	24.22	34
N14	113.00	0.28	140.22	27.22	39
N15	112.90	0.31	140.11	27.21	39
N16	112.80	0.28	140.01	27.21	39
N17	113.85	45.17	139.98	26.13	37
J-89	148.64	-52.44	148.64	-	-

Water Demand Design Sheet
Ultimate Condition (Dual Feed)

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Calculated Cells →

Reference: Ottawa Design Guidelines - Water Distribution (2010 and TBs)
MOE Design Guidelines for Drinking-Water Systems (2008)
Fire Underwriter's Survey Guideline (2020)
Ontario Building Code, Part 3 (2012)

Small System = NO

Location	Total Water Demand											
Node	Residential Input & Average Demand							Maximum Day & Peak Hour Demand				Design Fire Demand	
								Maximum Day Demand		Peak Hour Demand		Required Fire Flow (RFF)	
	Singles	Semis / Towns	Apts (2-BR)	Apts (1-BR)	Apts (Avg)	Pop. Equiv.	Res. Average Day Flow Demand (L/s)	Res. Peaking Factor	Max Day Flow Demand (L/s)	Res. Peaking Factor	Peak Hour Flow Demand (L/s)	FUS (L/min)	Max Day + RFF (L/s)
N1	3	4				21.00	0.09	2.50	0.21	5.50	0.47	7,980	133.21
N2		14				37.80	0.15	2.50	0.38	5.50	0.84	7,980	133.38
N3	6	10				47.40	0.19	2.50	0.48	5.50	1.06	7,980	133.48
N4	7	12				56.20	0.23	2.50	0.57	5.50	1.25	7,980	133.57
N5	11	5				50.90	0.21	2.50	0.52	5.50	1.13	7,980	133.52
N6	13	5				57.70	0.23	2.50	0.58	5.50	1.29	7,980	133.58
N7	12					40.80	0.17	2.50	0.41	5.50	0.91	7,980	133.41
N8	9	18				79.20	0.32	2.50	0.80	5.50	1.76	7,980	133.80
N9	11	5				50.90	0.21	2.50	0.52	5.50	1.13	7,980	133.52
N10	14					47.60	0.19	2.50	0.48	5.50	1.06	7,980	133.48
N11	9	4				41.40	0.17	2.50	0.42	5.50	0.92	7,980	133.42
N12	9	15				71.10	0.29	2.50	0.72	5.50	1.58	7,980	133.72
N13	9					30.60	0.12	2.50	0.31	5.50	0.68	7,980	133.31
N14	8					27.20	0.11	2.50	0.28	5.50	0.61	7,980	133.28
N15	9					30.60	0.12	2.50	0.31	5.50	0.68	7,980	133.31
N16	8					27.20	0.11	2.50	0.28	5.50	0.61	7,980	133.28
N17	5					17.00	0.07	2.50	0.17	5.50	0.38	7,980	133.17
J-89						0.00	0.00	2.50	0.00	5.50	0.00		
J-567						0.00	0.00	2.50	0.00	5.50	0.00		
Totals	**143**	**92**	**0**	**0**	**0**	**734.60**	**2.98**	**2.50**	**7.44**	**5.50**	**16.37**		

Demand Parameters

Residential					
Unit Type Population Equiv.	Singles	Semis/ Towns	Apts (2-BR)	Apts (1-BR)	Apts (Avg)
	3.4	2.7	2.1	1.4	1.8
Dailly Demand	L/per person/day				
Average Demand	350				
Basic Demand	200				

Residential Peaking Factors	Pop.	Max Day (x Avg Day)	Peak Hour (x Avg Day)
Large System (Default)	> 500	2.50	5.50

Water Demand Design Sheet
Ultimate Condition (Dual Feed)

NOVATECH
Engineers, Planners & Landscape Architects

Maximum Pressure During Average Day (AVDY) Conditions

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (40psi - 80psi)
Acceptable w/ PRV (81psi - 100psi)
Unacceptable (< 40psi or > 100psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)	Age (hrs)
N1	122.75	0.09	179.54	56.79	81	6
N2	126.00	0.15	179.54	53.54	76	5
N3	122.75	0.19	179.54	56.79	81	4
N4	119.55	0.23	179.54	59.99	85	6
N5	120.00	0.21	179.55	59.55	85	4
N6	118.50	0.23	179.54	61.04	87	5
N7	115.50	0.17	179.54	64.04	91	8
N8	125.60	0.32	179.55	53.95	77	7
N9	123.00	0.21	179.55	56.55	80	4
N10	123.10	0.19	179.56	56.46	80	4
N11	119.00	0.17	179.57	60.57	86	3
N12	118.38	0.29	179.57	61.19	87	3
N13	116.50	0.12	179.57	63.07	90	3
N14	113.00	0.11	179.58	66.58	95	2
N15	112.90	0.12	179.59	66.69	95	2
N16	112.80	0.11	179.59	66.79	95	2
N17	113.85	0.07	179.59	65.74	93	2
J-89	179.52	2.78	179.52	-	-	-
J-567	179.61	-5.76	179.61	-	-	-

Water Demand Design Sheet
Ultimate Condition (Dual Feed)

NOVATECH
Engineers, Planners & Landscape Architects

Minimum Pressure During Peak Hour (PKHR) Conditions

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 40psi)
Unacceptable (< 40psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.47	178.11	55.36	79
N2	126.00	0.84	178.10	52.10	74
N3	122.75	1.06	178.10	55.35	79
N4	119.55	1.25	178.10	58.55	83
N5	120.00	1.13	178.10	58.10	83
N6	118.50	1.29	178.10	59.60	85
N7	115.50	0.91	178.10	62.60	89
N8	125.60	1.76	178.10	52.50	75
N9	123.00	1.13	178.10	55.10	78
N10	123.10	1.06	178.11	55.01	78
N11	119.00	0.92	178.13	59.13	84
N12	118.38	1.58	178.13	59.75	85
N13	116.50	0.68	178.14	61.64	88
N14	113.00	0.61	178.16	65.16	93
N15	112.90	0.68	178.17	65.27	93
N16	112.80	0.61	178.18	65.38	93
N17	113.85	0.38	178.17	64.32	91
J-89	178.17	-4.90	178.17	-	-
J-567	178.26	-11.46	178.26	-	-

Water Demand Design Sheet
Ultimate Condition (Dual Feed)

NOVATECH
Engineers, Planners & Landscape Architects

Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 1

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	133.21	147.54	24.79	35
N2	126.00	0.38	147.89	21.89	31
N3	122.75	0.48	148.28	25.53	36
N4	119.55	0.57	148.20	28.65	41
N5	120.00	0.52	148.94	28.94	41
N6	118.50	0.58	148.47	29.97	43
N7	115.50	0.41	148.47	32.97	47
N8	125.60	0.80	150.15	24.55	35
N9	123.00	0.52	150.15	27.15	39
N10	123.10	0.48	151.39	28.29	40
N11	119.00	0.42	153.53	34.53	49
N12	118.38	0.72	153.98	35.60	51
N13	116.50	0.31	154.51	38.01	54
N14	113.00	0.28	156.03	43.03	61
N15	112.90	0.31	156.55	43.65	62
N16	112.80	0.28	157.11	44.31	63
N17	113.85	0.17	156.60	42.75	61
J-89	153.41	-55.89	153.41	-	-
J-567	160.15	-84.55	160.15	-	-

Water Demand Design Sheet
Ultimate Condition (Dual Feed)

Engineers, Planners & Landscape Architects

Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 2

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	147.81	25.06	36
N2	126.00	133.38	147.16	21.16	30
N3	122.75	0.48	147.88	25.13	36
N4	119.55	0.57	147.93	28.38	40
N5	120.00	0.52	148.60	28.60	41
N6	118.50	0.58	148.17	29.67	42
N7	115.50	0.41	148.17	32.67	46
N8	125.60	0.80	149.84	24.24	34
N9	123.00	0.52	149.84	26.84	38
N10	123.10	0.48	151.12	28.02	40
N11	119.00	0.42	153.32	34.32	49
N12	118.38	0.72	153.79	35.41	50
N13	116.50	0.31	154.34	37.84	54
N14	113.00	0.28	155.91	42.91	61
N15	112.90	0.31	156.44	43.54	62
N16	112.80	0.28	157.02	44.22	63
N17	113.85	0.17	156.49	42.64	61
J-89	153.41	-54.52	153.41	-	-
J-567	160.15	-85.92	160.15	-	-

Water Demand Design Sheet
Ultimate Condition (Dual Feed)

NOVATECH
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Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 3

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	148.02	25.27	36
N2	126.00	0.38	147.74	21.74	31
N3	122.75	133.48	147.44	24.69	35
N4	119.55	0.57	147.92	28.37	40
N5	120.00	0.52	148.30	28.30	40
N6	118.50	0.58	148.06	29.56	42
N7	115.50	0.41	148.06	32.56	46
N8	125.60	0.80	149.58	23.98	34
N9	123.00	0.52	149.58	26.58	38
N10	123.10	0.48	150.89	27.79	40
N11	119.00	0.42	153.15	34.15	49
N12	118.38	0.72	153.63	35.25	50
N13	116.50	0.31	154.19	37.69	54
N14	113.00	0.28	155.80	42.80	61
N15	112.90	0.31	156.35	43.45	62
N16	112.80	0.28	156.94	44.14	63
N17	113.85	0.17	156.40	42.55	61
J-89	153.41	-53.37	153.41	-	-
J-567	160.15	-87.07	160.15	-	-

