Robinson
Land Development

4101 Limebank Road, Ottawa, ON
Light Industrial Development
Scoped Master Servicing Study

Prepared For:

Groupe Montoni

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TABLE OF CONTENTS

LEGAL NOTIFICATION I
1. INTRODUCTION 1
1.1. Purpose 1
1.2. Previous Studies 1
1.3. Subject Property 1
1.4. Existing Services 2
1.5. Pre-consultation 2
2. WATER SERVICING 3
2.1. Existing Conditions 3
2.2. Water Servicing Criteria 3
2.3. Proposed Water Demand 3
2.4. Proposed Water Servicing Design 4
2.5. Hydraulic Model 4
3. SANITARY SERVICING 6
3.1. Existing Conditions 6
3.2. Sanitary Design Criteria 6
3.3. Proposed Demand 6
3.4. Proposed Sanitary Servicing Design 6
4. STORM SERVICING 7
4.1. Existing Conditions 7
4.2. Design Criteria 7
4.3. Discharge Route Options 8
4.4. Proposed Storm Servicing Design 9
4.5. Stormwater Modelling 10
4.6. Fluvial Geomorphology 11
4.7. Quality Control 11
4.8. Water Budget 11
5. DEVELOPMENT CHARGE ITEMS 11
6. CONCLUSIONS 11

LIST OF TABLES

Table 1 Boundary Conditions ..... Page 4
Table 2 Hydraulic Model Results ..... Page 5
Table 3 Discharge Route Options Analysis ..... Page 8
Table 4 Pre- and Post-Development Peak Flows ..... Page 10

LIST OF APPENDICES

Appendix A Background Documents & Services Plans

Appendix B Water Servicing

Appendix C Sanitary Servicing

Appendix D Storm Servicing

Appendix E Fluvial Geomorphology Assessment

LEGAL NOTIFICATION

This report was prepared by Robinson Land Development for the account of **Groupe Montoni.**

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1. INTRODUCTION

1.1. Purpose

Robinson Land Development has been retained by Groupe Montoni to prepare a Scoped Master Servicing Study in support of a Zoning By-Law Amendment and Site Plan Application for a proposed light industrial (offices and warehousing) development at the subject site located at 4101 Limebank Road in Ottawa, Ontario.

This report will review the existing and proposed sanitary, storm and water infrastructure that will service the subject site. This report is conducted in advance of a Phase 2 Riverside South Community Infrastructure Servicing Study Update (ISSU), which would include the subject site in the study area but has not been undertaken at the time of writing this report. The intent of this report is to prove serviceability for sanitary, storm and water infrastructure for the subject site. This report is in conjunction with the **Site Servicing & Stormwater Management Report** by Robinson Land Development dated September 2026 which details the interior of the site.

1.2. Previous Studies

In preparation of this study, following reports were referenced for the development of this assessment:

1. Riverside South Community Infrastructure Servicing Study Update Phase 1, Mosquito Creek Study Area (ISSU) by IBI Group dated August 2023;
2. Latest Community Design Plan (CDP) dated October 2023;
3. Riverside South Community Master Drainage Plan Updated, Mosquito Creek Study Area (MDP) by IBI Group dated April 2021;
4. Assessment of Adequacy of Public Services, 3700 Twin Falls Place (AAPS) by IBI Group dated March 2023;
5. Design Brief Phase 1, 3700 Twin Falls Place, Riverside South, by Arcadis (April 2024);
6. Leitrim Road Realignment and Widening Planning and Environmental Assessment Study (EA) by Parsons dated August 2018; and,
7. Stormwater Management Report, Limebank Road Widening, Contract No. 1, Vol. 2: South of Leitrim Road by J.L. Richards dated November 2008.

Further site-specific studies conducted for the property include:

1. Topographical Plan of Survey of Part of Lots 16 & 17 Concession 2 (Rideau Front), Geographic Township of Gloucester, City of Ottawa by Annis, O'Sullivan, Vollebekk Ltd. dated December 6, 2023 and updated July 17, 2025.
2. Geotechnical Investigation, Proposed Industrial Development, Leitrim Road and Limebank Road by EXP dated June 24, 2022;
3. Updated Geotechnical Investigation Report, Proposed Industrial Condominium and Warehouse Development, 4101 Limebank Road by EXP dated November 19, 2024; and,
4. Hydrogeological Investigation, Limebank Road and Leitrim Road by EXP dated June 24, 2022.

1.3. Subject Property

The property is located at 4101 Limebank Road and is 15.12 hectares in size. It is located northeast of Spratt Road, south of current Leitrim Road, and in the northwest corner of the future Limebank Road and realigned Leitrim Road intersection. The site falls within the Riverside South Community Secondary Plan – Volume 2 and is zoned Industrial and Logistics

(IL) as shown on Schedule A – Designation Plan. The client is proposing to erect five (5) separate buildings (two industrial multi-unit/office buildings and three warehouse buildings, each warehouse subdivided into three individual warehousing buildings) along with the associated access roads, parking, sidewalks and landscaping. The Geotechnical Investigation Report by EXP indicated a 1.0 m grade raise restriction which must be taken into account in bringing services to the site. Additionally, the Hydrogeological Investigation by EXP indicated high groundwater in silty clay soils with low hydraulic conductivity. Refer to **Appendix A** for the location plan, secondary plan, architectural site plan, topographic site survey, and EA alignment of Leitrim Road, Leitrim Road centreline elevations per MDP, and geotechnical and hydrogeological report excerpt. It should be noted that the EA and MDP proposed centreline elevations along realigned Leitrim Road along the south of the site that do not agree with one another, and it is the more recent MDP macro grades that this study will base grading upon.

The site is proposed ultimately to have three (3) site entrances: Limebank Road at the northwest corner of the site; realigned Leitrim Road approximately 240 m east of Limebank Road; and realigned Leitrim Road at the southeast corner of the site. However, the realigned Leitrim Road will only be built out approximately 250 m from Limebank Road to service the first site entrance for the subject site, with the southeast corner site corner site entrance to be put into service when realigned Leitrim Road is built out further. Realigned Leitrim Road will be a semi-rural cross-section, with ditches on either side of the road and a curb and sidewalk along the north side. This cross-section mirrors the cross-section of Mosquito Drive (realigned Leitrim Road) per the Design Brief Phase 1 of 3700 Twin Falls Place located on the west side of Limebank Road from the subject site.

1.4. Existing Services

Limebank Road is an existing major collector road that has an existing 375 mm dia. sanitary sewer and an existing 300 mm dia. watermain within its right of way that stubs north of the future Limebank Road & Leitrim Road intersection. A 300 mm dia. valved watermain stub was installed that enters the site approximately 80 m north of the future realigned Leitrim Road. See the Riverside South – 3700 Twin Falls Place, Proposed Limbank Road Crossing (South) Figure 4.4 'As Built' Drawing prepared by IBI in **Appendix D** and existing services plan in **Appendix A** for reference.

There is an existing large diameter (450-1200 mm dia.) storm sewer network within Limebank Road that collects the road drainage and drains to Pond 3 immediately south of the site on the south side of realigned Leitrim Road. Pond 3, which is currently under investigation by others for expansion, discharges to Tributary 3 of Mosquito Creek on the south side of Pond 3. There is an existing roadside ditch on the east side of Limebank Road that collects the storm runoff from the subject site and discharges directly to Tributary 3 downstream of the Pond 3 outlet (bypassing Pond 3).

There is an 18 m Trans Northern Pipelines (TNPI) easement that runs diagonally through the southwestern corner of the site with two gas mains that run through the easement, an active 324 mm dia. and an abandoned 219 mm dia. gas main. All crossings of the gas mains will be designed according to TNPI Crossing Guidelines.

1.5. Pre-consultation

A pre-consultation meeting was held with the City of Ottawa on August 23, 2023. From that meeting a Phase 1 Pre-Application Consultation Meeting Feedback and Zoning By-law Amendment & Site Plan Control – 4101 Limebank Road meeting notes were prepared and distributed to the client. A meeting was held with the City's Engineering Reviewer on June 12, 2025 to confirm the agreed direction for stormwater discharge and management for the subject site differing from the pre-consultation as the original route had proved infeasible. A formal

letter from the City's Engineering Reviewer was received on October 27, 2025 regarding servicing, most especially stormwater; and a follow-up meeting was held with the City Reviewer on November 6, 2026 to again discuss and clarify the direction for the stormwater servicing. See **Appendix A** for details of the preconsultation minutes, the following letter and the follow-up clarifying meeting.

2. WATER SERVICING

2.1. Existing Conditions

As noted above, there is an existing 300 mm dia. watermain on Limebank Road that runs from Spratt Road to the stub north of the future realigned Leitrim Road, with a 300 mm dia. valved watermain stubbed at the subject site. On Spratt Road there is an existing 750 mm dia. feedermain and various local watermains. See the Existing Services Plan in **Appendix A** and relevant plans from the ISSU and AAPS in **Appendix B.**

2.2. Water Servicing Criteria

The watermain design follows the following standards, guidelines, and background documents:

- Ottawa Design Guidelines – Water Distribution (2026) periodically amended as part of Technical Bulletins
- Fire Underwriters Survey (FUS) Water Supply for Public Fire Protection (2020)
- MECP Design Guidelines for Drinking-Water Systems (2008)
- Assessment of Adequacy of Public Services, 3700 Twin Falls Place, Riverside South, by IBI Group (March 2023)
- Riverside South Community Infrastructure Servicing Study Update Phase 1, Mosquito Creek Study Area by IBI Group (August 2023)

Accordingly, the following watermain design criteria have been utilized for the subject site:

- Industrial Demand: 35,000 L/gross ha/d
- Employee Demand: 137 L/cap/d (per ISSU)
- Commercial Peaking Factor: 1.5 Max Day; 1.8 Peak Hour
- Minimum Pressure During Peak Hour 276 kPa (40 psi)
- Minimum Pressure During Maximum Day Plus Fire 140 kPa (20 psi)
- Maximum Pressure in Unoccupied Areas 689 kPa (100 psi)
- Maximum Pressure in Occupied Areas 552 kPa (80 psi)

2.3. Proposed Water Demand

Based on the gross hectare criteria (not including the portion of the property to become Leitrim Rd. ROW) the total domestic water demand is

- 5.40 L/s average day
- 8.10 L/s maximum day
- 14.58 L/s peak hour

This is a very conservative estimate since the property is intended to be occupied mostly by warehousing, but will be used in this report for the purposes of assessing adequacy of public services. Refer to **Appendix B** for domestic demand estimate calculations.

As a comparison, the ISSU estimated an average of 76.6 jobs/ha (13,153 jobs in 171.7 ha) in the servicing boundary (F_2C_144) that contains the subject site. Applying the 137 L/cap/d employee demand this equates to about 1.62 L/s average day demand (about 1021 jobs) that the ISSU had assumed for the subject site. Based on the site plan, the number of employees is anticipated at an average of 15 per office unit and 35 per warehouse unit. This equates to

810 employees, or an average day demand of 1.28 L/s, less than 25% of the above estimate based on gross hectare criteria. The ISSU used a system-wide maximum fire flow of 13,000 L/min. The AAPS used both a 10,000 and 13,000 L/min fire flow for the 3700 Twin Falls site. Preliminary fire demand calculations were completed based on the site plan. A maximum fire demand of 12,000 L/min was estimated based on sprinklered warehouse buildings with fire wall separation. Therefore for this study, a 12,000 L/min and 13,000 L/min fire flow was applied to the subject site offsite water modelling. Refer to **Appendix B** for FUS demand estimate calculations.

2.4. Proposed Water Servicing Design

Since the average day demands calculated above exceed 50 m^3/d (0.58 L/s) the site will require two connection points to ensure redundancy. One connection point will be to the existing 300 mm dia. watermain service stub at the site, and a second point will be at the southwesterly site entrance along realigned Leitrim Road. A 300 mm dia. watermain will be extended from the existing 300 mm dia. watermain on Limebank Road approximately 240 m along realigned Leitrim Road. This watermain will be stubbed for the future development of the upstream Riverside South lands per the ISSU.

As identified in the ISSU and AAPS, a twinned 300 mm dia. watermain will need to be installed along Limebank Road, connected to the 750 mm dia. watermain on Spratt, to provide redundancy of service to the Employment Lands prior to the construction of the 4101 Limebank Road site. The twinning of the 300 mm dia. watermain is also a requirement of the ultimate buildout of 3700 Twin Falls, however Phase 1 has been permitted to proceed with the single watermain on Limebank Road. This watermain work is currently being developed by Arcadis for Riverside South Development Corporation (RSDC).

Refer to the servicing plans in **Appendix A** and ISSU, AAPS, and twinning watermain plans in **Appendix B** for reference. Detailed design of the infrastructure is provided under separate cover with the Site Servicing & Stormwater Management Report.

2.5. Hydraulic Model

Boundary conditions were received from the City at the twinned watermain connections at Limebank Road and Spratt Road under current pressure zone (2C). The boundary conditions also include the future SUC pressure zone reconfiguration. The domestic demands were based on the conservative demand estimates for the subject site and the ultimate demands for the 3700 Twin Falls site per the AAPS. The boundary conditions are summarized in **Table 1** below and detailed in **Appendix B**.

Table 1 – Boundary Conditions

Current PZ Demand Scenario	HGL @ Connection 1 (Twinned WM @ Spratt Rd.) (m)	HGL @ Connection 2 (Ex. WM @ Spratt) (m)
Maximum HGL (Average Day)	130.6	130.6
Minimum HGL (Peak Hour)	124.6	124.6
Max Day + Fire (12,000 L/min)	124.6	124.6
Max Day + Fire (13,000 L/min)	124.6	124.6

Future SUC Reconfiguration Demand Scenario	HGL @ Connection 1 (Twinned WM @ Spratt Rd.) (m)	HGL @ Connection 2 (Ex. WM @ Spratt) (m)
Maximum HGL (Average Day)	147.1	147.1
Minimum HGL (Peak Hour)	144.6	144.7
Max Day + Fire (12,000 L/min)	144.1	144.6
Max Day + Fire (13,000 L/min)	143.9	144.4

An EPANET hydraulic model was setup for the twin watermains on Limebank Road, for the subject site and the ultimate 3700 Twin Falls demand. Refer to **Appendix B** for details of the 3700 Twin Falls and site demands. The model was run for the average day, peak hour, and max day + fire (at 12,000 L/min and 13,000 L/min scenarios) conditions. The demands at the subject site were divided evenly between the two connection locations ("North" at Limebank Rd. and "South" at realigned Leitrim Rd.) for the purposes of this analysis. The results are summarized in **Table 2** below with the detailed model output provided in **Appendix B**.

Table 2 – Hydraulic Model Results

Current PZ Scenario	4101 Limebank Domestic Demand (L/s)	3700 Twin Falls Domestic Demand (L/s)	Fire Demand (L/min)	Pressure at North Connection (kPa)	Pressure at South Connection (kPa)
Avg. Day	5.40	14.65	-	398 (57.7 psi)	388 (56.2 psi)
Peak Hour	14.58	39.61	-	336 (48.7 psi)	326 (47.3 psi)
Max Day + Fire	8.10	22.00	12,000	280 (40.6 psi)	260 (37.7 psi)
Max Day + Fire	8.10	22.00	13,000	272 (39.4 psi)	250 (36.3 psi)
Future SUC Scenario	**4101 Limebank Domestic Demand (L/s)**	**3700 Twin Falls Domestic Demand (L/s)**	**Fire Demand (L/min)**	**Pressure at North Connection (kPa)**	**Pressure at South Connection (kPa)**
Avg. Day	5.40	14.65	-	559 (81.1 psi)	550 (79.7 psi)
Peak Hour	14.58	39.61	-	550 (77.2 psi)	522 (75.8 psi)
Max Day + Fire	8.10	22.00	12,000	474 (68.7 psi)	454 (65.8 psi)
Max Day + Fire	8.10	22.00	13,000	463 (67.2 psi)	442 (64.1 psi)

As indicated in **Table 2** above, domestic and fire demands are serviceable at current pressure zone configuration and future SUC reconfiguration, meeting minimum pressure requirements. During average day demand in the future SUC reconfiguration scenario, pressures at the subject site's connection points are slightly above the desired maximum of 552 kPa (80 psi). There will be further minor pressure losses within the site's private watermain network that will be investigated under the Site Servicing Report to determine whether pressure reducing valves will be needed at the buildings, however it would not be expected given anticipated site losses.

3. SANITARY SERVICING

3.1. Existing Conditions

As noted in above, there is an existing 375 mm dia. sanitary sewer on Limebank Road that runs from approximately 200 m north of the realigned Leitrim Road to Spratt Road. See the Existing Services Plan in **Appendix A** and relevant plans from the ISSU in **Appendix C**.

3.2. Sanitary Design Criteria

The sanitary sewer design follows the following standards, guidelines, and background documents:

- Ottawa Sewer Design Guidelines (2025) periodically amended as part of Technical Bulletins
- MECP Design Guidelines for Sewage Works (2008)
- Riverside South Community Infrastructure Servicing Study Update Phase 1, Mosquito Creek Study Area by IBI Group (August 2023)

Accordingly, the following design parameters have been implemented for the subject site:

- Employment Demand: 35,000 L/gross ha/d (per ISSU)
- Employment Demand: 137 L/cap/d (per ISSU for water)
- Employment Peak Factor: 1.0 if land use >20% area
  1.5 if land use <20% area
- Industrial Peak Factor: per OSDG App. 4-B
- Infiltration Allowance: 0.33 L/s/ha
- Velocity Range: 0.60-3.0 m/s

3.3. Proposed Demand

Based on the above gross area criteria, with a lot coverage of approximately 40% based on the site plan, the peak sanitary demand was calculated to be 11.14 L/s. The balance of the sanitary drainage area defined by the ISSU is assumed for the upstream contribution to the realigned Leitrim Rd. sewer, for a total of 34.37 L/s peak demand per the ISSU. Refer to the sanitary sewer design sheets in **Appendix C** for more details.

Since the land will be largely used for warehousing a gross area estimate will be very conservative. As comparison, the demand was also estimated based on the number of anticipated employees per the site plan at an average rate of 15 per office unit and 35 per warehouse unit. This equates to 810 employees, or a peak demand of 6.30 L/s (including infiltration), about 55% of the apportioned flow per the ISSU.

3.4. Proposed Sanitary Servicing Design

The proposed sanitary sewer on the realigned Leitrim Road was anticipated within the ISSU and included the subject site in its drainage area. In the ISSU the sewer was identified as a 375 mm dia. sewer in the plans but a 300 mm dia. sewer in the sewer design sheet. Refer to the plan and sewer design sheet excerpts from the ISSU in **Appendix C** for reference.

A 375 mm dia. sanitary sewer at 0.15% will be extended from Limebank Road approximately 240 m along the new realigned Leitrim Road corridor to the southwesterly site entrance to support the subject site development and future development of the upstream Riverside South lands per the ISSU. Refer to the servicing plans in **Appendix A** for reference. Detailed design

of the infrastructure is provided under separate cover with the Site Servicing & Stormwater Management Report.

4. STORM SERVICING

4.1. Existing Conditions

As noted above, there is an existing storm sewer within Limebank Road that discharges to Pond 3 on the south side of realigned Leitrim Road south of the subject site. The stormwater runoff from the subject site currently collects along the east roadside ditch of Limebank Road and discharges to Tributary 3 of Mosquito Creek, bypassing Pond 3 and downstream of the Pond 3 outlet. Previously, the subject site had been apportioned to Tributary 4 of Mosquito Creek through the 3700 Twin Falls industrial subdivision via a storm sewer along realigned Leitrim Road (currently Mosquito Drive) by the ISSU and AAPS. However, the Twin Falls subdivision has begun development including Mosquito Drive, which has been built as a semi-urban cross-section with roadside ditch discharging to Tributary 4. The Twin Falls subdivision was designed and built without consideration for any upstream stormwater flows, including the subject site. Therefore, alternative routes have been considered in this study. See the existing services plan and topographic survey in **Appendix A** and relevant plans from the ISSU and AAPS in **Appendix D** for reference.

4.2. Design Criteria

The storm sewer design follows the following standards, guidelines, and background documents:

- MECP Stormwater Management Planning and Design Manual (2003)
- Ottawa Sewer Design Guidelines (2025) periodically amended as part of Technical Bulletins
- Riverside South Community Master Drainage Plan Update, Mosquito Creek Study Area by IBI Group (April 2021)
- Assessment of Adequacy of Public Services, 3700 Twin Falls Place, Riverside South, by IBI Group (March 2023)
- Riverside South Community Infrastructure Servicing Study Update Phase 1, Mosquito Creek Study Area by IBI Group (August 2023)

Since the Twin Falls subdivision was designed and built without consideration for upstream storm flows apportioned per the ISSU and AAPS, discussions with the City have permitted alternative discharge routes for the subject site to be explored as part of this study, including alternative stormwater management criteria. Refer to **Appendix A** for notes from the relevant City meetings. Accordingly, the following design parameters have been implemented for the subject site:

- Peak Flow Control: Post-development to pre-development from 2yr to 100yr storm
- Max Drawdown Time: 48 hrs (Airport requirements)
- Quality Control: Enhanced (80% TSS reduction)

Further, it is required that the proposed discharge route is supported by a fluvial geomorphological assessment of the receiving natural watercourse to confirm that the proposed development will not adversely affect the watercourse.

The background documents (pre-consultation, MDP, and ISSU) had identified the requirement for infiltration-based LID measures on-site. However, the Geotechnical and Hydrogeological Investigations by EXP identified silty clay soils throughout the site with elevated groundwater levels and a low hydraulic conductivity ($2x10^{-6}$ cm/s) which is generally unfavourable for infiltration. Further, City of Ottawa Technical Bulletin IWSTB-2024-04 identified that infiltration-

based LID measures would not be permitted in poorly draining silt or clay soils. Therefore, no infiltration-based LID measures are required for the proposed development.

4.3. Discharge Route Options

Through discussion with the City's Engineering Reviewer it was determined that there are three options for discharging stormwater from the site:

1. Tributary 3:
   The subject site would discharge directly to Tributary 3 of Mosquito Creek via the Limebank Road eastside ditch, bypassing Pond 3. This is the existing discharge route for the site.

2. Pond 3:
   The subject site would discharge to Pond 3 on the south side of realigned Leitrim Road, which in turn discharges to Tributary 3 of Mosquito Creek. Pond 3 is actively under design for expansion by Arcadis for RSDC, but the proposed drainage area does not include the subject site.

3. Tributary 4:
   The subject site would discharge to Tributary 4 via realigned Leitrim Road (currently Mosquito Drive) through the Twin Falls subdivision. The existing ditch constructed along Mosquito Drive would be insufficient for the proposed development and therefore storm sewers would need to be constructed to Tributary 4.

These three options have been evaluated and compared qualitatively to determine the preferred option per Table 3 below, with the preferred option further investigated with stormwater modelling and fluvial geomorphological assessment.

Table 3 – Discharge Route Options Analysis

Options	Criteria	Notes	Technical Ranking	Financial Ranking	Schedule Ranking
#1. Tributary 3	Technical	- Most direct discharge route - Maintains the site within its existing drainage boundary - Coordination needed with Pond 3 expansion for discharge to Limebank ditch for detailed design.	**#1**		
	Financial	- Relatively short run of storm sewer (~150m)		**#1**	
	Schedule	- Implementation not dependent upon external development			**#1**
#2. Pond 3	Technical	- 4101 Limebank is not part of the current scope for Pond 3 expansion by Arcadis and it is understood that preliminarily there are significant challenges with expanding Pond 3 to support a larger drainage area, even without including the subject site. - Depending on overall Pond 3 expansion design, could necessitate on-site stormwater pump station given site grade raise restrictions. - Would maintain the site within its existing drainage boundary	**#3**		

	Financial	- Owner of 4101 Limebank would be subject to cost sharing for the Pond 3 expansion proportional to drainage area. - The Official Plan identified the southwest corner of the property for stormwater management; so, despite offsite stormwater management (Pond 3) additional developable area of the property would not be achievable and therefore no increase in development value to offset cost sharing for Pond 3 expansion. - Given site grade raise restrictions, may necessitate on-site stormwater pump station, increasing capital and maintenance costs		**#2**	
	Schedule	- Schedule of Pond 3 expansion unknown, therefore development of 4101 Limebank would be contingent on Pond 3 and outside of the owner's control.			**#3**
#3. Tributary 4	Technical	- While it maintains the site within the apportioned drainage area per the Phase 1 ISSU, it does change the drainage area from existing conditions. - It is understood the City intends for the Phase 2 ISSU to explore maintaining drainage areas (including the subject site) to their existing receiving watercourse - Given site grade raise restrictions, may necessitate on-site stormwater pump station - Storm sewer sizing would likely need to account for additional lands anticipated to connect and drain to Tributary 4, which may not be fully understood at this time.	**#2**		
	Financial	- Long run of large diameter (>975mm) storm sewer (~800m) - Replacement of newly constructed outlet Tributary 4 and oil-grit separator - Given site grade raise restrictions, may necessitate on-site stormwater pump station, increasing capital and maintenance costs - While the work would be subject to cost sharing for future development, there is no clear timeline or indication of further development and the Owner/Developer would need to fund the upfront costs.		**#3**	
	Schedule	- Design of sewer could become dependent on extents of anticipated additional lands connecting to the sewer			**#2**

Based on the qualitative evaluation of the three options, Option #1 direct discharge to Tributary 3 via Limebank roadside ditch is the most favourable. Therefore, this is the route that has been evaluated in detail. It is noted the selected route may be considered as the interim condition until a Phase 2 ISSU is completed, though may remain as the ultimate condition depending on the findings of the Phase 2 ISSU.

4.4. Proposed Storm Servicing Design

The subject site will collect internal stormwater runoff through a private storm sewer network and overland flow route to a dry pond located at the southwest corner of the property. Roof drainage will be controlled by each building with rooftop storage, and an outlet maintenance hole structure (modified with integrated orifice and weir structures) at the dry pond will provide final site quantity control. Due to site-wide 1 m grade raise restrictions and restrictions crossing the existing TNPI gas mains, the dry pond will be lower than the existing Limebank Road eastside ditch along the frontage of the property. Therefore, a 600 mm dia. storm sewer is proposed along the Limebank Road ROW to discharge to the Limebank Road ditch where the ditch begins to drop off towards Tributary 3 of Mosquito Creek. The site extremities and the

realigned Leitrim Road (partially developed for site access) will continue to drain to the existing Limebank Road eastside ditch. Refer to the servicing plans in **Appendix A** for reference. Detailed design of the infrastructure is provided under separate cover with the Site Servicing & Stormwater Management Report.

The proposed dry pond will have a minimum elevation of 89.05 m before discharging through the 600 mm dia. discharge sewer. If the future Phase 2 ISSU seeks to alter the site's discharge for the ultimate condition, it will need to maintain and account for the minimum elevation of the dry pond. For reference, per the MDP, which also anticipated an expansion of Pond 3, the 100yr ponding level of Pond 3 was anticipated to be 88.00 m.

4.5. Stormwater Modelling

The subject site was modelled with an array of design storms in PCSWMM in order to demonstrate the proposed development can meet the design criteria noted above. In order to facilitate the fluvial geomorphological assessment, the pre- to post-development was evaluated in the context of the overall drainage area of Tributary 3 where the subject site is proposed to discharge, total area of 84.9 ha. The results are summarized in **Table 4** below with the further details of the model provided in **Appendix D**.

Table 4 – Pre- and Post-Development Peak Flows

Design Storm		Tributary 3 Drainage Area (84.9 ha)		
		Pre-Development Peak Flow (m^3/s)	Post-Development Peak Flow (m^3/s)	Percent Reduction
4hr-25mm		0.2862	0.2587	-9.6%
2yr	12hr SCS Type II	0.7464	0.6733	-9.8%
	24hr SCS Type II	0.7743	0.6915	-10.7%
	3hr Chicago	0.5333	0.4725	-11.4%
	6hr Chicago	0.5991	0.5433	-9.3%
5yr	12hr SCS Type II	1.267	1.202	-5.1%
	24hr SCS Type II	1.241	1.171	-5.6%
	3hr Chicago	0.9362	0.8458	-9.7%
	6hr Chicago	1.040	0.9714	-6.6%
10yr	12hr SCS Type II	1.683	1.568	-6.8%
	24hr SCS Type II	1.613	1.507	-6.6%
	3hr Chicago	1.241	1.144	-7.8%
	6hr Chicago	1.373	1.292	-5.9%
25yr	12hr SCS Type II	2.209	2.038	-7.7%
	24hr SCS Type II	2.079	1.926	-7.4%
	3hr Chicago	1.682	1.542	-8.3%
	6hr Chicago	1.839	1.703	-7.4%
50yr	12hr SCS Type II	2.567	2.376	-7.4%
	24hr SCS Type II	2.446	2.268	-7.3%
	3hr Chicago	2.021	1.850	-8.5%
	6hr Chicago	2.205	2.026	-8.1%
100yr	12hr SCS Type II	2.938	2.698	-8.2%
	24hr SCS Type II	2.816	2.592	-8.0%
	3hr Chicago	2.379	2.177	-8.5%
	6hr Chicago	2.568	2.364	-7.9%

As indicated above, the proposed development can achieve the required stormwater management criteria for peak flow control to discharge to Tributary 3 via Limebank Road ditch, not only just meeting but reducing pre-development peak flows for all storm events. Detailed design of the proposed infrastructure and detailed assessment of all stormwater management criteria within the development is provided under separate cover with the Site Servicing & Stormwater Management Report.

4.6. Fluvial Geomorphology

GEO Morphix has provided a geomorphological assessment of Tributary 3 of Mosquito Creek to validate that the changes in flow rates and flow volumes due to the proposed development are within acceptable ranges and will not adversely affect the watercourse. Using a conservative unitary-derived erosion threshold for the subject site, the assessment determined that post-development there would be minor reductions in erosive potentials during frequent minor storms which offsets the minor increases in erosive potentials during infrequent major storms. Ultimately, the assessment concluded that the proposed development would effectively mitigate erosion risk within Tributary 3. Refer to the full assessment in **Appendix E** for details.

4.7. Quality Control

Quality control is assumed by the MDP and Phase 1 ISSU as being provided at the individual block level in the employment lands. The pre-consultation meeting also identified enhanced (80% TSS removal) as a requirement. Accordingly, the subject site will provide quality control internally within the site by means of oil-grit separators and the on-site dry pond, detailed under separate cover by the Site Servicing & Stormwater Management Report.

4.8. Water Budget

As noted above, since the site is identified as having silty clay soils throughout with elevated groundwater levels, low hydraulic conductivity, and grade raise restrictions, the site is ineligible for infiltration-based LID measures to be considered per City of Ottawa Technical Bulletin IWSTB-2024-04. Therefore, a pre- and post-development water budget of the subject site is not warranted.

5. DEVELOPMENT CHARGE ITEMS

Per the ISSU Development Charge items include watermains (diameter 406mm or above), sanitary sewers (nom. diameter 375mm or above), and storm sewers (nom. diameter 1650mm or above). The water and storm sewers do not meet this criteria, however the approximately 240 m sanitary sewer extension on realigned Leitrim Road will be eligible for development charges.

Further, it is acknowledged that area specific development charges (ASDC) will be implemented on all lands tributary to Mosquito Creek in support of erosion control/restoration works.

6. CONCLUSIONS

This Scoped Master Servicing Study has been prepared to support the Zoning By-Law Amendment and Site Plan Application for the development of the property located at 4101 Limebank Road in the City of Ottawa. The report has detailed the proposed means of externally servicing the site for potable water, sanitary sewer, and storm sewer and achieving stormwater management requirements. The key elements of this work are described as follows:

- A 300 mm dia. water will be extended from the existing 300 mm dia. watermain on Limebank Road approximately 240 m east on realigned Leitrim Road for the subject site.
- Two water connections will be utilized for the subject site: the existing 300 mm dia. valved stub approximately 80 m north of realigned Leitrim Road and at the site entrance on realigned Leitrim Road approximately 240 m east of Limebank Road.
- The twinning of the 300 mm dia. existing watermain on Limebank Rd. from Spratt Rd. will be required to provide redundancy and the required domestic and fire flows for the site. The twinning is currently under development by Arcadis for RSDC.
- A 375 mm dia. sanitary sewer will be extended from the existing 375 mm dia. sanitary on Limebank Road approximately 240 m east on realigned Leitrim Road for the subject site, and anticipating future upstream connections.
- The subject site's stormwater will be conveyed to the Limebank Road eastside ditch downstream of the site frontage, which discharges to Tributary 3 of Mosquito Creek.
- The subject site will control the peak flow to less than pre-development rates for the 2yr to 100yr design storms.
- Geomorphological assessment of Tributary 3 confirmed that the proposed development will effectively mitigate erosion risk of the receiving watercourse.

Report Prepared By:



Stephen McCaughey, P.Eng.
Project Engineer



Ivan Dzeparoski, M.Eng., P.Eng.
Senior Water Resources Engineer
For stormwater modelling

Appendix A

Riverside South / Riverside-sud

SECONDARY PLAN - VOLUME 2

Schedule A - Designation Plan

PLAN SECONDAIRE - VOLUME 2

Annexe A - Plan de désignation

0 125 250 500 750 1,000 m

Planning, Real Estate and Economic Development Department, Geospatial Analytics, Technology and Solutions
Direction générale de la planification, de l'immobilier et du développement économique
Analyse géospatiale, technologie et solutions

Vimy Memorial Bridge / Pont commémoratif Vimy

MAIN STREET/ RUE PRINCIPALE

Town Centre Boundary / Limite du centre ville

LEITRIM ROAD REALIGNMENT / NOUVEAU TRACÉ DU CHEMIN LEITRIM

SPRATT ROAD EXTENSION/ PROLONGEMENT DE CHEMIN SPRATT

Airport Operating Influence Zone / Zone d'influence d'exploitation de l'aéroport

EARL ARMSTRONG

SPRATT

SHORELINE

CANYON WALK

BOWESVILLE

LIMEBANK

RIVIÈRE RIDEAU RIVER

ruisseau Mosquito Creek

COLLECTOR/ COLLECTRICE 'A'

COLLECTOR/ COLLECTRICE 'B'

COLLECTOR/ COLLECTRICE 'C'

COLLECTOR/ COLLECTRICE 'D'

COLLECTOR/ COLLECTRICE 'E'

COLLECTOR/ COLLECTRICE 'F'

COLLECTOR/ COLLECTRICE 'G'

COLLECTOR/ COLLECTRICE 'H'

COLLECTOR/ COLLECTRICE 'I'

COLLECTOR/ COLLECTRICE 'J'

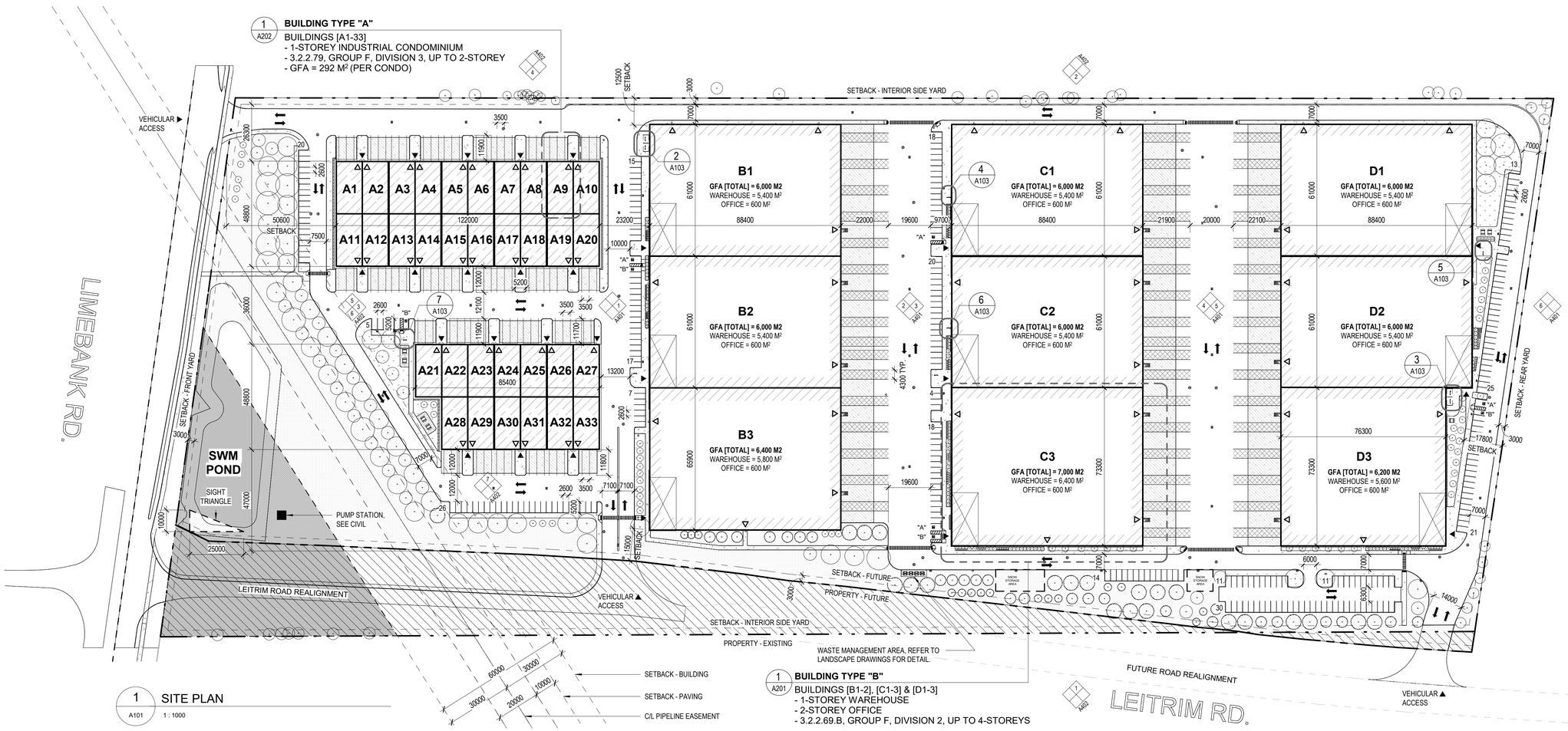
DESIGNATION / DÉSIGNATION

- LD - Neighbourhood - Low Density / Quartier de faible densité
- MDI - Neighbourhood - Medium Density I / Quartier de densité moyenne I
- MDII - Neighbourhood - Medium Density II / Quartier de densité moyenne II
- HD - Neighbourhood - High Density / Quartier de densité élevée
- TC - Town Centre / Centre ville
- NC - Commercial - Neighbourhood / Commercial quartier
- LC - Commercial - Local / Commercial local
- IL - Industrial and Logistics / Industrie et Logistique
- I/F - Institutional / Firehall / Institutionnel / Caserne de pompiers
- FC / FP / EC / EP - Schools - Secondary - Elementary / Écoles - secondaire - élémentaire
- Future O-Train Station Area / Zone des stations futures de l'O-Train
- DP - Park - District / Parc secteur
- CP - Park - Community / Parc communautaire
- NP - Park - Neighbourhood / Park quartier
- SP - Park - Parkette / Mini-parc
- OS - Passive Open Space(s) / Espace(s) de détente
- NEA - Natural Environment Area / Zone écologique naturelle
- SWM - Stormwater Management Facility / Installation de gestion des eaux pluviales
- UNF - Urban Natural Feature / Caractéristique naturelle zone urbaine
- UC - Green Transportation and Utility Corridor(s) / Transport vert et couloir(s) de(s) service(s) public(s)
- P&R - Park and Ride / Parc-o-bus
- Multi-Use Pathway / Sentier polyvalent

- Transfer Station / Station de correspondance
- Future O-Train Station / Station O-Train (futur)
- O-Train and Station / O-Train et station
- Transitway – at grade / Transitway – Voie à niveau
- Scenic Route / Route panoramique
- Main Street / Rue principale
- Transit Street / Rue longeant la Ligne Trillium, où circulent les autobus
- Secondary Plan Boundary / Limite du Plan secondaire

Consolidation and Amendments / Amendment au plan directeur approuvé

2024-02-26 DRAFT



1 A101 SITE PLAN
1 : 1000

SITE PLAN SYMBOLS LEGEND

- = ENTRANCE
- = EXIT
- = MANHOLE, CATCH BASIN, ETC, REFER TO CIVIL
- = LS, LIGHT STANDARD, REFER TO ELECTRICAL AND STRUCTURAL
- = DENOTES SLOPED GRADE, REFER TO CIVIL
- = DENOTES FIRE TRUCK ACCESS ROUTE, REFER TO CIVIL DRAWINGS
- = PROPERTY LINE
- = PEDESTRIAN WALKWAY
- = SWALE. REFER TO CIVIL DRAWINGS
- = SETBACK LINE
- = BOLLARD
- = SURVEY BAR
- = BICYCLE RACK (7 BICYLE CAPACITY)
- = BICYCLE SHELTER
- = IN-GROUND WASTE COLLECTION BIN
- = BUILDING ELEVATION

- = GRASS
- = LANDSCAPING
- = PAINTED LINES
- = RIGHT-OF-WAY WIDENING PROTECTION
- = OFFICE SPACE
- = STORMWATER MANAGEMENT POND
- = SIDEWALK/ LIGHT DUTY CONCRETE SURFACE
- = LOADING DOCK/ HEAVY DUTY CONCRETE SURFACE
- = OVERSIZED LOADING SPACE

GENERAL NOTES

1. CONTRACTOR TO CONFIRM ALL DIMESIONS AND REPORT ANY DISCREPANCIES TO CONTRACTOR ADMINISTRATOR PRIOR TO CONSTRUCTION.
2. LAYOUT TO APPROVED BY CONTRACT ADMINISTRATOR PRIOR TO ANY CONSTRUCTION OR REMOVALS.
3. ALL DIMENSIONS ARE IN METRIC UNLESS OTHERWISE NOTED.
4. CONTRACTOR IS RESPONSIBLE FOR ALL EXCAVATIONS, REMOVALS, DISPOSALS AND ROUGH GRADING AS REQUIRED AS SHOWN ON ALL PLANS, DETAILS AND SPECIFICATIONS.
5. LOCATION OF ALL UTILITITES SHOWN FOR ILLUSTRATION ONLY. CONTRACTOR MUST CONTACT ALL UTILITIES REGARDING RULES FOR WORKING IN THE AREA OF THE UTILITIES PRIOR TO COMMECEMENT OF ANY WORK. CONTRACTOR MUST CONFIRM LOCATION OF ALL UTILITIES PRIOR TO CONSTRUCTION.
6. ALL EXISTING EXISTING ROADS, SIDEWALKS, CURBS, FENCING, PAVING, SODDED AREAS, AND APPROACHES, ETC. TO REMAIN TO BE PROTECTED DURING CONSTRUCTION TO CONTRACT ADMINISTRATOR'S APPROVAL AT THE CONTRACTORS OWN COSTS.
7. FOR LANDSCAPE, REFER TO LANDSCAPE DRAWINGS.
8. FOR UTILITIES, GRADING, ETC. REFER TO CIVIL DRAWINGS.
9. LEGAL SURVEY BOUNDARIES AND TOPOGRAPHICAL INFORMATION TAKEN FROM TOPOGRAPHICAL PLAN OF SURVEY OF PART OF LOTS 16 & 17 CONCESSION 2 (RIDEAU FRONT) GEOGRAPHIC TOWNSHIP OF GLOUCESTER, DATED DECEMBER 6, 2023, FROM THE OFFICE OF ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

Loading Spaces

Requirement

Standard Loading Spaces:
Light Industrial / Warehouse: >25,000m² GFA: 3
65,240 > 25,000 = 3 loading spaces

Oversized Vehicle Loading Spaces:
Light Industrial / Warehouse: 1 space / first 5000m² + all required spaces for GFA > 5000m² = 4 total

	Requirement	Provided
Standard Loading Spaces	3 Spaces	66 Spaces
Oversized Loading Spaces	1 Space	49 Spaces

Site Information

Legal Description:	Part of lots 16 & 17, Concession 2 (Rideau Front), Geographic Township of Gloucester, City of Ottawa
P.I.N:	04331 - 0320
Easements:	Inst. GL54354, Part 16, Plan 4R-8983 Inst. GL50325. Part 2. Plan 5R-9196 Inst. OC2191832, Part 1, Plan 4R-32295
Municipal Address:	4101 Limebank Road, Ottawa, Ontario

Parking (4101 Limebank Road)

Requirement

Light Industrial: 0.8 / 100m² for first 5,000m²;
0.4 / 100m² of remaining gross floor area.

Total GFA = 65,240 m²
First 5,000 m² = 5,000 / [100/0.8] = 40 Spaces
Remaining m² = 60,240 / [100/0.4] = 240.96 Spaces [241 rounded up]

Proposed Buildings	281 Spaces
Accessible Parking	4 - Type A (5200 mm x 3400 mm (MIN.)) 4 - Type B (5200 mm x 2400 mm (MIN.))
Total Site Required	281 Spaces (Including Accessible Parking)

Provided

Total Site Provided	281 Spaces (Including 4 Type-A and 4 Type-B Accessible Parking)

	Requirement	Provided
Bicycle Parking		
Light Industrial: 1 / 1000m² of gross floor area	66 Spaces	70 Spaces

Zoning Statistics

Zoning: General Industrial (IG) - Currently Development Reserve Zone (DR)

Proposed Use:
Building Type "A" [Industrial Condo]: Group F, Division 3 Occupancy, Up to 2-Storeys
Building Type "B" [Warehouse]: Group F, Division 2 Occupancy, Up to 4-Storeys

Standard		Requirement	Provided
Lot Area (min.)		1,000 m²	151,250 m²
Lot Coverage (max.)		65%	43.1%
Gross Floor Area	Condo	N/A	9,640 m²
	Office (Warehouse)	N/A	5,400 m²
	Warehouse	N/A	50,200 m²
	Total	N/A	65,240 m²
Front Yard and Corner Side Yard (min.)			
Front Yard		3.0 m	50.6 m
Corner Side Yard		3.0 m	15.0 m
Side Yard (min.)			
Adjoining Residential or Institutional		15.0 m	N/A
All other cases		3 m	12.5 m [North]
Rear Yard (min.)			
Adjoining Residential or Institutional		15.0 m	N/A
All other cases		3 m	17.8 m
Maximum Floor Space Index		2.0	0.39
Maximum Building Height			
Within 20M of Adjoining Residential Zone		11.0 m	N/A
All other cases - Condo		22.0 m	10.0 m
All other cases - Warehouse		22.0 m	15.0 m
Minimum Width of Landscape Area		3.0 m	3.0 m
Landscaped Area within Parking Lot		N/A	5-10%
Total Vegetation and Landscaped Area		N/A	15%

ARCHITECTURE 49
ARCHITECTURE49
1345 ROSEMOUNT AVENUE | CORNWALL, ON, CANADA K6J 3E5
Phone: 613-933-5604 | cornwall@architecture49.com | architecture49.com

CONSULTANT

CONSULTANT

CONSULTANT

CLIENT

GROUPE MONTONI
Espace Montmorency
600, Lucien-Paiement St, suite 200
Laval (QC) H7N 0H7

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SEAL:

THIS BAR IS 25mm LONG WHEN PLOTTED AT CORRECT SCALE. DO NOT SCALE DRAWINGS. 25mm

NORTH ARROW: TRUE NORTH

DIGITAL REFERNECE:

PROJECT NO.: CA0014797.3416 CONTRACT NO.
DRAWN BY: TS CHECKED BY: APPROVED BY:

KEYPLAN:

NO.	DATE	ISSUED
7	2025-02-14	RE-ISSUED FOR SITE PLAN APPROVAL
6	2024-11-06	ISSUED FOR SITE PLAN APPROVAL
5	2024-10-24	ISSUED FOR COORDINATION
4	2024-10-16	ISSUED FOR CLIENT PRICING
3	2024-09-17	ISSUED FOR CLIENT REVIEW
2	2024-09-12	ISSUED FOR COORDINATION - PLANNING
1	2024-03-15	ISSUED FOR SITE PLAN APPLICATION

PROJECT

4101 Limebank Road Site Plan Application

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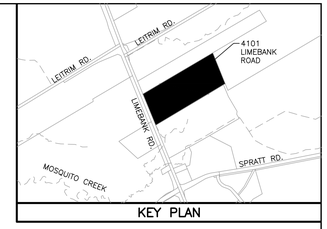
GENERAL SITE PLAN

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ARCH D (24" x 36" | 610mm x 914mm)





KEY PLAN

LEGEND

- PROPERTY BOUNDARY (4101 LIMEBANK RD.)
- FUTURE LEITRIM RD. REALIGNMENT
- EASEMENT

NOT FOR CONSTRUCTION

NOTES

THE POSITION OF ALL PROPERTY BOUNDARIES, EASEMENTS, FEATURES, AND UTILITIES, EXISTING AND FUTURE, ARE ILLUSTRATIVE ONLY.

NO.	REVISION DESCRIPTION	DATE	BY
2	ISSUED FOR CITY REVIEW	03/03/26	SM
1	ISSUED FOR CLIENT REVIEW	25/01/24	CC

SCALE

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HORIZONTAL 1:2500

Robinson
Land Development
200-2936 Baseline Road
Ottawa, ON K2H 1B3
(613) 592-6060 rcii.com

DESIGN	SM
CHECKED	BM
DRAWN	SM
CHECKED	BM
APPROVED	CC

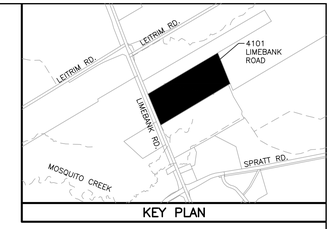
GROUPE MONTONI

4101 LIMEBANK RD.
CITY OF OTTAWA

OFFSITE SERVICING
-
LOCATION PLAN

PROJECT No.	23074
SURVEY	AOV
DATED	MAR 2026
DWG. No:	23074-OL1





KEY PLAN

LEGEND

- PROPERTY BOUNDARY (4101 LIMEBANK RD.)
- FUTURE LEITRIM RD. REALIGNMENT
- EASEMENT
- WATERMAIN
- SANITARY SEWER & MANHOLE
- STORM SEWER & MANHOLE

NOT FOR CONSTRUCTION

NOTES

THE POSITION OF ALL PROPERTY BOUNDARIES, EASEMENTS, FEATURES, AND UTILITIES, EXISTING AND FUTURE, ARE ILLUSTRATIVE ONLY.

NO.	REVISION DESCRIPTION	DATE	BY
2	ISSUED FOR CITY REVIEW	03/03/26	SM
1	ISSUED FOR CLIENT REVIEW	25/01/24	CC

SCALE

0 25m 50m 100m

HORIZONTAL 1:2500

Robinson Land Development
200-2936 Baseline Road
Ottawa, ON K2H 1B3
(613) 592-6060 rcii.com

DESIGN	SM
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DRAWN	SM
CHECKED	BM
APPROVED	CC

GROUPE MONTONI

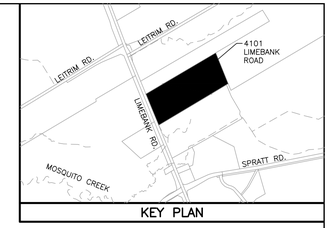
4101 LIMEBANK RD.
CITY OF OTTAWA

OFFSITE SERVICING
-
EXISTING SERVICES PLAN

PROJECT No.	23074
SURVEY	AOV
DATED	MAR 2026
DWG. No:	23074-OEX1



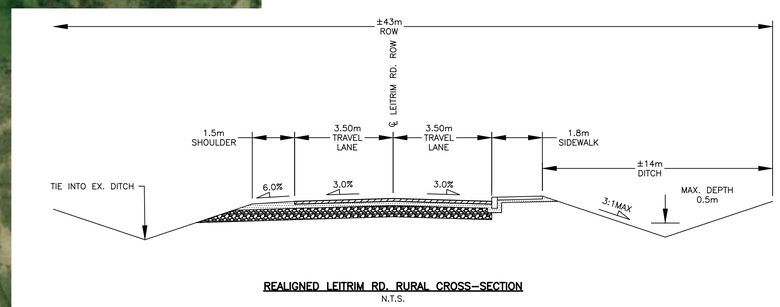




KEY PLAN

LEGEND

- PROPERTY BOUNDARY (4101 LIMEBANK RD.)
- FUTURE LEITRIM RD. REALIGNMENT
- EASEMENT
- EXISTING WATERMAIN
- FUTURE WATERMAIN
- EXISTING SANITARY SEWER & MANHOLE
- FUTURE SANITARY SEWER & MANHOLE
- EXISTING STORM SEWER & MANHOLE
- FUTURE STORM SEWER & MANHOLE
- ROADSIDE DITCH



REALIGNED LEITRIM RD. RURAL CROSS-SECTION
N.T.S.

NOT FOR CONSTRUCTION

NOTES

THE POSITION OF ALL PROPERTY BOUNDARIES, EASEMENTS, FEATURES, AND UTILITIES, EXISTING AND FUTURE, ARE ILLUSTRATIVE ONLY.

NO.	REVISION DESCRIPTION	DATE	BY
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2	REISSUED FOR CLIENT REVIEW	30/08/24	SM
1	ISSUED FOR CLIENT REVIEW	25/01/24	CC

SCALE

0 25m 50m 100m

HORIZONTAL 1:2500

Robinson Land Development
200-2936 Baseline Road
Ottawa, ON K2H 1B3
(613) 592-6060 rcii.com

DESIGN	SM
CHECKED	BM
DRAWN	SM
CHECKED	BM
APPROVED	CC

GROUPE MONTONI

4101 LIMEBANK RD.
CITY OF OTTAWA

OFFSITE SERVICING
-
SERVICING PLAN

PROJECT No.	23074
SURVEY	AOV
DATED	MAR 2026
DWG. No:	23074-OS1

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CONT'D ON SHEET NO. 04
MATCHLINE STA. 10+550

ONTARIO HYDRO EASEMENT

R=280

10+600 10+650 10+700 10+750 10+800 10+850 10+900 10+950 11+000 11+050 11+100 11+150 11+200

2.0m SIDEWALK
1.8m CYCLE TRACK
3.50 TRAVEL LANE
3.25 TRAVEL LANE
3.25 TRAVEL LANE
3.50 TRAVEL LANE
1.8m CYCLE TRACK
2.0m SIDEWALK

CONT'D ON SHEET 18

LIMEBANK ROAD

1.8m CYCLE TRACK
2.0m SIDEWALK
3.5m TRAVEL LANE
3.25m TRAVEL LANE
3.5m LEFT TURN LANE
3.25m TRAVEL LANE
3.5m TRAVEL LANE
1.8m CYCLE TRACK
2.0m SIDEWALK

3.5m TRAVEL LANE
3.5m TRAVEL LANE
3.5m LEFT TURN LANE
3.5m LEFT TURN LANE
3.5m TRAVEL LANE
3.5m TRAVEL LANE
3.6m RIGHT TURN LANE

2.0m SIDEWALK
1.8m CYCLE TRACK
3.5m TRAVEL LANE
3.25m TRAVEL LANE
3.25m LEFT TURN LANE
3.5m LEFT TURN LANE
3.25m TRAVEL LANE
3.5m TRAVEL LANE
1.8m CYCLE TRACK
2.0m SIDEWALK

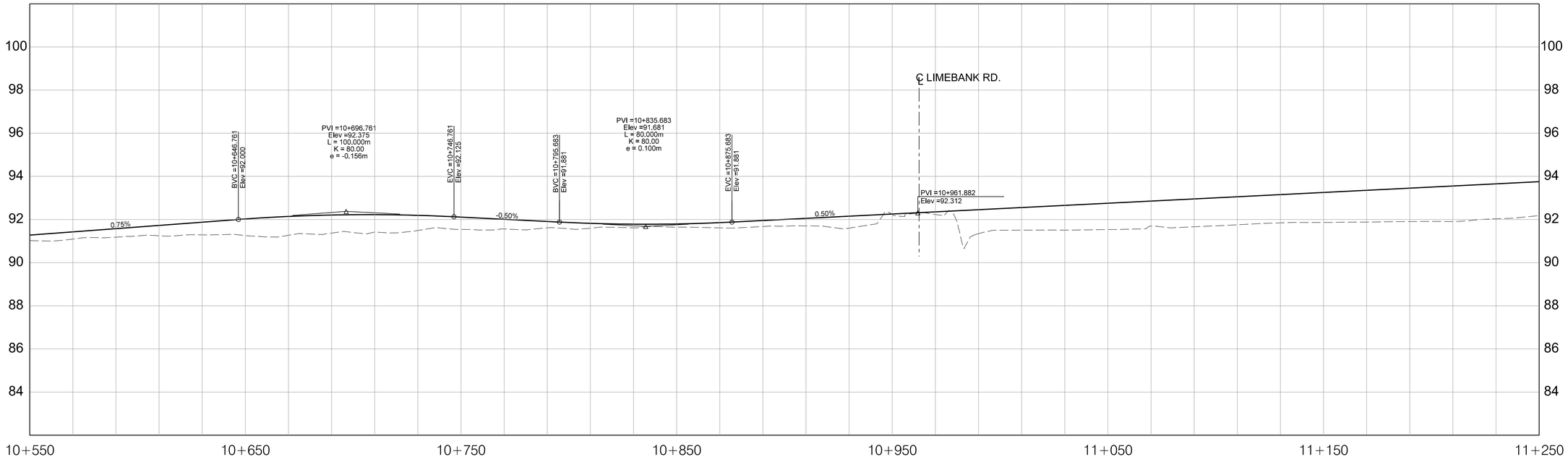
2.0m SIDEWALK
1.8m CYCLE TRACK
1.8m CYCLE TRACK
2.0m SIDEWALK

EXISTING SWM POND

TRANS-NORTHERN PIPELINE EASEMENT

MATCHLINE STA. 11+250
CONT'D ON SHEET NO. 06

CONT'D ON SHEET 18



March-2020

PARSONS

Scale:

0m 10 20 40 60 100



Legend:

- EXISTING PROPERTY LINE
- PROPOSED RIGHT OF WAY
- PROPOSED PROPERTY ACQUISITION
- PROPOSED BARRIER
- PROPOSED NEW INFRASTRUCTURE
- EXISTING INFRASTRUCTURE
- EXISTING BUILDING

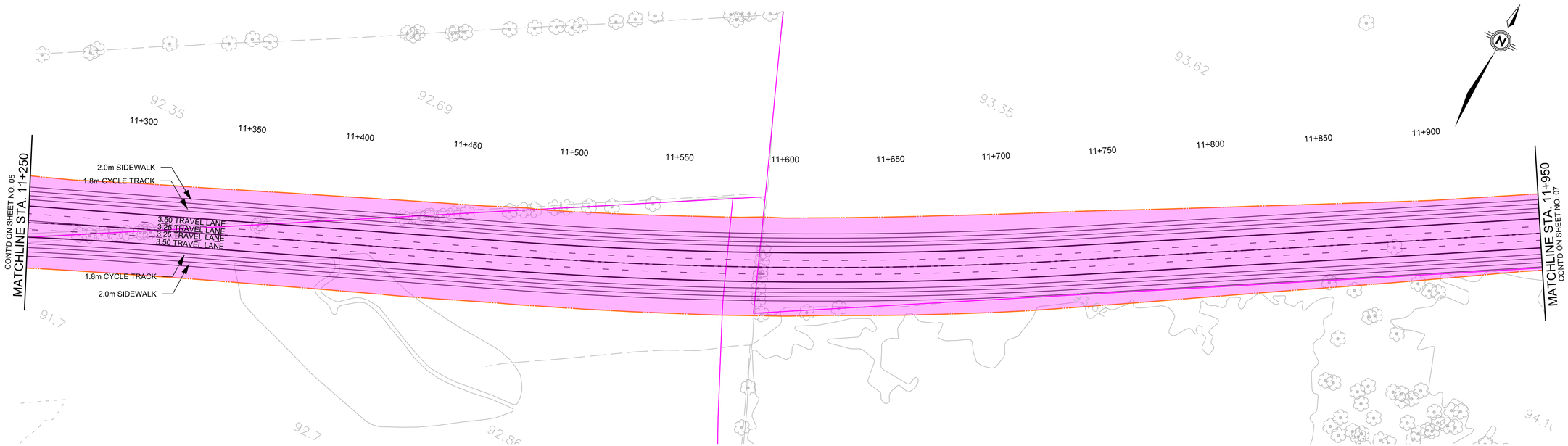
Ottawa

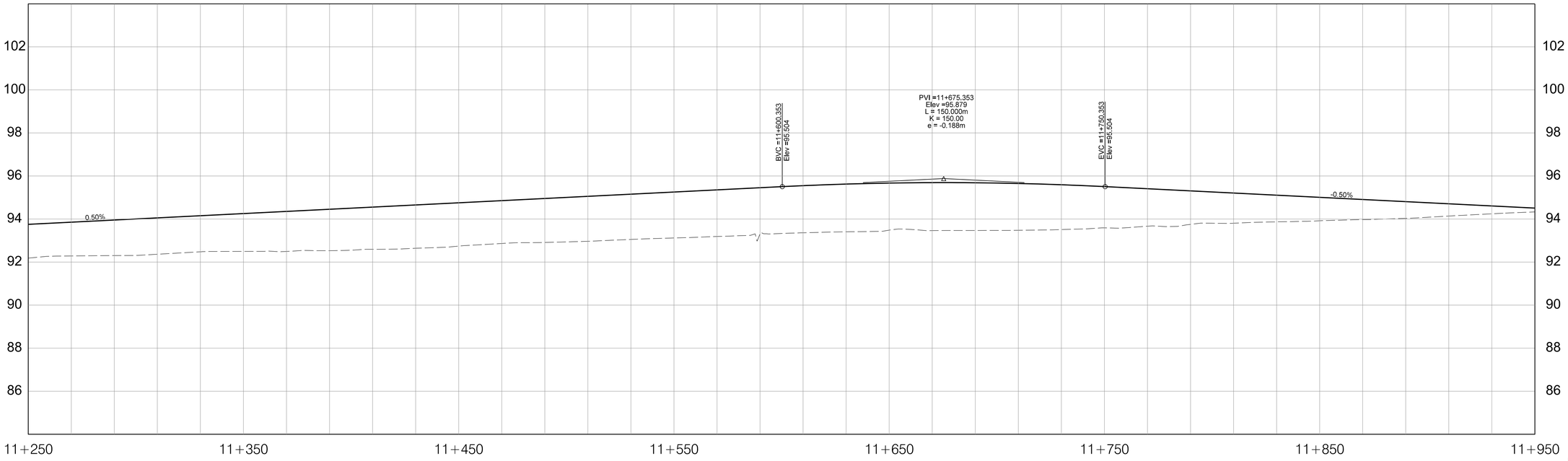
LEITRIM ROAD REALIGNMENT AND WIDENING
Environmental Assessment Study

RECOMMENDED PLAN - FUNCTIONAL DESIGN PLAN AND PROFILE 10+550 TO STA. 11+250

05

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March-2020

PARSONS

Scale:

0m 10 20 40 60 100



Legend:

- EXISTING PROPERTY LINE
- PROPOSED RIGHT OF WAY
- PROPOSED PROPERTY ACQUISITION
- PROPOSED BARRIER
- PROPOSED NEW INFRASTRUCTURE
- EXISTING INFRASTRUCTURE
- EXISTING BUILDING

Ottawa

LEITRIM ROAD REALIGNMENT AND WIDENING
Environmental Assessment Study

RECOMMENDED PLAN - FUNCTIONAL DESIGN PLAN AND PROFILE 11+250 TO STA. 11+950

06

TOPOGRAPHICAL PLAN OF SURVEY OF

PART OF LOTS 16 & 17
CONCESSION 2 (RIDEAU FRONT)
GEOGRAPHIC TOWNSHIP OF GLOUCESTER
CITY OF OTTAWA

Surveyed by Annis, O'Sullivan, Vollebekk Ltd.
REVISION NOTE: Elevations on top of exposed Gas Pipe added, January 13, 2025
REVISION NOTE: Topographical features and Elevations east, north and south of subject Land July 17, 2025

Scale 1 : 750

30 22.5 15 7.5 0 15 30 Metres

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

Surveyor's Certificate

I CERTIFY THAT :

1. This survey and plan are correct and in accordance with the Surveys Act and the Surveyors Act and the regulations made under them.
2. The survey was completed on the 5th day of December, 2023.

December 6, 2023 — Date

Andrew J. Broxham
Ontario Land Surveyor

Notes & Legend

Denotes

—○—	=	Survey Monument Planted
—■—	=	Survey Monument Found
SIB	=	Standard Iron Bar
SSIB	=	Short Standard Iron Bar
IB	=	Iron Bar
(Wit)	=	Witness
Meas	=	Measured
(P1)	=	Plan 5R-9196
(P2)	=	Plan 5R-12444
(P3)	=	Plan 4R-32295
(P4)	=	Registered Plan 4M-1363
(P5)	=	Plan 5R-13368
○ MH-ST	=	Maintenance Hole (Storm)
○ MH-S	=	Maintenance Hole (Sanitary)
⊖ VC	=	Valve Chamber (Watermain)
——ST——	=	Underground Storm Sewer
——S——	=	Underground Sanitary Sewer
——W——	=	Underground Water
——P——	=	Underground Power
——T——	=	Underground Traffic
——G——	=	Underground Gas
——OHW——	=	Overhead Wires
○ UP	=	Utility Pole
○ AN	=	Anchor
○ LS	=	Light Standard
□ CB	=	Catch Basin
□ CBI	=	Catch Basin Inlet
CSP	=	Corrugated Steel Pipe
CCP	=	Corrugated Concrete Pipe
○ FH	=	Fire Hydrant
▭ HH	=	Handhole
PWF	=	Post and Wire Fence
Inv.	=	Invert
T/P	=	Top of Pipe
T/G	=	Top of Grade
C/L	=	Centreline
+ 65.00	=	Location of Elevations
+ 65.00*	=	Top of Concrete Curb / Headwall Elevation

Bearings are grid and are referred to the northerly limit of Block 8 Registered Plan 4M-1363 having a bearing of N 58° 49' 50" E as shown thereon.

For bearing comparisons, a rotation of 1°04'00" counter-clockwise was applied to bearings on P2.

For bearing comparisons, a rotation of 1°03'40" counter-clockwise was applied to bearings on P5.

ELEVATION NOTES

1. Elevations shown are geodetic and are referred to the CGVD28 geodetic datum.
2. It is the responsibility of the user of this information to verify that the job benchmark has not been altered or disturbed and that it's relative elevation and description agrees with the information shown on this drawing.

UTILITY NOTES

1. This drawing cannot be accepted as acknowledging all of the utilities and it will be the responsibility of the user to contact the respective utility authorities for confirmation.
2. Only visible surface utilities were located.
3. A field location of underground plant by the pertinent utility authority is mandatory before any work involving breaking ground, probing, excavating etc.
4. Underground utility data derived from City of Ottawa utility sheet reference: Y-06-22, Y-06-28, Z-06-04, 14293p&p04R2, 14293p&p05R2 & 14293p&p06.
   Sanitary and storm sewer grades and inverts were compiled from: City of Ottawa Utility Sheets.

SITE AREA=15.1 Hectares

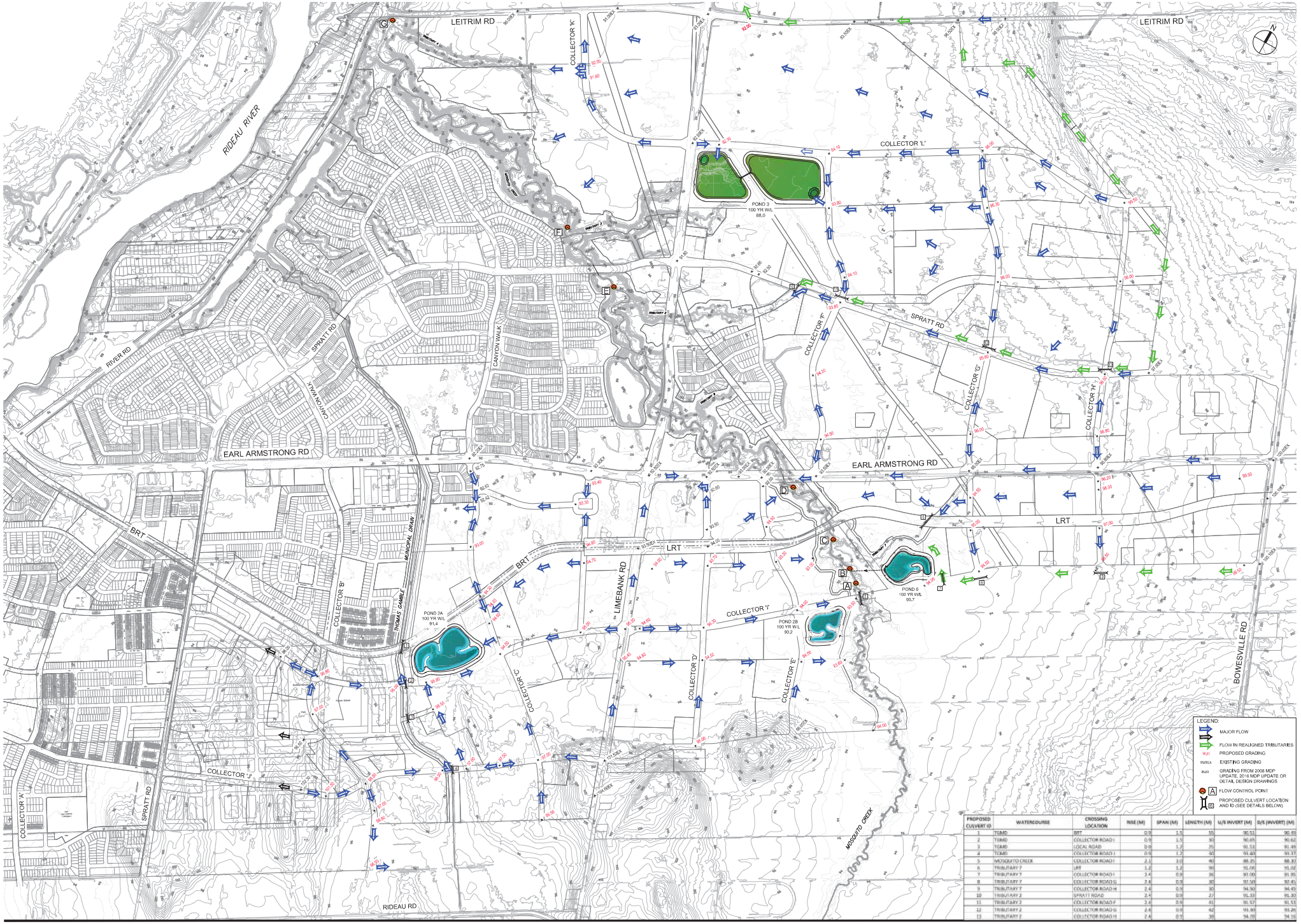
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Email: Nepean@avbltd.com

Ontario Land Surveyors

Job No. 24256-23 410 Limebank Rd PLN#5 B/T Cad T: F3



PROPOSED CULVERT ID	WATERCOURSE	CROSSING LOCATION	RISE (M)	SPAN (M)	LENGTH (M)	U/S INVERT (M)	D/S (INVERT) (M)
1	TGMD	BRT	0.9	1.5	55	90.51	90.39
2	TGMD	COLLECTOR ROAD I	0.9	1.5	30	90.65	90.62
3	TGMD	LOCAL ROAD	0.6	1.2	25	91.53	91.49
4	TGMD	COLLECTOR ROAD J	0.9	1.2	30	93.40	93.37
5	MOSQUITO CREEK	COLLECTOR ROAD I	2.1	3.0	40	88.35	88.30
6	TRIBUTARY 7	LRT	1.2	1.2	90	91.09	91.02
7	TRIBUTARY 7	COLLECTOR ROAD I	3.4	0.9	36	90.99	91.95
8	TRIBUTARY 7	COLLECTOR ROAD G	2.4	0.9	30	92.50	92.45
9	TRIBUTARY 7	COLLECTOR ROAD H	2.4	0.9	30	94.50	94.45
10	TRIBUTARY 2	SPRATT ROAD	2.4	0.9	27	91.33	91.30
11	TRIBUTARY 2	COLLECTOR ROAD F	2.4	0.9	62	91.57	91.53
12	TRIBUTARY 2	COLLECTOR ROAD G	2.4	0.9	62	93.36	93.26
13	TRIBUTARY 2	COLLECTOR ROAD H	2.4	0.9	35	94.70	94.16

Scale: 1:5000

Project Title: RIVERSIDE SOUTH COMMUNITY
MASTER DRAINAGE PLAN UPDATE
MOSQUITO CREEK STUDY AREA

Drawing Title: MACRO GRADING PLAN

SCALE: 1:5000

Sheet No.: FIGURE 7.5

7. Grade Raise Restrictions

For design purposes, the maximum grade raise at the site should be limited to 1.0 m due to the presence of compressible silly clay. Excavation for the grade raise should not extend into the native highly weathered silty clay crust.

3.5 Infiltration Testing

To assess the native soil's suitability to accommodate storm water flows generated by the redevelopment of the Site, an in-situ percolation tests were performed on May 10, 2022. The location of the test hole is shown on Figure 4 (P-1) and is in the location of the proposed stormwater management pond.

The percolation test was performed by hand-augering a 5 cm diameter hole in the soil. Once constructed the test hole was filled with water and the rate at which the water level in the hole fell was closely monitored using an electronic data logger as well as manual measurements. The result of the percolation test is summarized in Table 3-4 below and the data is presented in Appendix E.

Table 3.4: Summary of Percolation Test Results

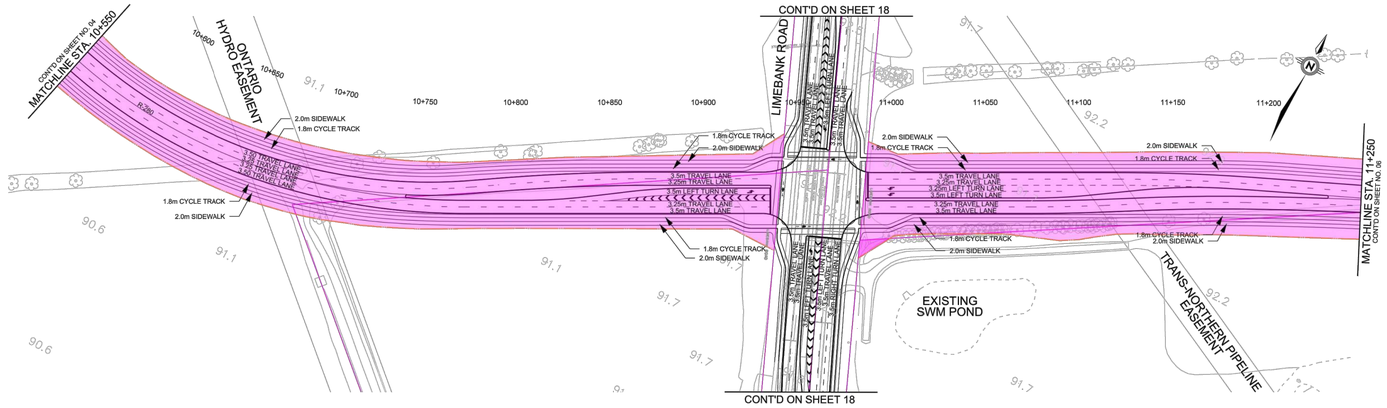
Test Location	Total Depth (mbgs)	Saturated Hydraulic conductivity (m/s)	Soil Description
P1	1.03	1.9E-8	Silty Clay

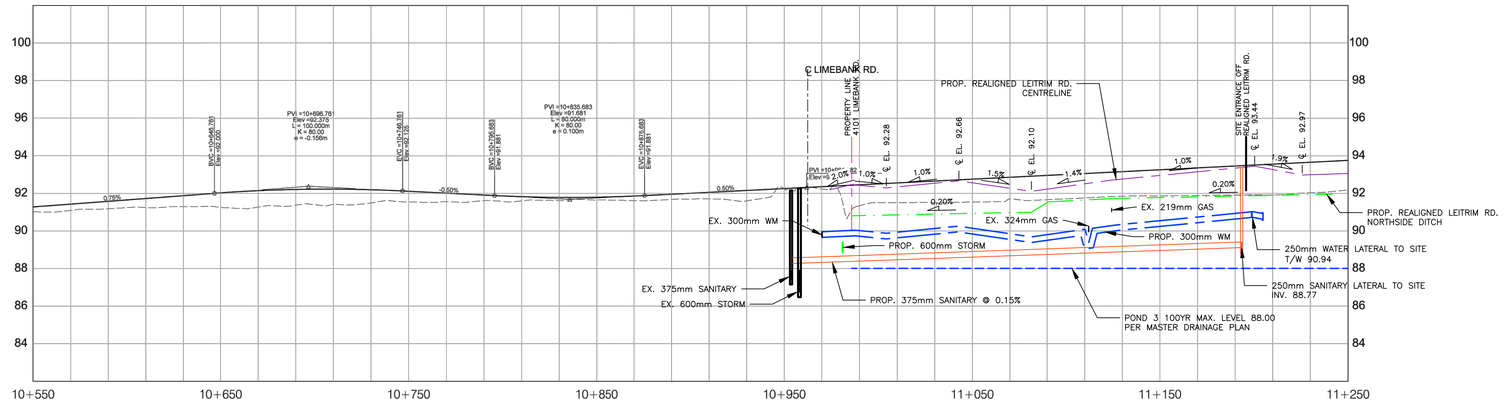
For the proposed storm water management pond in the vicinity of test hole P1, the water table in the overburden was found to be approximately 0.68 mbgs. Water added to this borehole for testing purposes did not fully drain after the test.

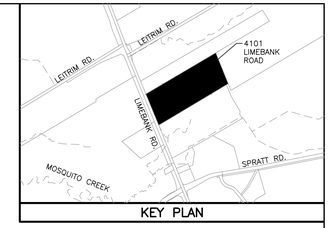
Flat topography and a high-water table make it difficult to separate stormwater from groundwater by 1.0 meter, as required in MOE (2003). A common stormwater management approach in a low-relief environment is to construct (wet) ponds or (pocket) wetlands. These are typically excavated below the water table to provide the required pool storage for pollutant removal. A weir above the pool can be used to create additional storage.

Keeping the normal pool elevation above the water table elevation reduces the influence of groundwater on the pond's water budget. As a practical target, groundwater should probably supply no more than a quarter of the stormwater quality pond's total water budget. The pond design should not rely on groundwater dilution alone for stormwater treatment. Depending on local groundwater quality, it is possible for groundwater to augment rather than dilute some pollutants (particularly nitrogen). Therefore, the design should maximize internal features that can provide greater physical and biological treatment of stormwater. Longer flow paths, greater residence times, higher treatment volumes and wetland plantings are essential in physical treatment for stormwater in high groundwater areas.

Infiltration into the underlying confined bedrock aquifer is not recommended.







KEY PLAN

LEGEND

- PROPERTY BOUNDARY (4101 LIMEBANK RD.)
- PROP. REALIGNED LEITRIM RD. CENTRELINE
- EXISTING WATERMAIN
- PROP. WATERMAIN
- EXISTING SANITARY SEWER & MANHOLE
- PROP. SANITARY SEWER & MANHOLE
- EXISTING STORM SEWER & MANHOLE
- PROP. STORM SEWER & MANHOLE
- PROP. ROADSIDE DITCH

NOT FOR CONSTRUCTION

NOTES

THE POSITION OF ALL PROPERTY BOUNDARIES, EASEMENTS, FEATURES, AND UTILITIES, EXISTING AND FUTURE, ARE ILLUSTRATIVE ONLY.

NO.	REVISION DESCRIPTION	DATE	BY
3	ISSUED FOR CITY REVIEW	03/03/26	SM
2	REISSUED FOR CLIENT REVIEW	30/08/24	CC
1	ISSUED FOR CLIENT REVIEW	08/02/24	CC

SCALE

HORIZONTAL 1:1500 (0, 15m, 30m, 60m)

VERTICAL 1:150 (0, 1.5m, 3m, 6m)

Robinson Land Development
200-2936 Baseline Road
Ottawa, ON K2H 1B3
(613) 592-6060 rcii.com

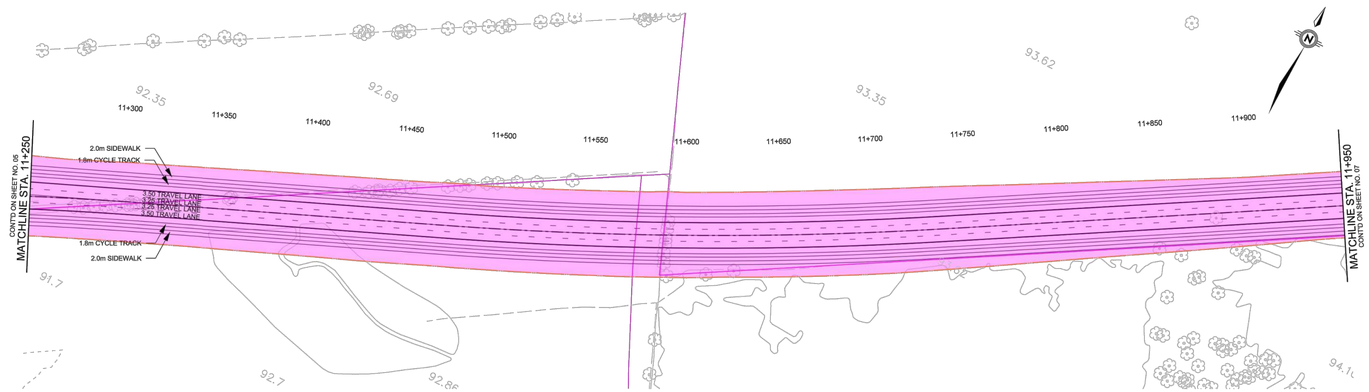
DESIGN	SM
CHECKED	BM
DRAWN	SM
CHECKED	BM
APPROVED	CC

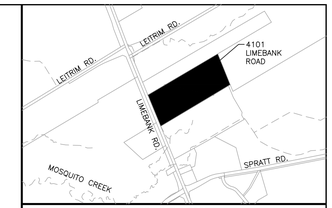
GROUPE MONTONI

4101 LIMEBANK RD.
CITY OF OTTAWA

OFFSITE SERVICING - REALIGNED LEITRIM RD. PROFILE PLAN

PROJECT No.	23074
SURVEY	AOV
DATED	MAR 2026
DWG. No:	23074-OP1

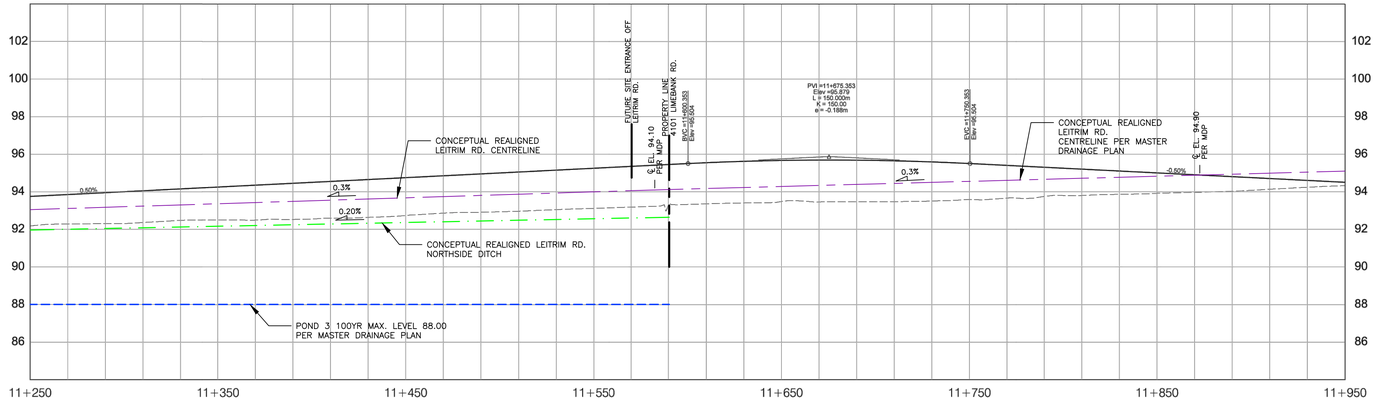




KEY PLAN

LEGEND

- PROPERTY BOUNDARY (4101 LIMEBANK RD.)
- PROP. REALIGNED LEITRIM RD. CENTRELINE
- EXISTING WATERMAIN
- PROP. WATERMAIN
- EXISTING SANITARY SEWER & MANHOLE
- PROP. SANITARY SEWER & MANHOLE
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- PROP. STORM SEWER & MANHOLE
- PROP. ROADSIDE DITCH



NOT FOR CONSTRUCTION

NOTES

THE POSITION OF ALL PROPERTY BOUNDARIES, EASEMENTS, FEATURES, AND UTILITIES, EXISTING AND FUTURE, ARE ILLUSTRATIVE ONLY.

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3	ISSUED FOR CITY REVIEW	03/03/26	SM
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SCALE

HORIZONTAL 1:1500 (0, 15m, 30m, 60m)

VERTICAL 1:150 (0, 1.5m, 3m, 6m)

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200-2936 Baseline Road
Ottawa, ON K2H 1B3
(613) 592-6060 rcii.com

DESIGN	SM
CHECKED	SG
DRAWN	SM
CHECKED	SG
APPROVED	CC

GROUPE MONTONI

4101 LIMEBANK RD.
CITY OF OTTAWA

OFFSITE SERVICING - REALIGNED LEITRIM RD. PROFILE PLAN

PROJECT No.	23074
SURVEY	AOV
DATED	MAR 2026
DWG. No:	23074-OP2

File No.: PC2023-0184

August 30, 2023

Tyler Yakichuk
Fotenn Planning and Design
Via email: yakicuk@fotenn.com

Subject: **Phase 1 Pre-Application Consultation Meeting Feedback**
Zoning By-law Amendment & Site Plan Control – 4101 Limebank Road

Please find below information regarding next steps as well as consolidated comments from the above-noted pre-application consultation meeting held on August 23, 2023.

Pre-Application Consultation Preliminary Assessment

1 ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☒

One (1) indicates that considerable major revisions are required while five (5) suggests that the proposal appears to meet the City's key land use policies and guidelines. This assessment is purely advisory and does not consider technical aspects of the proposal or in any way guarantee application approval.

Next Steps

1. As discussed during the Phase 1 pre-application consultation meeting, staff strongly recommend waiting for the **completion of the Mosquito Creek Master Servicing Study** prior to proceeding with the Phase 3 pre-application consultation application.

   When you are prepared to submit the Phase 3 pre-application consultation application, please send the completed form and studies/plans to planningcirculations@ottawa.ca.

2. In the next pre-application consultation submission, please include a detailed cover letter outlining how each of the comments were addressed. Please coordinate the numbering of the responses in your cover letter with the comment numbers herein.

Please note that if the proposal changes significantly in scope, design, or density, you may need to complete a Phase 2 pre-application consultation.

Supporting Information and Material Requirements

The attached **Study and Plan Identification List** outlines the information and material required (R) or advised (A) as for the Zoning By-law Amendment and Site Plan Control applications.

The required plans and studies must meet the City's Terms of Reference (ToR) and/or Guidelines, are available on Ottawa.ca.

Please note that the new ToR and Guidelines outline specific requirements to deem a plan and/or study adequate at the Phase 3 pre-application consultation.

Consultation with External Agencies

Staff encourage applicants to consult with external technical agencies early in the development of the project concept and application process. External agencies include:

- Ottawa Airport Authority – Delroy Brown at Delroy.Brown@yow.ca
- Trans Northern Pipeline Inc. – W. Watt at wwatt@tnpi.com
- Riverside South Landowners Cost Sharing Agreement - Ursula Melinz, Soloway Wright

Planning Comments – Siobhan Kelly, Planner I

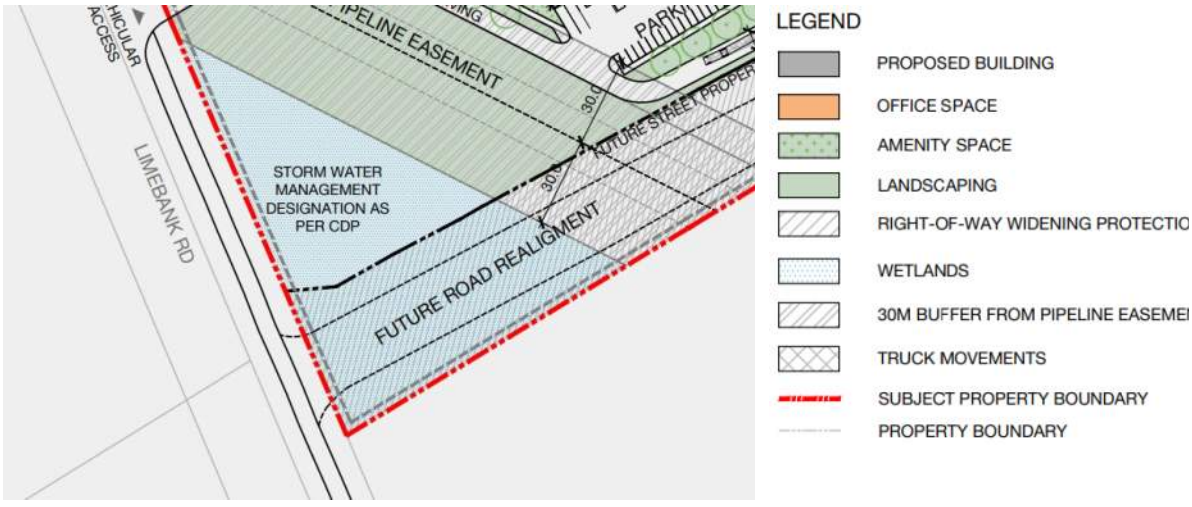
1. The Official Plan designates the property Industrial & Logistics in the Suburban Transect. The property is also within the Riverside South Secondary Plan area (to be drafted and approved by Council).

2. The property is subject to the Riverside South Community Design Plan. Please ensure that the Planning Rationale submitted in support of the application considers the policy and built form directions, including Section 6.3 Employment Areas Built Form.

3. Provide a copy of the registered easement agreement for the transmission pipeline with the application submission.

4. The Concept Plan submitted with the Phase 1 pre-application consultation shows a stormwater management (SWM) pond in the south-west corner of the site. Please note that the completed Mosquito Creek Master Servicing Study may reveal that a SWM pond is not required in this location.

5. The Concept Plan identifies the SWM pond as a wetland based on the notation in legend. Please confirm if the pond (if required) will be constructed as a wetland or dry pond.



6. For the Phase 3 application consultation please confirm if any site-specific amendments are needed to facilitate the proposed development. Provisions from the General Industrial (IG) zone to make note of include:

- Accessory display and sale areas are capped at 25% of the GFA of the warehouse use.

- Parking rates – if the office uses are accessory to the warehouse (i.e., service the warehouses on-site), you can rely on the warehouse parking rate.

7. Preliminary site plan comments:

    - Snow storage area(s) should be strategically located given the size of the site and amount of surface parking and loading spaces. If parking any spaces are used for snow storage, be aware that those spaces cannot contribute to the required parking space count.

    - Aisle width dimensions for loading spaces will depend on the angle of the loading space.

8. Section 37 requirements / Community Benefits Charge

    a. The former Section 37 regime has been replaced with a "Community Benefits Charge", By-law No. 2022-307, of 4% of the land value. This charge will be required for ALL buildings that are 5 or more storeys and 10 or more units and will be required at the time of building permit unless the development is subject to an existing registered Section 37 agreement. Questions regarding this change can be directed to Ranbir.Singh@ottawa.ca.

If you have any questions or require further information, please contact Siobhan Kelly, Planner I, at siobhan.kelly@ottawa.ca

Engineering Comments – Reed Adams, Infrastructure Project Manager

9. Phase 2 of the Mosquito Creek Master Servicing Study (IBI is the consultant completing the study) must be completed before the submission of this application.

    a. For updates on Phase 2 of the master servicing study, please refer to the following contacts:

        i. Terry Brule, P.Eng. Associate Director – Practice Lead, Land Engineering at Arcadis (formerly IBI), terry.brule@arcadis.com, Cell: 819-664-7322

        ii. Marcel Denomme, Vice President of Land Development at Urbandale Corporation, mdenomme@urbandale.com Office Number: 613-731-6712 ext: 1230, Cell 613-889-6204

10. Existing Public Services (Storm, Sanitary & Water Supply)

    a. 305mm watermain along Limebank Rd. (see water section below).

    b. 375mm sanitary sewer along Limebank Rd. (see sanitary section below).

    c. 600mm storm sewer along Limebank Rd. (see stormwater section below).

d. Monitoring manholes are required. They must be located in an accessible location on private property near the property line (ie. Not in a parking area).

11. Water Boundary condition requests must include the location of the service (map or plan with connection location(s) indicated) and the expected loads required by the proposed development, including calculations. Please provide the following information:

    a. Location of service

    b. Type of development and the amount of fire flow required (as per FUS).

    c. Average daily demand: ___ l/s.

    d. Maximum daily demand: ___l/s.

    e. Maximum hourly daily demand: ___ l/s.

12. An MECP Environmental Compliance Approval for **Industrial/Municipal/Private Sewage Works** will be required for the proposed development. Please contact the Ministry of the Environment, Conservation and Parks, Ottawa District Office to arrange a pre-submission consultation (pre-submission consultation only required for direct submission applications):

    a. Emily Diamond at (613) 521-3450, ext. 238 or Emily.Diamond@ontario.ca

13. Water

    a. The watermain currently under Limebank Rd is inactive and would need to be commissioned when approaching the service connection date. The commissioning would be done by City forces. An automatic private flushing chamber may also be required for water quality purposes.

    b. A second watermain will be required to provide looping to the proposed development if the anticipated flows are greater than 50 cum/day. Urbandale Corporation is currently in the process obtaining draft plan approval for a subdivision at 3700 Twin Falls. Contact Urbandale Corp to discuss opportunities to extend another watermain along Leitrim Rd to provide looping.

14. Sanitary

    a. The sanitary outlet for this site would be to the future sanitary sewer in the future Leitrim road realignment.

