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FUNCTIONAL SERVICING REPORT

FOR

TAMARACK (RICHMOND EAST) CORPORATION LANDS

CITY OF OTTAWA

DSEL PROJECT NO.: 18-1042

MARCH 20, 2025
2ND SUBMISSION

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TABLE OF CONTENTS

APPENDICES

Appendix A **Background**

Village of Richmond Schedule A – Designation Plan (City of Ottawa, November 2022)

Tamarack Richmond Draft Plan of Subdivision (Annis, O'Sullivan, Vollebekk Ltd, October 3, 2024)

Development Servicing Study Checklist (DSEL, March 2025)

Jock River Subwatershed (Reach 2) Flood Risk Maps (RVCA, July 1, 2005)

HEC RAS Output for Tributaries to the Jock River Subwatershed (Reach 2) (RVCA, July 2005)

RVCA Permit #RV5-0720 (RVCA, December 10, 2020)

Responses to City Comments (DSEL, March 2025)

Appendix B **Water Servicing**

Excerpts from Village of Richmond Water Supply Functional Design Study – Technical Memorandum: Optimization of Richmond Communal Water Systems – Draft (Stantec, September 11, 2024)

Water Demand Correspondence for Water Supply Functional Design Study (City Staff, January 2025)

Appendix C **Wastewater Servicing**

Village of Richmond Wastewater Collection System Upgrade – General Scope and Implementation Strategy (Joseph Zagorski, City of Ottawa, April 19, 2021)

Excerpts from the Village of Richmond Water and Sanitary Master Servicing Study (Stantec Consulting Ltd., July 2011)

**FUNCTIONAL SERVICING REPORT
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1.0 INTRODUCTION

Tamarack (Richmond East) Corporation (*Tamarack*) has retained David Schaeffer Engineering Ltd. (*DSEL*) to prepare this Functional Servicing Report (*FSR*) in support of their application for draft plan approval and Zoning By-law Amendment for an urban residential development at 5970 & 6038 Ottawa Street (*Tamarack Richmond Lands*). The study area is located south of Ottawa Street, Marlborough Creek (*Richmond By-Pass Drain*), and an existing high-speed railway corridor, between McBean Street and Eagleson Road, in the Village of Richmond as shown in **Figure 1** below.

Figure 1: Study Area Location (DSEL, Oct 2024)

The study area, formerly identified as the Richmond Southeast Development Lands, is part of the Village of Richmond Secondary Plan, found in Volume 2B of the City of Ottawa Official Plan (November 2022). As illustrated in the Village of Richmond Designation Plan (included in ***Appendix A*** for reference), the study area is mainly designated as Village Residential 1 and as the Southeastern Development Area, with a small northeastern portion designated as Village Commercial. The study area was also considered as a future industrial development as part of the *Village of Richmond Water and Sanitary Master Servicing Study (MSS)* (Stantec, July 2011).

The proposed urban residential development includes a community park, a school block, a stormwater management facility, a commercial block, and a road network connecting to both Eagleson Road and McBean Street. The Draft Plan of Subdivision can be found in ***Appendix A*** and the latest projected development statistics are summarized in ***Table 1.1*** below. The development is expected to advance in phases, subject to market demand and the owner's preferred timing.

Table 1.1: Development Statistics Projections

Land Use	Total Area (ha)[1]	Units				Projected Population
		SFH	Town	Back-to-Back	TOTAL	
Residential	51.08	536	531	106	1173	3543
Commercial	2.04					
Community Park	1.96					
School	3.14					
Communal Well Area	0.82					
SWM Pond	3.92					
Total	**62.96**	**536**	**531**	**106**	**1173**	**3543**

This FSR is provided to demonstrate the serviceability of the proposed development concept in conformance with the design criteria of the City of Ottawa, the MSS, other background studies, and general industry practices. This FSR has also been prepared per the City of Ottawa's Servicing Study Guidelines for Development Applications, as demonstrated by the checklist in ***Appendix A***.

1.1 Existing Conditions

The study area is a Greenfield Site within the Village of Richmond, with pre-development grades varying between 93.0 m and 98.0 m. A geotechnical investigation for the study area has been completed with the results and recommendations documented in *Geotechnical Investigation, Proposed Mixed-Use Development 5970 and 6083 Ottawa Street, Revision 4* (*Geotechnical Investigation)* (Paterson Group, March 14, 2025).

The study area is under the jurisdiction of the Rideau Valley Conservation Authority (RVCA). Marlborough Creek, also known as the Richmond By-Pass Drain, ultimately drains to the Jock River and traverses the northern boundary of the study area, south of an existing VIA railway corridor and existing properties fronting onto Ottawa Street. The

RVCA's Jock River Subwatershed (Reach 2) Flood Risk Maps and HEC-RAS model information are included in ***Appendix A****.* Cross-sections 2150 to 3137 are adjacent to the Tamarack Richmond Lands.

The meander belt width of Marlborough Creek has been identifiedin the *Marlborough Creek Meander Belt Width Delineation Report* (GEO Morphix Ltd., March 10, 2025) under separate cover.

Several adjacent parcels of land currently drain through the study area before ultimately discharging to Marlborough Creek. Refer to ***Drawing 02D*** for the external areas and existing drainage patterns.

There is an existing tributary to the Richmond By-Pass Drain which currently bisects the Tamarack Richmond Lands*.* This feature is referred to as Reach 4 in the *Headwater Drainage Feature Assessment* (*HDFA*) (Kilgour & Associates, August 8, 2019) and the *Environmental Impact Statement for the Proposed Development of 6012 Ottawa Street Area* (*EIS*) (Kilgour & Associates Ltd., January 14, 2020). Reach 4 received a management recommendation of "Conservation" and it is noted in the EIS that the feature may be maintained, or if necessary, relocated using natural channel design techniques to maintain or enhance the overall productivity of the reach. The EIS states that the current feature does not provide direct habitat for fish, frogs, or turtles. Reach 4 will be protected and flows maintained until the detailed design of the Tamarack Richmond lands has been completed and reviewed by the City and RVCA. Refer to ***Figure 03F*** for the location of Reach 4 and protection details. It is proposed that the future outlet channel for the ultimate stormwater management pond outlet will provide compensation for the productivity of Reach 4. Further details and necessary approval from the RVCA will be coordinated as part of detailed design.

The HDFA and EIS also identify several other minor features within the study area and conclude that compensation is not required for infilling these features. Some of these features have been closed in accordance with RVCA permit #RV5-0720, included in ***Appendix A***. As part of the work detailed in RVCA permit #RV5-0720, a temporary sediment management pond has been built within the study area to treat runoff before discharge to Marlborough Creek. Refer to ***Figure 03F*** for the location of the temporary sediment management pond.

1.2 Previous Submissions

The first FSR submission is dated November 12, 2020 and the City of Ottawa and other affected parties reviewed this submission and provided comments to Tamarack in December 2021. Comments related to the FSR, and associated formal responses, can be found in ***Appendix A***.

1.3 Required Permits / Approvals

Agency	Approval Type	Trigger	Remarks
City of Ottawa	Commence Work Notification (CWN)	Construction of new sanitary and storm sewers throughout the subdivision, including any required upgrades to existing sewers.	The City of Ottawa will issue a commence work notification for construction of the sanitary and storm sewers as well as the SWM Pond.
City of Ottawa	MECP Form 1 – Record of Watermains Authorized as a Future Alteration	Construction of watermains throughout the subdivision.	The City of Ottawa is expected to review the watermains on behalf of the MECP through the Form 1 – Record of Watermains Authorized as a Future Alteration.
City of Ottawa & Ministry of the Environment, Conservation and Parks (MECP)	Environmental Compliance Approval for sanitary and storm sewers & Stormwater Management Pond	Construction of new sanitary and storm sewers throughout the subdivision, including any required upgrades to existing sewers.	The City of Ottawa is expected to review the sanitary and storm sewers, and stormwater management pond on behalf of the MECP through the CLI-ECA process.
Rideau Valley Conservation Authority (RVCA)	Permit under Ontario Regulation 174/06, RVCA's Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation. Required for new outlet to the Marlborough Creek (Richmond By-Pass Drain).	Construction of the stormwater management pond and minor adjustments to the Marlborough Creek (Richmond By-Pass Drain) floodplain limits.	Authorization related to the construction of a new outlet to the Marlborough Creek (Richmond By-Pass Drain) and minor adjustments to the floodplain limits to allow for development.
Rideau Valley Conservation Authority (RVCA)	Permit under Ontario Regulation 174/06, RVCA's Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation. Required for the decommissioning of Reach 4.	Decommissioning of existing Reach 4.	Authorization related to the relocation and design of existing Reach 4 per the HDFA (must be replaced by feature that replicates or augments functionality) and the closure of the other existing tributaries.

2.0 BACKGROUND INFORMATION

2.1 Existing Studies, Guidelines, and Reports

The following studies were utilized in the preparation of this report.

- **Ottawa Sewer Design Guidelines**
  City of Ottawa, October 2012
  (Sewer Design Guidelines)
  - **Technical Bulletin ISDTB-2014-01**
    City of Ottawa, February 5, 2014
    (ITSB-2014-01)
  - **Technical Bulletin PIEDTB-2016-01**
    City of Ottawa, September 6, 2016
    (PIEDTB-2016-01)
  - **Technical Bulletin ISTB-2018-01**
    City of Ottawa, March 21, 2018
    (PIEDTB-2016-01)
  - **Technical Bulletin ISTB-2018-04**
    City of Ottawa, June 27, 2018
    (PIEDTB-2016-01)
  - **Technical Bulletin ISTB-2019-02**
    City of Ottawa, July 8, 2019
    (ITSB-2019-02)
  - **Technical Bulletin IWSTB-2024-04**
    City of Ottawa, July 8, 2019
    (IWTSB-2024-04)
- **Ottawa Design Guidelines – Water Distribution**
  City of Ottawa, July 2010
  (*Water Supply Guidelines*)
  - **Technical Bulletin ISD-2010-2**
    City of Ottawa, December 15, 2010
    (ISDTB-2010-2)
  - **Technical Bulletin ISDTB-2014-02**
    City of Ottawa, May 27, 2014
    (ISDTB-2014-02)

- **Technical Bulletin ISTB-2018-02**
  City of Ottawa, March 21, 2018
  (ISTB-2018-02)
- **Technical Bulletin ISTB-2021-03**
  City of Ottawa, August 18, 2021
  (*ISDTB-2021-03)*
- **Technical Bulletin IWSTB-2024-05**
  City of Ottawa, August 18, 2021
  (*IWSDTB-2024-05)*

➢ **City of Ottawa Official Plan**
Adopted by Council November 2022, amended from time to time.
(*Official Plan*)

➢ **Stormwater Management Planning and Design Manual**
Ministry of Environment, March 2003
(*SWMP Design Manual*)

➢ **Erosion & Sediment Control Guidelines for Urban Construction**
Greater Golden Horseshoe Area Conservation Authorities, December 2006
(E&S Guidelines)

➢ **Ontario Building Code Compendium**
Ministry of Municipal Affairs and Housing Building Development Branch, January 1, 2025 Update
(OBC)

➢ **Design Guidelines for Sewage Works**
Ministry of the Environment, 2008
(MECP Design Guidelines)

➢ **Village of Richmond Community Design Plan**
City of Ottawa, July 2010
(CDP)

➢ **Village of Richmond Environment Management Plan**
City of Ottawa, June 17, 2010
(EMP)

➢ **Village of Richmond Water and Sanitary Master Servicing Study**
Stantec Consulting Ltd., July 2011
(MSS)

- **Jock River Watershed Management Plan**
  Rideau Valley Conservation Authority, November 2001
  (Watershed Management Plan)
- **Headwater Drainage Feature Assessment**
  Kilgour & Associates, August 8, 2019
  (HDFA)
- **Technical Memorandum No. 1A – Richmond Population and Wastewater Flow Projections**
  Parsons, March 2019
- **Technical Memorandum No. 2 – Proposed Richmond Pumping Station Upgrade**
  Parsons, May 2019
- **Technical Memorandum No. 5 – New Gravity Trunk Sewer and Local Pumping Station**
  Parsons, August 30, 2019
- **Environmental Impact Statement for the Proposed Development of 6012 Ottawa Street Area**
  Kilgour & Associates Ltd., January 14, 2020
  (EIS)
- **Village of Richmond Water Supply – Functional Design Study – Summary Report - DRAFT**
  Stantec, October 13, 2023
- **Village of Richmond Water Supply – Functional Design Study – Hydrogeological Review**
  Stantec, June 27, 2024
- **Village of Richmond Water Supply Functional Design Study – Technical Memorandum: Optimization of Richmond Communal Water Systems - Draft**
  Stantec, September 11, 2024
  (Water Supply Study)
- **Geotechnical Investigation, Proposed Mixed-Use Development 5970 and 6083 Ottawa Street, Revision 4**
  Paterson Group, March 14, 2025
  (Geotechnical Investigation)
- **LID Feasibility Review – Proposed Residential Development Eagleson Road at Ottawa Street**
  Paterson Group, March 14, 2025
  (LID Feasibility Review)

- **Sump Pump Feasibility Report – Proposed Residential Development – 5970 and 6038 Ottawa Street**
  Paterson Group, March 19, 2025
  (Sump Pump Feasibility Report)
- **Marlborough Creek Outfall Design Drawings**
  GEOMorphix Ltd., March 7, 2025
- **Marlborough Creek Meander Belt Width Delineation Report**
  GEOMorphix Ltd., March 10, 2025

3.0 WATER SUPPLY SERVICING

3.1 Existing Water Services

Developed areas in the Village of Richmond mostly rely on private individual wells, other than the existing Kings Park development and the Western Development Lands, located west of Fortune Street, which are each serviced by their own municipal groundwater supply system.

The MSS for the Village of Richmond, offered recommendations for long-term servicing needs to accommodate both existing and future development within the Village of Richmond. The MSS concluded that the best option was to implement a new public communal well system. This system would draw water from a deep aquifer to service potential growth areas in the village's west (i.e. the Western Development Lands) and eventually meet the demand across the entire Village (both existing and future demands), through phased expansions as the need arises in the future.

Since the time of the MSS, the City of Ottawa has retained Stantec Consulting Ltd. (Stantec) to develop a functional design and phasing plan for the Richmond Village water supply over the short, intermediate, and long-term future conditions. At the time of this FSR, Stantec has prepared a draft summary report (October 2023), hydrogeological review memo (June 2024), and six technical memorandums (dated October 2021 through September 2024), the most recent being the *Draft Richmond Water Supply Functional Design Study - Technical Memorandum: Optimization of Richmond Communal Water Systems (Water Supply Study)* (Stantec, September 11, 2024).

3.2 Proposed Water Supply Strategy

The City of Ottawa and Stantec are in the process of evaluating and finalizing the preferred communal well location and village watermain network strategy. The Water Supply Study identifies that the preferred water supply strategy for the study area is to be serviced by a communal water system including new well facilities and proposed trunk watermains.

The Water Supply Study considers the projected water demands for the Tamarack Richmond Lands, and to ensure the ongoing functional design of the Richmond Village water supply aligns with the development concept outlined in this FSR, the latest development statistics were shared with City staff and Stantec. See related correspondence in ***Appendix B*** for details.

Given that the latest development projections for the study area are being considered in the ongoing design of the Richmond Village water supply system, it can be said that there will be capacity in the system to support the proposed development of the Tamarack Richmond Lands once the required works identified in the Stantec design are complete.

Internally, the study area will be serviced by a watermain distribution network, which will provide, at minimum, two connections to the external Richmond Village watermain network and/or communal well facilities. The conceptual layout of the internal watermain network can be seen in ***Figure 04F***. Once the functional design and phasing plan for the Richmond Village water supply is finalized, a hydraulic analysis will be conducted for the study area's internal watermain network. This analysis will incorporate boundary conditions, well locations, and off-site trunk watermain data from the village's functional design.

The watermain network will be designed to supply water throughout the proposed development in accordance with the City of Ottawa Water Supply Guidelines. Given the projected population for the Tamarack Richmond Lands exceeds 3,000, the water demand criteria summarized in ***Table 3.1*** will be applied to the development, consistent with direction from City staff from recent analyses for similar population sizes.

Table 3.1: Water Supply Guidelines

System Level Parameters	Consumption Rate[1]	Population Density cap/unit[3]	Average Day Demand (L/unit/d)	Residential Outdoor Water Demand (OWD) (L/unit/d)[4]	Maximum Day Demand (L/unit/d)	Peak Hour Demand
SFH	180	3.4	612	700	Average Day Demand + OWD	2.1 x Maximum Day Demand
MLT	198	2.7	535	350	Average Day Demand + OWD	2.1 x Maximum Day Demand
MLT without rear yards	198	2.7	535	0	Average Day Demand	1.6 x Maximum Day Demand
APT	219	1.8	394	0	Average Day Demand	1.6 x Maximum Day Demand
EMP[2]	138	1	138	N/A	1.5 x Average Day Demand[5]	1.8 x Maximum Day Demand
Water Loss per connection	N/A	N/A	80	N/A	Average Day Demand	Average Day Demand
Total Demand			**Sum above for Total Average Day**		**Sum above for Total Max Day**	**Sum above for Total Peak Hour**

1. *Values represent L/cap/day for residential land uses and L/emp/day for employment areas.*
2. *Apply a rate of 17,000 l/h/day if employment totals are unknown. The rate represents the average demand for ICI areas at the 90th percentile.*
3. *Occupancy factors should be chosen according to housing type. The values shown were extracted from Section 4.2.8 of the Ottawa Design Guidelines - Water Distribution (2010)*
4. *Outdoor water demand is applied to single family, semi-detached and townhome units with rear yards.*
5. *The 1.5 multiplier represents the additional outdoor water demand associated with employment areas.*

Watermain crossings of the VIA rail corridor and Marlborough Creek have been considered as part of the Water Supply Study. Any required approvals/agreements related to these potential crossings will be coordinated with the RVCA, VIA Rail, and any other required parties as part of the detailed design and approval process.

The Water Supply Study identifies the Tamarack Richmond Lands as a potential site for future communal well(s), and a dedicated block has been included in the Draft Plan of Subdivision, which can be found in ***Appendix A*** for reference. At the time of this FSR, Dillon Consulting, on behalf of Tamarack, is conducting water well testing to confirm the future supply well(s) can meet all required water quantity and quality requirements. As part of the Tamarack Richmond Lands' first phase of development, Front-Ending Agreements with the City may be required depending on final communal well locations and trunk watermains identified through the ongoing functional water supply design for the village.

3.3 Water Supply Conclusion

The City of Ottawa and Stantec are currently in the process of identifying the preferred communal well location and village watermain network strategy for the Village of Richmond. The *Draft Richmond Water Supply Functional Design Study - Technical Memorandum: Optimization of Richmond Communal Water* (Stantec, September 11, 2024) outlines a plan to service the study area with a communal system, including new communal well facilities and trunk watermains, to meet the projected water demands for the village, including the study area. The ongoing functional design process incorporates the latest development statistics for the Tamarack Richmond Lands to ensure the village's ultimate water supply network has sufficient capacity to support the proposed development.

An internal watermain distribution network with multiple connections to the external watermain network and communal well facilities will service the Tamarack Richmond Lands. A hydraulic analysis will be conducted to ensure the network meets the City of Ottawa's Water Supply Guidelines, considering boundary conditions, well locations, and off-site trunk watermain data from the finalized functional design. The design will accommodate the projected population of over 3,000, adhering to the demand rates outlined in ***Table 3.1***.

4.0 WASTEWATER SERVICING

4.1 Existing Wastewater Services

The MSS considered the ultimate sanitary outlet for the Tamarack Richmond Lands to be the existing Richmond Pump Station (RPS), located approximately 600 meters north of the site, at the intersection of Cockburn Street and Royal York Street. The RPS discharges into the City of Ottawa's central wastewater collection system in Kanata through a discharge forcemain. Required upgrades to the RPS were identified in the MSS and further detailed in the *Technical Memorandum No. 2 – Proposed Richmond Pumping Station Upgrade* (Parsons, May 2019). More recently, City staff prepared a letter dated April 19, 2021, providing a summary of completed works and schedule updates. The letter can be found in ***Appendix C***.

According to the MSS**,** the existing 250 mm and 300 mm diameter sanitary sewers along King Street and Royal York Street are identified as the preferred alignment to provide wastewater servicing capacity for the Tamarack Richmond Lands. Excerpts from the MSS can be found in ***Appendix C***. The study area's connection point considered in the MSS to the sanitary sewer network is MH 06091A, located on Ottawa Street at the intersection of King Street.

As noted in the MSS, the existing King Street and Royal York sewers are not large enough or deep enough to service the Tamarack Richmond Lands, and as such, a new trunk sewer along this route will be required. Since the time of the MSS, Parsons, on behalf of the City of Ottawa, completed a functional design study for the upgrades to the King Street and Royal York Street trunk sewers detailed within the *Technical Memorandum No. 5 – New Gravity Trunk Sewer and Local Pumping Station* (Parsons, August 30, 2019). The Parsons memo also considered upgrades to the existing 250 mm diameter sanitary sewer within Cockburn Street as an alternative to the upgrades detailed in the MSS.

4.2 Proposed Wastewater Servicing Strategy

Consistent with the strategy in the MSS, the study area is to be serviced through a local sanitary sewer network, directing flows to offsite trunk sanitary sewers on Ottawa Street, and ultimately discharging to the RPS.

The letter provided by City staff in April 2021 (Appendix B) confirms that once the planned upgrades to the RPS are completed, the total capacity of the pump station will increase from 160 L/s (pre-upgrades) to 360 L/s, as recommended by the Technical Memorandum No. 1A – Richmond Population and Wastewater Flow Projections (Parsons, March 2019).

The *Technical Memorandum No. 1A – Richmond Population and Wastewater Flow Projections* (Parsons, March 2019) assumed the study area was comprised of approximately 41.7 ha of residential development, 21 ha of industrial area and 1 ha of commercial development. Using these development statistics, and the wastewater design parameters detailed in the Parsons' technical memorandums, it was determined that the total peak flow for the study area was projected to be 50.46 L/s. Wastewater flow calculations using the design criteria detailed in the Parsons' technical memorandums can be found in ***Appendix C***.

To confirm capacity in the upgraded RPS, wastewater flow projections for the latest Tamarack Richmond Lands development statistic have been calculated using the same design criteria detailed in the Parsons' technical memorandums. The projected total peak flow for the development, per the wastewater flow calculations using the Parsons' design criteria, included in ***Appendix C***, is 46.53 L/s, which is below the 50.46 L/s allowance considered in the Parsons' technical memorandums.

The study area will be serviced by an internal network of gravity sanitary sewers ultimately conveying flows to Ottawa Street, consistent with the MSS. See ***Drawing 01D*** for details of the proposed sanitary sewer network. Sanitary design sheets have been prepared utilizing the City of Ottawa Sewer Design Guidelines parameters, which are outlined in ***Table 4.1*** below. The design sheets can be found in ***Appendix C***. The projected total wastewater flow from the study area directed to the Ottawa Street trunk sanitary sewers, applying the wastewater design criteria in ***Table 4.1***, is 54.98 L/s.

Table 4.1: Wastewater Design Criteria

Design Parameter	Value
Residential - Single Family	3.4 persons/unit
Residential – Semi-Detached Home / Townhome	2.7 persons/unit
Residential - Average Daily Demand	280 L/d/per
Residential - Peaking Factor	Harmon's Peaking Factor. Max 4.0, Min 2.0
Harmon - Correction Factor	0.80
Commercial / Institutional – Average Flow	28,000 L/ha/day
Commercial / Institutional – Peaking Factor	1.5 if ICI in contributing area is >20% 1.0 if ICI in contributing area is <20%
Infiltration and Inflow Allowance	0.33 L/s/ha
Park Flow	9,300 L/ha/day
Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} AR^{2/3} S^{1/2}$
Minimum Sewer Size	200 mm diameter
Minimum Manning's 'n'	0.013
Service Lateral Size	135 mm diameter PVC SDR 28 with a minimum slope of 1.0%
Minimum Depth of Cover	2.5 m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6 m/s
Maximum Full Flowing Velocity	3.0 m/s
Additional Considerations	Min slope of 0.65% for the furthest upstream public sewer when there are less than 10 residential connections in this length of pipe.
	The impact of groundwater levels and potential for exfiltration will be reviewed by a geotechnical engineer at detailed design and any required mitigation measures will be implemented.
• *Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012 and Technical Bulletin ISTB-2018-01.*	

As discussed in ***Section 4.1***, upgrades are required to the downstream sanitary sewer network are required to support development of the Tamarack Richmond Lands. The proposed downstream trunk sanitary sewers conveying flows to the RPS, have also been included in the design sheets in ***Appendix C***, and further details can be found in ***Figure 05F***. The downstream trunk sewers have been designed based on the Cockburn Street routing detailed in July 2019 functional design drawings appended to the *Technical Memorandum No. 5 – New Gravity Trunk Sewer and Local Pumping Station* (Parsons, August 30, 2019) and have been sized to keep capacity below 80%, and to provide clearance below the culvert crossing of Marlborough Creek on Ottawa Street. A Front-Ending Agreements with the City is expected be required for the construction of the downstream sanitary trunk sewers.

4.3 Wastewater Servicing Conclusion

The Tamarack Richmond Lands will be serviced by the Richmond Pump Station via an internal network of sanitary sewers and proposed offsite trunk sanitary sewers within Ottawa and Cockburn Street. Capacity within the Richmond Pump Station is available once the planned upgrades, detailed in the *Technical Memorandum No. 2 – Proposed Richmond Pumping Station Upgrade* (Parsons, May 2019) have been completed. The proposed internal gravity sewer network and downstream trunk sewer upgrades are designed to follow the City of Ottawa Sewer Design Guidelines.

5.0 STORM SERVICING & STORMWATER MANAGEMENT

5.1 Existing Stormwater Drainage Conditions

The study area is located within the Jock River Subwatershed (Reach 2) and falls under the jurisdiction of the RVCA. The site's northern boundary is traversed by Marlborough Creek, also known as the Richmond By-Pass Drain.

The majority of the study area drains directly to Marlborough Creek to the north, the exception being the northeast corner, which first drains to a roadside ditch of Eagleson Road to the east, before being conveyed into Marlborough Creek. The pre-development drainage plan is shown on ***Drawing 02D***. Refer to ***Section 1.1*** for more information related to external drainage areas and existing watercourses within the study area.

5.2 Proposed Stormwater Servicing Strategy

Stormwater management requirements for the study area have been adopted from the City Sewer Design Guidelines, MECP Design Guidelines, the MSS*,* the Subwatershed Study*,* and the EMP.

The following design criteria will be required for stormwater management within the Tamarack Richmond Lands, among other requirements:

- Storm sewers on local roads are to be designed to provide a minimum 2-year level of service per the City's Technical Bulletin PIEDTB-2016-01.
- Storm sewers on collector roads are to be designed to provide a minimum 5-year level of service per the City's Technical Bulletin PIEDTB-2016-01.
- Storm sewers on arterial roads are to be designed to provide a minimum 10-year level of service.
- For less frequent storms (i.e., larger than the minimum level of service), the minor system sewer capture will be restricted with the use of inlet control devices to prevent excessive hydraulic surcharges.
- Under full flow conditions, the allowable velocity in storm sewers is to be no less than 0.80 m/s and no greater than 6.0 m/s.
- For the 100-year storm and local and collector roads, the maximum depth of water (static and/or dynamic) on streets, rear yards, public spaces, and parking areas shall not exceed 0.35 m at the gutter.
- The major system shall be designed with sufficient capacity to allow the excess runoff of a 100-year storm to be conveyed within the public ROW or adjacent to the right-of-way provided that the water level must not touch any part of the building envelope, must remain below all building openings during the stress test event (100-year + 20%), and must maintain 15 cm vertical clearance between spill elevation on the street and the ground elevation at the nearest building envelope.

- When catch basins are installed in rear yards, safe overland flow routes are to be provided to allow the release of excess flows from such areas. A minimum of 30 cm of vertical clearance is required between the rear yard spill elevation and the ground elevation at the adjacent building envelope.
- The product of the maximum flow depths on streets and maximum flow velocity must be less than 0.60 m^2/s on all roads.
- Flow spread is not to exceed ½ of the lane width for local roads, must leave one lane free of water for collector roads, and leave one lane free of water in each direction for arterial roads.

Additional criteria per the *EMP* include:

- Enhanced level of stormwater quality treatment, which corresponds with 80% total suspended solids (TSS) removal in accordance with the MECP SWMP Design Manual.
- Though there are no specific quantity control requirements for the Jock River, the requirement for post to pre-development stormwater quantity control for the 2 to 100-year storm events is to be reviewed through appropriate analyses.
- The 7mm of rainfall is to be retained (abstracted) on-site via Low Impact Development (LID).
- General mitigation of stormwater discharge temperature to reduce impacts on the receiving watercourses.

5.2.1 Minor System

Minor system flows from the Tamarack Richmond Lands and its external drainage areas, will be captured and conveyed to a proposed stormwater management (SWM) Pond within the study area via a storm sewer network to be designed in accordance with the relevant City of Ottawa Sewer Design Guidelines, summarized in ***Table 5.1*** below.

The proposed minor system storm sewer network is detailed in ***Drawing 03D***, and associated rational method design sheets can be found in ***Appendix D***. Based on the rational method design sheets, the minor systems flows directed to the proposed SWM Pond are 4360 L/s (west inlet) and 3128 L/s (east inlet)

In the portions of the study area with silty clay soils, homes with basements will be equipped with sump pumps to provide foundation drainage, as is typical in the Village of Richmond. See the *Sump Pump Feasibility Report – Proposed Residential Development – 5970 and 6038 Ottawa Street (Sump Pump Feasibility Report)* (Paterson Group, March 2025) for additional details.

Table 5.1: Stormwater Management Design Criteria

Design Parameter	Value
Minor System Design Return Period	2-Year (Local Streets), 5-Year (Collector Streets), 10-Year (Arterial Streets) – PIEDTB-2016-01
Major System Design Return Period	100-Year
Intensity Duration Frequency Curve (IDF) 2-year storm event: A = 723.951, B = 6.199, C = 0.810 5-year storm event: A = 998.071, B = 6.053, C = 0.814	$i = \dfrac{A}{(t_c + B)^C}$
Minimum Time of Concentration	10 minutes
Rational Method	$Q = CiA$
Runoff coefficient for paved and roof areas	0.90
Runoff coefficient for landscaped areas	0.20
Storm sewers are to be sized employing the Manning's Equation	$Q = \dfrac{1}{n} AR^{2/3} S^{1/2}$
Minimum Sewer Size	250 mm diameter
Minimum Manning's 'n'	0.013
Service Lateral Size	100 mm dia PVC SDR 28 with a minimum slope of 1.0%, and a preferred slope of 2.0%.
Minimum Depth of Cover	2 m from the crown of the sewer to grade (or 1.5m where USF freeboard to HGL is not a constraint, such as in slab-on-grade products)
Minimum Full Flowing Velocity	0.8 m/s
Maximum Full Flowing Velocity	6.0 m/s
Clearance from 100-Year Hydraulic Grade Line to Building Opening	0.30 m
Max. Allowable Flow Depth on Municipal Roads	35 cm above gutter (PIEDTB-2016-01)
Extent of Major System	To be contained within the municipal right-of-way or adjacent to the right-of-way provided that the water level must not touch any part of the building envelope and must remain below the lowest building opening during the stress test event (100-year + 20%) and 15cm vertical clearance is maintained between spill elevation on the street and the ground elevation at the nearest building envelope (PIEDTB-2016-01)
Imperviousness	Based on runoff coefficient (C) where Percent Imperviousness = (C - 0.2) / 0.7 x 100%.
Stormwater Management Model	PCSWMM
Design Storms	Chicago 3-hour Design Storms and 24-hour SCS Type II Design Storms.
Historical Events	July 1st, 1979, August 4th, 1988, and August 8th, 1996

Extracted from City of Ottawa Sewer Design Guidelines, October 2012, as amended by PIEDTB-2016-01, *and based on recently approved residential subdivision designs in the City of Ottawa.*

5.2.2 Hydraulic Gradeline Analysis

A detailed hydraulic gradeline (HGL) analysis will be completed as part of the detailed design of the development. A preliminary PCSWMM 100-year HGL analysis for both the Chicago and 24-hour SCS storms has been conducted as part of this FSR to check storm sewer sizing and freeboard requirements. Results can be found in ***Appendix D***. Note that per ISTB-2018-04, in areas with sump pumps, the 100-year HGL can surcharge to the surface.

The minor system flows used in the preliminary hydraulic grade line analysis are based on the rational method minor system flows, with a 33% increase to account for the additional flows captured by catchbasin grates, lead pipes and/or inlet control devices under the higher surface water depths during the 100-year storm, considerations that will be included as part of the future detailed HGL analysis.

5.2.3 Major System and Grading

Major system flows will also be conveyed to the proposed stormwater management pond via the proposed road network, where they will be treated for quality control and quantity control prior to release to Marlborough Creek. Refer to ***Drawing 04D*** for the proposed major system (overland flow route).

The following grading criteria and guidelines will be applied at the time of detailed design as per City of Ottawa Sewer Design Guidelines:

- Driveway slopes will have a maximum slope of 6%;
- Slope in grassed areas will be between 2% and 5%;
- Grades in excess of 7% will require terracing to a maximum of a 3:1 slope;
- Swales are to be 0.15m deep with 3:1 side slopes unless otherwise indicated on the drawings; and,
- Perforated pipe will be required for drainage swales if they are less than 1.5% in slope.

A grade raise restriction of 2m is recommended in the Geotechnical Investigation for the areas where silty clay is present below services and foundations. Refer to Paterson's Geotechnical Investigation, submitted under separate cover, for additional details.

The preliminary road grading presented in ***Drawing 04D*** respects the grade raise restrictions for the site, partly enabled by the use of sump pumps, discussed in ***Section 5.2.1*** and the *Sump Pump Feasibility Report*.

5.2.4 Proposed Outlet - Stormwater Management (SWM) Pond

SWM Pond 1 is proposed to service the minor and major system flows from the Tamarack Richmond Lands and external drainage areas that drain through the study area. Flows will be treated in the pond for quantity and quality control before being directed into Marlborough Creek, which connects to the Jock River approximately 2 km downstream of the study area. The location of SWM Pond 1 can be seen in ***Drawing 03D*** and additional pond design details can be found in ***Figure 06F***.

The target quality control objective is an Enhanced Level of Protection, which corresponds with 80% total suspended solids (TSS) removal in accordance with the MECP *SWMP Design Manual*. There are no specific quantity control requirements for the Jock River, however, post to pre-development control for the 2 to 100-year storm events has been considered, consistent with the recommendations in the EMP.

SWM Pond 1 has been sized for a total drainage area of 152.87 Ha, and to provide peak outflows below the pre-development outflows for the 2 to 100-year storm events, as determined by JFSA. See pre-development modeling correspondence from September 2020 included in ***Appendix D***. Preliminary PCSWMM modeled peak outflows and storage volumes can also be found in the Allowable Pond Volume and Discharge Rates – SWM Pond 1 table in ***Appendix D***, which confirms the SWM Pond 1 respects the target outflows for the 2 to 100-year storm events.

The proposed SWM Pond 1 has a bottom elevation of 90.85 m, permanent pool elevation of 92.35 m, extended detention elevation of 92.65 m, and maximum storage elevation of 94.30 m. The permanent pool elevation has been set at the 2-year water level in Marlborough Creek at cross-section 2353. The RVCA floodplain mapping and HEC-RAS modeling results are included in ***Appendix A*** for reference.

Given that the Jock River water levels above the 2-year level will be higher than the permanent pool, restricted outlet conditions were also considered in preliminary pond modeling. Taking a similar approach to that documented for tributaries of the Jock River in the November 2004 Jock River Flood Risk Mapping Hydraulics Report, the 2, 5, 10, 25, 50 and 100-year flows on the subdivision were modeled with corresponding 100, 50, 25, 10, 5 and 2 year flood levels on the Jock River (at Tributary D, Reach 1, Cross-Section 2353 from **Appendix A**); each combination having a combined probability of a 100 year return period. The purpose of this approach is to account for the differences in timing between a subdivision and the much larger Jock River watershed. Both scenarios are considered to have a 1:100-year return period; assuming that 100-year rainfall on the subdivision and a 100-year flood level on the Jock River is occurring at the same time would be much more than a 100-year return period, statistically. Peak outflows and storage volumes under restricted outlet conditions can be found in the Allowable Pond Volume and Discharge Rates – SWM Pond 1 table, included in ***Appendix D***.

An open channel will convey pond outflows to Marlborough Creek, as shown in Figure 06F. GeoMorphix has prepared a preliminary design of the pond outlet channel using the modeled pond outflows included in ***Appendix D***. The preliminary pond outfall design can be seen in the *Marlborough Creek Outfall Design Drawings* (GEO Morphix Ltd., March 7, 2025), submitted under separate cover.

The drawdown time calculation for SWM Pond 1 per the *SWMP Design Manual* can be found in ***Appendix D***. Based on the extended detention elevation of 92.80 m, and an orifice diameter of 0.37 m, the proposed SWMP has a calculated drawdown time between 24 and 48 hours. Additional pond sizing and outlet structure information can be found in ***Figure 06F***.

At the inlets to the proposed SWM Pond, the storm sewers are partially submerged, but the amount of standing water in the pipes is gradually reduced as the sewers progress upstream and the inverts rise above the permanent pool elevation. At the time of detailed design, the extent of the submergence will be confirmed and considered in the HGL modeling consistent with the City Sewer Design Guidelines.

5.2.5 Low Impact Development (LID) Measures

As recommended by the EMP, the use of LIDs within the Tamarack Richmond Lands was considered, and the suitability of LIDs for the study area has been evaluated from a geotechnical and hydrogeological perspective by Paterson Group, in the *LID Feasibility Review – Proposed Residential Development – Eagleson Road at Ottawa Street (LID Feasibility Review)* (Paterson Group, March 14, 2025), submitted under separate cover. The review concludes that based on the soil gradation, and the groundwater information available at the time of this report, the study area will have difficulty meeting the requirements for infiltration-type LID measures detailed in the City's Technical Bulletin IWSTB-2024-04. The preliminary LID concept considered in this analysis is provided in ***Appendix D***.

As noted in the LID Feasibility Review, additional groundwater monitoring is ongoing, and the review will be updated upon the completion of the monitoring requirements detailed in IWSTB-2024-04.

Preliminary pre-development and post-development water budget calculations (***Appendix D***) have been prepared by Paterson Group, and will be updated as the design process advances to incorporate any LID measures incorporated into the development.

5.3 Stormwater Conclusions

Minor system flows for the Tamarack Richmond Lands and adjacent parcels of land currently draining through the study area will be captured and conveyed to the proposed SWM Pond 1 via an internal storm sewer network. Major system flows will also be conveyed to the proposed SWM Pond 1 via the internal road network. SWM Pond 1 has been sized to provide an Enhanced Level of Protection (80% TSS Removal) and post to pre-development control for the 2 to 100-year storm events before directing outflows to Marlborough Creek to the north.

The preliminary HGL modeling results demonstrate that the storm sewer network is adequately sized and meets freeboard requirements per the City of Ottawa Sewer Design Guidelines. A detailed HGL assessment will be prepared as part of the detailed design process.

6.0 UTILITIES

Utility services extending to the site may require connections to multiple existing infrastructure points: consultation with Enbridge Gas, Hydro Ottawa, Rogers, and Bell is ongoing to confirm the utility servicing strategy for the study area.

7.0 EROSION AND SEDIMENT CONTROL

Soil erosion occurs naturally and is a function of soil type, climate and topography. The extent of erosion losses is exaggerated where vegetation has been removed during construction and the top layer of soil becomes agitated, and where increased stormwater runoff is directed to natural areas.

Erosion and sediment controls will be implemented and will be maintained throughout construction. The erosion and sediment controls will include (but are not limited to):

- Minimize the area to be cleared and grubbed.
- Plan construction at proper time to avoid flooding.
- Provide sediment traps and basins during dewatering.
- Silt fence to be installed around the perimeter of the site, and along Reach 4. Silt fence to be cleaned and maintained throughout construction. Silt fence to remain in place until the working areas have been stabilized and re-vegetated. See ***Figure 03F.***
- A mud mat to be installed at the construction access points in order to prevent mud tracking onto adjacent roads.
- Catch basins to have inserts installed under the grate during construction to protect from silt entering the storm sewer system.
- Extent of exposed soils to be limited at any given time, and exposed areas will be re-vegetated as soon as possible.
- Bulkhead barriers to be installed over the lower half of the outletting sewers (where required) to reduce sediment loadings during construction.
- Exposed slopes to be protected with plastic or synthetic mulches.
- Stockpiles of cleared materials as well as equipment fueling and maintenance areas to be located away from swales, watercourses, and other conveyance routes.
- Seepage barriers such as silt fencing, straw bale check dams and other sediment and erosion control measures to be installed in any temporary drainage stormwater conveyance channels and around disturbed areas during construction and stockpiles of fine material.
- Open surface structures such as manholes and catchbasins will be covered until these structures are commissioned and put into use, streets are asphalted and curbed, and the surrounding landscape is stabilized.

As discussed in ***Section 1.1***, Reach 4 is to be protected with a silt fence until all necessary approvals are in place for its closure/replacement and a temporary sediment pond and outlet to the Marlborough Creek has been constructed in accordance with RVCA permit #RV5-0720, included in ***Appendix A***.

The contractor will, at every rainfall, complete inspections and guarantee proper performance. The inspection is to include:

- Verification that water is not flowing under silt barriers.
- Clean and change inserts at catch basins.

A qualified Inspector will give recommendations related to the mitigation measures that are being implemented and maintained. E.g. bulkhead barriers, filter cloths on open surface structures, silt fencing, and other ES&C measures may require removal of sediment and repairs. The City of Ottawa's Protocol for Wildlife Protection is to be followed during construction.

After build-out of the development, applicable sewers will be inspected and cleaned. All sediment and construction fencing should be removed following construction, providing there is no exposed soil or other potential sources of sedimentation.

8.0 CONCLUSIONS AND RECOMMENDATIONS

This Functional Servicing Report (DSEL, March 2025) provides details on the planned on-site and off-site municipal services for the Tamarack Richmond Lands and evaluates municipal infrastructure capacity in the Village of Richmond for the planned development.

- An internal watermain distribution network with multiple connections to the external watermain network and communal well facilities will service the Tamarack Richmond Lands.
- The City of Ottawa and Stantec are currently in the process of identifying the preferred communal well location and village watermain network strategy for the Village of Richmond, which will identify the preferred strategy to service the study area with a communal system, including new communal well facilities and trunk watermains. The ongoing functional design process incorporates the latest development statistics for the Tamarack Richmond Lands to ensure the village's ultimate water supply network has sufficient capacity to support the proposed development.
- The Tamarack Richmond Lands will be serviced by the Richmond Pump Station via an internal network of sanitary sewers and proposed offsite trunk sanitary sewers within Ottawa and Cockburn Street.
- Capacity within the Richmond Pump Station is available once the planned upgrades, detailed in the *Technical Memorandum No. 2 – Proposed Richmond Pumping Station Upgrade* (Parsons, May 2019) have been completed.
- Minor system flows for the Tamarack Richmond Lands and adjacent parcels of land currently draining through the study area will be captured and conveyed to the proposed SWM Pond 1 via an internal storm sewer network.
- Major system flows will also be conveyed to the proposed SWM Pond 1 via the internal road network.
- SWM Pond 1 has been sized to provide an Enhanced Level of Protection (80% TSS Removal) and post to pre-development control for the 2 to 100-year storm events before directing outflows to Marlborough Creek to the north.