Water Demand Design Sheet
Ultimate Condition (Dual Feed)

NOVATECH
Engineers, Planners & Landscape Architects

Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 4

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	147.97	25.22	36
N2	126.00	0.38	147.97	21.97	31
N3	122.75	0.48	147.97	25.22	36
N4	119.55	133.57	146.28	26.73	38
N5	120.00	0.52	148.37	28.37	40
N6	118.50	0.58	147.07	28.57	41
N7	115.50	0.41	147.07	31.57	45
N8	125.60	0.80	149.64	24.04	34
N9	123.00	0.52	149.64	26.64	38
N10	123.10	0.48	150.94	27.84	40
N11	119.00	0.42	153.19	34.19	49
N12	118.38	0.72	153.67	35.29	50
N13	116.50	0.31	154.22	37.72	54
N14	113.00	0.28	155.83	42.83	61
N15	112.90	0.31	156.37	43.47	62
N16	112.80	0.28	156.96	44.16	63
N17	113.85	0.17	156.42	42.57	61
J-89	153.41	-53.63	153.41	-	-
J-567	160.15	-86.81	160.15	-	-

Water Demand Design Sheet
Ultimate Condition (Dual Feed)

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Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 5

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	148.39	25.64	36
N2	126.00	0.38	148.23	22.23	32
N3	122.75	0.48	148.06	25.31	36
N4	119.55	0.57	148.08	28.53	41
N5	120.00	133.52	147.78	27.78	40
N6	118.50	0.58	147.96	29.46	42
N7	115.50	0.41	147.96	32.46	46
N8	125.60	0.80	149.11	23.51	33
N9	123.00	0.52	149.11	26.11	37
N10	123.10	0.48	150.49	27.39	39
N11	119.00	0.42	152.85	33.85	48
N12	118.38	0.72	153.35	34.97	50
N13	116.50	0.31	153.93	37.43	53
N14	113.00	0.28	155.61	42.61	61
N15	112.90	0.31	156.18	43.28	62
N16	112.80	0.28	156.80	44.00	63
N17	113.85	0.17	156.24	42.39	60
J-89	153.41	-51.36	153.41	-	-
J-567	160.15	-89.08	160.15	-	-

Water Demand Design Sheet
Ultimate Condition (Dual Feed)

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Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 6

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	148.15	25.40	36
N2	126.00	0.38	148.10	22.10	31
N3	122.75	0.48	148.05	25.30	36
N4	119.55	0.57	147.18	27.63	39
N5	120.00	0.52	148.13	28.13	40
N6	118.50	133.58	144.56	26.06	37
N7	115.50	0.41	144.56	29.06	41
N8	125.60	0.80	149.42	23.82	34
N9	123.00	0.52	149.42	26.42	38
N10	123.10	0.48	150.76	27.66	39
N11	119.00	0.42	153.05	34.05	48
N12	118.38	0.72	153.54	35.16	50
N13	116.50	0.31	154.10	37.60	53
N14	113.00	0.28	155.74	42.74	61
N15	112.90	0.31	156.29	43.39	62
N16	112.80	0.28	156.89	44.09	63
N17	113.85	0.17	156.35	42.50	60
J-89	153.41	-52.70	153.41	-	-
J-567	160.15	-87.74	160.15	-	-

Water Demand Design Sheet
Ultimate Condition (Dual Feed)

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Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 7

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	148.15	25.40	36
N2	126.00	0.38	148.10	22.10	31
N3	122.75	0.48	148.05	25.30	36
N4	119.55	0.57	147.18	27.63	39
N5	120.00	0.52	148.13	28.13	40
N6	118.50	0.58	144.56	26.06	37
N7	115.50	133.41	134.79	19.29	27
N8	125.60	0.80	149.42	23.82	34
N9	123.00	0.52	149.42	26.42	38
N10	123.10	0.48	150.76	27.66	39
N11	119.00	0.42	153.05	34.05	48
N12	118.38	0.72	153.54	35.16	50
N13	116.50	0.31	154.10	37.60	53
N14	113.00	0.28	155.74	42.74	61
N15	112.90	0.31	156.29	43.39	62
N16	112.80	0.28	156.89	44.09	63
N17	113.85	0.17	156.35	42.50	60
J-89	153.41	-52.70	153.41	-	-
J-567	160.15	-87.74	160.15	-	-

Water Demand Design Sheet
Ultimate Condition (Dual Feed)

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Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 8

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	149.09	26.34	37
N2	126.00	0.38	148.95	22.95	33
N3	122.75	0.48	148.80	26.05	37
N4	119.55	0.57	148.83	29.28	42
N5	120.00	0.52	148.57	28.57	41
N6	118.50	0.58	148.71	30.21	43
N7	115.50	0.41	148.71	33.21	47
N8	125.60	133.80	144.15	18.55	26
N9	123.00	0.52	148.17	25.17	36
N10	123.10	0.48	149.66	26.56	38
N11	119.00	0.42	152.23	33.23	47
N12	118.38	0.72	152.77	34.39	49
N13	116.50	0.31	153.40	36.90	52
N14	113.00	0.28	155.23	42.23	60
N15	112.90	0.31	155.85	42.95	61
N16	112.80	0.28	156.52	43.72	62
N17	113.85	0.17	155.91	42.06	60
J-89	153.41	-47.37	153.41	-	-
J-567	160.15	-93.07	160.15	-	-

Water Demand Design Sheet
Ultimate Condition (Dual Feed)

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Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 9

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	149.09	26.34	37
N2	126.00	0.38	148.95	22.95	33
N3	122.75	0.48	148.80	26.05	37
N4	119.55	0.57	148.83	29.28	42
N5	120.00	0.52	148.57	28.57	41
N6	118.50	0.58	148.71	30.21	43
N7	115.50	0.41	148.71	33.21	47
N8	125.60	0.80	148.17	22.57	32
N9	123.00	133.52	148.17	25.17	36
N10	123.10	0.48	149.66	26.56	38
N11	119.00	0.42	152.23	33.23	47
N12	118.38	0.72	152.77	34.39	49
N13	116.50	0.31	153.40	36.90	52
N14	113.00	0.28	155.23	42.23	60
N15	112.90	0.31	155.85	42.95	61
N16	112.80	0.28	156.52	43.72	62
N17	113.85	0.17	155.91	42.06	60
J-89	153.41	-47.37	153.41	-	-
J-567	160.15	-93.07	160.15	-	-

Water Demand Design Sheet
Ultimate Condition (Dual Feed)

NOVATECH
Engineers, Planners & Landscape Architects

Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 10

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	149.80	27.05	38
N2	126.00	0.38	149.68	23.68	34
N3	122.75	0.48	149.55	26.80	38
N4	119.55	0.57	149.58	30.03	43
N5	120.00	0.52	149.36	29.36	42
N6	118.50	0.58	149.48	30.98	44
N7	115.50	0.41	149.48	33.98	48
N8	125.60	0.80	149.03	23.43	33
N9	123.00	0.52	149.03	26.03	37
N10	123.10	133.48	148.72	25.62	36
N11	119.00	0.42	151.52	32.52	46
N12	118.38	0.72	152.12	33.74	48
N13	116.50	0.31	152.81	36.31	52
N14	113.00	0.28	154.79	41.79	59
N15	112.90	0.31	155.47	42.57	61
N16	112.80	0.28	156.20	43.40	62
N17	113.85	0.17	155.54	41.69	59
J-89	153.41	-43.02	153.41	-	-
J-567	160.15	-97.42	160.15	-	-

Water Demand Design Sheet
Ultimate Condition (Dual Feed)

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Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 11

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	151.03	28.28	40
N2	126.00	0.38	150.96	24.96	35
N3	122.75	0.48	150.88	28.13	40
N4	119.55	0.57	150.89	31.34	45
N5	120.00	0.52	150.75	30.75	44
N6	118.50	0.58	150.83	32.33	46
N7	115.50	0.41	150.83	35.33	50
N8	125.60	0.80	150.54	24.94	35
N9	123.00	0.52	150.54	27.54	39
N10	123.10	0.48	150.35	27.25	39
N11	119.00	133.42	150.03	31.03	44
N12	118.38	0.72	150.73	32.35	46
N13	116.50	0.31	151.54	35.04	50
N14	113.00	0.28	153.87	40.87	58
N15	112.90	0.31	154.66	41.76	59
N16	112.80	0.28	155.52	42.72	61
N17	113.85	0.17	154.74	40.89	58
J-89	153.41	-34.30	153.41	-	-
J-567	160.15	-106.14	160.15	-	-

Water Demand Design Sheet
Ultimate Condition (Dual Feed)

Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 12

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	151.46	28.71	41
N2	126.00	0.38	151.39	25.39	36
N3	122.75	0.48	151.33	28.58	41
N4	119.55	0.57	151.34	31.79	45
N5	120.00	0.52	151.23	31.23	44
N6	118.50	0.58	151.29	32.79	47
N7	115.50	0.41	151.29	35.79	51
N8	125.60	0.80	151.06	25.46	36
N9	123.00	0.52	151.06	28.06	40
N10	123.10	0.48	150.91	27.81	40
N11	119.00	0.42	150.65	31.65	45
N12	118.38	133.72	136.93	18.55	26
N13	116.50	0.31	151.01	34.51	49
N14	113.00	0.28	153.49	40.49	58
N15	112.90	0.31	154.33	41.43	59
N16	112.80	0.28	155.24	42.44	60
N17	113.85	0.17	154.41	40.56	58
J-89	153.41	-30.85	153.41	-	-
J-567	160.15	-109.59	160.15	-	-

