545 & 547 Bayfield Street
City of Barrie

Functional Servicing & Stormwater Management Report

June 2024

Submitted by:

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Project Number: 2700

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Submission History

Submission	Date	In Support Of	Distributed To
1st	June 2024	Site Plan Approval	City of Barrie, Simcoe County, Nottawasaga Valley Conservation Authority, MECP

1.0 Introduction

SCS Consulting Group Ltd. has been retained by 547 Bayfield Inc. to prepare a Servicing and Stormwater Management (SWM) Report for a proposed commercial development located at 545 & 547 Bayfield Street in the City of Barrie.

1.1 Purpose of the Report

The Servicing and SWM Report has been prepared in support of the Site Plan applications for the proposed development. The Site Plan is provided in **Appendix A**.

The purpose of this report is to demonstrate that the proposed development can be accommodated by the external storm, sanitary and water infrastructure and to define the proposed servicing and grading designs for the site plan application in accordance with the City of Barrie, Nottawasaga Valley Conservation Authority (NVCA), the Ontario Building Code, and the Ministry of Environment, Conservation and Parks (MECP) design criteria.

1.2 Study Area

The proposed development is considered Phase 1 of the site on 545 & 547 Bayfield Street. It is comprised of two (2) existing commercial buildings located within the Nottawasaga Watershed in the City of Barrie. As shown on **Figure 1.1**, the study area is bound by:

- Existing commercial development to the north;
- Existing commercial development to the south;
- Greenspace lands to the east (other lands owned by the applicant, slated as Phase 2 of the development); and
- Bayfield Street to the west.

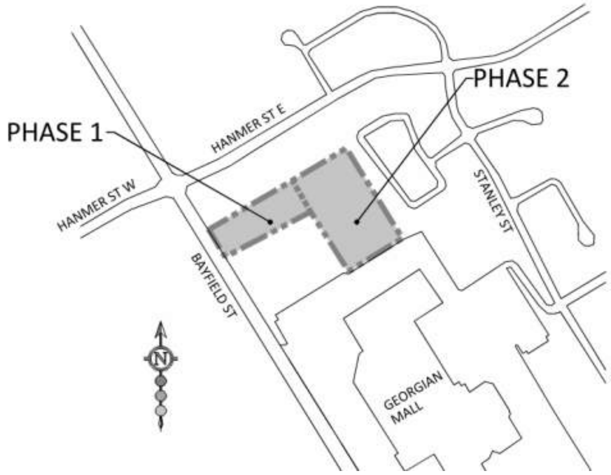

Figure 1.1: Site Location Plan

The proposed Phase 1 development is approximately 0.80 ha in size and proposes to repurpose the existing commercial buildings into a car wash and detailing centre (refer to the Site Plan in **Appendix A**). Access to the proposed development is proposed from Bayfield Street.

1.3 Background Servicing Information

In preparation of the servicing and SWM strategies, the following design guidelines and standards were used:

- Municipal design guidelines and standards (i.e. Stormwater Infrastructure Design Standard, City of Barrie (June 2023));
- Conservation Authority SWM guidelines (i.e. NVCA Stormwater Technical Guide, Nottawasaga Valley Conservation Authority (December 2013);
- Lake Simcoe Protection Plan (July 2009);
- Ministry of Environment, Conservation and Parks (MECP) Stormwater Management Planning and Design Manual (March 2003); and
- Ministry of Transportation (MTO) Drainage Management Manual (1997).

The site servicing and SWM strategies in this report are based on the following reports:

- Topographic Plan of Part of Lot 18 Concession 4 (Geographic Township of Vespra), City of Barrie prepared by Schaeffer Dzaldov Purcell Ltd (September 2023);
- Stormwater Management Report – Pond 1, East Bayfield Secondary Plan Area, City of Barrie, prepared by Richardson Engineering Ltd. (May 1999);
- Klassic Car Wash – Detailing Centre Site Plan prepared by Bicorp Design Group Ltd (March 2024); and

- Geotechnical Investigation for Proposed Car Wash Facility, 547 Bayfield Street, City of Barrie, prepared by Soil Engineers Ltd. (April 2024).

The site servicing and SWM strategies are also based on the following approved Engineering Drawings:

- 547 Bayfield Street - Water Service Drawing. prepared by City of Barrie Municipal Works, dated November 2007;
- Bayfield Street Watermain Extension - Sta. 0+680 to Sta. 1+025 - Plan & Profile As-Constructed Drawings Dwg No 001.005, prepared by Ainley and Associates Ltd., dated July 1950; and
- Bayfield Street Improvements - Sta. 2+180 to Sta. 2+340 - Plan & Profile As-Constructed Drawings Dwg No 9110-PP5, prepared by Richardson Engineering Ltd., dated August 1999.

The above listed drawings have been included in **Appendix B.**

2.0 Storm Servicing

2.1 Existing Storm Sewer System

As indicated in the record drawings (**Appendix B**), the sizes and locations of the existing storm sewers surrounding the site are:

- A 750mmØ concrete storm sewer on Bayfield Street flowing south;
- A 1950mmØ concrete storm sewer within the sanitary and storm servicing easement to the south of the site flowing east; and
- A Ditch Inlet CB at the southeastern corner of the property connecting to the 1950mm storm sewer noted above.

2.2 Proposed Storm Sewer System

The development is proposed to continue to manage storm drainage in the way it is managed currently on-site. No storm sewers are proposed, as the site is proposed to sheet drain into the Phase 2 lands east of the proposed Phase 1 development. The roof drains are proposed to discharge at-grade. The water is then directed to an enhanced grassed swale, promoting infiltration and evapotranspiration conveying runoff water east, subsequently continuing into the existing swale, which conveys water south into an existing ditch inlet catchbasin at the southeast corner of the Phase 2 lands. The swale and catchbasin are shown on the site survey in **Appendix B**.

3.0 Stormwater Management

3.1 Existing Drainage

The existing lands (0.80 ha) drain east via overland flow into the existing Phase 2 lands adjacent to the proposed development (Catchment 101 on **Figure 3.1**). An external area from the eastern part of Bayfield Street conveys runoff through the site to the east as well (Catchment 102 on **Figure 3.1**). Runoff from the site outlets to a tributary to the Willow Creek.

3.2 Existing Peak Flows

The target release rates for the proposed development are the existing peak runoff rates for the subject lands for storms up to and including the 100-year storm event. The rational method was used to determine the target release rates from the site based on Intensity-Duration-Frequency (IDF) rainfall curves from the City of Barrie Design Standards. Supporting calculations are provided in **Appendix C**. **Table 3.1** summarizes the existing peak flows from the Phase 1 development to the Phase 2 lands.

Table 3.1: Summary of Existing Peak Flows

Return Period Storm	Outlet Location (L/s)
2 Year	153.7
5 Year	201.8
10 Year	233.8
25 Year	275.0
50 Year	304.7
100 Year	335.1

3.3 Stormwater Runoff Control Criteria

The following stormwater runoff control criteria have been established based on the City of Barrie design criteria (June 2023) and the MECP Stormwater Management Planning and Design Manual (2003). The stormwater runoff criteria are summarized below in **Table 3.2**.

Table 3.2 Stormwater Runoff Control Criteria

Criteria	Control Measure
Quantity Control	Control proposed peak flows to existing peak flows for the 2 through 100-year storm events (City of Barrie, NVCA).
Quality Control	Provide MECP Enhanced (Level 1) Protection for 80% TSS Removal.

Criteria	Control Measure
Erosion Control	The first 5 mm of rainfall runoff is to be retained on-site (NVCA).
Water Budget	Where feasible, measures to minimize development impacts on the water balance to be incorporated into the development design (i.e. infiltration measures). Maintain groundwater recharge as the site is located within Well Head Protection Area – Q1 &Q2 (WHPA-Q) as set forth in the CTC Source Protection Plan.(NVCA, CTC Source Protection Plan).

3.4 Stormwater Best Management Practices Selection

In accordance with the Ministry of Environment Stormwater Management Planning and Design Manual (2003), a review of stormwater management best practices was completed using a treatment train approach, which evaluated at-source, conveyance system, and end-of-pipe alternatives. The potential best management practices were evaluated based on the stormwater management objectives listed in **Table 3.2**.

The following site characteristics were taken into consideration:

- Developable area of 0.80 ha consisting of commercial development;
- The site is located within the Willow Creek Subwatershed; and
- The site consists of asphalt underlain with sandy silt and silty sand till with traces of clay and gravel.

The following are examples of at-source, conveyance and end-of-pipe controls that were evaluated for use in the proposed development. While evaluating the following controls, cost, feasibility, groundwater and grading constraints were taken into consideration.

At-Source Controls

At-source controls are at-source measures that reduce runoff prior to stormwater entering the conveyance system, such as:

- Increased Topsoil Depth;
- Roof Leaders to Grassed Areas;
- Passive Landscaping;
- Roof Runoff to Soak-away Pits;
- Roof Runoff to Retention Cisterns (Rainwater Harvesting);
- Green Roofs;
- Rooftop and/or Parking Lot Detention Storage;
- Pervious Pavements; and
- Infiltration Trenches.

Conveyance Controls

Conveyance controls provide treatment of stormwater during the transport of runoff from individual lots to the receiving watercourse or end-of-pipe facility. Examples of conveyance controls include:

- Grassed Swales;
- Catchbasin Inserts; and
- Perforated Pipe System.

End-of-Pipe Controls

End-of-pipe stormwater management facilities receive stormwater flows from a conveyance system (i.e., storm sewers or ditches) and provide treatment of stormwater prior to discharging flows to the receiving watercourse. Typical end-of-pipe controls include:

- Stormwater Detention Facility;
- Wetlands;
- Dry ponds; and
- Manufactured Treatment Device.

3.4.1 At-Source Controls Evaluation

It is noted these controls are proposed on private properties. Incorporating controls that require minimal routine maintenance can be an effective method in the treatment train approach to SWM. The following controls have been evaluated for use in the proposed development:

Increased Topsoil Depth

An increase in the proposed topsoil depth is recommended to promote at source infiltration (minimum 0.3 m depth). Increased topsoil depth will also contribute to at source quality and quantity control and will contribute to ground water recharge. A **Error! Reference source not found.**topsoil depth of 0.30 m is proposed.

Roof Leaders to Grassed Areas

Roof leaders will be discharged to grassed areas to promote at-source infiltration, thereby contributing to water quality and quantity control.

Passive Landscaping

Planting of gardens and other vegetation designed to minimize local runoff or use rainwater as a watering source can be used to reduce rainwater runoff by increasing evaporation, transpiration, infiltration and contribute to groundwater recharge. By promoting infiltration through passive landscaping, water quality and quantity control is provided for the volume of water infiltrated. Passive landscaping can provide significant stormwater management benefits as part of the overall treatment train approach for the proposed development.

Roof Runoff to Soak-away Pits – Directing roof runoff to subsurface soak-away pits can be used to promote infiltration. By promoting infiltration water quality and quantity controls are provided for the volume of water retained. Infiltration of roof runoff can provide significant SWM benefits as part of the overall treatment train approach for the proposed development. The extents of the parking encompass the majority of the site and therefore a soak-away pit is not feasible for this application.

Roof Runoff to Retention Cisterns (Rainwater Harvesting) – Directing roof runoff to rainwater retention cisterns (i.e. rain barrels or greywater re-use) will contribute to water quality and water balance control. The retained rainwater can be harvested for reuse such as irrigation and/or greywater use. A retention cistern is not proposed for this application.

Green Roofs – Best suited for flat roofs, green roofs provide rainwater retention in the growing medium where it is evaporated, evapo-transpired, or slowly drains away after the rainfall event. The roof plans do not reflect green roof technology.

Rooftop and/or Parking Lot Detention Storage – Often employed with large rooftop or parking lot footprints, flow attenuation for quantity or extended detention control can be provided via a flow restriction with stormwater storage provided via ponding either on rooftops or parking lots. The proposed development is not proposing to have rooftop storage amongst the flat rooftops or parking detention storage in the parking lots.

Pervious Pavement

By encouraging infiltration and filtration, pervious pavement can contribute to water quality, balance, and erosion control. While feasible for the private laneways and parking areas, the maintenance requirement is high and it is not recommended for this application.

Infiltration Trenches

To meet water quality, erosion and water balance requirements, infiltration is proposed under the enhanced swale east of the site leading to the Phase 2 lands.

An evaluation of the suitability of potential lot-level controls for the proposed development is provided in **Table 3.3**.

3.4.2 Conveyance Controls Evaluation

Conveyance controls provide treatment of stormwater during the transport of runoff from individual lots to the receiving watercourse or end-of-pipe facility. The following conveyance controls have been evaluated for use in the proposed development:

Enhanced Grassed Swales

Enhanced grassed swales conveying runoff promote infiltration, filtration, and evapotranspiration, contributing to water quality and quantity control, and contribute to groundwater recharge. Grassed swales need an unimpeded and relatively wide stretch of landscaped area, such as within a wide boulevard with no driveways, to function properly. Runoff from the site is conveyed to a proposed north-south grassed swale, conveying runoff to an east-bound enhanced grassed swale ultimately outlet to the existing southbound swale in the Phase 2 lands.

Catchbasin Inserts

Catchbasin inserts are placed to provide an opportunity to allow the sediments in the runoff water to settle rather than be conveyed directly to the storm sewer as well as protect from re-dispersion of the sediments in the sump. This technology is useful as a screening measure upstream of centralized treatment or storage facilities to prevent sediment loading and provide an extended maintenance period. There are no catchbasins proposed within the site, therefore catchbasin inserts are not proposed.

Perforated Pipe System

Where rear lot catch basins are required due to grading constraints, a perforated pipe system could be incorporated into the rear lot catchbasin design to promote infiltration of ‘clean’ stormwater runoff. By promoting infiltration, water quality and quantity controls are provided for the volume of water retained. Infiltration can provide significant SWM benefits as part of the overall treatment train approach for the proposed development. The proposed enhanced grassed swales can provide adequate water quality and quantity control, therefore perforated pipe system is not proposed.

An evaluation of the suitability of potential conveyance BMPs is provided in **Table 3.3**.

3.4.3 Proposed End-of-Pipe Controls

While at-source and conveyance system controls are valuable components of the overall SWM plan, on their own they are not sufficient to meet the quantity and quality control objectives for the proposed development. End-of-pipe stormwater management facilities receive stormwater flows from a conveyance system (i.e., storm sewers or ditches) and provide treatment of stormwater prior to discharging flows to the receiving outlet. Accordingly, the following end-of-pipe controls have been evaluated for use in the proposed development:

Stormwater Detention Facility

To accommodate a potentially reduced release rate, stormwater detention facilities can be utilized to store stormwater runoff. A stormwater detention facility is not proposed in the Phase 1 area.

Wet Ponds, Wetlands, Dry Ponds

Sized following the MECP criteria, these end-of-pipe facilities can provide water quality, quantity, and erosion control treatment. Due to the size of the proposed development and the presence of the parking lots, these facilities are not proposed.

Manufactured Treatment Device

A properly sized manufactured treatment device (MTD) can assist in providing MECP Enhanced (Level 1) treatment and can contribute to the treatment train approach for water quality control. An MTD unit is not proposed as conveyance through enhanced grassed swale will provide quality control.

Table 3.3 below summarizes the recommended stormwater management Best Management Practices (BMPs) for the proposed development.

Table 3.3: Summary of the Recommended Best Management Practices (BMPs)

Stormwater Management Control	Recommended BMP
At-Source Controls	Increased Topsoil Depth Roof Leaders to Grassed Areas Passive Landscaping
Conveyance System Controls	Enhanced Grassed Swale
End of Pipe Controls	--

3.5 Proposed Storm Drainage

The proposed major and minor system flow patterns and drainage areas are shown on **Figure 3.2**. As illustrated, the proposed development will convey runoff east via overland flow into the existing Phase 2 lands adjacent to the proposed development (0.86 ha, Catchment 201 and 202 on **Figure 3.2**). Major and minor system flows from the majority of the proposed development will be captured and conveyed via an enhanced grassed swale (**Figure 3.2**) which outlets to the Phase 2 lands. Runoff from the site eventually outlets to the East Bayfield secondary plan area SWM pond located northeast of the site.

3.5.1 Proposed Infiltration Measures

A Low Impact Development (LID) design for the proposed development has been shown on **Figure 3.2** and the attached Grading Plan (**Appendix F**, GR-1).

As shown, the proposed development will convey runoff to the proposed enhanced swale which will capture and infiltrate the first 5 mm of rainfall. The permeability rate of 10^{-3} to 10^{-4} cm/s was obtained from the Geotechnical Investigation prepared by Soil Engineers Ltd. (attached in **Appendix B**). The corresponding infiltration rates of 50 mm/hr has been used conservatively for the drawdown calculations. Supporting calculations are included in **Appendix C**.

As identified on the attached drawing and in the attached calculations, the infiltration trench underneath the enhanced grassed swales is designed to be 1.4 m wide and 0.3 m deep to retain over 5.7 mm for the Catchment 201 of rainfall over any storm event. This retention satisfies the requirements for erosion control and water budget as laid out in **Table 3.2** above.

3.5.2 Quantity Control

Proposed release rates and required storage volumes were calculated using the modified rational method and the IDF rainfall curves from the City of Barrie Design Standards. Calculations are included in **Appendix C**.

Retention volume has been provided to exceed the 5mm retention criteria therefore there is an overall reduction in the peak flows from the existing to the proposed condition. The Low Impact Developments (LIDs) are incorporated to reduce the peak flows to below the existing conditions. **Table 3.4** below presents the peak flow without consideration of the LIDs. For further detail please refer to **Appendix C**.

Table 3.4: Summary of Proposed Peak Flows (No LIDs)

Storm Event	Existing Condition (L/s)	Proposed Condition (No LIDs) (L/s)
2 Year	153.7	165.6
5 Year	201.8	217.4
10 Year	233.8	215.8
25 Year	275.0	311.3
50 Year	304.7	345.6
100 Year	335.1	380.4

Note: The calculations above reflect the proposed conditions without the consideration of LIDs.

The retention volume provided on site will provide additional abstraction of the peak flows for all storm events, considering the storage volume provided in the infiltration facilities. It is demonstrated that the peak outflow from the site is reduced to match the existing condition as the proposed volume in the infiltration swale exceeds the required. **Table 3.5** below provides a summary of the proposed peak flows, calculations are included in **Appendix C**.

Table 3.5: Summary of Proposed Peak Flows (With LIDs)

Storm Event	Existing Condition (L/s)	Proposed Condition (With LID) (L/s)	Storage Required (m^3)
2 Year	153.7	153.7	7.1
5 Year	201.8	201.8	9.3
10 Year	233.8	233.8	10.8
25 Year	275.0	275.0	21.8
50 Year	304.7	304.7	24.5
100 Year	335.1	335.1	27.2

3.5.3 Quality Control

To contribute to quality control, the vegetated buffer strip on the east end of the site and the enhanced grass swale east of the site will provide quality control. The swale slopes and velocity are within range to provide quality control according to the MECP Stormwater Management Planning and Design Manual (2003). The enhanced grassed swale is sized to provide more than the required MECP Enhanced (Level 1) Protection (80% TSS removal). Sizing calculations for the swale are provided in **Appendix C**.

3.5.4 Erosion Control

As outlined in **Table 3.1**, erosion control is required in the form of the retention of the first 5 mm of rainfall on-site. The erosion control criterion is being achieved through infiltration in the proposed enhanced grassed swale. The required volume to achieve 5 mm retention requirement is 21.3 m^3, and the provided volume is 27.2 m^3. Calculations are included in **Appendix C**.

3.5.5 Water Balance

To meet the 5 mm retention for water balance requirements, infiltration is proposed under the enhanced grass swale east of the site. Water balance calculations and proposed infiltration trench sizing details are provided in **Appendix C**.

4.0 Sanitary Servicing

4.1 Existing Sanitary Servicing

As indicated in the record drawings (**Appendix B**), the sizes and locations of the existing sanitary sewers surrounding the Phase 1 site are:

- A 250 mm diameter sanitary sewer on Bayfield Street flowing south.

The existing buildings are serviced by existing sanitary service connections, which connect to the existing municipal system. The existing sanitary service connections will be decommissioned per City's sewer use by-law and engineering standards.

4.2 Proposed Sanitary Servicing

The sanitary servicing system from the proposed development is proposed to connect to the existing 250 mm diameter sanitary sewer on Bayfield Street via a new maintenance hole at the west entrance of the site, as shown on **Drawing S-1**. Per the servicing plan (**Appendix F**), the proposed sanitary sewer has 4.75 m of cover at the proposed service connection, which is sufficient to service the proposed development.

The sanitary sewers within the site will have slopes ranging between 0.5% and 2% (typically) and will be provided at 1.5 m to 4.75 m deep. Note that there is also a settling tank design for the car wash that is being designed by Bicorp Design Group Ltd. Refer to the site plan in **Appendix A** for details of this design.

The sanitary servicing system will be designed in accordance with the City of Barrie and MECP criteria, including but not limited to:

- Industrial/Commercial Sanitary Generation Rate: 0.32 l/s/ha
- Peaking Factor: Harmon (Min. 2.0)
- Infiltration Rate: 0.1 L/s/ha
- Minimum Municipal Pipe Size: 200 mm diameter
- Minimum Actual Velocity: 0.60 m/s
- Maximum Velocity: 3.0 m/s

As the zoned land use for the site is not changing and the building sizes are remaining the same, a downstream capacity analysis has not been performed. The sanitary sewer design sheet for the site sewer system is included in **Appendix D**.

5.0 Water Servicing

5.1 Existing Water Servicing

As indicated in the record drawings (**Appendix B**), the following existing watermains surround the site:

- A 300 mm diameter ductile iron watermain on the west side of Bayfield Street.

A hydrant flow test will be prepared in support of the next submission to determine existing flows and pressures for the Bayfield Street watermain.

5.2 Proposed Water Servicing

Water supply for the proposed development will be provided from the existing 300 mm diameter watermain on Bayfield Street. Both the domestic and fire connections are proposed at 300 mm, to allow for the servicing of the future Phase 2.

The proposed municipal water distribution system will be designed in accordance with the City of Barrie and MECP criteria, including but not limited to the following:

- Residential water usage rate: 225 l/c/d
- Population Density: 1.67 people/unit
- Commercial water usage rate: 28.0 m3/ha/d
- Industrial: 35 m3/ha/d
- Minimum Pipe Size: 150 mm diameter
- Minimum Pipe Depth: 1.7 m
- Maximum Hydrant Spacing: 150 m

A Water Distribution Analysis was completed by Municipal Engineering Solutions (MES) (**Appendix E**). According to the analysis, the maximum daily and peak hourly demand for the proposed development is 26.46 L/s and 26.76 L/s respectively. The FUS fire flow requirement is 83 L/s (547 Bayfield) and 100 L/s (545 Bayfield). The analysis also states that the municipal watermain on Erskine Avenue is sufficient to service the proposed development, as Max Day + Fire Flows range from 128 to 172 L/s at 20 psi. It should be noted that as there is a future Phase 2 east of the site, an oversized main (300 mm) has been provided that terminates east of the existing buildings in order to service these lands.

The proposed water servicing layout is outlined in **Drawing S-1.**

6.0 Grading

6.1 Existing Grading Conditions

The existing topography of the Phase 1 lands has mild slopes in the range 0.5% to 3% that convey water to the greenspace lands east of the proposed development. The ground surface elevations through the study area range from approximately 288.12 m in the northwest corner to approximately 285.61 m in the southeast corner.

6.2 Proposed Grading Concept

In general, the proposed development will be graded in a manner which satisfies the following goals:

Satisfy the City of Barrie lot grading and drainage infrastructure design criteria, create required depth for sanitary sewer, as well as provision of an efficient earthworks program, including:

- Minimum Driveway Grade: 2%
- Maximum Driveway Grade: 7%
- Minimize the need for retaining walls
- Minimize the volume of earth to be moved and minimize cut/fill differentials
- Minimize the need for rear lot catchbasins
- Achieve the stormwater management objectives required for the proposed development.

A grading plan is provided on **Drawing GR-1**. As illustrated, the site is graded in a manner to replicate the existing grading conditions of the site which convey drainage to the east greenspace.

7.0 Erosion and Sediment Control During Construction

During the detailed design stage in support of Site Plan approval, erosion and sediment control measures will be designed with a focus on erosion control practices (such as stabilization, track walking, staged earthworks, etc.) as well as sediment controls (such as fencing, mud mats, catchbasin sediment control devices, rock check dams and temporary sediment control ponds). These measures will be designed and constructed as per the Stormwater Management Technical Guidelines document (LSRCA, 2016). A detailed erosion and sediment control plan will be prepared for review and approval by the Town of Aurora and LSRCA prior to any proposed grading being undertaken. This plan will address phasing, inspection and monitoring aspects of erosion and sediment control. All reasonable measures will be taken to ensure sediment loading to the adjacent watercourses and properties are minimized both during and following construction.

8.0 Summary

This Servicing and Stormwater Management Report has outlined the means by which:

- The site can be serviced by full municipal services (storm, sanitary and water);
- The Site Plan layout supports the stormwater management requirements.

This Stormwater Management Report has outlined the means by which the proposed development will meet the objectives the Toronto Wet Weather Flow Management Guidelines through the following measures:

Quantity Control

- Runoff from the areas proposed will match the peak flows for the 2 through 100-year storm events; and
- Stormwater quantity control will be achieved through infiltration of enhanced grassed swales.

Quality Control

- The water quality is provided through use of enhanced grass swales and infiltration trenches which provides a net positive to water quality compared to existing conditions.

Water Balance

- Retention of runoff from a 5 mm rainfall event is provided through the use of infiltration trenches underneath the enhanced grass swale.

Erosion Control

- The erosion control criteria is satisfied as the design meets the water balance criteria of 5mm retention, and the site does not discharge directly or within 100 m of a natural watercourse.

Respectfully Submitted:

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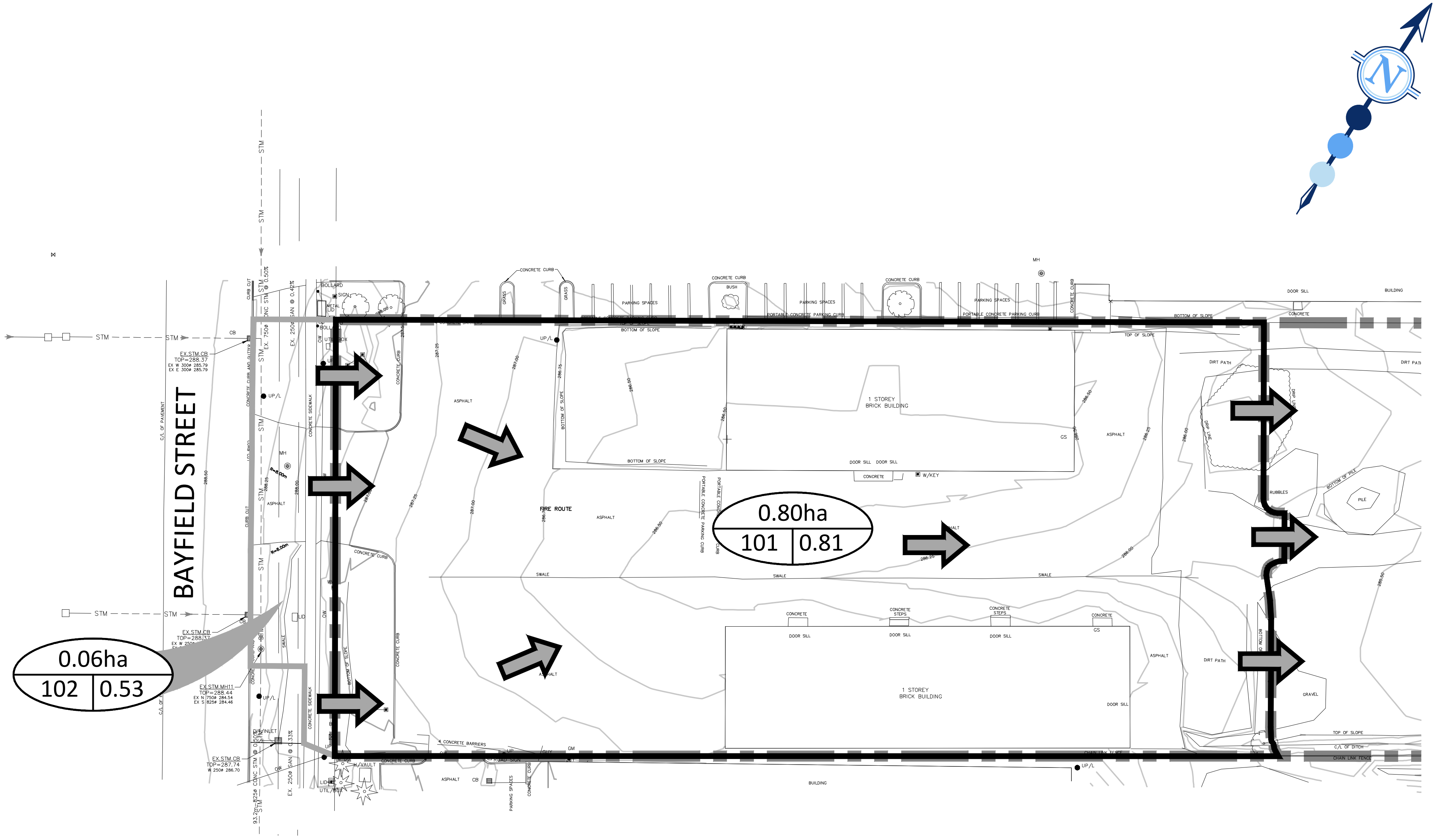
P:\2700 547 Bayfield Street, Barrie\Design\Reports\FSR\2700- FSSR (Site Plan).docx



LEGEND:

PROPERTY LINE

LIMIT OF WORK

MAJOR SYSTEM - OVERLAND FLOW

STORM DRAINAGE BOUNDARY

EXTERNAL STORM
DRAINAGE BOUNDARY

0.35ha — DRAINAGE AREA (HECTARES)

0.20 — RUNOFF COEFFICIENT

99 — CATCHMENT ID

SCS consulting group ltd

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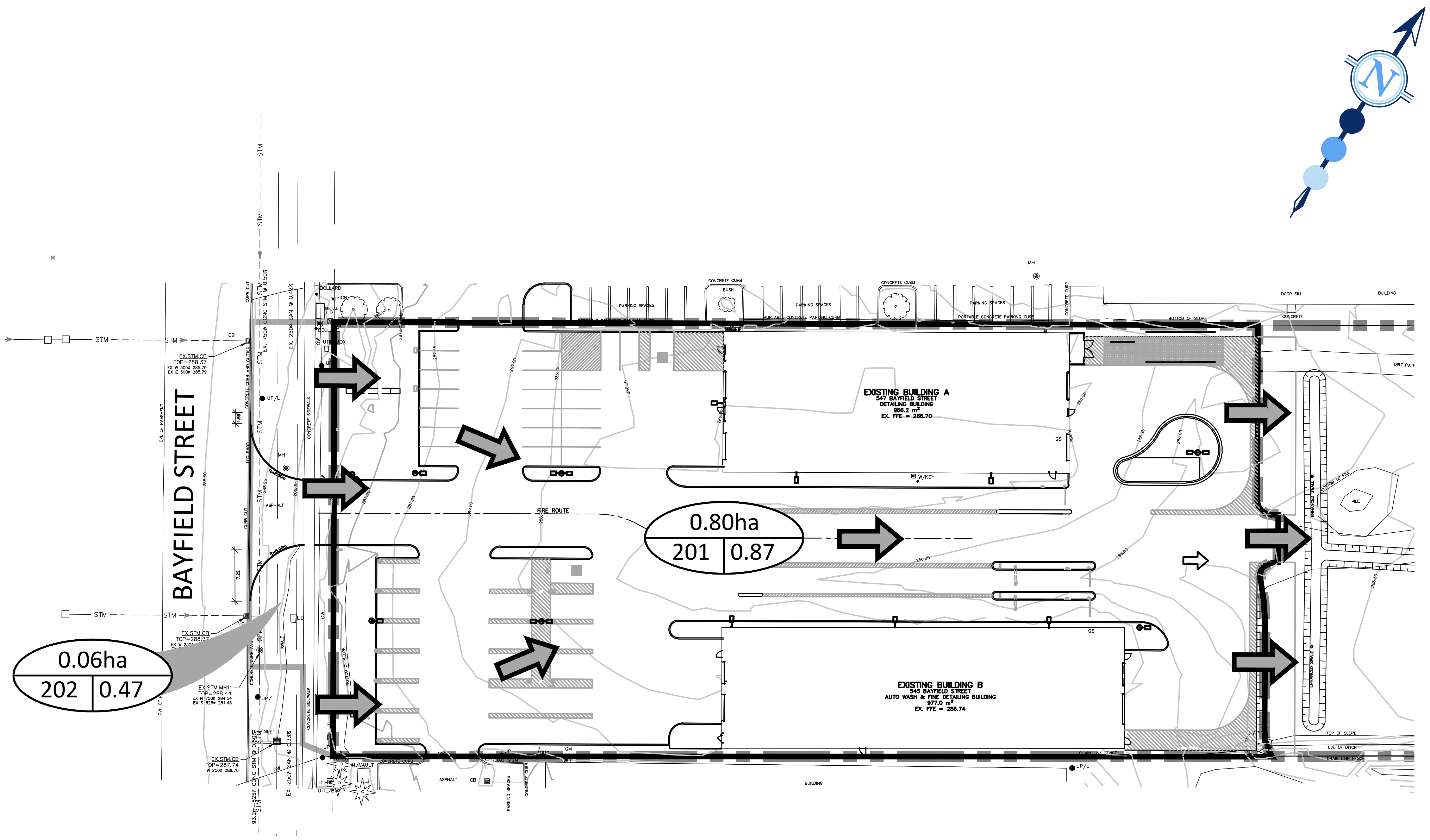
547 BAYFIELD INC.

547 BAYFIELD STREET - KLASSIC CAR WASH & DETAILING CENTRE

EXISTING STORM DRAINAGE PLAN

DESIGNED BY:	E.M.O.	CHECKED BY:	M.G.V.
SCALE:	1:750	DATE:	JUNE 2024
PROJECT No:	2700	FIGURE No:	3.1

File: P:\2700 547 Bayfield Street, Barrie\Drawings\Phase 1\Swm\Report Figures\2700P-3.1-STRM-EXST.dwg - Revised by <CYAO> : Thu, Jun 20 2024 - 9:57am



LEGEND:

▬ ▪ ▪ ▬	PROPERTY LINE
▬ ▬ ▬ ▬ ▬	LIMIT OF WORK
⇨	MAJOR SYSTEM - OVERLAND FLOW
▬	STORM DRAINAGE BOUNDARY
▬	EXTERNAL STORM DRAINAGE BOUNDARY
0.35ha	DRAINAGE AREA (HECTARES)
0.20	RUNOFF COEFFICIENT
99	CATCHMENT ID

SCS consulting group ltd

30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

547 BAYFIELD INC.

547 BAYFIELD STREET - KLASSIC CAR WASH & DETAILING CENTRE

PROPOSED STORM DRAINAGE PLAN

DESIGNED BY:	E.M.O.	CHECKED BY:	M.G.V.
SCALE:	1:750	DATE:	JUNE 2024
PROJECT No:	2700	FIGURE No:	3.2

File: P:\2700 547 Bayfield Street, Barrie\Drawings\Phase 1\Swm\Report Figures\2700P-3.2-STRM-PROP.dwg - Revised by <CYAO> : Thu, Jun 20 2024 - 9:59am

Appendix A Site Plan

10	-	-	7	-	-	4	-	-	1	01-15-2023	UPDATED SITE PLAN
11	-	-	8	-	-	5	-	-	2	01-30-2023	UPDATED RECLAIM TANKS + PIPING
12	-	-	9	-	-	6	-	-	3	04-25-2024	UPDATED RECLAIM TANKS + PIPING

REVISIONS

THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR CHECKING AND VERIFING ALL DIMENSIONS INCLUDING DATUM ELEVATIONS SHOWN ON ARCHITECTURAL DRAWINGS WITH STRUCTURAL, MECHANICAL, ELECTRICAL AND SITE SERVICE DRAWINGS AND REPORT ANY ERRORS OR OMMISSIONS TO BICORP DESIGN GROUP LTD. [B.D.G.] BEFORE COMMENCING THE WORK.

ALL WORK MUST CONFORM TO THE LATEST LOCAL BUILDING CODE, LOCAL RULES AND REGULATIONS OF LOCAL CODES AND AUTHORITIES HAVING JURISDICTION.

DRAWINGS MUST NOT BE SCALED

BICORP DESIGN GROUP LTD.
1235 FAIRVIEW STREET, SUITE 290, BURLINGTON, ONTARIO L7S 2K9
TEL: 416-705-9526
bicorpdesign@gmail.com

KLASSIC
CAR WASH
BARRIE ONTARIO

PROJECT:
KLASSIC CAR WASH - DETAILING CENTRE
547 BAYFIELD STREET
BARRIE, ONTARIO

TITLE:
SITE PLAN

DRAWN BY:
CHECKED BY:
APPROVED BY:
SCALE: 1:200
DATE: JUNE 2022
PRINTED: 10-16-2022
BLOCK: -
AREA:
DRAWING NO: A1
PROJECT NO:

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS
2. ALL SHRUBS SHALL BE CONTAINED IN A CONTINUOUS PLANTING BED, UNLESS OTHERWISE DIRECTED.
3. ALL DECIDUOUS OR CONIFEROUS SHRUBS TALLER THAN 1500mm SHALL BE STAKED WITH A MINIMUM OF ONE T-BAR 2400mm LONG. T-BAR TO BE PAINTED BLACK. SHALL NOT TOUCH OR PIERCE ROOT BALL.
4. MAINTAIN ORIGINAL GRADE AT SHRUB BASE OR SET SIGHTLY HIGHER (50mm) TO ALLOW FOR SETTLEMENT. FOR LARGE SHRUBS NOT IN PLANTING BED, FORM SAUCER AROUND ROOT BALL WITH PLANTING SOIL.
5. REMOVE ALL NURSERY TABS, PLASTIC OR METAL IMMEDIATELY FOLLOWING INSPECTION AND ACCEPTANCE BY CITY.

