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3200 Reid's Lane Subdivision

Conceptual Servicing and Stormwater Management Report

Prepared for: Crestview Innovation Inc.

39 Years

Engineering excellence. Planning progress. Liveable landscapes.

CONCEPTUAL SERVICING AND STORMWATER MANAGEMENT REPORT

3200 REID'S LANE SUBDIVISION

CITY OF OTTAWA

Prepared by:

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

September 2021

Novatech File No.: 119089
Report Reference No.: R-2021-060

September 3, 2021

BY EMAIL

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

Attention: Ms. Cheryl McWilliams

Dear Ms. McWilliams

Re: Conceptual Servicing and Stormwater Management Report
Reid's Lane Subdivision
3200 Reid's Lane, Ottawa, ON
Our File No.: 119089

Please find enclosed the "*Conceptual Servicing and Stormwater Management Report – Reid's Lane Subdivision*" dated September 2021, prepared in support of an application for Draft Plan Approval.

A copy of this report should be forwarded to the Rideau Valley Conservation Authority as part of the City's Draft Plan of Subdivision circulation.

Yours truly,

NOVATECH

L Bowley.

Lisa Bowley, P. Eng.
Project Manager | Land Development Engineering

Encl.

cc: Crestview Innovation Inc.

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867
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MODELLING FILES

Available upon request: Stormwater Management Modelling Files (PCSWMM)

1.0 INTRODUCTION

Novatech has been retained to provide a conceptual servicing and stormwater management report in support of an application for Draft Plan Approval for the proposed Reid's Lane subdivision.

1.1 Purpose

This report outlines the approach to servicing the development with regards to water supply, sanitary disposal, storm drainage and stormwater management.

A pre-consultation meeting was held with the City of Ottawa in May 2019. Pre-consultation notes (May 16, 2019 and May 28, 2019) are included in **Appendix A** for reference.

1.2 Site Location and Description

The Subject Property is located in the City of Ottawa. The subdivision lands are legally described as Part of Lots 27 & 28, Concession 1, Osgoode, and Part of Lots 50 & 51, Registered Plan 393, Ottawa. The property includes a portion of an adjacent eastern parcel that has been used historically as an informal walking trail connecting Osgoode Main Street and Lombardy Drive. The adjacent eastern parcel is legally described as Part of Lot 28, Concession 1, being parts 3 and 4 on Plan 5R1527, Osgoode. Refer to **Figure 1** for the site location.

The subdivision has approximately 22metres of frontage along Lombardy Drive, and an approximate area of 3.54hectares (8.75acres). The property is vacant and located north of residential properties fronting onto Osgoode Main Street. Refer to **Figure 2** for existing site conditions.

1.3 Additional Reports

This report should be read in conjunction with the following reports:

- Tree Conservation Report and Environmental Impact Statement prepared by Muncaster Environmental Planning Inc., dated April 30, 2020;
- Terrain Analysis and Hydrogeological Investigation prepared by Kollaard Associates., dated September 2021.

2.0 SITE SERVICING

The proposed development would extend Lombardy Drive approximately 230m from the existing cul-de-sac and would create seven residential lots approximately 0.4ha (1 acre) in size. The proposed lots would front onto a proposed internal roadway (Lombardy Drive extension). Refer to Preliminary Grading Plan **(119089-PGR)** for the Typical Road Cross-Section of the proposed internal roadway.

The proposed lot layout is shown on the Draft Plan of Subdivision included with this report.

2.1 Grading and Drainage

On-site grading would be minimized, as only the right-of-way and areas surrounding the houses and septic systems would be graded. The remainder of the site would be left at existing grade wherever possible. This would minimize the disturbance to the natural landscape and would reduce the impact of topsoil erosion and soils compaction, which in turn would minimize the construction related impact on infiltration, downstream erosion and sediment loading.

Preliminary road grades are shown on the Preliminary Grading Plan (**119089-PGR**).

2.2 Water Supply and Sewage Disposal

The proposed residential lots would be serviced by individual drilled wells. Discussion of the water supply is provided in the Terrain Analysis and Hydrogeological Investigation prepared by Kollaard.

Sanitary servicing for the proposed residential dwellings would be provided by individual on-site septic systems. Preliminary septic system locations and discussions regarding construction of the septic systems have been provided in the Terrain Analysis and Hydrogeological Investigation. Applications for approvals of the septic systems would be made by individual homeowners at the building permit stage.

Conceptual locations of the well and septic systems are shown on the Lot Development Plan provided in the Kollaard report, for all proposed lots within the subdivision.

3.0 STORMWATER MANAGEMENT CRITERIA

The following criteria will be applied to the stormwater management analysis and conceptual design.

Water Quantity

- Control post-development peak flows to pre-development levels.

Conveyance

- Road and driveway culverts are to be designed to convey the anticipated post-development peak flows:
  - Road crossing culverts are to have a minimum size of 600mm and are to be sized for the 10-year event.
  - Driveway culverts are to have a minimum size of 400mm and are to be sized for the 5-year event.
- Storm drainage is to be provided using roadside ditches and side/rearyard drainage swales:
  - Storm runoff for all storms up to and including the 100-year event is to be confined within the right-of-ways or within defined drainage easements.

Water Quality

- Implement lot level and conveyance Best Management Practices.
- Provide an *Enhanced* level of water quality protection, corresponding to a long-term average total suspended solid (TSS) removal rate of 80%.

Flood Protection

- Ensure the proposed residential lots are adequately protected from surface flooding during the 100-year storm event.
- Ensure there are no adverse surface flooding effects on existing downstream residential lots during the 100-year storm event.

Erosion and Sediment Control

- Provide temporary and permanent erosion and sediment control measures prior to, during and after construction.

4.0 STORMWATER MANAGEMENT DESIGN

Pre-development and Post-development drainage areas were developed to assess the stormwater management design requirements for the subject site. The Storm Drainage Area Plan (**119089-STM**) shows the catchment areas for both pre and post-development conditions.

As described by Kollaard, the soils on the site consist of topsoil underlain by fine to medium grained sand overlying silty clays or glacial tills.

Pre-development conditions

Under Pre-development conditions, all storm runoff from the site is tributary to the Doyle Municipal Drain and ultimately the Rideau River.

- Area EX-1 drains to the existing Osgoode Link Pathway.
- Area EX-2 drains to Lombardy Drive.

Storm runoff from both catchment areas (EX-1 and EX-2) is conveyed north by existing drainage ditches to the main branch of the Doyle Municipal Drain.

Post-development conditions

To provide a legal outlet for the drainage, the developed area of the subdivision will drain to Lombardy Drive under post-development conditions. The area draining to Lombardy Drive will be increased by approximately 1.73ha, and the area to the Osgoode Link Pathway will be reduced by the same amount.

4.1 Model Parameters

The time of concentration for each drainage area was calculated using the Uplands Overland Flow Method. Weighted curve numbers have been calculated for each drainage area. The times of concentration, curve numbers and initial abstraction values are summarized in **Table 1**. The curve numbers are shown on the Storm Drainage Area Plan.

Table 1 – Weighted Curve Numbers

Area ID	Area (ha)	Time of Concentration (min)	CN	I_a
Pre-Development				
EX-1	3.31	16	72	9.8
EX-2	1.44	15	74	9.0
Post-Development				
A	1.71	10	74	9.2
B	0.58	10	72	10.1
C	0.75	10	77	8.2
D	0.52	10	72	10.1
EX-1	0.23	10	81	6.0
EX-2	0.48	10	83	5.2
EX-3	0.48	10	81	6.0

4.2 Water Quantity Control

Under post-development conditions, the total peak flow leaving the site will be controlled by using the storage available in the proposed roadside ditches, with a flow control structure at the outlet from the subdivision towards Lombardy Drive. The drainage areas and flows to the Osgoode Link Pathway will be reduced to less than existing levels and no stormwater quantity control are required for these areas. The drainage areas and flows to Lombardy Drive will increase and are discussed below.

Peak flows for both pre and post-development conditions were evaluated using the PCSWMM model. Storm runoff from the subdivision will increase under post-development conditions due to an increase in imperviousness (i.e. roads, houses and driveways).

Refer to **Appendix B** for supporting stormwater management calculations and model output. PCSWMM modelling files are available upon request with this submission.

<u>Peak Flows</u>

Pre and post-development peak flows are summarized in **Table 2**:

- The 12-hour SCS storm event generated larger peak flows for both pre and post-development conditions, and required the maximum storage within the roadside ditches.
- The sizing of the flow control structure was governed by the 24-hour SCS storm event.

Table 2 demonstrates that the combined flow to the Osgoode Link Pathway and Lombardy Drive will be controlled to pre-development levels for all storm events with the exception of the 25mm water quality event. For the 25mm event, the model results indicate an increase of approximately 8 L/s under post-development conditions. This increase in flow is negligible and would have no adverse impacts on quantity control. Refer to **Section 4.3** for additional details on water quality treatment.

Table 2 – Peak Flows (L/s)

Storm Distribution->		3hr Chicago				12hr SCS			24hr SCS		
Return Period->		**25mm**	**2yr**	**5yr**	**100yr**	**2yr**	**5yr**	**100yr**	**2yr**	**5yr**	**100yr**
Osgoode Link Pathway	*Pre*	15	37	84	278	59	113	307	52	92	230
	Post	13	29	61	192	40	72	182	31	53	124
Lombardy Drive	*Pre*	8	20	43	137	30	56	147	25	44	107
	Post [1]	19	28	36	187	32	39	241	32	39	211
Total	*Pre*	23	57	128	415	89	169	454	77	137	337
	Post	31	57	97	379	72	112	422	63	92	335

[1] Controlled Flow

Storage and Outlet Structure

The conceptual PCSWMM model indicates that the proposed roadside ditches would provide sufficient storage to contain the runoff from all storms up to and including the 100-year event, and that post-development peak flows are controlled by the downstream outlet structure.

The outlet structure would be located on downstream end of the roadside ditches where the proposed subdivision connects to existing Lombardy Drive. A cross-culvert is proposed at the downstream end of the site to equalize flows between the east and west roadside ditches.

The conceptual design for the flow control structure consists of a single ditch inlet catchbasin with a controlled outlet (small diameter pipe or orifice) to control outflows during smaller storm events. Engineered overflow points (weirs) on both the east and west ditches will provide control for the larger storm events. The locations for the structure are shown on the Preliminary Grading Plan and the specific design of each structure would be established during detailed design.

In addition to the proposed control structure, Best Management Practices (BMPs) and Low Impact Development (LIDs) practices (refer to **Section 4.6**) could further reduce the post-development runoff. These practices are not typically modelled during the conceptual design stage but could be added to the modelling during detailed design.

Downstream Impacts

Under pre-development conditions, storm runoff from the site areas draining towards Lombardy Drive is collected primarily in the west roadside ditch at the existing cul-de-sac in the northeast corner of the site. The 100-year peak flow to the west ditch is approximately 147 L/s.

Based on the conceptual SWM design, there would be an increase in flow to Lombardy Drive under post-development conditions. The 12-hour SCS storm event would generate an additional 94 L/s to Lombardy Drive compared to pre-development conditions. The proposed control structure would split the 100-year flows from the site between the east and west ditches, 127 L/s and 114 L/s, respectively.

The capacity of the downstream culverts on Lombardy Drive were estimated to determine if there would be issues downstream of the outlet. The size and maximum head through the downstream culverts were estimated to determine the approximate capacity. Nomographs show that the downstream culverts should be able to convey 180 L/s (refer to **Appendix B**), which is more than the 100-year peak flows from the development. The capacity of the downstream ditches and culverts would be investigated in more detail at the detailed design stage.

4.3 Water Quality Control

The Rideau Valley Conservation Authority has indicated that an *Enhanced* level water quality control (corresponding to a long-term average TSS removal rate of 80%) is required for this subdivision. Quality control for the right-of-way and the front yard areas of the residential units would be provided by a combination of lot level "Best Management Practices" (BMPs) and conveyance controls.

Lot level BMPs would include minimizing grade changes on the lots, minimizing the disturbed area on each lot and encouraging builders to direct roof leaders to grassed areas. These practices would promote infiltration and reduce surface runoff.

Grassed Swale Design Criteria

The roadside ditches would be designed as water quality swales, using criteria outlined in section 4.5.9 of the "*Stormwater Management Planning and Design Manual*" (MOE, March 2003). The design criteria used is summarized in **Table 3**.

Table 3 – Water Quality Design Criteria for Grassed Swales

Criteria	**Recommended**
Drainage Area	< 2.0 ha
Channel Slope	< 4.0%
Bottom Width	> 0.75 m
Side Slopes (H:V)	> 2.5:1
25mm Event (Water Quality)	
Velocity	< 0.5 m/s

Although grassed ditches and swales are generally used for the conveyance of storm water, under the appropriate conditions they permit significant amounts of total suspended solid (TSS) removal. Grassed ditches are effective for treatment when the bottom width is maximized while the depth of flow and channel slope is minimized.

Grassed Swale Design (Roadside Ditches)

All ditches projected to drain the roadway and upstream external areas meet the criteria listed in **Table 3**. The PCSWMM model results indicate that the peak flows generated by the 25mm storm event (water quality event) would have a maximum velocity less than 0.5m/s in the ditches.

The MOE Manual states that "*Grassed swales are most effective for stormwater treatment when depth of flow is minimized, bottom width is maximized (≥ 0.75 m) and channel slope is minimized (e.g., ≤ 1%)*". The depth of flow in the ditches during the 25mm event would range from 0 to 0.22m. Most of the ditches would have a flow depth of less than 0.1m. The larger flow depths would occur at the upstream side of driveway culvert crossings and at the proposed flow control structure. The ditch bottom width would be 1.0m and the channel slope would be 0.5%.

Water quality calculations for each ditch would be provided as part of the detailed design submission. The conceptual model results demonstrate that it would be feasible to design the proposed ditches and swales to provide an *Enhanced* level of water quality treatment for the site.

Maintenance and Effectiveness

Case studies on the effectiveness of grassed ditches and swales for water quality control have provided variable results, which precludes the ability to precisely calculate pollutant removal efficiencies. However, the above referenced publications indicate that properly designed grassed channels can provide in excess of 80% long-term TSS removal, which will meet the requirements for an *Enhanced* level of quality control as per the MOE guidelines.

Both dry and wet swales demonstrate good pollutant removal, with dry swales providing significantly better performance for metals and nitrate. Dry swales typically remove 65 percent of total phosphorus (TP), 50 percent of total nitrogen (TN), and between 80 and 90 percent of metals. Wet swale removal rates are closer to 20 percent of TP, 40 percent of TN, and between 40 and 70 percent of metals. The total suspended solids (TSS) removal for both swale types is typically between 80 and 90 percent.[1]

The majority of contaminants would come from the right-of-way. Storm runoff from grassed areas typically does not require any quality treatment. The site grading and drainage system would be designed to minimize the drainage area to the roadside ditches and individual outlets to provide the requisite level of treatment. Treatment is based on the flow characteristics of the water quality storm event (the 25mm storm), namely the flow depth and velocity. The other recommended criteria in **Table 3** form recommended physical characteristics for a given swale based on a 35% catchment area imperviousness to achieve those flow characteristics. So, while some of the physical criteria such as the recommended maximum drainage area may not be met, the key flow criteria would be shown to be met as part of the detailed design. It is equally worth noting that the proposed site is substantially less impervious than the 35% which was used to populate the recommended physical design criteria for the grassed swale, therefore, TSS loading is anticipated to be quite low.

4.4 Flood Protection

The following items would be evaluated at the detailed design stage:

- The proposed roadside ditches/easements would be designed to convey runoff for storm events up to and including the 1:100 year event.
- Road and driveway culverts would be sized to minimize potential flooding of private property for all storms up to the 1:100 year event.
- All required quantity control storage would be provided in the roadside ditches and would be confined in the right-of-way and/or adjacent easements.
- Terrace elevations would be set a minimum of 0.3m above the 1:100year ponding elevation.

[1] *Stormwater Best Management Practices in an Ultra-Urban Setting: Selection and Monitoring (FHWA, 1996) http://www.fhwa.dot.gov/environment/ultraurb/3fs10.htm*

4.5 Erosion and Sediment Control

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). These measures are generally in conformance with the recommendations from the Environmental Impact Statement. An Erosion and Sediment Control drawing would be prepared at the detailed design stage.

4.5.1 Temporary Measures

- Installing silt fences;
- Installing a chain of rock flow checks at the outlet(s) from the site; and
- Conducting regular street sweeping once the roads are completed.

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

4.5.2 Permanent Measures

- Swales and roadside ditches constructed at minimum grade, where possible;
- Seeding disturbed areas and establishing grass growth; and
- Roadside ditches acting as water quality swales.

4.6 Best Management Practices and Low Impact Development

In addition to stormwater management measures designed to meet the quantity and quality control criteria for the subdivision, additional best management practices (BMPs) and low impact development practices (LIDs) should be considered where feasible. Lot-level and conveyance stormwater BMPs and LIDs can potentially increase infiltration throughout the site, and help to preserve the natural hydrologic cycle, recharge groundwater reserves, reduce runoff volumes and peak flows, and further promote the removal of pollutants from the site.

Most LIDs require periodic inspection and maintenance. As such, the selection of appropriate LIDs requires careful consideration of site conditions (soil type, groundwater table, existing and proposed land use, maintenance requirements) to ensure they will provide a long-term benefit to the proposed development.

The preliminary geotechnical investigation shows that there is a shallow depth to groundwater, making BMPs and LIDs unlikely to infiltrate effectively. BMPs and LIDs could still provide some infiltration and runoff improvements to the proposed development. The evaluation and selection of LIDs would be further refined during the detailed design process.

Maintenance of LID infrastructure in right-of-way would be the responsibility of the City, while LIDs and BMPs on private property would be the responsibility of the homeowner.

5.0 WATER BALANCE

The proposed subdivision will consist of residential estate lots. Proposed BMPs and LIDs are discussed in **Section 4.6**.

By implementing infiltration BMPs and LIDs as part of the storm drainage design, the impacts of development on the hydrologic cycle can be considerably reduced. In addition, infiltration of clean runoff will also benefit the stormwater management. There are currently no infiltration targets set for the site. A water budget was performed which is included in **Appendix C**. The water budget estimates the post-development annual infiltration will be 152mm, which is a 23mm decrease from the existing conditions estimate of 175mm. The water budget calculations are solely based on land use and do not take into account BMPs or infiltration measures implemented within the proposed development. The evaluation and selection of BMPs and LIDs would be investigated during the detailed design process.

6.0 CONCLUSIONS

The conclusions are as follows:

- Servicing for residential dwellings would be provided by individual wells and septic systems.
- The quantity of stormwater would be controlled to pre-development levels for the site. Storage would be provided by the roadside ditches and the outlet control structure.
- Stormwater quality control measures would provide an Enhanced level of water quality protection, corresponding to a long-term average TSS removal rate of 80%, by means of flat-bottomed roadside ditches which would act as water quality swales.
- Flood protection would be provided with 100-year storm runoff being contained within the roadside ditches. Terrace elevations would be set a minimum of 0.3m above the 1:100year ponding elevation.
- Erosion and sediment control would be provided both during construction and on a permanent basis.
- Best management practices and low impact development practices would be considered as part of the detailed design.
- The water balance shows that the proposed development would result in a 23mm decrease in infiltration.

NOVATECH

Prepared by:

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Project Manager
Land Development Engineering

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Reviewed by:

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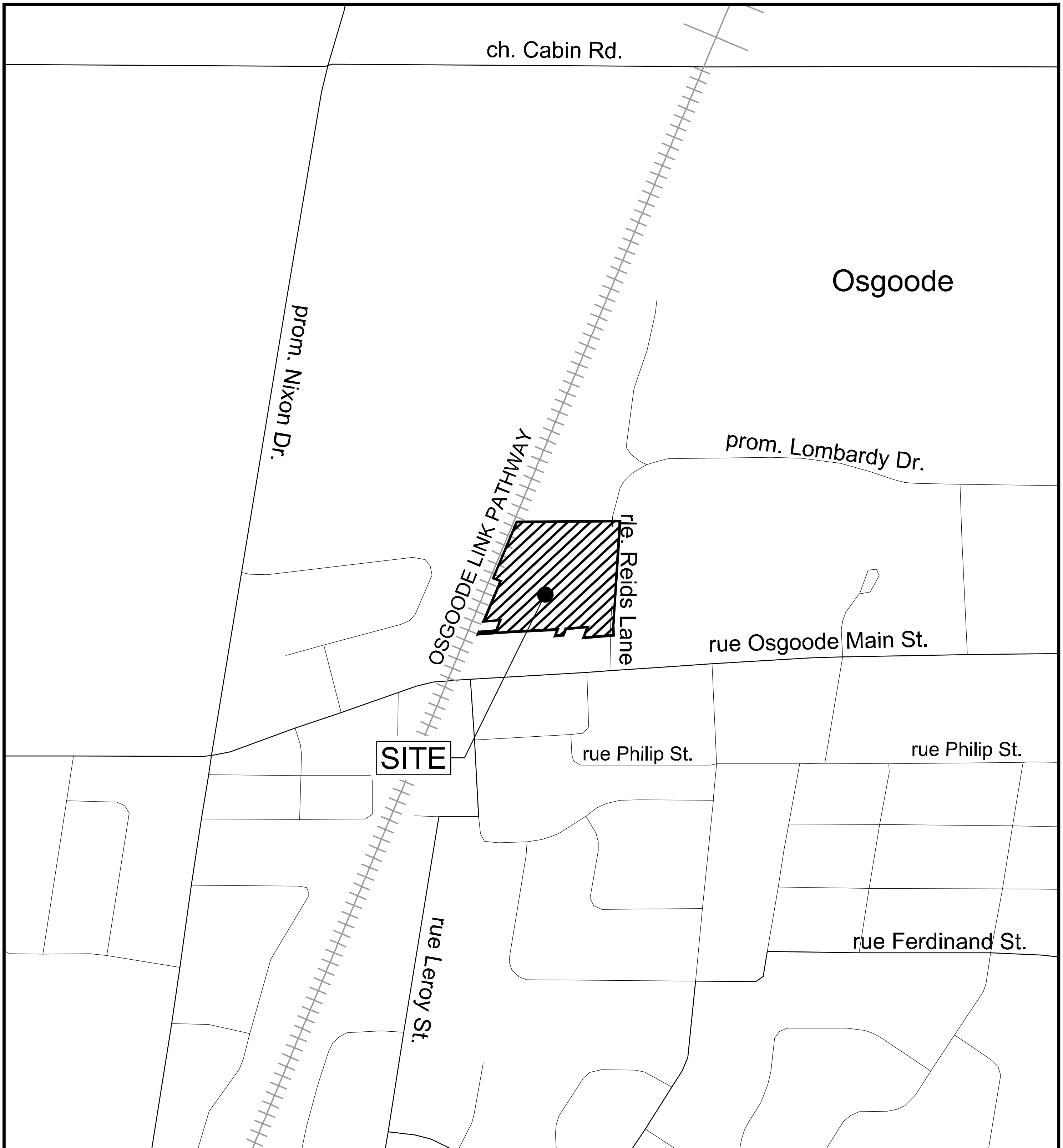
Director | Land Development



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REID'S LANE SUBDIVISION

KEY PLAN

SCALE 1 : 5000 (0, 50, 100, 150, 200)		
DATE SEP 2021	JOB 119089	FIGURE 1

SHT8X11.DWG - 216mmx279mm

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REID'S LANE SUBDIVISION

EXISTING CONDITIONS

SCALE 1 : 1250 (0 10 20 30 40 50)

DATE	JOB	FIGURE
SEP 2021	119089	2

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SHT11X17.DWG - 279mmX432mm

APPENDIX A

CORRESPONDENCE

Plan of Subdivision Pre-consultation

Meeting Date: May 16, 2019 & May 28, 2019

3200 Reid's Lane

Applicant: Novatech **Councillor** Eli El-Chantiry, Ward 5

Proposal Summary: To create a 7-lot residential subdivision and new road.