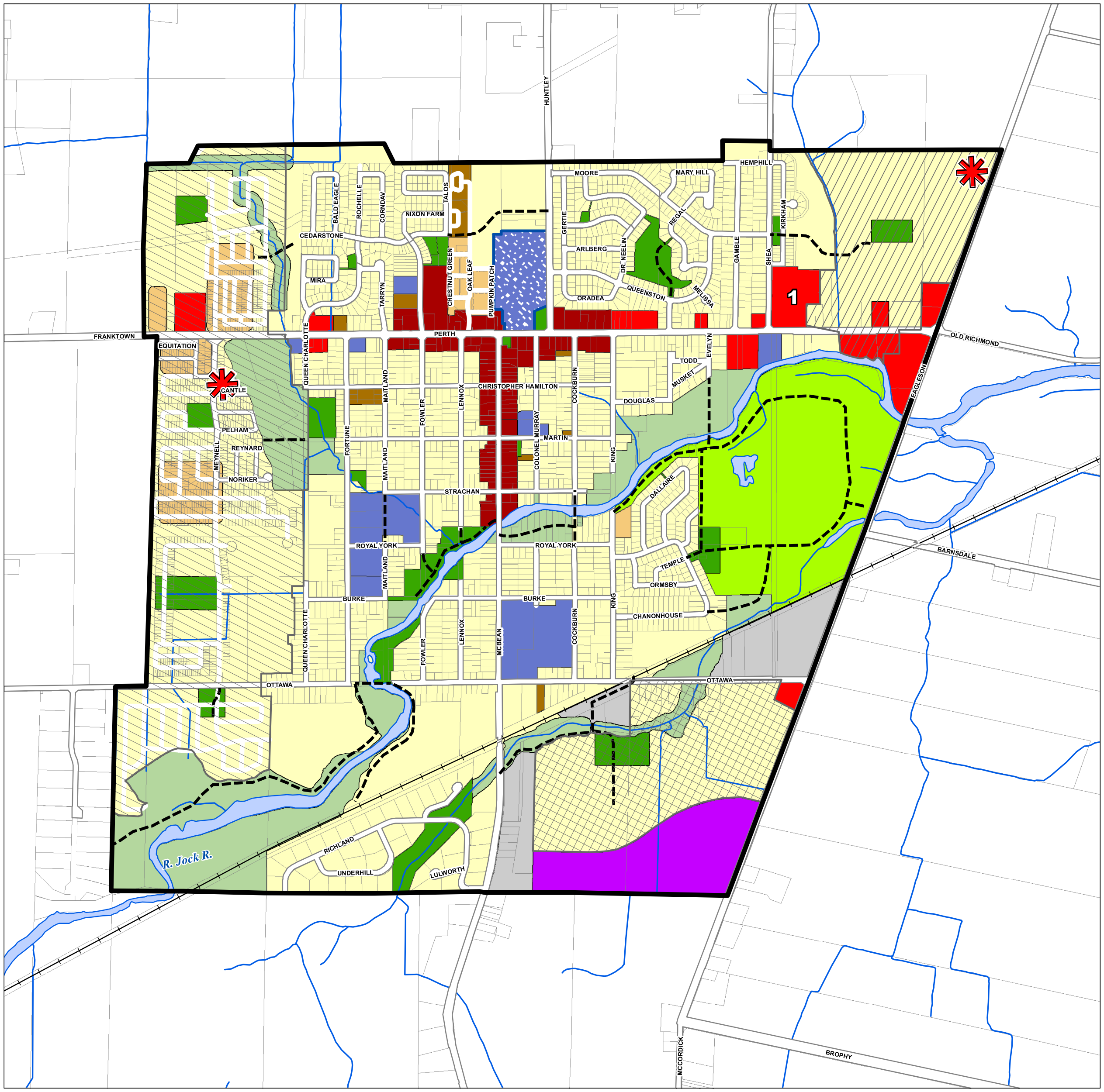
Prior to detailed design of the infrastructure presented in this report, this FSR will require approval under the Planning Act as supporting information for the development applications. Project-specific approvals are also expected to be required for the infrastructure presented in this report from the City of Ottawa, Ministry of Environment, Conservation, and Parks, Department of Fisheries and Oceans and Mississippi Valley Conservation Authority.

Prepared by,
David Schaeffer Engineering Ltd.

Per: Braden Kaminski, P.Eng.

Z:\Projects\18-1042_Tamarack_Richmond\B_Design\B3_Reports\B3-2_Servicing (DSEL)\2025-03-20_FSR_Sub2

Appendix A – Background



VILLAGE OF / VILLAGE DE

Richmond

SECONDARY PLAN - VOLUME 2

Schedule A - Designation Plan

PLAN SECONDAIRE - VOLUME 2

Annexe A - Plan de désignation

Richmond Secondary Plan Boundary / Limites du plan secondaire de Richmond

DESIGNATION / DÉSIGNATION

- Village Residential 1 / Zone résidentielle du village 1
- Village Residential 2 / Zone résidentielle du village 2
- Village Residential 3 / Zone résidentielle du village 3
- Village Core / Centre du village
- Village Commercial / Quartier commercial du village
- 1 Village Commercial 1/ Quartier commercial du village 1
- Potential Convenience Commercial Uses / Utilisations possibles de commerce de proximité
- Multi-use Pathways / Sentiers polyvalent
- Western Development Lands / Terrains d'urbanisation à l'ouest
- Northeastern Development Lands / Terrains d'urbanisation au nord-est
- Southeastern Development Lands / Terrains d'urbanisation au sud-est
- Village Industrial Area / Zone industrielle du village
- Southeastern Development Area / Zone de développement du sud-est
- Village Institutional / Zone institutionnel du village
- Fairgrounds / Parc d'expositions
- Village Greenspace / Espaces verts du village
- Village Park / Parc du village
- Natural Environment Area / Secteur écologique naturel

Consolidation and Amendments / Consolidation et amendements
OPA #5 - 09/23

Ottawa

0 125 250 500 750 1,000 Meters

Planning, Infrastructure and Economic Development Department, Geospatial Analytics, Technology and Solutions
Services de la planification, de l'infrastructure et du développement économique, Analyse géospatiale, technologie et solutions

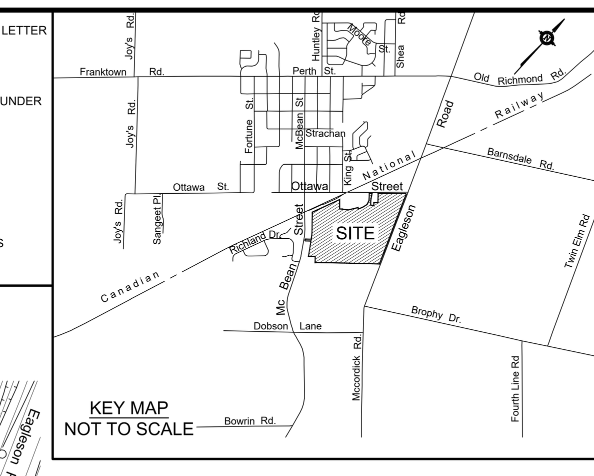
REVISION SCHEDULE			
NO.	REVISION	DATE	BY
12	WATERMAIN LINK BET. ST. 6/8	OCT. 3, 2024	N
11	REVISED CONCEPT	AUG. 22, 2024	N
10	REVISIONS PER CITY / LOTTING	MAY. 30, 2024	N
9	REVISED	MAR. 20, 2024	N
8	REVISED CONCEPT	FEB. 7, 2024	N
7	REVISED FLOOD LIMIT PER RVCA	JULY 26, 2023	N
6	REVISED CONCEPT	JULY 11, 2023	N
5	REVISED CONCEPT	JULY 6, 2023	N
4	AREA TABLE ADDED	MAY 9, 2023	N
4	REVISED CONCEPT	MAR. 17, 2022	N
3	REVISIONS	SEPT. 15, 2020	N
1	PLAN PREPARED	FEB. 13, 2020	PD

SUBJECT TO THE CONDITIONS, IF ANY, SET FORTH IN OUR LETTER DATED

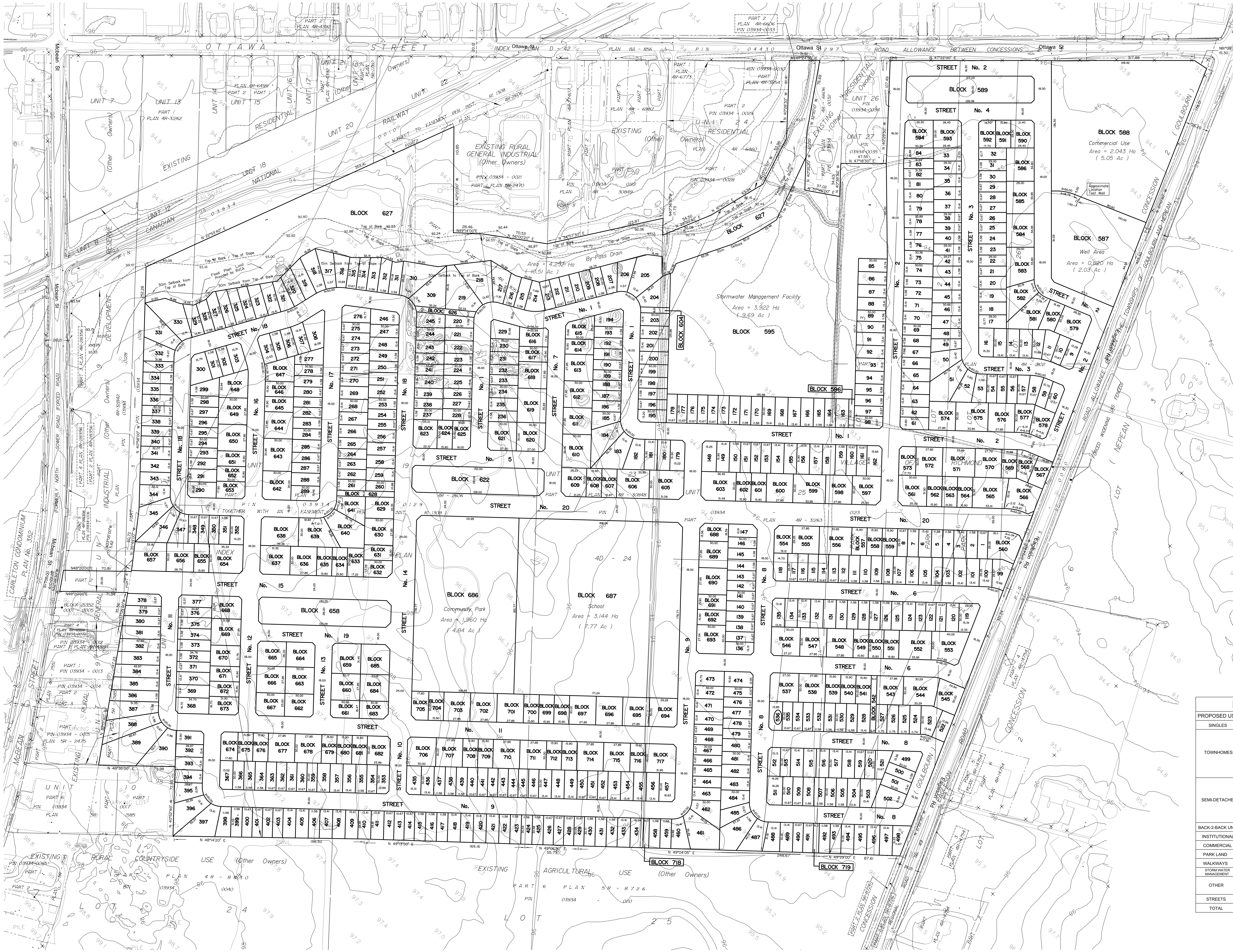
_________________________.

THIS DRAFT PLAN IS APPROVED BY THE CITY OF OTTAWA UNDER SECTION 51 OF THE PLANNING ACT.
THIS ____ DAY OF ____________, 20__ .

____
ADAM BROWN, MANAGER
DEVELOPMENT REVIEW-RURAL
PLANNING, DEVELOPMENT AND BUILDING SERVICES
DEPARTMENT, CITY OF OTTAWA



KEY MAP
NOT TO SCALE



DRAFT PLAN OF SUBDIVISION OF

PART OF LOT 26
CONCESSION 2
Geographic Township of Goulbourn
and
PARK LOTS 1 and **2** and
PART OF PARK LOT 3
(South Ottawa Street)
VILLAGE OF RICHMOND
and
PART OF UNITS 9, 11, 19, 23, 25
INDEX PLAN 4D-24
CITY OF OTTAWA
Prepared by Annis , O'Sullivan , Vollebekk Ltd.

Scale 1 : 1250

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 :
The boundaries of the lands to be subdivided and their relationship to adjoining lands have been accurately and correctly shown.

____________ Date

____
JAMIE LESLIE
ONTARIO LAND SURVEYOR

OWNER'S CERTIFICATE

This is to certify that we are the owners of the lands to be subdivided and that this plan was prepared in accordance with our instructions.

____________ Date

____
CHRISTOPHER TAGGART
TAMARACK (RICHMOND EAST) CORPORATION
TAMARACK (RICHMOND WEST) CORPORATION
I have authority to bind the corporation.

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51-17 OF THE PLANNING ACT
(a) see plan
(b) see plan
(c) see plan
(d) single, multiple family residential housing, commercial, park land, institutional, open space, stormwater management/drain
(e) see plan
(f) see plan
(g) see plan
(h) City of Ottawa
(i) see soils report
(j) see plan
(k) sanitary, storm sewers, municipal water, bell, hydro, cable and gas to be available
(l) see plan

PROPOSED LAND USE TABLE			
PROPOSED USE	LOT \ BLOCK	NO. OF UNITS	AREA Ha / (Ac)
SINGLES	1 - 536	536	21.775 (53.81)
TOWNHOMES	537, 538, 543-548, 552, 553, 555, 556, 560, 561, 565, 566, 570-572, 574-576, 579, 583-586, 590, 593, 594, 597-600, 603, 605, 606, 609-613, 618-621, 623, 629, 630, 636-639, 642-644, 648-650, 654, 656, 657, 659, 660, 662-670, 677, 678, 682, 684, 685, 689, 690, 693-697, 701-703, 706, 707, 710, 711, 714, 715, 717	387	8.435 (20.84)
SEMI-DETACHED	539, 540, 541, 549, 550, 551, 554, 557, 558, 559, 562-564, 567-569, 573, 577, 578, 580-582, 591, 592, 601, 602, 607, 608, 614-617, 624, 625, 631-635, 640, 641, 645-647, 651-653, 655, 661, 671-676, 679-681, 683, 688, 691, 692, 698-700, 704, 705, 708, 709, 712, 713, 716	144	3.765 (9.30)
BACK-2-BACK UNITS	589, 622, 658	106	1.139 (2.81)
INSTITUTIONAL	687		3.144 (7.77)
COMMERCIAL	588		2.044 (5.05)
PARK LAND	686		1.961 (4.85)
WALKWAYS	542, 596, 604, 626, 628, 718, 719		0.182 (0.45)
STORM WATER MANAGEMENT	595		3.922 (9.69)
OTHER	587		0.820 (2.03)
	627		4.252 (10.51)
STREETS	1 - 20		15.798 (39.04)
TOTAL		1 173	67.237 (166.15)

ANNIS, O'SULLIVAN, VOLLEBEKK LTD.
14 Concourse Gate, Suite 500
Nepean, Ont. K2E 7S6
Phone: (613) 727-0850 / Fax: (613) 727-1079
Email: Nepean@aovltd.com
Ontario Land Surveyors

Job No. 22005-20 Tamarack Pt Lt 26 C2 DPS DI2 | N

DEVELOPMENT SERVICING STUDY CHECKLIST

4.1 General Content		
☐	Executive Summary (for larger reports only).	N/A
☐	Date and revision number of the report.	Title Page
☐	Location map and plan showing municipal address, boundary, and layout of proposed development.	Appendix A
☐	Plan showing the site and location of all existing services.	Appendix D
☐	Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	Section 1.0, Section 1.1, Section 5.1
☐	Summary of Pre-consultation Meetings with City and other approval agencies.	Section 1.2
☐	Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.	All sections
☐	Statement of objectives and servicing criteria.	Section 1.0, Section 3.2, Section 4.2, and Section 5.2
☐	Identification of existing and proposed infrastructure available in the immediate area.	Sections 3.1, Section 4.1, and Section 5.1
☐	Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	Section 1.1
☐	Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	Drawing 04D
☐	Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	Section 3.1, Section 4.1
☐	Proposed phasing of the development, if applicable.	TBD
☐	Reference to geotechnical studies and recommendations concerning servicing.	Section 1.1, Section 2.1, Section 5.1, Section 5.2.3
☐	All preliminary and formal site plan submissions should have the following information: -Metric scale -North arrow (including construction North) -Key plan -Name and contact information of applicant and property owner -Property limits including bearings and dimensions -Existing and proposed structures and parking areas -Easements, road widening and rights-of-way -Adjacent street names	All Drawings

4.2 Development Servicing Report: Water		
☐	Confirm consistency with Master Servicing Study, if available	Section 3.2
☐	Availability of public infrastructure to service proposed development	Section 3.2, Appendix B
☐	Identification of system constraints	Section 3.1, Section 3.2
☐	Identify boundary conditions	TBD
☐	Confirmation of adequate domestic supply and pressure	Section 3.2, Appendix B

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☐	Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.	TBP
☐	Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.	TBP
☐	Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design	TBP
☐	Address reliability requirements such as appropriate location of shut-off valves	TBD
☐	Check on the necessity of a pressure zone boundary modification	N/A
☐	Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range	Stantec Water Supply Functional Design Study
☐	Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	Section 3.2 & Figure 04F
☐	Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	Stantec Water Supply Functional Design Study
☐	Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Section 3.2
☐	Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	TBP

4.3 Development Servicing Report: Wastewater

☐	Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).	Section 4.2
☐	Confirm consistency with Master Servicing Study and/or justifications for deviations.	Section 4.2
☐	Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	MSS
☐	Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Section 4.1 & 4.2, Appendix C
☐	Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	Section 4.2, Appendix C
☐	Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	Appendix C
☐	Description of proposed sewer network including sewers, pumping stations, and forcemains.	Section 4.2, Appendix C, Drawing 01D, Figure 05F
☐	Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	MSS

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☐	Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	Section 4.1 & 4.2, Appendix C
☐	Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	Technical Memorandum No. 1A – Richmond Population and Wastewater Flow Projections (Parsons, March 2019)
☐	Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	N/A
☐	Special considerations such as contamination, corrosive environment etc.	MSS

	4.4 Development Servicing Report: Stormwater Checklist	
☐	Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)	Section 1.1 & Section 5.1
☐	Analysis of available capacity in existing public infrastructure.	N/A
☐	A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	Drawing 03D
☐	Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	Section 5.2.4
☐	Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Section 5.2.4
☐	Description of the stormwater management concept with facility locations and descriptions with references and supporting information	Section 5.2.4, Figure 06F
☐	Set-back from private sewage disposal systems.	N/A
☐	Watercourse and hazard lands setbacks.	Appendix A
☐	Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	Section 1.2
☐	Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	Section 5.2
☐	Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).	Section 5.2, Section 5.2.4
☐	Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	Section 1.1, Section 5.1, Figure 03F
☐	Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	Section 5.2, Appendix D
☐	Any proposed diversion of drainage catchment areas from one outlet to another.	N/A
☐	Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	Section 5.2, Appendix D, Drawing 02D, 03D, Figure 06F
☐	If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.	N/A
☐	Identification of potential impacts to receiving watercourses	TBD (GeoMorphix Analysis)

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☐	Identification of municipal drains and related approval requirements.	Section 1.1, Section 1.3
☐	Descriptions of how the conveyance and storage capacity will be achieved for the development.	Section 5, Appendix D
☐	100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	Section 5.2.3 & Drawing 04D
☐	Inclusion of hydraulic analysis including hydraulic grade line elevations.	Section 5.2.2, Appendix D
☐	Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Section 7.0, Figure 03F
☐	Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	Section 1.1, Appendix A, Drawings, Figures
☐	Identification of fill constraints related to floodplain and geotechnical investigation.	Section 1.1, Appendix A

4.5 Approval and Permit Requirements: Checklist

☐	Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement ct. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.	Section 1.1
☐	Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	Section 1.3
☐	Changes to Municipal Drains.	Section 1.1, Section 5.1
☐	Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	Section 1.3

4.6 Conclusion Checklist

☐	Clearly stated conclusions and recommendations	Section 8.0
☐	Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	Section 1.2, Appendix A
☐	All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario	Section 8.0

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

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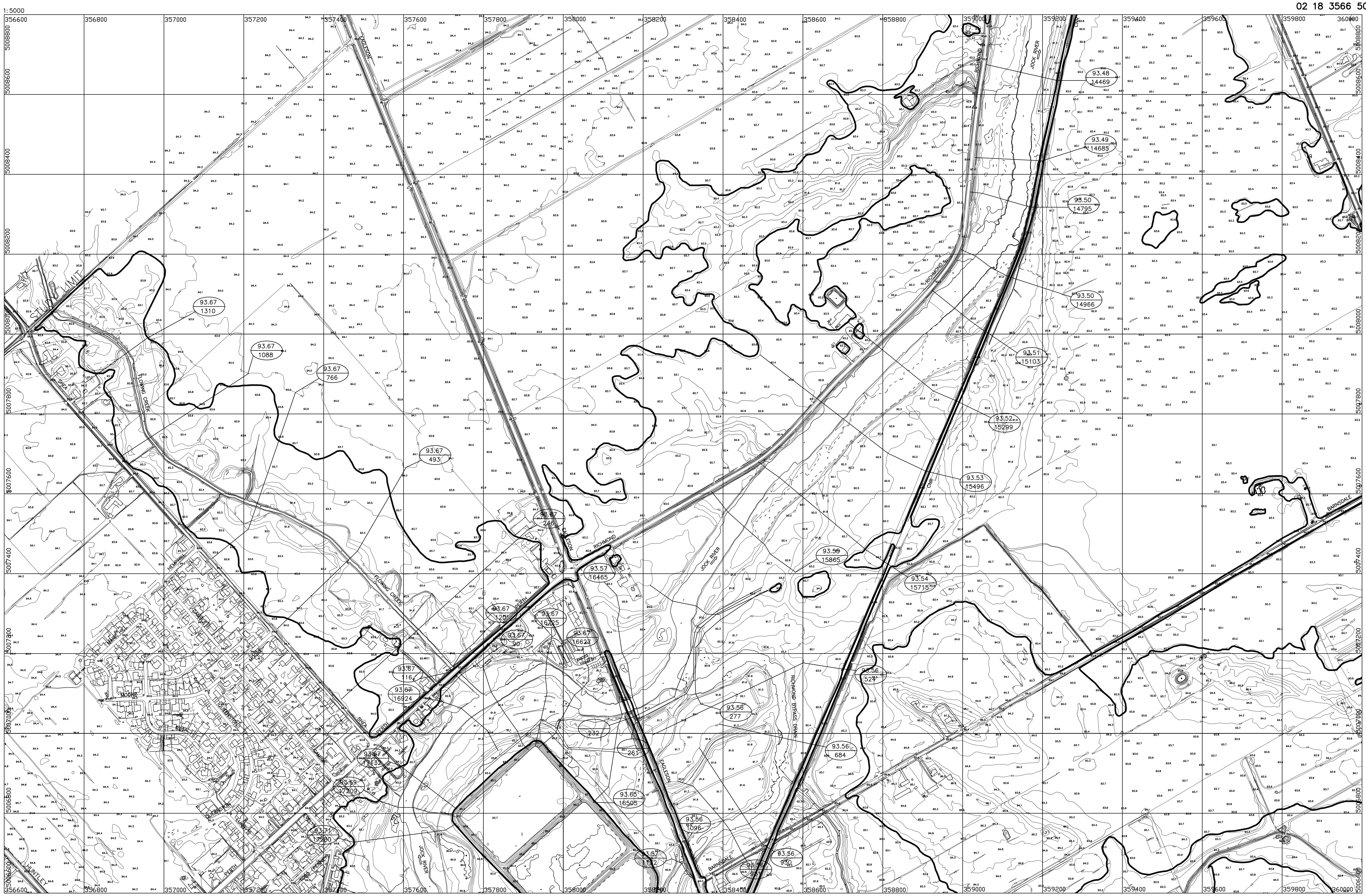


MAP No. 6
CARTE No.

RIDEAU VALLEY CONSERVATION AUTHORITY

OFFICE DE PROTECTION DE LA NATURE DE LA VALLEE RIDEAU

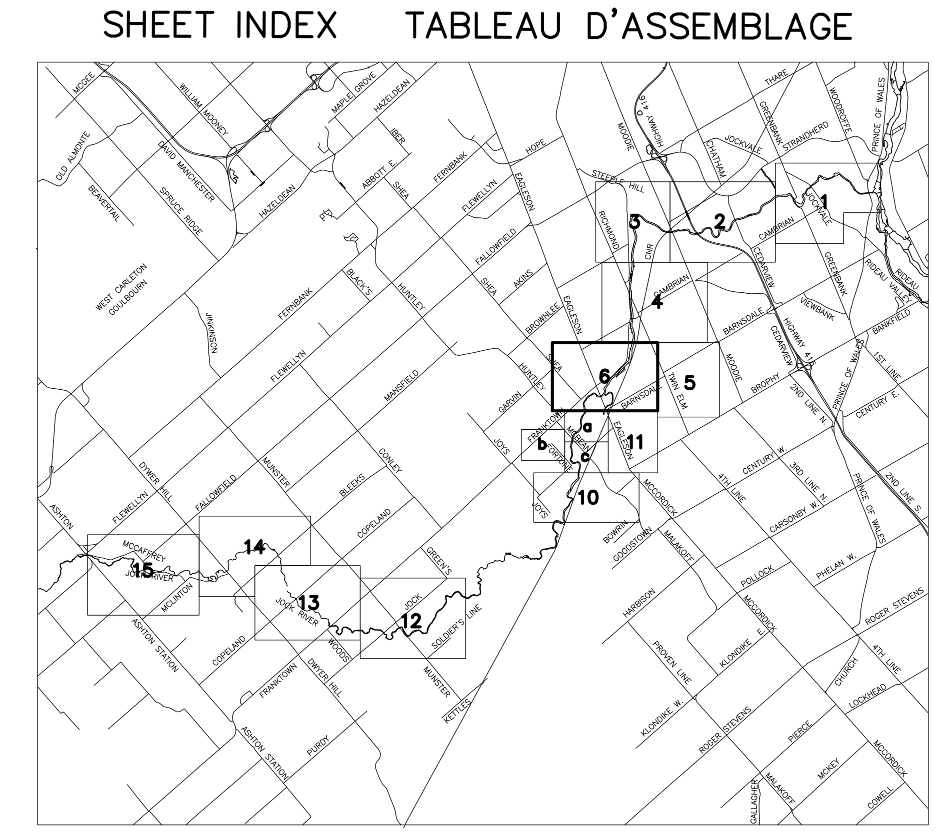
FLOOD RISK MAP
JOCK RIVER
CARTE DU RISQUE D'INONDATION

LÉGEND LEGENDE

Legend	Legende
Aerial Cableway	Telepherique
Boundary	**Frontiere**
International	Internationale
Interprovincial	de province
District Township Indian Reserve	Limite de district, de canton, de reserve indienne
Approximate	Approximatif
Lot, Concession	Lot, Concession
Approximate	Approximatif
Annotation LOT CON	Annotation
Park Boundary	Limite de parc
Bridge	**Pont**
Road, Railroad	de route, de chemin, de fer
Foot Bridge	Passerelle
Building	Batiment
Chimney	Cheminee
Cliff, Pit, Pile	Falaise, Graviere ou Sabliere, Pile
Contours	**Courbes de niveau**
Intermediate	intermediaires
Index	Maitresses
Auxiliary	Auxiliaires
Indefinite	Approximatives
Depression	Courbes de cuvettes
Control Points	**Points de controle**
Horizontal 010774051	Horizontal
Vertical 100.02	Vertical
Culvert	Ponceau
Dam	Barrage
Ditch	Fosse
Dyke	Digue
Falls	Chutes
Double line river	Riviere a ligne double
Fence, Hedge, Wall	Cloture , Haie, Mur
Feature Outline (construction features etc.)	Limites (en construction, etc.)
Flooded Land	Region Inondee
Lake, Pond	Lac, Bassin
Lock	Ecluses
Marsh or Swamp	Marais ou Marecage
Mast	Mat
Pipeline (above ground)	Pipe-Line (au dessus de la terre)
Railroad	**Chemin de fer**
Single Track	Voie Unique
Abandoned	Desaffecte
Turnable	Plaque Tournante
Rapids	**Rapides**
Double line river with multiple rapids	Riviere a ligne double avec plusieurs chutes
Double line river with multiple rapids	Riviere a ligne double avec plusieurs chutes
Reservoir	Reservoir
River, Stream, Canal	Fleuve, Riviere, Canal
Approximate Seasonal	Approximatif Saisonnier
Direction of Flow	Direction du courant
Road	**Route**
Hwy, County, Township	Chemin de Comte Canton
Access (road of doubtful maintenance or significant driveway)	Chemin d'acces (condition inconnue ou entree privee)
Trail, Bush , Road (portage, alley)	Sentier, Chemin de Bois (portage, ruelle)
Rock Significant	Roche Significatit
Shoal	Banc
Spot Elevation (lake elevations) 104.7	Point Cote (elevation du plan d'eau)
Tower	Tour
Transmission Line	Ligne de transport d'energie
Poles	Poteau
Pylon	Pylone
Tunnel	Tunnel
Utility Pole	Poteau
Wharf, Dock, Pier	Quai, Bassin, Jetee
Wooded Area	Region Boisee
Groyne	Epi
FLOOD PLAIN INFORMATION	**RENSEIGNEMENTS DES PLAINES INONDABLES**
Regulatory floodline	La crue regulatrice
Fill Line	Ligne de remblai

	87.65 / 1000	
Regulatory flood elevation	87.65	Niveau de la crue regulatrice
Cross section location		Emplacement de la coupe transversale
Cross section number	1000	Numero del la coupe transversale

SHEET INDEX TABLEAU D'ASSEMBLAGE



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15 1:5000 Map Sheet

e 1:2000 Map Sheet

CONTOUR INTERVAL 1.0 METRE
WITH 0.5 METRE AUXILLIARY CONTOUR
NORTH AMERICAN DATUM 1983

EQUIDISTANCE DES COURBES DE NIVEAU 1.0 METRE
AVEC COURBES DE NIVEAU AUXILIERE DE 0.5 METRE
SYSTEME DE REFERENCE GEODESIQUE NORD-AMERIQUE 1983

COMPILATION NOTE:
Production techniques used in the preparation of this map are designed for Class "A" standards.

PHOTOGRAMMETRIE:
Les normes de production de cette carte se conforment aux standards de premiere classe.

SCALE 1:5000 ECHELLE
METRES 50 0 100 200 300 400 500 METRES
FEET 200 0 200 400 600 800 1000 1200 1400 1600 1800 2000 FEET

GENERAL INFORMATION:

Vertical datum	Mean Sea Level
Horizontal datum	North American (1983)
Map Projection	3° Transverse Mercator
Central Meridian	75° 30m West
Grid Spacing	10 centimetres
Aerial Photography	September 2001 1:3600 scale

RESENSEIGNEMENTS GENEREAUX:

Niveau de reference	Niveau Moyen de la Mer
Systeme geodesique	Nord-Americain (1983)
Projection	3° Transverse de Mercator
Meridian central	75° 30m Ouest
Quadrillage de	10 centimetres
Photographies aeriennes	Septembre 2001 1:3600 Echelle

Ottawa

ASSOCIATION OF ONTARIO LAND SURVEYORS
S. M. PERKINS
CRII2
Responsible for provision of topographic mapping

PSR

REGISTERED PROFESSIONAL ENGINEER
P. FRIGON
PROVINCE OF ONTARIO
Responsible for flood plain delineation and hydrotechnical analysis

02 18 3566 50066

MAP No. a
CARTE No.

1:2000

02 18 3570 50056

RIDEAU VALLEY CONSERVATION AUTHORITY

OFFICE DE PROTECTION DE LA NATURE DE LA VALLEE RIDEAU

FLOOD RISK MAP
JOCK RIVER
CARTE DU RISQUE D'INONDATION

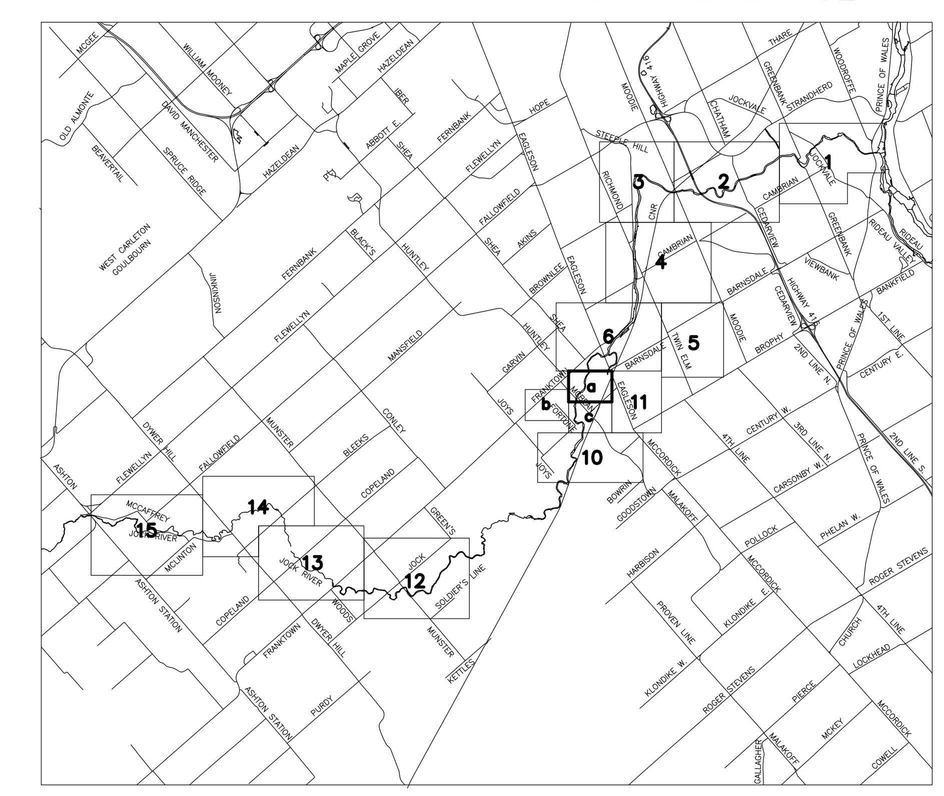
LÉGEND LEGENDE

Aerial Cableway	Telepherique
Boundary	Frontiere
International	Internationale
Interprovincial	de province
District Township Indian Reserve	Limite de district, de canton, de reserve indienne
Approximate	Approximatif
Lot, Concession	Lot, Concession
Approximate	Approximatif
Annotation LOT CON	Annotation
Park Boundary	Limite de parc
Bridge	Pont
Road, Railroad	de route, de chemin, de fer
Foot Bridge	Passerelle
Building	Batiment
Chimney	Cheminee
Cliff, Pit, Pile	Falaise, Graviere ou Sabliere, Pile
Contours	Courbes de niveau
Intermediate 69	intermediaires
Index 70	Maitresses
Auxiliary	Auxiliaires
Indefinite	Approximatives
Depression	Courbes de cuvettes
Control Points	Points de controle
Horizontal 010774051	Horizontal
Vertical 100.02	Vertical
Culvert	Ponceau
Dam	Barrage
Ditch D	Fosse
Dyke	Digue
Falls	Chutes
Double line river	Riviere a ligne double
Fence, Hedge, Wall -X- -W-	Cloture , Haie, Mur
Feature Outline (construction features etc.)	Limites (en construction, etc.)
Flooded Land Flooded	Region Inondee
Lake, Pond	Lac, Bassin
Lock	Ecluses
Marsh or Swamp	Marais ou Marecage
Mast	Mat
Pipeline (above ground)	Pipe-Line (au dessus de la terre)

Railroad	Chemin de fer
Single Track	Voie Unique
Abandoned	Desaffecte
Turnable	Plaque Tournante
Rapids	Rapides
Double line river with multiple rapids Rapids	Riviere a ligne double avec plusieurs chutes
Double line river with multiple rapids	Riviere a ligne double avec plusieurs chutes
Reservoir	Reservoir
River, Stream, Canal	Fleuve, Riviere, Canal
Approximate Seasonal	Approximatif Saisonnier
Direction of Flow	Direction du courant
Road	Route
Hwy, County, Township	Chemin de Comte Canton
Access (road of doubtful maintenance or significant driveway)	Chemin d'acces (condition inconnue ou entree privee)
Trail, Bush , Road (portage, alley)	Sentier, Chemin de Bois (portage, ruelle)
Rock Significant	Roche Significatit
Shoal SHOAL	Banc
Spot Elevation (lake elevations) 104.7	Point Cote (elevation du plan d'eau)
Tower	Tour
Transmission Line	Ligne de transport d'energie
Poles	Poteau
Pylon	Pylone
Tunnel	Tunnel
Utility Pole	Poteau
Wharf, Dock, Pier	Quai, Bassin, Jetee
Wooded Area	Region Boisee
Groyne	Epi
FLOOD PLAIN INFORMATION	RENSEIGNEMENTS DES PLAINES INONDABLES
Regulatory floodline	La crue regulatrice
Fill Line	Ligne de remblai

Regulatory flood elevation	87.65	Niveau de la crue regulatrice
Cross section location		Emplacement de la coupe transversale
Cross section number	1000	Numero del la coupe transversale

SHEET INDEX TABLEAU D'ASSEMBLAGE



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CONTOUR INTERVAL 1.0 METRE
WITH 0.5 METRE AUXILLIARY CONTOUR
NORTH AMERICAN DATUM 1983

EQUIDISTANCE DES COURBES DE NIVEAU 1.0 METRE
AVEC COURBES DE NIVEAU AUXILIERE DE 0.5 METRE
SYSTEME DE REFERENCE GEODESIQUE NORD-AMERIQUE 1983

COMPILATION NOTE:
Production techniques used in the preparation of this map are designed for Class "A" standards.

PHOTOGRAMMETRIE:
Les normes de production de cette carte se conforment aux standards de premiere classe.

