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FUNCTIONAL SERVICING REPORT

FOR

LEITRIM – BANK STREET (S-5)

CAIVAN

CITY OF OTTAWA

PROJECT NO.: 24-1414

JULY 2026

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FUNCTIONAL SERVICING REPORT
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FUNCTIONAL SERVICING REPORT
FOR
LEITRIM – BANK STREET - AREA S-5

JULY 2026

CITY OF OTTAWA
PROJECT NO.: 21-1414

1.0 INTRODUCTION

This functional servicing report is submitted on behalf of Caivan, to support the Leitrim Bank Street (S-5) draft plan application for the subject site, located within the community of Leitrim, Ontario.

The development areas are illustrated in ***Figure 1***, below. The study area encompasses approximately 17 ha of land and is bound by Blais Road to the south, Bank Street to the west, an existing urban subdivision development to the north and west (S-4 lands) and Findlay Creek and Findlay Creek SWM facility to the east and south.

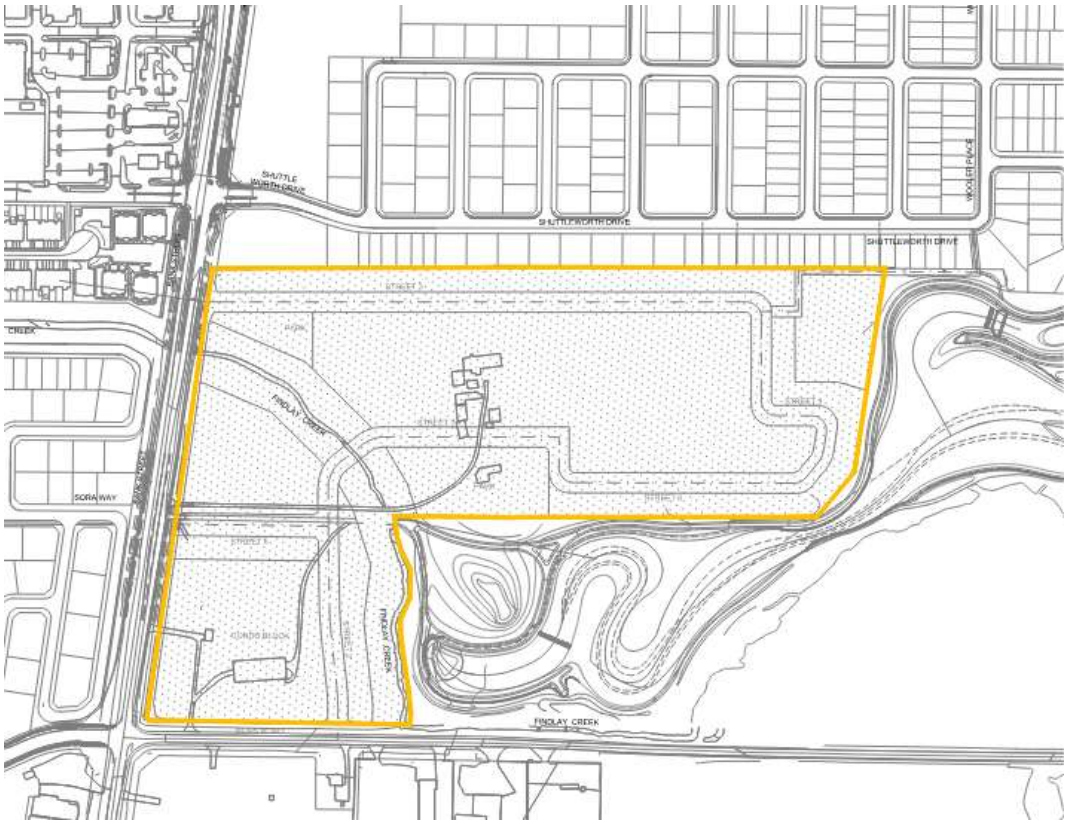

Figure 1: Caivan Leitrim Lands

The lands are planned to be developed with a mix of single-family homes, townhomes, stacked townhomes, park blocks, stormwater management (SWM) blocks, natural heritage system

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block, open space blocks and associated local road network (see ***Appendix A.1*** and ***A.2*** for the Draft Plan and preliminary lotted Concept Plan).

The objective of this report is to provide sufficient details to demonstrate that the proposed development area can be supported by municipal services.

1.1 Existing Conditions

The subject area is currently a mix of active/former agricultural lands and the existing tributary and associated vegetation. The overall area is bisected diagonally (northwest/south) by the existing Findley Creek tributary.

For the landholdings north/northeast of Findlay Creek (existing tributary) the site topography generally follows a mid-block high point/ridge and drains west and east (elevations ranging from 94 m to 88 m) with drainage ultimately being conveyed to the west to the existing tributary or to the east/south to the existing municipal SWM facility.

The landholdings south and west of the existing tributary drains eastward and southward (elevations ranging from 93 m to 91 m) to the existing tributary.

The subject lands are located within the City of Ottawa South Urban Community (SUC) Pressure Zone, with a hydraulic grade line of approximately 147 m. A 400 mm diameter feedermain, constructed in 2024, is located within the existing Bank Street right-of-way along the subject site's western frontage. The watermain servicing existing conditions figure can be found in ***Appendix B.1***.

The subject lands are tributary to the Leitrim Pump Station (PS) located on Findlay Creek Drive, approximately 400 m north of the subject lands. The Leitrim PS conveys wastewater to an existing 525 mm diameter sanitary sewer on Bank Street, approximately 1000 m north of the PS, and ultimately outlet to an existing 525 mm diameter gravity sanitary sewer on Conroy Road. As part of the Bank Street improvement works, a sanitary sewer connection was extended east from Sora Way to the Leitrim lands property line in support of a future connection to the proposed development. The sanitary servicing existing conditions figure can be found in ***Appendix C.1***.

Per the approved ***DSEL Scoped MSS***, the existing site topography for the subject properties generally follows a high ridge through the middle of the north lands which splits flows east and west to the existing municipal SWM facility and existing tributary respectively. The south lands generally slope to the south and east towards the existing tributary. As noted previously, the site is bisected by the existing watercourse and is adjacent to the existing Findlay Creek municipal SWM facility. The storm servicing existing conditions figure can be found in ***Appendix D.1***.

1.2 Development Layout

The subdivision is contemplated to consist of a mix of single-family homes, townhomes, condo block, park blocks, stormwater management block, open space and road allowances/widenings. See proposed draft plan of subdivision and concept plan in ***Appendix A***.

The predicted populations currently associated with the development concept are described in the following table below.

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Table 1: Development Statistics

Land Use	Units	Population
Residential (Low Density)	128	436
Residential (Low Density)	240	648
Condo Block (Medium Density)	252	454
Total	**602**	**1538**

** NOTE: Population projections may differ from population estimates used in background Transportation Studies, Planning Rationale, and other studies.*

1.3 Required Permits / Approvals

Once Draft Plan of Subdivision is obtained, the City of Ottawa must approve detailed engineering design drawings and reports prior to construction of the municipal infrastructure identified in this report.

The following additional approvals and permits listed in ***Table 2*** are expected to be required prior to construction of the municipal infrastructure detailed herein. Other permits and approvals may be required, as detailed in the other studies submitted as part of the Planning Act applications (e.g. *Tree Conservation Report, Phase 1 Environmental Site Assessment, etc*.).

Table 2: Potential Required Permits/Approvals

Agency	Permit/Approval Required	Trigger	Remarks
City of Ottawa	MECP Form SS2 – Record of Future Alteration Authorized for Components of the Municipal Sewage Collection System	Construction of new sanitary sewers.	City of Ottawa to review and approve plans prior to the completion of Form SS2.
City of Ottawa	MECP Form SW1 – Record of Future Alteration Authorized for Storm Sewers/Ditches/Culverts	Construction of new storm sewers, ditches, and culverts.	City of Ottawa to review and approve plans prior to the completion of Form SW1.
City of Ottawa	MECP Form SW2 – Record of Future Alteration Authorized for Stormwater Management Facilities	Construction of new Stormwater Management Facility (expansion).	City of Ottawa to review and approve plans prior to the completion of Form SW2.
MECP	Permit to Take Water	Construction of proposed land uses (e.g. basements for residential homes) and services.	Pumping of groundwater may be required during construction, given groundwater conditions and proposed land uses and on-site/off-site municipal infrastructure.

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City of Ottawa	MECP Form 1 – Record of Watermains Authorized as a Future Alteration.	Construction of watermains throughout the subdivision	The City of Ottawa will review the watermains on behalf of the MECP through the Form 1 – Record of Watermains Authorized as a Future Alteration.
SNCA	Permit under Ontario Regulation 174/06, RVCA's Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation	Grading (proposed development & potential temporary access roads) within the subject lands (i.e. crossing drainage feature(s))	Supporting applications and documentation as required through consultation with the SNCA.
SNCA	Alteration to Watercourses	Findley Creek enhancements per GeoMorphix and JFSA work under separate cover through consultation with the RVCA	Supporting applications and documentation as required through consultation with the SNCA.
City of Ottawa	Commence Work Notification (CWN)	Construction of new sanitary and storm sewers throughout the subdivision	The City of Ottawa will issue a commence work notification for construction of the sanitary and storm sewers once an approval is issued by the MECP.

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2.0 GUIDELINES, PREVIOUS STUDIES, AND REPORTS

2.1 Existing Studies, Guidelines, and Reports

The following documents were referenced 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
    (ISTB-2018-01)

  - Technical Bulletin ISTB-2018-04
    City of Ottawa, June 27, 2018
    (ISTB-2018-04)

  - Technical Bulletin ISTB-2019-02
    City of Ottawa, July 8, 2019
    (ISTB-2019-02)

  - Technical Bulletin IWSTB-2024-04
    City of Ottawa, September 12, 2024
    (IWSTB-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.
    (ISD-2010-2)

  - Technical Bulletin ISDTB-2014-2
    City of Ottawa, May 27, 2014.
    (ISDTB-2014-2)

  - 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
    (ISTB-2021-03)

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- City of Ottawa Official Plan,
  adopted by Council 2022.
  (Official Plan)

- Stormwater Planning and Design Manual
  Ministry of the 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, 2010 Update *(OBC)*

- Combined Environmental Impact Study & Tree Conservation Report, McKinley Environmental Solutions, June 2026 (**EIS**)

- Geotechnical Investigation, Paterson Group, July 9, 2026 (**GI**)

- Hydrogeological Study, Paterson Group, June 26, 2026 (**HS**)

- Transportation Noice Feasibility Study, GradientWind Engineers & Scientists, June 22, 2026 (**TNFS**)

- Preliminary Stormwater Analysis, JFSA, June 26, 2026 (**SWMA**)

- Transportation Impact Assessment, CGH Transportation, July 2026 (**TIA**)

- Hydraulic Capacity and Modeling Analysis, GeoAdvice Engineering Inc., June 18, 2026 (**HCMA**)

- Findlay Creek Conceptual Channel Design, Bank Street Subdivision, GeoMorphix, July 2026 (**CCD**)

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3.0 WATER SUPPLY SERVICING

3.1 Existing Water Supply Services

The subject lands are located within the City of Ottawa South Urban Community (SUC) Pressure Zone, with a hydraulic grade line of approximately 147 m (see ***Appendix B*** for reference). An existing 400 mm diameter feedermain, constructed in 2024, is located within the existing Bank Street right-of-way along the subject site's western frontage.

3.2 Water Supply Servicing Design

Potable water will be supplied to the subject property via a local watermain network that will follow the road network and ultimately connect to off-site watermains based generally on the layout presented in ***Figure 1.1*** of the *Hydraulic Capacity and Modelling Analysis Stittsville South Urban Expansion Area Development* (*GeoAdvice, June 2026*) report, included in ***Appendix B***. Watermain connections and feeder watermain sizing were assessed as part of FSR-level design to address City of Ottawa and MECP requirements.

The ***GeoAdvice Hydraulic Analysis*** assessed the adequacy of sizing for feeder watermain infrastructure to ensure that the proposed development can be adequately serviced. The local watermain network was sized to meet maximum hour and maximum day plus fire flow demands, with consideration to be given to subdivision phasing at detailed design. ***Table 3*** summarizes the Water Supply Design Criteria employed in the preparation of the preliminary water demand estimate.

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Table 3: Water Supply Design Criteria

Design Parameter	Value
Minimum Watermain Size	150 mm diameter
Minimum Depth of Cover	2.4 m from top of watermain to finished grade
During normal operating conditions desired operating pressure is within	350 kPa and 480 kPa
During normal operating conditions pressure must not drop below	270 kPa
During normal operating conditions pressure must not exceed	552 kPa
During fire flow operating pressure must not drop below	140 kPa
Residential - Single Family	3.4 p/unit
Residential – Townhome/ Semi	2.7 p/unit
Residential – High Density	1.8 p/unit
Average Day Demand	
Single Detached	612 L/unit/day
Multifamily	535 L/unit/day
Apartment/Condo	394 L/unit/day
Water Loss per Connection	80 L/unit/day
Parkland	28,000 L/ha/day
Outdoor Water Demand	
Single Detached	700 L/unit/day
Multifamily	350 L/unit/day
Apartment/Condo	0 L/unit/day
Parkland	0 L/unit/day
Maximum Day Demand	
Single Detached	AVDY + OWD L/unit/day
Multifamily	AVDY + OWD L/unit/day
Apartment/Condo	AVDY + OWD L/unit/day
Parkland	1.5 x AVDY
Peak Hour Demand	
Single Detached	2.1 x MXDY L/unit/day
Multifamily	2.1 x MXDY L/unit/day
Apartment/Condo	1.6 x MXDY L/unit/day
Parkland	1.8 x MXDY L/unit/day

[1] Values represent L/cap/day for residential land uses.
[2] Occupancy factors chosen according to housing type. The values shown were extracted from Section 4.2.8 of the Ottawa Design Guidelines - Water Distribution (2010)
[3] Outdoor water demand is applied to single family, semi-detached and townhome units with rear yards.
[4] The 1.5 multiplier represents the additional outdoor water demand associated with employment areas.

As detailed in their report (***Appendix B***), GeoAdvice has concluded that the proposed water network for the development will adequately supply domestic and fire flow demands within

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City of Ottawa guidelines. Their model indicates that system pressures will be within the recommended range, and that the system will maintain acceptable service pressures without the need for pressure reducing volves or booster facilities.

3.2.1 Fire Flow Requirements

The required fire flow for the development was established based on the Fire Underwriters Survey (FUS) methodology, with a conservative minimum fire flow of 250 L/s applied to all residential area. The ***GeoAdvice Hydraulic Analysis*** confirms that the proposed water distribution system can supply fire flow demands while maintaining the minimum residual pressure of 140 kPa as required by the City of Ottawa Water Distribution Guidelines (2010). The required and modeled available fire flows are summarized in ***Table 4***.

Table 4: Required and Available Fire Flow

Item	Value (L/s)	Notes	Reference
Required Fire Flow (All Residential + Park)	250 L/s	Assumed maximum required fire flow based on unit types.	*GeoAdvice Section 2.4*
Minimum Available Fire Flow (Modeled)	≥ 302 L/s	Maintains > 140 kPa residual pressure	*GeoAdvice Table 4.2*

The modelling and reporting provided in ***Appendix B*** indicates that the proposed watermain network can provide domestic flows to the subject area with service pressures within the acceptable range and can provide the required fire flow at all modelled nodes. This fire flow is considered representative of the maximum allowable flow for residential uses under current City guidelines and is suitable for planning purposes for the residential uses proposed.

3.2.2 Boundary Conditions

The boundary conditions used in the hydraulic model were provided by the City of Ottawa and represent the expected hydraulic grade line (HGL) at each proposed connection point to the municipal water distribution system. These conditions were applied for Average Day, Peak Hour, and Maximum Day plus Fire Flow scenarios to ensure that system performance meets the City's pressure criteria under both normal and emergency operating conditions. The boundary conditions applied in the analysis are summarized in ***Table 5***.

Table 5: City of Ottawa Boundary Conditions

Demand Scenario	Connection 1 Bank Street (at proposed entrance) (HGL m)	Connection 2 Bank Street (at Sora Way) (HGL m)	Reference
Average Day (Max Pressure Check)	147.0	147.0	*GeoAdvice Table 2.2*
Peak Hour (Min Pressure Check)	142.0	141.9	*GeoAdvice Table 2.2*
Max Day + Fire (250 L/s)	119.8	119.1	*GeoAdvice Table 2.2*

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3.2.3 Development Population and Water Demands

The water demands calculated using City parameters were applied within the hydraulic model prepared by GeoAdvice (June 2026). ***Table 6*** summarizes the projected Average Day, Maximum Day, and Peak Hour water demands for the proposed residential units.

Table 6: Development Water Demand Calculations & Comparison

Category/Dwelling Type	Units	Population	ADD (L/s)	MDD (L/s)	PHD (L/s)
Single Detached	128	436	1.41	3.53	7.77
Traditional Townhomes	244	659	2.14	5.34	11.75
Stacked Townhome Units	252	454	1.47	3.68	8.09
Residential Subtotal	**624**	**1549**	**5.02**	**12.55**	**27.61**

1. Water demand calculations based on Caivan draft plan presented in *GeoAdvice Hydraulic Analysis* (June 2026).

3.3 Water Supply Conclusion

The proposed development is to be serviced by a proposed network of watermains varying in diameter from 250 mm to 300 mm.

The ***GeoAdvice Hydraulic Analysis*** demonstrates that adequate water supply is available to the subject lands through connections from the local watermain network to existing surrounding water infrastructure.

All proposed water infrastructure is to be designed and constructed in accordance with Ministry of the Environment, Conservation, and Parks (MECP) and City of Ottawa guidelines as part of detailed design associated with the proposed development.

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4.0 WASTEWATER SERVICING

4.1 Existing Wastewater Services

The subject lands are tributary to the Leitrim Pump Station (PS) located on Findlay Creek Drive, approximately 400 m north of the subject lands. The Leitrim PS conveys wastewater to an existing 525 mm diameter sanitary sewer on Bank Street, approximately 1000 m north of the PS, and ultimately outlet to an existing 525 mm diameter gravity sanitary sewer on Conroy Road.

A 200 mm diameter sanitary sewer within the existing Sora Way ROW, west of Bank Street is available to service the western portion of the proposed development. The existing local sanitary sewer network was assessed previously by Arcadis (***Appendix C***) and determined to have capacity to service the proposed development. In addition, an existing 200 mm diameter sanitary sewer within the existing Shuttleworth Drive, at the corner of Shuttleworth Drive and Wooler Place, has adequate residual capacity to accept the generated flows from the proposed site per the Arcadis assessment located in ***Appendix C***.

4.2 Wastewater Design

As outlined in the ***DSEL Scoped MSS***, Option 3 was selected as the preferable servicing approach where sanitary flows from the South and North Lands are to be directed to existing local sanitary sewers within Sora Way and Shuttleworth Drive respectively via the proposed sanitary infrastructure as outlined in ***Drawing No. 4***. The previously completed capacity assessment completed by Arcadis continues to support the proposed development. It is noted that the assessment utilized a marginally lower population, yet larger area, in the assessment and therefore it is assumed that an updated assessment will be completed as part of the detailed design.

The proposed wastewater collection system is illustrated on ***Drawing No. 4***. Preliminary plan and profiles of the sanitary sewer are shown in ***Drawing No.5*** to ***Drawing No.8***. The subject property is required to route a 200 mm diameter pipe throughout the development to adequately service the proposed development.

The estimated population of the proposed subdivision is 1538 persons. As noted, this population is split between two proposed outlets. The estimated population being conveyed to the proposed Shuttleworth Drive connection is 882 persons with a total peak flow of 12.81 L/s. The estimated population being conveyed to the proposed Sora Way connection is 801 persons with a total peak flow of 10 L/s. The functional sanitary design sheet is provided in ***Appendix C*** for reference. It is noted that the sanitary design sheet is conservative in its estimates for population to ensure preliminary sewer sizing is conservative as the total population noted for each outlet has a sum of 1683 person, while the concept plan estimates a total population of 1538 persons. At detailed design a more refined approach to the sanitary design sheets will be used.

Table 7 below summarizes the **Design Standards** to be employed in the design of the proposed wastewater sewer system.

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Table 7: Wastewater Design Criteria

Design Parameter	Value
Current Design Guidelines	
Residential - Single Family	3.4 p/unit
Residential – Townhome/ Semi	2.7 p/unit
Residential – Apartment	1.8 p/unit
Average Daily Demand	280 L/d/per
Peaking Factor	Harmon's Peaking Factor. Max 4.0, Min 2.0
Infiltration and Inflow Allowance	0.33 L/s/ha for all areas
Park Flows	9300 L/ha/d (75 p/acre per Sewer Guidelines Appendix 4-A)
Park Peaking Factor	1.0
Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} A R^{2/3} S^{1/2}$
Minimum Sewer Size	200mm diameter
Minimum Manning's 'n'	0.013
Minimum Depth of Cover	2.5m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6m/s
Maximum Full Flowing Velocity	3.0m/s
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012, and recent residential subdivisions in City of Ottawa.	
Operational Parameters on Monitoring Data *(Example Only, Values to be Reviewed on Case-by-Case Basis with City of Ottawa)*	
Average Daily Demand	280 L/d/per
Harmon – Correction Factor	0.8
Commercial / Institutional Peak Factor	1 (non-coincident peak)
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012, and recent residential subdivisions in City of Ottawa.	

Per the City of Ottawa CLI-ECA requirements, the presence of a seasonally high water table in areas of the proposed development triggers the following requirements:

- 2.9.1. Sanitary Sewer systems which are installed lower than 0.6m below the Seasonally High Groundwater Table (SHGWT) shall be designed to minimize infiltration.
- 2.9.2. Where the SHGWT level is determined and supporting record is available, the Sewer pipes, pipe joints, and connections shall be designed to withstand a pressure of at least 1.25 times the pressure exerted by the groundwater above the sewer without leakage.
- 2.9.3. Where the SHGWT is unknown and/or the supporting record is not available, the Sewer pipes, pipe joints, and connections shall be designed to withstand a pressure based on the equivalent of at least 1.25 times the pressure exerted by the groundwater being at the ground surface elevation above the Sewer without leakage.
- 2.9.4. The sanitary maintenance holes shall be externally wrapped with waterproof membrane placed externally around all precast joints, including joints below the maintenance hole frame and cover, with a minimum 300mm wide strip.

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- 2.9.5 Buoyancy of Sewers and maintenance holes shall be considered in the design, and where required, adequate provision shall be made to prevent flotation.

This will be adequately assessed on a phase-by-phase basis through detailed design.

4.3 Sanitary HGL Analysis

PCSWMM was used to analyze the sanitary HGL elevations within the proposed development lands. Per the information in ***Appendix C*** the minimum freeboard was found to be 0.98 m and 0.98 m for the Rare and Annual scenarios respectively. It is noted that the location of this HGL is at proposed MH 201A located just north of Blais Road. Due to a relatively shallow sanitary sewer network at this location due to grading constraints, it is noted that the adjacent USF will be raised to accommodate this HGL. All other MH nodes have a minimum freeboard grater than 2.2 m. Assuming the typical USF elevation is approximately 1.8 m below the proposed top of manhole elevations, the minimum freeboard is sufficient for both the Rare and Annual flow conditions. The downstream HGL boundary conditions were provided from the previously completed downstream assessment completed by Arcadis, to be confirmed through detailed design.

Therefore, the proposed existing sanitary sewer infrastructure is sufficiently sized to convey sanitary flows away from the proposed development under various extreme conditions.

4.4 Wastewater Servicing Conclusions

The design of the sanitary sewer network is in accordance with the City of Ottawa Sewer Design Guidelines and the proposed design is in accordance with the ***DSEL Scoped MSS***.

Drawing No. 4 depicts the proposed sanitary network design.

The installation of a new 200 mm gravity sanitary sewer along the northeast property line, through the existing Findley Mill SWM facility block ultimately connecting to the existing 200 mm diameter sanitary sewer within Shuttleworth Drive will provide the most cost-effective solution to service the north lands. Connecting to the recently constructed extension of the existing local sanitary sewer system on Sora Way, within Bank Street, to the property line will provide the most cost-effective solution to service the south lands. A conceptual plan view of the proposed connections to the existing 200 mm diameter gravity sewers can be found on ***Drawing No. 4*** and a profile of the alignment on ***Drawing No. 6***.

All proposed sanitary sewer infrastructure is to be designed and constructed in accordance with the City of Ottawa Sewer Design Guidelines and MECP guidelines as part of detailed design.

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5.0 STORMWATER MANAGEMENT

5.1 Existing Stormwater Services

Per the Storm Servicing Existing Conditions Figure within ***Appendix D,*** the existing site topography generally drains eastward and southward, with Findley Creek bisecting the development area. The existing Findley Creek SWM facility is adjacent to the eastern and southern property lines not adjacent to Findley Creek. The residential development areas to the north and west of the subject development are (S-4 lands) serviced via the existing Findlay Creek municipal SWM Facility. The existing SWM facility outlets to an existing tributary located east of the proposed development lands, south of the existing municipal SWM facility. The existing SWM facility provides quality, quantity, and erosion SWM controls for the existing adjacent residential subdivisions and associated roads and commercial/retail blocks.

5.2 Post-Development Stormwater Management Targets

As outlined in the ***DSEL Scoped MSS***, the subject lands are required to adhere to the performance criteria outlined in Appendix A of the City of Ottawa Environmental Compliance Approval (ECA) as well as in the most recent amendment to the existing SWM Facility MECP ECA (April 3, 2018, ***Appendix D***):

- Water Balance: The Water Balance criteria for the site has been set through a combination of the Provincial Guidelines, the City of Ottawa OP and IMP, ***Water Budget*** and the ***EIS*** reports.
- Water Quality: Per Appendix A of the CLI–ECA, and per the most recent amendment to the original MECP ECA for the existing SWM Facility, Enhanced Level (80%) for suspended solids removal.
- Erosion Control: Per the most recent amendment to the original MECP ECA for the existing SWM Facility, erosion control to be provided by the existing facility.
- Water Quantity and Flood Control: Per the most recent amendment to the original MECP ECA for the existing SWM Facility, control post-development runoff to pre-development levels for all rain events up to and including the 100-year storm.

5.3 Proposed Stormwater Management Strategy

The stormwater management (SWM) design for the site will consist of minor and major systems. Frequent storm events will be collected by a network of storm sewers. Runoff in excess of the capacity of the minor system will be conveyed overland, away from properties to proposed 100 year capture locations, the proposed stormwater management facility expansion and to the existing Findley Creek. The proposed stormwater management facility expansion will enhance the existing erosion, quantity and quality controls in the existing Findley Creek SWM facility. As noted in the ***DSEL Scoped MSS***, no downstream improvements are anticipated to the existing Findley Creek SWM facility outlet to support the proposed development.

The proposed storm design layout is shown on ***Drawing No. 3***.

A stormwater control assessment was completed as part of the ***DSEL Scoped MSS***. The stormwater control assessment evaluated the following hierarchical order, with each step exhausted before proceeding to the next:1) retention, 2) filtration and 3) conventional SWM

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measures. In addition, the ***DSEL Scoped MSS*** identifies site constraints that are applicable to the proposed development include:

- A) Shallow Bedrock;
- B) High Groundwater;
- J) Surface water dominated or dependent features including but not limited to marshes and/or riparian forest wetlands which derive all if not a majority of their water from surface water, including streams, runoff, and overbank flooding. Surface water dominated or dependent features which are identified through approved site specific hydrologic or hydrogeologic studies, and/or Environmental Impact Statements (EIS) may be considered for a reduced volume control target; and,
- N) Economic considerations set by infrastructure feasibility and prioritization studies undertaken at either the local/site or municipal/system level.

5.3.1 Retention

It was determined that due to the presence of shallow bedrock, a shallow water table elevation, high RQD values identified during coring activities, and soils within the site having dual classification containing clay and silt there are no opportunities for infiltration-based LID measures.

5.3.2 Filtration

Stormwater filtration can be achieved via LIDs that are placed within the public realm and equipped with a filter media and an underdrain. Feasible filtration-based LIDs include stormwater planters, bioretention (rain gardens, bioswales, enhanced swales), and filter-based manufactured treatment devices (catchbasin or maintenance hole MTDs) located within the municipal ROW. Permeable pavements could be considered within the park blocks but are not appropriate within the ROWs and therefore are not applicable at this stage.

Due to the limited opportunities for filtration-based LIDs, it is not expected that the inclusion of filtration-based LIDs will make a large enough impact to reduce the proposed SWM facility blocks. Therefore, it is assumed at this stage that no filtration-based LIDs are proposed with respect to the design of the SWM facilities. Despite this, opportunities for incorporating filter based LIDs at detailed design will be explored as discussed further in ***Section 5.4***.

5.3.3 Conventional Stormwater Management

Lastly, the remaining volume that can't be controlled through retention and filtration are to be treated via conventional stormwater management. An expansion of the existing Findley Creek SWM facility is proposed to provide additional extended detention volume to the existing SWM facility that was previously sized to ensure adequate extended detention. The stormwater management facility is discussed further in ***Section 5.6***.

5.4 Low Impact Development (LID) Opportunities

In accordance with City of Ottawa guidelines and the MECP's requirements for sustainable stormwater management, the proposed development will incorporate Low Impact Development (LID) measures where practical and feasible within the right-of-way (ROW). The

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primary objective of these measures is to provide enhanced water quality treatment and reduce minor system loading through distributed source control.

Two filtration-based LID types that were applicable to be applied within the proposed municipal ROWs were reviewed for potential implementation within the subdivision:

- Green Gutter (Continuous Narrow Bioswale at Curb)
- Bioretention Curb Extension (Bump-Out Cells at Nodes)

Details for both LID types have are included in ***Appendix D*** and are discussed in more detail in the following section.

Other technologies such as tree planters/soil cells and permeable pavements have been reviewed in the context of the proposed development and have been deemed not applicable. Tree planters/soil cells are primarily used in areas of dense urban construction where the majority of the lands are hardscaped. As the proposed development has adequate boulevard space for traditional tree planting this option does not justify the additional costs. With respect to permeable pavement, it would only be appropriate within pedestrian sidewalks, and result in high long term operation and maintenance costs for the City and was not explored further.

5.4.1 Green Gutter (Continuous Narrow Bioswale at Curb)

The term green gutter refers to a narrow, linear bioretention facility located adjacent to the curb, designed to convey and treat roadway runoff prior to discharge to the storm sewer system. It functions as a vegetated swale with engineered soil media and a perforated underdrain, facilitating sedimentation and filtration.

This feature is best suited to long, uninterrupted frontages such as:

- Collector road boulevards where driveway and curb cuts are limited.
- Park and stormwater management (SWM) pond frontages where boulevard width is available and conflicts with utilities are minimized.

Typical implementation would involve linear segments between catchbasins or as inlet lead-ins to larger bioretention cells near intersections.

Typical Section and Design Criteria

- Width: Variable up to 1.0 m maximum.
- Curb-cut inlets: Typically spaced at ~15 m intervals.
- Underdrain: 200 mm perforated PVC pipe, provided where native infiltration <15 mm/h or where the system is lined.
- Erosion protection: 300 mm rip-rap aprons at inlet/outlet transitions.
- Longitudinal grade: Matches roadway/sidewalk profile.
- Clearances: Maintain outside the 2.1 m pedestrian clearway and clear of buried utilities.

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Key Conflicts to Review:

- Driveway crossings and private service laterals.
- Accessibility requirements.
- Joint Utility Trench (JUT) under sidewalks.
- Gas main and hydrant lateral clearances (0.6 m and 1.2 m, respectively).
- Streetlight foundations, transit pads, and tree root zones near inlets.

Given its narrow footprint and flexible geometry, the green gutter represents the most easily integrated LID within constrained ROW cross sections. Park and pond frontages, as well as the long collector segments with limited access interruptions, present the most realistic corridors for implementation.

5.4.2 Bioretention Curb Extension (Bump-Out Cells at Nodes)

Bioretention curb extensions, or bump-out cells, are localized vegetated depressions integrated into curb extensions at intersections or mid-block locations. They capture roadway runoff through curb-cut inlets and provide filtration through engineered bioretention media. Each cell discharges to the storm sewer via an underdrain and overflow structure.

These systems are ideally located at:

- Intersection corners and mid-block traffic-calming bump-outs.
- Collector and park edges, where space and visibility allow integration without impacting driveways or sightlines.

Typical Section and Design Criteria

- Width: Varies (full bump-out width typically 1.85–3.5 m).
- Bioretention media: 600 mm typical depth (greater if trees incorporated) over drainage layer with 200 mm PVC outlet.
- Overflow: Beehive inlet tied to storm sewer.
- Underdrain: 200 mm perforated PVC as required.
- Pedestrian clearways: Maintain accessible landings (150 mm min. step-up), detectable edge treatments, and full barrier curbs at the rear.

Key Conflicts to Review:

- Catchbasin relocations and curb radii adjustments.
- Bus stop pads, accessible ramps, and crosswalks.
- Driveway sight triangles and tree spacing.

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- Accessibility requirements.
- Electrical and communication utilities within bump-out footprint.

Bump-out bioretention cells are best suited to intersection nodes and collector street corners where boulevard space and drainage patterns converge. They can also serve dual purposes for traffic calming and aesthetic enhancement. Their implementation should be limited to locations with sufficient visibility, minimal underground utility conflicts, and available offset from travel lanes.

5.4.3 Summary of Feasible LID Locations

Table 8: LID Location Considerations and Feasibility

LID Type	Preferred Location	Typical Width	Key Feasibility Considerations	Most Realistic Corridors
Green Gutter	Continuous curb sections with minimal driveways	≤ 1.0 m	Avoid JUT, hydrants, gas mains, and tree roots; maintain 2.1 m pedestrian clearway	Park/SWM pond frontages, collector boulevards
Bioretention Curb Extension	Intersection corners and bump-outs	1.85–3.5 m	Maintain turning paths, sightlines, and pedestrian access; avoid bus pads	Intersections and park edge bump-outs

The reviewed LID options provide viable opportunities to integrate stormwater quality treatment into the ROW. Green gutters offer the most straightforward application within linear corridors, while bioretention bump-outs present targeted treatment and aesthetic enhancement at intersection nodes. Both measures align with the City's LID guidance and can be advanced into detailed design where site grading, drainage patterns, and utility layouts confirm available space and feasibility.

5.5 Best Management Practices

As indicated in **Section 5.3** there are no opportunities for municipally owned and operated infiltration-based LIDs. Therefore, there is limited opportunity for groundwater recharge. To provide a reduction in the post-development infiltration deficit as outlined in the Paterson ***Hydrogeological Study*** a suite of Best Management Practices (BMP) is proposed. The BMPs for assumed to be incorporated into the proposed development as indicated in the ***Hydrogeological Study*** water balance assessment:

- Roof leaders to grassed areas;
- Reduced lot grading;
- and Grassed swales.

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As identified in the ***Hydrogeological Study*** report, the rooftop drainage from detached homes and the rear portions of townhome roofs are assumed to be directed to adjacent lawn areas in conjunction with reduced lot grading to promote infiltration. At detailed design, additional means to promote retention of stormwater may include:

- Soil amendments;
- And vegetated filter strips.

5.6 Proposed Minor System

Under post-development conditions, approximately 13 ha of the development will drain to the existing Findley Creek SWM facility, though the existing western pond inlet or via the proposed forebay expansion. The remaining approximately 4 ha of the development will drain directly to Findley Creek directly via overland flow. These drainage areas have been based on the proposed draft plan development layout and their respective outlet locations. All minor system drainage directed to the existing SWM facility will be treated for water quality, erosion and quantity control for the development. The existing SWM facility and associated proposed SWM facility expansion within the development have been sized to ensure that the post-development runoff from the site will be attenuated in the ponds to a rate that matches pre-development conditions.

The subject property will be serviced by an internal gravity storm sewer system that is to generally follow the local road network and servicing easements as required. The functional storm design sheet is provided in ***Appendix D*** for reference. ***Drawing No. 3*** illustrates the contemplated storm sewer collection system. ***Drawing No. 6*** illustrates the preliminary plan and profiles. ***Table 9*** outlines the storm sewer design criteria used in the storm sewer functional design.

Table 9: Storm Sewer Design Criteria

Design Parameter	Value
Minor System Design Return Period	1:2 year (PIEDTB-2016-01) for local roads, without ponding 1:5 year (PIEDTB-2016-01) for collector roads, without ponding 1:10 year (PIEDTB-2016-01) for arterial road, without ponding
Major System Design Return Period	1:100 year
Intensity Duration Frequency Curve (IDF) 2-year storm event: A=732.951 | B=6.199 | C=0.810 5-year storm event: A = 998.071 | B = 6.053 | C = 0.814	$i = \frac{A}{(t_c + B)^C}$
Minimum Time of Concentration	10 minutes
Rational Method	$Q = CiA$
Storm sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} A R^{2/3} S^{1/2}$
Runoff coefficient for paved and roof areas	0.9
Runoff coefficient for landscaped areas	0.2

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Minimum Sewer Size	250 mm diameter
Minimum Manning's 'n' for pipe flow	0.013
Minimum Depth of Cover	2.0 m from crown of sewer to grade
Minimum Full Flowing Velocity	0.8 m/s
Maximum Full Flowing Velocity	6.0 m/s
Clearance from 100-Year Hydraulic Grade Line to Underside of Footing	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)
Stormwater Management Model	DDSWMM (release 2.1), SWMHYMO (v. 5.02) XPSWMM (v. 10), PCSWMM (v. 7.7)
Model Parameters	Of = 76.2 mm/hr, Fc = 13.2 mm/hr, DCAY = 4.14/hr, D.Stor.Imp. = 1.57 mm, D.Stor.Per. = 4.67 mm
Imperviousness	Based on runoff coefficient (C) where Percent Imperviousness = (C - 0.2) / 0.7 x 100%.
Design Storms	Chicago 3-hour Design Storms and 24-hour SCS Type II Design Storms. Maximum intensity averaged over 10 minutes.
Climate Change Street Test	20% increase in the 100-year, 3-hour Chicago storm
Extracted from City of Ottawa Sewer Design Guidelines, October 2012, and ISSU, based on recent residential subdivisions in City of Ottawa.	

The following key City standards will be required for stormwater management within the subject lands and conveyance to the proposed stormwater management pond, among other requirements:

- *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;*

- *When catchbasins 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; and,*

- *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.*

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The following additional grading criteria and guidelines will be applied to the detailed grading designs as per City of Ottawa 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 0.15 m deep with 3:1 side slopes unless otherwise indicated; and,*
- *Perforated pipe will be required for drainage swales if they are less than 1.5% in slope (preferred to promote infiltration) and will be used to interconnect rear yard catchbasins where possible.*

5.7 Stormwater Management Facility Forebay Expansion

A preliminary hydrologic evaluation of the proposed SWM facility expansion for the proposed development to evaluate pre and post-development hydrology was completed as part of the ***DSEL Scoped MSS***. The ***Preliminary Stormwater Analysis*** prepared by JFSA in support of the ***DSEL Scoped MSS (Appendix D)*** continues to accommodate the proposed Draft Plan as the ***Preliminary Stormwater Analysis*** was completed based on the latest plan included in ***Appendix A***. A summary of the evaluation and associated pond design is described below, and the ***Preliminary Stormwater Analysis*** is provided in ***Appendix D*** for reference.

The existing Findley Creek SWM facility was assessed as part of the ***DSEL Scoped MSS*** and was found to have adequate controls to incorporate the proposed development with additional active storage volume provided. As the proposed drainage area and imperviousness are consistent with the ***DSEL Scoped MSS,*** the existing Findley Creek SWM facility adequately services the proposed development.

The proposed SWM facility expansion is contemplated as a wet pond forebay per MECP guidelines. As noted in the ***DSEL Scoped MSS*** the existing Findley Creek SWM facility has adequate permanent pool volume to provide the required quality control requirements for the proposed development. To enhance the existing quality control provided by the existing SWM facility, the proposed SWM facility forebay expansion is sized per the SWMPDM guidance for wet pond forebays. The proposed SWM facility forebay expansion has a total drainage area of 10.12 ha. As evaluated in the ***Preliminary Stormwater Analysis*** the forebay sizing calculations were completed based on the drainage area to the proposed SWM facility expansion and confirm that the proposed design meets all applicable MECP criteria. The proposed forebay expansion SWM facility is illustrated in ***Figure 3***.

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Per Table 2 in the ***Preliminary Stormwater Analysis***, the existing Findley Creek SWM facility existing 100 year water level is noted to be consistent with the JFSA localized model which incorporates the proposed SWM facility forebay expansion at a water level of 88.60 m. In addition, the proposed added active storage volume results in a slight decrease in anticipated peak outflows during the 100-year design events. Therefore, the proposed SWM facility forebay expansion adequately assists the existing Findley Creek SWM facility to attenuate post-development flows to pre-development conditions up to and including the 100-year event.

5.8 Preliminary Storm HGL Update

A hydraulic grade line (HGL) analysis was completed as part of the ***Preliminary Stormwater Analysis*** based on the latest draft plan to ensure there will be sufficient freeboard between the HGL and the proposed manhole elevations within the site, as the underside of footing (USF) information is not available at this time. The analysis incorporates the latest minor system layout and assumes the highest estimated 100-year water levels for the existing Findley Creek SWM facility of 88.60.

As shown in ***Appendix D*** the average freeboard was found to be 2.90 m. A localized minimum freeboard of 1.66 m was observed at MH-208, however, this is expected as the structure only has a total depth of only 2.25 m due to grading constraints. There are three additional MH locations with freeboard less than 1.80 m, but these are situated immediately upstream of the SWM facility and do not have proposed house connections. Therefore, the HGL analysis demonstrates that gravity service connections to the storm sewer are generally feasible throughout the site.

5.9 Proposed Major System

The majority of the proposed major system flows for subdivision are to be conveyed to the existing Findley Creek SWM facility. The ***South Lands*** convey major system drainage to the existing SWM facility via the existing box storm sewer inlet to the existing western aftbay via the existing flow split manhole via 100 year capture at the low point of the proposed local ROW adjacent to the existing SWM facility. The ***North Lands*** convey major system drainage via overland flow to the proposed SWM facility forebay expansion via the proposed ROWs and an overland flow route into the proposed SWM facility. It is noted that at this stage, all major system drainage, except for parkland and rear yard areas adjacent to Findley Creek is designed to be directed to a the existing SWM facility. It is noted that both proposed ROW connections may result in a small amount of uncontrolled major system drainage to be directed to Bank Street and Blais Road. These areas will be accounted for at detailed design once these entrances and associated storm sewer design have been completed. As shown in Tables 2 & 3 within the ***Preliminary Stormwater Analysis*****,** the proposed outflow from the existing SWM facility and the proposed peak flows within Findley Creek downstream of the existing SWM facility outlet are reduced when compared to existing.

5.10 Condo Block SWM Controls

The proposed Condo Block is approximately 2.05 ha in size and located at the northeast corner of Blais Road and Bank Street. As the condo block is tributary to the existing Findley Creek SWM facility it is proposed to have on-site stormwater management controls to ensure minimize the impact to the downstream municipal infrastructure and ultimately the existing SWM facility.

