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Hannan Hills Subdivision

Serviceability and Conceptual Stormwater Management Report

Prepared for: 1384341 Ontario Ltd. (Cavanagh Developments)

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Serviceability and Conceptual Stormwater Management Report

Hannan Hills Subdivision

Almonte, ON

Prepared By:

NOVATECH
Suite 200, 240 Michael Cowpland Drive
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June 12, 2024

Novatech File: 118201
Ref: R-2024-048

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June 12, 2024

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

Attention: **Koren Lam, Senior Planner**

Reference: **Hannan Hills Subdivision**
Serviceability and Conceptual Stormwater Management Report
Our File No.: 118201

Please find enclosed the report entitled "Serviceability and Conceptual Stormwater Management Report" dated June 12, 2024 prepared in support of an application for Draft Plan approval for the Hannan Hills Subdivision.

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.

This report is to be read in conjunction with the Environmental Impact Study (CIMA+, June 2024) and the Hydrologic Impact Study (Novatech, June 12, 2024).

Yours truly,

NOVATECH

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

cc: Julie Stewart, Cavanagh Developments

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Environmental Impact Study (EIS) Report (CIMA+, June 2024)
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1.0 INTRODUCTION

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

1.1 Purpose

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

This report is to be read in conjunction with the Environmental Impact Study (EIS) (CIMA+) and Hydrologic Impact Study (Novatech). The EIS provides discussion on the environmental impacts on the wetland and the Hydrologic Impact Study outlines impacts of the development on the existing wetlands located on the subject property.

1.2 Site Location and Existing Conditions

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 Spring Creek 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. Refer to **Figure 2 (Existing Conditions Plan)** for an aerial photograph of the property.

The existing site drainage flows overland from west to east and discharges into the Spring Creek Municipal Drain. The portion of the site along the north property line (0.33 ha) drains towards a wetland prior to discharging to the Spring Creek Municipal Drain. The front lots of the houses on the southwest side of Florence Street and a portion of the forested area to the southeast of Adelaide between Florence Street to approximately 35m north of McDermott Street flow through the site to the Spring Creek Municipal Drain. This results in an additional 1.33 ha of upstream drainage, for a total drainage area of 5.48 ha.

The surficial soils consist of silty sand and glacial till (Hydrologic Soil Group 'B') based on the Preliminary Geotechnical Investigation (Paterson Group, 2019).

1.3 Proposed Development

It is proposed to develop a residential subdivision of 106 townhomes and four single family homes. The development would include three connections to the proposed extension of Adelaide Street and a connection to existing Florence Street, both of which would be upgraded as part of this development. A pedestrian connection would be made to the existing Mill Run Subdivision to the north via a pedestrian pathway from Adelaide Street to Honeyborne Street. Refer to the **Concept Plan** for a layout of the proposed subdivision.

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**.

1.4 Adjacent Developments

The adjacent development to the south (proposed Menzie Enclaves) would connect roads and servicing (sanitary sewer and watermain) to the Adelaide Street extension that is planned as part of the Hannan Hills development. The Menzie Enclaves development would have a separate stormwater management facility and outlet. Coordination between the two proposed developments is underway and would continue through the detailed design process. The Menzie Enclaves Draft Plan of Subdivision has been included in **Appendix G** for reference.

It is proposed to provide watermain and sanitary sewer stubs on Florence Street for potential connection of future development lands to the north. These lands are accounted for in the JL Richards Master Plan Report and the proposed sanitary sewer on Florence Street would be sized to account for future flows.

2.0 ENVIRONMENTAL CONSIDERATIONS

The site is bounded by the Spring Creek Municipal Drain to the east and a drainage channel within an existing easement to the north (North Feature). The North Feature channel is a constructed outlet for an existing residential development west of Florence Street.

As indicated in the EIS prepared by CIMA+ (June 2024), the Spring Creek Municipal Drain and approximately 10m of the east portion of the North Feature are considered direct fish habitat. The remainder of the North Feature is considered as contributing to fish habitat.

The existing site also contains a portion of an unevaluated wetland which would be removed. The Spring Creek Municipal Drain and North Feature are identified as turtle habitat, and the EIS notes that turtle exclusion barrier would be required. Turtle exclusion barrier has been shown on the **Preliminary Grading and Servicing Plan (118201-PGS**).

Based on the recommendations provided in the EIS, a 15-meter no-development buffer from the existing top of bank of the Spring Creek Municipal Drain would be provided along the east site boundary. An approximately 9-meter no-development buffer from the existing top of bank of the North Feature would be provided along the north site boundary. These buffers are shown on the **Constraints Plan (118201-ECP)** and the **Preliminary Grading and Servicing Plan (118201-PGS**).

Refer to the EIS prepared by CIMA+ for further environmental consideration details.

3.0 ROAD DESIGN

The internal subdivision roads would be constructed in accordance with the typical road cross-sections shown on the **Preliminary Grading and Servicing Plan** (**118201-PGS**). The proposed 18-metre right-of-way would have an 8.5-metre asphalt width and curbs with sidewalks on one side. Florence Street and Adelaide Street would be designed with a full urban cross section (8.5m asphalt width and curbs).

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

4.0 SITE SERVICING

4.1 Watermain

The proposed 250mm and 200mm watermain would connect to the existing 250mm watermain on Honeyborne Street and to the existing 150mm watermain on Adelaide Street at Finner Court. Refer to **Figure 3 (Watermain Servicing**) for preliminary watermain layout.

Domestic Demand

Domestic water demands for the proposed site were estimated as follows. Supporting water demand calculations can be found in **Appendix B.**

- Average Day Demand = 1.0 L/s
- Maximum Day Demand = 2.4 L/s
- Peak Hour Demand = 5.3 L/s

The JL Richards Master Plan Report outlines peak flow pressures throughout the town's watermain network at various build-out stages which are summarized in **Table 4.1** below.

Table 4.1: Peak Hour Pressures at Subject Site (JL Richards Master Report, 2018)

Build-out Time Period	Peak Hour Pressure (kPa)	JL Richards Figure #
2023 to 2028	301 to 400	12
2029 to 2037	301 to 400	14

As shown in the table, the range of pressures up to the 2037 buildout condition, which includes the development of the subject lands, is above the minimum required 275 kPa (40psi) peak hour pressure. This indicates that the proposed development can be adequately serviced for domestic water use in this time period. Refer to **Appendix F** for figures from the 2018 Master Report.

Fire Demand

Fire hydrants would be installed along the proposed streets to provide fire protection. The Municipality of Mississippi Mills indicated that Fire Underwriter's Survey (FUS) simplified method was to be used to calculate required fire flows. Refer to **Appendix B** for email correspondence. The FUS Table 7 & 8 Simple Method was used to indicate required fire flows between 67 L/s and 133 L/s, as outlined in **Table 4.2** below.

Table 4.2: Summary of FUS Table 7 & 8 Simple Method Fire Flows

Proposed Unit	Exposure Distance	FUS Table 7/8 Required Fire Flow (L/s)	Required Max Day + Fire Flow (L/s)
Single Family Homes	3m to 10m	67 L/s	70 L/s
Townhomes	3m to 10m	133 L/s	136 L/s

The JL Richards Master Plan Report outlines available maximum day plus fire flow throughout the town's watermain network at various build-out stages which are summarized in **Table 4.3** below.

Table 4.3: Max Day plus Fire Flow at Subject Site (JL Richards Master Report, 2018)

Build-out Time Period	Max Day + Fire Flow (L/s)	JL Richards Figure #
2023 to 2028	100 to 300	11
2029 to 2037	100 to 300	13

As shown in the table, the required maximum day plus fire flow is within the range indicated for the “2023 to 2028” and “2029 to 2037” buildout conditions. It is our understanding that pressure reducing valves may be required to limit average day pressures. Refer to **Appendix F** for figures from the 2018 Master Report.

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

4.2 Sanitary Sewer

Refer to **Figure 4 (Sanitary Servicing)** for preliminary sanitary sewer layout.

New 200mm diameter sanitary sewers would service the proposed development. The sewage flows from the site would be directed by gravity and connect to the proposed 375mm diameter sewer located on Florence Street which would 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 development are as follows:

Residential Areas

Average flow - residential	=	280 L/cap/day
Population for single family unit	=	3.4
Population for townhouse unit	=	2.7
Residential Peaking	=	based on Harmon Formula

The theoretical peak design flow for the proposed development was calculated to be in the order of 4.7 L/s which is less than the 5.97 L/s allocated to the site from the JL Richard Master Report Update.

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

The proposed sanitary sewer on Florence Street have sufficient capacity to convey the theoretical sanitary flows from the development as well as the developments adjacent to the site. Refer to the **Conceptual Sanitary Drainage Area Plan** (**118201-CSAN)** and the Sanitary Sewer Design Sheets provided in **Appendix C** for details.

4.3 Storm Drainage

Storm drainage, both the minor and major systems, would 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 Spring Creek Municipal Drain. Quantity control would be provided by a dry pond. Quality control would be provided by a hydrodynamic separator unit.

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

4.3.1 Storm Sewers (Minor System)

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

Refer to **Appendix D** for the **Pre-Development Storm Drainage Area Plan (118201-PRE-STM), Preliminary Storm Drainage Area Plan (118201-POST-STM)** and the Storm Sewer Design Sheet.

<u>Storm Sewer Design Criteria</u>

The following is the storm sewer design criteria were used:

- Rational Method (Q) = 2.78CIA, where
  - Q = peak flow (L/s)
  - C = runoff coefficient
    - C = (0.70 * %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

<u>Foundation Drainage</u>

Foundation drains surrounding the dwellings would be connected to the storm sewers. Based on a 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. The back-to-back townhomes would be slab on grade with no basements.

<u>Inlet Control Devices</u>

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

4.3.2 Major System Drainage

During detailed design, the site would 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.

5.0 STORMWATER MANAGEMENT

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.

5.1 Hydrologic & Hydraulic Modeling (PCSWMM)

The PCSWMM model created for the conceptual SWM design is a semi-lumped model that represents system flows from the development. The model was used to simulate runoff from the site, and to size the dry pond for quantity control to 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 within the post-development site and was selected as the critical storm distribution to be used in the design of the conveyance system. The 4-hour Chicago storm distribution was used for the 25mm event (water quality event). The highest storage volumes in the dry pond occurred during the 12-hour SCS storm event, so this event was used as the critical storm distribution for determining the required quantity control storage in the SWM facility.

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;
    - 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 a runoff coefficient that was determined from the proposed impervious area (roads, driveways, proposed building footprints, etc.). The percent impervious was determined using the following equation from the *Ottawa Sewer Design Guidelines* (2012);
  - $C = \left[\%\, imp \times C_{impervious}\right] + \left[(1 - \%\, imp) \times C_{pervious}\right]$
    - Where: $C_{impervious} = 0.90$; and $C_{pervious} = 0.20$
  - The equation was rearranged to get 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. 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 **Appendix D** for the **Pre-Development Storm Drainage Area Plan (118201-PRE-STM), Preliminary Storm Drainage Area Plan (118201-POST-STM)**. A detailed summary of model subcatchment parameters is included in **Appendix E**.

Dry Pond Sizing

Runoff from the site would 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 would 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 would 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 **Table 5.1**. Refer to **Figure 6 (Conceptual Stormwater Management Facility)** for the conceptual layout of the dry pond.

Table 5.1: 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)	137.70
Top of Pond Elevation (masl)	140.00
Bottom Area (m^2)	342
Top Area (m^2)	1,497
Storage Volume to Top of Pond (m^3)	2,048

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

The conceptual design for the dry pond outlet consists of:

- A 75 mm diameter orifice with an invert elevation of 137.60 m for the water quality event;
- A 140mm diameter orifice with an invert elevation of 138.55 m;
- A 0.35 m wide transverse weir with crest elevation of 139.40 m;
- An emergency overflow spillway with a crest elevation of 139.73 m.

The stage-storage-discharge table is provided in **Table 5.2.**

Table 5.2: 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	137.70	4	-
Bottom of Dry Pond	137.80	25	-
25mm Event	138.53	412	11
2yr Event	138.72	561	26
5yr Event	139.02	835	42
100yr Event	139.73	1,661	192
Top of Pond	140.00	2,048	-

Model Results – Hydraulic Grade Line

As discussed in Section 4.3.1, sump pumps would be required to drain the foundations to the storm sewers. Hydraulic grade lines would be reviewed further at the time of detailed design.

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 would 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 5.3**.

Table 5.3: Pre vs. Post-Development Peak Flows (L/s)

Scenario		4-hour Chicago	6-hour Chicago			12-hour SCS		
		25mm	2-yr	5-yr	100-yr	2-yr	5-yr	100-yr
Pre-Development		10	37	90	331	52	112	351
Post-Development	*Controlled*	*11*	*25*	*39*	*182*	*26*	*42*	*192*
	Uncontrolled	*7*	*12*	*42*	*146*	*5*	*30*	*78*
	Total	18	37	81	328	31	72	270

5.2 Quality Control

A hydrodynamic separator (HDS) unit providing quality control would be located within the SWM Facility block and would be accessible from the Street One for inspection and maintenance. In addition, the SWM Facility would 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.

5.3 Best Management Practices

The proposed development would use the following stormwater best management practices (BMPs) to mitigate the reduction in groundwater infiltration/recharge resulting from development:

- Existing site drainage direction and outlets would generally be maintained.
- Buffers from existing drainage channels would be maintained.
- Roof leaders would be directed to grassed areas.
- Lot grading slopes would be minimized, where possible, to promote infiltration.
- Rearyard swales would be designed with minimal longitudinal slope to promote infiltration.

By implementing stormwater management BMPs 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. The use of BMPs have not been included in the SWM calculations to provide a conservative estimate of the runoff volumes and storage requirements.

6.0 EROSION AND SEDIMENT CONTROL

6.1 Temporary Measures

The following erosion and sediment control measures would 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 would be implemented on-site during construction in accordance with the Best Management Practices for Erosion and Sediment Control. This includes the following temporary measures:

- Filter bags placed under the grates of on-site and nearby catchbasins and manholes and kept in place until vegetation has been established and construction is completed;
- Silt fencing placed around the construction limits;
- Straw bale barriers and/or rock flow check dams placed until vegetation has been established and construction is completed;
- Street sweeping and cleaning performed as required to suppress dust and to provide safe and clean roadways adjacent to the construction site;
- The extent of exposed soil during construction minimized and vegetation re-established as soon as possible; and
- All sewers inspected and cleaned after construction completion.

The proposed temporary erosion and sediment control measures would be implemented prior to construction and 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.

6.2 Permanent Measures

The following would provide permanent erosion and sediment control measures:

- Grass swales along the rear and side yard property lines;
- Slopes on finish lot grades minimized where possible to slow the runoff of water;
- The hydrodynamic separator unit designed to provide quality control for stormwater runoff prior to entering the SWM Facility;
- Vegetated buffers adjacent to the Municipal Drain and the North Feature would provide permanent no-touch areas.

7.0 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 subdivision has been accounted for in the J.L. Richards Master Plan Update Report – February 2018.
- The development would be serviced by connecting to existing watermains in the adjacent subdivisions (Finner Court and Mill Run).

- The development would be serviced by connecting sanitary sewers to the existing trunk sewer on Victoria Street.
- Stormwater runoff from the site would be captured by an onsite storm sewer system via a series of rear-yard swales and roadside catchbasins. The storm sewer system would direct runoff to a Stormwater Management Facility prior to releasing flows to the Spring Creek Municipal Drain.
- Quantity control of stormwater runoff would be provided by the Stormwater Management Facility (Dry Pond).
- Quality control of stormwater runoff would be provided by the Stormwater Management Facility which would include a hydrodynamic separator, a 24-hour draw down time, and a low flow channel.
- Temporary and permanent erosion and sediment control measures would be provided.

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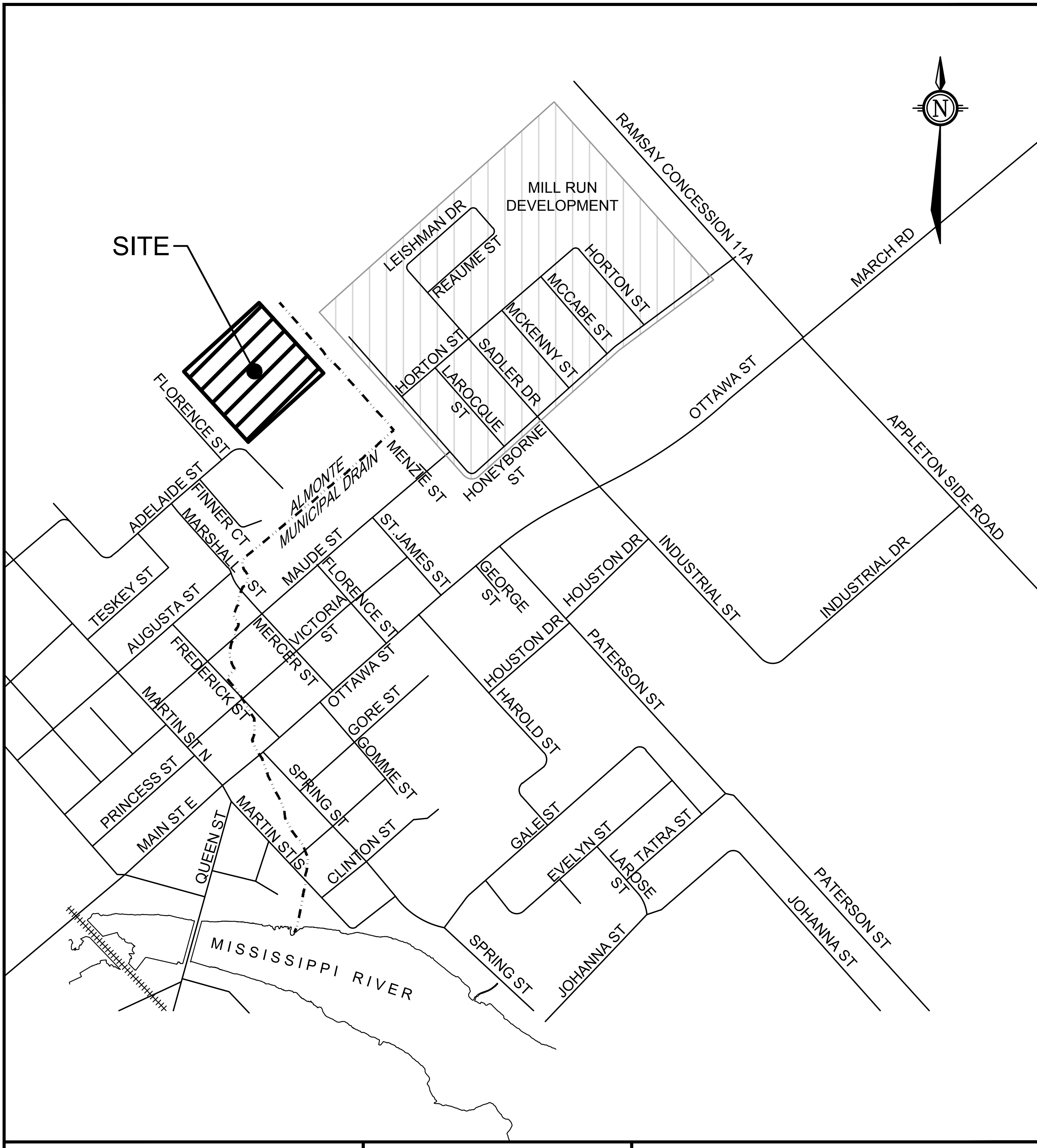

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MUNICIPALITY OF MISSISSIPPI MILLS

HANNAN HILLS SUBDIVISION

KEY PLAN

SCALE		
N.T.S.		
DATE JUN 2024	JOB 118201	FIGURE 1

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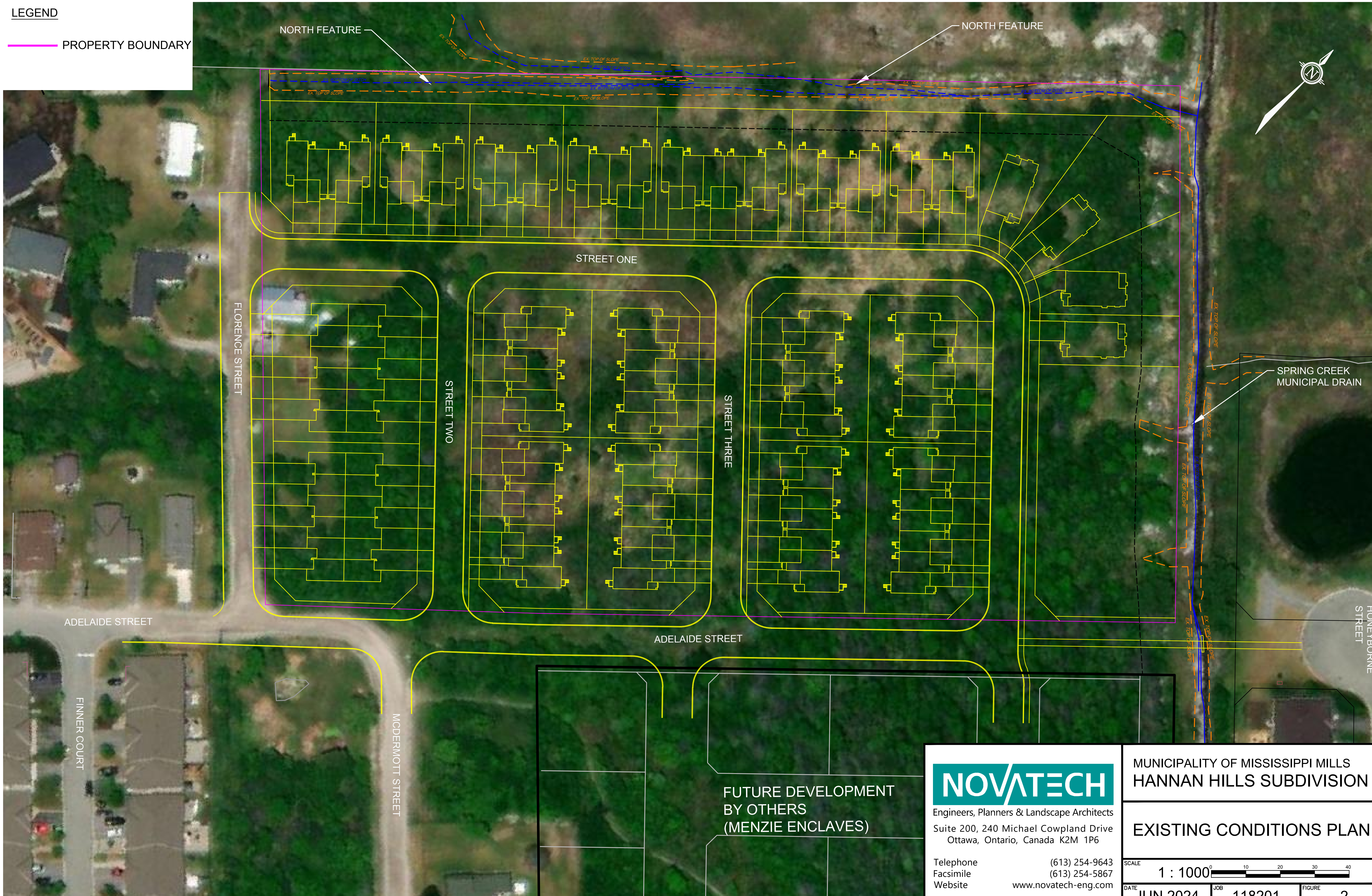

