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- Commercial & Institutional
- Environmental Restoration

39 Years

Hannan Hills

Serviceability and Conceptual Stormwater Management Report

Prepared for: 1384341 Ontario Ltd

SERVICEABILITY AND CONCEPTUAL STORMWATER MANAGEMENT REPORT

In support of Draft Plan of Subdivision And Zoning By-law Amendment Applications

Hannan Hills Residential Development

Almonte, ON

Prepared For:

NEILCORP
Award Winning Quality Homes

THOMAS CAVANAGH CONSTRUCTION LIMITED

Prepared By:

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

May 2021
Novatech File: 118201

Ref: R-2021-010

NOVATECH
Engineers, Planners & Landscape Architects

May 20, 2021 BY COURIER

County of Lanark
Planning Department
99 Christie Lake Road
Perth, ON K7H 3C6

Attention: Julie Stewart, RPP, MCIP County Planner

Reference: Hannan Hills Residential Development
Serviceability and Conceptual Stormwater Management Report
Our File No.: 118201

Please find enclosed the report entitled "Serviceability and Conceptual Stormwater Management Report" dated May 20, 2021 prepared for the Hannan Hills Residential Development.

The report outlines the preliminary servicing design for the proposed development with respect to water distribution, sanitary servicing and storm drainage, as well as a preliminary approach to stormwater management. This report is submitted in support of an application for Draft Plan Approval.

If you require any additional information, please contact the undersigned

Yours truly,

NOVATECH

Alex McAuley, P. Eng.
Project Manager | Land Development Engineering

cc: Robert Dick, Douglas McIntosh, Neilcorp Homes
Matt Nesrallah, Cavanagh Construction

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

Novatech has been retained to prepare a serviceability and conceptual stormwater management report in support of an application for Draft Plan Approval for the proposed Hannan Hills Residential Subdivision.

1.1 Purpose

This report outlines the conceptual servicing design for the proposed development with respect to water distribution, sanitary servicing and storm drainage, as well as the approach to stormwater management.

1.2 Site Location and Description

The property, approximately 4.15 hectares (10.3 acres) in size, is bound by undeveloped lands to the north with existing residential lands to the south, east and west. In addition, the Almonte Municipal Drain runs adjacent to the east property boundary. Refer to **Figure 1 (Key Plan)** for the site location.

The site is currently occupied by a single-family home and is lightly treed. Refer to **Figure 2 (Existing Conditions Plan)** for an aerial photograph of the property.

1.3 Proposed Development

It is proposed to develop a residential subdivision of 166 townhomes with the following unit breakdown:

Unit Type	Number of Units
2-Storey Street Facing Townhome	78
Stacked Townhome	48
Back-to-Back Townhome	40

The development will include one new road as well as an extension of Adelaide Street that will connect to Honeyborne Street. Refer to **Preliminary Grading and Servicing Plan** (**118201-PGR**) and **Figure 3** (**Concept Plan)** for the conceptual site layout.

Connections will be made to the existing Mill Run Subdivision to the east via the Adelaide Street extension to Honeyborne Street, and to Florence Street to the west. Refer to the **Draft Plan of Subdivision** for a detailed layout of the proposed subdivision.

Blocks for the stacked townhomes and back-to-back townhomes would be subject to site plan approval.

The proposed development and its impact on the existing surrounding infrastructure has been examined in a previous report by J.L. Richards (J.L. Richards Master Plan Update Report – February 2018) in which assumptions of future buildout within the town of Almonte have been made, along with recommendations on upgrades to existing infrastructure. This report references the J.L. Richards report throughout, and relevant excerpts are provided in **Appendix F**.

2.0 ROAD DESIGN

The internal subdivision roads will be constructed in accordance with the typical road cross-sections as shown on the **Preliminary Grading and Servicing Plan** (**118201-PGR**). The proposed 18-metre right-of-way will have an 8.5-metre asphalt width and curbs with no sidewalks. Upgrades to the existing municipal road allowances for Florence and Adelaide will be required. Based on required road-widenings and existing conditions, the municipal road cross sections will need to be determined at the detailed design stage.

The pavement structure will be confirmed based on a geotechnical recommendation during the detailed design stage.

3.0 SITE SERVICING

3.1 Watermain

Refer to **Figure 4 (Watermain Servicing**) for preliminary watermain layout.

The proposed 250mm and 200mm watermain to service the lots within the subdivision will connect to the existing 250mm watermain on Honeyborne Street (to the east), and to the existing 150mm watermain on Adelaide Street at Finner Court (to the west).

Fire hydrants will be installed along the proposed streets to provide fire protection. Preliminary Ontario Building Code (OBC) fire flow calculations indicate required fire flows between 45L/s and 90L/s. Addition of firewalls may be considered to reduce the higher end flow of 90L/s. Further analysis of required fire flow and potential firewall implementation would be completed at the detailed design stage. Fire flow calculations are provided in **Appendix B.**

Based on a review of the J.L. Richards Master Plan Update Report – February 2018 (2018 Master Report), the development can be adequately serviced. Initial review indicates that fire flow can be provided, and that pressure reducing valves may be required. Refer to **Appendix F** for excerpts from the 2018 Master Report.

The pressures and flows available as indicated in the 2018 Master Report are summarized in Table 3.1 below. All values below have been taken from J.L. Richards Figures 7-16 in **Appendix F**.

Table 3.1: J.L. Richards Master Plan Update Report – Honeyborne Watermain

Time Period	Peak Hour Pressure (kPa)	Max. Day + Fire Flow (L/s)	Figure #
Existing	401-550	100-300	7,8
2018-2022 (With Mill Run buildout)	401-550	100-300	9,10
2023-2028 (With subject lands developed)	301-400	100-300	11,12
2037+ (With future development to the north)	<274	68-75	15,16

Confirmation of existing flow conditions and a hydraulic network analysis of the proposed watermain layout would be completed at the detailed design stage.

3.2 Sanitary Sewer

Refer to **Figure 5 (Sanitary Servicing)** for preliminary sanitary sewer layout.

New 200mm diameter sanitary sewers will service the proposed development. The sewage flows from the site will be directed by gravity and connect to the proposed 300mm sewer located on Florence Street which will tie into the existing sanitary trunk sewer at Victoria Street. The trunk sewer ultimately conveys the flows to the Gemmill Bay Pump Station, which pumps to the Town of Mississippi Mills Wastewater Treatment Plant (WWTP).

The design criteria used to determine the size of the sanitary sewers required to service the subdivision are as follows:

Residential Areas

Average flow - residential = 350 L/cap/day
Population for townhouse unit = 3.5
Residential Peaking factor based on the Harmon Formula = 4

The theoretical peak flow for the proposed subdivision was calculated to be in the order of 10.7 L/s. Refer to the enclosed **Preliminary Sanitary Drainage Area Plan** (**118201-PSAN)** and the Sanitary Sewer Design Sheet provided in **Appendix C** for details. The proposed sanitary sewer system will have sufficient capacity to convey the theoretical sanitary flows from the subdivision.

The proposed 300mm sanitary sewer on Florence Street has been sized to capture future additional flows from the undeveloped land to the north ("Development Area 2" of J.L. Richards Figure 25), and future infill property south of the site. Allocated flows provided in the Master Report have been considered in the design of the affected downstream sanitary sewers. Refer to J.L. Richards Figure 25 in **Appendix F** for location and allocated flows of the future buildout.

3.3 Storm Drainage

Refer to **Figure 6 (Storm Servicing)** for preliminary storm sewer layout.

Storm drainage, both the minor and major systems, will outlet to a proposed stormwater management facility along the east side of the development. The stormwater management facility would provide quantity and quality control prior to discharging to the Almonte Municipal Drain. Quantity control would be provided by a dry pond. Quality control would be provided by a hydrodynamic separator unit.

3.3.1 Storm Sewers (Minor System)

The proposed storm sewers have been designed using the Rational Method to convey peak flows associated with a 5-year return period.

Refer to the **Preliminary Storm Drainage Area Plan (118201-PSTM**) and the Storm Sewer Design Sheet provided in **Appendix D** for details.

Storm Sewer Design Criteria

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 = (0.70 * %Imp.) + 0.20
    - I = rainfall intensity for a 2-year return period (mm/hr)
        - $I_{5yr} = 998.071 / [(Tc(min) + 6.053)]^{0.814}$
    - A = site area (ha)
- Minimum Pipe Size = 250 mm; Minimum / Maximum Full Flow Velocity = 0.8 m/s / 3.0 m/s

Inlet Control Devices

Inlet control devices (ICDs) will be used to restrict inflows to the minor system. Rear yard catch basins will be connected in series with an ICD installed at the outlet of the most downstream structure. ICDs will be sized to control minor system peak flows without causing surface ponding during a 5-year storm event.

Foundation Drains

Foundation drains surrounding the dwellings would be connected to the storm sewers. Based on the preliminary review of the hydraulic grade line, sump pumps would be required to drain the foundations. The sump pumps would connect to the storm sewer and would include backwater valves to prevent basement flooding in heavy rain events.

3.3.2 Major System Drainage

During detailed design, the site will be graded to provide an overland flow route to a proposed dry pond following the proposed roadway. The proposed storm sewer system would direct all minor storm runoff to the proposed Stormwater Management (SWM) Facility. Runoff from the major system would be directed overland to the same facility. The SWM Facility will be designed to provide stormwater quality and quantity control prior to outletting to the Almonte Municipal Drain.

4.0 STORMWATER MANAGEMENT

Refer to **Figure 7 (Conceptual Stormwater Management Facility)** for preliminary Stormwater Management Facility design. Supporting calculations are provided in the Conceptual Stormwater Management Design Memo in **Appendix E.**

All storm runoff (major and minor systems) from the proposed development will be directed to the proposed Stormwater Management Facility.

4.1.1 Quality Control

Water quality treatment will be provided by the SWM Facility. A water quality treatment unit is required as part of the proposed subdivision works to remove debris and sediment prior to discharging to the SWM Facility. A hydrodynamic separator (HDS) would be appropriately sized to meet this requirement and would be installed just upstream of the subdivision's outlet to the

SWM Facility. Supporting calculations are provided in the Conceptual Stormwater Management Design Memo in **Appendix E.** The HDS would be located within the SWM Facility block and would be accessible from the SWM Facility for inspection and maintenance. In addition, the SWM Facility will be able to provide a 24 hour draw down time and a low flow channel to supplement the total suspended solids removal of the HDS. The HDS unit and size would be confirmed at detailed design.

4.1.2 Quantity Control

Quantity control of peak flows to pre-development levels will be required. Flows entering the minor system will be controlled to the design capacity of the sewers. Peak flows from larger storm events may be stored in the rights-of-way and will be conveyed overland to the SWM Facility along the rights-of-way which will provide sufficient capacity to convey runoff from all storms up to and including the 100-year design event. Refer to **Appendix E** for the Conceptual Stormwater Management Design Memo detailing the conceptual stormwater management approach.

4.1.3 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:

- Rearyard CB leads will use perforated pipes to promote infiltration of runoff from rearyard areas.
- Roof leaders should be directed to rearyard areas.
- A review of pre and post-development water balance (infiltration, runoff, and evaporation) would be included in the detailed design stage. The water balance would include recommendations to meet pre-development infiltration rates. These measures may include infiltration trenches, rearyard subdrains, etc. and will be confirmed at the detailed design stage.

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 provides additional benefits: The performance of the proposed hydrodynamic separator unit would be improved, and the storage required in the SWM Facility would be reduced. 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 use and implementation of BMPs and LIDs will be reviewed again during the detailed design process.

5.0 EROSION AND SEDIMENT CONTROL

5.1 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 manholes 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.

5.2 Permanent Measures

The following will provide permanent erosion and sediment control measures:

- Grass swales along the rear and side yard property lines;
- The hydrodynamic separator unit will be designed to provide quality control for stormwater runoff prior to entering the SWMF.
- Rearyard drainage systems would be designed with a perforated pipe and clearstone to promote infiltration.
- Slopes on finish lot grades would be minimized where possible to slow the runoff of water.

6.0 CONCLUSIONS AND RECOMMENDATIONS

This report has been prepared in support of an application for Draft Plan Approval for the proposed Hannan Hills Residential Subdivision.

- The development will be serviced by connecting to existing watermains in the adjacent subdivisions.
- The development will be serviced by connecting sanitary sewers to the existing trunk sewer on Victoria Street.
- Stormwater runoff from the site will be captured by an onsite storm sewer system via a series of rear-yard swales and roadside catchbasins. The storm sewer system will direct runoff to a Stormwater Management Facility prior to releasing flows to the Almonte Municipal Drain.
- Quantity control of stormwater runoff will be provided by the Stormwater Management Facility (Dry Pond).
- Quality control of stormwater runoff will be provided by the Stormwater Management Facility which will include the hydrodynamic separator, a 24-hour draw down time, and a low flow channel.
- Temporary and permanent erosion and sediment control measures will be provided.
- Subdivision would be designed in accordance with the J.L. Richards Master Plan Update Report – February 2018

NOVATECH

Prepared by:

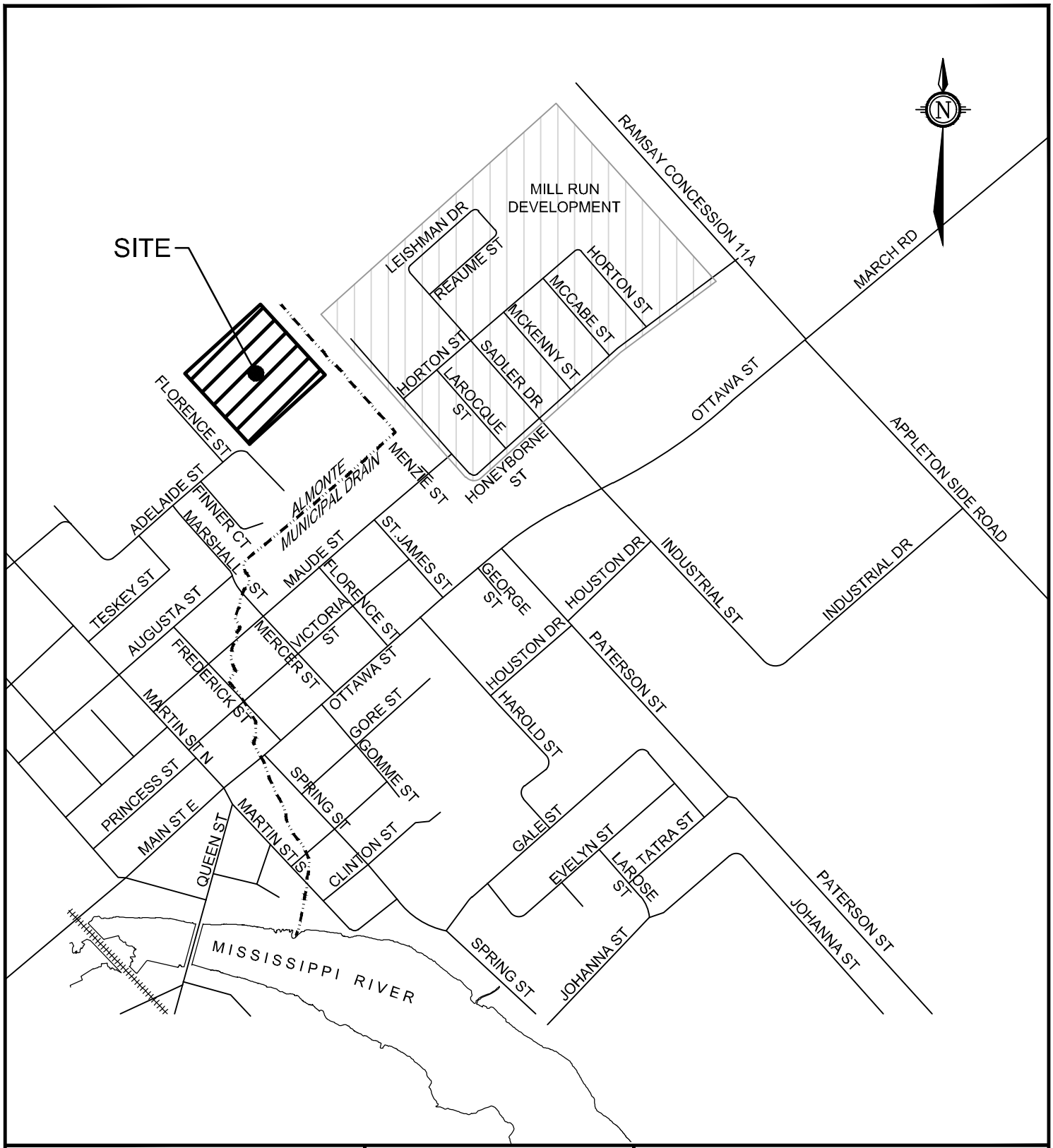
Mitch Parker, B. Eng.