Water Demand Design Sheet
Ultimate Condition (Dual Feed)

NOVATECH
Engineers, Planners & Landscape Architects

Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 13

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	151.62	28.87	41
N2	126.00	0.38	151.56	25.56	36
N3	122.75	0.48	151.50	28.75	41
N4	119.55	0.57	151.51	31.96	45
N5	120.00	0.52	151.41	31.41	45
N6	118.50	0.58	151.46	32.96	47
N7	115.50	0.41	151.46	35.96	51
N8	125.60	0.80	151.26	25.66	36
N9	123.00	0.52	151.26	28.26	40
N10	123.10	0.48	151.12	28.02	40
N11	119.00	0.42	150.89	31.89	45
N12	118.38	0.72	150.83	32.45	46
N13	116.50	133.31	150.79	34.29	49
N14	113.00	0.28	153.33	40.33	57
N15	112.90	0.31	154.19	41.29	59
N16	112.80	0.28	155.12	42.32	60
N17	113.85	0.17	154.27	40.42	57
J-89	153.41	-29.45	153.41	-	-
J-567	160.15	-110.99	160.15	-	-

Water Demand Design Sheet
Ultimate Condition (Dual Feed)

NOVATECH
Engineers, Planners & Landscape Architects

Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 14

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	152.56	29.81	42
N2	126.00	0.38	152.53	26.53	38
N3	122.75	0.48	152.51	29.76	42
N4	119.55	0.57	152.51	32.96	47
N5	120.00	0.52	152.47	32.47	46
N6	118.50	0.58	152.49	33.99	48
N7	115.50	0.41	152.49	36.99	53
N8	125.60	0.80	152.40	26.80	38
N9	123.00	0.52	152.40	29.40	42
N10	123.10	0.48	152.35	29.25	42
N11	119.00	0.42	152.26	33.26	47
N12	118.38	0.72	152.23	33.85	48
N13	116.50	0.31	152.22	35.72	51
N14	113.00	133.28	152.17	39.17	56
N15	112.90	0.31	153.18	40.28	57
N16	112.80	0.28	154.27	41.47	59
N17	113.85	0.17	153.28	39.43	56
J-89	153.41	-19.66	153.41	-	-
J-567	160.15	-120.78	160.15	-	-

Water Demand Design Sheet
Ultimate Condition (Dual Feed)

NOVATECH
Engineers, Planners & Landscape Architects

Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 15

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	152.93	30.18	43
N2	126.00	0.38	152.91	26.91	38
N3	122.75	0.48	152.90	30.15	43
N4	119.55	0.57	152.90	33.35	47
N5	120.00	0.52	152.88	32.88	47
N6	118.50	0.58	152.89	34.39	49
N7	115.50	0.41	152.89	37.39	53
N8	125.60	0.80	152.84	27.24	39
N9	123.00	0.52	152.85	29.85	42
N10	123.10	0.48	152.82	29.72	42
N11	119.00	0.42	152.78	33.78	48
N12	118.38	0.72	152.77	34.39	49
N13	116.50	0.31	152.76	36.26	52
N14	113.00	0.28	152.74	39.74	57
N15	112.90	133.31	151.13	38.23	54
N16	112.80	0.28	153.79	40.99	58
N17	113.85	0.17	153.30	39.45	56
J-89	153.41	-14.48	153.41	-	-
J-567	160.15	-125.96	160.15	-	-

Water Demand Design Sheet
Ultimate Condition (Dual Feed)

NOVATECH
Engineers, Planners & Landscape Architects

Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 16

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	153.24	30.49	43
N2	126.00	0.38	153.23	27.23	39
N3	122.75	0.48	153.23	30.48	43
N4	119.55	0.57	153.23	33.68	48
N5	120.00	0.52	153.22	33.22	47
N6	118.50	0.58	153.22	34.72	49
N7	115.50	0.41	153.22	37.72	54
N8	125.60	0.80	153.21	27.61	39
N9	123.00	0.52	153.21	30.21	43
N10	123.10	0.48	153.21	30.11	43
N11	119.00	0.42	153.20	34.20	49
N12	118.38	0.72	153.20	34.82	50
N13	116.50	0.31	153.20	36.70	52
N14	113.00	0.28	153.20	40.20	57
N15	112.90	0.31	153.20	40.30	57
N16	112.80	133.28	153.20	40.40	57
N17	113.85	0.17	153.20	39.35	56
J-89	153.41	-8.31	153.41	-	-
J-567	160.15	-132.13	160.15	-	-

Water Demand Design Sheet
Ultimate Condition (Dual Feed)

Engineers, Planners & Landscape Architects

Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition @ Node 17

Novatech Project #: 118178
Project Name: Brown Lands
Date: 13/02/2024
Input By: Samantha Bennett
Reviewed By: Trevor McKay
Drawing Reference: Figure 12

Legend: Input by User | No Input Required
Acceptable (=> 20psi)
Unacceptable (< 20psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
N1	122.75	0.21	152.91	30.16	43
N2	126.00	0.38	152.89	26.89	38
N3	122.75	0.48	152.87	30.12	43
N4	119.55	0.57	152.88	33.33	47
N5	120.00	0.52	152.85	32.85	47
N6	118.50	0.58	152.86	34.36	49
N7	115.50	0.41	152.86	37.36	53
N8	125.60	0.80	152.82	27.22	39
N9	123.00	0.52	152.82	29.82	42
N10	123.10	0.48	152.79	29.69	42
N11	119.00	0.42	152.75	33.75	48
N12	118.38	0.72	152.74	34.36	49
N13	116.50	0.31	152.73	36.23	52
N14	113.00	0.28	152.71	39.71	56
N15	112.90	0.31	153.24	40.34	57
N16	112.80	0.28	153.82	41.02	58
N17	113.85	133.17	152.35	38.50	55
J-89	153.41	-14.85	153.41	-	-
J-567	160.15	-125.59	160.15	-	-

Table 17: Opinion of Probable Costs Short-Term Water Distribution

Option	Diameter (mm)	Length (m)	Rate ($/m)(1)	Engineering and Contingency (27%)	Rounded Total(3)
Victoria Street Upgrade(2)	300	690	$470	$88,000	$410,000
County Road 29 Looping Wylie Street to Dunn Street	250	88	$1,100	$26,000	$125,000

1. Rates based on City of Ottawa 2015 Unit Rates for watermain, restoration of road (granulars, base and wear) and curb, and other past experience.
2. Victoria Street road reinstatement costs carried under wastewater collection servicing strategies and not included herein.
3. Rounded to the nearest $5,000.

4.8.2 Mid-Term (5 to 10 Years): Water Distribution

The mid-term water distribution system servicing options identified to address the required fire flow and system pressures include:

- County Road 29 Well 6 to Wylie Upgrade: Watermain upgrade will service residential development in the northwest quadrant.
- Pressure Zone 2 Optimization: Reducing the size of PZ-2 will improve existing water service and facilitate development of the northwest quadrant. This upgrade includes 2 new pressure reducing valves (PRVs) at Almonte Street and Hope Street, and decommissioning of the existing Almonte Street PRV. This was generally considered in the 2012 Master Plan for the 10 to 20 year timeframe.
- Martin Street North, from Teskey Street to Carss Street: This will improve servicing for expansion of the White Tail Subdivision. This upgrade was originally envisioned in the 2012 Master Plan for the 0 to 5 year timeframe.
- Princess Street and Martin Street North Upgrades: This rehabilitation and upgrades will service residential development in the northwest quadrant.
- Union Street North, from Princess Street to Carss Street: This rehabilitation and upgrades will service residential development in the northwest quadrant.
- Adelaide and Brookdale Street Looping: This will improve water servicing for expansion of the White Tail Subdivision. This upgrade was originally envisioned in the 2012 Master Plan for the 0 to 5 year timeframe.
- Carss Street, from Mitcheson Street to Union Street North: This watermain extension will service residential development in the northwest quadrant.
- Carss Street, from Union Street North to Mississippi River: This watermain extension will service residential development in the northwest quadrant.

- Mississippi River Third Crossing: This watermain extension will service residential development in the northwest quadrant.

It is noted that the 2012 Master Plan also envisioned mid-term upgrades for Ottawa Street to service the Mill Run development. Since 2012, this work was undertaken by the related developer.

The opinions of probable costs associated with the mid-term water distribution servicing strategies are summarized in Table 18.