15. Stormwater

    a. There are no storm sewers or end of pipe facilities planned for the business park.

    b. The storm outlet for this site would be going through Urbandale's realigned Leitrim Rd as part of their proposed subdivision.

    c. On-site stormwater quality and quantity control is required via LIDs (i.e. infiltration measures). Based on the current site plan, there does not appear to be any open space

for such LID features. This needs to be explored further to comply with the approved Mosquito Creek Master Drainage Plan.

d. A ditch type outlet would need to be accommodated along the future Leitrim Rd realignment and outlet to proposed (as part of Urbandale's future subdivision) 975mm diameter culvert under Limebank Road.

e. The existing drainage feature to the north of the site must be maintained.

f. Maximum release rate:

    a. 159.72 L/s (based on draft MSS Storm Drainage Plan Drawing 500)

g. The site is tributary to Tributary 4 (watercourse located at the corner of Leitrim and River Rd. that outlets to the Rideau River, to refer to Mosquito Creek Master Drainage Plan).

h. Quality control is required for the site, with enhanced TSS removal being required (80% TSS removal).

16. Background studies

    a. Riverside South Community Master Drainage Plan Update Mosquito Creek Study Area, 2021

If you have any questions or require further information, please contact Reed Adams, Infrastructure Project Manager, at reed.adams@ottawa.ca

Urban Design Comments – Molly Smith, Planner II

17. A Design Brief is required. Please refer to the **attached terms of reference**. The Design Brief is to be a standalone document and should follow the structure of Section 3.

18. Please review the guidelines in the Riverside South Community Design Plan. There is a section on 'Employment Areas Built Form', which applies to the site. The CDP seeks large landscape buffers (ideally 6m) and pedestrian connections within the site, and articulated elevations. A response to the CDP policies will be required to be included in the Design Brief.

19. The parking bays adjacent to the future road alignment are not supported by the CDP and should be internal to the site, not adjacent to the street edge.

20. Please ensure that pedestrian connections are direct to entrances from parking lots or are marked clearly. Where there are opportunities, please include trees in parking islands.

21. An outdoor refuge area would be beneficial for employees. Staff recommend locating this refuge area in proximity to a landscaped area, LIDs or include shade structures.

22. Please find locations for large tree plantings. The pipeline easement seems to be a great opportunity to provide plantings but please check with the pipeline that trees can be planted.

If you have any questions or require further information, please contact Molly Smith, Planner II, at molly.smith@ottawa.ca

Noise & Transportation – Neeti Paudel, Transportation Project Manager

23. A stationary noise study is **only required** if there will be any exposed mechanical equipment in proximity to neighbouring noise sensitive land uses. Please provide confirmation as part of the next submission.

24. A Transportation Impact Assessment (TIA) is required and should be prepared in accordance with the City's TIA Guidelines.

    a. The applicant will need to submit Step 2 of the TIA with the Phase 2 pre-application consultation. If a Phase 2 pre-application consultation is not warranted, it is the applicant's responsibility to submit Step 2 of the TIA to the Transportation Project Manager. Please submit this as soon as possible or at the latest, 14 days prior to the Phase 3 pre-application consultation submission. Failure to do so will result in deeming the application for a Phase 3 pre-application consultation incomplete.

    b. There is currently no timeline for the Leitrim Road realignment. The TIA should include an assessment of the Limebank Road access without future access on the realigned Leitrim Road. .

    c. Collaboration and communication between the applicant and City staff is required at the end of each step of the TIA process.

25. Corner triangle on Limebank Road and future Leitrim Road should be protected in accordance with the functional design of the EA. Please refer to the **attached drawing for realigned Leitrim Road**.

26. Ensure that the development proposal complies with the Right-of-Way protection requirements of the Official Plan's Schedule C16. Design for Leitrim is attached. Please note right of way requirements are reviewed and approved by Transportation Planning.

27. Clear throat requirements as per the Transportation Association of Canada (TAC) Guidelines should be met.

28. Site Plan comments:

    a. Show all details of the roads abutting the site up to and including the opposite curb; include such items as pavement markings, accesses and/or sidewalks.

    b. Turning templates will be required for all accesses showing the largest vehicle to access the site; required for internal movements and at all access (entering and exiting and going in both directions).

    c. Show all curb radii measurements; ensure that all curb radii are reduced as much as possible.

    d. Show lane/aisle widths.

    e. Sidewalk is to be continuous across access as per City Specification 7.1.

29. As the proposed site is industrial and for public use, the Accessibility for Ontarians with Disabilities Act (AODA) applies.

    a. Clearly define accessible parking stalls and ensure they meet AODA standards (include an access aisle next to the parking stall and a pedestrian curb ramp at the end of the access aisle, as required).

    b. Please consider using the City's Accessibility Design Standards, which provide a summary of AODA requirements. https://ottawa.ca/en/city-hall/creating-equal-inclusive-and-diverse-city/accessibility-services/accessibility-design-standards-features#accessibility-design-standards

If you have any questions or require further information, please contact Neeti Paudel, Transportation Project Manager, at Neeti.paudel@ottawa.ca

Environmental Planning Comments – Mark Elliott, Planner II

30. Environmental Planning staff have concerns with the lack of soft landscaping on site from the perspective of meeting the urban tree canopy, climate resilience, and urban heat island effect goals. More plantings (as preferred in the Bird Hazard Zone guide), are recommended.

31. A Tree Conservation Report is required to ensure the protection of species-at-risk butternut trees, should they exist in the hedgerows along the perimeter. An Environmental Impact Statement (EIS) is not required provided that the TCR fully addresses the butternut trees.

32. Based on the materials provided, it does not appear that the proposed development will encroach on the watercourse located in the southwestern corner of the property. The proposal should adhere to the Riverside South Master Drainage Plan.

33. The property is within the Airport Primary and Secondary Bird Hazard Zones, which impacts the types of trees that should be planted. Staff will follow up with a copy of the suggested planting guide.

If you have any questions or require further information, please contact Mark Elliott, Planner II, mark.elliott@ottawa.ca

Parks and Facilities Planning Comments – Burl Walker, Planner III

34. The parkland dedication requirement has been estimated for the proposed development based on the Site Information shown on Concept Plan – Option 1B revised June 16, 2023, and the rates established in the Parkland Dedication By-law No. 2022-280 for a parkland dedication requirement of 0.303 ha as follows:

    Table 1: Parkland Dedication Requirement.

Proposed Use	Gross Land Area (ha)	Parkland Dedication Rate	Parkland Dedication Requirement (ha)
Industrial	15.125 ha	2% of Gross Land Area	0.303

The Riverside South CDP Land Use Plan and the draft Land Use Plan for the Riverside South Secondary Plan do not identify any parks within the subdivision.

The Riverside South Landowners Cost Sharing Agreement is intended to address the sharing of park land and development costs in the Riverside South CDP area. Pursuant to Policy 11.6.11 of the Official Plan, the owner would be required to contribute to the cost sharing of the park land and development costs and to provide a letter from the Agreement Administrator stating that the owner is in good standing prior to the registration of the site plan agreement.

The subject lands correspond with the property described as 845471 Ontario Inc. in the schedules to the Riverside South Landowners Cost Sharing Agreement. 845471 Ontario Inc. is identified in the Agreement as a participating landowner. The Shared Park Land schedule to the agreement identifies a contribution from the site towards the overall parkland dedication in Riverside South. If the Parkland Dedication By-law requires a greater parkland dedication requirement compared to the owner's share of parkland dedication in the Cost Sharing Agreement, the remaining parkland dedication requirement may be taken in the form of cash-in-lieu of parkland dedication.

For further information on the Riverside South Landowners Cost Sharing Agreement, the applicant or owner should contact the Agreement Administrator, **Ursula Melinz at Soloway Wright**.

If you have any questions or require further information, please contact Burl Walker at burl.walker@ottawa.ca

Planning Forestry Comments – Hayley Murray, Forester

35. Confirm if there are any trees 10 cm or greater in size on the property and if there are any adjacently owned trees with critical root zones that extend into the property. If the answer is yes, a Tree Conservation Report (TCR) is required for the Site Plan Control application.

36. A landscape plan is required for the Site Plan Control application. Staff recommend submitting a high-level conceptual landscape plan with the Zoning By-law Application to demonstrate that there is adequate space and soil volume for tree planting.

37. Maximize tree planting opportunities on the property to mitigate the urban heat island effect and contribute to the City's 40% urban canopy cover target (as per Official Plan Sections 2.2.3 and 4.8.2).

38. Incorporate tree planting around the perimeter of the property and throughout the site where feasible.

39. Ensure that the landscape plan complies with the City's new terms of reference for landscape plans: https://documents.ottawa.ca/sites/documents/files/landscape_tor_en.pdf

40. Tree Conservation Report (TCR) requirements:

    a. The TCR must list all trees on site, as well as off-site trees if the CRZ extends into the developed area, by species, diameter, and health condition.

    b. Please identify trees by ownership – private onsite, private on adjoining site, city owned, boundary (trees on a property line).

    c. If trees are to be removed, the TCR must clearly show where they are, and document the reason they cannot be retained.

    d. All retained trees must be shown, and all retained trees within the area impacted by the development process must be protected as per City guidelines available at Tree Protection Specification or by searching Ottawa.ca

    e. The location of tree protection fencing must be shown on the plan.

    f. The City encourages the retention of healthy trees; if possible, please seek opportunities for tree retention that will contribute to the design/function of the site.

    g. For more information on the process or help with tree retention options, contact Hayley Murray hayley.murray@ottawa.ca or on City of Ottawa

    41. Landscape Plan Tree Planting Requirements:

        a. Minimum Setbacks

            - Maintain 1.5m from sidewalk or MUP/cycle track or water service laterals.
            - Maintain 2.5m from curb.
            - Coniferous species require a minimum 4.5m setback from curb, sidewalk, or MUP/cycle track/pathway.
            - Maintain 7.5m between large growing trees, and 4m between small growing trees. Park or open space planting should consider 10m spacing, except where otherwise approved in naturalization / afforestation areas. Adhere to Ottawa Hydro's planting guidelines (species and setbacks) when **planting around overhead primary conductors.**

        b. Tree specifications

            - Minimum stock size: 50mm tree caliper for deciduous, 200cm height for coniferous.
            - Maximize the use of large deciduous species wherever possible to maximize future canopy coverage.

- Tree planting on city property shall be in accordance with the City of Ottawa's Tree Planting Specification; and include watering and warranty as described in the specification (can be provided by Forestry Services).
- Plant native trees whenever possible
- No root barriers, dead man anchor systems, or planters are permitted.
- No tree stakes unless necessary (and only 1 on the prevailing winds side of the tree)

c. Hard surface planting

- Curb style planter is highly recommended.
- No grates are to be used and if guards are required, City of Ottawa standard (which can be provided) shall be used.
- Trees are to be planted at grade.

d. Soil Volume

- Please document on the LP that adequate soil volumes can be met:

Tree Type/Size	Single Tree Soil Volume (m3)	Multiple Tree Soil Volume (m3/tree)
Ornamental	15	9
Columnar	15	9
Small	20	12
Medium	25	15
Large	30	18
Conifer	25	15

** Please note that these soil volumes are not applicable in cases with Sensitive Marine Clay **

- Please follow the City's 2017 Tree Planting in Sensitive Marine Clay guidelines for trees in the Right of Way

e. Tree Canopy

- The landscape plan shall show how the proposed tree planting will replace and increase canopy cover on the site over time, to support the City's 40% urban forest canopy cover target.

- At a site level, efforts shall be made to provide as much canopy cover as possible, through tree planting and tree retention, with an aim of 40% canopy cover at 40 years, as appropriate. Indicate on the plan the projected future canopy cover at 40 years for the site.

If you have any questions or require further information, please contact Hayley Murray, Forester at Hayley.murray@ottawa.ca

Rideau Valley Conservation Authority – Eric Lalonde, Senior Planner

42. There are no natural hazards or regulated features on the property. The RVCA has no comments.

If you have any questions or require further information, please contact Eric Lalonde, Senior Planner at eric.lalande@rvca.ca

Other Notes

High-Performance Development Standards (HPDS)

- The High-Performance Development Standard (HPDS) is a collection of voluntary and required standards that raise the performance of new building projects to achieve sustainable and resilient design. Council passed the HPDS on April 13, 2022.

- The HPDS is not currently in effect and Council referred the 2023 HPDS Update Report back to staff with direction to bring forward an updated report to Committee with recommendations for revised phasing timelines, resource requirements and associated amendments to the Site Plan Control By-law by no later than Q1 2024.

- Please refer to the HPDS information attached and ottawa.ca/HPDS for more information.

If you have any questions or require further information, please feel free to to contact myself or the contacts identified for the above disciplines.

Regards,

Siobhan Kelly
Planner I
Development Review – South
Planning, Real Estate and Economic Development Department

cc.

Stream Shen, Planner III
Molly Smith, Planner II, Urban Design
Reed Adams, PM
John Sevigny, Senior PM
Neeti Paudel, TPM
Mark Elliott, Planner II, Environmental Planning
Hayley Murray, Forester
Burl Walker, Planner III, Parks & Facilities
Planning Circulations - planningcirculations@ottawa.ca

Stephen McCaughey

From: Stephen McCaughey
Sent: June 13, 2025 9:00 AM
To: Baird, Natasha; Sharif, Golam
Cc: Chris Collins; Tyler Yakichuk; David Paulozza; Cédric Courville
Subject: RE: 4101 Limebank - SWM Criteria

Hi Natasha, Sharif,

Just confirming as we spoke yesterday: the proposed stormwater management criteria of post- to pre-development flow is agreeable with yourselves and the City's stormwater group for the interim condition of continuing to drain to Limebank ditch to Tributary 3.

Updates from Geomorphix are still needed on the ongoing Tributary 3 monitoring program to understand current condition of the tributary, given the additional volume that would come from the 4101 Limebank subject site, and whether that would impact the stormwater criteria from the site or additional erosion control measures in Tributary 3

We will speak towards possible ultimate conditions at a high level (continue to Trib 3 directly, connect to expanded Pond 3, or go to Trib 4 via Twin Falls per Phase 1 MSS), but again the ultimate condition (to be defined as part of the future Phase 2 MSS) is unknown to date. As noted by yourselves the City will likely impose securities as part of the development agreement for integration of the site into the ultimate scenario. When Phase 2 MSS does occur coordination will be needed to ensure integration of 4101 Limebank and undue stormwater criteria are imposed on the site post hoc.

We will coordinate with Urbandale for their planned twinning of Limebank watermain, and understand their plans as well for their lands at southeast corner of Limebank & Spratt (Phase 5 lands).

We'll continue to coordinate as more information arrives (most immediately needed currently is GeoMorphix)

Thank you,

Stephen McCaughey, P.Eng.| Project Engineer
210-350 Palladium Drive, Ottawa ON, K2V 1A8
O: 613-592-6060 x160 | smccaughey@rcii.com | www.rcii.com

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From: Stephen McCaughey
Sent: June 5, 2025 5:02 PM
To: Baird, Natasha <Natasha.Baird@ottawa.ca>; Sharif, Golam <sharif.sharif@ottawa.ca>
Cc: Chris Collins <ccollins@rcii.com>; Tyler Yakichuk <yakichuk@fotenn.com>; David Paulozza

<dpaulozza@groupemontoni.com>; Cédric Courville <ccourville@groupemontoni.com>
Subject: 4101 Limebank - SWM Criteria

Hi Natasha, Sharif,

Following up from our conversation yesterday regarding the appropriate stormwater criteria for draining to Tributary 3. The Phase 1 Master Servicing Study ("ISSU") had given the site a 159.72 L/s discharge limit without justification (as far as I could identify), when it was routed to Tributary 4. As a comparison, we had estimated the pre-development flow from the site and calculated the 2yr pre-development flow to be about 148 L/s. See attached excerpts from the Scoped Master Servicing Study originally submitted October 2024.

To discharge to the existing Limebank roadside ditch and into Tributary 3 south of Pond 3, we would propose that the post-development site would discharge to the pre-development rates (2yr post to 2yr pre; up to 100yr post to 100yr pre) since this is the existing drainage route of the 4101 Limebank site.

Regarding the realigned Leitrim Rd. (which as I understand that property would be transferred to the City as part of the Site Plan Approval) it is proposed as a semi-rural cross-section to provide access to the 4101 Limebank site, same as the 3700 Twin Falls development across Limebank, with drainage uncontrolled to the same Limebank roadside ditch and into Tributary 3. While realigned Leitrim is ultimately planned to be an urbanized and the Phase 1 Master Servicing Study anticipated it being collected into the expanded Pond 3; that would be an ultimate condition for the future Phase 2 Master Servicing Study to determine.

Please confirm with the Stormwater Management Group if the proposed stormwater criteria for 4101 Limebank is acceptable and we'll move forward with revisions and resubmission. As we discussed yesterday, if we are in agreement about the site stormwater discharge location and criteria during interim condition (prior to the Phase 2 Master Servicing Study) then it will not hinder the approval and development of the site.

Thank you,

RCI Robinson Consultants

Stephen McCaughey, P.Eng.| Project Engineer
210-350 Palladium Drive, Ottawa ON, K2V 1A8
O: 613-592-6060 x160 | smccaughey@rcii.com | www.rcii.com

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From: Baird, Natasha <Natasha.Baird@ottawa.ca>
Sent: May 29, 2025 2:21 PM
To: Stephen McCaughey <smccaughey@rcii.com>
Cc: Sharif, Golam <sharif.sharif@ottawa.ca>; Chris Collins <ccollins@rcii.com>; Tyler Yakichuk <yakichuk@fotenn.com>; David Paulozza <dpaulozza@groupemontoni.com>; Cédric Courville <ccourville@groupemontoni.com>
Subject: RE: 4101 Limebank - Phase 2 Comments

"CAUTION: External Sender"
Yes that's good.

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From: Stephen McCaughey <smccaughey@rcii.com>
Sent: May 29, 2025 10:09 AM
To: Baird, Natasha <Natasha.Baird@ottawa.ca>
Cc: Sharif, Golam <sharif.sharif@ottawa.ca>; Chris Collins <ccollins@rcii.com>; Tyler Yakichuk <yakichuk@fotenn.com>; David Paulozza <dpaulozza@groupemontoni.com>; Cédric Courville <ccourville@groupemontoni.com>
Subject: RE: 4101 Limebank - Phase 2 Comments

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Hi Natasha,

Next Wednesday works for me, shall we say 2pm?

Stephen McCaughey, P.Eng.| Project Engineer
210-350 Palladium Drive, Ottawa ON, K2V 1A8
O: 613-592-6060 x160 | smccaughey@rcii.com | www.rcii.com

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From: Baird, Natasha <Natasha.Baird@ottawa.ca>
Sent: May 29, 2025 9:15 AM
To: Stephen McCaughey <smccaughey@rcii.com>
Cc: Sharif, Golam <sharif.sharif@ottawa.ca>; Chris Collins <ccollins@rcii.com>; Tyler Yakichuk <yakichuk@fotenn.com>; David Paulozza <dpaulozza@groupemontoni.com>; Cédric Courville <ccourville@groupemontoni.com>
Subject: RE: 4101 Limebank - Phase 2 Comments

"CAUTION: External Sender"
Hi Stephen,

I am available Wednesday afternoon until 5pm. Let me know if that works for you. I have meetings and training Monday and Tuesday.

Thanks,

Natasha

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From: Stephen McCaughey <smccaughey@rcii.com>
Sent: May 28, 2025 7:42 AM
To: Baird, Natasha <Natasha.Baird@ottawa.ca>
Cc: Sharif, Golam <sharif.sharif@ottawa.ca>; Chris Collins <ccollins@rcii.com>; Tyler Yakichuk <yakichuk@fotenn.com>; David Paulozza <dpaulozza@groupemontoni.com>; Cédric Courville <ccourville@groupemontoni.com>
Subject: RE: 4101 Limebank - Phase 2 Comments

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Hi Natasha, Yes next week works for me. Monday or Tuesday, and preferred time?

Thanks,

Stephen McCaughey, P.Eng.| Project Engineer
210-350 Palladium Drive, Ottawa ON, K2V 1A8
O: 613-592-6060 x160 | smccaughey@rcii.com | www.rcii.com

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From: Baird, Natasha <Natasha.Baird@ottawa.ca>
Sent: May 27, 2025 8:36 PM
To: Stephen McCaughey <smccaughey@rcii.com>
Cc: Sharif, Golam <sharif.sharif@ottawa.ca>; Chris Collins <ccollins@rcii.com>; Tyler Yakichuk <yakichuk@fotenn.com>; David Paulozza <dpaulozza@groupemontoni.com>; Cédric Courville <ccourville@groupemontoni.com>
Subject: RE: 4101 Limebank - Phase 2 Comments

"CAUTION: External Sender"
Hi Stephen,

I am quite busy this week. Can we meet early next week?

Natasha

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From: Stephen McCaughey <smccaughey@rcii.com>
Sent: May 27, 2025 9:25 AM
To: Baird, Natasha <Natasha.Baird@ottawa.ca>

Cc: Sharif, Golam <sharif.sharif@ottawa.ca>; Chris Collins <ccollins@rcii.com>; Tyler Yakichuk <yakichuk@fotenn.com>; David Paulozza <dpaulozza@groupemontoni.com>; Cédric Courville <ccourville@groupemontoni.com>
Subject: RE: 4101 Limebank - Phase 2 Comments

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Hi Natasha,

Yes, if we can please have a follow up meeting to discuss, if you can let me know your availability later this week.

Thank you,

Stephen McCaughey, P.Eng.| Project Engineer
210-350 Palladium Drive, Ottawa ON, K2V 1A8
O: 613-592-6060 x160 | smccaughey@rcii.com | www.rcii.com

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Classified as City of Ottawa - Internal / Ville d'Ottawa - classé interne

From: Baird, Natasha <Natasha.Baird@ottawa.ca>
Sent: May 22, 2025 4:53 PM
To: Stephen McCaughey <smccaughey@rcii.com>
Cc: Sharif, Golam <sharif.sharif@ottawa.ca>; Chris Collins <ccollins@rcii.com>; Tyler Yakichuk <yakichuk@fotenn.com>; David Paulozza <dpaulozza@groupemontoni.com>; Cédric Courville <ccourville@groupemontoni.com>
Subject: RE: 4101 Limebank - Phase 2 Comments

"CAUTION: External Sender"
Hi Stephen,

Please see my comments below. If you would like to meet to discuss, please let me know.

Natasha

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---

From: Stephen McCaughey <smccaughey@rcii.com>
Sent: May 18, 2025 5:53 PM
To: Baird, Natasha <Natasha.Baird@ottawa.ca>
Cc: Sharif, Golam <sharif.sharif@ottawa.ca>; Chris Collins <ccollins@rcii.com>; Tyler Yakichuk <yakichuk@fotenn.com>; David Paulozza <dpaulozza@groupemontoni.com>; Cédric Courville <ccourville@groupemontoni.com>

Subject: RE: 4101 Limebank - Phase 2 Comments
Importance: High

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Hi Natasha,

Thanks for the response. There are still some unanswered questions we'd like to ensure we are in agreement with the City before we proceed with amending the Scoped Master Servicing Study. We'd like to request a follow-up meeting to discuss and make sure we are all on the same page.

- The site will be designed to discharge to the existing Limebank eastside ditch, which drains directly to Tributary 3. Are we still required to discharge at the 159.72 L/s discharge rate per Phase 1 MSS (which had the site directed to Tributary 4) or would there be alternative discharge requirements? The discharge rate will have to accommodate the ditch capacity for the interim scenario and including the existing drainage area. If the existing ditch does not have sufficient capacity, other alternatives will need to be demonstrated. The discharge rate for the ultimate scenario will need to be determined through the scoped MSS. So the 159.72 L/s discharge rate based on Phase 1 MSS can change.
- Since it is by the City's direction that the storm discharge will not be to Tributary 4 (contrary to current Phase 1 MSS, though our understanding is that will be the direction of the Phase 2 MSS) and it will not be until the Phase 2 MSS is complete that the full Phase 2 Development lands will be understood (again, given the anticipated new direction away from Phase 1 MSS), I do not understand why or even how the site should consider the "ultimate" condition. The intent of the scoped MSS was to determine the interim and ultimate scenario for 4101 Limebank. I think it's important to discuss with Riverside South Development Corporation and Arcadis to come up with a solution for the scoped MSS.
- Can you confirm specifically what scope is being expected from the Fluvial Geomorphologist? Reviews of Tributary 3 were conducted for the MDP and the Phase 1 MSS. A desktop review was provided for Tributary 4 outlet given there is already bed armouring at the outlet, but given the direction away from Tributary 4 any further investigation should be unnecessary. Any reviews and recommendations of protection to Tributary 3 should be limited to impacts from the 4101 Limebank site as part the Scoped MSS. We are currently in discussions with Riverside South Development Corporation and Arcadis about a geofluvial monitoring started 2-3 years ago and waiting for a status. We will get back to you but feel free to contact them.
- Can you identify the Phase 5 lands you're referencing? I'm not sure I follow. I attached the approved draft plan for the Riverside South Phase 5 lands: The subject site is located to the south of Spratt Road and to the east of Limebank Road in the Riverside South Community. The parcel is irregular in shape and is bisected by Mosquito Creek valley lands and a Hydro One corridor. The site is vacant and has an area of approximately 34.6 hectares with frontage on Spratt Road, Limebank Road and Earl Armstrong Road.
- Since the 4101 Limebank Rd. development will be required to provide the watermain twinning along Limebank from Spratt to Realigned Leitrim, is there a specific connection location and routing the City has presumed or are we able to propose a connection and routing in the Limebank ROW to minimize construction impacts? You can propose a routing in the Limebank

ROW. Again, I would suggest you to contact Riverside South Development Corporation and Arcadis since they developed the subdivision across the street.

I look forward to a further discussion to ensure we are in agreement with the City on a path forward for the site.

Much appreciated,

Stephen McCaughey, P.Eng.| Project Engineer
210-350 Palladium Drive, Ottawa ON, K2V 1A8
O: 613-592-6060 x160 | smccaughey@rcii.com | www.rcii.com

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From: Baird, Natasha <Natasha.Baird@ottawa.ca>
Sent: May 15, 2025 3:53 PM
To: Stephen McCaughey <smccaughey@rcii.com>
Cc: Sharif, Golam <sharif.sharif@ottawa.ca>
Subject: RE: 4101 Limebank - Phase 2 Comments

"CAUTION: External Sender"
Hi Stephen,

Sorry for the delay. Sharif and I met with Amanda yesterday and we decided the following:

For interim conditions, the site can discharge to the Limebank eastside roadside ditch and does not need to connect to Pond 3, however, this site needs to be designed in consideration of the ultimate condition scenario. The scoped MSS needs to identify how the ultimate conditions will occur, either by going to Pond 3 and consequently to tributary 3 or as originally shown in the Phase 1 MSS to tributary 4. Both tributaries will require a geomorphological assessment, the tributary 3 outlet option will need to consider downstream erosion concerns in Mosquito Creek. We also recommend you discuss with Arcadis how Pond 3 will service Riverside South Phase 5. The cumulative impact of 4101 Limebank, Phase 5 and other lands on Mosquito Creek must be assessed and mitigated as needed.

Let me know if you need anything else. I am currently trying to figure out who constructed the pond.

Natasha

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---

From: Stephen McCaughey <smccaughey@rcii.com>
Sent: May 14, 2025 7:20 AM
To: Baird, Natasha <Natasha.Baird@ottawa.ca>
Cc: Sharif, Golam <sharif.sharif@ottawa.ca>
Subject: RE: 4101 Limebank - Phase 2 Comments

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Hi Natasha,

Thanks for the follow-up, I should be available this afternoon after 2pm for a call.

Stephen McCaughey, P.Eng.| Project Engineer
210-350 Palladium Drive, Ottawa ON, K2V 1A8
O: 613-592-6060 x160 | smccaughey@rcii.com | www.rcii.com

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From: Baird, Natasha <Natasha.Baird@ottawa.ca>
Sent: May 12, 2025 4:31 PM
To: Stephen McCaughey <smccaughey@rcii.com>
Cc: Sharif, Golam <sharif.sharif@ottawa.ca>
Subject: RE: 4101 Limebank - Phase 2 Comments

"CAUTION: External Sender"
Hi Stephen,

You can find the report here: 4101 Limebank

I will be speaking to Amanda Wednesday and follow up with you after. If you want to give me your availability, I can set up a meeting.

Thanks,

Natasha

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---

From: Stephen McCaughey <smccaughey@rcii.com>
Sent: May 08, 2025 2:59 PM
To: Baird, Natasha <Natasha.Baird@ottawa.ca>
Subject: RE: 4101 Limebank - Phase 2 Comments

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Thanks Natasha, look forward to hearing back

We want to be sure we're all on the same page before moving forward on revisions to the reports and site

Stephen McCaughey, P.Eng.| Project Engineer
210-350 Palladium Drive, Ottawa ON, K2V 1A8
O: 613-592-6060 x160 | smccaughey@rcii.com | www.rcii.com

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From: Baird, Natasha <Natasha.Baird@ottawa.ca>
Sent: May 8, 2025 2:54 PM
To: Stephen McCaughey <smccaughey@rcii.com>
Cc: Sharif, Golam <sharif.sharif@ottawa.ca>
Subject: RE: 4101 Limebank - Phase 2 Comments

"CAUTION: External Sender"
Hi Stephen,

We typically ask the applicant to go to the information centre for as-builts, but I already have the info, I attached the plans here. Let me know if you need more.

I will be speaking with Amanda about Pond 3.

Thanks,

Natasha

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---

From: Stephen McCaughey <smccaughey@rcii.com>
Sent: May 07, 2025 8:42 AM
To: Baird, Natasha <Natasha.Baird@ottawa.ca>
Cc: Sharif, Golam <sharif.sharif@ottawa.ca>; Chris Collins <ccollins@rcii.com>; Tyler Yakichuk <yakichuk@fotenn.com>; Cédric Courville <ccourville@groupemontoni.com>; David Paulozza <dpaulozza@groupemontoni.com>; Nicolas Meilleur <nmeilleur@groupemontoni.com>
Subject: RE: 4101 Limebank - Phase 2 Comments

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Hi Natasha,

Touching base on the below. I recently went to site and confirmed the existing Limebank eastside ditch (which collects the subject site) drains directly to Tributary 3, bypassing Pond 3. So I want to confirm is the intent of the City for the 4101 Limebank site to drain to Pond 3, and Pond 3 will need to be expanded to accommodate, or can we maintain the drainage to Tributary 3 given we are already controlling stormwater on-site? As well, are we still required to account for the anticipated upstream flows (250 L/s) from realigned Leitrim?

If the Limebank widening As-built documents can be provided as well, we'll need them for reference for the watermain twinning.

Feel free to give me a call at your convenience if easier to discuss.

Thank you!

Stephen McCaughey, P.Eng.| Project Engineer
210-350 Palladium Drive, Ottawa ON, K2V 1A8
O: 613-592-6060 x160 | smccaughey@rcii.com | www.rcii.com

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From: Stephen McCaughey
Sent: April 30, 2025 4:56 PM
To: Baird, Natasha <Natasha.Baird@ottawa.ca>
Cc: Sharif, Golam <sharif.sharif@ottawa.ca>; Chris Collins <ccollins@rcii.com>; Tyler Yakichuk <yakichuk@fotenn.com>; Cédric Courville <ccourville@groupemontoni.com>; David Paulozza <dpaulozza@groupemontoni.com>; Nicolas Meilleur <nmeilleur@groupemontoni.com>
Subject: RE: 4101 Limebank - Phase 2 Comments

Hi Natasha,

I've gone through the Pond 3 information provided (thank you for that). There's a few more pieces I'm still not fully grasping I want to confirm:
From the excerpts of Stantec's design for Pond 3, including the Phase 1 pond that is currently built, the drainage area never included the 4101 Limebank subject site. It had previously been our understanding that the site currently drains to Pond 3 via the Limebank ditch, but the drainage area plans did not account for the subject site. So I'm trying to understand where the subject site currently drains to (does

it drain to Pond 3 currently but unaccounted for by the design, or does the Limebank ditch drain elsewhere?).

When Limebank was widened was there alteration in the roadside ditches as well (therefore the design would identify the full ditch flow routes, and ideally their drainage areas)? Are the Limebank Rd. widening design reports and drawings also available for our reference?

I'd like to make sure I understand the City's intent for this revision of the Scoped MSS. Are we explicitly tying into Pond 3, and therefore reviewing what needs to be expanded in Pond 3 to accommodate the site? And would we need to accommodate the anticipated upstream flows along future realigned Leitrim Rd (250.4 L/s) in this Pond 3 expansion as well or can that be deferred into the formal Phase 2 MSS to account for all the Phase 2 lands and the full development of Pond 3? I presume there is an ECA for this Pond as well and an ECA amendment would need to be applied for on behalf of the City?

Happy to chat if it would be easier to discuss.

Thank you,

Stephen McCaughey, P.Eng.| Project Engineer
210-350 Palladium Drive, Ottawa ON, K2V 1A8
O: 613-592-6060 x160 | smccaughey@rcii.com | www.rcii.com

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From: Baird, Natasha <Natasha.Baird@ottawa.ca>
Sent: April 23, 2025 4:50 PM
To: Stephen McCaughey <smccaughey@rcii.com>
Cc: Sharif, Golam <sharif.sharif@ottawa.ca>
Subject: FW: 4101 Limebank - Phase 2 Comments

"CAUTION: External Sender"
Hi Stephen,

Please make sure to show the option for Pond 3 and what you had originally suggested for this site to discharge to tributary 4 in the scoped MSS. You can find reports in this folder: Riverside South Pond 3

I spoke to Amanda and a geofluvial morphology will be required since it is not part of the Phase 1 MSS. Trib 3 has had issues in the past and an assessment should be completed to confirm it is sufficient. There are also retrogressive landslide risks as Trib 3 discharges to Mosquito Creek upstream of the retrogressive landslide risk area so you will need to demonstrate that the site will not exacerbate erosion in Mosquito Creek and not just the tributary.

Let me know if you need to discuss.

Natasha

Thank you,

Natasha Baird, P.Eng. ing., LEED Green Associate
613.857.5684 (cellular)

Classified as City of Ottawa - Internal / Ville d'Ottawa - classé interne

From: Stephen McCaughey <smccaughey@rcii.com>
Sent: April 22, 2025 2:48 PM
To: Baird, Natasha <Natasha.Baird@ottawa.ca>
Subject: RE: 4101 Limebank - Phase 2 Comments

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Thank you for the comments Natasha,

Are you available this week to have a quick call to make sure I'm understanding your comments. There's a few items I wanted to clarify specifically:

- Water Servicing:
  - Has the existing 300mm watermain on Limebank been commissioned yet for the 3700 Twin Falls Phase 1A development yet? Also are you aware of plans with Urbandale for the required twinning of the 300mm WM on Limebank? We have not heard from Urbandale of when they are planning Phases 1B and beyond (which would necessitate the twinning). We're trying to determine who will be developing the twinned watermain.
  - I'm still not sure I understand the need for the autoflusher on realigned Leitrim. The 4101 Limebank site is proposed to be service off the existing site stub off Limebank and realigned Leitrim, with the proposed 300mm WM on realigned Leitrim stubbed shortly after the site connection to not create a "dead zone". Is it a question of water age? A quick back-of-the-envelope calculation I estimate the water age from Limebank/Spratt to the 4101 Limebank site (incl. the twinned WM) to be ~24hrs, even without including any demand from 3700 Twin Falls.
- Sanitary Servicing:
  - It is still our preference to discharge via realigned Leitrim Rd following the grading of the site
- Storm Outfall:
  - Am I understanding correctly that the City is in favour of, and recommending, the site discharging to the existing Pond 3 to Tributary 3, over the current proposal of discharging through 3700 Twin Falls to Tributary 4? Can you provide the existing stormwater report for Pond 3 that currently serves Limebank? We'll need to consider what capacity Pond 3 had assumed for the existing site (given it is the existing drainage outlet for the site via Limebank ditch) compared to the restrictions per MDP and Phase 1 MSS (which we are currently abiding by)
  - If so, are there any geofluvial morphology requirements if directing through ex. Pond 3?

- Water Budget:
    - Am I understanding correctly that the City still requires a full Water Budget Analysis to identify post-development runoff volumes despite no infiltration can be assumed due to clay soils? This would need to be provided by the HydroG consultant.
- TNPI gas main:
    - To clarify since the response: In consultation with TNPI, they do not provide crossing permits or consent for crossing during design phase, this would be done by the Contractor at the time of construction. The design shall be according to TNPI's Crossing Guidelines (and does based on our understanding of the guidelines)

I've also attached the final geotech and ex. hydroG report for reference.

Thanks very much,

Stephen McCaughey, P.Eng.| Project Engineer
210-350 Palladium Drive, Ottawa ON, K2V 1A8
O: 613-592-6060 x160 | smccaughey@rcii.com | www.rcii.com

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Classified as City of Ottawa - Internal / Ville d'Ottawa - classé interne

From: Baird, Natasha <Natasha.Baird@ottawa.ca>
Sent: April 11, 2025 3:10 PM
To: Stephen McCaughey <smccaughey@rcii.com>
Cc: Sharif, Golam <sharif.sharif@ottawa.ca>; Kelly, Siobhan <siobhan.kelly@ottawa.ca>; Tyler Yakichuk <yakichuk@fotenn.com>; Chris Collins <ccollins@rcii.com>; Nicolas Meilleur <nmeilleur@groupemontoni.com>; David Paulozza <dpaulozza@groupemontoni.com>
Subject: FW: 4101 Limebank - Phase 2 Comments

"CAUTION: External Sender"
Hi Stephen,

Please comments below. You can reach me on my cell at 613.857.5684 so we can discuss these comments to expediate the review.

I can also set up a meeting with you next week. I am available Monday afternoon and Tuesday morning.

Deficiencies:
D4. All engineering reports and plans must be signed and stamped.
Can you confirm what report/plan specifically? Our civil reports and plans were stamped. If related to the Geotech report by EXP, the final dated Nov 2024 I believe was since sent to the City

Pending. Some reports are updated and others not. Please send them to me directly.

D5. The water boundary condition was not verified with the City water modeling group. Water Boundary condition requests must include the location of the service (map or plan with connection locations indicated) and the expected loads required by the proposed development, including calculations.

The boundary conditions from the 3700 Twin Falls Adequacy of Services study. If we need to reconfirm boundary conditions, let this be our request. Connection locations same as Twin Falls at Limebank and Spratt (see attached)

D6. Provide the following information:
i. Location of service
ii. Type of development and the amount of fire flow required (as per FUS).
iii. Average daily demand: ___ l/s.
iv. Maximum daily demand: ___l/s.
v. Maximum hourly daily demand: ___ l/s.

Refer to Table 2 of the Scoped Master Servicing Study, including 3700 Twin Falls:
Average Day Demand: 20.22 L/s
Peak Hour Demand: 54.65 L/s
Max Day + Fire (12,000 L/min): 230.36 L/s (maximum fire flow at 4101 Limebank)
Max Day + Fire (13,000 L/min): 247.03 L/s (fire flow per 3700 Twin Falls)

See attached for D5 and D6

D7. The water capacity must be verified on Limebank Road (existing) and Realigned Leitrim Road (not constructed).

Off-site water model provided outputs at both connection points.

The existing 305 mm watermain on Limebank has been inactive since 2009. Additionally, there's a proposed dead-end 305 mm watermain on Realigned Leitrim Road. An autoflusher will likely be required in the area until adequate developments occur to improve water turn over rates.

D8. The proposed storm discharge is to the recently approved roadside ditch system of Twin Falls subdivision; however, the ditch system is not designed to receive discharge from this site.

Refer to Section 4.3 of the Scoped Master Servicing Study for discussion on changes to the ditch system to accommodate the site.

Twin Falls Subdivision has been approved and registered. We would have to revisit the subdivision design in order to accept this proposal. As mentioned in my March 28 email:

A few high-level comments for now: we were hoping to see more options in the scoping MSS such as servicing towards Pond 3. Yes, the phase 1 MSS does show a ditch going from the property line to Twin Falls Subdivision, but 4101 Limebank was not part of Phase 1. Twin Falls Subdivision is being approved and constructed in Phases to give a chance to complete the Retrogressive Landslide Guidelines for the City. Deeping the new ditch is raising a lot of issues, and I want to see more options than going through Twin Falls. This could hold this application back which is not a preferable solution.

Also deepening the ditch will require approval from RSDC and an update of all the plans and the downstream impact to Tributary 4.

Additionally, the hydrogeologist did not like the idea of having a higher volume of runoff to Mosquito Creek through Tributary 4 given the erosion issues. At this moment, we do not agree going through Twin Falls and would want to see a proposal to discharge to Pond 3.

D9. The Geotechnical report is preliminary and not stamped and signed. Therefore, the report was not reviewed.

I believe the City has since been sent the final report by EXP.

It seems the City hasn't received the updated report. Please send it to me directly by email. the only report I see is from March 2024. Is there an updated report?

D10. The Scoped MSS is missing the water budget analysis as previously requested.

Refer to Section 4.4 of the Scoped Master Servicing Study for discussion on discharge volumes. Per previous correspondence with Reed Adams forwarded to you, since infiltration-based LIDs are not viable a full water budget is moot but he did request nonetheless a note on the discharge volumes.

Comment: stating runoff volume increase for a single 25mm event does not address water budget considerations. The requirements and considerations for water budget are outline in the City's Water Budget Assessment Terms of Reference. There is a disconnect between the volume reported in this section and the discussion in GeoMorphix letter. See comment D11 and D13.

Link to Water Budget Assessment ToR: Water Budget Assessment

D11. The Scoped MSS does not include any discussion of the fluvial geomorphology impacts to Tributary 4. As these lands are not included in the ISSU Phase 1 lands, an updated fluvial geomorphology analysis is required to demonstrate that the proposed development will not negatively impact Tributary 4. If this was assessed as part of the Twin Falls subdivision, that analysis could be referenced.

Refer to Section 4.6 of the Scoped Master Servicing Study for discussion on fluvial geomorphology, as well as the letter from GeoMorphix in Appendix D.

The Geomorphix letter states "The specific magnitude of the anticipated flow changesat Tributary 4 (from the proposed discharge from the 4101 Limebank Road site, and, for that matter, the broader Phase 2 works) has yet to be defined via hydrological and hydraulic modelling analyses." However the MDP did identify planned ultimate flow to Tributary 4. the Scoped MSS should discuss the proposed deviation for 4101 Limebank in the context of the existing Master Drainage Plan and Phase 1 MSS.

D12. As Low Impact Development (LID) measures are required on site, a hydrogeological investigation is required to confirm the soil infiltration capacity/permeability and seasonal groundwater levels. The design of the LID features must be based on in-situ testing and not inferred from geotechnical soil classifications.

Infiltration-based LIDs are not viable on the site due to clay soils as noted in Section 4.4 of the Scoped Master Servicing Study. A hydrog report was previously completed by EXP in 2022.

Reference to the previously completed hydrog report should be included in the scoped MSS to support statements regarding clay soils, LID feasibility, etc. See comment D13 as well.

As per the CIL ECA explore other LID options besides infiltration such as evapo-transpiration, filtration, bio-swales.

D13. The Scoped MSS should document the proposed LID concept and demonstrate how the MDP criteria are met.

The Site Servicing & SWM Report discusses on-site measures while the Scoped Master Servicing Study discusses the off-site measures. From the correspondence with Reed Adams forwarded, it was agreed that the infiltration MDP criteria could not be met.

Comment:

The feasibility of LIDs should be assessed in alignment with the approach in Appendix A of the CLI ECA and other applicable policies and guidance documents. This includes the City of Ottawa Technical Bulletin IWSTB-2024-04 which provides the requirements for assessing the feasibility of infiltration-type LID measures. If site specific information is now available that impacts the feasibility and ability to meet the MDP criteria then the scoped MSS should document this in accordance with the above requirements. If infiltration based LID is not feasible, servicing options should consider options to integrate other types of LID.

D14. A more in depth scoped MSS is required as the site is proposing to discharge to the recently approved roadside ditch system under the Twin Falls Subdivision.

Please clarify what is being sought.

No additional comment. This is addressed in other comments.

Comments:

C8. Non-infiltration type LIDs are required because of the clay soils.

As discussed during last week's meeting please confirm what would be sought. Site stormwater discharges to two dry ponds to provide opportunity for settlement as discussed in Section 6.6 of the Site Servicing & SWM Report.

- See the response to comment D13.
- Dry ponds will not provide the 80% TSS removal required per the MDP
- The site plan servicing study will need to demonstrate how the proposed development will achieve 80% TSS removal

C9. Three culverts are proposed within the Trans Northern Pipeline easement. If consent is not obtained from Trans Northern Pipelines Inc. this may change the overall servicing design proposal for the development.

Pipelines were located and elevations confirmed. Obtaining crossing permit from TNPI.

C10. The proposed watermain on Realigned Leitrim Road will require an automatic flushing chamber as a connection is not currently available. Was this discussed with the City's Realigned Leitrim Road team?

Why would the watermain require an automatic flushing chamber, is there a concern on water age? The site connection is located near the stub therefore no lengthy dead zones. Please comment above about the flushing chamber.

C11. Why does the proposal contemplate a sanitary connection to Realigned Leitrim Road? Why not connect to the existing sanitary system on Limebank Road? Was this discussed with the City's Realigned Leitrim Road team?

This was explicitly noted in the Preconsultation meeting minutes – I will discuss later with you.

C12. The roadside ditch system that is part of the Phase 1 Twins Falls Subdivision does not have enough capacity to accommodate other developments without a full update to the Mosquito Creek Study. Has any other stormwater management outlet option been investigated for this proposed site design?

Ditch upgrades are discussed in Section 4.4 of Scoped Master Servicing Study to accommodate the site. The Phase 1 Master Servicing Study and Master Drainage Plan both had the 4101 Limebank site as part of the Tributary 4 drainage area ultimately. We were not looking to contradict previous master planning documents. See comments above about using Twin Falls Subdivision.

The scoped MSS should, at a minimum, speak to the constraints and limitations of any other interim outlet in order to support the proposed alterations to the Twin Falls ditches.

Additional Comments:

- The Scoped MSS proposes lowering the Leitrim Road lowpoint at Pond 3 by almost 1m. It is unclear in the report why it is proposed to lower Leitrim Road. While the report discusses the proposed road elevation relative to the pond 3 water level it does not discuss the overall impact to the Macro Grading Plan in the MDP.
- Clearance between the proposed 975mm dia. culvert under Limebank Road and the watermain should be confirmed. From Figure 4.4 it appears it might not be sufficient.
- Per the MSS Phase 1 Mosquito Creek Drive is to be urbanized and include a trunk storm sewer. The Scoped MSS should also confirm that the 4101 Limebank SWM controls meet the ultimate servicing requirements.
- Report Table 3 should include comparison to the Twin Falls phase 1 design HGLs.

Thank you,

Natasha Baird, P.Eng. ing., LEED Green Associate
613.857.5684 (cellular)

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File Number: D02-02-24-0071 & D07-12-24-0150

October 27, 2025

To / Destinataire : Stephen McCaughey, Robinson Consultant
Tyler Yakichuk, Fotenn

From / Expéditeur : Natasha Baird, P.Eng.
Project Manager
Development Review, South Branch

Subject / Objet : 4101 Limebank Road SPA and ZBA

Dear Mr. McCaughey and Mr. Yakichuk,

We are following up on the materials submitted for the zoning and site plan control application. This letter should be read in concurrence with the letter send on January 17, 2025 by Siobhan Kelly. Please ensure the following engineering information is included in the scoped MSS for the City's review:

1. Water Servicing:

The site can be serviced through the existing 300mm diameter watermain on Limebank Road. As per section 3.5 and Figure 3.2 of the Riverside South Community Master Drainage Plan Update, Mosquito Creek Study Area, dated April 30, 2021, there is a proposed 300mm diameter watermain in the future Leitrim re-alignment. Since this watermain has not been constructed, your site will require a second watermain connection to Limebank Road south of the intersection at Limebank Road and Mosquito Drive. Please coordinate with Urbandale and Arcadis for the status of the commissioning and watermain twinning.

2. Sanitary Servicing:

The site can be serviced through the existing 375mm diameter sanitary sewer, extending approximately 200m north of Mosquito Drive on Limebank Road. Please refer to section 4.4 and Figure 4.1 of the Riverside South Community Master Drainage Plan Update, Mosquito Creek Study Area, dated April 30, 2021.

3. Storm Servicing:

During the pre-consultation stage for 4101 Limebank Road, the applicant was informed to provide a scoped MSS study including an updated geomorphology study to support the stormwater servicing.

Given the site storm runoff volume will increase because of the proposed hard surface from greenfield conditions, the City needs confirmation that the receiving reaches of Mosquito Creek will not be impacted. We require an updated fluvial geomorphology assessment including an assessment of the anticipated volume from the site. The assessment should be an update to the report prepared by GeoMorphix in support of the Master Servicing Study (not the monitoring report) and not a separate assessment of 4101 Limebank only.

Once the scoped MSS and geomorphology study are prepared demonstrating no impact on Mosquito Creek and the associated tributaries (as determined through the scoped MSS), please resubmit the full application to ensure all plans and studies are consistent. As noted in the feedback form dated January 17, 2025, the civil plans and landscape plan showed two stormwater management ponds whereas no ponds were shown on the site plan. Further, the original scoped MSS and Servicing & Stormwater Management Reports contained site plans showing one stormwater management pond.

For staff to recommend approval of the zoning by-law amendment, an acceptable stormwater management solution must be demonstrated. Staff may place a holding provision on the zone until site servicing is in place.

The scoped MSS report, is to include an assessment of stormwater servicing options. We are suggesting the following options and are open to other possibilities if they show no or limited impact to Mosquito Creek and its tributaries. The report will need to include the required engineering works with financial information.

1. Demonstrate what would be required to comply with the existing approved plans and assess the feasibility of implementing this approved servicing plan. This includes construction of the storm sewers on Mosquito Drive. The existing OGS unit needs to accommodate the quality control requirements or be replaced to the satisfaction of the City and Rideau Valley Conservation Authority. A fluvial geomorphology study for Tributary 4 is required to support this assessment. Please refer to the Riverside South Community Infrastructure Servicing Study Update Phase 1, Mosquito Creek Study Area dated August 18, 2023 section 5.3.3.2, Table 5.11, Figure 5.7 and the Riverside South Community Master Drainage Plan Update, Mosquito Creek Study Area, dated April 30, 2021

2. Demonstrate if a storm outlet to Tributary 3 can be accommodated with no or little impact to Tributary 3 and Mosquito Creek. A fluvial geomorphology study for Tributary 3 and Mosquito Creek is required.

3. Demonstrate if a storm outlet to Tributary 3 via the existing Limebank road pond (or future Pond 3) can be accommodated with no or little impact to Tributary 3 and Mosquito Creek. A fluvial geomorphology study for Tributary 3 and Mosquito Creek is required. Further assessment of this option would require coordination with Arcadis for other ongoing studies.

Contact me at 613-580-2424, extension 27997 or natasha.baird@ottawa.ca if you have any questions.

Stephen McCaughey

From: Stephen McCaughey
Sent: November 7, 2025 8:46 AM
To: 'Baird, Natasha'; Sharif, Golam
Cc: Kelly, Siobhan; Chris Collins; Stephane Godin; Tyler Yakichuk; David Paulozza; Cédric Courville
Subject: RE: 4101 Limebank Rd SPA & Limebank RMA - Conflict with ex. Ditch
Attachments: Letter_scoped servicing.pdf

Hi Natasha, Sharif,

Thanks for the call yesterday. To confirm what we had discussed:

- The letter from Natasha dated Oct 27, 2025 was intended to provide clarity around what the City viewed as the options available for servicing the 4101 Limebank property, particularly with respect to stormwater
- The City noted they want the Scoped MSS to include an assessment of stormwater servicing options. The three stormwater options viewed are:
    1. Building the storm sewer down Mosquito Drive (future Leitrim Rd within the 3700 Twin Falls area) to outlet to Tributary 4 per original Phase 1 MSS, with supporting Fluvial Geomorphology (FG) study
    2. Outleting to existing Limebank ditch to Tributary 3, with supporting FG study
    3. Outleting to Pond 3 south of the site that is currently under design for expansion by Arcadis, with supporting FG study
- Robinson maintained that the preferred option will be Option 2, which was the route discussed previously with the City in June. Based on preliminary discussions with GeoMorphix (providing the FG study on Tributary 3), there aren't significant concerns with outleting to Tributary 3. Option 1 would involve the costly development of the storm sewer along Mosquito Dr, potentially upgrading the downstream OGS, and it doesn't make sense to provide a FG study (as well as retrogressive landslide study) for the Tributary 4 routing if we already know it is not a financially feasible option. Option 3, while appreciating the desire and potential opportunity to incorporate the site into the Pond 3 expansion currently under design, we have reached out to Arcadis around this incorporation of the site into Pond 3 and there was not the desire for the collaboration with them preferring this Pond 3 expansion to handle the Phase 5 lands and 4101 Limebank to handle its own stormwater.
- The City did note that they could broker a discussion around Pond 3 if needed.
- It was agreed that given the constraints around Option 1 and 3, Option 2 is still viewed as the preferred option with seemingly only the FG study being the potential issue that would nullify it as an option. Robinson will have GeoMorphix proceed to provide preliminary FG findings to share with the City prior to full submission to confirm feasibility. It was agreed then that a stormwater servicing options analysis within the Scoped MSS could be done qualitatively without the need of FG studies for each of the other options.
- Regarding the twinning of the watermain along Limebank: it is near design approval. Robinson will reach out to Arcadis if they can share the twinning plans, otherwise if the City can share.

- Regarding the Limebank RMA, it seems most likely that the ditch would be maintained with 3:1 slopes (instead of enclosing) and an easement pulled for the lands. Robinson will ensure space

is provided for the RMA ditch realignment. While the ZBLA could be approved without the RMA completed, the SPA would be conditional upon the completion of the RMA.

Let me know if there are any corrections or clarifications to these notes.

Thank you,

Stephen McCaughey, P.Eng.| Project Engineer
210-350 Palladium Drive, Ottawa ON, K2V 1A8
O: 613-592-6060 x160 | smccaughey@rcii.com |
www.rcii.com

WE'RE MOVING! 📦
Please note that Robinson Consultants Inc. will be relocating to 2936 Baseline Road, 2nd Floor, Ottawa, Ontario K2H 1B3 on November 24, 2025.

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From: Baird, Natasha <Natasha.Baird@ottawa.ca>
Sent: November 5, 2025 12:42 PM
To: Stephen McCaughey <smccaughey@rcii.com>
Cc: Sharif, Golam <sharif.sharif@ottawa.ca>; Kelly, Siobhan <siobhan.kelly@ottawa.ca>; Chris Collins <ccollins@rcii.com>
Subject: RE: 4101 Limebank Rd SPA & Limebank RMA - Conflict with ex. Ditch

"CAUTION: External Sender"
I am sorry Stephen. I have a conflict and can only meet at 3pm.

Classified as City of Ottawa - Internal / Ville d'Ottawa - classé interne

---

From: Stephen McCaughey <smccaughey@rcii.com>
Sent: Wednesday, November 5, 2025 12:38 PM
To: Baird, Natasha <Natasha.Baird@ottawa.ca>
Cc: Sharif, Golam <sharif.sharif@ottawa.ca>; Kelly, Siobhan <siobhan.kelly@ottawa.ca>; Chris Collins <ccollins@rcii.com>
Subject: RE: 4101 Limebank Rd SPA & Limebank RMA - Conflict with ex. Ditch

CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.

ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Hi Natasha,

I am available tomorrow at 2pm. I'll send and invite to discuss

Appendix B

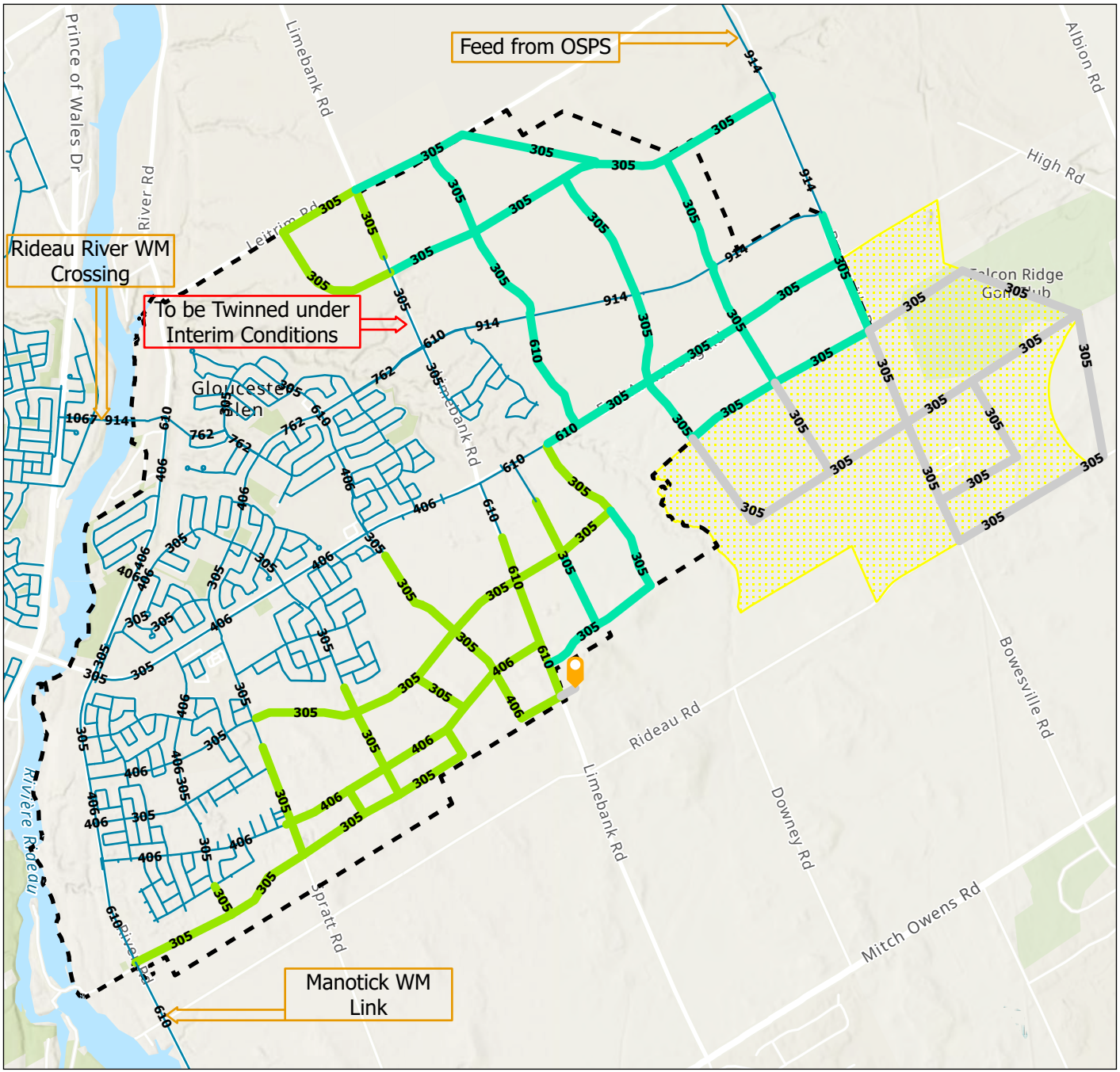


Figure No.
3-2

Title
Potable Water Servicing Plan

Client/Project
Riverside South Development Corporation
Riverside South ISSU Update
Potable Water Servicing

Project Location
Riverside South
Ottawa, Ontario

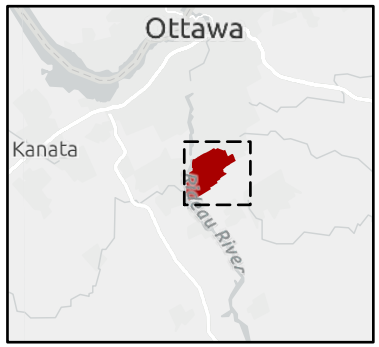
N

0 500 1,000 Meters

(At original document size of 8.5x11)
1:40,000

Legend

- Riverside South CDP Lands
- Expansion Lands
- Proposed Riverside South Elevated Tank
- Existing Watermain
- Proposed Watermain - Phase 1
- Proposed Watermain - Phase 2
- Proposed Watermain - Other



Notes
1. Coordinate System: NAD 1983 CSRS MTM 9
2. Watermain layout east of Bowesville Rd based on highlevel indications provided by Novatech.

Stantec

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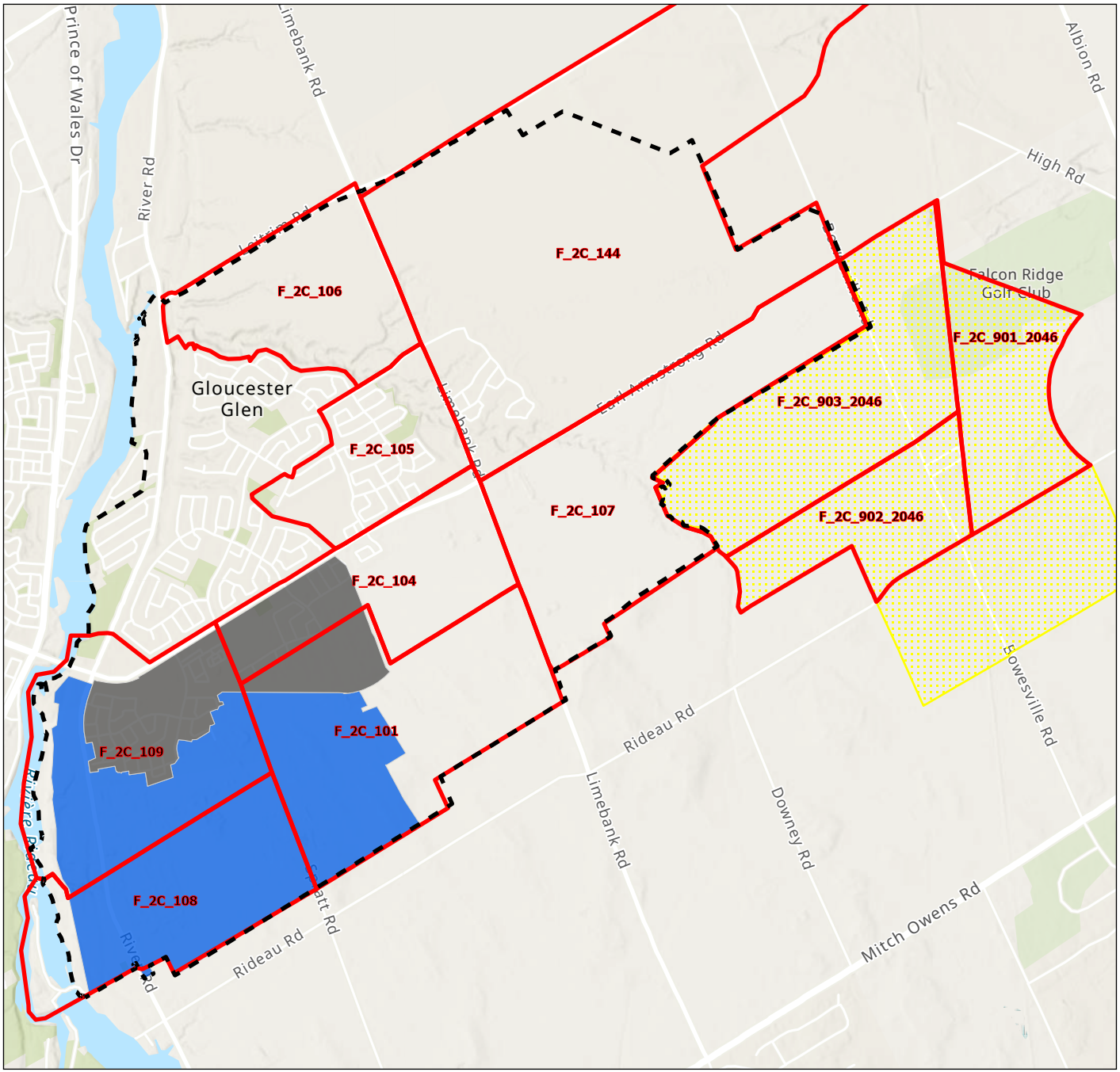


Figure No.
3-1

Title
SUC Growth Polygons

Client/Project
Riverside South Development Corporation
Riverside South ISSU Update
Potable Water Servicing

Project Location
Riverside South
Ottawa, Ontario

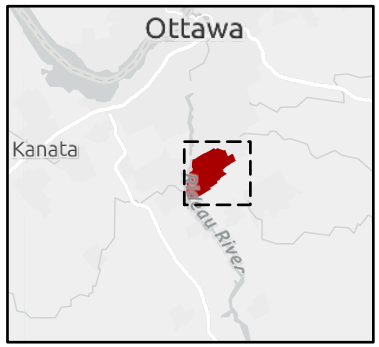
N

0 500 1,000 Meters

(At original document size of 8.5x11)
1:40,000

Legend

- SUC Growth Polygon
- Riverside South CDP Lands
- Existing Development
- Rideau River Pond 5 Development Area
- Expansion Lands

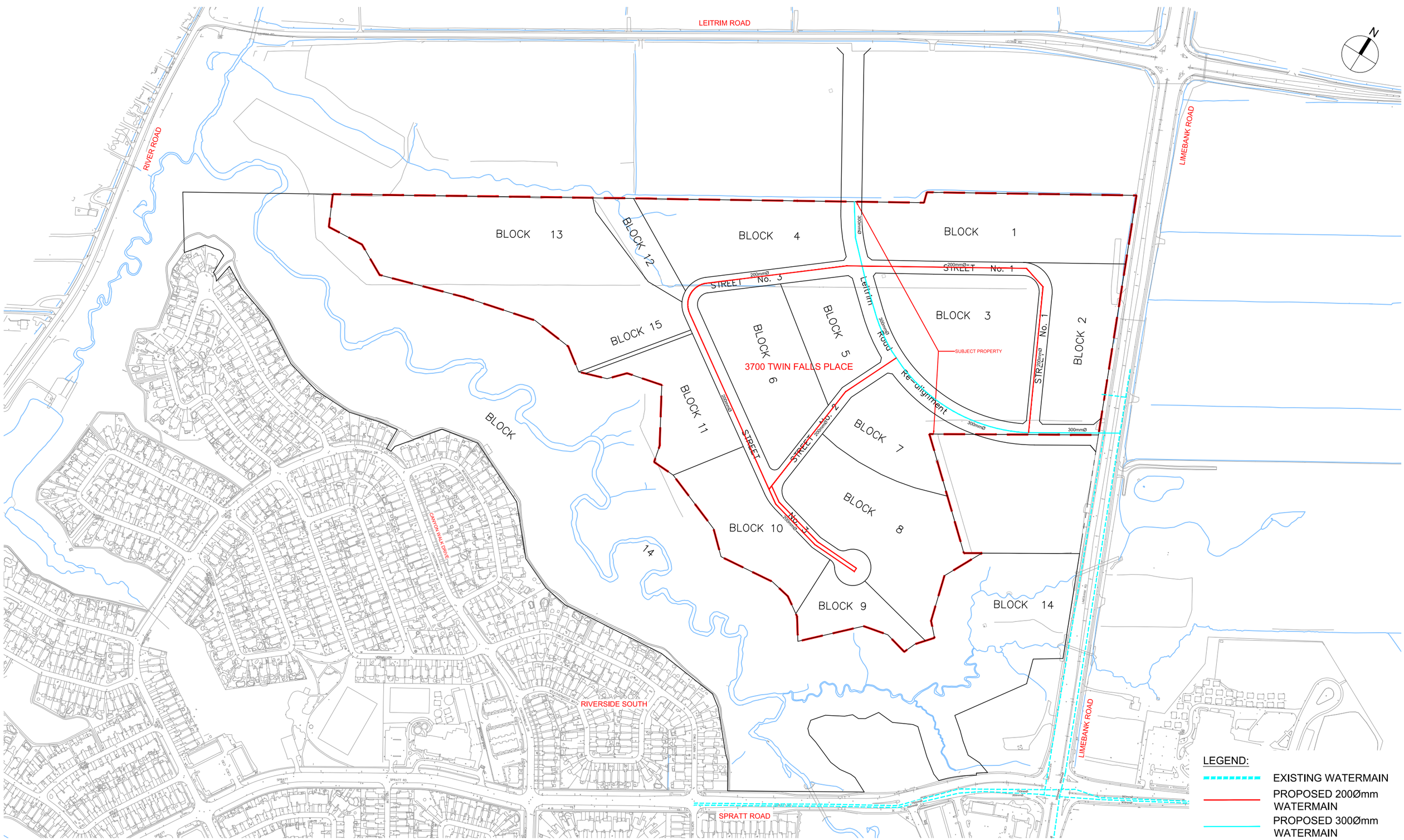


Notes
1. Coordinate System: NAD 1983 CSRS MTM 9

Stantec

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J:\136974_RSS_Employme\7.0_Production\7.03_Design\04_Civil_LAND_Adequacy Report\FIGURE 2.1 CONCEPTUAL WATER SERVICES.dwg Layout Name: CONCEPTUAL WATER SERVICES Last Saved By: Chris.Cormier Last Saved At: Mar. 14, 23



Scale	Project Title	Drawing Title	Sheet No.
N.T.S.	RIVERSIDE SOUTH 3700 TWIN FALLS PLACE	CONCEPTUAL WATER SERVICES	FIGURE 2.1



CLIENT

Riverside South

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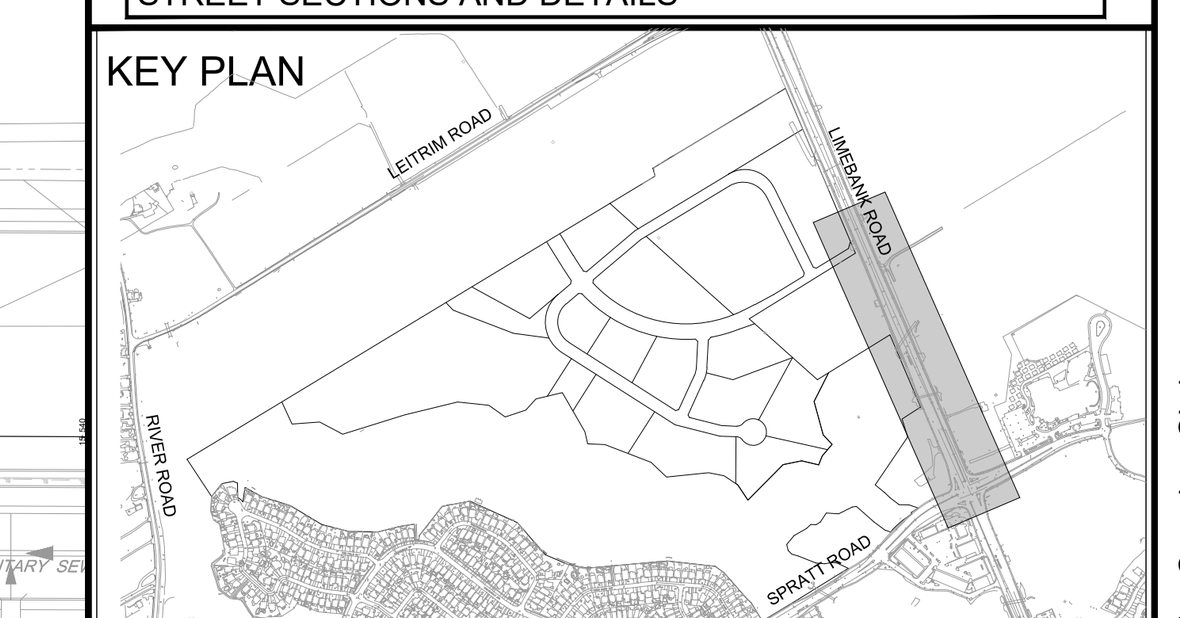
Arcadis Professional Services (Canada) Inc.
formerly IBI Group Professional Services (Canada) Inc.

ISSUES

No.	DESCRIPTION	DATE
1	SUBMISSION 1 FOR CITY REVIEW	2025-09-02
2	REVISED PER CITY COMMENTS	2025-10-31

SEE 010, 011, 012 FOR NOTES, LEGEND, CB TABLE, STREET SECTIONS AND DETAILS

KEY PLAN



1:1000 0 10 30 50m

SEAL

LICENSED PROFESSIONAL ENGINEER
L. M. ERION
13379508
2025/10/31
PROVINCE OF ONTARIO

PRIME CONSULTANT

ARCADIS
333 Preston Street - Suite 500
Ottawa ON K1S 5N4 Canada
tel 613 225 1311
www.arcadis.com

PROJECT

RIVERSIDE SOUTH
3700 TWIN FALLS PLACE
PHASE 1

PROJECT NO:
136974

DRAWN BY:	CHECKED BY:
C.C.	**L.E.**
PROJECT MGR:	APPROVED BY:
J.M.	**J.M.**

SHEET TITLE

GENERAL PLAN OF SERVICES
NEW WATERMAIN
INSTALLATION

SHEET NUMBER 003

ISSUE 2

SCALE CHECK 1 in 10mm

File Location: J:\136974_RSS_Employme\7.0_Production\7.03_Design\04_Civil\Sheets-Limebank\003 GENERAL PLAN OF SERVICES.dwg Last Saved: November 4, 2025, by cormierc3992 Plotted: November 4, 2025 3:57:39 PM by Cormier, Chris

D07-16-22-0014

19072

WATERMAIN DESIGN SHEET

4101 Limebank Rd., City of Ottawa

Project No. 23074

Robinson Consultants

	RESIDENTIAL POPULATION				NON-RES				AVG. DAILY					MAX. DAILY					PEAK HOURLY				
	ACTUAL COUNT				IND.	IND.	COMM.	INST.	DEMAND (L/s)					DEMAND (L/s)					DEMAND (L/s)				
	Low Density	Medium Density	High Density	Total Population	(ha)	(pop.)	(ha)	(ha)	RES.	IND.	COMM.	INST.	TOTAL	RES.	IND.	COMM.	INST.	TOTAL	RES.	IND.	COMM.	INST.	TOTAL
GROSS LAND					13.33					5.40			5.40		8.10			8.10		14.58			14.58
ISSU						1021				1.62			1.62		2.43			2.43		4.37			4.37
SITE						810				1.28			1.28		1.93			1.93		3.47			3.47

Note: gross area does not include property to be transferred to realigned Letrim Rd.

Residential Densities

Low Density (SFH's) =	3.4	cap/unit
Medium Density (Townhouses) =	2.7	cap/unit
High Density (Apartments) =	1.8	cap/unit

Avg. Daily Demand:			Max. Daily Demand:		Max. Hourly Demand:	
Residential =	280	L/cap/day	2.5	x Avg. Day	2.2	x Max. Day
Employment*=	**137**	**L/cap/day**	**1.5**	**x Avg. Day**	**1.8**	**x Max. Day**
Industrial (Light) =	**35000**	**L/ha/day**	1.5	x Avg. Day	1.8	x Max. Day
Commercial =	28000	L/ha/day	1.5	x Avg. Day	1.8	x Max. Day
Institutional =	28000	L/ha/day	1.5	x Avg. Day	1.8	x Max. Day

*Employee demand based on Riverside South Community Infrastructure Servicing Study Update Phase 1, Mosquito Creek Study Area (ISSU)

Note: ISSU averaged 76.6 employees/ha for servicing boundary containing the subject site

Note: Actual site employee count based on average 15 employees per office unit, 35 per warehouse unit

2026-08-19

Project Name:	4101 Limebank Rd.
Project Location:	Ottawa ON
Project No:	23074
Date:	19-Aug-26
Building Type:	Light Industrial
Building Being Considered:	Bldg A1

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				12080.0	m^2
	Total Effective Floor Area				**12,080.0**	**m^2**
C	**Fire Flow**				**19,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Combustible	0	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**0**	**L/min**
	Fire Flow				**19,000**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-9,500**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				50	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				100	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	100	m
	West Side Exposure Charge				**0.00**	

	North Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			120	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			240	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	100	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			50	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			100	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance			23	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			90	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			180	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	36	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0**	**< 0.75**
	Increase for Exposures			**0**	**L/min**
G	**Total Required Fire Flow**			**10,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Building construction type and fire wall dividing blocks assumed based on site plan

3. Floor areas used in Step B equivalent to 2-storey due to high 1-storey building height

4. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	4101 Limebank Rd.
Project Location:	Ottawa ON
Project No:	23074
Date:	19-Aug-26
Building Type:	Light Industrial
Building Being Considered:	Bldg A2

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**	Non-Combustible Construction (Type II)	0.8	
		Wood Frame (Type V)	1.5			
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				7940.0	m^2
	Total Effective Floor Area				**7,940.0**	**m^2**
C	**Fire Flow**				**16,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**	Combustible	0	
		Non-combustible	-0.25			
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**0**	**L/min**
	Fire Flow				**16,000**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**	Automatic Sprinkler Protection	-0.30	
		Automatic Sprinkler Protection	-0.30			
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-8,000**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				50	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				100	m.storeys
	Construction Type of Exposed Wall	**Options**		Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame				
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	100	m
	West Side Exposure Charge				**0.00**	

	North Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			120	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			240	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	36	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			50	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			100	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance			23	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			120	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			240	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	100	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0**	**< 0.75**
	Increase for Exposures			**0**	**L/min**
G	**Total Required Fire Flow**			**8,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Building construction type and fire wall dividing blocks assumed based on site plan

3. Floor areas used in Step B equivalent to 2-storey due to high 1-storey building height

4. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	4101 Limebank Rd.
Project Location:	Ottawa ON
Project No:	23074
Date:	19-Aug-26
Building Type:	Light Industrial - Warehousing
Building Being Considered:	Bldg B1

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				10800.0	m^2
	Total Effective Floor Area				**10,800.0**	**m^2**
C	**Fire Flow**				**18,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**2700**	**L/min**
	Fire Flow				**20,700**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-10,350**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				45	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				90	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance				23	m
	West Side Exposure Charge				**0.00**	

	North Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			90	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			180	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	100	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			60	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			120	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	51	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			90	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			180	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**Fire Wall Separation**	0	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0**	**< 0.75**
	Increase for Exposures			**0**	**L/min**
G	**Total Required Fire Flow**			**10,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Building construction type and fire wall dividing blocks assumed based on site plan

3. Floor areas used in Step B equivalent to 2-storey due to high 1-storey building height

4. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	4101 Limebank Rd.
Project Location:	Ottawa ON
Project No:	23074
Date:	19-Aug-26
Building Type:	Light Industrial - Warehousing
Building Being Considered:	Bldg B2

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				10800.0	m^2
	Total Effective Floor Area				**10,800.0**	**m^2**
C	**Fire Flow**				**18,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**2700**	**L/min**
	Fire Flow				**20,700**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-10,350**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				30	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				60	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance				23	m
	West Side Exposure Charge				**0.00**	

	North Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			90	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			180	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**Fire Wall Separation**	0	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			60	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			120	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	51	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			90	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			180	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**Fire Wall Separation**	0	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0**	**< 0.75**
	Increase for Exposures			**0**	**L/min**
G	**Total Required Fire Flow**			**10,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Building construction type and fire wall dividing blocks assumed based on site plan

3. Floor areas used in Step B equivalent to 2-storey due to high 1-storey building height

4. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	4101 Limebank Rd.
Project Location:	Ottawa ON
Project No:	23074
Date:	19-Aug-26
Building Type:	Light Industrial - Warehousing
Building Being Considered:	Bldg B3

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	**Type of Construction**	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				11640.0	m^2
	Total Effective Floor Area				**11,640.0**	**m^2**
C	**Fire Flow**				**19,000**	**L/min**
D	**Occupancy Class**	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**2850**	**L/min**
	Fire Flow				**21,850**	**L/min**
E	**Sprinkler Protection**	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-10,925**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				30	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				60	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance				23	m
	West Side Exposure Charge				**0.00**	

	North Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			90	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			180	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**Fire Wall Separation**	0	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			65	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			130	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	51	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			90	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			180	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	100	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0**	**< 0.75**
	Increase for Exposures			**0**	**L/min**
G	**Total Required Fire Flow**			**11,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Building construction type and fire wall dividing blocks assumed based on site plan

3. Floor areas used in Step B equivalent to 2-storey due to high 1-storey building height

4. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	4101 Limebank Rd.
Project Location:	Ottawa ON
Project No:	23074
Date:	19-Aug-26
Building Type:	Light Industrial - Warehousing
Building Being Considered:	Bldg C1

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				10760.0	m^2
	Total Effective Floor Area				**10,760.0**	**m^2**
C	**Fire Flow**				**18,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**2700**	**L/min**
	Fire Flow				**20,700**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-10,350**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				60	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				120	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	51	m
	West Side Exposure Charge				**0.00**	

	North Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			90	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			180	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	100	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			60	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			120	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	64	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			90	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			180	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**Fire Wall Separation**	0	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0**	**< 0.75**
	Increase for Exposures			**0**	**L/min**
G	**Total Required Fire Flow**			**10,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Building construction type and fire wall dividing blocks assumed based on site plan

3. Floor areas used in Step B equivalent to 2-storey due to high 1-storey building height

4. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	4101 Limebank Rd.
Project Location:	Ottawa ON
Project No:	23074
Date:	19-Aug-26
Building Type:	Light Industrial - Warehousing
Building Being Considered:	Bldg C2

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				10800.0	m^2
	Total Effective Floor Area				**10,800.0**	**m^2**
C	**Fire Flow**				**18,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**2700**	**L/min**
	Fire Flow				**20,700**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-10,350**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				60	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				120	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	51	m
	West Side Exposure Charge				**0.00**	

	North Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			90	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			180	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**Fire Wall Separation**	0	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			60	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			120	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	64	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			90	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			180	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**Fire Wall Separation**	0	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0**	**< 0.75**
	Increase for Exposures			**0**	**L/min**
G	**Total Required Fire Flow**			**10,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Building construction type and fire wall dividing blocks assumed based on site plan

3. Floor areas used in Step B equivalent to 2-storey due to high 1-storey building height

4. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	4101 Limebank Rd.
Project Location:	Ottawa ON
Project No:	23074
Date:	19-Aug-26
Building Type:	Light Industrial - Warehousing
Building Being Considered:	Bldg C3

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				12980.0	m^2
	Total Effective Floor Area				**12,980.0**	**m^2**
C	**Fire Flow**				**20,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**3000**	**L/min**
	Fire Flow				**23,000**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-11,500**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				65	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				130	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	51	m
	West Side Exposure Charge				**0.00**	

	North Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			90	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			180	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**Fire Wall Separation**	0	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			75	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			150	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	64	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			90	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			180	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	100	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0**	**< 0.75**
	Increase for Exposures			**0**	**L/min**
G	**Total Required Fire Flow**			**12,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Building construction type and fire wall dividing blocks assumed based on site plan

3. Floor areas used in Step B equivalent to 2-storey due to high 1-storey building height

4. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	4101 Limebank Rd.
Project Location:	Ottawa ON
Project No:	23074
Date:	19-Aug-26
Building Type:	Light Industrial - Warehousing
Building Being Considered:	Bldg D1

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				10760.0	m^2
	Total Effective Floor Area				**10,760.0**	**m^2**
C	**Fire Flow**				**18,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**2700**	**L/min**
	Fire Flow				**20,700**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-10,350**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				60	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				120	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	64	m
	West Side Exposure Charge				**0.00**	

	North Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			90	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			180	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	100	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			60	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			120	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	100	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			90	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			180	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**Fire Wall Separation**	0	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0**	**< 0.75**
	Increase for Exposures			**0**	**L/min**
G	**Total Required Fire Flow**			**10,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Building construction type and fire wall dividing blocks assumed based on site plan

3. Floor areas used in Step B equivalent to 2-storey due to high 1-storey building height

4. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	4101 Limebank Rd.
Project Location:	Ottawa ON
Project No:	23074
Date:	19-Aug-26
Building Type:	Light Industrial - Warehousing
Building Being Considered:	Bldg D2

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				10780.0	m^2
	Total Effective Floor Area				**10,780.0**	**m^2**
C	**Fire Flow**				**18,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**2700**	**L/min**
	Fire Flow				**20,700**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-10,350**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				60	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				120	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	64	m
	West Side Exposure Charge				**0.00**	

	North Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			90	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			180	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**Fire Wall Separation**	0	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			60	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			120	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	100	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			75	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			150	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**Fire Wall Separation**	0	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0**	**< 0.75**
	Increase for Exposures			**0**	**L/min**
G	**Total Required Fire Flow**			**10,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Building construction type and fire wall dividing blocks assumed based on site plan

3. Floor areas used in Step B equivalent to 2-storey due to high 1-storey building height

4. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	4101 Limebank Rd.
Project Location:	Ottawa ON
Project No:	23074
Date:	19-Aug-26
Building Type:	Light Industrial - Warehousing
Building Being Considered:	Bldg D3

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				11200.0	m^2
	Total Effective Floor Area				**11,200.0**	**m^2**
C	**Fire Flow**				**19,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**2850**	**L/min**
	Fire Flow				**21,850**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-10,925**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				75	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				150	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	64	m
	West Side Exposure Charge				**0.00**	

	North Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			75	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			150	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**Fire Wall Separation**	0	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			75	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			150	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	100	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			75	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			150	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	100	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0**	**< 0.75**
	Increase for Exposures			**0**	**L/min**
G	**Total Required Fire Flow**			**11,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Building construction type and fire wall dividing blocks assumed based on site plan

3. Floor areas used in Step B equivalent to 2-storey due to high 1-storey building height

4. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

IBI GROUP
333 PRESTON STREET
OTTAWA, ON
K1S 5N4

WATERMAIN DEMAND CALCULATION SHEET

FILE: 136974
DATE PRINTED: 09-Mar-23
DESIGN: LE
PAGE : 1 OF 1

PROJECT : RIVERSIDE SOUTH - 3700 TWIN FALLS PLACE
LOCATION : CITY OF OTTAWA
DEVELOPER : RIVERSIDE SOUTH DEVELOPMENT CORPORATION

NODE	BLOCK	RESIDENTIAL UNITS SF	RESIDENTIAL UNITS SD & TH	RESIDENTIAL UNITS MD (ha)	RESIDENTIAL POP'N	NON-RESIDENTIAL INDTRL (ha.)	NON-RESIDENTIAL COMM. (ha.)	NON-RESIDENTIAL INST. (ha.)	AVERAGE DAILY DEMAND (l/s) Res.	AVERAGE DAILY DEMAND (l/s) Non-res.	AVERAGE DAILY DEMAND (l/s) Total	MAXIMUM DAILY DEMAND (l/s) Res.	MAXIMUM DAILY DEMAND (l/s) Non-res.	MAXIMUM DAILY DEMAND (l/s) Total	MAXIMUM HOURLY DEMAND (l/s) Res.	MAXIMUM HOURLY DEMAND (l/s) Non-res.	MAXIMUM HOURLY DEMAND (l/s) Total	FIRE DEMAND (l/min)
J2	2						2.56		0.00	0.83	0.83	0.00	1.24	1.24	0.00	2.24	2.24	13,000
J3	3						4.61		0.00	1.49	1.49	0.00	2.24	2.24	0.00	4.03	4.03	13,000
J4	1						4.16		0.00	1.35	1.35	0.00	2.02	2.02	0.00	3.64	3.64	13,000
J5	5						1.52		0.00	0.49	0.49	0.00	0.74	0.74	0.00	1.33	1.33	13,000
J8	4, 13						11.92		0.00	3.86	3.86	0.00	5.79	5.79	0.00	10.43	10.43	13,000
J9	6, 11						5.41		0.00	1.75	1.75	0.00	2.63	2.63	0.00	4.73	4.73	13,000
J10	10						2.72		0.00	0.88	0.88	0.00	1.32	1.32	0.00	2.38	2.38	13,000
J11	8, 9						6.52		0.00	2.11	2.11	0.00	3.17	3.17	0.00	5.71	5.71	13,000
J12	7						1.95		0.00	0.63	0.63	0.00	0.95	0.95	0.00	1.71	1.71	13,000
J13	OTHER						3.90		0.00	1.26	1.26	0.00	1.90	1.90	0.00	3.41	3.41	13,000
											14.65			22.00			39.61	

ASSUMPTIONS

RESIDENTIAL DENSITIES

- Single Family (SF) 3.4 p / p / u
- Semi Detached (SD) & Townhouse (T 2.7 p / p / u
- Apartment (APT) 1.8 p / p / u
- -Medium Density Area (MD) 130 p / p / ha

AVG. DAILY DEMAND

- Residential 280 l / cap / day
- ICI 28,000 l / ha / day

MAX. DAILY DEMAND

- Residential 700 l / cap / day
- ICI 42,000 l / ha / day

MAX. HOURLY DEMAND

- Residential 1,540 l / cap / day
- ICI 75,600 l / ha / day

FIRE FLOW

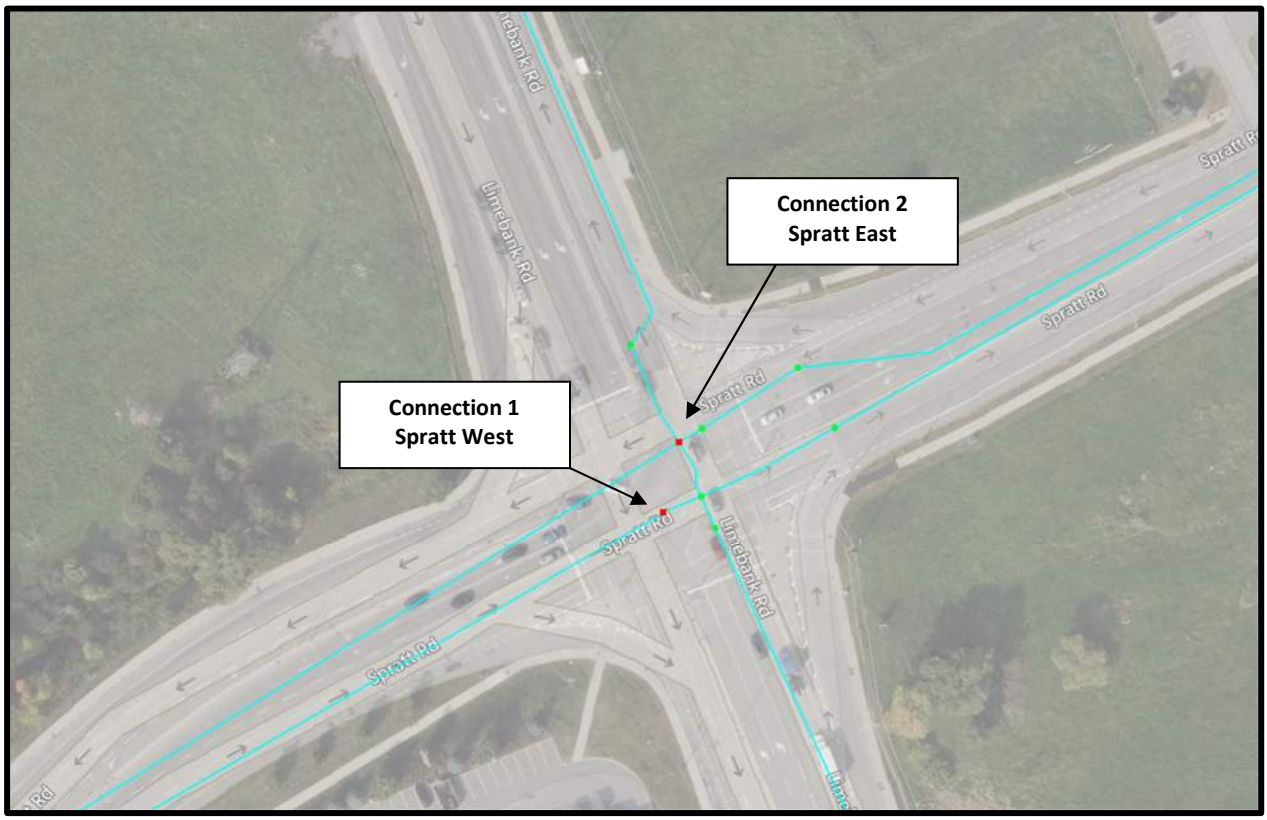
- SF, SD, TH & ST 10,000 l / min
- l / min
- ICI 13,000 l / min

Boundary Conditions
4101 Limebank

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	1,213	20.22
Maximum Daily Demand	1,822	30.36
Peak Hour	3,279	54.65
Fire Flow Demand #1	12,000	200.00
Fire Flow Demand #2	13,000	216.67

Location



Results

Existing Conditions

Connection 1 – Spratt West

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	130.6	55.2
Peak Hour	124.6	46.6
Max Day plus Fire Flow #1	124.6	46.6
Max Day plus Fire Flow #2	124.6	46.6

[1] Ground Elevation = 91.8 m

Connection 2 – Spratt East

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	130.6	55.2
Peak Hour	124.6	46.6
Max Day plus Fire Flow #1	124.6	46.6
Max Day plus Fire Flow #2	124.6	46.6

[1] Ground Elevation = 91.8 m

Future SUC

Connection 1 – Spratt West

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	147.1	78.7
Peak Hour	144.6	75.2
Max Day plus Fire Flow #1	144.1	74.4
Max Day plus Fire Flow #2	143.9	74.0

[1] Ground Elevation = 91.8 m

Connection 2 – Spratt East

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	147.1	78.7
Peak Hour	144.7	75.2
Max Day plus Fire Flow #1	144.6	75.1
Max Day plus Fire Flow #2	144.4	74.9

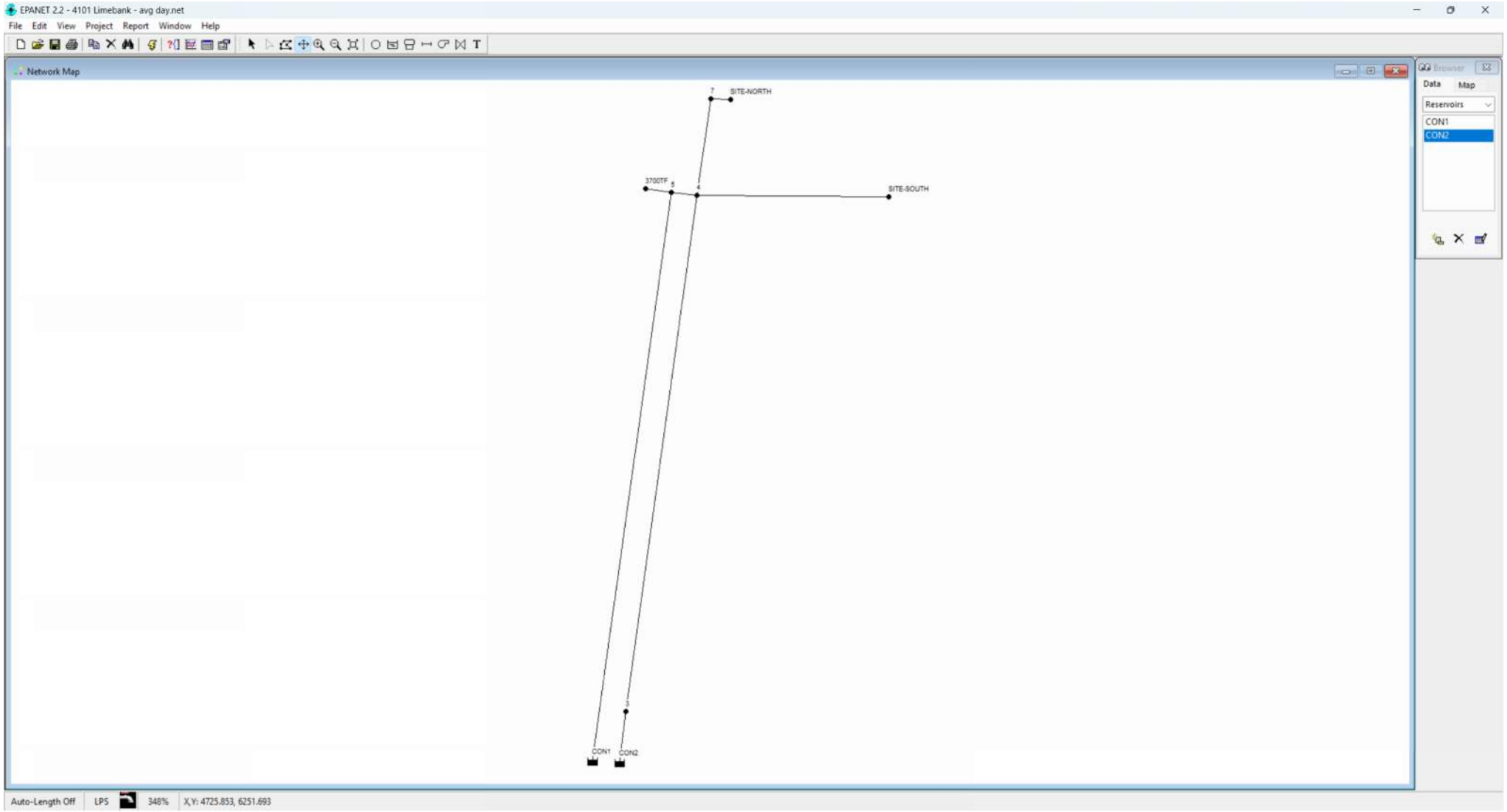
[1] Ground Elevation = 91.8 m

Notes

1. Demands for proposed *Connections 1 & 2* were assigned to junctions off the public looped watermains. The engineer must calculate headloss off the dead-end main.