SCALE 1:2000 ECHELLE

GENERAL INFORMATION:	
Vertical datum	Mean Sea Level
Horizontal datum	North American (1983)
Map Projection	3° Transverse Mercator
Central Meridian	75° 30m West
Grid Spacing	10 centimetres
Aerial Photography	September 2001 1:3600 scale

RESENSEIGNEMENTS GENEREAUX:	
Niveau de reference	Niveau Moyen de la Mer
Systeme geodesique	Nord-Americain (1983)
Projection	3° Transverse de Mercator
Meridian central	75° 30m Ouest
Quadrillage de	10 centimetres
Photographies aeriennes	Septembre 2001 1:3600 Échelle

Ottawa

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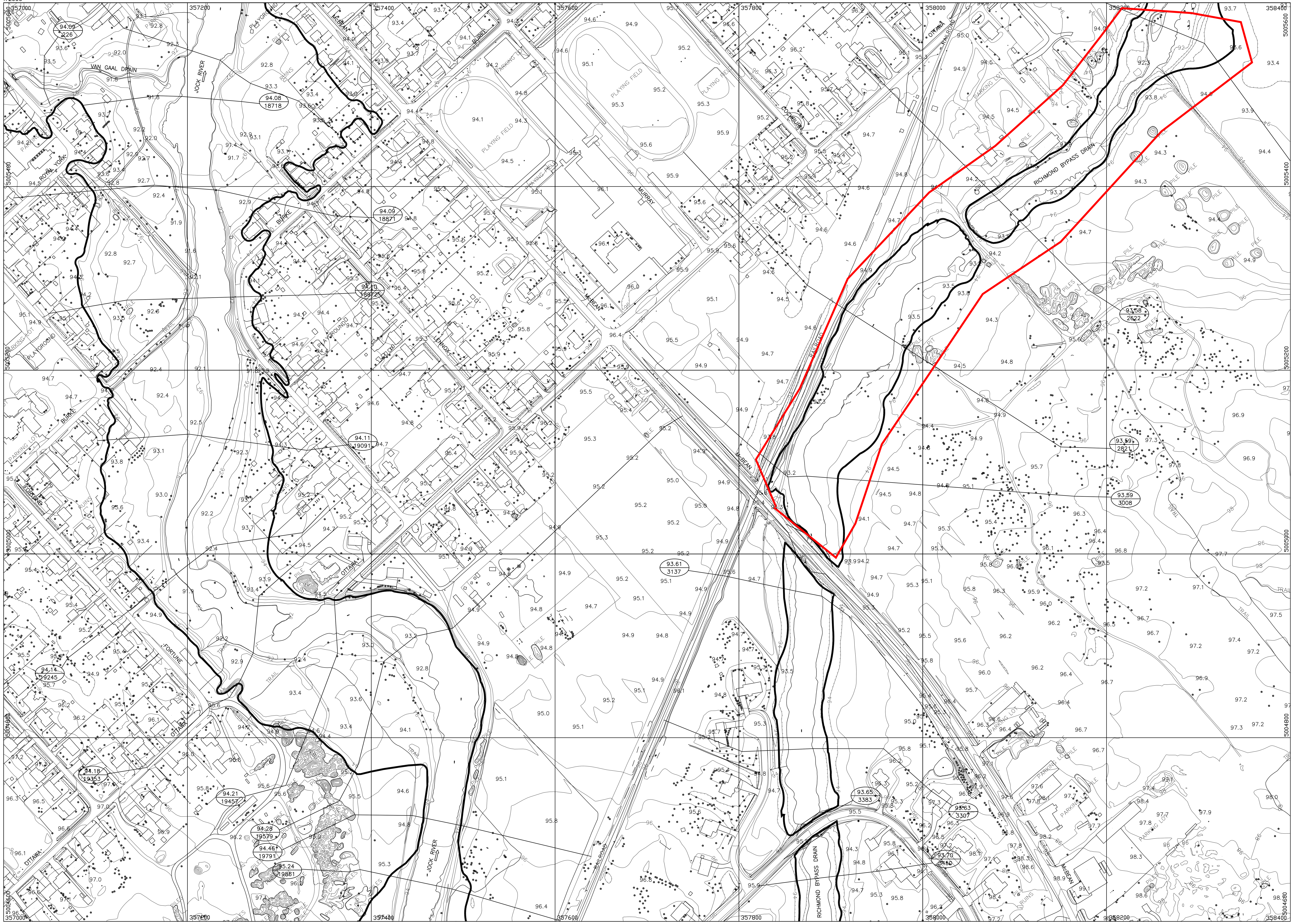

RIDEAU VALLEY CONSERVATION AUTHORITY

OFFICE DE PROTECTION DE LA NATURE DE LA VALLEE RIDEAU

FLOOD RISK MAP
JOCK RIVER
CARTE DU RISQUE D'INONDATION

LÉGEND LEGENDE

Aerial Cableway	Telepherique	Railroad	Chemin de fer
Boundary	Frontiere	Single Track	Voie Unique
International	Internationale	Abandoned	Desaffecte
Interprovincial	de province	Turnable	Plaque Tournante
District Township Indian Reserve	Limite de district, de canton, de reserve indienne	Rapids	Rapides
Approximate	Approximatif	Double line river with multiple rapids	Riviere a ligne double avec plusieurs chutes
Lot, Concession	Lot, Concession	Double line river with multiple rapids	Riviere a ligne double avec plusieurs chutes
Approximate	Approximatif	Reservoir	Reservoir
Annotation LOT CON	Annotation	River, Stream, Canal	Fleuve, Riviere, Canal
Park Boundary	Limite de parc	Approximate Seasonal	Approximatif Saisonnier
Bridge	Pont	Direction of Flow	Direction du courant
Road, Railroad	de route, de chemin, de fer	Road	Route
Foot Bridge	Passerelle	Hwy, County, Township	Chemin de Comte Canton
Building	Batiment	Access (road of doubtful maintenance or significant driveway)	Chemin d'acces (condition inconnue ou entree privee)
Chimney	Cheminee	Trail, Bush , Road (portage, alley)	Sentier, Chemin de Bois (portage, ruelle)
Cliff, Pit, Pile	Falaise, Graviere ou Sabliere, Pile	Rock Significant	Roche Significatit
Contours	Courbes de niveau	Shoal	Banc
Intermediate	intermediaires	Spot Elevation (lake elevations)	Point Cote (elevation du plan d'eau)
Index	Maitresses	Tower	Tour
Auxiliary	Auxiliaires	Transmission Line	Ligne de transport d'energie
Indefinite	Approximatives	Poles	Poteau
Depression	Courbes de cuvettes	Pylon	Pylone
Control Points	Points de controle	Tunnel	Tunnel
Horizontal	Horizontal	Utility Pole	Poteau
Vertical	Vertical	Wharf, Dock, Pier	Quai, Bassin, Jetee
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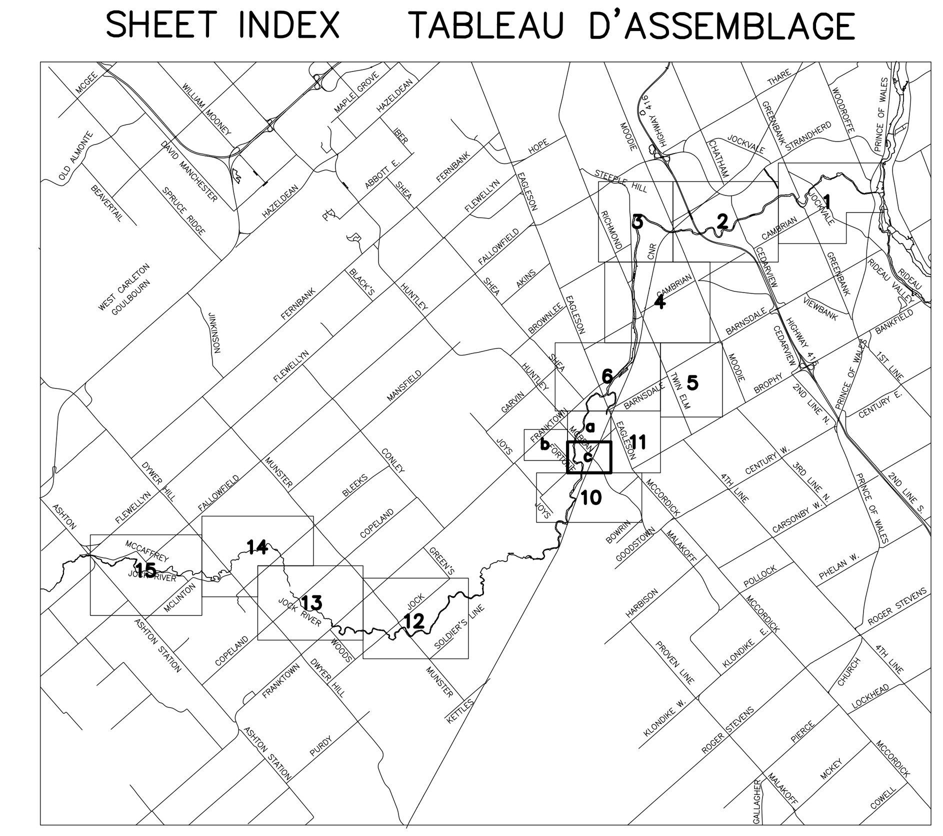
Dam	Barrage	Groyne	Epi
Ditch	Fosse	FLOOD PLAIN INFORMATION	RENSEIGNEMENTS DES PLAINES INONDABLES
Dyke	Digue	Regulatory floodline	La crue regulatrice
Falls	Chutes	Fill Line	Ligne de remblai
Double line river	Riviere a ligne double		
Fence, Hedge, Wall	Cloture , Haie, Mur		
Feature Outline (construction features etc.)	Limites (en construction, etc.)		
Flooded Land	Region Inondee		
Lake, Pond	Lac, Bassin		
Lock	Ecluses		
Marsh or Swamp	Marais ou Marecage		
Mast	Mat		
Pipeline (above ground)	Pipe–Line (au dessus de la terre)		

Regulatory flood elevation — Niveau de la crue regulatrice
Cross section location — Emplacement de la coupe transversale
Cross section number — Numero del la coupe transversale
87.65 / 1000

SHEET INDEX TABLEAU D'ASSEMBLAGE



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AVEC COURBES DE NIVEAU AUXILIERE DE 0.5 METRE
SYSTEME DE REFERENCE GEODESIQUE NORD–AMERIQUE 1983

COMPILATION NOTE:
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PHOTOGRAMMETRIE:
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SCALE 1:2000 ECHELLE

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GENERAL INFORMATION:

Vertical datum	Mean Sea Level
Horizontal datum	North American (1983)
Map Projection	3° Transverse Mercator
Central Meridian	75° 30m West
Grid Spacing	10 centimetres
Aerial Photography	September 2001 1:3600 scale

RESENSEIGNEMENTS GENEREAUX:

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Photographies aeriennes	Septembre 2001 1:3600 Echelle

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PSR

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Responsible for flood plain delineation and hydrotechnical analysis

= Reaches of interest to the Tamarack Richmond development

HEC-RAS Plan: Plan 01 (Continued)

River	Reach	River Sta	Profile	Q Total	W.S. Elev	Vel Chnl	Flow Area	Top Width	Cum Ch Len	Volume	Top W Chnl
				(m3/s)	(m)	(m/s)	(m2)	(m)	(m)	(1000 m3)	(m)
Tributary D	Reach 1	1964	100 year	4.24	93.57	0.25	19.81	12.06	1964.38	835.69	7.00
Tributary D	Reach 1	1964	50 year	3.96	93.42	0.25	18.20	11.35	1964.38	761.21	7.00
Tributary D	Reach 1	1964	25 year	3.52	93.21	0.25	15.96	10.56	1964.38	660.46	7.00
Tributary D	Reach 1	1964	10 year	3.10	93.01	0.25	13.85	9.77	1964.38	563.07	7.00
Tributary D	Reach 1	1964	5 year	2.67	92.57	0.29	9.75	8.90	1964.38	388.65	7.00
Tributary D	Reach 1	1964	2 year	1.88	92.34	0.25	7.81	8.44	1964.38	314.86	7.00
Tributary D	Reach 1	1971	100 year	4.24	93.57	0.13	51.93	54.80	1971.10	836.64	10.00
Tributary D	Reach 1	1971	50 year	3.96	93.42	0.14	44.25	49.36	1971.10	761.96	10.00
Tributary D	Reach 1	1971	25 year	3.52	93.22	0.14	34.97	40.29	1971.10	660.98	10.00
Tributary D	Reach 1	1971	10 year	3.10	93.01	0.15	27.55	31.20	1971.10	563.42	10.00
Tributary D	Reach 1	1971	5 year	2.67	92.57	0.17	17.03	16.86	1971.10	388.79	10.00
Tributary D	Reach 1	1971	2 year	1.88	92.35	0.15	13.75	13.68	1971.10	314.96	10.00
Tributary D	Reach 1	1985	100 year	4.24	93.57	0.01	868.82	486.33	1985.11	843.00	114.30
Tributary D	Reach 1	1985	50 year	3.96	93.43	0.01	797.55	486.17	1985.11	767.78	114.30
Tributary D	Reach 1	1985	25 year	3.52	93.22	0.01	697.00	485.73	1985.11	666.04	114.30
Tributary D	Reach 1	1985	10 year	3.10	93.01	0.01	596.26	485.28	1985.11	567.74	114.30
Tributary D	Reach 1	1985	5 year	2.67	92.57	0.01	406.42	378.49	1985.11	391.73	114.30
Tributary D	Reach 1	1985	2 year	1.88	92.35	0.01	326.23	340.11	1985.11	317.33	114.30
Tributary D	Reach 1	2087	100 year	4.24	93.57	0.06	102.74	122.14	2086.59	891.00	26.92
Tributary D	Reach 1	2087	50 year	3.96	93.43	0.06	87.73	83.61	2086.59	811.60	26.92
Tributary D	Reach 1	2087	25 year	3.52	93.22	0.06	71.38	74.42	2086.59	704.24	26.92
Tributary D	Reach 1	2087	10 year	3.10	93.01	0.06	56.90	65.20	2086.59	600.40	26.92
Tributary D	Reach 1	2087	5 year	2.67	92.57	0.08	36.62	39.20	2086.59	414.19	26.92
Tributary D	Reach 1	2087	2 year	1.88	92.35	0.07	28.46	33.90	2086.59	335.35	26.92
Tributary D	Reach 1	2128	100 year	4.24	93.57	0.17	33.72	25.03	2127.88	895.27	9.00
Tributary D	Reach 1	2128	50 year	3.96	93.42	0.17	30.08	24.14	2127.88	815.13	9.00
Tributary D	Reach 1	2128	25 year	3.52	93.22	0.17	25.34	21.69	2127.88	706.96	9.00
Tributary D	Reach 1	2128	10 year	3.10	93.01	0.18	21.09	19.23	2127.88	602.44	9.00
Tributary D	Reach 1	2128	5 year	2.67	92.57	0.21	13.90	13.58	2127.88	415.36	9.00
Tributary D	Reach 1	2128	2 year	1.88	92.35	0.18	11.08	11.91	2127.88	336.23	9.00
Tributary D	Reach 1	2150	100 year	4.24	93.57	0.28	15.01	48.92	2149.82	896.50	9.00
Tributary D	Reach 1	2150	50 year	3.96	93.42	0.28	14.18	47.81	2149.82	816.23	9.00
Tributary D	Reach 1	2150	25 year	3.52	93.22	0.27	13.00	44.81	2149.82	707.89	9.00
Tributary D	Reach 1	2150	10 year	3.10	93.01	0.26	11.82	41.80	2149.82	603.21	9.00
Tributary D	Reach 1	2150	5 year	2.67	92.57	0.29	9.32	39.28	2149.82	415.83	9.00
Tributary D	Reach 1	2150	2 year	1.88	92.35	0.23	8.04	32.03	2149.82	336.56	9.00
Tributary D	Reach 1	2159		Culvert							
Tributary D	Reach 1	2170	100 year	4.24	93.57	0.26	16.05	75.43	2170.82	901.00	22.86
Tributary D	Reach 1	2170	50 year	3.96	93.43	0.26	15.20	52.79	2170.82	820.12	22.86
Tributary D	Reach 1	2170	25 year	3.52	93.22	0.25	14.02	46.62	2170.82	711.05	22.86
Tributary D	Reach 1	2170	10 year	3.10	93.01	0.24	12.79	40.20	2170.82	605.73	22.86
Tributary D	Reach 1	2170	5 year	2.67	92.57	0.26	10.25	36.26	2170.82	417.18	22.86
Tributary D	Reach 1	2170	2 year	1.88	92.35	0.21	8.95	31.78	2170.82	337.40	22.86
Tributary D	Reach 1	2353	100 year	4.24	93.58	0.05	115.96	103.05	2354.43	920.16	35.68
Tributary D	Reach 1	2353	50 year	3.96	93.43	0.05	102.95	81.18	2354.43	836.59	35.68
Tributary D	Reach 1	2353	25 year	3.52	93.23	0.05	86.97	75.59	2354.43	724.67	35.68
Tributary D	Reach 1	2353	10 year	3.10	93.02	0.05	71.57	69.78	2354.43	616.86	35.68
Tributary D	Reach 1	2353	5 year	2.67	92.58	0.07	43.49	59.27	2354.43	424.21	35.68
Tributary D	Reach 1	2353	2 year	1.88	92.35	0.07	30.60	55.08	2354.43	342.66	35.68
Tributary D	Reach 1	2622	100 year	4.24	93.58	0.14	31.34	53.44	2623.48	940.13	48.88
Tributary D	Reach 1	2622	50 year	3.96	93.43	0.16	24.03	46.60	2623.48	853.73	46.60
Tributary D	Reach 1	2622	25 year	3.52	93.23	0.23	15.21	39.69	2623.48	738.40	39.69
Tributary D	Reach 1	2622	10 year	3.10	93.01	0.42	7.44	32.41	2623.48	627.44	32.41
Tributary D	Reach 1	2622	5 year	2.67	92.85	1.00	2.67	26.99	2623.48	430.37	26.99
Tributary D	Reach 1	2622	2 year	1.88	92.83	0.89	2.12	26.29	2623.48	347.02	26.29
Tributary D	Reach 1	2821	100 year	4.24	93.59	0.10	44.56	83.26	2822.19	947.66	69.88
Tributary D	Reach 1	2821	50 year	3.96	93.44	0.12	33.60	67.32	2822.19	859.45	67.32
Tributary D	Reach 1	2821	25 year	3.52	93.26	0.16	22.03	58.82	2822.19	742.10	58.82
Tributary D	Reach 1	2821	10 year	3.10	93.13	0.21	14.84	52.85	2822.19	629.66	52.85
Tributary D	Reach 1	2821	5 year	2.67	93.10	0.20	13.26	51.45	2822.19	431.95	51.45
Tributary D	Reach 1	2821	2 year	1.88	93.06	0.17	10.88	49.26	2822.19	348.31	49.26
Tributary D	Reach 1	3008	100 year	4.24	93.59	0.15	27.96	65.33	3008.66	954.33	56.32
Tributary D	Reach 1	3008	50 year	3.96	93.46	0.20	20.00	53.56	3008.66	864.45	53.56
Tributary D	Reach 1	3008	25 year	3.52	93.30	0.29	12.32	43.06	3008.66	745.30	43.06
Tributary D	Reach 1	3008	10 year	3.10	93.22	0.34	9.11	37.80	3008.66	631.89	37.80

= Reaches of interest to the Tamarack Richmond development

HEC-RAS Plan: Plan 01 (Continued)

River	Reach	River Sta	Profile	Q Total	W.S. Elev	Vel Chnl	Flow Area	Top Width	Cum Ch Len	Volume	Top W Chnl
				(m3/s)	(m)	(m/s)	(m2)	(m)	(m)	(1000 m3)	(m)
Tributary D	Reach 1	3008	5 year	2.67	93.19	0.33	8.12	36.03	3008.66	433.94	36.03
Tributary D	Reach 1	3008	2 year	1.88	93.14	0.30	6.30	32.52	3008.66	349.91	32.52
Tributary D	Reach 1	3075	100 year	4.24	93.59	0.38	11.03	35.51	3075.97	957.20	10.00
Tributary D	Reach 1	3075	50 year	3.96	93.46	0.38	10.37	31.99	3075.97	866.53	10.00
Tributary D	Reach 1	3075	25 year	3.52	93.31	0.37	9.60	26.05	3075.97	746.67	10.00
Tributary D	Reach 1	3075	10 year	3.10	93.23	0.34	9.21	23.08	3075.97	632.97	10.00
Tributary D	Reach 1	3075	5 year	2.67	93.20	0.29	9.07	22.02	3075.97	434.94	10.00
Tributary D	Reach 1	3075	2 year	1.88	93.15	0.21	8.80	19.90	3075.97	350.74	10.00
Tributary D	Reach 1	3090		Culvert							
Tributary D	Reach 1	3105	100 year	4.24	93.60	0.36	11.81	24.84	3105.68	959.12	10.00
Tributary D	Reach 1	3105	50 year	3.96	93.47	0.36	11.16	23.30	3105.68	867.96	10.00
Tributary D	Reach 1	3105	25 year	3.52	93.32	0.34	10.38	19.77	3105.68	747.63	10.00
Tributary D	Reach 1	3105	10 year	3.10	93.24	0.31	9.99	17.97	3105.68	633.74	10.00
Tributary D	Reach 1	3105	5 year	2.67	93.21	0.27	9.84	17.30	3105.68	435.65	10.00
Tributary D	Reach 1	3105	2 year	1.88	93.15	0.20	9.55	15.97	3105.68	351.35	10.00
Tributary D	Reach 1	3137	100 year	4.24	93.61	0.15	28.36	54.31	3137.79	960.21	48.92
Tributary D	Reach 1	3137	50 year	3.96	93.48	0.18	21.63	47.75	3137.79	868.81	47.75
Tributary D	Reach 1	3137	25 year	3.52	93.33	0.24	14.94	38.00	3137.79	748.25	38.00
Tributary D	Reach 1	3137	10 year	3.10	93.24	0.26	12.08	32.96	3137.79	634.27	32.96
Tributary D	Reach 1	3137	5 year	2.67	93.21	0.24	11.09	31.03	3137.79	436.14	31.03
Tributary D	Reach 1	3137	2 year	1.88	93.15	0.20	9.30	28.44	3137.79	351.78	28.44
Tributary D	Reach 1	3307	100 year	4.24	93.63	0.22	19.29	50.91	3308.14	964.24	43.98
Tributary D	Reach 1	3307	50 year	3.96	93.52	0.29	13.87	44.80	3308.14	871.83	43.98
Tributary D	Reach 1	3307	25 year	3.52	93.40	0.39	9.09	37.86	3308.14	750.29	37.86
Tributary D	Reach 1	3307	10 year	3.10	93.35	0.43	7.17	34.63	3308.14	635.91	34.63
Tributary D	Reach 1	3307	5 year	2.67	93.31	0.44	6.06	32.61	3308.14	437.60	32.61
Tributary D	Reach 1	3307	2 year	1.88	93.25	0.47	3.96	28.44	3308.14	352.91	28.44
Tributary D	Reach 1	3383	100 year	4.24	93.65	0.40	10.76	27.35	3384.08	965.40	25.68
Tributary D	Reach 1	3383	50 year	3.96	93.56	0.47	8.49	26.40	3384.08	872.68	25.68
Tributary D	Reach 1	3383	25 year	3.52	93.51	0.50	6.99	25.75	3384.08	750.90	25.68
Tributary D	Reach 1	3383	10 year	3.10	93.48	0.48	6.40	25.24	3384.08	636.42	25.24
Tributary D	Reach 1	3383	5 year	2.67	93.46	0.46	5.88	24.68	3384.08	438.05	24.68
Tributary D	Reach 1	3383	2 year	1.88	93.42	0.39	4.87	23.57	3384.08	353.25	23.57
Tributary D	Reach 1	3406	100 year	4.24	93.66	0.68	6.38	17.07	3407.43	965.60	14.38
Tributary D	Reach 1	3406	50 year	3.96	93.59	0.76	5.24	15.91	3407.43	872.84	14.38
Tributary D	Reach 1	3406	25 year	3.52	93.55	0.77	4.59	15.21	3407.43	751.04	14.38
Tributary D	Reach 1	3406	10 year	3.10	93.53	0.73	4.27	14.86	3407.43	636.55	14.38
Tributary D	Reach 1	3406	5 year	2.67	93.51	0.68	3.95	14.48	3407.43	438.17	14.38
Tributary D	Reach 1	3406	2 year	1.88	93.46	0.57	3.29	13.66	3407.43	353.34	13.66
Tributary D	Reach 1	3450	100 year	4.24	93.70	0.27	16.44	40.78	3450.95	966.10	31.90
Tributary D	Reach 1	3450	50 year	3.96	93.65	0.29	14.27	38.40	3450.95	873.27	31.90
Tributary D	Reach 1	3450	25 year	3.52	93.61	0.28	12.85	36.76	3450.95	751.42	31.90
Tributary D	Reach 1	3450	10 year	3.10	93.59	0.26	11.94	35.67	3450.95	636.90	31.90
Tributary D	Reach 1	3450	5 year	2.67	93.56	0.24	10.99	34.50	3450.95	438.49	31.90
Tributary D	Reach 1	3450	2 year	1.88	93.50	0.21	9.11	32.04	3450.95	353.61	31.90
Tributary D	Reach 1	3575	100 year	4.24	93.74	0.36	12.78	35.72	3576.39	967.96	25.24
Tributary D	Reach 1	3575	50 year	3.96	93.70	0.37	11.26	33.83	3576.39	874.89	25.24
Tributary D	Reach 1	3575	25 year	3.52	93.66	0.36	10.13	32.35	3576.39	752.87	25.24
Tributary D	Reach 1	3575	10 year	3.10	93.64	0.34	9.31	31.22	3576.39	638.24	25.24
Tributary D	Reach 1	3575	5 year	2.67	93.61	0.32	8.44	30.00	3576.39	439.72	25.24
Tributary D	Reach 1	3575	2 year	1.88	93.55	0.28	6.73	27.42	3576.39	354.61	25.24
Tributary D	Reach 1	3682	100 year	4.24	93.80	0.37	12.42	38.98	3683.48	969.31	27.32
Tributary D	Reach 1	3682	50 year	3.96	93.76	0.38	11.20	37.74	3683.48	876.08	27.32
Tributary D	Reach 1	3682	25 year	3.52	93.74	0.37	10.10	36.57	3683.48	753.95	27.32
Tributary D	Reach 1	3682	10 year	3.10	93.71	0.36	9.19	35.57	3683.48	639.23	27.32
Tributary D	Reach 1	3682	5 year	2.67	93.68	0.34	8.22	34.49	3683.48	440.61	27.32
Tributary D	Reach 1	3682	2 year	1.88	93.63	0.31	6.31	32.23	3683.48	355.30	27.32
Tributary D	Reach 1	3797	100 year	4.24	93.86	0.38	16.02	54.83	3798.19	970.81	15.68
Tributary D	Reach 1	3797	50 year	3.96	93.84	0.39	14.74	52.94	3798.19	877.46	15.68
Tributary D	Reach 1	3797	25 year	3.52	93.81	0.37	13.37	50.82	3798.19	755.20	15.68
Tributary D	Reach 1	3797	10 year	3.10	93.78	0.36	12.11	48.81	3798.19	640.36	15.68
Tributary D	Reach 1	3797	5 year	2.67	93.76	0.34	10.84	46.69	3798.19	441.63	15.68
Tributary D	Reach 1	3797	2 year	1.88	93.70	0.30	8.43	42.36	3798.19	356.10	15.68
Tributary D	Reach 1	3986	100 year	4.24	93.99	0.64	8.10	20.14	3987.45	973.06	10.26
Tributary D	Reach 1	3986	50 year	3.96	93.97	0.62	7.75	19.78	3987.45	879.56	10.26

RVCA Letter of Permission —

Ont. Reg. 174/06, S. 28 *Conservation Authorities Act* 1990, As Amended.

Date: December 10, 2020
File: RV5-0720
Contact: hal.stimson@rvca.ca (613) 692-3571 Ext 1127

Rideau Valley Conservation Authority
3889 Rideau Valley Drive
PO Box 599, Manotick ON K4M 1A5
T 613-692-3571 | 1-800-267-3504
F 613-692-0831 | www.rvca.ca

Michelle Taggart
Tamarack (Richmond) Ltd.
2515 St. Laurent Blvd.
Ottawa, Ontario
K1H 1B1

Permit for: Alteration to a Watercourse under Section 28 of the Conservation Authorities Act for storm outlet at Lot 25, Concession 2, Goulbourn Township now in the City Ottawa known municipally as 6012 Ottawa Street, Roll # 0614 2738 1018 6000 000

Dear Michelle Taggart,

The Rideau Valley Conservation Authority has reviewed your application on behalf of Taggart (Richmond) Ltd. and understands the proposal to be for:

> **The installation of a new storm water outlet discharging to a tributary of the Jock River known as Marlborough Creek as part of a future residential development. The work involves construction of a new temporary stormwater management pond to be located outside RVCA regulatory limits and will include a stormwater outlet consisting of a 300mm diameter outlet pipe and an emergency overflow spillway. Existing ditches will be decommissioned with reach 1 and 2 protected until storm sewers can accept flow. Reach 3 may be abandoned and reach 4 as identified in the Kilgour HDFA report is to be protected pending further detailed review. Rip rap erosion protection at the outlet is included in the design. Vegetation removal for the outlet should also be limited.**

This proposal was reviewed under Ontario Regulation 174/06, the “Development, Interference with Wetlands, and Alteration to Watercourse and Shorelines” regulation and the RVCA Development Policies (approved by the RVCA, Board of Directors), specifically Section 3 Alteration to Waterways. The proposal is not expected to impact the control of flooding, pollution, erosion or conservation of land providing conditions are followed.

PERMISSION AND CONDITIONS

By this letter the Rideau Valley Authority hereby grants you approval to undertake this project as outlined in your permit application but subject to the following conditions:

1. Approval is subject to the understanding of the project as described above and outlined in the application and submitted plans including:

- Drawing No. Sheet 1 titled Erosion & Sediment Control Plan for Project 18-1042, dated 20-12-03, Revision No. 2 as prepared by DSEL.
- Drawing No. Sheet 2 titled Erosion & Sediment Control Plan Details for Project 18-1042, dated 20-12-03, Revision No. 2 as prepared by DSEL.
- HDFA Report by Kilgour & Associates Ltd dated August 8, 2019 (35 pages).
- Environmental Impact Statement Report by Kilgour & Associates Ltd dated Jan 14, 2020 (62 pages).
- Letter dated revised December 3, 2020 by A. Temelini, P. Eng. of DSEL describing the project.

2. Any changes to the proposed work must be submitted in writing to the Conservation Authority for review and approval prior to implementation. No conditions are subject to change/revision by the on-site contractor(s).

3. Any excess excavated material, as a result of the work, must be disposed of in a suitable location outside any regulatory floodplain and fill regulated area. There should be no changes to area grades in the RVCA regulated area as a result of the work.

4. Only clean non-contaminated fill material will be used, and all work is to occur on your property or on other property with permission of the owners.

5. **There will be no in-water works between March 15 and June 30, of any given year to protect local aquatic species populations during their spawning and nursery time periods.**

6. Work in-water shall not be conducted at times when flows are elevated due to local rain events, storms or seasonal floods.

7. All in-stream work should be completed in the dry by de-watering the work area and diverting and/or pumping any flows around cofferdams placed at the limits of the work area. Silt or debris that has accumulated around the temporary cofferdams should be cautiously removed prior to their withdrawal. No other channel modifications or dredging is permitted or implied by this letter.

8. Sediment barriers should be used on site in an appropriate method according to the Ontario Provincial Standard Specifications (OPSS) for silt barriers as a minimum. In-water work will require the use of a properly secured silt curtain. Soil type, slope of land, drainage area, weather, predicted sediment load and deposition should be considered when selecting the type of sediment/erosion control.

9. Sediment and erosion control measures shall be in place before any excavation or construction works commence. All sediment/erosion control measures are to be monitored regularly by experienced personnel and maintained as necessary to ensure good working order. In the event that the erosion and sedimentation control measures are deemed not to be performing

adequately, the contractor shall undertake immediate additional measures as appropriate to the situation to the satisfaction of the Conservation Authority.

10. Activities such as equipment refueling and maintenance must be conducted away from the water to prevent entry of petroleum products, debris, or other deleterious substances into the water. Operate machinery from outside the water, or on the water in a manner that minimizes disturbance to the banks or bed of the watercourse.

11. All disturbed soil areas must be appropriately stabilized to prevent erosion.

12. It is recommended that you retain the services of a professional engineer to conduct on-site inspections to ensure adequacy of the work, verify stability of the final grade and slopes and confirm all imported fill is of suitable type and has been adequately placed and compacted.

13. It is recommended that you ensure your contractor(s) are provided with a copy of this letter to ensure compliance with the conditions listed herein.

14. The applicant agrees that Authority staff may visit the subject property, before, during and after project completion, to ensure compliance with the conditions as set out in this letter of permission.

15. A new application must be submitted should any work as specified in this letter be ongoing or planned for or after December 10, 2022.

16. The RVCA is to receive 48 hours notice of the proposed commencement of the works to ensure compliance with all conditions. The applicant agrees that Authority staff may visit the subject property, before, during and after project completion, to ensure compliance with the conditions as set out in this letter of permission.

All other approvals as might be required from the Municipality, and/or other Provincial or Federal Agencies must be obtained prior to initiation of work. This includes but is not limited to the Drainage Act, the Endangered Species Act, the Ontario Water Resources Act, Environmental Protection Act, Public Lands Act, or the Fisheries Act.

By this letter the Rideau Valley Conservation Authority assumes no responsibility or liability for any flood, erosion, or slope failure damage which may occur either to your property or the structures on it or if any activity undertaken by you adversely affects the property or interests of adjacent landowners. This letter does not relieve you of the necessity or responsibility for obtaining any other federal, provincial or municipal permits. This permit is not transferable to subsequent property owners.

Should you have any questions regarding this letter, please contact Hal Stimson.

Terry K. Davidson

Terry K. Davidson P.Eng
Conservation Authority S. 28 Signing delegate
O. Reg. 174/06

c.c. A. Temelini, P. Eng. DSEL

- Pursuant to the provisions of S. 28(12) of the *Conservation Authorities Act* (R.S.O.1990, as amended.) any or all of the conditions set out above may be appealed to the Executive Committee of the Conservation Authority in the event that they are not satisfactory or cannot be complied with.
- Failure to comply with the conditions of approval or the scope of the project may result in the cancelling of the permission and/or initiation of legal action under S. 28(16) of the Act.
- Commencement of the work and/or a signed and dated copy of this letter indicates acknowledgement and acceptance of the conditions of the RVCA's approval letter concerning the application and the undertaking and scope of the project.

Name: Michelle Taggart (print)

Signed: Michelle Taggart Date: December 16, 2020

Responses to City 1st Submission Comments

Comments provided in City letter dated Dec 17, 2021

No.	Comment	Responsibility	
A	**General**	**Responsibility**	**Action**
10	Legal and sufficient outlet for stormwater, water, and sanitary will need to be confirmed before draft approval and it is understood that sanitary capacity is not available in the Village.	Tamarack/DSEL	Noted. Sanitary capacity has been confirmed in the Village as part of the ongoing Richmond Pump Station upgrades.
55	ROW cross-sections are needed to demonstrate intended distribution of street trees and landscaping, sidewalks, on-street parking, cycling facilities, setbacks, etc. on the various street widths.	Tamarack / CGH / DSEL	ROW cross-sections will be provided as part of the detailed design submission.
75	No stormwater management facilities, encumbrances such as retaining walls, utility lines or easements of any kind shall be located on, or in front of, the dedicated park blocks.	Tamarack / DSEL	Noted.
	The following park services are required for each Park Block:		
76	The exact location of the servicing will be determined as the Composite Utility Plan is being developed; this plan is to be submitted to Parks & Facilities Planning at draft stage for comment. • A 300mm diameter storm sewer and CB/MH at 2m inside the park property line. • A 50mm diameter water line complete with standpost at 2m inside the park property line. A city standard park water vault chamber, standard detail W31.1 Page 10 of 28 latest version, must also be installed as part of parks water works. The park water vault will be funded from the park development budget. Coordination of all park water works including water vault and meter installation is an Owner responsibility. • 150mm diameter sanitary sewer and MH at 2m inside the park property line. • A 120/240 volt, 200 amperes single phase hydro service at 2m inside the park property line. The Owner is responsible for making all arrangements and coordinating the connection of the new hydro (electrical) service, including costs and inspections, with the respective hydro (electricity) agencies. The Owner is also responsible to ensure the park electricity service(s) is included on the approved CUP drawings.	Tamarack / DSEL	Noted. These requirements will be carried forward for the detailed design.
82	Please ensure the CUP is designed in conjunction with tree planting locations. Streetlights, laterals and other utilities often conflict with tree planting locations and should be considered in the design phase. Lateral services should be placed next to or under the driveways so they do not conflict with front yard greenspaces	Tamarack / DSEL	The CUP(s) will include tree planting locations. The CUP(s) will be prepared as part of the detailed design process.
D.	**Grading Plan, 04D, prepared by DSEL, dated November 2020**	**Responsibility**	**Action**
90	Preliminary comments: • It appears the plan shows a grade raise beyond that permitted.	DSEL	Drawing 04D has been updated as part of this submission. The preliminary road grades shown respect the grade raise restrictions for the site. As part of detailed design, Paterson will conduct a review of the detailed grading for the site to confirm.
E.	**Erosion and Sediment Control Plan, 03F, prepared by prepared by DSEL, dated November 2020**	**Responsibility**	**Action**
91	Preliminary comments: • The plan shows an access at a location that requires ownership and the ownership has not been confirmed. The silt fence splits the site in two; please provide rationale for the split. Sediment traps are suggested to be replaced due to the presence of clay. In due course additional comments will be provided.	DSEL	Figure 03F has been updated as part of this submission, and the limits have been corrected. The access to McBean Street is a part of the 6038 Ottawa Street property. The silt fence in the middle of the site surrounds Reach 4, detailed in the Headwater Drainage Feature Assessment (HDFA) (Kilgour & Associates, August 8, 2019). A label has been added to the figure for clarity.

No.	Comment	Responsibility	
M.	**Tamarack Hydraulic Analysis, project ref # 75-41-211554, prepared by C3 Water, dated August 5, 2021**	**Responsibility**	**Action**
168	Please cite the documentation that suggests, in sections 1.1 and 2.3, that the Richmond West Pumping Station is designed to serve the entire village, however, the city is of the opinion that that Richmond West water system had been designed to provide water supply for only the Caivan/Mattamy western development lands.	DSEL	Comment is no longer applicable. The ongoing functional design and phasing plan for the Richmond Village water supply includes water demands for the Tamarack Richmond Lands.
169	Please state the section of the Water Master Plan used for section 1.3.	DSEL	Comment is no longer applicable.
170	The storage proposed in section 2.2 was not located within the planned development and it is suggested that the storage requirement is unlikely to fit into existing areas. A water tower storage structure will need to be sited and designed. The report also indicates that additional well pumping capacity will be required to accommodate the proposed Tamarack development but does not provide details how and where that should be accomplished.	DSEL	Comment is no longer applicable. Communal well locations are to be determined as part of the Stantec functional design and phasing plan for the Richmond Village water supply.
171	Relying on the Kings Park Communal Well as a second feed to the subject site may not be possible as capacity at Kings Park is limited.	DSEL	Comment is no longer applicable. Connections to Kings Park are being considered as part of the Stantec functional design and phasing plan for the Richmond Village water supply.
172	Please specify the range of required fire flows (RFF) anticipated for this development.	DSEL	Required fire flows will be determined at the time of the hydraulic analysis for the study area's internal watermain network.
173	Please confirm capacity is available at the wells to meet peak hourly and maximum day plus fire demands.	DSEL	To be confirmed as part of the ongoing Stantec functional design and phasing plan. Per the Draft Richmond Water Supply Functional Design Study - Technical Memorandum: Optimization of Richmond Communal Water Systems (Water Supply Study) (Stantec, September 11, 2024), capacity in the potential well locations is expected.
174	Please confirm that two feeds are always servicing; a. 50 or more residential units (i.e. streets 12, 11 and 13) and b. commercial areas with basic day demands exceeding 50 m3/d.	DSEL	Watermain connection locations for units and commercial areas will be finalized as part of the detailed design.
175	Exhaustive details are required on the three watermain crossings of the Jock River (1) and Marlborough Creek (2) (i.e. feasibility, trenchless vs open cut, approvals, etc) and their sourcing, and of the provision of piping.	DSEL	Comment is no longer applicable. There are no watermain crossings of the Jock River or Marlborough Creek as part of this submission.
176	Please provide the anticipated underside of footing elevations for the subject site. Please also complete a sanitary HGL analysis during a pump station failure scenario.	DSEL	Failure scenarios have been analyzed as part of the ongoing Richmond Pump Station upgrades. Specifically in the Technical Memorandum No. 2 Proposed Richmond Pumping Station Upgrade (Parsons, May 2019).
177	Capacity at the Richmond sanitary pump station to accommodate new growth areas is limited until planned upgrades to existing pumps, bypass pumps and the extension of the secondary forcemain are implemented.	DSEL	Noted.
178	Please show the highest anticipated annual groundwater levels on the sewer profile drawings.	DSEL	Groundwater levels have been added to the profile drawings as requested.
179	List additional measures needed to minimize inflow and infiltration, specifically (amongst other techniques): a. Pipe material b. Maintenance hole protection c. Other	DSEL	As part of the detailed design, the sewers and manholes will be reviewed against detailed groundwater data, and detailed measures will be included in accordance with LCI-ECA Design Criteria (May 31, 2023).
180	The report's water servicing strategy for the Tamarack development assumes connections to the existing King's Park Communal Well System, however the City's objective is to decommission King's Park System in the future once different servicing options become available since King's Park system does not meet the current City's design and operation criteria (e.g. lack of water storage, fire protection flow, etc.)	DSEL	See **Comment 171**.

No.	Comment	Responsibility	
181	The report proposed fire flow of 8,000 L/min (133 l/s) does not meet City Infrastructure Master Plan recommended fire flow of 13,000 L/min (216 L/s) for the type of development recently proposed for the Richmond Western Land subdivision. The 13,000 L/min allowance will permit more flexibility in design and approval of the new subdivision development.	DSEL	Noted, this will be considered at the time of the hydraulic analysis for the study area's internal watermain network.
182	The City is currently conducting the Village of Richmond Water Supply Functional Design Study assignment that will provide recommendations for the Village's water supply over the short-term, interim and ultimate conditions to allow for the integration of all existing and known future development areas. The developers for the Village of Richmond including Tamarack (Taggart) representatives are part of the study Technical Advisory Committee and are involved in the study technical memorandums reviews during the study progress. The final functional design study summary report with recommendations is expected to be completed in Q1, 2022.	DSEL	Noted.
183	The concludes that additional capacity is required but does not provide said capacity.	DSEL	See **Comment 168**.
184	It is suggested that "wood frame" replace "ordinary construction" for the FUS calculations in Appendix A.	DSEL	Noted, this will be considered a the time of the hydraulic analysis for the study area's internal watermain network.
	Comments have been provided by the City's Infrastructure Planning Group		
185	The report water servicing strategy for the Tamarack development assumes connections to the existing King's Park Communal Well System. The City's objective is to decommission King's Park System in the future once different servicing options become available since this system does not meet the current City design and operation criteria (e.g. lack of water storage, fire protection flow, etc.).	DSEL	See **Comment 171**.
186	Second major assumption is that the proposed Tamarack development will depend on Richmond West wells, pumping station and storage. However, the Richmond West system had been designed to provide water supply for Caivan/Mattamy western development only with allowance for the expansion to service existing Richmond development currently relying on private wells should the need arise in the future.	DSEL	See **Comment 168**.
187	The report proposed fire flow of 8,000 L/min (133 l/s) does not meet City Infrastructure Master Plan recommended fire flow of 13,000 L/min (216 L/s) for the type of development recently proposed for the Richmond Western Land subdivision.	DSEL	See **Comment 181**.
188	The report clearly indicates that additional storage and well pumping capacity will be required to accommodate planned Tamarack development but does not provide details how and where that should be accomplished. To move forward, reporting would need to show that additional capacity stated as required in the report is actually available presently, as opposed to possibly.	DSEL	See **Comment 168**.
189	The City is currently conducting Village of Richmond Water Supply Functional Design Study assignment which will provide recommendations for the Village water supply over the short-term, interim and ultimate conditions to allow for the integration of all existing and known future development areas. Village of Richmond developers including Tamarack (Taggart) representatives are part of the study Technical Advisory Committee and are involved in the study technical memorandums reviews during the study progress. Final functional design study summary report with recommendations is expected to be completed in Q1 2022, and it is suggested that the memo is premature.	DSEL	Noted.

No.	Comment	Responsibility	
O.	**Functional Servicing Report, Project No 19-1042, prepared by DSEL, dated November 12, 2020**	**Responsibility**	**Action**
196	It is suggested that at least one ECA submission will be required for the development, in collaboration with others.	DSEL	Noted.
197	The headwater drainage feature discussed in section 1.1, reach 4, does not appear to be carried.	DSEL	The language of Section 1.1 has been revised in the latest report to include the following: "Reach 4 received a management recommendation of “Conservation” and it is noted in the EIS that the feature may be maintained, or if necessary, relocated using natural channel design techniques to maintain or enhance the overall productivity of the reach. The EIS states that the current feature does not provide direct habitat for fish, frogs, or turtles. Reach 4 will be protected and flows maintained until the detailed design of the Tamarack Richmond lands has been completed and reviewed by the City and RVCA."
198	The building code reference in section 2.1 should be updated.	DSEL	Section 2.1 has been updated as requested.
199	An agreement will be required, for water connection, between the developer and the Western Development Lands prior to draft approval.	DSEL	Comment no longer applicable based on the ongoing functional design and phasing plan for the Richmond Village water supply.
200	For table 3 please state the reference of the minimum hour demand factors.	DSEL	Table 3.1 (formerly Table 3) now reflects the design criteria provided by City staff for populations exceeding 3,000.
201	For section 4, please note that enhanced exfiltration techniques are required including, but not limited to, using pressure-rated pipe and wrapping all sanitary maintenance holes with BlueskinTM and applying protective covering.	DSEL	A reference to reviewing groundwater and exfiltration has been added to Table 4.1.
202	For table 4 please note that sewers servicing less than 10 residential connections, to any part of the sewer, to have a minimum gradient of 0.65%.	DSEL	Table 4.1 (formerly Table 4) has been updated to include consideration for the following excerpt from Section 6.1.2 of the City of Ottawa Sewer Design Guidelines: "the furthest upstream design of public sewer be constructed at minimum diameter with not less than a gradient of 0.65% when there are less than 10 residential connections in this length of pipe. "
203	For section 4.2 please note that draft approval will not be provided until sanitary capacity is available.	DSEL	Section 4.2 has been updated to clarify that there is capacity once the planned upgrades to the Richmond Pump Station are complete.
204	Please provide rationale for the last sentence of section 4.3.	DSEL	Capacity in the upgraded Richmond Pump Station is confirmed in Section 4.2 of the updated report.

No.	Comment	Responsibility	
205	Contrary to the ending comments of section 4.4 capacity is not available at the pump station for the proposal.	DSEL	Comment no longer relevant. Sanitary capacity has been confirmed in the Village as part of the ongoing Richmond Pump Station upgrades.
206	For Table 7, service laterals should be at 2%, as per section 5.7.1 of the Sewer Design Guidelines, Second Edition, Document SDG002, October 2012, City of Ottawa (Guidelines) including technical bulletins ISDTB-2014-01, PIEDTB-2016-01, ISTB 2018-01, ISTB-2018-04, ISTB-2019-02; a 1% slope is not the preferred grade.	DSEL	Table 5.1 (formerly Table 7) has been updated to clarify that 1% is the minimum allowable slope and 2% is the preferred slope for service laterals.
207	Comments in section 5.2 should confirm that during the minor storm that the HGL is not above the surface.	DSEL	This has been confirmed in Section 5.2.2 and Appendix D.
208	As the design includes partially submerged storm sewers the design will require an oil/grit separator towards two-thirds of the way along the submerged section.	DSEL	Please provide the City design guidelines related to implementing an oil/grit separator for partially submerged storm sewers.
209	The submerged sewer section should be minimised, preferably to zero.	DSEL	Noted. As part of detailed design, the extent of the partially submerged section will undergo detailed review and design considerations will be made in accordance with Section 8.3.8.3 of the City of Ottawa Sewer Design Guidelines.
210	Sump pump flows will, in due course, need to be added to storm sewer calculations.	DSEL	Noted, sump pump flows will be considered as part of the modeling during detail design.
211	For section 5.3 please note that 100-year flows are not to cross ROWs.	DSEL	Language has been added to Section 5.2.
212	Lands, and access, will be required for sediment removal from the SWM pond of section 5.4.	DSEL	Noted, proposed sediment management areas can be seen in Figure 06F.
213	LID is required to be discussed in section 5.4.1	DSEL	See Section 5.2.5 of the latest report.
214	Please discuss “relocate it…or something like that” in section 7.0.	DSEL	Section 7 has been updated in the latest report.
215	The comment in section 8 that there “will be sufficient capacity for the proposed development at the time of construction” needs to be removed.	DSEL	Section 8 has been updated in the latest report.
216	The pond design should conform to the draft SWM pond Guidelines.	DSEL	Noted.
217	Figure 02F appears to show the need for floodplain mitigation that needs to be discussed further.	DSEL	See Section 1.3 of the latest report.
218	Figure 04F shows an entrance from McBean Street that has not been confirmed.	DSEL	The access to McBean Street is a part of the 6038 Ottawa Street property. Figure 04F has been updated accordingly.

