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SCOPED MASTER SERVICING STUDY

FOR

LEITRIM – BANK STREET

CAIVAN COMMUNITIES

CITY OF OTTAWA

PROJECT NO.: 24-1414
JULY 2026
1ST SUBMISSION
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EXECUTIVE SUMMARY

This scoped Master Servicing Study (MSS) review has been prepared in support of the Leitrim South Urban Community (S-5) development on behalf of Caivan .

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.

The purpose of this MSS report is to recommend a feasible servicing strategy for the Leitrim South Urban Community (S-5), with respect to water, wastewater collection and stormwater management. Furthermore, this report includes an MSS level servicing design in support of a future draft plan application for the proposed development lands. The report also meets the requirements set out by the City of Ottawa's Serviceability Study Checklist.

The proposed development is located within the North Castor River subwatershed and is subject to the regulations associated with the South Nation Conservation Authority (SNCA). The ultimate storm outlet for the site is the existing Findlay Creek SWM facility. In addition, Findlay Creek bisects the proposed development and portions of the proposed development are proposed to discharge drainage directly to Findlay Creek. The existing Findlay Creek has an associated floodplain which influences limits of development for the subject site. Ultimately geomorphological and hydraulic improvements are recommended to Findlay Creek through the proposed development to improve existing flooding and geomorphological conditions.

The stormwater analysis contained in this report indicates that the existing Findlay Creek SWM facility, located adjacent to the proposed development lands, can receive peak runoff from the proposed development lands. Preliminary analysis has been completed to size the storm sewers (minor system) while accounting for flows in excess of the minor system by providing an overland flow route (major system). Several alternative SWM strategies were evaluated and the preferred option proposes an expansion to the existing SWM pond, with separate inlet locations for the lands on either side of the existing Findlay Creek. Trunk storm servicing would be provided within the development's Public Right of ways.

The Leitrim Pump Station (LPS) is expected to service the proposed development lands as contemplated in the ***IMP***. As previously assessed via correspondence with City staff in 2024, the existing gravity sanitary sewer network has the capacity to convey the gravity flows from the proposed development lands to the existing LPS. The wastewater servicing strategy is to direct all sanitary flows within the Study Area to the LPS via proposed connections to the existing gravity sewer network: west of Bank Street on Sora Way, and to the northeast of the existing Findlay Creek SWM facility on Shuttleworth Drive. It is anticipated that the existing LPS can accommodate the proposed development. As populations contemplated within this MSS are marginally higher than what was assessed previously, it is anticipated that the existing downstream system will be further evaluated as part of the Functional Servicing Report. The proposed pipe sizes and slopes are to meet the minimum requirements set out by the City of Ottawa Sewer Design Guidelines.

The study area is located at the southern boundary of the SUC pressure zone which is fed by the Ottawa South Pump Stations and Elevated Tank. Line pressure is generally good and is suitable to service the entire study area. The proposed trunk watermain network was analyzed to ensure that City of Ottawa guidelines were met. The potable water network is expected to provide the level of service required for the development of proposed development lands.

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SCOPED MASTER SERVICING STUDY
FOR
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1.0 INTRODUCTION

David Schaeffer Engineering Limited (DSEL) was retained to prepare a scoped Master Servicing Study (***MSS***) in support of the Leitrim Bank Street development (S-5) on behalf of Caivan Communities Inc. (Caivan). The S-5 Lands are identified on Schedule 1 of the Infrastructure Master Plan (***IMP***), included in ***Appendix A***.

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. **Exhibit 1** below illustrates the study area.

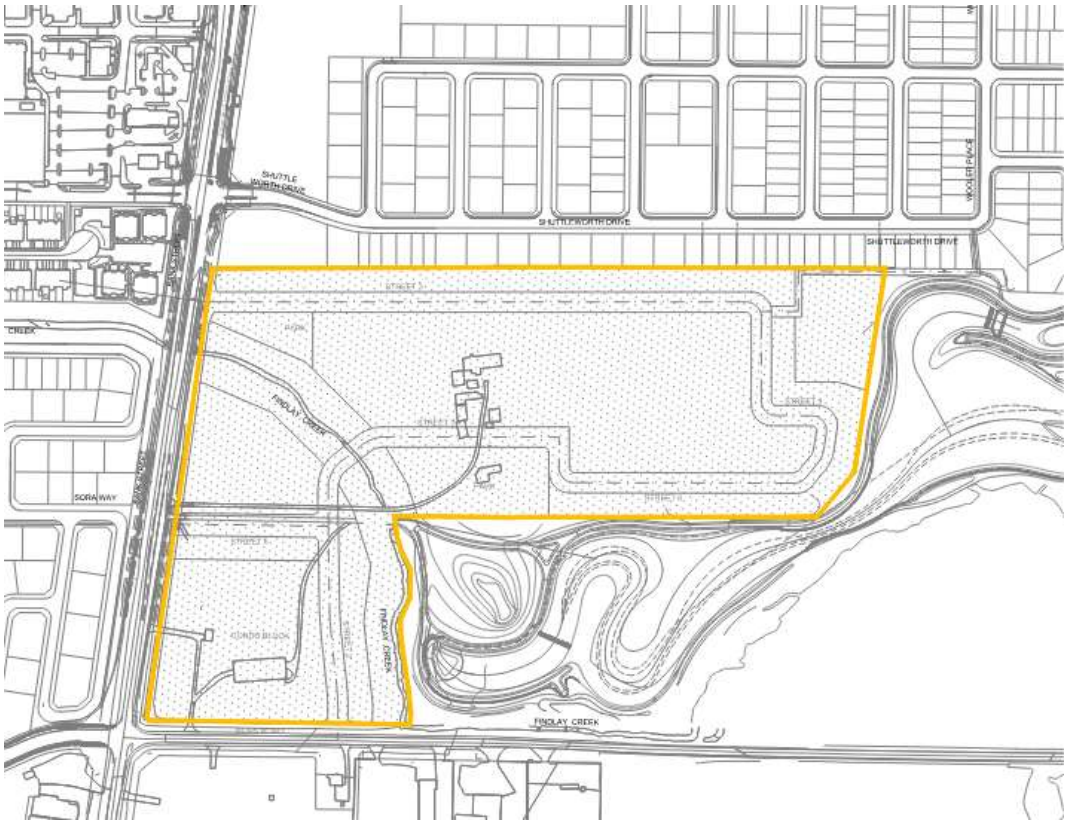


Exhibit 1: Site Location Plan

As illustrated on ***Exhibit 1***, the development area has been divided into two distinct land parcels for the purposes of this ***MSS*** on either side of the existing Findlay Creek.

The total landholdings also include the lands at 3301 Blais Road, but these lands do not form part of this application.

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The proposed future development activities within proposed development lands are contemplated to include the following land uses:

- Low Density Residential (single detached homes);
- Medium Density Residential (townhomes and stacked townhomes);
- Parkland;
- Open Space;
- Stormwater Management Facility; and,
- Roads (18 m right-of-ways (ROW)) and Multiuse Pathways.

The preferred Concept Plan for the proposed development is presented in ***Figure 1 (Appendix A)***, and illustrates the various components noted above. The preferred concept was prepared and refined in conjunction with the recommended sanitary and storm servicing strategies presented in this ***MSS***.

The preparation of this scoped ***MSS*** is supported by the following subconsultants in their respective fields:

- *Stormwater management analysis provided by J.F. Sabourin and Associates Inc.;*
- *Geomorphology analysis provided by GeoMorphix;*
- *Watermain analysis provided by GeoAdvice Engineering Inc.;*
- *Geotechnical and hydrogeological investigations completed by Paterson Group Inc.;*
- *Natural environment investigations completed by McKinley Environmental Solutions.; and.*
- *Transportation analysis completed by CGH Transportation.*

The ***MSS*** supports the Official Plan Amendment for the removal of the Future Neighborhood Overlay on Schedule C17. The scoped MSS will review and evaluate servicing options to support the subject lands and will demonstrate that the preferred servicing strategy is in conformance with the Provincial Planning Statement, Official Plan, Infrastructure Master Plan, and Terms of Reference.

1.1 Development Plan

The proposed concept plan is shown in ***Appendix A***. The plan was informed by the environmental, site servicing and other studies and guidelines noted in ***Section 2.*** 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. The following table summarizes the land use breakdown and predicted populations associated with the development concept.

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Table 1: Development Statistics Projection

Land Use	Area (ha)	Projected Residential Units	Residential Population per Unit	Projected Population
Residential (Low Density)	5.25	128	3.4	436
Residential (Low Density)	6.10	240	2.7	648
Condo Block (Medium Density)	2.04	252	1.8	454
Streets & Widening	0.17	-	-	-
Parks & Pathways	1.20	-	-	-
Natural Heritage System	1.73	-	-	-
Stormwater Facility	0.68	-	-	-
Total	**17.17**	**-**	**-**	**1538**

The above statistics were used to inform the servicing design for the site.

1.2 Provincial Planning Statement

2024 Provincial Planning Statement vision as it relates to Master Servicing planning is summarized in the following quotations;

- *… the province has set a goal of getting at least 1.5 million homes built by 2031.*
- *Ontario will increase the supply and mix of housing options, addressing the full range of housing affordability needs.*
- *Providing a sufficient supply with the necessary mix of housing options will support a diverse and growing population and workforce, now and for many years to come.*

As such, it is the province's direction to bring to market additional homes in a cost-effective matter.

Chapter 3.1 outlines the General Policies for Infrastructure and Public Service Facilities and Chapter 3.6 provides specific policies related to Sewage, Water, and Stormwater infrastructure.

1.3 Official Plan

Cost-effective civil solutions allow for a more affordable end product. The City of Ottawa Official Plan provides numerous polices to guide growth to provide affordable products to the market.

OP Section 1.1 "We will need to create an affordable supply of options across the city for different household types and income groups."

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Big Policy Move 5: "Becoming more liveable and affordable relative to other cities is a key to Ottawa's success."

Chapter 4.7 provides policy direction on Drinking Water, Wastewater and Stormwater Infrastructure.

Annex 4, Local Plan Framework, offers an outline of key points required in a Master Servicing Study.

1.4 Infrastructure Master Plan

The Infrastructure Master Plan establishes growth related polices, objectives, and priorities for municipal infrastructure.

Subject lands are identified as Future Neighbourhood Area S-5 and are illustrated on Schedule 1 of the ***IMP***. Schedule 1 extracted and included in ***Appendix A*** for reference. Furthermore, the lands are shown within the Public Service Area, see extracted Schedule 3 in ***Appendix A***. Except for certain circumstances as defined in the Official Plan, all development inside the Public Service Area is to be serviced by City-operated water and wastewater systems. Consideration of PSA expansion proposals will be governed by the polices outlined in both the IMP and the Official Plan. Each proposal will be evaluated on its own merits, based on local conditions, and without setting a precedent. The direction which follows provides further clarification to the Official Plan policies. This Plan permits service extensions outside of the Public Service Area as shown on Schedule 3 (Appendix A), subject to compliance with Official Plan policies 4.7.2.4 (a), (b), c), or (d), or their successors thereto.

The S-5 lands were considered to add 34 gross ha to the City containing 227 units with a total population of 553.

This MSS considered the IMP policies in evaluating water, wastewater, and stormwater infrastructure solutions. Sections 5.2, 6.3, and 7.2 outline the goals for each infrastructure component.

The IMP states that completion of an MSS requires fulfilling the following five study steps:

a) Pre-consultation will be conducted with the landowner group or proponent of Municipal Class EA undertakings required the local plan area;

b) Preparation of a study-specific Terms of Reference consistent with the City's Guidelines for preparing MSS Terms of Reference (Appendix C) and to the satisfaction of the City;

c) Completion of an MSS consistent with the approved study-specific Terms of Reference;

d) Completion of the Municipal Class Environment Assessment process, including the required public consultation; and

e) Approval of the MSS concurrent with approval of the local plan. MSSs supporting local plans identified in IMP policy 4.3.6.1 a) will require Council approval concurrent with approval of a CDP or Concept Plan and EMP.

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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:

- **Design Guidelines for Drinking-Water Systems,**
  Ministry of the Environment, Conservation, and Parks, May 11, 2023.

- **Design Guidelines for Sewage Works,**
  Ministry of the Environment, Conservation, and Parks, September 4, 2024.

- **Stormwater Planning and Design Manual,**
  Ministry of the Environment, March 2003.

- **Low Impact Development Stormwater Management Guidance Manual**,
  Draft for Consultation
  Ministry of the Environment, Conservation, and Parks, January 2022.

- **Ontario Building Code Compendium**
  Ministry of Municipal Affairs and Housing Building Development Branch, May 29, 2024.

- **City of Ottawa Official Plan**
  City of Ottawa, November 4, 2022.

- **City of Ottawa Infrastructure Master Plan**
  City of Ottawa, June 2024.

- **Ottawa Sewer Design Guidelines**,
  City of Ottawa, *SDG002,* October 2012.

    - Technical Bulletin ISDTB-2014-01, Revisions to Ottawa Design Guidelines – Sewer,
      City of Ottawa, February 5, 2014.

    - Technical Bulletin PIEDTB-2016-01, Revisions to Ottawa Design Guidelines – Sewer,
      City of Ottawa, September 6, 2016.

    - Technical Bulletin ISTB-2018-01, Revisions to Ottawa Design Guidelines – Sewer,
      City of Ottawa, March 21, 2018.

    - Technical Bulletin ISTB-2018-03, Revisions to Ottawa Design Guidelines – Sewer,
      City of Ottawa, June, 2018.

    - Technical Bulletin ISTB-2019-02, Revisions to Ottawa Design Guidelines – Sewer,
      City of Ottawa, July 8, 2019.

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  - Technical Bulletin IWSTB-2024-04, Screening Criteria – Infiltration-type LIDs for Development,
    City of Ottawa, September 12, 2024.

- **Ottawa Design Guidelines – Water Distribution**
  City of Ottawa, July 2010.

  - Technical Bulletin ISD-2010-2
    City of Ottawa, December 15, 2010.

  - Technical Bulletin ISDTB-2014-02
    City of Ottawa, May 27, 2014.

  - Technical Bulletin ISTB-2018-02
    City of Ottawa, March 21, 2018.

  - Technical Bulletin ISTB-2021-03
    City of Ottawa, August 18, 2021.

- Low Impact Development Technical Guidance Report, Implementation in Areas with Potential Hydrogeological Constraints
  Dillon Consulting and Aquafor Beech, February 2021
  *(**LID Report**)*

- Fire Underwriters Survey, 2020 (**FUS**)

- 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**)

2.2 Report Integration

In support of the Official Plan Amendment application for the subject lands, various studies and plans are required to identify: on-site and off-site municipal infrastructure (e.g. roads, water, and sewers); the natural heritage system; recreational pathways; community facility requirements; on-site and off-site transportation infrastructure; and land use densities and mixes.

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The reports and planning for the subject development were undertaken in a similar time frame and in a coordinated manner, resulting in an iterative planning and decision-making process. An inventory of the concurrent and inter-related reports is provided in the following table highlighting how the various components influence this ***MSS***. These reports are referenced throughout the ***MSS*** and are provided for reference in the appendices or as companion documents under separate cover.

Examples of inter-related aspects of the infrastructure and land use planning process include:

- *Analysis of existing conditions, which led to the identification of development constraints that were used as the starting point for the Land Use/Demonstration Plan;*
- *The establishment of trunk watermains, storm collector sewers and sanitary collector sewers along proposed major roads, which is meant to support orderly and cost-effective phasing of the subject lands; and,*
- *The integration and design of the pathways system to reflect environmental amenities, transportation networks, and neighborhood requirements.*

Table 2: Summary of Studies and Reports

Report	Relationship to Master Servicing Study
Combined Environmental Impact Study & Tree Conservation Report, McKinley Environmental Solutions, June 2026	Delineates the natural heritage system based on field studies performed and identifies opportunities for consideration in the planning process related to development options. Defines drainage features and setbacks within and adjacent to the subject lands, which influences stormwater management recommendations for the development.
Geotechnical Investigation – Proposed Residential Development (Paterson) dated June 22, 2026	Determines general site subsoil and groundwater conditions, provides grade-raise recommendations, and bedrock contours.
Hydrogeological Study, Proposed Residential Development (Paterson) dated June 22, 2026	Assesses the hydrogeological setting of the site with respect to bedrock and surficial geology, aquifers, aquitards, horizontal and vertical flow patterns, existing groundwater recharge/discharge, and aquifer vulnerability. Provides pre-development water budget analyses to identify infiltration potential and opportunities for the use of LID measures.
Preliminary Stormwater Analysis (JFSA) dated June 2026	Conceptual sizing SWM measures, impacts of discharging to the existing SWM Pond and existing tributary, and preliminary storm HGL analysis.
Hydraulic Capacity and Modeling Analysis – Leitrim Community Development (Technical Memorandum – Final) (GeoAdvice Engineering Inc.) dated June 2026	Describes the assumptions and results of the hydraulic modeling and capacity analysis for proposed development lands. Includes identification of connections to existing municipal infrastructure and ensuring guideline requirements are satisfied.
Findlay Creek Conceptual Channel Design, Bank Street Subdivision (GeoMorphix) dated July 2026	Fluvial geomorphological assessment of Findlay Creek and associated channel design to support the subject development to the satisfaction of the municipality and conservation authority.

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3.0 EXISTING CONDITIONS

As noted previously, this scoped MSS includes the following sections in lieu of a separate existing conditions report. The following summarizes key items regarding the existing conditions with reference to the appropriate supporting materials.

3.1 Existing and Adjacent Land Uses

The study area encompasses approximately 17 ha of land and is bound by Bank Street to the west, Blais Road to the south, an existing urban subdivision development to the north and west (S-4 lands) and is bound by Findlay Creek (existing tributary) and the existing Findlay Creek SWM Facility.

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 tributary.

Land use to the south and west of the subject consists of open space, rural and commercial uses.

3.2 Land Ownership

The subject lands are wholly owned by a single landowner. The total landholdings also include the lands at 3301 Blais Road, but these lands do not form part of this application as illustrated in ***Appendix A*** and discussed in ***Section 1.1*** of this report.

3.3 Source Protection

The subject lands reside within the South Nation Source protection area.

Mapping from the South Nation mapping indicates that no portions of the development area fall under the fringes of the Significant Groundwater Recharge Area (SGRA) mapping. As noted in the ***Hydrogeological Study*** the MECP mapping does identify the area as a potential SGRA.

There were no Wellhead protection zones. The subject lands do include Intake Protection Zones 3 as identified in the ***Hydrogeological Study***.

3.4 Road Infrastructure

As discussed above, the subject lands area bounded by the following existing roads:

- Bank Street and additional local roads to the west,
- Blais Road to the south, and
- Existing Shuttleworth Drive and additional local roads to the north.

3.5 Topography and Drainage

For the landholdings north and east of Findlay Creek (existing tributary) the site topography generally follows a mid-block high point/ridge and drains east and west (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.

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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 existing tributary bisects the proposed development area, conveying drainage from the northwest to the southeast and has an associated Regulatory floodplain. The existing municipal SWM facility conveys controlled stormwater runoff to the existing tributary, downstream of the proposed development lands.

The proposed subdivision includes development lands within the mapped 1:100 and 1:350-year floodplains. The 1:100-year floodplain is being removed through alterations and improvements to the adjacent watercourse, subject to an application and approval under the Conservation Authorities Act as administered by South Nation Conservation. Climate change vulnerability associated with the 1:350-year event will be entirely addressed by raising the grades to remove the lands from the potential extent of this flood event.

3.6 Geotechnical

Paterson Group (Paterson) was commissioned to complete geotechnical investigation for the subject lands.

Key details are discussed herein, while full details are provided in the above report. The geotechnical investigation indicates that:

- **Surface Conditions:** The majority of the subject site consists of agricultural lands with sparse areas of mature trees along the property boundary, hedgerows or associated with Findlay Creek.

- **Soil Profile:** Profile consists of topsoil overlying a layer of silty sand overlying a deposit of sandy silt to clayey silt and/or glacial till. A fill layer, consisting of brown silty sand and/or silty clay with gravel, cobbles, asphalt and crushed stone was encountered within the southern portion of the property.

- **Bedrock:** The bedrock within the subject area consists of poor to fair quality limestone bedrock, becoming excellent quality at depth. The inferred bedrock surface was encountered at depths ranging from 3 – 15 m below the existing ground surface. Proposed development within bedrock may require blasting; specific blasting requirements would apply. See bedrock contour plan extracted from the ***Geotechnical*** report in ***Appendix B***.

- **Preliminary Grade Raise:** From a geotechnical perspective, the subject site has been considered satisfactory for the proposed development. No specific grade raise restrictions have been identified based on the geotechnical investigation.

- **Slope Stability:** The slope is considered to be stable under both existing and proposed conditions and a stable slope allowance setback from top of slope is not required along the Findlay Creek.

- **Groundwater:** Groundwater monitoring wells were installed within the development area. The groundwater table will fluctuate seasonally but measured groundwater levels generally ranged from 1.0 to 3.0 m below existing ground. See groundwater contour plan extracted from the ***Hydrogeological Report*** in ***Appendix B***.

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3.7 Hydrogeological Conditions

The hydrogeology of the subject area has been analyzed by Paterson Group. The hydrogeological investigations indicate that:

- ***Groundwater Recharge:*** *Recharge of the shallow overburden aquifer will occur as precipitation infiltrates the subsoils where it will flow vertically downward through the unsaturated surficial soils before intercepting the overburden aquifer. The eastern portion of the site is identified as a significant groundwater recharge area (SGRA) by the MECP. While the extent of the discharge was not considered as part of the investigation it is noted that the nearby watercourse suggests discharge occurring is anticipated to be present but limited. Shallow groundwater was found to have flow generally travelling in an eastward direction within the Castor River subwatershed.*

- ***Water Budget:*** *It was Paterson's interpretation that saturated conditions in the permeable overburden soils represent the existing water table at the subject site with the potential for minor groundwater lowering due to servicing installation and a typical minor water budget deficit after development. The shallow bedrock, perched groundwater in the shallow overburden, and high RQD values may make it impractical to use infiltrating Low Impact Development (LID) measures on the site. The use of best management practices (BMP) should be used for stormwater quality and quantity control to assist in infiltrating clean water, treating salt impacted water where possible or redirecting salt impacted water away from the SGRA during seasonal periods with expected elevated salt levels.*

- ***Aquifers:*** *Groundwater was observed within the overburden soils at the subject site, and the soils were found to exhibit moderate hydraulic conductivities. Given the limited quantity of groundwater within the overburden aquifer, it is not considered an adequate source for water supply wells. If water supply wells are still in use in the vicinity of the subject site, it is anticipated that they are accessing bedrock aquifers. The bedrock aquifer systems consist of dolostone/dolostone and sandstone, sandstone or shale of the Oxford and March Formations, the Nepean Formation or Queenston Formation, respectively.*

- ***Wells:*** *As the potential to interfere with the water quality/quantity of existing well users in the area is negligible, a water well monitoring program is not recommend for the proposed development.*

3.8 Environmental Considerations

McKinley Environmental Solutions (MES) was commissioned to complete a Combined Environmental Impact Study (EIS) and Tree Conservation Report for the subject site, assessing the existing natural features, ecological assets, and potential environmental constraints to development.

The subject area is within the South Nation Conservation Authority jurisdiction. Most of the surface area of the subject site consists of Agricultural Fields and Cultural Meadow. Two Deciduous Hedgerows are present at the edges of the Site. Riparian (Deciduous) Hedgerows are also present along the banks of Findlay Creek. Several agricultural buildings occur within the Site. Findlay Creek flows through the Site in an approximately northwest to southeast direction. Portions of the western part of the Site are shown to be within the 1:100 Year Floodplain of Findlay Creek and the associated 15 m wide Hazard Setback/South Nation Conservation Authority Regulatory Limits. Findlay Creek and its associated floodplain/corridor

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were the only significant natural heritage features found within the Site and/or immediately adjacent to the Site. Several Category 1 (Non-Retainable) Butternut Trees (endangered) occur within the Site. No other significant Species at Risk concerns were identified.

As shown below in Figure 4, Findlay Creek flows in an approximately northwest to southeast direction through the Site. Portions of the western part of the Site are shown to be within the 1:100 Year Floodplain of Findlay Creek and the associated 15 m wide Hazard Setback/SNCA Regulatory Limits (City of Ottawa 2026). Findlay Creek was observed to have a wetted width between approximately 1.5 m and 3 m during the early spring (April 21st, 2025). The maximum observed water depth varied between approximately 60 cm during the early spring (April 21st, 2025) and approximately 30 cm during the early summer (June 10th, 2025). The watercourse had moderate flow volumes throughout the survey period and is likely to be hydrated year-round. The substrate of the watercourse includes a mix of silt, boulder, gravel, and detritus. The majority of the channel is heavily shaded and lacks in-stream aquatic vegetation. The riparian vegetation surrounding Findlay Creek is described above in Section 3.3 (i.e. the Riparian (Deciduous) Hedgerows). Within the Site, the watercourse flows through a large box culvert under the driveway that leads to the old farmhouse. Findlay Creek flows through the roadside ditch of Blais Road immediately downstream of the Site. The watercourse flows into the Findlay Creek Municipal Drain further downstream.

Fish were observed within Findlay Creek and therefore the watercourse provides direct fish habitat. Findlay Creek is a tributary of the North Castor River (SNCA 2015). Monitoring of the North Castor River subwatershed indicates that the North Castor River and its tributaries provide direct fish habitat for a low diversity fish community that is dominated by species that are common throughout the region. Only ten common fish species were documented within the North Castor River subwatershed by the South Nation Conservation Authority (SNCA). The ten common fish species that were documented within the North Castor River subwatershed included Bluntnose Minnow, Pumpkinseed, Brown Bullhead, Rock Bass, Central Mudminnow, Smallmouth Bass, Common Shiner, White Sucker, Golden Shiner, and Yellow Perch (SN 2015).

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FIGURE 4: WATERCOURSES & SNCA REGULATORY LIMITS

June 2026

4795 Bank Street, Ottawa, ON

Combined Environmental Impact Study & Tree Conservation Report



Schedule C11 – C – Natural Heritage System (East) of the City of Ottawa's New Official Plan does not identify any part of the Site as a Natural Environment Area, a Natural Heritage System Core Area, and/or as a Natural Heritage System Linkage Area (City of Ottawa 2022a). There are no unevaluated wetlands shown to exist within 30 m of the Site, and no Provincially Significant Wetlands shown to exist within 120 m of the Site (City of Ottawa 2026; OMNRF 2026). There are also no Areas of Natural and Scientific Interest (ANSI) shown to exist in the vicinity of the Site (OMNRF 2026). There are no forest and/or woodland habitats within the Site and/or immediately adjacent to the Site, and therefore there are no features in the vicinity of the Site which may qualify as Significant Woodlots. Findlay Creek and its associated floodplain/corridor were the only significant natural heritage features found within the Site and/or immediately adjacent to the Site The potential presence of Significant Wildlife Habitat and Species at Risk habitat was found to be minimal and that through standard mitigation measures, there is not anticipated significant negative effects on natural features and functions.

3.9 Geomorphological Considerations

GeoMorphix completed a geomorphological assessment as part of the ***Conceptual Channel Design Report***, submitted as part of the overall application. The assessment concludes that Findlay Creek within the subject property is a relatively straight, single-thread, mixed-load channel that was historically managed as a municipal drain before being abandoned and reclassified as a natural watercourse. The creek is delineated into two sub-reaches, FC-1a and FC-1b, which are separated by an existing culvert and differ primarily in their overall

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gradients—0.12% upstream and 0.67% downstream. The channel is partially confined by modified berms resulting from historical drain maintenance and the construction of the nearby existing Findlay Creek Stormwater Management (SWM) Facility.

Geomorphic assessments classify the creek as being in a state of "transition" or "stress," following an evolutionary trajectory of systematic widening and enlargement. Field observations indicate that approximately 60% of the channel banks are experiencing erosion, evidenced by frequent leaning trees, exposed roots, and woody debris jams that occasionally cause upstream backwatering. The channel bed is moderately entrenched and contains riffle-pool sequences that comprise about 30% of the reach, with substrates ranging from clay, silt, and organics in pools to coarse cobbles and sporadic large boulders in riffle sections.

While the corridor health is qualitatively ranked as being in "fair to good" condition, its overall stability is a significant limiting factor. The surrounding landscape consists primarily of agricultural fields or cultural meadows, with a moderate riparian border of established trees and shrubs providing canopy cover to the watercourse.

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4.0 NEED AND JUSTIFICATION FOR MUNICIPAL SERVICING

4.1 Vision & Goals for the Proposed Development

It is envisioned that the study area will be a residential enclave for the residents in the southern boundary area of Leitrim. The combination of diverse housing options, in addition to the leisure and recreational opportunities, will make it an attractive place to live and play. The integration of various housing options, coupled with leisure and recreational amenities within the development, is anticipated to foster an appealing living and recreational environment.

An offset grid pattern road network, characterized by regularly spaced intersections will optimize transit, cycling, vehicular travel, and pedestrian circulation. The existing stormwater management facility will provide a strong corridor for pedestrians and cyclists, which will form part of a Greenspace network that links features such as the existing stormwater management facility, watercourses, parks, and open spaces.

4.2 Servicing Problem Statement

A servicing strategy is needed to support the wastewater collection requirements, water demands, storm drainage requirements, and stormwater management requirements for the proposed land uses within the study area. The servicing strategy must be consistent with the Provincial Policy Statement (PPS), must meet City of Ottawa requirements, must meet the requirements of other approval agencies (e.g. Ontario Ministry of Environment, Conservation, and Parks, Ontario Ministry of Natural Resources and Forestry, South Nation Conservation Authority, etc.), and must demonstrate good engineering practice for the protection of public safety, the environment, and sustainable operation.

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5.0 WATER SUPPLY SERVICING

5.1 Existing Water Supply

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 existing grades of the subject site range from 89 m to 94 m.

5.2 Water Supply Design

As part of the Bank Street rehabilitation project, two 300 mm service connections were installed from the feedermain to the property limits of 4795 Bank Street. These connections will be available to service the subject lands upon commissioning and connection.

A hydraulic capacity and modelling analysis (***Water Report***) was completed and is included in ***Appendix B***.

5.3 Future Water Infrastructure Improvements

The City of Ottawa's Infrastructure Master Plan (IMP) does not illustrate any planned upgrades to the pressure zone specific to servicing the subject site.

5.4 Water Supply Goals

The following summarizes goals for the development of a preferred water supply network.

- Per the OP, civil infrastructure will need to be cost effective to support an affordable supply of options across the city for different household types and income groups.
- The subject lands are shown within the PSA, see extracted Schedule 3 in ***Appendix A***, therefore development of water supply options will be restricted to the expansion of the existing municipal system.
- Capable of potable water to the preferred concept plan in a cost-effective manner.
- In conformance with MECP and City of Ottawa design standards.
- Utilize existing infrastructure.
- Minimize disruption to existing communities.

5.5 Water Supply Targets

Table 3 summarizes the Water Supply Design Criteria employed in the preparation of the preliminary water demand estimate as provided by the City of Ottawa.

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Table 3: Water Supply Design Criteria

Design Parameter	Value
Extracted from City of Ottawa Design Guidelines	
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	276 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 – Townhouse/Semi-Detached	2.7 p/unit
Residential – Medium 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.

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5.6 Required Fire Flow

Fire Flow requirements are to be confirmed in accordance with Local Guidelines (Fire Underwriters Survey, 2020), City of Ottawa Water Supply Guidelines, and the Ontario Building Code, upon development of detailed concepts for the detached single homes, townhouses, stacked townhomes, and the park blocks. For planning purposes, fire flow estimates are provided in the preliminary water demand estimate based on the information available in the preliminary concept plan and comparable recent developments in the City of Ottawa.

Based on the analysis provided by GeoAdvice, the distribution network can sufficiently meet the required level of service under normal and emergency operating conditions. Adequate looping, hydrant spacing, and the elimination of dead end watermains will be emphasized within the development as detailed design proceeds to ensure that all guideline requirements are addressed. In addition, detailed fire flow calculations are to be completed for the purpose of sizing local watermains. The trunk watermain network has been designed for the maximum day plus 250 L/s fire flow requirement which will govern the watermain sizing.

A fire flow requirement of 250 L/s was assigned to low density and high-density residential areas for the purpose of trunk watermain network design in support of the proposed land uses in the proposed development. A summary of the minimum available fire flows is shown in ***Table 5.***

Table 4: Summary of Minimum Available Fire Flows (GeoAdvice, 2026)

Required Fire Flow	Minimum Available Fire Flow
250 L/s (15,000 L/min)	302 L/s (18,120 L/min)

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.

5.7 Boundary Conditions

The City of Ottawa provided boundary conditions at the following locations to assess serviceability and recommend a preferred trunk watermain network in support of the proposed development.

- ***Boundary Condition Location 1:*** *Proposed Bank Street Entrance, Bank Street, Existing 400 mm diameter watermain.*
- ***Boundary Condition Location 2****: Bank Street at Sora Way, Existing 400 mm diameter PVC watermain.*

5.8 Water Supply Servicing Design

GeoAdvice Engineering Inc. was retained to perform a preliminary hydraulic assessment for the proposed development. The ***GeoAdvice Hydraulic Analysis*** prepared by GeoAdvice Engineering Inc. dated July 2026 is enclosed in ***Appendix B*** for reference.

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The sizing of the trunk watermain infrastructure was considered in the ***GeoAdvice Hydraulic Analysis***. The overall distribution network will be assessed at the detailed design stage.

5.8.1 Water Supply Servicing Alternatives

To supply water to the entirety of the proposed development, a local watermain network will follow the road network and ultimately connect to existing off-site watermains based on the layout presented in the ***GeoAdvice Hydraulic Analysis*** and on ***Drawing 5***. Watermain connections and sizing were reviewed as part of MSS-level design to address City of Ottawa and MECP requirements.

Based on a review of the background infrastructure in this area, the watermain connections constructed as part of the previously completed Bank Street improvement project available to the west of the subject property present the only feasible option to service the lands, and no other logical or efficient alternative designs were advanced for additional analysis and evaluation. At this time, no opportunities exist to connect to the existing municipal infrastructure outside of what will be proposed below. Should a future watermain extension be contemplated for Blais Road, the proposed internal local system could connect at the proposed intersection to provide a possible additional connection opportunity, however, no infrastructure upgrades are currently identified in the *Infrastructure Master Plan* (City of Ottawa, 2023) and adequate supply can be provided to the proposed development in the absence of public infrastructure upgrades.

5.9 Commitments for Functional and Detailed Design

Detailed hydraulic analyses will be prepared for the phases of the proposed water distribution network at the time of their respective detailed designs, to determine that water supply is made available to the proposed development as specified in the City of Ottawa Water Supply Guidelines.

The proposed trunk watermain network is shown to generally follow the proposed road network. Note that as the road network is conceptual in nature and is subject to change, the watermain network is also subject to change. Easements may be required for local and trunk watermains as detailed design progresses for the development lands, in order to meet City and MECP guidelines.

During detailed design of the proposed development:

- *Demands will be updated, and distribution refined, once more detailed development information is available;*
- *Demand factors according to Section 4.2.1 of the City of Ottawa Design Guidelines & subsequent Technical Bulletins will be used (for localized areas with populations less than 3,000 and/or areas less than 50 ha);*
- *Local watermain sizing will need to be evaluated at the subdivision approval stage; and,*
- *Individual residential blocks will be evaluated for required fire flow as detailed plans for these sites are developed.*

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5.10 Water Supply Conclusion

The proposed development is to be serviced by a proposed network of 300 mm diameter trunk watermains. At this stage of analysis, only the trunk watermain are shown. A network of local watermains is assumed to service the proposed development via future local roads.

A preliminary hydraulic analysis, provided in ***Appendix B***, has been completed to ensure compliance with City of Ottawa Water Supply Guidelines. The proposed watermain network is expected to deliver all domestic and fire flows as per Ministry of the Environment, Conservation, and Parks (MECP), City of Ottawa and Fire Underwriters Criteria to support the proposed development. Estimated fire flows of 250 L/s for low density and medium density residential can be achieved for the development and service pressures are expected to fall within the appropriate ranges.

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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6.0 WASTEWATER SERVICING

6.1 Existing Infrastructure

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.

The City of Ottawa's **2023 Wastewater Master Plan (WWMP)** identifies capacity constraints in the Conroy Road sewer and recommends twinning this sewer to support future growth in the area. The **WWMP** also recommends upgrades to the Leitrim PS, which include capacity for the proposed development at 4795 Bank Street.

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.

6.2 Wastewater Collection Goals

The following summarizes goals for the development of a preferred wastewater collection system.

- *Conformance with design standards: Designed and planned in conformance with MECP and City of Ottawa design standards.*
- *Meets Public Service Area requirements: The subject lands are shown within the public service area, see extracted Schedule 3 in **Appendix A**, therefore development of wastewater supply options will be restricted conveyance of wastewater to the existing collection system. IE, on-site treatment is not contemplated in the development of collection alternatives.*
- *Level of Service: Per Section 4.3.2. of the IMP, System design criteria established in the IMP is intended to ensure that current City design and level of service guidelines can be met in future neighbourhoods. They are not intended to achieve improvements to levels of service in existing development areas.*
- *Affordable: Civil infrastructure will need to be cost effective to support an affordable supply of options across the city for different household types and income groups.*
- *Operable: Design to consider ease of operation.*
- *Sustainable: Preferred solution will consider future maintenance and operation cost.*
- *Community Impacts: Minimize disruption to existing community.*

6.3 Wastewater Design Targets

The criteria employed in the preliminary design of the proposed wastewater system are summarized in ***Table 5.***

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Table 5: 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 1.0
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	$Q = \frac{1}{n} AR^{2/3} S^{1/2}$
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
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	0.4 to 0.6
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.	

The City of Ottawa Sewer Design Guidelines state that wherever possible, the design of sanitary sewers should be based on the ultimate sewage flows permitted by the land use zoning. The preferred concept plan and associated population projections, detailed in Section 1.1 of this report, represent the best available planning information and thus have been used for the purpose of sizing the proposed trunk sanitary sewer network.

6.3.1 Wastewater Servicing Options

Per a previous memo titled "4795 Bank Street Off-Site Sanitary Sewer Evaluation of Alternative Sanitary Solutions", prepared by DSEL, dated July 15, 2024 (***Appendix C***) an assessment was completed to identify and evaluate potential wastewater servicing options. This was advanced in consultation with City staff in order to establish a preferred solution and identify off-site infrastructure requirements for inclusion in the City's Bank St. Rehabilitation project.

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As summarized in the memo, three alternatives were studied at the request of the City of Ottawa:

Option 1: Bank Street Gravity Sewer

- A 420 m long 300 mm gravity sewer proposed along Bank Street from the northern limits of the Leitrim lands to Findlay Creek Drive. The capacity in the downstream pipes was found to be consistent with previously approved designs, when considering the total flow from the subject property.

Option 2: New Pump Station on S5 Lands

- The second option is a pump station and off-site forcemains to replace the gravity sewer. The forcemains would direct flows to the 375mm gravity sewer at the intersection of Bank Street and Findlay Creek Drive. A capacity analysis would have similar findings to option 1. More details can be found in the Off-Site Sanitary Adequacy of Servicing Review.

Option 3: Split Drainage

- The third option would entail sanitary drainage being split and sent to existing neighboring communities. Figures and design parameters can be found in the Off-Site Sanitary Adequacy of Servicing Review.

Option 4: All Sanitary Flows to Northern Community

- The final option is sending all sanitary flows from the proposed development to the community to the north. The design flow parameter can be found in the Off-Site Sanitary Adequacy of Servicing Review. The proposed design flows exceed the theoretical residual capacities in some lengths of sewer along Shuttleworth Drive. In addition, there are additional grade raise and earthworks constraints within the S5 lands.

In consultation with City staff it was determined that Option 3 was the preferred solution.

In December 2024, Arcadis was instructed by the City of Ottawa to prepare an updated HGL analysis for the Leitrim community, including the subject property, based on the Option 3 servicing strategy. Caivan provided revised population and sanitary flow projections for the proposed development to inform the modeling. Results of this analysis, were completed and were provided to the City regarding the maximum allowable design flows permitted through the existing community infrastructure from 4795 Bank Street.

6.3.2 Preferred Wastewater Servicing Plan

Based on the above analysis the recommended alternative was found to be **Option 3.** Following the results of the Arcadis analysis and concurrence from City staff that Option 3 was the preferred servicing alternative, the City amended its Bank St. Rehabilitation project scope to include the sanitary connection to Sora Way. Relevant correspondence is included in ***Appendix C***.

This option mitigates additional costs and maintenance associated with an additional pumping station, utilizes/optimizes existing infrastructure and does not add additional uncertainty into the advancement of development. This is option is also consistent with the City's

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Infrastructure Master Plan, Draft Final (July 2024) which includes costs for the SRSPS and forcemain upgrades as part of its Wastewater Master Plan (Collection) Capital Program.

See attached ***Drawing No. 4*** for an overview of the proposed trunk sanitary network.

6.4 Commitments for Functional and Detailed Design

The wastewater conveyance systems will be designed to support the proposed development with no negative downstream impacts. All proposed sanitary sewer infrastructure is to be designed in accordance with the City of Ottawa Sewer Design Guidelines and all MECP guidelines.

The proposed gravity sewer conveyance systems are shown to generally follow the proposed road network. Note that as the road network is conceptual in nature, the alignments of the trunk sanitary sewers are also subject to change.

During design of the development within the subject lands:

- *Demands will be updated and distribution refined, once the more detailed development information is available;*
- *Design parameters according to City of Ottawa Sewer Design Guidelines will be used;*
- *Design of the trunk sewers are to be optimized for construction efficiency, provided that there are no significant negative impacts to affected landowners and that other requirements for minor amendments are met;*
- *Local sanitary sewer sizing will need to be evaluated at the subdivision approval stage; and*
- *Capacity in downstream infrastructure will be confirmed through sanitary sewer network modelling, as-builts, and/or sanitary design sheet information, as required.*

6.5 Wastewater Servicing Conclusion

The proposed sanitary solution for the proposed development includes two outlets to existing downstream sanitary infrastructure; to the west on Sora Way and to the northeast on Shuttleworth Drive. Adequate residual capacity is available within the receiving downstream infrastructure and it can be concluded that the downstream infrastructure can adequately service the proposed development. Additionally, PCSWMM modelling to analyze the sanitary HGL elevations within the proposed development lands based on the flow details previously provided by Arcadis has been provided in ***Appendix C***. Note that updated HGL analyses will be provided at the functional and detailed design stage as additional details are established.

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 associated with *Planning Act* applications within the proposed development.

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7.0 STORMWATER MANAGEMENT

7.1 Existing Stormwater Drainage

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 essentially bisected by an existing watercourse and is adjacent to the existing Findlay municipal SWM facility. See ***Drawing No. 3*** for an overview.

Existing Stormwater Management Facility

The residential development areas to the north and west of the subject development are serviced via the existing Findlay Creek municipal SWM Facility located immediately adjacent to the eastern/southeastern property line. This stormwater facility has the following characteristics:

Drainage Area = 713 ha, consisting of the original 626 ha area plus the additional 87 ha area added in support of the wet pond expansion completed in 2018. See associated MECP ECA in ***Appendix D*****.**

Permanent Pool Elevation = 87.10 m

100-Year Elevation = 88.60 m

The 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 controls for the existing adjacent residential subdivisions and associated roads and commercial/retail blocks.

7.2 Findlay Creek Channel Reconstruction

As outlined in the ***Findlay Creek Conceptual Channel Design Report*** the proposed conceptual channel design involves the realignment and naturalization of a portion of Findlay Creek, replacing the historically managed municipal drain with a 451-metre-long single-thread, riffle-pool system situated within an enhanced 53-metre-wide naturalized corridor. The conceptual design incorporates approximately 0.13 hectares of online and offline wet meadows alongside diverse habitat features such as overwintering pools, basking logs, brush piles, and rock piles to improve ecological complexity and floodplain connectivity. To ensure immediate and long-term stability, channel banks will be bioengineered using live stakes and 100% biodegradable erosion control blankets. These works are proposed in order to restore a more natural physical form, enhance aquatic and riparian habitats, and improve downstream water conveyance and quality through extended detention and sediment banking within the new corridor system.

A pre-consultation meeting was undertaken with SNC staff on June 25, 2026 to review the proposed alterations and receive staff feedback and establish submission requirements. SNC staff were conceptually supportive of the proposed design, and the project is consistent with SNC regulatory policies.

The SNC Findlay Creek floodplain model has been adopted with no alterations to the hydrology. Site specific existing conditions have been updated to include the recently replaced

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Bank Street culvert, site topography including survey of the low flow channel, specifications of the existing on-site crossing.

The floodplain and meanderbelt will be entirely contained within the proposed 53 m wide ecological corridor which will be ultimately conveyed to the City of Ottawa through registration of the subdivision. The design improves ecological richness, aquatic habitat conditions, removes natural hazards, supports climate change resilience and promotes efficient land use.

A complete application for this project will be submitted to the SNC for their review. Once they have completed their review and are in support of the project, a permit will be issued. A condition of draft approval requiring a permit and that works be completed to the satisfaction of the SNC will be required.

Completed construction of the project, survey and acceptance of the works in accordance with the permit will be required to revise the flood plain zoning overlay and register any phases affected by the works. At detailed design, final grading design will be completed to ensure that the flood limits are fully contained within the channel corridor outside the development limits. The conceptual 100-year flood elevations associated with the conceptual channel design are shown on ***Drawing 1*** demonstrating that there is no interaction between the proposed floodplain and the proposed development.

7.3 Stormwater Management Goals

The following summarizes goals for the development of a preferred stormwater management system.

- *Conformance with design standards: Designed and planned in conformance with MECP and City of Ottawa design standards and the City of Ottawa CLI ECA criteria.*

- Water Balance:
  - Establish water budget target to replicate the function of the existing hydrology to the extent feasible.

- Water Quality:
  - Mitigate the release of sediment from the development area to the receiving water course.

- Erosion Control:
  - Establish an erosion threshold release rate from the development to mitigate potential impacts of urbanization within the watershed.

- Quantity control:
  - Ensure no increase in water levels in the receiving water course.

- Conveyance:
  - Convey frequent storm events through an underground storm sewer system.
  - Convey major storm events to safe outlets along roadways and servicing corridors.
  - Site grading design to convey stormwater away from properties.

- Affordable:

  - Civil infrastructure will need to be cost effective to support an affordable

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supply of options across the city for different household types and income groups.

- Operable:
    - Design to consider ease of operation.
- Sustainable:
    - Preferred solution will consider future maintenance and operation cost.
- Community Impacts:
    - Minimize disruption to the existing community.

7.4 Stormwater Management Performance Criteria

The City of Ottawa was issued an Environmental Compliance Approval (ECA) for their Municipal Stormwater Management System on December 19, 2024. The ECA provides the City with the opportunity to submit modifications to their stormwater infrastructure without required separate ECA approvals for each project provided certain conditions are met.

Appendix A of the ECA provides performance criteria for all sites greater than 0.1ha outlining Water Balance, Water Quality, Erosion Control, Water Quantity, Flood Control, and Construction Erosion and Sediment Control.

7.4.1 Water Balance

Per Appendix A of the CLI-ECA, for development scenarios, water balance criteria can be identified through completion of one of the assessment studies listed in Table A1 of the City of Ottawa CLI-ECA. The Water Balance criteria for the site have been set through a combination of the Provincial Guidelines, the City of Ottawa OP and IMP, and the ***EIS*** reports.

7.4.2 Water Quality

Per Appendix A of the CLI–ECA, control 90th percentile storm event and if conventional methods are necessary, then enhanced (80%) for suspended solids removal.

7.4.3 Erosion Control

Per Appendix A of the CLI-ECA, for development scenarios, erosion control criteria can be identified through completion of one of the assessment studies listed in Table A1 of the City of Ottawa CLI-ECA. The majority of the proposed development outlets to the existing municipal SWM facility which provides an appropriate level of erosion control per the existing SWM facility MECP ECA (***Appendix D***).

7.4.4 Water Quantity

Control post-development runoff to pre-development levels for all rain events up to and including the 100-year storm.

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7.4.5 Flood Control

Control post-development runoff to pre-development levels for all rain events up to and including the 100-year storm.

7.5 Stormwater Control Assessment

Appendix A of the CLI-ECA provides direction on the preferred hierarchy of stormwater control as outlined in Table A1-Footnote. The applicable footnotes for the assessment of stormwater controls state:

3. Stormwater volumes generated from the geographically specific 90th percentile rainfall event on an annual average basis from all surfaces on the entire site are targeted for control. Control is in the following hierarchical order, with each step exhausted before proceeding to the next: 1) retention (infiltration, reuse, or evapotranspiration), 2) LID filtration, and 3) conventional Stormwater management. Step 3, conventional Stormwater management, should proceed only once Maximum Extent Possible [8] has been attained for Steps 1 and 2 for retention and filtration.

8. Maximum Extent Possible means maximum achievable Stormwater volume control through retention and LID filtration engineered/landscaped/technical Stormwater practices, given the site constraints [11].

11. Site constraints must be documented. A list of site constraints can be found in Table A2.

The following sections outline the site constraints and document the assessment of applicable stormwater controls for the stormwater volumes generated from the 90th percentile rainfall event.

7.5.1 Site Constraints

The following are site constraints that are applicable to the proposed development as listed in Appendix A of the CLI-ECA, Table 2A, and outlined in Paterson's **HydroG Report**, the **EIS** report, and the City of Ottawa Technical Memo IWSTB-2024-04:

- 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 or 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.

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In addition to the above constraints per the CLI-ECA, City of Ottawa IWSTB-2024-04 technical bulletin states, "Due to the poor hydraulic properties of silts and clay, infiltration-type LID practices are not permitted in clay or silt soils, nor in soils that warrant a dual classification with silt or clay as per the Unified Soil Classification System."

These constraints will be applied to the following stormwater performance assessment.

7.5.2 Control Hierarchy Step 1: Retention

Stormwater retention can be achieved via infiltration, reuse or evapotranspiration. While opportunities for reuse and enhanced evapotranspiration are available on a lot-level basis, these measures are not considered to achieve the stormwater criteria. Therefore, this first step assesses the potential for infiltration-based LIDs. It is noted that only LIDs that are to be included within the City CLI-ECA are to be evaluated. Therefore, only LIDs in the public realm (ROWs, parks, municipal lands) are to be evaluated.

Infiltration practices that may be feasible are required to be at/near surface and in areas of the development that have groundwater separation greater than 1.0 m below the proposed ground surface.

As outlined in Section 7.4.1, presence of shallow bedrock, shallow water table elevation, high RQD values identified during coring activities, and soils within the site having dual classification containing clay and silt (per Paterson Geotechnical Report) and therefore per the City's 2024 LID screening criteria memo, infiltration-style LIDs are not permitted.

7.5.3 Control Hierarchy Step 2: Filtration

Stormwater filtration can be achieved via LIDs that are equipped with a filter media and an underdrain. It is noted that only LIDs that are required to be included within the City CLI-ECA are to be evaluated. Therefore, only LIDs in the public realm (ROWs, parks, municipal lands) are to be evaluated.

As outlined in Section 7.4.1, presence of shallow bedrock, shallow water table elevation and high RQD values identified during coring activities, opportunities for filtration-based LID measures are limited.

The following list includes feasible filtration-based LIDs that could be located in the municipal realm. Should the following LIDs be incorporated into the overall stormwater treatment train, a reduction in downstream SWM Pond quality volumes would be expected. The following LID measures can be explored further through the Draft Plan and detailed design approval stage:

- Stormwater Planters
- Boulevard Bioretention (rain gardens, bioswales, enhanced swales)
- Exfiltration trenches
- Permeable Pavements (not applicable in ROW)
- Filter-based Manufactured Treatment Devices (Catchbasin or Maintenance Hole MTDs)

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7.5.4 Control Hierarchy Step 3: Conventional Stormwater Management

The remaining volume that can't be controlled through Steps 1 & 2 are to be treated via conventional stormwater management. SWM pond facilities are to be sized to ensure adequate extended detention of the control volume in the event additional upstream controls are not feasible and/or sufficient.

7.6 Best Management Practices

As indicated in Section 7.4.2 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 ***HydroG Budget*** report a suite of Best Management Practices (BMP) is proposed. The appropriate BMPs for the proposed development include:

- *Downspout / foundation drain disconnection;*
- *Roof leaders to grassed areas;*
- *Reduced lot grading;*
- *and Grassed swales.*

Additional means to promote retention of stormwater may include:

- *Soil amendments;*
- *And vegetated filter strips.*

7.7 Conveyance

The following table summarizes the conveyance target to inform design of the storm sewer network.

Table 6: 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 1:100 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	$Q = CiA$

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Storm sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} AR^{2/3} S^{1/2}$
Runoff coefficient for paved and roof areas	0.9
Runoff coefficient for landscaped areas	0.2
Minimum Sewer Size	250 mm diameter
Minimum Manning's 'n' for pipe flow	0.013
Minimum Depth of Cover	1.5 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 Building Opening	0.30 m
Max. Allowable Flow Depth on Municipal Roads	35 cm above gutter (PIEDTB-2016-01)
Extent of Major System	To be contained within the municipal right-of-way or adjacent to the right-of-way provided that the water level must not touch any part of the building envelope and must remain below the lowest building opening during the stress test event (100-year + 20%) and 15cm vertical clearance is maintained between spill elevation on the street and the ground elevation at the nearest building envelope (PIEDTB-2016-01)
Stormwater Management Model	DDSWMM (release 2.1), SWMHYMO (v. 5.02) and XPSWMM (v. 10)
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.
Historical Events	July 1st, 1979, August 4th, 1988 and August 8th, 1996
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 ponds, 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;*

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- *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.*

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.*

Conservative average runoff coefficients (C) values have been applied according to the conceptual land uses and the amount of impervious area in each catchment:

- ***Low Density Residential Areas:*** *The Concept Plan designates these areas for detached dwellings, semi-detached dwellings. These areas have been assigned an average runoff coefficient of 0.68 to account for impervious surfaces (driveways, roads, roofs) and pervious areas (backyards). This C value is representative of Caivan's developments in other parts of Ottawa.*

- ***Medium Density Residential Areas:*** *The Concept plan designates these areas rear-lane townhomes, back-to-back townhomes, stacked townhomes, back-to-back stacked townhomes, low-rise and mid-rise apartment buildings. These areas have conservatively been expected to have a small number of pervious surfaces. As such, an average runoff coefficient of 0.7 has been assigned. These C values are representative of recently approved studies of a similar scope to this MSS.*

- ***Park Blocks:*** *These blocks have been assigned an average runoff coefficient of 0.4, associated with maintained grass lawns.*

MECP has indicated a priority to prepare communities for the costs and impacts of climate change, including lowering the risk of basement flooding. As part of this MSS, the City of Ottawa's climate change stress test (100-year 3-hour Chicago storm plus 20%) has been applied in the sections that follow, to confirm that no basement flooding and no unacceptable surface flooding is expected in this test condition.

The preliminary conceptual servicing plan is shown on ***Drawing No.2***. As detailed design progresses, alignment and sizing of local storm sewers will be confirmed and additional

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servicing easements may be required, guiding the development of the future proposed lot fabric in the concept plan.

7.8 End of Pipe Stormwater Alternatives

There are several suitable end-of-pipe options for the treatment of stormwater runoff from urban areas including – Infiltration Basins, Wetlands, Dry Ponds, Wet Ponds, and Hydrodynamic Separation Units. ***Table 12*** presents the four options and their suitability as described in ***SWMPDM*** (MECP, March 2003).

Table 7: End of Pipe Treatment Systems Considered

Stormwater Management Practice	Description
Infiltration Basins	Infiltration basins are above-ground pond systems which are constructed in highly pervious soils. Water infiltrates into the basin and either recharges the groundwater system or is collected by an underground perforated pipe network and is discharged to a downstream outlet.
Wet Ponds	Wet ponds are the most common end-of-pipe stormwater facilities in Ontario. The performance does not depend on soil characteristics; permanent pool minimizes re-suspension of captured solids and minimizes blockages at the outlet. Furthermore, the biological removal of pollutants occurs. Wet ponds are suited to drainage areas 5ha and greater
Wetlands	Wetlands are normally more land-intensive than wet ponds because of their shallower permanent pool depth. They provide similar quality benefits as wet ponds, although the biological processes are enhanced.
Dry Ponds	Dry ponds have no permanent pool of water. As such the removal of containments is purely a function of the detention time in the pond.
Manufactured Treatment Devices	Manufactured Treatment Devices, whether filter based units, gravity based or hydrodynamic Oil / Grit separators are manufactured concrete units for the expressed purpose of trapping sediment and oil. The processes are patented and sizing is dependent on the manufacture's specifications and tends to work well with small (less than 5.0ha) catchments. These units tend to occupy less land area.

In developing the various end of pipe stormwater management alternatives, two additional considerations were given priority. First, siting a SWMP at the lowest elevations of the site

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was considered over higher elevations. Second, the ponds should be situated nearest to their respective outlet locations.

7.8.1 Preliminary Screening of End of Pipe Stormwater Management Alternatives

Infiltration basins main benefit is with respect to quality control and extended detention. As the existing downstream SWM facility provides levels of quality control and extended detention, the main purpose of the proposed SWM facility expansion is additional active storage. Therefore infiltration basins have not been explored as an end of pipe option.

Similar to infiltration basins, wetlands have additional quality control benefits but take up more land surface area than a traditional wet pond. As the proposed development is immediately upstream of an existing wet pond facility, incorporating a wetland style expansion is not consistent with the overall SWM strategy.

Based on the site characteristics, constraints, and requirements; stormwater management solutions incorporating wet ponds, or dry ponds/storage facilities with pre-treatment will be investigated in additional detail.

7.9 Stormwater Management Pond and Servicing Options

The following options were evaluated for stormwater management and servicing the proposed development.

Conservative average runoff coefficients (C) values were applied according to the conceptual land uses and the amount of impervious area in each catchment:

- ***Low Density Residential Areas:*** *The Concept Plan designates these areas for detached dwellings, semi-detached dwellings. These areas have been assigned an average runoff coefficient of 0.68 to account for impervious surfaces (driveways, roads, roofs) and pervious areas (backyards). This C value is representative of Caivan's developments in other parts of Ottawa.*

- ***Medium Density Residential Areas:*** *The Concept plan designates these areas rear-lane townhomes, back-to-back townhomes, stacked townhomes, back-to-back stacked townhomes, low-rise and mid-rise apartment buildings. These areas have conservatively been expected to have a small number of pervious surfaces. As such, an average runoff coefficient of 0.7 has been assigned. These C values are representative of recently approved studies of a similar scope to this MSS.*

- ***Park Blocks:*** *These blocks have been assigned an average runoff coefficient of 0.4, associated with maintained grass lawns.*

Based on the existing site topography the drainage for proposed development is directed to one of the two site outlets: the existing municipal SWM facility or the existing Findlay tributary. The entirety of the ***South Lands*** (4.62 ha, Figure 1) are directed to the existing tributary while the ***North Lands*** are directed to both the existing tributary (3.24 ha, Figure 1) and the existing SWM facility (7.51 ha, Figure 1). The existing SWM facility ultimately outlets into the existing tributary downstream of the proposed development.

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The potential options for treatment of SWM for the ***South Lands*** is limited due to the proximity to external roads and the existing tributary. Therefore it is proposed that that these lands are to utilize the existing municipal infrastructure and for all drainage to be directed to the existing SWM facility via the existing inlet box culvert within the proposed ***South Lands***. Rear lots adjacent to the existing tributary are anticipated to be conveyed directly to the existing tributary (***Drawing 3***).

Therefore, an analysis of potential SWM treatment options for the ***North Lands*** was conducted, incorporating the proposed SWM solution for the ***South Lands*****.**

A summary of all options evaluated is described in the following section and presented in ***Exhibits 2-4***.

7.9.1 Option 1: Forebay Expansion

This option consists of an expansion of the existing SWM facility, incorporating a new SWM pond forebay and associated active storage in the northeastern limit of the ***North Lands*****.** The proposed pond expansion would be directly connected to the existing SWM facility through the removal of a section of the existing SWM pond berm and rely on the existing downstream SWM facility control structure.

Under this option, 4.17 ha of the ***South Lands*** and 8.95 ha of the ***North Lands*** would be proposed to convey runoff to the existing SWM facility. The remaining 0.93 ha would be proposed to be conveyed directly to the existing tributary.

The proposed forebay expansion would provide adequate quantity, quality and erosion control in a combination of the proposed forebay as well as utilizing volume in the existing SWM facility. This option does not require any alteration to the existing SWM facility aside from the modifications to the existing access road and minor alterations to the existing pond berm to connect the proposed forebay expansion.

This option is shown below in ***Exhibit 2***.

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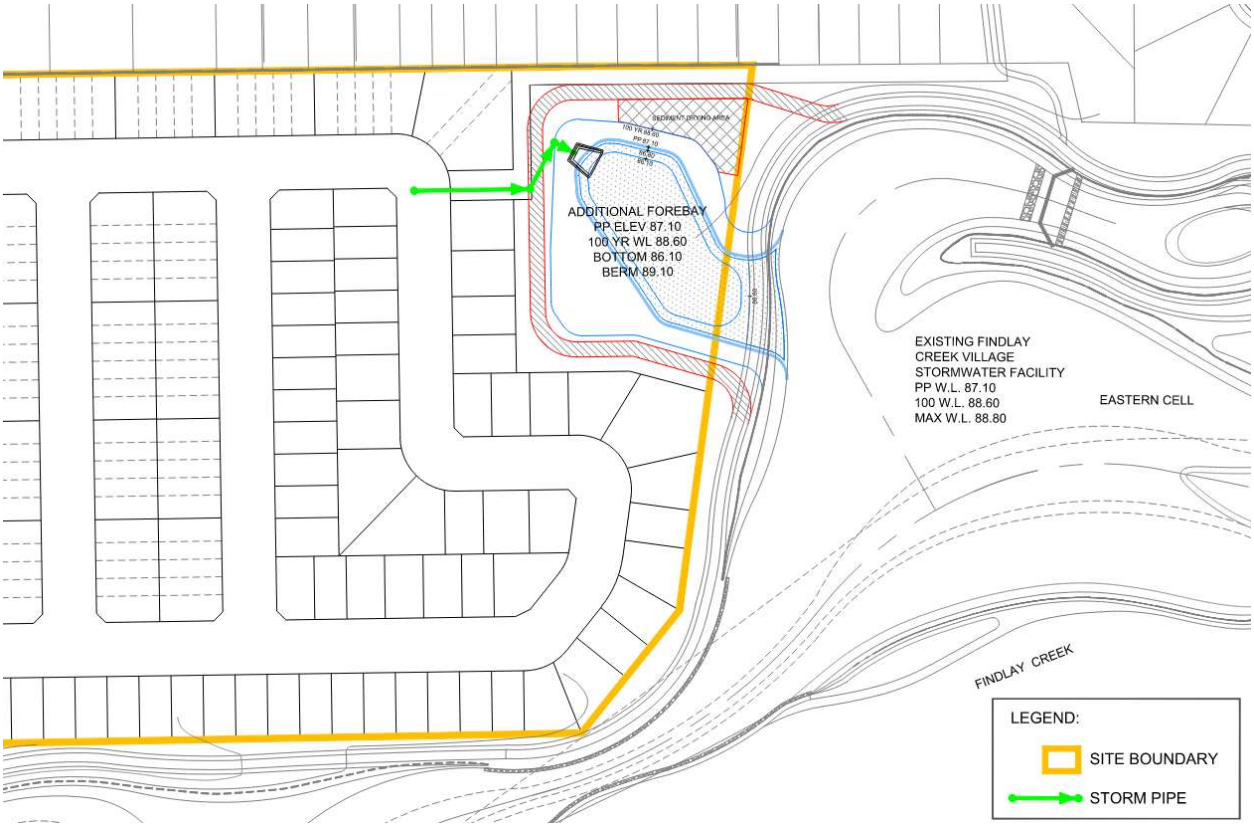


Exhibit 2: SWM Option 1 – Forebay Expansion

7.9.2 Option 2: Aftbay Expansion

Similar to Option 1 in that an expansion of the existing SWM facility is proposed, but with the pond expansion limited to only the active storage component, associated with the existing SWM facility aftbay. This option contemplates a new SWM facility inlet separate from the aftbay expansion as the proposed SWM facility expansion is intended to act as a dry pond facility. The proposed inlet, shown on **Exhibit 3**, is proposed to be treated by a municipally owned Manufactured Treatment Device (OGS) prior to discharging to the existing SWM facility as pre-treatment, with the remaining quality and erosion control provided by the existing SWM facility. This option presents the following opportunities/constraints/challenges compared to Option 1:

1) Greater disturbance to the existing SWM facility to facilitate expansion;
2) Requires new SWM pond inlet headwall separate from SWM pond expansion;
3) Requires OGS as pre-treatment as pond expansion is dry pond;
4) Cost savings due to:
    a. Reduction in overall earthworks requirements with dry pond facility;
5) Cost increases due to:
    a. OGS unit required in addition to pond expansion;
    b. Removal of existing SWM facility retaining wall
    c. Additional construction costs to mitigate both longer existing SWM facility berm removal and new SWM facility inlet headwall;

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This option is shown below in ***Exhibit 3***.

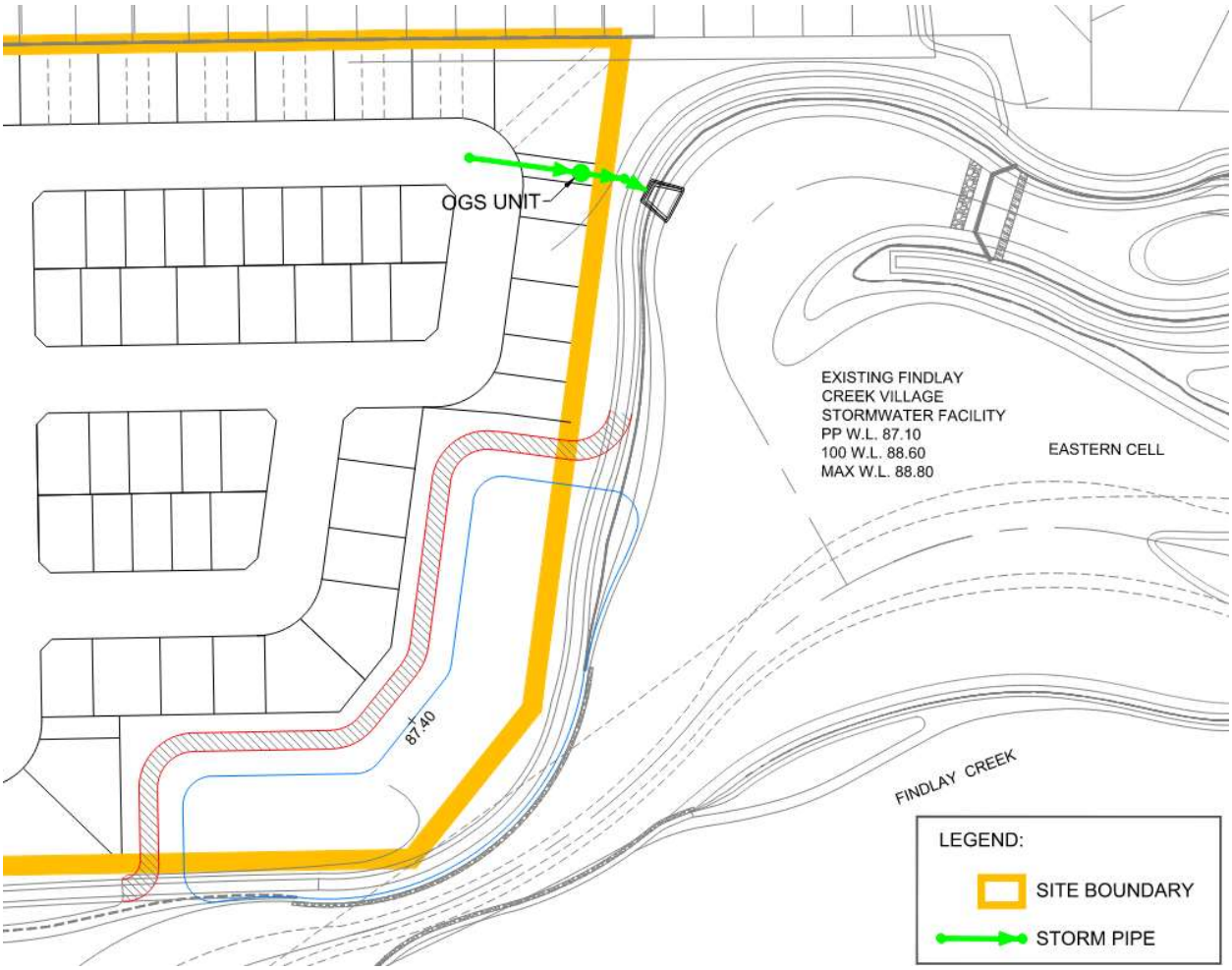


Exhibit 3: SWM Option 2 – Aftbay Expansion

7.9.3 Option 3: Underground Storage

This option would consist of providing the required on-site SWM treatment via a municipally owned and operated underground storage facility. Contemplated as Stormtech Chambers for sizing purposes, the underground storage facility is proposed to provide quality control via an isolator row system and quantity and erosion control volumes via additional chambers. The system would be connected directly to the existing SWM facility via a proposed outlet headwall/SWM pond inlet.

The underground storage system would require full 100 year capture upstream and/or an overland flow route from the proposed internal ROW to the existing SWM facility. Construction of the underground storage system can be done at a depth such that the invert of the proposed system is located slightly above the existing permanent pool elevation to ensure positive drainage between storm events.

Under this option, the proposed SWM block can be reduced with the more efficient storage configuration, and the lands above the proposed underground storage chambers can be

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repurposed as additional park space. This option presents the following opportunities/constraints/challenges compared to Option 1:

1) Least amount of disturbance to the existing SWM facility to facilitate expansion;
2) Requires new SWM pond inlet headwall;
3) Utilizes non-standard SWM storage via Stormtech chambers;
4) Requires more frequent maintenance and overall life-cycle replacement;
5) Cost savings due to:
    a. Reduction in overall earthworks requirements with forebay expansion;
    b. Reduction in land requirement for SWM facility;
6) Cost increases due to:
    a. Cost of underground storage system far exceeds reductions in land and excavation costs;
    b. Annual and life-cycle O&M costs highest for this option.
    c. Additional construction costs to mitigate both longer existing SWM facility berm removal and new SWM facility inlet headwall;

This option is shown below in ***Exhibit 4***.

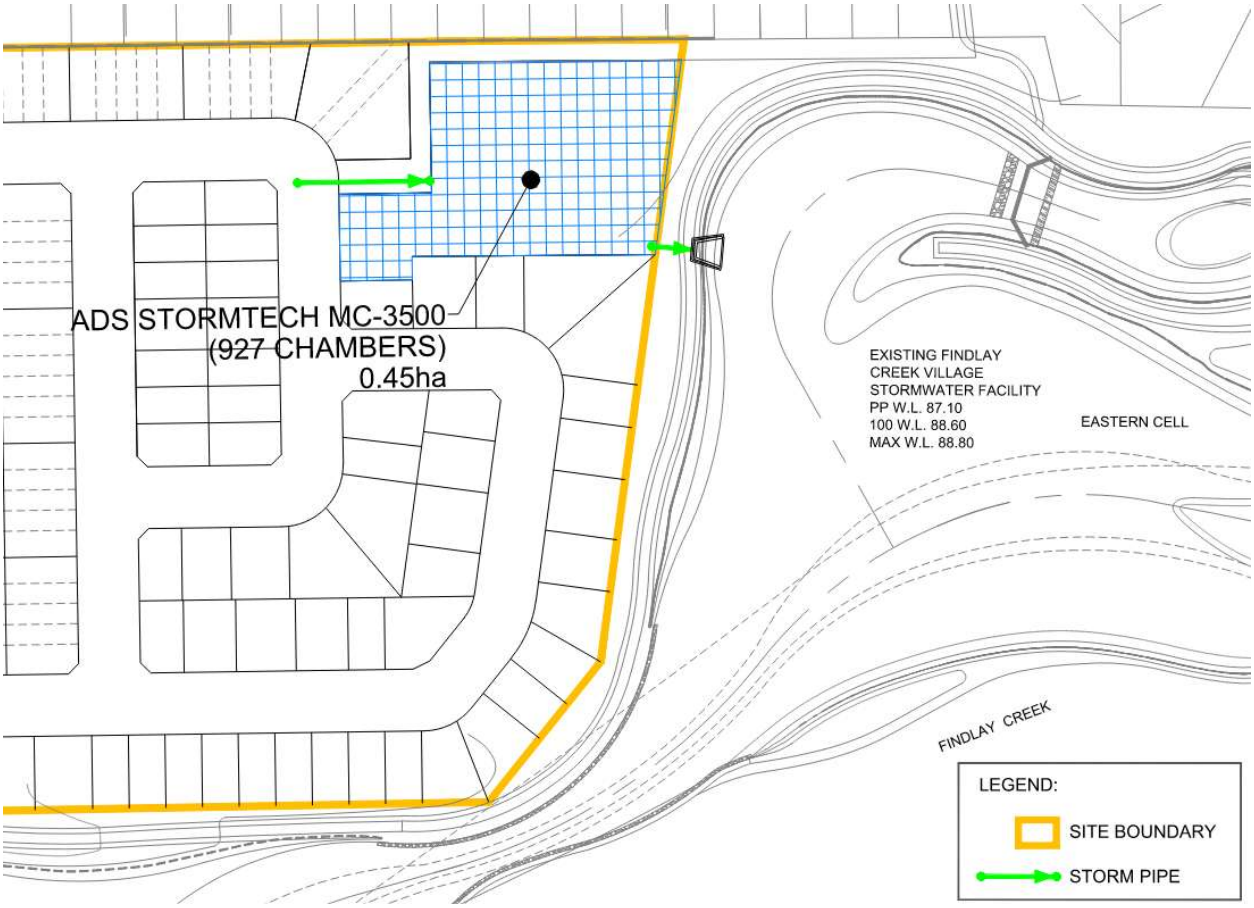


Exhibit 4: SWM Option 3 – Underground Storage

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7.9.4 Cost Comparison

A comparison of estimated SWM Pond costs for each option was prepared based on costs for similar work and summarized in the table below.

Table 8: Summary of Estimated SWM Costs

Option	Cost
1 – Forebay Expansion	$835,000
2 – Aftbay Expansion	$1,392,500
3 – Underground Storage	$4,388,000

A full breakdown of costs and associated assumptions can be found in ***Appendix D***.

7.10 Stormwater Evaluation Matrix

The stormwater management options presented in ***Section 7.4*** were brought forward for evaluation through a pair-wise comparison matrix. The evaluation matrix was developed based on the stormwater management goals which have been assigned to guide the selection of the preferred stormwater servicing solution.

Table 9: Stormwater Management Evaluation Criteria

Criterion	Value
Performance & Regulatory Alignment	30%
Costs	30%
Land Use & Servicing Integration	20%
Environment	20%

Design alternatives that did not meet design standards for level of service, quality, quantity, or conveyance requirements were not included for analysis. As such, these ranking factors were not included in the evaluation matrix.

The ranking values assigned to the alternatives based on the various criteria are given over a relative range from 1 to 5. The description of these rankings is presented in **Table 10**:

Table 10: Decision Matrix Categories Ranking System

Criterion	Standard Scores	Indicators	Baseline Section Weight (%)
1) Performance & Regulatory Alignment			**30**
a) Servicing Performance against SWM Targets	5	Meets all defined area SWM targets with clear buffer; robust to key assumptions	20
	4	Meets all defined area SWM targets with minimal sensitivity to downstream receiving systems	
	3	Meets targets with mitigating measures required and minor constraints	

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	2	Meets only with significant mitigating measures and/or constrained conditions	
	1	Borderline performance and/or high sensitivity	
	NV	Does not meet defined area SWM targets	
b) Alignment with Associated Studies, Policies, & Guidelines	5	Fulfills all associated study objectives & aligns strongly with IMP and OP policies, design guidelines	10
	4	Fulfills most associated study objectives & aligns with IMP and OP policies, design guidelines	
	3	Fulfills associated study objectives minimally & aligns with most IMP and OP objectives	
	2	Fulfills only some associated study objectives & does not align directly with IMP and OP and/or deviations from guidelines proposed	
	1	Minimally fulfills associated study objectives & minimal alignment with IMP and OP and/or significant deviations from guidelines proposed	
	NV	Fails to fulfill associated study objectives or has no alignment with IMP and OP and/or does not comply with design guidelines	
2) Costs			**30**
a) Capital Cost and Constructability	5	Lowest capital cost; straightforward construction; low risk conditions	15
	4	Low capital cost; minor constructability constraints	
	3	Moderate capital cost & constraints	
	2	High capital cost and/or significant constructability challenges	
	1	Highest capital cost and/or high construction risk	
b) Operations, Maintenance Burden and Life Cycle Costs	5	Simple system; easy access including winter; low life-cycle cost; operationally resilient	15
	4	Minor O&M burden; moderate life-cycle cost, no access issues	
	3	Non-conventional or complex system, moderate O&M burden, potential access issues	
	2	High O&M burden or constrained access; significant life-cycle cost	
	1	Very high O&M / reliability concern; excessive life-cycle cost	
3) Land Use & Servicing Integration			**20**
a) Land Use Compatibility	5	No land conflicts; optimizes land use compatibility; excellent integration with green network	10
	4	No land conflicts; functional land use compatibility; limited green network function impact	
	3	Minimal land conflicts or tradeoffs; acceptable land use compatibility & green network function impact	
	2	Significant land conflicts and/or requires land acquisition/easements	
	1	Major land conflicts and/or needs third-party land	
	NV	Cannot be accommodated with realistic demonstration plan	
b) Phasing and Infrastructure Integration/Efficiency	5	Supports early phases; minimal enabling works; legal outlet already established	10
	4	Some enabling works; good integration with existing systems; minimal barriers to legal outlet	
	3	Moderate enabling works & dependencies, moderate barriers to legal outlet	
	2	Significant enabling works or coordination complexity; significant barriers to legal outlet	
	1	Major phasing constraints causing schedule risk and/or no efficiency with existing infrastructure	

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	NV	No legal outlet available or no viable plan for establishing legal outlet	
4) Environment			**20**
a) Natural Environment and Water Systems Impacts	5	Lowest impact to natural systems; avoids sensitive features; strongest protection outcomes	10
	4	Minor impacts to natural systems with clear mitigation	
	3	Moderate impacts to natural systems with some mitigation required to sensitive features	
	2	Significant impacts or complex mitigation with sensitive features	
	1	Highest impact to natural systems including sensitive and/or significant natural heritage features	
b) Sustainability & Climate Resilience	5	Highly flexible/modular; strong resilience; sustainability co-benefits	10
	4	Clear, effective sustainability & resilience measures included in design	
	3	Some incorporation of sustainability & resilience concepts into design; some rigidity	
	2	Limited adaptability; significant resilience concerns, unexpandable	
	1	No resilience or sustainability incorporated into design	
Total Score			**100**

Note: NV = Not Viable; any options with NV scores do not proceed with ranking.

Under this ranking system, each individual criterion is ranked relatively for each alternative.

Table 11: SWM Evaluation – Option 1 – Forebay Expansion

Criterion	Description	Standard Score	Weighted Score
Performance & Regulator Alignment			*30*
1 a)	Meets all SWM targets and provides buffer through additional storage in proposed forebay expansion.	5	20
1 b)	Design of forebay expansion consistent with City of Ottawa and MECP SWM Facility guidelines.	5	10
Costs			*27*
2 a)	Lowest capital cost of the three options, connection to existing SWM facility creates minor constructability constraints.	4	12
2 b)	Simplest of the three options to O&M, no access issues.	5	15
Land Use & Servicing Integration			*20*
3 a)	Integrates into existing pond and green network, creating additional area of vegetation and access to municipal facility.	5	10
3 b)	Legal outlet established, built as part of Phase 1 in its entirety to support all phases.	5	10
Environment			*14*
4 a)	Minor impact to existing system via pond berm reconstruction. Mitigated through SWM facility plantings.	4	8
4 b)	Resilience built in via additional pond volume, once constructed no real flexibility in approach to treatment.	3	6
TOTAL SCORE			*91*

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Table 12: SWM Evaluation – Option 2 – Aftbay Expansion

Criterion	Description	Standard Score	Weighted Score
Performance & Regulator Alignment			*26*
1 a)	Meets all SWM targets and provides buffer through additional storage in proposed aftbay expansion.	4	16
1 b)	Design of forebay expansion consistent with City of Ottawa and MECP SWM Facility guidelines.	5	10
Costs			*21*
2 a)	Capital cost is comparable to Option 1 due to less excavation but added OGS and pond inlet headwall and associated construction. In addition, the longer berm removal requirements causes constructability constraints.	3	9
2 b)	Less O&M requirements for aftbay expansion than forebay expansion, but more frequent O&M and life-cycle costs for OGS/inlet infrastructure.	4	12
Land Use & Servicing Integration			*20*
3 a)	Integrates into existing pond and green network, creating additional area of vegetation and access to municipal facility.	5	10
3 b)	Legal outlet established, built as part of Phase 1 in its entirety to support all phases.	5	10
Environment			*14*
4 a)	Minor impact to existing system via pond berm reconstruction. Mitigated through SWM facility plantings.	4	8
4 b)	Resilience built in via additional pond volume, once constructed no real flexibility in approach to treatment.	3	6
TOTAL SCORE			*81*

Table 13: SWM Evaluation – Option 3 – Underground Storage

Criterion	Description	Standard Score	Weighted Score
Performance & Regulator Alignment			*20*
1 a)	Meets all SWM targets with less buffer than Options 1 & 2 but with additional benefits to downstream system.	4	16
1 b)	Design of forebay expansion consistent with City of Ottawa and MECP SWM Facility guidelines.	2	4
Costs			*14*
2 a)	Highest capital cost, potential constructability constraints with adjacent SWM facility and homes.	2	6
2 b)	Non-conventional system with limited access into underground chambers.	3	8
Land Use & Servicing Integration			*20*
3 a)	Optimizes land use while providing additional green space for future and existing residents.	5	10
3 b)	Legal outlet established, built as part of Phase 1 in its entirety to support all phases.	5	10

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Environment			*18*
4 a)	Lowest impact of three options, creates additional green space adjacent to natural system.	5	10
4 b)	Modular system, resilience with respect to opportunities for infiltration as well as expandable in future.	4	8
TOTAL SCORE			*72*

Table 14: Stormwater Management Evaluation

Option	1 Forebay Expansion	2 Aftbay Expansion	3 Underground Storage
Performance & Regulator Alignment	30	26	20
Costs	27	21	14
Land Use & Servicing Integration	20	20	20
Environment	14	14	18
TOTAL	**91**	**81**	**72**

7.10.1.1 Preferred SWM Pond Alternative

Based on the above analysis the recommended alternative was found to be **Option 1**, where it scored ***91***.

Option 1 – Forebay Expansion is the preferred stormwater servicing strategy for the Leitrim lands. As shown in **Table 1**, Option 1 is the most cost effective of the three options. In addition, the Option 1 alternative minimizes disruption to the existing stormwater facility and provides a consistent approach to stormwater management with the adjacent neighborhood's existing SWM facility.

7.10.1.2 South Lands

The ***South Lands*** development area will ultimately be captured and conveyed to the existing SWM facility via the existing pond inlet infrastructure located within and downstream of the proposed development area. The proposed forebay expansion within the ***North Lands*** will provide the required additional active storage volumes to account for the additional impervious area being conveyed to the existing municipal SWM facility from the proposed

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development lands. Lots that back onto the existing tributary are proposed to be conveyed uncontrolled directly to the existing tributary. The proposed condo block is proposed to require on-site quantity controls to limit the overall size and cost of downstream municipal infrastructure per the ***JFSA Memo*** (***Appendix D***). The required on-site controls will be further assessed and potentially refined through the Draft Plan and site plan application stages.

7.10.1.3 North Lands

The development of ***North Lands*** will require the construction of an expansion to the existing municipal SWM facility, utilizing the existing SWM facility outlet. To ensure no modification to existing pond water levels, an additional amount of active storage is required to account for the additional impervious area proposed to be sent to the existing municipal SWM facility from the proposed development. As noted previously, Option 1, forebay expansion was determined to be the best path forward to achieve this solution.

Per the ***JFSA memo*** the latest models for the existing SWM facility were utilized to develop conceptual sizing. The 100 year storm event was assessed to develop conceptual sizing and Table 2 within the ***JFSA memo*** demonstrates that based on the proposed storage volumes associated with the proposed SWM forebay expansion (***Exhibit 2***) the existing peak flows and associated pond active storage water levels are at or less than existing. Per Table 3 in the ***JFSA memo*** the 100 year peak flow rates are:

- *100 year existing (Chicago/SCS) – 7.97/17.32 m^3/s*
- *100 year proposed (Chicago/SCS) – 7.92/16.55 m^3/s*

Therefore it is shown that the proposed conceptual SWM forebay expansion provides adequate active storage volume to ensure no negative downstream impacts to the existing SWM facility while adding in the proposed development to the overall SWM facility catchment area.

7.11 Commitments for Functional and Detailed Design

The minor and major sewer systems and associated stormwater management facilities will be designed to support the proposed development. All proposed storm sewer infrastructure will be designed in accordance with the *Ottawa Sewer Design Guidelines*. The proposed forebay expansion of the existing municipal SWM facility will be completed according to City guidelines and the *MOE SWMP Design Manual*. Pond side slopes design is to be approved by a licensed Geotechnical Engineer prior to construction.

The proposed gravity sewer conveyance systems are shown to generally follow the proposed road network. Note that the road network is conceptual in nature and is subject to change. As such, the trunk storm sewer routing is also subject to change. Easements may be required to provide efficient servicing per City of Ottawa and MECP standards.

During design of the proposed development:

- *Average runoff coefficients will be updated to reflect detailed pervious/impervious surfaces information;*
- *Design parameters factors according to City of Ottawa Sewer Design Guidelines will be used;*

© DSEL

- *Design of the trunk sewers are to be optimized for construction efficiencies, provided that there are no significant impacts to affected landowners and other requirements related to minor amendments are met;*

- *Local storm sewer sizing will need to be evaluated at the subdivision approval stage;*

- *Detailed storage calculations/modelling will be done to ensure storage targets are being met;*

- *Overland flow routes will be detailed further; and,*

- *Capacity in downstream infrastructure will be confirmed through storm sewer network modelling, as-builts, and rational method design information.*

7.12 Stormwater Servicing Conclusions

Based on the existing site topography and constraints including the existing tributary an adjacent existing municipal SWM facility, DSEL prepared a stormwater servicing solution consisting of a forebay expansion of the existing municipal SWM facility.

The stormwater runoff is designed to be captured by an internal gravity sewer system that will convey flows to multiple outlet locations.

A preliminary assessment was conducted for the conceptual stormwater management (SWM) pond expansion. PCSWMM modeling analyzed storm and sanitary water elevations, concluding that gravity storm connections are feasible.

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8.0 CONCLUSIONS

This Master Servicing Study (***MSS***) provides historical background information regarding the servicing in the vicinity of the subject property and presents servicing options explored while determining the recommended servicing strategy. Sufficient detail is provided to demonstrate that the development of the subject property will be adequately supported by municipal services and demonstrate how the municipal services will conform to current guidelines and design criteria. The conclusions from this report are as follows:

- Paterson Group has completed geotechnical investigations of the development areas and has noted that the site has no grade raise restrictions.

- GeoMorphix has completed a geomorphological assessment and associated Findlay Creek conceptual channel design resulting in an improved environmental corridor while ensuring the floodplain associated with Findlay Creek is contained within the proposed channel corridor.

- The recommended water servicing preferred option of those evaluated is to connect to multiple connection points from the recently constructed 400 mm diameter watermain on Bank Street via the two 300 mm connections constructed in support of the proposed development as part of the Bank Street reconstruction project. The proposed network has demonstrated a watermain network that could provide RFF of 250 L/s based on the boundary conditions provided by City staff.

- Detailed modelling at the detailed design stage will confirm phasing of the extensions of trunk watermains and sizing of the local watermain network. The proposed water design supply is to conform to all relevant City and MECP Guidelines and Policies.

- Sanitary service will be provided for the subject property via two proposed connections to the existing local gravity sanitary sewer network. A connection to the west of Bank Street on Sora Way, and a second to the northeast within Shuttleworth Drive. Additional analyses and studies will assess the full scope of the upgrades and staging of the improvements.

- Stormwater service is to be provided by capturing stormwater runoff by an internal gravity sewer system that will convey flows to the existing Findlay Creek SWM facility via:

    1. Existing SWM Pond Inlet – the lands south of the existing Findlay Creek are proposed to connect to the existing inlet box culvert and convey flows directly to the existing SWM pond; and,
    2. Lands north and east of existing Findlay Creek and the existing SWM pond are proposed to be conveyed to a proposed forebay expansion of the existing SWM pond within the proposed development, ultimately to the existing SWM pond.

- A preliminary Hydraulic Grade Line (HGL) modelling analysis has been completed and demonstrates that the HGL is maintained below the anticipated future underside of footings for the site.

- Erosion and sediment control measures will be implemented and maintained throughout construction. The adjacent watercourse and SWM pond will be protected from any negative impacts during construction.

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- The proposed servicing and grading plans are expected to meet all City, SNCA, and MECP requirements as set out in background studies and current standards.

Prepared by,
David Schaeffer Engineering Ltd.



Per: John Priamo, P.Eng.

Reviewed by,
David Schaeffer Engineering Ltd.

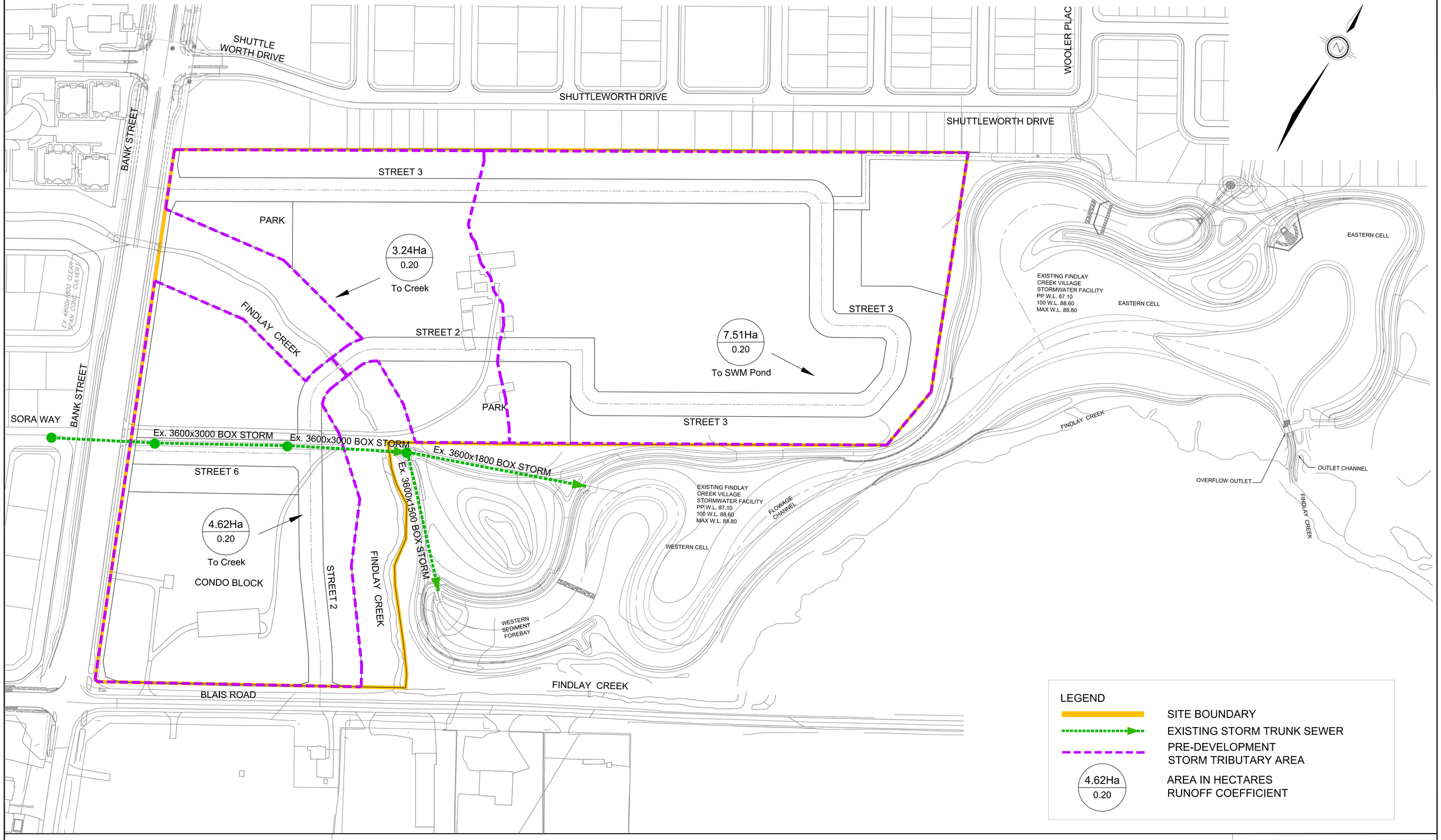


Per: Marc Pichette, P.Eng.