Attendees:

Murray Chown, Novatech
Susan Gordon, Novatech
Ryan Poulton, Novatech
Miles Yang, Owner
Cheryl McWilliams, Senior Planner, PIEDD, City of Ottawa
Harry Alvey, Project Manager, PIEDD, City of Ottawa
Amira Shehata, Transportation Engineer, PIEDD, City of Ottawa
Kersten Nitsche, Planner II, Parks and Facilities Planning, Recreation, Culture, and Facilities Department, City of Ottawa
Kevin Wherry, Manager, Parks and Facilities Planning, Recreation, Culture, and Facilities Department, City of Ottawa
Matthew Hayley, Environmental Planner, PIEDD, City of Ottawa
Seana Turkington, Planner, PIEDD, City of Ottawa

Meeting Minutes

May 16 Minutes

Proposal details

- Proposal to create 7 new residential lots via a Plan of Subdivision.
- There are 2 Concept Plans—Concept Plan 1 proposes encroaching onto City Parkland for the creation of a Right-of Way which starts at 26 metres and decreases to 20 metres as the road continues; Concept Plan 2 proposes an 18 metre Right-of-Way, with the road entirely contained on the subject site.
- The laneway which abuts the subject site is privately owned.

Planning (Provided by Cheryl McWilliams and Seana Turkington)

- Property designated Village on Schedule A of the Official Plan and is designated as Village Residential on the Land Use Schedule for the consolidated Villages Secondary Plan-Osgoode.
- Due to the lot configuration of abutting lots, it would be beneficial to consider lot line adjustments to the abutting lots. This would result in a more regular lot for the subject site; however, it would result in the loss of some land area for lots 4 through 7.
- Concerning a potential land swap for parkland in exchange for an extended pedestrian pathway.
- Concept Plan 1 has better connectivity with the Douglas Thompson Pathway, due to the proposed pathway between lots 3 and 4.
- The laneway to Osgoode Main currently has three properties with driveway access from the pathway. The pathway is also privately owned. If a pedestrian pathway were to be extended along this laneway, the existing driveways need to be taken into consideration.

Parks Planning Comments (Provided by Seana Turkington on behalf of Kersten Nitsche)

- Through the development application Parks will collect cash-in-lieu of parkland for this development.
- The cash-in-lieu of parkland amount will be calculated as the lesser of:

- One (1) hectare for every five hundred (500) dwelling units (pursuant to Section 42 of the *Planning Act*); or
- 10% of the value of the land as required by the Parkland Dedication By-law.

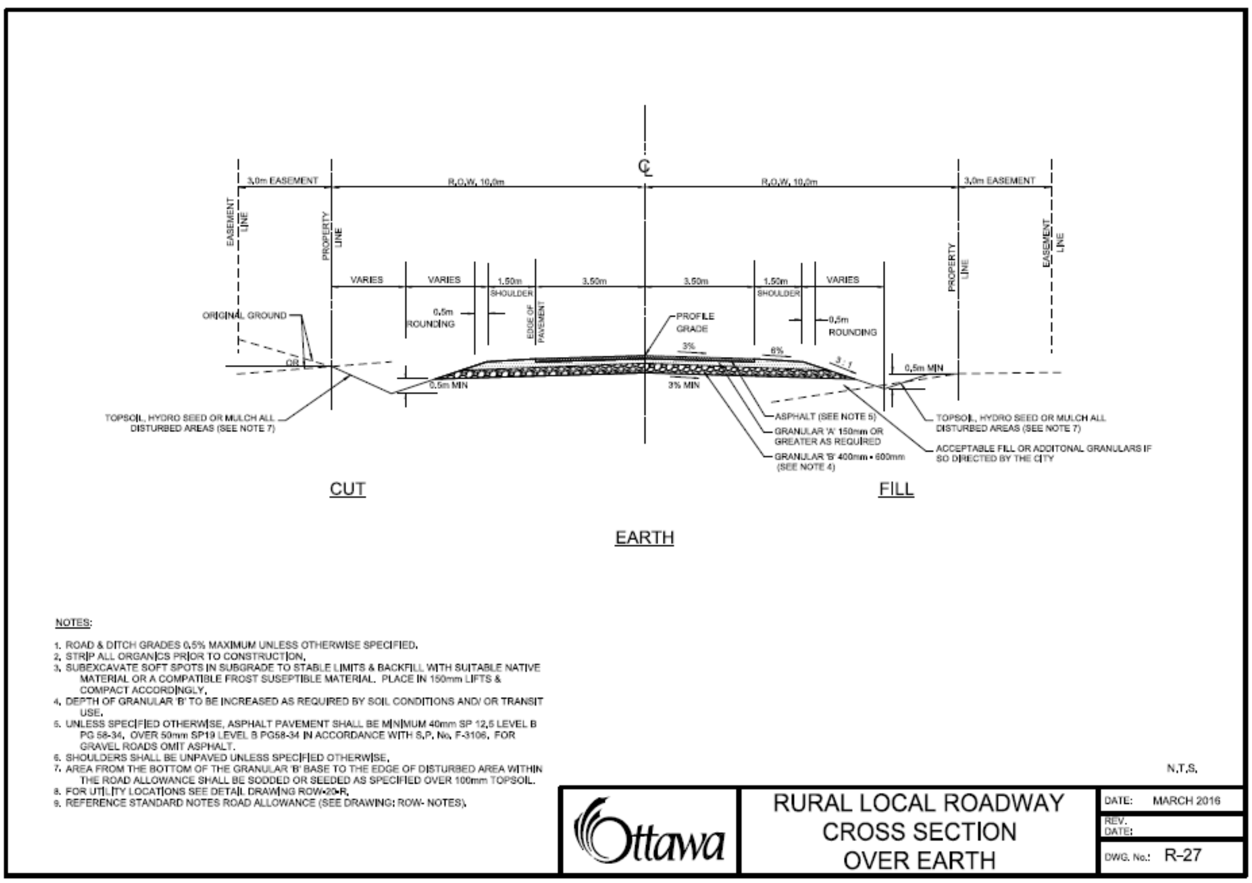
- Parks will also provide draft conditions depending on how this application proceeds.
- Parks is not supportive of Concept 1 as it proposes to use parkland for road access to the development. At this time, Parks will not support any applications to purchase parkland.

Engineering Comments (Provided by Harry Alvey)

- Review the size of the cul-de-sac to ensure that there is sufficient turning radii for garbage trucks and emergency services.
- There is an active rail line abutting the subject site. A 30-metre setback and safety berm will be required. Lots 3 and 4 will be impacted by the 30-metre setback and berm.
- At this point in time, no slope stability issues are anticipated.
- Note that there are high groundwater levels in Osgoode.

Transportation Comments (Provided by Amira Shehata)

- There is an existing pathway on Lombardi Street. If a pathway is extended further towards Osgoode Main, this would ensure pedestrian connectivity. If extension of the pathway is not possible, please explore alternative pedestrian connections.
- In the past, the intent was to extend Reid`s Lane to Osgoode Main.
- A Transportation Impact Assessment will not be required. This is based on the proposed development size and location.
- Please see the below road cross-section for a 20-metre ROW.



Environmental Comments (Provided by Matthew Hayley)

- A Tree Conservation Report will be required for any trees over 10cm in diameter.
- There is potential for Species at Risk on the subject site, specifically butternut.
- An Environmental Impact Statement will be required but, will be limited to potential Species at Risk present on site.

- There is a pathway shown in Concept Plan 1 that connects to the Douglas Thompson Pathway (DT Pathway) There is a tree on the DT Pathway that blocks the proposed pathway on Concept Plan 1. Consider moving pathway to ensure tree is preserved.

Rideau Valley Conservation Authority Comments (Provided by Jamie Batchelor)

- Regarding Stormwater Management, the recommendation is for post-development runoff to be equivalent to pre-development runoff and 80% TSS removal will be required.
- Please contact the RVCA to arrange a technical pre-consultation meeting to discuss the requirement for the hydrogeological report.

May 28 Minutes

- Considering a land exchange or outright purchase of lane to allow for the proposed Right-of-Way as shown in Concept Plan 1.

Parks Comments (Provided by Kevin Wherry and Kersten Nitsche)

- Consider connecting the proposed pathway (shown in a sketch provided May 24, 2019) to the Douglas Thompson Pathway and Peace Park.
- To infringe upon less parkland, altering the road design is highly recommended along with a width reduction to a 20-metre Right-of-Way for the entirety of the proposed road.
- There is a portion of Reid's Lane that is accessed by three properties. Consider closing Reid's Lane at the end of the access for these driveways.
- It would be worth considering a lot line adjustment to give some additional land to abutting lots. This would result in a better lot configuration for the subject site.
- Cash-in-Lieu of Parkland will be required, as will the fee in lieu of the Park Development Charge, which is currently $1818.
- There is currently some extra road allowance (the bulb-out) on Lombardy Drive. Initially, it was planned to extend Lombardy Drive to Osgoode Main. The subdivision agreement will need to be referenced to determine if this bulb-out is to return to the ownership of the property known as 5538 Lombardy Drive.

ADDITIONAL COMMENTS

Planning Comments

Official Plan: Village

Secondary Plan and/or Community Design Plan: Consolidated Villages Secondary Plan (Osgoode)

Zoning By-law: Development Reserve Zone, Subzone 1 (DR1)

Other: Based on GeoOttawa, the site has archaeological potential. As such, please fill out a screening form from the Ministry of Tourism, Culture and Sport's website and include with the application submission.

Environmental Comments

There are no further comments from Environmental Planning. For further comments from the RVCA, please contact the Conservation Authority directly.

Engineering Comments:

Water/Sanitary/Storm Servicing

- Water pipes:
    - No municipal water pipes are adjacent the proposed development. A hydrogeological and terrain analysis is required to determine that a satisfactory quality of groundwater is available and a quantity of flow that exceeds design requirements. The parameters tested shall be the "subdivision suite" known to local well testing companies.

- Sanitary Sewers:
    - No municipal sanitary pipes are adjacent the proposed development. A groundwater impact study is required to discuss the amount of septage treatment that is available if the design septage is more than 10,000 l/day.

- Storm Sewers:
  - No municipal storm pipes are adjacent the proposed development. The developer will need to define legal and sufficient outlet and achieve such outlet, entirely at the developer's cost. There appears to be a wet area on the site and an ephemeral stream that will both need to be discussed.

- Storm Water Management:
  - The consultant should determine a stormwater management regime for the application and, maintain post-development flows to pre-development levels by way of their choise, to the satisfaction of the municipality.
  - Any existing stormwater runoff from adjacent site(s) that crosses the property must be accommodated by the proposed stormwater management design.
  - Stormwater quality control is required for the site. The Rideau Valley Conservation Authority (RVCA) can be contacted to determine the level of stormwater quality control required for the site.
  - All stormwater management determinations shall have supporting rationale.
  - Stormwater management solutions should reference, and show concurrence with, the content of the Jock River Reach 2 and Mud Creek Sub-watershed Study.

Rights-of-Way

- Please refer to the City of Ottawa Private Approach By-Law 2003-447 for the entrance design.
- It is suggested that Lombardy Drive continues at the current width and that Reids Lane be converted to a MUP or other non-vehicular corridor.
- It is suggested to widen the adjacent rail corridor to the wider width of the two. The site is entirely within a 300 m rail corridor buffer and a 30 m setback and a safety berm, to appropriate standards, will be required (it is understood that the MECP will need the appropriate rail acceptance prior to their approval).
- A noise and vibration study because of the proximity of the rail corridor will be required.

Wellhead protection

- The application is within the Mississippi-Rideau highly vulnerable aquifer area- this will need to be researched for any ECA.

LID

- As per 8.3.13 of the Sewer Design Guidelines, Second Edition, document no. SDG002, prepared by the City of Ottawa, October 2012, including technical bulletins ISDTB-2014-1, PIEDTB-2016-01, ISDTB-2018-01, and ISTB-2018-04, the development shall include techniques for control of pollutants and sediments.

Permits and Approvals

- Please contact the Ministry of the Environment, Conservation and Parks (MECP) and the Rideau Valley Conservation Authority (RVCA), amongst other federal and provincial departments/agencies, to identify all the necessary permits and approvals required to facilitate the development: responsibility rests with the developer and their consultant for determining which approvals are needed and for obtaining all external agency approvals. The address shall be in good standing with all approval agencies, for example the RVCA, prior to approval.
- Copies of confirmation of correspondence will be required by the City of Ottawa from all approval agencies that a form of assent is given. Please note that a stormwater program for multiple lots is understood to be a to the direct type of Environmental Compliance Approval (ECA) application with the MOECC; please speak with your engineering consultant to understand the impact this has on the application. An MECP ECA application is not submitted until after planning approval. No construction shall commence until after a commence work notification is given in writing from an engineering Project Manager or Senior Engineer staff member of Development Review – Rural Services.

Ministry of the Environment, Conservation and Parks	Rideau Valley Conservation Authority
Contact Information:	Contact Information:
Christina Des Rochers	Roxanne Coghlan
Water Inspector	roxanne.coghlan@rvca.ca

613-521-3450 ext. 231

Christina.Desrochers@ontario.ca

Submission Requirements for engineering:

- Site Servicing Plan*
- Grading and Drainage Area Plan*
- Erosion and Sediment Control Plan* (for SPA only)

*All identified required plans are to be submitted on standard A1 size sheets as per City of Ottawa Servicing and Grading Plan Requirements (https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans#servicing-and-grading-plan-requirements), and, on at least one of the plans, note the survey monument used to establish datum on the plans with sufficient information to enable a layperson to locate the monument.

Report Submission Requirements[1]:

- Site Servicing Report
- Storm Water Management Report
  - Please note that engineering issues will need to be significantly acceptable to forward any SWM reports for modelling review.
  - Upstream catchments will need to be drawn and verified.
  - A range of historical storms will need to be modelled (if modelling is required/provided).
- Hydro-geological and terrain analysis
- Groundwater impact study (only if septage is more than 10,000 l/day)
- Erosion and Sediment Control Measures
- Geotechnical Investigation Study
  - Please note that the area may contain sensitive marine clays. If yes, please note that Atterberg limits, consolidation testing, sensitivity values, density tests, shrinkage tests, and grade raise restrictions, and vane shear test results, and rationalised discussion thereof will be required in the report. The geotechnical consultant will need to provide full copies of any published and peer reviewed papers relied on to determine results and conclusions.
  - Chemical analysis will be required.
  - Please note that a long-term groundwater elevation will be required as per section 8.2 of Technical Bulletin ISTB-2018-04, City of Ottawa, dated June 27, 2018.
  - Earthquake analysis is now required to be provided in the report.
  - Deviation from the “Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa”, 1st Edition, September 2007, Golder Associates (Geotechnical Guidelines), or “Slope Stability Guidelines for Development Applications in the City of Ottawa”, 1st Edition, December 2004, Golder Associates (Slope Stability Guidelines), revised 2012, is permitted with supply of full copies (either digital or printed) of per reviewed and published papers with specific reference to actual pages that plainly agree with the consultants’ design approach.

Footnote [1] - All required plans & reports are to be provided on a CD in *.pdf format (at application submission and for any, and all, re-submissions. Drawings shall be provided as individual files)

Application Submission Information

Application Type: **Plan of Subdivision**

For information on Applications, including fees, please visit: https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/fees-and-funding-programs/development-application-fees

The application processing timeline generally depends on the quality of the submission. For more information on standard processing timelines, please visit: https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/development-application-forms#site-plan-control

Prior to submitting a formal application, it is recommended that you pre-consult with the Ward Councillor.

Application Submission Requirements

For information on the preparation of Studies and Plans and the City's Planning and Engineering requirements, please visit: https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans

To request City of Ottawa plan(s) or report information, please contact the ISD Information Centre at (613)-580-2424 ext. 44455.

Please provide electronic copy (PDF) of all plans and studies required.

All plans and drawings must be produced on A1-sized paper and folded to 21.6 cm x 27.9 cm (8½"x 11").

Note that many of the plans and studies collected with this application must be signed, sealed and dated by a qualified engineer, architect, surveyor, planner or designated specialist.

APPENDIX B

STORMWATER MANAGEMENT CALCULATIONS

Project Name
Pre-Development Model Parameters

NOVATECH
Engineers, Planners & Landscape Architects

Time to Peak Calculations
(Uplands Overland Flow Method)
Existing Conditions

Area ID	Area (ha)	Overland Flow Length (m)	Overland Flow Elevation U/S (m)	Overland Flow Elevation D/S (m)	Overland Flow Slope (%)	Overland Flow Velocity (m/s)	Overland Flow Travel Time (min)	Concentrated Overland Flow Length (m)	Concentrated Overland Flow Elevation U/S (m)	Concentrated Overland Flow Elevation D/S (m)	Concentrated Overland Flow Slope (%)	Concentrated Overland Flow Velocity (m/s)	Concentrated Overland Flow Travel Time (min)	Overall Time of Concentration (min)	Overall Time to Peak (min)	Overall Time to Peak (min)
EX-1	3.31	100	94.00	91.15	2.8%	0.25	6.67	195	91.15	90.00	0.6%	0.35	9.29	16	11	11
EX-2	1.44	100	93.75	92.50	1.3%	0.16	10.42	140	92.50	90.50	1.4%	0.50	4.67	15	10	10

Weighted Curve Number Calculations
Soil type 'C' (Soil Mapping and Boreholes: silty sand and sandy clay)

Area ID	Land Use 1	Area	CN	Land Use 2	Area	CN	Weighted CN	
EX-1	Forest	79%	70	Residential	21%	81	72	** Soil Type (HSG) = C; Forest Cover = Good; Residential Unit = 1/3 acre
EX-2	Forest	67%	70	Residential	33%	83	74	** Soil Type (HSG) = C; Forest Cover = Good; Residential Unit = 1/4 acre

Weighted IA Calculations

Area ID	Land Use 1	Area	IA	Land Use 2	Area	IA	Weighted IA
EX-1	Forest	79%	10.9	Residential	21%	6.0	9.8
EX-2	Forest	67%	10.9	Residential	33%	5.2	9.0

NOVATECH
Engineers, Planners & Landscape Architects

Time to Peak Calculations
(Uplands Overland Flow Method)
Proposed 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 of Concentration (min)
A	1.71	85	93.25	91.70	1.8%	0.28	5.06	0	-	-	-	-	0.00	5	10
B	0.58	100	92.50	90.90	1.6%	0.26	6.41	0	-	-	-	-	0.00	6	10
C	0.75	35	91.70	91.50	0.6%	0.17	3.43	0	-	-	-	-	0.00	3	10
D	0.52	50	91.90	90.15	3.5%	0.40	2.08	0	-	-	-	-	0.00	2	10
EX-1	0.23	60	94.15	93.45	1.2%	0.22	4.55	0	-	-	-	-	0.00	5	10
EX-2	0.48	60	93.90	93.15	1.3%	0.24	4.17	0	-	-	-	-	0.00	4	10
EX-3	0.48	60	94.00	92.60	2.3%	0.32	3.13	0	-	-	-	-	0.00	3	10

Weighted Curve Number Calculations
Soil type 'C' (Soil Mapping and Boreholes: silty sand and sandy clay)

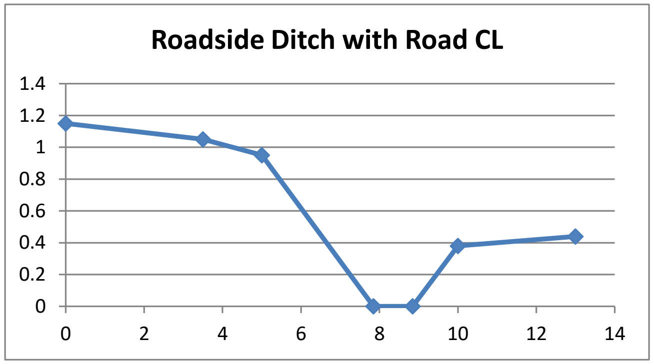
Area ID	Land Use 1	Area	CN	Land Use 2	Area	CN	Weighted CN	
A	Pavement/Roof	12%	98	Lawn	88%	71	74	** Soil Type (HSG) = C; Lawn = Meadow
B	Pavement/Roof	3%	98	Lawn	97%	71	72	** Soil Type (HSG) = C; Lawn = Meadow
C	Pavement/Roof	22%	98	Lawn	78%	71	77	** Soil Type (HSG) = C; Lawn = Meadow
D	Pavement/Roof	3%	98	Lawn	97%	71	72	** Soil Type (HSG) = C; Lawn = Meadow
EX-1	Residential	100%	81	Lawn	0%	71	81	** Soil Type (HSG) = C; Lawn = Meadow; Residential Unit = 1/3 acre
EX-2	Residential	100%	83	Lawn	0%	71	83	** Soil Type (HSG) = C; Lawn = Meadow; Residential Unit = 1/4 acre
EX-3	Residential	100%	81	Lawn	0%	71	81	** Soil Type (HSG) = C; Lawn = Meadow; Residential Unit = 1/3 acre

Weighted IA Calculations

Area ID	Land Use 1	Area	IA	Land Use 2	Area	IA	Weighted IA
A	Pavement/Roof	12%	0.5	Lawn	88%	10.4	9.2
B	Pavement/Roof	3%	0.5	Lawn	97%	10.4	10.1
C	Pavement/Roof	22%	0.5	Lawn	78%	10.4	8.2
D	Pavement/Roof	3%	0.5	Lawn	97%	10.4	10.1
EX-1	Residential	100%	6.0	Lawn	0%	10.4	6.0
EX-2	Residential	100%	5.2	Lawn	0%	10.4	5.2
EX-3	Residential	100%	6.0	Lawn	0%	10.4	6.0