No.	Comment	Responsibility	
219	Figure 04F shows a design of a watermain passing through a rail corridor: draft approval will not be given until crystal clear, and irrefutable, written approval is given from the rail corridor holder to the City.	DSEL	Comment is no longer applicable.
220	Figure 04F shows a design of a watermain passing through lot, on McBean Street, for which ownership has not been proven.	DSEL	See **Comment 218**.
221	For figure 05F pressure-rated pipe and wrapped maintenance holes will be required.	DSEL	See **Comment 201**.
222	For figure 05F it is suggested that a wider difference be applied between the Barbie pink, of the forcemain, and the phlox purple, of the sanitary line being replaced.	DSEL	The colours in Figure 05F have been revised as requested.
223	An inlet, to the north sediment forebay, discussed in section 5.2, was not found in figure 06F.	DSEL	The inlet is included in the updated Figure 06F.
224	The grade raise shown in figure 06F suggests grade raise approaching the permissible limit.	DSEL	See **Comment 90**.
225	For drawing 01D, without sanitary design of the commercial area, upstream pipes will need be designed at 0.65% as per section 6.1.2.2 of the Guidelines.	DSEL	Comment no longer applicable as the latest development concept does not include the southern commercial area from the first submission.
226	For drawing 02d it is suggested that additional external areas should be included and the corner parcel, at the intersection of Ottawa Street and Eagleson Road, flowing out is smaller than shown.	DSEL	The drainage areas detailed in Drawing 02D have been defined based on the avaiable topography of the area.
227	It is suggested that drainage easements over the commercial land will be required considering the comment shown on drawings 01D and 02D.	DSEL	Comment no longer applicable as the latest development concept does not include the southern commercial area from the first submission.
228	It is suggested that the fill proposed in part of 04D does not comply with the grade raise restrictions.	DSEL	See **Comment 90**.
229	Appendix A needs to discuss the reservoir needs of the two water sources proposed.	DSEL	Comment is no longer applicable. Communal well locations are to be determined as part of the Stantec functional design and phasing plan for the Richmond Village water supply.
230	It is suggested that Alternative 1 requires more than one connection to avoid having the proposed development be a vulnerable service area, though it is not clear as alternative 1 variously suggests connecting to King's Park system and not connecting to the King's Park System.	DSEL	Comment no longer applicable based on the ongoing functional design and phasing plan for the Richmond Village water supply.
231	Alternative 1 suggests reservoir expansion though support for this is not included (note that the City is supportive of the concept).	DSEL	Comment no longer applicable based on the ongoing functional design and phasing plan for the Richmond Village water supply.
232	The 1a alternative in Appendix A discusses connecting to both Richmond West and King's Park and then discusses further options, but it is not clear how the options partially feed from the existing systems.	DSEL	Comment no longer applicable based on the ongoing functional design and phasing plan for the Richmond Village water supply.
233	The comment above carries to figure 2 that shows two water connections but states only one.	DSEL	Comment no longer applicable based on the ongoing functional design and phasing plan for the Richmond Village water supply.
234	Alternatives 1B/1C provide vulnerable service areas and will not be accepted.	DSEL	Comment no longer applicable based on the ongoing functional design and phasing plan for the Richmond Village water supply.
235	The alternatives do not confirm that sufficient treatment capacity nor well supply is available, and this is required before draft approval.	DSEL	See **Comment 168**.
236	The water supply discussion appears to be included in Appendix B and in Appendix A.	DSEL	All water supply discussion is now located in Appendix B of the latest report.
237	It is not clear what is to be taken away from the table below the sanitary sewer design sheets.	DSEL	This table has been removed from the updated design sheets.
238	It is not clear what the purpose/intention of the red boxed numbers in the HEC-RAS values is.	DSEL	The red boxes highlight the values being referenced in the preliminary design. Labels have been added for clarity.

No.	Comment	Responsibility	
239	Please include more discussion for the SWM pond sizing.	DSEL	See Section 5.2.4 of the latest report.
240	In due course the SWM pond should exist on an east-west spread and tall trees provided on the south and west sides.	DSEL	The pond layout has been revised. Pond landscaping will be done at the time of detailed design.
241	The location is within the area covered by the Jock River Watershed Management Plan, November 2001, prepared by Rideau Valley Conservation Authority. The Stormwater Management Report must address the applicable requirements of the Jock River Watershed Management Plan.	DSEL	Noted, see Section 5.2 of the revised report.
242	The location is also within the area covered by the Village of Richmond Environmental Management Plan, June 2010, prepared by City of Ottawa. As per the Environmental Management Plan, measures are required to meet the enhanced level of treatment as per the former MOE's (now MECP) Stormwater Management Planning and Design Manual (2003). A post-development water balance will be required for the proposal. The design shall provide for on-site retention of the first 7 mm of all rainfall events (hydrogeological analysis is required to confirm groundwater elevation and percolation properties). Refer to the Village of Richmond Environmental Management Plan for additional details and a complete list of requirements. The Stormwater Management Report must address the applicable requirements of the Village of Richmond Environmental Management Plan.	DSEL	Noted, see Section 5.2 of the revised report.
243	A water balance calculation is required and requirements are to store 15% of the difference between the pre-development and post-development rates/volumes	DSEL	A preliminary water balance calculation has been provided in Appendix D. Please provide background information regarding the requirement to store 15% of the difference between the pre-development and post-development rates/volumes.
244	An emergency sanitary overflow may be required.	DSEL	It is understood from the September 2019 Functional Design Report that the Richmond Pump Station includes emergency storage and an emergency overflow.
245	Sanitary HGL is to be included.	DSEL	Consistent with the August 2019 Parsons functional design of the gravity trunk sewers, the sanitary sewer network has been designed assuming free flowing conditions. HGL boundary condition information of the Richmond Pump Station would be required from the City to complete this analysis.
246	The development requires all endeavours for a tight sanitary system and not to pond on sanitary maintenance hole lids.	DSEL	Road ponding will be prepared as part of the detailed design.
T.	**Conservation Authority Comments**	**Responsibility**	**Action**
292	Block 50 appears to be aligned as a 30 metre corridor along the watercourse. It should be noted that floodplain mapping varies along this channel. Please ensure that the floodplain is contained within the open space block and does not extend onto any residential or development block. It appears that there are portions of the floodplain that extend into residential blocks which is generally not supported. Modifications within the floodplain require written approval prior to any work being undertaken	DSEL	Noted, all required approvals will be coordinated in advance of construction.
293	The stormwater management pond appears to be adjacent to the floodplain. Please ensure that the stormwater management pond is disconnected from the floodplain during a major event. Please note based on the configuration presented, portions of grading work associated with the pond will require written approval prior to proceeding.	DSEL	Noted, all required approvals will be coordinated in advance of construction. As shown in Figure 06F, the pond has been designed to ensure the 100yr waterlevel of the Marlborough Creek does not spill overtop and into the pond.
294	The quality control design criteria are acceptable.	DSEL	Noted.

Appendix B – Water Servicing

Village of Richmond Water Supply Functional Design Study - Technical Memorandum: Optimization of Richmond Communal Water Systems

Draft

September 11, 2024

Prepared for:

City of Ottawa

Prepared by:

Stantec Consulting Ltd.

Revision	Description	Author		Quality Check		Independent Review	
0	Draft	CZ	20240403	JS	20240403	KA	20240405
1	Draft	CZ	20240506	JS	20240509	KA	20240509
2	Draft	CZ	20240827	JS	20240830	KA	20240909

Village of Richmond Water Supply - Functional Design Study
Calculations of Water Demands and Required Storage Volume: Taggart development lands

Legend
Input parameter/Manual entry

Abbreviations
SFH – Single Family Home
MLT – Multi-Residential Unit
BSDY – Basic (Average) Day Demand
MXDY – Maximum Day Demand

Consumption Rates & Factors		
Residential (SFH)	180	L/c/d
Residential (MLT)	198	L/c/d
Outdoor Water Demand, OWD (SFH)	1,049	L/SFH/d
Institutional (INS)	28,000	L/ha/d
Light Industrial (IND)	35,000	L/ha/d
Commercial (COM)	28,000	L/ha/d
Population Per Unit Type		
SFH	3.4	PPU
MLT	2.7	PPU

Fire Flow Requirements	Flow (L/min)	Duration (hr)
Existing Development under Future Conditions	10,000	2.0
Future Development	10,000	2.0
Ultimate Storage Requirements	13,000	3.0

Undeveloped Residential Areas within Development Area		
Average Day Consumption Rate	35	m^3/ha/d
Maximum Day Peaking Factor	2.75	

Development Area	Residential Unit Counts: SFH	MLT	Ratio MLT/(SFH +MLT)	Total	Cumulative	INS Area	IND Area	COM Area	Residential Population	Cumulative Residential Population	BSDY	Cumulative BSDY	OWD
	(-)	(-)	(%)	(-)	(-)	(ha)	(ha)	(ha)	(-)	(-)	(L/s)	(L/s)	(L/s)
Tamarack	504	625	55%	1,129	1,129	2.90	0	2.80	3,401	3,401	9.28	9.28	6.12
Additional Property Parcel Owned by Taggart near 6094 Ottawa Street (0.77 ha)	-	-	-	-	-	-	-	-	-	-	0.31	9.60	-

Development Area	MXDY	Cumulative MXDY	Fire Flow Requirement		MECP Required Storage Volume (Cumulative): Fire	Equalization (25% of MXDY Demand)	Emergency (25% of Fire + Equalization)	Total Storage Volume Required	Ultimate Storage Required (incl. 3-hr 13,000 L/min fire flow)
	(A)	(B)	(C)	(D)	(E) = (C)*(D)*60*60/1000	(F) = 0.25*(B)*60*60*24/1000	(G) = 0.25*[(E) + (F)]	(H) = (E) + (F) + (G)	
	(L/s)	(L/s)	(L/s)	(hrs)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)
Tamarack	15.40	15.40	166.7	2.0	1,200	333	383	1,916	3,341
Additional Property Parcel Owned by Taggart near 6094 Ottawa Street (0.77 ha)	0.86	16.26	166.7	2.0	1,200	351	388	1,939	3,364

Notes & Assumptions

(1) MECP Guidelines 2019: Section 8.4.2: Total Treated Water Storage Requirement = A + B + C Where: A = Fire Storage; B = Equalization Storage (25% of maximum day demand); and C = Emergency Storage (25% of A + B).
(2) Tamarack unit counts and ICI areas are from Tamarack's preliminary concept plan dated March 13, 2020.
(3) For the additional property parcel owned by Taggart, the average day consumption rate of 35 m^3/ha/d and maximum day peaking factor of 2.75 are from the City of Ottawa Water Distribution Design Guidelines and the MECP Design Guidelines for Drinking-Water Systems, respectively.

From: Rogers, Christopher <Christopher.Rogers@ottawa.ca>
Sent: January 22, 2025 10:42 AM
To: Sarah Al Hajjar <sarah.alhajjar@taggart.ca>; Tyler Ferguson <Tyler.Ferguson@cardelhomes.com>
Cc: Sandanayake, Hiran <Hiran.Sandanayake@ottawa.ca>; Alemany, Kevin <kevin.alemany@stantec.com>; Mike Green <mike.green@taggart.ca>; Elsby, Cam <Cam.Elsby@ottawa.ca>
Subject: RE: Village of Richmond FD Study - Review of Draft Optimization Technical Memorandum

Good morning Sarah and Tyler,

I hope you are both well. I wanted to follow up on our November meeting with a few updates regarding the Richmond water study.

First, I would like to introduce Cam Elsby, who will be stepping in as the new City lead for all Richmond infrastructure planning projects following Joe Zagorski's sudden retirement this past December. Cam is up to speed on the study and will be your main point of contact moving forward.

We have generated the following updated demands to inform your work plan for the next round of water quality testing. The scenarios indicated in the table below are referenced in TM#6.

Servicing Area	Scenario #	Basic (Average) Day Demand, BSDY (L/s)	Maximum Day Demand, MXDY (1) (L/s)
Taggart development lands + Kings Park area	INT-1	10.8	19.7
Cardel		3.1	6.2
Taggart development lands + Cardel development lands + Kings Park area	INT-2 / INT-3	13.9	25.9

Taggart development lands + Cardel development lands + Kings Park area + 50% of existing private well areas	Ultimate Conditions	36.0	57.0

As for the desired test well locations, the only input we have is that it is preferable to select a viable location close to where the proposed facility is to be placed based on the updated concept plans.

Lastly, I'd like to confirm that you have no further comments on the TM#6 following the November 19th meeting, as we're looking to ensure that Stantec has all comments in preparation for the draft final Functional Design Study report. All feedback provided to us to date has been shared with Stantec, who will prepare the final report once the additional water quality testing information is available.

Please provide Cam with your work plan for further testing at your earliest convenience, as this will be circulated internally to provide any feedback to help ensure the best possible results.

Please don't hesitate to reach out to Cam if you have any questions or need further clarification.

Regards,

Chris Rogers, M.A.Sc., P.Eng.
Program Manager, Infrastructure Planning
Infrastructure and Water Services
City of Ottawa
110 Laurier Avenue West
Ottawa, ON
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Appendix C – Wastewater Servicing

Village of Richmond Wastewater Collection System Upgrade
General Scope and Implementation Strategy
Updated April 19, 2021

Infrastructure Required to Support Growth

This implementation strategy includes the following components, as identified in the Village of Richmond Master Servicing Study (Stantec, 2011), and the City's 2013 Infrastructure Master Plan:

- Expand Richmond pumping station (Richmond PS)
- New 600mm dia. forcemain (13.5 km twinning of existing 500mm forcemain)
- Martin Street gravity sewer to service western development lands
- King Street gravity sewer to service southeast development
- Renewal of existing 500 mm dia. forcemain

Richmond Area Specific Wastewater Development Charges

In the 2014 Development Charges (DC) Study the cost of the above infrastructure projects was allocated 100% to growth. All the growth was expected to occur by 2031, i.e. the increase in need for service attributable to development would occur within the planning period (no Post Period Capacity or PPC).

Based on an appeal in 2014 staff lowered the growth allocation to 75% to build-out and build-out was changed by staff to beyond 2031 (therefore creating PPC) and 25% Benefit to Existing (BTE). These same allocations were carried forward into 2019 DC Study with build-out occurring post-2031.

The 75% growth allocation for the Richmond capacity upgrade projects was based on the benefit provided by the second forcemain, which represented the largest cost item in the sanitary program for the village.

The Village of Richmond wastewater area specific charge by-law will be updated in the next City DC Background Study including potential conversion of existing vacant industrial designated lands to residential uses (subject to Council final approval). The funding allocation for the Richmond PS upgrade/renewal has been reviewed based on the current project scope and it has been recommended that the allocation be adjusted to 56% growth, and 44% BTE. No changes to funding allocations are recommended for the remainder of the works listed above (75% growth and 25% BTE).

2019 Functional Design Study

In December 2017, Parsons was retained by the City of Ottawa to complete a Functional Design Study for the Village of Richmond Wastewater Collection System Upgrades identified in the 2011 MSS with the final study report issued in September 2019. The primary objective of this functional design study was to identify the works necessary to relieve current constraints on development in the Village of Richmond imposed by the capacity of the sanitary sewer system – and specifically, the capacity of the Richmond PS and forcemain during peak wet weather events.

The collection system is subject to high rates of wet weather inflow and infiltration (I&I), well in excess of City design guidelines. This usually occurs during the spring thaw but can, and does, occur at other times throughout the year during major rainfall events. These high flows often exceed the capacity of the pumping station and have, in the past, resulted in bypasses to the Jock River. The issue was addressed through a Class Environmental Assessment in 1999. Tackling I&I at its source was one of numerous recommendations, but a practical and immediate solution was that flows in excess of station capacity could be diverted to Cell C, one of three lagoons that were originally used for treatment of village wastewater, but were later decommissioned and incorporated into the Richmond Conservation Area when the central pump station and forcemain system was commissioned. Excess flows diverted to Cell C are temporarily stored until the peak in the collection system subsides. This has been implemented and as a result the risk of bypass to the Jock River has been reduced. However, the approved Class Environmental Assessment did not allow for Cell C to be used to accommodate growth, and therefore it is necessary to proceed with implementation of capacity upgrades to the pump station and forcemain system in order to support new development.

The functional study report updated the population and wastewater flow projections based on the available information and completed a detailed condition assessment of the Richmond PS, forcemain and Lagoon Cell C to identify deficiencies to consider as part of scoping the required upgrades. The final report included a functional design for the Richmond PS capacity upgrade, the forcemain twinning, the King Street gravity trunk sewers and local pumping station for the north-east development area.

2021 Implementation Update

<u>Phase 1 (Completed) – Martin Street Sewer and 1.2 km of Forcemain Twinning</u>

The MSS recommended gravity trunk sewers on Martin Street to service the western development lands. This sewer was completed in 2019 at a total capital cost of $2.8M under the front ending agreement between the City and Caivan. As well, approximately 1.2 km of 600 mm dia. PVC sanitary forcemain (1st stage) has been constructed from outside of the Richmond PS along the Jock River to a location north of Lagoon Cell C, at a total cost of $4.5M. Therefore, the total estimated capital cost for Phase 1 was $7.3M.

<u>Phase 2 – Pumping Station Upgrades</u>

The proposed Richmond PS capacity/renewal upgrades are intended to increase pumping capacity to satisfy the immediate and future development pressures. The design involves replacement of all existing pumps with four identical dry pit submersible pumps, each rated initially at 125 L/s at approximately 42 m TDH, with three pumps operating in parallel providing interim firm station capacity of 195 L/s. The effective station capacity will also increase as a result of extension of the forcemain twin. The detailed design work for the Richmond PS upgrade/renewal is completed and is ready to tender once funding has been confirmed. The estimated 2020 Class A capital cost is $12.1M.

Since the recent Class A Capital Cost (not available at the time of the 2021 budget submission) for the Richmond pumping station upgrade/renewal project is $ 12.1 M there is a $ 7.0 M capital funding shortfall. The rate-funded portion of the shortfall will be secured through Council approval of the 2022 capital budget. The Development Charge portion of the shortfall will require a front-ending agreement with the benefiting developers.

Phase 3 – Forcemain Twinning (2nd Stage)

The third phase of the proposed upgrades includes the second section of forcemain twinning. The 5.9 km of twinned forcemain, 600 mm in diameter, will extend from the end of existing 600 mm dia. forcemain adjacent to Lagoon Cell C along east side of Eagleson Road and will be reconnected with the existing 500 mm dia. forcemain. This will add another 45 l/s for a total system capacity of 240 L/s. The extension of the forcemain twin will also increase the reliability of the system, as service can be maintained in the event of a one forcemain shutdown within the twinned section. Detailed design for second stage forcemain twinning project had been completed and will be tendered once a front-ending agreement with Mattamy Homes has been executed. The estimated 2020 Class A capital cost for the project is $18.2M.

Phase 4 – Forcemain Twinning (3rd Stage)

The fourth phase of the proposed upgrades include the third and final section of forcemain twinning. The last 6.4 km of twinned forcemain, 600 mm in diameter, will extend the forcemain to the discharge chamber on the Glen Cairn Trunk Sewer within the City's urban area. This phase of the proposed upgrades will complete the forcemain twinning program to increase capacity to the build-out flow projection of 360 L/s. Detailed design for this section is currently under way and will be completed in Q2 2021. Tender and construction will be triggered according to funding availability and future development growth rates. The estimated 2020 Class C capital cost is $ 29.0 M. This capital budget will be further refined once more information regarding existing utility conflicts becomes available during the detailed design stage.

Phase 4A – Gravity Sewer along King or Cockburn Street

Phase 4A of the proposed upgrades includes the installation of a gravity trunk sewer to service future southeast development area. The new, deep gravity trunk sewer is proposed along King Street or Cockburn Street (subject to further evaluation). The timeline for this gravity sewer detailed design and construction will be established based on the development needs under front-ending agreement between the City and developer (Taggart). The estimated Class C capital cost of this gravity trunk sewer is estimated at $ 5.0 M.

Development Approvals

Caivan

- Caivan had been allocated wastewater capacity for 750 units (Fox Run Subdivision registered Phase's 1 and 2 and Phase 3 not yet registered) based on previous negotiations and recent funding to construct direct connection of the existing 300 mm forcemain/gravity drain to the existing pumping station pump. This will allow direct by-pass of flows from the Richmond PS to the lagoon during excessive flows or schedule maintenance and drain back to the station during normal operating conditions and eliminating need for the use of portable outside pumping unit.
- Caivan is seeking capacity for an additional 550 units (Green & Laffin lands subdivision). The development application is in the consultation phase with no draft approval and no capacity commitment granted by the City.

Mattamy

- There are 1051 units to be draft approved subject to Mattamy demonstrating wastewater capacity in Richmond. Once the funding for next 2nd stage of 600 mm dia. forcemain 5.9 km twining project is available based on finalizing Front Ending Agreement with Mattamy, the City will recognize that approximately 75% of these draft approved units as having wastewater capacity to proceed.

The City's estimate of capacity and timing would not be in accordance with the latest submission by Caivan. While the City will of course review any further submission, it is not clear at this time that development in accordance with Caivan's and Mattamy's express submissions is possible.

Conclusions

The City completed and has plans for number of projects and initiatives to manage current and future wastewater flows generated in the Village of Richmond:

- Upgrades to facilitate emergency use of Richmond Lagoon Cell C in extreme wet weather conditions, thus avoiding future sewage discharges to the Jock River including addition of 300 mm dia. forcemain/gravity drain are completed. Direct connection to the pumping station, to eliminate need for the portable pumping unit is currently under construction.
- Replacement of perforated sanitary MH covers in low points with solid covers and critical manholes grouting to reduce I&I is completed.
- Renewal of existing 500 mm dia. forcemain is completed.
- 1.2 km twinning of 600 mm dia. forcemain to increase effective capacity of system is completed.
- Upgrade of existing trunk sewer along Martin Street is completed.
- Roof leader and sump pump disconnection program is under way.
- Richmond PS upgrade/renewal detailed design work is completed with tender and construction to follow subject to budget availability.
- Detailed design for the next 2nd stage of 600 mm dia. forcemain 5.9 km twining project is completed with the tender and construction to follow subject to finalizing front-ending agreement with Mattamy.
- The last 3rd stage of 600 mm dia. forcemain 6.4 km twining contract will complete the forcemain twinning program and increase capacity to the build-out flow projection. Detailed design for this section will be completed in 2021 and construction will be triggered according to funding availability and future development growth rates.

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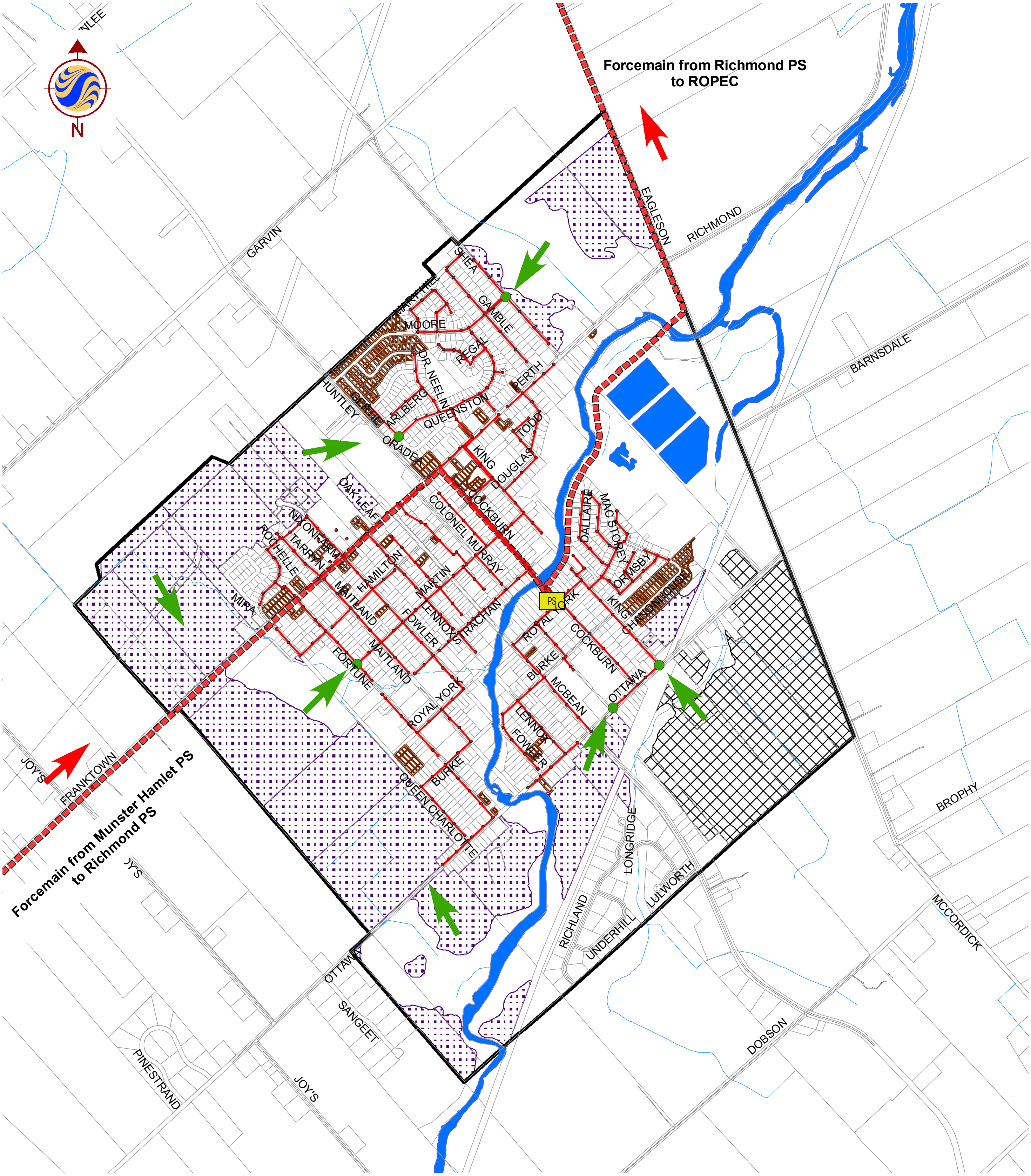
Chris Rogers, Program Manager, Infrastructure Planning
Gen Nielsen, Manager, Asset Management
John Bougadis, Senior Project Manager, Infrastructure Planning
Hasnaa Zaknoun, Manager, Wastewater Collection



W:\active\1634_00808_Richmond_Water_Sanitary\planning\drawing\GIS Data\Master Plan Figures\Figure 5.4-richmond_wastewater_servicing_existing&alternatives_20090203.mxd

Legend

PS WWPS	Village of Richmond Boundary
Future Dev. Loadings	Future Residential Development
Sanitary MH	Future Infill Development
Sanitary Collector	Future Industrial Development
Sanitary Forcemain	

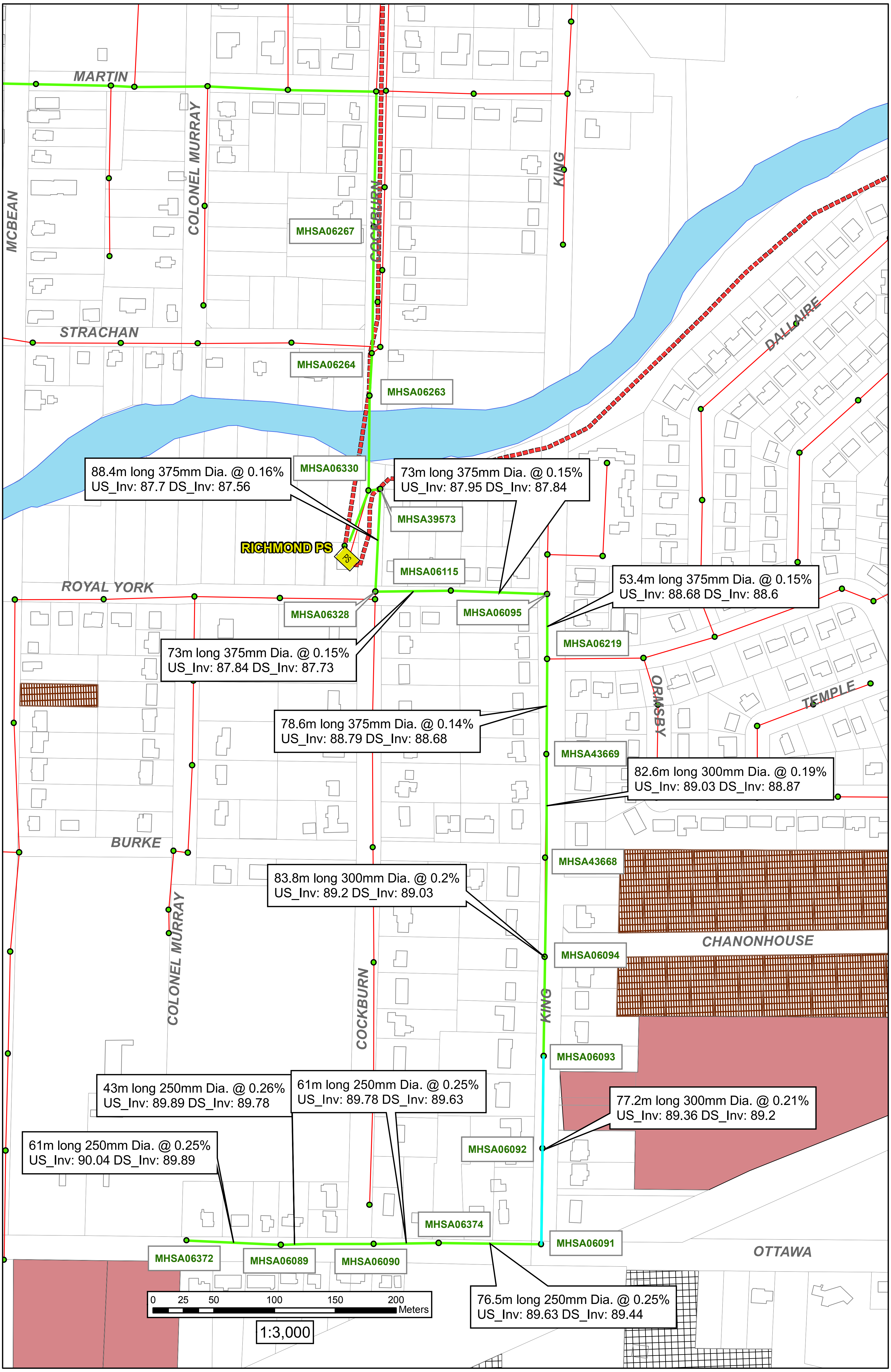
Stantec

Client/Project
CITY OF OTTAWA
VILLAGE OF RICHMOND
MASTER SERVICING STUDY

Figure No.
5.4

Title **Connection Locations to the Central Collection System**

January 2009



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Legend

- Sanitary Manhole
- Existing Sanitary Sewer
- Existing Sanitary Forcemain
- Future Development
- Future Infill
- Future Industrial

Stantec

May 2010
1634-00808

Client/Project
CITY OF OTTAWA
VILLAGE OF RICHMOND
MASTER SERVICING STUDY

Figure No.
8.7

Title
Functional Sanitary Sewer Design
South of the Jock River

Sanitary Flow Allowance Calculation Sheet for the Tamarack Richmond Lands

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION									COMM/INSTIT		INDSTR		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	UNITS Singles	UNITS Townhouse	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
Tamarack Richmond Lands per October 2024 Draft Plan of Subdivision																													
Total Sanitary Flow			51.08	1173	536	637	3543	51.08	3543	2.42	27.79	5.18	5.18	0.00	0.00	1.96	1.96	1.89	58.22	58.22	16.86	46.53							
Tamarack Richmond Lands per Technical Memorandum No. 5 Richmond Population and Wastewater Flow Projections (Parsons, August 30, 2019)																													
Total Sanitary Flow			41.70	-	-	-	2628	41.70	2628	2.42	20.61	1.00	1.00	21.00	21.00	-	-	8.83	63.70	63.70	21.02	50.46							

Notes:

*Demand and extraneous flow rates taken from Parsons Technical Memorandums

*Residential peaking factor of 2.42 applied based on the total projected population contributing to the Richmond Pump Station per the Parsons Technical Memorandums

*Where unit count is unknown, a residential density of 63p/ha was applied per Parsons Technical Memorandum No. 5 (August 30, 2019z0

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha	Dry Weather I&I		0.05	L/s/ha	
Average Daily Flow =	280	l/p/day			Total Wet Weather I&I		0.33	L/s/ha	
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Manning's n =	(Conc)	0.013	(Pvc)	0.013
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Townhouse coeff=		2.7		
Res. Peak Factor =	2.42				Single house coeff=		3.4		
ICI Peak Factor =	1.00								

Designed:	PROJECT: **Tamarack Richmond Lands**
Checked:	LOCATION: **City of Ottawa**
Dwg. Reference:	File Ref: 18-1042
Date: **December 2024**	Sheet No. 1 of 1

2025-03-06_1042_san_hmb.xlsx

SANITARY SEWER CALCULATION SHEET

Ottawa

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
STREET No. 4																											
Contribution From STREET No. 1-2, Pipe 131A - 132A						0.14	10				2.04		0.00		0.00		2.18	2.18									
	132A	134A	0.39		27	0.53	37	3.7	0.44		2.04		0.00		0.00	0.66	0.39	2.57	0.85	1.95	76.0	200	0.35	19.40	0.10	0.62	0.39
	134A	135A	0.39		27	0.92	64	3.6	0.75		2.04		0.00		0.00	0.66	0.39	2.96	0.98	2.39	76.5	200	0.35	19.40	0.12	0.62	0.42
To STREET No. 2, Pipe 135A - 136A						0.92	64				2.04		0.00		0.00			2.96									
STREET No. 3																											
	109A	110A	0.91		63	0.91	63	3.6	0.74		0.00		0.00		0.00	0.00	0.91	0.91	0.30	1.04	113.0	200	0.65	26.44	0.04	0.84	0.41
	110A	111A	0.79		55	1.70	118	3.6	1.37		0.00		0.00		0.00	0.00	0.79	1.70	0.56	1.93	108.0	200	0.35	19.40	0.10	0.62	0.39
	111A	112A	0.17		12	1.87	130	3.6	1.50		0.00		0.00		0.00	0.00	0.17	1.87	0.62	2.12	9.0	200	0.35	19.40	0.11	0.62	0.40
	112A	113A	0.49		34	2.36	164	3.5	1.88		0.00		0.00		0.00	0.00	0.49	2.36	0.78	2.66	62.5	200	0.35	19.40	0.14	0.62	0.43
	113A	114A	0.09		7	2.45	171	3.5	1.96		0.00		0.00		0.00	0.00	0.09	2.45	0.81	2.77	11.0	200	0.35	19.40	0.14	0.62	0.44
	114A	120A	0.20		14	2.65	185	3.5	2.12		0.00		0.00		0.00	0.00	0.20	2.65	0.87	2.99	34.0	200	0.35	19.40	0.15	0.62	0.45
To STREET No. 1-2, Pipe 120A - 121A						2.65	185				0.00		0.00		0.00			2.65									
SERVICING 1																											
Contribution From STREET No. 10,14,17-18, Pipe 25A - 26A						0.58	41				0.00		0.00		0.00		0.58	0.58									
	26A	27A				0.58	41	3.7	0.49		0.00		0.00		0.00	0.00	0.00	0.58	0.19	0.68	77.5	200	0.35	19.40	0.03	0.62	0.29
To STREET No. 10,14,17-18, Pipe 27A - 28A						0.58	41				0.00		0.00		0.00			0.58									
STREET No. 15																											
	16A	17A	0.37		26	0.37	26	3.7	0.31		0.00		0.00		0.00	0.00	0.37	0.37	0.12	0.43	108.0	200	0.65	26.44	0.02	0.84	0.30
Contribution From STREET No. 11, Pipe 15A - 17A						1.36	93				0.00		0.00		0.00		1.36	1.73									
	17A	20A	0.40		28	2.13	147	3.6	1.69		0.00		0.00		0.00	0.00	0.40	2.13	0.70	2.40	84.0	200	0.35	19.40	0.12	0.62	0.42
Contribution From STREET No. 12,16, Pipe 515A - 20A						0.85	59				0.00		0.00		0.00		0.85	2.98									
	20A	21A	0.50		35	3.48	241	3.5	2.73		0.00		0.00		0.00	0.00	0.50	3.48	1.15	3.88	79.5	200	0.35	19.40	0.20	0.62	0.48
	21A	22A	0.37		26	3.85	267	3.5	3.01		0.00		0.00		0.00	0.00	0.37	3.85	1.27	4.28	79.5	200	0.35	19.40	0.22	0.62	0.49
To STREET No. 10,14,17-18, Pipe 22A - 28A						3.85	267				0.00		0.00		0.00			3.85									
STREET No. 13																											
	11A	13A	0.62		43	0.62	43	3.7	0.51		0.00		0.00		0.00	0.00	0.62	0.62	0.20	0.71	81.0	200	0.65	26.44	0.03	0.84	0.36
To STREET No. 20, Pipe 13A - 14A						0.62	43				0.00		0.00		0.00			0.62									
STREET No. 20																											
	12A	13A	0.23		16	0.23	16	3.7	0.19		0.00		0.00		0.00	0.00	0.23	0.23	0.08	0.27	63.0	200	0.65	26.44	0.01	0.84	0.27
Contribution From STREET No. 13, Pipe 11A - 13A						0.62	43				0.00		0.00		0.00		0.62	0.85									
	13A	14A	0.23		16	1.08	75	3.6	0.88		0.00		0.00		0.00	0.00	0.23	1.08	0.36	1.24	81.5	200	0.35	19.40	0.06	0.62	0.34
To STREET No. 10,14,17-18, Pipe 14A - 22A						1.08	75				0.00		0.00		0.00			1.08									
STREET No. 11																											
	15A	17A	1.36		93	1.36	93	3.6	1.09		0.00		0.00		0.00	0.00	1.36	1.36	0.45	1.53	133.5	200	0.65	26.44	0.06	0.84	0.45
To STREET No. 15, Pipe 17A - 20A						1.36	93				0.00		0.00		0.00			1.36									
	37A	38A	1.16		79	1.16	79	3.6	0.93		0.00		0.00		0.00	0.00	1.16	1.16	0.38	1.31	144.5	200	0.65	26.44	0.05	0.84	0.43
	38A	39A	1.04		72	2.20	151	3.6	1.74		0.00		0.00		0.00	0.00	1.04	2.20	0.73	2.46	142.0	200	0.35	19.40	0.13	0.62	0.42
To STREET No. 9, Pipe 39A - 40A						2.20	151				0.00		0.00		0.00			2.20									
	2A	3A	0.35		24	0.35	24	3.7	0.29		0.00		0.00		0.00	0.00	0.35	0.35	0.12	0.40	34.5	200	0.65	26.44	0.02	0.84	0.30

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha				
Average Daily Flow =	280	l/p/day			Industrial Peak Factor = as per MOE Graph			
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Extraneous Flow =		0.330	L/s/ha
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Minimum Velocity =		0.600	m/s
Max Res. Peak Factor =	4.00				Manning's n =	(Conc)	0.013	(Pvc) 0.013
Commercial/Inst./Park Peak Factor =	1.00				Townhouse coeff=		2.7	
Institutional =	0.32	l/s/Ha			Single house coeff=		3.4	

Designed: SLM	PROJECT: TAMARACK RICHMOND		
Checked: SLM	LOCATION: City of Ottawa		
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No. 01D	File Ref: 18-1042	Date: 06 Mar 2025	Sheet No. 1 of 6

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
Contribution From STREET No. 9, Pipe 1A - 3A						0.42	29				0.00		0.00		0.00		0.42	0.77									
	3A	4A	0.16		11	0.93	64	3.6	0.75		0.00		0.00		0.00	0.00	0.16	0.93	0.31	1.06	35.5	200	0.35	19.40	0.05	0.62	0.33
	4A	5A	0.35		24	1.28	88	3.6	1.03		0.00		0.00		0.00	0.00	0.35	1.28	0.42	1.45	78.0	200	0.35	19.40	0.07	0.62	0.36
	5A	10A	0.35		24	1.63	112	3.6	1.30		0.00		0.00		0.00	0.00	0.35	1.63	0.54	1.84	81.5	200	0.35	19.40	0.09	0.62	0.39
To STREET No. 10,14,17-18, Pipe 10A - 14A						1.63	112				0.00		0.00		0.00			1.63									
STREET No. 9																											
	1A	3A	0.42		29	0.42	29	3.7	0.35		0.00		0.00		0.00	0.00	0.42	0.42	0.14	0.48	66.5	200	0.65	26.44	0.02	0.84	0.32
To STREET No. 11, Pipe 3A - 4A						0.42	29				0.00		0.00		0.00			0.42									
	8A	9A	0.52		36	0.52	36	3.7	0.43		0.00		0.00		0.00	0.00	0.52	0.52	0.17	0.60	65.5	200	0.85	30.24	0.02	0.96	0.37
To STREET No. 10,14,17-18, Pipe 9A - 10A						0.52	36				0.00		0.00		0.00			0.52									
	6A	7A	0.88		61	0.88	61	3.6	0.72		0.00		0.00		0.00	0.00	0.88	0.88	0.29	1.01	92.5	200	0.65	26.44	0.04	0.84	0.40
	7A	9A	0.65		45	1.53	106	3.6	1.23		0.00		0.00		0.00	0.00	0.65	1.53	0.50	1.74	88.0	200	0.35	19.40	0.09	0.62	0.38
To STREET No. 10,14,17-18, Pipe 9A - 10A						1.53	106				0.00		0.00		0.00			1.53									
	31A	32A	0.78		54	0.78	54	3.6	0.64		0.00		0.00		0.00	0.00	0.78	0.78	0.26	0.90	93.0	200	0.65	26.44	0.03	0.84	0.39
	32A	34A	0.71		49	1.49	103	3.6	1.20		0.00		0.00		0.00	0.00	0.71	1.49	0.49	1.69	92.5	200	0.35	19.40	0.09	0.62	0.37
	34A	35A	0.29		20	1.78	123	3.6	1.42		0.00		0.00		0.00	0.00	0.29	1.78	0.59	2.01	32.5	200	0.60	25.41	0.08	0.81	0.48
	35A	36A	0.13		9	1.91	132	3.6	1.53		0.00		0.00		0.00	0.00	0.13	1.91	0.63	2.16	8.0	200	0.35	19.40	0.11	0.62	0.41
	36A	39A	0.39		27	2.30	159	3.5	1.83		0.00		0.00		0.00	0.00	0.39	2.30	0.76	2.59	72.5	200	0.35	19.40	0.13	0.62	0.43
Contribution From STREET No. 11, Pipe 38A - 39A						2.20	151				0.00		0.00		0.00		2.20	4.50									
	39A	40A	0.61		42	5.11	352	3.4	3.92		0.00		0.00		0.00	0.00	0.61	5.11	1.69	5.61	117.5	200	0.35	19.40	0.29	0.62	0.53
	40A	41A	0.52		36	5.63	388	3.4	4.30		0.00		0.00		0.00	0.00	0.52	5.63	1.86	6.16	117.5	200	0.35	19.40	0.32	0.62	0.55
Contribution From STREET No. 14, Pipe 30A - 41A						11.64	810				0.00		3.14		1.96		16.74	22.37									
	41A	78A	0.14		10	17.41	1208	3.2	12.51		0.00		3.14		1.96	1.23	0.14	22.51	7.43	21.17	83.0	300	0.20	43.25	0.49	0.61	0.61
To STREET No. 1-2, Pipe 78A - 79A						17.41	1208				0.00		3.14		1.96			22.51									
STREET No. 5																											
	67A	503A	0.39		27	0.39	27	3.7	0.32		0.00		0.00		0.00	0.00	0.39	0.39	0.13	0.45	70.5	200	0.65	26.44	0.02	0.84	0.32
	503A	504A	0.22		16	0.61	43	3.7	0.51		0.00		0.00		0.00	0.00	0.22	0.61	0.20	0.71	78.0	200	0.35	19.40	0.04	0.62	0.29
To STREET No. 7, Pipe 504A - 502A						0.61	43				0.00		0.00		0.00			0.61									
STREET No. 7																											
	505A	504A	0.06		5	0.06	5	3.8	0.06		0.00		0.00		0.00	0.00	0.06	0.06	0.02	0.08	34.0	200	0.65	26.44	0.00	0.84	0.19
Contribution From STREET No. 5, Pipe 503A - 504A						0.61	43				0.00		0.00		0.00		0.61	0.67									
	504A	502A	0.60		42	1.27	90	3.6	1.05		0.00		0.00		0.00	0.00	0.60	1.27	0.42	1.47	75.0	200	0.35	19.40	0.08	0.62	0.36
	502A	501A	0.51		35	1.78	125	3.6	1.45		0.00		0.00		0.00	0.00	0.51	1.78	0.59	2.03	76.0	200	0.35	19.40	0.10	0.62	0.40
To STREET No. 1-2, Pipe 501A - 512A						1.78	125				0.00		0.00		0.00			1.78									
STREET No. 12,16																											
	18A	515A	0.70		48	0.70	48	3.7	0.57		0.00		0.00		0.00	0.00	0.70	0.70	0.23	0.80	81.0	200	0.65	26.44	0.03	0.84	0.37
	515A	20A	0.15		11	0.85	59	3.6	0.70		0.00		0.00		0.00	0.00	0.15	0.85	0.28	0.98	49.0	200	0.35	19.40	0.05	0.62	0.32
To STREET No. 15, Pipe 20A - 21A						0.85	59				0.00		0.00		0.00			0.85									
	42A	44A	0.13		9	0.13	9	3.7	0.11		0.00		0.00		0.00	0.00	0.13	0.13	0.04	0.15	70.0	200	0.70	27.44	0.01	0.87	0.22