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As outlined in the ***Preliminary Stormwater Analysis*** the existing SWM facility peak discharge rates were unitized to develop an allowable release rate for the proposed Condo Block. As noted in Table 1 in the ***Preliminary Stormwater Analysis*** the unitary target flow for the Condo Block was found to be 55 L/s/ha for the 100-year storm event. This equates to a total allowable release rate of 112.8 L/s. Based on the SWMHYMO modelling completed within the ***Preliminary Stormwater Analysis*** a preliminary storage requirement of 1,210 m^3 is anticipated to be required to meet this release rate. This storage is anticipated to be provided via a combination of surface ponding and underground storage methods. The design of the required storage and associated controls will be completed at the time of the site plan application process.

5.11 Grading and Drainage Design

The following additional grading criteria and guidelines are applied to detailed design, per City of Ottawa Guidelines:

- Slope for soft landscaped areas will be a minimum of 2.0% for all surfaces
- Slopes for all hard-surfaced walkways shall have a minimum of 2.0% and a maximum of 5.0%
- 3:1 maximum side slope for all swales and slopes
- 200 mm minimum swale depth, with a 1.5% minimum longitudinal gradient
- 300 mm minimum depth of rear yard swales and ditch outlets

Drawing No. 1 illustrates a conceptual grading plan for the subdivision. It is noted that elevations at the limit of the Natural Heritage System (NHS) associated with Findley Creek have been assumed to match existing. Through the Findley Creek floodplain and geomorphological enhancements proposed (under separate cover), these elevations may be raised in an attempt to minimize or eliminate the need for retaining walls. In a further attempt to reduce the need for retaining walls at the property limint, minor grading within the existing Findley Creek SWM facility lands is proposed between the existing access road and the proposed rear lot lines.

5.12 Stormwater Servicing Conclusions

Consistent with the ***DSEL Scoped MSS***, the proposed stormwater management strategy will utilize the existing downstream Findley Creek SWM facility with a proposed SWM facility forebay expansion that enhances the function of the existing Findley Creek SWM faciltiy.

It is recommended that the contemplated development forebay expansion assist the existing SWM facility to provide erosion, quality and quantity control. Further, the HGL analysis was updated, and it was confirmed that there will be sufficient freeboard between the HGL and proposed manhole elevations within the site.

The contemplated stormwater management plan meets the design objectives provided by the City and conservation authority.

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6.0 CONCLUSION AND RECOMMENDATIONS

Caivan has proposed development within the Bank Street (S-5) lands within the community of Leitrim in the City of Ottawa east of Bank Street and north of Blais Road. The proposed plan consists of park blocks, a stormwater pond block, and residential blocks with a mix of single-family homes, townhomes, and stacked condo units.

Potable water is available to support the development to the west. There are two available water supply connection locations to support the contemplated development.

Wastewater contribution from the subject lands were assessed in the downstream gravity sewers and two connections to the existing system, on Sora Way and Shuttleworth Drive have been shown to have adequate capacity to service the proposed development.

The contemplated stormwater management system proposes a forebay expansion of the existing Findley Creek SWM facility which when combined with the existing SWM facility provides adequate quantity, quality and erosion controls. Stormwater runoff within the development is proposed to be controlled to pre-development levels and adhere to the treatment requirements outlined in the City of Ottawa CLI-ECA.

The contemplated development is supported by the existing water, wastewater, and stormwater infrastructure.

Prepared by,
David Schaeffer Engineering Ltd.

Per: John Priamo, P.Eng.

Marc Pichette, P.Eng.

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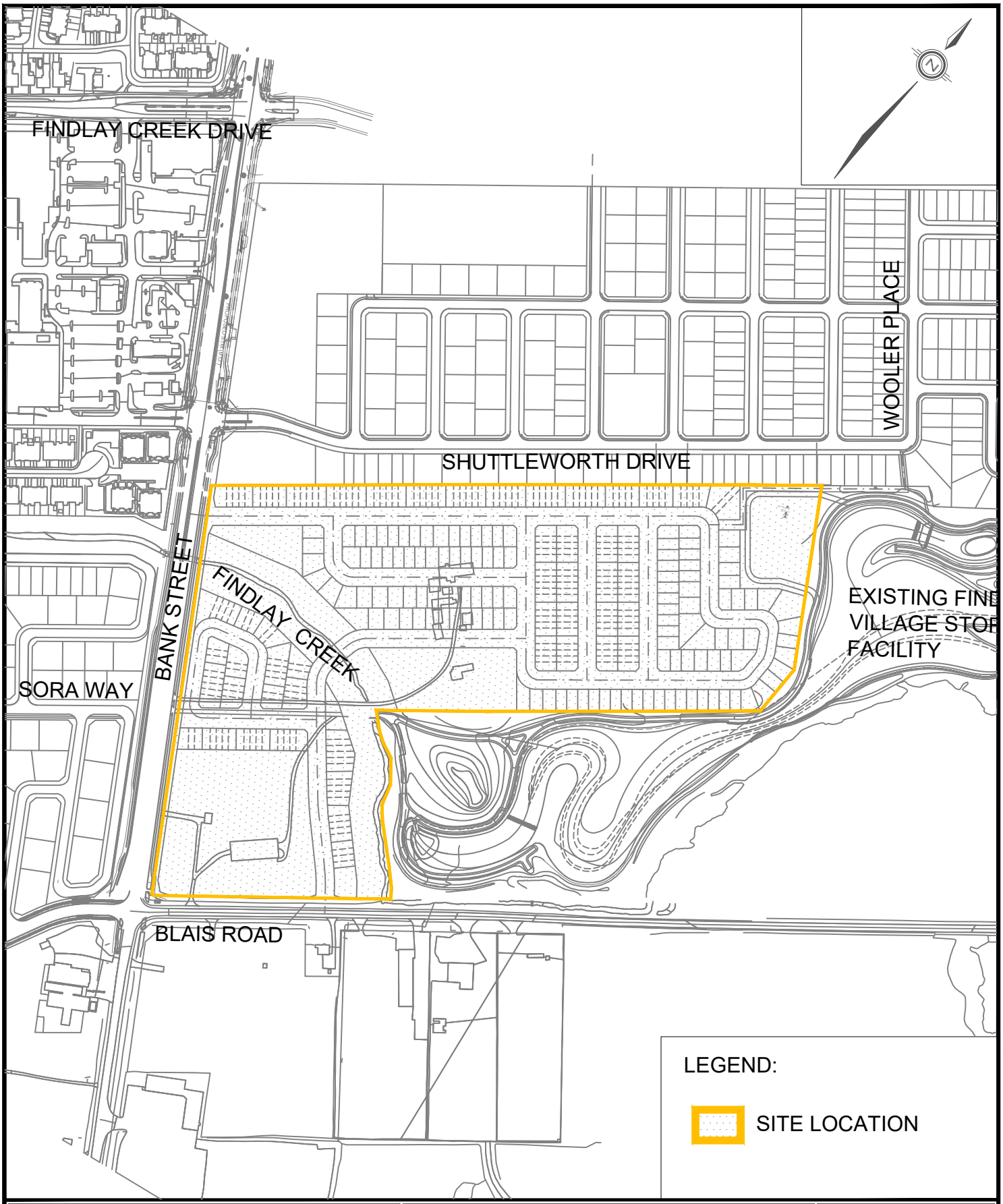
Figures



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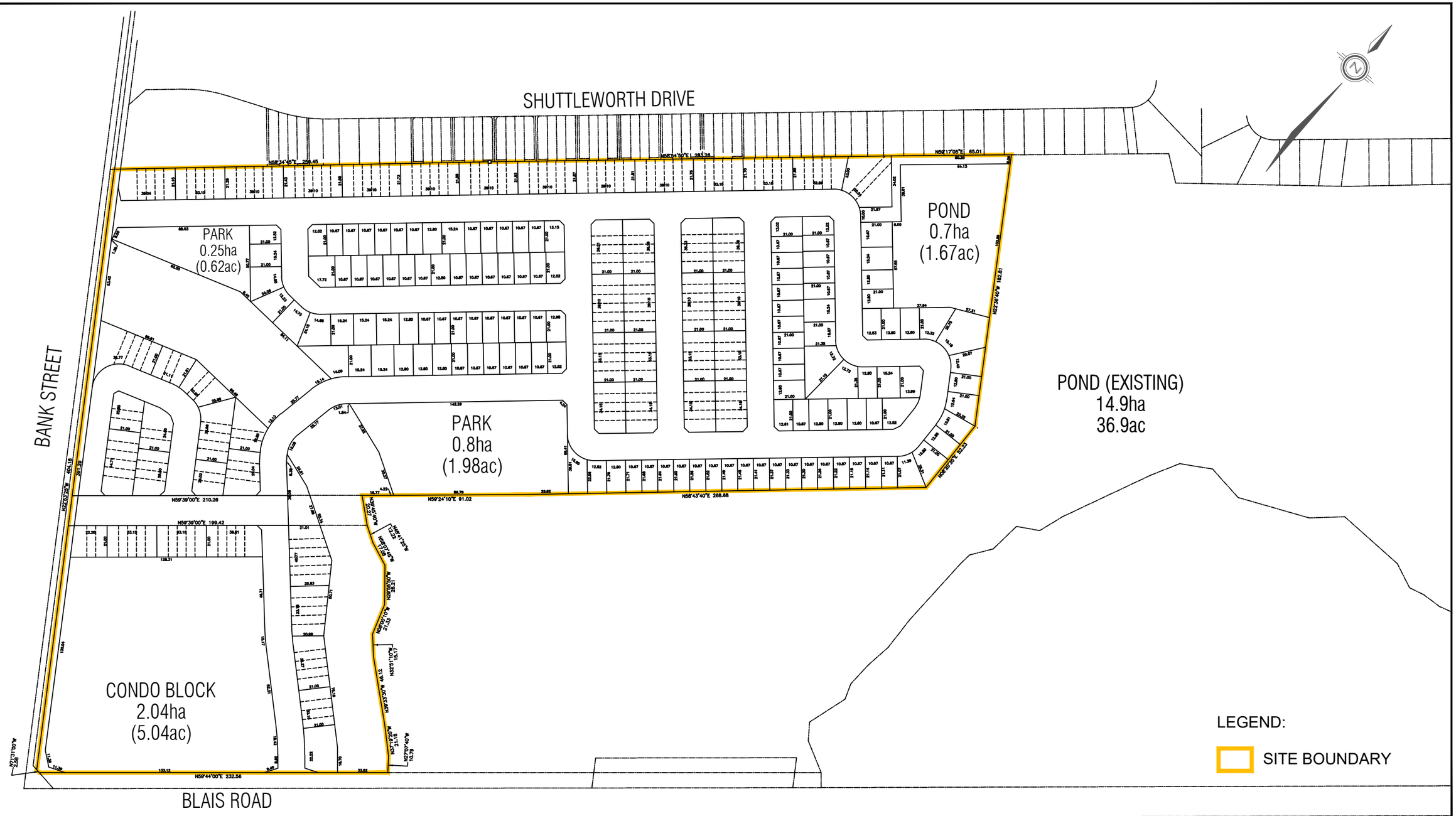
CAIVAN LEITRIM

KEY PLAN

CITY OF OTTAWA

DATE:	JULY 2026
SCALE:	1:5000
PROJECT No.:	24-1414
FIGURE:	1



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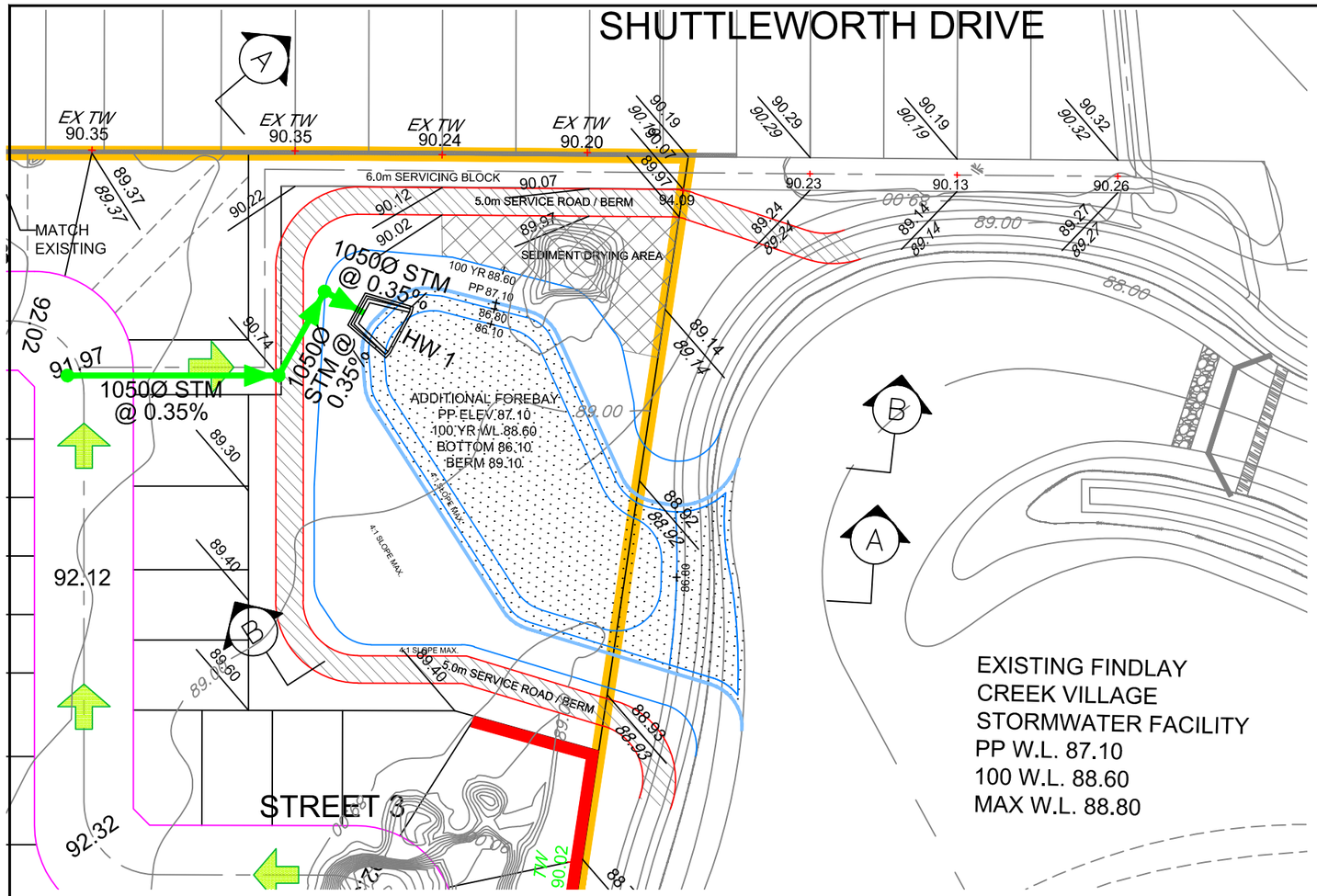
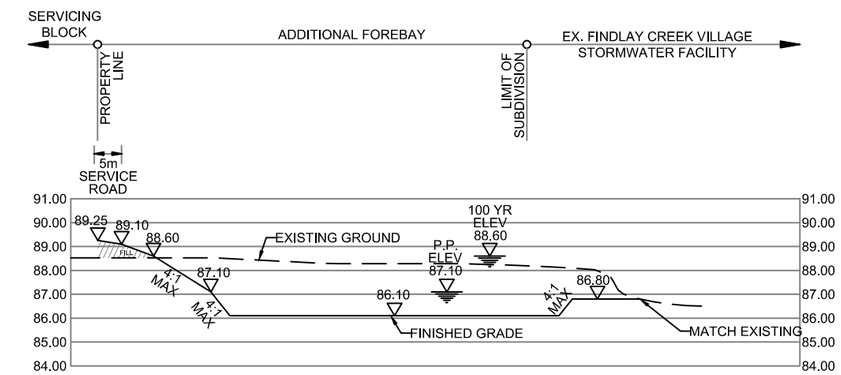
CAIVAN LEITRIM
SUBDIVISION PLAN
CITY OF OTTAWA

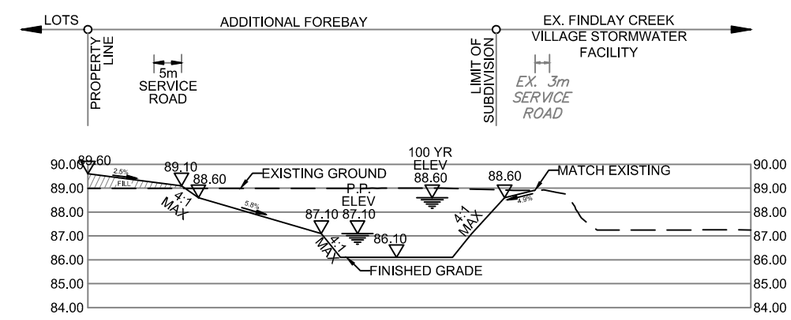
PROJECT No.:	24-1414
SCALE:	1:2500
DATE:	JULY 2026
FIGURE:	2



NOTE:
FOR POND INLET PROFILE SEE DWG. 6



ADDITIONAL FOREBAY
SECTION A-A
SCALE HOR. 1:1250
SCALE VER. 1:250



ADDITIONAL FOREBAY
SECTION B-B
SCALE HOR. 1:1250
SCALE VER. 1:250

LEGEND

- SITE BOUNDARY
- ACCESS ROAD
- PERMANENT POOL
- STORM OVERLAND FLOW ARROW
- 92.12 — PROPOSED CENTERLINE ELEVATION
- 88.92 / *88.92* — PROPOSED ELEVATION / EXISTING ELEVATION
- *244.50* — EXISTING CONTOUR ELEVATION

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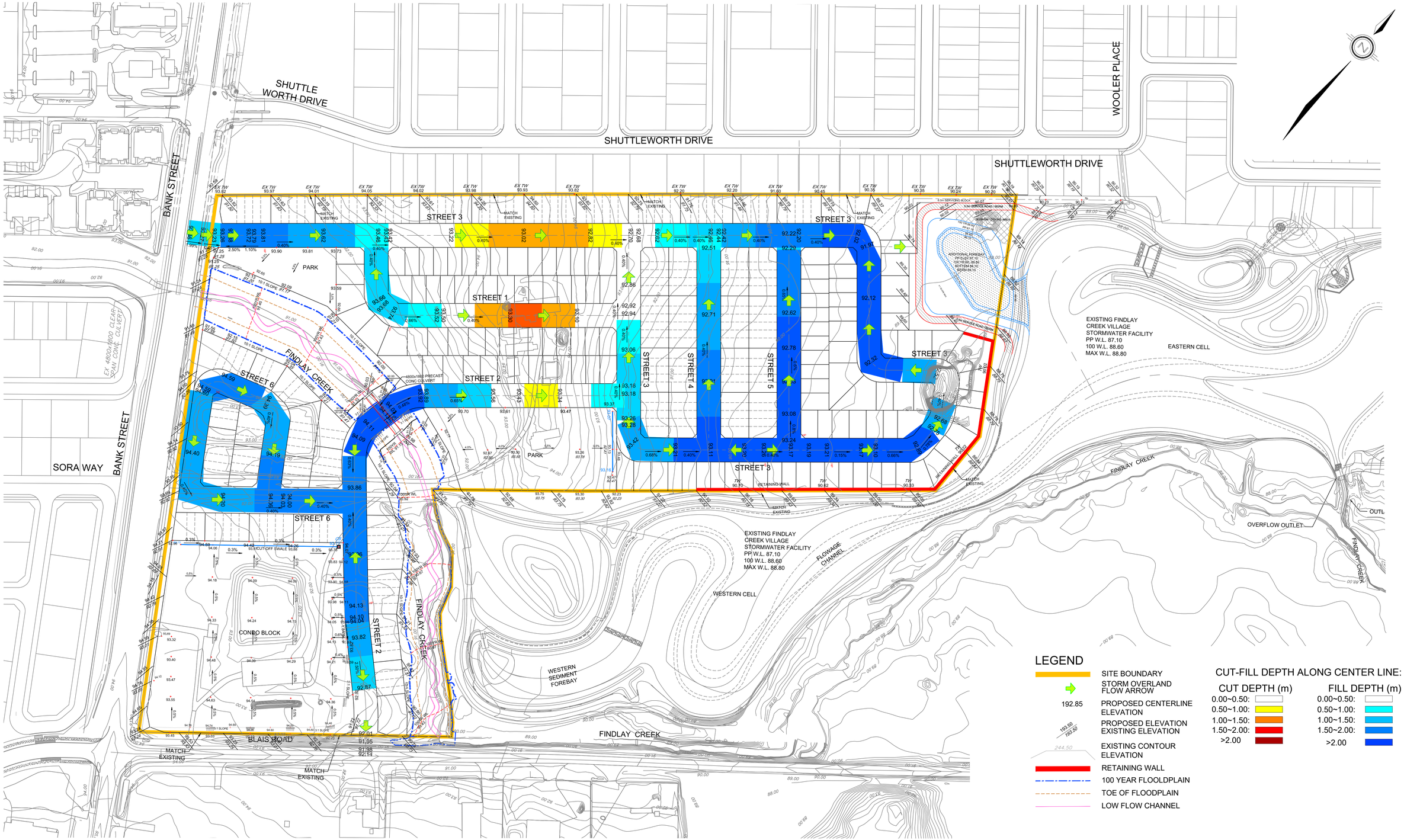
CAIVAN LEITRIM
SWM POND
CITY OF OTTAWA

PROJECT No.:	24-1414
SCALE:	1:1000
DATE:	JULY 2026
FIGURE:	3

Drawings



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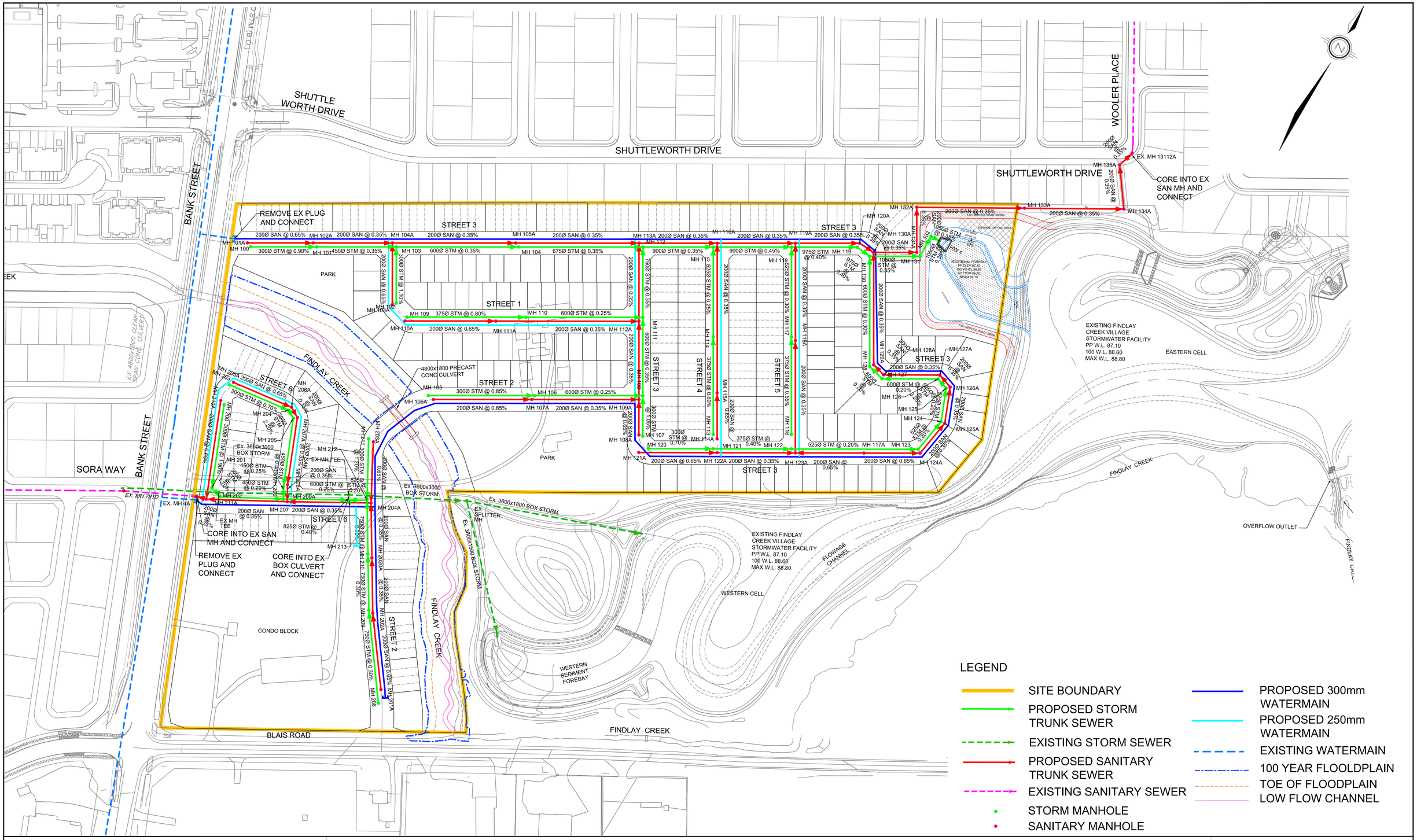
CAIVAN LEITRIM
CONCEPTUAL GRADING PLAN
CITY OF OTTAWA

PROJECT No. :	24-1414
SCALE:	1:1250
DATE:	JULY 2026
DRAWING No.	1



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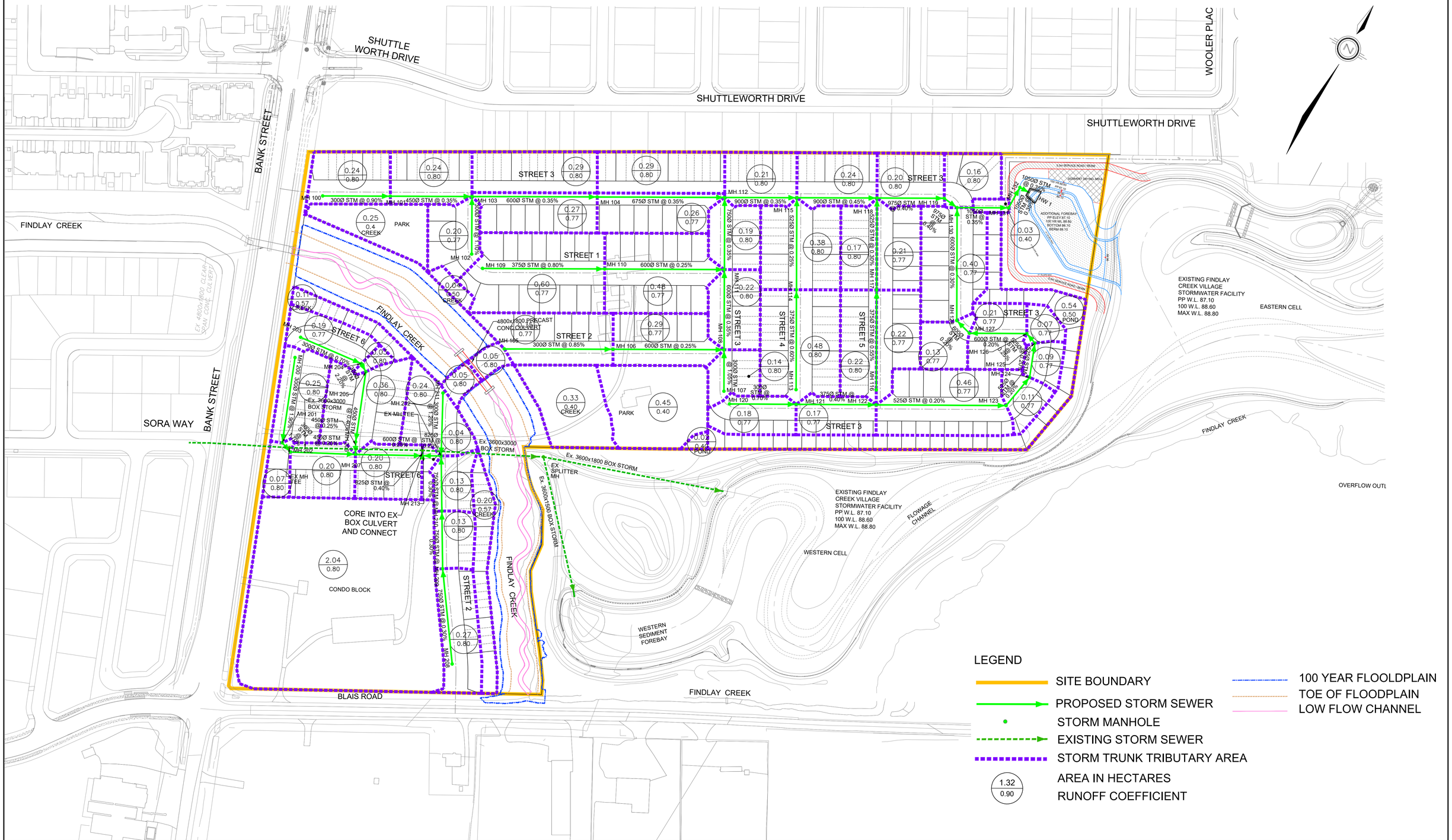
CAIVAN LEITRIM
CONCEPTUAL SERVICING PLAN
CITY OF OTTAWA

PROJECT No. :	24-1414
SCALE:	1:1250
DATE:	JULY 2026
DRAWING No.	2



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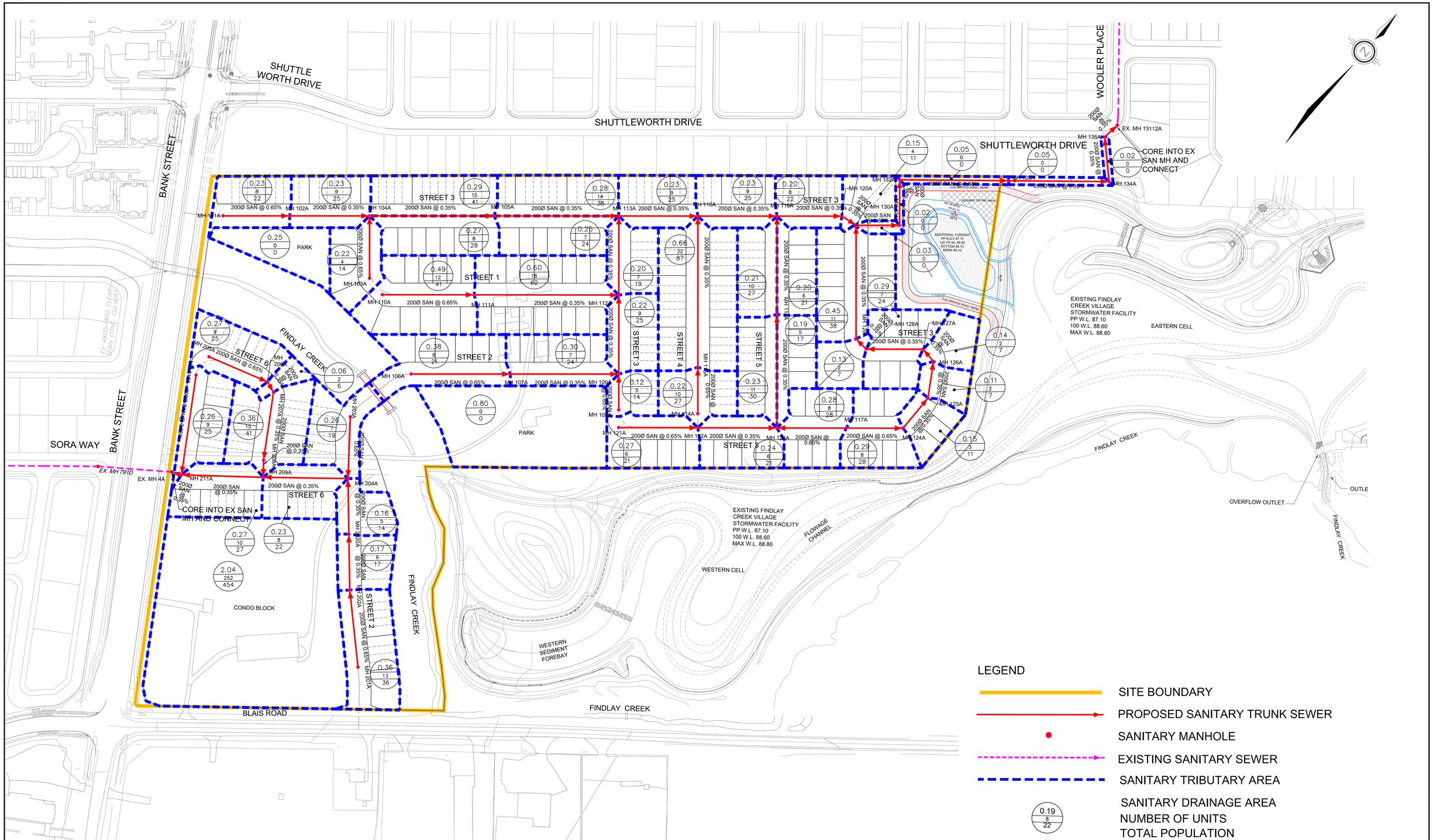
CAIVAN LEITRIM
STORM SERVICING PLAN
CITY OF OTTAWA

PROJECT No. :	24-1414
SCALE:	1:1250
DATE:	JULY 2026
DRAWING No.	3



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CAIVAN LEITRIM
SANITARY SERVICING PLAN
CITY OF OTTAWA

PROJECT No. :	24-1414
SCALE:	1:1250
DATE:	JULY 2026
DRAWING No.	4

SHUTTLE WORTH DRIVE

SHUTTLEWORTH DRIVE

SHUTTLEWORTH DRIVE

WOOLER PLACE

BANK STREET

REMOVE EX PLUG AND CONNECT

STREET 3

STREET 3

PARK

STREET 1

STREET 2

STREET 3

STREET 4

STREET 5

STREET 3

STREET 6

FINDLAY CREEK

EX 4800x1800 CLEAR SPAN CONC. CULVERT

BANK STREET

SORA WAY

PARK

STREET 3

STREET 6

REMOVE EX PLUG AND CONNECT

CONDO BLOCK

STREET 2

FINDLAY CREEK

BLAIS ROAD

EXISTING FINDLAY CREEK VILLAGE STORMWATER FACILITY
PP W.L. 87.10
100 W.L. 88.60
MAX W.L. 88.80

WESTERN CELL

FLOWAGE CHANNEL

WESTERN SEDIMENT FOREBAY

FINDLAY CREEK

EXISTING FINDLAY CREEK VILLAGE STORMWATER FACILITY
PP W.L. 87.10
100 W.L. 88.60
MAX W.L. 88.80

EASTERN CELL

FINDLAY CREEK

OVERFLOW OUTLET

OUTLE

FINDLAY CREEK

LEGEND

- SITE BOUNDARY
- EXISTING WATERMAIN
- PROPOSED 300mm WATERMAIN
- PROPOSED 250mmWATERMAIN

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120 Iber Road, Unit 103
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CAIVAN LEITRIM
WATERMAIN SERVICING PLAN
CITY OF OTTAWA

PROJECT No. :	24-1414
SCALE:	1:1250
DATE:	JULY 2026
DRAWING No.	5

1

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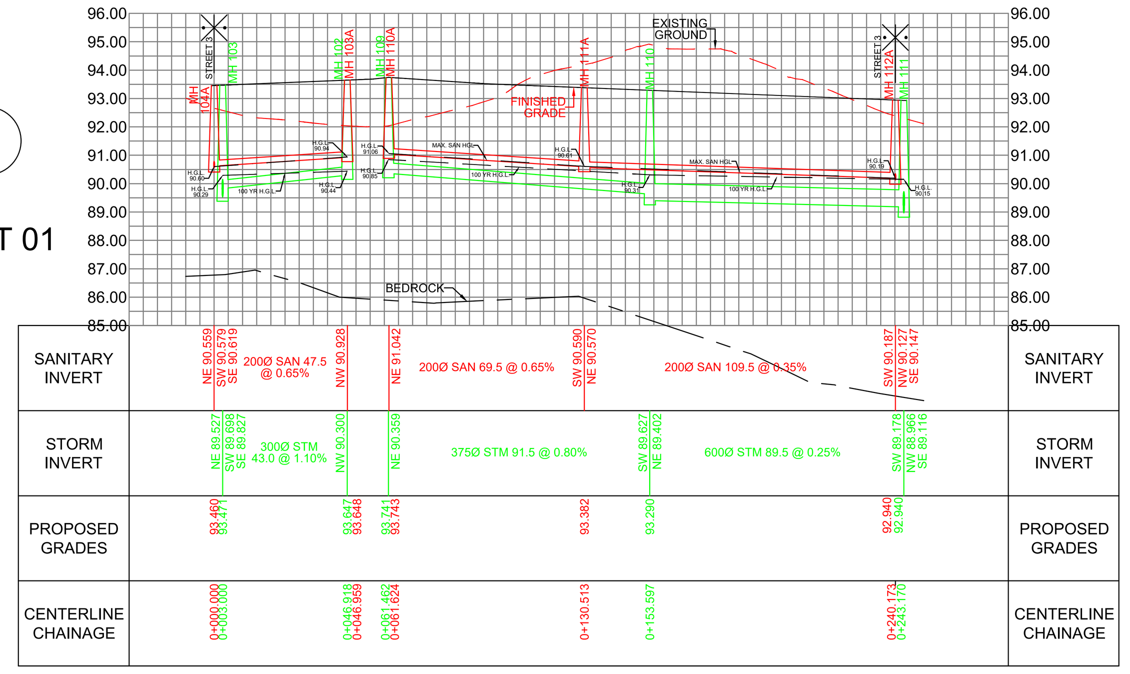

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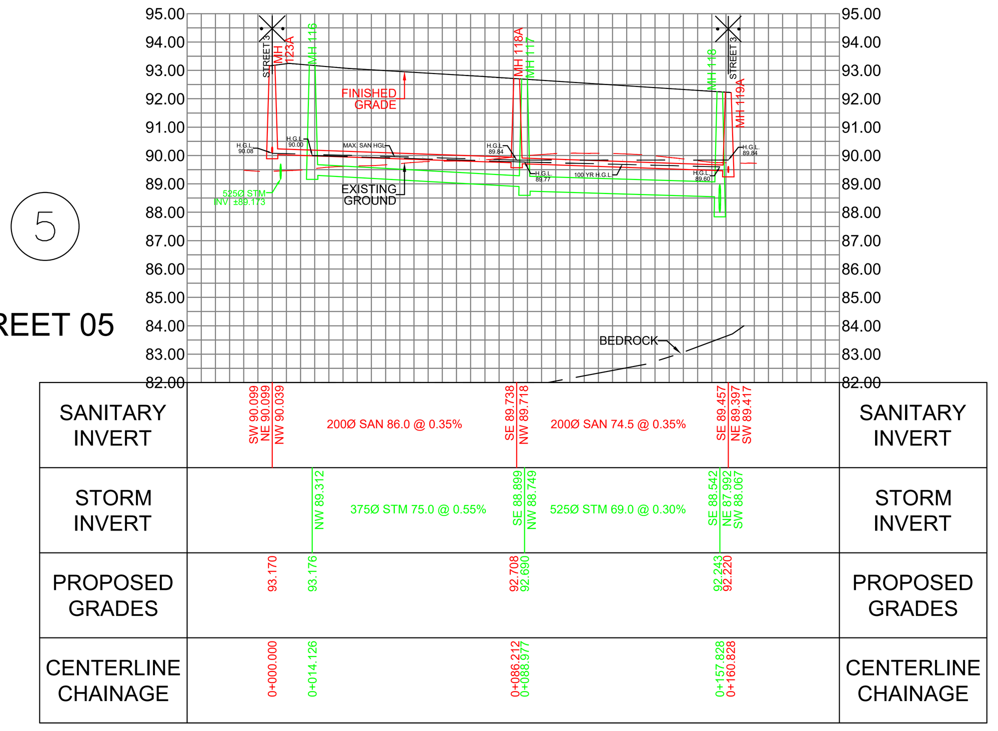

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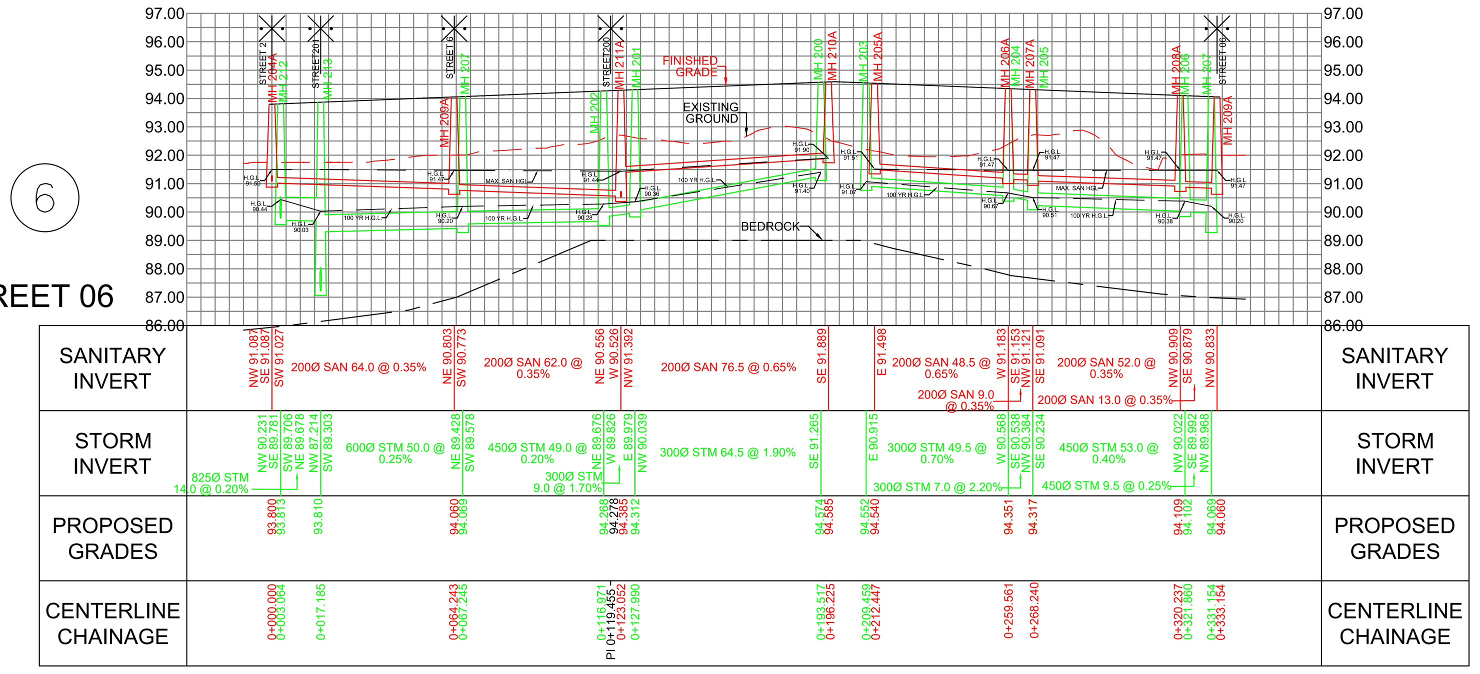