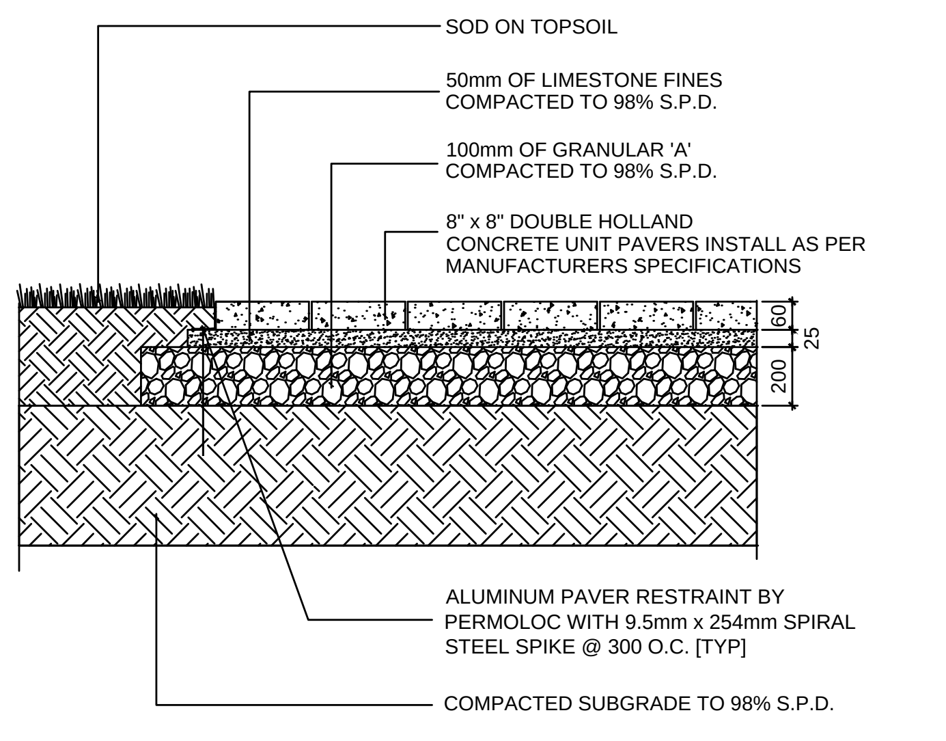
ROCKERY NOTES:

PLACE THIRTEEN [13] CUBICAL ARMOUR STONE BOULDERS
APPROXIMATE SIZE: 1M WIDE x 1.4M TO 1.8M LONG x 0.4M TO 0.6M HIGHT

STONES TO BE INSERTED APPROX 0.1M INTO PROPOSED GRADE C/W LEVEL TOPS.

PROVIDE FOR A BROAD RANGE OF PIECES IN ORDER TO CONSTRUCT A RANDOM NATURAL AFFECT.

PLACE A CONTINUOUS & OVERLAPPING SINGLE LAYER OF TERRAFIX 270R FABRIC UNDER ARMOUR STONE BOULDERS AND ALSO STONE MULCH.



NOTE:

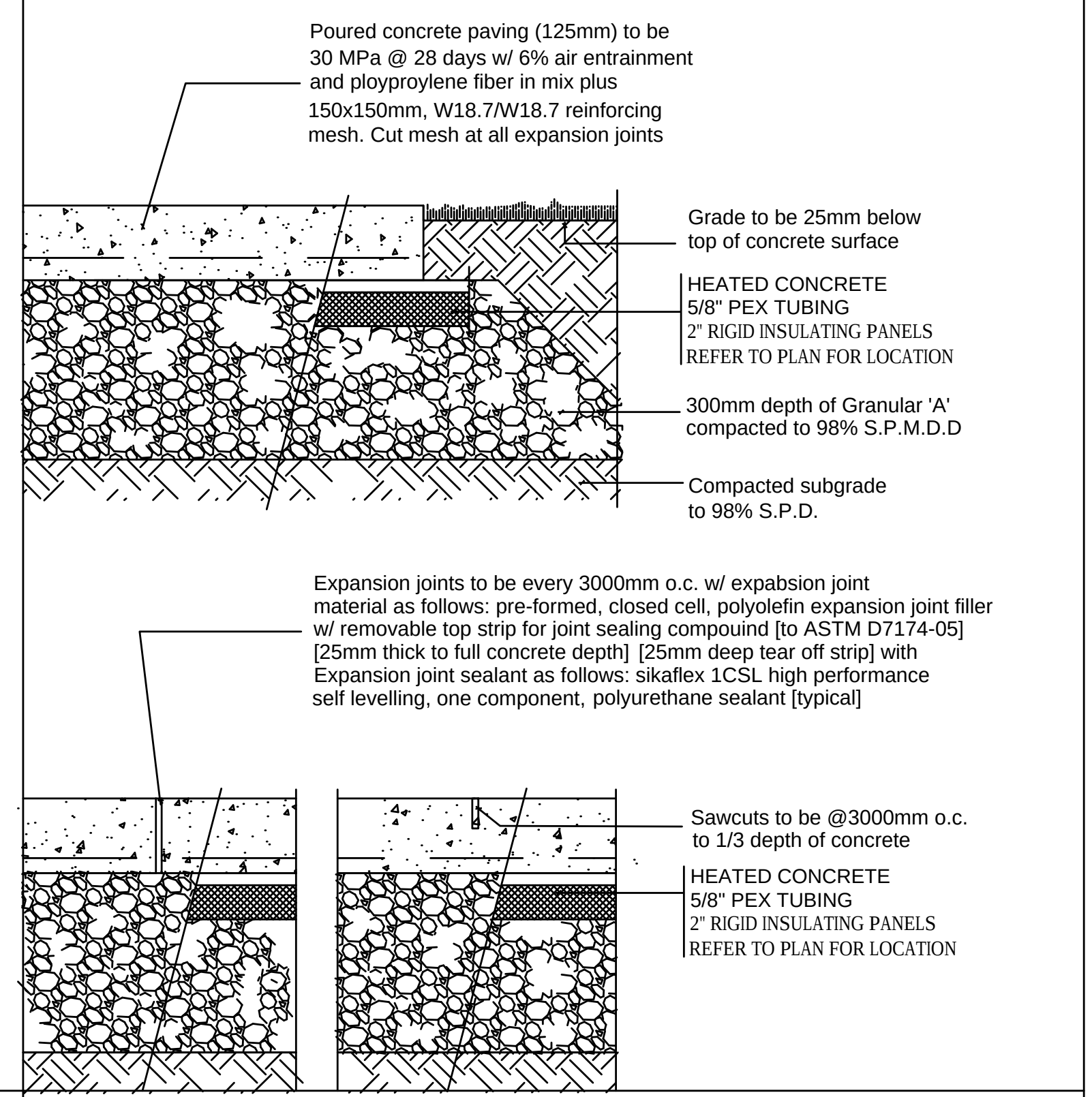
1. ENSURE THAT ALL ORGANIC MATTER IS REMOVED FROM THE EXCAVATED WALKWAY PRIOR TO PLACING LIMESTONE FINES.
2. PROVIDE GEOTEXTILE MEMBRANE ONLY IN AREAS WHERE BASE MATERIALS MAY BE IN CONTACT WITH CLAY OR DEEP LOAM SOILS.
3. REFER TO SPECIFICATIONS FOR PAVER COLOUR, PATTERN, SIZE AND MANUFACTURER.

4. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

STANDARD UNIT PAVING

SCALE: N.T.S.

4
L1

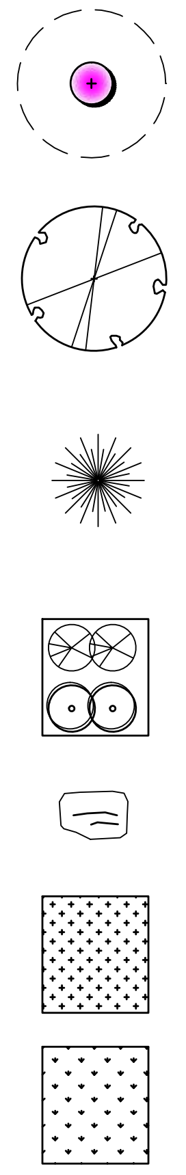


CONCRETE WALKWAY

SCALE: N.T.S.

4
L1

LEGEND



STANDARD PLANTING NOTES:

1. ALL SOD SHALL BE TURFGRASS NURSERY SOD CONFORMING TO THE LATEST EDITION OF THE CANADIAN NURSERY SOD GROWERS SPECIFICATIONS.
2. ALL TREES SHALL BE OPEN-GROWN FOR WIND-FIRMNESS.TREES SHALL NOT BE LEANING OR HAVE SIGNIFICANT SWEEP, CROOK OR BEND. DECIDUOUS TREES SHALL HAVE APPROXIMATELY TWO-THIRDS OF ITS TOTAL HEIGHT IN LIVING BRANCHES. ALL TREES SHALL HAVE GOOD CROWN SHAPE CHARACTERISTIC OF THEIR SPECIES. TREES SHALL HAVE A SINGLE DOMINANT LEADER WITH NO SIDE BRANCHES TALLER/LONGER THAN THE MAIN LEADER.
3. ALL TREES SHALL BE ENTIRELY FREE OF BARK DAMAGE AND FREE FROM PEST SIGNS AND SYMPTOMS, AND SHALL SHOW VIGOROUS GROWTH FOR AT LEAST THE LAST TWO GROWING SEASONS.
4. IF REQUIRED, TREES SHALL BE PROPERLY TARGET PRUNED [NEVER CUT, TRIMMED, ROUNDED-OVER, HEDGED, TIPPED OR TOPPED] AND DEAD/DAMAGED BRANCHES SHALL BE CO-DOMINANT LEADERS, AND BRANCHES GROWING UPWARD INSIDE THE CROWN SHALL BE PROPERLY PRUNED. TREES SHALL NOT BE TREATED AT ANY TIME WITH WOUND PAINT.
5. ALL TREES SHALL HAVE ROOT BALL SIZES THAT MEET OR EXCEED NURSERY STANDARDS. ROOT BALLS SHALL BE FIRM AND STRUCTURALLY INTEGRAL WITH THE TRUCK.
6. DO NOT FERTILIZE SPRING-PLANTED TREES AT TIME OF PLANTING. FERTILIZE IN LATE FALL AFTER LEAF ABSCISSION.
7. LANDSCAPE CONTRACTOR SHALL WARRANTY ALL PLANTING MATERIAL AND WORKMANSHIP FOR PERIOD OF 12 MONTHS.
8. REPAIR ALL DISTURBED AREA AROUND THE MULCH SAUCER WITH TOPSOIL AND SOD.
9. BACKFILL PLANTING SOIL SHALL BE NATIVE TOPSOIL, WELL AERATED AND PULVERIZED AND FREE OF DEBRIS AND CONTAMINANTS. WHERE SOIL CONDITIONS AREA EXCESSIVELY POOR, BACKFILL SOIL SHALL BE IMPORTED SANDY LOAM TOPSOIL TO APPROVAL OF THE TOWN. BACKFILL PLANTING SOIL SHALL BE AMENDED WITH WELL-ROTTED MANURE OR COMPOST AT A RATIO OD 4:1 SOIL TO MANURE/COMPOST AND SHALL BE WELL MIXED TO ENSURE UNIFORM CONSISTENCY. ADD FERTILIZERS AS PER SOIL TEST RECOMMENDATIONS. INSTALL BACKFILL PLANTING SOIL IN LAYERS AND CONCURRENTLY TAMP AND WATER TO ELIMINATE POCKETS.
10. TREES SHALL BE STRAIGHTENED IN THE PITS DURING BACKFILLING AND PRIOR TO STACKING. DO NOT DRIVE STACKS THROUGH ROOT BALL. ENSURE STAKES EXTEND A MIN. OF 300MM BELOW ROOT BALL.
11. COMPLETELY REMOVE ALL ROPES, BURLAP AND/OR WIRE BASKET FROM THE TOP HALF OF THE ROOT BALL PRIOR TO TOPPING PLANTING PIT AND MULCHING.
12. MULCH SHALL BE SHREDDED CONIFEROUS BARK MULCH PLACED TO 75mm DEPTH. ENSURE THAT MULCH IS KEPT CLEAR OF TRUNK FLARE FOR A MIN. DISTANCE OF 150mm. DO NOT PILE MULCH AROUND THE TRUCK. CONSTRUCT PERIMETER MULCH SAUCER 75 - 100mm DEPTH BEYOND EDGE OF ROOT BALL.
13. CONSTRUCT PLANTING PITS TO A MINIMUM WIDTH OF 2.5 TIMES THE DIAMETER OF THE ROOT BALL AND TO A DEPTH TO ALLOW THE TOP OF THE ROOT BALL TO EXTEND 100 - 150mm ABOVE ORIGINAL GRADE FOR POORLY DRAINED SOILS AND 50 - 75mm ABOVE ORIGINAL GRADE FOR WELL-DRAINMED SOIL. DO NOT OVER EXCAVATE PLANTING PIT DEPTH. ENSURE ROOF BALL IS SUPPORTED BY FIRM, UNDISTURBED SOIL. SIDES OF THE PIT SHALL BE SLOPED [NOT VERTICAL] AS PER DETAIL TO ENCOURAGE HORIZONTAL ROOT GROWTH. GLAZED SIDES AND BOTTOM OF PIT SHALL BE SCARIFIED AND LOOSENED PRIOR TO PLANTING.

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	NUM	SIZE	COND
TREES					
AF	ACER X 'FREEMANII'	AUTUMN BLAZE MAPLE	2	60mm CAL	WB
QR	QUERUS RIBRA	RED OAK	2	60mm CAL	WB
GT	GLEDITSIA TRICANTHUS VAR. INERMIS 'SKYLINE'	SKYLINE HONEY LOCUST	4	60mm CAL	WB
PP	PICEA PUNGENS	COLORADO BLUE SPRUCE	3	240cm HT	WB
JS	JUNIPERUS SCOPULORUM	BLUE HAVEN JUNIPER	3	150cm HT	WB
SHRUBS					
SG	SPIREA X BUMALDA 'GOLDFLAME'	GOLDFLAME SPIREA	14	60CM HT	
BA	SPIREA JAPONICA 'ANTHONY WATERER'	ANTHONY WATERER SPIREA	44	60CM HT	
HS	HEMEROCALLIS 'MINI STELLA'	STELLA D'ORO DAYLILY	36	50CM HT	
GRASSES					
CA	SALVIA NEMOROSA 'MAY NIGHT'	MAY NIGHT MEADOW SAGE	32	2 YR CONTAINER GROWN	
DA	CALAMAGROSTIS 'KARL FOERSTER'	FEATHER REED GRASS	40	15CM POT	
DB	PENNISETUM ALOPECUROIDES 'HAMELN'	DWARF FOUNTAIN GRASS	8	15CM POT	

NOTE:
CONTRACTOR SHALL CONFIRM THAT ALL QUANTITIES SHOWN ON THE PLANT LIST CONFORM WITH THE PLANS.
THE QUANTITIES SHOWN ON THE PLAN SUPERSEDE THE TOTALS OF THE LIST.
REPORT ANY DISCREPANCIES TO THE LANDSCAPE ARCHITECT.

TREE PRESERVATION

Tree Map Number	Species	Botanical	DBH (cm) @ 1.4 m	Tree Ownership	DripLine Tree Protection Distance (m)	Health	Structure	Overall Condition	CrownWidth(m)	Deadwood(%)
1	Scotch Pine	Pinus sylvestris	40	Neighbor	4.0	G	G	G	8	5
2	Scotch Pine	Pinus sylvestris	30	Neighbor	4.0	G	G	G	6	10

G: GOOD CONDITION F: FAIR CONDITION P: POOR CONDITION

SITE PLAN

SCALE: 1:200

1
L1

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

REVISIONS

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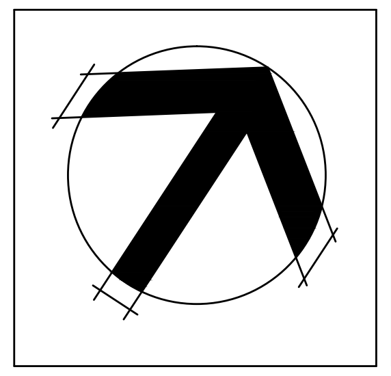
DRAWINGS MUST NOT BE SCALED

PASK LANDSCAPE ARCHITECTS LTD.

17 GWENDOLEN AVE. NORTH YORK
ONTARIO, M2N 1A1

TEL: 416-399-1553

email: pasklandscape@gmail.com



BICORP

BICORP DESIGN GROUP LTD.

1235 FAIRVIEW STREET, SUITE 290, BURLINGTON, ONTARIO L7S 2K9

TEL: 416-705-9526
bicorpdesign@gmail.com

KLASSIC
CAR WASH
BARRIE ONTARIO

PROJECT:
KLASSIC CAR WASH - DETAILING CENTRE

547 BAYFIELD STREET
BARRIE, ONTARIO

TITLE:
SITE LANDSCAPE & TREE MANAGEMENT PLAN

DRAWN BY:	CHECKED BY:	APPROVED BY:
SCALE: 1:200	DATE: JUNE 2022	PRINTED: 05-03-2024

BLOCK: -

AREA:

DRAWING NO:
L1

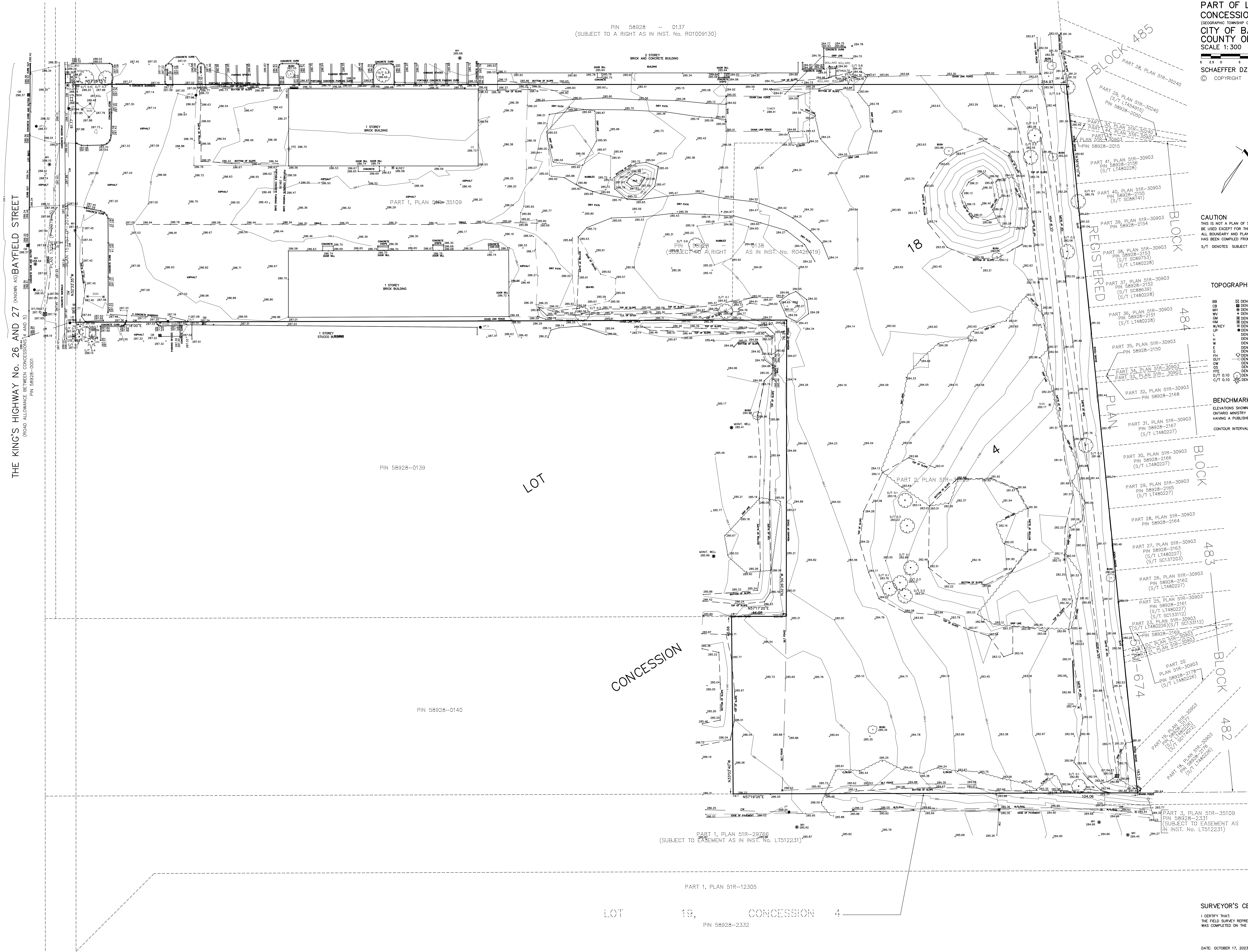
PROJECT NO: 2022-09

# Appendix B	Excerpts from Background Reports

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

TOPOGRAPHIC PLAN OF
PART OF LOT 18
CONCESSION 4
(GEOGRAPHIC TOWNSHIP OF VESPRA)
CITY OF BARRIE
COUNTY OF SIMCOE
SCALE 1:300

SCHAEFFER DZALDOV PURCELL LTD.



CAUTION
THIS IS NOT A PLAN OF SURVEY OF THE BOUNDARY AND SHALL NOT BE USED EXCEPT FOR THE PURPOSE INDICATED IN THE TITLE BLOCK. ALL BOUNDARY AND PLAN INFORMATION SHOWN ON THIS TOPOGRAPHIC PLAN HAS BEEN COMPILED FROM THE REGISTRY OFFICE RECORDS.

S/T DENOTES SUBJECT TO A RIGHT-TO-ENTER AS IN INST. No.

TOPOGRAPHIC NOTES

BB	☒ DENOTES	BELL BOX
CB	▤ DENOTES	CATCH BASIN
MH	◎ DENOTES	MANHOLE
WV	◉ DENOTES	WATER VALVE
GM	▣ DENOTES	GAS METER
HM	▣ DENOTES	HYDRO METER
W/KEY	▣ DENOTES	WATER KEY
UP	● DENOTES	UTILITY POLE
L	DENOTES	LIGHT
H	DENOTES	HYDRO
W	DENOTES	WOOD
E	DENOTES	EDGE
G	DENOTES	GUARD
FH	DENOTES	FIRE HYDRANT
GUY	—○ DENOTES	GUY WIRE/POLE
OW	DENOTES	OVERHEAD WIRES
GS	DENOTES	GARAGE SILL
FFE	DENOTES	FINISHED FLOOR ELEVATION AT LOCATION NOTED ONLY
D/T 0.10	DENOTES	DECIDUOUS TREE 0.10m dia.
C/T 0.10	DENOTES	CONIFEROUS TREE 0.10m dia.

BENCHMARK
ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE REFERRED TO ONTARIO MINISTRY OF NATURAL RESOURCES AND FORESTRY CONTROL No. 03120080033 HAVING A PUBLISHED ELEVATION OF 277.889 METRES (CGVD28:78)

CONTOUR INTERVAL 0.50m

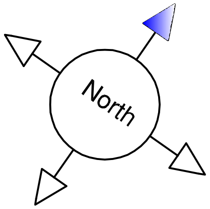
SURVEYOR'S CERTIFICATE
I CERTIFY THAT:
THE FIELD SURVEY REPRESENTED ON THIS TOPOGRAPHIC PLAN WAS COMPLETED ON THE 27th DAY OF SEPTEMBER, 2023.

DATE: OCTOBER 17, 2023.

DAN DZALDOV
ONTARIO LAND SURVEYOR

SCHAEFFER DZALDOV PURCELL LTD.
ONTARIO LAND SURVEYORS
64 JARDIN DRIVE CONCORD, ONTARIO L4K 3P3 TEL.(416)-987-0101
DRAWN: SAMI/LW CHECKED LEGAL JZ SCALE 1 : 300 JOB No. 23-395-00
PLOT SIZE: 36X48 OCTOBER 17, 2023

City of Barrie Municipal Works
Indust./Comm. Water Service Drawing



Address: 547 Bayfield St

Domestic Service Size/Type: 50mm Copper

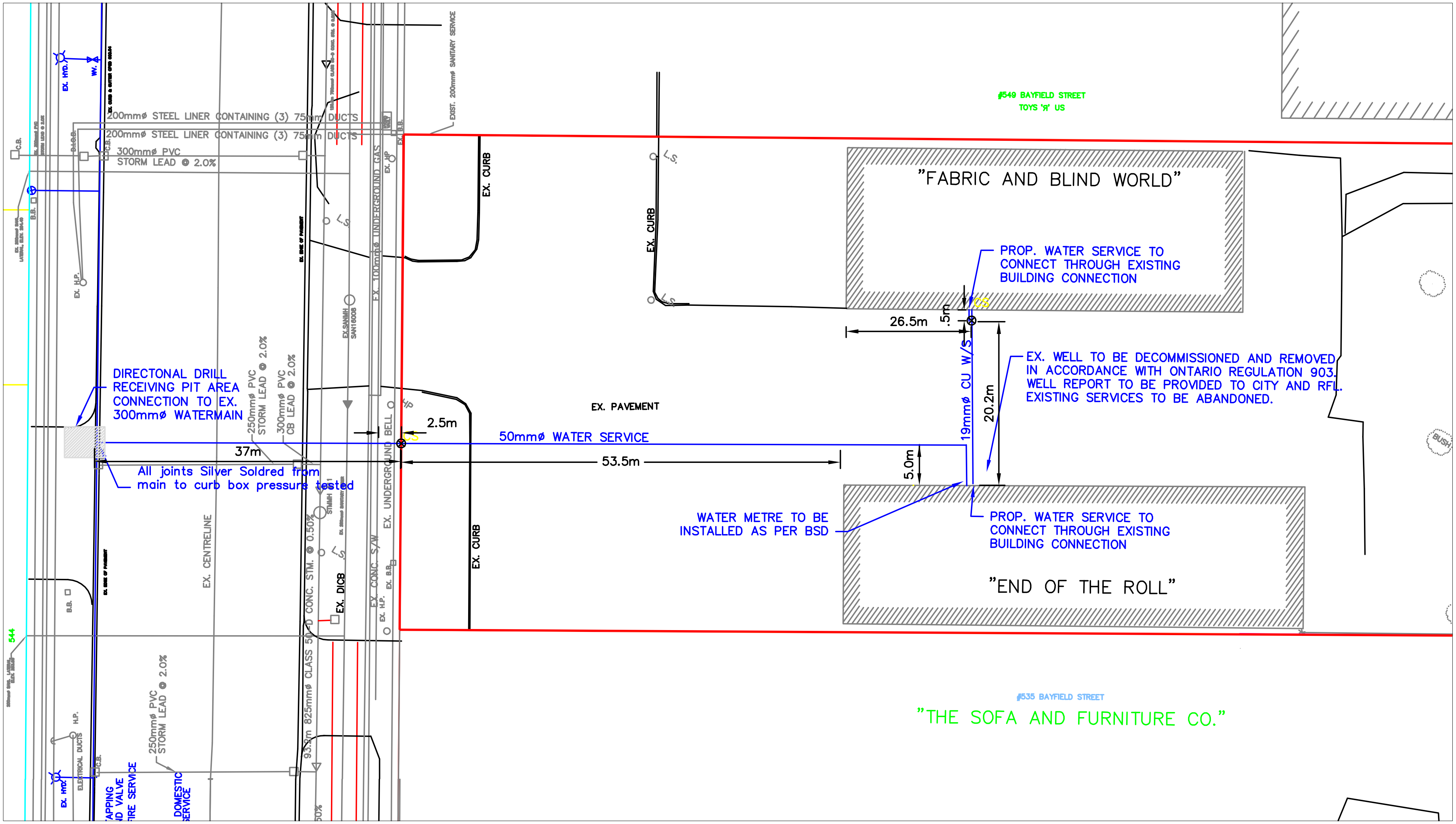
Watermain Size/Type: 300mm DI

Drawn By: Denise Morris

Fire Service Size/Type

Private Hydrant

Installed Date: Nov 27/07



Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE 100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	MUSKOKA	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 721-7863	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 721-7864	FAX: (905) 542-2769

April 4, 2024

Reference No. 2402-S095

547 Bayfield Inc.
1501 Creditstone Road
Concord, Ontario
L4K 5V6

Attention: Mr. Alex Sirizzotti

Re: Geotechnical Investigation for
Proposed Car Wash Facility
547 Bayfield Street
City of Barrie

Dear Sir:

In accordance with your written authorization dated February 22, 2024, a geotechnical investigation was carried for the captioned site and we herein present our findings and recommendations.

SITE AND PROJECT DESCRIPTION

The investigated property is located on the east side of Bayfield Street, approximately 100 m south of Hanmer Street East, having a municipal address of 547 Bayfield Street, City of Barrie. At the time of investigation, the site consists of two commercial buildings with access road to Bayfield Street and an on-grade parking lot. The balance of the site is open.

It is understood that the existing commercial buildings will remain on site and will be developed into a car wash facility with construction of underground water storage tank and municipal services.

FIELD WORK

The field work, consisting of 2 boreholes to a depth of 4.8 m, was performed on March 15, 2024, at the locations shown on the enclosed Borehole and Monitoring Well Location Plan, Drawing No. 1.

The boreholes were advanced at intervals to the sampling depths by a truck-mounted machine using solid stem augers and equipped with a split spoon sampler for soil sampling. Standard Penetration Tests, using the procedures described on the enclosed “List of Abbreviations and Terms”, were performed at the sampling depths. The test results are recorded as the Standard Penetration Resistance (or ‘N’ values) of the subsoil. The relative density of the non-cohesive strata and the consistency of the cohesive strata are inferred from the ‘N’ values. Split-spoon samples were recovered for soil classification and laboratory testing. The field work was supervised and the findings were recorded by a Geotechnical Technician.

Upon completion of drilling and sampling, two (2) monitoring wells were installed in boreholes to facilitate a hydrogeological assessment, which will be presented under separate cover. Details of the monitoring wells are shown on the corresponding Borehole Logs.

The ground elevation of each borehole location was obtained using a handheld Global Navigation Satellite System (GNSS) device.

SUBSURFACE SOIL CONDITIONS

The investigation has disclosed that beneath the pavement structure and a layer of earth fill in places, the site is generally underlain by a stratum of silty sand till.

Detailed descriptions of the encountered subsurface conditions are presented on the enclosed Borehole Logs, comprising Figures 1 and 2, and the revealed stratigraphy is plotted on the Subsurface Profile, Drawing No. 2. The engineering properties of the disclosed soils are discussed herein.

Pavement Structure

Boreholes 1 and 2 were carried out on the asphalt pavement, which consists of a layer of asphalt, approximately 51 mm in thickness, overlying a layer of granular fill, approximately 100 mm in thickness.

Grain size analyses were performed on two (2) granular fill samples; the results are plotted on Figure 3. The samples indicate the granular fill fails to meet the OPSS gradation requirement for Granular ‘A’ or Granular ‘B’, due to excessive fine particles by weight.

Earth Fill

A layer of earth fill, extending to depths of 0.8 m and 1.4 m below the existing grade was encountered in Boreholes 1 and 2, respectively. The fill is dark brown in color and consists of sandy silt with gravel with occasional topsoil inclusions.

The recorded 'N' values range from 5 to 14 blows per 30 cm of penetration. The natural water content values of the fill sample range between 13% and 14% indicating the fill is in moist conditions.

One must be aware that the samples retrieved from the boreholes may not be truly representative of the geotechnical and environmental quality of the fill, and do not indicate the presence of topsoil. This should be further assessed by laboratory testing and/or test pits.

Silty Sand Till

The native silty sand till deposit predominates the soil stratigraphy within the investigated depth of all boreholes. The tills consist of a mixture of clay and gravel, with silt and sand being the dominant fraction. Grain size analysis was performed on 2 representative samples of silty sand till; the results are plotted on Figure 4.

The recorded 'N' values range from 15 to over 50, with a median over 50 blows per 30 cm of penetration, indicating the silty sand till is compact to very dense, being generally very dense in relative density.

The natural water content values range from 6% to 15%, with a median of 7%, indicating that the tills are damp to moist, generally in a moist condition.

The engineering properties of the till deposit are given below:

- High frost susceptibility and low water erodibility.
- The tills will be relatively stable in steep excavation; however, prolonged exposure may lead to localized sloughing.

Compaction Characteristics of the Revealed Soils

The obtainable degree of compaction is primarily dependent on the soil moisture and, to a lesser extent, on the type of compactor used and the effort applied. As a general guide, the typical water content values of the revealed soils for Standard Proctor compaction are presented in Table below.

Soil Type	Determined Natural Water Content (%)	Water Content (%) for Standard Proctor Compaction	
		100% (optimum)	Range for 95% or +
Earth Fill	5 to 14 (median 12)	12	6 to 15
Silty Sand Till	6 to 15 (median 7)	11	5 to 16

GROUNDWATER CONDITIONS

The boreholes remained dry upon completion of drilling and the monitoring wells remained dry on March 22, 2024, approximately 1 week after the monitoring well installation.

DISCUSSION AND RECOMMENDATIONS

The investigation has disclosed that beneath the pavement structure and a layer of earth fill in Boreholes 1 and 2, the site is generally underlain by a stratum of silty sand till. All boreholes remained dry upon completion and in the monitoring wells 1 week after the monitoring well installation.

It is understood that the existing commercial buildings will remain on site and the property will be developed into a car wash facility with underground water storage tank and underground services. The geotechnical findings which warrant special consideration are presented below:

1. The existing asphalt can be pulverized and reused on site as the granular sub-base or it can be removed off-site.
2. The granular fill is suitable for use as structural backfill for the pipe bedding or as selected subgrade material.
3. The existing earth fill and weathered soil, in their present state, are not suitable to support any structure sensitive to movement. It can be subexcavated, sorted free of concentrated topsoil inclusions, if any, and recompacted in layers according to engineered fill requirements. In addition, where additional earth filling is required for site grading, an engineered fill can be used.
4. A Class ‘B’ bedding, consisting of compacted 19-mm Crusher-Run Limestone (CRL) or equivalent, is recommended for the construction of underground services. The service pipes must consist of leak-proof joints, or the joints must be wrapped with a waterproof membrane.
5. The final subgrade should be graded towards the catch basins or subdrains to remove any subsurface water percolated through the pavement structure.

The recommendations appropriate for the project are presented herein. One must be aware that the subsurface conditions may vary. Should this become apparent during construction, a geotechnical engineer must be consulted to determine whether the following recommendations require revision.

Underground Tanks for Car Wash Facility

A series of underground tanks are proposed for the car wash facility. At the time of the report preparation, the depth and invert of the tanks are not known.

Based on the borehole finding, the appropriate bearing pressure for the tanks are provided below:

- Maximum Soil Bearing Pressure at Serviceability Limit State (SLS) = 150 kPa
- Factored Ultimate Bearing Pressure at Ultimate Limit State (ULS) = 225 kPa

If the tanks lie below the recorded groundwater level within the property, it must be designed to resist any hydrostatic uplift or buoyancy effect. This can be further reviewed when the design of the tanks is available.

The installation of the tanks must follow the manufacturer's specification to avoid any damages and they must be designed for the surcharge loading. In addition, the fill material above the tank system should consist of inorganic soils, properly compacted to at least 98% of the maximum Standard Proctor Dry Density.

Underground Services

The subgrade for underground services should consist of native soil or compacted inorganic earth fill. Where weathered or soft soils are encountered, these materials must be subexcavated and replaced with properly compacted bedding material.

A Class 'B' bedding, consisting of compacted 19-mm CRL, is recommended for the construction of the underground services. The joints connecting into manholes and catch basins should be leak-proof or wrapped with an appropriate waterproof membrane to prevent subgrade migration.

In order to prevent pipe floatation when the sewer trench is deluged with water, a soil cover with a thickness equal to the diameter of the pipe should be in place at all times after completion of the pipe installation. Openings to subdrains and catch basins should be shielded with a fabric filter to prevent blockage by silting.

Backfilling in Trenches and Excavated Areas

The on site inorganic soils are suitable for use as trench backfill. The backfill soils should be sorted free of any topsoil inclusions and other deleterious material.

The backfill in service trenches and excavated areas should be compacted to at least 98% SPDD. In the zone within 1.0 m below the pavement subgrade, the backfill should be compacted with the water content at 2% to 3% drier than the optimum. This is to provide the required stiffness for pavement construction.

Narrow trenches should be cut at 2 horizontal:1 vertical, or flatter, so that the backfill can be effectively compacted. Otherwise, soil arching will prevent the achievement of proper compaction. The lift of each backfill layer should either be limited to a thickness of 20 cm, or the thickness should be determined by test strips.

In normal construction practice, the problem areas of settlement largely occur adjacent to manholes, catch basins and services crossings. It is recommended that a granular backfill should be used in the confined spaces, compacted with a light equipment.

Pavement Design

Based on the subsurface soil conditions, the recommended pavement design is presented as follows:

Course	Thickness (mm)	OPS Specifications
Asphalt Surface Course	40	HL3
Asphalt Base Course		HL8
Light Duty Parking	50	
Heavy Duty/Fire Route	70	
Granular Base	150	Granular 'A', or equivalent
Granular Sub-base		Granular 'B', or equivalent
Light Duty Parking	300	
Heavy Duty/Fire Route	450	

In preparation of pavement subgrade, any compressible material should be removed. The final subgrade must be proof-rolled and inspected. Any soft spot identified must be rectified by subexcavation and replacing with selected inorganic material, compacted to at least 98% SPDD, with the water content at 2% to 3% drier than its optimum. All the granular bases should be compacted to 100% SPDD.