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha				
Average Daily Flow =	280	l/p/day			Industrial Peak Factor = as per MOE Graph			
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Extraneous Flow =		0.330	L/s/ha
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Minimum Velocity =		0.600	m/s
Max Res. Peak Factor =	4.00				Manning's n =	(Conc)	0.013	(Pvc) 0.013
Commercial/Inst./Park Peak Factor =	1.00				Townhouse coeff=		2.7	
Institutional =	0.32	l/s/Ha			Single house coeff=		3.4	

Designed: SLM	PROJECT: TAMARACK RICHMOND		
Checked: SLM	LOCATION: City of Ottawa		
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No. 01D	File Ref: 18-1042	Date: 06 Mar 2025	Sheet No. 2 of 6

1042_SAN.xlsx

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
Contribution From STREET No. 10,14,17-18, Pipe 43A - 44A						0.24	17				0.00		0.00		0.00		0.24	0.37									
	44A	45A	1.09		75	1.46	101	3.6	1.18		0.00		0.00		0.00	0.00	1.09	1.46	0.48	1.66	148.5	200	0.35	19.40	0.09	0.62	0.37
	45A	52A	0.06		5	1.52	106	3.6	1.23		0.00		0.00		0.00	0.00	0.06	1.52	0.50	1.73	38.0	200	0.35	19.40	0.09	0.62	0.38
To STREET No. 10,14,17-18, Pipe 52A - 53A						1.52	106				0.00		0.00		0.00			1.52									
STREET No. 10,14,17-18																											
	43A	44A	0.24		17	0.24	17	3.7	0.20		0.00		0.00		0.00	0.00	0.24	0.24	0.08	0.28	46.5	200	1.05	33.61	0.01	1.07	0.33
To STREET No. 12,16, Pipe 44A - 45A						0.24	17				0.00		0.00		0.00			0.24									
	54A	55A	0.87		60	0.87	60	3.6	0.71		0.00		0.00		0.00	0.00	0.87	0.87	0.29	0.99	98.5	200	0.65	26.44	0.04	0.84	0.40
	55A	56A	0.52		36	1.39	96	3.6	1.12		0.00		0.00		0.00	0.00	0.52	1.39	0.46	1.58	97.0	200	0.35	19.40	0.08	0.62	0.37
	23A	24A	0.34		24	0.34	24	3.7	0.29		0.00		0.00		0.00	0.00	0.34	0.34	0.11	0.40	58.0	200	0.65	26.44	0.02	0.84	0.30
	24A	25A	0.24		17	0.58	41	3.7	0.49		0.00		0.00		0.00	0.00	0.24	0.58	0.19	0.68	10.5	200	0.35	19.40	0.03	0.62	0.29
	25A	26A				0.58	41	3.7	0.49		0.00		0.00		0.00	0.00	0.00	0.58	0.19	0.68	10.5	200	0.35	19.40	0.03	0.62	0.29
To SERVICING 1, Pipe 26A - 27A						0.58	41				0.00		0.00		0.00			0.58									
	58A	59A	0.68		47	0.68	47	3.7	0.56		0.00		0.00		0.00	0.00	0.68	0.68	0.22	0.78	110.5	200	0.65	26.44	0.03	0.84	0.37
	59A	60A	0.55		38	1.23	85	3.6	0.99		0.00		0.00		0.00	0.00	0.55	1.23	0.41	1.40	68.0	200	0.35	19.40	0.07	0.62	0.36
	60A	61A	0.14		10	1.37	95	3.6	1.11		0.00		0.00		0.00	0.00	0.14	1.37	0.45	1.56	7.5	200	0.35	19.40	0.08	0.62	0.37
To SERVICING 1, Pipe 61A - 64A						1.37	95				0.00		0.00		0.00			1.37									
Contribution From SERVICING 1, Pipe 26A - 27A						0.58	41				0.00		0.00		0.00		0.58	0.58									
	27A	28A	0.11		8	0.69	49	3.7	0.58		0.00		0.00		0.00	0.00	0.11	0.69	0.23	0.81	9.0	200	0.35	19.40	0.04	0.62	0.30
To STREET No. 14, Pipe 28A - 29A						0.69	49				0.00		0.00		0.00			0.69									
Contribution From STREET No. 9, Pipe 7A - 9A						1.53	106				0.00		0.00		0.00		1.53	1.53									
Contribution From STREET No. 9, Pipe 8A - 9A						0.52	36				0.00		0.00		0.00		0.52	2.05									
	9A	10A	0.13		9	2.18	151	3.6	1.74		0.00		0.00		0.00	0.00	0.13	2.18	0.72	2.46	78.0	200	0.35	19.40	0.13	0.62	0.42
Contribution From STREET No. 11, Pipe 5A - 10A						1.63	112				0.00		0.00		0.00		1.63	3.81									
	10A	14A	0.44		31	4.25	294	3.5	3.30		0.00		0.00		0.00	0.00	0.44	4.25	1.40	4.70	96.0	200	0.35	19.40	0.24	0.62	0.51
Contribution From STREET No. 20, Pipe 13A - 14A						1.08	75				0.00		0.00		0.00		1.08	5.33									
	14A	22A	0.10		7	5.43	376	3.4	4.18		0.00		0.00		0.00	0.00	0.10	5.43	1.79	5.97	49.0	200	0.35	19.40	0.31	0.62	0.54
Contribution From STREET No. 15, Pipe 21A - 22A						3.85	267				0.00		0.00		0.00		3.85	9.28									
	22A	28A	0.38		27	9.66	670	3.3	7.22		0.00		0.00		0.00	0.00	0.38	9.66	3.19	10.41	90.0	250	0.25	29.73	0.35	0.61	0.55
To STREET No. 14, Pipe 28A - 29A						9.66	670				0.00		0.00		0.00			9.66									
	47A	48A	0.20		14	0.20	14	3.7	0.17		0.00		0.00		0.00	0.00	0.20	0.20	0.07	0.23	8.5	200	3.75	63.51	0.00	2.02	0.45
	48A	49A	0.69		47	0.89	61	3.6	0.72		0.00		0.00		0.00	0.00	0.69	0.89	0.29	1.01	78.5	200	0.35	19.40	0.05	0.62	0.33
	49A	50A	0.55		38	1.44	99	3.6	1.15		0.00		0.00		0.00	0.00	0.55	1.44	0.48	1.63	73.0	200	0.35	19.40	0.08	0.62	0.37
	50A	51A	0.11		8	1.55	107	3.6	1.24		0.00		0.00		0.00	0.00	0.11	1.55	0.51	1.76	9.0	200	0.35	19.40	0.09	0.62	0.38
	51A	52A	0.60		42	2.15	149	3.6	1.72		0.00		0.00		0.00	0.00	0.60	2.15	0.71	2.43	63.0	200	0.35	19.40	0.12	0.62	0.42
Contribution From STREET No. 12,16, Pipe 45A - 52A						1.52	106				0.00		0.00		0.00		1.52	3.67									
	52A	53A	0.36		25	4.03	280	3.5	3.15		0.00		0.00		0.00	0.00	0.36	4.03	1.33	4.48	48.5	200	0.35	19.40	0.23	0.62	0.50
	53A	56A	0.42		29	4.45	309	3.5	3.46		0.00		0.00		0.00	0.00	0.42	4.45	1.47	4.93	50.0	200	0.35	19.40	0.25	0.62	0.51
	56A	57A	0.47		33	6.31	438	3.4	4.83		0.00		0.00		0.00	0.00	0.47	6.31	2.08	6.91	69.0	200	0.35	19.40	0.36	0.62	0.56
	57A	61A				6.31	438	3.4	4.83		0.00		0.00		0.00	0.00	0.00	6.31	2.08	6.91	7.5	200	0.35	19.40	0.36	0.62	0.56
To SERVICING 1, Pipe 61A - 64A						6.31	438				0.00		0.00		0.00			6.31									

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha	
Average Daily Flow =	280	l/p/day			Industrial Peak Factor = as per MOE Graph
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Extraneous Flow = 0.330 L/s/ha
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Minimum Velocity = 0.600 m/s
Max Res. Peak Factor =	4.00				Manning's n = (Conc) 0.013 (Pvc) 0.013
Commercial/Inst./Park Peak Factor =	1.00				Townhouse coeff= 2.7
Institutional =	0.32	l/s/Ha			Single house coeff= 3.4

Designed: SLM	PROJECT: TAMARACK RICHMOND		
Checked: SLM	LOCATION: City of Ottawa		
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No. 01D	File Ref: 18-1042	Date: 06 Mar 2025	Sheet No. 3 of 6

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
SERVICING 1																											
Contribution From STREET No. 10,14,17-18, Pipe 57A - 61A						6.31	438				0.00		0.00		0.00		6.31	6.31									
Contribution From STREET No. 10,14,17-18, Pipe 60A - 61A						1.37	95				0.00		0.00		0.00		1.37	7.68									
	61A	64A				7.68	533	3.4	5.82		0.00		0.00		0.00	0.00	0.00	7.68	2.53	8.35	85.5	200	0.35	19.40	0.43	0.62	0.59
To STREET No. 1-2, Pipe 64A - 65A						7.68	533				0.00		0.00		0.00			7.68									
STREET No. 1-2																											
	131A	132A	0.14		10	0.14	10	3.7	0.12	2.04	2.04		0.00		0.00	0.66	2.18	2.18	0.72	1.50	27.5	200	2.60	52.89	0.03	1.68	0.74
To STREET No. 4, Pipe 132A - 134A						0.14	10				2.04		0.00		0.00			2.18									
	137A	138A	0.43		29	0.43	29	3.7	0.35		0.00		0.00		0.00	0.00	0.43	0.43	0.14	0.49	133.5	200	0.65	26.44	0.02	0.84	0.32
To SERVICING 6, Pipe 138A - 139A						0.43	29				0.00		0.00		0.00			0.43									
	115A	116A	0.65		45	0.65	45	3.7	0.53		0.00		0.00		0.00	0.00	0.65	0.65	0.21	0.75	127.0	200	0.65	26.44	0.03	0.84	0.37
	116A	117A	0.20		14	0.85	59	3.6	0.70		0.00		0.00		0.00	0.00	0.20	0.85	0.28	0.98	8.0	200	0.35	19.40	0.05	0.62	0.32
	117A	118A				0.85	59	3.6	0.70	0.82	0.82		0.00		0.00	0.27	0.82	1.67	0.55	1.51	56.5	200	0.35	19.40	0.08	0.62	0.36
	118A	119A	0.27		19	1.12	78	3.6	0.91		0.82		0.00		0.00	0.27	0.27	1.94	0.64	1.82	10.0	200	0.35	19.40	0.09	0.62	0.39
	119A	120A	0.11		8	1.23	86	3.6	1.01		0.82		0.00		0.00	0.27	0.11	2.05	0.68	1.95	71.0	200	0.35	19.40	0.10	0.62	0.39
Contribution From STREET No. 3, Pipe 114A - 120A						2.65	185				0.00		0.00		0.00		2.65	4.70									
	120A	121A	0.11		8	3.99	279	3.5	3.14		0.82		0.00		0.00	0.27	0.11	4.81	1.59	4.99	71.0	200	0.35	19.40	0.26	0.62	0.52
	121A	122A	0.28		20	4.27	299	3.5	3.36		0.82		0.00		0.00	0.27	0.28	5.09	1.68	5.30	10.0	200	0.35	19.40	0.27	0.62	0.52
	122A	123A				4.27	299	3.5	3.36		0.82		0.00		0.00	0.27	0.00	5.09	1.68	5.30	22.5	200	0.35	19.40	0.27	0.62	0.52
	123A	124A	0.88		60	5.15	359	3.4	4.00		0.82		0.00		0.00	0.27	0.88	5.97	1.97	6.23	137.5	200	0.35	19.40	0.32	0.62	0.55
To STREET No. 2, Pipe 124A - 125A						5.15	359				0.82		0.00		0.00			5.97									
	62A	63A	0.98		67	0.98	67	3.6	0.79		0.00		0.00		0.00	0.00	0.98	0.98	0.32	1.11	128.0	200	0.65	26.44	0.04	0.84	0.41
	63A	64A				0.98	67	3.6	0.79		0.00		0.00		0.00	0.00	0.00	0.98	0.32	1.11	7.0	200	0.35	19.40	0.06	0.62	0.33
Contribution From SERVICING 1, Pipe 61A - 64A						7.68	533				0.00		0.00		0.00		7.68	8.66									
	64A	65A	0.17		12	8.83	612	3.3	6.63		0.00		0.00		0.00	0.00	0.17	8.83	2.91	9.54	11.0	200	0.35	19.40	0.49	0.62	0.61
	65A	66A	0.32		22	9.15	634	3.3	6.85		0.00		0.00		0.00	0.00	0.32	9.15	3.02	9.87	36.5	250	0.25	29.73	0.33	0.61	0.54
	66A	501A	0.13		9	9.28	643	3.3	6.94		0.00		0.00		0.00	0.00	0.13	9.28	3.06	10.01	29.5	250	0.25	29.73	0.34	0.61	0.54
Contribution From STREET No. 7, Pipe 502A - 501A						1.78	125				0.00		0.00		0.00		1.78	11.06									
	501A	512A	0.33		23	11.39	791	3.3	8.44		0.00		0.00		0.00	0.00	0.33	11.39	3.76	12.19	68.5	250	0.25	29.73	0.41	0.61	0.58
	512A	513A	0.29		20	11.68	811	3.3	8.63		0.00		0.00		0.00	0.00	0.29	11.68	3.85	12.49	15.0	250	0.25	29.73	0.42	0.61	0.58
	513A	514A	0.91		62	12.59	873	3.3	9.25		0.00		0.00		0.00	0.00	0.91	12.59	4.15	13.41	121.0	300	0.20	43.25	0.31	0.61	0.54
	514A	77A	0.19		14	12.78	887	3.3	9.39		0.00		0.00		0.00	0.00	0.19	12.78	4.22	13.61	7.5	300	0.20	43.25	0.31	0.61	0.54
	77A	78A	0.39		27	13.17	914	3.3	9.66		0.00		0.00		0.00	0.00	0.39	13.17	4.35	14.00	63.0	300	0.20	43.25	0.32	0.61	0.55
Contribution From STREET No. 9, Pipe 41A - 78A						17.41	1208				0.00		3.14		1.96		22.51	35.68									
	78A	79A	0.83		57	31.41	2179	3.0	21.50		0.00		3.14		1.96	1.23	0.83	36.51	12.05	34.78	111.0	375	0.15	67.91	0.51	0.61	0.62
	79A	124A	0.62		42	32.03	2221	3.0	21.88		0.00		3.14		1.96	1.23	0.62	37.13	12.25	35.36	95.0	375	0.15	67.91	0.52	0.61	0.62
To STREET No. 2, Pipe 124A - 125A						32.03	2221				0.00		3.14		1.96			37.13									
STREET No. 6																											
	100A	101A	1.06		73	1.06	73	3.6	0.86		0.00		0.00		0.00	0.00	1.06	1.06	0.35	1.21	117.0	200	0.65	26.44	0.05	0.84	0.43
	101A	102A	0.79		54	1.85	127	3.6	1.47		0.00		0.00		0.00	0.00	0.79	1.85	0.61	2.08	113.0	200	0.35	19.40	0.11	0.62	0.40
To STREET No. 8, Pipe 102A - 104A						1.85	127				0.00		0.00		0.00			1.85									
	93A	94A	0.31		22	0.31	22	3.7	0.26		0.00		0.00		0.00	0.00	0.31	0.31	0.10	0.37	19.0	200	0.65	26.44	0.01	0.84	0.29

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha				
Average Daily Flow =	280	l/p/day			Industrial Peak Factor = as per MOE Graph			
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Extraneous Flow =		0.330	L/s/ha
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Minimum Velocity =		0.600	m/s
Max Res. Peak Factor =	4.00				Manning's n =	(Conc)	0.013	(Pvc) 0.013
Commercial/Inst./Park Peak Factor =	1.00				Townhouse coeff=		2.7	
Institutional =	0.32	l/s/Ha			Single house coeff=		3.4	

Designed: SLM	PROJECT: **TAMARACK RICHMOND**		
Checked: SLM	LOCATION: **City of Ottawa**		
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No. 01D	File Ref: 18-1042	Date: **06 Mar 2025**	Sheet No. 4 of 6

1042_SAN.xlsx

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
	94A	95A	0.61		42	0.92	64	3.6	0.75		0.00		0.00		0.00	0.00	0.61	0.92	0.30	1.06	88.5	200	0.35	19.40	0.05	0.62	0.33
	95A	97A	0.73		50	1.65	114	3.6	1.32		0.00		0.00		0.00	0.00	0.73	1.65	0.54	1.87	94.0	200	0.35	19.40	0.10	0.62	0.39
To STREET No. 8, Pipe 97A - 102A						1.65	114				0.00		0.00		0.00			1.65									
STREET No. 8																											
	510A	511A	0.08		6	0.08	6	3.7	0.07		0.00		0.00		0.00	0.00	0.08	0.08	0.03	0.10	8.5	200	3.05	57.28	0.00	1.82	0.34
	511A	87A	0.56		38	0.64	44	3.7	0.52		0.00		0.00		0.00	0.00	0.56	0.64	0.21	0.73	87.0	200	0.35	19.40	0.04	0.62	0.29
To STREET No. 8, Pipe 87A - 88A						0.64	44				0.00		0.00		0.00			0.64									
	509A	508A	0.28		20	0.28	20	3.7	0.24		0.00		0.00		0.00	0.00	0.28	0.28	0.09	0.33	48.0	200	0.65	26.44	0.01	0.84	0.28
	508A	507A	0.13		9	0.41	29	3.7	0.35		0.00		0.00		0.00	0.00	0.13	0.41	0.14	0.48	14.0	200	1.15	35.17	0.01	1.12	0.39
	507A	506A	0.50		35	0.91	64	3.6	0.75		0.00		0.00		0.00	0.00	0.50	0.91	0.30	1.05	85.0	200	0.35	19.40	0.05	0.62	0.33
	506A	90A	0.65		45	1.56	109	3.6	1.27		0.00		0.00		0.00	0.00	0.65	1.56	0.51	1.78	86.5	200	0.35	19.40	0.09	0.62	0.38
To STREET No. 8, Pipe 90A - 97A						1.56	109				0.00		0.00		0.00			1.56									
STREET No. 8																											
Contribution From STREET No. 8, Pipe 511A - 87A						0.64	44				0.00		0.00		0.00		0.64	0.64									
	87A	88A	0.45		31	1.09	75	3.6	0.88		0.00		0.00		0.00	0.00	0.45	1.09	0.36	1.24	54.0	200	0.35	19.40	0.06	0.62	0.34
	88A	89A	0.18		13	1.27	88	3.6	1.03		0.00		0.00		0.00	0.00	0.18	1.27	0.42	1.45	11.0	200	0.35	19.40	0.07	0.62	0.36
	89A	90A	0.38		27	1.65	115	3.6	1.33		0.00		0.00		0.00	0.00	0.38	1.65	0.54	1.88	70.0	200	0.35	19.40	0.10	0.62	0.39
Contribution From STREET No. 8, Pipe 506A - 90A						1.56	109				0.00		0.00		0.00		1.56	3.21									
	90A	97A	0.34		24	3.55	248	3.5	2.80		0.00		0.00		0.00	0.00	0.34	3.55	1.17	3.98	78.0	200	0.35	19.40	0.20	0.62	0.48
Contribution From STREET No. 6, Pipe 95A - 97A						1.65	114				0.00		0.00		0.00		1.65	5.20									
	97A	102A	0.33		23	5.53	385	3.4	4.27		0.00		0.00		0.00	0.00	0.33	5.53	1.82	6.10	78.0	200	0.35	19.40	0.31	0.62	0.55
Contribution From STREET No. 6, Pipe 101A - 102A						1.85	127				0.00		0.00		0.00		1.85	7.38									
	102A	104A	0.34		24	7.72	536	3.4	5.85		0.00		0.00		0.00	0.00	0.34	7.72	2.55	8.40	79.0	200	0.35	19.40	0.43	0.62	0.59
To STREET No. 14, Pipe 104A - 108A						7.72	536				0.00		0.00		0.00			7.72									
STREET No. 14																											
	107A	108A	1.23		84	1.23	84	3.6	0.98		0.00		0.00		0.00	0.00	1.23	1.23	0.41	1.39	126.0	200	0.65	26.44	0.05	0.84	0.44
To STREET No. 2, Pipe 108A - 124A						1.23	84				0.00		0.00		0.00			1.23									
	103A	104A	0.37		26	0.37	26	3.7	0.31		0.00		0.00		0.00	0.00	0.37	0.37	0.12	0.43	63.0	200	0.65	26.44	0.02	0.84	0.30
Contribution From STREET No. 8, Pipe 102A - 104A						7.72	536				0.00		0.00		0.00		7.72	8.09									
	104A	108A	0.98		67	9.07	629	3.3	6.80		0.00		0.00		0.00	0.00	0.98	9.07	2.99	9.79	128.0	250	0.25	29.73	0.33	0.61	0.54
To STREET No. 2, Pipe 108A - 124A						9.07	629				0.00		0.00		0.00			9.07									
Contribution From STREET No. 10,14,17-18, Pipe 22A - 28A						9.66	670				0.00		0.00		0.00		9.66	9.66									
Contribution From STREET No. 10,14,17-18, Pipe 27A - 28A						0.69	49				0.00		0.00		0.00		0.69	10.35									
	28A	29A	0.28		20	10.63	739	3.3	7.91		0.00		0.00	1.96	1.96	0.21	2.24	12.59	4.15	12.28	77.0	250	0.25	29.73	0.41	0.61	0.58
	29A	30A	0.60		42	11.23	781	3.3	8.34		0.00		0.00		1.96	0.21	0.60	13.19	4.35	12.90	135.0	300	0.20	43.25	0.30	0.61	0.53
	30A	41A	0.41		29	11.64	810	3.3	8.63		0.00	3.14	3.14		1.96	1.23	3.55	16.74	5.52	15.38	88.5	300	0.20	43.25	0.36	0.61	0.56
To STREET No. 9, Pipe 41A - 78A						11.64	810				0.00		3.14		1.96			16.74									
STREET No. 2																											
Contribution From STREET No. 14, Pipe 104A - 108A						9.07	629				0.00		0.00		0.00		9.07	9.07									
Contribution From STREET No. 14, Pipe 107A - 108A						1.23	84				0.00		0.00		0.00		1.23	10.30									
	108A	124A	0.14		10	10.44	723	3.3	7.75		0.00		0.00		0.00	0.00	0.14	10.44	3.45	11.20	83.0	250	0.25	29.73	0.38	0.61	0.56

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha	
Average Daily Flow =	280	l/p/day			Industrial Peak Factor = as per MOE Graph
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Extraneous Flow = 0.330 L/s/ha
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Minimum Velocity = 0.600 m/s
Max Res. Peak Factor =	4.00				Manning's n = (Conc) 0.013 (Pvc) 0.013
Commercial/Inst./Park Peak Factor =	1.00				Townhouse coeff= 2.7
Institutional =	0.32	l/s/Ha			Single house coeff= 3.4

Designed: SLM

Checked: SLM

Dwg. Reference: Sanitary Drainage Plan, Dwgs. No. 01D

PROJECT: **TAMARACK RICHMOND**

LOCATION: **City of Ottawa**

File Ref: 18-1042

Date: 06 Mar 2025

Sheet No. 5 of 6

1042_SAN.xlsx

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
Contribution From STREET No. 1-2, Pipe 123A - 124A						5.15	359				0.82		0.00		0.00		5.97	16.41									
Contribution From STREET No. 1-2, Pipe 79A - 124A						32.03	2221				0.00		3.14		1.96		37.13	53.54									
	124A	125A	0.68		47	48.30	3350	2.9	31.71		0.82		3.14		1.96	1.49	0.68	54.22	17.89	51.10	94.0	450	0.12	98.76	0.52	0.62	0.63
	125A	126A	0.69		47	48.99	3397	2.9	32.11		0.82		3.14		1.96	1.49	0.69	54.91	18.12	51.72	90.5	450	0.12	98.76	0.52	0.62	0.63
	126A	128A	0.23		16	49.22	3413	2.9	32.25		0.82		3.14		1.96	1.49	0.23	55.14	18.20	51.94	43.0	450	0.12	98.76	0.53	0.62	0.63
	128A	129A	0.26		18	49.48	3431	2.9	32.40		0.82		3.14		1.96	1.49	0.26	55.40	18.28	52.17	59.0	450	0.12	98.76	0.53	0.62	0.63
	129A	135A	0.16		11	49.64	3442	2.9	32.49		0.82		3.14		1.96	1.49	0.16	55.56	18.33	52.32	54.5	450	0.12	98.76	0.53	0.62	0.63
Contribution From STREET No. 4, Pipe 134A - 135A						0.92	64				2.04		0.00		0.00		2.96	58.52									
	135A	136A	0.06		5	50.62	3511	2.9	33.07		2.86		3.14		1.96	2.16	0.06	58.58	19.33	54.56	37.5	450	0.12	98.76	0.55	0.62	0.64
	136A	138A	0.03		3	50.65	3514	2.9	33.10		2.86		3.14		1.96	2.16	0.03	58.61	19.34	54.60	11.0	450	0.12	98.76	0.55	0.62	0.64
To SERVICING 6, Pipe 138A - 139A						50.65	3514				2.86		3.14		1.96			58.61									
SERVICING 6																											
Contribution From STREET No. 2, Pipe 136A - 138A						50.65	3514				2.86		3.14		1.96		58.61	58.61									
Contribution From STREET No. 1-2, Pipe 137A - 138A						0.43	29				0.00		0.00		0.00		0.43	59.04									
	138A	139A				51.08	3543	2.9	33.34		2.86		3.14		1.96	2.16	0.00	59.04	19.48	54.98	34.0	450	0.12	98.76	0.56	0.62	0.64
To EXTERNAL SANITARY, Pipe 139A - 83A						51.08	3543				2.86		3.14		1.96			59.04									
EXTERNAL SANITARY																											
	86A	85A				0.00					0.00		0.00		0.00	0.00	0.00	0.00	0.00	0.00	110.0	200	0.65	26.44	0.00	0.84	0.05
	85A	84A				0.00	0				0.00		0.00		0.00	0.00	0.00	0.00	0.00	0.00	111.0	200	0.35	19.40	0.00	0.62	0.03
	84A	139A				0.00	0				0.00		0.00		0.00	0.00	0.00	0.00	0.00	0.00	69.0	200	0.35	19.40	0.00	0.62	0.03
Contribution From SERVICING 6, Pipe 138A - 139A						51.08	3543				2.86		3.14		1.96		59.04	59.04									
	139A	83A				51.08	3543	2.9	33.34		2.86		3.14		1.96	2.16	0.00	59.04	19.48	54.98	41.0	450	0.12	98.76	0.56	0.62	0.64
	83A	82A				51.08	3543	2.9	33.34		2.86		3.14		1.96	2.16	0.00	59.04	19.48	54.98	117.0	450	0.12	98.76	0.56	0.62	0.64
	82A	81A				51.08	3543	2.9	33.34		2.86		3.14		1.96	2.16	0.00	59.04	19.48	54.98	42.0	450	0.12	98.76	0.56	0.62	0.64
	81A	80A				51.08	3543	2.9	33.34		2.86		3.14		1.96	2.16	0.00	59.04	19.48	54.98	110.0	450	0.12	98.76	0.56	0.62	0.64
	80A	68A				51.08	3543	2.9	33.34		2.86		3.14		1.96	2.16	0.00	59.04	19.48	54.98	110.0	450	0.12	98.76	0.56	0.62	0.64
	68A	69A				51.08	3543	2.9	33.34		2.86		3.14		1.96	2.16	0.00	59.04	19.48	54.98	87.5	450	0.12	98.76	0.56	0.62	0.64
	69A	70A				51.08	3543	2.9	33.34		2.86		3.14		1.96	2.16	0.00	59.04	19.48	54.98	67.0	450	0.12	98.76	0.56	0.62	0.64
	70A	71A				51.08	3543	2.9	33.34		2.86		3.14		1.96	2.16	0.00	59.04	19.48	54.98	110.0	450	0.12	98.76	0.56	0.62	0.64
	71A	72A				51.08	3543	2.9	33.34		2.86		3.14		1.96	2.16	0.00	59.04	19.48	54.98	110.0	450	0.12	98.76	0.56	0.62	0.64
	72A	73A				51.08	3543	2.9	33.34		2.86		3.14		1.96	2.16	0.00	59.04	19.48	54.98	106.0	450	0.12	98.76	0.56	0.62	0.64
	73A	74A				51.08	3543	2.9	33.34		2.86		3.14		1.96	2.16	0.00	59.04	19.48	54.98	104.0	450	0.12	98.76	0.56	0.62	0.64
	74A	75A				51.08	3543	2.9	33.34		2.86		3.14		1.96	2.16	0.00	59.04	19.48	54.98	102.0	450	0.12	98.76	0.56	0.62	0.64
	75A	76A				51.08	3543	2.9	33.34		2.86		3.14		1.96	2.16	0.00	59.04	19.48	54.98	8.5	450	0.12	98.76	0.56	0.62	0.64
	76A	19A				51.08	3543	2.9	33.34		2.86		3.14		1.96	2.16	0.00	59.04	19.48	54.98	30.0	450	0.12	98.76	0.56	0.62	0.64

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha						
Average Daily Flow =	280	l/p/day			Industrial Peak Factor = as per MOE Graph					
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Extraneous Flow =		0.330	L/s/ha		
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Minimum Velocity =		0.600	m/s		
Max Res. Peak Factor =	4.00				Manning's n =	(Conc)	0.013	(Pvc)	0.013	
Commercial/Inst./Park Peak Factor =	1.00				Townhouse coeff=		2.7			
Institutional =	0.32	l/s/Ha			Single house coeff=		3.4			

Designed: SLM	PROJECT: TAMARACK RICHMOND		
Checked: SLM	LOCATION: City of Ottawa		
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No. 01D	File Ref: 18-1042	Date: 06 Mar 2025	Sheet No. 6 of 6

Appendix D – Stormwater Management

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Arterial Roads Return Frequency = 10 years

Manning 0.013

Ottawa

LOCATION			AREA (Ha)																FLOW						SEWER DATA								
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min)	Q/Q full
SERVICING 5																																	
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00						1013									
	68	69			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	1013	900	900	CONC	0.50	39.0	1280.0833	2.0122	0.3230	0.791
To STREET No. 9, Pipe 69 - 70						0.00				0.00				0.00				0.00	10.32					1013									
STREET No. 7																																	
Contribution From STREET No. 14, Pipe 58 - 60						0.00				3.17				0.00				0.00	12.35														
Contribution From STREET No. 14, Pipe 59 - 60						0.00				0.64				0.00				0.00	11.31														
	60	62	0.08	0.66	0.15	0.15			0.00	3.81			0.00	0.00			0.00	0.00	12.35	68.83	93.23	109.24	159.61	366	750	750	CONC	0.20	49.5	497.8726	1.1270	0.7321	0.734
Contribution From STREET No. 5, Pipe 61 - 62						0.40				0.00				0.00				0.00	11.29														
	62	63	0.60	0.66	1.10	1.65			0.00	3.81			0.00	0.00			0.00	0.00	13.08	66.70	90.32	105.81	154.57	454	825	825	CONC	0.20	75.5	641.9463	1.2009	1.0478	0.708
	63	64	0.51	0.66	0.94	2.59			0.00	3.81			0.00	0.00			0.00	0.00	14.13	63.90	86.48	101.29	147.94	495	825	825	CONC	0.20	75.5	641.9463	1.2009	1.0478	0.771
To STREET No. 1-2, Pipe 64 - 65						2.59				3.81				0.00				0.00	15.18														
SERVICING 1																																	
Contribution From STREET No. 10,14,17-18, Pipe 49 - 53						11.58				0.00				0.00				0.00	17.20														
Contribution From STREET No. 10,14,17-18, Pipe 52 - 53						2.18				0.00				0.00				0.00	12.74														
	53	54			0.00	13.76			0.00	0.00			0.00	0.00			0.00	0.00	17.20	57.02	77.06	90.21	131.68	785	1200	1200	CONC	0.10	82.5	1232.8868	1.0901	1.2613	0.636
To STREET No. 1-2, Pipe 54 - 55						13.76				0.00				0.00				0.00	18.46														
SERVICING 2																																	
Contribution From STREET No. 10,14,17-18, Pipe 26 - 27						1.08				0.00				0.00				0.00	11.50														
	27	28			0.00	1.08			0.00	0.00			0.00	0.00			0.00	0.00	11.50	71.50	96.89	113.55	165.93	77	450	450	CONC	0.20	82.5	127.5033	0.8017	1.7151	0.607
To STREET No. 10,14,17-18, Pipe 28 - 29						1.08				0.00				0.00				0.00	13.21														
STREET No. 12,16																																	
	19	20	0.58	0.66	1.06	1.06			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	82	450	450	CONC	0.20	65.0	127.5033	0.8017	1.3513	0.641
	20	21	0.27	0.66	0.50	1.56			0.00	0.00			0.00	0.00			0.00	0.00	11.35	71.98	97.56	114.33	167.08	112	450	450	CONC	0.25	65.0	142.5531	0.8963	1.2086	0.787
To STREET No. 15, Pipe 21 - 22						1.56				0.00				0.00				0.00	12.56														
	33	35	0.12	0.66	0.22	0.22			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	17	300	300	PVC	0.35	69.0	57.2089	0.8093	1.4209	0.296
Contribution From STREET No. 10,14,17-18, Pipe 34 - 35						0.42				0.00				0.00				0.00	10.95														
	35	36	0.55	0.66	1.01	1.65			0.00	0.00			0.00	0.00			0.00	0.00	11.42	71.75	97.24	113.96	166.54	118	450	450	CONC	0.30	75.0	156.1591	0.9819	1.2731	0.759
	36	37	0.54	0.66	0.99	2.64			0.00	0.00			0.00	0.00			0.00	0.00	12.69	67.81	91.83	107.59	157.18	179	600	600	CONC	0.15	75.0	237.8056	0.8411	1.4862	0.753
	37	44	0.07	0.66	0.13	2.77			0.00	0.00			0.00	0.00			0.00	0.00	14.18	63.77	86.30	101.08	147.63	177	600	600	CONC	0.15	40.0	237.8056	0.8411	0.7926	0.743
To STREET No. 10,14,17-18, Pipe 44 - 45						2.77				0.00				0.00				0.00	14.97														
STREET No. 15																																	
	16	17			0.00	0.00	0.12	0.66	0.22	0.22			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	23	300	300	PVC	0.35	50.5	57.2089	0.8093	1.0399	0.401
	17	18			0.00	0.00	0.24	0.66	0.44	0.66			0.00	0.00			0.00	0.00	11.04	73.03	99.00	116.03	169.58	65	375	375	PVC	0.30	62.0	96.0323	0.8695	1.1884	0.681
Contribution From STREET No. 11, Pipe 15 - 18						2.50				0.00				0.00				0.00	12.46														
	18	21			0.00	2.50	0.41	0.66	0.75	1.41			0.00	0.00			0.00	0.00	12.46	68.48	92.76	108.67	158.78	302	750	750	CONC	0.15	79.5	431.1703	0.9760	1.3576	0.700
Contribution From STREET No. 12,16, Pipe 20 - 21						1.56				0.00				0.00				0.00	12.56														
	21	22			0.00	4.05	0.51	0.66	0.94	2.35			0.00	0.00			0.00	0.00	13.82	64.69	87.56	102.57	149.81	468	825	825	CONC	0.20	82.0	641.9463	1.2009	1.1381	0.729
	22	23			0.00	4.05	0.38	0.66	0.70	3.05			0.00	0.00			0.00	0.00	14.96	61.86	83.68	98.00	143.11	506	825	825	CONC	0.20	82.0	641.9463	1.2009	1.1381	0.788
To STREET No. 10,14,17-18, Pipe 23 - 28						4.05				3.05				0.00				0.00	16.10														
STREET No. 13																																	
	10	12	0.62	0.66	1.14	1.14			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	87	450	450	CONC	0.20	81.0	127.5033	0.8017	1.6839	0.685
To STREET No. 20, Pipe 12 - 13						1.14				0.00				0.00				0.00	11.68														
STREET No. 20																																	
	11	12	0.22	0.66	0.40	0.40			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	31	300	300	PVC	0.35	67.5	57.2089	0.8093	1.3900	0.542
Contribution From STREET No. 13, Pipe 10 - 12						1.14				0.00				0.00				0.00	11.68														
	12	13	0.23	0.66	0.42	1.96			0.00	0.00			0.00	0.00			0.00	0.00	11.68	70.89	96.07	112.57	164.50	139	525	525	CONC	0.20	81.5	192.3297	0.8885	1.5289	0.724
To STREET No. 10,14,17-18, Pipe 13 - 23						1.96				0.00				0.00				0.00	13.21														

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

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: TAMARACK RICHMOND		
Checked: SLM	LOCATION: City of Ottawa		
Dwg. Reference: 03D	File Ref: 18-1042	Date: 06-Mar-25	Sheet No. SHEET 1 OF 6

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

LOCATION			AREA (Ha) 2 YEAR				5 YEAR				10 YEAR				100 YEAR				FLOW Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	SEWER DATA DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
STREET No. 11																																	
	14	15	0.86	0.66	1.58	1.58			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	121	450	450	CONC	0.30	67.0	156.1591	0.9819	1.1373	0.776
	15	18	0.50	0.66	0.92	2.50			0.00	0.00			0.00	0.00			0.00	0.00	11.14	72.70	98.55	115.49	168.79	181	600	600	CONC	0.15	67.0	237.8056	0.8411	1.3277	0.763
To STREET No. 15, Pipe 18 - 21						2.50				0.00				0.00				0.00	12.46														
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00						151									
	2	3	0.35	0.66	0.64	0.64			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	200	525	525	CONC	0.35	38.0	254.4283	1.1753	0.5389	0.787
Contribution From STREET No. 9, Pipe 1 - 3						0.77				0.00				0.00				0.00	11.28														
	3	4	0.41	0.66	0.75	2.17			0.00	0.00			0.00	0.00			0.00	0.00	11.28	72.20	97.87	114.69	167.61	307	750	750	CONC	0.15	97.5	431.1703	0.9760	1.6650	0.713
	4	9	0.47	0.66	0.86	3.03			0.00	0.00			0.00	0.00			0.00	0.00	12.95	67.07	90.83	106.40	155.45	354	825	825	CONC	0.10	97.5	453.9246	0.8492	1.9137	0.780
To STREET No. 10,14,17-18, Pipe 9 - 13						3.03				0.00				0.00				0.00	14.86					151									
	72	73	0.72	0.66	1.32	1.32			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	101	450	450	CONC	0.20	94.0	127.5033	0.8017	1.9542	0.796
	73	74	0.83	0.66	1.52	2.84			0.00	0.00			0.00	0.00			0.00	0.00	11.95	70.04	94.89	111.19	162.47	199	600	600	CONC	0.20	94.0	274.5943	0.9712	1.6132	0.725
	74	75	0.64	0.66	1.17	4.02			0.00	0.00			0.00	0.00			0.00	0.00	13.57	65.37	88.49	103.66	151.41	263	675	675	CONC	0.20	94.0	375.9224	1.0505	1.4913	0.699
To STREET No. 9, Pipe 75 - 76						4.02				0.00				0.00				0.00	15.06														
STREET No. 9																																	
	1	3	0.42	0.66	0.77	0.77			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	59	375	375	PVC	0.30	67.0	96.0323	0.8695	1.2843	0.616
To STREET No. 11, Pipe 3 - 4						0.77				0.00				0.00				0.00	11.28														
	7	8	0.52	0.66	0.95	0.95			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	73	375	375	PVC	0.30	62.0	96.0323	0.8695	1.1884	0.763
To STREET No. 10,14,17-18, Pipe 8 - 9						0.95				0.00				0.00				0.00	11.19														
	5	6	0.84	0.66	1.54	1.54			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	118	525	525	CONC	0.20	92.0	192.3297	0.8885	1.7258	0.615
	6	8	0.69	0.66	1.27	2.81			0.00	0.00			0.00	0.00			0.00	0.00	11.73	70.76	95.88	112.36	164.18	199	600	600	CONC	0.20	92.0	274.5943	0.9712	1.5788	0.723
To STREET No. 10,14,17-18, Pipe 8 - 9						2.81				0.00				0.00				0.00	13.30														
	66	67	0.78	0.66	1.43	1.43			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	110	450	450	CONC	0.25	94.5	142.5531	0.8963	1.7572	0.771
	67	69	0.71	0.66	1.30	2.73			0.00	0.00			0.00	0.00			0.00	0.00	11.76	70.66	95.75	112.19	163.95	190	600	600	CONC	0.20	94.5	274.5943	0.9712	1.6217	0.703
Contribution From SERVICING 5, Pipe 68 - 69						0.00				0.00				0.00				0.00	10.32					1013									
	69	70	0.29	0.66	0.53	3.27			0.00	0.00			0.00	0.00			0.00	0.00	13.38	65.88	89.19	104.48	152.62	1228	975	975	CONC	0.50	28.5	1584.6640	2.1225	0.2238	0.775
	70	71	0.13	0.66	0.24	3.50			0.00	0.00			0.00	0.00			0.00	0.00	13.60	65.27	88.36	103.50	151.19	1242	975	975	CONC	0.50	7.0	1584.6640	2.1225	0.0550	0.784
	71	75	0.40	0.66	0.73	4.24			0.00	0.00			0.00	0.00			0.00	0.00	13.66	65.13	88.16	103.27	150.84	1289	1050	1050	CONC	0.35	73.0	1615.5188	1.8657	0.6521	0.798
Contribution From STREET No. 11, Pipe 74 - 75						4.02				0.00				0.00				0.00	15.06														
	75	76	0.50	0.66	0.92	9.17			0.00	0.00			0.00	0.00			0.00	0.00	15.06	61.63	83.37	97.63	142.57	1578	1500	1500	CONC	0.10	117.5	2235.3724	1.2650	1.5481	0.706
			0.53	0.66	0.97	10.15			0.00	0.00			0.00	0.00			0.00	0.00															
	76	78			0.00	10.15	3.14	0.70	6.11	6.11			0.00	0.00			0.00	0.00	16.61	58.22	78.70	92.14	134.52	2085	1500	1500	CONC	0.15	117.5	2737.7609	1.5493	1.2640	0.761
Contribution From STREET No. 14, Pipe 77 - 78						0.00				0.68				0.00				0.00	11.31														
	78	79	0.13	0.66	0.24	10.38			0.00	6.79			0.00	0.00			0.00	0.00	17.87	55.73	75.30	88.14	128.65	2103	1500	1500	CONC	0.15	83.0	2737.7609	1.5493	0.8929	0.768
To STREET No. 1-2, Pipe 79 - 80						10.38				6.79				0.00				0.00	18.76					1013									
STREET No. 10,14,17-18																																	
	34	35	0.23	0.66	0.42	0.42			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	32	300	300	PVC	0.35	46.0	57.2089	0.8093	0.9473	0.567
To STREET No. 12,16, Pipe 35 - 36						0.42				0.00				0.00				0.00	10.95														
	46	47	0.82	0.66	1.50	1.50			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	116	525	525	CONC	0.20	97.0	192.3297	0.8885	1.8196	0.601
	47	48	0.57	0.66	1.05	2.55			0.00	0.00			0.00	0.00			0.00	0.00	11.82	70.46	95.47	111.87	163.48	180	600	600	CONC	0.15	103.0	237.8056	0.8411	2.0411	0.756
	24	25	0.35	0.66	0.64	0.64			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	49	375	375	PVC	0.30	58.0	96.0323	0.8695	1.1118	0.514
	25	26			0.00	0.64			0.00	0.00			0.00	0.00			0.00	0.00	11.11	72.78	98.67	115.63	169.00	47	375	375	PVC	0.30	9.5	96.0323	0.8695	0.1821	0.487
	26	27	0.24	0.66	0.44	1.08			0.00	0.00			0.00	0.00			0.00	0.00	11.29	72.17	97.82	114.64	167.54	78	375	375	PVC	0.35	11.5	103.7267	0.9392	0.2041	0.753
To SERVICING 2, Pipe 27 - 28						1.08				0.00				0.00				0.00	11.50														
	50	51	0.54	0.66	0.99	0.99			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	76	375	375	PVC	0.30	67.5	96.0323	0.8695	1.2939	0.792
	51	52	0.51	0.66	0.94	1.93			0.00	0.00			0.00	0.00			0.00	0.00	11.29	72.17	97.82	114.64	167.54	139	525	525	CONC	0.20	67.5	192.3297	0.8885	1.2662	0.723