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2026-09-30_1414_mss_sub1.docx



Figures



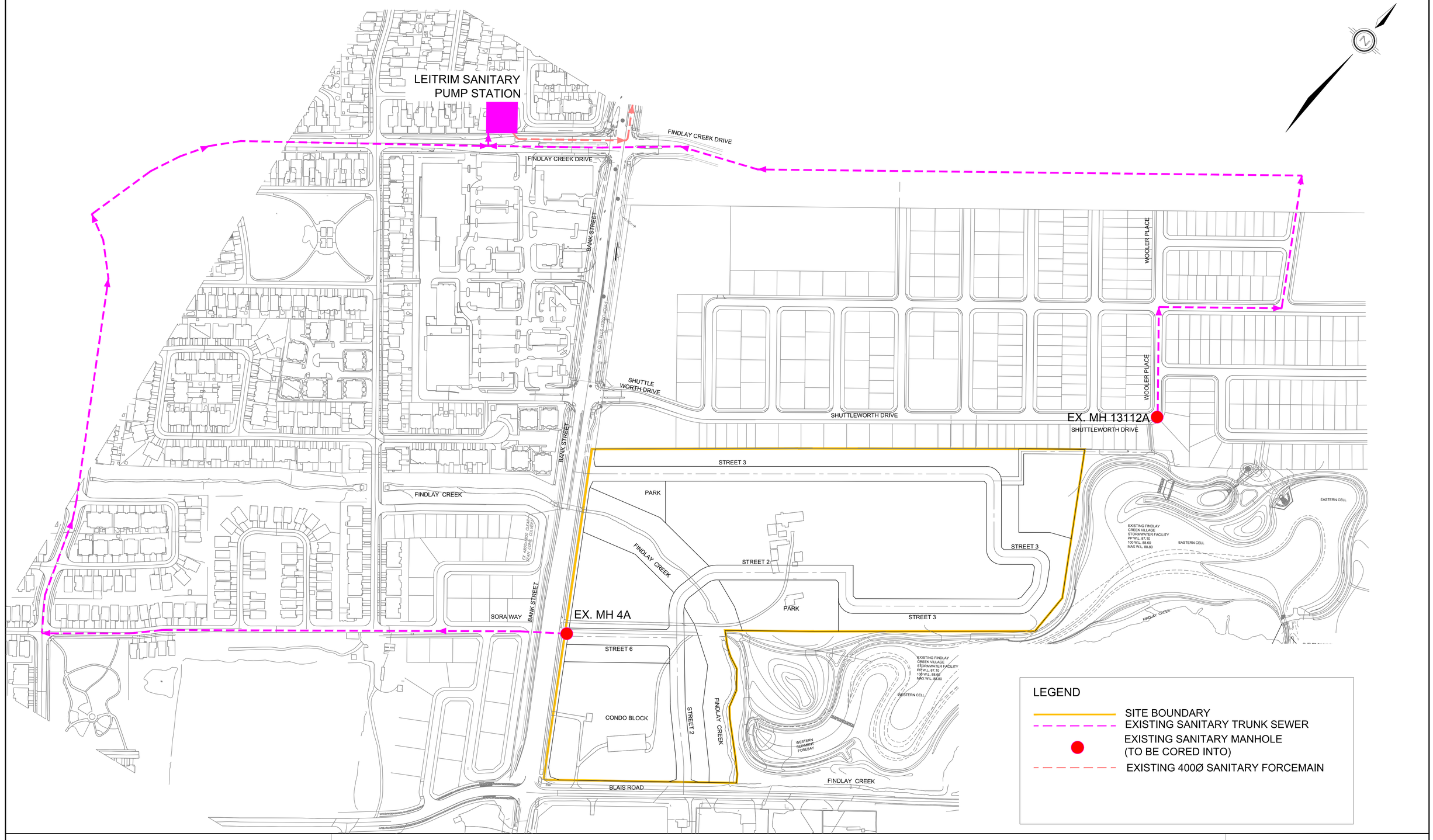
LEGEND

- SITE BOUNDARY
- EXISTING STORM TRUNK SEWER
- PRE-DEVELOPMENT STORM TRIBUTARY AREA
- 4.62Ha / 0.20 — AREA IN HECTARES / RUNOFF COEFFICIENT

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

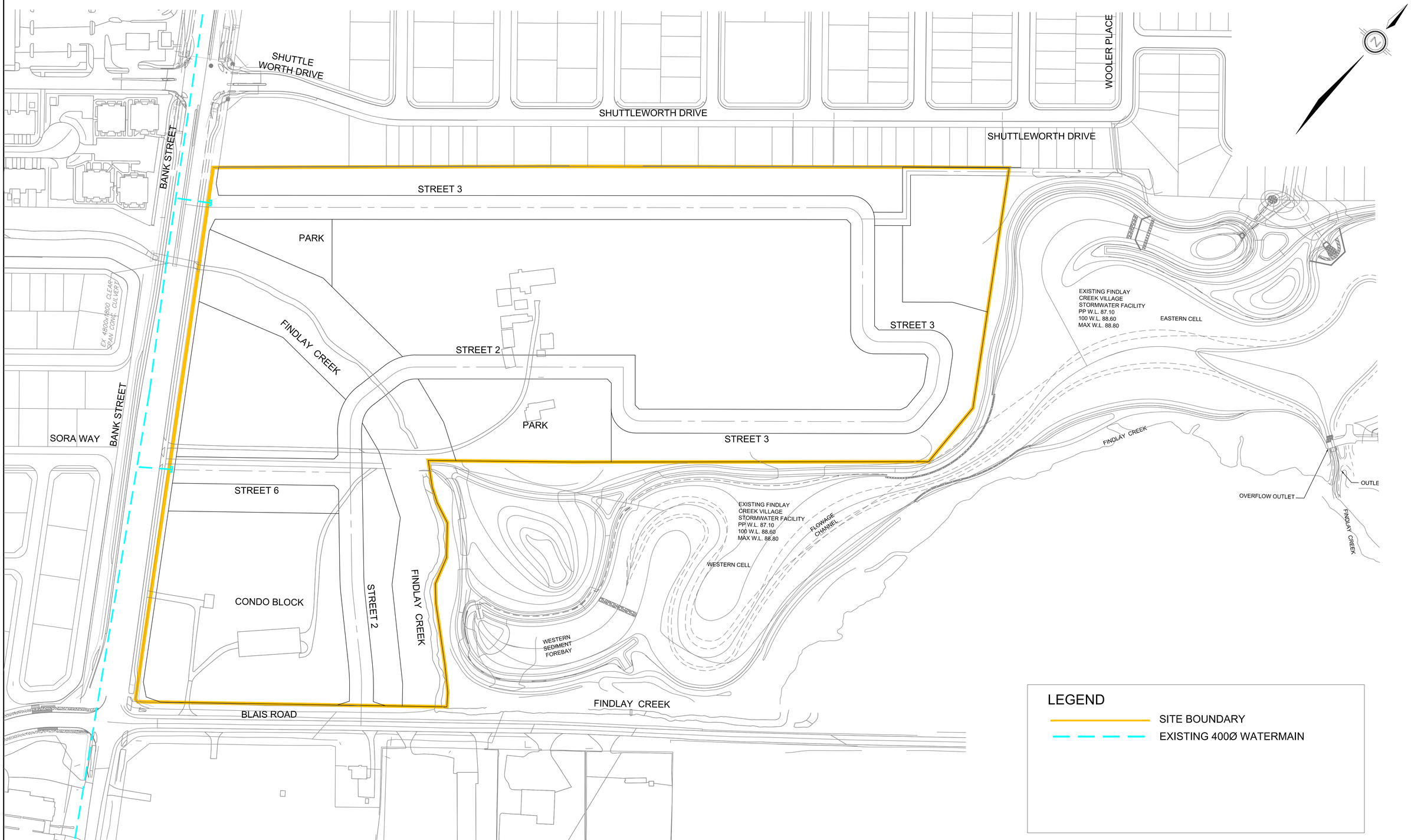
PROJECT No. :	24-1414
SCALE:	1:1250
DATE:	JULY 2026
FIGURE No.	1



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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



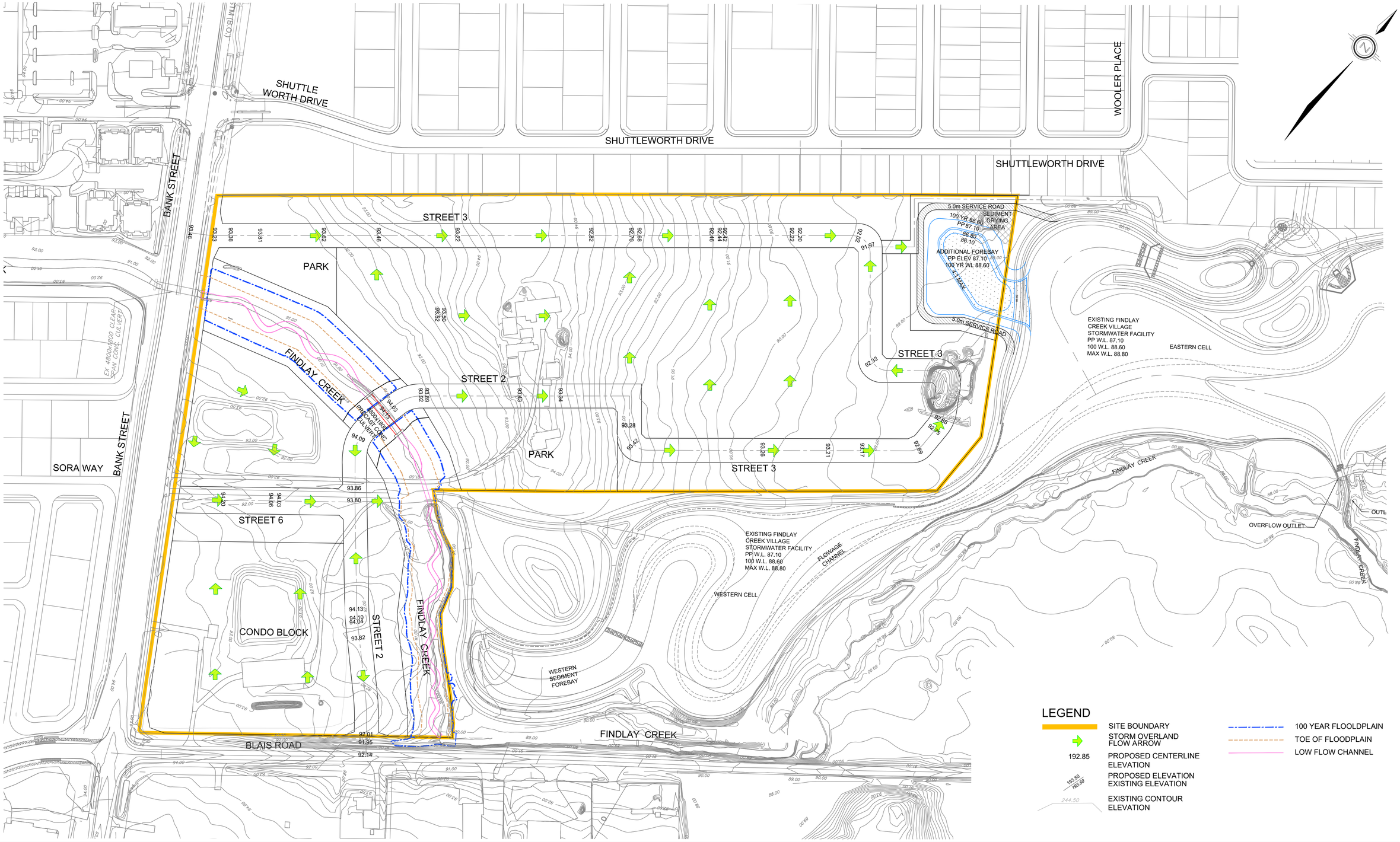
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CAIVAN LEITRIM
WATERMAIN EXISTING CONDITIONS FIGURE
CITY OF OTTAWA

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



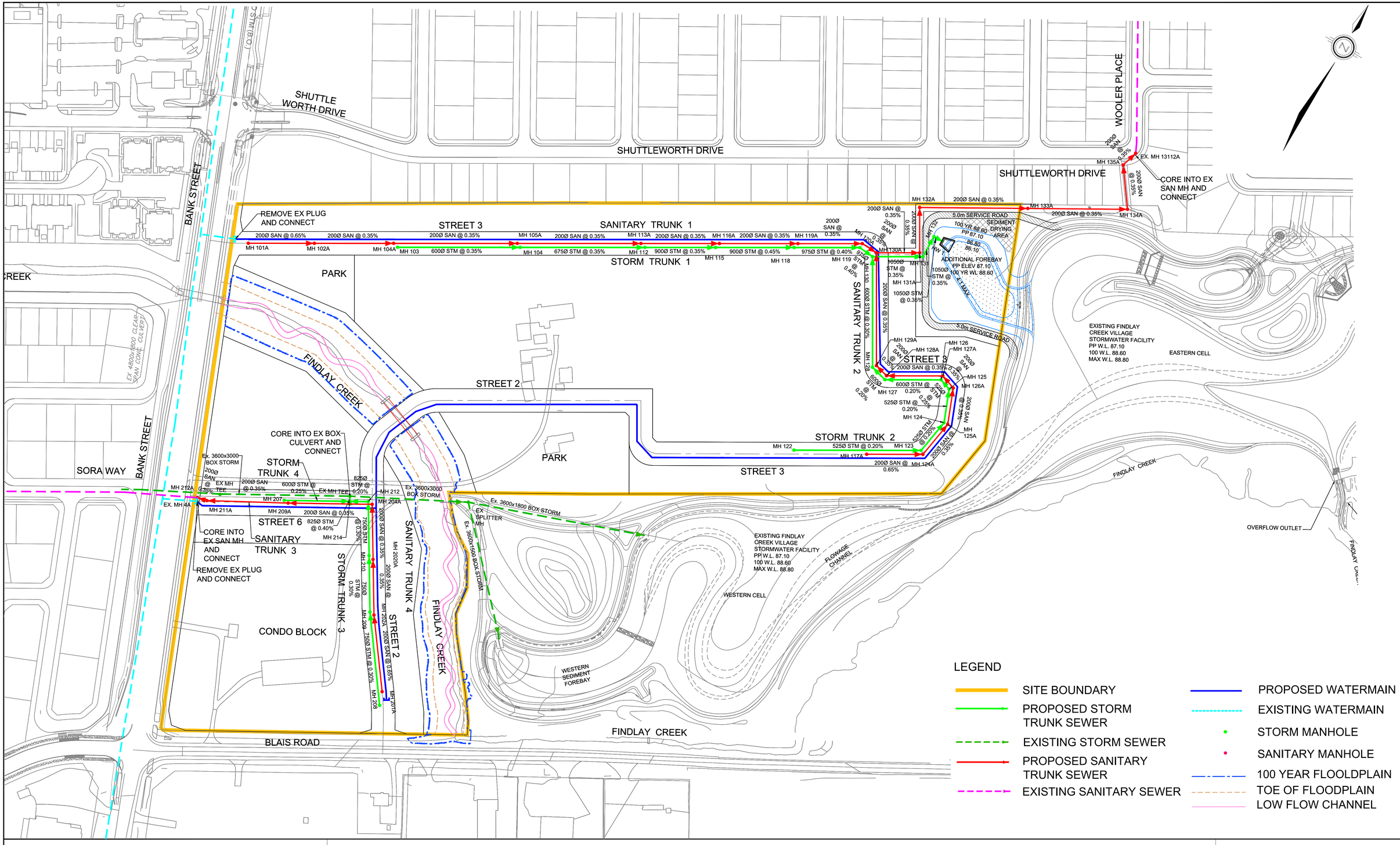
Drawings



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CAIVAN LEITRIM
CONCEPTUAL GRADING PLAN
CITY OF OTTAWA

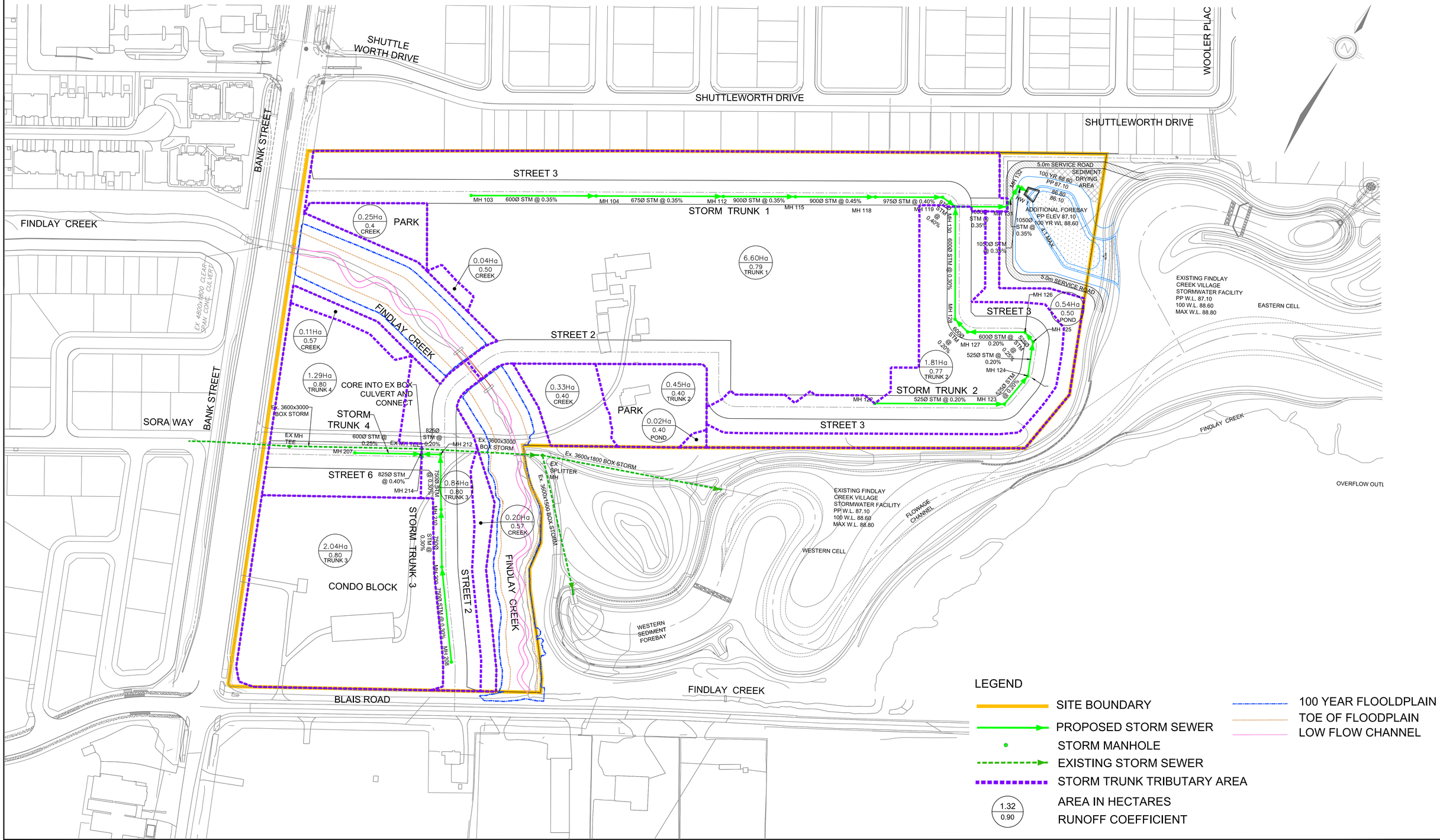
PROJECT No. :	24-1414
SCALE:	1:1250
DATE:	JULY 2026
DRAWING No.	1



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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



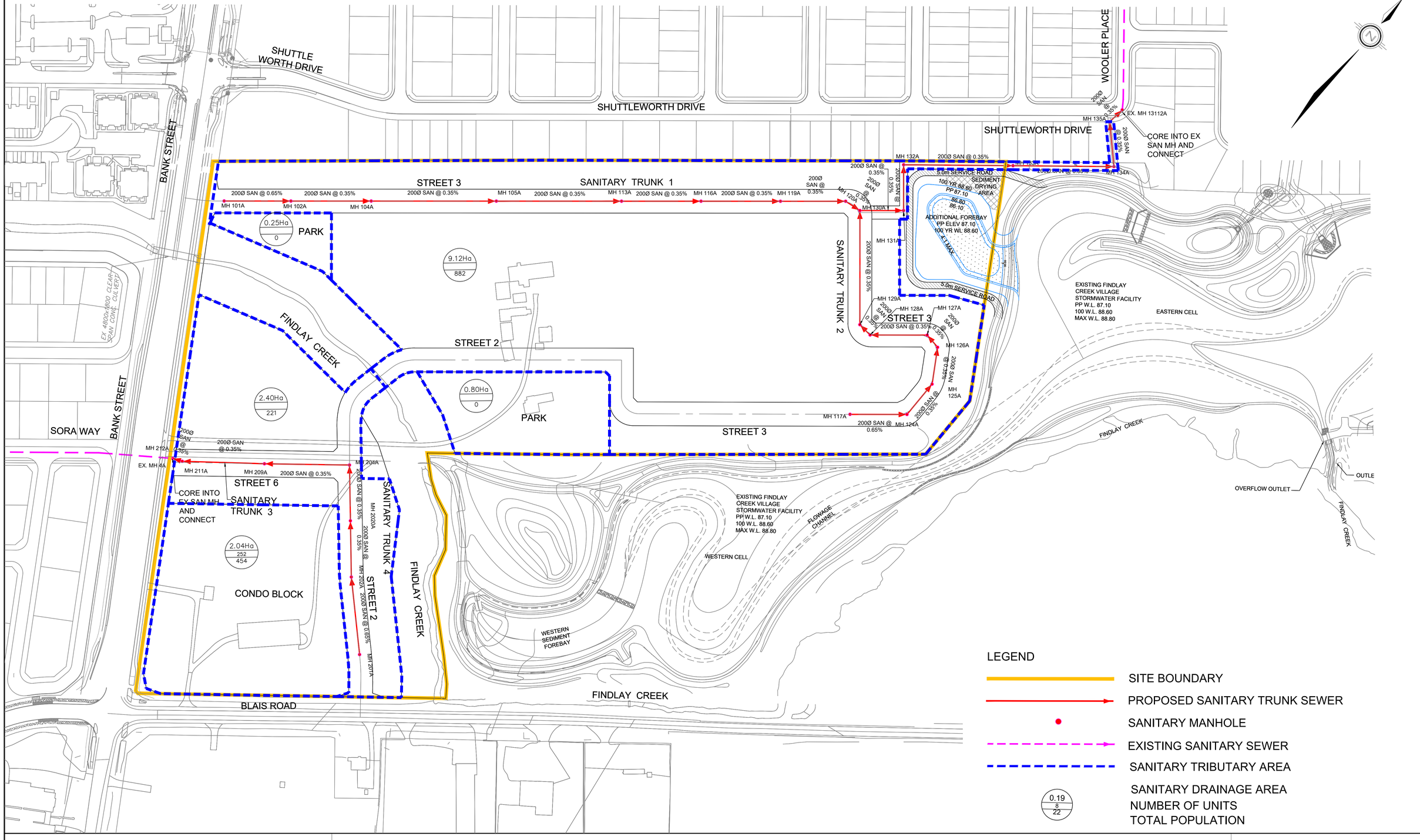
LEGEND

- SITE BOUNDARY
- PROPOSED STORM SEWER
- STORM MANHOLE
- EXISTING STORM SEWER
- STORM TRUNK TRIBUTARY AREA
- 1.32 / 0.90 — AREA IN HECTARES / RUNOFF COEFFICIENT
- 100 YEAR FLOOLDPLAIN
- TOE OF FLOODPLAIN
- LOW FLOW CHANNEL

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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



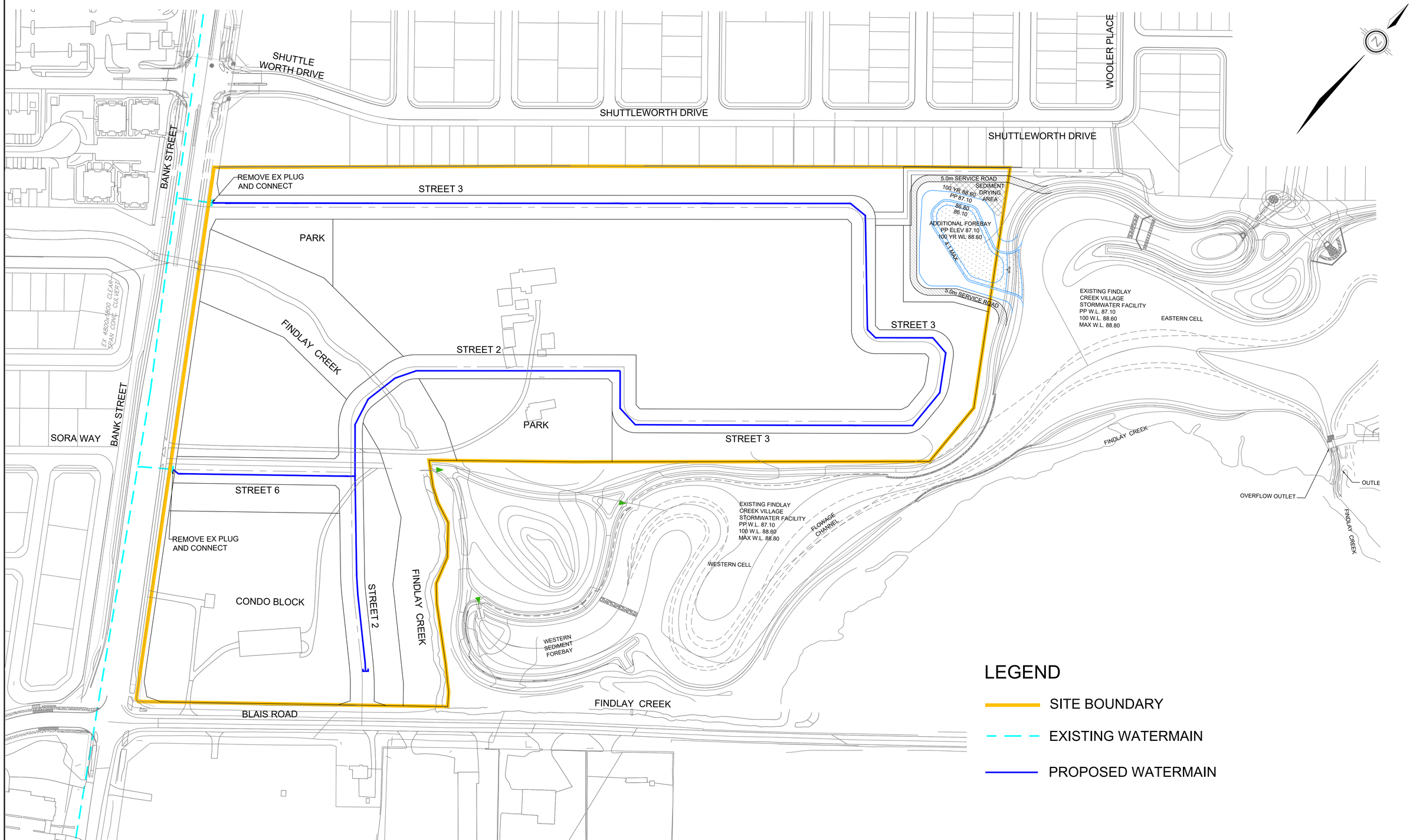
LEGEND

- SITE BOUNDARY
- PROPOSED SANITARY TRUNK SEWER
- SANITARY MANHOLE
- EXISTING SANITARY SEWER
- SANITARY TRIBUTARY AREA
- 0.19 / 8 / 22 — SANITARY DRAINAGE AREA / NUMBER OF UNITS / TOTAL POPULATION

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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



LEGEND

- SITE BOUNDARY
- EXISTING WATERMAIN
- PROPOSED WATERMAIN

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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



Appendix A

General

CAIVAN

LEITRIM

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

SHUTTLEWORTH DRIVE

ENTRANCE

PARK
0.25ha
(0.62ac)

POND
0.7ha
(1.67ac)

BANK STREET

53

PARK
0.8ha
(1.98ac)

BANK STREET
ROAD WIDENING
ALLOWANCE.

CITY OF OTTAWA EASEMENT
FOR EXISTING SWM SEWER.

CONDO BLOCK
2.04ha
(5.04ac)

ENTRANCE

BLAIS ROAD

UNITS	
240	FRONT LOADED TOWNS
70	SINGLES (35')
13	SINGLES (37')
26	SINGLES (42')
19	SINGLES (50')
252	STACKED CONDO BLOCK
620	

- NHS
- PARK
- PATHWAY
- SWM POND
- ROW
- ROAD WIDENING

SCHEDULE			
PART	LOT	CONCESSION	PIN
1	PART OF 20	5 (RIDEAU FRONT)	ALL OF 04345-0346
2			
3			
4			ALL OF 04345-0347

PART 2 IS SUBJECT TO EASEMENT PER INST. OC425556

PLAN 4R-37086

Received and deposited

September 15th, 2025

Lucy Wang

Representative for the Land Registrar for the Land Titles Division of Ottawa-carleton (No.4)

The Land is in Land Registry Office #4

PLAN OF SURVEY OF

PART OF LOT 20 CONCESSION 5 (RIDEAU FRONT)

(GEOGRAPHIC TOWNSHIP OF GLOUCESTER)

CITY OF OTTAWA

Scale 1:1000

20 0 20 40 60 METRES

THE INTENDED PLOT SIZE OF THIS PLAN IS 1219 mm IN WIDTH BY 610 mm IN HEIGHT WHEN PLOTTED AT A SCALE OF 1:1000 m.

METRIC CONVERSION

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

GRID SCALE CONVERSION

DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999963.

BEARING NOTE

BEARINGS ARE GRID, DERIVED FROM THE CAN-NET VRS NETWORK OBSERVATIONS ON NCC HORIZONTAL CONTROL MONUMENTS 19773035 AND 19680191, CENTRAL MERIDIAN, 76°30' WEST LONGITUDE MTM ZONE 9, NAD83 (ORIGINAL).

19773035 N:5006060.42 E:324888.04
19680191 N:5033564.26 E:388064.94

MONUMENTATION NOTE

SSIB'S WERE SET DUE TO LACK OF OVERBURDEN AND/OR POSSIBLE UNDERGROUND UTILITIES IN ACCORDANCE WITH SECTION 11 (4) OF REG. 525/91.

LEGEND

■	DENOTES	FOUND MONUMENTS
□	"	SET MONUMENTS
IB	"	IRON BAR
IBØ	"	ROUND IRON BAR
SIB	"	STANDARD IRON BAR
SSIB	"	SHORT STANDARD IRON BAR
CC	"	CUT CROSS
CP	"	CONCRETE PIN
WIT	"	WITNESS
PIN	"	PROPERTY IDENTIFICATION NUMBER
M/MEAS	"	MEASURED
S	"	SET
OU	"	ORIGIN UNKNOWN
SG	"	STANTEC GEOMATICS LTD.
P1	"	PLAN 4R-20045
P2	"	REGISTERED PLAN 4M-1624
ORP	"	OBSERVED REFERENCE POINT
UP	"	UTILITY POLE
——OHW——	"	OVERHEAD UTILITY WIRES

OBSERVED REFERENCE POINTS DERIVED FROM THE CAN-NET VRS NETWORK GPS OBSERVATIONS ON NCC HORIZONTAL CONTROL MONUMENTS 19773035 AND 19680191, CENTRAL MERIDIAN, 76°30' WEST LONGITUDE MTM ZONE 9, NAD83 (ORIGINAL). COORDINATES TO URBAN ACCURACY PER SEC 14(2) OF O.REG. 216/10

POINT ID	NORTHING	EASTING
A	5020297.89	374837.71
B	5020223.54	374995.72

COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE 6th DAY OF FEBRUARY, 2025.

Sep. 12, 2025
DATE

J. FRANCIS LAU
ONTARIO LAND SURVEYOR

THIS PLAN OF SURVEY RELATES TO AOLS PLAN SUBMISSION FORM NUMBER Y-97148.

Stantec Geomatics Ltd.
CANADA LANDS SURVEYORS
ONTARIO LAND SURVEYORS
1331 CLYDE AVENUE, SUITE 300
OTTAWA, ONTARIO, K2C 3G4
TEL. 613.722.4420
stantec.com

DRAWN: ME | CHECKED: CK | PM: FL | FIELD: CA | PROJECT No.: 161600000

PART 1 4R-30466

PART 1 4R-34980

PIN 04345 – 2095

PART 1 PIN 04345 – 0345

PART 1 4R-20045

PART 2 4R-20045 SUBJECT TO EASEMENT OC425556

PART 3 4R-20045

PART 4 4R-20045

PART 5 4R-20045

PART 6 4R-20045

PIN 04345 – 0347

PIN 04345 – 0346

PART 7 5R

PART 6 -

PART 1 -

PART 2 -

PART 3 3820

LOT 21

PART 1 5R - 1025

BLAIS ROAD ROAD ALLOWANCE BETWEEN LOTS 20 AND 21 PIN 04345-0150

INST. NO. GL81462 (P, O, S,)

INST. NO. GL81463 (P, O, S,)

INST. GL45353 PIN 04345-0150

BY-LAW-SEE INST. NO. GL80706

BANK STREET (FORMERLY THE KING'S HIGHWAY No. 31) (AS WIDENED BY INST. NO. GL50844 PIN 04345 0149)

ROAD ALLOWANCE BETWEEN LOTS 4 AND 5 (RF)

promenade Shuttleworth Drive

REGISTERED BLOCK 222 PIN 04345-1112 SET OC2010903

PLAN 4M-1624

LOT 20

CONCESSION 5 (RIDEAU FRONT)

AM - 1624

SUBJECT TO EASEMENTS OC2093472, OC2093474, OC2093476, OC2093683 & OC2437853

SUBJECT TO EASEMENTS OC2093472, OC2093474, OC2093476 & OC2093683

PART 1 PART 2 PART 3 PART 4 PART 5 PART 6

FARM BUILDINGS

FARM BUILDING

CONCRETE BLOCK RETAINING WALL (SOUTH FACE NOTED)

CHAIN LINK FENCE

WALL (EAST FACE) 0.90 WEST

WALL (HEAT FACED) 1.27 EAST SOUTH

WALL 0.19 SOUTH

WALL 0.09 SOUTH

WALL 0.38 NORTH

FENCE 0.06 NORTH

FENCE 0.05 NORTH

FENCE 0.03 SOUTH

FENCE 4.05 (Calc per P1&P2)

CONCRETE SIDEWALK

CONCRETE CURB

CONCRETE CURB & GUTTER

CONCRETE SIDEWALK

CONCRETE BLOCK RETAINING WALL

SSIB (WIT) 0.19 SOUTH

SSIB (WIT) 0.09 SOUTH

SSIB (ADD)

SSIB (ADD) ORP A

SSIB (50)

IB (50)

IB FOUND RESET SSIB

SIB(50) IBØ RESET SSIB

SIB(50) LEANING EAST (TOP NOTED)

IB (50) BASE NOTED

SIB(1175)

(R1)170WT 0.06 SOUTH (P1&D)

ORP B

N58°34'45"E 2.75 Per P1

N58°24'45"E 246.45 (P1&SET)

246.70 (P2&M)

N59°17'05"E (P1&SET)

N59°41'10"W 1.00

65.01 (P1&SET)

104.98 (P1&SET)

N25°25'25"W 80.71 (P1&SET)

N25°25'10"W (P1&MEAS) 406.25 MEAS (406.34P1)

N26°36'40"W 102.81 (P1&MEAS)

N59°39'00"E 210.26 (P1&MEAS)

193.49 (P1&MEAS)

N59°39'00"E 199.42 (P1&MEAS)

N59°24'10"E 91.02 (P1&MEAS)

N58°43'40"E 268.68 (P1&MEAS)

N59°34'30"E 448.29 (P1&MEAS)

262.84 (P1&MEAS)

167.43 (P1&MEAS)

203.69 (P1&MEAS)

17.66 (P1&M)

11.22 (P1&M)

N59°44'00"E 521.87 (P1&MEAS)

106.61 (P1&MEAS)

121.97 (P1&SET)

43.28 (P1&SET)

N21°11'00"W 2.58 (P1&SET)

N25°25'10"W 43.28 (P1&M)

N25°25'10"W 10.79 (P1&M)

N25°25'10"W 10.82 (P1&M)

N25°25'10"W 10.82 (P1&M)

N25°25'10"W 10.82

Note:
1) This figure forms part of the Infrastructure Master Plan of the City of Ottawa and should be read in conjunction with the text.
2) This figure is intended as a schematic representation of existing and/or proposed works; consequently alignments and locations of facilities are approximate.

Note:
1) Cette figure fait partie intégrante du Plan directeur de l'infrastructure de la Ville d'Ottawa et devrait être lue conjointement avec le texte.
2) Cette figure se veut être une représentation schématique des travaux actuels et proposés; en conséquence, les tracés et les emplacements des installations sont approximatifs.

1

City of / Ville de GATINEAU

W-1 W-2 W-3 W-4

E-1 E-2 E-3 E-4 E-5

S-1 S-2 S-3 S-4 S-5

Tewin

Subject lands

MARCH, TERRY FOX, CARP, CARLING, HIGHWAY 417, ROBERTSON, HAZELDEAN, SITTSVILLE MAIN, EAGLESON, OLD RICHMOND, HOPE SIDE, FALLOWFIELD, HUNTLEY, FRANKTOWN, TRAIL, MOODIE, HIGHWAY 416, MARCH, ROCKCLIFFE, BEECHWOOD, SUSSEX, SCOTT, RIDEAU, SOMERSET, CATHERINE, ELGIN, VANIER, MCARTHUR, ST LAURENT, AVIATION, MONTREAL, BLAIR, REGIONAL ROAD 174, OGILVIE, ST. JOSEPH, JEANNE D'ARC, ORLEANS, INNES, TRIM, OLD MONTREAL, Centrum, BASELINE, MEADOWLANDS, FISHER, BRONSON, BANK, MAIN, INDUSTRIAL, SMYTH, HERON, WALKLEY, RIVERSIDE, MERIVALE, WEST HUNT CLUB, GREENBANK, WOODROFFE, PRINCE OF WALES, UPLANDS, AIRPORT, HUNT CLUB, CONROY, HAWTHORNE, RUSSELL, RAMSAYVILLE, ANDERSON, TENTH LINE, NIVAN, LESTER, ALBION, LEITRIM, HIGHWAY 417, RUSSELL, BOUNDARY, MILTON, COLONIAL, RIVER

URBAN EXPANSION AREAS / ZONES D'EXPANSION URBAINE

- Future Neighbourhood / Futur quartier
- Industrial and Logistics / Industrie et Logistique
- Urban Boundary / Périmètre d'urbanisation
- Expansion Areas added and then rescinded by MMHA / Zones d'expansion ajoutées puis annulées par MMHA

TRANSECT POLICY AREAS / SECTEURS STRATÉGIQUES DU TRANSECT

- Downtown Core / Centre-ville
- Inner Urban / Urbain intérieur
- Outer Urban / Urbain extérieur
- Greenbelt / Ceinture de verdure
- Suburban / Suburbain
- Rural / Rural

Ottawa

INFRASTRUCTURE MASTER PLAN - Schedule 1

Urban Expansion Areas as defined in the Official Plan

PLAN DIRECTEUR DE L'INFRASTRUCTURE - Annexe 1

Zones d'expansion urbaine comme défini dans le Plan officiel

0 1.25 2.5 5 7.5 10 km

Planning, Development and Building Services, Geospatial Analytics, Technology and Solutions
Direction générale des sevices de planification, de l'aménagement se du bâtiment, Analyse géospatiale, technologie et solutions

Note:
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1) Cette figure fait partie intégrante du Plan directeur de l'infrastructure de la Ville d'Ottawa et devrait être lue conjointement avec le texte.
2) Cette figure se veut être une représentation schématique des travaux actuels et proposés; en conséquence, les tracés et les emplacements des installations sont approximatifs.

3

City of / Ville de GATINEAU

Subject lands

URBAN EXPANSION AREAS / ZONES D'EXPANSION URBAINE

- Future Neighbourhood / Futur quartier
- Industrial and Logistics / Industrie et Logistique
- Expansion Areas added and then rescinded by MMHA / Zones d'expansion ajoutées puis annulées par MMHA
- Urban Boundary / Périmètre d'urbanisation
- Greenbelt / Ceinture de verdure
- Other urban area inside the urban boundary / Autre zone urbaine à l'intérieur des limites urbaines

PUBLIC SERVICE AREAS / ZONES DE SERVICES PUBLICS

- Serviced Greenbelt Facilities / Installations de la Ceinture de verdure desservies
- Public Service Area - Water (outside the Urban Boundary) / Zone de services publics – Plans d'eau (hors du périmètre urbain)
- Public Service Area - Water (outside the Urban Boundary - limited connection capacity/availability) / Zone de services publics – Plans d'eau (hors du périmètre urbain – capacité/disponibilité limitée du raccordement)
- Public Service Area - Wastewater (outside the Urban Boundary) / Zone de services publics – Eaux usées (hors du périmètre urbain)
- Public Service Area - Water and Wastewater (outside the Urban Boundary) / Zone de services publics – Aqueduc et égout (hors du périmètre urbain)
- * Rideau Carleton Raceway Casino public supplied water and wastewater through private systems / Casino hippodrome Rideau Carleton : alimentation en eau et aqueduc dans le cadre de réseaux privés

Ottawa

INFRASTRUCTURE MASTER PLAN - Schedule 3
Public Service Areas

PLAN DIRECTEUR DE L'INFRASTRUCTURE - Annexe 3
Zones de services publics

0 1.25 2.5 5 7.5 10 km

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Direction générale des sevices de planification, de l'aménagement se du bâtiment, Analyse géospatiale, technologie et solutions

Appendix B

Geotechnical, Hydrogeological, and Hydraulic Technical Reports

PATERSON GROUP

Geotechnical Investigation

Proposed Residential Development

4795 Bank Street & 3301 Blais Road
Ottawa, Ontario

Prepared for Caivan Communities

Report PG7301-1 Revision 3 dated July 9, 2026

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1.0 Introduction

Paterson Group (Paterson) was commissioned by Caivan Communities to conduct a geotechnical investigation for the proposed residential development to be located at 4795 Bank Street in the City of Ottawa, Ontario (refer to Figure 1 - Key Plan in Appendix 2 for the general site location). **The geotechnical investigation also included 3301 Blais Road, however, it is understood that only the development of the 4795 Bank Street property is being proposed at the time of report writing.**

The objectives of the geotechnical investigation were to:

- ❑ Determine the subsoil and groundwater conditions at this site by means of test holes.
- ❑ Provide geotechnical recommendations pertaining to the design of the proposed development including construction considerations which may affect the design.

The following report has been prepared specifically and solely for the aforementioned project which is described herein. It contains our findings and includes geotechnical recommendations pertaining to the design and construction of the subject development as they are understood at the time of writing this report.

Investigating for the presence or potential presence of contamination on the subject property was not part of the scope of the present investigation. Therefore, the present report does not address environmental issues.

2.0 Proposed Development

Based on the late concept plans, it is expected that the proposed development at 4795 Bank Street will consist of a series of single and townhouse-style residential dwellings, as well as stacked townhomes with basements or of slab-on-grade construction. Access lanes, at-grade parking areas, associated driveways, local roadways and landscaped areas are also anticipated as part of the development. No development is currently proposed at 3301 Blais Road.

It is also expected that the proposed development is to be municipally serviced. A stormwater management pond is proposed within the northeast limits of the 4795 Bank Street property.

It is anticipated that the existing structures located at the site will be demolished to accommodate the construction of the proposed development.

3.0 Method of Investigation

3.1 Field Investigation

Field Program

A supplemental geotechnical investigation was carried out to support the preliminary design of the proposed stormwater management pond to be located at the subject site. The supplemental investigation was completed on March 2 and 3, 2026 and consisted of advancing a total of 6 boreholes to a maximum depth of 10.3 m below the existing ground surface.

The field program for the original geotechnical investigation was carried out between September 25 and October 4, 2024 and consisted of advancing a total of 20 boreholes and 50 probe holes to maximum depths of 6.1 m and 14.9 m below the existing ground surface, respectively. A previous geotechnical investigation was completed by Paterson at the subject site on November 10, 2023. At that time, a total of three (3) test pits were advanced to a maximum depth of 5.1 m below the existing grade within the northeast portion of the site.

The borehole and probe hole locations for the current geotechnical investigation were distributed in a manner to provide general coverage of the proposed development, taking into consideration existing site features and underground services. The approximate locations of the test holes are presented on Drawing PG7301-1 - Test Hole Location Plan included in Appendix 2.

The boreholes were advanced using a low-clearance, auger drill rig operated by a two-person crew. The probe holes were advanced using a track mounted, pneumatic drill rig operated by a two-person crew.

The test pits were excavated using a hydraulic shovel and backfilled with the excavated soil upon completion. All fieldwork was conducted under the full-time supervision of Paterson personnel under the direction of a senior engineer. The test hole procedure consisted of augering/excavating to the required depths at the selected locations, and sampling and testing the overburden.

Sampling and In-Situ Testing

Soil samples were collected from the boreholes using two different techniques, namely, sampled directly from the auger flights (AU) or collected using a 50 mm diameter split-spoon (SS) sampler. Rock cores (RC) were obtained from the boreholes advanced within the footprint of the stormwater management pond using 47.6 mm inside diameter coring equipment.

All samples were visually inspected and initially classified on site. The auger and split-spoon samples were placed in sealed plastic bags, and rock cores were placed in cardboard boxes. All samples were transported to our laboratory for further examination and classification.

The depths at which the auger, split spoon and rock core samples were recovered from the boreholes are shown as AU, SS and RC, respectively, on the Soil Profile and Test Data sheets presented in Appendix 1.

A Standard Penetration Test (SPT) was conducted in conjunction with the recovery of the split-spoon samples and are recorded as “N” values on the Soil Profile and Test Data sheets. The “N” value is the number of blows required to drive the split-spoon sampler 300 mm into the soil after a 150 mm initial penetration using a 63.5 kg hammer falling from a height of 760 mm.

Undrained shear strength testing, using a vane apparatus, was carried out at regular intervals of depth in cohesive soils.

The thickness of the overburden was evaluated during the course of the investigation by a dynamic cone penetration test (DCPT) at boreholes BH 9-24, BH 15A-24 and BH 16-24 and via the probe hole program. The DCPT consists of driving a steel drill rod, equipped with a 50 mm diameter cone at its tip, using a 63.5 kg hammer falling from a height of 760 mm. The number of blows required to drive the cone into the soil is recorded for each 300 mm increment.

The subsurface conditions observed in the boreholes and test pits were recorded in detail in the field. The soil profiles are presented on the Soil Profile and Test Data sheets in Appendix 1 of this report.

Groundwater

Monitoring wells were installed in boreholes BH 1-26 through BH 6-26, BH 2-24, BH 4-24, BH 6-24, BH 9-24, BH 10-24, BH 11-24, BH 12-24, BH 13-24, BH 15-24 and BH 17-24 during the geotechnical investigations to permit monitoring of the groundwater levels subsequent to the completion of the sampling program. Flexible piezometers were installed in the remaining boreholes.

All monitoring wells were equipped with a submersible datalogger (TD-Diver, VanEssen Instruments) to accurately monitor fluctuations in the groundwater levels for a specified period of time. The datalogger can measure the equivalent hydrostatic pressure of the water above the sensor diaphragm to calculate the total water depth. The dataloggers were programmed to continuously measure and record groundwater levels at a fixed rate of one (1) reading every 24 hours.

In addition to the continuous datalogger measurements, manual water level measurements were periodically taken throughout the groundwater monitoring program using an electronic water level meter. The groundwater observations are discussed in Subsection 4.3 and presented in the Soil Profile and Test Data sheets in Appendix 1.

Sample Storage

All samples will be stored in the laboratory for a period of one (1) month after issuance of this report. They will then be discarded unless we are otherwise directed.

3.2 Field Survey

The current test hole locations, and ground surface elevation at each test hole location, were surveyed by Paterson using a handheld GPS and referenced to a geodetic datum. The locations of the test holes, and ground surface elevation at each test hole location, are presented on Drawing PG7301-1 - Test Hole Location Plan in Appendix 2.

3.3 Laboratory Review

Soil samples were recovered from the subject site and visually examined in our laboratory to review the results of the field logging. Moisture content testing was completed on recovered soil samples from all boreholes. Additionally, 11 grain size distribution and hydrometer analysis and three (3) Atterberg Limits tests were completed on selected soil samples. The results are presented in the Soil Profile and Test Data Sheets in Appendix 1.

3.4 Analytical Testing

One (1) soil sample was submitted for analytical testing to assess the corrosion potential for exposed ferrous metals and the potential of sulphate attacks against subsurface concrete structures. The sample was submitted to determine the concentration of sulphate and chloride, the resistivity, and the pH of the samples. The results are presented in Appendix 1 and are discussed further in Section 6.7.

3.5 Hydraulic Conductivity (Slug) Testing

Hydraulic conductivity (slug) testing was conducted at each monitoring well location installed within the footprint of the proposed stormwater management pond. The testing was completed to assist in confirming anticipated groundwater flow rates within the subsoils and within the proposed pond block. The test data was analyzed as per the method set out by Hvorslev (1951). Assumptions inherent in the Hvorslev method include a homogeneous and isotropic aquifer of infinite extent with zero-storage assumption, and a screen length significantly greater than the monitoring well diameter. The assumption regarding aquifer storage is considered to be appropriate for groundwater inflow through the overburden and bedrock aquifers.

While the idealized assumptions regarding aquifer extent, homogeneity, and isotropy are not strictly met in this case (or in any real-world situation), it has been our experience that the Hvorslev method produces effective point estimates of hydraulic conductivity in conditions similar to those encountered at the subject site.

The Hvorslev analysis is based on the line of best fit through the field data (hydraulic head recovery vs. time), plotted on a semi-logarithmic scale. In cases where the initial hydraulic head displacement is known with relative certainty, such as in this case where a physical slug has been introduced, the line of best fit is considered to pass through the origin. The semi-log drawdown vs. time plots for rising and falling head at each borehole location are presented in Appendix 1.

The results of testing and hydrogeological recommendations are further discussed in Subsection 4.2.

4.0 Observations

4.1 Surface Conditions

4795 Bank Street

The majority of the subject site consists of agricultural lands with sparse areas of mature trees which generally follow the property boundary and/or subdivide the fields. Residential and agricultural buildings are located within the central and southeast limits of the property. The western portion of the property is bisected by the Findlay Creek.

The property is bordered by an existing residential development and associated stormwater managing system to the north and east respectively, by Blais Road to the south and by Bank Street to the west. The ground surface across the property slopes gently downward from west to east at approximate geodetic elevations of 94 m to 88 m.

3301 Blais Road

The property consists of agricultural lands with mature trees located along the perimeter of the property. The property is bordered by Findlay Creek and further by the aforementioned a storm water management facility to the north and west, by vacant lands to the east and by Blais Road to the south. The ground surface across the site property slopes downward from west to east at approximate geodetic elevations of 90 m to 88 m.

4.2 Subsurface Profile

Overburden

4795 Bank Street

Generally, the subsurface profile at the 4975 Bank Street property consists of topsoil underlain by a layer of silty sand overlying a deposit of sandy silt to clayey silt and/or glacial till. A fill layer, consisting of brown silty sand and/or silty clay to with gravel, cobbles, asphalt and crushed stone was encountered at boreholes BH 2-24 and BH 4-24 within the southern portion of the property and extended to approximate depths of 1.5 m and 0.7 m, respectively.

A layer of loose brown silty sand was encountered below the topsoil within the northern portion of the property and was noted to extend to a maximum depth of 1.0 m below the existing ground surface.

A compact brown sandy silt was observed below the topsoil and/or silty sand at the test pit locations, within the eastern limits of the property.

An approximate 1.0 to 5.3 m thick deposit of compact to loose brown sandy silt to clayey silt was encountered below the topsoil and/or silty sand at test holes BH 1-26, BH 2-26, BH 4-26, BH 5-26, BH 11-24, BH 12-24, TP 2-23 and TP 3-23, becoming grey in colour by approximate depths of 2.0 to 2.3 m.

A glacial till deposit was encountered underlying the above-noted soils at all test hole locations and was generally observed to consist of a loose to very dense, brown silty sand/or silty clay with gravel, cobbles and boulders. The glacial till deposit was observed to transition from brown to grey in colour at approximate depths ranging from 1.5 to 3.9 m below ground surface. Practical refusal to augering on inferred large boulders was encountered at several borehole locations at approximate depths ranging from 1.0 to 5.3 m. Large boulders were cored through at approximate depths 4.9 and 6.3 m at borehole BH 2-26.

3301 Blais Road

Generally, the subsurface profile at the 3301 Blais Street property consists of topsoil underlain by a deposit of silty sand to sandy silt underlain by glacial till. Fill material, intermixed with topsoil layers, was encountered at borehole BH 18-24 within the northeast corner of the property. The fill and topsoil layers were observed to extend to an approximate depth of 1.5 m below the existing ground surface.

A deposit of loose to dense brown silty sand to sandy silt was generally encountered below the topsoil across the property, extending to approximate depths of 0.7 to 4.1 m below the existing ground surface.

An approximate 3.6 m thick layer of stiff to firm grey clayey silt to silty clay was encountered below the topsoil and sandy silt at boreholes BH 15-24.

A glacial till deposit was encountered underlying the above-noted soils at all test hole locations and was generally observed to consist of a loose to very dense, silty sand with gravel, cobbles and boulders. The glacial till deposit was observed to transition from brown to grey in colour at approximate depths 1.5 to 3.1 m below ground surface at boreholes BH 17-24 and BH 18-24, respectively. Practical refusal to augering on inferred large boulders was encountered at depths ranging from 3.9 to 5.4 m at boreholes BH 17-24 to BH 20-24.

Reference should be made to the Soil Profile and Test Data sheets in Appendix 1 for the details of the soil profile encountered at each test hole location.

Grain Size Distribution and Hydrometer Testing

Eleven (11) grain size and hydrometer tests were completed to further classify selected soil samples. The results are summarized in Table 1 below and are presented in Appendix 1.

Table 1 – Summary of Grain Size Distribution Analysis

Test Hole	Sample	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
BH 1-26	SS3	0.3	1.8	82.0	16.0
BH 1-26	SS5	0.0	0.4	87.6	12.0
BH 2-26	SS3	0.0	1.6	85.4	13.0
BH 2-26	SS8	13.3	35.1	47.6	4.0
BH 4-26	SS3	3.2	3.2	78.1	15.5
BH 4-26	SS5	1.1	1.3	85.0	12.5
BH 11-24	SS2	0.0	1.7	88.2	10.2
BH 12-24	SS3	0.0	1.1	90.9	8.0
BH 12-24	SS5	0.0	4.5	84.9	10.6
BH 12-24	SS6	0.0	3.6	86.6	9.8
BH 15-24	SS5	0.0	1.2	85.5	13.3

Atterberg Limit Tests

A total of three (3) samples were submitted for Atterberg Limits testing. The test results indicate that the samples are classified as Inorganic Silts of Slight Plasticity (ML). These classifications are in accordance with the Unified Soil Classification System. The results are summarized in Table 2 on the following page.

Table 2 – Summary of Atterberg Limits Results

Test hole	Sample	Depth (m)	LL (%)	PL (%)	PI (%)	Classification
BH 12-24	SS5	3.0 – 3.6	23	20	3	ML
BH 12-24	SS6	3.8 – 4.4	21	19	2	ML
BH 15-24	SS5	3.0 – 3.6	23	19	4	ML

Notes: LL: Liquid Limit; PL: Plastic Limit; PI: Plasticity Index; ML: Inorganic Silts of Slight Plasticity; CL: Inorganic Clays of Low Plasticity

Bedrock

The bedrock was cored during the supplemental investigation at borehole BH 1-26, BH 2-26, and BH 5-26 within the proposed pond block and was observed to consist of poor to fair quality limestone bedrock, becoming excellent in quality at depth. The bedrock was cored to depths ranging from 6.5 to 10.3 m below the existing ground surface at the aforementioned borehole locations.

Practical refusal on the inferred bedrock surface was encountered at approximate depths ranging from 3.0 to 14.9 m below the existing ground surface during the supplemental probe hole program. The inferred bedrock surface was generally observed to shallow from east to west across the subject site. Reference should be made to Drawings PG7301-2 – Bedrock Contour Plan which illustrates the interpolated elevation of the inferred bedrock surface across the subject site.

Based on available geological mapping, the bedrock in the area of the subject site generally consists of shale of the Carlsbad Formation, with the exception of the southeast corner of the site which is understood to consist of sandstone of the Nepean Formation.

Hydraulic Conductivity Values

Hydraulic conductivity (slug) testing values were recorded at each monitoring well installed at the proposed pond block during the supplemental investigation. The results are presented in Table 3 below.

Table 3 – Summary hydraulic conductivity values

Test Hole ID	Ground Surface Elevation (m)	Depth to Bottom of Screen (m)	K (m/sec)	Test Type	Soil Type / Bedrock
BH 1-26	89.47	8.71	$1.7x10^{-4}$	Falling Head	Bedrock
			$1.2x10^{-4}$	Rising Head	
BH 2-26	88.86	10.11	$1.3x10^{-5}$	Falling Head	Bedrock
			$1.6x10^{-5}$	Rising Head	
BH 3-26	89.19	6.10	$9.0x10^{-6}$	Falling Head	Inferred Glacial Till
			$5.4x10^{-6}$	Rising Head	
BH 4-26	89.18	4.95	$6.8x10^{-7}$	Falling Head	Clayey Silt
BH 5-26	89.25	6.50	$5.7x10^{-3}$	Falling Head	Bedrock
			$2.3x10^{-3}$	Rising Head	
BH 6-26	89.81	5.21	$2.6x10^{-5}$	Falling Head	Inferred Glacial Till
			$9.3x10^{-6}$	Rising Head	

Slug testing completed at the monitoring wells screened in the overburden (BH 3-26, BH 4-26, and BH 6-26) identified hydraulic conductivity values ranging from approximately $6.8x10^{-7}$ to $2.6x10^{-5}$ m/sec. These values are generally consistent with similar material Paterson has encountered on other sites and typical published values for silt and glacial till, which typically range from $1x10^{-5}$ to $1x10^{-9}$ m/sec and is dependent on the ratio of sand and/or clay to silt within the material.

Slug testing completed at the monitoring wells screened in the bedrock (BH 1-26, BH 2-26, and BH 5-26,) identified hydraulic conductivity values ranging from approximately $1.3x10^{-5}$ to $5.7x10^{-3}$ m/sec. These values are generally consistent with similar material Paterson has encountered on other sites and typical published values for limestone bedrock, which typically range from $1x10^{-5}$ to $1x10^{-10}$ m/sec and is dependent on the quality of the bedrock at a given location.

4.3 Groundwater

Groundwater levels were measured within the installed monitoring wells and piezometers on March 20 and May 21, 2026 and on October 9, 2024, at the time of the original geotechnical investigation. Groundwater infiltration into the open test pits was also observed and recorded. A long-term groundwater monitoring program for the overall site was initiated in the fall of 2024 and continued through the capture of the spring high water levels in 2026. A groundwater monitoring program was also initiated within the proposed pond block, beginning in March of 2026. The measured groundwater levels are summarized in Table 4 below and the results of the monitoring programs are included in Appendix 2.

Table 4 – Summary of Groundwater Levels

Test Hole Number	Ground Surface Elevation (m)	Measured Groundwater Level		Dated Recorded
		Depth (m)	Elevation (m)	
BH 1-26	89.47	1.51	87.96	March 20, 2026
		1.80	87.67	May 21, 2026
BH 2-26	88.86	1.12	87.74	March 20, 2026
		1.40	87.46	May 21, 2026
BH 3-26	89.19	1.00	88.19	March 20, 2026
		1.39	87.80	May 21, 2026
BH 4-26	89.18	1.08	88.10	March 20, 2026
		1.52	87.66	May 21, 2026
BH 5-26	89.25	1.36	87.89	March 20, 2026
BH 5-26	89.25	1.65	87.60	May 21, 2026

Table 4 – Summary of Groundwater Levels

Test Hole Number	Ground Surface Elevation (m)	Measured Groundwater Level		Dated Recorded
		Depth (m)	Elevation (m)	
BH 6-26	89.81	1.96	87.85	March 20, 2026
		1.99	87.82	May 21, 2026
BH 1-24	93.47	Dry	-	October 9, 2024
BH 2-24*	93.13	2.90	90.23	October 9, 2024
		3.50	89.63	October 22, 2025
		2.23	90.90	May 21, 2026
BH 3-24	91.48	Dry	-	October 9, 2024
BH 4-24*	91.80	Dry	-	October 9, 2024
		Dry	-	October 22, 2025
		2.68	89.12	May 21, 2026
BH 5-24	91.56	Dry	-	October 9, 2024
BH 6-24*	92.27	Dry	-	October 9, 2024
BH 7-24	91.61	Dry	-	October 9, 2024
BH 8-24	93.69	Dry	-	October 9, 2024
BH 9-24*	92.90	3.20	89.70	October 9, 2024
		2.31	90.59	May 21, 2026
BH 10-24*	91.91	5.76	86.15	October 9, 2024
BH 11-24*	94.30	Dry	-	October 9, 2024
		1.42	92.88	October 22, 2025
		1.15	93.15	May 21, 2026
BH 12-24*	89.53	2.05	87.48	October 9, 2024
		2.02	87.51	October 22, 2025
		1.77	87.76	May 21, 2026
BH 13-24*	89.31	1.93	87.38	October 9, 2024
		2.01	87.30	October 22, 2025
		1.42	87.89	May 21, 2026
BH 14-24	90.17	Dry	-	October 9, 2024
BH 15-24*	89.29	2.17	87.12	October 9, 2024
		2.11	87.18	October 22, 2025
		1.75	87.54	May 21, 2026
BH 16-24	88.88	2.05	86.83	October 9, 2024

Table 4 – Summary of Groundwater Levels

Test Hole Number	Ground Surface Elevation (m)	Measured Groundwater Level		Dated Recorded
		Depth (m)	Elevation (m)	
BH 17-24*	89.28	2.07	87.21	October 9, 2024
		2.31	86.97	October 22, 2025
		1.46	87.82	May 21, 2026
BH 18-24	88.30	1.31	86.99	October 9, 2024
TP 1-23	88.83	3.50	85.33	October 4, 2023
TP 2-23	89.05	1.70	87.35	
TP 3-23	89.07	1.60	87.47	

Note: The ground surface elevation at each test hole location was surveyed using a GPS referenced to a geodetic datum.
***-** Denotes Monitoring Well

Average groundwater levels were found to range from approximately **2.0 to 3.0 m** below the ground surface at the time of the geotechnical investigation. It should be noted that groundwater levels are subject to seasonal fluctuations, therefore, the groundwater levels could vary at the time of construction.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is suitable for the proposed residential development. It is recommended that the proposed residential buildings be founded on conventional spread footings bearing on undisturbed compact sandy silt to silty sand, stiff clayey silt, compact to very dense glacial till or clean surface sounded bedrock.

Depending on the proposed site grading, it is expected that some bedrock removal may be required for service installation. Further, it is anticipated that cobbles and large boulders will be encountered frequently throughout servicing trench and building excavation. All contractors should be prepared for bedrock and oversized boulder removal throughout the site.

The above and other considerations are further discussed in the following sections.

5.2 Site Grading and Preparation

Stripping Depth

Topsoil and deleterious fill, such as those containing organic or deleterious materials, should be stripped from under the proposed building and other settlement sensitive structures.

Existing foundation walls and other construction debris should be entirely removed from within the building perimeters. Under paved areas, existing construction remnants, such as foundation walls should be excavated to a minimum of 1 m below final grade.

Bedrock/Boulder Removal

Bedrock and/or boulder removal may be required at the subject site and can be accomplished by hoe ramming where the bedrock is weathered, and/or where only small quantities need to be removed. Sound bedrock may be removed by line drilling in conjunction with controlled blasting and/or hoe ramming.

Prior to considering blasting operations, the blasting effects on the existing services, buildings, and other structures should be addressed. A pre-blast or pre-construction survey of the existing structures located in the proximity of the blasting operations should be carried out prior to commencing site activities.

The extent of the survey should be determined by the blasting consultant and should be sufficient to respond to any inquiries or claims related to the blasting operations. The blasting operations must be planned and conducted under the supervision of a licensed professional engineer who is also an experienced blasting consultant.

Vibration Considerations

Construction operations are also the cause of vibrations, and possibly, sources of nuisance to the community. Therefore, means to reduce the vibration levels should be incorporated in the construction operations to maintain, as much as possible, a cooperative environment with the residents.

The following construction equipment could be a source of vibrations: piling rig, hoe ram, compactor, dozer, crane, truck traffic, etc. Vibrations, whether caused by blasting operations or by construction operations, could be the cause of the source of detrimental vibrations on the nearby buildings and structures. Therefore, it is recommended that all vibrations be limited.

Two parameters are used to determine the permissible vibrations, namely, the maximum peak particle velocity and the frequency. For low frequency vibrations, the maximum allowable peak particle velocity is less than that for high frequency vibrations. As a guideline, the peak particle velocity should be less than 15 mm/s between frequencies of 4 to 12 Hz, and 50 mm/s above a frequency of 40 Hz (interpolate between 12 and 40 Hz).

It should be noted that these guidelines are for today's construction standards. Considering that these guidelines are above perceptible human level and, in some cases, could be very disturbing to some people, it is recommended that a pre-construction survey be completed to minimize the risks of claims during or following the construction of the proposed buildings.

Fill Placement

Fill placed for grading beneath the building areas should consist, unless otherwise specified, of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. The imported fill material should be tested and approved prior to delivery. This material should be tested and approved prior to delivery. The fill should be placed in maximum 300 mm thick loose lifts and compacted by suitable compaction equipment. Fill placed beneath the propose building should be compacted to a minimum 98% of the Standard Proctor Maximum Dry Density (SPMDD).

Non-specified existing fill, along with site-excavated soil, can be used as general landscaping fill where settlement of the ground surface is of minor concern. These materials should be spread in thin lifts and at least compacted by the tracks of the spreading equipment to minimize voids. If this material is to be used to build up the subgrade level for areas to be paved, it should be compacted in thin lifts to at least 95% of the material's SPMDD.

If excavated rock is to be used as fill, it should be suitably fragmented to produce a well-graded material with a maximum particle size of 300 mm. Where this fill material is open-graded, a woven geotextile may be required to prevent adjacent finer materials from migrating into the voids, with associated loss of ground and settlements. Where excavated bedrock is used as engineered fill under a building footprint, it should be capped with a minimum 300 mm of OPSS Granular A or Granular B Type II prior to the construction of footings and floor slabs. Site-generated blast rock fill should be compacted using a suitably sized smooth drum vibratory roller when considered for placement. This can be assessed at the time of construction.

Under winter conditions, if snow and ice is present within the blast rock fill below future basement slabs, then settlement of the fill should be expected and support of a future basement slab and/or temporary supports for slab pours will be negatively impacted and could undergo settlement during spring and summer time conditions. The geotechnical consultant should complete periodic inspections during fill placement to ensure that snow and ice quantities are minimized.

5.3 Foundation Design

Bearing Resistance Values

Footings placed on an undisturbed, compact sandy silt to silty sand and/or compact clayey silt can be designed using a bearing resistance value at serviceability limit states (SLS) of **100 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **150 kPa.** A geotechnical factor of 0.5 was incorporated to the bearing resistance value at ULS.

Footings placed on an undisturbed, compact to very dense glacial till can be designed using a bearing resistance value at serviceability limit states (SLS) of **150 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **225 kPa.** A geotechnical factor of 0.5 was incorporated to the bearing resistance value at ULS.

If the silty sand, sandy silt, clayey silt or glacial till bearing medium is encountered in a loose state of compactness at the time of construction, the bearing surface should be proof-rolled using a suitable compaction material making several passes. The proof-rolling should be completed under dry conditions and above freezing temperatures and approved by the Paterson at the time of construction.

Footings designed using the bearing resistance values at SLS given above will be subjected to potential post construction total and differential settlements of 25 and 20 mm, respectively.

An undisturbed soil bearing surface consists of a surface from which all topsoil and deleterious materials, such as loose, frozen or disturbed soil, whether in-situ or not, have been removed, in the dry, prior to the placement of concrete for footings.

Footings supported directly on clean, surface-sounded bedrock, or on lean concrete which is placed directly over clean, surface sounded bedrock, can be designed using a factored bearing resistance value at ultimate limit states (ULS) of **1,000 kPa**. A geotechnical resistance factor of 0.5 was applied to the bearing resistance value at ULS.

A clean, surface-sounded bedrock bearing surface should be free of loose materials, and have no near surface seams, voids, fissures or open joints which can be detected from surface sounding with a rock hammer.

Footings supported directly on clean, surface sounded bedrock and design for the bearing resistance values provided above will be subject to negligible post-construction total and differential settlements.

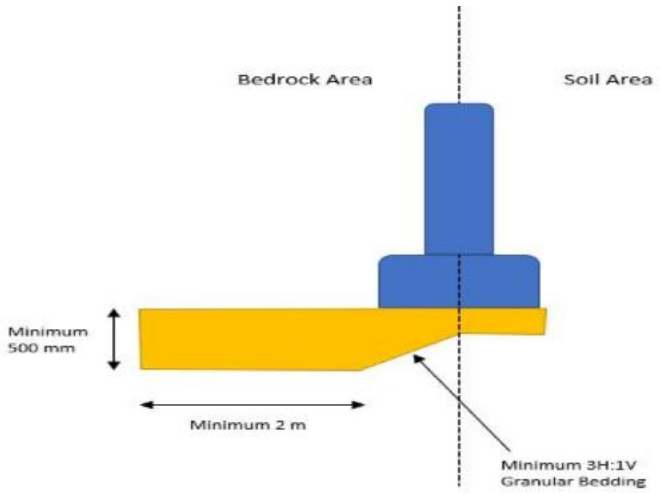
Lateral Support

The bearing medium under footing-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Adequate lateral support is provided to the in-situ bearing medium soils above the groundwater table when a plane extending down and out from the bottom edges of the footing, at a minimum of 1.5H:1V, passes only through in-situ soil or engineered fill of the same or higher capacity as that of the bearing medium.

Adequate lateral support is provided to a sound bedrock bearing medium when a plane extending down and out from the bottom edge of the footing at 1H:6V (or flatter) passes only through sound bedrock or a material of the same or higher capacity as the bedrock, such as concrete. A soil bearing medium or a heavily fractured, weathered bedrock will require a lateral support zone of 1H:1V (or flatter).

Bedrock/Soil Transition

Where a building is founded partly on bedrock and partly on soil, it is recommended at the soil/bedrock and bedrock/soil transitions that the upper 0.5 m of the bedrock be removed for a minimum length of 2 m (on the bedrock side) and replaced with nominally compacted OPSS Granular A or Granular B Type II material, see below. The width of the sub-excavation should be at least the proposed footing width plus 0.5 m. Steel reinforcement, extending at least 3 m on both sides of the 2 m long transition, should be placed in the top part of the footings and foundation walls.



Bedrock/Soil Transition Treatment

5.4 Design for Earthquakes

The site class for seismic site response can be taken as **Class X_C**. If a higher seismic site class is required for the proposed buildings which are founded on, or within 3 m of, the bedrock surface, a site-specific shear wave velocity test should be completed in accordance with the Ontario Building Code (OBC) 2024 to accurately determine the applicable seismic site classification for foundation design of the proposed building.

Based on Paterson's review of the in-situ soil characteristics, the soils underlying the subject site are not considered susceptible to liquefaction.

5.5 Basement Slab / Slab-on-Grade Construction

With the removal of all topsoil and fill, containing significant amounts of deleterious or organic materials, the native soil and/or approved fill is considered to be an acceptable subgrade surface on which to commence backfilling for floor slab construction.

For structures with slab-on-grade construction, it is recommended that the upper 200 mm of sub-slab fill consist of OPSS Granular A crushed stone. All backfill material within the footprint of the proposed buildings should be placed in a maximum 300 mm thick loose layers and compacted to a minimum of 98% of the material's SPMDD.

For structures with basement slabs, it is recommended that the upper 300 mm of sub-floor fill consists of 19 mm clear crush stone.

Any soft areas should be removed and backfilled with appropriate backfill material prior to placing any fill. OPSS Granular B Type II, with a maximum particle size of 50 mm, are recommended for backfilling below the floor slab.

5.6 Pavement Design

For preliminary design purposes, the following pavement structures, presented in Tables 4 and 5, are recommended for car parking areas and access lanes.

Table 4 – Recommended Pavement Structure – Driveways / Car only Parking Areas

Thickness (mm)	Material Description
50	**Wear Course** – Superpave 12.5 Asphaltic Concrete
150	**BASE** – OPSS Granular A Crushed Stone
300	**SUBBASE** – OPSS Granular B Type II
SUBGRADE – Either fill, in situ soils or OPSS Granular B Type I or II material placed over in situ soil or bedrock.	

Table 5 – Recommended Asphalt Pavement Structure – Local roadways	
Thickness (mm)	**Material Description**
40	**Wear Course** – Superpave 12.5 Asphaltic Concrete
50	**Binder Course** – Superpave 19.0 Asphaltic Concrete
150	**BASE** – OPSS Granular A Crushed Stone
450	**SUBBASE** – OPSS Granular B Type II
SUBGRADE – Either fill, in situ soils or OPSS Granular B Type I or II material placed over in situ soil or bedrock.	

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project.

If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type II material. The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 100% of the material's SPMDD using suitable compaction equipment.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

Foundation Drainage

It is recommended that a perimeter foundation drainage system be provided for each proposed structure which has below-grade space. The system should consist of a 100 or 150 mm diameter, geotextile-wrapped, perforated and corrugated plastic pipe which is surrounded on all sides by 150 mm of 19 mm clear crushed stone, and placed at the footing level around the exterior perimeter of the structure. The pipe should have a positive outlet, such as a gravity connection to the storm sewer, or to the sump pit where sump pumps are proposed at the residential dwellings.

Foundation Backfill

Backfill against the exterior sides of the foundation walls should consist of free-draining, non-frost susceptible granular materials. The greater part of the site excavated materials will be frost susceptible and, as such, are not recommended for re-use as backfill against the foundation walls, unless used in conjunction with a drainage geo-composite board, such as Delta Drain 6000, connected to the perimeter foundation drainage system.

6.2 Protection of Footings Against Frost Action

Perimeter foundations of heated structures are required to be insulated against the deleterious effects of frost action. A minimum 1.5 m thick soil cover, or an equivalent thickness of soil cover and foundation insulation, should be provided in this regard.

Exterior unheated foundations, such as isolated piers, are more prone to deleterious movement associated with frost action than the exterior walls of the structure, and require additional protection, such as soil cover of 2.1 m, or an equivalent combination of soil cover and foundation insulation.

6.3 Excavation Side Slopes

The side slopes of excavations in the overburden materials should either be cut back at acceptable slopes or should be retained by shoring systems from the start of the excavation until the structure is backfilled. For the proposed development, it is anticipated that sufficient room will be available for the greater part of the excavation to be undertaken by open-cut methods (i.e. unsupported excavations).

The excavation side slopes in the overburdened soils, above the groundwater level extending to a maximum depth of 3 m should be cut back at 1H:1V or flatter. A flatter slope is required for excavation below groundwater level, such as 3H:1V. The subsurface soil at this site is considered to be mainly Type 2 and 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects.

Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should be kept away from the excavation sides.

Slopes in excess of 3 m in height should be periodically inspected by the geotechnical consultant in order to detect if the slopes are exhibiting signs of distress.

It is recommended that a trench box is used at all times to protect personnel working in trenches with steep or vertical sides. It is expected that services will be installed by “cut and cover” methods and excavations will not be left open for extended periods of time.

6.4 Pipe Bedding and Backfill

Bedding and backfill materials should be in accordance with the most recent material specifications and standard detail drawings from the department of public works and services, infrastructure services branch of the City of Ottawa.

A minimum 150 mm of OPSS Granular A should be placed for bedding for sewer or water pipes when placed on a soil subgrade. If the bedding is placed on bedrock, the thickness of the bedding should be increased to 300 mm for sewer pipe. The bedding should extend to the spring line of the pipe.

Cover material, from the spring line to a minimum of 300 mm above the obvert of the pipe, should consist of OPSS Granular A (concrete or PSM PVC pipes) or sand (concrete pipe). The bedding and cover materials should be placed in maximum 225 mm thick lifts and compacted to a minimum of 99% of its SPMDD.

It should generally be possible to re-use the site generated fill materials (moist, not wet) above the cover material if excavation and filling operations are carried out in dry and non-freezing weather conditions.

Where hard surface areas are considered above the trench backfill, the trench backfill material within the frost zone (about 1.8 m below finished grade) and above the cover material should match the soils exposed at the trench walls to minimize differential frost heaving. The trench backfill should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 95% of the material's SPMDD. All cobbles larger than 200 mm in their longest direction should be segregated from re-use as trench backfill.

6.5 Groundwater Control

It is anticipated that groundwater infiltration into the excavation should be low to moderate and controllable using open sumps. The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium.

Permit to Take Water

Under the current regulations enacted by the Ministry of Environment, Conservation and Parks (MECP), any dewatering in excess of 50,000 L/day requires a registration on the Environmental Activity and Sector Registry (EASR), so long as that dewatering is related to construction. If the dewatering is not related to construction, a Permit to Take Water obtained from the MECP will be required.

In the event that an EASR is required to facilitate dewatering of the proposed development, a minimum of three to four weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan, to be prepared by a Qualified Person as stipulated under O.Reg. 63/16. Should a Permit to Take Water be required, a minimum of five to six months should be allotted for completion of the permit, due to the minimum review period imposed by the MECP.

6.6 Winter Construction

Precautions must be taken if winter construction is considered for this project. The subsoil conditions at this site consist of frost susceptible materials. In the presence of water and freezing conditions, ice could form within the soil mass. Heaving and settlement upon thawing could occur.

In the event of construction during below zero temperatures, the founding stratum should be protected from freezing temperatures using straw, propane heaters and tarpaulins or other suitable means. In this regard, the base of the excavations should be insulated from sub-zero temperatures immediately upon exposure and until such time as heat is adequately supplied to the building and the footings are protected with sufficient soil cover to prevent freezing at founding level.

Trench excavations and pavement construction are also difficult activities to complete during freezing conditions without introducing frost into the subgrade or in the excavation walls and bottoms. Precautions should be taken if such activities are to be carried out during freezing conditions. Additional information could be provided, if required.

6.7 Corrosion Potential and Sulphate

The results of analytical testing show that the sulphate content is less than 0.1%. This result is indicative that Type 10 Portland cement (GU – General Use cement) would be appropriate for this site. The chloride content and pH of the sample indicate that they are not a significant factor in creating a corrosive environment for exposed ferrous metals at this site, whereas the resistivity is indicative of a low to slightly aggressive corrosive environment.

6.8 Landscaping Considerations

Based on the results of the investigation, a silty clay deposit was generally not encountered between the anticipated underside of footing and 3.5 m below the underside of footing. As such, tree planting setbacks are not required at the subject site.

6.9 Slope Stability Assessment

Summary of Assessment

A slope stability analysis was completed at the subject site to determine the applicable geotechnical Limit of Hazard Lands setback from the slopes of the Findlay Creek which runs through the western portion of the 4795 Bank Street property, as well as from the slopes located along the southern and eastern limits of the property, which abut the existing stormwater management pond. The analysis was completed for both the existing conditions, as well as for the proposed conditions.

Based on the current field investigation and available topographic information three (3) slope cross-sections were analyzed for slope stability using SLIDE, a computer program for two-dimensional slope stability analysis. The cross-section locations are presented on Drawing PG7301-1-Test Hole Location Plan in Appendix 2.

Slope Stability Analysis

The slope stability analysis was modelled in SLIDE, a computer program which permits a two-dimensional slope stability analysis calculating several methods

including the Bishop's method, which is a widely accepted slope analysis method. The program calculates a factor of safety, which represents the ratio of the forces resisting failure to forces favoring failure.

Theoretically, a factor of safety of 1.0 represents a condition where the slope is stable. However, due to intrinsic limitations of the calculation methods and the variability of the subsurface soil and groundwater conditions, a factor of safety greater than 1.0 is generally required for the failure risk to be considered acceptable. A minimum factor of safety of 1.5 is generally recommended for conditions where the slope failure would comprise permanent structures.

An analysis considering seismic loading was also completed. A horizontal acceleration of 0.171 g was considered for the sections for the seismic loading condition. A factor of safety of 1.1 is considered to be satisfactory for stability analyses including seismic loading.

Three (3) cross-sections (Section A through C) were studied as the worst-case scenario. It should be noted that details of the slope height and slope angle under existing and proposed conditions at the cross-section locations are presented in Figures 2 through 5, based on the available topographic data, as well as available preliminary grading information.

The effective and total strength soil parameters used for the static analyses were chosen based on the subsoil information recovered during the site investigation. The effective strength soil parameters used for the analyses are presented in Table 6 below:

Table 6 - Total Strength Soil and Material Parameters – Static Analysis

Soil Layer	Unit Weight (kN/m^3)	Friction Angle (degrees)	Cohesion (kPa)
Topsoil	16	33	5
Engineered Fill	19	35	2
Brown Silty Clay	17	33	7
Silty Sand	19	35	1
Brown Clayey Silt	17	33	7
Grey Clayey Silt	16	33	10
Glacial Till	20	33	2
Bedrock	22	-	-
Concrete	22	-	-

The total strength soil parameters used for seismic analysis were also chosen based on the subsoil information recovered within the boreholes. The strength parameters used for seismic analysis presented in Table 7 below.

Table 7 - Total Strength Soil and Material Parameters – Seismic Analysis

Soil Layer	Unit Weight (kN/m^3)	Friction Angle (degrees)	Cohesion (kPa)
Topsoil	16	33	5
Engineered Fill	19	35	2
Brown Silty Clay	17	0	80
Silty Sand	19	35	1
Brown Clayey Silt	17	0	80
Grey Clayey Silt	16	0	60
Glacial Till	20	33	2
Bedrock	22	-	-
Concrete	22	-	-

Sections A & B – Existing Stormwater Management System

Stable Slope Allowance

The results of the static analysis at Section A under existing and proposed conditions are shown in Figures 2A and 2C, respectively, while the results of the static analysis at Section B under existing and proposed conditions are shown in Figures 3A and 3C. The factor of safety was found to be greater than 1.5 at slope Sections A and B under existing and proposed conditions. Further, the results of the seismic analyses at Sections A and B under existing and proposed conditions are shown in Figures 2B, 2D, 3B and 3D. The factor of safety was found to be greater than 1.1 at all slope sections. As such, the slope is considered to be stable under both existing and proposed conditions and a stable slope allowance setback from top of slope is not required.

Toe Erosion Allowance

The toe of slope at Sections A and B is noted to consist of the bottom of an engineered slope abutting the existing stormwater management pond. The engineered stormwater management pond is not considered to be an active watercourse. As such a toe erosion setback is not considered to be required at Sections A-A and B-B.

Erosion Access Allowance

As the slope is considered to be stable under seismic and static conditions, under existing and proposed conditions, and the SWMP located along the toe of slope is not considered to be an active watercourse, an erosion access allowance is not required.

It is recommended that the existing vegetation on the slope faces not be removed, as it plays a vital role in maintaining slope stability and mitigating erosion.

Limit of Hazard Lands

Based on these observations and the results of the slope stability analysis under existing and proposed conditions, a Limit of Hazard Lands setback from the observed top of the slope is not required along the slope at the southern and eastern limits of the 4795 Bank Street property which slope down towards the adjacent existing SWMP.

Slope Section C-C – Findlay Creek

Existing Conditions

Stable Slope Allowance

The results of the static analysis at Section C under existing conditions along the southern bank of Findlay Creek are shown in Figure 4A. The factor of safety was found to be less than 1.5 under existing conditions. Further, the results of the seismic analyses under existing conditions are shown in Figure 4B. The factor of safety was found to be less than 1.1.

As such, a **stable slope allowance of 2.5** was applied to the overall Limit of Hazard Lands setbacks at Sections C under existing conditions, which extends to the required factors of safety of 1.5 and 1.1 under static and seismic analysis conditions, respectively.

The results of the static slope stability analysis for Section C under existing conditions along the eastern bank of Findlay Creek are presented in Figure 5A. The factor of safety was found to be greater than 1.5 under existing conditions. The results of the seismic slope stability analysis under existing conditions are presented in Figure 5B, with the factor of safety found to be greater than 1.1.

Based on the results of the analyses, the slope along the eastern bank of Findlay Creek is considered stable under existing conditions. Therefore, a stable slope allowance setback from the top of slope is not required along the eastern bank of the creek.

Toe Erosion Allowance

The toe of slope at Section C directly abuts the Findlay Creek. Erosion of the toe of slope is considered to be a notable factor in assessing slope stability. The banks abutting the watercourse were observed to be affected by minor signs of erosion. Signs of active erosion were mostly noted in the lower portion of the slopes and consisted of occasional small patches of loss vegetation or exposed root systems along the face of slope.

Based on the above-note observations, and in accordance with the City of Ottawa's Slope Stability Guidelines for Development Applications (2004) and the Ministry of Natural Resource's Technical Guide – River and Stream Systems: Erosion Hazard Limit (2002), it is considered that a toe erosion allowance of 6.0 m is appropriate for the corridor walls confining the creek. The toe erosion allowance should be applied from the top of stable slope.

Erosion Access Allowance

Based on our review and current guidelines, a 6.0 m erosion access allowance is recommended from the top of the stable slopes to allow for future maintenance of the slope.

Proposed Conditions

Based on discussion with the design team, it is understood that creek improvements designed by others are proposed to address the potential for erosion. The creek improvements are understood to consist of reshaping the creek such that floodplain and meander belt are fully contained. Further, it is understood that the creek will be reshaped with slopes less than 2 m high. As such, **under proposed conditions the slopes of the Findlay Creek will be considered stable, such that a Limit of Hazard Lands is not required.** Paterson should complete a review of relevant drawings, in advance of detailed design.

Limit of Hazard Lands

Based on these observations and the results of the slope stability analysis under existing and proposed conditions, Paterson has established a Limit of Hazard Lands setback from the observed top of the slope. The Limit of Hazard Lands is determined by a combination of stable slope allowance, toe erosion allowance, and erosion access allowance.

As a result, **under existing conditions**, the required Limit of Hazard Lands designation extends approximately **14.5 m** from the top of slope along the south side of Findlay Creek and approximately **12 m** from the top of slope along the eastern side of the creek. This Limit of Hazard Land setback is shown on the attached Drawing PG7301-1 - Test Hole Location Plan.

As noted above, a Limit of Hazard Lands Setback is not considered to be required along Findlay Creek under proposed conditions, taking into consideration the creek improvements designed by others.

6.9 Stormwater Management Pond Design Recommendations

While details of the proposed pond were not available at the time of reporting, it is understood that the proposed stormwater management pond (SWMP) will be located within the northeast portion of the 4795 Bank Street property. A supplemental field investigation was completed and a groundwater monitoring program has been initiated to support the detailed design of the SWMP.

It is assumed that the pond will include inlet and outlet structures with concrete headwalls and that inlet structures will be connected to the stormwater drainage infrastructure.

It is expected that the side slopes for the proposed pond will tie into the proposed ground surface and will be provided with a geosynthetic clay liner, due to the subsurface soil conditions encountered within the pond block.

Summary of Supplemental Investigation – SWMP Block

As outlined in Section 3.1 above, Paterson completed a supplemental field investigation within the proposed pond block to provide design recommendations from a geotechnical and hydrogeological perspective. The supplemental investigation was completed on March 2 and 3, 2026 and consisted of advancing a total of 6 boreholes to a maximum depth of 10.3 m below the existing ground surface.

Monitoring wells were installed within the supplemental boreholes and had hydraulic conductivity testing completed. Additionally, the monitoring wells were outfitted with data loggers to allow for completion of a water level monitoring program. The test hole locations are shown on Drawing PG7301 – Test Hole Location Plan in Appendix 2.

Subsurface Soil Profile – SWMP Block

Generally, the subsurface soil profile encountered at the proposed pond consists of topsoil underlain by a deposit of sandy silt to clayey silt underlain by glacial till.

A compact to loose brown silty sand to sandy silt was encountered underlying the topsoil at boreholes BH 1-26 and BH 3-26 within the pond block and extended to approximate depths of 4.1 and 1.4, respectively. A deposit of loose to compact clayey silt was observed underlying the topsoil and/or sandy silt at boreholes BH 2-26, BH 4-26 and BH 6-26 and extended to depths ranging approximately between 2.8 and 5.3 m below ground surface. The glacial till was generally observed to consist of loose to very dense silty sand to sandy silt with gravel, cobbles and boulders, and variable amounts of clay. Large boulders were cored through at approximate depths 4.9 and 6.3 m at borehole BH 2-26.

Bedrock was cored at boreholes BH 1-26, BH 2-26, and BH 5-26 to approximate depths ranging from 6.5 and 10.3 m below the existing ground surface. The bedrock at these locates was observed to consist of a poor to excellent quality limestone bedrock, based on the RQD values.

Groundwater Level Monitoring – SWMP Block

In addition to manual water level measurements, a groundwater monitoring program was carried out to provide an overview of the variations of the monitoring well water levels based on seasonal fluctuations. The monitoring wells installed at boreholes at BH 1-26 through BH 6-26 were equipped with a submersible datalogger to accurately monitor fluctuations in the water levels. The datalogger can measure the equivalent hydrostatic pressure of the water above the sensor diaphragm to calculate the total water depth.

Groundwater level monitoring was initiated at the monitoring wells installed within the pond block in March 2026. While the program is ongoing, the available data is considered adequate to support preliminary design of the proposed pond. The data obtained from the 2026 spring freshet will be used to support design of the proposed SWMP.

Further, groundwater level monitoring across the subject site was initiated in October 2024 and is currently ongoing. The dataloggers were programmed to continuously measure and record groundwater levels at a fixed rate of one (1) reading every 24 hours. The monitoring data was also compared with Environment and Natural Resources Canada precipitation data from the Ottawa International Airport over the same time period. Monitoring Well Water Elevation Plots are presented in Appendix 2.

Hydraulic Conductivity Testing

The results of the hydraulic conductivity (slug) testing conducted at the monitoring wells installed within the proposed pond block are discussed in Section 4.2, and are presented in Table 3 above.

In summary, slug testing completed at the monitoring wells screened in the overburden identified hydraulic conductivity values ranging from approximately $6.8x10^{-7}$ to $2.6x10^{-5}$ m/sec and slug testing completed at the monitoring wells screened in the bedrock identified hydraulic conductivity values ranging from approximately $1.3x10^{-5}$ to $5.7x10^{-3}$ m/sec.

Design and Construction Recommendations

From a geotechnical perspective, the proposed block is suitable for construction of a SWMP. The following sections detail our preliminary design and construction recommendations for the proposed pond. **A supplemental review will be required once details of the pond are available and a formal review of the proposed pond will be completed under a separate memorandum.**

Groundwater Infiltration During Construction

Dependent on the design of the proposed pond, and based on the findings of our geotechnical investigations, the excavation may extend through layers of compact to loose silty sand to sandy silt, compact to loose clayey silt, loose to very dense glacial till and fair to excellent quality limestone bedrock. It is anticipated that excavation will advance below the current groundwater table to reach the bottom of the pond elevation.

The proposed SWMP will be located in an area where water infiltration will be required to be managed during the construction phase. The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium and to undertake all proposed works in the dry.

Based on the results of the hydraulic conductivity testing, it is likely that an Environmental Activity and Sector Registry (EASR) will be required to manage groundwater inflows during construction. A minimum of two to four weeks should be allotted for the completion of the EASR registration and Water Taking and Discharge Plan to be prepared by a Qualified Person as stipulated under O.Reg.63/16. Paterson personnel should review the excavation at the time of construction to assess the soil type at the bottom of the excavation and the water infiltration observations, once exposed.

Long-Term Groundwater Control

It is expected that the base and portions of the pond sidewalls will be located below the groundwater table. As such, preliminary design considerations such as the use of use of subdrains installed around the perimeter of the pond, the installation of a geosynthetic liner over the pond bottom, subdrains beneath the liner and a ballast to resist uplift pressure should be taken in consideration during design of the pond, to ensure functionality of the system as a pond during periods when local groundwater levels may rise above the permanent pool elevation.

Perimeter and Liner Subdrains

Portions of the pond which extend below the groundwater table may be subject to uplift pressure. To reduce the potential uplift pressure acting against a pond liner, a series of subdrains may be placed around the perimeter of the pond. The subdrains are recommended to be placed at an elevation coinciding with the permanent pool elevation, to maintain a static groundwater table elevation at the pond location. The subdrain system should be connected to, and gravity drain towards, the pond outlet structures.

The subdrain system should be suitably sized to prevent groundwater migration into the pond footprint and can consist of lines of HDPE perforated pipes fitted with a geosock liner and surrounded on all sides by 300 mm of 19 mm clear crushed stone. The clear stone should be wrapped in a non-woven geotextile.

Subdrains beneath the pond liner, located within the engineered fill subbase, can be connected to the perimeter subdrain to allow for the dissipation of additional pressure and are intended to function in a passive manner. Drain sizing and spacing is to be determined at detailed design.

Geosynthetic Liner

Due to the permeable soils and the bedrock expected to be encountered along the sidewalls and at the base of the proposed pond, a geosynthetic liner is recommended across the pond footprint to act as a hydraulic barrier.

For preliminary design purposes, it is recommended that the geosynthetic liner be placed above an approximate 300 mm thickness of 19 mm clear crushed stone or reworked native soil which is placed directly over the approved pond subgrade or bedrock surface. The liner should be placed at an elevation which accounts for the overlying ballast thickness, if applicable. The liner should extend up the side slopes of the pond, to approximately 0.3 m above the permanent pond elevation. The geomembrane liner is recommended to be installed as per the manufacturer's recommendations and installation guidelines to provide a relatively watertight liner system.

Ballast

Dependent on the proposed pond design, a ballast may be required to resist uplift pressure acting against the pond liner. Where required, the ballast should consist of blast rock placed above the geosynthetic liner. To maintain storage volumes within the proposed pond, the top of ballast should match the proposed pond bottom elevation. The top of ballast should be surfaced in accordance with applicable City of Ottawa standards for accessibility and maintenance.

Excavation of Base and Pond Sidewalls

The long-term performance of the subject pond will depend on the stability of its excavation side slopes. The pond sidewalls, within overburden soils and poor quality rock, should be maintained at 3H:1V or flatter. In sound bedrock, almost vertical side slopes can be constructed, provided all weathered and loose rock is removed or stabilized with rock anchors. A minimum 1 m horizontal ledge should remain between the overburden soils and sound bedrock surface.

Fill Placement

Fill used for grading, where required, can be undertaken by re-using site-generated silty sand to sandy silt, clayey silt, and/or glacial till. The site-generated material should be in a workable, relatively dry state (i.e., not saturated, wet, grey soils) and able to be placed, compacted and shaped using a suitably sized vibratory roller. All fill should be free of organics, debris, and cobbles or fractured rock greater than 200 mm in diameter.

The placement of the fill should be reviewed by Paterson at the time of placement. Compaction of the material may be achieved by making several passes using a suitably sized roller and is recommended to be undertaken during dry and above-freezing conditions. The fill should not be frozen at the time of placement.

Fill used to raise the grade surrounding the pond in areas where settlement of the ground is not a major concern (i.e. beyond areas of settlement sensitive structures

and surfaces, such as hardscaping), could be placed in suitably-sized lifts and compacted by the tracks of the earthworks equipment making several passes. The placement and preparation of the above-noted fill should be reviewed and approved at the time of construction by Paterson personnel.

Bearing Capacity for Concrete Structures

Structures for the proposed SWMP placed over an undisturbed, compact silty sand to sandy silt and/or compact clayey silt, can be designed using a bearing resistance value at serviceability limit states (SLS) of **100 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **150 kPa.** A geotechnical factor of 0.5 was incorporated to the bearing resistance value at ULS.

Structures for the proposed SWMP placed over an undisturbed, compact to very dense glacial till can be designed using a bearing resistance value at serviceability limit states (SLS) of **150 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **225 kPa.** A geotechnical factor of 0.5 was incorporated to the bearing resistance value at ULS.

Where loose or disturbed native soil is encountered at subgrade level, a proof-rolling program should be implemented, consisting of compacting the loose material with several passes of a vibratory drum roller under dry conditions and above freezing temperatures, and under the observation of Paterson.

Structures for the proposed SWMP placed over a clean surface-sounded limestone bedrock can be designed using a bearing resistance value at ultimate limit states (ULS) of **1000 kPa**.

A clean, surface-sounded bedrock bearing surface should be free of loose materials, and have no near surface seams, voids, fissures or open joints which can be detected from surface sounding with a rock hammer.

Footings designed using the bearing resistance values at SLS provided above will be subjected to potential post construction total and differential settlements of 25 and 20 mm, respectively. Footings placed on clean, surface sounded bedrock will be subjected to negligible settlements.

Field Inspections

All fieldwork, including service bedding/spring-line/cover placement, roadway subgrade fill placement and roadway subbase, base and asphalt layer placement, should be reviewed and approved by Paterson at the time of construction. Paterson should be notified upon the commencement of work and establish a schedule for periodic inspections to be completed by field personnel throughout construction.

It should be noted that if winter construction is anticipated, the contractor should take every precaution to prevent frost from migrating below settlement sensitive structures. Reference should be made to the aforementioned geotechnical report for further detail regarding winter construction recommendations.

7.0 Recommendations

It is a requirement for the foundation design data provided herein to be applicable that the following material testing and observation program be performed by the geotechnical consultant.

- ❑ Observation of all bearing surfaces prior to the placement of concrete.
- ❑ Sampling and testing of the concrete and fill materials.
- ❑ Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- ❑ Observation of all subgrades prior to backfilling.
- ❑ Field density tests to determine the level of compaction achieved.
- ❑ Sampling and testing of the bituminous concrete including mix design reviews.

A report confirming that these works have been conducted in general accordance with our recommendations could be issued upon the completion of a satisfactory inspection program by the geotechnical consultant.

All excess soil must be handled as per *Ontario Regulation 406/19: On-Site and Excess Soil Management.*

8.0 Statement of Limitations

The recommendations provided are in accordance with the present understanding of the project. Paterson requests permission to review the recommendations when the drawings and specifications are completed.

A soils investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, Paterson requests immediate notification to permit reassessment of our recommendations.

The recommendations provided herein should only be used by the design professionals associated with this project. They are not intended for contractors bidding on or undertaking the work. The latter should evaluate the factual information provided in this report and determine the suitability and completeness for their intended construction schedule and methods. Additional testing may be required for their purposes.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Caivan Communities, or their agents, is not authorized without review by Paterson for the applicability of our recommendations to the alternative use of the report.

Paterson Group Inc.







Mrunmayi Anvekar, M.Eng. Kevin Pickard, P.Eng.