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MUNICIPALITY OF MISSISSIPPI MILLS
HANNAN HILLS SUBDIVISION

EXISTING CONDITIONS PLAN

SCALE 1 : 1000

DATE JUN 2024 | JOB 118201 | FIGURE 2

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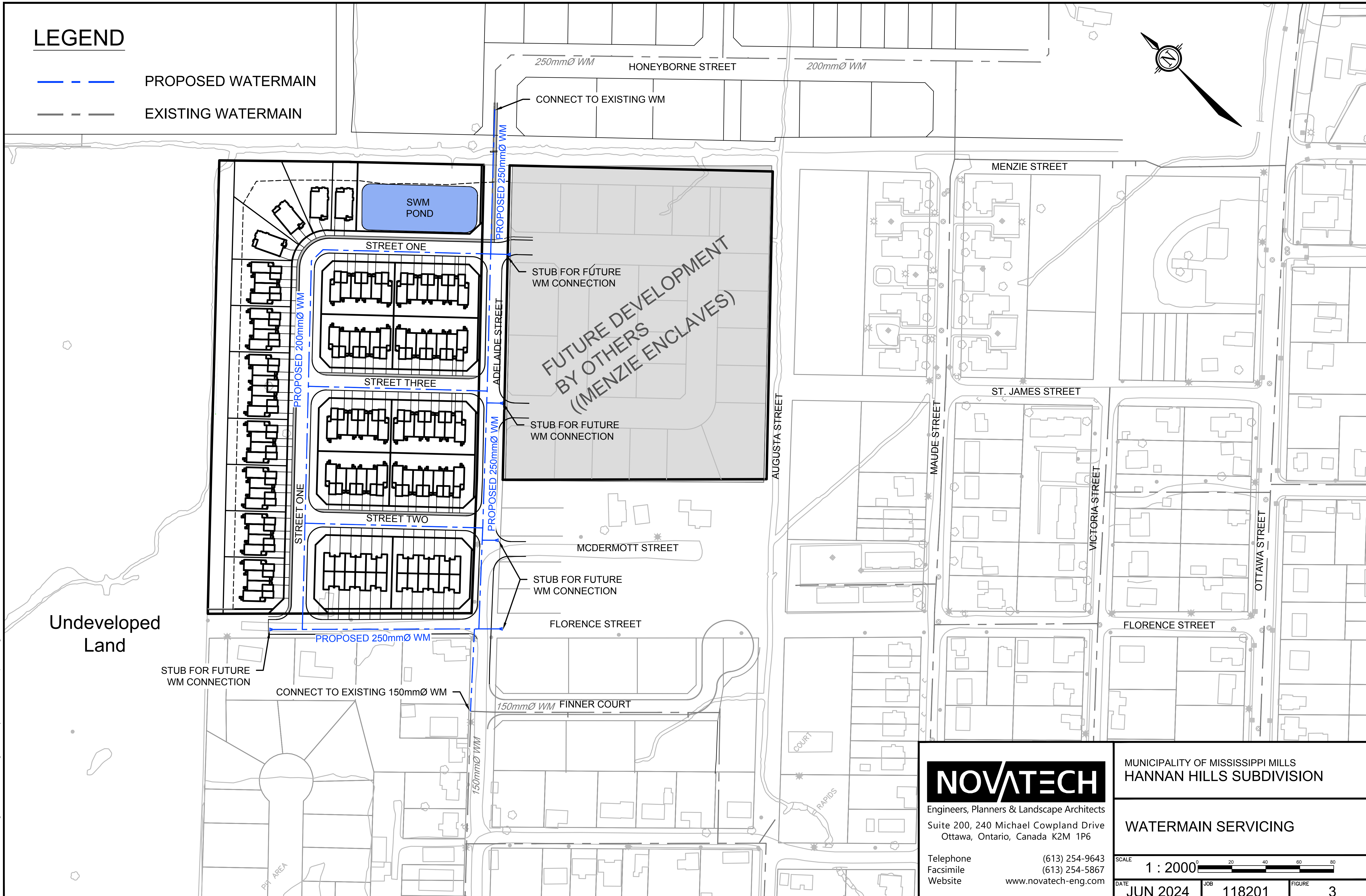

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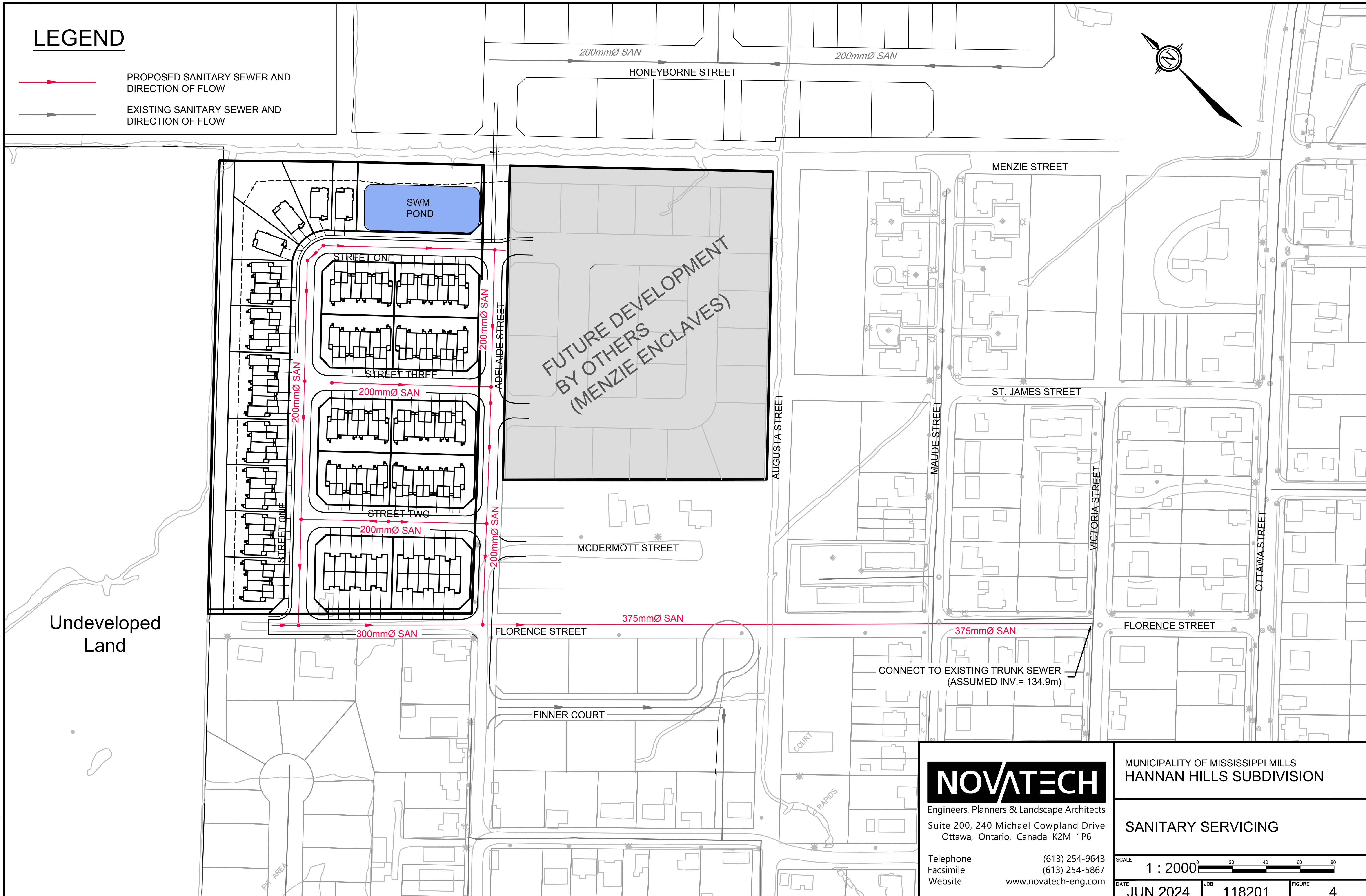

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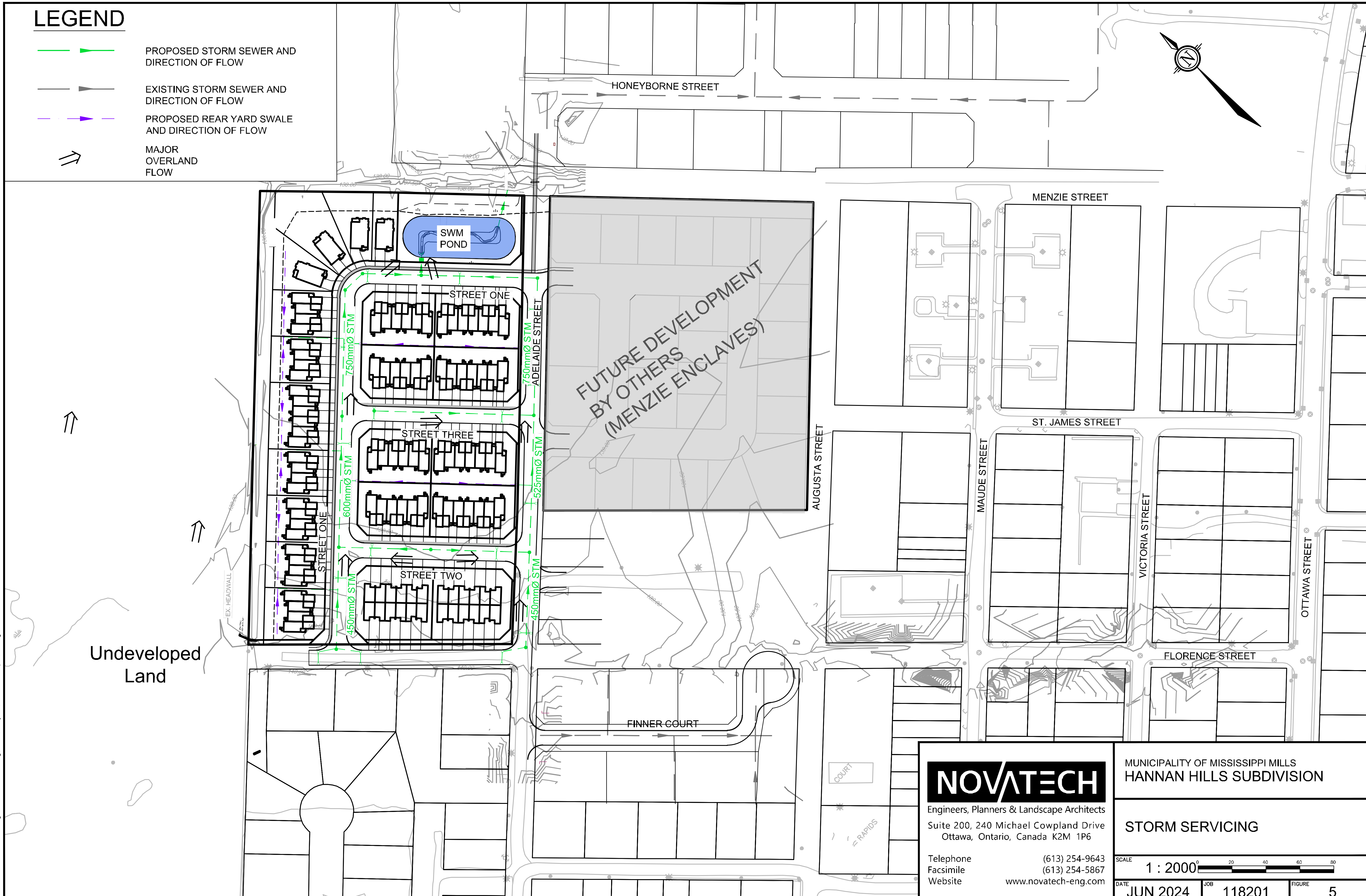

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MUNICIPALITY OF MISSISSIPPI MILLS
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STORM SERVICING

SCALE 1 : 2000

DATE JUN 2024 | JOB 118201 | FIGURE 5

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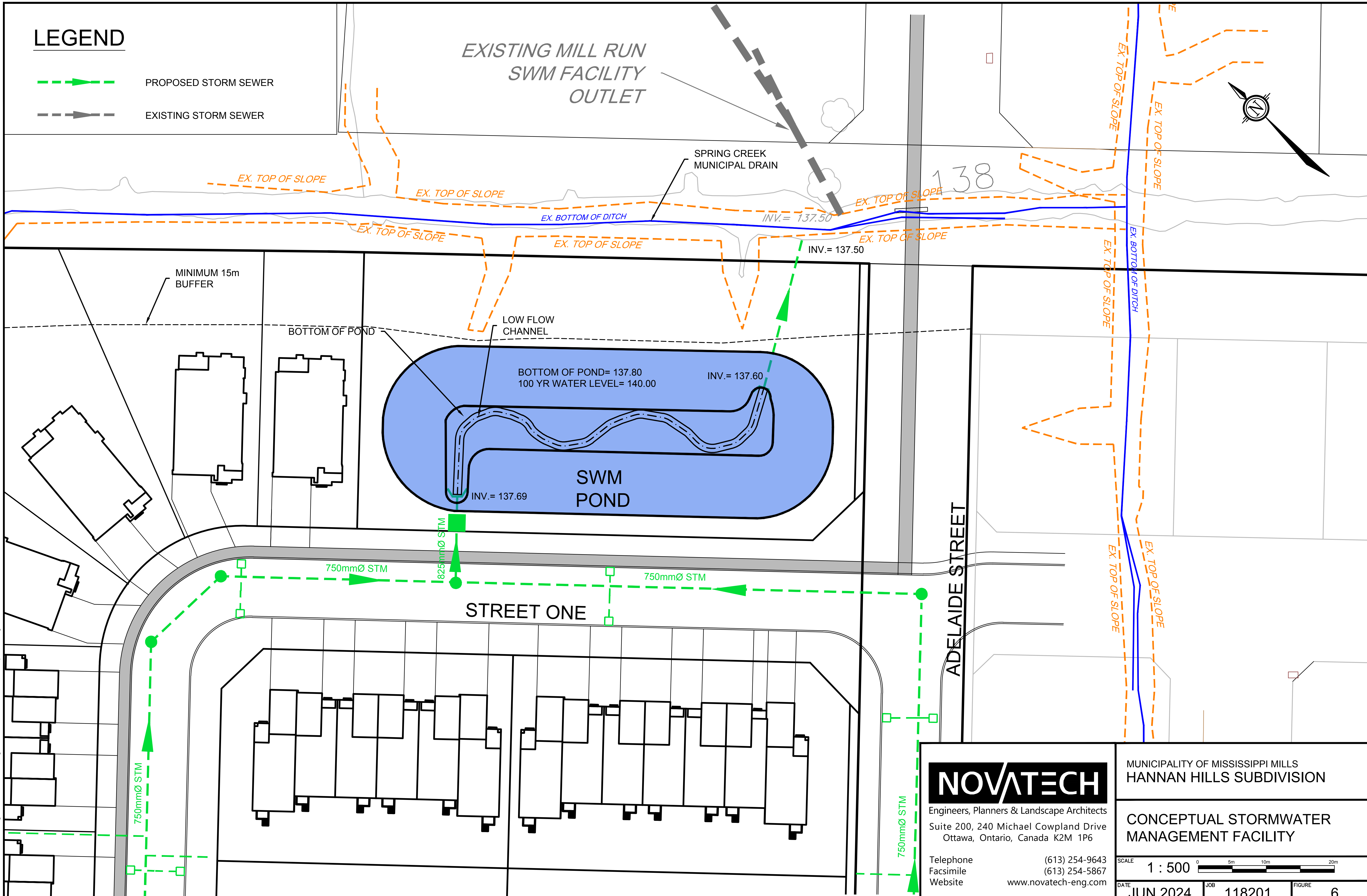

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Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

MUNICIPALITY OF MISSISSIPPI MILLS
HANNAN HILLS SUBDIVISION

CONCEPTUAL STORMWATER MANAGEMENT FACILITY

SCALE 1 : 500

DATE JUN 2024 | JOB 118201 | FIGURE 6

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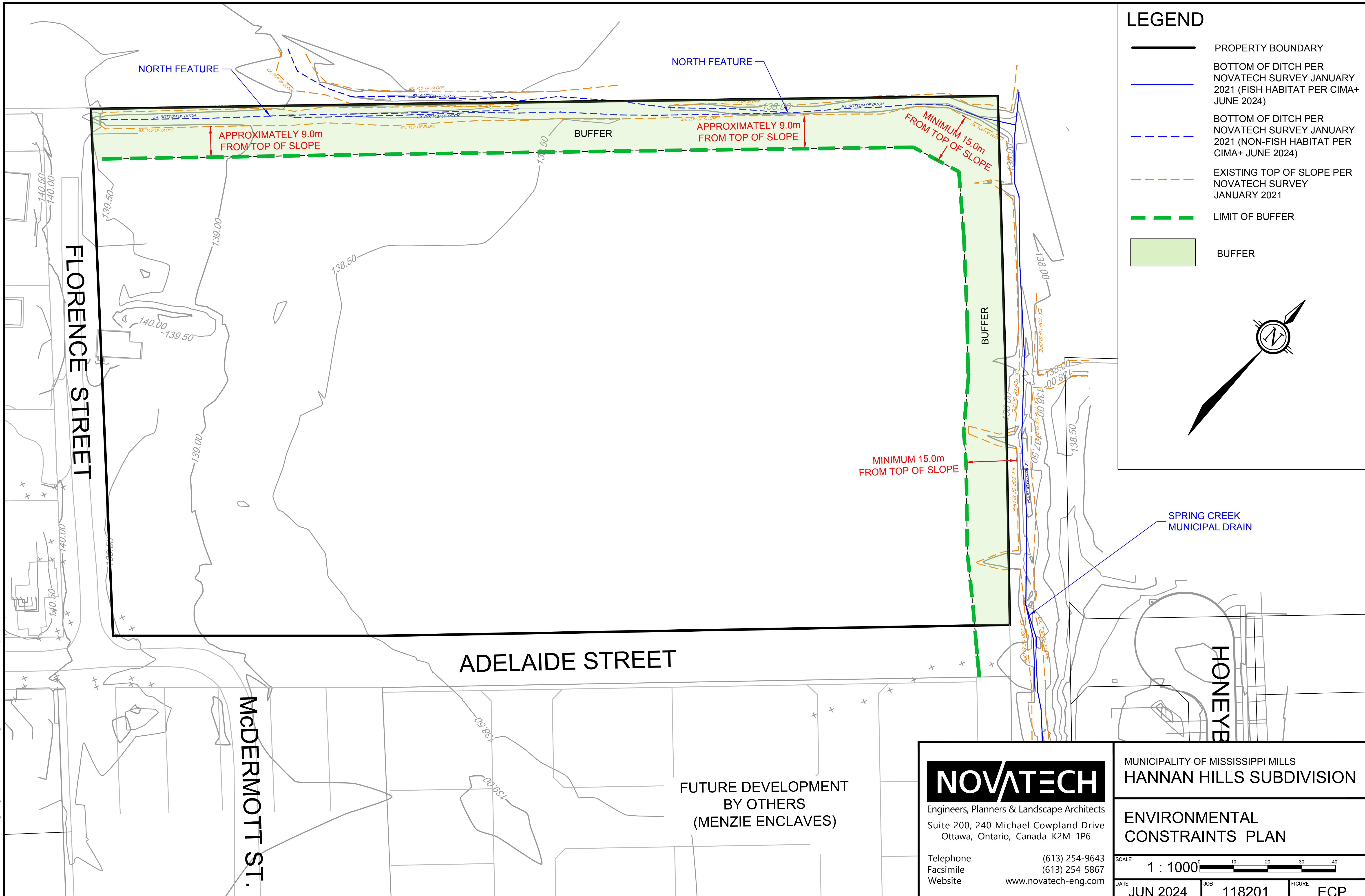

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MUNICIPALITY OF MISSISSIPPI MILLS

HANNAN HILLS SUBDIVISION

ENVIRONMENTAL CONSTRAINTS PLAN

SCALE 1 : 1000

DATE JUN 2024 | JOB 118201 | FIGURE ECP

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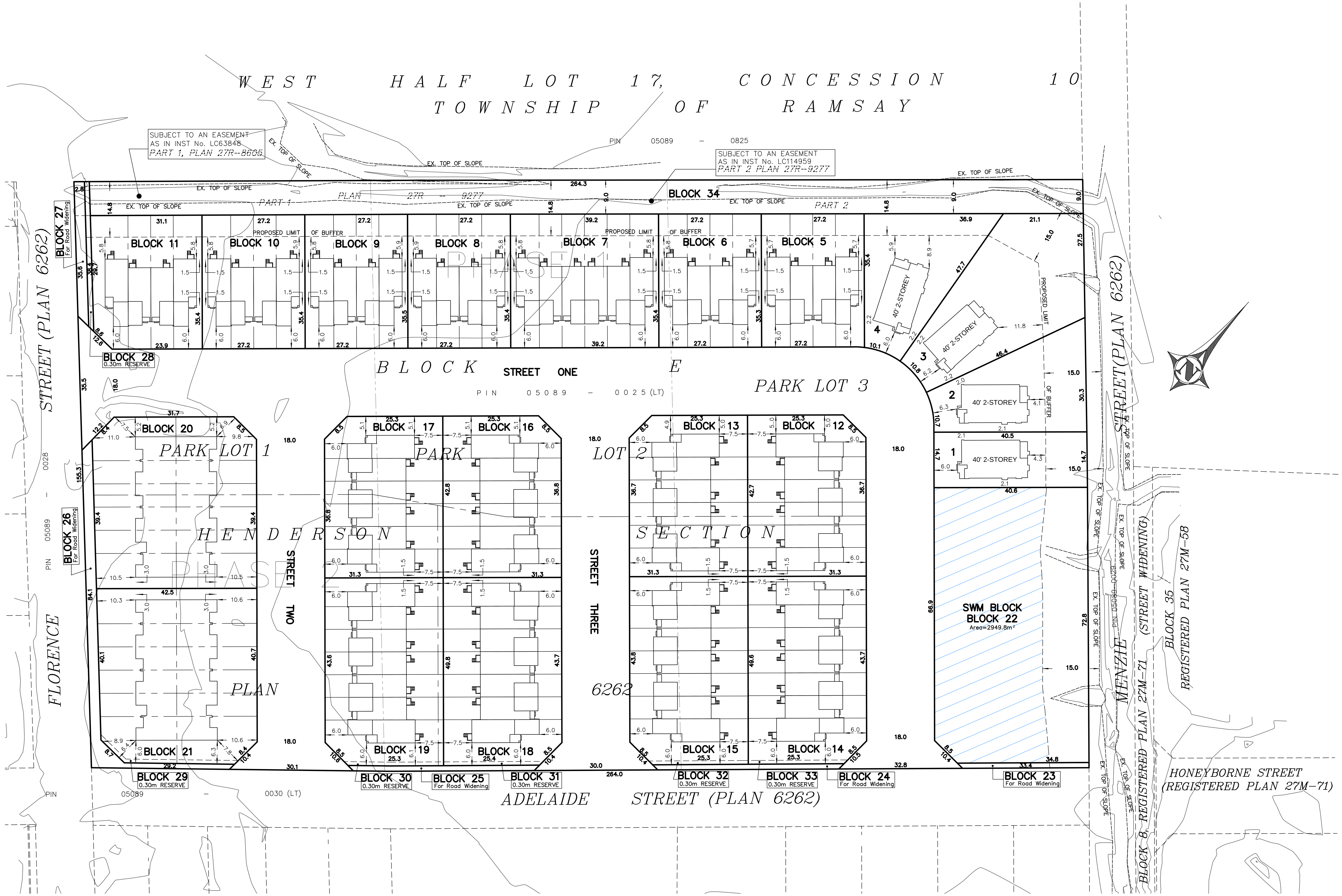


SKETCH TO ILLUSTRATE A
SUBDIVISION CONCEPT PLAN OF ALL OF

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

McINTOSH PERRY SURVEYING INC

SCALE 1 : 500
0 10 20 30 40 50 Metres

METRIC :

DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

Hannan Hills – Concept Plan Information

	PHASE 1	PHASE 2	TOTAL
UNITS	60	50	110
TOTAL AREA (Ha)	2.97	1.17	4.14
TOTAL RESIDENTIAL AREA (Ha)	1.66	0.95	2.61
NET DENSITY	36.14	52.63	42.14
GROSS DENSITY	20.20	42.73	26.57

SETBACKS:

FRONT YARD = 6m
REAR YARD = 7.5m
INTERIOR SIDEYARD = 1.2m
EXTERIOR SIDEYARD = 4.5m

JOB No. 24–2594	DRAWING: 24–2594 Concept Plan_V14
THIS PLAN WAS PREPARED FOR: THOMAS CAVANAGH CONSTRUCTION LTD.	