Prepared by:

Alex McAuley, P.Eng.
Project Manager | Land Development

Reviewed by:

Susan Gordon, P.Eng., MBA
Director | Land Development



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MUNICIPALITY OF MISSISSIPPI MILLS
HANNAN HILLS

KEY PLAN

SCALE		
N.T.S.		
DATE	JOB	FIGURE
MAY 2021	118201	1

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SHT8X11.DWG - 216mmx279mm

LEGEND

PROPERTY BOUNDARY

STREET ONE

FLORENCE STREET

ADELAIDE STREET

FINNER COURT

MCDERMOTT STREET

HONEYBORNE STREET

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HANNAN HILLS

EXISTING CONDITIONS PLAN

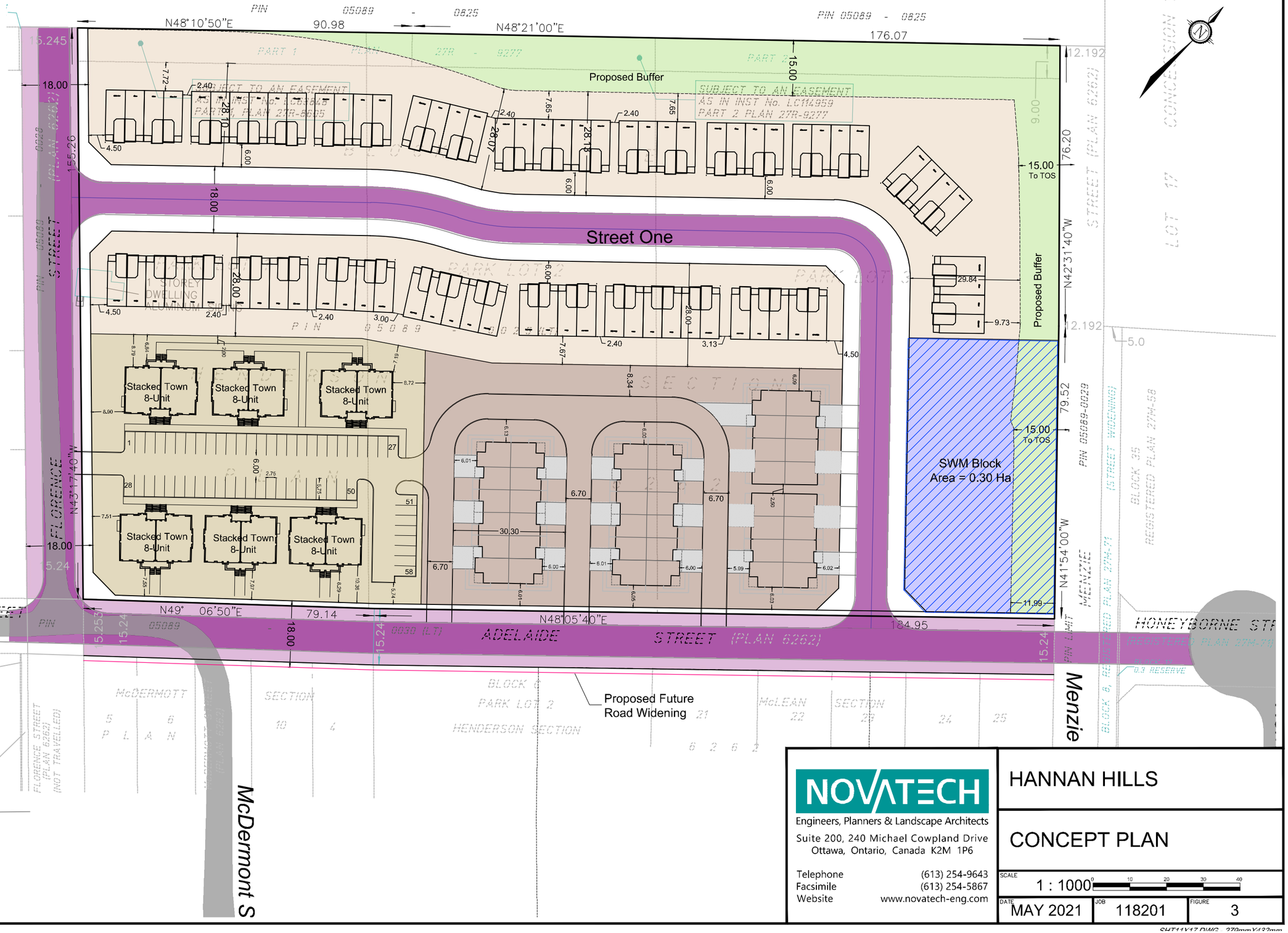
SCALE 1 : 1000 (0, 10, 20, 30, 40)

DATE MAY 2021 | JOB 118201 | FIGURE 2

LEGEND

- Town Owned ROW
- SWM Block
- Proposed Buffer
- Proposed Roadway
- Existing Roadway

UNIT COUNT	
Unit Type	
2-Storey Town	78
Stacked Town	48
Back-to-Back	40
TOTAL	166



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HANNAN HILLS

CONCEPT PLAN

SCALE 1 : 1000 (0 10 20 30 40)

DATE MAY 2021 | JOB 118201 | FIGURE 3

LEGEND

PROPOSED WATERMAIN

EXISTING WATERMAIN

250mmØ WM

HONEYBORNE STREET

200mmØ WM

CONNECT TO EXISTING WM

PROPOSED 250mmØ WM

SWM POND

STREET 1

STUB FOR FUTURE WM CONNECTION

FUTURE DEVELOPMENT BY OTHERS

15.0m SETBACK

PROPOSED 200mmØ WM

ADELAIDE STREET

STUB FOR FUTURE WM CONNECTION

MENZIE STREET

ST. JAMES STREET

AUGUSTA STREET

MAUDE STREET

VICTORIA STREET

OTTAWA STREET

MCDERMOTT STREET

STUB FOR FUTURE WM CONNECTION

FLORENCE STREET

Undeveloped Land

PROPOSED 250mmØ WM

STUB FOR FUTURE WM CONNECTION

CONNECT TO EXISTING 150mmØ WM

150mmØ WM

FINNER COURT

150mmØ WM

PH1 AREA

COURT

RAPIDS

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MUNICIPALITY OF MISSISSIPPI MILLS

HANNAN HILLS

WATERMAIN SERVICING

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

DATE MAY 2021 | JOB 118201 | FIGURE 4

SHT11X17.DWG - 279mmX432mm

LEGEND

PROPOSED SANITARY SEWER AND DIRECTION OF FLOW

EXISTING SANITARY SEWER AND DIRECTION OF FLOW

200mmØ SAN

HONEYBORNE STREET

200mmØ SAN

SWM POND

STREET 1

15.0m SETBACK

PROPOSED 200mmØ SAN

ADELAIDE STREET

FUTURE DEVELOPMENT BY OTHERS

STREET 2

PROPOSED 200mmØ SAN

STREET 1

MENZIE STREET

ST. JAMES STREET

AUGUSTA STREET

MAUDE STREET

VICTORIA STREET

OTTAWA STREET

MCDERMOTT STREET

Undeveloped Land

PROPOSED 300mmØ SAN

FLORENCE STREET

PROPOSED 300mmØ SAN

FLORENCE STREET

CONNECT TO EXISTING TRUNK SEWER
(ASSUMED INV.= 134.9m)

FINNER COURT

200mmØ SAN

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MUNICIPALITY OF MISSISSIPPI MILLS
HANNAN HILLS

SANITARY SERVICING

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

DATE MAY 2021 | JOB 118201 | FIGURE 5

SHT11X17.DWG - 279mmX432mm

LEGEND

PROPOSED STORM SEWER AND DIRECTION OF FLOW

EXISTING STORM SEWER AND DIRECTION OF FLOW

MAJOR OVERLAND FLOW

MILL RUN SWM FACILITY

HONEYBORNE STREET

SWM POND

STREET 1

PROPOSED 600mmØ STM

PROPOSED 600mmØ STM

ADELAIDE STREET

FUTURE DEVELOPMENT BY OTHERS

STREET 2

STREET 1

PROPOSED 450mmØ STM

PROPOSED 450mmØ STM

MCDERMOTT STREET

FLORENCE STREET

FINNER COURT

Undeveloped Land

MENZIE STREET

ST. JAMES STREET

AUGUSTA STREET

MAUDE STREET

VICTORIA STREET

OTTAWA STREET

FLORENCE STREET

COURT

RAPIDS

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MUNICIPALITY OF MISSISSIPPI MILLS
HANNAN HILLS

STORM SERVICING

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

DATE MAY 2021 | JOB 118201 | FIGURE 6

SHT11X17.DWG - 279mmX432mm

LEGEND

PROPOSED STORM SEWER

EXISTING STORM SEWER

EXISTING MILL RUN
SWM FACILITY
OUTLET

INV.= 137.50

INV.= 137.50

INV.= 137.55

TOP OF POND

LOW FLOW
CHANNEL

BOTTOM OF POND

TOP OF POND= 139.50
BOTTOM OF POND= 137.85
100 YR/INLET OBV.=

INV.= 137.60

SWM
POND

INV.= 137.69

15m-750mmØ @ 0.1%

STREET 1

PROPOSED 600mmØ STM

PROPOSED 600mmØ STM

ADELAIDE STREET

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MUNICIPALITY OF MISSISSIPPI MILLS
HANNAN HILLS

CONCEPTUAL STORMWATER
MANAGEMENT FACILITY

SCALE 1 : 500 (0, 5m, 10m, 20m)

DATE MAY 2021 | JOB 118201 | FIGURE 7

SHT11X17.DWG - 279mmX432mm

APPENDIX A
Correspondence

Pre-Consultation Meeting Notes
Virtual zoom meeting – January 27, 2021
Prepared By: Julie Stewart

In Attendance
Steve Pentz – Senior Project Manager, Novatech
John Riddell – Regional Group
Susan Gordon – Novatech
Matt Nesrallah – Cavanagh Construction
Robert Dick - Neilcorp
Maggie Yet – Junior Planner, Mississippi Mills
Marc Rivet – Planner, JL Richards – Mississippi Mills
Ken Kelly – CAO, Mississippi Mills
Cory Smith – Public Works, Mississippi Mills
Matt Craig - Planner, MVCA
Kelly Stiles – Biologist, MVCA
Diane Reid – Environmental Planner, MVCA
Julie Stewart – County Planner, County of Lanark

Steve Pentz provided a brief background.
Official Plan Designation – Residential
Zoning – Development Reserve

- Proposing an 18 m right of way
- Mix of townhouses and semi-detached – total of 96 units
- Units designed to accommodate the market need of the municipality - family friendly, and price points
- Propose a 15m setback from the wetland

9 metre easement on subject property which is an existing Drainage Easement in favour of the Town

Planning Report – density to be addressed within.

Environmental Impact Study
– MVCA spoke to background and requirements.
Matt provided background on the conservation authorities wetlands policies from 2019 and the consultation at that time.
Following the meeting notes were provided by MVCA and are included below:

Planning

- We will need to review the SW Plan and EIS.
- Components of this plan should include any mitigation from the results of the HIS & EIS and impacts to the function of the wetland on site.
- Lot orientation and layout – seem predetermined prior to submission of an EIS, should include LID

MVCA and the Township have recommended that the SW pond be located on the NE corner of the site, if not possible then these lands may need to remain undeveloped to provide adequate buffer to wetlands to the north.

MVCA Requirements

- Hydrologic Impact Assessment and EIS (concurrent with planning requirements) as it relates to the SW requirements - what are the results of development on the adjacent watercourse, water table and wetlands? The report should include mitigation and offsetting recommendations to address the loss of wetland on site.

- Organic material must be removed from the site.

- Permits required for the development as in regulated area and out letting to any watercourse.

Servicing Options Statement
- As the site is will be on public services, a Conceptual Servicing Report shall be submitted with the application.

Stormwater Drainage Plan
- MVCA advised that Stormwater Management, Quality and Quantity control would be required, with Quality to an enhanced level of treatment – 80%.
- Reference was made to water balance

Traffic Study
- The Municipality advised that a traffic study will be required to address connection to municipal streets and the increase in traffic.

OTHER

Geotechnical Report – required

Environmental Site Assessment

- The developer indicated that an ESA has been prepared.

Please refer to the attached Pre-Consultation Checklist as well as the itemized items above.

APPENDIX B
Watermain Design

NOVATECH
Engineers, Planners & Landscape Architects

HANNAN HILLS SUBDIVISION
Preliminary Demands

JOB NO. 118201

Water Demand Calculations

Node	Residential Population				Demand (L/s)		
	Units		Total Population		Avg Day	Max. Daily	Peak Hour
	Townhouse (row)	Townhouse (stacked)					
Street One (Freeholds)	78		211		0.85	2.14	4.70
Adelaide (Back-to-back)	40		108		0.44	1.09	2.41
Adelaide (stacked)		48	130		0.53	1.32	2.90
Total	118	48	449		1.82	4.55	10.00

Notes:

Residential Densities (from City of Ottawa data):

- Townhouse/Semi Detached =		2.7	cap/unit

Avg. Daily Demand:

- Residential	=	350	L/cap/day

Max. Daily Demand:

- Residential	=	2.5	x Avg. Day

Peak Hourly Demand:

- Residential	=	2.2	x Max. Day

Prepared By:
NOVATECH
Date: May 13 2021

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 #: 118201
Project Name: Hannan Hills
Date: 5/13/2021
Input By: M.Parker
Reviewed By: A.McAuley

Legend
Input by User
No Input Required

Building Description: Back-to-back 8 Unit Townhome

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**				
	Building Width - W	25.50	m		
	Building Length - L	18.30	m	Area (W * L) = 467 m2	
	Building Height - H	9.2	m		
	Total Building Volume - V =			W * L * H	**4293 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	6.10	m	Sside 1 = **0.39**	
	East	15.30	m	Sside 2 = **0.00**	
	South	1.20	m	Sside 3 = **0.50**	
	West	9.70	m	Sside 4 = **0.03**	
	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)	**1.92**
4	**Minimum Fire Protection Water Supply Volume**				
	Q =			$K * V * S_{Tot}$	**189,587 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)	**5,400 L/min** or **90 L/s**
Minimum Fire Protection Water Supply Volume for 30 minutes					
6	**Q =**			= Minimum Water Supply Flow Rate (L/min) * 30 minutes	**162,000 L**
Required Fire Protection Water Supply Volume					
7	**Q =**			Highest volume out of (4) and (6)	**189,587 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 #: 118201
Project Name: Hannan Hills
Date: 5/13/2021
Input By: M.Parker
Reviewed By: A.McAuley

Building Description: Back-to-back 12 Unit Townhome

Unsprinklered

Legend
Input by User
No Input Required

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**				
	Building Width - W	38.40	m		
	Building Length - L	18.30	m	Area (W * L) = 703 m2	
	Building Height - H	9.2	m		
	Total Building Volume - V =			W * L * H	**6465 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	9.20	m	Sside 1 = **0.08**	
	East	10.10	m	Sside 2 = **0.00**	
	South	14.90	m	Sside 3 = **0.00**	
	West	10.50	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)	**1.08**
4	**Minimum Fire Protection Water Supply Volume**				
	Q =			$K * V * S_{Tot}$	**160,591 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)	**4,500 L/min** or **75 L/s**
Minimum Fire Protection Water Supply Volume for 30 minutes					
6	**Q =**			= Minimum Water Supply Flow Rate (L/min) * 30 minutes	**135,000 L**
Required Fire Protection Water Supply Volume					
7	**Q =**			Highest volume out of (4) and (6)	**160,591 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 #: 118201
Project Name: Evoy
Date: 5/13/2021
Input By: M.Parker
Reviewed By: A.McAuley

Legend
Input by User
No Input Required

Building Description: Stacked-8 Unit Townhome

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**				
	Building Width - W	19.80	m		
	Building Length - L	13.00	m	Area (W * L) = 257 m2	
	Building Height - H	15.2	m		
	Total Building Volume - V =			W * L * H	**3912 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	13.50	m	Sside 1 = **0.00**	
	East	1.50	m	Sside 2 = **0.50**	
	South	17.00	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 =			$K * V * S_{Tot}$	**179,974 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)	**5,400 L/min** or **90 L/s**
Minimum Fire Protection Water Supply Volume for 30 minutes					
6	**Q =**			= Minimum Water Supply Flow Rate (L/min) * 30 minutes	**162,000 L**
Required Fire Protection Water Supply Volume					
7	**Q =**			Highest volume out of (4) and (6)	**179,974 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 #: 118201
Project Name: Evoy
Date: 5/13/2021
Input By: M.Parker
Reviewed By: A.McAuley

Legend
Input by User
No Input Required

Building Description: Street Facing 4 Unit Townhome

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**				
	Building Width - W	20.90	m		
	Building Length - L	14.30	m	Area (W * L) = 299 m2	
	Building Height - H	9.2	m		
	Total Building Volume - V =			W * L * H	**2750 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	15.60	m	Sside 1 = **0.00**	
	East	1.20	m	Sside 2 = **0.50**	
	South	7.60	m	Sside 3 = **0.24**	
	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 =			$K * V * S_{Tot}$	**126,482 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)	**126,482 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 #: 118201
Project Name: Hannan Hills
Date: 5/13/2021
Input By: M.Parker
Reviewed By: A.McAuley

Building Description: Street Facing 6 Unit Townhome

Unsprinklered

Legend
Input by User
No Input Required

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**				
	Building Width - W	31.30	m		
	Building Length - L	14.30	m	Area (W * L) = 448 m2	
	Building Height - H	9.2	m		
	Total Building Volume - V =			W * L * H	**4118 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	16.30	m	Sside 1 = **0.00**	
	East	1.20	m	Sside 2 = **0.50**	
	South	15.40	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 =			$K * V * S_{Tot}$	**189,420 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)	**5,400 L/min** or **90 L/s**
Minimum Fire Protection Water Supply Volume for 30 minutes					
6	**Q =**			= Minimum Water Supply Flow Rate (L/min) * 30 minutes	**162,000 L**
Required Fire Protection Water Supply Volume					
7	**Q =**			Highest volume out of (4) and (6)	**189,420 L**
Notes					

APPENDIX C
Sanitary Sewer Design

SANITARY SEWER DESIGN SHEET

PROJECT: Hannan Hills Subdivision

PROJECT #: 118201
DESIGNED BY: MNP
CHECKED BY: ARM
DATE: May 13, 2021

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AREA ID	STREET	MANHOLE		INVERTS		UNITS			INDIVIDUAL		CUMULATIVE		PEAK	POPULATION FLOW	PEAK EXTRAN.	PEAK DESIGN	PROPOSED SEWER								
	NAME	FROM	TO	UPS	DWS	SINGLES/SEMI	APARTMENT	TOWNS	Population (thousands)	AREA (ha.)	Population (thousands)	AREA (ha.)	FACTOR M	Q (p) (L/s)	FLOW Q(i) (L/s)	FLOW Q(d) (L/s)	LENGTH (m)	PIPE SIZE (mm)	TYPE OF PIPE	GRADE %	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	% OF CAPACITY (q_{full}/Q_{actual})	% OF VELOCITY (v_{full}/V_{actual})	ACUTAL VELOCITY (m/s)
D (Future by Others)	STREET 2	-	1			0	0	113	0.396	2.86	0.396	2.86	4.0	6.4	0.80	7.25	336.0	200.0	PVC	2.0	48.4	1.5	15%	70%	1.04
	*Note Assumed population based on areas A,B,C unit density																								
A (Site)	STREET 1	-	2			0	0	78	0.273	2.68	0.273	2.68	4.0	4.4	0.75	5.17	288.0	200.0	PVC	2.0	48.4	1.5	11%	64%	0.95
B (Site)	ADELAIDE	-	1			0	0	40	0.140	1.03	0.140	1.03	4.0	2.3	0.29	2.56	90.0	200.0	PVC	0.5	24.2	0.7	11%	64%	0.48
C (Site)	ADELAIDE	1	3			0	0	48	0.168	0.80	0.704	4.69	3.9	11.1	1.31	12.41	126.0	200.0	PVC	0.5	24.2	0.7	51%	100%	0.75
E	FUTURE DEVELOPMENT	-	2			0	0	577	2.020	40.10	2.020	40.10	3.6	29.3	11.23	40.54	-	300.0	PVC	0.5	71.3	1.0	57%	103%	1.01
F	FLORENCE	2	3			0	0	0	0.000	0.19	2.293	42.97	3.5	32.9	12.03	44.90	77.0	300.0	PVC	0.5	71.3	1.0	63%	104%	1.02
G	FLORENCE	3	4			0	0	0	0.000	0.24	2.996	47.90	3.4	41.8	13.41	55.20	203.0	300.0	PVC	0.5	71.3	1.0	77%	108%	1.06
	*NOTE Existing 200mm sanitary on Florence between Maude and Victoria to be upgraded																								
H (Future Infill by Others)	MCDERMOTT	-	4			5	0	3	0.030	1.32	0.030	1.32	4.0	0.5	0.37	0.85	203.0	300.0	PVC	0.5	71.3	1.0	1%	33%	0.32
	**NOTE Assumed populaion based on the allocated flow from the 2018 Master Report on a L/s/ha basis (5.97L/s over 9.5ha = 0.63L/s/ha)																								
I	FLORENCE	4	5			0	0	0	0.000	0.14	3.026	49.36	3.4	42.2	13.82	55.97	96.0	300.0	PVC	0.5	71.3	1.0	78%	108%	1.06
J	FLORENCE	5	6			0	0	0	0.000	0.15	3.026	49.51	3.4	42.2	13.86	56.01	96.0	300.0	PVC	0.5	71.3	1.0	79%	108%	1.06

Notes:
1. Residential Average Flow of 350L/cap/day
2. Population Density (People/unit): Singles = 3.8, Semis = 3.8, Towns =3.5, Apartments = 3.0
3. Peaking Factor (M) = Harmon Formula (4.0 max) = 1+(14/4+(Population/1000)^(1/2))
4. Population Flow = Q(p) = (Population X 350L/day/person X Peaking Factor) ÷ 86,400s/day
5. Infiltration Inflow = Q(i) = 0.28 L/sec/ha
6. Peak Flow = Q(d) = Q(p) + Q(i)

LEGEND

PROPOSED SANITARY SEWER AND DIRECTION OF FLOW

EXISTING SANITARY SEWER AND DIRECTION OF FLOW

DRAINAGE AREA

HONEYBORNE STREET

MENZIE STREET

SWM POND

STREET 1

PROPOSED 200mmØ SAN

ADELAIDE STREET

FUTURE DEVELOPMENT BY OTHERS

STREET 2

A

B

C

D

K

FUTURE DEVELOPMENT NOT INCLUDED

ST. JAMES STREET

MAUDE STREET

VICTORIA STREET

OTTAWA STREET

MCDERMOTT STREET

H

E

Undeveloped Land

PROPOSED 300mmØ SAN

FLORENCE STREET

F

G

I

J

FINNER COURT

AUGUSTA STREET

RAPIDS COURT

PH1 AREA

M:\2018\118201\CAD\Design\118201-SR.dwg, SAN AREAS, May 18, 2021 - 2:44pm, mparker

NOVATECH

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Website www.novatech-eng.com

MUNICIPALITY OF MISSISSIPPI MILLS

HANNAN HILLS

PRELIMINARY SANITARY DRAINAGE AREA PLAN

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

DATE MAY 2021 | JOB 118201 | FIGURE PSAN

SHT11X17.DWG - 279mmX432mm

APPENDIX D
Storm Sewer Design

PROJECT #: 118201
PROJECT NAME: HANNAN HILLS
LOCATION: ALMONTE, ON.