Report Distribution:

- ❑ Caivan Communities (email copy)
- ❑ Paterson Group (1 copy)

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

GRAIN SIZE DISTRIBUTION AND HYDROMETER TESTING RESULTS

ATTERBERG LIMIT TESTING RESULTS

ANALYTICAL TESTING RESULTS

HYDRAULIC CONDUCTIVITY TESTING RESULTS

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376522.67 **NORTHING:** 5020400.87 **ELEVATION:** 89.47

PROJECT: Geotechnical Investigation

ADVANCED BY: Track Mounted Drill Rig

REMARKS: Datum: NAD1983 (Canada) Geoid: HT2-2010 **DATE:** March 2, 2026

FILE NO. : PG7301

HOLE NO. : BH 1-26

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) ▲ UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL: with organics			AU 1			22			89
0.25m [89.22m]									
Compact to loose, brown **SILTY SAND** to **SANDY SILT**, trace clay		1	SS 2	42	4-2-3-4 5	27			
- Silt content increasing by 1.52m depth		2	SS 3	75	5-6-5-5 11	23		1.51 m 2026-3-20	88
- Grey by 2.21m depth		3	SS 4	50	2-3-4-4 7	29			87
			SS 5	50	1-1-2-2 3	31			86
4.11m [85.36m]		4	SS 6	50	1-2-10-12 12	28			
GLACIAL TILL: Very dense, grey sandy silt with gravel, occasional cobbles and boulders			SS 7	77	16-15-50-/ 65/0.03	16 15			85
4.90m [84.57m]		5	RC 1	100	RQD 37				84
BEDROCK: Poor to fair quality limestone bedrock		6	RC 2	100	RQD 34				83
- Excellent quality bedrock by 7.26m depth		7						7.19m	82
		8	RC 3	100	RQD 93				81
8.76m [80.71m]								8.71m	
End of Borehole		9							80
(GWL at 1.51 m depth - March 20, 2026)		10							79
		11							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376514.79 **NORTHING:** 5020324.14 **ELEVATION:** 88.86

PROJECT: Geotechnical Investigation

ADVANCED BY: Track Mounted Drill Rig

REMARKS: Datum: NAD1983 (Canada) Geoid: HT2-2010 **DATE:** March 2, 2026

FILE NO. : PG7301

HOLE NO. : BH 2-26

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL: with organics			AU 1			24			
0.25m [88.61m]									
Stiff, brown **SILTY CLAY**, trace sand									
0.69m [88.17m]									
Loose to compact, brown **CLAYEY SILT**, trace sand		1	SS 2	50	3-3-5-4 8	26		1.12 m 2026-3-20	88
		2	SS 3	50	2-2-2-2 4	36			87
- Grey by 2.21m depth			SS 4	50	1-1-1-1 2	35			
- Silt content increasing by 2.90m depth		3	SS 5	67	P	44			86
		4	SS 6	50	1-2-6-6 8	30			85
4.50m [84.36m]									
GLACIAL TILL: Dense to very dense, grey silty fine sand with gravel, cobbles and boulders		5	SS 7	82	27-7-9-7 16	11			84
			RC 1	78					
		6	SS 8	58	24-17-18-14 35	11			83
			SS 9	34	9-50-/-/ 50/0.03	16			
6.71m [82.15m]		7	RC 2	100	RQD 45				82
BEDROCK: Good to excellent quality limestone bedrock		8	RC 3	100	RQD 78			8.59m	81
		9							80
		10	RC 4	100	RQD 87			10.11m	79
10.26m [78.59m]									
End of Borehole		11							78
(GWL at 1.12 m depth - March 20, 2026)									

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376510.67 **NORTHING:** 5020331.96 **ELEVATION:** 89.19

PROJECT: Geotechnical Investigation

ADVANCED BY: Track Mounted Drill Rig

REMARKS: Datum: NAD1983 (Canada) Geoid: HT2-2010 **DATE:** March 3, 2026

FILE NO. : PG7301

HOLE NO. : BH 3-26

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE: TYPE AND NO.	SAMPLE: RECOVERY (%)	SAMPLE: N OR RQD	SAMPLE: WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80	REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80	PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0									89
For soil profile refer to BH 2-26		1								1.00 m 2026-3-20	88
		2									87
		3									86
		4									85
		5								4.58m	84
6.10m [83.09m]		6								6.10m	83
End of Borehole		7									82
(GWL at 1.00 m depth - March 20, 2026)		8									81
		9									80
		10									79
		11									

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376547.38 **NORTHING:** 5020340.33 **ELEVATION:** 89.18

PROJECT: Geotechnical Investigation

ADVANCED BY: Track Mounted Drill Rig

REMARKS: Datum: NAD1983 (Canada) Geoid: HT2-2010 **DATE:** March 3, 2026

FILE NO. : PG7301

HOLE NO. : BH 4-26

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL: with organics 0.23m [88.95m]			AU 1			20			89
Stiff, brown **SILTY CLAY**, trace sand 0.69m [88.49m]		1	SS 2	50	6-6-5-8 11	29		1.08 m 2026-3-20	88
Compact, brown **SILTY SAND** to **SANDY SILT**, trace gravel and clay 1.37m [87.81m]		2	SS 3	100	2-2-4-3 6	31			87
Compact to loose, brown **CLAYEY SILT**, trace sand - Grey by 2.29m depth - Silt content increasing by 2.90m depth		3	SS 4	58	2-2-2-3 4	29		3.43m	86
		4	SS 5	50	1-2-2-2 4	36			85
5.26m [83.92m]		5	SS 6	50	2-3-3-4 6	25		4.95m	84
GLACIAL TILL: Loose to compact, grey silty fine sand with gravel, occasional cobbles - Running sand by 6.10m depth 6.35m [82.83m]		6	SS 7	42	2-2-15-10 17	25			83
End of Borehole (GWL at 1.08 m depth - March 20, 2026)		7	SS 8	25	2-5-5-9 10	14			82
		8	SS 9		10-50-/-/ 50/0.1	16			81
		9							80
		10							79
		11							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376492.29 **NORTHING:** 5020369.66 **ELEVATION:** 89.25

PROJECT: Geotechnical Investigation

ADVANCED BY: Track Mounted Drill Rig

REMARKS: Datum: NAD1983 (Canada) Geoid: HT2-2010 **DATE:** March 3, 2026

FILE NO. : PG7301

HOLE NO. : BH 5-26

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) ▲ UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL: with organics 0.25m [89.00m]									89
Loose, brown **CLAYEY SILT**, trace sand			AU 1			24			
		1	SS 2	58	4-2-2-2 4	31			88
- Silt content increasing by 1.37m depth								1.36 m 2026-3-20	
			SS 3	67	2-3-3-2 6	33			
- Grey by 1.98m depth		2				30			87
2.82m [86.43m]			SS 4	33	1-1-1-6 2	28			
GLACIAL TILL: Compact, grey silty fine sand to medium sand with gravel, trace clay		3	SS 5	42	3-10-9-8 19	11			86
4.09m [85.16m]			SS 6	102	50-/-/-/ 50/0.1	14			
BEDROCK: Good to excellent quality limestone bedrock		4	RC 1	100	RQD 100				85
- Vertical shear form 4.09m to 4.39m depth									
- 80mm mud seams at 4.62m depth		5	RC 2	100	RQD 92			4.98m	84
6.50m [82.75m]		6	RC 3	100	RQD 75			6.50m	83
End of Borehole									
(GWL at 1.36 m depth - March 20, 2026)		7							82
		8							81
		9							80
		10							79
		11							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376511.84 **NORTHING:** 5020397.47 **ELEVATION:** 89.81

PROJECT: Geotechnical Investigation

ADVANCED BY: Track Mounted Drill Rig

REMARKS: Datum: NAD1983 (Canada) Geoid: HT2-2010 **DATE:** March 3, 2026

FILE NO. : **PG7301**

HOLE NO. : **BH 6-26**

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE: TYPE AND NO.	SAMPLE: RECOVERY (%)	SAMPLE: N OR RQD	SAMPLE: WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80	REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80	PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE											
OVERBURDEN		0									89
		1									
		2								1.96 m 2026-3-20	88
		3									87
		4								3.69m	86
5.59m [84.22m]		5								5.21m	85
End of Borehole		6									84
(GWL at 1.96 m depth - March 20, 2026)		7									83
		8									82
		9									81
		10									80
		11									79

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376166.29 **NORTHING:** 5019808.33 **ELEVATION:** 93.47

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 25, 2024

FILE NO. : PG7301

HOLE NO. : BH 1-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics 0.15m [93.32m]		0	AU 1						93
GLACIAL TILL: Loose brown silty sand with gravel, cobbles and boulders - Very dense by 0.80 m depth 1.17m [92.30m]		1	SS 2	74	6-23-50-/ 73/0.25	9.5			92
End of Borehole Practical refusal to augering at 1.17 m depth (BH Dry - October 09, 2024)		2							91
		3							90
		4							89
		5							88
		6							87
		7							86
		8							85
		9							84
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376261.50 **NORTHING:** 5019824.46 **ELEVATION:** 93.13

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 25, 2024

FILE NO. : PG7301

HOLE NO. : BH 2-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	RECOVERY (%)	N, Nc OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics 0.20m [92.93m]		0	AU 1						93
FILL: Very dense, brown silty clay, with sand, trace gravel, cobbles and asphalt 1.45m [91.68m]		1	SS 2	92	17-31-35-42 66	9.89			92
GLACIAL TILL: Very dense, brown silty sand, trace clay, occasional gravel, cobbles and boulders 3.89m [89.24m]		2	SS 3	92	28-28-35-27 63	7.06			91
		3	SS 4	79	10-12-14-17 26	16.49		2.9 m 2024-10-09	90
			SS 5	4	10-9-8-10 17	21.47			
GLACIAL TILL: Very stiff, grey silty clay, with gravel and cobbles 5.23m [87.90m]		4	SS 6	42	7-6-26-12 32	13.79 10.6			89
		5	SS 7	43	7-5-23-50 28	10.56			88
End of Borehole Practical refusal to augering at 5.23 m depth (GWL at 2.90 m depth - October 9, 2024)		6							87
		7							86
		8							85
		9							84
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376312.22 **NORTHING:** 5019885.37 **ELEVATION:** 91.48

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 25, 2024

FILE NO. : PG7301

HOLE NO. : BH 3-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics		0							91
0.15m [91.33m]									
GLACIAL TILL: Loose brown silty sand, trace clay, occasional gravel, cobbles and boulders			AU 1						
- Very dense by 0.8 m depth		1	SS 2	86	16-50-/-/ 50/0.3	10.19			90
1.02m [90.46m]									
End of Borehole									
Practical refusal to augering at 1.02 m depth		2							89
(BH Dry - October 09, 2024)		3							88
		4							87
		5							86
		6							85
		7							84
		8							83
		9							82
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376195.40 **NORTHING:** 5019922.75 **ELEVATION:** 91.80

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 25, 2024

FILE NO. : PG7301

HOLE NO. : BH 4-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / △ REMOULDED SHEAR STRENGTH, Cur (kPa) ▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
FILL: Loose, brown silty sand, trace crushed stone		0	AU 1						
0.69m [91.11m]									
GLACIAL TILL: Dense, brown silty sand, with gravel, trace cobbles and boulders		1	SS 2	71	13-22-23-16 45	6.4	○		91
- Grey by 1.5 m depth		2	SS 3	50	6-15-27-50 42	7.04	○		90
2.62m [89.18m]			SS 4	70	5-50-/-/ 50/0.1	9.27	○		
End of Borehole		3							89
Practical refusal to augering at 2.62 m depth									
(BH Dry - October 09, 2024)		4							88
		5							87
		6							86
		7							85
		8							84
		9							83
		10							82

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376185.77 **NORTHING:** 5020018.09 **ELEVATION:** 91.56

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 25, 2024

FILE NO. : PG7301

HOLE NO. : BH 5-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics		0	AU 1						91
0.18m [91.38m]									
GLACIAL TILL: Loose, brown silty sand, trace gravel, some cobbles, boulders		1	SS 2	75	7-12-18-21 30	8.59 5.51			90
- Compact by 1.10 m depth			SS 3	84	9-18-50-/ 68/0.18	4.64			
1.83m [89.73m]		2							89
End of Borehole									
Practical refusal to augering at 1.83 m depth		3							88
(BH Dry - October 09, 2024)		4							87
		5							86
		6							85
		7							84
		8							83
		9							82
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376093.56 **NORTHING:** 5020000.31 **ELEVATION:** 92.27

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 25, 2024

FILE NO. : PG7301

HOLE NO. : BH 6-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics 0.28m [91.99m]		0	AU 1						92
Loose, brown **SILTY SAND** 0.61m [91.66m]									
GLACIAL TILL: Very dense, brown silty sand, with gravel, cobbles and boulders		1	SS 2	92	15-29-37-30 66	8.91	○		91
1.88m [90.39m]			SS 3	78	15-46-50-/ 96/0.2	8.82	○		
End of Borehole		2							90
Practical refusal to augering at 1.88 m depth									
(BH Dry - October 09, 2024)		3							89
		4							88
		5							87
		6							86
		7							85
		8							84
		9							83
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376044.89 **NORTHING:** 5020116.72 **ELEVATION:** 91.61

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 25, 2024

FILE NO. : PG7301

HOLE NO. : BH 7-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							91
TOPSOIL and organics 0.30m [91.31m]			AU 1						
Loose, brown **SILTY SAND** 0.76m [90.85m]		1	SS 2	54	3-5-11-7 16	12.03	○		90
GLACIAL TILL: Compact, brown silty sand, occasional gravel, cobbles and boulders									
- Grey by 1.5 m depth			SS 3	25	2-1-5-18 6	9.17	○		
2.13m [89.48m]		2							89
End of Borehole									
Practical refusal to augering at 2.13 m depth									
(BH Dry - October 09, 2024)									88
		3							
		4							87
		5							
		6							86
		7							85
		8							84
		9							83
		10							82

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376132.74 **NORTHING:** 5020181.66 **ELEVATION:** 93.69

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 26, 2024

FILE NO. : PG7301

HOLE NO. : BH 8-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / △ REMOULDED SHEAR STRENGTH, Cur (kPa) ▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							93
TOPSOIL and organics 0.18m [93.51m]			AU 1						
Loose, brown **SILTY SAND**, trace gravel 0.69m [93.00m]		1	SS 2	96	17-25-48-37 73	9.38			92
GLACIAL TILL: Very dense, brown silty clay, with gravel, occasional cobbles and boulders - Grey by 1.5 m depth		2	SS 3	92	16-21-26-24 47	7.14			91
		3	SS 4	79	9-30-35-33 65	7.51			90
			SS 5	42	15-37-29-10 66	7.74			
3.84m [89.85m]			SS 6	0	50-/-/-/ 50/0.03				
End of Borehole		4							89
Practical refusal to augering at 3.84 m depth		5							88
(BH Dry - October 09, 2024)		6							87
		7							86
		8							85
		9							84
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376290.59 **NORTHING:** 5020275.07 **ELEVATION:** 92.90

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 26, 2024

FILE NO. : PG7301

HOLE NO. : BH 9-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80	REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80	PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0									92
TOPSOIL and organics 0.28m [92.62m]			AU 1								
Loose, brown **SILTY SAND**, trace gravel 1.02m [91.88m]		1	SS 2	83	4-11-34-26 45	10.65 9.67					
GLACIAL TILL: Very dense, brown silty sand, with gravel, cobbles and boulders 1.52m [91.38m]			SS 3	92	16-27-30-29 57	6.84					91
GLACIAL TILL: Grey clayey silt, with gravel, cobbles and boulders		2	SS 4	75	8-17-27-15 44	8.66					
		3	SS 5	67	8-14-23-29 37	7.71				3.2 m ▼ 2024-10-09	90
4.57m [88.33m]			SS 6	100	18-50-/-/ 50/0.05	9.71					89
GLACIAL TILL: Grey sandy silt, trace clay, with gravel, cobbles and boulders		4	SS 7	71	11-28-50-/ 78/0.28	11.21					88
6.10m [86.80m]		5	SS 8	100	35-50-/-/ 50/0.05	9.81					87
Dynamic Cone Penetration Test Comenced at 6.10 m depth 6.40m [86.50m]		6									
End of Borehole											86
Practical refusal to DCPT at 6.40 m depth		7									
(GWL at 3.20 m depth - October 9, 2024)		8									85
		9									84
		10									83

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376347.34 **NORTHING:** 5020162.69 **ELEVATION:** 91.91

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 26, 2024

FILE NO. : PG7301

HOLE NO. : BH10-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	RECOVERY (%)	N, Nc OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics		0							
0.23m [91.68m]									
Firm, brown **SILTY CLAY**, trace sand									
0.69m [91.22m]									
GLACIAL TILL: Very dense, brown silty clay, with gravel, cobbles and boulders		1	AU 1						91
			SS 2	79	10-17-28-44 45	9.09			
- Grey by 1.8 m depth		2	SS 3	100	18-23-24-28 47	9.87 7.12			90
		3	SS 4	75	4-4-9-15 13	9.94			89
			SS 5	71	3-12-15-30 27	12.2			
		4	SS 6	100	15-24-35-48 59	6.99			88
		5	SS 7	91	38-50-/-/ 50/0.13	6.8			87
			SS 8	100	25-50-/-/ 50/0.08	5.73		5.8 m 2024-10-09	
6.10m [85.81m]		6							86
End of Borehole									
(GWL at 5.76 m depth - October 9, 2024)		7							85
		8							84
		9							83
		10							82

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376217.33 **NORTHING:** 5020152.31 **ELEVATION:** 94.30

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 26, 2024

FILE NO. : PG7301

HOLE NO. : BH11-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / △ REMOULDED SHEAR STRENGTH, Cur (kPa) ▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							94
TOPSOIL and organics 0.25m [94.05m]			AU 1						
Loose, brown **SILTY SAND** 0.69m [93.61m]		1	SS 2	83	3-6-14-17 20	25.24			93
Very stiff, brown **CLAYEY SILT** 1.68m [92.62m]			SS 3	96	15-24-22-14 46	23.83 8.46			
GLACIAL TILL: Very dense, brown silty sand, trace clay, with gravel, occasional cobbles and boulders - Grey by 2.3 m depth 2.62m [91.68m]		2	SS 4	71	3-50-/-/ 50/0.1	9.72			92
End of Borehole		3							91
Practical refusal to augering at 2.62 m depth		4							90
(BH Dry - October 09, 2024)		5							89
		6							88
		7							87
		8							86
		9							85
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376432.01 **NORTHING:** 5020344.88 **ELEVATION:** 89.53

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 26, 2024

FILE NO. : PG7301

HOLE NO. : BH12-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	RECOVERY (%)	N, Nc OR RQD	WATER CONTENT (%)	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0						89
TOPSOIL and organics 0.36m [89.17m]								
Loose, brown **SILTY SAND**, trace clay 0.69m [88.84m]			AU 1					
Stiff, Brown **CLAYEY SILT** with sand		1	SS 2	71	6-6-6-10 12	25.09 20.49		88
		2	SS 3	75	7-6-8-9 14	27.1	2.0 m ▼ 2024-10-09	87
- Very stiff and grey by 2.4 m			SS 4	67	6-9-8-7 17	23.37		
- soft by 3.1 m depth		3	SS 5	100	1-1-2-1 3	25.52		86
4.11m [85.42m]		4	SS 6	62	P	29.54 19.35		85
Compact, grey **SILTY SAND**, trace gravel 5.26m [84.27m]		5	SS 7	100	4-5-9-5 14	15.75		84
GLACIAL TILL: Dense sandy silt, with gravel, cobbles 6.10m [83.43m]		6	SS 8	100	10-14-15-16 29	14.59		83
End of Borehole (GWL at 2.05 m depth - October 9, 2024)		7 8 9 10						82 81 80

PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) — 20 40 60 80

△ REMOULDED SHEAR STRENGTH, Cur (kPa)

▲ PEAK SHEAR STRENGTH, Cu (kPa) — 20 40 60 80

PL (%) WATER CONTENT (%) LL (%) — 20 40 60 80

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376509.59 **NORTHING:** 5020188.33 **ELEVATION:** 89.31

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 27, 2024

FILE NO. : PG7301

HOLE NO. : BH13-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	RECOVERY (%)	N, Nc OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							89
TOPSOIL and organics 0.23m [89.08m]									
Loose, brown **SILTY SAND**, trace clay 0.61m [88.70m]									
GLACIAL TILL: Compact, brown silty sand, trace clay with gravel, occasional cobbles		1	AU 1						88
			SS 2	79	7-6-5-7 11	11.11			
		2	SS 3	87	8-12-11-19 23	9.42 13.89		2.0 m ▼ 2024-10-09	87
- Very dense by 2.30m depth			SS 4	75	10-19-25-38 44	10.54			
		3	SS 5	88	6-28-50-/ 78/0.28	11.15			86
3.66m [85.65m]									
GLACIAL TILL: Very dense, brown silty clay, with gravel, occasional cobbles		4	SS 6	100	50-/-/-/ 50/0.13	10.84			85
		5	SS 7	78	27-50-/-/ 50/0.08	9.74			
5.28m [84.03m]			SS 8	100	50-/-/-/ 50/0.13	9.22			84
End of Borehole		6							
Practical refusal to augering at 5.28 m depth									83
(GWL at 1.93 m depth - October 9, 2024)		7							82
		8							81
		9							80
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376413.92 **NORTHING:** 5020249.09 **ELEVATION:** 90.17

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 27, 2024

FILE NO. : PG7301

HOLE NO. : BH14-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / △ REMOULDED SHEAR STRENGTH, Cur (kPa) ▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							90
TOPSOIL and organics 0.25m [89.92m]			AU 1						
Loose, brown **SILTY SAND**, trace clay 0.69m [89.48m]		1	SS 2	67	5-24-24-18 48	8.75			89
GLACIAL TILL: Dense to very dense, brown silty sand with gravel, cobbles and boulders - Grey by 1.5 m depth		2	SS 3	79	18-30-36-50 66	6.93			88
			SS 4	100	34-50-/-/ 50/0.13	6.56			
		3	SS 5	100	39-50-/-/ 50/0.13	6.43			87
		4	SS 6	100	16-50-/-/ 50/0.1	6.13			86
		5	SS 7	100	23-50-/-/ 50/0.1	5.57			85
			SS 8	100	29-50-/-/ 50/0.03	5.37			
6.10m [84.07m]		6							84
End of Borehole (BH Dry - October 09, 2024)		7							83
		8							82
		9							81
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376738.02 **NORTHING:** 5020086.71 **ELEVATION:** 89.29

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 27, 2024

FILE NO. : PG7301

HOLE NO. : BH15-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	RECOVERY (%)	N, Nc OR RQD	WATER CONTENT (%)	ELEVATION (m)
GROUND SURFACE		0					89
TOPSOIL and organics 0.28m [89.01m]			AU 1				
Loose to compact, brown **SANDY SILT**		1	SS 2	75	6-12-12-13 24	21.05	88
		2	SS 3	71	9-12-14-14 26	20.87	
2.21m [87.08m]							
Firm to soft, grey **CLAYEY SILT**		3	SS 4	75	8-3-2-3 5	25.5	87
			SS 5	83	1-1-0-0 1	28.75	86
		4	SS 6	83	0-2-1-0 3	33.96	
5.03m [84.26m]			SS 7	100	P	30.81	85
Stiff, grey **SILTY CLAY** 5.44m [83.85m]		5				37.87	
Firm, grey **CLAYEY SILT** 5.84m [83.45m]			SS 8	100	0-0-3-9 3	29.94	84
GLACIAL TILL: Very loose, grey silty sand with gravel 6.10m [83.19m]		6				12.47	
End of Borehole							83
(GWL at 2.17 m depth - October 9, 2024)		7					82
		8					81
		9					
		10					80

PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80

△ REMOULDED SHEAR STRENGTH, Cur (kPa)

▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80

PL (%) WATER CONTENT (%) LL (%) 20 40 60 80

MONITORING WELL CONSTRUCTION

2.2 m ▼ 2024-10-09

1923

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376738.02 **NORTHING:** 5020086.71 **ELEVATION:** 89.29

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 30, 2024

FILE NO. : PG7301

HOLE NO. : BH15A-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
OVERBURDEN		0							89
		1							88
		2							87
2.29m [87.00m]									
Firm, grey **CLAYEY SILT**		3							86
		4					189.0 Δ		85
4.57m [84.72m]									
Dynamic Cone Penetration Test Comenced at 4.57 m depth		5							84
		6							83
		7							82
7.62m [81.67m]									
End of Borehole Practical refusal to DCPT at 7.62 m depth		8							81
		9							80
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376652.26 **NORTHING:** 5020184.99 **ELEVATION:** 88.88

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 30, 2024

FILE NO. : PG7301

HOLE NO. : BH16-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							88
TOPSOIL and organics			AU 1						
0.20m [88.68m]									
Loose, brown **SILTY SAND**, with clay									
0.69m [88.19m]		1	SS 2	75	13-20-18-22 38	16.81			87
Dense, brown **SANDY SILT**, trace clay									
- Grey by 1.52 m depth		2	SS 3	67	12-22-20-22 42	17.85		2.0 m 2024-10-09	
- Trace clay by 2.29 m depth			SS 4	79	13-15-12-10 27	22.95			86
		3	SS 5	83	5-9-7-7 16	23.47			
4.11m [84.77m]		4	SS 6	75	3-15-15-18 30	26.05 10.75			85
GLACIAL TILL: Compact, grey silty sand, with gravel, occasional cobbles, boulders		5	SS 7	46	5-9-7-18 16	11.48			84
6.10m [82.78m]		6	SS 8	83	11-14-17-23 31	10.13			83
Dynamic Cone Penetration Test Comenced at 6.10 m depth									
6.76m [82.12m]		7							82
End of Borehole									
Practical refusal to DCPT at 6.76 m depth		8							81
(GWL at 2.05 m depth - October 9, 2024)									
		9							80
		10							79

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376837.58 **NORTHING:** 5020217.72 **ELEVATION:** 89.28

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 30, 2024

FILE NO. : PG7301

HOLE NO. : BH17-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							89
TOPSOIL and organics 0.10m [89.18m]			AU 1						
Loose, brown **SANDY SILT**, trace clay 0.69m [88.59m]		1	SS 2	87	10-19-20-29 39	9.28			88
GLACIAL TILL: Dense brown silty sand with gravel, cobbles, boulders, trace clay - Grey by 1.5 m depth		2	SS 3	58	21-23-20-12 43	9.29		2.1 m 2024-10-09	87
			SS 4	67	9-21-12-14 33	7.67			
- Very dense below 3.1m depth		3	SS 5	100	23-50-/-/ 50/0.13	7.18			86
4.14m [85.14m]		4	SS 6	100	19-50-/-/ 50/0.08	7.89			85
End of Borehole Practical refusal to augering at 4.14m depth (GWL at 2.07 m depth - October 9, 2024)		5							84
		6							83
		7							82
		8							81
		9							80
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376938.22 **NORTHING:** 5020281.76 **ELEVATION:** 88.30

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 30, 2024

FILE NO. : PG7301

HOLE NO. : BH18-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	RECOVERY (%)	N, Nc OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / △ REMOULDED SHEAR STRENGTH, Cur (kPa) ▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics 0.13m [88.17m]		0	AU 1						88
FILL: Firm, brown silty clay 0.69m [87.61m]									
TOPSOIL 0.86m [87.44m]									
FILL: Firm clayey silt 1.45m [86.85m]		1	SS 2	75	4-4-4-3 8	18.61 29.23		1.3 m 2024-10-09	87
TOPSOIL and organics 1.52m [86.78m]									
GLACIAL TILL: Compact, brown silty sand with gravel, occasional cobbles		2	SS 3	8	2-2-2-2 4	17.43			
			SS 4	46	8-8-15-16 23	14.27			86
- Grey by 3.1 m depth		3	SS 5	46	5-7-10-8 17	11.77			85
		4	SS 6	87	35-15-18-18 33	13.4			84
4.72m [83.58m]			SS 7	100	50-/-/-/ 50/0.15	10.33			
End of Borehole		5							83
Practical refusal to augering at 4.72 m depth									
(GWL at 1.31 m depth - October 9, 2024)		6							82
		7							81
		8							80
		9							79
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376684.09 **NORTHING:** 5020118.93 **ELEVATION:** 90.08

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 30, 2024

FILE NO. : PG7301

HOLE NO. : BH19-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / △ REMOULDED SHEAR STRENGTH, Cur (kPa) ▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							90
OVERBURDEN		1							89
		2							88
		3							87
3.89m [86.19m]		4							86
End of Borehole Practical refusal to augering at 3.89 m depth		5							85
		6							84
		7							83
		8							82
		9							81
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376740.96 **NORTHING:** 5020242.35 **ELEVATION:** 88.78

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 30, 2024

FILE NO. : PG7301

HOLE NO. : BH20-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80	REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80	PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE											
OVERBURDEN		0									88
		1									87
		2									86
		3									85
		4									84
5.44m [83.34m]		5									83
End of Borehole Practical refusal to augering at 5.44m depth		6									82
		7									81
		8									80
		9									79
		10									

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SOIL PROFILE AND TEST DATA

GEOTECHNICAL INVESTIGATION

4795 Bank St. & 3301 Blais Rd., Ottawa, Ontario

DATUM: Geodetic **EASTING:** 376563.628 **NORTHING:** 5020241.291 **ELEVATION:** 88.83 m

PROJECT: Proposed Development

BORINGS BY: Excavator

REMARKS:

DATE: November 10, 2023

FILE NO. PG6896

HOLE NO. TP 1-23

SAMPLE DESCRIPTION	STRATA PLOT	Sample No.	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 50 100	Peak Shear Strength (kPa) 0 50 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 50 100	Piezometer Construction
Ground Surface EL 88.83 m										
TOPSOIL		G1			31.2	0				
0.45 m EL 88.38 m		G2			17.5					
Compact, brown SANDY SILT		G3			21.2	1				
1.2 m EL 87.63 m		G4			20.3					
Compact to dense, grey SANDY SILT										
- trace gravel by 2.0m depth		G5			20	2				
- trace clay by 3.0m depth										
- occasional cobbles by 3.6m depth										
- some clay from 4.0 to 4.3m depth		G6			23.8	3				▼
		G7			22.5	4				
		G8			27.1					
5.1 m EL 83.73 m		G9			25.6	5				
End of Test Pit						6				
(Groundwater infiltration at 3.5m depth)										

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SOIL PROFILE AND TEST DATA

GEOTECHNICAL INVESTIGATION

4795 Bank St. & 3301 Blais Rd., Ottawa, Ontario

DATUM: Geodetic **EASTING:** 376495.134 **NORTHING:** 5020294.256 **ELEVATION:** 89.05 m

PROJECT: Proposed Development

BORINGS BY: Excavator

REMARKS:

DATE: November 10, 2023

FILE NO. PG6896

HOLE NO. TP 2-23

SAMPLE DESCRIPTION	STRATA PLOT	Sample No.	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 50 100	Peak Shear Strength (kPa) 0 50 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 50 100	Piezometer Construction
Ground Surface EL 89.05 m						0				
TOPSOIL 0.15 m EL 88.9 m		G1			30.4					
Loose, brown SILTY SAND, occasional cobbles 0.55 m EL 88.5 m		G2			16.5					
		G3			17.3					
Compact, brown SANDY SILT		G4			24.4	1				
- trace clay by 1.6m depth										
- thin interbedded layers of silty clay at 1.8m depth		G5			30					▼
2.1 m EL 86.95 m						2				
Loose, grey SANDY SILT with thin interbedded layers of silty clay 2.5 m EL 86.55 m		G6			27.7					
		G7			34					
Firm, grey SILTY CLAY to CLAYEY SILT with interbedded sandy silt layers		G8			33			35 22		
3.45 m EL 85.6 m						3				
GLACIAL TILL: Grey silty sand with gravel		G9			14.1					
4 m EL 85.05 m		G10			11.2	4				
End of Test Pit										
(Groundwater infiltration at 1.7m depth)						5				
						6				

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SOIL PROFILE AND TEST DATA

GEOTECHNICAL INVESTIGATION

4795 Bank St. & 3301 Blais Rd., Ottawa, Ontario

DATUM: Geodetic **EASTING:** 376509.066 **NORTHING:** 5020384.595 **ELEVATION:** 89.07 m

PROJECT: Proposed Development

BORINGS BY: Excavator

REMARKS:

DATE: November 10, 2023

FILE NO. PG6896

HOLE NO. TP3-23

SAMPLE DESCRIPTION	STRATA PLOT	Sample No.	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 50 100	Peak Shear Strength (kPa) 0 50 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 50 100	Piezometer Construction
Ground Surface EL 89.07 m										
TOPSOIL 0.3 m EL 88.77 m		G1			30.7	0				
Compact, brown SANDY SILT with thin interbedded layers of silty sand		G2			13.9					
- trace clay by 0.7m depth		G3			24.1	1				
		G4			22.9					
1.6 m EL 87.47 m		G5			30.6	2				▼
Stiff, grey CLAYEY SILT with thin interbedded layers of silty clay		G6			28.9					
3.2 m EL 85.87 m		G7			12.6	3				
GLACIAL TILL: Dense, grey clayey silt to sandy silt with gravel, occasional boulders 3.3 m EL 85.77 m										
End of Test Pit						4				
Practical refusal to excavation on large boulders at 3.30m depth.										
(Groundwater infiltration at 1.6m depth)						5				
						6				

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SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the strength of cohesionless soils is the relative density, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm.

Relative Density	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NXL size core. However, it can be used on smaller core sizes, such as BX, if the bulk of the fractures caused by drilling stresses (called “mechanical breaks”) are easily distinguishable from the normal in situ fractures.

RQD %	ROCK QUALITY
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

MC%	-	Natural moisture content or water content of sample, %
LL	-	Liquid Limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic limit, % (water content above which soil behaves plastically)
PI	-	Plasticity index, % (difference between LL and PL)
Dxx	-	Grain size which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D30)^2$ / (D10 x D60)
Cu	-	Uniformity coefficient = D60 / D10

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$
Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$
Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.
Cc and Cu are not applicable for the description of soils with more than 10% silt and clay
(more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

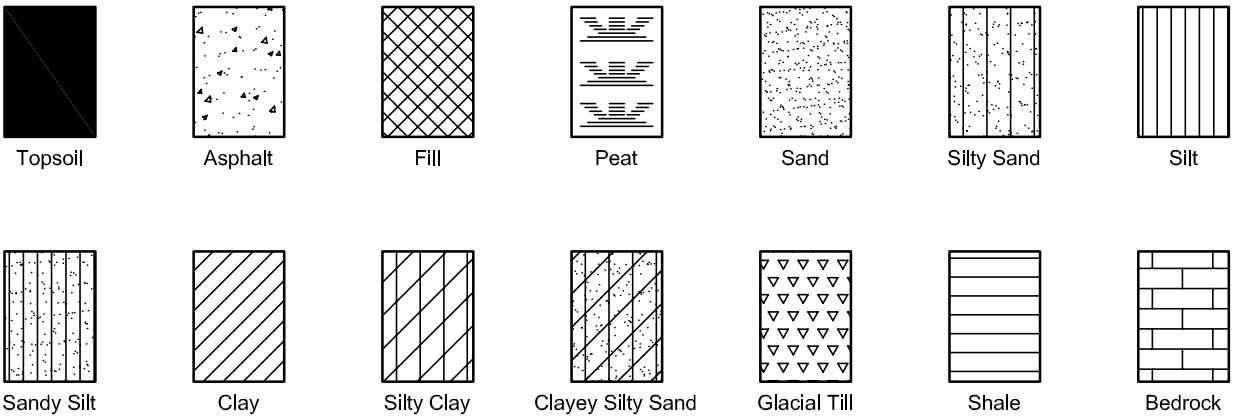
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

PERMEABILITY TEST

k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.

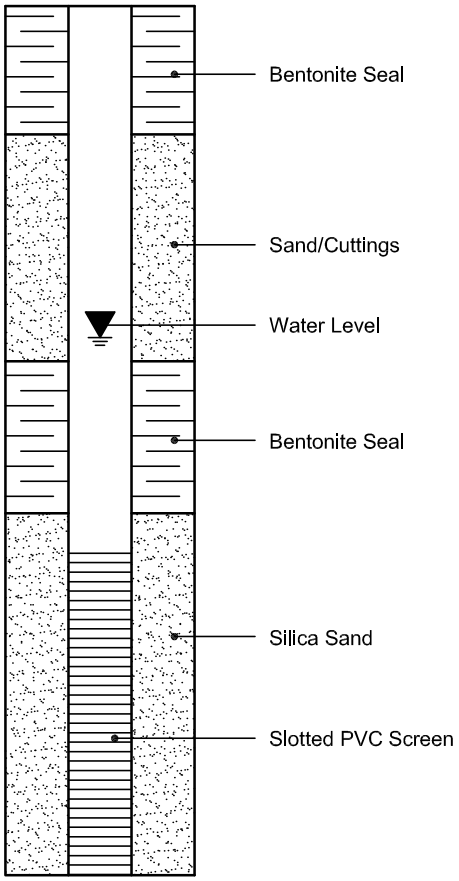
SYMBOLS AND TERMS (continued)

STRATA PLOT

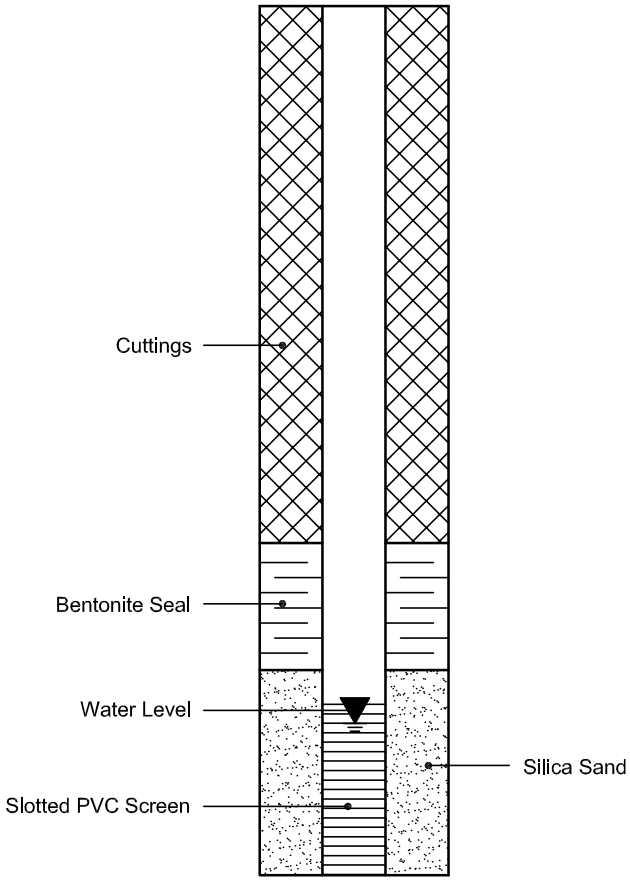


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



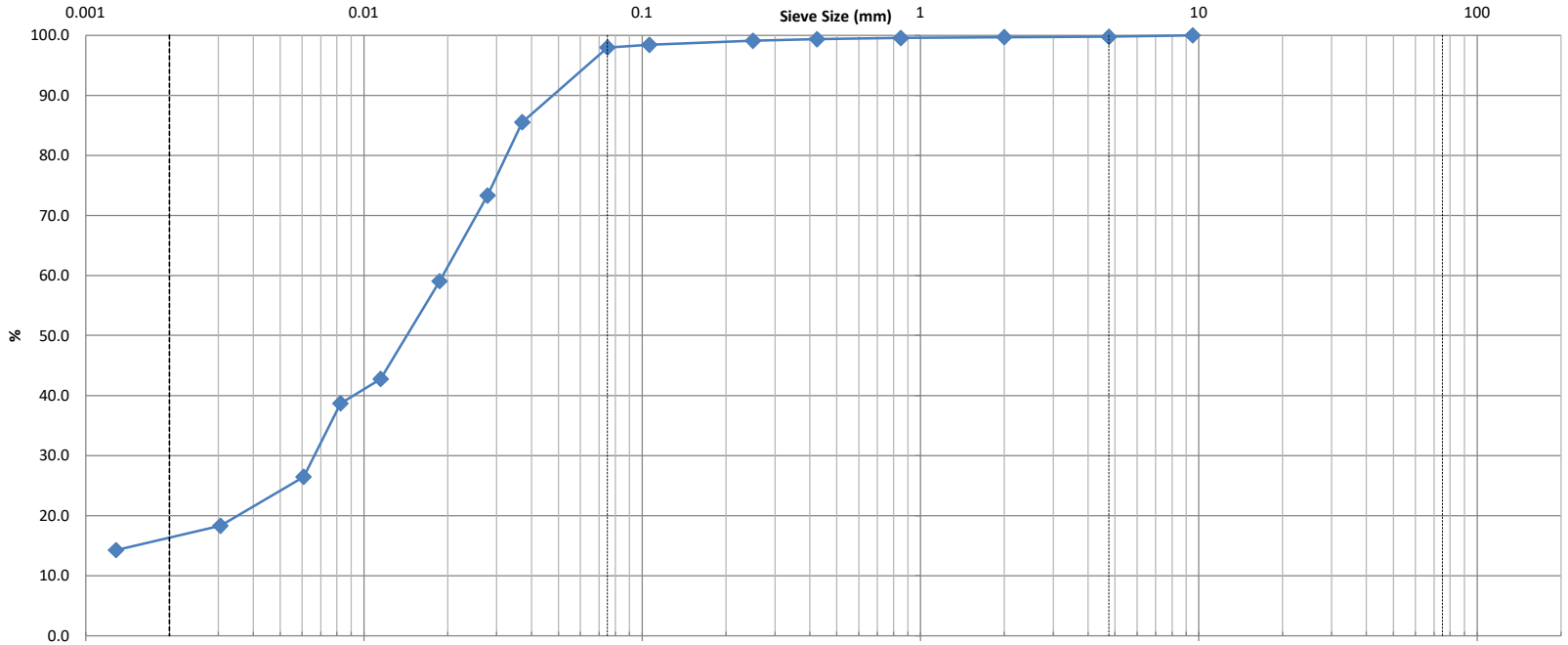
PIEZOMETER CONSTRUCTION



PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	Caivan	DEPTH:	-	FILE NO:	PG7301
CONTRACT NO.:		BH OR TP No.:	BH1-26 SS3	LAB NO:	65709
PROJECT:	4795 Bank Street			DATE RECEIVED:	6-Apr-26
				DATE TESTED:	7-Apr-26
DATE SAMPLED:	6-Apr-26			DATE REPORTED:	15-Apr-26
SAMPLED BY:	A.E.			TESTED BY:	C.M



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu
						21.3%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)	
					0.3	1.8		82.0		16.0	

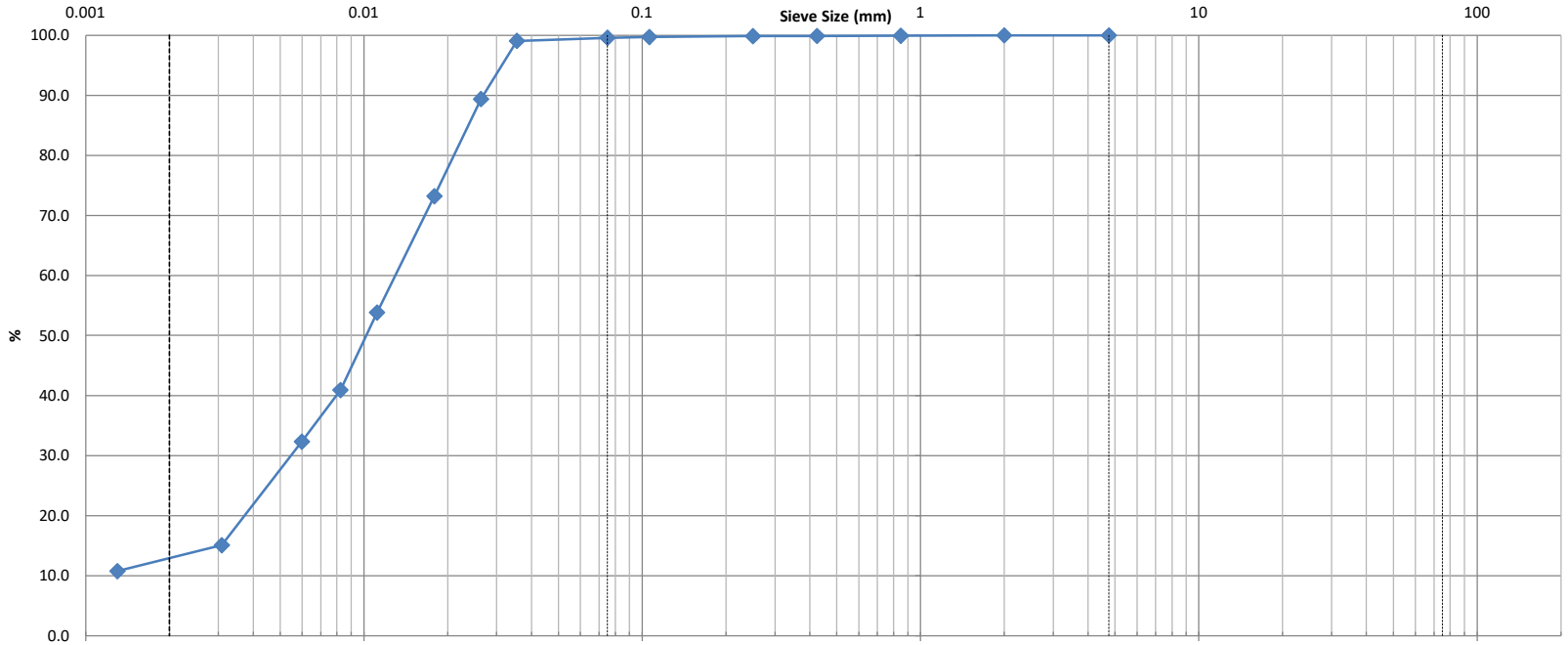
Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	Caivan	DEPTH:	-	FILE NO:	PG7301
CONTRACT NO.:		BH OR TP No.:	BH1-26 SS5	LAB NO:	65710
PROJECT:	4795 Bank Street			DATE RECEIVED:	6-Apr-26
				DATE TESTED:	7-Apr-26
DATE SAMPLED:	6-Apr-26			DATE REPORTED:	15-Apr-26
SAMPLED BY:	A.E.			TESTED BY:	C.M



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu
						31.0%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)	
					0.0	0.4		87.6		12.0	

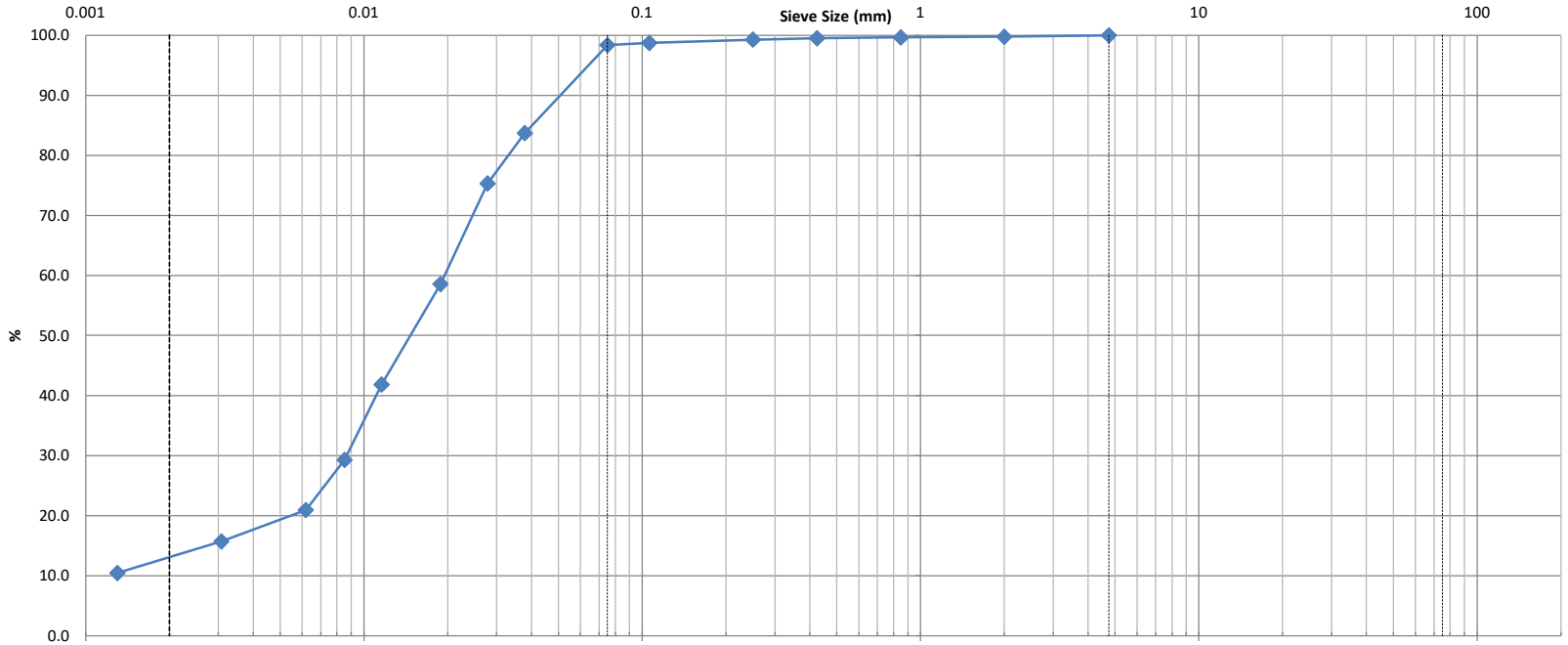
Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	Caivan	DEPTH:	-	FILE NO:	PG7301
CONTRACT NO.:		BH OR TP No.:	BH2-26 SS3	LAB NO:	65711
PROJECT:	4795 Bank Street			DATE RECEIVED:	6-Apr-26
				DATE TESTED:	7-Apr-26
DATE SAMPLED:	6-Apr-26			DATE REPORTED:	15-Apr-26
SAMPLED BY:	A.E.			TESTED BY:	C.M



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu
						29.9%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)	
					0.0	1.6		85.4		13.0	

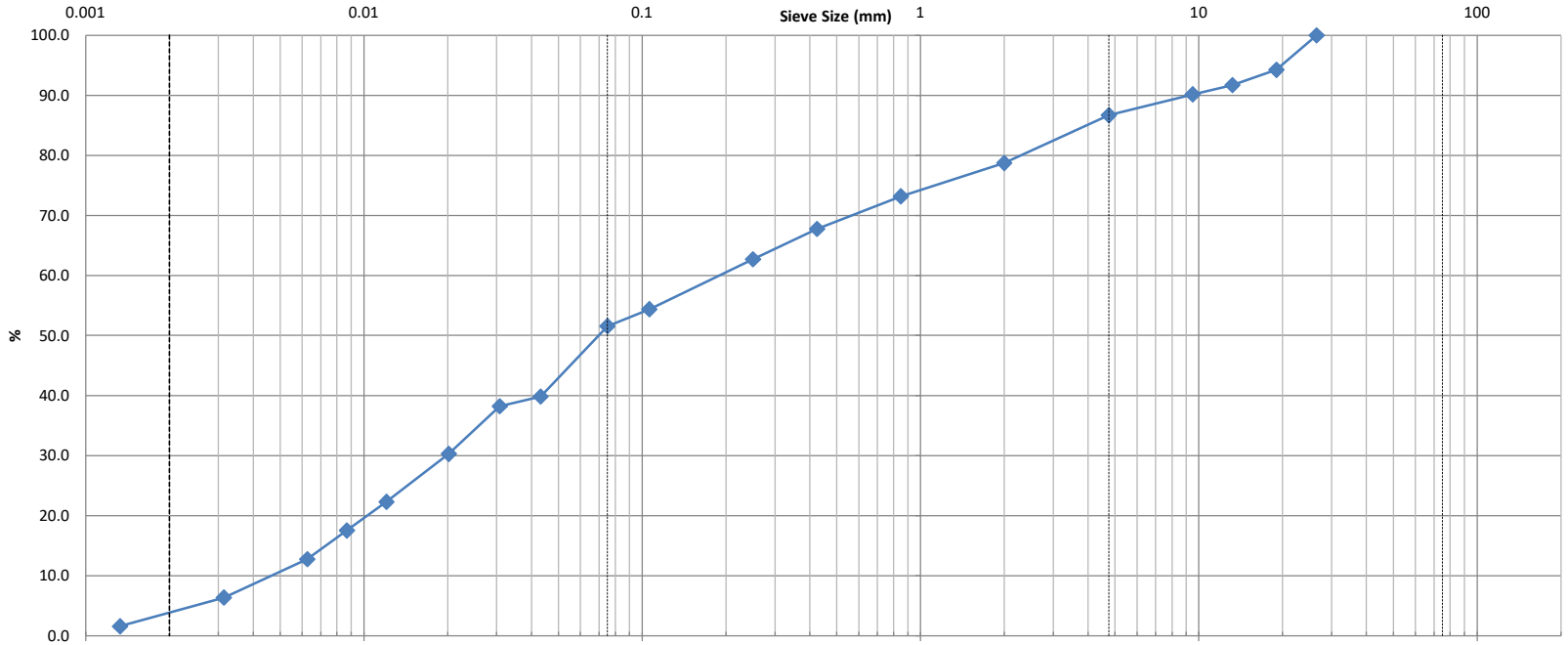
Comments:

REVIEWED BY: **Curtis Beadow** **Joe Forsyth, P. Eng.**

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	Caivan	DEPTH:	-	FILE NO:	PG7301
CONTRACT NO.:		BH OR TP No.:	BH2-26 SS8	LAB NO:	65712
PROJECT:	4795 Bank Street			DATE RECEIVED:	6-Apr-26
				DATE TESTED:	7-Apr-26
DATE SAMPLED:	6-Apr-26			DATE REPORTED:	15-Apr-26
SAMPLED BY:	A.E.			TESTED BY:	C.M



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu
						10.0%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)	
					13.3	35.1		47.6		4.0	

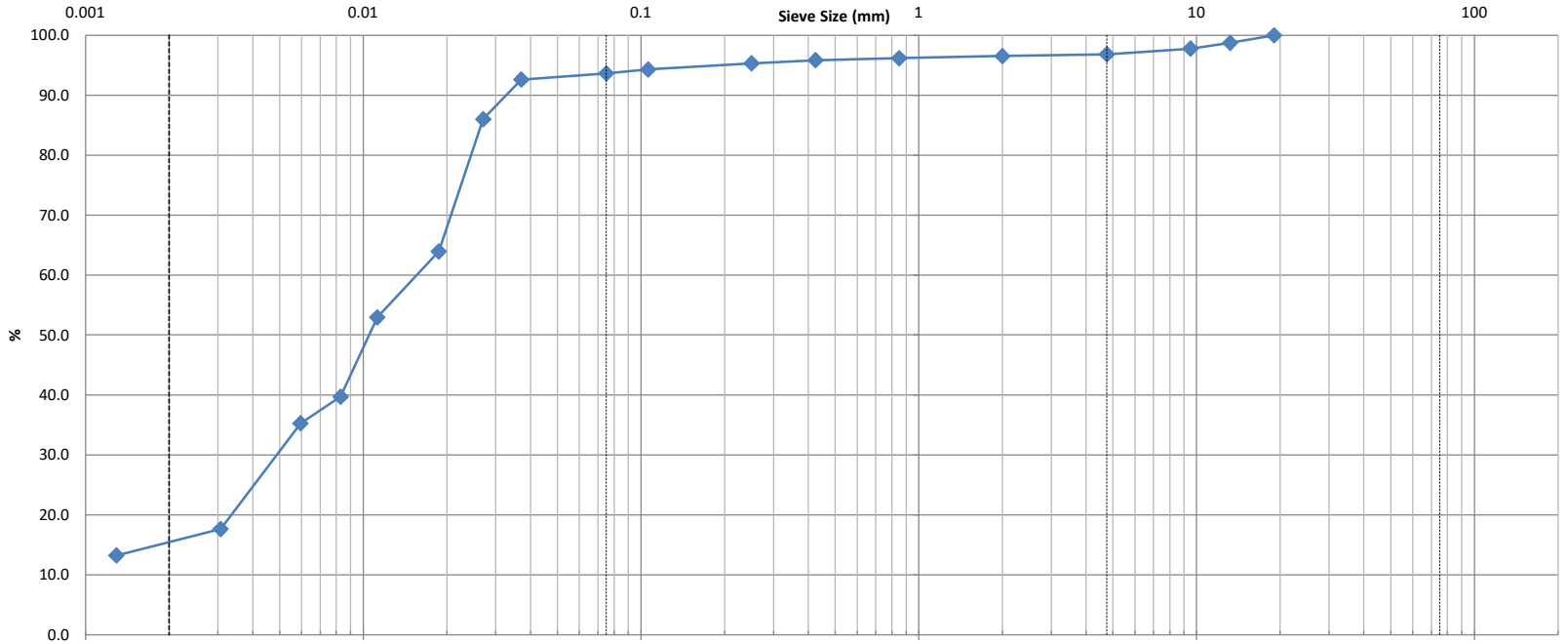
Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	Caivan	DEPTH:	-	FILE NO:	PG7301
CONTRACT NO.:		BH OR TP No.:	BH4-26 SS3	LAB NO:	65713
PROJECT:	4795 Bank Street			DATE RECEIVED:	6-Apr-26
				DATE TESTED:	7-Apr-26
DATE SAMPLED:	6-Apr-26			DATE REPORTED:	16-Apr-26
SAMPLED BY:	A.E.			TESTED BY:	C.M



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu
						29.2%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)	
					3.2	3.2		78.1		15.5	

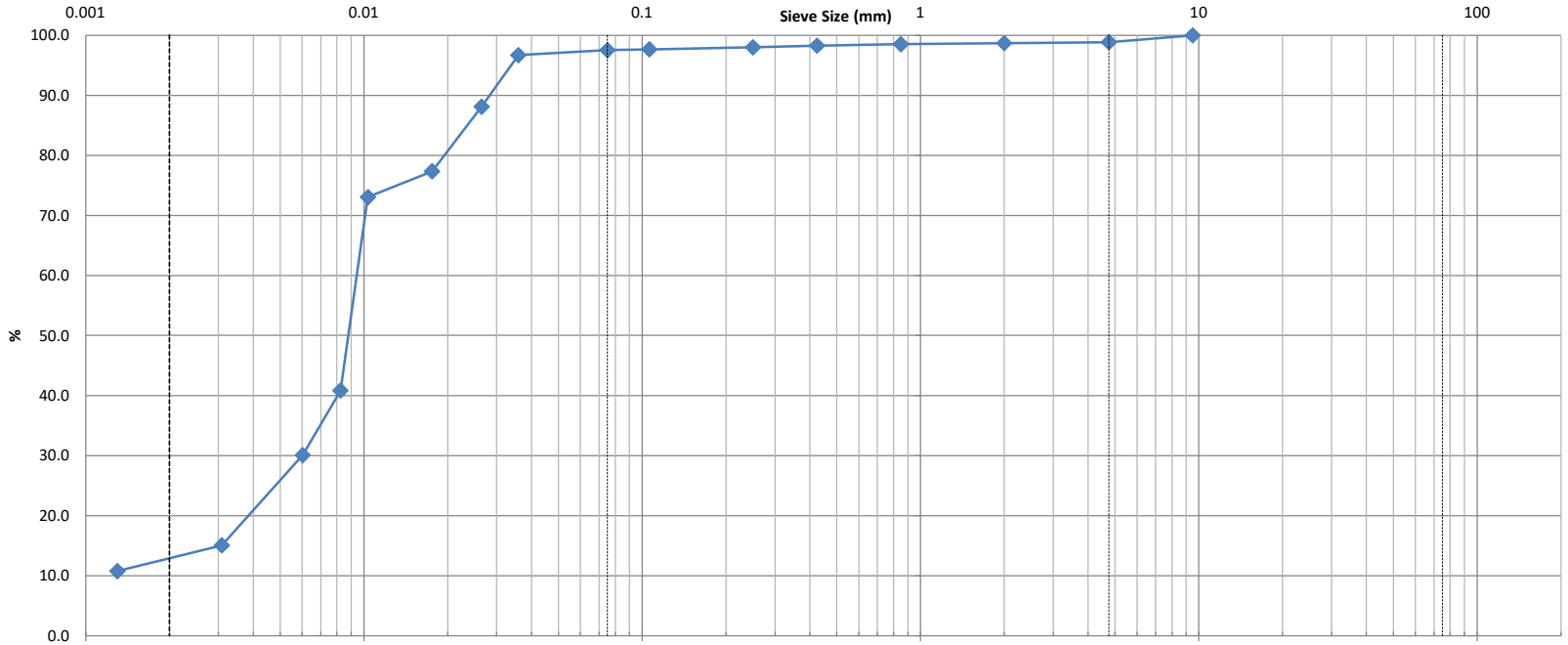
Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	Caivan	DEPTH:	-	FILE NO:	PG7301
CONTRACT NO.:		BH OR TP No.:	BH4-26 SS5	LAB NO:	65714
PROJECT:	4795 Bank Street			DATE RECEIVED:	6-Apr-26
				DATE TESTED:	7-Apr-26
DATE SAMPLED:	6-Apr-26			DATE REPORTED:	16-Apr-26
SAMPLED BY:	A.E.			TESTED BY:	C.M



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu
						28.6%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)	
					1.1	1.3		85.0		12.5	

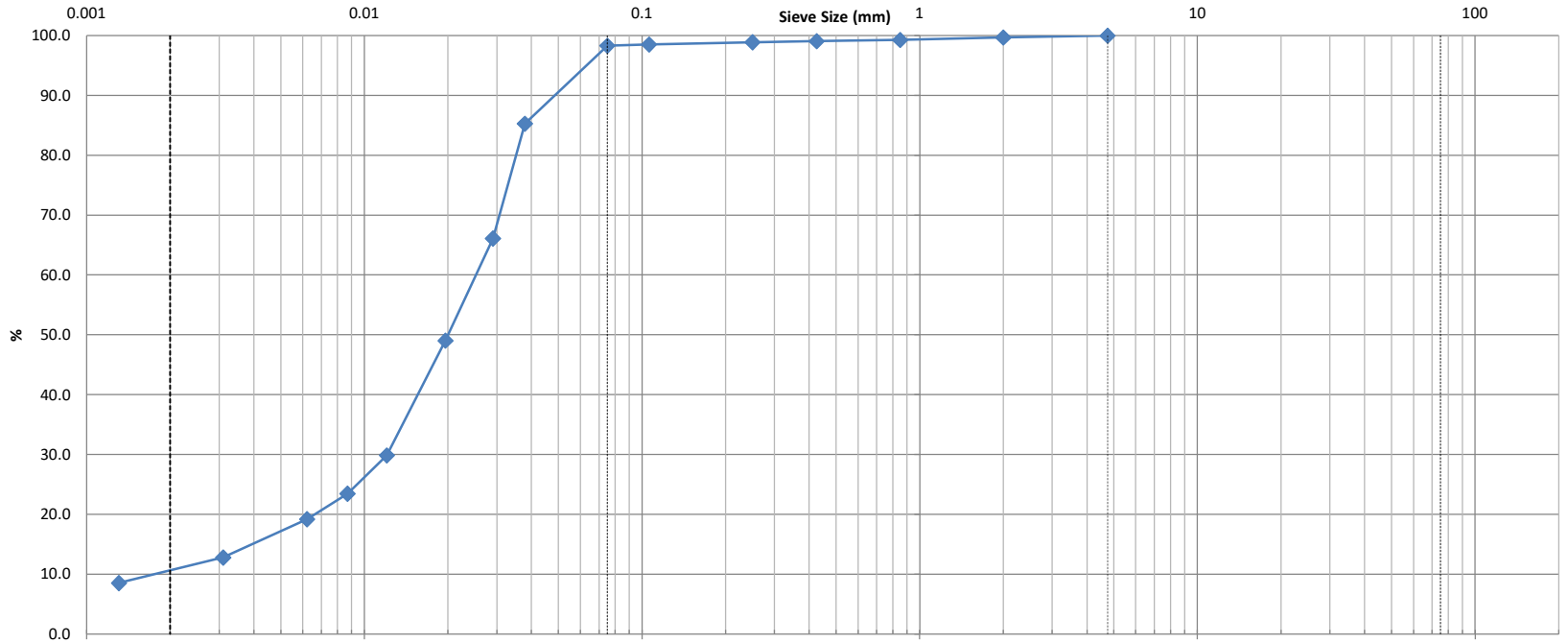
Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	Caivan	DEPTH:	2'6" - 4'6"	FILE NO:	PG7301
CONTRACT NO.:		BH OR TP No.:	BH11-24 SS2	LAB NO:	57070
PROJECT:	4795 Bank Street, Ottawa, ON			DATE RECEIVED:	2-Oct-24
				DATE TESTED:	3-Oct-24
DATE SAMPLED:	26/27-Sep-24			DATE REPORTED:	17-Oct-24
SAMPLED BY:	Max R.			TESTED BY:	D.K



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu
						25.0%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)	
					0.0	1.7		88.2		10.2	

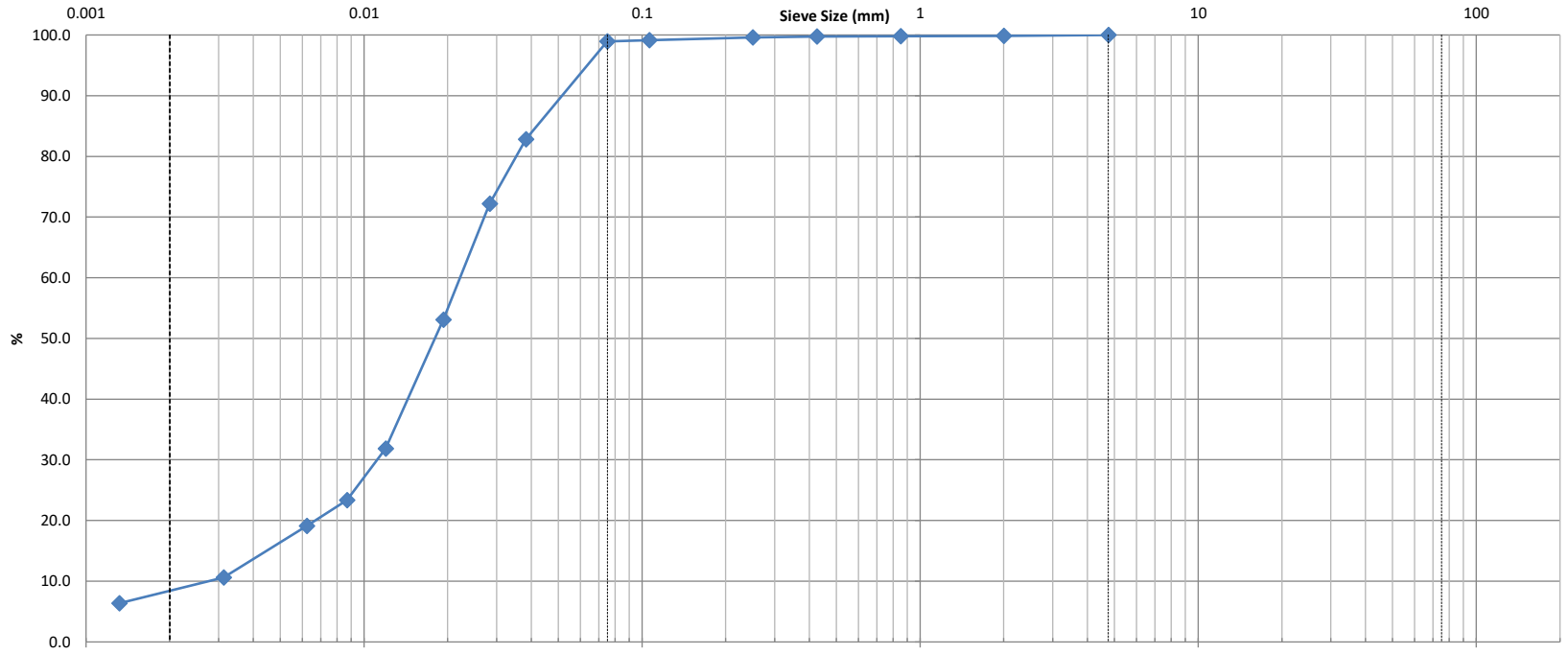
Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS **ASTM C136**

CLIENT:	Caivan	DEPTH:	5' - 7'	FILE NO:	PG7301
CONTRACT NO.:		BH OR TP No.:	BH12-24 SS3	LAB NO:	57071
PROJECT:	4795 Bank Street, Ottawa, ON			DATE RECEIVED:	2-Oct-24
				DATE TESTED:	3-Oct-24
DATE SAMPLED:	26/27-Sep-24			DATE REPORTED:	17-Oct-24
SAMPLED BY:	Max R.			TESTED BY:	D.K



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification				MC(%)	LL	PL	PI	Cc	Cu
					23.7%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)
					0.0	1.1		90.9		8.0

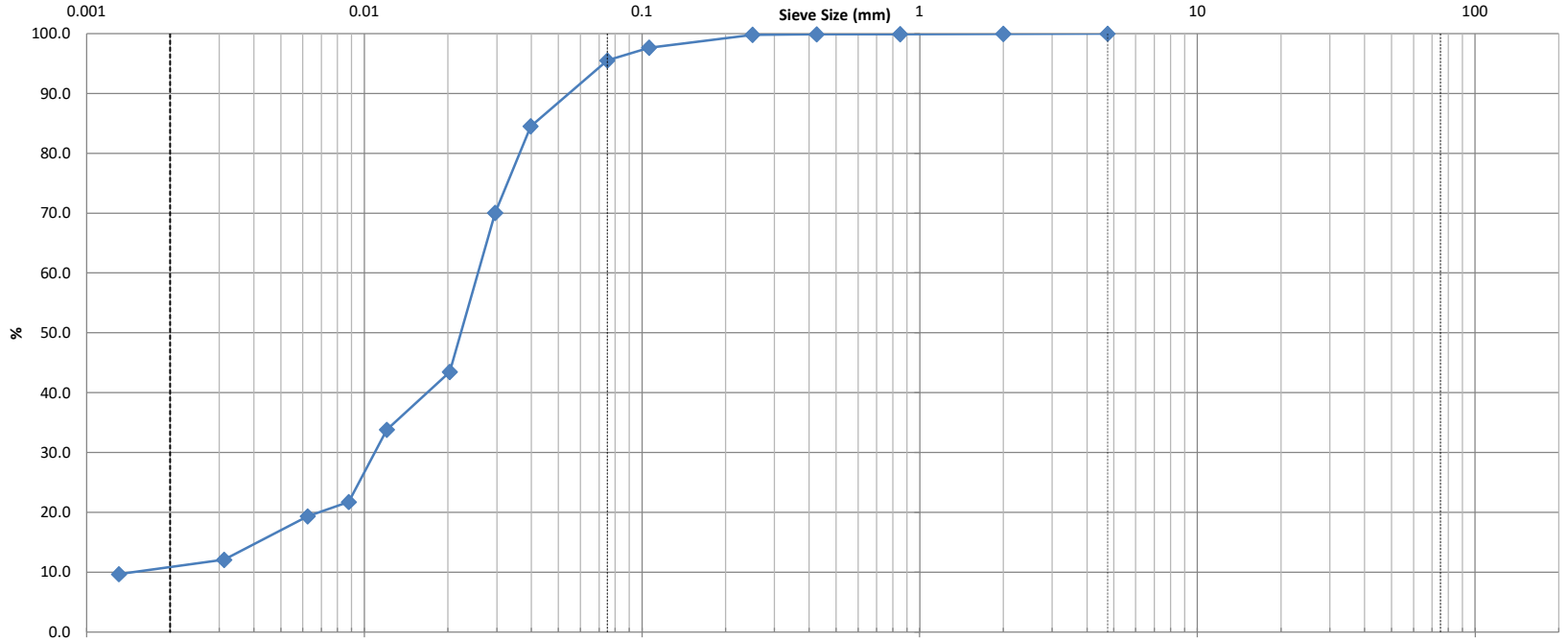
Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	Caivan	DEPTH:	10' - 12'	FILE NO:	PG7301
CONTRACT NO.:		BH OR TP No.:	BH12-24 SS5	LAB NO:	57072
PROJECT:	4795 Bank Street, Ottawa, ON			DATE RECEIVED:	2-Oct-24
				DATE TESTED:	3-Oct-24
DATE SAMPLED:	26/27-Sep-24			DATE REPORTED:	18-Oct-24
SAMPLED BY:	Max R.			TESTED BY:	D.K



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu
						31.5%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)	
					0.0	4.5		84.9		10.6	

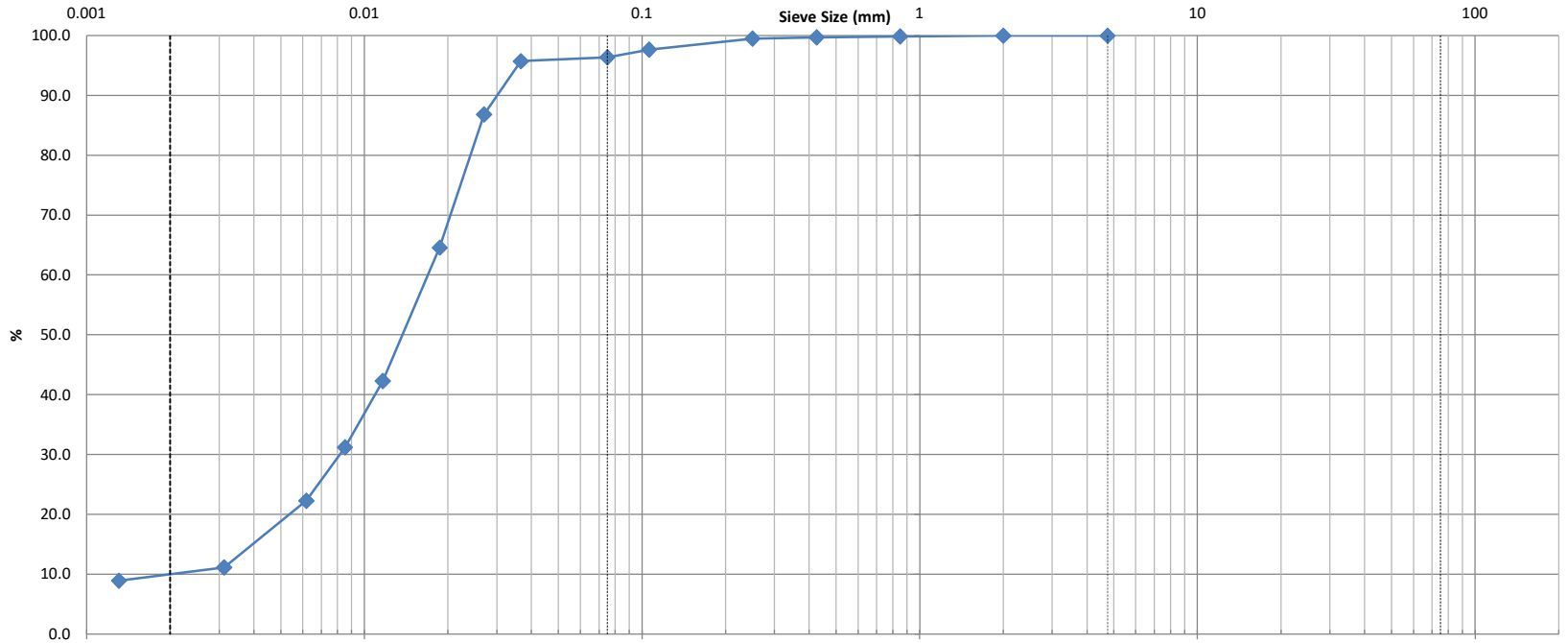
Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	Caivan	DEPTH:	12'6" - 14'6"	FILE NO:	PG7301
CONTRACT NO.:		BH OR TP No.:	BH12-24 SS6	LAB NO:	57073
PROJECT:	4795 Bank Street, Ottawa, ON			DATE RECEIVED:	2-Oct-24
				DATE TESTED:	3-Oct-24
DATE SAMPLED:	26/27-Sep-24			DATE REPORTED:	18-Oct-24
SAMPLED BY:	Max R.			TESTED BY:	D.K



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu
						11.4%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)	
					0.0	3.6		86.6		9.8	

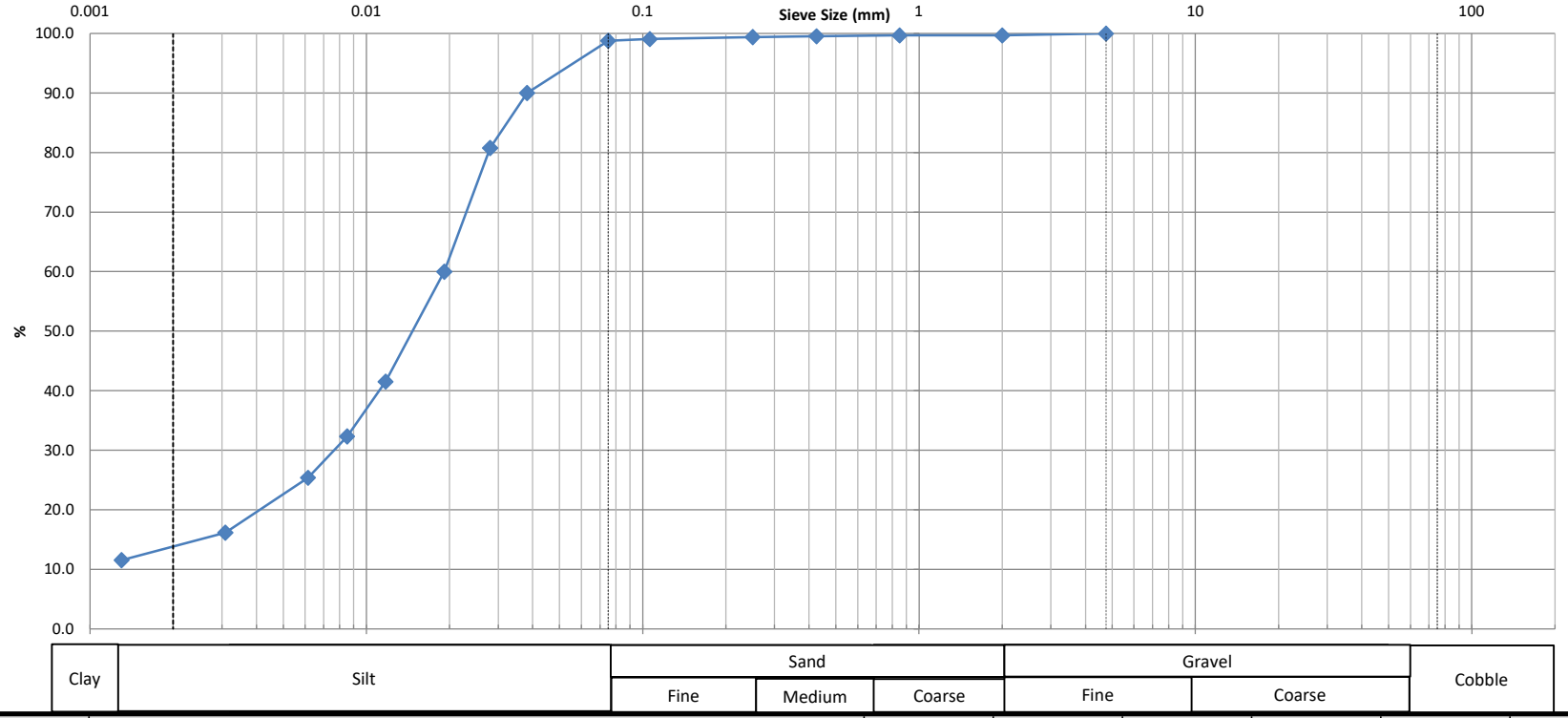
Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.
		

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

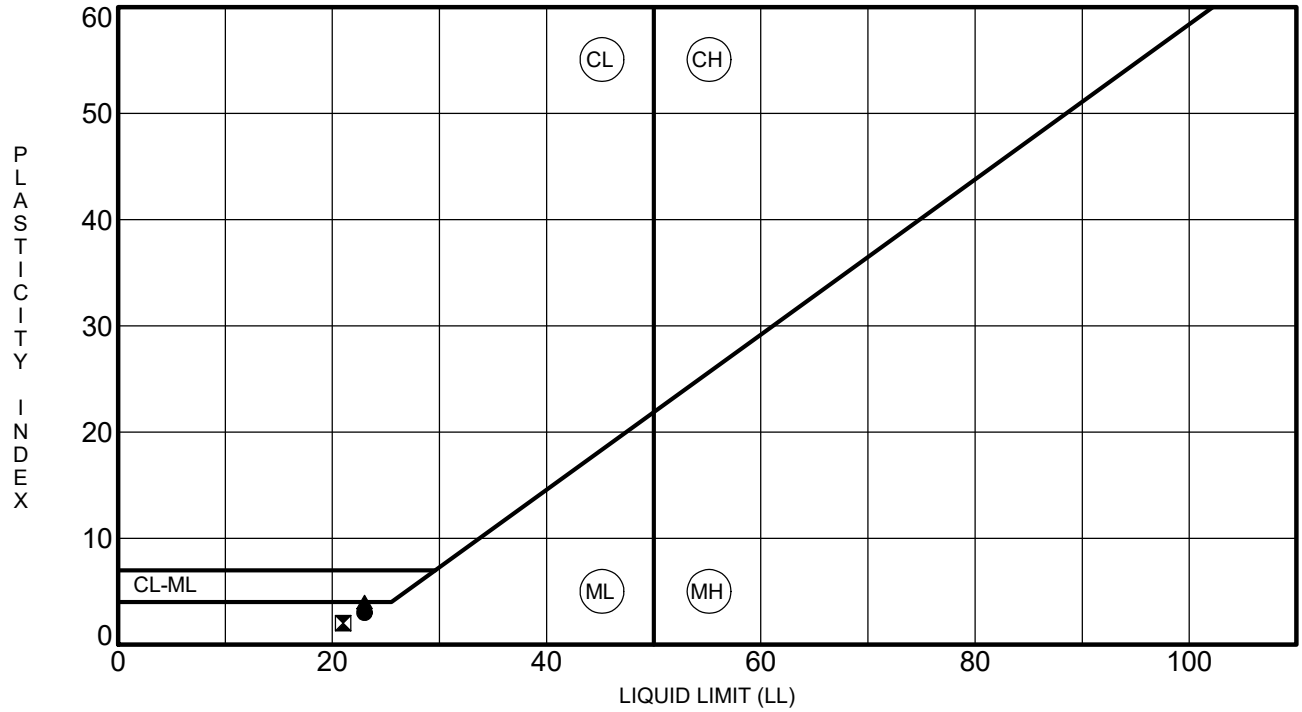
CLIENT:	Caivan	DEPTH:	10' - 12'	FILE NO:	PG7301
CONTRACT NO.:		BH OR TP No.:	BH15-24 SS5	LAB NO:	57074
PROJECT:	4795 Bank Street, Ottawa, ON			DATE RECEIVED:	2-Oct-24
				DATE TESTED:	3-Oct-24
DATE SAMPLED:	26/27-Sep-24			DATE REPORTED:	17-Oct-24
SAMPLED BY:	Max R.			TESTED BY:	D.K



Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu
						30.7%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)	
					0.0	1.2		85.5		13.3	

Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.



Specimen Identification		LL	PL	PI	Fines	Classification
●	**BH12-24 SS5**	**23**	**20**	**3**		**ML - Inorganic silts of slight plasticity**
⧓	**BH12-24 SS6**	**21**	**19**	**2**		**ML - Inorganic silts of slight plasticity**
▲	**BH15-24 SS5**	**23**	**19**	**4**		**ML - Inorganic silts of slight plasticity**

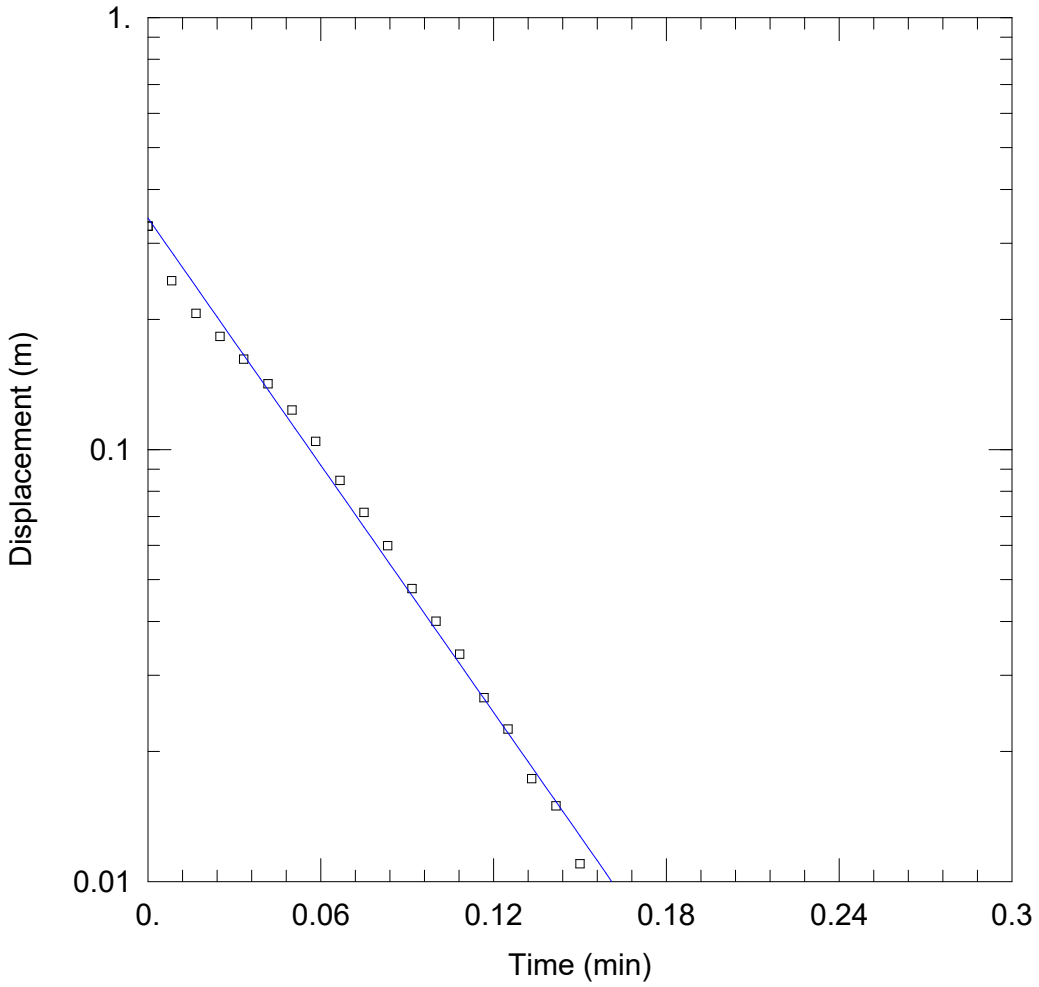
CLIENT **Caivan Communities** FILE NO. **PG7301**

PROJECT **Geotechnical Investigation - 4795 Bank Street & 3301 Blais Road, Ottawa, Ontario** DATE **17 Oct 24**

PATERSON GROUP
9 Auriga Drive
Ottawa, Ontario
K2E 7T9
TEL: (613) 226-7381

ATTERBERG LIMITS' RESULTS

	Client ID:	BH16-24 SS4	-	-	-		
	Sample Date:	30-Sep-24 09:00	-	-	-	-	-
	Sample ID:	2440489-01	-	-	-		
	Matrix:	Soil	-	-	-		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	82.0	-	-	-	-	-
General Inorganics							
pH	0.05 pH Units	7.43	-	-	-	-	-
Resistivity	0.1 Ohm.m	51.4	-	-	-	-	-
Anions							
Chloride	10 ug/g	<10	-	-	-	-	-
Sulphate	10 ug/g	68	-	-	-	-	-



WELL TEST ANALYSIS

PROJECT INFORMATION

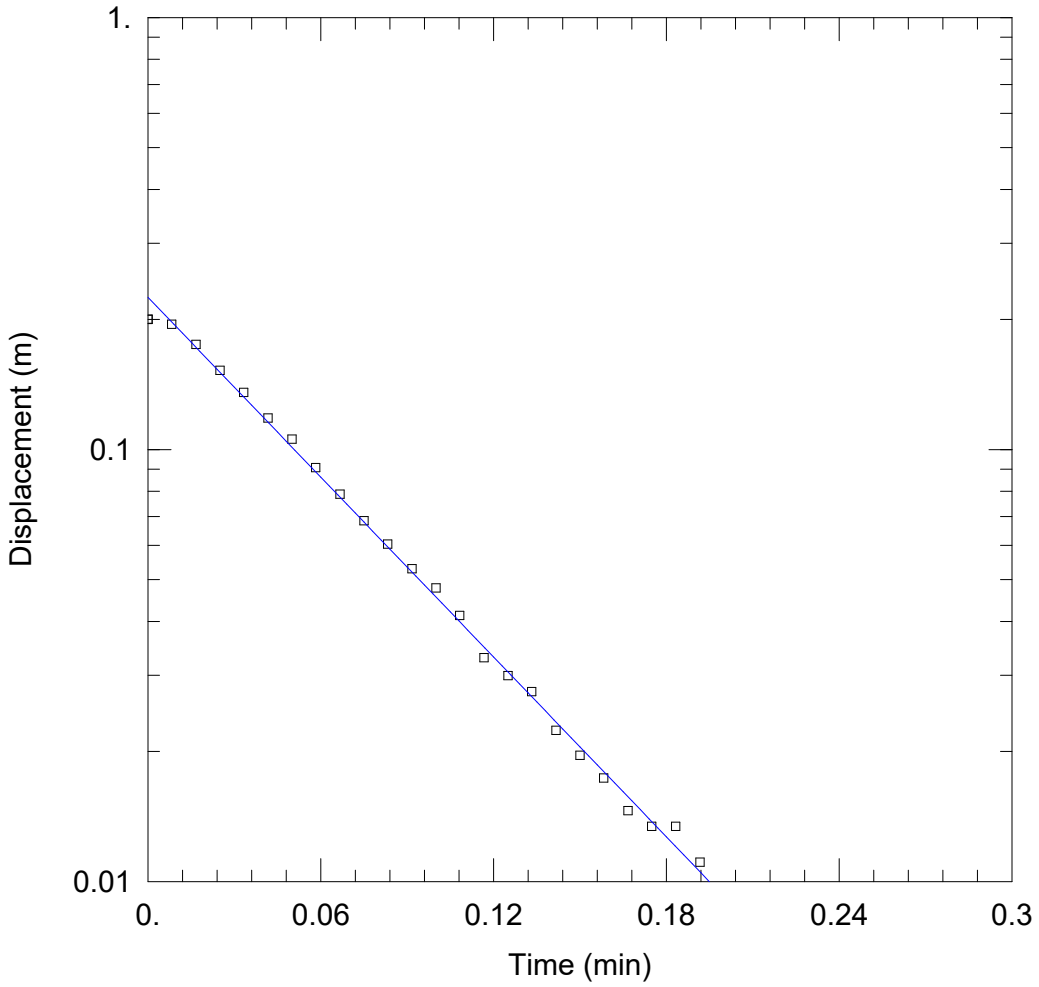
Company: Paterson Group
Client: Caivan Communities
Project: PG7301
Location: 4795 Bank Street
Test Well: BH1-26
Test Date: May 26, 2026

WELL DATA (BH1-26)

Initial Displacement: 0.329 m
Total Well Penetration Depth: 6.98 m
Casing Radius: 0.01588 m
Static Water Column Height: 6.98 m
Screen Length: 1.524 m
Well Radius: 0.0381 m

SOLUTION

Aquifer Model: Unconfined
K = 0.0001674 m/sec
Solution Method: Hvorslev
y0 = 0.3433 m



WELL TEST ANALYSIS

PROJECT INFORMATION

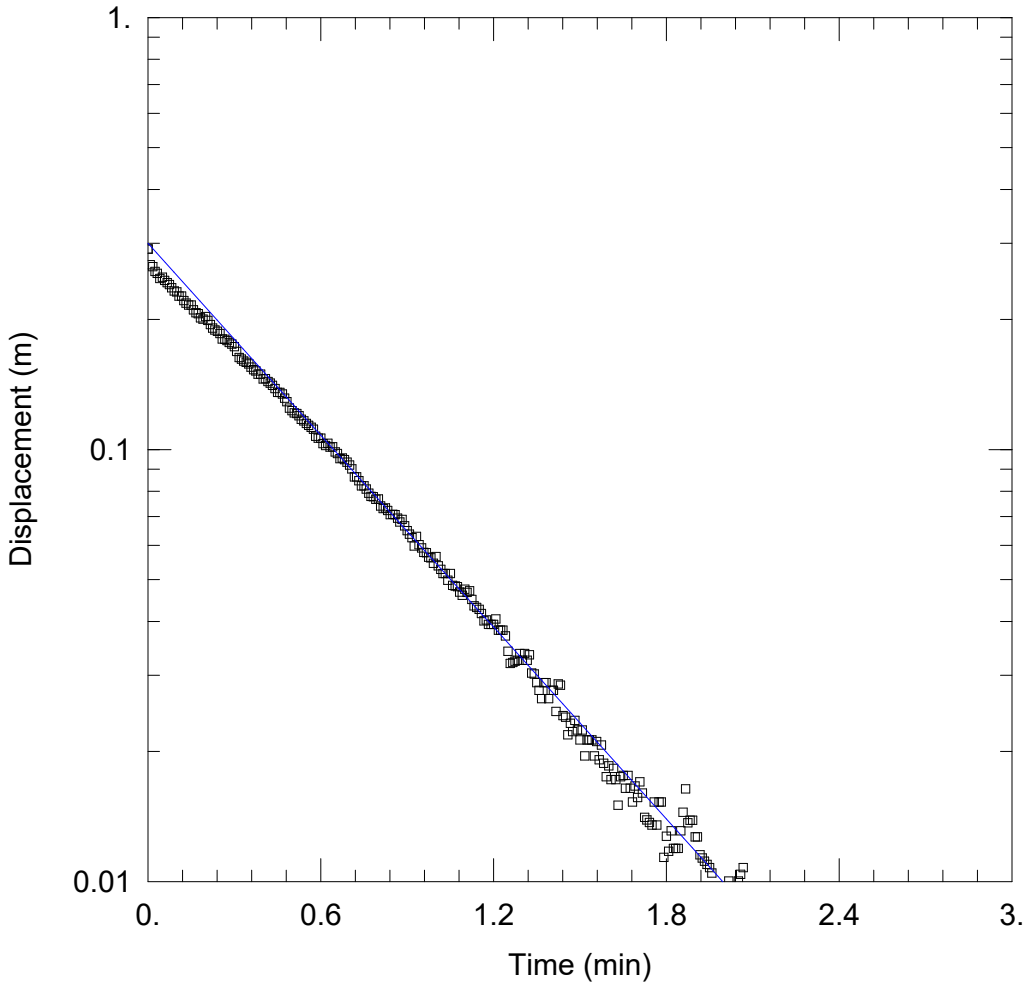
Company: Paterson Group
Client: Caivan Communities
Project: PG7301
Location: 4795 Bank Street
Test Well: BH1-26
Test Date: May 26, 2026

WELL DATA (BH1-26)

Initial Displacement: 0.2 m
Total Well Penetration Depth: 6.98 m
Casing Radius: 0.01588 m
Static Water Column Height: 6.98 m
Screen Length: 1.524 m
Well Radius: 0.0381 m

SOLUTION

Aquifer Model: Unconfined
K = 0.0001218 m/sec
Solution Method: Hvorslev
y0 = 0.225 m



WELL TEST ANALYSIS

PROJECT INFORMATION

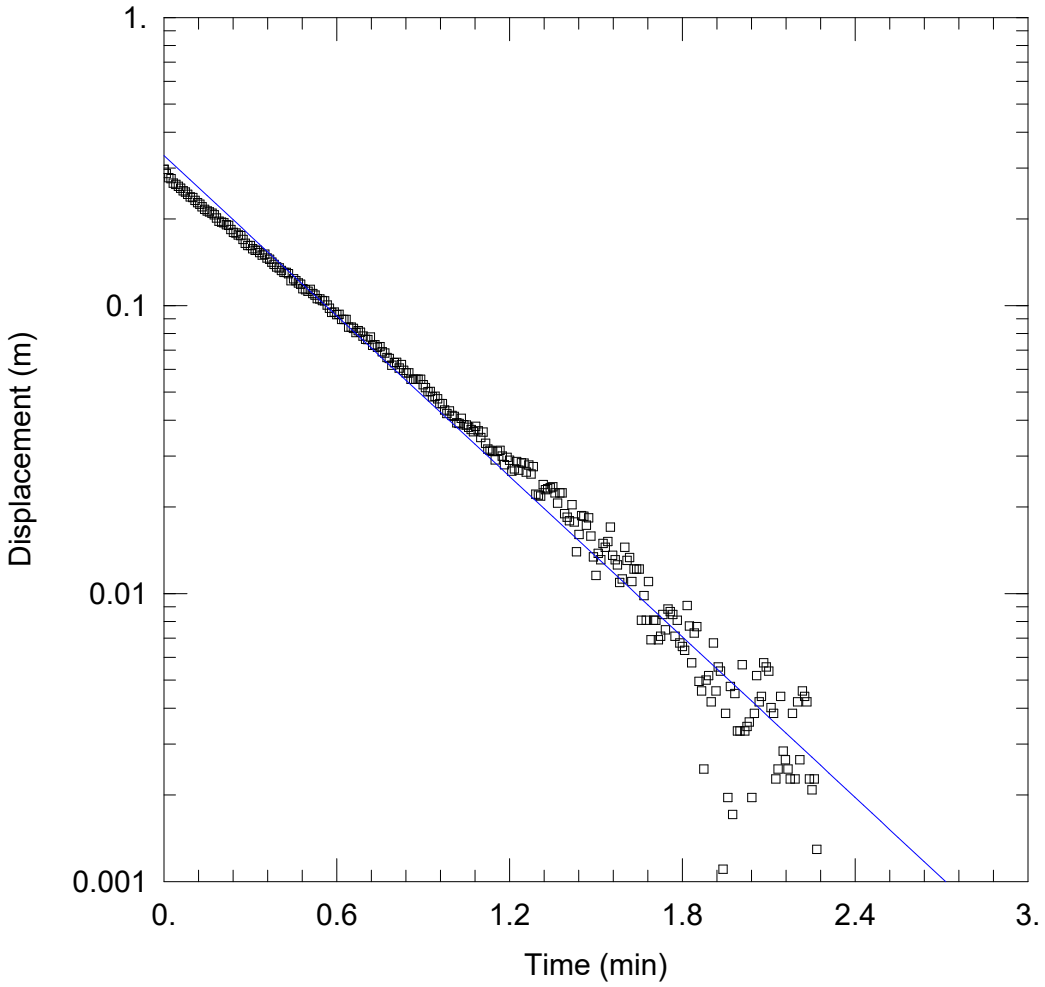
Company: Paterson Group
Client: Caivan Communities
Project: PG7301
Location: 4795 Bank Street
Test Well: BH2-26
Test Date: May 26, 2026

WELL DATA (BH2-26)

Initial Displacement: 0.291 m
Total Well Penetration Depth: 8.73 m
Casing Radius: 0.01588 m
Static Water Column Height: 8.73 m
Screen Length: 1.524 m
Well Radius: 0.0381 m

SOLUTION

Aquifer Model: Unconfined
K = 1.299E-5 m/sec
Solution Method: Hvorslev
y0 = 0.2999 m



WELL TEST ANALYSIS

Data Set: P:\...\PG7301- BH2-26 Rising Head 2 of 2.aqt
Date: 05/27/26 Time: 15:23:39

PROJECT INFORMATION

Company: Paterson Group
Client: Caivan Communities
Project: PG7301
Location: 4795 Bank Street
Test Well: BH2-26
Test Date: May 26, 2026

AQUIFER DATA

Saturated Thickness: 8.74 m Anisotropy Ratio (Kz/Kr): 0.1

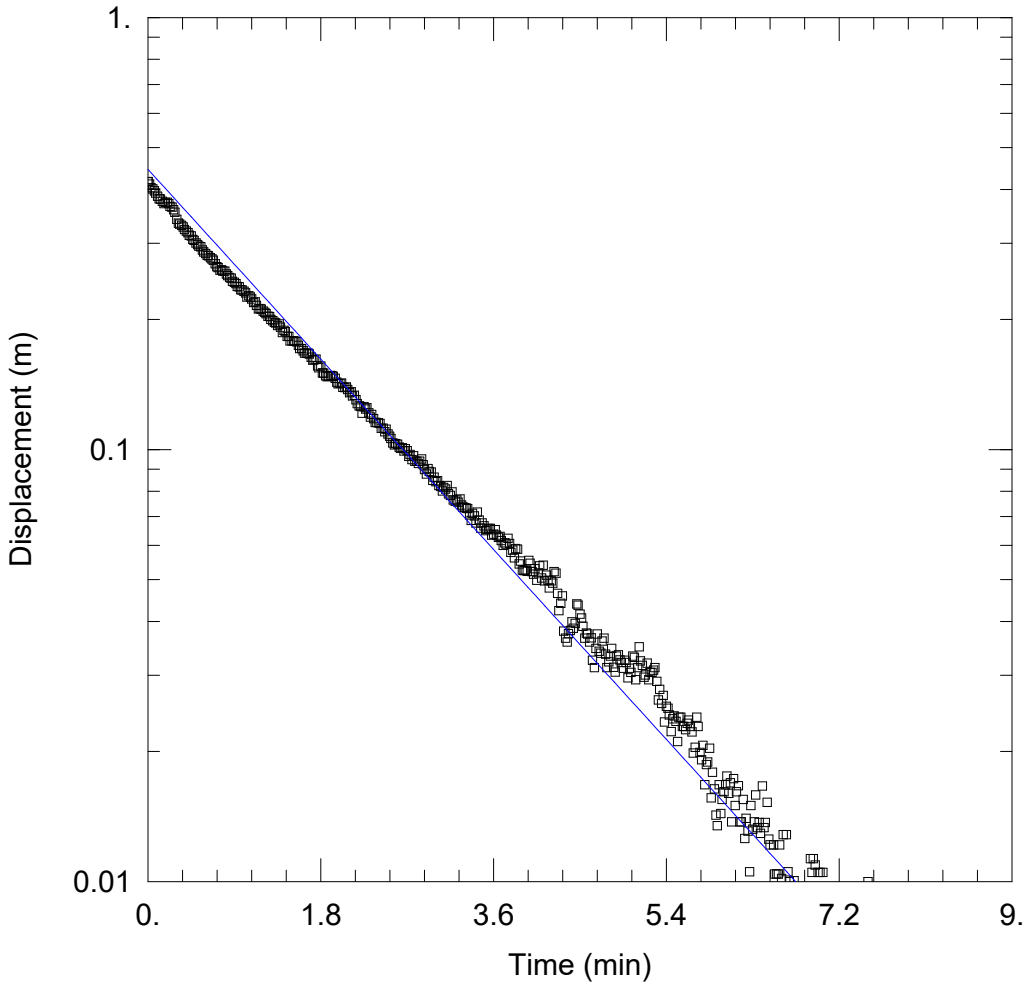
WELL DATA (BH2-26)

Initial Displacement: 0.2973 m
Total Well Penetration Depth: 8.74 m
Casing Radius: 0.01588 m
Static Water Column Height: 8.74 m
Screen Length: 1.524 m
Well Radius: 0.0381 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.63E-5 m/sec y0 = 0.3317 m