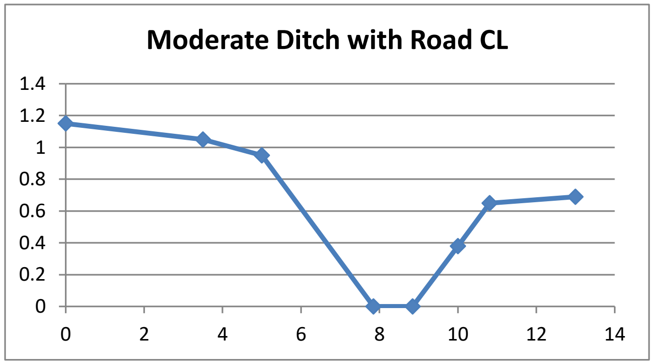
Roadside Ditch with Road CL

0	1.15
3.5	1.05
5	0.95
7.85	0
8.85	0
10	0.38
13	0.44



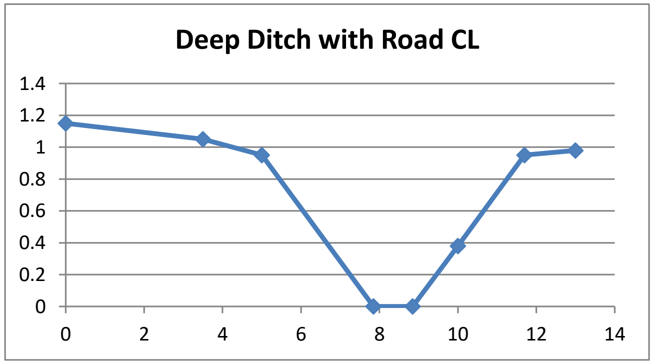
Moderate Ditch with Road CL

0	1.15
3.5	1.05
5	0.95
7.85	0
8.85	0
10	0.38
10.81	0.65
13	0.69



Deep Ditch with Road CL

0	1.15
3.5	1.05
5	0.95
7.85	0
8.85	0
10	0.38
11.7	0.95
13	0.98



3200 Reid's Lane (119089)
Design Storm Time Series Data
Chicago Design Storms

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

3200 Reid's Lane (119089)
Design Storm Time Series Data
Chicago Design Storms

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

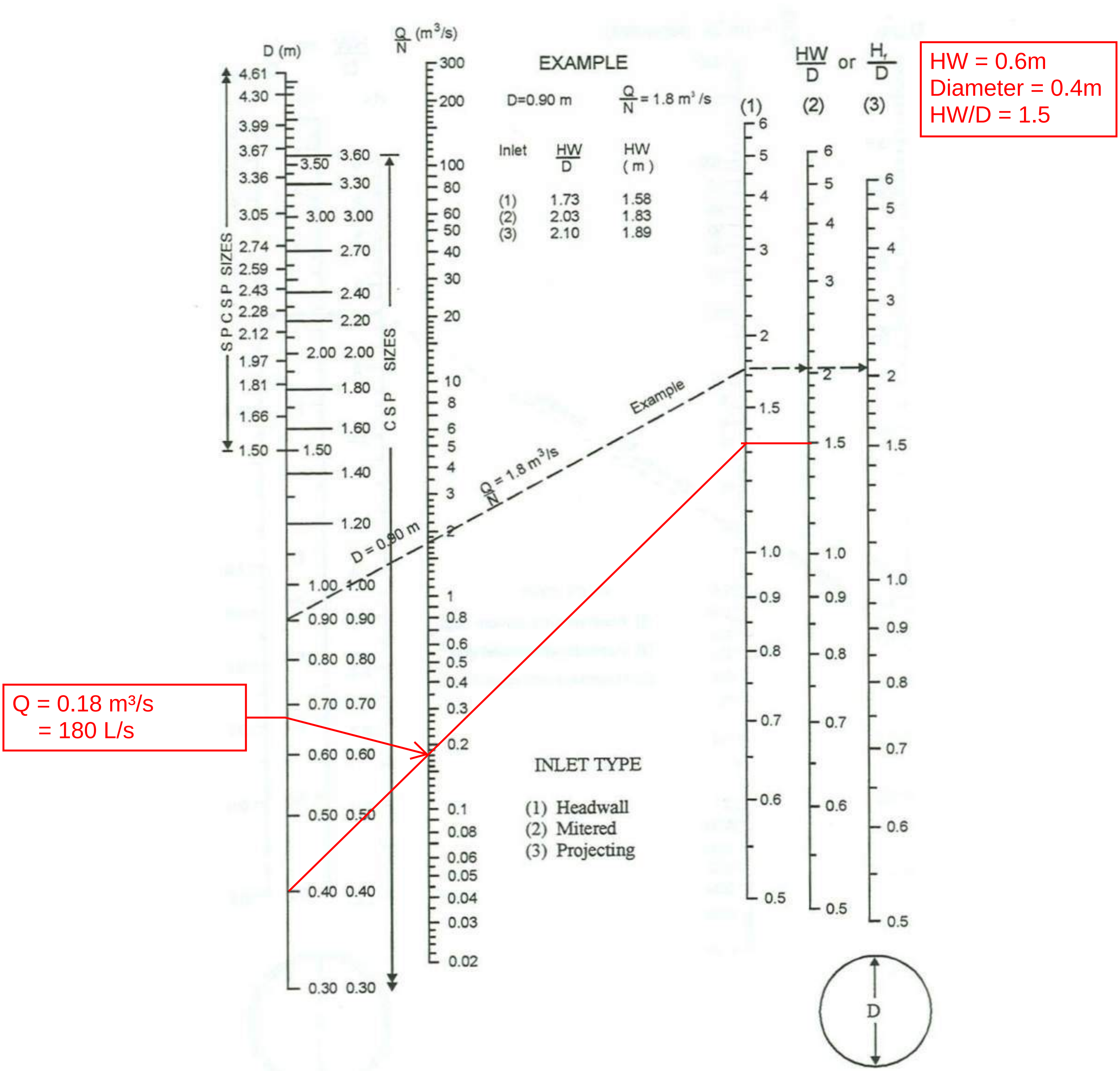
3200 Reid's Lane (119089)
Design Storm Time Series Data
SCS Design Storms

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

3200 Reid's Lane (119089)
Design Storm Time Series Data
SCS Design Storms

S2-24.stm			S5-24.stm			S100-24.stm	
Duration	Intensity		Duration	Intensity		Duration	Intensity
min	mm/hr		min	mm/hr		min	mm/hr
0:00	0.00		0:00	0		0:00	0
1:00	0.72		1:00	0.44		1:00	0.6
2:00	0.34		2:00	0.44		2:00	0.75
3:00	0.63		3:00	0.81		3:00	1.39
4:00	0.63		4:00	0.81		4:00	1.39
5:00	0.81		5:00	1.06		5:00	1.81
6:00	0.72		6:00	0.94		6:00	1.6
7:00	0.96		7:00	1.25		7:00	2.13
8:00	0.96		8:00	1.25		8:00	2.13
9:00	1.30		9:00	1.68		9:00	2.88
10:00	1.63		10:00	2.12		10:00	3.63
11:00	2.59		11:00	3.37		11:00	5.76
12:00	20.55		12:00	26.71		12:00	45.69
13:00	5.23		13:00	6.8		13:00	11.64
14:00	2.30		14:00	2.99		14:00	5.12
15:00	1.54		15:00	2		15:00	3.42
16:00	1.34		16:00	1.75		16:00	2.99
17:00	1.06		17:00	1.37		17:00	2.35
18:00	1.11		18:00	1.44		18:00	2.46
19:00	0.72		19:00	0.94		19:00	1.6
20:00	0.58		20:00	0.75		20:00	1.28
21:00	0.81		21:00	1.06		21:00	1.81
22:00	0.53		22:00	0.68		22:00	1.17
23:00	0.48		23:00	0.63		23:00	1.07
0:00	0.48		0:00	0.63		0:00	1.07

Design Chart 2.32: Inlet Control: Circular CSP and SPCSP Culverts



Source: Herr (1977)

Overall Model Schematic

Date: 2021-08-27
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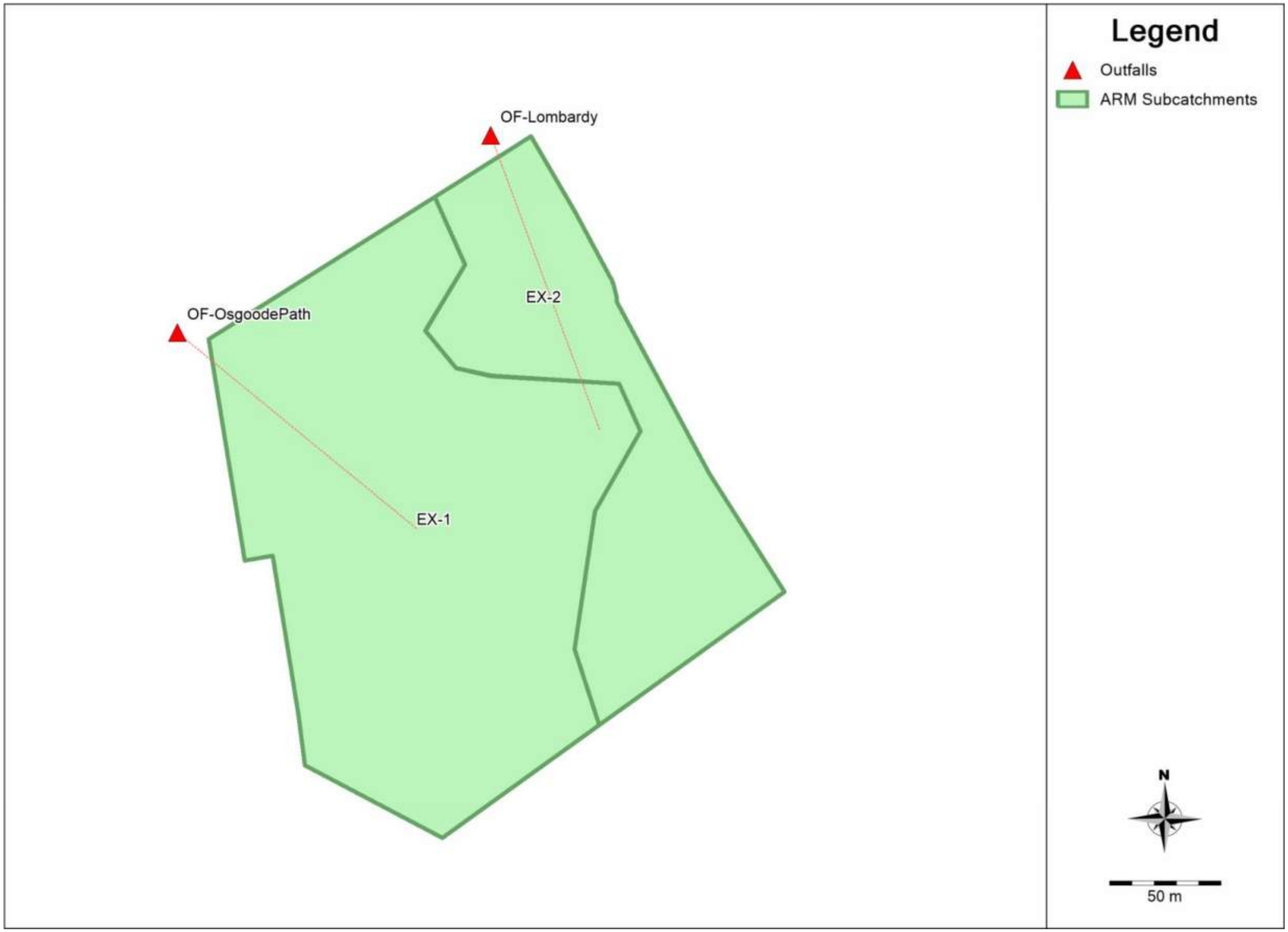
Subcatchments and Outfalls



Date: 2021-08-27
M:\2019\119089\DATA\Calculations\Sewer Calcs\SWM\PCSWMM\119089-Pre PCSWMM Model Schematics.docx

```
ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM VERSION 7.4.3240
---------------------------------------------------------

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:              05/04/2021 00:00:00
Simulation end time:                05/06/2021 00:00:00
Runoff wet weather time steps:      240 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-2	Nash IUH	Raingage	1.44	15	10	62	0.01299	0.998
EX-1	Nash IUH	Raingage	3.31	16	10.67	69.33	0.028	0.999

```
******************
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-2	93.91	52.511	41.326	0.595	147.197	0.44
EX-1	93.91	55.228	38.64	1.279	306.992	0.411

```
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	07-SCS100yr-12hr	INTENSITY	30 min.

```
************
Node Summary
************
                                                 Invert      Max.    Ponded    External
Name                  Type                        Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
OF-Lombardy           OUTFALL                     90.80      0.00       0.0
OF-OsgoodePath        OUTFALL                     90.75      0.00       0.0


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

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Surcharge Method ......... EXTRAN
Starting Date ............ 05/04/2021 00:00:00
Ending Date .............. 05/06/2021 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 ..........         0.187         1.874
External Outflow .........         0.187         1.874
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:  Fri Aug 27 13:27:45 2021
Analysis ended on:  Fri Aug 27 13:27:45 2021
Total elapsed time: < 1 sec
```

NOVATECH
Engineers, Planners & Landscape Architects

ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM VERSION 7.4.3240

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:	05/04/2021 00:00:00
Simulation end time:	05/06/2021 00:00:00
Runoff wet weather time steps:	240 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 ($m^3/s/mm$)	UH Depth (mm)
EX-2	Nash IUH	Raingage	1.44	15	10	62	0.01299	0.998
EX-1	Nash IUH	Raingage	3.31	16	10.67	69.33	0.028	0.999

****
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-2	106.73	55.647	50.993	0.734	107.249	0.478
EX-1	106.73	58.723	47.946	1.587	229.942	0.449

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	10-SCS100yr-24hr	INTENSITY	60 min.

```
************
Node Summary
************
                                            Invert      Max.    Ponded    External
Name                 Type                    Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
OF-Lombardy          OUTFALL                 90.80      0.00       0.0
OF-OsgoodePath       OUTFALL                 90.75      0.00       0.0


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

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Surcharge Method ......... EXTRAN
Starting Date ............ 05/04/2021 00:00:00
Ending Date .............. 05/06/2021 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00

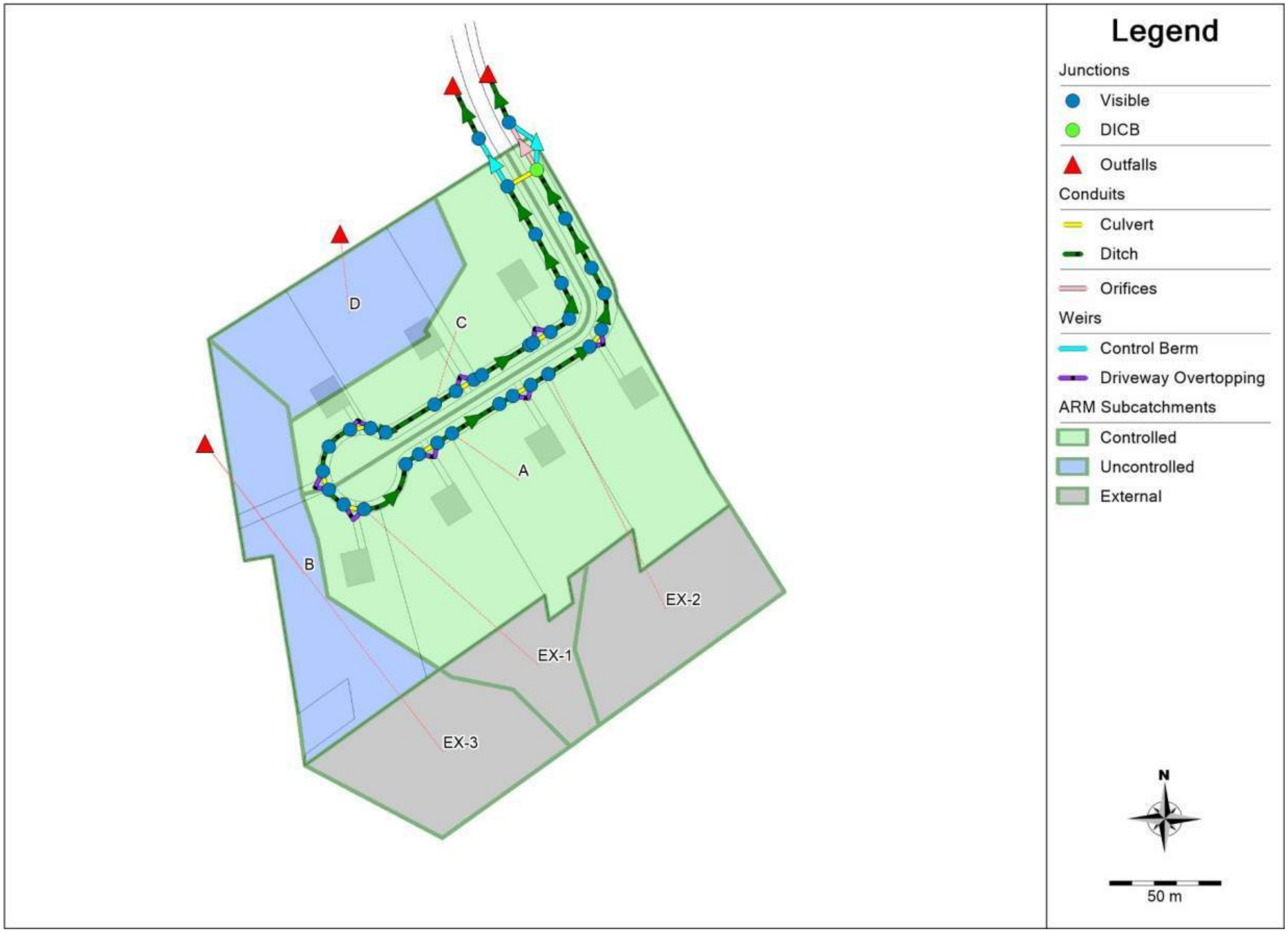
**************************        Volume         Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------      ---------
Dry Weather Inflow .......         0.000          0.000
Wet Weather Inflow .......         0.000          0.000
Groundwater Inflow .......         0.000          0.000
RDII Inflow ..............         0.000          0.000
External Inflow ..........         0.232          2.321
External Outflow .........         0.232          2.321
Flooding Loss ............         0.000          0.000
Evaporation Loss .........         0.000          0.000
Exfiltration Loss ........         0.000          0.000
Initial Stored Volume ....         0.000          0.000
Final Stored Volume ......         0.000          0.000
Continuity Error (%) .....         0.000


Analysis begun on:  Thu Aug 12 09:49:29 2021
Analysis ended on:  Thu Aug 12 09:49:29 2021
Total elapsed time: < 1 sec
```

Overall Model Schematic

Date: 2021-08-27
M:\2019\119089\DATA\Calculations\Sewer Calcs\SWM\PCSWMM\119089-Post PCSWMM Model Schematics.docx

Subcatchments



Date: 2021-08-27
M:\2019\119089\DATA\Calculations\Sewer Calcs\SWM\PCSWMM\119089-Post PCSWMM Model Schematics.docx

Junctions and Outfalls

Date: 2021-08-27
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ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM VERSION 7.4.3240

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:	05/04/2021 00:00:00
Simulation end time:	05/06/2021 00:00:00
Runoff wet weather time steps:	240 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)
D	Nash IUH	Raingage	0.52	10	6.67	41.33	0.00704	0.992
A	Nash IUH	Raingage	1.71	10	6.67	45.33	0.02314	0.992
EX-2	Nash IUH	Raingage	0.48	10	6.67	41.33	0.0065	0.992
EX-1	Nash IUH	Raingage	0.23	10	6.67	37.33	0.00311	0.992
C	Nash IUH	Raingage	0.75	10	6.67	41.33	0.01015	0.992
EX-3	Nash IUH	Raingage	0.48	10	6.67	41.33	0.0065	0.992
B	Nash IUH	Raingage	0.58	10	6.67	41.33	0.00785	0.992

****
ARM Runoff Summary
****

Subcatchment	Total Precip (mm)	Total Losses (mm)	Total Runoff (mm)	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff (fraction)
D	56.185	41.524	14.544	0.076	20.199	0.259
A	56.185	39.98	16.076	0.275	73.905	0.286
EX-2	56.185	30.95	25.042	0.12	32.645	0.446
EX-1	56.185	33.24	22.757	0.052	14.224	0.405
C	56.185	37.594	18.44	0.138	37.485	0.328
EX-3	56.185	33.24	22.771	0.109	29.685	0.405
B	56.185	41.524	14.545	0.084	22.53	0.259

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

WARNING 02: maximum depth increased for Node J04
WARNING 02: maximum depth increased for Node J08
WARNING 02: maximum depth increased for Node J19

****
Element Count
****

Number of rain gages 1
Number of subcatchments ... 0

```
Number of nodes ........... 39
Number of links ........... 46
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                      Data       Recording
Name                 Data Source                      Type       Interval
-------------------------------------------------------------------------
Raingage             06-SCS5yr-12hr                   INTENSITY   30 min.