Disclaimer

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


EPANET 2.2 - 4101 Limebank - avg day.net
File Edit View Project Report Window Help
Network Map
7
SITE-NORTH
3700TF
5
4
SITE-SOUTH
3
CON1
CON2
Browser
Data
Map
Reservoirs
CON1
CON2
Auto-Length Off
LPS
348%
X,Y: 4725.853, 6251.693

```
******************************************************************
*                            E P A N E T                         *
*                     Hydraulic and Water Quality                *
*                     Analysis for Pipe Networks                 *
*                           Version 2.2                          *
******************************************************************

Input File: 4101 Limebank - current avg day.net
```

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	CON2	3	17	600
2	3	4	522	300
3	CON1	5	560	300
4	5	3700TF	5	300
5	5	4	5	300
10	7	SITE-NORTH	16	300
6	7	4	84	300
7	4	SITE-SOUTH	229	300

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality	
3	0.00	130.60	41.60	0.00	
5	0.00	130.54	40.54	0.00	
3700TF	14.65	130.54	40.54	0.00	
4	0.00	130.54	40.54	0.00	
7	0.00	130.54	40.54	0.00	
SITE-NORTH	2.70	130.54	40.54	0.00	
SITE-SOUTH	2.70	130.54	39.54	0.00	
CON1	-9.84	130.60	0.00	0.00	Reservoir
CON2	-10.21	130.60	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	10.21	0.04	0.00	Open
2	10.21	0.14	0.11	Open
3	9.84	0.14	0.10	Open
4	14.65	0.21	0.21	Open

5	-4.81	0.07	0.03	Open
10	2.70	0.04	0.01	Open
6	-2.70	0.04	0.01	Open
7	2.70	0.04	0.01	Open

```
******************************************************************
*                            E P A N E T                         *
*                     Hydraulic and Water Quality                *
*                     Analysis for Pipe Networks                 *
*                           Version 2.2                          *
******************************************************************

Input File: 4101 Limebank - current peak hour.net
```

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	CON2	3	17	600
2	3	4	522	300
3	CON1	5	560	300
4	5	3700TF	5	300
5	5	4	5	300
10	7	SITE-NORTH	16	300
6	7	4	84	300
7	4	SITE-SOUTH	229	300

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality	
3	0.00	124.60	35.60	0.00	
5	0.00	124.24	34.24	0.00	
3700TF	39.61	124.23	34.23	0.00	
4	0.00	124.24	34.24	0.00	
7	0.00	124.24	34.24	0.00	
SITE-NORTH	7.29	124.24	34.24	0.00	
SITE-SOUTH	7.29	124.23	33.23	0.00	
CON1	-26.61	124.60	0.00	0.00	Reservoir
CON2	-27.58	124.60	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	27.58	0.10	0.02	Open
2	27.58	0.39	0.69	Open
3	26.61	0.38	0.64	Open
4	39.61	0.56	1.34	Open

5	-13.00	0.18	0.17	Open
10	7.29	0.10	0.06	Open
6	-7.29	0.10	0.06	Open
7	7.29	0.10	0.06	Open

```
******************************************************************
*                            E P A N E T                         *
*                     Hydraulic and Water Quality                *
*                     Analysis for Pipe Networks                 *
*                          Version 2.2                           *
******************************************************************

Input File: 4101 Limebank - current max day + 12,000 fire.net
```

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	CON2	3	17	600
2	3	4	522	300
3	CON1	5	560	300
4	5	3700TF	5	300
5	5	4	5	300
10	7	SITE-NORTH	16	300
6	7	4	84	300
7	4	SITE-SOUTH	229	300

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality	
3	0.00	124.59	35.59	0.00	
5	0.00	119.39	29.39	0.00	
3700TF	22.00	119.39	29.39	0.00	
4	0.00	119.36	29.36	0.00	
7	0.00	118.69	28.69	0.00	
SITE-NORTH	104.05	118.56	28.56	0.00	
SITE-SOUTH	104.05	117.52	26.52	0.00	
CON1	-112.72	124.60	0.00	0.00	Reservoir
CON2	-117.38	124.60	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	117.38	0.42	0.34	Open
2	117.38	1.66	10.03	Open
3	112.72	1.59	9.30	Open
4	22.00	0.31	0.45	Open

5	90.72	1.28	6.22	Open
10	104.05	1.47	8.02	Open
6	-104.05	1.47	8.02	Open
7	104.05	1.47	8.02	Open

```
******************************************************************
*                          E P A N E T                           *
*                   Hydraulic and Water Quality                  *
*                   Analysis for Pipe Networks                   *
*                         Version 2.2                            *
******************************************************************

Input File: 4101 Limebank - current max day + 13,000 fire.net
```

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	CON2	3	17	600
2	3	4	522	300
3	CON1	5	560	300
4	5	3700TF	5	300
5	5	4	5	300
10	7	SITE-NORTH	16	300
6	7	4	84	300
7	4	SITE-SOUTH	229	300

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality	
3	0.00	124.59	35.59	0.00	
5	0.00	118.67	28.67	0.00	
3700TF	22.00	118.67	28.67	0.00	
4	0.00	118.63	28.63	0.00	
7	0.00	117.86	27.86	0.00	
SITE-NORTH	112.38	117.71	27.71	0.00	
SITE-SOUTH	112.38	116.52	25.52	0.00	
CON1	-120.87	124.60	0.00	0.00	Reservoir
CON2	-125.89	124.60	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	125.89	0.45	0.39	Open
2	125.89	1.78	11.42	Open
3	120.87	1.71	10.59	Open
4	22.00	0.31	0.45	Open

5	98.87	1.40	7.30	Open
10	112.38	1.59	9.25	Open
6	-112.38	1.59	9.25	Open
7	112.38	1.59	9.25	Open

```
******************************************************************
*                            E P A N E T                         *
*                     Hydraulic and Water Quality                *
*                     Analysis for Pipe Networks                 *
*                           Version 2.2                          *
******************************************************************

Input File: 4101 Limebank - future avg day.net
```

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	CON2	3	17	600
2	3	4	522	300
3	CON1	5	560	300
4	5	3700TF	5	300
5	5	4	5	300
10	7	SITE-NORTH	16	300
6	7	4	84	300
7	4	SITE-SOUTH	229	300

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality	
3	0.00	147.10	58.10	0.00	
5	0.00	147.04	57.04	0.00	
3700TF	14.65	147.04	57.04	0.00	
4	0.00	147.04	57.04	0.00	
7	0.00	147.04	57.04	0.00	
SITE-NORTH	2.70	147.04	57.04	0.00	
SITE-SOUTH	2.70	147.04	56.04	0.00	
CON1	-9.84	147.10	0.00	0.00	Reservoir
CON2	-10.21	147.10	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	10.21	0.04	0.00	Open
2	10.21	0.14	0.11	Open
3	9.84	0.14	0.10	Open
4	14.65	0.21	0.21	Open

5	-4.81	0.07	0.03	Open
10	2.70	0.04	0.01	Open
6	-2.70	0.04	0.01	Open
7	2.70	0.04	0.01	Open

```
******************************************************************
*                          E P A N E T                           *
*                   Hydraulic and Water Quality                  *
*                   Analysis for Pipe Networks                   *
*                         Version 2.2                            *
******************************************************************

Input File: 4101 Limebank - future peak hour.net
```

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	CON2	3	17	600
2	3	4	522	300
3	CON1	5	560	300
4	5	3700TF	5	300
5	5	4	5	300
10	7	SITE-NORTH	16	300
6	7	4	84	300
7	4	SITE-SOUTH	229	300

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality	
3	0.00	144.70	55.70	0.00	
5	0.00	144.29	54.29	0.00	
3700TF	39.61	144.28	54.28	0.00	
4	0.00	144.29	54.29	0.00	
7	0.00	144.29	54.29	0.00	
SITE-NORTH	7.29	144.29	54.29	0.00	
SITE-SOUTH	7.29	144.28	53.28	0.00	
CON1	-24.57	144.60	0.00	0.00	Reservoir
CON2	-29.62	144.70	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	29.62	0.10	0.03	Open
2	29.62	0.42	0.78	Open
3	24.57	0.35	0.55	Open
4	39.61	0.56	1.34	Open

5	-15.04	0.21	0.22	Open
10	7.29	0.10	0.06	Open
6	-7.29	0.10	0.06	Open
7	7.29	0.10	0.06	Open

```
******************************************************************
*                          E P A N E T                           *
*                   Hydraulic and Water Quality                  *
*                   Analysis for Pipe Networks                   *
*                         Version 2.2                            *
******************************************************************

Input File: 4101 Limebank - future max day + 12,000 fire.net
```

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	CON2	3	17	600
2	3	4	522	300
3	CON1	5	560	300
4	5	3700TF	5	300
5	5	4	5	300
10	7	SITE-NORTH	16	300
6	7	4	84	300
7	4	SITE-SOUTH	229	300

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality	
3	0.00	144.59	55.59	0.00	
5	0.00	139.14	49.14	0.00	
3700TF	22.00	139.14	49.14	0.00	
4	0.00	139.11	49.11	0.00	
7	0.00	138.44	48.44	0.00	
SITE-NORTH	104.05	138.31	48.31	0.00	
SITE-SOUTH	104.05	137.27	46.27	0.00	
CON1	-109.76	144.10	0.00	0.00	Reservoir
CON2	-120.34	144.60	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	120.34	0.43	0.36	Open
2	120.34	1.70	10.50	Open
3	109.76	1.55	8.86	Open
4	22.00	0.31	0.45	Open

5	87.76	1.24	5.85	Open
10	104.05	1.47	8.02	Open
6	-104.05	1.47	8.02	Open
7	104.05	1.47	8.02	Open

```
******************************************************************
*                            E P A N E T                         *
*                     Hydraulic and Water Quality                *
*                     Analysis for Pipe Networks                 *
*                          Version 2.2                           *
******************************************************************

Input File: 4101 Limebank - future max day + 13,000 fire.net
```

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	CON2	3	17	600
2	3	4	522	300
3	CON1	5	560	300
4	5	3700TF	5	300
5	5	4	5	300
10	7	SITE-NORTH	16	300
6	7	4	84	300
7	4	SITE-SOUTH	229	300

Node Results:

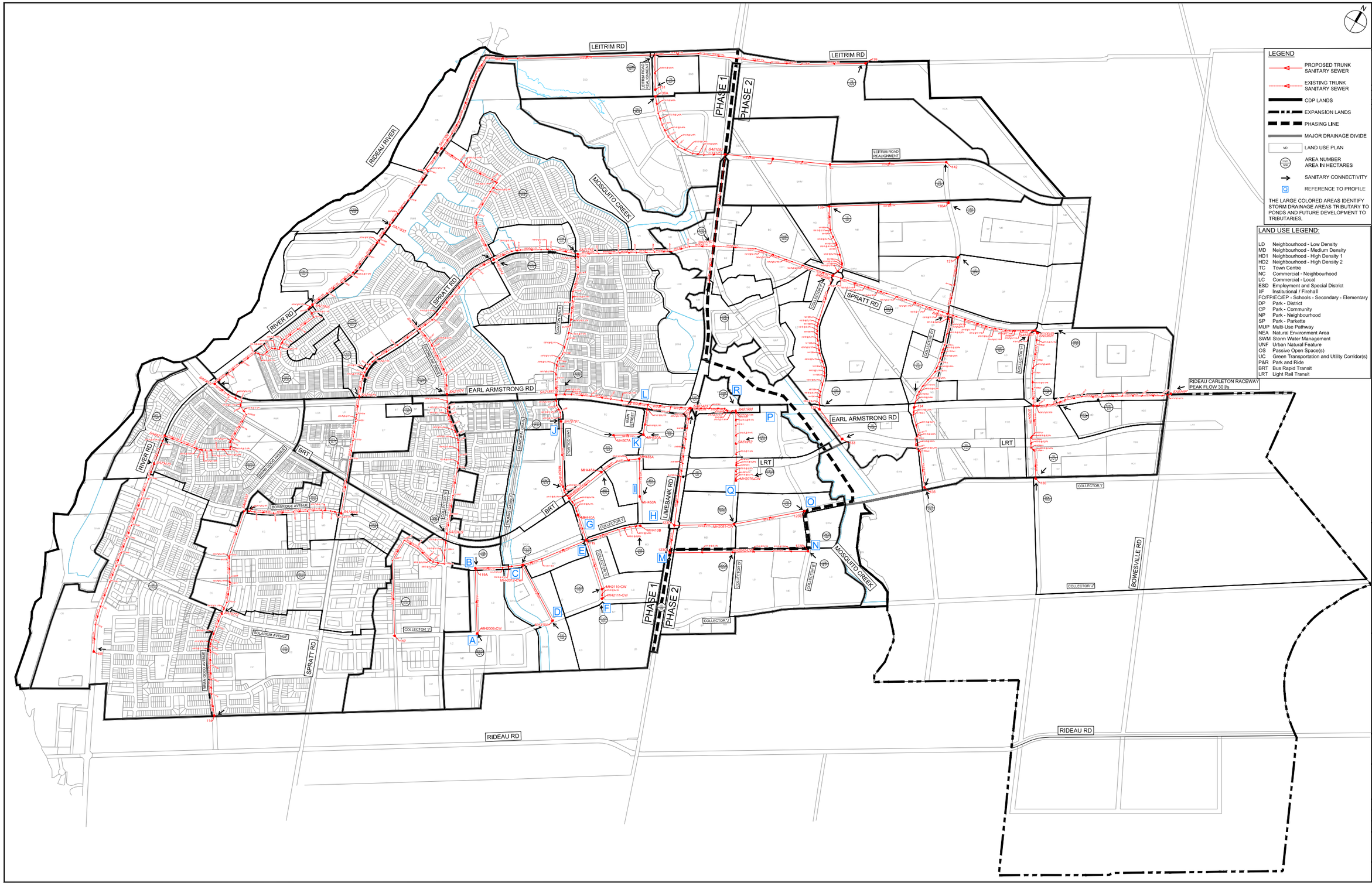
Node ID	Demand LPS	Head m	Pressure m	Quality	
3	0.00	144.39	55.39	0.00	
5	0.00	138.22	48.22	0.00	
3700TF	22.00	138.22	48.22	0.00	
4	0.00	138.19	48.19	0.00	
7	0.00	137.41	47.41	0.00	
SITE-NORTH	112.38	137.26	47.26	0.00	
SITE-SOUTH	112.38	136.07	45.07	0.00	
CON1	-118.08	143.90	0.00	0.00	Reservoir
CON2	-128.68	144.40	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	128.68	0.46	0.41	Open
2	128.68	1.82	11.89	Open
3	118.08	1.67	10.14	Open
4	22.00	0.31	0.45	Open

5	96.08	1.36	6.92	Open
10	112.38	1.59	9.25	Open
6	-112.38	1.59	9.25	Open
7	112.38	1.59	9.25	Open

Appendix C



LEGEND

- PROPOSED TRUNK SANITARY SEWER
- EXISTING TRUNK SANITARY SEWER
- CDP LANDS
- EXPANSION LANDS
- PHASING LINE
- MAJOR DRAINAGE DIVIDE
- LAND USE PLAN
- AREA NUMBER / AREA IN HECTARES
- SANITARY CONNECTIVITY
- REFERENCE TO PROFILE

THE LARGE COLORED AREAS IDENTIFY STORM DRAINAGE AREAS TRIBUTARY TO PONDS AND FUTURE DEVELOPMENT TO TRIBUTARIES.

LAND USE LEGEND:

LD	Neighbourhood - Low Density
MD	Neighbourhood - Medium Density
HD1	Neighbourhood - High Density 1
HD2	Neighbourhood - High Density 2
TC	Town Centre
NC	Commercial - Neighbourhood
LC	Commercial - Local
ESD	Employment and Special District
I/F	Institutional / Firehall
FC/FP/EC/EP	Schools - Secondary - Elementary
DP	Park - District
CP	Park - Community
NP	Park - Neighbourhood
SP	Park - Parkette
MUP	Multi-Use Pathway
NEA	Natural Environment Area
SWM	Storm Water Management
UNF	Urban Natural Feature
OS	Passive Open Space(s)
UC	Green Transportation and Utility Corridor(s)
P&R	Park and Ride
BRT	Bus Rapid Transit
LRT	Light Rail Transit

CLIENT

Ottawa

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ISSUES

No.	DESCRIPTION	DATE
1	RSU PH 1 SUBMISSION 1	2022-12-02
2	RSU PH 1 SUBMISSION 2	2023-03-24
3	RSU PH 1 SUBMISSION 3	2023-05-19

CONSULTANTS

1:4000 (ANSI D) 1:8000 (ANSI E)

SEAL

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ibigroup.com

PROJECT
RIVERSIDE SOUTH COMMUNITY INFRASTRUCTURE SERVICING STUDY UPDATE PHASE 1
MOSQUITO CREEK STUDY AREA

PROJECT NO: 125127	
DRAWN BY: C.C.	CHECKED BY: L.E.
PROJECT MGR: M.B.	APPROVED BY: R.W.

SHEET TITLE
SANITARY DRAINAGE AREA PLAN

SHEET NUMBER 400 | ISSUE 3

Plotted: May 24, 2023 by Chris Cummer
Last Saved: May 24, 2023 by Chris Cummer
File Location: C:\Users\ccummer\OneDrive - IBI Group\Documents\125127 Riverside South Phase 1 Update\Drawings\Sanitary\125127 Riverside South Phase 1 Update Sanitary.dwg

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SANITARY SEWER DESIGN SHEET

RSS ISSU Phase 1 Mosquito Creek Study Area - With Expansion Lands
City of Ottawa

LOCATION				RESIDENTIAL														ICI AREAS										ROAD LRT/BRT (Ha)	PARK O/S (Ha)	INFILTRATION ALLOWANCE			FIXED FLOW (L/s)		TOTAL FLOW	PROPOSED SEWER DESIGN							
				DENSITIES (POP/Ha)						UNIT TYPE				POPULATION		RES PEAK FACTOR	K FACTOR	PEAK FLOW (L/s)	AREA (Ha)						ICI PEAK FACTOR	PEAK FLOW (L/s)			AREA (Ha)		FLOW					CAPACITY	LENGTH	DIA	SLOPE	VELOCITY (full)	AVAILABLE CAPACITY	
STREET	AREA ID	FROM MH	TO MH	LD	MD	HDI	HD2	TC	EXP	SF	TH/SD	APT	AREA (Ha)	IND	CUM				INSTITUTIONAL IND	INSTITUTIONAL CUM	COMMERCIAL IND	COMMERCIAL CUM	EMPLOYMENT IND	EMPLOYMENT CUM				IND	CUM	(L/s)	IND	CUM	(L/s)						L/s	(%)
				59.5	71.8	97.2	194.4	122.4	60.0																																
Collector K	136A	136A	MH1126-N											0.0	0.0	3.80	0.80	0.00	0.00	0.00	0.00	0.00	47.61	47.61	1.50	19.29	5.65	2.12	55.38	55.38	18.28	0.00	0.00	37.56	115.68	101.13	375	0.40	1.015	78.12	67.53%
		MH1126-N	MH1125-N											0.0	0.0	3.80	0.80	0.00	0.00	0.00	0.00	0.00	0.00	47.61	1.50	19.29			0.00	55.38	18.28	0.00	0.00	37.56	115.68	74.00	375	0.40	1.015	78.12	67.53%
		MH1125-N	MH1124-N											0.0	0.0	3.80	0.80	0.00	0.00	0.00	0.00	0.00	0.00	47.61	1.50	19.29			0.00	55.38	18.28	0.00	0.00	37.56	115.68	80.55	375	0.40	1.015	78.12	67.53%
		MH1124-N	MH1123-N											0.0	0.0	3.80	0.80	0.00	0.00	0.00	0.00	0.00	0.00	47.61	1.50	19.29			0.00	55.38	18.28	0.00	0.00	37.56	115.68	83.33	375	0.40	1.015	78.12	67.53%
		MH1123-N	MH1122-N											0.0	0.0	3.80	0.80	0.00	0.00	0.00	0.00	0.00	0.00	47.61	1.50	19.29			0.00	55.38	18.28	0.00	0.00	37.56	115.68	95.60	375	0.40	1.015	78.12	67.53%
		MH1122-N	MH1120-N											0.0	0.0	3.80	0.80	0.00	0.00	0.00	0.00	0.00	0.00	47.61	1.50	19.29			0.00	55.38	18.28	0.00	0.00	37.56	115.68	68.51	375	0.40	1.015	78.12	67.53%
		MH1120-N	SA61082											0.0	0.0	3.80	0.80	0.00	0.00	0.00	0.00	0.00	0.00	47.61	1.50	19.29			0.00	55.38	18.28	0.00	0.00	37.56	115.68	125.63	375	0.40	1.015	78.12	67.53%
Collector L	142	142	141											0.0	0.0	3.80	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36.12	36.12	1.50	14.63	8.15	15.54	59.81	59.81	19.74	0.00	0.00	34.37	59.68	693.70	300	0.35	0.818	25.31	42.41%
		141	140											0.0	0.0	3.80	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36.12	36.12	1.50	14.63			0.00	59.81	19.74	0.00	0.00	34.37	59.68	342.94	300	0.35	0.818	25.31	42.41%
		140	SA61082											0.0	0.0	3.80	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36.12	36.12	1.50	14.63			0.00	59.81	19.74	0.00	0.00	34.37	59.68	285.07	300	0.35	0.818	25.31	42.41%
Limebank Road		SA61082	SA21757											0.0	0.0	3.80	0.80	0.00	0.00	0.00	0.00	0.00	0.00	83.73	1.50	33.92			0.00	115.19	38.01	0.00	0.00	71.93	113.19	537.93	375	0.38	0.993	41.26	36.45%
Spratt Road	21757	SA21757	SA21760		2.12	0.92								242.0	17,964.4	2.36	0.80	137.36	1.66	30.73	3.16	5.15	0.00	84.70	1.50	51.75	4.66	6.72	19.24	483.66	159.61	0.00	30.00	378.72	630.29	143.65	900	0.11	0.960	251.56	39.91%
		SA21760	SA21759											0.0	17,964.4	2.36	0.80	137.36	0.00	30.73	0.00	5.15	0.00	84.70	1.50	51.75			0.00	483.66	159.61	0.00	30.00	378.72	664.00	*113.26*	*900*	*0.12*	1.011	285.27	42.96%
		SA21759	SA21758											0.0	17,964.4	2.36	0.80	137.36	0.00	30.73	0.00	5.15	0.00	84.70	1.50	51.75			0.00	483.66	159.61	0.00	30.00	378.72	783.39	98.80	900	0.17	1.193	404.66	51.66%
		SA21758	SA21756											0.0	17,964.4	2.36	0.80	137.36	0.00	30.73	0.00	5.15	0.00	84.70	1.50	51.75			0.00	483.66	159.61	0.00	30.00	378.72	704.73	*107.73*	*900*	*0.14*	1.073	326.00	46.26%
		SA21756	SA21769											0.0	17,964.4	2.36	0.80	137.36	0.00	30.73	0.00	5.15	0.00	84.70	1.50	51.75			0.00	483.66	159.61	0.00	30.00	378.72	685.42	98.70	900	0.13	1.044	306.70	44.75%
		SA21769	SA21752											0.0	17,964.4	2.36	0.80	137.36	0.00	30.73	0.00	5.15	0.00	84.70	1.50	51.75			0.00	483.66	159.61	0.00	30.00	378.72	732.12	*126.43*	*900*	*0.15*	1.115	353.39	48.27%
		SA21752	SA21749											0.0	17,964.4	2.36	0.80	137.36	0.00	30.73	0.00	5.15	0.00	84.70	1.50	51.75			0.00	483.66	159.61	0.00	30.00	378.72	1,399.23	125.70	900	0.55	2.131	1020.50	72.93%
Collector D	2076-CW	MH2076-CW	MH2077-CW					11.63						1,423.5	1,423.5	3.16	0.80	14.56	0.00	0.00	0.00	0.00	11.63	11.63	1.50	4.71	5.31	0.51	17.45	17.45	5.76	0.00	0.00	25.03	81.80	35.31	375	0.20	0.717	56.77	69.40%
		MH2077-CW	SA61914											0.0	1,423.5	3.16	0.80	14.56	0.00	0.00	0.00	0.00	0.00	11.63	1.50	4.71			0.00	17.45	5.76	0.00	0.00	25.03	81.80	53.36	375	0.20	0.717	56.77	69.40%
		SA61914	SA61913											0.0	1,423.5	3.16	0.80	14.56	0.00	0.00	0.00	0.00	0.00	11.63	1.50	4.71			0.00	17.45	5.76	0.00	0.00	25.03	91.23	*18.89*	*375*	*0.25*	0.800	66.20	72.56%
	61913	SA61913	SA61912					15.55						1,903.3	3,326.8	2.92	0.80	31.52	0.00	0.00	0.00	0.00	15.55	27.18	1.50	11.01	2.77		18.32	35.77	11.80	0.00	0.00	54.33	70.42	113.35	375	0.15	0.618	16.09	22.85%
		SA61912	SA61911											0.0	3,326.8	2.92	0.80	31.52	0.00	0.00	0.00	0.00	0.00	27.18	1.50	11.01			0.00	35.77	11.80	0.00	0.00	54.33	68.79	*106.74*	*375*	*0.14*	0.603	14.47	21.03%
		SA61911	SA61989											0.0	3,326.8	2.92	0.80	31.52	0.00	0.00	0.00	0.00	0.00	27.18	1.50	11.01			0.00	35.77	11.80	0.00	0.00	54.33	70.88	77.91	375	0.15	0.622	16.55	23.35%
		SA61989	SA61988											0.0	3,326.8	2.92	0.80	31.52	0.00	0.00	0.00	0.00	0.00	27.18	1.50	11.01			0.00	35.77	11.80	0.00	0.00	54.33	78.61	*10.83*	*375*	*0.18*	0.689	24.28	30.89%
Earl Armstrong Road	61988	SA61988	SA61986					2.95						361.1	3,687.9	2.89	0.80	34.56	0.00	0.00	0.00	0.00	2.95	30.13	1.50	12.21	1.88		4.83	40.60	13.40	0.00	0.00	60.16	79.13	48.09	375	0.19	0.694	18.96	23.96%
		SA61986	SA61985											0.0	3,687.9	2.89	0.80	34.56	0.00	0.00	0.00	0.00	0.00	30.13	1.50	12.21			0.00	40.60	13.40	0.00	0.00	60.16	84.41	*23.48*	*375*	*0.21*	0.740	24.25	28.72%
		SA61985	SA61984											0.0	3,687.9	2.89	0.80	34.56	0.00	0.00	0.00	0.00	0.00	30.13	1.50	12.21			0.00	40.60	13.40	0.00	0.00	60.16	81.16	91.43	375	0.20	0.712	20.99	25.87%
		SA61984	SA61423											0.0	3,687.9	2.89	0.80	34.56	0.00	0.00	0.00	0.00	0.00	30.13	1.50	12.21			0.00	40.60	13.40	0.00	0.00	60.16	82.71	*112.47*	*375*	*0.20*	0.726	22.55	27.26%
	123B	123B	MH2041-CW	18.69	2.53									1,293.8	1,293.8	3.18	0.80	13.33	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.93	3.22	26.37	26.37	8.70	0.00	0.00	22.04	70.84	211.17	375	0.15	0.621	48.81	68.89%
		MH2041-CW	MH2042-CW											0.0	1,293.8	3.18	0.80	13.33	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00			0.00	26.37	8.70	0.00	0.00	22.04	70.84	237.98	375	0.15	0.621	48.81	68.89%
	2024-CW	MH2042-CW	123C	10.04	5.33									980.2	2,273.9	3.03	0.80	22.35	1.16	1.16	1.07	1.07	0.00	0.00	1.00	0.72	2.15		19.75	46.12	15.22	0.00	0.00	38.30	81.80	376.12	375	0.20	0.717	43.50	53.18%
Limebank Road	123C	123C	123D											0.0	2,273.9	3.03	0.80	22.35	0.00	1.16	0.00	1.07	0.00	0.00	1.00	0.72	3.38		3.38	49.50	16.34	0.00	0.00	39.41	155.42	166.57	525	0.12	0.696	116.01	74.64%
	123E	123E	MH2081-CW		4.09			6.20						1,052.6	1,052.6	3.23	0.80	11.01	2.94	2.94	0.00	0.00	6.20	6.20	1.50	3.94	2.35		15.58	15.58	5.14	0.00	0.00	20.10	45.12	427.98	300	0.20	0.618	25.02	55.46%
	2081-CW	MH2081-CW	123D		4.28			5.63						996.5	2,049.1	3.06	0.80	20.33	0.00	2.94	0.00	0.00	5.63	11.83	1.50	6.22	1.84		11.75	27.33	9.02	0.00	0.00	35.57	70.84	355.81	375	0.15	0.621	35.27	49.78%
Limebank Road	123D	123D	SA61994											0.0	4,323.1	2.84	0.80	39.82	0.00	4.10	0.00	1.07	0.00	11.83	1.50	7.31	3.34		3.34	80.17	26.46	0.00	0.00	73.58	221.90	293.52	600	0.12	0.760	148.31	66.84%
		SA61994	SA61993											0.0	4,323.1	2.84	0.80	39.82	0.00	4.10	0.00	1.07	0.00	11.83	1.50	7.31			0.00	80.17	26.46	0.00	0.00	73.58	214.04	79.71	600	0.11	0.733	140.45	65.62%
		SA61993	SA61992											0.0	4,323.1	2.84	0.80	39.82	0.00	4.10	0.00	1.07	0.00	11.83	1.50	7.31			0.00	80.17	26.46	0.00	0.00	73.58	245.20	*92.13*	*600*	*0.15*	0.840	171.61	69.99%
		SA61992	SA61991											0.0	4,323.1	2.84	0.80	39.82	0.00	4.10	0.00	1.07	0.00	11.83	1.50	7.31			0.00	80.17	26.46	0.00	0.00	73.58	215.64	120.00	600	0.11	0.739	142.06	65.88%
		SA61991	SA61423											0.0	4,323.1	2.84	0.80	39.82	0.00	4.10	0.00	1.07	0.00	11.83	1.50	7.31			0.00	80.17	26.46	0.00	0.00	73.58	245.28	*120.04*	*600*	*0.15*	0.840	171.70	70.00%
Earl Armstrong Road	61423	SA61423	SA61424											0.0	8,011.0	2.64	0.80	68.53	0.00	4.10	0.00	1.07	0.00	41.96	1.50	19.51	3.41		3.41	124.18	40.98	0.00	0.00	129.02	231.80	*7.64*	*600*	*0.13*	0.794	102.78	44.34%
		SA61424	SA61425											0.0	8,011.0	2.64	0.80	68.53	0.00	4.10	0.00	1.07	0.00	41.96	1.50	19.51			0.00	124.18	40.98	0.00	0.00	129.02	227.85	110.65	600	0.13	0.781	98.83	43.37%
		SA61425	SA61456											0.0	8,011.0	2.64	0.80	68.53	0.00	4.10	0.00	1.07	0.00	41.96	1.50	19.51			0.00	124.18	40.98	0.00	0.00	129.02	203.96	*138.09*	*600*	*0.10*	0.699	74.94	36.74%
	507A	MH507A	MH520A					7.41						907.0	907.0	3.26	0.80	9.59	0.00	0.00	0.00	0.00	7.41	7.41	1.50	3.00	1.25	9.62	18.28	18.28	6.03	0.00	0.00	18.62	45.12	177.43	300	0.20	0.618	26.49	58.73%
	520A	MH520A	MH2125-CW					4.89						598.5	1,505.5	3.14	0.80	15.33	0.00	0.00	0.00	0.00	4.89	12.30	1.50	4.98	3.26	0.33	8.48	26.76	8.83	0.00	0.00	29.15	70.84	131.34	375	0.15	0.621	41.69	58.86%
		MH2125-CW	SA61456											0.0	1,505.5	3.14	0.80	15.33	0.00	0.00	0.00	0.00	0.00	12.30	1.50	4.98			0.00	26.76	8.83	0.00	0.00	29.15	70.84	50.65	375	0.15	0.621	41.69	58.86%
Earl Armstrong Road		SA61456	SA31030											0.0	9,516.5	2.58	0.80	79.59	0.00	4.10	0.00	1.07	0.00	54.26	1.50	24.49			0.00	150.94	49.81	0.00	0.00	153.90	254.43	*101.41*	*600*	*0.16*	0.872	100.54	39.51%
		SA31030	SA61020											0.0	9,516.5	2.58	0.80	79.59	0.00	4.10	0.00	1.07	0.00	54.26	1.50	24.49			0.00	150.94	49.81	0.00	0.00	153.90	247.72	120.36	600	0.15	0.849	93.82	37.87%
		SA61020	SA61019											0.0	9,516.5	2.58	0.80	79.59	0.00	4.10	0.00	1.07	0.00	54.26	1.50	24.49			0.00	150.94	49.81	0.00	0.00	153.90	202.55	*120.01*	*600*	*0.10*	0.694	48.65	24.02%
		SA61019	SA61018											0.0	9,516.5	2.58	0.80	79.59	0.00	4.10	0.00	1.07	0.00	54.26	1.50	24.49			0.00	150.94	49.81	0.00	0.00	153.90	228.86	117.51	600	0.13	0.784	74.96	32.75%
		SA61018	SA21883											0.0	9,516.5	2.58	0.80	79.59	0.00	4.10	0.00	1.07	0.00	54.26	1.50	24.49			0.00	150.94	49.81	0.00	0.00	153.90	232.45	*91.13*	*600*	*0.13*	0.796	78.55	33.79%
	2006-CW	MH2006-CW	119A	17.13	2.88									1,226.1	1,226.1	3.19	0.80	12.69	1.27	1.27	1.51	1.51	0.00	0.00	1.00	0.90	5.33		28.12	28.12	9.28	0.00	0.00	22.87	70.84	390.25	375	0.15	0.621	47.97	67.72%
Collector I	119A	119A	MH-2137CW		2.80									201.1	1,427.2	3.16	0.80	14.60	0.00	1.27	0.00	1.51	0.00	0.00	1.00	0.90	0.88		3.68	31.80	10.49	0.00	0.00	25.99	70.84	163.31	375	0.15	0.621	44.85	63.31%
		MH-2137CW	MH-2012-CW											0.0	1,427.2	3.16	0.80	14.60	0.00	1.27	0.00	1.51	0.00	0.00	1.00	0.90			0.00	31.80	10.49	0.00	0.00	25.99	70.84	120.15	375	0.15	0.621	44.85	63.31%
	310A	MH310A	MH-2012-CW	9.75										580.1	580.1	3.35	0.80	6.30	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.97	4.67	15.39	15.39	5.08	0.00	0.00	11.38	45.12	377.37	300	0.20	0.618	33.73	74.77%
Collector I	2012-CW	MH-2012-CW	MH2011-CW		4.22									303.1	2,310.4	3.03	0.80	22.68	0.00	1.27	0.00	1.51	0.00	0.00	1.00	0.90	1.78	7.91	13.91	61.10	20.16	0.00	0.00	43.74	103.03	118.30	450	0.12	0.628	59.29	57.55%
		MH2011-CW	119											0.0	2,310.4	3.03	0.80	22.68	0.00	1.27	0.00	1.51	0.00	0.00	1.00	0.90			0.00	61.10	20.16	0.00	0.00	43.74	103.03	288.83	450	0.12	0.628	59.29	57.55%
Collector C	2111-CW	MH2111-CW	MH2110-CW	15.66										931.8	931.8	3.26	0.80	9.83	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.30	1.09	18.05	18.05	5.96	0.00	0.00	15.79	70.84	57.00	375	0.15	0.621	55.05	77.71%
	2110-CW	MH2110-CW	119	12.01										714.6	1,646.4	3.12	0.80	16.65	2.68	2.68	0.00	0.00	0.00	0.00	1.00	0.87	2.38		17.07	35.12	11.59	0.00	0.00	29.10	70.84	306.46	375	0.15	0.621	41.74	58.92%
Collector I	410B	MH410B	MH411A		8.22									590.4	590.4	3.35	0.80	6.41	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.29		9.51	9.51	3.14	0.00	0.00	9.55	45.12	62.02	300	0.20	0.618	35.57	78.84%
		MH411A	MH412A											0.0	590.4	3.35	0.80	6.41	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00			0.00	9.51	3.14	0.00	0.00	9.55	45.12	74.23	300	0.20	0.618	35.57	78.84%
		MH412A	119											0.0	590.4	3.35	0.80	6.41	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00			0.00	9.51	3.14	0.00	0.00	9.55	45.12	197.97	300	0.20	0.618	35.57	78.84%
Collector C		119	MH440A											0.0	4,547.1	2.83	0.80	41.65	0.00	3.95	0.00	1.51	0.00	0.00	1.00	1.77			0.00	105.73	34.89	0.00	0.00	78.31	155.42	158.71	525	0.12	0.696	77.11	49.61%
		MH440A	MH2016-CW											0.0	4,547.1	2.83	0.80	41.65	0.00	3.95	0.00	1.51	0.00	0.00	1.00	1.77			0.00	105.73	34.89	0.00	0.00	78.31	155.42	62.84	525	0.12	0.696	77.11	49.61%
		MH2016-CW	MH460A											0.0	4,547.1	2.83	0.80	41.65	0.00	3.95	0.00	1.51	0.00	0.00	1.00	1.77			0.00	105.73	34.89	0.00	0.00	78.31	155.42	51.29	525	0.12	0.696	77.11	49.61%
	450A	MH450A	MH455A					6.35						777.2	777.2	3.29	0.80	8.30	3.72	3.72	0.00	0.00	6.35	6.35	1.50	4.38	2.06		12.13	12.13	4.00	0.00	0.00	16.68	81.80	225.12	375	0.20	0.717	65.12	79.61%
		MH455A	MH446A											0.0	777.2	3.29	0.80	8.30	0.00	3.72	0.00	0.00	0.00	6.35	1.50	4.38			0.00	12.13	4.00	0.00	0.00	16.68	81.80	139.26	375	0.20	0.717	65.12	79.61%
	445A	MH446A	MH445A					8.18						1,001.2	1,778.5	3.10	0.80	17.87	0.00	3.72	0.00	0.00	8.18	14.53	1.50	7.69	1.95		10.13	22.26	7.35	0.00	0.00	32.91	81.80	107.45	375	0.20	0.717	48.89	59.77%
		MH445A	MH460A											0.0	1,778.5	3.10	0.80	17.87	0.00	3.72	0.00	0.00	0.00	14.53	1.50	7.69			0.00	22.26	7.35	0.00	0.00	32.91	81.80	247.53	375	0.20	0.717	48.89	59.77%
		MH460A	MH2017-CW											0.0	6,325.6	2.72	0.80	55.74	0.00	7.67	0.00	1.51	0.00	14.53	1.00	8.86			0.00	127.99	42.24	0.00	0.00	106.84	155.42	44.97	525	0.12	0.696	48.58	31.26%
		MH2017-CW	MH2018-CW											0.0	6,325.6	2.72	0.80	55.74	0.00	7.67	0.00	1.51	0.00	14.53	1.00	8.86			0.00	127.99	42.24	0.00	0.00	106.84	155.42	35.27	525	0.12	0.696	48.58	31.26%
	2018-CW	MH2018-CW	SA70791		8.81									632.7	6,958.3	2.69	0.80	60.60	0.00	7.67	0.00	1.51	0.00	14.53	1.00	8.86	1.38	8.51	18.70	146.69	48.41	0.00	0.00	117.87	155.42	389.43	525	0.12	0.696	37.55	24.16%
Portico Way	70791	SA70791	SA70790			1.65				140	380	24	1,662.4	8,620.7	2.61	0.80	73.05	0.00	7.67	0.00	1.51	0.00	14.53	1.00	8.86		2.61	27.86	174.55	57.60	0.00	0.00	139.51	204.74	52.82	525	0.21	0.916	65.23	31.86%
		SA70790	SA70789											0.0	8,620.7	2.61	0.80	73.05	0.00	7.67	0.00	1.51	0.00	14.53	1.00	8.86			0.00	174.55	57.60	0.00	0.00	139.51	191.87	*49.21*	*525*	*0.18*	0.859	52.36	27.29%
		SA70789	SA21883											0.0	8,620.7	2.61	0.80	73.05	0.00	7.67	0.00	1.51	0.00	14.53	1.00	8.86			0.00	174.55	57.60	0.00	0.00	139.51	255.60	61.62	525	0.32	1.144	116.08	45.42%

SANITARY SEWER DESIGN SHEET
for
4101 LIMEBANK RD., CITY OF OTTAWA

Robinson
Land Development

LOCATION					INDUSTRIAL FLOW				CUM. PEAK DESIGN FLOW (L/s)	PIPE						
	FROM MH	TO MH	DRAINAGE AREA (ha)	INFILTRATION AREA (ha)	POPULATION	AVG FLOW (L/s)	PEAK FLOW (L/s)	EXTRAN. FLOW (L/s)		LENGTH (m)	DIAMETER (mm)	SLOPE (%)	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	EXCESS CAPACITY (L/s)	PERCENT FULL
	142	141	21.00	44.61		8.51	8.51	14.72	**23.23**	680	300	0.35%	57.27	0.81	34.04	41%
	141	140				0.00	0.00	0.00	**23.23**	390	300	0.35%	57.27	0.81	34.04	41%
GROSS AREA	SITE	140	15.12	15.20		6.13	6.13	5.02	**11.14**	25	250	0.30%	32.60	0.66	21.46	34%
SITE	SITE	140	15.12	15.20	810	1.28	1.28	5.02	**6.30**	25	250	0.30%	32.60	0.66	26.30	19%
	140	SA61082				0.00	0.00	0.00	**34.37**	240	375	0.15%	67.97	0.62	33.60	51%

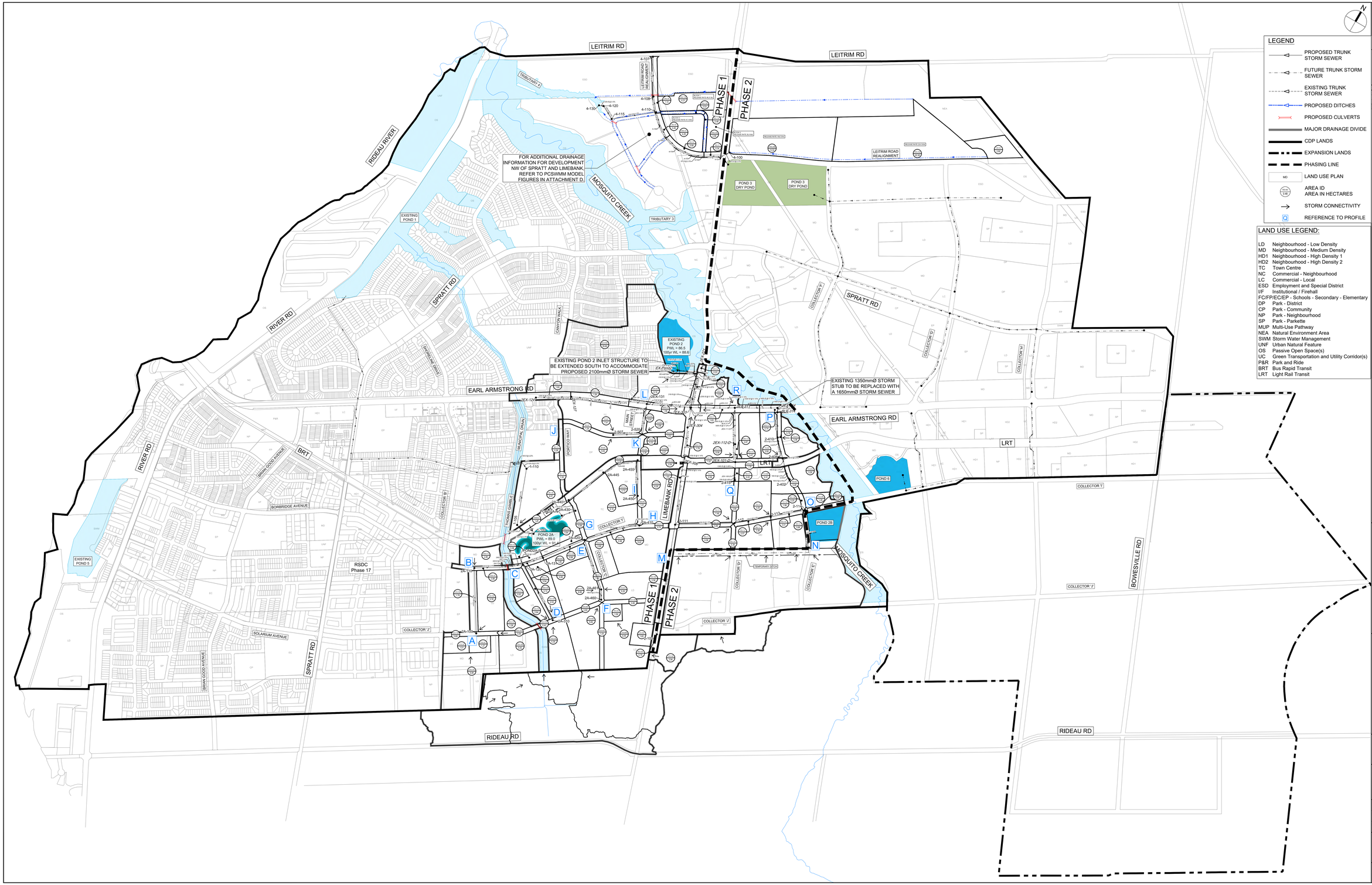
DESIGN PARAMETERS

Employment Flow =	**137**	**L/cap/day**	**per ISSU for water**
Employment Flow =	**35000**	**L/ha/day**	**per ISSU**
Maximum Residential Peak Factor =	4.0		
Employment Peak Factor =	1.0	if >20% area	per ISSU
Employment Peak Factor =	1.5	if <20% area	per ISSU
Extraneous Flow =	0.33	L/s/ha	
Minimum Velocity =	0.6	m/s	
Maximum Velocity =	3.0	m/s	

*Employee demand based on Riverside South Community Infrastructure Servicing Study Update Phase 1, Mosquito Creek Study Area (ISSU)
Note: Employee count based on average 15 employees per office unit, 35 per warehouse unit

2026-08-20

Appendix D



LEGEND

- PROPOSED TRUNK STORM SEWER
- FUTURE TRUNK STORM SEWER
- EXISTING TRUNK STORM SEWER
- PROPOSED DITCHES
- PROPOSED CULVERTS
- MAJOR DRAINAGE DIVIDE
- CDP LANDS
- EXPANSION LANDS
- PHASING LINE
- MD — LAND USE PLAN
- AREA ID / AREA IN HECTARES
- STORM CONNECTIVITY
- Q — REFERENCE TO PROFILE

LAND USE LEGEND:

LD	Neighbourhood - Low Density
MD	Neighbourhood - Medium Density
HD1	Neighbourhood - High Density 1
HD2	Neighbourhood - High Density 2
TC	Town Centre
NC	Commercial - Neighbourhood
LC	Commercial - Local
ESD	Employment and Special District
I/F	Institutional / Firehall
FC/FP/EC/EP	Schools - Secondary - Elementary
DP	Park - District
CP	Park - Community
NP	Park - Neighbourhood
SP	Park - Parkette
MUP	Multi-Use Pathway
NEA	Natural Environment Area
SWM	Storm Water Management
UNF	Urban Natural Feature
OS	Passive Open Space(s)
UC	Green Transportation and Utility Corridor(s)
P&R	Park and Ride
BRT	Bus Rapid Transit
LRT	Light Rail Transit

CLIENT

Ottawa

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ISSUES

No.	DESCRIPTION	DATE
1	ISSU PH 1 SUBMISSION 1	2022-12-02
2	ISSU PH 1 SUBMISSION 2	2023-05-24
3	ISSU PH 1 SUBMISSION 3	2023-08-18

CONSULTANTS

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PROJECT
RIVERSIDE SOUTH COMMUNITY INFRASTRUCTURE SERVICING STUDY UPDATE PHASE 1
MOSQUITO CREEK STUDY AREA

PROJECT NO: 125127

DRAWN BY: C.C.	CHECKED BY: L.E.
PROJECT MGR: M.B.	APPROVED BY: R.W.

SHEET TITLE
STORM DRAINAGE AREA PLAN

SHEET NUMBER 500 | ISSUE 3

File location: J:\125127_Riverside\02_Cad\Planning\02-Design\Key_Plan\Phase1\125127-500.dwg Last Saved: May 24, 2023 by Chris Cormier Plotted: Wednesday, May 24, 2023 11:34:37 AM by Chris Cormier

J:\136974_RSS_Employme\7.0_Production\7.03_Design\27_Water\Sheets\136974-Figure 4.1-Drainage Area Plan.dwg Layout Name: Layout1 Plot Style: ---- Plot Scale: 1:2.5849 Plotted At: 3/28/2023 10:30 AM Last Saved By: svukic Last Saved At: Mar. 28, 23

RIDEAU RIVER
RIVER ROAD
TRIBUTARY 4
MOSQUITO CREEK
LIMEBANK ROAD
LEITRIM ROAD
TRIBUTARY 3
SPRATT ROAD
LIMEBANK ROAD
N

4_S12 4.09 93
4_S13 8.19 92
4_S14 11.55 84
4_S16 15.86 93
4_S19 7.61 [28]
4_S20A 7.71 [63]
4_S20B 2.80 [41]
4_S21 11.03 93
4_S17 14.52 91
4_S18 20.36 93
4_S15 3.75 93
4_B1 4.21 93
4_B2 2.56 93
4_B3 4.28 93
4_B4 3.16 93
4_B5 1.71 93
4_B6 3.17 93
4_B7 2.09 93
4_B8 4.20 93
4_B9 1.23 93
4_B10 2.49 93
4_B11 2.25 93
4_B12 0.61 40
4_B13 7.27 93
4_R1_1-1 0.26 70
4_R1_1-2 0.27 70
4_R1_2-1 0.23 70
4_R1_2-2 0.24 70
4_R2_1-1 0.11 70
4_R2_1-2 0.11 70
4_R2_2-1 0.14 70
4_R2_2-2 0.15 70
4_R3_1-1 0.31 70
4_R3_1-2 0.30 70
4_R3_2-1 0.36 70
4_R3_2-2 0.39 70
4_R3_3-1 0.30 70
4_R3_3-2 0.29 70
4_R4_1 0.34 70
4_R4_2 0.80 70
4_R4_3 0.49 70
4_R4_4 0.33 70

LEGEND:

- SUBJECT SITE DRAINAGE AREAS
- EXTERNAL TRIBUTARY DRAINAGE AREAS TO TRIBUTARY 4 - EMPLOYMENT AND SPECIAL DISTRICT
- EXTERNAL TRIBUTARY DRAINAGE AREAS TO TRIBUTARY 4 - NATURAL ENVIRONMENT AREA
- EXTERNAL DRAINAGE AREAS
- 4_B1 / 5.36 | 83 — AREA ID; IMPERVIOUS VALUE (%) / [TIME OF CONCENTRATION (min)]; AREA (h)
- TOTAL FLOW CONNECTIVITY
- PROPOSED DITCH WITH FLOW DIRECTION
- PROPOSED CULVERT
- EXISTING CULVERT
- RVCA REGULATION LIMIT
- GEO Morphix (July 2019): MEANDER BELT WIDTH
- Paterson Group (June 2020): TOP OF SLOPE; STABLE SLOPE ALLOWANCE; TOE EROSION ALLOWANCE; EROSION ACCESS ALLOWANCE; LIMIT OF HAZARD LANDS

IBI

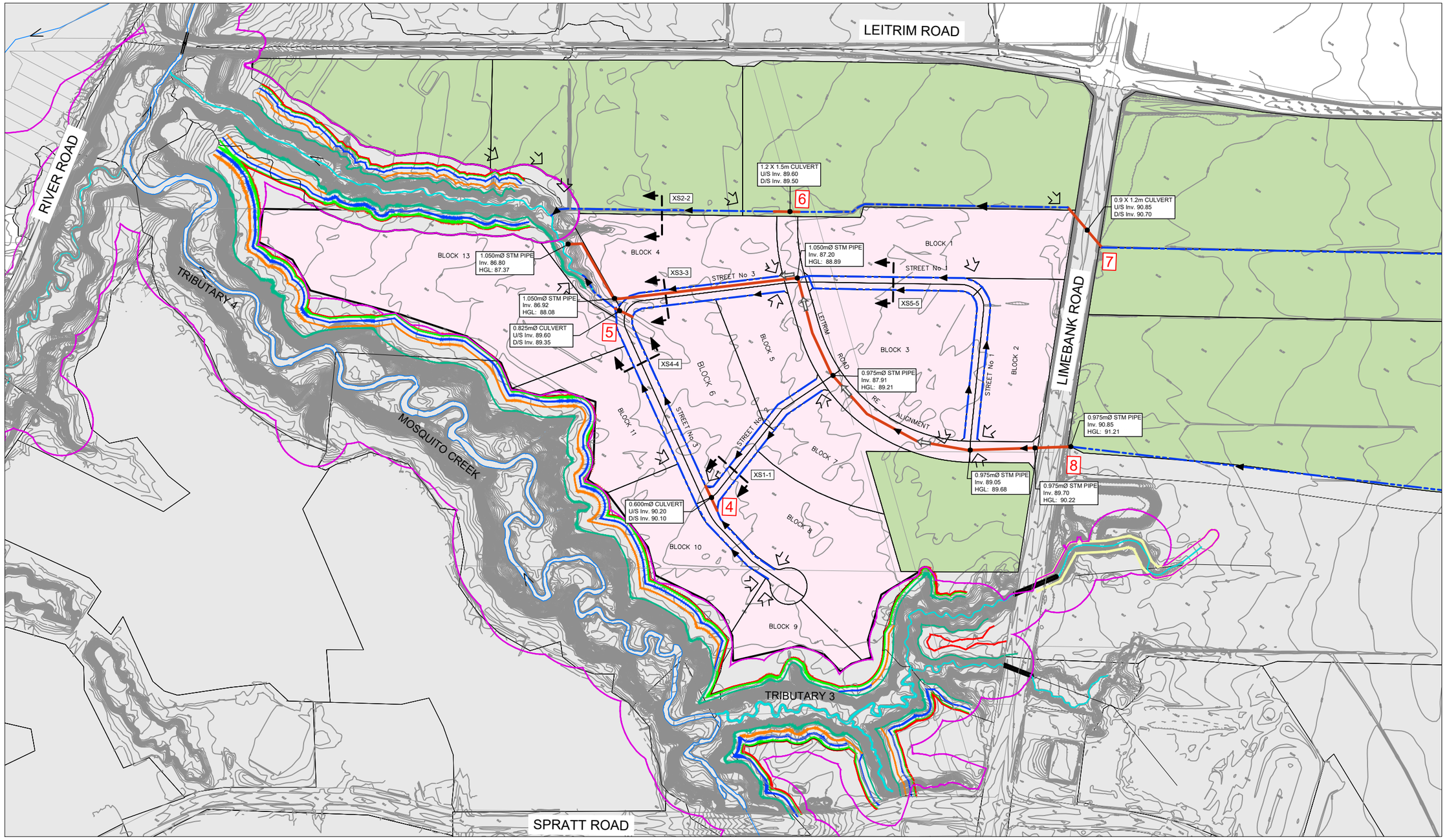
Scale: N.T.S

Project Title: RIVERSIDE SOUTH
3700 TWIN FALLS PLACE

Drawing Title: STORM DRAINAGE AREA PLAN

Sheet No.: FIGURE 4.1

J:\136974_RSS_Employme\7.0_Production\7.03_Design\27_Water\Sheets\136974-Figure 4.2- Cross sections Plan View.dwg Layout: Layout1 Plot Style: ----- Plot Scale: 1:2.5849 Plotted At: 3/28/2023 3:29 PM Last Saved By: svukic Last Saved At: Mar. 28, 23



LEGEND:

- SUBJECT SITE DRAINAGE AREAS
- EXTERNAL DRAINAGE AREAS TO TRIBUTARY 4 - EMPLOYMENT AND SPECIAL DISTRICT
- EXTERNAL DRAINAGE AREAS TO TRIBUTARY 4 - NATURAL ENVIRONMENT AREA
- EXTERNAL DRAINAGE AREAS
- PROPOSED DITCH WITH FLOW DIRECTION
- PROPOSED CULVERT / STORM PIPE
- EXISTING CULVERT
- 8 PROPOSED CULVERT ID
- XS1-1 CROSS SECTION ID
- TOTAL FLOW CONNECTIVITY
- MAJOR FLOW CONNECTIVITY
- RVCA REGULATION LIMIT

GEO Morphix (July 2019)

- MEANDER BELT WIDTH

Paterson Group (June 2020)

- TOP OF SLOPE
- STABLE SLOPE ALLOWANCE
- TOE EROSION ALLOWANCE
- EROSION ACCESS ALLOWANCE
- LIMIT OF HAZARD LANDS

NOTE:

FOR PROPOSED LIMEBANK CROSSING CULVERT "7" AND "8" REFER TO FIGURE 4.3 AND 4.4

FOR CROSS SECTIONS REFER TO FIGURE 4.5

IBI

Scale: N.T.S

Project Title: RIVERSIDE SOUTH
3700 TWIN FALLS PLACE

Drawing Title: CROSS SECTIONS
PLAN VIEW

Sheet No.: FIGURE 4.2

CATCH BASIN DATA

STATION	OFFSET	CATCH BASIN TYPE	T/G ELEVATION	CATCH BASIN LEAD LENGTH (1)	LENGTH (2)	INVERT (1)	INVERT (2)
4+735.00	11.75 L	OPSD 705.010 - S3,S22,S23	92.87	15.86	8.25	91.27	91.27
4+741.12	11.75 R	OPSD 705.020 - S3,S22,S23	92.84	6.91	8.25	91.24	91.24
4+784.95	11.75 L	OPSD 705.020 - S3,S22,S23	92.66	15.86	8.25	91.06	91.06
4+787.01	11.75 R	OPSD 705.010 - S3,S22,S23	92.66	6.91	8.25	91.06	91.06
4+829.99	11.75 L	OPSD 705.010 - S3,S22,S23	92.47	15.86	8.25	90.87	90.87
4+830.99	11.75 R	OPSD 705.020 - S3,S22,S23	92.47	6.91	8.25	90.87	90.87
4+875.03	11.75 L	OPSD 705.010 - S3,S22,S23	92.29	15.86	8.25	90.69	90.69
4+877.00	11.75 R	OPSD 705.020 - S3,S22,S23	92.28	6.91	8.25	90.68	90.68
4+914.99	11.75 L	OPSD 705.020 - S3,S22,S23	92.12	15.75	8.25	90.52	90.52

SUBDRAIN INSERT LOCATION TO ACCOMMODATE 200mm DIA. LEAD

CATCH BASIN DATA

NO.	STATION	OFFSET	CATCH BASIN TYPE	T/G ELEVATION	CATCH BASIN LEAD LENGTH (1)	LENGTH (2)	INVERT (1)	INVERT (2)
CB 62	14+921.00	11.75 R	OPSD 705.010 - S3,S22,S23	92.10	6.82	8.25	90.50	90.50
CB 63	14+954.96	12.00 L	OPSD 705.010 - S3,S22,S23	91.95	16.61	8.25	90.35	90.35
CB 64	14+965.98	12.25 R	OPSD 705.020 - S3,S22,S23	91.90	6.72	8.25	90.30	90.30
*CB 65	14+994.98	12.75 L	OPSD 705.020 - S3,S22,S23	91.77	17.81	8.25(E)	90.17	90.11(E&S)
*CB 66	15+011.00	13.00 R	OPSD 705.020 - S3,S22,S23	91.71	6.94	8.25(W)	90.11	89.86(S&W)
*CB 67	15+034.69	13.50 L	OPSD 705.010 - S3,S22,S23	91.60	18.77	39.00(N)	90.00	90.30(N)

NOTES:
- CATCH BASIN OFFSETS ARE FROM ALIGNMENT CONTROL LINE TO FACE OF CURB .
- CB LEAD NOTE (1) DENOTES CB LEAD LENGTH AND INVERT ELEVATION FOR FINAL CONNECTION TO THE STORM SEWER. CATCH BASIN LEAD TO BE CAPPED WITH SPIGOT PLUG. ALL CATCH BASIN LEADS TO STORM SEWER SHALL BE 200mm DIA. PVC SDR 35 INSTALLED AT 2% SLOPE UNLESS OTHERWISE SPECIFIED ON THE DRAWINGS.
- CB LEAD NOTE (2) DENOTES CB LEAD LENGTH AND INVERT ELEVATION FOR INTERIM CONNECTION TO THE DRAINAGE DITCH. ALL CATCH BASIN LEADS SHALL OUTLET AT BOTTOM OF DITCH; SLOPE OF EACH LEAD TO BE ADJUSTED ACCORDINGLY.
- REFER TO GENERAL ARRANGEMENT DRAWINGS BY MORRISON HERSHFIELD FOR CULVERT INSTALLATION DETAILS.

STORM MAINTENANCE HOLE DATA

NO.	STRUCTURE TYPE / SIZE	COORDINATES NORTHING	COORDINATES EASTING
ST 205	OPSD 701.011 - 1200mm Ø C/W SAFETY PLATFORM	5017512.291	369490.943
ST 206	OPSD 701.011 - 1200mm Ø C/W SAFETY PLATFORM	5017416.549	369531.556
ST 207	1520mm x 1830mm BOX MH C/W SAFETY PLATFORM	5017343.806	369562.369
ST 208	OPSD 701.011 - 1500mm Ø C/W SAFETY PLATFORM	5017260.463	369596.359

SANITARY MAINTENANCE HOLE DATA

NO.	STRUCTURE TYPE / SIZE	COORDINATES NORTHING	COORDINATES EASTING
SA 21	OPSD 701.010 - 1200mm Ø C/W SAFETY PLATFORM	5017458.133	369509.583
SA 21A	OPSD 701.010 - 1200mm Ø	5017437.048	369518.936
SA 22	OPSD 701.010 - 1200mm Ø	5017348.620	369556.389
SA 23	OPSD 701.010 - 1200mm Ø	5017237.505	369601.845

J.L.Richards
ENGINEERS·ARCHITECTS·PLANNERS
J.L. Richards & Associates Limited
864 Lady Ellen Place
Ottawa, ON Canada
K1Z 5M2
Tel: 613 728 3571
Fax: 613 728 6012

NO.	REVISIONS	BY	DATE
0	ISSUED FOR TENDER	JB	12/06/08
1	ISSUED FOR CONSTRUCTION	JB	03/06/09
2	ISSUED WITH CCN # 7	JB	09/08/09
3	'AS BUILT' INFORMATION ADDED	JB	10/25/12

NOTE: The location of the utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage

LIMEBANK ROAD WIDENING
BALMORAL DRIVE TO SPRATT ROAD

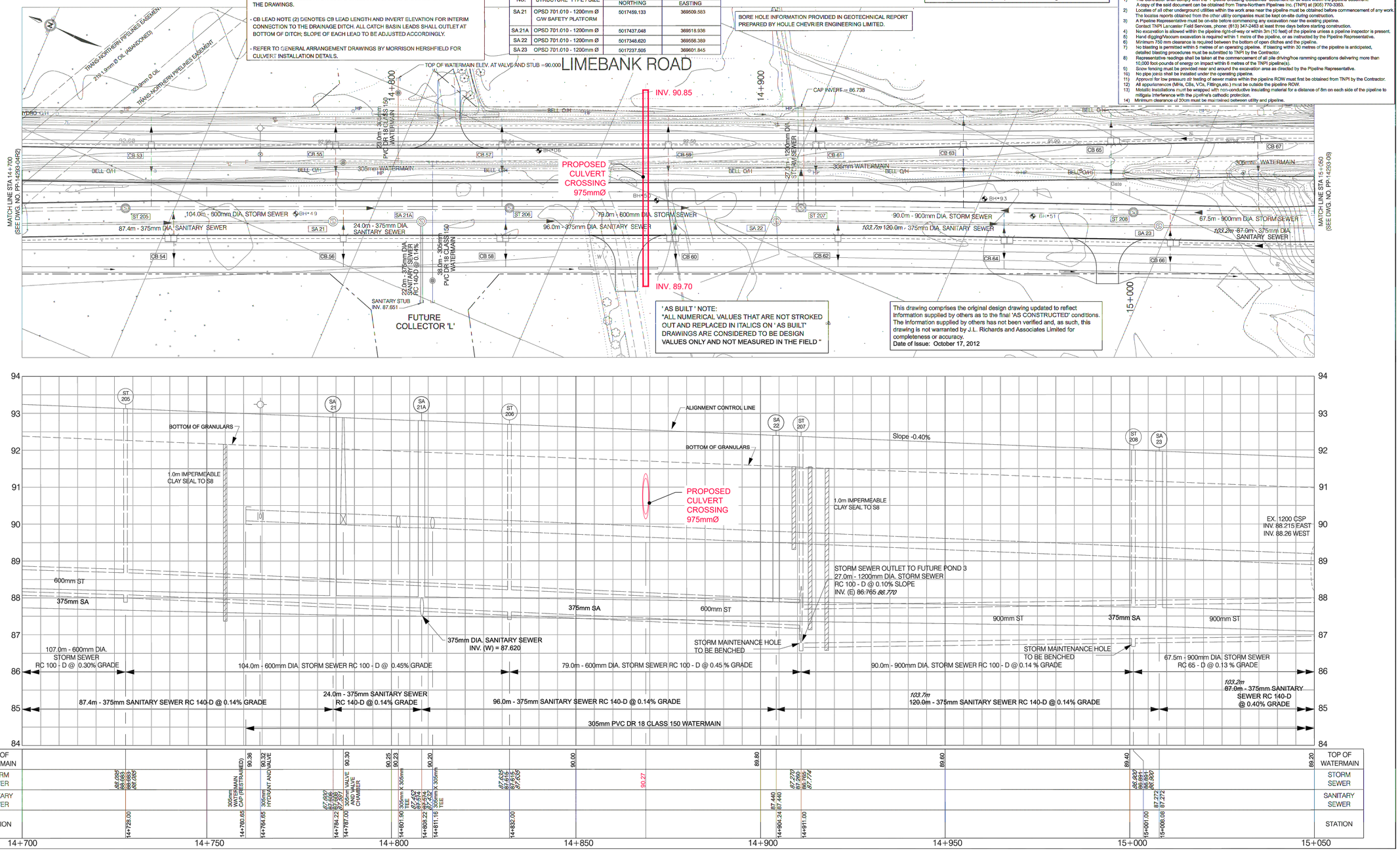
PLAN AND PROFILE
STA.14+700 TO STA. 15+050

Ottawa
CONTRACT NO.
ISB07-5047
DWG. NO.
PP -14293 -05R2
SHEET 54 OF 149
Date: OCTOBER 2008
Scale: 0m 5 10 20

W. NEWELL, P. Eng
Director Infrastructure Services
Des: MF, MGB Chkd: PDR

ZIAD A. GHADBAN, P. Eng.
Manager Construction Services - Development
Des: KD , JB Chkd: PDR

Trans-Northern Pipeline Crossing
1) The Contractor shall comply with the "Pipeline Crossing Guidelines" document for all work within the pipeline easement. A copy of the said document can be obtained from Trans-Northern Pipelines Inc. (TNPI) at (905) 770-3353.
2) Locates of all other underground utilities within the work area near the pipeline must be obtained before commencement of any work. The locates reports obtained from the other utility companies must be kept on-site during construction.
3) A Pipeline Representative must be on-site before commencing any excavation near the existing pipeline. Contact TNPI Lancaster Field Services, phone: (613) 347-2463 at least three days before starting construction.
4) No excavation is allowed within the pipeline right-of-way or within 3m (10 feet) of the pipeline unless a pipeline inspector is present.
5) Hand digging/Vacuum excavation is required within 1 metre of the pipeline, or as instructed by the Pipeline Representative.
6) Minimum 750 mm clearance is required between the bottom of open ditches and the pipeline.
7) No blasting is permitted within 5 metres of an operating pipeline. If blasting within 30 metres of the pipeline is anticipated, detailed blasting procedures must be submitted to TNPI by the Contractor.
8) Representative readings shall be taken at the commencement of all pile driving/hoe ramming operations delivering more than 10,000 foot-pounds of energy on impact within 6 metres of the TNPI pipeline(s).
9) Snow fencing must be provided near and around the excavation area as directed by the Pipeline Representative.
10) No pipe joints shall be installed under the operating pipeline.
11) Approval for low pressure air testing of sewer mains within the pipeline ROW must first be obtained from TNPI by the Contractor.
12) All appurtenances (MHs, CBs, VCs, Fittings,etc.) must be outside the pipeline ROW.
13) Metallic installations must be wrapped with non-conductive insulating material for a distance of 8m on each side of the pipeline to mitigate interference with the pipeline's cathodic protection.
14) Minimum clearance of 30cm must be maintained between utility and pipeline.



LEGEND:
PROPOSED CULVERT

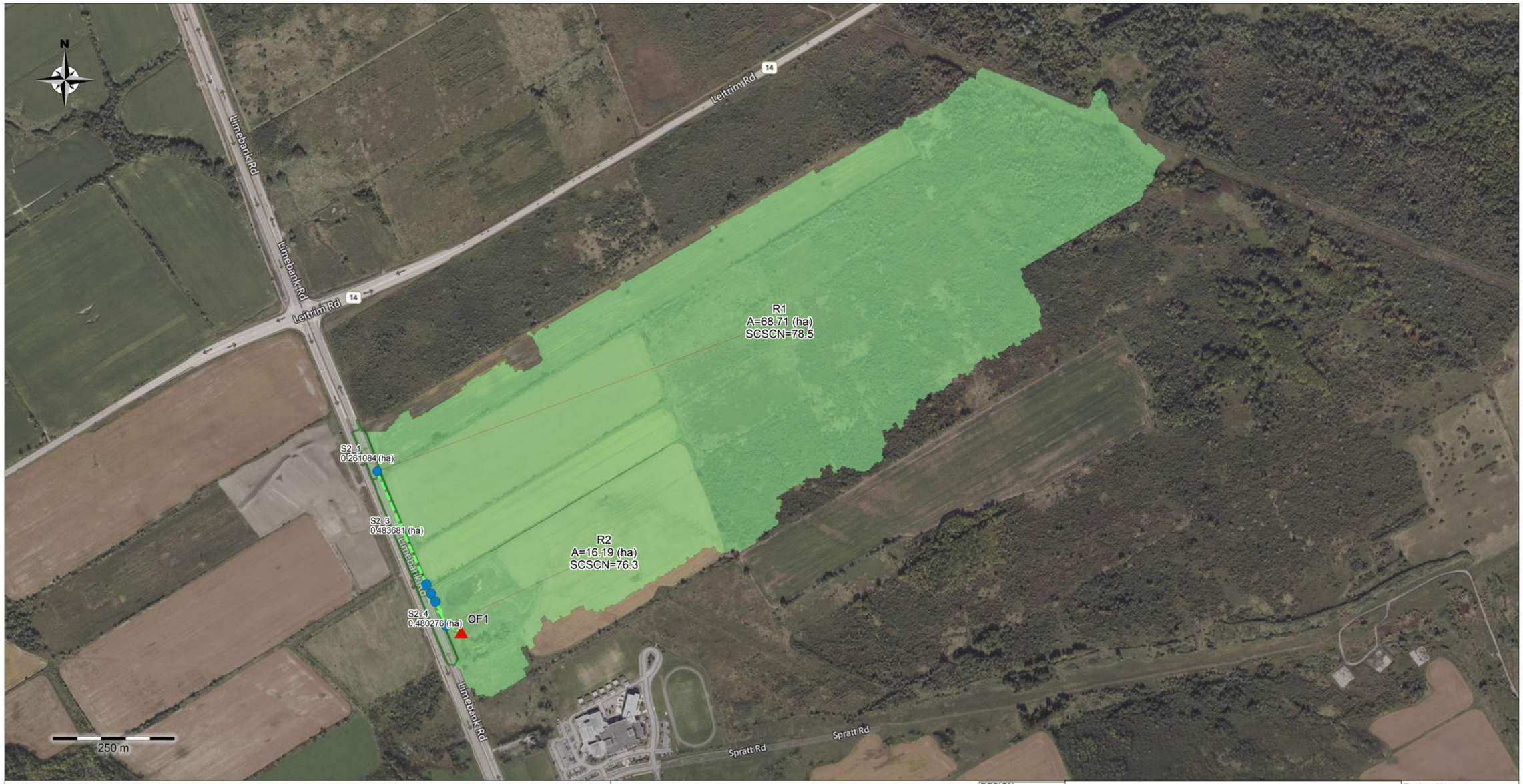
Scale

Project Title
RIVERSIDE SOUTH
3700 TWIN FALLS PLACE

Drawing Title
PROPOSED LIMEBANK ROAD CROSSING (SOUTH)

Sheet No.
FIGURE 4.4

J:\13974_BSS_Employee\7.0_Production\7.03_Design\27_Water\Sheets\139374-Figure 4.4 Proposed Limebank Road Crossing (South).dwg Layout Name: A4 Plot Style: ----- Plot Scale: 1.2584 Plotted At: 3/28/2023 11:57 AM Last Saved By: svaikk Last Saved At: Mar. 28, 23



Legend

- Junctions
- Outfalls
- Conduits
  - Coneyance ditch
  - Storm Sewer
  - Culvert
- ARM Subcatchments
- Subcatchments

Robinson Land Development
2936 Baseline Road,
Suite 200,
Ottawa, ON K2H 1B3
rcii.com

DESIGN:	JB
DRAWN:	JB
CHECKED:	ID
APPROVED	SM

GROUPE MONTONI

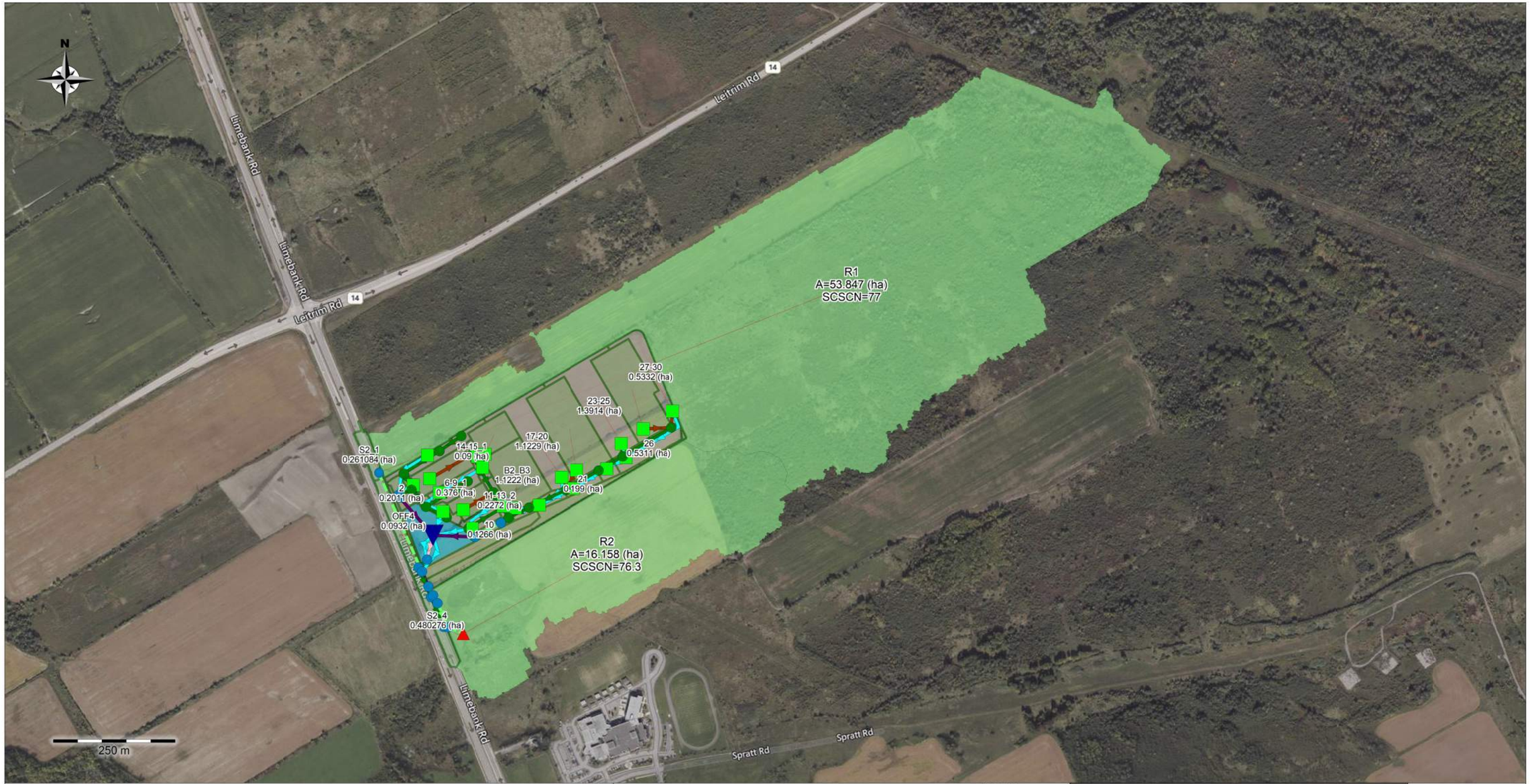
4101 LIMEBANK ROAD, OTTAWA, ON
LIGHT INDUSTRIAL DEVELOPMENT
SCOPE MASTER SERVICING STUDY

MODEL SCHEMATIC
PRE-DEVELOPMENT DRAINAGE CONDITIONS

Project No.: 23074

Date: AUGUST 2026

Drawing No.: FIGURE



Legend

- Outfalls
- Storages
  - CB Area
  - Storm Sewer Manhole
  - SWM Dry Pond
- Conduits
  - Coneyance ditch
  - Storm Sewer
  - Culvert
- Orifices
- Weirs
- Subcatchments
  - Subcatchments
  - SWM Block
  - Impervious

Robinson Land Development
2936 Baseline Road,
Suite 200,
Ottawa, ON K2H 1B3
rcii.com