WELL TEST ANALYSIS

PROJECT INFORMATION

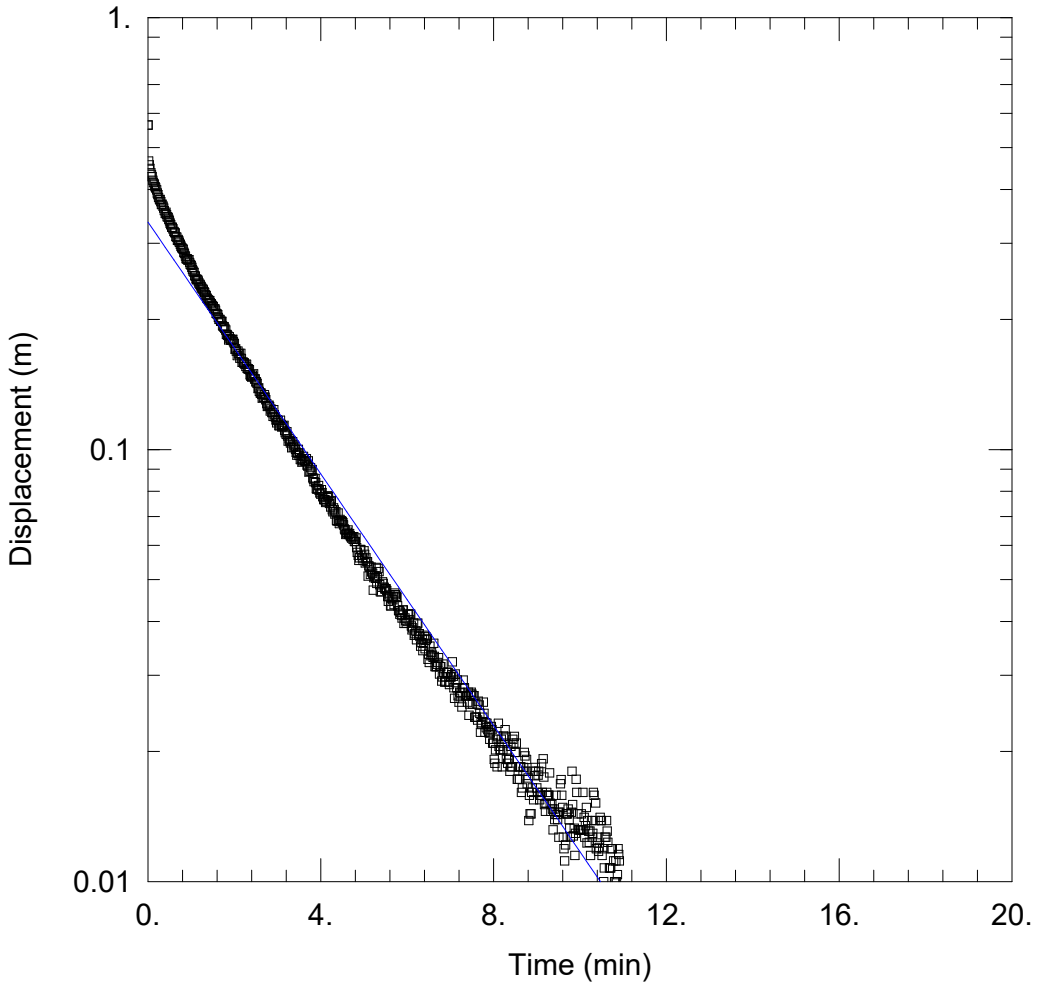
Company: Paterson Group
Client: Caivan Communities
Project: PG7301
Location: 4795 Bank Street
Test Well: BH3-26
Test Date: May 26, 2026

WELL DATA (BH3-26)

Initial Displacement: 0.417 m
Total Well Penetration Depth: 4.9 m
Casing Radius: 0.0254 m
Static Water Column Height: 4.9 m
Screen Length: 1.524 m
Well Radius: 0.1048 m

SOLUTION

Aquifer Model: Unconfined
K = 8.971E-6 m/sec
Solution Method: Hvorslev
y0 = 0.4452 m



WELL TEST ANALYSIS

PROJECT INFORMATION

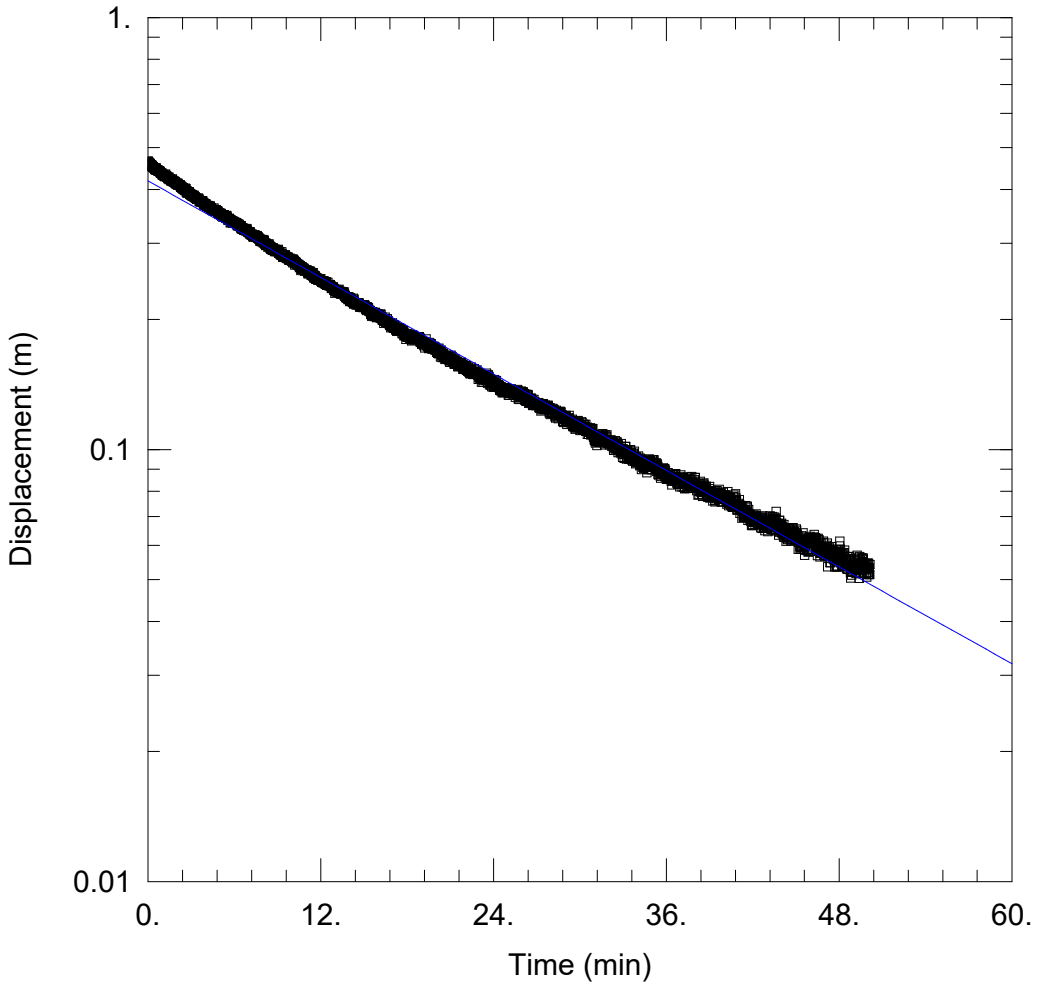
Company: Paterson Group
Client: Caivan Communities
Project: PG7301
Location: 4795 Bank Street
Test Well: BH3-26
Test Date: May 26, 2026

WELL DATA (BH3-26)

Initial Displacement: 0.564 m
Total Well Penetration Depth: 4.92 m
Casing Radius: 0.0254 m
Static Water Column Height: 4.92 m
Screen Length: 1.524 m
Well Radius: 0.1048 m

SOLUTION

Aquifer Model: Unconfined
K = 5.35E-6 m/sec
Solution Method: Hvorslev
y0 = 0.3359 m



WELL TEST ANALYSIS

PROJECT INFORMATION

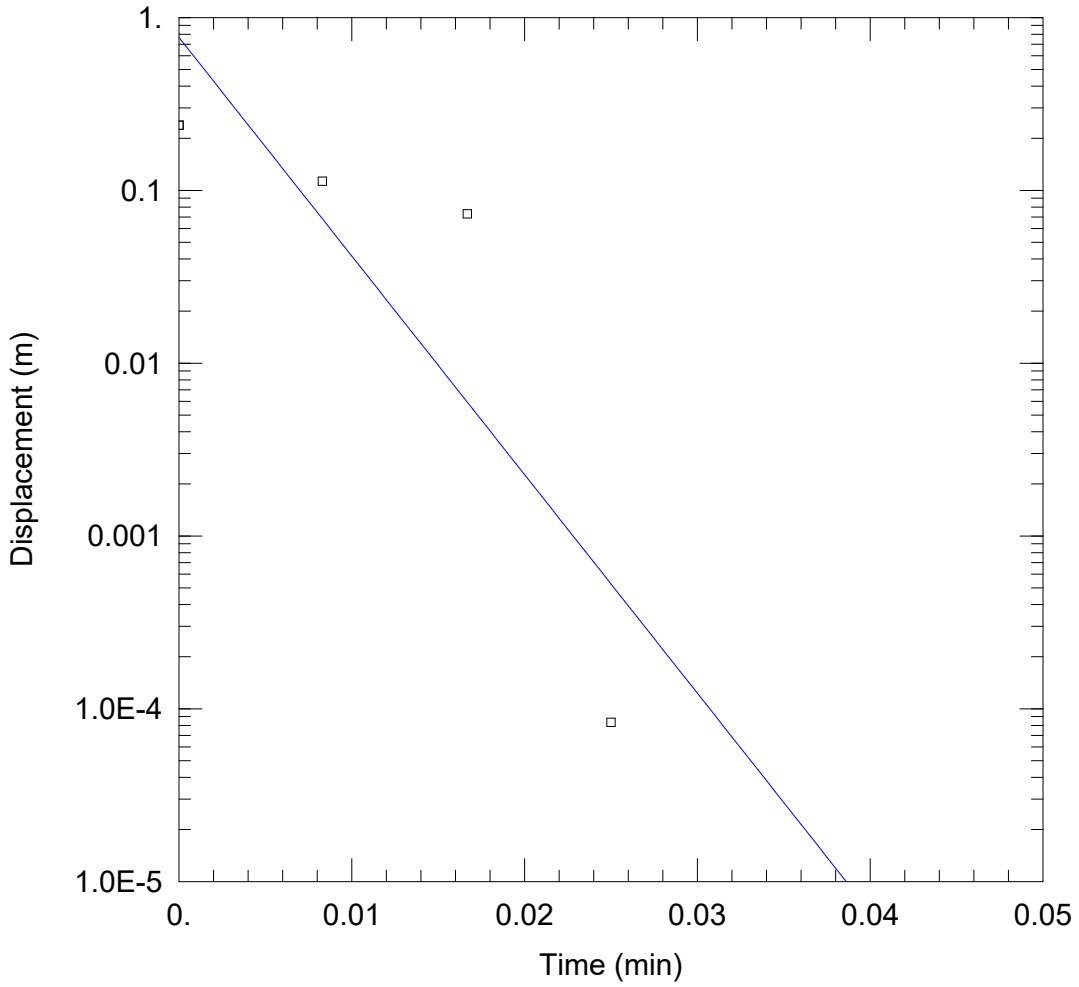
Company: Paterson Group
Client: Caivan Communities
Project: PG7301
Location: 4795 Bank Street
Test Well: BH4-26
Test Date: May 26, 2026

WELL DATA (BH4-26)

Initial Displacement: 0.465 m
Total Well Penetration Depth: 3.49 m
Casing Radius: 0.0254 m
Static Water Column Height: 3.49 m
Screen Length: 1.524 m
Well Radius: 0.1048 m

SOLUTION

Aquifer Model: Unconfined
K = 6.84E-7 m/sec
Solution Method: Hvorslev
y0 = 0.4184 m



WELL TEST ANALYSIS

PROJECT INFORMATION

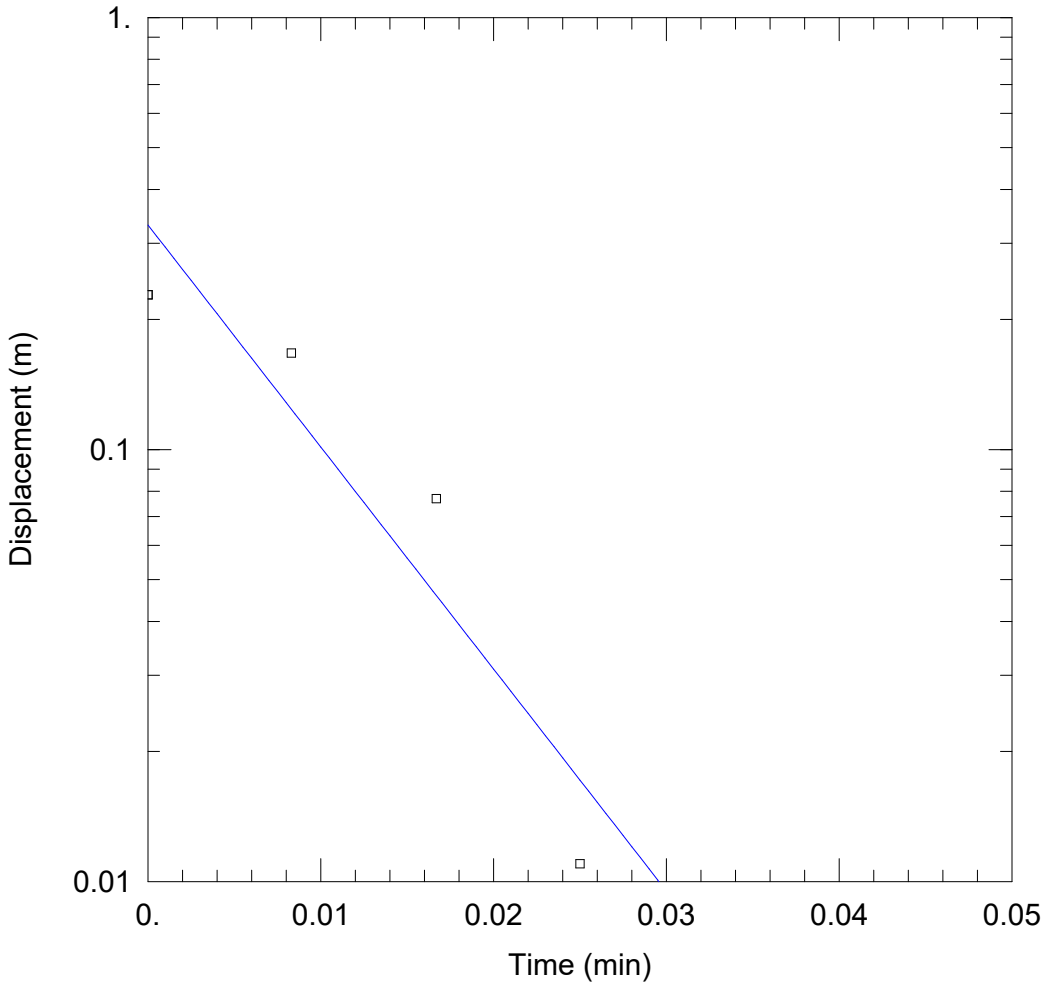
Company: Paterson Group
Client: Caivan Communities
Project: PG7301
Location: 4795 Bank Street
Test Well: BH5-26
Test Date: May 26, 2026

WELL DATA (BH5-26)

Initial Displacement: 0.2381 m
Total Well Penetration Depth: 5. m
Casing Radius: 0.0254 m
Static Water Column Height: 5. m
Screen Length: 1.524 m
Well Radius: 0.0381 m

SOLUTION

Aquifer Model: Unconfined
K = 0.005686 m/sec
Solution Method: Hvorslev
y0 = 0.7668 m



WELL TEST ANALYSIS

Data Set: P:\...\PG7301- BH5-26 Rising Head 2 of 2.aqt
Date: 05/27/26 Time: 16:18:16

PROJECT INFORMATION

Company: Paterson Group
Client: Caivan Communities
Project: PG7301
Location: 4795 Bank Street
Test Well: BH5-26
Test Date: May 26, 2026

AQUIFER DATA

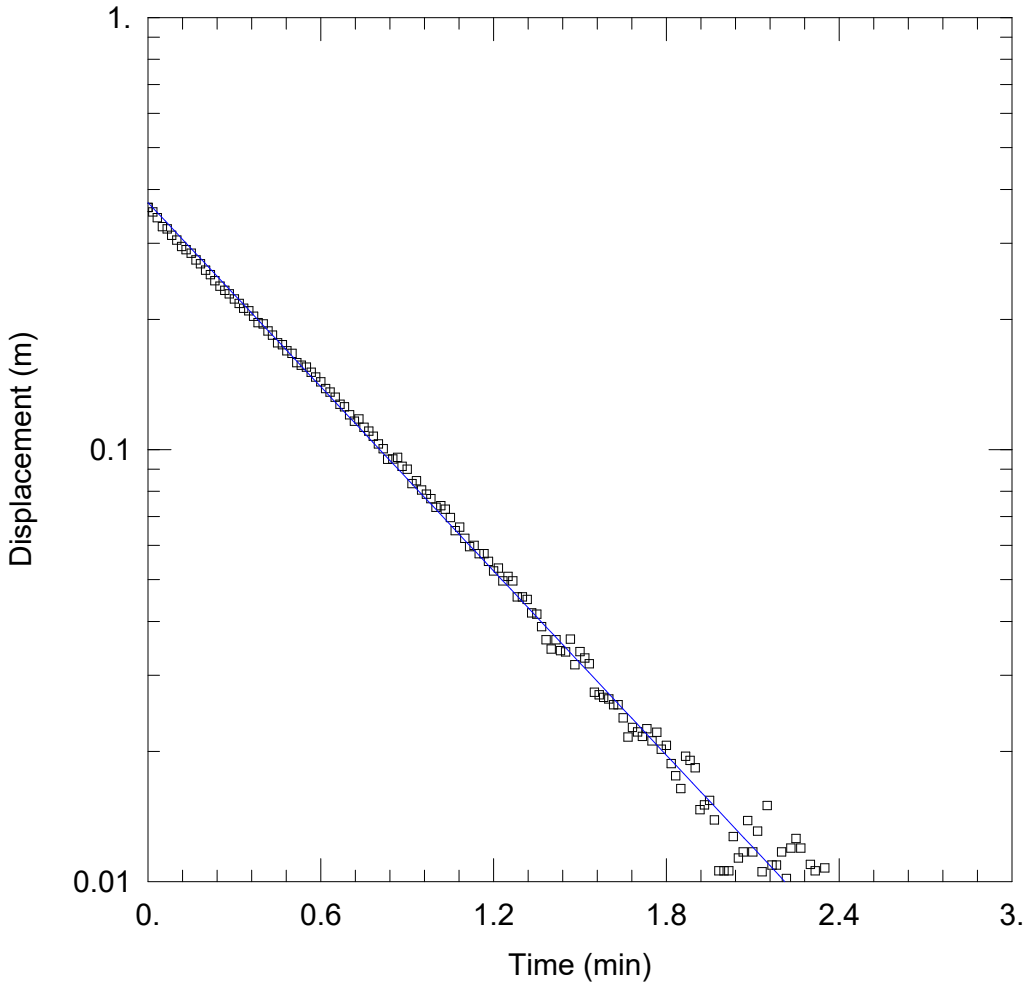
Saturated Thickness: 5. m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (BH5-26)

Initial Displacement: 0.228 m
Total Well Penetration Depth: 5. m
Casing Radius: 0.0254 m
Static Water Column Height: 5. m
Screen Length: 1.524 m
Well Radius: 0.0381 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.00231 m/sec
y0 = 0.3309 m



WELL TEST ANALYSIS

PROJECT INFORMATION

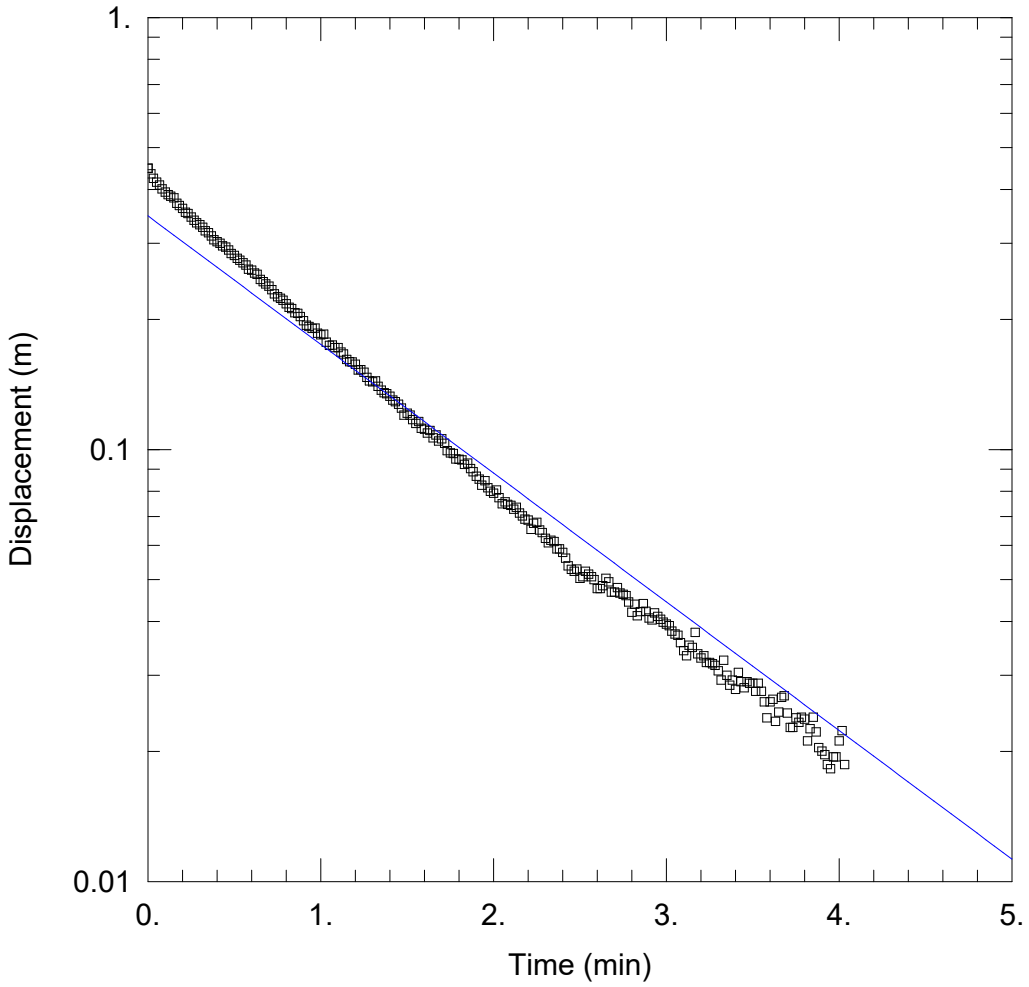
Company: Paterson Group
Client: Caivan Communities
Project: PG7301
Location: 4795 Bank Street
Test Well: BH6-26
Test Date: May 26, 2026

WELL DATA (BH6-26)

Initial Displacement: 0.3633 m
Total Well Penetration Depth: 3.23 m
Casing Radius: 0.0254 m
Static Water Column Height: 3.23 m
Screen Length: 1.524 m
Well Radius: 0.1048 m

SOLUTION

Aquifer Model: Unconfined
K = 2.61E-5 m/sec
Solution Method: Hvorslev
y0 = 0.3729 m



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: Paterson Group
Client: Caivan Communities
Project: PG7301
Location: 4795 Bank Street
Test Well: BH6-26
Test Date: May 26, 2026

WELL DATA (BH6-26)

Initial Displacement: 0.448 m
Total Well Penetration Depth: 3.22 m
Casing Radius: 0.0254 m
Static Water Column Height: 3.22 m
Screen Length: 1.524 m
Well Radius: 0.1048 m

SOLUTION

Aquifer Model: Unconfined
K = 9.259E-6 m/sec
Solution Method: Hvorslev
y0 = 0.3474 m

APPENDIX 2

FIGURE 1 - KEY PLAN

FIGURES 2 to 5 – SLOPE STABILITY SECTIONS

MONITORING WELL WATER ELEVATION PLOTS

DRAWING PG7301-1 – TEST HOLE LOCATION PLAN

DRAWING PG7301-2 – BEDROCK CONTOUR PLAN

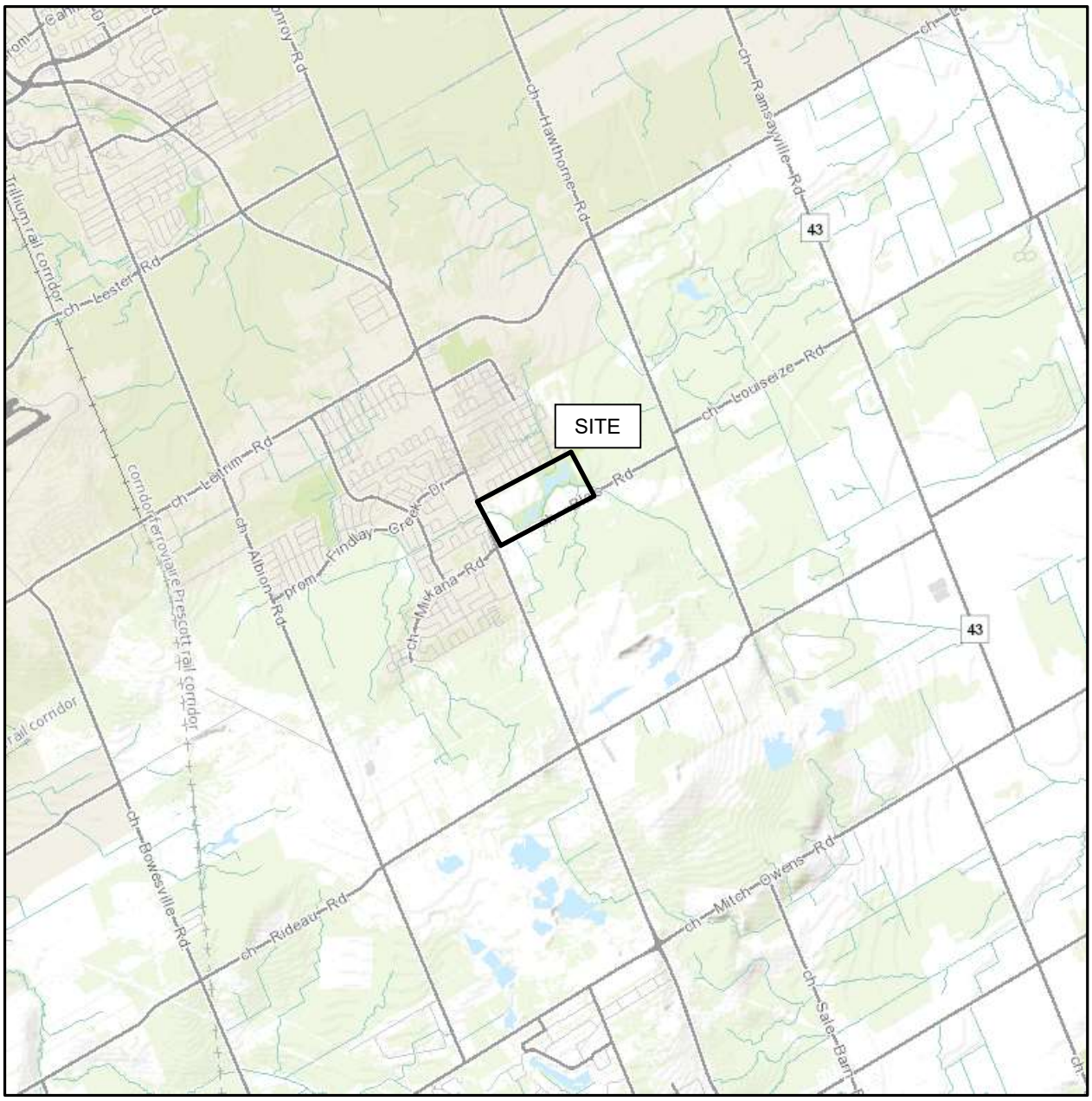
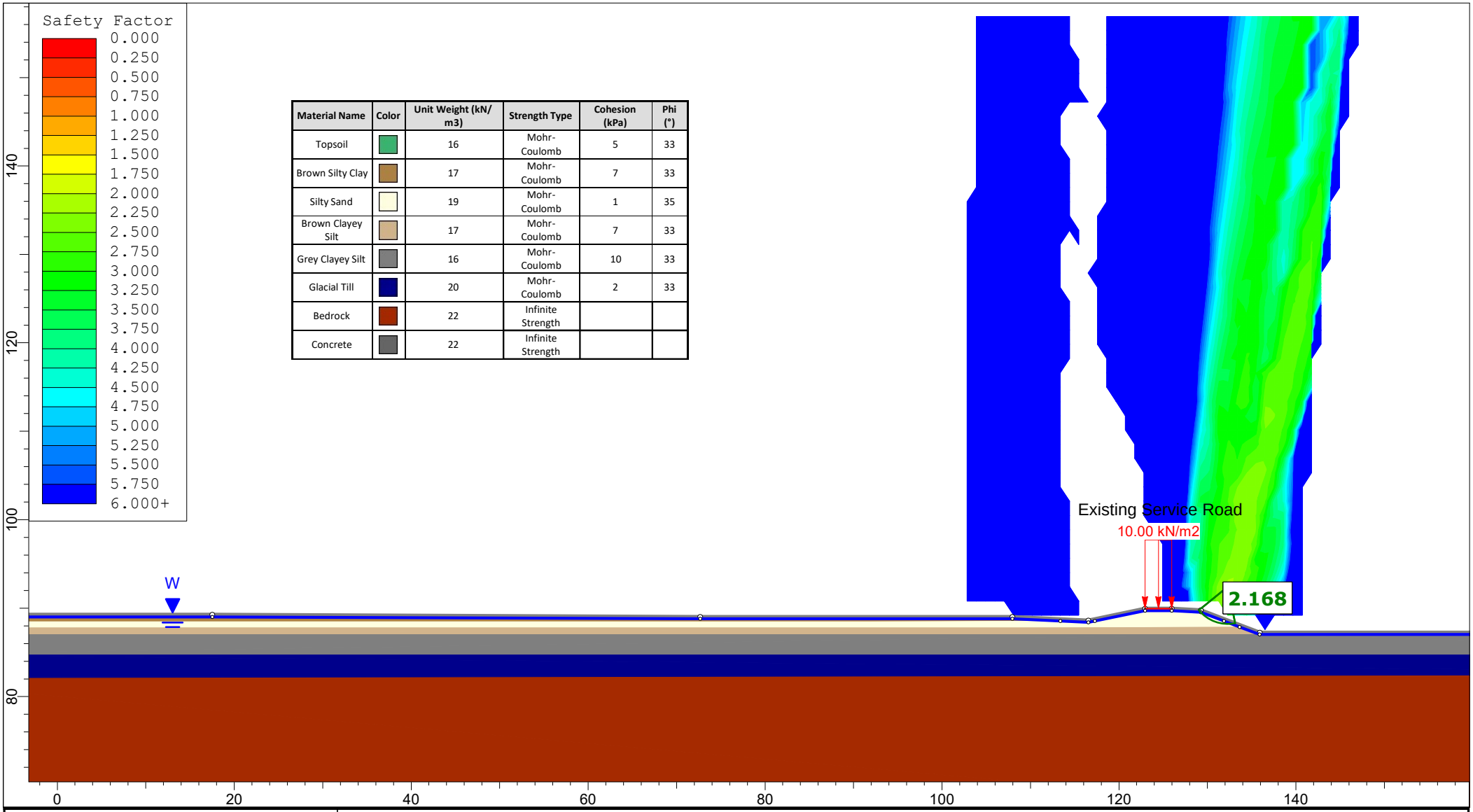


FIGURE 1

KEY PLAN

PATERSON GROUP

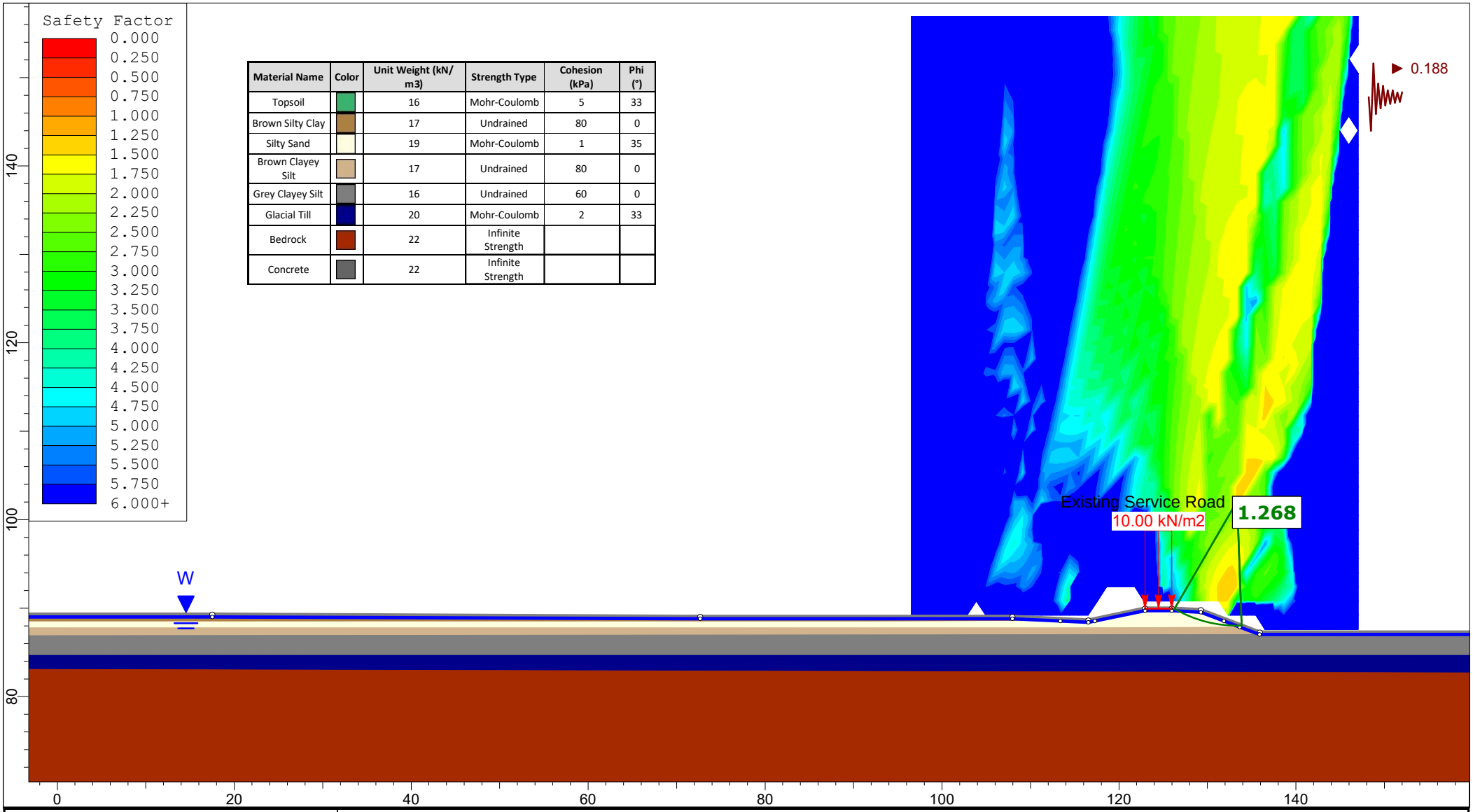


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)
Topsoil		16	Mohr-Coulomb	5	33
Brown Silty Clay		17	Mohr-Coulomb	7	33
Silty Sand		19	Mohr-Coulomb	1	35
Brown Clayey Silt		17	Mohr-Coulomb	7	33
Grey Clayey Silt		16	Mohr-Coulomb	10	33
Glacial Till		20	Mohr-Coulomb	2	33
Bedrock		22	Infinite Strength		
Concrete		22	Infinite Strength		

PATERSON GROUP

SLIDEINTERPRET 9.036

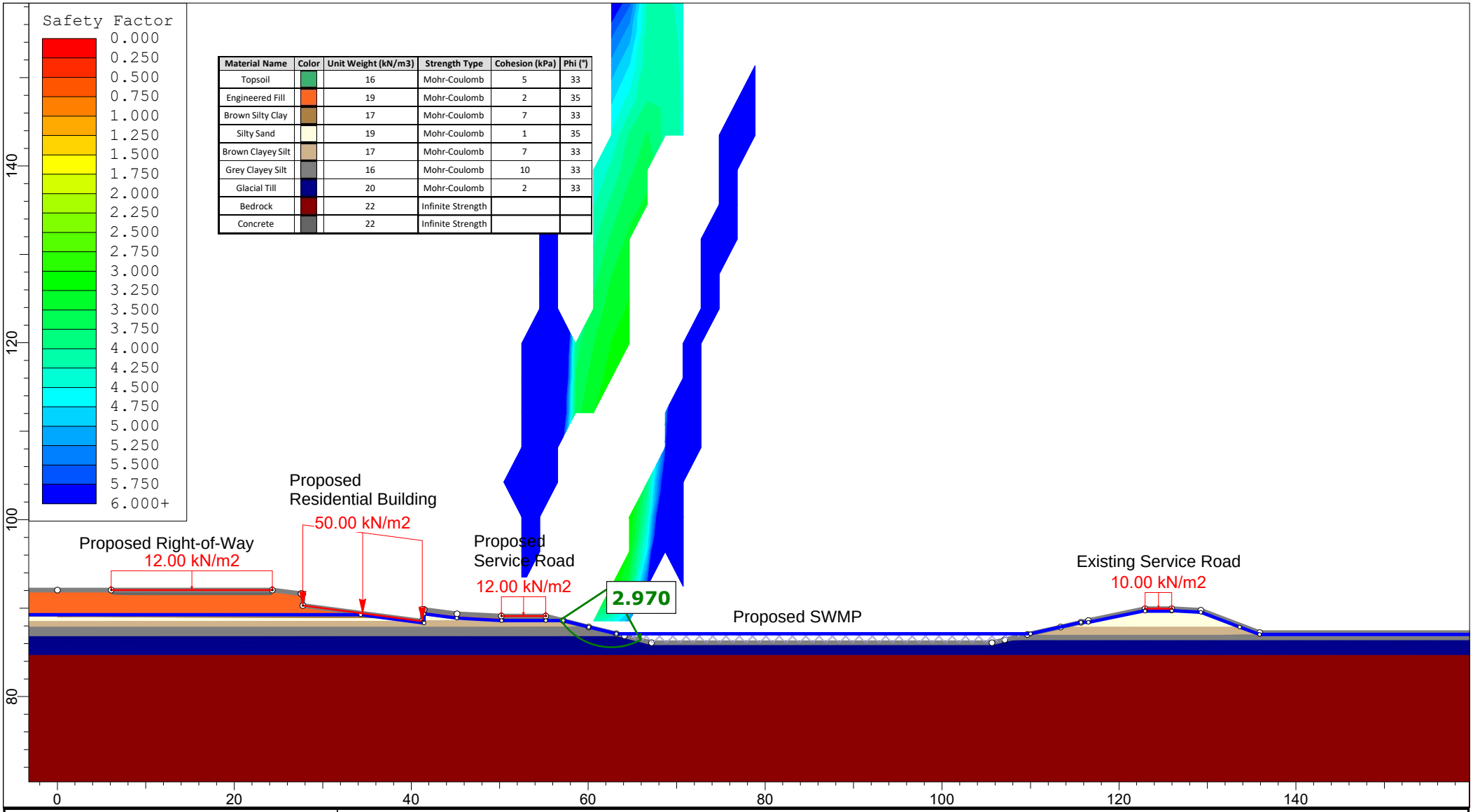
Project No.:	**PG7301 - 4795 Bank Street, Ottawa, ON**		
Drawing No.:	**Figure 2A - Section A-A - Existing Conditions - Static Analysis**		
Prepared By: MA		Approved By: KP	*Date:* 2026-06-26



PATERSON GROUP

SLIDEINTERPRET 9.036

Project No.:	**PG7301 - 4795 Bank Street, Ottawa, ON**		
Drawing No.:	**Figure 2B - Section A-A - Existing Conditions - Seismic Analysis**		
Prepared By: MA	Approved By: KP	*Date:* 2026-06-26	

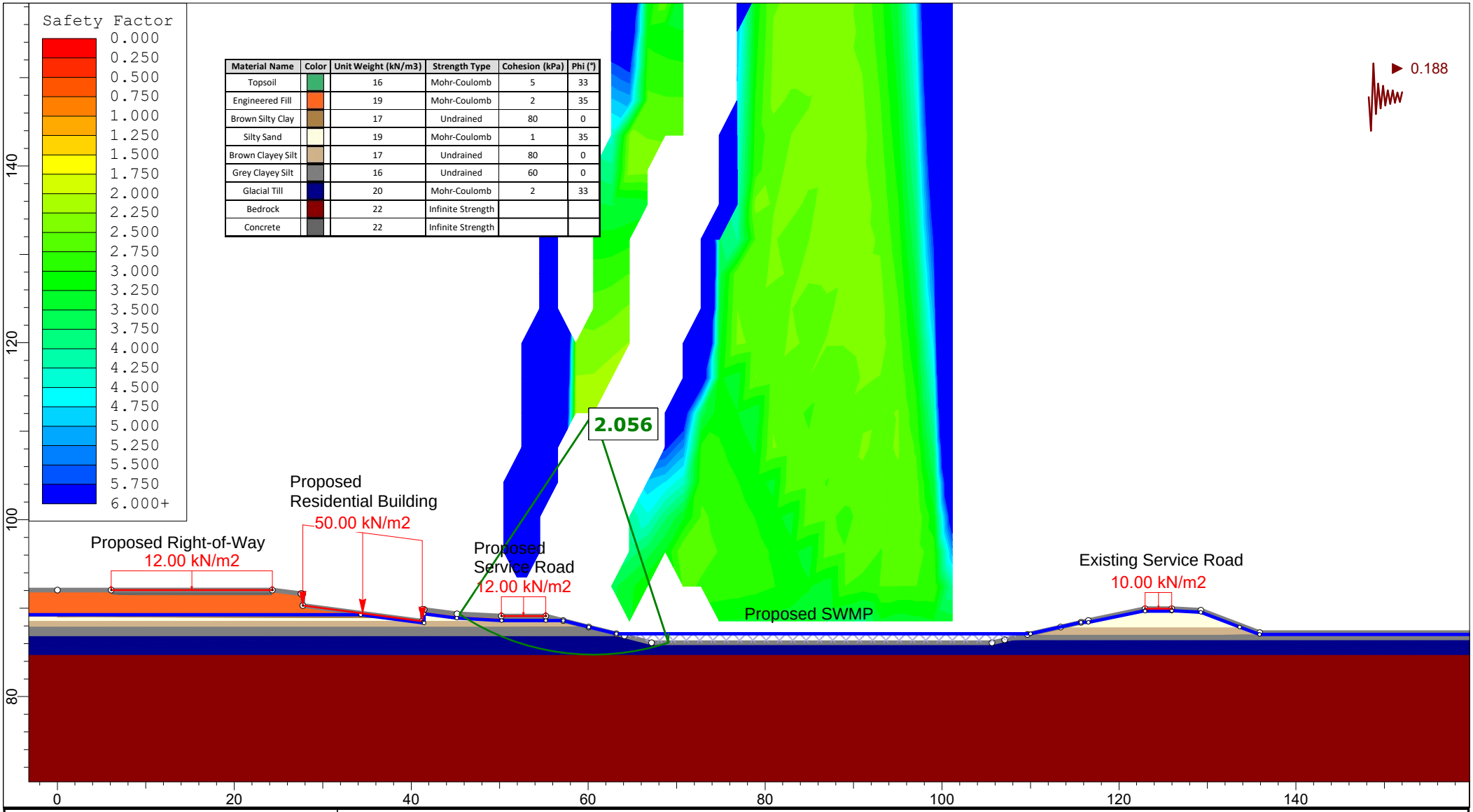


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)
Topsoil		16	Mohr-Coulomb	5	33
Engineered Fill		19	Mohr-Coulomb	2	35
Brown Silty Clay		17	Mohr-Coulomb	7	33
Silty Sand		19	Mohr-Coulomb	1	35
Brown Clayey Silt		17	Mohr-Coulomb	7	33
Grey Clayey Silt		16	Mohr-Coulomb	10	33
Glacial Till		20	Mohr-Coulomb	2	33
Bedrock		22	Infinite Strength		
Concrete		22	Infinite Strength		

PATERSON GROUP

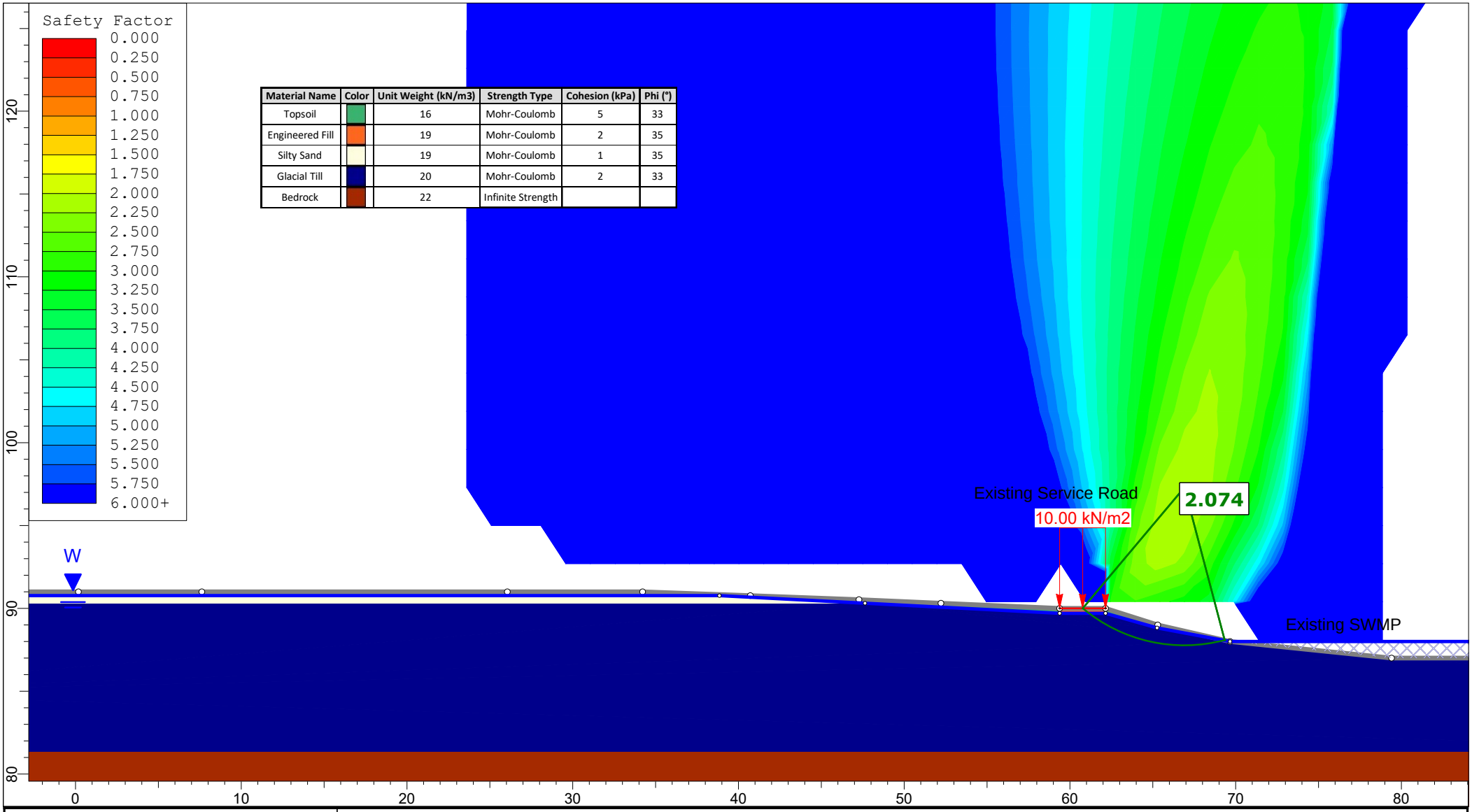
SLIDEINTERPRET 9.036

Project No.:	**PG7301 - 4795 Bank Street, Ottawa, ON**		
Drawing No.:	**Figure 2C - Section A-A - Proposed Conditions - Static Analysis**		
Prepared By: MA		Approved By: KP	*Date:* 2026-06-26



PATERSON GROUP	*Project No.:*	**PG7301 - 4795 Bank Street, Ottawa, ON**	
	Drawing No.:	**Figure 2D - Section A-A - Proposed Conditions - Seismic Analysis**	
	Prepared By: MA	Approved By: KP	*Date:* 2026-06-26

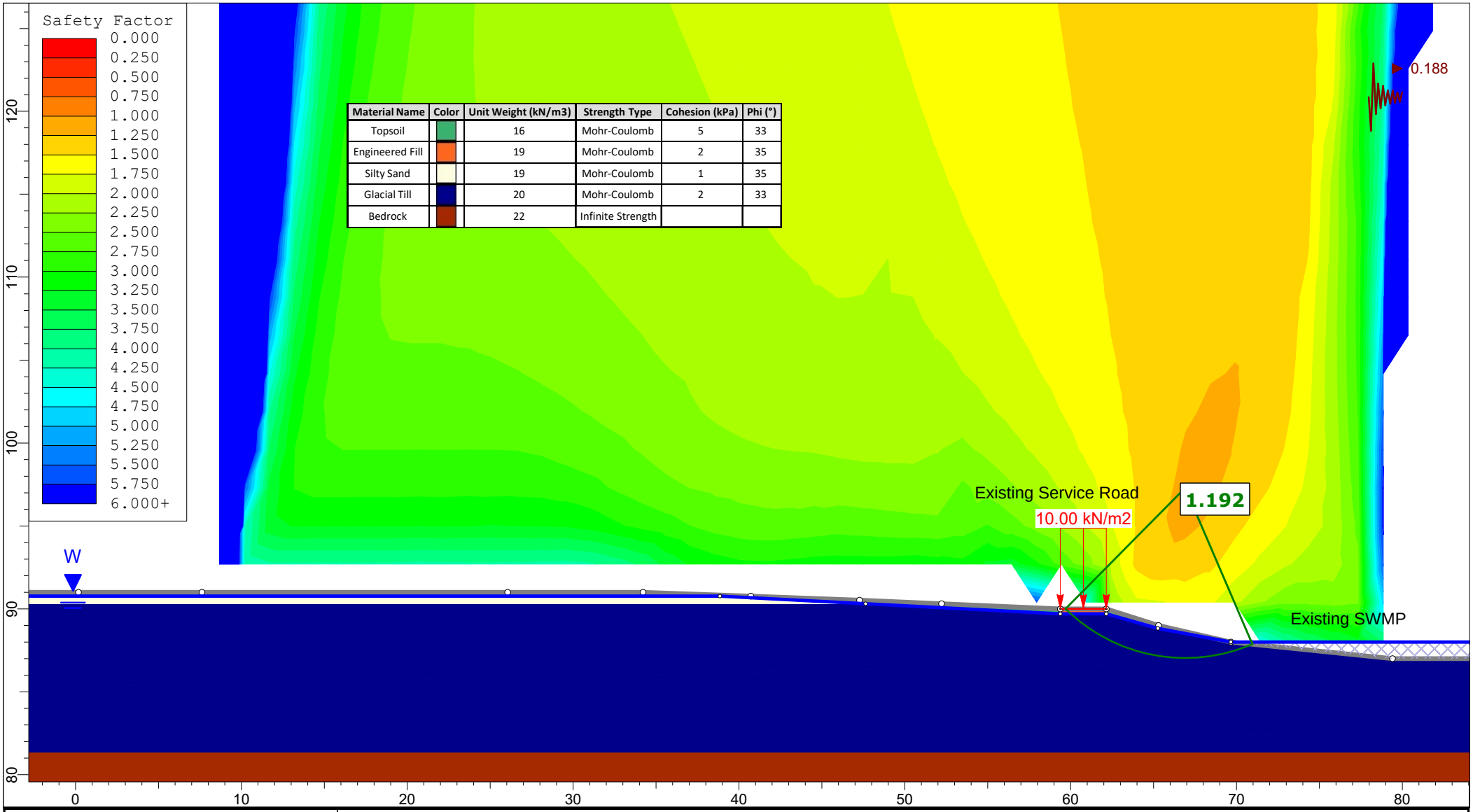
SLIDEINTERPRET 9.036



PATERSON GROUP

SLIDEINTERPRET 9.036

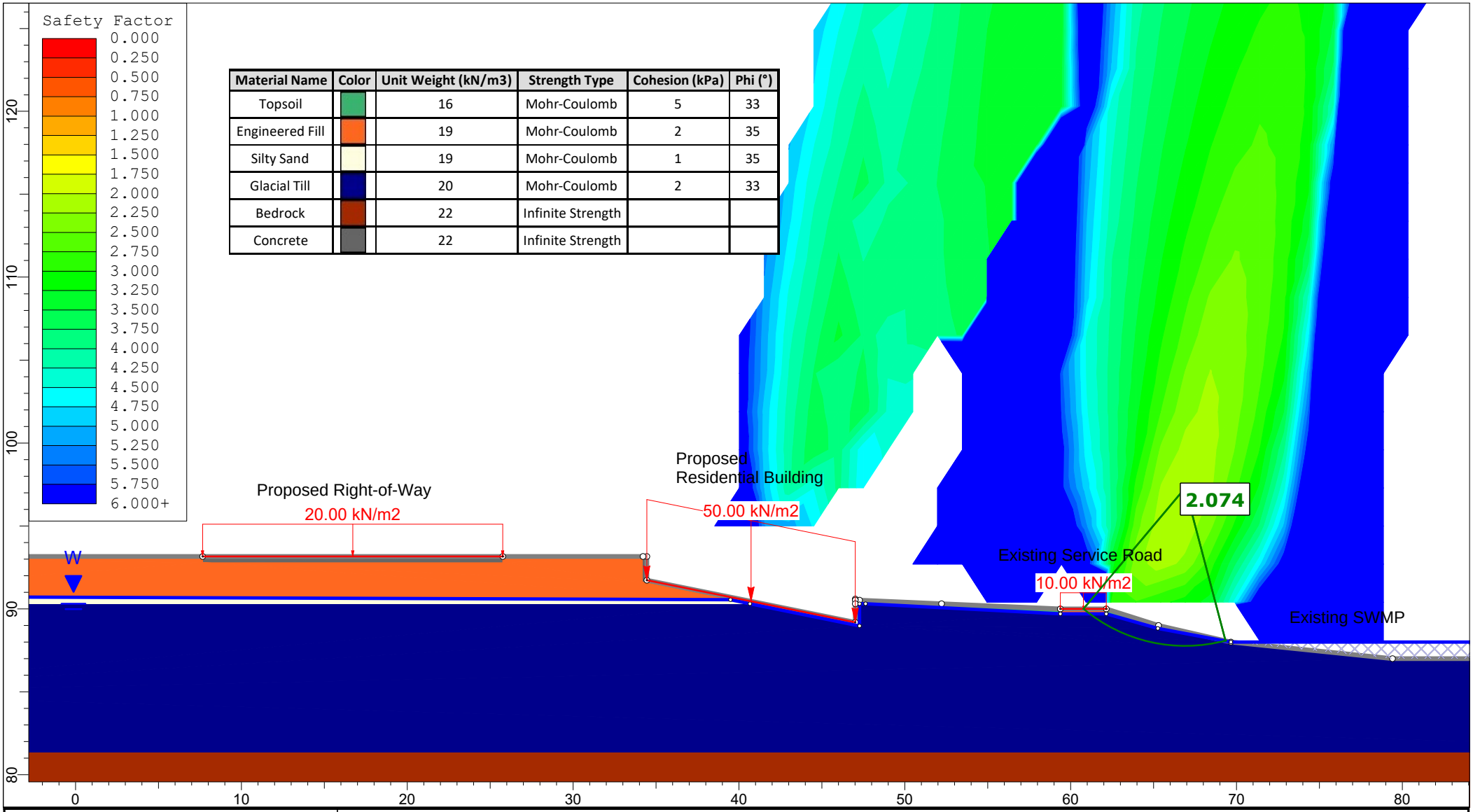
Project No.:	**PG7301 - 4795 Bank Street, Ottawa, ON**		
Drawing No.:	**Figure 3A - Section B-B - Existing Conditions - Static Analysis**		
Prepared By: MA		Approved By: KP	*Date:* 2026-06-26



PATERSON GROUP

SLIDEINTERPRET 9.036

Project No.:	**PG7301 - 4795 Bank Street, Ottawa, ON**		
Drawing No.:	**Figure 3B - Section B-B - Existing Conditions - Seismic Analysis**		
Prepared By: MA		Approved By: KP	*Date:* 2026-06-26

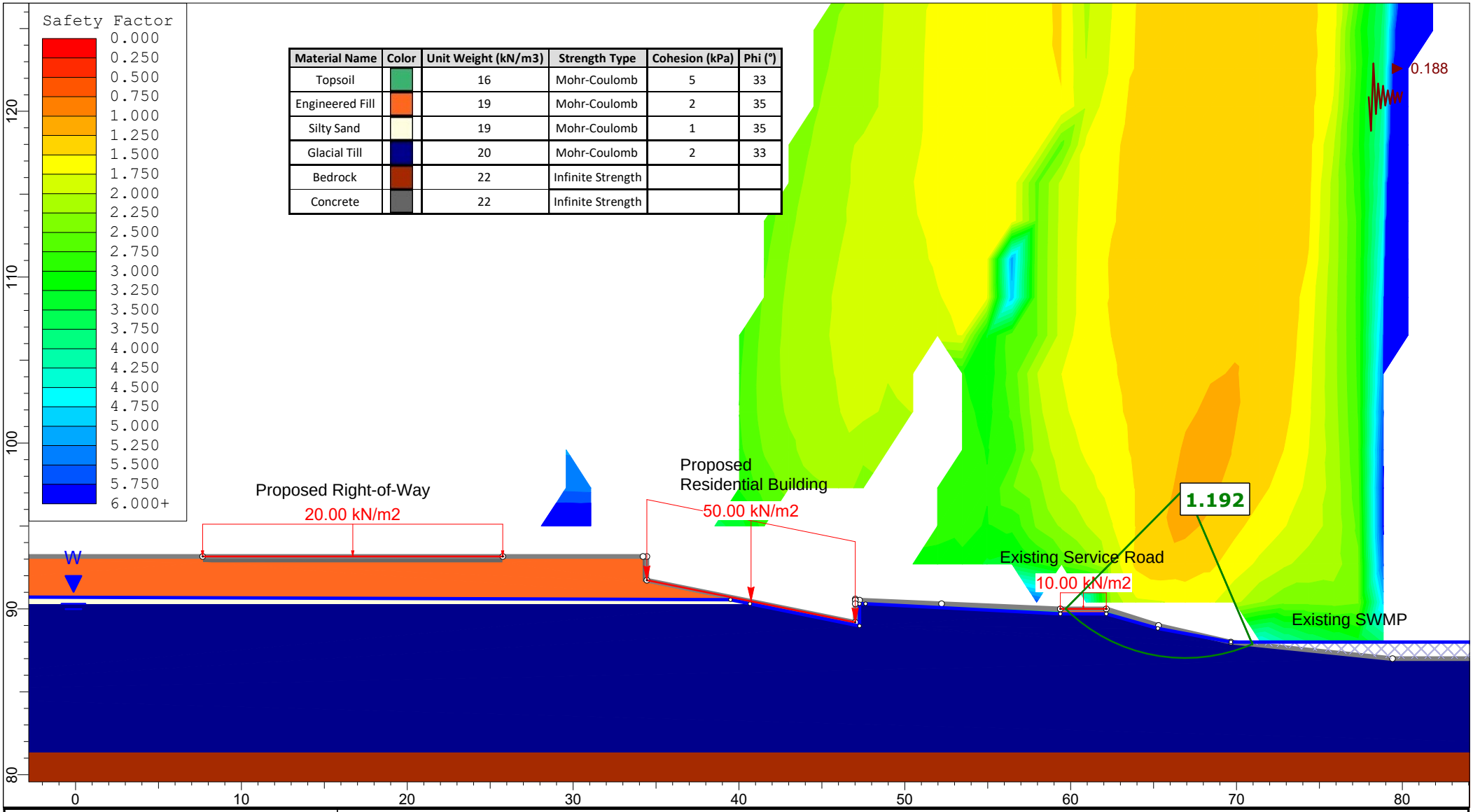


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)
Topsoil		16	Mohr-Coulomb	5	33
Engineered Fill		19	Mohr-Coulomb	2	35
Silty Sand		19	Mohr-Coulomb	1	35
Glacial Till		20	Mohr-Coulomb	2	33
Bedrock		22	Infinite Strength		
Concrete		22	Infinite Strength		

PATERSON GROUP

SLIDEINTERPRET 9.036

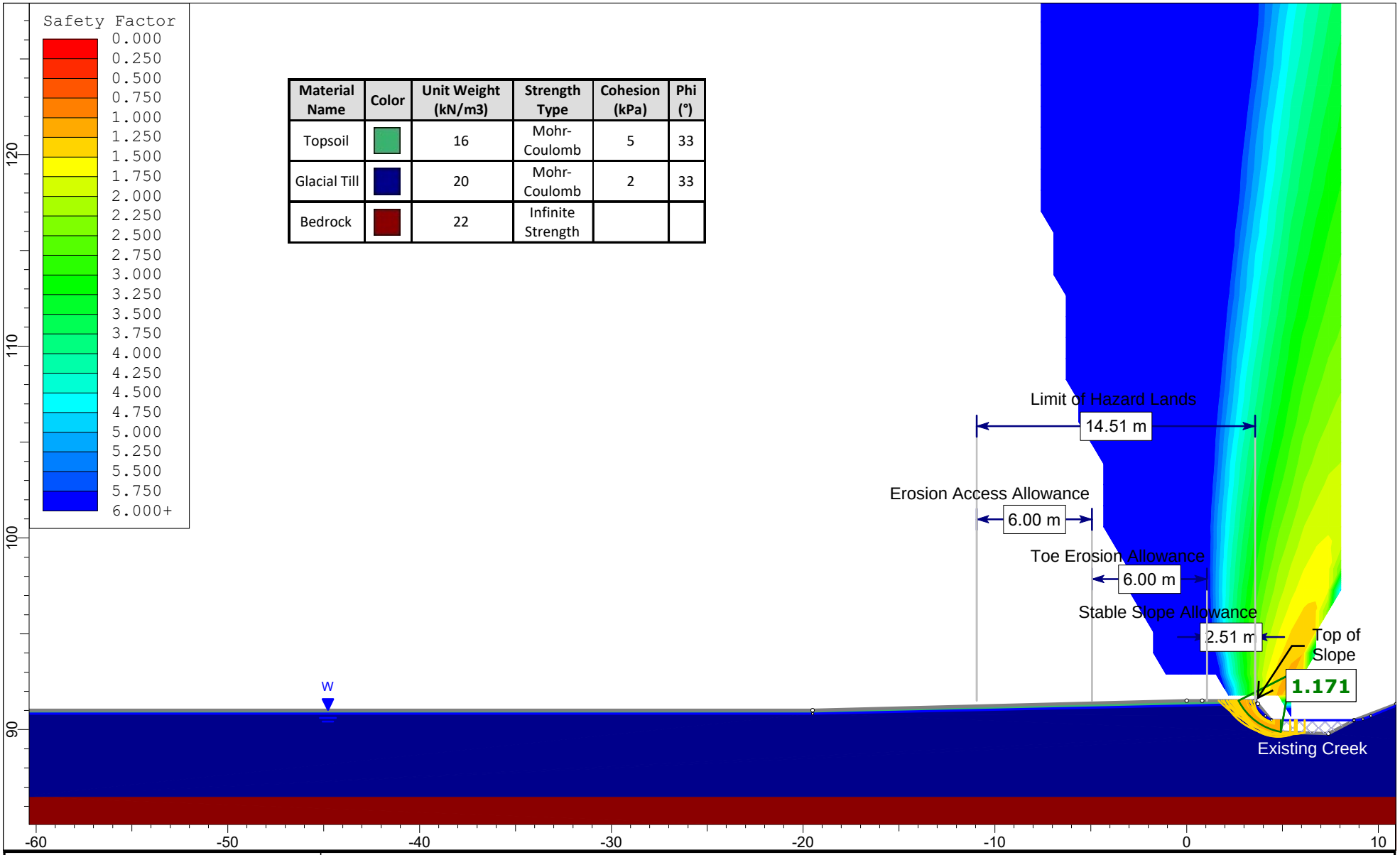
Project No.:	**PG7301 - 4795 Bank Street, Ottawa, ON**		
Drawing No.:	**Figure 3C - Section B-B - Proposed Conditions - Static Analysis**		
Prepared By: MA	Approved By: KP	*Date:* 2026-06-26	



PATERSON GROUP

SLIDEINTERPRET 9.036

Project No.:	**PG7301 - 4795 Bank Street, Ottawa, ON**		
Drawing No.:	**Figure 3D - Section B-B - Proposed Conditions - Seismic Analysis**		
Prepared By: MA		Approved By: KP	*Date:* 2026-06-26

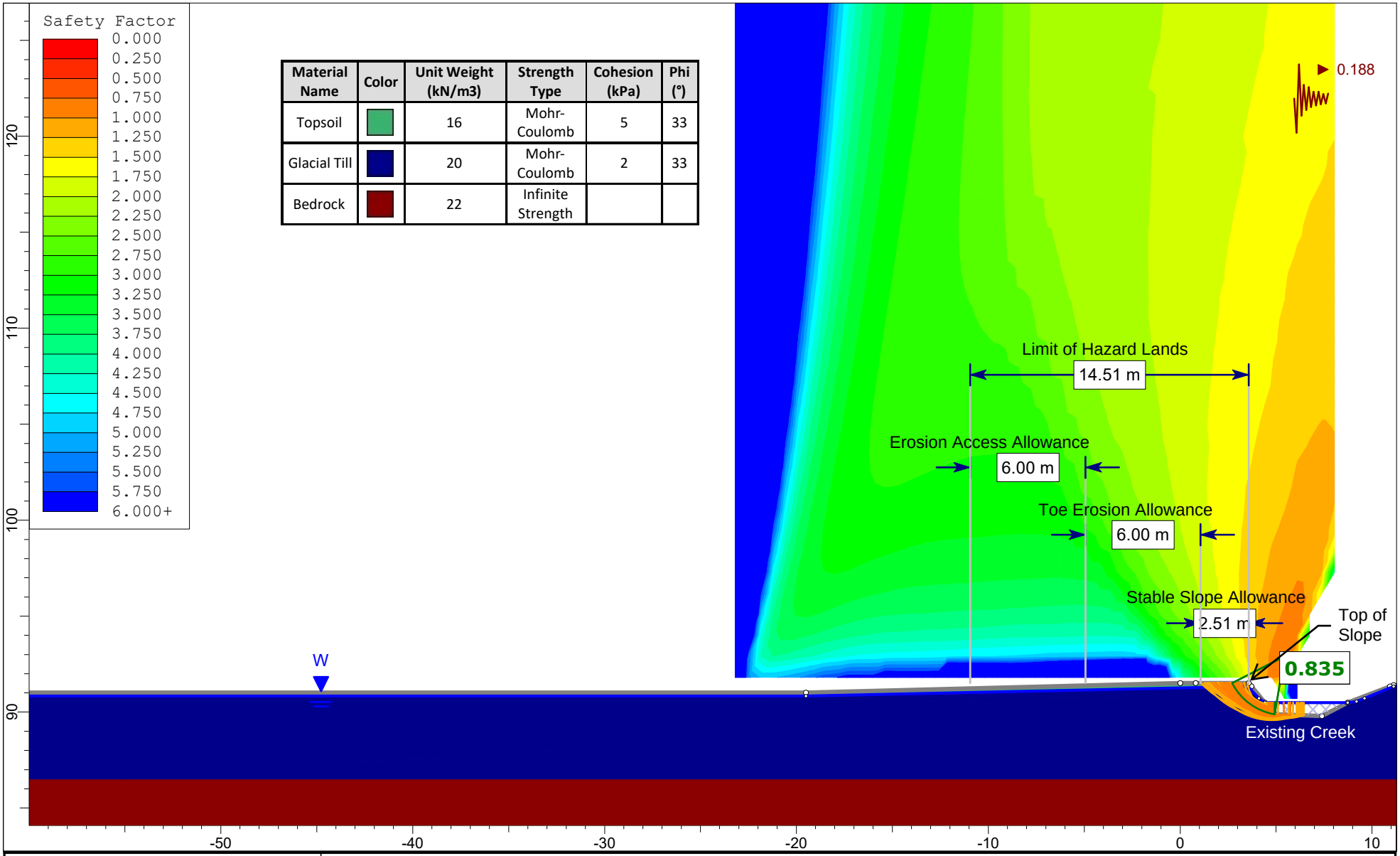


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)
Topsoil		16	Mohr-Coulomb	5	33
Glacial Till		20	Mohr-Coulomb	2	33
Bedrock		22	Infinite Strength		

PATERSON GROUP

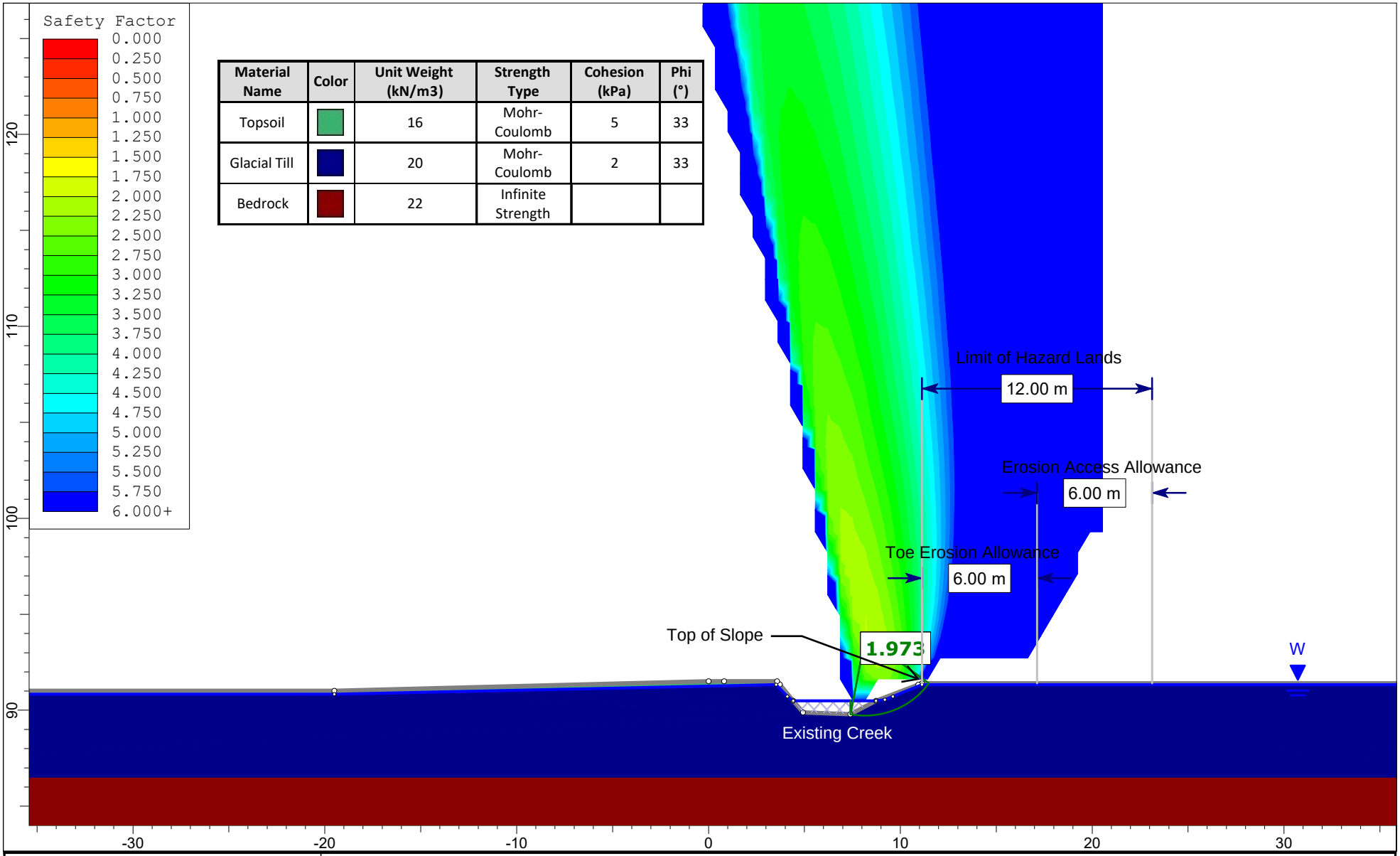
SLIDEINTERPRET 9.036

Project No.:	**PG7301 - 4795 Bank Street, Ottawa, ON**		
Drawing No.:	**Figure 4A - Section C-C - Existing Conditions - Static Analysis**		
Prepared By: MA		Approved By: KP	*Date:* 2026-06-26



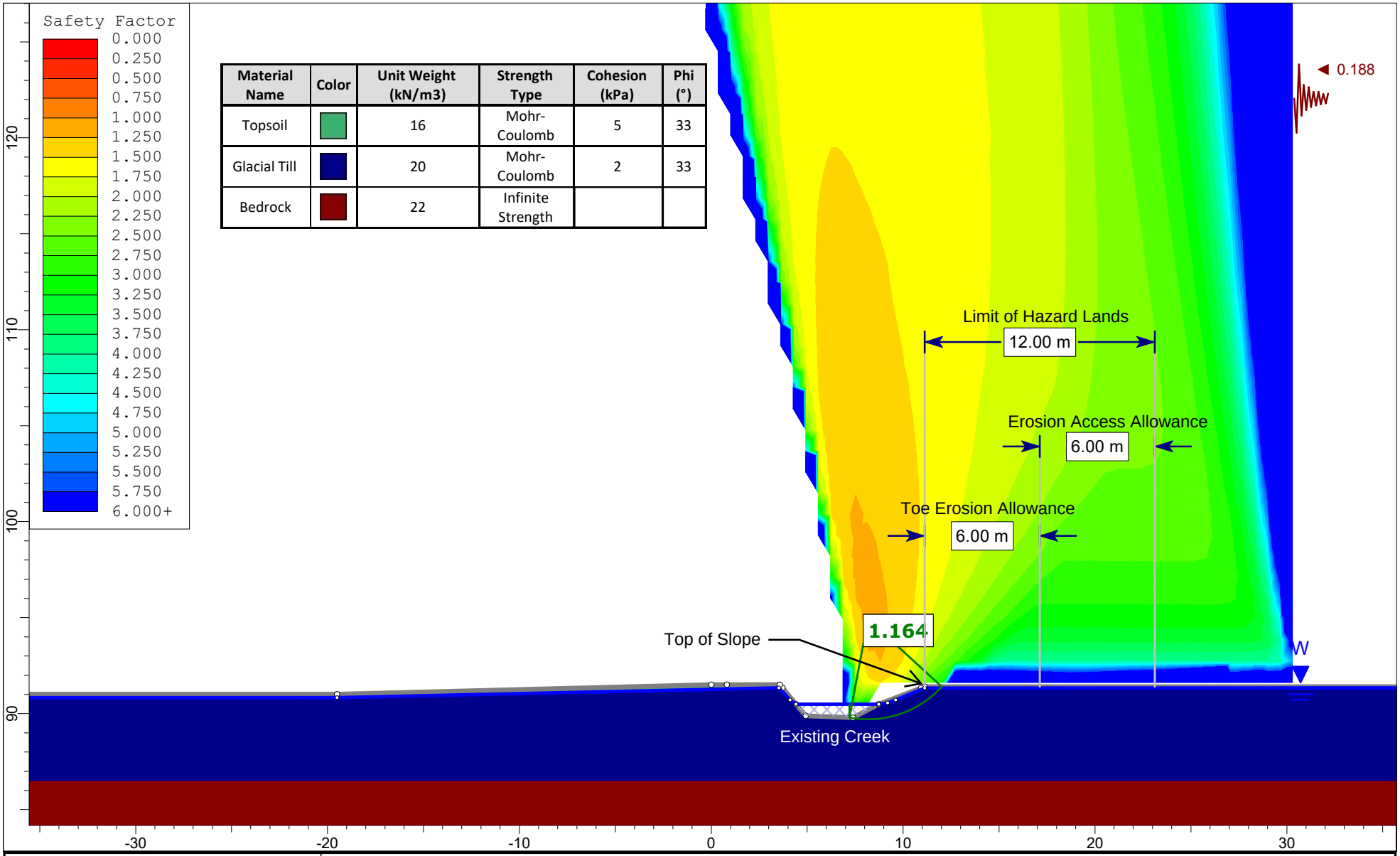
PATERSON GROUP	*Project No.:*	**PG7301 - 4795 Bank Street, Ottawa, ON**	
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	Prepared By: MA	Approved By: KP	*Date:* 2026-06-26

SLIDEINTERPRET 9.036



PATERSON GROUP	*Project No.:*	**PG7301 - 4795 Bank Street, Ottawa, ON**	
	Drawing No.:	**Figure 5A - Section C-C - Existing Conditions - Static Analysis**	
	Prepared By: MA	Approved By: KP	*Date:* 2026-06-26

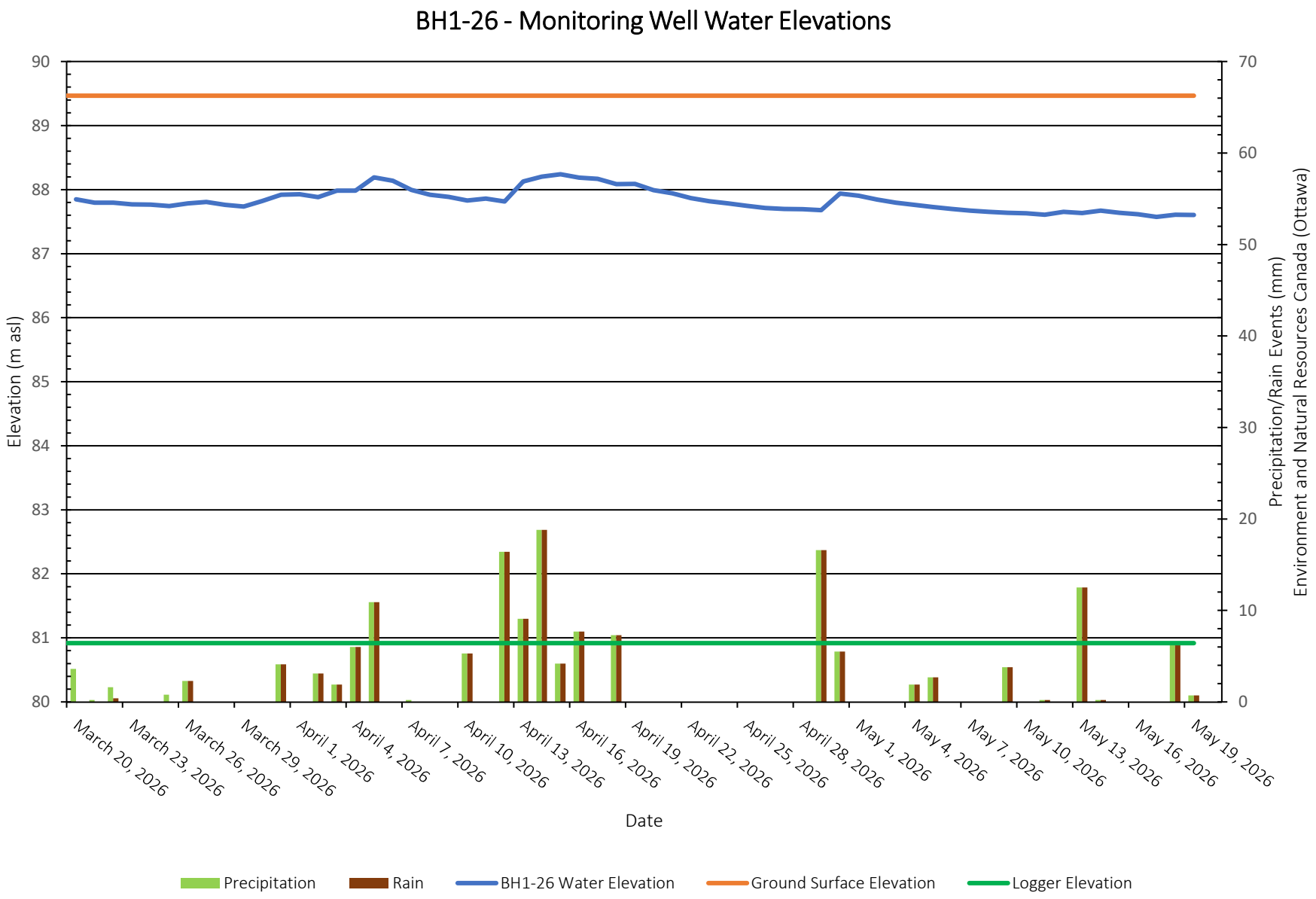
SLIDEINTERPRET 9.036



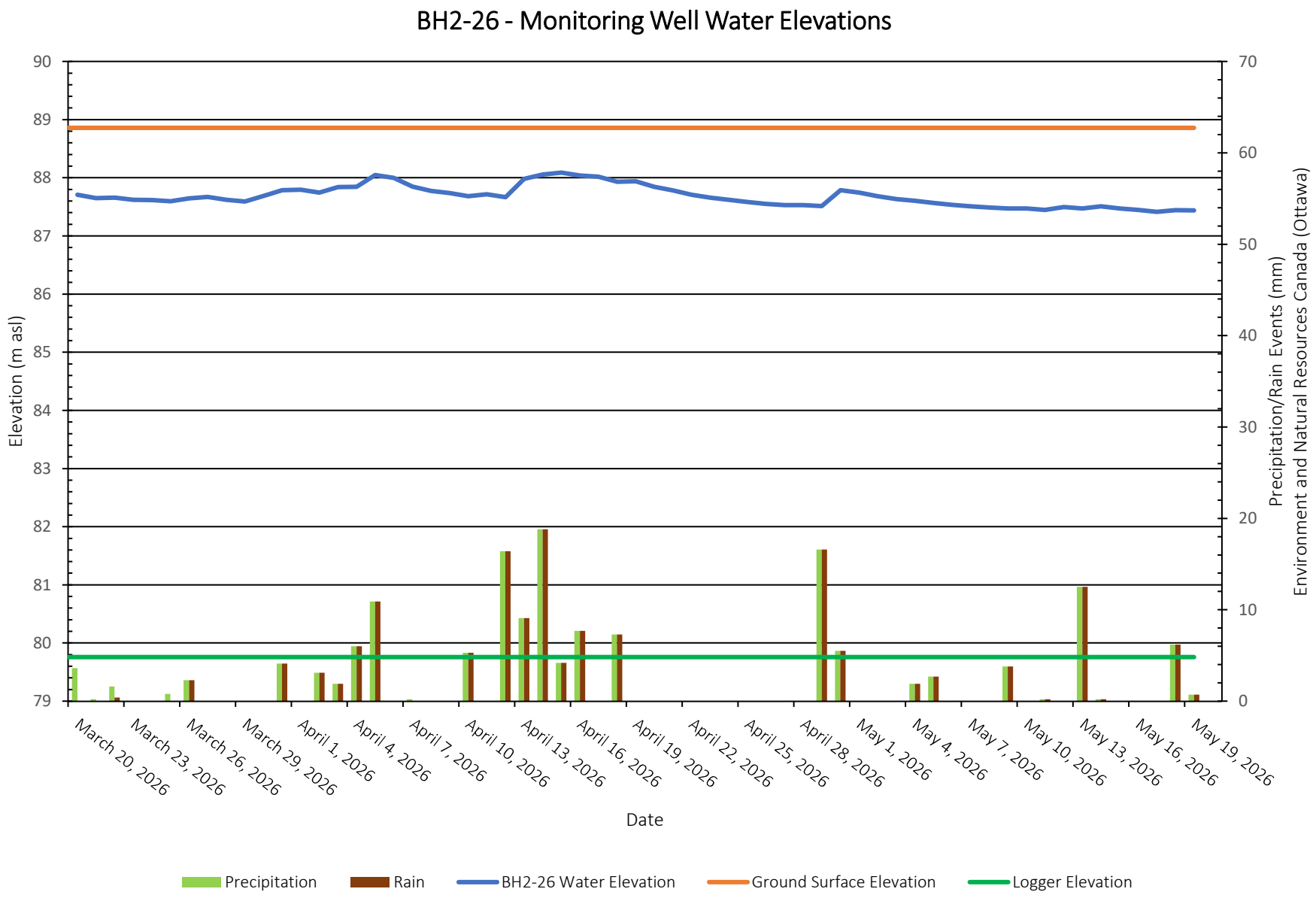
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	Drawing No.:	**Figure 5B - Section C-C - Existing Conditions - Seismic Analysis**	
	Prepared By: MA	Approved By: KP	*Date:* 2026-06-26

SLIDEINTERPRET 9.036

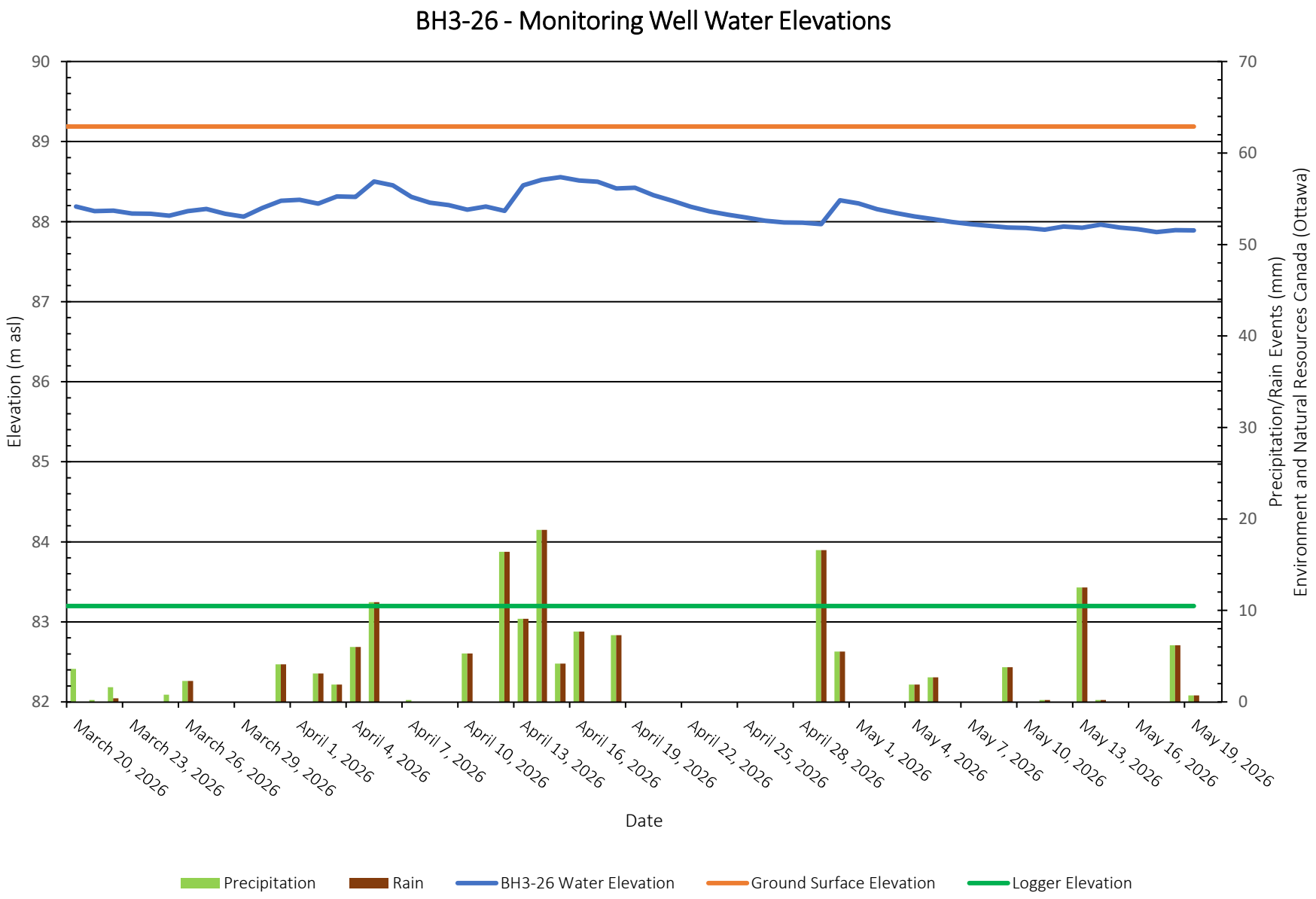
Caivan Communities
4795 Bank Street and 3301 Blais Road, Ottawa
Monitoring Well Water Elevations



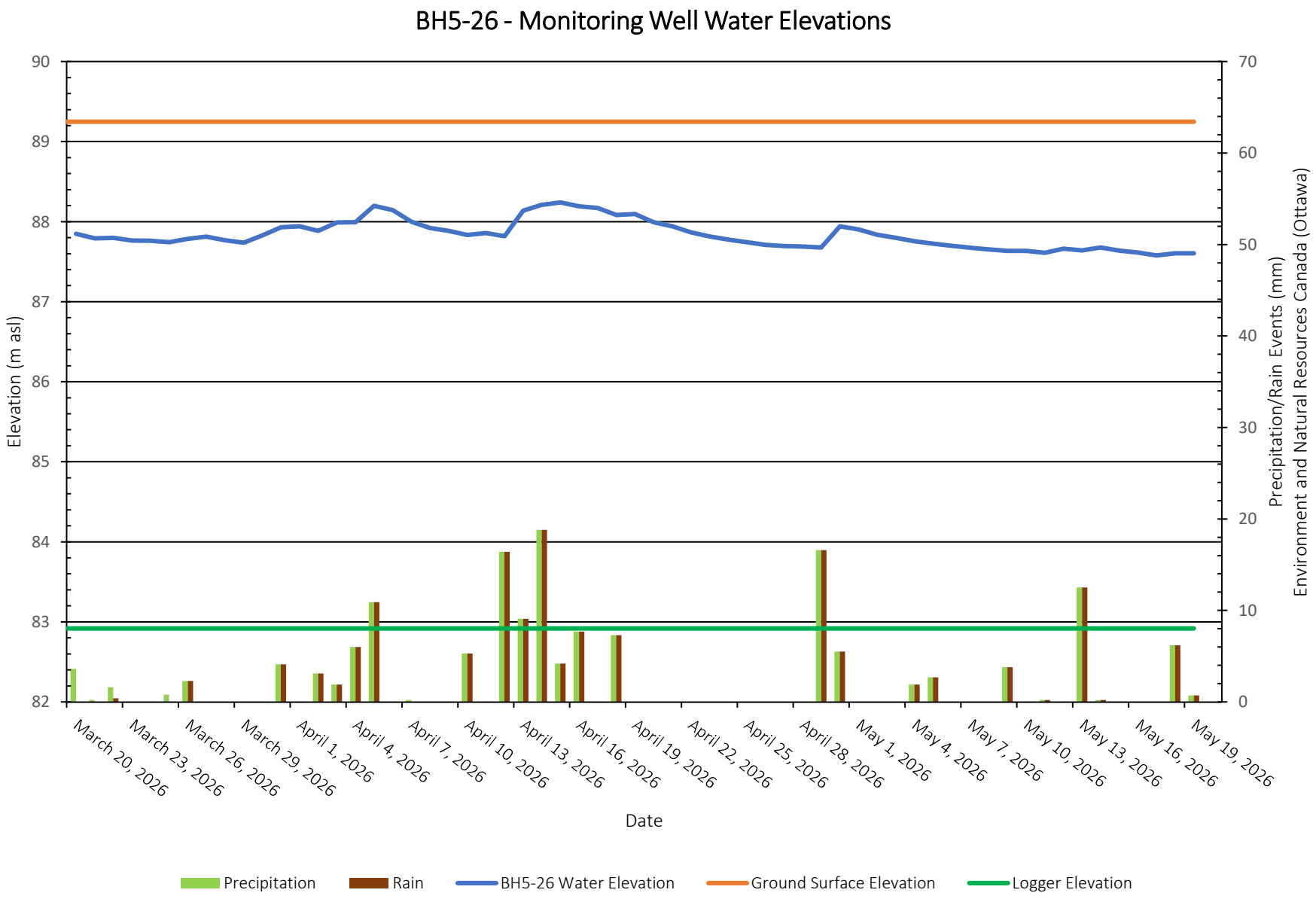
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Monitoring Well Water Elevations



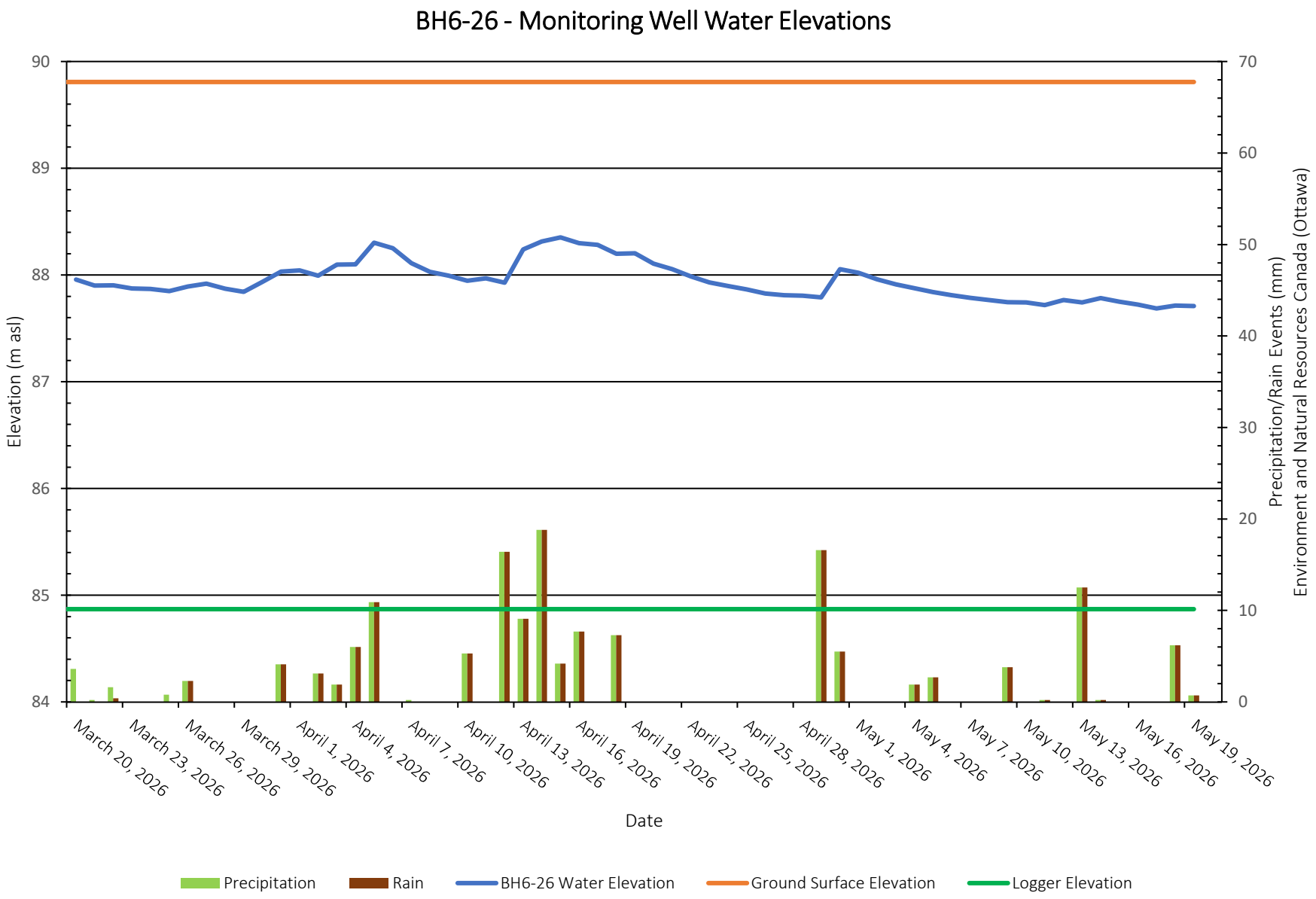
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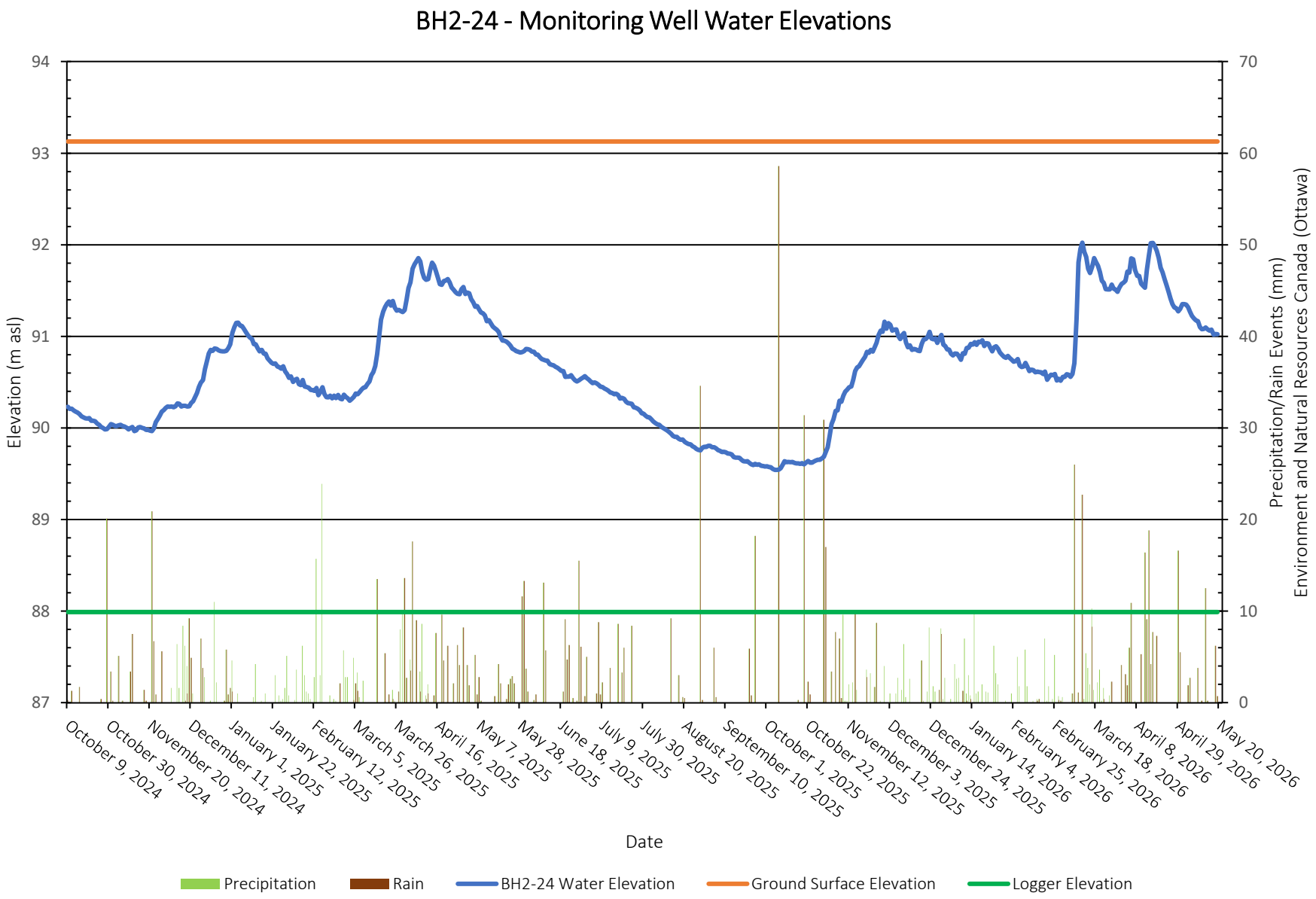
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4795 Bank Street and 3301 Blais Road, Ottawa
Monitoring Well Water Elevations