The pavement subgrade will suffer a strength regression if water is allowed to saturate the mantle. Along the perimeter where runoff may drain onto the pavement, swale or an intercept subdrain system should be installed to prevent infiltrating precipitation from seeping into the granular bases (since this may inflict frost damage on the flexible pavement). At the lower spots around catch basins, subdrains consisting of filter-wrapped weepers should also be installed and they should be connected into the catch basins. The subdrains should be backfilled with free-draining granular material.

Soil Parameters

The recommended soil parameters for the project design are given in the following table.

Unit Weight and Bulk Factor	**Bulk Unit Weight (kN/m^3)**	**Estimated Bulk Factor**	
		Loose	**Compacted**
Earth Fill	20.5	1.20	0.98
Silty Sand Till	22.5	1.33	1.05

Lateral Earth Pressure Coefficients	**Active K_a**	**At Rest K_0**	**Passive K_p**
Earth Fill	0.40	0.50	2.50
Silty Sand Till	0.32	0.48	3.12

Coefficients of Friction	
Between Concrete and Granular Base	0.50
Between Concrete and Sound Native Soils/Compacted Earth Fill	0.35

Excavation

The excavation should be carried out in accordance with Ontario Regulation 213/91. The types of soils are classified below:

Material	Type
Silty Sand Till	2
Earth Fill	3

Any boulders larger than 15 cm in size are not suitable for structural backfill.

Perched water in the granular bedding or earth fill may be encountered during the wet seasons. The groundwater yield will be slow in rate and limited in quantity. It can be collected and removed by conventional pumping from sump pits.

LIMITATIONS OF REPORT

This report was prepared by Soil Engineers Ltd. for the account of 547 Bayfield Inc. and for review by their designated consultants, financial institutions and government agencies. The material in the report reflects the judgement of Penchala Harish Mannepalli, M.Eng, EIT and Kelvin Hung, P.Eng., in light of the information available to it at the time of the preparation.

Use of the report is subject to the conditions and limitations of the contractual agreement. Any use which a Third Party makes of this report, or any reliance on decisions to be made based on it, are the responsibility of such Third Party. Soil Engineers Ltd. accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

We trust this letter satisfies your present requirements; however, should any queries arise, please feel free to contact this office.

Yours truly,
SOIL ENGINEERS LTD.

Penchala Harish Mannepalli, M.Eng, EIT
PHM/KH

Kelvin Hung, P.Eng.

LICENSED PROFESSIONAL ENGINEER
4/4/24
K. W. K. HUNG
100124295
PROVINCE OF ONTARIO

ENCLOSURES

Borehole Logs	Figures 1 and 2
Grain Size Distribution Graph	Figures 3 and 4
Borehole Location Plan	Drawing No. 1
Subsurface Profile	Drawing No. 2

LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

The abbreviations and terms commonly employed on the borehole logs and figures, and in the text of the report, are as follows:

SAMPLE TYPES

AS	Auger sample
CS	Chunk sample
DO	Drive open (split spoon)
DS	Denison type sample
FS	Foil sample
RC	Rock core (with size and percentage recovery)
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

PENETRATION RESISTANCE

Standard Penetration Resistance or 'N' Value:

The number of blows of a 63.5 kg hammer falling from a height of 76 cm required to advance a 51 mm outer diameter drive open sampler 30 cm into undisturbed soil, after an initial penetration of 15 cm.

Plotted as '○'

Dynamic Cone Penetration Resistance:

A continuous profile showing the number of blows per each 30 cm of penetration of a 51 mm diameter, 90° point cone driven by a 63.5 kg hammer falling from a height of 76 cm.

Plotted as '—●—'

WH	Sampler advanced by static weight
PH	Sampler advanced by hydraulic pressure
PM	Sampler advanced by manual pressure
NP	No penetration

SOIL DESCRIPTION

Cohesionless Soils:

'N' (blows/30 cm)	Relative Density
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
>50	very dense

Cohesive Soils:

Undrained Shear Strength (kPa)	'N' (blows/30 cm)	Consistency
<12	<2	very soft
12 to <25	2 to <4	soft
25 to <50	4 to <8	firm
50 to <100	8 to <15	stiff
100 to 200	15 to 30	very stiff
>200	>30	hard

Method of Determination of Undrained Shear Strength of Cohesive Soils:

x 0.0	Field vane test in borehole; the number denotes the sensitivity to remoulding
△	Laboratory vane test

METRIC CONVERSION FACTORS

1 ft = 0.3048 m
1 inch = 25.4 mm
1 lb = 0.454 kg
1 ksf = 47.88 kPa

JOB NO.: 2402-S095

LOG OF BOREHOLE: 1

FIGURE NO.: 1

PROJECT DESCRIPTION: Proposed Car Wash Facility

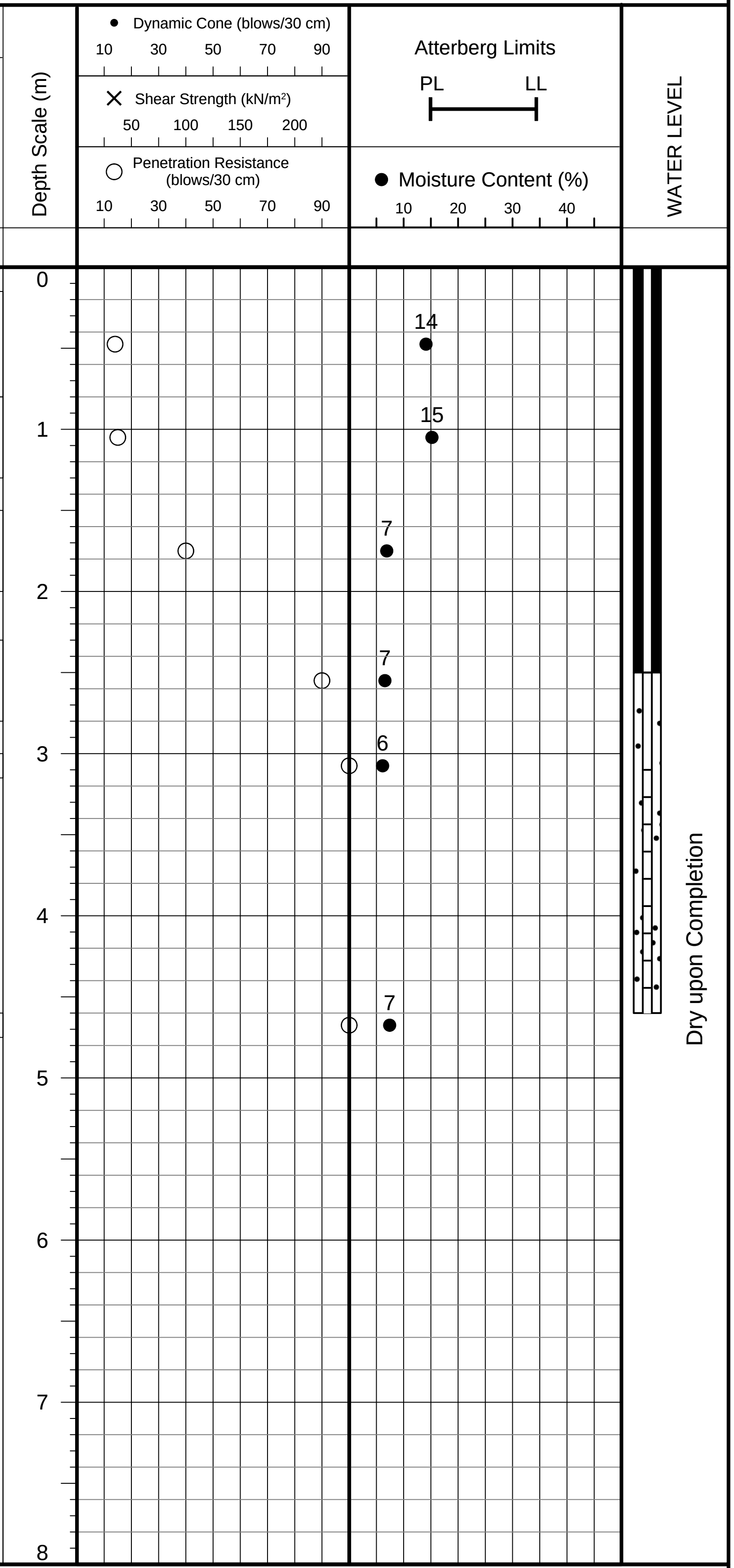
METHOD OF BORING: Soild Stem Augers

PROJECT LOCATION: 547 Bayfield Street, City of Barrie

DRILLING DATE: March 15, 2024

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES		
		Number	Type	N-Value
286.6	Pavement Surface			
0.0	**51 mm ASPHALT** **100 mm GRANULAR FILL**			
	EARTH FILL Dark brown, sandy silt with gravel	1	DO	14
285.8 0.8	some clay	2	DO	15
	Brown, compact to very dense **SILTY SAND TILL** traces of clay and gravel occ. cobbles and boulders	3	DO	40
		4	DO	90
		5	DO	50/15
		6	DO	50/15
281.9 4.8	**END OF BOREHOLE**			

Installed 50 mm Ø monitoring well to 4.6 m
completed with 1.5 m screen
Sand backfill from 2.5 m to 4.6 m
Bentonite seal from 0.0 m to 2.5 m
Provided with a flush mount casing



JOB NO.: 2402-S095

LOG OF BOREHOLE: 2

FIGURE NO.: 2

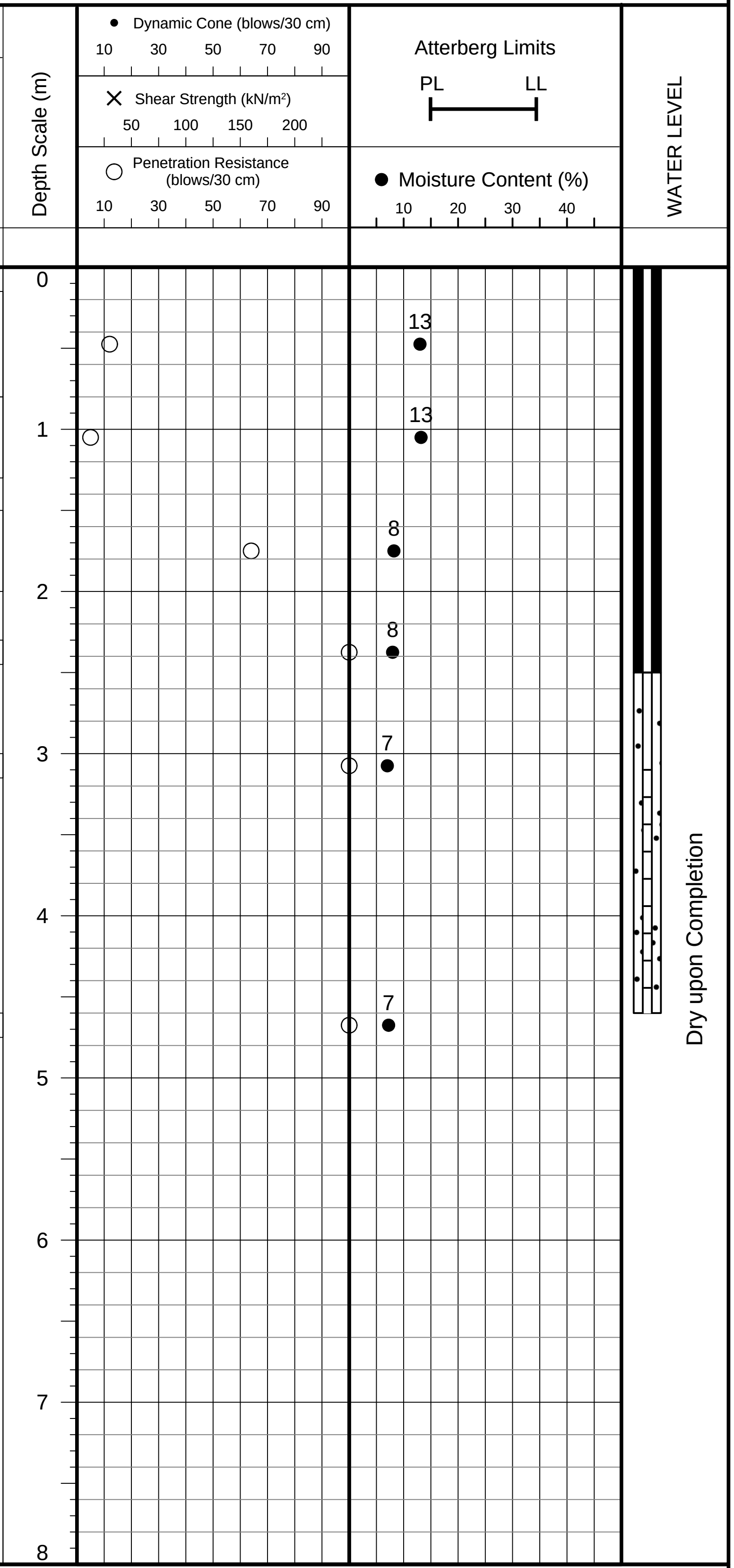
PROJECT DESCRIPTION: Proposed Car Wash Facility

METHOD OF BORING: Soild Stem Augers

PROJECT LOCATION: 547 Bayfield Street, City of Barrie

DRILLING DATE: March 15, 2024

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
286.3	Pavement Surface			
0.0	**51 mm ASPHALT** **100 mm GRANULAR FILL**			
	EARTH FILL Dark brown, sandy silt with gravel	1	DO	12
		2	DO	5
284.8 1.4	Brown, very dense **SILTY SAND TILL** traces of clay and gravel occ. cobbles and boulders	3	DO	64
		4	DO	50/15
		5	DO	50/15
		6	DO	50/15
281.6 4.8	**END OF BOREHOLE**			



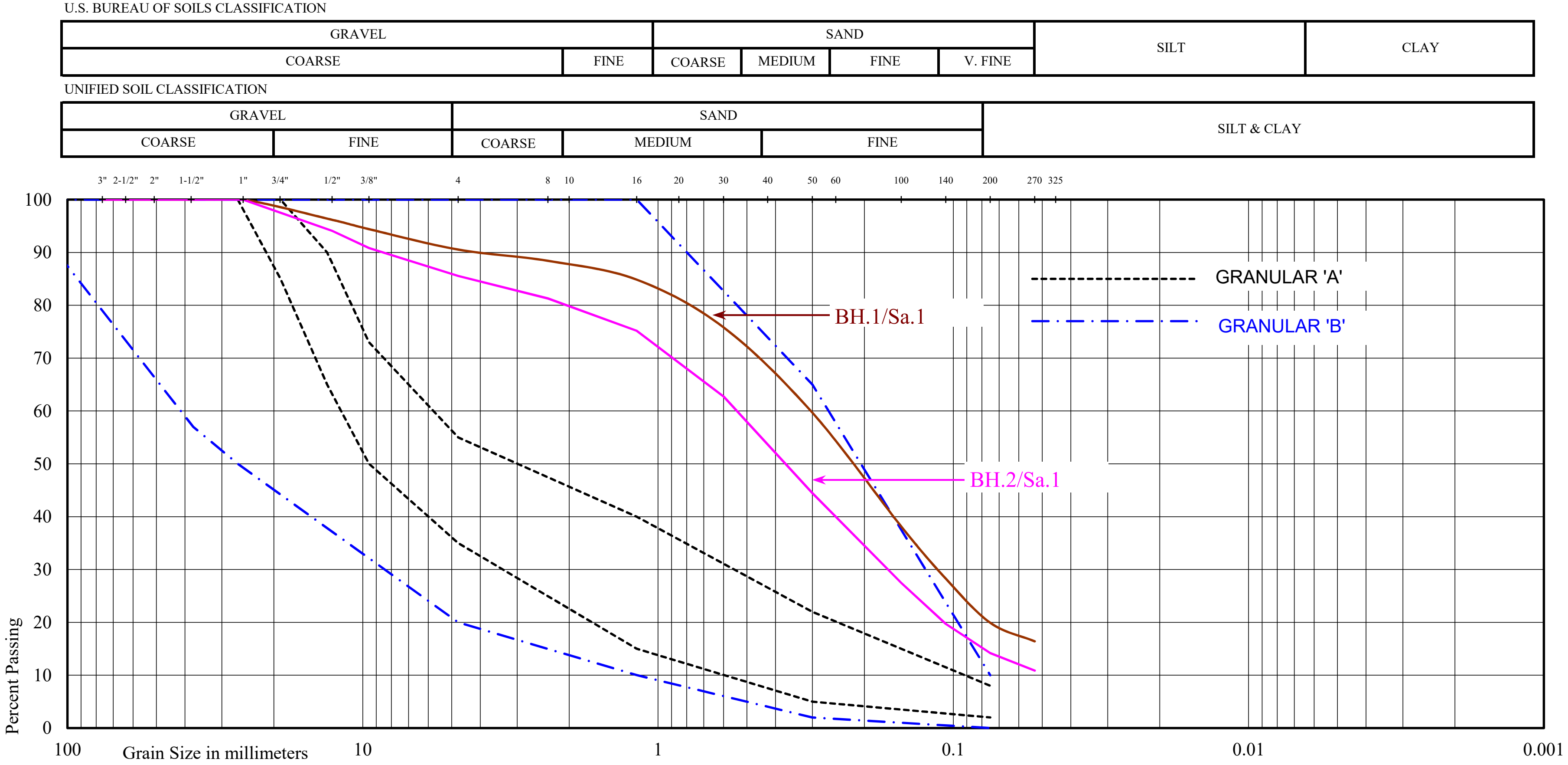
Installed 50 mm Ø monitoring well to 4.6 m
completed with 1.5 m screen
Sand backfill from 2.5 m to 4.6 m
Bentonite seal from 0.0 m to 2.5 m
Provided with a flush mount casing

Soil Engineers Ltd.

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2402-S095



Project:	Proposed Car Wash Facility	
Location:	547 Bayfield Street, City of Barrie	
Borehole No:	1	2
Sample No:	1	1
Depth (m):	0.2	0.2
Elevation (m):	286.5	286.2

BH./Sa.	1/1	2/1
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	14	13
Estimated Permeability (cm./sec.) =	10^{-3}	10^{-3}

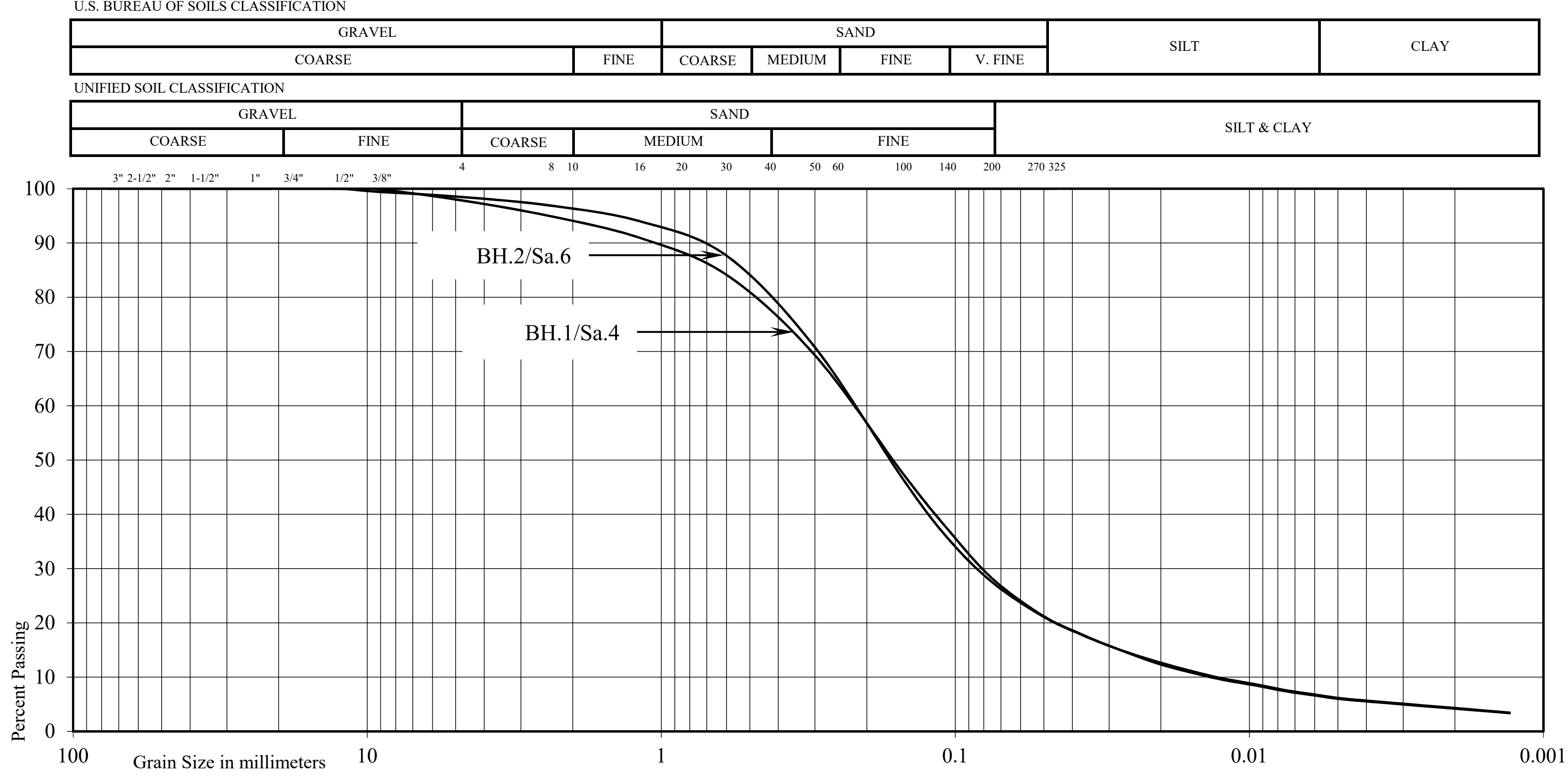
Classification of Sample [& Group Symbol]: GRANULAR FILL

Figure: 3

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2402-S095



Project: Proposed Car Wash Facility

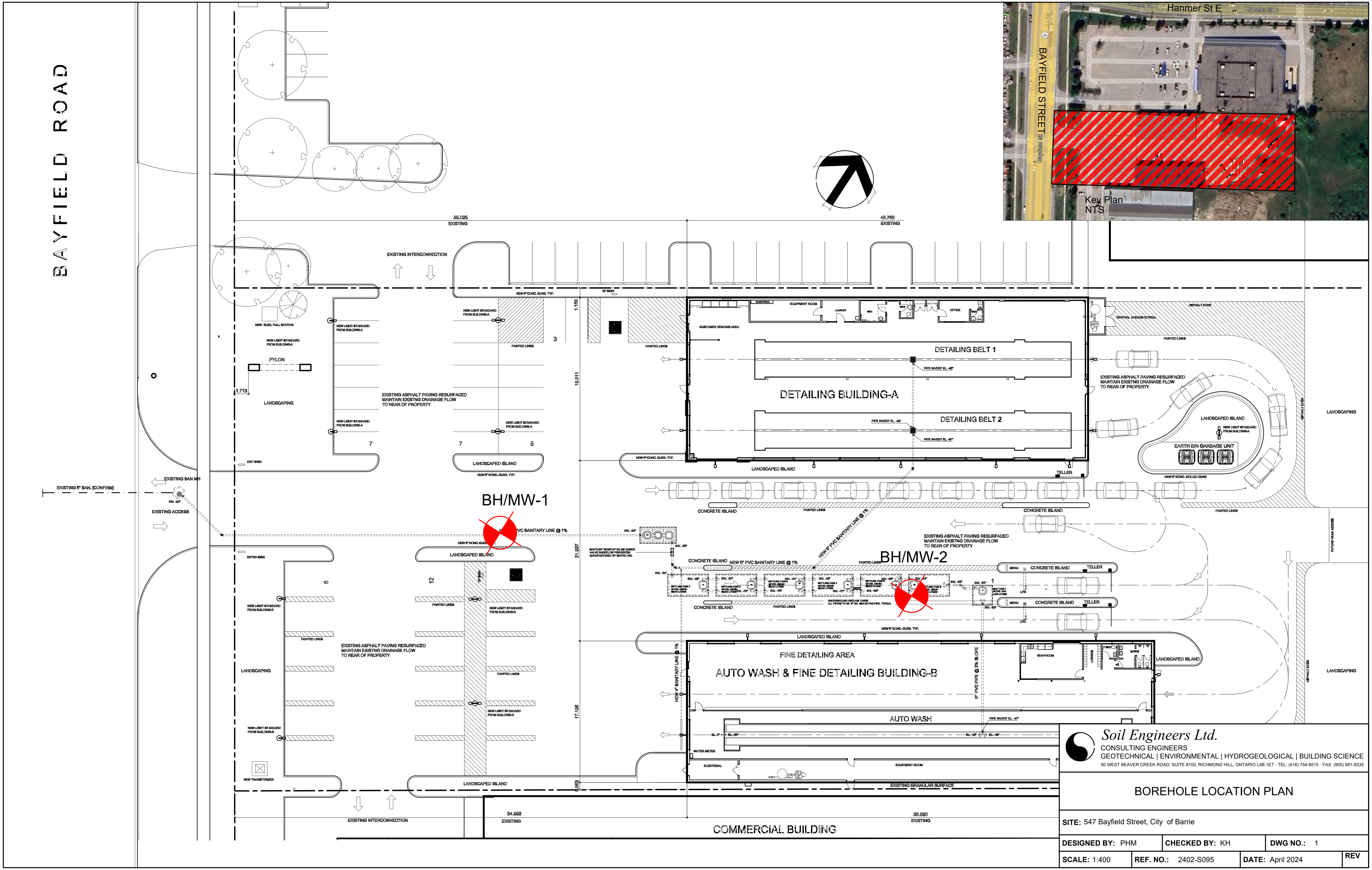
Location: 547 Bayfield Street, City of Barrie

Borehole No:	1	2
Sample No:	4	6
Depth (m):	2.3	4.6
Elevation (m):	284.3	281.7

BH./Sa.	1/4	2/6
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	7	7
Estimated Permeability (cm./sec.) =	10^{-4}	10^{-4}

Classification of Sample [& Group Symbol]: SILTY SAND TILL, traces of clay and gravel

Figure: 4



Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE #100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

BOREHOLE LOCATION PLAN

SITE: 547 Bayfield Street, City of Barrie

DESIGNED BY: PHM	**CHECKED BY:** KH	**DWG NO.:** 1	
SCALE: 1:400	**REF. NO.:** 2402-S095	**DATE:** April 2024	**REV**

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE

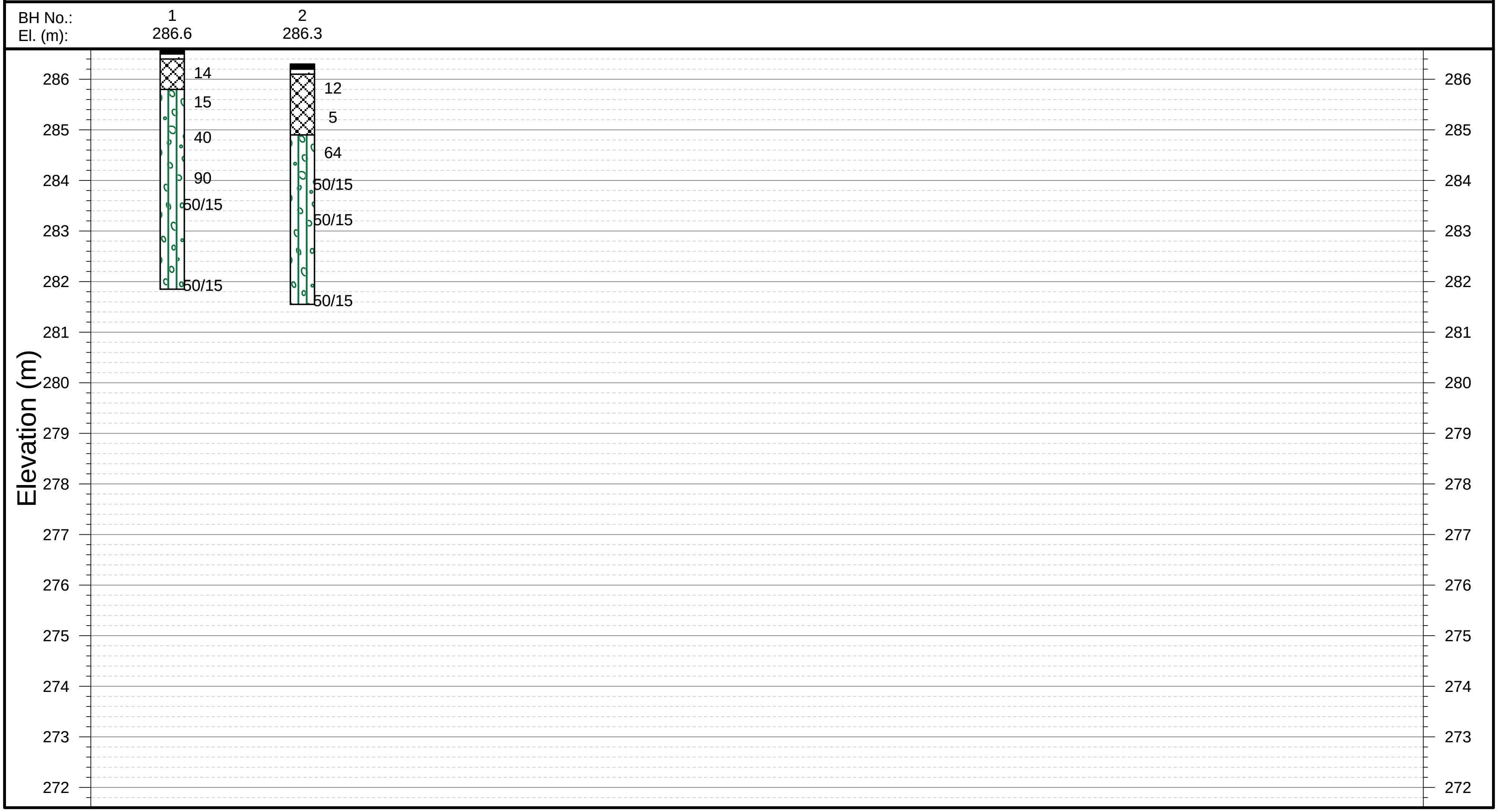
SUBSURFACE PROFILE
DRAWING NO. 2
SCALE: AS SHOWN

JOB NO.: 2402-S095
REPORT DATE: April 2024
PROJECT DESCRIPTION: Proposed Car Wash Facility

PROJECT LOCATION: 547 Bayfield Street, City of Barrie

LEGEND

■ ASPHALT ▨ FILL ⁘ GRANULAR ▥ SILTY SAND TILL



RICHARDSON ENGINEERING LTD
CONSULTING ENGINEERS

VIA COURIER

May 31, 1999

City of Barrie
Box 400
Barrie, ON L4M 4T5

Attention: Mr. Lorran Cooney

Dear Sir:

RE: East Bayfield Secondary Plan Area, Pond No. 1
Our Project 8113/DS

Further to you May 21, 1999 letter to Paul Gordon regarding cost sharing of the proposed stormwater management Pond No. 1 in the East Bayfield Secondary Plan Area we are forwarding the final designs for the facility to you for your approval.

Included in this submission are the following drawings:

8113-PD1 to –PD3, Pond Details
8113-GN, General Notes
8113-SD, Standard Details

The Stormwater Management Report has been included with electronic copies of the OTTHYMO modelling to assist you in your review.

This engineering submission has incorporated the requested modifications from the City regarding the pre and post development modelling parameters in the OTTHYMO program and allows for the uncontrolled drainage from Bayfield Street, Catchments E1 and E3A, to drain to the East Bayfield Stormwater Management Pond No. 1.

This submission is for your review and approval. If you have any questions or concerns please do not hesitate to contact the undersigned.

Yours truly,

RICHARDSON ENGINEERING LTD.

Michael Schmalz, P.Eng.

MS/bjs

CC: East Bayfield Northern Owners

Richardson Engineering Ltd.
Unit D, 4 Cedar Pointe Drive, Barrie, Ontario L4N 5R7 • Phone: 705-728-0009 • Fax: 705-727-7774 • E-mail: engineer@richardson.on.ca

RICHARDSON ENGINEERING LTD.
CONSULTING ENGINEERS

TRANSMITTAL

To: LORAN COONEY

CITY OF BARRIE

Attn.

Date: MAR 23/99
File : E113/052

Re: EAST BAYFIELD POND 1

Contract No.:

Dear Sir:

We are forwarding by ☐ mail ☑ hand delivery ☐ courier ☐ under separate cover ☐

the following ☐ prints ☐ sepias ☐ reports ☐ originals ☑ information ☐

No. of copies	Drawing No.	Rev. no.	Description
1			STORAGE / DISCHARGE INFO
1			+ STORM TABLE FOR.
			POND 1
			YOUR REDLINE OF ABOVE.

These are submitted for your:

☑ information/use ☐ approval ☐ revisions
☐ records ☐ review ☐ construction
☐

Remarks:

March 31/99
Amended Stage storage discharge data appears acceptable.

Yours truly,

cc.

Table 1: Comparison of Modelling Results for East Bayfield Pond 1
Master Servicing Report vs. Detailed Design Report

	Storm Peak Event Flow (m^3/s)					
Pre Development Condition	**Area (ha)**	**SCS Storm Distribution (1:x Year Return Storm)**				**Timmins Storm**
Return Period (years)		**2**	**5**	**25**	**100**	**Regional**
Master Servicing Report	131.64	0.52	0.88	1.77	3.45	6.41
Pond 1 Detailed Design Report	**138.60**	**0.61**	**1.03** ✓	**3.18**	**5.61** ✓	**7.80**
Post Development Condition						
Master Servicing Report	126.09	0.35	0.58	1.24	3.18	6.30
Pond 1 Detailed Design Report	**133.05**	**0.46**	**0.82** ✓	**1.81**	**4.44** ✓	**7.78** ✓

East Bayfield Secondary Plan Area
Pond 1 Hydraulic Calculation Sheet

Extended Detention Orifice

RADIUS= 0.120 m
Outlet Dia= 240.0 mm
Height= 1.5 m

Weir Details

Height 5.48 m ✓
Length 4 m ✓

Permanent Pool Volume 7882 m^3

Secondary Orifice

RADIUS= 0.260 m
Outlet Dia= 520.0 mm
Height= 3.6 m

Total STORAGE m^3	Active Detention STORAGE m^3	Extended Detention ORFICE m^3/s	Secondary ORFICE m^3/s	WATER DEPTH m	OUTFLOW WEIR m^3/s	TOTAL OUTFLOW m^3/s	Elevation m	
0	0	0.00	0.00	0.00	0.00	0.00	262.70	
2401	0	0.00	0.00	0.50	0.00	0.00	263.20	
5653	0	0.00	0.00	1.10	0.00	0.00	263.80	
8260	378	0.00	0.00	1.50	0.00	0.00	264.20	permanent pool level
12827	4945	0.09	0.00	2.10	0.00	0.09	264.80	
14583	6701	0.11	0.00	2.30	0.00	0.11	265.00	
16475	8593	0.12	0.00	2.50	0.00	0.12	265.20	
22862	14980	0.15	0.00	3.10	0.00	0.15	265.80	
25202	17320	0.16	0.00	3.30	0.00	0.16	266.00	extended detention level
27601	19719	0.17	0.00	3.50	0.00	0.17	266.20	two year flow level
28812	20930	0.17	0.00	3.60	0.00	0.17	266.30	
30162	22280	0.18	0.18	3.70	0.00	0.36 ✓	266.40	
36819	28937	0.19	0.40	4.10	0.00	0.59	266.80	
37998	30116	0.20	0.47	4.30	0.00	0.67	267.00	
41039	33157	0.21	0.54	4.50	0.00	0.74	267.20	five year flow level
44224	36342	0.21	0.59	4.70	0.00	0.81 ✓	267.40	
50821	42939	0.23	0.69	5.10	0.00	0.92 ✓	267.80	
57786	49904	0.24	0.78	5.50	0.02	1.04	268.20	
61367	53485	0.25	0.82	5.70	0.75	1.81	268.40	
65390	57508	0.25	0.86	5.90	1.98	3.08 ✓	268.60	
68456	60574	0.26	0.88	6.05	3.12	4.26 ✓	268.75	100 year flow level
69705	61823	0.26	0.89	6.10	3.54	4.69	268.80	
74123	66241	0.26	0.93	6.30	5.39	6.58	269.00	
75412	67530	0.26	0.94	6.36	5.99	7.20	269.06	Regional flow level
78123	70241	0.27	0.96	6.50	7.48	8.71	269.20	
				6.66			269.36	Top of Berm

Orifice Outflow equation is for orifice flow given by: $Q=0.6A(2gH)^{0.5}$

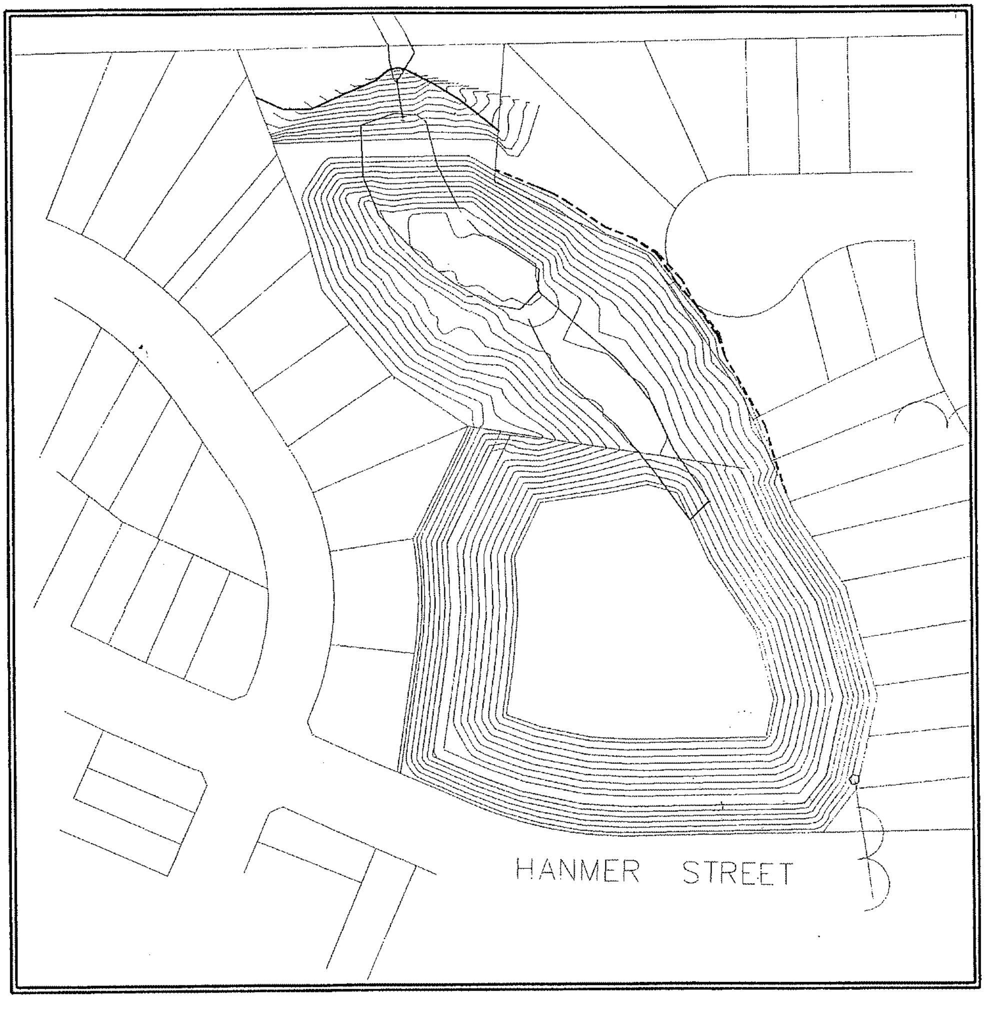
Flow over the top of the weir is given by weir flow $Q=1.815LH^{1.5}$

where:

Q=flow m^3/s
H=depth m
L=weir length m
g=9.81 m/s^2
A=Area of Culvert opening m^2

STORMWATER MANAGEMENT REPORT

POND 1
EAST BAYFIELD SECONDARY
PLAN AREA
CITY OF BARRIE



Project 8113/SWM
May, 1999

Prepared by:
Richardson Engineering Ltd
Consulting Engineers & Project Managers
Unit D, 4 Cedar Pointe Drive, Barrie, Ontario L4N 5R7
Phone: (705) 728 0009 Fax: (705) 727 7774
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EAST BAYFIELD SECONDARY PLAN AREA - STORMWATER MANGEMENT POND 1
STORMWATER MANAGEMENT REPORT

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8113-PD2	Pond 1 Detail Drawing
8113-PD2	Pond 1 Staging Drawing
8113-GN	General Notes
8113-SD	Standard Details

1.0 INTRODUCTION

1.1 Appointment

Reinders and Associates (Barrie) Ltd. have been appointed by the East Bayfield Landowners Group for the preparation of a Stormwater Management Report for the construction of the stormwater management facility identified as Pond 1 in the East Bayfield Secondary Plan (EBSP) Master Servicing Report.