DESIGN:	JB
DRAWN:	JB
CHECKED:	ID
APPROVED	SM

GROUPE MONTONI

4101 LIMEBANK ROAD, OTTAWA, ON
LIGHT INDUSTRIAL DEVELOPMENT
SCOPE MASTER SERVICING STUDY

MODEL SCHEMATIC
POST-DEVELOPMENT DRAINAGE CONDITIONS

Project No.: 23074

Date: AUGUST 2026

Drawing No.: FIGURE

1:100-year 12-hour SCS PCSWMM Input File Pre-Development Conditions

```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option             Value
FLOW_UNITS           CMS
INFILTRATION         HORTON
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         ELEVATION
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           01/01/2000
START_TIME           00:00:00
REPORT_START_DATE    01/01/2000
REPORT_START_TIME    00:00:00
END_DATE             01/04/2000
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:05:00
DRY_STEP             00:05:00
ROUTING_STEP         1
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              16

[FILES]
;;Interfacing Files
USE INFLOWS "C:\Users\jboyes\OneDrive - Robinson
Consultants\Documents\PCSWMM Projects\23074 -
Limebank\Modelling\PRE 12SCS100.arm.txt"

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0.0
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- -------- -------- ----------
Rainfall         INTENSITY 0:15     1.0      TIMESERIES
12SCS100

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area
%Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- --------
-------- -------- -------- -------- ----------------
S2_1             Rainfall         J1               0.261084
60       130.542  3        0
S2_3             Rainfall         STMMH_467_(STM)  0.483681
60       241.841  3        0
S2_4             Rainfall         STMMH_468_(STM)  0.480276
60       240.138  3        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv
PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ----------
---------- ---------- ----------
S2_1             0.013      0.25       1.57       4.67
0          OUTLET
S2_3             0.013      0.25       1.57       4.67
0          OUTLET
S2_4             0.013      0.25       1.57       4.67
0          OUTLET

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4
Param5
;;-------------- ---------- ---------- ---------- ----------
----------
S2_1             82.75      0          7          0
0          CURVE_NUMBER
S2_3             82.75      0          7          0
0          CURVE_NUMBER
S2_4             82.75      0          7          0
0          CURVE_NUMBER

[JUNCTIONS]
;;Name           Elevation  MaxDepth   InitDepth  SurDepth
Aponded
;;-------------- ---------- ---------- ---------- ----------
----------
J1               91.35      1.75       0          0
0
;Concentric Cylindrical Structure SI
STMMH_467_(STM)  90.4       1.65       0          0
0
;Concentric Cylindrical Structure SI
STMMH_468_(STM)  88.37      1.525      0          0
0
;Concentric Cylindrical Structure SI
STMMH_474_(STM)  89.84      3          0          0
0
;Concentric Cylindrical Structure SI
STMMH_475_(STM)  89.33      3          0          0
0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data
Gated    Route To
;;-------------- ---------- ---------- ---------------- ----
---- ----------------
OF1              87.12      FREE                        NO

[CONDUITS]
;;Name           From Node        To Node          Length
Roughness  InOffset   OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------
- ---------- ---------- ---------- ---------- ----------
;Concrete Pipe SI
244_(STM)        STMMH_474_(STM)  STMMH_475_(STM)  17.841
0.024      89.84      89.63      0          0
C1               STMMH_475_(STM)  STMMH_468_(STM)  53.881
0.04       89.33      88.37      0          0
C2               STMMH_467_(STM)  STMMH_474_(STM)  20.914
0.04       90.4       89.84      0          0
C3               STMMH_468_(STM)  OF1              30.258
0.01       88.37      87.12      0          0
C6               J1               STMMH_467_(STM)  258
0.01       91.35      90.4       0          0

[XSECTIONS]
;;Link           Shape        Geom1            Geom2
Geom3      Geom4      Barrels    Culvert
;;-------------- ------------ ---------------- ---------- --
-------- ---------- ---------- ----------
244_(STM)        CIRCULAR     1.3              0          0
0          1          6
C1               IRREGULAR    Channe_475-468
C2               IRREGULAR    Chann1_467-474
C3               IRREGULAR    Outfall_Ditch
C6               IRREGULAR    LimebankDitch

[TRANSECTS]
;;Transect Data in HEC-2 format
;
;Averaged transect, created from transects:
;4, 5
NC 0.045    0.045    0.035
```

```
X1 Channe_475-468    17       6.5      10.5     0.0      0.0
0.0      0.0      0.0
GR 90.216   1.5      90.094   2.5      90.016   3.5
89.953   4.5      89.925   5.5
GR 89.836   6.5      89.534   7.5      89.579   9.5
89.888   10.5     90.158   11.5
GR 90.326   12.5     90.496   13.5     90.682   14.5
90.917   15.5     91.125   16.5
GR 91.276   17.5     91.489   18.5
;
;Ditch created from measure tool across ditch
NC 0.045    0.045    0.035
X1 Channl_467-474    21       9        18       0.0      0.0
0.0      0.0      0.0
GR 92.045   0        92.053   1        92       2
91.883   3        91.753   4
GR 91.617   5        91.485   6        91.253   7
91.043   8        90.789   9
GR 90.494   10       90.304   11       90.256   12
90.242   13       90.249   14
GR 90.276   15       90.411   16       90.568   17
90.691   18       90.767   19
GR 90.8     19.497
;
;Ditch created from measure tool, conveying flows from
expanded DA down Limebank
NC 0.045    0.045    0.035
X1 LimebankDitch     15       4        11       0.0      0.0
0.0      0.0      0.0
GR 92.635   0        92.669   1        92.668   2
92.553   3        92.302   4
GR 91.813   5        91.5     6        91.158   7
91.19    8        91.362   9
GR 91.464   10       92.3     11       92.3     12
92.3     13       92.3     14
;
NC 0.045    0.045    0.045
X1 NW_Storage_Ditch  21       7        17       0.0      0.0
0.0      0.0      0.0
GR 92.56    0        92.454   1        92.346   2
92.13    3        91.831   4
GR 91.626   5        91.313   6        91.004   7
90.688   8        90.402   9
GR 90.243   10       90.401   11       90.509   12
90.6     13       90.694   14
GR 90.816   15       90.873   16       90.964   17
91.054   18       91.154   19
GR 91.265   20
;
;Ditch created from measure tool across ditch
NC 0.045    0.045    0.035
X1 Outfall_Ditch     16       5        10       0.0      0.0
0.0      0.0      0.0
GR 89.433   0        89.423   1        89.42    2
89.395   3        89.362   4
GR 89.251   5        88.665   6        88.05    7
88.136   8        89.023   9
GR 89.681   10       89.874   11       90.118   12
90.276   13       90.352   14
GR 90.378   14.848

[LOSSES]
;;Link           Kentry     Kexit      Kavg       Flap Gate
Seepage
;;-------------- ---------- ---------- ---------- ----------
----------
244_(STM)        0.9        0.5        0          NO
0

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;Rainfall (mm/hr)
12SCS10          01/01/2000 00:00:00   1.344
12SCS10          01/01/2000 00:15:00   1.613
12SCS10          01/01/2000 00:30:00   1.613
12SCS10          01/01/2000 00:45:00   1.613
12SCS10          01/01/2000 01:00:00   1.613
12SCS10          01/01/2000 01:15:00   1.613
12SCS10          01/01/2000 01:30:00   1.613
12SCS10          01/01/2000 01:45:00   1.882
12SCS10          01/01/2000 02:00:00   2.15
12SCS10          01/01/2000 02:15:00   2.15
12SCS10          01/01/2000 02:30:00   2.15
12SCS10          01/01/2000 02:45:00   2.15
12SCS10          01/01/2000 03:00:00   2.688
12SCS10          01/01/2000 03:15:00   2.688
12SCS10          01/01/2000 03:30:00   2.688
12SCS10          01/01/2000 03:45:00   2.688
12SCS10          01/01/2000 04:00:00   3.494
12SCS10          01/01/2000 04:15:00   3.763
12SCS10          01/01/2000 04:30:00   4.301
12SCS10          01/01/2000 04:45:00   4.838
12SCS10          01/01/2000 05:00:00   5.914
12SCS10          01/01/2000 05:15:00   8.87
12SCS10          01/01/2000 05:30:00   12.634
12SCS10          01/01/2000 05:45:00   102.144
12SCS10          01/01/2000 06:00:00   19.354
12SCS10          01/01/2000 06:15:00   11.021
12SCS10          01/01/2000 06:30:00   7.526
12SCS10          01/01/2000 06:45:00   5.645
12SCS10          01/01/2000 07:00:00   4.57
12SCS10          01/01/2000 07:15:00   3.763
12SCS10          01/01/2000 07:30:00   3.494
12SCS10          01/01/2000 07:45:00   3.226
12SCS10          01/01/2000 08:00:00   3.226
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12SCS10          01/01/2000 08:30:00   2.688
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12SCS10          01/01/2000 09:15:00   2.15
12SCS10          01/01/2000 09:30:00   2.15
12SCS10          01/01/2000 09:45:00   1.882
12SCS10          01/01/2000 10:00:00   1.613
12SCS10          01/01/2000 10:15:00   1.613
12SCS10          01/01/2000 10:30:00   1.613
12SCS10          01/01/2000 10:45:00   1.613
12SCS10          01/01/2000 11:00:00   1.613
12SCS10          01/01/2000 11:15:00   1.613
12SCS10          01/01/2000 11:30:00   1.613
12SCS10          01/01/2000 11:45:00   1.344

;Rainfall (mm/hr)
12SCS100         01/01/2000 00:00:00   1.92
12SCS100         01/01/2000 00:15:00   2.304
12SCS100         01/01/2000 00:30:00   2.304
12SCS100         01/01/2000 00:45:00   2.304
12SCS100         01/01/2000 01:00:00   2.304
12SCS100         01/01/2000 01:15:00   2.304
12SCS100         01/01/2000 01:30:00   2.304
12SCS100         01/01/2000 01:45:00   2.688
12SCS100         01/01/2000 02:00:00   3.072
12SCS100         01/01/2000 02:15:00   3.072
12SCS100         01/01/2000 02:30:00   3.072
12SCS100         01/01/2000 02:45:00   3.072
12SCS100         01/01/2000 03:00:00   3.84
12SCS100         01/01/2000 03:15:00   3.84
12SCS100         01/01/2000 03:30:00   3.84
12SCS100         01/01/2000 03:45:00   3.84
12SCS100         01/01/2000 04:00:00   4.992
12SCS100         01/01/2000 04:15:00   5.376
12SCS100         01/01/2000 04:30:00   6.144
12SCS100         01/01/2000 04:45:00   6.912
12SCS100         01/01/2000 05:00:00   8.448
12SCS100         01/01/2000 05:15:00   12.672
12SCS100         01/01/2000 05:30:00   18.048
12SCS100         01/01/2000 05:45:00   145.92
12SCS100         01/01/2000 06:00:00   27.648
12SCS100         01/01/2000 06:15:00   15.744
12SCS100         01/01/2000 06:30:00   10.752
12SCS100         01/01/2000 06:45:00   8.064
12SCS100         01/01/2000 07:00:00   6.528
12SCS100         01/01/2000 07:15:00   5.376
12SCS100         01/01/2000 07:30:00   4.992
12SCS100         01/01/2000 07:45:00   4.608
12SCS100         01/01/2000 08:00:00   4.608
12SCS100         01/01/2000 08:15:00   3.84
12SCS100         01/01/2000 08:30:00   3.84
12SCS100         01/01/2000 08:45:00   3.456
12SCS100         01/01/2000 09:00:00   3.072
12SCS100         01/01/2000 09:15:00   3.072
12SCS100         01/01/2000 09:30:00   3.072
```

```
12SCS100          01/01/2000 09:45:00   2.688
12SCS100          01/01/2000 10:00:00   2.304
12SCS100          01/01/2000 10:15:00   2.304
12SCS100          01/01/2000 10:30:00   2.304
12SCS100          01/01/2000 10:45:00   2.304
12SCS100          01/01/2000 11:00:00   2.304
12SCS100          01/01/2000 11:15:00   2.304
12SCS100          01/01/2000 11:30:00   2.304
12SCS100          01/01/2000 11:45:00   1.92

;Rainfall (mm/hr)
12SCS2            01/01/2000 00:00:00   0.864
12SCS2            01/01/2000 00:15:00   1.037
12SCS2            01/01/2000 00:30:00   1.037
12SCS2            01/01/2000 00:45:00   1.037
12SCS2            01/01/2000 01:00:00   1.037
12SCS2            01/01/2000 01:15:00   1.037
12SCS2            01/01/2000 01:30:00   1.037
12SCS2            01/01/2000 01:45:00   1.21
12SCS2            01/01/2000 02:00:00   1.382
12SCS2            01/01/2000 02:15:00   1.382
12SCS2            01/01/2000 02:30:00   1.382
12SCS2            01/01/2000 02:45:00   1.382
12SCS2            01/01/2000 03:00:00   1.728
12SCS2            01/01/2000 03:15:00   1.728
12SCS2            01/01/2000 03:30:00   1.728
12SCS2            01/01/2000 03:45:00   1.728
12SCS2            01/01/2000 04:00:00   2.246
12SCS2            01/01/2000 04:15:00   2.419
12SCS2            01/01/2000 04:30:00   2.765
12SCS2            01/01/2000 04:45:00   3.11
12SCS2            01/01/2000 05:00:00   3.802
12SCS2            01/01/2000 05:15:00   5.702
12SCS2            01/01/2000 05:30:00   8.122
12SCS2            01/01/2000 05:45:00   65.664
12SCS2            01/01/2000 06:00:00   12.442
12SCS2            01/01/2000 06:15:00   7.085
12SCS2            01/01/2000 06:30:00   4.838
12SCS2            01/01/2000 06:45:00   3.629
12SCS2            01/01/2000 07:00:00   2.938
12SCS2            01/01/2000 07:15:00   2.419
12SCS2            01/01/2000 07:30:00   2.246
12SCS2            01/01/2000 07:45:00   2.074
12SCS2            01/01/2000 08:00:00   2.074
12SCS2            01/01/2000 08:15:00   1.728
12SCS2            01/01/2000 08:30:00   1.728
12SCS2            01/01/2000 08:45:00   1.555
12SCS2            01/01/2000 09:00:00   1.382
12SCS2            01/01/2000 09:15:00   1.382
12SCS2            01/01/2000 09:30:00   1.382
12SCS2            01/01/2000 09:45:00   1.21
12SCS2            01/01/2000 10:00:00   1.037
12SCS2            01/01/2000 10:15:00   1.037
12SCS2            01/01/2000 10:30:00   1.037
12SCS2            01/01/2000 10:45:00   1.037
12SCS2            01/01/2000 11:00:00   1.037
12SCS2            01/01/2000 11:15:00   1.037
12SCS2            01/01/2000 11:30:00   1.037
12SCS2            01/01/2000 11:45:00   0.864

;Rainfall (mm/hr)
12SCS25           01/01/2000 00:00:00   1.584
12SCS25           01/01/2000 00:15:00   1.901
12SCS25           01/01/2000 00:30:00   1.901
12SCS25           01/01/2000 00:45:00   1.901
12SCS25           01/01/2000 01:00:00   1.901
12SCS25           01/01/2000 01:15:00   1.901
12SCS25           01/01/2000 01:30:00   1.901
12SCS25           01/01/2000 01:45:00   2.218
12SCS25           01/01/2000 02:00:00   2.534
12SCS25           01/01/2000 02:15:00   2.534
12SCS25           01/01/2000 02:30:00   2.534
12SCS25           01/01/2000 02:45:00   2.534
12SCS25           01/01/2000 03:00:00   3.168
12SCS25           01/01/2000 03:15:00   3.168
12SCS25           01/01/2000 03:30:00   3.168
12SCS25           01/01/2000 03:45:00   3.168
12SCS25           01/01/2000 04:00:00   4.118
12SCS25           01/01/2000 04:15:00   4.435
12SCS25           01/01/2000 04:30:00   5.069
12SCS25           01/01/2000 04:45:00   5.702
12SCS25           01/01/2000 05:00:00   6.97
12SCS25           01/01/2000 05:15:00   10.454
12SCS25           01/01/2000 05:30:00   14.89
12SCS25           01/01/2000 05:45:00   120.384
12SCS25           01/01/2000 06:00:00   22.81
12SCS25           01/01/2000 06:15:00   12.989
12SCS25           01/01/2000 06:30:00   8.87
12SCS25           01/01/2000 06:45:00   6.653
12SCS25           01/01/2000 07:00:00   5.386
12SCS25           01/01/2000 07:15:00   4.435
12SCS25           01/01/2000 07:30:00   4.118
12SCS25           01/01/2000 07:45:00   3.802
12SCS25           01/01/2000 08:00:00   3.802
12SCS25           01/01/2000 08:15:00   3.168
12SCS25           01/01/2000 08:30:00   3.168
12SCS25           01/01/2000 08:45:00   2.851
12SCS25           01/01/2000 09:00:00   2.534
12SCS25           01/01/2000 09:15:00   2.534
12SCS25           01/01/2000 09:30:00   2.534
12SCS25           01/01/2000 09:45:00   2.218
12SCS25           01/01/2000 10:00:00   1.901
12SCS25           01/01/2000 10:15:00   1.901
12SCS25           01/01/2000 10:30:00   1.901
12SCS25           01/01/2000 10:45:00   1.901
12SCS25           01/01/2000 11:00:00   1.901
12SCS25           01/01/2000 11:15:00   1.901
12SCS25           01/01/2000 11:30:00   1.901
12SCS25           01/01/2000 11:45:00   1.584

;Rainfall (mm/hr)
12SCS5            01/01/2000 00:00:00   1.152
12SCS5            01/01/2000 00:15:00   1.382
12SCS5            01/01/2000 00:30:00   1.382
12SCS5            01/01/2000 00:45:00   1.382
12SCS5            01/01/2000 01:00:00   1.382
12SCS5            01/01/2000 01:15:00   1.382
12SCS5            01/01/2000 01:30:00   1.382
12SCS5            01/01/2000 01:45:00   1.613
12SCS5            01/01/2000 02:00:00   1.843
12SCS5            01/01/2000 02:15:00   1.843
12SCS5            01/01/2000 02:30:00   1.843
12SCS5            01/01/2000 02:45:00   1.843
12SCS5            01/01/2000 03:00:00   2.304
12SCS5            01/01/2000 03:15:00   2.304
12SCS5            01/01/2000 03:30:00   2.304
12SCS5            01/01/2000 03:45:00   2.304
12SCS5            01/01/2000 04:00:00   2.995
12SCS5            01/01/2000 04:15:00   3.226
12SCS5            01/01/2000 04:30:00   3.686
12SCS5            01/01/2000 04:45:00   4.147
12SCS5            01/01/2000 05:00:00   5.069
12SCS5            01/01/2000 05:15:00   7.603
12SCS5            01/01/2000 05:30:00   10.829
12SCS5            01/01/2000 05:45:00   87.552
12SCS5            01/01/2000 06:00:00   16.589
12SCS5            01/01/2000 06:15:00   9.446
12SCS5            01/01/2000 06:30:00   6.451
12SCS5            01/01/2000 06:45:00   4.838
12SCS5            01/01/2000 07:00:00   3.917
12SCS5            01/01/2000 07:15:00   3.226
12SCS5            01/01/2000 07:30:00   2.995
12SCS5            01/01/2000 07:45:00   2.765
12SCS5            01/01/2000 08:00:00   2.765
12SCS5            01/01/2000 08:15:00   2.304
12SCS5            01/01/2000 08:30:00   2.304
12SCS5            01/01/2000 08:45:00   2.074
12SCS5            01/01/2000 09:00:00   1.843
12SCS5            01/01/2000 09:15:00   1.843
12SCS5            01/01/2000 09:30:00   1.843
12SCS5            01/01/2000 09:45:00   1.613
12SCS5            01/01/2000 10:00:00   1.382
12SCS5            01/01/2000 10:15:00   1.382
12SCS5            01/01/2000 10:30:00   1.382
12SCS5            01/01/2000 10:45:00   1.382
12SCS5            01/01/2000 11:00:00   1.382
12SCS5            01/01/2000 11:15:00   1.382
12SCS5            01/01/2000 11:30:00   1.382
12SCS5            01/01/2000 11:45:00   1.152

;Rainfall (mm/hr)
12SCS50           01/01/2000 00:00:00   1.752
```

```
12SCS50          01/01/2000 00:15:00   2.102
12SCS50          01/01/2000 00:30:00   2.102
12SCS50          01/01/2000 00:45:00   2.102
12SCS50          01/01/2000 01:00:00   2.102
12SCS50          01/01/2000 01:15:00   2.102
12SCS50          01/01/2000 01:30:00   2.102
12SCS50          01/01/2000 01:45:00   2.453
12SCS50          01/01/2000 02:00:00   2.803
12SCS50          01/01/2000 02:15:00   2.803
12SCS50          01/01/2000 02:30:00   2.803
12SCS50          01/01/2000 02:45:00   2.803
12SCS50          01/01/2000 03:00:00   3.504
12SCS50          01/01/2000 03:15:00   3.504
12SCS50          01/01/2000 03:30:00   3.504
12SCS50          01/01/2000 03:45:00   3.504
12SCS50          01/01/2000 04:00:00   4.555
12SCS50          01/01/2000 04:15:00   4.906
12SCS50          01/01/2000 04:30:00   5.606
12SCS50          01/01/2000 04:45:00   6.307
12SCS50          01/01/2000 05:00:00   7.709
12SCS50          01/01/2000 05:15:00   11.563
12SCS50          01/01/2000 05:30:00   16.469
12SCS50          01/01/2000 05:45:00   133.152
12SCS50          01/01/2000 06:00:00   25.229
12SCS50          01/01/2000 06:15:00   14.366
12SCS50          01/01/2000 06:30:00   9.811
12SCS50          01/01/2000 06:45:00   7.358
12SCS50          01/01/2000 07:00:00   5.957
12SCS50          01/01/2000 07:15:00   4.906
12SCS50          01/01/2000 07:30:00   4.555
12SCS50          01/01/2000 07:45:00   4.205
12SCS50          01/01/2000 08:00:00   4.205
12SCS50          01/01/2000 08:15:00   3.504
12SCS50          01/01/2000 08:30:00   3.504
12SCS50          01/01/2000 08:45:00   3.154
12SCS50          01/01/2000 09:00:00   2.803
12SCS50          01/01/2000 09:15:00   2.803
12SCS50          01/01/2000 09:30:00   2.803
12SCS50          01/01/2000 09:45:00   2.453
12SCS50          01/01/2000 10:00:00   2.102
12SCS50          01/01/2000 10:15:00   2.102
12SCS50          01/01/2000 10:30:00   2.102
12SCS50          01/01/2000 10:45:00   2.102
12SCS50          01/01/2000 11:00:00   2.102
12SCS50          01/01/2000 11:15:00   2.102
12SCS50          01/01/2000 11:30:00   2.102
12SCS50          01/01/2000 11:45:00   1.752

;Rainfall (mm/hr)
24SCS10          01/01/2000 00:00:00   0.792
24SCS10          01/01/2000 00:15:00   0.792
24SCS10          01/01/2000 00:30:00   0.792
24SCS10          01/01/2000 00:45:00   0.792
24SCS10          01/01/2000 01:00:00   0.792
24SCS10          01/01/2000 01:15:00   0.792
24SCS10          01/01/2000 01:30:00   0.792
24SCS10          01/01/2000 01:45:00   0.792
24SCS10          01/01/2000 02:00:00   0.936
24SCS10          01/01/2000 02:15:00   0.936
24SCS10          01/01/2000 02:30:00   0.936
24SCS10          01/01/2000 02:45:00   0.936
24SCS10          01/01/2000 03:00:00   0.936
24SCS10          01/01/2000 03:15:00   0.936
24SCS10          01/01/2000 03:30:00   0.936
24SCS10          01/01/2000 03:45:00   0.936
24SCS10          01/01/2000 04:00:00   1.152
24SCS10          01/01/2000 04:15:00   1.152
24SCS10          01/01/2000 04:30:00   1.152
24SCS10          01/01/2000 04:45:00   1.152
24SCS10          01/01/2000 05:00:00   1.152
24SCS10          01/01/2000 05:15:00   1.152
24SCS10          01/01/2000 05:30:00   1.152
24SCS10          01/01/2000 05:45:00   1.152
24SCS10          01/01/2000 06:00:00   1.296
24SCS10          01/01/2000 06:15:00   1.296
24SCS10          01/01/2000 06:30:00   1.296
24SCS10          01/01/2000 06:45:00   1.296
24SCS10          01/01/2000 07:00:00   1.584
24SCS10          01/01/2000 07:15:00   1.584
24SCS10          01/01/2000 07:30:00   1.584
24SCS10          01/01/2000 07:45:00   1.584
24SCS10          01/01/2000 08:00:00   1.872
24SCS10          01/01/2000 08:15:00   1.872
24SCS10          01/01/2000 08:30:00   2.016
24SCS10          01/01/2000 08:45:00   2.016
24SCS10          01/01/2000 09:00:00   2.304
24SCS10          01/01/2000 09:15:00   2.304
24SCS10          01/01/2000 09:30:00   2.592
24SCS10          01/01/2000 09:45:00   2.592
24SCS10          01/01/2000 10:00:00   3.312
24SCS10          01/01/2000 10:15:00   3.312
24SCS10          01/01/2000 10:30:00   4.464
24SCS10          01/01/2000 10:45:00   4.464
24SCS10          01/01/2000 11:00:00   6.912
24SCS10          01/01/2000 11:15:00   6.912
24SCS10          01/01/2000 11:30:00   21.312
24SCS10          01/01/2000 11:45:00   88.128
24SCS10          01/01/2000 12:00:00   10.368
24SCS10          01/01/2000 12:15:00   10.368
24SCS10          01/01/2000 12:30:00   5.328
24SCS10          01/01/2000 12:45:00   5.328
24SCS10          01/01/2000 13:00:00   3.888
24SCS10          01/01/2000 13:15:00   3.888
24SCS10          01/01/2000 13:30:00   3.024
24SCS10          01/01/2000 13:45:00   3.024
24SCS10          01/01/2000 14:00:00   2.16
24SCS10          01/01/2000 14:15:00   2.16
24SCS10          01/01/2000 14:30:00   2.16
24SCS10          01/01/2000 14:45:00   2.16
24SCS10          01/01/2000 15:00:00   2.16
24SCS10          01/01/2000 15:15:00   2.16
24SCS10          01/01/2000 15:30:00   2.16
24SCS10          01/01/2000 15:45:00   2.16
24SCS10          01/01/2000 16:00:00   1.296
24SCS10          01/01/2000 16:15:00   1.296
24SCS10          01/01/2000 16:30:00   1.296
24SCS10          01/01/2000 16:45:00   1.296
24SCS10          01/01/2000 17:00:00   1.296
24SCS10          01/01/2000 17:15:00   1.296
24SCS10          01/01/2000 17:30:00   1.296
24SCS10          01/01/2000 17:45:00   1.296
24SCS10          01/01/2000 18:00:00   1.296
24SCS10          01/01/2000 18:15:00   1.296
24SCS10          01/01/2000 18:30:00   1.296
24SCS10          01/01/2000 18:45:00   1.296
24SCS10          01/01/2000 19:00:00   1.296
24SCS10          01/01/2000 19:15:00   1.296
24SCS10          01/01/2000 19:30:00   1.296
24SCS10          01/01/2000 19:45:00   1.296
24SCS10          01/01/2000 20:00:00   0.864
24SCS10          01/01/2000 20:15:00   0.864
24SCS10          01/01/2000 20:30:00   0.864
24SCS10          01/01/2000 20:45:00   0.864
24SCS10          01/01/2000 21:00:00   0.864
24SCS10          01/01/2000 21:15:00   0.864
24SCS10          01/01/2000 21:30:00   0.864
24SCS10          01/01/2000 21:45:00   0.864
24SCS10          01/01/2000 22:00:00   0.864
24SCS10          01/01/2000 22:15:00   0.864
24SCS10          01/01/2000 22:30:00   0.864
24SCS10          01/01/2000 22:45:00   0.864
24SCS10          01/01/2000 23:00:00   0.864
24SCS10          01/01/2000 23:15:00   0.864
24SCS10          01/01/2000 23:30:00   0.864
24SCS10          01/01/2000 23:45:00   0.864

;Rainfall (mm/hr)
24SCS100         01/01/2000 00:00:00   1.135
24SCS100         01/01/2000 00:15:00   1.135
24SCS100         01/01/2000 00:30:00   1.135
24SCS100         01/01/2000 00:45:00   1.135
24SCS100         01/01/2000 01:00:00   1.135
24SCS100         01/01/2000 01:15:00   1.135
24SCS100         01/01/2000 01:30:00   1.135
24SCS100         01/01/2000 01:45:00   1.135
24SCS100         01/01/2000 02:00:00   1.342
24SCS100         01/01/2000 02:15:00   1.342
24SCS100         01/01/2000 02:30:00   1.342
24SCS100         01/01/2000 02:45:00   1.342
24SCS100         01/01/2000 03:00:00   1.342
24SCS100         01/01/2000 03:15:00   1.342
24SCS100         01/01/2000 03:30:00   1.342
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24SCS100        01/01/2000 03:45:00   1.342
24SCS100        01/01/2000 04:00:00   1.651
24SCS100        01/01/2000 04:15:00   1.651
24SCS100        01/01/2000 04:30:00   1.651
24SCS100        01/01/2000 04:45:00   1.651
24SCS100        01/01/2000 05:00:00   1.651
24SCS100        01/01/2000 05:15:00   1.651
24SCS100        01/01/2000 05:30:00   1.651
24SCS100        01/01/2000 05:45:00   1.651
24SCS100        01/01/2000 06:00:00   1.858
24SCS100        01/01/2000 06:15:00   1.858
24SCS100        01/01/2000 06:30:00   1.858
24SCS100        01/01/2000 06:45:00   1.858
24SCS100        01/01/2000 07:00:00   2.27
24SCS100        01/01/2000 07:15:00   2.27
24SCS100        01/01/2000 07:30:00   2.27
24SCS100        01/01/2000 07:45:00   2.27
24SCS100        01/01/2000 08:00:00   2.683
24SCS100        01/01/2000 08:15:00   2.683
24SCS100        01/01/2000 08:30:00   2.89
24SCS100        01/01/2000 08:45:00   2.89
24SCS100        01/01/2000 09:00:00   3.302
24SCS100        01/01/2000 09:15:00   3.302
24SCS100        01/01/2000 09:30:00   3.715
24SCS100        01/01/2000 09:45:00   3.715
24SCS100        01/01/2000 10:00:00   4.747
24SCS100        01/01/2000 10:15:00   4.747
24SCS100        01/01/2000 10:30:00   6.398
24SCS100        01/01/2000 10:45:00   6.398
24SCS100        01/01/2000 11:00:00   9.907
24SCS100        01/01/2000 11:15:00   9.907
24SCS100        01/01/2000 11:30:00   30.547
24SCS100        01/01/2000 11:45:00   126.317
24SCS100        01/01/2000 12:00:00   14.861
24SCS100        01/01/2000 12:15:00   14.861
24SCS100        01/01/2000 12:30:00   7.637
24SCS100        01/01/2000 12:45:00   7.637
24SCS100        01/01/2000 13:00:00   5.573
24SCS100        01/01/2000 13:15:00   5.573
24SCS100        01/01/2000 13:30:00   4.334
24SCS100        01/01/2000 13:45:00   4.334
24SCS100        01/01/2000 14:00:00   3.096
24SCS100        01/01/2000 14:15:00   3.096
24SCS100        01/01/2000 14:30:00   3.096
24SCS100        01/01/2000 14:45:00   3.096
24SCS100        01/01/2000 15:00:00   3.096
24SCS100        01/01/2000 15:15:00   3.096
24SCS100        01/01/2000 15:30:00   3.096
24SCS100        01/01/2000 15:45:00   3.096
24SCS100        01/01/2000 16:00:00   1.858
24SCS100        01/01/2000 16:15:00   1.858
24SCS100        01/01/2000 16:30:00   1.858
24SCS100        01/01/2000 16:45:00   1.858
24SCS100        01/01/2000 17:00:00   1.858
24SCS100        01/01/2000 17:15:00   1.858
24SCS100        01/01/2000 17:30:00   1.858
24SCS100        01/01/2000 17:45:00   1.858
24SCS100        01/01/2000 18:00:00   1.858
24SCS100        01/01/2000 18:15:00   1.858
24SCS100        01/01/2000 18:30:00   1.858
24SCS100        01/01/2000 18:45:00   1.858
24SCS100        01/01/2000 19:00:00   1.858
24SCS100        01/01/2000 19:15:00   1.858
24SCS100        01/01/2000 19:30:00   1.858
24SCS100        01/01/2000 19:45:00   1.858
24SCS100        01/01/2000 20:00:00   1.238
24SCS100        01/01/2000 20:15:00   1.238
24SCS100        01/01/2000 20:30:00   1.238
24SCS100        01/01/2000 20:45:00   1.238
24SCS100        01/01/2000 21:00:00   1.238
24SCS100        01/01/2000 21:15:00   1.238
24SCS100        01/01/2000 21:30:00   1.238
24SCS100        01/01/2000 21:45:00   1.238
24SCS100        01/01/2000 22:00:00   1.238
24SCS100        01/01/2000 22:15:00   1.238
24SCS100        01/01/2000 22:30:00   1.238
24SCS100        01/01/2000 22:45:00   1.238
24SCS100        01/01/2000 23:00:00   1.238
24SCS100        01/01/2000 23:15:00   1.238
24SCS100        01/01/2000 23:30:00   1.238
24SCS100        01/01/2000 23:45:00   1.238

;Rainfall (mm/hr)
24SCS2          01/01/2000 00:00:00   0.528
24SCS2          01/01/2000 00:15:00   0.528
24SCS2          01/01/2000 00:30:00   0.528
24SCS2          01/01/2000 00:45:00   0.528
24SCS2          01/01/2000 01:00:00   0.528
24SCS2          01/01/2000 01:15:00   0.528
24SCS2          01/01/2000 01:30:00   0.528
24SCS2          01/01/2000 01:45:00   0.528
24SCS2          01/01/2000 02:00:00   0.624
24SCS2          01/01/2000 02:15:00   0.624
24SCS2          01/01/2000 02:30:00   0.624
24SCS2          01/01/2000 02:45:00   0.624
24SCS2          01/01/2000 03:00:00   0.624
24SCS2          01/01/2000 03:15:00   0.624
24SCS2          01/01/2000 03:30:00   0.624
24SCS2          01/01/2000 03:45:00   0.624
24SCS2          01/01/2000 04:00:00   0.768
24SCS2          01/01/2000 04:15:00   0.768
24SCS2          01/01/2000 04:30:00   0.768
24SCS2          01/01/2000 04:45:00   0.768
24SCS2          01/01/2000 05:00:00   0.768
24SCS2          01/01/2000 05:15:00   0.768
24SCS2          01/01/2000 05:30:00   0.768
24SCS2          01/01/2000 05:45:00   0.768
24SCS2          01/01/2000 06:00:00   0.864
24SCS2          01/01/2000 06:15:00   0.864
24SCS2          01/01/2000 06:30:00   0.864
24SCS2          01/01/2000 06:45:00   0.864
24SCS2          01/01/2000 07:00:00   1.056
24SCS2          01/01/2000 07:15:00   1.056
24SCS2          01/01/2000 07:30:00   1.056
24SCS2          01/01/2000 07:45:00   1.056
24SCS2          01/01/2000 08:00:00   1.248
24SCS2          01/01/2000 08:15:00   1.248
24SCS2          01/01/2000 08:30:00   1.344
24SCS2          01/01/2000 08:45:00   1.344
24SCS2          01/01/2000 09:00:00   1.536
24SCS2          01/01/2000 09:15:00   1.536
24SCS2          01/01/2000 09:30:00   1.728
24SCS2          01/01/2000 09:45:00   1.728
24SCS2          01/01/2000 10:00:00   2.208
24SCS2          01/01/2000 10:15:00   2.208
24SCS2          01/01/2000 10:30:00   2.976
24SCS2          01/01/2000 10:45:00   2.976
24SCS2          01/01/2000 11:00:00   4.608
24SCS2          01/01/2000 11:15:00   4.608
24SCS2          01/01/2000 11:30:00   14.208
24SCS2          01/01/2000 11:45:00   58.752
24SCS2          01/01/2000 12:00:00   6.912
24SCS2          01/01/2000 12:15:00   6.912
24SCS2          01/01/2000 12:30:00   3.552
24SCS2          01/01/2000 12:45:00   3.552
24SCS2          01/01/2000 13:00:00   2.592
24SCS2          01/01/2000 13:15:00   2.592
24SCS2          01/01/2000 13:30:00   2.016
24SCS2          01/01/2000 13:45:00   2.016
24SCS2          01/01/2000 14:00:00   1.44
24SCS2          01/01/2000 14:15:00   1.44
24SCS2          01/01/2000 14:30:00   1.44
24SCS2          01/01/2000 14:45:00   1.44
24SCS2          01/01/2000 15:00:00   1.44
24SCS2          01/01/2000 15:15:00   1.44
24SCS2          01/01/2000 15:30:00   1.44
24SCS2          01/01/2000 15:45:00   1.44
24SCS2          01/01/2000 16:00:00   0.864
24SCS2          01/01/2000 16:15:00   0.864
24SCS2          01/01/2000 16:30:00   0.864
24SCS2          01/01/2000 16:45:00   0.864
24SCS2          01/01/2000 17:00:00   0.864
24SCS2          01/01/2000 17:15:00   0.864
24SCS2          01/01/2000 17:30:00   0.864
24SCS2          01/01/2000 17:45:00   0.864
24SCS2          01/01/2000 18:00:00   0.864
24SCS2          01/01/2000 18:15:00   0.864
24SCS2          01/01/2000 18:30:00   0.864
24SCS2          01/01/2000 18:45:00   0.864
24SCS2          01/01/2000 19:00:00   0.864
24SCS2          01/01/2000 19:15:00   0.864
24SCS2          01/01/2000 19:30:00   0.864
```

```
24SCS2           01/01/2000 19:45:00   0.864
24SCS2           01/01/2000 20:00:00   0.576
24SCS2           01/01/2000 20:15:00   0.576
24SCS2           01/01/2000 20:30:00   0.576
24SCS2           01/01/2000 20:45:00   0.576
24SCS2           01/01/2000 21:00:00   0.576
24SCS2           01/01/2000 21:15:00   0.576
24SCS2           01/01/2000 21:30:00   0.576
24SCS2           01/01/2000 21:45:00   0.576
24SCS2           01/01/2000 22:00:00   0.576
24SCS2           01/01/2000 22:15:00   0.576
24SCS2           01/01/2000 22:30:00   0.576
24SCS2           01/01/2000 22:45:00   0.576
24SCS2           01/01/2000 23:00:00   0.576
24SCS2           01/01/2000 23:15:00   0.576
24SCS2           01/01/2000 23:30:00   0.576
24SCS2           01/01/2000 23:45:00   0.576

;Rainfall (mm/hr)
24SCS25          01/01/2000 00:00:00   0.924
24SCS25          01/01/2000 00:15:00   0.924
24SCS25          01/01/2000 00:30:00   0.924
24SCS25          01/01/2000 00:45:00   0.924
24SCS25          01/01/2000 01:00:00   0.924
24SCS25          01/01/2000 01:15:00   0.924
24SCS25          01/01/2000 01:30:00   0.924
24SCS25          01/01/2000 01:45:00   0.924
24SCS25          01/01/2000 02:00:00   1.092
24SCS25          01/01/2000 02:15:00   1.092
24SCS25          01/01/2000 02:30:00   1.092
24SCS25          01/01/2000 02:45:00   1.092
24SCS25          01/01/2000 03:00:00   1.092
24SCS25          01/01/2000 03:15:00   1.092
24SCS25          01/01/2000 03:30:00   1.092
24SCS25          01/01/2000 03:45:00   1.092
24SCS25          01/01/2000 04:00:00   1.344
24SCS25          01/01/2000 04:15:00   1.344
24SCS25          01/01/2000 04:30:00   1.344
24SCS25          01/01/2000 04:45:00   1.344
24SCS25          01/01/2000 05:00:00   1.344
24SCS25          01/01/2000 05:15:00   1.344
24SCS25          01/01/2000 05:30:00   1.344
24SCS25          01/01/2000 05:45:00   1.344
24SCS25          01/01/2000 06:00:00   1.512
24SCS25          01/01/2000 06:15:00   1.512
24SCS25          01/01/2000 06:30:00   1.512
24SCS25          01/01/2000 06:45:00   1.512
24SCS25          01/01/2000 07:00:00   1.848
24SCS25          01/01/2000 07:15:00   1.848
24SCS25          01/01/2000 07:30:00   1.848
24SCS25          01/01/2000 07:45:00   1.848
24SCS25          01/01/2000 08:00:00   2.184
24SCS25          01/01/2000 08:15:00   2.184
24SCS25          01/01/2000 08:30:00   2.352
24SCS25          01/01/2000 08:45:00   2.352
24SCS25          01/01/2000 09:00:00   2.688
24SCS25          01/01/2000 09:15:00   2.688
24SCS25          01/01/2000 09:30:00   3.024
24SCS25          01/01/2000 09:45:00   3.024
24SCS25          01/01/2000 10:00:00   3.864
24SCS25          01/01/2000 10:15:00   3.864
24SCS25          01/01/2000 10:30:00   5.208
24SCS25          01/01/2000 10:45:00   5.208
24SCS25          01/01/2000 11:00:00   8.064
24SCS25          01/01/2000 11:15:00   8.064
24SCS25          01/01/2000 11:30:00   24.864
24SCS25          01/01/2000 11:45:00   102.816
24SCS25          01/01/2000 12:00:00   12.096
24SCS25          01/01/2000 12:15:00   12.096
24SCS25          01/01/2000 12:30:00   6.216
24SCS25          01/01/2000 12:45:00   6.216
24SCS25          01/01/2000 13:00:00   4.536
24SCS25          01/01/2000 13:15:00   4.536
24SCS25          01/01/2000 13:30:00   3.528
24SCS25          01/01/2000 13:45:00   3.528
24SCS25          01/01/2000 14:00:00   2.52
24SCS25          01/01/2000 14:15:00   2.52
24SCS25          01/01/2000 14:30:00   2.52
24SCS25          01/01/2000 14:45:00   2.52
24SCS25          01/01/2000 15:00:00   2.52
24SCS25          01/01/2000 15:15:00   2.52
24SCS25          01/01/2000 15:30:00   2.52
24SCS25          01/01/2000 15:45:00   2.52
24SCS25          01/01/2000 16:00:00   1.512
24SCS25          01/01/2000 16:15:00   1.512
24SCS25          01/01/2000 16:30:00   1.512
24SCS25          01/01/2000 16:45:00   1.512
24SCS25          01/01/2000 17:00:00   1.512
24SCS25          01/01/2000 17:15:00   1.512
24SCS25          01/01/2000 17:30:00   1.512
24SCS25          01/01/2000 17:45:00   1.512
24SCS25          01/01/2000 18:00:00   1.512
24SCS25          01/01/2000 18:15:00   1.512
24SCS25          01/01/2000 18:30:00   1.512
24SCS25          01/01/2000 18:45:00   1.512
24SCS25          01/01/2000 19:00:00   1.512
24SCS25          01/01/2000 19:15:00   1.512
24SCS25          01/01/2000 19:30:00   1.512
24SCS25          01/01/2000 19:45:00   1.512
24SCS25          01/01/2000 20:00:00   1.008
24SCS25          01/01/2000 20:15:00   1.008
24SCS25          01/01/2000 20:30:00   1.008
24SCS25          01/01/2000 20:45:00   1.008
24SCS25          01/01/2000 21:00:00   1.008
24SCS25          01/01/2000 21:15:00   1.008
24SCS25          01/01/2000 21:30:00   1.008
24SCS25          01/01/2000 21:45:00   1.008
24SCS25          01/01/2000 22:00:00   1.008
24SCS25          01/01/2000 22:15:00   1.008
24SCS25          01/01/2000 22:30:00   1.008
24SCS25          01/01/2000 22:45:00   1.008
24SCS25          01/01/2000 23:00:00   1.008
24SCS25          01/01/2000 23:15:00   1.008
24SCS25          01/01/2000 23:30:00   1.008
24SCS25          01/01/2000 23:45:00   1.008

;Rainfall (mm/hr)
24SCS5           01/01/2000 00:00:00   0.686
24SCS5           01/01/2000 00:15:00   0.686
24SCS5           01/01/2000 00:30:00   0.686
24SCS5           01/01/2000 00:45:00   0.686
24SCS5           01/01/2000 01:00:00   0.686
24SCS5           01/01/2000 01:15:00   0.686
24SCS5           01/01/2000 01:30:00   0.686
24SCS5           01/01/2000 01:45:00   0.686
24SCS5           01/01/2000 02:00:00   0.811
24SCS5           01/01/2000 02:15:00   0.811
24SCS5           01/01/2000 02:30:00   0.811
24SCS5           01/01/2000 02:45:00   0.811
24SCS5           01/01/2000 03:00:00   0.811
24SCS5           01/01/2000 03:15:00   0.811
24SCS5           01/01/2000 03:30:00   0.811
24SCS5           01/01/2000 03:45:00   0.811
24SCS5           01/01/2000 04:00:00   0.998
24SCS5           01/01/2000 04:15:00   0.998
24SCS5           01/01/2000 04:30:00   0.998
24SCS5           01/01/2000 04:45:00   0.998
24SCS5           01/01/2000 05:00:00   0.998
24SCS5           01/01/2000 05:15:00   0.998
24SCS5           01/01/2000 05:30:00   0.998
24SCS5           01/01/2000 05:45:00   0.998
24SCS5           01/01/2000 06:00:00   1.123
24SCS5           01/01/2000 06:15:00   1.123
24SCS5           01/01/2000 06:30:00   1.123
24SCS5           01/01/2000 06:45:00   1.123
24SCS5           01/01/2000 07:00:00   1.373
24SCS5           01/01/2000 07:15:00   1.373
24SCS5           01/01/2000 07:30:00   1.373
24SCS5           01/01/2000 07:45:00   1.373
24SCS5           01/01/2000 08:00:00   1.622
24SCS5           01/01/2000 08:15:00   1.622
24SCS5           01/01/2000 08:30:00   1.747
24SCS5           01/01/2000 08:45:00   1.747
24SCS5           01/01/2000 09:00:00   1.997
24SCS5           01/01/2000 09:15:00   1.997
24SCS5           01/01/2000 09:30:00   2.246
24SCS5           01/01/2000 09:45:00   2.246
24SCS5           01/01/2000 10:00:00   2.87
24SCS5           01/01/2000 10:15:00   2.87
24SCS5           01/01/2000 10:30:00   3.869
24SCS5           01/01/2000 10:45:00   3.869
24SCS5           01/01/2000 11:00:00   5.99
```

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24SCS5          01/01/2000 11:15:00   5.99
24SCS5          01/01/2000 11:30:00   18.47
24SCS5          01/01/2000 11:45:00   76.378
24SCS5          01/01/2000 12:00:00   8.986
24SCS5          01/01/2000 12:15:00   8.986
24SCS5          01/01/2000 12:30:00   4.618
24SCS5          01/01/2000 12:45:00   4.618
24SCS5          01/01/2000 13:00:00   3.37
24SCS5          01/01/2000 13:15:00   3.37
24SCS5          01/01/2000 13:30:00   2.621
24SCS5          01/01/2000 13:45:00   2.621
24SCS5          01/01/2000 14:00:00   1.872
24SCS5          01/01/2000 14:15:00   1.872
24SCS5          01/01/2000 14:30:00   1.872
24SCS5          01/01/2000 14:45:00   1.872
24SCS5          01/01/2000 15:00:00   1.872
24SCS5          01/01/2000 15:15:00   1.872
24SCS5          01/01/2000 15:30:00   1.872
24SCS5          01/01/2000 15:45:00   1.872
24SCS5          01/01/2000 16:00:00   1.123
24SCS5          01/01/2000 16:15:00   1.123
24SCS5          01/01/2000 16:30:00   1.123
24SCS5          01/01/2000 16:45:00   1.123
24SCS5          01/01/2000 17:00:00   1.123
24SCS5          01/01/2000 17:15:00   1.123
24SCS5          01/01/2000 17:30:00   1.123
24SCS5          01/01/2000 17:45:00   1.123
24SCS5          01/01/2000 18:00:00   1.123
24SCS5          01/01/2000 18:15:00   1.123
24SCS5          01/01/2000 18:30:00   1.123
24SCS5          01/01/2000 18:45:00   1.123
24SCS5          01/01/2000 19:00:00   1.123
24SCS5          01/01/2000 19:15:00   1.123
24SCS5          01/01/2000 19:30:00   1.123
24SCS5          01/01/2000 19:45:00   1.123
24SCS5          01/01/2000 20:00:00   0.749
24SCS5          01/01/2000 20:15:00   0.749
24SCS5          01/01/2000 20:30:00   0.749
24SCS5          01/01/2000 20:45:00   0.749
24SCS5          01/01/2000 21:00:00   0.749
24SCS5          01/01/2000 21:15:00   0.749
24SCS5          01/01/2000 21:30:00   0.749
24SCS5          01/01/2000 21:45:00   0.749
24SCS5          01/01/2000 22:00:00   0.749
24SCS5          01/01/2000 22:15:00   0.749
24SCS5          01/01/2000 22:30:00   0.749
24SCS5          01/01/2000 22:45:00   0.749
24SCS5          01/01/2000 23:00:00   0.749
24SCS5          01/01/2000 23:15:00   0.749
24SCS5          01/01/2000 23:30:00   0.749
24SCS5          01/01/2000 23:45:00   0.749

;Rainfall (mm/hr)
24SCS50         01/01/2000 00:00:00   1.03
24SCS50         01/01/2000 00:15:00   1.03
24SCS50         01/01/2000 00:30:00   1.03
24SCS50         01/01/2000 00:45:00   1.03
24SCS50         01/01/2000 01:00:00   1.03
24SCS50         01/01/2000 01:15:00   1.03
24SCS50         01/01/2000 01:30:00   1.03
24SCS50         01/01/2000 01:45:00   1.03
24SCS50         01/01/2000 02:00:00   1.217
24SCS50         01/01/2000 02:15:00   1.217
24SCS50         01/01/2000 02:30:00   1.217
24SCS50         01/01/2000 02:45:00   1.217
24SCS50         01/01/2000 03:00:00   1.217
24SCS50         01/01/2000 03:15:00   1.217
24SCS50         01/01/2000 03:30:00   1.217
24SCS50         01/01/2000 03:45:00   1.217
24SCS50         01/01/2000 04:00:00   1.498
24SCS50         01/01/2000 04:15:00   1.498
24SCS50         01/01/2000 04:30:00   1.498
24SCS50         01/01/2000 04:45:00   1.498
24SCS50         01/01/2000 05:00:00   1.498
24SCS50         01/01/2000 05:15:00   1.498
24SCS50         01/01/2000 05:30:00   1.498
24SCS50         01/01/2000 05:45:00   1.498
24SCS50         01/01/2000 06:00:00   1.685
24SCS50         01/01/2000 06:15:00   1.685
24SCS50         01/01/2000 06:30:00   1.685
24SCS50         01/01/2000 06:45:00   1.685
24SCS50         01/01/2000 07:00:00   2.059
24SCS50         01/01/2000 07:15:00   2.059
24SCS50         01/01/2000 07:30:00   2.059
24SCS50         01/01/2000 07:45:00   2.059
24SCS50         01/01/2000 08:00:00   2.434
24SCS50         01/01/2000 08:15:00   2.434
24SCS50         01/01/2000 08:30:00   2.621
24SCS50         01/01/2000 08:45:00   2.621
24SCS50         01/01/2000 09:00:00   2.995
24SCS50         01/01/2000 09:15:00   2.995
24SCS50         01/01/2000 09:30:00   3.37
24SCS50         01/01/2000 09:45:00   3.37
24SCS50         01/01/2000 10:00:00   4.306
24SCS50         01/01/2000 10:15:00   4.306
24SCS50         01/01/2000 10:30:00   5.803
24SCS50         01/01/2000 10:45:00   5.803
24SCS50         01/01/2000 11:00:00   8.986
24SCS50         01/01/2000 11:15:00   8.986
24SCS50         01/01/2000 11:30:00   27.706
24SCS50         01/01/2000 11:45:00   114.566
24SCS50         01/01/2000 12:00:00   13.478
24SCS50         01/01/2000 12:15:00   13.478
24SCS50         01/01/2000 12:30:00   6.926
24SCS50         01/01/2000 12:45:00   6.926
24SCS50         01/01/2000 13:00:00   5.054
24SCS50         01/01/2000 13:15:00   5.054
24SCS50         01/01/2000 13:30:00   3.931
24SCS50         01/01/2000 13:45:00   3.931
24SCS50         01/01/2000 14:00:00   2.808
24SCS50         01/01/2000 14:15:00   2.808
24SCS50         01/01/2000 14:30:00   2.808
24SCS50         01/01/2000 14:45:00   2.808
24SCS50         01/01/2000 15:00:00   2.808
24SCS50         01/01/2000 15:15:00   2.808
24SCS50         01/01/2000 15:30:00   2.808
24SCS50         01/01/2000 15:45:00   2.808
24SCS50         01/01/2000 16:00:00   1.685
24SCS50         01/01/2000 16:15:00   1.685
24SCS50         01/01/2000 16:30:00   1.685
24SCS50         01/01/2000 16:45:00   1.685
24SCS50         01/01/2000 17:00:00   1.685
24SCS50         01/01/2000 17:15:00   1.685
24SCS50         01/01/2000 17:30:00   1.685
24SCS50         01/01/2000 17:45:00   1.685
24SCS50         01/01/2000 18:00:00   1.685
24SCS50         01/01/2000 18:15:00   1.685
24SCS50         01/01/2000 18:30:00   1.685
24SCS50         01/01/2000 18:45:00   1.685
24SCS50         01/01/2000 19:00:00   1.685
24SCS50         01/01/2000 19:15:00   1.685
24SCS50         01/01/2000 19:30:00   1.685
24SCS50         01/01/2000 19:45:00   1.685
24SCS50         01/01/2000 20:00:00   1.123
24SCS50         01/01/2000 20:15:00   1.123
24SCS50         01/01/2000 20:30:00   1.123
24SCS50         01/01/2000 20:45:00   1.123
24SCS50         01/01/2000 21:00:00   1.123
24SCS50         01/01/2000 21:15:00   1.123
24SCS50         01/01/2000 21:30:00   1.123
24SCS50         01/01/2000 21:45:00   1.123
24SCS50         01/01/2000 22:00:00   1.123
24SCS50         01/01/2000 22:15:00   1.123
24SCS50         01/01/2000 22:30:00   1.123
24SCS50         01/01/2000 22:45:00   1.123
24SCS50         01/01/2000 23:00:00   1.123
24SCS50         01/01/2000 23:15:00   1.123
24SCS50         01/01/2000 23:30:00   1.123
24SCS50         01/01/2000 23:45:00   1.123

;Rainfall (mm/hr)
AUG4-88         01/01/2000 00:00:00   0
AUG4-88         01/01/2000 00:05:00   0.1
AUG4-88         01/01/2000 00:10:00   0.1
AUG4-88         01/01/2000 00:15:00   0
AUG4-88         01/01/2000 00:20:00   3.7
AUG4-88         01/01/2000 00:25:00   6.2
AUG4-88         01/01/2000 00:30:00   101.5
AUG4-88         01/01/2000 00:35:00   15.5
AUG4-88         01/01/2000 00:40:00   29.3
AUG4-88         01/01/2000 00:45:00   19.8
AUG4-88         01/01/2000 00:50:00   1.5
```

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AUG4-88          01/01/2000 00:55:00   1.7
AUG4-88          01/01/2000 01:00:00   5.4
AUG4-88          01/01/2000 01:05:00   24.6
AUG4-88          01/01/2000 01:10:00   26.5
AUG4-88          01/01/2000 01:15:00   34.9
AUG4-88          01/01/2000 01:20:00   10.2
AUG4-88          01/01/2000 01:25:00   27.1
AUG4-88          01/01/2000 01:30:00   104.4
AUG4-88          01/01/2000 01:35:00   27.5
AUG4-88          01/01/2000 01:40:00   62.5
AUG4-88          01/01/2000 01:45:00   31.8
AUG4-88          01/01/2000 01:50:00   79.8
AUG4-88          01/01/2000 01:55:00   67.5
AUG4-88          01/01/2000 02:00:00   156.2
AUG4-88          01/01/2000 02:05:00   5.1
AUG4-88          01/01/2000 02:10:00   0.2
AUG4-88          01/01/2000 02:15:00   0.2
AUG4-88          01/01/2000 02:20:00   0.2
AUG4-88          01/01/2000 02:25:00   0.2
AUG4-88          01/01/2000 02:30:00   0.2
AUG4-88          01/01/2000 02:35:00   0.2
AUG4-88          01/01/2000 02:40:00   0.2
AUG4-88          01/01/2000 02:45:00   0.2
AUG4-88          01/01/2000 02:50:00   0.2
AUG4-88          01/01/2000 02:55:00   0.2
AUG4-88          01/01/2000 03:00:00   12.8
AUG4-88          01/01/2000 03:05:00   14
AUG4-88          01/01/2000 03:10:00   22.2
AUG4-88          01/01/2000 03:15:00   21.8
AUG4-88          01/01/2000 03:20:00   1.4
AUG4-88          01/01/2000 03:25:00   0.2
AUG4-88          01/01/2000 03:30:00   0.2
AUG4-88          01/01/2000 03:35:00   0.2
AUG4-88          01/01/2000 03:40:00   0.2
AUG4-88          01/01/2000 03:45:00   0.2
AUG4-88          01/01/2000 03:50:00   0.2
AUG4-88          01/01/2000 03:55:00   0.2
AUG4-88          01/01/2000 04:00:00   0.2
AUG4-88          01/01/2000 04:05:00   0.2
AUG4-88          01/01/2000 04:10:00   0.2
AUG4-88          01/01/2000 04:15:00   0.2
AUG4-88          01/01/2000 04:20:00   0.2
AUG4-88          01/01/2000 04:25:00   0.2
AUG4-88          01/01/2000 04:30:00   0.2
AUG4-88          01/01/2000 04:35:00   0.2
AUG4-88          01/01/2000 04:40:00   0.2
AUG4-88          01/01/2000 04:45:00   0.2
AUG4-88          01/01/2000 04:50:00   0.2
AUG4-88          01/01/2000 04:55:00   0.2
AUG4-88          01/01/2000 05:00:00   2.9
AUG4-88          01/01/2000 05:05:00   7.8
AUG4-88          01/01/2000 05:10:00   10
AUG4-88          01/01/2000 05:15:00   6.3
AUG4-88          01/01/2000 05:20:00   5.1
AUG4-88          01/01/2000 05:25:00   9.8
AUG4-88          01/01/2000 05:30:00   2.6
AUG4-88          01/01/2000 05:35:00   1.7
AUG4-88          01/01/2000 05:40:00   0
AUG4-88          01/01/2000 05:45:00   0

;Rainfall (mm/hr)
AUG8-96          01/01/2000 00:00:00   4
AUG8-96          01/01/2000 00:05:00   11.9
AUG8-96          01/01/2000 00:10:00   26.5
AUG8-96          01/01/2000 00:15:00   13.3
AUG8-96          01/01/2000 00:20:00   0
AUG8-96          01/01/2000 00:25:00   2.7
AUG8-96          01/01/2000 00:30:00   0
AUG8-96          01/01/2000 00:35:00   8
AUG8-96          01/01/2000 00:40:00   18.6
AUG8-96          01/01/2000 00:45:00   10.6
AUG8-96          01/01/2000 00:50:00   21.2
AUG8-96          01/01/2000 00:55:00   2.7
AUG8-96          01/01/2000 01:00:00   2.7
AUG8-96          01/01/2000 01:05:00   15.9
AUG8-96          01/01/2000 01:10:00   66.3
AUG8-96          01/01/2000 01:15:00   55.7
AUG8-96          01/01/2000 01:20:00   122
AUG8-96          01/01/2000 01:25:00   88.9
AUG8-96          01/01/2000 01:30:00   9.3
AUG8-96          01/01/2000 01:35:00   8
AUG8-96          01/01/2000 01:40:00   4
AUG8-96          01/01/2000 01:45:00   0
AUG8-96          01/01/2000 01:50:00   2.7
AUG8-96          01/01/2000 01:55:00   0
AUG8-96          01/01/2000 02:00:00   0
AUG8-96          01/01/2000 02:05:00   0
AUG8-96          01/01/2000 02:10:00   5.3
AUG8-96          01/01/2000 02:15:00   0
AUG8-96          01/01/2000 02:20:00   0
AUG8-96          01/01/2000 02:25:00   0
AUG8-96          01/01/2000 02:30:00   0
AUG8-96          01/01/2000 02:35:00   0
AUG8-96          01/01/2000 02:40:00   0
AUG8-96          01/01/2000 02:45:00   4
AUG8-96          01/01/2000 02:50:00   53.1
AUG8-96          01/01/2000 02:55:00   69
AUG8-96          01/01/2000 03:00:00   63.7
AUG8-96          01/01/2000 03:05:00   58.4
AUG8-96          01/01/2000 03:10:00   47.8
AUG8-96          01/01/2000 03:15:00   15.9
AUG8-96          01/01/2000 03:20:00   13.3
AUG8-96          01/01/2000 03:25:00   8
AUG8-96          01/01/2000 03:30:00   5.3
AUG8-96          01/01/2000 03:35:00   6.6
AUG8-96          01/01/2000 03:40:00   2.7
AUG8-96          01/01/2000 03:45:00   4
AUG8-96          01/01/2000 03:50:00   2.7
AUG8-96          01/01/2000 03:55:00   4
AUG8-96          01/01/2000 04:00:00   2.7
AUG8-96          01/01/2000 04:05:00   5.3
AUG8-96          01/01/2000 04:10:00   4
AUG8-96          01/01/2000 04:15:00   2.7
AUG8-96          01/01/2000 04:20:00   4
AUG8-96          01/01/2000 04:25:00   2.7
AUG8-96          01/01/2000 04:30:00   1.3
AUG8-96          01/01/2000 04:35:00   1.3
AUG8-96          01/01/2000 04:40:00   0
AUG8-96          01/01/2000 04:45:00   0
AUG8-96          01/01/2000 04:50:00   0
AUG8-96          01/01/2000 04:55:00   0
AUG8-96          01/01/2000 05:00:00   2.7
AUG8-96          01/01/2000 05:05:00   0
AUG8-96          01/01/2000 05:10:00   0
AUG8-96          01/01/2000 05:15:00   0
AUG8-96          01/01/2000 05:20:00   0
AUG8-96          01/01/2000 05:25:00   0
AUG8-96          01/01/2000 05:30:00   0
AUG8-96          01/01/2000 05:35:00   0
AUG8-96          01/01/2000 05:40:00   1.3
AUG8-96          01/01/2000 05:45:00   0

;Rainfall (mm/hr)
CHI_3hr_10       01/01/2000 00:00:00   3.755
CHI_3hr_10       01/01/2000 00:10:00   4.478
CHI_3hr_10       01/01/2000 00:20:00   5.593
CHI_3hr_10       01/01/2000 00:30:00   7.551
CHI_3hr_10       01/01/2000 00:40:00   11.936
CHI_3hr_10       01/01/2000 00:50:00   30.856
CHI_3hr_10       01/01/2000 01:00:00   122.142
CHI_3hr_10       01/01/2000 01:10:00   35.237
CHI_3hr_10       01/01/2000 01:20:00   18.159
CHI_3hr_10       01/01/2000 01:30:00   12.238
CHI_3hr_10       01/01/2000 01:40:00   9.269
CHI_3hr_10       01/01/2000 01:50:00   7.492
CHI_3hr_10       01/01/2000 02:00:00   6.309
CHI_3hr_10       01/01/2000 02:10:00   5.465
CHI_3hr_10       01/01/2000 02:20:00   4.831
CHI_3hr_10       01/01/2000 02:30:00   4.338
CHI_3hr_10       01/01/2000 02:40:00   3.942
CHI_3hr_10       01/01/2000 02:50:00   3.617
CHI_3hr_10       01/01/2000 03:00:00   0

;Rainfall (mm/hr)
CHI_3hr_100      01/01/2000 00:00:00   5.339
CHI_3hr_100      01/01/2000 00:10:00   6.376
CHI_3hr_100      01/01/2000 00:20:00   7.977
CHI_3hr_100      01/01/2000 00:30:00   10.797
CHI_3hr_100      01/01/2000 00:40:00   17.136
CHI_3hr_100      01/01/2000 00:50:00   45.128
CHI_3hr_100      01/01/2000 01:00:00   178.107
CHI_3hr_100      01/01/2000 01:10:00   51.056
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CHI_3hr_100      01/01/2000 01:20:00   26.163
CHI_3hr_100      01/01/2000 01:30:00   17.571
CHI_3hr_100      01/01/2000 01:40:00   13.277
CHI_3hr_100      01/01/2000 01:50:00   10.712
CHI_3hr_100      01/01/2000 02:00:00   9.008
CHI_3hr_100      01/01/2000 02:10:00   7.793
CHI_3hr_100      01/01/2000 02:20:00   6.883
CHI_3hr_100      01/01/2000 02:30:00   6.174
CHI_3hr_100      01/01/2000 02:40:00   5.607
CHI_3hr_100      01/01/2000 02:50:00   5.142
CHI_3hr_100      01/01/2000 03:00:00   0

;Rainfall (mm/hr)
CHI_3hr_2        01/01/2000 00:00:00   2.491
CHI_3hr_2        01/01/2000 00:10:00   2.966
CHI_3hr_2        01/01/2000 00:20:00   3.696
CHI_3hr_2        01/01/2000 00:30:00   4.976
CHI_3hr_2        01/01/2000 00:40:00   7.828
CHI_3hr_2        01/01/2000 00:50:00   19.966
CHI_3hr_2        01/01/2000 01:00:00   76.805
CHI_3hr_2        01/01/2000 01:10:00   22.777
CHI_3hr_2        01/01/2000 01:20:00   11.852
CHI_3hr_2        01/01/2000 01:30:00   8.025
CHI_3hr_2        01/01/2000 01:40:00   6.096
CHI_3hr_2        01/01/2000 01:50:00   4.938
CHI_3hr_2        01/01/2000 02:00:00   4.165
CHI_3hr_2        01/01/2000 02:10:00   3.613
CHI_3hr_2        01/01/2000 02:20:00   3.197
CHI_3hr_2        01/01/2000 02:30:00   2.873
CHI_3hr_2        01/01/2000 02:40:00   2.613
CHI_3hr_2        01/01/2000 02:50:00   2.4
CHI_3hr_2        01/01/2000 03:00:00   0

;Rainfall (mm/hr)
CHI_3hr_25       01/01/2000 00:00:00   4.358
CHI_3hr_25       01/01/2000 00:10:00   5.202
CHI_3hr_25       01/01/2000 00:20:00   6.506
CHI_3hr_25       01/01/2000 00:30:00   8.801
CHI_3hr_25       01/01/2000 00:40:00   13.954
CHI_3hr_25       01/01/2000 00:50:00   36.302
CHI_3hr_25       01/01/2000 01:00:00   144.693
CHI_3hr_25       01/01/2000 01:10:00   41.479
CHI_3hr_25       01/01/2000 01:20:00   21.286
CHI_3hr_25       01/01/2000 01:30:00   14.308
CHI_3hr_25       01/01/2000 01:40:00   10.818
CHI_3hr_25       01/01/2000 01:50:00   8.732
CHI_3hr_25       01/01/2000 02:00:00   7.345
CHI_3hr_25       01/01/2000 02:10:00   6.356
CHI_3hr_25       01/01/2000 02:20:00   5.615
CHI_3hr_25       01/01/2000 02:30:00   5.038
CHI_3hr_25       01/01/2000 02:40:00   4.576
CHI_3hr_25       01/01/2000 02:50:00   4.197
CHI_3hr_25       01/01/2000 03:00:00   0

;Rainfall (mm/hr)
CHI_3hr_5        01/01/2000 00:00:00   3.256
CHI_3hr_5        01/01/2000 00:10:00   3.881
CHI_3hr_5        01/01/2000 00:20:00   4.844
CHI_3hr_5        01/01/2000 00:30:00   6.532
CHI_3hr_5        01/01/2000 00:40:00   10.308
CHI_3hr_5        01/01/2000 00:50:00   26.792
CHI_3hr_5        01/01/2000 01:00:00   103.93
CHI_3hr_5        01/01/2000 01:10:00   30.286
CHI_3hr_5        01/01/2000 01:20:00   15.655
CHI_3hr_5        01/01/2000 01:30:00   10.568
CHI_3hr_5        01/01/2000 01:40:00   8.013
CHI_3hr_5        01/01/2000 01:50:00   6.482
CHI_3hr_5        01/01/2000 02:00:00   5.462
CHI_3hr_5        01/01/2000 02:10:00   4.733
CHI_3hr_5        01/01/2000 02:20:00   4.186
CHI_3hr_5        01/01/2000 02:30:00   3.76
CHI_3hr_5        01/01/2000 02:40:00   3.418
CHI_3hr_5        01/01/2000 02:50:00   3.137
CHI_3hr_5        01/01/2000 03:00:00   0

;Rainfall (mm/hr)
CHI_3hr_50       01/01/2000 00:00:00   4.828
CHI_3hr_50       01/01/2000 00:10:00   5.766
CHI_3hr_50       01/01/2000 00:20:00   7.214
CHI_3hr_50       01/01/2000 00:30:00   9.763
CHI_3hr_50       01/01/2000 00:40:00   15.496
CHI_3hr_50       01/01/2000 00:50:00   40.401
CHI_3hr_50       01/01/2000 01:00:00   161.471
CHI_3hr_50       01/01/2000 01:10:00   46.17
CHI_3hr_50       01/01/2000 01:20:00   23.66
CHI_3hr_50       01/01/2000 01:30:00   15.89
CHI_3hr_50       01/01/2000 01:40:00   12.006
CHI_3hr_50       01/01/2000 01:50:00   9.687
CHI_3hr_50       01/01/2000 02:00:00   8.146
CHI_3hr_50       01/01/2000 02:10:00   7.047
CHI_3hr_50       01/01/2000 02:20:00   6.224
CHI_3hr_50       01/01/2000 02:30:00   5.583
CHI_3hr_50       01/01/2000 02:40:00   5.07
CHI_3hr_50       01/01/2000 02:50:00   4.649
CHI_3hr_50       01/01/2000 03:00:00   0

;Rainfall (mm/hr)
CHI_6hr_10       01/01/2000 00:00:00   1.944
CHI_6hr_10       01/01/2000 00:10:00   2.097
CHI_6hr_10       01/01/2000 00:20:00   2.278
CHI_6hr_10       01/01/2000 00:30:00   2.499
CHI_6hr_10       01/01/2000 00:40:00   2.772
CHI_6hr_10       01/01/2000 00:50:00   3.122
CHI_6hr_10       01/01/2000 01:00:00   3.585
CHI_6hr_10       01/01/2000 01:10:00   4.231
CHI_6hr_10       01/01/2000 01:20:00   5.199
CHI_6hr_10       01/01/2000 01:30:00   6.823
CHI_6hr_10       01/01/2000 01:40:00   10.137
CHI_6hr_10       01/01/2000 01:50:00   20.829
CHI_6hr_10       01/01/2000 02:00:00   122.142
CHI_6hr_10       01/01/2000 02:10:00   41.92
CHI_6hr_10       01/01/2000 02:20:00   21.263
CHI_6hr_10       01/01/2000 02:30:00   13.557
CHI_6hr_10       01/01/2000 02:40:00   9.991
CHI_6hr_10       01/01/2000 02:50:00   7.945
CHI_6hr_10       01/01/2000 03:00:00   6.62
CHI_6hr_10       01/01/2000 03:10:00   5.692
CHI_6hr_10       01/01/2000 03:20:00   5.004
CHI_6hr_10       01/01/2000 03:30:00   4.474
CHI_6hr_10       01/01/2000 03:40:00   4.052
CHI_6hr_10       01/01/2000 03:50:00   3.708
CHI_6hr_10       01/01/2000 04:00:00   3.422
CHI_6hr_10       01/01/2000 04:10:00   3.181
CHI_6hr_10       01/01/2000 04:20:00   2.973
CHI_6hr_10       01/01/2000 04:30:00   2.794
CHI_6hr_10       01/01/2000 04:40:00   2.636
CHI_6hr_10       01/01/2000 04:50:00   2.497
CHI_6hr_10       01/01/2000 05:00:00   2.373
CHI_6hr_10       01/01/2000 05:10:00   2.262
CHI_6hr_10       01/01/2000 05:20:00   2.162
CHI_6hr_10       01/01/2000 05:30:00   2.071
CHI_6hr_10       01/01/2000 05:40:00   1.988
CHI_6hr_10       01/01/2000 05:50:00   1.912
CHI_6hr_10       01/01/2000 06:00:00   0

;Rainfall (mm/hr)
CHI_6hr_100      01/01/2000 00:00:00   2.752
CHI_6hr_100      01/01/2000 00:10:00   2.969
CHI_6hr_100      01/01/2000 00:20:00   3.228
CHI_6hr_100      01/01/2000 00:30:00   3.542
CHI_6hr_100      01/01/2000 00:40:00   3.933
CHI_6hr_100      01/01/2000 00:50:00   4.432
CHI_6hr_100      01/01/2000 01:00:00   5.095
CHI_6hr_100      01/01/2000 01:10:00   6.021
CHI_6hr_100      01/01/2000 01:20:00   7.412
CHI_6hr_100      01/01/2000 01:30:00   9.748
CHI_6hr_100      01/01/2000 01:40:00   14.532
CHI_6hr_100      01/01/2000 01:50:00   30.054
CHI_6hr_100      01/01/2000 02:00:00   178.559
CHI_6hr_100      01/01/2000 02:10:00   60.818
CHI_6hr_100      01/01/2000 02:20:00   30.678
CHI_6hr_100      01/01/2000 02:30:00   19.483
CHI_6hr_100      01/01/2000 02:40:00   14.32
CHI_6hr_100      01/01/2000 02:50:00   11.366
CHI_6hr_100      01/01/2000 03:00:00   9.456
CHI_6hr_100      01/01/2000 03:10:00   8.119
CHI_6hr_100      01/01/2000 03:20:00   7.131
CHI_6hr_100      01/01/2000 03:30:00   6.37
CHI_6hr_100      01/01/2000 03:40:00   5.765
CHI_6hr_100      01/01/2000 03:50:00   5.272
CHI_6hr_100      01/01/2000 04:00:00   4.863
CHI_6hr_100      01/01/2000 04:10:00   4.517
```

```
CHI_6hr_100      01/01/2000 04:20:00   4.22
CHI_6hr_100      01/01/2000 04:30:00   3.964
CHI_6hr_100      01/01/2000 04:40:00   3.739
CHI_6hr_100      01/01/2000 04:50:00   3.54
CHI_6hr_100      01/01/2000 05:00:00   3.363
CHI_6hr_100      01/01/2000 05:10:00   3.205
CHI_6hr_100      01/01/2000 05:20:00   3.062
CHI_6hr_100      01/01/2000 05:30:00   2.932
CHI_6hr_100      01/01/2000 05:40:00   2.814
CHI_6hr_100      01/01/2000 05:50:00   2.706
CHI_6hr_100      01/01/2000 06:00:00   0

;Rainfall (mm/hr)
CHI_6hr_2        01/01/2000 00:00:00   1.297
CHI_6hr_2        01/01/2000 00:10:00   1.398
CHI_6hr_2        01/01/2000 00:20:00   1.518
CHI_6hr_2        01/01/2000 00:30:00   1.663
CHI_6hr_2        01/01/2000 00:40:00   1.843
CHI_6hr_2        01/01/2000 00:50:00   2.074
CHI_6hr_2        01/01/2000 01:00:00   2.379
CHI_6hr_2        01/01/2000 01:10:00   2.803
CHI_6hr_2        01/01/2000 01:20:00   3.439
CHI_6hr_2        01/01/2000 01:30:00   4.501
CHI_6hr_2        01/01/2000 01:40:00   6.66
CHI_6hr_2        01/01/2000 01:50:00   13.563
CHI_6hr_2        01/01/2000 02:00:00   76.805
CHI_6hr_2        01/01/2000 02:10:00   27.028
CHI_6hr_2        01/01/2000 02:20:00   13.849
CHI_6hr_2        01/01/2000 02:30:00   8.88
CHI_6hr_2        01/01/2000 02:40:00   6.566
CHI_6hr_2        01/01/2000 02:50:00   5.234
CHI_6hr_2        01/01/2000 03:00:00   4.369
CHI_6hr_2        01/01/2000 03:10:00   3.761
CHI_6hr_2        01/01/2000 03:20:00   3.311
CHI_6hr_2        01/01/2000 03:30:00   2.963
CHI_6hr_2        01/01/2000 03:40:00   2.686
CHI_6hr_2        01/01/2000 03:50:00   2.46
CHI_6hr_2        01/01/2000 04:00:00   2.272
CHI_6hr_2        01/01/2000 04:10:00   2.113
CHI_6hr_2        01/01/2000 04:20:00   1.976
CHI_6hr_2        01/01/2000 04:30:00   1.858
CHI_6hr_2        01/01/2000 04:40:00   1.754
CHI_6hr_2        01/01/2000 04:50:00   1.662
CHI_6hr_2        01/01/2000 05:00:00   1.58
CHI_6hr_2        01/01/2000 05:10:00   1.507
CHI_6hr_2        01/01/2000 05:20:00   1.441
CHI_6hr_2        01/01/2000 05:30:00   1.38
CHI_6hr_2        01/01/2000 05:40:00   1.326
CHI_6hr_2        01/01/2000 05:50:00   1.275
CHI_6hr_2        01/01/2000 06:00:00   0

;Rainfall (mm/hr)
CHI_6hr_25       01/01/2000 00:00:00   2.249
CHI_6hr_25       01/01/2000 00:10:00   2.426
CHI_6hr_25       01/01/2000 00:20:00   2.637
CHI_6hr_25       01/01/2000 00:30:00   2.893
CHI_6hr_25       01/01/2000 00:40:00   3.212
CHI_6hr_25       01/01/2000 00:50:00   3.619
CHI_6hr_25       01/01/2000 01:00:00   4.159
CHI_6hr_25       01/01/2000 01:10:00   4.914
CHI_6hr_25       01/01/2000 01:20:00   6.046
CHI_6hr_25       01/01/2000 01:30:00   7.947
CHI_6hr_25       01/01/2000 01:40:00   11.837
CHI_6hr_25       01/01/2000 01:50:00   24.442
CHI_6hr_25       01/01/2000 02:00:00   144.693
CHI_6hr_25       01/01/2000 02:10:00   49.392
CHI_6hr_25       01/01/2000 02:20:00   24.95
CHI_6hr_25       01/01/2000 02:30:00   15.861
CHI_6hr_25       01/01/2000 02:40:00   11.666
CHI_6hr_25       01/01/2000 02:50:00   9.263
CHI_6hr_25       01/01/2000 03:00:00   7.71
CHI_6hr_25       01/01/2000 03:10:00   6.622
CHI_6hr_25       01/01/2000 03:20:00   5.817
CHI_6hr_25       01/01/2000 03:30:00   5.197
CHI_6hr_25       01/01/2000 03:40:00   4.705
CHI_6hr_25       01/01/2000 03:50:00   4.303
CHI_6hr_25       01/01/2000 04:00:00   3.97
CHI_6hr_25       01/01/2000 04:10:00   3.688
CHI_6hr_25       01/01/2000 04:20:00   3.446
CHI_6hr_25       01/01/2000 04:30:00   3.237
CHI_6hr_25       01/01/2000 04:40:00   3.054
CHI_6hr_25       01/01/2000 04:50:00   2.892
CHI_6hr_25       01/01/2000 05:00:00   2.747
CHI_6hr_25       01/01/2000 05:10:00   2.618
CHI_6hr_25       01/01/2000 05:20:00   2.501
CHI_6hr_25       01/01/2000 05:30:00   2.396
CHI_6hr_25       01/01/2000 05:40:00   2.299
CHI_6hr_25       01/01/2000 05:50:00   2.211
CHI_6hr_25       01/01/2000 06:00:00   0

;Rainfall (mm/hr)
CHI_6hr_5        01/01/2000 00:00:00   1.69
CHI_6hr_5        01/01/2000 00:10:00   1.822
CHI_6hr_5        01/01/2000 00:20:00   1.979
CHI_6hr_5        01/01/2000 00:30:00   2.169
CHI_6hr_5        01/01/2000 00:40:00   2.406
CHI_6hr_5        01/01/2000 00:50:00   2.708
CHI_6hr_5        01/01/2000 01:00:00   3.109
CHI_6hr_5        01/01/2000 01:10:00   3.667
CHI_6hr_5        01/01/2000 01:20:00   4.504
CHI_6hr_5        01/01/2000 01:30:00   5.905
CHI_6hr_5        01/01/2000 01:40:00   8.759
CHI_6hr_5        01/01/2000 01:50:00   17.944
CHI_6hr_5        01/01/2000 02:00:00   104.193
CHI_6hr_5        01/01/2000 02:10:00   36.002
CHI_6hr_5        01/01/2000 02:20:00   18.319
CHI_6hr_5        01/01/2000 02:30:00   11.702
CHI_6hr_5        01/01/2000 02:40:00   8.634
CHI_6hr_5        01/01/2000 02:50:00   6.872
CHI_6hr_5        01/01/2000 03:00:00   5.73
CHI_6hr_5        01/01/2000 03:10:00   4.929
CHI_6hr_5        01/01/2000 03:20:00   4.335
CHI_6hr_5        01/01/2000 03:30:00   3.877
CHI_6hr_5        01/01/2000 03:40:00   3.513
CHI_6hr_5        01/01/2000 03:50:00   3.216
CHI_6hr_5        01/01/2000 04:00:00   2.969
CHI_6hr_5        01/01/2000 04:10:00   2.76
CHI_6hr_5        01/01/2000 04:20:00   2.58
CHI_6hr_5        01/01/2000 04:30:00   2.425
CHI_6hr_5        01/01/2000 04:40:00   2.289
CHI_6hr_5        01/01/2000 04:50:00   2.168
CHI_6hr_5        01/01/2000 05:00:00   2.061
CHI_6hr_5        01/01/2000 05:10:00   1.965
CHI_6hr_5        01/01/2000 05:20:00   1.878
CHI_6hr_5        01/01/2000 05:30:00   1.799
CHI_6hr_5        01/01/2000 05:40:00   1.727
CHI_6hr_5        01/01/2000 05:50:00   1.661
CHI_6hr_5        01/01/2000 06:00:00   0

;Rainfall (mm/hr)
CHI_6hr_50       01/01/2000 00:00:00   2.489
CHI_6hr_50       01/01/2000 00:10:00   2.685
CHI_6hr_50       01/01/2000 00:20:00   2.919
CHI_6hr_50       01/01/2000 00:30:00   3.203
CHI_6hr_50       01/01/2000 00:40:00   3.556
CHI_6hr_50       01/01/2000 00:50:00   4.008
CHI_6hr_50       01/01/2000 01:00:00   4.608
CHI_6hr_50       01/01/2000 01:10:00   5.445
CHI_6hr_50       01/01/2000 01:20:00   6.702
CHI_6hr_50       01/01/2000 01:30:00   8.815
CHI_6hr_50       01/01/2000 01:40:00   13.141
CHI_6hr_50       01/01/2000 01:50:00   27.177
CHI_6hr_50       01/01/2000 02:00:00   161.471
CHI_6hr_50       01/01/2000 02:10:00   54.997
CHI_6hr_50       01/01/2000 02:20:00   27.742
CHI_6hr_50       01/01/2000 02:30:00   17.619
CHI_6hr_50       01/01/2000 02:40:00   12.949
CHI_6hr_50       01/01/2000 02:50:00   10.278
CHI_6hr_50       01/01/2000 03:00:00   8.551
CHI_6hr_50       01/01/2000 03:10:00   7.342
CHI_6hr_50       01/01/2000 03:20:00   6.448
CHI_6hr_50       01/01/2000 03:30:00   5.76
CHI_6hr_50       01/01/2000 03:40:00   5.213
CHI_6hr_50       01/01/2000 03:50:00   4.768
CHI_6hr_50       01/01/2000 04:00:00   4.397
CHI_6hr_50       01/01/2000 04:10:00   4.084
CHI_6hr_50       01/01/2000 04:20:00   3.817
CHI_6hr_50       01/01/2000 04:30:00   3.584
CHI_6hr_50       01/01/2000 04:40:00   3.381
CHI_6hr_50       01/01/2000 04:50:00   3.201
CHI_6hr_50       01/01/2000 05:00:00   3.041
CHI_6hr_50       01/01/2000 05:10:00   2.898
```

```
CHI_6hr_50       01/01/2000 05:20:00   2.769
CHI_6hr_50       01/01/2000 05:30:00   2.651
CHI_6hr_50       01/01/2000 05:40:00   2.545
CHI_6hr_50       01/01/2000 05:50:00   2.447
CHI_6hr_50       01/01/2000 06:00:00   0

;Rainfall (mm/hr)
JUL1-79          01/01/2000 00:00:00   2.3
JUL1-79          01/01/2000 00:05:00   2.3
JUL1-79          01/01/2000 00:10:00   8.89
JUL1-79          01/01/2000 00:15:00   8.89
JUL1-79          01/01/2000 00:20:00   8.89
JUL1-79          01/01/2000 00:25:00   8.89
JUL1-79          01/01/2000 00:30:00   38.1
JUL1-79          01/01/2000 00:35:00   38.1
JUL1-79          01/01/2000 00:40:00   38.1
JUL1-79          01/01/2000 00:45:00   38.1
JUL1-79          01/01/2000 00:50:00   38.1
JUL1-79          01/01/2000 00:55:00   38.1
JUL1-79          01/01/2000 01:00:00   38.1
JUL1-79          01/01/2000 01:05:00   50.8
JUL1-79          01/01/2000 01:10:00   50.8
JUL1-79          01/01/2000 01:15:00   76.2
JUL1-79          01/01/2000 01:20:00   106.7
JUL1-79          01/01/2000 01:25:00   106.7
JUL1-79          01/01/2000 01:30:00   71.1
JUL1-79          01/01/2000 01:35:00   71.1
JUL1-79          01/01/2000 01:40:00   30.5
JUL1-79          01/01/2000 01:45:00   30.5
JUL1-79          01/01/2000 01:50:00   30.5
JUL1-79          01/01/2000 01:55:00   30.5
JUL1-79          01/01/2000 02:00:00   3.8
JUL1-79          01/01/2000 02:05:00   3.8
JUL1-79          01/01/2000 02:10:00   3.8
JUL1-79          01/01/2000 02:15:00   3.8
JUL1-79          01/01/2000 02:20:00   3.8
JUL1-79          01/01/2000 02:25:00   3.8
JUL1-79          01/01/2000 02:30:00   3.8
JUL1-79          01/01/2000 02:35:00   3.8
JUL1-79          01/01/2000 02:40:00   3.8
JUL1-79          01/01/2000 02:45:00   3.8
JUL1-79          01/01/2000 02:50:00   3.8
JUL1-79          01/01/2000 02:55:00   3.8

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]
Link       244_(STM)        Culvert
Link       C1               Ditch
Link       C2               Ditch
Link       C3               Ditch
Link       C6               Ditch

[MAP]
DIMENSIONS       369414.0948      5017174.41005
369675.9432      5017722.93495
UNITS            Meters

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[POLYGONS]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------


[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[PROFILES]
;;Name           Links
;;-------------- ----------
```

1:100-year 12-hour SCS PCSWMM Output File Pre-Development Conditions

```
  ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM VERSION 7.7.3920
  ---------------------------------------------------------

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

  Simulation start time:                  01/01/2000
00:00:00
  Simulation end time:                    01/04/2000
00:00:00
  Runoff wet weather time steps:          300 seconds
  Report time steps:                      60 seconds
  Number of data points:                  4321


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

  ------------------------------------------------------------
------------------------------------------------------------
----------------------------------------

Area    Time of Concentration  Time to Peak    Time after
Peak    Peak UH Flow    UH Depth
  Subcatchment          Runoff Method             Raingage
(ha)    (min)                 (min)            (min)
(m³/s/mm)       (mm)
  ------------------------------------------------------------
------------------------------------------------------------
----------------------------------------
  R2                    Nash IUH                  Rainfall
16.19  121.3                 80.87           464.13
0.01806         1
  R1                    Nash IUH                  Rainfall
68.71  146.5                 97.67           632.33
0.06347         1


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

  ------------------------------------------------------------
---------------------------------
                        Total       Total       Total
Total       Peak        Runoff
                        Precip      Losses      Runoff
Runoff      Runoff      Coeff
  Subcatchment          (mm)        (mm)        (mm)
10^6 ltr    CMS         (fraction)
  ------------------------------------------------------------
---------------------------------
  R2                    96          47          48.993
7.932       0.601       0.51
  R1                    96          44.158      51.841
35.62       2.335       0.54



  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build
5.2.4)
  ------------------------------------------------------------
--

  WARNING 02: maximum depth increased for Node
STMMH_467_(STM)
  WARNING 02: maximum depth increased for Node
STMMH_468_(STM)

  *************

  Element Count
  *************
  Number of rain gages ...... 1
  Number of subcatchments ... 3
  Number of nodes ........... 6
  Number of links ........... 5
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                        Data
Recording
  Name                  Data Source                     Type
Interval
  ------------------------------------------------------------
--------------
  Rainfall              12SCS100
INTENSITY   15 min.


  ********************
  Subcatchment Summary
  ********************
  Name                         Area     Width   %Imperv
%Slope Rain Gage            Outlet
  ------------------------------------------------------------
-------------------------------------------------
  S2_1                          0.26    130.54     60.00
3.0000 Rainfall             J1
  S2_3                          0.48    241.84     60.00
3.0000 Rainfall             STMMH_467_(STM)
  S2_4                          0.48    240.14     60.00
3.0000 Rainfall             STMMH_468_(STM)


  *************
  Node Summary
  *************
                                          Invert      Max.
Ponded    External
  Name                  Type                Elev.     Depth
Area    Inflow
  ------------------------------------------------------------
----------------------
  J1                    JUNCTION              91.35      1.75
0.0
  STMMH_467_(STM)       JUNCTION              90.40      1.81
0.0
  STMMH_468_(STM)       JUNCTION              88.37      2.33
0.0
  STMMH_474_(STM)       JUNCTION              89.84      3.00
0.0
  STMMH_475_(STM)       JUNCTION              89.33      3.00
0.0
  OF1                   OUTFALL               87.12      2.33
0.0


  *************
  Link Summary
  *************
  Name              From Node         To Node           Type
Length    %Slope Roughness
  ------------------------------------------------------------
-----------------------------------
  244_(STM)         STMMH_474_(STM)   STMMH_475_(STM)   CONDUIT
17.8    1.1771    0.0240
  C1                STMMH_475_(STM)   STMMH_468_(STM)   CONDUIT
53.9    1.7820    0.0350
  C2                STMMH_467_(STM)   STMMH_474_(STM)   CONDUIT
20.9    2.6786    0.0350
  C3                STMMH_468_(STM)   OF1               CONDUIT
30.3    4.1347    0.0350
  C6                J1                STMMH_467_(STM)   CONDUIT
258.0    0.3682    0.0350


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

```
  Cross Section Summary
  *********************
                                        Full     Full
Hyd.     Max.   No. of     Full
  Conduit          Shape                Depth     Area
Rad.    Width  Barrels     Flow
  ------------------------------------------------------------
----------------------------
  244_(STM)        CIRCULAR             1.30     1.33
0.33     1.30        1     2.84
  C1               Channe_475-468       1.96    21.10
1.03    17.00        1    82.04
  C2               Channl_467-474       1.81    20.86
1.26    19.50        1   113.75
  C3               Outfall_Ditch        2.33    14.74
1.00    14.85        1    85.61
  C6               LimebankDitch        1.51     9.32
0.89    14.00        1    14.92



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

  Transect Channe_475-468
  Area:
              0.0017     0.0058     0.0105     0.0156
0.0211
              0.0272     0.0337     0.0407     0.0486
0.0576
              0.0685     0.0812     0.0952     0.1105
0.1269
              0.1441     0.1623     0.1815     0.2011
0.2211
              0.2416     0.2625     0.2839     0.3057
0.3278
              0.3504     0.3734     0.3968     0.4205
0.4447
              0.4691     0.4939     0.5189     0.5443
0.5700
              0.5959     0.6223     0.6490     0.6760
0.7034
              0.7311     0.7593     0.7880     0.8171
0.8467
              0.8767     0.9070     0.9377     0.9687
1.0000
  Hrad:
              0.0189     0.0501     0.0806     0.1089
0.1354
              0.1607     0.1849     0.2100     0.2357
0.2639
              0.2833     0.2994     0.3144     0.3292
0.3446
              0.3608     0.3765     0.3941     0.4138
0.4339
              0.4544     0.4749     0.4955     0.5160
0.5364
              0.5568     0.5771     0.5973     0.6172
0.6373
              0.6575     0.6776     0.6975     0.7173
0.7369
              0.7562     0.7751     0.7938     0.8123
0.8307
              0.8485     0.8651     0.8814     0.8976
0.9143
              0.9317     0.9490     0.9661     0.9831
1.0000
  Width:
              0.1098     0.1392     0.1543     0.1693
0.1844
              0.1994     0.2145     0.2346     0.2679
0.3022
              0.3799     0.4249     0.4652     0.5032
0.5340
              0.5616     0.5941     0.6162     0.6299
0.6436
              0.6571     0.6707     0.6842     0.6977
0.7108
              0.7231     0.7355     0.7479     0.7602
0.7710
              0.7808     0.7905     0.8003     0.8101
0.8199
              0.8305     0.8415     0.8526     0.8637
0.8747
              0.8871     0.9023     0.9175     0.9328
0.9460
              0.9568     0.9676     0.9784     0.9892
1.0000

  Transect Channl_467-474
  Area:
              0.0040     0.0109     0.0188     0.0275
0.0370
              0.0473     0.0583     0.0700     0.0822
0.0952
              0.1089     0.1233     0.1384     0.1546
0.1719
              0.1901     0.2087     0.2275     0.2466
0.2659
              0.2855     0.3053     0.3253     0.3457
0.3664
              0.3873     0.4086     0.4302     0.4520
0.4742
              0.4966     0.5192     0.5422     0.5654
0.5889
              0.6129     0.6374     0.6623     0.6877
0.7136
              0.7399     0.7667     0.7940     0.8218
0.8500
              0.8788     0.9081     0.9379     0.9683
1.0000
  Hrad:
              0.0188     0.0413     0.0645     0.0861
0.1068
              0.1269     0.1463     0.1665     0.1860
0.2034
              0.2205     0.2373     0.2585     0.2808
0.3014
              0.3246     0.3484     0.3723     0.3962
0.4200
              0.4437     0.4673     0.4906     0.5137
0.5365
              0.5592     0.5816     0.6037     0.6258
0.6476
              0.6693     0.6908     0.7121     0.7333
0.7536
              0.7732     0.7925     0.8115     0.8302
0.8486
              0.8666     0.8844     0.9018     0.9190
0.9359
              0.9523     0.9683     0.9841     0.9978
1.0000
  Width:
              0.1785     0.2226     0.2461     0.2697
0.2926
              0.3142     0.3356     0.3538     0.3719
0.3933
              0.4147     0.4361     0.4631     0.4939
0.5264
              0.5450     0.5523     0.5596     0.5669
0.5742
              0.5815     0.5888     0.5975     0.6064
0.6152
              0.6240     0.6329     0.6417     0.6497
0.6577
              0.6657     0.6737     0.6817     0.6897
0.7019
              0.7159     0.7300     0.7441     0.7577
0.7714
              0.7850     0.7989     0.8132     0.8275
0.8418
              0.8571     0.8730     0.8889     0.9137
1.0000

  Transect LimebankDitch
  Area:
              0.0017     0.0056     0.0104     0.0160
0.0225
              0.0299     0.0381     0.0474     0.0580
0.0699
```

```
            0.0826    0.0958    0.1095    0.1235
0.1380
            0.1529    0.1682    0.1840    0.2002
0.2168
            0.2339    0.2514    0.2692    0.2874
0.3058
            0.3246    0.3437    0.3631    0.3829
0.4029
            0.4233    0.4440    0.4650    0.4863
0.5079
            0.5299    0.5522    0.5768    0.6095
0.6426
            0.6760    0.7099    0.7441    0.7787
0.8138
            0.8492    0.8851    0.9219    0.9596
1.0000
  Hrad:
            0.0169    0.0432    0.0667    0.0882
0.1085
            0.1279    0.1452    0.1583    0.1722
0.1866
            0.2115    0.2368    0.2613    0.2852
0.3085
            0.3313    0.3537    0.3757    0.3973
0.4185
            0.4394    0.4609    0.4837    0.5063
0.5285
            0.5504    0.5720    0.5934    0.6145
0.6354
            0.6561    0.6765    0.6968    0.7168
0.7367
            0.7564    0.7759    0.7933    0.8070
0.8224
            0.8390    0.8565    0.8747    0.8933
0.9124
            0.9319    0.9510    0.9697    0.9881
1.0000
  Width:
            0.0738    0.0959    0.1147    0.1336
0.1524
            0.1713    0.1923    0.2198    0.2473
0.2747
            0.2860    0.2953    0.3047    0.3142
0.3237
            0.3332    0.3427    0.3521    0.3616
0.3711
            0.3806    0.3892    0.3962    0.4032
0.4102
            0.4172    0.4242    0.4312    0.4382
0.4452
            0.4522    0.4592    0.4662    0.4732
0.4802
            0.4872    0.4942    0.7155    0.7241
0.7327
            0.7413    0.7499    0.7585    0.7671
0.7757
            0.7843    0.8015    0.8202    0.8469
1.0000

  Transect NW_Storage_Ditch
  Area:
            0.0005    0.0019    0.0043    0.0077
0.0120
            0.0174    0.0237    0.0312    0.0398
0.0494
            0.0600    0.0714    0.0839    0.0978
0.1129
            0.1290    0.1463    0.1646    0.1840
0.2044
            0.2257    0.2479    0.2708    0.2939
0.3173
            0.3409    0.3647    0.3888    0.4132
0.4377
            0.4626    0.4879    0.5136    0.5396
0.5659
            0.5926    0.6194    0.6466    0.6739
0.7016
            0.7295    0.7577    0.7863    0.8152
0.8445
            0.8742    0.9046    0.9357    0.9675
1.0000
  Hrad:
            0.0165    0.0330    0.0496    0.0659
0.0823
            0.0982    0.1130    0.1284    0.1442
0.1612
            0.1801    0.1987    0.2100    0.2218
0.2384
            0.2549    0.2712    0.2882    0.3057
0.3235
            0.3419    0.3601    0.3884    0.4170
0.4453
            0.4734    0.5012    0.5287    0.5561
0.5827
            0.6067    0.6305    0.6540    0.6774
0.7027
            0.7285    0.7542    0.7797    0.8050
0.8301
            0.8543    0.8763    0.8981    0.9198
0.9414
            0.9562    0.9670    0.9779    0.9888
1.0000
  Width:
            0.0292    0.0585    0.0877    0.1173
0.1468
            0.1774    0.2110    0.2443    0.2771
0.3080
            0.3343    0.3606    0.4007    0.4425
0.4753
            0.5083    0.5414    0.5734    0.6041
0.6339
            0.6623    0.6907    0.6993    0.7067
0.7141
            0.7215    0.7289    0.7363    0.7437
0.7518
            0.7631    0.7744    0.7857    0.7970
0.8057
            0.8134    0.8212    0.8289    0.8367
0.8444
            0.8530    0.8637    0.8744    0.8852
0.8959
            0.9133    0.9347    0.9563    0.9781
1.0000

  Transect Outfall_Ditch
  Area:
            0.0010    0.0039    0.0077    0.0120
0.0167
            0.0218    0.0273    0.0332    0.0394
0.0461
            0.0533    0.0608    0.0687    0.0770
0.0857
            0.0949    0.1045    0.1145    0.1249
0.1357
            0.1470    0.1586    0.1708    0.1835
0.1966
            0.2102    0.2250    0.2414    0.2604
0.2869
            0.3175    0.3483    0.3793    0.4106
0.4420
            0.4740    0.5067    0.5402    0.5744
0.6094
            0.6449    0.6811    0.7178    0.7552
0.7932
            0.8321    0.8720    0.9128    0.9552
1.0000
  Hrad:
            0.0226    0.0478    0.0842    0.1168
0.1468
            0.1749    0.2014    0.2268    0.2512
0.2749
            0.2980    0.3206    0.3428    0.3643
0.3855
            0.4065    0.4273    0.4479    0.4684
0.4888
            0.5088    0.5273    0.5459    0.5646
0.5834
            0.6043    0.6301    0.6515    0.6649
0.6574
            0.6509    0.6523    0.6590    0.6694
0.6826
```

```
             0.7056     0.7287     0.7516     0.7744
0.7971
             0.8197     0.8423     0.8648     0.8872
0.9090
             0.9301     0.9507     0.9703     0.9874
1.0000
  Width:
             0.0416     0.0781     0.0867     0.0954
0.1040
             0.1126     0.1213     0.1299     0.1385
0.1472
             0.1558     0.1644     0.1731     0.1819
0.1908
             0.1997     0.2086     0.2174     0.2263
0.2352
             0.2442     0.2543     0.2645     0.2746
0.2847
             0.2995     0.3325     0.3655     0.4568
0.6495
             0.6543     0.6591     0.6638     0.6686
0.6733
             0.6893     0.7055     0.7217     0.7380
0.7514
             0.7643     0.7771     0.7900     0.8028
0.8198
             0.8396     0.8595     0.8834     0.9247
1.0000


  ****************
  Analysis Options
  ****************
  Flow Units ............... CMS
  Process Models:
    Rainfall/Runoff ........ YES
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ NO
    Water Quality .......... NO
  Infiltration Method ...... HORTON
  Flow Routing Method ...... DYNWAVE
  Surcharge Method ......... EXTRAN
  Starting Date ............ 01/01/2000 00:00:00
  Ending Date .............. 01/04/2000 00:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 00:01:00
  Wet Time Step ............ 00:05:00
  Dry Time Step ............ 00:05:00
  Routing Time Step ........ 1.00 sec
  Variable Time Step ....... YES
  Maximum Trials ........... 8
  Number of Threads ........ 1
  Head Tolerance ........... 0.001500 m


  **************************        Volume         Depth
  Runoff Quantity Continuity     hectare-m            mm
  **************************     ---------      -------
  Total Precipitation ......         0.118        96.000
  Evaporation Loss .........         0.000         0.000
  Infiltration Loss ........         0.019        15.132
  Surface Runoff ...........         0.098        79.657
  Final Storage ............         0.002         1.443
  Continuity Error (%) .....        -0.243


  **************************        Volume        Volume
  Flow Routing Continuity        hectare-m      10^6 ltr
  **************************     ---------     ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......         0.098         0.976
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         4.355        43.546
  External Outflow .........         4.450        44.501
  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 (%) .....         0.048


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


  *******************************
  Highest Flow Instability Indexes
  *******************************
  All links are stable.


  *******************************
  Most Frequent Nonconverging Nodes
  *******************************
  Convergence obtained at all time steps.