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

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: **TAMARACK RICHMOND**		
Checked: SLM	LOCATION: **City of Ottawa**		
Dwg. Reference: 03D	File Ref: 18-1042	Date: 06-Mar-25	Sheet No. SHEET 2 OF 6

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

LOCATION			AREA (Ha) 2 YEAR				5 YEAR				10 YEAR				100 YEAR				FLOW Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	SEWER DATA DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
Location	From Node	To Node	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	Conc. (min)	2 Year (mm/h)	5 Year (mm/h)	10 Year (mm/h)	100 Year (mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	FLOW (min)	Q/Q full
	52	53	0.14	0.66	0.26	2.18			0.00	0.00			0.00	0.00			0.00	0.00	12.56	68.20	92.37	108.22	158.11	149	525	525	CONC	0.20	9.5	192.3297	0.8885	0.1782	0.774
To SERVICING 1, Pipe 53 - 54						2.18				0.00				0.00				0.00	12.74														
Contribution From STREET No. 9, Pipe 6 - 8						2.81				0.00				0.00				0.00	13.30														
Contribution From STREET No. 9, Pipe 7 - 8						0.95				0.00				0.00				0.00	11.19														
	8	9	0.13	0.66	0.24	4.00			0.00	0.00			0.00	0.00			0.00	0.00	13.30	66.08	89.47	104.80	153.10	264	675	675	CONC	0.20	78.0	375.9224	1.0505	1.2375	0.703
Contribution From STREET No. 11, Pipe 4 - 9						3.03				0.00				0.00				0.00	14.86					151									
	9	13			0.00	7.03	0.44	0.66	0.81	0.81			0.00	0.00			0.00	0.00	14.86	62.09	84.00	98.38	143.66	655	975	975	CONC	0.15	96.0	867.9562	1.1625	1.3763	0.755
Contribution From STREET No. 20, Pipe 12 - 13						1.96				0.00				0.00				0.00	13.21														
	13	23			0.00	8.99	0.10	0.66	0.18	0.99			0.00	0.00			0.00	0.00	16.24	58.99	79.76	93.38	136.34	760	1200	1200	CONC	0.10	49.0	1232.8868	1.0901	0.7492	0.617
Contribution From STREET No. 15, Pipe 22 - 23						4.05				3.05				0.00				0.00	16.10														
	23	28			0.00	13.05	0.49	0.66	0.90	4.94			0.00	0.00			0.00	0.00	16.99	57.44	77.64	90.89	132.68	1284	1350	1350	CONC	0.10	99.0	1687.8347	1.1792	1.3993	0.760
Contribution From SERVICING 2, Pipe 27 - 28						1.08				0.00				0.00				0.00	13.21														
	28	29	0.18	0.66	0.33	14.46			0.00	4.94			0.00	0.00			0.00	0.00	18.39	54.78	74.00	86.62	126.41	1308	1350	1350	CONC	0.10	40.0	1687.8347	1.1792	0.5654	0.775
To STREET No. 5, Pipe 29 - 30						14.46				4.94				0.00				0.00	18.95					151									
	39	40	0.28	0.66	0.51	0.51			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	39	300	300	PVC	0.35	10.0	57.2089	0.8093	0.2059	0.690
	40	41	0.61	0.66	1.12	1.63			0.00	0.00			0.00	0.00			0.00	0.00	10.21	76.02	103.12	120.87	176.70	124	525	525	CONC	0.20	76.5	192.3297	0.8885	1.4351	0.645
	41	42	0.56	0.66	1.03	2.66			0.00	0.00			0.00	0.00			0.00	0.00	11.64	71.03	96.26	112.80	164.83	189	600	600	CONC	0.15	76.5	237.8056	0.8411	1.5159	0.795
	42	43	0.11	0.66	0.20	2.86			0.00	0.00			0.00	0.00			0.00	0.00	13.16	66.49	90.03	105.46	154.07	190	600	600	CONC	0.15	10.0	237.8056	0.8411	0.1982	0.800
	43	44	0.56	0.66	1.03	3.89			0.00	0.00			0.00	0.00			0.00	0.00	13.36	65.94	89.28	104.58	152.77	257	675	675	CONC	0.15	61.5	325.5584	0.9098	1.1267	0.788
Contribution From STREET No. 12,16, Pipe 37 - 44						2.77				0.00				0.00				0.00	14.97														
	44	45	0.37	0.66	0.68	7.34			0.00	0.00			0.00	0.00			0.00	0.00	14.97	61.83	83.65	97.96	143.05	454	750	750	CONC	0.30	51.0	609.7669	1.3802	0.6158	0.744
	45	48	0.46	0.66	0.84	8.18			0.00	0.00			0.00	0.00			0.00	0.00	15.59	60.41	81.70	95.67	139.69	494	825	825	CONC	0.20	52.5	641.9463	1.2009	0.7286	0.770
	48	49	0.46	0.66	0.84	11.58			0.00	0.00			0.00	0.00			0.00	0.00	16.32	58.82	79.53	93.12	135.94	681	900	900	CONC	0.25	67.5	905.1556	1.4228	0.7907	0.752
	49	53			0.00	11.58			0.00	0.00			0.00	0.00			0.00	0.00	17.11	57.20	77.31	90.51	132.12	662	900	900	CONC	0.25	8.0	905.1556	1.4228	0.0937	0.732
To SERVICING 1, Pipe 53 - 54						11.58				0.00				0.00				0.00	17.20														
STREET No. 5																																	
	61	62	0.22	0.66	0.40	0.40			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	31	300	300	PVC	0.35	62.5	57.2089	0.8093	1.2871	0.542
To STREET No. 7, Pipe 62 - 63						0.40				0.00				0.00				0.00	11.29														
Contribution From STREET No. 10,14,17-18, Pipe 28 - 29						14.46				4.94				0.00				0.00	18.95					151									
	29	30	0.39	0.66	0.72	15.17			0.00	4.94			0.00	0.00			0.00	0.00	18.95	53.78	72.64	85.01	124.06	1326	1350	1350	CONC	0.10	73.0	1687.8347	1.1792	1.0318	0.785
To STREET No. 1-2, Pipe 30 - 31						15.17				4.94				0.00				0.00	19.98					151									
POND INLET WEST																																	
Contribution From STREET No. 1-2, Pipe 65 - 83						35.54				8.75				0.00				0.00	24.10					151									
Contribution From STREET No. 1-2, Pipe 82 - 83						13.14				6.79				0.00				0.00	20.96					1013									
	83	110			0.00	48.68			0.00	15.54			0.00	0.00			0.00	0.00	24.10	46.25	62.37	72.95	106.38	4384	1800	1800	CONC	0.25	38.5	5747.3797	2.2586	0.2841	0.763
	110	HW1			0.00	48.68			0.00	15.54			0.00	0.00			0.00	0.00	24.39	45.90	61.89	72.40	105.56	4360	1800	1800	CONC	0.25	25.5	5747.3797	2.2586	0.1882	0.759
STREET No. 4																																	
Contribution From STREET No. 1-2, Pipe 136 - 138						0.15				4.54				0.00				0.00	10.47														
Contribution From STREET No. 1-2, Pipe 137 - 138						0.11				0.00				0.00				0.00	10.55														
	138	140	0.39	0.66	0.72	0.97			0.00	4.54			0.00	0.00			0.00	0.00	10.55	74.77	101.40	118.85	173.72	533	900	900	CONC	0.15	76.0	701.1305	1.1021	1.1493	0.760
Contribution From STREET No. 3, Pipe 139 - 140						0.24				0.00				0.00				0.00	10.54														
	140	145	0.21	0.66	0.39	1.60			0.00	4.54			0.00	0.00			0.00	0.00	11.70	70.86	96.02	112.51	164.42	549	900	900	CONC	0.15	76.5	701.1305	1.1021	1.1569	0.783
To STREET No. 2, Pipe 145 - 147						1.60				4.54				0.00				0.00	12.85														
STREET No. 3																																	
	139	140	0.13	0.66	0.24	0.24			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	18	300	300	PVC	0.35	26.0	57.2089	0.8093	0.5354	0.320
To STREET No. 4, Pipe 140 - 145						0.24				0.00				0.00				0.00	10.54														
	115	116	0.86	0.66	1.58	1.58			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	121	600	600	CONC	0.15	111.5	237.8056	0.8411	2.2095	0.510
	116	117	0.79	0.66	1.45	3.03			0.00	0.00			0.00	0.00			0.00	0.00	12.21	69.25	93.81	109.92	160.60	210	675	675	CONC	0.15	111.5	325.5584	0.9098	2.0426	0.644
	117	118	0.17	0.66	0.31	3.34			0.00	0.00			0.00	0.00			0.00	0.00	14.25	63.59	86.05	100.79	147.20	212	675	675	CONC	0.15	10.5	325.5584	0.9098	0.1924	0.652
	118	119	0.48	0.66	0.88	4.22			0.00	0.00			0.00	0.00			0.00	0.00	14.44	63.11	85.40	100.01	146.07	266	750	750	CONC	0.15	63.0	431.1703	0.9760	1.0759	0.618
	119	120			0.00	4.22			0.00	0.00			0.00	0.00			0.00	0.00	15.52	60.57	81.91	95.92	140.06	256	825	825	CONC	0.10	10.5	453.9246	0.8492	0.2061	0.563

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

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: **TAMARACK RICHMOND**	
Checked: SLM	LOCATION: **City of Ottawa**	
Dwg. Reference: 03D	File Ref: 18-1042	Date: 06-Mar-25	Sheet No. SHEET 3 OF 6

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

	LOCATION		AREA (Ha)																FLOW						SEWER DATA								
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min)	Q/Q full
	120	127			0.00	4.22			0.00	0.00			0.00	0.00			0.00	0.00	15.73	60.10	81.28	95.18	138.97	254	825	825	CONC	0.10	31.5	453.9246	0.8492	0.6183	0.559
To STREET No. 1-2, Pipe 127 - 128						4.22				0.00				0.00				0.00	16.34														
STREET No. 1-2																																	
			0.08	0.66	0.15	0.15			0.00	0.00			0.00	0.00			0.00	0.00															
	136	138			0.00	0.15	2.04	0.80	4.54	4.54			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	484	750	750	CONC	0.30	39.0	609.7669	1.3802	0.4709	0.794
To STREET No. 4, Pipe 138 - 140						0.15				4.54				0.00				0.00	10.47														
	137	138	0.06	0.66	0.11	0.11			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	8	300	300	PVC	0.35	26.5	57.2089	0.8093	0.5457	0.148
To STREET No. 4, Pipe 138 - 140						0.11				0.00				0.00				0.00	10.55														
	132	133	0.83	0.66	1.52	1.52			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	117	600	600	CONC	0.15	95.0	237.8056	0.8411	1.8825	0.492
	133	134	0.61	0.66	1.12	2.64			0.00	0.00			0.00	0.00			0.00	0.00	11.88	70.26	95.20	111.55	163.01	186	825	825	CONC	0.10	95.0	453.9246	0.8492	1.8646	0.409
To STREET No. 2, Pipe 134 - 135						2.64				0.00				0.00				0.00	13.75														
	141	142	0.23	0.66	0.42	0.42			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	32	300	300	PVC	0.35	66.5	57.2089	0.8093	1.3694	0.567
	142	143	0.20	0.66	0.37	0.79			0.00	0.00			0.00	0.00			0.00	0.00	11.37	71.92	97.48	114.23	166.94	57	375	375	PVC	0.30	69.0	96.0323	0.8695	1.3226	0.591
To STREET No. 2, Pipe 143 - 144						0.79				0.00				0.00				0.00	12.69														
	121	122	0.33	0.66	0.61	0.61			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	47	450	450	CONC	0.20	64.5	127.5033	0.8017	1.3409	0.365
	122	123	0.33	0.66	0.61	1.21			0.00	0.00			0.00	0.00			0.00	0.00	11.34	72.01	97.61	114.38	167.16	87	450	450	CONC	0.20	64.5	127.5033	0.8017	1.3409	0.684
	123	124	0.10	0.66	0.18	1.39			0.00	0.00			0.00	0.00			0.00	0.00	12.68	67.84	91.88	107.64	157.27	95	450	450	CONC	0.20	9.5	127.5033	0.8017	0.1975	0.742
	124	125			0.00	1.39			0.00	0.00			0.00	0.00			0.00	0.00	12.88	67.27	91.10	106.73	155.92	94	600	600	CONC	0.15	55.5	237.8056	0.8411	1.0998	0.394
			0.37	0.66	0.68	2.07			0.00	0.00			0.00	0.00			0.00	0.00															
	125	126			0.00	2.07	0.82	0.50	1.14	1.14			0.00	0.00			0.00	0.00	13.98	64.29	87.01	101.91	148.85	232	675	675	CONC	0.15	9.0	325.5584	0.9098	0.1649	0.714
	126	127	0.12	0.66	0.22	2.29			0.00	1.14			0.00	0.00			0.00	0.00	14.14	63.86	86.43	101.23	147.85	245	825	825	CONC	0.10	72.0	453.9246	0.8492	1.4132	0.540
Contribution From STREET No. 3, Pipe 120 - 127						4.22				0.00				0.00				0.00	16.34														
	127	128	0.40	0.66	0.73	7.25			0.00	1.14			0.00	0.00			0.00	0.00	16.34	58.77	79.45	93.02	135.81	516	975	975	CONC	0.10	67.0	708.6833	0.9492	1.1764	0.729
					0.00	7.25	0.00	0.00	0.00	1.14			0.00	0.00			0.00	0.00						614									
	128	129	0.29	0.66	0.53	7.78			0.00	1.14			0.00	0.00			0.00	0.00	17.52	56.39	76.21	89.21	130.22	1140	1050	1050	CONC	0.30	9.0	1495.6798	1.7273	0.0868	0.762
	129	130			0.00	7.78			0.00	1.14			0.00	0.00			0.00	0.00	17.61	56.23	75.98	88.94	129.82	1138	1200	1200	CONC	0.15	21.5	1509.9717	1.3351	0.2684	0.754
	130	131	0.54	0.66	0.99	8.77			0.00	1.14			0.00	0.00			0.00	0.00	17.88	55.72	75.29	88.13	128.63	1188	1350	1350	CONC	0.10	70.0	1687.8347	1.1792	0.9894	0.704
	131	134	0.34	0.66	0.62	9.39			0.00	1.14			0.00	0.00			0.00	0.00	18.87	53.93	72.84	85.26	124.42	1204	1500	1500	CONC	0.10	70.0	2235.3724	1.2650	0.9223	0.538
To STREET No. 2, Pipe 134 - 135						9.39				1.14				0.00				0.00	19.79					614									
Contribution From STREET No. 9, Pipe 78 - 79						10.38				6.79				0.00				0.00	18.76					1013									
	79	80	0.39	0.66	0.72	11.10			0.00	6.79			0.00	0.00			0.00	0.00	18.76	54.11	73.09	85.54	124.84	2110	1500	1500	CONC	0.15	58.5	2737.7609	1.5493	0.6293	0.771
	80	81	0.19	0.66	0.35	11.45			0.00	6.79			0.00	0.00			0.00	0.00	19.39	53.03	71.61	83.81	122.29	2106	1500	1500	CONC	0.15	6.5	2737.7609	1.5493	0.0699	0.769
	81	82	0.50	0.66	0.92	12.37			0.00	6.79			0.00	0.00			0.00	0.00	19.46	52.91	71.45	83.62	122.02	2152	1650	1650	CONC	0.10	60.5	2882.2416	1.3479	0.7481	0.747
	82	83	0.42	0.66	0.77	13.14			0.00	6.79			0.00	0.00			0.00	0.00	20.21	51.69	69.79	81.67	119.16	2166	1650	1650	CONC	0.10	60.5	2882.2416	1.3479	0.7481	0.751
To POND INLET WEST, Pipe 83 - 110						13.14				6.79				0.00				0.00	20.96					1013									
Contribution From STREET No. 5, Pipe 29 - 30						15.17				4.94				0.00				0.00	19.98					151									
	30	31	0.42	0.66	0.77	15.94			0.00	4.94			0.00	0.00			0.00	0.00	19.98	52.06	70.28	82.25	120.01	1328	1350	1350	CONC	0.10	70.5	1687.8347	1.1792	0.9965	0.787
	31	32	0.55	0.66	1.01	16.95			0.00	4.94			0.00	0.00			0.00	0.00	20.98	50.50	68.17	79.76	116.36	1344	1350	1350	CONC	0.10	70.5	1687.8347	1.1792	0.9965	0.796
	32	54			0.00	16.95			0.00	4.94			0.00	0.00			0.00	0.00	21.98	49.05	66.19	77.44	112.95	1309	1350	1350	CONC	0.10	9.5	1687.8347	1.1792	0.1343	0.776
Contribution From SERVICING 1, Pipe 53 - 54						13.76				0.00				0.00				0.00	18.46														
	54	55	0.28	0.66	0.51	31.23			0.00	4.94			0.00	0.00			0.00	0.00	22.11	48.86	65.93	77.14	112.51	2002	1650	1650	CONC	0.10	12.0	2882.2416	1.3479	0.1484	0.695
	55	56	0.20	0.66	0.37	31.60			0.00	4.94			0.00	0.00			0.00	0.00	22.26	48.66	65.65	76.81	112.03	2012	1650	1650	CONC	0.10	37.5	2882.2416	1.3479	0.4637	0.698
	56	64	0.12	0.66	0.22	31.82			0.00	4.94			0.00	0.00			0.00	0.00	22.72	48.02	64.79	75.79	110.54	1999	1650	1650	CONC	0.10	26.0	2882.2416	1.3479	0.3215	0.693
Contribution From STREET No. 7, Pipe 63 - 64						2.59				3.81				0.00				0.00	15.18														
	64	65	0.33	0.66	0.61	35.01			0.00	8.75			0.00	0.00			0.00	0.00	23.05	47.60	64.20	75.11	109.54	2379	1800	1800	CONC	0.10	72.0	3634.9621	1.4284	0.8401	0.654
	65	83	0.29	0.66	0.53	35.54			0.00	8.75			0.00	0.00			0.00	0.00	23.89	46.52	62.73	73.38	107.01	2353	1800	1800	CONC	0.10	18.5	3634.9621	1.4284	0.2159	0.647
To POND INLET WEST, Pipe 83 - 110						35.54				8.75				0.00				0.00	24.10					151									
STREET No. 6																																	
	100	101			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	0	600	600	CONC	0.15	67.0	237.8056	0.8411	1.3277	0.000
To STREET No. 8, Pipe 101 - 106						0.00				0.00				0.00				0.00	11.33														

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

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: **TAMARACK RICHMOND**		
Checked: SLM	LOCATION: **City of Ottawa**		
Dwg. Reference: 03D	File Ref: 18-1042	Date: 06-Mar-25	Sheet No. SHEET 4 OF 6

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

	LOCATION		AREA (Ha)																FLOW						SEWER DATA								
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
	102	103			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	0	450	450	CONC	0.20	25.0	127.5033	0.8017	0.5197	0.000
	103	104	0.18	0.66	0.33	0.33			0.00	0.00			0.00	0.00			0.00	0.00	10.52	74.87	101.53	119.00	173.94	25	600	600	CONC	0.15	9.5	237.8056	0.8411	0.1883	0.104
	104	105	0.86	0.66	1.58	1.91			0.00	0.00			0.00	0.00			0.00	0.00	10.71	74.19	100.60	117.91	172.34	142	825	825	CONC	0.10	113.0	453.9246	0.8492	2.2179	0.312
	105	106	0.80	0.66	1.47	3.38			0.00	0.00			0.00	0.00			0.00	0.00	12.93	67.14	90.92	106.51	155.60	227	825	825	CONC	0.10	113.0	453.9246	0.8492	2.2179	0.499
To STREET No. 8, Pipe 106 - 108						3.38				0.00				0.00				0.00	15.14														
	95	96			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	0	375	375	PVC	0.30	27.5	96.0323	0.8695	0.5271	0.000
	96	97	0.17	0.66	0.31	0.31			0.00	0.00			0.00	0.00			0.00	0.00	10.53	74.84	101.49	118.96	173.88	23	450	450	CONC	0.20	9.5	127.5033	0.8017	0.1975	0.183
	97	98	0.14	0.66	0.26	0.57			0.00	0.00			0.00	0.00			0.00	0.00	10.72	74.13	100.51	117.81	172.20	42	600	600	CONC	0.15	19.0	237.8056	0.8411	0.3765	0.177
	98	99	0.66	0.66	1.21	1.78			0.00	0.00			0.00	0.00			0.00	0.00	11.10	72.82	98.72	115.69	169.08	130	825	825	CONC	0.10	90.0	453.9246	0.8492	1.7665	0.286
	99	101	1.02	0.66	1.87	3.65			0.00	0.00			0.00	0.00			0.00	0.00	12.87	67.31	91.15	106.78	156.00	246	825	825	CONC	0.10	90.0	453.9246	0.8492	1.7665	0.541
To STREET No. 8, Pipe 101 - 106						3.65				0.00				0.00				0.00	14.63														
SERVICING 6																																	
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00						267									
	90	91			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	267	750	750	CONC	0.15	39.0	431.1703	0.9760	0.6660	0.619
To STREET No. 8, Pipe 91 - 92						0.00				0.00				0.00				0.00	10.67					267									
STREET No. 8																																	
	88	89	0.08	0.66	0.15	0.15			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	11	600	600	CONC	0.15	7.0	237.8056	0.8411	0.1387	0.047
	89	91	0.61	0.66	1.12	1.27			0.00	0.00			0.00	0.00			0.00	0.00	10.14	76.28	103.47	121.29	177.30	97	825	825	CONC	0.10	85.0	453.9246	0.8492	1.6683	0.213
To STREET No. 8, Pipe 91 - 92						1.27				0.00				0.00				0.00	11.81														
	84	85	0.28	0.66	0.51	0.51			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	39	450	450	CONC	0.20	47.5	127.5033	0.8017	0.9875	0.309
	85	86	0.07	0.66	0.13	0.64			0.00	0.00			0.00	0.00			0.00	0.00	10.99	73.21	99.25	116.32	170.01	47	600	600	CONC	0.15	16.0	237.8056	0.8411	0.3171	0.198
	86	87	0.58	0.66	1.06	1.71			0.00	0.00			0.00	0.00			0.00	0.00	11.30	72.13	97.77	114.58	167.45	123	825	825	CONC	0.10	85.0	453.9246	0.8492	1.6683	0.271
	87	94	0.62	0.66	1.14	2.84			0.00	0.00			0.00	0.00			0.00	0.00	12.97	67.01	90.73	106.30	155.29	191	900	900	CONC	0.10	85.0	572.4707	0.8999	1.5743	0.333
To STREET No. 8, Pipe 94 - 101						2.84				0.00				0.00				0.00	14.55														
STREET No. 8																																	
Contribution From STREET No. 8, Pipe 89 - 91						1.27				0.00				0.00				0.00	11.81														
Contribution From SERVICING 6, Pipe 90 - 91						0.00				0.00				0.00				0.00	10.67					267									
	91	92	0.40	0.66	0.73	2.00			0.00	0.00			0.00	0.00			0.00	0.00	11.81	70.50	95.53	111.94	163.57	408	825	825	CONC	0.15	55.0	555.9418	1.0400	0.8814	0.734
	92	93	0.18	0.66	0.33	2.33			0.00	0.00			0.00	0.00			0.00	0.00	12.69	67.82	91.85	107.61	157.22	425	900	900	CONC	0.10	9.5	572.4707	0.8999	0.1760	0.742
	93	94	0.38	0.66	0.70	3.03			0.00	0.00			0.00	0.00			0.00	0.00	12.86	67.32	91.16	106.79	156.02	471	975	975	CONC	0.10	71.5	708.6833	0.9492	1.2555	0.664
Contribution From STREET No. 8, Pipe 87 - 94						2.84				0.00				0.00				0.00	14.55														
	94	101			0.00	5.87			0.00	0.00			0.00	0.00			0.00	0.00	14.55	62.86	85.05	99.61	145.47	636	1050	1050	CONC	0.10	78.0	863.5311	0.9973	1.3036	0.737
Contribution From STREET No. 6, Pipe 100 - 101						0.00				0.00				0.00				0.00	11.33														
Contribution From STREET No. 6, Pipe 99 - 101						3.65				0.00				0.00				0.00	14.63														
	101	106	0.44	0.66	0.81	10.33			0.00	0.00			0.00	0.00			0.00	0.00	15.85	59.83	80.91	94.73	138.32	885	1200	1200	CONC	0.10	73.5	1232.8868	1.0901	1.1237	0.718
Contribution From STREET No. 6, Pipe 105 - 106						3.38				0.00				0.00				0.00	15.14														
	106	108	0.35	0.66	0.64	14.35			0.00	0.00			0.00	0.00			0.00	0.00	16.97	57.47	77.68	90.94	132.75	1092	1200	1200	CONC	0.15	84.0	1509.9717	1.3351	1.0486	0.723
To STREET No. 14, Pipe 108 - 109						14.35				0.00				0.00				0.00	18.02					267									
STREET No. 14																																	
	59	60			0.00	0.00	0.35	0.66	0.64	0.64			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	67	375	375	PVC	0.30	68.5	96.0323	0.8695	1.3130	0.697
To STREET No. 7, Pipe 60 - 62						0.00				0.64				0.00				0.00	11.31														
	77	78			0.00	0.00	0.37	0.66	0.68	0.68			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	71	600	600	CONC	0.15	66.0	237.8056	0.8411	1.3079	0.297
To STREET No. 9, Pipe 78 - 79						0.00				0.68				0.00				0.00	11.31														
	57	58			0.00	0.00	0.26	0.66	0.48	0.48			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	50	375	375	PVC	0.30	67.0	96.0323	0.8695	1.2843	0.518
					0.00	0.00	0.28	0.66	0.51	0.99			0.00	0.00			0.00	0.00															
	58	60			0.00	0.00	1.96	0.40	2.18	3.17			0.00	0.00			0.00	0.00	11.28	72.20	97.87	114.69	167.61	310	675	675	CONC	0.25	75.0	420.2941	1.1745	1.0643	0.738
To STREET No. 7, Pipe 60 - 62						0.00				3.17				0.00				0.00	12.35														

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

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: TAMARACK RICHMOND		
Checked: SLM	LOCATION: City of Ottawa		
Dwg. Reference: 03D	File Ref: 18-1042	Date: 06-Mar-25	Sheet No. SHEET 5 OF 6

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

LOCATION			AREA (Ha) 2 YEAR				5 YEAR				10 YEAR				100 YEAR				FLOW Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	SEWER DATA DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
Location	From Node	To Node	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	Conc. (min)	2 Year (mm/h)	5 Year (mm/h)	10 Year (mm/h)	100 Year (mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
	111	112			0.00	0.00	0.20	0.66	0.37	0.37			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	38	600	600	CONC	0.15	16.5	237.8056	0.8411	0.3270	0.161
	112	113			0.00	0.00	0.56	0.66	1.03	1.39			0.00	0.00			0.00	0.00	10.33	75.57	102.50	120.14	175.62	143	825	825	CONC	0.10	64.5	453.9246	0.8492	1.2660	0.315
	113	114			0.00	0.00	0.48	0.66	0.88	2.28			0.00	0.00			0.00	0.00	11.59	71.19	96.47	113.05	165.20	219	825	825	CONC	0.10	64.5	453.9246	0.8492	1.2660	0.484
To STREET No. 2, Pipe 114 - 134						0.00				2.28				0.00				0.00	12.86														
	107	108			0.00	0.00	0.38	0.66	0.70	0.70			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	73	600	600	CONC	0.15	67.0	237.8056	0.8411	1.3277	0.305
Contribution From STREET No. 8, Pipe 106 - 108						14.35				0.00				0.00				0.00	18.02					267									
	108	109			0.00	14.35	0.46	0.66	0.84	1.54			0.00	0.00			0.00	0.00	18.02	55.45	74.91	87.69	127.98	1178	1350	1350	CONC	0.10	61.5	1687.8347	1.1792	0.8693	0.698
	109	114			0.00	14.35	0.51	0.66	0.94	2.48			0.00	0.00			0.00	0.00	18.89	53.88	72.78	85.18	124.31	1220	1350	1350	CONC	0.10	61.5	1687.8347	1.1792	0.8693	0.723
To STREET No. 2, Pipe 114 - 134						14.35				2.48				0.00				0.00	19.76					267									
STREET No. 2																																	
Contribution From STREET No. 1-2, Pipe 142 - 143						0.79				0.00				0.00				0.00	12.69														
	143	144	0.03	0.66	0.06	0.84			0.00	0.00			0.00	0.00			0.00	0.00	12.69	67.81	91.84	107.60	157.20	57	375	375	PVC	0.30	12.0	96.0323	0.8695	0.2300	0.596
	144	145	0.06	0.66	0.11	0.95			0.00	0.00			0.00	0.00			0.00	0.00	12.92	67.15	90.93	106.53	155.63	64	375	375	PVC	0.30	36.5	96.0323	0.8695	0.6996	0.667
Contribution From STREET No. 4, Pipe 140 - 145						1.60				4.54				0.00				0.00	12.85														
	145	147	0.25	0.66	0.46	3.01			0.00	4.54			0.00	0.00			0.00	0.00	13.62	65.22	88.29	103.42	151.07	597	900	900	CONC	1.10	56.5	1898.6704	2.9845	0.3155	0.314
	147	146	0.36	0.66	0.66	3.67			0.00	4.54			0.00	0.00			0.00	0.00	13.94	64.40	87.16	102.08	149.11	632	1050	1050	CONC	0.10	74.0	863.5311	0.9973	1.2367	0.732
To POND INLET EAST, Pipe 146 - HW2						3.67				4.54				0.00				0.00	15.17														
Contribution From STREET No. 14, Pipe 109 - 114						14.35				2.48				0.00				0.00	19.76					267									
Contribution From STREET No. 14, Pipe 113 - 114						0.00				2.28				0.00				0.00	12.86														
	114	134	0.13	0.66	0.24	14.59			0.00	4.75			0.00	0.00			0.00	0.00	19.76	52.42	70.78	82.83	120.86	1368	1500	1500	CONC	0.10	83.0	2235.3724	1.2650	1.0936	0.612
Contribution From STREET No. 1-2, Pipe 131 - 134						9.39				1.14				0.00				0.00	19.79					614									
Contribution From STREET No. 1-2, Pipe 133 - 134						2.64				0.00				0.00				0.00	13.75														
	134	135	0.82	0.66	1.50	28.13			0.00	5.89			0.00	0.00			0.00	0.00	20.86	50.69	68.43	80.07	116.81	2710	1650	1650	CONC	0.15	111.0	3530.0106	1.6509	1.1206	0.768
	135	146	0.68	0.66	1.25	29.38			0.00	5.89			0.00	0.00			0.00	0.00	21.98	49.06	66.19	77.44	112.96	2712	1650	1650	CONC	0.15	98.0	3530.0106	1.6509	0.9894	0.768
To POND INLET EAST, Pipe 146 - HW2						29.38				5.89				0.00				0.00	22.97					881									
POND INLET EAST																																	
Contribution From STREET No. 2, Pipe 135 - 146						29.38				5.89				0.00				0.00	22.97					881									
Contribution From STREET No. 2, Pipe 147 - 146						3.67				4.54				0.00				0.00	15.17														
	146	HW2			0.00	33.04			0.00	10.43			0.00	0.00			0.00	0.00	22.97	47.70	64.35	75.28	109.79	3128	1650	1650	CONC	0.20	17.0	4076.1052	1.9063	0.1486	0.768

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

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: TAMARACK RICHMOND		
Checked: SLM	LOCATION: City of Ottawa		
Dwg. Reference: 03D	File Ref: 18-1042	Date: 06-Mar-25	Sheet No. SHEET 6 OF 6

100-Year SCS 24hr HGL

U/S MH	D/S MH	U/S HGL	D/S HGL
MH-100	MH-101	94.72	94.62
MH-101	MH-106	94.62	94.46
MH-10	MH-12	94.88	94.83
MH-102	MH-103	94.82	94.78
MH-103	MH-104	94.78	94.76
MH-104	MH-105	94.76	94.63
MH-105	MH-106	94.63	94.46
MH-106	MH-108	94.46	94.27
MH-107	MH-108	94.33	94.27
MH-108	MH-109	94.27	94.19
MH-109	MH-114	94.19	94.03
MH-110	Pond1_1	93.93	93.93
MH-111	MH-112	94.05	94.04
MH-11	MH-12	94.85	94.83
MH-112	MH-113	94.04	94.01
MH-113	MH-114	94.01	94.03
MH-114	MH-134	94.03	93.95
MH-115	MH-116	94.78	94.69
MH-116	MH-117	94.69	94.49
MH-117	MH-118	94.49	94.46
MH-118	MH-119	94.46	94.41
MH-119	MH-120	94.41	94.4
MH-120	MH-127	94.4	94.32
MH-121	MH-122	94.43	94.4
MH-12	MH-13	94.83	94.75
MH-122	MH-123	94.4	94.39
MH-123	MH-124	94.39	94.37
MH-124	MH-125	94.37	94.34
MH-125	MH-126	94.34	94.32
MH-126	MH-127	94.32	94.32
MH-127	MH-128	94.32	94.21
MH-128	MH-129	94.21	94.14
MH-129	MH-130	94.14	94.11
MH-1	MH-3	95.73	95.63
MH-130	MH-131	94.11	94.04
MH-131	MH-134	94.04	93.95
MH-132	MH-133	93.99	93.95
MH-13	MH-23	94.75	94.71
MH-133	MH-134	93.95	93.95
MH-134	MH-135	93.95	93.93
MH-135	MH-146	93.93	93.93
MH-136	MH-138	94.11	93.93
MH-137	MH-138	94.13	93.93

100-Year CHI HGL

U/S MH	D/S MH	U/S HGL	D/S HGL
MH-100	MH-101	93.75	93.75
MH-101	MH-106	93.75	93.75
MH-10	MH-12	95.57	95.44
MH-102	MH-103	93.75	93.75
MH-103	MH-104	93.75	93.75
MH-104	MH-105	93.75	93.75
MH-105	MH-106	93.75	93.75
MH-106	MH-108	93.75	93.74
MH-107	MH-108	93.74	93.74
MH-108	MH-109	93.74	93.74
MH-109	MH-114	93.74	93.74
MH-110	Pond1_1	93.74	93.74
MH-111	MH-112	93.74	93.74
MH-11	MH-12	95.57	95.44
MH-112	MH-113	93.74	93.74
MH-113	MH-114	93.74	93.74
MH-114	MH-134	93.74	93.74
MH-115	MH-116	93.94	93.84
MH-116	MH-117	93.84	93.75
MH-117	MH-118	93.75	93.75
MH-118	MH-119	93.75	93.75
MH-119	MH-120	93.75	93.75
MH-120	MH-127	93.75	93.75
MH-121	MH-122	93.89	93.85
MH-12	MH-13	95.44	95.26
MH-122	MH-123	93.85	93.75
MH-123	MH-124	93.75	93.75
MH-124	MH-125	93.75	93.75
MH-125	MH-126	93.75	93.75
MH-126	MH-127	93.75	93.75
MH-127	MH-128	93.75	93.75
MH-128	MH-129	93.75	93.75
MH-129	MH-130	93.75	93.75
MH-1	MH-3	96.83	96.67
MH-130	MH-131	93.75	93.74
MH-131	MH-134	93.74	93.74
MH-132	MH-133	93.74	93.74
MH-13	MH-23	95.26	95.19
MH-133	MH-134	93.74	93.74
MH-134	MH-135	93.74	93.74
MH-135	MH-146	93.74	93.74
MH-136	MH-138	94.22	93.98
MH-137	MH-138	94.14	93.98

100-Year SCS 24hr HGL

U/S MH	D/S MH	U/S HGL	D/S HGL
MH-138	MH-140	93.93	93.93
MH-139	MH-140	94.06	93.93
MH-140	MH-145	93.93	93.93
MH-141	MH-142	94.22	93.98
MH-14	MH-15	95.12	94.97
MH-142	MH-143	93.98	93.93
MH-143	MH-144	93.93	93.93
MH-144	MH-145	93.93	93.93
MH-145	MH-147	93.93	93.93
MH-146	Pond1_2	93.93	93.93
MH-147	MH-146	93.93	93.93
MH-15	MH-18	94.97	94.93
MH-16	MH-17	95.04	94.92
MH-17	MH-18	94.92	94.93
MH-18	MH-21	94.93	94.9
MH-19	MH-20	94.98	94.97
MH-20	MH-21	94.97	94.9
MH-21	MH-22	94.9	94.83
MH-22	MH-23	94.83	94.71
MH-2	MH-3	96.27	95.63
MH-23	MH-28	94.71	94.61
MH-24	MH-25	94.72	94.68
MH-25	MH-26	94.68	94.68
MH-26	MH-27	94.68	94.65
MH-27	MH-28	94.65	94.61
MH-28	MH-29	94.61	94.48
MH-29	MH-30	94.48	94.31
MH-30	MH-31	94.31	94.22
MH-31	MH-32	94.22	94.11
MH-32	MH-54	94.11	94.09
MH-33	MH-35	94.74	94.75
MH-3	MH-4	95.63	95.27
MH-34	MH-35	94.78	94.75
MH-35	MH-36	94.75	94.64
MH-36	MH-37	94.64	94.58
MH-37	MH-44	94.58	94.5
MH-39	MH-40	94.77	94.65
MH-40	MH-41	94.65	94.61
MH-41	MH-42	94.61	94.55
MH-42	MH-43	94.55	94.53
MH-43	MH-44	94.53	94.5
MH-44	MH-45	94.5	94.4
MH-45	MH-48	94.4	94.3
MH-46	MH-47	94.47	94.39

100-Year CHI HGL

U/S MH	D/S MH	U/S HGL	D/S HGL
MH-138	MH-140	93.98	93.91
MH-139	MH-140	94.08	93.91
MH-140	MH-145	93.91	93.74
MH-141	MH-142	94.24	94.01
MH-14	MH-15	96.02	95.85
MH-142	MH-143	94.01	93.8
MH-143	MH-144	93.8	93.74
MH-144	MH-145	93.74	93.74
MH-145	MH-147	93.74	93.74
MH-146	Pond1_2	93.74	93.74
MH-147	MH-146	93.74	93.74
MH-15	MH-18	95.85	95.76
MH-16	MH-17	95.93	95.9
MH-17	MH-18	95.9	95.76
MH-18	MH-21	95.76	95.65
MH-19	MH-20	95.9	95.84
MH-20	MH-21	95.84	95.65
MH-21	MH-22	95.65	95.5
MH-22	MH-23	95.5	95.19
MH-2	MH-3	97.58	96.67
MH-23	MH-28	95.19	95.02
MH-24	MH-25	95.22	95.19
MH-25	MH-26	95.19	95.17
MH-26	MH-27	95.17	95.11
MH-27	MH-28	95.11	95.02
MH-28	MH-29	95.02	94.77
MH-29	MH-30	94.77	94.43
MH-30	MH-31	94.43	94.26
MH-31	MH-32	94.26	94.05
MH-32	MH-54	94.05	93.99
MH-33	MH-35	95.17	95.13
MH-3	MH-4	96.67	96.14
MH-34	MH-35	95.27	95.13
MH-35	MH-36	95.13	94.9
MH-36	MH-37	94.9	94.77
MH-37	MH-44	94.77	94.64
MH-39	MH-40	95.05	95.02
MH-40	MH-41	95.02	94.93
MH-41	MH-42	94.93	94.78
MH-42	MH-43	94.78	94.75
MH-43	MH-44	94.75	94.64
MH-44	MH-45	94.64	94.46
MH-45	MH-48	94.46	94.32
MH-46	MH-47	94.56	94.46