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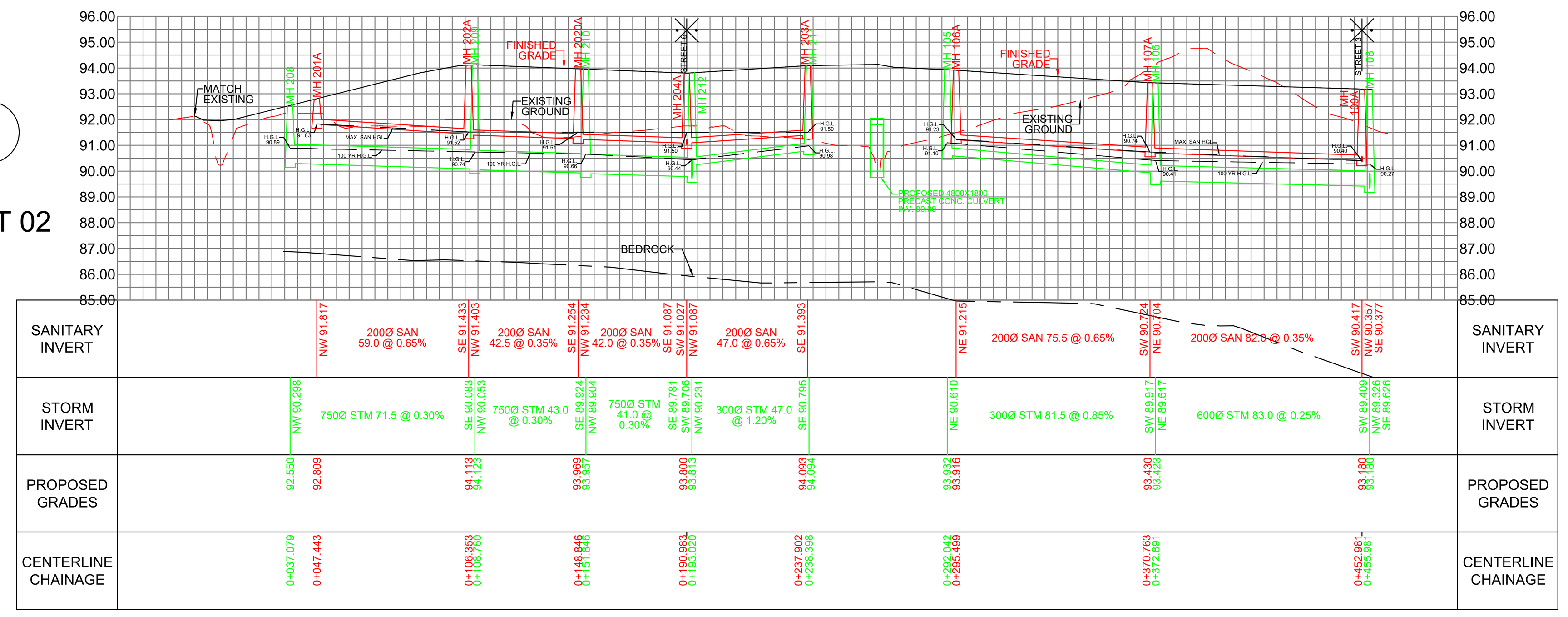

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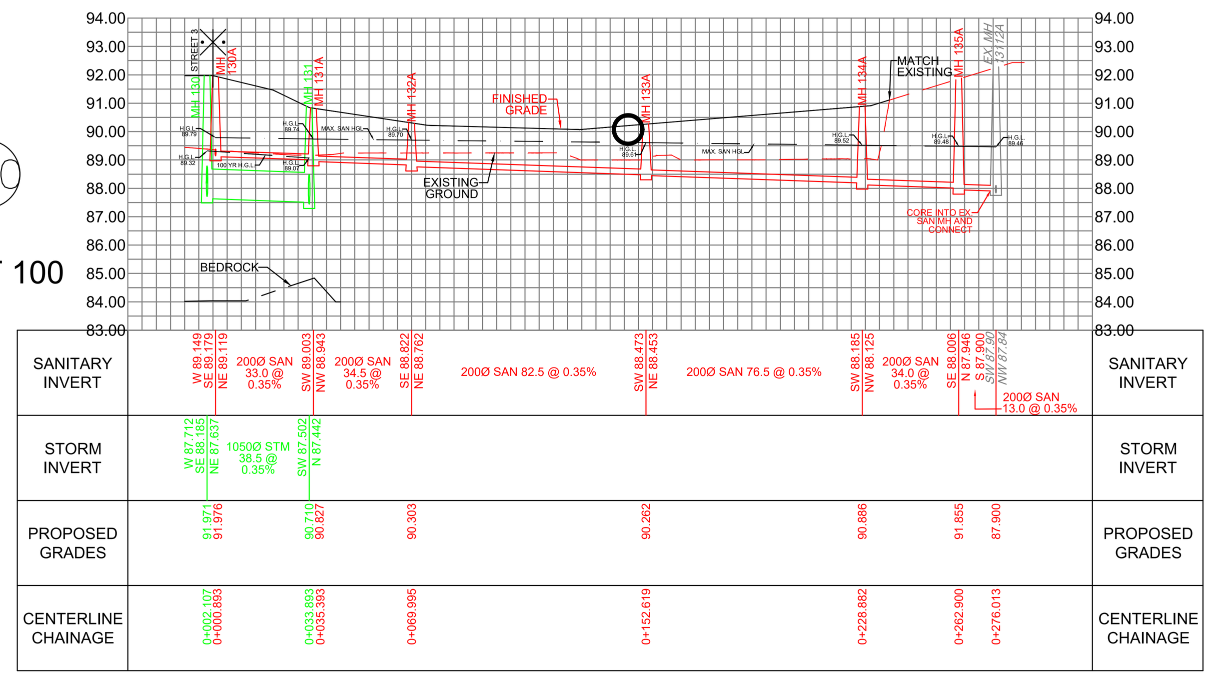

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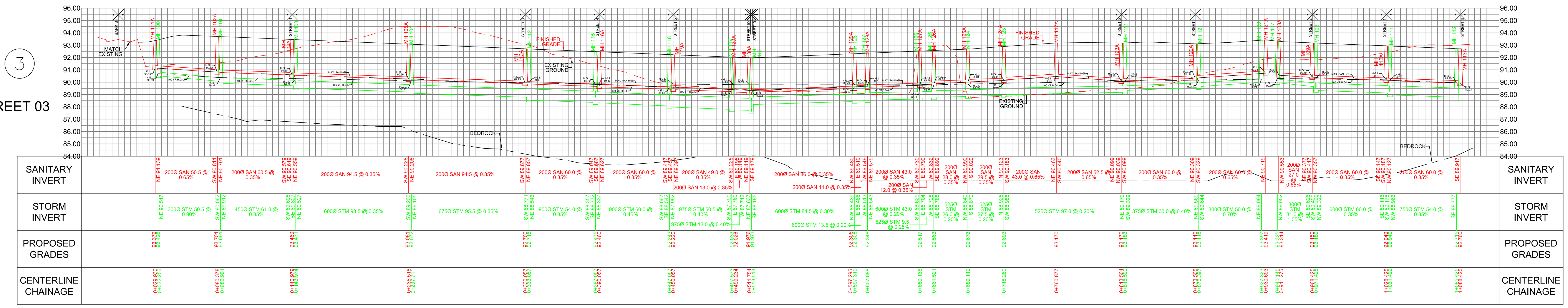

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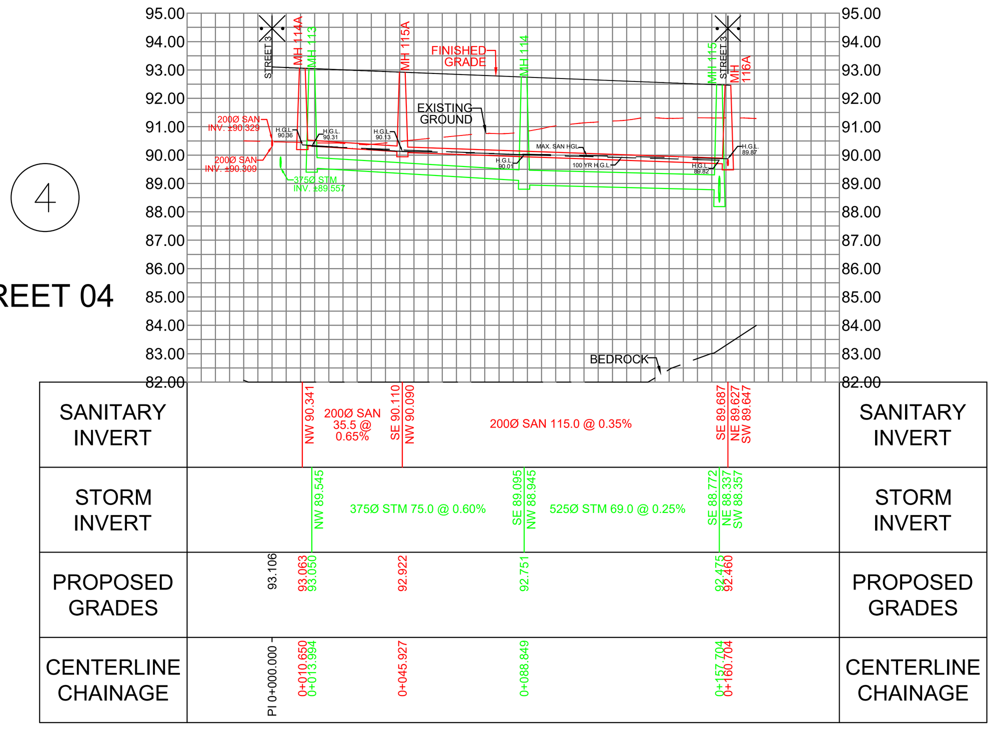

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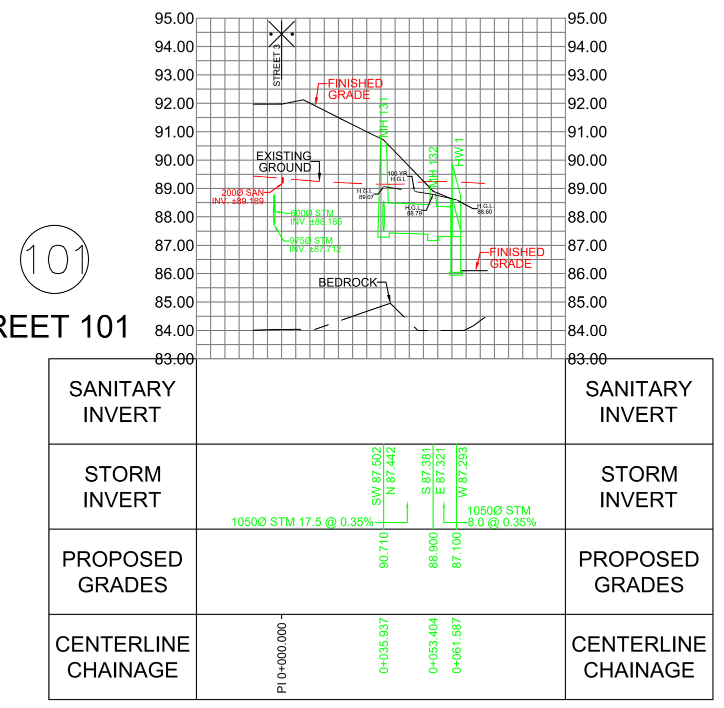

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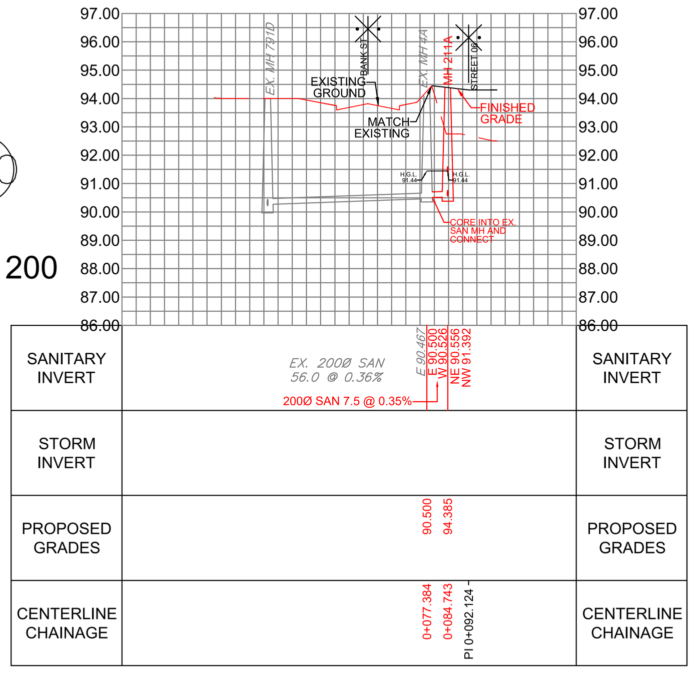

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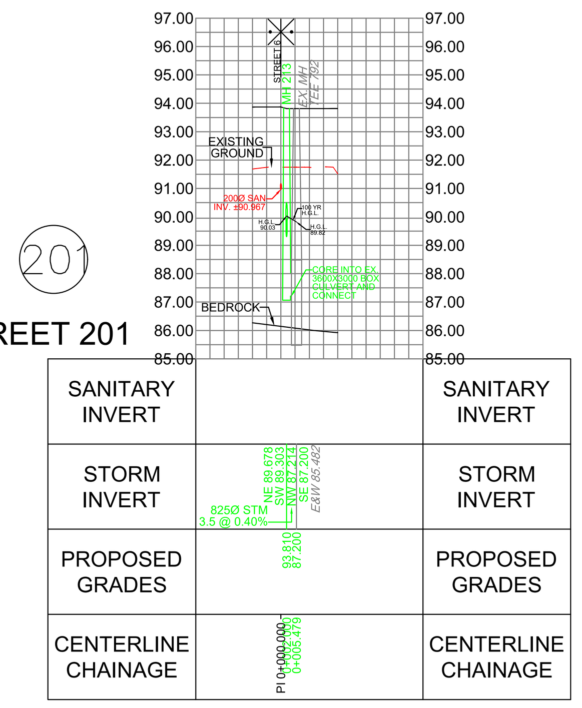

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CAIVAN LEITRIM
SERVICING PROFILES
CITY OF OTTAWA

PROJECT No. :	24-1414
SCALE: VER= 1:150 HOR= 1:1500	
DATE:	JULY 2026
DRAWING No.	6

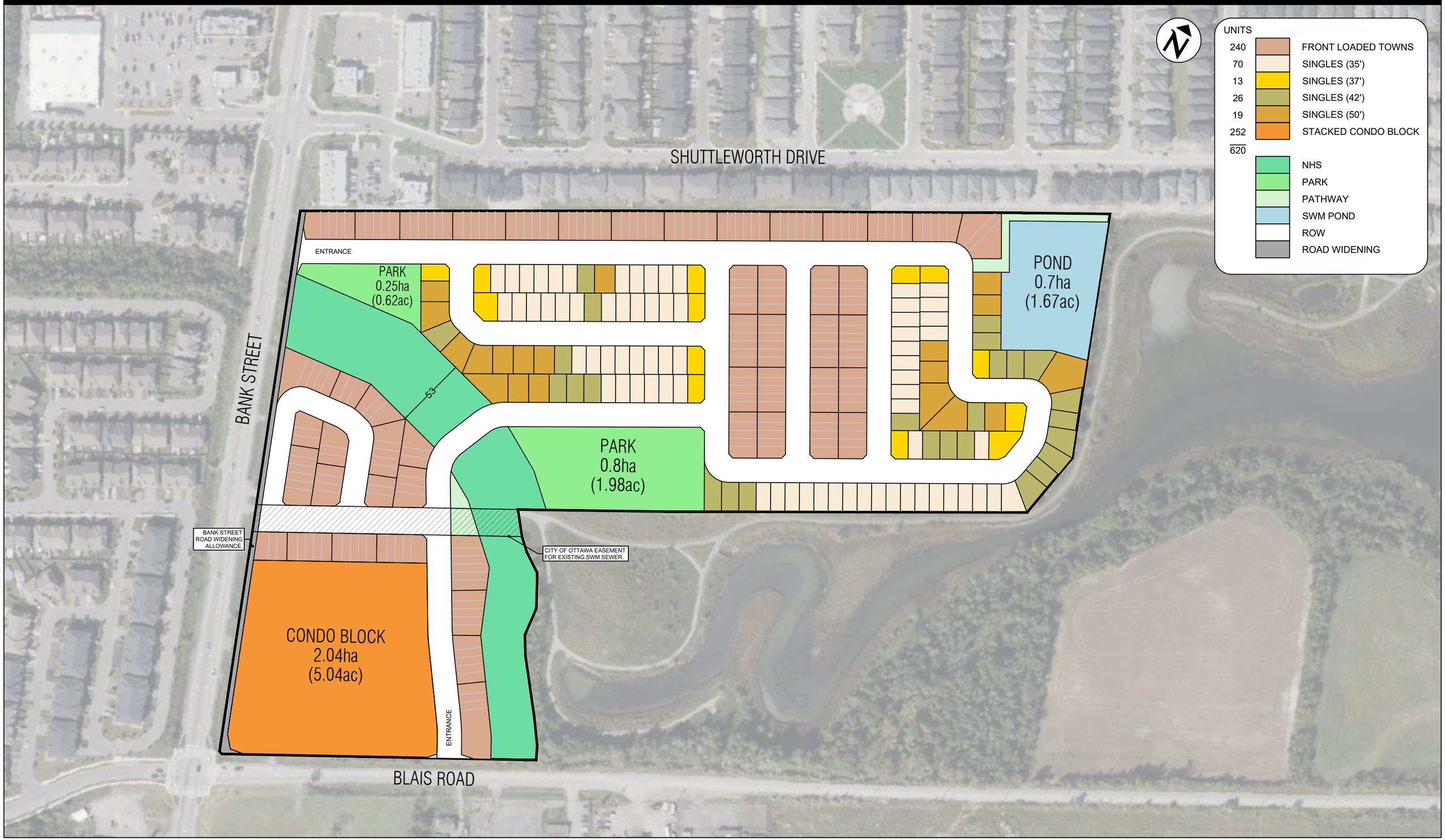
Appendix A

General

CAIVAN

LEITRIM

DRAWING: CP-14
DATE: 06/10/2026
AUTHOR: JZ
SCALE: 1:2,500



Appendix B

Water Supply

Hydraulic Capacity and Modeling Analysis Leitrim Community Development

Technical Memorandum

DRAFT

Prepared for:
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Prepared by:
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Submission Date: June 18, 2026

Contact: Mr. Werner de Schaetzen, Ph.D., P.Eng.
Project: 2026-082-DSE

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BC Permit to Practice: 1000623
ON CofA Number: 100118603

Document History and Version Control

Revision No.	Date	Document Description	Revised By	Reviewed By
R0	June 18, 2026	Draft	Leon Wang	Werner de Schaetzen

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1 Introduction

GeoAdvice Engineering Inc. ("GeoAdvice") was retained by David Schaeffer Engineering Ltd. ("DSEL") to size the proposed watermain network for the Leitrim Community development ("Development") in the City of Ottawa, ON ("City").

The development will have two (2) connections to the City's water distribution system along Bank Street that will feed the proposed development. The connections used for modeling the proposed development were based on boundary conditions provided by the City on May 29, 2026 (refer to **Appendix C**).

The development site is shown in **Figure 1.1** on the following page, with the recommended watermain pipe diameter.

This memo describes the assumptions and results of the hydraulic modeling and capacity analysis using InfoWater Pro (Autodesk software), a GIS water distribution system modeling and management software application.

The results presented in this memo are based on the analysis of steady state simulations. The predicted available fire flows, as calculated by the hydraulic model, represent the flow available in the watermain while maintaining a residual pressure of 20 psi at the hydrant. No extended period simulations were completed in this analysis to assess the water quality or to assess the hydraulic impact on storage and pumping.

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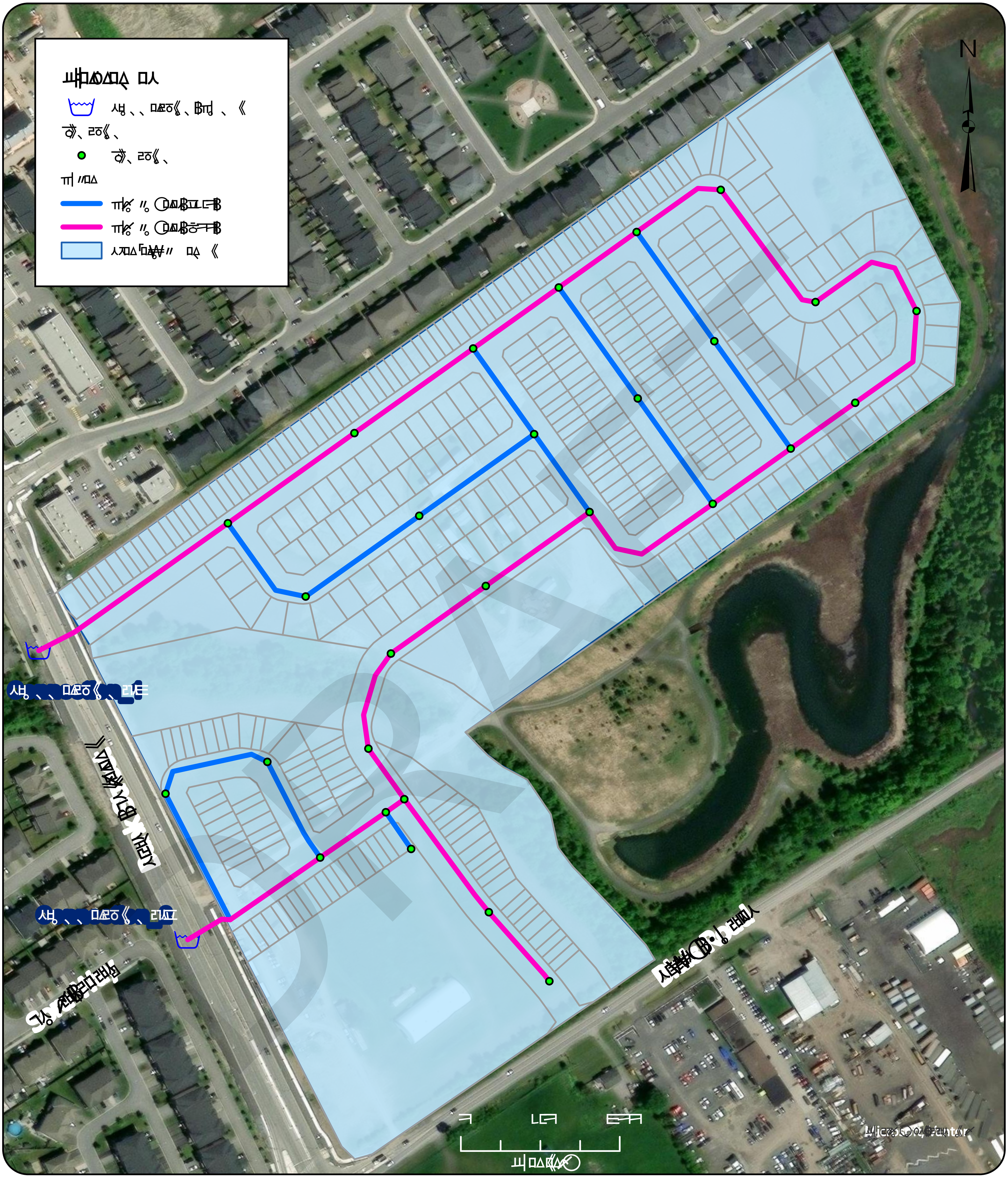
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2 Modeling Considerations

2.1 Watermain Configuration

The watermain network was modeled based on drawings prepared by DSEL and provided to GeoAdvice on June 14, 2026.

2.2 Elevations

Elevations of the modeled junctions were assigned according to a preliminary site grading plan at road level, which was prepared by DSEL and provided to GeoAdvice on June 14, 2026.

2.3 Consumer Demands

The residential demands for the development were provided by DSEL as summarized in **Table 2.1** and were uniformly distributed to all junctions within the development.

Detailed demand calculations are provided in **Appendix A**.

Table 2.1: Development Water Demands

Scenario	Demand (L/s)
Average Day Demand (ADD)	5.02
Max Day Demand (MDD)	12.55
Peak Hour Demand (PHD)	27.61

2.4 Fire Flow Demand

Fire flow demands are typically determined in accordance with the Fire Underwriters Survey's Water Supply for Public fire Protection guideline (2020). FUS calculations are based on the types of building, floor area, number of storeys, construction class, occupancy class and exposure factor. At this time, there is not enough information about the building construction details to complete FUS calculations.

As agreed with DSEL, the following required fire flows were assumed:

- Single Family Residential: 250 L/s
- Townhouse: 250 L/s
- Duplex: 250 L/s
- Park and National Heritage System: 250 L/s

FUS calculations should be completed once detailed drawings become available to validate the required fire flow assumptions. The FUS fire flows may vary from those assumed in this memo.

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Fire flow simulations were completed at each node. The locations of nodes do not necessarily represent hydrant locations. Details of the required fire flows within the development are shown in **Appendix B**.

2.5 Boundary Conditions

The boundary conditions were provided by the City of Ottawa in the form of Hydraulic Grade Line (HGL) at the following locations:

- Connection 1: Bank Street
- Connection 2: Bank Street & Sora Way

The two (2) connections to the proposed development are illustrated in **Figure 1.1**.

Boundary conditions were provided for Peak Hour (PHD), Maximum Day plus Fire (MDD+FF) and Average Day (high pressure check, ADD) demand conditions. The City boundary conditions were provided on May 29, 2026, summarized in **Table 2.2,** and details can be found in **Appendix C**.

Table 2.2: Boundary Conditions

City Scenario	Condition	Connection 1 HGL (m)	Connection 2 HGL (m)
Existing	Average Day (max. pressure)	154.8	154.8
	Peak Hour (min. pressure)	147.0	147.0
	Max Day + Fire Flow (250 L/s)	**119.8**	**119.1**
SUC	**Average Day (max. pressure)**	**147.0**	**147.0**
	Peak Hour (min. pressure)	**142.0**	**141.9**
	Max Day + Fire Flow (250 L/s)	127.7	127.2

To evaluate the proposed network under the most stringent operating conditions, the hydraulic analysis was conducted utilizing a combination of the **bold** boundary conditions highlighted in **Table 2.2**. This approach aggregates the lowest available Hydraulic Grade Line (HGL) values across the different city scenarios to establish a highly conservative, worst-case scenario for system evaluation.

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3 Hydraulic Capacity Design Criteria

3.1 Pipe Characteristics

Pipe characteristics of internal diameter (ID) and Hazen-Williams C factors were assigned in the model according to the City of Ottawa Design Guidelines for PVC watermain material. Pipe characteristics used for the development are outlined in **Table 3.1** below.

Table 3.1: Model Pipe Characteristics

Nominal Diameter (mm)	ID PVC (mm)	Hazen Williams C-Factor (/)
250	250	110
300	297	120

3.2 Pressure Requirements

As outlined in the City of Ottawa Design Guidelines, the generally accepted best practice is to design new water distribution systems to operate between 350 kPa (50 psi) and 480 kPa (70 psi). The maximum pressure at any point in the distribution system in occupied areas outside of the public right-of-way shall not exceed 552 kPa (80 psi). Pressure requirements are outlined in **Table 3.2.**

Table 3.2: Pressure Requirements

Demand Condition	Minimum Pressure		Maximum Pressure	
	(kPa)	(psi)	(kPa)	(psi)
Normal Operating Pressure (maximum daily flow)	350	50	480	70
Peak Hour Demand (minimum allowable pressure)	276	40	-	-
Maximum Fixture Pressure (Ontario Building Code)	-	-	552	80
Maximum Distribution Pressure (minimum hour check)	-	-	552	80
Maximum Day Plus Fire	140	20	-	-

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4 Hydraulic Capacity Analysis

The proposed watermains within the development were sized to satisfy the greater of maximum day plus fire and peak hour demand. Modeling was carried out for average day, peak hour and maximum day plus fire flow using InfoWater Pro.

4.1 Development Pressure Analysis

Modeled service pressures for the development are summarized in **Table 4.1**.

Table 4.1: Summary of Available Service Pressures

Average Day Demand Maximum Pressure	Peak Hour Demand Minimum Pressure
78 psi (539 kPa)	67 psi (464 kPa)

As outlined in the City of Ottawa Design Guidelines, the generally accepted best practice is to design new water distribution systems to operate between 350 kPa (50 psi) and 480 kPa (70 psi). The maximum pressure at any point within the distribution system in occupied areas outside of the public right-of-way shall not exceed 552 kPa (80 psi) and the minimum pressure at any point within the distribution system shall not fall below 270 kPa (40 psi).

As shown in **Table 4.1**, the modeled maximum pressure of 539 kPa (78 psi) under ADD slightly exceeds the City's preferred best-practice range but remains safely below the absolute maximum threshold of 552 kPa (80 psi). The minimum pressure of 464 kPa (67 psi) under PHD is well within the preferred operating range. Consequently, the system will maintain acceptable service pressures without the need for pressure reducing valves (PRVs) or booster facilities. Detailed maps illustrating the pressure modeling results can be found in **Appendix D**.

4.2 Development Fire Flow Analysis

Summary of the minimum available fire flow in the development is shown in **Table 4.2**.

Table 4.2: Summary of the Minimum Available Fire Flows

Required Fire Flow	Minimum Available Flow
250 L/s	302 L/s

As shown in **Table 4.2**, the fire flow requirements can be met at all junctions within the development.

Summaries of the residual pressures in the development are shown in **Table 4.3**. The minimum allowable pressure under fire flow conditions is 140 kPa (20 psi) at the location of the fire.

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Table 4.3: Summary of the Residual Pressures

Minimum Residual Pressure	Average Residual Pressure	Maximum Residual Pressure
25 psi (173 kPa)	30 psi (208 kPa)	34 psi (234 kPa)

As shown in **Table 4.3**, the minimum allowable pressure under fire flow conditions can be met at all junctions within the development.

The figure illustrating the fire flow results can be found in **Appendix E**.

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ON CofA Number: 100118603

Submission

Prepared by:

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Hydraulic Modeler / Project Engineer

Approved by:

Werner de Schaetzen, Ph.D., P.Eng.
Senior Modeling Review / Project Manager

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Appendix A Demand Calculations

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Water Demand Design Flows per Unit Count
City of Ottawa - Water Distribution Guidelines, July 2010

Domestic Demand

Type of Housing	Per / Unit	Units	Pop
Single Family	3.4	128	436
Semi-detached	2.7	-	0
Townhouse	2.7	244	659
Duplex	1.8	252	454
Apartment			0
Bachelor	1.4	-	0
1 Bedroom	1.4	-	0
2 Bedroom	2.1	-	0
3 Bedroom	3.1	-	0
Average	1.8	-	0

	Pop	Avg. Daily		Max Day		Peak Hour	
		m^3/d	L/min	m^3/d	L/min	m^3/d	L/min
Total Domestic Demand	1549	433.7	301.2	1084.3	753.0	2385.5	1656.6

Institutional / Commercial / Industrial Demand

Property Type	Unit Rate		Units	Avg. Daily m^3/d	Avg. Daily L/min	Max Day m^3/d	Max Day L/min	Peak Hour m^3/d	Peak Hour L/min
Commercial floor space	2.5	$L/m^2/d$	-	0.00	0.0	0.0	0.0	0.0	0.0
Office	75	$L/9.3m^2/d$	-	0.00	0.0	0.0	0.0	0.0	0.0
Restaurant*	125	L/seat/d	-	0.00	0.0	0.0	0.0	0.0	0.0
Industrial - Light	35,000	L/gross ha/d	-	0.00	0.0	0.0	0.0	0.0	0.0
Industrial - Heavy	55,000	L/gross ha/d	-	0.00	0.0	0.0	0.0	0.0	0.0
			Total I/CI Demand	0.0	0.0	0.0	0.0	0.0	0.0
			Total Demand	**433.7**	**301.2**	**1084.3**	**753.0**	**2385.5**	**1656.6**

* Estimated number of seats at 1seat per $9.3m^2$

Appendix B Required Fire Flows

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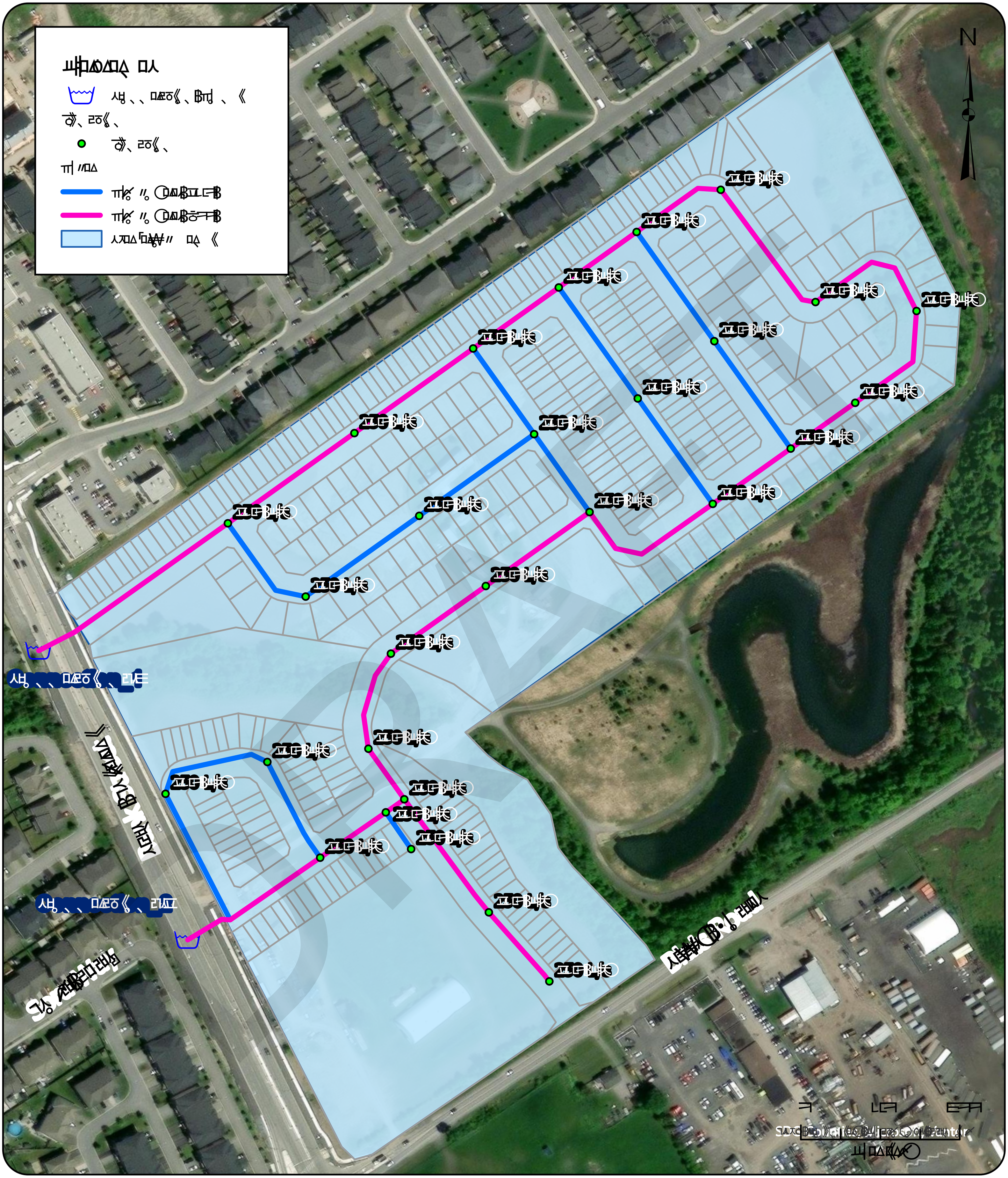
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Appendix C Boundary Conditions

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Boundary Conditions
4795 Bank Street– 2026

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	301.2	5.02
Maximum Daily Demand	753.0	12.55
Peak Hour	1,656.6	27.61
Fire Flow Demand #1	15,000.0	250.00

Location

Results

Existing Conditions
Connection 1 - Bank St.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	154.8	87
Peak Hour	147.0	76
Max Day plus Fire Flow #1	119.8	37

[1] Ground Elevation = 93.9 m

Connection 2 - Bank St.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	154.8	86
Peak Hour	147.0	75
Max Day plus Fire Flow #1	119.1	35

[1] Ground Elevation = 94.3 m

SUC
Connection 1 - Bank St.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	147.0	76
Peak Hour	142.0	69
Max Day plus Fire Flow #1	127.7	48

[1] Ground Elevation = 93.9 m

Connection 2 - Bank St.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	147.0	75
Peak Hour	141.9	68
Max Day plus Fire Flow #1	127.2	47

[1] Ground Elevation = 94.3 m

Notes

1. Any connection to a watermain 400 mm or larger should be approved by DWS as per the Water Design Guidelines Section 2.4 Review by Drinking Water Services.