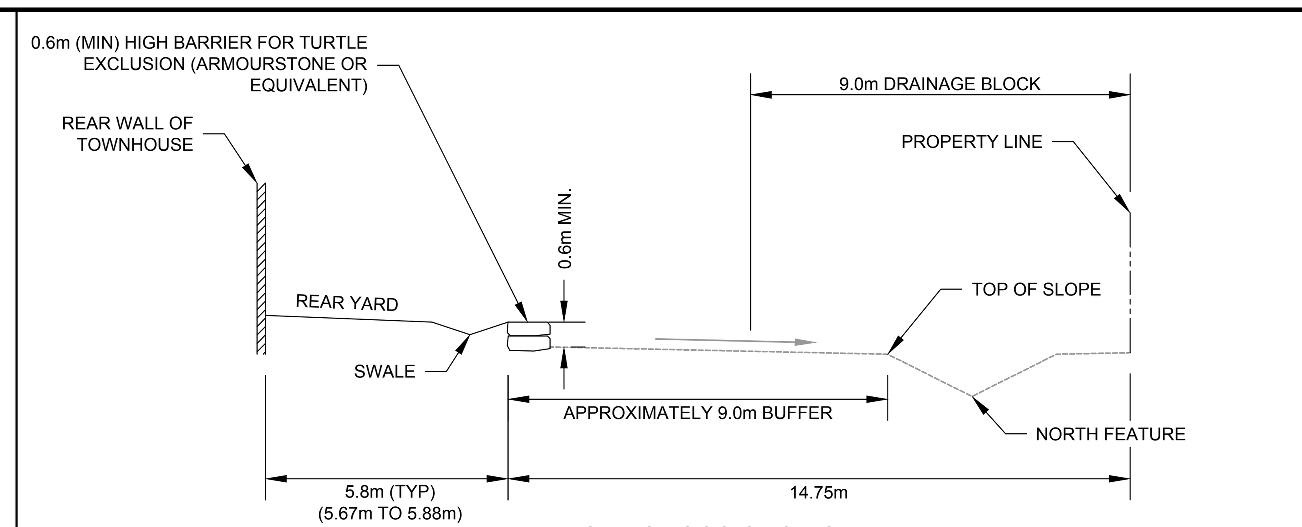
egis SURVEYING INC.
info.north-america@egis-group.com
www.egis-group.com

3240 Drummond Con. 5A, R.R. #7
Perth, ON K7H 3C9
Tel: 613-267-6524 Fax: 613-267-7992

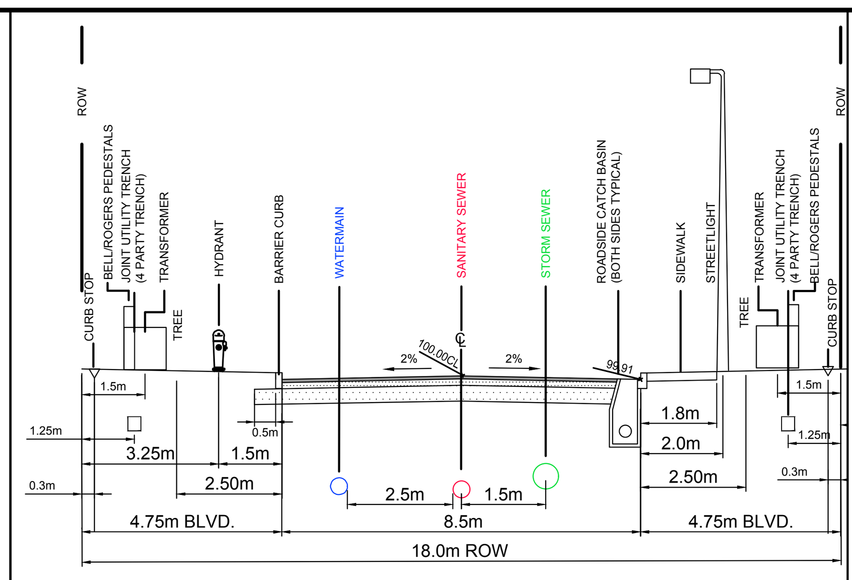
EXAMINED:	CAD: MP

LEGEND

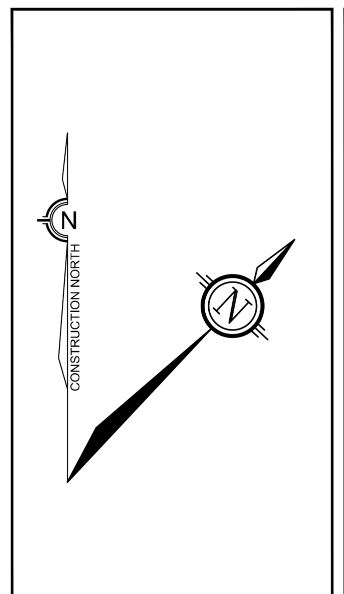
(solid black line)	PROPERTY BOUNDARY
450mmØ STM	PROPOSED STORM SEWER, DIAMETER AND DIRECTION OF FLOW
(green dot)	PROPOSED STORM MANHOLE
(green square)	PROPOSED ROADSIDE CATCHBASIN
200mmØ SAN	PROPOSED SANITARY SEWER, DIAMETER AND DIRECTION OF FLOW
(red dot)	PROPOSED SANITARY MANHOLE
200mmØ WM	PROPOSED WATERMAIN AND DIAMETER
(valve symbol)	PROPOSED VALVE AND VALVE BOX
(purple dashed arrow)	PROPOSED REAR YARD SWALE AND DIRECTION OF FLOW
(purple square)	PROPOSED REAR YARD CATCHBASIN
(grey dashed line)	EXISTING WATERMAIN
140.25	PROPOSED CENTRELINE OF ROAD ELEVATION
TF = 140.50	TOP OF FOUNDATION ELEVATION
140.59	TERRACE ELEVATION
TP18-B 138.54 [138.22]	TESTPIT NUMBER GROUND ELEVATION [BEDROCK ELEVATION]
(grey band)	1.8m MONOLITHIC CONCRETE CURB AND SIDEWALK
(brown line)	TURTLE EXCLUSION BARRIER (SEE TYPICAL DETAIL)
139.53 TW 138.93 BW	PROPOSED TOP OF WALL ELEVATION / PROPOSED BOTTOM OF WALL ELEVATION
139.53 / 138.93	PROPOSED ELEVATION / EXISTING ELEVATION



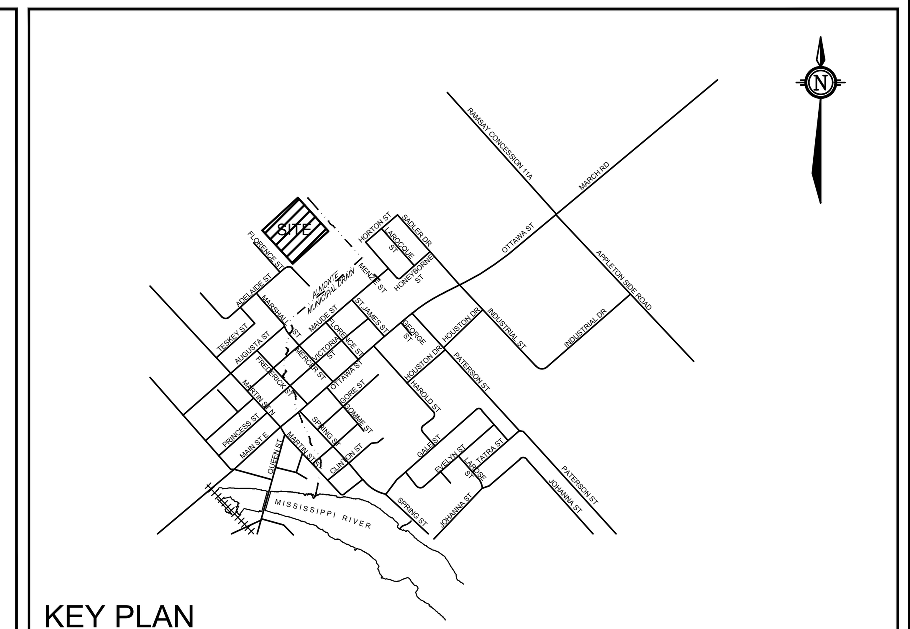
TYPICAL CROSS SECTION
TURTLE EXCLUSION BARRIER
1:150



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



NORTH



KEY PLAN
N.T.S.

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

SOURCE REFERENCE:
Hannan Hills Concept Plan: *24-2594 Concept Plan_V14*
EGIS Surveying Inc.
Legal Plan: *24-2594 Draft Plan of Subdivision_V3*
EGIS Surveying Inc.
Menzie Enclaves Concept Plan: *Menzie Enclaves Subdivision - Draft Plan of Subdivision Option 3, Advance Engineering Ltd.*
Topographic Survey: *Topographic Information by Novatech (2021)*

No.	REVISION	DATE	BY
3.	ISSUED WITH SERVICEABILITY AND CSWM REPORT	JUN 12/24	ARM
2.	ISSUED WITH DEVELOPMENT COST ESTIMATE	MAR 12/24	MNP
1.	ISSUED WITH SERVICEABILITY AND CSWM REPORT	MAY 20/21	ARM

SCALE	1:500
DESIGN	MNP
CHECKED	AAR
DRAWN	MNP
CHECKED	AAR
APPROVED	ARM

1:500
0 5 10 15 20

FOR REVIEW ONLY

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
MUNICIPALITY OF MISSISSIPPI MILLS
HANNAN HILLS SUBDIVISION

DRAWING NAME
PRELIMINARY GRADING AND SERVICING PLAN

PROJECT No. 118201-00
REV: REV # 3
DRAWING No. 118201-PGS

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APPENDIX A

Correspondence

- Pre-consultation Meeting Notes - January 27, 2021

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

- Mississippi Mills FUS Simple Method Email – March 28, 2024
- Water Demand Calculations – June 2024
- Excerpt from FUS – Water Supply for Public Fire Protection - 2020

Aden Rongve

From: Julie Stewart <JStewart@thomascavanagh.ca>
Sent: Thursday, March 28, 2024 8:58 AM
To: Susan Gordon
Cc: Erin O'Connor; Steve Pentz; Alex McAuley; Aden Rongve; Mitch Parker; Pierre Dufresne; Ben Houle; Marko Cekic

Subject: RE: Back to Back Towns
Attachments: System Capacity Check Form Fillable.pdf

Hi Susan – I reached out to Mississippi Mills in regards to the requirement for FUS. The Municipality does require that FUS is met for new developments. Please see the response below from Luke Harrington. Luke has also provided a System Capacity Check Form – I assume that you have seen this form for this project or similar developments ?

Please confirm what separation distance is required based on the available fire flow as noted by Luke. Once you provide this confirmation, I will have egis look at the layout on the conceptual plan and work on meeting the required separation distance. Please advise if you can have this provided to me by Tuesday of next week.

"Hello Julie,

In Almonte there is no direct separation distance requirements for homes. We let the developers engineer determine what separation distance is required based on the available fire flow to the project site. That being said, we do require that developments design their neighbourhoods using the FUS simplified method. I see your email regarding the 3m separation. Like I said, I will leave it up to your engineers to show that it is compliant with the available fire flow.

With regards to the servicing capacity check form. See attached. This form needs to be filled out and returned to the Municipality so that we can determine what water supply and sewer capacity is available for your development. I assume that your intention is to run a capacity check for the Hannan Hills development? If this is the case, please have your engineers provide the theoretical servicing layout for the site such as the future Florence street water main and connections to Adelaide and Honeyborne. If you or your colleagues have any questions, please reach out to me."

Best Regards,

Luke Harrington B.Eng.
Engineering Coordinator
613-256-2064 ext. 408

Thank you,
Julie

Julie Stewart, MCIP, RPP
Project Manager, Planning
Cavanagh Developments
613-257-2918 Ext. 1382 | 613-812-8214
JStewart@thomascavanagh.ca

From: Susan Gordon <s.gordon@novatech-eng.com>
Sent: Friday, March 22, 2024 10:09 AM
To: Julie Stewart <JStewart@thomascavanagh.ca>
Cc: Erin O'Connor <EOConnor@thomascavanagh.ca>; Steve Pentz <s.pentz@novatech-eng.com>; Alex McAuley <a.mcauley@novatech-eng.com>; Aden Rongve <a.rongve@novatech-eng.com>; Mitch Parker <m.parker@novatech-eng.com>
Subject: RE: Back to Back Towns

Hi Julie,

Thank you for the house plans for the back to back townhouses.

In addition, we need to confirm the following for the Draft Plan application engineering, i.e. for our conceptual stormwater management analysis and to establish a preliminary pond size/land area required. This is time critical, so let us know if you would like to discuss so we can finalize our engineering.

- Building separation: We recommend 3.0m separation between buildings otherwise fire walls are required between every few units. With a 3.0m separation our analysis is showing that fire walls are not required (subject to Town's review).
- We are assuming double driveways for the single family homes, single driveways for townhouses and back to back townhouses.
- We are using the setbacks noted on the McIntosh Perry Concept Plan (v10, attached) to estimate the impervious area to calculate the runoff to the storm water management pond.

Susan Gordon, P.Eng., MBA, Director | Land Development
NOVATECH
Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 269 | Cell: 613.265.5415

From: Julie Stewart <JStewart@thomascavanagh.ca>
Sent: Thursday, March 21, 2024 3:03 PM
To: Susan Gordon <s.gordon@novatech-eng.com>; Steve Pentz <s.pentz@novatech-eng.com>
Subject: FW: Back to Back Towns

Hi Susan - I was speaking with Steve this am, and he mentioned the engineers needed more details on driveway and garage locations. Please see the attached set of plans for back-to-back in Shea Village as an example of the Patten product.

You had a few other questions, can you send me an e-mail and I can either respond via e-mail or call you tomorrow. I am in an on-line training session tomorrow, but I may have an opportunity to make a call.

Thanks
Julie

Julie Stewart, MCIP, RPP
Project Manager, Planning
Cavanagh Developments
613-257-2918 Ext. 1382 | 613-812-8214
JStewart@thomascavanagh.ca

From: Alyssa Stack <AStack@pattenhomes.com>
Sent: Thursday, March 21, 2024 2:57 PM
To: Julie Stewart <JStewart@thomascavanagh.ca>
Subject: Back to Back Towns

Hey Julie,

This is a set of plans from BLK 162 in Shea. It has the site plan included and should give them all info they need.

Alyssa Stack
General Manager
613-831-5674 Ext. 106
AStack@pattenhomes.com

Water Demand Design Sheet

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #:	118201	**Legend:**	Input by User	No Input Required
Project Name:	Hannan Hills Subdivision		Calculated Cells →	
Date:	June 2024	**Reference:**	Ottawa Design Guidelines - Water Distribution (2010 and TBs)	
Input By:	A. Rongve		MOE Design Guidelines for Drinking-Water Systems (2008)	
Reviewed By:	A. McAuley		Fire Underwriter's Survey Guideline (2020)	
Drawing Reference:	Figure 3		Ontario Building Code, Part 3 (2012)	
			JL Richards Master Plan Update Report (February 2018)	

Small System = NO

	# of Dwellings	Area (ha.)	Pop. Equiv.	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)
Residential Input						
Singles	4		13.60	0.04	0.11	0.24
Townhomes	106		286.20	0.93	2.32	5.10
Totals	**110**	**0.00**	**299.80**	**0.97**	**2.43**	**5.34**

Summary

i. Type of Development and Units:	106 Townhomes and 4 Single Family Homes		
ii. Proposed Water Service Connection Location(s):	Refer to Watermain Servicing Figure 3 in the Serviceability and Conceptual Stormwater Management Report.		
iii. Average Day Flow Demand:		1.0	L/s
iv. Peak Hour Flow Demand:		5.3	L/s
v. Maximum Day Flow Demand:		2.4	L/s
vi. Required Fire Flow #1 (Single Family Homes):		67	L/min
vii. Required Fire Flow #2 (Townhouse Buildings):		133	L/min

Design Parameters

Residential					
Unit Type Population Equiv.	**Singles**	**Semis/ Towns**	**Apts (2-BR)**	**Apts (1-BR)**	**Apts (Avg)**
	3.4	2.7	2.1	1.4	1.8
Dailly Demand	L/per person/day				
Average Demand	280				

Residential Peaking Factors	**Pop.**	**Max Day (x Avg Day)**	**Peak Hour (x Avg Day)**
Small System (If Applicable)	0	9.50	14.30
	30	9.50	14.30
	150	4.90	7.40
Modified	300	3.60	*5.50*
	450	3.00	*5.50*
	500	2.90	*5.50*
Large System (Default)	> 500	2.50	5.50

EXCERPT FROM FIRE UNDERWRITER'S SURVEY - WATER SUPPLY FOR PUBLIC FIRE PROTECTION (2020)

Additional Items of Note

i. The required fire flow calculation guide is not expected to provide an adequate required fire flow for complex and unusual risks such as lumber yards, petroleum storage, refineries, grain elevators, and large chemical plants, but may indicate a minimum value for these hazards. Applicable industry standards and guidelines should be consulted when reviewing fire flows and emergency response needs for complex and high consequence risks.

ii. Judgment must be used for business, industrial, and other occupancies not specifically mentioned.

iii. Consideration should be given to the configuration of the building(s) being considered and accessibility by the fire department with respect to applying hose streams.

iv. Consideration should be given to carefully reviewing closely spaced, wood frame construction and the potential for fire spread beyond the building of origin. There are many risk factors that may contribute to the risk of these types of fires, one of which is spacing of structures. If the designer or the Authority Having Jurisdiction determines there to be a high potential for fire spread between closely spaced combustible buildings, the designer should consider the maximum probable fire size involvement when determining the Total Effective Area of the design fire.

v. Where wood shingle or shake roofs contribute to risk of fire spread in the subject building, an additional charge of 2,000 L/min to 4,000 L/min should be added to the required fire flow in accordance with the extent and condition of the risk.

vi. For one and two-family dwellings not exceeding two storeys in height and having Total Effective Area of not more than 450 m^2, the following short method may be used in determining a required fire flow:

Table 7 Simple Method for One and Two Family Dwellings Up To 450 sq.m

Exposure distances	Suggested Required Fire Flow (LPM) [4,5,6]	
	Wood Frame	Masonry or Brick
Less than 3m	8,000	6,000
3 to 10m	4,000	4,000
10.1 to 30m	3,000	3,000
Over 30m	2,000	2,000

[4] For sprinkler protected risks, 50% of the value from this table may be used, to a minimum required fire flow of 2,000 LPM

[5] If all exposures within 30m of subject building are sprinkler protected, a minimum required fire flow of 2,000 LPM may be used

[6] If all exposing building faces within 10m have protected openings (or blank walls) and a minimum 1 hr FRR, the required fire flow may be reduced by 2,000 LPM to a minimum of 2,000 LPM.

vii. For one and two-family dwellings not exceeding two storeys but having a Total Effective Area of more than 450 m^2, and for row housing, the following short method may be used in determining a required fire flow:

Table 8 Simple Method for One and Two Family Dwellings Exceeding 450 sq.m, and Row Housing Exposure distances

Exposure distances	Suggested Required Fire Flow [4,5,6]	
	Wood Frame	Masonry or Brick
Less than 3m	12,000	9,000
3 to 10m	8,000	8,000
10.1 to 30m	6,000	6,000
Over 30m	4,000	4,000

Note that for larger and more complex developments, a full calculation of required fire flows is recommended.

viii. Special hazards

a. In areas where there is a significant hazard of wildfires and a significant level of exposure to fuels, further investigation into adequate water supplies for public fire protection should be made and may consider alternative fire suppression strategies including, but not limited to, exterior exposure protection fire sprinkler systems, structure protection units and other methods of protection of the built environment from wildland fires in the interface areas. For further information see the National Research Council publication National Guide for Wildland-Urban Interface Fires.
b. In areas where there is a significant hazard of seismic events, consideration should be given to the need for redundancy in water supplies both for manual fire fighting and for building sprinkler systems, particularly in areas where there is a significant life safety hazard.

APPENDIX C

Sanitary Sewer Design

- Hannan Hills Subdivision Sanitary Flows – June 2024
- Conceptual Sanitary Drainage Area Plan (118201-CSAN) – June 2024
- Sanitary Sewer Design Sheet – June 2024

SANITARY FLOWS FROM PROPOSED DEVELOPMENT

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 118201
Project Name: Hannan Hills Subdivision
Date: June 2024
Input By: A.Rongve
Reviewed By: A.McAuley
Drawing Reference: 118201-CSAN

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

Reference: City of Ottawa - Sewer Design Guidelines (2012 and TBs)
MOE - Design Guidelines for Sewage Works (2008)
JL Richards Master Plan Update Report (February 2018)

Location			Demand											
			Residential Flow									Extraneous Flow Area Method		Total Design Flow
Area ID	From MH	To MH	Singles	Semis / Towns	Population (in 1000's)	Cumulative Population (in 1000's)	Average Pop. Flow Q(q) (L/s)	Design Peaking Factor M	Peak Design Pop. Flow Q(p) (L/s)	Res. Drainage Area (ha.)	Cumulative Res. Drainage Area (ha.)	Cumulative Extraneous Drainage Area (ha.)	Design Extraneous Flow Q(e) (L/s)	Total Peak Design Flow Q(D) (L/s)
TOTAL HANNAN HILLS DEVELOPMENT			4	106	0.300	0.300	1.0	3.5	3.4	4.1	4.1	4.1	1.4	4.7

Demand Equation / Parameters

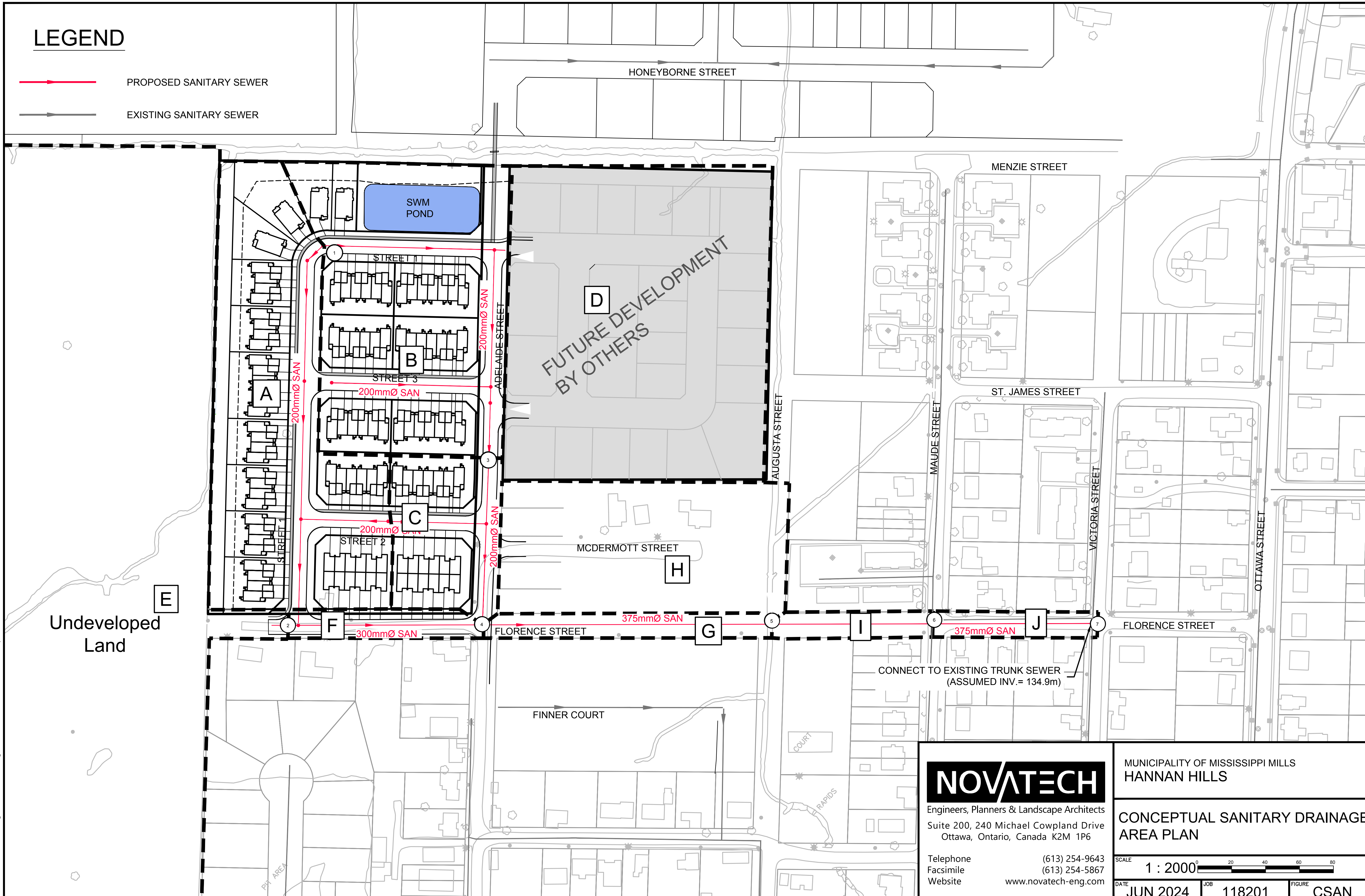
1. **Q(D) =** Q(p) + Q(ici) + Q(e)
2. **Q(p) =** (P x q x M x K / 86,400)
3. **q =** 280 L/per person/day (design)
4. **M = Harmon Formula (maximum of 4.0)**
5. **K =** 0.8 (design)
6. **Park flow is considered equivalent to a single unit / ha**
   Park Demand = 4 single unit equivalent / park ha (~ 3,600 L/ha/day)
7. **Q(ici) =** ICI Area x ICI Flow x ICI Peak
8. **Q(e) =** 0.33 L/s/ha (design)

Definitions

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

	Singles	Townhouses
P = Residential Population =	3.4	2.7

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



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SANITARY SEWER DESIGN SHEET

Novatech Project #: 118201
Project Name: Hannan Hills Subdivision
Date: June 2024
Input By: A.Rongve
Reviewed By: A.McAuley
Drawing Reference: 118201-CSAN

Legend: Design Input by User; As-Built Input by User; Cumulative Cell; Calculated Design Cell Output

Reference: City of Ottawa - Sewer Design Guidelines (2012 and TBs)
MOE - Design Guidelines for Sewage Works (2008)
JL Richards Master Plan Update Report (February 2018)

Location			Demand												Design Capacity							
			Residential Flow									Extraneous Flow Area Method		Total Design Flow	Proposed Sewer Pipe Sizing / Design							
Area ID	From MH	To MH	Singles	Semis / Towns	Population (in 1000's)	Cumulative Population (in 1000's)	Average Pop. Flow Q(q) (L/s)	Design Peaking Factor M	Peak Design Pop. Flow Q(p) (L/s)	Res. Drainage Area (ha.)	Cumulative Res. Drainage Area (ha.)	Cumulative Extraneous Drainage Area (ha.)	Design Extraneous Flow Q(e) (L/s)	Total Peak Design Flow Q(D) (L/s)	Pipe Length (m)	Pipe Size (mm) and Material	Pipe ID Actual (m)	Roughness n	Design Grade So (%)	Capacity Qfull (L/s)	Full Flow Velocity (m/s)	Q(D) / Qfull
A	1	2	2	48	0.136	0.136	0.44	3.56	1.58	1.959	1.959	1.959	0.65	2.22	230	200 PVC	0.203	0.013	0.4	21.6	0.67	10.3%
E (FUTURE)	-	2		1049	2.832	2.832	9.18	2.97	27.27	40.100	40.100	40.100	13.23	40.50								
F	2	4				2.969	9.62	2.96	28.45	0.188	42.247	42.247	13.94	42.39	108	300 PVC	0.305	0.013	0.4	63.8	0.87	66.4%
B	1	3	2	39	0.112	0.112	0.36	3.58	1.30	1.951	1.951	1.951	0.64	1.95	225	200 PVC	0.203	0.013	0.4	21.6	0.67	9.0%
D (Menzie Enclaves)	-	3		56	0.151	0.151	0.49	3.55	1.74	2.879	2.879	2.879	0.95	2.69								
C	3	4		19	0.051	0.315	1.02	3.46	3.52	0.593	5.423	5.423	1.79	5.31	100	200 PVC	0.203	0.013	0.4	21.6	0.67	24.6%
G	4	5			0.000	3.283	10.64	2.93	31.14	0.240	47.910	47.910	15.81	46.96	170	375 PVC	0.381	0.013	0.3	103.5	0.91	45.4%
H (Future McDermott)	-	5	5	3	0.025	0.025	0.08	3.69	0.30	1.320	1.320	1.320	0.44	0.74								
I	5	6			0.000	3.308	10.72	2.92	31.36	0.144	49.374	49.374	16.29	47.65		375 PVC	0.381	0.013	0.3	103.5	0.91	46.1%
J	6	7			0.000	3.308	10.72	2.92	31.36	0.145	49.519	49.519	16.34	47.70		375 PVC	0.381	0.013	0.3	103.5	0.91	46.1%
			9	**1214**	**3.308**	**3.308**	**10.72**	**2.92**	**31.36**	**49.519**	**49.519**	**49.519**	**16.34**	**47.70**	**833.0**							