Caivan Communities
4795 Bank Street and 3301 Blais Road, Ottawa
Monitoring Well Water Elevations

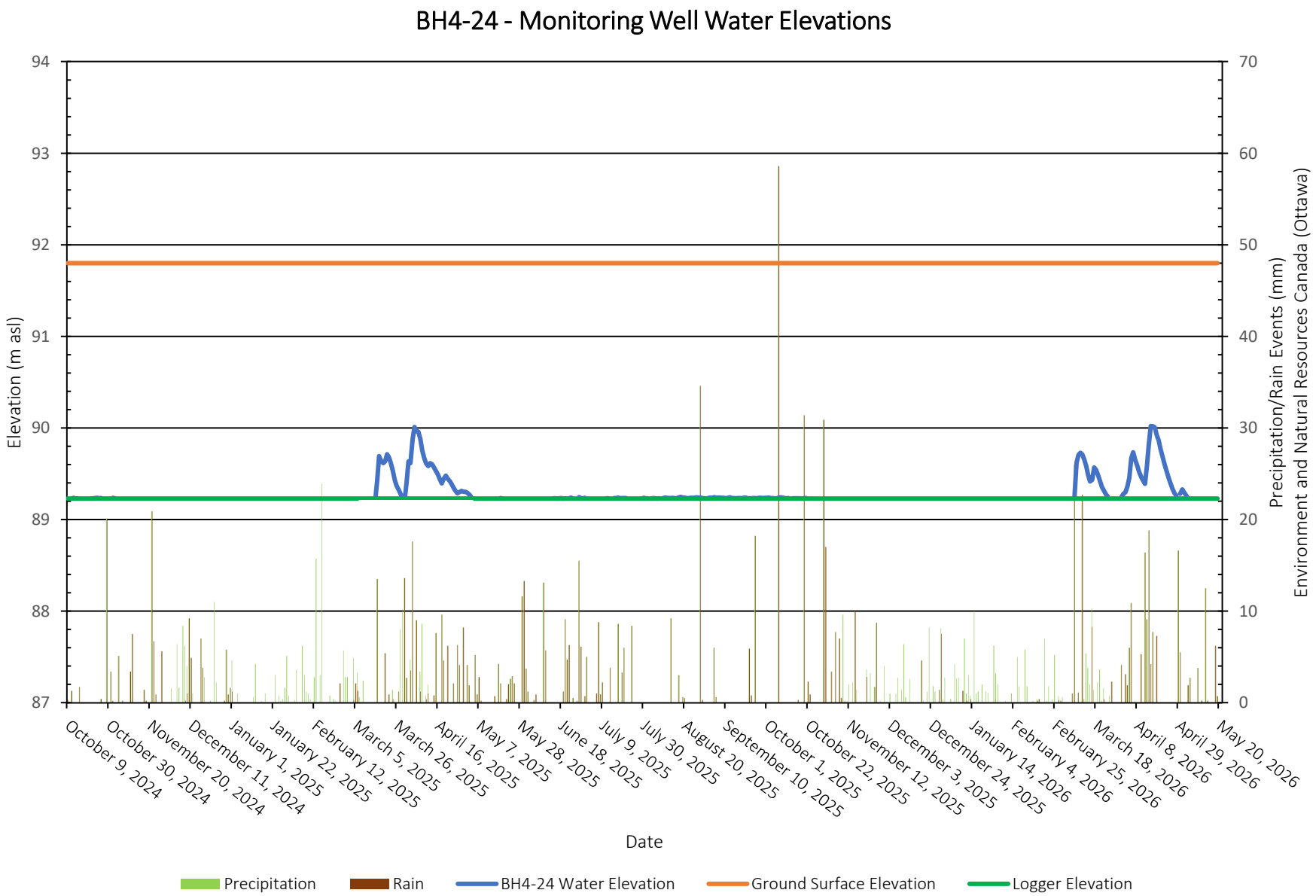


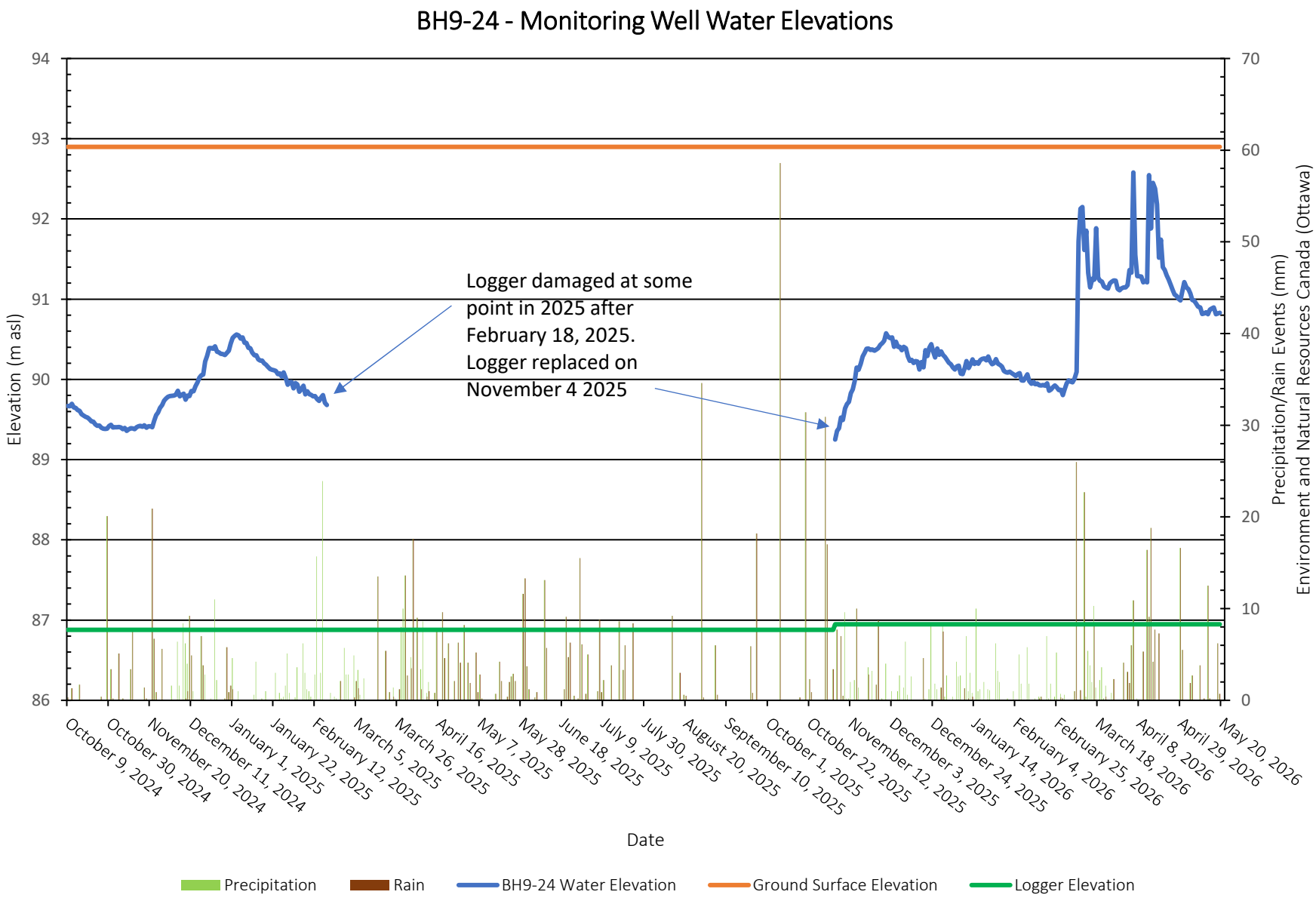
Caivan Communities
4795 Bank Street and 3301 Blais Road, Ottawa
Monitoring Well Water Elevations



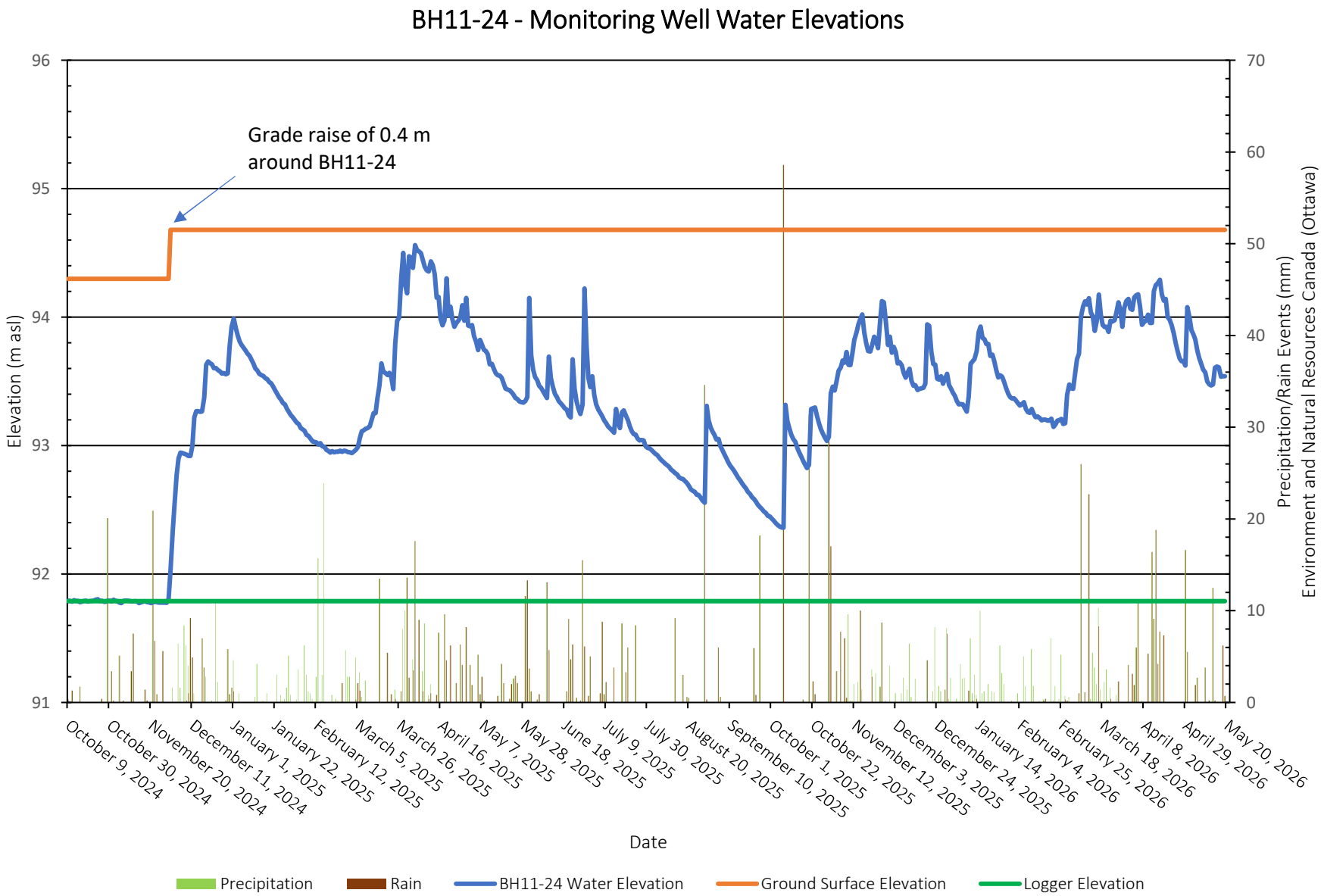
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Caivan Communities
4795 Bank Street and 3301 Blais Road, Ottawa
Monitoring Well Water Elevations



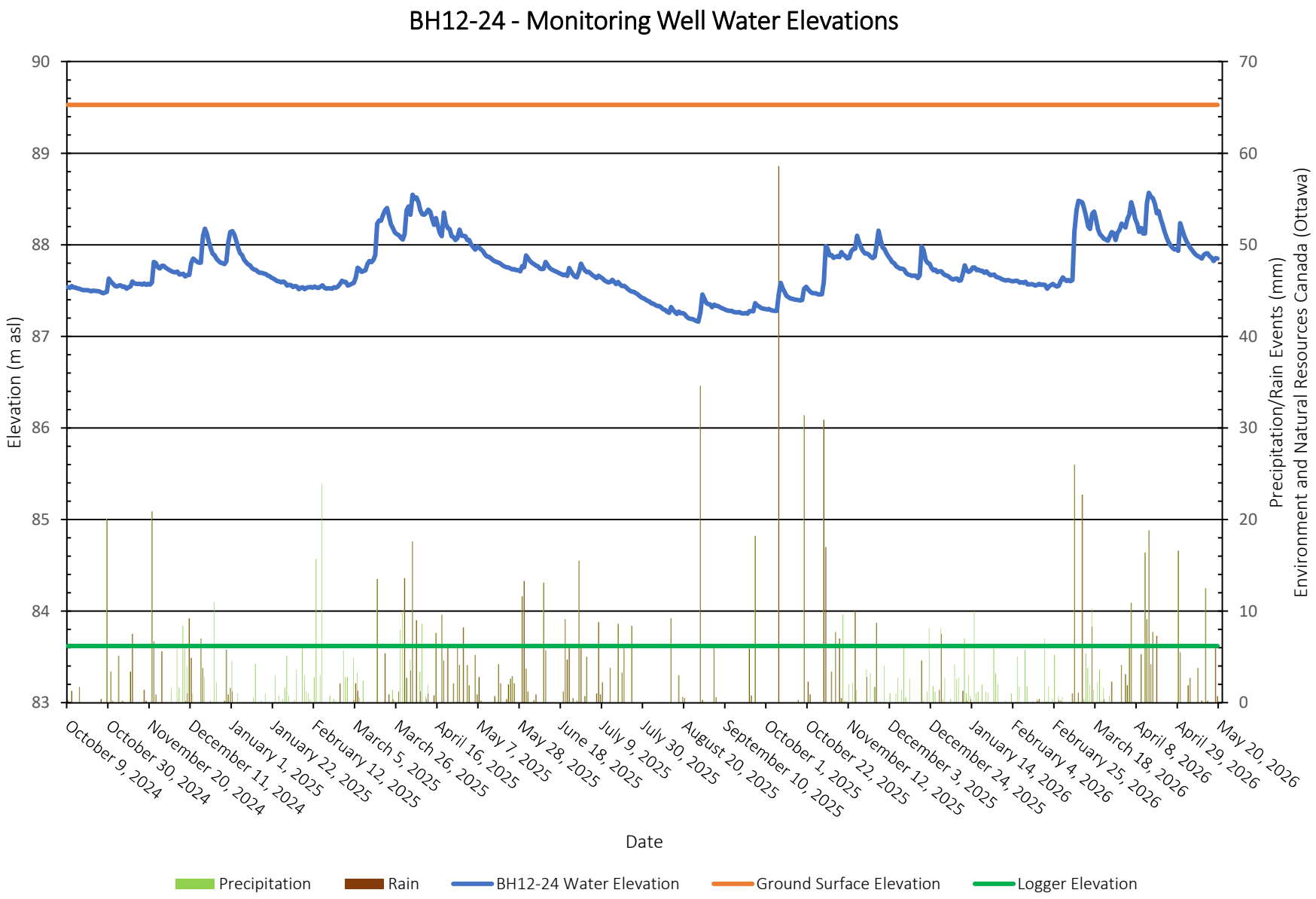

BH9-24 - Monitoring Well Water Elevations
Elevation (m asl)
Precipitation/Rain Events (mm)
Environment and Natural Resources Canada (Ottawa)
Logger damaged at some point in 2025 after February 18, 2025. Logger replaced on November 4 2025
Date
Precipitation
Rain
BH9-24 Water Elevation
Ground Surface Elevation
Logger Elevation

Caivan Communities
4795 Bank Street and 3301 Blais Road, Ottawa
Monitoring Well Water Elevations

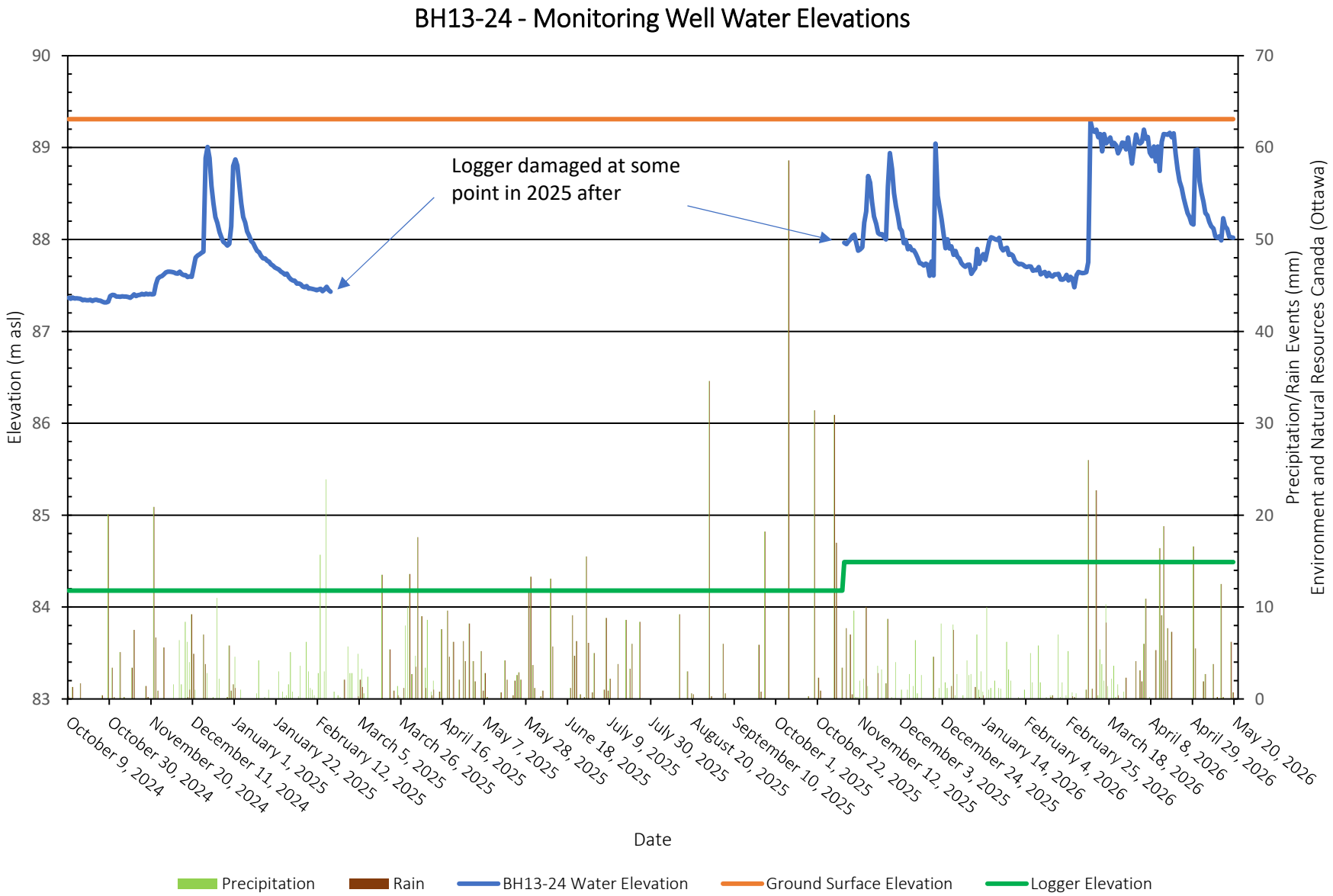


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Caivan Communities
4795 Bank Street and 3301 Blais Road, Ottawa
Monitoring Well Water Elevations

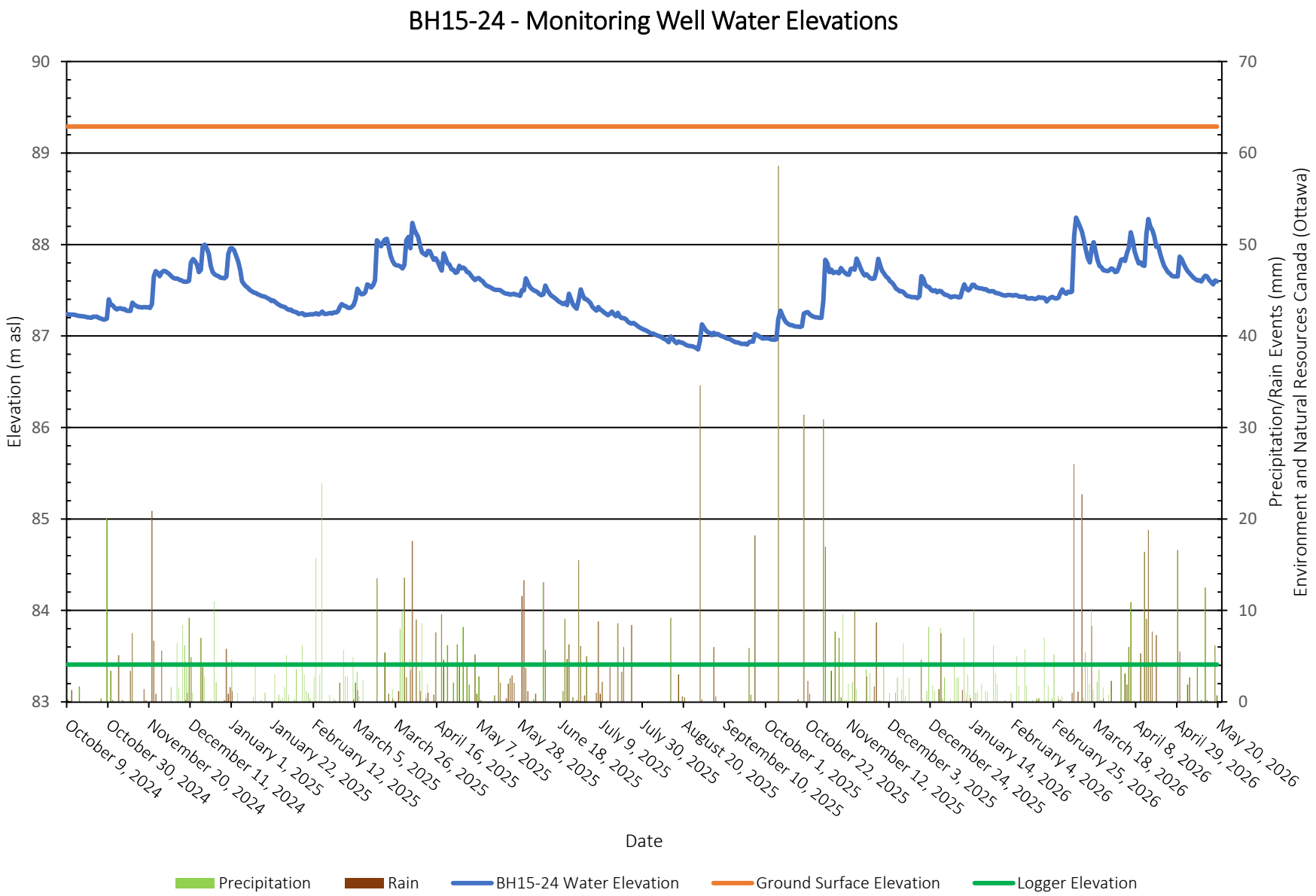


Caivan Communities
4795 Bank Street and 3301 Blais Road, Ottawa
Monitoring Well Water Elevations

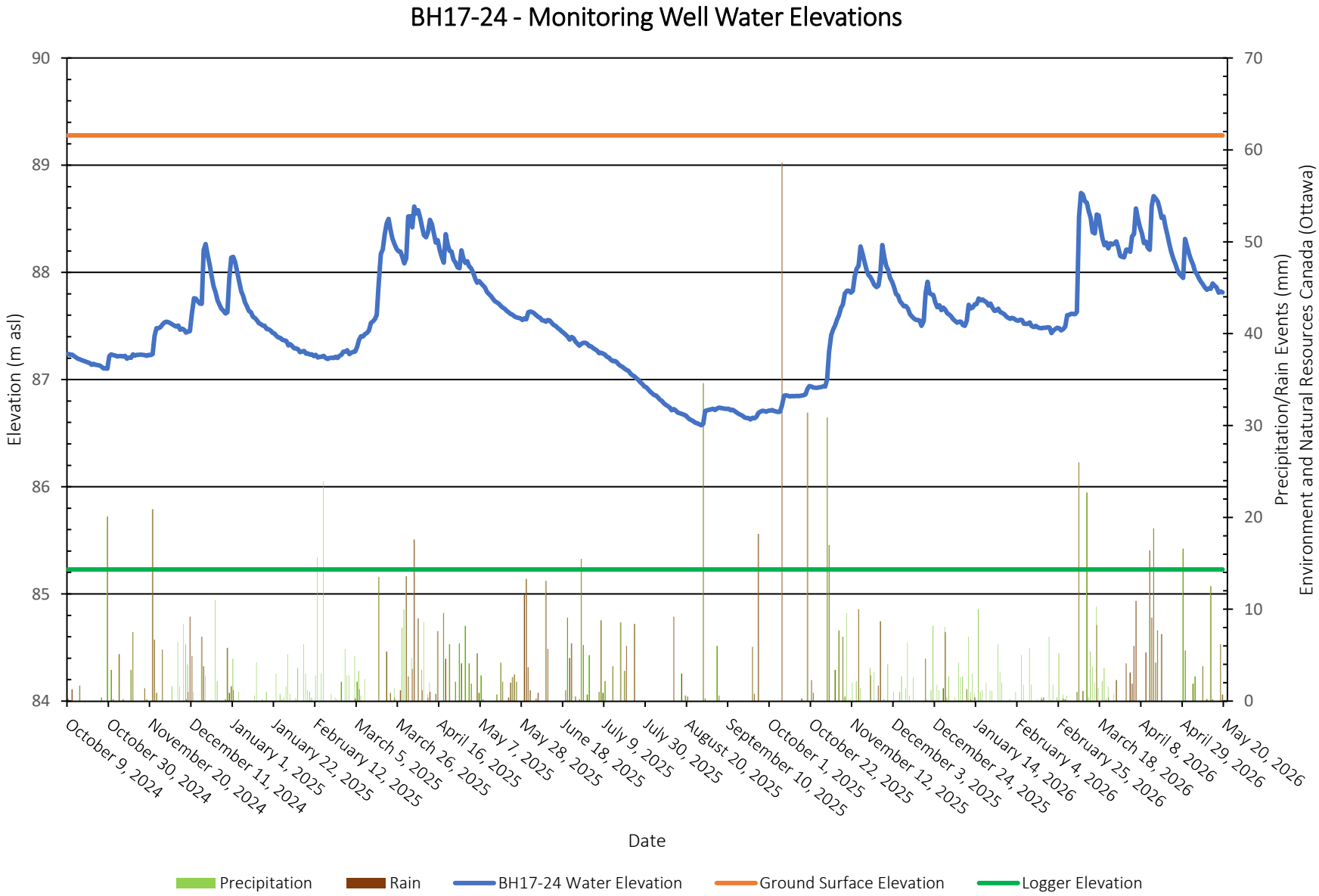


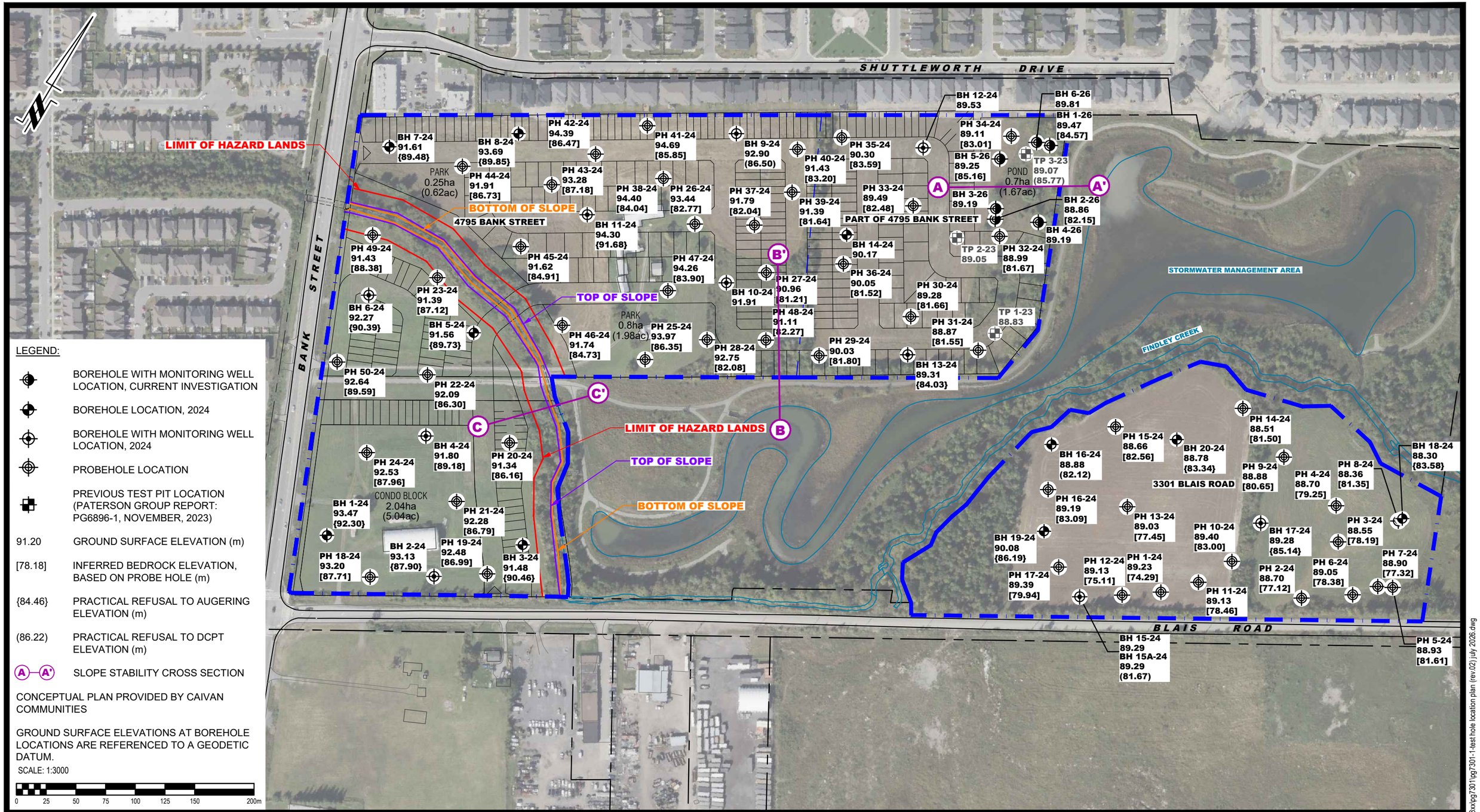
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Caivan Communities
4795 Bank Street and 3301 Blais Road, Ottawa
Monitoring Well Water Elevations



Caivan Communities
4795 Bank Street and 3301 Blais Road, Ottawa
Monitoring Well Water Elevations





LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION, CURRENT INVESTIGATION
- BOREHOLE LOCATION, 2024
- BOREHOLE WITH MONITORING WELL LOCATION, 2024
- PROBEHOLE LOCATION
- PREVIOUS TEST PIT LOCATION (PATERSON GROUP REPORT: PG6896-1, NOVEMBER, 2023)

91.20 GROUND SURFACE ELEVATION (m)

[78.18] INFERRED BEDROCK ELEVATION, BASED ON PROBE HOLE (m)

{84.46} PRACTICAL REFUSAL TO AUGERING ELEVATION (m)

(86.22) PRACTICAL REFUSAL TO DCPT ELEVATION (m)

A—A' SLOPE STABILITY CROSS SECTION

CONCEPTUAL PLAN PROVIDED BY CAIVAN COMMUNITIES

GROUND SURFACE ELEVATIONS AT BOREHOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM.

SCALE: 1:3000

0 25 50 75 100 125 150 200m

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

NO.	REVISIONS	DD/MM/YYYY	INITIAL
2	ADDED CONCEPTUAL PLAN AND SLOPE STABILITY CROSS-SECTIONS	07/03/2026	KP
1	ADDED 2026 BOREHOLE LOCATION BH 1-26 TO BH 6-26	27/05/2026	KP

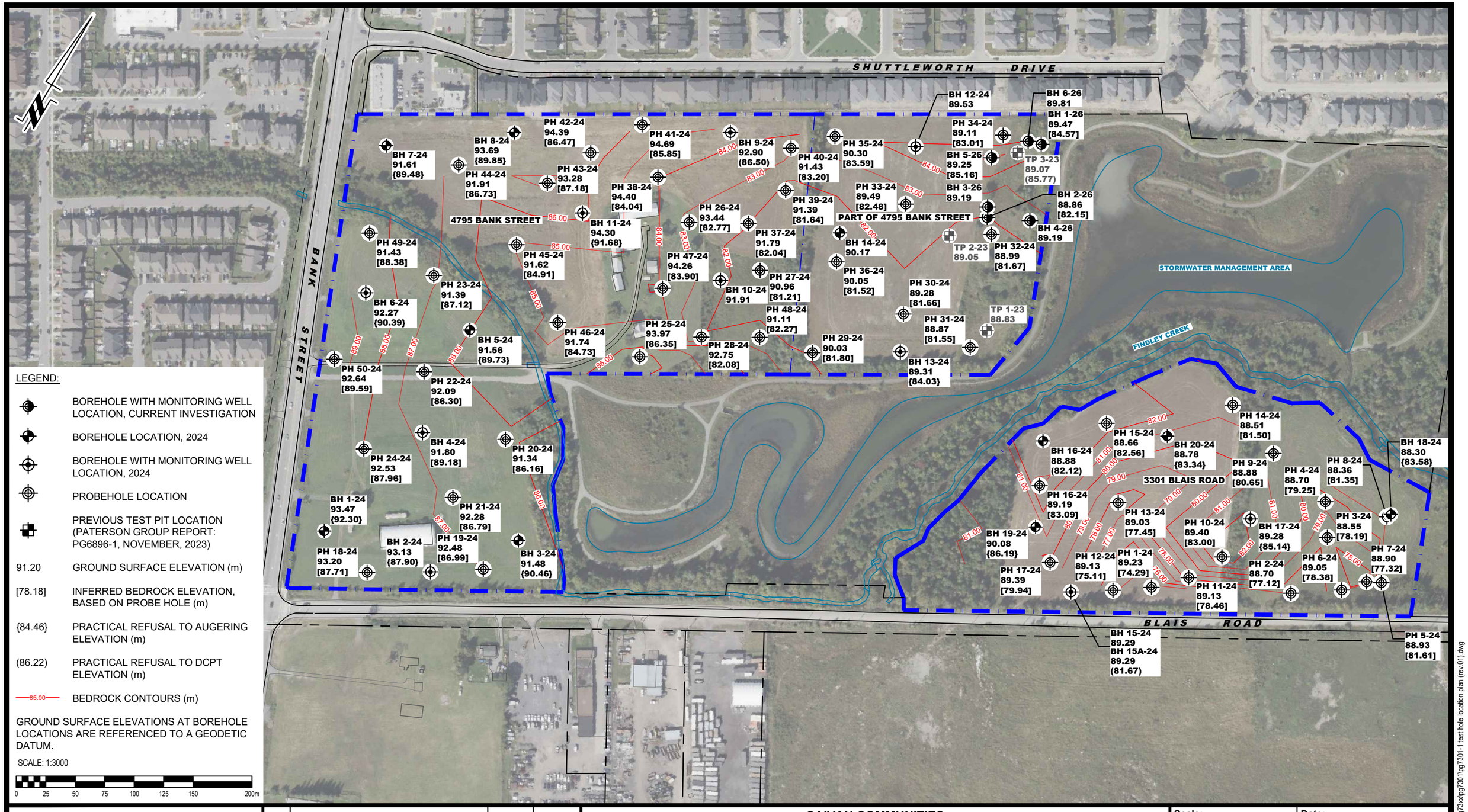
CAIVAN COMMUNITIES
GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
4795 BANK STREET & 3301 BLAIS ROAD
OTTAWA, ONTARIO

Title:
TEST HOLE LOCATION PLAN

Scale: 1:3000	Date: 10/2024
Drawn by: ZS	Report No.: PG7301-1
Checked by: MA	Dwg. No.: PG7301-1
Approved by: KP	Revision No.: 2

11x17

p:\autocad drawings\geotechnical\pg73xx\pg7301\pg7301-1-test hole location plan (rev.02) | july 2026.dwg



LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION, CURRENT INVESTIGATION
- BOREHOLE LOCATION, 2024
- BOREHOLE WITH MONITORING WELL LOCATION, 2024
- PROBEHOLE LOCATION
- PREVIOUS TEST PIT LOCATION (PATERSON GROUP REPORT: PG6896-1, NOVEMBER, 2023)

91.20 GROUND SURFACE ELEVATION (m)

[78.18] INFERRED BEDROCK ELEVATION, BASED ON PROBE HOLE (m)

{84.46} PRACTICAL REFUSAL TO AUGERING ELEVATION (m)

(86.22) PRACTICAL REFUSAL TO DCPT ELEVATION (m)

85.00 BEDROCK CONTOURS (m)

GROUND SURFACE ELEVATIONS AT BOREHOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM.

SCALE: 1:3000

0 25 50 75 100 125 150 200m

PATERSON GROUP

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

NO.	REVISIONS	DD/MM/YYYY	INITIAL
1	ADDED 2026 BOREHOLE LOCATION BH 1-26 TO BH 6-26 AND UPDATED BEDROCK CONTOURS	27/05/2026	KP

CAIVAN COMMUNITIES
GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
4795 BANK STREET & 3301 BLAIS ROAD
OTTAWA, ONTARIO

Title:

BEDROCK CONTOUR PLAN

Scale: 1:3000	Date: 12/2024
Drawn by: ZS	Report No.: PG7301-1
Checked by: MA	Dwg. No.: PG7301-2
Approved by: KP	Revision No.: 1

11x17

p:\autocad drawings\geotechnical\pg73xx\pg7301\pg7301-1 test hole location plan (rev.01).dwg

PATERSON GROUP

Hydrogeological Study

Proposed Residential Development

4795 Bank Street
Ottawa, Ontario

Prepared for Caivan Communities

Report PH5254-REP.01.R1
Dated June 26, 2026

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1.0 INTRODUCTION

1.1 Background

Paterson Group (Paterson) was retained by Caivan Communities to conduct a hydrogeological study for the proposed residential development located at 4795 Bank Street in the City of Ottawa (hereinafter referred to as the "subject site"). The location of the subject site is shown on Drawing PH5254-1 - Site Plan appended to this report. This report incorporates the findings of Paterson Report PG7301-1 prepared concurrently.

1.2 Scope of Work

Paterson has completed this report in accordance with the scope prepared by Paterson. As per the agreed upon scope, the purpose of this study was to:

- ❒ Complete a groundwater impact assessment to determine potential impacts to adjacent infrastructure, well users and the surrounding environment.

Additionally, the study was to include the standard components of a Water Budget Assessment as per the City of Ottawa's Water Budget Assessment Terms of Reference, which included the following:

- ❒ Review related higher-level studies.
- ❒ Conduct pre- and post-development water budget analyses, including water budget equations, to determine the hydrogeological function of the subject site in order to assess the need for supplemental stormwater management measures.
- ❒ Develop a conceptual model to characterize pre and post-development hydrologic and hydrogeologic site conditions.
- ❒ Identify sensitive hydrologic and hydrogeologic features (if any) within the study area.
- ❒ Identify water budget targets (if applicable) to mitigate post-development hydrologic and hydrogeologic impacts.
- ❒ Identify how climate change projections may impact the water budget.

2.0 RELATED REPORTS

In addition to a review of the general literature summarized in the following sections and in the 'References' section of this report (MECP water well mapping, available geological and physiographic mapping), Paterson reviewed the following site-specific/related reports:

- ❒ PG7301 Geotechnical Investigation - Proposed Residential Development - 4795 Bank Street and 3301 Blais Road - prepared by Paterson Group concurrently with this report.
- ❒ PE6876-1 Phase I Environmental Site Assessment - 4795 Bank Street and 3301 Blais Road - prepared by Paterson Group – January 28, 2025.

3.0 METHOD OF INVESTIGATION

3.1 Records Review

A review of available geological, and hydrogeological data was completed as a part of this assessment. However, the literature review and previous reports did not provide site-specific data regarding overburden and bedrock aquifers, recharge and discharge conditions or flow contributions to the nearby water features. Further detail is provided in the following sections.

3.2 Field Program

The geotechnical and hydrogeological field programs were developed to assess geology, groundwater conditions, hydraulic gradients and the overall hydrologic/hydrogeologic function of the subject site. The test holes were advanced to various depths across the site to assess hydrogeological and geotechnical conditions.

Geotechnical field investigations were completed by Paterson at the subject site between September 2024 and February 2026. During this time, 26 boreholes and 50 probe holes were advanced to a maximum depth of 10.26 m and 14.9 m below ground surface (bgs), respectively. The location of the test holes are shown on Drawing PG7301-1 - Test Hole Location Plan, included in Appendix 1.

Soil samples were obtained from the boreholes by means of split spoon sampling and the sampling of shallow soils directly from auger flights. Split-spoon samples were taken at approximate 0.76 m intervals. In addition to soil sampling, rock core samples were obtained with the use of a standard diamond drill bit. The depth at which split-spoon, auger samples and rock core samples were obtained from the test holes are shown as "**SS**", "**AU**" and "**RC**", respectively, on the Soil Profile and Test Data sheets, included in Appendix 1.

All samples were classified on site, placed in sealed plastic bags and were transported to our laboratory for further review and testing. Transportation of the samples was completed in accordance with ASTM D4220-95 (2007) - Standard Practice for Preserving and Transporting Soils. Rock core samples were recovered from select boreholes (BH1-22 and BH2-26) drilled during the February 2026 geotechnical investigation using a core barrel and diamond drilling techniques. The bedrock samples were classified on site, placed in hard cardboard core boxes and transported to Paterson's laboratory.

The Standard Penetration Test (SPT) was conducted in conjunction with the recovery of the split-spoon samples. The SPT results are recorded as "N" values on the Soil Profile and Test Data sheets. The "N" value is the number of blows required to drive the split-spoon sampler 300 mm into the ground after an initial penetration of 150 mm using a 63.5 kg hammer falling from a height of 760 mm. This test was done in accordance with ASTM D1586-11 - Standard Method for Penetration Test and Split-Barrel Sampling of Soils.

The recovery value and a Rock Quality Designation (RQD) value were calculated for each drilled section of bedrock and are presented on the borehole logs. The recovery value is the length of the bedrock sample recovered over the length of the drilled section. The RQD value is the total length of intact rock pieces longer than 100 mm over the length of the core run. The values indicate the bedrock quality.

Reference should be made to the Soil Profile and Test Data sheets presented in Appendix 1 for specific details of the soil profiles encountered at the test hole locations.

Drawdown Analysis - Hydraulic Conductivity Testing

Hydraulic conductivity testing (slug testing) was completed at the monitoring wells installed during the geotechnical investigations completed during February 2026. Falling head and rising head tests (slug tests) were completed in accordance with ASTM Standard Test Method D 4404 - Field Procedure for Instantaneous Change in Head (Slug) Tests for Determining Hydraulic Properties of Aquifers.

Slug testing was completed on May 26, 2026 by Paterson personnel. The general test method consisted of measuring the static water level in the well, followed by inducing a near-instantaneous change of head in the well and subsequent monitoring of water level recovery with an electronic water level meter and a water level data logger. The change in head was induced by the introduction of either an acetal slug, 0.9 m in length and 38 mm in diameter, or an acetal slug, 1.0 m in length and 19 mm in diameter, depending on the well diameter. The slug was introduced to raise the groundwater level in the monitoring well, following which the decrease in water level over time was monitored (falling head test). Once the water level had stabilized (or nearly stabilized), the slug was then removed to lower the groundwater level, following which the increase in water level over time was monitored (rising head test).

Following the completion of the slug tests, the test data was analyzed using the AQTESOLV Pro Version 4.5 aquifer analysis software package by HydroSOLVE

Inc. and the results were processed as per the method set out by Hvorslev (1951). Assumptions inherent in the Hvorslev method include a homogeneous aquifer of infinite extent and a screen length significantly greater than the monitoring well diameter. The assumption regarding screen length and well diameter is considered to be met based upon a typical length of 1.52 m and a diameter of 0.03 to 0.05 m.

While the idealized assumptions regarding aquifer extent, homogeneity are not strictly met in this case (or in any real-world situation), it has been our experience that the Hvorslev method produces effective point estimates of hydraulic conductivity in conditions similar to those encountered at the subject site. Hvorslev analysis is based on the line of best fit through the field data (hydraulic head recovery vs. time), plotted on a semi-logarithmic scale.

3.3 Laboratory Testing

All soil samples were retained for laboratory review following the field portion of the subsurface investigation. The soils were classified in general accordance with ASTM D2488-09a, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Based on the soil descriptions across the subject site during the geotechnical investigations, these samples are considered to be sufficiently representative of the site.

3.4 Monitoring Well Installations

As part of the geotechnical field programs completed between September 2024 and February 2026, monitoring wells were installed in select boreholes to permit the monitoring of groundwater levels and conduct drawdown analyses. The well installations were compliant with ASTM D5092 standards.

3.5 Water Level Measurements

Following the completion of the September 2024, October 2024 and February 2026 drilling programs, groundwater levels were measured at the monitoring well locations. Water levels were measured using an electronic water level meter relative to the ground surface elevation at each location and are noted on the Soil Profile and Test Data sheets, included in Appendix 1.

In addition to the manual groundwater level measurements, select wells were outfitted with dataloggers to record long-term fluctuations in monitoring well water elevations. The monitoring program began in October 2024 and continued until the spring freshet was captured in May 2026. Once the additional monitoring wells

were installed in February 2026, they were outfitted with dataloggers in March 2026. Groundwater monitoring data collected to date is presented in the Monitoring Well Water Elevation Plots in the Figures section of this report.

3.6 Surveying

The test hole locations and ground surface elevations at each test hole location completed by Paterson were surveyed using a GPS unit with respect to a geodetic datum. The locations and ground surface elevations for each test hole are presented on Drawing PG7301-1 - Test Hole Location Plan, included in Appendix 1.

4.0 REVIEW AND EVALUATION

4.1 Physical Setting

At the time of the field investigations, the majority of the subject site consists of agricultural lands with sparse areas of mature trees which generally follow the property boundary and/or subdivide the fields. Residential and agricultural buildings are located within the central and southeast limits of the property. The western portion of the property is bisected by Findlay Creek.

The property is bordered by an existing residential development to the north and associated stormwater managing system to the east, respectively. The property is bordered by Blais Road to the south, followed by unoccupied lands, a single residential property, and commercial developments, and by Bank Street to the west followed by existing residential developments. The ground surface across the property slopes gently downward from west to east at approximate geodetic elevations of 94 m to 89 m. The location of the subject site is shown on Drawing PH5254-1 - Site Plan, appended to this report.

Based on mapping provided by the Ministry of Conservation and Parks (MECP) Source Protection Information Atlas, the subject site is located within the Castor River subwatershed. There are several surface water features located within the subject site and within 500 m of the subject site. These include unnamed scratch ditches, drainage ditches and conveyance channels as well as an existing stormwater management pond and Findlay Creek, adjacent to the site. Also, the Findlay Creek Wetlands lies approximately 250 m south of the subject site. The site is generally at grade with adjacent roadways and properties. The site slopes from west to east with an elevation difference of approximately 4-5 m.

According to available mapping from the Ontario Geologic Survey (OGS; MRD 228), the majority of the subject site is located in the sand plans physiographic region. The sand plains region is characterized by silty sand deposits. This is generally consistent with field observations at the subject site.

4.2 Geology

Surficial Geology

Overburden mapping provided by the OGS was reviewed as part of this assessment. Available mapping (MRD 128) indicates that overburden soils throughout the subject site largely consist of till (stone-poor, sandy silt to silty sand-textured till on paleozoic terrain) with isolated areas within the west corner and eastern side consisting of coarse-textured glaciomarine deposits (sand, gravel, minor silt and clay). Overburden soil mapping is shown on Drawing PH5254-3 - Surficial Geology Plan, appended to this report.

Overburden soils identified during the geotechnical investigations by Paterson between September 2024 and February 2026 were generally consistent with the available mapping. Soils generally consisted of topsoil overlying a silty sand layer or glacial till underlain by bedrock. Fill material was encountered at select borehole locations and generally consisted of brown silty sand/silty clay with sand, gravel and cobbles, extending to a maximum depth of 2.6 m bgs. The glacial till deposit generally consisted of a silty sand/silty clay matrix with varying amounts of gravel, cobbles and boulders and trace clay, extending to a maximum observed depth of 6.1 m bgs.

Specific details are provided on the Soil Profile and Test Data Sheets included in Appendix 1 of this report. More details regarding the overburden soils can be found in Paterson Report PG7301-1.R1 prepared concurrently with this report.

Bedrock Geology

Bedrock was encountered between 4.1 to 6.7 m bgs during Paterson's 2026 geotechnical field investigation and cored to a maximum depth of 10.3 m bgs. The bedrock was observed to vary from poor to excellent quality. Based on available mapping, the overburden drift thickness at the subject site ranges between 1 and 10 m. A number of probe holes were completed across the subject site and encountered refusal on inferred bedrock at depths from 3.1 to 10.7 m bgs. Bedrock geology mapping is shown on Drawing PH5254-4 - Bedrock Geology Plan, appended to this report.

Karst Features

The term "karst" refers to a geologic formation characterized by the dissolution of carbonate bedrock, such as limestone or dolostone. In order for karstification to occur, precipitation must be able to infiltrate the top of the bedrock, causing

dissolution which enlarges previously existing joints and bedding planes. Based on available mapping by the OGS (GRS 005), the subject site is located within an area that does not contain karstic landforms.

4.3 Hydrogeological Setting (Conceptual Model)

Based on the field investigations at the subject site, Paterson used borehole data, existing water well records, topography, monitoring well water levels, hydraulic conductivity and infiltration rates to develop a conceptual model of the transport fate of surface water and groundwater at the subject site. Information related to the conceptual flow model is described below.

Existing Aquifer Systems

Aquifer systems may be defined as geological media, either overburden soils or fractured bedrock, which permit the movement of groundwater under hydraulic gradients. In general, aquifer systems may be present in overburden soils or bedrock. Groundwater was observed within the overburden soils at the subject site, and the soils were found to exhibit moderate hydraulic conductivities. Given the limited quantity of groundwater within the overburden aquifer, it is not considered an adequate source for water supply wells. If water supply wells are still in use in the vicinity of the subject site, it is anticipated that they are accessing bedrock aquifers.

Based on a review of the MECP water well record database, available geological mapping and field investigations, Paterson has identified four (4) aquifer systems in the vicinity of the study area which consist of the overburden aquifer and three underlying bedrock aquifers. The bedrock aquifer systems consist of dolostone/dolostone and sandstone, sandstone or shale of the Oxford and March Formations, the Nepean Formation or Queenston Formation, respectively. Surrounding water well records are included in Appendix 4.

Groundwater Levels

Piezometers and monitoring wells were installed across the subject site for the purpose of monitoring groundwater levels within the overburden and bedrock. Groundwater levels were observed to be dry in the piezometers ranged from 1.0 and 5.8 m bgs in the monitoring wells. The initial groundwater level measurements are shown on the Soil Profile and Test Data Sheets appended to this report in Appendix 1. Groundwater elevations that were collected on May 21, 2026 were used to determine hydraulic gradients and the general groundwater flow direction at the subject site which is shown on Drawing PH5254-5 - Groundwater Contour

Plan appended to this report. The manual groundwater level measurements are presented in Table 1 below.

Table 1 – Summary of Manual Groundwater Level Measurements

Borehole ID	Ground Surface Elevation (m asl)	Manual Groundwater Level Measurement		Date Recorded
		Depth (m bgs)	Elevation (m asl)	
BH2-24*	92.85	2.23	90.62	21-May-26
BH4-24*	91.53	Dry	-	21-May-26
BH6-24*	92.00	Destroyed	-	21-May-26
BH9-24*	92.62	2.31	90.31	21-May-26
BH10-24*	91.64	Destroyed	-	21-May-26
BH11-24*	94.43	1.15	93.28	21-May-26
BH12-24*	89.26	1.77	87.49	21-May-26
BH13-24*	89.04	1.42	87.63	21-May-26
BH1-26*	89.47	1.80	87.67	21-May-26
BH2-26*	88.86	1.40	87.46	21-May-26
BH3-26*	89.19	1.39	87.81	21-May-26
BH4-26*	89.18	1.52	87.66	21-May-26
BH5-26*	89.25	1.65	87.61	21-May-26
BH6-26*	89.81	1.99	87.82	21-May-26
BH1-26*	89.47	1.51	87.96	20-Mar-26
BH2-26*	88.86	1.12	87.74	20-Mar-26
BH3-26*	89.19	1.00	88.19	20-Mar-26
BH4-26*	89.18	1.08	88.10	20-Mar-26
BH5-26*	89.25	1.36	87.89	20-Mar-26
BH6-26*	89.81	1.96	87.85	20-Mar-26
BH2-24*	92.85	3.45	89.40	22-Oct-25
BH4-24*	91.53	Dry	-	22-Oct-25
BH6-24*	92.00	Destroyed	-	22-Oct-25
BH9-24*	92.62	3.72	88.90	03-Nov-25
BH10-24*	91.64	Destroyed	-	22-Oct-25
BH11-24*	94.43	3.07	91.36	22-Oct-25
BH12-24*	89.26	2.02	87.24	22-Oct-25
BH13-24*	89.04	1.28	87.76	03-Nov-25
BH2-24*	92.85	2.74	90.11	20-Feb-25
BH4-24*	91.53	Dry	-	20-Feb-25
BH6-24*	92.00	Dry	-	20-Feb-25
BH9-24*	92.62	3.11	89.51	20-Feb-25
BH10-24*	91.64	2.81	88.83	20-Feb-25
BH11-24*	94.03	1.30	92.73	20-Feb-25
BH12-24*	89.26	2.04	87.22	20-Feb-25
BH13-24*	89.04	1.82	87.22	20-Feb-25
BH1-24	93.20	Dry	-	09-Oct-24
BH2-24*	92.85	2.90	89.95	09-Oct-24

BH3-24	91.20	Dry	-	09-Oct-24
BH4-24*	91.53	Dry	-	09-Oct-24
BH5-24	91.28	Dry	-	09-Oct-24
BH6-24*	92.00	Dry	-	09-Oct-24
BH7-24	91.33	Dry	-	09-Oct-24
BH8-24	93.41	Dry	-	09-Oct-24
BH9-24*	92.62	3.20	89.42	09-Oct-24
BH10-24*	91.64	5.76	85.88	09-Oct-24
BH11-24*	94.03	Dry	-	09-Oct-24
BH12-24*	89.26	2.05	87.21	09-Oct-24
BH13-24*	89.04	1.96	87.08	09-Oct-24
BH14-24	89.90	Dry	-	09-Oct-24
Note: The ground surface elevation at each borehole location was surveyed by Paterson using a handheld GPS and was referenced to a geodetic datum. *Borehole instrumented with groundwater monitoring well.				

Van Essen TD-Diver dataloggers were installed at all monitoring well locations to collect water level readings at a minimum of one (1) reading every 24 hours.

The long-term groundwater monitoring program began in October 2024 and lasted until spring high water levels were captured in May 2026. The monitoring data collected to date was compared with Environment and Natural Resources Canada precipitation data from the Ottawa International Airport over the same timeframe as part of the monitoring program. The monitoring data from each monitoring location is presented on the Monitoring Well Water Elevation Plots appended to this report.

Horizontal Hydraulic Gradients

Due to the nature of the water levels obtained from field work conducted at the subject site (groundwater monitoring wells), the absolute direction of horizontal hydraulic gradients in the vicinity of the subject site was not determined. However, using the available data, it was possible to approximate the horizontal hydraulic gradients in the overburden materials given that the horizontal hydraulic gradient between any 2 points is the slope of the hydraulic head between those points:

$$i=h_2-h_1/L$$

Where: i = horizontal gradient
h = water elevation (m asl)
L = horizontal distance between test hole locations

Using the above noted formula, the horizontal hydraulic gradients within the site were observed to be in an approximate easterly orientation with a magnitude of

approximately 0.011 to 0.018 m/m in the glacial till deposit within the study area. The approximate groundwater flow directions are presented on Drawing PH5254-5 – Overburden Groundwater Contour Plan, appended to this report. Regional groundwater flow in the overburden is expected to be in a southeasterly orientation towards Castor River which is consistent with available watershed mapping.

Hydraulic Conductivity

Hydraulic conductivity testing (slug testing) was completed by Paterson as part of the field investigations at the subject site. The test data was analyzed as per the method set out by Hvorslev (1951). The testing yielded hydraulic conductivity values of 5.4 x 10^{-6} to 9.0 x 10^{-6} m/sec for glacial till, 6.8 x 10^{-7} m/sec for silty clay to clayey silt, 9.3 x 10^{-6} to 2.6 x 10^{-5} m/sec for silty sand to sandy silt, and 1.2 x 10^{-4} to 5.7 x 10^{-3} m/sec for bedrock. Hydraulic conductivity results are summarized in Table 2 below and have been included in Appendix 3.

Table 2 – Summary of Hydraulic Conductivity (Slug) Testing Results

Test Hole ID	Ground Surface Elevation (m asl)	Testing Elevation (m asl)	Hydraulic Conductivity (m/sec)	Test Type	Soil Type
BH1-26	89.47	80.76-82.28	1.67 x 10^{-4}	Falling Head	Bedrock
			1.22 x 10^{-4}	Rising Head	
BH2-26	88.86	78.75-80.27	1.23 x 10^{-5}	Falling Head	Bedrock
			1.63 x 10^{-5}	Rising Head	
BH3-26	89.19	83.09-84.61	8.97 x 10^{-6}	Falling Head	Glacial Till
			5.35 x 10^{-6}	Rising Head	
BH4-26	89.18	84.23-85.75	6.84 x 10^{-7}	Falling Head	Silty Clay to Clayey Silt
BH5-26	89.25	82.75-84.27	5.69 x 10^{-3}	Falling Head	Bedrock
			2.31 x 10^{-3}	Rising Head	
BH6-26	89.81	84.60-86.12	2.61 x 10^{-5}	Falling Head	Silty Sand to Sandy Silt
			9.26 x 10^{-6}	Rising Head	

Groundwater Recharge and Discharge

In general, groundwater will follow the path of least resistance from areas of higher hydraulic head to areas of lower hydraulic head. Upward and downward hydraulic gradients are typically indicative of areas of discharge and recharge, respectively.

It is our interpretation that there is recharge is occurring at the subject site due to the soils identified at the time of the field investigations. Recharge of the shallow overburden aquifer will occur as precipitation infiltrates the subsoils where it will flow vertically downward through the unsaturated surficial soils before intercepting

the overburden aquifer. Furthermore, the eastern portion of the site mapped as a significant groundwater recharge area (SGRA) by the MECP.

With regards to discharge zones, both the topography and the geological conditions would suggest that there is a potential for discharge to be occurring within the confines of the subject site. While the extent of the discharge was not considered as part of the current investigation, given the nature of the nearby watercourse (creek), the extent of discharge occurring is anticipated to be limited.

The subject site intersects one subwatershed as previously mentioned. However, within the confines of the subject site, shallow groundwater was found to have flow generally travelling in an eastward direction.

It should be noted that the subject site is identified by the MECP as an Intake Protection Zone 3.

Catchment Areas

The subject site is located within the Castor River subwatershed. As shown on Drawing PH5254 - 5 - Groundwater Contour Plan, the groundwater flows in an eastward direction within the eastern portion of the subject site towards the stormwater management pond and Findlay Creek. Therefore, it is Paterson's opinion that the subject site is predominantly characterized by one catchment area.

Groundwater Inflow/Dewatering Requirements

Four (4) potential sources of dewatering have been identified at the subject site. The sources consist of the excavation footprints related to the building foundations, condominium foundations, servicing trenches and eastern stormwater management pond (SWMP). Details regarding the excavation footprints and depths for each potential dewatering source were based on the information available at the time of report preparation. Therefore, the building, servicing and SWMP excavations are assumed to encompass areas of approximately 750 m^2, 20,400 m^2, 125 m^2 and 7,040 m^2, respectively, for a preliminary dewatering assessment. It should be noted that, although drift thickness is mapped to be shallow, probe holes across the site showed refusal at depths ranging from 3.05 to 10.67 m, with the overburden being shallowest in the western corner and deepest in the middle and eastern sections.

Based on available conceptual drawings for the site, excavation sizes were estimated based on proposed building footprints, typical servicing excavation sizes based on previous experience at similar sites and the proposed SWMP footprint.

The infiltration rates provided for the following sources were calculated using the Dupuit Forchheimer method:

$Q = \pi k((h_0^2-h_p^2)/ln(R/r))$

- ❑ k = hydraulic conductivity (m/sec)
- ❑ h_0 = thickness of the aquifer (m)
- ❑ h_p = thickness of the aquifer from the base of the excavation to the base of the aquifer (m)
- ❑ R = effective drawdown radius for the excavation (m)
- ❑ r = equivalent radius of the excavation (m)

The groundwater infiltration calculations for the excavation footprints are provided in Appendix 3 of this report.

The stratigraphy within the anticipated saturated depth of the building excavations generally consists of a glacial till deposit. Specific design details were not available at the time of report preparation. For the purpose of this study, it has been assumed the buildings will consist of slab-on-grade construction or one basement level with a maximum excavation depth of 3 m bgs. Calculations are based on an excavation size of approximately 750 m^2 and a saturated depth of 2 m. Using a representative hydraulic conductivity of 6.0 x 10^{-6} m/sec (geometric mean of the calculated hydraulic conductivities from overburden wells), the steady state volume of groundwater inflow is estimated to be between approximately 90,000 to 100,000 L/day, per excavation.

The stratigraphy within the anticipated saturated depth of the condominium excavations generally consists of a glacial till deposit. Specific design details were not available at the time of report preparation. For the purpose of this study, it has been assumed the buildings will consist of slab-on-grade construction or one basement level with a maximum excavation depth of 3 m bgs. Calculations are based on an excavation size of approximately 20,500 m^2 and a saturated depth of 2 m. Using a representative hydraulic conductivity of 6.0 x 10^{-6} m/sec (geometric mean of the calculated hydraulic conductivities from overburden wells), the steady state volume of groundwater inflow is estimated to be between approximately 210,000 to 230,000 L/day, per excavation.

The servicing trench excavations are anticipated to primarily encounter saturated glacial till material with the potential to intercept shallow saturated bedrock in some locations. Specific design details were not available at the time of report

preparation. For the purpose of this study, it has been assumed the servicing trenches will have a maximum excavation depth of 5 m bgs. Calculations are based on an excavation size of approximately 125 m^2 and either a saturated depth of 4 m within the glacial till and up to 2 m within the bedrock where bedrock is present. Based on probe holes completed on site, it is anticipated that bedrock will only be encountered in the western corner of the site and servicing excavations at other locations will be only in the glacial till. Using a representative hydraulic conductivity of 6.0 x 10^{-6} m/sec and 1.9 x 10^{-4} (geometric mean of the calculated hydraulic conductivities from overburden and bedrock wells, respectively), the steady state volume of groundwater inflow is estimated to be between approximately 70,000 to 75,000 L/day and 1,700,000 to 1,800,000 L/day, per excavation within the glacial till and bedrock, respectively.

The stratigraphy within the anticipated saturated depth of the western SWMP excavation generally consists of a glacial till deposit. Based on available drawings at the time of report preparation, it is anticipated that the SWMP excavation will have a maximum excavation depth of approximately 3 m bgs. Calculations are based on an excavation size of approximately 7,040 m^2 and a saturated depth of 2 m. Using a representative hydraulic conductivity of 6.0 x 10^{-6} m/ sec (geometric mean of the calculated hydraulic conductivities from overburden wells), the steady state groundwater inflow is anticipated is to be between approximately 240,000 to 260,000 L/day.

It should be noted that the above estimated inflow values are unfactored. It is recommended that source specific dewatering calculations be completed once more specific development details are available.

5.0 SITE SPECIFIC WATER BUDGET ASSESSMENT

The site-specific water budget assessment (SSWB) was conducted to determine the hydrogeological function of the subject site, to identify infiltration potential and to identify opportunities for supplemental stormwater management measures. At the time of the field investigations the study area mainly consisted of mature trees, grass and shrubs. The pre and post-development terrain compositions are illustrated on Drawings PH5254-6 - Pre-Development Terrain Composition Plan and PH5254-7 - Post-Development Terrain Composition Plan, appended to this report.

5.1 Calculations

Thornthwaite and Mather Water Balance Calculations

When falling precipitation intercepts the ground, three possible outcomes arise. The water can either evaporate/transpire back into the atmosphere (evapotranspiration), infiltrate into the surface soils (infiltration) or leave the area as runoff.

The method employed by Thornthwaite and Mather (1957) was used along with modelling software by Environment Canada's Engineering Climate Services Unit (EC-ECS) to determine the partitioning of water throughout various portions of the hydrologic cycle. Inputs into the modelling program included monthly temperature, precipitation, water holding capacities and site latitude. Using the long-term averages of these variables, it was possible to calculate annual potential and actual evapotranspiration, change in soil moisture storage and the water surplus.

The formula employed by Thornthwaite and Mather is as follows:

$$S = R + I = P - ET$$

Where: S = surplus (mm/year)
R = annual runoff (mm/year)
I = annual infiltration (mm/year)
P = annual precipitation (mm/year)
ET = annual evapotranspiration (mm/year).

Shallow unsaturated soils within the study area generally consisted of topsoil overlying a silty sand- or silty clay- based glacial till deposit, dependent on the location across the site. Additionally, there is carrying amounts of treed areas,

shrubs and farmland across the site. Therefore, the above noted calculations were carried out for the soil moisture holding capacities of each material found on site.

Based on the location of the site within the Ottawa area, climatic data was obtained from the climate station located at the McDonald-Cartier International Airport covering the period of January 1939 to December 2022. The information was provided by Environment Canada's Engineering Climate Services Unit and is presented in Appendix 2 of the report.

Table 3, below, displays the soil types present within the study area and their associated water holding capacities (WHC) as well as the actual evapotranspiration (AET) and surplus data. For the purposes of this study, AET values were used as they account for accumulated soil moisture deficit. This deficit represents the volume of water retained within the available pore spaces of the soil and is subtracted from the potential evapotranspiration (PET) value to more accurately calculate the water surplus. The monthly/annual water balance data is presented in Tables 5 to 8 in Appendix 2 of this report. For the purpose of this study, 70% of the single and detached homes property footprints and 80% of the condominium footprints are considered to be impervious surfaces (100% of surplus will result in runoff) and 30% of the single and detached homes and 20% of the condominium footprints are considered to be urban lawns with the remainder (70 and 80%, respectively) is considered as impervious surfaces.

Table 3 - Site Specific Water Surplus Information

Land Use Unit	Water Holding Capacity (mm)	Actual Evapotranspiration (mm/year)	Surplus Water (mm/year)
Impervious Surfaces	N/A	145*	759
Urban Lawn/Shallow Rooted Crops (Fine Sandy Loam)	75	525	378
Pasture and Shrubs (Fine Sandy Loam)	150	574	329
Pasture and Shrubs (Clay Loam)	250	600	304
Mature Forests (Fine Sandy Loam)	300	605	298

Table reproduced using WHC values from MOE (2003) - Stormwater Management Planning and Design Manual and modelling data from Environment Canada's Engineering Climate Services Unit.
*Values based on evaporation information for urban areas (16% of precipitation) included in the Eastern Ontario Water Resources Management Study prepared by CH2M HILL Canada Limited (March 30, 2001).

Infiltration Factors

In order to break down the surplus water values for the various materials into infiltration and runoff, various factors must be considered. The MOE Stormwater Management Planning and Design Manual (2003) lists three main factors that contribute to surface water infiltration rates.

The first factor is topography, which is broken down further into three sections: flat and average slope, rolling land and hilly land. Flat and average slope provides the greatest potential for infiltration and has the largest infiltration factor applied to it (0.3), while the other two have progressively lower infiltration factors (rolling land is 0.2 and hilly land is 0.1).

The second factor is soil, which is also broken down further into three sections: tight impervious clay, medium combinations of clay and loam and open sandy loam. Open sandy loam provides the greatest potential for infiltration (infiltration factor of 0.4) while the other two have progressively lower potential for infiltration to occur (infiltration factor for medium combinations of clay and loam is 0.2 and for tight impervious clay is 0.1).

The final factor the MOE manual uses to partition infiltration from runoff is land cover. It is broken down into two sections: open fields/cultivated lands and woodlands. Woodlands have greater infiltration potential and an infiltration factor of 0.2. Open fields and cultivated lands have lower potential and with an infiltration factor of 0.1. A summary of the MOE manual's descriptors and their associated infiltration factors is shown below in Table 4.

Table 4 - MOE (2003) Infiltration Factors

Description of Area/Development Site	Value of Infiltration Factor
Topography	
Flat and average slope (<0.6 m/km)	0.30
Rolling land (slope of 2.8-3.8 m/km)	0.20
Hilly land (slope of 28-47 m/km)	0.10
Soil	
Tight impervious clay	0.10
Medium combinations of clay and loam	0.20
Open sandy loam	0.40
Cover	
Open fields/cultivated lands	0.10
Woodlands	0.20

Table reproduced from MOE (2003) - Stormwater Management Planning and Design Manual.

The topography of the study area is classified as hilly land (slope of 28-47 m/km throughout the subject site) Therefore, a pre-development topography infiltration factor of 0.1 was given for the materials analysed on this property. In order for

development to proceed, it is expected that alterations will be made to the topography of the site. In general, it is expected that the overall slope of the site will be reduced to accommodate buildings and parking areas. Therefore, the topography of the subject site under post-development conditions will consist of a mix rolling and hilly land and was therefore assigned a post-development topography infiltration factor of 0.15. An infiltration factor of 0 was assigned to the impervious surfaces due to its negligible infiltration capacity.

As previously discussed, soils within the study area generally consisted of topsoil overlying a glacial till deposit of varying composition. Therefore, a pre-development soil infiltration factor of 0.3 was given for the sand-textured materials analysed on this property and 0.2 was given for the clay-textured materials analysed on this property. Under post-development conditions, the majority of the site will consist of either landscaped areas or impervious surfaces, with soil infiltration factors ranging from 0.3 for fine sandy loam to 0 for impervious surfaces.

At the time of the field investigations, the subject site generally consisted of shallow rooted crops (i.e soybeans) or overgrown with some forested areas. A pre-development vegetation infiltration factor of 0.1 was therefore used for the site. Post-development, it is expected the majority of the trees remaining on site will be removed to accommodate buildings, parking areas and roadways. As such, a post-development vegetation infiltration factor of 0.1 was assigned to the site, except for impervious surfaces, which were given an infiltration factor of 0 due to its negligible potential to benefit from vegetation cover.

The pre and post-development infiltration factors for all materials considered are included in the water budget calculations provided in Table 9 and Table 10 included in Appendix 2 of this report.

5.2 Pre and Post-Development Water Budget

The pre-development water budget analysis conducted for the study area determined that an estimated 25,966,399 L/year of surplus water currently infiltrates the surface soils. The remaining estimated 39,046,230 L/year of surplus leaves the site as runoff.

The post-development water budget analysis determined that an estimated 11,089,802 L/year of surplus water will infiltrate the surface soils and approximately 93,608,617 L/year will leave the site as runoff. These values equate to an approximate decrease in infiltration of 57% and an increase in runoff of 140%.

The main variable that changed from pre-development conditions to post-development conditions was the addition of approximately 9.6 hectares of impervious surfaces. This results in reducing the area of pervious materials throughout the subject site, therefore, reducing the overall infiltration potential of the subject site. The remaining areas that are not being converted to impervious surfaces will become landscaped surfaces characterized by urban lawn (fine sandy loam) material. Also, it should be noted that the SWMP area was excluded from the post-development water budget analysis given that this area is designed to manage stormwater runoff and does not contribute to the infiltration or runoff potential of the site.

It is important to note that the post-development water budget analysis for the subject site does not consider any potential infiltration of the impervious surfaces (100% runoff was taken as a conservative approach). In reality, some portion of surface water that lands on impervious surfaces infiltrates (asphalt is not 100% impervious) or is diverted to grassed areas where additional infiltration may occur. As such, the post-development runoff volumes should be considered a conservative estimate and not expected to definitively represent future conditions.

Details of the pre and post-development water budget analyses are presented in Tables 9 and 10, included in Appendix 2 of this report.

6.0 GROUNDWATER IMPACT ASSESSMENT

6.1 Impact of Proposed Development on Surrounding Infrastructure

As previously discussed, soils within the subject site generally consisted of topsoil, overlying a glacial till deposit. The expected groundwater infiltration will be encountered within the glacial till deposit.

The steady-state radius of influence calculations completed were based upon the Sichardt equation as shown below. The assumed setting for the analytical solution was one in which open cut trenches were used to install the services at the subject site, creating an unconfined condition which would allow use of the equation to determine the radius of influence.

$$R = 3000 * \Delta h(K^{0.5})$$

Where: R = radius of influence (m)
Δh = expected groundwater drawdown (m)
K = hydraulic conductivity (m/sec).

For the purposes of completing the calculations, the following values were used in the analysis for the glacial till:

- Δh = 2 to 4 m for the glacial till and 1 to 2 m for the bedrock.
- K = 6.0 x 10^{-6} m/sec for the glacial till and 1.9 x 10^{-4} m/sec for the bedrock.

Using the above equation and assumptions, a radius of influence of approximately 15 to 29 m will develop as a steady state condition within the glacial till, extending from the edge of the excavation, depending on the groundwater levels and hydraulic properties of the specific soils encountered. If shallow bedrock removal is required, a radius of influence of approximately 41 to 83 m will develop as a steady state condition based on the geometric mean hydraulic conductivity values measured at the bedrock well location.

The surrounding area consists of mostly low-rise residential homes and commercial properties. The buildings located within the theoretical radius of influence are generally expected to be founded on the glacial till deposit. The majority of the groundwater infiltration is expected to occur within the glacial till with minimal compressibility. Furthermore, water takings are also expected to be short term in duration, given the nature of the development. As such, adverse

effects to surrounding infrastructure related to dewatering activities at the subject site are expected to be negligible.

6.2 Impact of Proposed Development on Existing Well Users

A search of the Ontario Water Well Records online mapping database indicates there are a number of wells within 500 m of the site as depicted on Drawing PH5254-2 - MECP Water Well Location Plan, appended to this report. However, it is expected that the majority of these wells are either no longer in use due to their installation dates and developed nature of the region or are monitoring well installations. Additionally, the majority of properties surrounding the site are serviced by municipal water supplies. Any wells that may still be in use are cased well below the anticipated excavation depths associated with the proposed development and are accessing the deeper bedrock aquifer. Therefore, it is anticipated that the existing wells will either no longer be in use or have adequate vertical and horizontal separation from proposed construction activities. Therefore, dewatering activities at the subject site are not expected to cause any interference to the water supply of surrounding properties or other negative impacts.

However, as a precautionary measure, a Baseline Water Sampling Program has been recommended to be completed prior to commencing construction on site. The premise of the program is to obtain groundwater quality information from the water supply wells in the vicinity of the proposed development prior to the project commencing. This ensures that all parties involved (developer, homeowners, and City of Ottawa) are protected should a concern arise during or after construction.

Baseline Water Sampling Program

As mentioned above, the theoretical radius of influence that may develop as a result of dewatering activities associated with the proposed development is expected to be 25 to 97 m, from the edge of the excavations at the time of construction, depending on the hydraulic properties and groundwater levels across the site. The domestic wells in the area were completed at depths well below the anticipated municipal servicing depths with WWRs noting that the majority of water-bearing zones were encountered below the anticipated servicing depths at the subject site.

Based on the water service mapping provided by the City of Ottawa, as well as all the available information, a total of three (3) potential privately serviced lots have been identified to be included in the Baseline Water Sampling Program and are shown on the attached Drawing PH5254-2 MECP Water Well Location Plan. All privately serviced lots on Blais Road were included in the program, which provides

a sampling radius in excess of the potential theoretical radius of influence discussed above. Furthermore, given the size and layout of the proposed development, only servicing installations on the outer perimeter of the subject site will have a radius of influence that may intercept adjacent properties.

The following municipal addresses are proposed to be included in the Baseline Water Sampling Program:

- 3216 Blais Road
- 3238 Blais Road
- 3250 Blais Road

The available water well records that are mapped within the aforementioned properties are included with the historical water well records included in Appendix 4.

The homeowners of the aforementioned properties will be invited to participate in the Baseline Water Sampling Program by providing one registered letter delivered by Canada Post. Upon receipt of the letter, homeowners will have approximately two to four weeks to contact Paterson to participate in the sampling program. To avoid the harassment of homeowners, homeowners that do not contact Paterson within four weeks of receiving the notification letter will be considered to have elected not to participate in the program. Interested homeowners will be interviewed for the purpose of obtaining anecdotal baseline water quality/quantity information about their water supply well followed by the collection of a raw water sample that will be submitted to an accredited laboratory for analysis.

The parameters that are being analyzed as part of the sampling program consist of the "Subdivision Water Quality Package" offered by Eurofins Environmental Testing Canada Inc. This package includes; alkalinity, bacteria, colour, conductivity, pH, hardness, IC anions, NH_3, TKN, DOC, phenols, sulphide, trace metals (as listed in City of Ottawa's Hydrogeological and Terrain Analysis Guidelines), Tannin & Lignin, TDS and turbidity.

A draft copy of the registered letter will be submitted to the City of Ottawa for review prior to commencement of the Baseline Water Sampling Program outlined above.

If wells are found to remain in existence on the subject site, they should be decommissioned in accordance with Ontario Regulation 903 prior to construction.

6.3 Impact of Proposed Development on the Environment

A search of the MECP Environmental Site Registry for Records Site Condition (RSCs) was conducted as part of the assessment of the site, neighbouring

properties and the general area. No RSCs were identified within the 500 m of the subject site.

A Phase I Environmental Site Assessment (ESA) was completed by Paterson for the subject site. It was determined that there were no areas of potential environmental concern within the assessment area and it was Paterson's opinion that a Phase II ESA was not required for the property.

There are several surface water features located within the subject site and within 500 m of the subject site. These include unnamed scratch ditches, drainage ditches, conveyance channels and Findlay Creek. Also, the Findlay Creek Wetlands lies south of the subject site.

Based on the results of the water budget assessment, it is anticipated that there will be an increase in contribution of flow to Findlay Creek as a result of the increase in runoff under post-development conditions. To mitigate this increase, studies are currently being undertaken by both geomorphologists and stormwater engineers (Geomorphix and JSFA, respectively). Specific details were unavailable at the time of report preparation, however it is expected that the recommendations provided as part of their assessments will be incorporated into the overall stormwater management strategy for the subject site to mitigate potential impacts to the water feature.

6.4 Adjacent PTTW/EASRs/ECAs

A search of the MECP Permit to Take Water (PTTW) database provided one (1) PTTW within a 500 m radius of the subject site.

PTTW 7437-D73S6L is registered to Thomas Cavanagh Construction Limited and is located to the west and northwest of the subject site along Bank Street. The above noted permit contains 1 source (Servicing Trenches) with a maximum taking of 45,121,000 L/day.

A search of the MECP Environmental Activity and Sector Registry (EASR) database provided one (1) active EASR within a 500 m radius of the subject site.

EASR R-009-4295072770 is registered to Thomas Cavanagh Construction Limited and is located within the subject site associated with the street widening of Bank Street. The above noted permit contains 1 source (Construction Dewatering) with a maximum taking of 400,000 L/day, per source. It is anticipated that this EASR has been replaced by the aforementioned PTTW.

It is anticipated that the street widening will be completed prior to the commencement of construction and therefore, it is unlikely that dewatering between the two sites would be taking place concurrently. Cumulative impacts related to anticipated dewatering activities for the proposed development from adjacent water taking permits are not anticipated.

With respect to Environmental Compliance Approvals (ECAs), given the nature of the development in the area (residential and commercial), there are several ECAs that exist for various purposes in the areas bordering the site. Three (3) ECAs were found to be in relation to existing stormwater and sanitary management systems in the area, however they were stated to be expired in 2025. Upon review of the aforementioned ECAs, the ECAs generally relate to installations of new sanitary and storm sewers for new residential developments along with stormwater management facilities on the respective sites. As the ECAs relate to municipal stormwater infrastructure, no concerns were found from a hydrogeological perspective in relation to the subject site.

7.0 ASSESSMENT AND RECOMMENDTIONS

7.1 Sources of Contamination

Prior to and during site development, it is recommended that construction best management practices with respect to fuels and chemical handling, spill prevention, and erosion and sediment control be followed. This will minimize the potential for the introduction of contaminants to the soil, surface water, or groundwater at the subject site.

It is anticipated that the material on site will be disposed of as per Ontario Regulation 406/19 – On-site and Excess Soil Management.

With respect to stormwater runoff quality, it is recommended that best management practices with respect to operational standards be maintained for any stormwater management facilities constructed for the proposed development.

7.2 Surface Water Features

There are several surface water features located within the subject site and within 500 m of the subject site. These include unnamed scratch ditches, drainage ditches, conveyance channels and Findlay Creek. As previously noted, various studies were currently underway by others at the time of report preparation to assess the extent of effort required to mitigate potential impacts resulting from increased flows from the proposed development. Dependant on the outcome of these studies, additional measures may need to be incorporated into the overall stormwater management strategy for the site to limit the extent of increase in flows to the creek.

With respect to water discharge, water that is pumped from on site excavations must be managed in an appropriate manner. The contractor will be required to implement a water management program to dispose of the pumped water. If the discharge point for the pumped water is directed to overland drainage, it is expected that a multi-barrier approach (such as hay bales, geosocks, silt fence, etc.) to a non-frozen, well vegetated area will be utilized in order to promote re-infiltration prior to reaching a watercourse. Furthermore, if the discharged water is to be directed to overland drainage within 30 m of a water body/watercourse, the turbidity of the water shall not exceed 8 NTU above background levels of the nearest water body. The contractor will be required to maintain appropriate BMPs with respect to sediment and erosion control to ensure negative effects to the surrounding environment are minimized.

7.3 Existing Wells

Any wells within the subject site must be decommissioned prior to construction in accordance with Ontario Regulation 903.

If construction activities are shown to cause negative impacts to the water supplies of existing well users, the developer shall take action to make available a supply of water equivalent in quality and quantity of their typical takings, or shall compensate those affected for reasonable costs for doing so, or shall reduce water taking amounts to alleviate the negative impacts. The contractor shall provide temporary water supplies, to those affected, to meet their typical takings or compensate such persons for reasonable costs associated to do so until permanent restoration of the affected water supply or an equivalent source. As the potential to interfere with the water quality/quantity of existing well users in the area is negligible, a water well monitoring program is not recommended for the proposed development.

7.4 Water Taking Permitting Requirements

If water taking volumes are greater than 50,000 L/day, a MECP water taking Environmental Activity Sector Registry (EASR) or Permit to Take Water (PTTW) will be required. Depending on the nature of the proposed water takings, an additional hydrogeological investigation may be required.

7.5 Infiltration Potential

At the time of report preparation, site specific infiltration testing had not been completed based on the current stage of development approvals. As previously discussed, surficial soils within the study area generally consisted of topsoil overlying a glacial till deposit. From a theoretical perspective, K_{fs} values within the glacial till are anticipated to range from 1×10^{-8} to 1×10^{-5} m/sec., with the variation in the K_{fs} values dependent on the composition/compaction of the material at a given location. Should infiltration-based Low Impact Development (LID) measures be considered at the subject site, it is recommended that site-specific infiltration testing be completed once additional development details become available.

As noted above, the results of the water budget analyses completed at the subject site indicated that 25,966,399 L/year of infiltration and 39,046,230 L/year of surface runoff are occurring under pre-development conditions. Under post development conditions, it is expected that there will be a 57% infiltration deficit and a 140%

increase in runoff. Therefore, it will likely be necessary to incorporate various stormwater management measures into the design of the development. It should be noted that Paterson's water budget assessment is based on mean water budget values for the soil types at the subject site that were calculated by modeling conducted by EC-ECS. The EC-ECS model is calibrated to historical climate data and does not account for climate change predictions. Therefore, based on the National Capital Commission and City of Ottawa climate change predictions, the stormwater management design team could consider potential seasonal changes (longer spring and shorter winter) and increases in temperature and precipitation when developing their stormwater management strategy.

The stormwater management strategy should target methods best suited to mitigate the impacts that may arise due to the post-development decrease in infiltration and increase in runoff at the subject site, while maintaining consideration of site constraints as defined by the Appendix 10 of the City of Ottawa's Sewer Design Guideline and the MECP's Consolidated Linear Infrastructure Environmental Compliance Approval documentation. Based on the site constraints observed at the subject site (i.e., shallow water table, shallow bedrock), infiltration based Low Impact Development (LID) measures are not recommended at the time of report preparation. Given that infiltration based LID's are not feasible due to site constraints, it is anticipated that the stormwater management strategy for the site will include conventional stormwater management measures (i.e. end of pipe quality and quantity control) and Best Management Practices.

8.0 CLOSURE

The client should be aware that any information pertaining to soils and all test hole logs are furnished as a matter of general information only, and test hole descriptions or logs are not to be interpreted as descriptive of conditions at locations other than those of the test holes.

A hydrogeological review of this nature is a limited sampling of a site. The recommendations are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around the test locations. Should any conditions at the site be encountered which differ from those at the test locations, we request notification immediately in order to permit reassessment of our recommendations.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Caivan Communities or their agent(s) is not authorized without review by Paterson Group for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.

Oliver Blume, P.Geo.

Michael Laflamme, P.Geo.

PROFESSIONAL GEOSCIENTIST
June 26, 2026
MICHAEL LAFLAMME
PRACTISING MEMBER
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ONTARIO

9.0 REFERENCES

Government of Ontario. Provincial Policy Statement 2020 Under the Planning Act.

Engineering Technologies Canada Ltd, “ETC Pask (Constant Head Well) Permeameter – User Guide”, dated March 2016.

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Freeze, R.A., and Cherry, J.A. “Groundwater”. Prentice-Hall, Inc., 1979.

FIGURES

DRAWING PH5254-1 - SITE PLAN

DRAWING PH5254-2 - MECP WATER WELL LOCATION PLAN

DRAWING PH5254-3 - SURFICIAL GEOLOGY PLAN

DRAWING PH5254-4 - BEDROCK GEOLOGY PLAN

DRAWING PH5254-5 - GROUNDWATER CONTOUR PLAN

DRAWING PH5254-6 - PRE-DEVELOPMENT TERRAIN COMPOSITION PLAN

DRAWING PH5254-7 - POST-DEVELOPMENT TERRAIN COMPOSITION PLAN

MONITORING WELL WATER ELEVATION PLOTS



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1	UPDATED CONCEPT PLAN	26/06/2026	OB

CAIVAN COMMUNITIES
HYDROGEOLOGICAL STUDY
PROPOSED RESIDENTIAL DEVELOPMENT
4795 BANK STREET
OTTAWA, ONTARIO

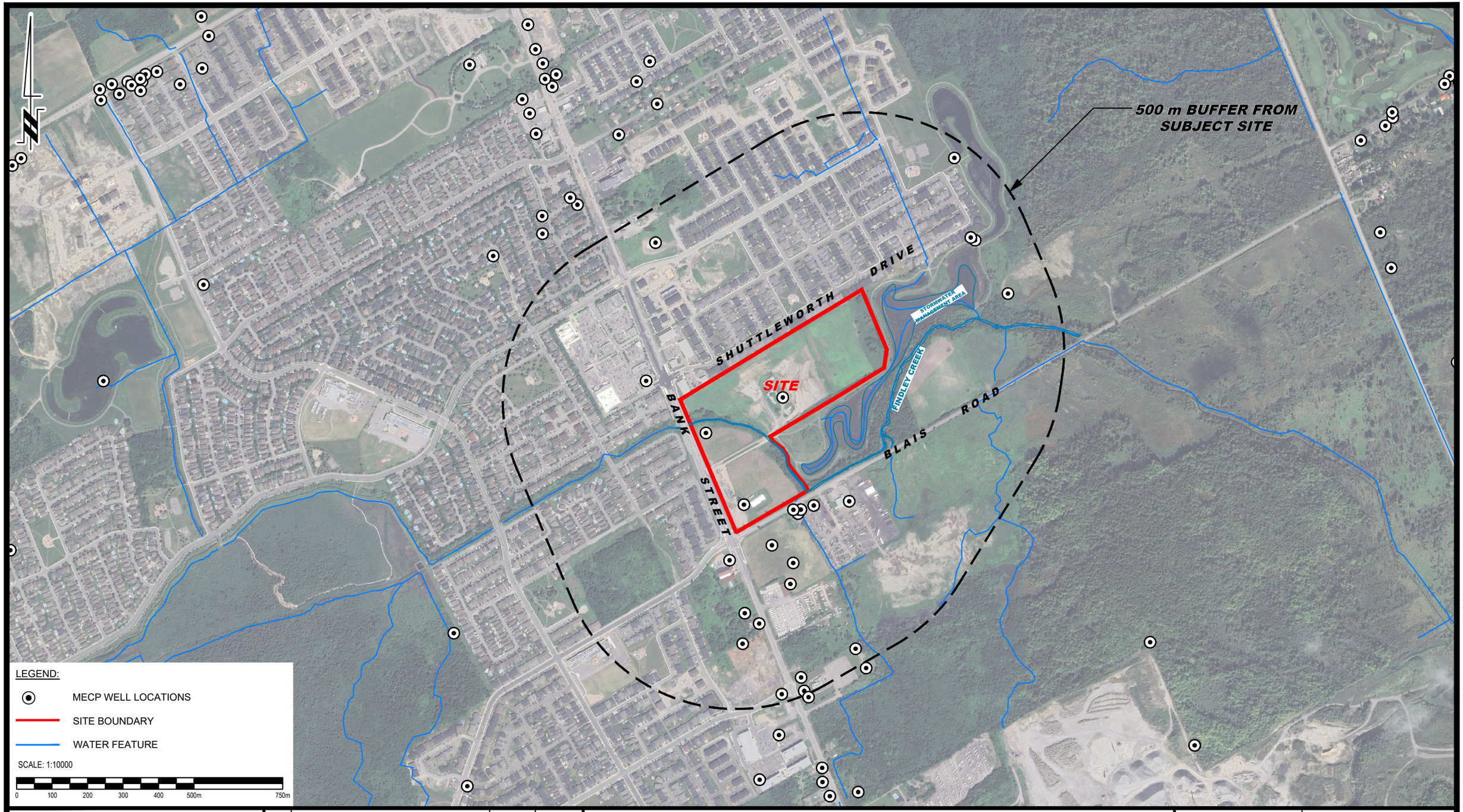
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SITE PLAN

Scale: 1:4000	Date: 05/2026
Drawn by: GK	Report No.: PH5254-REP.01
Checked by: AS	Dwg. No.: PH5254-1
Approved by: ML	Revision No.: 1

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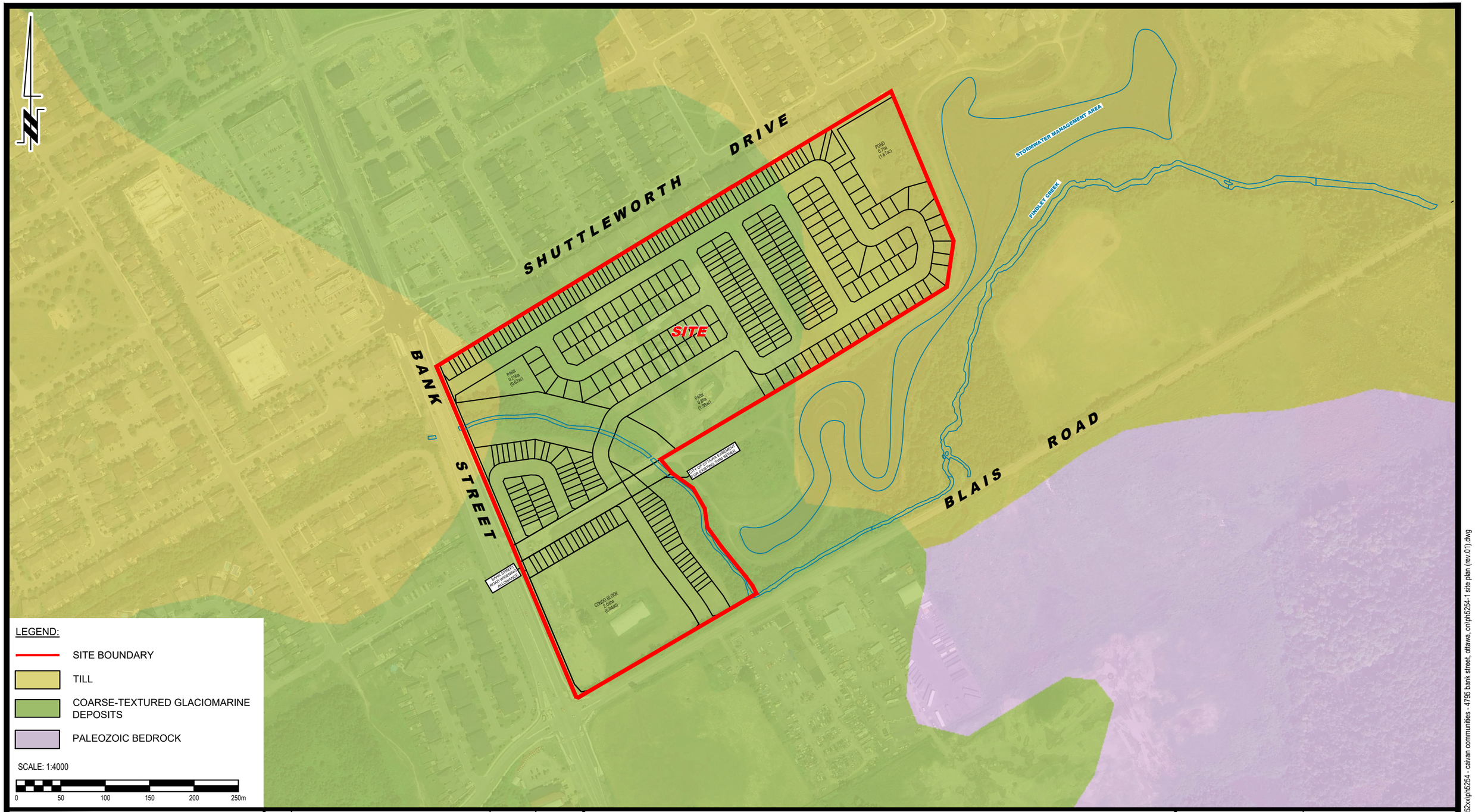
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PROPOSED RESIDENTIAL DEVELOPMENT
4795 BANK STREET
OTTAWA, ONTARIO

Title:
SITE PLAN

Scale: 1:10000	Date: 05/2026
Drawn by: GK	Report No.: PH5254-REP.01
Checked by: AS	Dwg. No.: PH5254-2
Approved by: ML	Revision No.:

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1	UPDATED CONCEPT PLAN	26/06/2026	OB

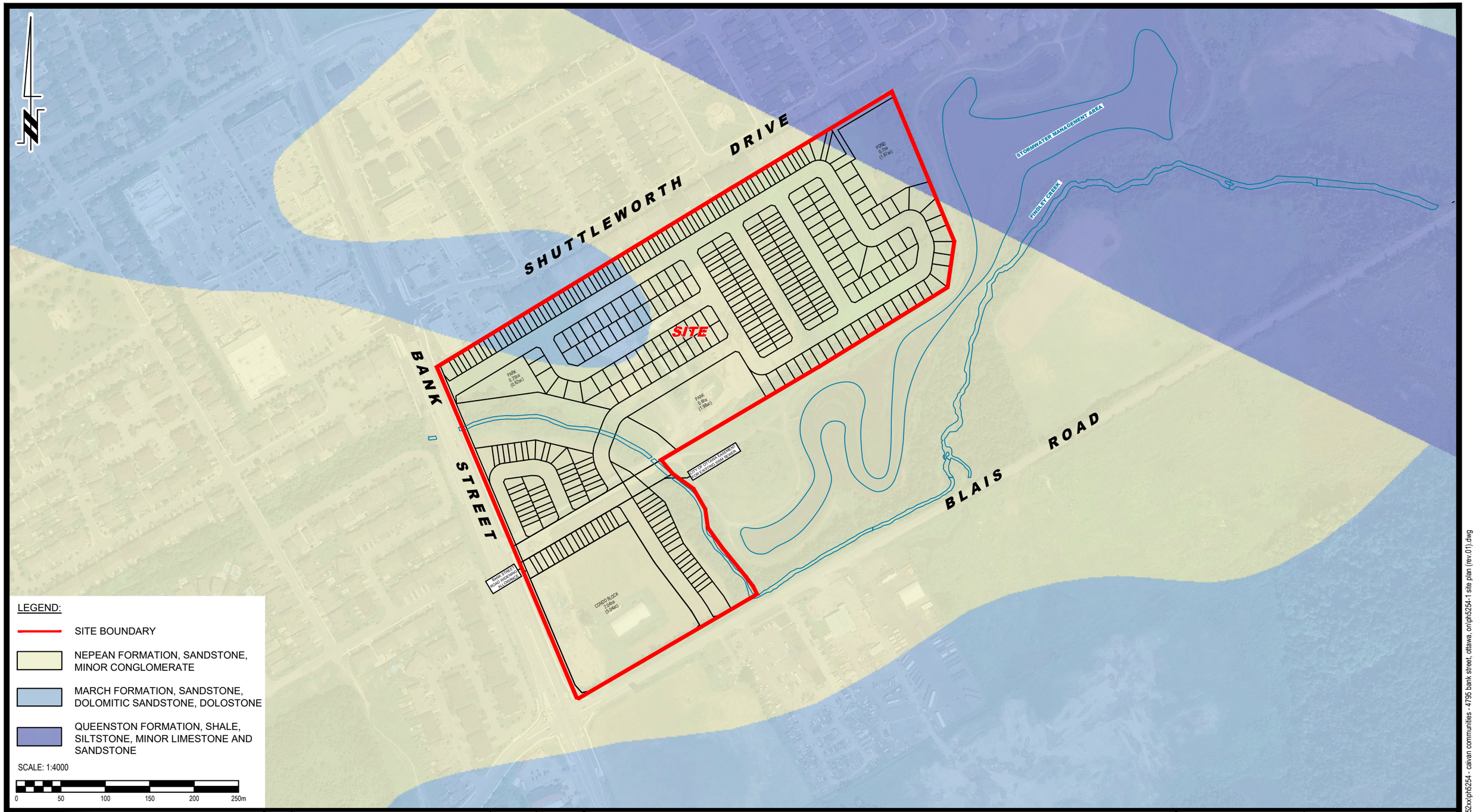
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PROPOSED RESIDENTIAL DEVELOPMENT
4795 BANK STREET
OTTAWA, ONTARIO

Title:
SURFICIAL GEOLOGY PLAN

Scale: 1:4000	Date: 05/2026
Drawn by: GK	Report No.: PH5254-REP.01
Checked by: AS	Dwg. No.: PH5254-3
Approved by: ML	Revision No.: 1

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CAIVAN COMMUNITIES
HYDROGEOLOGICAL STUDY
PROPOSED RESIDENTIAL DEVELOPMENT
4795 BANK STREET
OTTAWA, ONTARIO

Title:
BEDROCK GEOLOGY PLAN

Scale: 1:4000	Date: 05/2026
Drawn by: GK	Report No.: PH5254-REP.01
Checked by: AS	Dwg. No.: PH5254-4
Approved by: ML	Revision No.: 1

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LEGEND:

- SITE BOUNDARY
- BOREHOLE WITH MONITORING WELL LOCATION, CURRENT INVESTIGATION
- BOREHOLE LOCATION, 2024
- BOREHOLE WITH MONITORING WELL LOCATION, 2024
- PROBEHOLE LOCATION
- PREVIOUS TEST PIT LOCATION (PATERSON GROUP REPORT: PG6896-1, NOVEMBER, 2023)

91.20 GROUND SURFACE ELEVATION (m)

[78.18] INFERRED BEDROCK ELEVATION, BASED ON PROBE HOLE (m)

{84.46} PRACTICAL REFUSAL TO AUGERING ELEVATION (m)

(86.22) PRACTICAL REFUSAL TO DCPT ELEVATION (m)

(90.23) OVERBURDEN GROUNDWATER SURFACE ELEVATION (m) (MAY 21, 2026)

89 GROUNDWATER CONTOUR (m)

APPROX.GROUNDWATER FLOW DIRECTION

GROUND SURFACE ELEVATIONS AT BOREHOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM.