NOVATECH
Engineers, Planners & Landscape Architects

DATE PREPARED: MAY 13, 2021

5 Year Storm Sewer Design Sheet

LOCATION		AREA (Ha)			FLOW					PROPOSED SEWER							
FROM	TO	TOTAL AREA	R= 0.2	R= 0.65	INDIV 2.78 AR	ACCUM 2.78 AR	TIME OF CONC.	RAINFALL INTENSITY I	*PEAK FLOW Q (l/s)	PIPE SIZE (mm)	PIPE SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min.)	EXCESS CAPACITY (l/s)	Q/Qfull
A	B	1.26		1.26	2.28	2.28	20.00	70.25	159.95	450	0.40	108.0	180.50	1.13	1.59	20.55	0.89
B	C	1.31		1.31	2.37	4.64	21.59	66.95	310.91	600	0.40	135.0	388.73	1.37	1.64	77.82	0.80
D	E	1.05		1.05	1.90	1.90	20.00	70.25	133.29	450	0.40	105.0	180.50	1.13	1.54	47.21	0.74
E	C	1.13		1.13	2.04	3.94	21.54	67.04	264.07	600	0.40	107.0	388.73	1.37	1.30	124.66	0.68
C	POND				0.00	8.58	21.59	66.95	574.64	750	0.40	15.0	704.81	1.59	0.16	130.17	0.82
		4.750															

Definitions
Q = 2.78 AIR
Q = Peak Flow, in Litres per second (L/s)
A = Area in hectares (ha)
I = 5 YEAR Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min Velocity = 0.76 m/sec.
3) 5 Year intensity = 998.071 / (time + 6.053)$^{0.814}$

LEGEND

PROPOSED STORM SEWER AND DIRECTION OF FLOW

EXISTING STORM SEWER AND DIRECTION OF FLOW

DRAINAGE AREA

MAJOR OVERLAND FLOW

1.13 / 6 / E-C / 0.65 — DRAINAGE AREA (hectares); AREA ID; MANHOLE TO MANHOLE; RUN-OFF COEFFICIENT

MILL RUN SWM FACILITY

HONEYBORNE STREET

MENZIE STREET

ST. JAMES STREET

0.32 / 7 / 0.20 — SWM POND

STREET 1

15.0m SETBACK

1.31 / 3 / B-C / 0.65

PROPOSED 600mmØ STM

ADELAIDE STREET

FUTURE DEVELOPMENT BY OTHERS

STREET 2

1.13 / 6 / E-C / 0.65

0.95 / 2 / A-B / 0.65

0.79 / 5 / D-E / 0.65

PROPOSED 450mmØ STM

STREET 1

AUGUSTA STREET

MAUDE STREET

VICTORIA STREET

OTTAWA STREET

MCDERMOTT STREET

FLORENCE STREET

0.30 / 1 / A / 0.65

0.26 / 4 / D / 0.65

FINNER COURT

Undeveloped Land

M:\2018\118201\CADDesign\118201-STM.dwg, STM AREAS, May 13, 2021 - 2:09pm, mparker

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Ottawa, Ontario, Canada K2M 1P6

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MUNICIPALITY OF MISSISSIPPI MILLS
HANNAN HILLS

PRELIMINARY STORM DRAINAGE AREA PLAN

SCALE 1 : 2000 (0 20 40 60 80)

DATE MAY 2021 | JOB 118201 | FIGURE PSTM

SHT11X17.DWG - 279mmX432mm

APPENDIX E
Conceptual Stormwater Management Design Memo

NOVATECH
Engineers, Planners & Landscape Architects

M E M O R A N D U M

DATE: MAY 13, 2021 **PROJECT: 118201**

TO: ALEX MCAULEY

FROM: MELANIE SCHROEDER

RE: HANNAN HILLS SUBDIVISION
CONCEPTUAL STORMWATER MANAGEMENT DESIGN

CC: MIKE PETEPIECE

The purpose of this memorandum is to provide details on the conceptual stormwater management (SWM) design for the proposed Hannan Hills Subdivision. Below is a review of the SWM criteria and presentation of conceptual stormwater water quality and quantity control for the site.

BACKGROUND

The proposed Hannan Hills Subdivision is a 4.34 hectare (ha) site located in the Town of Almonte within the Municipality of Mississippi Mills, Ontario. The site is located to the north of the intersection of Florence Street and Adelaide Street. The existing land use consists of a single house surrounded by a lightly forested area. The site is adjacent to existing residential developments to the south of Florence Street and to the east of Adelaide Street.

STORMWATER MANAGEMENT CRITERIA

The site is within the jurisdiction of the Municipality of Mississippi Mills and Mississippi Valley Conservation Authority (MVCA). The stormwater management criteria for the Hannan Hills Subdivision are as follows:

Stormwater Quality Criteria:

- Provide an Enhanced level of water quality treatment corresponding to 80% long-term TSS removal.

Stormwater Quantity Criteria:

- Control post-development peak flows to pre-development release rates for all storms up-to and including the 100-year event.

EXISTING CONDITIONS

The existing site is 4.34 ha and consists of a single house surrounded by a lightly forested area. The existing site drainage flows overland from southwest to northeast and discharges into the Almonte Municipal Drain. The front lots of the houses on the southwest side of Florence Street flow through the site to the Almonte Drain, resulting in an additional 0.58 ha of upstream drainage, for a total drainage area of 4.92 ha. The surficial soils consist of silty sand and glacial till (Hydrologic Soil

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Group 'B') based on the Preliminary Geotechnical Investigation (Paterson Group, 2019). Refer to **Figure 2 – Existing Conditions Plan** for an aerial image of the existing site.

PROPOSED CONDITIONS

The proposed conceptual site development consists of 2-storey townhouses and two residential blocks: one with stacked townhouses and the other with back-to-back townhouses. A proposed SWM block will contain a dry pond that will control post-development peak flows to pre-development levels. Water quality will be provided by means of a water quality treatment unit in conjunction with settlement in the dry pond.

The storm sewer system within the roadway will be sized to collect and convey the 5-year storm event to the pond. There will be a major drainage flow path within the roadways that will direct overland flow to the dry pond. Refer to **Drawing 118201-PGR** and **Figure 6 – Storm Servicing** for the conceptual grading and storm sewer layout.

The inlets, with inlet control devices (ICDs), to the storm sewers have been sized to convey the 5-year flow into the storm sewers. ICDs will be sized at the detailed design stage.

HYDROLOGIC & HYDRAULIC MODELING (PCSWMM)

The PCSWMM model is a semi-lumped model that represents system flows from the development. The results of the analysis were used to simulate runoff from the site, size the dry pond for quantity control, and ensure the total peak flow leaving the site does not exceed pre-development levels. PCSWMM model schematics and model output are attached.

Design Storms

Initial model runs were completed for the 1:100 year event using the 3-hour, 4-hour, and 6-hour Chicago distributions, and the 6-hour, 12-hour, and 24-hour SCS distributions to determine the critical storm event for the Site.

The 6-hour Chicago distribution (10-minute time step) was determined to generate the highest peak flows and storage volume within the post-development site and was selected as the critical storm distribution to be used in the analysis. The 4-hour Chicago storm distribution was used for the 25mm event (water quality event).

Modeling Parameters

Hydrologic modeling parameters for each subcatchment were developed based on soil type, existing and proposed land use, and topography. Modeling parameters were determined as follows:

- Soil types were identified based on test pit data from the Preliminary Geotechnical Investigation (Paterson Group, 2019);
- Land use and ground cover were determined from satellite images and the proposed site layout;
- SCS Curve Numbers were assigned for the pre-development area based on the soil types and land use of the pervious areas;

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  - For the pre-development model, an area weighted CN value was used based on land cover. A CN value of 75 was used to represent good condition half acre rural residential lots with the hydrologic soil group (HSG) 'B' and a CN value of 60 was used to represent fair condition forest with the hydrologic soil group (HSG) 'B';

- For post-development conditions, the percentage of impervious area was determined for each subcatchment based on an approximate runoff coefficient of 0.65 based on townhouse land use. The percent impervious was determined using the following equation;
  - $\% \, imp = \frac{C-0.2}{0.7}$
- The "zero imperviousness" parameter represents the percent of the impervious area that has no depression storage (i.e., roof area);
- Equivalent width refers to the width of the subcatchment flow path.
- The hydrologic simulation uses depression storage to represent the amount of rainfall required to generate runoff from a catchment area;
  - Depression Storage (pervious areas): 4.67 mm;
  - Depression Storage (roads, driveways): 1.57 mm;
  - Depression Storage (rooftops): 0 mm.
- The simulation uses Manning's roughness coefficients (n) to represent the surface roughness for impervious and pervious land uses, open channels, and culverts. The model uses the following:
  - Impervious areas (roadways, rooftops, paved areas): 0.015;
  - Pervious areas (grassed areas): 0.25;
- The simulation also uses Manning's roughness coefficients (n) to represent the roughness of the conduits that convey major and minor system flows. The model uses the following:
  - Concrete or PVC pipes: 0.013;
  - Roadways for overland flow: 0.015;
  - Open channels: 0.035.

Refer to **Figure 118201-PSTM** for drainage areas. A detailed summary of model subcatchment parameters is attached.

Dry Pond Sizing

Controlled runoff from the site will be directed to a proposed dry pond, which has been sized to control post-development peak flows to pre-development levels for storms up to and including the 100-year design event. The dry pond will also provide water quality treatment through a 24-hour to 48-hour drawdown time for the water quality event (4-hour 25 mm Chicago Storm event) and a low flow channel. Additional quality control will be provided by a water quality treatment unit located upstream of the pond inlet.

A summary of the pond design and storage volumes is provided in

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Table 1. Refer to **Figure 7 – Conceptual Stormwater Management Facility** for the conceptual layout of the dry pond.

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Table 1: Dry Pond Design Summary

Feature	Dry Pond
Side Slopes (H:V)	3:1
Bottom of Low Flow Channel (masl)	137.60
Bottom of Pond Elevation (masl)	137.85
Top of Pond Elevation (masl)	139.50
Bottom Area (m^2)	963
Bottom Area (m^2)	1,964
Storage Volume to Top of Pond (m^3)	2,496

Outflows from the dry pond will be routed through an outlet structure designed to restrict flows to pre-development levels before outletting to the Almonte Drain. An emergency overflow spillway will be located along the northeast side of the pond, adjacent to the Almonte Drain and will allow for conveyance of events above the 100-year event.

The conceptual design for the dry pond outlet consists of:

- An 75 mm diameter orifice with an invert elevation of 137.60 m for the water quality event;
- A 250mm diameter orifice with an invert elevation of 138.30 m;
- A 0.8 m wide transverse weir with crest elevation of 138.85 m;
- An emergency overflow spillway with a crest elevation of 139.20 m.

The stage-storage-discharge table is provided in **Table 2**.

Table 2: Dry Pond Stage-Storage-Discharge (6-hour Chicago Storm Event)

Stage	Elevation (m)	Volume (m^3)	Release Rate (L/s)
Outlet of Low Flow Channel	137.60	0	0
Inlet of Low Flow Channel	137.69	2	-
Bottom of Dry Pond	137.85	83	-
25mm Event	138.28	554	10
2yr Event	138.42	727	25
5yr Event	138.59	968	66
100yr Event	139.12	1,802	335
Top of Pond	139.50	2,496	-

Model Results – Hydraulic Grade Line

Lots will need to be serviced with storm sump pumps due to the elevation of the pond outlet to the Almonte Drain. This will be evaluated using a hydraulic model of the proposed storm sewers during the detailed design stage.

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Model Results – Peak Flows

The PCSWMM model was used to evaluate pre- and post-development peak flows from the pond. The results of this analysis demonstrate that the proposed stormwater management strategy for the Hannan Hills Subdivision will control post-development peak flows to pre-development levels for all storm events up to and including the 100-year design event. The modelled peak flows are summarized in **Table 3**.

Table 3: Pre vs. Post-Development Peak Flows (6-hour Chicago Storm)

Scenario	Peak Flow (L/s)			
	25mm	2-year	5-year	100-year
Pre-Development	10	39	93	346
Post-Development	10	25	66	335

CONCLUSIONS

Post-development peak flows will be controlled to less than the pre-development peak flow rate for the 2-year through 100-year event. The dry pond will provide adequate storage for controlling the 100-year event to pre-development conditions. An Enhanced level of water quality treatment (80% long-term TSS removal) will be provided through a water quality treatment unit and the dry pond. The need for foundation drainage sump pumps will be analyzed in more detail at the detailed design stage.

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ATTACHMENTS

- Figures
  - Figure 2– Existing Conditions Plan
  - Figure 6 – Storm Servicing
  - 118201-PSTM
  - Figure 7 – Conceptual Stormwater Management Facility
- Drawing
  - 118201-PGR
- Model Subcatchment Parameters
- Theoretical ICD Sizing
- Model Schematics
  - Pre-Development
  - Post-Development
- PCSWMM Model Output Results
  - Pre-Development
  - Post-Development

MODELLING FILES

Available and can be provided upon request:

- Packaged PCSWMM model
  - Pre-Development
  - Post Development

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LEGEND

PROPERTY BOUNDARY

STREET ONE

FLORENCE STREET

ADELAIDE STREET

FINNER COURT

MCDERMOTT STREET

HONEYBORNE STREET

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HANNAN HILLS

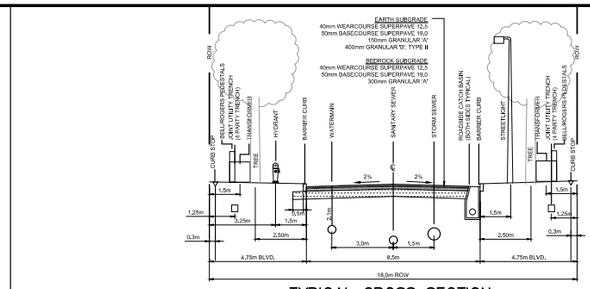
EXISTING CONDITIONS PLAN

SCALE 1 : 1000 (0, 10, 20, 30, 40)

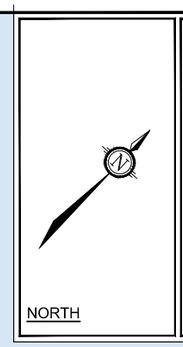
DATE MAY 2021 | JOB 118201 | FIGURE 2

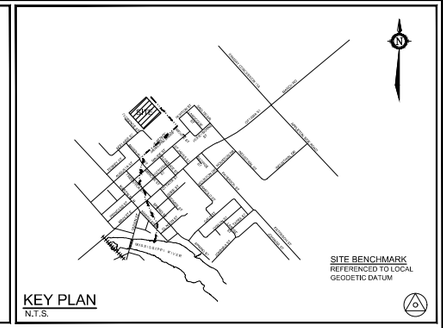
LEGEND

117.00 / 116.50	PROPOSED ELEVATION / *EXISTING ELEVATION*
TF=117.03	TOP OF FOUNDATION ELEVATION
USF=114.44	MINIMUM UNDERSIDE OF FOOTING ELEVATION
116.63	PROPOSED DRIVEWAY ELEVATION
(116.63)	PROPOSED CENTRELINE OF ROAD ELEVATION
	MAJOR OVERLAND FLOW
TP18-B 138.54 [138.22]	TESTPIT NUMBER GROUND ELEVATION [BEDROCK ELEVATION]



TYPICAL CROSS SECTION
RESIDENTIAL ROAD 18.0m ROAD ALLOWANCE
1:150





KEY PLAN
N.T.S.