100-Year SCS 24hr HGL

U/S MH	D/S MH	U/S HGL	D/S HGL
MH-47	MH-48	94.39	94.3
MH-48	MH-49	94.3	94.17
MH-4	MH-9	95.27	94.93
MH-49	MH-53	94.17	94.14
MH-50	MH-51	94.38	94.24
MH-51	MH-52	94.24	94.18
MH-52	MH-53	94.18	94.14
MH-53	MH-54	94.14	94.09
MH-54	MH-55	94.09	94.04
MH-55	MH-56	94.04	94
MH-5	MH-6	95.1	95.07
MH-56	MH-64	94	93.97
MH-57	MH-58	94.34	94.26
MH-58	MH-60	94.26	94.19
MH-59	MH-60	94.27	94.19
MH-60	MH-62	94.19	94.15
MH-61	MH-62	94.24	94.15
MH-62	MH-63	94.15	94.1
MH-63	MH-64	94.1	93.97
MH-64	MH-65	93.97	93.93
MH-65	MH-83	93.93	93.93
MH-66	MH-67	94.98	94.68
MH-67	MH-69	94.68	94.51
MH-6	MH-8	95.07	95.02
MH-68	MH-69	94.67	94.51
MH-69	MH-70	94.51	94.44
MH-70	MH-71	94.44	94.4
MH-71	MH-75	94.4	94.3
MH-72	MH-73	94.81	94.59
MH-73	MH-74	94.59	94.44
MH-74	MH-75	94.44	94.3
MH-75	MH-76	94.3	94.25
MH-76	MH-78	94.25	94.17
MH-77	MH-78	94.17	94.17
MH-7	MH-8	95.08	95.02
MH-78	MH-79	94.17	94.04
MH-79	MH-80	94.04	93.98
MH-80	MH-81	93.98	93.95
MH-81	MH-82	93.95	93.94
MH-82	MH-83	93.94	93.93
MH-83	MH-110	93.93	93.93
MH-84	MH-85	95.37	95.04
MH-85	MH-86	95.04	95.07
MH-86	MH-87	95.07	95.01

100-Year CHI HGL

U/S MH	D/S MH	U/S HGL	D/S HGL
MH-47	MH-48	94.46	94.32
MH-48	MH-49	94.32	94.11
MH-4	MH-9	96.14	95.59
MH-49	MH-53	94.11	94.07
MH-50	MH-51	94.44	94.23
MH-51	MH-52	94.23	94.15
MH-52	MH-53	94.15	94.07
MH-53	MH-54	94.07	93.99
MH-54	MH-55	93.99	93.91
MH-55	MH-56	93.91	93.81
MH-5	MH-6	96.04	95.95
MH-56	MH-64	93.81	93.76
MH-57	MH-58	94.36	94.26
MH-58	MH-60	94.26	94.02
MH-59	MH-60	94.31	94.02
MH-60	MH-62	94.02	94
MH-61	MH-62	94.27	94
MH-62	MH-63	94	93.93
MH-63	MH-64	93.93	93.76
MH-64	MH-65	93.76	93.74
MH-65	MH-83	93.74	93.74
MH-66	MH-67	95.04	94.74
MH-67	MH-69	94.74	94.23
MH-6	MH-8	95.95	95.72
MH-68	MH-69	94.55	94.23
MH-69	MH-70	94.23	94.07
MH-70	MH-71	94.07	93.95
MH-71	MH-75	93.95	93.83
MH-72	MH-73	94.99	94.76
MH-73	MH-74	94.76	94.55
MH-74	MH-75	94.55	93.83
MH-75	MH-76	93.83	93.8
MH-76	MH-78	93.8	93.76
MH-77	MH-78	93.76	93.76
MH-7	MH-8	95.91	95.72
MH-78	MH-79	93.76	93.75
MH-79	MH-80	93.75	93.75
MH-80	MH-81	93.75	93.75
MH-81	MH-82	93.75	93.75
MH-82	MH-83	93.75	93.74
MH-83	MH-110	93.74	93.74
MH-84	MH-85	93.91	93.75
MH-85	MH-86	93.75	93.75
MH-86	MH-87	93.75	93.75

100-Year SCS 24hr HGL

U/S MH	D/S MH	U/S HGL	D/S HGL
MH-87	MH-94	95.01	94.83
MH-88	MH-89	95.01	95.01
MH-8	MH-9	95.02	94.93
MH-89	MH-91	95.01	94.99
MH-90	MH-91	95.11	94.99
MH-9	MH-13	94.93	94.75
MH-91	MH-92	94.99	94.83
MH-92	MH-93	94.83	94.8
MH-93	MH-94	94.8	94.83
MH-94	MH-101	94.83	94.62
MH-95	MH-96	94.81	94.68
MH-96	MH-97	94.68	94.68
MH-97	MH-98	94.68	94.65
MH-98	MH-99	94.65	94.69
MH-99	MH-101	94.69	94.62

100-Year CHI HGL

U/S MH	D/S MH	U/S HGL	D/S HGL
MH-87	MH-94	93.75	93.75
MH-88	MH-89	93.75	93.75
MH-8	MH-9	95.72	95.59
MH-89	MH-91	93.75	93.75
MH-90	MH-91	93.88	93.75
MH-9	MH-13	95.59	95.26
MH-91	MH-92	93.75	93.75
MH-92	MH-93	93.75	93.75
MH-93	MH-94	93.75	93.75
MH-94	MH-101	93.75	93.75
MH-95	MH-96	93.75	93.75
MH-96	MH-97	93.75	93.75
MH-97	MH-98	93.75	93.75
MH-98	MH-99	93.75	93.75
MH-99	MH-101	93.75	93.75

100yrSCS_24hr

Name	Min. Freeboard (m)
MH-1	**2.064**
MH-10	**2.625**
MH-100	**1.071**
MH-101	**1.067**
MH-102	**1.231**
MH-103	**1.212**
MH-104	**1.175**
MH-105	**1.121**
MH-106	**1.119**
MH-107	**1.221**
MH-108	**1.188**
MH-109	**1.175**
MH-11	**2.635**
MH-110	**0.696**
MH-111	**1.429**
MH-112	**1.419**
MH-113	**1.345**
MH-114	**1.232**
MH-115	**1.798**
MH-116	**1.148**
MH-117	**1.18**
MH-118	**1.202**
MH-119	**1.154**
MH-12	**2.554**
MH-120	**1.152**
MH-121	**2.313**
MH-122	**1.415**
MH-123	**1.346**
MH-124	**1.357**
MH-125	**1.284**
MH-126	**1.281**
MH-127	**1.176**
MH-128	**1.181**
MH-129	**1.237**
MH-13	**2.514**
MH-130	**1.24**
MH-131	**1.202**
MH-132	**1.436**
MH-133	**1.339**
MH-134	**1.189**
MH-135	**1.039**
MH-136	**2.744**
MH-137	**2.712**

100yrCHI_3hr

Name	Min. Freeboard (m)
MH-1	**0.974**
MH-10	**1.936**
MH-100	**2.04**
MH-101	**1.939**
MH-102	**2.303**
MH-103	**2.245**
MH-104	**2.189**
MH-105	**1.999**
MH-106	**1.834**
MH-107	**1.81**
MH-108	**1.71**
MH-109	**1.617**
MH-11	**1.913**
MH-110	**0.884**
MH-111	**1.734**
MH-112	**1.712**
MH-113	**1.616**
MH-114	**1.519**
MH-115	**2.633**
MH-116	**1.998**
MH-117	**1.922**
MH-118	**1.909**
MH-119	**1.817**
MH-12	**1.946**
MH-120	**1.801**
MH-121	**2.856**
MH-122	**1.961**
MH-123	**1.982**
MH-124	**1.982**
MH-125	**1.872**
MH-126	**1.857**
MH-127	**1.747**
MH-128	**1.645**
MH-129	**1.633**
MH-13	**2.003**
MH-130	**1.602**
MH-131	**1.498**
MH-132	**1.687**
MH-133	**1.544**
MH-134	**1.394**
MH-135	**1.229**
MH-136	**2.634**
MH-137	**2.702**

100yrSCS_24hr

Name	Min. Freeboard (m)
MH-138	**2.866**
MH-139	**2.66**
MH-14	**2.635**
MH-140	**2.752**
MH-141	**2.621**
MH-142	**2.762**
MH-143	**2.712**
MH-144	**2.697**
MH-145	**2.643**
MH-146	**0.873**
MH-147	**1.632**
MH-15	**2.684**
MH-16	**2.683**
MH-17	**2.727**
MH-18	**2.624**
MH-19	**2.642**
MH-2	**1.487**
MH-20	**2.555**
MH-21	**2.532**
MH-22	**2.477**
MH-23	**2.476**
MH-24	**2.579**
MH-25	**2.528**
MH-26	**2.519**
MH-27	**2.533**
MH-28	**2.446**
MH-29	**2.501**
MH-3	**2.073**
MH-30	**2.558**
MH-31	**2.537**
MH-32	**2.537**
MH-33	**2.678**
MH-34	**2.604**
MH-35	**2.567**
MH-36	**2.559**
MH-37	**2.508**
MH-39	**2.607**
MH-4	**2.287**
MH-40	**2.715**
MH-41	**2.642**
MH-42	**2.589**
MH-43	**2.591**
MH-44	**2.535**
MH-45	**2.563**

100yrCHI_3hr

Name	Min. Freeboard (m)
MH-138	**2.816**
MH-139	**2.64**
MH-14	**1.736**
MH-140	**2.772**
MH-141	**2.601**
MH-142	**2.732**
MH-143	**2.84**
MH-144	**2.885**
MH-145	**2.833**
MH-146	**1.062**
MH-147	**1.82**
MH-15	**1.807**
MH-16	**1.789**
MH-17	**1.748**
MH-18	**1.797**
MH-19	**1.725**
MH-2	**0.177**
MH-20	**1.684**
MH-21	**1.789**
MH-22	**1.811**
MH-23	**1.995**
MH-24	**2.083**
MH-25	**2.025**
MH-26	**2.021**
MH-27	**2.068**
MH-28	**2.034**
MH-29	**2.207**
MH-3	**1.024**
MH-30	**2.435**
MH-31	**2.493**
MH-32	**2.605**
MH-33	**2.243**
MH-34	**2.118**
MH-35	**2.18**
MH-36	**2.3**
MH-37	**2.317**
MH-39	**2.325**
MH-4	**1.417**
MH-40	**2.343**
MH-41	**2.321**
MH-42	**2.357**
MH-43	**2.379**
MH-44	**2.398**
MH-45	**2.498**

100yrSCS_24hr

Name	Min. Freeboard (m)
MH-46	**2.709**
MH-47	**2.643**
MH-48	**2.58**
MH-49	**2.612**
MH-5	**2.699**
MH-50	**2.602**
MH-51	**2.64**
MH-52	**2.594**
MH-53	**2.625**
MH-54	**2.554**
MH-55	**2.581**
MH-56	**2.571**
MH-57	**2.702**
MH-58	**2.681**
MH-59	**2.654**
MH-6	**2.591**
MH-60	**2.631**
MH-61	**2.61**
MH-62	**2.594**
MH-63	**2.538**
MH-64	**2.555**
MH-65	**2.492**
MH-66	**2.627**
MH-67	**2.785**
MH-68	**2.713**
MH-69	**2.814**
MH-7	**2.542**
MH-70	**2.84**
MH-71	**2.868**
MH-72	2.621
MH-73	2.856
MH-74	2.865
MH-75	2.858
MH-76	1.499
MH-77	2.737
MH-78	1.404
MH-79	1.409
MH-8	2.503
MH-80	2.612
MH-81	2.632
MH-82	2.551
MH-83	2.353
MH-84	0.788
MH-85	1.041

100yrCHI_3hr

Name	Min. Freeboard (m)
MH-46	**2.619**
MH-47	**2.573**
MH-48	**2.56**
MH-49	**2.67**
MH-5	**1.76**
MH-50	**2.542**
MH-51	**2.65**
MH-52	**2.626**
MH-53	**2.697**
MH-54	**2.651**
MH-55	**2.718**
MH-56	**2.757**
MH-57	**2.682**
MH-58	**2.681**
MH-59	**2.614**
MH-6	**1.71**
MH-60	**2.801**
MH-61	**2.58**
MH-62	**2.747**
MH-63	**2.703**
MH-64	**2.769**
MH-65	**2.681**
MH-66	**2.567**
MH-67	**2.725**
MH-68	**2.833**
MH-69	**3.094**
MH-7	**1.71**
MH-70	**3.21**
MH-71	**3.318**
MH-72	2.446
MH-73	2.682
MH-74	2.755
MH-75	3.328
MH-76	1.947
MH-77	3.151
MH-78	1.811
MH-79	1.701
MH-8	1.807
MH-80	2.842
MH-81	2.833
MH-82	2.742
MH-83	2.542
MH-84	2.244
MH-85	2.335

100yrSCS_24hr

Name	Min. Freeboard (m)
MH-86	0.994
MH-87	0.935
MH-88	1.139
MH-89	1.133
MH-9	2.478
MH-90	0.953
MH-91	1.023
MH-92	1.101
MH-93	1.114
MH-94	0.977
MH-95	1.238
MH-96	1.328
MH-97	1.311
MH-98	1.315
MH-99	1.147
Name	**Max. HGL (m)**
Pond1_1	93.93
Pond1_2	93.93

100yrCHI_3hr

Name	Min. Freeboard (m)
MH-86	2.316
MH-87	2.191
MH-88	2.404
MH-89	2.391
MH-9	1.814
MH-90	2.187
MH-91	2.261
MH-92	2.18
MH-93	2.165
MH-94	2.057
MH-95	2.303
MH-96	2.261
MH-97	2.245
MH-98	2.216
MH-99	2.082
Name	**Max. HGL (m)**
Pond1_1	93.74
Pond1_2	93.74

Anthony Temelini

From:	Laura Pipkins <lpipkins@jfsa.com>
Sent:	September 11, 2020 2:51 PM
To:	Adam Fobert
Cc:	Anthony Temelini; Ciaran McKee; Matt Wingate; Steve Merrick; JF Sabourin; Jennifer Ailey; Steve Pichette
Subject:	RE: P2001: DSEL #1042 - List of Drawings

Hi Adam,

As per your email below, I understand that the drainage area has been reduced from 157.2 ha to 149.72 ha. Based on this revised drainage area, the 2- to 100-year pre-development outflows from the site are simulated as follows in SWMHYMO, based on the 24-hour SCS Type II design storm:

2-year: 0.817 m3/s
5-year: 1.391 m3/s
10-year: 1.818 m3/s
25-year: 2.387 m3/s
50-year: 2.850 m3/s
100-year: 3.368 m3/s

Please feel free to contact me with any comments or questions.

Thank you,
Laura

Laura Pipkins, P.Eng.
Project Engineer in Water Resources

JFSA

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Tel.: 613-315-7517 | Email: lpipkins@jfsa.com | Website: www.jfsa.com
Ottawa-Paris(ON)-Gatineau-Montréal-Québec

Project Name:	Tamarack
Project Number:	1042
Designed By:	AL
Checked By:	AVN
Date	23-Jan-25

David Schaeffer Engineering Limited
600 Alden Road, Suite 606
Markham, ON L3R 0E7

ALLOWABLE POND VOLUME AND DISCHARGE RATES - SWM POND 1

	Total	Internal	External
Drainage area (ha)	152.87	63.0	89.9
Imp %	27.5	64.8	1.4
Imp area (ha)	42.07	40.8	1.3

Pond Component	Target Outflow	With Restrictions SCS			Without Restrictions SCS		
		Peak Outflow	Pond Volume	Pond Elevation	Peak Outflow	Pond Volume	Pond Elevation
	m^3/s	m^3/s	m^3	masl	m^3/s	m^3	masl
Erosion Control/Extended Det.	N/A	0.152	10253	92.8	0.152	10253	92.8
2 Year Design Storm	0.817	0.796	37558	93.9	0.308	13583	92.94
5 Year Design Storm	1.391	1.005	38601	93.94	0.713	18901	93.16
10 Year Design Storm	1.818	1.144	37558	93.9	0.925	23082	93.33
25 Year Design Storm	2.387	1.319	37819	93.91	1.143	28838	93.56
50 Year Design Storm	2.850	1.369	36260	93.85	1.287	33165	93.73
100 Year Design Storm	3.368	1.427	38340	93.93	1.427	38340	93.93
1979July01	N/A	N/A	N/A	N/A	1.56	43601	94.13
1988Aug04	N/A	N/A	N/A	N/A	1.332	34709	93.79
1996Aug08	N/A	N/A	N/A	N/A	1.141	28838	93.56

Project Name:	Tamarack
Project Number:	1042
Designed By:	AVN
Checked By:	AVN
Date	21-Jan-25

David Schaeffer Engineering Limited
600 Alden Road, Suite 606
Markham, ON L3R 0E7

DRAWDOWN TIME CALCULATION - SWM POND 1

Ministry of the Environment
Stormwater Management Planning and Design Manual (March 2003)

Equation 4.11: Drawdown Time

$$t = \frac{0.66C_2h^{1.5} + 2C_3h^{0.5}}{2.75A_O} = \textbf{102,083 sec}$$

$$= \textbf{28.4 hr}$$

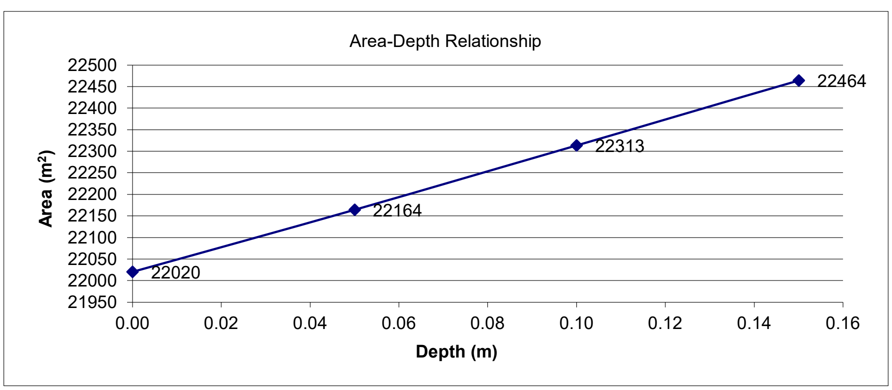
1.2 days

t = drawdown time (sec)
A_O = cross-sectional area of the orifice (m^2)
h = maximum water elevation above the orifice (m)
C_2 = slope coefficient from the area-depth linear regression
C_3 = intercept from the area-depth linear regression

Input Parameters:

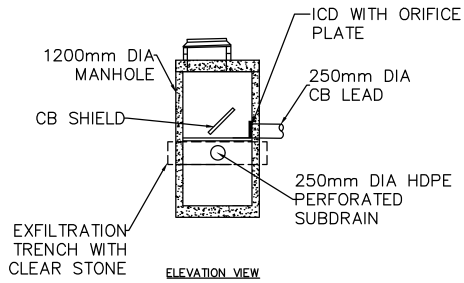
Orifice Diameter =	0.370	m
Extended Detention Elevation =	92.80	m
Extended Detention Head, h =	0.45	m
A_O =	0.108	m^2
C_2 =	3791	
C_3 =	21935	

		X - Values	Y - Values
Pond Stage	**Elevation** (m)	**Depth** (m)	**Area** (m^2)
PP	92.35	0.00	22020
	92.40	0.05	22164
	92.45	0.10	22313
	92.50	0.15	22464
	92.55	0.20	22617
	92.60	0.25	22770
	92.65	0.30	22933
	92.70	0.35	23426
	92.75	0.40	23532
	92.80	0.45	23639

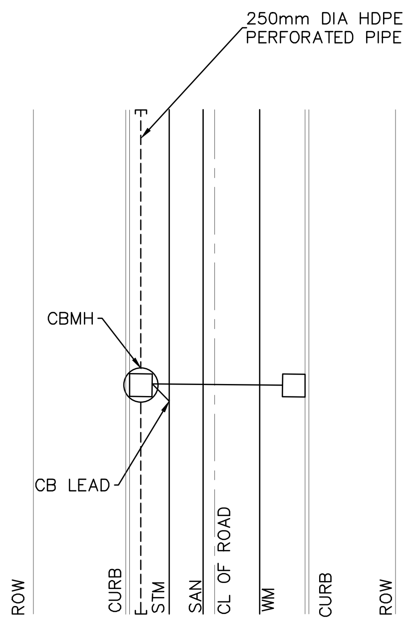


LOW IMPACT DEVELOPMENT CONCEPT DETAILS
TAMARACK RICHMOND

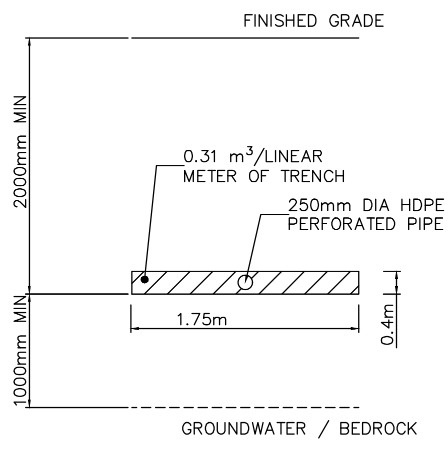
PREPARED BY DSEL
FEB 2025



DETAIL 1: CATCH BASIN MAINTENANCE STRUCTURE WITH INFILTRATION SYSTEM
SCALE: N.T.S.



PLAN VIEW



INFILTRATION TRENCH SECTION
SCALE: N.T.S.

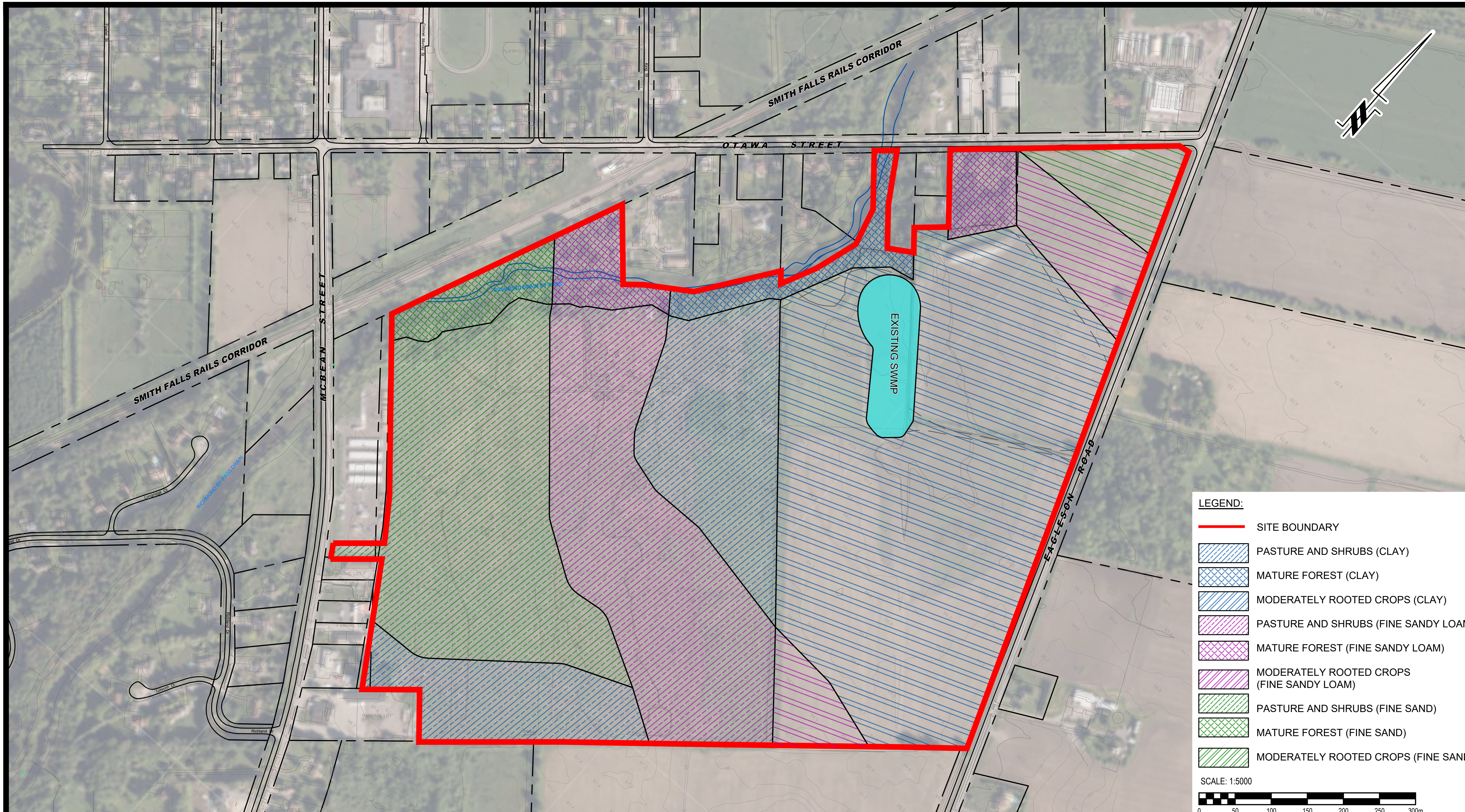
Table 1 - Pre-Development Annual Water Budget Calculations

Land Use Unit	Area (m^2)	Water Surplus (mm)	Topography Factor	Soil Factor	Vegetation Factor	Infiltration Factor	Runoff Factor	Total Infiltration (mm/year)	Total Infiltration (L/year)	Total Runoff (mm/year)	Total Runoff (L/year)
Mature Forest (Clay)	14,454	294	0.1	0.1	0.2	0.4	0.6	117.6	1,699,790.40	176.4	2,549,685.60
Pasture and Shrubs (Clay)	96,736	312	0.2	0.1	0.1	0.4	0.6	124.8	12,072,652.80	187.2	18,108,979.20
Moderately Rooted Crops (Clay)	229,658	329	0.2	0.1	0.1	0.4	0.6	131.6	30,222,992.80	197.4	45,334,489.20
Mature Forest (Fine Sand)	14,568	304	0.1	0.3	0.2	0.6	0.4	182.4	2,657,203.20	121.6	1,771,468.80
Pasture and Shrubs (Fine Sand)	117,163	360	0.2	0.3	0.1	0.6	0.4	216	25,307,208.00	144	16,871,472.00
Moderately Rooted Crops (Fine Sand)	18,142	378	0.2	0.3	0.1	0.6	0.4	226.8	4,114,605.60	151.2	2,743,070.40
Mature Forest (Fine Sandy Loam)	24,265	298	0.1	0.4	0.2	0.7	0.3	208.6	5,061,679.00	89.4	2,169,291.00
Pasture and Shrubs (Fine Sandy Loam)	107,818	329	0.2	0.4	0.1	0.7	0.3	230.3	24,830,485.40	98.7	10,641,636.60
Moderately Rooted Crops (Fine Sandy Loam)	34,139	329	0.2	0.4	0.1	0.7	0.3	230.3	7,862,211.70	98.7	3,369,519.30
Existing Stormwater Pond	15,058	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total	**672,001**								**113,828,828.90**		**103,559,612.10**

Table 2 - Post-Development Annual Water Budget Calculations

Land Use Unit	Area (m^2)	Water Surplus (mm)	Topography Factor	Soil Factor	Vegetation Factor	Infiltration Factor	Runoff Factor	Total Infiltration (mm/year)	Total Infiltration (L/year)	Total Runoff (mm/year)	Total Runoff (L/year)
Impervious Surfaces	417,038	449	0	0	0	0	1	0	0.00	449	187,249,882.40
Urban Lawn (Clay Loam)	173,281	360	0.2	0.2	0.1	0.5	0.5	180	31,190,652.00	180	31,190,652.00
Mature Forest (Fine Sand)	14,568	304	0.1	0.3	0.2	0.6	0.4	182.4	2,657,203.20	121.6	1,771,468.80
Mature Forest (Fine Sandy Loam)	13,500	298	0.1	0.4	0.2	0.7	0.3	208.6	2,816,100.00	89.4	1,206,900.00
Mature Forest (Clay)	14,454	294	0.1	0.1	0.2	0.4	0.6	117.6	1,699,790.40	176.4	2,549,685.60
Stormwater Management Ponds	39,160	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Totals	**672,001**								**38,363,745.60**		**223,968,588.80**
Difference (L/year)									**-75,465,083.30**		**120,408,976.70**
Percentage Variation									**-66.30%**		**116.27%**

PATERSON GROUP



PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL

TAMARACK (RICHMOND) CORPORATION
WATER BUDGET ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
EAGLESON ROAD AT OTTAWA STREET

OTTAWA, ONTARIO

Title:
PRE-DEVELOPMENT TERRAIN COMPOSITION PLAN

Scale: 1:5000	Date: 12/2024
Drawn by: GK	Report No.: PH5013-1
Checked by: NZ	Dwg. No.: PH5013-1
Approved by: NZ	Revision No.:

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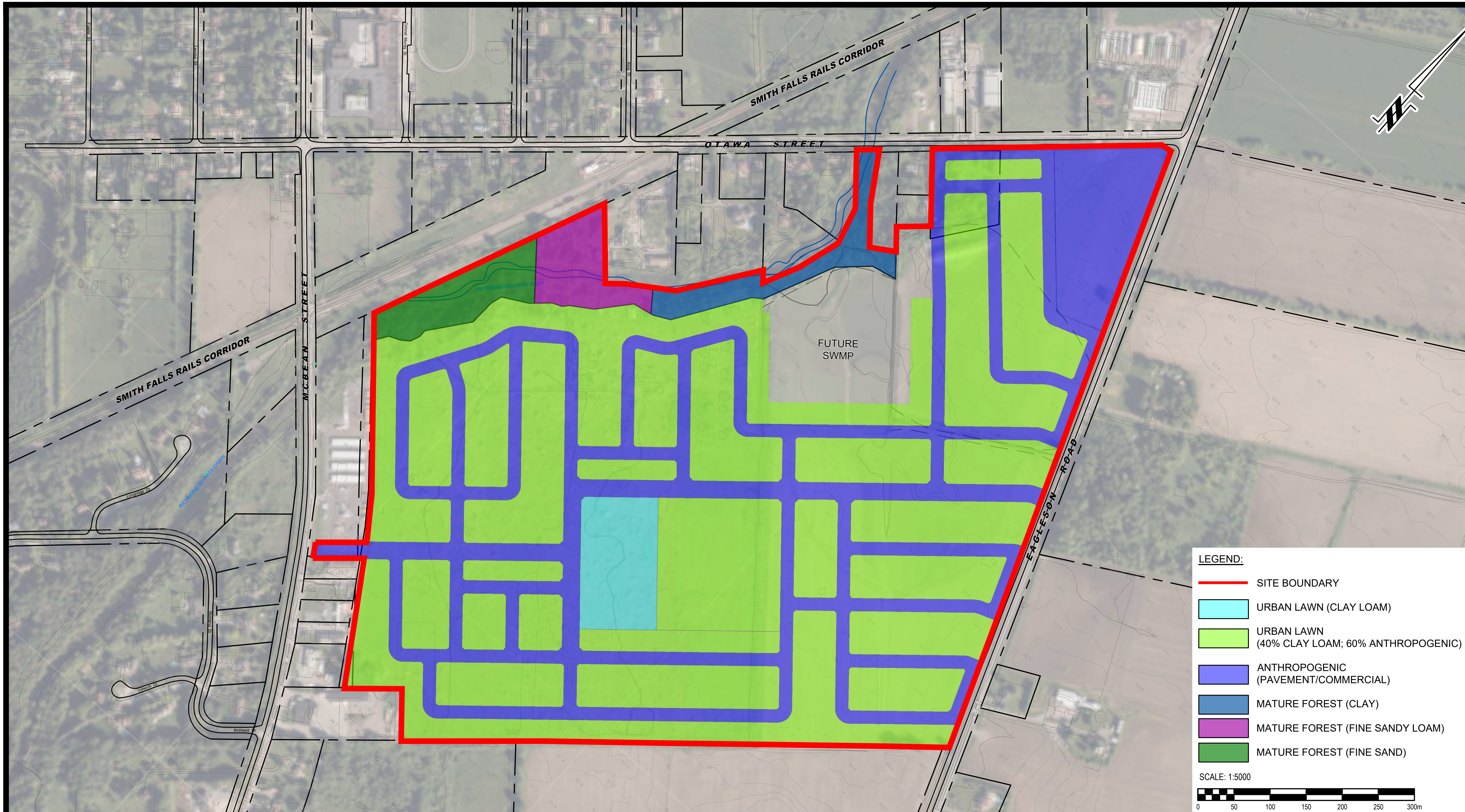
11x17



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NO.	REVISIONS	DATE	INITIAL

TAMARACK (RICHMOND) CORPORATION
WATER BUDGET ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
EAGLESON ROAD AT OTTAWA STREET

OTTAWA, ONTARIO

Title:
POST-DEVELOPMENT TERRAIN COMPOSITION PLAN

Scale: 1:5000	Date: 12/2024
Drawn by: GK	Report No.: PH5013-1
Checked by: NZ	Dwg. No.: PH5013-2
Approved by: NZ	Revision No.:

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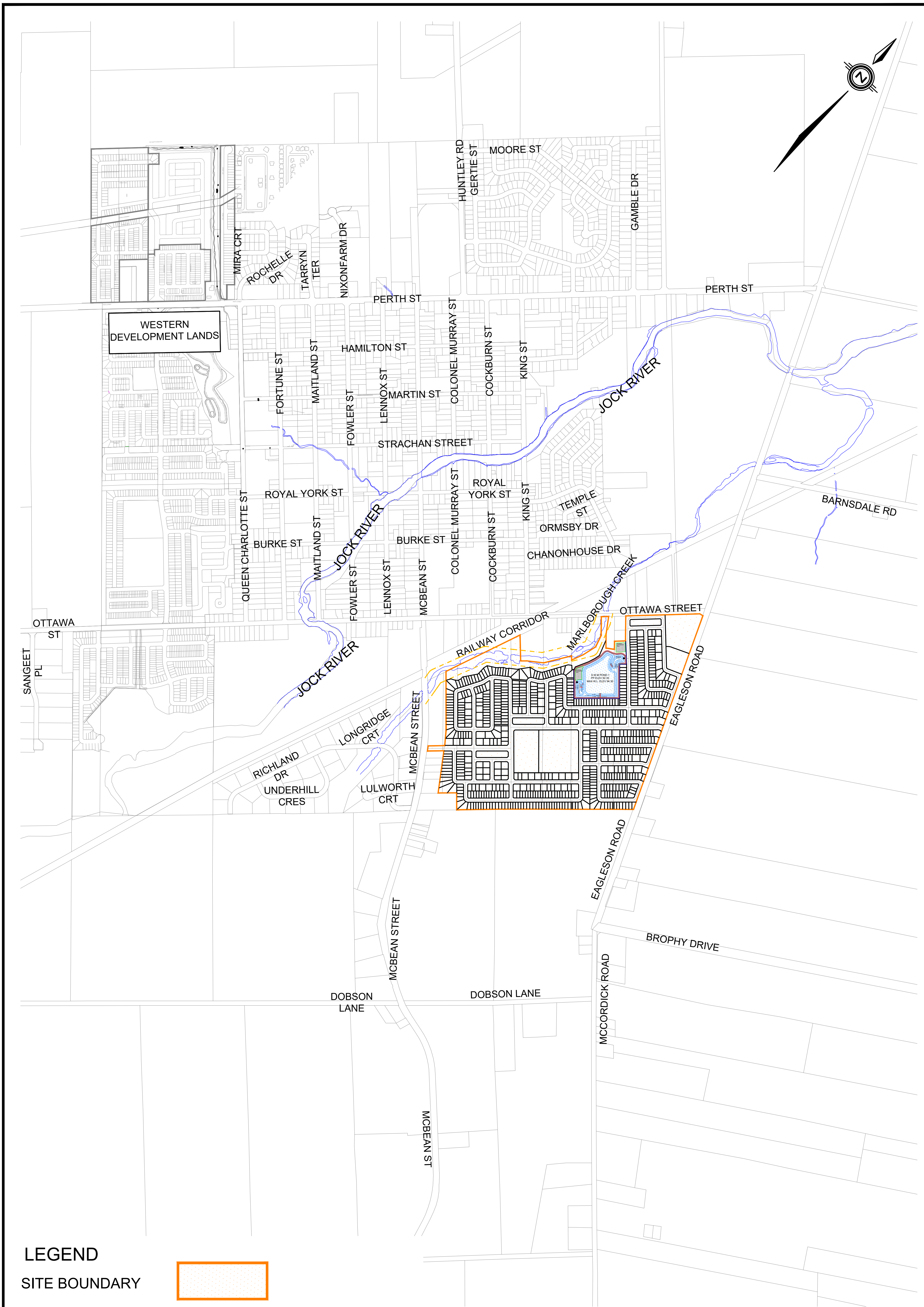
11x17

Drawings & Figures



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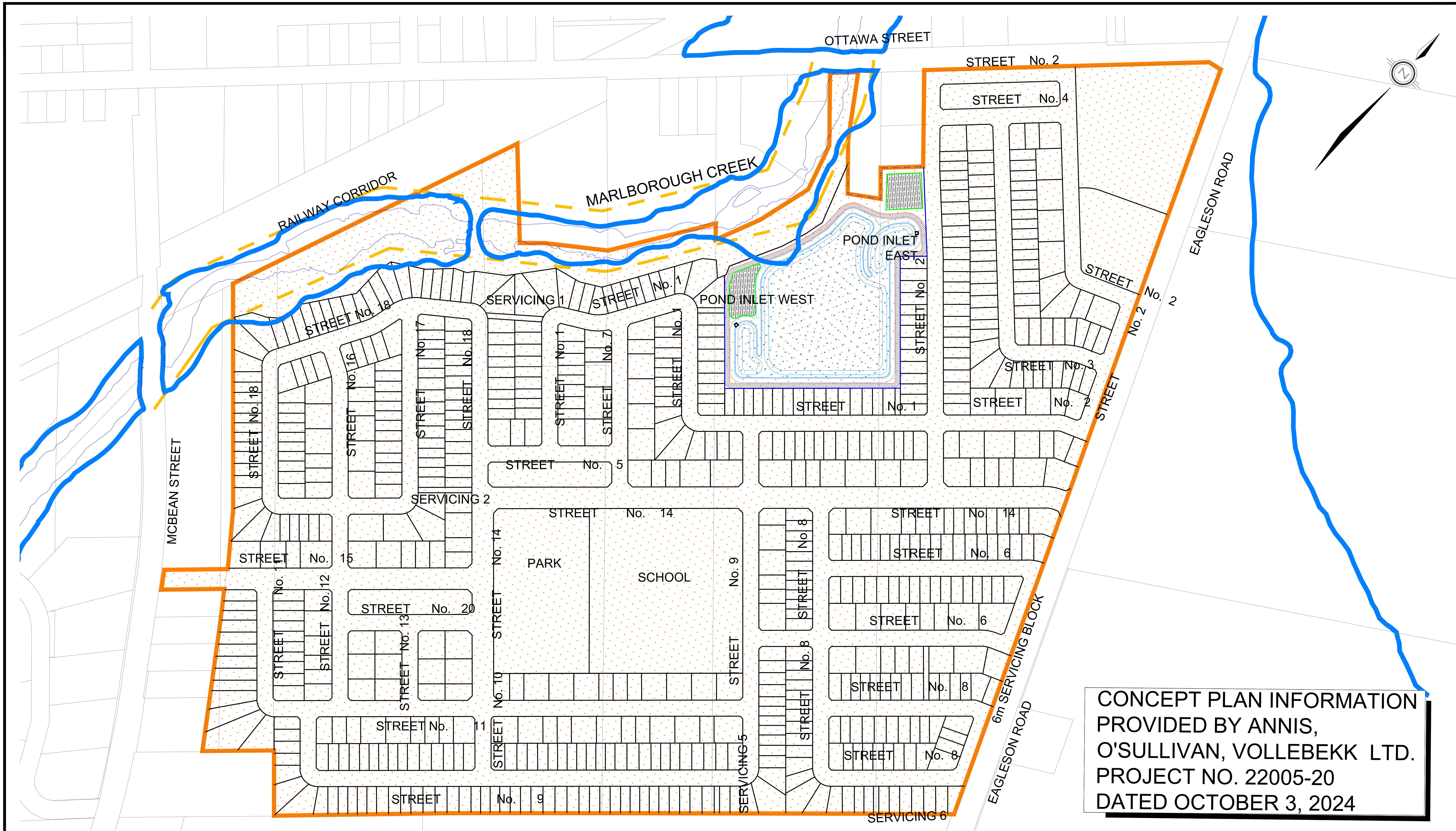
TAMARACK RICHMOND

CITY OF OTTAWA

KEY PLAN

SCALE:	1:15000	PROJECT No.:	1042
DATE:	MARCH 2025	FIGURE:	01F



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LEGEND

SITE BOUNDARY

MEANDER BELT LIMIT

FLOODPLAIN

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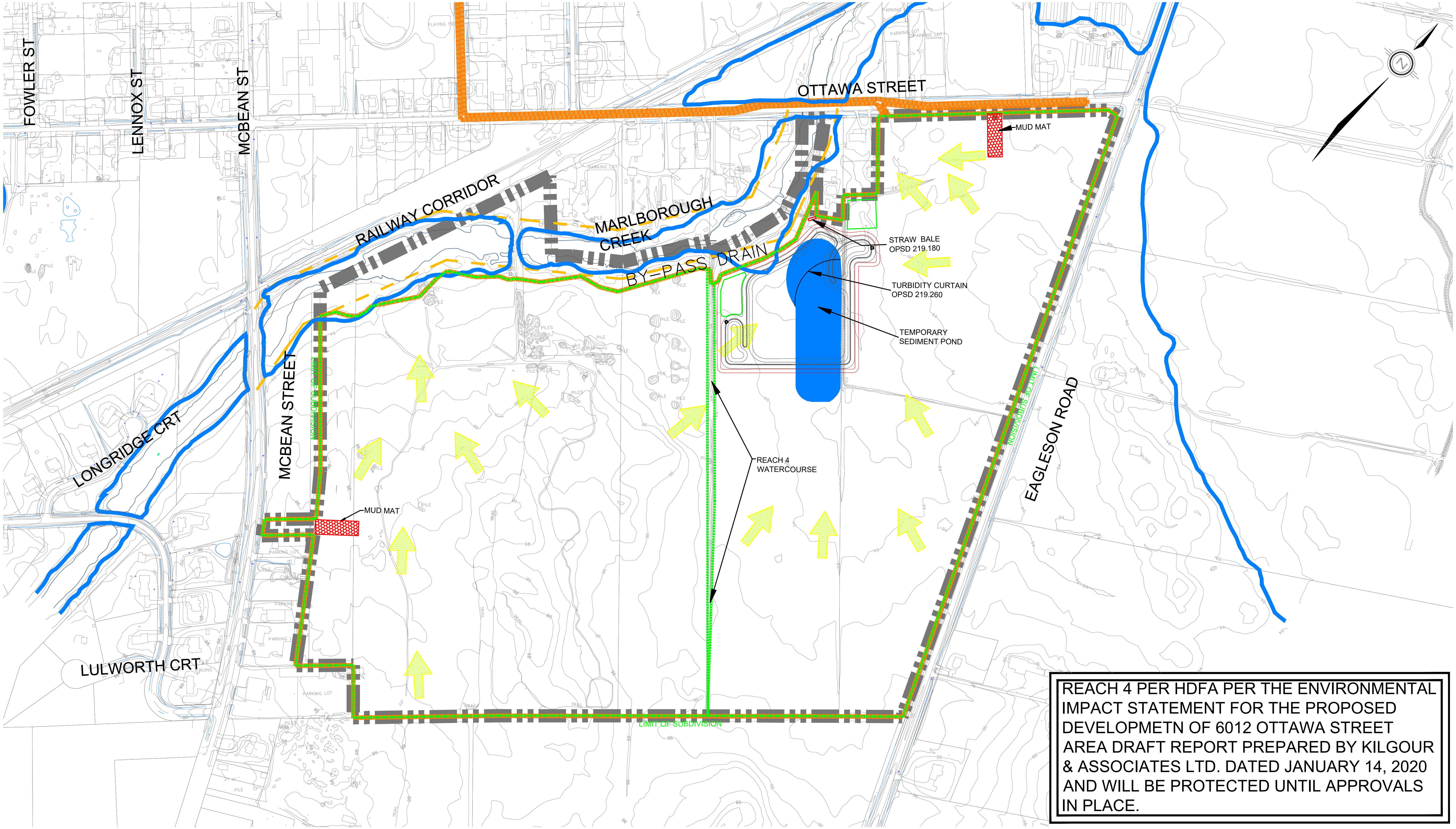
CITY OF OTTAWA