SCALE: 1:4000

0 50 100 150 200 250m

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NO.	REVISIONS	DD/MM/YYYY	INITIAL
1	UPDATED CONCEPT PLAN	26/06/2026	OB

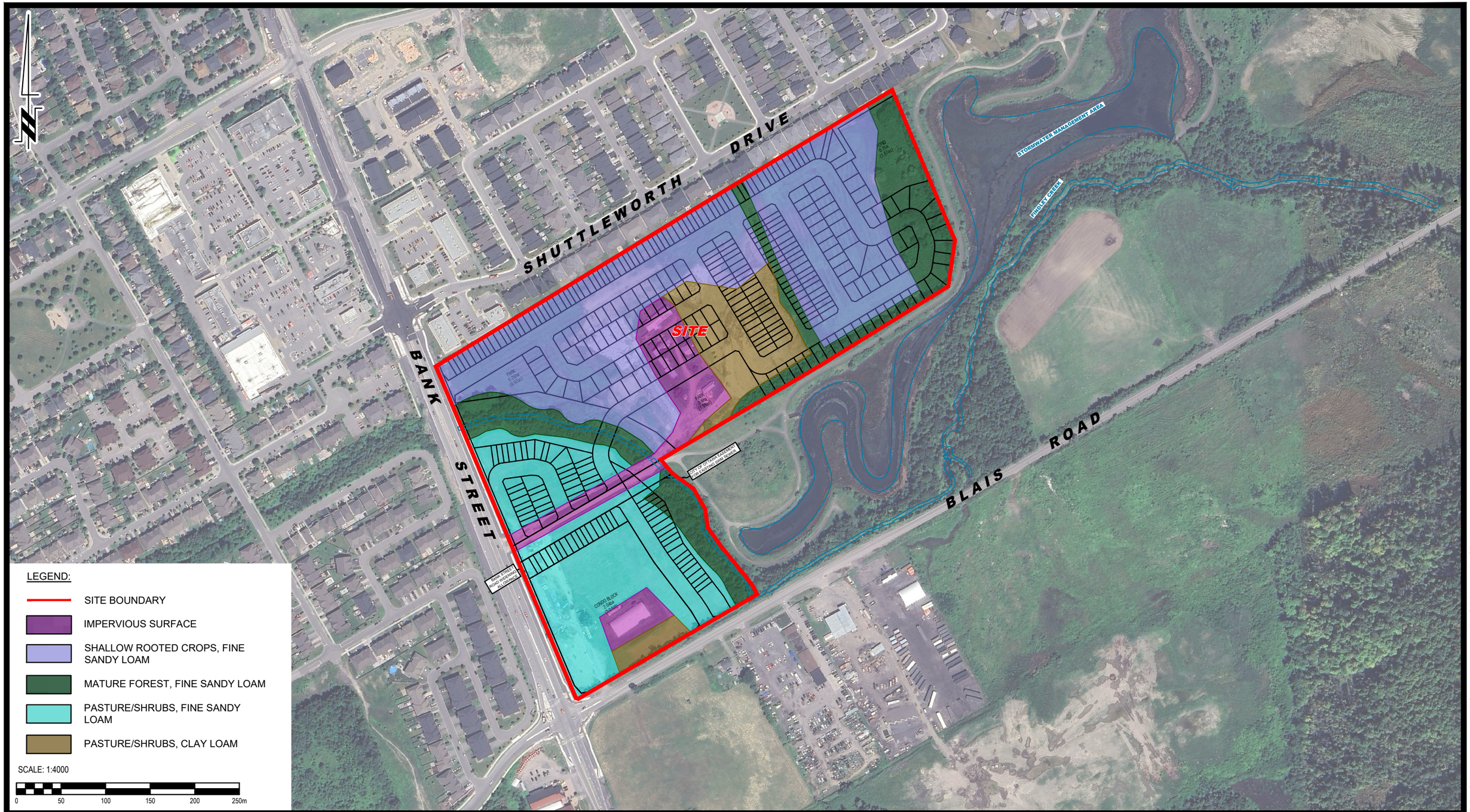
CAIVAN COMMUNITIES
HYDROGEOLOGICAL STUDY
PROPOSED RESIDENTIAL DEVELOPMENT
4795 BANK STREET
OTTAWA, ONTARIO

Title:
OVERBURDEN GROUNDWATER CONTOUR PLAN

Scale: 1:4000	Date: 05/2026
Drawn by: GK	Report No.: PH5254-REP.01
Checked by: AS	Dwg. No.: PH5254-5
Approved by: ML	Revision No.: 1

11x17

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

NO.	REVISIONS	DD/MM/YYYY	INITIAL
1	UPDATED CONCEPT PLAN	26/06/2026	OB

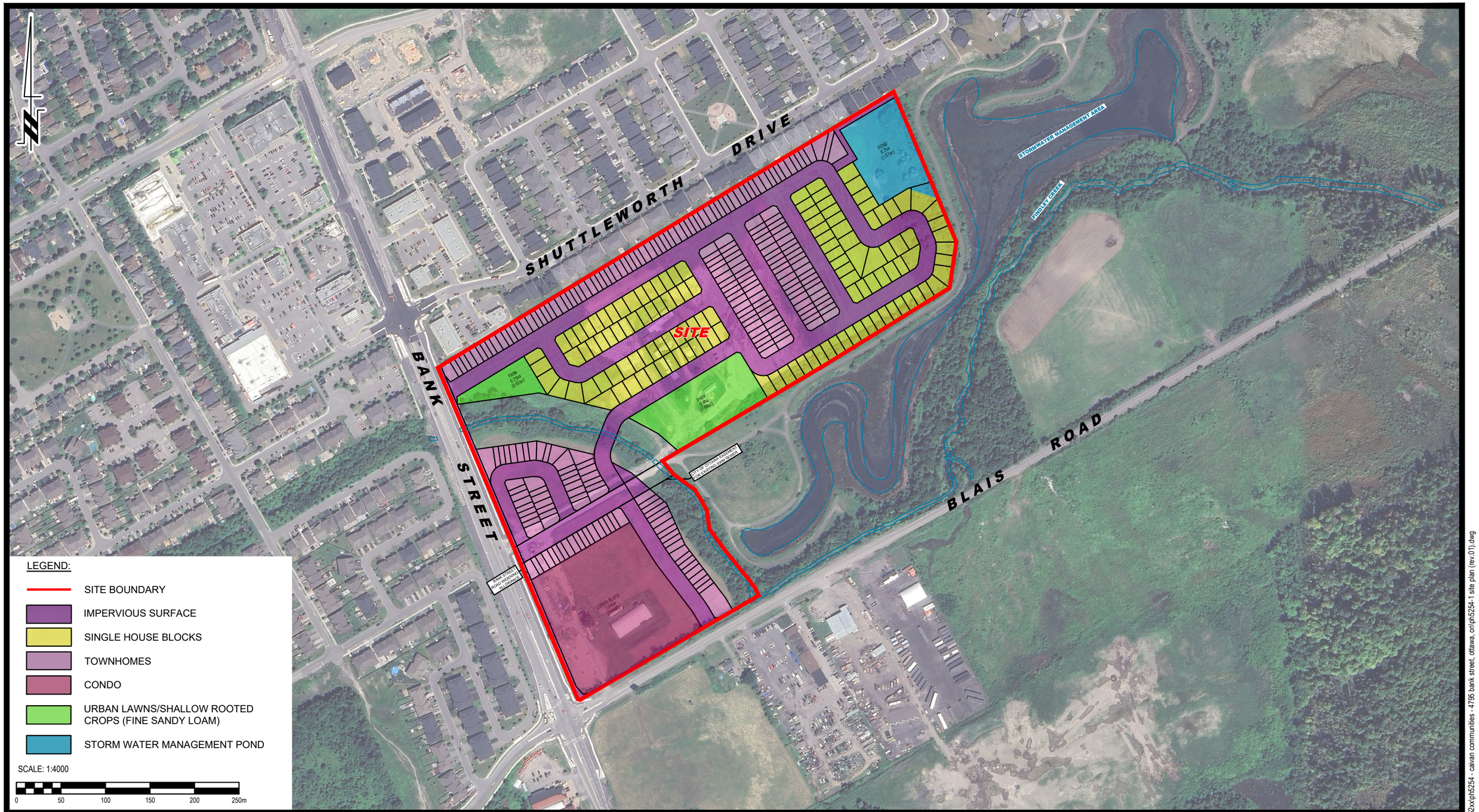
CAIVAN COMMUNITIES
HYDROGEOLOGICAL STUDY
PROPOSED RESIDENTIAL DEVELOPMENT
4795 BANK STREET
OTTAWA, ONTARIO

Title:
PRE-DEVELOPMENT TERRAIN COMPOSITION PLAN

Scale: 1:4000	Date: 05/2026
Drawn by: GK	Report No.: PH5254-REP.01
Checked by: AS	Dwg. No.: PH5254-6
Approved by: ML	Revision No.: 1

11x17

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NO.	REVISIONS	DD/MM/YYYY	INITIAL
1	UPDATED CONCEPT PLAN	26/06/2026	OB

CAIVAN COMMUNITIES
HYDROGEOLOGICAL STUDY
PROPOSED RESIDENTIAL DEVELOPMENT
4795 BANK STREET
OTTAWA, ONTARIO

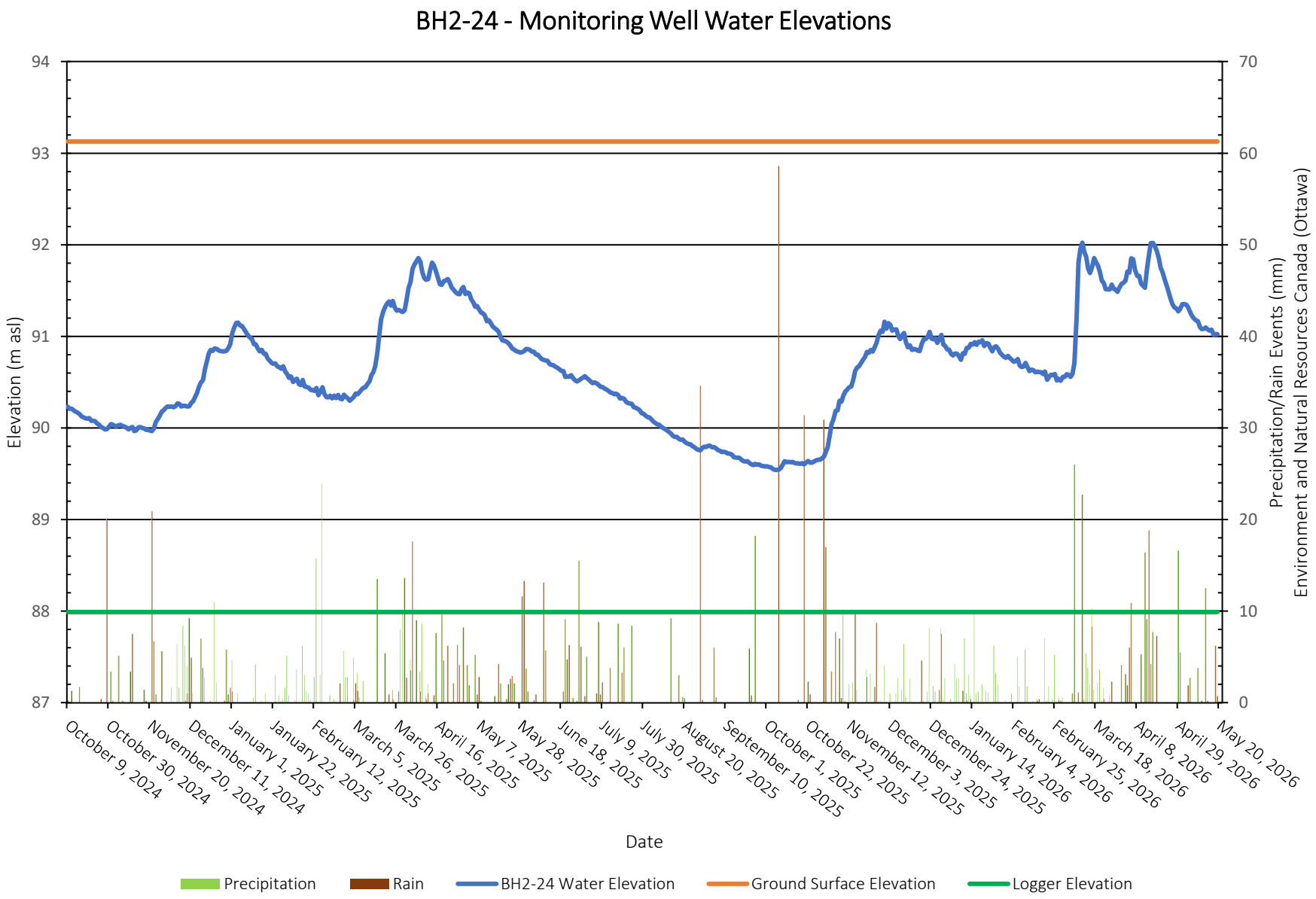
Title:
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Scale: 1:4000	Date: 05/2026
Drawn by: GK	Report No.: PH5254-REP.01
Checked by: AS	Dwg. No.: PH5254-7
Approved by: ML	Revision No.: 1

11x17

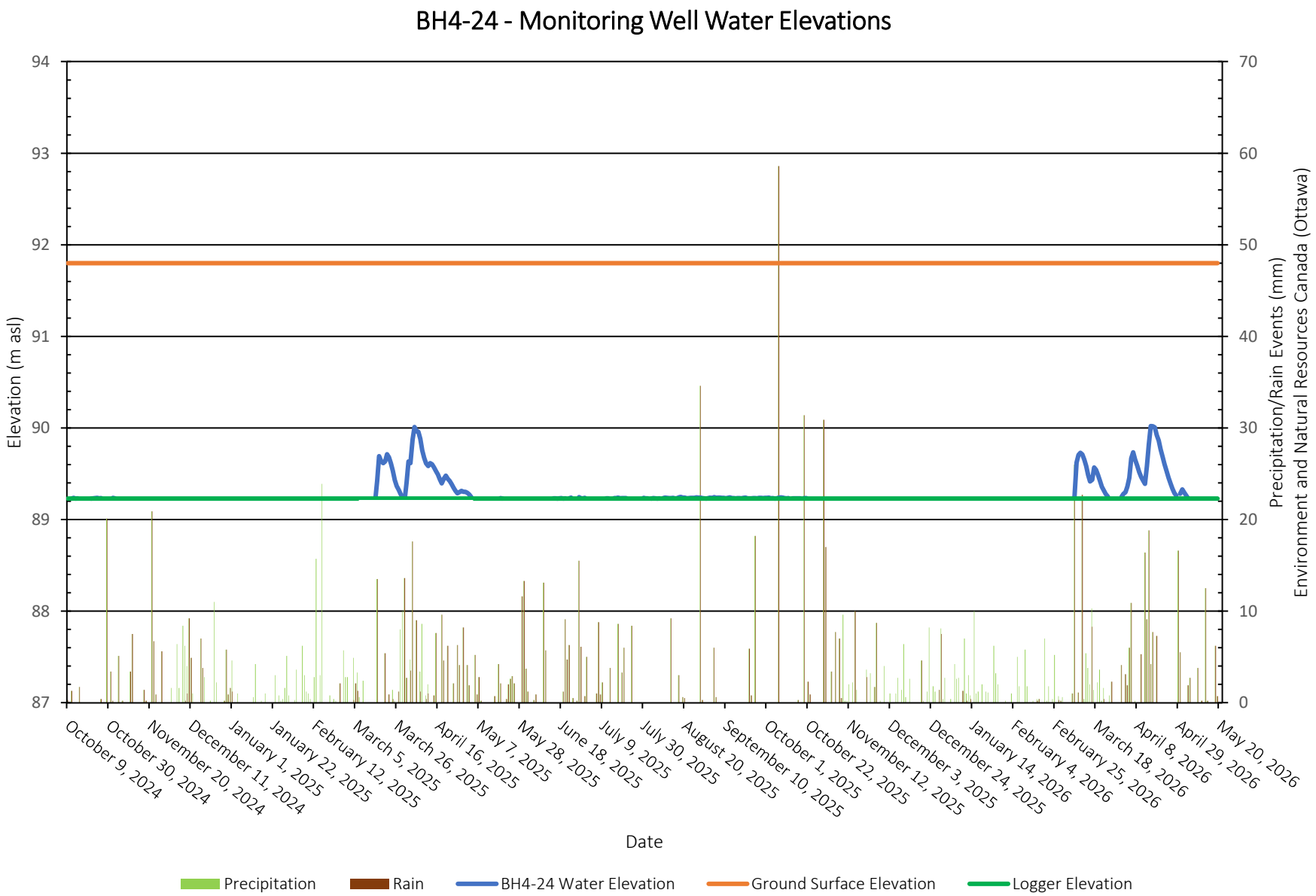
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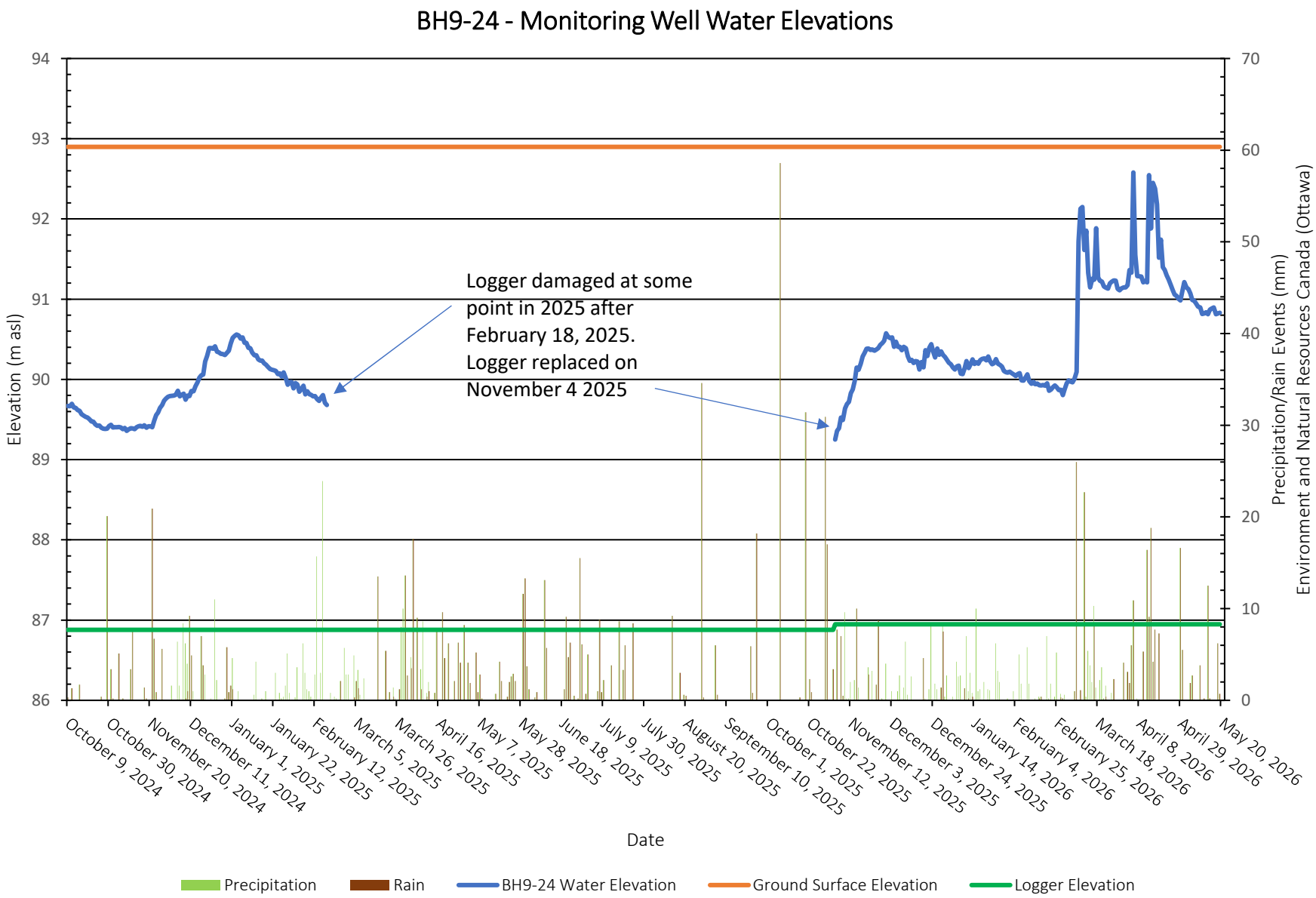
Caivan Communities
4795 Bank Street and 3301 Blais Road, Ottawa
Monitoring Well Water Elevations



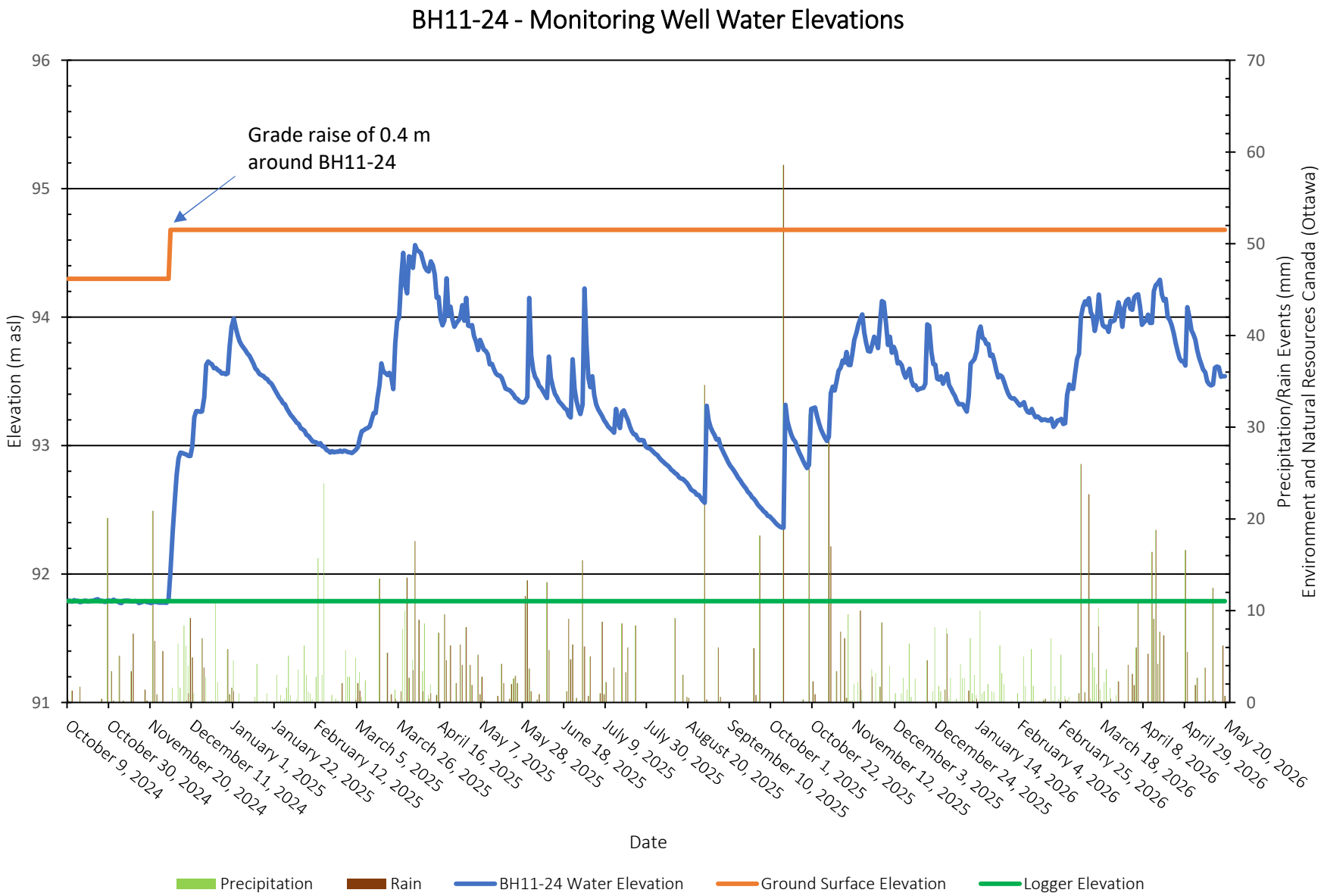
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Caivan Communities
4795 Bank Street and 3301 Blais Road, Ottawa
Monitoring Well Water Elevations



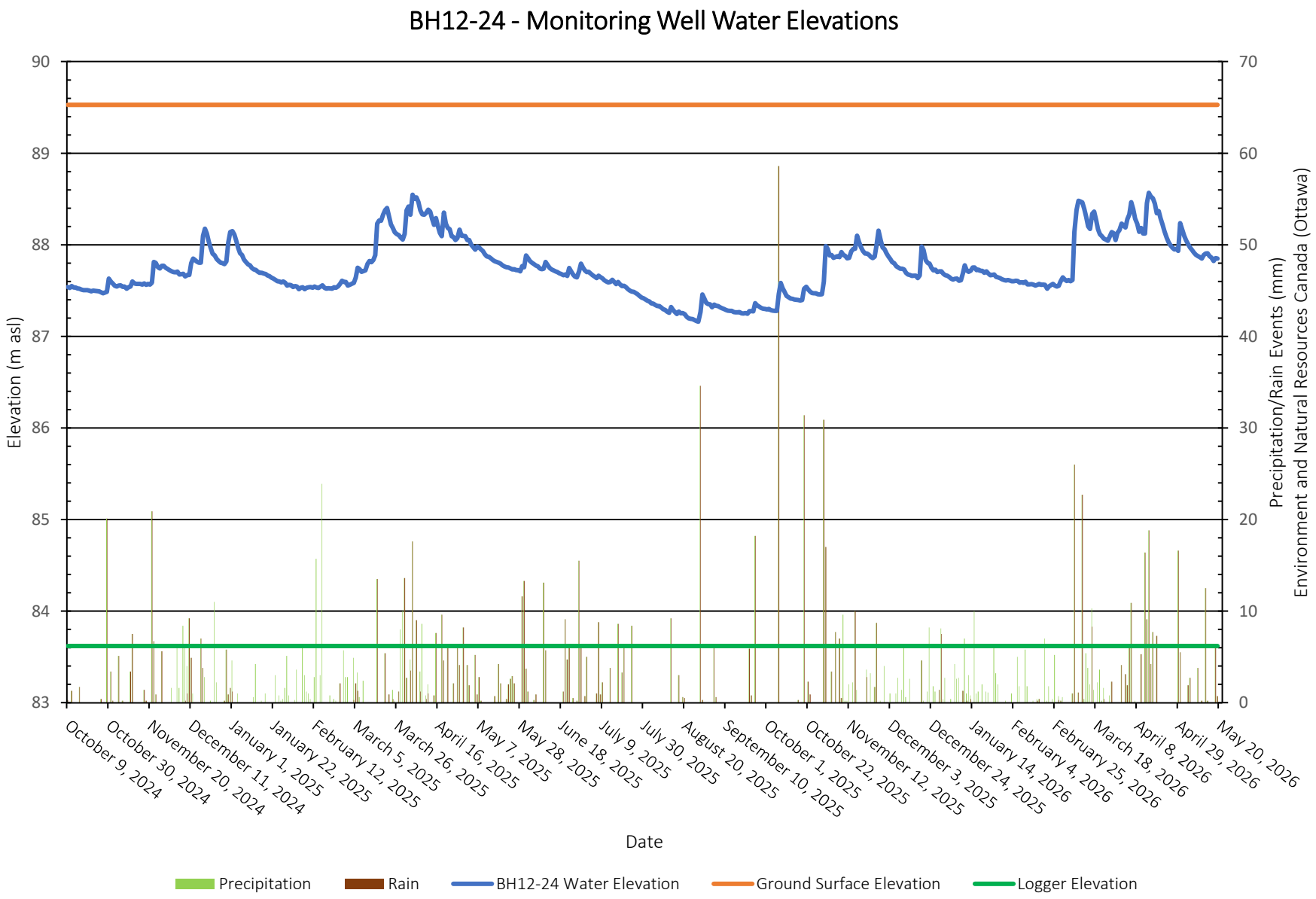

BH9-24 - Monitoring Well Water Elevations
Elevation (m asl)
Precipitation/Rain Events (mm)
Environment and Natural Resources Canada (Ottawa)
Logger damaged at some point in 2025 after February 18, 2025. Logger replaced on November 4 2025
Date
Precipitation
Rain
BH9-24 Water Elevation
Ground Surface Elevation
Logger Elevation

Caivan Communities
4795 Bank Street and 3301 Blais Road, Ottawa
Monitoring Well Water Elevations

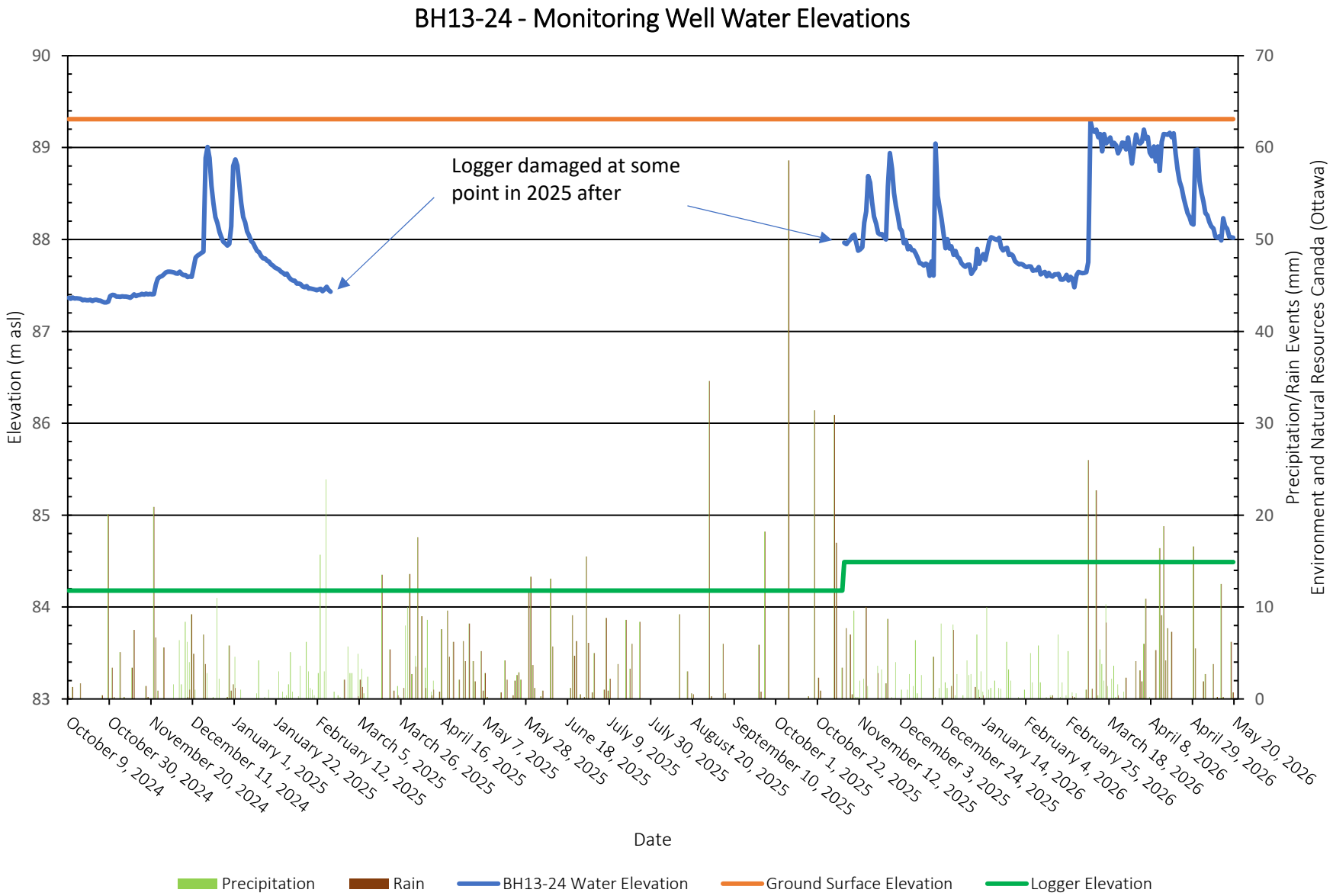


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Caivan Communities
4795 Bank Street and 3301 Blais Road, Ottawa
Monitoring Well Water Elevations

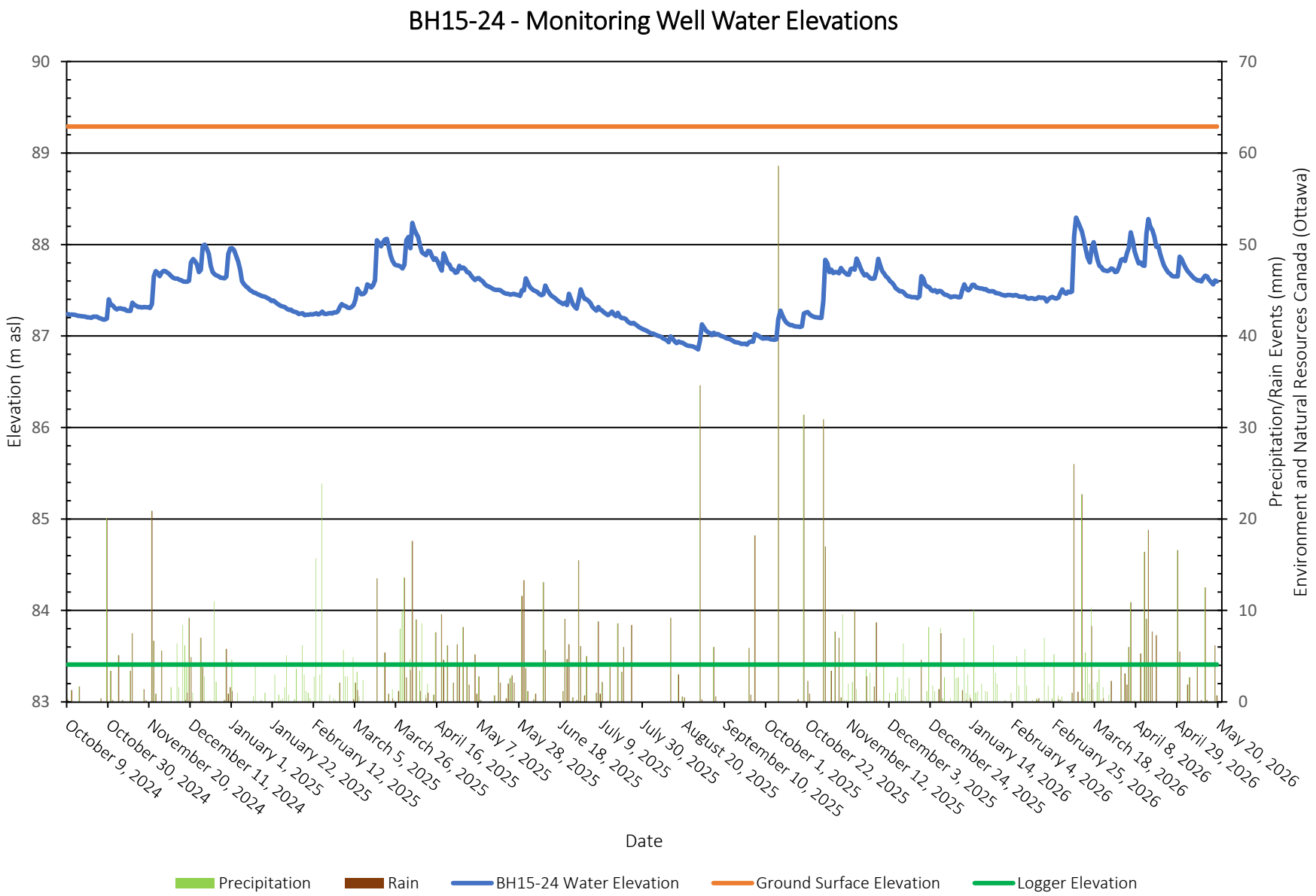


Caivan Communities
4795 Bank Street and 3301 Blais Road, Ottawa
Monitoring Well Water Elevations

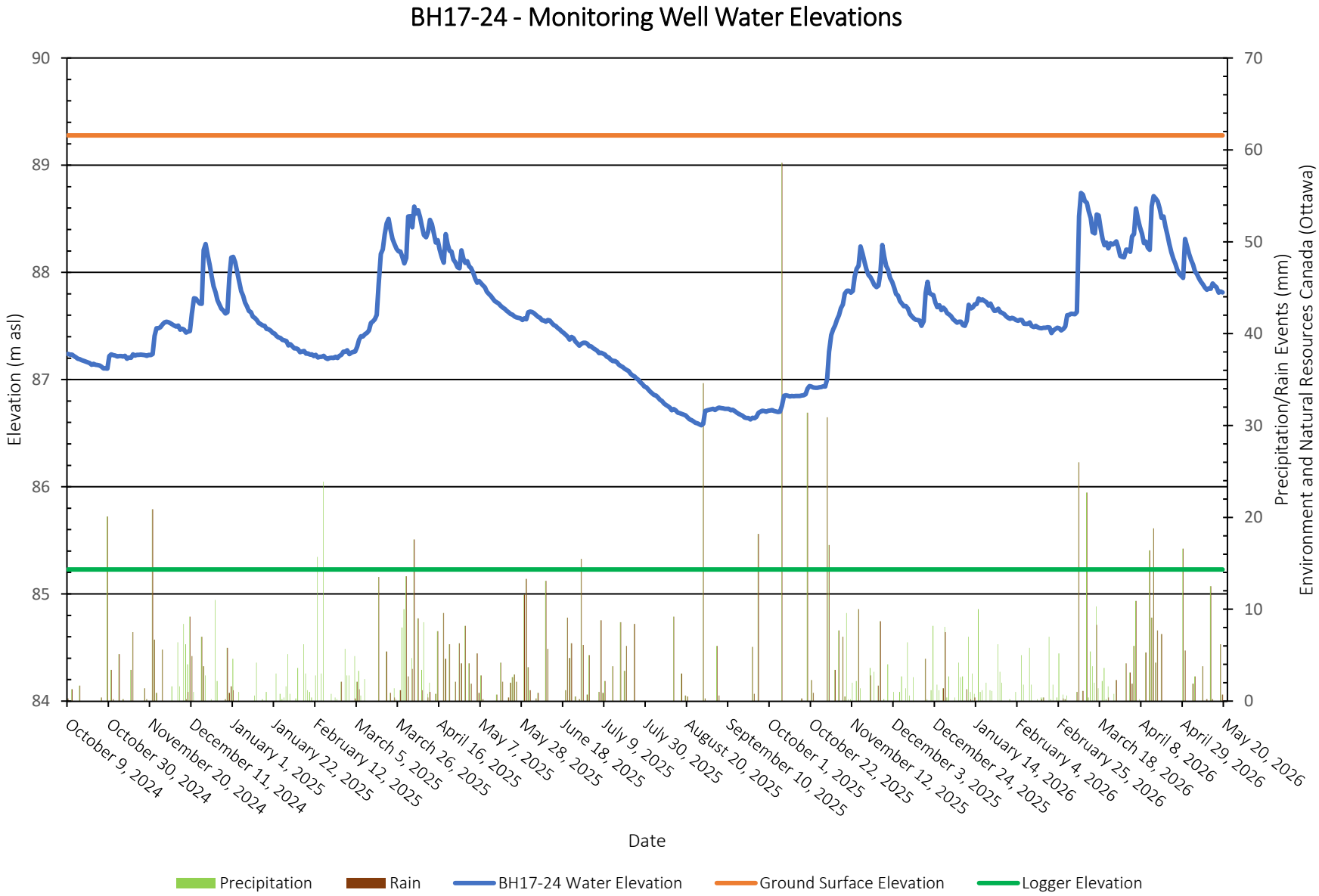


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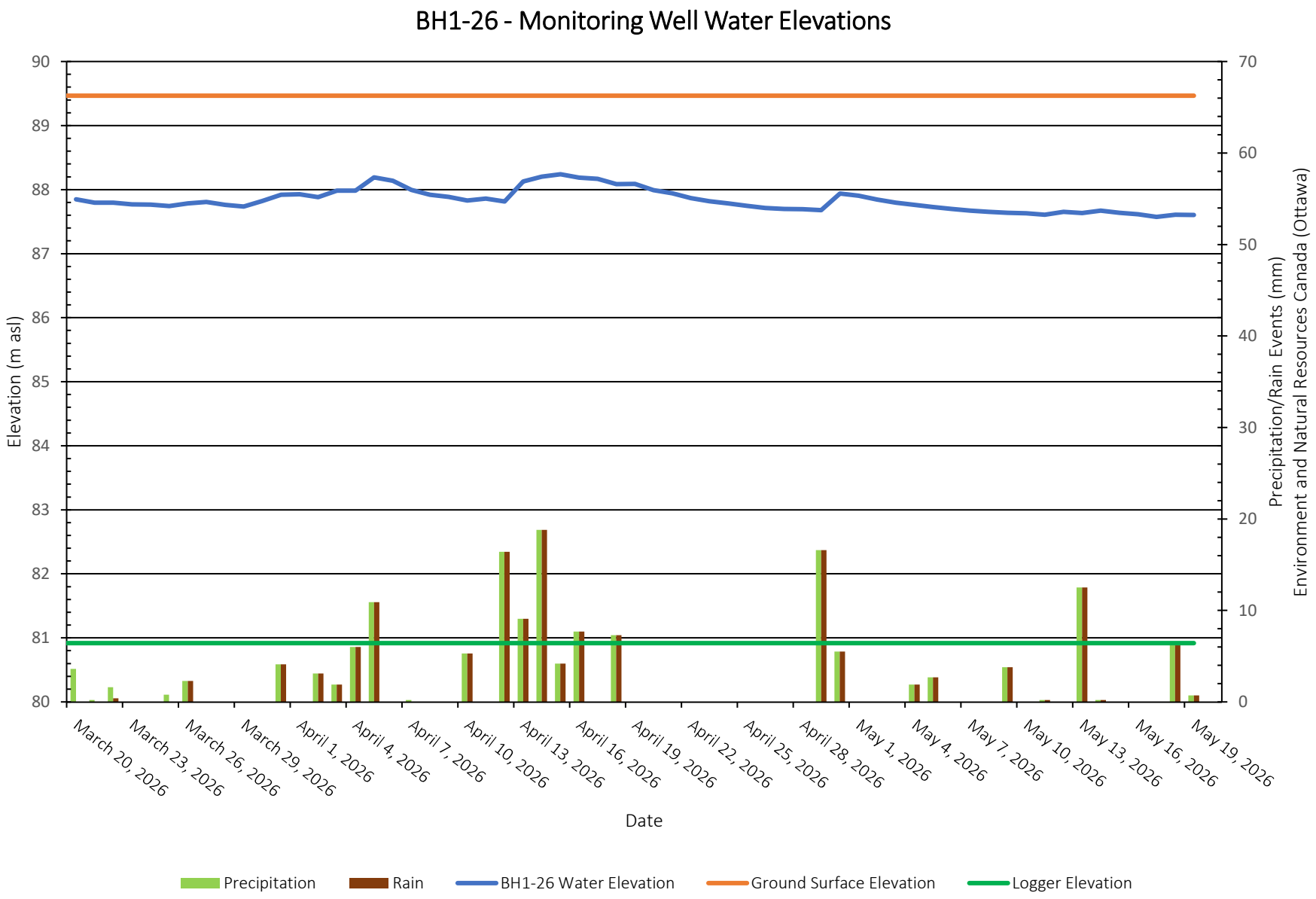
Caivan Communities
4795 Bank Street and 3301 Blais Road, Ottawa
Monitoring Well Water Elevations



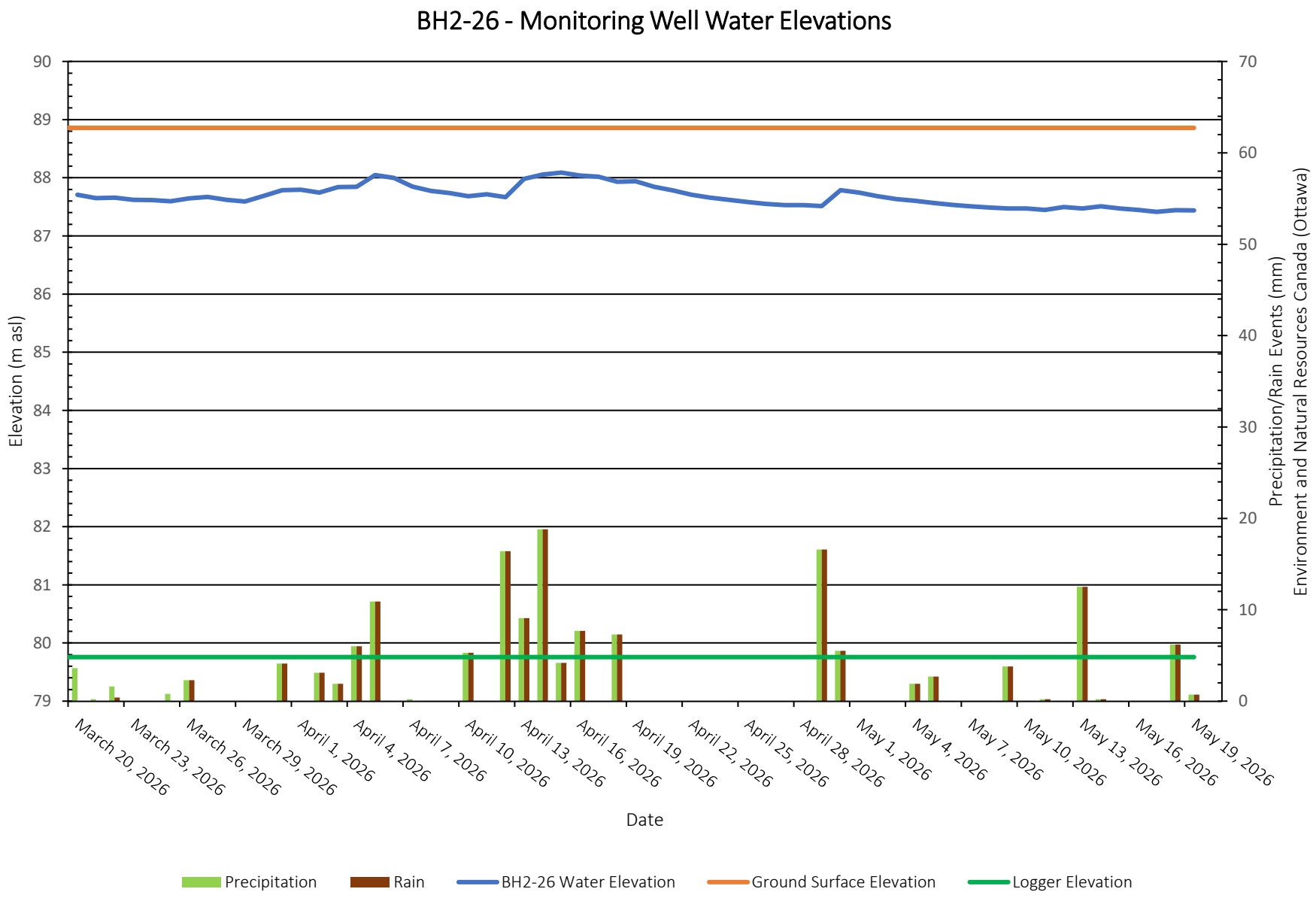
Caivan Communities
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Monitoring Well Water Elevations



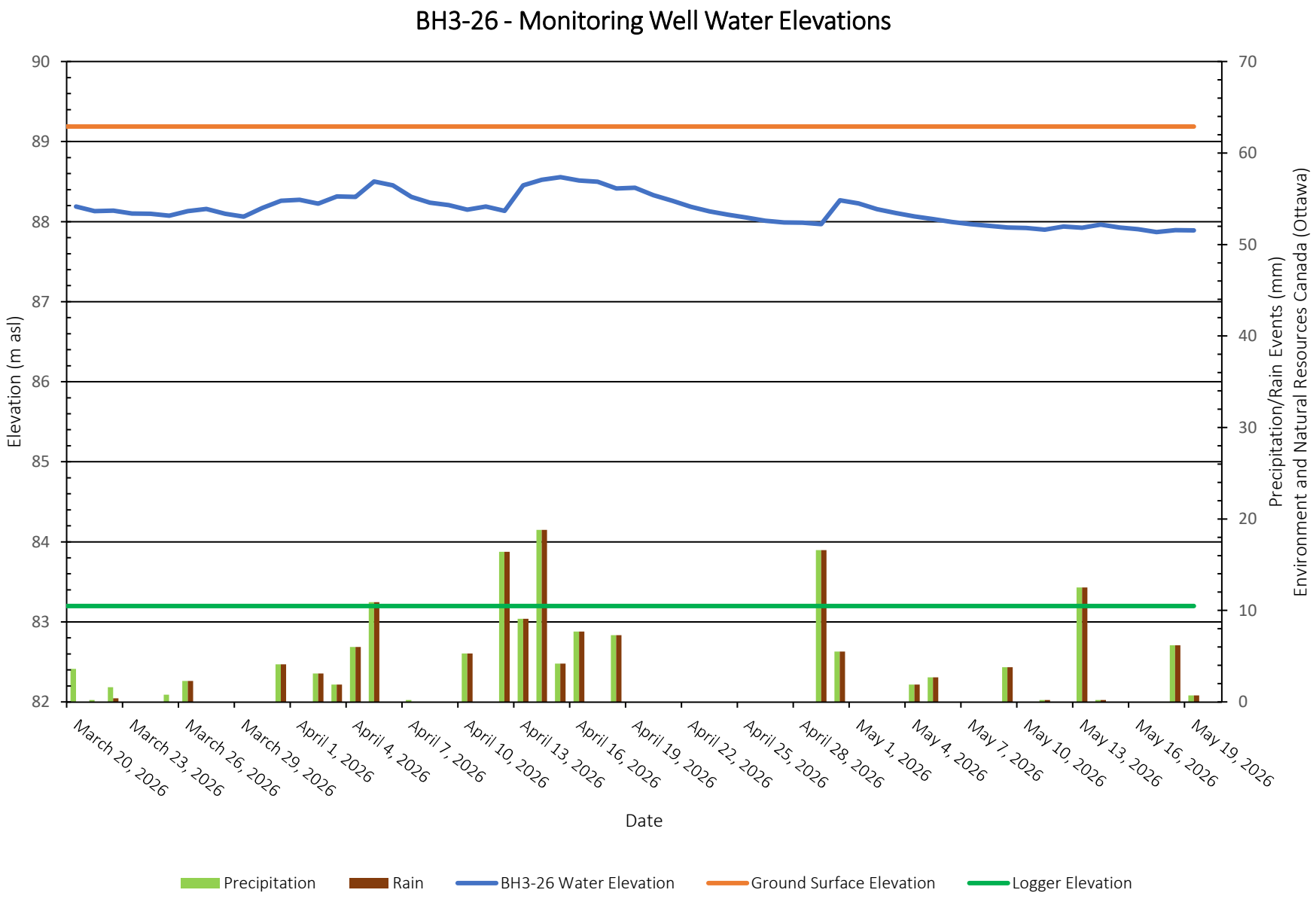
Caivan Communities
4795 Bank Street and 3301 Blais Road, Ottawa
Monitoring Well Water Elevations



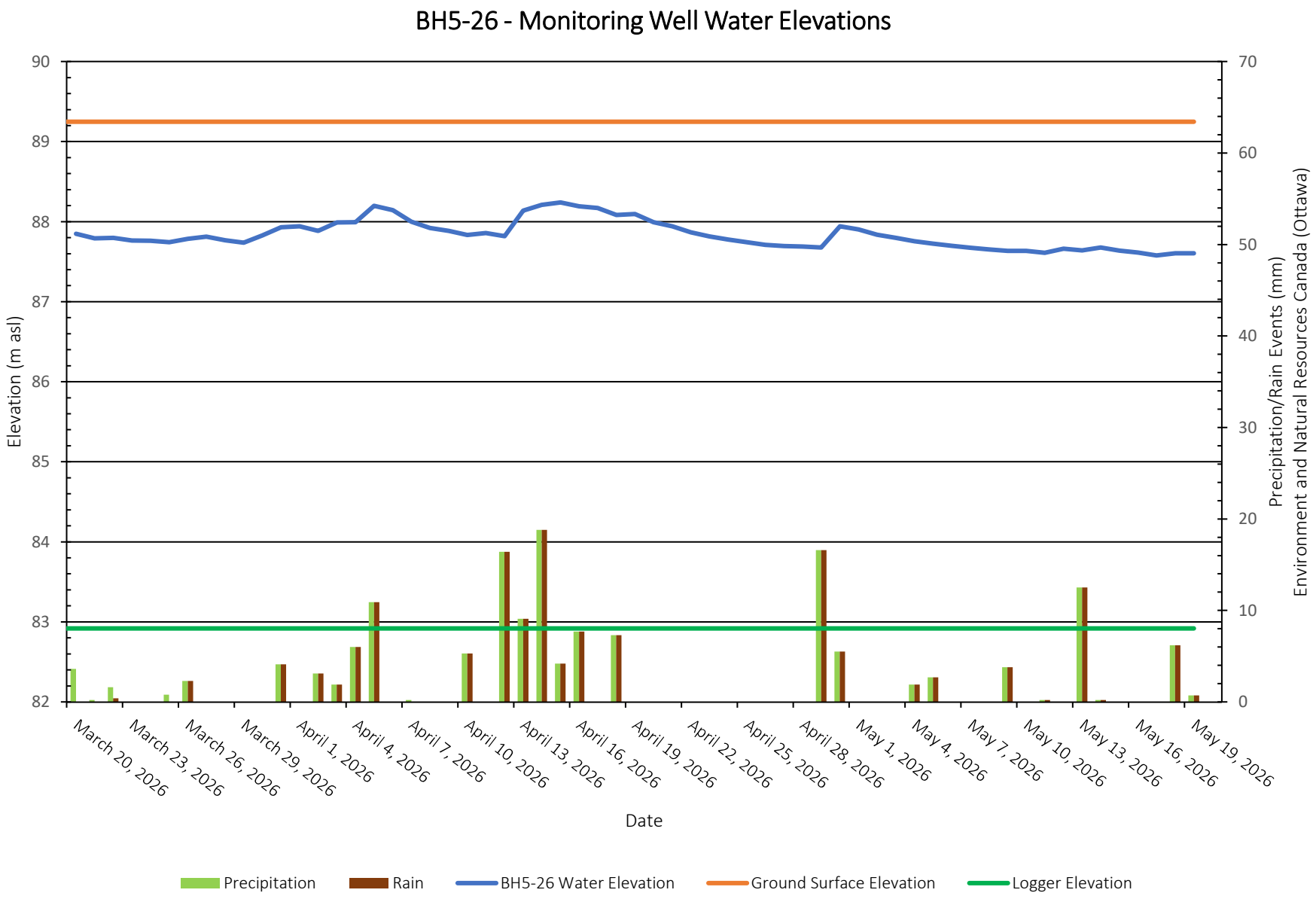
Caivan Communities
4795 Bank Street and 3301 Blais Road, Ottawa
Monitoring Well Water Elevations



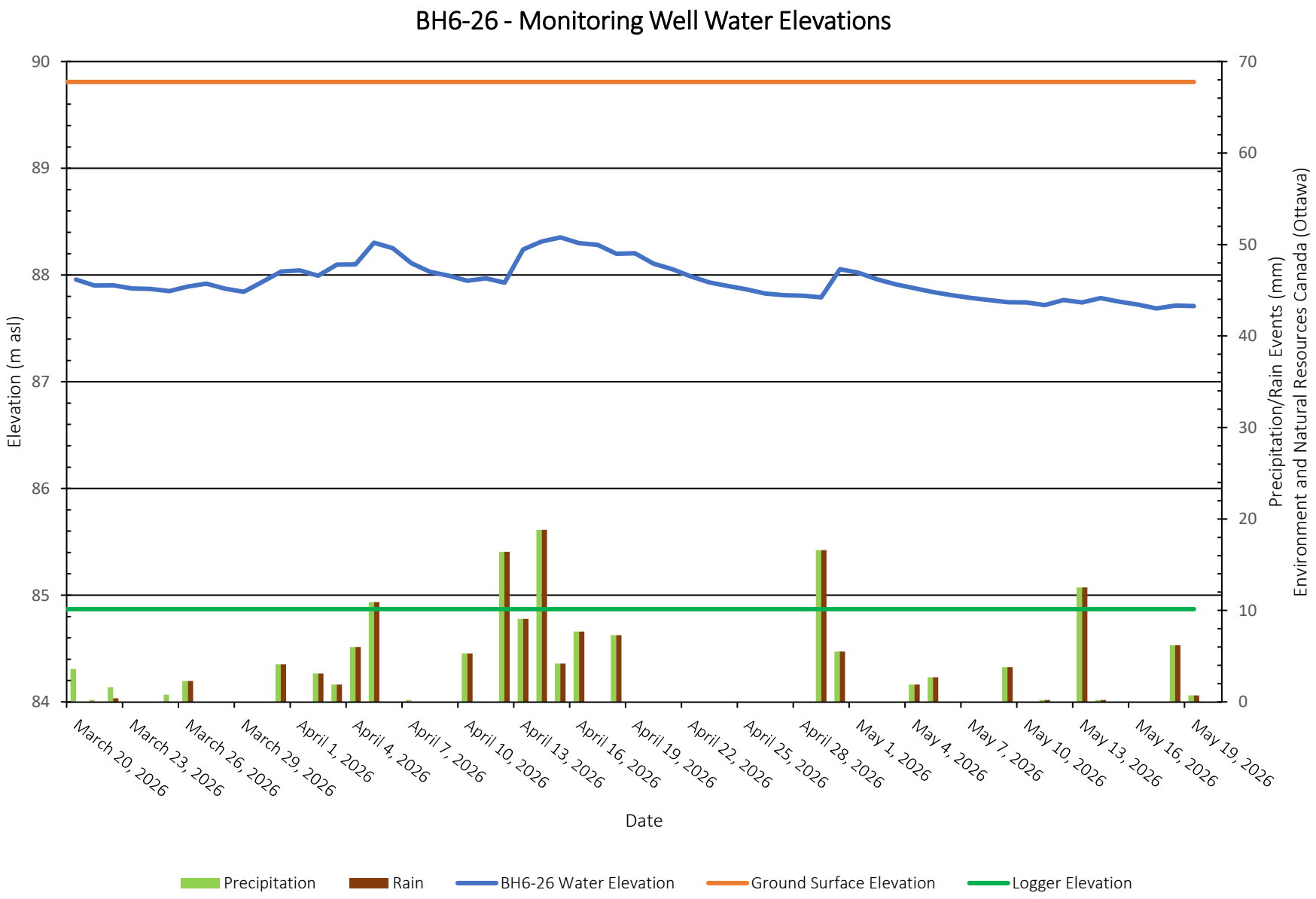
Caivan Communities
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Caivan Communities
4795 Bank Street and 3301 Blais Road, Ottawa
Monitoring Well Water Elevations



Caivan Communities
4795 Bank Street and 3301 Blais Road, Ottawa
Monitoring Well Water Elevations



APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

DRAWING PG7301-1 - TEST HOLE LOCATION PLAN

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376166.29 **NORTHING:** 5019808.33 **ELEVATION:** 93.47

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 25, 2024

FILE NO. : PG7301

HOLE NO. : BH 1-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics 0.15m [93.32m]		0	AU 1						93
GLACIAL TILL: Loose brown silty sand with gravel, cobbles and boulders - Very dense by 0.80 m depth 1.17m [92.30m]		1	SS 2	74	6-23-50-/ 73/0.25	9.5			92
End of Borehole Practical refusal to augering at 1.17 m depth (BH Dry - October 09, 2024)		2							91
		3							90
		4							89
		5							88
		6							87
		7							86
		8							85
		9							84
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376261.50 **NORTHING:** 5019824.46 **ELEVATION:** 93.13

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 25, 2024

FILE NO. : PG7301

HOLE NO. : BH 2-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	RECOVERY (%)	N, Nc OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics 0.20m [92.93m]		0	AU 1						93
FILL: Very dense, brown silty clay, with sand, trace gravel, cobbles and asphalt 1.45m [91.68m]		1	SS 2	92	17-31-35-42 66	9.89			92
GLACIAL TILL: Very dense, brown silty sand, trace clay, occasional gravel, cobbles and boulders 3.89m [89.24m]		2	SS 3	92	28-28-35-27 63	7.06			91
		3	SS 4	79	10-12-14-17 26	16.49		2.9 m 2024-10-09	90
			SS 5	4	10-9-8-10 17	21.47			
GLACIAL TILL: Very stiff, grey silty clay, with gravel and cobbles 5.23m [87.90m]		4	SS 6	42	7-6-26-12 32	13.79 10.6			89
		5	SS 7	43	7-5-23-50 28	10.56			88
End of Borehole Practical refusal to augering at 5.23 m depth (GWL at 2.90 m depth - October 9, 2024)		6							87
		7							86
		8							85
		9							84
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376312.22 **NORTHING:** 5019885.37 **ELEVATION:** 91.48

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 25, 2024

FILE NO. : PG7301

HOLE NO. : BH 3-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics		0							91
0.15m [91.33m]									
GLACIAL TILL: Loose brown silty sand, trace clay, occasional gravel, cobbles and boulders			AU 1						
- Very dense by 0.8 m depth		1	SS 2	86	16-50-/-/ 50/0.3	10.19			90
1.02m [90.46m]									
End of Borehole									
Practical refusal to augering at 1.02 m depth		2							89
(BH Dry - October 09, 2024)		3							88
		4							87
		5							86
		6							85
		7							84
		8							83
		9							82
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376195.40 **NORTHING:** 5019922.75 **ELEVATION:** 91.80

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 25, 2024

FILE NO. : PG7301

HOLE NO. : BH 4-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / △ REMOULDED SHEAR STRENGTH, Cur (kPa) ▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
FILL: Loose, brown silty sand, trace crushed stone		0	AU 1						
0.69m [91.11m]									
GLACIAL TILL: Dense, brown silty sand, with gravel, trace cobbles and boulders		1	SS 2	71	13-22-23-16 45	6.4	○		91
- Grey by 1.5 m depth		2	SS 3	50	6-15-27-50 42	7.04	○		90
2.62m [89.18m]			SS 4	70	5-50-/-/ 50/0.1	9.27	○		
End of Borehole		3							89
Practical refusal to augering at 2.62 m depth									
(BH Dry - October 09, 2024)		4							88
		5							87
		6							86
		7							85
		8							84
		9							83
		10							82

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376185.77 **NORTHING:** 5020018.09 **ELEVATION:** 91.56

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 25, 2024

FILE NO. : PG7301

HOLE NO. : BH 5-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics		0	AU 1						91
0.18m [91.38m]									
GLACIAL TILL: Loose, brown silty sand, trace gravel, some cobbles, boulders		1	SS 2	75	7-12-18-21 30	8.59 5.51			90
- Compact by 1.10 m depth			SS 3	84	9-18-50-/ 68/0.18	4.64			
1.83m [89.73m]		2							89
End of Borehole									
Practical refusal to augering at 1.83 m depth		3							88
(BH Dry - October 09, 2024)		4							87
		5							86
		6							85
		7							84
		8							83
		9							82
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376093.56 **NORTHING:** 5020000.31 **ELEVATION:** 92.27

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 25, 2024

FILE NO. : PG7301

HOLE NO. : BH 6-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics 0.28m [91.99m]		0	AU 1						92
Loose, brown **SILTY SAND** 0.61m [91.66m]									
GLACIAL TILL: Very dense, brown silty sand, with gravel, cobbles and boulders		1	SS 2	92	15-29-37-30 66	8.91	○		91
1.88m [90.39m]			SS 3	78	15-46-50-/ 96/0.2	8.82	○		
End of Borehole		2							90
Practical refusal to augering at 1.88 m depth									
(BH Dry - October 09, 2024)		3							89
		4							88
		5							87
		6							86
		7							85
		8							84
		9							83
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376044.89 **NORTHING:** 5020116.72 **ELEVATION:** 91.61

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 25, 2024

FILE NO. : PG7301

HOLE NO. : BH 7-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							91
TOPSOIL and organics 0.30m [91.31m]			AU 1						
Loose, brown **SILTY SAND** 0.76m [90.85m]		1	SS 2	54	3-5-11-7 16	12.03	○		90
GLACIAL TILL: Compact, brown silty sand, occasional gravel, cobbles and boulders									
- Grey by 1.5 m depth			SS 3	25	2-1-5-18 6	9.17	○		
2.13m [89.48m]		2							89
End of Borehole									
Practical refusal to augering at 2.13 m depth									
(BH Dry - October 09, 2024)									88
		3							
		4							87
		5							
		6							86
		7							85
		8							84
		9							83
		10							82

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376132.74 **NORTHING:** 5020181.66 **ELEVATION:** 93.69

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 26, 2024

FILE NO. : PG7301

HOLE NO. : BH 8-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / △ REMOULDED SHEAR STRENGTH, Cur (kPa) ▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							93
TOPSOIL and organics 0.18m [93.51m]			AU 1						
Loose, brown **SILTY SAND**, trace gravel 0.69m [93.00m]		1	SS 2	96	17-25-48-37 73	9.38			92
GLACIAL TILL: Very dense, brown silty clay, with gravel, occasional cobbles and boulders - Grey by 1.5 m depth		2	SS 3	92	16-21-26-24 47	7.14			91
		3	SS 4	79	9-30-35-33 65	7.51			90
			SS 5	42	15-37-29-10 66	7.74			
3.84m [89.85m]			SS 6	0	50-/-/-/ 50/0.03				
End of Borehole		4							89
Practical refusal to augering at 3.84 m depth		5							88
(BH Dry - October 09, 2024)		6							87
		7							86
		8							85
		9							84
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376290.59 **NORTHING:** 5020275.07 **ELEVATION:** 92.90

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 26, 2024

FILE NO. : PG7301

HOLE NO. : BH 9-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80	REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80	PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0									92
TOPSOIL and organics 0.28m [92.62m]			AU 1								
Loose, brown **SILTY SAND**, trace gravel 1.02m [91.88m]		1	SS 2	83	4-11-34-26 45	10.65 9.67					
GLACIAL TILL: Very dense, brown silty sand, with gravel, cobbles and boulders 1.52m [91.38m]			SS 3	92	16-27-30-29 57	6.84					91
GLACIAL TILL: Grey clayey silt, with gravel, cobbles and boulders		2	SS 4	75	8-17-27-15 44	8.66					
		3	SS 5	67	8-14-23-29 37	7.71				3.2 m ▼ 2024-10-09	90
4.57m [88.33m]			SS 6	100	18-50-/-/ 50/0.05	9.71					89
GLACIAL TILL: Grey sandy silt, trace clay, with gravel, cobbles and boulders		4	SS 7	71	11-28-50-/ 78/0.28	11.21					88
6.10m [86.80m]		5	SS 8	100	35-50-/-/ 50/0.05	9.81					87
Dynamic Cone Penetration Test Comenced at 6.10 m depth 6.40m [86.50m]		6									
End of Borehole											86
Practical refusal to DCPT at 6.40 m depth		7									
(GWL at 3.20 m depth - October 9, 2024)		8									85
		9									84
		10									83

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376347.34 **NORTHING:** 5020162.69 **ELEVATION:** 91.91

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 26, 2024

FILE NO. : PG7301

HOLE NO. : BH10-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	RECOVERY (%)	N, Nc OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics		0							
0.23m [91.68m]									
Firm, brown **SILTY CLAY**, trace sand									
0.69m [91.22m]									
GLACIAL TILL: Very dense, brown silty clay, with gravel, cobbles and boulders		1	AU 1						91
			SS 2	79	10-17-28-44 45	9.09			
- Grey by 1.8 m depth		2	SS 3	100	18-23-24-28 47	9.87 7.12			90
		3	SS 4	75	4-4-9-15 13	9.94			89
			SS 5	71	3-12-15-30 27	12.2			
		4	SS 6	100	15-24-35-48 59	6.99			88
		5	SS 7	91	38-50-/-/ 50/0.13	6.8			87
			SS 8	100	25-50-/-/ 50/0.08	5.73		5.8 m 2024-10-09	
6.10m [85.81m]		6							86
End of Borehole									
(GWL at 5.76 m depth - October 9, 2024)		7							85
		8							84
		9							83
		10							82

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376217.33 **NORTHING:** 5020152.31 **ELEVATION:** 94.30

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 26, 2024

FILE NO. : PG7301

HOLE NO. : BH11-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / △ REMOULDED SHEAR STRENGTH, Cur (kPa) ▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							94
TOPSOIL and organics 0.25m [94.05m]			AU 1						
Loose, brown **SILTY SAND** 0.69m [93.61m]		1	SS 2	83	3-6-14-17 20	25.24			93
Very stiff, brown **CLAYEY SILT** 1.68m [92.62m]			SS 3	96	15-24-22-14 46	23.83 8.46			
GLACIAL TILL: Very dense, brown silty sand, trace clay, with gravel, occasional cobbles and boulders - Grey by 2.3 m depth 2.62m [91.68m]		2	SS 4	71	3-50-/-/ 50/0.1	9.72			92
End of Borehole		3							91
Practical refusal to augering at 2.62 m depth		4							90
(BH Dry - October 09, 2024)		5							89
		6							88
		7							87
		8							86
		9							85
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376432.01 **NORTHING:** 5020344.88 **ELEVATION:** 89.53

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 26, 2024

FILE NO. : PG7301

HOLE NO. : BH12-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	RECOVERY (%)	N, Nc OR RQD	WATER CONTENT (%)	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0						89
TOPSOIL and organics 0.36m [89.17m]								
Loose, brown **SILTY SAND**, trace clay 0.69m [88.84m]			AU 1					
Stiff, Brown **CLAYEY SILT** with sand		1	SS 2	71	6-6-6-10 12	25.09 20.49		88
		2	SS 3	75	7-6-8-9 14	27.1	2.0 m ▼ 2024-10-09	87
- Very stiff and grey by 2.4 m			SS 4	67	6-9-8-7 17	23.37		
- soft by 3.1 m depth		3	SS 5	100	1-1-2-1 3	25.52		86
4.11m [85.42m]		4	SS 6	62	P	29.54 19.35		85
Compact, grey **SILTY SAND**, trace gravel 5.26m [84.27m]		5	SS 7	100	4-5-9-5 14	15.75		84
GLACIAL TILL: Dense sandy silt, with gravel, cobbles 6.10m [83.43m]		6	SS 8	100	10-14-15-16 29	14.59		83
End of Borehole (GWL at 2.05 m depth - October 9, 2024)		7 8 9 10						82 81 80

PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) — 20 40 60 80

△ REMOULDED SHEAR STRENGTH, Cur (kPa)

▲ PEAK SHEAR STRENGTH, Cu (kPa) — 20 40 60 80

PL (%) WATER CONTENT (%) LL (%) — 20 40 60 80

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376509.59 **NORTHING:** 5020188.33 **ELEVATION:** 89.31

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 27, 2024

FILE NO. : PG7301

HOLE NO. : BH13-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	RECOVERY (%)	N, Nc OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							89
TOPSOIL and organics 0.23m [89.08m]									
Loose, brown **SILTY SAND**, trace clay 0.61m [88.70m]									
GLACIAL TILL: Compact, brown silty sand, trace clay with gravel, occasional cobbles		1	AU 1						88
			SS 2	79	7-6-5-7 11	11.11			
		2	SS 3	87	8-12-11-19 23	9.42 13.89		2.0 m ▼ 2024-10-09	87
- Very dense by 2.30m depth			SS 4	75	10-19-25-38 44	10.54			
		3	SS 5	88	6-28-50-/ 78/0.28	11.15			86
3.66m [85.65m]									
GLACIAL TILL: Very dense, brown silty clay, with gravel, occasional cobbles		4	SS 6	100	50-/-/-/ 50/0.13	10.84			85
		5	SS 7	78	27-50-/-/ 50/0.08	9.74			
5.28m [84.03m]			SS 8	100	50-/-/-/ 50/0.13	9.22			84
End of Borehole		6							
Practical refusal to augering at 5.28 m depth									83
(GWL at 1.93 m depth - October 9, 2024)		7							82
		8							81
		9							80
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376413.92 **NORTHING:** 5020249.09 **ELEVATION:** 90.17

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 27, 2024

FILE NO. : PG7301

HOLE NO. : BH14-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / △ REMOULDED SHEAR STRENGTH, Cur (kPa) ▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							90
TOPSOIL and organics 0.25m [89.92m]			AU 1						
Loose, brown **SILTY SAND**, trace clay 0.69m [89.48m]		1	SS 2	67	5-24-24-18 48	8.75			89
GLACIAL TILL: Dense to very dense, brown silty sand with gravel, cobbles and boulders - Grey by 1.5 m depth		2	SS 3	79	18-30-36-50 66	6.93			88
			SS 4	100	34-50-/-/ 50/0.13	6.56			
		3	SS 5	100	39-50-/-/ 50/0.13	6.43			87
		4	SS 6	100	16-50-/-/ 50/0.1	6.13			86
		5	SS 7	100	23-50-/-/ 50/0.1	5.57			85
			SS 8	100	29-50-/-/ 50/0.03	5.37			
6.10m [84.07m]		6							84
End of Borehole (BH Dry - October 09, 2024)		7							83
		8							82
		9							81
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376738.02 **NORTHING:** 5020086.71 **ELEVATION:** 89.29

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 27, 2024

FILE NO. : PG7301

HOLE NO. : BH15-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	RECOVERY (%)	N, Nc OR RQD	WATER CONTENT (%)	ELEVATION (m)
GROUND SURFACE		0					89
TOPSOIL and organics 0.28m [89.01m]			AU 1				
Loose to compact, brown **SANDY SILT**		1	SS 2	75	6-12-12-13 24	21.05	88
		2	SS 3	71	9-12-14-14 26	20.87	
2.21m [87.08m]							
Firm to soft, grey **CLAYEY SILT**		3	SS 4	75	8-3-2-3 5	25.5	87
			SS 5	83	1-1-0-0 1	28.75	86
		4	SS 6	83	0-2-1-0 3	33.96	
5.03m [84.26m]			SS 7	100	P	30.81	85
Stiff, grey **SILTY CLAY** 5.44m [83.85m]		5				37.87	
Firm, grey **CLAYEY SILT** 5.84m [83.45m]			SS 8	100	0-0-3-9 3	29.94	84
GLACIAL TILL: Very loose, grey silty sand with gravel 6.10m [83.19m]		6				12.47	
End of Borehole							83
(GWL at 2.17 m depth - October 9, 2024)		7					82
		8					81
		9					
		10					80

PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80

△ REMOULDED SHEAR STRENGTH, Cur (kPa)

▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80

PL (%) WATER CONTENT (%) LL (%) 20 40 60 80

MONITORING WELL CONSTRUCTION

2.2 m ▼ 2024-10-09

1923

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376738.02 **NORTHING:** 5020086.71 **ELEVATION:** 89.29

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 30, 2024

FILE NO. : PG7301

HOLE NO. : BH15A-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
OVERBURDEN		0							89
		1							88
		2							87
2.29m [87.00m]									
Firm, grey **CLAYEY SILT**		3							86
		4					189.0 Δ		85
4.57m [84.72m]									
Dynamic Cone Penetration Test Comenced at 4.57 m depth		5							84
		6							83
		7							82
7.62m [81.67m]									
End of Borehole Practical refusal to DCPT at 7.62 m depth		8							81
		9							80
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376652.26 **NORTHING:** 5020184.99 **ELEVATION:** 88.88

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 30, 2024

FILE NO. : PG7301

HOLE NO. : BH16-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							88
TOPSOIL and organics			AU 1						
0.20m [88.68m]									
Loose, brown **SILTY SAND**, with clay									
0.69m [88.19m]		1	SS 2	75	13-20-18-22 38	16.81			87
Dense, brown **SANDY SILT**, trace clay									
- Grey by 1.52 m depth		2	SS 3	67	12-22-20-22 42	17.85		2.0 m 2024-10-09	
- Trace clay by 2.29 m depth			SS 4	79	13-15-12-10 27	22.95			86
		3	SS 5	83	5-9-7-7 16	23.47			
4.11m [84.77m]		4	SS 6	75	3-15-15-18 30	26.05 10.75			85
GLACIAL TILL: Compact, grey silty sand, with gravel, occasional cobbles, boulders		5	SS 7	46	5-9-7-18 16	11.48			84
6.10m [82.78m]		6	SS 8	83	11-14-17-23 31	10.13			83
Dynamic Cone Penetration Test Comenced at 6.10 m depth									
6.76m [82.12m]		7							82
End of Borehole									
Practical refusal to DCPT at 6.76 m depth		8							81
(GWL at 2.05 m depth - October 9, 2024)									
		9							80
		10							79

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376837.58 **NORTHING:** 5020217.72 **ELEVATION:** 89.28

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 30, 2024

FILE NO. : PG7301

HOLE NO. : BH17-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							89
TOPSOIL and organics 0.10m [89.18m]			AU 1						
Loose, brown **SANDY SILT**, trace clay 0.69m [88.59m]		1	SS 2	87	10-19-20-29 39	9.28			88
GLACIAL TILL: Dense brown silty sand with gravel, cobbles, boulders, trace clay - Grey by 1.5 m depth		2	SS 3	58	21-23-20-12 43	9.29		2.1 m 2024-10-09	87
			SS 4	67	9-21-12-14 33	7.67			
- Very dense below 3.1m depth		3	SS 5	100	23-50-/-/ 50/0.13	7.18			86
4.14m [85.14m]		4	SS 6	100	19-50-/-/ 50/0.08	7.89			85
End of Borehole Practical refusal to augering at 4.14m depth (GWL at 2.07 m depth - October 9, 2024)		5							84
		6							83
		7							82
		8							81
		9							80
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376938.22 **NORTHING:** 5020281.76 **ELEVATION:** 88.30

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 30, 2024

FILE NO. : PG7301

HOLE NO. : BH18-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	RECOVERY (%)	N, Nc OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / △ REMOULDED SHEAR STRENGTH, Cur (kPa) ▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics 0.13m [88.17m]		0	AU 1						88
FILL: Firm, brown silty clay 0.69m [87.61m]									
TOPSOIL 0.86m [87.44m]									
FILL: Firm clayey silt 1.45m [86.85m]		1	SS 2	75	4-4-4-3 8	18.61 29.23		1.3 m 2024-10-09	87
TOPSOIL and organics 1.52m [86.78m]									
GLACIAL TILL: Compact, brown silty sand with gravel, occasional cobbles		2	SS 3	8	2-2-2-2 4	17.43			
			SS 4	46	8-8-15-16 23	14.27			86
- Grey by 3.1 m depth		3	SS 5	46	5-7-10-8 17	11.77			85
		4	SS 6	87	35-15-18-18 33	13.4			84
4.72m [83.58m]			SS 7	100	50-/-/-/ 50/0.15	10.33			
End of Borehole		5							83
Practical refusal to augering at 4.72 m depth									
(GWL at 1.31 m depth - October 9, 2024)		6							82
		7							81
		8							80
		9							79
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376684.09 **NORTHING:** 5020118.93 **ELEVATION:** 90.08

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 30, 2024

FILE NO. : PG7301

HOLE NO. : BH19-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / △ REMOULDED SHEAR STRENGTH, Cur (kPa) ▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							90
OVERBURDEN		1							89
		2							88
		3							87
3.89m [86.19m]		4							86
End of Borehole Practical refusal to augering at 3.89 m depth		5							85
		6							84
		7							83
		8							82
		9							81
		10							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376740.96 **NORTHING:** 5020242.35 **ELEVATION:** 88.78

PROJECT: Geotechnical Investigation

BORINGS BY: CME-55 Low Clearance Drill

REMARKS:

DATE: September 30, 2024

FILE NO. : PG7301

HOLE NO. : BH20-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80	REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80	PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE											
OVERBURDEN		0									88
		1									87
		2									86
		3									85
		4									84
5.44m [83.34m]		5									83
End of Borehole Practical refusal to augering at 5.44m depth		6									82
		7									81
		8									80
		9									79
		10									

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SOIL PROFILE AND TEST DATA

GEOTECHNICAL INVESTIGATION

4795 Bank St. & 3301 Blais Rd., Ottawa, Ontario

DATUM: Geodetic **EASTING:** 376563.628 **NORTHING:** 5020241.291 **ELEVATION:** 88.83 m

PROJECT: Proposed Development

BORINGS BY: Excavator

REMARKS:

DATE: November 10, 2023

FILE NO. PG6896

HOLE NO. TP 1-23

SAMPLE DESCRIPTION	STRATA PLOT	Sample No.	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 50 100	Peak Shear Strength (kPa) 0 50 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 50 100	Piezometer Construction
Ground Surface EL 88.83 m										
TOPSOIL		G1			31.2	0				
0.45 m EL 88.38 m		G2			17.5					
Compact, brown SANDY SILT		G3			21.2	1				
1.2 m EL 87.63 m		G4			20.3					
Compact to dense, grey SANDY SILT										
- trace gravel by 2.0m depth		G5			20	2				
- trace clay by 3.0m depth										
- occasional cobbles by 3.6m depth										
- some clay from 4.0 to 4.3m depth		G6			23.8	3				▼
		G7			22.5	4				
		G8			27.1					
5.1 m EL 83.73 m		G9			25.6	5				
End of Test Pit						6				
(Groundwater infiltration at 3.5m depth)										

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SOIL PROFILE AND TEST DATA

GEOTECHNICAL INVESTIGATION

4795 Bank St. & 3301 Blais Rd., Ottawa, Ontario

DATUM: Geodetic **EASTING:** 376495.134 **NORTHING:** 5020294.256 **ELEVATION:** 89.05 m

PROJECT: Proposed Development

BORINGS BY: Excavator

REMARKS:

DATE: November 10, 2023

FILE NO. PG6896

HOLE NO. TP 2-23

SAMPLE DESCRIPTION	STRATA PLOT	Sample No.	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 50 100	Peak Shear Strength (kPa) 0 50 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 50 100	Piezometer Construction
Ground Surface EL 89.05 m						0				
TOPSOIL 0.15 m EL 88.9 m		G1			30.4					
Loose, brown SILTY SAND, occasional cobbles 0.55 m EL 88.5 m		G2			16.5					
		G3			17.3					
Compact, brown SANDY SILT		G4			24.4	1				
- trace clay by 1.6m depth										
- thin interbedded layers of silty clay at 1.8m depth		G5			30					▼
2.1 m EL 86.95 m						2				
Loose, grey SANDY SILT with thin interbedded layers of silty clay 2.5 m EL 86.55 m		G6			27.7					
		G7			34					
Firm, grey SILTY CLAY to CLAYEY SILT with interbedded sandy silt layers		G8			33			35 22		
3.45 m EL 85.6 m						3				
GLACIAL TILL: Grey silty sand with gravel		G9			14.1					
4 m EL 85.05 m		G10			11.2	4				
End of Test Pit										
(Groundwater infiltration at 1.7m depth)						5				
						6				

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SOIL PROFILE AND TEST DATA

GEOTECHNICAL INVESTIGATION

4795 Bank St. & 3301 Blais Rd., Ottawa, Ontario

DATUM: Geodetic **EASTING:** 376509.066 **NORTHING:** 5020384.595 **ELEVATION:** 89.07 m

PROJECT: Proposed Development

BORINGS BY: Excavator

REMARKS:

DATE: November 10, 2023

FILE NO. PG6896

HOLE NO. TP3-23

SAMPLE DESCRIPTION	STRATA PLOT	Sample No.	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 50 100	Peak Shear Strength (kPa) 0 50 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 50 100	Piezometer Construction
Ground Surface EL 89.07 m										
TOPSOIL 0.3 m EL 88.77 m		G1			30.7	0				
Compact, brown SANDY SILT with thin interbedded layers of silty sand		G2			13.9					
- trace clay by 0.7m depth		G3			24.1	1				
		G4			22.9					
1.6 m EL 87.47 m		G5			30.6	2				▼
Stiff, grey CLAYEY SILT with thin interbedded layers of silty clay		G6			28.9					
3.2 m EL 85.87 m		G7			12.6	3				
GLACIAL TILL: Dense, grey clayey silt to sandy silt with gravel, occasional boulders 3.3 m EL 85.77 m										
End of Test Pit						4				
Practical refusal to excavation on large boulders at 3.30m depth.										
(Groundwater infiltration at 1.6m depth)						5				
						6				

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376522.67 **NORTHING:** 5020400.87 **ELEVATION:** 89.47

PROJECT: Geotechnical Investigation

ADVANCED BY: Track Mounted Drill Rig

REMARKS: Datum: NAD1983 (Canada) Geoid: HT2-2010 **DATE:** March 2, 2026

FILE NO. : PG7301

HOLE NO. : BH 1-26

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) ▲ UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL: with organics 0.25m [89.22m]									
Compact, brown **SILTY SAND** to **SANDY SILT**, trace clay		1	AU 1			22			89
			SS 2	42	4-2-3-4 5	27			
- Silt content increasing by 1.52m depth		2	SS 3	75	5-6-5-5 11	23			88
- Grey by 2.21m depth			SS 4	50	2-3-4-4 7	29			87
		3	SS 5	50	1-1-2-2 3	31			86
4.11m [85.36m]		4	SS 6	50	1-2-10-12 12	28			
GLACIAL TILL: Very dense, grey sandy silt with gravel, occasional cobbles and boulders 4.90m [84.57m]			SS 7	77	16-15-50-/ 65/0.03	16 15			85
BEDROCK: Poor to fair quality limestone bedrock		5	RC 1	100	RQD 37				84
		6	RC 2	100	RQD 34				83
- Excellent quality bedrock by 7.26m depth		7						7.19m	82
8.76m [80.71m]		8	RC 3	100	RQD 93			8.71m	81
End of Borehole		9							80
		10							79
		11							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376514.79 **NORTHING:** 5020324.14 **ELEVATION:** 88.86

PROJECT: Geotechnical Investigation

ADVANCED BY: Track Mounted Drill Rig

REMARKS: Datum: NAD1983 (Canada) Geoid: HT2-2010 **DATE:** March 2, 2026

FILE NO. : PG7301

HOLE NO. : BH 2-26

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) ▲ UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL: with organics			AU 1			24			
0.25m [88.61m]									
Stiff, brown **SILTY CLAY**, trace sand									
0.69m [88.17m]									
Loose to compact, brown **SILTY CLAY** to **CLAYEY SILT**, trace sand		1	SS 2	50	3-3-5-4 8	26			88
		2	SS 3	50	2-2-2-2 4	36			87
- Grey by 2.21m depth			SS 4	50	1-1-1-1 2	35			
- Silt content increasing by 2.90m depth		3	SS 5	67	P	44			86
		4	SS 6	50	1-2-6-6 8	30			85
4.50m [84.36m]									
GLACIAL TILL: Dense to very dense, grey silty fine sand with gravel, cobbles and boulders		5	SS 7	82	27-7-9-7 16	11			84
			RC 1	78					
		6	SS 8	58	24-17-18-14 35	11			83
			SS 9	34	9-50-/-/ 50/0.03	16			
6.71m [82.15m]		7	RC 2	100	RQD 45				82
BEDROCK: Good to excellent quality limestone bedrock		8	RC 3	100	RQD 78				81
		9							80
			RC 4	100	RQD 87				
10.26m [78.59m]		10						8.59m / 10.11m	79
End of Borehole		11							78

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376510.67 **NORTHING:** 5020331.96 **ELEVATION:** 89.19

PROJECT: Geotechnical Investigation

ADVANCED BY: Track Mounted Drill Rig

REMARKS: Datum: NAD1983 (Canada) Geoid: HT2-2010 **DATE:** March 3, 2026

FILE NO. : PG7301

HOLE NO. : BH 3-26

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE: TYPE AND NO.	SAMPLE: RECOVERY (%)	SAMPLE: N OR RQD	SAMPLE: WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							89
For soil profile refer to BH 2-26		1							88
		2							87
		3							86
		4							85
		5							84
6.10m [83.09m]		6						4.58m / 6.10m	83
End of Borehole		7							82
		8							81
		9							80
		10							79
		11							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376547.38 **NORTHING:** 5020340.33 **ELEVATION:** 89.18

PROJECT: Geotechnical Investigation

ADVANCED BY: Track Mounted Drill Rig

REMARKS: Datum: NAD1983 (Canada) Geoid: HT2-2010 **DATE:** March 3, 2026

FILE NO. : PG7301

HOLE NO. : BH 4-26

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL: with organics 0.23m [88.95m]			AU 1			20			89
Stiff, brown **SILTY CLAY**, trace sand 0.69m [88.49m]									
Brown **SILTY SAND** to **SANDY SILT**, trace gravel and clay 1.37m [87.81m]		1	SS 2	50	6-6-5-8 11	29			88
Brown **SILTY CLAY** to **CLAYEY SILT**, trace sand - No gravel below 1.52m depth - Grey by 2.29m depth - Silt content increasing by 2.90m depth		2	SS 3	100	2-2-4-3 6	31			87
			SS 4	58	2-2-2-3 4	29			
		3	SS 5	50	1-2-2-2 4	36			86
		4	SS 6	50	2-3-3-4 6	25			85
5.26m [83.92m]		5	SS 7	42	2-2-15-10 17	25			84
GLACIAL TILL: Loose to compact, grey silty fine sand with gravel, occasional cobbles - Running sand by 6.10m depth 6.35m [82.83m]		6	SS 8	25	2-5-5-9 10	14			83
			SS 9		10-50-/-/ 50/0.1	16			
End of Borehole		7							82
		8							81
		9							80
		10							79
		11							

MONITORING WELL CONSTRUCTION: 3.43m, 4.95m

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376492.29 **NORTHING:** 5020369.66 **ELEVATION:** 89.25

PROJECT: Geotechnical Investigation

ADVANCED BY: Track Mounted Drill Rig

REMARKS: Datum: NAD1983 (Canada) Geoid: HT2-2010 **DATE:** March 3, 2026

FILE NO. : PG7301

HOLE NO. : BH 5-26

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) ▲ UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL: with organics 0.25m [89.00m]									
Brown **SILTY CLAY** to **CLAYEY SILT**, trace sand			AU 1			24			
		1	SS 2	58	4-2-2-2 4	31			
- Silt content increasing by 1.37m depth						33			
		2	SS 3	67	2-3-3-2 6				
- Grey by 1.98m depth						30			
2.82m [86.43m]			SS 4	33	1-1-1-6 2	28			
GLACIAL TILL: Compact, grey silty fine sand to medium sand with gravel, trace clay		3	SS 5	42	3-10-9-8 19	11			
4.09m [85.16m]		4	SS 6	102	50-/-/-/ 50/0.1	14			
BEDROCK: Good to excellent quality limestone bedrock			RC 1	100	RQD 100				
- Vertical shear form 4.09m to 4.39m depth		5	RC 2	100	RQD 92			4.98m	
- 80mm mud seams at 4.62m depth		6	RC 3	100	RQD 75			6.50m	
6.50m [82.75m]									
End of Borehole		7							
		8							
		9							
		10							
		11							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4795 Bank Street & 3301 Blais Road, Ottawa, Ontario.

COORD. SYS.: MTM ZONE 9 **EASTING:** 376511.84 **NORTHING:** 5020397.47 **ELEVATION:** 89.81

PROJECT: Geotechnical Investigation

ADVANCED BY: Track Mounted Drill Rig

REMARKS: Datum: NAD1983 (Canada) Geoid: HT2-2010 **DATE:** March 3, 2026

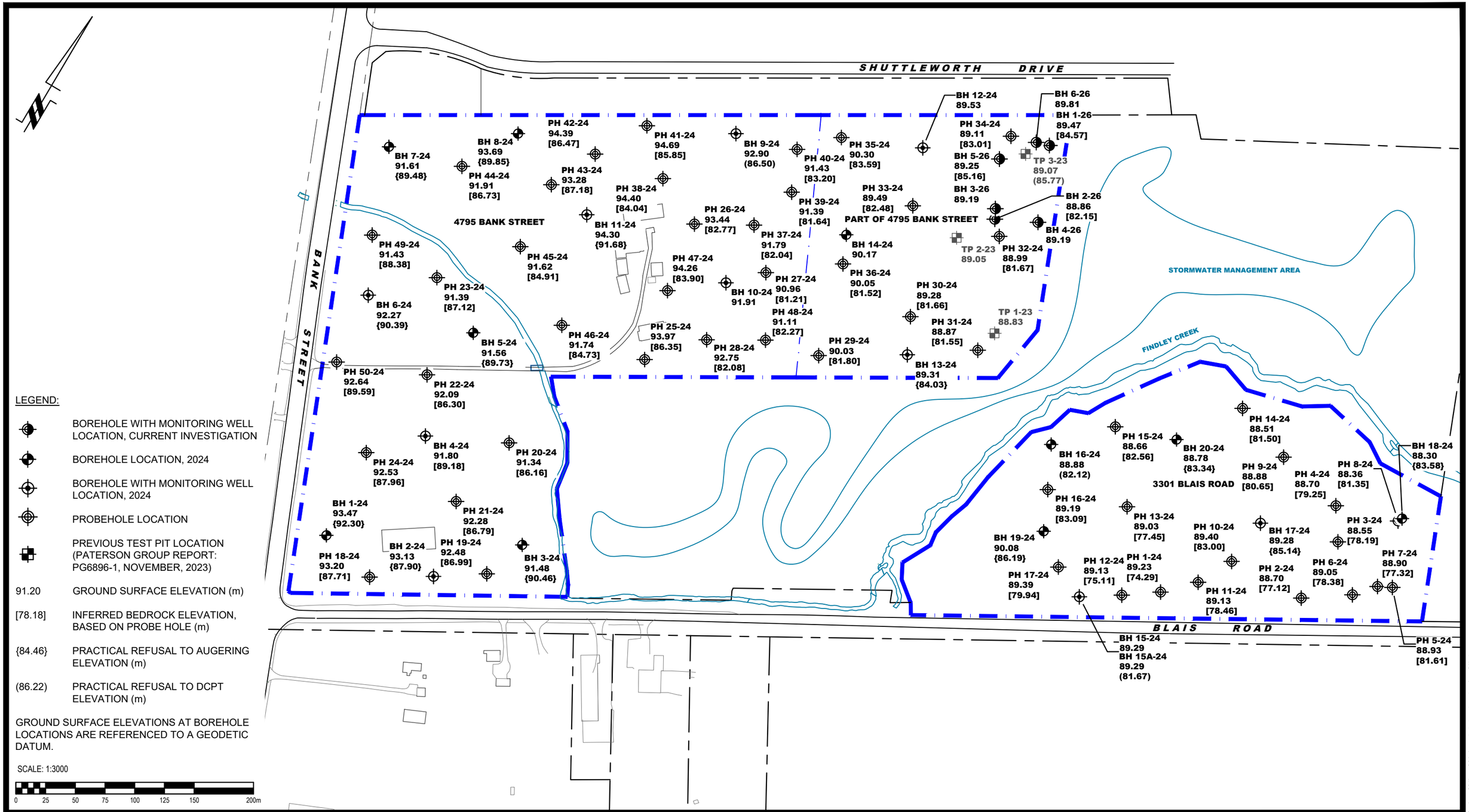
FILE NO. : PG7301

HOLE NO. : BH 6-26

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80	REMOULDED SHEAR STRENGTH (kPa) ▲ UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80	PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE											
OVERBURDEN		1									89
		2									88
		3									87
		4								3.69m	86
		5									85
5.59m [84.22m]										5.21m	
End of Borehole		6									84
		7									83
		8									82
		9									81
		10									80
		11									79

DISCLAIMER: THE DATA PRESENTED IN THIS SHEET IS THE PROPERTY OF PATERSON GROUP AND THE CLIENT FOR WHOM IT WAS PRODUCED. THIS SHEET SHOULD BE READ IN CONJUNCTION WITH ITS CORRESPONDING REPORT. PATERSON GROUP IS NOT RESPONSIBLE FOR THE UNAUTHORIZED USE OF THIS DATA.