  ************************
  Routing Time Step Summary
  ************************
  Minimum Time Step           :     0.50 sec
  Average Time Step           :     1.00 sec
  Maximum Time Step           :     1.00 sec
  % of Time in Steady State   :     0.00
  Average Iterations per Step :     2.00
  % of Steps Not Converging   :     0.00
  Time Step Frequencies       :
      1.000 -  0.871 sec      :   100.00 %
      0.871 -  0.758 sec      :     0.00 %
      0.758 -  0.660 sec      :     0.00 %
      0.660 -  0.574 sec      :     0.00 %
      0.574 -  0.500 sec      :     0.00 %


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

  ------------------------------------------------------------
------------------------------------------------------------
--------
                                Total      Total      Total
Total     Imperv       Perv      Total      Total     Peak
Runoff
                              Precip      Runon       Evap
Infil     Runoff     Runoff     Runoff     Runoff    Runoff
Coeff
  Subcatchment                 mm         mm         mm
mm         mm         mm         mm    10^6 ltr      CMS
  ------------------------------------------------------------
------------------------------------------------------------
--------
  S2_1                       96.00       0.00       0.00
15.13      56.70      22.95      79.66       0.21      0.10
0.830
  S2_3                       96.00       0.00       0.00
15.13      56.70      22.95      79.66       0.39      0.18
0.830
  S2_4                       96.00       0.00       0.00
15.13      56.70      22.95      79.66       0.38      0.18
0.830


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

  ------------------------------------------------------------
-----------------------
                                  Average  Maximum  Maximum
Time of Max    Reported
                                    Depth    Depth      HGL
Occurrence   Max Depth
  Node                 Type       Meters   Meters   Meters
days hr:min      Meters
```

```
  ---------------------------------------------------------
----------------------
  J1                    JUNCTION     0.09     0.69    92.04
0  06:42        0.69
  STMMH_467_(STM)       JUNCTION     0.05     0.85    91.25
0  07:57        0.85
  STMMH_468_(STM)       JUNCTION     0.06     0.61    88.98
0  07:52        0.61
  STMMH_474_(STM)       JUNCTION     0.12     1.66    91.50
0  07:56        1.65
  STMMH_475_(STM)       JUNCTION     0.04     0.44    89.77
0  07:56        0.44
  OF1                   OUTFALL      0.06     0.61    87.73
0  07:52        0.61


  *******************
  Node Inflow Summary
  *******************

  ---------------------------------------------------------
----------------------------------------
                                  Maximum  Maximum
Lateral       Total        Flow
                                  Lateral    Total  Time of
Max      Inflow      Inflow     Balance
                                   Inflow   Inflow
Occurrence      Volume      Volume       Error
  Node                 Type            CMS      CMS  days
hr:min    10^6 ltr    10^6 ltr     Percent
  ---------------------------------------------------------
----------------------------------------
  J1                    JUNCTION     2.339    2.339     0
07:45        35.8        35.8       0.005
  STMMH_467_(STM)       JUNCTION     0.176    7.575     0
07:52       0.385        48.5      -0.482
  STMMH_468_(STM)       JUNCTION     0.608    3.109     0
07:52        8.31        44.5       0.035
  STMMH_474_(STM)       JUNCTION     0.000    9.939     0
07:56           0        48.8       0.528
  STMMH_475_(STM)       JUNCTION     0.000    2.921     0
07:58           0        36.2      -0.048
  OF1                   OUTFALL      0.000    2.945     0
07:52           0        44.5       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       CMS       CMS    10^6
ltr
  ---------------------------------------------------------
-
  OF1                  45.84     0.375     2.945
44.501
  ---------------------------------------------------------
-
  System               45.84     0.375     2.945
44.501


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

  ---------------------------------------------------------
-------------------
                                  Maximum  Time of Max
Maximum    Max/    Max/
                                   |Flow|   Occurrence
|Veloc|    Full    Full
  Link                 Type          CMS  days hr:min
m/sec    Flow   Depth
  ---------------------------------------------------------
-------------------
  244_(STM)            CONDUIT     2.921     0  07:58
2.42    1.03    0.86
  C1                   CHANNEL     2.536     0  07:58
1.22    0.03    0.27
  C2                   CHANNEL     9.939     0  07:56
1.09    0.09    0.67
  C3                   CHANNEL     2.945     0  07:52
2.86    0.03    0.26
  C6                   CHANNEL     2.342     0  07:47
0.94    0.16    0.51


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

  ---------------------------------------------------------
---------------------------
                       Adjusted    ---------- Fraction of
Time in Flow Class ----------
                        /Actual          Up    Down  Sub   Sup
Up    Down  Norm  Inlet
  Conduit               Length    Dry  Dry   Dry   Crit
Crit  Crit  Crit  Ltd   Ctrl
  ---------------------------------------------------------
---------------------------
  244_(STM)               1.00   0.01  0.00  0.00  0.00
0.00  0.00  0.99  0.00  0.21
  C1                      1.00   0.01  0.00  0.00  0.99
0.00  0.00  0.00  0.99  0.00
  C2                      1.00   0.01  0.00  0.00  0.99
0.00  0.00  0.00  0.93  0.00
  C3                      1.00   0.01  0.00  0.00  0.02
0.97  0.00  0.00  0.04  0.00
  C6                      1.00   0.01  0.00  0.00  0.99
0.00  0.00  0.00  0.02  0.00


  *************************
  Conduit Surcharge Summary
  *************************

  ---------------------------------------------------------
------------------

Hours        Hours
                          --------- Hours Full --------
Above Full   Capacity
  Conduit               Both Ends  Upstream  Dnstream
Normal Flow   Limited
  ---------------------------------------------------------
------------------
  244_(STM)                   0.01      1.12      0.01
0.10         0.01


  Analysis begun on:  Fri Jul 10 18:15:43 2026
  Analysis ended on:  Fri Jul 10 18:15:48 2026
  Total elapsed time: 00:00:05
```

1:100-year 12-hour SCS PCSWMM Input File Post-Development Conditions

```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option             Value
FLOW_UNITS           CMS
INFILTRATION         HORTON
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         ELEVATION
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           01/01/2000
START_TIME           00:00:00
REPORT_START_DATE    01/01/2000
REPORT_START_TIME    00:00:00
END_DATE             01/04/2000
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:05:00
DRY_STEP             00:05:00
ROUTING_STEP         1
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              16

[FILES]
;;Interfacing Files
USE INFLOWS "C:\Users\jboyes\OneDrive - Robinson
Consultants\Documents\PCSWMM Projects\23074 -
Limebank\Modelling\POST 12SCS100.arm.txt"

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0.0
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- -------- -------- ----------
Rainfall         INTENSITY 0:15     1.0      TIMESERIES
12SCS100

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area
%Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- --------
-------- -------- -------- -------- ----------------
10               Rainfall         STMMH_451_(STM)  0.1266
7.143    148.941  0.5      0
11-13_1          Rainfall         St_CB11          0.2473
94.286   140.018  1        0
11-13_2          Rainfall         St_CBMH108       0.2272
94.286   201.974  2        0
;14-15 split
14-15_1          Rainfall         St_CB12          0.09
87.143   45.014   1.5      0
;14-15 split
14-15_2          Rainfall         St_CBMH110       0.106
87.143   45.032   1.4      0
16               Rainfall         St_CB13          0.2358
10       226.7    1.5      0
17-20            Rainfall         St_CB14          1.1229
97.143   410      2        0
2                Rainfall         STMMH_477_(STM)  0.2011
11.429   80.44    7.5      0
21               Rainfall         St_CB21          0.199
42.857   161.526  3        0
22               Rainfall         St_CB23          0.1248
35.714   80       0.5      0
23-25            Rainfall         St_CB24          1.3914
100      410      1.8      0
26               Rainfall         St_CB31          0.5311
65.714   302.3    1.5      0
27-30            Rainfall         St_CB34          0.5332
74.286   418.02   1.8      0
3-5_1            Rainfall         St_CBMH102       0.1474
95.714   60.016   1        0
;x1 channel flow width
3-5_2            Rainfall         St_CB01          0.4014
95.714   159.984  2.75     0
6-9_1            Rainfall         St_CB05          0.376
88.571   202.009  2        0
6-9_2            Rainfall         St_CBMH105       0.2078
88.571   83.12    0.5      0
A1               Rainfall         St_A1            0.6042
100      135.945  1        0
A2               Rainfall         St_A2            0.3973
100      89.392   1        0
B1               Rainfall         St_B1            0.5396
100      121.41   1        0
B2_B3            Rainfall         St_B2_B3         1.1222
100      252.495  1        0
C1_C2_C3         Rainfall         St_C1_C2_C3      1.7265
100      388.462  1        0
D1_D2_D3         Rainfall         St_D1_D2_D3      1.6365
100      368.213  1        0
OFF1             Rainfall         STMMH_466_(STM)  0.5761
30       523.727  0.2      0
OFF2             Rainfall         STMMH_467_(STM)  0.8556
12.857   213.9    0.235    0
OFF4             Rainfall         STMMH_466_(STM)  0.0932
1.429    175      4.978    0
Pond-1           Rainfall         Pond             1.0347
28.571   344.9    2        0
S2_1             Rainfall         J1               0.261084
60       130.542  3        0
S2_3             Rainfall         STMMH_466_(STM)  0.483681
60       241.841  3        0
S2_4             Rainfall         STMMH_468_(STM)  0.480276
60       240.138  3        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv
PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ----------
---------- ---------- ----------
10               0.013      0.25       1.57       4.67
0          OUTLET
11-13_1          0.013      0.25       1.57       4.67
0          OUTLET
11-13_2          0.013      0.25       1.57       4.67
0          OUTLET
14-15_1          0.013      0.25       1.57       4.67
0          OUTLET
14-15_2          0.013      0.25       1.57       4.67
0          OUTLET
16               0.013      0.25       1.57       4.67
0          OUTLET
17-20            0.013      0.25       1.57       4.67
0          OUTLET
2                0.013      0.25       1.57       4.67
0          OUTLET
21               0.013      0.25       1.57       4.67
0          OUTLET
22               0.013      0.25       1.57       4.67
0          OUTLET
23-25            0.013      0.25       1.57       4.67
0          OUTLET
26               0.013      0.25       1.57       4.67
0          OUTLET
```

```
27-30           0.013      0.25       1.57       4.67
0          OUTLET
3-5_1           0.013      0.25       1.57       4.67
0          OUTLET
3-5_2           0.013      0.25       1.57       4.67
0          OUTLET
6-9_1           0.013      0.25       1.57       4.67
0          OUTLET
6-9_2           0.013      0.25       1.57       4.67
0          OUTLET
A1              0.013      0.25       1.57       4.67
0          OUTLET
A2              0.013      0.25       1.57       4.67
0          OUTLET
B1              0.013      0.25       1.57       4.67
0          OUTLET
B2_B3           0.013      0.25       1.57       4.67
0          OUTLET
C1_C2_C3        0.013      0.25       1.57       4.67
0          OUTLET
D1_D2_D3        0.013      0.25       1.57       4.67
0          OUTLET
OFF1            0.013      0.25       1.57       4.67
0          OUTLET
OFF2            0.013      0.25       1.57       4.67
0          OUTLET
OFF4            0.013      0.25       1.57       4.67
0          OUTLET
Pond-1          0.013      0.25       1.57       4.67
0          OUTLET
S2_1            0.013      0.25       1.57       4.67
0          OUTLET
S2_3            0.013      0.25       1.57       4.67
0          OUTLET
S2_4            0.013      0.25       1.57       4.67
0          OUTLET

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4
Param5
;;-------------- ---------- ---------- ---------- ----------
----------
10              80         0.5        7          0
0          CURVE_NUMBER
11-13_1         80         0.5        7          0
0          CURVE_NUMBER
11-13_2         80         0.5        7          0
0          CURVE_NUMBER
14-15_1         80         0.5        7          0
0          CURVE_NUMBER
14-15_2         80         0.5        7          0
0          CURVE_NUMBER
16              80         0.5        7          0
0          CURVE_NUMBER
17-20           80         0.5        7          0
0          CURVE_NUMBER
2               80         0.5        7          0
0          CURVE_NUMBER
21              80         0.5        7          0
0          CURVE_NUMBER
22              80         0.5        7          0
0          CURVE_NUMBER
23-25           80         0.5        7          0
0          CURVE_NUMBER
26              80         0.5        7          0
0          CURVE_NUMBER
27-30           80         0.5        7          0
0          CURVE_NUMBER
3-5_1           80         0.5        7          0
0          CURVE_NUMBER
3-5_2           80         0.5        7          0
0          CURVE_NUMBER
6-9_1           80         0.5        7          0
0          CURVE_NUMBER
6-9_2           80         0.5        7          0
0          CURVE_NUMBER
A1              80         0.5        7          0
0          CURVE_NUMBER
A2              80         0.5        7          0
0          CURVE_NUMBER
B1              80         0.5        7          0
0          CURVE_NUMBER
B2_B3           80         0.5        7          0
0          CURVE_NUMBER
C1_C2_C3        80         0.5        7          0
0          CURVE_NUMBER
D1_D2_D3        80         0.5        7          0
0          CURVE_NUMBER
OFF1            80         0.5        7          0
0          CURVE_NUMBER
OFF2            80         0.5        7          0
0          CURVE_NUMBER
OFF4            80         0.5        7          0
0          CURVE_NUMBER
Pond-1          80         0.5        7          0
0          CURVE_NUMBER
S2_1            82.75      0          7          0
0          CURVE_NUMBER
S2_3            82.75      0          7          0
0          CURVE_NUMBER
S2_4            82.75      0          7          0
0          CURVE_NUMBER

[JUNCTIONS]
;;Name           Elevation  MaxDepth   InitDepth  SurDepth
Aponded
;;-------------- ---------- ---------- ---------- ----------
----------
J1              91.35      1.75       0          0
0
;Concentric Cylindrical Structure SI
STMMH_201_(STM)  88.4       2.916      0          0
0
;Concentric Cylindrical Structure SI
STMMH_202_(STM)  88.53      2.873      0          0
0
;Concentric Cylindrical Structure SI
STMMH_203_(STM)  88.65      3.257      0          0
0
;Concentric Cylindrical Structure SI
STMMH_451_(STM)  89.28      1.975      0          0
0
;Concentric Cylindrical Structure SI
STMMH_459_(STM)  88.82      1.4        0          0
0
;Concentric Cylindrical Structure SI
STMMH_465_(STM)  88.75      2.75       0          0
0
;Concentric Cylindrical Structure SI
STMMH_466_(STM)  90.73      1.65       0          0
0
;Concentric Cylindrical Structure SI
STMMH_467_(STM)  90.4       1.65       0          0
0
;Concentric Cylindrical Structure SI
STMMH_468_(STM)  88.37      1.525      0          0
0
;Concentric Cylindrical Structure SI
STMMH_473_(STM)  89.731     1.24       0          0
0
;Concentric Cylindrical Structure SI
STMMH_474_(STM)  89.84      3          0          0
0
;Concentric Cylindrical Structure SI
STMMH_475_(STM)  89.33      3          0          0
0
;Concentric Cylindrical Structure SI
STMMH_477_(STM)  89.85      1.326      0          0
0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data
Gated    Route To
;;-------------- ---------- ---------- ---------------- ----
---- ----------------
OF1             87.12      FREE                        NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape
Curve Name/Params            SurDepth Fevap    Psi      Ksat
IMD
```

```
;;-------------- -------- ---------- ---------- ----------
---------------------------- -------- -------- -------- ----
---- --------
;Concentric Cylindrical Structure SI
CB_04_(STM)      90.73    1.875      0          FUNCTIONAL
0         0         1.13     0        0
;Concentric Cylindrical Structure SI
CB_07_(STM)      90.61    2.59       0          FUNCTIONAL
0         0         1.13     0        0
;Concentric Cylindrical Structure SI
CB_08_(STM)      90.62    2.481      0          FUNCTIONAL
0         0         1.13     0        0
;Concentric Cylindrical Structure SI
CB_11_(STM)      90.42    1.875      0          FUNCTIONAL
0         0         1.13     0        0
;Concentric Cylindrical Structure SI
CB_12_(STM)      90.49    1.86       0          FUNCTIONAL
0         0         1.13     0        0
;Concentric Cylindrical Structure SI
CBMH_102_(STM)   89.95    2.25       0          FUNCTIONAL
0         0         1.13     0        0
;Concentric Cylindrical Structure SI
CBMH_103_(STM)   90.11    2.11       0          FUNCTIONAL
0         0         1.13     0        0
;Concentric Cylindrical Structure SI
CBMH_105_(STM)   90.13    2.07       0          FUNCTIONAL
0         0         1.13     0        0
;Concentric Cylindrical Structure SI
CBMH_108_(STM)   89.72    2.42       0          FUNCTIONAL
0         0         1.13     0        0
;Concentric Cylindrical Structure SI
CBMH_109_(STM)   89.89    2.41       0          FUNCTIONAL
0         0         1.13     0        0
;Concentric Cylindrical Structure SI
CBMH_110_(STM)   90.1     2.2        0          FUNCTIONAL
0         0         1.13     0        0
Pond             89.05    3.25       0          TABULAR
SWM_Facility_1                0        0
St_A1            102.7    0.05       0          FUNCTIONAL
0         0         6042     0        0
St_A2            102.7    0.05       0          FUNCTIONAL
0         0         3973     0        0
St_B1            108      0.05       0          FUNCTIONAL
0         0         5396     0        0
St_B2_B3         107.8    0.05       0          FUNCTIONAL
0         0         11222    0        0
St_C1_C2_C3      108      0.05       0          FUNCTIONAL
0         0         17265    0        0
St_CB01          92.12    0.3        0          TABULAR
CB01                          0        0
St_CB05          92.2     0.33       0          TABULAR
CB5                           0        0
St_CB11          92.18    0.54       0          TABULAR
CB11_revised                  0        0
St_CB12          92.35    0.35       0          TABULAR
CB12_revised                  0        0
St_CB13          91.47    0.91       0          TABULAR
CB13                          0        0
St_CB14          92.18    0.45       0          TABULAR
CB14                          0        0
St_CB21          92.21    0.38       0          TABULAR
CB21                          0        0
St_CB23          92.32    0.35       0          TABULAR
CB23                          0        0
St_CB24          92.33    0.41       0          TABULAR
CB24                          0        0
St_CB31          92.31    0.4        0          TABULAR
CB31                          0        0
St_CB34          92.5     0.41       0          TABULAR
CB34                          0        0
St_CBMH102       92.2     0.25       0          TABULAR
CBMH103                       0        0
St_CBMH105       92.1     0.44       0          TABULAR
CBMH105                       0        0
St_CBMH108       92.14    0.37       0          TABULAR
CBMH108                       0        0
St_CBMH110       92.3     0.25       0          TABULAR
CBMH110_revised               0        0
St_D1_D2_D3      103.1    0.05       0          FUNCTIONAL
0         0         16365    0        0
;Concentric Cylindrical Structure SI
STMMH_101_(STM)  89.91    2.327      0          FUNCTIONAL
0         0         1.13     0        0
;Concentric Cylindrical Structure SI
STMMH_104_(STM)  90.36    2.045      0          FUNCTIONAL
0         0         1.13     0        0
;Concentric Cylindrical Structure SI
STMMH_106_(STM)  90.45    1.897      0          FUNCTIONAL
0         0         1.13     0        0
;Concentric Cylindrical Structure SI
STMMH_107_(STM)  89.31    3.627      0          FUNCTIONAL
0         0         1.13     0        0
;Concentric Cylindrical Structure SI
STMMH_111_(STM)  89.46    3.203      0          FUNCTIONAL
0         0         1.13     0        0
;Concentric Cylindrical Structure SI
STMMH_112_(STM)  89.6     2.826      0          FUNCTIONAL
0         0         1.13     0        0
;Concentric Cylindrical Structure SI
STMMH_116_(STM)  89.77    2.858      0          FUNCTIONAL
0         0         1.13     0        0
;Concentric Cylindrical Structure SI
STMMH_117_(STM)  90.16    2.335      0          FUNCTIONAL
0         0         1.13     0        0
;Null Structure
STMMH_120_(STM)  90.18    2.52       0          FUNCTIONAL
0         0         1.13     0        0

[CONDUITS]
;;Name           From Node        To Node          Length
Roughness  InOffset   OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------
- ---------- ---------- ---------- ---------- ----------
;Concrete Pipe SI
154_(1)_(STM)    STMMH_120_(STM)  STMMH_117_(STM)  115.603
0.013      90.48      90.31      0          0
;Concrete Pipe SI
156_(STM)        CB_04_(STM)      STMMH_104_(STM)  53.637
0.013      91.03      90.82      0          0
;Concrete Pipe SI
157_(1)_(STM)    CBMH_109_(STM)   CBMH_108_(STM)   35.916
0.013      90.19      90.12      0          0
;Concrete Pipe SI
158_(1)_(STM)    STMMH_107_(STM)  STMMH_451_(STM)  18.539
0.013      89.61      89.58      0          0
;Concrete Pipe SI
158_(STM)        CBMH_108_(STM)   STMMH_107_(STM)  23.966
0.013      90.02      90         0          0
;Concrete Pipe SI
160_(STM)        STMMH_104_(STM)  CBMH_103_(STM)   86.041
0.013      90.66      90.47      0          0
;Concrete Pipe SI
161_(STM)        CBMH_103_(STM)   CBMH_102_(STM)   36.659
0.013      90.41      90.33      0          0
;PVC Pipe SI
166_(STM)        CBMH_105_(STM)   CBMH_102_(STM)   44.613
0.013      90.43      90.33      0          0
;Concrete Pipe SI
167_(3)_(STM)    STMMH_117_(STM)  STMMH_116_(STM)  56.717
0.013      90.16      90.09      0          0
;Corrugated Metal Pipe SI
170_(STM)        STMMH_112_(STM)  STMMH_111_(STM)  82.822
0.013      89.9       89.78      0          0
;Concrete Pipe SI
171_(1)_(STM)    STMMH_106_(STM)  CBMH_105_(STM)   76.541
0.013      90.75      90.52      0          0
;Concrete Pipe SI
172_(STM)        CB_07_(STM)      STMMH_106_(STM)  22.878
0.013      90.91      90.82      0          0
;Concrete Pipe SI
175_(STM)        CBMH_102_(STM)   STMMH_101_(STM)  3.327
0.013      90.25      90.24      0          0
;Concrete Pipe SI
176_(1)_(1)_(STM) CB_11_(STM)     CBMH_108_(STM)   82.217
0.013      90.72      90.35      0          0
;Concrete Pipe SI
179_(STM)        CB_08_(STM)      CBMH_105_(STM)   47.258
0.013      90.92      90.64      0          0
;Corrugated Metal Pipe SI
184_(STM)        CBMH_110_(STM)   CBMH_109_(STM)   51.082
0.013      90.4       90.27      0          0
;Corrugated Metal Pipe SI
```

```
186_(STM)        CB_12_(STM)      CBMH_110_(STM)   38.593
0.013      90.79      90.56      0          0
;Corrugated Metal Pipe SI
200_(STM)        STMMH_101_(STM)  STMMH_477_(STM)  28.286
0.013      90.21      90.15      0          0
;Corrugated HDPE Pipe SI
226_(1)_(1)_(2)_(STM) STMMH_459_(STM) Pond         47.775
0.024      89.359     89.12      0          0
;Corrugated HDPE Pipe SI
226_(1)_(STM)    STMMH_473_(STM)  Pond             52.297
0.024      90.031     89.77      0          0
;Concrete Pipe SI
230_(STM)        STMMH_466_(STM)  STMMH_467_(STM)  32.852
0.024      90.73      90.7       0          0
;Corrugated Metal Pipe SI
237_(STM)        STMMH_111_(STM)  STMMH_107_(STM)  46.477
0.013      89.76      89.69      0          0
;Concrete Pipe SI
238_(STM)        STMMH_465_(STM)  STMMH_203_(STM)  23.523
0.013      89.05      89.01      0          0
;Concrete Pipe SI
239_(1)_(STM)    STMMH_202_(STM)  STMMH_201_(STM)  65.809
0.013      88.83      88.73      0          0
;Concrete Pipe SI
239_(STM)        STMMH_203_(STM)  STMMH_202_(STM)  65.232
0.013      88.95      88.85      0          0
;Concrete Pipe SI
240_(STM)        STMMH_201_(STM)  STMMH_468_(STM)  9.92
0.013      88.7       88.67      0          0
;Concrete Pipe SI
242_(STM)        STMMH_116_(STM)  STMMH_112_(STM)  78.969
0.013      90.07      89.98      0          0
;Concrete Pipe SI
244_(STM)        STMMH_474_(STM)  STMMH_475_(STM)  17.841
0.024      89.84      89.63      0          0
C1               STMMH_475_(STM)  STMMH_468_(STM)  53.881
0.04       89.33      88.37      0          0
C2               STMMH_467_(STM)  STMMH_474_(STM)  20.914
0.04       90.4       89.84      0          0
C3               STMMH_468_(STM)  OF1              30.258
0.01       88.37      87.12      0          0
C4               STMMH_477_(STM)  STMMH_473_(STM)  28
0.04       90.15      90.031     0          0
C5               STMMH_451_(STM)  STMMH_459_(STM)  57.9
0.04       89.58      89.359     0          0
C6               J1               STMMH_466_(STM)  225
0.01       91.35      90.73      0          0

[ORIFICES]
;;Name           From Node        To Node          Type
Offset     Qcoeff     Gated    CloseTime
;;-------------- ---------------- ---------------- ---------
---------- ---------- ---------- -------- ----------
OR3              Pond             STMMH_465_(STM)  SIDE
89.05      0.61       NO       0

[WEIRS]
;;Name           From Node        To Node          Type
CrestHt    Qcoeff     Gated    EndCon   EndCoeff   Surcharge
RoadWidth  RoadSurf   Coeff. Curve
;;-------------- ---------------- ---------------- ----------
---------- ---------- ---------- -------- -------- ---------- -----
----- ---------- ---------- ----------------
;Dwg notes emergency spill EL as 92.2. Confirm.
W_Pond           Pond             STMMH_466_(STM)
TRAPEZOIDAL  92.2       1.84       NO       0        0
NO
W_St_CB05        St_CB05          St_CBMH105       V-NOTCH
92.31      0.62       NO       0          0        NO
W_St_CB11        St_CB11          Pond             V-NOTCH
92.28      0.62       NO       0          0        NO
;Effective weir combining curb depression and curb inlet
W_St_CB13        St_CB13          St_CBMH108       V-NOTCH
92.3       0.62       NO       0          0        NO
W_St_CB14        St_CB14          St_CB13
TRANSVERSE   92.48      1.84       NO       0        0
NO
W_St_CB21        St_CB21          St_CB13
TRANSVERSE   92.44      1.84       NO       0        0
NO
W_St_CB23        St_CB23          St_CB21
TRANSVERSE   92.52      1.84       NO       0        0
NO
W_St_CB24        St_CB24          St_CB31
TRANSVERSE   92.59      1.84       NO       0        0
NO
W_St_CB31        St_CB31          St_CB23
TRANSVERSE   92.56      1.84       NO       0        0
NO
W_St_CB34        St_CB34          St_CB31
TRANSVERSE   92.76      1.84       NO       0        0
NO
W_St_CBMH102     St_CBMH102       STMMH_477_(STM)  V-NOTCH
92.3       0.62       NO       0          0        NO
W_St_CBMH108     St_CBMH108       St_CB11
TRANSVERSE   92.36      1.84       NO       0        0
NO
W_St_CBMH110     St_CBMH110       St_CB05          V-NOTCH
92.4       0.62       NO       0          0        NO
W1               St_CB01          STMMH_477_(STM)
TRANSVERSE   92.27      1.84       NO       0        0
NO
W1_St_CB12       St_CB12          St_CBMH110
TRANSVERSE   92.55      1.84       NO       0        0
NO
W2               St_CBMH105       Pond             V-NOTCH
92.17      0.62       NO       0          0        NO
W3               Pond             STMMH_465_(STM)
TRANSVERSE   89.9       1.84       NO       0        0
YES
W4               Pond             STMMH_465_(STM)
TRANSVERSE   90.2       1.84       NO       0        0
YES

[OUTLETS]
;;Name           From Node        To Node          Offset
Type             QTable/Qcoeff    Qexpon     Gated
;;-------------- ---------------- ---------------- ---------
- ---------------- ---------------- ---------- --------
OUT_St_A1        St_A1            CB_12_(STM)      102.7
TABULAR/HEAD     Roof_A1                     YES
OUT_St_A2        St_A2            CBMH_109_(STM)   102.7
TABULAR/HEAD     Roof_A2                     YES
OUT_St_B1        St_B1            CB_12_(STM)      108
TABULAR/HEAD     Roof_B1                     YES
OUT_St_B2_B3     St_B2_B3         CBMH_108_(STM)   107.8
TABULAR/HEAD     Roof_B2_B3                  YES
OUT_St_C1_C2_C3  St_C1_C2_C3      STMMH_112_(STM)  108
TABULAR/HEAD     Roof_C1_C2_C3               YES
OUT_St_CB01      St_CB01          STMMH_104_(STM)  92.12
TABULAR/HEAD     CBx4                        NO
OUT_St_CB05      St_CB05          STMMH_106_(STM)  92.2
TABULAR/HEAD     CBx3                        NO
OUT_St_CB11      St_CB11          CB_11_(STM)      92.18
TABULAR/HEAD     CBx3                        NO
OUT_St_CB12      St_CB12          CB_12_(STM)      92.35
TABULAR/HEAD     CBx1                        NO
OUT_St_CB13      St_CB13          STMMH_111_(STM)  91.47
TABULAR/HEAD     CBx1                        NO
OUT_St_CB14      St_CB14          STMMH_112_(STM)  92.18
TABULAR/HEAD     CBx6                        NO
OUT_St_CB21      St_CB21          STMMH_112_(STM)  92.21
TABULAR/HEAD     CBx2                        NO
OUT_St_CB23      St_CB23          STMMH_116_(STM)  92.32
TABULAR/HEAD     CBx1                        NO
OUT_St_CB24      St_CB24          STMMH_117_(STM)  92.33
TABULAR/HEAD     CBx7                        NO
OUT_St_CB31      St_CB31          STMMH_117_(STM)  92.31
TABULAR/HEAD     CBx3                        NO
OUT_St_CB34      St_CB34          STMMH_120_(STM)  92.5
TABULAR/HEAD     CBx6                        NO
OUT_St_CBMH102   St_CBMH102       CBMH_102_(STM)   92.2
TABULAR/HEAD     CBMHx2                      NO
OUT_St_CBMH105   St_CBMH105       CB_08_(STM)      92.1
TABULAR/HEAD     CBx2                        NO
OUT_St_CBMH108   St_CBMH108       CBMH_108_(STM)   92.14
TABULAR/HEAD     CBMHx2                      NO
OUT_St_CBMH110   St_CBMH110       CBMH_110_(STM)   92.3
TABULAR/HEAD     CBMHx1                      NO
OUT_St_D1_D2_D3  St_D1_D2_D3      STMMH_120_(STM)  103.1
TABULAR/HEAD     Roof_D1_D2_D3               YES
```

```
OVF_CB_07        CB_07_(STM)      St_CB05          92.2
TABULAR/HEAD     Manhole_Rating_Curve            YES
OVF_CB_08        CB_08_(STM)      St_CBMH105       92.101
TABULAR/HEAD     Manhole_Rating_Curve            YES

[XSECTIONS]
;;Link           Shape        Geom1            Geom2
Geom3      Geom4      Barrels    Culvert
;;-------------- ------------ ---------------- ---------- --
-------- ---------- ---------- ----------
154_(1)_(STM)    CIRCULAR     0.675            0          0
0          1
156_(STM)        CIRCULAR     0.3              0          0
0          1
157_(1)_(STM)    CIRCULAR     0.525            0          0
0          1
158_(1)_(STM)    CIRCULAR     0.975            0          0
0          1
158_(STM)        CIRCULAR     0.6              0          0
0          1
160_(STM)        CIRCULAR     0.45             0          0
0          1
161_(STM)        CIRCULAR     0.45             0          0
0          1
166_(STM)        CIRCULAR     0.45             0          0
0          1
167_(3)_(STM)    CIRCULAR     0.825            0          0
0          1
170_(STM)        CIRCULAR     0.9              0          0
0          1
171_(1)_(STM)    CIRCULAR     0.375            0          0
0          1
172_(STM)        CIRCULAR     0.3              0          0
0          1
175_(STM)        CIRCULAR     0.525            0          0
0          1
176_(1)_(1)_(STM) CIRCULAR    0.3              0          0
0          1
179_(STM)        CIRCULAR     0.25             0          0
0          1
184_(STM)        CIRCULAR     0.45             0          0
0          1
186_(STM)        CIRCULAR     0.3              0          0
0          1
200_(STM)        CIRCULAR     0.525            0          0
0          1
226_(1)_(1)_(2)_(STM) CIRCULAR 0.4            0          0
0          4          6
226_(1)_(STM)    CIRCULAR     0.4              0          0
0          2          6
230_(STM)        CIRCULAR     1.3              0          0
0          1          6
237_(STM)        CIRCULAR     0.9              0          0
0          1
238_(STM)        CIRCULAR     0.6              0          0
0          1
239_(1)_(STM)    CIRCULAR     0.6              0          0
0          1
239_(STM)        CIRCULAR     0.6              0          0
0          1
240_(STM)        CIRCULAR     0.6              0          0
0          1
242_(STM)        CIRCULAR     0.825            0          0
0          1
244_(STM)        CIRCULAR     1.3              0          0
0          1          6
C1               IRREGULAR    Channe_475-468
C2               IRREGULAR    Channl_467-474
C3               IRREGULAR    Outfall_Ditch
C4               IRREGULAR    NW_Storage_Ditch
C5               TRAPEZOIDAL  2                6
3.5        3.5        1
C6               IRREGULAR    LimebankDitch
OR3              CIRCULAR     0.15             0          0
0
W_Pond           TRAPEZOIDAL  0.1              77.4       15
15
W_St_CB05        TRIANGULAR   0.22             20         0
0
W_St_CB11        TRIANGULAR   0.44             24.1       0
0
W_St_CB13        TRIANGULAR   0.08             30         0
0
W_St_CB14        RECT_OPEN    0.15             19.46      0
0
W_St_CB21        RECT_OPEN    0.15             5.34       1
1
W_St_CB23        RECT_OPEN    0.15             7.41       0
0
W_St_CB24        RECT_OPEN    0.15             22.6       0
0
W_St_CB31        RECT_OPEN    0.15             12.35      0
0
W_St_CB34        RECT_OPEN    0.15             13.6       0
0
W_St_CBMH102     TRIANGULAR   0.15             52         0
0
W_St_CBMH108     RECT_OPEN    0.15             23.16      0
0
W_St_CBMH110     TRIANGULAR   0.23             12.53      0
0
W1               RECT_OPEN    0.15             12.85      0
0
W1_St_CB12       RECT_OPEN    0.15             10.11      0
0
W2               TRIANGULAR   0.37             37.79      0
0
W3               RECT_OPEN    2.49             0.3        0
0
W4               RECT_OPEN    2.05             2          0
0

[TRANSECTS]
;;Transect Data in HEC-2 format
;
;Averaged transect, created from transects:
;4, 5
NC 0.045    0.045    0.035
X1 Channe_475-468    17       6.5      10.5     0.0      0.0
0.0      0.0      0.0
GR 90.216   1.5      90.094   2.5      90.016   3.5
89.953   4.5      89.925   5.5
GR 89.836   6.5      89.534   7.5      89.579   9.5
89.888   10.5     90.158   11.5
GR 90.326   12.5     90.496   13.5     90.682   14.5
90.917   15.5     91.125   16.5
GR 91.276   17.5     91.489   18.5
;
;Ditch created from measure tool across ditch
NC 0.045    0.045    0.035
X1 Channl_467-474    21       9        18       0.0      0.0
0.0      0.0      0.0
GR 92.045   0        92.053   1        92       2
91.883   3        91.753   4
GR 91.617   5        91.485   6        91.253   7
91.043   8        90.789   9
GR 90.494   10       90.304   11       90.256   12
90.242   13       90.249   14
GR 90.276   15       90.411   16       90.568   17
90.691   18       90.767   19
GR 90.8     19.497
;
;Ditch created from measure tool, conveying flows from
expanded DA down Limebank
NC 0.045    0.045    0.035
X1 LimebankDitch     15       4        11       0.0      0.0
0.0      0.0      0.0
GR 92.635   0        92.669   1        92.668   2
92.553   3        92.302   4
GR 91.813   5        91.5     6        91.158   7
91.19    8        91.362   9
GR 91.464   10       92.3     11       92.3     12
92.3     13       92.3     14
;
NC 0.045    0.045    0.045
X1 NW_Storage_Ditch  21       7        17       0.0      0.0
0.0      0.0      0.0
GR 92.56    0        92.454   1        92.346   2
92.13    3        91.831   4
GR 91.626   5        91.313   6        91.004   7
90.688   8        90.402   9
```

```
GR 90.243   10       90.401   11       90.509   12
90.6     13       90.694   14
GR 90.816   15       90.873   16       90.964   17
91.054   18       91.154   19
GR 91.265   20
;
;Ditch created from measure tool across ditch
NC 0.045    0.045    0.035
X1 Outfall_Ditch     16       5        10       0.0      0.0
0.0      0.0      0.0
GR 89.433   0        89.423   1        89.42    2
89.395   3        89.362   4
GR 89.251   5        88.665   6        88.05    7
88.136   8        89.023   9
GR 89.681   10       89.874   11       90.118   12
90.276   13       90.352   14
GR 90.378   14.848

[LOSSES]
;;Link           Kentry     Kexit      Kavg       Flap Gate
Seepage
;;-------------- ---------- ---------- ---------- ----------
----------
154_(1)_(STM)    0          0.032      0          NO
0
156_(STM)        0          0.032      0          NO
0
157_(1)_(STM)    0          0.032      0          NO
0
158_(1)_(STM)    0          0.5        0          NO
0
158_(STM)        0          1.319      0          NO
0
160_(STM)        0          1.319      0          NO
0
161_(STM)        0          1.319      0          NO
0
166_(STM)        0          1.195      0          NO
0
167_(3)_(STM)    0          0.032      0          NO
0
170_(STM)        0          0.032      0          NO
0
171_(1)_(STM)    0          1.195      0          NO
0
172_(STM)        0          0.051      0          NO
0
175_(STM)        0          0.051      0          NO
0
176_(1)_(1)_(STM) 0         1.319      0          NO
0
179_(STM)        0          0.21       0          NO
0
184_(STM)        0          0.032      0          NO
0
186_(STM)        0          1.319      0          NO
0
200_(STM)        0          1.319      0          NO
0
226_(1)_(1)_(2)_(STM) 0.9   0.5        0          NO
0
226_(1)_(STM)    0.9        0.5        0          NO
0
230_(STM)        0.9        0.5        0          NO
0
237_(STM)        0          0.051      0          NO
0
238_(STM)        0          0.843      0          NO
0
239_(1)_(STM)    0          0.726      0          NO
0
239_(STM)        0          1.319      0          NO
0
240_(STM)        0          0.116      0          NO
0
242_(STM)        0          0.032      0          NO
0
244_(STM)        0.9        0.5        0          NO
0

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
;City of Ottawa Continuous Fishbone CB Inlet Curve
CB_Fishbone      Rating     0          0
CB_Fishbone                 0.01       0.001
CB_Fishbone                 0.015      0.003
CB_Fishbone                 0.021      0.007
CB_Fishbone                 0.03       0.014
CB_Fishbone                 0.04       0.024
CB_Fishbone                 0.05       0.036
CB_Fishbone                 0.054      0.036
CB_Fishbone                 0.06       0.047
CB_Fishbone                 0.07       0.05
CB_Fishbone                 1          0.05

;CBMH Inlet Capture Curve based on the OSDG Appendix 7-A
CBMHx1           Rating     0          0
CBMHx1                      0.122      0.06
CBMHx1                      0.183      0.073
CBMHx1                      0.2        0.076
CBMHx1                      0.243      0.084
CBMHx1                      0.305      0.094

;x2 concurrent CBMH discharge
CBMHx2           Rating     0          0
CBMHx2                      0.122      0.12
CBMHx2                      0.183      0.146
CBMHx2                      0.2        0.152
CBMHx2                      0.243      0.168
CBMHx2                      0.305      0.188

;x3 concurrent CBMH discharge
CBMHx3           Rating     0          0
CBMHx3                      0.122      0.18
CBMHx3                      0.183      0.219
CBMHx3                      0.2        0.228
CBMHx3                      0.243      0.252
CBMHx3                      0.305      0.282

;City of Ottawa Standard CB Inlet Curve at low point
CBx1             Rating     0          0
CBx1                        0.01       0.002
CBx1                        0.015      0.002
CBx1                        0.021      0.003
CBx1                        0.03       0.005
CBx1                        0.04       0.006
CBx1                        0.05       0.008
CBx1                        0.054      0.01
CBx1                        0.06       0.013
CBx1                        0.08       0.022
CBx1                        0.09       0.034
CBx1                        0.1        0.048
CBx1                        0.104      0.052
CBx1                        0.11       0.06
CBx1                        0.14       0.08
CBx1                        0.15       0.085
CBx1                        0.16       0.09
CBx1                        0.17       0.095
CBx1                        0.2        0.097
CBx1                        0.3        0.1
CBx1                        1          0.1

;2 concurrent CBs
CBx2             Rating     0          0
CBx2                        0.01       0.004
CBx2                        0.015      0.004
CBx2                        0.021      0.006
CBx2                        0.03       0.01
CBx2                        0.04       0.012
CBx2                        0.05       0.016
CBx2                        0.054      0.02
CBx2                        0.06       0.026
CBx2                        0.08       0.044
CBx2                        0.09       0.068
CBx2                        0.1        0.096
CBx2                        0.104      0.104
CBx2                        0.11       0.12
CBx2                        0.14       0.16
CBx2                        0.15       0.17
CBx2                        0.16       0.18
CBx2                        0.17       0.19
```

```
CBx2                    0.2       0.194
CBx2                    0.3       0.2
CBx2                    1         0.2

;3 concurrent CB discharge
CBx3            Rating  0         0
CBx3                    0.01      0.006
CBx3                    0.015     0.006
CBx3                    0.021     0.009
CBx3                    0.03      0.015
CBx3                    0.04      0.018
CBx3                    0.05      0.024
CBx3                    0.054     0.03
CBx3                    0.06      0.039
CBx3                    0.08      0.066
CBx3                    0.09      0.102
CBx3                    0.1       0.144
CBx3                    0.104     0.156
CBx3                    0.11      0.18
CBx3                    0.14      0.24
CBx3                    0.15      0.255
CBx3                    0.16      0.27
CBx3                    0.17      0.285
CBx3                    0.2       0.291
CBx3                    0.3       0.3
CBx3                    1         0.3

;4 concurrent CB discharge
CBx4            Rating  0         0
CBx4                    0.01      0.008
CBx4                    0.015     0.008
CBx4                    0.021     0.012
CBx4                    0.03      0.02
CBx4                    0.04      0.024
CBx4                    0.05      0.032
CBx4                    0.054     0.04
CBx4                    0.06      0.052
CBx4                    0.08      0.088
CBx4                    0.09      0.136
CBx4                    0.1       0.192
CBx4                    0.104     0.208
CBx4                    0.11      0.24
CBx4                    0.14      0.32
CBx4                    0.15      0.34
CBx4                    0.16      0.36
CBx4                    0.17      0.38
CBx4                    0.2       0.388
CBx4                    0.3       0.4
CBx4                    1         0.4

;5 concurrent CB discharge
CBx5            Rating  0         0
CBx5                    0.01      0.01
CBx5                    0.015     0.01
CBx5                    0.021     0.015
CBx5                    0.03      0.025
CBx5                    0.04      0.03
CBx5                    0.05      0.04
CBx5                    0.054     0.05
CBx5                    0.06      0.065
CBx5                    0.08      0.11
CBx5                    0.09      0.17
CBx5                    0.1       0.24
CBx5                    0.104     0.26
CBx5                    0.11      0.3
CBx5                    0.14      0.4
CBx5                    0.15      0.425
CBx5                    0.16      0.45
CBx5                    0.17      0.475
CBx5                    0.2       0.485
CBx5                    0.3       0.5
CBx5                    1         0.5

;6 CB concurrent discharge
CBx6            Rating  0         0
CBx6                    0.01      0.012
CBx6                    0.015     0.012
CBx6                    0.021     0.018
CBx6                    0.03      0.03
CBx6                    0.04      0.036
CBx6                    0.05      0.048
CBx6                    0.054     0.06
CBx6                    0.06      0.078
CBx6                    0.08      0.132
CBx6                    0.09      0.204
CBx6                    0.1       0.288
CBx6                    0.104     0.312
CBx6                    0.11      0.36
CBx6                    0.14      0.48
CBx6                    0.15      0.51
CBx6                    0.16      0.54
CBx6                    0.17      0.57
CBx6                    0.2       0.582
CBx6                    0.3       0.6
CBx6                    1         0.6

;7 concurrent CB discharge
CBx7            Rating  0         0
CBx7                    0.01      0.014
CBx7                    0.015     0.014
CBx7                    0.021     0.021
CBx7                    0.03      0.035
CBx7                    0.04      0.042
CBx7                    0.05      0.056
CBx7                    0.054     0.07
CBx7                    0.06      0.091
CBx7                    0.08      0.154
CBx7                    0.09      0.238
CBx7                    0.1       0.336
CBx7                    0.104     0.364
CBx7                    0.11      0.42
CBx7                    0.14      0.56
CBx7                    0.15      0.595
CBx7                    0.16      0.63
CBx7                    0.17      0.665
CBx7                    0.2       0.679
CBx7                    0.3       0.7
CBx7                    1         0.7

Manhole_Rating_Curve Rating     0.11      0
Manhole_Rating_Curve            0.2       0.3
Manhole_Rating_Curve            0.3       0.63
Manhole_Rating_Curve            0.4       0.96
Manhole_Rating_Curve            0.5       1.3
Manhole_Rating_Curve            0.6       1.63
Manhole_Rating_Curve            0.7       1.96
Manhole_Rating_Curve            0.8       2.29
Manhole_Rating_Curve            0.9       2.63
Manhole_Rating_Curve            1         2.96

;The outflow from the roof is calculated based on the
release rate of 24 l/s/ha
Roof_A1         Rating  0         0
Roof_A1                 0.01      0.023
Roof_A1                 0.5       0.024

;The outflow from the roof is calculated based on the
release rate of 16 l/s/ha
Roof_A2         Rating  0         0
Roof_A2                 0.01      0.015
Roof_A2                 0.15      0.016

;The outflow from the roof is calculated based on the
release rate of 22 l/s/ha
Roof_B1         Rating  0         0
Roof_B1                 0.01      0.021
Roof_B1                 0.5       0.022

;Roof B2-B3 cum. release rate.
Roof_B2_B3      Rating  0         0
Roof_B2_B3              0.01      0.044
Roof_B2_B3              0.5       0.045

;Roof C1-C3 cum. release rate.
Roof_C1_C2_C3   Rating  0         0
Roof_C1_C2_C3           0.01      0.068
Roof_C1_C2_C3           0.5       0.069

;Roof D1-D3 cum. release rate.
Roof_D1_D2_D3   Rating  0         0
Roof_D1_D2_D3           0.01      0.065
Roof_D1_D2_D3           0.5       0.066
```

```
;Takes into account available storage areas at the upstream
CBs: 1-4. 300mm above 92.3 spill EL
CB01            Storage    0          0
CB01                       0.05       18.13375705
CB01                       0.1        103.2470128
CB01                       0.15       305.908016
CB01                       0.2        633.7163064
CB01                       0.25       1086.671884
CB01                       0.3        1664.774749
CB01                       0.35       2368.024901
CB01                       0.4        3196.42234
CB01                       0.45       4149.967067
CB01                       0.5        5228.659081

;Takes into account available storage areas at the upstream
CBs: 9, 10, 11. 300mm above 92.28 spill EL
CB11_revised    Storage    0          0
CB11_revised               0.05       45.52875
CB11_revised               0.1        210.2744444
CB11_revised               0.15       498.2598611
CB11_revised               0.2        909.485
CB11_revised               0.25       1443.949861
CB11_revised               0.3        2101.654444
CB11_revised               0.35       2882.59875
CB11_revised               0.4        3786.782778

;Takes into account available storage areas at CB12 only.
Extrapolated 300mm above ponding depth
CB12_revised    Storage    0          0
CB12_revised               0.05       13.95
CB12_revised               0.1        55.8
CB12_revised               0.15       125.55
CB12_revised               0.2        223.2
CB12_revised               0.25       348.75
CB12_revised               0.3        502.2
CB12_revised               0.35       683.55
CB12_revised               0.4        892.8
CB12_revised               0.45       1129.95
CB12_revised               0.5        1395

;Storage at CB13
CB13            Storage    0          0
CB13                       0.1        7.504798243
CB13                       0.2        30.01919297
CB13                       0.3        67.54318418
CB13                       0.4        120.0767719
CB13                       0.5        187.6199561
CB13                       0.6        270.1727367
CB13                       0.7        367.7351139
CB13                       0.8        480.3070875
CB13                       0.9        607.8886576
CB13                       1          750.4798243
CB13                       1.1        908.0805874

;Takes into account available storage areas at the upstream
CB 14-19
CB14            Storage    0          0
CB14                       0.05       13.11138889
CB14                       0.1        52.44555556
CB14                       0.15       124.593875
CB14                       0.2        262.4031972
CB14                       0.25       493.601955
CB14                       0.3        878.3107544
CB14                       0.35       1513.864935
CB14                       0.4        2408.773385
CB14                       0.45       3563.036104

;Takes into account available storage areas at the upstream
CB 21-22
CB21            Storage    0          0
CB21                       0.05       6.307655955
CB21                       0.1        26.49765983
CB21                       0.15       72.29009473
CB21                       0.2        146.5357917
CB21                       0.25       249.2347507
CB21                       0.3        380.3869717
CB21                       0.35       539.9924548

;Takes into account available storage areas at the upstream
CB 23
CB23            Storage    0          0
CB23                       0.1        48.3475
CB23                       0.2        193.39
CB23                       0.3        435.1275
CB23                       0.4        773.56

;Takes into account available storage areas at the upstream
CB 24-30
CB24            Storage    0          0
CB24                       0.05       23.06065089
CB24                       0.1        92.24260355
CB24                       0.15       236.907108
CB24                       0.2        487.6779475
CB24                       0.25       896.9239222
CB24                       0.3        1528.855832
CB24                       0.35       2388.231543
CB24                       0.4        3501.319611
CB24                       0.45       4938.836013
CB24                       0.5        6746.625356
CB24                       0.55       8927.594829
CB24                       0.6        11481.74443

;Takes into account available storage areas at the upstream
CB 33-31
CB31            Storage    0          0
CB31                       0.05       14.28454694
CB31                       0.1        80.6288
CB31                       0.15       207.0304122
CB31                       0.2        408.2072663
CB31                       0.25       687.7393878
CB31                       0.3        1045.626777
CB31                       0.35       1481.869433
CB31                       0.4        1996.467356

;Takes into account availabl storage areas at the upstream
CBs: CB39, CB38,CB37,CB36,CB35 and CB34
CB34            Storage    0          0
CB34                       0.05       13.28846154
CB34                       0.1        53.15384615
CB34                       0.15       136.5836538
CB34                       0.2        280.5653846
CB34                       0.25       485.0990385
CB34                       0.3        750.1846154
CB34                       0.35       1117.580461
CB34                       0.4        1629.044921
CB34                       0.45       2284.577995
CB34                       0.5        3104.364683
CB34                       0.55       4117.806661
CB34                       0.6        5362.794703
CB34                       0.65       6843.425109
CB34                       0.7        8559.697879

;Takes into account available storage areas at the upstream
CB 5-7. Note these CBs all have the same T/G elevation so
shape is triangular
CB5             Storage    0          0
CB5                        0.05       70.93669994
CB5                        0.1        283.7467998
CB5                        0.15       638.4302995
CB5                        0.2        1134.987199
CB5                        0.25       1773.417499
CB5                        0.3        2553.721198
CB5                        0.35       3475.898297
CB5                        0.4        4539.948796
CB5                        0.45       5745.872695

;Takes into account available storage areas at the
upstreamMH CBs: 103,102
CBMH103         Storage    0          0
CBMH103                    0.05       8.728373702
CBMH103                    0.1        34.91349481
CBMH103                    0.15       109.2928633
CBMH103                    0.2        262.6039792
CBMH103                    0.25       494.8468426
CBMH103                    0.3        806.0214533
CBMH103                    0.35       1196.127811
CBMH103                    0.4        1665.165917
CBMH103                    0.45       2213.13577
CBMH103                    0.5        2840.03737
CBMH103                    0.55       3545.870718
```

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;Takes into account available storage areas at the
upstreamMH CBs: 105, 8
CBMH105          Storage    0          0
CBMH105                     0.05       18.94387755
CBMH105                     0.1        75.7755102
CBMH105                     0.15       205.394898
CBMH105                     0.2        442.7020408
CBMH105                     0.25       787.6969388
CBMH105                     0.3        1240.379592
CBMH105                     0.35       1800.75
CBMH105                     0.4        2468.808163
CBMH105                     0.45       3244.554082

;Takes into account available storage areas at the upstream
MHCBs:108, 109. 300mm above 92.36 spill EL
CBMH108          Storage    0          0
CBMH108                     0.05       16.55165289
CBMH108                     0.1        66.20661157
CBMH108                     0.15       148.964876
CBMH108                     0.2        273.8312463
CBMH108                     0.25       459.3781223
CBMH108                     0.3        706.1683041
CBMH108                     0.35       1014.201792
CBMH108                     0.4        1383.478585
CBMH108                     0.45       1813.998684
CBMH108                     0.5        2305.762089

CBMH110          Storage    0          0
CBMH110                     0.05       27.59
CBMH110                     0.1        124.31
CBMH110                     0.15       304.11
CBMH110                     0.2        566.99
CBMH110                     0.25       912.95
CBMH110                     0.3        1341.99
CBMH110                     0.35       1854.11

;Takes into account available storage areas at CBMH110 only.
Extrapolated 300mm above ponding depth
CBMH110_revised  Storage    0          0
CBMH110_revised             0.05       27.59
CBMH110_revised             0.1        110.36
CBMH110_revised             0.15       248.31
CBMH110_revised             0.2        441.44
CBMH110_revised             0.25       689.75
CBMH110_revised             0.3        993.24
CBMH110_revised             0.35       1351.91
CBMH110_revised             0.4        1765.76

;From stage-storage curve provided up to 91.22. Interpolated
last interval to emergency spill depth of 92.2
SWM_Facility_1   Storage    0          0
SWM_Facility_1              0.05       306.3
SWM_Facility_1              0.15       1888.71
SWM_Facility_1              0.25       2712.57
SWM_Facility_1              0.35       2809.39
SWM_Facility_1              0.45       2918.17
SWM_Facility_1              0.55       3049.52
SWM_Facility_1              0.65       3189.01
SWM_Facility_1              0.75       3329.2
SWM_Facility_1              0.85       3470.09
SWM_Facility_1              0.95       3611.68
SWM_Facility_1              1.05       3754.34
SWM_Facility_1              1.15       3903.79
SWM_Facility_1              1.25       4061.99
SWM_Facility_1              1.35       4229.89
SWM_Facility_1              1.45       4422.7
SWM_Facility_1              1.55       4624.54
SWM_Facility_1              1.65       4831.05
SWM_Facility_1              1.75       5042.15
SWM_Facility_1              1.85       5257.81
SWM_Facility_1              1.95       5478.04
SWM_Facility_1              2.05       5702.84
SWM_Facility_1              2.15       5932.2
SWM_Facility_1              2.17       5978.86
SWM_Facility_1              3.15       8265

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;Rainfall (mm/hr)
12SCS10          01/01/2000 00:00:00   1.344
12SCS10          01/01/2000 00:15:00   1.613
12SCS10          01/01/2000 00:30:00   1.613
12SCS10          01/01/2000 00:45:00   1.613
12SCS10          01/01/2000 01:00:00   1.613
12SCS10          01/01/2000 01:15:00   1.613
12SCS10          01/01/2000 01:30:00   1.613
12SCS10          01/01/2000 01:45:00   1.882
12SCS10          01/01/2000 02:00:00   2.15
12SCS10          01/01/2000 02:15:00   2.15
12SCS10          01/01/2000 02:30:00   2.15
12SCS10          01/01/2000 02:45:00   2.15
12SCS10          01/01/2000 03:00:00   2.688
12SCS10          01/01/2000 03:15:00   2.688
12SCS10          01/01/2000 03:30:00   2.688
12SCS10          01/01/2000 03:45:00   2.688
12SCS10          01/01/2000 04:00:00   3.494
12SCS10          01/01/2000 04:15:00   3.763
12SCS10          01/01/2000 04:30:00   4.301
12SCS10          01/01/2000 04:45:00   4.838
12SCS10          01/01/2000 05:00:00   5.914
12SCS10          01/01/2000 05:15:00   8.87
12SCS10          01/01/2000 05:30:00   12.634
12SCS10          01/01/2000 05:45:00   102.144
12SCS10          01/01/2000 06:00:00   19.354
12SCS10          01/01/2000 06:15:00   11.021
12SCS10          01/01/2000 06:30:00   7.526
12SCS10          01/01/2000 06:45:00   5.645
12SCS10          01/01/2000 07:00:00   4.57
12SCS10          01/01/2000 07:15:00   3.763
12SCS10          01/01/2000 07:30:00   3.494
12SCS10          01/01/2000 07:45:00   3.226
12SCS10          01/01/2000 08:00:00   3.226
12SCS10          01/01/2000 08:15:00   2.688
12SCS10          01/01/2000 08:30:00   2.688
12SCS10          01/01/2000 08:45:00   2.419
12SCS10          01/01/2000 09:00:00   2.15
12SCS10          01/01/2000 09:15:00   2.15
12SCS10          01/01/2000 09:30:00   2.15
12SCS10          01/01/2000 09:45:00   1.882
12SCS10          01/01/2000 10:00:00   1.613
12SCS10          01/01/2000 10:15:00   1.613
12SCS10          01/01/2000 10:30:00   1.613
12SCS10          01/01/2000 10:45:00   1.613
12SCS10          01/01/2000 11:00:00   1.613
12SCS10          01/01/2000 11:15:00   1.613
12SCS10          01/01/2000 11:30:00   1.613
12SCS10          01/01/2000 11:45:00   1.344

;Rainfall (mm/hr)
12SCS100         01/01/2000 00:00:00   1.92
12SCS100         01/01/2000 00:15:00   2.304
12SCS100         01/01/2000 00:30:00   2.304
12SCS100         01/01/2000 00:45:00   2.304
12SCS100         01/01/2000 01:00:00   2.304
12SCS100         01/01/2000 01:15:00   2.304
12SCS100         01/01/2000 01:30:00   2.304
12SCS100         01/01/2000 01:45:00   2.688
12SCS100         01/01/2000 02:00:00   3.072
12SCS100         01/01/2000 02:15:00   3.072
12SCS100         01/01/2000 02:30:00   3.072
12SCS100         01/01/2000 02:45:00   3.072
12SCS100         01/01/2000 03:00:00   3.84
12SCS100         01/01/2000 03:15:00   3.84
12SCS100         01/01/2000 03:30:00   3.84
12SCS100         01/01/2000 03:45:00   3.84
12SCS100         01/01/2000 04:00:00   4.992
12SCS100         01/01/2000 04:15:00   5.376
12SCS100         01/01/2000 04:30:00   6.144
12SCS100         01/01/2000 04:45:00   6.912
12SCS100         01/01/2000 05:00:00   8.448
12SCS100         01/01/2000 05:15:00   12.672
12SCS100         01/01/2000 05:30:00   18.048
12SCS100         01/01/2000 05:45:00   145.92
12SCS100         01/01/2000 06:00:00   27.648
12SCS100         01/01/2000 06:15:00   15.744
12SCS100         01/01/2000 06:30:00   10.752
12SCS100         01/01/2000 06:45:00   8.064
12SCS100         01/01/2000 07:00:00   6.528
12SCS100         01/01/2000 07:15:00   5.376
12SCS100         01/01/2000 07:30:00   4.992
12SCS100         01/01/2000 07:45:00   4.608
```

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12SCS100          01/01/2000 08:00:00   4.608
12SCS100          01/01/2000 08:15:00   3.84
12SCS100          01/01/2000 08:30:00   3.84
12SCS100          01/01/2000 08:45:00   3.456
12SCS100          01/01/2000 09:00:00   3.072
12SCS100          01/01/2000 09:15:00   3.072
12SCS100          01/01/2000 09:30:00   3.072
12SCS100          01/01/2000 09:45:00   2.688
12SCS100          01/01/2000 10:00:00   2.304
12SCS100          01/01/2000 10:15:00   2.304
12SCS100          01/01/2000 10:30:00   2.304
12SCS100          01/01/2000 10:45:00   2.304
12SCS100          01/01/2000 11:00:00   2.304
12SCS100          01/01/2000 11:15:00   2.304
12SCS100          01/01/2000 11:30:00   2.304
12SCS100          01/01/2000 11:45:00   1.92

;Rainfall (mm/hr)
12SCS2            01/01/2000 00:00:00   0.864
12SCS2            01/01/2000 00:15:00   1.037
12SCS2            01/01/2000 00:30:00   1.037
12SCS2            01/01/2000 00:45:00   1.037
12SCS2            01/01/2000 01:00:00   1.037
12SCS2            01/01/2000 01:15:00   1.037
12SCS2            01/01/2000 01:30:00   1.037
12SCS2            01/01/2000 01:45:00   1.21
12SCS2            01/01/2000 02:00:00   1.382
12SCS2            01/01/2000 02:15:00   1.382
12SCS2            01/01/2000 02:30:00   1.382
12SCS2            01/01/2000 02:45:00   1.382
12SCS2            01/01/2000 03:00:00   1.728
12SCS2            01/01/2000 03:15:00   1.728
12SCS2            01/01/2000 03:30:00   1.728
12SCS2            01/01/2000 03:45:00   1.728
12SCS2            01/01/2000 04:00:00   2.246
12SCS2            01/01/2000 04:15:00   2.419
12SCS2            01/01/2000 04:30:00   2.765
12SCS2            01/01/2000 04:45:00   3.11
12SCS2            01/01/2000 05:00:00   3.802
12SCS2            01/01/2000 05:15:00   5.702
12SCS2            01/01/2000 05:30:00   8.122
12SCS2            01/01/2000 05:45:00   65.664
12SCS2            01/01/2000 06:00:00   12.442
12SCS2            01/01/2000 06:15:00   7.085
12SCS2            01/01/2000 06:30:00   4.838
12SCS2            01/01/2000 06:45:00   3.629
12SCS2            01/01/2000 07:00:00   2.938
12SCS2            01/01/2000 07:15:00   2.419
12SCS2            01/01/2000 07:30:00   2.246
12SCS2            01/01/2000 07:45:00   2.074
12SCS2            01/01/2000 08:00:00   2.074
12SCS2            01/01/2000 08:15:00   1.728
12SCS2            01/01/2000 08:30:00   1.728
12SCS2            01/01/2000 08:45:00   1.555
12SCS2            01/01/2000 09:00:00   1.382
12SCS2            01/01/2000 09:15:00   1.382
12SCS2            01/01/2000 09:30:00   1.382
12SCS2            01/01/2000 09:45:00   1.21
12SCS2            01/01/2000 10:00:00   1.037
12SCS2            01/01/2000 10:15:00   1.037
12SCS2            01/01/2000 10:30:00   1.037
12SCS2            01/01/2000 10:45:00   1.037
12SCS2            01/01/2000 11:00:00   1.037
12SCS2            01/01/2000 11:15:00   1.037
12SCS2            01/01/2000 11:30:00   1.037
12SCS2            01/01/2000 11:45:00   0.864

;Rainfall (mm/hr)
12SCS25           01/01/2000 00:00:00   1.584
12SCS25           01/01/2000 00:15:00   1.901
12SCS25           01/01/2000 00:30:00   1.901
12SCS25           01/01/2000 00:45:00   1.901
12SCS25           01/01/2000 01:00:00   1.901
12SCS25           01/01/2000 01:15:00   1.901
12SCS25           01/01/2000 01:30:00   1.901
12SCS25           01/01/2000 01:45:00   2.218
12SCS25           01/01/2000 02:00:00   2.534
12SCS25           01/01/2000 02:15:00   2.534
12SCS25           01/01/2000 02:30:00   2.534
12SCS25           01/01/2000 02:45:00   2.534
12SCS25           01/01/2000 03:00:00   3.168
12SCS25           01/01/2000 03:15:00   3.168
12SCS25           01/01/2000 03:30:00   3.168
12SCS25           01/01/2000 03:45:00   3.168
12SCS25           01/01/2000 04:00:00   4.118
12SCS25           01/01/2000 04:15:00   4.435
12SCS25           01/01/2000 04:30:00   5.069
12SCS25           01/01/2000 04:45:00   5.702
12SCS25           01/01/2000 05:00:00   6.97
12SCS25           01/01/2000 05:15:00   10.454
12SCS25           01/01/2000 05:30:00   14.89
12SCS25           01/01/2000 05:45:00   120.384
12SCS25           01/01/2000 06:00:00   22.81
12SCS25           01/01/2000 06:15:00   12.989
12SCS25           01/01/2000 06:30:00   8.87
12SCS25           01/01/2000 06:45:00   6.653
12SCS25           01/01/2000 07:00:00   5.386
12SCS25           01/01/2000 07:15:00   4.435
12SCS25           01/01/2000 07:30:00   4.118
12SCS25           01/01/2000 07:45:00   3.802
12SCS25           01/01/2000 08:00:00   3.802
12SCS25           01/01/2000 08:15:00   3.168
12SCS25           01/01/2000 08:30:00   3.168
12SCS25           01/01/2000 08:45:00   2.851
12SCS25           01/01/2000 09:00:00   2.534
12SCS25           01/01/2000 09:15:00   2.534
12SCS25           01/01/2000 09:30:00   2.534
12SCS25           01/01/2000 09:45:00   2.218
12SCS25           01/01/2000 10:00:00   1.901
12SCS25           01/01/2000 10:15:00   1.901
12SCS25           01/01/2000 10:30:00   1.901
12SCS25           01/01/2000 10:45:00   1.901
12SCS25           01/01/2000 11:00:00   1.901
12SCS25           01/01/2000 11:15:00   1.901
12SCS25           01/01/2000 11:30:00   1.901
12SCS25           01/01/2000 11:45:00   1.584

;Rainfall (mm/hr)
12SCS5            01/01/2000 00:00:00   1.152
12SCS5            01/01/2000 00:15:00   1.382
12SCS5            01/01/2000 00:30:00   1.382
12SCS5            01/01/2000 00:45:00   1.382
12SCS5            01/01/2000 01:00:00   1.382
12SCS5            01/01/2000 01:15:00   1.382
12SCS5            01/01/2000 01:30:00   1.382
12SCS5            01/01/2000 01:45:00   1.613
12SCS5            01/01/2000 02:00:00   1.843
12SCS5            01/01/2000 02:15:00   1.843
12SCS5            01/01/2000 02:30:00   1.843
12SCS5            01/01/2000 02:45:00   1.843
12SCS5            01/01/2000 03:00:00   2.304
12SCS5            01/01/2000 03:15:00   2.304
12SCS5            01/01/2000 03:30:00   2.304
12SCS5            01/01/2000 03:45:00   2.304
12SCS5            01/01/2000 04:00:00   2.995
12SCS5            01/01/2000 04:15:00   3.226
12SCS5            01/01/2000 04:30:00   3.686
12SCS5            01/01/2000 04:45:00   4.147
12SCS5            01/01/2000 05:00:00   5.069
12SCS5            01/01/2000 05:15:00   7.603
12SCS5            01/01/2000 05:30:00   10.829
12SCS5            01/01/2000 05:45:00   87.552
12SCS5            01/01/2000 06:00:00   16.589
12SCS5            01/01/2000 06:15:00   9.446
12SCS5            01/01/2000 06:30:00   6.451
12SCS5            01/01/2000 06:45:00   4.838
12SCS5            01/01/2000 07:00:00   3.917
12SCS5            01/01/2000 07:15:00   3.226
12SCS5            01/01/2000 07:30:00   2.995
12SCS5            01/01/2000 07:45:00   2.765
12SCS5            01/01/2000 08:00:00   2.765
12SCS5            01/01/2000 08:15:00   2.304
12SCS5            01/01/2000 08:30:00   2.304
12SCS5            01/01/2000 08:45:00   2.074
12SCS5            01/01/2000 09:00:00   1.843
12SCS5            01/01/2000 09:15:00   1.843
12SCS5            01/01/2000 09:30:00   1.843
12SCS5            01/01/2000 09:45:00   1.613
12SCS5            01/01/2000 10:00:00   1.382
12SCS5            01/01/2000 10:15:00   1.382
12SCS5            01/01/2000 10:30:00   1.382
12SCS5            01/01/2000 10:45:00   1.382
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12SCS5          01/01/2000 11:00:00   1.382
12SCS5          01/01/2000 11:15:00   1.382
12SCS5          01/01/2000 11:30:00   1.382
12SCS5          01/01/2000 11:45:00   1.152

;Rainfall (mm/hr)
12SCS50         01/01/2000 00:00:00   1.752
12SCS50         01/01/2000 00:15:00   2.102
12SCS50         01/01/2000 00:30:00   2.102
12SCS50         01/01/2000 00:45:00   2.102
12SCS50         01/01/2000 01:00:00   2.102
12SCS50         01/01/2000 01:15:00   2.102
12SCS50         01/01/2000 01:30:00   2.102
12SCS50         01/01/2000 01:45:00   2.453
12SCS50         01/01/2000 02:00:00   2.803
12SCS50         01/01/2000 02:15:00   2.803
12SCS50         01/01/2000 02:30:00   2.803
12SCS50         01/01/2000 02:45:00   2.803
12SCS50         01/01/2000 03:00:00   3.504
12SCS50         01/01/2000 03:15:00   3.504
12SCS50         01/01/2000 03:30:00   3.504
12SCS50         01/01/2000 03:45:00   3.504
12SCS50         01/01/2000 04:00:00   4.555
12SCS50         01/01/2000 04:15:00   4.906
12SCS50         01/01/2000 04:30:00   5.606
12SCS50         01/01/2000 04:45:00   6.307
12SCS50         01/01/2000 05:00:00   7.709
12SCS50         01/01/2000 05:15:00   11.563
12SCS50         01/01/2000 05:30:00   16.469
12SCS50         01/01/2000 05:45:00   133.152
12SCS50         01/01/2000 06:00:00   25.229
12SCS50         01/01/2000 06:15:00   14.366
12SCS50         01/01/2000 06:30:00   9.811
12SCS50         01/01/2000 06:45:00   7.358
12SCS50         01/01/2000 07:00:00   5.957
12SCS50         01/01/2000 07:15:00   4.906
12SCS50         01/01/2000 07:30:00   4.555
12SCS50         01/01/2000 07:45:00   4.205
12SCS50         01/01/2000 08:00:00   4.205
12SCS50         01/01/2000 08:15:00   3.504
12SCS50         01/01/2000 08:30:00   3.504
12SCS50         01/01/2000 08:45:00   3.154
12SCS50         01/01/2000 09:00:00   2.803
12SCS50         01/01/2000 09:15:00   2.803
12SCS50         01/01/2000 09:30:00   2.803
12SCS50         01/01/2000 09:45:00   2.453
12SCS50         01/01/2000 10:00:00   2.102
12SCS50         01/01/2000 10:15:00   2.102
12SCS50         01/01/2000 10:30:00   2.102
12SCS50         01/01/2000 10:45:00   2.102
12SCS50         01/01/2000 11:00:00   2.102
12SCS50         01/01/2000 11:15:00   2.102
12SCS50         01/01/2000 11:30:00   2.102
12SCS50         01/01/2000 11:45:00   1.752

;Rainfall (mm/hr)
24SCS10         01/01/2000 00:00:00   0.792
24SCS10         01/01/2000 00:15:00   0.792
24SCS10         01/01/2000 00:30:00   0.792
24SCS10         01/01/2000 00:45:00   0.792
24SCS10         01/01/2000 01:00:00   0.792
24SCS10         01/01/2000 01:15:00   0.792
24SCS10         01/01/2000 01:30:00   0.792
24SCS10         01/01/2000 01:45:00   0.792
24SCS10         01/01/2000 02:00:00   0.936
24SCS10         01/01/2000 02:15:00   0.936
24SCS10         01/01/2000 02:30:00   0.936
24SCS10         01/01/2000 02:45:00   0.936
24SCS10         01/01/2000 03:00:00   0.936
24SCS10         01/01/2000 03:15:00   0.936
24SCS10         01/01/2000 03:30:00   0.936
24SCS10         01/01/2000 03:45:00   0.936
24SCS10         01/01/2000 04:00:00   1.152
24SCS10         01/01/2000 04:15:00   1.152
24SCS10         01/01/2000 04:30:00   1.152
24SCS10         01/01/2000 04:45:00   1.152
24SCS10         01/01/2000 05:00:00   1.152
24SCS10         01/01/2000 05:15:00   1.152
24SCS10         01/01/2000 05:30:00   1.152
24SCS10         01/01/2000 05:45:00   1.152
24SCS10         01/01/2000 06:00:00   1.296
24SCS10         01/01/2000 06:15:00   1.296
24SCS10         01/01/2000 06:30:00   1.296
24SCS10         01/01/2000 06:45:00   1.296
24SCS10         01/01/2000 07:00:00   1.584
24SCS10         01/01/2000 07:15:00   1.584
24SCS10         01/01/2000 07:30:00   1.584
24SCS10         01/01/2000 07:45:00   1.584
24SCS10         01/01/2000 08:00:00   1.872
24SCS10         01/01/2000 08:15:00   1.872
24SCS10         01/01/2000 08:30:00   2.016
24SCS10         01/01/2000 08:45:00   2.016
24SCS10         01/01/2000 09:00:00   2.304
24SCS10         01/01/2000 09:15:00   2.304
24SCS10         01/01/2000 09:30:00   2.592
24SCS10         01/01/2000 09:45:00   2.592
24SCS10         01/01/2000 10:00:00   3.312
24SCS10         01/01/2000 10:15:00   3.312
24SCS10         01/01/2000 10:30:00   4.464
24SCS10         01/01/2000 10:45:00   4.464
24SCS10         01/01/2000 11:00:00   6.912
24SCS10         01/01/2000 11:15:00   6.912
24SCS10         01/01/2000 11:30:00   21.312
24SCS10         01/01/2000 11:45:00   88.128
24SCS10         01/01/2000 12:00:00   10.368
24SCS10         01/01/2000 12:15:00   10.368
24SCS10         01/01/2000 12:30:00   5.328
24SCS10         01/01/2000 12:45:00   5.328
24SCS10         01/01/2000 13:00:00   3.888
24SCS10         01/01/2000 13:15:00   3.888
24SCS10         01/01/2000 13:30:00   3.024
24SCS10         01/01/2000 13:45:00   3.024
24SCS10         01/01/2000 14:00:00   2.16
24SCS10         01/01/2000 14:15:00   2.16
24SCS10         01/01/2000 14:30:00   2.16
24SCS10         01/01/2000 14:45:00   2.16
24SCS10         01/01/2000 15:00:00   2.16
24SCS10         01/01/2000 15:15:00   2.16
24SCS10         01/01/2000 15:30:00   2.16
24SCS10         01/01/2000 15:45:00   2.16
24SCS10         01/01/2000 16:00:00   1.296
24SCS10         01/01/2000 16:15:00   1.296
24SCS10         01/01/2000 16:30:00   1.296
24SCS10         01/01/2000 16:45:00   1.296
24SCS10         01/01/2000 17:00:00   1.296
24SCS10         01/01/2000 17:15:00   1.296
24SCS10         01/01/2000 17:30:00   1.296
24SCS10         01/01/2000 17:45:00   1.296
24SCS10         01/01/2000 18:00:00   1.296
24SCS10         01/01/2000 18:15:00   1.296
24SCS10         01/01/2000 18:30:00   1.296
24SCS10         01/01/2000 18:45:00   1.296
24SCS10         01/01/2000 19:00:00   1.296
24SCS10         01/01/2000 19:15:00   1.296
24SCS10         01/01/2000 19:30:00   1.296
24SCS10         01/01/2000 19:45:00   1.296
24SCS10         01/01/2000 20:00:00   0.864
24SCS10         01/01/2000 20:15:00   0.864
24SCS10         01/01/2000 20:30:00   0.864
24SCS10         01/01/2000 20:45:00   0.864
24SCS10         01/01/2000 21:00:00   0.864
24SCS10         01/01/2000 21:15:00   0.864
24SCS10         01/01/2000 21:30:00   0.864
24SCS10         01/01/2000 21:45:00   0.864
24SCS10         01/01/2000 22:00:00   0.864
24SCS10         01/01/2000 22:15:00   0.864
24SCS10         01/01/2000 22:30:00   0.864
24SCS10         01/01/2000 22:45:00   0.864
24SCS10         01/01/2000 23:00:00   0.864
24SCS10         01/01/2000 23:15:00   0.864
24SCS10         01/01/2000 23:30:00   0.864
24SCS10         01/01/2000 23:45:00   0.864

;Rainfall (mm/hr)
24SCS100        01/01/2000 00:00:00   1.135
24SCS100        01/01/2000 00:15:00   1.135
24SCS100        01/01/2000 00:30:00   1.135
24SCS100        01/01/2000 00:45:00   1.135
24SCS100        01/01/2000 01:00:00   1.135
24SCS100        01/01/2000 01:15:00   1.135
24SCS100        01/01/2000 01:30:00   1.135
24SCS100        01/01/2000 01:45:00   1.135
```

```
24SCS100        01/01/2000 02:00:00   1.342
24SCS100        01/01/2000 02:15:00   1.342
24SCS100        01/01/2000 02:30:00   1.342
24SCS100        01/01/2000 02:45:00   1.342
24SCS100        01/01/2000 03:00:00   1.342
24SCS100        01/01/2000 03:15:00   1.342
24SCS100        01/01/2000 03:30:00   1.342
24SCS100        01/01/2000 03:45:00   1.342
24SCS100        01/01/2000 04:00:00   1.651
24SCS100        01/01/2000 04:15:00   1.651
24SCS100        01/01/2000 04:30:00   1.651
24SCS100        01/01/2000 04:45:00   1.651
24SCS100        01/01/2000 05:00:00   1.651
24SCS100        01/01/2000 05:15:00   1.651
24SCS100        01/01/2000 05:30:00   1.651
24SCS100        01/01/2000 05:45:00   1.651
24SCS100        01/01/2000 06:00:00   1.858
24SCS100        01/01/2000 06:15:00   1.858
24SCS100        01/01/2000 06:30:00   1.858
24SCS100        01/01/2000 06:45:00   1.858
24SCS100        01/01/2000 07:00:00   2.27
24SCS100        01/01/2000 07:15:00   2.27
24SCS100        01/01/2000 07:30:00   2.27
24SCS100        01/01/2000 07:45:00   2.27
24SCS100        01/01/2000 08:00:00   2.683
24SCS100        01/01/2000 08:15:00   2.683
24SCS100        01/01/2000 08:30:00   2.89
24SCS100        01/01/2000 08:45:00   2.89
24SCS100        01/01/2000 09:00:00   3.302
24SCS100        01/01/2000 09:15:00   3.302
24SCS100        01/01/2000 09:30:00   3.715
24SCS100        01/01/2000 09:45:00   3.715
24SCS100        01/01/2000 10:00:00   4.747
24SCS100        01/01/2000 10:15:00   4.747
24SCS100        01/01/2000 10:30:00   6.398
24SCS100        01/01/2000 10:45:00   6.398
24SCS100        01/01/2000 11:00:00   9.907
24SCS100        01/01/2000 11:15:00   9.907
24SCS100        01/01/2000 11:30:00   30.547
24SCS100        01/01/2000 11:45:00   126.317
24SCS100        01/01/2000 12:00:00   14.861
24SCS100        01/01/2000 12:15:00   14.861
24SCS100        01/01/2000 12:30:00   7.637
24SCS100        01/01/2000 12:45:00   7.637
24SCS100        01/01/2000 13:00:00   5.573
24SCS100        01/01/2000 13:15:00   5.573
24SCS100        01/01/2000 13:30:00   4.334
24SCS100        01/01/2000 13:45:00   4.334
24SCS100        01/01/2000 14:00:00   3.096
24SCS100        01/01/2000 14:15:00   3.096
24SCS100        01/01/2000 14:30:00   3.096
24SCS100        01/01/2000 14:45:00   3.096
24SCS100        01/01/2000 15:00:00   3.096
24SCS100        01/01/2000 15:15:00   3.096
24SCS100        01/01/2000 15:30:00   3.096
24SCS100        01/01/2000 15:45:00   3.096
24SCS100        01/01/2000 16:00:00   1.858
24SCS100        01/01/2000 16:15:00   1.858
24SCS100        01/01/2000 16:30:00   1.858
24SCS100        01/01/2000 16:45:00   1.858
24SCS100        01/01/2000 17:00:00   1.858
24SCS100        01/01/2000 17:15:00   1.858
24SCS100        01/01/2000 17:30:00   1.858
24SCS100        01/01/2000 17:45:00   1.858
24SCS100        01/01/2000 18:00:00   1.858
24SCS100        01/01/2000 18:15:00   1.858
24SCS100        01/01/2000 18:30:00   1.858
24SCS100        01/01/2000 18:45:00   1.858
24SCS100        01/01/2000 19:00:00   1.858
24SCS100        01/01/2000 19:15:00   1.858
24SCS100        01/01/2000 19:30:00   1.858
24SCS100        01/01/2000 19:45:00   1.858
24SCS100        01/01/2000 20:00:00   1.238
24SCS100        01/01/2000 20:15:00   1.238
24SCS100        01/01/2000 20:30:00   1.238
24SCS100        01/01/2000 20:45:00   1.238
24SCS100        01/01/2000 21:00:00   1.238
24SCS100        01/01/2000 21:15:00   1.238
24SCS100        01/01/2000 21:30:00   1.238
24SCS100        01/01/2000 21:45:00   1.238
24SCS100        01/01/2000 22:00:00   1.238
24SCS100        01/01/2000 22:15:00   1.238
24SCS100        01/01/2000 22:30:00   1.238
24SCS100        01/01/2000 22:45:00   1.238
24SCS100        01/01/2000 23:00:00   1.238
24SCS100        01/01/2000 23:15:00   1.238
24SCS100        01/01/2000 23:30:00   1.238
24SCS100        01/01/2000 23:45:00   1.238

;Rainfall (mm/hr)
24SCS2          01/01/2000 00:00:00   0.528
24SCS2          01/01/2000 00:15:00   0.528
24SCS2          01/01/2000 00:30:00   0.528
24SCS2          01/01/2000 00:45:00   0.528
24SCS2          01/01/2000 01:00:00   0.528
24SCS2          01/01/2000 01:15:00   0.528
24SCS2          01/01/2000 01:30:00   0.528
24SCS2          01/01/2000 01:45:00   0.528
24SCS2          01/01/2000 02:00:00   0.624
24SCS2          01/01/2000 02:15:00   0.624
24SCS2          01/01/2000 02:30:00   0.624
24SCS2          01/01/2000 02:45:00   0.624
24SCS2          01/01/2000 03:00:00   0.624
24SCS2          01/01/2000 03:15:00   0.624
24SCS2          01/01/2000 03:30:00   0.624
24SCS2          01/01/2000 03:45:00   0.624
24SCS2          01/01/2000 04:00:00   0.768
24SCS2          01/01/2000 04:15:00   0.768
24SCS2          01/01/2000 04:30:00   0.768
24SCS2          01/01/2000 04:45:00   0.768
24SCS2          01/01/2000 05:00:00   0.768
24SCS2          01/01/2000 05:15:00   0.768
24SCS2          01/01/2000 05:30:00   0.768
24SCS2          01/01/2000 05:45:00   0.768
24SCS2          01/01/2000 06:00:00   0.864
24SCS2          01/01/2000 06:15:00   0.864
24SCS2          01/01/2000 06:30:00   0.864
24SCS2          01/01/2000 06:45:00   0.864
24SCS2          01/01/2000 07:00:00   1.056
24SCS2          01/01/2000 07:15:00   1.056
24SCS2          01/01/2000 07:30:00   1.056
24SCS2          01/01/2000 07:45:00   1.056
24SCS2          01/01/2000 08:00:00   1.248
24SCS2          01/01/2000 08:15:00   1.248
24SCS2          01/01/2000 08:30:00   1.344
24SCS2          01/01/2000 08:45:00   1.344
24SCS2          01/01/2000 09:00:00   1.536
24SCS2          01/01/2000 09:15:00   1.536
24SCS2          01/01/2000 09:30:00   1.728
24SCS2          01/01/2000 09:45:00   1.728
24SCS2          01/01/2000 10:00:00   2.208
24SCS2          01/01/2000 10:15:00   2.208
24SCS2          01/01/2000 10:30:00   2.976
24SCS2          01/01/2000 10:45:00   2.976
24SCS2          01/01/2000 11:00:00   4.608
24SCS2          01/01/2000 11:15:00   4.608
24SCS2          01/01/2000 11:30:00   14.208
24SCS2          01/01/2000 11:45:00   58.752
24SCS2          01/01/2000 12:00:00   6.912
24SCS2          01/01/2000 12:15:00   6.912
24SCS2          01/01/2000 12:30:00   3.552
24SCS2          01/01/2000 12:45:00   3.552
24SCS2          01/01/2000 13:00:00   2.592
24SCS2          01/01/2000 13:15:00   2.592
24SCS2          01/01/2000 13:30:00   2.016
24SCS2          01/01/2000 13:45:00   2.016
24SCS2          01/01/2000 14:00:00   1.44
24SCS2          01/01/2000 14:15:00   1.44
24SCS2          01/01/2000 14:30:00   1.44
24SCS2          01/01/2000 14:45:00   1.44
24SCS2          01/01/2000 15:00:00   1.44
24SCS2          01/01/2000 15:15:00   1.44
24SCS2          01/01/2000 15:30:00   1.44
24SCS2          01/01/2000 15:45:00   1.44
24SCS2          01/01/2000 16:00:00   0.864
24SCS2          01/01/2000 16:15:00   0.864
24SCS2          01/01/2000 16:30:00   0.864
24SCS2          01/01/2000 16:45:00   0.864
24SCS2          01/01/2000 17:00:00   0.864
24SCS2          01/01/2000 17:15:00   0.864
24SCS2          01/01/2000 17:30:00   0.864
24SCS2          01/01/2000 17:45:00   0.864
```

```
24SCS2           01/01/2000 18:00:00   0.864
24SCS2           01/01/2000 18:15:00   0.864
24SCS2           01/01/2000 18:30:00   0.864
24SCS2           01/01/2000 18:45:00   0.864
24SCS2           01/01/2000 19:00:00   0.864
24SCS2           01/01/2000 19:15:00   0.864
24SCS2           01/01/2000 19:30:00   0.864
24SCS2           01/01/2000 19:45:00   0.864
24SCS2           01/01/2000 20:00:00   0.576
24SCS2           01/01/2000 20:15:00   0.576
24SCS2           01/01/2000 20:30:00   0.576
24SCS2           01/01/2000 20:45:00   0.576
24SCS2           01/01/2000 21:00:00   0.576
24SCS2           01/01/2000 21:15:00   0.576
24SCS2           01/01/2000 21:30:00   0.576
24SCS2           01/01/2000 21:45:00   0.576
24SCS2           01/01/2000 22:00:00   0.576
24SCS2           01/01/2000 22:15:00   0.576
24SCS2           01/01/2000 22:30:00   0.576
24SCS2           01/01/2000 22:45:00   0.576
24SCS2           01/01/2000 23:00:00   0.576
24SCS2           01/01/2000 23:15:00   0.576
24SCS2           01/01/2000 23:30:00   0.576
24SCS2           01/01/2000 23:45:00   0.576

;Rainfall (mm/hr)
24SCS25          01/01/2000 00:00:00   0.924
24SCS25          01/01/2000 00:15:00   0.924
24SCS25          01/01/2000 00:30:00   0.924
24SCS25          01/01/2000 00:45:00   0.924
24SCS25          01/01/2000 01:00:00   0.924
24SCS25          01/01/2000 01:15:00   0.924
24SCS25          01/01/2000 01:30:00   0.924
24SCS25          01/01/2000 01:45:00   0.924
24SCS25          01/01/2000 02:00:00   1.092
24SCS25          01/01/2000 02:15:00   1.092
24SCS25          01/01/2000 02:30:00   1.092
24SCS25          01/01/2000 02:45:00   1.092
24SCS25          01/01/2000 03:00:00   1.092
24SCS25          01/01/2000 03:15:00   1.092
24SCS25          01/01/2000 03:30:00   1.092
24SCS25          01/01/2000 03:45:00   1.092
24SCS25          01/01/2000 04:00:00   1.344
24SCS25          01/01/2000 04:15:00   1.344
24SCS25          01/01/2000 04:30:00   1.344
24SCS25          01/01/2000 04:45:00   1.344
24SCS25          01/01/2000 05:00:00   1.344
24SCS25          01/01/2000 05:15:00   1.344
24SCS25          01/01/2000 05:30:00   1.344
24SCS25          01/01/2000 05:45:00   1.344
24SCS25          01/01/2000 06:00:00   1.512
24SCS25          01/01/2000 06:15:00   1.512
24SCS25          01/01/2000 06:30:00   1.512
24SCS25          01/01/2000 06:45:00   1.512
24SCS25          01/01/2000 07:00:00   1.848
24SCS25          01/01/2000 07:15:00   1.848
24SCS25          01/01/2000 07:30:00   1.848
24SCS25          01/01/2000 07:45:00   1.848
24SCS25          01/01/2000 08:00:00   2.184
24SCS25          01/01/2000 08:15:00   2.184
24SCS25          01/01/2000 08:30:00   2.352
24SCS25          01/01/2000 08:45:00   2.352
24SCS25          01/01/2000 09:00:00   2.688
24SCS25          01/01/2000 09:15:00   2.688
24SCS25          01/01/2000 09:30:00   3.024
24SCS25          01/01/2000 09:45:00   3.024
24SCS25          01/01/2000 10:00:00   3.864
24SCS25          01/01/2000 10:15:00   3.864
24SCS25          01/01/2000 10:30:00   5.208
24SCS25          01/01/2000 10:45:00   5.208
24SCS25          01/01/2000 11:00:00   8.064
24SCS25          01/01/2000 11:15:00   8.064
24SCS25          01/01/2000 11:30:00   24.864
24SCS25          01/01/2000 11:45:00   102.816
24SCS25          01/01/2000 12:00:00   12.096
24SCS25          01/01/2000 12:15:00   12.096
24SCS25          01/01/2000 12:30:00   6.216
24SCS25          01/01/2000 12:45:00   6.216
24SCS25          01/01/2000 13:00:00   4.536
24SCS25          01/01/2000 13:15:00   4.536
24SCS25          01/01/2000 13:30:00   3.528
24SCS25          01/01/2000 13:45:00   3.528
24SCS25          01/01/2000 14:00:00   2.52
24SCS25          01/01/2000 14:15:00   2.52
24SCS25          01/01/2000 14:30:00   2.52
24SCS25          01/01/2000 14:45:00   2.52
24SCS25          01/01/2000 15:00:00   2.52
24SCS25          01/01/2000 15:15:00   2.52
24SCS25          01/01/2000 15:30:00   2.52
24SCS25          01/01/2000 15:45:00   2.52
24SCS25          01/01/2000 16:00:00   1.512
24SCS25          01/01/2000 16:15:00   1.512
24SCS25          01/01/2000 16:30:00   1.512
24SCS25          01/01/2000 16:45:00   1.512
24SCS25          01/01/2000 17:00:00   1.512
24SCS25          01/01/2000 17:15:00   1.512
24SCS25          01/01/2000 17:30:00   1.512
24SCS25          01/01/2000 17:45:00   1.512
24SCS25          01/01/2000 18:00:00   1.512
24SCS25          01/01/2000 18:15:00   1.512
24SCS25          01/01/2000 18:30:00   1.512
24SCS25          01/01/2000 18:45:00   1.512
24SCS25          01/01/2000 19:00:00   1.512
24SCS25          01/01/2000 19:15:00   1.512
24SCS25          01/01/2000 19:30:00   1.512
24SCS25          01/01/2000 19:45:00   1.512
24SCS25          01/01/2000 20:00:00   1.008
24SCS25          01/01/2000 20:15:00   1.008
24SCS25          01/01/2000 20:30:00   1.008
24SCS25          01/01/2000 20:45:00   1.008
24SCS25          01/01/2000 21:00:00   1.008
24SCS25          01/01/2000 21:15:00   1.008
24SCS25          01/01/2000 21:30:00   1.008
24SCS25          01/01/2000 21:45:00   1.008
24SCS25          01/01/2000 22:00:00   1.008
24SCS25          01/01/2000 22:15:00   1.008
24SCS25          01/01/2000 22:30:00   1.008
24SCS25          01/01/2000 22:45:00   1.008
24SCS25          01/01/2000 23:00:00   1.008
24SCS25          01/01/2000 23:15:00   1.008
24SCS25          01/01/2000 23:30:00   1.008
24SCS25          01/01/2000 23:45:00   1.008

;Rainfall (mm/hr)
24SCS5           01/01/2000 00:00:00   0.686
24SCS5           01/01/2000 00:15:00   0.686
24SCS5           01/01/2000 00:30:00   0.686
24SCS5           01/01/2000 00:45:00   0.686
24SCS5           01/01/2000 01:00:00   0.686
24SCS5           01/01/2000 01:15:00   0.686
24SCS5           01/01/2000 01:30:00   0.686
24SCS5           01/01/2000 01:45:00   0.686
24SCS5           01/01/2000 02:00:00   0.811
24SCS5           01/01/2000 02:15:00   0.811
24SCS5           01/01/2000 02:30:00   0.811
24SCS5           01/01/2000 02:45:00   0.811
24SCS5           01/01/2000 03:00:00   0.811
24SCS5           01/01/2000 03:15:00   0.811
24SCS5           01/01/2000 03:30:00   0.811
24SCS5           01/01/2000 03:45:00   0.811
24SCS5           01/01/2000 04:00:00   0.998
24SCS5           01/01/2000 04:15:00   0.998
24SCS5           01/01/2000 04:30:00   0.998
24SCS5           01/01/2000 04:45:00   0.998
24SCS5           01/01/2000 05:00:00   0.998
24SCS5           01/01/2000 05:15:00   0.998
24SCS5           01/01/2000 05:30:00   0.998
24SCS5           01/01/2000 05:45:00   0.998
24SCS5           01/01/2000 06:00:00   1.123
24SCS5           01/01/2000 06:15:00   1.123
24SCS5           01/01/2000 06:30:00   1.123
24SCS5           01/01/2000 06:45:00   1.123
24SCS5           01/01/2000 07:00:00   1.373
24SCS5           01/01/2000 07:15:00   1.373
24SCS5           01/01/2000 07:30:00   1.373
24SCS5           01/01/2000 07:45:00   1.373
24SCS5           01/01/2000 08:00:00   1.622
24SCS5           01/01/2000 08:15:00   1.622
24SCS5           01/01/2000 08:30:00   1.747
24SCS5           01/01/2000 08:45:00   1.747
24SCS5           01/01/2000 09:00:00   1.997
24SCS5           01/01/2000 09:15:00   1.997
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24SCS5          01/01/2000 09:30:00   2.246
24SCS5          01/01/2000 09:45:00   2.246
24SCS5          01/01/2000 10:00:00   2.87
24SCS5          01/01/2000 10:15:00   2.87
24SCS5          01/01/2000 10:30:00   3.869
24SCS5          01/01/2000 10:45:00   3.869
24SCS5          01/01/2000 11:00:00   5.99
24SCS5          01/01/2000 11:15:00   5.99
24SCS5          01/01/2000 11:30:00   18.47
24SCS5          01/01/2000 11:45:00   76.378
24SCS5          01/01/2000 12:00:00   8.986
24SCS5          01/01/2000 12:15:00   8.986
24SCS5          01/01/2000 12:30:00   4.618
24SCS5          01/01/2000 12:45:00   4.618
24SCS5          01/01/2000 13:00:00   3.37
24SCS5          01/01/2000 13:15:00   3.37
24SCS5          01/01/2000 13:30:00   2.621
24SCS5          01/01/2000 13:45:00   2.621
24SCS5          01/01/2000 14:00:00   1.872
24SCS5          01/01/2000 14:15:00   1.872
24SCS5          01/01/2000 14:30:00   1.872
24SCS5          01/01/2000 14:45:00   1.872
24SCS5          01/01/2000 15:00:00   1.872
24SCS5          01/01/2000 15:15:00   1.872
24SCS5          01/01/2000 15:30:00   1.872
24SCS5          01/01/2000 15:45:00   1.872
24SCS5          01/01/2000 16:00:00   1.123
24SCS5          01/01/2000 16:15:00   1.123
24SCS5          01/01/2000 16:30:00   1.123
24SCS5          01/01/2000 16:45:00   1.123
24SCS5          01/01/2000 17:00:00   1.123
24SCS5          01/01/2000 17:15:00   1.123
24SCS5          01/01/2000 17:30:00   1.123
24SCS5          01/01/2000 17:45:00   1.123
24SCS5          01/01/2000 18:00:00   1.123
24SCS5          01/01/2000 18:15:00   1.123
24SCS5          01/01/2000 18:30:00   1.123
24SCS5          01/01/2000 18:45:00   1.123
24SCS5          01/01/2000 19:00:00   1.123
24SCS5          01/01/2000 19:15:00   1.123
24SCS5          01/01/2000 19:30:00   1.123
24SCS5          01/01/2000 19:45:00   1.123
24SCS5          01/01/2000 20:00:00   0.749
24SCS5          01/01/2000 20:15:00   0.749
24SCS5          01/01/2000 20:30:00   0.749
24SCS5          01/01/2000 20:45:00   0.749
24SCS5          01/01/2000 21:00:00   0.749
24SCS5          01/01/2000 21:15:00   0.749
24SCS5          01/01/2000 21:30:00   0.749
24SCS5          01/01/2000 21:45:00   0.749
24SCS5          01/01/2000 22:00:00   0.749
24SCS5          01/01/2000 22:15:00   0.749
24SCS5          01/01/2000 22:30:00   0.749
24SCS5          01/01/2000 22:45:00   0.749
24SCS5          01/01/2000 23:00:00   0.749
24SCS5          01/01/2000 23:15:00   0.749
24SCS5          01/01/2000 23:30:00   0.749
24SCS5          01/01/2000 23:45:00   0.749