2. As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:
    - If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
    - Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

Disclaimer

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

Appendix D Pressure Results

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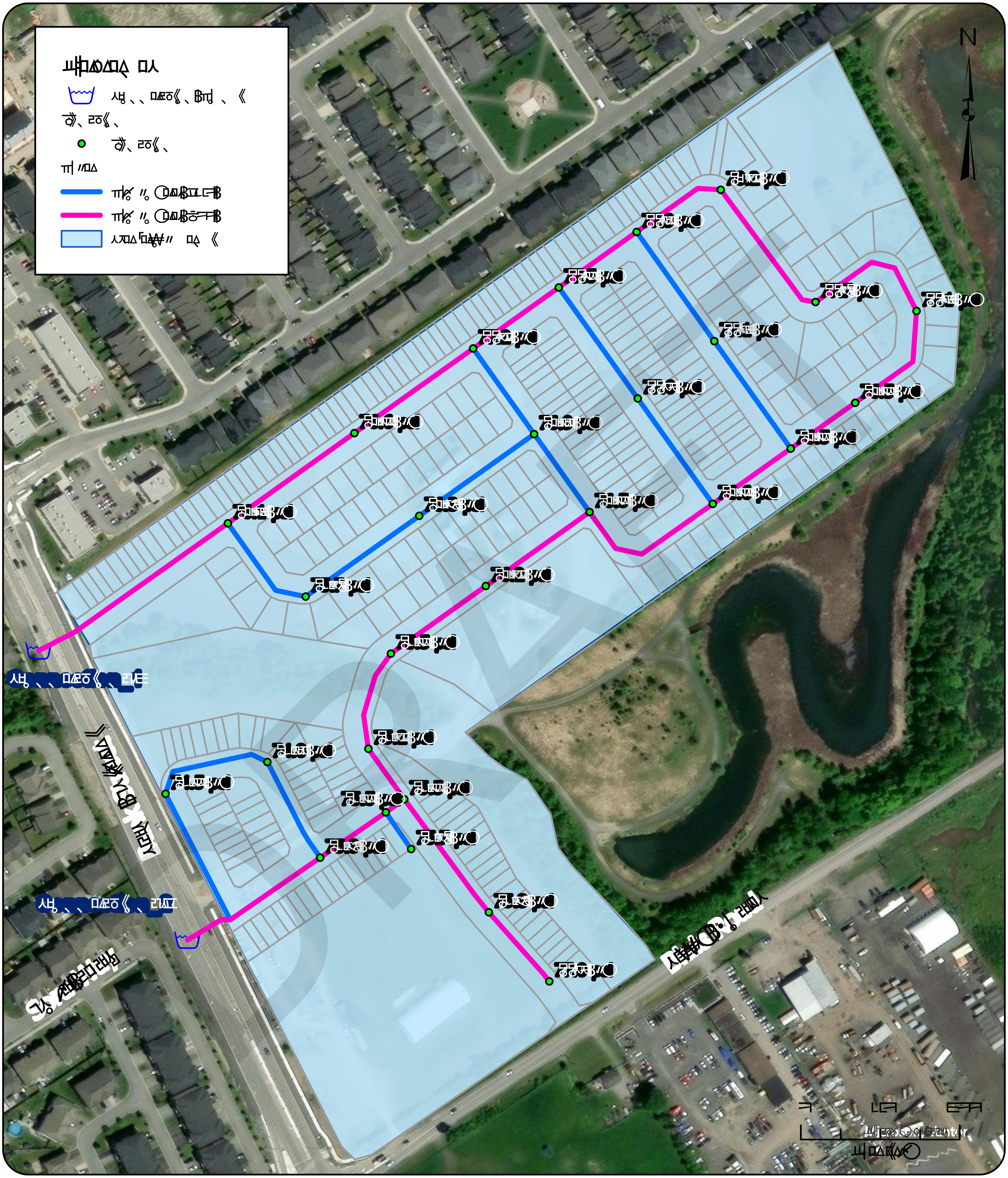
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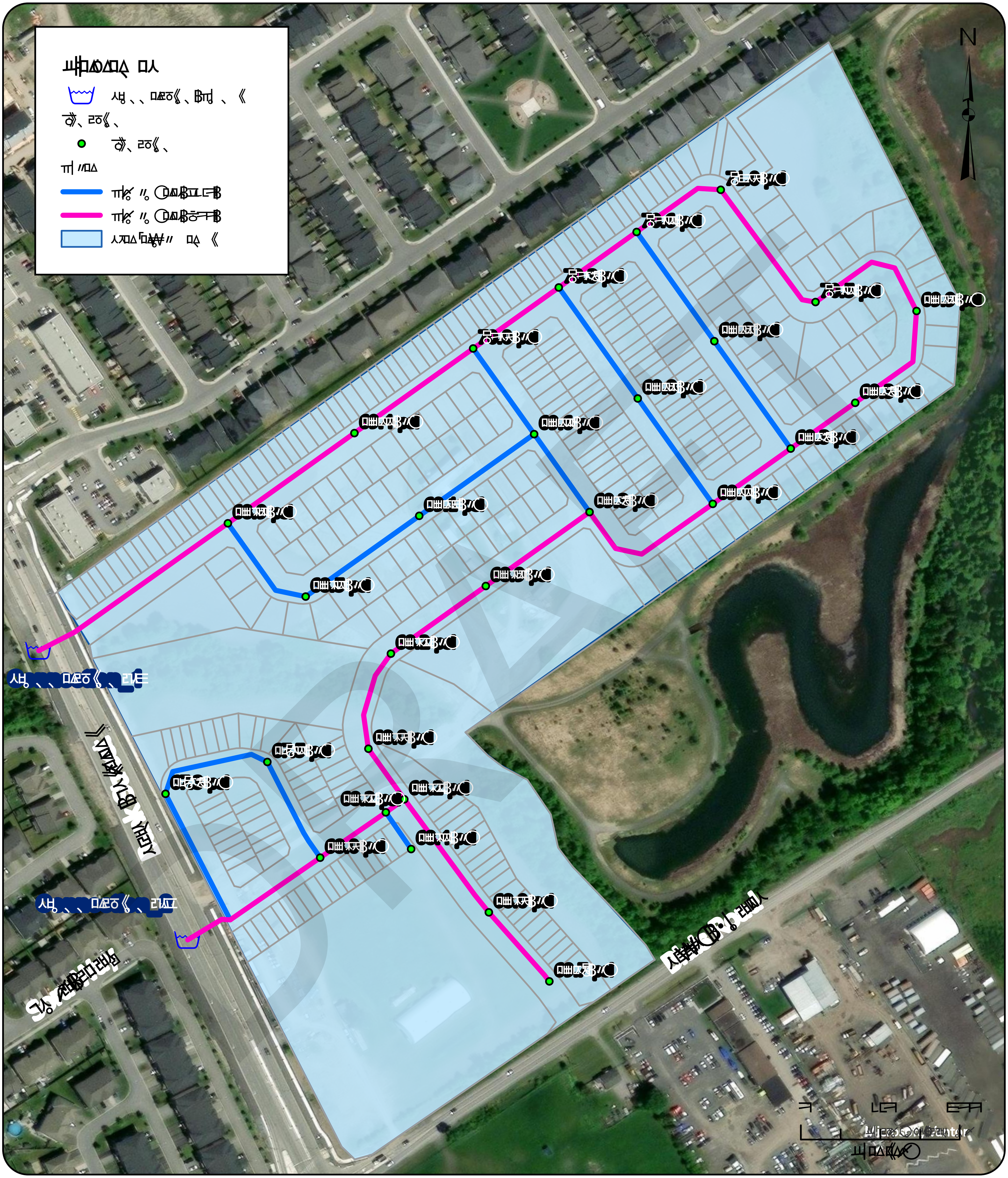
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Appendix E MDD+FF Model Results

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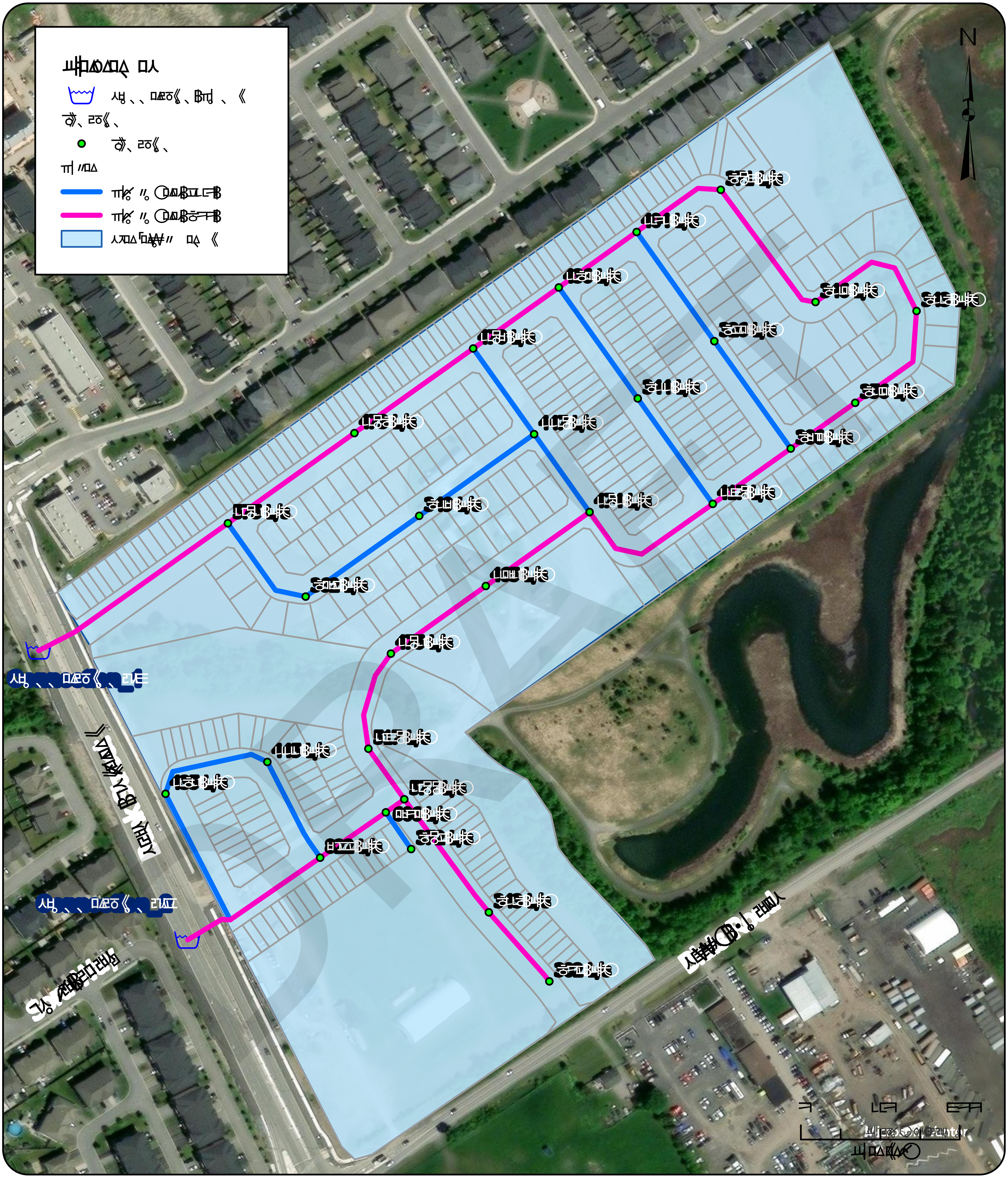
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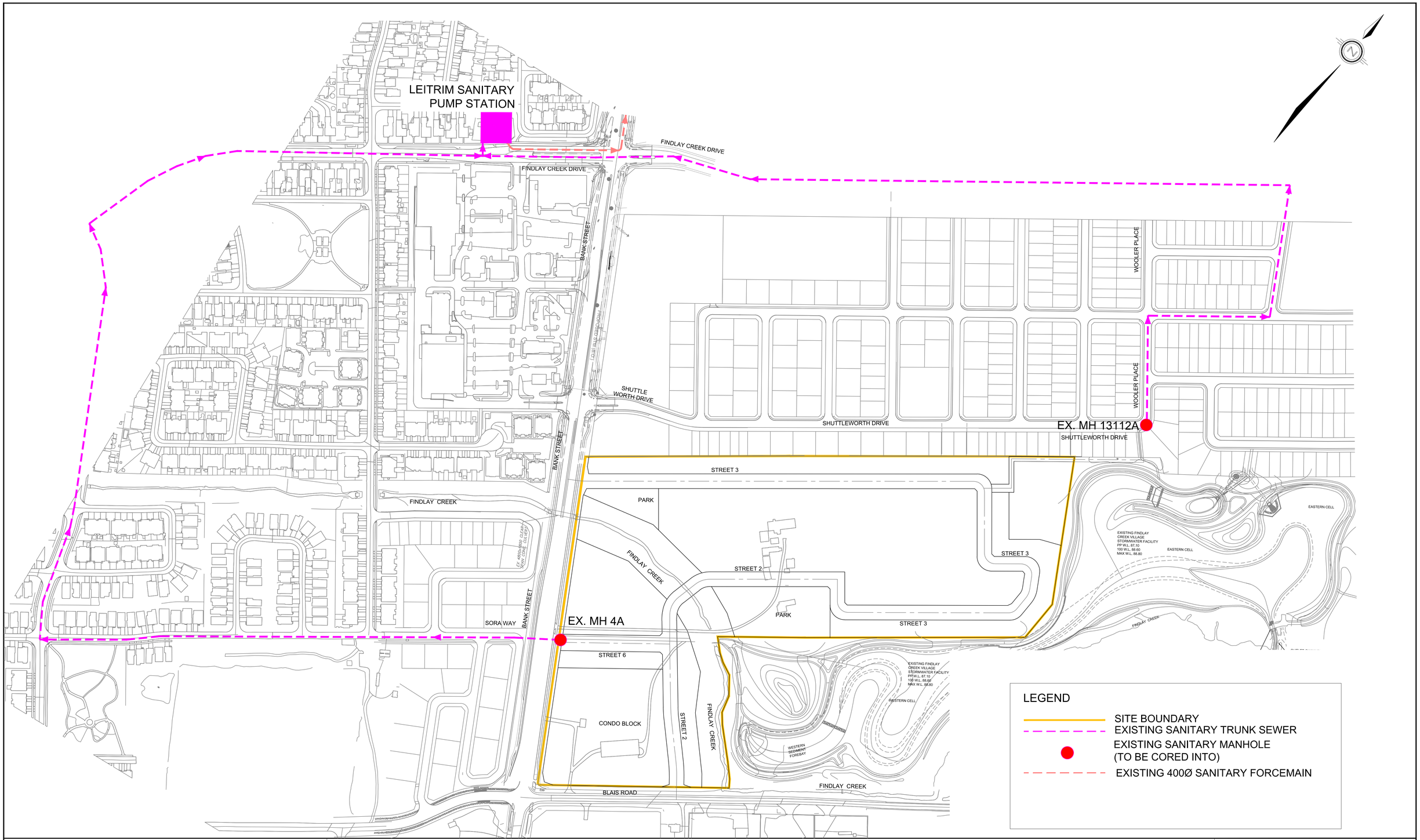
Appendix C

Wastewater Collection



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CAIVAN LEITRIM
SANITARY EXISTING CONDITIONS PLAN
CITY OF OTTAWA

PROJECT No. :	24-1414
SCALE:	1:2000
DATE:	JULY 2026
FIGURE No.	2

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)
STREET 5																											
Contribution From STREET 3, Pipe 117A - 123A						0.28	28				0.00		0.00		0.00		0.28	0.28									
Contribution From STREET 3, Pipe 122A - 123A						0.51	42				0.00		0.00		0.00		0.51	0.79									
			0.19	5	17	0.98	87				0.00		0.00		0.00		0.19	0.98									
	123A	118A	0.23	11	30	1.21	117	3.6	1.36		0.00		0.00		0.00	0.00	0.23	1.21	0.40	1.76	86.0	200	0.35	19.40	0.09	0.62	0.38
			0.20	6	21	1.41	138				0.00		0.00		0.00		0.20	1.41									
	118A	119A	0.21	10	27	1.62	165	3.5	1.89		0.00		0.00		0.00	0.00	0.21	1.62	0.53	2.43	74.5	200	0.35	19.40	0.13	0.62	0.42
To STREET 3, Pipe 119A - 120A						1.62	165				0.00		0.00		0.00			1.62									
STREET 4																											
	114A	115A	0.22	10	27	0.22	27	3.7	0.32		0.00		0.00		0.00	0.00	0.22	0.22	0.07	0.40	35.5	200	0.65	26.44	0.01	0.84	0.30
	115A	116A	0.66	32	87	0.88	114	3.6	1.32		0.00		0.00		0.00	0.00	0.66	0.88	0.29	1.61	115.0	200	0.35	19.40	0.08	0.62	0.37
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STREET 1																											
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	111A	112A	0.60	18	62	1.09	103	3.6	1.20		0.00		0.00		0.00	0.00	0.60	1.09	0.36	1.56	109.5	200	0.35	19.40	0.08	0.62	0.37
To STREET 3, Pipe 112A - 113A						1.09	103				0.00		0.00		0.00			1.09									
STREET 3																											
	117A	123A	0.28	8	28	0.28	28	3.7	0.33		0.00		0.00		0.00	0.00	0.28	0.28	0.09	0.43	52.5	200	0.65	26.44	0.02	0.84	0.30
To STREET 5, Pipe 123A - 118A						0.28	28				0.00		0.00		0.00			0.28									
	121A	122A	0.27	6	21	0.27	21	3.7	0.25		0.00		0.00		0.00	0.00	0.27	0.27	0.09	0.34	60.0	200	0.65	26.44	0.01	0.84	0.28
	122A	123A	0.24	6	21	0.51	42	3.7	0.50		0.00		0.00		0.00	0.00	0.24	0.51	0.17	0.67	60.0	200	0.35	19.40	0.03	0.62	0.29
To STREET 5, Pipe 123A - 118A						0.51	42				0.00		0.00		0.00			0.51									
	108A	109A	0.12	5	14	0.12	14	3.7	0.17		0.00		0.00		0.00	0.00	0.12	0.12	0.04	0.21	27.0	200	0.65	26.44	0.01	0.84	0.24
Contribution From STREET 2, Pipe 107A - 109A						0.68	45				0.00		0.00		0.80		1.48	1.60									
	109A	112A	0.22	9	25	1.02	84	3.6	0.98		0.00		0.00		0.80	0.09	0.22	1.82	0.60	1.67	60.0	200	0.35	19.40	0.09	0.62	0.37
Contribution From STREET 1, Pipe 111A - 112A						1.09	103				0.00		0.00		0.00		1.09	2.91									
	112A	113A	0.20	7	19	2.31	206	3.5	2.35		0.00		0.00		0.80	0.09	0.20	3.11	1.03	3.46	60.0	200	0.35	19.40	0.18	0.62	0.47
	117A	124A	0.29	8	28	0.29	28	3.7	0.33		0.00		0.00		0.00	0.00	0.29	0.29	0.10	0.43	43.0	200	0.65	26.44	0.02	0.84	0.30
	124A	125A	0.15	3	11	0.44	39	3.7	0.46		0.00		0.00		0.00	0.00	0.15	0.44	0.15	0.61	29.5	200	0.35	19.40	0.03	0.62	0.28
	125A	126A	0.11	2	7	0.55	46	3.7	0.55		0.00		0.00		0.00	0.00	0.11	0.55	0.18	0.73	28.0	200	0.35	19.40	0.04	0.62	0.29
	126A	127A	0.14	2	7	0.69	53	3.6	0.63		0.00		0.00		0.00	0.00	0.14	0.69	0.23	0.85	12.0	200	0.35	19.40	0.04	0.62	0.31
	127A	128A	0.29	7	24	0.98	77	3.6	0.90		0.00		0.00		0.00	0.00	0.29	0.98	0.32	1.23	43.0	200	0.35	19.40	0.06	0.62	0.34
	128A	129A	0.13	2	7	1.11	84	3.6	0.98		0.00		0.00		0.00	0.00	0.13	1.11	0.37	1.35	11.0	200	0.35	19.40	0.07	0.62	0.35
	129A	130A	0.45	11	38	1.56	122	3.6	1.41		0.00		0.00		0.00	0.00	0.45	1.56	0.51	1.93	86.0	200	0.35	19.40	0.10	0.62	0.39
To SANITARY SERVICING EASEMENT, Pipe 130A - 131A						1.56	122				0.00		0.00		0.00			1.56									
	101A	102A	0.23	8	22	0.23	22	3.7	0.26		0.00		0.00		0.00	0.00	0.23	0.23	0.08	0.34	50.5	200	0.65	26.44	0.01	0.84	0.28
	102A	104A	0.23	9	25	0.46	47	3.7	0.56		0.00		0.00	0.25	0.25	0.03	0.48	0.71	0.23	0.82	60.5	200	0.35	19.40	0.04	0.62	0.31

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: A.S.

Checked: W.L.

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

PROJECT: **Caivan Leitrim**

LOCATION: **City of Ottawa**

File Ref: **24-1414**

Date: **18 Jun 2026**

Sheet No. 1 of 3

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 1, Pipe 103A - 104A						0.22	14				0.00		0.00		0.00		0.22	0.93									
			0.27	8	28	0.95	89				0.00		0.00		0.25		0.27	1.20									
	104A	105A	0.29	15	41	1.24	130	3.6	1.50		0.00		0.00		0.25	0.03	0.29	1.49	0.49	2.02	94.5	200	0.35	19.40	0.10	0.62	0.40
			0.25	7	24	1.49	154				0.00		0.00		0.25		0.25	1.74									
	105A	113A	0.28	14	38	1.77	192	3.5	2.19		0.00		0.00		0.25	0.03	0.28	2.02	0.67	2.89	94.5	200	0.35	19.40	0.15	0.62	0.44
	113A	116A	0.23	9	25	4.31	423	3.4	4.67		0.00		0.00		1.05	0.11	0.23	5.36	1.77	6.55	60.0	200	0.35	19.40	0.34	0.62	0.56
Contribution From STREET 4, Pipe 115A - 116A						0.88	114				0.00		0.00		0.00		0.88	6.24									
	116A	119A	0.23	9	25	5.42	562	3.4	6.12		0.00		0.00		1.05	0.11	0.23	6.47	2.14	8.36	60.0	200	0.35	19.40	0.43	0.62	0.59
Contribution From STREET 5, Pipe 118A - 119A						1.62	165				0.00		0.00		0.00		1.62	8.09									
	119A	120A	0.20	8	22	7.24	749	3.3	8.01		0.00		0.00		1.05	0.11	0.20	8.29	2.74	10.86	49.0	200	0.35	19.40	0.56	0.62	0.63
	120A	130A	0.15	4	11	7.39	760	3.3	8.13		0.00		0.00		1.05	0.11	0.15	8.44	2.79	11.02	13.0	200	0.35	19.40	0.57	0.62	0.64
To SANITARY SERVICING EASEMENT, Pipe 130A - 131A						7.39	760				0.00		0.00		1.05			8.44									
SANITARY SERVICING EASEMENT																											
Contribution From STREET 3, Pipe 120A - 130A						7.39	760				0.00		0.00		1.05		8.44	8.44									
Contribution From STREET 3, Pipe 129A - 130A						1.56	122				0.00		0.00		0.00		1.56	10.00									
	130A	131A	0.03		0	8.98	882	3.3	9.34		0.00		0.00		1.05	0.11	0.03	10.03	3.31	12.76	33.0	200	0.35	19.40	0.66	0.62	0.66
	131A	132A	0.02		0	9.00	882	3.3	9.34		0.00		0.00		1.05	0.11	0.02	10.05	3.32	12.77	34.5	200	0.35	19.40	0.66	0.62	0.66
	132A	133A	0.05		0	9.05	882	3.3	9.34		0.00		0.00		1.05	0.11	0.05	10.10	3.33	12.79	82.5	200	0.35	19.40	0.66	0.62	0.66
	133A	134A	0.05		0	9.10	882	3.3	9.34		0.00		0.00		1.05	0.11	0.05	10.15	3.35	12.80	76.5	200	0.35	19.40	0.66	0.62	0.66
	134A	135A	0.02		0	9.12	882	3.3	9.34		0.00		0.00		1.05	0.11	0.02	10.17	3.36	12.81	34.0	200	0.35	19.40	0.66	0.62	0.66
	135A	136A				9.12	882	3.3	9.34		0.00		0.00		1.05	0.11	0.00	10.17	3.36	12.81	13.0	200	0.35	19.40	0.66	0.62	0.66
STREET 2																											
	203A	204A	0.26	7	19	0.26	19	3.7	0.23		0.00		0.00		0.00	0.00	0.26	0.26	0.09	0.31	47.0	200	0.65	26.44	0.01	0.84	0.28
To STREET 6, Pipe 204A - 209A						0.26	19				0.00		0.00		0.00			0.26									
	106A	107A	0.38	6	21	0.38	21	3.7	0.25		0.00		0.00		0.00	0.00	0.38	0.38	0.13	0.38	75.5	200	0.65	26.44	0.01	0.84	0.29
	107A	109A	0.30	7	24	0.68	45	3.7	0.53		0.00		0.00	0.80	0.80	0.09	1.10	1.48	0.49	1.11	82.0	200	0.35	19.40	0.06	0.62	0.33
To STREET 3, Pipe 109A - 112A						0.68	45				0.00		0.00		0.80			1.48									
	201A	202A	0.36	9	25	0.36	25	3.7	0.30		0.00		0.00		0.00	0.00	0.36	0.36	0.12	0.42	59.0	200	0.65	26.44	0.02	0.84	0.30
			0.17	6	17	0.53	42				0.00		0.00		0.00		0.17	0.53									
	202A	2020A	2.04	252	454	2.57	496	3.4	5.43		0.00		0.00		0.00	0.00	2.04	2.57	0.85	6.28	42.5	200	0.35	19.40	0.32	0.62	0.55
	2020A	204A	0.16	5	14	2.73	510	3.4	5.58		0.00		0.00		0.00	0.00	0.16	2.73	0.90	6.48	42.0	200	0.35	19.40	0.33	0.62	0.55
To STREET 6, Pipe 204A - 209A						2.73	510				0.00		0.00		0.00			2.73									
STREET 6																											
	210A	211A	0.26	9	25	0.26	25	3.7	0.30		0.00		0.00		0.00	0.00	0.26	0.26	0.09	0.39	76.5	200	0.65	26.44	0.01	0.84	0.29
To SANITARY OUTLET, Pipe 211A - 212A						0.26	25				0.00		0.00		0.00			0.26									
Contribution From STREET 2, Pipe 2020A - 204A						2.73	510				0.00		0.00		0.00		2.73	2.73									
Contribution From STREET 2, Pipe 203A - 204A						0.26	19				0.00		0.00		0.00		0.26	2.99									
	204A	209A	0.23	8	22	3.22	551	3.4	6.00		0.00		0.00		0.00	0.00	0.23	3.22	1.06	7.07	64.0	200	0.35	19.40	0.36	0.62	0.57
	205A	206A	0.27	9	25	0.27	25	3.7	0.30		0.00		0.00		0.00	0.00	0.27	0.27	0.09	0.39	48.5	200	0.65	26.44	0.01	0.84	0.29
	206A	207A	0.06	2	6	0.33	31	3.7	0.37		0.00		0.00		0.00	0.00	0.06	0.33	0.11	0.48	9.0	200	0.35	19.40	0.02	0.62	0.26
	207A	208A	0.36	15	41	0.69	72	3.6	0.85		0.00		0.00		0.00	0.00	0.36	0.69	0.23	1.07	52.0	200	0.35	19.40	0.06	0.62	0.33
	208A	209A				0.69	72	3.6	0.85		0.00		0.00		0.00	0.00	0.00	0.69	0.23	1.07	13.0	200	0.35	19.40	0.06	0.62	0.33

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: A.S.

Checked: W.L.

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

PROJECT: **Caivan Leitrim**

LOCATION: **City of Ottawa**

File Ref: **24-1414**

Date: **18 Jun 2026**

Sheet No. 2 of 3

1414_SAN_Designsheets.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)
		209A	211A	0.27	10	27	4.18	650	3.3	7.02		0.00		0.00		0.00	0.00	0.27	4.18	1.38	8.39	62.0	200	0.35	19.40	0.43	0.62	0.59
To SANITARY OUTLET, Pipe 211A - 212A							4.18	650				0.00		0.00		0.00			4.18									
SANITARY OUTLET																												
Contribution From STREET 6, Pipe 209A - 211A							4.18	650				0.00		0.00		0.00		4.18	4.18									
Contribution From STREET 6, Pipe 210A - 211A							0.26	25				0.00		0.00		0.00		0.26	4.44									
		211A	212A				4.44	675	3.3	7.27		0.00		0.00		0.00	0.00	0.00	4.44	1.47	8.73	7.5	200	0.35	19.40	0.45	0.62	0.60

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: A.S.	PROJECT: **Caivan Leitrim**		
Checked: W.L.	LOCATION: **City of Ottawa**		
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No.	File Ref: **24-1414**	Date: **18 Jun 2026**	Sheet No. 3 of 3

Project Number:	1414
Project Name:	4795 Bank Street Caivan
Prepared By:	TG
Date:	31-Jul-26

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

HGL Analysis Annual

Name	Rim Elev. (m)	Max. HGL (m)	Inv Elev. (m)	Baseline (L/s)	Freeboard (m)
101A	93.37	91.15	91.14	0.22	2.22
102A	93.70	90.82	90.79	0.34	2.88
103A	93.65	90.94	90.93	0.16	2.71
104A	93.46	90.60	90.56	0.62	2.86
105A	93.08	90.25	90.21	0.56	2.83
106A	93.92	91.23	91.22	0.26	2.69
107A	93.43	90.73	90.70	0.58	2.70
108A	93.32	90.56	90.55	0.13	2.76
109A	93.18	90.39	90.36	0.23	2.79
110A	93.74	91.06	91.04	0.43	2.68
111A	93.38	90.60	90.57	0.60	2.78
112A	92.94	90.18	90.13	0.16	2.76
113A	92.70	89.93	89.86	0.16	2.77
114A	93.07	90.36	90.34	0.25	2.71
115A	92.93	90.12	90.09	0.78	2.81
116A	92.46	89.70	89.63	0.15	2.76
117A	93.17	90.45	90.44	0.28	2.72
118A	92.71	89.76	89.72	0.44	2.95
119A	92.22	89.66	89.40	0.08	2.56
120A	92.02	89.64	89.20	0.11	2.38
121A	93.42	90.73	90.72	0.23	2.69
122A	93.11	90.33	90.31	0.22	2.78
123A	93.17	90.07	90.04	0.43	3.10
124A	92.89	90.14	90.12	0.12	2.75
125A	92.67	90.01	89.99	0.08	2.66
126A	92.57	89.85	89.832	0.08959	2.72
127A	92.52	89.75	89.73	0.25	2.77
128A	92.35	89.63	89.55	0.09	2.72
129A	92.31	89.63	89.48	0.39	2.68
130A	91.97	89.63	89.12	-0.10	2.34
131A	90.83	89.60	88.94	0.01	1.23
132A	90.30	89.58	88.76	0.02	0.72
133A	90.26	89.52	88.45	0.02	0.74
134A	90.89	89.47	88.13	0.01	1.42
135A	91.86	89.45	87.95	0.00	2.41
136A	92.21	89.44	87.90	0.00	2.77
201A	92.81	91.83	91.817	0.282777	0.98

Name	Rim Elev. (m)	Max. HGL (m)	Inv Elev. (m)	Baseline (L/s)	Freeboard (m)
2020A	93.97	91.48	91.23	0.13	2.49
202A	94.12	91.49	91.40	4.45	2.63
203A	94.09	91.47	91.39	0.21	2.62
204A	93.80	91.47	91.03	0.18	2.33
205A	94.54	91.51	91.50	0.26	3.03
206A	94.35	91.45	91.153	0.059323	2.90
207A	94.32	91.45	91.09	0.39	2.87
208A	94.19	91.45	90.88	0.00	2.74
209A	94.06	91.45	90.77	0.18	2.61
210A	94.59	91.90	91.89	0.25	2.69
211A	94.31	91.43	90.53	-0.03	2.88
212A	94.00	91.43	90.50	0.00	2.57
791D	94.32	91.41	90.27	0.00	2.91
SA74022	92.17	89.43	87.81	0.00	2.74

Project Number:	1414
Project Name:	4795 Bank Street Caivan
Prepared By:	TG
Date:	31-Jul-26

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

HGL Analysis Rare Condition

Name	Rim Elev. (m)	Max. HGL (m)	Inv Elev. (m)	Baseline (L/s)	Freeboard (m)
101A	93.37	91.15	91.14	0.28	2.22
102A	93.70	90.82	90.79	0.46	2.88
103A	93.65	90.94	90.93	0.22	2.71
104A	93.46	90.60	90.56	0.76	2.86
105A	93.08	90.26	90.21	0.70	2.82
106A	93.92	91.23	91.22	0.36	2.69
107A	93.43	90.74	90.70	0.86	2.69
108A	93.32	90.56	90.55	0.16	2.76
109A	93.18	90.40	90.36	0.29	2.78
110A	93.74	91.06	91.04	0.55	2.68
111A	93.38	90.61	90.57	0.75	2.77
112A	92.94	90.19	90.13	0.21	2.75
113A	92.70	89.92	89.86	-0.90	2.78
114A	93.07	90.36	90.34	0.31	2.71
115A	92.93	90.13	90.09	0.95	2.80
116A	92.46	89.87	89.63	1.32	2.59
117A	93.17	90.46	90.44	0.35	2.71
118A	92.71	89.84	89.72	0.54	2.87
119A	92.22	89.84	89.40	0.13	2.38
120A	92.02	89.80	89.20	0.15	2.22
121A	93.42	90.73	90.72	0.30	2.69
122A	93.11	90.33	90.31	0.28	2.78
123A	93.17	90.08	90.04	0.54	3.09
124A	92.89	90.14	90.12	0.16	2.75
125A	92.67	90.01	89.99	0.11	2.66
126A	92.57	89.85	89.832	0.12459	2.72
127A	92.52	89.79	89.73	0.32	2.73
128A	92.35	89.79	89.55	0.12	2.56
129A	92.31	89.79	89.48	0.50	2.52
130A	91.97	89.79	89.12	-0.09	2.18
131A	90.83	89.74	88.94	0.01	1.09
132A	90.30	89.70	88.76	0.03	0.60
133A	90.26	89.61	88.45	0.03	0.65
134A	90.89	89.52	88.13	0.01	1.37
135A	91.86	89.48	87.95	0.00	2.38
136A	92.21	89.46	87.90	0.00	2.75
201A	92.81	91.83	91.817	0.372777	0.98

Name	Rim Elev. (m)	Max. HGL (m)	Inv Elev. (m)	Baseline (L/s)	Freeboard (m)
2020A	93.97	91.51	91.23	0.17	2.46
202A	94.12	91.52	91.40	5.01	2.60
203A	94.09	91.50	91.39	0.28	2.59
204A	93.80	91.50	91.03	0.24	2.30
205A	94.54	91.51	91.50	0.32	3.03
206A	94.35	91.47	91.153	0.074323	2.88
207A	94.32	91.47	91.09	0.48	2.85
208A	94.19	91.47	90.88	0.00	2.72
209A	94.06	91.47	90.77	0.24	2.59
210A	94.59	91.90	91.89	0.32	2.69
211A	94.31	91.44	90.53	-0.03	2.87
212A	94.00	91.44	90.50	0.00	2.56
791D	94.32	91.41	90.27	0.00	2.91
SA74022	92.17	89.45	87.81	0.00	2.72

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TECHNICAL MEMORANDUM

DATE:	July 15, 2024
TO:	**Gib Patterson**
FROM:	Jeremy Chouinard, P.Eng.
SUBJECT:	**4795 Bank Street Off-Site Sanitary Sewer Evaluation of Alternative Sanitary Solutions**
OUR FILE:	23-1352
ATTACHMENTS:	• Memo – S-4 Leitrim Expansion Lands Sanitary Sewer Installation on Bank Street, prepared by Arcadis, July 11, 2024 • Email from the City of Ottawa dated June 17, 2024

Per the City of Ottawa's request following its review of DSEL's June 11th Adequacy of Servicing Review memo, DSEL has reviewed alternate sanitary servicing options for the S5 lands.

DSEL's June 11th memo focused on serviceability of the S5 lands via a new gravity sewer along Bank Street connecting to an existing sanitary sewer upstream of the Leitrim Pump Station. This memo will present three (3) additional servicing options:

1- New pump station on S5 lands with forcemains discharging into the 375mm inlet pipe at the Leitrim Pump Station.
2- Splitting sanitary drainage from the S5 lands, allowing gravity drainage to the existing communities to the North and West of the property.
3- Drain all sanitary flows from the S5 lands via gravity North to the existing community.

Furthermore, in the attached email dated June 17th, 2024, the City of Ottawa questioned the land use and whether water services would be required from Bank St. to the S5 lands.

While the street layout for the expansion area S5 is unknown, DSEL has assumed the lands will be dedicated to residential use and has used a metric of 75pop/ha for capacity verifications. Water connections will be required to service the property. It is recommended that water service stubs be brought to the property line as part of the current Bank Street Reconstruction project

Sanitary Servicing Options

The following sanitary servicing alternatives have been reviewed by DSEL:

Option 1) Bank Street Gravity Sewer

The first proposed option for sanitary drainage from the S5 lands was discussed in DSEL's June 11th Adequacy of Servicing Review, where a 420m long 300mm gravity sewer was proposed along Bank Street from the northern limits of the S5 lands to Findlay Creek Drive. Capacity in the downstream pipes was evaluated and found to be consistent with previously approved designs, when considering a total flow of 17.13 l/s from the subject property.

Option 2) New Pump Station on S5 Lands

Alternatively, a pump station and off-site forcemains, as illustrated in **Figure 1**, could replace the gravity sewer. Similar to the previous option, the forcemains would direct flows to the 375mm gravity sewer at the intersection of Bank Street and Findlay Creek Drive. A capacity analysis would yield similar findings as the gravity sewer option.

Figure 1 – Proposed Pump Station

Option 3) Split Drainage

DSEL investigated an option where sanitary drainage is split and sent to existing neighboring communities. **Figure 2** shows an area of 4.78 hectares 1800 294 0985 draining to an existing

manhole on Sora Way on the west side of Bank Street and an area of 10.99 hectares draining to an existing manhole on Shuttleworth Drive through the storm servicing block to the North.

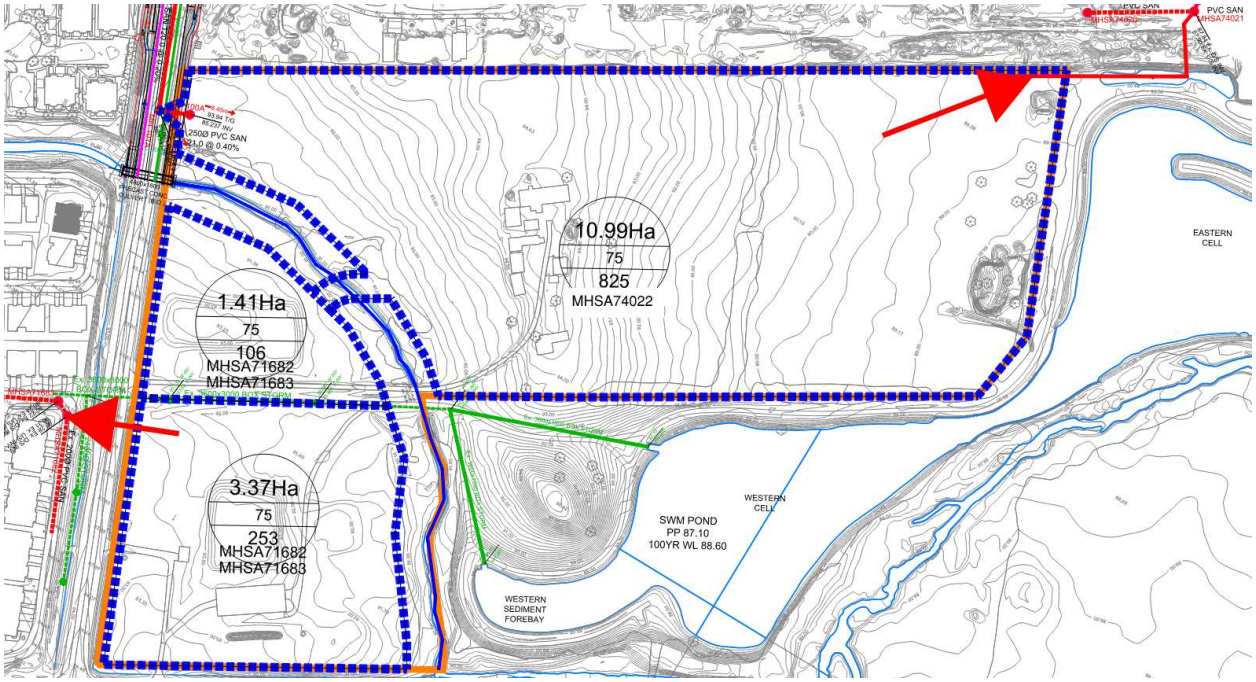


***Figure 2** – Proposed Split Drainage*

Using the design parameters seen in **Table 1**, design flows for the southern portion of the subject property were calculated to be 5.57 l/s and are proposed to drain to MHSA71683 on Sora Way. In addition to the sanitary flows from S5, the S4 lands also propose draining a portion of their lands to this existing sewer. A complete analysis of the residual capacities in exiting sewers and impacts on the sanitary HGL can be found in the attached memo prepared by Arcadis. DSEL completed a similar analysis for the northern 10.99ha area where design flows were calculated to be 12.40 l/s while residual capacities in the existing sewers range from 12.8-40 l/s.

***Table 1**: Wastewater Design Criteria*

Design Parameter	Value
Residential – Single Family	3.4 P/unit
Residential – Townhome	2.7 P/unit
Residential – Back-To-Back	1.8 P/unit
Average Daily Demand	280 L/d/per
Commercial and Institutional	28,000L/day/ha
Peaking Factor	Harmon's Peaking Factor. Max 4.0, Min 2.0 Harmon's Corrector Factor 0.8
Infiltration and Inflow Allowance	0.05 L/s/ha (Dry Weather) 0.28 L/s/ha (Wet Weather) 0.33 L/s/ha (Total)
Park Flows	0.33 L/s/ha
Parking Peaking Factor	9300 L/ha/d

Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} A R^{2/3} S^{1/2}$
Minimum Sewer Size	200 mm diameter
Minimum Manning's 'n'	0.013
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
Minimum Service Size	
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012, and recent residential subdivisions in City of Ottawa (including revisions per ISTB Sewer-2018-01)	

Option 4) All Sanitary Flows to Northern Community

The final option DSEL reviewed contemplated sending all sanitary flows from the 15.77ha parcel to the community to the north. The total design flows based on the parameters in **Table 1** were calculated to be 17.13l/s. In this option, the proposed design flows exceed the theoretical residual capacities in some lengths of sewer along Shuttleworth Drive. This option also introduces additional grade raise and earthworks constraints within the S5 lands.

Conclusion:

After reviewing several sanitary design options, DSEL has concluded that the first three options (Option 1-3) discussed above are feasible for servicing the S5 lands from a downstream sanitary capacity perspective.

Due to the complexity of off-site servicing and future operations/maintenance associated with Options 1 and 2, DSEL recommends further investigation of Option 3. Further analysis and discussions are required with the City of Ottawa to verify capacities of the existing downstream sewers.

Yours Truly,
David Schaeffer Engineering Ltd.

Per: Jeremy Chouinard, P.Eng.

Attachment 1 – Arcadis Bank Street Sanitary Report

Memo

SUBJECT
S-4 Leitrim Expansion Lands
Sanitary Sewer Installation on Bank Street

TO
Jeff Shillington
Senior Project Manager, Infrastructure Planning
City of Ottawa

DATE
July 11, 2024

OUR REF
Places Canada – Land Engineering

DEPARTMENT
Land Engineering

PROJECT NUMBER
145172

COPIES TO
Robin Van de Lande, City of Ottawa
John Bougadis, City of Ottawa
Evan Garfinkel, Regional Group

NAME
Ryan Magladry, C.E.T
ryan.magladry@arcadis.com

Arcadis Professional Services (Canada) Inc. has been retained by Regional Group to provide development consultation and design services for its property located at 4850 Bank Street, also known as area S-4 Leitrim Expansion Lands in the City's new official plan. This memo has been prepared to support the installation of a new sanitary sewer on Bank Street. The purpose of this memo is to provide information on the key design considerations and outline the necessity for installation to coincide with the City's work in the subject area.

1.1 Study Area

The new sanitary sewer would connect to the existing sewer in Labrador Crescent and extend approximately 165 m south along Bank Street, ending just past of the limit of construction of the city's contract. An aerial photo of the subject site location is provided below.

2.1 Project Description

The City of Ottawa S-4 Leitrim Expansion Lands, located to the south of the subject area, will require a sanitary sewer outlet to Bank Street when the land is serviced in future years. The proposed sewer outlet will flow north to the subject area and will connect to the existing infrastructure on Labrador Crescent to the west. The City of Ottawa has contracted to widen Bank Street from Leitrim Road to Blais/Miikana Road. Following discussions with the City of Ottawa and Regional Group, it is in both party's best interest to proceed with the installation of the sanitary sewer in the Bank Street contract limits, prior to a formal development approval. Proceeding with this installation will avoid future intersection disruptions and reinstatement costs, and delays associated with the Bank Street moratorium.

2.1.1 Scope of Work

The project shall include the installation of approximately 190 m of 200 mm diameter PVC pipe, 3 sanitary maintenance holes and a connection to the existing sanitary maintenance hole on Labrador Crescent. The scope of work will also include all excavation, support of existing utilities, backfilling, and compaction of the disturbed areas.

3.1 Existing Conditions

The proposed sanitary sewer will connect to the existing MH793A on Labrador Crescent. Arcadis has reviewed the downstream system from the subject area for theoretical residual capacity.

At the connection, the existing system has an available capacity of 15.60 L/s in a 200 mm diameter sewer, as shown on the as-built Sanitary Sewer Design Sheet prepared by IBI Group in 2017, located in **Appendix A.**

Downstream on Sora Way through Findlay Creek Village Stage 2 – Phase 4C to Cedar Creek Drive, residual capacities range from 14.35 to 7.83 L/s in a 200 mm diameter sewer. Continuing downstream on Sora Way, through Findlay Creek Village Stage 2 – Phase 4B to Kelly Farm Drive, residual capacities range from 21.05 to 5.99 L/s, in a 250 mm diameter sewer. Copies of the as-built sewer design sheets for Findlay Creek Village Stage 2 – Phase 4B and 4C have been included in **Appendix A.**

It should be noted that the existing conditions, as stated above, reflect the initial sewer design sheets prepared by IBI Group in Appendix A. The values in these design sheets were determined using the outdated City of Ottawa Sewer Design Criteria, where 350l/c/d was used for average residential flow and a Harmon Peaking Factor coefficient of 1.0 was used. Similarly, the extraneous flows (infiltration) used a rate of 0.28L/s. As part of the proposed analysis presented in section 3.9, the Sora Way sanitary sewer has been re-evaluated using current City of Ottawa Sewer Design Criteria from its connection on Labrador Crescent to Kelly Farm Drive.

At Kelly Farm Drive, flows continue north in a 375 mm diameter sewer to Findlay Creek Drive and head east to the Findlay Creek Sanitary Pumping Station.

3.2 Design Criteria

The sanitary flows for the subject lands were determined using on current City of Ottawa Sewer Design Criteria and the population densities established in the MSS, which include, but is not limited to the following:

3.2.1 Design Flow

- Population density = 60ppl/ha
- Average residential flow = 280 l/c/d
- Peak residential flow factor = (Harmon Formula) x 0.80
- Inflow and Infiltration Rate = 0.33 l/s/ha

- Minimum Full Flow Velocity = 0.60 m/s
- Maximum Full Flow Velocity = 3.0 m/s
- Minimum Pipe Size = 200 mm diameter
- Minimum Design Slope = 0.32%

3.5 Proposed Wastewater Disposal System

The S-4 Leitrim Expansion Lands are proposed to discharge into a future wastewater disposal system on Bank Street. The wastewater will flow north to the subject area and tie into the existing infrastructure on Labrador Crescent. The wastewater will then enter the existing Findlay Creek Village Stage 2 – Phase 4C sewer system and flow west on Sora Way to Kelly Farm Drive, continuing north on Kelly Farm Drive to Findlay Creek Drive. At Findlay Creek Drive, the flow will head east into the Findlay Creek Sanitary Pumping Station.