CAP SERVICES FOR FUTURE DEVELOPMENT
CONNECT TO EXISTING WM
CAP WM FOR FUTURE DEVELOPMENT
CAP WM FOR FUTURE DEVELOPMENT
CAP SERVICES FOR FUTURE DEVELOPMENT
CAP SERVICES FOR FUTURE DEVELOPMENT
CONNECT TO EXISTING WM
FUTURE DEVELOPMENT BY OTHERS
NOTE ASSUMED VICTORIA STREET TRUNK SEWER INV. = 134.9m (2m DEPTH)
15.0m SETBACK
15.0m SETBACK
STREET 1
STREET 2
ADELAIDE STREET
FLORENCE STREET
FINNER COURT
MCDERMOTT STREET
150mmØ PVC DR 18
250mmØ WM
TOP OF POND= 139.50
BOTTOM OF POND= 137.50
100 YR/INLET OBV.= 138.52
EX. TOP OF SLOPE
EX. BOTTOM OF DITCH
EX. TOP OF DITCH
TF=141.04 USF=138.35
TF=141.01 USF=138.32
TF=140.98 USF=138.29
TF=140.95 USF=138.26
TF=140.91 USF=138.22
TF=140.88 USF=138.19
TF=140.85 USF=138.16
TF=140.82 USF=138.13
TF=140.80 USF=138.11
TF=140.89 USF=138.20
TF=140.93 USF=138.24
TF=141.06 USF=139.11
TF=141.03 USF=139.08
TF=141.01 USF=139.06
TF=140.81 USF=138.12
TF=140.36 USF=139.08
TP18-A 138.38 [137.65]
TP18-B 138.54 [138.22]
TP18-C 138.60 [137.99]
TP18-D 138.17 [136.93]
TP18-E 138.27 [137.37]
TP18-F 138.27 [136.57]
TP18-G 138.35 [136.72]
TP18-H 138.14 [137.10]
TP18-I 138.13 [137.01]
TP18-J 138.15 [137.34]
92m-450mmØ @ 0.4%
94m-200mmØ @ 0.50%
200mmØ
22m-450mmØ @ 0.4%
22m-200mmØ @ 0.5%
100m-600mmØ @ 0.4%
99m-200mmØ @ 0.50%
39m-600mmØ @ 0.4%
15m-750mmØ @ 0.1%
22m-600mmØ @ 0.40%
86m-200mmØ @ 0.5%
119m-450mmØ @ 0.4%
41m-200mmØ @ 0.5%
92m-200mmØ @ 0.5%
98m-600mmØ @ 0.4%
11m-450mmØ @ 0.40%
250mmØ
OBV.= 139.49
INV.= 138.34
OBV.= 139.12
INV.= 136.81
OBV.= 139.03
INV.= 136.92
OBV.= 138.63
INV.= 137.41
OBV.= 138.59
INV.= 137.46
INV.= 137.69
INV.= 137.60
INV.= 138.05
INV.= 136.20
OBV.= 138.61
INV.= 136.63
OBV.= 139.14
INV.= 136.84
INV.= 137.44
OBV.= 138.74
OBV.= 138.78
INV.= 137.55
INV.= 137.50
INV.= 137.05
REFER TO _____ FOR ADDITIONAL NOTES

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 WITH SERVICEABILITY AND CSWM REPORT	MAY 20/21	ARM

SCALE: 1:500 (1:500 0 5 10 15 20)

DESIGN: XXX
CHECKED: XXX
DRAWN: XXX
CHECKED: XXX
APPROVED: XXX

FOR REVIEW ONLY

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Website www.novatech-eng.com

LOCATION
MUNICIPALITY OF MISSISSIPPI MILLS
HANNAN HILLS

DRAWING NAME
PRELIMINARY GRADING AND SERVICING PLAN

PROJECT No. 118201-00
REV REV # 1
DRAWING No. 118201-PGR

M:\2018\118201\CAD\Design\118201-SR.dwg, GR, May 19, 2021 - 2:29pm, mcarter
PLAN17.DWG - 841mmx594mm

LEGEND

PROPOSED STORM SEWER AND DIRECTION OF FLOW

EXISTING STORM SEWER AND DIRECTION OF FLOW

MAJOR OVERLAND FLOW

MILL RUN SWM FACILITY

HONEYBORNE STREET

SWM POND

STREET 1

PROPOSED 600mmØ STM

PROPOSED 600mmØ STM

ADELAIDE STREET

FUTURE DEVELOPMENT BY OTHERS

STREET 2

STREET 1

PROPOSED 450mmØ STM

PROPOSED 450mmØ STM

MCDERMOTT STREET

FLORENCE STREET

FINNER COURT

Undeveloped Land

MENZIE STREET

ST. JAMES STREET

AUGUSTA STREET

MAUDE STREET

VICTORIA STREET

OTTAWA STREET

FLORENCE STREET

COURT

RAPIDS

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MUNICIPALITY OF MISSISSIPPI MILLS
HANNAN HILLS

STORM SERVICING

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

DATE MAY 2021 | JOB 118201 | FIGURE 6

SHT11X17.DWG - 279mmX432mm

LEGEND

PROPOSED STORM SEWER AND DIRECTION OF FLOW

EXISTING STORM SEWER AND DIRECTION OF FLOW

DRAINAGE AREA

MAJOR OVERLAND FLOW

1.13 / 6 / E-C / 0.65 — DRAINAGE AREA (hectares); AREA ID; MANHOLE TO MANHOLE; RUN-OFF COEFFICIENT

MILL RUN SWM FACILITY

HONEYBORNE STREET

MENZIE STREET

ST. JAMES STREET

0.32 / 7 / 0.20 — SWM POND

STREET 1

15.0m SETBACK

1.31 / 3 / B-C / 0.65

PROPOSED 600mmØ STM

ADELAIDE STREET

FUTURE DEVELOPMENT BY OTHERS

STREET 2

1.13 / 6 / E-C / 0.65

0.95 / 2 / A-B / 0.65

0.79 / 5 / D-E / 0.65

PROPOSED 450mmØ STM

STREET 1

AUGUSTA STREET

MAUDE STREET

VICTORIA STREET

OTTAWA STREET

MCDERMOTT STREET

FLORENCE STREET

0.30 / 1 / A / 0.65

0.26 / 4 / D / 0.65

FINNER COURT

Undeveloped Land

M:\2018\118201\CADDesign\118201-STM.dwg, STM AREAS, May 13, 2021 - 2:09pm, mparker

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MUNICIPALITY OF MISSISSIPPI MILLS
HANNAN HILLS

PRELIMINARY STORM DRAINAGE AREA PLAN

SCALE 1 : 2000 (0 20 40 60 80)

DATE MAY 2021 | JOB 118201 | FIGURE PSTM

SHT11X17.DWG - 279mmX432mm

LEGEND

PROPOSED STORM SEWER

EXISTING STORM SEWER

EXISTING MILL RUN
SWM FACILITY
OUTLET

INV.= 137.50

INV.= 137.50

INV.= 137.55

TOP OF POND

LOW FLOW
CHANNEL

BOTTOM OF POND

TOP OF POND= 139.50
BOTTOM OF POND= 137.85
100 YR/INLET OBV.=

INV.= 137.60

SWM
POND

INV.= 137.69

15m-750mmØ @ 0.1%

STREET 1

PROPOSED 600mmØ STM

PROPOSED 600mmØ STM

ADELAIDE STREET

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MUNICIPALITY OF MISSISSIPPI MILLS
HANNAN HILLS

CONCEPTUAL STORMWATER
MANAGEMENT FACILITY

SCALE 1 : 500 (0, 5m, 10m, 20m)

DATE MAY 2021 | JOB 118201 | FIGURE 7

SHT11X17.DWG - 279mmX432mm

Hannan Hills Subdivision (118201)
Pre-Development Model Parameters

Engineers, Planners & Landscape Architects

Time to Peak Calculations

(Uplands Overland Flow Method)

Existing Conditions

Area ID	Area (ha)	Overland Flow						Concentrated Overland Flow						Overall		
		Length (m)	Elevation U/S (m)	Elevation D/S (m)	Slope (%)	Velocity (m/s)	Travel Time (min)	Length (m)	Elevation U/S (m)	Elevation D/S (m)	Slope (%)	Velocity (m/s)	Travel Time (min)	Time of Concentratio (min)	Time to Peak (min)	Time to Peak (min)
R1	4.920	100	141.0	140.0	1.0%	0.25	6.67	200	140	137.0	1.5%	0.55	6.06	13	9	10

Weighted Curve Number Calculations

Soil type 'B'

Area ID	Land Use 1	Area	CN	Land Use 2	Area	CN	Weighted CN
R1	Rural Residential	15%	75	Forest	85%	60	62

**1/2 acre residential lots, woods fair

Silty sand/glacial till = soil type B

Weighted IA Calculations

Area ID	Land Use 1	Area	IA	Land Use 2	Area	IA	Weighted IA
R1	Rural Residential	15%	6.4	Forest	85%	12.7	11.7

Hannan Hills Subdivision (118201)
Post-Development Model Parameters

NOVATECH
Engineers, Planners & Landscape Architects

Area ID	Catchment Area (ha)	Runoff Coefficient (C)	Percent Impervious (%)	No Depression (%)	Flow Path Length (m)	Equivalent Width (m)	Average Slope (%)
A1	0.310	0.65	64%	10%	34	9	2%
A2	0.950	0.65	64%	45%	45	21	2%
A3	1.240	0.65	64%	40%	50	25	2%
A4	0.270	0.65	64%	10%	34	8	2%
A5	0.750	0.65	64%	35%	67	11	2%
A6	1.120	0.65	64%	30%	64	18	2%
A7	0.280	0.20	0%	0%	21	13	2%
TOTAL:	**4.92**						

Hannan Hills Subdivision (118201)
Conceptual PCSWMM Model - Orifice Sizing

NOVATECH
Engineers, Planners & Landscape Architects

Equivalent Orifice Sizing

Inlet Name	Inlet / Outlet Node	Invert (m)	T/G (m)	CB Depth (m)	Area ID	Drainage Area (ha)	Static Ponding Depth (m)	Design Flow Rate[1] (L/s)	Artificial Orific Dia.[2] (m)
2-year Inlet Capture Rate									
O-CB01	CB01	138.62	139.82	1.20	A1 & A2	1.26	0.25	265.2	0.338
O-CB02	CB02	138.49	139.69	1.20	A3	1.24	0.25	258.7	0.334
O-CB03	CB03	138.49	139.69	1.20	A6	1.12	0.25	228.8	0.314
O-CB04	CB04	138.60	139.80	1.20	A4 & A5	1.02	0.25	209.3	0.301
TOTAL						**4.64**	**-**	**962.0**	**-**

[1] *Design flow rate = 5-year peak flow based on PCSWMM model results (6-hour Chicago storm).*

[2] *Theoretical orifice size based on design flow rate and estimated 1.2m CB depth.*

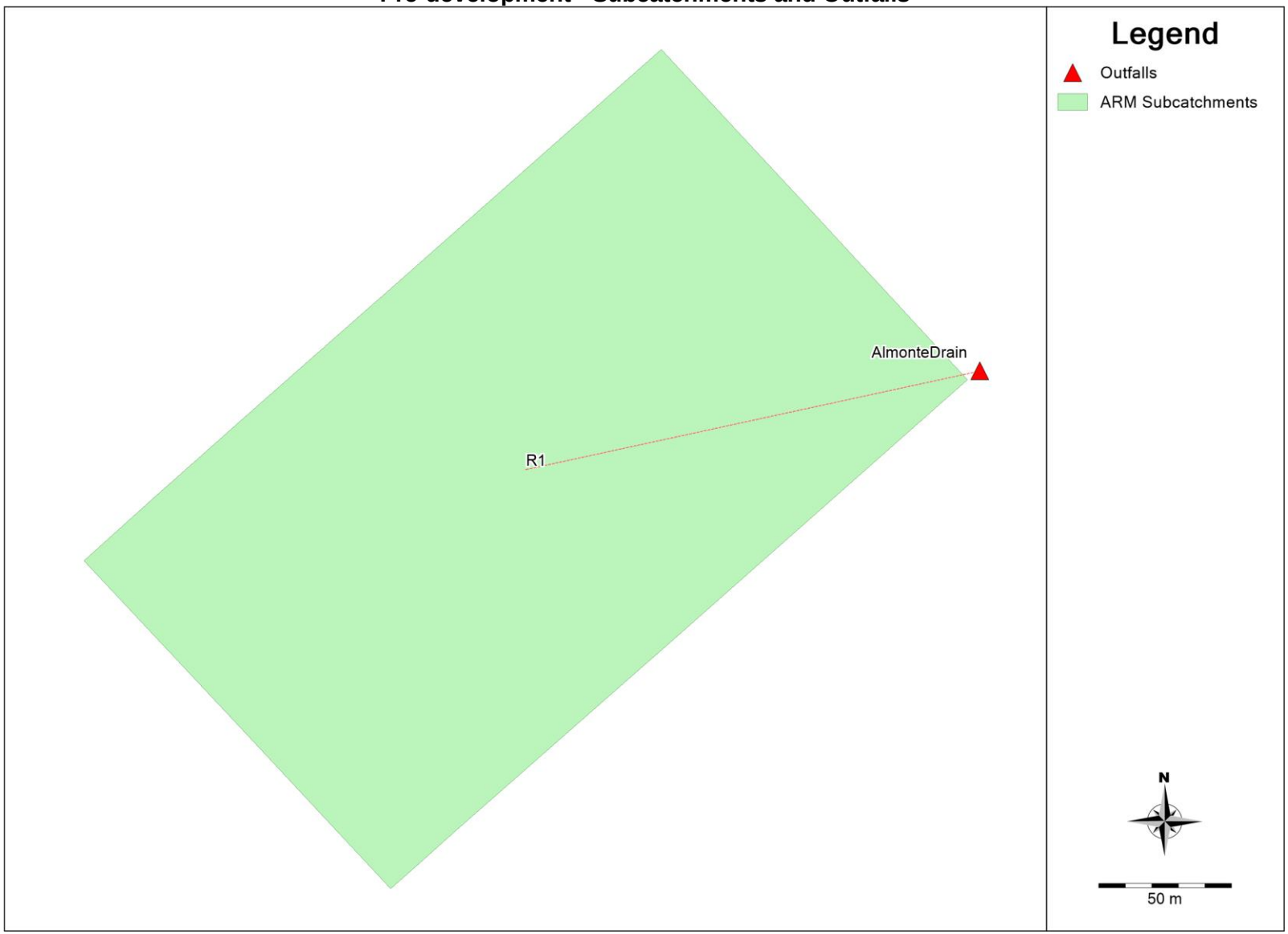
Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

Pre-development - Overall Model Schematic

Date: 2021-05-13
M:\2018\118201\DATA\Calculations\SWM\118201-PCSWMM Model Schematics.docx

Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

Pre-development - Subcatchments and Outfalls



Date: 2021-05-13
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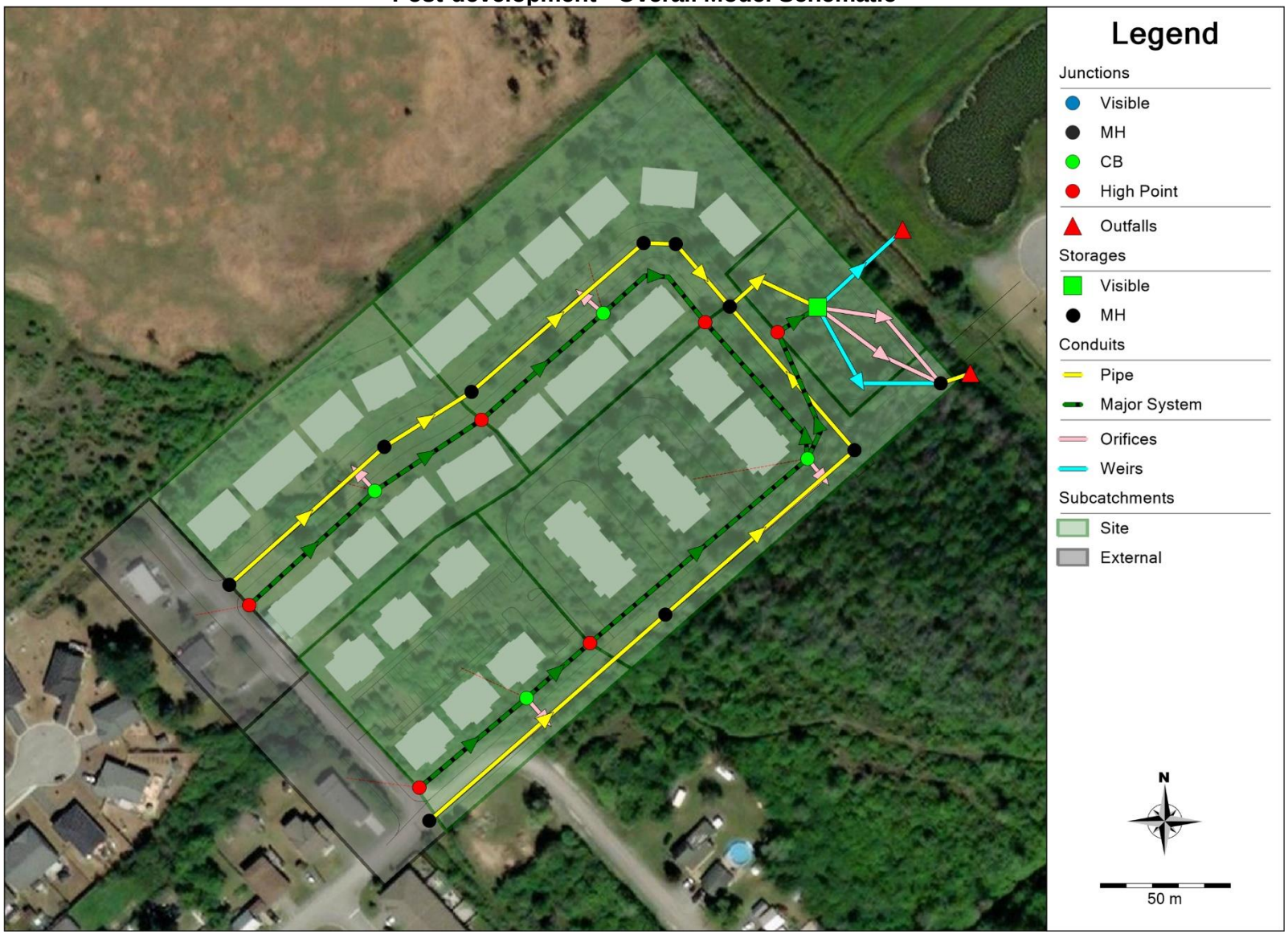
Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

Post-development - Overall Model Schematic



Date: 2021-05-13
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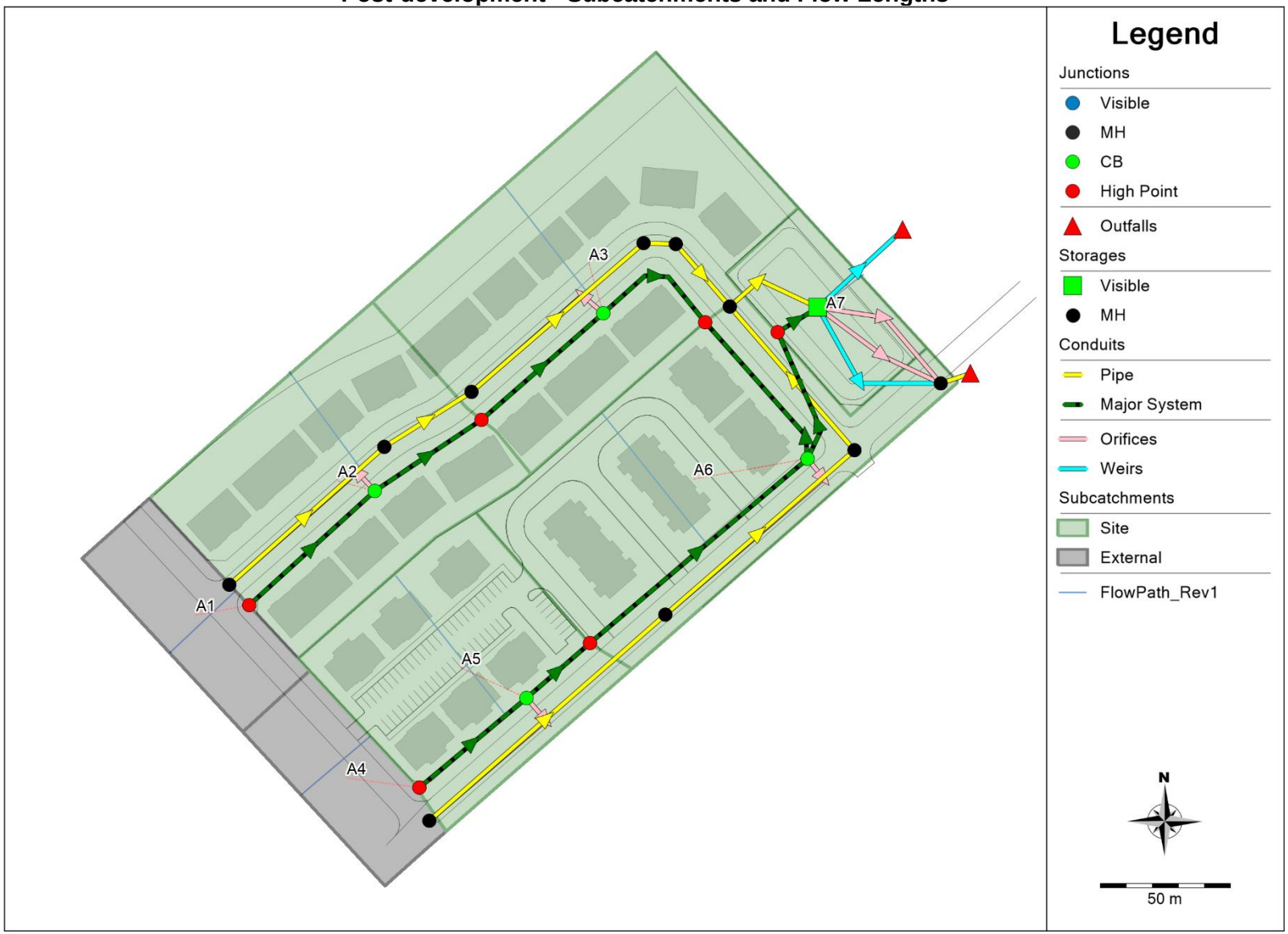
Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