Demand Equation / Parameters

1. **Q(D) =** Q(p) + Q(ici) + Q(e)
2. **Q(p) =** (P x q x M x K / 86,400)
3. **q =** 280 L/per person/day (design)
4. **M = Harmon Formula (maximum of 4.0)**
5. **K =** 0.8 (design)
6. **Park flow is considered equivalent to a single unit / ha**
   Park Demand = 4 single unit equivalent / park ha (~ 3,600 L/ha/day)
7. **Q(ici) =** ICI Area x ICI Flow x ICI Peak
8. **Q(e) =** 0.33 L/s/ha (design)

Definitions

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

	Singles	Semi's/Townhouses
P = Residential Population =	3.4	2.7

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

Capacity Equation

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

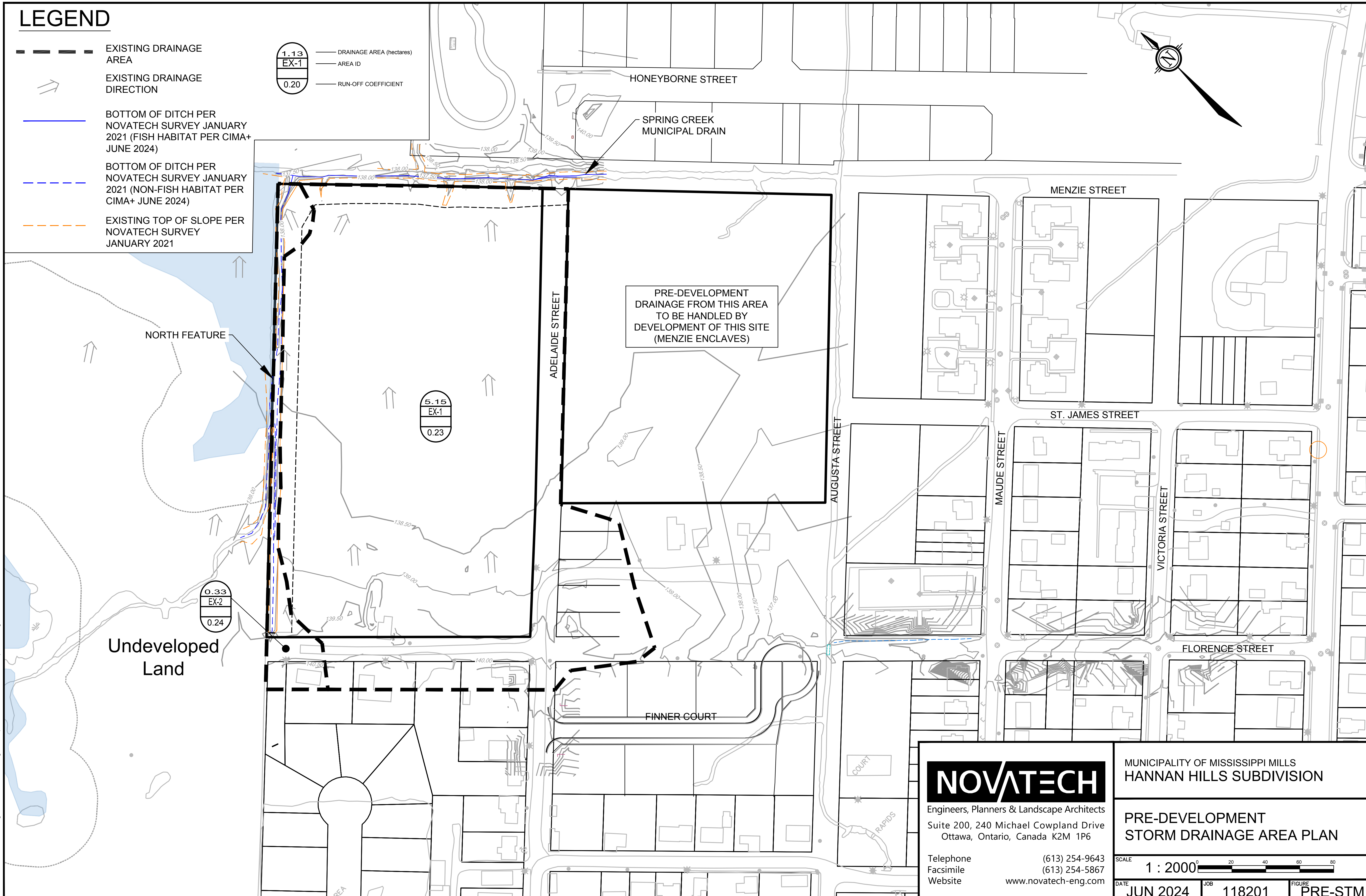
Definitions

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

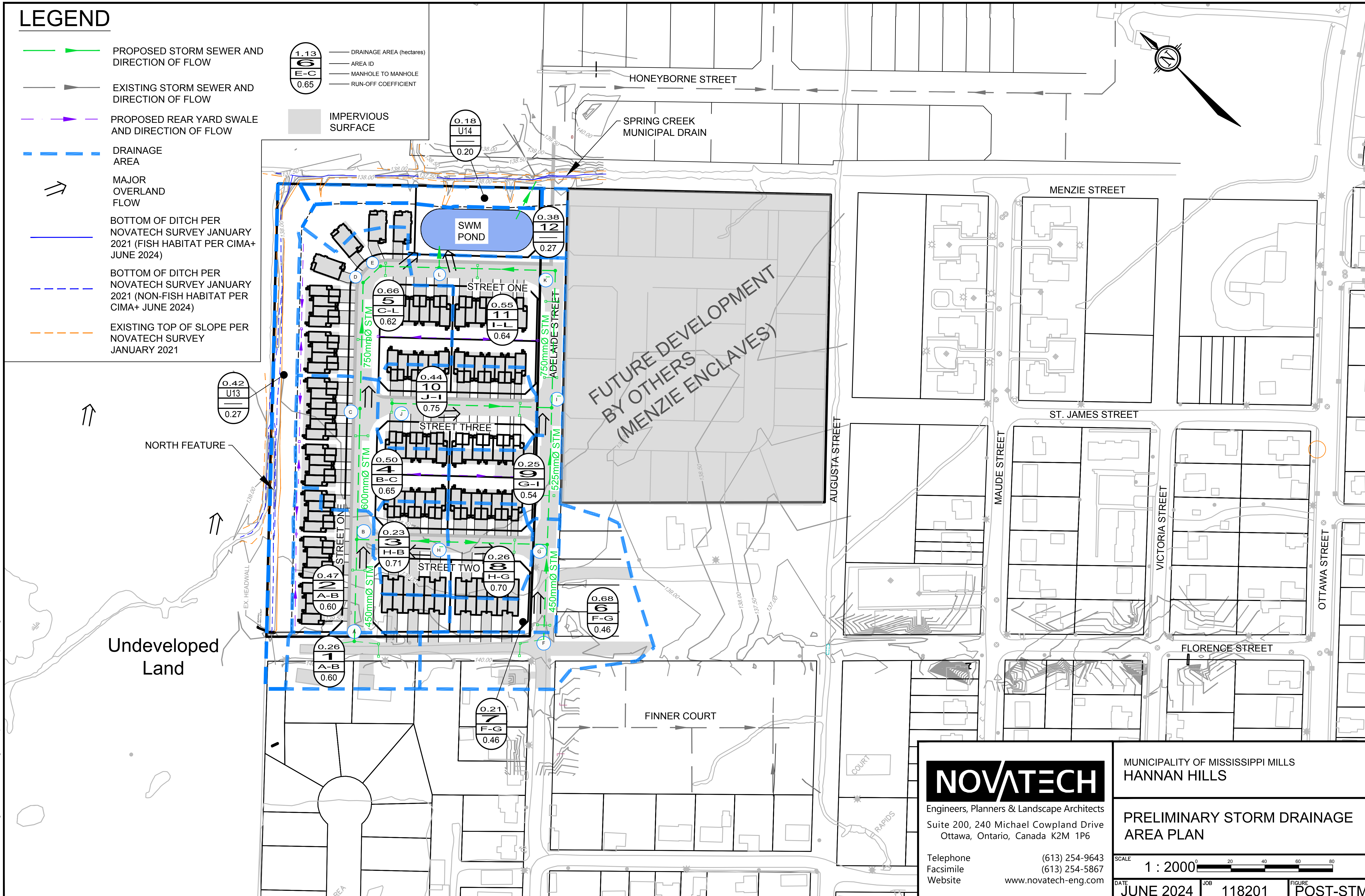
APPENDIX D

Storm Sewer Design

- Pre-Development Storm Drainage Area Plan (118201-PRE-STM) – June 2024
- Preliminary Storm Drainage Area Plan (118201-POST-STM) – June 2024
- 5-Year Storm Sewer Design Sheet – June 2024



M:\2018\118201\CAD\Design\118201-STM.dwg, STM pre, Jun 12, 2024 - 1:33pm, arongve


LEGEND
PROPOSED STORM SEWER AND DIRECTION OF FLOW
EXISTING STORM SEWER AND DIRECTION OF FLOW
PROPOSED REAR YARD SWALE AND DIRECTION OF FLOW
DRAINAGE AREA
MAJOR OVERLAND FLOW
BOTTOM OF DITCH PER NOVATECH SURVEY JANUARY 2021 (FISH HABITAT PER CIMA+ JUNE 2024)
BOTTOM OF DITCH PER NOVATECH SURVEY JANUARY 2021 (NON-FISH HABITAT PER CIMA+ JUNE 2024)
EXISTING TOP OF SLOPE PER NOVATECH SURVEY JANUARY 2021
1.13 6 E-C 0.65
DRAINAGE AREA (hectares)
AREA ID
MANHOLE TO MANHOLE
RUN-OFF COEFFICIENT
IMPERVIOUS SURFACE
HONEYBORNE STREET
SPRING CREEK MUNICIPAL DRAIN
MENZIE STREET
ST. JAMES STREET
AUGUSTA STREET
MAUDE STREET
VICTORIA STREET
OTTAWA STREET
FLORENCE STREET
FINNER COURT
SWM POND
STREET ONE
STREET TWO
STREET THREE
ADELAIDE STREET
FUTURE DEVELOPMENT BY OTHERS (MENZIE ENCLAVES)
NORTH FEATURE
EX. HEADWALL
Undeveloped Land
750mmØ STM
600mmØ STM
450mmØ STM
525mmØ STM
0.18 U14 0.20
0.38 12 0.27
0.66 5 C-L 0.62
0.55 11 I-L 0.64
0.44 10 J-I 0.75
0.42 U13 0.27
0.50 4 B-C 0.65
0.25 9 G-I 0.54
0.23 3 H-B 0.71
0.26 8 H-G 0.70
0.47 2 A-B 0.60
0.68 6 F-G 0.46
0.26 1 A-B 0.60
0.21 7 F-G 0.46
NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com
MUNICIPALITY OF MISSISSIPPI MILLS
HANNAN HILLS
PRELIMINARY STORM DRAINAGE AREA PLAN
SCALE 1 : 2000
DATE JUNE 2024
JOB 118201
FIGURE POST-STM
M:\2018\118201\CAD\Design\118201-STM.dwg, STM post, Jun 12, 2024 - 1:36pm, arongve

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

NOVATECH
Engineers, Planners & Landscape Architects

DATE PREPARED: JUNE 12, 2024

5 Year Storm Sewer Design Sheet

DRAINAGE AREA	LOCATION		AREA (Ha)				FLOW					PROPOSED SEWER							
	FROM	TO	TOTAL AREA	R= 0.2	R= 0.9	C Value	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
1&2	A	B	0.73	0.31	0.42	0.60	1.21	1.21	10.00	104.19	126.59	450	0.4	60	180.50	1.13	0.88	53.90	0.70
3	H	B	0.23	0.06	0.17	0.71	0.45	0.45	10.00	104.19	47.39	450	0.4	53.0	180.50	1.13	0.78	133.11	0.26
4	B	C	0.50	0.18	0.32	0.65	0.90	2.57	10.78	100.25	257.31	600	0.4	77.0	388.73	1.37	0.93	131.42	0.66
5	C	L	0.66	0.26	0.40	0.62	1.14	3.70	11.71	95.94	355.19	750	0.4	120.0	704.81	1.59	1.25	349.62	0.50
6&7	F	G	0.89	0.56	0.33	0.46	1.14	1.14	10.00	104.19	118.90	450	0.4	56.0	180.50	1.13	0.82	61.60	0.66
8	H	G	0.26	0.08	0.18	0.70	0.50	0.50	10.00	104.19	52.37	450	0.4	59.0	180.50	1.13	0.87	128.13	0.29
9	G	I	0.25	0.13	0.12	0.54	0.37	2.01	10.82	100.04	201.31	525	0.4	81.0	272.27	1.26	1.07	70.96	0.74
10	J	I	0.44	0.10	0.35	0.75	0.92	0.92	10.00	104.19	95.62	450	0.4	94.0	180.50	1.13	1.38	84.88	0.53
11	I	L	0.55	0.20	0.35	0.64	0.98	3.91	11.90	95.13	371.59	750	0.3	152.0	610.38	1.38	1.84	238.79	0.61
	L	POND					0.00	7.61	13.73	87.89	668.66	825	0.3	15.0	787.01	1.47	0.17	118.35	0.85
			4.50																

Additional Drainage Areas

12	Pond	0.38	0.34	0.04	0.27
U13	Uncontrolled to Wetland	0.42	0.38	0.04	0.27
U14	Uncontrolled to Menzie drain	0.18	0.18	0.00	0.20

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)$^{0.814}$

APPENDIX E

Conceptual Stormwater Management Modeling

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 Concentration (min)	Time to Peak (min)	Time to Peak (min)
EX-1	5.15	100	140.5	138.5	2.0%	0.21	7.94	196	138.5	138.0	0.3%	0.32	10.21	18	12	12
EX-2	0.33	76	140.8	139.0	2.3%	0.24	5.28	-	-	-	-	-	-	5	4	10

Weighted Curve Number Calculations

Soil type 'B'

Area ID	Land Use 1	Area	CN	Land Use 2	Area	CN	Land Use 3	Area	CN	Weighted CN	
EX-1	Impervious	4%	98	Lawn	4%	61	Forest	91%	60	62	Silty sand/glacial till = soil type B
EX-2	Impervious	7%	98	Lawn	9%	61	Forest	84%	60	63	Silty sand/glacial till = soil type B

Weighted IA Calculations

Area ID	Land Use 1	Area	IA	Land Use 2	Area	IA	Land Use 3	Area	IA	Weighted IA
EX-1	Impervious	4%	0.4	Lawn	4%	12.2	Forest	91%	12.7	12.1
EX-2	Impervious	7%	0.4	Lawn	9%	12.2	Forest	84%	12.7	11.8

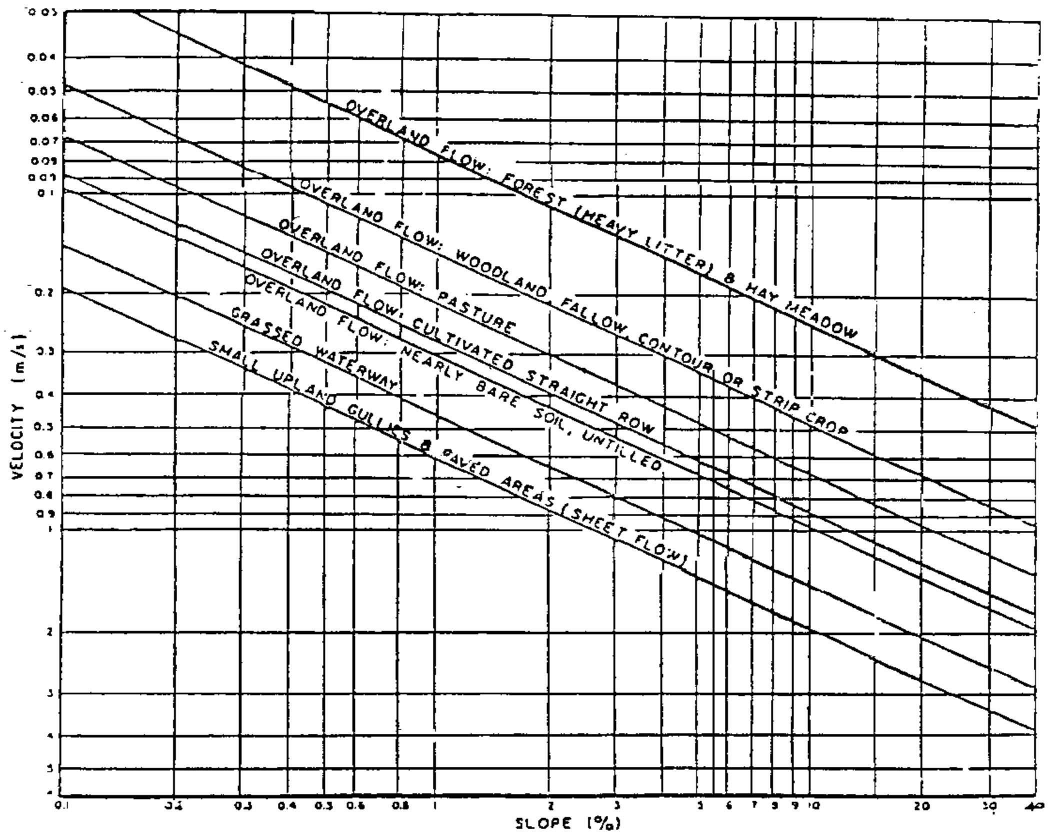


Figure A.5.2: Upland Method for Estimating Time of Concentration (SCS National Engineering Handbook, 1971)

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 (%)
01	0.26	0.60	57.1%	15%	33	79	2%
02	0.47	0.60	57.1%	65%	44	106	2%
03	0.23	0.71	72.9%	45%	30	78	2%
04	0.50	0.65	64.3%	60%	37	135	2%
05	0.66	0.62	60.0%	60%	39	170	2%
06	0.68	0.46	37.1%	5%	33	205	2%
07	0.21	0.46	37.1%	50%	18	115	2%
08	0.26	0.70	71.4%	45%	31	84	2%
09	0.25	0.54	48.6%	60%	58	43	2%
10	0.44	0.75	78.6%	40%	24	181	2%
11	0.55	0.64	62.9%	30%	55	101	2%
12	0.38	0.27	10.0%	80%	69	55	2%
U13	0.42	0.27	10.0%	0%	15	287	2%
U14	0.18	0.20	0.0%	0%	14	132	2%
TOTAL:	**5.49**						

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 Orifice Dia.[2] (m)	Modelled Orifice Dia.[3] (m)
2-year Inlet Capture Rate										
O-CB01	CB01	139.12	139.87	0.75	1 & 2	0.73	0.25	141.2	0.278	0.295
O-CB02	CB02	139.02	139.77	0.75	4	0.50	0.25	107.2	0.242	0.250
O-CB03	CB03	138.94	139.69	0.75	5	0.66	0.25	133.2	0.270	0.280
O-CB04	CB04	139.04	139.79	0.75	11	0.55	0.15	111.7	0.247	0.252
O-CB05	CB05	139.02	139.77	0.75	9	0.25	0.25	40.5	0.149	0.149
O-CB06	CB06	139.07	139.82	0.75	6&7	0.89	0.25	131.0	0.267	0.295
O-CB07	CB07	139.12	139.87	0.75	3	0.23	0.25	55.4	0.174	0.176
O-CB08	CB08	139.07	139.82	0.75	8	0.26	0.25	61.5	0.183	0.185
O-CB09	CB09	139.02	139.77	0.75	10	0.44	0.25	113.3	0.249	0.255
TOTAL						**4.51**	**-**	**895.0**	**-**	

[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 0.75m CB depth.
[3] Modelled orifice size to convey 5-year runoff due to shallow pipes causing backwater into orifices.

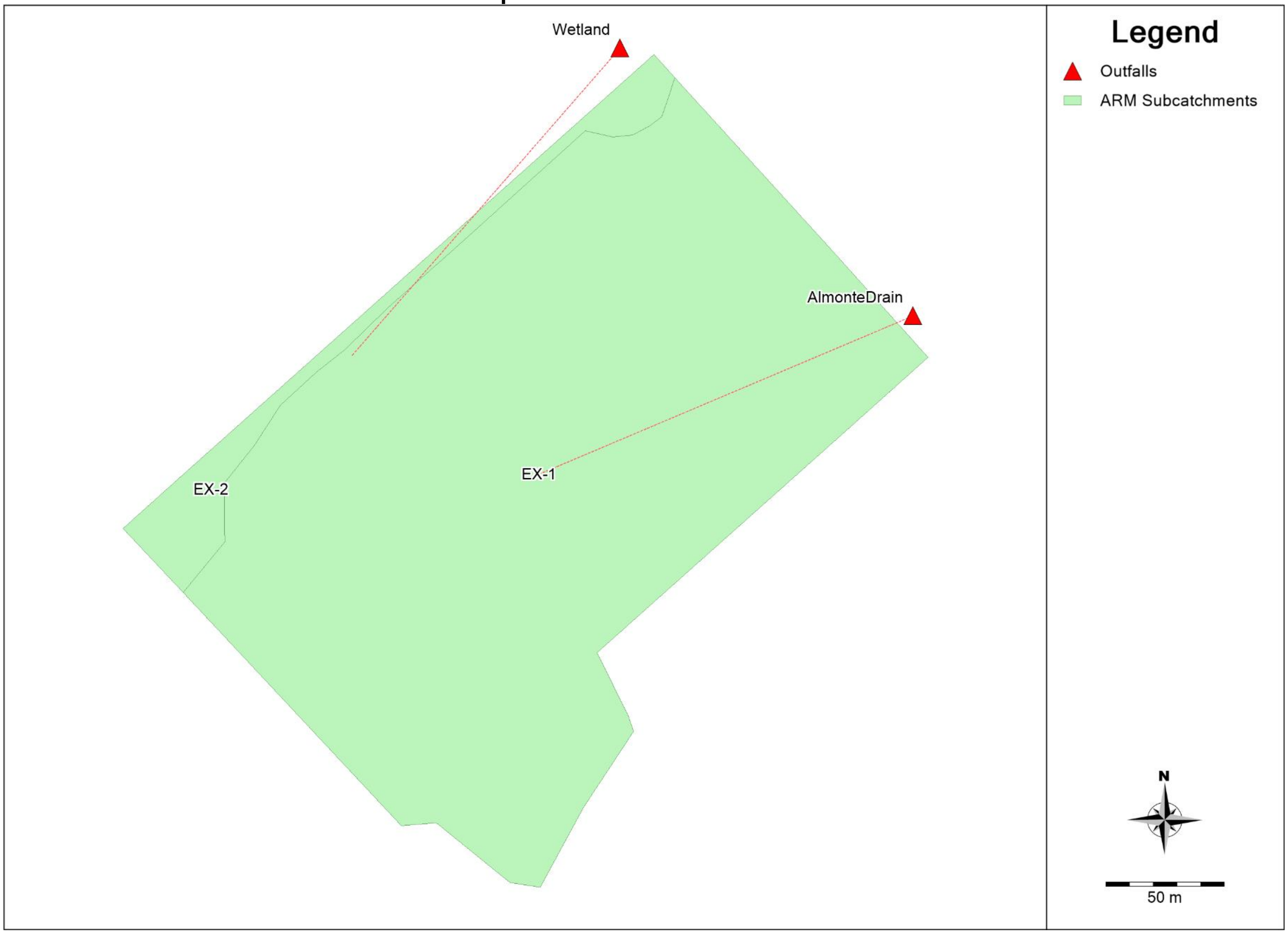
Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

Pre-development - Overall Model Schematic

Date: 2024-04-16
\\novatech2018\nova2\2018\118201\DATA\Calculations\SWM\118201-PCSWMM Model Schematics_Rev1.docx

Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

Pre-development - Subcatchments and Outfalls



Date: 2024-04-16
\\novatech2018\nova2\2018\118201\DATA\Calculations\SWM\118201-PCSWMM Model Schematics_Rev1.docx

Hannan Hills Subdivision (118201)
PCSWMM Pre-Development Model Output (100-year 6-hour Chicago)

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

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

Simulation start time:                  01/25/2021 00:00:00
Simulation end time:                    01/27/2021 00:00:00
Runoff wet weather time steps:          300 seconds
Report time steps:                      60 seconds
Number of data points:                  2881


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

Subcatchment	Runoff Method	Raingage	Area (ha)	Time of Concentration (min)	Time to Peak (min)	Time after Peak (min)	Peak UH Flow (m³/s/mm)	UH Depth (mm)
EX-1	Nash IUH	Raingage	5.15	18	12	83	0.03872	0.998
EX-2	Nash IUH	Raingage	0.33	5	3.33	26.67	0.00893	0.822

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

Subcatchment	Total Precip (mm)	Total Losses (mm)	Total Runoff (mm)	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff (fraction)
EX-1	82.323	60.494	21.786	1.122	304.43	0.265
EX-2	82.323	59.685	18.615	0.061	26.83	0.226

```
WARNING ARM01: Computed UH depth for ARM subcatchment EX-2 is not unity. Consider reducing wet weather time step.


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 ........... 2
Number of links ........... 0
Number of pollutants ...... 0
Number of land uses ....... 0


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

Name	Data Source	Data Type	Recording Interval
Raingage	06-C6hr-100yr	INTENSITY	10 min.