Proposed Sanitary sewers will consist of 200 mm dia. PVC pipe, constructed to current City of Ottawa design standards. A detailed sanitary sewer design sheet, plan and profile drawings **145172-100/101** and a Sanitary Drainage Area Plan **Figure 1** are provided in **Appendix B**. They demonstrate the sewers have been designed to meet City of Ottawa sewer design criteria and MECP guidelines.

3.6 Proposed Peak Flow Calculations

As previously noted, the concept development plan is not completed and therefore an approximated population density, based on the OSDG of 60ppl/Ha has been used. The total anticipated design population tributary to Labrador Crescent is indicated below.

AREA	POPULATION DENSITY	POPULATION
8.47 Ha	60 ppl/ ha	508

Using the population design calculated above, the peak design flow inclusive of extraneous flows (infiltration), has been demonstrated below.

POPULATION	280L/POP/DAY	PEAK FAFACTOR	PEAK FLOW (L/s)	AREA (ha)	EXT. FLOW (L/s)	TOTAL FLOW (L/s)
508	280	3.38	5.56	8.47	2.80	8.36
N/A				2.25	0.74	0.74
N/A				0.66	0.22	0.22
			Total:	**11.38**	**3.76**	**9.32**

The approximated flow, calculated from the future S-4 Expansion Lands inclusive of an infiltration allowance on Bank Street, is **9.32 L/s**. This was determined using the current Ottawa Sewer Design Criteria, as depicted in section 3.2 of this memo.

3.7 Additional Flows From S-5 Lands

Subsequent to initial discussions with the City, David Schaeffer Engineering Ltd. (DSEL) has contacted Arcadis to consider the south-western portion of the S-5 Leitrim Expansion Lands in the Sora Way sanitary sewer analysis.

DSEL has provided preliminary wastewater flows for approximately 4.78 ha of future development land south of the existing Findlay Creek. The estimated peak flows provided by DSEL are **5.57 L/s**, using a population density of 75 people/ha. Correspondence from DSEL has been provided in **Appendix C**.

3.8 Total Flows to Sora Way

As mentioned in sections 3.6 and 3.7, the estimated peak flows from the S-4 Leitrim Expansion Lands are **9.32 L/s,** and the estimated peak flows from the S-5 Leitrim Expansion Lands are **5.57 L/s**. Therefore, the total additional estimated flows to Sora Way are **14.89 L/s**.

3.9 Verification of Residual Capacity

As noted in section 3.1, using the current City of Ottawa Sewer Design Criteria, Arcadis has reviewed the downstream sewer system from the connection point on Labrador Crescent to Kelly Farm Drive. The calculations are provided on the Sewer Design sheet in **Appendix B** and summarized below.

U/S MH ID	D/S MH ID	Combined Peak Design Flow Q_p (L/s)	Pipe Capacity (L/s)	Residual Capacity (L/s)
735A	730A	34.19	46.84	12.65
740A	735A	33.87	31.63	*-2.24*
750A	740A	33.59	31.02	*-2.57*
760A	750A	31.85	31.02	*-0.83*
770A	760A	30.72	31.02	0.30
780A	770A	22.42	19.66	*-2.76*
790A	780A	20.60	20.24	*-0.36*
791D	790A	17.80	19.66	1.86
791A	791D	12.99	19.66	6.67
792A	791A	12.92	21.09	8.17
793A	792A	12.59	19.95	7.36

Based on the current City of Ottawa Sewer Design Criteria, the proposed design flows exceed the theoretical residual capacity at several locations along Sora Way. The net result is that some localized minor surcharging to the existing system may occur during theoretical peak conditions.

A static HGL analysis has been completed for Sora Way to determine the estimated surcharging effect on the existing sewer. The calculations are included in Appendix B and summarized in the table below.

MH ID	Sewer Obvert Elevation (m)	Static HGL (m)	Height of Surcharge (m)	Low USF (m)	Freeboard (m)
730A	88.330	88.330*		N/A	N/A
735A	88.934	88.847	-0.088	92.10	3.25
740A	89.066	89.066	*0*	92.45	3.38
750A	89.330	89.367	*0.037*	92.20	2.83
760A	89.539	89.600	*0.061*	N/A	N/A
770A	89.752	89.820	*0.068*	N/A	N/A
780A	89.812	90.198	*0.386*	92.28	2.08
790A	90.265	90.425	*0.160*	92.43	2.00
791D	90.413	90.546	*0.133*	92.58	2.03
791A	90.472	90.563	*0.091*	92.58	2.02
792A	90.820	90.736	-0.084	92.68	1.94
793A	91.091	91.007	-0.084	92.73	1.72

*For calculation purposes only, the downstream HGL at Kelly Farm Drive has been assumed to be equal to the pipe obvert.

We have also reviewed the existing house footing elevations; generally, the USF elevations range from 92.10 to 92.63 on Sora Way (from Kelly Farm to Labrador), and 92.58 to 92.73 on Labrador Crescent. The elevation of the existing sanitary sewer on Sora Way ranges from invert 88.210 to 90.275 (from Kelly Farm to Labrador), and from 90.472 to 91.091 on Labrador Crescent. The freeboard in this system ranges from 3.4m to 1.7m. Therefore, the minor localized surcharging resulting from the additional flows will not impact existing houses in the area.

3.10 Conclusions

This memo and the accompanying working drawings indicate that the proposed sanitary sewer meets the requirements of the stakeholder regulators, including the City of Ottawa, provincial MECP and SNC.

The design will be subject to governmental approval prior to construction, including but not limited to the following:

- Commence Work Notification: City of Ottawa
- Municipal Consent Circulation
- Addition to the City of Ottawa's CLI ECA

Ryan Magladry, C.E.T
Associate | Manager, Land Engineering

Demetrius Yannoulopoulos, P.Eng
Director | Office Lead

Angela Soward, EIT
Engineer in Training

Appendix A

FCV ST2 – PH4A – Sanitary Sewer Design Sheet

FCV ST2 - PH4B – Sanitary Sewer Design Sheet

FCV ST2 – PH4C – Sanitary Sewer Design Sheet

CUMMING COCKBURN LIMITED
1770 WOODWARD DRIVE
OTTAWA, ONTARIO
K2C 0P8

SANITARY SEWER DESIGN SHEET

Project: Findlay Creek Village Phase 4
Location: City of Ottawa
Owner: Findlay Creek Properties Ltd. And 1374537ontario Limited (Tartan)

Date: 26-Sep-05
Design: JIM Review: RK

LOCATION			INDIVIDUAL RESIDENTIAL						CUMULATIVE RESID'L FLOW			CUMULATIVE ICI FLOW			INFILTRATION ALLOWANCE			TOTAL	PROPOSED SEWER DESIGN					
Street	From MH	To MH	Residential Units Sing/Semi	Towns	Mixed Use	Area (Ha.)	Population	ICI Area (Ha.)	Population	Peaking Factor	Peak Flow (l/s)	Area	Pk. Fact.	Pk. Flow (l/s)	Incr. Area (Ha.)	Cum. Area (Ha.)	Flow (l/s)	FLOW (l/s)	Capacity (l/s)	Pipe Size (mm)	Length (M)	Slope (%)	Velocity(f) M/sec	Avail. Cap. (%)
Findlay Creek Drive	290 A	280 A				0.28	0		0	4.00	0.00			0.00	1.58	1.58	0.44	0.44	21.64	200	106.2	0.40	0.67	97.96
Findlay Creek Drive	280 A	265A				0.26	0	0.31	0	4.00	0.00	0.31	1.50	0.47	0.57	2.15	0.60	1.07	21.64	200	103.9	0.40	0.67	95.07
Netley Circle	323A	322A	10			0.81	32		32	4.00	0.52			0.00	0.81	0.81	0.23	0.75	27.59	200	99.2	0.65	0.85	97.29
	322A	265A	15			1.21	48		80	4.00	1.30			0.00	1.21	2.02	0.57	1.87	39.24	250	140.0	0.40	0.77	95.25
Findlay Creek Drive	265 A	250A				0.26	0		80	4.00	1.30	0.31	1.50	0.47	0.26	4.43	1.24	3.01	39.24	250	102.1	0.40	0.77	92.34
	323A	327A	13			1.11	42		42	4.00	0.67			0.00	1.11	1.11	0.31	0.98	27.59	200	185.5	0.65	0.85	96.45
Netley Circle	327A	250A	17			1.35	54		96	4.00	1.56			0.00	1.35	2.46	0.69	2.25	39.24	250	146.0	0.40	0.77	94.27
Findlay Creek Drive	250 A	235 A				0.23	0		176	4.00	2.85			0.00	0.23	7.12	1.99	4.84	39.24	250	70.8	0.40	0.77	87.66
Cedar Creek Drive	341A	320A	3	4		0.25	19		19	4.00	0.31			0.00	0.25	0.25	0.07	0.38	34.22	200	50.0	1.00	1.06	98.89
Block 120	Bulkhead	320A			60	1.04	114		114	4.00	1.85			0.00	1.04	1.04	0.29	2.14	39.24	250	13.0	0.40	0.77	94.54
Cedar Creek Drive	320A	319A	11			0.52	35		168	4.00	2.73			0.00	0.52	1.81	0.51	3.24	39.24	250	89.5	0.40	0.77	91.75
Hillman Marsh Way	313A	310A	11	9		0.68	57		57	4.00	0.92			0.00	0.68	0.68	0.19	1.11	27.59	200	72.0	0.65	0.85	95.98
Hillman Marsh Way	313A	315A	5	8		0.58	35		35	4.00	0.57			0.00	0.58	0.58	0.16	0.73	27.59	200	83.4	0.65	0.85	97.35
Old Crow Way	*Ex MH*	315A	4	8		0.48	32		32	4.00	0.52			0.00	0.48	0.48	0.13	0.65	28.63	200	102.8	0.70	0.88	97.71
Hillman Marsh Way	315A	319A	12	8		0.77	58		125	4.00	2.02			0.00	0.77	1.83	0.51	2.53	39.24	250	159.3	0.40	0.77	93.55
Cedar Creek Drive	319 A	Ex Stub	4	8		0.51	32		325	4.00	5.27			0.00	0.51	4.15	1.16	6.43	39.24	250	96.0	0.40	0.77	83.61
Kelly Farm Drive (External)		700A				31.50	1890								31.50									
Kelly Farm Drive (External)		700A				56.00	3360								56.00	87.50								
	700A	333A	0	0		0.00	0		5250	3.23	68.59				0.00	87.50	24.50	93.09	115.68	375	182.3	0.40	1.02	19.53
High Level Sewer																								
Kelly Farm Drive	336B	335B	16	16		1.19	96		96	4.00	1.45			0.00	1.19	1.19	0.33	1.78	28.63	200	139.7	0.70	0.88	95.77
	335B	333B	16	17		1.18	92		92	4.00	1.49			0.00	1.18	1.18	0.33	1.82	28.63	200	139.7	0.70	0.88	93.64
Alasken Drive		Bulkhead				8.32	499		499						8.32									
	Bulkhead	333B		8		0.27	19		518	3.97	8.33				0.27	8.59	2.41	10.74	55.26	300	38.0	0.30	0.76	80.57
	333B	333A	0	0		0	0		700	3.89	11.04				0.00	10.96	3.07	14.11	55.26	300	7.3	0.30	0.76	74.47
Kelly Farm Drive	333A	331A	0	0		0	0		5950	3.17	76.51				0.00	98.46	27.57	104.08	115.68	375	135.7	0.40	1.02	10.03

Population Per Unit: 3.2 For Singles/Semi's
2.4 Townhouses
1.9 Mixed Use
Avg. Per Capita Flow Rate: 350 l/day
Infiltration Allowance: 0.28 l/sec/Ha
Residential Peaking Factor: Harmon Formula = 1+(14/(4+P^0.5)) where P = pop'n in thousands
Avg. Commercial/Institutional: 50000 l/Ha/day with Peaking Factor = 1.5
Avg. Pop'n Density Other Lands: 60 persons/Ha

Assumed pipe loss ceofficient = 0.013

Revisions:
No. 1 03-Nov-05

IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

LEGEND

Black text	5 year event curve design
Dark Red	*As-Built Length and Slope*
Grey Text	*Exisitng Sewer Length and Slope*

SANITARY SEWER DESIGN SHEET

PROJECT: FINDLAY CREEK VILLAGE STAGE 2 PHASE 4C
LOCATION: CITY OF OTTAWA
CLIENT: FINDLAY CREEK PARTNERSHIP

LOCATION				RESIDENTIAL									ICI AREAS							INFILTRATION ALLOWANCE			TOTAL	PROPOSED SEWER DESIGN						
				UNIT TYPES				AREA	POPULATION		PEAK	PEAK	AREA (Ha)						PEAK	AREA (Ha)		FLOW	FLOW	CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
											FACTOR	FLOW	INSTITUTIONAL		COMMERCIAL		INDUSTRIAL		FLOW									(full)		
STREET	AREA ID	FROM MH	TO MH	SF	SD	TH	APT	(Ha)	IND	CUM		(L/s)	IND	CUM	IND	CUM	IND	CUM	(L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(m/s)	L/s	(%)
SAGEBRUSH CRESCENT	763Aa	MH763A	MH754A	5				0.34	16.0	16.0	4.00	0.26		0.00		0.00		0.00	0.00	0.34	0.34	0.10	0.35	28.01	*54.80*	200	*0.67*	0.864	27.65	98.73%
SAGEBRUSH CRESCENT	754A	MH754A	MH753A	2				0.23	6.4	22.4	4.00	0.36		0.00		0.00		0.00	0.00	0.23	0.57	0.16	0.52	28.42	*17.40*	200	*0.69*	0.876	27.90	98.16%
SAGEBRUSH CRESCENT	753A	MH753A	*BULK750AN*	16				0.84	51.2	73.6	4.00	1.19		0.00		0.00		0.00	0.00	0.84	1.41	0.39	1.59	26.94	*90.40*	200	*0.62*	0.831	25.35	94.11%
SAGEBRUSH CRESCENT		*BULK750AN*	*MH750A*						0.0	73.6	4.00	1.19		0.00		0.00		0.00	0.00	0.00	1.41	0.39	1.59	20.24	*18.00*	*200*	*0.35*	0.624	18.66	92.16%
SAGEBRUSH CRESCENT	763Ab	MH763A	MH762A	2				0.21	6.4	6.4	4.00	0.10		0.00		0.00		0.00	0.00	0.21	0.21	0.06	0.16	29.23	*15.90*	200	*0.73*	0.901	29.07	99.44%
SAGEBRUSH CRESCENT	762A	MH762A	*BULK760AN*	15				0.81	48.0	54.4	4.00	0.88		0.00		0.00		0.00	0.00	0.81	1.02	0.29	1.17	27.59	*89.80*	200	*0.65*	0.851	26.42	95.77%
SAGEBRUSH CRESCENT		*BULK760AN*	*MH760A*						0.0	54.4	4.00	0.88		0.00		0.00		0.00	0.00	0.00	1.02	0.29	1.17	27.59	*18.00*	*200*	*0.65*	0.851	26.42	95.77%
ERIC MALONEY	787A	MH787A	MH788A	3				0.20	9.6	9.6	4.00	0.16		0.00		0.00		0.00	0.00	0.20	0.20	0.06	0.21	27.16	*45.86*	200	*0.63*	0.837	26.95	99.22%
ERIC MALONEY	788A	MH788A	MH789A	6				0.32	19.2	28.8	4.00	0.47		0.00		0.00		0.00	0.00	0.32	0.52	0.15	0.61	28.22	*64.85*	200	*0.68*	0.870	27.60	97.83%
ERIC MALONEY	789A	MH789A	MH789B	3				0.18	9.6	38.4	4.00	0.62		0.00		0.00		0.00	0.00	0.18	0.70	0.20	0.82	27.80	*36.68*	200	*0.66*	0.857	26.98	97.06%
ERIC MALONEY		MH789B	*MH772A*						0.0	38.4	4.00	0.62		0.00		0.00		0.00	0.00	0.00	0.70	0.20	0.82	19.66	*18.10*	200	*0.33*	0.606	18.84	95.84%
ERIC MALONEY	786A	MH786A	MH785A			6		0.27	14.4	14.4	4.00	0.23		0.00		0.00		0.00	0.00	0.27	0.27	0.08	0.31	28.01	*47.68*	200	*0.67*	0.864	27.70	98.90%
ERIC MALONEY	785A	MH785A	MH784A			1		0.05	2.4	16.8	4.00	0.27		0.00		0.00		0.00	0.00	0.05	0.32	0.09	0.36	28.83	*10.78*	200	*0.71*	0.889	28.47	98.75%
ERIC MALONEY	784A	MH784A	MH783A			10		0.28	24.0	40.8	4.00	0.66		0.00		0.00		0.00	0.00	0.28	0.60	0.17	0.83	27.37	*50.95*	200	*0.64*	0.844	26.54	96.97%
ERIC MALONEY	783A	MH783A	MH782A			14		0.37	33.6	74.4	4.00	1.21		0.00		0.00		0.00	0.00	0.37	0.97	0.27	1.48	19.95	*51.03*	200	*0.34*	0.615	18.47	92.60%
ERIC MALONEY	782A	MH782A	MH781A			4		0.18	9.6	84.0	4.00	1.36		0.00		0.00		0.00	0.00	0.18	1.15	0.32	1.68	21.91	*11.93*	200	*0.41*	0.676	20.23	92.32%
ERIC MALONEY	781A	MH781A	MH780A			8		0.30	19.2	103.2	4.00	1.67		0.00		0.00		0.00	0.00	0.30	1.45	0.41	2.08	19.95	*67.17*	200	*0.34*	0.615	17.87	89.58%
BLAIS ROAD	COM., 794A	BULK794AS	MH794A					0.49	0.0	0.0	4.00	0.00		0.00	3.41	3.41		0.00	2.96	3.90	3.90	1.09	4.05	19.66	*33.00*	200	*0.33*	0.606	15.60	79.38%
LABRADOR CRESCENT		MH794A	MH793A						0.0	0.0	4.00	0.00		0.00		3.41		0.00	2.96	0.00	3.90	1.09	4.05	19.66	*19.60*	200	*0.33*	0.606	15.60	79.38%
LABRADOR CRESCENT	793A	MH793A	MH792A			10		0.26	24.0	24.0	4.00	0.39		0.00		3.41		0.00	2.96	0.26	4.16	1.16	4.51	19.95	*73.40*	200	*0.34*	0.615	15.44	77.38%
LABRADOR CRESCENT	792A	MH792A	MH791A			10		0.23	24.0	48.0	4.00	0.78		0.00		3.41		0.00	2.96	0.23	4.39	1.23	4.97	21.09	*86.10*	200	*0.38*	0.650	16.13	76.45%
LABRADOR CRESCENT	791Ab	MH791A	MH791D			2		0.08	4.8	52.8	4.00	0.86		0.00		3.41		0.00	2.96	0.08	4.47	1.25	5.07	19.66	*9.50*	200	*0.33*	0.606	14.59	74.22%
SORA WAY	791Aa	MH791D	MH790A			5		0.17	12.0	64.8	4.00	1.05		0.00		3.41		0.00	2.96	0.17	4.64	1.30	5.31	19.66	*40.85*	200	*0.33*	0.606	14.35	72.99%
LABRADOR CRESCENT	795A	MH795A	MH796A			3		0.10	7.2	7.2	4.00	0.12		0.00		0.00		0.00	0.00	0.10	0.10	0.03	0.14	28.63	*12.99*	200	*0.70*	0.883	28.48	99.49%
LABRADOR CRESCENT	796A	MH796A	MH797A			21		0.41	50.4	57.6	4.00	0.93		0.00		0.00		0.00	0.00	0.41	0.51	0.14	1.08	27.37	*91.56*	200	*0.64*	0.844	26.30	96.07%
HAWKMERE WAY	769A	MH769A	MH768A			1		0.10	2.4	60.0	4.00	0.97		0.00		0.00		0.00	0.00	0.10	0.61	0.17	1.14	21.09	*11.33*	200	*0.38*	0.650	19.95	94.58%
HAWKMERE WAY	768A	MH768A	MH767A			8		0.24	19.2	19.2	4.00	0.31		0.00		0.00		0.00	0.00	0.24	0.24	0.07	0.38	27.59	*35.76*	200	*0.65*	0.851	27.21	98.63%
HAWKMERE WAY	767A	MH767A	MH766A			22		0.54	52.8	72.0	4.00	1.17		0.00		0.00		0.00	0.00	0.54	0.78	0.22	1.39	19.95	*78.10*	200	*0.34*	0.615	18.57	93.06%
HAWKMERE WAY	766A	MH766A	MH765A			4		0.20	9.6	81.6	4.00	1.32		0.00		0.00		0.00	0.00	0.20	0.98	0.27	1.60	22.44	*11.01*	200	*0.43*	0.692	20.84	92.88%
HAWKMERE WAY	765A	MH765A	MH797A			5		0.19	12.0	93.6	4.00	1.52		0.00		0.00		0.00	0.00	0.19	1.17	0.33	1.84	21.09	*40.52*	200	*0.38*	0.650	19.25	91.26%
LABRADOR CRESCENT	797A	MH797A	MH798A			9		0.22	21.6	172.8	4.00	2.80		0.00		0.00		0.00	0.00	0.22	1.90	0.53	3.33	20.81	*69.56*	200	*0.37*	0.642	17.48	83.99%
LABRADOR CRESCENT		MH798A	MH790A						0.0	172.8	4.00	2.80		0.00		0.00		0.00	0.00	0.00	1.90	0.53	3.33	21.37	*10.62*	200	*0.39*	0.659	18.04	84.41%
SORA WAY	790A	MH790A	MH780A			13		0.39	31.2	268.8	4.00	4.36		0.00		3.41		0.00	2.96	0.39	6.93	1.94	9.26	20.24	*57.35*	200	*0.35*	0.624	10.99	54.27%
SORA WAY	780A	MH780A	*BULK770E*			10		0.36	24.0	396.0	4.00	6.42		0.00		3.41		0.00	2.96	0.36	8.74	2.45	11.82	19.66	*62.24*	200	*0.33*	0.606	7.83	39.85%
SORA WAY		*BULK770E*	*MH770A*						0.0	396.0	4.00	6.42		0.00		3.41		0.00	2.96	0.00	8.74	2.45	11.82	19.66	*18.39*	*200*	*0.33*	0.606	7.83	39.85%

Error

should read 175.2

Error

should read 2.00

Design Parameters:

Residential			ICI Areas			Peak Factor
SF	3.2	p/p/u				
TH/SD	2.4	p/p/u	INST	50,000	L/Ha/day	1.5
APT	1.9	p/p/u	COM	50,000	L/Ha/day	1.5
Other	60	p/p/Ha	IND	35,000	L/Ha/day	MOE Chart
				17000	L/Ha/day	

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day 300 L/day
3. Infiltration allowance: 0.28 L/s/Ha 0.4 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+P^0.5))
   where P = population in thousands

Designed: W.Y.

Checked: J.I.M.

Dwg. Reference: 34249

No.	Revision	Date
1.	SUBMISSION #1 FOR CITY REVIEW	30/06/2016
2.	SUBMISSION #2 FOR CITY REVIEW	25/08/2016
3.	ISSUED FOR MOECC APPROVAL	20/09/2016
4.	SUBMISSION #3 FOR CITY REVIEW	14/10/2016
5.	AS-BUILT	6/7/2017

File Reference:	Date:	Sheet No:
34249.5.7.1	30/06/2016	1 of 1

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
July 7/17
PROVINCE OF ONTARIO

IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

SANITARY SEWER DESIGN SHEET

PROJECT: FINDLAY CREEK VILLAGE STAGE 2 PHASE 4B
LOCATION: CITY OF OTTAWA
CLIENT: FINDLAY CREEK PARTNERSHIP

LOCATION				RESIDENTIAL									ICI AREAS							INFILTRATION ALLOWANCE			TOTAL	PROPOSED SEWER DESIGN						
				UNIT TYPES				AREA	POPULATION		PEAK	PEAK	AREA (Ha)						PEAK	AREA (Ha)		FLOW	FLOW	CAPACITY	LENGTH	DIA	SLOPE	VELOCITY (full)	AVAILABLE CAPACITY	
											FACTOR	FLOW	INSTITUTIONAL		COMMERCIAL		INDUSTRIAL		FLOW											
STREET	AREA ID	FROM MH	TO MH	SF	SD	TH	APT	(Ha)	IND	CUM		(L/s)	IND	CUM	IND	CUM	IND	CUM	(L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(m/s)	L/s	(%)
HELEN RAPP WAY	705Ab	EX. 705A	738A	5				0.34	16.0	16.0	4.00	0.26							0.00	0.34	0.34	0.10	0.35	27.16	80.06	200	0.63	0.837	26.80	98.69%
HELEN RAPP WAY	735Aa	735A	736A	2				0.20	6.4	6.4	4.00	0.10							0.00	0.20	0.20	0.06	0.16	26.06	9.61	200	0.58	0.804	25.90	99.39%
HELEN RAPP WAY	736A	736A	737A	12				0.65	38.4	44.8	4.00	0.73							0.00	0.65	0.85	0.24	0.96	28.42	74.63	200	0.69	0.876	27.46	96.61%
HELEN RAPP WAY	737A	737A	738A	6				0.36	19.2	64.0	4.00	1.04							0.00	0.36	1.21	0.34	1.38	19.95	67.66	200	0.34	0.615	18.58	93.10%
MABERLY WAY	738A	738A	731A	9				0.52	28.8	108.8	4.00	1.76							0.00	0.52	2.07	0.58	2.34	22.17	73.95	200	0.42	0.684	19.83	89.44%
HELEN RAPP WAY	735Ab	735A	734A	5				0.28	16.0	16.0	4.00	0.26							0.00	0.28	0.28	0.08	0.34	28.01	65.02	200	0.67	0.864	27.67	98.79%
HELEN RAPP WAY	734A	734A	733A	2				0.18	6.4	22.4	4.00	0.36							0.00	0.18	0.46	0.13	0.49	37.48	9.95	200	1.20	1.156	36.99	98.69%
HELEN RAPP WAY	733A	733A	732A	11				0.54	35.2	57.6	4.00	0.93							0.00	0.54	1.00	0.28	1.21	26.72	72.44	200	0.61	0.824	25.51	95.46%
HELEN RAPP WAY	732A	732A	731A	6				0.33	19.2	76.8	4.00	1.24							0.00	0.33	1.33	0.37	1.62	19.95	70.36	200	0.34	0.615	18.33	91.90%
MABERLY WAY	731A	731A	EX. STUB	9				0.51	28.8	214.4	4.00	3.47							0.00	0.51	3.91	1.09	4.57	39.46	75.19	200	1.33	1.217	34.89	88.42%
MABERLY WAY		EX. STUB	EX.730A						0.0	214.4	4.00	3.47							0.00	0.00	0.00	0.00	3.47	20.24	5.00	200	0.35	0.624	16.77	82.84%
KELLY FARM DRIVE	RES., COM., INST.		647A					61.75	3668.8	3668.8	3.37	50.04	2.46	2.46	7.12	7.12			8.32	75.67	75.67	21.19	79.54							
KELLY FARM DRIVE	647A	647A	742A			5		0.28	12.0	3680.8	3.37	50.18		2.46		7.12			8.32	0.28	75.95	21.27	79.76	101.84	80.31	375	0.31	0.893	22.08	21.68%
KESTREL STREET	FUT.	BULKHEAD	751A			22		0.65	52.8	52.8	4.00	0.86							0.00	0.65	0.65	0.18	1.04	31.55	18.75	200	0.85	0.973	30.51	96.71%
KESTREL STREET	751A	751A	745A			4		0.12	9.6	62.4	4.00	1.01							0.00	0.12	0.12	0.03	1.04	29.83	25.77	200	0.76	0.920	28.78	96.50%
KESTREL STREET	745A, PARK	745A	742A			11		0.37	26.4	88.8	4.00	1.44							0.00	0.37	1.02	0.29	1.72	28.22	88.63	200	0.68	0.870	26.49	93.89%
KELLY FARM DRIVE	742A	742A	741A			11		0.39	26.4	3796.0	3.35	51.57		2.46		7.12			8.32	0.39	77.36	21.66	81.55	96.79	74.52	375	0.28	0.849	15.24	15.75%
KELLY FARM DRIVE	741A	741A	EX.730A			5		0.28	12.0	3808.0	3.35	51.71		2.46		7.12			8.32	1.50	78.86	22.08	82.11	114.23	73.37	375	0.39	1.002	32.12	28.12%
REDPOLL WAY	FUT.	BULKHEAD	772A	12				0.70	38.4	38.4	4.00	0.62							0.00	1.92	1.92	0.54	1.16	19.66	14.30	200	0.33	0.606	18.50	94.10%
CEDAR CREEK DRIVE	772A	772A	771A			16		0.57	38.4	76.8	4.00	1.24							0.00	1.79	3.71	1.04	2.28	19.95	71.89	200	0.34	0.615	17.67	88.56%
CEDAR CREEK DRIVE	771A	771A	770A			18		0.56	43.2	120.0	4.00	1.94							0.00	1.78	5.49	1.54	3.48	20.81	74.46	200	0.37	0.642	17.33	83.27%
CEDAR CREEK DRIVE	FUT.	777A	770A			161		4.75	386.4	386.4	4.00	6.26							0.00	4.75	4.75	1.33	7.59	19.66	25.14	200	0.33	0.606	12.06	61.38%
SORA WAY	FUT., COM.	BULKHEAD	770A	24		65	48	5.29	324.0	324.0	4.00	5.25			3.41	3.41			2.96	8.70	8.70	2.44	10.65	19.95	18.39	200	0.34	0.615	9.31	46.64%
SORA WAY	770A	770A	760A	3				0.27	9.6	840.0	3.85	13.09				3.41			2.96	0.27	19.21	5.38	21.43	31.02	82.14	250	0.25	0.612	9.59	30.91%
SAGEBUSH CRESCENT	FUT.	BULKHEAD	760A	16				0.97	51.2	51.2	4.00	0.83							0.00	0.97	0.97	0.27	1.10	24.19	18.00	200	0.50	0.746	23.09	95.45%
SORA WAY	760A	760A	750A	6				0.37	19.2	910.4	3.83	14.11				3.41			2.96	0.37	20.55	5.75	22.82	31.02	81.07	250	0.25	0.612	8.20	26.42%
SAGEBUSH CRESCENT	FUT.	BULKHEAD	750A	22				1.46	70.4	70.4	4.00	1.14							0.00	1.46	1.46	0.41	1.55	22.70	18.00	200	0.44	0.700	21.15	93.17%
SORA WAY	750A	750A	740A	13				0.68	41.6	1022.4	3.79	15.71				3.41			2.96	0.68	22.69	6.35	25.03	31.02	94.16	250	0.25	0.612	5.99	19.32%
SORA WAY	740A	740A	735A	6				0.31	19.2	1041.6	3.79	15.99				3.41			2.96	0.31	23.00	6.44	25.39	31.63	40.58	250	0.26	0.624	6.25	19.75%
SORA WAY	735A	735A	EX.730A	6				0.46	19.2	1060.8	3.78	16.26				3.41			2.96	0.46	23.46	6.57	25.79	46.84	105.34	250	0.57	0.924	21.05	44.95%
SILVERBELL CRESCENT	714Aa	714A	715A	1				0.11	3.2	3.2	4.00	0.05							0.00	0.11	0.11	0.03	0.08	30.60	10.68	200	0.80	0.944	30.52	99.73%
SILVERBELL CRESCENT	715A	715A	716A	5	3	4		0.55	32.8	36.0	4.00	0.58							0.00	0.55	0.66	0.18	0.77	26.28	70.03	200	0.59	0.810	25.51	97.08%
SILVERBELL CRESCENT	716A	716A	EX.717A	3	4			0.29	19.2	55.2	4.00	0.89							0.00	0.29	0.95	0.27	1.16	21.91	33.95	200	0.41	0.676	20.75	94.70%
SILVERBELL CRESCENT	717A	EX.717A	EX.720A	2	1			0.19	8.8	64.0	4.00	1.04							0.00	0.19	1.14	0.32	1.36	20.24	31.48	200	0.35	0.624	18.89	93.30%
SILVERBELL CRESCENT	714Ab	714A	713A	5				0.36	16.0	16.0	4.00	0.26							0.00	0.36	0.36	0.10	0.36	27.37	61.34	200	0.64	0.844	27.01	98.68%
SILVERBELL CRESCENT	713A	713A	712A	1				0.08	3.2	19.2	4.00	0.31							0.00	0.08	0.44	0.12	0.43	31.73	11.53	200	0.86	0.978	31.30	98.63%
SILVERBELL CRESCENT	712A	712A	EX.711A			9		0.38	21.6	40.8	4.00	0.66							0.00	0.38	0.82	0.23	0.89	27.59	79.63	200	0.65	0.851	26.70	96.77%
SILVERBELL CRESCENT	711A	EX.711A	EX.700A			3		0.14	7.2	48.0	4.00	0.78							0.00	0.14	0.96	0.27	1.05	20.24	31.60	200	0.35	0.624	19.20	94.83%
KELLY FARM DRIVE		EX.700A	EX.334A						0.0	5304.0	3.22	69.21		2.46		10.53			11.28	0.00	111.04	31.09	111.58	121.33	89.60	375	0.44	1.064	9.75	8.04%

Design Parameters:

Residential			ICI Areas			Peak Factor
SF	3.2	p/p/u	INST	50,000	L/Ha/day	1.5
TH/SD	2.4	p/p/u	COM	50,000	L/Ha/day	1.5
APT	1.9	p/p/u	IND	35,000	L/Ha/day	MOE Chart
Other	60	p/p/Ha		17000	L/Ha/day	

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day 300 L/day
3. Infiltration allowance: 0.28 L/s/Ha 0.4 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+P^0.5))
   where P = population in thousands

Designed: P.K.

Checked: J.I.M.

Dwg. Reference: 34249 - 501C & 501D

No.	Revision	Date
1.	SUBMISSION #1 FOR CITY REVIEW	21/11/2014
2.	SUBMISSION #2 FOR CITY REVIEW	28/04/2015
3.	RE-SUBMISSION #2 FOR CITY REVIEW	31/07/2015
4.	AS-BUILT (Silverbell, Maberly and Helen Rapp (MH705A to MH 734A))	7/3/2016
5	AS-BUILT	8/8/2016

File Reference:	Date:	Sheet No:
34249.5.7.1	21/11/2014	1 of 1

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
Aug 10/16
PROVINCE OF ONTARIO

Appendix B

Sanitary Sewer Design Sheet

Figure 1 – Sanitary Drainage Area Plan

Sanitary Hydraulic Grade Line Design Sheet

145172 – DWG100_Plan and Profile

145172 – DWG101_Plan and Profile

ARCADIS PROFESSIONAL SERVICES (CANADA) INC.
500-333 Preston Street
Ottawa, Ontario K1S 5N4 Canada
arcadis.com

SANITARY SEWER DESIGN SHEET
Bank Street Sanitary Sewer
Regional Group
CITY OF OTTAWA

LOCATION				RESIDENTIAL										ICI AREAS								INFILTRATION ALLOWANCE			FIXED FLOW (L/s)		TOTAL FLOW	PROPOSED SEWER DESIGN						
				AREA w/ Units	UNIT TYPES				AREA w/o Units	POPULATION		RES PEAK FACTOR	PEAK FLOW	AREA (Ha)						ICI PEAK FACTOR	PEAK FLOW	AREA (Ha)		FLOW				CAPACITY	LENGTH	DIA	SLOPE	VELOCITY (full)	AVAILABLE CAPACITY	
														INSTITUTIONAL		COMMERCIAL		INDUSTRIAL																
STREET	AREA ID	FROM MH	TO MH	(Ha)	SF	TH/SD	1 Bed APT	2 Bed APT	(Ha)	IND	CUM		(L/s)	IND	CUM	IND	CUM	IND	CUM		(L/s)	IND	CUM	(L/s)	IND	CUM	(L/s)	(L/s)	(m)	(mm)	(%)	(full) (m/s)	L/s	(%)
S-4 Leitrim Expansion Lands	**Future**	**S-4**	**Bank**						**8.47**	**508.2**	**508.2**	**3.38**	**5.56**		**0.0**		**0.0**		**0.0**	**1.00**	**0.00**	**8.47**	**8.47**	**2.80**		**0.0**	**8.36**	**20.24**	**0.00**	**200**	**0.35**	**0.624**	**11.89**	**58.72%**
Bank Street	**Future**	**Bank**	**MH300A**						**2.25**	**0.0**	**508.2**	**3.38**	**5.56**		**0.0**		**0.0**		**0.0**	**1.00**	**0.00**	**2.25**	**10.72**	**3.54**		**0.0**	**9.10**	**20.24**	**0.00**	**200**	**0.35**	**0.624**	**11.14**	**55.05%**
Bank Street_San	**Proposed**	**MH300A**	**MH200A**							**0.0**	**508.2**	**3.38**	**5.56**		**0.0**		**0.0**		**0.0**	**1.00**	**0.00**	**0.00**	**10.72**	**3.54**		**0.0**	**9.10**	**20.24**	**71.44**	**200**	**0.35**	**0.624**	**11.14**	**55.05%**
Bank Street_San	**Proposed**	**MH200A**	**MH100A**						**0.66**	**0.0**	**508.2**	**3.38**	**5.56**		**0.0**		**0.0**		**0.0**	**1.00**	**0.00**	**0.66**	**11.38**	**3.76**		**0.0**	**9.32**	**20.24**	**92.12**	**200**	**0.35**	**0.624**	**10.93**	**53.98%**
Bank Street_San	**Proposed**	**MH100A**	**MH793A**							**0.0**	**508.2**	**3.38**	**5.56**		**0.0**		**0.0**		**0.0**	**1.00**	**0.00**	**0.00**	**11.38**	**3.76**		**0.0**	**9.32**	**24.19**	**24.98**	**200**	**0.50**	**0.746**	**14.88**	**61.49%**
Labrador Crescent	Existing	Blk794AS	MH794A						0.49	0.0	0.0	3.80	0.00		0.0	3.41	3.41		0.0	1.50	1.66	3.90	3.90	1.29		0.0	2.94	19.66	*33.00*	200	*0.33*	0.606	16.71	85.02%
Labrador Crescent	Existing	MH794A	MH793A						0.00	0.0	0.0	3.80	0.00		0.0		3.41		0.0	1.50	1.66	0.00	3.90	1.29		0.0	2.94	19.66	*19.60*	200	*0.33*	0.606	16.71	85.02%
Labrador Crescent	Existing	MH793A	MH792A	0.26						24.0	532.2	3.37	5.81		0.0		3.41		0.0	1.50	1.66	0.26	15.5	5.13		0.0	12.59	19.95	*73.40*	200	*0.34*	0.615	7.36	36.87%
Labrador Crescent	Existing	MH792A	MH791A	0.23						24.0	556.2	3.36	6.06		0.0		3.41		0.0	1.50	1.66	0.23	15.8	5.20		0.0	12.92	21.09	*86.10*	200	*0.38*	0.650	8.17	38.75%
Labrador Crescent	Existing	MH791A	MH791D	0.08						4.8	561.0	3.36	6.11		0.0		3.41		0.0	1.50	1.66	0.08	15.9	5.23		0.0	12.99	19.66	*9.50*	200	*0.33*	0.606	6.66	33.89%
Potential S-5 Lands	**Potential**	**S-5**	**MH791D**	**4.78**						**359.0**	**359.0**	**3.44**	**4.00**		**0.0**		**0.00**		**0.0**	**1.00**	**0.00**	**4.78**	**4.8**	**1.58**		**0.0**	**5.57**							
Sora Way	Existing	MH791D	MH790A	0.17						12.0	932.0	3.26	9.83		0.0		3.41		0.0	1.00	1.11	0.17	20.8	6.86		0.0	17.80	19.66	*40.85*	200	*0.33*	0.606	1.85	9.43%
Labrador Crescent West	Existing	Labrador	MH790A	2.00						175.2	175.2	3.53	2.01		0.0		0.00		0.0	1.00	0.00	2.00	2.0	0.66		0.0	2.67	21.37	*10.62*	200	*0.39*	0.659	18.70	87.52%
Sora Way	Existing	MH790A	MH780A	0.39						31.2	1138.4	3.21	11.84		0.0		3.41		0.0	1.00	1.11	0.39	23.2	7.65		0.0	20.60	20.24	*57.35*	200	*0.35*	0.624	**-0.36**	**-1.77%**
Eric Maloney Way	Existing	Eric Maloney	MH780A	1.45						103.2	103.2	3.59	1.20		0.0		0.00		0.0	1.00	0.00	1.45	1.5	0.48		0.0	1.68	19.95	*67.17*	200	*0.34*	0.615	18.27	91.58%
Sora Way	Existing	MH780A	MH770A	0.36						24.0	1265.6	3.19	13.06		0.0		3.41		0.0	1.00	1.11	0.36	25.0	8.25		0.0	22.42	19.66	*80.63*	200	*0.33*	0.606	**-2.76**	**-14.06%**
Cedar Creek Drive	Existing	Cedar Creek	MH770A	5.49						120.0	120.0	3.58	1.39		0.0		0.00		0.0	1.00	0.00	5.49	5.5	1.81		0.0	3.20	20.81	*74.46*	200	*0.37*	0.642	17.61	84.61%
Cedar Creek Drive	Existing	BULKHEAD	MH770A	4.75						386.4	386.4	3.42	4.29		0.0		0.00		0.0	1.00	0.00	4.75	4.8	1.57		0.0	5.85	19.66	*25.14*	200	*0.33*	0.606	13.80	70.22%
Sora Way	Existing	MH770A	MH760A	0.27						9.6	1781.6	3.10	17.90		0.0		3.41		0.0	1.00	1.11	0.27	35.5	11.72		0.0	30.72	31.02	*82.14*	250	*0.25*	0.612	0.30	0.97%
Sagebush Cresc. East	Existing	Sagebush	MH760A	1.02						54.4	54.4	3.65	0.64		0.0		0.00		0.0	1.00	0.00	1.02	1.0	0.34		0.0	0.98	27.59	*107.80*	200	*0.65*	0.851	26.61	96.45%
Sora Way	Existing	MH760A	MH750A	0.37						19.2	1855.2	3.09	18.57		0.0		3.41		0.0	1.00	1.11	0.37	36.9	12.18		0.0	31.85	31.02	*81.07*	250	*0.25*	0.612	**-0.83**	**-2.69%**
Sagebush Cresc. West	Existing	Sagebush	MH750A	1.41						73.6	73.6	3.62	0.86		0.0		0.00		0.0	1.00	0.00	1.41	1.4	0.47		0.0	1.33	20.24	*108.40*	200	*0.35*	0.624	18.91	93.43%
Sora Way	Existing	MH750A	MH740A	0.68						41.6	1970.4	3.07	19.62		0.0		3.41		0.0	1.00	1.11	0.68	39.0	12.87		0.0	33.59	31.02	*94.16*	250	*0.25*	0.612	**-2.57**	**-8.29%**
Sora Way	Existing	MH740A	MH735A	0.31						19.2	1989.6	3.07	19.79		0.0		3.41		0.0	1.00	1.11	0.31	39.3	12.97		0.0	33.87	31.63	*40.58*	250	*0.26*	0.624	**-2.24**	**-7.07%**
Sora Way	Existing	MH735A	MH730A	0.46						19.2	2008.8	3.07	19.97		0.0		3.41		0.0	1.00	1.11	0.46	39.8	13.12		0.0	34.19	46.84	*105.34*	250	*0.57*	0.924	12.64	26.99%
										2008.8	TRUE						3.4		TRUE			39.8	TRUE											