Table 18: Opinion of Probable Costs Mid-Term Water Distribution

Option	Diameter (mm)	Length (m)	Rate ($/m)(1)	Engineering and Contingency (27%)	Rounded Total(5)
County Road 29 Well 6 to Wylie Street Upgrade	250	570	$1,100	$169,000	$795,000
Pressure Zone 2 Optimization	$150,000(2)			$37,500	$188,000
Martin Street North, from Teskey Street to Carss Street	200	441	$1,030	$123,000	$575,000
Princess Street and Martin Street North Upgrades(3)	300	281	$470	$36,000	$170,000
Union Street North, from Princess Street to Carss Street(3)	300	710	$470	$90,000	$425,000
Adelaide and Brookdale Street Looping	200	199	$1,030	$55,000	$260,000
Carss Street, from Mitcheson Street to Union Street North	200	97	$1,030	$27,000	$125,000
Carss Street, from Union Street North to Mississippi River	300	160	$1,090	$47,000	$220,000
Mississippi River Third Crossing	300	200	$10,000(4)	$540,000	$2,540,000

1. Rates based on City of Ottawa 2015 Unit Rates for watermain, restoration of road (granulars, base and wear) and curb, and other past experience.
2. Allowance.
3. Road reinstatement costs carried under wastewater collection servicing strategies and so not included herein.
4. High level estimate for rock boring below Mississippi River.
5. Rounded to the nearest $5,000.

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MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WATER SYSTEM EXISTING MAX DAY DEMAND / FIRE FLOW

DESIGN:	MB		
DRAWN:	KTK	DRAWING #:	
CHECKED:	SG		**FIGURE 7**
JLR #:	27456-01		

PLOT DATE: January 5, 2018 8:40:14 AM

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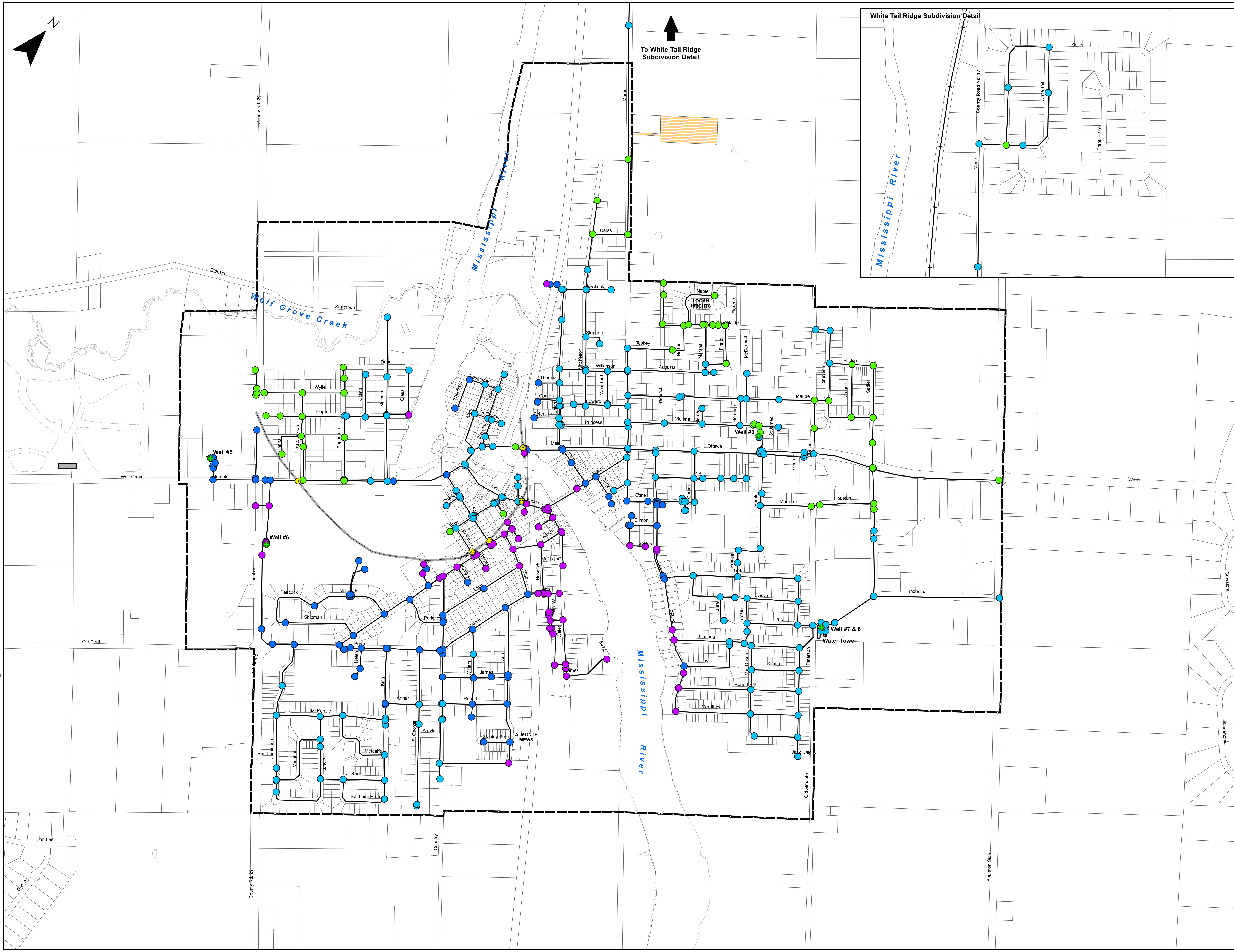

Peak Hour

- < 274 kPa
- 275 to 300 kPa
- 301 to 400 kPa
- 401 to 500 kPa
- 501 to 550 kPa
- > 550 kPa

Infrastructure

- Pressure Reducing Valve
- Well
- Water Tower
- Pressure Zone
- Watermain

Land Use

- Almonte Ward Limits
- Existing Lots
- Closed Waste Disposal Site

No.	ISSUE / REVISION	DD/MM/YY

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MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WATER SYSTEM EXISTING PEAK HOUR

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 8**

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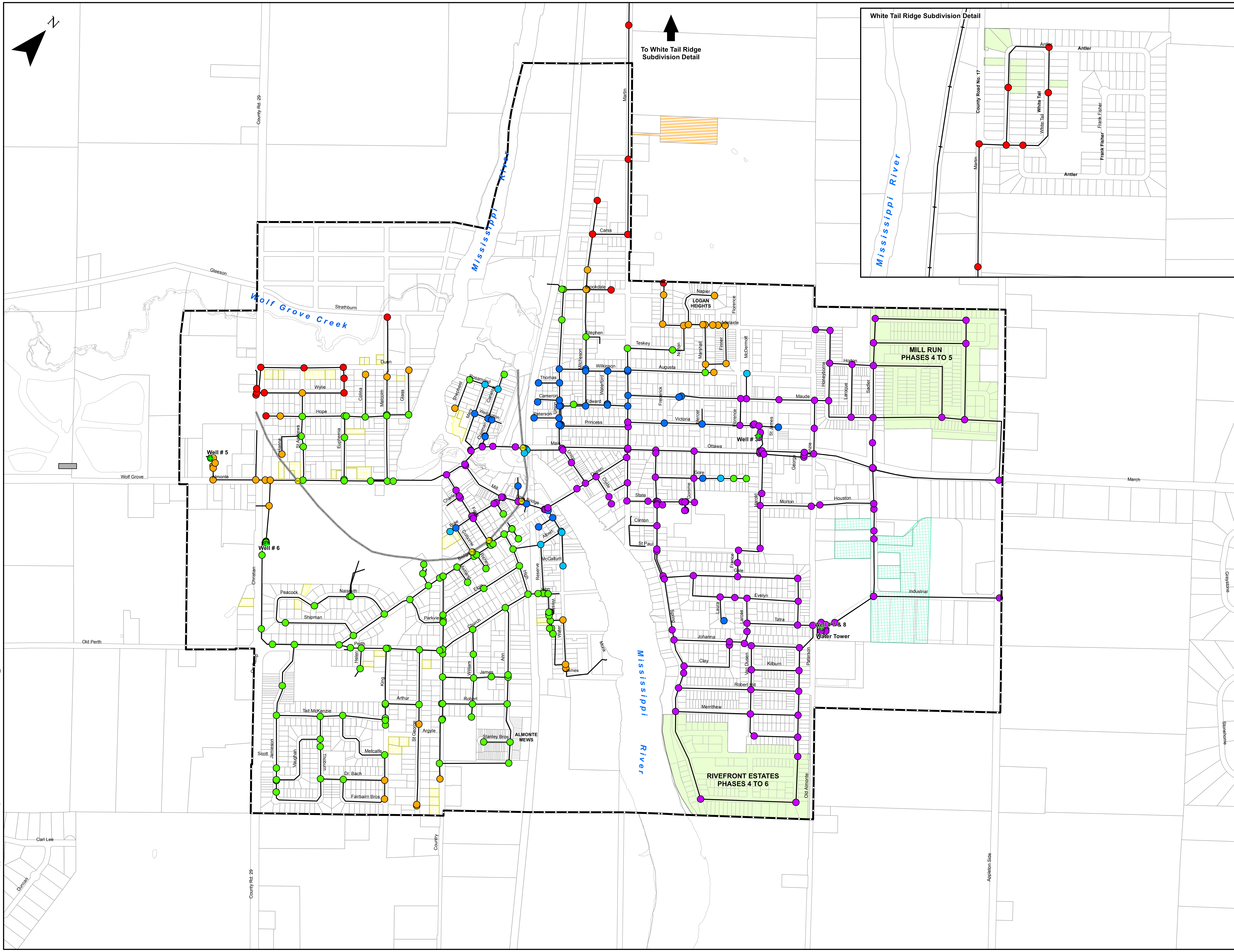

Max Day + Fire Flow

- < 32 L/s
- 33 to 50 L/s
- 51 to 67 L/s
- 68 to 75 L/s
- 76 to 100 L/s
- 100 to 300 L/s