1.2 Description of the East Bayfield Lands

The East Bayfield Secondary Plan Area comprises 112.0 hectares (276.7 acres) bounded by the Municipal boundary to the north, St. Vincent Street to the east, the Cundles East Planning Area to the south and the Bayfield Planning Area to the west in the City of Barrie, County of Simcoe. The stormwater management pond proposed in this report drains approximately 65% of the land in the East Bayfield Secondary Plan Area.

Existing development (primarily residential) has taken place in the Cundles East Planning Area to the south and the Bayfield Planning Area (commercial development adjacent to subject lands) to the west. Construction is underway on residential development in the Little Lake Secondary Plan Area (LLSP) east of St. Vincent Street and southeast of the subject lands. There is an existing golf course east of St. Vincent Street, northeast of the subject lands.

The subject lands are approximately square and undeveloped except for a few residential buildings fronting onto St. Vincent Street. The lands are typically free of tree cover except for an area in the southwest portion of the plan and a small area in the northeast portion and are generally rolling pasture fields and corn fields. The southern third slopes southwards, the middle third slopes to a depression area (elevation approximately 270m) roughly in the centre of the plan, and the northern third slopes predominantly northwards except for a small section which slopes towards the northeast. Elevations of the development area vary for approximately 285m in the southwest to approximately 260m in the northeast. A detailed topographical survey was carried out by Reinders and Associates in July and August, 1997.

The East Bayfield Secondary Plan area is mostly located within the Willow Creek watershed with a small portion of the southeast area of the property draining to Little Lake. The subject property forms the upper reach of the watershed of the Little Lake and Willow Creek Watersheds. An external catchment area of 58 ha on Bayfield Street drains to the EBSPA.

1.4 Approving and Review Authorities

This report will be submitted for approval to:

i) City of Barrie
ii) Nottawasaga Valley Conservation Authority (NVCA):
iii) MOE: in conjunction with an application of a Certificate of Approval as required for the construction of stormwater management facilities in Ontario. This report will be submitted to the MOE under the "direct submission" procedure.

2.0 DESIGN STANDARDS

2.1 General

The guidelines of the "Stormwater Management Practices and Planning Design Manual of the Ministry of Environment and Energy, June 1994 apply. The servicing requirements for the storm drainage system must be designed according to the City of Barrie's Drainage and Storm Sewerage Policies and Criteria as well as the NVCA requirements.

Design of the storm sewers and overflow drainage paths of the individual subdivision plans must ensure adequate depths to service upstream drainage areas. Subdivision designs must generally comply with the drainage patterns or land use incorporated in this study.

The East Bayfield Secondary Plan Area is to be developed with full urban services including a piped storm sewer system (minor system), overland curb and gutter flow routes (major system), stormwater management facilities, infiltration and methods for sediment and erosion protection.

2.1.1 Nottawasaga Valley Conservation Authority

i) Post development peak stormwater runoff flows shall not exceed pre-development flows. This requirement is to be applied for the 2 year to the 100 year storm to ensure downstream flood and erosion protection.
ii) Minimum baseflow be maintained on existing channels to ensure the preservation of downstream wetland areas.
iii) No lot development below "Top of Bank", although the existing north pond and valley lands are to be used for stormwater management.
iv) The stormwater quality system meets Level 1 Protection as defined by the MOE for new development and Level 4 for existing development.
v) Sediment and erosion controls during construction are to be installed and maintained.

2.1.2 City of Barrie

The stormwater design and stormwater management must conform to the standards in the City of Barrie and the MOE.

3.0 SITE PHYSIOGRAPHY

3.1 Existing Internal Drainage Patterns

With the exception of some residential development on St. Vincent Street, all lands in the East Bayfield Secondary Plan Area are undeveloped. The terrain consists of open grassy fields or cornfields.

An existing pond is located in the gully of the Willow Creek Tributary at the north limits of the subject lands. The pond was created by constructing a berm in the low lying area. The berm is approximately 3m high with a 450mm diameter PVC outlet culvert approximately 1m up the berm. The pond capacity is approximately 2500m^3. This basin located at the northern property limit of the EBSPA and forms the area designated for Pond 1 in the post development drainage scenario. Refer to Figure 3.

Runoff generated within the EBSPA is generally via sheet flow. There are no signs of significant erosion problems. The area identified below as catchment 1 drains to a local low or depression area in the centre of the EBSPA. This depressed area is not a natural or significant feature and is apparently a result of ponding of surface runoff from the Georgian Mall in a low depression. This depression area has a volume of approximately 20,000m^3. The infiltration characteristics of the depression basin are considered to be poor as standing water is observed in the basin throughout the year. During large storm events, this depression basin overflows and discharges to the north to the existing pond described above.

The existing drainage patterns and areas are as follows for lands in the EBSPA draining to Pond 1 (See Figure 3):

i) 35.1 ha (catchment 1) drains to the depression area
ii) 19.1 ha (catchment 2) drains to the north east
iii) 22.7 ha (catchment 3) drains to the north via the Valley lands

The remaining 35.5ha of land in the EBSPA that drains easterly to the culvert under St. Vincent Street and drains south via Cundles Planning Area and do not form part of the subwatershed draining to Pond 1. Stormwater management for the development of this property has been addressed in the Kerbal Stormwater Management Report prepared by Richardson Engineering Ltd, April 1999.

3.2 Existing External Drainage

City of Barrie Topographic Maps based on Ontario Base Maps (1:2000 scale) and drainage plans for existing adjacent subdivisions were used in the delineation of the pre-development catchments and drainage conditions outside the secondary plan area.
The EBSP is near the upper end of the Little Lake and Willow Creek Watersheds. 57.7ha of upstream lands drain through the EBSP. Land use in the external areas (E1, E2, E3a and E3b) includes the Georgian Mall shopping center as well as existing commercial development along the east (E2, 10.3ha) and west side of Bayfield Street. The external area to the west of Bayfield Street (E1) drains to an existing 900mm x 1200mm concrete box culvert on Bayfield Street in front of Georgian Mall.

Runoff from the external catchment areas E1 and E3b, including the parking areas from the Georgian Mall, is captured by an existing 1400mm dia. and 450mm dia. storm sewer which discharge to a stormwater management pond located at the eastern side of the Georgian Mall.

Runoff enters the pond via piped flow (1400mm dia. and 450mm dia.) as well as via overland flow from the parking lot. The 1400mm pipe has a full flow capacity of 2.4m^3/s. This capacity is insufficient to convey the 100 year storm for the runoff from catchments E1 and E3b. The capacity of 1400mm pipe will convey up to the five year flow runoff from catchments E1 and E3b in the existing development condition while the remainder of the runoff temporarily accumulates on the Georgian Mall parking lot or at the low point of Bayfield Street. A small portion of the runoff reaches the Georgian Mall stormwater management pond via overland flow from the parking lot.

There is an existing stormwater management facility located to the east of Georgian Mall located partially within the EBSPA and the CF Realty lands which provides stormwater quality control and attenuation of the more frequent storms for the runoff from the Mall as well as approximately 29 ha of land to the west of Bayfield Street. Runoff is collected from this external area via storm sewers and overland flow. This facility was designed primarily as a sediment removal facility. A 1400mm dia and a 450mm dia storm sewer outfall to this pond. The pond has an attenuation capacity of approximately 5000 m^3 and discharges to an intermittent overflow route that drains to the depressed area in the middle of pre-development catchment 1 as described above.

During the 100 year storm, some attenuation may occur in areas of the E1, E3a and E3b catchments that do not have positive drainage. This attenuation is considered minor and is not accounted for in the hydrologic model (Section 4.0). The effective functioning of any roof or parking lot controls in the Georgian Mall cannot be verified. Therefore, the runoff from the Georgian Mall and parking areas (catchment E3) is conservatively assumed to be unattenuated prior to entering the Georgian Mall stormwater management pond.

Catchment E1 includes commercial and some undeveloped areas. The City of Barrie has advised that any future development in this catchment will require attenuation of the peak flow runoff to pre-development levels. For the purpose of estimating runoff, the total impervious area of this catchment is taken at 50% of the total catchment area for both the pre- and post-developed conditions.

The external catchment area E2 consists of existing commercial development on the east side of Bayfield Street. A large portion of the E2 catchment is occupied by the Toys "R" Us and White Rose commercial buildings. Each of these commercial complexes was constructed with a stormwater management pond designed to attenuate post development flow to pre-development levels. As these are private facilities, they are not subject to the same maintenance as municipal facilities. The overall impermeability of this catchment has been conservatively estimated at 35% incorporating the attenuation effects of the two ponds.

3.3 Proposed Drainage Patterns

The proposed EBSP land use will include a mix of medium to low density residential, commercial, parkland and institutional (school) development. The road system will form the major drainage routes. Minor storm system for storm events up to the 5 year return storm will be accommodated by an underground storm sewer system.

Two communal extended detention stormwater management facilities are proposed for stormwater quality and quantity. These facilities are identified as stormwater Ponds 1 (north) and 2 (south) on the Post Development Drainage Plan, Figure 4. Approximately two thirds of the EBSPA lands drain to Pond 1 with the remainder draining to Pond 2.

The existing depressed area located in Pre Development Catchment 1 is to be filled. The attenuation function of this depressed area, and the existing Georgian Mall pond for runoff from Georgian Mall and commercial lands west of Bayfield Street is to be transferred downstream to Pond 1.

The Georgian Mall stormwater management pond may be removed in the post development condition if warranted by the proposed development. The 5000m^3 capacity of this facility has been allowed for in Pond 1. If the existing Georgian Mall (GM) pond is removed, the piped flow (1400mm and 450mm storm pipes) is to be directed to Pond 1 via a large storm sewer or an open channel. The water quality control from the existing GM pond to Level 4 control has been incorporated in Pond 1 downstream in addition to the displaced attenuation volume of 5000m^3.

The City of Barrie has advised that it is seeking a solution to relieve current ponding problems that occur on Bayfield Street adjacent to the Georgian Mall. **The proposed stormwater management design in this report allows for the eventual remediation of flooding that occurs in the external Catchment E3b on Bayfield St.. The post development drainage model treats runoff from all the external catchments as draining unattenuated under existing development conditions to the EBSPA and to Pond 1.** Any development or redevelopment that occurs in the external areas draining to the EBSPA will require on site stormwater controls to ensure that post development peak flows do not exceed existing peak flows off-site. All remediation costs for work outside the East Bayfield Secondary Plan Area will be borne by the City of Barrie and the benefiting landowner outside East Bayfield.

Improvements to the stormwater conveyance system through the East Bayfield properties for the additional external flow will have to incorporated in the municipal design of those properties at the detailed design phase. The City of Barrie is requested that cost sharing for the required upgrades be assured as site plan requirement between the East Bayfield landowners and external landowners for the improvements to the stormwater conveyance system as well as to Pond 1.

4.0 HYDROLOGY

4.1 Model Input

The watershed area was divided into catchment and subareas for both the pre- and post development condition and modelled using the Visual OTTHYMO V.1.04 computer model for the purpose of estimating pre and post development peak runoff values. The following outlines the procedures used for determining the parameters in the model

4.1.1 Soils

The Simcoe County Soils Map is used as a basis for defining the drainage and runoff conditions of the soil. These are identified as Tioga and Vasey series sandy loams.

Terraprobe completed a soil investigation of the Secondary Plan Area in September, 1997. Soil conditions range from sandy silts in the western portion of the plan area to silty sands in the eastern portion. At depth ranging from 3 to 5m denser till and cobbles were encountered.

The groundwater table varies in depth from between 1.5m to over 6m. Infiltration is poor in the central region in the vicinity of the depression area, and reasonable in the eastern half. The sandy silts in the western section at depths of approximately 3m to 4m are characterized as well draining with good infiltration characteristics.

4.1.2 Curve Number (CN)

The Soil Conservation Service (SCS) curve number (CN) for a catchment area relates soil and surface conditions.

The overall surface soil type generally conforms to MTO soil type specifications AB (Sandy silts to silty sands) with a CN of 62 for the internal pre-development catchments.

The post development stormwater management pond block areas have a CN of 50 assuming existing water levels or saturated conditions in the storm block and permanent pool area.

Although soil and topographic conditions within a subarea may change, the CN represents an average value. Chart H2-8, MTO Drainage Manual, Vol. 3 provided the criteria for assigning CN numbers.

4.1.3 Time to Peak (T_p)

The time to peak is the time measured from the onset of a storm event to the occurrence of peak runoff. Time to peak (t_p) was estimated using the Upland method. This method, recommended for use with the OTTHYMO model, is given by the following equation:

$$t_c = l/v$$
$$t_p = 0.66\ t_c$$

where:
t_p is the time to peak. (OTTYMO model)
t_c is the time to concentration (velocity method)
l is the overland flow distance.

v is an estimation of the flow velocity based on slope and land use given by the SCS National Engineering Handbook.

The time to peak t_p required in the OTTHYMO model is taken as taken as 66% of time to concentration. The OTTHYMO printouts for each design storm are appended in Appendix E.

4.1.4 Imperviousness

The imperviousness for subareas within the catchment in the pre- and post development condition were estimated as a percentage based on land use. This is based on the total hardened area including driveways, rooftops, sidewalks and roadways.

Land Use	**Imperviousness**	
	TIMP	XIMP
Park Block	60%	60%
Low and Medium Density Residential[1]	40%	32%
Open Space	n/a	n/a
Stormwater Management Facilities	n/a	n/a

4.1.5 Infiltration

The following input data was used for infiltration on urbanized subwatersheds. These parameters are consistent with the most recent City of Barrie standards for quantifying drainage and stormwater runoff volumes.

Infiltration based on the Horton Method
Depression Storage Pervious- DPSP - 4.6 mm
Depression Storage Impervious DPSI - 1.5 mm
Initial Infiltration- Fo – 76.2 mm/hr
Final Infiltration- Fc – 13.2 mm/hr
Decay Constant DCAY 2.0 mm/hr

4.1.6 Design Storms

The following rainfall events have been modeled:

1. The 24 hour SCS Type II and 4 hour Chicago: 2, 5, 25 and 100 year storm events based on Orilla rainfall data.
2. Timmins Storm

The Regional Storm is defined as the greater of the Timmins storm or the 1:100 year return storm. For the subject property, the Regional Storm has been determined to be the Timmins Storm event. Due to the watershed characteristics, this storm generates the highest peak flows.

4.1.7 Subwatershed Decretization

Tables 1 and 2, summarize the subarea data used in the hydrologic model for the pre- and post development condition respectively.

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[1] TIMP and XIMP parameters for residential lands are based on R3 zoning values as provided by the City of Barrie.

Table 1: Summary of Pre-Development Hydrologic Model Input

Catchment	Area (ha)	L (m)	S (m/m)	V (m/s)	CN	t_p (hr)
E1	23.65	600	N/a	N/a	50% Imp.	N/a
E2	10.30	300	N/a	N/a	35% Imp.	N/a
E3a	13.61	550	N/a	N/a	80% Imp.	N/a
E3b	10.19	450	N/a	N/a	95% Imp.	N/a
1	35.11	450	0.7%	0.15	62	0.55
2	19.07	620	3.0%	0.25	62	0.45
3	22.73	650	1.0%	0.20	62	0.59
Total Area Internal	76.91 ha					
Total Area External	57.75ha					
Total Area	134.66 ha					

Table 2: Summary of Post Development Hydrologic Model Input

Catchment No. and Proposed Land Use	**Area (ha)**	**L (m)**	**V (m/s)**	**% Impervious (TIMP/XIMP)**	**CN**	**t_p (hr)**
E1	23.65	600	N/a	50*	N/a	N/a
E2	10.30	300	N/a	35*	N/a	N/a
E3a Bayfield St. and Georgian Mall	13.61	550	N/a	80/80	N/a	N/a
E3b Georgian Mall	10.19	450	N/a	95/95	N/a	N/a
1 Low Density Res. and school	12.93	600	N/a	40/32	N/a	N/a
2 Community Park	6.61	500	N/a	60/60	N/a	N/a
3 Med. Density Res. and Special Policy Area A	6.42	240	N/a	40/32	N/a	N/a
4 Low Density Res.	17.54	500	N/a	40/32	N/a	N/a
5 Low and Med. Density Res.	12.90	400	N/a	40/32	N/a	N/a
6 Storm Pond #1	3.36	N/a	N/a	N/a	50	0.20
7 Passive Park and Low Density Res	4.52	250	0.20	N/a	62	0.23
8 Rear Lots on St. Vincent St.	1.34	50	0.20	N/a	62	0.20
9 Med. Density Res	4.91	300	N/a	40/32	N/a	N/a
10 Rear Lots adjacent to Springwater Twnshp	0.83	30	0.20	N/a	62	0.20
Total Area Internal	71.36 ha					
Total Area External	57.75 ha					
Total Area	129.11 ha					

Note: Catchments E2 and E1 have been modelled in the post development condition with impervious levels of 80% and synthetic controls to the levels shown above to account for the runoff regime of the fully developed catchment with on-site stormwater runoff controls to pre-development peak rates.
Special Policy Area A to be developed as either Commercial or Medium Density Residential.

4.2 Model Results

The results of the hydrological modeling are quantified in the Table 3. The results for the pre-development condition include attenuation provided by the Depressed Area in the middle of pre-development catchment 1, the existing GM pond ($5000m^3$) and the existing pond at the north limits of EBSPA ($2500m^3$). Outflows from the Depressed Area to pre-development catchment 5 to the north occur for storm events in the order of the 5 year storm.

The results for the post development catchments include stormwater attenuation through Pond 1.

The hydrologic analysis in this section does not consider stormwater runoff removed from surface flow though enhanced lot level infiltration.

Table 3: Model Results for Pre and Post Development Peak Flows with Attenuation

Storm Event	Pre-Development to Willow Creek **(m^3/s)**	Post Development to Willow Creek **(m^3/s)**
SCS 24 Hour 2 Year Return Storm	0.62	0.56
SCS 24 Hour 5 Year Return Storm	1.32	1.16
SCS 24 Hour 25 Year Return Storm	4.11	1.97
SCS 24 Hour 100 Year Return Storm	8.54	5.18
Chicago 4 Hour 2 Year Return Storm	0.52	0.52
Chicago 4 Hour 5 Year Return Storm	1.89	1.04
Chicago 4 Hour 25 Year Return Storm	3.89	1.95
Chicago 4 Hour 100 Year Return Storm	5.39	3.95
Timmins Regional Storm	9.23	8.32

5.0 PROPOSED STORMWATER MANAGEMENT PLAN

It is proposed that:

1. Stormwater quality and quantity be addressed on a communal basis through the construction of a wet extended stormwater detention pond at the northern portion of the East Bayfield Secondary Plan area.
2. Infiltration is to be promoted. Areas of specific interest should be identified at the detailed design stage of each subdivision draining to Pond 1.

5.1 Stormwater Management Pond Design

To achieve level 1 protection of receiving waters, the extended detention pond is to provide a minimum volume of 155 m^3 per ha of developed land for water quality for new development in the plan area. This capacity is based on residential development with an impervious area 40%.

The valley lands (catchment 6) have been designated as a stormwater detention area. The valley is vegetated and partially treed. An extended detention stormwater pond having an active and permanent pool storage volume of approximately 78,000m^3 is proposed. The design of the extended detention pond is to include the preservation of the existing vegetation and topography of the valley where possible. The top of berm elevation is 269.20m. The Regional flood elevation is approximately 268.90m at a water depth of 6.35m. Refer to Drawing 8113-PD1.

The extended detention volume for the pond is calculated as follows:
The water quality pond sizing component for pond 1 as per the MOE guidelines is as follows.

Level 1 Internal lands

(40% Impervious area), catchments 1, 3, 4, and 5 (155m^3/ha)[2]
49.79ha x 115 m^3/ha = 5726 m^3 (permanent pool)
49.79ha x 40 m^3/ha = 1992 m^3 (extended detention, water quality)

(60% Impervious area), catchment 2 (180m^3/ha)
6.61ha x 140 m^3/ha = 925 m^3 (permanent pool)
6.61ha x 40 m^3/ha = 264 m^3 (extended detention, water quality)

Level 4 External lands

(80-95% Impervious area), catchments E3a,b (65m^3/ha)
23.80ha x 25 m^3/ha = 595 m^3 (permanent pool)
23.80ha x 40 m^3/ha = 952 m^3 (extended detention, water quality)

(35%-50% impervious area), catchments E1 and E2 (60m^3/ha)
33.95ha x 20 m^3/ha= 679 m^3 (permanent pool)
33.95ha x 40 m^3/ha = 1358 m^3 (extended detention, water quality)

Extended Detention for Erosion Control

49.79ha x 25mm x 0.40 = 4979 m^3 (internal)
6.61ha x 25mm x 0.60 = 992 m^3 (parkland)
29.42ha x 25mm x 0.50 = 3956 m^3 (E1)
13.61ha x 25mm x 0.80 = 2722 m^3 (E3a)

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[2] The value of 155m^3/ha was interpolated from Table 4.1 of the MOE Design Manual between 35% at 140m^3/ha and 55% at 190m^3/ha.

10.19ha x 25mm x 0.95 = 2420 m^3 (E3b)
10.30ha x 25mm x 0.35 = 901 m^3 (E2)
Total = 15970 m^3

Total Pond 1 Volumes
Permanent Pool **7925 m^3**
Extended Detention **15903 m^3**

The extended detention outlet is 270mm in diameter. The drawdown equation has been used to verify the minimum 24 hour detention required for the extended detention volume. The equation is given as follows:

$$t = \frac{2A_P}{CA_0\sqrt{2g}}(\sqrt{h_2}-\sqrt{h_1})$$

where
t= drawdown time (seconds)
A_p= average surface area of the pond (15145m^2)
C= discharge co-efficient (0.63)
A_0= cross sectional area of the extended detention orifice (0.057m^2)
h_1= starting water elevation (0m)
h_2= ending water elevation (2.2m)

The pond parameter values were taken from the detailed pond design. Refer to Drawing 8113-PD. Given the above information, the extended detention storage time was determined to exceed 48 hours assuring the minimum 24 hour detention required by the MOE.

The storage-discharge-relationships are used in the OTTHYMO model to determine volume storage required for the stormwater detention pond.

To address the issue of thermal degradation in the wet stormwater management facility, it is proposed that the outlet structure for pond 1 be constructed with an outlet pipe at a reverse grade that draws down from an elevation below the permanent pool surface level. The outlet elevation of the pipe should be no higher than 264.9m.

Refer to Drawing 8113-PD1, and -PD2 for the detailed design of Pond 1.

Table 4: Proposed Storage Discharge Relationship for Pond 1

TOTAL STORAGE (m^3)	**ACTIVE STORAGE (m^3)**	**OUTFLOW ORFICE[4] (m^3/s)**	**ELEVATION[3] (m)**	**WATER DEPTH (m)**	**OUTFLOW WEIR (m^3/s)**	**TOTAL OUTFLOW (m^3/s)**	
7925	0	0	264.20	1.50	0	0	Permanent Pool
23828	15903	0.15	265.80	3.10	0	0.15	Extended Detention
41039	33114	0.88	267.20	4.50	0	0.88	5 Year SCS Return
66026	58101	1.19	268.65	5.95	3.64	4.83	100 Year SCS Return
70826	62901	1.27	268.90	6.20	6.42	7.69	Regional Storm
			269.20				Top of Pond Berm

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[3] The elevation at the Springwater Township boundary is approximately 262.6m.
[4] Combined Extended Detention and Secondary Orifice Flow.

To achieve the storage volumes above, the proposed forebay area in Pond 1 has must be excavated to provide and additional volume of 35,000m^3 – 45,000m^3 of storage. The excavation has been completed such that the permanent pool depth does not exceed the maximum depth of 3.0m within the forebay.

To provide additional thermal protection, fringe planting is recommended for Pond 1. The fringe planting should incorporate large leaf deciduous trees to minimize the amount of direct sunlight exposure to the ponding area. It is recommended that fringe planting be implemented in the post construction period in conjunction with the City of Barrie, Parks and Recreation Department.

5.2 Construction Practices

During construction, there is the potential for increased sediment transport to existing wetlands and watercourses. The sandy loam that covers much of the developable portion of the East Bayfield area is susceptible to erosion. To minimize erosion during construction, the following practices are proposed.

i) Stockpiling of temporary excess material such as topsoil or earth fill must be maintained away from existing watercourses. Stockpiles shall be seeded or covered with erosion control if left for periods of greater than 30 days.
ii) Silt fences are to be installed in appropriate locations to intercept stormwater runoff from construction areas.
iii) As the proposed forebay for Pond1 has significant through flow, it should not be used for construction sediment control in conjunction with upstream development. This should be provided by upstream sediment control ponds.
iv) All siltation control devices should be installed prior to the commencement of construction and maintained on a regular basis until completion of boulevard sodding.

Refer to drawing 8113-PD1 for the proposed construction sediment controls for the construction of Pond 1.

5.3 Infiltration Trenches

On site infiltration trenches are to be installed only in areas where recommended by the geotechnical engineer. These may be where the soil conditions will provide acceptable percolation rates greater than 15mm per hour, the water table is a minimum of 1.0 m below the infiltration trench and where the integrity of services and structures are not compromised. The MOE guide-lines should be followed for trench design and construction.

On considering trench location, due regard must also be given to tree preservation. Preliminary investigation indicates various areas with good potential for location of infiltration trenches. It is the intent that infiltration shall be maximized in these areas (up to the recommended 20mm) subject to technical verification. Infiltration trenches or similar infiltration methods shall be implemented in all remaining areas that meet the constraints outlined above and will be subject to technical verification at the detailed design stage of each development.

It is recommended that infiltration trenches be considered at the subdivision stage of the development lands draining to pond 1.

5.4 OUTFALL DOWNSTREAM OF POND 1

It is recommended that the point of discharge of Pond 1 be sufficiently protected with permanent erosion controls and energy dissipation devices to control the outlet velocities from the stormwater management pond to a non-erosive velocity at the discharge point to the Willow Creek tributary.

The velocities in the watercourse 180 m downstream of pond 1 range from 0.8 to 1.0 m/s for flows resulting from the 2 year storm, and 1.6 to 1.7 m/s for the 100 year storm. Discharge to the downstream watercourse has been controlled to pre-development levels and water velocities for minor storms are non-erosive.

The grade of the Willow Creek tributary immediately downstream of Pond 1 is modest, ranging from 0.3% to 0.7%. The channel is well vegetated and capable of conveying minor storm events at non-erosive water velocities. No works downstream of the EBSP lands are envisaged.

6.0 RECOMMENDATIONS

1. Strict erosion and sedimentation controls as outlined in Section 5.2 are to be implemented during construction.
2. A wet single cell, extended detention stormwater management pond is proposed to be constructed as detailed in Section 5.0 and on Drawing 8113-PD1 and PD2.
3. Excavation in the forebay area (southern portion) of Pond 1 is required to achieve the required storage volume. Approximately 35,000 to 40,000m^3 of material is to be excavated from the forebay area.
4. This storm water management plan allows for the routing of the external drainage area on Bayfield St. across from the Georgian Mall where pond is presently occurring. The means of conveyance of this runoff is to be designed by the City of Barrie.
5. For any future development within the external catchment (E1, E2 and E3), the City of Barrie is requested to seek on-site quality controls to level 1 protection (MOE) where feasible and quantity attenuation to pre-development peak flows for up to the 100 year or Regional event.
6. To further improve stormwater quality, it is recommended that the use infiltration trenches be evaluated on a subdivision basis for all development in the EBSPA draining to Pond 1.
7. The design of the East Bayfield Secondary Plan Area Stormwater Management Pond 1 is consistent with the intent of the Master Servicing Report. It is recommended that the design be accepted by the approving authorities as meeting their criteria for storm drainage and stormwater management within the East Bayfield Secondary Plan Area.

Respectfully Submitted,

Richardson Engineering Ltd

May 27, 1999

LICENSED PROFESSIONAL ENGINEER
M. P. SCHMALZ
PROVINCE OF ONTARIO

Michael Schmalz, MESc, MBA, P.Eng.

APPENDICE

Appendix 1: Pon Stage Discharge Relationship

East Bayfield Secondary Plan Area
Pond 1 Hydraulic Calculation Sheet

Extended Detention Orifice

RADIUS= 0.120 m

Outlet Dia= 240.0 mm

Height= 1.5 m

Weir Details

Height 5.40 m

Length 5 m

Permanent Pool Volume 7925 m^3

Secondary Orifice

RADIUS= 0.260 m

Outlet Dia= 520.0 mm

Height= 3.1 m

Total STORAGE m^3	Active Detention STORAGE m^3	Extended Detention ORFICE m^3/s	Secondary ORFICE m^3/s	WATER DEPTH m	OUTFLOW WEIR m^3/s	TOTAL OUTFLOW m^3/s	Elevation m
0	0	0.00	0.00	0.00	0.00	0.00	262.70
2401	0	0.00	0.00	0.50	0.00	0.00	263.20
5653	0	0.00	0.00	1.10	0.00	0.00	263.80
8260	335	0.00	0.00	1.50	0.00	0.00	264.20
12827	4902	0.09	0.00	2.10	0.00	0.09	264.80
14583	6658	0.11	0.00	2.30	0.00	0.11	265.00
16475	8550	0.12	0.00	2.50	0.00	0.12	265.20
22862	14937	0.15	0.00	3.10	0.00	0.15	265.80
25202	17277	0.16	0.25	3.30	0.00	0.41	266.00
27601	19676	0.17	0.36	3.50	0.00	0.53	266.20
28812	20887	0.17	0.40	3.60	0.00	0.57	266.30
30162	22237	0.18	0.44	3.70	0.00	0.62	266.40
36819	28894	0.19	0.56	4.10	0.00	0.76	266.80
37998	30073	0.20	0.62	4.30	0.00	0.82	267.00
41039	33114	0.21	0.67	4.50	0.00	0.88	267.20
44224	36299	0.21	0.71	4.70	0.00	0.93	267.40
50821	42896	0.23	0.80	5.10	0.00	1.03	267.80
57786	49861	0.24	0.87	5.50	0.29	1.40	268.20
61367	53442	0.25	0.91	5.70	1.49	2.65	268.40
65189	57264	0.25	0.94	5.90	3.21	4.40	268.60
68456	60531	0.26	0.97	6.05	4.76	5.98	268.75
68971	61046	0.26	0.98	6.10	5.31	6.55	268.80
72847	64922	0.26	1.01	6.30	7.75	9.02	269.00
74309	66384	0.26	1.02	6.36	8.54	9.82	269.06
76821	68896	0.27	1.04	6.50	10.47	11.78	269.20

Orifice Outflow equation is for orifice flow given by: $Q=0.6A(2gH)^{0.5}$

Flow over the top of the weir is given by weir flow $Q=1.815LH^{1.5}$

Appendix 2: OTTHYMO Data

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 Qbase
                                       min      ha      cms    hrs      mm

 cms

   □□□ START @    .00 hrs
       ---------------------
   □□□ READ STORM                       12.0
       [ Ptot= 46.11 mm ]
       fname :C:\STORMS\SCS2.STM
       remark:2 YR. SCS. STORM
 *
   *   CALIB STANDHYD       0031   1   2.0    23.65     1.28 12.03   22.31  .48
 .000
       [I%=50.0:S%= 2.00]
 *
```

```
  *   CALIB STANDHYD     0330  1   2.0    13.61     1.31 12.03  27.84   .60
.000
       [I%=80.0:S%= 1.00]
*
 □□□ ADD [0031 + 0330]   0400  3   2.0    37.26     2.59 12.03  24.33   n/a
.000
*
 □□□ RESRVR [ 2 : 0400]  0200  1   2.0    37.26      .93 12.33  24.32   n/a
.000
       {ST=   .32 ha.m }
*
  *   CALIB STANDHYD     0331  1   2.0    10.19     1.23 12.00  33.06   .72
.000
       [I%=95.0:S%= 2.00]
*
 □□□ ADD [0200 + 0331]   0406  3   2.0    47.45     1.86 12.03  26.20   n/a
.000
*
 □□□ RESRVR [ 2 : 0406]  0201  1   2.0    47.45     1.76 12.07  26.20   n/a
.000
       {ST=   .04 ha.m }
*
  *   CAL1B NASHYD       0002  1   2.0    35.11      .56 12.23   6.03   .13
.000
       [CN=62.0           ]
       [ N = 3.0:Tp   .33]
*
 □□□ ADD [0201 + 0002]   0402  3   2.0    82.56     2.23 12.10  17.62   n/a
.000
*
 □□□ RESRVR [ 2 : 0402]  0202  1   2.0    82.56      .00   .00    .00   n/a
.000
       {ST=  1.45 ha.m }
*
  *   CAL1B STANDHYD     0032  1   2.0    10.30      .48 12.00  12.18   .26
.000
       [1%=35.0:S%= 2.00]
*
  *   CALIB NASHYD       0005  1   2.0    22.73      .32 12.30   6.03   .13
.000
       [CN=62.0           ]
       [ N = 3.0:Tp   .40]
*
 □□□ ADD [0032 + 0005]   0401  3   2.0    33.03      .66 12.03   7.95   n/a
.000
*
 □□□ ADD [0202 + 0401]   0403  3   2.0   115.59      .66 12.03   2.27   n/a
.000
*
 □□□ RESRVR [ 2 : 0403]  0203  1   2.0   115.59      .33 12.53   2.27   n/a
.000
       {ST=   .06 ha.m }
*
  *   CALIB NASHYD       0004  1   2.0    19.07      .30 12.23   6.03   .13
.000
       [CN=62.0           ]
       [ N = 3.0:Tp   .34]
```

```
*
  □□□ ADD [0203 + 0004]  0405  3  2.0  134.66     .62 12.27   2.80  n/a
.000
*
 FINISH

=====================================================================
===================================
```

```
=====================================================================
===================================

      V     V    I     SSSSS  U    U     A      L
      V     V    I     SS     U    U    A A     L
       V   V     I      SS    U    U   AAAAA    L
       V   V     I       SS   U    U   A    A   L
        VV       I     SSSSS  UUUUU    A    A   LLLLL

       OOO    TTTTT   TTTTT   H    H   Y    Y   M    M    OOO      TM, Version
1.0.4
      O    O     T       T     H    H     Y Y     MM MM   O    O
      O    O     T       T     HHHHH       Y      M M M   O    O    Licensed To:
      O    O     T       T     H    H      Y      M    M  O    O    Richardson
Engineering
       OOO       T       T     H    H      Y      M    M   OOO      VO104-0004-01

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& Assoc., 1999.