CONCEPT PLAN

SCALE:	1:4000	PROJECT No.:	1042
DATE:	MARCH 2025	FIGURE:	02F



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LEGEND

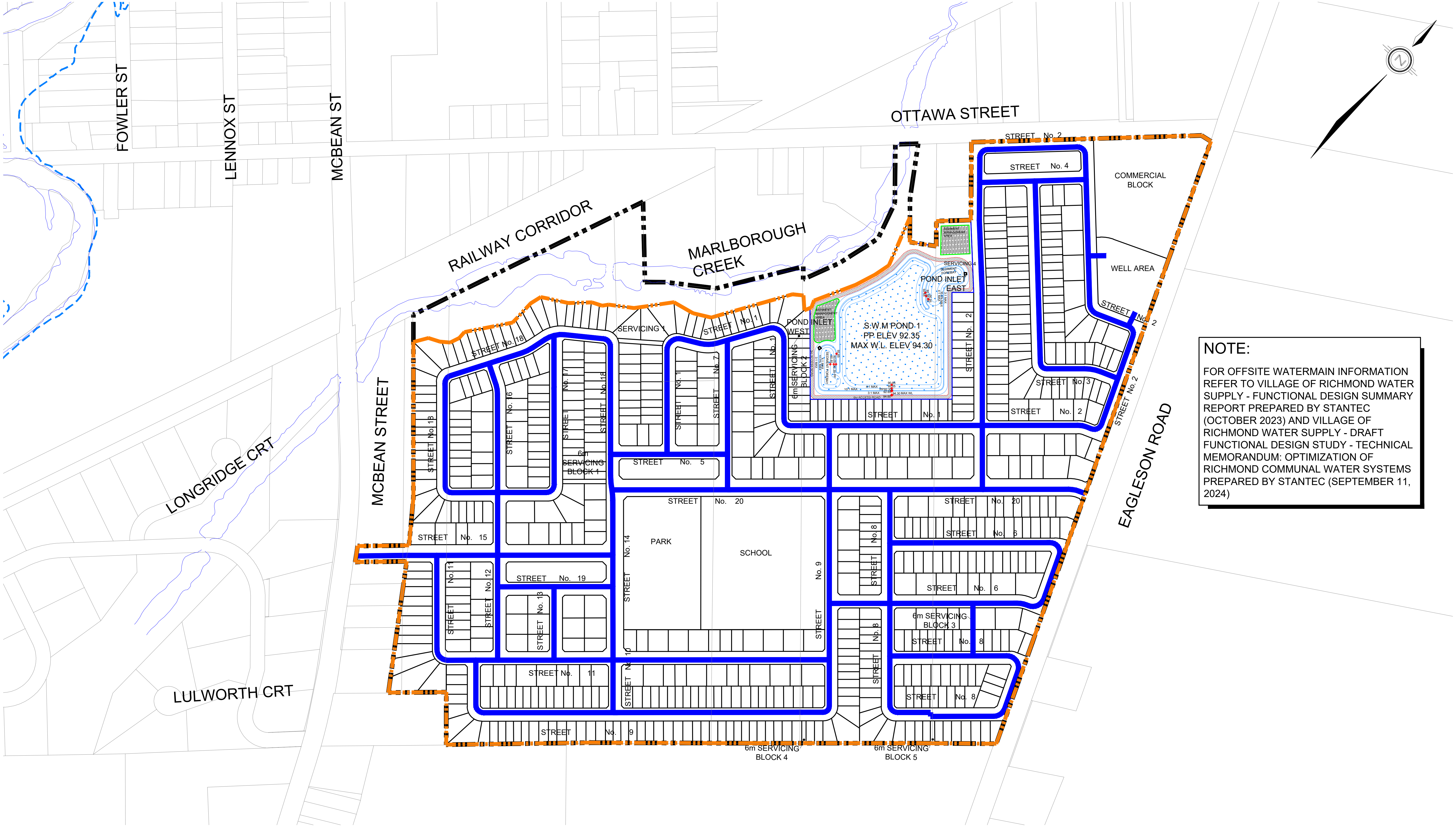
- SILT FENCE
- SUBJECT LANDS
- OVERLAND FLOW
- MEANDER BELT LIMIT
- FLOODPLAIN
- LIMIT OF WORK

TAMARACK RICHMOND

CITY OF OTTAWA

EROSION SEDIMENT CONTROL PLAN

SCALE:	1:5000	PROJECT No.:	1042
DATE:	MARCH 2025	FIGURE:	03F



NOTE:
FOR OFFSITE WATERMAIN INFORMATION REFER TO VILLAGE OF RICHMOND WATER SUPPLY - FUNCTIONAL DESIGN SUMMARY REPORT PREPARED BY STANTEC (OCTOBER 2023) AND VILLAGE OF RICHMOND WATER SUPPLY - DRAFT FUNCTIONAL DESIGN STUDY - TECHNICAL MEMORANDUM: OPTIMIZATION OF RICHMOND COMMUNAL WATER SYSTEMS PREPARED BY STANTEC (SEPTEMBER 11, 2024)

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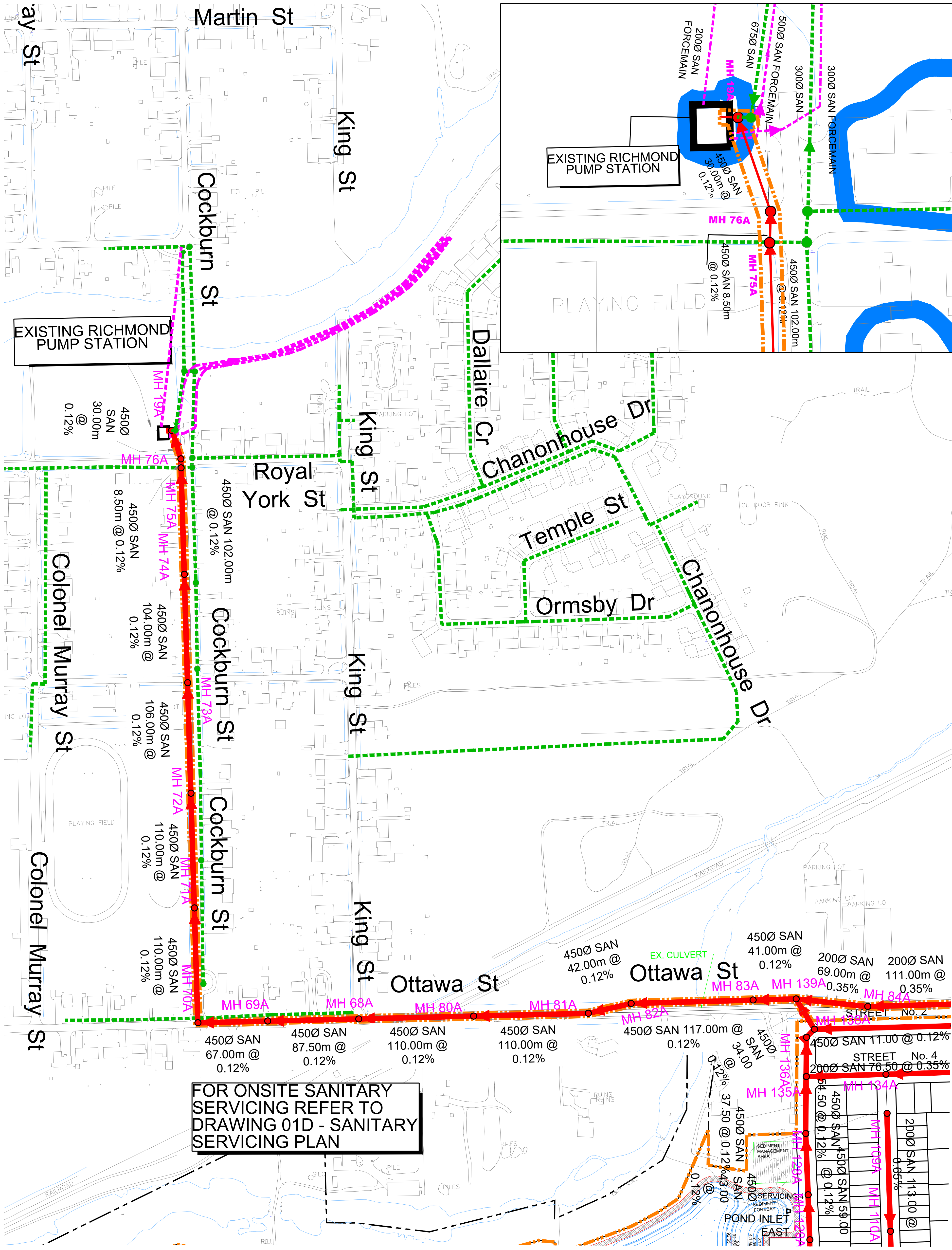
LEGEND
- SUBJECT LANDS
- PROPOSED LOCAL WATERMAIN
- LIMIT OF WORK

TAMARACK RICHMOND

CITY OF OTTAWA

WATERMAIN SERVICING PLAN

SCALE:	1:5000	PROJECT No.:	1042
DATE:	MARCH 2025	FIGURE:	04F



LEGEND

- SUBJECT LANDS
- LIMIT OF WORK
- EXISTING SANITARY SEWER
- PROPOSED SANITARY SEWER
- EXISTING SANITARY FORCEMAIN
- PROPOSED SANITARY MANHOLE

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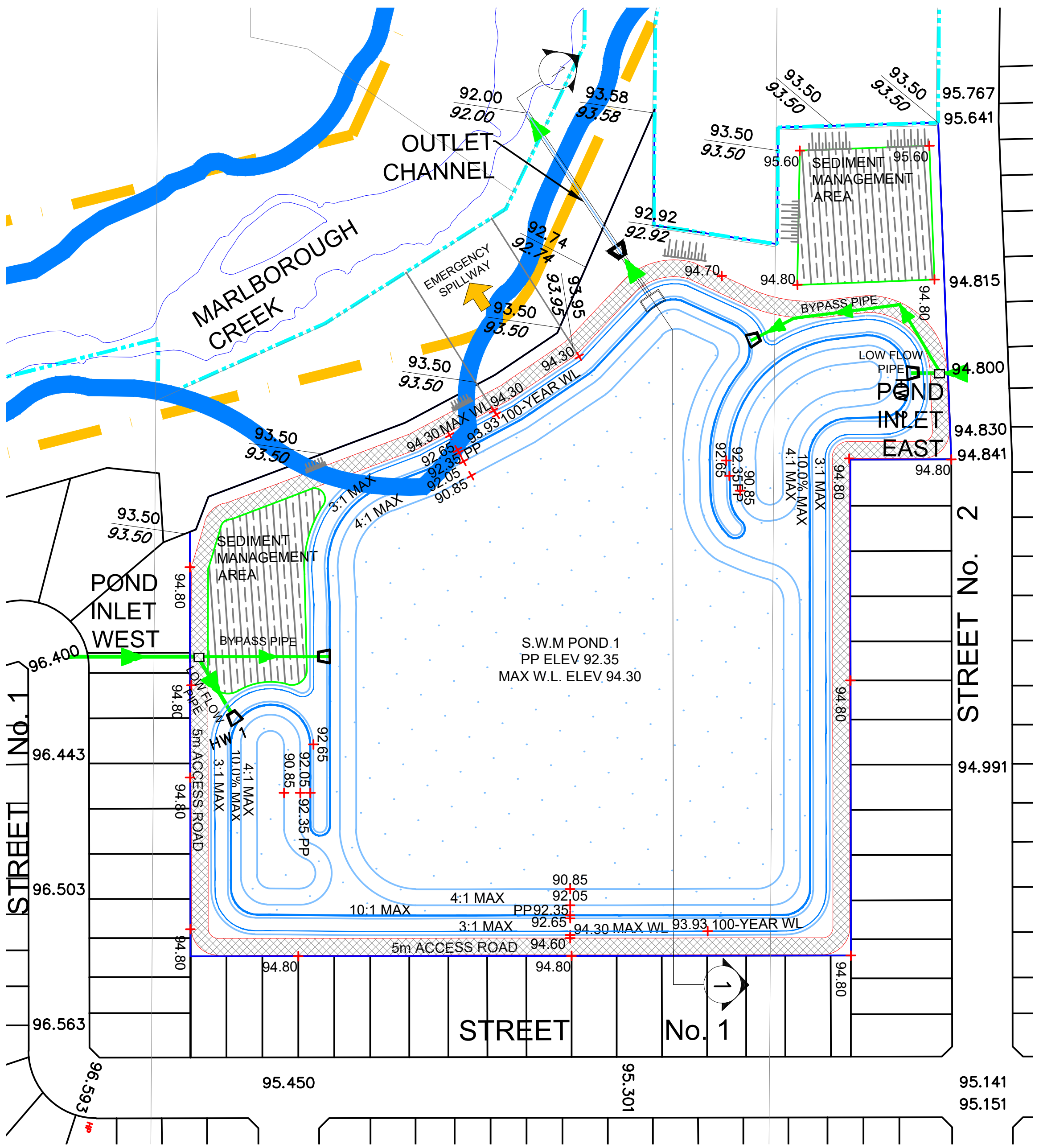
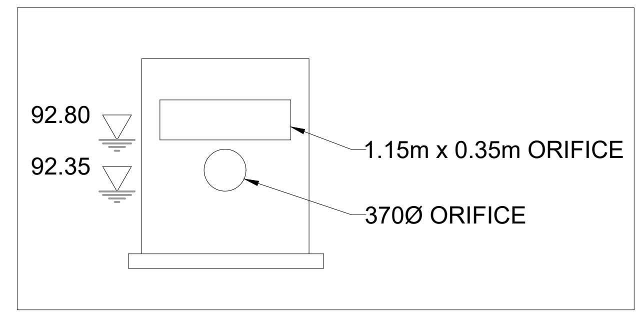
CITY OF OTTAWA

EXTERNAL SANITARY SERVICING PLAN

SCALE:	1:3500	PROJECT No.:	1042
DATE:	MARCH 2025	FIGURE:	05F

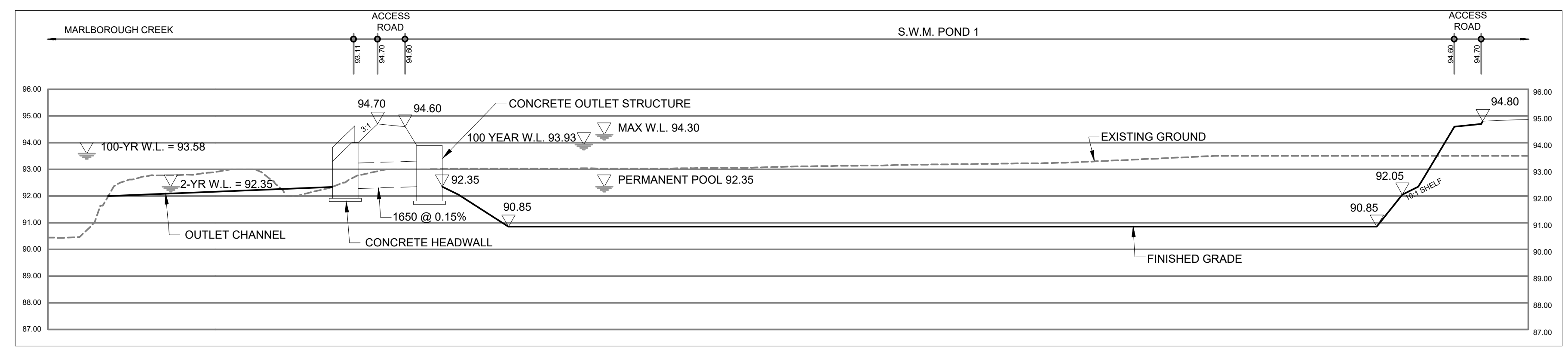


S.W.M. POND 1
OUTLET STRUCTURE DETAIL
NTS



POND CHARACTERISTICS				
	LOWER ELEVATION (m)	UPPER ELEVATION (m)	VOLUME REQUIRED(m^3)	VOLUME PROVIDED(m^3)
PERMANENT POOL	90.85	92.35	12,535	28,083
EXTENDED DETENTION	92.35	92.80	6,115	10,252
MAX WL	92.35	94.30	38,340	48,142

S.W.M. POND 1
SECTION 1-1
NTS



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LEGEND

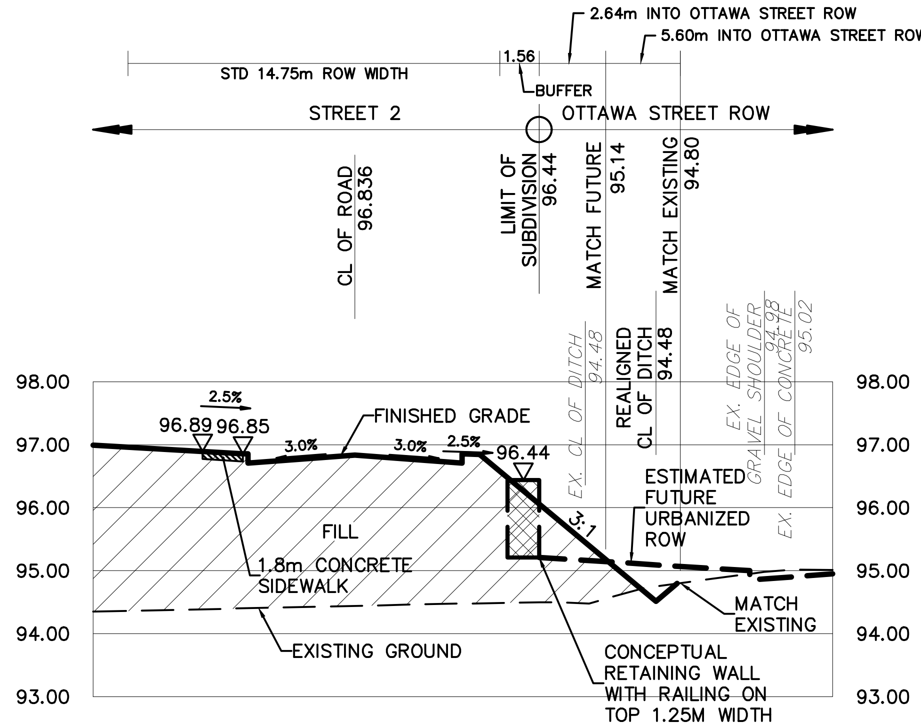
- SITE BOUNDARY
- PROPOSED OUTLET CHANNEL
- MEANDER BELT LIMIT
- FLOODPLAIN
- 98.512 PROPOSED GRADE
- POND INLET
- PERMANENT POOL
- ACCESS ROAD
- SEDIMENT MANAGEMENT AREA
- EMERGENCY OVERFLOW DIRECTION

TAMARACK RICHMOND

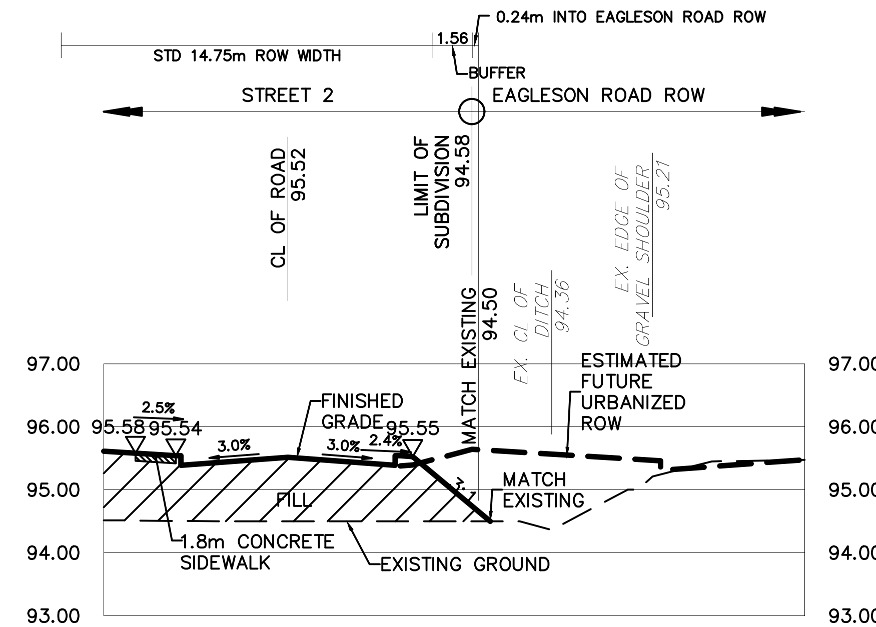
CITY OF OTTAWA

SWM POND

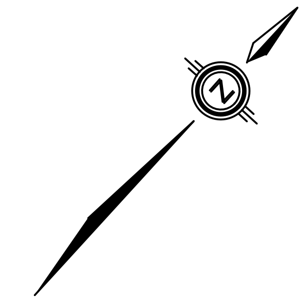
SCALE:	1:2000	PROJECT No.:	1042
DATE:	MARCH 2025	FIGURE:	06F



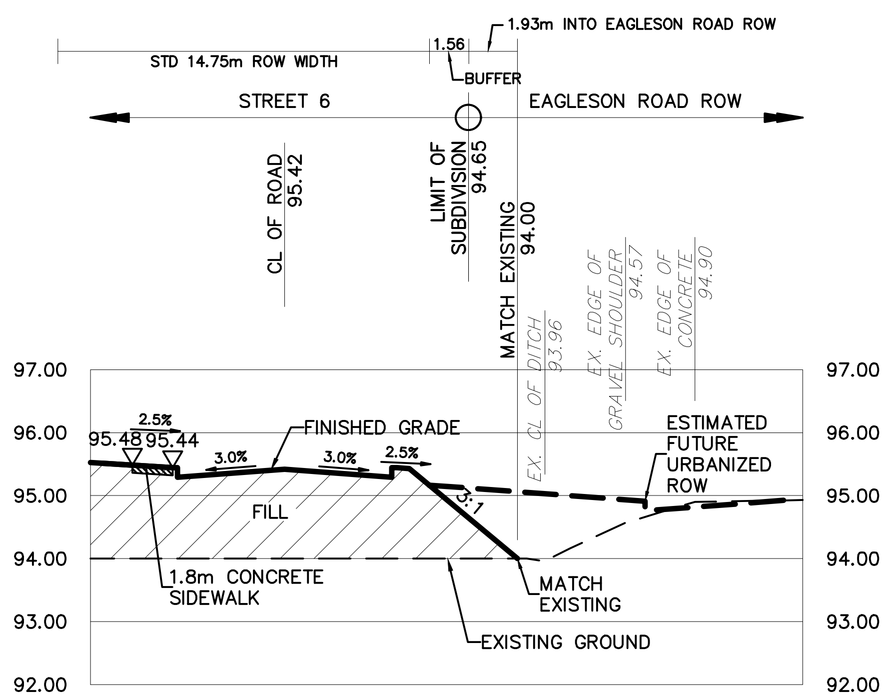
SECTION 1–1
SCALE HOR. 1:100
VER. 1:250



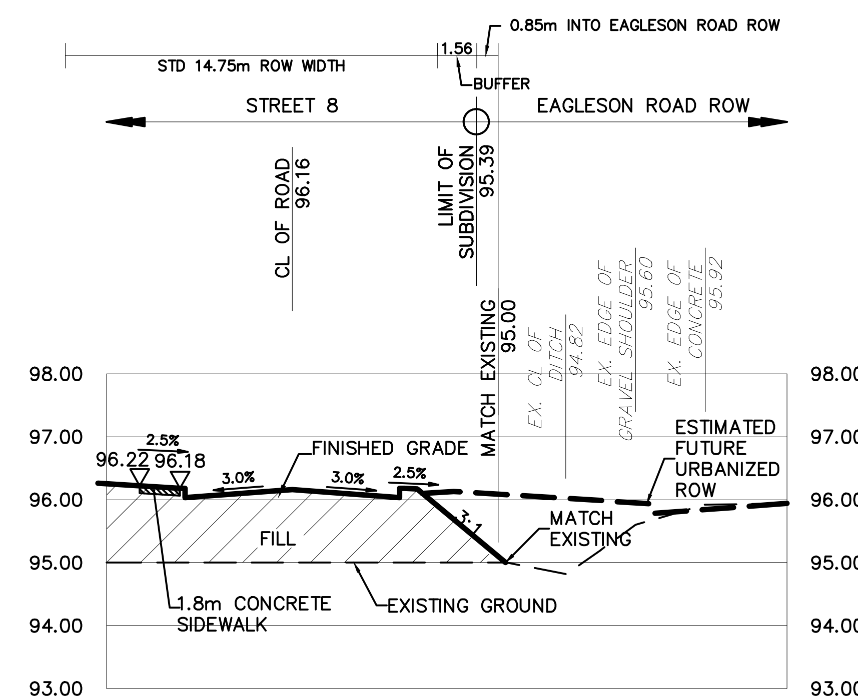
SECTION 2–2
SCALE HOR. 1:100
VER. 1:250



NOTE:
REFER TO GRADING PLAN FOR CROSS SECTION LOCATIONS



SECTION 3–3
SCALE HOR. 1:100
VER. 1:250



SECTION 4–4
SCALE HOR. 1:100
VER. 1:250

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CROSS SECTIONS

SCALE:	AS SHOWN	PROJECT No.:	1042
DATE:	MARCH 2025	FIGURE:	07F

LEGEND

SUBJECT LANDS	SANITARY DRAINAGE AREA
SANITARY SEWER	SANITARY MANHOLE
EXISTING SANITARY SEWER	
LIMIT OF WORK	

0.77	DRAINAGE AREA IN HECTARES
82.07	POPULATION PER HA
63	POPULATION
MH 513A	UPSTREAM MANHOLE
MH 514A	DOWNSTREAM MANHOLE
RESIDENTIAL	TRIBUTARY TYPE

3.4	POPULATION PER UNIT
0.30	EXTERNAL DRAINAGE AREA IN HECTARES
18	POPULATION
Residential	TRIBUTARY TYPE

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SANITARY SERVICING PLAN

SCALE:	1:2000	PROJECT No.:	1042
DATE:	MARCH 2025	DRAWING:	01D

LEGEND

- SUBJECT LANDS
- EXISTING STORM DRAINAGE AREA
- MEANDER BELT LIMIT
- FLOODPLAIN
- OVERLAND FLOW DIRECTION
- RIVER/CREEK FLOW DIRECTION

AREA=1.00 HA	DRAINAGE AREA
TC = 10 MIN	TIME OF CONCENTRATION
RUNOFF COEFFICIENT C= 0.20 / 100-YR	STORM FREQUENCY

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PRE-DEVELOPMENT STORM DRAINAGE PLAN

SCALE:	1:5000	PROJECT No.:	1042
DATE:	MARCH 2025	DRAWING:	02D

LEGEND

SUBJECT LANDS	STORM DRAINAGE AREA
STORM SEWER	EXISTING STORM DRAINAGE AREA
FLOODPLAIN	STORM MANHOLE
MEANDER BELT LIMIT	LIMIT OF WORK

PROPOSED CUTOFF SWALE

EXTERNAL DRAINAGE

RUNOFF COEFFICIENT

AREA=1.00 HA — EXTERNAL DRAINAGE AREA
TC = 10 MIN — TIME OF CONCENTRATION
C=0.20 / 100-YR — STORM FREQUENCY
614 L/S — 100-YEAR FLOW RATE

0.45 — DRAINAGE AREA
0.66 — IMPERVIOUSNESS
MH 41 MH 42 — UPSTREAM/DOWNSTREAM MANHOLE
2-YEAR — STORM FREQUENCY

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CITY OF OTTAWA

STORM SERVICING PLAN

SCALE:	1:2000	PROJECT No.:	1042
DATE:	MARCH 2025	DRAWING:	03D

GRADING NOTES

- PRELIMINARY GRADING REPRESENTS PROPOSED LOWPOINTS ALONG CENTERLINE OF ROAD. CENTERLINE GRADES COULD BE UP TO 0.35m HIGHER AFTER HIGH POINTS ARE ADDED AT DETAILED DESIGN.
- GRADE RAISE RESTRICTIONS AND PLACEMENT OF LIGHTWEIGHT FILL TO BE REVIEWED BY PATERSON GROUP DURING DETAILED DESIGN
- PRELIMINARY GRADING DOES NOT REPRESENT ROAD SAGS, MINIMUM LONGITUDINAL SLOPES OF 0.5% TO BE MAINTAINED DURING DETAILED DESIGN THROUGH SAWTOOTHING

LEGEND

- SUBJECT LANDS
- STORM OVERLAND FLOW ARROW
- 192.851 PROPOSED CENTERLINE ELEVATION
- [192.85] FUTURE GRADES (BY OTHERS)
- FLOODPLAIN
- PROPOSED ELEVATION / EXISTING ELEVATION
- EXISTING CONTOUR ELEVATION
- LIMIT OF WORK
- MEANDER BELT LIMIT

CUT-FILL DEPTH TO EXISTING GROUND

CUT DEPTH (m)	FILL DEPTH (m)
0 - 1.0	0 - 1.0
1.0 - 2.0	1.0 - 2.0
2.0 - 3.0	2.0 - 3.0
>3.0	>3.0

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CITY OF OTTAWA

GRADING PLAN

SCALE:	1:2000	PROJECT No.:	1042
DATE:	MARCH 2025	DRAWING:	04D

NOTE: GROUNDWATER ELEVATION REFLECTS PRELIMINARY SEASONAL HIGH GROUNDWATER LEVEL PER PATERSON GROUP PH5013-MEMO-01 DATED MARCH 14, 2025

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TAMARACK RICHMOND

CITY OF OTTAWA

PROFILES

SCALE:	H 1:2000 V 1:200	PROJECT No.:	1042
DATE:	MARCH 2025	DRAWING:	05D

NOTE: GROUNDWATER ELEVATION REFLECTS PRELIMINARY SEASONAL HIGH GROUNDWATER LEVEL PER PATERSON GROUP PH5013-MEMO-01 DATED MARCH 14, 2025

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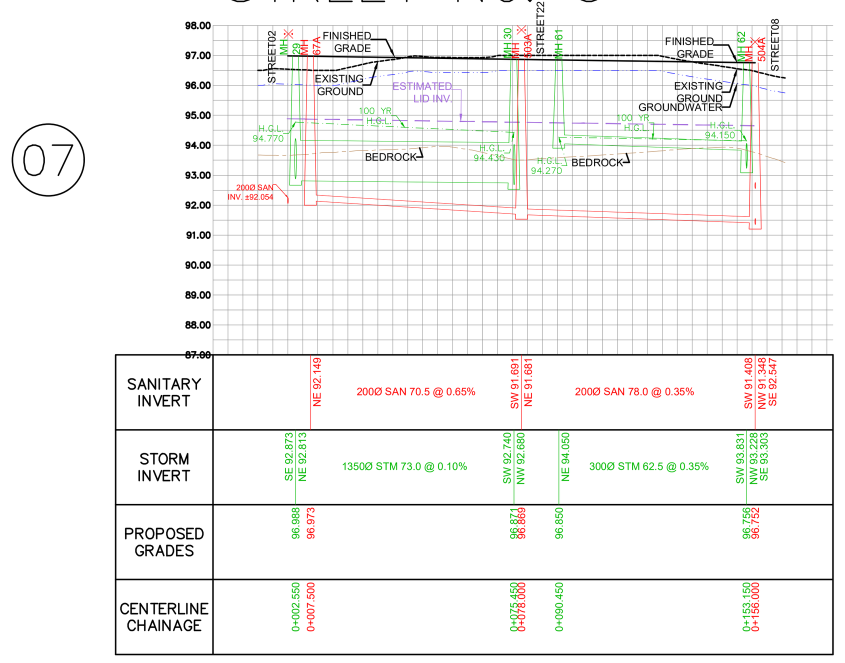
TAMARACK RICHMOND

CITY OF OTTAWA

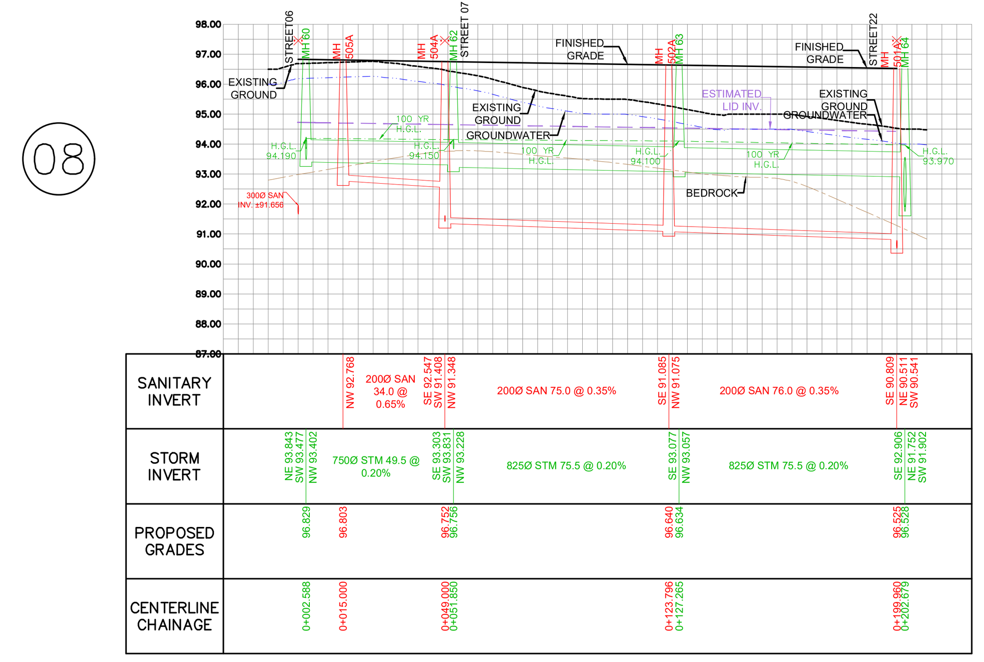
PROFILES

SCALE:	H 1:2000 V 1:200	PROJECT No.:	1042
DATE:	MARCH 2025	DRAWING:	06D

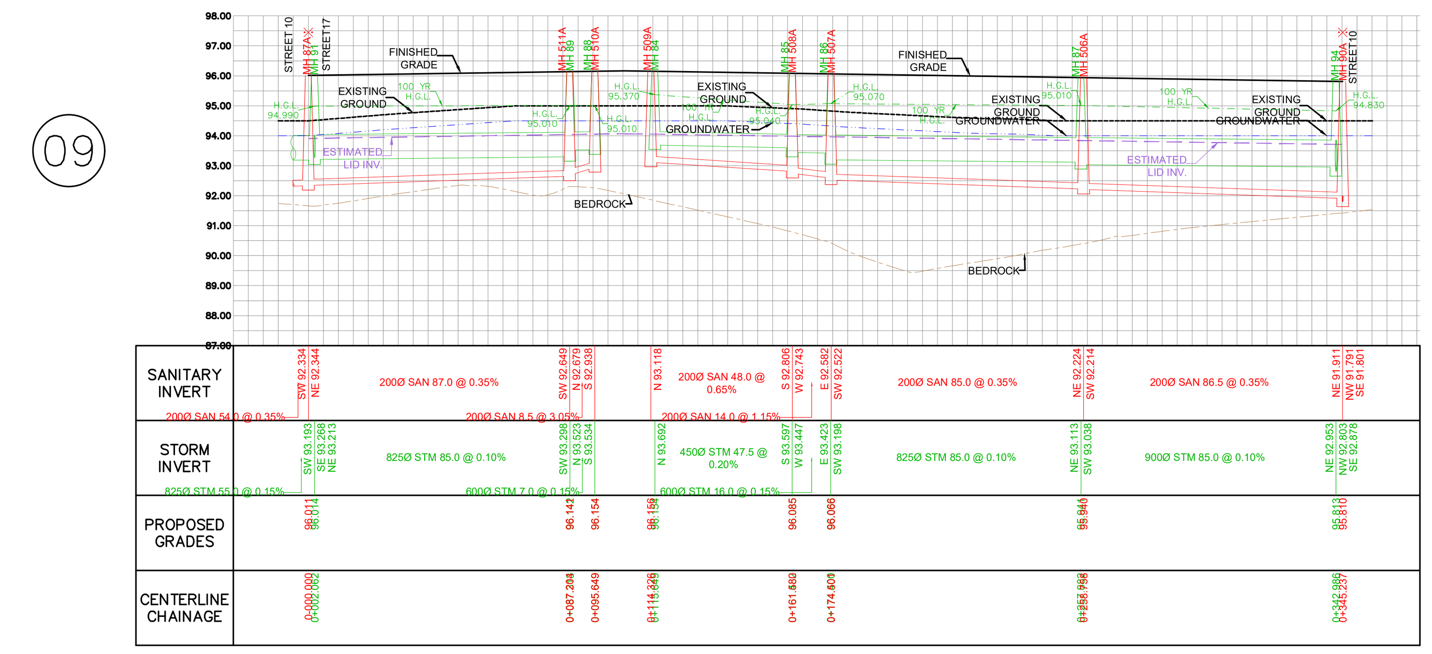
STREET No. 5



STREET No. 7



STREET No. 8



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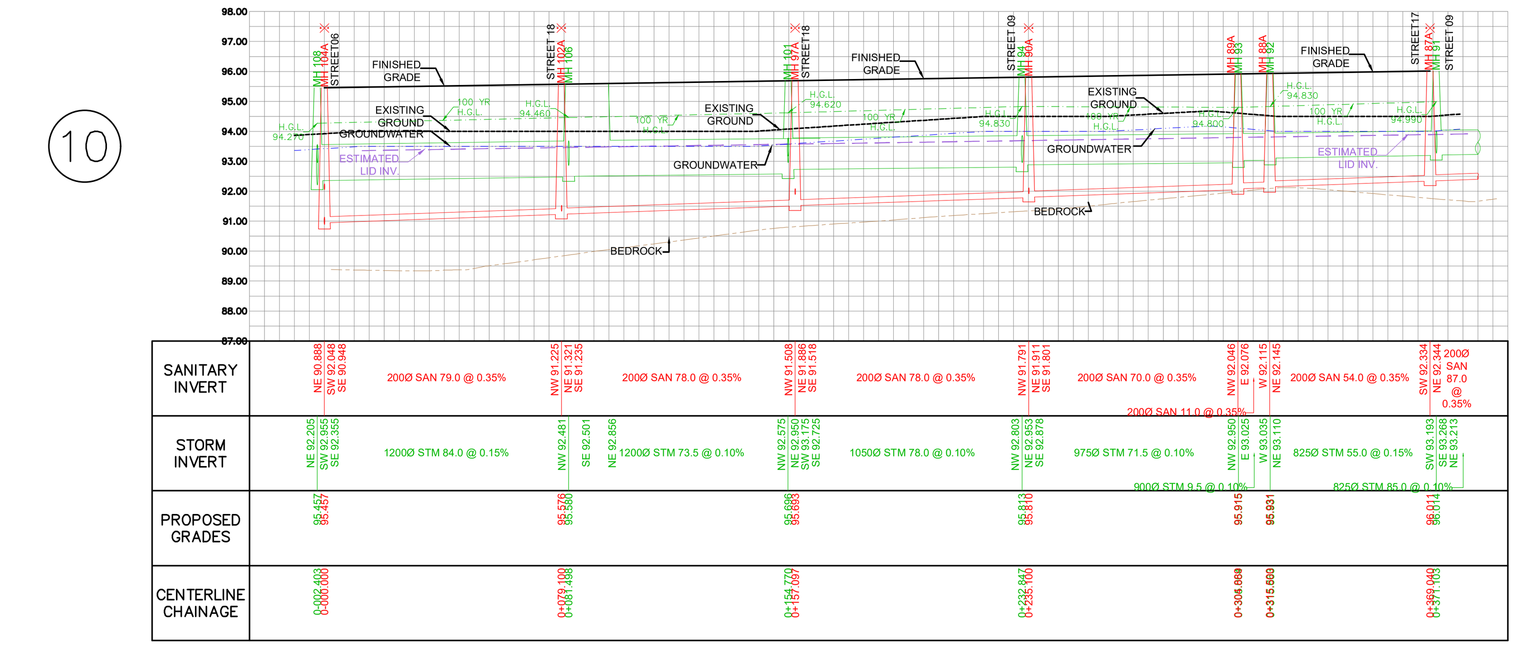
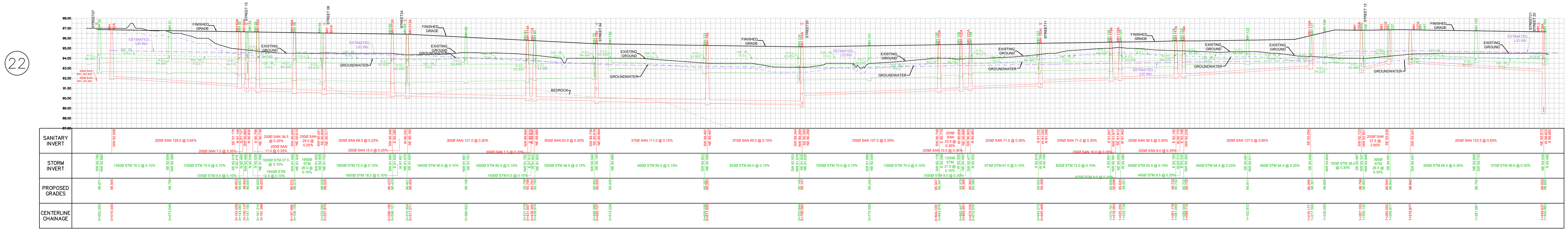
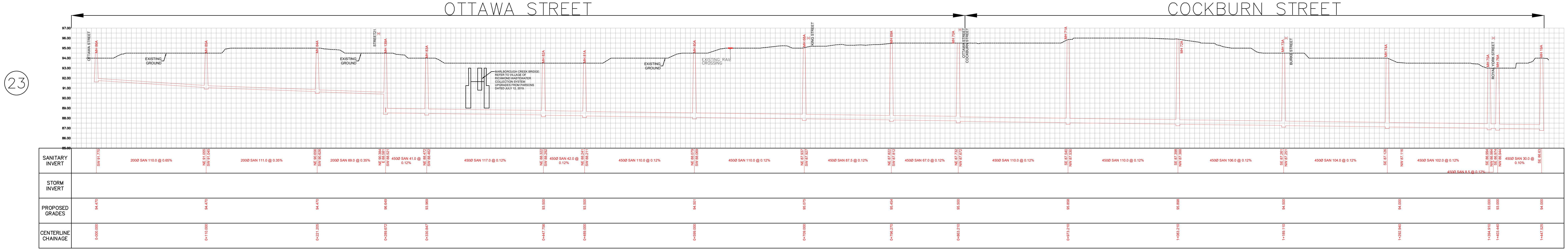


STREET No. 1–2



OTTAWA STREET / COCKBURN STREET



NOTE: GROUNDWATER ELEVATION REFLECTS PRELIMINARY SEASONAL HIGH GROUNDWATER LEVEL PER PATERSON GROUP PH5013-MEMO-01 DATED MARCH 14, 2025

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TAMARACK RICHMOND	PROFILES		
CITY OF OTTAWA	SCALE: H 1:2000 V 1:200	PROJECT No.:	1042
	DATE: MARCH 2025	DRAWING:	07D