;Rainfall (mm/hr)
24SCS50         01/01/2000 00:00:00   1.03
24SCS50         01/01/2000 00:15:00   1.03
24SCS50         01/01/2000 00:30:00   1.03
24SCS50         01/01/2000 00:45:00   1.03
24SCS50         01/01/2000 01:00:00   1.03
24SCS50         01/01/2000 01:15:00   1.03
24SCS50         01/01/2000 01:30:00   1.03
24SCS50         01/01/2000 01:45:00   1.03
24SCS50         01/01/2000 02:00:00   1.217
24SCS50         01/01/2000 02:15:00   1.217
24SCS50         01/01/2000 02:30:00   1.217
24SCS50         01/01/2000 02:45:00   1.217
24SCS50         01/01/2000 03:00:00   1.217
24SCS50         01/01/2000 03:15:00   1.217
24SCS50         01/01/2000 03:30:00   1.217
24SCS50         01/01/2000 03:45:00   1.217
24SCS50         01/01/2000 04:00:00   1.498
24SCS50         01/01/2000 04:15:00   1.498
24SCS50         01/01/2000 04:30:00   1.498
24SCS50         01/01/2000 04:45:00   1.498
24SCS50         01/01/2000 05:00:00   1.498
24SCS50         01/01/2000 05:15:00   1.498
24SCS50         01/01/2000 05:30:00   1.498
24SCS50         01/01/2000 05:45:00   1.498
24SCS50         01/01/2000 06:00:00   1.685
24SCS50         01/01/2000 06:15:00   1.685
24SCS50         01/01/2000 06:30:00   1.685
24SCS50         01/01/2000 06:45:00   1.685
24SCS50         01/01/2000 07:00:00   2.059
24SCS50         01/01/2000 07:15:00   2.059
24SCS50         01/01/2000 07:30:00   2.059
24SCS50         01/01/2000 07:45:00   2.059
24SCS50         01/01/2000 08:00:00   2.434
24SCS50         01/01/2000 08:15:00   2.434
24SCS50         01/01/2000 08:30:00   2.621
24SCS50         01/01/2000 08:45:00   2.621
24SCS50         01/01/2000 09:00:00   2.995
24SCS50         01/01/2000 09:15:00   2.995
24SCS50         01/01/2000 09:30:00   3.37
24SCS50         01/01/2000 09:45:00   3.37
24SCS50         01/01/2000 10:00:00   4.306
24SCS50         01/01/2000 10:15:00   4.306
24SCS50         01/01/2000 10:30:00   5.803
24SCS50         01/01/2000 10:45:00   5.803
24SCS50         01/01/2000 11:00:00   8.986
24SCS50         01/01/2000 11:15:00   8.986
24SCS50         01/01/2000 11:30:00   27.706
24SCS50         01/01/2000 11:45:00   114.566
24SCS50         01/01/2000 12:00:00   13.478
24SCS50         01/01/2000 12:15:00   13.478
24SCS50         01/01/2000 12:30:00   6.926
24SCS50         01/01/2000 12:45:00   6.926
24SCS50         01/01/2000 13:00:00   5.054
24SCS50         01/01/2000 13:15:00   5.054
24SCS50         01/01/2000 13:30:00   3.931
24SCS50         01/01/2000 13:45:00   3.931
24SCS50         01/01/2000 14:00:00   2.808
24SCS50         01/01/2000 14:15:00   2.808
24SCS50         01/01/2000 14:30:00   2.808
24SCS50         01/01/2000 14:45:00   2.808
24SCS50         01/01/2000 15:00:00   2.808
24SCS50         01/01/2000 15:15:00   2.808
24SCS50         01/01/2000 15:30:00   2.808
24SCS50         01/01/2000 15:45:00   2.808
24SCS50         01/01/2000 16:00:00   1.685
24SCS50         01/01/2000 16:15:00   1.685
24SCS50         01/01/2000 16:30:00   1.685
24SCS50         01/01/2000 16:45:00   1.685
24SCS50         01/01/2000 17:00:00   1.685
24SCS50         01/01/2000 17:15:00   1.685
24SCS50         01/01/2000 17:30:00   1.685
24SCS50         01/01/2000 17:45:00   1.685
24SCS50         01/01/2000 18:00:00   1.685
24SCS50         01/01/2000 18:15:00   1.685
24SCS50         01/01/2000 18:30:00   1.685
24SCS50         01/01/2000 18:45:00   1.685
24SCS50         01/01/2000 19:00:00   1.685
24SCS50         01/01/2000 19:15:00   1.685
24SCS50         01/01/2000 19:30:00   1.685
24SCS50         01/01/2000 19:45:00   1.685
24SCS50         01/01/2000 20:00:00   1.123
24SCS50         01/01/2000 20:15:00   1.123
24SCS50         01/01/2000 20:30:00   1.123
24SCS50         01/01/2000 20:45:00   1.123
24SCS50         01/01/2000 21:00:00   1.123
24SCS50         01/01/2000 21:15:00   1.123
24SCS50         01/01/2000 21:30:00   1.123
24SCS50         01/01/2000 21:45:00   1.123
24SCS50         01/01/2000 22:00:00   1.123
24SCS50         01/01/2000 22:15:00   1.123
24SCS50         01/01/2000 22:30:00   1.123
24SCS50         01/01/2000 22:45:00   1.123
24SCS50         01/01/2000 23:00:00   1.123
24SCS50         01/01/2000 23:15:00   1.123
24SCS50         01/01/2000 23:30:00   1.123
24SCS50         01/01/2000 23:45:00   1.123

;Rainfall (mm/hr)
4hr-25mm        01/01/2000 00:00:00   1.777
4hr-25mm        01/01/2000 00:15:00   2.357
4hr-25mm        01/01/2000 00:30:00   3.618
4hr-25mm        01/01/2000 00:45:00   8.975
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4hr-25mm          01/01/2000 01:00:00   45.631
4hr-25mm          01/01/2000 01:15:00   11.911
4hr-25mm          01/01/2000 01:30:00   6.051
4hr-25mm          01/01/2000 01:45:00   4.108
4hr-25mm          01/01/2000 02:00:00   3.138
4hr-25mm          01/01/2000 02:15:00   2.555
4hr-25mm          01/01/2000 02:30:00   2.165
4hr-25mm          01/01/2000 02:45:00   1.885
4hr-25mm          01/01/2000 03:00:00   1.675
4hr-25mm          01/01/2000 03:15:00   1.509
4hr-25mm          01/01/2000 03:30:00   1.376
4hr-25mm          01/01/2000 03:45:00   1.266

;Rainfall (mm/hr)
AUG4-88           01/01/2000 00:00:00   0
AUG4-88           01/01/2000 00:05:00   0.1
AUG4-88           01/01/2000 00:10:00   0.1
AUG4-88           01/01/2000 00:15:00   0
AUG4-88           01/01/2000 00:20:00   3.7
AUG4-88           01/01/2000 00:25:00   6.2
AUG4-88           01/01/2000 00:30:00   101.5
AUG4-88           01/01/2000 00:35:00   15.5
AUG4-88           01/01/2000 00:40:00   29.3
AUG4-88           01/01/2000 00:45:00   19.8
AUG4-88           01/01/2000 00:50:00   1.5
AUG4-88           01/01/2000 00:55:00   1.7
AUG4-88           01/01/2000 01:00:00   5.4
AUG4-88           01/01/2000 01:05:00   24.6
AUG4-88           01/01/2000 01:10:00   26.5
AUG4-88           01/01/2000 01:15:00   34.9
AUG4-88           01/01/2000 01:20:00   10.2
AUG4-88           01/01/2000 01:25:00   27.1
AUG4-88           01/01/2000 01:30:00   104.4
AUG4-88           01/01/2000 01:35:00   27.5
AUG4-88           01/01/2000 01:40:00   62.5
AUG4-88           01/01/2000 01:45:00   31.8
AUG4-88           01/01/2000 01:50:00   79.8
AUG4-88           01/01/2000 01:55:00   67.5
AUG4-88           01/01/2000 02:00:00   156.2
AUG4-88           01/01/2000 02:05:00   5.1
AUG4-88           01/01/2000 02:10:00   0.2
AUG4-88           01/01/2000 02:15:00   0.2
AUG4-88           01/01/2000 02:20:00   0.2
AUG4-88           01/01/2000 02:25:00   0.2
AUG4-88           01/01/2000 02:30:00   0.2
AUG4-88           01/01/2000 02:35:00   0.2
AUG4-88           01/01/2000 02:40:00   0.2
AUG4-88           01/01/2000 02:45:00   0.2
AUG4-88           01/01/2000 02:50:00   0.2
AUG4-88           01/01/2000 02:55:00   0.2
AUG4-88           01/01/2000 03:00:00   12.8
AUG4-88           01/01/2000 03:05:00   14
AUG4-88           01/01/2000 03:10:00   22.2
AUG4-88           01/01/2000 03:15:00   21.8
AUG4-88           01/01/2000 03:20:00   1.4
AUG4-88           01/01/2000 03:25:00   0.2
AUG4-88           01/01/2000 03:30:00   0.2
AUG4-88           01/01/2000 03:35:00   0.2
AUG4-88           01/01/2000 03:40:00   0.2
AUG4-88           01/01/2000 03:45:00   0.2
AUG4-88           01/01/2000 03:50:00   0.2
AUG4-88           01/01/2000 03:55:00   0.2
AUG4-88           01/01/2000 04:00:00   0.2
AUG4-88           01/01/2000 04:05:00   0.2
AUG4-88           01/01/2000 04:10:00   0.2
AUG4-88           01/01/2000 04:15:00   0.2
AUG4-88           01/01/2000 04:20:00   0.2
AUG4-88           01/01/2000 04:25:00   0.2
AUG4-88           01/01/2000 04:30:00   0.2
AUG4-88           01/01/2000 04:35:00   0.2
AUG4-88           01/01/2000 04:40:00   0.2
AUG4-88           01/01/2000 04:45:00   0.2
AUG4-88           01/01/2000 04:50:00   0.2
AUG4-88           01/01/2000 04:55:00   0.2
AUG4-88           01/01/2000 05:00:00   2.9
AUG4-88           01/01/2000 05:05:00   7.8
AUG4-88           01/01/2000 05:10:00   10
AUG4-88           01/01/2000 05:15:00   6.3
AUG4-88           01/01/2000 05:20:00   5.1
AUG4-88           01/01/2000 05:25:00   9.8
AUG4-88           01/01/2000 05:30:00   2.6
AUG4-88           01/01/2000 05:35:00   1.7
AUG4-88           01/01/2000 05:40:00   0
AUG4-88           01/01/2000 05:45:00   0

;Rainfall (mm/hr)
AUG8-96           01/01/2000 00:00:00   4
AUG8-96           01/01/2000 00:05:00   11.9
AUG8-96           01/01/2000 00:10:00   26.5
AUG8-96           01/01/2000 00:15:00   13.3
AUG8-96           01/01/2000 00:20:00   0
AUG8-96           01/01/2000 00:25:00   2.7
AUG8-96           01/01/2000 00:30:00   0
AUG8-96           01/01/2000 00:35:00   8
AUG8-96           01/01/2000 00:40:00   18.6
AUG8-96           01/01/2000 00:45:00   10.6
AUG8-96           01/01/2000 00:50:00   21.2
AUG8-96           01/01/2000 00:55:00   2.7
AUG8-96           01/01/2000 01:00:00   2.7
AUG8-96           01/01/2000 01:05:00   15.9
AUG8-96           01/01/2000 01:10:00   66.3
AUG8-96           01/01/2000 01:15:00   55.7
AUG8-96           01/01/2000 01:20:00   122
AUG8-96           01/01/2000 01:25:00   88.9
AUG8-96           01/01/2000 01:30:00   9.3
AUG8-96           01/01/2000 01:35:00   8
AUG8-96           01/01/2000 01:40:00   4
AUG8-96           01/01/2000 01:45:00   0
AUG8-96           01/01/2000 01:50:00   2.7
AUG8-96           01/01/2000 01:55:00   0
AUG8-96           01/01/2000 02:00:00   0
AUG8-96           01/01/2000 02:05:00   0
AUG8-96           01/01/2000 02:10:00   5.3
AUG8-96           01/01/2000 02:15:00   0
AUG8-96           01/01/2000 02:20:00   0
AUG8-96           01/01/2000 02:25:00   0
AUG8-96           01/01/2000 02:30:00   0
AUG8-96           01/01/2000 02:35:00   0
AUG8-96           01/01/2000 02:40:00   0
AUG8-96           01/01/2000 02:45:00   4
AUG8-96           01/01/2000 02:50:00   53.1
AUG8-96           01/01/2000 02:55:00   69
AUG8-96           01/01/2000 03:00:00   63.7
AUG8-96           01/01/2000 03:05:00   58.4
AUG8-96           01/01/2000 03:10:00   47.8
AUG8-96           01/01/2000 03:15:00   15.9
AUG8-96           01/01/2000 03:20:00   13.3
AUG8-96           01/01/2000 03:25:00   8
AUG8-96           01/01/2000 03:30:00   5.3
AUG8-96           01/01/2000 03:35:00   6.6
AUG8-96           01/01/2000 03:40:00   2.7
AUG8-96           01/01/2000 03:45:00   4
AUG8-96           01/01/2000 03:50:00   2.7
AUG8-96           01/01/2000 03:55:00   4
AUG8-96           01/01/2000 04:00:00   2.7
AUG8-96           01/01/2000 04:05:00   5.3
AUG8-96           01/01/2000 04:10:00   4
AUG8-96           01/01/2000 04:15:00   2.7
AUG8-96           01/01/2000 04:20:00   4
AUG8-96           01/01/2000 04:25:00   2.7
AUG8-96           01/01/2000 04:30:00   1.3
AUG8-96           01/01/2000 04:35:00   1.3
AUG8-96           01/01/2000 04:40:00   0
AUG8-96           01/01/2000 04:45:00   0
AUG8-96           01/01/2000 04:50:00   0
AUG8-96           01/01/2000 04:55:00   0
AUG8-96           01/01/2000 05:00:00   2.7
AUG8-96           01/01/2000 05:05:00   0
AUG8-96           01/01/2000 05:10:00   0
AUG8-96           01/01/2000 05:15:00   0
AUG8-96           01/01/2000 05:20:00   0
AUG8-96           01/01/2000 05:25:00   0
AUG8-96           01/01/2000 05:30:00   0
AUG8-96           01/01/2000 05:35:00   0
AUG8-96           01/01/2000 05:40:00   1.3
AUG8-96           01/01/2000 05:45:00   0

;Rainfall (mm/hr)
CHI_3hr_10        01/01/2000 00:00:00   3.755
CHI_3hr_10        01/01/2000 00:10:00   4.478
CHI_3hr_10        01/01/2000 00:20:00   5.593
CHI_3hr_10        01/01/2000 00:30:00   7.551
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CHI_3hr_10       01/01/2000 00:40:00   11.936
CHI_3hr_10       01/01/2000 00:50:00   30.856
CHI_3hr_10       01/01/2000 01:00:00   122.142
CHI_3hr_10       01/01/2000 01:10:00   35.237
CHI_3hr_10       01/01/2000 01:20:00   18.159
CHI_3hr_10       01/01/2000 01:30:00   12.238
CHI_3hr_10       01/01/2000 01:40:00   9.269
CHI_3hr_10       01/01/2000 01:50:00   7.492
CHI_3hr_10       01/01/2000 02:00:00   6.309
CHI_3hr_10       01/01/2000 02:10:00   5.465
CHI_3hr_10       01/01/2000 02:20:00   4.831
CHI_3hr_10       01/01/2000 02:30:00   4.338
CHI_3hr_10       01/01/2000 02:40:00   3.942
CHI_3hr_10       01/01/2000 02:50:00   3.617
CHI_3hr_10       01/01/2000 03:00:00   0

;Rainfall (mm/hr)
CHI_3hr_100      01/01/2000 00:00:00   5.339
CHI_3hr_100      01/01/2000 00:10:00   6.376
CHI_3hr_100      01/01/2000 00:20:00   7.977
CHI_3hr_100      01/01/2000 00:30:00   10.797
CHI_3hr_100      01/01/2000 00:40:00   17.136
CHI_3hr_100      01/01/2000 00:50:00   45.128
CHI_3hr_100      01/01/2000 01:00:00   178.107
CHI_3hr_100      01/01/2000 01:10:00   51.056
CHI_3hr_100      01/01/2000 01:20:00   26.163
CHI_3hr_100      01/01/2000 01:30:00   17.571
CHI_3hr_100      01/01/2000 01:40:00   13.277
CHI_3hr_100      01/01/2000 01:50:00   10.712
CHI_3hr_100      01/01/2000 02:00:00   9.008
CHI_3hr_100      01/01/2000 02:10:00   7.793
CHI_3hr_100      01/01/2000 02:20:00   6.883
CHI_3hr_100      01/01/2000 02:30:00   6.174
CHI_3hr_100      01/01/2000 02:40:00   5.607
CHI_3hr_100      01/01/2000 02:50:00   5.142
CHI_3hr_100      01/01/2000 03:00:00   0

;Rainfall (mm/hr)
CHI_3hr_2        01/01/2000 00:00:00   2.491
CHI_3hr_2        01/01/2000 00:10:00   2.966
CHI_3hr_2        01/01/2000 00:20:00   3.696
CHI_3hr_2        01/01/2000 00:30:00   4.976
CHI_3hr_2        01/01/2000 00:40:00   7.828
CHI_3hr_2        01/01/2000 00:50:00   19.966
CHI_3hr_2        01/01/2000 01:00:00   76.805
CHI_3hr_2        01/01/2000 01:10:00   22.777
CHI_3hr_2        01/01/2000 01:20:00   11.852
CHI_3hr_2        01/01/2000 01:30:00   8.025
CHI_3hr_2        01/01/2000 01:40:00   6.096
CHI_3hr_2        01/01/2000 01:50:00   4.938
CHI_3hr_2        01/01/2000 02:00:00   4.165
CHI_3hr_2        01/01/2000 02:10:00   3.613
CHI_3hr_2        01/01/2000 02:20:00   3.197
CHI_3hr_2        01/01/2000 02:30:00   2.873
CHI_3hr_2        01/01/2000 02:40:00   2.613
CHI_3hr_2        01/01/2000 02:50:00   2.4
CHI_3hr_2        01/01/2000 03:00:00   0

;Rainfall (mm/hr)
CHI_3hr_25       01/01/2000 00:00:00   4.358
CHI_3hr_25       01/01/2000 00:10:00   5.202
CHI_3hr_25       01/01/2000 00:20:00   6.506
CHI_3hr_25       01/01/2000 00:30:00   8.801
CHI_3hr_25       01/01/2000 00:40:00   13.954
CHI_3hr_25       01/01/2000 00:50:00   36.302
CHI_3hr_25       01/01/2000 01:00:00   144.693
CHI_3hr_25       01/01/2000 01:10:00   41.479
CHI_3hr_25       01/01/2000 01:20:00   21.286
CHI_3hr_25       01/01/2000 01:30:00   14.308
CHI_3hr_25       01/01/2000 01:40:00   10.818
CHI_3hr_25       01/01/2000 01:50:00   8.732
CHI_3hr_25       01/01/2000 02:00:00   7.345
CHI_3hr_25       01/01/2000 02:10:00   6.356
CHI_3hr_25       01/01/2000 02:20:00   5.615
CHI_3hr_25       01/01/2000 02:30:00   5.038
CHI_3hr_25       01/01/2000 02:40:00   4.576
CHI_3hr_25       01/01/2000 02:50:00   4.197
CHI_3hr_25       01/01/2000 03:00:00   0

;Rainfall (mm/hr)
CHI_3hr_5        01/01/2000 00:00:00   3.256
CHI_3hr_5        01/01/2000 00:10:00   3.881
CHI_3hr_5        01/01/2000 00:20:00   4.844
CHI_3hr_5        01/01/2000 00:30:00   6.532
CHI_3hr_5        01/01/2000 00:40:00   10.308
CHI_3hr_5        01/01/2000 00:50:00   26.792
CHI_3hr_5        01/01/2000 01:00:00   103.93
CHI_3hr_5        01/01/2000 01:10:00   30.286
CHI_3hr_5        01/01/2000 01:20:00   15.655
CHI_3hr_5        01/01/2000 01:30:00   10.568
CHI_3hr_5        01/01/2000 01:40:00   8.013
CHI_3hr_5        01/01/2000 01:50:00   6.482
CHI_3hr_5        01/01/2000 02:00:00   5.462
CHI_3hr_5        01/01/2000 02:10:00   4.733
CHI_3hr_5        01/01/2000 02:20:00   4.186
CHI_3hr_5        01/01/2000 02:30:00   3.76
CHI_3hr_5        01/01/2000 02:40:00   3.418
CHI_3hr_5        01/01/2000 02:50:00   3.137
CHI_3hr_5        01/01/2000 03:00:00   0

;Rainfall (mm/hr)
CHI_3hr_50       01/01/2000 00:00:00   4.828
CHI_3hr_50       01/01/2000 00:10:00   5.766
CHI_3hr_50       01/01/2000 00:20:00   7.214
CHI_3hr_50       01/01/2000 00:30:00   9.763
CHI_3hr_50       01/01/2000 00:40:00   15.496
CHI_3hr_50       01/01/2000 00:50:00   40.401
CHI_3hr_50       01/01/2000 01:00:00   161.471
CHI_3hr_50       01/01/2000 01:10:00   46.17
CHI_3hr_50       01/01/2000 01:20:00   23.66
CHI_3hr_50       01/01/2000 01:30:00   15.89
CHI_3hr_50       01/01/2000 01:40:00   12.006
CHI_3hr_50       01/01/2000 01:50:00   9.687
CHI_3hr_50       01/01/2000 02:00:00   8.146
CHI_3hr_50       01/01/2000 02:10:00   7.047
CHI_3hr_50       01/01/2000 02:20:00   6.224
CHI_3hr_50       01/01/2000 02:30:00   5.583
CHI_3hr_50       01/01/2000 02:40:00   5.07
CHI_3hr_50       01/01/2000 02:50:00   4.649
CHI_3hr_50       01/01/2000 03:00:00   0

;Rainfall (mm/hr)
CHI_6hr_10       01/01/2000 00:00:00   1.944
CHI_6hr_10       01/01/2000 00:10:00   2.097
CHI_6hr_10       01/01/2000 00:20:00   2.278
CHI_6hr_10       01/01/2000 00:30:00   2.499
CHI_6hr_10       01/01/2000 00:40:00   2.772
CHI_6hr_10       01/01/2000 00:50:00   3.122
CHI_6hr_10       01/01/2000 01:00:00   3.585
CHI_6hr_10       01/01/2000 01:10:00   4.231
CHI_6hr_10       01/01/2000 01:20:00   5.199
CHI_6hr_10       01/01/2000 01:30:00   6.823
CHI_6hr_10       01/01/2000 01:40:00   10.137
CHI_6hr_10       01/01/2000 01:50:00   20.829
CHI_6hr_10       01/01/2000 02:00:00   122.142
CHI_6hr_10       01/01/2000 02:10:00   41.92
CHI_6hr_10       01/01/2000 02:20:00   21.263
CHI_6hr_10       01/01/2000 02:30:00   13.557
CHI_6hr_10       01/01/2000 02:40:00   9.991
CHI_6hr_10       01/01/2000 02:50:00   7.945
CHI_6hr_10       01/01/2000 03:00:00   6.62
CHI_6hr_10       01/01/2000 03:10:00   5.692
CHI_6hr_10       01/01/2000 03:20:00   5.004
CHI_6hr_10       01/01/2000 03:30:00   4.474
CHI_6hr_10       01/01/2000 03:40:00   4.052
CHI_6hr_10       01/01/2000 03:50:00   3.708
CHI_6hr_10       01/01/2000 04:00:00   3.422
CHI_6hr_10       01/01/2000 04:10:00   3.181
CHI_6hr_10       01/01/2000 04:20:00   2.973
CHI_6hr_10       01/01/2000 04:30:00   2.794
CHI_6hr_10       01/01/2000 04:40:00   2.636
CHI_6hr_10       01/01/2000 04:50:00   2.497
CHI_6hr_10       01/01/2000 05:00:00   2.373
CHI_6hr_10       01/01/2000 05:10:00   2.262
CHI_6hr_10       01/01/2000 05:20:00   2.162
CHI_6hr_10       01/01/2000 05:30:00   2.071
CHI_6hr_10       01/01/2000 05:40:00   1.988
CHI_6hr_10       01/01/2000 05:50:00   1.912
CHI_6hr_10       01/01/2000 06:00:00   0

;Rainfall (mm/hr)
CHI_6hr_100      01/01/2000 00:00:00   2.752
```

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CHI_6hr_100      01/01/2000 00:10:00   2.969
CHI_6hr_100      01/01/2000 00:20:00   3.228
CHI_6hr_100      01/01/2000 00:30:00   3.542
CHI_6hr_100      01/01/2000 00:40:00   3.933
CHI_6hr_100      01/01/2000 00:50:00   4.432
CHI_6hr_100      01/01/2000 01:00:00   5.095
CHI_6hr_100      01/01/2000 01:10:00   6.021
CHI_6hr_100      01/01/2000 01:20:00   7.412
CHI_6hr_100      01/01/2000 01:30:00   9.748
CHI_6hr_100      01/01/2000 01:40:00   14.532
CHI_6hr_100      01/01/2000 01:50:00   30.054
CHI_6hr_100      01/01/2000 02:00:00   178.559
CHI_6hr_100      01/01/2000 02:10:00   60.818
CHI_6hr_100      01/01/2000 02:20:00   30.678
CHI_6hr_100      01/01/2000 02:30:00   19.483
CHI_6hr_100      01/01/2000 02:40:00   14.32
CHI_6hr_100      01/01/2000 02:50:00   11.366
CHI_6hr_100      01/01/2000 03:00:00   9.456
CHI_6hr_100      01/01/2000 03:10:00   8.119
CHI_6hr_100      01/01/2000 03:20:00   7.131
CHI_6hr_100      01/01/2000 03:30:00   6.37
CHI_6hr_100      01/01/2000 03:40:00   5.765
CHI_6hr_100      01/01/2000 03:50:00   5.272
CHI_6hr_100      01/01/2000 04:00:00   4.863
CHI_6hr_100      01/01/2000 04:10:00   4.517
CHI_6hr_100      01/01/2000 04:20:00   4.22
CHI_6hr_100      01/01/2000 04:30:00   3.964
CHI_6hr_100      01/01/2000 04:40:00   3.739
CHI_6hr_100      01/01/2000 04:50:00   3.54
CHI_6hr_100      01/01/2000 05:00:00   3.363
CHI_6hr_100      01/01/2000 05:10:00   3.205
CHI_6hr_100      01/01/2000 05:20:00   3.062
CHI_6hr_100      01/01/2000 05:30:00   2.932
CHI_6hr_100      01/01/2000 05:40:00   2.814
CHI_6hr_100      01/01/2000 05:50:00   2.706
CHI_6hr_100      01/01/2000 06:00:00   0

;Rainfall (mm/hr)
CHI_6hr_2        01/01/2000 00:00:00   1.297
CHI_6hr_2        01/01/2000 00:10:00   1.398
CHI_6hr_2        01/01/2000 00:20:00   1.518
CHI_6hr_2        01/01/2000 00:30:00   1.663
CHI_6hr_2        01/01/2000 00:40:00   1.843
CHI_6hr_2        01/01/2000 00:50:00   2.074
CHI_6hr_2        01/01/2000 01:00:00   2.379
CHI_6hr_2        01/01/2000 01:10:00   2.803
CHI_6hr_2        01/01/2000 01:20:00   3.439
CHI_6hr_2        01/01/2000 01:30:00   4.501
CHI_6hr_2        01/01/2000 01:40:00   6.66
CHI_6hr_2        01/01/2000 01:50:00   13.563
CHI_6hr_2        01/01/2000 02:00:00   76.805
CHI_6hr_2        01/01/2000 02:10:00   27.028
CHI_6hr_2        01/01/2000 02:20:00   13.849
CHI_6hr_2        01/01/2000 02:30:00   8.88
CHI_6hr_2        01/01/2000 02:40:00   6.566
CHI_6hr_2        01/01/2000 02:50:00   5.234
CHI_6hr_2        01/01/2000 03:00:00   4.369
CHI_6hr_2        01/01/2000 03:10:00   3.761
CHI_6hr_2        01/01/2000 03:20:00   3.311
CHI_6hr_2        01/01/2000 03:30:00   2.963
CHI_6hr_2        01/01/2000 03:40:00   2.686
CHI_6hr_2        01/01/2000 03:50:00   2.46
CHI_6hr_2        01/01/2000 04:00:00   2.272
CHI_6hr_2        01/01/2000 04:10:00   2.113
CHI_6hr_2        01/01/2000 04:20:00   1.976
CHI_6hr_2        01/01/2000 04:30:00   1.858
CHI_6hr_2        01/01/2000 04:40:00   1.754
CHI_6hr_2        01/01/2000 04:50:00   1.662
CHI_6hr_2        01/01/2000 05:00:00   1.58
CHI_6hr_2        01/01/2000 05:10:00   1.507
CHI_6hr_2        01/01/2000 05:20:00   1.441
CHI_6hr_2        01/01/2000 05:30:00   1.38
CHI_6hr_2        01/01/2000 05:40:00   1.326
CHI_6hr_2        01/01/2000 05:50:00   1.275
CHI_6hr_2        01/01/2000 06:00:00   0

;Rainfall (mm/hr)
CHI_6hr_25       01/01/2000 00:00:00   2.249
CHI_6hr_25       01/01/2000 00:10:00   2.426
CHI_6hr_25       01/01/2000 00:20:00   2.637
CHI_6hr_25       01/01/2000 00:30:00   2.893
CHI_6hr_25       01/01/2000 00:40:00   3.212
CHI_6hr_25       01/01/2000 00:50:00   3.619
CHI_6hr_25       01/01/2000 01:00:00   4.159
CHI_6hr_25       01/01/2000 01:10:00   4.914
CHI_6hr_25       01/01/2000 01:20:00   6.046
CHI_6hr_25       01/01/2000 01:30:00   7.947
CHI_6hr_25       01/01/2000 01:40:00   11.837
CHI_6hr_25       01/01/2000 01:50:00   24.442
CHI_6hr_25       01/01/2000 02:00:00   144.693
CHI_6hr_25       01/01/2000 02:10:00   49.392
CHI_6hr_25       01/01/2000 02:20:00   24.95
CHI_6hr_25       01/01/2000 02:30:00   15.861
CHI_6hr_25       01/01/2000 02:40:00   11.666
CHI_6hr_25       01/01/2000 02:50:00   9.263
CHI_6hr_25       01/01/2000 03:00:00   7.71
CHI_6hr_25       01/01/2000 03:10:00   6.622
CHI_6hr_25       01/01/2000 03:20:00   5.817
CHI_6hr_25       01/01/2000 03:30:00   5.197
CHI_6hr_25       01/01/2000 03:40:00   4.705
CHI_6hr_25       01/01/2000 03:50:00   4.303
CHI_6hr_25       01/01/2000 04:00:00   3.97
CHI_6hr_25       01/01/2000 04:10:00   3.688
CHI_6hr_25       01/01/2000 04:20:00   3.446
CHI_6hr_25       01/01/2000 04:30:00   3.237
CHI_6hr_25       01/01/2000 04:40:00   3.054
CHI_6hr_25       01/01/2000 04:50:00   2.892
CHI_6hr_25       01/01/2000 05:00:00   2.747
CHI_6hr_25       01/01/2000 05:10:00   2.618
CHI_6hr_25       01/01/2000 05:20:00   2.501
CHI_6hr_25       01/01/2000 05:30:00   2.396
CHI_6hr_25       01/01/2000 05:40:00   2.299
CHI_6hr_25       01/01/2000 05:50:00   2.211
CHI_6hr_25       01/01/2000 06:00:00   0

;Rainfall (mm/hr)
CHI_6hr_5        01/01/2000 00:00:00   1.69
CHI_6hr_5        01/01/2000 00:10:00   1.822
CHI_6hr_5        01/01/2000 00:20:00   1.979
CHI_6hr_5        01/01/2000 00:30:00   2.169
CHI_6hr_5        01/01/2000 00:40:00   2.406
CHI_6hr_5        01/01/2000 00:50:00   2.708
CHI_6hr_5        01/01/2000 01:00:00   3.109
CHI_6hr_5        01/01/2000 01:10:00   3.667
CHI_6hr_5        01/01/2000 01:20:00   4.504
CHI_6hr_5        01/01/2000 01:30:00   5.905
CHI_6hr_5        01/01/2000 01:40:00   8.759
CHI_6hr_5        01/01/2000 01:50:00   17.944
CHI_6hr_5        01/01/2000 02:00:00   104.193
CHI_6hr_5        01/01/2000 02:10:00   36.002
CHI_6hr_5        01/01/2000 02:20:00   18.319
CHI_6hr_5        01/01/2000 02:30:00   11.702
CHI_6hr_5        01/01/2000 02:40:00   8.634
CHI_6hr_5        01/01/2000 02:50:00   6.872
CHI_6hr_5        01/01/2000 03:00:00   5.73
CHI_6hr_5        01/01/2000 03:10:00   4.929
CHI_6hr_5        01/01/2000 03:20:00   4.335
CHI_6hr_5        01/01/2000 03:30:00   3.877
CHI_6hr_5        01/01/2000 03:40:00   3.513
CHI_6hr_5        01/01/2000 03:50:00   3.216
CHI_6hr_5        01/01/2000 04:00:00   2.969
CHI_6hr_5        01/01/2000 04:10:00   2.76
CHI_6hr_5        01/01/2000 04:20:00   2.58
CHI_6hr_5        01/01/2000 04:30:00   2.425
CHI_6hr_5        01/01/2000 04:40:00   2.289
CHI_6hr_5        01/01/2000 04:50:00   2.168
CHI_6hr_5        01/01/2000 05:00:00   2.061
CHI_6hr_5        01/01/2000 05:10:00   1.965
CHI_6hr_5        01/01/2000 05:20:00   1.878
CHI_6hr_5        01/01/2000 05:30:00   1.799
CHI_6hr_5        01/01/2000 05:40:00   1.727
CHI_6hr_5        01/01/2000 05:50:00   1.661
CHI_6hr_5        01/01/2000 06:00:00   0

;Rainfall (mm/hr)
CHI_6hr_50       01/01/2000 00:00:00   2.489
CHI_6hr_50       01/01/2000 00:10:00   2.685
CHI_6hr_50       01/01/2000 00:20:00   2.919
CHI_6hr_50       01/01/2000 00:30:00   3.203
CHI_6hr_50       01/01/2000 00:40:00   3.556
CHI_6hr_50       01/01/2000 00:50:00   4.008
CHI_6hr_50       01/01/2000 01:00:00   4.608
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CHI_6hr_50       01/01/2000 01:10:00   5.445
CHI_6hr_50       01/01/2000 01:20:00   6.702
CHI_6hr_50       01/01/2000 01:30:00   8.815
CHI_6hr_50       01/01/2000 01:40:00   13.141
CHI_6hr_50       01/01/2000 01:50:00   27.177
CHI_6hr_50       01/01/2000 02:00:00   161.471
CHI_6hr_50       01/01/2000 02:10:00   54.997
CHI_6hr_50       01/01/2000 02:20:00   27.742
CHI_6hr_50       01/01/2000 02:30:00   17.619
CHI_6hr_50       01/01/2000 02:40:00   12.949
CHI_6hr_50       01/01/2000 02:50:00   10.278
CHI_6hr_50       01/01/2000 03:00:00   8.551
CHI_6hr_50       01/01/2000 03:10:00   7.342
CHI_6hr_50       01/01/2000 03:20:00   6.448
CHI_6hr_50       01/01/2000 03:30:00   5.76
CHI_6hr_50       01/01/2000 03:40:00   5.213
CHI_6hr_50       01/01/2000 03:50:00   4.768
CHI_6hr_50       01/01/2000 04:00:00   4.397
CHI_6hr_50       01/01/2000 04:10:00   4.084
CHI_6hr_50       01/01/2000 04:20:00   3.817
CHI_6hr_50       01/01/2000 04:30:00   3.584
CHI_6hr_50       01/01/2000 04:40:00   3.381
CHI_6hr_50       01/01/2000 04:50:00   3.201
CHI_6hr_50       01/01/2000 05:00:00   3.041
CHI_6hr_50       01/01/2000 05:10:00   2.898
CHI_6hr_50       01/01/2000 05:20:00   2.769
CHI_6hr_50       01/01/2000 05:30:00   2.651
CHI_6hr_50       01/01/2000 05:40:00   2.545
CHI_6hr_50       01/01/2000 05:50:00   2.447
CHI_6hr_50       01/01/2000 06:00:00   0

;Rainfall (mm/hr)
JUL1-79          01/01/2000 00:00:00   2.3
JUL1-79          01/01/2000 00:05:00   2.3
JUL1-79          01/01/2000 00:10:00   8.89
JUL1-79          01/01/2000 00:15:00   8.89
JUL1-79          01/01/2000 00:20:00   8.89
JUL1-79          01/01/2000 00:25:00   8.89
JUL1-79          01/01/2000 00:30:00   38.1
JUL1-79          01/01/2000 00:35:00   38.1
JUL1-79          01/01/2000 00:40:00   38.1
JUL1-79          01/01/2000 00:45:00   38.1
JUL1-79          01/01/2000 00:50:00   38.1
JUL1-79          01/01/2000 00:55:00   38.1
JUL1-79          01/01/2000 01:00:00   38.1
JUL1-79          01/01/2000 01:05:00   50.8
JUL1-79          01/01/2000 01:10:00   50.8
JUL1-79          01/01/2000 01:15:00   76.2
JUL1-79          01/01/2000 01:20:00   106.7
JUL1-79          01/01/2000 01:25:00   106.7
JUL1-79          01/01/2000 01:30:00   71.1
JUL1-79          01/01/2000 01:35:00   71.1
JUL1-79          01/01/2000 01:40:00   30.5
JUL1-79          01/01/2000 01:45:00   30.5
JUL1-79          01/01/2000 01:50:00   30.5
JUL1-79          01/01/2000 01:55:00   30.5
JUL1-79          01/01/2000 02:00:00   3.8
JUL1-79          01/01/2000 02:05:00   3.8
JUL1-79          01/01/2000 02:10:00   3.8
JUL1-79          01/01/2000 02:15:00   3.8
JUL1-79          01/01/2000 02:20:00   3.8
JUL1-79          01/01/2000 02:25:00   3.8
JUL1-79          01/01/2000 02:30:00   3.8
JUL1-79          01/01/2000 02:35:00   3.8
JUL1-79          01/01/2000 02:40:00   3.8
JUL1-79          01/01/2000 02:45:00   3.8
JUL1-79          01/01/2000 02:50:00   3.8
JUL1-79          01/01/2000 02:55:00   3.8

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]
Subcatch   10               Overland_Flow_Area
Subcatch   11-13_1          Parking
Subcatch   11-13_2          Parking
Subcatch   14-15_1          Parking
Subcatch   14-15_2          Parking
Subcatch   16               Parking
Subcatch   17-20            Parking
Subcatch   2                Overland_Flow_Area
Subcatch   21               Parking
Subcatch   22               Parking
Subcatch   23-25            Parking
Subcatch   26               Parking
Subcatch   27-30            Parking
Subcatch   3-5_1            Parking
Subcatch   3-5_2            Parking
Subcatch   6-9_1            Parking
Subcatch   6-9_2            Parking
Subcatch   A1               Roof
Subcatch   A2               Roof
Subcatch   B1               Roof
Subcatch   B2_B3            Roof
Subcatch   C1_C2_C3         Roof
Subcatch   D1_D2_D3         Roof
Subcatch   OFF1             Off-site
Subcatch   OFF2             Off-site
Subcatch   OFF4             Off-site
Subcatch   Pond-1           SWM_Block
Node       CB_04_(STM)      Manhole
Node       CB_07_(STM)      Manhole
Node       CB_08_(STM)      Manhole
Node       CB_11_(STM)      Manhole
Node       CB_12_(STM)      Manhole
Node       CBMH_102_(STM)   Manhole
Node       CBMH_103_(STM)   Manhole
Node       CBMH_105_(STM)   Manhole
Node       CBMH_108_(STM)   Manhole
Node       CBMH_109_(STM)   Manhole
Node       CBMH_110_(STM)   Manhole
Node       Pond             Pond
Node       St_C1_C2_C3      On_Site_Storage
Node       St_CB34          Low_Point
Node       St_D1_D2_D3      On-Site_Storage
Node       STMMH_101_(STM)  Manhole
Node       STMMH_104_(STM)  Manhole
Node       STMMH_106_(STM)  Manhole
Node       STMMH_107_(STM)  Manhole
Node       STMMH_111_(STM)  Manhole
Node       STMMH_112_(STM)  Manhole
Node       STMMH_116_(STM)  Manhole
Node       STMMH_117_(STM)  Manhole
Node       STMMH_120_(STM)  Manhole
Link       154_(1)_(STM)    Storm_Sewer
Link       156_(STM)        Storm_Sewer
Link       157_(1)_(STM)    Storm_Sewer
Link       158_(1)_(STM)    Storm_Sewer
Link       158_(STM)        Storm_Sewer
Link       160_(STM)        Storm_Sewer
Link       161_(STM)        Storm_Sewer
Link       166_(STM)        Storm_Sewer
Link       167_(3)_(STM)    Storm_Sewer
Link       170_(STM)        Storm_Sewer
Link       171_(1)_(STM)    Storm_Sewer
Link       172_(STM)        Storm_Sewer
Link       175_(STM)        Storm_Sewer
Link       176_(1)_(1)_(STM) Storm_Sewer
Link       179_(STM)        Storm_Sewer
Link       184_(STM)        Storm_Sewer
Link       186_(STM)        Storm_Sewer
Link       200_(STM)        Storm_Sewer
Link       226_(1)_(1)_(2)_(STM) Culvert
Link       226_(1)_(STM)    Culvert
Link       230_(STM)        Culvert
Link       237_(STM)        Storm_Sewer
Link       238_(STM)        Storm_Sewer
Link       239_(1)_(STM)    Storm_Sewer
Link       239_(STM)        Storm_Sewer
Link       240_(STM)        Storm_Sewer
Link       242_(STM)        Storm_Sewer
Link       244_(STM)        Culvert
Link       C1               Ditch
Link       C2               Ditch
Link       C3               Ditch
Link       C4               Ditch
Link       C5               Ditch
```

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Link       C6               Ditch
Link       OUT_St_A1        Roof_Outflow
Link       OUT_St_A2        Roof_Outflow
Link       OUT_St_B1        Roof_Outflow
Link       OUT_St_B2_B3     Roof_Outflow
Link       OUT_St_C1_C2_C3  Roof_Outflow
Link       OUT_St_CB01      Storm_Inlet
Link       OUT_St_CB05      Storm_Inlet
Link       OUT_St_CB11      Storm_Inlet
Link       OUT_St_CB12      Storm_Inlet
Link       OUT_St_CB13      Storm_Inlet
Link       OUT_St_CB14      Storm_Inlet
Link       OUT_St_CB21      Storm_Inlet
Link       OUT_St_CB23      Storm_Inlet
Link       OUT_St_CB24      Storm_Inlet
Link       OUT_St_CB31      Storm_Inlet
Link       OUT_St_CB34      Storm_Inlet
Link       OUT_St_CBMH102   Storm_Inlet
Link       OUT_St_CBMH105   Storm_Inlet
Link       OUT_St_CBMH108   Storm_Inlet
Link       OUT_St_CBMH110   Storm_Inlet
Link       OUT_St_D1_D2_D3  Roof_Outflow
Link       OVF_CB_07        Surcharge
Link       OVF_CB_08        Surcharge

[MAP]
DIMENSIONS       369391.9254      5017164.8251
370141.5006      5017924.2189
UNITS            Meters

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[POLYGONS]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
2                369529.235         5017584.131

;;Storage Node   X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
```

1:100-year 12-hour SCS PCSWMM Output File Post-Development Conditions

```
  ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM VERSION 7.7.3920
  ---------------------------------------------------------

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

  Simulation start time:                  01/01/2000
00:00:00
  Simulation end time:                    01/04/2000
00:00:00
  Runoff wet weather time steps:          300 seconds
  Report time steps:                      60 seconds
  Number of data points:                  4321


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

  ------------------------------------------------------------
------------------------------------------------------------
----------------------------------------

Area    Time of Concentration  Time to Peak    Time after
Peak     Peak UH Flow    UH Depth
  Subcatchment          Runoff Method             Raingage
(ha)    (min)                 (min)           (min)
(m³/s/mm)       (mm)
  ------------------------------------------------------------
------------------------------------------------------------
----------------------------------------
  R1                    Nash IUH                  Rainfall
53.847 156.1                  104.07          650.93
0.04668         1
  R2                    Nash IUH                  Rainfall
16.158 118.9                  79.27           455.73
0.01839         1


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

  ------------------------------------------------------------
---------------------------------
                        Total       Total       Total
Total       Peak        Runoff
                        Precip      Losses      Runoff
Runoff      Runoff      Coeff
  Subcatchment          (mm)        (mm)        (mm)
10^6 ltr    CMS          (fraction)
  ------------------------------------------------------------
---------------------------------
  R1                    96          46.113      49.882
26.86       1.67         0.52
  R2                    96          46.572      49.418
7.985       0.614        0.515



  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build
5.2.4)
  ------------------------------------------------------------
--

  WARNING 02: maximum depth increased for Node
STMMH_451_(STM)
  WARNING 02: maximum depth increased for Node
STMMH_459_(STM)
  WARNING 02: maximum depth increased for Node
STMMH_467_(STM)
  WARNING 02: maximum depth increased for Node
STMMH_468_(STM)
  WARNING 02: maximum depth increased for Node
STMMH_473_(STM)
  WARNING 02: maximum depth increased for Node
STMMH_477_(STM)

  *************
  Element Count
  *************
  Number of rain gages ...... 1
  Number of subcatchments ... 30
  Number of nodes ........... 57
  Number of links ........... 76
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                          Data
Recording
  Name                Data Source                       Type
Interval
  ------------------------------------------------------------
--------------
  Rainfall            12SCS100
INTENSITY   15 min.


  ********************
  Subcatchment Summary
  ********************
  Name                        Area     Width   %Imperv
%Slope Rain Gage            Outlet
  ------------------------------------------------------------
-------------------------------------------------
  10                         0.13    148.94      7.14
0.5000 Rainfall             STMMH_451_(STM)
  11-13_1                    0.25    140.02     94.29
1.0000 Rainfall             St_CB11
  11-13_2                    0.23    201.97     94.29
2.0000 Rainfall             St_CBMH108
  14-15_1                    0.09     45.01     87.14
1.5000 Rainfall             St_CB12
  14-15_2                    0.11     45.03     87.14
1.4000 Rainfall             St_CBMH110
  16                         0.24    226.70     10.00
1.5000 Rainfall             St_CB13
  17-20                      1.12    410.00     97.14
2.0000 Rainfall             St_CB14
  2                          0.20     80.44     11.43
7.5000 Rainfall             STMMH_477_(STM)
  21                         0.20    161.53     42.86
3.0000 Rainfall             St_CB21
  22                         0.12     80.00     35.71
0.5000 Rainfall             St_CB23
  23-25                      1.39    410.00    100.00
1.8000 Rainfall             St_CB24
  26                         0.53    302.30     65.71
1.5000 Rainfall             St_CB31
  27-30                      0.53    418.02     74.29
1.8000 Rainfall             St_CB34
  3-5_1                      0.15     60.02     95.71
1.0000 Rainfall             St_CBMH102
  3-5_2                      0.40    159.98     95.71
2.7500 Rainfall             St_CB01
  6-9_1                      0.38    202.01     88.57
2.0000 Rainfall             St_CB05
  6-9_2                      0.21     83.12     88.57
0.5000 Rainfall             St_CBMH105
  A1                         0.60    135.94    100.00
1.0000 Rainfall             St_A1
  A2                         0.40     89.39    100.00
1.0000 Rainfall             St_A2
  B1                         0.54    121.41    100.00
1.0000 Rainfall             St_B1
  B2_B3                      1.12    252.50    100.00
1.0000 Rainfall             St_B2_B3
  C1_C2_C3                   1.73    388.46    100.00
1.0000 Rainfall             St_C1_C2_C3
```

```
  D1_D2_D3                  1.64    368.21    100.00
1.0000 Rainfall             St_D1_D2_D3
  OFF1                      0.58    523.73     30.00
0.2000 Rainfall             STMMH_466_(STM)
  OFF2                      0.86    213.90     12.86
0.2350 Rainfall             STMMH_467_(STM)
  OFF4                      0.09    175.00      1.43
4.9780 Rainfall             STMMH_466_(STM)
  Pond-1                    1.03    344.90     28.57
2.0000 Rainfall             Pond
  S2_1                      0.26    130.54     60.00
3.0000 Rainfall             J1
  S2_3                      0.48    241.84     60.00
3.0000 Rainfall             STMMH_466_(STM)
  S2_4                      0.48    240.14     60.00
3.0000 Rainfall             STMMH_468_(STM)


  ************
  Node Summary
  ************
                                      Invert      Max.
Ponded    External
  Name                  Type           Elev.     Depth
Area    Inflow
  ------------------------------------------------------------
---------------------
  J1                    JUNCTION         91.35      1.75
0.0
  STMMH_201_(STM)       JUNCTION         88.40      2.92
0.0
  STMMH_202_(STM)       JUNCTION         88.53      2.87
0.0
  STMMH_203_(STM)       JUNCTION         88.65      3.26
0.0
  STMMH_451_(STM)       JUNCTION         89.28      2.30
0.0
  STMMH_459_(STM)       JUNCTION         88.82      2.54
0.0
  STMMH_465_(STM)       JUNCTION         88.75      2.75
0.0
  STMMH_466_(STM)       JUNCTION         90.73      1.65
0.0
  STMMH_467_(STM)       JUNCTION         90.40      1.81
0.0
  STMMH_468_(STM)       JUNCTION         88.37      2.33
0.0
  STMMH_473_(STM)       JUNCTION         89.73      2.62
0.0
  STMMH_474_(STM)       JUNCTION         89.84      3.00
0.0
  STMMH_475_(STM)       JUNCTION         89.33      3.00
0.0
  STMMH_477_(STM)       JUNCTION         89.85      2.62
0.0
  OF1                   OUTFALL          87.12      2.33
0.0
  CB_04_(STM)           STORAGE          90.73      1.87
0.0
  CB_07_(STM)           STORAGE          90.61      2.59
0.0
  CB_08_(STM)           STORAGE          90.62      2.48
0.0
  CB_11_(STM)           STORAGE          90.42      1.87
0.0
  CB_12_(STM)           STORAGE          90.49      1.86
0.0
  CBMH_102_(STM)        STORAGE          89.95      2.25
0.0
  CBMH_103_(STM)        STORAGE          90.11      2.11
0.0
  CBMH_105_(STM)        STORAGE          90.13      2.07
0.0
  CBMH_108_(STM)        STORAGE          89.72      2.42
0.0
  CBMH_109_(STM)        STORAGE          89.89      2.41
0.0
  CBMH_110_(STM)        STORAGE          90.10      2.20
0.0
  Pond                  STORAGE          89.05      3.25
0.0
  St_A1                 STORAGE         102.70      0.05
0.0
  St_A2                 STORAGE         102.70      0.05
0.0
  St_B1                 STORAGE         108.00      0.05
0.0
  St_B2_B3              STORAGE         107.80      0.05
0.0
  St_C1_C2_C3           STORAGE         108.00      0.05
0.0
  St_CB01               STORAGE          92.12      0.30
0.0
  St_CB05               STORAGE          92.20      0.33
0.0
  St_CB11               STORAGE          92.18      0.54
0.0
  St_CB12               STORAGE          92.35      0.35
0.0
  St_CB13               STORAGE          91.47      0.91
0.0
  St_CB14               STORAGE          92.18      0.45
0.0
  St_CB21               STORAGE          92.21      0.38
0.0
  St_CB23               STORAGE          92.32      0.35
0.0
  St_CB24               STORAGE          92.33      0.41
0.0
  St_CB31               STORAGE          92.31      0.40
0.0
  St_CB34               STORAGE          92.50      0.41
0.0
  St_CBMH102            STORAGE          92.20      0.25
0.0
  St_CBMH105            STORAGE          92.10      0.44
0.0
  St_CBMH108            STORAGE          92.14      0.37
0.0
  St_CBMH110            STORAGE          92.30      0.25
0.0
  St_D1_D2_D3           STORAGE         103.10      0.05
0.0
  STMMH_101_(STM)       STORAGE          89.91      2.33
0.0
  STMMH_104_(STM)       STORAGE          90.36      2.04
0.0
  STMMH_106_(STM)       STORAGE          90.45      1.90
0.0
  STMMH_107_(STM)       STORAGE          89.31      3.63
0.0
  STMMH_111_(STM)       STORAGE          89.46      3.20
0.0
  STMMH_112_(STM)       STORAGE          89.60      2.83
0.0
  STMMH_116_(STM)       STORAGE          89.77      2.86
0.0
  STMMH_117_(STM)       STORAGE          90.16      2.33
0.0
  STMMH_120_(STM)       STORAGE          90.18      2.52
0.0


  ************
  Link Summary
  ************
  Name              From Node        To Node          Type
Length    %Slope Roughness
  ------------------------------------------------------------
-----------------------------------
  154_(1)_(STM)     STMMH_120_(STM)  STMMH_117_(STM)  CONDUIT
115.6     0.1471    0.0130
  156_(STM)         CB_04_(STM)      STMMH_104_(STM)  CONDUIT
53.6      0.3915    0.0130
  157_(1)_(STM)     CBMH_109_(STM)   CBMH_108_(STM)   CONDUIT
35.9      0.1949    0.0130
  158_(1)_(STM)     STMMH_107_(STM)  STMMH_451_(STM)  CONDUIT
18.5      0.1618    0.0130
  158_(STM)         CBMH_108_(STM)   STMMH_107_(STM)  CONDUIT
24.0      0.0835    0.0130
  160_(STM)         STMMH_104_(STM)  CBMH_103_(STM)   CONDUIT
86.0      0.2208    0.0130
```

```
  161_(STM)        CBMH_103_(STM)   CBMH_102_(STM)   CONDUIT
36.7    0.2182    0.0130
  166_(STM)        CBMH_105_(STM)   CBMH_102_(STM)   CONDUIT
44.6    0.2242    0.0130
  167_(3)_(STM)    STMMH_117_(STM)  STMMH_116_(STM)  CONDUIT
56.7    0.1234    0.0130
  170_(STM)        STMMH_112_(STM)  STMMH_111_(STM)  CONDUIT
82.8    0.1449    0.0130
  171_(1)_(STM)    STMMH_106_(STM)  CBMH_105_(STM)   CONDUIT
76.5    0.3005    0.0130
  172_(STM)        CB_07_(STM)      STMMH_106_(STM)  CONDUIT
22.9    0.3934    0.0130
  175_(STM)        CBMH_102_(STM)   STMMH_101_(STM)  CONDUIT
3.3    0.3006    0.0130
  176_(1)_(1)_(STM) CB_11_(STM)      CBMH_108_(STM)
CONDUIT          82.2    0.4500    0.0130
  179_(STM)        CB_08_(STM)      CBMH_105_(STM)   CONDUIT
47.3    0.5925    0.0130
  184_(STM)        CBMH_110_(STM)   CBMH_109_(STM)   CONDUIT
51.1    0.2545    0.0130
  186_(STM)        CB_12_(STM)      CBMH_110_(STM)   CONDUIT
38.6    0.5960    0.0130
  200_(STM)        STMMH_101_(STM)  STMMH_477_(STM)  CONDUIT
28.3    0.2121    0.0130
  226_(1)_(1)_(2)_(STM) STMMH_459_(STM)  Pond
CONDUIT          47.8    0.5003    0.0240
  226_(1)_(STM)    STMMH_473_(STM)  Pond             CONDUIT
52.3    0.4991    0.0240
  230_(STM)        STMMH_466_(STM)  STMMH_467_(STM)  CONDUIT
32.9    0.0913    0.0240
  237_(STM)        STMMH_111_(STM)  STMMH_107_(STM)  CONDUIT
46.5    0.1506    0.0130
  238_(STM)        STMMH_465_(STM)  STMMH_203_(STM)  CONDUIT
23.5    0.1700    0.0130
  239_(1)_(STM)    STMMH_202_(STM)  STMMH_201_(STM)  CONDUIT
65.8    0.1520    0.0130
  239_(STM)        STMMH_203_(STM)  STMMH_202_(STM)  CONDUIT
65.2    0.1533    0.0130
  240_(STM)        STMMH_201_(STM)  STMMH_468_(STM)  CONDUIT
9.9    0.3024    0.0130
  242_(STM)        STMMH_116_(STM)  STMMH_112_(STM)  CONDUIT
79.0    0.1140    0.0130
  244_(STM)        STMMH_474_(STM)  STMMH_475_(STM)  CONDUIT
17.8    1.1771    0.0240
  C1               STMMH_475_(STM)  STMMH_468_(STM)  CONDUIT
53.9    1.7820    0.0350
  C2               STMMH_467_(STM)  STMMH_474_(STM)  CONDUIT
20.9    2.6786    0.0350
  C3               STMMH_468_(STM)  OF1              CONDUIT
30.3    4.1347    0.0350
  C4               STMMH_477_(STM)  STMMH_473_(STM)  CONDUIT
28.0    0.4250    0.0450
  C5               STMMH_451_(STM)  STMMH_459_(STM)  CONDUIT
57.9    0.3817    0.0400
  C6               J1               STMMH_466_(STM)  CONDUIT
225.0    0.2756    0.0350
  OR3              Pond             STMMH_465_(STM)  ORIFICE
  W_Pond           Pond             STMMH_466_(STM)  WEIR
  W_St_CB05        St_CB05          St_CBMH105       WEIR
  W_St_CB11        St_CB11          Pond             WEIR
  W_St_CB13        St_CB13          St_CBMH108       WEIR
  W_St_CB14        St_CB14          St_CB13          WEIR
  W_St_CB21        St_CB21          St_CB13          WEIR
  W_St_CB23        St_CB23          St_CB21          WEIR
  W_St_CB24        St_CB24          St_CB31          WEIR
  W_St_CB31        St_CB31          St_CB23          WEIR
  W_St_CB34        St_CB34          St_CB31          WEIR
  W_St_CBMH102     St_CBMH102       STMMH_477_(STM)  WEIR
  W_St_CBMH108     St_CBMH108       St_CB11          WEIR
  W_St_CBMH110     St_CBMH110       St_CB05          WEIR
  W1               St_CB01          STMMH_477_(STM)  WEIR
  W1_St_CB12       St_CB12          St_CBMH110       WEIR
  W2               St_CBMH105       Pond             WEIR
  W3               Pond             STMMH_465_(STM)  WEIR
  W4               Pond             STMMH_465_(STM)  WEIR
  OUT_St_A1        St_A1            CB_12_(STM)      OUTLET
  OUT_St_A2        St_A2            CBMH_109_(STM)   OUTLET
  OUT_St_B1        St_B1            CB_12_(STM)      OUTLET
  OUT_St_B2_B3     St_B2_B3         CBMH_108_(STM)   OUTLET
  OUT_St_C1_C2_C3  St_C1_C2_C3      STMMH_112_(STM)  OUTLET
  OUT_St_CB01      St_CB01          STMMH_104_(STM)  OUTLET
  OUT_St_CB05      St_CB05          STMMH_106_(STM)  OUTLET
  OUT_St_CB11      St_CB11          CB_11_(STM)      OUTLET
  OUT_St_CB12      St_CB12          CB_12_(STM)      OUTLET
  OUT_St_CB13      St_CB13          STMMH_111_(STM)  OUTLET
  OUT_St_CB14      St_CB14          STMMH_112_(STM)  OUTLET
  OUT_St_CB21      St_CB21          STMMH_112_(STM)  OUTLET
  OUT_St_CB23      St_CB23          STMMH_116_(STM)  OUTLET
  OUT_St_CB24      St_CB24          STMMH_117_(STM)  OUTLET
  OUT_St_CB31      St_CB31          STMMH_117_(STM)  OUTLET
  OUT_St_CB34      St_CB34          STMMH_120_(STM)  OUTLET
  OUT_St_CBMH102   St_CBMH102       CBMH_102_(STM)   OUTLET
  OUT_St_CBMH105   St_CBMH105       CB_08_(STM)      OUTLET
  OUT_St_CBMH108   St_CBMH108       CBMH_108_(STM)   OUTLET
  OUT_St_CBMH110   St_CBMH110       CBMH_110_(STM)   OUTLET
  OUT_St_D1_D2_D3  St_D1_D2_D3      STMMH_120_(STM)  OUTLET
  OVF_CB_07        CB_07_(STM)      St_CB05          OUTLET
  OVF_CB_08        CB_08_(STM)      St_CBMH105       OUTLET


  **********
  Cross Section Summary
  **********
                                                    Full     Full
Hyd.     Max.   No. of     Full
  Conduit          Shape                Depth     Area
Rad.    Width  Barrels     Flow
  ------------------------------------------------------------
----------------------------
  154_(1)_(STM)    CIRCULAR             0.68     0.36
0.17     0.68        1     0.32
  156_(STM)        CIRCULAR             0.30     0.07
0.07     0.30        1     0.06
  157_(1)_(STM)    CIRCULAR             0.53     0.22
0.13     0.53        1     0.19
  158_(1)_(STM)    CIRCULAR             0.97     0.75
0.24     0.97        1     0.90
  158_(STM)        CIRCULAR             0.60     0.28
0.15     0.60        1     0.18
  160_(STM)        CIRCULAR             0.45     0.16
0.11     0.45        1     0.13
  161_(STM)        CIRCULAR             0.45     0.16
0.11     0.45        1     0.13
  166_(STM)        CIRCULAR             0.45     0.16
0.11     0.45        1     0.14
  167_(3)_(STM)    CIRCULAR             0.82     0.53
0.21     0.82        1     0.50
  170_(STM)        CIRCULAR             0.90     0.64
0.23     0.90        1     0.69
  171_(1)_(STM)    CIRCULAR             0.38     0.11
0.09     0.38        1     0.10
  172_(STM)        CIRCULAR             0.30     0.07
0.07     0.30        1     0.06
  175_(STM)        CIRCULAR             0.53     0.22
0.13     0.53        1     0.24
  176_(1)_(1)_(STM) CIRCULAR              0.30     0.07
0.07     0.30        1     0.06
  179_(STM)        CIRCULAR             0.25     0.05
0.06     0.25        1     0.05
  184_(STM)        CIRCULAR             0.45     0.16
0.11     0.45        1     0.14
  186_(STM)        CIRCULAR             0.30     0.07
0.07     0.30        1     0.07
  200_(STM)        CIRCULAR             0.53     0.22
0.13     0.53        1     0.20
  226_(1)_(1)_(2)_(STM) CIRCULAR             0.40     0.13
0.10     0.40        4     0.08
  226_(1)_(STM)    CIRCULAR             0.40     0.13
0.10     0.40        2     0.08
  230_(STM)        CIRCULAR             1.30     1.33
0.33     1.30        1     0.79
  237_(STM)        CIRCULAR             0.90     0.64
0.23     0.90        1     0.70
  238_(STM)        CIRCULAR             0.60     0.28
0.15     0.60        1     0.25
  239_(1)_(STM)    CIRCULAR             0.60     0.28
0.15     0.60        1     0.24
  239_(STM)        CIRCULAR             0.60     0.28
0.15     0.60        1     0.24
  240_(STM)        CIRCULAR             0.60     0.28
0.15     0.60        1     0.34
```

```
  242_(STM)        CIRCULAR             0.82     0.53
0.21     0.82        1     0.48
  244_(STM)        CIRCULAR             1.30     1.33
0.33     1.30        1     2.84
  C1               Channe_475-468       1.96    21.10
1.03    17.00        1    82.04
  C2               Channl_467-474       1.81    20.86
1.26    19.50        1   113.75
  C3               Outfall_Ditch        2.33    14.74
1.00    14.85        1    85.61
  C4               NW_Storage_Ditch     2.32    28.19
1.38    20.00        1    50.61
  C5               TRAPEZOIDAL          2.00    26.00
1.26    20.00        1    46.97
  C6               LimebankDitch        1.51     9.32
0.89    14.00        1    12.91


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

  Transect Channe_475-468
  Area:
              0.0017     0.0058     0.0105     0.0156
0.0211
              0.0272     0.0337     0.0407     0.0486
0.0576
              0.0685     0.0812     0.0952     0.1105
0.1269
              0.1441     0.1623     0.1815     0.2011
0.2211
              0.2416     0.2625     0.2839     0.3057
0.3278
              0.3504     0.3734     0.3968     0.4205
0.4447
              0.4691     0.4939     0.5189     0.5443
0.5700
              0.5959     0.6223     0.6490     0.6760
0.7034
              0.7311     0.7593     0.7880     0.8171
0.8467
              0.8767     0.9070     0.9377     0.9687
1.0000
  Hrad:
              0.0189     0.0501     0.0806     0.1089
0.1354
              0.1607     0.1849     0.2100     0.2357
0.2639
              0.2833     0.2994     0.3144     0.3292
0.3446
              0.3608     0.3765     0.3941     0.4138
0.4339
              0.4544     0.4749     0.4955     0.5160
0.5364
              0.5568     0.5771     0.5973     0.6172
0.6373
              0.6575     0.6776     0.6975     0.7173
0.7369
              0.7562     0.7751     0.7938     0.8123
0.8307
              0.8485     0.8651     0.8814     0.8976
0.9143
              0.9317     0.9490     0.9661     0.9831
1.0000
  Width:
              0.1098     0.1392     0.1543     0.1693
0.1844
              0.1994     0.2145     0.2346     0.2679
0.3022
              0.3799     0.4249     0.4652     0.5032
0.5340
              0.5616     0.5941     0.6162     0.6299
0.6436
              0.6571     0.6707     0.6842     0.6977
0.7108
              0.7231     0.7355     0.7479     0.7602
0.7710
              0.7808     0.7905     0.8003     0.8101
0.8199
              0.8305     0.8415     0.8526     0.8637
0.8747
              0.8871     0.9023     0.9175     0.9328
0.9460
              0.9568     0.9676     0.9784     0.9892
1.0000

  Transect Channl_467-474
  Area:
              0.0040     0.0109     0.0188     0.0275
0.0370
              0.0473     0.0583     0.0700     0.0822
0.0952
              0.1089     0.1233     0.1384     0.1546
0.1719
              0.1901     0.2087     0.2275     0.2466
0.2659
              0.2855     0.3053     0.3253     0.3457
0.3664
              0.3873     0.4086     0.4302     0.4520
0.4742
              0.4966     0.5192     0.5422     0.5654
0.5889
              0.6129     0.6374     0.6623     0.6877
0.7136
              0.7399     0.7667     0.7940     0.8218
0.8500
              0.8788     0.9081     0.9379     0.9683
1.0000
  Hrad:
              0.0188     0.0413     0.0645     0.0861
0.1068
              0.1269     0.1463     0.1665     0.1860
0.2034
              0.2205     0.2373     0.2585     0.2808
0.3014
              0.3246     0.3484     0.3723     0.3962
0.4200
              0.4437     0.4673     0.4906     0.5137
0.5365
              0.5592     0.5816     0.6037     0.6258
0.6476
              0.6693     0.6908     0.7121     0.7333
0.7536
              0.7732     0.7925     0.8115     0.8302
0.8486
              0.8666     0.8844     0.9018     0.9190
0.9359
              0.9523     0.9683     0.9841     0.9978
1.0000
  Width:
              0.1785     0.2226     0.2461     0.2697
0.2926
              0.3142     0.3356     0.3538     0.3719
0.3933
              0.4147     0.4361     0.4631     0.4939
0.5264
              0.5450     0.5523     0.5596     0.5669
0.5742
              0.5815     0.5888     0.5975     0.6064
0.6152
              0.6240     0.6329     0.6417     0.6497
0.6577
              0.6657     0.6737     0.6817     0.6897
0.7019
              0.7159     0.7300     0.7441     0.7577
0.7714
              0.7850     0.7989     0.8132     0.8275
0.8418
              0.8571     0.8730     0.8889     0.9137
1.0000

  Transect LimebankDitch
  Area:
              0.0017     0.0056     0.0104     0.0160
0.0225
              0.0299     0.0381     0.0474     0.0580
0.0699
              0.0826     0.0958     0.1095     0.1235
0.1380
```

```
            0.1529     0.1682     0.1840     0.2002
0.2168
            0.2339     0.2514     0.2692     0.2874
0.3058
            0.3246     0.3437     0.3631     0.3829
0.4029
            0.4233     0.4440     0.4650     0.4863
0.5079
            0.5299     0.5522     0.5768     0.6095
0.6426
            0.6760     0.7099     0.7441     0.7787
0.8138
            0.8492     0.8851     0.9219     0.9596
1.0000
  Hrad:
            0.0169     0.0432     0.0667     0.0882
0.1085
            0.1279     0.1452     0.1583     0.1722
0.1866
            0.2115     0.2368     0.2613     0.2852
0.3085
            0.3313     0.3537     0.3757     0.3973
0.4185
            0.4394     0.4609     0.4837     0.5063
0.5285
            0.5504     0.5720     0.5934     0.6145
0.6354
            0.6561     0.6765     0.6968     0.7168
0.7367
            0.7564     0.7759     0.7933     0.8070
0.8224
            0.8390     0.8565     0.8747     0.8933
0.9124
            0.9319     0.9510     0.9697     0.9881
1.0000
  Width:
            0.0738     0.0959     0.1147     0.1336
0.1524
            0.1713     0.1923     0.2198     0.2473
0.2747
            0.2860     0.2953     0.3047     0.3142
0.3237
            0.3332     0.3427     0.3521     0.3616
0.3711
            0.3806     0.3892     0.3962     0.4032
0.4102
            0.4172     0.4242     0.4312     0.4382
0.4452
            0.4522     0.4592     0.4662     0.4732
0.4802
            0.4872     0.4942     0.7155     0.7241
0.7327
            0.7413     0.7499     0.7585     0.7671
0.7757
            0.7843     0.8015     0.8202     0.8469
1.0000

  Transect NW_Storage_Ditch
  Area:
            0.0005     0.0019     0.0043     0.0077
0.0120
            0.0174     0.0237     0.0312     0.0398
0.0494
            0.0600     0.0714     0.0839     0.0978
0.1129
            0.1290     0.1463     0.1646     0.1840
0.2044
            0.2257     0.2479     0.2708     0.2939
0.3173
            0.3409     0.3647     0.3888     0.4132
0.4377
            0.4626     0.4879     0.5136     0.5396
0.5659
            0.5926     0.6194     0.6466     0.6739
0.7016
            0.7295     0.7577     0.7863     0.8152
0.8445
            0.8742     0.9046     0.9357     0.9675
1.0000
  Hrad:
            0.0165     0.0330     0.0496     0.0659
0.0823
            0.0982     0.1130     0.1284     0.1442
0.1612
            0.1801     0.1987     0.2100     0.2218
0.2384
            0.2549     0.2712     0.2882     0.3057
0.3235
            0.3419     0.3601     0.3884     0.4170
0.4453
            0.4734     0.5012     0.5287     0.5561
0.5827
            0.6067     0.6305     0.6540     0.6774
0.7027
            0.7285     0.7542     0.7797     0.8050
0.8301
            0.8543     0.8763     0.8981     0.9198
0.9414
            0.9562     0.9670     0.9779     0.9888
1.0000
  Width:
            0.0292     0.0585     0.0877     0.1173
0.1468
            0.1774     0.2110     0.2443     0.2771
0.3080
            0.3343     0.3606     0.4007     0.4425
0.4753
            0.5083     0.5414     0.5734     0.6041
0.6339
            0.6623     0.6907     0.6993     0.7067
0.7141
            0.7215     0.7289     0.7363     0.7437
0.7518
            0.7631     0.7744     0.7857     0.7970
0.8057
            0.8134     0.8212     0.8289     0.8367
0.8444
            0.8530     0.8637     0.8744     0.8852
0.8959
            0.9133     0.9347     0.9563     0.9781
1.0000

  Transect Outfall_Ditch
  Area:
            0.0010     0.0039     0.0077     0.0120
0.0167
            0.0218     0.0273     0.0332     0.0394
0.0461
            0.0533     0.0608     0.0687     0.0770
0.0857
            0.0949     0.1045     0.1145     0.1249
0.1357
            0.1470     0.1586     0.1708     0.1835
0.1966
            0.2102     0.2250     0.2414     0.2604
0.2869
            0.3175     0.3483     0.3793     0.4106
0.4420
            0.4740     0.5067     0.5402     0.5744
0.6094
            0.6449     0.6811     0.7178     0.7552
0.7932
            0.8321     0.8720     0.9128     0.9552
1.0000
  Hrad:
            0.0226     0.0478     0.0842     0.1168
0.1468
            0.1749     0.2014     0.2268     0.2512
0.2749
            0.2980     0.3206     0.3428     0.3643
0.3855
            0.4065     0.4273     0.4479     0.4684
0.4888
            0.5088     0.5273     0.5459     0.5646
0.5834
            0.6043     0.6301     0.6515     0.6649
0.6574
            0.6509     0.6523     0.6590     0.6694
0.6826
            0.7056     0.7287     0.7516     0.7744
0.7971
```

```
             0.8197     0.8423     0.8648     0.8872
0.9090
             0.9301     0.9507     0.9703     0.9874
1.0000
  Width:
             0.0416     0.0781     0.0867     0.0954
0.1040
             0.1126     0.1213     0.1299     0.1385
0.1472
             0.1558     0.1644     0.1731     0.1819
0.1908
             0.1997     0.2086     0.2174     0.2263
0.2352
             0.2442     0.2543     0.2645     0.2746
0.2847
             0.2995     0.3325     0.3655     0.4568
0.6495
             0.6543     0.6591     0.6638     0.6686
0.6733
             0.6893     0.7055     0.7217     0.7380
0.7514
             0.7643     0.7771     0.7900     0.8028
0.8198
             0.8396     0.8595     0.8834     0.9247
1.0000


  ***************
  Analysis Options
  ***************
  Flow Units ............... CMS
  Process Models:
    Rainfall/Runoff ........ YES
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ NO
    Water Quality .......... NO
  Infiltration Method ...... HORTON
  Flow Routing Method ...... DYNWAVE
  Surcharge Method ......... EXTRAN
  Starting Date ............ 01/01/2000 00:00:00
  Ending Date .............. 01/04/2000 00:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 00:01:00
  Wet Time Step ............ 00:05:00
  Dry Time Step ............ 00:05:00
  Routing Time Step ........ 1.00 sec
  Variable Time Step ....... YES
  Maximum Trials ........... 8
  Number of Threads ........ 12
  Head Tolerance ........... 0.001500 m


  *************************        Volume         Depth
  Runoff Quantity Continuity     hectare-m            mm
  *************************     ---------       -------
  Total Precipitation ......         1.544        96.000
  Evaporation Loss .........         0.000         0.000
  Infiltration Loss ........         0.153         9.528
  Surface Runoff ...........         1.373        85.383
  Final Storage ............         0.024         1.498
  Continuity Error (%) .....        -0.426


  *************************        Volume        Volume
  Flow Routing Continuity        hectare-m      10^6 ltr
  *************************     ---------      ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......         1.373        13.730
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         3.484        34.843
  External Outflow .........         4.858        48.580
  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 ......         0.001         0.008
  Continuity Error (%) .....        -0.033


  ************************
  Highest Continuity Errors
  ************************
  Node STMMH_473_(STM) (1.40%)
  Node STMMH_104_(STM) (1.07%)


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


  *********************************
  Highest Flow Instability Indexes
  *********************************
  Link 244_(STM) (5)
  Link C1 (3)
  Link OUT_St_D1_D2_D3 (2)
  Link OUT_St_B2_B3 (2)
  Link OUT_St_C1_C2_C3 (2)


  *********************************
  Most Frequent Nonconverging Nodes
  *********************************
  Convergence obtained at all time steps.


  ************************
  Routing Time Step Summary
  ************************
  Minimum Time Step           :     0.50 sec
  Average Time Step           :     1.00 sec
  Maximum Time Step           :     1.00 sec
  % of Time in Steady State   :     0.00
  Average Iterations per Step :     2.00
  % of Steps Not Converging   :     0.00
  Time Step Frequencies       :
      1.000 -  0.871 sec      :    99.73 %
      0.871 -  0.758 sec      :     0.09 %
      0.758 -  0.660 sec      :     0.06 %
      0.660 -  0.574 sec      :     0.04 %
      0.574 -  0.500 sec      :     0.08 %


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

  ---------------------------------------------------------
-----------------------------------------------------------------
--------
                             Total      Total      Total      Total
Imperv       Perv      Total       Total     Peak  Runoff
                           Precip      Runon      Evap      Infil
Runoff     Runoff     Runoff      Runoff   Runoff   Coeff
  Subcatchment                mm         mm         mm         mm
mm         mm         mm    10^6 ltr      CMS
  ---------------------------------------------------------------------
-----------------------------------------------------------
  10                        96.00       0.00       0.00      39.17
6.75      49.12      55.87        0.07     0.03   0.582
  11-13_1                   96.00       0.00       0.00       2.39
89.31       3.05      92.36        0.23     0.10   0.962
  11-13_2                   96.00       0.00       0.00       2.38
89.12       3.04      92.16        0.21     0.09   0.960
  14-15_1                   96.00       0.00       0.00       5.38
82.50       6.86      89.36        0.08     0.04   0.931
  14-15_2                   96.00       0.00       0.00       5.38
82.56       6.86      89.42        0.09     0.04   0.931
  16                        96.00       0.00       0.00      37.85
9.45      47.76      57.21        0.13     0.07   0.596
  17-20                     96.00       0.00       0.00       1.19
92.07       1.52      93.59        1.05     0.45   0.975
  2                         96.00       0.00       0.00      37.27
10.80      46.98      57.78        0.12     0.06   0.602
  21                        96.00       0.00       0.00      23.96
40.49      30.44      70.93        0.14     0.07   0.739
  22                        96.00       0.00       0.00      27.16
33.78      33.93      67.71        0.08     0.04   0.705
  23-25                     96.00       0.00       0.00       0.00
94.89       0.00      94.89        1.32     0.56   0.988
```

```
  26                      96.00       0.00       0.00      14.38
62.13      18.25      80.38        0.43      0.19    0.837
  27-30                   96.00       0.00       0.00      10.76
70.21      13.72      83.93        0.45      0.20    0.874
  3-5_1                   96.00       0.00       0.00       1.79
90.79       2.29      93.08        0.14      0.06    0.970
  3-5_2                   96.00       0.00       0.00       1.79
90.62       2.28      92.90        0.37      0.16    0.968
  6-9_1                   96.00       0.00       0.00       4.78
83.79       6.10      89.89        0.34      0.15    0.936
  6-9_2                   96.00       0.00       0.00       4.79
84.11       6.09      90.20        0.19      0.08    0.940
  A1                      96.00       0.00       0.00       0.00
95.06       0.00      95.06        0.57      0.24    0.990
  A2                      96.00       0.00       0.00       0.00
95.06       0.00      95.06        0.38      0.16    0.990
  B1                      96.00       0.00       0.00       0.00
95.06       0.00      95.06        0.51      0.22    0.990
  B2_B3                   96.00       0.00       0.00       0.00
95.06       0.00      95.06        1.07      0.45    0.990
  C1_C2_C3                96.00       0.00       0.00       0.00
95.06       0.00      95.06        1.64      0.70    0.990
  D1_D2_D3                96.00       0.00       0.00       0.00
95.06       0.00      95.06        1.56      0.66    0.990
  OFF1                    96.00       0.00       0.00      29.63
28.36      36.87      65.23        0.38      0.16    0.679
  OFF2                    96.00       0.00       0.00      37.75
12.16      44.90      57.06        0.49      0.12    0.594
  OFF4                    96.00       0.00       0.00      41.25
1.35       52.61      53.96        0.05      0.03    0.562
  Pond-1                  96.00       0.00       0.00      30.20
27.00      37.68      64.68        0.67      0.29    0.674
  S2_1                    96.00       0.00       0.00      15.13
56.70      22.95      79.66        0.21      0.10    0.830
  S2_3                    96.00       0.00       0.00      15.13
56.70      22.95      79.66        0.39      0.18    0.830
  S2_4                    96.00       0.00       0.00      15.13
56.70      22.95      79.66        0.38      0.18    0.830


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


  ------------------------------------------------------------
-----------------------
                                    Average  Maximum  Maximum
Time of Max    Reported
                                      Depth    Depth      HGL
Occurrence   Max Depth
  Node                 Type        Meters   Meters   Meters
days hr:min      Meters
  ------------------------------------------------------------
-----------------------
  J1                   JUNCTION      0.07     0.64    91.99
0  08:03         0.64
  STMMH_201_(STM)      JUNCTION      0.39     0.79    89.19
0  07:28         0.79
  STMMH_202_(STM)      JUNCTION      0.44     1.11    89.64
0  07:27         1.11
  STMMH_203_(STM)      JUNCTION      0.45     1.48    90.13
0  07:27         1.48
  STMMH_451_(STM)      JUNCTION      0.46     2.05    91.33
0  06:09         2.05
  STMMH_459_(STM)      JUNCTION      0.78     2.51    91.33
0  06:09         2.51
  STMMH_465_(STM)      JUNCTION      0.46     1.60    90.35
0  07:27         1.60
  STMMH_466_(STM)      JUNCTION      0.12     1.16    91.89
0  08:05         1.16
  STMMH_467_(STM)      JUNCTION      0.03     0.67    91.07
0  08:03         0.67
  STMMH_468_(STM)      JUNCTION      0.09     0.53    88.90
0  08:04         0.52
  STMMH_473_(STM)      JUNCTION      0.34     1.24    90.97
0  06:06         1.24
  STMMH_474_(STM)      JUNCTION      0.10     1.22    91.06
0  08:09         1.21
  STMMH_475_(STM)      JUNCTION      0.04     0.38    89.71
0  08:06         0.38
  STMMH_477_(STM)      JUNCTION      0.33     1.12    90.97
0  06:06         1.12
  OF1                  OUTFALL       0.09     0.52    87.64
0  08:04         0.52
  CB_04_(STM)          STORAGE       0.28     1.04    91.77
0  06:00         1.04
  CB_07_(STM)          STORAGE       0.28     1.60    92.21
0  06:00         1.59
  CB_08_(STM)          STORAGE       0.31     1.51    92.13
0  06:00         1.51
  CB_11_(STM)          STORAGE       0.32     1.77    92.19
0  06:00         1.77
  CB_12_(STM)          STORAGE       0.33     1.36    91.85
0  06:01         1.36
  CBMH_102_(STM)       STORAGE       0.32     1.40    91.35
0  06:01         1.40
  CBMH_103_(STM)       STORAGE       0.31     1.38    91.49
0  06:01         1.38
  CBMH_105_(STM)       STORAGE       0.31     1.52    91.65
0  06:01         1.52
  CBMH_108_(STM)       STORAGE       0.38     1.76    91.48
0  06:03         1.76
  CBMH_109_(STM)       STORAGE       0.35     1.62    91.51
0  06:03         1.62
  CBMH_110_(STM)       STORAGE       0.34     1.47    91.57
0  06:02         1.47
  Pond                 STORAGE       0.39     1.38    90.43
0  07:27         1.38
  St_A1                STORAGE       0.00     0.05   102.75
0  06:33         0.05
  St_A2                STORAGE       0.00     0.05   102.75
0  06:32         0.05
  St_B1                STORAGE       0.00     0.05   108.05
0  06:32         0.05
  St_B2_B3             STORAGE       0.00     0.04   107.84
0  06:32         0.04
  St_C1_C2_C3          STORAGE       0.00     0.04   108.04
0  06:32         0.04
  St_CB01              STORAGE       0.00     0.09    92.21
0  06:00         0.09
  St_CB05              STORAGE       0.00     0.10    92.30
0  06:00         0.10
  St_CB11              STORAGE       0.00     0.09    92.27
0  06:00         0.09
  St_CB12              STORAGE       0.00     0.09    92.44
0  06:00         0.09
  St_CB13              STORAGE       0.00     0.21    91.68
0  06:03         0.21
  St_CB14              STORAGE       0.00     0.13    92.31
0  06:00         0.13
  St_CB21              STORAGE       0.00     0.09    92.30
0  06:00         0.09
  St_CB23              STORAGE       0.00     0.09    92.41
0  06:00         0.09
  St_CB24              STORAGE       0.00     0.21    92.54
0  06:01         0.21
  St_CB31              STORAGE       0.00     0.21    92.52
0  06:02         0.21
  St_CB34              STORAGE       0.00     0.11    92.61
0  06:00         0.11
  St_CBMH102           STORAGE       0.00     0.06    92.26
0  06:00         0.06
  St_CBMH105           STORAGE       0.00     0.11    92.21
0  06:00         0.11
  St_CBMH108           STORAGE       0.00     0.09    92.23
0  06:00         0.09
  St_CBMH110           STORAGE       0.00     0.08    92.38
0  06:00         0.08
  St_D1_D2_D3          STORAGE       0.00     0.04   103.14
0  06:32         0.04
  STMMH_101_(STM)      STORAGE       0.32     1.41    91.32
0  06:02         1.41
  STMMH_104_(STM)      STORAGE       0.31     1.40    91.76
0  06:00         1.40
  STMMH_106_(STM)      STORAGE       0.31     1.75    92.20
0  06:00         1.75
  STMMH_107_(STM)      STORAGE       0.46     2.10    91.41
0  06:06         2.10
  STMMH_111_(STM)      STORAGE       0.42     2.12    91.58
0  06:03         2.12
  STMMH_112_(STM)      STORAGE       0.40     2.41    92.01
0  06:00         2.41
  STMMH_116_(STM)      STORAGE       0.37     2.49    92.26
0  06:00         2.49
  STMMH_117_(STM)      STORAGE       0.07     2.27    92.43
0  06:01         2.27
```

```
  STMMH_120_(STM)      STORAGE      0.34     2.34    92.52
0  06:00        2.34


  ********************
  Node Inflow Summary
  ********************

  ------------------------------------------------------------
--------------------------------------
                                 Maximum  Maximum
Lateral       Total        Flow
                               Lateral    Total  Time of
Max      Inflow      Inflow     Balance
                                Inflow   Inflow
Occurrence      Volume      Volume       Error
  Node                Type           CMS      CMS  days
hr:min    10^6 ltr    10^6 ltr     Percent
  ------------------------------------------------------------
--------------------------------------
  J1                  JUNCTION     1.674    1.674     0
07:55        27.1        27.1     0.002
  STMMH_201_(STM)     JUNCTION     0.000    0.433     0
07:28           0        11.9     0.002
  STMMH_202_(STM)     JUNCTION     0.000    0.433     0
07:28           0        11.9     0.012
  STMMH_203_(STM)     JUNCTION     0.000    0.433     0
07:28           0        11.9     0.001
  STMMH_451_(STM)     JUNCTION     0.034    1.789     0
05:57      0.0707          10    -0.038
  STMMH_459_(STM)     JUNCTION     0.000    1.223     0
05:59           0          10     0.010
  STMMH_465_(STM)     JUNCTION     0.000    0.433     0
07:27           0        11.9     0.004
  STMMH_466_(STM)     JUNCTION     0.365    1.682     0
07:57       0.811        27.9    -0.001
  STMMH_467_(STM)     JUNCTION     0.121    3.840     0
07:48       0.488        31.3     0.052
  STMMH_468_(STM)     JUNCTION     0.175    2.211     0
08:04       0.383        40.6     0.007
  STMMH_473_(STM)     JUNCTION     0.000    0.358     0
06:00           0        1.14     1.417
  STMMH_474_(STM)     JUNCTION     0.000    5.399     0
07:57           0        31.3    -0.025
  STMMH_475_(STM)     JUNCTION     0.000    1.986     0
08:03           0        28.4    -0.028
  STMMH_477_(STM)     JUNCTION     0.057    0.439     0
06:00       0.116        1.14    -0.220
  OF1                 OUTFALL      0.614    2.699     0
07:51        7.98        48.6     0.000
  CB_04_(STM)          STORAGE     0.000    0.019     0
05:52           0     0.00392    -11.782
  CB_07_(STM)          STORAGE     0.000    0.016     0
05:51           0     0.00378     -4.469
  CB_08_(STM)          STORAGE     0.000    0.078     0
05:55           0       0.183     0.806
  CB_11_(STM)          STORAGE     0.000    0.099     0
05:59           0       0.228     0.961
  CB_12_(STM)          STORAGE     0.000    0.079     0
06:00           0        1.17     0.075
  CBMH_102_(STM)       STORAGE     0.000    0.390     0
06:00           0        1.03    -0.105
  CBMH_103_(STM)       STORAGE     0.000    0.148     0
06:00           0       0.369    -0.965
  CBMH_105_(STM)       STORAGE     0.000    0.203     0
05:55           0       0.517    -0.460
  CBMH_108_(STM)       STORAGE     0.000    0.336     0
06:00           0        3.14    -0.022
  CBMH_109_(STM)       STORAGE     0.000    0.124     0
06:01           0        1.64    -0.041
  CBMH_110_(STM)       STORAGE     0.000    0.116     0
05:52           0        1.26     0.030
  Pond                 STORAGE     0.294    1.190     0
06:00       0.669        11.8    -0.075
  St_A1                STORAGE     0.245    0.245     0
06:00       0.574       0.574    -0.005
  St_A2                STORAGE     0.161    0.161     0
06:00       0.378       0.378    -0.005
  St_B1                STORAGE     0.219    0.219     0
06:00       0.513       0.513    -0.005
  St_B2_B3             STORAGE     0.455    0.455     0
06:00        1.07        1.07    -0.005
  St_C1_C2_C3          STORAGE     0.700    0.700     0
06:00        1.64        1.64    -0.005
  St_CB01              STORAGE     0.161    0.161     0
06:00       0.373       0.373    -0.002
  St_CB05              STORAGE     0.148    0.148     0
06:00       0.338       0.338    -0.001
  St_CB11              STORAGE     0.099    0.099     0
06:00       0.228       0.228    -0.002
  St_CB12              STORAGE     0.035    0.035     0
06:00      0.0804      0.0804    -0.002
  St_CB13              STORAGE     0.067    0.067     0
06:00       0.135       0.135     0.000
  St_CB14              STORAGE     0.452    0.452     0
06:00        1.05        1.05    -0.002
  St_CB21              STORAGE     0.067    0.067     0
06:00       0.141       0.141    -0.000
  St_CB23              STORAGE     0.037    0.037     0
06:00      0.0845      0.0845    -0.000
  St_CB24              STORAGE     0.564    0.564     0
06:00        1.32        1.32    -0.002
  St_CB31              STORAGE     0.193    0.193     0
06:00       0.427       0.427    -0.001
  St_CB34              STORAGE     0.200    0.200     0
06:00       0.448       0.448    -0.001
  St_CBMH102           STORAGE     0.059    0.059     0
06:00       0.137       0.137    -0.006
  St_CBMH105           STORAGE     0.081    0.081     0
06:00       0.187       0.187    -0.003
  St_CBMH108           STORAGE     0.091    0.091     0
06:00       0.209       0.209    -0.002
  St_CBMH110           STORAGE     0.041    0.041     0
06:00      0.0948      0.0948    -0.004
  St_D1_D2_D3          STORAGE     0.663    0.663     0
06:00        1.56        1.56    -0.005
  STMMH_101_(STM)      STORAGE     0.000    0.384     0
06:00           0        1.03     0.214
  STMMH_104_(STM)      STORAGE     0.000    0.161     0
06:00           0       0.377     1.082
  STMMH_106_(STM)      STORAGE     0.000    0.147     0
06:00           0       0.342     0.447
  STMMH_107_(STM)      STORAGE     0.000    1.780     0
05:56           0        9.96    -0.032
  STMMH_111_(STM)      STORAGE     0.000    1.507     0
05:56           0        6.81    -0.166
  STMMH_112_(STM)      STORAGE     0.000    1.495     0
05:56           0        6.67    -0.082
  STMMH_116_(STM)      STORAGE     0.000    0.957     0
05:55           0        3.83    -0.191
  STMMH_117_(STM)      STORAGE     0.000    0.976     0
05:55           0        3.75    -0.019
  STMMH_120_(STM)      STORAGE     0.000    0.264     0
05:58           0            2     0.075


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

  Surcharging occurs when water rises above the top of the
highest conduit.
  ------------------------------------------------------------
-----------
                                                    Max. Height
Min. Depth
                                     Hours       Above Crown
Below Rim
  Node                Type      Surcharged          Meters
Meters
  ------------------------------------------------------------
-----------
  STMMH_202_(STM)     JUNCTION         3.58           0.195
1.758
  STMMH_203_(STM)     JUNCTION         4.31           0.518
1.779