```
************
Node Summary
************
```

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
AlmonteDrain	OUTFALL	137.50	0.00	0.0	
Wetland	OUTFALL	0.00	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 .............. 01/27/2021 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 ..........         0.118          1.183
External Outflow .........         0.118          1.183
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
```

Hannan Hills Subdivision (118201)
PCSWMM Pre-Development Model Output (100-year 6-hour Chicago)

```
Analysis begun on:  Tue Apr 16 11:48:39 2024
Analysis ended on:  Tue Apr 16 11:48:39 2024
Total elapsed time: < 1 sec
```

Hannan Hills Subdivision (118201)
PCSWMM Pre-Development Model Output (100-year 12-hour SCS)

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

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

Simulation start time:                01/25/2021 00:00:00
Simulation end time:                  01/27/2021 00:00:00
Runoff wet weather time steps:        300 seconds
Report time steps:                    60 seconds
Number of data points:                2881


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

Subcatchment	Runoff Method	Raingage	Area (ha)	Time of Concentration (min)	Time to Peak (min)	Time after Peak (min)	Peak UH Flow (m³/s/mm)	UH Depth (mm)
EX-1	Nash IUH	Raingage	5.15	18	12	83	0.03872	0.998
EX-2	Nash IUH	Raingage	0.33	5	3.33	26.67	0.00893	0.822

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

Subcatchment	Total Precip (mm)	Total Losses (mm)	Total Runoff (mm)	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff (fraction)
EX-1	93.91	65.728	28.136	1.449	326.918	0.3
EX-2	93.91	64.76	23.973	0.079	23.776	0.255

```
WARNING ARM01: Computed UH depth for ARM subcatchment EX-2 is not unity. Consider reducing wet weather time step.



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 ........... 2
Number of links ........... 0
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                Data       Recording
Name                 Data Source                Type       Interval
--------------------------------------------------------------------
Raingage             D3-S12hr-100yr             INTENSITY   30 min.


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

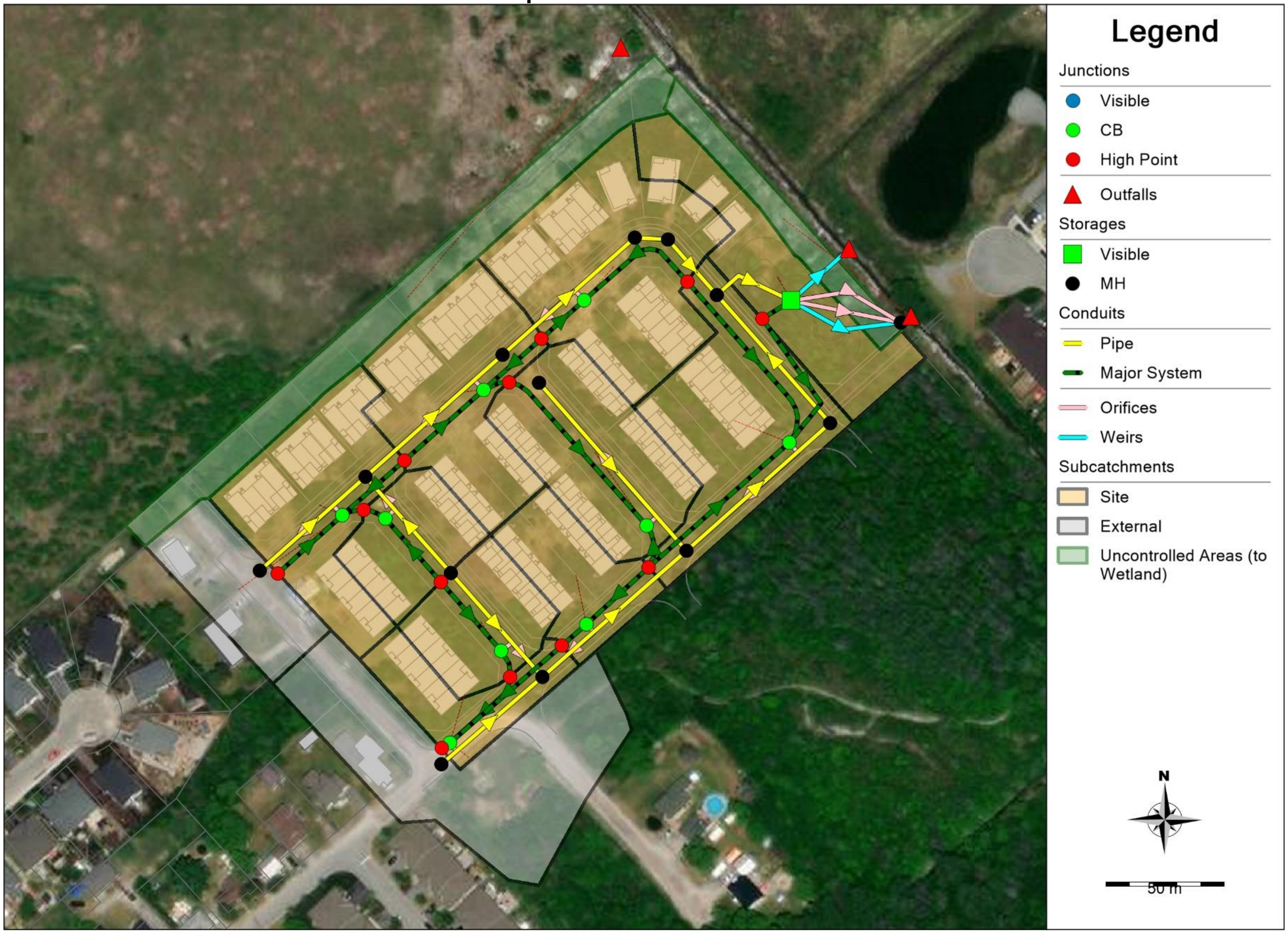
```
****************
Transect Summary
****************

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 .............. 01/27/2021 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 ..........         0.153          1.528
External Outflow .........         0.153          1.528
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:  Tue Apr 16 14:07:05 2024
Analysis ended on:  Tue Apr 16 14:07:05 2024
Total elapsed time: < 1 sec
```

Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

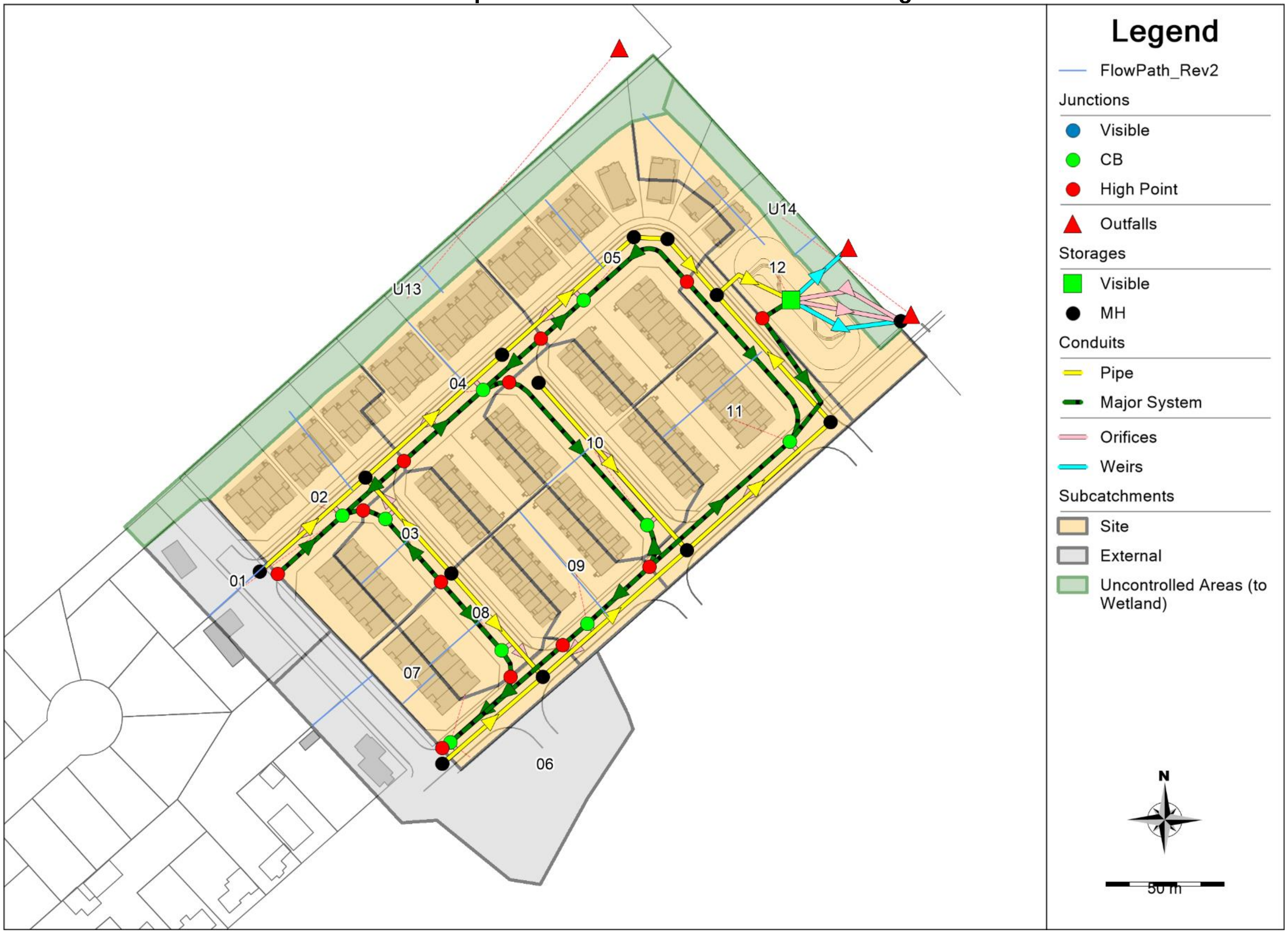
Post-development - Overall Model Schematic



Date: 2024-04-16
\\novatech2018\nova2\2018\118201\DATA\Calculations\SWM\118201-PCSWMM Model Schematics_Rev1.docx

Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

Post-development - Subcatchments and Flow Lengths



Date: 2024-04-16
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Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

Post-development – Storage Nodes

Date: 2024-04-16
\\novatech2018\nova2\2018\118201\DATA\Calculations\SWM\118201-PCSWMM Model Schematics_Rev1.docx

Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

Post-development – Junctions and Outfalls

Date: 2024-04-16
\\novatech2018\nova2\2018\118201\DATA\Calculations\SWM\118201-PCSWMM Model Schematics_Rev1.docx

Hannan Hills Subdivision (118201)
PCSWMM Post-Development Model Output (100-year 6-hour Chicago)

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

WARNING 02: maximum depth increased for Node CB03
WARNING 02: maximum depth increased for Node CB04
WARNING 02: maximum depth increased for Node CB06
WARNING 02: maximum depth increased for Node CB08

****
Element Count
****
Number of rain gages 1
Number of subcatchments ... 14
Number of nodes 38
Number of links 50
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Raingage	06-C6hr-100yr	INTENSITY	10 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
01	0.26	78.81	57.10	2.0000	Raingage	CB01
02	0.47	105.99	57.10	2.0000	Raingage	CB01
03	0.23	77.88	72.90	2.0000	Raingage	CB07
04	0.50	135.36	64.30	2.0000	Raingage	CB02
05	0.66	169.99	60.00	2.0000	Raingage	CB03
06	0.68	204.53	37.10	2.0000	Raingage	CB06
07	0.21	115.37	37.10	2.0000	Raingage	CB06
08	0.26	84.49	71.40	2.0000	Raingage	CB08
09	0.25	43.09	48.60	2.0000	Raingage	CB05
10	0.44	181.48	78.60	2.0000	Raingage	CB09
11	0.55	100.84	62.90	2.0000	Raingage	CB04
12	0.38	54.68	10.00	2.0000	Raingage	DryPond
U13	0.42	287.13	10.00	2.0000	Raingage	Wetland
U14	0.18	132.22	0.00	2.0000	Raingage	AlmonteDrain

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
CB01	JUNCTION	139.12	1.75	0.0	
CB02	JUNCTION	139.02	1.75	0.0	
CB03	JUNCTION	138.94	1.75	0.0	
CB04	JUNCTION	139.04	1.75	0.0	
CB05	JUNCTION	139.02	1.75	0.0	
CB06	JUNCTION	139.07	1.75	0.0	
CB07	JUNCTION	139.12	1.75	0.0	
CB08	JUNCTION	139.07	1.75	0.0	
CB09	JUNCTION	139.02	1.75	0.0	
HP01	JUNCTION	140.17	1.00	0.0	
HP02	JUNCTION	140.12	1.00	0.0	
HP03	JUNCTION	140.02	1.00	0.0	
HP04	JUNCTION	139.94	1.00	0.0	
HP05	JUNCTION	140.02	1.00	0.0	
HP06	JUNCTION	140.07	1.00	0.0	
HP07	JUNCTION	140.12	1.00	0.0	
HP08	JUNCTION	140.07	1.00	0.0	
HP09	JUNCTION	140.17	1.00	0.0	
HP10	JUNCTION	140.12	1.00	0.0	
HP11	JUNCTION	140.02	1.00	0.0	
HP12	JUNCTION	140.09	1.00	0.0	
AlmonteDrain	OUTFALL	137.50	0.38	0.0	
PondSpill	OUTFALL	139.00	0.00	0.0	
Wetland	OUTFALL	0.00	0.00	0.0	
DryPond	STORAGE	137.60	2.40	0.0	
MH_outlet	STORAGE	137.55	1.45	0.0	

MH01	STORAGE	139.04	1.26	0.0
MH02	STORAGE	138.65	1.60	0.0
MH03	STORAGE	138.20	1.95	0.0
MH04	STORAGE	137.88	2.22	0.0
MH05	STORAGE	137.84	2.26	0.0
MH06	STORAGE	137.73	2.34	0.0
MH07	STORAGE	137.99	2.06	0.0
MH08	STORAGE	138.20	1.95	0.0
MH09	STORAGE	138.73	1.47	0.0
MH10	STORAGE	139.05	1.20	0.0
MH11	STORAGE	139.00	1.30	0.0
MH12	STORAGE	138.85	1.30	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
MH01-02	MH01	MH02	CONDUIT	60.0	0.4000	0.0130
MH02-03	MH02	MH03	CONDUIT	77.0	0.3896	0.0130
MH03-04	MH03	MH04	CONDUIT	74.0	0.4324	0.0130
MH04-05	MH04	MH05	CONDUIT	14.0	0.2857	0.0130
MH05-06	MH05	MH06	CONDUIT	31.0	0.1290	0.0130
MH06-SWMF	MH06	DryPond	CONDUIT	15.0	0.2000	0.0130
MH07-06	MH07	MH06	CONDUIT	72.0	0.2639	0.0130
MH08-07	MH08	MH07	CONDUIT	81.0	0.2593	0.0130
MH09-08	MH09	MH08	CONDUIT	81.0	0.3704	0.0130
MH10-09	MH10	MH09	CONDUIT	56.0	0.4464	0.0130
MH11-02	MH11	MH02	CONDUIT	53.0	0.3774	0.0130
MH11-09	MH11	MH09	CONDUIT	59.0	0.3390	0.0130
MH12-08	MH12	MH08	CONDUIT	94.0	0.3723	0.0130
MHoutlet-Drain	MH_outlet	AlmonteDrain	CONDUIT	5.0	1.0001	0.0130
MS01	HP01	CB01	CONDUIT	37.0	0.8108	0.0150
MS02	HP10	CB01	CONDUIT	9.0	2.7789	0.0150
MS03	HP10	CB07	CONDUIT	10.0	2.5008	0.0150
MS04	HP09	CB07	CONDUIT	35.0	0.8572	0.0150
MS05	HP02	CB01	CONDUIT	35.0	0.7143	0.0150
MS06	HP02	CB02	CONDUIT	45.0	0.7778	0.0150
MS07	HP11	CB02	CONDUIT	11.0	2.2733	0.0150
MS08	HP03	CB02	CONDUIT	32.0	0.7813	0.0150
MS09	HP03	CB03	CONDUIT	24.0	1.3751	0.0150
MS10	HP04	CB03	CONDUIT	57.0	0.4386	0.0150
MS11	HP04	CB04	CONDUIT	85.0	0.1765	0.0150
MS12	HP07	CB06	CONDUIT	4.0	7.5212	0.0150
MS13	HP08	CB06	CONDUIT	5.0	5.0063	0.0150
MS14	HP08	CB08	CONDUIT	12.0	2.0838	0.0150
MS15	HP09	CB08	CONDUIT	38.0	0.9211	0.0150
MS16	HP06	CB06	CONDUIT	62.0	0.4032	0.0150
MS17	HP06	CB05	CONDUIT	14.0	2.1433	0.0150
MS18	HP05	CB05	CONDUIT	35.0	0.7143	0.0150
MS19	HP11	CB09	CONDUIT	84.0	0.2976	0.0150
MS20	HP05	CB09	CONDUIT	19.0	1.3159	0.0150
MS21	HP05	CB04	CONDUIT	79.0	0.2911	0.0150
MS22	HP12	CB04	CONDUIT	5.0	6.0108	0.0130
MS23	HP12	DryPond	CONDUIT	3.0	148.8086	0.0350
O-CB01	CB01	MH01	ORIFICE			
O-CB02	CB02	MH02	ORIFICE			
O-CB03	CB03	MH03	ORIFICE			
O-CB04	CB04	MH08	ORIFICE			
O-CB05	CB05	MH09	ORIFICE			
O-CB06	CB06	MH10	ORIFICE			
O-CB07	CB07	MH02	ORIFICE			
O-CB08	CB08	MH09	ORIFICE			
O-CB09	CB09	MH12	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	180.33
MH02-03	CIRCULAR	0.60	0.28	0.15	0.60	1	383.28
MH03-04	CIRCULAR	0.75	0.44	0.19	0.75	1	732.13
MH04-05	CIRCULAR	0.75	0.44	0.19	0.75	1	595.11
MH05-06	CIRCULAR	0.75	0.44	0.19	0.75	1	399.93

```
MH06-SWMF        CIRCULAR            0.82     0.53     0.21     0.82        1   641.99
MH07-06          CIRCULAR            0.75     0.44     0.19     0.75        1   571.93
MH08-07          CIRCULAR            0.75     0.44     0.19     0.75        1   566.89
MH09-08          CIRCULAR            0.53     0.22     0.13     0.53        1   261.74
MH10-09          CIRCULAR            0.45     0.16     0.11     0.45        1   190.51
MH11-02          CIRCULAR            0.45     0.16     0.11     0.45        1   175.15
MH11-09          CIRCULAR            0.45     0.16     0.11     0.45        1   166.01
MH12-08          CIRCULAR            0.45     0.16     0.11     0.45        1   173.98
MHoutlet-Drain   CIRCULAR            0.38     0.11     0.09     0.38        1   175.35
MS01             18mROW              1.00    15.30     0.52    18.00        1 59038.69
MS02             18mROW              1.00    15.30     0.52    18.00        1 109295.52
MS03             18mROW              1.00    15.30     0.52    18.00        1 103683.03
MS04             18mROW              1.00    15.30     0.52    18.00        1 60702.19
MS05             18mROW              1.00    15.30     0.52    18.00        1 55412.96
MS06             18mROW              1.00    15.30     0.52    18.00        1 57823.47
MS07             18mROW              1.00    15.30     0.52    18.00        1 98855.21
MS08             18mROW              1.00    15.30     0.52    18.00        1 57952.40
MS09             18mROW              1.00    15.30     0.52    18.00        1 76885.01
MS10             18mROW              1.00    15.30     0.52    18.00        1 43421.46
MS11             18mROW              1.00    15.30     0.52    18.00        1 27542.69
MS12             18mROW              1.00    15.30     0.52    18.00        1 179809.60
MS13             18mROW              1.00    15.30     0.52    18.00        1 146698.80
MS14             18mROW              1.00    15.30     0.52    18.00        1 94644.70
MS15             18mROW              1.00    15.30     0.52    18.00        1 62924.71
MS16             18mROW              1.00    15.30     0.52    18.00        1 41633.77
MS17             18mROW              1.00    15.30     0.52    18.00        1 95987.85
MS18             18mROW              1.00    15.30     0.52    18.00        1 55412.96
MS19             18mROW              1.00    15.30     0.52    18.00        1 35768.53
MS20             18mROW              1.00    15.30     0.52    18.00        1 75211.08
MS21             18mROW              1.00    15.30     0.52    18.00        1 35377.01
MS22             RECT_OPEN           1.00     3.00     0.60     3.00        1 40250.57
MS23             RECT_OPEN           1.00     3.00     0.60     3.00        1 74386.52


****************
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.
*********************************************************

****************
```

Hannan Hills Subdivision (118201)
PCSWMM Post-Development Model Output (100-year 6-hour Chicago)

```
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 .............. 01/28/2021 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

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.452        82.323
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.150        27.246
Surface Runoff ...........         0.304        55.325
Final Storage ............         0.002         0.437
Continuity Error (%) .....        -0.832

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
```

```
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.304         3.037
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.304         3.039
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 (%) .....        -0.080

***************************
Time-Step Critical Elements
***************************
Link MHoutlet-Drain (17.48%)

********************************
Highest Flow Instability Indexes
********************************
Link O-CB06 (7)
Link O-CB03 (7)
Link O-CB01 (6)
Link O-CB02 (4)
Link O-CB09 (4)

*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     1.92 sec
Maximum Time Step           :     2.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.09
Percent Not Converging      :     0.00
Time Step Frequencies       :
    2.000 -  1.516 sec      :    94.47 %
```

```
1.516 -  1.149 sec      :     3.83 %
1.149 -  0.871 sec      :     1.69 %
0.871 -  0.660 sec      :     0.00 %
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
01	82.32	0.00	0.00	22.84	46.34	13.04	59.38	0.15	109.66	0.721
02	82.32	0.00	0.00	23.02	46.83	12.74	59.57	0.28	190.04	0.724
03	82.32	0.00	0.00	14.27	59.53	8.56	68.08	0.16	107.22	0.827
04	82.32	0.00	0.00	18.97	52.67	10.91	63.58	0.32	218.74	0.772
05	82.32	0.00	0.00	21.34	49.15	12.07	61.22	0.40	278.41	0.744
06	82.32	0.00	0.00	33.86	30.02	18.53	48.55	0.33	240.12	0.590
07	82.32	0.00	0.00	33.32	30.27	19.40	49.67	0.10	84.78	0.603
08	82.32	0.00	0.00	15.08	58.31	8.98	67.28	0.17	120.13	0.817
09	82.32	0.00	0.00	28.05	39.84	14.64	54.48	0.14	88.32	0.662
10	82.32	0.00	0.00	11.21	64.10	6.94	71.03	0.31	210.57	0.863
11	82.32	0.00	0.00	19.95	51.30	10.96	62.27	0.34	227.40	0.756
12	82.32	0.00	0.00	51.20	8.21	23.25	31.45	0.12		
U13	82.32	0.00	0.00	47.82	8.08	27.50	35.58	0.15	146.43	0.432
U14	82.32	0.00	0.00	53.18	0.00	30.48	30.48	0.05	59.05	0.370