                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Ott\0-8113f\pre.ott
  Output  filename: C:\Ott\0-8113f\pre-2detail.txt
  Summary filename: C:\Ott\0-8113f\pre-2summary.txt


 DATE: 5/27/99                              TIME: 2:21:19 PM

 USER: ms


  ===<comment>=== pre-development scenario

   ****************************
   ** SIMULATION NUMBER:   2 **
   ****************************

   W/E COMMAND              HYD ID   DT     AREA    Qpeak  Tpeak    R.V.  R.C.
 Qbase
                                     min     ha      cms    hrs      mm

 cms

    *   START @    .00 hrs
        ---------------------
   □□□  READ STORM                  12.0
        [ Ptot= 66.81 mm ]
        fname :C:\STORMS\SCS5.STM
        remark:5 YEAR S.C.S. STORM
 *
    **  CALIB STANDHYD       0031  1  2.0    23.65    2.04 12.03   35.35   .53
 .000
        [I%=50.0:S%= 2.00]
 *
```

```
 **  CALIB STANDHYD      0330  1   2.0    13.61      2.02 12.00   41.95   .63
.000
     [I%=80.0:S%= 1.00]
*
 □□□ ADD [0031 + 0330]  0400  3   2.0    37.26      4.01 12.00   37.76  n/a
.000
*
 □□□ RESRVR [ 2 : 0400] 0200  1   2.0    37.26      1.39 12.30   37.76  n/a
.000
     {ST=    .49 ha.m }
*
 **  CALIB STANDHYD      0331  1   2.0    10.19      1.85 12.00   48.80   .73
.000
     [I%=95.0:S%= 2.00]
*
 □□□ ADD [0200 + 0331]  0406  3   2.0    47.45      2.86 12.03   40.13  n/a
.000
*
 □□□ RESRVR [ 2 : 0406] 0201  1   2.0    47.45      2.70 12.07   40.13  n/a
.000
     {ST=    .06 ha.m }
*
 **  CALIB NASHYD        0002  1   2.0    35.11      1.12 12.23   12.19   .18
.000
     [CN=62.0           ]
     [ N = 3.0:Tp   .33]
*
 □□□ ADD [0201 + 0002]  0402  3   2.0    82.56      3.65 12.10   28.25  n/a
.000
*
 □□□ RESRVR [ 2 : 0402] 0202  1   2.0    82.56       .37 14.43    4.02  n/a
.000
     {ST=  2.03 ha.m }
*
 **  CALIB STANDHYD      0032  1   2.0    10.30       .73 12.00   21.38   .32
.000
     [I%=35.0:S%= 2.00]
*
 **  CALIB NASHYD        0005  1   2.0    22.73       .64 12.30   12.19   .18
.000
     [CN=62.0           ]
     [ N = 3.0:Tp   .40]
*
 □□□ ADD [0032 + 0005]  0401  3   2.0    33.03      1.08 12.00   15.06  n/a
.000
*
 □□□ ADD [0202 + 0401]  0403  3   2.0   115.59      1.08 12.00    7.18  n/a
.000
*
 □□□ RESRVR [ 2 : 0403] 0203  1   2.0   115.59       .75 12.37    7.18  n/a
.000
     {ST=    .13 ha.m }
*
 **  CALIB NASHYD        0004  1   2.0    19.07       .60 12.23   12.19   .18
.000
     [CN=62.0           ]
     [ N = 3.0:Tp   .34]
```

```
*
  □□□ ADD [0203 + 0004]  0405  3  2.0  134.66    1.32 12.33    7.89  n/a
.000
*
 FINISH

===========================================================================
=====================================
```

```
==========================================================================
=====================================

       V     V    I     SSSSS  U    U     A     L
       V     V    I     SS     U    U    A A    L
        V   V     I      SS    U    U   AAAAA   L
        V   V     I       SS   U    U   A    A  L
         VV       I     SSSSS  UUUUU    A    A  LLLLL

        OOO    TTTTT  TTTTT  H    H  Y    Y  M    M   OOO    TM, Version
1.0.4
       O   O    T       T    H    H   Y Y    MM MM   O   O
       O   O    T       T    HHHHH     Y     M M M   O   O   Licensed To:
       O   O    T       T    H    H    Y     M    M  O   O   Richardson
Engineering
        OOO     T       T    H    H    Y     M    M   OOO    V0104-0004-01

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                    *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Ott\0-8113f\pre.ott
  Output  filename: C:\Ott\0-8113f\pre-3detail.txt
  Summary filename: C:\Ott\0-8113f\pre-3summary.txt


DATE: 5/27/99                                TIME: 2:21:26 PM

USER: ms


 ===<comment>=== pre-development scenario

  ****************************
  ** SIMULATION NUMBER:   3 **
  ****************************

  W/E COMMAND              HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.
Qbase
                                   min     ha     cms   hrs     mm

cms

  **  START @    .00 hrs
      --------------------
  □□□ READ STORM                  12.0
      [ Ptot= 95.55 mm ]
      fname :C:\STORMS\SCS25.STM
      remark:25 YR. S.C.S. STORM
 *
  **  CALIB STANDHYD     0031  1  2.0   23.65    3.28 12.03  55.55  .58
 .000
      [I%=50.0:S%= 2.00]
 *
```

```
 **  CALIB STANDHYD      0330  1  2.0    13.61     2.95 12.00  62.03  .65
.000
      [I%=80.0:S%= 1.00]
*
 □□□ ADD [0031 + 0330]   0400  3  2.0    37.26     6.18 12.03  57.92  n/a
.000
*
 □□□ RESRVR [ 2 : 0400]  0200  1  2.0    37.26     2.23 12.33  57.91  n/a
.000
      {ST=    .78 ha.m }
*
 **  CALIB STANDHYD      0331  1  2.0    10.19     2.57 12.00  70.46  .74
.000
      [I%=95.0:S%= 2.00]
*
 □□□ ADD [0200 + 0331]   0406  3  2.0    47.45     4.07 12.03  60.61  n/a
.000
*
 □□□ RESRVR [ 2 : 0406]  0201  1  2.0    47.45     3.36 12.13  60.61  n/a
.000
      {ST=    .10 ha.m }
*
 **  CALIB NASHYD        0002  1  2.0    35.11     2.03 12.23  22.91  .24
.000
      [CN=62.0           ]
      [ N = 3.0:Tp   .33]
*
 □□□ ADD [0201 + 0002]   0402  3  2.0    82.56     5.33 12.20  44.58  n/a
.000
*
 □□□ RESRVR [ 2 : 0402]  0202  1  2.0    82.56     2.72 12.90  20.35  n/a
.000
      {ST=  2.22 ha.m }
*
 **  CALIB STANDHYD      0032  1  2.0    10.30     1.02 12.00  36.73  .38
.000
      [I%=35.0:S%= 2.00]
*
 **  CALIB NASHYD        0005  1  2.0    22.73     1.16 12.30  22.91  .24
.000
      [CN=62.0           ]
      [ N = 3.0:Tp   .40]
*
 □□□ ADD [0032 + 0005]   0401  3  2.0    33.03     1.69 12.00  27.22  n/a
.000
*
 □□□ ADD [0202 + 0401]   0403  3  2.0   115.59     3.63 12.80  22.32  n/a
.000
*
 □□□ RESRVR [ 2 : 0403]  0203  1  2.0   115.59     3.63 12.83  22.32  n/a
.000
      {ST=    .14 ha.m }
*
 **  CALIB NASHYD        0004  1  2.0    19.07     1.08 12.23  22.91  .24
.000
      [CN=62.0           ]
      [ N = 3.0:Tp   .34]
```

```
*
  □□□ ADD [0203 + 0004]  0405  3  2.0  134.66    4.11 12.80  22.40  n/a
.000
*
 FINISH

=================================================================
=================================
```

```
==========================================================================
=====================================

       V      V    I    SSSSS  U    U     A     L
       V      V    I    SS     U    U    A A    L
        V    V     I     SS    U    U   AAAAA   L
        V    V     I      SS   U    U   A    A  L
          VV       I    SSSSS  UUUUU  A     A  LLLLL

        OOO    TTTTT  TTTTT  H    H  Y    Y  M    M   OOO      TM, Version
1.0.4
       O   O    T      T     H    H   Y  Y   MM  MM  O   O
       O   O    T      T     HHHHH     Y     M  M  M  O   O   Licensed To:
       O   O    T      T     H    H    Y     M    M  O   O   Richardson
Engineering
        OOO     T      T     H    H    Y     M    M   OOO      VO104-0004-01

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                         *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Ott\0-8113f\pre.ott
  Output  filename: C:\Ott\0-8113f\pre-4detail.txt
  Summary filename: C:\Ott\0-8113f\pre-4summary.txt


DATE: 5/27/99                                    TIME: 2:21:31 PM

USER: ms


 ===<comment>=== pre-development scenario

  ****************************
  ** SIMULATION NUMBER:    4 **
  ****************************

  W/E COMMAND                HYD ID   DT     AREA    Qpeak  Tpeak    R.V.  R.C.
Qbase
                                      min     ha      cms    hrs      mm

cms

  **   START @    .00 hrs
       --------------------
  □□□  READ STORM                     12.0
       [ Ptot=120.68 mm ]
       fname :C:\STORMS\SCS100.STM
       remark:100 YR S.C.S.  STORM
*
  **   CALIB STANDHYD       0031  1   2.0    23.65     4.80 12.03   74.50   .62
.000
       [I%=50.0:S%= 2.00]
*
```

```
  **  CALIB STANDHYD      0330  1  2.0    13.61     3.91 12.00  80.31  .67
.000
      [I%=80.0:S%= 1.00]
*
 □□□ ADD [0031 + 0330]   0400  3  2.0    37.26     8.62 12.03  76.62  n/a
.000
*
 □□□ RESRVR [ 2 : 0400] 0200  1  2.0    37.26     2.42 12.40  76.62  n/a
.000
      {ST=  1.12 ha.m }
*
  **  CALIB STANDHYD      0331  1  2.0    10.19     3.37 12.00  89.77  .74
.000
      [I%=95.0:S%= 2.00]
*
 □□□ ADD [0200 + 0331]   0406  3  2.0    47.45     5.39 12.00  79.45  n/a
.000
*
 □□□ RESRVR [ 2 : 0406] 0201  1  2.0    47.45     4.03 12.10  79.45  n/a
.000
      {ST=   .16 ha.m }
*
  **  CALIB NASHYD        0002  1  2.0    35.11     3.00 12.23  34.13  .28
.000
      [CN=62.0          ]
      [ N = 3.0:Tp  .33]
*
 □□□ ADD [0201 + 0002]   0402  3  2.0    82.56     6.90 12.17  60.17  n/a
.000
*
 □□□ RESRVR [ 2 : 0402] 0202  1  2.0    82.56     5.26 12.53  35.95  n/a
.000
      {ST=  2.35 ha.m }
*
  **  CALIB STANDHYD      0032  1  2.0    10.30     1.41 12.00  51.91  .43
.000
      [I%=35.0:S%= 2.00]
*
  **  CALIB NASHYD        0005  1  2.0    22.73     1.71 12.30  34.13  .28
.000
      [CN=62.0          ]
      [ N = 3.0:Tp  .40]
*
 □□□ ADD [0032 + 0005]   0401  3  2.0    33.03     2.44 12.03  39.68  n/a
.000
*
 □□□ ADD [0202 + 0401]   0403  3  2.0   115.59     7.39 12.50  37.01  n/a
.000
*
 □□□ RESRVR [ 2 : 0403] 0203  1  2.0   115.59     7.37 12.53  37.01  n/a
.000
      {ST=   .17 ha.m }
*
  **  CALIB NASHYD        0004  1  2.0    19.07     1.60 12.23  34.13  .28
.000
      [CN=62.0          ]
      [ N = 3.0:Tp  .34]
```

```
*
  □□□ ADD [0203 + 0004]  0405  3  2.0  134.66    8.54 12.53  36.61  n/a
.000
*
 FINISH
=========================================================================
====================================
```

```
========================================================================
====================================

      V     V    I    SSSSS  U    U     A     L
      V     V    I    SS     U    U    A A    L
       V   V     I     SS    U    U   AAAAA   L
       V   V     I      SS   U    U   A    A  L
        VV       I    SSSSS  UUUUU    A    A  LLLLL

       OOO   TTTTT  TTTTT  H    H  Y    Y  M    M   OOO     TM, Version
1.0.4
      O   O    T      T    H    H   Y Y    MM MM   O   O
      O   O    T      T    HHHHH     Y     M M M   O   O    Licensed To:
      O   O    T      T    H    H    Y     M    M  O   O    Richardson
Engineering
       OOO     T      T    H    H    Y     M    M   OOO     V0104-0004-01

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                     *****  S U M M A R Y   O U T P U T  *****

  Input   filename: C:\Ott\0-8113f\pre.ott
  Output  filename: C:\Ott\0-8113f\pre-1detail.txt
  Summary filename: C:\Ott\0-8113f\pre-1summary.txt


DATE: 5/27/99                                 TIME: 3:06:41 PM

USER: MS


 ===<comment>=== Second try to Pond 1

  ****************************
  ** SIMULATION NUMBER:   1 **
  ****************************

  W/E COMMAND               HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.
Qbase
                                    min    ha     cms   hrs      mm

cms

  **  START @    .00 hrs
      --------------------

  ☐☐☐ READ STORM                  12.0
      [ Ptot=193.00 mm ]
      fname :C:\STORMS\Timmins.stm
      remark:* REGIONAL DESIGN STORM
*
  **  CALIB STANDHYD      0031  1  2.0    23.65    2.20  7.00 119.66   .62
.000
      [I%=50.0:S%= 2.00]
*
```

```
  **  CALIB STANDHYD      0330  1   2.0    13.61      1.48  7.00 162.77   .84
.000
      [I%=80.0:S%= 1.00]
*
 □□□ ADD [0031 + 0330]  0400  3   2.0    37.26      3.68  7.00 135.41   n/a
.000
*
 □□□ RESRVR [ 2 : 0400] 0200  1   2.0    37.26      2.33  7.40 135.41   n/a
.000
      {ST=    .89 ha.m }
*
  **  CALIB STANDHYD      0331  1   2.0    10.19      1.20  7.00 184.32   .96
.000
      [I%=95.0:S%= 2.00]
*
 □□□ ADD [0200 + 0331]  0406  3   2.0    47.45      3.49  7.00 145.91   n/a
.000
*
 □□□ RESRVR [ 2 : 0406] 0201  1   2.0    47.45      3.26  7.13 145.91   n/a
.000
      {ST=    .09 ha.m }
*
  **  CALIB NASHYD        0002  1   2.0    35.11      2.51  7.07 104.83   .54
.000
      [CN=62.0           ]
      [ N = 3.0:Tp   .33]
*
 □□□ ADD [0201 + 0002]  0402  3   2.0    82.56      5.76  7.10 128.44   n/a
.000
*
 □□□ RESRVR [ 2 : 0402] 0202  1   2.0    82.56      5.70  7.17 104.21   n/a
.000
      {ST=  2.36 ha.m }
*
  **  CALIB STANDHYD      0032  1   2.0    10.30       .74  7.00  98.11   .51
.000
      [I%=35.0:S%= 2.00]
*
  **  CALIB NASHYD        0005  1   2.0    22.73      1.56  7.10 104.83   .54
.000
      [CN=62.0           ]
      [ N = 3.0:Tp   .40]
*
 □□□ ADD [0032 + 0005]  0401  3   2.0    33.03      2.27  7.03 102.74   n/a
.000
*
 □□□ ADD [0202 + 0401]  0403  3   2.0   115.59      7.88  7.13 103.79   n/a
.000
*
 □□□ RESRVR [ 2 : 0403] 0203  1   2.0   115.59      7.88  7.13 103.79   n/a
.000
      {ST=    .17 ha.m }
*
  **  CALIB NASHYD        0004  1   2.0    19.07      1.36  7.07 104.83   .54
.000
      [CN=62.0           ]
      [ N = 3.0:Tp   .34]
```

```
*
  □□□ ADD [0203 + 0004]   0405  3  2.0   134.66     9.23   7.13 103.94   n/a
.000
*
 FINISH

==================================================================
==================================
```

```
============================================================================
======================================

        V     V    I    SSSSS  U    U     A     L
        V     V    I    SS     U    U    A A    L
         V   V     I     SS    U    U   AAAAA   L
         V   V     I      SS   U    U   A   A   L
          VV       I    SSSSS  UUUUU   A   A   LLLLL

         OOO    TTTTT  TTTTT  H    H  Y    Y  M    M   OOO     TM, Version
1.0.4
        O   O     T      T    H    H   Y Y    MM MM   O   O
        O   O     T      T    HHHHH     Y     M M M   O   O    Licensed To:
        O   O     T      T    H    H    Y     M    M  O   O    Richardson
Engineering
         OOO      T      T    H    H    Y     M    M   OOO     VO104-0004-01

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                    *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Ott\0-8113f\Post1.ott
  Output  filename: C:\Ott\0-8113f\Post1-1detail.txt
  Summary filename: C:\Ott\0-8113f\Post1-1summary.txt


DATE: 5/27/99                                 TIME: 4:39:31 PM

USER: MS


 ===<comment>=== Second try to Pond 1

  ****************************
  ** SIMULATION NUMBER:   1 **
  ****************************

  W/E COMMAND                HYD ID   DT    AREA   Qpeak Tpeak    R.V.  R.C.
Qbase
                                     min     ha     cms    hrs      mm
cms

  **  START @    .00 hrs
      --------------------
  □□□ READ STORM                    12.0
      [ Ptot= 46.11 mm ]
      fname :C:\STORMS\SCS2.STM
      remark:2 YR. SCS. STORM
*
  **  CALIB NASHYD           0007  1  5.0    4.52     .09 12.08   9.54  .21
.000
      [CN=62.0           ]
      [ N = 3.0:Tp   .24]
```

```
*
  *   CALIB STANDHYD      0002  1   5.0     6.61       .45 12.00   26.77  .58
.000
      [I%=60.0:S%= 2.00]
*
  *   CALIB STANDHYD      0001  1   5.0    12.93       .43 12.00   14.34  .31
.000
      [I%=32.0:S%= 2.00]
*
  *   CALIB STANDHYD      0003  1   5.0     6.42       .35 12.00   17.84  .39
.000
      [I%=40.0:S%= 2.00]
*
  *   CALIB STANDHYD      0331  1   5.0    10.19      1.28 12.00   42.38  .92
.000
      [I%=95.0:S%= 2.00]
*
  *   CALIB STANDHYD      0031  1   5.0    23.65      2.07 12.00   35.69  .77
.000
      [I%=80.0:S%= 2.00]
*
 □□□  RESRVR [ 2 : 0031] 0205  1   5.0    23.65      1.25 12.17   35.69  n/a
.000
      {ST=   .17 ha.m }
*
  *   CALIB STANDHYD      0330  1   5.0    13.61      1.40 12.00   35.69  .77
.000
      [I%=80.0:S%= 2.00]
*
 □□□  ADD [0205 + 0330]  0100  3   5.0    37.26      2.32 12.00   35.69  n/a
.000
*
 □□□  ADD [0331 + 0100]  0115  3   5.0    47.45      3.60 12.00   37.13  n/a
.000
*
 □□□  ADD [0003 + 0115]  0101  3   5.0    53.87      3.95 12.00   34.83  n/a
.000
*
 □□□  ADD [0001 + 0101]  0102  3   5.0    66.80      4.38 12.00   30.86  n/a
.000
*
 □□□  ADD [0002 + 0102]  0103  3   5.0    73.41      4.83 12.00   30.49  n/a
.000
*
  *   CALIB STANDHYD      0005  1   5.0    12.90       .49 12.00   14.34  .31
.000
      [I%=32.0:S%= 2.00]
*
  *   CALIB STANDHYD      0032  1   5.0    10.30      1.10 12.00   35.69  .77
.000
      [I%=80.0:S%= 2.00]
*
 □□□  RESRVR [ 2 : 0032] 0204  1   5.0    10.30       .42 12.17   35.68  n/a
.000
      {ST=   .11 ha.m }
*
```

```
  □□□ ADD [0005 + 0204]   0105  3   5.0    23.20      .86 12.08   23.81   n/a
.000
*
   *   CALIB STANDHYD     0004  1   5.0    17.54      .60 12.00   14.34   .31
.000
       [I%=32.0:S%= 2.00]
*
  □□□ ADD [0105 + 0004]   0106  3   5.0    40.74     1.44 12.00   19.73   n/a
.000
*
  □□□ ADD [0103 + 0106]   0104  3   5.0   114.15     6.27 12.00   26.65   n/a
.000
*
   *   CALIB NASHYD       0006  1   5.0     3.36      .05 12.08    6.38   .14
.000
       [CN=50.0         ]
       [ N = 3.0:Tp  .20]
*
  □□□ ADD [0104 + 0006]   0107  3   5.0   117.51     6.31 12.00   26.07   n/a
.000
*
  □□□ RESRVR [ 2 : 0107] 0201  1   5.0   117.51      .53 13.83   26.06   n/a
.000
       {ST=  1.97 ha.m }
*
   *   CALIB NASHYD       0010  1   5.0      .83      .02 12.08    9.53   .21
.000
       [CN=62.0         ]
       [ N = 3.0:Tp  .20]
*
  □□□ ADD [0201 + 0010]   0109  3   5.0   118.34      .53 13.83   25.95   n/a
.000
*
  □□□ ADD [0007 + 0109]   0108  3   5.0   122.86      .54 13.83   25.34   n/a
.000
*
   *   CALIB NASHYD       0008  1   5.0     1.34      .03 12.08    9.53   .21
.000
       [CN=62.0         ]
       [ N = 3.0:Tp  .20]
*
  □□□ ADD [0108 + 0008]   0113  3   5.0   124.20      .54 13.83   25.17   n/a
.000
*
   *   CALIB STANDHYD     0009  1   5.0     4.91      .21 12.00   14.34   .31
.000
       [I%=32.0:S%= 2.00]
*
  □□□ ADD [0113 + 0009]   0114  3   5.0   129.11      .56 13.83   24.76   n/a
.000
*
 FINISH

=======================================================================
===================================
```

```
===========================================================================
====================================

        V     V    I    SSSSS  U    U    A    L
        V     V    I    SS     U    U   A A   L
         V   V     I     SS    U    U  AAAAA  L
         V   V     I      SS   U    U  A   A  L
          VV       I    SSSSS  UUUUU   A   A  LLLLL

         OOO    TTTTT  TTTTT  H    H  Y    Y  M    M   OOO     TM, Version
1.0.4
        O   O     T      T    H    H   Y Y    MM MM  O   O
        O   O     T      T    HHHHH     Y     M M M  O   O    Licensed To:
        O   O     T      T    H    H    Y     M    M  O   O    Richardson
Engineering
         OOO      T      T    H    H    Y     M    M   OOO     VO104-0004-01

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& Assoc., 1999.


                    *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Ott\0-8113f\Post1.ott
  Output  filename: C:\Ott\0-8113f\Post1-2detail.txt
  Summary filename: C:\Ott\0-8113f\Post1-2summary.txt


DATE: 5/27/99                               TIME: 4:39:38 PM

USER: MS


 ===<comment>=== Second try to Pond 1

  ****************************
  ** SIMULATION NUMBER:   2 **
  ****************************

  W/E COMMAND              HYD ID   DT     AREA    Qpeak Tpeak    R.V. R.C.
Qbase
                                    min     ha      cms   hrs      mm
cms

  *    START @    .00 hrs
       --------------------

  □□□ READ STORM                   12.0
       [ Ptot= 66.81 mm ]
       fname :C:\STORMS\SCS5.STM
       remark:5 YEAR S.C.S. STORM
*
  **   CALIB NASHYD        0007  1   5.0     4.52      .18 12.08   18.78   .28
.000
       [CN=62.0          ]
       [ N = 3.0:Tp   .24]
```

```
*
  **   CALIB STANDHYD      0002  1   5.0     6.61      .76 12.00  41.34  .62
.000
       [I%=60.0:S%= 2.00]
*
  **   CALIB STANDHYD      0001  1   5.0    12.93      .88 12.08  26.39  .40
.000
       [I%=32.0:S%= 2.00]
*
   *   CALIB STANDHYD      0003  1   5.0     6.42      .62 12.00  30.46  .46
.000
       [I%=40.0:S%= 2.00]
*
   *   CALIB STANDHYD      0331  1   5.0    10.19     1.92 12.00  62.31  .93
.000
       [I%=95.0:S%= 2.00]
*
   *   CALIB STANDHYD      0031  1   5.0    23.65     3.16 12.00  53.32  .80
.000
       [I%=80.0:S%= 2.00]
*
  □□□ RESRVR [ 2 : 0031] 0205  1   5.0    23.65     2.05 12.17  53.32  n/a
.000
       {ST=    .24 ha.m }
*
   *   CALIB STANDHYD      0330  1   5.0    13.61     2.11 12.00  53.32  .80
.000
       [I%=80.0:S%= 2.00]
*
  □□□ ADD [0205 + 0330]  0100  3   5.0    37.26     3.54 12.00  53.32  n/a
.000
*
  □□□ ADD [0331 + 0100]  0115  3   5.0    47.45     5.46 12.00  55.25  n/a
.000
*
  □□□ ADD [0003 + 0115]  0101  3   5.0    53.87     6.08 12.00  52.30  n/a
.000
*
  □□□ ADD [0001 + 0101]  0102  3   5.0    66.80     6.88 12.00  47.28  n/a
.000
*
  □□□ ADD [0002 + 0102]  0103  3   5.0    73.41     7.64 12.00  46.75  n/a
.000
*
   *   CALIB STANDHYD      0005  1   5.0    12.90      .96 12.00  26.39  .40
.000
       [I%=32.0:S%= 2.00]
*
   *   CALIB STANDHYD      0032  1   5.0    10.30     1.63 12.00  53.32  .80
.000
       [I%=80.0:S%= 2.00]
*
  □□□ RESRVR [ 2 : 0032] 0204  1   5.0    10.30      .65 12.17  53.32  n/a
.000
       {ST=    .16 ha.m }
*
```

```
 □□□ ADD [0005 + 0204]  0105  3  5.0   23.20     1.51 12.00  38.35  n/a
.000
*
  *   CALIB STANDHYD     0004  1  5.0   17.54     1.20 12.08  26.39  .40
.000
      [I%=32.0:S%= 2.00]
*
 □□□ ADD [0105 + 0004]  0106  3  5.0   40.74     2.62 12.00  33.20  n/a
.000
*
 □□□ ADD [0103 + 0106]  0104  3  5.0  114.15    10.27 12.00  41.91  n/a
.000
*
  *   CALIB NASHYD       0006  1  5.0    3.36      .10 12.08  12.97  .19
.000
      [CN=50.0        ]
      [ N = 3.0:Tp  .20]
*
 □□□ ADD [0104 + 0006]  0107  3  5.0  117.51    10.36 12.00  41.09  n/a
.000
*
 □□□ RESRVR [ 2 : 0107] 0201  1  5.0  117.51      .84 13.67  41.07  n/a
.000
      {ST=  3.13 ha.m }
*
  *   CALIB NASHYD       0010  1  5.0     .83      .04 12.08  18.76  .28
.000
      [CN=62.0        ]
      [ N = 3.0:Tp  .20]
*
 □□□ ADD [0201 + 0010]  0109  3  5.0  118.34      .85 13.67  40.92  n/a
.000
*
 □□□ ADD [0007 + 0109]  0108  3  5.0  122.86      .87 13.00  40.10  n/a
.000
*
  *   CALIB NASHYD       0008  1  5.0    1.34      .06 12.08  18.76  .28
.000
      [CN=62.0        ]
      [ N = 3.0:Tp  .20]
*
 □□□ ADD [0108 + 0008]  0113  3  5.0  124.20      .88 12.25  39.87  n/a
.000
*
  *   CALIB STANDHYD     0009  1  5.0    4.91      .41 12.00  26.39  .40
.000
      [I%=32.0:S%= 2.00]
*
 □□□ ADD [0113 + 0009]  0114  3  5.0  129.11     1.16 12.17  39.36  n/a
.000
*
 FINISH

=================================================================
=================================
```

```
=======================================================================
====================================

      V     V    I    SSSSS  U    U     A     L
      V     V    I    SS     U    U    A A    L
       V   V     I     SS    U    U   AAAAA   L
       V   V     I      SS   U    U   A    A  L
        VV       I    SSSSS  UUUUU    A    A  LLLLL

       OOO    TTTTT   TTTTT  H    H  Y    Y  M    M    OOO     TM, Version
1.0.4
      O   O     T       T    H    H   Y Y    MM MM   O    O
      O   O     T       T    HHHHH     Y     M M M   O    O    Licensed To:
      O   O     T       T    H    H    Y     M    M  O    O    Richardson
Engineering
       OOO      T       T    H    H    Y     M    M    OOO     VO104-0004-01

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& Assoc., 1999.

                    *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Ott\0-8113f\Post1.ott
  Output  filename: C:\Ott\0-8113f\Post1-3detail.txt
  Summary filename: C:\Ott\0-8113f\Post1-3summary.txt


DATE: 5/27/99                              TIME: 4:39:45 PM

USER: MS


 ===<comment>=== Second try to Pond 1

  ***************************
  ** SIMULATION NUMBER:   3 **
  ***************************

  W/E COMMAND              HYD ID   DT     AREA   Qpeak Tpeak   R.V. R.C.
Qbase
                                    min     ha     cms   hrs     mm
cms

  *   START @    .00 hrs
      --------------------
  □□□ READ STORM                   12.0
      [ Ptot= 95.55 mm ]
      fname :C:\STORMS\SCS25.STM
      remark:25 YR. S.C.S. STORM
*
  **  CALIB NASHYD        0007  1  5.0     4.52     .32 12.08  34.78  .36
.000
      [CN=62.0          ]
      [ N = 3.0:Tp  .24]
```

```
*
  **   CALIB STANDHYD      0002  1   5.0     6.61     1.21 12.00  63.21  .66
.000
       [I%=60.0:S%= 2.00]
*
  **   CALIB STANDHYD      0001  1   5.0    12.93     1.66 12.08  43.99  .46
.000
       [I%=32.0:S%= 2.00]
*
  *    CALIB STANDHYD      0003  1   5.0     6.42     1.08 12.00  49.22  .52
.000
       [I%=40.0:S%= 2.00]
*
  *    CALIB STANDHYD      0331  1   5.0    10.19     2.64 12.00  90.19  .94
.000
       [I%=95.0:S%= 2.00]
*
  *    CALIB STANDHYD      0031  1   5.0    23.65     4.91 12.00  78.63  .82
.000
       [I%=80.0:S%= 2.00]
*
  □□□ RESRVR [ 2 : 0031] 0205  1   5.0    23.65     3.29 12.08  78.63  n/a
.000
       {ST=    .33 ha.m }
*
  *    CALIB STANDHYD      0330  1   5.0    13.61     2.96 12.00  78.63  .82
.000
       [I%=80.0:S%= 2.00]
*
  □□□ ADD [0205 + 0330]   0100  3   5.0    37.26     5.84 12.00  78.63  n/a
.000
*
  □□□ ADD [0331 + 0100]   0115  3   5.0    47.45     8.48 12.00  81.11  n/a
.000
*
  □□□ ADD [0003 + 0115]   0101  3   5.0    53.87     9.57 12.00  77.31  n/a
.000
*
  □□□ ADD [0001 + 0101]   0102  3   5.0    66.80    11.04 12.00  70.86  n/a
.000
*
  □□□ ADD [0002 + 0102]   0103  3   5.0    73.41    12.25 12.00  70.17  n/a
.000
*
  *    CALIB STANDHYD      0005  1   5.0    12.90     1.94 12.00  43.99  .46
.000
       [I%=32.0:S%= 2.00]
*
  *    CALIB STANDHYD      0032  1   5.0    10.30     2.21 12.00  78.63  .82
.000
       [I%=80.0:S%= 2.00]
*
  □□□ RESRVR [ 2 : 0032] 0204  1   5.0    10.30      .92 12.08  78.62  n/a
.000
       {ST=    .22 ha.m }
*
```

```
 □□□ ADD [0005 + 0204]  0105  3  5.0   23.20     2.76 12.00  59.36  n/a
.000
*
  *   CALIB STANDHYD     0004  1  5.0   17.54     2.27 12.08  43.99  .46
.000
      [I%=32.0:S%= 2.00]
*
 □□□ ADD [0105 + 0004]  0106  3  5.0   40.74     4.87 12.08  52.74  n/a
.000
*
 □□□ ADD [0103 + 0106]  0104  3  5.0  114.15    17.04 12.00  63.95  n/a
.000
*
  *   CALIB NASHYD       0006  1  5.0    3.36      .18 12.08  24.90  .26
.000
      [CN=50.0         ]
      [ N = 3.0:Tp  .20]
*
 □□□ ADD [0104 + 0006]  0107  3  5.0  117.51    17.21 12.00  62.83  n/a
.000
*
 □□□ RESRVR [ 2 : 0107] 0201  1  5.0  117.51     1.33 13.50  62.82  n/a
.000
      {ST=  4.86 ha.m }
*
  *   CALIB NASHYD       0010  1  5.0     .83      .06 12.08  34.74  .36
.000
      [CN=62.0         ]
      [ N = 3.0:Tp  .20]
*
 □□□ ADD [0201 + 0010]  0109  3  5.0  118.34     1.34 13.50  62.63  n/a
.000
*
 □□□ ADD [0007 + 0109]  0108  3  5.0  122.86     1.37 13.25  61.60  n/a
.000
*
  *   CALIB NASHYD       0008  1  5.0    1.34      .10 12.08  34.74  .36
.000
      [CN=62.0         ]
      [ N = 3.0:Tp  .20]
*
 □□□ ADD [0108 + 0008]  0113  3  5.0  124.20     1.39 13.17  61.31  n/a
.000
*
  *   CALIB STANDHYD     0009  1  5.0    4.91      .76 12.00  43.99  .46
.000
      [I%=32.0:S%= 2.00]
*
 □□□ ADD [0113 + 0009]  0114  3  5.0  129.11     1.97 12.08  60.65  n/a
.000
*
 FINISH

=========================================================================
=====================================
```

```
==========================================================================
=====================================


       V     V    I    SSSSS  U    U     A     L
       V     V    I    SS     U    U    A A    L
        V   V     I     SS    U    U   AAAAA   L
        V   V     I      SS   U    U   A    A  L
         VV       I    SSSSS  UUUUU    A    A  LLLLL

        OOO    TTTTT  TTTTT  H    H  Y    Y  M    M   OOO    TM, Version
1.0.4
       O   O     T      T    H    H   Y Y    MM MM  O   O
       O   O     T      T    HHHHH     Y     M M M  O   O   Licensed To:
       O   O     T      T    H    H    Y     M    M  O   O   Richardson
Engineering
        OOO      T      T    H    H    Y     M    M   OOO    VO104-0004-01

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                   *****  S U M M A R Y   O U T P U T  *****


  Input    filename: C:\Ott\0-8113f\Post1.ott
  Output   filename: C:\Ott\0-8113f\Post1-4detail.txt
  Summary filename: C:\Ott\0-8113f\Post1-4summary.txt


DATE: 5/27/99                                  TIME: 4:39:52 PM

USER: MS


 ===<comment>=== Second try to Pond 1

  ****************************
  ** SIMULATION NUMBER:    4 **
  ****************************

  W/E COMMAND                HYD ID    DT     AREA   Qpeak Tpeak   R.V.  R.C.
Qbase
                                       min     ha     cms   hrs      mm
cms

  *    START @    .00 hrs
       --------------------
  □□□ READ STORM                      12.0
       [ Ptot=120.68 mm ]
       fname :C:\STORMS\SCS100.STM
       remark:100 YR S.C.S. STORM
*
  **   CALIB NASHYD        0007  1   5.0     4.52     .47 12.08   50.95   .42
.000
       [CN=62.0            ]
       [ N = 3.0:Tp   .24]
```

```
*
  **  CALIB STANDHYD       0002  1  5.0     6.61     1.68 12.00  83.41   .69
.000
      [I%=60.0:S%= 2.00]
*
  **  CALIB STANDHYD       0001  1  5.0    12.93     2.65 12.08  61.21   .51
.000
      [I%=32.0:S%= 2.00]
*
   *  CALIB STANDHYD       0003  1  5.0     6.42     1.54 12.00  67.32   .56
.000
      [I%=40.0:S%= 2.00]
*
   *  CALIB STANDHYD       0331  1  5.0    10.19     3.40 12.00 114.71   .95
.000
      [I%=95.0:S%= 2.00]
*
   *  CALIB STANDHYD       0031  1  5.0    23.65     6.49 12.00 101.29   .84
.000
      [I%=80.0:S%= 2.00]
*
 □□□ RESRVR [ 2 : 0031] 0205  1  5.0    23.65     4.79 12.08 101.29   n/a
.000
      {ST=   .41 ha.m }
*
   *  CALIB STANDHYD       0330  1  5.0    13.61     3.90 12.00 101.29   .84
.000
      [I%=80.0:S%= 2.00]
*
 □□□ ADD [0205 + 0330]  0100  3  5.0    37.26     8.17 12.00 101.29   n/a
.000
*
 □□□ ADD [0331 + 0100]  0115  3  5.0    47.45    11.57 12.00 104.17   n/a
.000
*
 □□□ ADD [0003 + 0115]  0101  3  5.0    53.87    13.12 12.00  99.78   n/a
.000
*
 □□□ ADD [0001 + 0101]  0102  3  5.0    66.80    15.63 12.00  92.32   n/a
.000
*
 □□□ ADD [0002 + 0102]  0103  3  5.0    73.41    17.31 12.00  91.51   n/a
.000
*
   *  CALIB STANDHYD       0005  1  5.0    12.90     2.83 12.00  61.21   .51
.000
      [I%=32.0:S%= 2.00]
*
   *  CALIB STANDHYD       0032  1  5.0    10.30     2.86 12.00 101.29   .84
.000
      [I%=80.0:S%= 2.00]
*
 □□□ RESRVR [ 2 : 0032] 0204  1  5.0    10.30     1.19 12.08 101.29   n/a
.000
      {ST=   .28 ha.m }
*
```

```
 □□□ ADD [0005 + 0204]  0105  3   5.0    23.20     3.89 12.00   79.01   n/a
.000
*
  *   CALIB STANDHYD      0004  1   5.0    17.54     3.58 12.00   61.21   .51
.000
      [I%=32.0:S%= 2.00]
*
 □□□ ADD [0105 + 0004]  0106  3   5.0    40.74     7.47 12.00   71.35   n/a
.000
*
 □□□ ADD [0103 + 0106]  0104  3   5.0   114.15    24.77 12.00   84.32   n/a
.000
*
  *   CALIB NASHYD        0006  1   5.0     3.36      .28 12.08   37.45   .31
.000
      [CN=50.0          ]
      [ N = 3.0:Tp   .20]
*
 □□□ ADD [0104 + 0006]  0107  3   5.0   117.51    25.03 12.00   82.98   n/a
.000
*
 □□□ RESRVR [ 2 : 0107] 0201  1   5.0   117.51     4.83 12.67   82.97   n/a
.000
      {ST=  5.81 ha.m }
*
  *   CALIB NASHYD        0010  1   5.0      .83      .10 12.08   50.90   .42
.000
      [CN=62.0          ]
      [ N = 3.0:Tp   .20]
*
 □□□ ADD [0201 + 0010]  0109  3   5.0   118.34     4.85 12.67   82.74   n/a
.000
*
 □□□ ADD [0007 + 0109]  0108  3   5.0   122.86     5.01 12.58   81.57   n/a
.000
*
  *   CALIB NASHYD        0008  1   5.0     1.34      .15 12.08   50.90   .42
.000
      [CN=62.0          ]
      [ N = 3.0:Tp   .20]
*
 □□□ ADD [0108 + 0008]  0113  3   5.0   124.20     5.05 12.58   81.24   n/a
.000
*
  *   CALIB STANDHYD      0009  1   5.0     4.91     1.11 12.00   61.21   .51
.000
      [I%=32.0:S%= 2.00]
*
 □□□ ADD [0113 + 0009]  0114  3   5.0   129.11     5.18 12.58   80.48   n/a
.000
*
 FINISH

=========================================================================
=====================================
```

```
=====================================================================
===================================

          V     V    I    SSSSS  U    U     A     L
          V     V    I    SS     U    U    A A    L
           V   V     I     SS    U    U   AAAAA   L
           V   V     I      SS   U    U   A    A  L
            VV       I    SSSSS  UUUUU    A    A  LLLLL

           OOO    TTTTT  TTTTT   H    H   Y    Y  M    M   OOO      TM, Version
1.0.4
          O   O    T       T     H    H    Y Y    MM  MM   O   O
          O   O    T       T     HHHHH      Y     M M M    O   O    Licensed To:
          O   O    T       T     H    H     Y     M    M   O   O    Richardson
Engineering
           OOO     T       T     H    H     Y     M    M    OOO     V0104-0004-01

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& Assoc., 1999.