Infrastructure

- Pressure Reducing Valve
- Well
- Water Tower
- Pressure Zone
- Watermain

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- SUBDIVISION
- Business Park (9.0 ha)
- Residential - Infill (3.8 ha)

No.	ISSUE / REVISION	DD/MM/YY

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SCALE: 0 50 100 200 300 400 Meters

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MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WATER SYSTEM 0 TO 5 YEARS (2018 TO 2022) MAX DAY DEMAND / FIRE FLOW

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 9**

PLOT DATE: January 5, 2018 8:48:58 AM

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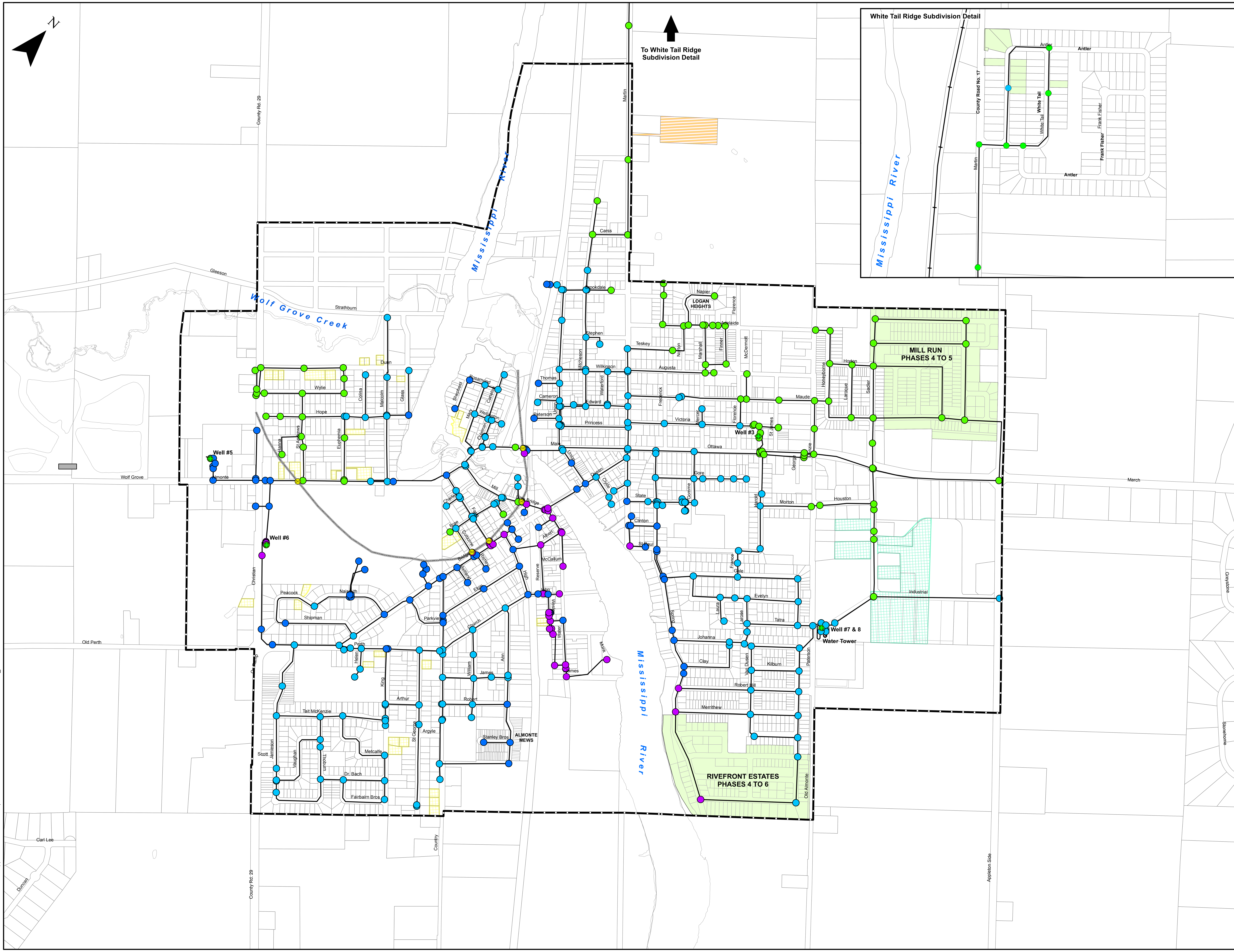

Peak Hour

- < 274 kPa
- 275 to 300 kPa
- 301 to 400 kPa
- 401 to 500 kPa
- 501 to 550 kPa
- > 550 kPa

Infrastructure

- Pressure Reducing Valve
- Well
- Water Tower
- Pressure Zone
- Watermain

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- SUBDIVISION
- Business Park (9.0 ha)
- Residential - Infill (3.8 ha)

No.	ISSUE / REVISION	DD/MM/YY

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SCALE:

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MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WATER SYSTEM 0 TO 5 YEARS (2018 TO 2022) PEAK HOUR

DESIGN: MB	
DRAWN: KTK	DRAWING #:
CHECKED: SG	**FIGURE 10**
JLR #: 27456-01	

PLOT DATE: January 5, 2018 8:51:05 AM

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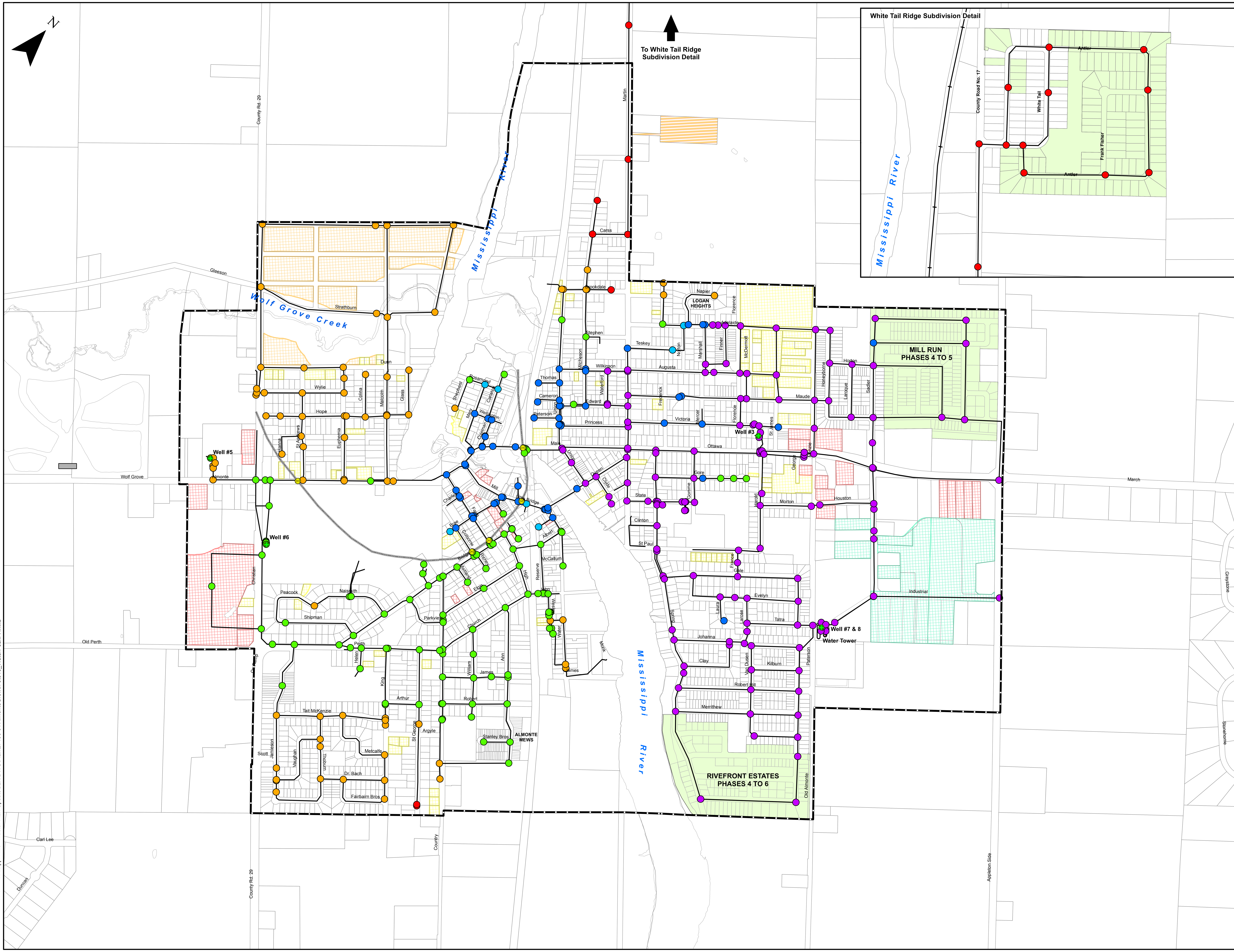

Max Day + Fire Flow

- < 32 L/s
- 33 to 50 L/s
- 51 to 67 L/s
- 68 to 75 L/s
- 76 to 100 L/s
- 100 to 300 L/s

Infrastructure

- Pressure Reducing Valve
- Well
- Water Tower
- Pressure Zone
- Watermain

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Business Park (17.0 ha)
- Commercial (15.6 ha)
- Residential - Geenfield (14.2 ha)
- Residential - Infill (16.0 ha)