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

```
  No nodes were flooded.


  **********************
  Storage Volume Summary
  **********************

  ------------------------------------------------------------
-------------------------------------
                           Average    Avg   Evap  Exfil
Maximum    Max    Time of Max    Maximum
                            Volume   Pcnt   Pcnt   Pcnt
Volume   Pcnt     Occurrence    Outflow
  Storage Unit           1000 m³   Full   Loss   Loss
1000 m³   Full    days hr:min        CMS
  ------------------------------------------------------------
-------------------------------------
  CB_04_(STM)              0.000   14.8    0.0    0.0
0.001   55.5       0  06:00      0.012
  CB_07_(STM)              0.000   10.8    0.0    0.0
0.002   61.6       0  06:00      0.009
  CB_08_(STM)              0.000   12.4    0.0    0.0
0.002   60.8       0  06:00      0.073
  CB_11_(STM)              0.000   16.8    0.0    0.0
0.002   94.2       0  06:00      0.090
  CB_12_(STM)              0.000   17.6    0.0    0.0
0.002   73.2       0  06:01      0.079
  CBMH_102_(STM)           0.000   14.1    0.0    0.0
0.002   62.3       0  06:01      0.384
  CBMH_103_(STM)           0.000   14.8    0.0    0.0
0.002   65.4       0  06:01      0.142
  CBMH_105_(STM)           0.000   15.1    0.0    0.0
0.002   73.3       0  06:01      0.193
  CBMH_108_(STM)           0.000   15.5    0.0    0.0
0.002   72.8       0  06:03      0.323
  CBMH_109_(STM)           0.000   14.6    0.0    0.0
0.002   67.1       0  06:03      0.119
  CBMH_110_(STM)           0.000   15.3    0.0    0.0
0.002   66.9       0  06:02      0.109
  Pond                     0.941    5.8    0.0    0.0
4.219   26.2       0  07:27      0.433
  St_A1                    0.014    4.8    0.0    0.0
0.274   90.8       0  06:33      0.023
  St_A2                    0.010    4.8    0.0    0.0
0.180   90.8       0  06:32      0.015
  St_B1                    0.013    4.6    0.0    0.0
0.243   90.1       0  06:32      0.021
  St_B2_B3                 0.026    4.6    0.0    0.0
0.505   89.9       0  06:32      0.044
  St_C1_C2_C3              0.039    4.6    0.0    0.0
0.775   89.8       0  06:32      0.068
  St_CB01                  0.000    0.0    0.0    0.0
0.003    2.0       0  06:00      0.161
  St_CB05                  0.000    0.0    0.0    0.0
0.011    3.2       0  06:00      0.147
  St_CB11                  0.000    0.0    0.0    0.0
0.006    0.5       0  06:00      0.099
  St_CB12                  0.000    0.0    0.0    0.0
0.002    2.0       0  06:00      0.035
  St_CB13                  0.000    0.0    0.0    0.0
0.003    1.3       0  06:03      0.065
  St_CB14                  0.000    0.0    0.0    0.0
0.004    1.2       0  06:00      0.451
  St_CB21                  0.000    0.0    0.0    0.0
0.001    1.0       0  06:00      0.067
  St_CB23                  0.000    0.0    0.0    0.0
0.002    2.8       0  06:00      0.037
  St_CB24                  0.000    0.0    0.0    0.0
0.036    8.8       0  06:01      0.563
  St_CB31                  0.000    0.0    0.0    0.0
0.031   12.5       0  06:02      0.277
  St_CB34                  0.000    0.0    0.0    0.0
0.002    1.2       0  06:00      0.199
  St_CBMH102               0.000    0.0    0.0    0.0
0.000    1.0       0  06:00      0.059
  St_CBMH105               0.000    0.0    0.0    0.0
0.004    1.1       0  06:00      0.080
  St_CBMH108               0.000    0.0    0.0    0.0
0.002    1.5       0  06:00      0.091
  St_CBMH110               0.000    0.0    0.0    0.0
0.003    4.3       0  06:00      0.041
  St_D1_D2_D3              0.037    4.5    0.0    0.0
0.733   89.5       0  06:32      0.065
  STMMH_101_(STM)          0.000   13.8    0.0    0.0
0.002   60.5       0  06:02      0.382
  STMMH_104_(STM)          0.000   15.2    0.0    0.0
0.002   68.5       0  06:00      0.151
  STMMH_106_(STM)          0.000   16.4    0.0    0.0
0.002   92.3       0  06:00      0.141
  STMMH_107_(STM)          0.001   12.7    0.0    0.0
0.002   57.8       0  06:06      1.759
  STMMH_111_(STM)          0.000   13.2    0.0    0.0
0.002   66.3       0  06:03      1.473
  STMMH_112_(STM)          0.000   14.0    0.0    0.0
0.003   85.3       0  06:00      1.448
  STMMH_116_(STM)          0.000   13.0    0.0    0.0
0.003   87.2       0  06:00      0.913
  STMMH_117_(STM)          0.000    2.9    0.0    0.0
0.003   97.2       0  06:01      0.924
  STMMH_120_(STM)          0.000   13.6    0.0    0.0
0.003   92.8       0  06:00      0.265


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

  ------------------------------------------------------------
-
                           Flow       Avg       Max
Total
                           Freq      Flow      Flow
Volume
  Outfall Node             Pcnt       CMS       CMS    10^6
ltr
  ------------------------------------------------------------
-
  OF1                     79.65     0.237     2.699
48.580
  ------------------------------------------------------------
-
  System                  79.65     0.237     2.699
48.580


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

  ------------------------------------------------------------
------------------
                                    Maximum  Time of Max
Maximum    Max/    Max/
                                     |Flow|   Occurrence
|Veloc|    Full    Full
  Link                Type           CMS  days hr:min
m/sec    Flow   Depth
  ------------------------------------------------------------
------------------
  154_(1)_(STM)        CONDUIT     0.265     0  05:57
0.81    0.82    1.00
  156_(STM)            CONDUIT     0.019     0  05:52
0.33    0.32    1.00
  157_(1)_(STM)        CONDUIT     0.119     0  06:02
0.64    0.63    1.00
  158_(1)_(STM)        CONDUIT     1.759     0  05:57
2.36    1.95    1.00
  158_(STM)            CONDUIT     0.323     0  06:00
1.14    1.82    1.00
  160_(STM)            CONDUIT     0.148     0  06:00
0.96    1.10    1.00
  161_(STM)            CONDUIT     0.142     0  06:01
0.89    1.06    1.00
  166_(STM)            CONDUIT     0.193     0  06:01
1.22    1.43    1.00
  167_(3)_(STM)        CONDUIT     0.924     0  05:55
1.73    1.83    1.00
  170_(STM)            CONDUIT     1.448     0  05:56
2.28    2.10    1.00
```

```
  171_(1)_(STM)         CONDUIT     0.139     0  06:00
1.26    1.45    1.00
  172_(STM)             CONDUIT     0.016     0  05:51
0.34    0.27    1.00
  175_(STM)             CONDUIT     0.384     0  06:00
1.78    1.63    1.00
  176_(1)_(1)_(STM)     CONDUIT     0.090     0  05:59
1.28    1.39    1.00
  179_(STM)             CONDUIT     0.073     0  05:55
1.48    1.59    1.00
  184_(STM)             CONDUIT     0.109     0  06:01
0.97    0.76    1.00
  186_(STM)             CONDUIT     0.079     0  05:52
1.17    1.06    1.00
  200_(STM)             CONDUIT     0.382     0  06:00
1.76    1.93    1.00
  226_(1)_(1)_(2)_(STM) CONDUIT     0.690     0  06:07
1.37    2.16    1.00
  226_(1)_(STM)         CONDUIT     0.283     0  06:08
1.23    1.78    1.00
  230_(STM)             CONDUIT     1.678     0  08:05
1.66    2.12    0.71
  237_(STM)             CONDUIT     1.473     0  05:56
2.32    2.10    1.00
  238_(STM)             CONDUIT     0.433     0  07:28
1.53    1.71    1.00
  239_(1)_(STM)         CONDUIT     0.433     0  07:28
1.64    1.81    0.88
  239_(STM)             CONDUIT     0.433     0  07:28
1.53    1.80    1.00
  240_(STM)             CONDUIT     0.433     0  07:28
1.87    1.28    0.76
  242_(STM)             CONDUIT     0.913     0  05:56
1.71    1.88    1.00
  244_(STM)             CONDUIT     1.986     0  08:03
1.84    0.70    0.76
  C1                    CHANNEL     1.778     0  08:06
1.13    0.02    0.23
  C2                    CHANNEL     5.399     0  07:57
0.84    0.05    0.46
  C3                    CHANNEL     2.138     0  08:04
2.63    0.02    0.23
  C4                    CHANNEL     0.358     0  06:00
0.36    0.01    0.38
  C5                    CONDUIT     1.223     0  05:59
0.16    0.03    0.93
  C6                    CHANNEL     1.668     0  08:00
0.46    0.13    0.59
  OR3                   ORIFICE     0.043     0  06:16
1.00
  W_Pond                WEIR        0.000     0  00:00
0.00
  W_St_CB05             WEIR        0.000     0  00:00
0.00
  W_St_CB11             WEIR        0.000     0  00:00
0.00
  W_St_CB13             WEIR        0.000     0  00:00
0.00
  W_St_CB14             WEIR        0.000     0  00:00
0.00
  W_St_CB21             WEIR        0.000     0  00:00
0.00
  W_St_CB23             WEIR        0.000     0  00:00
0.00
  W_St_CB24             WEIR        0.000     0  00:00
0.00
  W_St_CB31             WEIR        0.000     0  00:00
0.00
  W_St_CB34             WEIR        0.000     0  00:00
0.00
  W_St_CBMH102          WEIR        0.000     0  00:00
0.00
  W_St_CBMH108          WEIR        0.000     0  00:00
0.00
  W_St_CBMH110          WEIR        0.000     0  00:00
0.00
  W1                    WEIR        0.000     0  00:00
0.00
  W1_St_CB12            WEIR        0.000     0  00:00
0.00
  W2                    WEIR        0.013     0  06:00
0.12
  W3                    WEIR        0.153     0  06:30
0.21
  W4                    WEIR        0.301     0  07:27
0.11
  OUT_St_A1             DUMMY       0.023     0  06:33
  OUT_St_A2             DUMMY       0.015     0  06:33
  OUT_St_B1             DUMMY       0.021     0  06:32
  OUT_St_B2_B3          DUMMY       0.044     0  06:32
  OUT_St_C1_C2_C3       DUMMY       0.068     0  06:32
  OUT_St_CB01           DUMMY       0.161     0  06:00
  OUT_St_CB05           DUMMY       0.147     0  06:00
  OUT_St_CB11           DUMMY       0.099     0  05:59
  OUT_St_CB12           DUMMY       0.035     0  06:00
  OUT_St_CB13           DUMMY       0.065     0  05:59
  OUT_St_CB14           DUMMY       0.451     0  06:00
  OUT_St_CB21           DUMMY       0.067     0  06:00
  OUT_St_CB23           DUMMY       0.037     0  06:00
  OUT_St_CB24           DUMMY       0.563     0  05:56
  OUT_St_CB31           DUMMY       0.277     0  06:05
  OUT_St_CB34           DUMMY       0.199     0  05:58
  OUT_St_CBMH102        DUMMY       0.059     0  06:00
  OUT_St_CBMH105        DUMMY       0.078     0  05:55
  OUT_St_CBMH108        DUMMY       0.091     0  06:00
  OUT_St_CBMH110        DUMMY       0.041     0  06:00
  OUT_St_D1_D2_D3       DUMMY       0.065     0  06:32
  OVF_CB_07             DUMMY       0.000     0  00:00
  OVF_CB_08             DUMMY       0.000     0  00:00


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

  -------------------------------------------------------------
----------------------------
                         Adjusted    ---------- Fraction of
Time in Flow Class ----------
                          /Actual          Up    Down  Sub   Sup
Up    Down  Norm  Inlet
  Conduit               Length    Dry  Dry   Dry   Crit
Crit  Crit  Crit  Ltd   Ctrl
  -------------------------------------------------------------
----------------------------
  154_(1)_(STM)            1.00   0.01  0.00  0.00  0.08
0.00  0.00  0.91  0.02  0.00
  156_(STM)                1.00   0.08  0.00  0.00  0.01
0.00  0.00  0.91  0.00  0.00
  157_(1)_(STM)            1.00   0.01  0.00  0.00  0.13
0.00  0.00  0.86  0.01  0.00
  158_(1)_(STM)            1.00   0.01  0.00  0.00  0.85
0.00  0.00  0.14  0.03  0.00
  158_(STM)                1.00   0.01  0.00  0.00  0.14
0.00  0.00  0.85  0.00  0.00
  160_(STM)                1.00   0.01  0.00  0.00  0.01
0.00  0.00  0.98  0.00  0.00
  161_(STM)                1.00   0.01  0.00  0.00  0.05
0.00  0.00  0.94  0.02  0.00
  166_(STM)                1.00   0.01  0.00  0.00  0.04
0.00  0.00  0.95  0.02  0.00
  167_(3)_(STM)            1.00   0.01  0.00  0.00  0.18
0.00  0.00  0.81  0.02  0.00
  170_(STM)                1.00   0.01  0.00  0.00  0.29
0.00  0.00  0.70  0.05  0.00
  171_(1)_(STM)            1.00   0.01  0.00  0.00  0.01
0.00  0.00  0.98  0.00  0.00
  172_(STM)                1.00   0.07  0.01  0.00  0.02
0.00  0.00  0.90  0.91  0.00
  175_(STM)                1.00   0.01  0.00  0.00  0.09
0.00  0.00  0.90  0.00  0.00
  176_(1)_(1)_(STM)        1.00   0.01  0.00  0.00  0.07
0.00  0.00  0.91  0.04  0.00
  179_(STM)                1.00   0.01  0.00  0.00  0.01
0.00  0.00  0.98  0.00  0.00
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  200_(STM)                1.00   0.01  0.42  0.00  0.57
0.00  0.00  0.00  0.86  0.00
```

```
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0.00  0.00  0.99  0.00  0.07
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  C4                       1.00   0.01  0.00  0.00  0.69
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0.00  0.00  0.01  0.66  0.00
  C6                       1.00   0.01  0.00  0.00  0.99
0.00  0.00  0.00  0.97  0.00


  *************************
  Conduit Surcharge Summary
  *************************

  ---------------------------------------------------------
------------------

Hours        Hours
                        --------- Hours Full --------
Above Full   Capacity
  Conduit                Both Ends  Upstream  Dnstream
Normal Flow   Limited
  ---------------------------------------------------------
------------------
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0.01         0.01
  156_(STM)                   0.20      0.20      0.28
0.01         0.01
  157_(1)_(STM)               2.51      2.51      3.10
0.01         0.01
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0.31         0.32
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0.31         1.71
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0.15         0.19
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0.09         0.23
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0.25         0.27
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0.32         0.28
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0.32         0.26
  238_(STM)                   4.31      4.56      4.31
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4.95         3.58
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3.49         0.01
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0.31         0.29


  Analysis begun on:  Fri Jul 10 18:28:11 2026
  Analysis ended on:  Fri Jul 10 18:28:56 2026
  Total elapsed time: 00:00:45
```

Appendix E

Mosquito Creek Tributary 3 Geomorphological Assessment

4101 Limebank Road

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Prepared for:
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Submitted:
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GEO Morphix Project No. 25148

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Table of Contents

1 Introduction 1
2 Study Area 2
2.1 Reach Delineation 2
2.2 Desktop Assessment 2
2.2.1 Physiography and surficial geology 2
2.2.2 Terrain Analysis 3
2.2.3 Historical Changes 3
2.2.4 Drainage Area Analysis 4
3 Field Assessments 5
3.1 Methodology 5
3.1.1 Reach Descriptions 6
3.1.2 Results and Discussion 6
3.2 Detailed Geomorphological Assessment 8
4 Erosion Threshold Analysis 8
4.1 Erosion Threshold Analysis 9
4.1.1 Methodology 9
4.1.2 Erosion Threshold Results 10
4.2 Unitary erosion threshold 11
5 Erosion Exceedance Analysis 12
5.1 Methods 12
5.2 Event-based projection 13
5.3 Results 13
6 Discussion 14
7 References 16

List of Tables

Table 1. Historical assessment of the Mosquito Creek Tributary 3. 4
Table 2. Drainage area analysis for Mosquito Creek Tributary 3 5
Table 3: Summary of reconnaissance-level assessments 7
Table 4: Detailed assessment summary (GEO Morphix, 2021) 8
Table 5. Summary of the erosion threshold analysis (GEO Morphix, 2021) 11
Table 6. Unitary-based erosion thresholds for select reaches within Tributary 3 11
Table 7. Summary of results of event-based erosion exceedance analysis 14

Appendices

Appendix A: Subject Land Maps

Appendix B: Historic Air Photographs

Appendix C: Photographic Record

Appendix D: Reconnaissance-level Geomorphic Assessment Data

Appendix E: Erosion Exceedance Hydrographs

Appendix F: Event-based Erosion Exceedance Results

1 Introduction

A site at 4101 Limebank Road, Ottawa ("subject lands") is proposed to be developed from agricultural land into commercial use. The subject lands occupy 15.12 ha, of which 13.4 ha will be developed. The remaining 1.8 ha is proposed for development as a semi-rural access road by the City of Ottawa. Stormwater servicing will be achieved through a proposed stormwater management (SWM) Pond situated within the southwestern corner of the subject lands. We note that an existing SWM Pond (Pond 3) located south of the subject lands is proposed for expansion and will service lands external to the proposed 4101 Limebank Road development. The proposed SWM Pond will outlet into **Tributary 3** of Mosquito Creek, which itself flows into Rideau River approximately 3 km to the west. The subject lands lie within the Primary Bird Hazard Zone of Ottawa International Airport (YOW). As such, any stormwater ponds within this zone must be fully drained following storm events to minimise wildfowl hazards within YOW airspace. Robinson Consultants Inc. (RCI) are designing the upgrades a proposed SWM Pond to receive stormwater runoff from the site; the pond will be designed to drain within 48 hours of rainfall events to minimise congregation of wildfowl near the Ottawa International Airport, while limiting geomorphic impacts in the downstream watercourse.

GEO Morphix Ltd (GEO Morphix) have been retained by Groupe Montoni to complete a fluvial geomorphological assessment for **Tributary 3**. The objectives of the assessment were to document and characterize existing conditions within the watercourse, quantify the erosion thresholds for boundary materials, and assess the potential for stormwater discharges to alter erosion rates with the subject tributary. The results of analysis will assist with determining detention and release rates that minimise erosion within **Tributary 3** and Mosquito Creek while also enabling the SWM Pond to drain within 48 hours. GEO Morphix has extensive knowledge and experience working within the Mosquito Creek watershed, including **Tributary 3**, having authored the Master Drainage Plan (MDP) for the ongoing developments in the area (GEO Morphix, 2021), and several subsequent reports.

The following activities were completed as part of the fluvial geomorphological assessment:

- Review of available background reports and mapping (i.e., watershed/subwatershed reporting, geology, topography, etc.) related to channel form and function and controlling factors related to fluvial geomorphology
- Terrain analysis and historical assessment using aerial photograph records and LiDAR-derived DEM data to identify changes to the system due to land use and past channel modifications within the primary and extended study areas
- Review previous reach delineation along the receiving watercourses through a desktop exercise, and revise if necessary
- Conduct a rapid geomorphological field assessment to verify the findings of the background review and desktop assessment, confirm that no significant changes have occurred in the watercourse since the previous field assessment and identify the most erosion-sensitive reach along the receiving watercourse
- Review of previous detailed geomorphological field assessment along the most erosion-sensitive reach to support and inform erosion threshold modelling and erosion exceedance analysis
- Conduct a drainage area analysis of delineated reaches using LiDAR-derived DEM data to quantify the proportional contribution of the subject lands on downstream reaches
- Review and revise erosion threshold assessment for the most erosion-sensitive reach to determine the limiting erosion threshold value based on the proportional area of the subject lands to the watershed
- Conduct an event-based analysis of pre- and post-development erosion potential for the most erosion-sensitive reach under a range of synthetic storms to inform and evaluate stormwater mitigation measures and SWM pond design.

2 Study Area

The subject lands cover an area of 15.12 ha, of which 13.4 ha will be developed, with the remaining 1.8 ha reserved for the future realignment of Leitrim Road (RCI, 2026). At the confluence of **Tributary 3** and Mosquito Creek, the entire subject lands comprise around 3% of the drainage area of **Tributary 3** and 0.5% of the combined drainage area of Mosquito Creek and Tributary 3. As a result, the potential for measurable downstream impact of stormwater from the development of the subject land is limited to **Tributary 3**, with negligible potential impact in the mainstem of Mosquito Creek. As a result, the assessment provided here will focus on **Tributary 3** alone.

2.1 Reach Delineation

A reach is a length of channel that has a relatively consistent set of controlling conditions and resulting morphological characteristics, such that it can be treated as an individual unit of analysis. The upstream and downstream limits of a reach are defined as locations where there is a significant change in controlling conditions, transitions which typically manifest as a change in reach morphological characteristics. Reaches are studied semi-independently as each is expected to function in a manner that is at least slightly different from adjoining reaches. This method allows for a meaningful characterization of a watercourse as the aggregate of reaches, or an understanding of a particular reach, for example, as it relates to a proposed activity. Reaches are typically delineated based on changes in the following:

- Channel planform
- Channel gradient
- Valley confinement
- Physiography
- Land cover (land use or vegetation)
- Tributary confluences
- Soil type and surficial geology
- Historical channel modifications

Reach delineation followed a scientifically defensible methodology proposed by Montgomery and Buffington (1997), the Toronto and Region Conservation Authority (TRCA, 2004) and others. Several watercourse reaches were delineated within the subject lands based on a desktop assessment of available data (e.g., MNRF stream layer, surficial geology, historical and recent aerial photographs, topographic data.

Three distinct tributaries (**T3A**, **T3B**, and **T3C)** meet and flow into Mosquito Creek **Tributary 3** (**T3)** before flowing into the mainstem of Mosquito Creek. There were seven distinct reaches within the network of tributaries: **T3**, **T3A**, **T3B**, **T3B1-R1**, **T3B1-R2**, **T3C-R1 and T3C-R2**. This delineation follows previous reporting (GEO Morphix, 2021), and there is no evidence which would require changing the previously established reaches.

See **Appendix A** for mapping of the delineated reaches.

2.2 Desktop Assessment

Stream morphodynamics are largely governed by the flow regime and the availability and type of sediments (e.g., surficial geology) within the stream corridor. Secondary variables that affect the channel include the surrounding topography, land use and riparian vegetation. These are explored as they not only offer insight into existing conditions, but also potential changes that could be expected in the future as they relate to a proposed activity.

2.2.1 Physiography and surficial geology

The study area lies within the Clay Plains physiographic area (Unit 12), comprising fine glaciomarine silt and clay sediments (surficial geology unit 10a; Chapman and Putnam, 2007; OGS 2010). Site and

hillshade maps of the area are provided in **Appendix A**. Clayey sediments produce relatively stable cohesive banks which can lead to relatively deep, narrow channels.

2.2.2 Terrain Analysis

Stream channels are inherently dynamic features of the landscape, and a detailed review of channel and valley geomorphology using spatial datasets is useful to gain insight into how a given fluvial system has adjusted and is likely to adjust over time within the wider landscape, due to gradients, sediment supply and confinement and channel boundary materials. In particular, high-resolution bare-earth digital elevation models derived from airborne LiDAR surveys allow for detailed, landscape-scale mapping and analysis of geomorphic features.

A LiDAR-derived bare-earth digital elevation model was obtained from a publicly available dataset maintained by the Ontario Ministry of Natural Resources and Forestry (MNRF; 2023). The bare-earth elevation raster was used to generate a hillshade model to aid in interpreting and analyzing geomorphic features.

The areas surrounding the subject lands are low relief, consistent with the mapped clay plain physiographic region. Smaller watercourses and headwater drainage features largely flow over the surface of the clay plain, forming unconfined reaches. Larger watercourses incise into the surface of the clay plain, forming confined meandering reaches within narrow valleys; reach **T3** lies around 8 m below the upper surface of the clay plain. The meanders appear to be actively migrating within reach **T3**, with cutoff meanders observed, particularly near the confluence with Mosquito Creek. Previous erosion hazard assessments concluded that the meander belt was confined within the valley (GEO Morphix, 2021).

Valley walls slope at between approximately 15° and 25°; meander cut banks frequently impinge on the valley walls, forming steep slopes exceeding 45°. These over-steepened valley walls create an elevated risk of mass movements, and the clayey surficial geology of the study area is prone to rotational slumps and translational slides (Gautier *et al*., 2025). An 8 m toe erosion allowance has been applied to Mosquito Creek and its tributaries to account for the potential of these mass movements (Paterson Group, 2019; GEO Morphix, 2021).

2.2.3 Historical Changes

Historical aerial photographs were reviewed as part of the MDP (GEO Morphix, 2021) to determine changes to the channel and surrounding land use/cover. This study will also examine the visible changes in the watercourse since 2020. This information, in part, provides an understanding of the historical factors that have contributed to current channel morphodynamics. The 1945 photos were retrieved from NAPL; the 1976, 1991, and 2005 aerials were provided by the City of Ottawa; and the 2018 and 2025 images were retrieved from Google Earth Pro.

A summary of the historical changes to the watercourses is provided in **Table 1** and available air photographs are presented in **Appendix B**.

Broadly, the land use/land cover of the study area can be characterised as agricultural, with minor changes to human development up to 2005. Between 2005 and 2025, urban development accelerates, principally the widening of Limebank Road with associated alterations to **Tributary 3**, and the initiation of commercial development around the intersection of Limebank Road and Spratt Road. Reach **T3C-R1** was realigned and stabilised prior to 2012, with no visible change in channel course since.

Table 1. Historical assessment of the Mosquito Creek Tributary 3.

Year	Description of changes
1945	Land use is predominantly agricultural, grass and herbaceous riparian vegetation.
1976	No observable changes in riparian buffer or planform since 1945
1991	No major changes noted in land use. Growth and increased connectivity of trees within riparian buffer in T3 and T3A.
2005	The establishment of the Riverside South community has little effect at this time due to development occurring south and west of Mosquito Creek. The construction of Spratt Road entailed the re-alignment of a non-assessed reach entering T3A immediately north of Spratt Road, and the construction of a culvert for the passage of a non-assessed reach south of Spratt Road. Continued growth, and increased connectivity of trees within riparian buffer within T3 and T3A to form continuous tree cover. Expansion of trees into T3C-R1 to form continuous cover. Growth of sparse trees alongside other reaches.
2018	Widening of Limebank entails the construction of new watercourse crossings at T3B. Reaches T3C-R1 and T3C-R2 are realigned into an artificial meandering planform. Farm buildings alongside reach T3C-R2, east of Limebank Road, are demolished. A small agricultural field west of Limebank Road is converted into Pond 3. New channel design project alters the planform of T3A-R1 from an irregular meandering pattern to a regular meandering pattern. Construction of a commercial plaza at the south-east corner of Limebank and Spratt entailed the construction of a passage for a non-assessed reach immediately upstream of T3A. Construction of stormwater pond alongside T3C-R2 Continued growth and connectivity of trees within riparian zone of all reaches of Tributary 3.
2025	Initial land clearance and road construction of development on west side of Limebank Road (Gastop Street, Mosquito Drive) alongside Tributary 3. Significant increase in tree connectivity in T3C-R1; continued tree growth in other reaches.

2.2.4 Drainage Area Analysis

The potential influence of stormwater runoff from the subject lands on downstream channel erosion processes generally decreases as the contributing drainage area of the receiving watercourse increases. In this context, runoff from the proposed site accounts for a progressively smaller portion of the streamflow at downstream locations. Broadly, reaches where the proposed development contributes less than 10% of the total contributing drainage area are generally considered beyond the downstream limit of potential influence from changes in land use associated with the proposed development. The assessment therefore focused on the reaches receiving a more significant relative runoff contribution from the subject lands.

Drainage areas were defined for all reaches of **Tributary 3** from the proposed SWM pond outfall to the confluence with Mosquito Creek. The areas were determined through LiDAR-based analysis utilising Whitebox Watershed Analysis tools in QGIS through a standard workflow. The results were compared to existing mapping of drainage divides and watercourses (RVCA; City of Ottawa) and adjusted, as necessary, to the agency delineated drainage divides; RCI (2026) provided the drainage area for reach **T3C-R2** based on their hydrologic modelling, which aligned well with the drainage area delineated by GEO Morphix.

The drainage areas for each reach and the proportional contribution of the subject lands are presented in **Table 2**.

Table 2. Drainage area analysis for Mosquito Creek Tributary 3

Reach	Location	Drainage Area (ha)	Subject land contribution (%)
Subject Lands	4101 Limebank Road	13.4[a]	100
T3C-R2	Limebank Road crossing	86.1[b]	17.56
T3C-R1	Upstream of reach T3	93.8	16.12
T3	Combined flow of T3C-R1 and T3B	458.7	3.30
T3	Upstream of Mosquito Creek	466.2	3.24
Mosquito Creek	Immediately downstream of T3	3014.1	0.50

a. Area proposed for development, excluding the lands reserved for the future realigned Leitrim Road (RCI, 2026)
b. Provided by RCI (2026)

The drainage area analysis reveals that the proportional impact of the subject lands is greatest in reaches **T3C-R1** and **T3C-R2**, contributing 16.1 and 17.6% of the drainage area, respectively. The subject land contribution to reach **T3** drops significantly to 3.3% downstream of the confluence with reach **T3B**. As a result, stormwater from the subject lands will likely have minimal impact on reach **T3**. The drainage area contribution drops to 0.5% within the mainstem of Mosquito Creek, indicating that controlled drainage from the subject lands will have no detectable effect downstream of **Tributary 3**.

3 Field Assessments

Field-based reconnaissance-level assessments were undertaken in the three reaches downstream of the proposed development (**T3C-R2**; **T3C-R1**; **T3**) in August 2017 (GEO Morphix, 2018; 2021). Repeat field assessments were undertaken in November 2025 to determine whether significant change had occurred in these reaches since 2017 and whether previously determined conditions were still representative of the watercourse, and to assess the applicability of the earlier findings to the current conditions within **Tributary 3**, including the determination of an appropriate erosion threshold.

Reconnaissance-level assessments were completed to identify dominant geomorphic processes and channel forms, document stream health, and identify any areas of concern regarding channel erosion or channel instability. The assessment approach integrates several complementary methods for geomorphic assessment which are detailed below.

3.1 Methodology

The geomorphic field assessments applied a modified version of the Brierley and Fryirs (2005) River Styles Framework, which is a set of procedures used to describe channel forms and processes and assess channel response and potential future behaviour. These procedures are integrated into our geomorphic field assessment protocol. The Framework draws on established geomorphic models, such as Thorne (1999), Schumm (1985), and Downs (1995), to identify active fluvial processes, relative stability, dominant sediment transport mechanisms, and the energy in a system to do geomorphic work (e.g., mobilize sediment, erode bed/banks, reshape the channel). It also indicates the type and degree of sinuosity, system gradient, confinement, and the number of channels present in equilibrium conditions. Collectively, this information provides insight into the geomorphic structure, function, systematic adjustments, and the evolutionary trajectory of a river system, which, in turn, is used to inform river management applications (Brierley and Fryirs, 2005).

Our geomorphic field assessment protocol also incorporates the Downs (1995) model. The model uses physical indicators of systematic adjustment including channel, bank and bar morphology to classify and

forecast the type of channel instability. In doing so, the nature of fluvial and hillslope processes that are working to change the system are inferred. Channel instability is classified as varying degrees of stable, depositional, migrating laterally, enlarging, and experiencing various types of erosion (Downs, 1995; Simon and Downs, 1995).

Information gathered as part of the River Styles Framework and the Downs model of channel evolution is reviewed in tandem with rapid geomorphic assessment techniques to fully characterize a given fluvial system. Applied techniques include the Rapid Geomorphic Assessment (RGA) and Rapid Stream Assessment Tool (RSAT), which are described below.

The Rapid Geomorphic Assessment (RGA) technique evaluates systematic adjustments characterized as degradation, aggradation, widening, and planimetric form adjustment at the reach scale (MOE, 2003; VANR, 2007). The RGA method relies on the absence or presence of these indicators to evaluate the systematic adjustments in the reach associated with natural causes or human activities. Systematic adjustments typically result in changes to the floodplain, channel or valley characteristics. The end result of the RGA is to produce a score, or stability index, which evaluates the degree to which a reach has departed from the equilibrium condition. A reach with a score of less than 0.20 is classified as 'in regime', indicating minimal changes to its shape or processes over time. A score of 0.21 to 0.40 indicates that the reach is 'in transition' or 'stress' and is experiencing a change to process and form outside the natural range of geomorphic variability. A score of greater than 0.41 indicates that the reach is in adjustment, likely exhibiting continued adjustment to the point of either returning to equilibrium or moving toward a new equilibrium (MOE, 2003; VANR, 2007).

In addition, the Rapid Stream Assessment Tool (RSAT) was applied, which evaluates stream health, based on an inclusion of biological indicators (Galli, 1996). This technique relies on a scale ranging from 'poor' to 'excellent' for observations concerning channel stability, channel scouring/sediment deposition, physical instream habitat, water quality, and riparian habitat conditions, to provide a qualitative assessment of stream health. The evaluation produces values that indicate whether the channel is in poor (score <13), fair (score 13-24), good (score 25-34), or excellent (score >34) condition (Galli, 1996).

3.1.1 Reach Descriptions

Reach **T3** was located after the confluence of reaches **T3B** and **T3C-R1** and flowed downstream to Mosquito Creek (**Appendix A**) and was situated in confined valley setting. Riparian vegetation consisted of mature deciduous trees. Bed materials consisted of clay, sand, gravel and cobble in the riffles, and clay, silt and sand in the pools. Average bankfull width and depth were 4.3 m and 0.74 m, respectively. The reach showed significant evidence of ongoing geomorphic change, with bank failures and steep valley wall contacts.

Reach **T3C-R1** consisted of a designed channel in which coarse substrates and a clear riffle pool formation was present, unlike the other reaches within the subwatershed. Average bankfull width within the channel was 2.3 m, and average bankfull depth was 0.36 m. The channel occupied a partially confined forested valley and showed little evidence of ongoing geomorphic change.

Reach **T3C-R2** consisted of an intermittent swale occupying a confined valley conveying flows westward towards Limebank Road. The feature was well vegetated by purple loosestrife and other hydrophilic vegetation and had poor channel development. The feature was delineated from the surrounding landscape using the extent of aquatic vegetation and was an average of 3.3 m wide and 0.4 m deep. Minimal evidence of ongoing geomorphic change was observed at the time of the field assessment.

3.1.2 Results and Discussion

The reconnaissance-level assessment in reach **T3** recorded processes broadly consistent with a confined meandering channel undergoing bank erosion and meander migration. Reach **T3** was assigned an RGA score of 0.48 in 2017, and 0.51 in 2025 (both "in adjustment"), with RSAT scores of 23 and 24 (Fair) respectively. The primary mode of adjustment was widening, in the form of bank and bed scour, bank fractures, fallen trees and exposed roots; the RSAT score was similarly limited by channel stability. The channel system was assessed as 'Depositional' under the Downs (1995) Channel Evolution Model in both

surveys. The River Styles framework (Brierley and Fryirs, 2005) varied slightly from "meandering, mixed load" in 2017 to "meandering, bedload" in 2025; this appears to result from minor differences in interpretation between investigators, rather than systematic changes to the regime in reach **T3**. These results indicate that reach **T3** is prone to geomorphic alteration through bank erosion, without major change in this state between 2017 and 2025. Based on this consistency, we determine that previous detailed assessments, and the previously determined erosion threshold, are still representative of conditions within reach **T3**.

Reach **T3C-R1** was consistently stable in both reconnaissance-level assessments, reflecting the extensive realignment and engineering control. The RGA score for **T3C-R1** decreased from 0.09 to 0.07 (in regime; evidence of degradation) between 2017 and 2025, with the RSAT score increasing from 33 to 34 (Good; limited by riparian habitat). The Downs (1995) Channel Evolution model was Stable in both surveys. As above, minor differences in the River Style Framework (Brierley and Fryirs, 2005) between "meandering, mixed load" and "meandering, bedload" are accounted for by investigator interpretation. Broadly, reach **T3C-R1** appears to be stable after the completed realignment, and is undergoing no observable geomorphological change. There is no evidence of major changes in the channel conditions between 2017 and 2025.

Reach **T3C-R2** largely occupies an enlarged agricultural channel and was consistently stable between both surveys. The RGA score for **T3C-R2** remained at 0.08 (in regime; evidence of planimetric form adjustment). The RSAT score in 2017 was not assessed due to a dry channel at the time of the survey, while the 2025 RSAT score was 26 (Good, limited by the physical instream habitat). The channel was assessed under the Downs (1995) model as stable in both surveys. A difference in the River Style Framework (Brierley and Fryirs, 2005) was noted, altering from "meandering, suspended load" in 2017 to "straight, bedload" in 2025. A straight planform appears more consistent with observed mapping, and the relative dominance of suspended and bedload appears to reflect the specific conditions at the time of each assessment. Reach **T3C-R2** is not undergoing significant geomorphological change, with no alteration in conditions between 2017 and 2025

The summary results of both sets of reconnaissance-level field assessments are summarised in **Table 3**. Completed 2025 field assessment sheets for all reaches are presented in **Appendix D**.

Table 3: Summary of reconnaissance-level assessments

Reach	RGA (MOE, 2003)			RSAT (Galli, 1996)			Downs (1995) Channel Evolution Model	River Styles Framework (Brierley and Fryirs, 2005)
	Score	Condition	Dominant Systematic Adjustment	Score	Condition	Limiting Feature(s)		
2017								
T3	0.48	In Adjustment	Widening	23	Fair	Channel Stability	D - depositional	Meandering, mixed load
T3C-R1	0.09	In regime	Degradation	33	Good	Riparian Habitat	S - stable	Meandering, mixed load
T3C-R2	0.08	In regime - Swale	Planimetric Form Adjustment	N/A – Dry Channel			S - stable	Meandering, suspended load
2025								
T3	0.52	In Adjustment	Widening	24	Fair	Channel Stability	D - depositional	Meandering, bedload
T3C-R1	0.07	In regime	Widening	34	Good	Riparian Habitat	S - stable	Meandering, bedload
T3C-R2	0.08	In regime	Planimetric Form Adjustment	26	Good	Physical Instream Habitat	S - stable	Straight, bedload

3.2 Detailed Geomorphological Assessment

Reach **T3** was identified as the reach most susceptible to erosion based on the reconnaissance-level assessments, observed evidence of bank instability, and its relatively high RGA score (0.48). reach **T3** was therefore selected for detailed assessment, which was completed on August 23, 2017 (GEO Morphix, 2018; 2021).

The detailed assessment involved selecting an appropriate survey length based on bankfull channel width (typically 20 times the bankfull width) and the distribution of geomorphic units (riffles, runs, pools). A representative section of the reach was then selected, and eight representative cross sections and a bed longitudinal profile were surveyed within this section of the reach. A modified Wolman (1954) pebble count was completed at each cross-section. The resulting data were used to characterize average bankfull channel dimensions and to estimate bankfull discharge, velocity, shear stress, and sensitivity to erosion and sediment transport. A summary of measured and calculated parameters is presented in **Table 4**.

The detailed assessment confirmed that reach **T3** is underlain by fine-grained bed and bank materials, primarily silt and clay, consistent with the mapped surficial geology of the area. These sediments are susceptible to erosion at flows producing shear stress of around 1.5 Pa, well below the estimated bankfull shear stress of 3.45 Pa.

Long-term monitoring data for reach **T3** cross-sections were updated in November 2025 and showed no significant change in channel geometry since the detailed 2017 assessment. In addition, the reconnaissance-level assessments confirmed that the general channel conditions observed in 2017 are representative of the existing conditions within reach. Accordingly, the 2017 detailed assessment data are considered appropriate for the subsequent erosion-threshold analysis.

Table 4: Detailed assessment summary (GEO Morphix, 2018; 2021)

Channel parameter	Results
Measured (2017)	
Average bankfull channel width (m)	4.29
Average bankfull channel depth (m)	0.70
Bankfull channel gradient (%)	0.19
D_{50} (mm)	< 2 mm
D_{84} (mm)	< 2 mm
Manning's n roughness coefficient	0.037
Computed	
Bankfull discharge (m^3/s) [a]	1.53
Average bankfull velocity (m/s)	0.51
Unit stream power at bankfull discharge (W/m^2)	1.74
Tractive force at bankfull (N/m^2)	3.45
Critical shear stress (N/m^2) [b]	1.46

[a] Based on Manning's equation

[b] Based on Shields diagram from Miller et al. (1997)

4 Erosion Threshold Analysis

Information collected during the detailed geomorphological assessments was used to define an erosion threshold for reach **T3**. This threshold was then used to derive a conservative unitary-based erosion threshold for the upstream reaches located closer to the proposed SWM pond outlet for the subject

lands. Although reach **T3** was identified as the most erosion-sensitive reach of the reaches assessed downstream of the subject lands, the subject lands contribute a small proportion of the total drainage to the reach (approximate 3%; see drainage area analysis provided above). The potential influence of runoff from the subject lands on erosion processes within reach **T3** is therefore expected to be limited relative to the upstream reaches closer to the proposed SWM pond outlet. Nonetheless, to provide a conservative, lower-bound estimate of the erosion threshold for these upstream reaches, the erosion threshold for reach **T3** was used to derive the subject erosion thresholds and to minimize the potential impact on erosion rates within reach **T3**.

Of the upstream reaches, reach **T3C-R1** has been realigned and appears to have been effectively stabilised by the engineering works along the reach. This interpretation is supported by a review of historical air photograph analysis which reveal indicate little observable change in channel form, and by minimal evidence of channel instability documented during reconnaissance-level assessments of the reach. Therefore, reach **T3C-R2** was selected for further analysis as the direct receiving reach of the stormwater from the subject lands. The erosion threshold for this reach was based on the previously determined value for reach **T3** via a unitary approach. This approach establishes a conservative erosion threshold for reach **T3C-R2**, and ensures that release rates from the SWM pond will be scaled to the erosion threshold for reach **T3**, to ensure the proposed SWM plan effectively mitigates any increases in erosion potential for the subject reaches.

4.1 Erosion Threshold Analysis

Erosion thresholds are used to determine the magnitude of flow required to potentially entrain and transport bed and/or bank material (Garcia, 2008; Villard and Parish, 2003). The erosion threshold is the theoretical point, typically expressed as a critical discharge, shear stress or velocity, at which entrainment of sediment would occur based on bed and bank materials, channel geometry and other characteristics. Due to variability between bed and bank composition and structure, erosion thresholds are determined for both bed and bank materials, with the lower of the erosion thresholds adopted, as the more conservative and limiting estimate of erosion potential within the reach.

Changes in the magnitude, duration, and frequency of streamflow may alter the pattern and rates of channel erosion. As such, defined erosion thresholds inform erosion mitigation strategies in channels influenced by conceptual flow and stormwater management plans. Erosion thresholds were modelled using the results of the detailed assessment in reach **T3**, selected as the most erosion-sensitive reach downstream of the proposed SWM Pond. This erosion threshold was then used to derive a conservative unitary-based erosion threshold for reach **T3C-R2**, the reach immediately downstream of the proposed SWM pond outlet.

4.1.1 Methodology

Erosion threshold targets are determined using different methods that depend on the channel's sediment characteristics. For example, thresholds for non-cohesive sediments are commonly estimated using a shear stress approach, similar to that of Miller et al. (1977), which is based on a modified Shield's curve. A velocity approach could also be applied (Villard & Parish, 2003). For cohesive materials, a method such as that described by Komar (1987), or empirically derived values such as those compiled by Fischenich (2001), Chow (1959) or Julien (1994), could be applied. Villard and Parish (2003) emphasize the importance of selecting methods that reflect local sediment conditions and integrating them into site-specific geomorphic assessments.

An erosion threshold is quantified based on the bed and bank materials and local channel geometry, in the form of a critical discharge (Villard & Parish, 2003; TRCA 2012). Theoretically, above this discharge, entrainment and transport of sediment can occur. To determine this discharge, the velocity (U) or the shear stress (τ) is calculated at various depths for a representative cross-section until the average velocity or shear stress slightly exceeds the critical threshold of the bed material. The velocity is determined using Manning's approach, where Manning's n value is visually estimated through a method described by Acrement and Schneider (1989) or calculated using the Limerino (1970) approach. A Manning's n value of 0.035 was used for the assessment, based on the physical characteristics of the

subject reach, primarily the coarse pebble-cobble bed material. The reach average bankfull slope of 0.74% was used throughout this analysis. The velocity is mathematically represented as:

$$U = \frac{1}{n} d^{2/3} S^{1/2} \quad \text{[Eq. 1.]}$$

where *d* is the depth of water, *S* is the channel slope, and *n* is the Manning's roughness.

The shear stress is determined using the depth-slope product, which can be applied to the bed of open channels containing fluid undergoing steady flows. The shear stress is mathematically represented as:

$$\tau_0 = d\rho g S \quad \text{[Eq. 2.]}$$

Where, τ_0 is bed shear stress, *d* is the water depth, *ρ* is water density, *g* is acceleration due to gravity, and *S* is the channel slope.

Because only 75% of bed shear stress applies to channel banks in uniform cross sections (Chow, 1959), the erosion threshold for bank material is scaled appropriately for these materials.

4.1.2 Erosion Threshold Results

The bed and bank material of reach **T3** was characterised as fairly compact clay (55% clay, 45% silt, 10% sand); occasional pebbles and small cobbles were present on the bed of the reach. This sediment reflects the local glaciomarine surficial geology. The channel banks showed a clear contact delineating the cohesive glaciomarine clay and a fairly compact to loose clay clayey soil found in the upper section of the channel banks (GEO Morphix, 2021).

Within reach **T3**, the lower fairly compact clay within the banks was identified as the limiting boundary material for the erosion-threshold assessment, as it is expected to be more subject to erosion than the overlaying loose clay soil horizon. The erosion threshold for the lower clay unit was therefore used to establish the erosion threshold (GEO Morphix, 2021). Using the criteria of Chow (1959), this compact, fine material within reach **T3** was determined to have a critical shear stress of 2.4 N/m^2. Utilising this value, the average erosion threshold discharge through each surveyed cross-section was **0.61 m^3/s**; this value was accepted as the erosion threshold for reach **T3**.

The **Tributary 3** watershed covers an area of 466.2 ha, giving a unitary erosion threshold of **0.00131 m^3/s/ha**. This unitary threshold value is updated from previous reporting (e.g., GEO Morphix, 2021) due to a refinement of the original OWIT-derived drainage area to a more accurate LiDAR-based analysis presented here, which better reflects City of Ottawa and RVCA mapping of watershed areas.

The results of the erosion threshold analysis are presented in **Table 4**.

Table 5. Summary of the erosion threshold analysis (GEO Morphix, 2021)

Channel parameter	Reach T3
Average bankfull channel width (m)	4.29
Average maximum bankfull depth (m)	0.91
Bankfull gradient (%)	0.19
D_{50} (mm)	< 2.0
Manning's *n* roughness coefficient	0.035
Drainage Area (ha)*	466.2[a]
Bankfull discharge (m^3/s)	1.53
Average bankfull velocity (m/s)	0.88
Erosion Threshold (Bank Material)	
Material	Fairly compact to loose clay
Reference	Chow (1959)
Critical velocity (m/s)	0.51
Critical depth (m)	0.65
Limiting erosion threshold (m^3/s)	**0.61**
Limiting unitary threshold ($m^3/s/ha$)	**0.00131**

a. Determined from LiDAR-based drainage area analysis; updated from GEO Morphix, 2021

4.2 Unitary erosion threshold

The established unitary threshold value was applied to nearby watercourses, assuming comparable channel conditions and boundary materials. Because reach **T3** was determined to be the most erosion-sensitive reach, scaling to this value creates a conservative erosion threshold estimate for upstream reaches. Establishing a SWM mitigation strategy for an upstream reach using this conservative erosion threshold ensures that all downstream reaches will be minimally impacted.

The unitary erosion threshold of 0.00131 $m^3/s/ha$ determined for reach **T3** was applied to reach **T3C-R2** with a drainage area of 86.1 ha, resulting in an estimated erosion threshold of **0.113 m^3/s**.

The results of the unitary analysis are presented in **Table 6**.

Table 6. Unitary-based erosion thresholds for select reaches within Tributary 3

Reach	Reach T3 unitary erosion threshold ($m^3/s/ha$)	Area (ha)	Unitary-derived erosion threshold (m^3/s)
Subject lands	0.00131	13.4[a]	0.018
T3C-R2		**86.1[b]**	**0.113**
T3C-R1		93.8[c]	0.123

a. Area proposed for development, excluding the lands reserved for the future realigned Leitrim Road (RCI, 2026)
b. Provided by RCI (2026)
c. LiDAR-based drainage area analysis

5 Erosion Exceedance Analysis

To evaluate the proposed SWM plan, an erosion exceedance analysis was completed for reach **T3C-R2** to inform release rates from the proposed SWM Pond. The application of erosion threshold analysis for evaluating the effectiveness of stormwater management facilities in mitigating changes in downstream erosion potential is a concept developed with support by a co-author of the present report (Villard and Parish, 2003)) and used widely across Ontario (e.g., TRCA, 2012; CVC, 2015).

Agency guidance is that post-development erosion exceedance should match pre-development exceedance (TRCA, 2012; CVC, 2015); practically minor differences of less than 5% in the key erosion metric, Cumulative Effective Work Index (CEWI), are considered negligible as they are within the expected uncertainty of the modelling approach and unlikely to produce a measurable geomorphic response in the receiving watercourse.

5.1 Methods

Catchment-wide hydrologic simulations were provided by RCI (2026) for the downstream extent of reach **T3C-R2** at the Limebank Road crossing, comprising pre- and post-development projections of a range of synthetic storms (25 mm four-hour storm, and 3-, 6-, 12- and 24-hour storms; 2-, 5-, 10-, 25-, 50 and 100-year recurrence intervals). Hydrographs for all reaches were provided at 1-minute time steps.

To calculate erosion indices, both velocity and shear stress were calculated at each time step. Through an iterative process, water depth and velocity were calculated for each discharge value passing through a representative cross-section. The cross-section is divided into floodplain and bankfull sections, and then further broken into panels; velocity (U) is calculated for each panel using the Manning's approach. This is a conservative approach as it allows dissipation of flood energy in the floodplain.

The cross-section for reach **T3C-R2** was determined from in-field measurements taken during the reconnaissance-scale field assessments, applied to a simplified U-shaped channel. The channel bed is inset within a deep artificial channel, represented by 3 m high slopes projecting from the channel banks at 30°. The in-channel value for Manning's n was estimated as 0.05, reflecting a smooth, straight channel with moderate in-channel vegetation, as observed in the field. The valley slopes were assigned a value of 0.08, reflecting grass and herbaceous vegetation. A channel slope of 1.1% was determined from LiDAR DEM data.

The total discharge, Q_T at each time-step is based on the summation of the discharge of all panels, Q_i, such that:

$$Q_{T=} \sum Q_i \quad \text{[Eq. 1]}$$

Q_i is discharge through a panel (which is set at 10 percent of the cross-section). Q_i is defined as:

$$Q_i = U_i w_i d_i \quad \text{[Eq. 2]}$$

where, w_i and d_i are width and depth for each panel. The discharge for each panel was then summed to give a total discharge. This is more accurate than using average cross-sectional dimensions of a simple trapezoidal channel, as the bed is usually irregular, and a panel approach more accurately represents the true cross-sectional area.

For each event, the discharge is converted into a maximum depth and average velocity. The maximum depth is used to calculate a maximum bed shear stress, $\tau_{o_{\max}}$ based on:

$$\tau_{o_{\max}} = d_{\max} \rho g S_{\text{bed}} \quad \text{[Eq. 3]}$$

where, $d_{\max}$ is the maximum water depth, ρ is water density, g is acceleration due to gravity, and S_{bed} is the channel bed slope.

Cumulative total work, ω_{tot} is defined as:

$$\omega_{tot} = \sum \tau_{0_{max}} . U_{avg} . \Delta t \quad \text{[Eq. 4]}$$

where, U_{avg} is average velocity (Q_{tot}/A_{tot}, where A_{tot} is wetted area), while cumulative effective work index (ω_{eff}) is defined by:

$$CEWI = \sum \tau - \tau_{cr} . U . \Delta t, \omega < 0 = 0 \quad \text{[Eq. 5]}$$

where, τ_{cr} is the critical shear stress.

Time of exceedance t_{ex} defined as:

$$t_{ex} = \sum \Delta t \ \text{ for } (Q_T > Q_{threshold}) \quad \text{[Eq. 6]}$$

where, $Q_{threshold}$ is the discharge at the erosion threshold.

The cumulative effective discharge volume (CEV) is defined as the integral of all discharge exceeding the erosion threshold over the time of exceedance:

$$CEV = \sum (Q \cdot t) \ \text{ for } (Q > Q_{threshold})$$

5.2 Event-based projection

A 100-year erosion exceedance projection was calculated from event-based exceedance modelling results using a frequency-weighted approach. The expected number of events in each recurrence interval over the 100-year period was estimated using a cumulative frequency approach. This approach accounts for all larger-magnitude, lower-frequency events that are statistically nested within higher-frequency events, ensuring each event is represented once in the cumulative exceedance analysis.

$$N_R = \frac{100}{R} - \sum_{i>R} N_i \quad \text{[Eq. 8]}$$

Where R is the recurrence interval (years) N_R is the number of events uniquely associated with a given recurrence interval, and $\Sigma_{i>R}N_i$ is the cumulative number of events associated with all larger recurrence intervals.

The 100-year projection of the determined erosion metrics (CEV, CEWI, T_{ex}) was calculated as follows:

$$M_{100} = \sum_R (N_R M_R) \quad \text{[Eq. 9]}$$

Where M_{100} is the total projected value of an erosion metric (CEV, CEWI, etc.) for the 100-year period and M_R is the modelled value of a given erosion metric for a given recurrence interval.

This analysis was conducted separately for the 24-, 12-, 6- and 3-hour modelling scenarios provided by RCI (2026). The 25 mm, 4-hour storm event was analyzed as a single event.

5.3 Results

The erosion-exceedance analysis indicates that the proposed SWM plan is expected to mitigate potential post-development increases in erosion potential within the receiving watercourse. All analysed scenarios show either near parity or a reduction in pre- to post-development CEWI based on the event-based projections. Broadly, these reductions are achieved through a combination of reduced peak flows and CEV, and extended exceedances (T_{ex}). All storm events within the 3- to 24-hour modelling are within 5% of the existing conditions, with the exception of the 2-year, 3-hour storm which shows a reduction of 5.9%. Similarly, the 25 mm, 4-hour storm results in a 9.6% reduction in CEWI. The cumulative 100-year projection of all scenarios is similarly within 5% of the existing conditions.

Summary results of the event-based analysis for each storm duration are presented in **Table 7**. A comparison of existing and proposed hydrographs for all reaches and events is shown in **Appendix D**, with complete results for the event-based analysis **Appendix E**.

Table 7. Summary of results of event-based erosion exceedance analysis

Reach		CEV (m^3)	CEWI (N/m)	t_{ex} (hours)
25 mm, 4-hour (single event)	PRE	1,577	20.9	4.08
	POST	1,417	18.9	4.55
	Change (%)	**-10.15**	**-9.65**	**11.43**
3-hour (cumulative 100-year projection)	PRE	357,676	4,359	268
	POST	350,319	4,309	316
	Change (%)	**-2.06**	**-1.14**	**17.81**
6-hour (cumulative 100-year projection)	PRE	481,282	5,829	325
	POST	483,494	5,896	373
	Change (%)	**0.46**	**1.15**	**14.77**
12-hour (cumulative 100-year projection)	PRE	651,228	7,805	413
	POST	662,303	7,991	450
	Change (%)	**1.70**	**2.38**	**9.02**
24-hour (cumulative 100-year projection)	PRE	676,085	8,179	577
	POST	696,495	8,499	664
	Change (%)	**3.02**	**3.92**	**15.10**

In summary, the proposed development conditions are comparable to existing conditions, with minor reductions in erosive potential during smaller, more frequent storms. The results of the erosion exceedance modelling show that the proposed stormwater management plan will effectively mitigate erosion risk within **Tributary 3** of Mosquito Creek.

6 Discussion

Groupe Montoni retained GEO Morphix Ltd. to assist in assessing the impact of the proposed SWM plan and its effectiveness on mitigating increases in erosion potential in the receiving watercourse downstream of a proposed 15.12 ha development at 4101 Limebank Road, Ottawa. New reconnaissance-scale assessment data confirm that conditions in **Tributary 3** are similar to those in 2017, and that reach T3 is the most erosion-sensitive reach downstream of the proposed SWM Pond. The previous detailed assessment and erosion threshold analysis (**0.61 m^3/s**) remain applicable to the reach. An updated drainage area analysis allowed determination of a new unitary erosion threshold for reach **T3** of **0.00131 $m^3/s/ha$**.

Applying the updated unitary value yields a conservative erosion threshold of 0.113 m^3/s for reach **T3C-R2**, which receives stormwater pond discharge directly from the subject lands. This allowed appropriate scaling of SWM pond discharge to a conservative erosion threshold in reach **T3C-R2**, ensuring that the SWM mitigation strategy would also be effective for the erosion-sensitive reach **T3** downstream. Further, the subject lands contribute only approximately 3% of the total drainage area to reach **T3.** This relatively

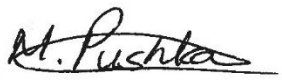
small proportional contribution, together with the implementation of the proposed SWM plan, provides additional support for the conclusion that the proposed development is not expected to result in a measurable increase in erosion potential within the receiving watercourses.

Event-based erosion exceedance analysis shows parity in pre- and post-development erosion potential within reach **T3C-R2**, and our understanding is that the SWM pond will be fully drained within 48 hours to reduce wildfowl congregation in proximity to Ottawa International Airport.

The results of this assessment show that the proposed SWM mitigation strategy will successfully mitigate erosion risk within reach **T3C-R2** based on a conservative, unitary-derived erosion threshold estimate for the reach. Accordingly, because the SWM mitigation strategy was developed using a conservative erosion threshold for the upstream receiving reach and the subject lands contribute only a small portion of the total drainage area to Reach **T3**, the proposed SWM plan is expected to effectively mitigate erosion risk in the more erosion-sensitive Reach **T3** located further downstream.

We trust this report meets your requirements. Should you have any questions, please contact the undersigned.

Respectfully submitted,



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Watershed Scientist

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Appendix A:
Subject Land Maps



GEO MORPHIX™

DRAFT

Study Area

Mosquito Creek
Tributary 3

Ottawa, Ontario

Legend

- Reach Break and ID
- Approximate Study Area

INTERNAL USE ONLY

N

0 100 200

Metres

Hillshade: MNRF, 2020. Watercourse, Municipal Drain: City of Ottawa / MNRF, 2020. HDF: Gemtec, 2024. SGU: MNRF, 2024. Reach Break and ID: Gemtec/GEO Morphix Ltd., 2024. Study Area and 0.25 m Contour: Novatech, 2023. Print Date: November 2025. PN25148. Drawn By: M.O., J.C., G.U.

GEO MORPHIX™

Study Area

Mosquito Creek
Tributary 3

Ottawa, Ontario

Leitrim Road

Limebank Road

Spratt Rd

MC-R2

MC-R3

Mosquito Creek

T3

T3A

T3B

T3C-R1

T3C-R2

T3B1-R1

T3B1-R2

Surficial Geology: Offshore marine deposits (clay, silt)

Legend

- Reach Break and ID
- Approximate Study Area

N

0 100 200

Metres

Hillshade: MNRF, 2020. Watercourse, Municipal Drain: City of Ottawa / MNRF, 2020. HDF: Gemtec, 2024. SGU: MNRF, 2024. Reach Break and ID: Gemtec/GEO Morphix Ltd., 2024. Study Area and 0.25 m Contour: Novatech, 2023. Print Date: November 2025. PN25148. Drawn By: M.O., J.C., G.U.

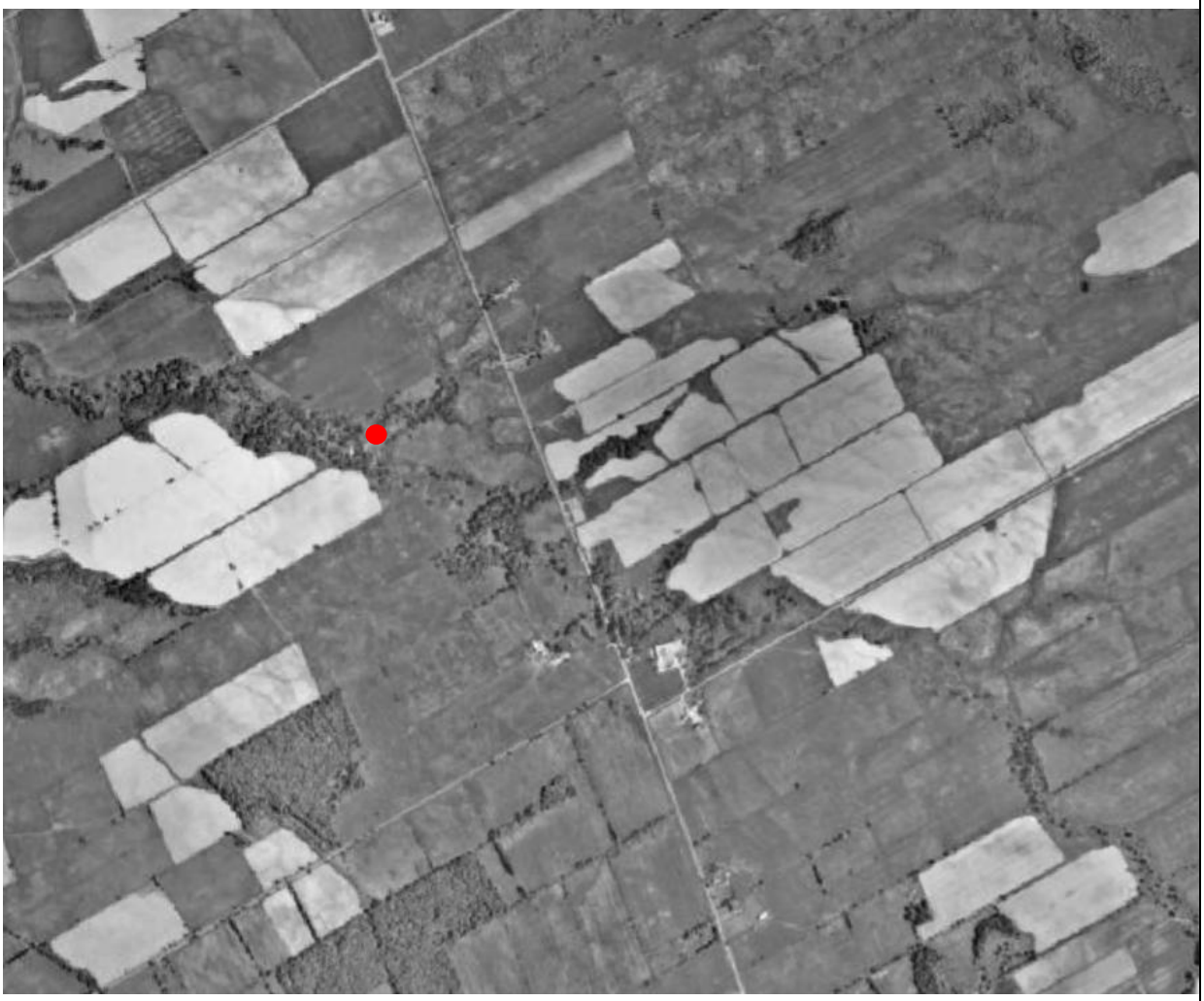
Appendix B:
Historic Air Photographs



Location: Earl Armstrong Road & Limebank Road, Riverside South, Ottawa ON
Year: 1965
Source: NAPL
Red Dot: Reach T3



Location: Earl Armstrong Road & Limebank Road, Riverside South, Ottawa ON
Year: 1976
Source: City of Ottawa (maps.ottawa.ca/geoottawa/)
Red Dot: Reach T3



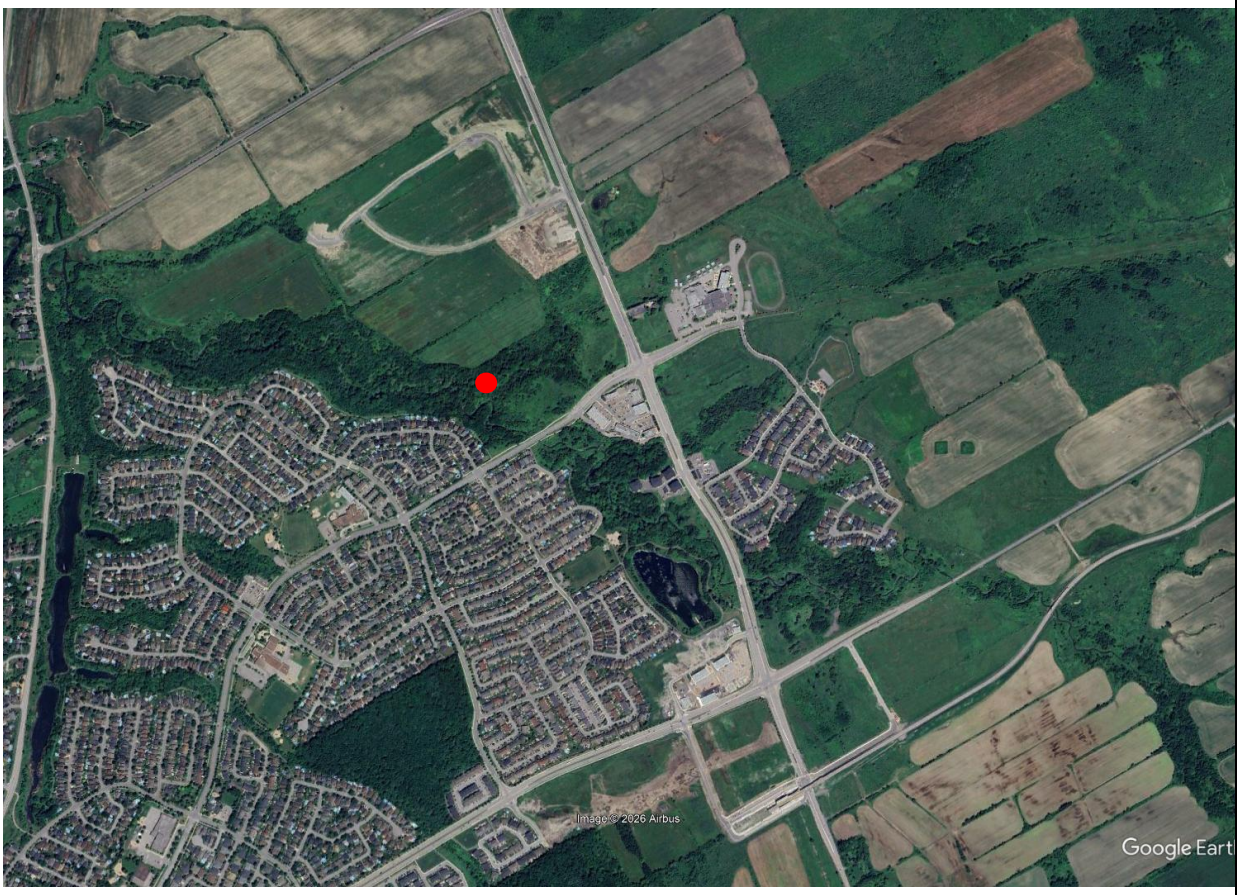
Location: Earl Armstrong Road & Limebank Road, Riverside South, Ottawa ON
Year: 1991
Source: City of Ottawa
Red Dot: Reach T3



Location: Earl Armstrong Road & Limebank Road, Riverside South, Ottawa ON
Year: 2005
Source: City of Ottawa
Red Dot: Reach T3



Location: Earl Armstrong Road & Limebank Road, Riverside South, Ottawa ON
Year: 2018
Source: Google Earth Pro
Red Dot: Reach T3



Location: Earl Armstrong Road & Limebank Road, Riverside South, Ottawa ON
Year: 2025
Source: Google Earth Pro
Red Dot: Reach T3

Appendix C:
Photographic Record

Photo 1
Mosquito Creek Tributary 3: Reach **T3**



Reach **T3** comprises a confined meandering channel within a broad riparian zone of established forest.

Photo 2
Mosquito Creek Tributary 3: Reach **T3**



Bank erosion, including undercutting, was common throughout reach **T3**, particularly on meander cut banks.

Photo 3
Mosquito Creek Tributary 3: Reach **T3**



Bank material is predominantly fairly compact to loose clay. Tree roots typically provide additional cohesion, but they are frequently exposed throughout reach T3 due to bank erosion.

Photo 4
Mosquito Creek Tributary 3: Reach **T3**



Slumping was observed where bank erosion has undercut the valley walls.

Photo 5
Mosquito Creek Tributary 3: Reach **T3**



The bed material in reach **T3** is primarily compact clayey silt, reflecting the local glaciomarine surficial geology. This material is generally resistant to erosion, promoting bank erosion rather than bed degradation.

Photo 6
Mosquito Creek Tributary 3: Reach **T3**



Pebble to cobble grade gravel was observed on the bed of reach **T3**, increasing in frequency upstream. The gravel does not generally cover a high proportion of the bed and is unlikely to provide armouring and increased erosion resistance to the underlying silt and clay.

Photo 7
Mosquito Creek Tributary 3: Reach **T3**



Large woody debris was common throughout reach **T3**, resulting from tree falls due to unstable banks. Woody debris blocks flow, resulting in localised sedimentation and/or increased scour.

Photo 8
Mosquito Creek Tributary 3: Reach **T3C-R1**



Reach **T3C-R1** is a gravel-bedded meandering reach within a narrow riparian zone of young trees and shrubs.

Photo 9
Mosquito Creek Tributary 3: Reach **T3C-R1**



Reach **T3C-R1** has been extensively realigned; bank armouring is common.

Photo 10
Mosquito Creek Tributary 3: Reach **T3C-R1**



Woody debris is present in sections along reach **T3C-R1**, causing localised blockages.

Photo 11
Mosquito Creek Tributary 3: Reach **T3C-R2**



Downstream of the proposed SWM pond outfall, reach **T3C-R1** comprises a straight engineered channel with moderate in-channel vegetation. Steep banks create a deepened channel. The riparian zone is grass and herbaceous vegetation.

Photo 12
Mosquito Creek Tributary 3: Reach **T3C-R2**



Upstream of the proposed pond outlet, reach **T3C-R2** comprises an entrenched channel, with abundant pebble gravel overlying local glaciomarine clay. The bank material is largely loose sandy silt loam. The proposed SWM pond outfall will not impact these sections of channel.

Appendix D:
Reconnaissance-level Geomorphic Assessment Data

GEO MORPHIX

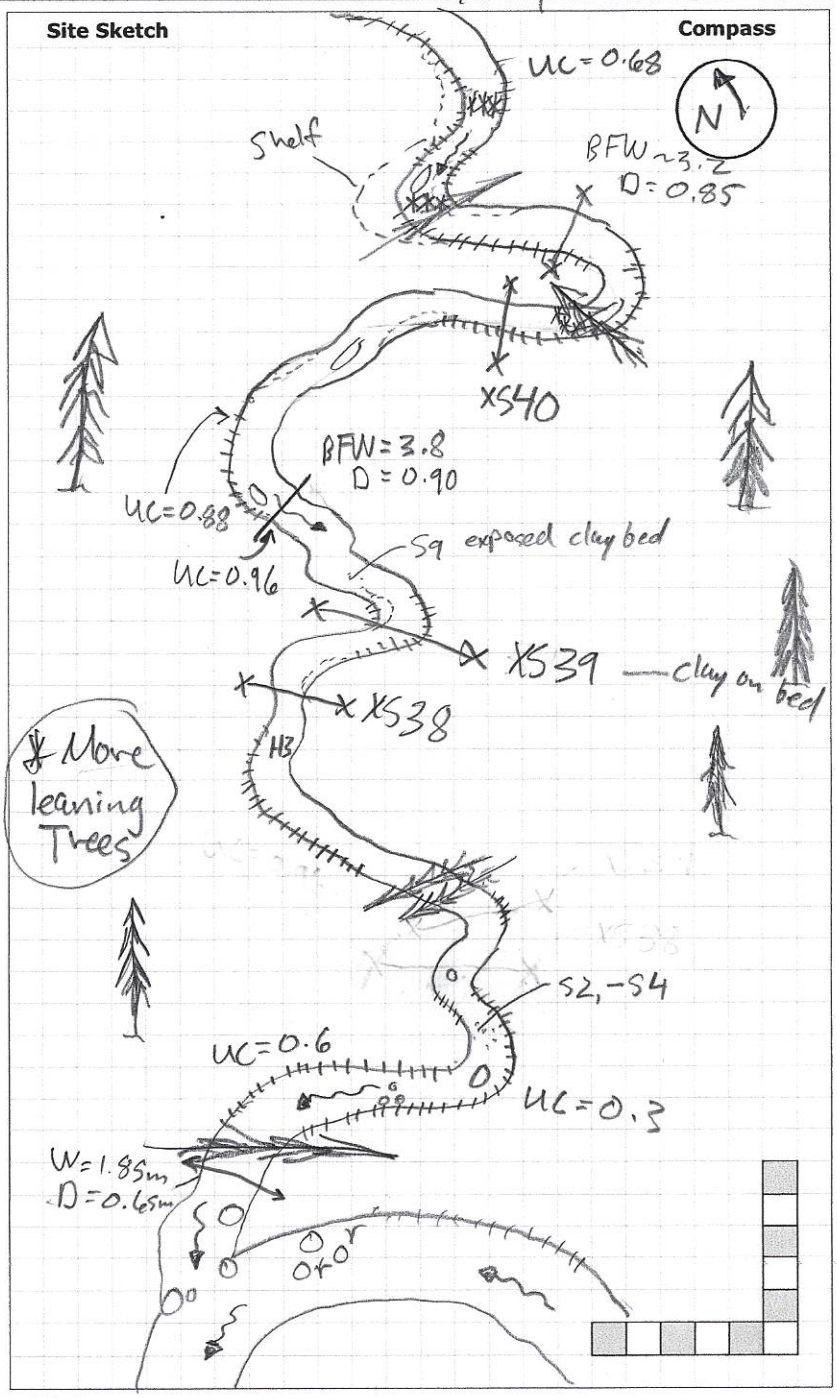
General Site Characteristics

Project Number: 25148

Date:	2025/11/19	**Stream:**	Trib 3
Time:	9:30 am	**Reach:**	T3
Weather:	1°C, overcast	**Location:**	N of Spruce Road, W of Limebank Rd.
Field Staff:	EG, BM	**Watershed/Subwatershed:**	Mosquito Creek

Features		Monitoring	
	Reach break		Long-profile
	Station location		Monumented XS
	Cross-section		Monumented photo
	Flow direction		Monumented photo direction
	Riffle		Sediment sampling
	Pool		Erosion pins
	Sediment bar		Scour chains
	Eroded bank/slope	**Additional Symbols**	
	Undercut bank		
	Bank stabilization		
	Leaning tree		
	Fence		
	Culvert/outfall		
	Swamp/wetland		
	Grasses		
	Tree		
	Instream log/tree		
	Woody debris		
	Beaver dam		
	Vegetated island		

Site Sketch



Flow Type

H1	Standing water	**H1A**	Back water
H2	Scarcely perceptible flow		
H3	Smooth surface flow		
H4	Upwelling		
H5	Rippled		
H6	Unbroken standing wave		
H7	Broken standing wave		
H8	Chute		
H9	Free fall	**H9A**	Dissipates below free fall

Substrate

S1	Silt	**S6**	Small boulder
S2	Sand	**S7**	Large boulder
S3	Gravel	**S8**	Bimodal
S4	Small cobble	**S9**	Bedrock/till
S5	Large cobble		

Other

BM	Benchmark	**EP**	Erosion pin
BS	Backsight	**RB**	Rebar
DS	Downstream	**US**	Upstream
WDJ	Woody debris jam	**TR**	Terrace
VWC	Valley wall contact	**FC**	Flood chute
BOS	Bottom of slope	**FP**	Flood plain
TOS	Top of slope	**KP**	Knick point

Photos:

Notes: Move leaning trees + woody debris in stream.

GEO MORPHIX

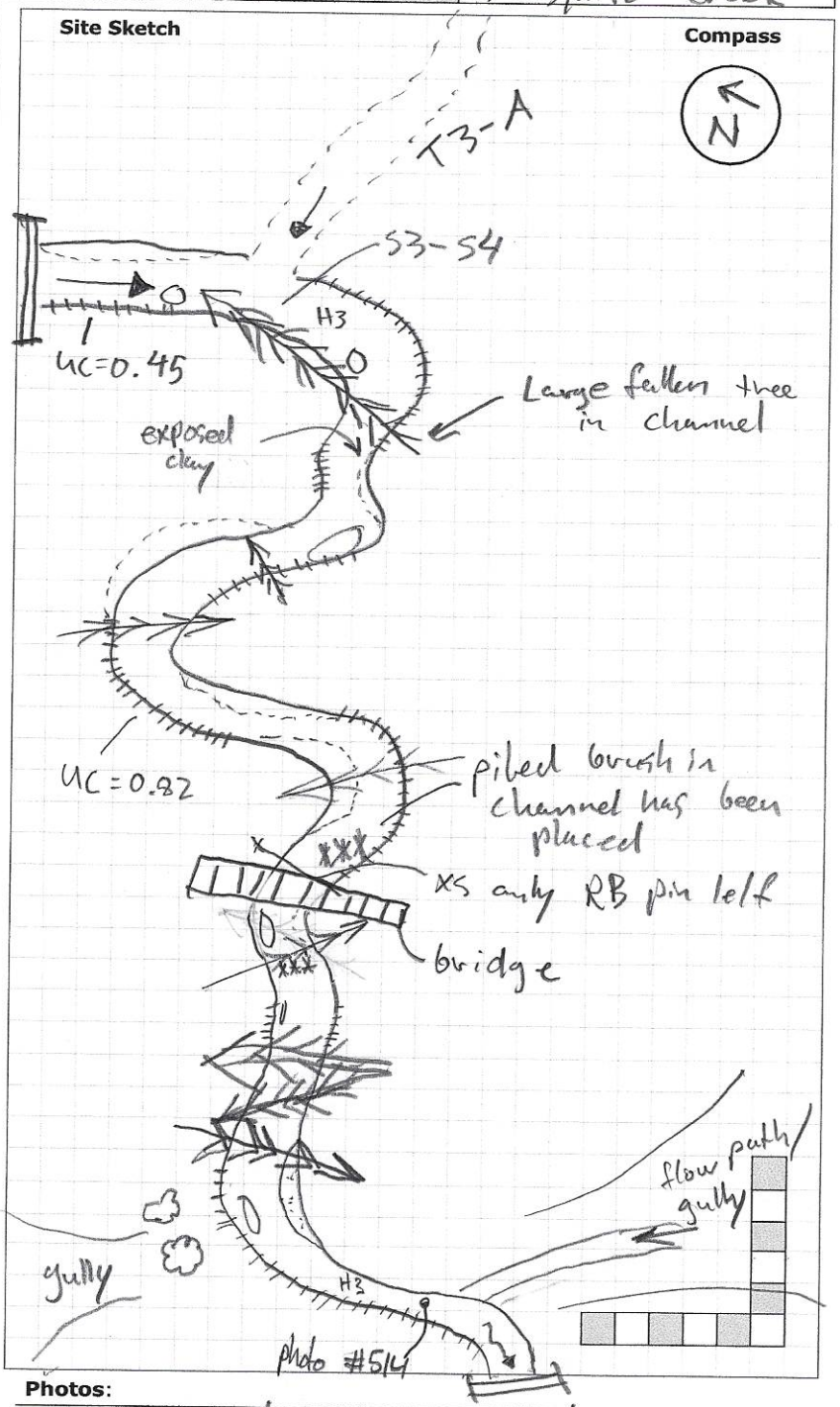
General Site Characteristics

Project Number: 25148

Date:	2025/11/19	**Stream:**	Trib 3
Time:	11:00 am	**Reach:**	T3
Weather:	1°C, overcast	**Location:**	NW of Spruth R + Limebank intersect
Field Staff:	EG, BM	**Watershed/Subwatershed:**	Mosquito Creek

Features	Monitoring
Reach break	Long-profile
Station location	Monumented XS
Cross-section	Monumented photo
Flow direction	Monumented photo direction
Riffle	Sediment sampling
Pool	Erosion pins
Sediment bar	Scour chains
Eroded bank/slope	**Additional Symbols**
Undercut bank	
Bank stabilization	
Leaning tree	
Fence	
Culvert/outfall	
Swamp/wetland	
Grasses	
Tree	
Instream log/tree	
Woody debris	
Beaver dam	
Vegetated island	

Site Sketch



Photos:

Notes: leaf litter on channel bed.

Flow Type			
H1	Standing water	**H1A**	Back water
H2	Scarcely perceptible flow		
H3	Smooth surface flow		
H4	Upwelling		
H5	Rippled		
H6	Unbroken standing wave		
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S5	Large cobble		

Other			
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WDJ	Woody debris jam	**TR**	Terrace
VWC	Valley wall contact	**FC**	Flood chute
BOS	Bottom of slope	**FP**	Flood plain
TOS	Top of slope	**KP**	Knick point

GEO MORPHIX

General Site Characteristics

Project Number: 25148

Date:	2025/11/19	**Stream:**	Trib 3
Time:	12:30 am	**Reach:**	T3
Weather:	1°C, overcast	**Location:**	NW of Sprott/Linebank Rd. intersect
Field Staff:	EG, BM	**Watershed/Subwatershed:**	Mosquito Creek

Features		Monitoring	
	Reach break		Long-profile
	Station location		Monumented XS
	Cross-section		Monumented photo
	Flow direction		Monumented photo direction
	Riffle		Sediment sampling
	Pool		Erosion pins
	Sediment bar		Scour chains
	Eroded bank/slope	**Additional Symbols**	
	Undercut bank		
	Bank stabilization		
	Leaning tree		
	Fence		
	Culvert/outfall		
	Swamp/wetland		
	Grasses		
	Tree		
	Instream log/tree		
	Woody debris		
	Beaver dam		
	Vegetated island		

Flow Type

H1	Standing water	**H1A**	Back water
H2	Scarcely perceptible flow		
H3	Smooth surface flow		
H4	Upwelling		
H5	Rippled		
H6	Unbroken standing wave		
H7	Broken standing wave		
H8	Chute		
H9	Free fall	**H9A**	Dissipates below free fall

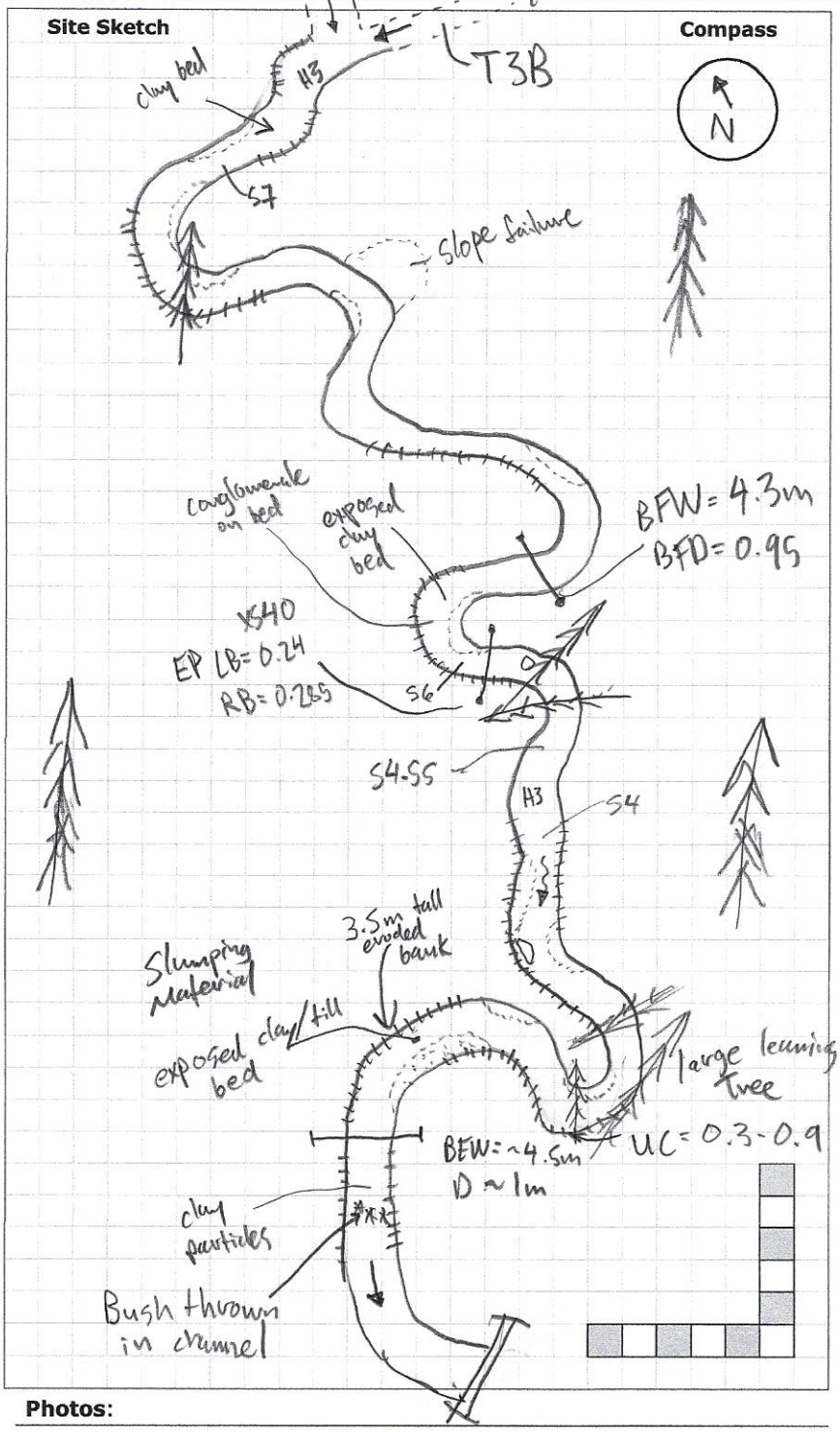
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S4	Small cobble	**S9**	Bedrock/till
S5	Large cobble		

Other

BM	Benchmark	**EP**	Erosion pin
BS	Backsight	**RB**	Rebar
DS	Downstream	**US**	Upstream
WDJ	Woody debris jam	**TR**	Terrace
VWC	Valley wall contact	**FC**	Flood chute
BOS	Bottom of slope	**FP**	Flood plain
TOS	Top of slope	**KP**	Knick point

Site Sketch



Photos:

Notes:

Version #4
Last edited: 21/02/2023

Senior staff sign-off (if required): _____ Checked by: _____ Completed by: _____

GEO MORPHIX

Rapid Geomorphic Assessment

Project Number: 25148

Date:	2025/11/19	**Stream:**	TR63
Time:	10:27	**Reach:**	T3
Weather:	1°C, overcast	**Location:**	Limebank Road / Spratt Road
Field Staff:	EG, BM	**Watershed/Subwatershed:**	Mosquito Creek

Process	No.	Geomorphological Indicator: Description	Present? Yes	Present? No	Factor Value
Evidence of Aggradation (AI)	1	Lobate bar		✓	4/7
	2	Coarse materials in riffles embedded		✓	
	3	Siltation in pools	✓		
	4	Medial bars	✓		
	5	Accretion on point bars	✓		
	6	Poor longitudinal sorting of bed materials		✓	
	7	Deposition in the overbank zone	✓		
		Sum of indices =	4	3	0.57
Evidence of Degradation (DI)	1	Exposed bridge footing(s)			1/5
	2	Exposed sanitary / storm sewer / pipeline / etc.			
	3	Elevated storm sewer outfall(s)			
	4	Undermined gabion baskets / concrete aprons / etc.			
	5	Scour pools downstream of culverts / storm sewer outlets			
	6	Cut face on bar forms		✓	
	7	Head cutting due to knickpoint migration		✓	
	8	Terrace cut through older bar material		✓	
	9	Suspended armour layer visible in bank		✓	
	10	Channel worn into undisturbed overburden / bedrock	✓		
		Sum of indices =	1	4	0.2
Evidence of Widening (WI)	1	Fallen / leaning trees / fence posts / etc.	✓		6/7
	2	Occurrence of large organic debris	✓		
	3	Exposed tree roots	✓		
	4	Basal scour on inside meander bends		✓	
	5	Basal scour on both sides of channel through riffle	✓		
	6	Outflanked gabion baskets / concrete walls / etc.			
	7	Length of basal scour >50% through subject reach	✓		
	8	Exposed length of previously buried pipe / cable / etc.			
	9	Fracture lines along top of bank	✓		
	10	Exposed building foundation			
		Sum of indices =	6	1	0.86
Evidence of Planimetric Form Adjustment (PI)	1	Formation of chute(s)	✓		3/7
	2	Single thread channel to multiple channel		✓	
	3	Evolution of pool-riffle form to low bed relief form		✓	
	4	Cut-off channel(s)		✓	
	5	Formation of island(s)		✓	
	6	Thalweg alignment out of phase with meander form	✓		
	7	Bar forms poorly formed / reworked / removed	✓		
		Sum of indices =	3	4	0.43

Notes:

Stability Index (SI) = (AI+DI+WI+PI)/4 = 0.515

In Regime	In Transition/Stress	In Adjustment
☐ 0.00 – 0.20	☐ 0.21 – 0.40	☑ 0.41

Version #3
Last edited: 10/02/2023

Senior staff sign-off (if required): _____ Checked by: _____ Completed by: EG

GEO MORPHIX

Date:	2025/11/19	PN:	25148	Location:	Mosquito Creek

Category	Poor	Fair	Good	Excellent
Physical Instream Habitat	• Wetted perimeter < 40% of bottom channel width (< 45% for large mainstem areas)	• Wetted perimeter 40-60% of bottom channel width (45-65% for large mainstem areas)	• Wetted perimeter 61-85% of bottom channel width (66-90% for large mainstem areas)	• Wetted perimeter > 85% of bottom channel width (> 90% for large mainstem areas)
	• Dominated by one habitat type (usually runs) and by one velocity and depth condition (slow and shallow) (for large mainstem areas, few riffles present, runs and pools dominant, velocity and depth diversity low)	• Few pools present, riffles and runs dominant. • Velocity and depth generally slow and shallow (for large mainstem areas, runs and pools dominant, velocity and depth diversity intermediate)	• Good mix between riffles, runs and pools • Relatively diverse velocity and depth of flow	• Riffles, runs and pool habitat present • Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)
	• Riffle substrate composition: predominantly gravel with high amount of sand • < 5% cobble	• Riffle substrate composition: predominantly small cobble, gravel and sand • 5-24% cobble	• Riffle substrate composition: good mix of gravel, cobble, and rubble material • 25-49% cobble	• Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand • > 50% cobble
	• Riffle depth < 10 cm for large mainstem areas	• Riffle depth 10-15 cm for large mainstem areas	• Riffle depth 15-20 cm for large mainstem areas	• Riffle depth > 20 cm for large mainstem areas
	• Large pools generally < 30 cm deep (< 61 cm for large mainstem areas) and devoid of overhead cover/structure	• Large pools generally 30-46 cm deep (61-91 cm for large mainstem areas) with little or no overhead cover/structure	• Large pools generally 46-61 cm deep (91-122 cm for large mainstem areas) with some overhead cover/structure	• Large pools generally > 61 cm deep (> 122 cm for large mainstem areas) with good overhead cover/structure
	• Extensive channel alteration and/or point bar formation/enlargement	• Moderate amount of channel alteration and/or moderate increase in point bar formation/enlargement	• Slight amount of channel alteration and/or slight increase in point bar formation/enlargement	• No channel alteration or significant point bar formation/enlargement
	• Riffle/Pool ratio 0.49:1 ; ≥1.51:1	• Riffle/Pool ratio 0.5-0.69:1 ; 1.31-1.5:1	• Riffle/Pool ratio 0.7-0.89:1 ; 1.11-1.3:1	• Riffle/Pool ratio 0.9-1.1:1
	• Summer afternoon water temperature > 27°C	• Summer afternoon water temperature 24-27°C	• Summer afternoon water temperature 20-24°C	• Summer afternoon water temperature < 20°C
Point range	☐ 0 ☐ 1 ☐ 2	☐ 3 ☑ 4	☑ 5 ☐ 6	☐ 7 ☐ 8
Water Quality	• Substrate fouling level: High (> 50%)	• Substrate fouling level: Moderate (21-50%)	• Substrate fouling level: Very light (11-20%)	• Substrate fouling level: Rock underside (0-10%)
	• Brown colour • TDS: > 150 mg/L	• Grey colour • TDS: 101-150 mg/L	• Slightly grey colour • TDS: 50-100 mg/L	• Clear flow • TDS: < 50 mg/L
	• Objects visible to depth < 0.15m below surface	• Objects visible to depth 0.15-0.5m below surface	• Objects visible to depth 0.5-1.0m below surface	• Objects visible to depth > 1.0m below surface
	• Moderate to strong organic odour	• Slight to moderate organic odour	• Slight organic odour	• No odour
Point range	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4	☐ 5 ☑ 6	☐ 7 ☐ 8
Riparian Habitat Conditions	• Narrow riparian area of mostly non-woody vegetation	• Riparian area predominantly wooded but with major localized gaps	• Forested buffer generally > 31 m wide along major portion of both banks	• Wide (> 60 m) mature forested buffer along both banks
	• Canopy coverage: <50% shading (30% for large mainstem areas)	• Canopy coverage: 50-60% shading (30-44% for large mainstem areas)	• Canopy coverage: 60-79% shading (45-59% for large mainstem areas)	• Canopy coverage: >80% shading (> 60% for large mainstem areas)
Point range	☐ 0 ☐ 1	☐ 2 ☐ 3	☐ 4 ☐ 5	☐ 6 ☑ 7

Total overall score (0–42) = 24	Poor (<13)	Fair (13-24)	Good (25-34)	Excellent (>35)

Version #2
Last edited: 10/02/2023

Senior staff sign-off (if required): _____ Checked by: _____ Completed by: EG

GEO MORPHIX™

Rapid Stream Assessment Technique Project Number: 25148

Date:	2025/11/19	**Stream:**	Trib 3
Time:		**Reach:**	T3
Weather:	1°C, Overcast	**Location:**	Limebank Road / Spratt Road
Field Staff:	EG, BM	**Watershed/Subwatershed:**	Mosquito Creek

Category	Poor	Fair	Good	Excellent
Channel Stability	• < 50% of bank network stable • Recent bank sloughing, slumping or failure frequently observed	• 50-70% of bank network stable • Recent signs of bank sloughing, slumping or failure fairly common	• 71-80% of bank network stable • Infrequent signs of bank sloughing, slumping or failure	• > 80% of bank network stable • No evidence of bank sloughing, slumping or failure
	• Stream bend areas highly unstable • Outer bank height 1.2 m above stream bank (2.1 m above stream bank for large mainstem areas) • Bank overhang > 0.8-1.0 m	• Stream bend areas unstable • Outer bank height 0.9-1.2 m above stream bank (1.5-2.1 m above stream bank for large mainstem areas) • Bank overhang 0.8-0.9m	• Stream bend areas stable • Outer bank height 0.6-0.9 m above stream bank (1.2-1.5 m above stream bank for large mainstem areas) • Bank overhang 0.6-0.8 m	• Stream bend areas very stable • Height < 0.6 m above stream (< 1.2 m above stream bank for large mainstem areas) • Bank overhang < 0.6 m
	• Young exposed tree roots abundant • > 6 recent large tree falls per stream mile	• Young exposed tree roots common • 4-5 recent large tree falls per stream mile	• Exposed tree roots predominantly old and large, smaller young roots scarce • 2-3 recent large tree falls per stream mile	• Exposed tree roots old, large and woody • Generally 0-1 recent large tree falls per stream mile
	• Bottom 1/3 of bank is highly erodible material • Plant/soil matrix severely compromised	• Bottom 1/3 of bank is generally highly erodible material • Plant/soil matrix compromised	• Bottom 1/3 of bank is generally highly resistant plant/soil matrix or material	• Bottom 1/3 of bank is generally highly resistant plant/soil matrix or material
	• Channel cross-section is generally trapezoidally-shaped	• Channel cross-section is generally trapezoidally-shaped	• Channel cross-section is generally V- or U-shaped	• Channel cross-section is generally V- or U-shaped
Point range	☐ 0 ☐ 1 ☐ 2	☒ 3 ☐ 4 ☐ 5	☐ 6 ☐ 7 ☐ 8	☐ 9 ☐ 10 ☐ 11
Channel Scouring/ Sediment Deposition	• > 75% embedded (> 85% embedded for large mainstem areas)	• 50-75% embedded (60-85% embedded for large mainstem areas)	• 25-49% embedded (35-59% embedded for large mainstem areas)	• Riffle embeddedness < 25% sand-silt (< 35% embedded for large mainstem areas)
	• Few, if any, deep pools • Pool substrate composition >81% sand-silt	• Low to moderate number of deep pools • Pool substrate composition 60-80% sand-silt	• Moderate number of deep pools • Pool substrate composition 30-59% sand-silt	• High number of deep pools (> 61 cm deep) (> 122 cm deep for large mainstem areas) • Pool substrate composition <30% sand-silt
	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits uncommon	• Streambed streak marks and/or "banana"-shaped sediment deposits absent
	• Fresh, large sand deposits very common in channel • Moderate to heavy sand deposition along major portion of overbank area	• Fresh, large sand deposits common in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits uncommon in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits rare or absent from channel • No evidence of fresh sediment deposition on overbank
	• Point bars present at most stream bends, moderate to large and unstable with high amount of fresh sand	• Point bars common, moderate to large and unstable with high amount of fresh sand	• Point bars small and stable, well-vegetated and/or armoured with little or no fresh sand	• Point bars few, small and stable, well-vegetated and/or armoured with little or no fresh sand
Point range	☐ 0 ☐ 1 ☐ 2	☐ 3 ☒ 4	☐ 5 ☐ 6	☐ 7 ☐ 8