************
Node Summary
************
                                           Invert      Max.    Ponded    External
Name                 Type                   Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
J01                  JUNCTION               91.43      1.15       0.0
J02                  JUNCTION               91.38      1.15       0.0
J03                  JUNCTION               91.32      1.15       0.0
J04                  JUNCTION               91.25      1.15       0.0
J05                  JUNCTION               91.19      1.15       0.0
J06                  JUNCTION               91.15      1.15       0.0
J07                  JUNCTION               91.02      1.15       0.0
J08                  JUNCTION               90.96      1.15       0.0
J09                  JUNCTION               90.91      1.15       0.0
J10                  JUNCTION               90.89      1.15       0.0
J11                  JUNCTION               90.77      1.15       0.0
J12                  JUNCTION               90.76      1.15       0.0
J13                  JUNCTION               90.71      1.15       0.0
J14                  JUNCTION               90.66      1.15       0.0
J15                  JUNCTION               90.57      1.15       0.0
J16                  JUNCTION               90.45      1.15       0.0
J17                  JUNCTION               90.32      1.15       0.0
J18                  JUNCTION               90.19      1.15       0.0
J19                  JUNCTION               91.41      1.15       0.0
J20                  JUNCTION               91.39      1.15       0.0
J21                  JUNCTION               91.22      1.15       0.0
J22                  JUNCTION               91.18      1.15       0.0
J23                  JUNCTION               91.13      1.15       0.0
J24                  JUNCTION               91.09      1.15       0.0
J25                  JUNCTION               90.97      1.15       0.0
J26                  JUNCTION               90.93      1.15       0.0
J27                  JUNCTION               90.89      1.15       0.0
J28                  JUNCTION               90.84      1.15       0.0
J29                  JUNCTION               90.73      1.15       0.0
J30                  JUNCTION               90.69      1.15       0.0
J31                  JUNCTION               90.60      1.15       0.0
J32                  JUNCTION               90.53      1.15       0.0
J33                  JUNCTION               90.41      1.15       0.0
J34                  JUNCTION               90.28      1.15       0.0
J35                  JUNCTION               90.16      1.15       0.0
OF-LombardyEast      OUTFALL                90.04      1.15       0.0
OF-LombardyWest      OUTFALL                90.06      1.15       0.0
OF-OsgoodePath       OUTFALL                91.00      0.00       0.0
OF-RY-UNC            OUTFALL                90.00      0.00       0.0


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

Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C01	J01	J02	CONDUIT	9.0	0.5556	0.0240
C02	J02	J03	CONDUIT	12.0	0.5000	0.0350
C03	J03	J04	CONDUIT	12.0	0.5833	0.0350
C04	J04	J05	CONDUIT	9.0	0.6667	0.0240
C05	J05	J06	CONDUIT	7.0	0.5714	0.0350
C06	J06	J07	CONDUIT	25.0	0.5200	0.0350
C07	J07	J08	CONDUIT	11.0	0.5455	0.0350
C08	J08	J09	CONDUIT	9.0	0.5556	0.0240
C09	J09	J10	CONDUIT	4.0	0.5000	0.0350
C10	J10	J11	CONDUIT	25.0	0.4800	0.0350
C11	J11	J12	CONDUIT	3.0	0.3333	0.0350
C12	J12	J13	CONDUIT	9.0	0.5556	0.0240
C13	J13	J14	CONDUIT	10.0	0.5000	0.0350
C14	J14	J15	CONDUIT	17.0	0.5294	0.0350
C15	J15	J16	CONDUIT	25.0	0.4800	0.0350
C16	J16	J17	CONDUIT	25.0	0.5200	0.0350
C18	J18	OF-LombardyWest	CONDUIT	26.0	0.5000	0.0350
C19	J01	J19	CONDUIT	10.0	0.2000	0.0350
C20	J19	J20	CONDUIT	9.0	0.2222	0.0240
C21	J20	J21	CONDUIT	32.0	0.5313	0.0350
C22	J21	J22	CONDUIT	7.0	0.5714	0.0350
C23	J22	J23	CONDUIT	9.0	0.5556	0.0240
C24	J23	J24	CONDUIT	8.0	0.5000	0.0350
C25	J24	J25	CONDUIT	25.0	0.4800	0.0350
C26	J25	J26	CONDUIT	7.0	0.5714	0.0350
C27	J26	J27	CONDUIT	9.0	0.4444	0.0240
C28	J27	J28	CONDUIT	9.0	0.5556	0.0350
C29	J28	J29	CONDUIT	22.0	0.5000	0.0350
C30	J29	J30	CONDUIT	9.0	0.4444	0.0240
C31	J30	J31	CONDUIT	16.0	0.5625	0.0350
C32	J31	J32	CONDUIT	13.0	0.5385	0.0350
C33	J32	J33	CONDUIT	25.0	0.4800	0.0350
C34	J33	J34	CONDUIT	25.0	0.5200	0.0350
C36	J35	OF-LombardyEast	CONDUIT	24.0	0.5000	0.0350
C37	J17	J34	CONDUIT	20.0	0.2000	0.0240
OR1	J34	J35	ORIFICE			
W01	J17	J18	WEIR			
W02	J34	J35	WEIR			
W03	J01	J02	WEIR			
W04	J04	J05	WEIR			
W05	J08	J09	WEIR			
W06	J12	J13	WEIR			
W07	J19	J20	WEIR			
W08	J22	J23	WEIR			
W09	J26	J27	WEIR			
W10	J29	J30	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C01	CIRCULAR	0.40	0.13	0.10	0.40	1	84.09
C02	RoadsideDitch-Normal	1.15	6.80	0.89	13.00	1	12711.10
C03	RoadsideDitch-Normal	1.15	6.80	0.89	13.00	1	13729.59
C04	CIRCULAR	0.40	0.13	0.10	0.40	1	92.11
C05	RoadsideDitch-Normal	1.15	6.80	0.89	13.00	1	13588.76

```
C06              RoadsideDitch-Normal     1.15     6.80     0.89    13.00        1 12962.84
C07              RoadsideDitch-Normal     1.15     6.80     0.89    13.00        1 13276.33
C08              CIRCULAR             0.40     0.13     0.10     0.40        1    84.09
C09              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 13043.80
C10              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 12780.26
C11              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 10650.18
C12              CIRCULAR             0.40     0.13     0.10     0.40        1    84.09
C13              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 13043.80
C14              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 13421.97
C15              RoadsideDitch-Deep     1.15     5.64     0.65    13.00        1  8423.95
C16              RoadsideDitch-Deep     1.15     5.64     0.65    13.00        1  8767.93
C18              RoadsideDitch-Normal     1.15     6.80     0.89    13.00        1 12711.10
C19              RoadsideDitch-Normal     1.15     6.80     0.89    13.00        1  8039.16
C20              CIRCULAR             0.40     0.13     0.10     0.40        1    53.18
C21              RoadsideDitch-Normal     1.15     6.80     0.89    13.00        1 13102.31
C22              RoadsideDitch-Normal     1.15     6.80     0.89    13.00        1 13588.76
C23              CIRCULAR             0.40     0.13     0.10     0.40        1    84.09
C24              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 13043.80
C25              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 12780.26
C26              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 13944.44
C27              CIRCULAR             0.40     0.13     0.10     0.40        1    75.21
C28              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 13749.40
C29              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 13043.80
C30              CIRCULAR             0.40     0.13     0.10     0.40        1    75.21
C31              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 13835.06
C32              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 13536.21
C33              RoadsideDitch-Deep     1.15     5.64     0.65    13.00        1  8423.95
C34              RoadsideDitch-Deep     1.15     5.64     0.65    13.00        1  8767.93
C36              RoadsideDitch-Normal     1.15     6.80     0.89    13.00        1 12711.10
C37              CIRCULAR             0.60     0.28     0.15     0.60        1   148.75


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

Transect RoadsideDitch-Deep
Area:
            0.0044     0.0093     0.0148     0.0208     0.0274
            0.0346     0.0424     0.0507     0.0596     0.0690
            0.0790     0.0896     0.1007     0.1124     0.1247
            0.1375     0.1509     0.1649     0.1794     0.1945
            0.2101     0.2263     0.2431     0.2604     0.2783
            0.2967     0.3158     0.3353     0.3554     0.3761
            0.3974     0.4192     0.4416     0.4645     0.4880
            0.5121     0.5367     0.5618     0.5876     0.6139
            0.6407     0.6693     0.7029     0.7386     0.7757
            0.8143     0.8558     0.9006     0.9487     1.0000
Hrad:
            0.0326     0.0616     0.0881     0.1128     0.1361
            0.1584     0.1798     0.2006     0.2209     0.2407
            0.2602     0.2793     0.2982     0.3169     0.3354
            0.3537     0.3720     0.3901     0.4081     0.4261
            0.4439     0.4616     0.4793     0.4969     0.5144
            0.5319     0.5493     0.5667     0.5840     0.6013
            0.6185     0.6358     0.6530     0.6701     0.6872
            0.7043     0.7214     0.7385     0.7555     0.7726
            0.7896     0.8158     0.8403     0.8642     0.8887
            0.9129     0.9352     0.9569     0.9784     1.0000
Width:
            0.0876     0.0982     0.1089     0.1196     0.1302
            0.1409     0.1516     0.1622     0.1729     0.1835
```

```
            0.1942     0.2049     0.2155     0.2262     0.2369
            0.2475     0.2581     0.2687     0.2793     0.2899
            0.3005     0.3111     0.3216     0.3322     0.3428
            0.3534     0.3640     0.3746     0.3852     0.3957
            0.4063     0.4169     0.4275     0.4381     0.4487
            0.4592     0.4698     0.4804     0.4910     0.5016
            0.5122     0.5872     0.6604     0.6869     0.7135
            0.7523     0.8142     0.8762     0.9381     1.0000

  Transect RoadsideDitch-Moderate
  Area:
            0.0040     0.0085     0.0136     0.0191     0.0252
            0.0318     0.0389     0.0466     0.0547     0.0634
            0.0726     0.0823     0.0925     0.1033     0.1145
            0.1263     0.1386     0.1515     0.1648     0.1786
            0.1930     0.2079     0.2233     0.2392     0.2557
            0.2726     0.2901     0.3081     0.3278     0.3524
            0.3795     0.4069     0.4346     0.4626     0.4908
            0.5192     0.5479     0.5769     0.6061     0.6356
            0.6653     0.6956     0.7271     0.7599     0.7940
            0.8294     0.8675     0.9087     0.9528     1.0000
  Hrad:
            0.0198     0.0375     0.0536     0.0686     0.0827
            0.0963     0.1093     0.1219     0.1343     0.1463
            0.1582     0.1698     0.1813     0.1926     0.2039
            0.2150     0.3745     0.3928     0.4109     0.4289
            0.4468     0.4647     0.4824     0.5001     0.5177
            0.5353     0.5528     0.5703     0.5052     0.4457
            0.4755     0.5049     0.5341     0.5631     0.5919
            0.6204     0.6487     0.6768     0.7047     0.7324
            0.7599     0.7915     0.8235     0.8541     0.8835
            0.9115     0.9365     0.9593     0.9804     1.0000
  Width:
            0.0876     0.0982     0.1089     0.1196     0.1302
            0.1409     0.1516     0.1622     0.1729     0.1835
            0.1942     0.2049     0.2155     0.2262     0.2369
            0.2475     0.2582     0.2688     0.2794     0.2900
            0.3006     0.3112     0.3218     0.3325     0.3431
            0.3537     0.3643     0.3749     0.4532     0.5554
            0.5607     0.5660     0.5713     0.5766     0.5819
            0.5872     0.5925     0.5978     0.6032     0.6085
            0.6138     0.6338     0.6604     0.6869     0.7135
            0.7523     0.8142     0.8762     0.9381     1.0000

  Transect RoadsideDitch-Normal
  Area:
            0.0036     0.0077     0.0123     0.0173     0.0228
            0.0287     0.0352     0.0421     0.0494     0.0573
            0.0656     0.0744     0.0836     0.0933     0.1035
            0.1142     0.1257     0.1409     0.1602     0.1821
            0.2043     0.2268     0.2494     0.2723     0.2955
            0.3189     0.3425     0.3663     0.3904     0.4147
            0.4393     0.4640     0.4891     0.5143     0.5398
            0.5655     0.5914     0.6176     0.6440     0.6707
            0.6976     0.7249     0.7534     0.7830     0.8138
            0.8458     0.8803     0.9175     0.9574     1.0000
  Hrad:
            0.0240     0.0453     0.0648     0.0830     0.1001
            0.1165     0.1323     0.1476     0.1625     0.1770
            0.1914     0.2055     0.2194     0.2331     0.2467
            0.2602     0.2750     0.2848     0.2896     0.2980
            0.3119     0.3290     0.3483     0.3691     0.3909
            0.4135     0.4367     0.4603     0.4842     0.5083
```

```
            0.5327     0.5571     0.5816     0.6061     0.6307
            0.6552     0.6797     0.7042     0.7286     0.7530
            0.7773     0.8057     0.8347     0.8626     0.8896
            0.9154     0.9387     0.9603     0.9806     1.0000
  Width:
            0.0876     0.0982     0.1089     0.1196     0.1302
            0.1409     0.1516     0.1622     0.1729     0.1835
            0.1942     0.2049     0.2155     0.2262     0.2369
            0.2475     0.2979     0.3917     0.4855     0.5023
            0.5076     0.5129     0.5182     0.5235     0.5288
            0.5342     0.5395     0.5448     0.5501     0.5554
            0.5607     0.5660     0.5713     0.5766     0.5819
            0.5872     0.5925     0.5978     0.6032     0.6085
            0.6138     0.6338     0.6604     0.6869     0.7135
            0.7523     0.8142     0.8762     0.9381     1.0000


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

  ****************
  Analysis Options
  ****************
  Flow Units ............... LPS
  Process Models:
    Rainfall/Runoff ........ YES
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ NO
    Water Quality .......... NO
  Flow Routing Method ...... DYNWAVE
  Surcharge Method ......... EXTRAN
  Starting Date ............ 05/04/2021 00:00:00
  Ending Date .............. 05/06/2021 00:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 00:01:00
  Routing Time Step ........ 2.00 sec
  Variable Time Step ....... YES
  Maximum Trials ........... 8
  Number of Threads ........ 4
  Head Tolerance ........... 0.001500 m


  **************************        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 ..........           0.085          0.855
  External Outflow .........           0.085          0.855
  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
```

```
*************************
Highest Continuity Errors
*************************
Node J04 (17.43%)
Node J06 (5.12%)
Node J03 (1.44%)
Node J02 (1.09%)


***************************
Time-Step Critical Elements
***************************
Link C11 (3.89%)


********************************
Highest Flow Instability Indexes
********************************
Link C27 (3)
Link C30 (2)
Link C28 (1)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     1.39 sec
Average Time Step           :     1.99 sec
Maximum Time Step           :     2.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00
Time Step Frequencies       :
    2.000 -  1.516 sec      :   100.00 %
    1.516 -  1.149 sec      :     0.00 %
    1.149 -  0.871 sec      :     0.00 %
    0.871 -  0.660 sec      :     0.00 %
    0.660 -  0.500 sec      :     0.00 %


******************
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
J01	JUNCTION	0.00	0.01	91.44	0	06:33	0.01
J02	JUNCTION	0.00	0.00	91.38	0	06:37	0.00
J03	JUNCTION	0.00	0.00	91.32	0	06:49	0.00
J04	JUNCTION	0.00	0.00	91.25	0	07:24	0.00
J05	JUNCTION	0.00	0.00	91.19	0	07:32	0.00
J06	JUNCTION	0.00	0.00	91.15	0	08:19	0.00
J07	JUNCTION	0.00	0.12	91.14	0	06:31	0.12
J08	JUNCTION	0.01	0.18	91.14	0	06:31	0.18
J09	JUNCTION	0.00	0.09	91.00	0	06:32	0.09
J10	JUNCTION	0.01	0.10	90.99	0	07:11	0.10
J11	JUNCTION	0.01	0.22	90.99	0	07:14	0.22
J12	JUNCTION	0.02	0.23	90.99	0	07:14	0.23

J13	JUNCTION	0.01	0.28	90.99	0	07:13	0.28
J14	JUNCTION	0.02	0.33	90.99	0	07:13	0.33
J15	JUNCTION	0.02	0.42	90.99	0	07:13	0.42
J16	JUNCTION	0.04	0.54	90.99	0	07:13	0.54
J17	JUNCTION	0.05	0.67	90.99	0	07:13	0.67
J18	JUNCTION	0.00	0.00	90.19	0	00:00	0.00
J19	JUNCTION	0.00	0.03	91.44	0	06:32	0.03
J20	JUNCTION	0.00	0.05	91.44	0	06:32	0.05
J21	JUNCTION	0.00	0.07	91.29	0	06:34	0.07
J22	JUNCTION	0.01	0.11	91.29	0	06:34	0.11
J23	JUNCTION	0.00	0.14	91.27	0	06:34	0.14
J24	JUNCTION	0.01	0.18	91.27	0	06:34	0.18
J25	JUNCTION	0.01	0.29	91.26	0	06:34	0.29
J26	JUNCTION	0.02	0.32	91.25	0	06:34	0.32
J27	JUNCTION	0.01	0.24	91.13	0	06:36	0.24
J28	JUNCTION	0.01	0.28	91.12	0	06:36	0.28
J29	JUNCTION	0.02	0.39	91.12	0	06:36	0.39
J30	JUNCTION	0.02	0.30	90.99	0	07:12	0.30
J31	JUNCTION	0.02	0.39	90.99	0	07:12	0.39
J32	JUNCTION	0.03	0.46	90.99	0	07:12	0.46
J33	JUNCTION	0.04	0.58	90.99	0	07:12	0.58
J34	JUNCTION	0.06	0.71	90.99	0	07:13	0.71
J35	JUNCTION	0.01	0.09	90.25	0	07:13	0.09
OF-LombardyEast	OUTFALL	0.01	0.09	90.13	0	07:13	0.09
OF-LombardyWest	OUTFALL	0.00	0.00	90.06	0	00:00	0.00
OF-OsgoodePath	OUTFALL	0.00	0.00	91.00	0	00:00	0.00
OF-RY-UNC	OUTFALL	0.00	0.00	90.00	0	00:00	0.00

****
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	
J01	JUNCTION	0.00	0.11	0 06:23	0	5.66e-05	0.176	
J02	JUNCTION	0.00	0.02	0 06:33	0	1.36e-05	0.149	ltr
J03	JUNCTION	0.00	0.01	0 06:39	0	1.35e-05	0.195	ltr
J04	JUNCTION	0.00	0.01	0 06:53	0	1.33e-05	2.317	ltr
J05	JUNCTION	0.00	0.00	0 07:28	0	1.1e-05	0.023	ltr
J06	JUNCTION	0.00	0.00	0 07:43	0	1.09e-05	0.561	ltr
J07	JUNCTION	37.48	37.48	0 06:32	0.138	0.138	-0.005	
J08	JUNCTION	0.00	37.91	0 06:32	0	0.138	0.016	
J09	JUNCTION	0.00	38.88	0 06:31	0	0.138	-0.018	
J10	JUNCTION	0.00	38.22	0 06:31	0	0.138	-0.063	
J11	JUNCTION	0.00	36.99	0 06:32	0	0.138	0.064	
J12	JUNCTION	0.00	36.45	0 06:34	0	0.138	0.008	
J13	JUNCTION	0.00	36.97	0 06:34	0	0.138	-0.037	
J14	JUNCTION	0.00	33.84	0 06:35	0	0.138	-0.028	
J15	JUNCTION	0.00	32.01	0 06:28	0	0.138	-0.027	
J16	JUNCTION	0.00	25.08	0 06:34	0	0.147	0.076	
J17	JUNCTION	0.00	25.28	0 06:34	0	0.175	0.037	
J18	JUNCTION	0.00	0.00	0 00:00	0	0	0.000	ltr
J19	JUNCTION	0.00	0.23	0 06:20	0	0.000281	0.400	
J20	JUNCTION	14.22	14.22	0 06:32	0.0523	0.0526	-0.021	
J21	JUNCTION	0.00	14.06	0 06:32	0	0.0523	0.018	
J22	JUNCTION	0.00	13.49	0 06:34	0	0.0523	0.009	
J23	JUNCTION	0.00	13.47	0 06:35	0	0.0523	-0.001	
J24	JUNCTION	73.90	86.50	0 06:32	0.275	0.327	-0.023	

J25	JUNCTION	0.00	84.41	0	06:32	0	0.327	0.020
J26	JUNCTION	0.00	82.42	0	06:34	0	0.327	0.094
J27	JUNCTION	0.00	82.35	0	06:34	0	0.327	-0.099
J28	JUNCTION	32.64	112.43	0	06:32	0.12	0.447	-0.013
J29	JUNCTION	0.00	110.27	0	06:34	0	0.448	0.062
J30	JUNCTION	0.00	109.60	0	06:36	0	0.447	-0.087
J31	JUNCTION	0.00	107.56	0	06:36	0	0.448	0.012
J32	JUNCTION	0.00	101.22	0	06:34	0	0.448	-0.033
J33	JUNCTION	0.00	90.24	0	06:34	0	0.448	0.032
J34	JUNCTION	0.00	71.04	0	06:34	0	0.615	0.018
J35	JUNCTION	0.00	39.13	0	07:13	0	0.586	-0.000
OF-LombardyEast	OUTFALL	0.00	39.13	0	07:13	0	0.586	0.000
OF-LombardyWest	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
OF-OsgoodePath	OUTFALL	52.21	52.21	0	06:32	0.194	0.194	0.000
OF-RY-UNC	OUTFALL	20.20	20.20	0	06:32	0.0756	0.0756	0.000

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

No nodes were surcharged.


*********************
Node Flooding Summary
*********************

No nodes were flooded.


***********************
Outfall Loading Summary
***********************
```

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
OF-LombardyEast	23.36	14.99	39.13	0.586
OF-LombardyWest	0.00	0.00	0.00	0.000
OF-OsgoodePath	17.32	6.79	52.21	0.194
OF-RY-UNC	14.76	3.11	20.20	0.076
System	13.86	24.89	103.64	0.855

```
********************
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
C01	CONDUIT	0.02	0	06:33	0.07	0.00	0.01
C02	CHANNEL	0.01	0	06:39	0.00	0.00	0.00
C03	CHANNEL	0.01	0	06:53	0.00	0.00	0.00
C04	CONDUIT	0.00	0	07:28	0.00	0.00	0.00
C05	CHANNEL	0.00	0	07:43	0.00	0.00	0.00
C06	CHANNEL	0.00	0	08:19	0.00	0.00	0.05

C07	CHANNEL	37.91	0	06:32	0.19	0.00	0.13
C08	CONDUIT	38.88	0	06:31	1.11	0.46	0.33
C09	CHANNEL	38.22	0	06:31	0.35	0.00	0.08
C10	CHANNEL	36.99	0	06:32	0.23	0.00	0.14
C11	CHANNEL	36.45	0	06:34	0.16	0.00	0.20
C12	CONDUIT	36.97	0	06:34	1.09	0.44	0.65
C13	CHANNEL	33.84	0	06:35	0.33	0.00	0.27
C14	CHANNEL	32.01	0	06:28	0.31	0.00	0.33
C15	CHANNEL	24.47	0	06:23	0.26	0.00	0.42
C16	CHANNEL	12.28	0	07:46	0.08	0.00	0.53
C18	CHANNEL	0.00	0	00:00	0.00	0.00	0.00
C19	CHANNEL	0.11	0	06:23	0.01	0.00	0.02
C20	CONDUIT	0.23	0	06:20	0.07	0.00	0.10
C21	CHANNEL	14.06	0	06:32	0.20	0.00	0.05
C22	CHANNEL	13.49	0	06:34	0.12	0.00	0.08
C23	CONDUIT	13.47	0	06:35	0.56	0.16	0.31
C24	CHANNEL	13.84	0	06:37	0.08	0.00	0.14
C25	CHANNEL	84.41	0	06:32	0.28	0.01	0.20
C26	CHANNEL	82.42	0	06:34	0.18	0.01	0.26
C27	CONDUIT	82.35	0	06:34	1.10	1.09	0.70
C28	CHANNEL	81.97	0	06:35	0.28	0.01	0.23
C29	CHANNEL	110.27	0	06:34	0.23	0.01	0.29
C30	CONDUIT	109.60	0	06:36	1.23	1.46	0.73
C31	CHANNEL	107.56	0	06:36	0.46	0.01	0.30
C32	CHANNEL	101.22	0	06:34	0.43	0.01	0.37
C33	CHANNEL	90.24	0	06:34	0.36	0.01	0.45
C34	CHANNEL	71.04	0	06:34	0.20	0.01	0.56
C36	CHANNEL	39.13	0	07:13	0.35	0.00	0.08
C37	CONDUIT	25.28	0	06:34	0.17	0.17	1.00
OR1	ORIFICE	39.13	0	07:13			1.00
W01	WEIR	0.00	0	00:00			0.00
W02	WEIR	0.00	0	00:00			0.00
W03	WEIR	0.00	0	00:00			0.00
W04	WEIR	0.00	0	00:00			0.00
W05	WEIR	0.00	0	00:00			0.00
W06	WEIR	0.00	0	00:00			0.00
W07	WEIR	0.00	0	00:00			0.00
W08	WEIR	0.00	0	00:00			0.00
W09	WEIR	0.00	0	00:00			0.00
W10	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 ----------								
C01	1.00	0.95	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00
C02	1.00	0.93	0.03	0.00	0.04	0.00	0.00	0.00	0.86	0.00
C03	1.00	0.14	0.80	0.00	0.06	0.00	0.00	0.00	0.86	0.00
C04	1.00	0.14	0.00	0.00	0.86	0.00	0.00	0.00	0.00	0.00
C05	1.00	0.88	0.04	0.00	0.08	0.00	0.00	0.00	0.83	0.00
C06	1.00	0.76	0.13	0.00	0.11	0.00	0.00	0.00	0.85	0.00
C07	1.00	0.10	0.65	0.00	0.24	0.00	0.00	0.00	0.87	0.00
C08	1.00	0.11	0.00	0.00	0.88	0.01	0.00	0.00	0.00	0.11
C09	1.00	0.68	0.04	0.00	0.28	0.00	0.00	0.00	0.83	0.00
C10	1.00	0.65	0.03	0.00	0.32	0.00	0.00	0.00	0.85	0.00
C11	1.00	0.11	0.54	0.00	0.35	0.00	0.00	0.00	0.71	0.00
C12	1.00	0.12	0.00	0.00	0.88	0.01	0.00	0.00	0.00	0.08

C13	1.00	0.64	0.02	0.00	0.34	0.00	0.00	0.00	0.75	0.00
C14	1.00	0.60	0.04	0.00	0.36	0.00	0.00	0.00	0.80	0.00
C15	1.00	0.56	0.04	0.00	0.40	0.00	0.00	0.00	0.76	0.00
C16	1.00	0.12	0.44	0.00	0.44	0.00	0.00	0.00	0.78	0.00
C18	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.93	0.03	0.00	0.05	0.00	0.00	0.00	0.86	0.00
C20	1.00	0.75	0.18	0.00	0.07	0.00	0.00	0.00	0.00	0.85
C21	1.00	0.71	0.04	0.00	0.25	0.00	0.00	0.00	0.78	0.00
C22	1.00	0.09	0.63	0.00	0.28	0.00	0.00	0.00	0.87	0.00
C23	1.00	0.10	0.00	0.00	0.90	0.01	0.00	0.00	0.00	0.08
C24	1.00	0.68	0.04	0.00	0.28	0.00	0.00	0.00	0.86	0.00
C25	1.00	0.66	0.02	0.00	0.32	0.00	0.00	0.00	0.86	0.00
C26	1.00	0.11	0.56	0.00	0.33	0.00	0.00	0.00	0.75	0.00
C27	1.00	0.11	0.00	0.00	0.85	0.04	0.00	0.00	0.00	0.08
C28	1.00	0.60	0.07	0.00	0.33	0.00	0.00	0.00	0.84	0.00
C29	1.00	0.08	0.52	0.00	0.40	0.00	0.00	0.00	0.86	0.00
C30	1.00	0.08	0.00	0.00	0.88	0.03	0.00	0.00	0.00	0.06
C31	1.00	0.46	0.03	0.00	0.52	0.00	0.00	0.00	0.81	0.00
C32	1.00	0.43	0.03	0.00	0.54	0.00	0.00	0.00	0.82	0.00
C33	1.00	0.39	0.04	0.00	0.57	0.00	0.00	0.00	0.75	0.00
C34	1.00	0.35	0.05	0.00	0.60	0.00	0.00	0.00	0.80	0.00
C36	1.00	0.35	0.00	0.00	0.65	0.00	0.00	0.00	0.53	0.00
C37	1.00	0.11	0.02	0.00	0.88	0.00	0.00	0.00	0.00	0.12

****
Conduit Surcharge Summary
****

Conduit	Hours Full Both Ends	Hours Full Upstream	Hours Full Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C27	0.01	0.01	0.01	0.18	0.01
C30	0.01	0.01	0.01	0.40	0.01
C37	1.44	1.44	1.84	0.01	0.01

Analysis begun on: Fri Aug 27 10:54:15 2021
Analysis ended on: Fri Aug 27 10:54:19 2021
Total elapsed time: 00:00:04