                     *****  S U M M A R Y   O U T P U T  *****


   Input   filename: C:\Ott\0-8113f\Post1.ott
   Output  filename: C:\Ott\0-8113f\Post1-1detail.txt
   Summary filename: C:\Ott\0-8113f\Post1-1summary.txt


 DATE: 5/27/99                              TIME: 4:38:36 PM

 USER: MS


  ===<comment>=== Second try to Pond 1

   ***************************
   ** SIMULATION NUMBER:   1 **
   ***************************

   W/E COMMAND                 HYD ID   DT     AREA    Qpeak  Tpeak    R.V.  R.C.
 Qbase
                                        min     ha      cms    hrs      mm

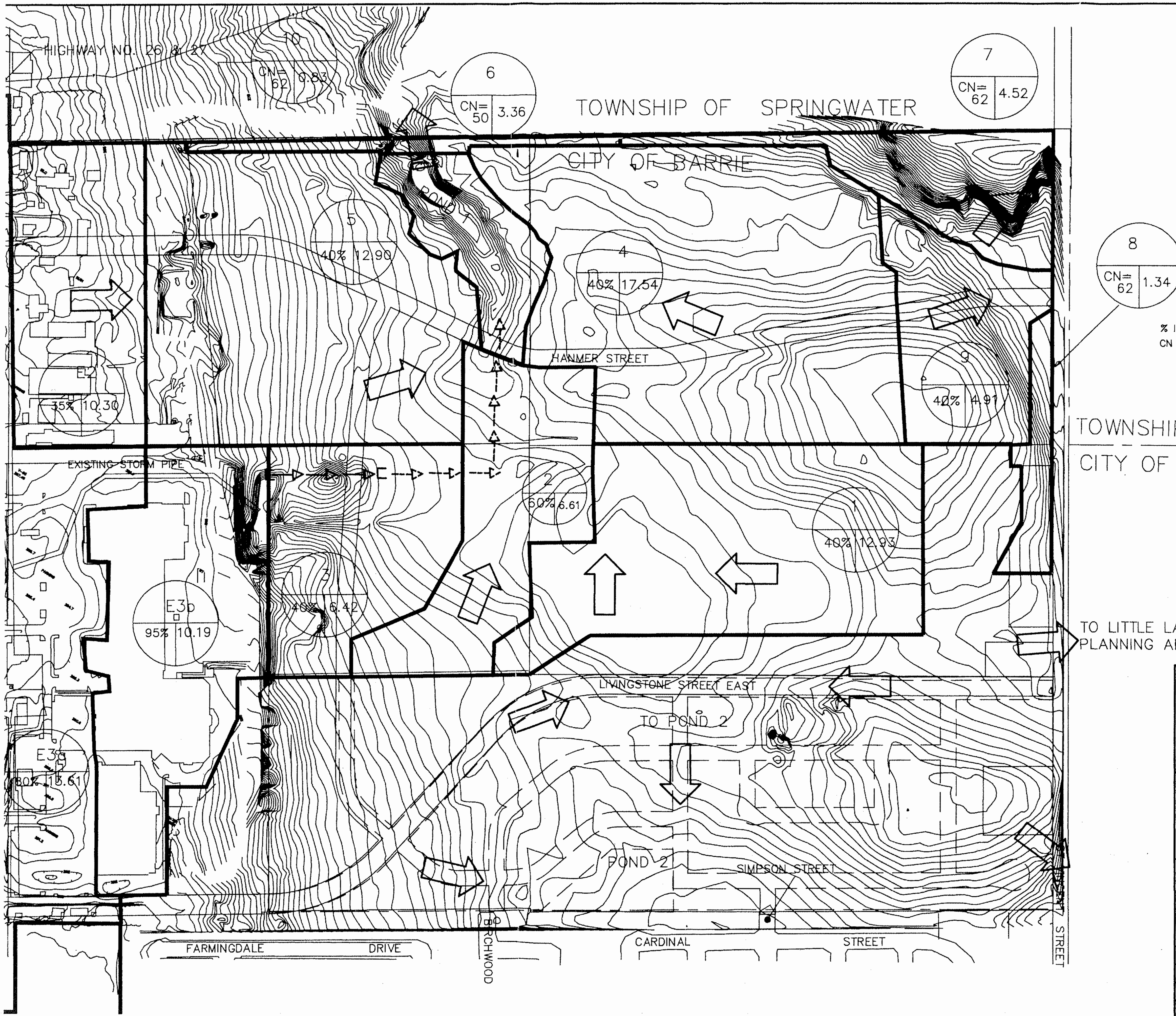
 cms

   *   START @    .00 hrs
       --------------------
   □□□ READ STORM                      12.0
       [ Ptot=193.00 mm ]
       fname :C:\STORMS\Timmins.stm
       remark:* REGIONAL DESIGN STORM
 *
   **  CALIB NASHYD        0007  1   5.0     4.52     .34    7.00 104.73  .54
 .000
       [CN=62.0          ]
       [ N = 3.0:Tp   .24]
```

```
 □□□ ADD [0005 + 0204]  0105  3  5.0   23.20    2.09  7.00 128.19  n/a
.000
*
 **  CALIB STANDHYD      0004  1  5.0   17.54    1.61  7.00 100.59  .52
.000
      [I%=32.0:S%= 2.00]
*
 □□□ ADD [0105 + 0004]  0106  3  5.0   40.74    3.70  7.00 116.31  n/a
.000
*
 □□□ ADD [0103 + 0106]  0104  3  5.0  114.15   11.33  7.00 136.41  n/a
.000
*
 **  CALIB NASHYD        0006  1  5.0    3.36     .20  7.00  81.49  .42
.000
      [CN=50.0          ]
      [ N = 3.0:Tp  .20]
*
 □□□ ADD [0104 + 0006]  0107  3  5.0  117.51   11.52  7.00 134.83  n/a
.000
*
 □□□ RESRVR [ 2 : 0107] 0201  1  5.0  117.51    7.69  7.42 134.82  n/a
.000
      {ST=  6.29 ha.m }
*
 **  CALIB NASHYD        0010  1  5.0     .83     .06  7.00 104.63  .54
.000
      [CN=62.0          ]
      [ N = 3.0:Tp  .20]
*
 □□□ ADD [0201 + 0010]  0109  3  5.0  118.34    7.73  7.33 134.61  n/a
.000
*
 □□□ ADD [0007 + 0109]  0108  3  5.0  122.86    7.97  7.33 133.51  n/a
.000
*
 **  CALIB NASHYD        0008  1  5.0    1.34     .10  7.00 104.63  .54
.000
      [CN=62.0          ]
      [ N = 3.0:Tp  .20]
*
 □□□ ADD [0108 + 0008]  0113  3  5.0  124.20    8.03  7.33 133.20  n/a
.000
*
 **  CALIB STANDHYD      0009  1  5.0    4.91     .47  7.00 100.59  .52
.000
      [I%=32.0:S%= 2.00]
*
 □□□ ADD [0113 + 0009]  0114  3  5.0  129.11    8.32  7.33 131.96  n/a
.000
*
 FINISH

==========================================================================
=====================================
```