No.	ISSUE / REVISION	DD/MM/YY

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

SCALE: 0 50 100 200 300 400 Meters

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MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WATER SYSTEM 5 TO 10 YEARS (2023 TO 2028) MAX DAY DEMAND / FIRE FLOW

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 11**

PLOT DATE: January 5, 2018 8:54:26 AM

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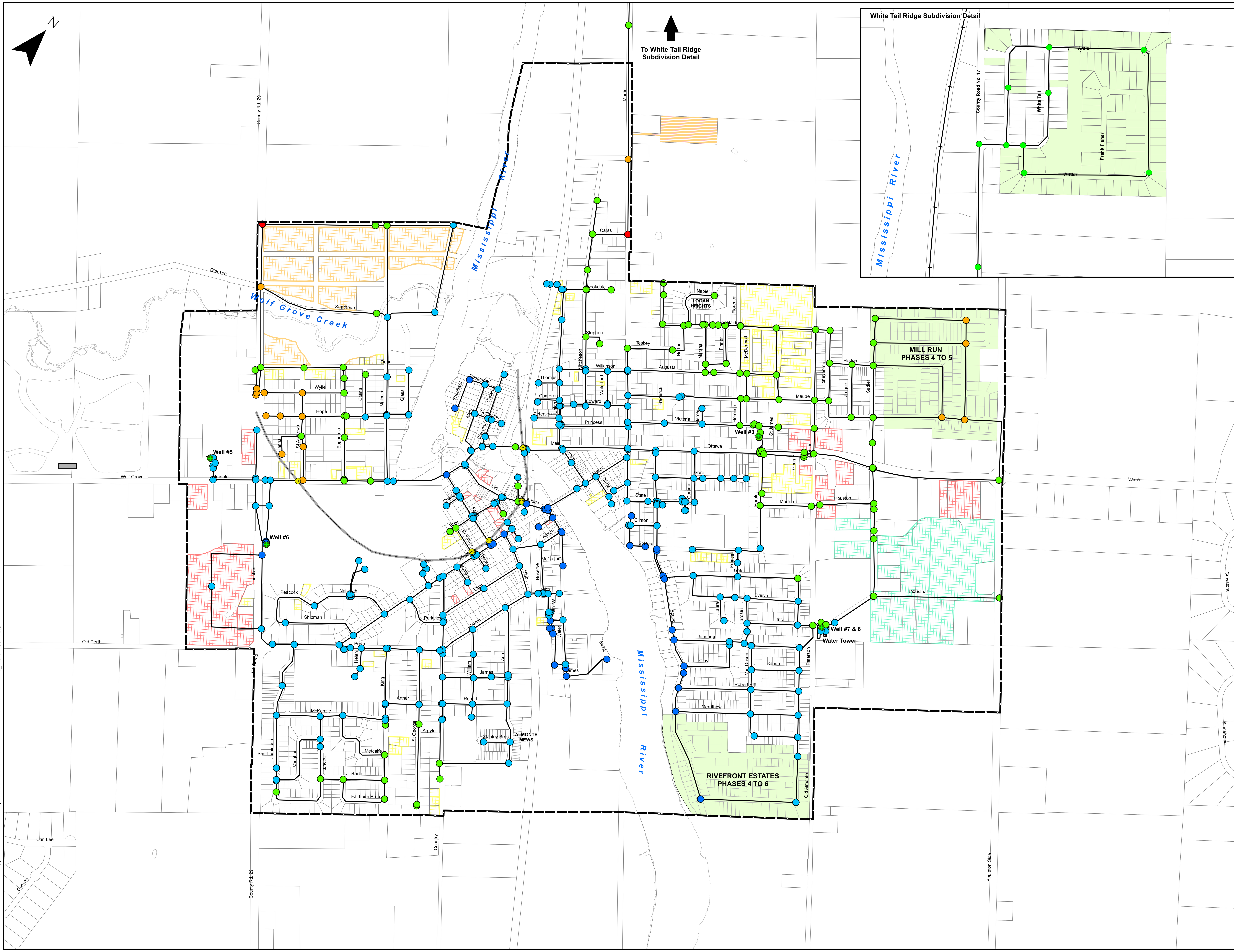

Peak Hour

- < 274 kPa
- 275 to 300 kPa
- 301 to 400 kPa
- 401 to 500 kPa
- 501 to 550 kPa
- > 550 kPa

Infrastructure

- Pressure Reducing Valve
- Well
- Water Tower
- Pressure Zone
- Watermain

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Business Park (17.0 ha)
- Commercial (15.6 ha)
- Residential - Geenfield (14.2 ha)
- Residential - Infill (16.0 ha)

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MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WATER SYSTEM 5 TO 10 YEARS (2023 TO 2028) PEAK HOUR

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 12**

PLOT DATE: January 5, 2018 8:56:08 AM

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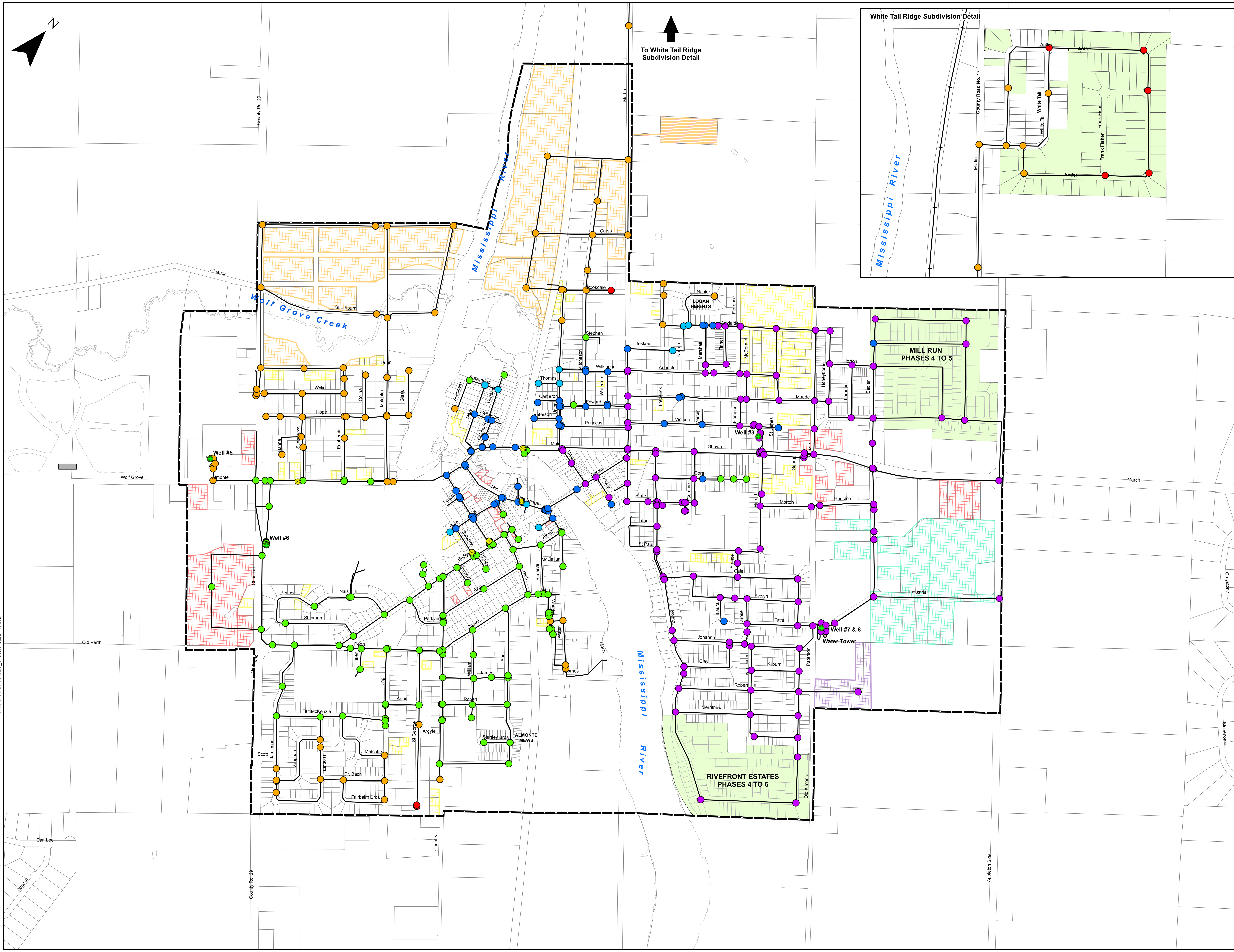

Max Day + Fire Flow

- < 32 L/s
- 33 to 50 L/s
- 51 to 67 L/s
- 68 to 75 L/s
- 76 to 100 L/s
- 100 to 300 L/s

Infrastructure

- Pressure Reducing Valve
- Well
- Water Tower
- Watermain

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Business Park (17.0 ha)
- Community Facility (3.1 ha)
- Commercial (15.6 ha)
- Residential - Geenfield (34.2 ha)
- Residential - Infill (16.0 ha)

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SCALE: 0 50 100 200 300 400 Meters

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MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WATER SYSTEM 10 TO 20 YEARS (2029 TO 2037) MAX DAY DEMAND / FIRE FLOW