P:/AutoCAD Drawings/Test Hole Data Files/PG73xx/PG7301/PG7301 (2026)/data.sqlite 2026-04-06, 17:06 Paterson_Template MR



LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION, CURRENT INVESTIGATION
- BOREHOLE LOCATION, 2024
- BOREHOLE WITH MONITORING WELL LOCATION, 2024
- PROBEHOLE LOCATION
- PREVIOUS TEST PIT LOCATION (PATERSON GROUP REPORT: PG6896-1, NOVEMBER, 2023)

91.20 GROUND SURFACE ELEVATION (m)

[78.18] INFERRED BEDROCK ELEVATION, BASED ON PROBE HOLE (m)

{84.46} PRACTICAL REFUSAL TO AUGERING ELEVATION (m)

(86.22) PRACTICAL REFUSAL TO DCPT ELEVATION (m)

GROUND SURFACE ELEVATIONS AT BOREHOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM.

SCALE: 1:3000

0 25 50 75 100 125 150 200m

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

NO.	REVISIONS	DD/MM/YYYY	INITIAL
1	ADDED 2026 BOREHOLE LOCATION BH 1-26 TO BH 6-26	27/05/2026	KP

CAIVAN COMMUNITIES
GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
4795 BANK STREET & 3301 BLAIS ROAD
OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:3000	Date: 10/2024
Drawn by: ZS	Report No.: PG7301-1
Checked by: MA	Dwg. No.: PG7301-1
Approved by: KP	Revision No.: 1

11x17

p:\autocad drawings\geotechnical\pg73xx\pg7301\pg7301-1 test hole location plan (rev.01).dwg

APPENDIX 2

TABLE 5 - MONTHLY WATER BALANCE FOR SOIL WITH 75 mm WATER HOLDING CAPACITY AT THE OTTAWA INTERNATIONAL AIRPORT

TABLE 6 - MONTHLY WATER BALANCE FOR SOIL WITH 150 mm WATER HOLDING CAPACITY AT THE OTTAWA INTERNATIONAL AIRPORT

TABLE 7 - MONTHLY WATER BALANCE FOR SOIL WITH 250 mm WATER HOLDING CAPACITY AT THE OTTAWA INTERNATIONAL AIRPORT

TABLE 8 - MONTHLY WATER BALANCE FOR SOIL WITH 300 mm WATER HOLDING CAPACITY AT THE OTTAWA INTERNATIONAL AIRPORT

TABLE 9 - PRE-DEVELOPMENT ANNUAL WATER BUDGET CALCULATIONS

TABLE 10 - POST-DEVELOPMENT ANNUAL WATER BUDGET CALCULATIONS

Table 5 - Monthly Water Balance for Soil With 75 mm Water Holding Capacity at the Ottawa International Airport				
Month	**Temperature (°C)**	**Total Precipitation (mm)**	**Actual Evapotranspiration (mm)**	**Water Surplus (mm)**
January	-10.6	62	0	25
February	-9.0	56	1	26
March	-2.8	65	6	103
April	5.7	73	31	110
May	13.1	76	80	14
June	18.3	85	107	4
July	20.9	88	104	3
August	19.7	85	84	1
September	14.8	82	65	3
October	8.3	76	36	14
November	1.3	77	10	38
December	-6.8	79	1	37
Annual	**6**	**904**	**525**	**378**

Table 6 - Monthly Water Balance for Soil With 150 mm Water Holding Capacity at the Ottawa International Airport				
Month	**Temperature (°C)**	**Total Precipitation (mm)**	**Actual Evapotranspiration (mm)**	**Water Surplus (mm)**
January	-10.6	62	0	21
February	-9.0	56	1	24
March	-2.8	65	6	99
April	5.7	73	31	109
May	13.1	76	80	14
June	18.3	85	116	4
July	20.9	89	127	3
August	19.7	84	98	1
September	14.8	82	68	2
October	8.3	76	36	7
November	1.3	77	10	20
December	-6.8	80	0.1	25
Annual	**6**	**904**	**574**	**329**

Table 7 - Monthly Water Balance for Soil With 250 mm Water Holding Capacity at the Ottawa International Airport				
Month	**Temperature (°C)**	**Total Precipitation (mm)**	**Actual Evapotranspiration (mm)**	**Water Surplus (mm)**
January	-10.6	62	0	18
February	-9.0	56	1	22
March	-2.8	65	6	92
April	5.7	73	31	107
May	13.1	76	80	14
June	18.3	85	116	4
July	20.9	89	135	3
August	19.7	84	111	1
September	14.8	82	72	2
October	8.3	76	37	6
November	1.3	77	10	16
December	-6.8	80	1	19
Annual	**6**	**904**	**600**	**304**

Table 8 - Monthly Water Balance for Soil With 300 mm Water Holding Capacity at the Ottawa International Airport				
Month	**Temperature (°C)**	**Total Precipitation (mm)**	**Actual Evapotranspiration (mm)**	**Water Surplus (mm)**
January	-10.6	62	0	17
February	-9.0	56	1	21
March	-2.8	65	6	91
April	5.7	73	31	105
May	13.1	76	80	14
June	18.3	85	116	4
July	20.9	89	135	3
August	19.7	84	114	1
September	14.8	82	73	2
October	8.3	76	37	6
November	1.3	77	10	16
December	-6.8	80	1	18
Annual	**6**	**904**	**605**	**298**

Table 9 - Pre-Development Annual Water Budget Calculations

Land Use Unit	Area (m^2)	Water Surplus (mm)	Topography Factor	Soil Factor	Vegetation Factor	Infiltration Factor	Runoff Factor	Total Infiltration (mm/year)	Total Infiltration (L/year)	Total Runoff (mm/year)	Total Runoff (L/year)
Impervious surfaces	15,310	759	0	0	0	0	1	0	0.00	759	11,620,290
Urban Lawn/ Shallow Rooted Crops (Fine Sandy Loam)	70,075	378	0.1	0.3	0.1	0.5	0.5	189	13,244,175	189	13,244,175
Pasture and Shrubs (Fine Sandy Loam)	29,799	329	0.1	0.3	0.1	0.5	0.5	164.5	4,901,936	164.5	4,901,936
Pasture and Shrubs (Clay Loam)	40,128	304	0.1	0.2	0.1	0.4	0.6	121.6	4,879,565	182.4	7,319,347
Mature Forest (Fine Sandy Loam)	16,447	298	0.1	0.3	0.2	0.6	0.4	178.8	2,940,724	119.2	1,960,482
Total	**171,759**								**25,966,399**		**39,046,230**

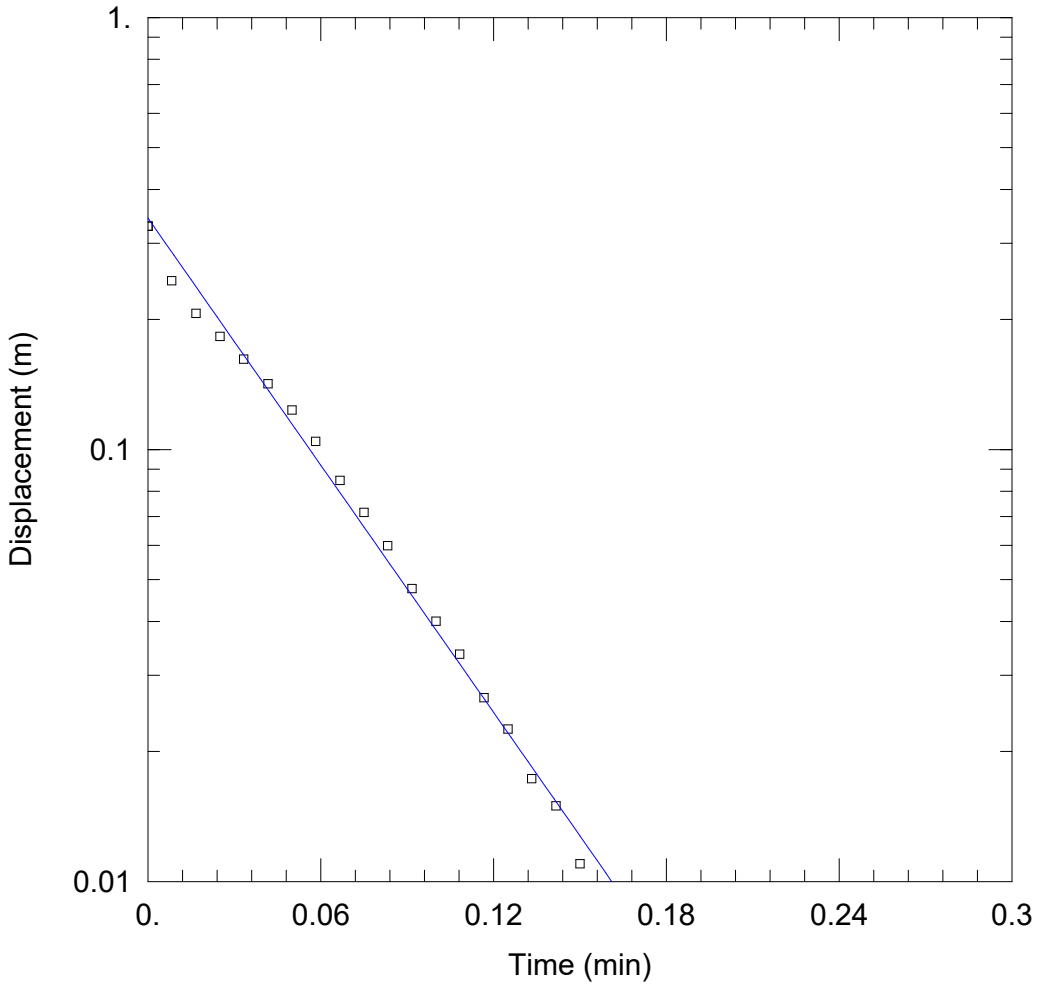
Table 10 - Post-Development Annual Water Budget Calculations

Land Use Unit	Area (m^2)	Water Surplus (mm)	Topography Factor	Soil Factor	Vegetation Factor	Infiltration Factor	Runoff Factor	Total Infiltration (mm/year)	Total Infiltration (L/year)	Total Runoff (mm/year)	Total Runoff (L/year)
Impervious Surfaces	111,377	759	0	0	0	0	1	0	0	759.0	84,535,143
Urban Lawn/Shallow Rooted Crops (Fine Sandy Loam)	53,342	378	0.15	0.3	0.1	0.55	0.45	207.9	11,089,802	170.1	9,073,474
Stormwater Management Pond	7,040	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Totals	**171,759**								**11,089,802**		**93,608,617**
Difference (L/year)									**-14,876,597**		**54,562,387**
Percentage Variation									**-57%**		**140%**

APPENDIX 3

HYDRAULIC CONDUCTIVITY RESULTS - FALLING AND RISING HEAD TESTS

SAMPLE CALCULATIONS - DUPUIT FORCHHEIMER



WELL TEST ANALYSIS

PROJECT INFORMATION

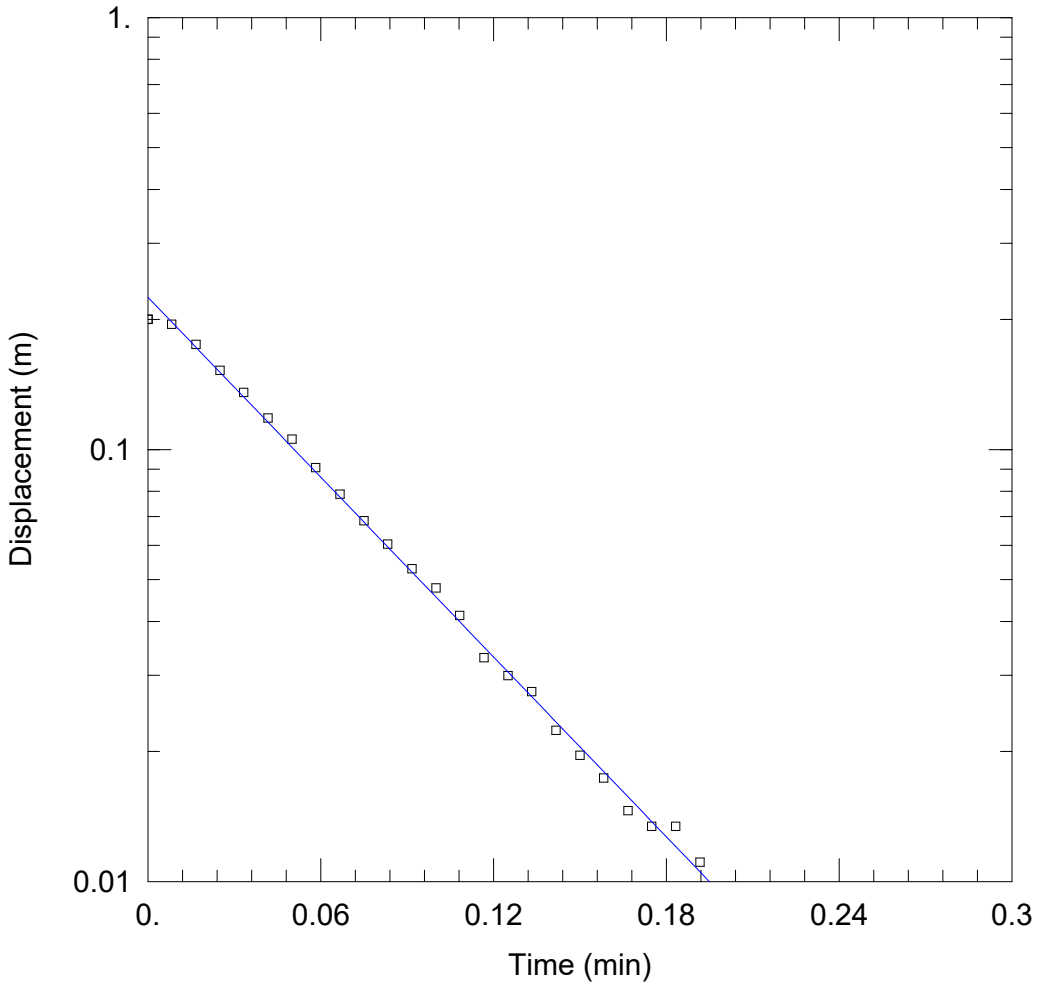
Company: Paterson Group
Client: Caivan Communities
Project: PG7301
Location: 4795 Bank Street
Test Well: BH1-26
Test Date: May 26, 2026

WELL DATA (BH1-26)

Initial Displacement: 0.329 m
Total Well Penetration Depth: 6.98 m
Casing Radius: 0.01588 m
Static Water Column Height: 6.98 m
Screen Length: 1.524 m
Well Radius: 0.0381 m

SOLUTION

Aquifer Model: Unconfined
K = 0.0001674 m/sec
Solution Method: Hvorslev
y0 = 0.3433 m



WELL TEST ANALYSIS

PROJECT INFORMATION

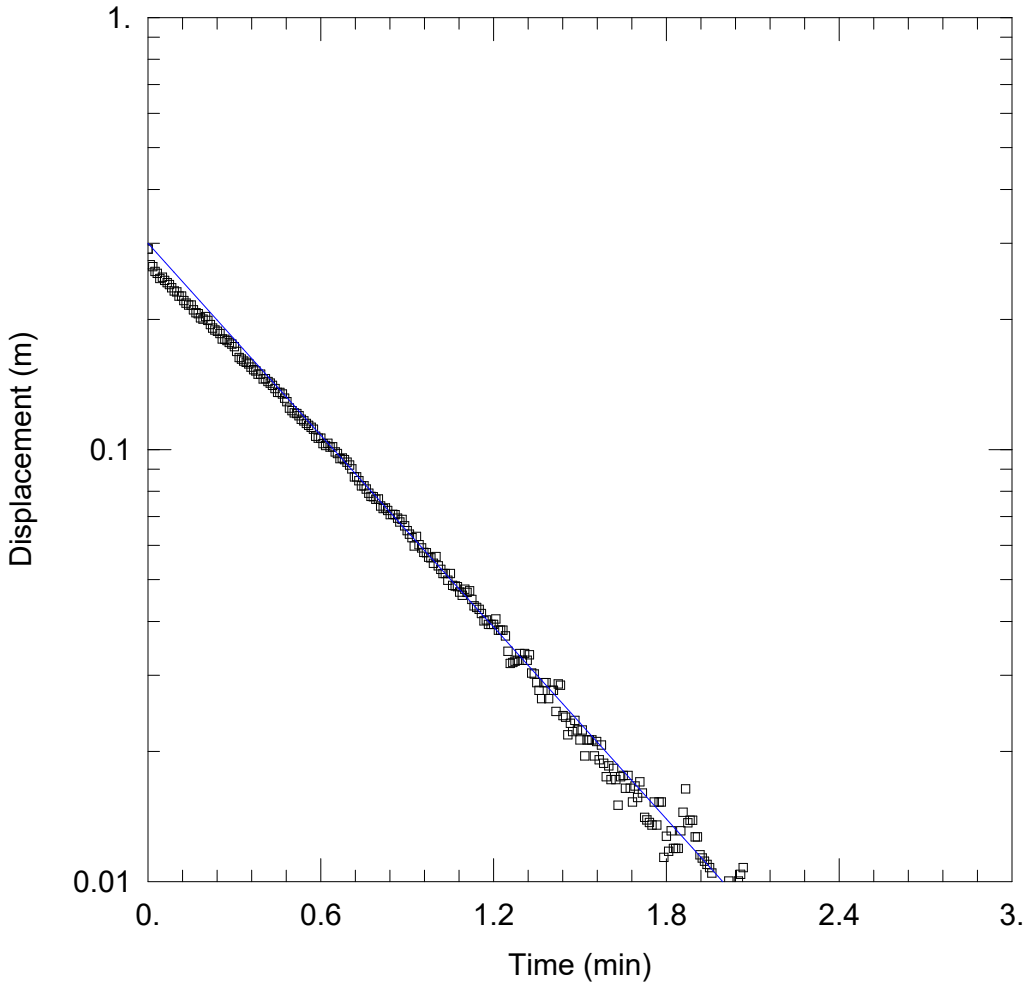
Company: Paterson Group
Client: Caivan Communities
Project: PG7301
Location: 4795 Bank Street
Test Well: BH1-26
Test Date: May 26, 2026

WELL DATA (BH1-26)

Initial Displacement: 0.2 m
Total Well Penetration Depth: 6.98 m
Casing Radius: 0.01588 m
Static Water Column Height: 6.98 m
Screen Length: 1.524 m
Well Radius: 0.0381 m

SOLUTION

Aquifer Model: Unconfined
K = 0.0001218 m/sec
Solution Method: Hvorslev
y0 = 0.225 m



WELL TEST ANALYSIS

PROJECT INFORMATION

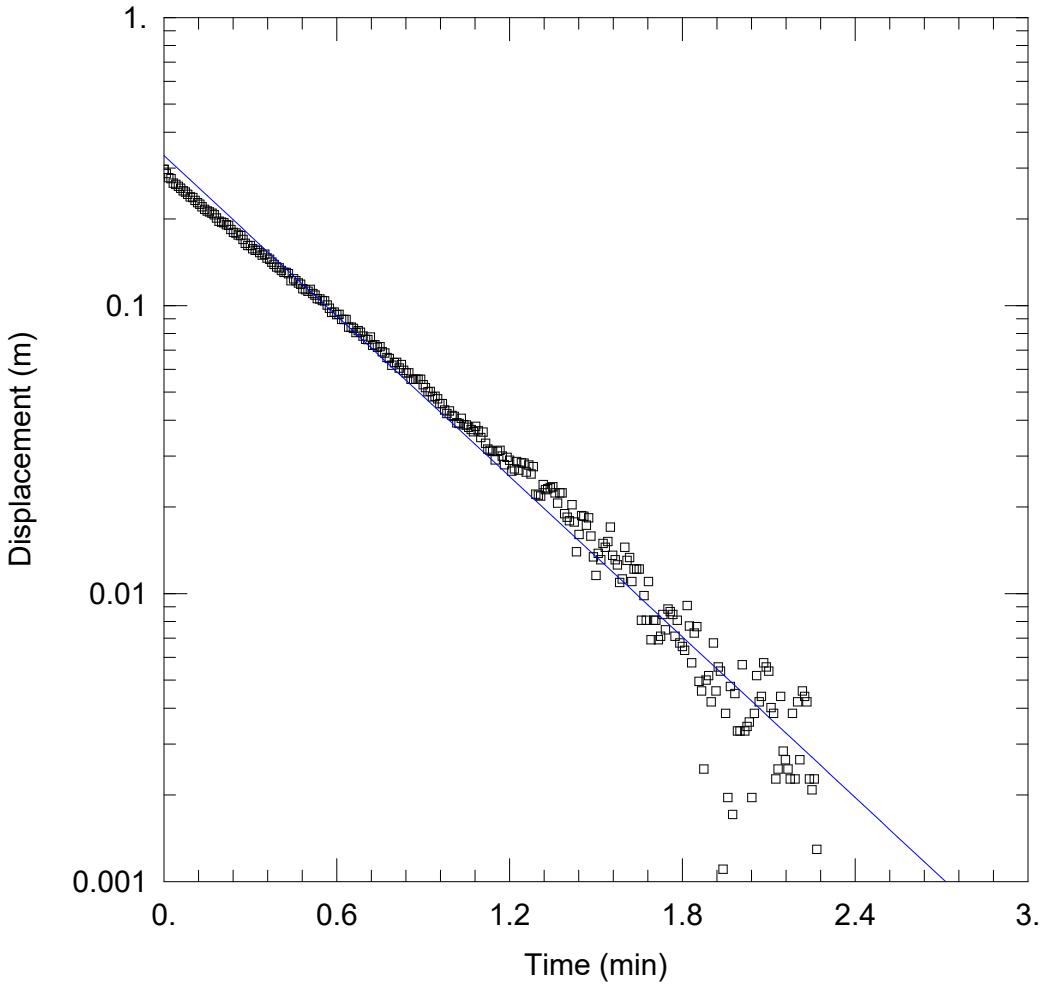
Company: Paterson Group
Client: Caivan Communities
Project: PG7301
Location: 4795 Bank Street
Test Well: BH2-26
Test Date: May 26, 2026

WELL DATA (BH2-26)

Initial Displacement: 0.291 m
Total Well Penetration Depth: 8.73 m
Casing Radius: 0.01588 m
Static Water Column Height: 8.73 m
Screen Length: 1.524 m
Well Radius: 0.0381 m

SOLUTION

Aquifer Model: Unconfined
K = 1.299E-5 m/sec
Solution Method: Hvorslev
y0 = 0.2999 m



WELL TEST ANALYSIS

Data Set: P:\...\PG7301- BH2-26 Rising Head 2 of 2.aqt
Date: 05/27/26 Time: 15:23:39

PROJECT INFORMATION

Company: Paterson Group
Client: Caivan Communities
Project: PG7301
Location: 4795 Bank Street
Test Well: BH2-26
Test Date: May 26, 2026

AQUIFER DATA

Saturated Thickness: 8.74 m Anisotropy Ratio (Kz/Kr): 0.1

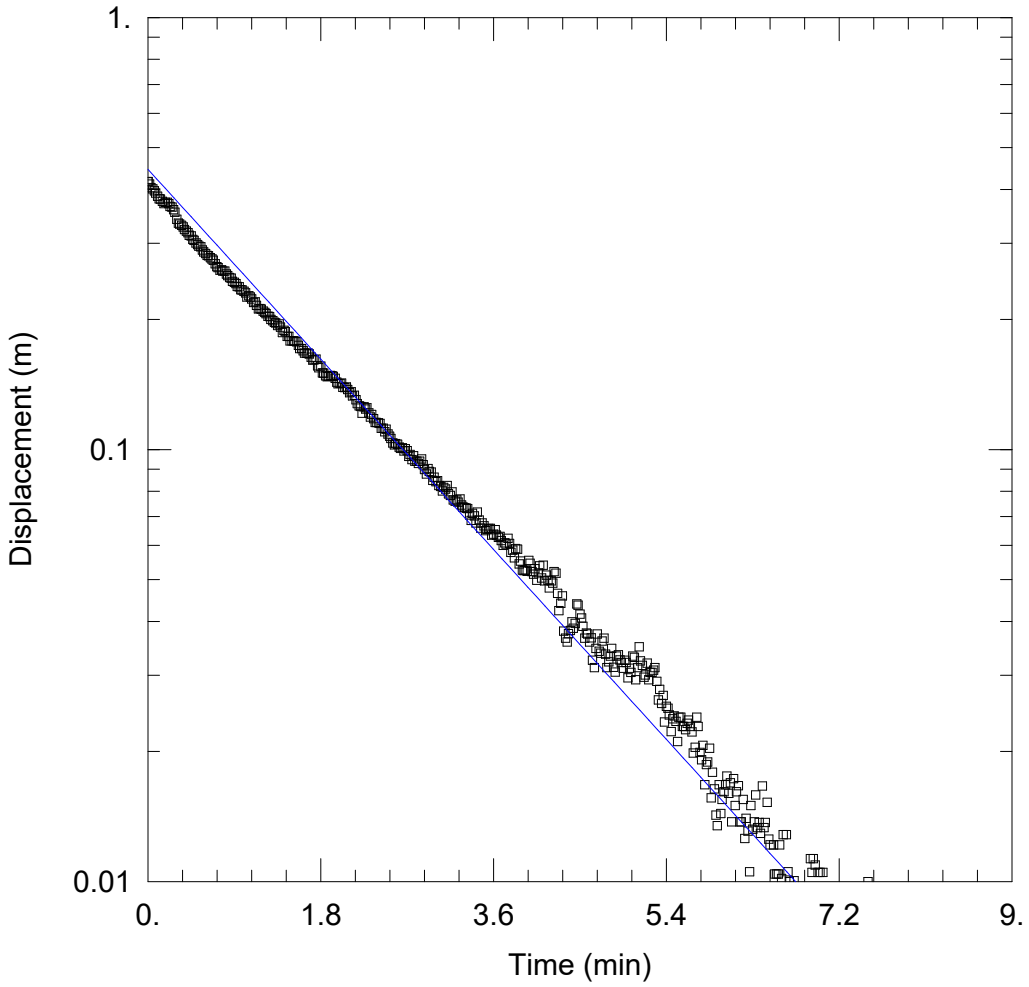
WELL DATA (BH2-26)

Initial Displacement: 0.2973 m
Total Well Penetration Depth: 8.74 m
Casing Radius: 0.01588 m
Static Water Column Height: 8.74 m
Screen Length: 1.524 m
Well Radius: 0.0381 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.63E-5 m/sec y0 = 0.3317 m



WELL TEST ANALYSIS

PROJECT INFORMATION

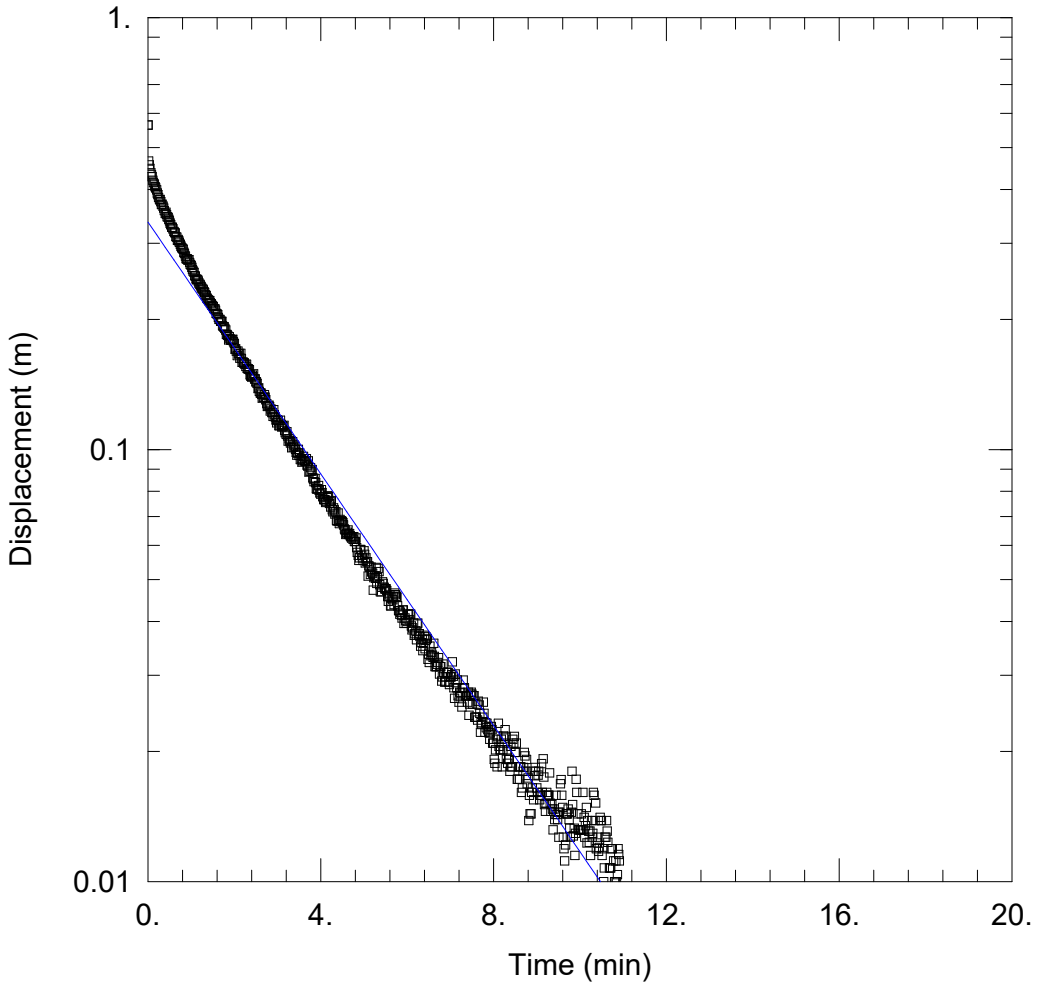
Company: Paterson Group
Client: Caivan Communities
Project: PG7301
Location: 4795 Bank Street
Test Well: BH3-26
Test Date: May 26, 2026

WELL DATA (BH3-26)

Initial Displacement: 0.417 m
Total Well Penetration Depth: 4.9 m
Casing Radius: 0.0254 m
Static Water Column Height: 4.9 m
Screen Length: 1.524 m
Well Radius: 0.1048 m

SOLUTION

Aquifer Model: Unconfined
K = 8.971E-6 m/sec
Solution Method: Hvorslev
y0 = 0.4452 m



WELL TEST ANALYSIS

PROJECT INFORMATION

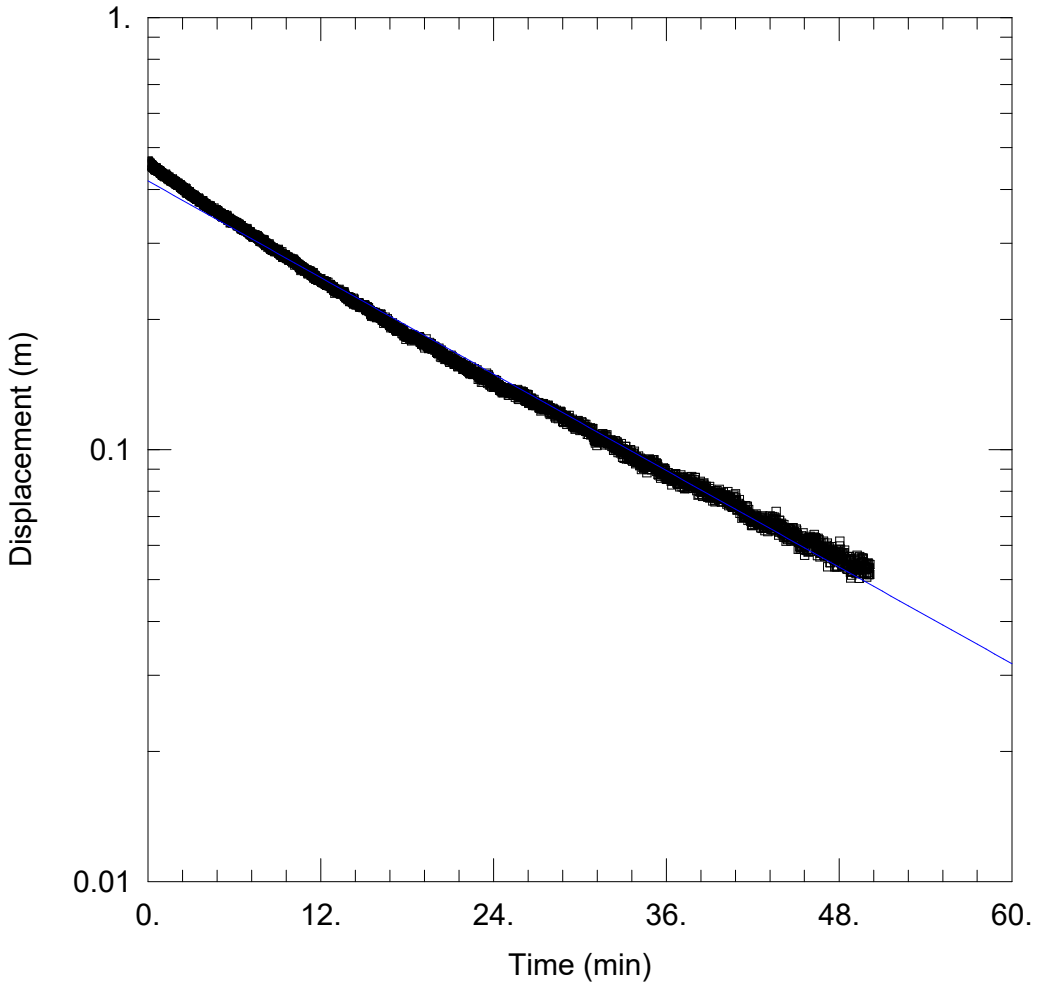
Company: Paterson Group
Client: Caivan Communities
Project: PG7301
Location: 4795 Bank Street
Test Well: BH3-26
Test Date: May 26, 2026

WELL DATA (BH3-26)

Initial Displacement: 0.564 m
Total Well Penetration Depth: 4.92 m
Casing Radius: 0.0254 m
Static Water Column Height: 4.92 m
Screen Length: 1.524 m
Well Radius: 0.1048 m

SOLUTION

Aquifer Model: Unconfined
K = 5.35E-6 m/sec
Solution Method: Hvorslev
y0 = 0.3359 m



WELL TEST ANALYSIS

PROJECT INFORMATION

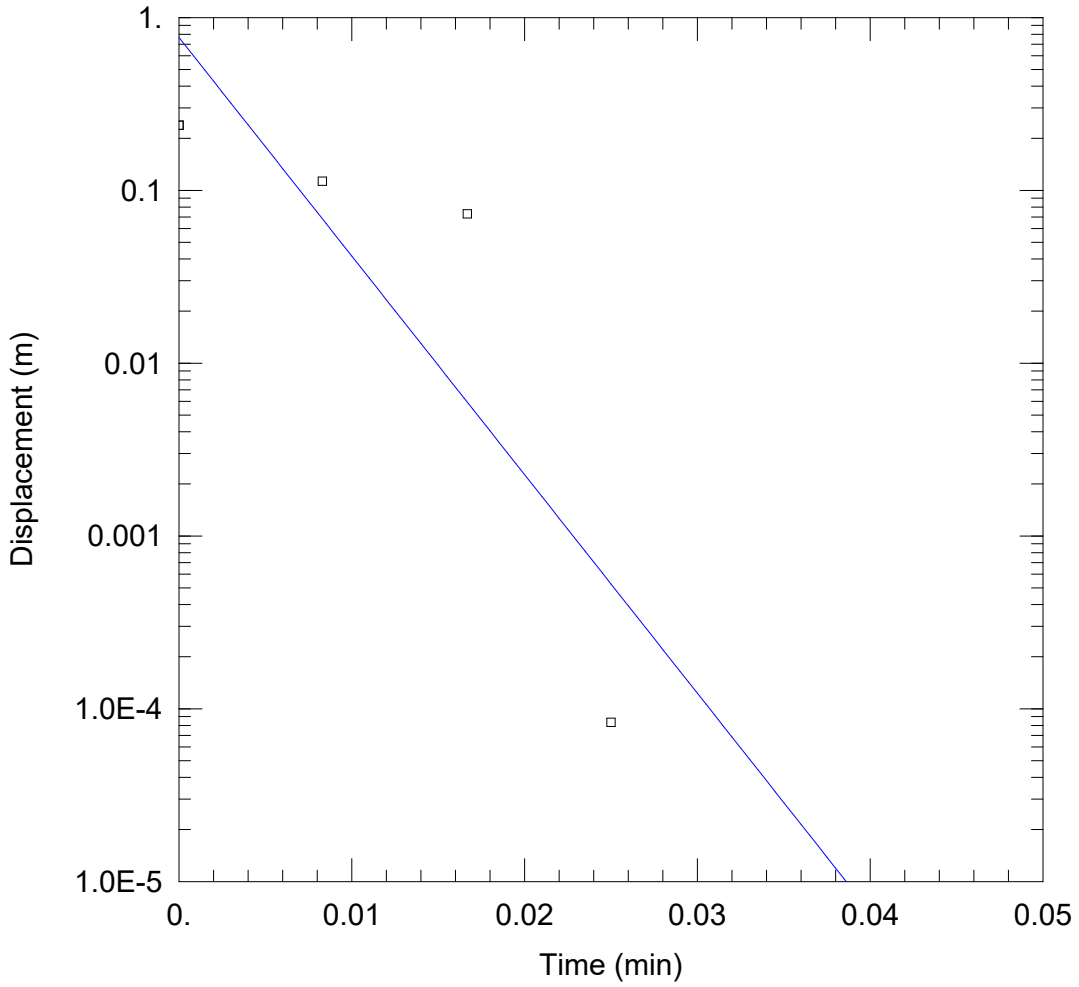
Company: Paterson Group
Client: Caivan Communities
Project: PG7301
Location: 4795 Bank Street
Test Well: BH4-26
Test Date: May 26, 2026

WELL DATA (BH4-26)

Initial Displacement: 0.465 m
Total Well Penetration Depth: 3.49 m
Casing Radius: 0.0254 m
Static Water Column Height: 3.49 m
Screen Length: 1.524 m
Well Radius: 0.1048 m

SOLUTION

Aquifer Model: Unconfined
K = 6.84E-7 m/sec
Solution Method: Hvorslev
y0 = 0.4184 m



WELL TEST ANALYSIS

PROJECT INFORMATION

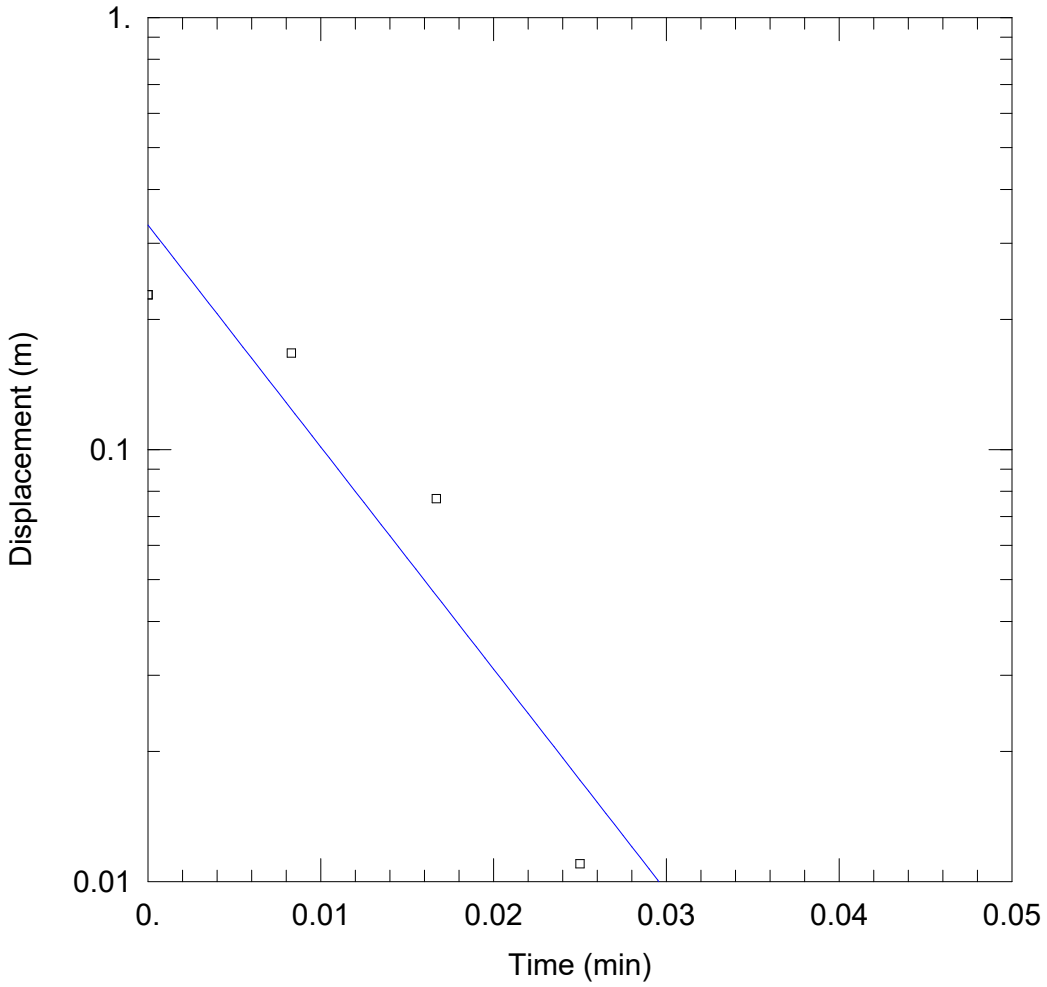
Company: Paterson Group
Client: Caivan Communities
Project: PG7301
Location: 4795 Bank Street
Test Well: BH5-26
Test Date: May 26, 2026

WELL DATA (BH5-26)

Initial Displacement: 0.2381 m
Total Well Penetration Depth: 5. m
Casing Radius: 0.0254 m
Static Water Column Height: 5. m
Screen Length: 1.524 m
Well Radius: 0.0381 m

SOLUTION

Aquifer Model: Unconfined
K = 0.005686 m/sec
Solution Method: Hvorslev
y0 = 0.7668 m



WELL TEST ANALYSIS

Data Set: P:\...\PG7301- BH5-26 Rising Head 2 of 2.aqt
Date: 05/27/26 Time: 16:18:16

PROJECT INFORMATION

Company: Paterson Group
Client: Caivan Communities
Project: PG7301
Location: 4795 Bank Street
Test Well: BH5-26
Test Date: May 26, 2026

AQUIFER DATA

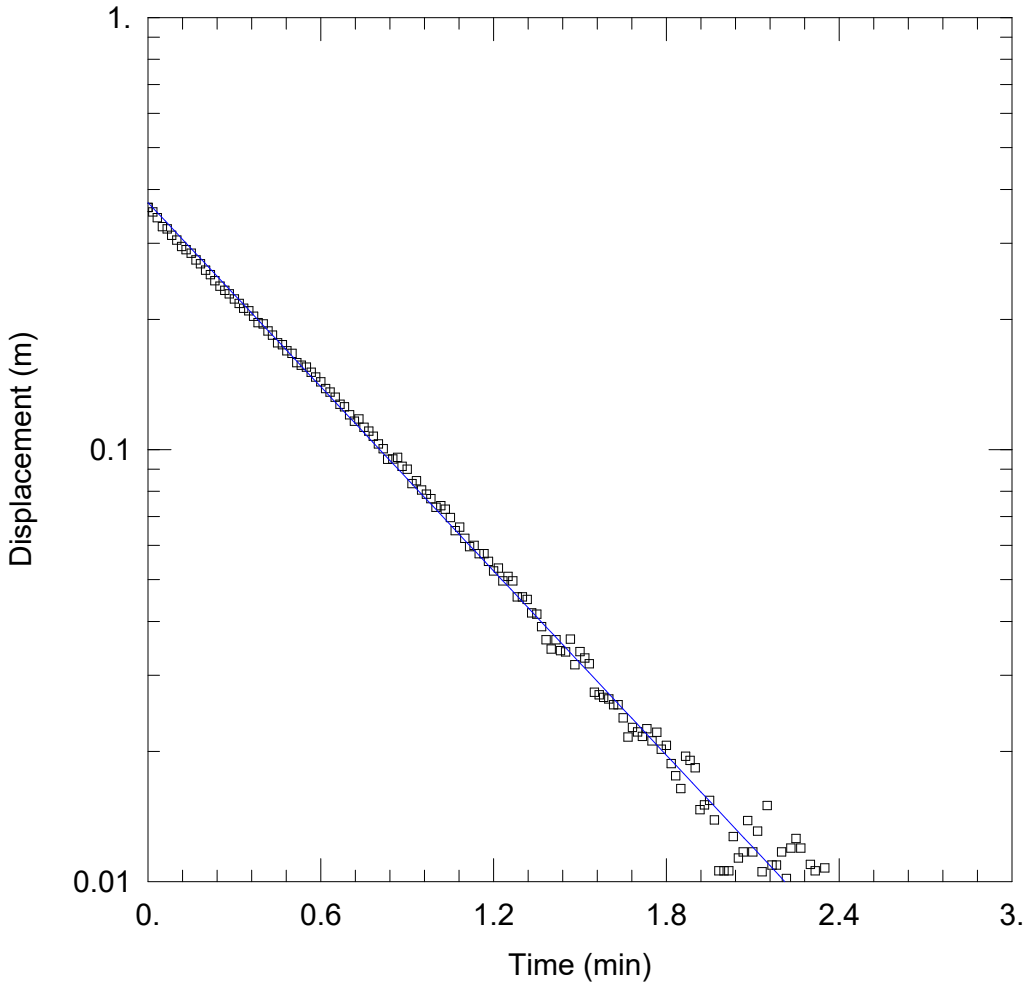
Saturated Thickness: 5. m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (BH5-26)

Initial Displacement: 0.228 m
Total Well Penetration Depth: 5. m
Casing Radius: 0.0254 m
Static Water Column Height: 5. m
Screen Length: 1.524 m
Well Radius: 0.0381 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.00231 m/sec
y0 = 0.3309 m



WELL TEST ANALYSIS

PROJECT INFORMATION

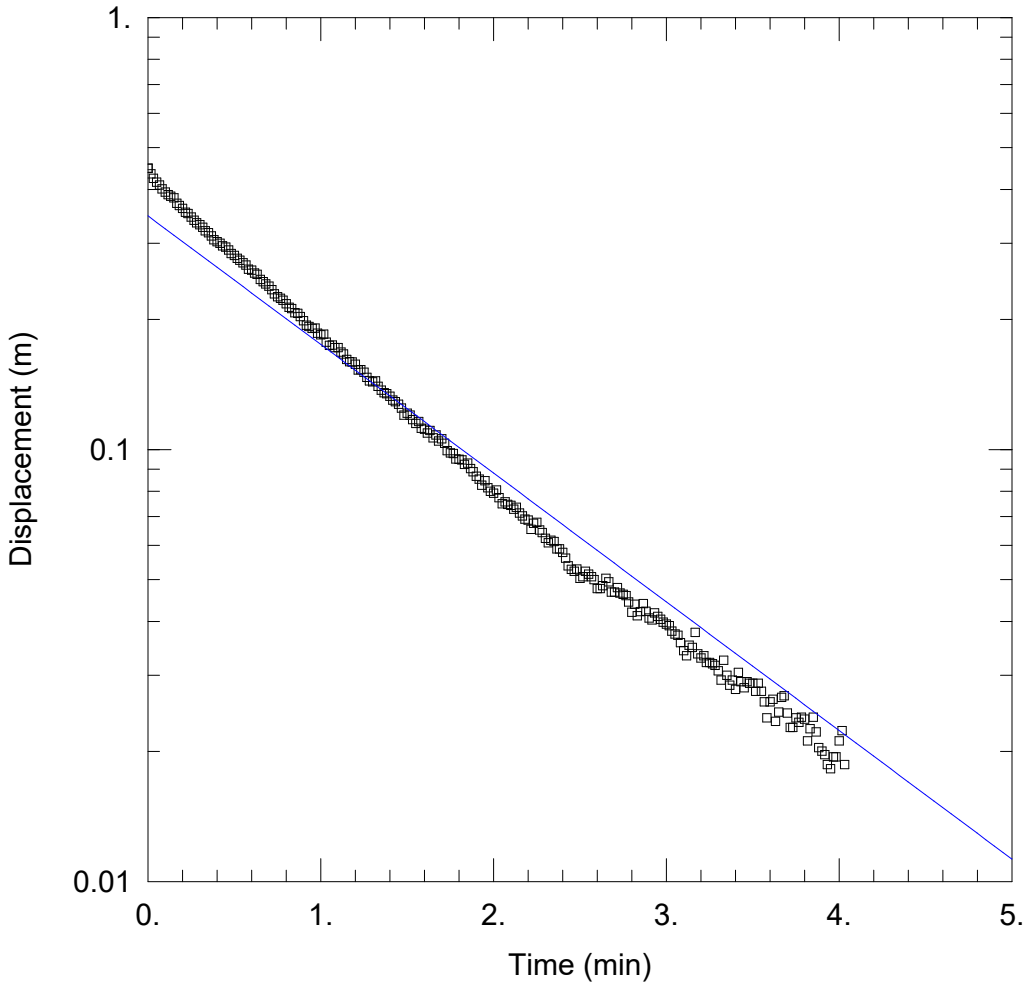
Company: Paterson Group
Client: Caivan Communities
Project: PG7301
Location: 4795 Bank Street
Test Well: BH6-26
Test Date: May 26, 2026

WELL DATA (BH6-26)

Initial Displacement: 0.3633 m
Total Well Penetration Depth: 3.23 m
Casing Radius: 0.0254 m
Static Water Column Height: 3.23 m
Screen Length: 1.524 m
Well Radius: 0.1048 m

SOLUTION

Aquifer Model: Unconfined
K = 2.61E-5 m/sec
Solution Method: Hvorslev
y0 = 0.3729 m



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: Paterson Group
Client: Caivan Communities
Project: PG7301
Location: 4795 Bank Street
Test Well: BH6-26
Test Date: May 26, 2026

WELL DATA (BH6-26)

Initial Displacement: 0.448 m
Total Well Penetration Depth: 3.22 m
Casing Radius: 0.0254 m
Static Water Column Height: 3.22 m
Screen Length: 1.524 m
Well Radius: 0.1048 m

SOLUTION

Aquifer Model: Unconfined
K = 9.259E-6 m/sec
Solution Method: Hvorslev
y0 = 0.3474 m

File: PH5254

Estimated Groundwater Inflow

Caivan Communities - 4795 Bank Street - Building Excavation

Dupuit-Forchheimer Equation $Q = \pi K((h_0^2 - h_p^2)/\ln(R/r))$

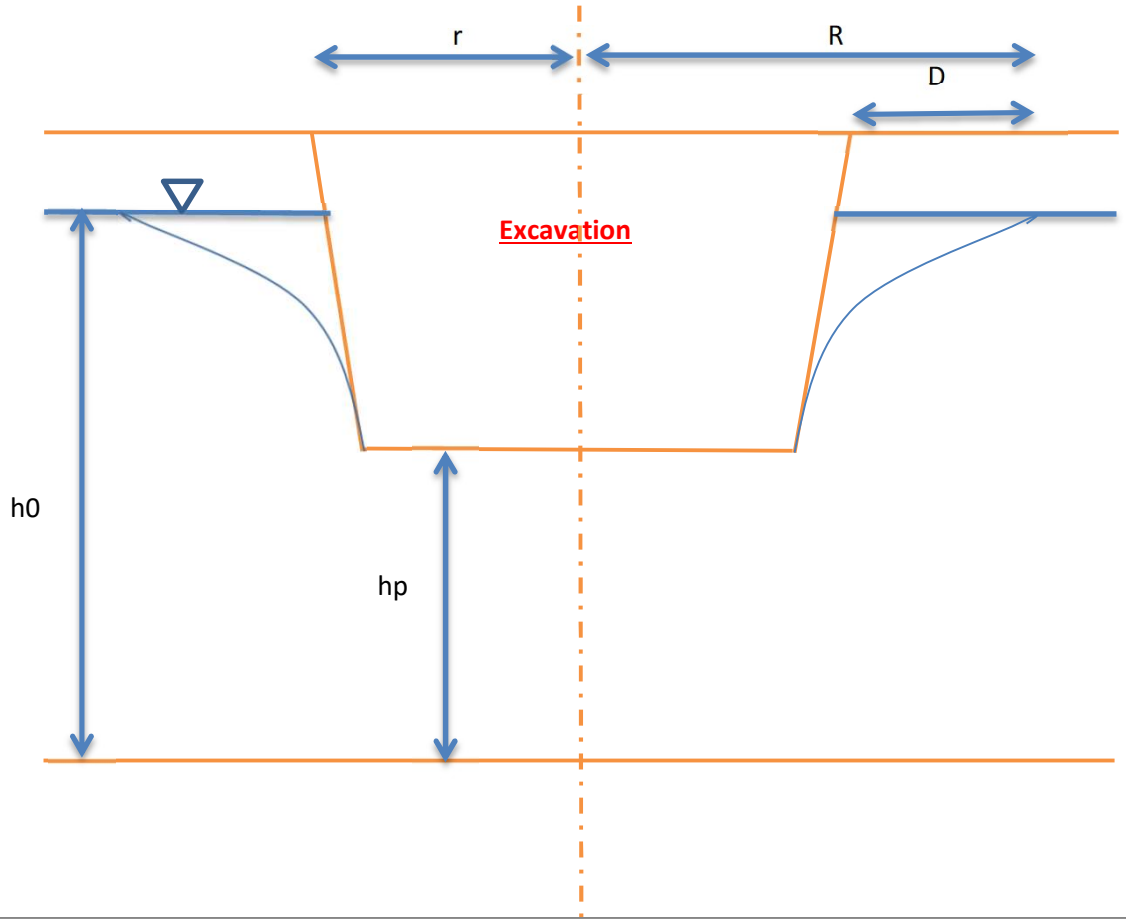
Equivalent Radius of Excavation = A+B=Pi*r

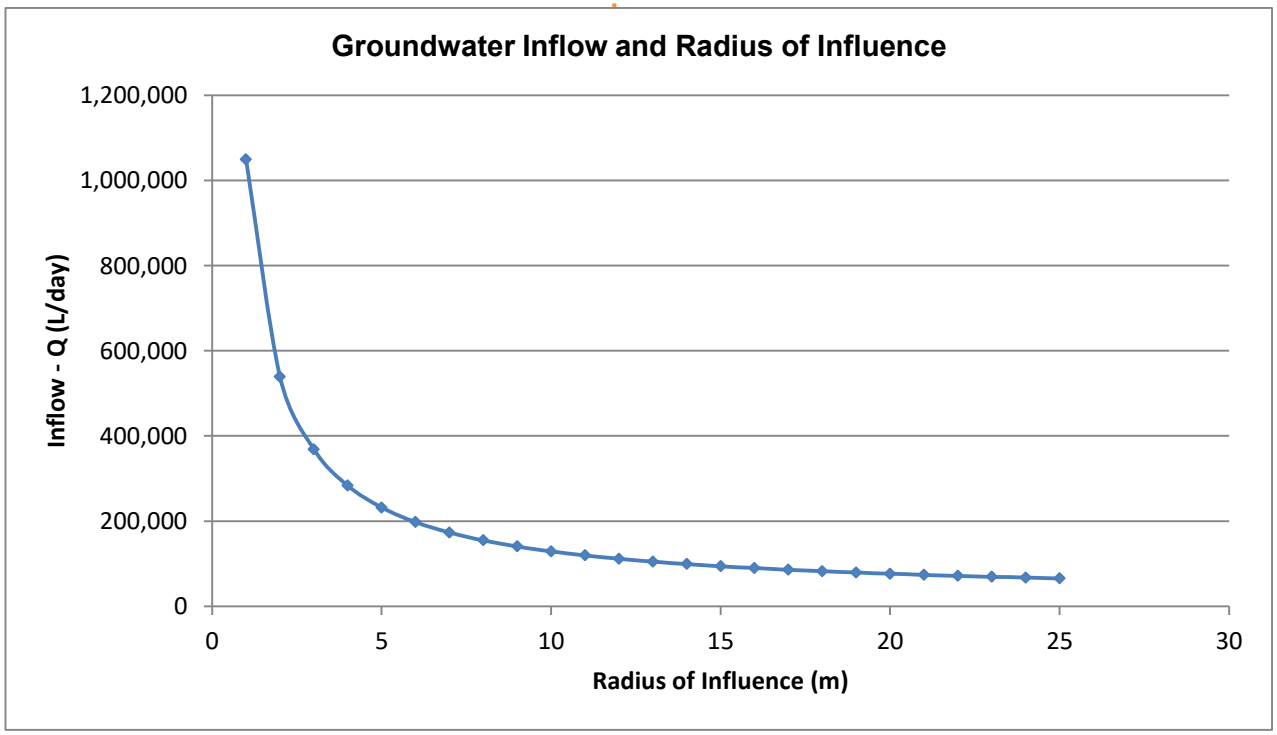
K (m/sec) =	6.02E-06
h0 (m) =	10
hp (m) =	8
r (m) =	17.35

Excavation Width (A) =	26.5 m
Excavation Length (B) =	28 m
Perimeter Length =	109 m
Equivalent Radius (r) =	17.35 m

R	Distance to edge of excavation (D)	Q (m^3/s)	Q (m^3/day)	Q (L/day)
18.35	1.00	0.0121	1049.6	1,049,629
19.35	2.00	0.0062	539.1	539,123
20.35	3.00	0.0043	368.8	368,795
21.35	4.00	0.0033	283.5	283,519
22.35	5.00	0.0027	232.3	232,271
23.35	6.00	0.0023	198.0	198,040
24.35	7.00	0.0020	173.5	173,538
25.35	8.00	0.0018	155.1	155,119
26.35	9.00	0.0016	140.8	140,758
27.35	10.00	0.0015	129.2	129,238
28.35	11.00	0.0014	119.8	119,787
29.35	12.00	0.0013	111.9	111,888
30.35	13.00	0.0012	105.2	105,185
31.35	**14.00**	**0.0012**	**99.4**	**99,421**
32.35	**15.00**	**0.0011**	**94.4**	**94,410**
33.35	16.00	0.0010	90.0	90,012
34.35	17.00	0.0010	86.1	86,119
35.35	18.00	0.0010	82.6	82,646
36.35	19.00	0.0009	79.5	79,529
37.35	20.00	0.0009	76.7	76,714
38.35	21.00	0.0009	74.2	74,159
39.35	22.00	0.0008	71.8	71,828
40.35	23.00	0.0008	69.7	69,692
41.35	24.00	0.0008	67.7	67,728
42.35	25.00	0.0008	65.9	65,914
43.35	26.00	0.0007	64.2	64,234
44.35	27.00	0.0007	62.7	62,674
45.35	28.00	0.0007	61.2	61,219
46.35	29.00	0.0007	59.9	59,860
47.35	30.00	0.0007	58.6	58,588

PATERSON GROUP





PATERSON GROUP

File: PH5254

Estimated Groundwater Inflow

Caivan Communities - 4795 Bank Street - Condominum Excavation

Dupuit-Forchheimer Equation $Q = \pi K((h_0^2 - h_p^2)/\ln(R/r))$

K (m/sec) = 6.02E-06
h0 (m) = 6
hp (m) = 4
r (m) = 91.04

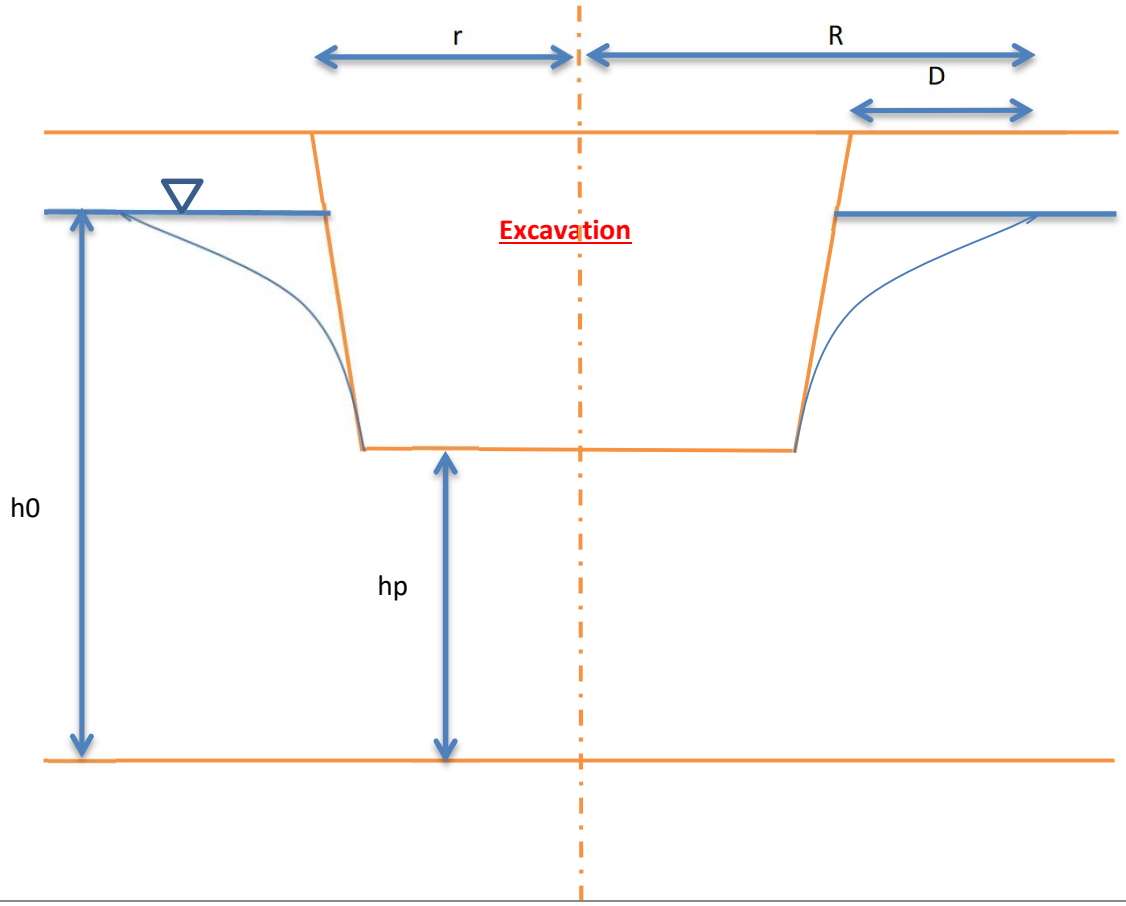
Equivalent Radius of Excavation = A+B=Pi*r

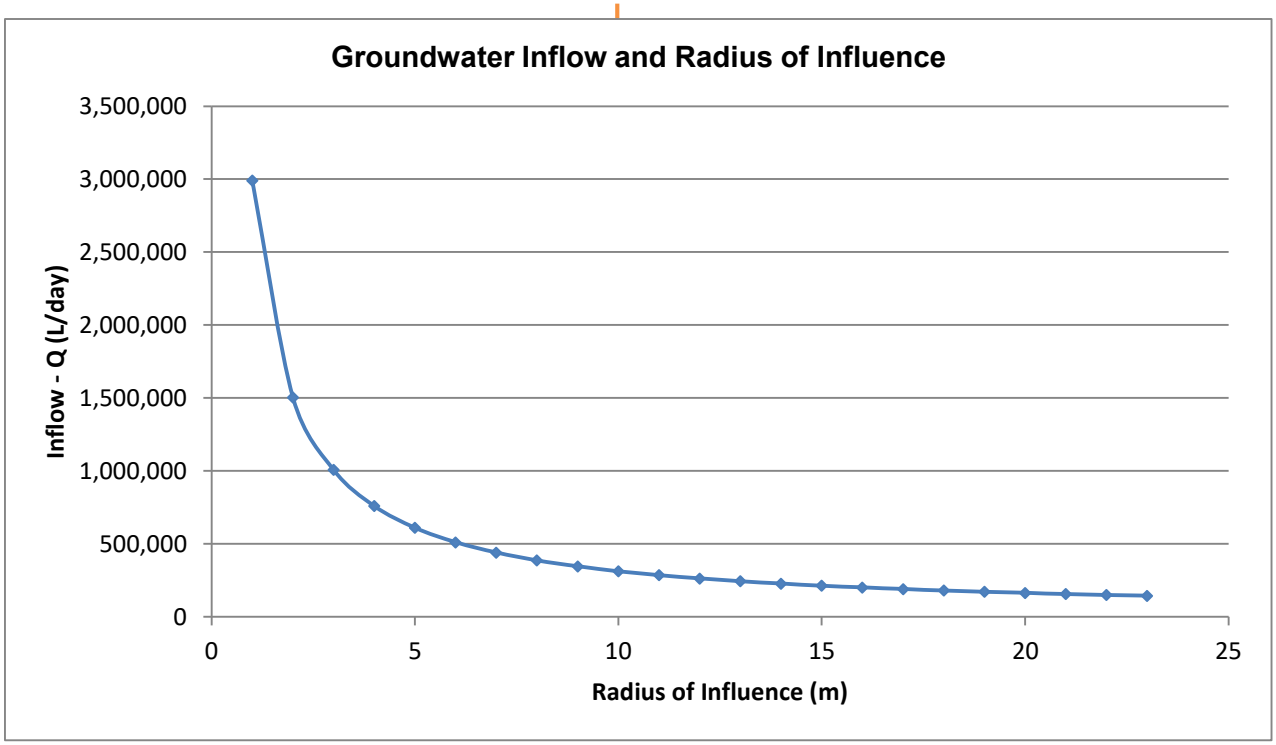
Excavation Width (X) = 141 m
Excavation Length (Y) = 145 m
Perimeter Length = 572 m
Equivalent Radius (r) = 91.04 m

R	Distance to edge of excavation (D)	Q (m^3/s)	Q (m^3/day)	Q (L/day)
92.04	1.00	0.0346	2991.4	2,991,443
93.04	2.00	0.0174	1503.8	1,503,847
94.04	3.00	0.0117	1008.0	1,007,963
95.04	4.00	0.0088	760.0	760,006
96.04	5.00	0.0071	611.2	611,221
97.04	6.00	0.0059	512.0	512,022
98.04	7.00	0.0051	441.2	441,157
99.04	8.00	0.0045	388.0	388,002
100.04	9.00	0.0040	346.7	346,654
101.04	10.00	0.0036	313.6	313,570
102.04	11.00	0.0033	286.5	286,496
103.04	12.00	0.0031	263.9	263,931
104.04	13.00	0.0028	244.8	244,833
105.04	**14.00**	**0.0026**	**228.5**	**228,460**
106.04	**15.00**	**0.0025**	**214.3**	**214,267**
107.04	16.00	0.0023	201.8	201,845
108.04	17.00	0.0022	190.9	190,882
109.04	18.00	0.0021	181.1	181,134
110.04	19.00	0.0020	172.4	172,410
111.04	20.00	0.0019	164.6	164,556
112.04	21.00	0.0018	157.4	157,448
113.04	22.00	0.0017	151.0	150,985
114.04	23.00	0.0017	145.1	145,081
115.04	24.00	0.0016	139.7	139,667
116.04	25.00	0.0016	134.7	134,685
117.04	26.00	0.0015	130.1	130,085
118.04	27.00	0.0015	125.8	125,824
119.04	28.00	0.0014	121.9	121,866
120.04	29.00	0.0014	118.2	118,179
121.04	30.00	0.0013	114.7	114,737

PATERSON GROUP

File: PH5254





PATERSON GROUP

File: PH5254

Estimated Groundwater Inflow

Caivan Communities - 4795 Bank Street - Servicing Excavation

Dupuit-Forchheimer Equation **$Q = \pi K((h0^2-hp^2)/\ln(R/r))$**

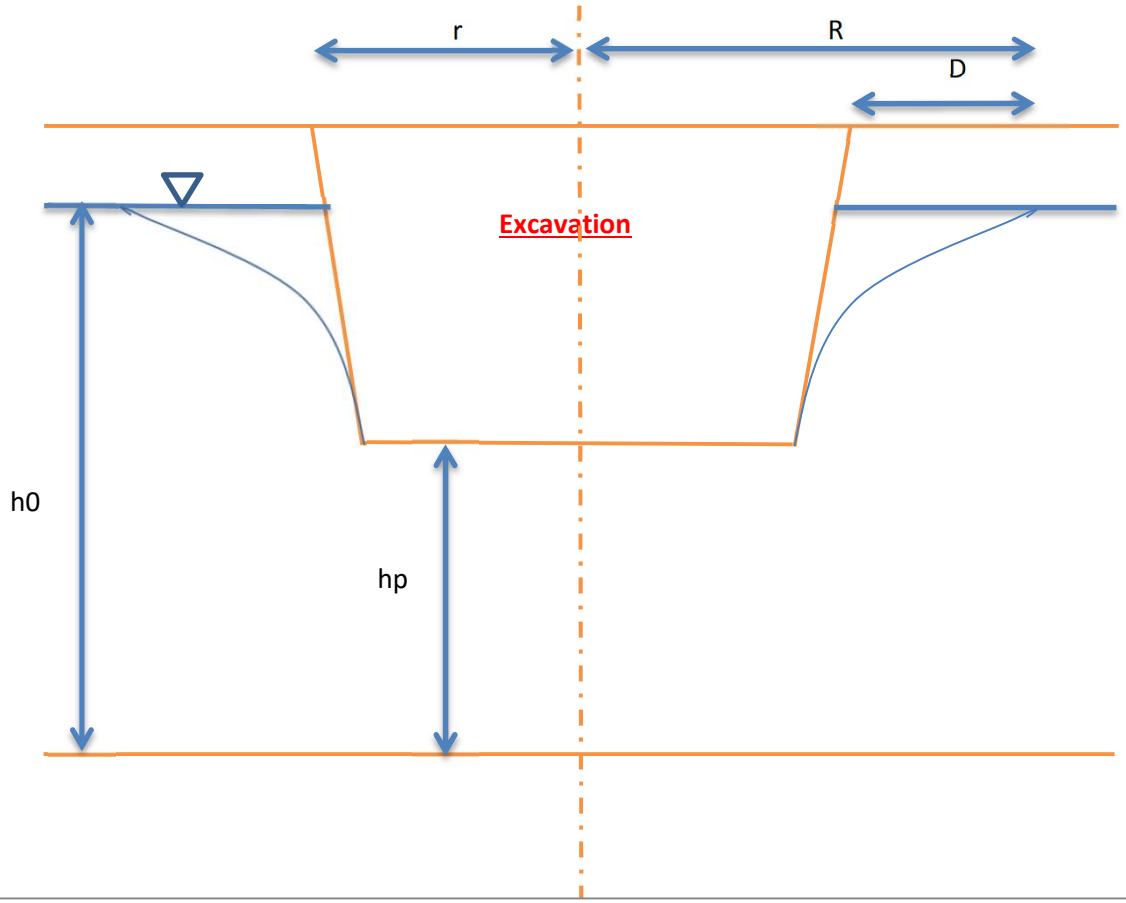
K (m/sec) = 6.02E-06
h0 (m) = 10
hp (m) = 6
r (m) = 9.55

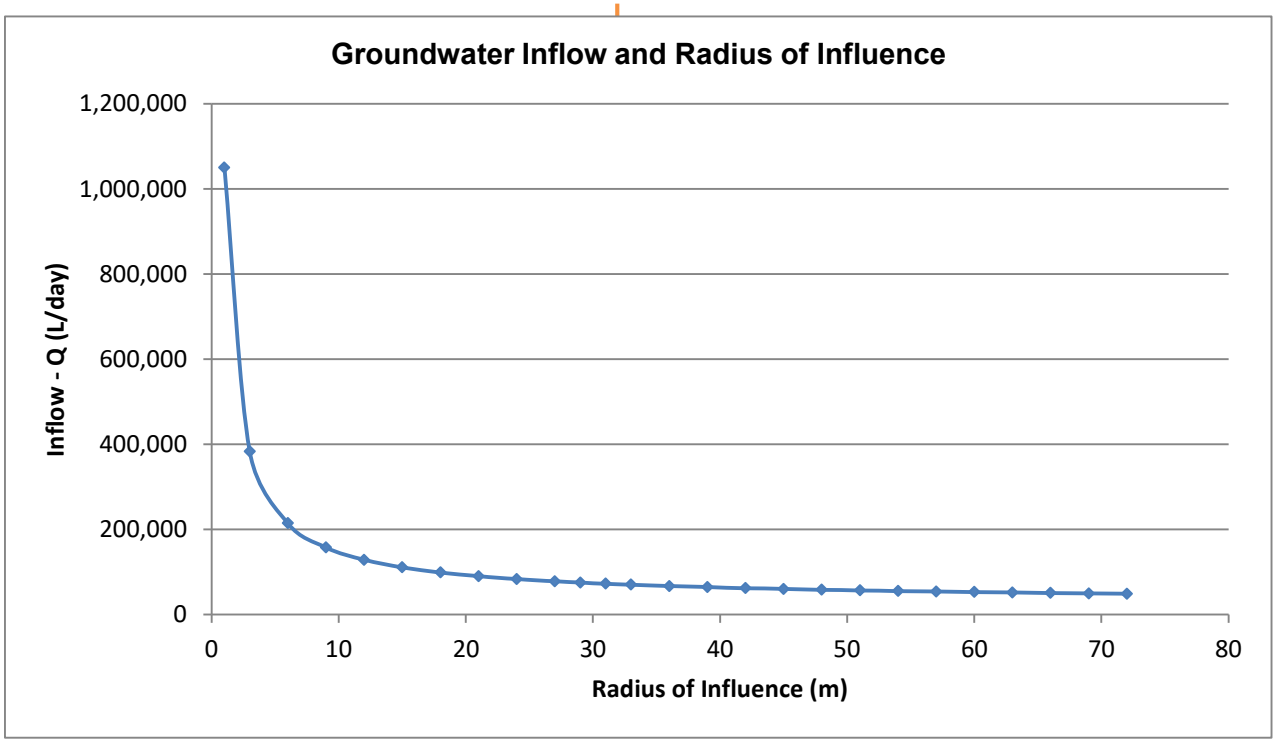
Equivalent Radius of Excavation = A+B=Pi + r

Excavation Width (X) = 5 m
Excavation Length (Y) = 25 m
Perimeter Length = 60 m
Equivalent Radius (r) = 9.55 m

R	Distance to edge of excavation (D)	Q (m^3/s)	Q (m^3/day)	Q (L/day)
10.55	1.00	0.0122	1050.1	1,050,067
12.55	3.00	0.0044	382.8	382,793
15.55	6.00	0.0025	214.5	214,498
18.55	9.00	0.0018	157.5	157,505
21.55	12.00	0.0015	128.5	128,494
24.55	15.00	0.0013	110.8	110,756
27.55	18.00	0.0011	98.7	98,704
30.55	21.00	0.0010	89.9	89,931
33.55	24.00	0.0010	83.2	83,226
36.55	27.00	0.0009	77.9	77,916
38.55	**29.00**	**0.0009**	**74.9**	**74,941**
40.55	**31.00**	**0.0008**	**72.3**	**72,320**
42.55	33.00	0.0008	70.0	69,989
45.55	36.00	0.0008	66.9	66,937
48.55	39.00	0.0007	64.3	64,312
51.55	42.00	0.0007	62.0	62,025
54.55	45.00	0.0007	60.0	60,011
57.55	48.00	0.0007	58.2	58,223
60.55	51.00	0.0007	56.6	56,621
63.55	54.00	0.0006	55.2	55,176
66.55	57.00	0.0006	53.9	53,865
69.55	60.00	0.0006	52.7	52,669
72.55	63.00	0.0006	51.6	51,572
75.55	66.00	0.0006	50.6	50,562
78.55	69.00	0.0006	49.6	49,627
81.55	72.00	0.0006	48.8	48,760
84.55	75.00	0.0006	48.0	47,952
87.55	78.00	0.0005	47.2	47,198
90.55	81.00	0.0005	46.5	46,491
93.55	84.00	0.0005	45.8	45,827

PATERSON GROUP





PATERSON GROUP

File: PH5254

Estimated Groundwater Inflow

Caivan Communities - 4795 Bank Street - SWMP Excavation

Dupuit-Forchheimer Equation **$Q = \pi K((h0^2-hp^2)/\ln(R/r))$**

Equivalent Radius of Excavation = A+B=Pi + r

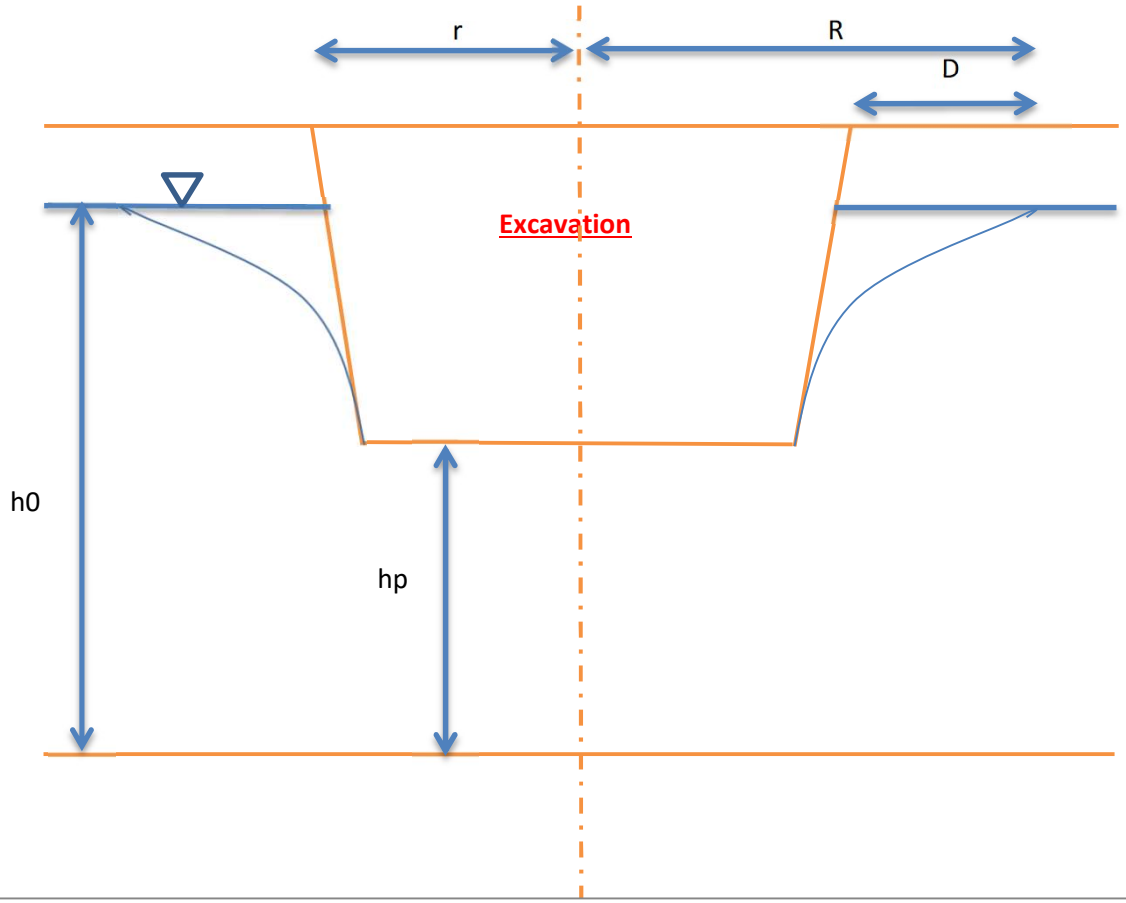
K (m/sec) =	6.02E-06
h0 (m) =	10
hp (m) =	8
r (m) =	53.79

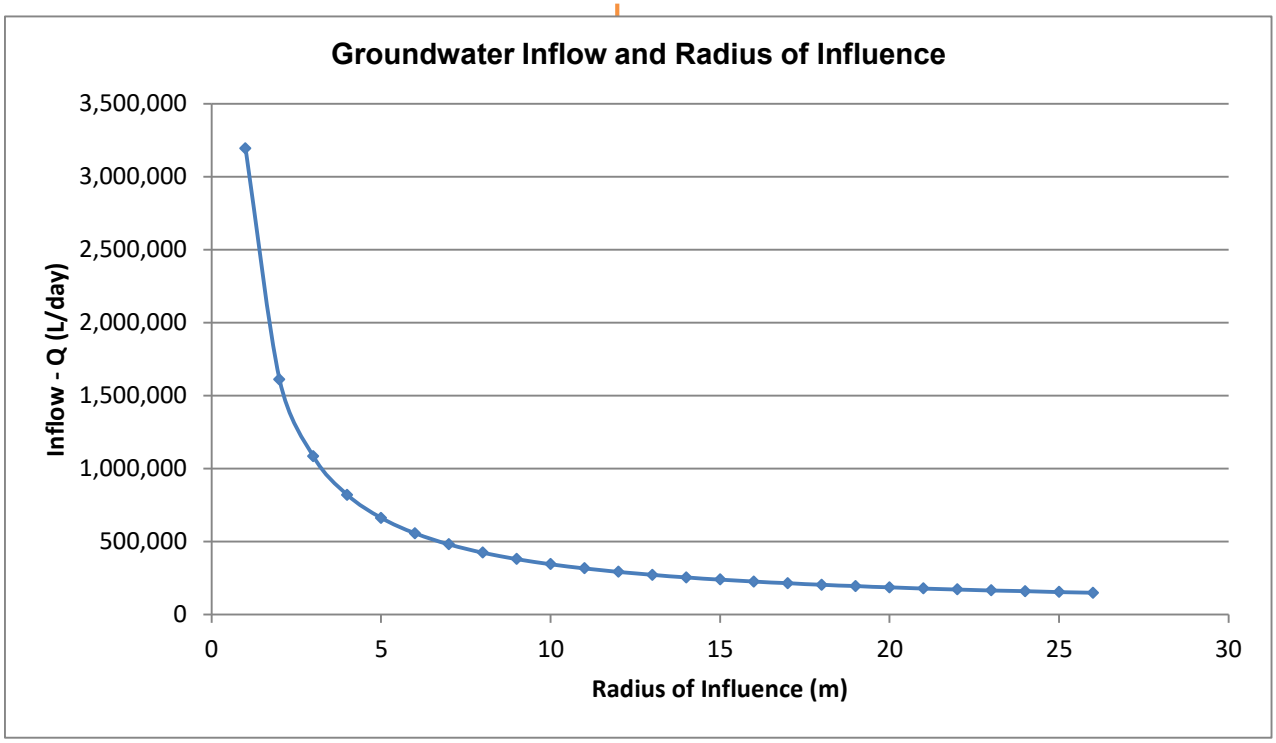
Excavation Width (X) =	74 m
Excavation Length (Y) =	95 m
Perimeter Length =	338 m
Equivalent Radius (r) =	53.79 m

R	Distance to edge of excavation (D)	Q (m^3/s)	Q (m^3/day)	Q (L/day)
54.79	1.00	0.0370	3193.8	3,193,781
55.79	2.00	0.0187	1611.5	1,611,463
56.79	3.00	0.0125	1084.0	1,083,966
57.79	4.00	0.0095	820.2	820,176
58.79	5.00	0.0077	661.9	661,869
59.79	6.00	0.0064	556.3	556,304
60.79	7.00	0.0056	480.9	480,879
61.79	8.00	0.0049	424.3	424,290
62.79	9.00	0.0044	380.3	380,261
63.79	10.00	0.0040	345.0	345,023
64.79	11.00	0.0037	316.2	316,179
65.79	12.00	0.0034	292.1	292,131
66.79	13.00	0.0031	271.8	271,772
67.79	**14.00**	**0.0029**	**254.3**	**254,312**
68.79	**15.00**	**0.0028**	**239.2**	**239,172**
69.79	16.00	0.0026	225.9	225,916
70.79	17.00	0.0025	214.2	214,213
71.79	18.00	0.0024	203.8	203,803
72.79	19.00	0.0023	194.5	194,483
73.79	20.00	0.0022	186.1	186,088
74.79	21.00	0.0021	178.5	178,488
75.79	22.00	0.0020	171.6	171,574
76.79	23.00	0.0019	165.3	165,256
77.79	24.00	0.0018	159.5	159,461
78.79	25.00	0.0018	154.1	154,124
79.79	26.00	0.0017	149.2	149,195
80.79	27.00	0.0017	144.6	144,626
81.79	28.00	0.0016	140.4	140,381
82.79	29.00	0.0016	136.4	136,425
83.79	30.00	0.0015	132.7	132,729

PATERSON GROUP

File: PH5254





PATERSON GROUP

File: PH5254

Estimated Groundwater Inflow

Caivan Communities - 4795 Bank Street - Servicing Excavation-Bedrock

Dupuit-Forchheimer Equation **$Q = \pi K((h0^2-hp^2)/\ln(R/r))$**

K (m/sec) =	1.94E-04
h0 (m) =	20
hp (m) =	18
r (m) =	9.55

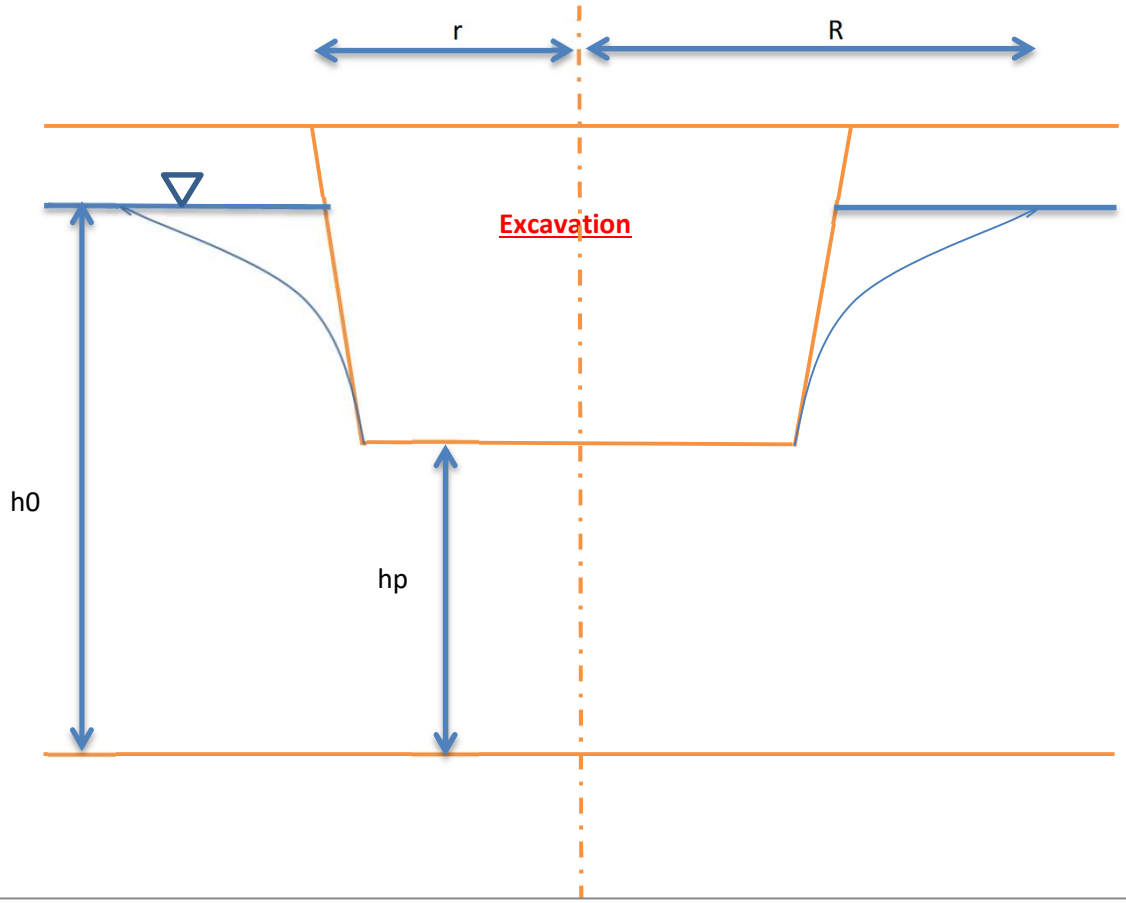
Equivalent Radius of Excavation = A+B=Pi + r

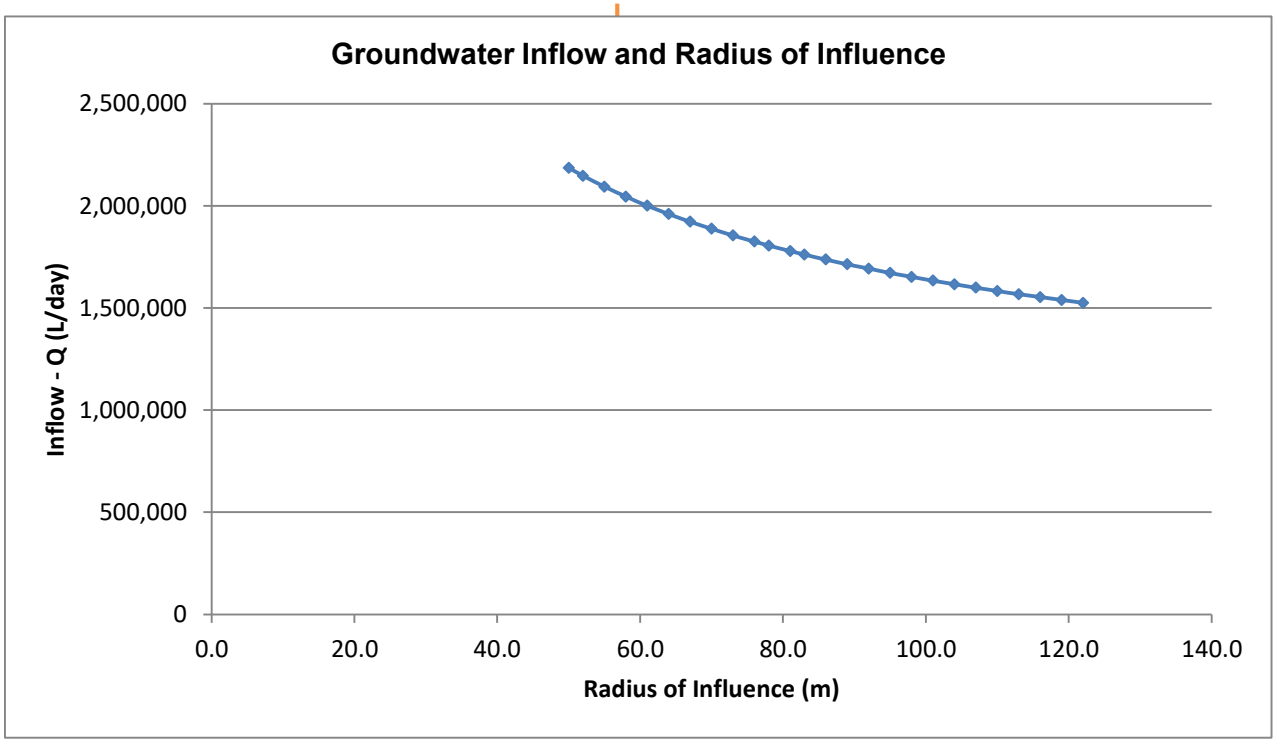
Excavation Width (X) =	5 m
Excavation Length (Y) =	25 m
Perimeter Length =	60 m
Equivalent Radius (r) =	9.55 m

R	Distance to edge of excavation (D)	Q (m^3/s)	Q (m^3/day)	Q (L/day)
59.55	50.00	0.0253	2186.5	2,186,492
61.55	52.00	0.0249	2147.7	2,147,730
64.55	55.00	0.0242	2094.2	2,094,242
67.55	58.00	0.0237	2045.6	2,045,613
70.55	61.00	0.0232	2001.2	2,001,164
73.55	64.00	0.0227	1960.3	1,960,343
76.55	67.00	0.0223	1922.7	1,922,690
79.55	70.00	0.0218	1887.8	1,887,825
82.55	73.00	0.0215	1855.4	1,855,424
85.55	76.00	0.0211	1825.2	1,825,217
87.55	78.00	0.0209	1806.2	1,806,181
90.55	81.00	0.0206	1779.1	1,779,127
92.55	**83.00**	**0.0204**	**1762.0**	**1,762,014**
95.55	**86.00**	**0.0201**	**1737.6**	**1,737,609**
98.55	89.00	0.0198	1714.6	1,714,595
101.55	92.00	0.0196	1692.8	1,692,846
104.55	95.00	0.0194	1672.3	1,672,251
107.55	98.00	0.0191	1652.7	1,652,714
110.55	101.00	0.0189	1634.1	1,634,147
113.55	104.00	0.0187	1616.5	1,616,474
116.55	107.00	0.0185	1599.6	1,599,625
119.55	110.00	0.0183	1583.5	1,583,539
122.55	113.00	0.0182	1568.2	1,568,160
125.55	116.00	0.0180	1553.4	1,553,439
128.55	119.00	0.0178	1539.3	1,539,329
131.55	122.00	0.0177	1525.8	1,525,790
134.55	125.00	0.0175	1512.8	1,512,785
137.55	128.00	0.0174	1500.3	1,500,279
140.55	131.00	0.0172	1488.2	1,488,242
143.55	134.00	0.0171	1476.6	1,476,644

PATERSON GROUP

File: PH5254





PATERSON GROUP

APPENDIX 4

SURROUNDING WATER WELL RECORDS

31 9/50.

UTM | 18 Z | 415171210 E
| 5 R | 5011717110 N
Elev. | 4 R | 013016
Basis Asphalt from +
Con IV
lot 21

ONTARIO

The Water-well Drillers Act, 1954
Department of Mines

GROUND WATER BRANCH 15 N. 217
SEP 9 1957
ONTARIO WATER RESOURCES COMMISSION

Water-Well Record

County or Territorial District Carleton Township, Village, Town or City Gloucester
[redacted] in Village, Town or City)
Address Building Bridge

(day) (month) (year)

Pipe and Casing Record

Casing diameter(s) 2
Length(s) 20
Type of screen
Length of screen

Pumping Test

Static level 10 ft
Pumping rate 200 G.P.H
Pumping level 30 ft
Duration of test 3 hrs

Well Log — Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, or sulphur)
Boulders and sand	0	20	60	50	Fresh
Sandstone	20	60			

For what purpose(s) is the water to be used? Home
Is water clear or cloudy? Clear
Is well on upland, in valley, or on hillside? upland
Drilling firm F R Corvette
Address 1632 Baseline R.D. City Rideau
Name of Driller F R Corvette
Address

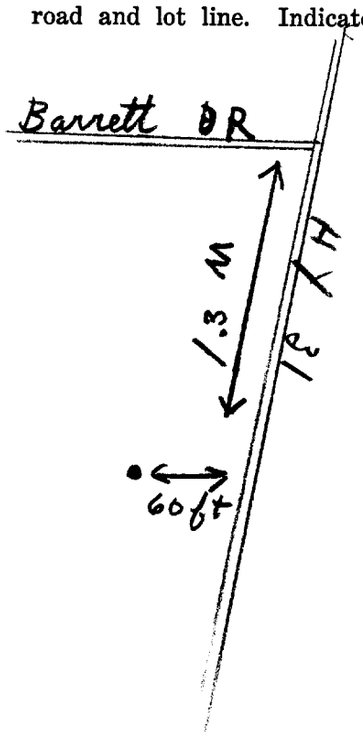
Licence Number 395

I certify that the foregoing statements of fact are true.

Date 29 Aug 57 F R Corvette
Signature of Licensee

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 5

316/52

UTM 18 Z 415317 6010 E
15 R 5061715 6010 N
Elev. 4 R 0131 15
Basin 25

GROUND WATER BRANCH
SEP 15 1962
No 2176
ONTARIO WATER RESOURCES COMMISSION

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District CARLETON Township, Village, Town or City GLOUCESTER

Con. 4 RF Lot 21 Date completed 20 (day) JULY (month) 62 (year)

[redacted] dress BILLINGS BRIDGE

Casing and Screen Record

Inside diameter of casing 4
Total length of casing 18
Type of screen —
Length of screen —
Depth to top of screen —
Diameter of finished hole 4

Pumping Test

Static level 6
Test-pumping rate 6 G.P.M.
Pumping level 8
Duration of test pumping 1 HR
Water clear or cloudy at end of test CC
Recommended pumping rate 6 G.P.M.
with pump setting of 30 feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Water Record: Kind of water (fresh, salty, sulphur)
CLAY	0	18		
LIMESTONE	18	45	45	F

For what purpose(s) is the water to be used? Home

Is well on upland, in valley, or on hillside? U

Drilling or Boring Firm M MEDSTER

Address [illegible]

Licence Number [illegible]

Name of Driller or Borer SIMS

Address [illegible]

Date AUG 28

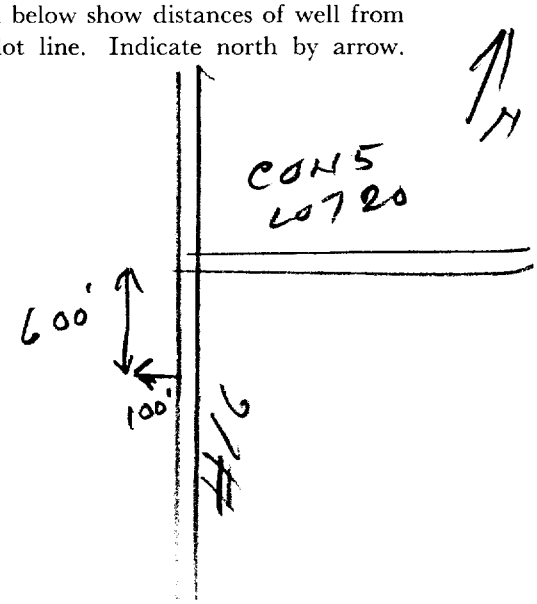
M Meagher
(Signature of Licensed Drilling or Boring Contractor)

Form 7 10M-62-1152

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



CSS.58

46

316/50

UTM 18 Z 415161610 E
18 R 5101810710 N
Elev. 4 R 102915
Basin 15

ONTARIO
The Well Drillers Act
Department of Mines, Province of Ontario

15 No. 2245

RECEIVED
MAR 31 1952
GEOLOGICAL BRANCH
DEPARTMENT of MINES

Water Well Record

Carleton Gloucester Township, ~~Village, Town or City~~ Gloucester
[redacted] Town or City)
[redacted] ss R.R.#1 Billings Bridge
Date Completed 25 Sept 51 (day) (month) (year) Cost of Well (excluding pump)

Pipe and Casing Record

Casing diameter(s) 5"
Length(s) of casing(s) 10'
Type of screen
Length of screen
Distance from top of screen to ground level
Is well a gravel-wall type? No

Pumping Test

Date Sept 25 1951
Static level 10'
Pumping level 15'
Pumping rate 300 G.P.H.
Duration of test 30 MIN
Distance from cylinder or bowls to ground level

Water Record

Kind (fresh or mineral) Fresh
Quality (hard, soft, contains iron, sulphur, etc.) Hard
Appearance (clear, cloudy, coloured) Clear
For what purpose(s) is the water to be used? Household
How far is well from possible source of contamination? 50 Feet
What is the source of contamination? Privy
Enclose a copy of any mineral analysis that has been made of water

Depth(s) to Water Horizon(s)	Kind of Water	No. of Feet Water Rises
37'	Good	27'

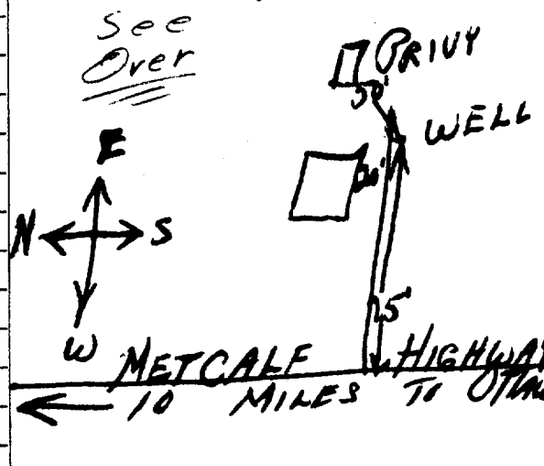
Well Log

Overburden and Bedrock Record	From	To
Clay	0 ft.	4 ft.
Limestone	4'	37'

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.