```
*
  **   CALIB STANDHYD      0002  1   5.0     6.61      .67  7.00 134.03   .69
.000
       [I%=60.0:S%= 2.00]
*
  **   CALIB STANDHYD      0001  1   5.0    12.93     1.18  7.00 100.59   .52
.000
       [I%=32.0:S%= 2.00]
*
  **   CALIB STANDHYD      0003  1   5.0     6.42      .62  7.00 109.49   .57
.000
       [I%=40.0:S%= 2.00]
*
  **   CALIB STANDHYD      0331  1   5.0    10.19     1.20  7.00 184.32   .96
.000
       [I%=95.0:S%= 2.00]
*
  **   CALIB STANDHYD      0031  1   5.0    23.65     2.57  7.00 162.77   .84
.000
       [I%=80.0:S%= 2.00]
*
  □□□ RESRVR [ 2 : 0031] 0205  1   5.0    23.65     2.47  7.08 162.76   n/a
.000
       {ST=    .28 ha.m }
*
  **   CALIB STANDHYD      0330  1   5.0    13.61     1.49  7.00 162.77   .84
.000
       [I%=80.0:S%= 2.00]
*
  □□□ ADD [0205 + 0330]   0100  3   5.0    37.26     3.95  7.00 162.77   n/a
.000
*
  □□□ ADD [0331 + 0100]   0115  3   5.0    47.45     5.15  7.00 167.39   n/a
.000
*
  □□□ ADD [0003 + 0115]   0101  3   5.0    53.87     5.77  7.00 160.49   n/a
.000
*
  □□□ ADD [0001 + 0101]   0102  3   5.0    66.80     6.95  7.00 148.90   n/a
.000
*
  □□□ ADD [0002 + 0102]   0103  3   5.0    73.41     7.63  7.00 147.56   n/a
.000
*
  **   CALIB STANDHYD      0005  1   5.0    12.90     1.21  7.00 100.59   .52
.000
       [I%=32.0:S%= 2.00]
*
  **   CALIB STANDHYD      0032  1   5.0    10.30     1.08  7.00 162.76   .84
.000
       [I%=80.0:S%= 2.00]
*
  □□□ RESRVR [ 2 : 0032] 0204  1   5.0    10.30      .89  7.08 162.76   n/a
.000
       {ST=    .21 ha.m }
*
```



8
CN= 62 1.34

TOWNSHIP OF SPRINGWATER
CITY OF BARRIE

TO LITTLE LAKE PLANNING AREA

N

POST-DEVELOPMENT SUBWATERSHED BOUNDARIES

AREA #
% IMPERVIOUS AREA/ CN NUMBER
AREA (ha)

OVERFLOW ROUTE FROM GEORGIAN MALL
PIPED
CHANNEL

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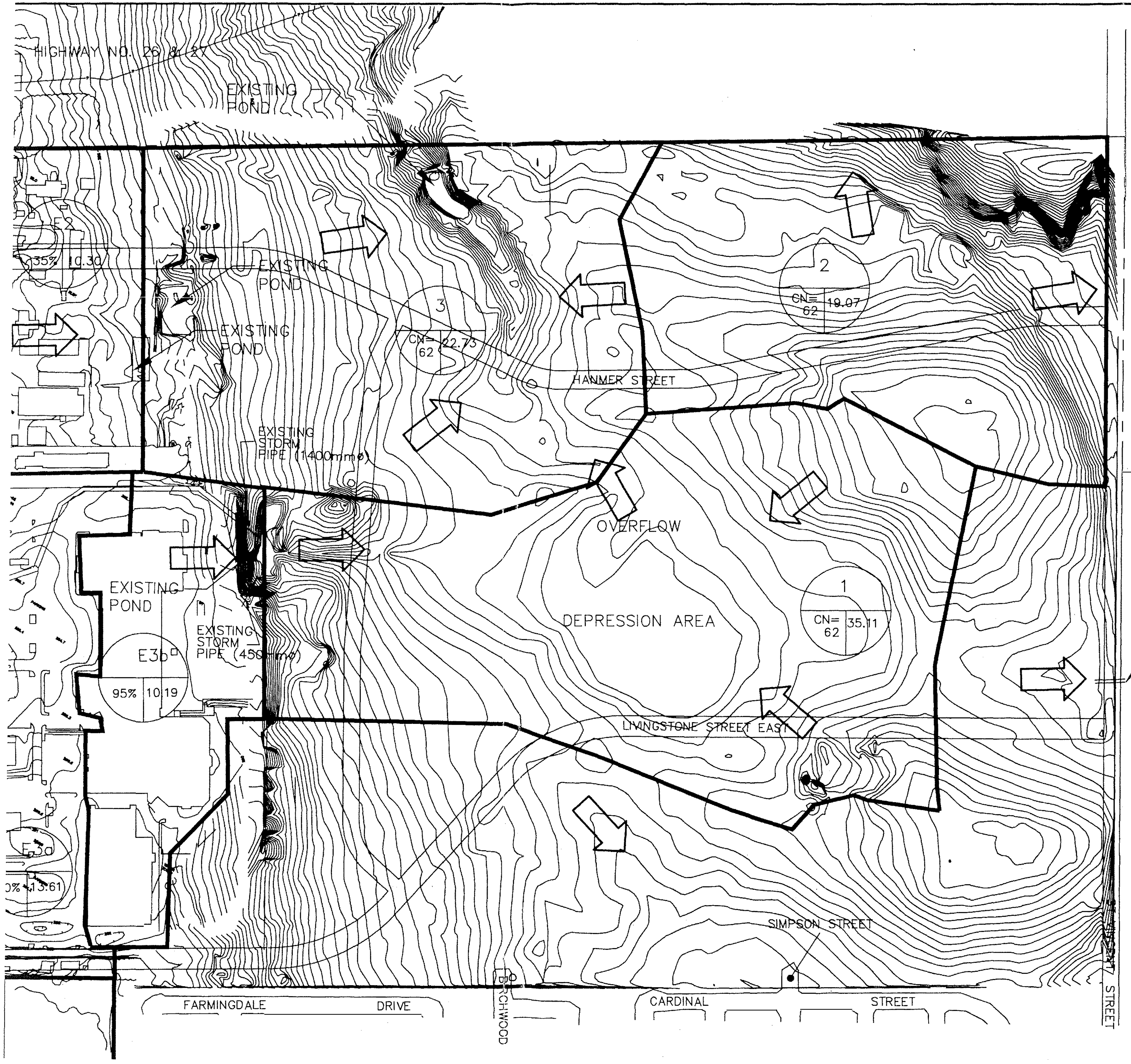
CITY of BARRIE
MUNICIPAL WORKS DEPARTMENT

EAST BAYFIELD POND 1 STORM WATER MANAGEMENT REPORT

POST-DEVELOPMENT DRAINAGE
FIGURE 4

DESIGN	SCALE HOR. 1 : 5 000	
DRAWN G. ANDREWS	REVIEWED B. RICHARDSON	DRAWING No.
DATE JAN. 7, 1999	SHEET No.	8113–FIG4

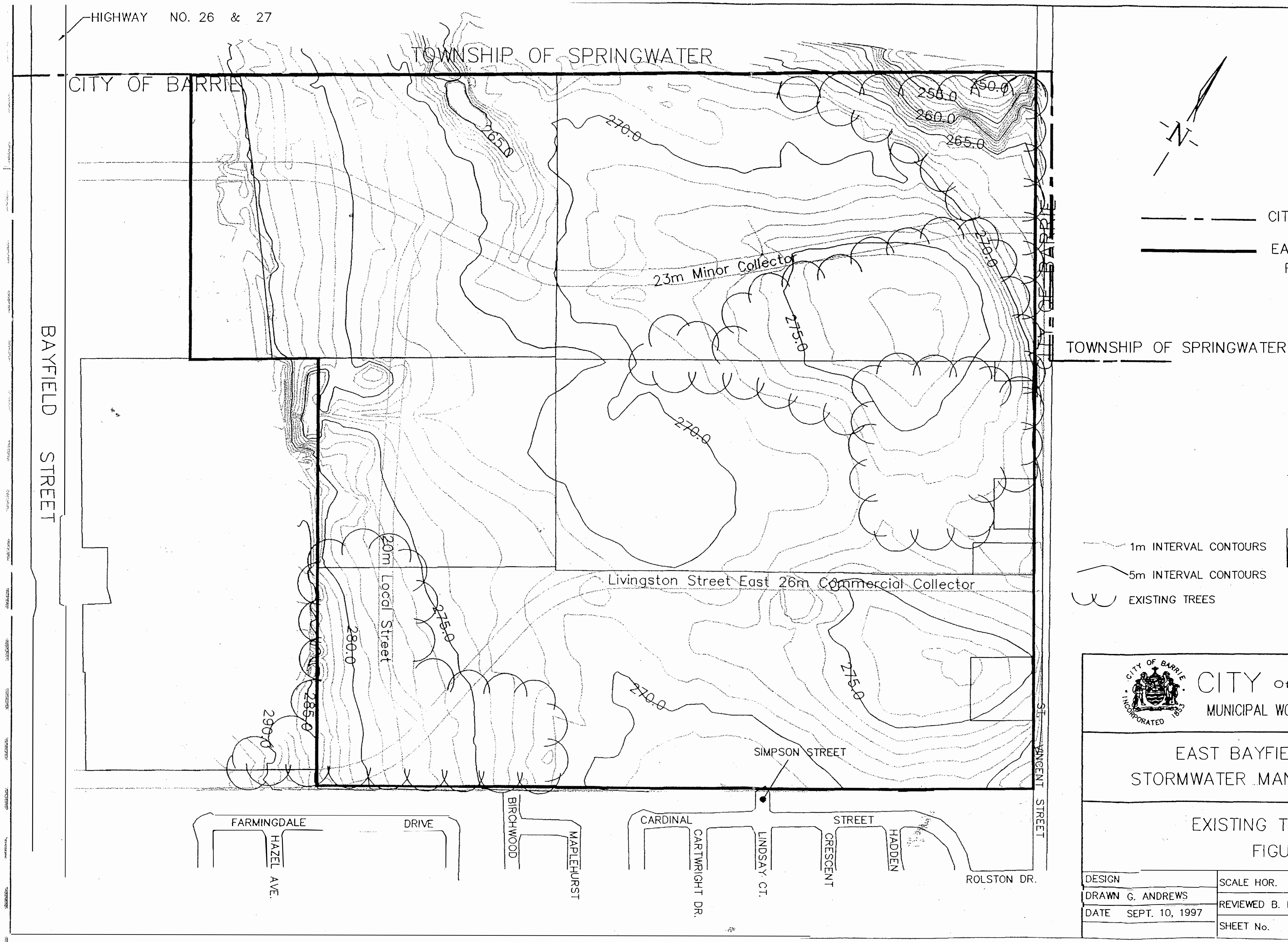


CITY OF BARRIE
MUNICIPAL WORKS DEPARTMENT

EAST BAYFIELD
POND 1
STORM WATER MANAGEMENT REPORT

PRE-DEVELOPMENT DRAINAGE
FIGURE 3

DESIGN
DRAWN G. ANDREWS
DATE JAN. 7, 1999
SCALE HOR. 1 : 5 000
REVIEWED B. RICHARDSON
DRAWING No. 8113-FIG3
SHEET No.



REINDERS

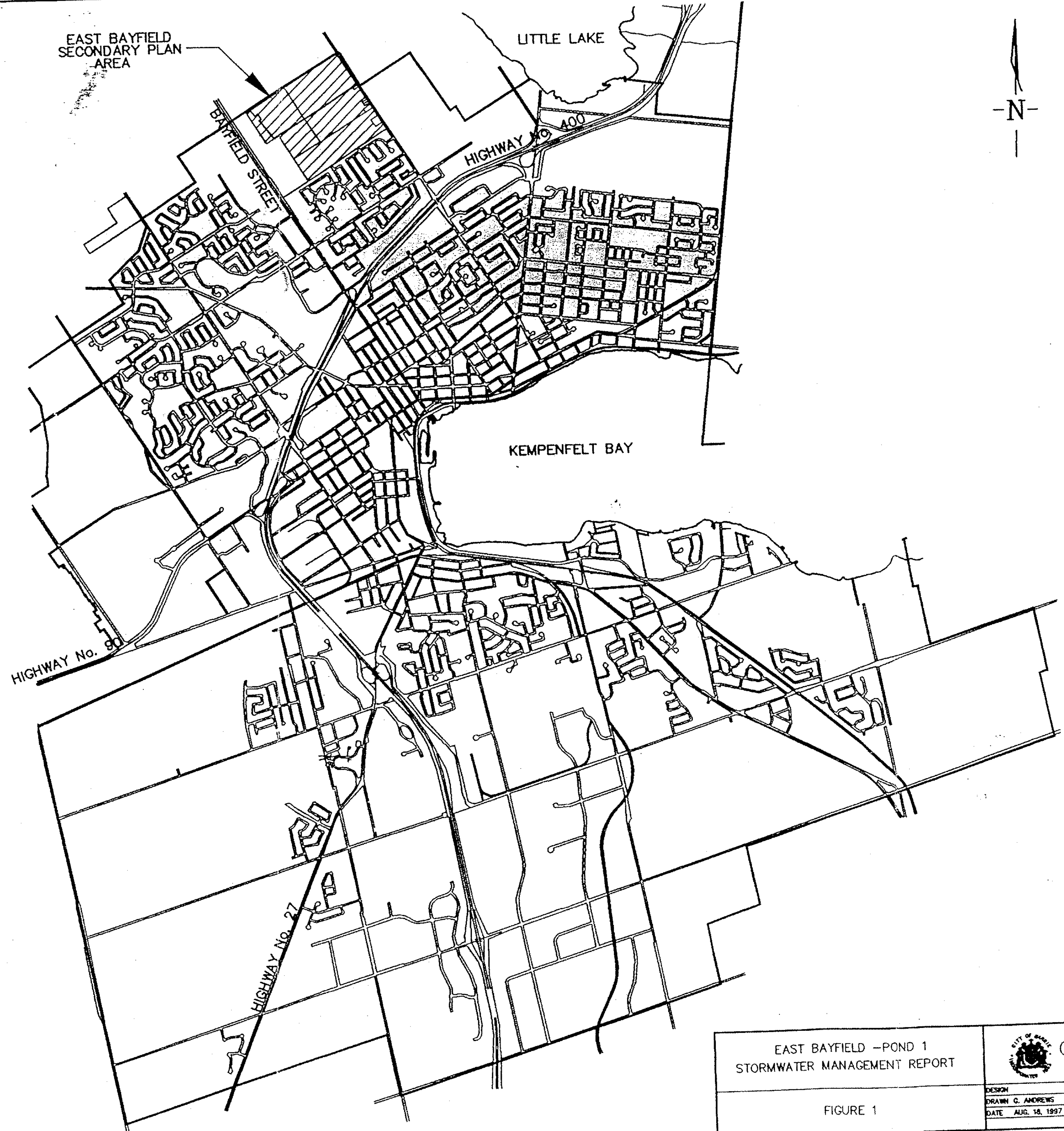
Reinders and Associates (Barrie) Limited
Architect, Engineers, Planners, Project Managers
54 Cedar Point Drive, Barrie L4N 5R7
Tel. (705) 726-6722
Fax (705) 726-9445

CITY OF BARRIE
MUNICIPAL WORKS DEPARTMENT

EAST BAYFIELD – POND 1
STORMWATER MANAGEMENT REPORT

EXISTING TOPOGRAPHY
FIGURE 2

DESIGN	SCALE HOR. 1 : 5 000	
DRAWN G. ANDREWS	REVIEWED B. RICHARDSON	DRAWING No.
DATE SEPT. 10, 1997	SHEET No.	8113-FIG2



REINDERS

EAST BAYFIELD –POND 1
STORMWATER MANAGEMENT REPORT

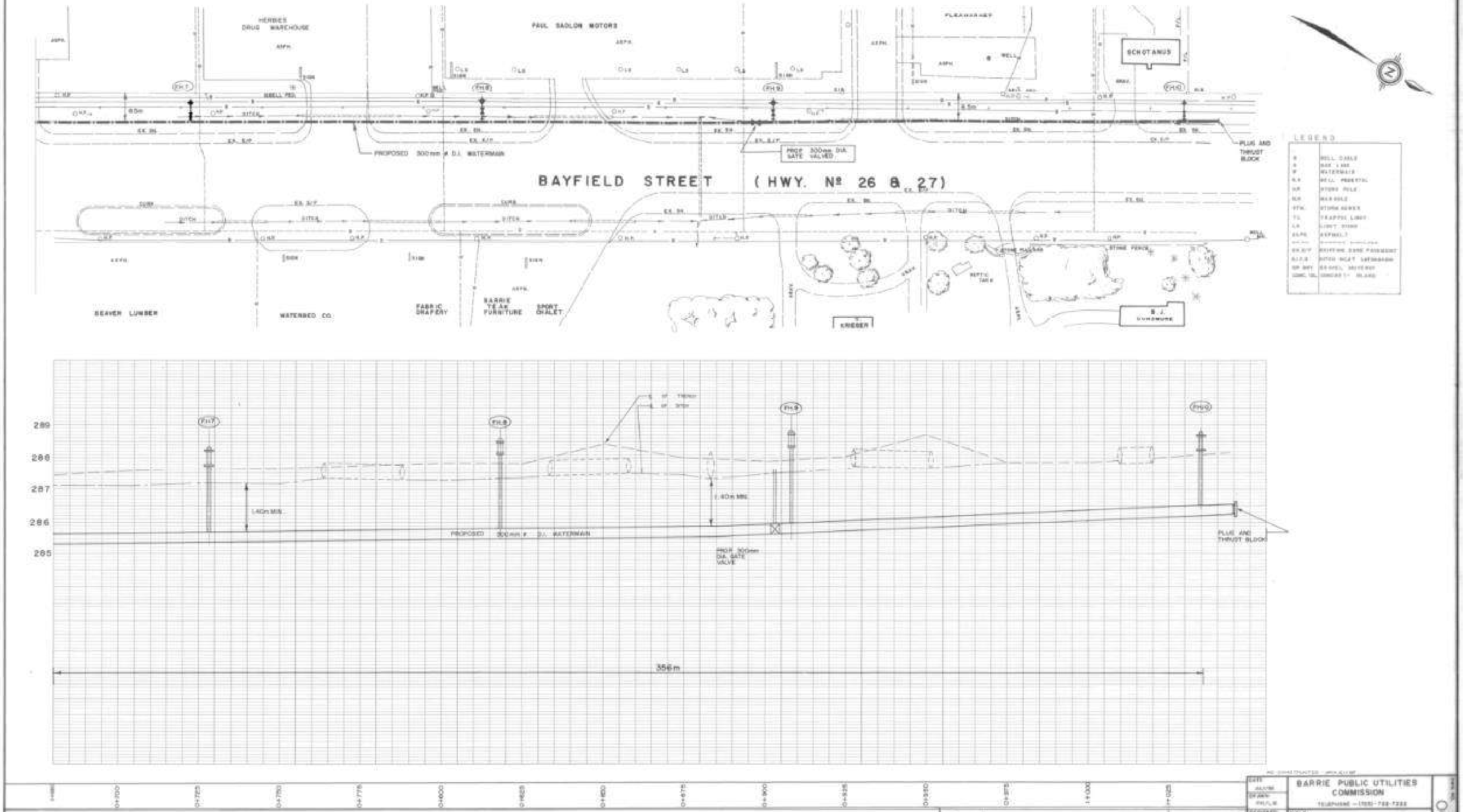
FIGURE 1

CITY of BARRIE
MUNICIPAL WORKS DEPARTMENT

DESIGN
DRAWN C. ANDREWS
DATE AUG. 18, 1997
SCALE HOR. NTS
REVIEWED B. RICHARDSON
SHEET No.
DRAWING No. 8113–FIG1

DWG.NO.001,005

DWG. NO. 001,005.



Ainley and Associates Ltd.
Consulting Engineers and Planners
Collingwood — Barrie — Belleville

SCALE: HORZ. 1:500
VERT. 1:50

DESIGN H.J.C. | CHECKED
DRAWN | DATE

DWG. Nº 286356 - 3

1950-351-003

BARRIE PUBLIC UTILITIES
COMMISSION

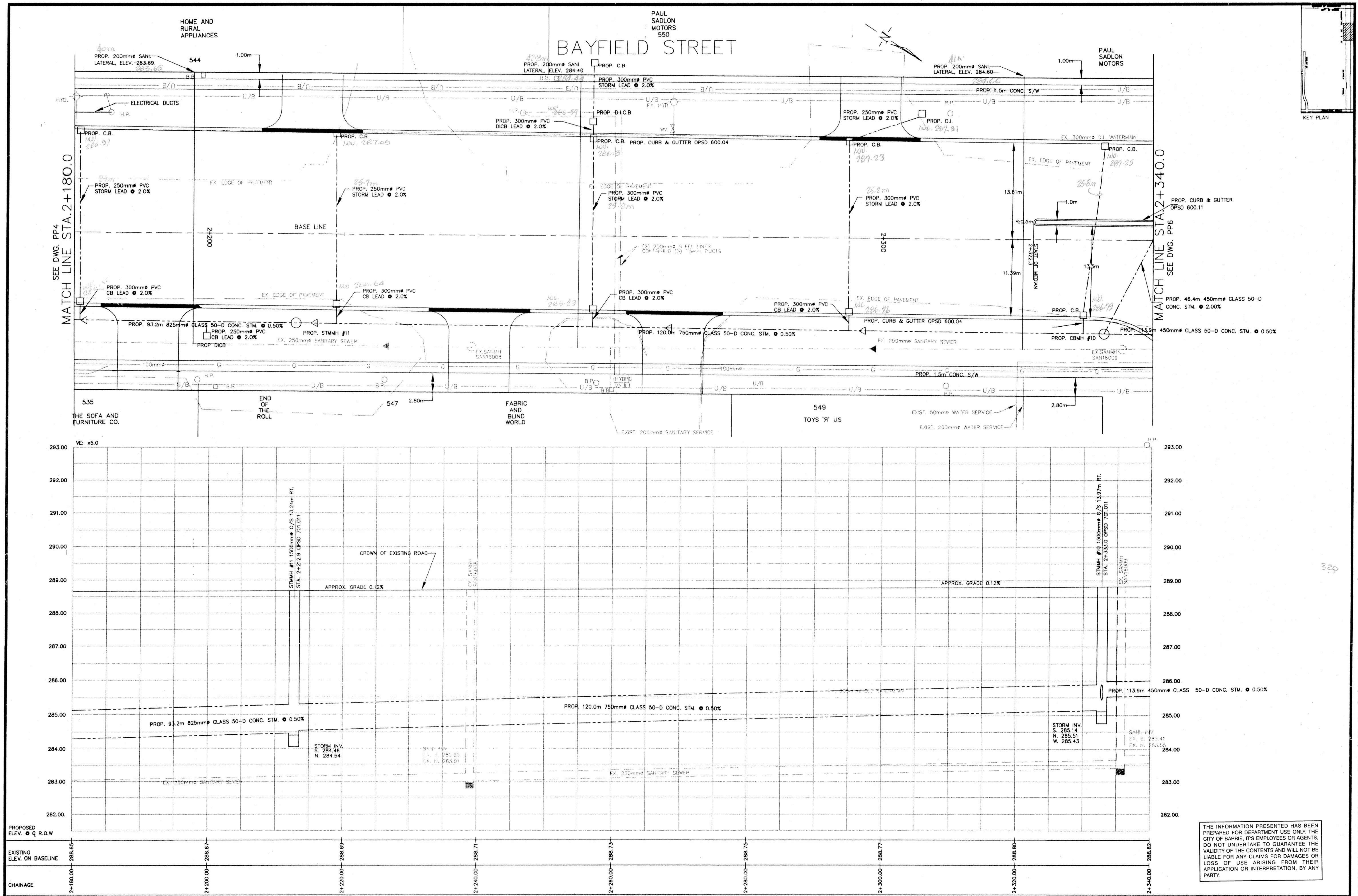
TITLE:
BAYFIELD STREET
WATERMAIN EXTENSION
STA. 0+680 TO STA. 1+025
BAYFIELD ST.

APPROVED BY, P.ENG.

DWG SIZE D

DWG. NO. 001,005

001,005



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RICHARDSON ENGINEERING LTD.
CONSULTING ENGINEERS
Unit D, 4 Cedar Pointe Drive
Barrie, Ontario L4N 5R7
Tel. (705) 728-0009
Fax (705) 727-7774
E-mail: engineer@richardson.on.ca

GENERAL NOTES

BEARING NOTE:
BEARINGS ARE UTM GRID BEARINGS AND ARE REFERRED TO THE CENTRAL MERIDIAN IN ZONE 17 (81°)AND ARE DERIVED FROM OBSERVATIONS ON MNR CONTROL MONUMENTS 010860416 (N=4913255.256, E=606528.103) AND 010860410(N=4913103.464, E=606668.620)

DISTANCE NOTE:
DISTANCES SHOWN HEREON ARE GROUND DISTANCES AND CAN BE CONVERTED TO GRID DISTANCES BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.99970

BENCH MARKS

SECOND ORDER VERTICAL CONTROL MONUMENT
CITY OF BARRIE BENCH MARK NO V010865472

ELEVATION 270.934

SPLIT LEVEL DWELLING #60 LOCATED ON SOUTH SIDE OF MAPLEHURST CRESCENT IN THE CITY OF BARRIE. BRASS TABLET SET HORIZONTALLY IN THE NORTH FACE OF THE CONCRETE FOUNDATION, 17.8cm SOUTH OF THE CENTERLINE OF OF MAPLEHURST CRES. AND 24cm EAST OF THE MOST WESTERLY BUILDING CORNER.

NO.	REVISIONS	DATE	APPROVED
1	ISSUED FOR CONSTRUCTION	11.8.99	MS

"This Record Drawing has been prepared, in part, based upon information furnished by others. While this information is believed to be reliable, the City does not warrant the accuracy of this information, and shall not be held responsible for damages arising from the use of the Record Drawing. The user hereby releases and discharges the City, its employees or agents from any claims, losses or damages and agrees to indemnify and save harmless, the City, from any claims, losses, or damages arising from the use of the Record Drawing."

CITY OF BARRIE
APPROVED
DATE. 1999 08 17
R. W. McArthur P.Eng.
DIRECTOR OF MUNICIPAL WORKS

M. P. SCHMALZ
Aug 11/99

BAYFIELD STREET IMPROVEMENTS

LIVINGSTONE STREET TO CITY LIMITS
STA. 2+180 TO STA. 2+340

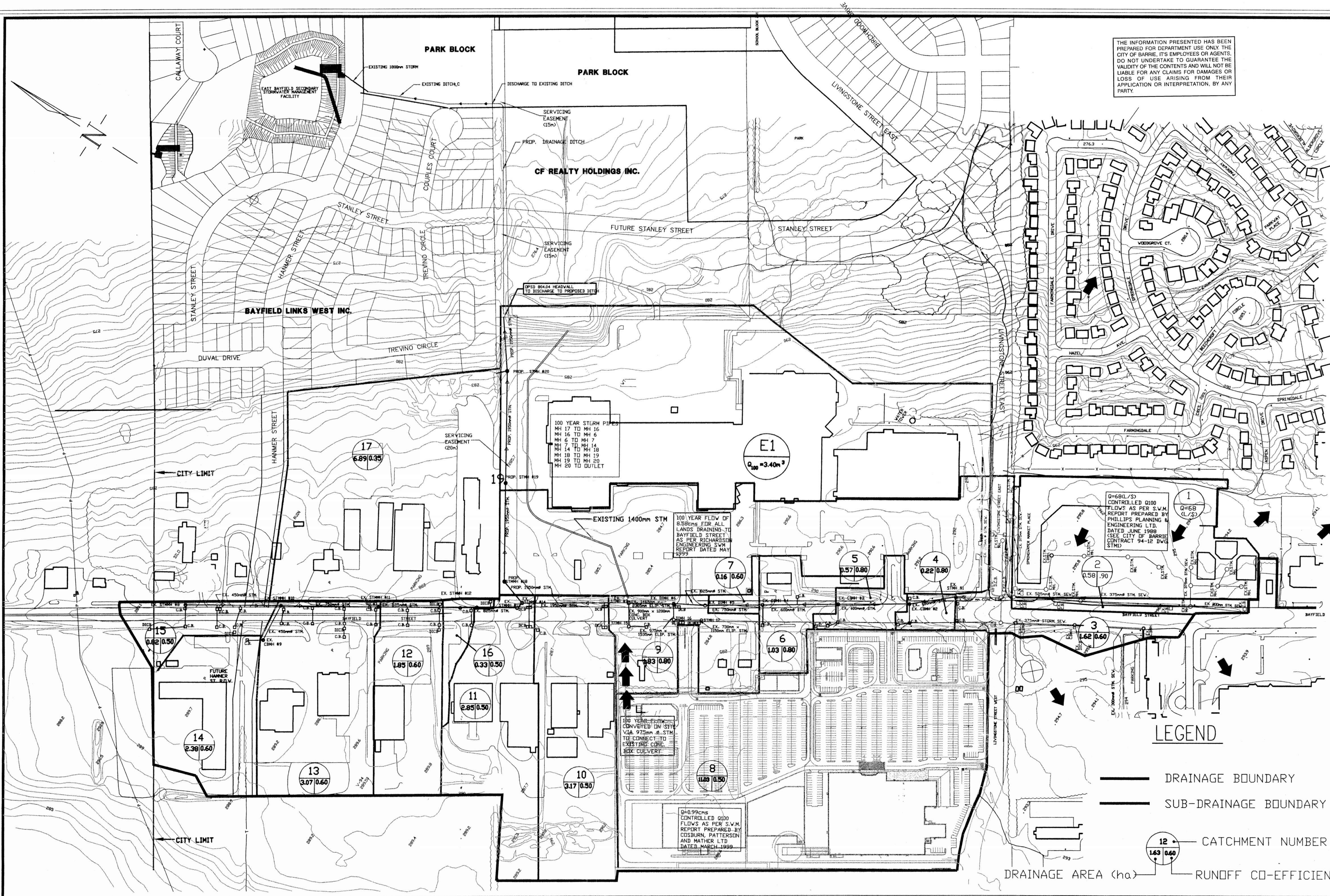
CITY of BARRIE
MUNICIPAL WORKS DEPARTMENT

SCALE HOR.	1:250	VERT.	1:50	DRAWING NO.	9110-PP5
DESIGN	M.S./B.S.	DRAWN	B.S.	SHEET NO.	PP5
REVIEWED	M.S.	DATE	AUGUST 6, 1999		

1999-022-008

99-22 PP5

99-22 SH.8 OF 44



RICHARDSON ENGINEERING LTD.
CONSULTING ENGINEERS
Unit D, 4 Cedar Pointe Drive
Barrie, Ontario L4N 5R7
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E-mail: engineer@richardson.on.ca

BEARING NOTE:
BEARINGS ARE UTM GRID BEARINGS AND ARE REFERRED TO THE CENTRAL MERIDIAN IN ZONE 17 (81°)AND ARE DERIVED FROM OBSERVATIONS ON MNR CONTROL MONUMENTS 010860416 (N=4913255.256, E=606528.103) AND 010860410(N=4913103.464, E=606668.620)

DISTANCE NOTE:
DISTANCES SHOWN HEREON ARE GROUND DISTANCES AND CAN BE CONVERTED TO GRID DISTANCES BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.99970

BENCH MARK
SECOND ORDER VERTICAL CONTROL MONUMENT
CITY OF BARRIE BENCH MARK NO V010865472

ELEVATION 270.934

SPLIT LEVEL DWELLING #60 LOCATED ON SOUTH SIDE OF MAPLEHURST CRESCENT IN THE CITY OF BARRIE. BRASS TABLET SET HORIZONTALLY IN THE NORTH FACE OF THE CONCRETE FOUNDATION, 17.8cm SOUTH OF THE CENTERLINE OF OF MAPLEHURST CRES. AND 24cm EAST OF THE MOST WESTERLY BUILDING CORNER.

NO.	REVISIONS	DATE	APPROVED

CITY OF BARRIE
APPROVED
DATE. July. 23, 2001
R. W. McArthur, P.Eng.
DIRECTOR OF MUNICIPAL WORKS

M. P. SCHMALZ
July 18/01
PROVINCE OF ONTARIO

BAYFIELD STREET
OUTLET SANITARY AND STORM SEWER

STORM DRAINAGE PLAN

CITY of BARRIE
MUNICIPAL WORKS DEPARTMENT

SCALE HOR.	1:2000	VERT.	——	DRAWING NO.	0057-STM
DESIGN	M.S.	DRAWN	B.S.	SHEET NO.	STM
REVIEWED	M.S.	DATE	JULY 17, 2001		

2000-016-002

Appendix C Stormwater Management Calculations

SCS consulting group ltd

EXISTING WEIGHTED RUNOFF COEFFICIENT

547 Bayfield Street
Project Number: 2700
Date: June 2024
Designer Initials: C.Y.

Catchment 101 Outlets to: East

	Runoff Coefficient	Area (ha)	Weighted Runoff Coefficient	Weighted Runoff Coefficient (10 year)	Weighted Runoff Coefficient (25 year)	Weighted Runoff Coefficient (50 year)	Weighted Runoff Coefficient (100 year)
Asphalt	0.95	0.45	0.53	0.53	0.56	0.56	0.56
Rooftops	0.95	0.19	0.23	0.23	0.24	0.24	0.24
Landscape [1]	0.16	0.16	0.03	0.03	0.03	0.04	0.04
TOTAL		0.80	0.80	0.80	0.84	0.84	0.84

Catchment 102 Outlets to: East

	Runoff Coefficient	Area (ha)	Weighted Runoff Coefficient	Weighted Runoff Coefficient (10 year)	Weighted Runoff Coefficient (25 year)	Weighted Runoff Coefficient (50 year)	Weighted Runoff Coefficient (100 year)
Asphalt/Concrete	0.95	0.03	0.40	0.40	0.42	0.42	0.42
Grass [1]	0.16	0.04	0.09	0.09	0.10	0.11	0.12
TOTAL		0.06	0.49	0.49	0.52	0.53	0.54

Notes:

[1] The runoff coefficient was obtained from **Table 3.2** from *Design Chart 1.07, Ontario Ministry of Transportation, "MTO Drainage Management Manual", MTO. (1997).* Assuming it's Lawn 2-7% grade, hydraulic soil group B-BC.

East Total

Catchment	Runoff Coefficient	Area	Weighted Runoff Coefficient	Weighted Runoff Coefficient (10 year)	Weighted Runoff Coefficient (25 year)	Weighted Runoff Coefficient (50 year)	Weighted Runoff Coefficient (100 year)
101	0.80	0.80	0.74	0.74	0.81	0.89	0.92
102	0.49	0.06	0.04	0.04	0.04	0.04	0.04
TOTAL		0.86	0.77	0.77	0.85	0.93	0.97

Overall Total

Catchment	Runoff Coefficient	Area	Weighted Runoff Coefficient	Weighted Runoff Coefficient (10 year)	Weighted Runoff Coefficient (25 year)	Weighted Runoff Coefficient (50 year)	Weighted Runoff Coefficient (100 year)
101	0.80	0.80	0.74	0.74	0.81	0.89	0.92
102	0.49	0.06	0.04	0.04	0.04	0.04	0.04
TOTAL		0.86	0.77	97.88	0.85	0.93	0.97

2 Year storm

IDF Parameters*

a = 675.586
t = 10 min
b = 4.681
c = 0.780

Runoff Coefficient:

C1 = 0.80
C2 = 0.49

Allowable Release Rate Calculation

Outlet ID	Area	time t	Intensity i=a/(t+b)^c	Flow Q=CiA/360
	ha	*min*	*mm/hr*	*l/s*
Catchment 101	0.80	10.00	83.10	146.6
Catchment 102	0.06	10.00	83.10	7.1
Total	**0.86**			**153.7**

* a,b,c's per City of Barrie

5 Year storm

IDF Parameters*

a = 843.019
t = 10 min
b = 4.582
c = 0.763

Runoff Coefficient:

C1 = 0.80
C2 = 0.49

Allowable Release Rate Calculation

Outlet ID	Area	time t	Intensity i=a/(t+b)^c	Flow Q=CiA/360
	ha	*min*	*mm/hr*	*l/s*
Catchment 101	0.80	10.00	109.11	192.5
Catchment 102	0.06	10.00	109.11	9.3
Total	**0.86**			**201.8**

* a,b,c's per City of Barrie

ALLOWABLE RELEASE RATE

10 Year storm

IDF Parameters*

a = 976.898
t = 10 min
b = 4.745
c = 0.760

Runoff Coefficient:

C1 = 0.80
C2 = 0.49

Allowable Release Rate Calculation

Outlet	Area	time	Intensity	Flow
ID		t	i=a/(t+b)^c	Q=CiA/360
	ha	*min*	*mm/hr*	*l/s*
Catchment 101	0.80	10.00	126.38	223.0
Catchment 102	0.06	10.00	126.38	10.8
Total	**0.86**			**233.8**

* a,b,c's per City of Barrie

25 Year storm

IDF Parameters*

a = 1133.123
t = 10 min
b = 4.734
c = 0.756

Runoff Coefficient:

C1 = 0.84
C2 = 0.52

Allowable Release Rate Calculation

Outlet	Area	time	Intensity	Flow
ID		t	i=a/(t+b)^c	Q=CiA/360
	ha	*min*	*mm/hr*	*l/s*
Catchment 101	0.80	10.00	148.26	261.6
Catchment 102	0.06	10.00	148.26	13.4
Total	**0.86**			**275.0**

* a,b,c's per City of Barrie

ALLOWABLE RELEASE RATE

50 Year storm

IDF Parameters*

a = 1251.473
t = 10 min
b = 4.847
c = 0.753

Runoff Coefficient:

C1 = 0.84
C2 = 0.53

Allowable Release Rate Calculation

Outlet ID	Area	time	Intensity	Flow
		t	i=a/(t+b)^c	Q=CiA/360
	ha	*min*	*mm/hr*	*l/s*
Catchment 101	0.80	10.00	164.13	289.6
Catchment 102	0.06	10.00	164.13	15.1
Total	**0.86**			**304.7**

* a,b,c's per City of Barrie

100 Year storm

IDF Parameters*

a = 1383.628
t = 10 min
b = 4.905
c = 0.754

Runoff Coefficient:

C1 = 0.84
C2 = 0.54

Allowable Release Rate Calculation

Outlet ID	Area	time	Intensity	Flow
		t	i=a/(t+b)^c	Q=CiA/360
	ha	*min*	*mm/hr*	*l/s*
Catchment 101	0.80	10.00	180.44	318.3
Catchment 102	0.06	10.00	180.44	16.8
Total	**0.86**			**335.1**

* a,b,c's per City of Barrie

PROPOSED WEIGHTED RUNOFF COEFFICIENT

Catchment 201 Outlets to: East

	Runoff Coefficient	Area (ha)	Weighted Runoff Coefficient	Weighted Runoff Coefficient (10 Year)	Weighted Runoff Coefficient (25 Year)	Weighted Runoff Coefficient (50 Year)	Weighted Runoff Coefficient (100 Year)
Asphalt	0.95	0.52	0.62	0.62	0.65	0.65	0.65
Rooftops	0.95	0.19	0.23	0.23	0.24	0.24	0.24
Landscape [1]	0.16	0.09	0.02	0.02	0.02	0.02	0.02
TOTAL		0.80	0.86	0.86	0.91	0.91	0.91

Catchment 202 Outlets to: East

	Runoff Coefficient	Area (ha)	Weighted Runoff Coefficient	Weighted Runoff Coefficient (10 Year)	Weighted Runoff Coefficient (25 Year)	Weighted Runoff Coefficient (50 Year)	Weighted Runoff Coefficient (100 Year)
Asphalt	0.95	0.02	0.33	0.33	0.35	0.35	0.35
Landscape [1]	0.16	0.04	0.10	0.10	0.12	0.13	0.13
TOTAL		0.06	0.43	0.43	0.46	0.47	0.48

Notes:

[1] The runoff coefficient was obtained from **Table 3.2** from *Design Chart 1.07, Ontario Ministry of Transportation, "MTO Drainage Management Manual", MTO. (1997).* Assuming it's Lawn 2-7% grade, hydraulic soil group B-BC.

East Total

Catchment	Runoff Coefficient	Area	Weighted Runoff Coefficient	Weighted Runoff Coefficient (10 year)	Weighted Runoff Coefficient (25 year)	Weighted Runoff Coefficient (50 year)	Weighted Runoff Coefficient (100 year)
201	0.86	0.80	0.80	0.80	0.88	0.93	0.93
202	0.43	0.06	0.03	0.03	0.03	0.04	0.04
TOTAL		0.86	0.83	0.83	0.92	0.97	0.97

Overall Total

Catchment	Runoff Coefficient	Area	Weighted Runoff Coefficient	Weighted Runoff Coefficient (10 year)	Weighted Runoff Coefficient (25 year)	Weighted Runoff Coefficient (50 year)	Weighted Runoff Coefficient (100 year)
201	0.86	0.80	0.80	0.80	0.88	0.93	0.93
202	0.43	0.06	0.03	0.03	0.03	0.04	0.04
TOTAL		0.86	0.83	0.83	0.92	0.97	0.97

SCS consulting group ltd

SUMMARY

547 Bayfield Street
Project Number: 2700
Date: June 2024
Designer Initials: C.Y.

					100 Year			
Catchment ID	**Routing**		**Runoff Coef.**	**Area (ha)**	**Release Rate (L/s) ^{2}**	**Storage Required (m^3) ^{2}**	**Storage Available (m^3)**	**Uncontrolled Release Rate (L/s)**
201	is routed through		0.91	0.80	335.1	27.2	27.2	335
202	is routed through	201	0.48	0.06	14.9	0.0	0.0	15
Total				0.86	335.1	27.2	27.2	

East Allowable Release Rate	335.1	L/s
East Proposed Release Rate	335.1	L/s

Notes:

^{2} Per Modified Rational Calculations (attached)

					50 Year			
Catchment ID	**Routing**		**Runoff Coef.**	**Area (ha)**	**Release Rate (L/s) ^{2}**	**Storage Required (m^3) ^{2}**	**Storage Available (m^3)**	**Uncontrolled Release Rate (L/s)**
201	is routed through		0.91	0.80	304.7	24.5	27.2	305
202	is routed through	201	0.47	0.06	13.4	0.0	0.0	13
Total				0.86	304.7	24.5	27.2	

East Allowable Release Rate	304.7	L/s
East Proposed Release Rate	304.7	L/s

Notes:

^{2} Per Modified Rational Calculations (attached)

					25 Year			
Catchment ID	**Routing**		**Runoff Coef.**	**Area (ha)**	**Release Rate (L/s) ^{2}**	**Storage Required (m^3) ^{2}**	**Storage Available (m^3)**	**Uncontrolled Release Rate (L/s)**
201	is routed through		0.91	0.80	275.0	21.8	27.2	275
202	is routed through	201	0.46	0.06	11.8	0.0	0.0	12
Total				0.86	275.0	21.8	27.2	

East Allowable Release Rate	275.0	L/s
East Proposed Release Rate	275.0	L/s

Notes:

^{2} Per Modified Rational Calculations (attached)

SCS consulting group ltd

SUMMARY

547 Bayfield Street
Project Number: 2700
Date: June 2024
Designer Initials: C.Y.

					10 Year			
Catchment ID	**Routing**		**Runoff Coef.**	**Area (ha)**	**Release Rate (L/s) ^{2}**	**Storage Required (m^3) ^{2}**	**Storage Available (m^3)**	**Uncontrolled Release Rate (L/s)**
201	is routed through		0.86	0.80	233.8	10.8	27.2	234
202	is routed through	201	0.43	0.06	9.5	0.0	0.0	9
Total				0.86	243.2	10.8	27.2	

East Allowable Release Rate	233.8	L/s
East Proposed Release Rate	233.8	L/s

Notes:

[2] Per Modified Rational Calculations (attached)

					5 Year			
Catchment ID	**Routing**		**Runoff Coef.**	**Area (ha)**	**Release Rate (L/s) ^{2}**	**Storage Required (m^3) ^{2}**	**Storage Available (m^3)**	**Uncontrolled Release Rate (L/s)**
201	is routed through		0.86	0.80	201.8	9.3	27.2	202
202	is routed through	201	0.43	0.06	8.2	0	0	8
Total				0.86	201.8	9.3	27.2	

East Allowable Release Rate	201.8	L/s
East Proposed Release Rate	201.8	L/s

Notes:

[2] Per Modified Rational Calculations (attached)

					2 Year			
Catchment ID	**Routing**		**Runoff Coef.**	**Area (ha)**	**Release Rate (L/s) ^{2}**	**Storage Required (m^3) ^{2}**	**Storage Available (m^3)**	**Uncontrolled Release Rate (L/s)**
201	is routed through		0.86	0.80	153.7	7.1	27.2	154
202	is routed through	201	0.43	0.06	6.2	0	0	6
Total				0.86	153.7	7.1	27.2	

East Allowable Release Rate	153.7	L/s
East Proposed Release Rate	153.7	L/s

Notes:

[2] Per Modified Rational Calculations (attached)

MODIFIED RATIONAL METHOD

Area ID: 201

Area = **0.798** ha
"C" = **0.91**
AC= **0.7287**
Tc = **10.0** min
Time Increment = **10.0** min
Release Rate = **335.11** l/s
Max.Storage = **27.2** m^3

City of Barrie 100 Year
a= 1383.628
b= 4.905
c= 0.754

NOTE: Catchment 202 is routed through Catchment 201

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff [1] (l/s)	Runoff Volume (m^3)	Released Volume (m^3)	Storage Volume (m^3)	
10.0	180.4	380.4	228.3	201.1	27.2	<<<<
20.0	122.5	258.3	310.0	301.6	8.4	
30.0	95.0	200.3	360.5	402.1	0.0	
40.0	78.6	165.6	397.5	502.7	0.0	
50.0	67.5	142.3	427.0	603.2	0.0	
60.0	59.5	125.5	451.7	703.7	0.0	
70.0	53.4	112.6	473.0	804.3	0.0	
80.0	48.6	102.5	491.8	904.8	0.0	
90.0	44.7	94.2	508.7	1005.3	0.0	
100.0	41.4	87.4	524.1	1105.9	0.0	
110.0	38.7	81.6	538.3	1206.4	0.0	
120.0	36.3	76.6	551.4	1306.9	0.0	
130.0	34.3	72.3	563.7	1407.5	0.0	
140.0	32.5	68.5	575.2	1508.0	0.0	
150.0	30.9	65.1	586.0	1608.5	0.0	
160.0	29.5	62.1	596.3	1709.1	0.0	
170.0	28.2	59.4	606.0	1809.6	0.0	
180.0	27.0	57.0	615.3	1910.1	0.0	
190.0	26.0	54.8	624.2	2010.7	0.0	
200.0	25.0	52.7	632.8	2111.2	0.0	
210.0	24.1	50.9	640.9	2211.7	0.0	
220.0	23.3	49.2	648.8	2312.3	0.0	
230.0	22.6	47.6	656.4	2412.8	0.0	
240.0	21.9	46.1	663.8	2513.4	0.0	

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[1] **The released volume from Catchment 202 has been added to the runoff volume of Catchment 201**

MODIFIED RATIONAL METHOD

Area ID: 201

Area = **0.798** ha
"C" = **0.91**
AC= **0.7280**
Tc = **10.0** min
Time Increment = **10.0** min
Release Rate = **304.69** l/s
Max.Storage = **24.5** m^3

City of Barrie 50 Year
a= 1251.473
b= 4.847
c= 0.753

NOTE: Catchment 202 is routed through Catchment 201

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff [1] (l/s)	Runoff Volume (m^3)	Released Volume (m^3)	Storage Volume (m^3)	
10.0	164.1	345.6	207.3	182.8	24.5	<<<<
20.0	111.4	234.5	281.4	274.2	7.2	
30.0	86.3	181.8	327.2	365.6	0.0	
40.0	71.4	150.3	360.8	457.0	0.0	
50.0	61.4	129.2	387.5	548.4	0.0	
60.0	54.1	113.9	409.9	639.8	0.0	
70.0	48.5	102.2	429.3	731.3	0.0	
80.0	44.2	93.0	446.4	822.7	0.0	
90.0	40.6	85.5	461.8	914.1	0.0	
100.0	37.7	79.3	475.8	1005.5	0.0	
110.0	35.2	74.0	488.7	1096.9	0.0	
120.0	33.0	69.5	500.7	1188.3	0.0	
130.0	31.2	65.6	511.8	1279.7	0.0	
140.0	29.5	62.2	522.3	1371.1	0.0	
150.0	28.1	59.1	532.1	1462.5	0.0	
160.0	26.8	56.4	541.5	1553.9	0.0	
170.0	25.6	54.0	550.4	1645.3	0.0	
180.0	24.6	51.7	558.9	1736.7	0.0	
190.0	23.6	49.7	567.0	1828.1	0.0	
200.0	22.7	47.9	574.7	1919.5	0.0	
210.0	21.9	46.2	582.2	2010.9	0.0	
220.0	21.2	44.6	589.4	2102.3	0.0	
230.0	20.5	43.2	596.3	2193.8	0.0	
240.0	19.9	41.9	603.0	2285.2	0.0	

[1] **The released volume from Catchment 202 has been added to the runoff volume of Catchment 201**

MODIFIED RATIONAL METHOD

Area ID: 201

Area = **0.798** ha
"C" = **0.91**
AC= **0.7266**
Tc = **10.0** min
Time Increment = **10.0** min
Release Rate = **275.00** l/s
Max.Storage = **21.8** m^3

City of Barrie 25 Year
a= 1133.123
b= 4.734
c= 0.756

NOTE: Catchment 202 is routed through Catchment 201

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff [1] (l/s)	Runoff Volume (m^3)	Released Volume (m^3)	Storage Volume (m^3)	
10.0	148.3	311.3	186.8	165.0	21.8	<<<<
20.0	100.2	210.4	252.5	247.5	5.0	
30.0	77.5	162.8	293.0	330.0	0.0	
40.0	64.0	134.5	322.7	412.5	0.0	
50.0	55.0	115.4	346.3	495.0	0.0	
60.0	48.4	101.7	366.1	577.5	0.0	
70.0	43.4	91.2	383.1	660.0	0.0	
80.0	39.5	83.0	398.2	742.5	0.0	
90.0	36.3	76.2	411.7	825.0	0.0	
100.0	33.7	70.7	424.1	907.5	0.0	
110.0	31.4	66.0	435.4	990.0	0.0	
120.0	29.5	61.9	445.9	1072.5	0.0	
130.0	27.8	58.4	455.7	1155.0	0.0	
140.0	26.4	55.3	464.9	1237.5	0.0	
150.0	25.1	52.6	473.6	1320.0	0.0	
160.0	23.9	50.2	481.8	1402.5	0.0	
170.0	22.9	48.0	489.6	1485.0	0.0	
180.0	21.9	46.0	497.0	1567.5	0.0	
190.0	21.1	44.2	504.1	1650.0	0.0	
200.0	20.3	42.6	511.0	1732.5	0.0	
210.0	19.6	41.1	517.5	1815.0	0.0	
220.0	18.9	39.7	523.8	1897.5	0.0	
230.0	18.3	38.4	529.9	1980.0	0.0	
240.0	17.7	37.2	535.8	2062.5	0.0	

[1] **The released volume from Catchment 202 has been added to the runoff volume of Catchment 201**

MODIFIED RATIONAL METHOD

547 Bayfield Street
Project Number: 2700
Date: June 2024
Designer Initials: C.Y.

Area ID: 201

Area = **0.798** ha
"C" = **0.86**
AC= **0.6897**
Tc = **10.0** min
Time Increment = **10.0** min
Release Rate = **233.75** l/s
Max.Storage = **10.8** m^3

City of Barrie 10 Year
a= 976.898
b= 4.745
c= 0.76

NOTE: Catchment 202 is routed through Catchment 201

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff [1] (l/s)	Runoff Volume (m^3)	Runoff Volume (m^3)	Storage Volume (m^3)	
10.0	126.4	251.8	151.1	140.3	10.8	<<<<
20.0	85.3	169.9	203.9	210.4	0.0	
30.0	65.9	131.3	236.3	280.5	0.0	
40.0	54.4	108.3	259.9	350.6	0.0	
50.0	46.6	92.9	278.7	420.8	0.0	
60.0	41.1	81.8	294.4	490.9	0.0	
70.0	36.8	73.3	308.0	561.0	0.0	
80.0	33.5	66.7	319.9	631.1	0.0	
90.0	30.7	61.2	330.7	701.3	0.0	
100.0	28.5	56.7	340.4	771.4	0.0	
110.0	26.6	52.9	349.4	841.5	0.0	
120.0	24.9	49.7	357.7	911.6	0.0	
130.0	23.5	46.9	365.5	981.8	0.0	
140.0	22.3	44.4	372.8	1051.9	0.0	
150.0	21.2	42.2	379.6	1122.0	0.0	
160.0	20.2	40.2	386.1	1192.1	0.0	
170.0	19.3	38.5	392.3	1262.3	0.0	
180.0	18.5	36.9	398.1	1332.4	0.0	
190.0	17.8	35.4	403.7	1402.5	0.0	
200.0	17.1	34.1	409.1	1472.6	0.0	
210.0	16.5	32.9	414.3	1542.8	0.0	
220.0	15.9	31.8	419.3	1612.9	0.0	
230.0	15.4	30.7	424.1	1683.0	0.0	
240.0	14.9	29.8	428.7	1753.1	0.0	

[1] **The released volume from Catchment 202 has been added to the runoff volume of Catchment 201**

MODIFIED RATIONAL METHOD

Area ID: 201

Area = **0.798** ha
"C" = **0.86**
AC= **0.6897**
Tc = **10.0** min
Time Increment = **10.0** min
Release Rate = **201.80** l/s
Max.Storage = **9.3** m^3

City of Barrie 5 Year
a= 843.019
b= 4.582
c= 0.763

NOTE: Catchment 202 is routed through Catchment 201

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff [1] (l/s)	Runoff Volume (m^3)	Released Volume (m^3)	Storage Volume (m^3)
10.0	109.1	217.4	130.4	121.1	9.3
20.0	73.2	145.9	175.1	181.6	0.0
30.0	56.5	112.5	202.5	242.2	0.0
40.0	46.5	92.7	222.4	302.7	0.0
50.0	39.9	79.4	238.2	363.2	0.0
60.0	35.1	69.8	251.4	423.8	0.0
70.0	31.4	62.6	262.8	484.3	0.0
80.0	28.5	56.8	272.8	544.9	0.0
90.0	26.2	52.2	281.9	605.4	0.0
100.0	24.3	48.3	290.1	665.9	0.0
110.0	22.6	45.1	297.6	726.5	0.0
120.0	21.2	42.3	304.6	787.0	0.0
130.0	20.0	39.9	311.1	847.6	0.0
140.0	19.0	37.8	317.2	908.1	0.0
150.0	18.0	35.9	322.9	968.6	0.0
160.0	17.2	34.2	328.4	1029.2	0.0
170.0	16.4	32.7	333.5	1089.7	0.0
180.0	15.7	31.3	338.5	1150.3	0.0
190.0	15.1	30.1	343.2	1210.8	0.0
200.0	14.5	29.0	347.7	1271.3	0.0
210.0	14.0	27.9	352.0	1331.9	0.0
220.0	13.5	27.0	356.2	1392.4	0.0
230.0	13.1	26.1	360.2	1453.0	0.0
240.0	12.7	25.3	364.1	1513.5	0.0

<<<<

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[1] **The released volume from Catchment 202 has been added to the runoff volume of Catchment 201**

MODIFIED RATIONAL METHOD

547 Bayfield Street
Project Number: 2700
Date: June 2024
Designer Initials: C.Y.

Area ID: 201

Area = **0.798** ha
"C" = **0.86**
AC= **0.6897**
Tc = **10.0** min
Time Increment = **10.0** min
Release Rate = **153.70** l/s
Max.Storage = **7.1** m^3

City of Barrie 2 Year
a= 675.586
b= 4.681
c= 0.78

NOTE: Catchment 202 is routed through Catchment 201

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff [1] (l/s)	Runoff Volume (m^3)	Released Volume (m^3)	Storage Volume (m^3)	
10.0	83.1	165.6	99.3	92.2	7.1	<<<<
20.0	55.4	110.4	132.5	138.3	0.0	
30.0	42.5	84.7	152.4	184.4	0.0	
40.0	34.9	69.5	166.8	230.6	0.0	
50.0	29.8	59.4	178.1	276.7	0.0	
60.0	26.1	52.1	187.5	322.8	0.0	
70.0	23.4	46.6	195.5	368.9	0.0	
80.0	21.2	42.2	202.6	415.0	0.0	
90.0	19.4	38.7	208.9	461.1	0.0	
100.0	18.0	35.8	214.6	507.2	0.0	
110.0	16.7	33.3	219.9	553.3	0.0	
120.0	15.7	31.2	224.7	599.4	0.0	
130.0	14.8	29.4	229.2	645.6	0.0	
140.0	13.9	27.8	233.4	691.7	0.0	
150.0	13.2	26.4	237.4	737.8	0.0	
160.0	12.6	25.1	241.2	783.9	0.0	
170.0	12.0	24.0	244.7	830.0	0.0	
180.0	11.5	23.0	248.1	876.1	0.0	
190.0	11.1	22.0	251.3	922.2	0.0	
200.0	10.6	21.2	254.4	968.3	0.0	
210.0	10.3	20.4	257.4	1014.4	0.0	
220.0	9.9	19.7	260.2	1060.6	0.0	
230.0	9.6	19.1	263.0	1106.7	0.0	
240.0	9.3	18.4	265.6	1152.8	0.0	

[1] **The released volume from Catchment 202 has been added to the runoff volume of Catchment 201**

Area ID: 202

Area = **0.062** ha
"C" = **0.48**
AC= **0.0297**
Tc = **10.0** min
Time Increment = **10.0** min
Release Rate = **14.88** l/s
Max.Storage = **0.0** m^3

City of Barrie 100 Year
a= 1383.628
b= 4.905
c= 0.754

NOTE: Catchment 202 is routed through Catchment 201

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (l/s)	Runoff Volume (m^3)	Released Volume (m^3)	Storage Volume (m^3)
10.0	180.4	14.88	8.9	8.9	0.0
20.0	122.5	10.10	12.1	13.4	0.0
30.0	95.0	7.83	14.1	17.9	0.0
40.0	78.6	6.48	15.5	22.3	0.0
50.0	67.5	5.57	16.7	26.8	0.0
60.0	59.5	4.91	17.7	31.2	0.0
70.0	53.4	4.40	18.5	35.7	0.0
80.0	48.6	4.01	19.2	40.2	0.0
90.0	44.7	3.68	19.9	44.6	0.0
100.0	41.4	3.42	20.5	49.1	0.0
110.0	38.7	3.19	21.1	53.6	0.0
120.0	36.3	3.00	21.6	58.0	0.0
130.0	34.3	2.83	22.0	62.5	0.0
140.0	32.5	2.68	22.5	67.0	0.0
150.0	30.9	2.55	22.9	71.4	0.0
160.0	29.5	2.43	23.3	75.9	0.0
170.0	28.2	2.32	23.7	80.4	0.0
180.0	27.0	2.23	24.1	84.8	0.0
190.0	26.0	2.14	24.4	89.3	0.0
200.0	25.0	2.06	24.7	93.7	0.0
210.0	24.1	1.99	25.1	98.2	0.0
220.0	23.3	1.92	25.4	102.7	0.0
230.0	22.6	1.86	25.7	107.1	0.0
240.0	21.9	1.80	26.0	111.6	0.0

<<<<

MODIFIED RATIONAL METHOD

Area ID: 202

Area = **0.062** ha
"C" = **0.47**
AC= **0.0293**
Tc = **10.0** min
Time Increment = **10.0** min
Release Rate = **13.39** l/s
Max.Storage = **0.0** m^3

City of Barrie 50 Year
a= 1251.473
b= 4.847
c= 0.753

NOTE: Catchment 202 is routed through Catchment 201

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (l/s)	Runoff Volume (m^3)	Released Volume (m^3)	Storage Volume (m^3)
10.0	164.1	13.39	8.0	8.0	0.0
20.0	111.4	9.08	10.9	12.0	0.0
30.0	86.3	7.04	12.7	16.1	0.0
40.0	71.4	5.82	14.0	20.1	0.0
50.0	61.4	5.00	15.0	24.1	0.0
60.0	54.1	4.41	15.9	28.1	0.0
70.0	48.5	3.96	16.6	32.1	0.0
80.0	44.2	3.60	17.3	36.1	0.0
90.0	40.6	3.31	17.9	40.2	0.0
100.0	37.7	3.07	18.4	44.2	0.0
110.0	35.2	2.87	18.9	48.2	0.0
120.0	33.0	2.69	19.4	52.2	0.0
130.0	31.2	2.54	19.8	56.2	0.0
140.0	29.5	2.41	20.2	60.2	0.0
150.0	28.1	2.29	20.6	64.3	0.0
160.0	26.8	2.19	21.0	68.3	0.0
170.0	25.6	2.09	21.3	72.3	0.0
180.0	24.6	2.00	21.6	76.3	0.0
190.0	23.6	1.93	22.0	80.3	0.0
200.0	22.7	1.86	22.3	84.3	0.0
210.0	21.9	1.79	22.6	88.4	0.0
220.0	21.2	1.73	22.8	92.4	0.0
230.0	20.5	1.67	23.1	96.4	0.0
240.0	19.9	1.62	23.4	100.4	0.0

<<<<

MODIFIED RATIONAL METHOD

Area ID: 202

Area = **0.062** ha
"C" = **0.46**
AC= **0.0287**
Tc = **10.0** min
Time Increment = **10.0** min
Release Rate = **11.82** l/s
Max.Storage = **0.0** m^3

City of Barrie 25 Year
a= 1133.123
b= 4.734
c= 0.756

NOTE: Catchment 202 is routed through Catchment 201

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (l/s)	Runoff Volume (m^3)	Released Volume (m^3)	Storage Volume (m^3)	
10.0	148.3	11.82	7.1	7.1	0.0	<<<<
20.0	100.2	7.99	9.6	10.6	0.0	
30.0	77.5	6.18	11.1	14.2	0.0	
40.0	64.0	5.11	12.3	17.7	0.0	
50.0	55.0	4.38	13.2	21.3	0.0	
60.0	48.4	3.86	13.9	24.8	0.0	
70.0	43.4	3.46	14.6	28.4	0.0	
80.0	39.5	3.15	15.1	31.9	0.0	
90.0	36.3	2.90	15.6	35.5	0.0	
100.0	33.7	2.68	16.1	39.0	0.0	
110.0	31.4	2.51	16.5	42.6	0.0	
120.0	29.5	2.35	16.9	46.1	0.0	
130.0	27.8	2.22	17.3	49.7	0.0	
140.0	26.4	2.10	17.7	53.2	0.0	
150.0	25.1	2.00	18.0	56.8	0.0	
160.0	23.9	1.91	18.3	60.3	0.0	
170.0	22.9	1.82	18.6	63.9	0.0	
180.0	21.9	1.75	18.9	67.4	0.0	
190.0	21.1	1.68	19.1	70.9	0.0	
200.0	20.3	1.62	19.4	74.5	0.0	
210.0	19.6	1.56	19.7	78.0	0.0	
220.0	18.9	1.51	19.9	81.6	0.0	
230.0	18.3	1.46	20.1	85.1	0.0	
240.0	17.7	1.41	20.3	88.7	0.0	

MODIFIED RATIONAL METHOD

Area ID: 202

Area = **0.062** ha
"C" = **0.43**
AC= **0.0270**
Tc = **10.0** min
Time Increment = **10.0** min
Release Rate = **9.47** l/s
Max.Storage = **0.0** m^3

City of Barrie 10 Year
a= 976.898
b= 4.745
c= 0.76

NOTE: Catchment 202 is routed through Catchment 201

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (l/s)	Runoff Volume (m^3)	Released Volume (m^3)	Storage Volume (m^3)	
10.0	126.4	9.47	5.7	5.7	0.0	<<<<
20.0	85.3	6.39	7.7	8.5	0.0	
30.0	65.9	4.94	8.9	11.4	0.0	
40.0	54.4	4.07	9.8	14.2	0.0	
50.0	46.6	3.50	10.5	17.1	0.0	
60.0	41.1	3.08	11.1	19.9	0.0	
70.0	36.8	2.76	11.6	22.7	0.0	
80.0	33.5	2.51	12.0	25.6	0.0	
90.0	30.7	2.30	12.4	28.4	0.0	
100.0	28.5	2.13	12.8	31.3	0.0	
110.0	26.6	1.99	13.1	34.1	0.0	
120.0	24.9	1.87	13.5	36.9	0.0	
130.0	23.5	1.76	13.7	39.8	0.0	
140.0	22.3	1.67	14.0	42.6	0.0	
150.0	21.2	1.59	14.3	45.5	0.0	
160.0	20.2	1.51	14.5	48.3	0.0	
170.0	19.3	1.45	14.8	51.2	0.0	
180.0	18.5	1.39	15.0	54.0	0.0	
190.0	17.8	1.33	15.2	56.8	0.0	
200.0	17.1	1.28	15.4	59.7	0.0	
210.0	16.5	1.24	15.6	62.5	0.0	
220.0	15.9	1.19	15.8	65.4	0.0	
230.0	15.4	1.16	16.0	68.2	0.0	
240.0	14.9	1.12	16.1	71.0	0.0	

Area ID: 202

Area = **0.062** ha
"C" = **0.43**
AC= **0.0270**
Tc = **10.0** min
Time Increment = **10.0** min
Release Rate = **8.18** l/s
Max.Storage = **0.0** m^3

City of Barrie 5 Year
a= 843.019
b= 4.582
c= 0.763

NOTE: Catchment 202 is routed through Catchment 201

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (l/s)	Runoff Volume (m^3)	Released Volume (m^3)	Storage Volume (m^3)	
10.0	109.1	8.18	4.9	4.9	0.0	<<<<