```
ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM VERSION 7.4.3240
---------------------------------------------------------

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:                05/04/2021 00:00:00
Simulation end time:                  05/06/2021 00:00:00
Runoff wet weather time steps:        240 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)
D	Nash IUH	Raingage	0.52	10	6.67	41.33	0.00704	0.992
A	Nash IUH	Raingage	1.71	10	6.67	45.33	0.02314	0.992
EX-2	Nash IUH	Raingage	0.48	10	6.67	41.33	0.0065	0.992
EX-1	Nash IUH	Raingage	0.23	10	6.67	37.33	0.00311	0.992
C	Nash IUH	Raingage	0.75	10	6.67	41.33	0.01015	0.992
EX-3	Nash IUH	Raingage	0.48	10	6.67	41.33	0.0065	0.992
B	Nash IUH	Raingage	0.58	10	6.67	41.33	0.00785	0.992

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

Subcatchment	Total Precip (mm)	Total Losses (mm)	Total Runoff (mm)	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff (fraction)
D	106.73	58.946	47.404	0.246	37.652	0.444
A	106.73	55.801	50.532	0.864	131.322	0.473
EX-2	106.73	39.598	66.604	0.32	46.816	0.624
EX-1	106.73	43.437	62.783	0.144	21.361	0.588
C	106.73	51.064	55.227	0.414	62.507	0.517
EX-3	106.73	43.437	62.792	0.301	44.592	0.588
B	106.73	58.946	47.414	0.275	41.996	0.444

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

WARNING 02: maximum depth increased for Node J04
WARNING 02: maximum depth increased for Node J08
WARNING 02: maximum depth increased for Node J19

*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 0
```

```
Number of nodes ........... 39
Number of links ........... 46
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                  Data      Recording
Name                Data Source                   Type      Interval 
-----------------------------------------------------------------------
Raingage            11-SCS100yr-24hr              INTENSITY   60 min.


************
Node Summary
************
                                          Invert      Max.    Ponded    External
Name                Type                   Elev.     Depth      Area    Inflow  
-------------------------------------------------------------------------------
J01                 JUNCTION               91.43      1.15       0.0
J02                 JUNCTION               91.38      1.15       0.0
J03                 JUNCTION               91.32      1.15       0.0
J04                 JUNCTION               91.25      1.15       0.0
J05                 JUNCTION               91.19      1.15       0.0
J06                 JUNCTION               91.15      1.15       0.0
J07                 JUNCTION               91.02      1.15       0.0
J08                 JUNCTION               90.96      1.15       0.0
J09                 JUNCTION               90.91      1.15       0.0
J10                 JUNCTION               90.89      1.15       0.0
J11                 JUNCTION               90.77      1.15       0.0
J12                 JUNCTION               90.76      1.15       0.0
J13                 JUNCTION               90.71      1.15       0.0
J14                 JUNCTION               90.66      1.15       0.0
J15                 JUNCTION               90.57      1.15       0.0
J16                 JUNCTION               90.45      1.15       0.0
J17                 JUNCTION               90.32      1.15       0.0
J18                 JUNCTION               90.19      1.15       0.0
J19                 JUNCTION               91.41      1.15       0.0
J20                 JUNCTION               91.39      1.15       0.0
J21                 JUNCTION               91.22      1.15       0.0
J22                 JUNCTION               91.18      1.15       0.0
J23                 JUNCTION               91.13      1.15       0.0
J24                 JUNCTION               91.09      1.15       0.0
J25                 JUNCTION               90.97      1.15       0.0
J26                 JUNCTION               90.93      1.15       0.0
J27                 JUNCTION               90.89      1.15       0.0
J28                 JUNCTION               90.84      1.15       0.0
J29                 JUNCTION               90.73      1.15       0.0
J30                 JUNCTION               90.69      1.15       0.0
J31                 JUNCTION               90.60      1.15       0.0
J32                 JUNCTION               90.53      1.15       0.0
J33                 JUNCTION               90.41      1.15       0.0
J34                 JUNCTION               90.28      1.15       0.0
J35                 JUNCTION               90.16      1.15       0.0
OF-LombardyEast     OUTFALL                90.04      1.15       0.0
OF-LombardyWest     OUTFALL                90.06      1.15       0.0
OF-OsgoodePath      OUTFALL                91.00      0.00       0.0
OF-RY-UNC           OUTFALL                90.00      0.00       0.0


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Link Summary
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Name	From Node	To Node	Type	Length	%Slope	Roughness
C01	J01	J02	CONDUIT	9.0	0.5556	0.0240
C02	J02	J03	CONDUIT	12.0	0.5000	0.0350
C03	J03	J04	CONDUIT	12.0	0.5833	0.0350
C04	J04	J05	CONDUIT	9.0	0.6667	0.0240
C05	J05	J06	CONDUIT	7.0	0.5714	0.0350
C06	J06	J07	CONDUIT	25.0	0.5200	0.0350
C07	J07	J08	CONDUIT	11.0	0.5455	0.0350
C08	J08	J09	CONDUIT	9.0	0.5556	0.0240
C09	J09	J10	CONDUIT	4.0	0.5000	0.0350
C10	J10	J11	CONDUIT	25.0	0.4800	0.0350
C11	J11	J12	CONDUIT	3.0	0.3333	0.0350
C12	J12	J13	CONDUIT	9.0	0.5556	0.0240
C13	J13	J14	CONDUIT	10.0	0.5000	0.0350
C14	J14	J15	CONDUIT	17.0	0.5294	0.0350
C15	J15	J16	CONDUIT	25.0	0.4800	0.0350
C16	J16	J17	CONDUIT	25.0	0.5200	0.0350
C18	J18	OF-LombardyWest	CONDUIT	26.0	0.5000	0.0350
C19	J01	J19	CONDUIT	10.0	0.2000	0.0350
C20	J19	J20	CONDUIT	9.0	0.2222	0.0240
C21	J20	J21	CONDUIT	32.0	0.5313	0.0350
C22	J21	J22	CONDUIT	7.0	0.5714	0.0350
C23	J22	J23	CONDUIT	9.0	0.5556	0.0240
C24	J23	J24	CONDUIT	8.0	0.5000	0.0350
C25	J24	J25	CONDUIT	25.0	0.4800	0.0350
C26	J25	J26	CONDUIT	7.0	0.5714	0.0350
C27	J26	J27	CONDUIT	9.0	0.4444	0.0240
C28	J27	J28	CONDUIT	9.0	0.5556	0.0350
C29	J28	J29	CONDUIT	22.0	0.5000	0.0350
C30	J29	J30	CONDUIT	9.0	0.4444	0.0240
C31	J30	J31	CONDUIT	16.0	0.5625	0.0350
C32	J31	J32	CONDUIT	13.0	0.5385	0.0350
C33	J32	J33	CONDUIT	25.0	0.4800	0.0350
C34	J33	J34	CONDUIT	25.0	0.5200	0.0350
C36	J35	OF-LombardyEast	CONDUIT	24.0	0.5000	0.0350
C37	J17	J34	CONDUIT	20.0	0.2000	0.0240
OR1	J34	J35	ORIFICE			
W01	J17	J18	WEIR			
W02	J34	J35	WEIR			
W03	J01	J02	WEIR			
W04	J04	J05	WEIR			
W05	J08	J09	WEIR			
W06	J12	J13	WEIR			
W07	J19	J20	WEIR			
W08	J22	J23	WEIR			
W09	J26	J27	WEIR			
W10	J29	J30	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C01	CIRCULAR	0.40	0.13	0.10	0.40	1	84.09
C02	RoadsideDitch-Normal	1.15	6.80	0.89	13.00	1	12711.10
C03	RoadsideDitch-Normal	1.15	6.80	0.89	13.00	1	13729.59
C04	CIRCULAR	0.40	0.13	0.10	0.40	1	92.11
C05	RoadsideDitch-Normal	1.15	6.80	0.89	13.00	1	13588.76

```
C06              RoadsideDitch-Normal     1.15     6.80     0.89    13.00        1 12962.84
C07              RoadsideDitch-Normal     1.15     6.80     0.89    13.00        1 13276.33
C08              CIRCULAR             0.40     0.13     0.10     0.40        1    84.09
C09              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 13043.80
C10              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 12780.26
C11              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 10650.18
C12              CIRCULAR             0.40     0.13     0.10     0.40        1    84.09
C13              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 13043.80
C14              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 13421.97
C15              RoadsideDitch-Deep     1.15     5.64     0.65    13.00        1  8423.95
C16              RoadsideDitch-Deep     1.15     5.64     0.65    13.00        1  8767.93
C18              RoadsideDitch-Normal     1.15     6.80     0.89    13.00        1 12711.10
C19              RoadsideDitch-Normal     1.15     6.80     0.89    13.00        1  8039.16
C20              CIRCULAR             0.40     0.13     0.10     0.40        1    53.18
C21              RoadsideDitch-Normal     1.15     6.80     0.89    13.00        1 13102.31
C22              RoadsideDitch-Normal     1.15     6.80     0.89    13.00        1 13588.76
C23              CIRCULAR             0.40     0.13     0.10     0.40        1    84.09
C24              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 13043.80
C25              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 12780.26
C26              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 13944.44
C27              CIRCULAR             0.40     0.13     0.10     0.40        1    75.21
C28              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 13749.40
C29              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 13043.80
C30              CIRCULAR             0.40     0.13     0.10     0.40        1    75.21
C31              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 13835.06
C32              RoadsideDitch-Moderate     1.15     6.14     1.08    13.00        1 13536.21
C33              RoadsideDitch-Deep     1.15     5.64     0.65    13.00        1  8423.95
C34              RoadsideDitch-Deep     1.15     5.64     0.65    13.00        1  8767.93
C36              RoadsideDitch-Normal     1.15     6.80     0.89    13.00        1 12711.10
C37              CIRCULAR             0.60     0.28     0.15     0.60        1   148.75


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

Transect RoadsideDitch-Deep
Area:
            0.0044     0.0093     0.0148     0.0208     0.0274
            0.0346     0.0424     0.0507     0.0596     0.0690
            0.0790     0.0896     0.1007     0.1124     0.1247
            0.1375     0.1509     0.1649     0.1794     0.1945
            0.2101     0.2263     0.2431     0.2604     0.2783
            0.2967     0.3158     0.3353     0.3554     0.3761
            0.3974     0.4192     0.4416     0.4645     0.4880
            0.5121     0.5367     0.5618     0.5876     0.6139
            0.6407     0.6693     0.7029     0.7386     0.7757
            0.8143     0.8558     0.9006     0.9487     1.0000
Hrad:
            0.0326     0.0616     0.0881     0.1128     0.1361
            0.1584     0.1798     0.2006     0.2209     0.2407
            0.2602     0.2793     0.2982     0.3169     0.3354
            0.3537     0.3720     0.3901     0.4081     0.4261
            0.4439     0.4616     0.4793     0.4969     0.5144
            0.5319     0.5493     0.5667     0.5840     0.6013
            0.6185     0.6358     0.6530     0.6701     0.6872
            0.7043     0.7214     0.7385     0.7555     0.7726
            0.7896     0.8158     0.8403     0.8642     0.8887
            0.9129     0.9352     0.9569     0.9784     1.0000
Width:
            0.0876     0.0982     0.1089     0.1196     0.1302
            0.1409     0.1516     0.1622     0.1729     0.1835
```

```
              0.1942      0.2049      0.2155      0.2262      0.2369
              0.2475      0.2581      0.2687      0.2793      0.2899
              0.3005      0.3111      0.3216      0.3322      0.3428
              0.3534      0.3640      0.3746      0.3852      0.3957
              0.4063      0.4169      0.4275      0.4381      0.4487
              0.4592      0.4698      0.4804      0.4910      0.5016
              0.5122      0.5872      0.6604      0.6869      0.7135
              0.7523      0.8142      0.8762      0.9381      1.0000

  Transect RoadsideDitch-Moderate
  Area:
              0.0040      0.0085      0.0136      0.0191      0.0252
              0.0318      0.0389      0.0466      0.0547      0.0634
              0.0726      0.0823      0.0925      0.1033      0.1145
              0.1263      0.1386      0.1515      0.1648      0.1786
              0.1930      0.2079      0.2233      0.2392      0.2557
              0.2726      0.2901      0.3081      0.3278      0.3524
              0.3795      0.4069      0.4346      0.4626      0.4908
              0.5192      0.5479      0.5769      0.6061      0.6356
              0.6653      0.6956      0.7271      0.7599      0.7940
              0.8294      0.8675      0.9087      0.9528      1.0000
  Hrad:
              0.0198      0.0375      0.0536      0.0686      0.0827
              0.0963      0.1093      0.1219      0.1343      0.1463
              0.1582      0.1698      0.1813      0.1926      0.2039
              0.2150      0.3745      0.3928      0.4109      0.4289
              0.4468      0.4647      0.4824      0.5001      0.5177
              0.5353      0.5528      0.5703      0.5052      0.4457
              0.4755      0.5049      0.5341      0.5631      0.5919
              0.6204      0.6487      0.6768      0.7047      0.7324
              0.7599      0.7915      0.8235      0.8541      0.8835
              0.9115      0.9365      0.9593      0.9804      1.0000
  Width:
              0.0876      0.0982      0.1089      0.1196      0.1302
              0.1409      0.1516      0.1622      0.1729      0.1835
              0.1942      0.2049      0.2155      0.2262      0.2369
              0.2475      0.2582      0.2688      0.2794      0.2900
              0.3006      0.3112      0.3218      0.3325      0.3431
              0.3537      0.3643      0.3749      0.4532      0.5554
              0.5607      0.5660      0.5713      0.5766      0.5819
              0.5872      0.5925      0.5978      0.6032      0.6085
              0.6138      0.6338      0.6604      0.6869      0.7135
              0.7523      0.8142      0.8762      0.9381      1.0000

  Transect RoadsideDitch-Normal
  Area:
              0.0036      0.0077      0.0123      0.0173      0.0228
              0.0287      0.0352      0.0421      0.0494      0.0573
              0.0656      0.0744      0.0836      0.0933      0.1035
              0.1142      0.1257      0.1409      0.1602      0.1821
              0.2043      0.2268      0.2494      0.2723      0.2955
              0.3189      0.3425      0.3663      0.3904      0.4147
              0.4393      0.4640      0.4891      0.5143      0.5398
              0.5655      0.5914      0.6176      0.6440      0.6707
              0.6976      0.7249      0.7534      0.7830      0.8138
              0.8458      0.8803      0.9175      0.9574      1.0000
  Hrad:
              0.0240      0.0453      0.0648      0.0830      0.1001
              0.1165      0.1323      0.1476      0.1625      0.1770
              0.1914      0.2055      0.2194      0.2331      0.2467
              0.2602      0.2750      0.2848      0.2896      0.2980
              0.3119      0.3290      0.3483      0.3691      0.3909
              0.4135      0.4367      0.4603      0.4842      0.5083
```

```
             0.5327      0.5571      0.5816      0.6061      0.6307
             0.6552      0.6797      0.7042      0.7286      0.7530
             0.7773      0.8057      0.8347      0.8626      0.8896
             0.9154      0.9387      0.9603      0.9806      1.0000
  Width:
             0.0876      0.0982      0.1089      0.1196      0.1302
             0.1409      0.1516      0.1622      0.1729      0.1835
             0.1942      0.2049      0.2155      0.2262      0.2369
             0.2475      0.2979      0.3917      0.4855      0.5023
             0.5076      0.5129      0.5182      0.5235      0.5288
             0.5342      0.5395      0.5448      0.5501      0.5554
             0.5607      0.5660      0.5713      0.5766      0.5819
             0.5872      0.5925      0.5978      0.6032      0.6085
             0.6138      0.6338      0.6604      0.6869      0.7135
             0.7523      0.8142      0.8762      0.9381      1.0000


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

  ****************
  Analysis Options
  ****************
  Flow Units ............... LPS
  Process Models:
    Rainfall/Runoff ........ YES
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ NO
    Water Quality .......... NO
  Flow Routing Method ...... DYNWAVE
  Surcharge Method ......... EXTRAN
  Starting Date ............ 05/04/2021 00:00:00
  Ending Date .............. 05/06/2021 00:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 00:01:00
  Routing Time Step ........ 2.00 sec
  Variable Time Step ....... YES
  Maximum Trials ........... 8
  Number of Threads ........ 4
  Head Tolerance ........... 0.001500 m


  **************************        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 ..........          0.257         2.565
  External Outflow .........          0.256         2.565
  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 (%) .....          0.002
```

```
***************************
Time-Step Critical Elements
***************************
Link C11 (9.76%)


********************************
Highest Flow Instability Indexes
********************************
Link C30 (5)
Link C27 (4)
Link C28 (2)
Link C23 (1)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     1.95 sec
Maximum Time Step           :     2.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00
Time Step Frequencies       :
    2.000 -  1.516 sec      :    95.36 %
    1.516 -  1.149 sec      :     3.67 %
    1.149 -  0.871 sec      :     0.34 %
    0.871 -  0.660 sec      :     0.24 %
    0.660 -  0.500 sec      :     0.39 %


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

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J01	JUNCTION	0.00	0.05	91.48	0 13:06	0.05
J02	JUNCTION	0.00	0.02	91.40	0 13:06	0.02
J03	JUNCTION	0.00	0.02	91.34	0 13:08	0.02
J04	JUNCTION	0.00	0.05	91.30	0 13:10	0.05
J05	JUNCTION	0.00	0.04	91.23	0 13:02	0.04
J06	JUNCTION	0.00	0.08	91.23	0 13:02	0.08
J07	JUNCTION	0.01	0.21	91.23	0 13:01	0.21
J08	JUNCTION	0.03	0.27	91.23	0 13:03	0.27
J09	JUNCTION	0.02	0.28	91.19	0 13:05	0.28
J10	JUNCTION	0.02	0.30	91.19	0 13:06	0.30
J11	JUNCTION	0.04	0.42	91.19	0 13:06	0.42
J12	JUNCTION	0.05	0.43	91.19	0 13:06	0.43
J13	JUNCTION	0.05	0.46	91.17	0 13:09	0.46
J14	JUNCTION	0.05	0.51	91.17	0 13:09	0.51
J15	JUNCTION	0.07	0.60	91.17	0 13:09	0.60
J16	JUNCTION	0.09	0.72	91.17	0 13:09	0.72
J17	JUNCTION	0.12	0.85	91.17	0 13:09	0.85
J18	JUNCTION	0.01	0.15	90.34	0 13:09	0.15
J19	JUNCTION	0.00	0.07	91.48	0 13:06	0.07
J20	JUNCTION	0.01	0.10	91.49	0 13:05	0.10

J21	JUNCTION	0.01	0.27	91.49	0	13:05	0.27
J22	JUNCTION	0.02	0.31	91.49	0	13:05	0.31
J23	JUNCTION	0.01	0.35	91.48	0	13:05	0.35
J24	JUNCTION	0.02	0.39	91.48	0	13:05	0.39
J25	JUNCTION	0.03	0.51	91.48	0	13:05	0.51
J26	JUNCTION	0.05	0.55	91.48	0	13:05	0.55
J27	JUNCTION	0.03	0.48	91.37	0	13:06	0.48
J28	JUNCTION	0.04	0.53	91.37	0	13:06	0.53
J29	JUNCTION	0.07	0.64	91.37	0	13:05	0.64
J30	JUNCTION	0.05	0.49	91.18	0	13:09	0.49
J31	JUNCTION	0.07	0.58	91.18	0	13:09	0.58
J32	JUNCTION	0.08	0.65	91.18	0	13:09	0.65
J33	JUNCTION	0.10	0.77	91.18	0	13:09	0.77
J34	JUNCTION	0.14	0.90	91.18	0	13:09	0.90
J35	JUNCTION	0.02	0.16	90.32	0	13:09	0.16
OF-LombardyEast	OUTFALL	0.02	0.16	90.20	0	13:09	0.16
OF-LombardyWest	OUTFALL	0.01	0.15	90.21	0	13:09	0.15
OF-OsgoodePath	OUTFALL	0.00	0.00	91.00	0	00:00	0.00
OF-RY-UNC	OUTFALL	0.00	0.00	90.00	0	00:00	0.00

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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
J01	JUNCTION	0.00	2.38	0	13:05	0	0.00159	0.015
J02	JUNCTION	0.00	2.22	0	13:06	0	0.00146	0.039
J03	JUNCTION	0.00	2.26	0	13:07	0	0.00146	-0.039
J04	JUNCTION	0.00	2.20	0	13:08	0	0.00146	0.599
J05	JUNCTION	0.00	1.97	0	13:10	0	0.00155	-0.248
J06	JUNCTION	0.00	4.17	0	12:43	0	0.00349	0.122
J07	JUNCTION	62.51	62.51	0	13:00	0.414	0.418	-0.007
J08	JUNCTION	0.00	61.34	0	13:00	0	0.416	0.039
J09	JUNCTION	0.00	61.14	0	13:00	0	0.415	-0.044
J10	JUNCTION	0.00	60.81	0	13:00	0	0.416	-0.025
J11	JUNCTION	0.00	58.84	0	13:00	0	0.416	0.030
J12	JUNCTION	0.00	57.01	0	13:02	0	0.416	0.014
J13	JUNCTION	0.00	56.81	0	13:02	0	0.416	-0.024
J14	JUNCTION	0.00	56.21	0	13:02	0	0.416	-0.007
J15	JUNCTION	0.00	54.62	0	13:03	0	0.416	-0.007
J16	JUNCTION	0.00	52.51	0	13:05	0	0.434	0.027
J17	JUNCTION	0.00	97.93	0	13:08	0	0.608	0.007
J18	JUNCTION	0.00	97.76	0	13:09	0	0.315	-0.000
J19	JUNCTION	0.00	2.75	0	13:04	0	0.00212	0.128
J20	JUNCTION	21.36	21.36	0	13:00	0.144	0.145	-0.064
J21	JUNCTION	0.00	20.74	0	12:56	0	0.143	0.061
J22	JUNCTION	0.00	23.28	0	13:12	0	0.143	0.002
J23	JUNCTION	0.00	25.16	0	13:13	0	0.143	0.004
J24	JUNCTION	131.32	141.12	0	12:57	0.864	1.01	-0.014
J25	JUNCTION	0.00	134.99	0	13:00	0	1.01	0.011
J26	JUNCTION	0.00	128.56	0	13:02	0	1.01	0.045
J27	JUNCTION	0.00	127.66	0	13:04	0	1.01	-0.048
J28	JUNCTION	46.82	171.77	0	13:00	0.32	1.33	-0.005
J29	JUNCTION	0.00	166.96	0	13:03	0	1.33	0.038
J30	JUNCTION	0.00	164.96	0	13:05	0	1.33	-0.043
J31	JUNCTION	0.00	164.30	0	13:05	0	1.33	0.005
J32	JUNCTION	0.00	163.17	0	13:06	0	1.33	-0.012

```
J33                  JUNCTION     0.00   161.88     0  13:07           0        1.33       0.015
J34                  JUNCTION     0.00   161.08     0  13:09           0         1.6       0.007
J35                  JUNCTION     0.00   113.10     0  13:09           0        1.43      -0.000
OF-LombardyEast      OUTFALL      0.00   113.09     0  13:09           0        1.43       0.000
OF-LombardyWest      OUTFALL      0.00    97.74     0  13:09           0       0.315       0.000
OF-OsgoodePath       OUTFALL     86.59    86.59     0  13:00       0.576       0.576       0.000
OF-RY-UNC            OUTFALL     37.65    37.65     0  13:00       0.246       0.246       0.000


**********************
Node Surcharge Summary
**********************

No nodes were surcharged.