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 13**

PLOT DATE: January 5, 2018 8:58:10 AM

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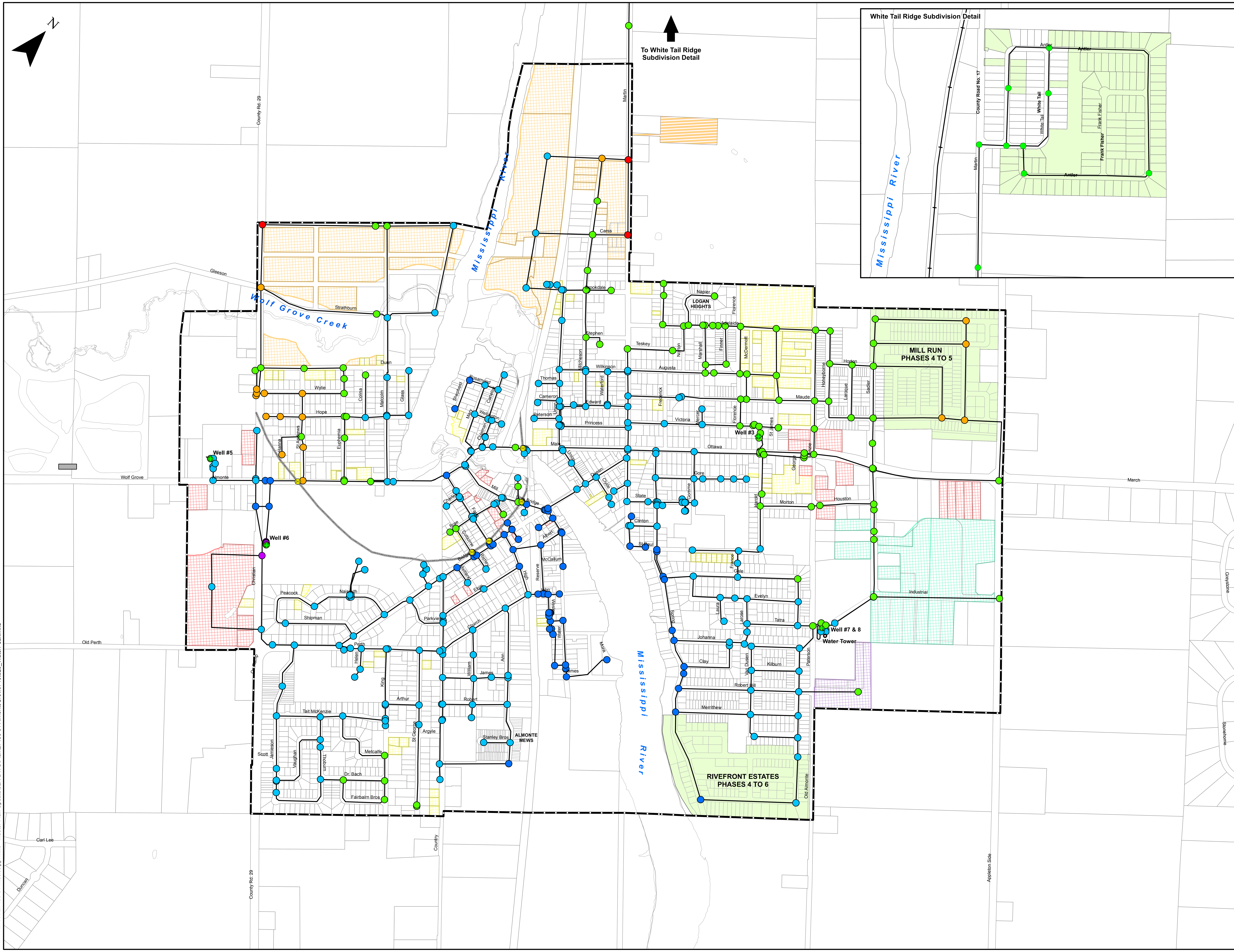

Peak Hour

- < 274 kPa
- 275 to 300 kPa
- 301 to 400 kPa
- 401 to 500 kPa
- 501 to 550 kPa
- > 550 kPa

Infrastructure

- Pressure Reducing Valve
- Well
- Water Tower
- Pressure Zone
- Watermain

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Business Park (17.0 ha)
- Community Facility (3.1 ha)
- Commercial (15.6 ha)
- Residential - Geenfield (34.2 ha)
- Residential - Infill (16.0 ha)

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SCALE: 0 50 100 200 300 400 Meters

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MISSISSIPPI MILLS, ONTARIO

DRAWING:

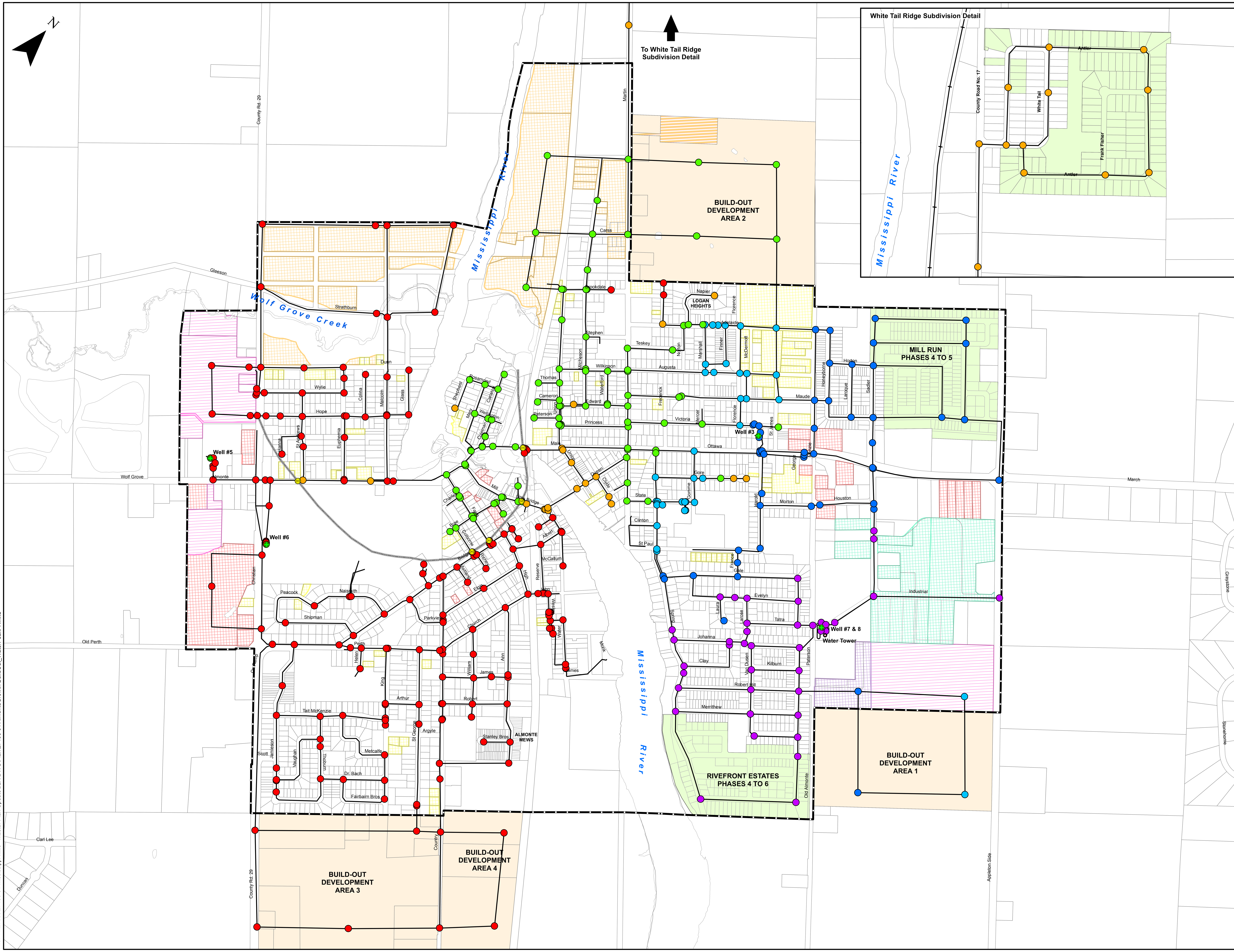
ALMONTE WARD WATER SYSTEM 10 TO 20 YEARS (2029 TO 2037) PEAK HOUR

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 14**

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 AlmonteGrowth 10to20_WaterPeak.mxd

PLOT DATE: January 5, 2018 8:59:35 AM



Max Day + Fire Flow

- < 32 L/s
- 33 to 50 L/s
- 51 to 67 L/s
- 68 to 75 L/s
- 76 to 100 L/s
- 100 to 300 L/s

Infrastructure

- Pressure Reducing Valve
- Well
- Water Tower
- Pressure Zone
- Watermain

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Build Out
- Business Park (17.0 ha)
- Community Facility (3.1 ha)
- Commercial (15.6 ha)
- Industrial (24.1 ha)
- Residential - Geenfield (34.2 ha)
- Residential - Infill (16.0 ha)

No.	ISSUE / REVISION	DD/MM/YY

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

SCALE: 0 50 100 200 300 400 Meters

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PROJECT:

MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WATER SYSTEM BUILD-OUT (2037+) MAX DAY DEMAND / FIRE FLOW

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 15**

PLOT DATE: January 5, 2018 2:34:35 PM

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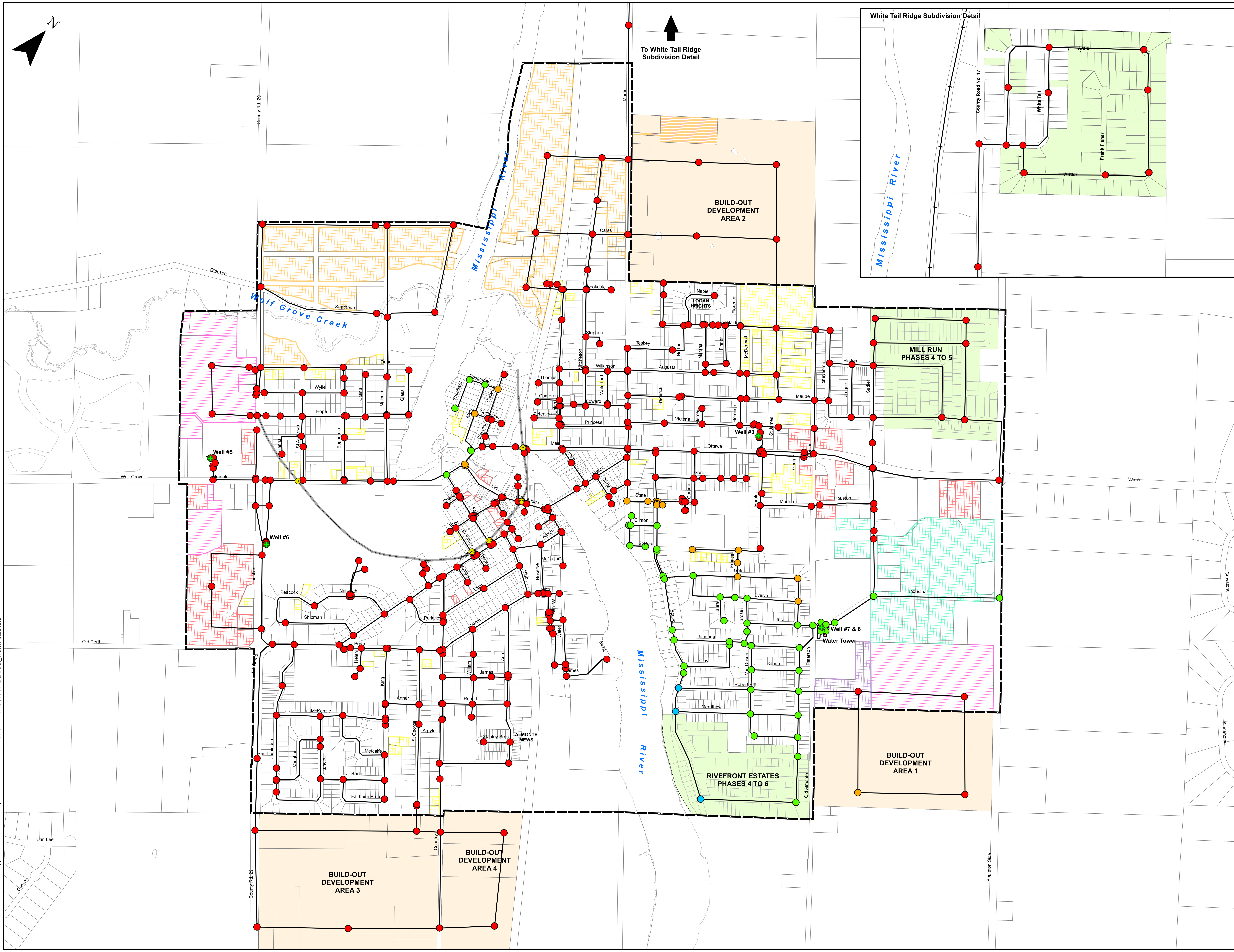

Peak Hour

- < 274 kPa
- 275 to 300 kPa
- 301 to 400 kPa
- 401 to 500 kPa
- 501 to 550 kPa
- > 550 kPa

Infrastructure

- Pressure Reducing Valve
- Well
- Water Tower
- Pressure Zone
- Watermain

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Build Out
- Business Park (17.0 ha)
- Community Facility (3.1 ha)
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- Residential - Geenfield (34.2 ha)
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No.	ISSUE / REVISION	DD/MM/YY

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SCALE: 0 50 100 200 300 400 Meters

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PROJECT:

MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

DRAWING:

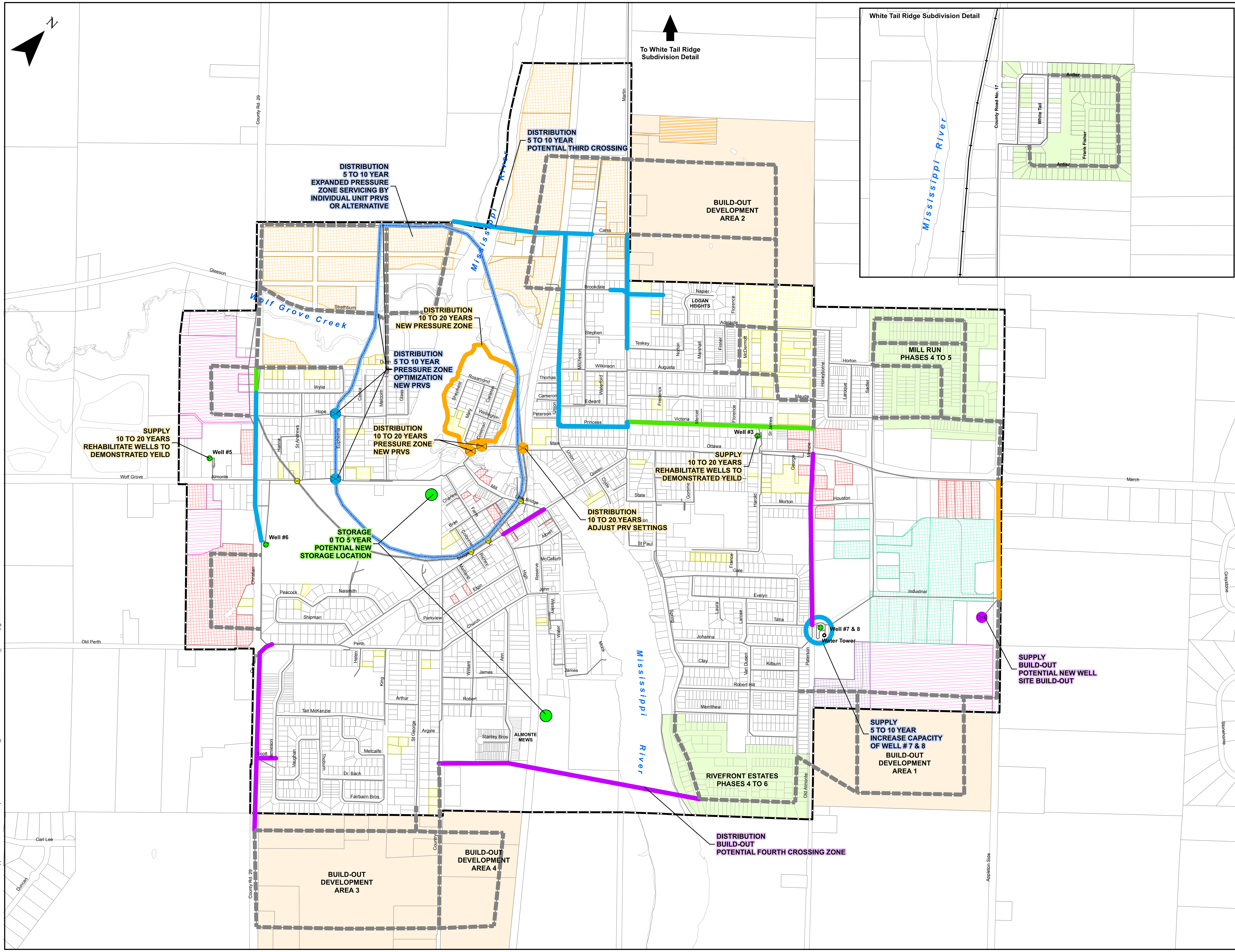
ALMONTE WARD WATER SYSTEM BUILD-OUT (2037+) PEAK HOUR

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 16**

PLOT DATE: January 5, 2018 2:35:54 PM

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\ULR DWG\Plan\27456-01 AlmonteGrowth BuildOut_WaterPeak.mxd



Watermain Upgrades

- Future Pressure Zone
- 0 to 5 Years
- 5 to 10 Years
- 10 to 20 Years
- Future Watermain
- Simulated Watermain Routing (conceptual) to be finalized during development stage

Infrastructure

- Pressure Reducing Valve
- Well
- Water Tower
- Existing Pressure Zone
- Watermain

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Build Out
- Business Park (17.0 ha)
- Community Facility (3.1 ha)
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- Residential - Geenfield (34.2 ha)
- Residential - Infill (16.0 ha)

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PROJECT:

MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WATER SYSTEM SERVICING STRATEGIES SUPPLY STORAGE DISTRIBUTION

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 17**

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\17_27456-01 AlmonteGrowth BuildOut_WaterUpgrades.mxd

PLOT DATE: January 26, 2018 11:13:39 AM