See Over



Situation: Is well on upland, in valley, or on hillside? Upland
Drilling Firm G. A. Wellman
Address 578 Westminster
Name of Driller G. A. Wellman Address 578 Westminster
Date Sept 25 1951 Licence Number 243
G. A. Wellman
Signature of Licensee

FORM 5

316/52 162

UTM | 18 Z | 4513840 E
| 5 R | 5017178510 N
Elev. | 4 R | 013016
Basin | 25 | | |

ONTARIO

The Well Drillers Act
Department of Mines, Province of Ontario

15 No. 2246

RECEIVED
DEC 6 1951
GEOLOGICAL BRANCH
DEPARTMENT OF MINES

Water Well Record

[redacted] Township, ~~Village, Town or City~~ Gloucester
Town or City)
ss. Leitrim
Date Completed 1.0. 2. 1.2.0 (day) (month) (year) Cost of Well (excluding pump) $3.27.00

Pipe and Casing Record

Casing diameter(s) 5"
Length(s) of casing(s) 0
Type of screen —
Length of screen —
Distance from top of screen to ground level —
Is well a gravel-wall type? No

Pumping Test

Date Nov 24
Static level 5'
Pumping level 20'
Pumping rate 8 GPM
Duration of test 30 Min
Distance from cylinder or bowls to ground level —

Water Record

Kind (fresh or mineral) Fresh
Quality (hard, soft, contains iron, sulphur, etc.) Hard
Appearance (clear, cloudy, coloured) clear
For what purpose(s) is the water to be used? Farm
How far is well from possible source of contamination? 100' Barn
What is the source of contamination? BARN
Enclose a copy of any mineral analysis that has been made of water

Depth(s) to Water Horizon(s)	Kind of Water	No. of Feet Water Rises
30'	good	~~5~~ 30'
60'	"	55"
99'	"	74'

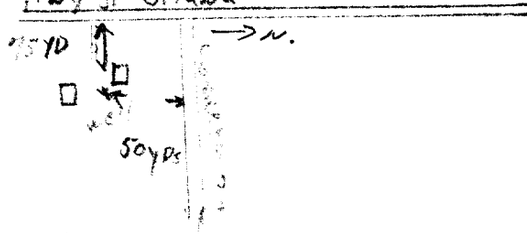
Well Log

Overburden and Bedrock Record	From	To
BOULDER TILL	0 ft.	5 ft.
SANDSTONE	5"	80'

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.

Hwy 31 Ottawa →



See OVER

Situation: Is well on upland, in valley, or on hillside? up land
Drilling Firm F.A. McGINN & SON
Address 185 JAMES ST.
Name of Driller M. Renaud Address
Date Nov Dec 1, 60 Licence Number

Signature of Licensee

FORM 5

R.F

31G/52

UTM Zone 18 Z | 4 5 4 1 0 6 10 E

L.S.R. 24 | 5 0 1 1 7 1 8 7 1 9 N

Elev. 4 R | 0 3 1 / 10

Basin 2 5

15 No 2248

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District CARLETON

Township, Village, Town or City GLOUCESTER

Con. 5 RF Lot 21

Date completed 25 (day) 4 (month) 1966 (year)

[redacted] dress P.O. BOX 212 R.R #6 OTTAWA, ONT.

Casing and Screen Record

Inside diameter of casing 6 1/4"

Total length of casing 21' 3"

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole 6"

Pumping Test

Static level 14'

Test-pumping rate 3 G.P.M.

Pumping level 90

Duration of test pumping 1 1/2 HRS

Water clear or cloudy at end of test CLEAR

Recommended pumping rate 3 G.P.M.

with pump setting of 90 feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Water Record: Kind of water (fresh, salty, sulphur)
TOP SOIL	0	1		
CLAY	1	6		Fresh
SAND STONE	6	98	80 - 97	

For what purpose(s) is the water to be used? INDUSTRY

Is well on upland, in valley, or on hillside? Upland

Drilling or Boring Firm MCLEAN WATER SUPPLY LTD.

Address 1532 RAVEN AVE OTTAWA, ONT.

Licence Number 2154

Name of Driller or Borer LOUIS BURROWS

Address [illegible]

Date APR. 26 - 1966

A. J. Schaf

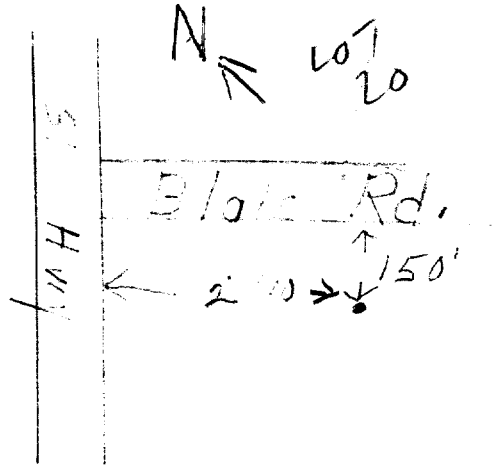
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



CSS.58

9 ##

UTM | 1 | 8 | Z | 4 | 5 | 3 | 9 | 6 | 10 | E
| 5 | R | 5 | 0 | 1 | 7 | 8 | 6 | 0 | N

Elev. | 4 | R | 0 | 3 | 0 | 0 | 1

Basin | 2 | 5 |

The Ontario Water Resources Commission Act

WATER WELL RECORD

WATER RESOURCES DIVISION
DEC 14 1966
ONTARIO WATER RESOURCES COMMISSION

15 No 2249

County or District Carl

Township, Village, Town or City Gloucester

Con. 5 1/2 F Lot 21

Date completed 19 (day) Nov. (month) 1966 (year)

[redacted]

Address RR #3 Metcalfe Ont

Casing and Screen Record

Inside diameter of casing 5"

Total length of casing 20'

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole 5"

Pumping Test

Static level 15

Test-pumping rate 5 G.P.M.

Pumping level 45

Duration of test pumping 1 hr

Water clear or cloudy at end of test cloudy

Recommended pumping rate 5 G.P.M.

with pump setting of 75' feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Water Record: Kind of water (fresh, salty, sulphur)
sand fill	0	4	83	fresh
sandstone	4	85		

For what purpose(s) is the water to be used?
old house

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm Capital Water Supply

Address 14 Ashford Dr Ottawa 6

Licence Number 2158

Name of Driller or Borer H Scott

Address

Date Nov 19, 1966

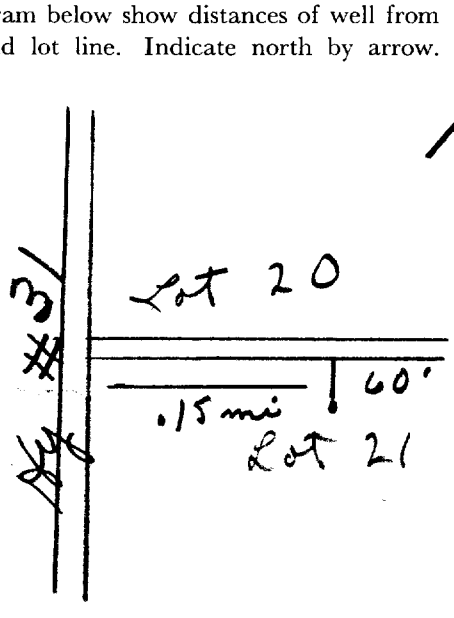
Walter Lavanagh
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



UTM 18 453890 RF Con V Lot 21
5042 5017640
Elev. 4 0308
Zone 25

CODED

Province of Ontario — 509925

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District Carleton — Township, Village, Town or City Gloucester

Con. RF 5 — Lot 2021 — Date completed 6 December 1968 (day / month / year)

[redacted] Address Long Sault, Ontario

Casing and Screen Record

Inside diameter of casing 6"

Total length of casing 15'

Type of screen nil

Length of screen n/a

Depth to top of screen n/a

Diameter of finished hole 6"

Pumping Test

Static level 2'

Test-pumping rate 10 G.P.M.

Pumping level 5'

Duration of test pumping 1 Hour

Water clear or cloudy at end of test cloudy

Recommended pumping rate 10 G.P.M.

with pump setting of 25' feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Water Record: Kind of water (fresh, salty, sulphur)
Closely packed Boulders	0'	13'		
Very Abrassive Sandstone	13'	63'	60'	fresh

For what purpose(s) is the water to be used?

Trailer Sales Depot

Is well on upland, in valley, or on hillside? Valley

Drilling or Boring Firm

Blair Phillips Drilling Co. Ltd.,

Address 1119 Belaise Road, Ottawa 5, Ontario.

Licence Number 2779

Name of Driller or Borer J. Moore

Address Kars, Ontario

Date 6 December 1968

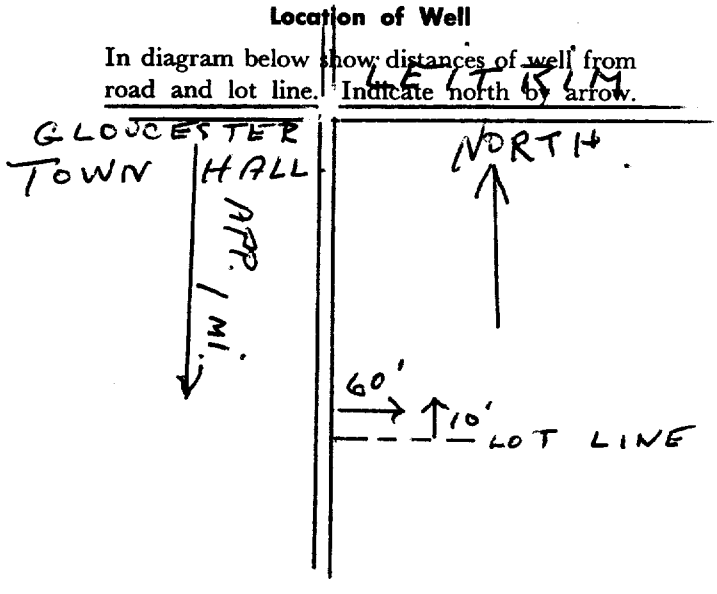
(Signature of Licensed Drilling or Boring Contractor)

Form 7

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

31G 5a

1517349

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

(11)

MUNICIP 15002 CON 05

COUNTY OR DISTRICT: Ottawa Co. [redacted]
TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Gloucester
CON., BLOCK, TRACT, SURVEY, ETC.: 5 R.F.
LOT: 021
#6 Ottawa Ont.
DATE COMPLETED: DD 09 MO 06 YR 80
17699 RC 4 ELEVATION 0305 RC 4 BASIN CODE 26

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Brown	sandy soil	stone		0	8
Brown	hard	granite rock.		8	27

(31) 0008602128 1 0027621 1273

(32)

(41) WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0027	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

(51) CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
06 6 1/4	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	188	0	0027
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

(61) PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER, ETC.)
10-13	14-17	
18-21	22-25	
26-29	30-33	

(71) PUMPING TEST

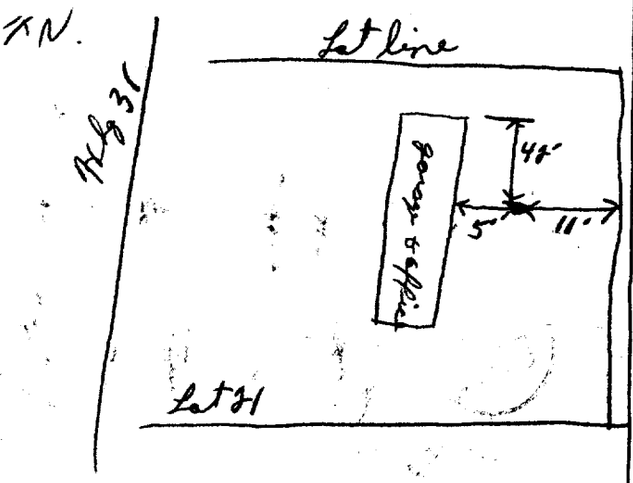
PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER
PUMPING RATE: 0015 GPM
DURATION OF PUMPING: 01 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
005 FEET	014 FEET		013 FEET	012 FEET	014 FEET	014 FEET

IF FLOWING, GIVE RATE: GPM
PUMP INTAKE SET AT: 27 FEET
WATER AT END OF TEST: 1 ☐ CLEAR 2 ☒ CLOUDY
RECOMMENDED PUMP TYPE: ☒ SHALLOW ☐ DEEP
RECOMMENDED PUMP SETTING: 023 FEET
RECOMMENDED PUMPING RATE: 0007 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL (84): 1 ☒ WATER SUPPLY; 2 ☐ OBSERVATION WELL; 3 ☐ TEST HOLE; 4 ☐ RECHARGE WELL; 5 ☐ ABANDONED, INSUFFICIENT SUPPLY; 6 ☐ ABANDONED, POOR QUALITY; 7 ☐ UNFINISHED

WATER USE (55-56) 05: 1 ☐ DOMESTIC; 2 ☐ STOCK; 3 ☐ IRRIGATION; 4 ☐ INDUSTRIAL; ☐ OTHER; 5 ☒ COMMERCIAL; 6 ☐ MUNICIPAL; 7 ☐ PUBLIC SUPPLY; 8 ☐ COOLING OR AIR CONDITIONING; 9 ☐ NOT USED

METHOD OF DRILLING (57) 1: 1 ☒ CABLE TOOL; 2 ☐ ROTARY (CONVENTIONAL); 3 ☐ ROTARY (REVERSE); 4 ☐ ROTARY (AIR); 5 ☐ AIR PERCUSSION; 6 ☐ BORING; 7 ☐ DIAMOND; 8 ☐ JETTING; 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Maurice Cyr Ltd. LICENCE NUMBER: 1517
ADDRESS: Casselman Ont.
NAME OF DRILLER OR BORER: LICENCE NUMBER:
SIGNATURE OF CONTRACTOR: Maurice Cyr SUBMISSION DATE: DAY MO YR

OFFICE USE ONLY

DATA SOURCE (58): 1 CONTRACTOR (59-62): 1517 DATE RECEIVED (63-68): 020980
DATE OF INSPECTION: INSPECTOR: Km
REMARKS:

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506-8-77

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

1517349

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11

MUNICIP | CON

COUNTY OR DISTRICT: Ottawa Carleton [redacted]
TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Gloucester
CON., BLOCK, TRACT, SURVEY, ETC: 5
LOT: 21
ADDRESS: R R #6 Ottawa Ont.
DATE COMPLETED: DAY 9 MO June YR 80

21

ZONE | EASTING | NORTHING | RC | ELEVATION | RC | BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Brown	sandy soil	stone		0	8
Brown	hard	granite rock.		8	22

31

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
17	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6 1/4	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE	.188	0	20
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER
PUMPING RATE: 15 GPM
DURATION OF PUMPING: 1 HOURS ___ MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING
5 FEET	14 FEET

WATER LEVELS DURING: 1 ☐ PUMPING 2 ☐ RECOVERY

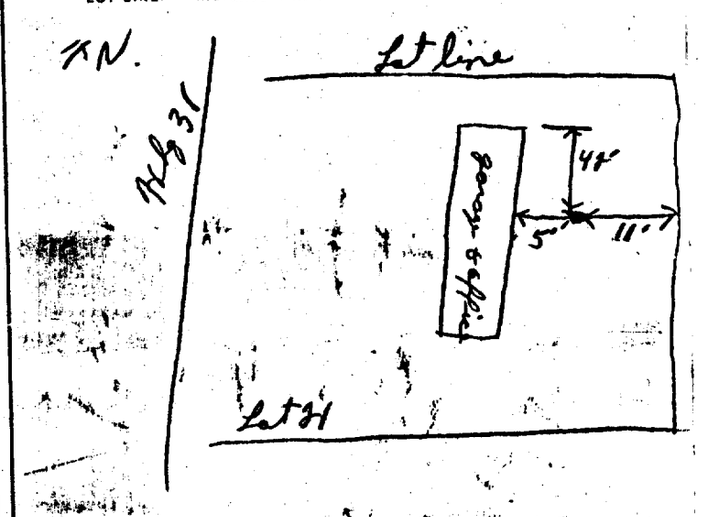
15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
12 FEET	12 FEET	14 FEET	14 FEET

IF POWING GIVE RATE ___ GPM
PUMP INTAKE SET AT: 27 FEET
WATER AT END OF TEST: 1 ☐ CLEAR 2 ☒ CLOUDY

RECOMMENDED PUMP TYPE: ☒ SHALLOW ☐ DEEP
RECOMMENDED PUMP SETTING: 23 FEET
RECOMMENDED PUMPING RATE: 7 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE

1 ☐ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☒ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING

1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Maurice Cayer Ltd. | LICENCE NUMBER: 1517
ADDRESS: Carp Ont.
NAME OF DRILLER OR BORER | LICENCE NUMBER
SIGNATURE OF CONTRACTOR: Maurice Cayer | SUBMISSION DATE: DAY ___ MO ___ YR ___

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR | 020980
DATE OF INSPECTION | INSPECTOR
REMARKS

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 1528323 MUNICIP. 15002 CON. R.F. LOT 05

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON. BLOCK, TRACT, SURVEY, ETC.	LOT
[redacted]	Gloucester	5	20

[redacted] Pineglen Cres. Nepean, Ontario K2G 0G9

DATE COMPLETED: DAY 14 MO 10 YR 94

RC. ELEVATION RC. BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Brown	Clay			0	4
Gray	Sand	Gravel, Boulders		4	12
Gray	Shale			12	123

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
30	2 SALTY
115	2 SALTY
	NOT TESTED

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6 1/4	2 GALVANIZED	.188	0	22
6	4 OPEN HOLE		22	123

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
20	0	Grouted Cement (3)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☒ PUMP 2 ☐ BAILER

PUMPING RATE: 4 GPM

DURATION OF PUMPING: 1 HOURS ____ MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY			
		15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
18 FEET	120 FEET	50 FEET	75 FEET	100 FEET	120 FEET

IF FLOWING, GIVE RATE: ____ GPM

PUMP INTAKE SET AT: ____ FEET

WATER AT END OF TEST: 1 ☐ CLEAR 2 ☒ CLOUDY

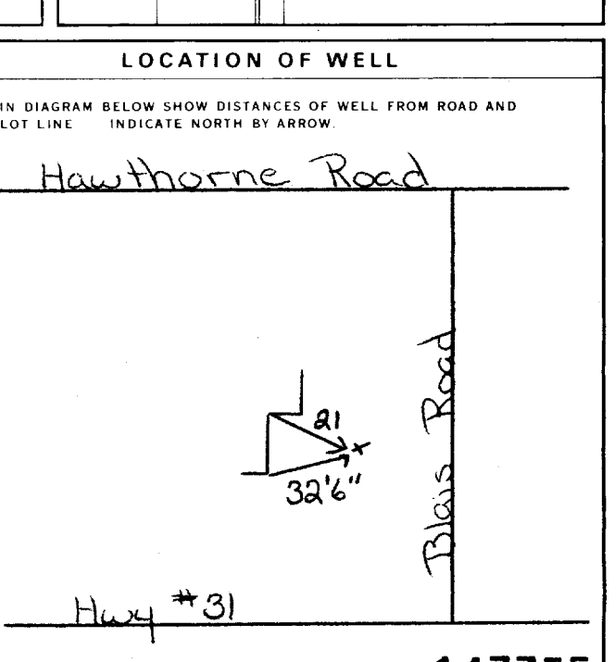
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP

RECOMMENDED PUMP SETTING: 115 FEET

RECOMMENDED PUMPING RATE: 4 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS: 147755

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED
☐ DEWATERING

WATER USE

1 ☒ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
☐ OTHER
9 ☐ NOT USED

METHOD OF CONSTRUCTION

1 ☐ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☒ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING
☐ DIGGING ☐ OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR: Capital Water Supply Ltd.
WELL CONTRACTOR'S LICENCE NUMBER: 1558
ADDRESS: P.O. Box 490 Stittsville, Ontario K2S 1A6
NAME OF WELL TECHNICIAN: S. Miller
WELL TECHNICIAN'S LICENCE NUMBER: T0097
SIGNATURE OF TECHNICIAN/CONTRACTOR
SUBMISSION DATE: DAY 17 MO 10 YR 94

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR 1558 | DATE RECEIVED DEC 07 1994
DATE OF INSPECTION | INSPECTOR
REMARKS

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506 (11/86) FORM 9

Ontario Ministry of the Environment

The Ontario Water Resources Act
WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11 (1-2) **1531693**

Municipality (10-14) 15002 Con. (15-22) CON (23-24) 05

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot (25-27)
[redacted]	Gloucester	5	6
	Address Greely Dr	Date completed (48-53) 25 day 10 month 00 year	

21 (1-2) UTM (10) (12-17) Northing (18-24) RC (25) Elevation (26) RC (30) Basin Code (31) ii iii iv (47)

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
	gravel			0	3
grey	Sandstone			3	220

31 (10-80)

32 (10-80)

41 WATER RECORD

Water found at - feet	Kind of water
10-13: 206	1 ☑ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas 6 ☐
15-18: 214	1 ☑ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas 6 ☐
20-23	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas 6 ☐
25-28	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas 6 ☐
30-33	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas 6 ☐ (60)

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
10-11: 6 1/4	1 ☑ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic (12)	188	0	13-16: 22
17-18: 8 3/4	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☑ Open hole 5 ☐ Plastic (19)		0	20-23: 20
24-25: 6	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☒ Open hole 5 ☐ Plastic (26)		20	27-30: 220

SCREEN

Sizes of opening (Slot No.) (31-33)	Diameter (34-38) inches	Length (39-40) feet
Material and type	**Depth at top of screen (41-44) feet**	(30)

61 PLUGGING & SEALING RECORD

☑ Annular space ☐ Abandonment

Depth set at - feet From	Depth set at - feet To	Material and type (Cement grout, bentonite, etc.)
10-13: 2	14-17: 22	cement grout
18-21	22-25	
26-29	30-33	(80)

71 PUMPING TEST

Pumping test method (10): 1 ☑ Pump 2 ☐ Bailer

Pumping rate (11-14): 10 GPM

Duration of pumping (15-16 Hours, 17-18 Mins): 1 Hours

Static level (19-21): 30 feet

Water level end of pumping (22-24): 120 feet

(25) Water levels during: 1 ☐ Pumping 2 ☑ Recovery

15 minutes (26-28)	30 minutes (29-31)	45 minutes (32-34)	60 minutes (35-37)
30 feet	30 feet	30 feet	30 feet

If flowing give rate (38-41): GPM

Pump intake set at: feet

Water at end of test (42): ☐ Clear ☑ Cloudy

Recommended pump type: ☐ Shallow ☑ Deep

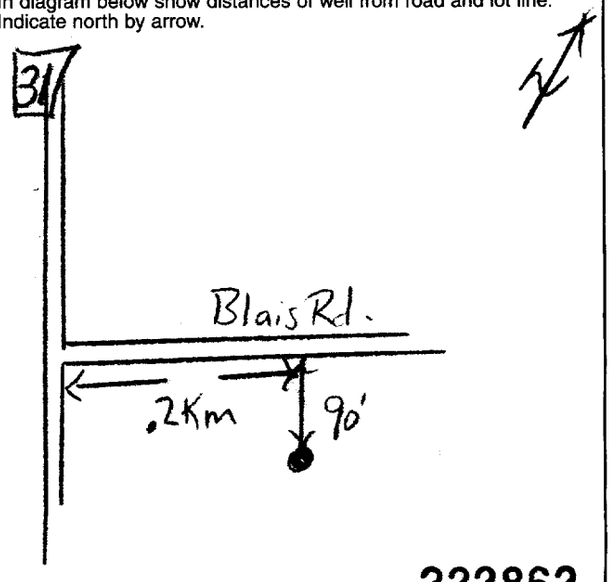
Recommended pump setting (43-45): 120 feet

Recommended pump rate (46-49): 10 GPM

(50-53)

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



222862

FINAL STATUS OF WELL (54)

1 ☑ Water supply 2 ☐ Observation well 3 ☐ Test hole 4 ☐ Recharge well 5 ☐ Abandoned, insufficient supply 6 ☐ Abandoned, poor quality 7 ☐ Abandoned (Other) 8 ☐ Dewatering 9 ☐ Unfinished 10 ☐ Replacement well

WATER USE (55-56)

1 ☑ Domestic 2 ☐ Stock 3 ☐ Irrigation 4 ☐ Industrial 5 ☐ Commercial 6 ☐ Municipal 7 ☐ Public supply 8 ☐ Cooling & air conditioning 9 ☐ Not use 10 ☐ Other

METHOD OF CONSTRUCTION (57)

1 ☐ Cable tool 2 ☐ Rotary (conventional) 3 ☐ Rotary (reverse) 4 ☐ Rotary (air) 5 ☑ Air percussion 6 ☐ Boring 7 ☐ Diamond 8 ☐ Jetting 9 ☐ Driving 10 ☐ Digging 11 ☐ Other

Name of Well Contractor	Well Contractor's Licence No.
Air-Rock Drilling Co Ltd	1119
Address: RR # 2 Jasper Ont	
Name of Well Technician: Shannon Purcell	Well Technician's Licence No.: T2122
Signature of Technician/Contractor	Submission date: 02 day 11 mo 00

2 - MINISTRY OF THE ENVIRONMENT COPY

MINISTRY USE ONLY

Data source (58)	Contractor (59-62)	Date received (63-68) (80)
	1119	JAN 03 2001
Date of inspection	Inspector	
Remarks		

CSS.ES1

0506 (11/98) Front Form 9

Ontario Ministry of the Environment

The Ontario Water Resources Act
WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11 1533566 Municipality 15002 Con. RF 05

County or District: Ottawa Carleton
Township/Borough/City/Town/Village: Gloucester
Con block tract survey, etc.: 5
Lot: 21
Address: Gloucester, Ont
Date completed: 07 day 02 month 03 year

21 UTM Northing RC Elevation RC Basin Code ii iii iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
	Sand			0	7
grey	Sandstone			7	98
"	Limestone			98	127
"	Sandstone			127	220

31
32

41 WATER RECORD

Water found at - feet	Kind of water
216	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☑ Minerals 5 ☐ Gas
75	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
6	1 ☑ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	188	0	22
8 3/4	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☑ Open hole 5 ☐ Plastic		0	20
6	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☑ Open hole 5 ☐ Plastic		20	220

SCREEN

Sizes of opening (Slot No.)	Diameter inches	Length feet

Material and type: | Depth at top of screen feet:

61 PLUGGING & SEALING RECORD

☑ Annular space ☐ Abandonment

Depth set at - feet From	Depth set at - feet To	Material and type (Cement grout, bentonite, etc.)
2	22	Cement grout

71 PUMPING TEST

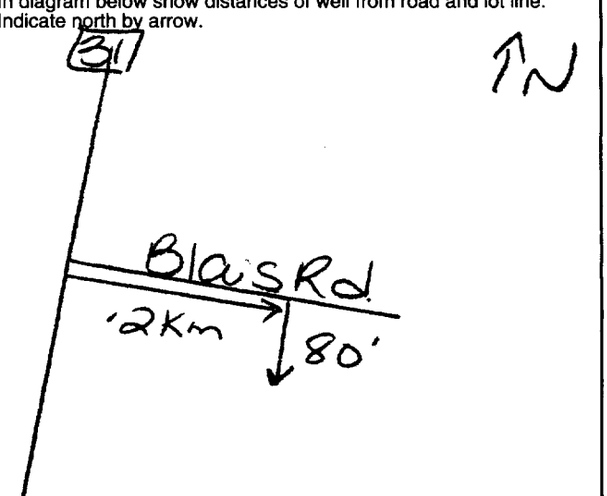
Pumping test method: 1 ☑ Pump 2 ☐ Bailer
Pumping rate: 9 GPM
Duration of pumping: 1 Hours Mins

Static level	Water level end of pumping	Water levels during: 1 ☐ Pumping 2 ☐ Recovery	15 minutes	30 minutes	45 minutes	60 minutes
16 feet	120 feet		16 feet	16 feet	16 feet	16 feet

If flowing give rate: GPM
Pump intake set at: feet
Water at end of test: ☐ Clear ☑ Cloudy
Recommended pump type: ☐ Shallow ☑ Deep
Recommended pump setting: 120 feet
Recommended pump rate: 9 GPM

LOCATION OF WELL

In diagram below show distances of well from road and lot line.
Indicate north by arrow.



248869

FINAL STATUS OF WELL

1 ☑ Water supply 2 ☐ Observation well 3 ☐ Test hole 4 ☐ Recharge well 5 ☐ Abandoned, insufficient supply 6 ☐ Abandoned, poor quality 7 ☐ Abandoned (Other) 8 ☐ Dewatering 9 ☐ Unfinished 10 ☐ Replacement well

WATER USE

1 ☑ Domestic 2 ☐ Stock 3 ☐ Irrigation 4 ☐ Industrial 5 ☐ Commercial 6 ☐ Municipal 7 ☐ Public supply 8 ☐ Cooling & air conditioning 9 ☐ Not use 10 ☐ Other

METHOD OF CONSTRUCTION

1 ☐ Cable tool 2 ☐ Rotary (conventional) 3 ☐ Rotary (reverse) 4 ☐ Rotary (air) 5 ☑ Air percussion 6 ☐ Boring 7 ☐ Diamond 8 ☐ Jetting 9 ☐ Driving 10 ☐ Digging 11 ☐ Other

Name of Well Contractor: A. Rock Dr. Ltd. | Well Contractor's Licence No.: 1119
Address: RR#1 Richmond, Ont
Name of Well Technician: Shannon Purcell | Well Technician's Licence No.: T2122
Signature of Technician/Contractor: | Submission date: 28 day 02 mo 03 yr

MINISTRY USE ONLY

Data source | Contractor: 1119 | Date received: MAR 31 2003
Date of inspection | Inspector
Remarks: CSS.ES3

2 - MINISTRY OF THE ENVIRONMENT COPY

Ontario **Ministry of the Environment**

The Ontario Water Resources Act
WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11 **1533567** Municipality 15002 Con. RF 05

County or District	Township/Borough/City/Town/Village	Con	block	tract	survey, etc.	Lot
Ottawa Carleton	Gloucester	5				21

[redacted]

Address: Gloucester, Ont

Date completed: 07 day 02 month 03 year

21 UTM Northing RC Elevation RC Basin Code ii iii iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
	WELL ABANDONMENT				

31

32

41 WATER RECORD

Water found at - feet	Kind of water
10-13	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas (14)
15-18	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (19)
20-23	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (24)
25-28	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (29)
30-33	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (34) (60)

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
10-11	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic (12)			13-16
17-18	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic (19)			20-23
24-25	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic (26)			27-30

SCREEN

Sizes of opening (Slot No.) (31-33)	Diameter inches (34-38)	Length feet (39-40)
Material and type	Depth at top of screen feet (41-44)	(30)

61 PLUGGING & SEALING RECORD

☐ Annular space ☑ Abandonment

Depth set at - feet From	Depth set at - feet To	Material and type (Cement grout, bentonite, etc.)
0 (10-13)	75 (14-17)	hole plug
18-21	22-25	
26-29	30-33 (80)	

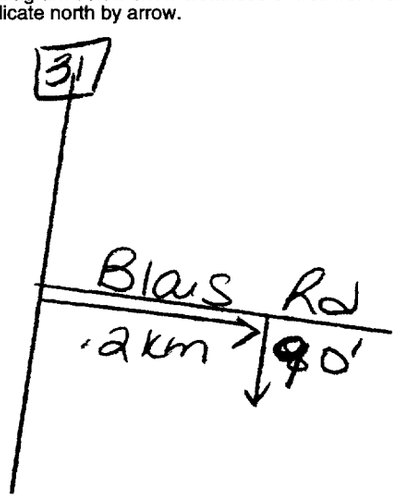
71 PUMPING TEST

Pumping test method (10) 1 ☐ Pump 2 ☐ Bailer	Pumping rate (11-14) GPM	Duration of pumping (15-16) Hours (17-18) Mins
Static level (19-21) feet	Water level end of pumping (22-24) feet	Water levels during (25) 1 ☐ Pumping 2 ☐ Recovery
15 minutes (26-28) feet	30 minutes (29-31) feet	45 minutes (32-34) feet / 60 minutes (35-37) feet
If flowing give rate (38-41) GPM	Pump intake set at feet	Water at end of test (42) ☐ Clear ☐ Cloudy
Recommended pump type ☐ Shallow ☐ Deep	Recommended pump setting (43-45) feet	Recommended pump rate (46-49) GPM

(50-53)

LOCATION OF WELL

In diagram below show distances of well from road and lot line.
Indicate north by arrow.



248870

FINAL STATUS OF WELL (54)

1 ☐ Water supply
2 ☐ Observation well
3 ☐ Test hole
4 ☐ Recharge well
☑ Abandoned, insufficient supply
6 ☐ Abandoned, poor quality
7 ☐ Abandoned (Other)
8 ☐ Dewatering
9 ☐ Unfinished
10 ☐ Replacement well

WATER USE (55-56)

1 ☐ Domestic
2 ☐ Stock
3 ☐ Irrigation
4 ☐ Industrial
5 ☐ Commercial
6 ☐ Municipal
7 ☐ Public supply
8 ☐ Cooling & air conditioning
☑ Not use
10 ☐ Other

METHOD OF CONSTRUCTION (57)

1 ☐ Cable tool
2 ☐ Rotary (conventional)
3 ☐ Rotary (reverse)
4 ☐ Rotary (air)
5 ☐ Air percussion
6 ☐ Boring
7 ☐ Diamond
8 ☐ Jetting
9 ☐ Driving
10 ☐ Digging
11 ☐ Other

Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Ltd	1119
Address: RR#1 Richmond, Ont	
Name of Well Technician: Ken DeSaulniers	Well Technician's Licence No.: T4
Signature of Technician/Contractor	Submission date: 28 day 02 mo 03 yr

MINISTRY USE ONLY

Data source (58)	Contractor (59-62)	Date received (63-68) (80)
	1119	MAR 31 2003
Date of inspection	Inspector	
Remarks: CSS.ES3		

0506 (07/00) Front Form 9

2 - MINISTRY OF THE ENVIRONMENT COPY

Ontario Ministry of the Environment

Well Tag No. *(Place Sticker and/or Print Below)* A051569 A 051569

Well Record

Regulation 903 Ontario Water Resources Act

Page _____ of _____

Well Owner's Information

First Name	Last Name	E-mail Address	Well Constructed by Well Owner
Airport Golfland			☐

Mailing Address (Street Number/Name, RR)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
6357 Emerald Links	Greely	Ontario	K4P 1M4	613 850 5468

Part A Construction and/or Major Alteration of a Well

Address of Well Location (Street Number/Name, RR)	Township	Lot	Concession
Hwy 31	Gloucester	20	5

County/District/Municipality	City/Town/Village	Province	Postal Code
Ottawa Carleton	Gloucester	Ontario	

UTM Coordinates	Zone	Easting	Northing	GPS Unit Make	Model	Mode of Operation
NAD 83	18	453794	5018088		Garmin	☐ Undifferentiated ☑ Averaged ☐ Differentiated, specify

Overburden and Bedrock Materials *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (Metres) From	Depth (Metres) To
Brown	Clay	Stones	Packed	0	3.35
Grey	Limestone		Broken	3.35	4.57
Grey	Limestone		Medium Hard	4.57	42.66
Grey	Limestone	Sandstone Layers	Hard	42.66	52.72

Annular Space/Abandonment Sealing Record

Depth Set at (Metres) From	To	Type of Sealant Used (Material and Type)	Volume Placed (Cubic Metres)
6.40	0	Grouted Bentonite Slurry	.132m³

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☒ Rotary (Air) ☐ Digging
☐ Air percussion ☐ Boring
☐ Other, *specify* _____

Water Use

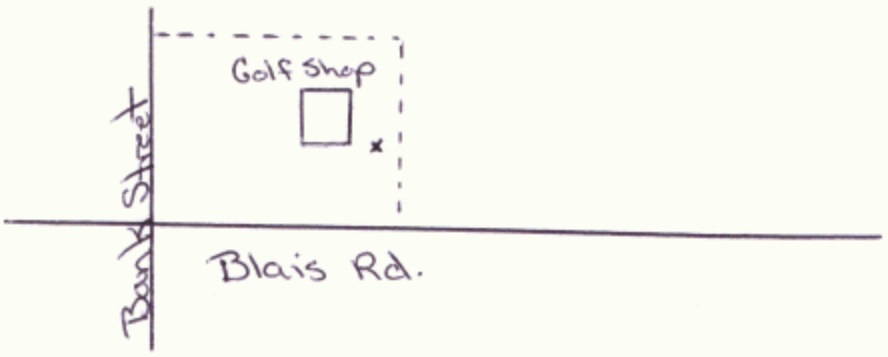
☐ Public ☐ Commercial ☐ Not used
☒ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify* _____

Status of Well

☒ Water Supply ☐ Dewatering Well ☐ Observation and/or Monitoring Hole
☐ Replacement Well ☐ Abandoned, Insufficient Supply ☐ Alteration (Construction)
☐ Test Hole ☐ Abandoned, Poor Water Quality ☐ Other, *specify* _____
☐ Recharge Well ☐ Abandoned, other, *specify* _____

Location of Well

Please provide a map below showing:
- all property boundaries, and measurements sufficient to locate the well in relation to fixed points,
- an arrow indicating the North direction
- detailed drawings can be provided as attachments no larger than legal size (8.5" by 14")
- vidigital pictures of inside of well can also be provided



Date Well Completed (yyyy/mm/dd)	Was the well owner's information package delivered?	Date the Well Record and Package Delivered to Well Owner (yyyy/mm/dd)
2008/07/14	☒ Yes ☐ No	2008/07/15

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Capital Water Supply Ltd.	1558

Business Address (Street No./Name, number, RR)	Municipality
Box 490	Stittsville

Province	Postal Code	Business E-mail Address
Ontario	K2S 1A6	office@capitalwater.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
613 836 1766	Miller, Stephen

Well Technician's Licence No.	Signature of Technician	Date Submitted (yyyy/mm/dd)
0097		2008/07/16

Results of Well Yield Testing

Check box if after test of well yield, water was:
☒ Clear and sand free
☐ Cannot develop to sand-free state

If pumping discontinued, give reason:

Pumping test method: Submersible

Pump intake set at (Metres): 45.71

Pumping rate (Litres/min): 54.6

Duration of pumping: 3 hrs + _____ min

Final water level end of pumping (Metres): 21.37

Recommended pump type: ☐ Shallow ☒ Deep

Recommended pump depth: 30.47 Metres

Recommended pump rate (Litres/min): 45.5

If flowing give rate (Litres/min):

	Draw Down Time (Min)	Draw Down Water Level (Metres)	Recovery Time (Min)	Recovery Water Level (Metres)
Static Level		4.75	Static Level	
1		6.42	1	18.19
2		8.55	2	17.26
3		9.96	3	15.67
4		11.18	4	14.50
5		12.29	5	13.32
10		16.10	10	9.44
15		18.20	15	7.38
20		19.51	20	6.24
25		20.36	25	5.61
30		20.94	30	5.18
40		21.64	40	4.75
50		22.01	50	
60		22.14	60	

Water Details

Water found at Depth	Kind of Water
51.50 Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals — Not Tested
Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals

Casing Used

☐ Galvanized
☒ Steel
☐ Fibreglass
☐ Plastic
☐ Concrete

Screen Used

☐ Galvanized
☐ Steel
☐ Fibreglass
☐ Plastic
☐ Concrete

No Casing and Screen Used

☐ Open Hole

Disinfected? ☒ Yes ☐ No

Casing and Well Details

Diameter of the Hole (Centimetres): 15.39

Depth of the Hole (Metres): 52.72

Wall Thickness (Metres): .48

Inside Diameter of the Casing (Metres): 15.86

Depth of the Casing (Metres): +.45 to 6.40

Ministry Use Only

Audit No.	Well Contractor No.
z 77392	
Date Received (yyyy/mm/dd) OCT 14 2008	Date of Inspection (yyyy/mm/dd)
Remarks	

0506E (11/2006)

Ministry's Copy

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7205441

Ontario Ministry of the Environment

Measurements recorded in: ☐ Metric ☑ Imperial

Well Tag No. (Place Sticker and/or Print Below) **A111266**

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
4792 Bank	OTTAWA		
County/District/Municipality	**City/Town/Village**	**Province**	**Postal Code**
OTTAWA	Ottawa	Ontario	
UTM Coordinates Zone / Easting / Northing	**Municipal Plan and Sublot Number**	**Other**	
NAD 83 18 453525 5018442			

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0	14	Holeplug	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, *specify* _____

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify* _____

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
2"	Plastic		0	14'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☑ Abandoned, other, *specify* Construction
☐ Other, *specify*

Water Details

Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, *specify*

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify* _____

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping _____ hrs + _____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

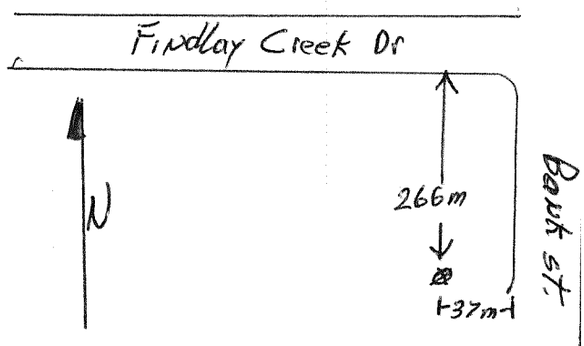
Well production *(l/min / GPM)*

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Marathon Drilling Co Ltd	6894
Business Address (Street Number/Name)	**Municipality**
6847 Hiram Dr.	Ottawa
Province	**Postal Code**	**Business E-mail Address**
ON	K4P 1A2	twright@marathondrilling.com
Bus. Telephone No. (inc. area code)	**Name of Well Technician (Last Name, First Name)**
6138220571	Wright Terry
Well Technician's Licence No.	**Signature of Technician and/or Contractor**	**Date Submitted**
0715		20130627

Well owner's information package delivered ☐ Yes ☐ No

Date Package Delivered Y Y Y Y M M D D

Date Work Completed Y Y Y Y M M D D

Ministry Use Only

Audit No. Z 82651

Received JUL 25 2013

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Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☒ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* A149011 **Tag#: A149011**

Well Record

Regulation 903 Ontario Water Resources Act

Page _____ of _____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
Airport Golf Land			

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
6357 Emerald Links Drive	Greely	Ontario	K4P1M4	6138505468

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
4795 Bank Street	Gloucester		

County/District/Municipality	City/Town/Village	Province	Postal Code
Ottawa Carleton	Gloucester	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	453909	5018388		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Soil	Stones	Packed	0	3.65
Gray	Till		Hard Packed	3.65	9.75
Gray	Limestone	Brown Layers	Medium	9.75	68.57

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used *(Material and Type)*	Volume Placed *(m³/ft³)*
11.58	0	Grouted Cement & Bentonite	.42m3

Method of Construction

☐ Cable Tool ☐ Diamond
☒ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☒ Air percussion
☐ Other, *specify* _____

Well Use

☐ Public ☐ Commercial ☐ Not used
☒ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify* _____

Construction Record - Casing

Inside Diameter *(cm/in)*	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness *(cm/in)*	Depth (m/ft) From	Depth (m/ft) To
27.13	Open		0	11.58
15.86	Steel	.48	+1.60	11.58

Construction Record - Screen

Outside Diameter *(cm/in)*	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

☒ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify* _____
☐ Other, *specify* _____

Water Details

Water found at Depth	Kind of Water	
20.11 (m/ft) ☐ Gas	☐ Fresh ☒ Untested	☐ Other, *specify*
65.83 (m/ft) ☐ Gas	☐ Fresh ☒ Untested	☐ Other, *specify*
(m/ft) ☐ Gas	☐ Fresh ☐ Untested	☐ Other, *specify*

Hole Diameter

Depth (m/ft) From	To	Diameter *(cm/in)*
0	11.58	15.86
11.58	68.57	15.55

Results of Well Yield Testing

After test of well yield, water was:
☒ Clear and sand free
☐ Other, *specify* _____

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*: 60.95

Pumping rate *(l/min / GPM)*: 36.4

Duration of pumping: 1 hrs + _____ min

Final water level end of pumping *(m/ft)*: 45.

If flowing give rate *(l/min / GPM)*:

Recommended pump depth *(m/ft)*: 60.95

Recommended pump rate *(l/min / GPM)*: 36.4

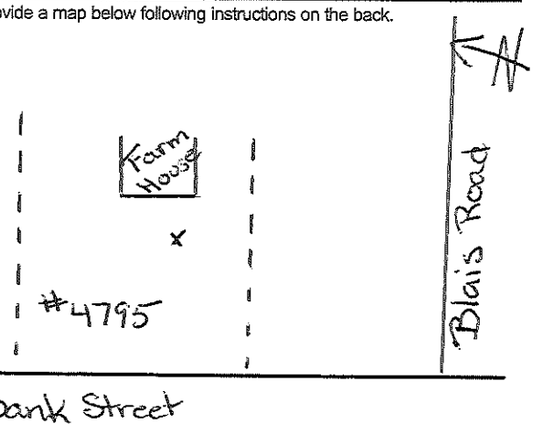
Well production *(l/min / GPM)*:

Disinfected? ☒ Yes ☐ No

Draw Down Time *(min)*	Water Level *(m/ft)*	Recovery Time *(min)*	Water Level *(m/ft)*
Static Level	6.21		
1	7.71	1	42.55
2	8.88	2	40.77
3	10.42	3	39.66
4	11.69	4	37.82
5	12.90	5	36.20
10	17.07	10	30.30
15	18.65	15	25.95
20	20.33	20	21.60
25	24.90	25	19.10
30	28.60	30	18.40
40	34.99	40	17.60
50	40.10	50	16.06
60	45.	60	13.06

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Capital Water Supply Ltd.	1558

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
P.O. Box 490	Stittsville	Ontario	K2S1A6	office capitalwater.ca

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
6138361766	S Miller, Stephen	0097		2016 12 09

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2016 12 08	2016 12 07

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Audit No. Z226858

Received MAY 25 2017

0506E (2014/11)

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Hydraulic Capacity and Modeling Analysis Leitrim Community Development

Technical Memorandum

DRAFT

Prepared for:
David Schaeffer Engineering Ltd.
120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

Prepared by:
GeoAdvice Engineering Inc.
Unit 203, 2502 St. John's Street
Port Moody, BC V3H 2B4

Submission Date: June 18, 2026

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

DRAFT

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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

DRAFT

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BC Permit to Practice: 1000623
ON CofA Number: 100118603

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.

DRAFT

BC Permit to Practice: 1000623
ON CofA Number: 100118603

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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:

Leon Wang, E.I.T.
Hydraulic Modeler / Project Engineer

Approved by:

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

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ON CofA Number: 100118603

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		Max Day		Peak Hour	
			m^3/d	L/min	m^3/d	L/min	m^3/d	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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Appendix C Boundary Conditions

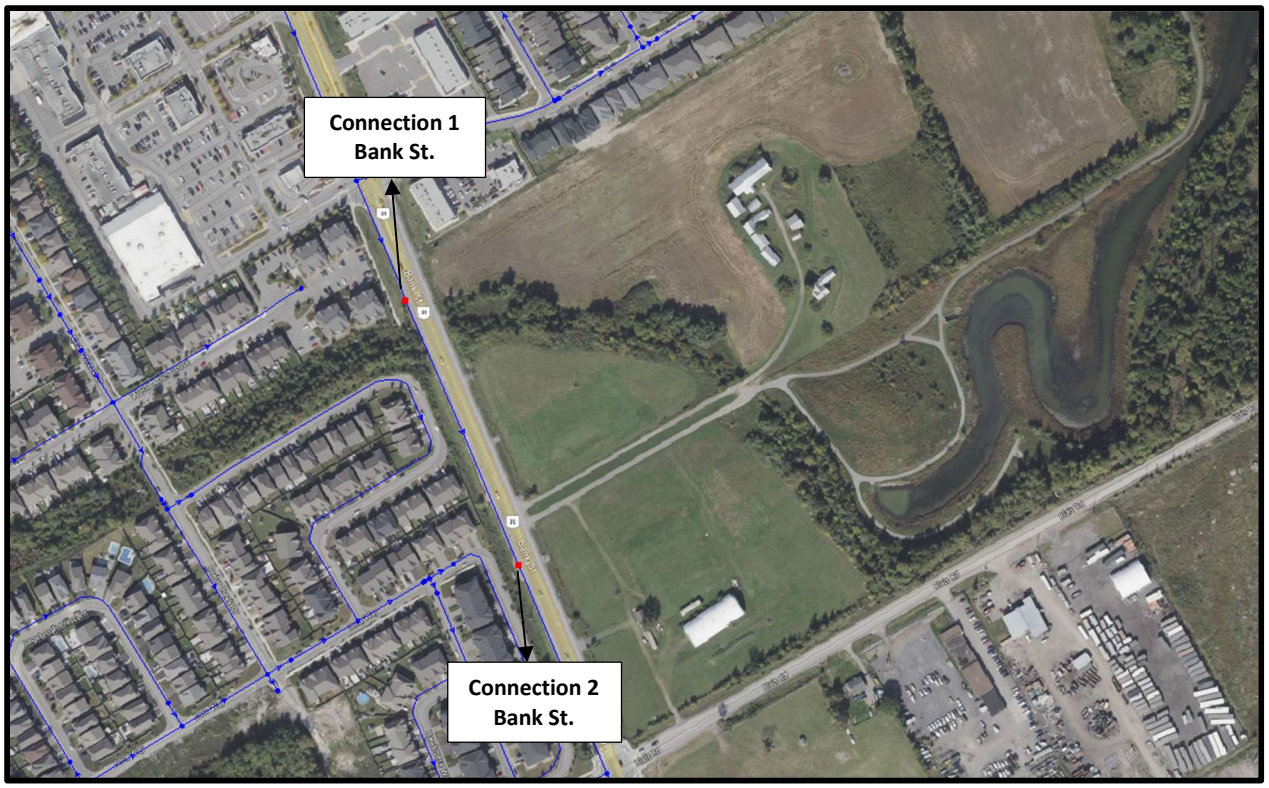
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Boundary Conditions
4795 Bank Street– 2026

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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Appendix E MDD+FF Model Results

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Appendix C

Sanitary Supporting Material and Modelling

David Schaeffer Engineering Ltd.
120 Iber Road, Suite 103
Stittsville, ON K2S 1E9
613-836-0856
dsel.ca

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.

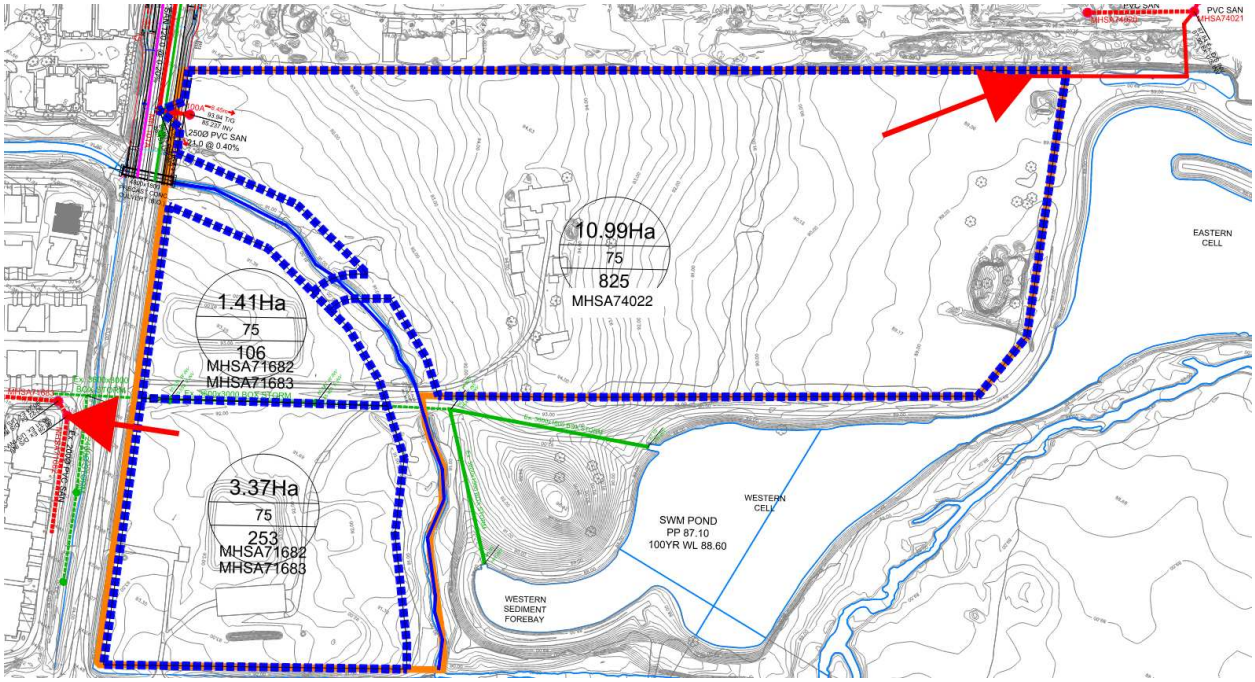


***Figure 2** – Proposed Split Drainage*

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	To	Residential Units			Area	Population	ICI Area	Population	Peaking	Peak Flow	Area	Pk. Fact.	Pk. Flow	Incr. Area	Cum. Area	Flow	FLOW	Capacity	Pipe Size	Length	Slope	Velocity(f)	Avail. Cap.
	MH	MH	Sing/Semi	Towns	Mixed Use	(Ha.)		(Ha.)		Factor	(l/s)			(l/s)	(Ha.)	(Ha.)	(l/s)	(l/s)	(l/s)	(mm)	(M)	(%)	M/sec	(%)
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~~	~~335B~~	~~333B~~	~~16~~	~~17~~		~~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~~	~~93.77~~
	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

2024-07-024:00 PM

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 FLOW	PROPOSED SEWER DESIGN						
				UNIT TYPES				AREA	POPULATION		PEAK FACTOR	PEAK FLOW	AREA (Ha)						PEAK FLOW	AREA (Ha)		FLOW		CAPACITY	LENGTH	DIA	SLOPE	VELOCITY (full)	AVAILABLE CAPACITY	
													INSTITUTIONAL		COMMERCIAL		INDUSTRIAL												
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%
[illegible]	[illegible]	[illegible]	[illegible]			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%
[illegible]	[illegible]	[illegible]	[illegible]			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: 34249.5.7.1
Date: 30/06/2016
Sheet No: 1 of 1

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
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	AVAILABLE CAPACITY	
													INSTITUTIONAL		COMMERCIAL		INDUSTRIAL												
STREET	AREA ID	FROM MH	TO MH	SF	SD	TH	APT	(Ha)	IND	CUM	FACTOR	FLOW (L/s)	IND	CUM	IND	CUM	IND	CUM	FLOW (L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(full) (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: 34249.5.7.1 | Date: 21/11/2014 | Sheet No: 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	UNIT TYPES				POPULATION				AREA (Ha)						ICI		AREA (Ha)		FLOW				CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
STREET	AREA ID	FROM MH	TO MH	w/ Units (Ha)	SF	TH/SD	1 Bed APT	2 Bed APT	AREA w/o Units (Ha)	IND	CUM	RES PEAK FACTOR	PEAK FLOW (L/s)	INSTITUTIONAL IND	INSTITUTIONAL CUM	COMMERCIAL IND	COMMERCIAL CUM	INDUSTRIAL IND	INDUSTRIAL CUM	PEAK FACTOR	PEAK FLOW (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	INST	28,000	L/Ha/day	
TH/SD	2.4	p/p/u	COM	28,000	L/Ha/day	
1 Bed	1.4	p/p/u	IND	35,000	L/Ha/day	MOE Chart
2 Bed	2.1	p/p/u		17000	L/Ha/day	
Other	60	p/p/Ha				

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

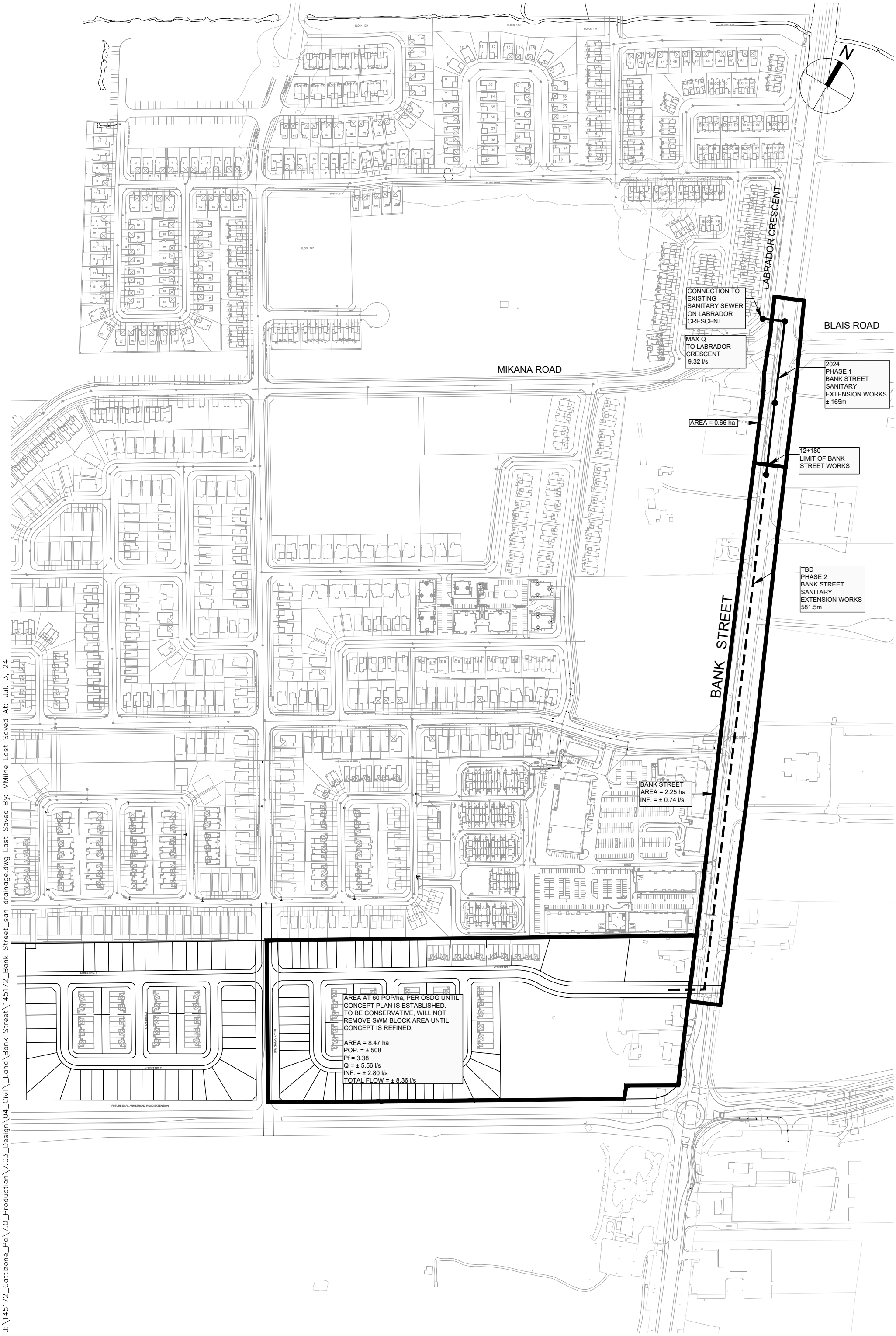
Designed: AS/RM

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

CATTAZONE-BANK STREET
SANITARY SEWER

Drawing Title

SANITARY
DRAINAGE AREA PLAN

Sheet No.

FIGURE 1
JULY 2, 2024

ARCADIS

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
$HL = K_L * V^2/ 2g$

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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
$HL = K_L * V^2/ 2g$

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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

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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

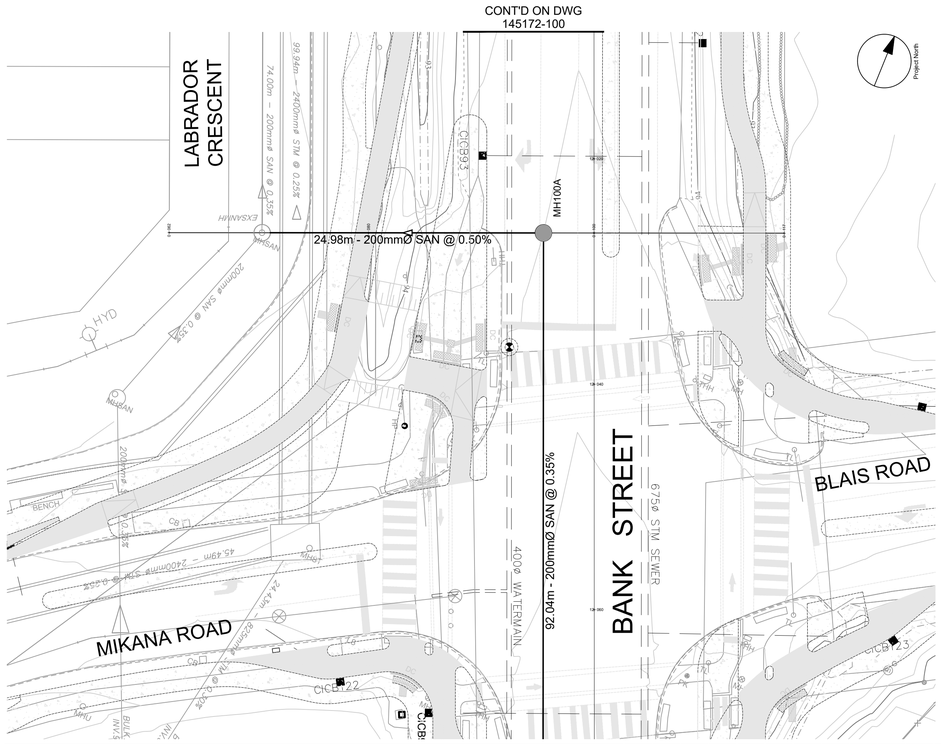
FRICTION LOSS	FROM MH	TO MH	PIPE ID
Labrador Crescent	**792A**	**793A**	
INVERT ELEVATION (m)	90.638	90.891	
OBVERT ELEVATION (m)	90.838	91.091	
DIAMETER (mm)			200
LENGTH (m)			73.40
FLOW (l/s)			12.59
HGL (m) ***	**90.736**	**90.844**	**0.108**
MANHOLE COEF K= 0.02	LOSS (m)	0.000	
TOTAL HGL (m)		**91.007**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

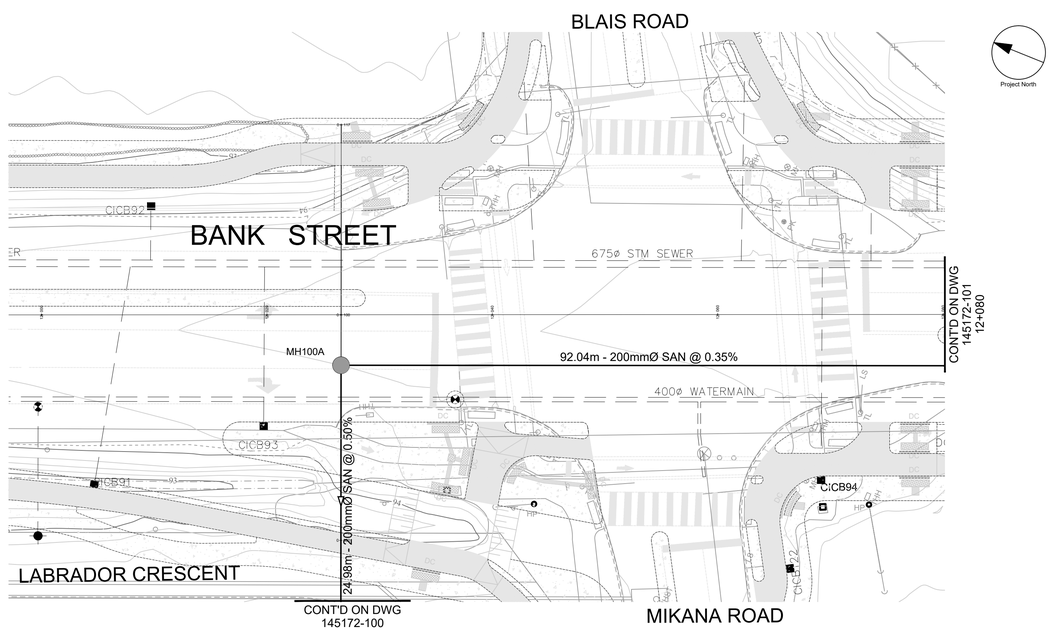
MANNING FORMULA - FLOWING FULL

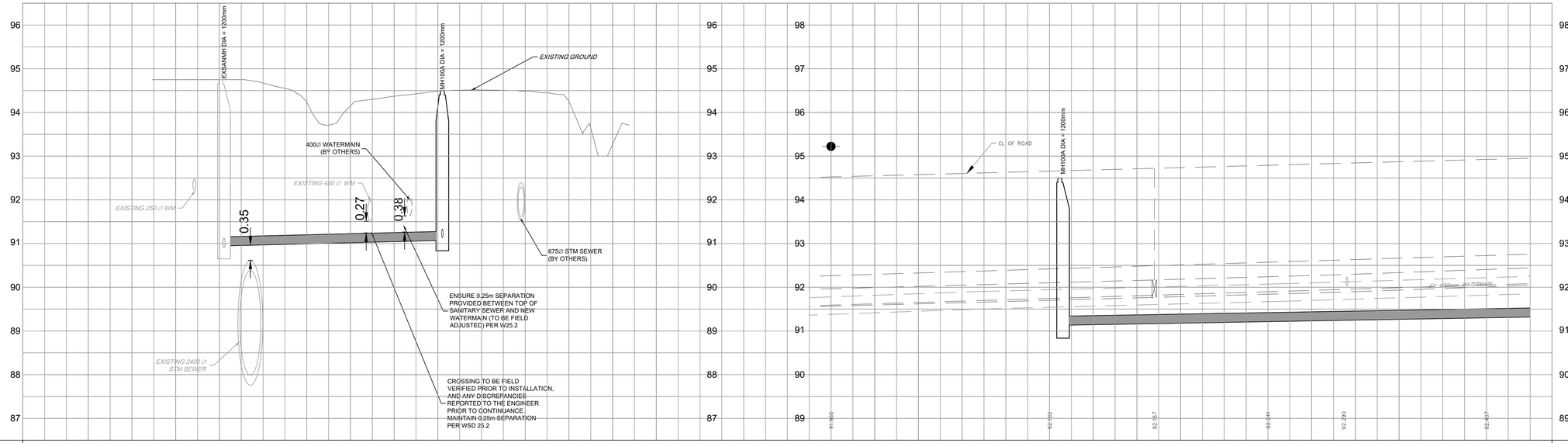
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.2	0.03	0.63	0.345	0.05	0.61	19.25

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

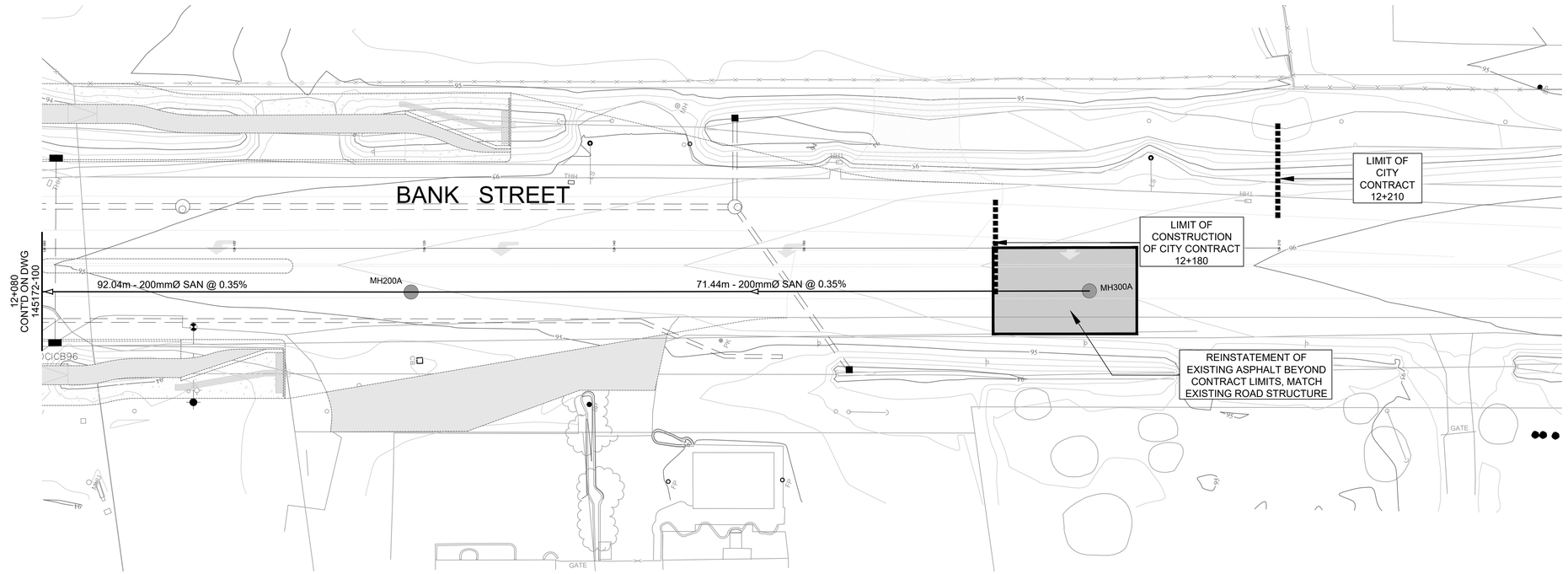
Head loss in manhole simplified method p. 71 (MWDM)
fig1.7.1, Kratio = 0.75 for 45 bends K_L=0.02
Velocity = Flow / Area = 0.40 m/s
HL = K_L * V^2/ 2g

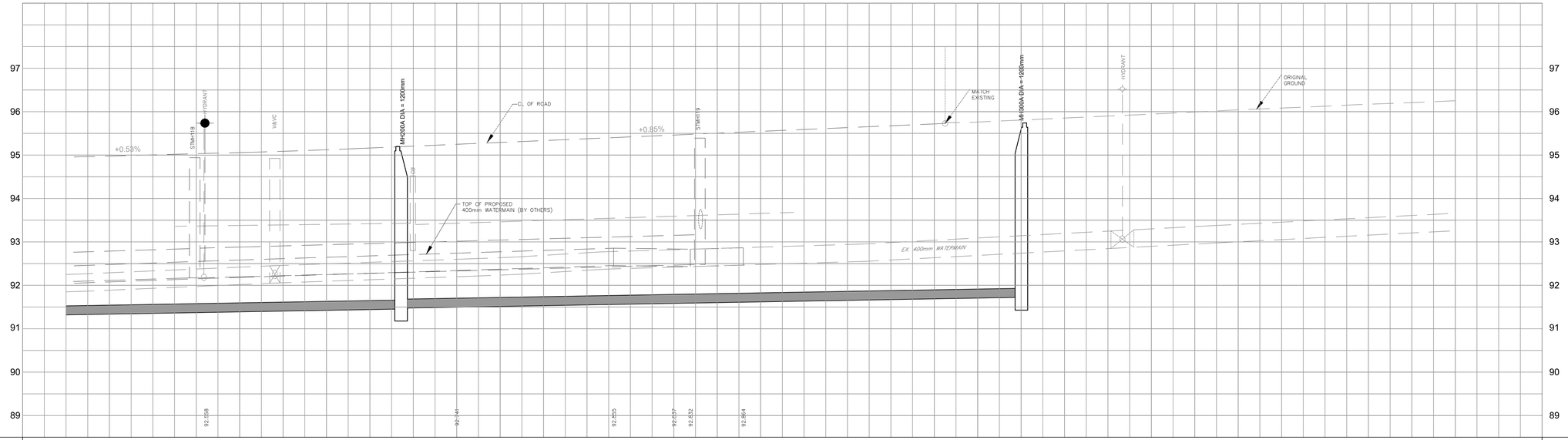

CONT'D ON DWG
145172-100
LABRADOR
CRESCENT
74.00m - 200mmø SAN @ 0.25%
99.94m - 240mmø STM @ 0.25%
EXSANMH
CICB93
MH100A
24.98m - 200mmØ SAN @ 0.50%
HYD
200mmø SAN @ 0.25%
BENCH
45.49m - 240mmø STM @ 0.25%
24.47m - 825mmø STM @ 0.25%
MIKANA ROAD
CICB122
CICB
BANK STREET
675ø STM SEWER
400ø WATERMAIN
92.04m - 200mmØ SAN @ 0.35%
BLAIS ROAD
CICB123
Project North


BLAIS ROAD
CICB92
BANK STREET
675ø STM SEWER
CONT'D ON DWG
145172-101
12+080
MH100A
92.04m - 200mmØ SAN @ 0.35%
400ø WATERMAIN
CICB93
CICB91
CICB94
CICB122
24.98m - 200mmØ SAN @ 0.50%
LABRADOR CRESCENT
CONT'D ON DWG
145172-100
MIKANA ROAD
Project North


EXSANMH DIA = 1200mm
MH100A DIA = 1200mm
EXISTING GROUND
400Ø WATERMAIN
(BY OTHERS)
EXISTING 400 Ø WM
EXISTING 250 Ø WM
0.35
0.27
0.38
675Ø STM SEWER
(BY OTHERS)
ENSURE 0.25m SEPARATION
PROVIDED BETWEEN TOP OF
SANITARY SEWER AND NEW
WATERMAIN (TO BE FIELD
ADJUSTED) PER W25.2
EXISTING 2400 Ø
STM SEWER
CROSSING TO BE FIELD
VERIFIED PRIOR TO INSTALLATION,
AND ANY DISCREPANCIES
REPORTED TO THE ENGINEER
PRIOR TO CONTINUANCE.
MAINTAIN 0.25m SEPARATION
PER WSD 25.2
CL OF ROAD
MH100A DIA = 1200mm
EX 400mm WATERMAIN
96
95
94
93
92
91
90
89
88
87
98
97

| | | |


BANK STREET
12+080
CONTD ON DWG
145172-100
92.04m - 200mmØ SAN @ 0.35%
MH200A
71.44m - 200mmØ SAN @ 0.35%
MH300A
LIMIT OF
CITY
CONTRACT
12+210
LIMIT OF
CONSTRUCTION
OF CITY CONTRACT
12+180
REINSTATEMENT OF
EXISTING ASPHALT BEYOND
CONTRACT LIMITS, MATCH
EXISTING ROAD STRUCTURE
GATE
Project North


97
96
95
94
93
92
91
90
89
+0.53%
+0.85%
STM118
HYDRANT
V&VC
MH200A DIA = 1200mm
CL OF ROAD
TOP OF PROPOSED
400mm WATERMAIN (BY OTHERS)
STM119
MATCH
EXISTING
MH300A DIA = 1200mm
HYDRANT
ORIGINAL
GROUND
EX. 400mm WATERMAIN
92.658
92.741
92.855
92.697
92.832
92.864

| | | |

Appendix C

Email Correspondence from DSEL

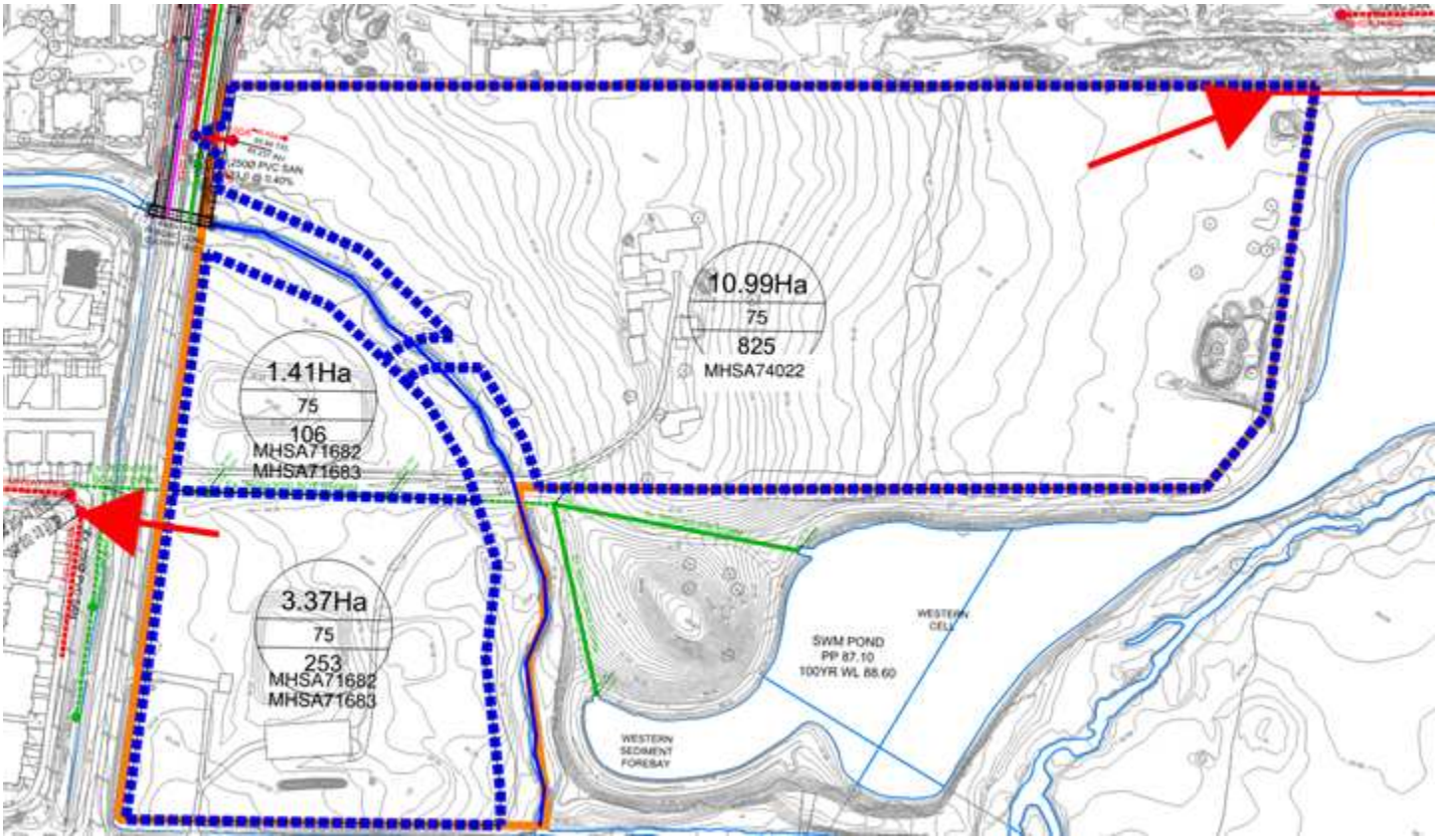
Soward, Angela

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.

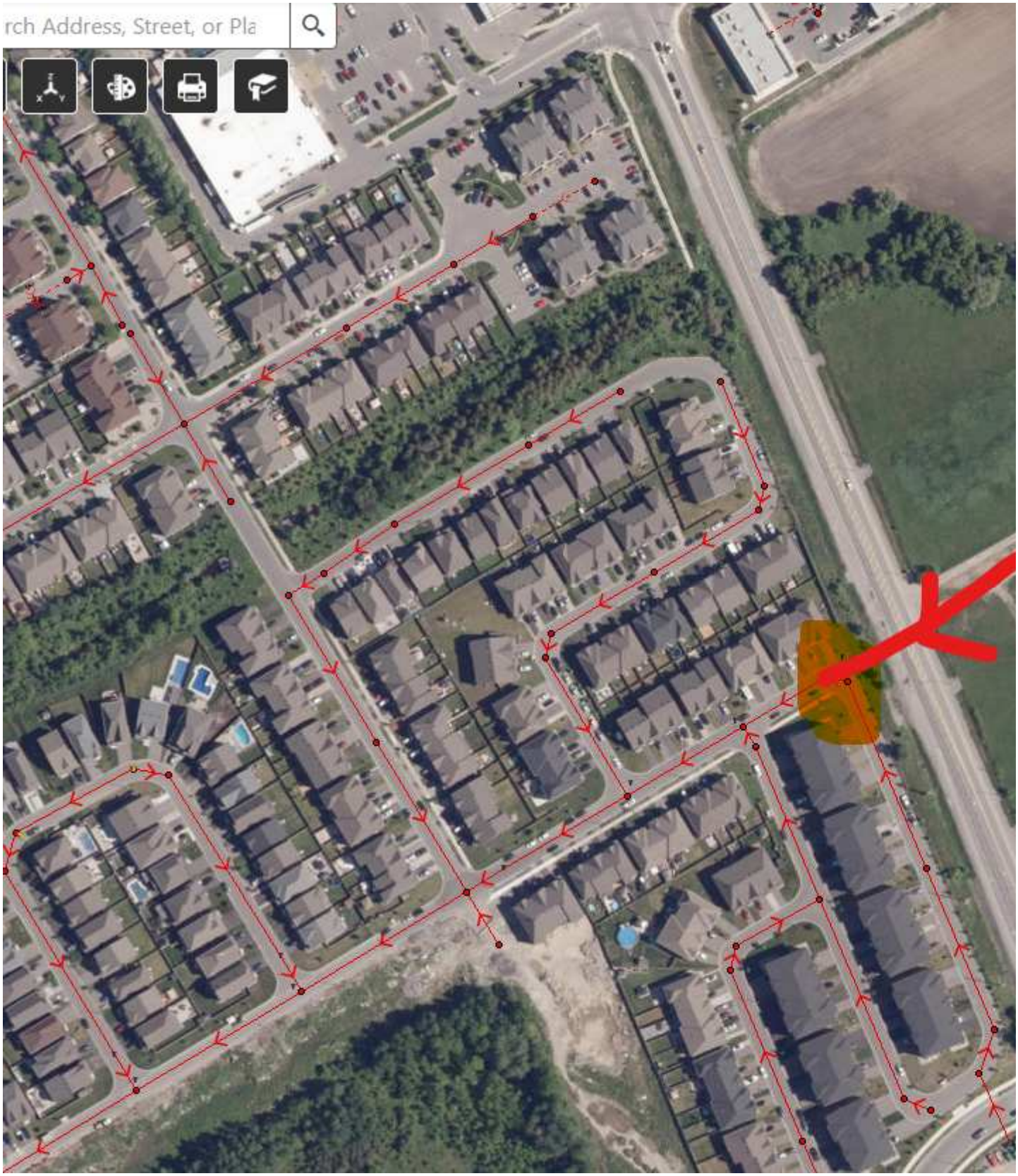
From: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Sent: June 17, 2024 3:54 PM
To: Marc Pichette <MPichette@dsel.ca>
Cc: Bougadis, John <John.Bougadis@ottawa.ca>; Xu, Lily <Lily.Xu@ottawa.ca>; Sharif, Golam <sharif.sharif@ottawa.ca>; van de Lande, Robin <Robin.vandeLande@ottawa.ca>; Rogers, Christopher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

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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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Outlook

Re: 1352 - Proposed Sanitary Servicing

From Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Date Tue 2024-07-23 2:01 PM
To Jeremy Chouinard <JChouinard@dsel.ca>; Bougadis, John <John.Bougadis@ottawa.ca>
Cc Marc Pichette <MPichette@dsel.ca>

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

Hi Jeremy,

We've met internally to discuss and Option 3 is the preferred option. You can proceed with detailed design.

Regarding the water stubs on Bank Street we have the following comments:

- The watermain stubs off Bank St. should be 300 mm dia. with valves in close proximity to the 400 mm dia. trunk on Bank St. to reduce water quality issues. If it is determined at a later date that a 300 mm dia. watermain is not required to service the subdivision, reducers will be required to the appropriate size.
- Condition will be added to the agreement that if the watermain stubs are not used within a certain time frame (5 years) or are not in the proper location, the developer will be responsible for blanking the existing stubs.
- Please submit boundary conditions for the S5 lands identifying demands and connection locations.

Let us know if you have any further questions prior to moving to detailed design.

Regards,

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: Jeremy Chouinard <JChouinard@dsel.ca >
Sent: Thursday, July 18, 2024 11:48 AM
To: Bougadis, John <John.Bougadis@ottawa.ca >
Cc: Shillington, Jeffrey <jeff.shillington@ottawa.ca >; Marc Pichette <MPichette@dsel.ca >
Subject: 1352 - Proposed Sanitary Servicing

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Hi John,

As discussed, please find attached a sketch showing proposed sanitary drainage areas, connections to the existing subdivisions, and locations of 2 proposed water stubs.

I've also attached design sheets showing proposed flows and capacities in the existing sanitary sewers. Please note the following:

- The capacity analysis for the community to the north was prepared using design info currently available to DSEL. We can review again when Arcadis sends as-built conditions

- There is a slight variance between the flows DSEL calculated compared to the flows presented in the memo Arcadis submitted last week for the sewers west of S5

- As discussed in Arcadis's memo, some sewers are over capacity based on City design guidelines however there is little impact to the existing houses when comparing the HGL to USF elevations, as discussed during our meeting dated July 16 th , please confirm that this is acceptable by the City of Ottawa.

- Similarly, we calculated some capacities close to max in the last few sewers near the pump station on Findlay Creek Drive, however these are very deep and we do not foresee any negative impact on the existing community, as discussed during our meeting dated July 16 th , please confirm that this is acceptable by the City of Ottawa.

Lastly, in order to provide recommended water connection sizes, we will need boundary conditions at the proposed contemplated connection locations. The estimated demands on the system are as follows:

- Avg Day = 230.2L/min
- Max Day = 575.6L/min
- Peak Hour = 1,266.2L/min

In the absence of a concept plan for the subdivision, we anticipate a fire flow of 14,000L/min.

We will follow up with Plan and Profiles of the proposed stubs and a cross section of the storm servicing block for your review.

Let me know if you require any additional information.

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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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

Appendix D

Stormwater Management

COST ESTIMATE

PROJECT TITLE: BANK STREET - LEITRIM
CONTRACT: STORM WATER MANAGEMENT OPTIONS
OWNER: CAIVAN COMMUNITIES

CONTRACT SUMMARY		CONTRACT AMOUNT
SUMMARY OF CONTRACT SECTIONS:		
OPTION 1: WET POND		
SECTION 1 - SITE PREPARATION AND POND		$439,200.00
SECTION 2 - STORM SEWERS AND APPURTENANCES		$147,800.00
SECTION 3 -ROADWORKS		$152,100.00
SUBTOTAL - OPTION 1: WET POND		**$739,100.00**
H.S.T. (13%)		**$96,083.00**
CONTRACT AMOUNT (INCLUDING HST):	=	**$835,183.00**
OPTION 2: DRY POND AND OGS		
SECTION 1 - SITE PREPARATION AND POND		$991,800.00
SECTION 2 - STORM SEWERS AND APPURTENANCES		$106,000.00
SECTION 3 -ROADWORKS		$134,400.00
SUBTOTAL - OPTION 2: DRY POND AND OGS		**$1,232,200.00**
H.S.T. (13%)		**$160,186.00**
CONTRACT AMOUNT (INCLUDING HST):	=	**$1,392,386.00**
OPTION 3: UNDERGROUND STORAGE		
SECTION 1 - SITE PREPARATION		$65,000.00
SECTION 2 - STORM SEWERS AND APPURTENANCES		$3,818,250.00
SUBTOTAL - OPTION 3: UNDERGROUND STORAGE		**$3,883,250.00**
H.S.T. (13%)		**$504,822.50**
CONTRACT AMOUNT (INCLUDING HST):	=	**$4,388,072.50**

Notes:

- This assessment is based on DSEL SWM Option figures dated June 2026.
- This assessment does not include topsoil costs.
- This assessment does not include landscaping or utilities.
- This assessment is based on 2026 average tendered unit rates for similar projects.
- This assessment does not include any allowance for dewatering.
- This assessment does not include any allowance for seasonal restrictions.
- Unless otherwise noted, this assessment does not include soft costs associated with consultant fees, permits, applications, agency review, etc.
- This assessment does not include removal of trees / buildings etc., landscaping, construction of buildings, off-site road improvements, interim servicing, etc.
- This assessment does not include off-site utility infrastructure or costs related to Offers to Connect. The Owner is to coordinate with utility providers to ensure sufficient capacity exists in surrounding infrastructure.
- This assessment does not include allowances for easements or other land costs for any off-site works.
- ADS Underground Storage System unit rate is based on a smaller volume system. No comparable rates for this size of tank.
- This assessment does NOT include construction cost contingencies. It is recommended that a contingency of 20% be carried.

LIST OF CONTRACT ITEMS-BANK STREET LEITRIM-WET POND

ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST	Comment/ COST CODE
SECTION 1 - SITE PREPARATION & POND						
Provide all labour, materials, equipment and services required to construct completely, the following work as per Contract Drawings and Specifications.						
1.01	**Erosion & Sediment Control, Dewatering and Work area Isolation**	**1**	**LS**	**$25,000.00**	**$25,000.00**	
1.02	**Pond Excavation Cut/Fill**	**1**	**LS**	**$120,000.00**	**$120,000.00**	
1.03	**Pond Grading-All grading operations included within the Hard/Softscape area.** Areas graded to 0.15m below FG.	**9500**	**m2**	**$3.00**	**$28,500.00**	
1.04	**Scrim reinforced geosynthetic liner (Bentofix SRNWL) -** Includes clear stone below liner.	**2,700**	**m2**	**$45.00**	**$121,500.00**	
1.05	**Forebay -** 700mm thick Granular B bottom on top of Terrafix 270R filter cloth (or equivalent)	**1,600**	**m2**	**$42.00**	**$67,200.00**	
1.06	**Submerged Impermeable Berm - 300mm RIP-RAP Stone 0.60m thick on top of Terrafix 400R filter cloth (or approved equal).**	**450**	**m2**	**$60.00**	**$27,000.00**	
1.07	**Headwalls - includes railing, grates and all associated appurtenances (excluding stop logs)**					
.01	**HW#1 (OPSD 804.040)**	**1**	**Ea**	**$50,000.00**	**$50,000.00**	
TOTAL: SECTION 1 - SITE PREPARATION & POND					**$439,200.00**	
SECTION 2 - STORM SEWERS AND APPURTENANCES						
Includes: layout, material, equipment, labour, excavation, backfill, appurtenances, granular backfill around structures, compaction, temporary access roads, restoration, dewatering, frost protection, benching, drop structures, class B bedding (unless otherwise), safety landings, clay seals, frames, covers, testing, reinstatement in roadways or landscaped areas to match existing conditions, adjustments to base course asphalt or finished grade in landscape areas and as-builts as required.						
2.01	**Storm Sewer Pipes**					
.01	**1050mm CONC 65-D**	**65**	**Lm**	**$1,100.00**	**$71,500.00**	
2.02	**Storm Manholes**					
.01	**2400mm (OPSD 701.010)**	**3**	**Ea**	**$25,000.00**	**$75,000.00**	
2.03	**Preliminary Storm CCTV Inspection**	**65**	**Lm**	**$9.50**	**$617.50**	
2.04	**Final Storm CCTV Inspection**	**65**	**Lm**	**$10.50**	**$682.50**	
TOTAL: SECTION 2 - STORM SEWERS AND APPURTENANCES					**$147,800.00**	
SECTION 3 -ROADWORKS						
Includes all field layout, labour, materials, equipment and services required to construct, the following roadwork's and associated work, including restoration, allowance for Utility Crossings by others, as per Contract Drawings and Specifications and as-builts as required.						
3.01	**5.0m Service Road** (3.0m asphalt pavement, 1m topsoil shouldering per side)	**1350**	**m2**	**$110.00**	**$148,500.00**	
3.02	**Final Iron Adjustments**					
.01	**Manhole**	**3**	**Ea**	**$1,200.00**	**$3,600.00**	
TOTAL: SECTION 3 - ROADWORKS					**$152,100.00**	

LIST OF CONTRACT ITEMS-BANK STREET LEITRIM-DRY POND & OGS

ITEM NO.		ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST	Comment/ COST CODE
SECTION 1 - SITE PREPARATION & POND							
Provide all labour, materials, equipment and services required to construct completely, the following work as per Contract Drawings and Specifications.							
1.01		**Erosion & Sediment Control, Dewatering and Work area Isolation**	**1**	**LS**	**$50,000.00**	**$50,000.00**	
1.02		**Pond Excavation Cut/Fill**	**1**	**LS**	**$180,000.00**	**$180,000.00**	
1.03		**Pond Grading-All grading operations included within the Hard/Softscape area.** Areas graded to 0.15m below FG.	**10600**	**m2**	**$3.00**	**$31,800.00**	
1.04		**Scrim reinforced geosynthetic liner (Bentofix SRNWL) -** Includes clear stone below liner.	**6,000**	**m2**	**$45.00**	**$270,000.00**	
1.05		**Headwalls - includes railing, grates and all associated appurtenances (excluding stop logs)**					
	.01	**HW#1 (OPSD 804.040)**	**1**	**Ea**	**$50,000.00**	**$50,000.00**	
1.06		**Remove & Dispose Existing Retaining Wall & Railing**	**1**	**Allowance**	**$50,000.00**	**$50,000.00**	
1.07		**Remove Pathway**	**1**	**Allowance**	**$20,000.00**	**$20,000.00**	
1.08		**OGS 1 (CDS ETV 10 offline with a diversion vault of 3353mm x 2438mm) -** Includes bypass structure, twin 600mm CONC bypass pipes, sluice gates, weir etc. Including all inspections, signoffs from manufacturer.	**1**	**Ea**	**$340,000.00**	**$340,000.00**	
TOTAL: SECTION 1 - SITE PREPARATION & POND						**$991,800.00**	
SECTION 2 - STORM SEWERS AND APPURTENANCES							
Includes: layout, material, equipment, labour, excavation, backfill, appurtenances, granular backfill around structures, compaction, temporary access roads, restoration, dewatering, frost protection, benching, drop structures, class B bedding (unless otherwise), safety landings, clay seals, frames, covers, testing, reinstatement in roadways or landscaped areas to match existing conditions, adjustments to base course asphalt or finished grade in landscape areas and as-builts as required.							
2.01		**Storm Sewer Pipes**					
	.01	**1050mm CONC 65-D**	**50**	**Lm**	**$1,100.00**	**$55,000.00**	
2.02		**Storm Manholes**					
	.01	**2400mm (OPSD 701.010)**	**2**	**Ea**	**$25,000.00**	**$50,000.00**	
2.03		**Preliminary Storm CCTV Inspection**	**50**	**Lm**	**$9.50**	**$475.00**	
2.04		**Final Storm CCTV Inspection**	**50**	**Lm**	**$10.50**	**$525.00**	
TOTAL: SECTION 2 - STORM SEWERS AND APPURTENANCES						**$106,000.00**	
SECTION 3 -ROADWORKS							
Includes all field layout, labour, materials, equipment and services required to construct, the following roadwork's and associated work, including restoration, allowance for Utility Crossings by others, as per Contract Drawings and Specifications and as-builts as required.							
3.01		**5.0m Service Road** (3.0m asphalt pavement, 1m topsoil shouldering per side)	**1200**	**m2**	**$110.00**	**$132,000.00**	
3.02		**Final Iron Adjustments**					
	.01	**Manhole**	**2**	**Ea**	**$1,200.00**	**$2,400.00**	
TOTAL: SECTION 3 - ROADWORKS						**$134,400.00**	

LIST OF CONTRACT ITEMS-BANK STREET LEITRIM-UNDERGROUND STORAGE

ITEM NO.		ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST	Comment/ COST CODE
SECTION 1 - SITE PREPARATION							
Provide all labour, materials, equipment and services required to construct completely, the following work as per Contract Drawings and Specifications.							
1.01		**Erosion & Sediment Control, Dewatering and Work area Isolation**	**1**	**LS**	**$15,000.00**	**$15,000.00**	
1.02		**Headwalls - includes railing, grates and all associated appurtenances (excluding stop logs)**					
	.01	**HW#1 (OPSD 804.040)**	**1**	**Ea**	**$50,000.00**	**$50,000.00**	
TOTAL: SECTION 1 - SITE PREPARATION						**$65,000.00**	
SECTION 2 - STORM SEWERS AND APPURTENANCES							
Includes: layout, material, equipment, labour, excavation, backfill, appurtenances, granular backfill around structures, compaction, temporary access roads, restoration, dewatering, frost protection, benching, drop structures, class B bedding (unless otherwise), safety landings, clay seals, frames, covers, testing, reinstatement in roadways or landscaped areas to match existing conditions, adjustments to base course asphalt or finished grade in landscape areas and as-builts as required.							
2.01		**Storm Sewer Pipes**					
	.01	**1050mm CONC 65-D**	**45**	**Lm**	**$1,130.00**	**$50,850.00**	
2.02		**Storm Manholes**					
	.01	**2400mm (OPSD 701.010)**	**3**	**Ea**	**$23,000.00**	**$69,000.00**	
2.03		**Underground Storage Tanks-**Stormtech MC-3500 or approved equivalent					
	.01	**927 Chambers-5,100m3**	**5100**	**m3**	**$725.00**	**$3,697,500.00**	
2.04		**Preliminary Storm CCTV Inspection**	**45**	**Lm**	**$9.50**	**$427.50**	
2.05		**Final Storm CCTV Inspection**	**45**	**Lm**	**$10.50**	**$472.50**	
TOTAL: SECTION 2 - STORM SEWERS AND APPURTENANCES						**$3,818,250.00**	

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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

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June 26, 2026 Project Number: 2704(e01)

David Schaeffer Engineering Ltd
120 Iber Road, Unit 103
Ottawa, Ontario
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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 m^3 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

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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

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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