Design Parameters:

Residential			ICI Areas			
SF	3.2	p/p/u				
TH/SD	2.4	p/p/u	INST	28,000	L/Ha/day	
1 Bed	1.4	p/p/u	COM	28,000	L/Ha/day	
2 Bed	2.1	p/p/u	IND	35,000	L/Ha/day	MOE Chart
Other	60	p/p/Ha		17000	L/Ha/day	

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 280 L/day 200 L/day
3. Infiltration allowance: 0.33 L/s/Ha
4. Residential Peaking Factor:
Harmon Formula = 1+(14/(4+(P/1000)^0.5))0.8
where K = 0.8 Correction Factor
5. Commercial and Institutional Peak Factors based on total area,
1.5 if greater than 20%, otherwise 1.0

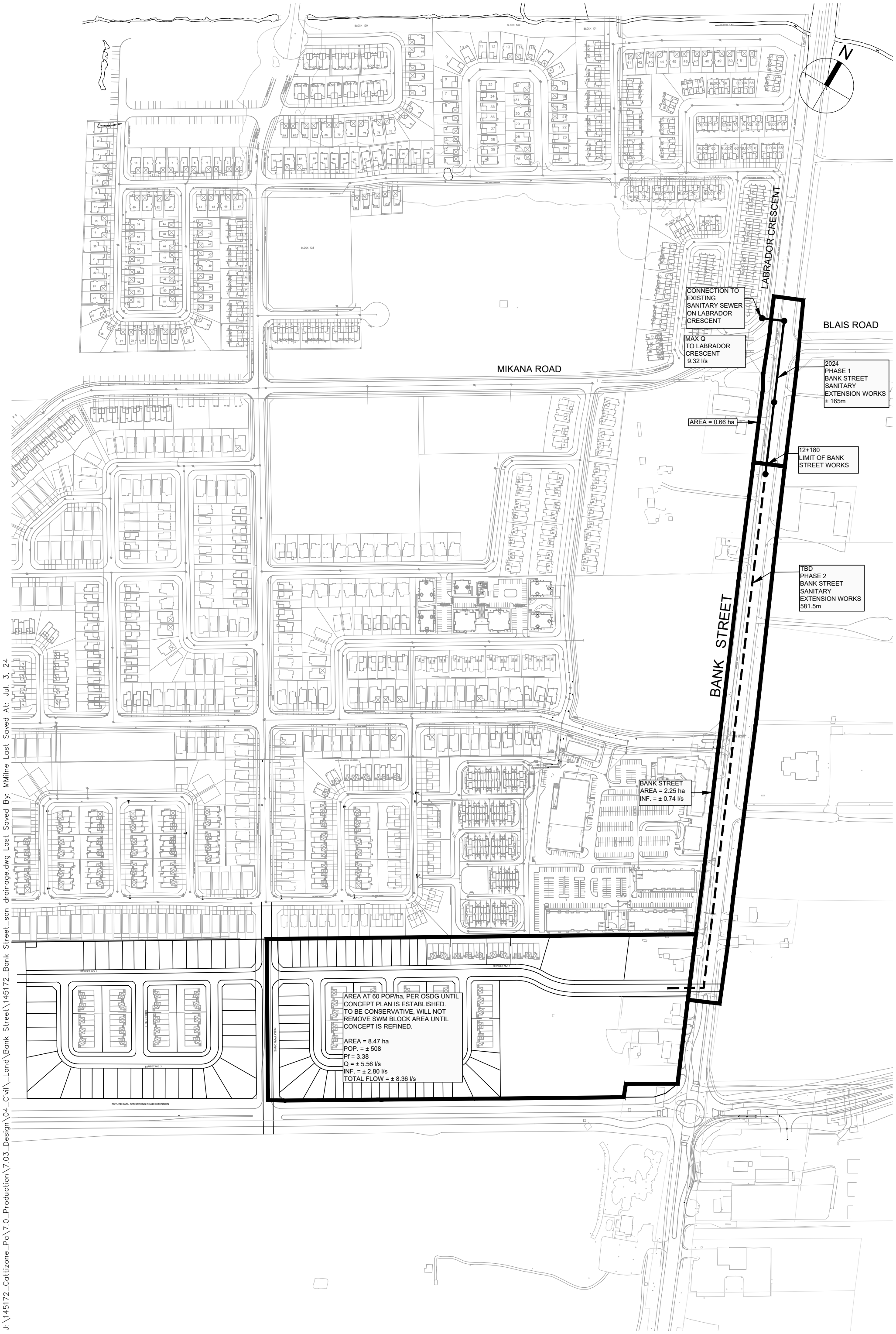
Designed: AS/RM

Checked: RM/DY

Dwg. Reference: 145172-100

No.	Revision	Date
1.	Bank Street Sanitary Sewer (S-4 Letrim Expansion Lands - Sanitary Sewer Installation on Bank Street Memo) - Submission No. 1	2024-07-09

File Reference:	Date:	Sheet No:
145172-6.04.03	2024-07-04	1 of 1



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Project Title	Drawing Title	Sheet No.
ARCADIS CATTAZONE-BANK STREET SANITARY SEWER	SANITARY DRAINAGE AREA PLAN	FIGURE 1 JULY 2, 2024

ARCADIS PROFESSIONAL SERVICES (CANADA) INC.
500-333 Preston Street
Ottawa, Ontario K1S 5N4 Canada
arcadis.com

SANITARY HYDRAULIC GRADE LINE DESIGN SHEET

Bank Street Sanitary Sewer | Regional Group
145172-6.0 | Rev #2 | 2024-07-09
Prepared By: AS | Checked By: RM

FRICTION LOSS	FROM MH	TO MH	PIPE ID
Sora Way	730A	735A	
INVERT ELEVATION (m)	88.080	88.684	
OBVERT ELEVATION (m)	88.330	88.934	
DIAMETER (mm)			250
LENGTH (m)			105.34
FLOW (l/s)			34.19
HGL (m) ***	88.330	88.679	0.349
MANHOLE COEF K= 0.02	LOSS (m)	0.000	
TOTAL HGL (m)		88.847	
MAX. SURCHARGE (mm)		-88	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.25	0.05	0.79	0.573	0.06	0.92	45.01

HYDRAULIC SLOPE = 0.49%
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) = 0.760
DESIGN FLOW DEPTH = 0.163

Head loss in manhole simplified method p. 71 (MWDM)
fig1.7.1, Kratio = 0.75 for 45 bends K_L=0.02
Velocity = Flow / Area = 0.70 m/s
HL = K_L * V^2/ 2g

FRICTION LOSS	FROM MH	TO MH	PIPE ID
Sora Way	735A	740A	
INVERT ELEVATION (m)	88.711	88.816	
OBVERT ELEVATION (m)	88.961	89.066	
DIAMETER (mm)			250
LENGTH (m)			40.58
FLOW (l/s)			33.87
HGL (m) ***	88.847	88.978	0.132
MANHOLE COEF K= 0.02	LOSS (m)	0.000	
TOTAL HGL (m)		89.066	
MAX. SURCHARGE (mm)		0	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.25	0.05	0.79	0.259	0.06	0.62	30.23

HYDRAULIC SLOPE = 0.54%
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) = 1.120
DESIGN FLOW DEPTH = 0.250

Head loss in manhole simplified method p. 71 (MWDM)
fig1.7.1, Kratio = 0.75 for 45 bends K_L=0.02
Velocity = Flow / Area = 0.69 m/s
HL = K_L * V^2/ 2g

FRICTION LOSS	FROM MH	TO MH	PIPE ID
Sora Way	740A	750A	
INVERT ELEVATION (m)	88.847	89.080	
OBVERT ELEVATION (m)	89.097	89.330	
DIAMETER (mm)			250
LENGTH (m)			94.16
FLOW (l/s)			33.59
HGL (m) ***	89.066	89.367	0.301
MANHOLE COEF K= 0.02	LOSS (m)	0.000	
TOTAL HGL (m)		89.367	
MAX. SURCHARGE (mm)		37	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.25	0.05	0.79	0.247	0.06	0.60	29.57

HYDRAULIC SLOPE = 0.32%
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) = 1.136
DESIGN FLOW DEPTH = 0.250

Head loss in manhole simplified method p. 71 (MWDM)
fig1.7.1, Kratio = 0.75 for 45 bends K_L=0.02
Velocity = Flow / Area = 0.68 m/s
HL = K_L * V^2/ 2g

FRICTION LOSS	FROM MH	TO MH	PIPE ID
Sora Way	750A	760A	
INVERT ELEVATION (m)	89.086	89.289	
OBVERT ELEVATION (m)	89.336	89.539	
DIAMETER (mm)			250
LENGTH (m)			81.07
FLOW (l/s)			31.85
HGL (m) ***	89.367	89.600	0.233
MANHOLE COEF K= 0.02	LOSS (m)	0.000	
TOTAL HGL (m)		89.600	
MAX. SURCHARGE (mm)		61	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.25	0.05	0.79	0.250	0.06	0.61	29.74

HYDRAULIC SLOPE =	0.29%
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) =	1.071
DESIGN FLOW DEPTH =	0.225

Head loss in manhole simplified method p. 71 (MWDM)
fig1.7.1, Kratio = 0.75 for 45 bends K_L=0.02
Velocity = Flow / Area = 0.65 m/s
HL = K_L * V^2/ 2g

FRICTION LOSS	FROM MH	TO MH	PIPE ID
Sora Way	760A	770A	
INVERT ELEVATION (m)	89.294	89.502	
OBVERT ELEVATION (m)	89.544	89.752	
DIAMETER (mm)			250
LENGTH (m)			82.14
FLOW (l/s)			30.72
HGL (m) ***	89.600	89.820	0.219
MANHOLE COEF K= 0.02	LOSS (m)	0.000	
TOTAL HGL (m)		89.820	
MAX. SURCHARGE (mm)		68	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.25	0.05	0.79	0.253	0.06	0.61	29.91

HYDRAULIC SLOPE =	0.27%
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) =	1.027
DESIGN FLOW DEPTH =	0.210

Head loss in manhole simplified method p. 71 (MWDM)
fig1.7.1, Kratio = 0.75 for 45 bends K_L=0.02
Velocity = Flow / Area = 0.63 m/s
HL = K_L * V^2/ 2g

FRICTION LOSS	FROM MH	TO MH	PIPE ID
Sora Way	770A	780A	
INVERT ELEVATION (m)	89.349	89.612	
OBVERT ELEVATION (m)	89.549	89.812	
DIAMETER (mm)			200
LENGTH (m)			80.63
FLOW (l/s)			22.42
HGL (m) ***	89.820	90.197	0.377
MANHOLE COEF K= 0.02	LOSS (m)	0.001	
TOTAL HGL (m)		90.198	
MAX. SURCHARGE (mm)		386	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.2	0.03	0.63	0.326	0.05	0.60	18.72

HYDRAULIC SLOPE =	0.47%
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) =	1.197
DESIGN FLOW DEPTH =	0.200

Head loss in manhole simplified method p. 71 (MWDM)
fig1.7.1, Kratio = 0.75 for 45 bends K_L=0.02
Velocity = Flow / Area = 0.71 m/s
HL = K_L * V^2/ 2g

FRICTION LOSS	FROM MH	TO MH	PIPE ID
Sora Way	780A	790A	
INVERT ELEVATION (m)	89.867	90.065	
OBVERT ELEVATION (m)	90.067	90.265	
DIAMETER (mm)			200
LENGTH (m)			57.35
FLOW (l/s)			20.60
HGL (m) ***	90.198	90.424	0.226
MANHOLE COEF K= 0.02	LOSS (m)	0.000	
TOTAL HGL (m)		90.425	
MAX. SURCHARGE (mm)		160	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.2	0.03	0.63	0.345	0.05	0.61	19.26

HYDRAULIC SLOPE = 0.40%
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) = 1.069
DESIGN FLOW DEPTH = 0.180

Head loss in manhole simplified method p. 71 (MWDM)
fig1.7.1, Kratio = 0.75 for 45 bends K_L=0.02
Velocity = Flow / Area = 0.66 m/s
HL = K_L * V^2/ 2g

FRICTION LOSS	FROM MH	TO MH	PIPE ID
Sora Way	790A	791D	
INVERT ELEVATION (m)	90.080	90.213	
OBVERT ELEVATION (m)	90.280	90.413	
DIAMETER (mm)			200
LENGTH (m)			40.85
FLOW (l/s)			17.80
HGL (m) ***	90.425	90.545	0.120
MANHOLE COEF K= 0.02	LOSS (m)	0.000	
TOTAL HGL (m)		90.546	
MAX. SURCHARGE (mm)		133	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.2	0.03	0.63	0.326	0.05	0.60	18.71

HYDRAULIC SLOPE = 0.30%
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) = 0.952
DESIGN FLOW DEPTH = 0.154

Head loss in manhole simplified method p. 71 (MWDM)
fig1.7.1, Kratio = 0.75 for 45 bends K_L=0.02
Velocity = Flow / Area = 0.57 m/s
HL = K_L * V^2/ 2g

FRICTION LOSS	FROM MH	TO MH	PIPE ID
Sora Way	791D	791A	
INVERT ELEVATION (m)	90.241	90.272	
OBVERT ELEVATION (m)	90.441	90.472	
DIAMETER (mm)			200
LENGTH (m)			9.50
FLOW (l/s)			12.99
HGL (m) ***	90.546	90.560	0.015
MANHOLE COEF K= 0.30	LOSS (m)	0.003	
TOTAL HGL (m)		90.563	
MAX. SURCHARGE (mm)		91	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.2	0.03	0.63	0.326	0.05	0.60	18.73

HYDRAULIC SLOPE = 0.18%
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) = 0.694
DESIGN FLOW DEPTH = 0.122

Head loss in manhole simplified method p. 71 (MWDM)
fig1.7.1, Kratio = 0.75 for 45 bends K_L=0.30
Velocity = Flow / Area = 0.41 m/s
HL = K_L * V^2/ 2g

ARCADIS PROFESSIONAL SERVICES (CANADA) INC.
500-333 Preston Street
Ottawa, Ontario K1S 5N4 Canada
arcadis.com

SANITARY HYDRAULIC GRADE LINE DESIGN SHEET

Bank Street Sanitary Sewer | Regional Group
145172-6.0 | Rev #2 | 2024-07-09
Prepared By: AS | Checked By: RM

FRICTION LOSS	FROM MH	TO MH	PIPE ID
Labrador Crescent	**791A**	**792A**	
INVERT ELEVATION (m)	90.296	90.620	
OBVERT ELEVATION (m)	90.496	90.820	
DIAMETER (mm)			200
LENGTH (m)			86.10
FLOW (l/s)			12.92
HGL (m) ***	**90.563**	**90.697**	**0.134**
MANHOLE COEF K= 0.02	LOSS (m)	0.000	
TOTAL HGL (m)		**90.736**	
MAX. SURCHARGE (mm)		**-84**	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.2	0.03	0.63	0.376	0.05	0.64	20.11

HYDRAULIC SLOPE =	0.20%
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) =	0.642
DESIGN FLOW DEPTH =	0.116

Head loss in manhole simplified method p. 71 (MWDM)
fig1.7.1, Kratio = 0.75 for 45 bends K_L=0.02
Velocity = Flow / Area = 0.41 m/s
HL = K_L * V^2/ 2g

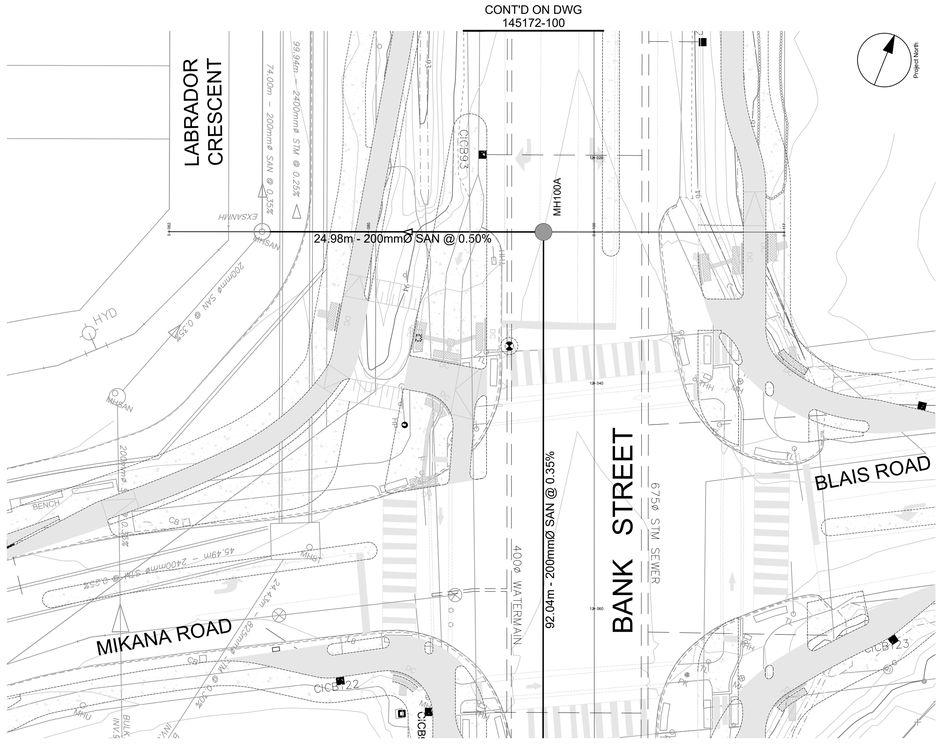
FRICTION LOSS	FROM MH	TO MH	PIPE ID
Labrador Crescent	**792A**	**793A**	
INVERT ELEVATION (m)	90.638	90.891	
OBVERT ELEVATION (m)	90.838	91.091	
DIAMETER (mm)			200
LENGTH (m)			73.40
FLOW (l/s)			12.59
HGL (m) ***	**90.736**	**90.844**	**0.108**
MANHOLE COEF K= 0.02	LOSS (m)	0.000	
TOTAL HGL (m)		**91.007**	
MAX. SURCHARGE (mm)		**-84**	

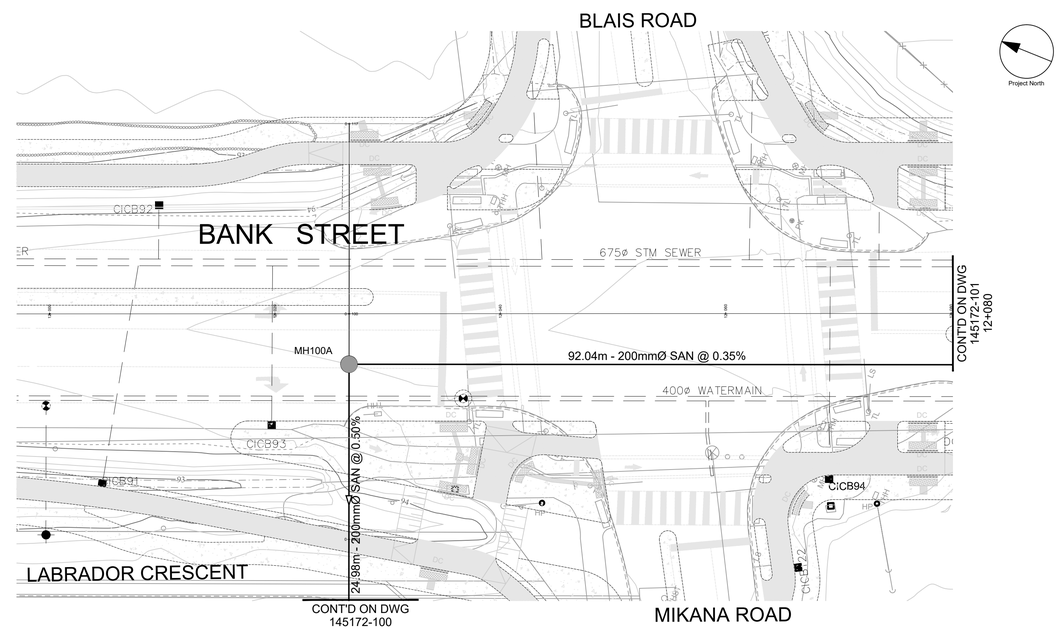
MANNING FORMULA - FLOWING FULL

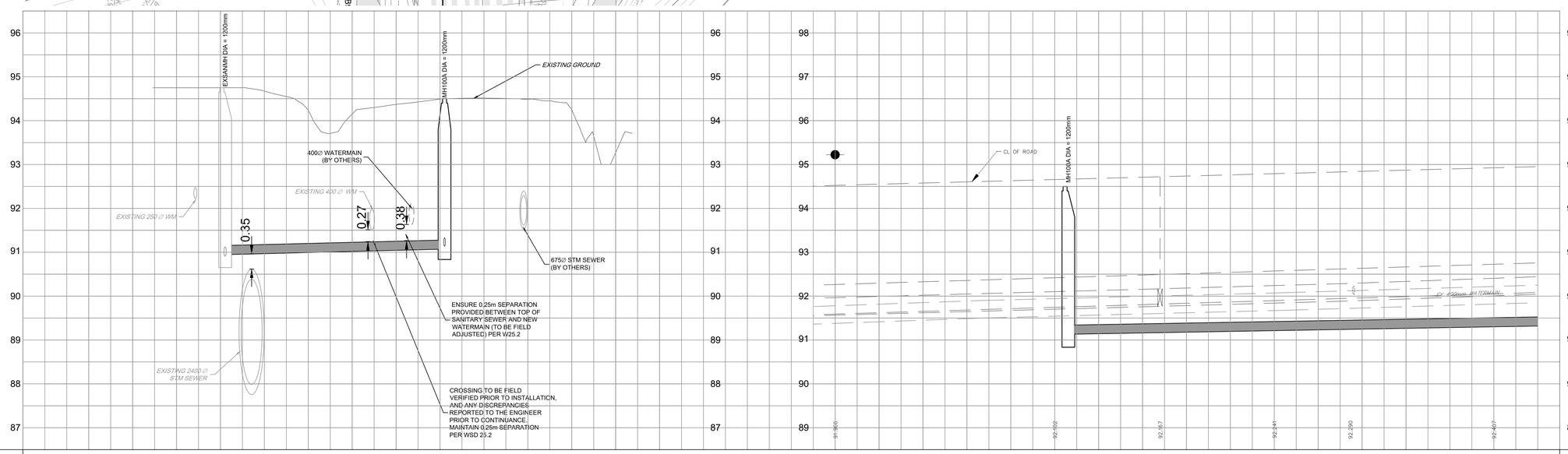
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.2	0.03	0.63	0.345	0.05	0.61	19.25

HYDRAULIC SLOPE =	0.37%
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) =	0.654
DESIGN FLOW DEPTH =	0.116

Head loss in manhole simplified method p. 71 (MWDM)
fig1.7.1, Kratio = 0.75 for 45 bends K_L=0.02
Velocity = Flow / Area = 0.40 m/s
HL = K_L * V^2/ 2g







ROAD GRADE	94.749, 94.750, 94.234, 93.750, 94.498, 94.513, 94.492, 93.750, 94.270, 94.455, 94.504, 94.508, 94.522, 94.625, 94.750, 94.750, 94.935, 94.955	ROAD GRADE
TOP OF WATERMAIN		TOP OF WATERMAIN
STM SEWER INVERT	115.0m–675mmØ CONC CL 100–D STORM SEWER @ 0.80% (BY OTHERS)	STM SEWER INVERT
SAN SEWER INVERT	92.851 WW 92.851 SSW 90.950NE 24.98m - 200mmØ PVC DR-35 SAN @ 0.50% 91.13SSE 91.07SSW 91.07SSW 91.13SSE 92.04m - 200mmØ PVC DR-35 SAN @ 0.35%	SAN SEWER INVERT
STATION	0+060, 0+080, 0+100, 0+120, 12+000, 12+020, 12+040, 12+060, 12+080	STATION

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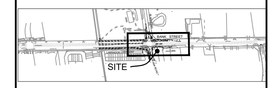
ISSUES

No.	DESCRIPTION	DATE
1	SUBMISSION NO.1 FOR CITY REVIEW	2024-07-04
2		
3		
4		

NOT FOR CONSTRUCTION

KEY PLAN



CONSULTANTS

1:250 0 2.5 7.5 12.5m

SEAL

LICENSED PROFESSIONAL ENGINEER
L.D. K. Yannoulopoulos
2024/07/04
PROVINCE OF ONTARIO

PRIME CONSULTANT

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

PROJECT
S-4 LEITRIM EXPANSION LANDS - BANK STREET SANITARY EXTENSION PHASE 1

PROJECT NO: 145172

DRAWN BY:	CHECKED BY:
M.M.	R.M.
PROJECT MGR:	APPROVED BY:
R.M.	D.G.Y.

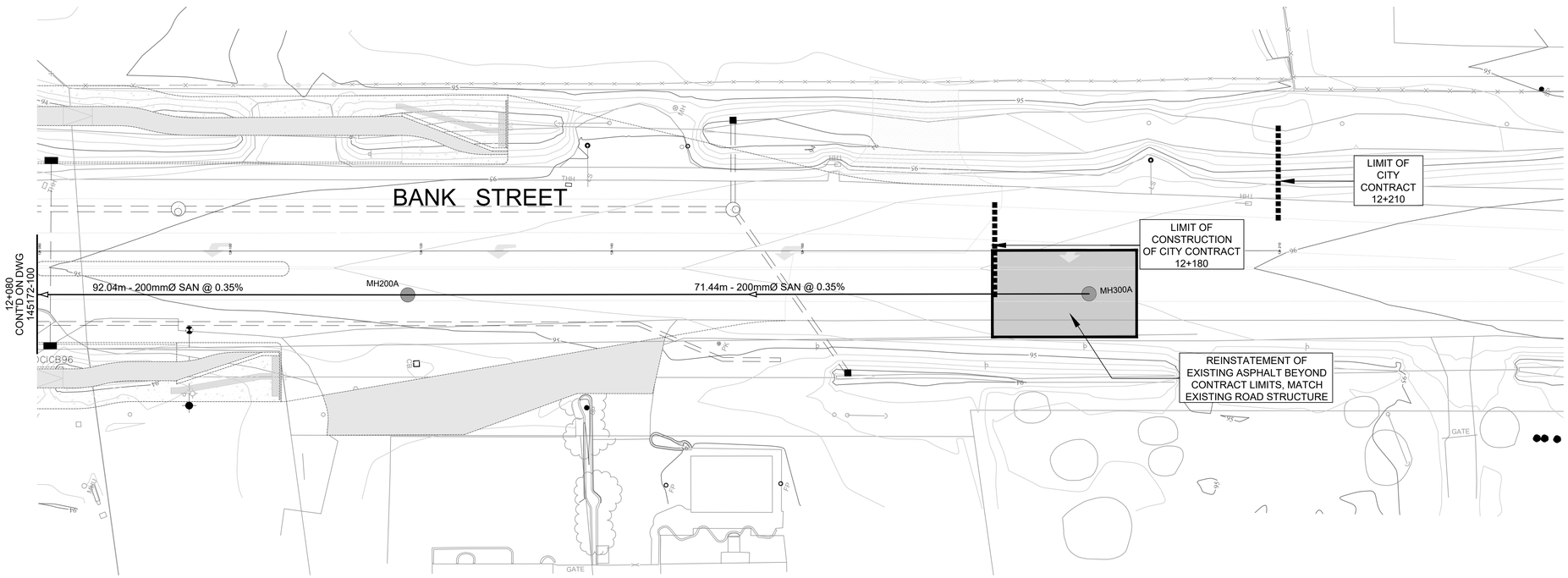
SHEET TITLE
BANK STREET SANITARY SEWER

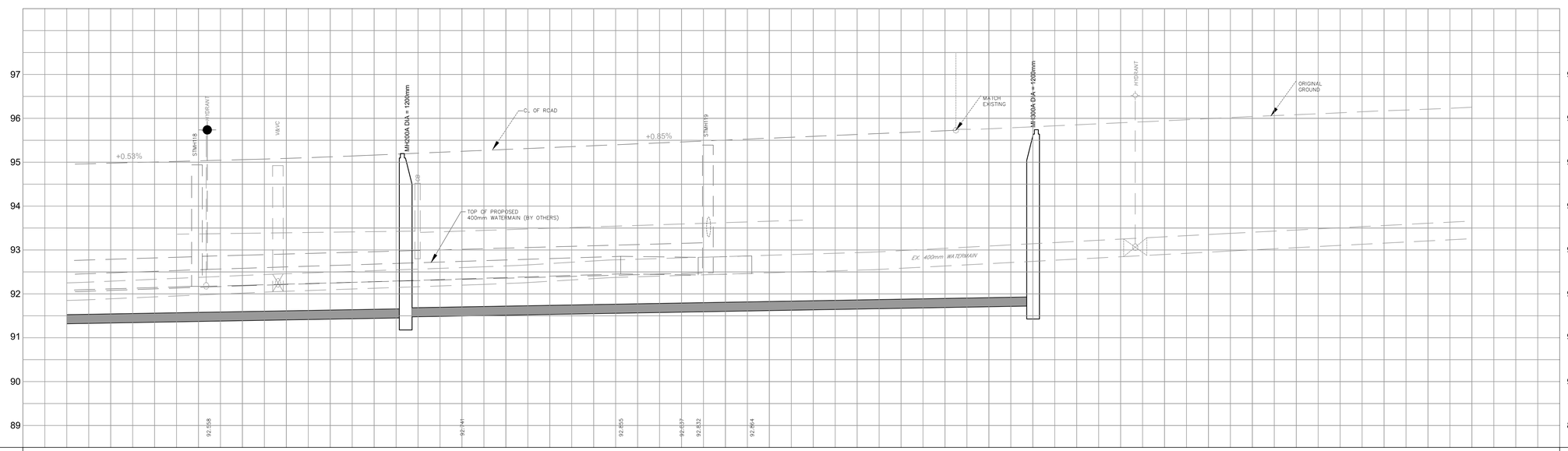
SHEET NUMBER 100 | ISSUE 1

D07-XX-XX-XXXX

SCALE CHECK 1 in 10mm XXXXX

File Location: J:\145172_Calliizone_Pa\7.0_Production\7.03_Design\04_Civil\Sheets\Bank Street\101_BANK STREET.dwg Last Saved: July 4, 2024, by MMilne Plotted: Thursday, July 4, 2024 3:03:00 PM by Marian Milne





ROAD GRADE	94.965, 95.000, 95.000, 95.000, 95.188, 95.260, 95.273, 95.301, 95.500, 95.507, 95.513, 95.682, 95.697, 95.773, 95.810, 95.937	ROAD GRADE
TOP OF WATERMAIN		TOP OF WATERMAIN
STM SEWER INVERT	92.162, 92.170; 58.2m–675mmØ CONC CL 100–D STORM SEWER @ 0.54% (BY OTHERS); 92.478	STM SEWER INVERT
SAN SEWER INVERT	92.04m - 200mmØ PVC DR-35 SAN @ 0.35%; 91.457NW, 91.477SE; 71.44m - 200mmØ PVC DR-35 SAN @ 0.35%; 91.727NW	SAN SEWER INVERT
STATION	12+080, 12+100, 12+120, 12+140, 12+160, 12+180, 12+200, 12+220	STATION

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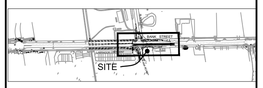
ISSUES

No.	DESCRIPTION	DATE
1	SUBMISSION NO.1 FOR CITY REVIEW	2024-07-04
2		
3		
4		

NOT FOR CONSTRUCTION

KEY PLAN



CONSULTANTS

1:250 0 2.5 7.5 12.5m

SEAL

LICENSED PROFESSIONAL ENGINEER
L.D. K. Yannoulopoulos
2024/07/04
PROVINCE OF ONTARIO

PRIME CONSULTANT

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

PROJECT
S-4 LEITRIM EXPANSION LANDS - BANK STREET SANITARY EXTENSION PHASE 1

PROJECT NO: 145172	
DRAWN BY: **M.M.**	CHECKED BY: **R.M.**
PROJECT MGR: **R.M.**	APPROVED BY: **D.G.Y.**

SHEET TITLE
BANK STREET SANITARY SEWER

SHEET NUMBER 101 | ISSUE 1

D07-XX-XX-XXXX

SCALE CHECK 1 in 10mm XXXXX

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Appendix C

Email Correspondence from DSEL

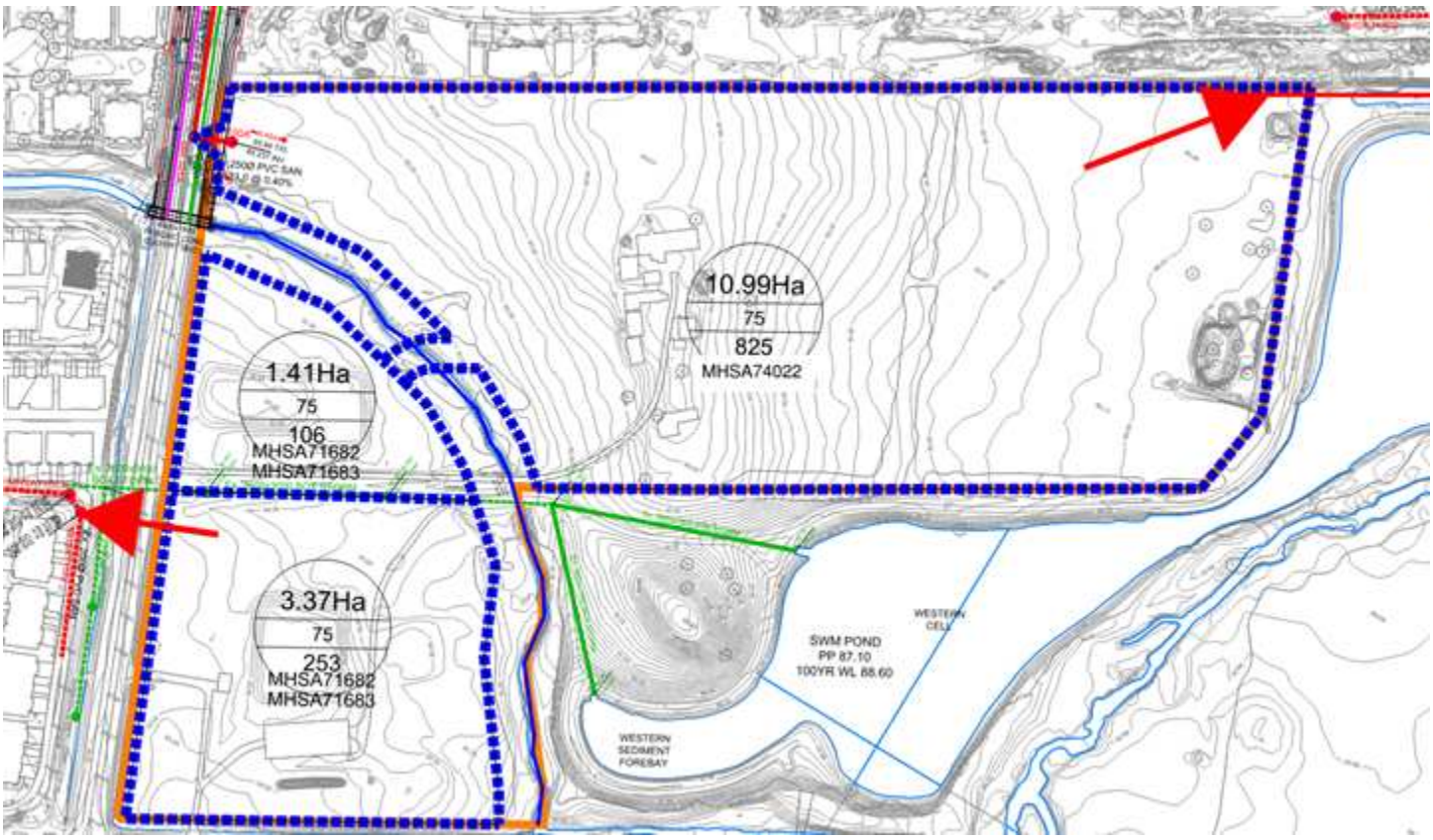
Soward, Angela

From: Jeremy Chouinard <JChouinard@dsel.ca>
Sent: Thursday, June 27, 2024 9:19 AM
To: Magladry, Ryan; Soward, Angela; Marc Pichette
Subject: RE: Bank Street Sanitary - Labrador and Sora Way As-builts

Arcadis Warning: Exercise caution with email messages from external sources such as this message. Always verify the sender and avoid clicking on links or scanning QR codes unless certain of their authenticity.

Hi Ryan,

As discussed, please see sketch below of what we're proposing for sanitary design. The flows from the south-west would be 5.57 l/s assuming 75pop/ha, 4.78 ha and current design guidelines. We'd be tying in to MHSA71682.



Let me know if you have any questions, thanks,

Jeremy Chouinard, P.Eng.,
Project Manager

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

Attachment 2 – City of Ottawa Email

Jeremy Chouinard

From: Marc Pichette
Sent: June 17, 2024 4:12 PM
To: Adam Fobert; Jeremy Chouinard
Subject: FW: 4795 Bank - Bank Street Reconstruction Drawings

FYI – lets discuss tomorrow morning.

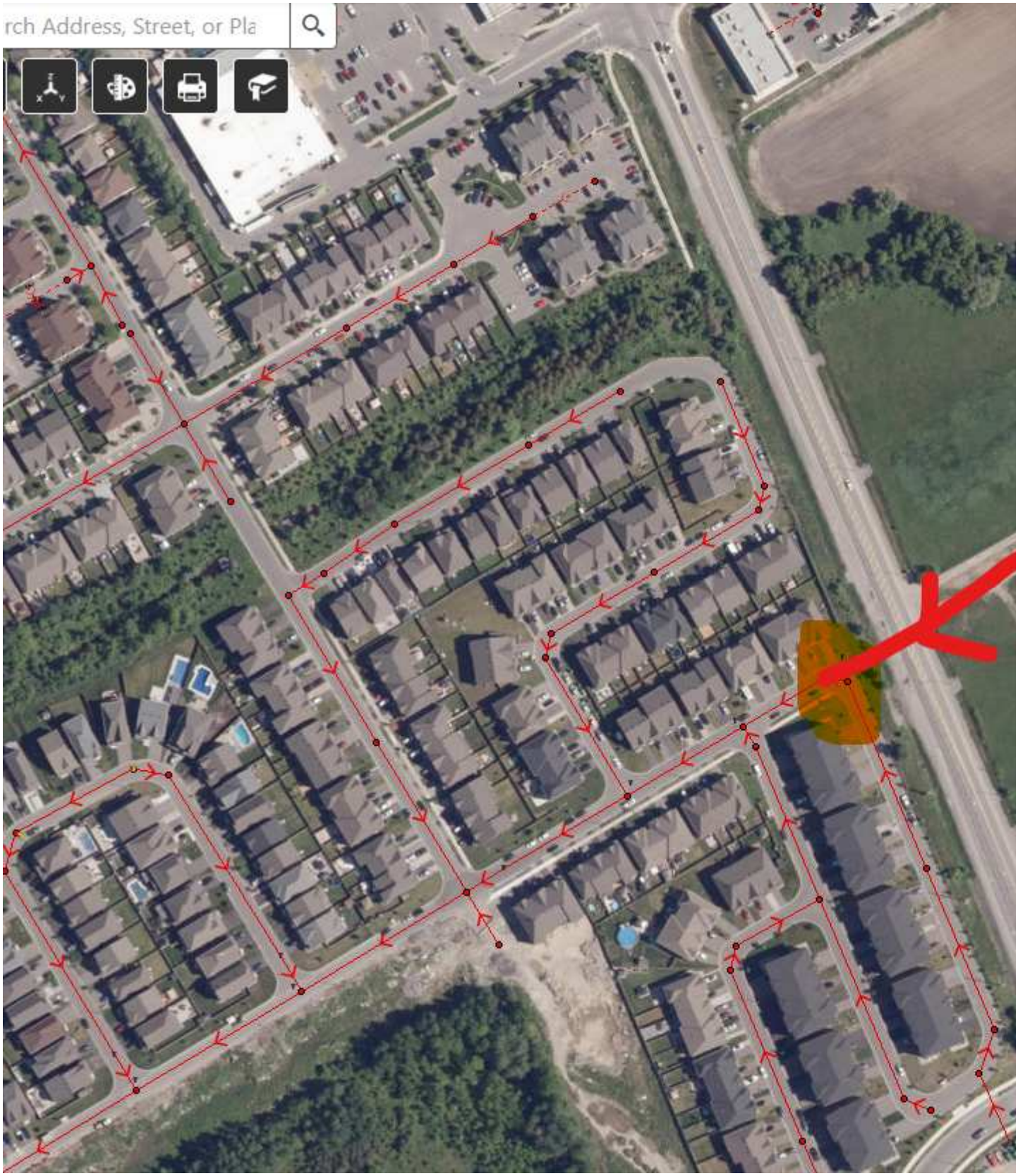
From: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Sent: June 17, 2024 3:54 PM
To: Marc Pichette <MPichette@dsel.ca>
Cc: Bougadis, John <John.Bougadis@ottawa.ca>; Xu, Lily <Lily.Xu@ottawa.ca>; Sharif, Golam <sharif.sharif@ottawa.ca>; van de Lande, Robin <Robin.vandeLande@ottawa.ca>; Rogers, Christopher <Christopher.Rogers@ottawa.ca>; Moodie, Derrick <Derrick.Moodie@ottawa.ca>
Subject: Re: 4795 Bank - Bank Street Reconstruction Drawings

EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Marc,

We have the following comments on your memo:

- Can DSEL provide more detailed information on the land use types and street layout for expansion area S5?
- Is it possible to direct sanitary flow from the S5 lands south of Findlay Creek to the existing 200 mm sewer on Sora Way to avoid a deep crossing of Findlay Creek?



- The City needs evidence that alternatives have been evaluated to ensure that impact to the project is minimized. This would be a normal requirement for a Master Servicing Study for new urban expansion areas. Is constructing a new sewer on Bank Street the only viable option to service the S5 lands?

- Please confirm if a connection to the Bank Street watermain is required for capacity and redundancy.
- Has the need for watermain connections from the Bank Street watermain to the new expansion areas been considered?

Please let us know if you would like to discuss or require clarification.

Jeff Shillington, P. Eng.

Senior Project Manager, Development Review, South Branch

Planning, Infrastructure and Economic Development

City of Ottawa

tel: 580-2424 x 16960

email: jeff.shillington@ottawa.ca

From: Marc Pichette <MPichette@dsel.ca>
Sent: Monday, June 17, 2024 2:14 PM
To: Shillington, Jeffrey <jeff.shillington@ottawa.ca>; Bougadis, John <John.Bougadis@ottawa.ca>
Subject: RE: 4795 Bank - Bank Street Reconstruction Drawings

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Thanks Jeff. I believe Ted has a follow-up meeting with the City setup for tomorrow (not sure who with), would be great to get any preliminary thoughts in advance of that if possible.