Post-development - Subcatchments and Flow Lengths



Date: 2021-05-13
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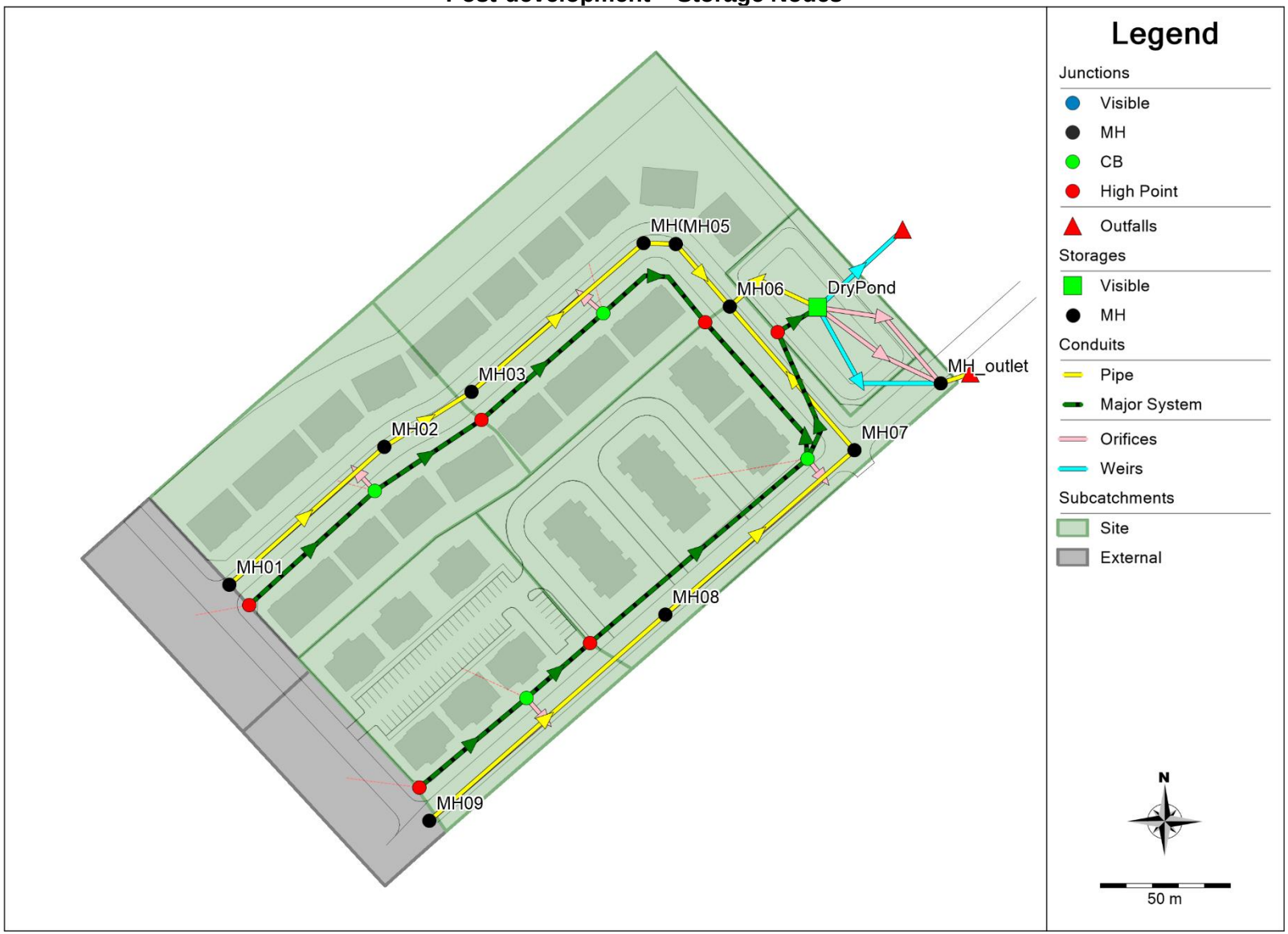
Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

Post-development – Storage Nodes



Date: 2021-05-13
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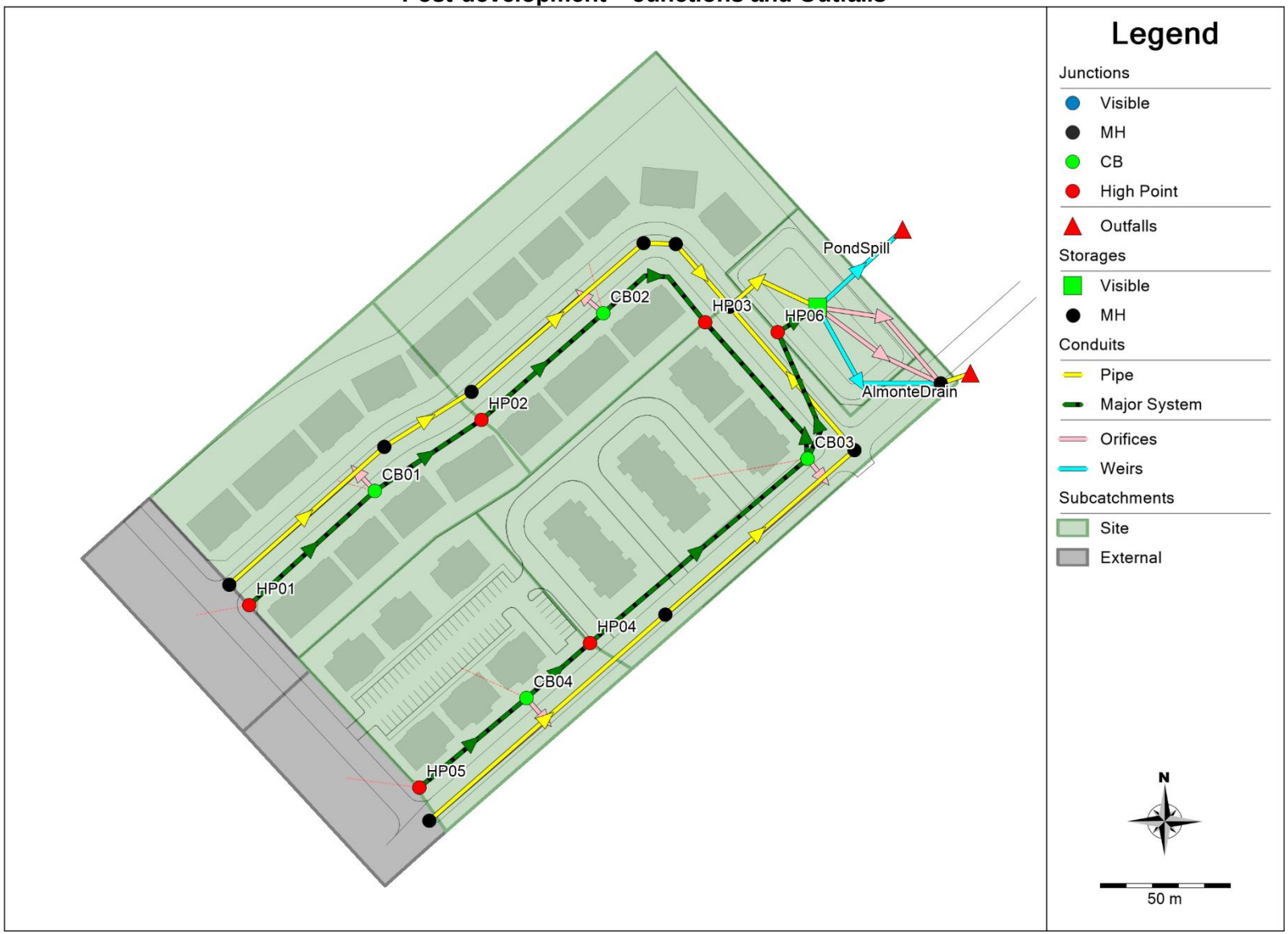
Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

Post-development – Junctions and Outfalls



Date: 2021-05-13
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```
ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM VERSION 7.3.3095
---------------------------------------------------------

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:                 1/25/2021 00:00
Simulation end time:                   1/26/2021 00:00
Runoff wet weather time steps:         300 seconds
Report time steps:                     60 seconds
Number of data points:                 1441


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

-------------------------------------------------------------------------------------------------------------------------------
                                                                          Area   Time of Concentration  Time to Peak    Time after Pea
Subcatchment         Runoff Method             Raingage                   (ha)   (min)                 (min)           (min)
-------------------------------------------------------------------------------------------------------------------------------
R1                   Nash IUH                  Raingage                   4.92   13                    8.67            61.33


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

-------------------------------------------------------------------------------------
                     Total       Total       Total       Total       Peak        Runoff
                     Precip      Losses      Runoff      Runoff      Runoff      Coeff
Subcatchment         (mm)        (mm)        (mm)        10^6 ltr    LPS         (fraction)
-------------------------------------------------------------------------------------
R1                   76.002      57.206      18.671      0.919       318.878     0.246



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 ........... 1
Number of links ........... 0
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                  Data       Recording
Name                 Data Source                  Type       Interval
----------------------------------------------------------------------
Raingage             C4hr-100yr                   INTENSITY   10 min.


************
Node Summary
************
                                    Invert      Max.    Ponded    External
Name                 Type            Elev.     Depth      Area    Inflow
-----------------------------------------------------------------------
AlmonteDrain         OUTFALL        137.50      0.00       0.0


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

Transect 18mROW
Area:
            0.0009     0.0034     0.0077     0.0137     0.0214
            0.0308     0.0417     0.0530     0.0657     0.0801
            0.0962     0.1139     0.1333     0.1543     0.1770
            0.2005     0.2240     0.2475     0.2710     0.2945
            0.3180     0.3415     0.3650     0.3885     0.4120
            0.4356     0.4591     0.4826     0.5061     0.5296
            0.5531     0.5766     0.6001     0.6237     0.6472
            0.6707     0.6942     0.7177     0.7412     0.7648
            0.7883     0.8118     0.8353     0.8588     0.8824
            0.9059     0.9294     0.9529     0.9765     1.0000
Hrad:
            0.0188     0.0376     0.0564     0.0751     0.0939
            0.1127     0.1406     0.1767     0.2070     0.2318
```

```
            0.2524     0.2698     0.2847     0.2977     0.3093
            0.3240     0.3404     0.3578     0.3760     0.3948
            0.4140     0.4335     0.4532     0.4731     0.4932
            0.5133     0.5335     0.5538     0.5742     0.5945
            0.6149     0.6353     0.6557     0.6761     0.6965
            0.7169     0.7373     0.7577     0.7780     0.7983
            0.8186     0.8389     0.8591     0.8793     0.8995
            0.9197     0.9398     0.9599     0.9800     1.0000
Width:
            0.0726     0.1453     0.2179     0.2905     0.3631
            0.4358     0.4721     0.5073     0.5776     0.6478
            0.7180     0.7882     0.8584     0.9287     0.9989
            0.9989     0.9990     0.9990     0.9990     0.9990
            0.9991     0.9991     0.9991     0.9992     0.9992
            0.9992     0.9993     0.9993     0.9993     0.9994
            0.9994     0.9994     0.9995     0.9995     0.9995
            0.9996     0.9996     0.9996     0.9997     0.9997
            0.9997     0.9997     0.9998     0.9998     0.9998
            0.9999     0.9999     0.9999     1.0000     1.0000


************************************************************
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 ............ 01/25/2021 00:00:00
Ending Date .............. 01/26/2021 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 ..........         0.092         0.919
External Outflow .........         0.092         0.919
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:  Thu Apr 22 00:04:57 2021
Analysis ended on:  Thu Apr 22 00:04:57 2021
Total elapsed time: < 1 sec
```

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

WARNING 10: crest elevation raised to downstream invert for regulator Link O-CB01
WARNING 10: crest elevation raised to downstream invert for regulator Link O-CB04
WARNING 02: maximum depth increased for Node CB04

*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 7
Number of nodes ........... 23
Number of links ........... 28
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                 Data       Recording
Name                 Data Source                 Type       Interval
------------------------------------------------------------------------
Raingage             C6hr-100yr                  INTENSITY   10 min.


********************
Subcatchment Summary
********************
Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
------------------------------------------------------------------------------------------
A1                          0.31     90.87     64.30    2.0000 Raingage             HP01
A2                          0.95    210.62     64.30    2.0000 Raingage             CB01
A3                          1.24    249.35     64.30    2.0000 Raingage             CB02
A4                          0.27     79.50     64.30    2.0000 Raingage             HP05
A5                          0.75    111.75     64.30    2.0000 Raingage             CB04
A6                          1.12    176.32     64.30    2.0000 Raingage             CB03
A7                          0.28    130.29      0.00    2.0000 Raingage             DryPond


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

```
Name                 Type                 Elev.     Depth      Area    Inflow
------------------------------------------------------------------------------
CB01                 JUNCTION           138.62      2.20       0.0
CB02                 JUNCTION           138.49      2.20       0.0
CB03                 JUNCTION           138.49      2.20       0.0
CB04                 JUNCTION           138.60      2.20       0.0
HP01                 JUNCTION           140.17      1.00       0.0
HP02                 JUNCTION           140.07      1.00       0.0
HP03                 JUNCTION           139.94      1.00       0.0
HP04                 JUNCTION           140.05      1.00       0.0
HP05                 JUNCTION           140.12      1.00       0.0
HP06                 JUNCTION           140.07      1.00       0.0
AlmonteDrain         OUTFALL            137.50      0.38       0.0
PondSpill            OUTFALL            139.00      0.00       0.0
DryPond              STORAGE            137.60      1.90       0.0
MH_outlet            STORAGE            137.55      1.45       0.0
MH01                 STORAGE            138.69      1.61       0.0
MH02                 STORAGE            138.37      1.88       0.0
MH03                 STORAGE            138.22      1.98       0.0
MH04                 STORAGE            137.88      2.22       0.0
MH05                 STORAGE            137.81      2.29       0.0
MH06                 STORAGE            137.71      2.36       0.0
MH07                 STORAGE            137.99      2.06       0.0
MH08                 STORAGE            138.37      1.78       0.0
MH09                 STORAGE            138.85      1.35       0.0


************
Link Summary
************
Name             From Node        To Node          Type            Length    %Slope Roughness
---------------------------------------------------------------------------------------------
MH01-02          MH01             MH02             CONDUIT           78.0    0.4103    0.0130
MH02-03          MH02             MH03             CONDUIT           39.0    0.3846    0.0130
MH03-04          MH03             MH04             CONDUIT           86.0    0.3954    0.0130
MH04-05          MH04             MH05             CONDUIT           16.0    0.4375    0.0130
MH05-06          MH05             MH06             CONDUIT           31.0    0.3226    0.0130
MH06-SWMF        MH06             DryPond          CONDUIT           15.0    0.7334    0.0130
MH07-06          MH07             MH06             CONDUIT           72.0    0.3889    0.0130
MH08-07          MH08             MH07             CONDUIT           95.0    0.4000    0.0130
MH09-08          MH09             MH08             CONDUIT          119.0    0.4034    0.0130
MHoutlet-Drain   MH_outlet        AlmonteDrain     CONDUIT           12.0    0.4167    0.0130
MS01             HP01             CB01             CONDUIT           64.5    0.5426    0.0150
MS02             CB01             HP02             CONDUIT           48.6   -0.5144    0.0150
MS03             HP02             CB02             CONDUIT           61.4    0.6189    0.0150
MS04             CB02             HP03             CONDUIT           52.5   -0.4762    0.0150
```

MS05	HP05	CB04	CONDUIT	53.0	0.6038	0.0150
MS06	CB04	HP04	CONDUIT	32.0	-0.7813	0.0150
MS07	HP04	CB03	CONDUIT	108.2	0.3327	0.0150
MS08	CB03	HP03	CONDUIT	66.3	-0.3771	0.0150
MS09	CB03	HP06	CONDUIT	18.0	-2.1116	0.0130
MS10	HP06	DryPond	CONDUIT	3.0	145.0659	0.0350
O-CB01	CB01	MH01	ORIFICE			
O-CB02	CB02	MH03	ORIFICE			
O-CB03	CB03	MH08	ORIFICE			
O-CB04	CB04	MH09	ORIFICE			
O-SWMF1	DryPond	MH_outlet	ORIFICE			
O-SWMF2	DryPond	MH_outlet	ORIFICE			
W1	DryPond	MH_outlet	WEIR			
W2	DryPond	PondSpill	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
MH01-02	CIRCULAR	0.45	0.16	0.11	0.45	1	182.63
MH02-03	CIRCULAR	0.45	0.16	0.11	0.45	1	176.83
MH03-04	CIRCULAR	0.60	0.28	0.15	0.60	1	386.10
MH04-05	CIRCULAR	0.60	0.28	0.15	0.60	1	406.16
MH05-06	CIRCULAR	0.60	0.28	0.15	0.60	1	348.76
MH06-SWMF	CIRCULAR	0.75	0.44	0.19	0.75	1	953.42
MH07-06	CIRCULAR	0.60	0.28	0.15	0.60	1	382.93
MH08-07	CIRCULAR	0.60	0.28	0.15	0.60	1	388.36
MH09-08	CIRCULAR	0.45	0.16	0.11	0.45	1	181.08
MHoutlet-Drain	CIRCULAR	0.38	0.11	0.09	0.38	1	113.18
MS01	18mROW	1.00	15.30	0.52	18.00	1	48297.78
MS02	18mROW	1.00	15.30	0.52	18.00	1	47024.54
MS03	18mROW	1.00	15.30	0.52	18.00	1	51580.03
MS04	18mROW	1.00	15.30	0.52	18.00	1	45244.17
MS05	18mROW	1.00	15.30	0.52	18.00	1	50946.08
MS06	18mROW	1.00	15.30	0.52	18.00	1	57952.40
MS07	18mROW	1.00	15.30	0.52	18.00	1	37818.88
MS08	18mROW	1.00	15.30	0.52	18.00	1	40261.00
MS09	RECT_OPEN	1.00	3.00	0.60	3.00	1	23856.62
MS10	RECT_OPEN	1.00	3.00	0.60	3.00	1	73445.11

****

Transect Summary
****

Transect 18mROW
Area:

0.0009	0.0034	0.0077	0.0137	0.0214
0.0308	0.0417	0.0530	0.0657	0.0801
0.0962	0.1139	0.1333	0.1543	0.1770
0.2005	0.2240	0.2475	0.2710	0.2945
0.3180	0.3415	0.3650	0.3885	0.4120
0.4356	0.4591	0.4826	0.5061	0.5296
0.5531	0.5766	0.6001	0.6237	0.6472
0.6707	0.6942	0.7177	0.7412	0.7648
0.7883	0.8118	0.8353	0.8588	0.8824
0.9059	0.9294	0.9529	0.9765	1.0000

Hrad:

0.0188	0.0376	0.0564	0.0751	0.0939
0.1127	0.1406	0.1767	0.2070	0.2318
0.2524	0.2698	0.2847	0.2977	0.3093
0.3240	0.3404	0.3578	0.3760	0.3948
0.4140	0.4335	0.4532	0.4731	0.4932
0.5133	0.5335	0.5538	0.5742	0.5945
0.6149	0.6353	0.6557	0.6761	0.6965
0.7169	0.7373	0.7577	0.7780	0.7983
0.8186	0.8389	0.8591	0.8793	0.8995
0.9197	0.9398	0.9599	0.9800	1.0000

Width:

0.0726	0.1453	0.2179	0.2905	0.3631
0.4358	0.4721	0.5073	0.5776	0.6478
0.7180	0.7882	0.8584	0.9287	0.9989
0.9989	0.9990	0.9990	0.9990	0.9990
0.9991	0.9991	0.9991	0.9992	0.9992
0.9992	0.9993	0.9993	0.9993	0.9994
0.9994	0.9994	0.9995	0.9995	0.9995
0.9996	0.9996	0.9996	0.9997	0.9997
0.9997	0.9997	0.9998	0.9998	0.9998
0.9999	0.9999	0.9999	1.0000	1.0000

****
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 ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date ..... 01/25/2021 00:00:00
Ending Date ..... 01/27/2021 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 ..... 4
Head Tolerance ..... 0.001500 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	0.405	82.323
Evaporation Loss	0.000	0.000
Infiltration Loss	0.104	21.128
Surface Runoff	0.301	61.212
Final Storage	0.003	0.628
Continuity Error (%)	-0.783	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.301	3.012
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.302	3.018
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 (%)	-0.216	