Version #2
Last edited: 10/02/2023

Senior staff sign-off (if required): _____ Checked by: _____ Completed by: EG

GEO MORPHIX™

Reach Characteristics Project Number: 25148

Date:	2025/11/19	**Field Staff:**	EG, BM	**Watershed/Subwatershed:**	Mosquito Creek
Time:		**Stream:**	Trib 3	**UTM (Upstream):**	
Weather:	1°C overcast	**Reach:**	T3	**UTM (Downstream):**	

Land Use (Table 1): 1 | **Valley Type** (Table 2): 2 | **Channel Type** (Table 3): * 2/3 | **Channel Zone** (Table 4): 2 | **Flow Type** (Table 5): No | ☐ Evidence of Groundwater Location:_____ Photo:_____

Riparian Vegetation

Dominant Type (Table 6): 1

Encroachment (Table 7): 2

Coverage	Channel Widths	Age (yrs)
☐ None	☐ 1 - 4	☐ Immature (<5)
☐ Fragmented	☐ 4 - 10	☐ Established (5-30)
☑ Continuous	☑ > 10	☑ Mature (>30)

Aquatic & Instream Vegetation

Type (Table 8):

Reach Coverage %: 0

Woody Debris	WD Density
☑ In Cutbank	☐ Low
☑ In Channel	☐ Mod
☐ Not Present	☑ High

* WDJ/50m: 3

Water Quality

Odour (Table 16): 1

Turbidity (Table 17): 3

Channel Characteristics

Sinuosity Type (Table 9): 2

Gradient (Table 11): 2

Entrenchment (Table 13): 2

Down's Model (Table 15): M/m

Sed Sorting (Table 20): Mod

Transport Mode (Table 21): 3

Geomorphic Units (Table 22): 5/6/8

Riffle-Pool Spacing (m): irregular

Sinuosity Degree (Table 10): 3

# of Channels (Table 12): 1

Bank Failure (Table 14): 2

Bankfull Indicators (Table 18): 5/7 *

Sediment Transport Observed? ☐ Yes ☑ No ☐ Not Visible

% of Bed Active:

Mass Movement (Table 23): 1/4

% Riffles: 10 **% Pools:** 20

Bank Angle: ☐ 0 - 30 ☐ 30 - 60 ☐ 60 - 90 ☑ Undercut

Bank Erosion: ☐ < 5% ☐ 5 - 30% ☐ 30 - 60% ☑ 60 - 100%

(Table 19)	Clay/Silt	Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Bank	☑	☑	☐	☐	☐	☑	☐
Riffle	☐	☐	☑	☑	☑	☐	☐
Pool	☑	☑	☐	☐	☐	☐	☐
Bed (if no riffle-pool morphology)	☐	☐	☐	☐	☐	☐	☐

Bankfull Width (m)	1.85	3.8	3.2	**Wetted Width (m)**
Bankfull Depth (m)	0.65	0.9	0.85	**Wetted Depth (m)**
Undercuts (m)	0.3	0.96	0.68	**Velocity (m/s)**
Pool Depth (m)				**Velocity Estimate Method**
Riffle Length (m)				**Meander Amplitude (m)**

Notes:

Photos:

Version #4
Last edited: 04/04/2023

Senior staff sign-off (if required): _____ Checked by: _____ Completed by: _____

GEO MORPHIX™

General Site Characteristics

Project Number: 25148

Date:	2025/11/19	**Stream:**	Trib 3
Time:	13:00	**Reach:**	T3C-R1
Weather:	Sunny, 1°C	**Location:**	NW of sprott/limebank intercept
Field Staff:	EG, BM	**Watershed/Subwatershed:**	Mosquito Creek

Features		Monitoring	
	Reach break		Long-profile
	Station location		Monumented XS
	Cross-section		Monumented photo
	Flow direction		Monumented photo direction
	Riffle		Sediment sampling
	Pool		Erosion pins
	Sediment bar		Scour chains
	Eroded bank/slope	**Additional Symbols**	
	Undercut bank		
	Bank stabilization		
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	Fence		
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	Tree		
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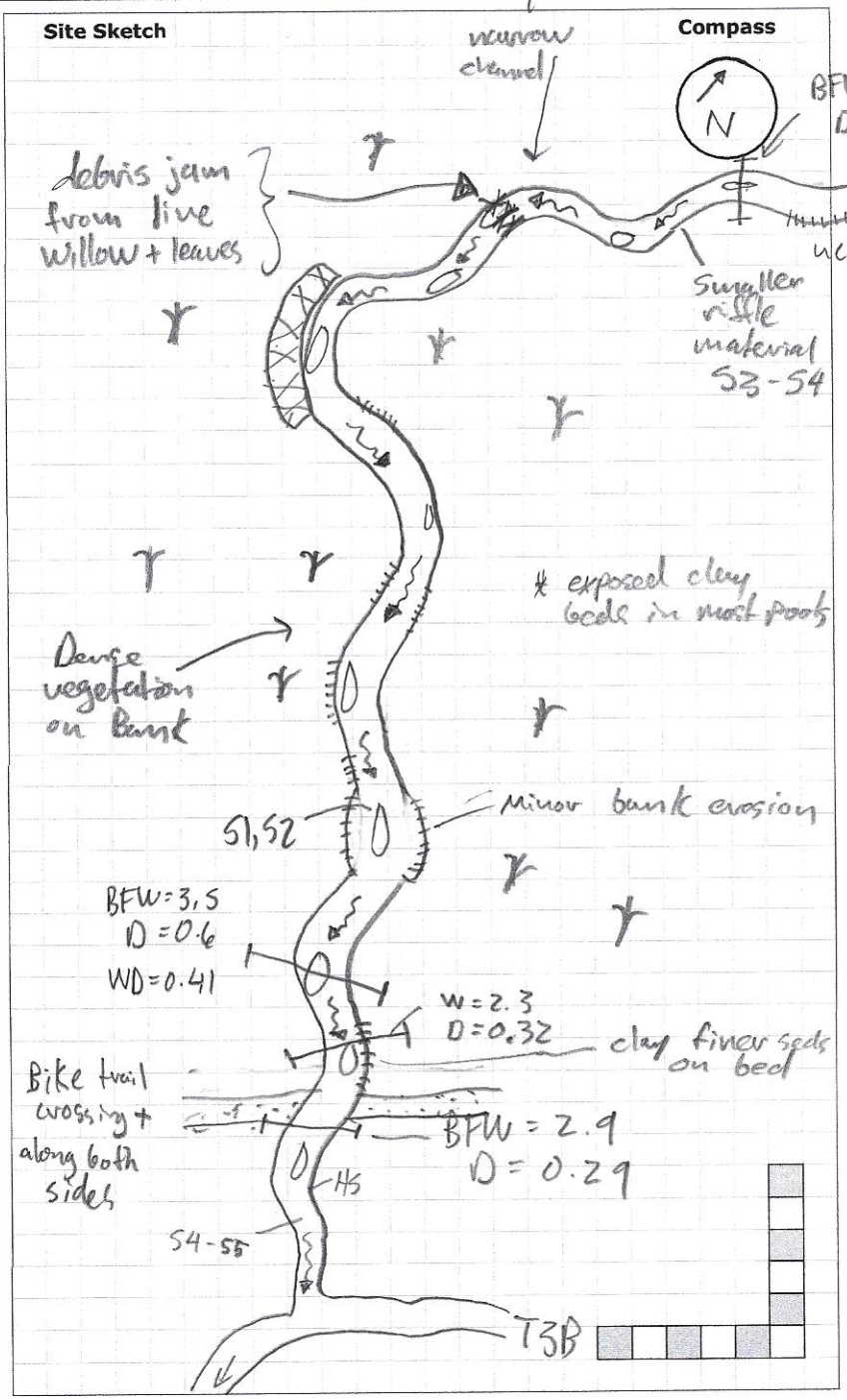
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S1	Silt	**S6**	Small boulder
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S5	Large cobble		

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VWC	Valley wall contact	**FC**	Flood chute
BOS	Bottom of slope	**FP**	Flood plain
TOS	Top of slope	**KP**	Knick point

Site Sketch



Photos:

Notes:

Version #4
Last edited: 21/02/2023

Senior staff sign-off (if required): _____ Checked by: _____ Completed by: EG

GEO MORPHIX™

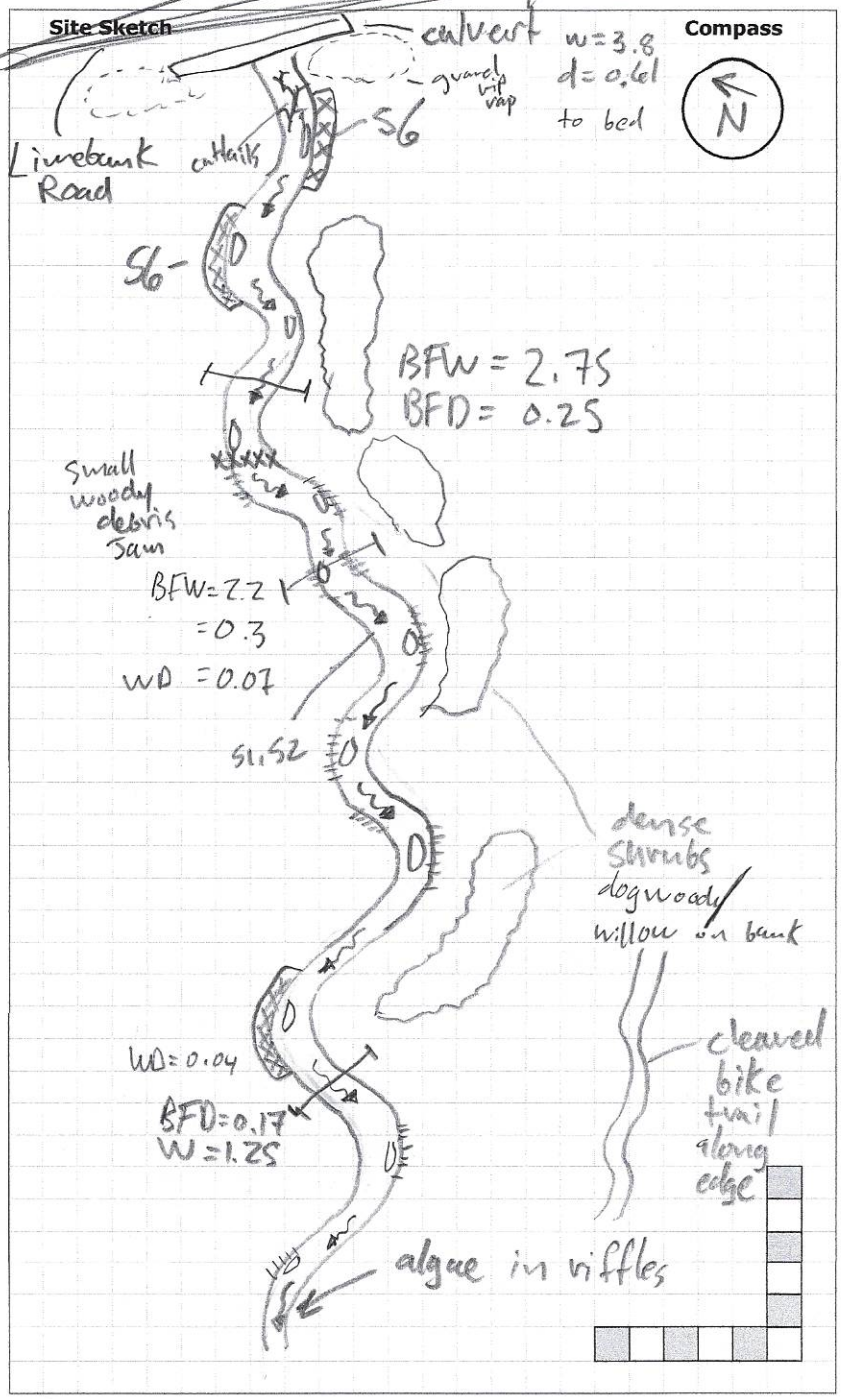
General Site Characteristics

Project Number: 25148

Date:	2025/11/19	**Stream:**	Trib 3
Time:	14:00	**Reach:**	T3 C - R1
Weather:	Sunny, 1°C	**Location:**	NW of Spruitt / Limebank intercept
Field Staff:	EG, BM	**Watershed/Subwatershed:**	Mosquito Creek

Features		Monitoring	
	Reach break		Long-profile
	Station location		Monumented XS
	Cross-section		Monumented photo
	Flow direction		Monumented photo direction
	Riffle		Sediment sampling
	Pool		Erosion pins
	Sediment bar		Scour chains
	Eroded bank/slope	**Additional Symbols**	
	Undercut bank		
	Bank stabilization		
	Leaning tree		
	Fence		
	Culvert/outfall		
	Swamp/wetland		
	Grasses		
	Tree		
	Instream log/tree		
	Woody debris		
	Beaver dam		
	Vegetated island		

Site Sketch



Photos:

Notes:

Flow Type			
H1	Standing water	**H1A**	Back water
H2	Scarcely perceptible flow		
H3	Smooth surface flow		
H4	Upwelling		
H5	Rippled		
H6	Unbroken standing wave		
H7	Broken standing wave		
H8	Chute		
H9	Free fall	**H9A**	Dissipates below free fall

Substrate			
S1	Silt	**S6**	Small boulder
S2	Sand	**S7**	Large boulder
S3	Gravel	**S8**	Bimodal
S4	Small cobble	**S9**	Bedrock/till
S5	Large cobble		

Other			
BM	Benchmark	**EP**	Erosion pin
BS	Backsight	**RB**	Rebar
DS	Downstream	**US**	Upstream
WDJ	Woody debris jam	**TR**	Terrace
VWC	Valley wall contact	**FC**	Flood chute
BOS	Bottom of slope	**FP**	Flood plain
TOS	Top of slope	**KP**	Knick point

GEO MORPHIX

Rapid Geomorphic Assessment

Project Number: 25148

Date:	2025/11/19	**Stream:**	Trib 3
Time:		**Reach:**	T3C-R1
Weather:	1°C, overcast	**Location:**	Cruebank Road / Spruce Road (NW)
Field Staff:	EG, BM	**Watershed/Subwatershed:**	Mosquito Creek

Process	No.	Geomorphological Indicator: Description	Present? Yes	Present? No	Factor Value
Evidence of Aggradation (AI)	1	Lobate bar		✓	0/7
	2	Coarse materials in riffles embedded		✓	
	3	Siltation in pools		✓	
	4	Medial bars		✓	
	5	Accretion on point bars		✓	
	6	Poor longitudinal sorting of bed materials		✓	
	7	Deposition in the overbank zone		✓	
		Sum of indices =		0	0
Evidence of Degradation (DI)	1	Exposed bridge footing(s)			0/6
	2	Exposed sanitary / storm sewer / pipeline / etc.			
	3	Elevated storm sewer outfall(s)			
	4	Undermined gabion baskets / concrete aprons / etc.			
	5	Scour pools downstream of culverts / storm sewer outlets		✓	
	6	Cut face on bar forms		✓	
	7	Head cutting due to knickpoint migration		✓	
	8	Terrace cut through older bar material		✓	
	9	Suspended armour layer visible in bank		✓	
	10	Channel worn into undisturbed overburden / bedrock		✓	
		Sum of indices =	0	6	0
Evidence of Widening (WI)	1	Fallen / leaning trees / fence posts / etc.		✓	1/7
	2	Occurrence of large organic debris	✓		
	3	Exposed tree roots		✓	
	4	Basal scour on inside meander bends		✓	
	5	Basal scour on both sides of channel through riffle		✓	
	6	Outflanked gabion baskets / concrete walls / etc.			
	7	Length of basal scour >50% through subject reach		✓	
	8	Exposed length of previously buried pipe / cable / etc.			
	9	Fracture lines along top of bank		✓	
	10	Exposed building foundation			
		Sum of indices =	1	6	0.14
Evidence of Planimetric Form Adjustment (PI)	1	Formation of chute(s)		✓	1/7
	2	Single thread channel to multiple channel		✓	
	3	Evolution of pool-riffle form to low bed relief form		✓	
	4	Cut-off channel(s)		✓	
	5	Formation of island(s)		✓	
	6	Thalweg alignment out of phase with meander form		✓	
	7	Bar forms poorly formed / reworked / removed	✓		
		Sum of indices =	1	6	0.14

Notes: Channel previously constructed → riffles + pools abundant + consistent.
- New trails (bike, skiing etc) established near and over the tributary. Riparian veg cut and many thrown into creek.

Stability Index (SI) = (AI+DI+WI+PI)/4 = 0.07

In Regime	In Transition/Stress	In Adjustment
☑ 0.00 - 0.20	☐ 0.21 - 0.40	☐ 0.41

Version #3
Last edited: 10/02/2023

Senior staff sign-off (if required): _____ Checked by: _____ Completed by: EG

GEO MORPHIX

Rapid Stream Assessment Technique Project Number: 25148

Date:	2025/11/19	**Stream:**	Trib 3
Time:		**Reach:**	T3C-R1
Weather:	1°C overcast	**Location:**	NW of Sprott/Limebank Road intersection
Field Staff:	EG, BM	**Watershed/Subwatershed:**	Mosquito Creek

Category	Poor	Fair	Good	Excellent
Channel Stability	• < 50% of bank network stable • Recent bank sloughing, slumping or failure frequently observed	• 50-70% of bank network stable • Recent signs of bank sloughing, slumping or failure fairly common	• 71-80% of bank network stable • Infrequent signs of bank sloughing, slumping or failure	• > 80% of bank network stable • No evidence of bank sloughing, slumping or failure
	• Stream bend areas highly unstable • Outer bank height 1.2 m above stream bank (2.1 m above stream bank for large mainstem areas) • Bank overhang > 0.8-1.0 m	• Stream bend areas unstable • Outer bank height 0.9-1.2 m above stream bank (1.5-2.1 m above stream bank for large mainstem areas) • Bank overhang 0.8-0.9m	• Stream bend areas stable • Outer bank height 0.6-0.9 m above stream bank (1.2-1.5 m above stream bank for large mainstem areas) • Bank overhang 0.6-0.8 m	• Stream bend areas very stable • Height < 0.6 m above stream (< 1.2 m above stream bank for large mainstem areas) • Bank overhang < 0.6 m
	• Young exposed tree roots abundant • > 6 recent large tree falls per stream mile	• Young exposed tree roots common • 4-5 recent large tree falls per stream mile	• Exposed tree roots predominantly old and large, smaller young roots scarce • 2-3 recent large tree falls per stream mile	• Exposed tree roots old, large and woody • Generally 0-1 recent large tree falls per stream mile
	• Bottom 1/3 of bank is highly erodible material • Plant/soil matrix severely compromised	• Bottom 1/3 of bank is generally highly erodible material • Plant/soil matrix compromised	• Bottom 1/3 of bank is generally highly resistant plant/soil matrix or material	• Bottom 1/3 of bank is generally highly resistant plant/soil matrix or material
	• Channel cross-section is generally trapezoidally-shaped	• Channel cross-section is generally trapezoidally-shaped	• Channel cross-section is generally V- or U-shaped	• Channel cross-section is generally V- or U-shaped
Point range	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4 ☐ 5	☐ 6 ☐ 7 ☑ 8	☐ 9 ☐ 10 ☐ 11
Channel Scouring/ Sediment Deposition	• > 75% embedded (> 85% embedded for large mainstem areas)	• 50-75% embedded (60-85% embedded for large mainstem areas)	• 25-49% embedded (35-59% embedded for large mainstem areas)	• Riffle embeddedness < 25% sand-silt (< 35% embedded for large mainstem areas)
	• Few, if any, deep pools • Pool substrate composition >81% sand-silt	• Low to moderate number of deep pools • Pool substrate composition 60-80% sand-silt	• Moderate number of deep pools • Pool substrate composition 30-59% sand-silt	• High number of deep pools (> 61 cm deep) (> 122 cm deep for large mainstem areas) • Pool substrate composition <30% sand-silt
	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits uncommon	• Streambed streak marks and/or "banana"-shaped sediment deposits absent
	• Fresh, large sand deposits very common in channel • Moderate to heavy sand deposition along major portion of overbank area	• Fresh, large sand deposits common in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits uncommon in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits rare or absent from channel • No evidence of fresh sediment deposition on overbank
	• Point bars present at most stream bends, moderate to large and unstable with high amount of fresh sand	• Point bars common, moderate to large and unstable with high amount of fresh sand	• Point bars small and stable, well-vegetated and/or armoured with little or no fresh sand	• Point bars few, small and stable, well-vegetated and/or armoured with little or no fresh sand
Point range	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4	☐ 5 ☐ 6	☐ 7 ☐ 8

Version #2
Last edited: 10/02/2023

Senior staff sign-off (if required): _____ Checked by: _____ Completed by: EG

GEO MORPHIX™

Date:	2025/11/19	PN:	25149	Location:	Mosquito Creek

Category	Poor	Fair	Good	Excellent
Physical Instream Habitat	• Wetted perimeter < 40% of bottom channel width (< 45% for large mainstem areas)	• Wetted perimeter 40-60% of bottom channel width (45-65% for large mainstem areas)	• Wetted perimeter 61-85% of bottom channel width (66-90% for large mainstem areas)	• Wetted perimeter > 85% of bottom channel width (> 90% for large mainstem areas)
	• Dominated by one habitat type (usually runs) and by one velocity and depth condition (slow and shallow) (for large mainstem areas, few riffles present, runs and pools dominant, velocity and depth diversity low)	• Few pools present, riffles and runs dominant. • Velocity and depth generally slow and shallow (for large mainstem areas, runs and pools dominant, velocity and depth diversity intermediate)	• Good mix between riffles, runs and pools • Relatively diverse velocity and depth of flow	• Riffles, runs and pool habitat present • Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)
	• Riffle substrate composition: predominantly gravel with high amount of sand • < 5% cobble	• Riffle substrate composition: predominantly small cobble, gravel and sand • 5-24% cobble	• Riffle substrate composition: good mix of gravel, cobble, and rubble material • 25-49% cobble	• Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand • > 50% cobble
	• Riffle depth < 10 cm for large mainstem areas	• Riffle depth 10-15 cm for large mainstem areas	• Riffle depth 15-20 cm for large mainstem areas	• Riffle depth > 20 cm for large mainstem areas
	• Large pools generally < 30 cm deep (< 61 cm for large mainstem areas) and devoid of overhead cover/structure	• Large pools generally 30-46 cm deep (61-91 cm for large mainstem areas) with little or no overhead cover/structure	• Large pools generally 46-61 cm deep (91-122 cm for large mainstem areas) with some overhead cover/structure	• Large pools generally > 61 cm deep (> 122 cm for large mainstem areas) with good overhead cover/structure
	• Extensive channel alteration and/or point bar formation/enlargement	• Moderate amount of channel alteration and/or moderate increase in point bar formation/enlargement	• Slight amount of channel alteration and/or slight increase in point bar formation/enlargement	• No channel alteration or significant point bar formation/enlargement
	• Riffle/Pool ratio 0.49:1 ; ≥1.51:1	• Riffle/Pool ratio 0.5-0.69:1 ; 1.31-1.5:1	• Riffle/Pool ratio 0.7-0.89:1 ; 1.11-1.3:1	• Riffle/Pool ratio 0.9-1.1:1
	• Summer afternoon water temperature > 27°C	• Summer afternoon water temperature 24-27°C	• Summer afternoon water temperature 20-24°C	• Summer afternoon water temperature < 20°C
Point range	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4	☐ 5 ☐ 6	☐ 7 ☐ 8
Water Quality	• Substrate fouling level: High (> 50%)	• Substrate fouling level: Moderate (21-50%)	• Substrate fouling level: Very light (11-20%)	• Substrate fouling level: Rock underside (0-10%)
	• Brown colour • TDS: > 150 mg/L	• Grey colour • TDS: 101-150 mg/L	• Slightly grey colour • TDS: 50-100 mg/L	• Clear flow • TDS: < 50 mg/L
	• Objects visible to depth < 0.15m below surface	• Objects visible to depth 0.15-0.5m below surface	• Objects visible to depth 0.5-1.0m below surface	• Objects visible to depth > 1.0m below surface
	• Moderate to strong organic odour	• Slight to moderate organic odour	• Slight organic odour	• No odour
Point range	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4	☐ 5 ☒ 6	☐ 7 ☐ 8
Riparian Habitat Conditions	• Narrow riparian area of mostly non-woody vegetation	• Riparian area predominantly wooded but with major localized gaps	• Forested buffer generally > 31 m wide along major portion of both banks	• Wide (> 60 m) mature forested buffer along both banks
	• Canopy coverage: <50% shading (30% for large mainstem areas)	• Canopy coverage: 50-60% shading (30-44% for large mainstem areas)	• Canopy coverage: 60-79% shading (45-59% for large mainstem areas)	• Canopy coverage: >80% shading (> 60% for large mainstem areas)
Point range	☐ 0 ☐ 1	☐ 2 ☐ 3	☐ 4 ☒ 5	☐ 6 ☐ 7

Total overall score (0–42) = 34	Poor (<13)	Fair (13-24)	Good (25-34)	Excellent (>35)

Version #2
Last edited: 10/02/2023

Senior staff sign-off (if required): _____ Checked by: _____ Completed by: EG

GEO MORPHIX™

Reach Characteristics Project Number: 25148

Date:	2025/11/19	**Field Staff:**	EG, BM	**Watershed/Subwatershed:**	Mosquito Creek
Time:		**Stream:**	Trib 3	**UTM (Upstream):**	
Weather:	1°C, overcast	**Reach:**	T3C-R1	**UTM (Downstream):**	

Land Use (Table 1): 1,2 | **Valley Type** (Table 2): 2/3 | **Channel Type** (Table 3): 9 | **Channel Zone** (Table 4): 2 | **Flow Type** (Table 5): 1 | ☐ Evidence of Groundwater Location:_____ Photo:_____

Riparian Vegetation

Dominant Type (Table 6): 12 | **Encroachment** (Table 7): 3

Coverage	Channel Widths	Age (yrs)
☐ None	☐ 1 - 4	☐ Immature (<5)
☐ Fragmented	☑ 4 - 10	☑ Established (5-30)
☑ Continuous	☐ > 10	☐ Mature (>30)

Aquatic & Instream Vegetation

Type (Table 8): 1 | **Reach Coverage %**: 30

Woody Debris	WD Density
☐ In Cutbank	☑ Low
☑ In Channel	☐ Mod
☐ Not Present	☐ High

WDJ/50m: 0.5

Water Quality

Odour (Table 16): 1 | **Turbidity** (Table 17): 2

Channel Characteristics

Sinuosity Type (Table 9): 2 | **Gradient** (Table 11): Mod | **Entrenchment** (Table 13): Mod | **Down's Model** (Table 15): S | **Sed Sorting** (Table 20): Wells. | **Transport Mode** (Table 21): 3. | **Geomorphic Units** (Table 22): S/G/R | **Riffle-Pool Spacing (m)**: 3

Sinuosity Degree (Table 10): 3 | **# of Channels** (Table 12): 1 | **Bank Failure** (Table 14): None | **Bankfull Indicators** (Table 18): 5 | **Sediment Transport Observed?** ☐ Yes ☒ No ☐ Not Visible | **% of Bed Active** | **Mass Movement** (Table 23): 1 | **% Riffles**: 35 | **% Pools**: 35

Bank Angle	Bank Erosion
☐ 0 – 30	☐ < 5%
☒ 30 – 60	☒ 5 – 30%
☒ 60 – 90	☐ 30 – 60%
☐ Undercut	☐ 60 – 100%

(Table 19)	Clay/Silt	Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Bank	☑	☐	☐	☐	☐	☑	☐
Riffle	☐	☐	☑	☑	☑	☐	☐
Pool	☑	☑	☐	☐	☐	☑	☐
Bed (if no riffle-pool morphology)	☐	☐	☐	☐	☐	☐	☐

Bankfull Width (m)	2.75	2.2	1.25	**Wetted Width (m)**	
Bankfull Depth (m)	0.25	0.30	0.17	**Wetted Depth (m)**	0.04 / 0.07 / 0.41 * Add
Undercuts (m)	0	0	0	**Velocity (m/s)**	
Pool Depth (m)	0.4			**Velocity Estimate Method**	
Riffle Length (m)	0.07			**Meander Amplitude (m)**	

Notes:

Photos:

Version #4
Last edited: 04/04/2023

Senior staff sign-off (if required): _____ Checked by: _____ Completed by: EG

GEO MORPHIX

General Site Characteristics

Project Number: 25148

Date:	2025/11/19	**Stream:**	Trib 3
Time:	14:00	**Reach:**	T3C-R2
Weather:	Sunny, 10°C	**Location:**	NE of Sprott/Limebank intersect
Field Staff:	EG, BM	**Watershed/Subwatershed:**	Mosquito Creek

Features		Monitoring	
	Reach break		Long-profile
	Station location		Monumented XS
	Cross-section		Monumented photo
	Flow direction		Monumented photo direction
	Riffle		Sediment sampling
	Pool		Erosion pins
	Sediment bar		Scour chains
	Eroded bank/slope	**Additional Symbols**	
	Undercut bank		
	Bank stabilization		
	Leaning tree		
	Fence		
	Culvert/outfall		
	Swamp/wetland		
	Grasses		
	Tree		
	Instream log/tree		
	Woody debris		
	Beaver dam		
	Vegetated island		

Flow Type

H1	Standing water	**H1A**	Back water
H2	Scarcely perceptible flow		
H3	Smooth surface flow		
H4	Upwelling		
H5	Rippled		
H6	Unbroken standing wave		
H7	Broken standing wave		
H8	Chute		
H9	Free fall	**H9A**	Dissipates below free fall

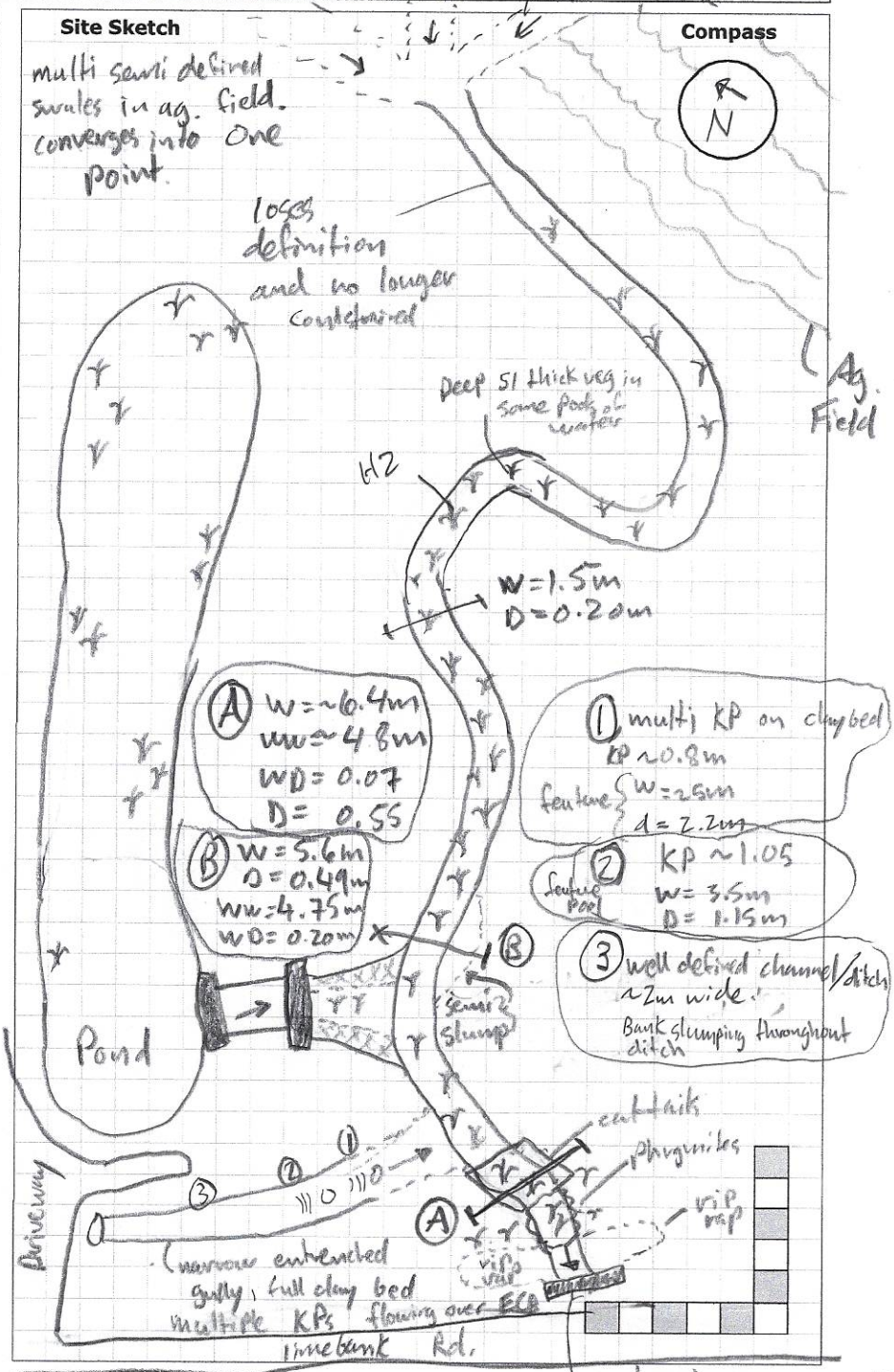
Substrate

S1	Silt	**S6**	Small boulder
S2	Sand	**S7**	Large boulder
S3	Gravel	**S8**	Bimodal
S4	Small cobble	**S9**	Bedrock/till
S5	Large cobble		

Other

BM	Benchmark	**EP**	Erosion pin
BS	Backsight	**RB**	Rebar
DS	Downstream	**US**	Upstream
WDJ	Woody debris jam	**TR**	Terrace
VWC	Valley wall contact	**FC**	Flood chute
BOS	Bottom of slope	**FP**	Flood plain
TOS	Top of slope	**KP**	Knick point

Site Sketch



Photos:

Notes:

- Tributary lacks channel definition
- No defined geomorphological units
- Highly vegetated
- RSAT not completed due to conditions

Version #4
Last edited: 21/02/2023

Senior staff sign-off (if required): _____ Checked by: _____ Completed by: EG

*No previous RSAT, Not to submit in Report

GEO MORPHIX

Rapid Stream Assessment Technique Project Number:

Date:	2025/11/19	**Stream:**	Tri 6 3
Time:		**Reach:**	T3C-R2
Weather:	Sunny, 1°C	**Location:**	NE of Spratt/Limebank R. intercept
Field Staff:	EG, BM	**Watershed/Subwatershed:**	Mosquito Creek

Category	Poor	Fair	Good	Excellent
T3C R2 → = Stable, but, small trench and a lot of erosion	• < 50% of bank network stable • Recent bank sloughing, slumping or failure frequently observed	• 50-70% of bank network stable • Recent signs of bank sloughing, slumping or failure fairly common	• 71-80% of bank network stable • Infrequent signs of bank sloughing, slumping or failure	• > 80% of bank network stable • No evidence of bank sloughing, slumping or failure
Channel Stability	• Stream bend areas highly unstable • Outer bank height 1.2 m above stream bank (2.1 m above stream bank for large mainstem areas) • Bank overhang > 0.8-1.0 m	• Stream bend areas unstable • Outer bank height 0.9-1.2 m above stream bank (1.5-2.1 m above stream bank for large mainstem areas) • Bank overhang 0.8-0.9m	• Stream bend areas stable • Outer bank height 0.6-0.9 m above stream bank (1.2-1.5 m above stream bank for large mainstem areas) • Bank overhang 0.6-0.8 m	• Stream bend areas very stable • Height < 0.6 m above stream (< 1.2 m above stream bank for large mainstem areas) • Bank overhang < 0.6 m
	• Young exposed tree roots abundant • > 6 recent large tree falls per stream mile	• Young exposed tree roots common • 4-5 recent large tree falls per stream mile	• Exposed tree roots predominantly old and large, smaller young roots scarce • 2-3 recent large tree falls per stream mile	• Exposed tree roots old, large and woody • Generally 0-1 recent large tree falls per stream mile
	• Bottom 1/3 of bank is highly erodible material • Plant/soil matrix severely compromised	• Bottom 1/3 of bank is generally highly erodible material • Plant/soil matrix compromised	• Bottom 1/3 of bank is generally highly resistant plant/soil matrix or material	• Bottom 1/3 of bank is generally highly resistant plant/soil matrix or material
	• Channel cross-section is generally trapezoidally-shaped	• Channel cross-section is generally trapezoidally-shaped	• Channel cross-section is generally V- or U-shaped	• Channel cross-section is generally V- or U-shaped
Point range	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4 ☐ 5	☐ 6 ☐ 7 ☐ 8	☑ 9 ☐ 10 ☐ 11
Channel Scouring/ Sediment Deposition	• > 75% embedded (> 85% embedded for large mainstem areas)	• 50-75% embedded (60-85% embedded for large mainstem areas)	• 25-49% embedded (35-59% embedded for large mainstem areas)	• Riffle embeddedness < 25% sand-silt (< 35% embedded for large mainstem areas)
	• Few, if any, deep pools • Pool substrate composition >81% sand-silt	• Low to moderate number of deep pools • Pool substrate composition 60-80% sand-silt	• Moderate number of deep pools • Pool substrate composition 30-59% sand-silt	• High number of deep pools (> 61 cm deep) (> 122 cm deep for large mainstem areas) • Pool substrate composition <30% sand-silt
	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits uncommon	• Streambed streak marks and/or "banana"-shaped sediment deposits absent
	• Fresh, large sand deposits very common in channel • Moderate to heavy sand deposition along major portion of overbank area	• Fresh, large sand deposits common in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits uncommon in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits rare or absent from channel • No evidence of fresh sediment deposition on overbank
	• Point bars present at most stream bends, moderate to large and unstable with high amount of fresh sand	• Point bars common, moderate to large and unstable with high amount of fresh sand	• Point bars small and stable, well-vegetated and/or armoured with little or no fresh sand	• Point bars few, small and stable, well-vegetated and/or armoured with little or no fresh sand
Point range	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4	☐ 5 ☑ 6	☐ 7 ☐ 8

GEO MORPHIX™

Date:	2025/11/19	PN:	25148	Location:	Mosquito Creek

Category	Poor	Fair	Good	Excellent
Physical Instream Habitat	• Wetted perimeter < 40% of bottom channel width (< 45% for large mainstem areas)	• Wetted perimeter 40-60% of bottom channel width (45-65% for large mainstem areas)	• Wetted perimeter 61-85% of bottom channel width (66-90% for large mainstem areas)	• Wetted perimeter > 85% of bottom channel width (> 90% for large mainstem areas)
	• Dominated by one habitat type (usually runs) and by one velocity and depth condition (slow and shallow) (for large mainstem areas, few riffles present, runs and pools dominant, velocity and depth diversity low)	• Few pools present, riffles and runs dominant. • Velocity and depth generally slow and shallow (for large mainstem areas, runs and pools dominant, velocity and depth diversity intermediate)	• Good mix between riffles, runs and pools • Relatively diverse velocity and depth of flow	• Riffles, runs and pool habitat present • Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)
	• Riffle substrate composition: predominantly gravel with high amount of sand • < 5% cobble	• Riffle substrate composition: predominantly small cobble, gravel and sand • 5-24% cobble	• Riffle substrate composition: good mix of gravel, cobble, and rubble material • 25-49% cobble	• Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand • > 50% cobble
	• Riffle depth < 10 cm for large mainstem areas	• Riffle depth 10-15 cm for large mainstem areas	• Riffle depth 15-20 cm for large mainstem areas	• Riffle depth > 20 cm for large mainstem areas
	• Large pools generally < 30 cm deep (< 61 cm for large mainstem areas) and devoid of overhead cover/structure	• Large pools generally 30-46 cm deep (61-91 cm for large mainstem areas) with little or no overhead cover/structure	• Large pools generally 46-61 cm deep (91-122 cm for large mainstem areas) with some overhead cover/structure	• Large pools generally > 61 cm deep (> 122 cm for large mainstem areas) with good overhead cover/structure
	• Extensive channel alteration and/or point bar formation/enlargement	• Moderate amount of channel alteration and/or moderate increase in point bar formation/enlargement	• Slight amount of channel alteration and/or slight increase in point bar formation/enlargement	• No channel alteration or significant point bar formation/enlargement
	• Riffle/Pool ratio 0.49:1 ; ≥1.51:1	• Riffle/Pool ratio 0.5-0.69:1 ; 1.31-1.5:1	• Riffle/Pool ratio 0.7-0.89:1 ; 1.11-1.3:1	• Riffle/Pool ratio 0.9-1.1:1
	• Summer afternoon water temperature > 27°C	• Summer afternoon water temperature 24-27°C	• Summer afternoon water temperature 20-24°C	• Summer afternoon water temperature < 20°C
Point range	☐ 0 ☐ 1 ☐ 2	☑ 3 ☐ 4	☐ 5 ☐ 6	☐ 7 ☐ 8
Water Quality (water not deep enough)	• Substrate fouling level: High (> 50%)	• Substrate fouling level: Moderate (21-50%)	• Substrate fouling level: Very light (11-20%)	• Substrate fouling level: Rock underside (0-10%)
	• Brown colour • TDS: > 150 mg/L	• Grey colour • TDS: 101-150 mg/L	• Slightly grey colour • TDS: 50-100 mg/L	• Clear flow • TDS: < 50 mg/L
	• Objects visible to depth < 0.15m below surface	• Objects visible to depth 0.15-0.5m below surface	• Objects visible to depth 0.5-1.0m below surface	• Objects visible to depth > 1.0m below surface
	• Moderate to strong organic odour	• Slight to moderate organic odour	• Slight organic odour	• No odour
Point range	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4	☑ 5 ☐ 6	☐ 7 ☐ 8
Riparian Habitat Conditions	• Narrow riparian area of mostly non-woody vegetation	• Riparian area predominantly wooded but with major localized gaps	• Forested buffer generally > 31 m wide along major portion of both banks	• Wide (> 60 m) mature forested buffer along both banks
	• Canopy coverage: <50% shading (30% for large mainstem areas)	• Canopy coverage: 50-60% shading (30-44% for large mainstem areas)	• Canopy coverage: 60-79% shading (45-59% for large mainstem areas)	• Canopy coverage: >80% shading (> 60% for large mainstem areas)
Point range	☐ 0 ☐ 1	☐ 2 ☑ 3	☐ 4 ☐ 5	☐ 6 ☐ 7

Total overall score (0–42) = 26	Poor (<13)	Fair (13-24)	Good (25-34)	Excellent (>35)

Version #2
Last edited: 10/02/2023

Senior staff sign-off (if required): _____ Checked by: _____ Completed by: EG

GEO MORPHIX

Rapid Geomorphic Assessment

Project Number: 25148

Date:	2025/11/19	**Stream:**	Trib 3
Time:		**Reach:**	T3C-R2
Weather:	Sunny, 1°C	**Location:**	NE of Spratt/Limestone R. inlet/outlet
Field Staff:	EG, BM	**Watershed/Subwatershed:**	Mosquito Creek

Process	No.	Geomorphological Indicator	Present? Yes	Present? No	Factor Value
Evidence of Aggradation (AI)	1	Lobate bar		✓	0/5
	2	Coarse materials in riffles embedded			
	3	Siltation in pools			
	4	Medial bars		✓	
	5	Accretion on point bars		✓	
	6	Poor longitudinal sorting of bed materials		✓	
	7	Deposition in the overbank zone		✓	
		Sum of indices =	0	5	0
Evidence of Degradation (DI)	1	Exposed bridge footing(s)			0/6
	2	Exposed sanitary / storm sewer / pipeline / etc.			
	3	Elevated storm sewer outfall(s)			
	4	Undermined gabion baskets / concrete aprons / etc.			
	5	Scour pools downstream of culverts / storm sewer outlets		✓	
	6	Cut face on bar forms		✓	
	7	Head cutting due to knickpoint migration		✓	
	8	Terrace cut through older bar material		✓	
	9	Suspended armour layer visible in bank		✓	
	10	Channel worn into undisturbed overburden / bedrock		✓	
		Sum of indices =	0	6	0
Evidence of Widening (WI)	1	Fallen / leaning trees / fence posts / etc.		✓	0/7
	2	Occurrence of large organic debris		✓	
	3	Exposed tree roots		✓	
	4	Basal scour on inside meander bends		✓	
	5	Basal scour on both sides of channel through riffle		✓	
	6	Outflanked gabion baskets / concrete walls / etc.			
	7	Length of basal scour >50% through subject reach		✓	
	8	Exposed length of previously buried pipe / cable / etc.			
	9	Fracture lines along top of bank			
	10	Exposed building foundation			
		Sum of indices =	0	7	0
Evidence of Planimetric Form Adjustment (PI)	1	Formation of chute(s)		✓	2/6
	2	Single thread channel to multiple channel		✓	
	3	Evolution of pool-riffle form to low bed relief form	✓		
	4	Cut-off channel(s)		✓	
	5	Formation of island(s)			
	6	Thalweg alignment out of phase with meander form		✓	
	7	Bar forms poorly formed / reworked / removed	✓		
		Sum of indices =	2	4	0.33

Notes:

Stability Index (SI) = (AI+DI+WI+PI)/4 = 0.08

In Regime	In Transition/Stress	In Adjustment
☑ 0.00 - 0.20	☐ 0.21 - 0.40	☐ 0.41

Version #3
Last edited: 10/02/2023

Senior staff sign-off (if required): _____ Checked by: _____ Completed by: EG

GEO MORPHIX

Reach Characteristics

Project Number:

Date:	2025/11/19	**Field Staff:**	EG, BM	**Watershed/Subwatershed:**	Mosquito Creek
Time:		**Stream:**	Trib 3	**UTM (Upstream):**	
Weather:	Sunny, 10°C	**Reach:**	T3C-R2	**UTM (Downstream):**	

Land Use (Table 1): 3 | **Valley Type** (Table 2): 2 | **Channel Type** (Table 3): 1 | **Channel Zone** (Table 4): 2 | **Flow Type** (Table 5): 1 | ☐ Evidence of Groundwater Location:_____ Photo:_____

Riparian Vegetation

Dominant Type (Table 6): 3 | **Encroachment** (Table 7): 4

Coverage	Channel Widths	Age (yrs)
☐ None	☐ 1 - 4	☑ Immature (<5)
☐ Fragmented	☑ 4 - 10	☐ Established (5-30)
☑ Continuous	☐ > 10	☐ Mature (>30)

Aquatic & Instream Vegetation

Type (Table 8): 1 | **Reach Coverage %**: 100

Woody Debris	WD Density
☐ In Cutbank	☑ Low
☐ In Channel	☐ Mod
☑ Not Present	☐ High

WDJ/50m: 0

Water Quality

Odour (Table 16): 1 | **Turbidity** (Table 17): 2

Channel Characteristics

Sinuosity Type (Table 9): 3 | **Gradient** (Table 11): 2 | **Entrenchment** (Table 13): 1 | **Down's Model** (Table 15): 5 | **Sed Sorting** (Table 20): WS | **Transport Mode** (Table 21): 3 | **Geomorphic Units** (Table 22): 8 | **Riffle-Pool Spacing (m):**

Sinuosity Degree (Table 10): 3 | **# of Channels** (Table 12): 1 | **Bank Failure** (Table 14): None | **Bankfull Indicators** (Table 18): 5

Sediment Transport Observed? ☐ Yes ☑ No ☐ Not Visible

% of Bed Active | **Mass Movement** (Table 23) | **% Riffles:** | **% Pools:**

Bank Angle
☐ 0 – 30
☐ 30 – 60
☐ 60 – 90
☐ Undercut

Bank Erosion
☐ < 5%
☐ 5 – 30%
☐ 30 – 60%
☐ 60 – 100%

(Table 19)	Clay/Silt	Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Bank	☑	☑	☐	☐	☐	☐	☐
Riffle	☐	☐	☐	☐	☐	☐	☐
Pool	☐	☐	☐	☐	☐	☐	☐
Bed (if no riffle-pool morphology)	☐	☐	☐	☐	☐	☐	☐

Bankfull Width (m)	1.5	6.4	5.6	**Wetted Width (m)**	4.8	4.75
Bankfull Depth (m)	0.2	0.55	0.49	**Wetted Depth (m)**	0.07	0.2
Undercuts (m)				**Velocity (m/s)**		
Pool Depth (m)				**Velocity Estimate Method**		
Riffle Length (m)				**Meander Amplitude (m)**		

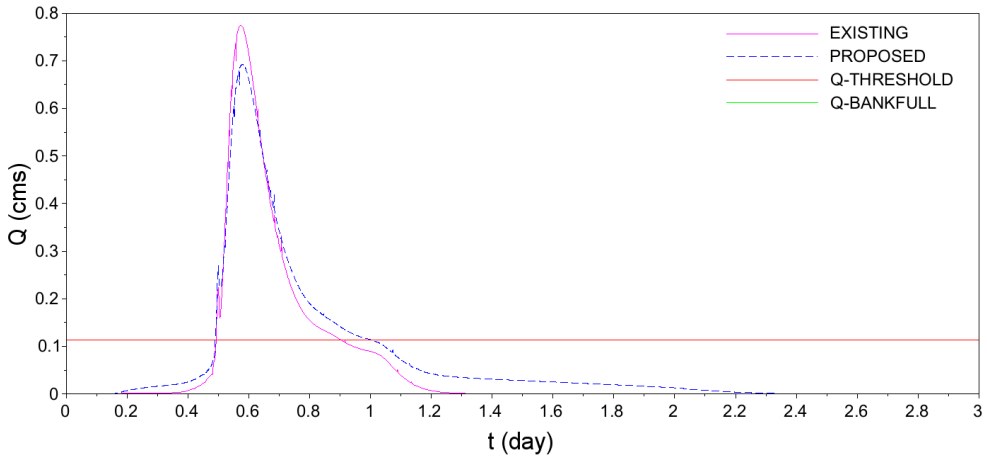
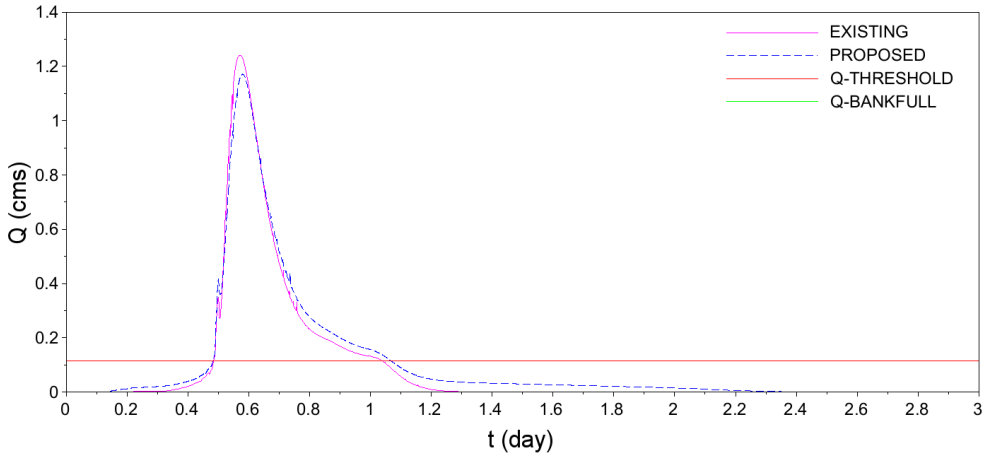
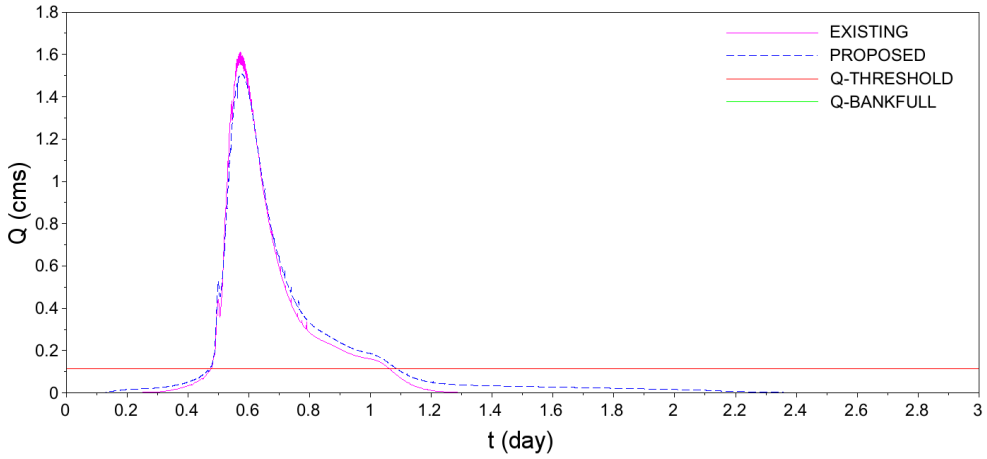
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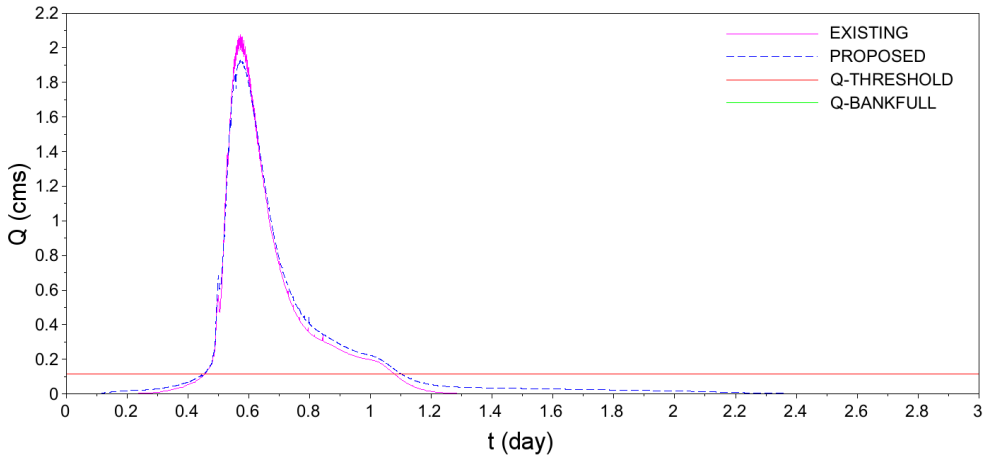
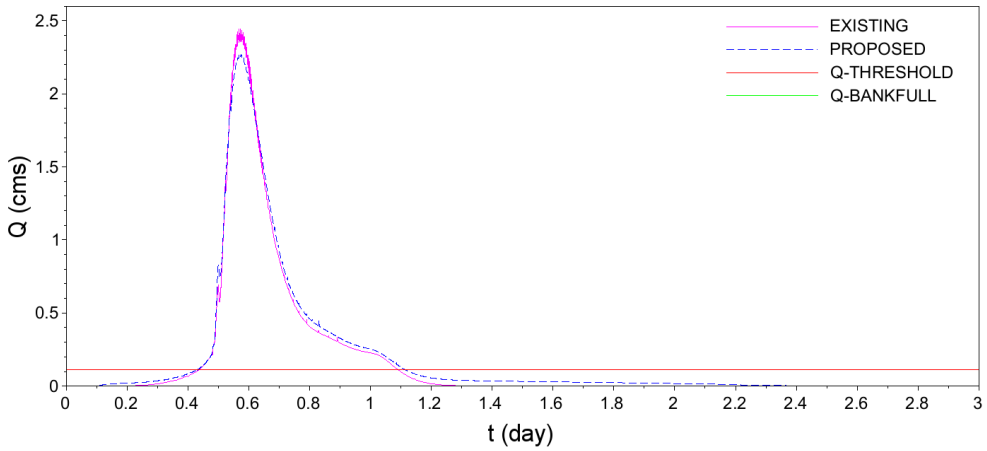
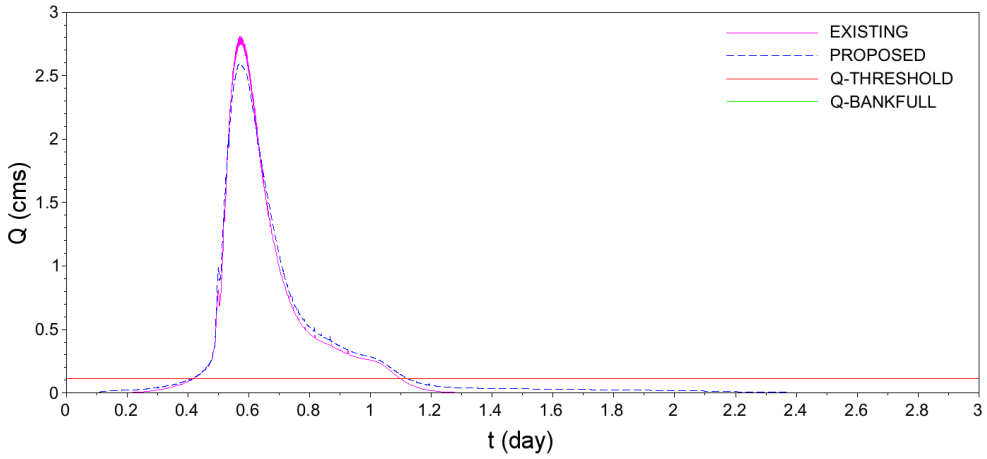
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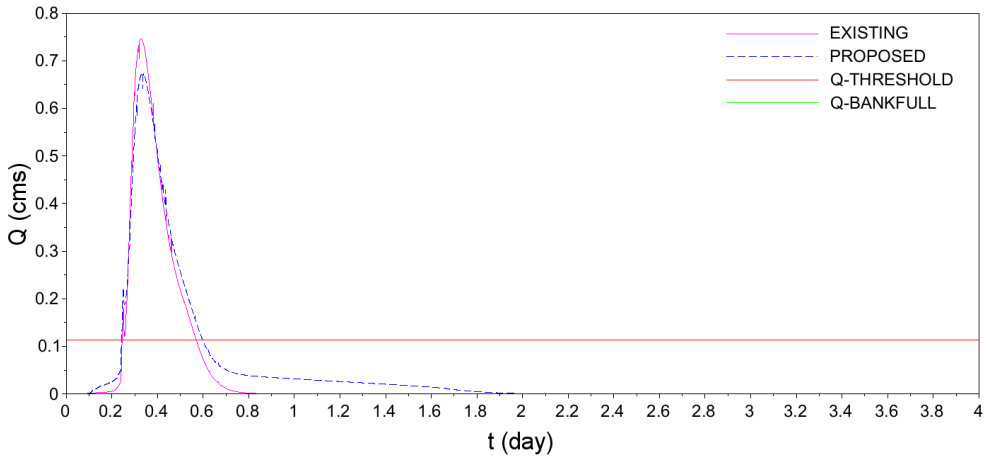
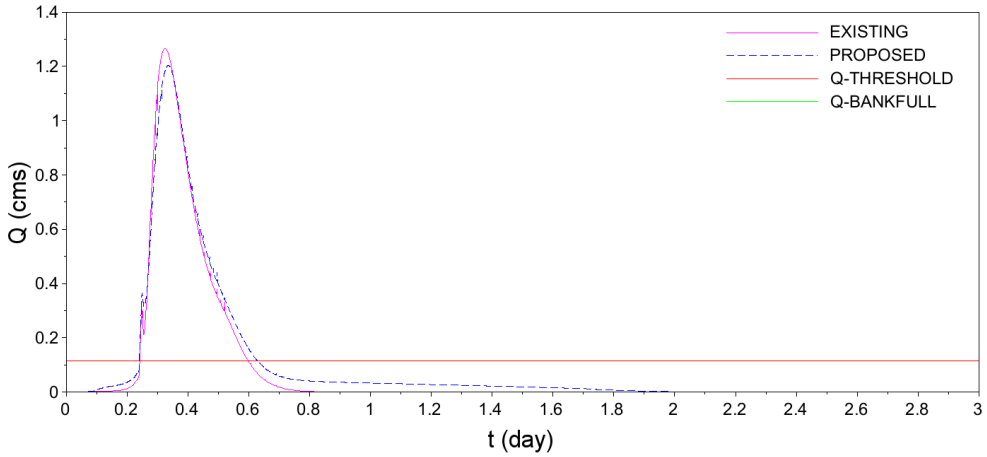
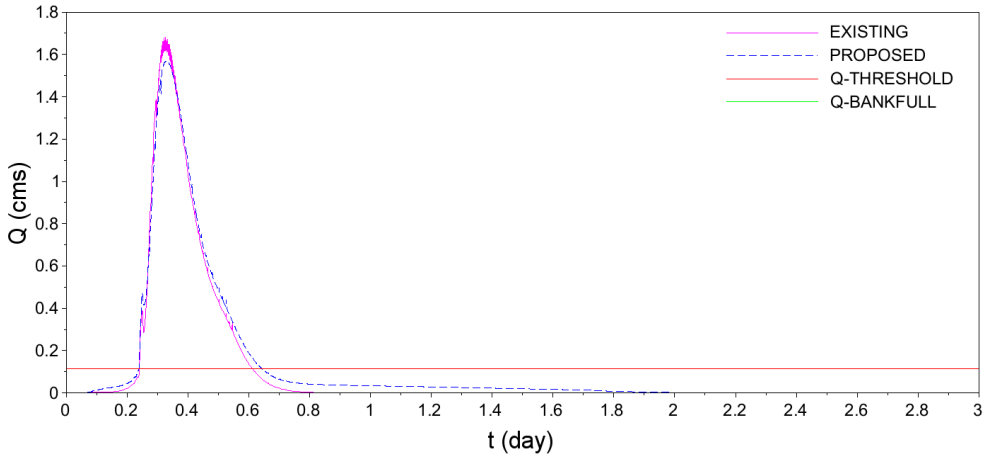
Version #4
Last edited: 04/04/2023

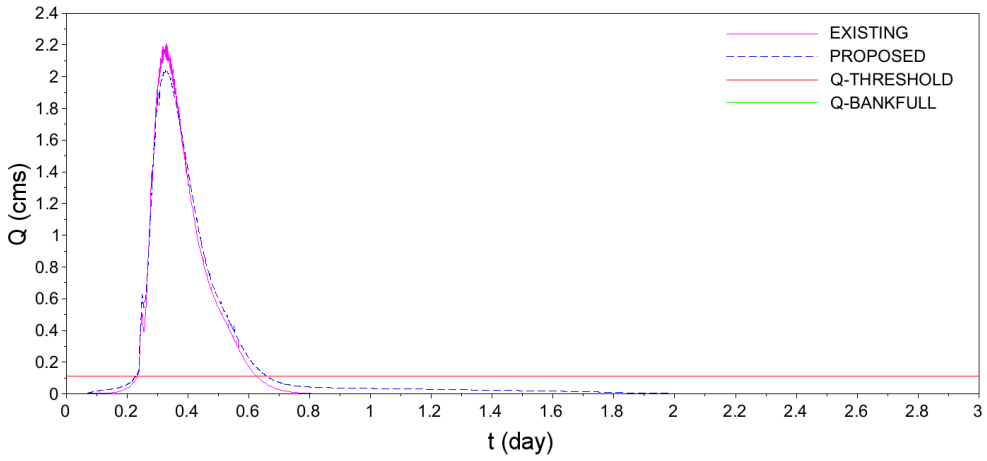
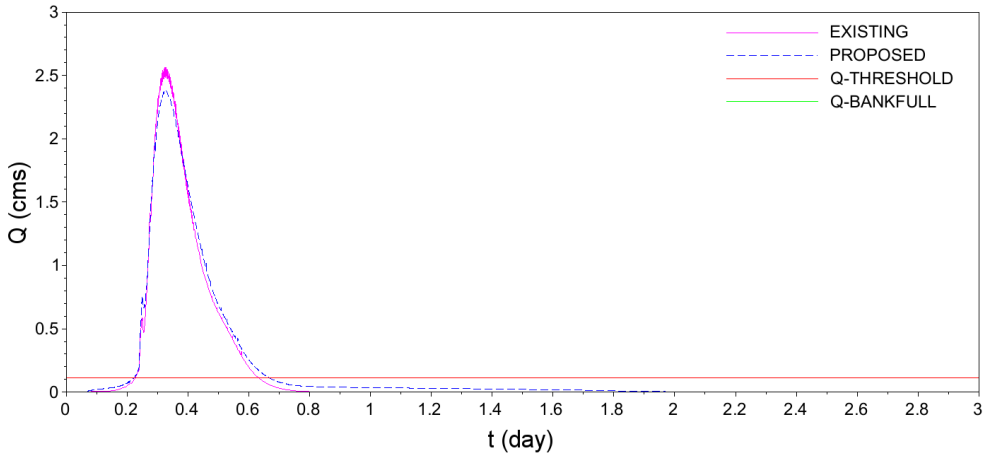
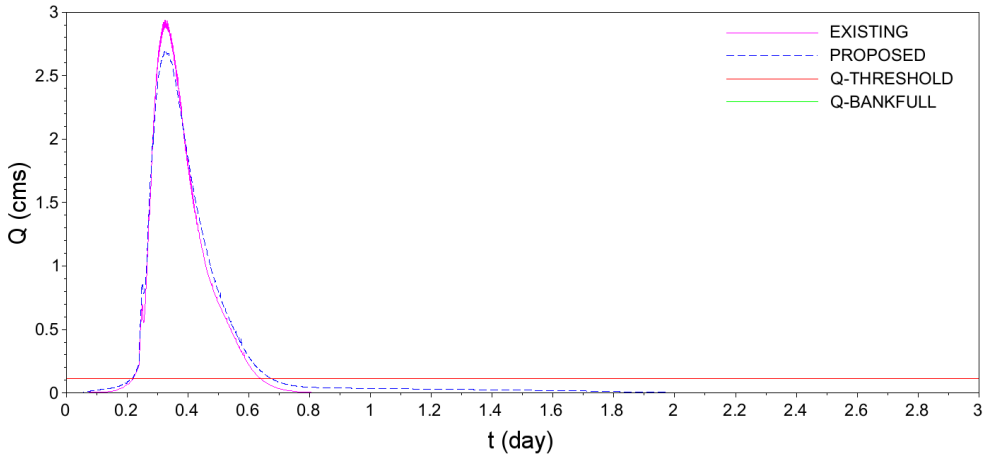
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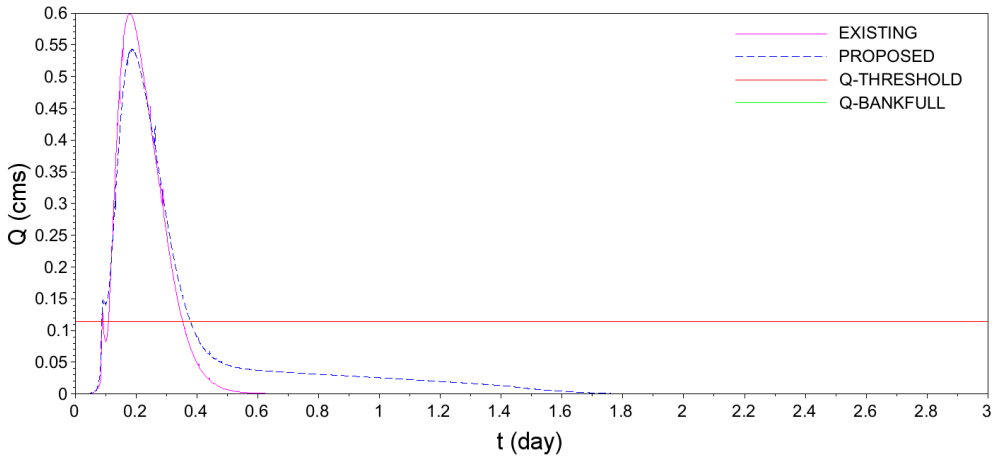
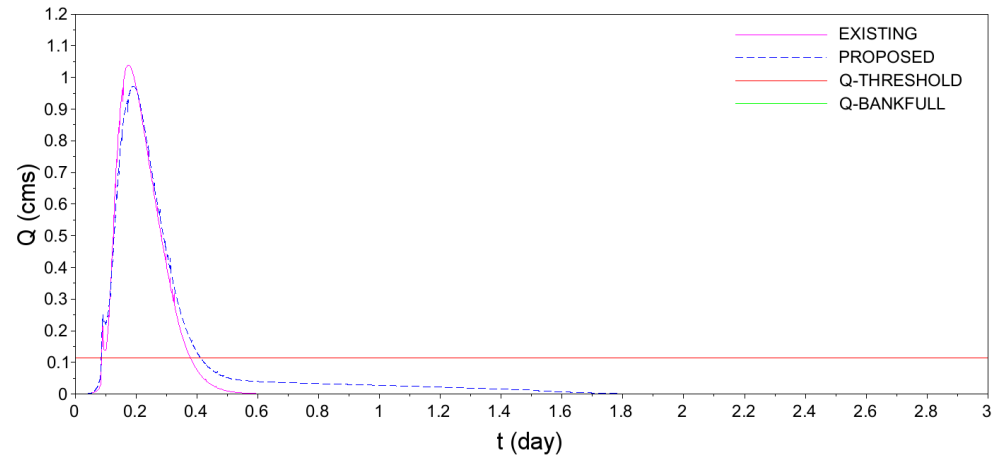
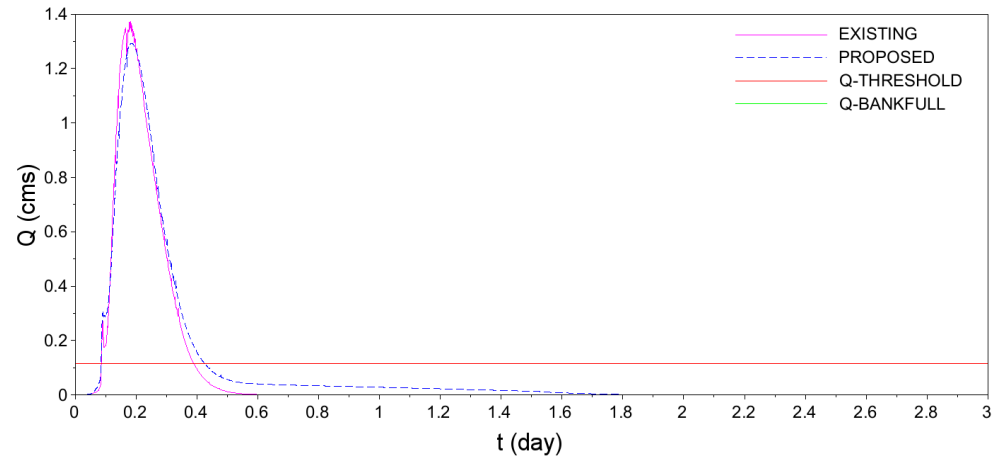
Appendix E:
Erosion Exceedance Hydrographs

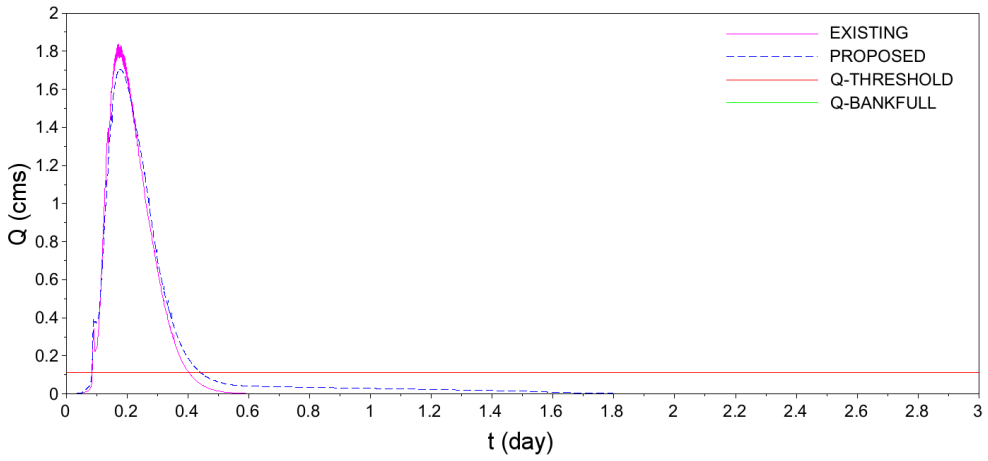
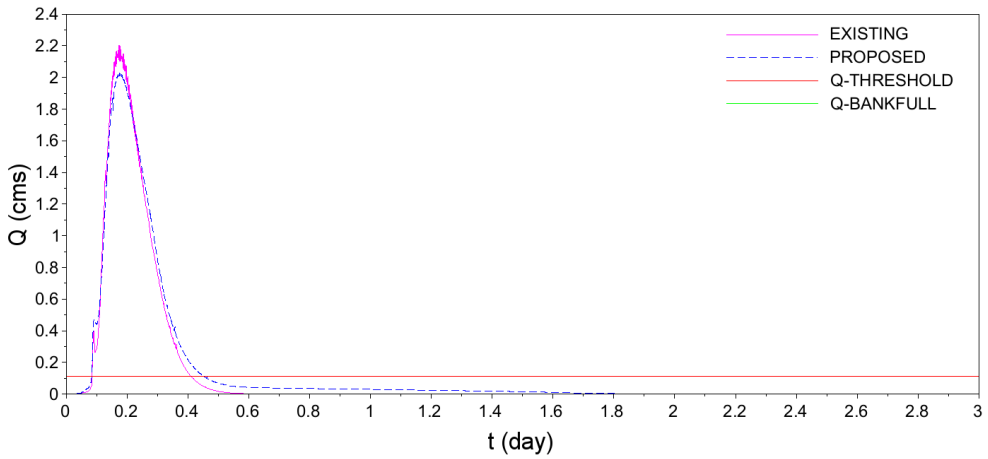
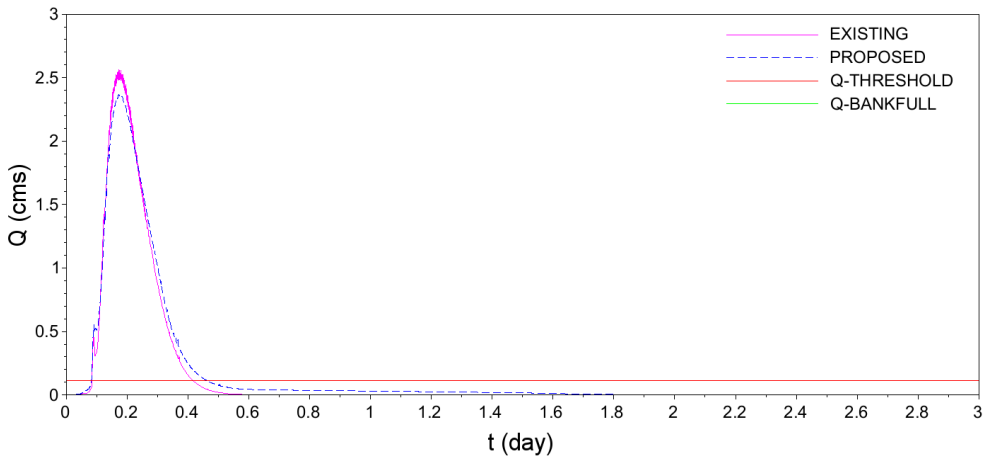
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24 hours **5-year SCS**	
24 hours **10-year SCS**	

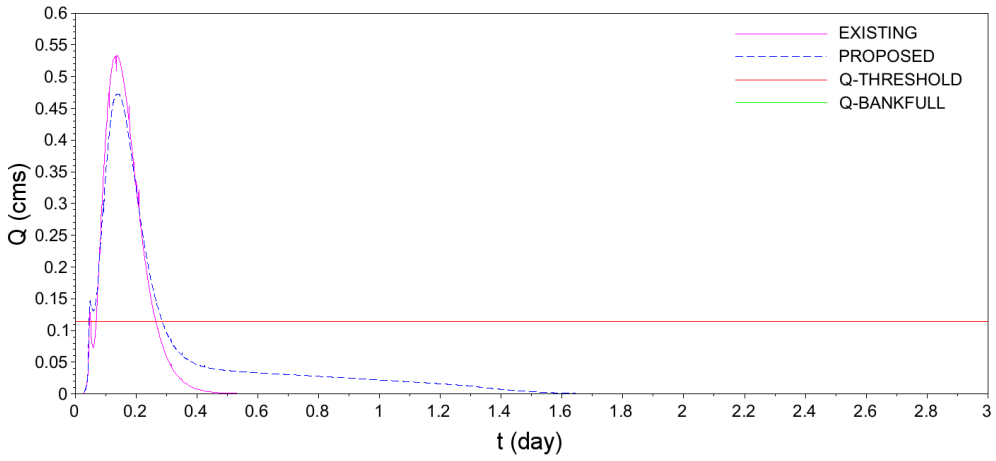
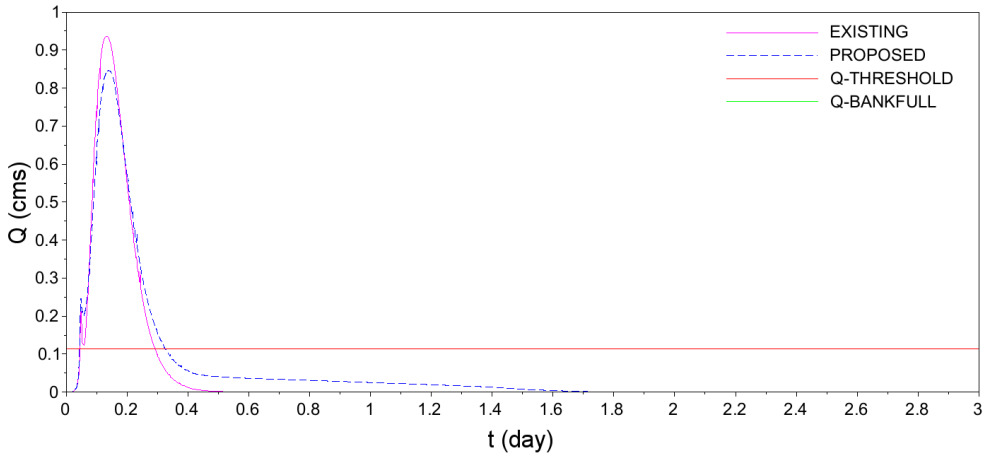
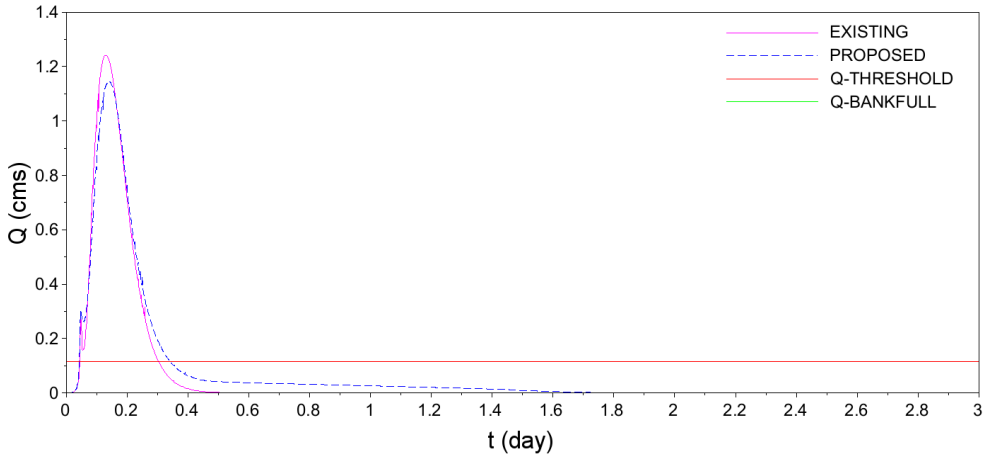
24 hours **25-year SCS**	
24 hours **50-year SCS**	
24 hours **100-year SCS**	

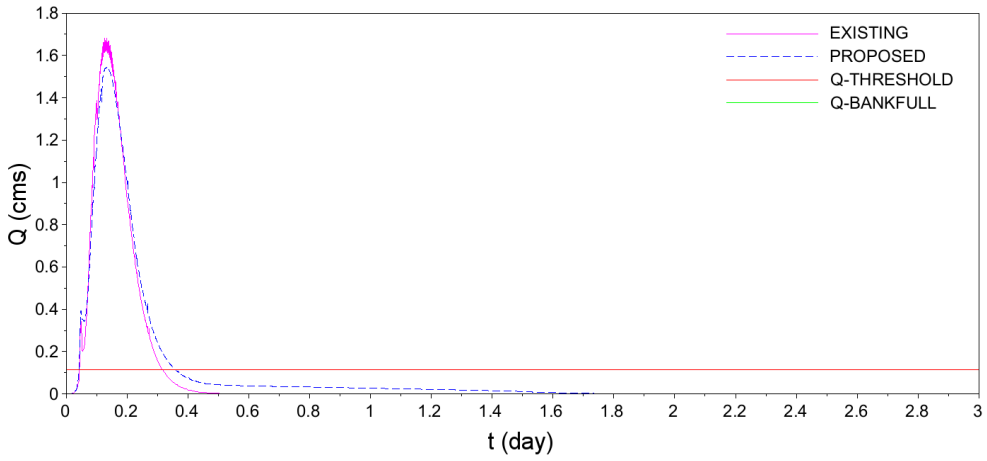
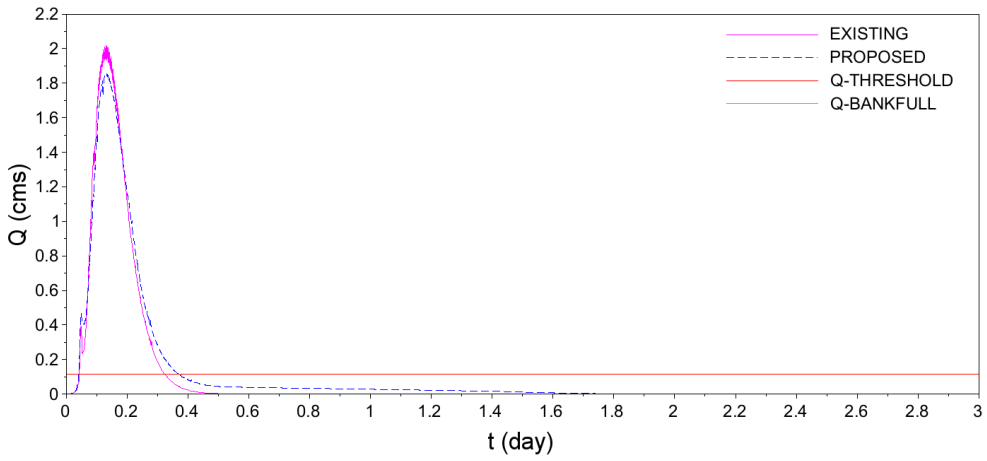
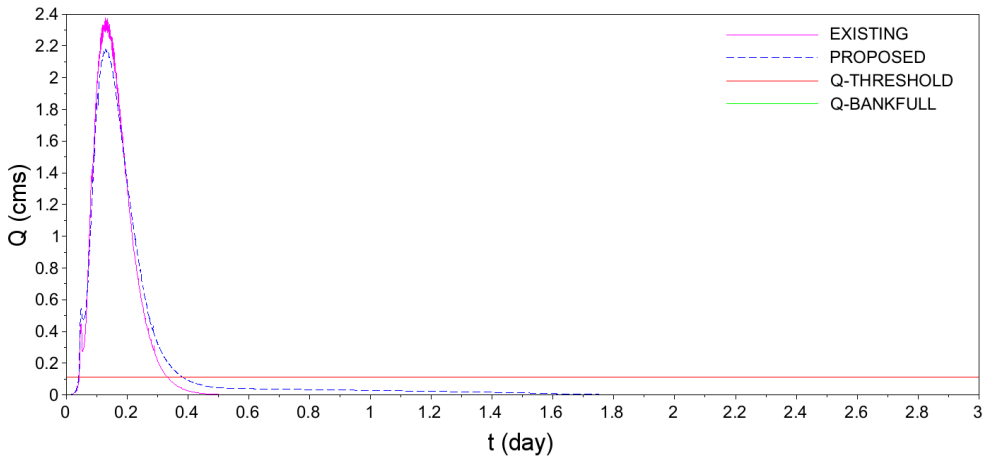
12 hours **2-year SCS**	
12 hours **5-year SCS**	
12 hours **10-year SCS**	

12 hours 25-year SCS	
12 hours 50-year SCS	
12 hours 100-year SCS	

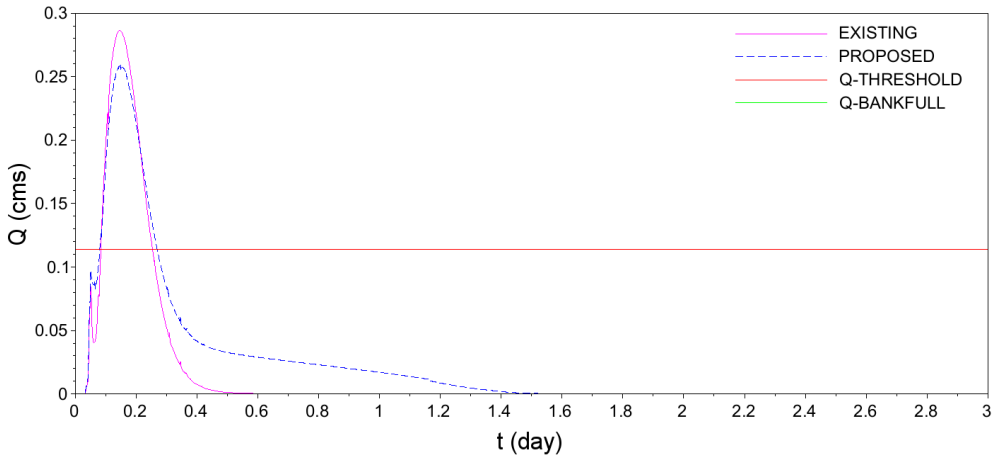
6 hours **2-year Chicago**	
6 hours **5-year Chicago**	
6 hours **10-year Chicago**	

6 hours **25-year Chicago**	
6 hours **50-year Chicago**	
6 hours **100-year Chicago**	

3 hours **2-year Chicago**	
3 hours **5-year Chicago**	
3 hours **10-year Chicago**	

3 hours **25-year Chicago**	
3 hours **50-year Chicago**	
3 hours **100-year Chicago**	

25 mm, 4-hour


EXISTING
PROPOSED
Q-THRESHOLD
Q-BANKFULL
Q (cms)
t (day)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
2.2
2.4
2.6
2.8
3

Appendix F:
Event-based Erosion Exceedance Results

Table G.1. Erosion exceedance results for simulated 25 mm, 4-hour storm event

Return Interval Scenario	Peak Discharge (m^3/s)	CEV	CEWI	t_{ex}
		(m^3)	(N/m)	(hrs)
25 mm	0.286	1,577	20.9	4.08
	0.259	1,417	18.9	4.55
	-9.62	**-10.15**	**-9.65**	**11.43**

Table G.2. Erosion exceedance results of cumulative 100-year projection for simulated 24-hour SCS Type II storms

Return Interval Scenario	Events per 100 years		Peak Discharge (m^3/s)	CEV	CEWI	t_{ex}
				(m^3)	(N/m)	(hrs)
2-year	**30**	PRE	0.774	8,443	106	9.88
		POST	0.691	8,618	109	12.35
		Change (%)	**-10.70**	**2.08**	**3.15**	**24.96**
5-year	**10**	PRE	1.241	15,903	193	13.37
		POST	1.171	16,518	202	14.03
		Change (%)	**-5.71**	**3.87**	**4.83**	**4.99**
10-year	**6**	PRE	1.613	21,501	255	14.10
		POST	1.507	22,287	267	14.75
		Change (%)	**-6.61**	**3.66**	**4.43**	**4.61**
25-year	**2**	PRE	2.079	28,947	335	15.00
		POST	1.926	29,921	349	15.63
		Change (%)	**-7.38**	**3.36**	**4.04**	**4.22**
50-year	**1**	PRE	2.446	35,204	399	15.67
		POST	2.268	36,308	415	16.30
		Change (%)	**-7.26**	**3.14**	**3.81**	**4.04**
100-year	**1**	PRE	2.816	41,676	464	16.30
		POST	2.591	42,896	481	16.93
		Change (%)	**-7.96**	**2.93**	**3.64**	**3.89**
Frequency Weighted	**50**	(PRE)	**-**	676,085	8,179	577
		(POST)	-	696,495	8,499	664
		Change (%)	-	**3.02**	**3.92**	**15.10**

Table G.3. Erosion exceedance results of cumulative 100-year projection for simulated 12-hour SCS Type II storms

Return Interval Scenario	Events per 100 years		Peak Discharge (m^3/s)	CEV	CEWI	t_{ex}
				(m^3)	(N/m)	(hrs)
2-year	**30**	PRE	0.746	7,987	100	7.82
		POST	0.673	8,020	102	8.53
		Change (%)	**-9.78**	**0.41**	**1.20**	**9.17**
5-year	**10**	PRE	1.267	15,486	186	8.58
		POST	1.202	15,840	192	9.35
		Change (%)	**-5.10**	**2.29**	**2.95**	**8.93**
10-year	**6**	PRE	1.683	21,055	246	8.93
		POST	1.568	21,598	254	9.72
		Change (%)	**-6.87**	**2.58**	**3.18**	**8.77**
25-year	**2**	PRE	2.209	28,474	322	9.38
		POST	2.038	29,217	333	10.22
		Change (%)	**-7.73**	**2.61**	**3.28**	**8.88**
50-year	**1**	PRE	2.567	33,925	376	9.75
		POST	2.376	34,790	388	10.57
		Change (%)	**-7.46**	**2.55**	**3.32**	**8.38**
100-year	**1**	PRE	2.938	39,560	429	10.07
		POST	2.698	40,497	443	10.92
		Change (%)	**-8.18**	**2.37**	**3.30**	**8.44**
Frequency Weighted	**50**	(PRE)	**-**	651,228	7,805	413
		(POST)	-	662,303	7,991	450
		Change (%)	-	**1.70**	**2.38**	**9.02**

Table G.4. Erosion exceedance results of cumulative 100-year projection for simulated 6-hour Chicago storms

Return Interval Scenario	Events per 100 years		Peak Discharge (m^3/s)	CEV	CEWI	t_{ex}
				(m^3)	(N/m)	(hrs)
2-year	**30**	PRE	0.599	5,681	72	5.98
		POST	0.543	5,548	71	7.00
		Change (%)	**-9.30**	**-2.33**	**-1.64**	**16.99**
5-year	**10**	PRE	1.040	11,490	140	7.03
		POST	0.971	11,647	143	7.87
		Change (%)	**-6.56**	**1.37**	**2.16**	**11.85**
10-year	**6**	PRE	1.373	15,829	188	7.33
		POST	1.291	16,190	193	8.20
		Change (%)	**-5.94**	**2.28**	**2.98**	**11.82**
25-year	**2**	PRE	1.839	21,644	249	7.63
		POST	1.703	22,193	257	8.57
		Change (%)	**-7.36**	**2.54**	**3.33**	**12.23**
50-year	**1**	PRE	2.205	26,305	295	7.80
		POST	2.026	26,948	305	8.80
		Change (%)	**-8.12**	**2.44**	**3.41**	**12.82**
100-year	**1**	PRE	2.568	31,389	344	7.98
		POST	2.364	32,097	356	9.08
		Change (%)	**-7.94**	**2.26**	**3.43**	**13.78**
Frequency Weighted	**50**	(PRE)	**-**	481,282	5,829	325
		(POST)	-	483,494	5,896	373
		Change (%)	-	**0.46**	**1.15**	**14.77**

Table G.5. Erosion exceedance results of cumulative 100-year projection for simulated 3-hour Chicago storms

Return Interval Scenario	Events per 100 years		Peak Discharge (m^3/s)	CEV	CEWI	t_{ex}
				(m^3)	(N/m)	(hrs)
2-year	**30**	PRE	0.533	3,997	51	4.80
		POST	0.473	3,727	48	5.78
		Change (%)	**-11.40**	**-6.75**	**-5.94**	**20.49**
5-year	**10**	PRE	0.936	8,582	105	5.95
		POST	0.846	8,491	106	6.78
		Change (%)	**-9.66**	**-1.05**	**0.05**	**14.01**
10-year	**6**	PRE	1.241	12,094	145	6.27
		POST	1.144	12,157	147	7.20
		Change (%)	**-7.76**	**0.52**	**1.64**	**14.89**
25-year	**2**	PRE	1.682	16,875	196	6.60
		POST	1.542	17,118	201	7.60
		Change (%)	**-8.35**	**1.44**	**2.64**	**15.15**
50-year	**1**	PRE	2.021	20,725	235	6.78
		POST	1.850	21,073	242	7.88
		Change (%)	**-8.48**	**1.68**	**3.01**	**16.22**
100-year	**1**	PRE	2.379	24,921	276	6.97
		POST	2.177	25,351	285	8.18
		Change (%)	**-8.50**	**1.73**	**3.26**	**17.46**
Frequency Weighted	**50**	(PRE)	**-**	357,676	4,359	268
		(POST)	-	350,319	4,309	316
		Change (%)	-	**-2.06**	**-1.14**	**17.81**