From: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Sent: June 14, 2024 10:02 AM
To: Marc Pichette <MPichette@dsel.ca>; Bougadis, John <John.Bougadis@ottawa.ca>
Subject: Re: 4795 Bank - Bank Street Reconstruction Drawings

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HI Marc,

Yes we've received it and will have some comments for you early next week.

Jeff

From: Marc Pichette <MPichette@dsel.ca>
Sent: Thursday, June 13, 2024 2:59 PM
To: Shillington, Jeffrey <jeff.shillington@ottawa.ca>; Bougadis, John <John.Bougadis@ottawa.ca>
Subject: RE: 4795 Bank - Bank Street Reconstruction Drawings

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Just following up to confirm receipt.

I'm out of the office tomorrow afternoon but can otherwise work around your schedules to find a time to review quickly.

From: Marc Pichette
Sent: June 11, 2024 10:00 PM
To: 'Shillington, Jeffrey' <jeff.shillington@ottawa.ca>; 'Bougadis, John' <John.Bougadis@ottawa.ca>
Cc: 'stephen.gallagher@ottawa.ca' <stephen.gallagher@ottawa.ca>; 'ted@dilligafproperties.com' <ted@dilligafproperties.com>; Jeremy Chouinard <JChouinard@dsel.ca>; Steve Pichette <SPichette@dsel.ca>
Subject: FW: 4795 Bank - Bank Street Reconstruction Drawings
Importance: High

Hi Jeff and John,

Please find attached memo which includes our functional design figure for the proposed sanitary sewer on Bank St. as well a review of the capacity of the downstream sewers. I think it would be helpful to have a quick meeting to present our analysis and ensure you have all information you need at this stage in order for us (or Robinson depending on the City's direction) to begin a detailed design ASAP.

Let me know your availability Wednesday/Thursday.

Thanks,

Marc

From: Sharif, Golam <sharif.sharif@ottawa.ca>
Sent: May 30, 2024 3:36 PM
To: Jeremy Chouinard <JChouinard@dsel.ca>
Cc: Xu, Lily <Lily.Xu@ottawa.ca>
Subject: RE: 4795 Bank (not 1352) - Bank Street Reconstruction Drawings

EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Jeremy,

I am following up on the email you sent to Stephen. We have discussed internally with different units of the City and these are the steps discussed:

1. Landowners should contact Robyn to coordinate the secondary planning for the S5 lands and organize a meeting to review the scope of work and servicing needs.

2. S4 and S5 landowners should prepare an adequacy of servicing report for their lands, including a design brief for the local sanitary sewer required on Bank Street. The report should also identify connections to the existing watermain on Bank Street and ensure that post-development stormwater runoff to Bank Street matches pre-development rates.

3. Circulate the design brief, including functional level plan and profile drawings of the sewer, to other City groups for approval.

4. Transfer the design brief and drawings to Stephen/Robinson to incorporate into the design of Bank Street.

5. Begin work on legal agreements and cost-sharing arrangements for the design and construction of sewers benefiting S4 and S5. This discussion can happen now.

5. A Third-Party Infrastructure Agreement will be required, and in the cases here, would require Council approval since it will likely be over the upset limit of $350,000 under the delegated authority.

There is no specific category of application intake for this type of work within our usual City system. However, we will setup up this work/ application under a category and go through all the necessary steps discussed above. Let me know if you have any question. I have also cc'd Lily Xu, Manager of DR South here.

Regards,

Sharif

Golam Sharif, P.Eng., M.Eng.

Senior Project Manager (A), Infrastructure Projects

Development Review South

Planning, Development and Building Services Department (PDBS) Department |

Direction générale des services de la planification, de l'aménagement et du bâtiment (DGSPAB)

City of Ottawa | Ville d'Ottawa

110 Laurier Avenue West. Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1

613.580.2424 ext./poste **20763**, fax/téléc:613-580-2576, sharif.sharif@ottawa.ca

---

From: Jeremy Chouinard <JChouinard@dsel.ca>
Sent: Monday, May 27, 2024 9:53 AM
To: Gallagher, Stephen <stephen.gallagher@ottawa.ca>
Subject: RE: 1352 - Bank Street Reconstruction Drawings

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Good morning,

Please find attached the sketches we reviewed last Thursday.

Regards,

Jeremy Chouinard, P.Eng.,

Project Manager

DSEL

david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

Cell: 613-668-2585
e-mail: jchouinard@DSEL.ca

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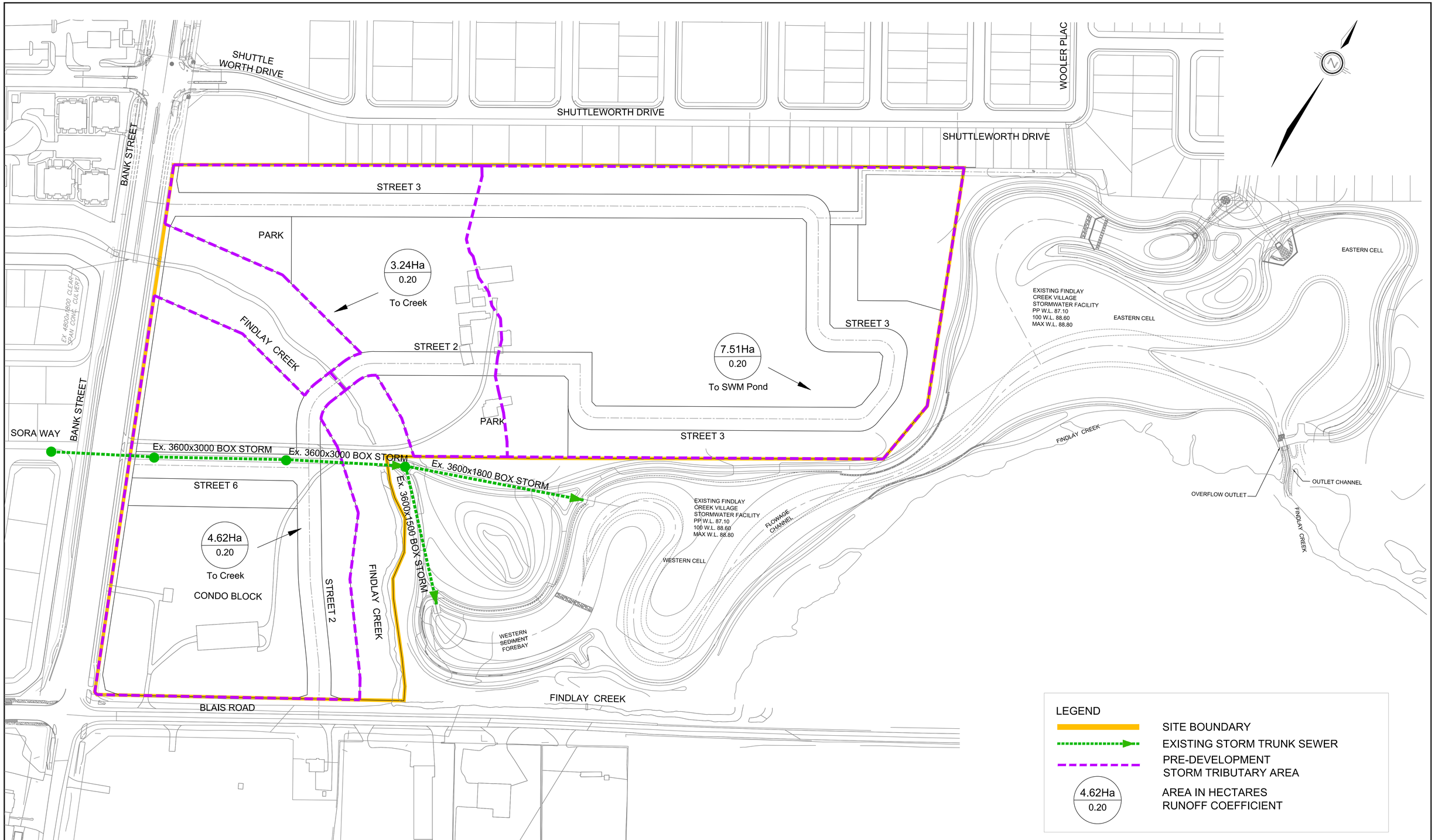
Appendix D

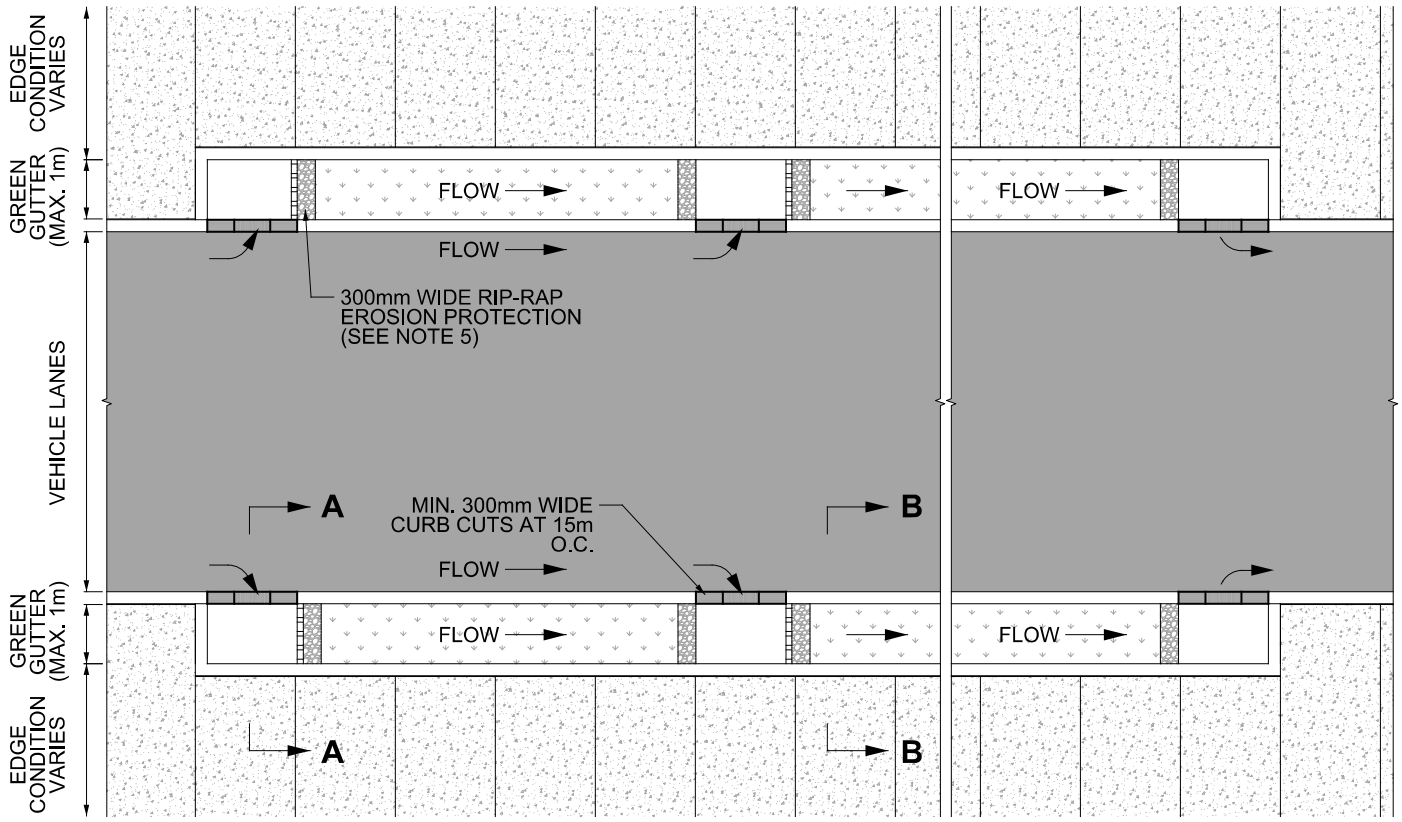
Stormwater Management



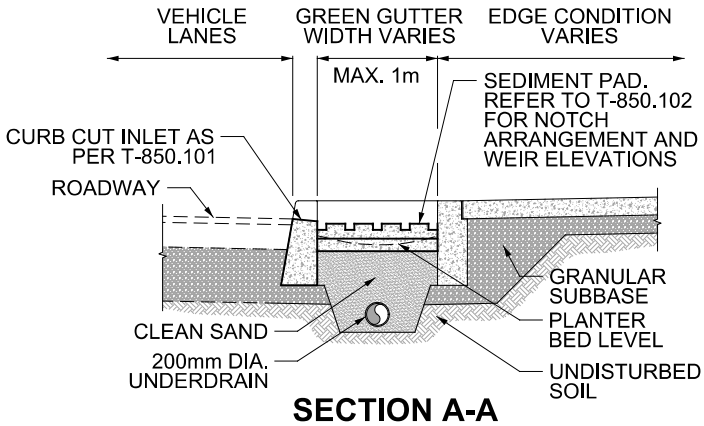
DSEL
120 Iber Road, Unit 103
Stittsville, ON K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

CAIVAN LEITRIM
STORM EXISTING CONDITIONS PLAN
CITY OF OTTAWA

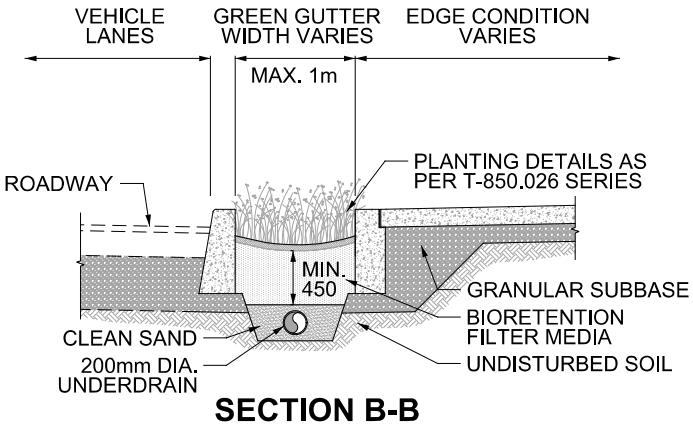
PROJECT No. :	24-1414
SCALE:	1:1250
DATE:	JULY 2026
FIGURE No.	1



PLAN



SECTION A-A



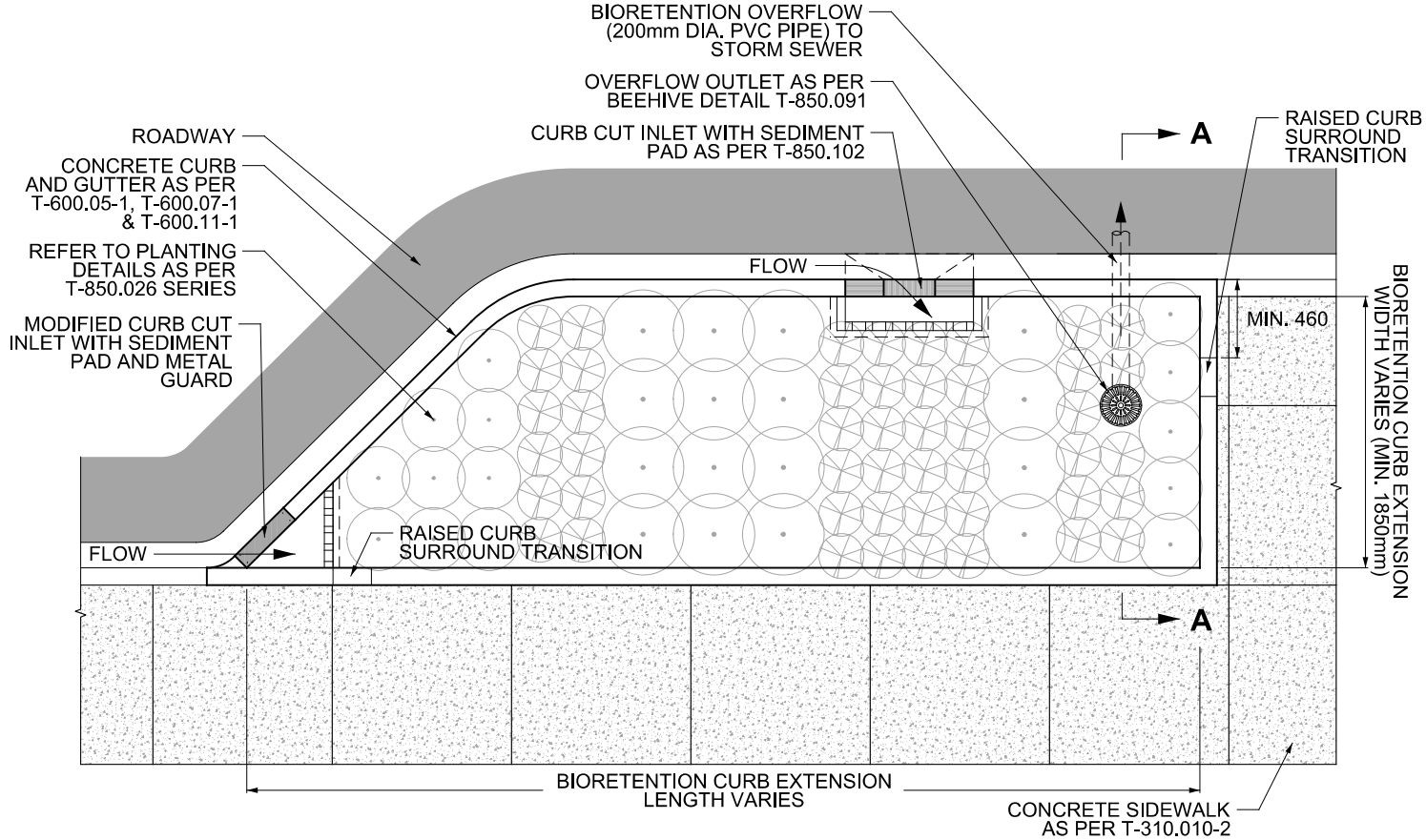
SECTION B-B

NOTES:

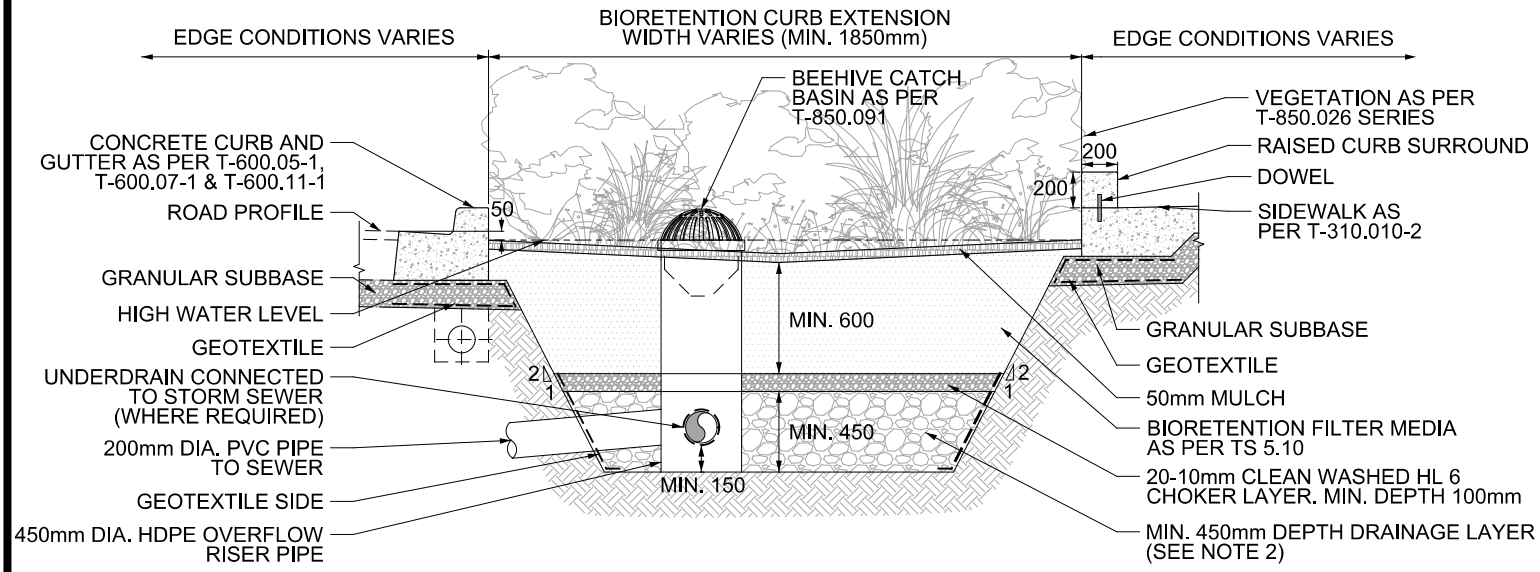
1. GREEN GUTTER WIDTH VARIES BASED ON AVAILABLE SPACE WITHIN RIGHT-OF-WAY. MAXIMUM 1m WIDTH.
2. ALL INLETS MUST HAVE SEDIMENT PAD AS PER T-850.102 FOR SEDIMENT AND EROSION PROTECTION.
3. LONGITUDINAL SLOPE TO MATCH ADJACENT FEATURE (ROADWAY, SIDEWALK, STREETCAR TRACK).
4. UNDERDRAIN IS REQUIRED WHERE NATIVE SOIL INFILTRATION RATES ARE LESS THAN 15mm/hr, OR IF GREEN GREEN GUTTER IS MEMBRANE LINED. UNDERDRAIN TO BE 200mm DIA. SMOOTH INTERIOR WALLED PERFORATED PIPE, MIN. INSTALLED 50mm ABOVE THE BOTTOM OF THE DRAINAGE LAYER.
5. RIP-RAP EROSION PROTECTION TO BE 300mm WIDE AND PLACED DOWNSTREAM OF SEDIMENT PADS AND UPSTREAM OF ANY INTERMEDIATE INLETS AND OUTLETS.

All dimensions are in millimetres unless otherwise shown.

TORONTO	ENGINEERING & CONSTRUCTION SERVICES STANDARD DRAWING	REV 0	SEP 2021
	GREEN GUTTER	**T-850.141**	
	LAYOUT AND SECTIONS	NTS	SHEET 1



PLAN



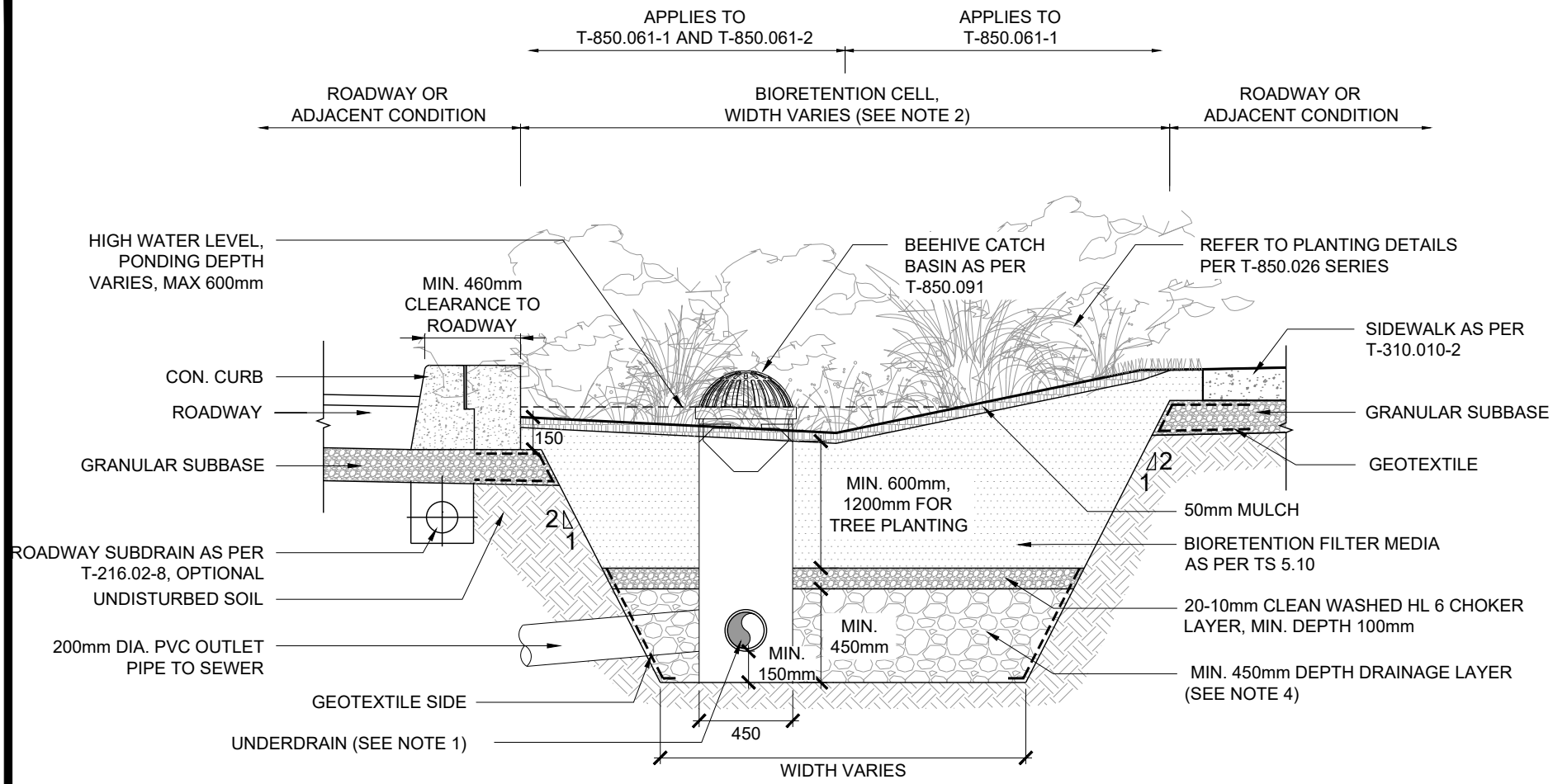
SECTION A-A

NOTES:

1. UNDERDRAIN IS REQUIRED WHERE NATIVE SOIL INFILTRATION RATES ARE LESS THAN 15mm/hr, WHEN TREES PLANTINGS ARE PRESENT, OR WHEN CURB EXTENSION IS MEMBRANE LINED. UNDERDRAIN TO BE 200mm DIA. SMOOTH INTERIOR WALLED PERFORATED PIPE, INSTALLED MIN. 150mm ABOVE THE BOTTOM OF THE DRAINAGE LAYER.
2. GRAVEL USED FOR DRAINAGE LAYER TO BE 20 TO 50mm, UNIFORMLY-GRADED, CLEAN (MAXIMUM WASH LOSS OF 0.5%), CRUSHED ANGULAR STONE THAT HAS A POROSITY OF 0.4.

All dimensions are in millimetres unless otherwise shown.

TORONTO	ENGINEERING & CONSTRUCTION SERVICES STANDARD DRAWING	REV 0	SEP 2021
	BIORETENTION CURB EXTENSION	**T-850.072**	
	LAYOUT AND SECTION	NTS	SHEET 2



SECTION A-A

NOTES:

1. UNDERDRAIN IS REQUIRED WHERE NATIVE SOIL INFILTRATION RATES ARE LESS THAN 15mm/hr, WHEN TREE PLANTINGS ARE PRESENT, OR WHEN GREEN INFRASTRUCTURE SYSTEM IS MEMBRANE LINED. UNDERDRAIN TO BE 200mm DIA. SMOOTH INTERIOR WALLED PERFORATED PIPE WRAPPED IN GEOTEXTILE FABRIC, INSTALLED 150mm MIN. ABOVE BASE OF GREEN INFRASTRUCTURE SYSTEM.
2. BIORETENTION CELL WIDTH TO BE MIN. 3500mm WHERE TREES ARE PROPOSED AND MIN. 1850mm WITHOUT TREES.
3. FOR TREE HEALTH, LOCATE INLETS AWAY FROM ROOT BALLS TO MINIMIZE POTENTIAL DAMAGE.
4. GRAVEL USED FOR DRAINAGE LAYER TO BE 20 OR 50mm UNIFORMLY GRADED, CLEAN (MAXIMUM WASH LOSS OF 0.5%), CRUSHED ANGULAR STONE THAT HAS A POROSITY OF 0.4.

All dimensions are in millimetres unless otherwise shown.

TORONTO	ENGINEERING & CONSTRUCTION SERVICES STANDARD DRAWING	REV 0	SEP 2021
	BIORETENTION CELL IN BOULEVARD OR MEDIAN TYPICAL SECTION	**T-850.061-3**	
		1:30	SHEET 1

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

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
STREET 5																																	
			0.22	0.77	0.47	0.47			0.00	0.00			0.00	0.00			0.00	0.00															
	116	117	0.22	0.80	0.49	0.96			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	74	375	375	PVC	0.55	75.0	130.0283	1.1773	1.0618	0.567
			0.17	0.80	0.38	1.34			0.00	0.00			0.00	0.00			0.00	0.00															
	117	118	0.21	0.77	0.45	1.79			0.00	0.00			0.00	0.00			0.00	0.00	11.06	72.96	98.90	115.91	169.40	130	525	525	CONC	0.30	69.0	235.5548	1.0881	1.0569	0.554
To STREET 3, Pipe 118 - 119						1.79				0.00				0.00				0.00	12.12														
STREET 4																																	
	113	114	0.48	0.80	1.07	1.07			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	82	375	375	PVC	0.60	75.0	135.8101	1.2296	1.0166	0.604
	114	115	0.38	0.80	0.85	1.91			0.00	0.00			0.00	0.00			0.00	0.00	11.02	73.11	99.11	116.16	169.77	140	525	525	CONC	0.25	69.0	215.0311	0.9933	1.1577	0.650
To STREET 3, Pipe 115 - 118						1.91				0.00				0.00				0.00	12.17														
STREET 1																																	
	102	103	0.20	0.77	0.43	0.43			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	33	300	300	PVC	1.10	43.0	101.4206	1.4348	0.4995	0.324
To STREET 3, Pipe 103 - 104						0.43				0.00				0.00				0.00	10.50														
	109	110	0.60	0.77	1.28	1.28			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	99	375	375	PVC	0.80	91.5	156.8200	1.4199	1.0740	0.629
	110	111	0.48	0.77	1.03	2.31			0.00	0.00			0.00	0.00			0.00	0.00	11.07	72.91	98.84	115.84	169.30	169	600	600	CONC	0.25	89.5	307.0058	1.0858	1.3738	0.549
To STREET 3, Pipe 111 - 112						2.31				0.00				0.00				0.00	12.45														
STREET 3																																	
	107	108	0.14	0.80	0.31	0.31			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	24	300	300	PVC	1.05	31.0	99.0888	1.4018	0.3686	0.241
Contribution From STREET 2, Pipe 106 - 108						1.48				0.50				0.00				0.00	12.35														
	108	111	0.22	0.80	0.49	2.28			0.00	0.50			0.00	0.00			0.00	0.00	12.35	68.82	93.22	109.22	159.59	204	600	600	CONC	0.35	60.0	363.2541	1.2847	0.7784	0.561
Contribution From STREET 1, Pipe 110 - 111						2.31				0.00				0.00				0.00	12.45														
	111	112	0.19	0.80	0.42	5.02			0.00	0.50			0.00	0.00			0.00	0.00	13.13	66.57	90.13	105.59	154.25	379	750	750	CONC	0.35	54.0	658.6236	1.4908	0.6037	0.575
	100	101	0.24	0.80	0.53	0.53			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	41	300	300	PVC	0.90	50.5	91.7384	1.2978	0.6485	0.447
	101	103	0.24	0.80	0.53	1.07			0.00	0.00			0.00	0.00			0.00	0.00	10.65	74.40	100.89	118.25	172.84	79	450	450	CONC	0.35	61.0	168.6711	1.0605	0.9586	0.471
Contribution From STREET 1, Pipe 102 - 103						0.43				0.00				0.00				0.00	10.50														
			0.27	0.77	0.58	2.07			0.00	0.00			0.00	0.00			0.00	0.00															
	103	104	0.29	0.80	0.64	2.72			0.00	0.00			0.00	0.00			0.00	0.00	11.61	71.14	96.41	112.97	165.09	193	600	600	CONC	0.35	93.5	363.2541	1.2847	1.2129	0.532
			0.26	0.77	0.56	3.28			0.00	0.00			0.00	0.00			0.00	0.00															
	104	112	0.29	0.80	0.64	3.92			0.00	0.00			0.00	0.00			0.00	0.00	12.82	67.44	91.33	107.00	156.32	264	675	675	CONC	0.35	95.5	497.2987	1.3897	1.1453	0.532
	112	115	0.21	0.80	0.47	9.40			0.00	0.50			0.00	0.00			0.00	0.00	13.97	64.32	87.06	101.97	148.93	648	900	900	CONC	0.35	54.0	1070.9945	1.6835	0.5346	0.605
Contribution From STREET 4, Pipe 114 - 115						1.91				0.00				0.00				0.00	12.17														
	115	118	0.24	0.80	0.53	11.85			0.00	0.50			0.00	0.00			0.00	0.00	14.50	62.97	85.21	99.79	145.74	789	900	900	CONC	0.45	60.0	1214.3936	1.9089	0.5239	0.650
Contribution From STREET 5, Pipe 117 - 118						1.79				0.00				0.00				0.00	12.12														
	118	119	0.20	0.80	0.44	14.08			0.00	0.50			0.00	0.00			0.00	0.00	15.02	61.71	83.48	97.76	142.76	911	975	975	CONC	0.40	50.5	1417.3665	1.8984	0.4434	0.643
	119	130	0.16	0.80	0.36	14.44			0.00	0.50			0.00	0.00			0.00	0.00	15.47	60.69	82.08	96.11	140.34	917	975	975	CONC	0.40	12.0	1417.3665	1.8984	0.1054	0.647
To POND INLET, Pipe 130 - 131						14.44				0.50				0.00				0.00	15.57														
	120	121	0.18	0.77	0.39	0.39			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	30	300	300	PVC	0.70	50.0	80.9057	1.1446	0.7281	0.366
	121	122	0.17	0.77	0.36	0.75			0.00	0.00			0.00	0.00			0.00	0.00	10.73	74.12	100.50	117.79	172.17	56	375	375	PVC	0.40	60.0	110.8885	1.0040	0.9960	0.501
	122	123	0.46	0.77	0.98	1.73			0.00	0.00			0.00	0.00			0.00	0.00	11.72	70.76	95.89	112.36	164.20	123	525	525	CONC	0.20	97.0	192.3297	0.8885	1.8196	0.638
	123	124	0.11	0.77	0.24	1.97			0.00	0.00			0.00	0.00			0.00	0.00	13.54	65.43	88.58	103.76	151.56	129	525	525	CONC	0.20	27.5	192.3297	0.8885	0.5159	0.670
	124	125	0.09	0.77	0.19	2.16			0.00	0.00			0.00	0.00			0.00	0.00	14.06	64.08	86.72	101.58	148.36	139	525	525	CONC	0.20	26.0	192.3297	0.8885	0.4877	0.720
	125	126	0.07	0.77	0.15	2.31			0.00	0.00			0.00	0.00			0.00	0.00	14.55	62.86	85.05	99.61	145.47	145	525	525	CONC	0.25	9.5	215.0311	0.9933	0.1594	0.676
	126	127	0.21	0.77	0.45	2.76			0.00	0.00			0.00	0.00			0.00	0.00	14.71	62.47	84.52	98.98	144.55	172	600	600	CONC	0.20	43.0	274.5943	0.9712	0.7379	0.628
	127	128	0.13	0.77	0.28	3.04			0.00	0.00			0.00	0.00			0.00	0.00	15.44	60.74	82.15	96.19	140.46	185	600	600	CONC	0.20	13.5	274.5943	0.9712	0.2317	0.672
	128	130	0.40	0.77	0.86	3.90			0.00	0.00			0.00	0.00			0.00	0.00	15.68	60.22	81.43	95.35	139.23	235	600	600	CONC	0.30	84.5	336.3080	1.1894	1.1840	0.698
To POND INLET, Pipe 130 - 131						3.90				0.00				0.00				0.00	16.86														

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: A.S.	PROJECT: Caivan Leitrim	
Checked: W.L.	LOCATION: City of Ottawa	
Dwg. Reference:	File Ref: 24-1414	Date: Jul 2026
		Sheet No. SHEET 1 OF 2

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
POND INLET																																	
Contribution From STREET 3, Pipe 119 - 130						14.44				0.50				0.00				0.00	15.57														
Contribution From STREET 3, Pipe 128 - 130						3.90				0.00				0.00				0.00	16.86														
	130	131			0.00	18.33			0.00	0.50			0.00	0.00			0.00	0.00	16.86	57.70	77.99	91.31	133.29	1097	1050	1050	CONC	0.35	38.5	1615.5188	1.8657	0.3439	0.679
To POND INLET, Pipe 131 - 132						18.33				0.50				0.00				0.00	17.20														
Contribution From POND INLET, Pipe 130 - 131						18.33				0.50				0.00				0.00	17.20														
	131	132			0.00	18.33			0.00	0.50			0.00	0.00			0.00	0.00	17.20	57.01	77.05	90.20	131.67	1084	1050	1050	CONC	0.35	17.5	1615.5188	1.8657	0.1563	0.671
	132	HW1			0.00	18.33			0.00	0.50			0.00	0.00			0.00	0.00	17.36	56.70	76.63	89.71	130.95	1078	1050	1050	CONC	0.35	8.0	1615.5188	1.8657	0.0715	0.667
STREET 2																																	
			0.05	0.80	0.11	0.11			0.00	0.00			0.00	0.00			0.00	0.00															
	211	212	0.24	0.80	0.53	0.64			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	50	300	300	PVC	1.20	47.0	105.9304	1.4986	0.5227	0.468
To STREET 6, Pipe 212 - 213						0.64				0.00				0.00				0.00	10.52														
			0.05	0.80	0.11	0.11			0.00	0.00			0.00	0.00			0.00	0.00															
	105	106	0.35	0.77	0.75	0.86			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	66	300	300	PVC	0.85	81.5	89.1537	1.2613	1.0770	0.741
			0.29	0.77	0.62	1.48			0.00	0.00			0.00	0.00			0.00	0.00															
	106	108			0.00	1.48	0.45	0.40	0.50	0.50			0.00	0.00			0.00	0.00	11.08	72.90	98.83	115.82	169.28	157	600	600	CONC	0.25	83.0	307.0058	1.0858	1.2740	0.513
To STREET 3, Pipe 108 - 111						1.48				0.50				0.00				0.00	12.35														
			0.27	0.80	0.60	0.60			0.00	0.00			0.00	0.00			0.00	0.00															
	208	209	2.04	0.80	4.54	5.14			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	395	750	750	CONC	0.30	71.5	609.7669	1.3802	0.8634	0.647
	209	210	0.13	0.80	0.29	5.43			0.00	0.00			0.00	0.00			0.00	0.00	10.86	73.64	99.84	117.02	171.03	400	750	750	CONC	0.30	43.0	609.7669	1.3802	0.5192	0.655
	210	212	0.13	0.80	0.29	5.72			0.00	0.00			0.00	0.00			0.00	0.00	11.38	71.87	97.42	114.16	166.84	411	750	750	CONC	0.30	41.0	609.7669	1.3802	0.4951	0.674
To STREET 6, Pipe 212 - 213						5.72				0.00				0.00				0.00	11.88														
STREET 6																																	
	203	204	0.19	0.77	0.41	0.41			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	0.70	49.5	80.9057	1.1446	0.7208	0.386
	204	205	0.03	0.80	0.07	0.47			0.00	0.00			0.00	0.00			0.00	0.00	10.72	74.14	100.53	117.83	172.23	35	300	300	PVC	2.20	7.0	143.4304	2.0291	0.0575	0.245
	205	206	0.36	0.80	0.80	1.27			0.00	0.00			0.00	0.00			0.00	0.00	10.78	73.94	100.25	117.50	171.74	94	450	450	CONC	0.40	53.0	180.3170	1.1338	0.7791	0.522
	206	207			0.00	1.27			0.00	0.00			0.00	0.00			0.00	0.00	11.56	71.30	96.63	113.23	165.47	91	450	450	CONC	0.25	9.5	142.5531	0.8963	0.1766	0.637
Contribution From STREET 2, Pipe 210 - 212						5.72				0.00				0.00				0.00	11.88														
Contribution From STREET 2, Pipe 211 - 212						0.64				0.00				0.00				0.00	10.52														
	212	213	0.04	0.80	0.09	6.45			0.00	0.00			0.00	0.00			0.00	0.00	11.88	70.28	95.22	111.58	163.04	453	825	825	CONC	0.20	14.0	641.9463	1.2009	0.1943	0.706
To STM INLET, Pipe 213 - 214						6.45				0.00				0.00				0.00	12.07														
	200	201	0.25	0.80	0.56	0.56			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	43	300	300	PVC	1.90	64.5	133.2928	1.8857	0.5701	0.320
	201	202	0.07	0.80	0.16	0.71			0.00	0.00			0.00	0.00			0.00	0.00	10.57	74.68	101.28	118.70	173.51	53	300	300	PVC	1.70	9.0	126.0824	1.7837	0.0841	0.422
	202	207	0.20	0.80	0.44	1.16			0.00	0.00			0.00	0.00			0.00	0.00	10.65	74.38	100.86	118.22	172.79	86	450	450	CONC	0.20	49.0	127.5033	0.8017	1.0187	0.675
	207	213	0.20	0.80	0.44	2.88			0.00	0.00			0.00	0.00			0.00	0.00	11.73	70.73	95.85	112.31	164.12	203	600	600	CONC	0.25	50.0	307.0058	1.0858	0.7675	0.662
To STM INLET, Pipe 213 - 214						2.88				0.00				0.00				0.00	12.50														
STM INLET																																	
Contribution From STREET 6, Pipe 207 - 213						2.88				0.00				0.00				0.00	12.50														
Contribution From STREET 6, Pipe 212 - 213						6.45				0.00				0.00				0.00	12.07														
	213	214			0.00	9.32			0.00	0.00			0.00	0.00			0.00	0.00	12.50	68.37	92.61	108.50	158.52	638	825	825	CONC	0.40	3.5	907.8492	1.6983	0.0343	0.702

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: A.S.	PROJECT: Caivan Leitrim	
Checked: W.L.	LOCATION: City of Ottawa	
Dwg. Reference:	File Ref: 24-1414	Date: Jul 2026 / Sheet No. SHEET 2 OF 2

JFSA Canada Inc.
52 Springbrook Drive,
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June 26, 2026 Project Number: 2704(e01)

David Schaeffer Engineering Ltd
120 Iber Road, Unit 103
Ottawa, Ontario
K2S 1E9

Attention: **John Priamo, P.Eng**

Subject: **4795 Bank Street, Ottawa – Preliminary Stormwater Analysis**

INTRODUCTION

This preliminary stormwater management analysis has been prepared to support the applications for the proposed development located at 4795 Bank Street in Ottawa. The subject property encompasses a total parcel area of 17.17 ha, of which approximately 12.62 ha is slated for residential development, with the remaining lands consisting of a pond block, park lands and a natural corridor.