```
**************************
Time-Step Critical Elements
**************************
None

******************************
Highest Flow Instability Indexes
******************************
Link O-CB02 (2)
Link O-CB03 (1)
Link O-CB04 (1)
Link O-CB01 (1)

************************
Routing Time Step Summary
************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     2.00 sec
Maximum Time Step           :     2.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.01
Percent Not Converging      :     0.00
Time Step Frequencies       :
    2.000 -  1.516 sec      :    99.94 %
    1.516 -  1.149 sec      :     0.02 %
    1.149 -  0.871 sec      :     0.02 %
    0.871 -  0.660 sec      :     0.01 %
    0.660 -  0.500 sec      :     0.01 %

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

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
A1	82.32	0.00	0.00	18.94	52.18	10.97	63.15	0.20	136.71	0.767
A2	82.32	0.00	0.00	19.06	52.59	10.75	63.34	0.60	406.63	0.769
A3	82.32	0.00	0.00	19.12	52.56	10.66	63.23	0.78	524.73	0.768
A4	82.32	0.00	0.00	18.93	52.18	10.97	63.15	0.17	119.13	0.767
A5	82.32	0.00	0.00	19.31	52.57	10.39	62.97	0.47	305.81	0.765
A6	82.32	0.00	0.00	19.27	52.51	10.44	62.96	0.71	459.88	0.765
A7	82.32	0.00	0.00	53.88	0.00	29.39	29.39	0.08	74.18	0.357

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
CB01	JUNCTION	0.11	1.52	140.14	0 02:14	1.52
CB02	JUNCTION	0.05	1.51	140.00	0 02:17	1.51
CB03	JUNCTION	0.05	1.47	139.96	0 02:22	1.47
CB04	JUNCTION	0.28	1.51	140.11	0 02:14	1.51
HP01	JUNCTION	0.00	0.08	140.25	0 02:10	0.08
HP02	JUNCTION	0.00	0.07	140.14	0 02:15	0.07
HP03	JUNCTION	0.00	0.06	140.00	0 02:18	0.06
HP04	JUNCTION	0.00	0.06	140.11	0 02:15	0.06
HP05	JUNCTION	0.00	0.08	140.20	0 02:10	0.08
HP06	JUNCTION	0.00	0.00	140.07	0 00:00	0.00
AlmonteDrain	OUTFALL	0.07	0.38	137.88	0 02:44	0.38
PondSpill	OUTFALL	0.00	0.00	139.00	0 00:00	0.00
DryPond	STORAGE	0.41	1.52	139.12	0 02:51	1.52
MH_outlet	STORAGE	0.07	0.76	138.31	0 02:51	0.76
MH01	STORAGE	0.03	1.00	139.69	0 02:34	1.00
MH02	STORAGE	0.06	1.12	139.49	0 02:40	1.12
MH03	STORAGE	0.09	1.18	139.40	0 02:42	1.18
MH04	STORAGE	0.22	1.35	139.23	0 02:45	1.35
MH05	STORAGE	0.26	1.39	139.20	0 02:46	1.39
MH06	STORAGE	0.33	1.43	139.14	0 02:48	1.43
MH07	STORAGE	0.17	1.26	139.25	0 02:46	1.26
MH08	STORAGE	0.06	1.03	139.40	0 02:45	1.03
MH09	STORAGE	0.02	0.75	139.60	0 02:37	0.75

****
Node Inflow Summary
****

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	
CB01	JUNCTION	406.63	539.00	0 02:10	0.602	0.804	0.133	
CB02	JUNCTION	524.73	525.20	0 02:10	0.784	0.841	-0.259	
CB03	JUNCTION	459.88	460.10	0 02:10	0.705	0.765	-0.051	
CB04	JUNCTION	305.81	421.36	0 02:10	0.472	0.652	0.167	
HP01	JUNCTION	136.71	136.71	0 02:10	0.196	0.196	-1.058	
HP02	JUNCTION	0.00	135.45	0 02:11	0	0.0578	3.584	
HP03	JUNCTION	0.00	105.12	0 02:11	0	0.0398	0.000	
HP04	JUNCTION	0.00	113.70	0 02:10	0	0.0356	2.774	
HP05	JUNCTION	119.13	119.13	0 02:10	0.171	0.171	-0.961	
HP06	JUNCTION	0.00	0.00	0 00:00	0	0	0.000	ltr
AlmonteDrain	OUTFALL	0.00	333.71	0 02:51	0	3.02	0.000	
PondSpill	OUTFALL	0.00	0.00	0 00:00	0	0	0.000	ltr
DryPond	STORAGE	74.18	797.87	0 02:08	0.0823	3.02	0.004	
MH_outlet	STORAGE	0.00	333.70	0 02:51	0	3.02	-0.000	
MH01	STORAGE	0.00	209.71	0 02:02	0	0.745	0.013	
MH02	STORAGE	0.00	201.56	0 02:02	0	0.745	-0.148	
MH03	STORAGE	0.00	425.20	0 02:05	0	1.55	-0.030	
MH04	STORAGE	0.00	417.67	0 02:05	0	1.55	-0.078	
MH05	STORAGE	0.00	410.61	0 02:05	0	1.55	-0.000	
MH06	STORAGE	0.00	762.75	0 02:05	0	2.94	-0.014	
MH07	STORAGE	0.00	377.12	0 02:08	0	1.38	-0.106	
MH08	STORAGE	0.00	382.17	0 02:09	0	1.38	-0.171	
MH09	STORAGE	0.00	176.74	0 02:09	0	0.615	-0.023	

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

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
DryPond	0.325	13	0	0	1.802	72	0 02:51	333.70
MH_outlet	0.000	5	0	0	0.001	52	0 02:51	333.71
MH01	0.000	2	0	0	0.001	62	0 02:34	201.56
MH02	0.000	3	0	0	0.001	60	0 02:40	185.70
MH03	0.000	4	0	0	0.001	60	0 02:42	417.67
MH04	0.000	10	0	0	0.002	61	0 02:45	410.61
MH05	0.000	12	0	0	0.002	61	0 02:46	407.49
MH06	0.000	14	0	0	0.002	61	0 02:48	754.94
MH07	0.000	8	0	0	0.001	61	0 02:46	359.15
MH08	0.000	3	0	0	0.001	58	0 02:45	377.12
MH09	0.000	2	0	0	0.001	55	0 02:37	172.17

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
AlmonteDrain	76.67	23.13	333.71	3.018
PondSpill	0.00	0.00	0.00	0.000
System	38.34	23.13	333.71	3.018

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
MH01-02	CONDUIT	201.56	0 02:02	1.34	1.10	1.00
MH02-03	CONDUIT	185.70	0 02:05	1.17	1.05	1.00
MH03-04	CONDUIT	417.67	0 02:05	1.58	1.08	1.00
MH04-05	CONDUIT	410.61	0 02:05	1.49	1.01	1.00
MH05-06	CONDUIT	407.49	0 02:05	1.48	1.17	1.00
MH06-SWMF	CONDUIT	754.94	0 02:06	2.09	0.79	1.00
MH07-06	CONDUIT	359.15	0 02:07	1.36	0.94	1.00
MH08-07	CONDUIT	377.12	0 02:08	1.61	0.97	1.00
MH09-08	CONDUIT	172.17	0 02:09	1.14	0.95	1.00
MHoutlet-Drain	CONDUIT	333.71	0 02:51	3.02	2.95	1.00
MS01	CHANNEL	133.01	0 02:10	0.47	0.00	0.19
MS02	CHANNEL	135.45	0 02:11	0.16	0.00	0.19
MS03	CHANNEL	78.27	0 02:15	0.20	0.00	0.19
MS04	CHANNEL	105.12	0 02:11	0.18	0.00	0.18
MS05	CHANNEL	116.07	0 02:10	0.46	0.00	0.19
MS06	CHANNEL	113.70	0 02:10	0.23	0.00	0.18
MS07	CHANNEL	38.57	0 02:15	0.13	0.00	0.16
MS08	CHANNEL	40.87	0 02:18	0.14	0.00	0.16
MS09	CONDUIT	0.00	0 00:00	0.00	0.00	0.13
MS10	CONDUIT	0.00	0 00:00	0.00	0.00	0.50
O-CB01	ORIFICE	209.71	0 02:02			1.00
O-CB02	ORIFICE	240.12	0 02:02			1.00
O-CB03	ORIFICE	210.00	0 02:09			1.00
O-CB04	ORIFICE	176.74	0 02:09			1.00
O-SWMF1	ORIFICE	12.35	0 03:44			1.00
O-SWMF2	ORIFICE	110.97	0 02:51			1.00
W1	WEIR	211.95	0 02:51			0.42
W2	WEIR	0.00	0 00:00			0.00

****
Flow Classification Summary
****

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
MH01-02	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.88	0.00
MH02-03	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.60	0.00
MH03-04	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.50	0.00

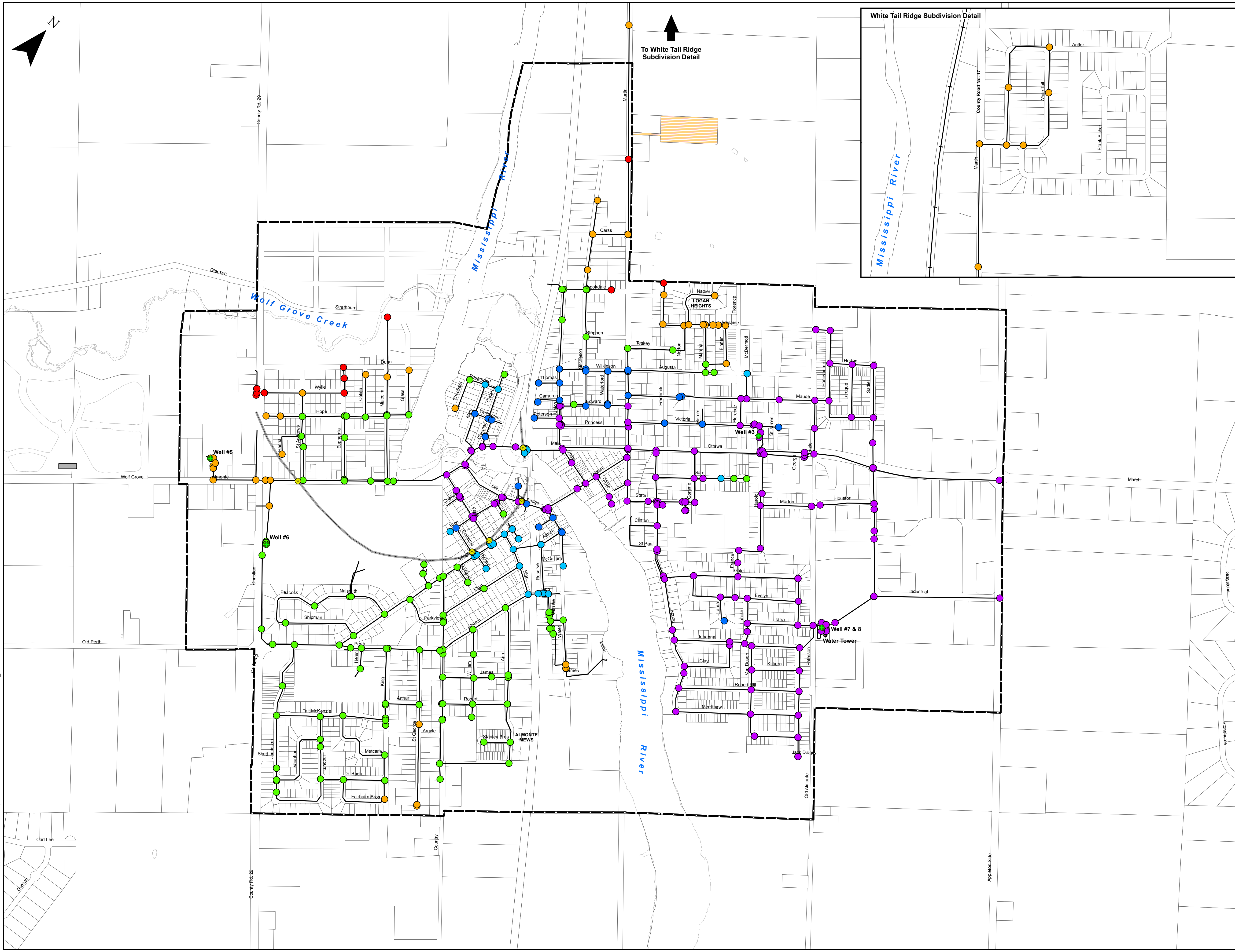
MH04-05	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.27	0.00
MH05-06	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.18	0.00
MH06-SWMF	1.00	0.00	0.02	0.00	0.98	0.00	0.00	0.00	0.11	0.00
MH07-06	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.39	0.00
MH08-07	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.67	0.00
MH09-08	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.64	0.00
MHoutlet-Drain	1.00	0.01	0.00	0.00	0.98	0.01	0.00	0.00	0.00	0.00
MS01	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.02	0.00
MS02	1.00	0.04	0.00	0.00	0.01	0.00	0.00	0.94	0.01	0.00
MS03	1.00	0.04	0.00	0.00	0.01	0.00	0.00	0.94	0.01	0.00
MS04	1.00	0.04	0.00	0.00	0.01	0.00	0.00	0.94	0.01	0.00
MS05	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.02	0.00
MS06	1.00	0.04	0.00	0.00	0.01	0.00	0.00	0.94	0.01	0.00
MS07	1.00	0.04	0.00	0.00	0.02	0.00	0.00	0.94	0.02	0.00
MS08	1.00	0.04	0.00	0.00	0.02	0.00	0.00	0.94	0.02	0.00
MS09	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS10	1.00	0.01	0.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

	Hours Full			Hours Above Full	Hours Capacity
Conduit	Both Ends	Upstream	Dnstream	Normal Flow	Limited
MH01-02	0.86	0.86	2.42	0.17	0.16
MH02-03	2.42	2.42	3.66	0.18	0.19
MH03-04	2.35	2.36	5.25	0.22	0.16
MH04-05	5.25	5.25	6.22	0.03	0.01
MH05-06	6.21	6.22	8.84	0.36	0.29
MH06-SWMF	5.41	5.41	7.49	0.01	0.01
MH07-06	4.25	4.25	8.84	0.01	0.01
MH08-07	1.24	1.24	4.25	0.01	0.01
MH09-08	0.63	0.63	2.39	0.01	0.01
MHoutlet-Drain	0.24	0.87	0.24	1.42	0.24

Analysis begun on: Thu Apr 22 16:31:35 2021
Analysis ended on: Thu Apr 22 16:31:39 2021
Total elapsed time: 00:00:04

APPENDIX F
Excerpts From J.L. Richards Master Plan Update Report – February 2018



No.	ISSUE / REVISION	DD/MM/YY

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PROJECT:

MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

DRAWING:

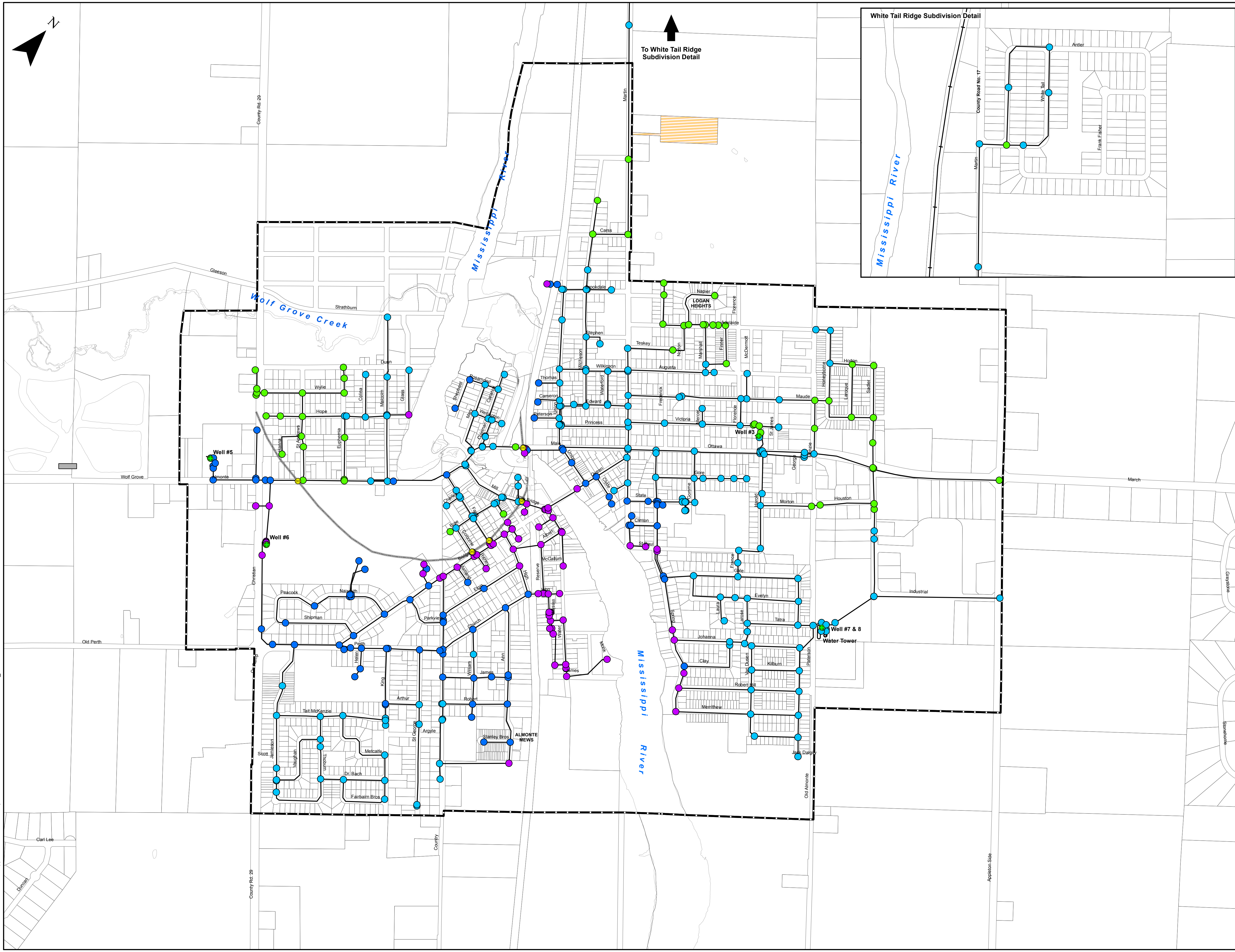
ALMONTE WARD WATER SYSTEM EXISTING MAX DAY DEMAND / FIRE FLOW

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

DRAWING #: **FIGURE 7**

PLOT DATE: January 5, 2018 8:40:14 AM

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



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

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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 EXISTING PEAK HOUR