*********************
Node Flooding Summary
*********************

No nodes were flooded.


***********************
Outfall Loading Summary
***********************

-----------------------------------------------------------
                     Flow       Avg       Max       Total
                     Freq      Flow      Flow      Volume
Outfall Node         Pcnt       LPS       LPS    10^6 ltr
-----------------------------------------------------------
OF-LombardyEast     46.44     20.94    113.09       1.427
OF-LombardyWest      7.96     34.47     97.74       0.315
OF-OsgoodePath      40.89     10.18     86.59       0.576
OF-RY-UNC           36.18      4.94     37.65       0.246
-----------------------------------------------------------
System              32.87     70.54    314.81       2.565


********************
Link Flow Summary
********************

-----------------------------------------------------------------------------
                                Maximum  Time of Max   Maximum    Max/    Max/
                                 |Flow|   Occurrence   |Veloc|    Full    Full
Link                 Type           LPS  days hr:min     m/sec    Flow   Depth
-----------------------------------------------------------------------------
C01                  CONDUIT       2.22     0  13:06      0.42    0.03    0.09
C02                  CHANNEL       2.26     0  13:07      0.13    0.00    0.01
C03                  CHANNEL       2.20     0  13:08      0.07    0.00    0.03
C04                  CONDUIT       1.97     0  13:10      0.40    0.02    0.09
C05                  CHANNEL       2.28     0  13:10      0.05    0.00    0.05
C06                  CHANNEL       4.17     0  12:43      0.04    0.00    0.13
C07                  CHANNEL      61.34     0  13:00      0.19    0.00    0.21
C08                  CONDUIT      61.14     0  13:00      1.19    0.73    0.69
C09                  CHANNEL      60.81     0  13:00      0.38    0.00    0.26
C10                  CHANNEL      58.84     0  13:00      0.24    0.00    0.32
C11                  CHANNEL      57.01     0  13:02      0.16    0.01    0.37
C12                  CONDUIT      56.81     0  13:02      1.10    0.68    1.00
C13                  CHANNEL      56.21     0  13:02      0.34    0.00    0.42
C14                  CHANNEL      54.62     0  13:03      0.33    0.00    0.49
```

C15	CHANNEL	52.51	0	13:05	0.24	0.01	0.58
C16	CHANNEL	50.58	0	13:07	0.06	0.01	0.69
C18	CHANNEL	97.74	0	13:09	0.46	0.01	0.13
C19	CHANNEL	2.38	0	13:05	0.03	0.00	0.05
C20	CONDUIT	2.75	0	13:04	0.16	0.05	0.21
C21	CHANNEL	20.74	0	12:56	0.20	0.00	0.16
C22	CHANNEL	23.28	0	13:12	0.12	0.00	0.25
C23	CONDUIT	25.16	0	13:13	0.55	0.30	0.82
C24	CHANNEL	27.67	0	13:12	0.08	0.00	0.32
C25	CHANNEL	134.99	0	13:00	0.29	0.01	0.39
C26	CHANNEL	128.56	0	13:02	0.18	0.01	0.46
C27	CONDUIT	127.66	0	13:04	1.15	1.70	1.00
C28	CHANNEL	127.09	0	13:04	0.30	0.01	0.44
C29	CHANNEL	166.96	0	13:03	0.23	0.01	0.51
C30	CONDUIT	164.96	0	13:05	1.31	2.19	1.00
C31	CHANNEL	164.30	0	13:05	0.47	0.01	0.46
C32	CHANNEL	163.17	0	13:06	0.44	0.01	0.53
C33	CHANNEL	161.88	0	13:07	0.33	0.02	0.62
C34	CHANNEL	161.08	0	13:09	0.15	0.02	0.72
C36	CHANNEL	113.09	0	13:09	0.48	0.01	0.14
C37	CONDUIT	48.35	0	13:12	0.17	0.33	1.00
OR1	ORIFICE	44.44	0	13:09			1.00
W01	WEIR	97.76	0	13:09			0.34
W02	WEIR	68.66	0	13:09			0.33
W03	WEIR	0.00	0	00:00			0.00
W04	WEIR	0.00	0	00:00			0.00
W05	WEIR	0.00	0	00:00			0.00
W06	WEIR	0.00	0	00:00			0.00
W07	WEIR	0.00	0	00:00			0.00
W08	WEIR	0.00	0	00:00			0.00
W09	WEIR	0.00	0	00:00			0.00
W10	WEIR	0.00	0	00:00			0.00