****
Node Depth Summary
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Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days	Time of Max Occurrence hr:min	Reported Max Depth Meters
CB01	JUNCTION	0.05	1.01	140.13	0	02:14	1.01
CB02	JUNCTION	0.06	0.96	139.98	0	02:14	0.96
CB03	JUNCTION	0.07	0.99	139.93	0	02:14	0.99
CB04	JUNCTION	0.05	0.90	139.94	0	02:14	0.90
CB05	JUNCTION	0.06	0.99	140.01	0	02:24	0.99
CB06	JUNCTION	0.05	1.03	140.10	0	02:15	1.03
CB07	JUNCTION	0.04	0.95	140.07	0	02:13	0.95
CB08	JUNCTION	0.05	0.97	140.04	0	02:18	0.97
CB09	JUNCTION	0.06	0.94	139.96	0	02:13	0.94
HP01	JUNCTION	0.00	0.00	140.17	0	00:00	0.00
HP02	JUNCTION	0.00	0.01	140.13	0	02:14	0.01
HP03	JUNCTION	0.00	0.00	140.02	0	00:00	0.00
HP04	JUNCTION	0.00	0.00	139.94	0	02:17	0.00
HP05	JUNCTION	0.00	0.00	140.02	0	00:00	0.00
HP06	JUNCTION	0.00	0.03	140.10	0	02:13	0.03
HP07	JUNCTION	0.00	0.00	140.12	0	00:00	0.00
HP08	JUNCTION	0.00	0.03	140.10	0	02:15	0.03
HP09	JUNCTION	0.00	0.00	140.17	0	00:00	0.00
HP10	JUNCTION	0.00	0.01	140.13	0	02:13	0.01
HP11	JUNCTION	0.00	0.00	140.02	0	00:00	0.00
HP12	JUNCTION	0.00	0.00	140.09	0	00:00	0.00
AlmonteDrain	OUTFALL	0.04	0.38	137.88	0	02:50	0.38
PondSpill	OUTFALL	0.00	0.00	139.00	0	00:00	0.00
Wetland	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
DryPond	STORAGE	0.46	2.12	139.72	0	02:52	2.12
MH_outlet	STORAGE	0.04	0.32	137.87	0	02:51	0.32

MH01	STORAGE	0.05	0.78	139.82	0	02:37	0.78
MH02	STORAGE	0.11	1.13	139.78	0	02:42	1.13
MH03	STORAGE	0.22	1.55	139.75	0	02:44	1.55
MH04	STORAGE	0.33	1.86	139.74	0	02:50	1.86
MH05	STORAGE	0.35	1.90	139.74	0	02:50	1.90
MH06	STORAGE	0.40	2.00	139.73	0	02:51	2.00
MH07	STORAGE	0.29	1.75	139.74	0	02:49	1.75
MH08	STORAGE	0.22	1.55	139.75	0	02:45	1.55
MH09	STORAGE	0.09	1.06	139.79	0	02:42	1.06
MH10	STORAGE	0.05	0.78	139.83	0	02:38	0.78
MH11	STORAGE	0.05	0.78	139.78	0	02:42	0.78
MH12	STORAGE	0.08	0.91	139.76	0	02:48	0.91

****
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	299.70	299.70	0 02:10	0.434	0.435	0.207
CB02	JUNCTION	218.74	218.74	0 02:10	0.318	0.319	0.587
CB03	JUNCTION	278.41	278.41	0 02:10	0.404	0.404	0.512
CB04	JUNCTION	227.40	227.40	0 02:10	0.342	0.343	0.486
CB05	JUNCTION	88.32	88.32	0 02:10	0.136	0.145	0.242
CB06	JUNCTION	324.90	324.90	0 02:10	0.434	0.436	0.337
CB07	JUNCTION	107.22	107.22	0 02:10	0.157	0.157	0.317
CB08	JUNCTION	120.13	120.13	0 02:10	0.175	0.182	0.231
CB09	JUNCTION	210.57	210.57	0 02:10	0.312	0.314	0.745
HP01	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP02	JUNCTION	0.00	22.55	0 02:13	0	0.00171	51.146
HP03	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP04	JUNCTION	0.00	5.81	0 02:15	0	0.000889	93.487
HP05	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP06	JUNCTION	0.00	56.03	0 02:12	0	0.0103	6.231
HP07	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP08	JUNCTION	0.00	20.21	0 02:11	0	0.00747	0.638
HP09	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP10	JUNCTION	0.00	9.84	0 02:12	0	0.000285	28.953
HP11	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP12	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
AlmonteDrain	OUTFALL	59.05	181.51	0 02:51	0.0548	2.89	0.000
PondSpill	OUTFALL	0.00	0.00	0 00:00	0	0	0.000 ltr
Wetland	OUTFALL	146.43	146.43	0 02:10	0.149	0.149	0.000
DryPond	STORAGE	62.48	795.89	0 02:08	0.119	2.83	-0.016
MH_outlet	STORAGE	0.00	177.36	0 02:52	0	2.83	-0.007
MH01	STORAGE	0.00	155.79	0 02:09	0	0.432	0.449
MH02	STORAGE	0.00	337.46	0 02:07	0	0.983	0.117
MH03	STORAGE	0.00	469.21	0 02:06	0	1.38	-0.772
MH04	STORAGE	0.00	423.36	0 02:07	0	1.39	0.019
MH05	STORAGE	0.00	407.13	0 02:07	0	1.39	0.045
MH06	STORAGE	0.00	764.09	0 02:07	0	2.71	-0.037
MH07	STORAGE	0.00	391.71	0 02:07	0	1.32	0.068
MH08	STORAGE	0.00	459.74	0 02:06	0	1.31	-0.967
MH09	STORAGE	0.00	253.13	0 02:08	0	0.743	0.298
MH10	STORAGE	0.00	152.67	0 02:09	0	0.417	0.111
MH11	STORAGE	0.00	47.18	0 02:08	0	0.0794	0.049
MH12	STORAGE	0.00	119.17	0 02:07	0	0.311	0.626

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Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
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Hannan Hills Subdivision (118201)
PCSWMM Post-Development Model Output (100-year 6-hour Chicago)

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	0.253	12	0	0	1.651	81	0 02:52	177.36
MH_outlet	0.000	3	0	0	0.000	22	0 02:51	179.49
MH01	0.000	4	0	0	0.001	62	0 02:37	154.46
MH02	0.000	7	0	0	0.001	71	0 02:42	326.37
MH03	0.000	11	0	0	0.002	79	0 02:44	423.36
MH04	0.000	15	0	0	0.002	84	0 02:50	407.13
MH05	0.000	16	0	0	0.002	84	0 02:50	398.97
MH06	0.000	17	0	0	0.002	85	0 02:51	746.22
MH07	0.000	14	0	0	0.002	85	0 02:49	365.38
MH08	0.000	11	0	0	0.002	80	0 02:45	391.71
MH09	0.000	6	0	0	0.001	72	0 02:42	243.63
MH10	0.000	4	0	0	0.001	65	0 02:38	151.23
MH11	0.000	4	0	0	0.001	60	0 02:42	35.76
MH12	0.000	6	0	0	0.001	70	0 02:48	122.51

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Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
AlmonteDrain	49.03	28.71	181.51	2.890
PondSpill	0.00	0.00	0.00	0.000
Wetland	10.08	6.73	146.43	0.149
System	19.70	35.44	232.47	3.039

****
Link Flow Summary
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Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
MH01-02	CONDUIT	154.46	0 02:09	1.36	0.86	1.00
MH02-03	CONDUIT	326.37	0 02:06	1.59	0.85	1.00
MH03-04	CONDUIT	423.36	0 02:07	1.09	0.58	1.00
MH04-05	CONDUIT	407.13	0 02:07	0.92	0.68	1.00
MH05-06	CONDUIT	398.97	0 02:07	0.90	1.00	1.00
MH06-SWMF	CONDUIT	746.22	0 02:07	1.40	1.16	1.00
MH07-06	CONDUIT	365.38	0 02:07	0.83	0.64	1.00
MH08-07	CONDUIT	391.71	0 02:07	1.05	0.69	1.00
MH09-08	CONDUIT	227.89	0 02:06	1.41	0.87	1.00
MH10-09	CONDUIT	151.23	0 02:09	1.32	0.79	1.00
MH11-02	CONDUIT	35.76	0 02:45	0.24	0.20	1.00
MH11-09	CONDUIT	36.18	0 02:45	0.34	0.22	1.00
MH12-08	CONDUIT	122.51	0 02:06	1.09	0.70	1.00
MHoutlet-Drain	CONDUIT	179.49	0 02:51	1.82	1.02	0.92
MS01	CHANNEL	0.00	0 00:00	0.00	0.00	0.13
MS02	CHANNEL	9.84	0 02:12	0.02	0.00	0.13
MS03	CHANNEL	0.31	0 02:14	0.03	0.00	0.10
MS04	CHANNEL	0.00	0 00:00	0.00	0.00	0.10
MS05	CHANNEL	22.55	0 02:13	0.12	0.00	0.13
MS06	CHANNEL	0.50	0 02:14	0.10	0.00	0.11
MS07	CHANNEL	0.00	0 00:00	0.00	0.00	0.11
MS08	CHANNEL	0.00	0 00:00	0.00	0.00	0.11
MS09	CHANNEL	0.00	0 00:00	0.00	0.00	0.12
MS10	CHANNEL	0.02	0 02:17	0.05	0.00	0.12
MS11	CHANNEL	5.81	0 02:15	0.03	0.00	0.08
MS12	CHANNEL	0.00	0 00:00	0.00	0.00	0.14
MS13	CHANNEL	20.21	0 02:11	0.04	0.00	0.15
MS14	CHANNEL	13.75	0 02:15	0.03	0.00	0.12
MS15	CHANNEL	0.00	0 00:00	0.00	0.00	0.11
MS16	CHANNEL	56.03	0 02:12	0.09	0.00	0.15
MS17	CHANNEL	16.49	0 02:13	0.14	0.00	0.13
MS18	CHANNEL	0.00	0 00:00	0.00	0.00	0.12
MS19	CHANNEL	0.00	0 00:00	0.00	0.00	0.09
MS20	CHANNEL	0.00	0 00:00	0.00	0.00	0.09
MS21	CHANNEL	0.00	0 00:00	0.00	0.00	0.08
MS22	CONDUIT	0.00	0 00:00	0.00	0.00	0.08

MS23	CONDUIT	0.00	0	00:00	0.00	0.00	0.50
O-CB01	ORIFICE	155.79	0	02:09			1.00
O-CB02	ORIFICE	115.68	0	02:08			1.00
O-CB03	ORIFICE	148.46	0	02:09			1.00
O-CB04	ORIFICE	117.27	0	02:10			1.00
O-CB05	ORIFICE	40.90	0	02:07			1.00
O-CB06	ORIFICE	152.67	0	02:09			1.00
O-CB07	ORIFICE	59.46	0	02:09			1.00
O-CB08	ORIFICE	64.85	0	02:08			1.00
O-CB09	ORIFICE	119.17	0	02:07			1.00
O-SWMF1	ORIFICE	16.29	0	02:48			1.00
O-SWMF2	ORIFICE	43.66	0	02:52			1.00
W1	WEIR	117.43	0	02:52			0.54
W2	WEIR	0.00	0	00:00			0.00

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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	0.00	0.00	0.00	0.16	0.00	0.00	0.84	0.03	0.00
MH02-03	1.00	0.00	0.00	0.00	0.27	0.00	0.00	0.73	0.10	0.00
MH03-04	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.13	0.00
MH04-05	1.00	0.00	0.30	0.00	0.70	0.00	0.00	0.00	0.60	0.00
MH05-06	1.00	0.00	0.00	0.00	0.44	0.00	0.00	0.56	0.01	0.00
MH06-SWMF	1.00	0.00	0.00	0.00	0.46	0.00	0.00	0.53	0.01	0.00
MH07-06	1.00	0.00	0.00	0.00	0.44	0.00	0.00	0.56	0.07	0.00
MH08-07	1.00	0.00	0.12	0.00	0.88	0.00	0.00	0.00	0.66	0.00
MH09-08	1.00	0.00	0.00	0.00	0.24	0.00	0.00	0.75	0.09	0.00
MH10-09	1.00	0.00	0.00	0.00	0.16	0.00	0.00	0.84	0.03	0.00
MH11-02	1.00	0.84	0.00	0.00	0.16	0.00	0.00	0.00	0.88	0.00
MH11-09	1.00	0.83	0.01	0.00	0.16	0.00	0.00	0.00	0.87	0.00
MH12-08	1.00	0.00	0.00	0.00	0.22	0.00	0.00	0.77	0.10	0.00
MHoutlet-Drain	1.00	0.00	0.00	0.00	0.51	0.48	0.00	0.00	0.64	0.00
MS01	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS02	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS03	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS04	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS05	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS06	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS07	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS08	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	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	0.03	0.00	0.00	0.02	0.00	0.00	0.95	0.01	0.00
MS11	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS12	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS13	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS14	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS15	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS16	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS17	1.00	0.03	0.00	0.00	0.02	0.00	0.00	0.95	0.01	0.00
MS18	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS19	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS20	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS21	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS22	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS23	1.00	0.07	0.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
MH01-02	2.33	2.33	4.85	0.01	0.01
MH02-03	4.85	4.85	7.48	0.01	0.01
MH03-04	7.48	7.48	10.99	0.01	0.01
MH04-05	10.99	10.99	11.73	0.01	0.01
MH05-06	11.72	11.73	12.60	0.01	0.43
MH06-SWMF	12.46	12.48	13.15	0.27	0.58
MH07-06	9.53	9.53	12.60	0.01	0.01
MH08-07	7.48	7.48	9.53	0.01	0.01
MH09-08	4.81	4.81	7.44	0.01	0.01

MH10-09	2.23	2.23	4.86	0.01	0.01
MH11-02	2.72	2.72	4.85	0.01	0.01
MH11-09	2.72	2.72	4.86	0.01	0.01
MH12-08	4.44	4.44	7.48	0.01	0.01
MHoutlet-Drain	0.01	0.01	0.05	0.08	0.01

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Analysis begun on:  Tue Apr 16 14:09:47 2024
Analysis ended on:  Tue Apr 16 14:09:50 2024
Total elapsed time: 00:00:03
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Hannan Hills Subdivision (118201)
PCSWMM Post-Development Model Output (100-year 12-hour SCS)

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

WARNING 02: maximum depth increased for Node CB03
WARNING 02: maximum depth increased for Node CB04
WARNING 02: maximum depth increased for Node CB06
WARNING 02: maximum depth increased for Node CB08

****
Element Count
****

Number of rain gages 1
Number of subcatchments ... 14
Number of nodes 38
Number of links 50
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Raingage	D3-S12hr-100yr	INTENSITY	30 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
01	0.26	78.81	57.10	2.0000	Raingage	CB01
02	0.47	105.99	57.10	2.0000	Raingage	CB01
03	0.23	77.88	72.90	2.0000	Raingage	CB07
04	0.50	135.36	64.30	2.0000	Raingage	CB02
05	0.66	169.99	60.00	2.0000	Raingage	CB03
06	0.68	204.53	37.10	2.0000	Raingage	CB06
07	0.21	115.37	37.10	2.0000	Raingage	CB06
08	0.26	84.49	71.40	2.0000	Raingage	CB08
09	0.25	43.09	48.60	2.0000	Raingage	CB05
10	0.44	181.48	78.60	2.0000	Raingage	CB09
11	0.55	100.84	62.90	2.0000	Raingage	CB04
12	0.38	54.68	10.00	2.0000	Raingage	DryPond
U13	0.42	287.13	10.00	2.0000	Raingage	Wetland
U14	0.18	132.22	0.00	2.0000	Raingage	AlmonteDrain

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
CB01	JUNCTION	139.12	1.75	0.0	
CB02	JUNCTION	139.02	1.75	0.0	
CB03	JUNCTION	138.94	1.75	0.0	
CB04	JUNCTION	139.04	1.75	0.0	
CB05	JUNCTION	139.02	1.75	0.0	
CB06	JUNCTION	139.07	1.75	0.0	
CB07	JUNCTION	139.12	1.75	0.0	
CB08	JUNCTION	139.07	1.75	0.0	
CB09	JUNCTION	139.02	1.75	0.0	
HP01	JUNCTION	140.17	1.00	0.0	
HP02	JUNCTION	140.12	1.00	0.0	
HP03	JUNCTION	140.02	1.00	0.0	
HP04	JUNCTION	139.94	1.00	0.0	
HP05	JUNCTION	140.02	1.00	0.0	
HP06	JUNCTION	140.07	1.00	0.0	
HP07	JUNCTION	140.12	1.00	0.0	
HP08	JUNCTION	140.07	1.00	0.0	
HP09	JUNCTION	140.17	1.00	0.0	
HP10	JUNCTION	140.12	1.00	0.0	
HP11	JUNCTION	140.02	1.00	0.0	
HP12	JUNCTION	140.09	1.00	0.0	
AlmonteDrain	OUTFALL	137.50	0.38	0.0	
PondSpill	OUTFALL	139.00	0.00	0.0	
Wetland	OUTFALL	0.00	0.00	0.0	
DryPond	STORAGE	137.60	2.40	0.0	
MH_outlet	STORAGE	137.55	1.45	0.0	

MH01	STORAGE	139.04	1.26	0.0
MH02	STORAGE	138.65	1.60	0.0
MH03	STORAGE	138.20	1.95	0.0
MH04	STORAGE	137.88	2.22	0.0
MH05	STORAGE	137.84	2.26	0.0
MH06	STORAGE	137.73	2.34	0.0
MH07	STORAGE	137.99	2.06	0.0
MH08	STORAGE	138.20	1.95	0.0
MH09	STORAGE	138.73	1.47	0.0
MH10	STORAGE	139.05	1.20	0.0
MH11	STORAGE	139.00	1.30	0.0
MH12	STORAGE	138.85	1.30	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
MH01-02	MH01	MH02	CONDUIT	60.0	0.4000	0.0130
MH02-03	MH02	MH03	CONDUIT	77.0	0.3896	0.0130
MH03-04	MH03	MH04	CONDUIT	74.0	0.4324	0.0130
MH04-05	MH04	MH05	CONDUIT	14.0	0.2857	0.0130
MH05-06	MH05	MH06	CONDUIT	31.0	0.1290	0.0130
MH06-SWMF	MH06	DryPond	CONDUIT	15.0	0.2000	0.0130
MH07-06	MH07	MH06	CONDUIT	72.0	0.2639	0.0130
MH08-07	MH08	MH07	CONDUIT	81.0	0.2593	0.0130
MH09-08	MH09	MH08	CONDUIT	81.0	0.3704	0.0130
MH10-09	MH10	MH09	CONDUIT	56.0	0.4464	0.0130
MH11-02	MH11	MH02	CONDUIT	53.0	0.3774	0.0130
MH11-09	MH11	MH09	CONDUIT	59.0	0.3390	0.0130
MH12-08	MH12	MH08	CONDUIT	94.0	0.3723	0.0130
MHoutlet-Drain	MH_outlet	AlmonteDrain	CONDUIT	5.0	1.0001	0.0130
MS01	HP01	CB01	CONDUIT	37.0	0.8108	0.0150
MS02	HP10	CB01	CONDUIT	9.0	2.7789	0.0150
MS03	HP10	CB07	CONDUIT	10.0	2.5008	0.0150
MS04	HP09	CB07	CONDUIT	35.0	0.8572	0.0150
MS05	HP02	CB01	CONDUIT	35.0	0.7143	0.0150
MS06	HP02	CB02	CONDUIT	45.0	0.7778	0.0150
MS07	HP11	CB02	CONDUIT	11.0	2.2733	0.0150
MS08	HP03	CB02	CONDUIT	32.0	0.7813	0.0150
MS09	HP03	CB03	CONDUIT	24.0	1.3751	0.0150
MS10	HP04	CB03	CONDUIT	57.0	0.4386	0.0150
MS11	HP04	CB04	CONDUIT	85.0	0.1765	0.0150
MS12	HP07	CB06	CONDUIT	4.0	7.5212	0.0150
MS13	HP08	CB06	CONDUIT	5.0	5.0063	0.0150
MS14	HP08	CB08	CONDUIT	12.0	2.0838	0.0150
MS15	HP09	CB08	CONDUIT	38.0	0.9211	0.0150
MS16	HP06	CB06	CONDUIT	62.0	0.4032	0.0150
MS17	HP06	CB05	CONDUIT	14.0	2.1433	0.0150
MS18	HP05	CB05	CONDUIT	35.0	0.7143	0.0150
MS19	HP11	CB09	CONDUIT	84.0	0.2976	0.0150
MS20	HP05	CB09	CONDUIT	19.0	1.3159	0.0150
MS21	HP05	CB04	CONDUIT	79.0	0.2911	0.0150
MS22	HP12	CB04	CONDUIT	5.0	6.0108	0.0130
MS23	HP12	DryPond	CONDUIT	3.0	148.8086	0.0350
O-CB01	CB01	MH01	ORIFICE			
O-CB02	CB02	MH02	ORIFICE			
O-CB03	CB03	MH03	ORIFICE			
O-CB04	CB04	MH08	ORIFICE			
O-CB05	CB05	MH09	ORIFICE			
O-CB06	CB06	MH10	ORIFICE			
O-CB07	CB07	MH02	ORIFICE			
O-CB08	CB08	MH09	ORIFICE			
O-CB09	CB09	MH12	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
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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	180.33
MH02-03	CIRCULAR	0.60	0.28	0.15	0.60	1	383.28
MH03-04	CIRCULAR	0.75	0.44	0.19	0.75	1	732.13
MH04-05	CIRCULAR	0.75	0.44	0.19	0.75	1	595.11
MH05-06	CIRCULAR	0.75	0.44	0.19	0.75	1	399.93

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MH06-SWMF        CIRCULAR           0.82      0.53      0.21      0.82         1   641.99
MH07-06          CIRCULAR           0.75      0.44      0.19      0.75         1   571.93
MH08-07          CIRCULAR           0.75      0.44      0.19      0.75         1   566.89
MH09-08          CIRCULAR           0.53      0.22      0.13      0.53         1   261.74
MH10-09          CIRCULAR           0.45      0.16      0.11      0.45         1   190.51
MH11-02          CIRCULAR           0.45      0.16      0.11      0.45         1   175.15
MH11-09          CIRCULAR           0.45      0.16      0.11      0.45         1   166.01
MH12-08          CIRCULAR           0.45      0.16      0.11      0.45         1   173.98
MHoutlet-Drain   CIRCULAR           0.38      0.11      0.09      0.38         1   175.35
MS01             18mROW             1.00     15.30      0.52     18.00         1 59038.69
MS02             18mROW             1.00     15.30      0.52     18.00         1 109295.52
MS03             18mROW             1.00     15.30      0.52     18.00         1 103683.03
MS04             18mROW             1.00     15.30      0.52     18.00         1 60702.19
MS05             18mROW             1.00     15.30      0.52     18.00         1 55412.96
MS06             18mROW             1.00     15.30      0.52     18.00         1 57823.47
MS07             18mROW             1.00     15.30      0.52     18.00         1 98855.21
MS08             18mROW             1.00     15.30      0.52     18.00         1 57952.40
MS09             18mROW             1.00     15.30      0.52     18.00         1 76885.01
MS10             18mROW             1.00     15.30      0.52     18.00         1 43421.46
MS11             18mROW             1.00     15.30      0.52     18.00         1 27542.69
MS12             18mROW             1.00     15.30      0.52     18.00         1 179809.60
MS13             18mROW             1.00     15.30      0.52     18.00         1 146698.80
MS14             18mROW             1.00     15.30      0.52     18.00         1 94644.70
MS15             18mROW             1.00     15.30      0.52     18.00         1 62924.71
MS16             18mROW             1.00     15.30      0.52     18.00         1 41633.77
MS17             18mROW             1.00     15.30      0.52     18.00         1 95987.85
MS18             18mROW             1.00     15.30      0.52     18.00         1 55412.96
MS19             18mROW             1.00     15.30      0.52     18.00         1 35768.53
MS20             18mROW             1.00     15.30      0.52     18.00         1 75211.08
MS21             18mROW             1.00     15.30      0.52     18.00         1 35377.01
MS22             RECT_OPEN          1.00      3.00      0.60      3.00         1 40250.57
MS23             RECT_OPEN          1.00      3.00      0.60      3.00         1 74386.52


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

Transect 18mROW
Area:
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```
            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.
*********************************************************

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Hannan Hills Subdivision (118201)
PCSWMM Post-Development Model Output (100-year 12-hour SCS)

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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 .............. 01/28/2021 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


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.516        93.910
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.181        32.925
Surface Runoff ...........         0.334        60.810
Final Storage ............         0.002         0.437
Continuity Error (%) .....        -0.279


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.334         3.338
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.334         3.340
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 (%) .....        -0.055