DESIGN: MB

DRAWN: KTK

CHECKED: SG

JLR #: 27456-01

DRAWING #: **FIGURE 8**

PLOT DATE: January 5, 2018 8:41:18 AM

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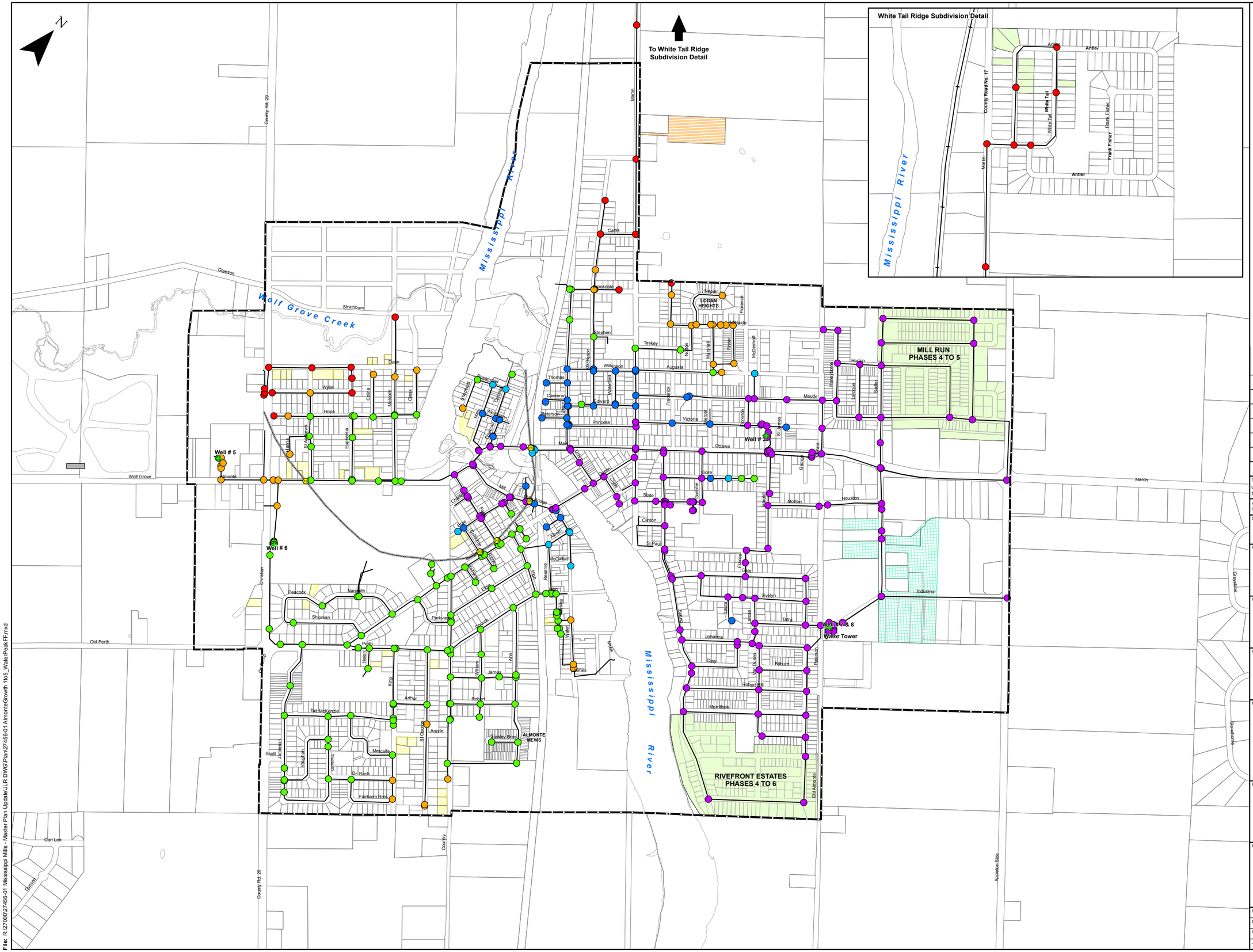

Max Day + Fire Flow

- < 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
- SUBDIVISION
- Business Park (9.0 ha)
- Residential - Infill (3.8 ha)

No.	ISSUE / REVISION	DD/MM/YY

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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	DRAWING #:
CHECKED: SG	**FIGURE 9**
J&R #: 27456-01	

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 AlmonteGrowth 1to5_WaterPeakFF.mxd

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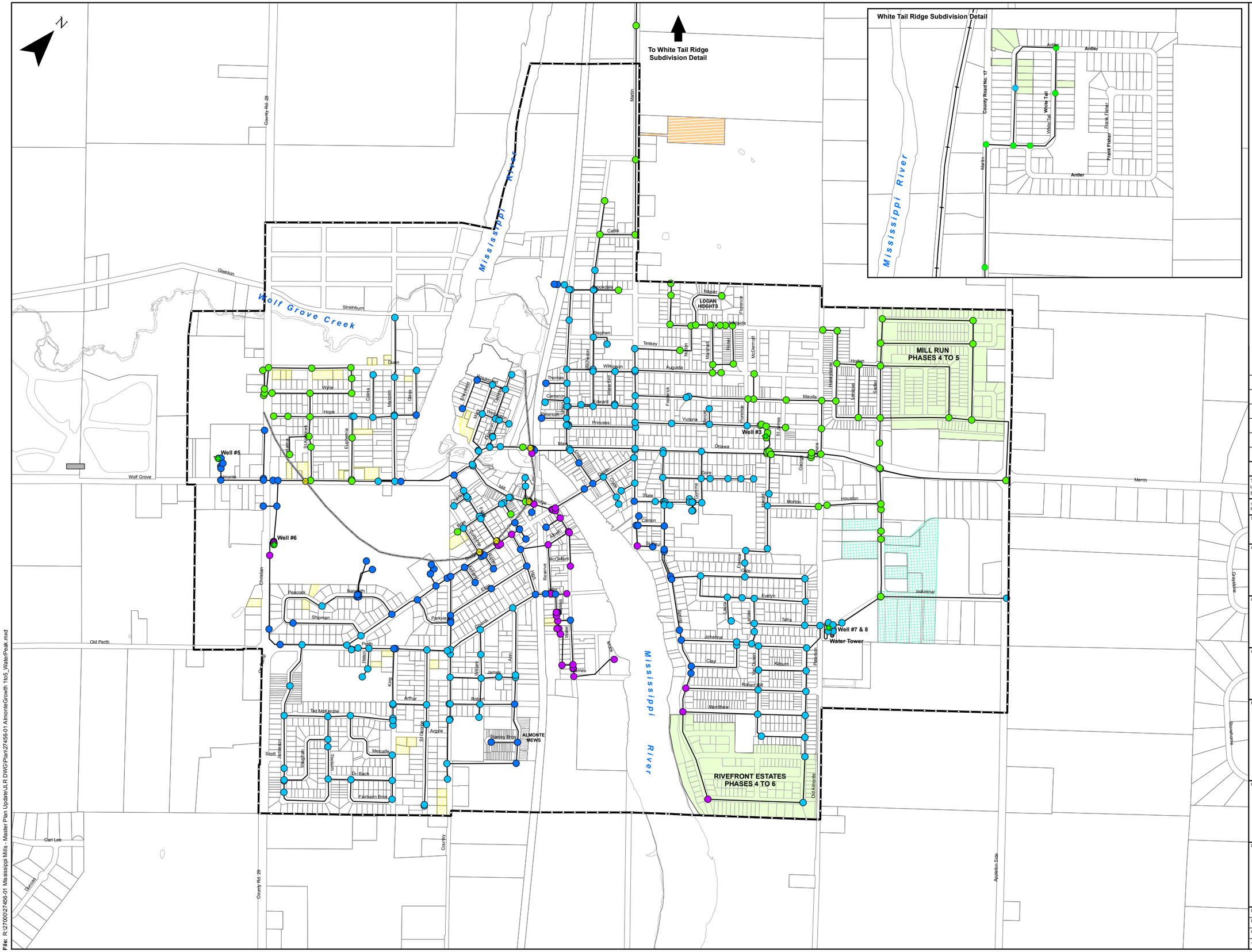

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MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WATER SYSTEM 0 TO 5 YEARS (2018 TO 2022) PEAK HOUR

DESIGN: MB	DRAWING #:
DRAWN: KTK	**FIGURE 10**
CHECKED: SG	
JLR #: 27456-01	

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 AlmonteGrowth 1to5_WaterPeak.mxd

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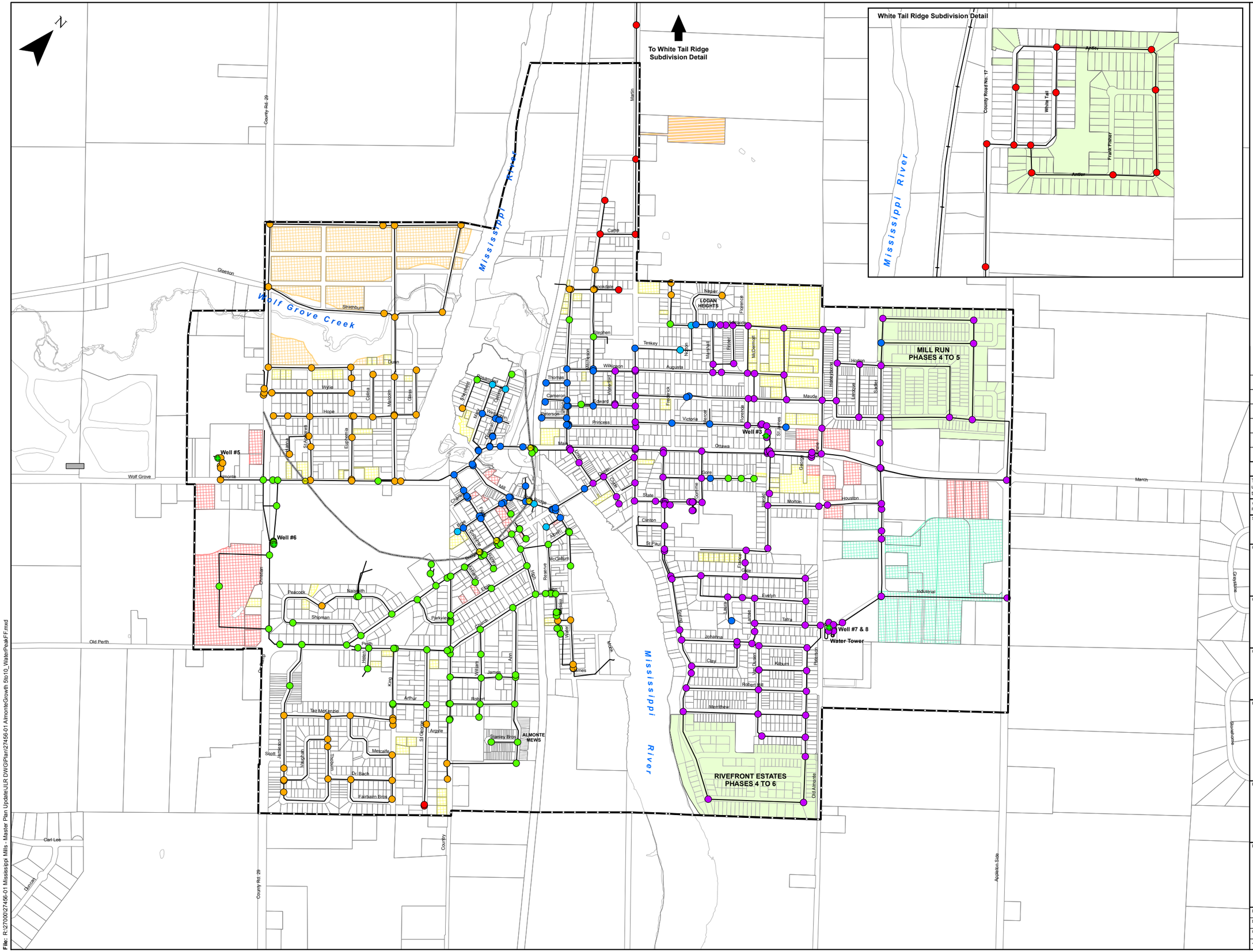

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ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

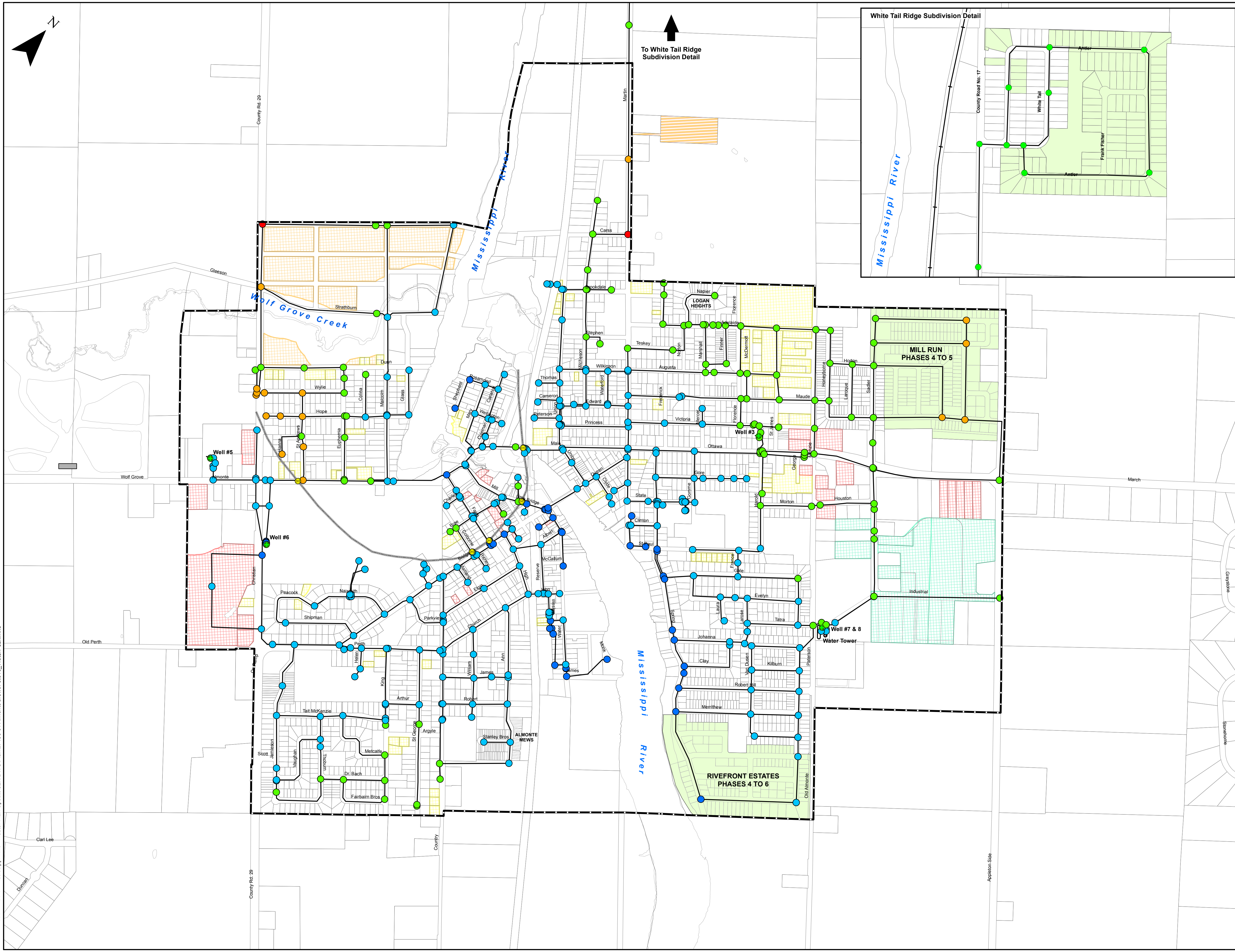
DRAWING:

ALMONTE WARD WATER SYSTEM
5 TO 10 YEARS (2023 TO 2028)
MAX DAY DEMAND / FIRE FLOW

DESIGN: MB	
DRAWN: KTK	DRAWING #:
CHECKED: SG	**FIGURE 11**
J&R #: 27456-01	

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 AlmonteGrowth 5to10_WaterPeakFF.mxd

PLOT DATE: January 5, 2018 8:54:26 AM



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)

No.	ISSUE / REVISION	DD/MM/YY

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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) PEAK HOUR