The objective of this analysis is to evaluate the proposed stormwater infrastructure and ensure that the development can be effectively serviced while mitigating impacts on the receiving systems. Specifically, this memo assesses the following core components:

- **Minor System Hydraulics:** A preliminary hydraulic grade line (HGL) analysis, completed using PCSWMM, to verify that the proposed storm sewer network can safely convey minor system flows while maintaining adequate freeboard and basement flooding protection.
- **On-Site Attenuation:** The preliminary sizing of internal stormwater controls to meet established unitary release rates for a proposed 2.05 ha condominium block at the intersection of Bank Street and Blais Road.
- **Pond Expansion Logistics:** A hydrologic and hydraulic evaluation of a conceptual expansion to the existing Findlay Creek Village Stormwater Management Facility (FCVSWMF) to offset the increased runoff generated by the newly developed lands.
- **Downstream Impact Assessment:** Analysis to confirm that the combination of on-site attenuation and the proposed facility expansion yields a net reduction in peak flows to the downstream Findlay Creek watercourse.

PRELIMINARY STORM HGL ANALYSIS

A preliminary hydraulic grade line (HGL) analysis for the proposed Bank Street development was completed using PCSWMM modelling software. Pipe data, storm sewer layout, and Rational Method flows were provided by DSEL. Minor system design flows were calculated based on variable levels of service requirements dictated by City standards for specific land uses (e.g., 2-year for residential, 5-year for parks). To accommodate the increased minor system capture during the 100-year event, the baseline Rational Method flows were increased by 35%. This multiplier reflects the higher inflow rates through ICDs resulting from increased head during road ponding, alongside the 100-year capture from rear yard catchbasins.

The proposed storm sewer infrastructure data provided by DSEL was incorporated into the PCSWMM model. The flows were applied to each corresponding maintenance hole (MH) as steady inflows using the baseline inflow option. Exit losses were applied to all storm sewer pipes based on the angle of the downstream connection. A fixed tailwater boundary condition of 88.60 m was applied at the system outlet, corresponding to the 100-year high water level of the Findlay Creek Village Stormwater Facility (FCVSWMF).

The maximum HGL elevation obtained at each MH has been extracted and is provided in **Table A1 of Attachment A**. In the absence of detailed Underside of Footing (USF) elevations for the site at this preliminary stage, it was assumed that a minimum freeboard of 1.80 m from the top of the MH to the 100-year HGL provides sufficient clearance to protect the ultimate USF elevations of the proposed buildings. HGLs and freeboards will be verified and updated during the detailed design stage once unit-specific USF elevations are established.

An average freeboard of **2.90 m** from the top of grate to the 100-year HGL was observed throughout the proposed development. A localized minimum freeboard of **1.66 m** was recorded at MH-208; however, this is a shallow structure with a total depth of only 2.25 m, dictated by grading constraints required to tie into the existing Blais Road elevations. There are three additional locations with freeboards less than 1.80 m, but these are situated within the SWM pond and servicing block, which will not contain USF connections.

Based on these results, the proposed storm sewer infrastructure is sufficiently sized to safely convey minor system flows from the development under extreme conditions while maintaining adequate basement flooding protection. The PCSWMM model and associated digital files have been provided electronically.

CONDO ON-SITE STORAGE

A 2.05 ha condominium block is proposed at the intersection of Bank Street and Blais Road. Given the high imperviousness of the site (assumed runoff coefficient of 0.80) and the physical viability of implementing on-site storage—via surface ponding in parking areas, subsurface infrastructure, or a combination thereof—it is assumed that post-development stormwater controls will be managed internally within the block.

Allowable unitary release rates were established based on the Expansion of Findlay Creek Village Stormwater Facility Leitrim Development Area Design Brief (IBI Group, December 2017). Allowable discharge rates from Table 6.5 of the brief were prorated over the facility's 405 ha drainage area. **Table 1** below outlines the extracted peak discharge values and the resulting unitary target rates.

Table 1: Peak Flows from FCVSMF
(IBI Group, December 2017).

Storm Event	Facility Discharge (m^3/s)	Unitary Target Flow (L/s/ha)
25mmCHI4HR	1.09	6
2YRSCS24HR	2.86	14
5YRSCS24HR	4.82	24
100YRCHI3HR	8.44	43
100YRSCS24HR	10.89	55

Preliminary hydrologic modelling was conducted using SWMHYMO, applying the various design storms and iterating the required storage volume to meet the unitary release rates. To attenuate post-development flows to the governing 100-year target release rate, the analysis indicates a required on-site storage volume of approximately **1,210 m³**. Normalized over the 2.05 ha site, this translates to a unitary storage volume of **590 m³/ha**. While this represents a high specific storage requirement, it remains securely within a feasible range for on-site implementation.

POND EXPANSION

JFSA acquired the latest iterations of the XPSWMM and SWMHYMO models for the Findlay Creek Village Stormwater Management Facility (FCVSWMF) from Arcadis in May 2026. Concurrently, DSEL provided a post-development stormwater management plan delineating the proposed drainage areas, associated runoff coefficients, and respective outlets for the site.

To establish preliminary design parameters for DSEL, a conceptual hydrologic model was initially developed using the unitary release rates for the FCVSWMF (previously outlined in Table 1) in conjunction with DSEL's stormwater management plan. This preliminary model approximated the additional storage volume required within the existing FCVSWMF to offset the increased runoff generated by the proposed Bank Street development. Utilizing these target volumes, DSEL developed a detailed stage-storage curve for the proposed pond expansion to mitigate water level increases associated with the new development flows. The complete stage-storage curves are provided in **Attachment B**.

Following the conceptual sizing, the Arcadis SWMHYMO model was updated to accurately reflect the proposed Bank Street development lands. The resulting inflow hydrographs directed to the SWM pond were extracted for integration into the XPSWMM model to assess the impacts on the pond's operation.

The original Arcadis XPSWMM model was comprehensive, encompassing both the storm sewer and sanitary networks with over 1,000 nodes and links. Because the objective of this analysis is specifically to evaluate the hydraulic performance (water levels and peak outflows) of the expanded pond under the new flow regime, a truncated version of the model was developed. This localized model consists exclusively of the pond node, the pond outlet structure, and the direct inflow hydrographs. By extracting the hydrographs from the original large-scale model and applying them as direct boundary conditions to the pond node, upstream pipe routing is bypassed while exactly replicating the inflows to the facility. This approach significantly streamlines the analysis and reduces simulation run times.

It should be noted that while the original Arcadis model was executed in XPSWMM v9.1, the updated JFSA localized model was run utilizing XPSTORM v10.6. This transition in software platforms and versions yields minor computational differences; therefore, to ensure a valid comparative analysis, the JFSA post-development condition is compared exclusively against a JFSA-run pre-development (existing) condition model. The original Arcadis-reported values are retained in the summary table strictly for reference context.

Table 2 summarizes the peak water levels and peak outflows for the SWM facility during the 100-year design events. A full suite of design storms will be evaluated during the detailed design phase; the current preliminary analysis focuses on confirming that the proposed pond expansion provides sufficient attenuation storage for the critical 100-year events.

Table 2: Peak Water Levels & Outflows from the FCVSWMF

Condition	Modeller	Sanitary	Event	Pond Level (m)	Pond Outflow (m^3/s)
Pre-Dev - XPSWMMv9.1	Arcadis	Annual	100YRCHI3HR 100YRSCS24HR	88.419 88.648	8.791 11.496
Pre-Dev - XPSTORMv10.6 (Localized Model)	JFSA	Annual	100YRCHI3HR 100YRSCS24HR	88.394 88.605	8.545 11.214
Post-Dev - XPSTORMv10.6 (Localized Model)	JFSA	Annual	100YRCHI3HR 100YRSCS24HR	88.393 88.601	8.536 11.165

The results of this analysis indicate that the proposed pond expansion, even when subjected to the additional flows from the proposed Bank Street development, yields a net reduction in peak water levels by 1 to 4 mm and a decrease in peak outflows by 9 to 49 L/s during the 100-year design events. Consequently, the proposed expansion is appropriately sized to mitigate and accommodate the runoff from the newly developed lands.

Additional preliminary analysis was conducted on the proposed pond expansion forebay to ensure compliance with current Ministry of the Environment, Conservation and Parks (MECP) guidelines. Based on the preliminary inflow rates and the proposed forebay geometry, the design satisfies all critical sediment settlement criteria, including minimum dispersion length, settling velocity, required active volume, and minimum bottom width. Forebay design will be revisited and assessed again at detailed design.

DOWNSTREAM IMPACT ASSESSMENT

To evaluate the downstream impacts of the proposed development, a coupled modelling approach was utilized to capture both the site hydrology and the facility hydraulics. The regional Arcadis SWMHYMO model was updated to reflect all post-development hydrologic parameters for the Bank Street development site, including the proposed drainage areas, altered imperviousness, and condo on-site storage. Runoff generated from these specific areas is directed to the Expanded Pond. Conversely, the remaining natural, uncontrolled lands bypass the stormwater management facility entirely and drain directly to Findlay Creek.

The inflow hydrographs generated by the SWMHYMO model were routed through the localized XPSTORM v10.6 model of the Expanded Pond. The resulting attenuated outflow hydrographs were subsequently extracted and read back into the regional SWMHYMO model, where they combine with the uncontrolled bypass flows to simulate the total response in the receiving watercourse.

Peak flows were evaluated at "Node C," an established point of interest within the existing Arcadis model located on Findlay Creek, immediately downstream of the SWM facility outlet and upstream of the Blais Road crossing. This specific node was selected to maintain continuity with historical reporting by others and to provide a consistent baseline for evaluating downstream hydraulic conditions.

The hydrologic routing demonstrates that the proposed Bank Street development, in conjunction with the SWM pond expansion, provides a net benefit to the downstream watercourse. As summarized in **Table 3**, the updated condition yields a reduction in peak flows ranging from **52 L/s** to **771 L/s** during the 100-year design events. This reduction in downstream peak flows demonstrates that the expanded pond successfully attenuates the runoff from the proposed development site. As noted previously, the full suite of design storms will be evaluated comprehensively during the detailed design phase.

Table 3: 100-Year Peak Flows at Node C - Findlay Creek at Blais Road

Scenario	Peak Flow (m^3/s) 100YRCHI3HR	100YRSCS24HR
Pre-Dev (Arcadis)	7.969	17.316
Post-Dev (JFSA)	7.917	16.545
Difference	**-0.052**	**-0.771**

CONCLUSION

Based on the preliminary stormwater management analysis, the proposed development at 4795 Bank Street can be effectively serviced while mitigating adverse impacts on the existing infrastructure and receiving watercourses. The hydraulic grade line analysis confirms that the proposed storm sewer network is sufficiently sized to safely convey minor system flows from the development under extreme conditions while maintaining adequate basement flooding protection. For the proposed condominium block, implementing approximately 1,210 m³ of on-site storage provides a feasible approach to attenuate post-development flows to the governing 100-year target release rate. Furthermore, the conceptual expansion of the Findlay Creek Village Stormwater Management Facility is appropriately sized to mitigate and accommodate the runoff from the newly developed lands. Hydrologic routing demonstrates that this expansion, in conjunction with the site's stormwater controls, yields a reduction in peak water levels within the facility and decreases downstream peak flows to Findlay Creek during the 100-year design events.

Yours truly,
JFSA Canada Inc.

Jonathon Burnett, B.Eng, P.Eng, MBA
Senior Water Resources Engineer

LICENSED PROFESSIONAL ENGINEER
J. J. BURNETT
100227734
26-JUNE-2026
PROVINCE OF ONTARIO

Tables
Table 1: Peak Flows from FCVSMF
Table 2: Peak Water Levels & Outflows from the FCVSWMF
Table 3: 100-Year Peak Flows at Node C - Findlay Creek at Blais Road

Attachments
Attachment A: HGL Analysis
Attachment B: FCVSWMF - Pond Expansion

Modelling Files	
SWMHYMO	**Pre Dev:** LD_UP-CN.dat LD_UP-H.dat **Post Dev:** LD_UP-CN-Post.dat LD_UP-H-Post.dat
XPSWMM	**Pre Dev:** LeitrimPond_Annual_PreDev_3CHI100_20260601.xp LeitrimPond_Annual_PreDev_24SCS100_20260601.xp **Post Dev** LeitrimPond_Annual_PostDev_3CHI100_20260619.xp LeitrimPond_Annual_PostDev_24SCS100_20260619.xp
PCSWMM	**Post Dev:** LTR_v01.1-Fixed.inp

All modelling files above have been provided digitally

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Attachment A

HGL Analysis

N

Legend

- Development Plan
- Outfalls
- Junctions
- Conduits

SCALE: 1:2500

0 50 100 150 m

DSEL

JFSA CANADA INC.
WATER RESOURCE ENGINEERING, ENVIRONMENTAL MANAGEMENT AND LAND PLANNING CONSULTANTS

Bank Street

Figure A1 - Storm Sewer Plan

PROJECT	2704(e01)
DRAWN	JB
DATE	June 2026

C:\Users\JonathonBurnett\J.F. Sabourin and Associates Inc\JFSA-OTTAWA-SERVER - Documents\PROJ\2704-24\2704(e01)\Design\GIS\20260626-Storm_Plan

Table A1: Bank Street Developments
Preliminary 100-year HGL Analysis

Connection Point	MH-ID	Invert Elevation (m)	Top of MH (m)	Max HGL (m)	Top of MH Freeboard (m)	Notes
Additional Findlay Creek SWM Facility Forebay	MH-100	90.52	93.43	90.69	2.74	
	MH-101	89.91	93.69	90.37	3.32	
	MH-102	90.30	93.65	90.44	3.21	
	MH-103	89.53	93.45	90.29	3.16	
	MH-104	89.11	93.07	90.12	2.95	
	MH-105	90.61	93.94	91.10	2.84	
	MH-106	89.62	93.42	90.41	3.01	
	MH-107	89.95	93.33	90.30	3.03	
	MH-108	89.33	93.17	90.27	2.90	
	MH-109	90.36	93.74	90.85	2.89	
	MH-110	89.40	93.29	90.31	2.98	
	MH-111	88.97	92.93	90.15	2.78	
	MH-112	88.55	92.69	89.95	2.74	
	MH-113	89.55	93.05	90.31	2.74	
	MH-114	88.95	92.75	90.01	2.75	
	MH-115	88.34	92.47	89.82	2.65	
	MH-116	89.31	93.15	90.00	3.15	
	MH-117	88.75	92.69	89.77	2.92	
	MH-118	87.99	92.23	89.60	2.63	
	MH-119	87.76	92.03	89.40	2.63	
	MH-120	89.99	93.40	90.24	3.16	
	MH-121	89.57	93.12	90.17	2.95	
	MH-122	89.18	93.18	90.06	3.12	
	MH-123	88.93	92.89	89.91	2.99	
	MH-124	88.84	92.67	89.85	2.82	
	MH-125	88.73	92.57	89.78	2.79	
	MH-126	88.63	92.52	89.74	2.78	
	MH-127	88.51	92.35	89.67	2.68	
	MH-128	88.44	92.31	89.63	2.68	
	MH-130	87.64	91.97	89.32	2.65	
	MH-131	87.44	90.71	89.07	1.64	Located within the Servicing Blk; No STM service connection
	MH-132	87.32	88.90	88.79	0.11	U/S of Additional Forebay; No STM service connection
	HW1	84.00	88.85	88.60	0.25	Additional Forebay Inlet Headwall
MH-214 (Ex. Storm Sewer Junction S792A)	MH-200	91.26	94.58	91.40	3.18	
	MH-201	89.98	94.33	90.36	3.97	
	MH-202	89.67	94.29	90.28	4.01	
	MH-203	90.91	94.55	91.07	3.48	
	MH-204	90.54	94.35	90.67	3.68	
	MH-205	90.23	94.32	90.51	3.81	
	MH-206	89.99	94.10	90.38	3.72	
	MH-207	89.43	94.07	90.20	3.87	
	MH-208	90.30	92.55	90.89	1.66	Low freeboard due to tie in to existing grades at Blais
	MH-209	90.05	94.13	90.74	3.39	
	MH-210	89.90	93.95	90.66	3.29	
	MH-211	90.79	94.09	90.98	3.11	
	MH-212	89.70	93.81	90.44	3.37	
	MH-213	87.21	93.81	90.03	3.78	
	S792A	85.48	91.85	89.82	2.03	Existing Storm Sewer Connection (MH-214)
				Min	0.11	
				Max	4.01	
				Average	2.90	

Notes:

(1) Analysis assumes the use of ICDs throughout the development, therefore the Rational Method flows as per DSEL's storm design sheets were increased by 35% to account for additional flows captured into the minor system during the 100-year event.

(2) Analysis assumes a preliminary 100-year water level of 88.60m in the proposed additional Findlay Creek SWM Facility forebay as per Table 6.5 of the Dec 14, 2017 Design Brief Expansion of Findlay Creek Village SWM Facility by IBI Group.

(3) Analysis conservatively assumes a steady 100 year peak flow (27.382m^3/s) in existing storm sewer junction S792A as per 100-yr 24hr storm from the XPSWMM model by IBI Group.

(4) Model Name: LTR_v01.1-Fixed.inp.

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Attachment B

FCVSWMF - Pond Expansion

Table B1: FCVSWM Pond Expansion Curve

Elevation	Volume (m3)	Area (m2)
86.10	0	1,564
86.15	79	1,598
86.20	160	1,634
86.25	242	1,671
86.30	327	1,708
86.35	413	1,746
86.40	501	1,784
86.45	592	1,822
86.50	684	1,861
86.55	778	1,901
86.60	874	1,942
86.65	972	1,982
86.70	1,072	2,024
86.75	1,174	2,066
86.80	1,279	2,119
86.85	1,394	2,487
86.90	1,520	2,536
86.95	1,648	2,584
87.00	1,778	2,633
87.05	1,911	2,683
87.10	2,047	2,742
87.15	2,185	2,808
87.20	2,327	2,874
87.25	2,473	2,941
87.30	2,622	3,009
87.35	2,774	3,077
87.40	2,929	3,146
87.45	3,088	3,216
87.50	3,251	3,286
87.55	3,417	3,357
87.60	3,587	3,429
87.65	3,760	3,501
87.70	3,937	3,574
87.75	4,117	3,647
87.80	4,302	3,722
87.85	4,489	3,796
87.90	4,681	3,872
87.95	4,877	3,948
88.00	5,076	4,024
88.05	5,279	4,102
88.10	5,486	4,180
88.15	5,697	4,259
88.20	5,912	4,338
88.25	6,131	4,418
88.30	6,354	4,498
88.35	6,581	4,579
88.40	6,812	4,661
88.45	7,047	4,744
88.50	7,286	4,827
88.55	7,530	4,910
88.60	7,779	5,068

CALCULATION SHEET B-2: FOREBAY SIZING FOR SWM FACILITY

Bank Street Subdivision
FCVSWMF
City of Ottawa
Calculation of South Forebay Size

Settling Criteria

From the SWMP Manual, the required length for settling is as follows:

$$L_{min} = \left(\frac{rQ_p}{V_s}\right)^{0.5}$$

where:
- r = length to width ratio, at the invert of the inlet pipe.
- Q_p = peak outflow during design quality storm
- V_s = settling velocity

Input:
- r = 3.00 (90 m / 30 m)
- Q_p = 0.764 m^3/s
- V_s = 0.0003 m/s

L_{min} = 87.41 m

The peak flow rate from the pond during the quality storm is taken as the flow that would occur just below the quantity controls (Refer to Table C-6 of Appendix B)

Dispersion Criteria

From the SWMP Manual, the required length for dispersion is as follows:

$$L_{min} = \frac{8Q}{dV_t}$$

where:
- Q = Inlet flow rate (10-Year, 12-Hour SCS Storm)
- d = depth of permanent pool (forebay) during peak 10-year inflow
- V_f = desired final velocity

Input:
- Q = 2.043 m^3/s
- d = 2.00 m
- Vf = 0.5 m/s

L_{min} = 16.34 m

The minimum forebay length is determined by the larger of the settling or dispersion criteria.

Minimum Length of Forebay Required	87 m	
Length of Forebay Provided	**82.5 m**	(at elevation 91.20)

Average Forebay Velocity

From the SWMP Manual, the maximum allowable average velocity is 0.15 m/s:

$$V_{avg} = \frac{Q}{d\,W_{avg}}$$

where:
- Q = Inlet flow rate (10-Year, 3-Hour CHI Storm)
- d = depth of pond during peak 10-year inflow
- W_{avg} = average width of forebay

Input:
- Q = 2.043 m^3/s
- d = 2.00 m
- W_{avg} = 30 m (21 m bottom, 33 m top)

V = 0.03 m/s < 0.15 m/s

Content Copy Of Original

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 4126-AXAHFC
Issue Date: April 3, 2018

City of Ottawa
110 Laurier Avenue West
Ottawa, Ontario
K1P 1J1

Site Location: Findlay Creek Village Stormwater Management Facility #1
3265 and 3491 Blais Road, 4346 Hawthorne Road
Lots 12, 18, 19 and 20, Concession 5, Rideau Front
City of Ottawa, Ontario

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act , R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

an amendment to existing stormwater management works to serve the urban expansion lands of the Leitrim Development Area, specifically the area bounded by Bank Street to the west, Analdea Drive to the North, Urban Boundary to the East and the existing Findlay Creek Stormwater Management Pond #1 to the south, in the City of Ottawa, for the treatment and disposal of stormwater runoff, to provide Enhanced Level water quality protection and to attenuate post-development peak flows to pre-development peak flows for a total catchment area of approximately an additional 87 hectares, for all storm events up to and including the 100-year storm event, discharging to the existing Findlay Creek Stormwater Management Pond#1, comprising:

Proposed Works:

one (1) wet pond expansion,located east of Bank Street, serving a total drainage area of approximately 87 hectares and having a total maximum length of approximately 460 metres and a total maximum width of approximately 125 metres, consisting of:

- a riprap-lined plunge pool at the inlet that has a minimum length of 16 metres, a maximum width of 10 metres, and a depth of 2.20 metres;
- sediment forebay (that includes the plunge pool) with a 400 millimetre Granular B bottom that has a minimum length of 100 metre, a maximum width of 35 metre, a depth of 1.60 metre, and is separated from the main cell via a peninsula and rock check dam;

- a main cell that has a minimum permanent storage volume of 35,000 cubic metres, a minimum active storage volume of 3,500 cubic metres, a maximum permanent pool depth of 2.10 metres and a maximum available depth of 1.50 metres;
- an eastern inlet structure consisting of a 3,048 millimetre by 4,270 millimetre concrete flow splitter manhole, with a 3,000 millimetre diameter inlet trunk storm sewer, a 1,500 millimetre by 1,800 millimetre first flush concrete box culvert with a concrete outlet headwall structure discharging to the plunge pool in the sediment forebay protected with rip-rap, a 1,500 millimetre by 2,400 millimetre overflow concrete culvert with an overflow concrete headwall structure discharging to the main pond protected with rip-rap;
- an outlet connecting to the eastern existing wet pond detention cell comprised of a twin 1,800 millimetre x 2,400 millimetre wide concrete box culverts and not designed to control outflow from the expansion cell;

a major system conveyance grassed swale , located west of the detention pond, serving a drainage area of 2.64 hectares, having a total length of 50 metres, a V-notch bottom, side slopes of 2.5:1, a maximum depth of 2.80 metres, a maximum flow depth of 1.50 metres (100-year storm event), complete with a combination of a 600 millimetre diameter CSP pipe and weir spillway outlet allowing a maximum discharge of 2,637 litres/second under the 100-year storm event to the main cell of the proposed wet pond expansion;

Previous Works

Existing Works approved under Certificate of Approval No. 3969-8GWJ8L dated June 14, 2011

- a 3,810 millimetre by 3,048 millimetre concrete flow splitter manhole (MH 145), with a 2,100 millimetre diameter inlet trunk storm sewer, a 1,800 millimetre by 900 millimetre first flush concrete box culvert with a concrete outlet headwall with provision for stop log control discharging to the existing plunge pool in the sediment forebay protected with rip-rap, a 2,400 millimetre by 1,200 millimetre overflow concrete box culvert with a concrete outlet headwall discharging to the

main pond protected with rip-rap;

- an interim clay berm and turbidity curtain in the sediment forebay and a second interim clay berm and turbidity curtain around the proposed overflow outlet to the main pond during construction of the eastern inlet to the existing Findlay Creek Village Stormwater Facility.

Existing Works approved under Certificate of Approval No. 7056-7U7KYH dated September 2, 2009

The Leitrim Wetland Control Structure serving a total catchment area of 626 hectares, designed to control the release of water to Findlay Creek from the Leitrim Wetland during flood events to maintain water levels in the Leitrim Wetland within a range of elevations that will ensure that the natural ecosystem functions of the wetland are protected, and the existing stormwater management works for the collection, transmission, treatment and disposal of stormwater run-off from a catchment area of 435 hectares to provide Enhanced Level water quality protection and erosion control and to attenuate post-development peak flows to pre-development levels, discharging to Findlay Creek, for all storm events up to and including the 100-year return storm, consisting of the following:

- an inlet structure consisting of box culverts - of sizes 1.8 metres by 2.4 metres and 1.8 metres by 0.9 metres - stacked to form a modified box manhole with an 800 millimetre wide by 800 millimetre high opening fitted with a sluice gate, located within a depressed pool in the close vicinity of the Leitrim Wetland berm, including a boom made of floating logs, located just upstream of the depressed pool to prevent clogging of the inlet structure, rock boulders, rip-rap on geotextile, complete with a fenced catwalk to provide a controlled access from the wetland berm to the structure via a lockable gate;
- a 900 millimetre diameter outlet pipe extending between the inlet and outlet structures and overlaid by compacted clay to seal the Leitrim Wetland berm against percolation;
- an emergency overflow channel located south of the principal axis of the Leitrim Wetland Control Structure, 2.3 metre wide at the bottom, lined with rip-rap (top elevation of 94.4 metre) on geotextile, discharging directly to Findlay Creek;
- an outlet structure consisting of box culverts – of sizes 1.8 metre by

0.9 metre and 2.4 metre by 0.9 metre – stacked to form a modified manhole with a 0.5 metre wide by 2.7 metre high opening fitted with a sluice gate on the downstream side of the Leitrim Wetland Control Structure to control the wetland water level as required and to discharge to Findlay Creek via a 1.5 metre wide by 3 metre long concrete splash pad, followed by an outlet channel lined with rip-rap on geotextile;

Existing Works approved under Certificate of Approval No. 1806-6JVSTH dated January 25, 2006

- the Albion Road east ditch realignment and extension from Albion Road to approximately 1,500 metres east of Albion Road conveying stormwater run-off from west and north of the Leitrim Development Area, discharging flows of 3.1 cubic metres/second (2- year storm event) to Findlay Creek and flows above 3.1 cubic metres/second to Leitrim Wetland;
- the Park Swale conveying the 100-year stormwater run-off from north of Leitrim Road, discharging flows of 2.4 cubic metres/second to Albion Road east ditch extension;
- the Leitrim Wetland Berm separating the wetland regime from the Leitrim Development Area;
- the stormwater management pond (Pond #1) to service the Leitrim Development Area, located east of Bank Street, having a permanent storage volume of 44,000 cubic metres, an extended detention storage volume of 37,000 cubic metres, and a total active storage volume of 109,000 cubic metres complete with one (1) inlet structure consisting of a flow splitter manhole, a 3.0 metres by 1.5 metres first flush box pipe discharging to western sediment forebay, first flush headwall, sluice gate, a 1,200 millimetre diameter maintenance chimney, concrete apron and plunge pool and a 3.6 metres by 1.8 metres overflow box pipe discharging flows above 7.1 cubic metres/second (approximately the 25 millimetre storm event) and 9.8 cubic metres/second (100-year storm event) to western cell, overflow headwall, stop logs, concrete apron and plunge pool; and one (1) 2.4 metre diameter inlet pipe discharging to eastern sediment forebay and plunge pool, two (2) sediment forebays, one (1) 125 metres long and

30 metres wide (western sediment forebay) and one (1) 90 metres long and 20 metres wide (eastern sediment forebay), two (2) submerged permeable rock check dams, one (1) deep flowage channel, two (2) wet cells, a 3 m wide access road, an emergency overflow located on top of the outlet structure, deep pool and one (1) outlet structure consisting of a 900 millimetre diameter outlet pipe, a 1.5 metre by 0.75 metre weir with a sluice gate and a three (3) sided weir having a total length of 8.6 metre, together allowing a maximum discharge of 10.6 cubic metres/second (100-year storm event) via outlet channel to Findlay Creek;

including erosion/sedimentation control measures during construction and all other controls and appurtenances essential for the proper operation of the aforementioned Works;

all in accordance with the submitted application and supporting documents listed in Schedule "A" forming part of this approval.

For the purpose of this environmental compliance approval, the following definitions apply:

1. "*Approval*" means this entire document and any schedules attached to it, and the application;
2. "*Director*" means a person appointed by the Minister pursuant to section 5 of the *EPA* for the purposes of Part II.1 of the *EPA*;
3. "*EPA*" means the *Environmental Protection Act,* R.S.O. 1990, c.E.19, as amended;
4. "*Equivalent*" means a substituted oil and grit separator that meets the required quality and performance standards of the approved oil and grit separator;
5. "*Ministry*" means the ministry of the government of Ontario responsible for the *EPA* and *OWRA* and includes all officials, employees or other persons acting on its behalf;
6. "*Owner*" means City of Ottawa, and includes its successors and assignees;
7. "*OWRA*" means the *Ontario Water Resources Act, R.S.O. 1990, c. O.40*, as amended;

8. "*Water Supervisor*" means the Water Supervisor of the appropriate local office of the Safe Drinking Water Branch of the *Ministry*, where the *Works* are geographically located;
9. "*Wet Event*" means a rainfall event with a minimum of 15 millimetres of rain in a 24 hour period;
10. "*Works*" means the sewage works described in the *Owner*'s application, and this *Approval*.
11. "*Previous Works*" means those portions of the sewage Works previously approved under an Approval;
12. "*Proposed Works*" means the sewage works described in the *Owner's* application, this *Approval*, to the extent approved by this *Approval*;

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. **GENERAL CONDITIONS**
    1. The *Owner* shall ensure that any person authorized to carry out work on or operate any aspect of the *Works* is notified of this *Approval* and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.
    2. Except as otherwise provided by these Conditions, the *Owner* shall design, build, install, operate and maintain the *Works* in accordance with the description given in this *Approval*, and the application for approval of the *Works*.
    3. Where there is a conflict between a provision of any document in the schedule referred to in this *Approval* and the conditions of this *Approval*, the conditions in this *Approval* shall take precedence, and where there is a conflict between the documents in the schedule, the document bearing the most recent date shall prevail.
    4. Where there is a conflict between the documents listed in Schedule "A" and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.
    5. The conditions of this *Approval* are severable. If any condition of this *Approval*, or the application of any requirement of this *Approval* to any circumstance, is held invalid or unenforceable, the application of such

condition to other circumstances and the remainder of this *Approval* shall not be affected thereby.

6. The issuance of, and compliance with the conditions of, this *Approval* does not:
   a. relieve any person of any obligation to comply with any provision of any applicable statute, regulation or other legal requirement, including, but not limited to, the obligation to obtain approval from the local conservation authority/MNR necessary to construct or operate the sewage works; or
   b. limit in any way the authority of the *Ministry* to require certain steps be taken to require the *Owner* to furnish any further information related to compliance with this *Approval*.

2. **EXPIRY OF APPROVAL**
   1. This *Approval* will cease to apply to those parts of the Work which have not been constructed within five (5) years of the date of this *Approval*.
   2. In the event that completion and commissioning of any portion of the *Works* is anticipated to be delayed beyond the specified expiry period, the *Owner* shall submit an application of extension to the expiry period, at least twelve (12) months prior to the end of the period. The application for extension shall include the reason(s) for the delay, whether there is any design change(s) and a review of whether the standards applicable at the time of Approval of the *Works* are still applicable at the time of request for extension, to ensure the ongoing protection of the environment.

3. **CHANGE OF OWNER**
   1. The *Owner* shall notify the *Water Supervisor* and the *Director*, in writing, of any of the following changes within thirty (30) days of the change occurring:
      a. change of Owner;
      b. change of address of the *Owner*;
      c. change of partners where the *Owner* is or at any time becomes a partnership, and a copy of the most recent declaration filed under the *Business Names Act*, R.S.O. 1990, c.B17 shall be included in the notification to the *Water Supervisor*; or
      d. change of name of the corporation where the *Owner* is or at any time becomes a corporation, and a copy of the most current information filed under the *Corporations Information Act*, R.S.O. 1990, c. C39 shall be included in the notification to the *Water Supervisor*.
   2. In the event of any change in ownership of the *Works*, other than a change to

a successor municipality, the *Owner* shall notify in writing the succeeding owner of the existence of this *Approval*, and a copy of such notice shall be forwarded to the *Water Supervisor* and the *Director*.

3. The *Owner* shall ensure that all communications made pursuant to this condition refer to the number at the top of this *Approval*.

4. **OPERATION AND MAINTENANCE**
    1. If applicable, any proposed storm sewers or other stormwater conveyance in this *Approval* can be constructed but not operated until the proposed stormwater management facilities in this *Approval* or any other *Approval* that are designed to service the storm sewers or other stormwater conveyance are in operation.
    2. The *Owner* shall make all necessary investigations, take all necessary steps and obtain all necessary approvals so as to ensure that the physical structure, siting and operations of the *Works* do not constitute a safety or health hazard to the general public.
    3. The *Owner* shall undertake an inspection of the condition of the *Works*, at least once a year, and undertake any necessary cleaning and maintenance to ensure that sediment, debris and excessive decaying vegetation are removed from the *Works* to prevent the excessive build-up of sediment, oil/grit, debris and/or decaying vegetation, to avoid reduction of the capacity and/or permeability of the *Works*, as applicable. The *Owner* shall also regularly inspect and clean out the inlet to and outlet from the *Works* to ensure that these are not obstructed.
    4. The *Owner* shall design, construct and operate the *Works* with the objective that the effluent from the *Works* is essentially free of floating and settleable solids and does not contain oil or any other substance in amounts sufficient to create a visible film, sheen, foam or discoloration on the receiving waters.
    5. The *Owner* shall maintain a logbook to record the results of these inspections and any cleaning and maintenance operations undertaken, and shall keep the logbook at the *Owner's* administration office for inspection by the *Ministry*. The logbook shall include the following:
        a. the name of the *Works*; and
        b. the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed and method of clean-out of the *Works*.
    6. The *Owner* shall prepare an operations manual prior to the commencement of operation of the *Works* that includes, but is not necessarily limited to, the following information:

a. operating and maintenance procedures for routine operation of the *Works*;

b. inspection programs, including frequency of inspection, for the *Works* and the methods or tests employed to detect when maintenance is necessary;

c. repair and maintenance programs, including the frequency of repair and maintenance for the *Works*;

d. contingency plans and procedures for dealing with potential spills and any other abnormal situations and for notifying the *Water Supervisor*; and

e. procedures for receiving, responding and recording public complaints, including recording any follow-up actions taken.

7. The *Owner* shall maintain the operations manual current and retain a copy at the location of the *Works* for the operational life of the *Works*. Upon request, the *Owner* shall make the manual available to *Ministry* staff.

8. The Owner shall take all reasonable steps to maintain the Leitrim Wetland water level within the range of elevations 91.7 m to 93.6 m. In the event that this range of elevations needs to be modified, as identified in a report prepared by a qualified person, new levels may be established, provided they are permitted in writing by the Ontario Ministry of Natural Resources and Forestry and communicated in writing to the District Manager within **ten (10) business days** following authorization by the Ontario Ministry of Natural Resources and Forestry.

9. The Owner shall operate the Leitrim Wetland Control Structure in accordance with Section 5 of the draft report entitled "Leitrim Wetland Control Structure, Operation & Maintenance Manual", dated July 2008, prepared by IBI Group. If any of the operating procedures need to be modified, a new operating procedure may be implemented provided that the new operating procedure is permitted in writing by South Nation Conservation and communicated in writing to the District Manager within **ten (10) business days** following authorization by South Nation Conservation.

10. The Owner shall inspect and maintain the Leitrim Wetland Control Structure in accordance with the Maintenance Schedule outlined in the draft report entitled "Leitrim Wetland Control Structure, Operation & Maintenance Manual", dated July 2008, prepared by IBI Group and as amended from time to time.

5. **TEMPORARY EROSION AND SEDIMENT CONTROL**

1. The *Owner* shall install and maintain temporary sediment and erosion control measures during construction and conduct inspections once every two (2) weeks and after each significant storm event (a significant storm event is defined as a minimum of 25 mm of rain in any 24 hours period). The inspections and maintenance of the temporary sediment and erosion control measures shall continue until they are no longer required and at which time they shall be removed and all disturbed areas reinstated properly.
2. The *Owner* shall maintain records of inspections and maintenance which shall be made available for inspection by the *Ministry*, upon request. The record shall include the name of the inspector, date of inspection, and the remedial measures. if any, undertaken to maintain the temporary sediment and erosion control measures.

6. **MONITORING AND RECORDING**

The *Owner* shall, upon commencement of operation of the *Works*, carry out the following monitoring program:

1. All samples and measurements taken for the purposes of this *Approval* are to be taken at a time and in a location characteristic of the quality and quantity of the effluent stream over the time period being monitored.
2. Samples shall be collected at the following sampling points, at the frequency specified, by means of the specified sample type and analyzed for each parameter listed and all results recorded, as outlined in Schedule "B".
3. The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following:
   a. the *Ministry's* Procedure F-10-1, “Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only)”, as amended from time to time by more recently published editions;
   b. the *Ministry's* publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater” (January 1999), ISBN 0-7778-1880-9, as amended from time to time by more recently published editions; and
   c. the publication “Standard Methods for the Examination of Water and Wastewater” (21st edition), as amended from time to time by more recently published editions.

7. **REPORTING**

1. One (1) week prior to the start-up of the operation of the *Works*, the *Owner* shall notify the *Water Supervisor* (in writing) of the pending start-up date.

2. The *Owner* shall, upon request, make all manuals, plans, records, data, procedures and supporting documentation available to *Ministry* staff.
3. The *Owner* shall prepare and submit a performance report to the *Water Supervisor* on an annual basis, within ninety (90) days following the end of the period being reported upon. The first such report shall cover the first annual period following the commencement of operation of the *Works* and subsequent reports shall be submitted to cover successive annual periods following thereafter. The reports shall contain, but shall not be limited to, the following information:
    a. a summary and interpretation of all monitoring data and an overview of the success and adequacy of the *Works*, including demonstration using the monitoring data that the appropriate level of quality control has been achieved;
    b. a description of any operating problems encountered and corrective actions taken;
    c. a summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the *Works*, including an estimate of the quantity of any materials removed from the *Works*;
    d. a summary of the calibration and maintenance carried out on all monitoring equipment;
    e. a summary of any complaints received during the reporting period and any steps taken to address the complaints;
    f. a summary of all spill or abnormal discharge events; and
    g. any other information the *Water Supervisor* requires from time to time.

8. **RECORD KEEPING**
    1. The Owner shall retain for a minimum of **five (5) years** from the date of their creation, all records and information related to or resulting from the operation and maintenance activities required by this Approval.

SCHEDULE "A"

1. Application for Environmental Compliance Approval for Municipal and Private Sewage Works, dated March 7, 2018 and received on March 9, 2018, submitted by City of Ottawa.
2. Transfer of Review Letter of Recommendation, dated March 2, 2018 and signed by Charles Warnock, P. Eng., Senior Engineer Stormwater, City of Ottawa.

SCHEDULE "B"

Table 1: Effluent Monitoring

(Samples to be collected from the influent and effluent streams of the Findlay Creek Village Stormwater Management Facility #1)

Sample Type	**Grab**
Frequency	Three (3) rainfall *Wet Events* per year, with two (2) of the events occurring between May and September
Parameters	Total Suspended Solids, Phosphorus and Temperature

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the *Works* are constructed and operated in the manner in which they were described and upon which approval was granted. This condition is also included to emphasize the precedence of conditions in the *Approval* and the practice that the *Approval* is based on the most current document, if several conflicting documents are submitted for review. Condition 1.6 is included to emphasize that the issuance of this *Approval* does not diminish any other statutory and regulatory obligations to which the *Owner* is subject in the construction, maintenance and operation of the *Works*. The Condition specifically highlights the need to obtain any necessary conservation authority approvals. The Condition also emphasizes the fact that this *Approval* doesn't limit the authority of the *Ministry* to require further information.
2. Condition 2 is included to ensure that, when the *Works* are constructed, the *Works* will meet the standards that apply at the time of construction to ensure the ongoing protection of the environment.
3. Condition 3 is included to ensure that the *Ministry* records are kept accurate and current with respect to approved Works and to ensure that subsequent owners of the *Works* are made aware of the *Approval* and continue to operate the *Works* in compliance with it.
4. Condition 4.1 is included to prevent the operation of stormwater pipes and other conveyance until such time that their required associated stormwater management *Works* are also constructed.
5. Condition 4.2 - 4.10 is included as regular inspection and necessary removal of sediment and excessive decaying vegetation from the *Works* are required to mitigate the impact of sediment, debris and/or decaying vegetation on the treatment capacity of the *Works*. The Condition also ensures that adequate storage is maintained in the *Works* at all times as required by the design. Furthermore, this Condition is included to ensure that the *Works* are operated and

maintained to function as designed.

6. Condition 5 is included as installation, regular inspection and maintenance of the temporary sediment and erosion control measures is required to mitigate the impact on the downstream receiving watercourse during construction until they are no longer required.
7. Condition 6 is included to enable the *Owner* to evaluate and demonstrate the performance of the *Works*, on a continual basis, so that the *Works* are properly operated and maintained at a level which is consistent with the design objectives specified in the *Approval* and that the *Works* do not cause any impairment to the receiving watercourse or the environment.
8. Condition 7 is included to provide a performance record for future references, to ensure that the *Ministry* is made aware of problems as they arise, and to provide a compliance record for all the terms and conditions outlined in this *Approval*, so that the *Ministry* can work with the *Owner* in resolving any problems in a timely manner.
9. Condition 8 is included to require that all records are required for a sufficient time period to adequately evaluate the long-term operation and maintenance of the Works.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 3969-8GWJ8L issued on June 14, 2011.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

a. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
b. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

1. The name of the appellant;

2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;
6. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1
of the Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or** www.ert.gov.on.ca

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 3rd day of April, 2018

Christina Labarge, P.Eng.
Director
appointed for the purposes of Part II.1 of the *Environmental Protection Act*

SW/
c: District Manager, MOECC Ottawa District Office
City Clerk, City of Ottawa (File No. D07-20-17-0003)
Peter Spal, P. Eng., IBI Group
Rikke Brown, P. Eng., IBI Group