***************************
Time-Step Critical Elements
***************************
Link MHoutlet-Drain (19.04%)


*********************************
Highest Flow Instability Indexes
*********************************
Link O-CB06 (11)
Link O-CB03 (8)
Link O-CB09 (8)
Link O-CB02 (8)
Link O-CB07 (6)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     1.91 sec
Maximum Time Step           :     2.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.10
Percent Not Converging      :     0.00
Time Step Frequencies       :
    2.000 -  1.516 sec      :    94.11 %
```

1.516 - 1.149 sec	:	3.94 %
1.149 - 0.871 sec	:	1.82 %
0.871 - 0.660 sec	:	0.13 %
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
01	93.91	0.00	0.00	27.65	52.97	12.78	65.75	0.17	53.17	0.700
02	93.91	0.00	0.00	27.84	53.45	12.58	66.03	0.31	95.09	0.703
03	93.91	0.00	0.00	17.30	67.99	8.27	76.26	0.18	48.87	0.812
04	93.91	0.00	0.00	22.97	60.13	10.68	70.81	0.35	103.97	0.754
05	93.91	0.00	0.00	25.83	56.11	11.86	67.97	0.45	135.46	0.724
06	93.91	0.00	0.00	40.92	34.33	18.33	52.66	0.36	130.00	0.561
07	93.91	0.00	0.00	40.38	34.57	18.93	53.50	0.11	41.39	0.570
08	93.91	0.00	0.00	18.28	66.59	8.70	75.29	0.20	55.06	0.802
09	93.91	0.00	0.00	33.82	45.47	14.57	60.04	0.15	47.79	0.639
10	93.91	0.00	0.00	13.60	73.23	6.61	79.84	0.35	94.55	0.850
11	93.91	0.00	0.00	24.11	58.57	10.83	69.40	0.38	112.56	0.739
12	93.91	0.00	0.00	61.32	9.37	23.33	32.69	0.12		
U13	93.91	0.00	0.00	57.92	9.24	26.91	36.15	0.15	77.56	0.385
U14	93.91	0.00	0.00	64.40	0.00	29.86	29.86	0.05	32.40	0.318

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days	Time of Max Occurrence hr:min	Reported Max Depth Meters
CB01	JUNCTION	0.05	0.92	140.04	0	06:32	0.92
CB02	JUNCTION	0.06	0.89	139.91	0	06:33	0.89
CB03	JUNCTION	0.07	0.91	139.85	0	06:33	0.91
CB04	JUNCTION	0.06	0.84	139.88	0	06:33	0.84
CB05	JUNCTION	0.06	0.92	139.94	0	06:34	0.92
CB06	JUNCTION	0.06	0.98	140.05	0	06:33	0.98
CB07	JUNCTION	0.05	0.85	139.97	0	06:32	0.85
CB08	JUNCTION	0.05	0.87	139.94	0	06:32	0.87
CB09	JUNCTION	0.06	0.85	139.87	0	06:32	0.85
HP01	JUNCTION	0.00	0.00	140.17	0	00:00	0.00
HP02	JUNCTION	0.00	0.00	140.12	0	00:00	0.00
HP03	JUNCTION	0.00	0.00	140.02	0	00:00	0.00
HP04	JUNCTION	0.00	0.00	139.94	0	00:00	0.00
HP05	JUNCTION	0.00	0.00	140.02	0	00:00	0.00
HP06	JUNCTION	0.00	0.00	140.07	0	00:00	0.00
HP07	JUNCTION	0.00	0.00	140.12	0	00:00	0.00
HP08	JUNCTION	0.00	0.00	140.07	0	00:00	0.00
HP09	JUNCTION	0.00	0.00	140.17	0	00:00	0.00
HP10	JUNCTION	0.00	0.00	140.12	0	00:00	0.00
HP11	JUNCTION	0.00	0.00	140.02	0	00:00	0.00
HP12	JUNCTION	0.00	0.00	140.09	0	00:00	0.00
AlmonteDrain	OUTFALL	0.05	0.38	137.88	0	06:58	0.38
PondSpill	OUTFALL	0.00	0.00	139.00	0	00:00	0.00
Wetland	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
DryPond	STORAGE	0.51	2.13	139.73	0	07:03	2.13
MH_outlet	STORAGE	0.05	0.35	137.90	0	07:05	0.35

MH01	STORAGE	0.06	0.75	139.79	0	06:39	0.75
MH02	STORAGE	0.12	1.11	139.76	0	07:00	1.11
MH03	STORAGE	0.24	1.55	139.75	0	07:00	1.55
MH04	STORAGE	0.37	1.86	139.74	0	07:01	1.86
MH05	STORAGE	0.39	1.90	139.74	0	07:01	1.90
MH06	STORAGE	0.44	2.01	139.74	0	07:02	2.01
MH07	STORAGE	0.32	1.75	139.74	0	07:01	1.75
MH08	STORAGE	0.24	1.55	139.75	0	07:00	1.55
MH09	STORAGE	0.11	1.04	139.77	0	06:58	1.04
MH10	STORAGE	0.06	0.76	139.81	0	06:44	0.76
MH11	STORAGE	0.06	0.77	139.77	0	06:59	0.77
MH12	STORAGE	0.08	0.91	139.76	0	07:00	0.91

****
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	148.26	148.26	0 06:30	0.481	0.481	0.210
CB02	JUNCTION	103.97	103.97	0 06:30	0.354	0.355	0.342
CB03	JUNCTION	135.46	135.46	0 06:30	0.449	0.449	0.661
CB04	JUNCTION	112.56	112.56	0 06:30	0.382	0.383	0.265
CB05	JUNCTION	47.79	47.79	0 06:30	0.15	0.15	0.120
CB06	JUNCTION	171.39	171.39	0 06:30	0.47	0.471	0.370
CB07	JUNCTION	48.87	48.87	0 06:30	0.175	0.175	0.160
CB08	JUNCTION	55.06	55.06	0 06:30	0.196	0.196	0.048
CB09	JUNCTION	94.55	94.55	0 06:30	0.351	0.353	0.372
HP01	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP02	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP03	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP04	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP05	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP06	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP07	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP08	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP09	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP10	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP11	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP12	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
AlmonteDrain	OUTFALL	32.40	191.52	0 07:03	0.0537	3.19	0.000
PondSpill	OUTFALL	0.00	0.00	0 00:00	0	0	0.000 ltr
Wetland	OUTFALL	77.56	77.56	0 06:30	0.152	0.152	0.000
DryPond	STORAGE	50.52	657.42	0 06:19	0.124	3.13	-0.003
MH_outlet	STORAGE	0.00	181.20	0 07:03	0	3.13	-0.007
MH01	STORAGE	0.00	130.60	0 06:17	0	0.48	0.344
MH02	STORAGE	0.00	271.32	0 06:15	0	1.09	0.062
MH03	STORAGE	0.00	359.93	0 06:18	0	1.53	-0.570
MH04	STORAGE	0.00	345.21	0 06:18	0	1.54	0.015
MH05	STORAGE	0.00	335.57	0 06:18	0	1.54	0.024
MH06	STORAGE	0.00	637.10	0 06:19	0	3.01	-0.019
MH07	STORAGE	0.00	321.76	0 06:18	0	1.47	0.035
MH08	STORAGE	0.00	357.56	0 06:11	0	1.46	-0.620
MH09	STORAGE	0.00	217.32	0 06:15	0	0.814	0.224
MH10	STORAGE	0.00	131.19	0 06:16	0	0.469	-0.011
MH11	STORAGE	0.00	32.26	0 06:14	0	0.0783	0.009
MH12	STORAGE	0.00	92.22	0 06:17	0	0.352	0.556

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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	0.277	14	0	0	1.661	81	0 07:03	181.20
MH_outlet	0.000	3	0	0	0.000	24	0 07:05	188.59
MH01	0.000	5	0	0	0.001	60	0 06:39	128.57
MH02	0.000	8	0	0	0.001	70	0 07:00	245.48
MH03	0.000	12	0	0	0.002	80	0 07:00	345.21
MH04	0.000	17	0	0	0.002	84	0 07:01	335.57
MH05	0.000	17	0	0	0.002	84	0 07:01	330.65
MH06	0.000	19	0	0	0.002	86	0 07:02	625.45
MH07	0.000	15	0	0	0.002	85	0 07:01	306.84
MH08	0.000	12	0	0	0.002	80	0 07:00	321.76
MH09	0.000	7	0	0	0.001	71	0 06:58	187.62
MH10	0.000	5	0	0	0.001	63	0 06:44	130.69
MH11	0.000	4	0	0	0.001	59	0 06:59	27.95
MH12	0.000	7	0	0	0.001	70	0 07:00	89.50

****

Outfall Loading Summary

****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
AlmonteDrain	55.38	28.07	191.52	3.188
PondSpill	0.00	0.00	0.00	0.000
Wetland	18.71	3.94	77.56	0.152
System	24.70	32.01	199.79	3.340

****

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	128.57	0 06:16	1.28	0.71	1.00
MH02-03	CONDUIT	245.48	0 06:19	1.41	0.64	1.00
MH03-04	CONDUIT	345.21	0 06:18	0.78	0.47	1.00
MH04-05	CONDUIT	335.57	0 06:18	0.76	0.56	1.00
MH05-06	CONDUIT	330.65	0 06:18	0.75	0.83	1.00
MH06-SWMF	CONDUIT	625.45	0 06:19	1.17	0.97	1.00
MH07-06	CONDUIT	306.84	0 06:19	0.69	0.54	1.00
MH08-07	CONDUIT	321.76	0 06:18	0.75	0.57	1.00
MH09-08	CONDUIT	178.89	0 06:11	1.26	0.68	1.00
MH10-09	CONDUIT	130.69	0 06:16	1.22	0.69	1.00
MH11-02	CONDUIT	27.95	0 06:48	0.18	0.16	1.00
MH11-09	CONDUIT	30.17	0 06:16	0.34	0.18	1.00
MH12-08	CONDUIT	89.50	0 06:09	1.04	0.51	1.00
MHoutlet-Drain	CONDUIT	188.59	0 07:05	1.82	1.08	0.97
MS01	CHANNEL	0.00	0 00:00	0.00	0.00	0.08
MS02	CHANNEL	0.00	0 00:00	0.00	0.00	0.08
MS03	CHANNEL	0.00	0 00:00	0.00	0.00	0.05
MS04	CHANNEL	0.00	0 00:00	0.00	0.00	0.05
MS05	CHANNEL	0.00	0 00:00	0.00	0.00	0.08
MS06	CHANNEL	0.00	0 00:00	0.00	0.00	0.07
MS07	CHANNEL	0.00	0 00:00	0.00	0.00	0.07
MS08	CHANNEL	0.00	0 00:00	0.00	0.00	0.07
MS09	CHANNEL	0.00	0 00:00	0.00	0.00	0.08
MS10	CHANNEL	0.00	0 00:00	0.00	0.00	0.08
MS11	CHANNEL	0.00	0 00:00	0.00	0.00	0.05
MS12	CHANNEL	0.00	0 00:00	0.00	0.00	0.12
MS13	CHANNEL	0.00	0 00:00	0.00	0.00	0.12
MS14	CHANNEL	0.00	0 00:00	0.00	0.00	0.06
MS15	CHANNEL	0.00	0 00:00	0.00	0.00	0.06
MS16	CHANNEL	0.00	0 00:00	0.00	0.00	0.12
MS17	CHANNEL	0.00	0 00:00	0.00	0.00	0.08
MS18	CHANNEL	0.00	0 00:00	0.00	0.00	0.08
MS19	CHANNEL	0.00	0 00:00	0.00	0.00	0.05
MS20	CHANNEL	0.00	0 00:00	0.00	0.00	0.05
MS21	CHANNEL	0.00	0 00:00	0.00	0.00	0.05
MS22	CONDUIT	0.00	0 00:00	0.00	0.00	0.05

MS23	CONDUIT	0.00	0	00:00	0.00	0.00	0.50
O-CB01	ORIFICE	130.60	0	06:17			1.00
O-CB02	ORIFICE	94.16	0	06:16			1.00
O-CB03	ORIFICE	120.90	0	06:16			1.00
O-CB04	ORIFICE	100.90	0	06:17			1.00
O-CB05	ORIFICE	35.79	0	06:15			1.00
O-CB06	ORIFICE	131.19	0	06:16			1.00
O-CB07	ORIFICE	46.97	0	06:18			1.00
O-CB08	ORIFICE	52.02	0	06:17			1.00
O-CB09	ORIFICE	92.22	0	06:17			1.00
O-SWMF1	ORIFICE	16.29	0	06:56			1.00
O-SWMF2	ORIFICE	43.80	0	07:03			1.00
W1	WEIR	121.22	0	07:03			0.55
W2	WEIR	0.00	0	00:00			0.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		---------- Fraction of Time in Flow Class ----------								
MH01-02	1.00	0.01	0.00	0.00	0.17	0.00	0.00	0.82	0.03	0.00
MH02-03	1.00	0.01	0.00	0.00	0.28	0.00	0.00	0.71	0.10	0.00
MH03-04	1.00	0.01	0.03	0.00	0.96	0.00	0.00	0.00	0.20	0.00
MH04-05	1.00	0.01	0.39	0.00	0.60	0.00	0.00	0.00	0.54	0.00
MH05-06	1.00	0.01	0.00	0.00	0.49	0.00	0.00	0.50	0.02	0.00
MH06-SWMF	1.00	0.01	0.00	0.00	0.53	0.00	0.00	0.47	0.01	0.00
MH07-06	1.00	0.01	0.01	0.00	0.48	0.00	0.00	0.50	0.08	0.00
MH08-07	1.00	0.01	0.14	0.00	0.86	0.00	0.00	0.00	0.63	0.00
MH09-08	1.00	0.01	0.00	0.00	0.26	0.00	0.00	0.73	0.09	0.00
MH10-09	1.00	0.01	0.00	0.00	0.17	0.00	0.00	0.82	0.03	0.00
MH11-02	1.00	0.83	0.00	0.00	0.17	0.00	0.00	0.00	0.81	0.00
MH11-09	1.00	0.81	0.01	0.00	0.17	0.00	0.00	0.00	0.81	0.00
MH12-08	1.00	0.01	0.00	0.00	0.24	0.00	0.00	0.76	0.09	0.00
MHoutlet-Drain	1.00	0.01	0.00	0.00	0.45	0.54	0.00	0.00	0.57	0.00
MS01	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS02	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS03	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS04	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS05	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS06	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS07	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS08	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS09	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS10	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS11	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS12	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS13	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS14	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS15	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS16	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS17	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS18	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS19	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS20	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS21	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS22	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS23	1.00	0.04	0.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
MH01-02	2.39	2.39	5.41	0.01	0.01
MH02-03	5.41	5.41	8.34	0.01	0.01
MH03-04	8.34	8.34	11.89	0.01	0.01
MH04-05	11.89	11.89	12.64	0.01	0.01
MH05-06	12.64	12.64	13.52	0.01	0.43
MH06-SWMF	13.39	13.40	14.09	0.01	0.63
MH07-06	10.42	10.42	13.52	0.01	0.01
MH08-07	8.35	8.35	10.42	0.01	0.01
MH09-08	5.36	5.36	8.31	0.01	0.01

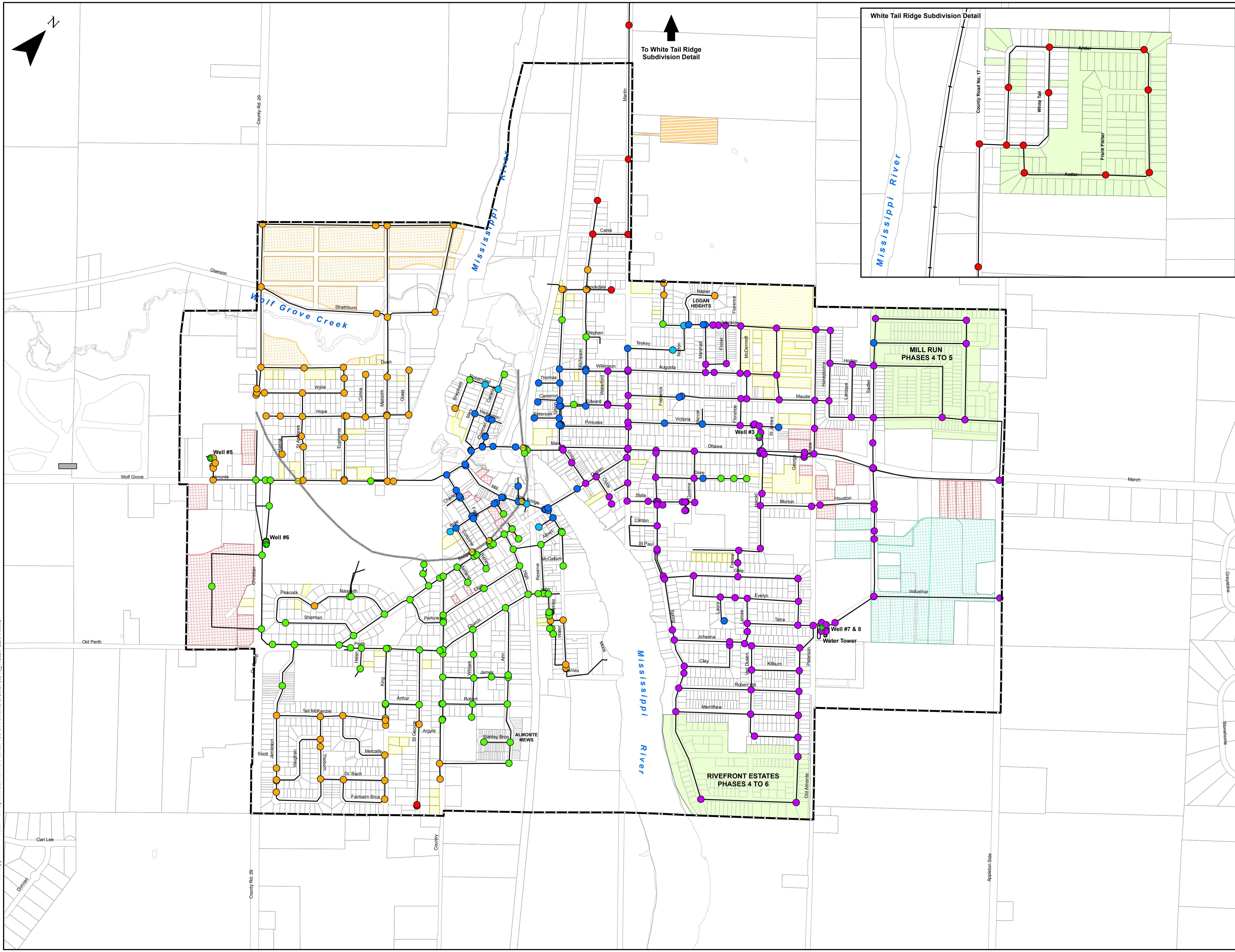
```
MH10-09                     2.29      2.29      5.41      0.01         0.01
MH11-02                     2.81      2.81      5.41      0.01         0.01
MH11-09                     2.81      2.81      5.41      0.01         0.01
MH12-08                     4.82      4.82      8.35      0.01         0.01
MHoutlet-Drain              0.01      0.01      0.14      0.18         0.01