DESIGN: MB	
DRAWN: KTK	DRAWING #:
CHECKED: SG	**FIGURE 12**
JLR #: 27456-01	

PLOT DATE: January 5, 2018 8:56:08 AM

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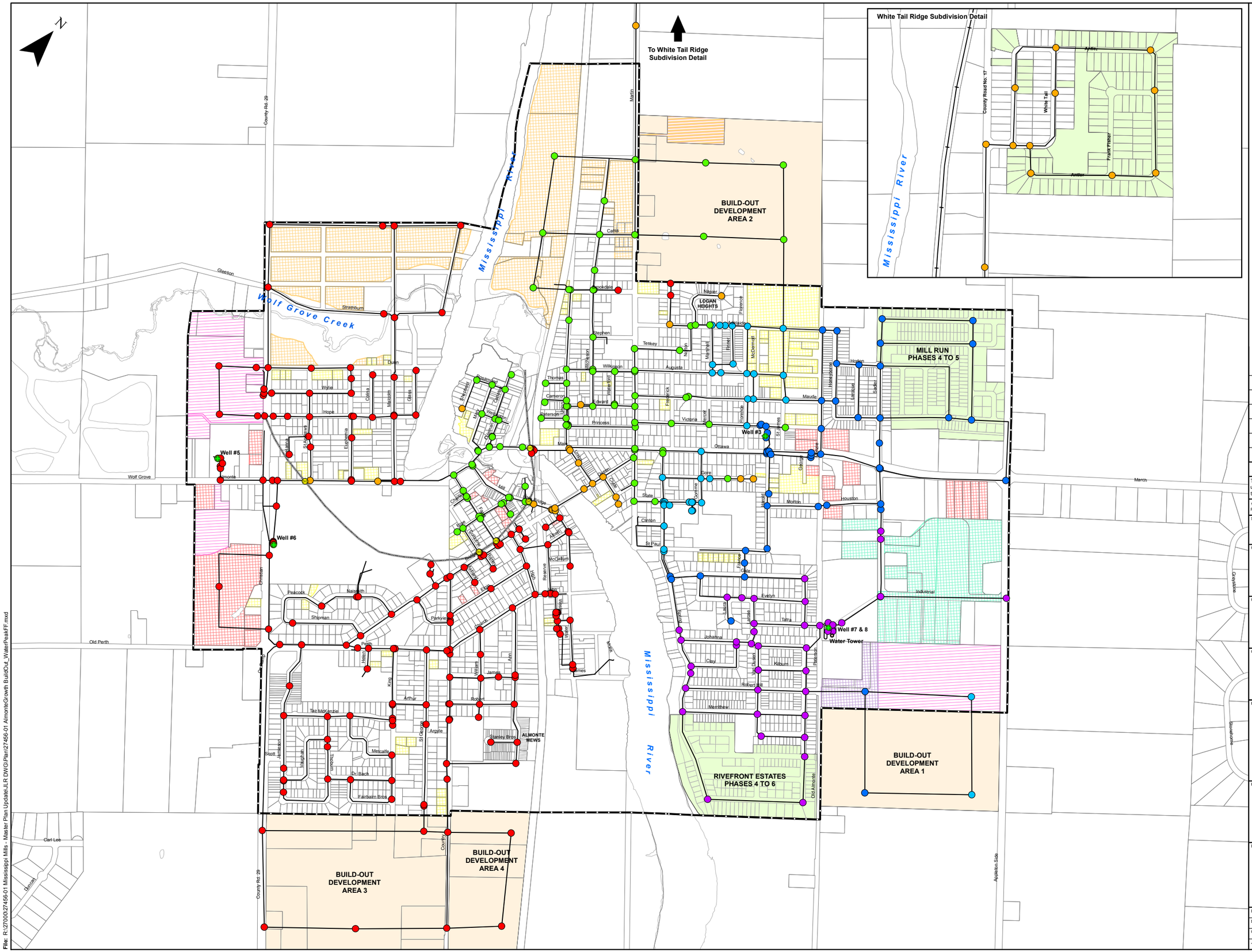

Max Day + Fire Flow

- < 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
- 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)

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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	DRAWING #:
CHECKED: SG	**FIGURE 15**
JLR #: 27456-01	

PLOT DATE: January 5, 2018 2:34:35 PM

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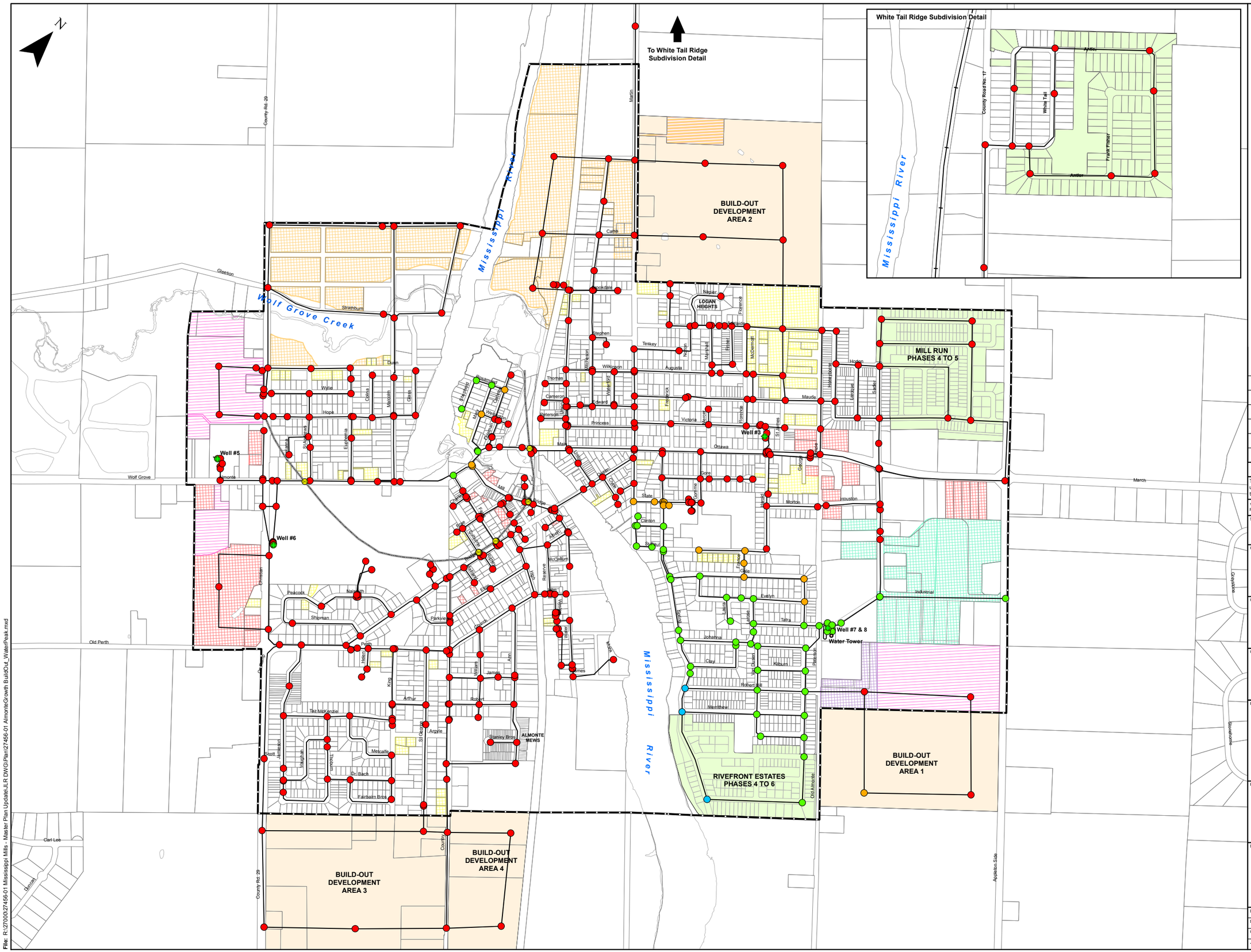

Peak Hour

- < 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)
- Commercial (15.6 ha)
- Industrial (24.1 ha)
- Residential - Geenfield (34.2 ha)
- Residential - Infill (16.0 ha)

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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	DRAWING #:
CHECKED: SG	**FIGURE 16**
JLR #: 27456-01	

PLOT DATE: January 5, 2018 2:35:54 PM

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

Existing: 2-117
Residential - Greenfield
10 - 20 years
11.72 L/s
Pumped

Existing: 1-108
Residential - Greenfield
5 - 10 years
10.27 L/s
Pumped

Existing: 1-325
Industrial
Build-out
11.48 L/s
Gravity

Existing: 1-120
Industrial
Build-out
2.63 L/s
Pumped

Existing: 1-107
Commercial
5 - 10 years
7.42 L/s
Pumped

To White Tail Ridge Subdivision Detail

Existing: 2-328
Residential - Greenfield
10 - 20 years
2.75 L/s
Pumped

Existing: 2-207
Upgrade: Victoria and Florence
Development Area 2
Build-out
40.54 L/s
Gravity

BUILD-OUT DEVELOPMENT AREA 2

Existing: 2-207
Upgrade: Victoria and Menzie
Residential - Infill
5 - 10 years
5.97 L/s
Gravity

Existing: 4-009
Commercial
5 - 10 years
0.31 L/s
Gravity

4-009
Residential - Infill
5 - 10 years
0.92 L/S
Gravity

Existing: 2-207
Upgrade: Victoria and Menzie
Commercial
5 - 10 years
1.06 L/s
Gravity

4-108
Mill Run
0 - 5 years
19.34 L/S
Gravity

Existing: 4-105
Commercial
5 - 10 years
0.89 L/s
Gravity

Existing: 4-109
Commercial
5 - 10 years
1.63 L/s
Gravity

Existing: 4-107
Upgrade: Ottawa and Menzie
Business Park
5 - 10 years
10.99 L/s
Gravity

Existing: 4-107
Upgrade: Ottawa and Menzie
Business Park
0 - 5 years
12.36 L/s
Gravity

Existing: 4-107
Upgrade: Ottawa and Menzie
Industrial
Build-out
12.25 L/s
Pumped

Existing: 4-107
Upgrade: Ottawa and Menzie
Community Facility
10 - 20 years
2.37 L/s
Pumped

Existing: 4-107
Upgrade: Ottawa and Menzie
Development Area 1
Build-out
25.07 L/s
Pumped

Existing: 3-119
Almonte Mews
0 - 5 years
1.04 L/S
Gravity

Existing: 3-043
Development Area 3
Build-out
41.53 L/s
Gravity

Existing: 4-321
Riverfront Estates
0 - 5 years
12.08 L/S
Gravity

Existing: 3-119
Development Area 4
Build-out
17.43 L/s
Pumped

Existing: 4-432
Riverfront Estates
0 - 5 years
1.07 L/s
Gravity

BUILD-OUT DEVELOPMENT AREA 3

BUILD-OUT DEVELOPMENT AREA 4

BUILD-OUT DEVELOPMENT AREA 1

RIVEFRONT ESTATES PHASES 4 TO 6

MILL RUN PHASES 4 TO 5

ALMONTE MEWS

LOGAN HEIGHTS

White Tail Ridge Subdivision Detail

Existing: 2-330
White Tail Ridge
0 - 5 years
0.35 L/S
Gravity

Existing: 2-330
White Tail Ridge
5 - 10 years
3.92 L/S
Gravity

Mississippi River

Wolf Grove Creek

Island Pump Station

Hope & Glass Street Pump Station

Wastewater Treatment Plant

Christian Street Pump Station

Gemmill Bay Pump Station

Mill Street Pump Station

Spring Street Pump Station

Ann Street Pump Station

Riverfront Pump Station

Orchardview Pump Station

Infrastructure

- 4-102 Manhole ID
- Pumping Station
- Cleanout
- Sanitary Manhole
- Saniatry Sewer
- Private Forecmain
- 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
Upgrade : Ottawa and Menzie
Commercial
5 - 10 years
1.63 L/s
Gravity

- Manhole ID
- Intersection
- Development Name or Type
- Development Timeline
- Estimated Park Flow
- Anticipated Future Trunk Servicing

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PROJECT:
MUNICIPALITY OF MISSISSIPPI MILLS
ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE
MISSISSIPPI MILLS, ONTARIO

DRAWING:
WASTEWATER HYDRAULIC MODEL DEMAND ALLOCATION

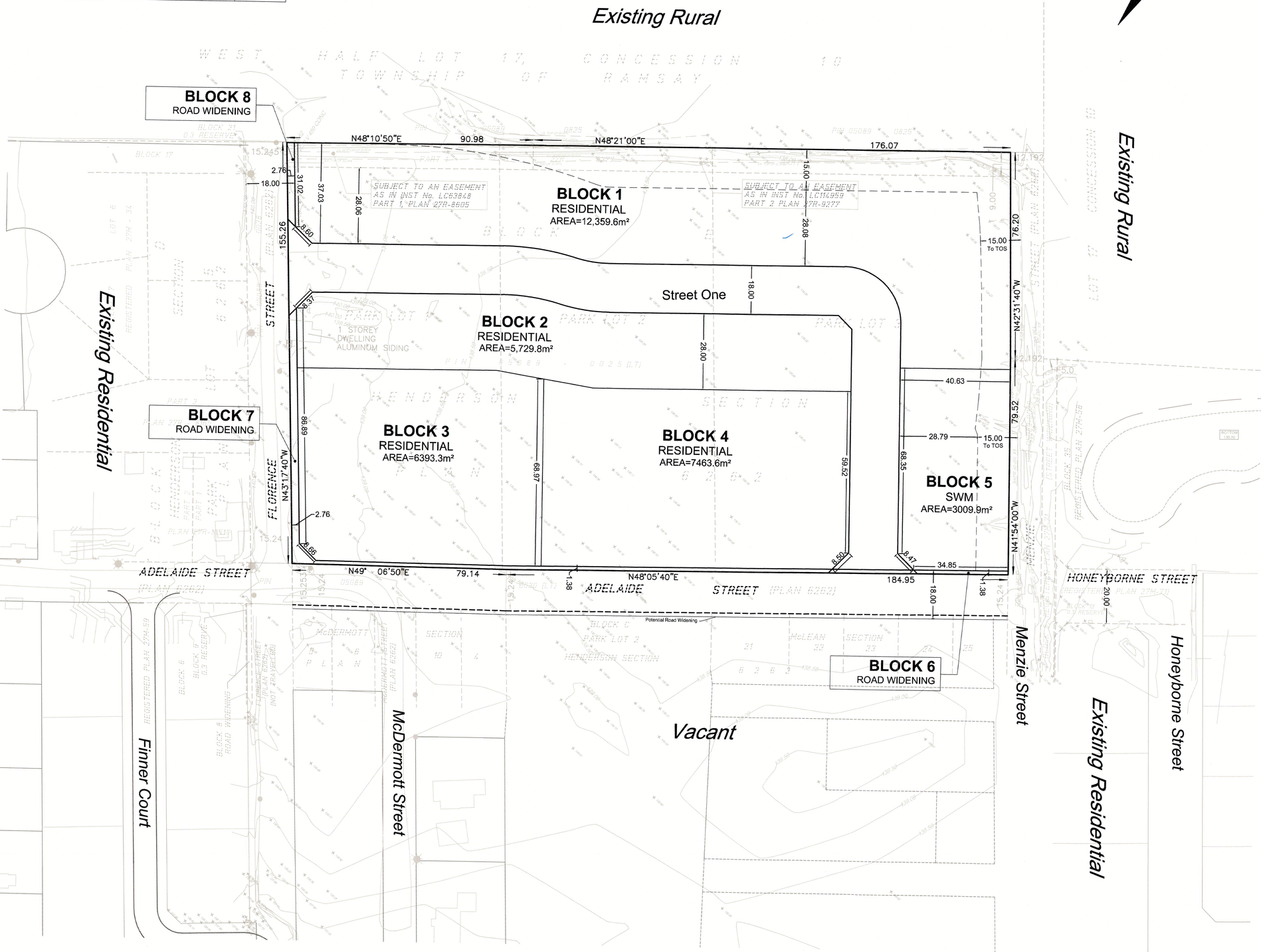
DESIGN: MB	
DRAWN: KTK	DRAWING #:
CHECKED: SG	FIGURE 25
JLR #: 27456-01	

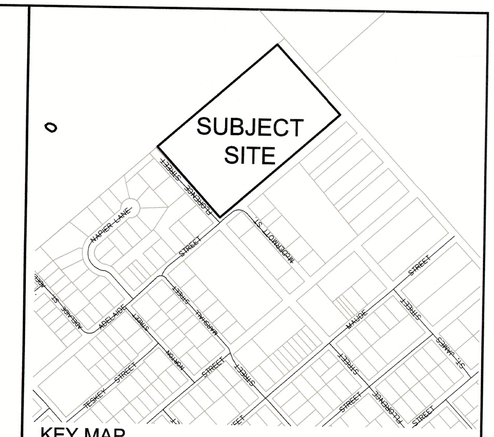
PLOT DATE: January 5, 2018 10:32:24 AM

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

SCHEDULE OF LAND USE

BLOCK #'s	LAND USE	UNITS	AREA (m²)
1	Townhouse	44	12359.6
2	Townhouse	34	5729.8
3	Stacked Townhouse	48	6393.3
4	Back-to-Back Townhouse	40	7463.6
5	SWM		3009.9
6-8	Road Widening		807.7
	Street One		5707.1
TOTAL		166	41471.00





METRIC : MEASUREMENTS SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

DRAFT PLAN OF SUBDIVISION OF
PARK LOTS 1, 2 & 3
BLOCK E, HENDERSON SECTION
PLAN 6262
MUNICIPALITY OF MISSISSIPPI MILLS
COUNTY OF LANARK

SCALE
1 : 750

DATE: MAY, 2021

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO ADJOINING LANDS ARE CORRECTLY SHOWN.

DATED May 11, 2021

G.A. Smith
ONTARIO LAND SURVEYOR

Callon Dietz Inc.
ONTARIO LAND SURVEYORS

Job No. 21-1092

OWNER'S CERTIFICATE

I, ARCHIE ALBERT EVOY, BEING THE REGISTERED OWNER(S), HEREBY AUTHORIZE NOVATECH TO PREPARE AND SUBMIT THIS DRAFT PLAN OF SUBDIVISION TO THE COUNTY OF LANARK FOR REVIEW AND APPROVAL.

DATED May 19, 2021

Archie Evoy

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51 (17) OF THE PLANNING ACT.

A) The boundaries of the land proposed to be subdivided, certified by an Ontario land Surveyor;
As shown on Draft Plan

B) The locations, widths & names of the proposed highways within the proposed subdivision & of existing highways on which the proposed subdivision abuts;
As shown on Draft Plan

C) On a small keyplan, on a scale of not less than 1cm to 100m, all of the land adjacent to the proposed subdivision that is owned by the applicant or in which the applicant has an interest, every subdivision adjacent to the proposed subdivision & the relationship of the boundaries of the land to be subdivided to the boundaries of the township lot of other original grant of which the land forms the whole part;
As Shown on Draft Plan

D) The purpose for which the proposed lots are to be used;
Residential, Open Space, and Stormwater Management shown on Draft Plan

E) The existing uses of all adjoining lands;
Residential, Open Space, and Rural shown on Draft Plan

F) The approximate dimensions & layout of the proposed lots;
As shown on Draft Plan

G) Natural & artificial features such as buildings or other structures or installations, railways, highways, watercources, drainage ditches, wetlands & wooded areas within or adjacent to the land proposed to be subdivided;
As shown on Draft Plan

H) The availability and nature of domestic water supplies;
Development will be supplied with full municipal piped water service

I) The nature & porosity of the soil;
Refer to Soils Report

J) Existing contours or elevations as may be required to determine the grade of the highways and the drainage of the land proposed to be subdivided;
Contours shown at 0.5 metre intervals on Draft Plan

K) The municipal services available or to be available to the land proposed to be subdivided;
Development will be supplied with full sanitary and storm water sewer services.

L) The nature & extent of any restrictions affecting the land proposed to be subdivided, including restrictive covenants or easements. 1994, c. 23, s. 30; 1996, c. 4, s. 28 (3);
As shown on Draft Plan.

HANNAN HILLS

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

PROJECT No. 118201

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REFER TO __________ FOR ADDITIONAL NOTES

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 WITH SERVICEABILITY AND CSWM REPORT	MAY 20/21	ARM

SCALE 1:500

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
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LOCATION
MUNICIPALITY OF MISSISSIPPI MILLS
HANNAN HILLS

DRAWING NAME
PRELIMINARY GRADING AND SERVICING PLAN

PROJECT No. 118201-00
REV
REV # 1
DRAWING No.
118201-PGR

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