```
***************************
Flow Classification Summary
***************************
```

	Adjusted	---------- Fraction of Time in Flow Class ----------								
Conduit	/Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C01	1.00	0.92	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00
C02	1.00	0.90	0.03	0.00	0.07	0.00	0.00	0.00	0.73	0.00
C03	1.00	0.25	0.65	0.00	0.10	0.00	0.00	0.00	0.74	0.00
C04	1.00	0.25	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.01
C05	1.00	0.80	0.05	0.00	0.16	0.00	0.00	0.00	0.73	0.00
C06	1.00	0.53	0.26	0.00	0.20	0.00	0.00	0.00	0.72	0.00
C07	1.00	0.14	0.39	0.00	0.47	0.00	0.00	0.00	0.78	0.00
C08	1.00	0.14	0.00	0.00	0.84	0.01	0.00	0.00	0.00	0.25
C09	1.00	0.46	0.04	0.00	0.50	0.00	0.00	0.00	0.71	0.00
C10	1.00	0.43	0.03	0.00	0.54	0.00	0.00	0.00	0.75	0.00
C11	1.00	0.15	0.28	0.00	0.57	0.00	0.00	0.00	0.46	0.00
C12	1.00	0.16	0.00	0.00	0.83	0.01	0.00	0.00	0.00	0.20
C13	1.00	0.42	0.02	0.00	0.56	0.00	0.00	0.00	0.51	0.00
C14	1.00	0.39	0.04	0.00	0.58	0.00	0.00	0.00	0.69	0.00
C15	1.00	0.35	0.04	0.00	0.61	0.00	0.00	0.00	0.51	0.00
C16	1.00	0.17	0.19	0.00	0.65	0.00	0.00	0.00	0.65	0.00
C18	1.00	0.86	0.00	0.00	0.14	0.00	0.00	0.00	0.71	0.00
C19	1.00	0.87	0.05	0.00	0.08	0.00	0.00	0.00	0.72	0.00
C20	1.00	0.51	0.36	0.00	0.13	0.00	0.00	0.00	0.00	0.70
C21	1.00	0.48	0.03	0.00	0.49	0.00	0.00	0.00	0.56	0.00

C22	1.00	0.12	0.37	0.00	0.51	0.00	0.00	0.00	0.80	0.00
C23	1.00	0.12	0.00	0.00	0.87	0.01	0.00	0.00	0.00	0.19
C24	1.00	0.45	0.04	0.00	0.51	0.00	0.00	0.00	0.79	0.00
C25	1.00	0.43	0.02	0.00	0.55	0.00	0.00	0.00	0.75	0.00
C26	1.00	0.14	0.30	0.00	0.56	0.00	0.00	0.00	0.55	0.00
C27	1.00	0.14	0.00	0.00	0.75	0.11	0.00	0.00	0.00	0.14
C28	1.00	0.36	0.08	0.00	0.56	0.00	0.00	0.00	0.76	0.00
C29	1.00	0.10	0.26	0.00	0.64	0.00	0.00	0.00	0.78	0.00
C30	1.00	0.11	0.00	0.00	0.77	0.12	0.00	0.00	0.00	0.11
C31	1.00	0.23	0.03	0.00	0.75	0.00	0.00	0.00	0.70	0.00
C32	1.00	0.20	0.03	0.00	0.77	0.00	0.00	0.00	0.72	0.00
C33	1.00	0.17	0.04	0.00	0.79	0.00	0.00	0.00	0.51	0.00
C34	1.00	0.13	0.04	0.00	0.83	0.00	0.00	0.00	0.68	0.00
C36	1.00	0.13	0.00	0.00	0.87	0.00	0.00	0.00	0.60	0.00
C37	1.00	0.13	0.04	0.00	0.83	0.00	0.00	0.00	0.00	0.13

****
Conduit Surcharge Summary
****

Conduit	Hours Full Both Ends	Hours Full Upstream	Hours Full Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C12	0.47	0.47	0.90	0.01	0.01
C27	0.47	0.72	0.47	1.06	0.47
C30	1.01	1.36	1.41	1.23	0.74
C37	4.00	4.00	4.46	0.01	0.01

Analysis begun on: Fri Aug 27 10:18:58 2021
Analysis ended on: Fri Aug 27 10:19:02 2021
Total elapsed time: 00:00:04

APPENDIX C

WATER BALANCE CALCULATIONS

Water Balance Model Description

The Thornthwaite-Mather (1957) water balance models are conceptual models that are used to simulate steady-state climatic averages or continuous values of precipitation (rain + snow), snowpack, snowmelt, soil moisture, evapotranspiration, and water surplus (infiltration + runoff) (refer to **Figure 1)**. Input parameters consist of daily precipitation *(PRECIP),* temperature *(MAX / MIN TEMP),* potential evaportranspiration *(PET)*, and the available water content *(AWC)* that can also be referred to as the water holding capacity of the soil. All water quantities in the model are based on monthly calculations and are represented as depths (volume per unit area) of liquid water over the area being simulated. *All model units are in millimetres (mm)*.

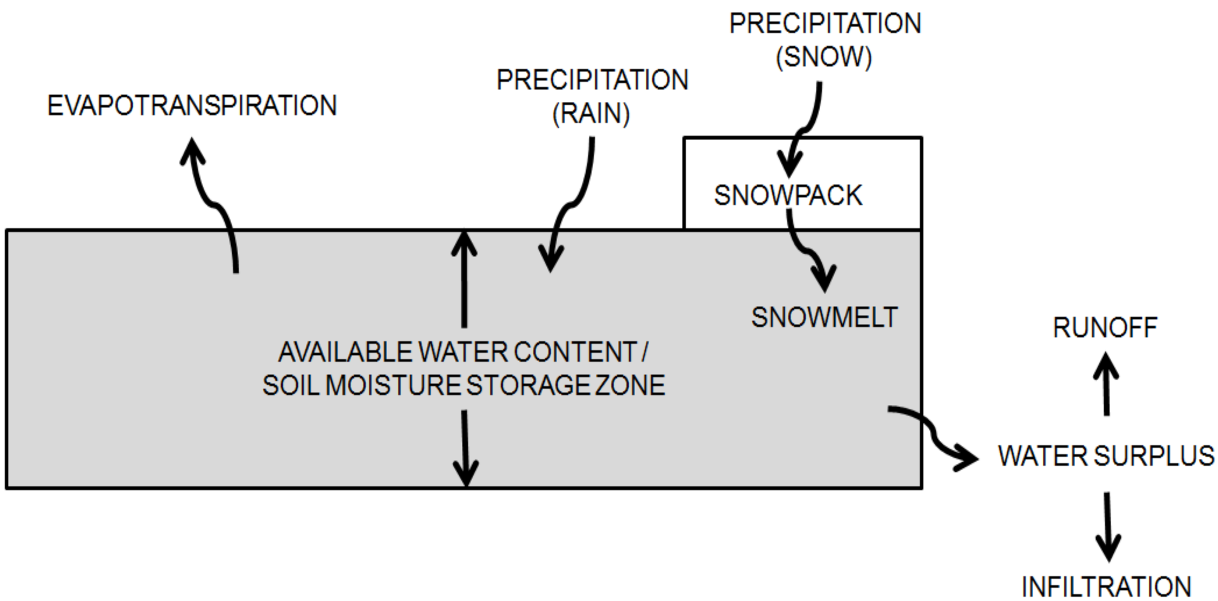


Figure 1: Conceptual Water Balance Model

Available Water Content (Water Holding Capacity)

The available water content (AWC) or water holding capacity of the soil was taken from Table 3.1 from the *Stormwater Management and Planning Manual (MOE, 2003)*, which has been reproduced in **Table 1** below. The available water content is the soil-moisture storage zone or the zone between the field capacity and vertical extent of the root zone.

Table 1: Water Holding Capacity Values (MOE, 2003)

Land Use / Soil Type	Hydrologic Soil Group	Water Holding Capacity (mm)
Urban Lawns / Shallow Rooted Crops (spinach, beans, beets, carrots)		
Fine Sand	A	50
Fine Sandy Loam	B	75
Silt Loam	C	125
Clay Loam	CD	100
Clay	D	75

Water Balance Model Description

Land Use / Soil Type	Hydrologic Soil Group	Water Holding Capacity (mm)
Moderately Rooted Crops (corn and cereal grains)		
Fine Sand	A	75
Fine Sandy Loam	B	150
Silt Loam	C	200
Clay Loam	CD	200
Clay	D	150
Pasture and Shrubs		
Fine Sand	A	100
Fine Sandy Loam	B	150
Silt Loam	C	250
Clay Loam	CD	250
Clay	D	200
Mature Forests		
Fine Sand	A	250
Fine Sandy Loam	B	300
Silt Loam	C	400
Clay Loam	CD	400
Clay	D	350

Precipitation

Daily precipitation *(PRECIP)* values consist of the total daily rainfall and water equivalent of snowmelt that fell on that day. Based on the mean daily temperature *(MEAN TEMP)* precipitation falls either as rainfall *(RAIN)* or the water equivalent of snowfall *(SNOW)*:

- *RAIN: If (MEAN TEMP >= 0, RAIN, SNOW)*
- *SNOW: If (MEAN TEMP < 0, SNOW, RAIN)*

Snowmelt / Snowpack / Water Input

Snowmelt *(MELT)* occurs if there is available snow (water equivalent) in the snowpack *(SNOWPACK)* and the maximum daily temperature *(MAX TEMP)* is greater than 0. The available snowmelt is limited to the available water in the snowpack.

Snowmelt is computed by a degree-day equation (Haith, 1985):

SNOWMELT (cm/d) = MELT COEFICIENT x [AIR TEMP (^{O}C) – MELT TEMP(^{O}C)]

The melt coefficient is typically 0.45 for northern climates (Haith, 1985). The melt temperature is assumed to be 0^{O}C. The air temperature is assumed to be the max temperature multiplied by a ratio of the max to min temperatures:

AIR TEMP = *MAX TEMP / (MAX TEMP – MIN TEMP)*

Therefore the snowmelt equation is:

- *MELT: If (MAX TEMP > 0, IF(SNOWPACK > 0, MIN((MAX TEMP*0.45*MAX TEMP/(MAX TEMP – MIN TEMP)*10mm/cm), SNOWPACK), 0), 0)*

Snow accumulates in the snowpack from the previous day if precipitation falls as snow and there is no snowmelt or the amount of snow that falls in a day exceeds the daily snowmelt:

$SNOWPACK_N = SNOWPACK_{N-1} + SNOW - MELT$

The initial snowmelt on day 1 (i.e. January 1) is assumed to be 0. The initial snowpack on day 1 is assumed to be the snowpack on the last day of simulation (i.e. December 31).

The total water input (W) is rain + snowmelt. This is the available water that fills the soil moisture storage zone each day.

Evaporation

Measured potential evaporation (PE) data (i.e. lake evaporation) is provided with the Environment Canada Climate Normals (see example below). The data represents daily averages for each month over a 20+ year period.

▼ Evaporation

Evaporation														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
Lake Evaporation (mm)	0	0	0	0	3.6	4.3	4.5	3.7	2.4	1.4	0	0	0	C

The daily evaporation data was assumed to represent the middle or 15th of each month and 'smoothed' to represent the transition from month to month (see **Figure 2** below). As shown in **Figure 2** this produces a more realistic curve of potential evapotranspiration.

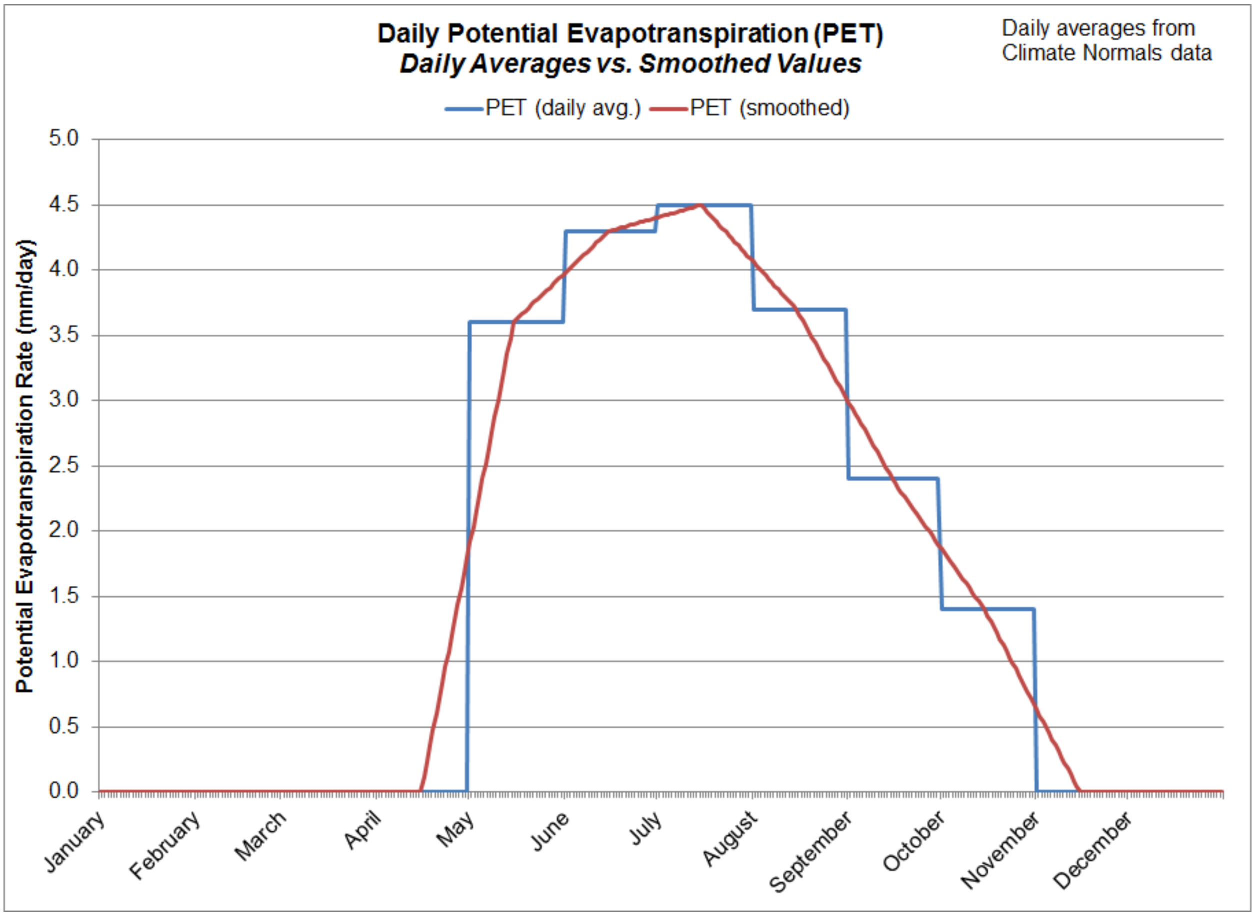


Figure 2: Daily Potential Evapotranspiration Rates (Daily Averages vs. Smoothed Values)

Potential Evapotranspiration

To convert potential evaporation data to potential crop evapotranspiration (PET) data a cover coefficient is applied based on land use and growing / dormant seasons:

PET = PE x Crop Cover Coefficient

Crop cover coefficients are based on the crop growth stages for different crop types (see **Figure 3**). A typical crop coefficient curve is shown in **Figure 4**, which depicts a crop that provides transpiration above the potential evaporation rates during the growing season.

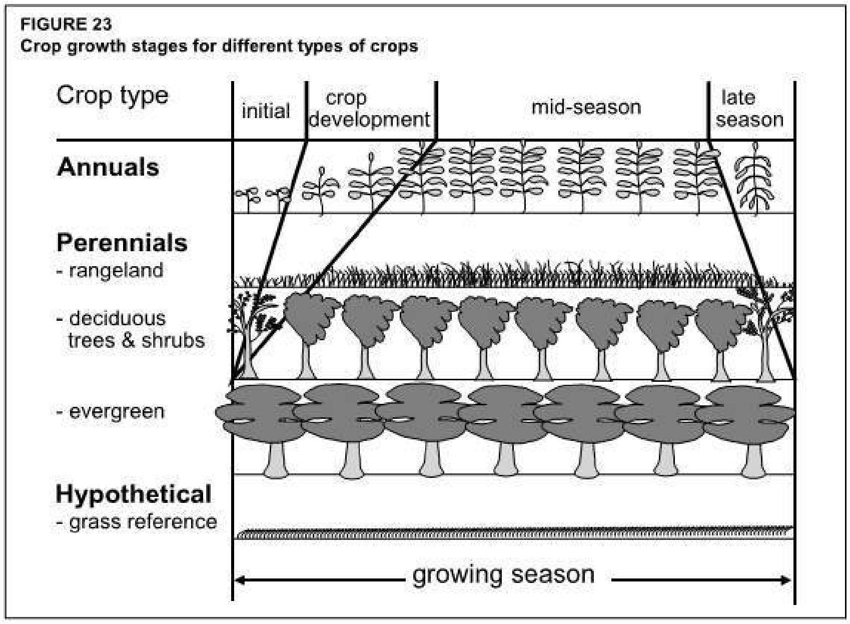


Figure 3: Crop Growth Stages for Different Types of Crops

Source: Food and Agriculture Organization of the United Nations (FAO), 1998, Crop Evapotranspiration - Guidelines for Computing Crop Water Requirements. FAO Irrigation and Drainage paper 56.

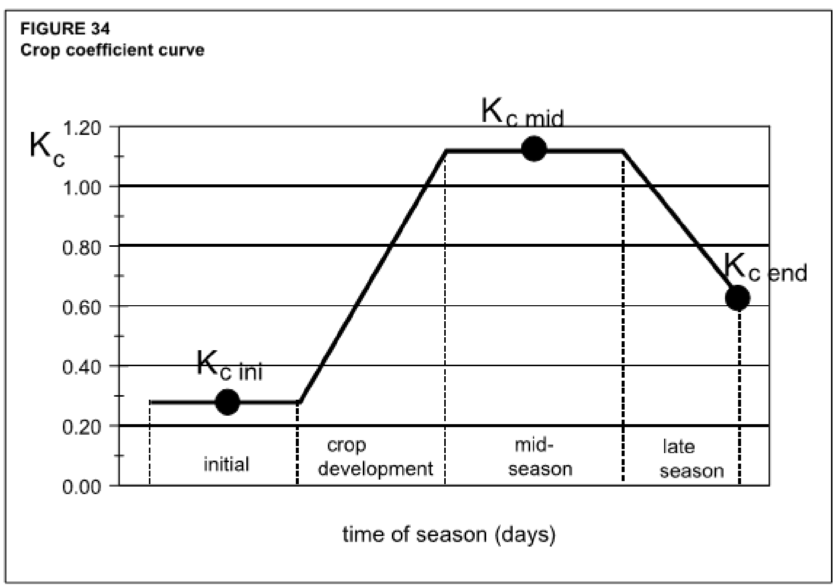


Figure 4: Crop Coefficient Curve

Source: Food and Agriculture Organization of the United Nations (FAO), 1998, Crop Evapotranspiration - Guidelines for Computing Crop Water Requirements. FAO Irrigation and Drainage paper 56.

Water Balance Model Description

The crop cover coefficients used in the water budget model for the various land use types is shown in **Table 2**. The growing / dormant seasons are shown in **Table 3**. The crop cover coefficients for the initial growing season are based on the average value of the dormant and middle of the growing season.

Table 2: Crop Cover Coefficients

Land Use	Dormant Season	Initial Growing Season	Middle of Growing Season	End of Growing Season
Urban Lawns / Shallow Rooted Crops	0.40	0.78	1.15	0.55
Moderately Rooted Crops	0.30	0.73	1.15	0.40
Pasture and Shrubs	0.40	0.68	0.95	0.90
Mature Forest	0.3	0.75	1.20	0.30
Impervious Areas	1.00	1.00	1.00	1.00

Reference: Data is based on Table 12 from the Food and Agriculture Organization of the United Nations (FAO), 1998, Crop Evapotranspiration - Guidelines for Computing Crop Water Requirements. FAO Irrigation and Drainage paper 56.

Table 3: Crop Growing Season

Month(s)	Crop Growing Season
January – April	Dormant Season
May	Initial Growing Season
June - August	Middle of Growing Season
September	End of Growing Season
October - December	Dormant Season (harvest in October)

Reference: Food and Agriculture Organization of the United Nations (FAO), 1977, Crop Water Requirements. FAO Irrigation and Drainage paper 24.

Actual Evapotranspiration

Following Alley (1984), if the monthly water input (i.e. rain + snowmelt) is greater than the potential evapotranspiration (PET) rate, the actual evapotranspiration (AET) rate takes place at the potential evapotranspiration rate:

IF W > PET, then AET = PET

If the monthly water input is less than the potential evapotranspiration rate (i.e. W < PET) then the actual evapotranspiration rate is the sum of the water input and an increment removed from the available water in the soil moisture storage zone (SOIL WATER):

IF W < PET, then AET = W + ΔSOIL WATER

WHERE: $\Delta SOIL\ WATER = SOIL\ WATER_{N-1} - SOIL\ WATER_N$

Figure 5 shows a comparison of the average monthly potential evapotranspiration and actual evapotranspiration rates.

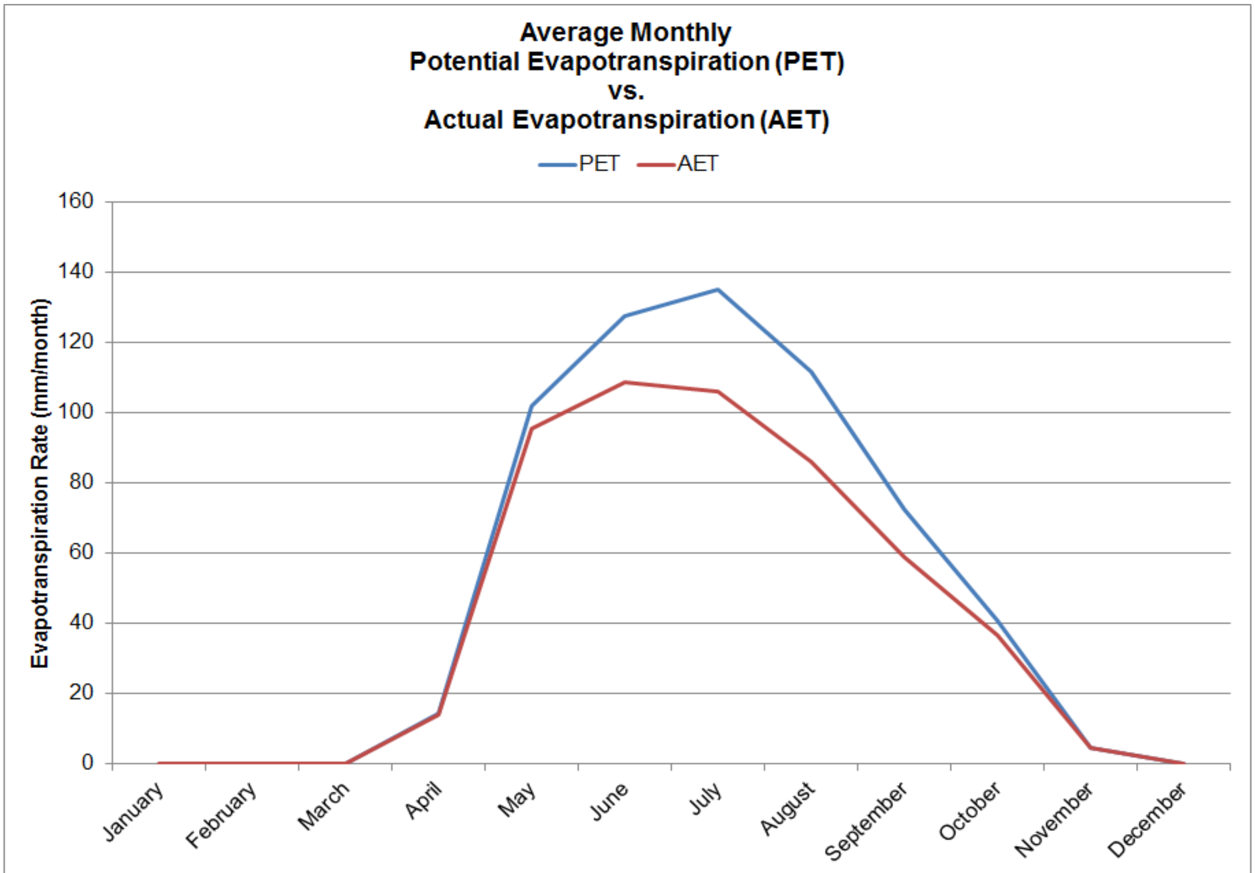


Figure 5: Average Monthly Potential Evapotranspiration vs. Actual Evapotranspiration

Soil Moisture

The soil moisture storage zone (SOIL WATER) is the amount of water available for actual evapotranspiration, but actual evapotranspiration is limited by the potential evapotranspiration rate.

The decrease / change in the soil moisture storage zone (ΔSOIL WATER) is based on the following relationship (Thornthwaite,1948), where AWC represents the available water content:

$$\Delta SOIL\ WATER = SOIL\ WATER_{N-1} \times [1-\exp(-((PET - W) / AWC))]$$

The soil moisture storage zone is replenished with rainwater and snowmelt (i.e. the water input) to the maximum value of the available water content (AWC):

$$SOIL\ WATER_N = \min[(W - PET) + SOIL\ WATER_{N-1}), AWC]$$

Water Balance Model Description

Water Surplus

The water surplus (SURPLUS) is defined as the excess water that is greater than the available water content (AWC).

SURPLUS = W – AET - ΔSOIL WATER

The water surplus represents the difference between precipitation and evapotranspiration. It is an estimate of the water that is available to contribute to infiltration and runoff (i.e. streamflow).

Infiltration / Runoff

The amount of water surplus that is infiltration was determined by summing the infiltration factors (IF) based on topography, soils and land cover. Since the water surplus represents infiltration and runoff; direct runoff is the amount of water surplus remaining after taking into account infiltration: (1.0 – infiltration factor = runoff factor). The infiltration and runoff factors were applied to the average monthly water surplus values:

INFILTRATION = IF x SURPLUS

RUNOFF = (1.0 – IF) x SURPLUS

The infiltration factors are shown in **Table 4**, which was reproduced from Table 3.1 in the *Stormwater Management and Planning Manual (MOE, 2003)*. These infiltration factors were initially presented in the document *"Hydrogeological Technical Information Requirements for Land Development Applications" (MOE, 1995)*.

Table 4: Infiltration Factors (MOE, 2003)

Description	Value of Infiltration Factor
Topography	
Flat Land, average slope < 0.6 m/km	0.3
Rolling Land, average slope 2.8 m/km to 3.8 m/km	0.2
Hilly Land, average slope 28 m/km to 47 m/km	0.1
Surficial Soils	
Tight impervious clay	0.1
Medium combination of clay and loam	0.2
Open sandy loam	0.4
Land Cover	
Cultivated Land	0.1
Woodland	0.2

Water Balance Model Description

Each soil type been assigned a corresponding infiltration factor as per Table 3.1 in the *Stormwater Management and Planning Manual (MOE, 2003),* as shown in **Table 5** below.

Table 5: Soils Infiltration Factors

Soil Type	Hydrologic Soil Group	Infiltration Factor
Coarse Sand	A	0.40
Fine Sand	AB	0.40
Fine Sandy Loam	B	0.30
Loam	BC	0.30
Silt Loam	C	0.20
Clay Loam	CD	0.15
Clay	D	0.10

The land use was combined into five (5) main categories (mature forest, row crops, pasture / meadow, urban lawns, and impervious areas) to be consistent with Table 3.1 in the *Stormwater Management and Planning Manual (MOE, 2003)*. The land use infiltration factors are shown in **Table 6** below.

Table 6: Land Use Infiltration Factor

Land Use	Infiltration Factor
Urban Lawns	0.10
Row Crops	0.10
Pasture / Meadow	0.10
Mature Forest	0.20
Impervious Areas	0.00

Land Use / Soils / Topography

The available water content (AWC) and infiltration factors (IF), and crop cover coefficients (CROP COEF) are determined based on the combination of land use, soils and topography, as shown in **Table 7**.

Table 7: Model Parameters based on Land Use / Soils (existing areas)

Land Use	Soils (HSG)	AWC (mm)	IF (Land Use)	IF (Soils)	Crop Cover Coefficient			
					Dormant Season	Initial Growing Season	Middle of Growing Season	End of Growing Season
Urban Lawns	A	50	0.10	0.40	0.40	0.78	1.15	0.55
	AB	62.5		0.40				
	B	75		0.30				
	BC	100		0.30				
	C	125		0.20				
	CD	100		0.15				
	D	75		0.10				
Row Crops	A	75	0.10	0.40	0.30	0.73	1.15	0.40
	AB	112.5		0.40				
	B	150		0.30				
	BC	175		0.30				
	C	200		0.20				
	CD	200		0.15				
	D	150		0.10				
Pasture / Meadow	A	100	0.10	0.40	0.40	0.68	0.95	0.90
	AB	125		0.40				
	B	150		0.30				
	BC	200		0.30				
	C	250		0.20				
	CD	250		0.15				
	D	200		0.10				
Mature Forest	A	250	0.20	0.40	0.30	0.75	1.20	0.30
	AB	275		0.40				
	B	300		0.30				
	BC	350		0.30				
	C	400		0.20				
	CD	400		0.15				
	D	350		0.10				
Impervious Areas *(see Table 9)*	A	1.57	0.00	0.00	1.00	1.00	1.00	1.00
	AB	1.57						
	B	1.57						
	BC	1.57						
	C	1.57						
	CD	1.57						
	D	1.57						

*For impervious areas, potential evapotranspiration is equal to potential evaporation (i.e. crop cover coefficient = 1.00).

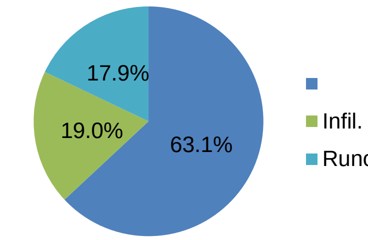
3200 Reid's Lane (119089)
Water Balance Calculations

Pre-Development

Drainage Area 4.750 ha

Landuse	% of Watershed	Watershed Area	% of Pervious Area within Watershed	Water Holding Capacity	Infiltration Factor	Factor	Condition	Infiltration Factor
Mature Forest	74.9%	3.558	76.6%	400 mm	0.20	**Topography**	Rolling to Hilly Land	0.15
Pasture/Meadow	0.0%	0.000	0.0%	250 mm	0.10	**Soils**	Silty sand / Sandy Clay	0.20
Urban Lawns	22.9%	1.088	23.4%	125 mm	0.10		**Pervious Infiltration Factor**	**0.53**
Imp. Areas	2.2%	0.105	-	0 mm	0.00		**Weighted Infiltration Factor**	**0.52**
Average				**328 mm**	**0.18**		**Runoff Factor**	**0.49**

*table 3.1 MOE



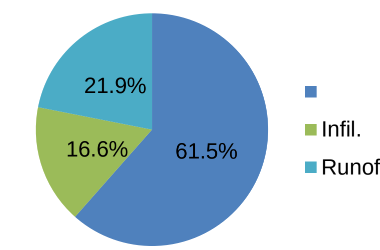
Ottawa (6105976)
1981-2010

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Total Precipitation (mm)	**P**	63	50	58	71	87	93	84	84	93	86	83	70	**920**
Potential Evapotranspiration (mm)	**PE**	0	0	0	0	112	129	136	115	72	43	0	0	**607**
Total Precip. - Potential ET (mm)	P-PE	63	50	58	71	-25	-36	-52	-31	21	43	83	70	
Soil Moisture Storage (mm)	ST	328	328	328	328	304	272	232	211	232	275	328	328	
Change in Soil Moisture Storage (mm)	ΔST	0	0	0	0	-24	-32	-40	-21	21	43	54	0	
Deficit (mm)	D	0	0	0	0	1	4	12	10	0	0	0	0	**27**
Actual Evapotranspiration (mm)	**AE**	0	0	0	0	111	125	124	105	72	43	0	0	**580**
Water Surplus (mm)	**S**	63	50	58	71	0	0	0	0	0	0	29	70	**340**
Annual Infiltration (mm)	**I**													**175**
Annual Runoff (mm)	**R**													**165**

Post-Development

Drainage Area 4.750 ha

Landuse	% of Watershed	Watershed Area	% of Pervious Area within Watershed	Water Holding Capacity	Infiltration Factor	Factor	Condition	Infiltration Factor
Mature Forest	32.0%	1.520	36.1%	400 mm	0.20	**Topography**	Rolling to Hilly Land	0.15
Pasture/Meadow	0.0%	0.000	0.0%	250 mm	0.10	**Soils**	Silty sand / Sandy Clay	0.20
Urban Lawns	56.6%	2.689	63.9%	125 mm	0.10		**Pervious Infiltration Factor**	**0.49**
Imp. Areas	11.4%	0.542	-	0 mm	0.00		**Weighted Infiltration Factor**	**0.43**
Average				**199 mm**	**0.14**		**Runoff Factor**	**0.57**



Ottawa (6105976)
1981-2010

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Total Precipitation (mm)	**P**	63	50	58	71	87	93	84	84	93	86	83	70	**920**
Potential Evapotranspiration (mm)	**PE**	0	0	0	0	112	129	136	115	72	43	0	0	**607**
Total Precip. - Potential Evap. (mm)	P-PE	63	50	58	71	-25	-36	-52	-31	21	43	83	70	
Soil Moisture Storage (mm)	ST	199	199	199	199	175	146	112	96	117	159	199	199	
Change in Soil Moisture Storage (mm)	ΔST	0	0	0	0	-24	-29	-34	-16	21	43	40	0	
Deficit (mm)	D	0	0	0	0	1	7	18	15	0	0	0	0	**41**
Actual Evapotranspiration (mm)	**AE**	0	0	0	0	110	122	118	100	72	43	0	0	**566**
Water Surplus (mm)	**S**	63	50	58	71	0	0	0	0	0	0	43	70	**354**
Annual Infiltration (mm)	**I**													**152**
Annual Runoff (mm)	**R**													**201**

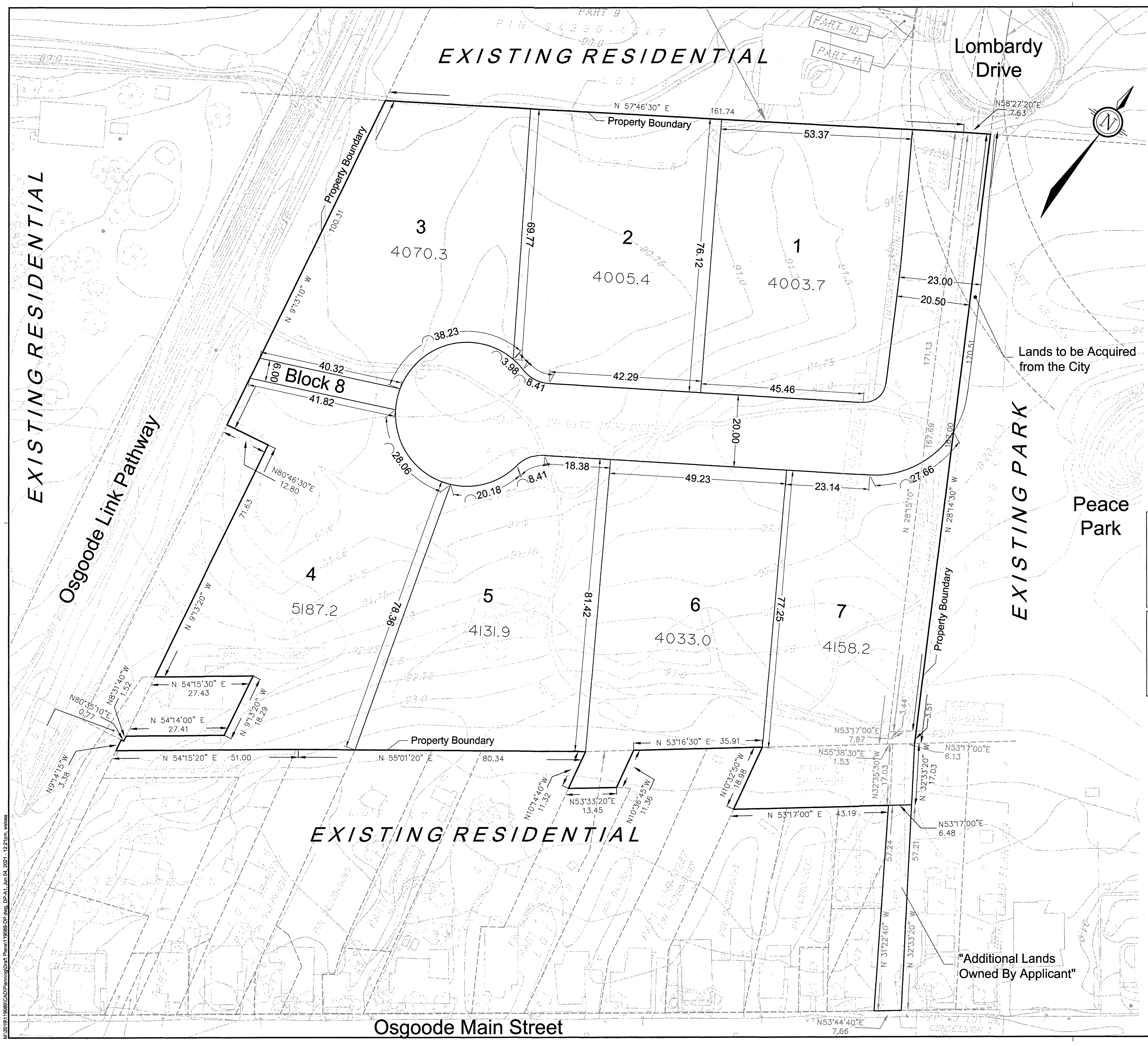
Notes:
1) Uses measured average monthly total precipitation and potential evaporation data (converted to evapotranspiration based on a cover coefficient of 1.0).
2) Actual evapotranspiration and water surplus calculated using the Thornthwaite & Mather (1957) methodology.
3) Runoff and infiltration calculated as per the MOE SWM Planning and Design Manual (2003) methodology.
4) Impervious areas consist of rooftops, roads, and driveways.

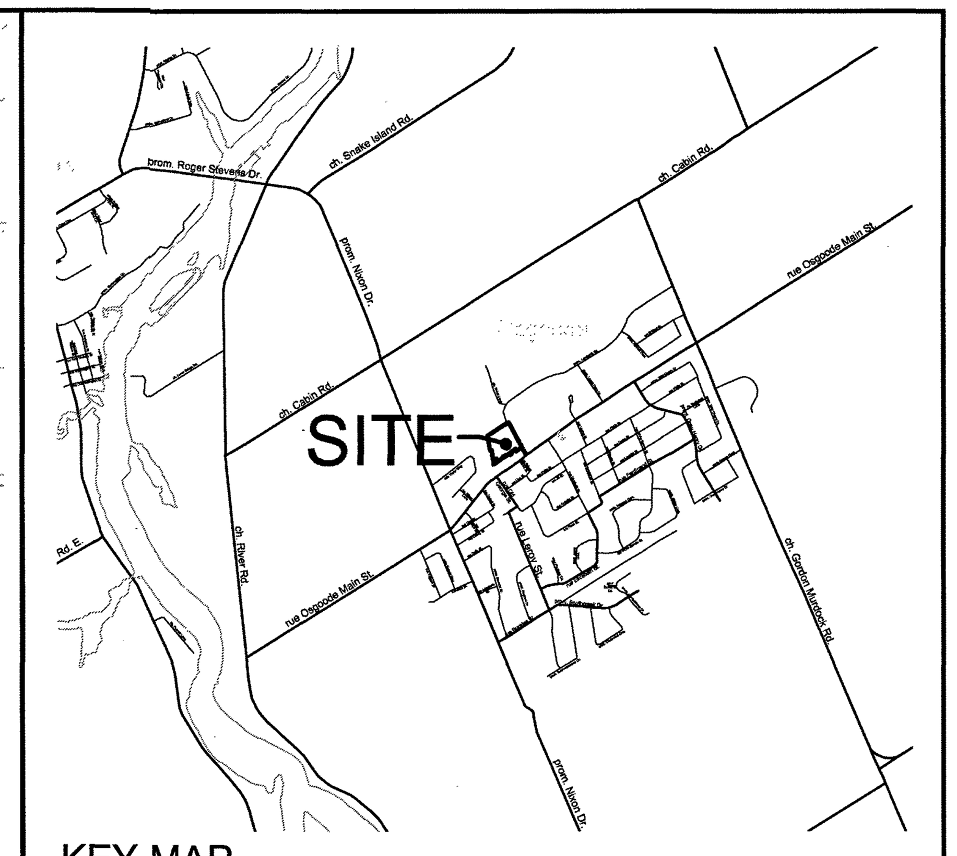
Annual Summary

Sceneario	Precipitation	ET		Surplus		Infil.		Runoff	
Pre-Development	920 mm	580 mm	63.1%	340 mm	36.9%	175 mm	19.0%	165 mm	17.9%
Post-Development	920 mm	566 mm	61.5%	354 mm	38.5%	152 mm	16.6%	201 mm	21.9%
Difference (Post - Pre)	0 mm	-14 mm	-1.5%	14 mm	1.5%	-23 mm	-2.5%	37 mm	4.0%

Thornthwaite, C.W., and Mather, J.R. 1957. Instructions and tables for computing potential evapotranspiration and the water balance.
Centerton, N.J., Laboratory of Climatology, Publications in Climatology, v.10, no.3, p.185-311

Prepared by Novatech Engineering Consultants Ltd.
Date: 8/27/2021





KEY MAP
NOT TO SCALE

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

DRAFT PLAN OF SUBDIVISION OF
PART OF LOTS 27 & 28
CONCESSION 1
TOWNSHIP of OSGOODE
CITY OF OTTAWA
SCALE
1 : 500
DATE: MAY, 2021

SURVEYOR'S CERTIFICATE

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

DATED 2021/06/07

JOHN H. GUTRI
ONTARIO LAND SURVEYOR

FAIRHILL, MOFFATT & WOODLAND
ONTARIO LAND SURVEYORS AA29500

OWNER'S CERTIFICATE

I/WE, ,BEING THE REGISTERED OWNER(S), HEREBY AUTHORIZE NOVATECH TO PREPARE AND SUBMIT THIS DRAFT PLAN OF SUBDIVISION TO THE CITY OF OTTAWA FOR REVIEW AND APPROVAL.

DATED ______________________ ______________________
owner name

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

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

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

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

D) The purpose for which the proposed lots ere to be used;
Residential shown on Draft Plan

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

F) The epproximate dimensions & leyout of the proposed lots;
As shown on Draft Plan

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

H) The evailability and nature of domestic water supplies;
Development will be supplied with individual drilled wells

I) The nature & porosity of the soil;
Please refer to Terrain Analysis Report

J) Existing contours or elevations es may be required to determine the grade of the highways end the drainege of the land proposed to be subdivided;
Contours shown at 0.25 metre intervals on Draft Plan

K) The municipel services available or to be availeble to the land proposed to be subdivided;
Development will not be supplied with municipal services

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

REID'S LANE SUBDIVISION

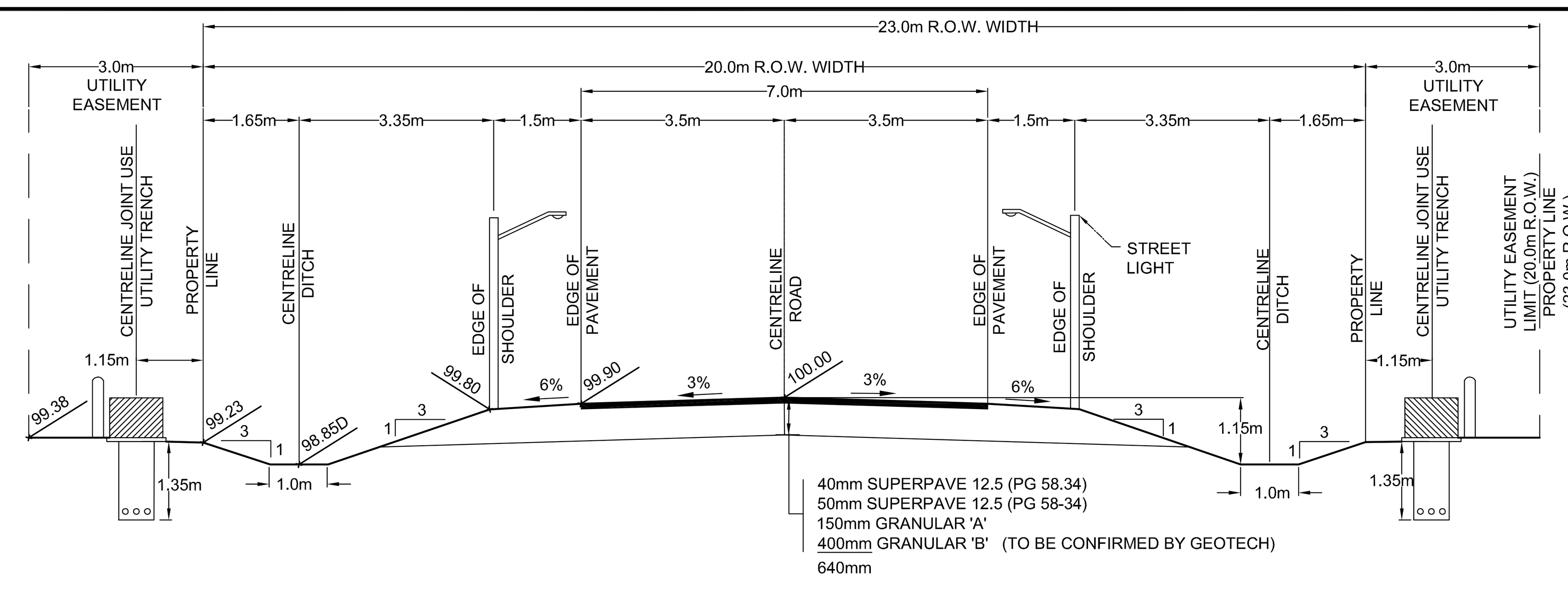
NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6

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

PROJECT No. 119089

Dxx-xx-xx-xxxx

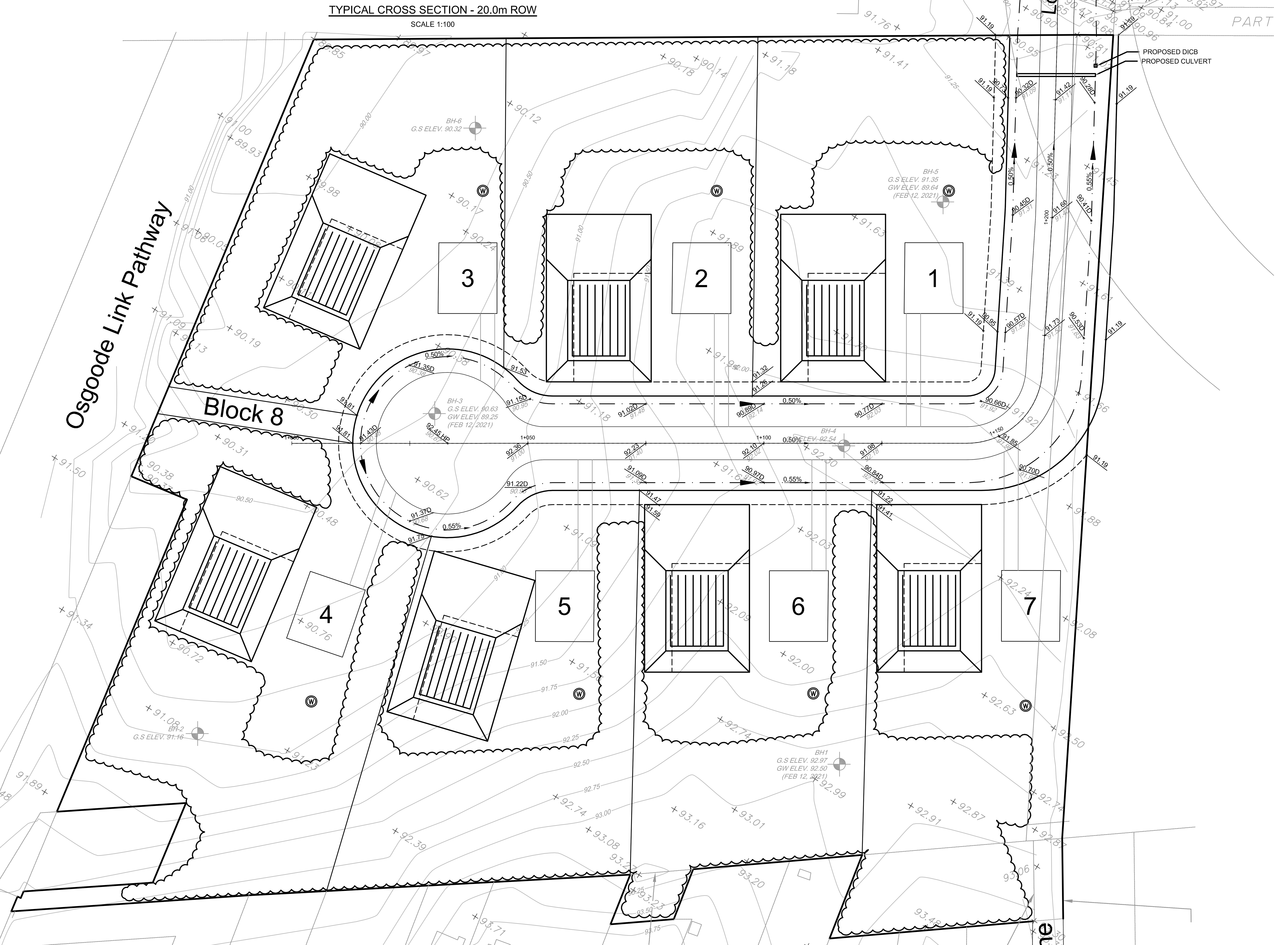
#xxxxx

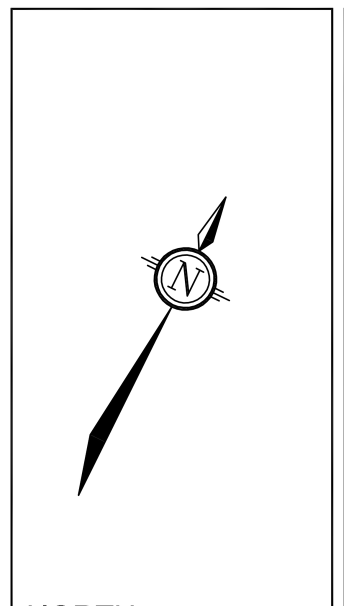


NOTES: 1. ELEVATIONS SHOWN ARE ASSUMED
2. CROSS-SECTION TO BE VIEWED LOOKING UP CHAINAGE

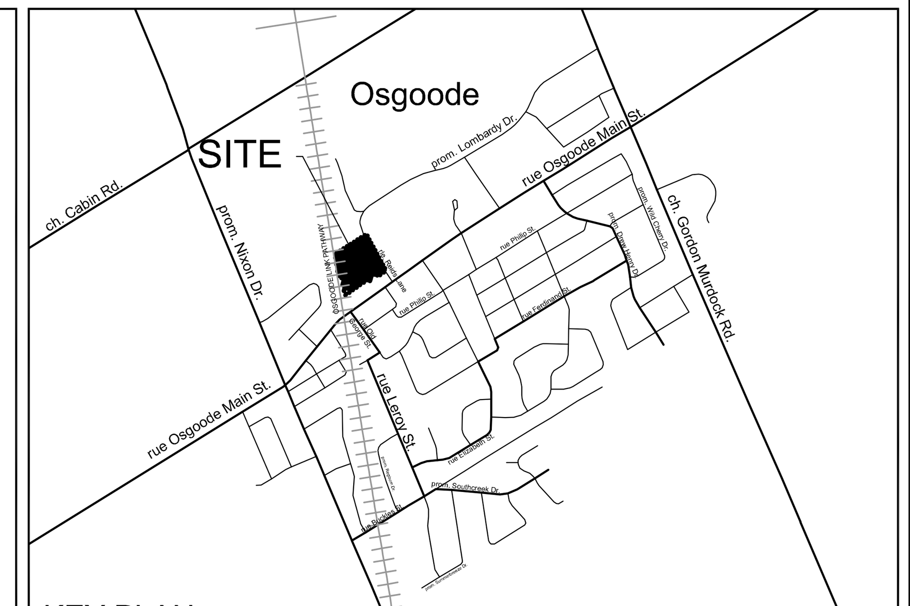
TYPICAL CROSS SECTION - 20.0m ROW

SCALE 1:100





NORTH



KEY PLAN

N.T.S.

LEGEND

- PROPERTY LINE
- 30m RAIL CORRIDOR SETBACK
- HOUSE SETBACK
- ℄ DITCH AND DIRECTION OF FLOW
- 92.10 / 92.02 — PROPOSED ELEVATION / *EXISTING ELEVATION*
- 92.53 — PROPOSED ELEVATION
- 90.97D — PROPOSED DITCH ELEVATION
- 0.5% — GRADE AND DIRECTION
- LIMIT OF TREE PRESERVATION (SOURCE: MAP 2 - TREE CONSERVATION REPORT AND ENVIRONMENTAL IMPACT STATEMENT BY MUNCATER ENVIRONMENTAL PLANNING INC. REPORT, DATED APRIL 1ST, 2021).
- BH-1 G.S. ELEV.91.35 GW ELEV. 89.64 — BOREHOLE NUMBER, INFORMATION AND APPROXIMATE LOCATION (PROVIDED BY KOLLAARD ASSOCIATES, MARCH 9, 2021)
- PROPOSED WELL
- PROPOSED HOUSE FOOTPRINT (2000 ft^2)
- PROPOSED RAISED TILE FIELD

SOURCE REFERENCE:
LEGAL INFORMATION:
CITY OF OTTAWA LEGAL PLANS 5R-9330, 5R-13990, 4R-17009, 4R-20040 AND 4R-19665
TOPOGRAPHIC INFORMATION:
FAIRHALL MOFFATT & WOOLAND LIMITED (208-1 OSGOODE) PART OF LOTS 27 & 28 CONCESSION 1 (OSGOODE) AND PART OF LOTS 50 & 51 REGISTERED PLAN 393 / NOVEMBER 5, 2020 / MTM ZONE 9 (NAD83 ORIGINAL)

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

No.	REVISION	DATE	BY
1.	ISSUED WITH CONCEPTUAL SWM REPORT	SEPT 03/21	LAB

SCALE: 1:500 (bar scale 1:500, 0 5 10 15 20)

DESIGN	RJK
CHECKED	LAB
DRAWN	RJK
CHECKED	LAB
APPROVED	SMG

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
CITY OF OTTAWA
REID'S LANE SUBDIVISION

DRAWING NAME
PRELIMINARY GRADING PLAN

PROJECT No.	119089
REV	REV # 1
DRAWING No.	119089-PGR

PLANA1.DWG - 841mmx594mm

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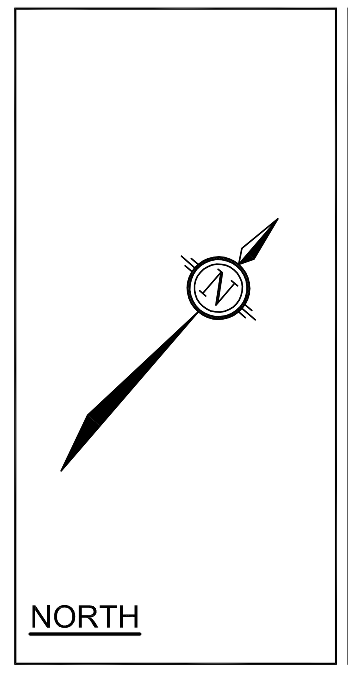
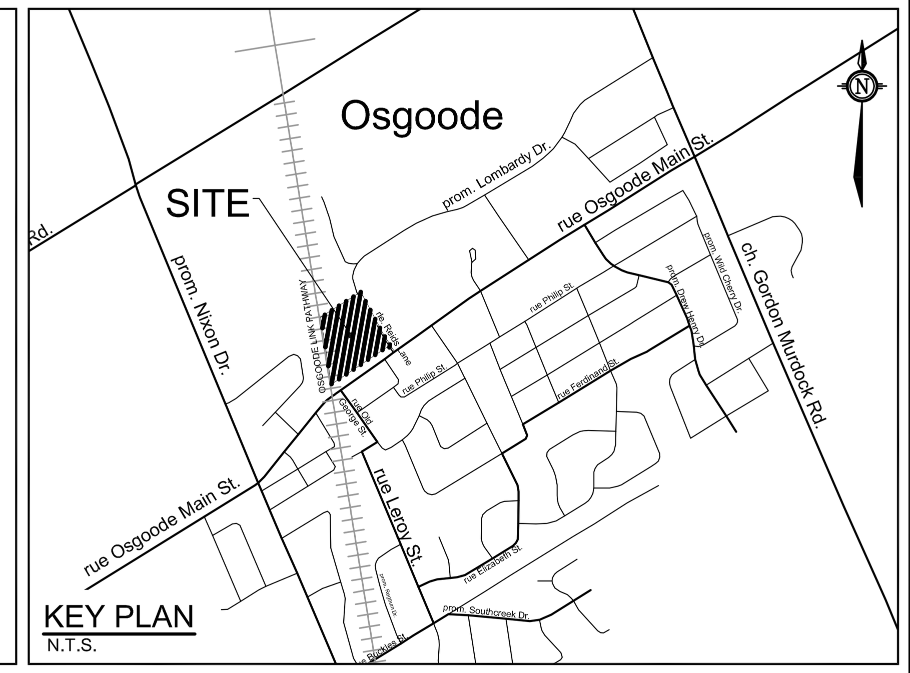
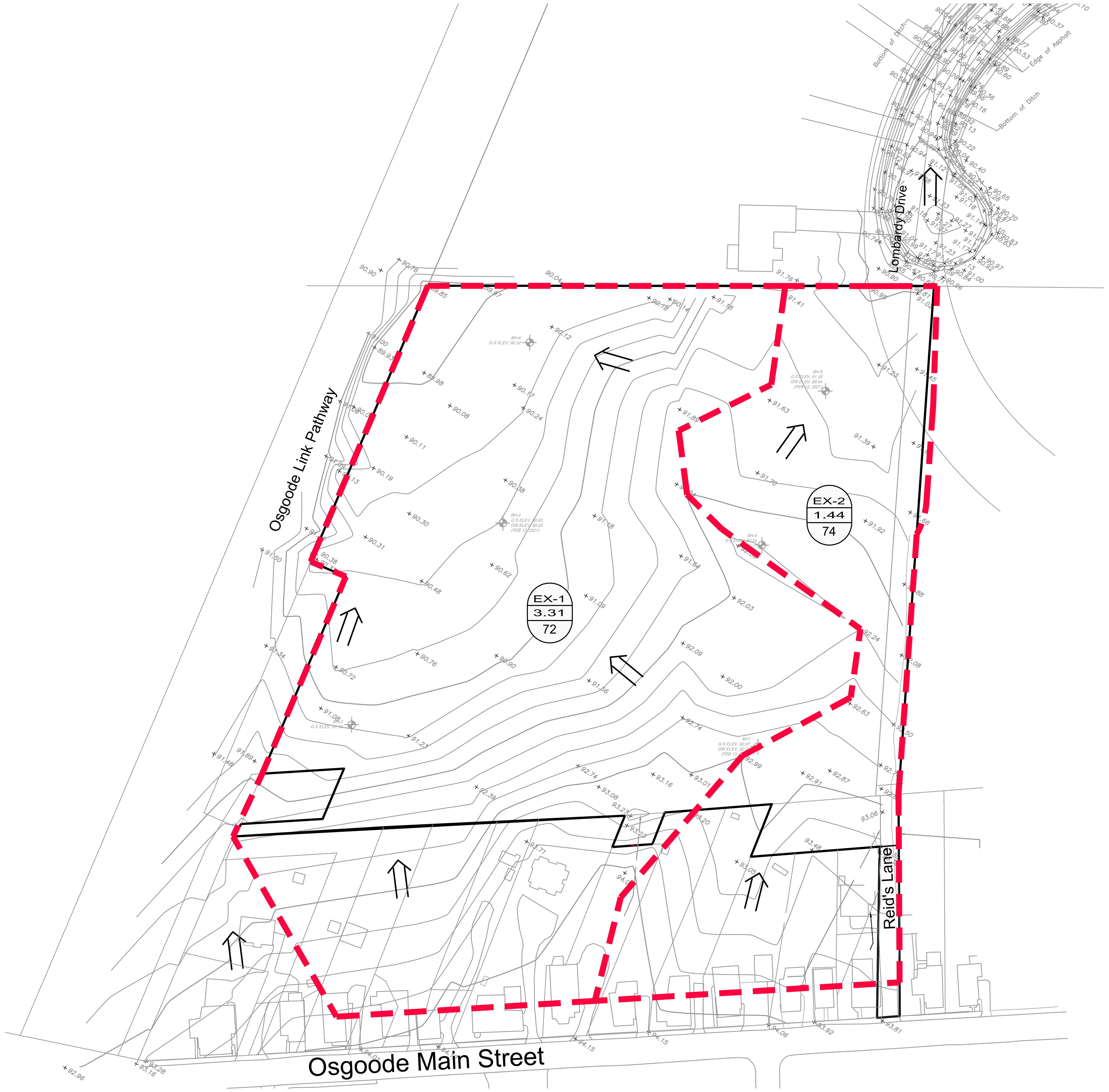
LEGEND

- A — AREA ID
- 1.71 — DRAINAGE AREA (hectares)
- 74 — CURVE NUMBER
- STORM DRAINAGE AREA
- OVERLAND FLOW

TOTAL DRAINAGE AREA = 4.75 ha







PRE-DEVELOPMENT DRAINAGE AREAS

POST-DEVELOPMENT DRAINAGE AREAS

SOURCE REFERENCE:
LEGAL INFORMATION:
CITY OF OTTAWA LEGAL PLANS 5R-9330, 5R-13990, 4R-17009, 4R-20040 AND 4R-19665
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No.	REVISION	DATE	BY
1.	ISSUED WITH CONCEPTUAL SWM REPORT	SEPT 03/21	LAB

SCALE: 1:1000

1:1000 — 0 10 20 30 40

DESIGN	RJK
CHECKED	LAB
DRAWN	RJK
CHECKED	LAB
APPROVED	SMG

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LOCATION
CITY OF OTTAWA
REID'S LANE SUBDIVISION

DRAWING NAME
STORM DRAINAGE AREA PLAN

PROJECT No. 119089
REV: REV # 1
DRAWING No. 119089-STM

PLANA1.DWG - 841mmx594mm

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