Analysis begun on:  Tue Apr 16 14:13:32 2024
Analysis ended on:  Tue Apr 16 14:13:35 2024
Total elapsed time: 00:00:03
```

APPENDIX F

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

- Master Plan Update Report Figures 11, 12, 13, 14, 25



Max Day + Fire Flow

- < 32 L/s
- 33 to 50 L/s
- 51 to 67 L/s
- 68 to 75 L/s
- 76 to 100 L/s
- 100 to 300 L/s

Infrastructure

- Pressure Reducing Valve
- Well
- Water Tower
- Pressure Zone
- Watermain

Land Use

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

No.	ISSUE / REVISION	DD/MM/YY

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

SCALE: 0 50 100 200 300 400 Meters

CLIENT:

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

CONSULTANT:

PROFESSIONAL STAMP

PROFESSIONAL STAMP

PROJECT:

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

MISSISSIPPI MILLS, ONTARIO

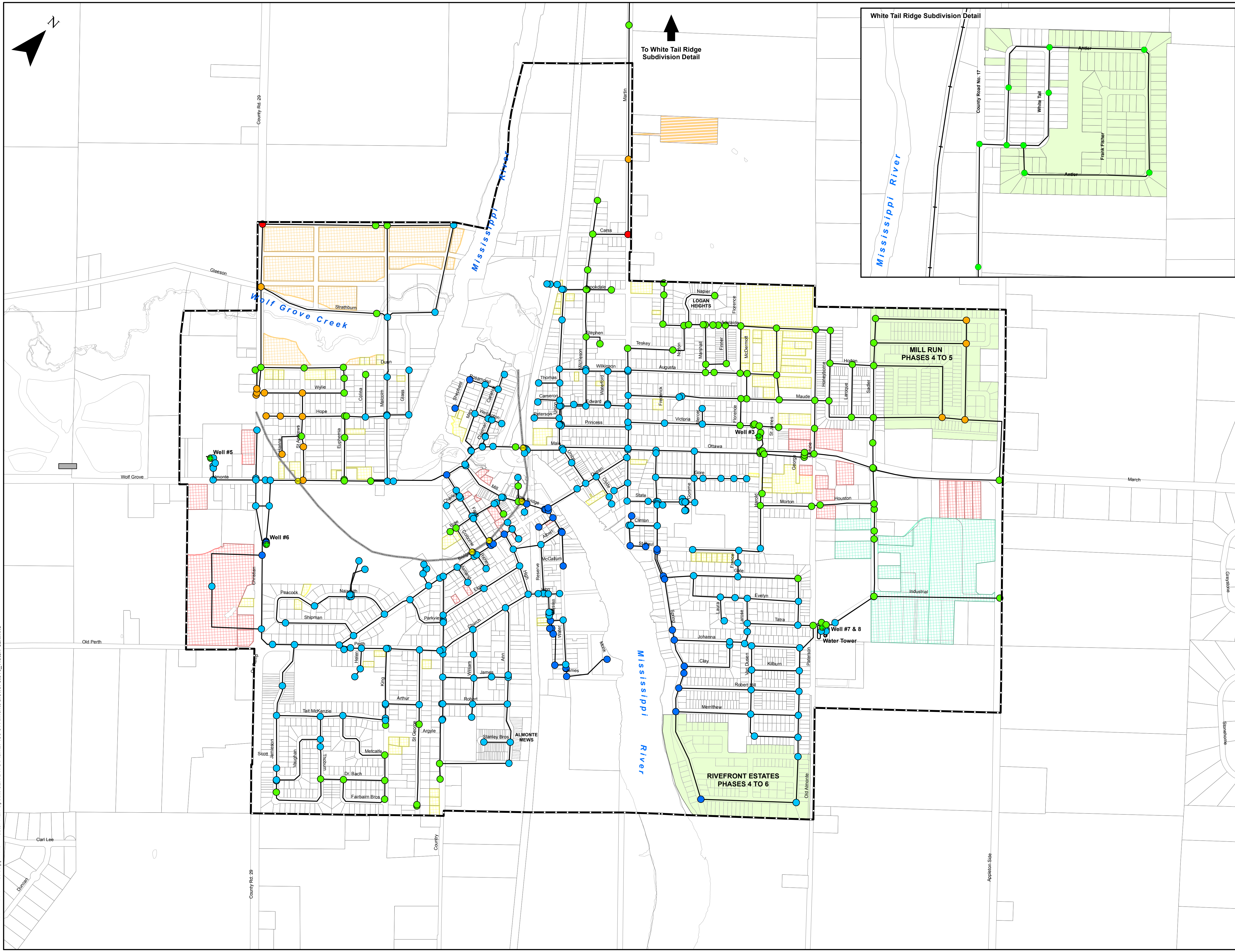
DRAWING:

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

DESIGN:	MB	DRAWING #:	
DRAWN:	KTK		
CHECKED:	SG		**FIGURE 11**
JLR #:	27456-01		

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

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 AlmonteGrowth 5to10_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
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Business Park (17.0 ha)
- Commercial (15.6 ha)
- Residential - Geenfield (14.2 ha)
- Residential - Infill (16.0 ha)

No.	ISSUE / REVISION	DD/MM/YY

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

SCALE: 0 50 100 200 300 400 Meters

CLIENT:

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PROFESSIONAL STAMP

PROJECT:

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

MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WATER SYSTEM 5 TO 10 YEARS (2023 TO 2028) PEAK HOUR

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

DRAWING #: **FIGURE 12**

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

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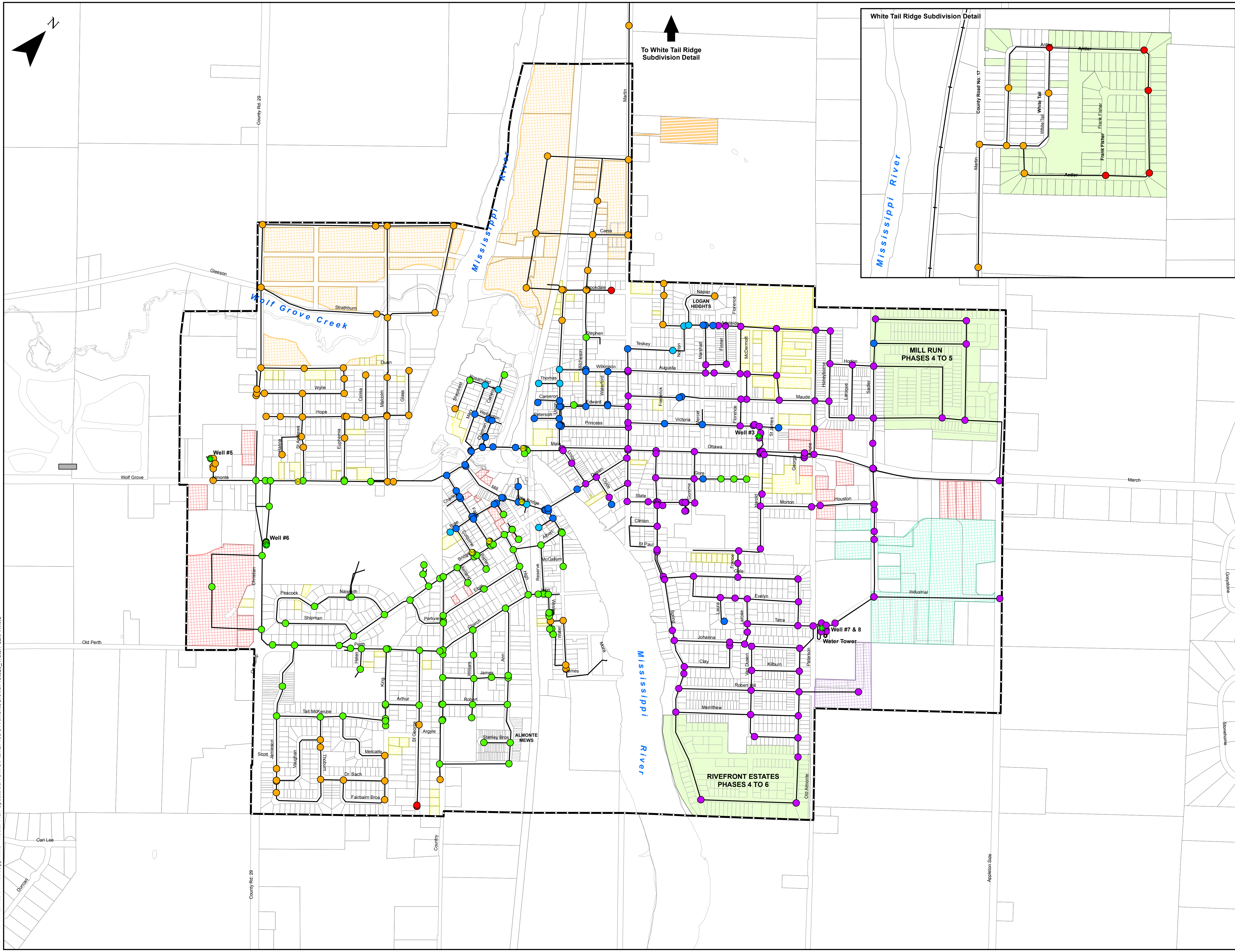

No.	ISSUE / REVISION	DD/MM/YY

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

SCALE: 0 50 100 200 300 400 Meters

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PROJECT:

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

MISSISSIPPI MILLS, ONTARIO

DRAWING:

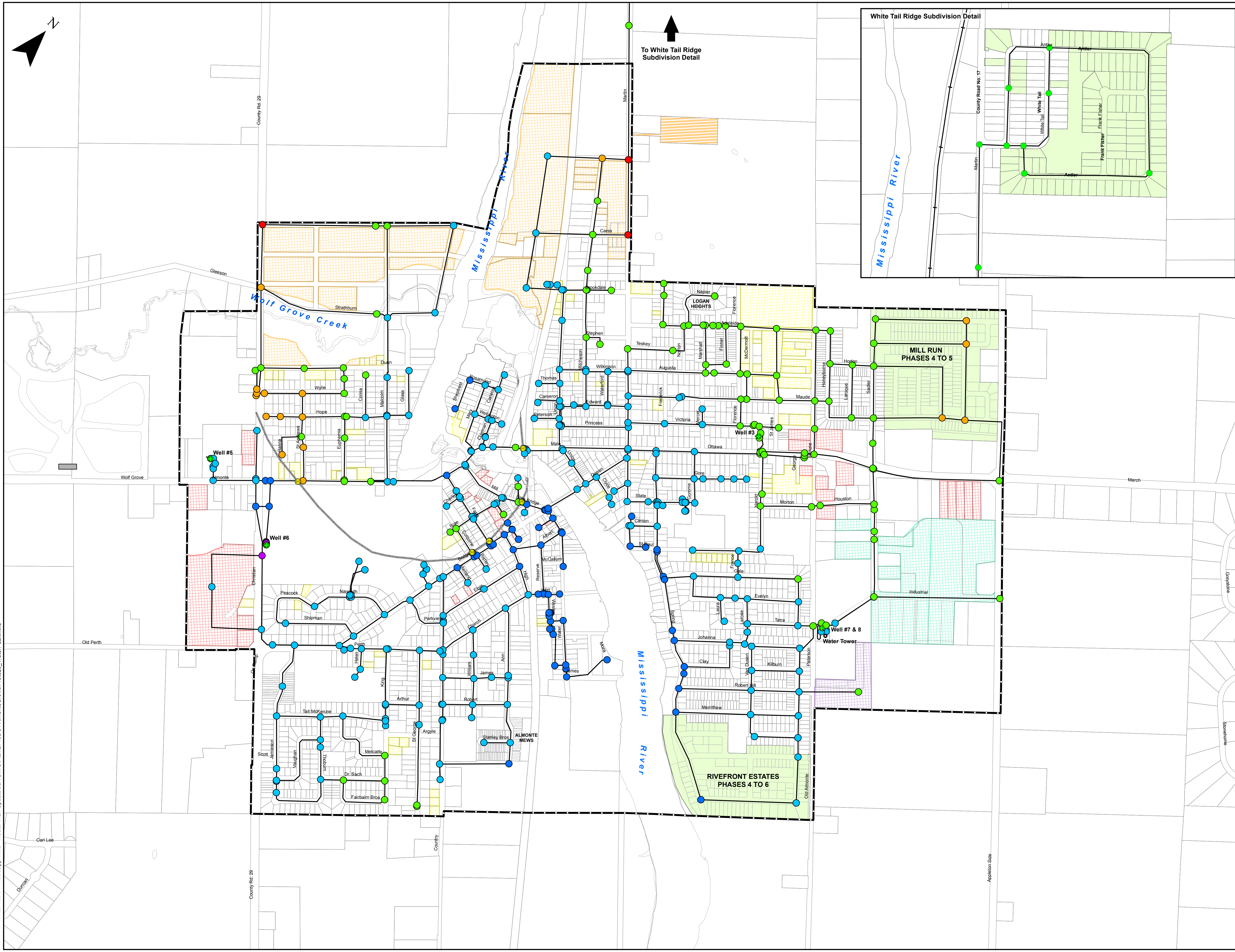
ALMONTE WARD WATER SYSTEM 10 TO 20 YEARS (2029 TO 2037) MAX DAY DEMAND / FIRE FLOW

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

DRAWING #: **FIGURE 13**

PLOT DATE: January 5, 2018 8:58:10 AM

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 AlmonteGrowth 10to20_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
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Business Park (17.0 ha)
- Community Facility (3.1 ha)
- Commercial (15.6 ha)
- Residential - Geenfield (34.2 ha)
- Residential - Infill (16.0 ha)

No.	ISSUE / REVISION	DD/MM/YY

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

SCALE: 0 50 100 200 300 400 Meters

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PROJECT:

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

MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WATER SYSTEM 10 TO 20 YEARS (2029 TO 2037) PEAK HOUR

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

DRAWING #: **FIGURE 14**

PLOT DATE: January 5, 2018 8:59:35 AM

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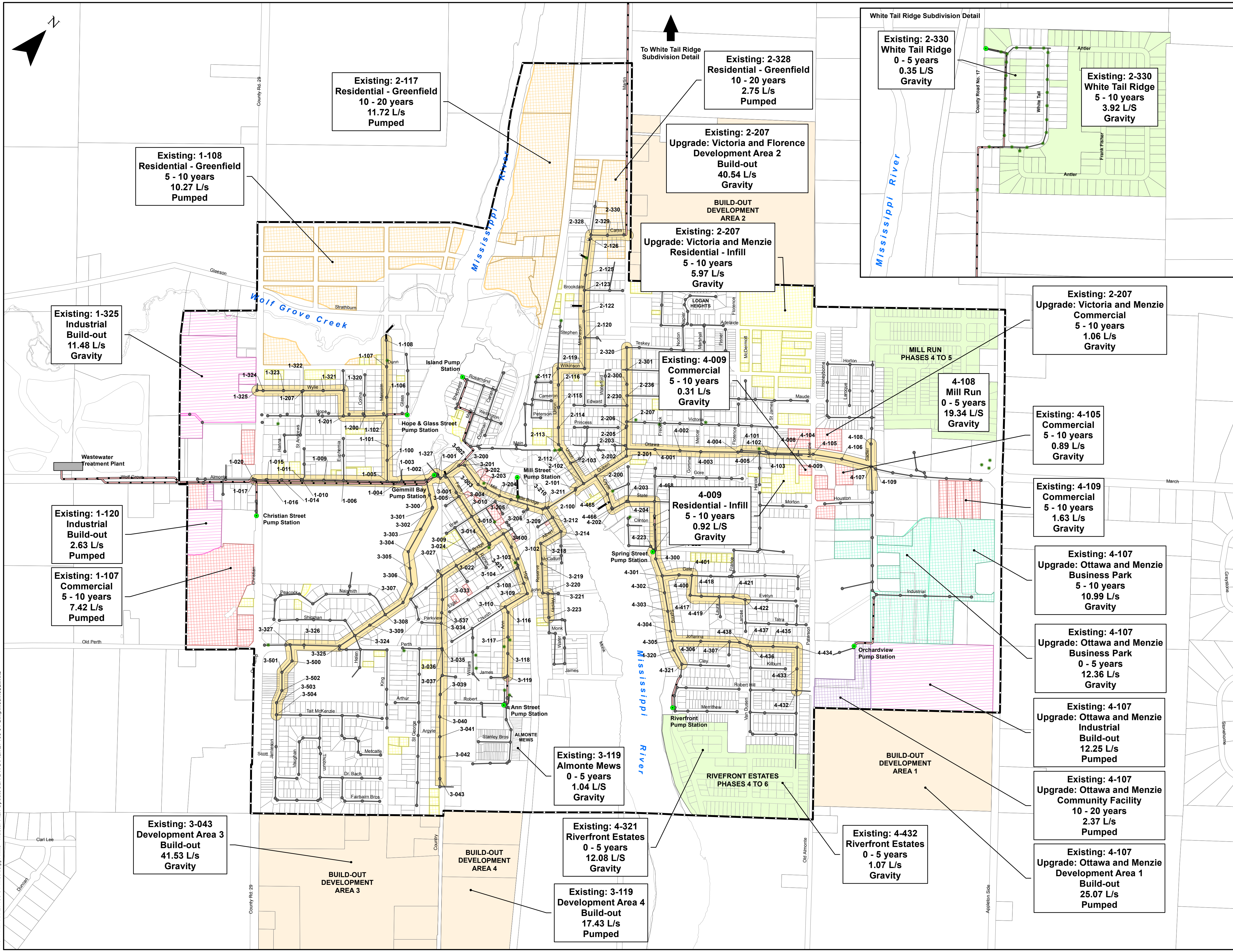

Infrastructure
- 4-102 Manhole ID
- Pumping Station
- Cleanout
- Sanitary Manhole
- Sanitary Sewer
- Private Forecmain
- Forcemain
- Sanitary Trunk Sewers

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

No.	ISSUE / REVISION	DD/MM/YY

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

SCALE: 0 50 100 200 300 400 Meters

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

CONSULTANT:

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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
CHECKED: SG
JLR #: 27456-01
DRAWING #: **FIGURE 25**

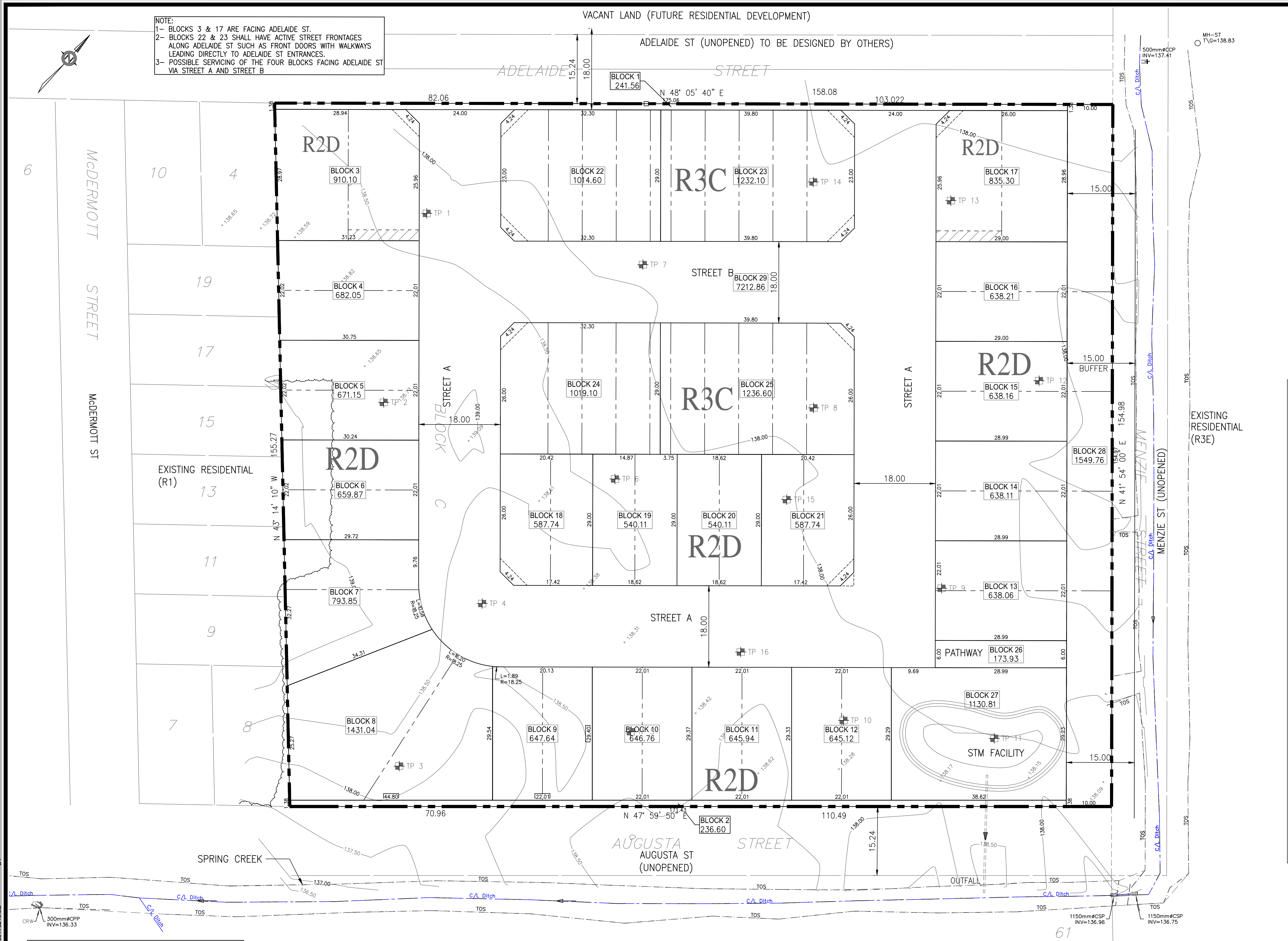
PLOT DATE: January 5, 2018 10:32:24 AM

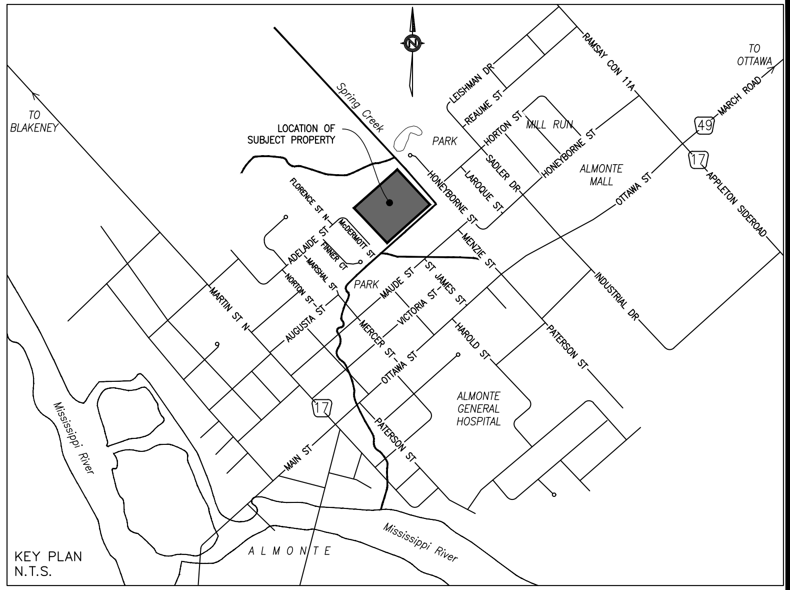
File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 SimplifiedModel.mxd

APPENDIX G

Menzie Enclaves Subdivision Drawing

- Menzie Enclaves Draft Plan of Subdivision Option 3 (DP-1, rev2), prepared by Advance Engineering – March 2024





0 6.2 12 25
1:400 Metres

SURVEY LEGEND

	Denotes	
	"	Survey Monument Planted
	"	Survey Monument Found
SIB	"	Standard Iron Bar
SSIB	"	Short Standard Iron Bar
IB	"	Iron Bar
CC	"	Cut Cross
CP	"	Concrete Pin
IBø	"	Round Iron Bar
S&W	"	Spike & Washer
SSIB*	"	Short Standard Iron Bar
IB*	"	Iron Bar
(WIT)	"	Witness
Meas.	"	Measured
(AOG)	"	Annis, O'Sullivan, Vollebekk Ltd.
(P1)	"	Plan
(P2)	"	Plan
(P3)	"	Plan
	"	Deciduous Tree
	"	Coniferous Tree
MH–ST	"	Maintenance Hole (Storm Sewer)
MH	"	Maintenance Hole (Unidentified)
CB	"	Catch Basin
CSP	"	Corrugated Steel Pipe
CPP	"	Corrugated Plastic Pipe
CCP	"	Concrete Pipe
BOS	"	Bottom of Slope
CRW	"	Concrete Retaining Wall
T/G	"	Top of Grate
FH	"	Fire Hydrant
+65.00	"	Location of Elevations
+65.00	"	Top of Wall Elevation
C/L	"	Centreline

NOTES:
– DISTANCES ARE IN METRE. TO CONVERT TO FEET DIVIDE BY 0.3048.
– PROPOSED 1.5m SIDEWALK ON ONE SIDE OF THE STREETS.
– CHAIN–LINK FENCES SHALL BE INSTALLED ON EITHER SIDE OF THE PUBLIC WALKWAYS AND SURROUNDING THE STORMWATER FACILITY
– WATERMAIN, SANITARY SEWERS AND OTHER UTILITIES HAVE BEEN IDENTIFIED ALONG ADELAIDE ST AND FINNER CT.

DRAFT PLAN OF SUBDIVISION OF
PARK LOT 2, BLOCK C, HENDERSON SECTION,
AND
LOTS 1 TO 25 INCLUSIVE, PARK BLOCK C, McLEAN SECTION,
AND
ALFRED STREET
AND
ALEXANDRA STREET
REGISTERED PLAN 6262
FORMER TOWN OF ALMONTE
MUNICIPALITY OF MISSISSIPPI MILLS
COUNTY OF LANARK

No.	REVISION / ISSUE	DATE MM/DD/YY
2	RIPARIAN AREA ADDED AS A BLOCK	03/04/24
1	DRAFT PLAN APPROVAL – OPTION 3	10/02/23

PREPARED BY:
Mongi Mabrouk P.Eng.
Phone: 613-896-9170
Email: eng.services.ca@gmail.com
ADVANCE ENGINEERING

PROJECT NAME AND ADDRESS:
MENZIE ENCLAVES SUBDIVISION
ADELAIDE ST, ALMONTE, MISSISSIPPI MILLS, ONTARIO

APPLICANT:
ASH SHARMA
13165647 CANADA INC. (514-817-8265)
27 Queen Street East #407 Toronto, ON

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

DATED (ONTARIO LAND SURVEYOR)
ANNIS O'SULLIVAN VOLLEBEKK LTD.

OWNER'S CERTIFICATE
I, 13165647 CANADA INC., BEING THE REGISTERED OWNER, HEREBY AUTHORIZE ADVANCE ENGINEERING TO PREPARE AND SUBMIT THIS DRAFT PLAN OF SUBDIVISION TO THE COUNTY OF LANARK FOR REVIEW AND APPROVAL.

DATED FOR 13165647 CANADA INC.
ASH SHARMA

SUBJECT TO THE CONDITIONS, IF ANY SET FORTH IN MY LETTER
DATED ...., 202 ,
THIS DRAFT PLAN IS APPROVED BY THE COUNTY OF LANARK
UNDER SECTION 51 OF THE PLANNING ACT THIS .... DAY
OF ...., 202 .

KURT GREAVES – CAO
COUNTY OF LANARK

TITLE:
DRAFT PLAN OF SUBDIVISION OPTION 3

SCALE: 1:400
DRAWING No.: DP-1
DRAFTED BY:
PROJECT No.: 123
DATE: 03-04-2024

TABLE OF BLOCKS

BLOCK No.	AREA (m²)	DESCRIPTION
1	241.56	ADELAIDE ST WIDENING
2	236.60	AUGUSTA ST WIDENING
3	910.10	2 SEMI–DETACHED
4	682.05	2 SEMI–DETACHED
5	671.15	2 SEMI–DETACHED
6	659.87	2 SEMI–DETACHED
7	793.85	2 SEMI–DETACHED
8	1431.04	2 SEMI–DETACHED
9	647.64	2 SEMI–DETACHED
10	646.76	2 SEMI–DETACHED
11	645.94	2 SEMI–DETACHED
12	645.12	2 SEMI–DETACHED
13	638.06	2 SEMI–DETACHED
14	638.11	2 SEMI–DETACHED
15	638.16	2 SEMI–DETACHED

BLOCK No.	AREA (m²)	DESCRIPTION
16	638.21	2 SEMI–DETACHED
17	835.30	2 SEMI–DETACHED
18	587.74	2 SEMI–DETACHED
19	540.11	2 SEMI–DETACHED
20	540.11	2 SEMI–DETACHED
21	587.74	2 SEMI–DETACHED
22	1014.60	4 TOWNHOUSES
23	1232.10	5 TOWNHOUSES
24	1019.10	4 TOWNHOUSES
25	1236.60	5 TOWNHOUSES
26	173.93	6M PATHWAY / UTILITY
27	1130.81	STORMWATER FACILITY
28	1549.76	RIPARIAN AREA
29	7212.86	R–O–W–

ZONING TYPE	UNITS	AREA (ha)	RATIO LD & MD	DENSITY PER NET ha	REQUIRED DENSITY	TOTAL UNITS	DENSITY PER NET ha	DENSITY PER GROSS ha
MEDIUM DENSITY (TOWNHOUSES R3C)	18	0.4502	25.2%	40.0	30-40	56	31.3	19.70
LOW DENSITY (SEMI-DETACHED R2D)	38	1.3377	74.8%	28.4	15-30			
			100.0%					

TOTAL NET AREA (ha): 1.7879
TOTAL GROSS AREA (ha): 2.8425 Including R-O-Ws, Riparian and STM Facility

MEDIUM DENSITY (TOWNHOUSES)	18	32%
LOW DENSITY (SEMI)	38	68%

CONTENT REQUIRED UNDER SECTION 51 (17) OF THE PLANNING ACT, R.S.O.1990:

(17) The applicant shall provide the approval authority with the prescribed information and material and as many copies as may be required by the approval authority of a draft plan of the proposed subdivision drawn to scale and showing,

(a) the boundaries of the land proposed to be subdivided, certified by an Ontario land surveyor; AS SHOWN ON THE DRAFT PLAN.

(b) the locations, widths and names of the proposed highways within the proposed subdivision and of existing highways on which the proposed subdivision abuts; AS SHOWN ON THE DRAFT PLAN.

(c) on a small key plan, on a scale of not less than one centimetre to 100 metres, 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 and the relationship of the boundaries of the land to be subdivided to the boundaries of the township lot or other original grant of which the land forms the whole or part; AS SHOWN ON THE DRAFT PLAN.

(d) the purpose for which the proposed lots are to be used; RESIDENTIAL: SEMI–DETACHED AND TOWNHOUSE BLOCKS, ONE BLOCK FOR A STORMWATER MANAGEMENT FACILITY AND TWO BLOCKS FOR FUTURE ROAD EXTENSION AS SHOWN ON THE DRAFT PLAN.

(e) the existing uses of all adjoining lands; EXISTING RESIDENTIAL TO THE WEST, VACANT LAND TO THE NORTH AND RESIDENTIAL BEYOND SPRING CREEK EAST AND SOUTH AS SHOWN ON THE DRAFT PLAN.

(f) the approximate dimensions and layout of the proposed lots; AS SHOWN ON THE DRAFT PLAN.

(a.1) if any affordable housing units are being proposed, the shape and dimensions of each proposed affordable housing unit and the approximate location of each proposed affordable housing unit in relation to other proposed residential units; N/A

(g) natural and artificial features such as buildings or other structures or installations, railways, highways, watercourses, drainage ditches, wetlands and wooded areas within or adjacent to the land proposed to be subdivided; SPRING CREEK ON EAST AND SOUTH SIDE OF DEVELOPMENT AS SHOWN ON THE DRAFT PLAN. PROVIDE 15 m BUFFER FOR FISH HABITAT ALONG THE CREEK.

(h) the availability and nature of domestic water supplies; AVAILABLE VIA MUNICIPAL WATERMAIN AT ADELAIDE ST AND MENZIE ST.

(i) the nature and porosity of the soil; LAYER OF TOPSOIL AND/OR PEAT (0.1 TO 0.4 m) UNDERLAIN BY MARL (0.4 TO 0.8 m) AND/OR A GLACIAL TILL DEPOSIT (0.1 TO 0.7 m). BEDROCK AT DEPTHS RANGING BETWEEN 0.3 AND 1.1 m.

(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; AS SHOWN ON THE DRAFT PLAN.

(k) the municipal services available or to be available to the land proposed to be subdivided; SANITARY SEWER, WATER SUPPLY ARE AVAILABLE ACCORDING TO THE MUNICIPAL MASTER PLAN. BELL, HYDRO AND GAS ARE ALSO IN THE IMMEDIATE AREA and

(l) the nature and extent of any restrictions affecting the land proposed to be subdivided, including restrictive covenants or easements. 15 m SETBACK ALONG THE SPRING CREEK.