20.0	73.2	5.49	6.6	7.4	0.0	
30.0	56.5	4.23	7.6	9.8	0.0	
40.0	46.5	3.49	8.4	12.3	0.0	
50.0	39.9	2.99	9.0	14.7	0.0	
60.0	35.1	2.63	9.5	17.2	0.0	
70.0	31.4	2.35	9.9	19.6	0.0	
80.0	28.5	2.14	10.3	22.1	0.0	
90.0	26.2	1.96	10.6	24.5	0.0	
100.0	24.3	1.82	10.9	27.0	0.0	
110.0	22.6	1.70	11.2	29.4	0.0	
120.0	21.2	1.59	11.5	31.9	0.0	
130.0	20.0	1.50	11.7	34.3	0.0	
140.0	19.0	1.42	11.9	36.8	0.0	
150.0	18.0	1.35	12.1	39.3	0.0	
160.0	17.2	1.29	12.4	41.7	0.0	
170.0	16.4	1.23	12.5	44.2	0.0	
180.0	15.7	1.18	12.7	46.6	0.0	
190.0	15.1	1.13	12.9	49.1	0.0	
200.0	14.5	1.09	13.1	51.5	0.0	
210.0	14.0	1.05	13.2	54.0	0.0	
220.0	13.5	1.02	13.4	56.4	0.0	
230.0	13.1	0.98	13.6	58.9	0.0	
240.0	12.7	0.95	13.7	61.3	0.0	

Area ID: 202

Area = **0.062** ha
"C" = **0.43**
AC= **0.0270**
Tc = **10.0** min
Time Increment = **10.0** min
Release Rate = **6.23** l/s
Max.Storage = **0.0** m^3

City of Barrie 2 Year
a= 675.586
b= 4.681
c= 0.78

NOTE: Catchment 202 is routed through Catchment 201

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (l/s)	Runoff Volume (m^3)	Released Volume (m^3)	Storage Volume (m^3)
10.0	83.1	6.23	3.7	3.7	0.0
20.0	55.4	4.15	5.0	5.6	0.0
30.0	42.5	3.19	5.7	7.5	0.0
40.0	34.9	2.61	6.3	9.3	0.0
50.0	29.8	2.23	6.7	11.2	0.0
60.0	26.1	1.96	7.1	13.1	0.0
70.0	23.4	1.75	7.4	14.9	0.0
80.0	21.2	1.59	7.6	16.8	0.0
90.0	19.4	1.46	7.9	18.7	0.0
100.0	18.0	1.35	8.1	20.6	0.0
110.0	16.7	1.25	8.3	22.4	0.0
120.0	15.7	1.17	8.5	24.3	0.0
130.0	14.8	1.11	8.6	26.2	0.0
140.0	13.9	1.05	8.8	28.0	0.0
150.0	13.2	0.99	8.9	29.9	0.0
160.0	12.6	0.95	9.1	31.8	0.0
170.0	12.0	0.90	9.2	33.6	0.0
180.0	11.5	0.86	9.3	35.5	0.0
190.0	11.1	0.83	9.5	37.4	0.0
200.0	10.6	0.80	9.6	39.2	0.0
210.0	10.3	0.77	9.7	41.1	0.0
220.0	9.9	0.74	9.8	43.0	0.0
230.0	9.6	0.72	9.9	44.8	0.0
240.0	9.3	0.69	10.0	46.7	0.0

<<<<

WATER BALANCE

547 Bayfield Street
Project Number: 2700
Date: June 2024
Designer Initials: C.Y.

Post Development Conditions

Catchment	Area (ha)	Rainfall Depth (mm)	Rainfall Volume (m^3)	Initial Abstraction (mm)	Initial Abstraction Volume (m^3)	Runoff Volume (m^3)
	(1)	(2)	(3) = (2)x(1)x10 m3/ha-mm	(4)	(5) = (4)x(1)x10 m3/ha-mm	(6) = (3) - (5)
Asphalt	0.52	5	25.9	2	10.4	15.5
Rooftops	0.19	5	9.7	2	3.9	5.8
Grass	0.09	5	4.4	5	4.4	0.0
Total	**0.80**		**39.9**		**18.6**	**21.3**

Therefore, 18.6 cu.m of rainfall will be captured via initial abstraction, soil infiltration, and permeable pavement. Water balance treatment of the remaining 21.3 cu.m is required. This can be achieved with the proposed enhanced grassed swale east of the site.

CATCHMENT #: 201

Quality Control - Enhanced Grassed Swale

Level of Protection = Enhanced (Level 1)

Impervious = 89 %

Drainage Area = 0.80 ha

SWMP Type = 1. Infiltration

Required Storage Volume = 25 m^3/ha

Required Storage Volume = 20.0 m^3

TABLE 3.2 - WATER QUALITY STORAGE REQUIREMENTS
(FROM MOE SWM PLANNING AND DESIGN MANUAL - 2003)

Protection Level	SWMP Type	Storage Volume (m^3/ha) for Impervious Level			
		35%	55%	70%	85%
Enhanced (Level 1)	1. Infiltration	25	30	35	40
	2. Wetlands	80	105	120	140
	3. Hybrid Wet Pond/Wetland	110	150	175	195
	4. Wet Pond	140	190	225	250

Project Number: 2700
Date: June 2024
Designer Initials: C.Y.

Infiltration Trench Sizing

	Units	Catchment 201
Total Area	m^2	7985
Runoff Coefficient	--	0.86
Imperviousness	%	89%
Total Impervious Area	m^2	7106
Min Required Volume	m^3	27.2
Equivalent rainfall to be retained	mm	5.7
Initial Abstraction (IMP)	mm	2
Initial Abstraction (PERVIOUS)	mm	5
Rainfall Available (IMP)	mm	3.7
Rainfall Available (PERVIOUS)	mm	0.7
V - Total Volume Retained	m^3	27.2

Infiltration Trench Design

I - Infiltration Rate*	mm/hr	50
Safety correction factor		3.5
ts- Time to drain	hr	48
Vr - Media Porosity		0.4
Dm - Max Allowable Depth	m	1.71
Am - Minimum footprint area	m^2	39.7

**Based on Geotechnical Report provided by Soil Engineers Ltd. (2024)- Silty Sand Till, included in Appendix B for reference.*

$$Dm = \frac{I*ts}{Vr}$$

$$Am = \frac{V}{Dr * Vr}$$

Infiltration Trench Design - Provided

	Units	Enhanced Swale - 201
Dr - Depth	m	0.3
W - Width	m	1.4
L - Length	m	161.6
Af - Footfrint Area	m^2	226.7
# Of Trenches		1
Storage Volume	m^3	27.2

Design Chart 1.13: Infiltration Parameters

Horton Equation - Typical Values

		Minimum Infiltration Rate (mm/hr)	Maximum* Infiltration Rate (mm/hr)
Soil Group	A	25	250
	B	13	200
	C	5	125
	D	5	75

Decay Parameter 2 hr^{-1}

*Dry Soil Conditions

Green-Ampt Method - Typical Values

		IMD (mm/mm)	S_u (mm)	K_s (mm/hr)
Soil Group	A (sand)	0.34	100	25
	B (silt loam)	0.32	300	13
	C (sand clay loam)	0.26	250	5
	D (clay)	0.21	180	3

Source: M.L. Terstriep and J.B. Stall (1974)
U.S. EPA (1989)

Table C2: Safety correction factors for calculating design infiltration rates

Ratio of Mean Measured Infiltration Rates[1]	Safety Correction Factor[2]
≤ 1	2.5
1.1 to 4.0	3.5
4.1 to 8.0	4.5
8.1 to 16.0	6.5
16.1 or greater	8.5

Source: Wisconsin Department of Natural Resources. 2004. Conservation Practice Standards. Site Evaluation for Stormwater Infiltration (1002). Madison, WI.

Notes:

1. Ratio is determined by dividing the geometric mean measured infiltration rate at the proposed bottom elevation of the BMP by the geometric mean measured infiltration rate of the least permeable soil horizon within 1.5 metres below the proposed bottom elevation of the BMP.
2. The design infiltration rate is calculated by dividing the geometric mean measured infiltration rate at the proposed bottom elevation of the BMP by the safety correction factor.

The design infiltration rate should be used to determine the maximum depth of the water storage component of the BMP, based on the desired drawdown period (typically 48 hours to fully drain the BMP; see Chapter 4 for guidance regarding the design of specific infiltration BMP types). Based on the calculated design infiltration rate, assumptions regarding the bottom elevation of the BMP may need to be reconsidered and further infiltration testing may be warranted.

Worksheet for Enhanced Swale - 100yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.030
Channel Slope	2.3 %
Left Side Slope	3.0 H:V
Right Side Slope	3.0 H:V
Bottom Width	1.40 m
Discharge	335.11 L/s

Results

Normal Depth	0.15 m
Flow Area	0.3 m²
Wetted Perimeter	2.3 m
Hydraulic Radius	0.12 m
Top Width	2.30 m
Critical Depth	0.16 m
Critical Slope	1.8 %
Velocity	1.21 m/s
Velocity Head	0.08 m
Specific Energy	0.22 m
Froude Number	1.118
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.00 m
Length	0.0 m
Number Of Steps	0

GVF Output Data

Upstream Depth	0.00 m
Profile Description	N/A
Profile Headloss	0.00 m
Downstream Velocity	Infinity m/s
Upstream Velocity	Infinity m/s
Normal Depth	0.15 m
Critical Depth	0.16 m
Channel Slope	2.3 %
Critical Slope	1.8 %

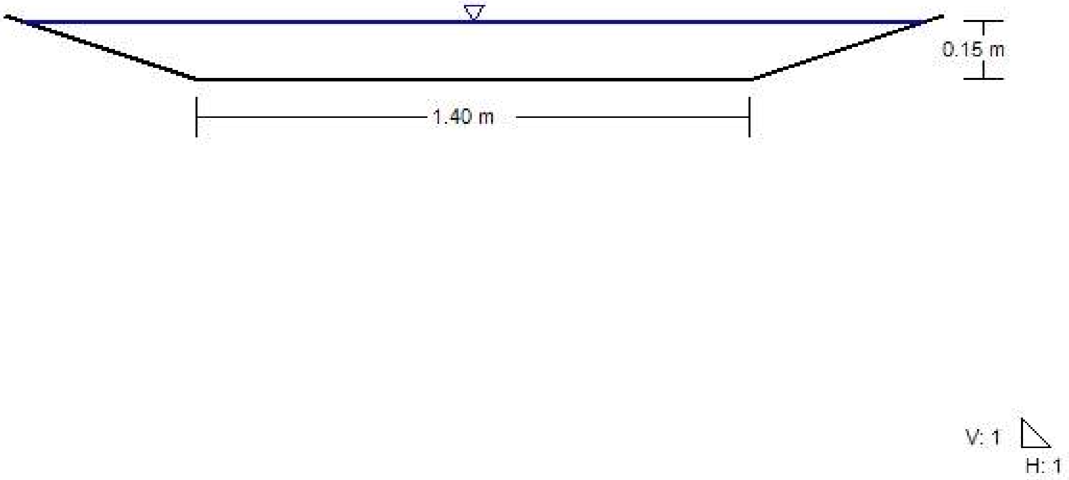
Cross Section for Enhanced Swale - 100yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.030
Channel Slope	2.3 %
Normal Depth	0.15 m
Left Side Slope	3.0 H:V
Right Side Slope	3.0 H:V
Bottom Width	1.40 m
Discharge	335.11 L/s



Appendix D Sanitary Flow Calculations

SCS consulting group ltd

Sanitary Design Sheet
545-547 Bayfield Street
Klassic Car Wash
Barrie, Simcoe

Project: 545-547 Bayfield Street
Project No. 2700
Date: 20-Jun-24
Designed By: P.R.
Reviewed By: D.S.

Minimum Sewer Diameter (mm) = 200
Mannings n = 0.013
Minimum Velocity (m/s) = 0.60
Maximum Velocity (m/s) = 3
Minimum Pipe Slope (%) = 0.40

Avg. Domestic Flow (l/cap/day) = 225
Infiltration Rate (l/s/ha) = 0.26
Max. Harmon Peaking Factor = 3.8
Min. Harmon Peaking Factor = 1.5
NOMINAL PIPE SIZE USED

P:\2700 547 Bayfield Street, Barrie\Design\Pipe Design\Sanitary\[2700- Sanitary Sheet Design-2024 04(Apr) 29.xlsm]Design

LOCATION			RESIDENTIAL							INDUSTRIAL/COMMERCIAL/INSTITUTIONAL					FLOW CALCULATIONS								PIPE DATA				
STREET	MANHOLE		AREA	ACCUM. AREA	UNITS	DENSITY		RESIDENTIAL POPULATION	ACCUM. RESIDENTIAL POPULATION	AREA	ACCUM. AREA	POPULATION DENSITY	FLOW RATE	ACCUM. EQUIV. POPULATION	INFILTRATION	TOTAL ACCUM. POPULATION	AVG. DOMESTIC FLOW	ACCUM. AVG. DOMESTIC FLOW	PEAKING FACTOR	PEAKED RESIDENTIAL FLOW	ICI FLOW	TOTAL FLOW	LENGTH	PIPE DIAMETER	SLOPE	FULL FLOW CAPACITY	FULL FLOW VELOCITY
	FROM	TO				PER UNIT	PER HA																				
			(ha)	(ha)	(#)	(p/unit)	(p/ha)			(ha)	(ha)	(p/ha)	(l/s/ha)		(L/s)		(L/s)	(L/s)		(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(L/s)	(m/s)
BUILDING B	PLUG1	MH1A	0	0	0			0	0	0.98	0.98	0	0.324	0	0.3	0	0.0	0.0	3.80	0.0	0.3	0.6	14.3	150	1.00	15.2	0.86
SITE	MH1A	MH2A	0	0	0			0	0	0	0.98	0	0	0	0.3	0	0.0	0.0	3.80	0.0	0.3	0.6	63.3	150	1.00	15.2	0.86
CAR WASH	MH2A	MH3A	0	0	0			0	0	0	0.98	0	0	0	0.3	0	0.0	0.0	3.80	0.0	0.3	0.6	7.6	200	1.00	32.8	1.04
BUILDING A	PLUG 2	MH3A	0	0	0			0	0	0.97	0.97	0	0.324	0	0.3	0	0.0	0.0	3.80	0.0	0.3	0.6	18.0	150	1.00	15.2	0.86
SITE	MH3A	MH4A	0	0	0			0	0	0	1.95	0	0	0	0.5	0	0.0	0.0	3.80	0.0	0.6	1.1	44.7	200	1.00	32.8	1.04
CONNECTION TO EXISTING	MH4A	.SAN.MH160	0	0	0			0	0	0	1.95	0	0	0	0.5	0	0.0	0.0	3.80	0.0	0.6	1.1	7.5	250	2.00	84.1	1.71

Appendix E Water Distribution Analysis

Municipal Engineering
Solutions

June 21, 2024 Project No. 17002-188

Mr. Bobby Pillitteri
547 Bayfield Inc.
1501 Creditstone Road
Concord, Ontario
L4K 5V6

**Subject: 545 & 547 Bayfield Phase 1 Watermain Analysis
City of Barrie**

Dear Mr. Pillitteri,

We are pleased to submit our report entitled "545 & 547 Bayfield Phase 1 Watermain Analysis" outlining the results of our water distribution analysis for a carwash in the City of Barrie. This report covers only Phase 1. No modeling has been completed for Phase 2.

This development was incorporated into an Infowater sub-model of the site and modeled utilizing the design information provided to Municipal Engineering Solutions. The findings of our analysis are summarized in the following report.

We trust you will find this report satisfactory. Should you have any questions or require further clarification, please call.

Yours truly,

Municipal Engineering Solutions

John C. Bourrie

Per: John C. Bourrie, P.Eng.

/LMC

File Location: D:\Projects\2024\24-001 545 547 Bayfield Barrie SCS 17002-188\3.0 Report\Final Report\17002-188 545 547 Bayfield Watermain Analysis_20240621.docx

55 Gilbank Drive, Aurora, Ontario L4G 6H9
Tel: 905.726.1016 Cell: 416.434.0186 Fax: 905.726.1225

545 & 547 BAYFIELD PHASE 1

WATERMAIN ANALYSIS

PREPARED BY:

MUNICIPAL ENGINEERING SOLUTIONS

FOR:

547 BAYFIELD INC.
June 2024

Project Number: 17002-188

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APPENDICES

Appendix A Demands
Appendix B Model Results

Section 1 – INTRODUCTION

Municipal Engineering Solutions ("MES") was retained by 547 Bayfield Inc.to conduct a hydraulic water analysis for the proposed 545 & 547 Bayfield Development located in the City of Barrie. As part of this hydraulic assessment MES was requested to undertake the following:

1. Calculate/verify water demands for the proposed development using City of Barrie, provincial and industry design standards;
2. Add the subject watermains/development/boundary information to development water model;
3. Run the model to size the subject mains to achieve service criteria during Average Day, Peak Hour and fire flow during Maximum Day demand; and
4. Prepare a Report summarizing the modeling results for agency review and design purposes.

1.1 Development Background

The 545 & 547 Bayfield site is located on the east side of Bayfield Street, south of Hammer Street West in the City of Barrie. In Phase 1, the existing buildings are being converted into two car wash facilities. Phase 2 plans have not yet been confirmed. The demands for Phase 1 are shown in **Appendix A**. The proposed Phase 1 area is shown below on **Figure 1**.

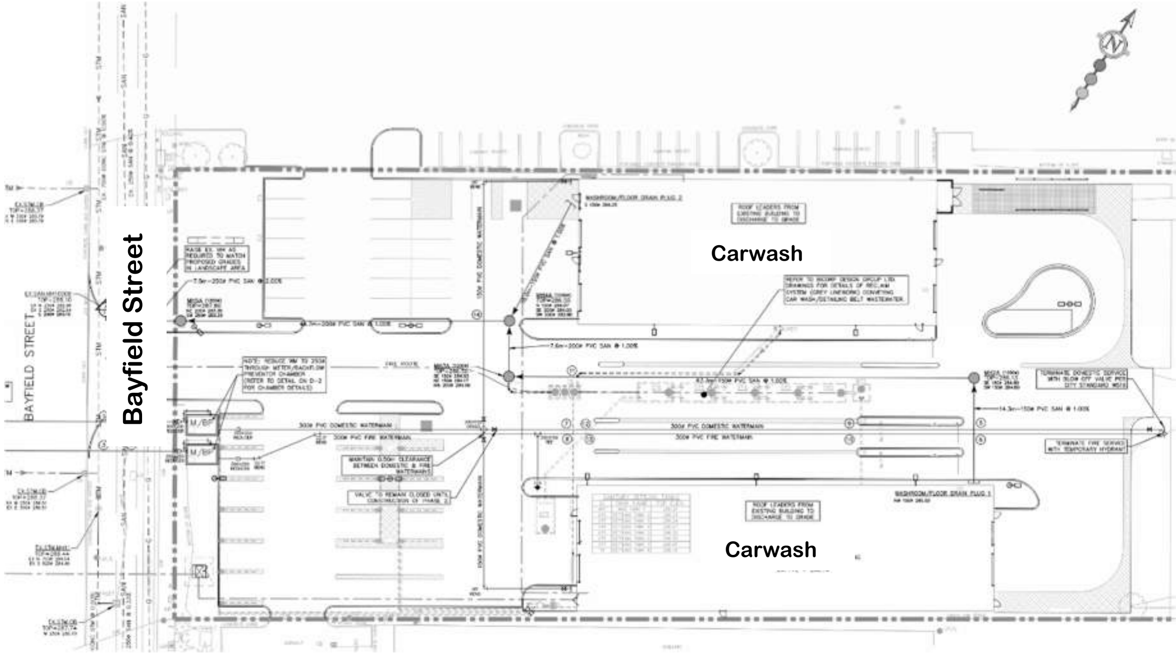


Figure 1 - Proposed 545 & 547 Bayfield Development

Section 2 – WATERMAIN DESIGN CRITERIA

The design criteria utilized to estimate the water demands for the hydraulic water model follows general industry standards and is calculated using the design criteria and guidelines outlined in the City of Barrie Water Transmission & Distribution Policies Design Guidelines, the Ministry of the Environment Conservation and Parks (MECP) Watermain Design Criteria, and the Fire Underwriters Survey.

The following sections summarize the specific design criteria used to carry out the hydraulic watermain assessment for this development.

2.1 Water Demands

To calculate the equivalent population and water design factors for this development MES used City of Barrie standard population densities as noted in the *“Water Transmission & Distribution Policies Design Guidelines June 2022”*. **Table 1** summarizes the population densities and **Table 2** summarizes the average daily demand and peaking factors used for this analysis.

Table 1 – Equivalent Population Density

Type of Development	Equivalent Population (Persons/Unit)
Single Family	3.25
Townhouse	2.57
Apartment	1.67
Commercial	28 m^2/ha/day

Source: Water Transmission & Distribution Policies & Design Guidelines June 2022

Table 2 - Water Design Factors

Type of Development	Average Daily Demand (L per capita)	Maximum Daily Demand Peaking Factor	Peak Hour Demand Peaking Factor
Residential & ICI	225	2.75	4.13

Source: Water Transmission & Distribution Policies & Design Guidelines June 2022 and MECP

The buildings will also contain the equipment for the car wash facilities. The peak water usage was provided by the suppliers and included in the Appendix.

Section 3 –FLOW DEMANDS

Utilizing the equivalent population data from **Table 1** and the corresponding Average Day, Peak Hour and Maximum Day data from **Table 2** the water demands for this development were calculated.

3.1 Equivalent Population Flow Demands

The calculated demands for Phase 1 are summarized in **Table 3** and include the car wash demands. The car wash demands were split between the two buildings. For additional details on the development water demands and assigned demand nodes used in the water model see **Appendix A**.

Table 3 – Water Demand for Bradford/Vespra Development

	Average Day Demand (L/S)	Maximum Day Demand (L/S)	Peak Hour Demand (L/S)
Total	25.93	26.46	26.76

3.2 Fire Flow Demands

The fire demands were calculated using the Fire Underwriters Survey (“FUS”) formula outlined in the `Water Supply For Public Fire Protection Guideline', dated 2020. The minimum required fire flows assumed for this development are summarized in **Table 4**. Details on the calculations are in **Appendix A**. The minimum required fire flow used in this analysis is lower than the City’s minimum required fire flow of 283 L/s for commercial areas, however, it is typical for municipalities to use the FUS as a guideline for minimum fire flow requirements. The calculated fire flow using the FUS formular is reasonable for this type of development. The minimum fire flow requirement for this site must be confirmed with the City and the fire department.

Table 4 –Fire Flow Requirements

Type of Development	Fire Flow (L/S)
547 Bayfield St – Building A	83
545 Bayfield St – Building B	100

Source: Fire Underwriters Survey, 2020

Hydrant tests performed on Bayfield Street indicate that the maximum flow currently available at this site is 199 L/s at 20 psi, below the City's minimum fire flow requirement of 283 L/s for commercial areas. This is an existing condition for the commercial area on Bayfield Street. As such, the calculated FUS fire flow requirement has been used in this analysis.

As noted, the fire flow in **Table 4** above is calculated using the FUS formula and are based on estimated GCA the building. **Table 5** below summarizes the criteria utilized to develop the fire flow anticipated as well as the assumptions made. Once the detailed designs/configurations (specifics) for these building(s) are finalized the assumptions noted in **Table 5** must be reviewed and confirmed by the appropriate designer (architect or sprinkler system designer) and any design/criteria changes required are to be reported to MES so that the actual required fire flows can be confirmed. Building construction and sprinkler systems may need to be designed to suit the available flow and pressure.

Table 5 – FUS Criteria/Assumptions

	1 Storey Building
Type of Construction	Non-Combustible Construction
Occupancy Type	Limited Combustible
Fire Protection (Sprinkler/Firewalls)	No Sprinklers
Area Considered	Area Considered: Building A - 547 Bayfield Area Considered 966 m^2 Building B - 545 Bayfield Area Considered 977 m^2

Note: For Additional Information on FUS Criteria Refer to Water Supply for Public Protection Guide, Fire Underwriters Survey, 2020

3.3 External Demands

The hydrant tests results would have considered external demands.

Section 4 – OTHER SYSTEM REQUIREMENTS

4.1 System Pressure Requirements

In addition to meeting the various flow requirements, the system must also satisfy minimum and maximum pressure requirements as outlined by the City of Barrie. The City's pressure requirements are outlined in the Design Criteria and stipulate the following:

1. The minimum system pressure shall not be less than 140 kPa (20 psi) at any point in the water system under fire flow conditions.
2. The minimum operating pressure shall be 275 kPa (40 psi).
3. The maximum operating pressure shall be 700 kPa (100 psi).
4. Preferred operating shall generally range between 350 to 485 kPa (50 to 70 psi). Pressures outside this range can be accepted.
5. Where the maximum pressures exceed 550 kPa (80 psi) pressure reducing valves are required after the water meter.

4.2 Watermain Sizing

The City of Barrie also stipulates that all watermains are adequately sized to maintain demand flows at the required pressures without causing excessive energy loss or result in water quality decay. The watermain system must therefore be designed to accommodate the Maximum day plus fire demand.

For distribution systems providing fire protection the minimum pipe size shall be 150 mm diameter in accordance with Ministry of the Environment Conservation and Parks (MECP) and NFPA requirements.

To provide appropriate fire protection, reliable supply, and pressures the water distribution system should be looped wherever possible to improve supply security and water quality and also have two connections to the existing system where possible.

4.3 Watermain C-Factor

In designing and modeling of the pipes the Coefficient of Roughness (C-Factor) factors from the City's design manual were utilized. The Coefficient of Roughness assigned to each pipe size in summarized in **Table 6** below.

Table 6- Hazen-Williams Coefficient of Roughness (C-Factors)

Size of Pipe (Diameter in mm)	Coefficient of Roughness (C)
150 mm	100
200 mm to 250 mm	110
300 mm to 600 mm	120
Greater Than 600 mm	130

Source: City of Barrie Water Transmission & Distribution Design Standard June 2022

Section 5 – ANALYSIS & MODELING RESULTS

To conduct the hydraulic water analysis for the proposed development the water demands were estimated by MES using the design criteria previously discussed and incorporated the demands into an InfoWater submodel of the site. The following sections discusses the model setup and results.

5.1 Model Setup

The 545 & 547 Bayfield site is located on the east side of Bayfield Street. There is an existing 300 mm watermain along the west side of the street. The site will have separate domestic and fire supply connections from the Bayfield Street watermain.

Hydrant tests were completed on June 11, 2024. The test results are included in **Appendix B** along with a model comparison graph. A model of the immediate area was created by using a dummy pump and reservoir to recreate the results of the hydrant test. To check the adequacy of the pump curve entered into the model, a simulated hydrant curve (modeled flow) at the test location was graphed against the data points of the actual hydrant test.

Fire flows placed on nodes as noted in the demand table and on the nearby existing hydrants on Bayfield Street. New nodes were created to add the flow demands and the elevation information to an Infowater hydraulic water distribution model created for the site and nearby municipal watermains. Watermains for the future Phase 2 lands were also included in the model.

Friction factor for the pipes were assigned according to **Table 6**.

5.2 Watermain Sizing and System Pressures

The analysis was conducted under Average Day, Maximum Day, and Maximum day plus Fire demands to confirm the watermain sizing and meet the pressure requirements. The pipe sizes and layout are shown in **Appendix C**.

The domestic and fire connections were sized at 300 mm. The domestic connections to the buildings sized at 150 mm. The size of the domestic connections to the buildings should be confirmed by the building mechanical piping designer.

Fire flow demand can be met based on the assumptions outlined in this report. This report covers Phase 1 of the site only. No modeling of Phase 2 has been done for this report. At the direction of the client, the watermains for Phase 2 that are to be built within Phase 1 are included in this report, but no future demands included. As the plans for Phase 2 are not yet known, the watermains were sized at 300 mm to provide flexibility to those future buildings. The domestic watermain will need to be temporarily decommissioned from the 150 x 300 cross to the phase boundary until connected to Phase 2 watermains.

Modeled service pressures are summarized in **Table 7**. Since modeling was completed using a single demand scenario for boundary conditions (hydrant test), it is anticipated that pressure will be lower during peak hour and higher during minimum hour than indicated in the modeling. Detailed pipe and node tables for the various scenarios modelled are attached to this report in **Appendix B**.

Table 7 - Modeled Service Pressures

Scenario	Average Day	Maximum Day	Peak Hour	Max. Day + Fire
Existing	46.8 to 52.9 psi (323 to 365 kPa)	46.7 to 52.8 psi (322 to 364 kPa)	46.7 to 52.8 psi (322 to 364 kPa)	128 to 172 L/s @ 20 psi (140 kPa)

Section 6 – CONCLUSIONS/RECOMMENDATIONS

The results are summarized below.

- The service pressures are expected to range from 46.7 to 52.9 psi (322 to 365 kPa).
- The available fire flow within the site meets or exceeds the fire flow demand utilized for this assessment as noted in **Table 4** at the minimum pressure of 20 psi (140 kPa) based on the proposed watermain configuration.
- The fire flow utilized in this analysis is based on the Fire Underwriters Survey formula. It is typical for municipalities to use the FUS as a guideline for minimum fire flow requirements, and the FUS calculated fire flow is reasonable for this type of development. The minimum fire flow requirements for this site must be confirmed with the City and the fire department.
- The diameter of the buildings' domestic connections should be confirmed with the building mechanical designer.
- This report covers Phase 1 of the site only. No modeling of Phase 2 has been done for this report. At the direction of the client, the watermains for Phase 2 that are to be built within Phase 1 are included in this report, but no future demands included. As the plans for Phase 2 are not yet known, the watermains were sized at 300 mm to provide flexibility to those future buildings.
- The domestic watermain will need to be temporarily decommissioned until connected to Phase 2 watermains.
- Once the building designs/configurations are known for the proposed development the FUS fire flows summarized in Table 4 must be reviewed and confirmed by the designer(s), architect, and mechanical consultant as appropriate to ensure the fire flows used within this report are still valid prior to implementation and construction. It may also be necessary for the building construction or fire protection system to be designed to suit the available flows.
- Confirmation and/or changes to the criteria should also be provided to and reviewed with MES prior to the finalization of the detailed design drawings and construction of the watermain system. Final design parameters are to be provided to MES prior to construction for further review to confirm that the actual (final) site conditions and building design(s) reflect those modeled by MES within this report.
- This report, including all modeling assumptions used, is to be submitted to and reviewed by the water operating authority (municipality) to confirm that the modeling parameters used are acceptable to the operating authority and/or confirm if modified domestic or fire flow requirements are required or should be implemented for this particular development.

Appendix A

Model Inputs

Barrie Design Criteria

Water Transmission & Distribution Policies Design Guidelines June 2022 (unless otherwise stated)

Equivalent Population by Unit

(Sanitary Sewage Collection System Policies and Design Guidelines Oct 2017 for population and Average Day Demand)

Type of Development	**Equivalent Population Density**
	(Person/Unit)
Single Family or Semi-Detached	3.25
Townhouse	2.57
Apartment	1.67

Equivalent Population by Area

Type of Development	**Equivalent Population Density**	**Average Day Demands**
	(Person/Hectare)	***(m3/ha/day)***
Single Family, Duplex, Semis	78.25	
Triplex and 4-plex	81.9	
Townhouse	110	
Apartments (>6 stories)	500	
Light Commercial Areas	124	28.00
Community Services	124	28.00
Light Industrial Areas	155	35.00
Hospitals (persons/bed)		

Water Design Factors

Average Daily Demand (m3/capita)	0.225	
Maximum Daily Demand P.F.	9.5	MECP
Maximum Hourly Demand P.F.		
Residential		MECP
I/C/I	*14.3*	

Cofficient of Roughness

Size of Pipe (mm Dia.)	**Coefficient of Roughness (C)**
150	100
200-250	110
300-600	120
Over 600	130

Minimum Pipe Size

Type of Development	**Size of Pipe (mm Dia.)**
Designed for Fire Protection	150
Domestic supply only	50

Working Pressures

Parameter	**Pressure**
Normal Condition	
Minimum Pressure	345kPa (50 psi)
Maximum (Building Code)	550 kPa (80 psi)
Maximum	620 kPa (90 psi)
Fire Flow Conditions	
Minimum Pressure	140 kPa (20 psi)

Water Demand
545-547 Bayfield, Barrie ON
June 14, 2024

Municipal Engineering Solutions

Node		**Elevation**	**e of Developn**	**Equivalent Population**		**Demands**			**Fire Flow Demands**
			Commercial	Total Population	Total Population	ADD	MDD	PHD	
		(m)	*(ha)*	*(Residential)*	*(ICI)*	*(L/s)*	*(L/s)*	*(L/s)*	*(L/s)*
HYD-600		286.70		0	0	0.00	0.00	0.00	100
HYD-601		288.00		0	0	0.00	0.00	0.00	100
HYD-602		286.80		0	0	0.00	0.00	0.00	100
J-600		286.90		0	0	0.00	0.00	0.00	
J-601		287.00		0	0	0.00	0.00	0.00	
J-602		288.00		0	0	0.00	0.00	0.00	
J-603		287.62		0	0	0.00	0.00	0.00	
J-604		286.45		0	0	0.00	0.00	0.00	
J-605	Bldg A	286.70	*0.09662*	0	12	12.96	13.23	13.38	
J-606		285.50		0	0	0.00	0.00	0.00	
J-607	Bldg B	286.74	*0.0977*	0	12	12.96	13.23	13.38	
J-608		287.80		0	0	0.00	0.00	0.00	
J-609		288.76		0	0	0.00	0.00	0.00	
J-610		286.40		0	0	0.00	0.00	0.00	
J-611		285.50		0	0	0.00	0.00	0.00	

Total			**0.194**	**0**	**24**	**25.93**	**26.46**	**26.76**	

Klassic Car Wash peak water usage

Items no.	Description	Application	Details	Qty.	GPM	PSI	Total	Water type	Recycled water	Hydraflex	Notes
	High-pressure										
	Prep guns	Clean-up	M1000	1	8	800	8	Cold (not softened)	Potential		Will probably use reclaim
	TWT high side/rear sprays	Pre-washing	M3500	1	35	800	35	Cold (not softened)	Potential		Will probably use reclaim
	TWT DS grill/side sprays	Washing	M2000	1	20	800	20	Cold (not softened)	Potential		Will probably use reclaim
	TWT PS grill/side sprays	Washing	M2001	1	20	800	20	Cold (not softened)	Potential		Will probably use reclaim
	Petit 360-t	Prepping	M3500	2	35	800	70	Cold (softened)	Potential		Will probably use reclaim
	BB-200 bumper blaster	Washing	M2000	1	20	800	20	Cold (not softened)	Potential		Will probably use reclaim
	TWT HP arch	Rinsing	M3500	3	35	800	105	Cold (not softened)			
							278	Total GPM if no reclaim			
							173	Total GPM of reclaim			Assume last high-pressure will be fresh water
	Fresh water use (not softenened)										
	Undercarriage			1	9	40	9.0	Fresh water or reclaim	Potential		Will probably use reclaim
	Versa trans arch -foaming	Drying agent		2	7.5	40	15	Cold (not softened)		√	
							15.0	Total GPM of fresh water			
	Fresh water (Soft water)										
	Brushes										
	RS701 (wraps)			2	3.2	40	6.4	Cold or hot (softened)		√	Soap on both
	RS301 (high side)			1	4.8	40	4.8	Cold or hot (softened)		√	Soap on both
	RS400 (low side)			2	3.2	40	6.4	Cold or hot (softened)		√	Soap on both
	RS1000 (top brush)			3	1.6	40	4.8	Cold or hot (softened)		√	Soap on both
	RS550 (sonics)			1	8	40	8	Cold or hot (softened)		√	No soap
	M2000 (wheel boss)			1	0	0	0				
	Low pressure										
	Versa Trans arch with single foaming	Initial presoak		1	3.25	40	3.25	Cold or hot (softened)		√	Mr. Foamer
	Versa Trans arch with foaminator	Lava arch		1	10	40	10	Cold or hot (softened)		√	Mr. Foamer
	Single foam streamers			2	2.25	40	4.5	Cold or hot (softened)		√	Mr. Foamer
	Triple foam streamers			2	6.75	40	13.5	Cold or hot (softened)		√√√	Mr. Foamer
	Versa trans arch with foaminator	Foaming ceramic		1	10	40	10	Cold or hot (softened)		√	Mr. Foamer
	Versa trans arch with foaminator	Foaming wax		1	10	40	10	Cold or hot (softened)		√	Mr. Foamer
	Chemical tire applicators			4	2.25	40	9.0	Cold or hot (softened)		√	Mr. Foamer
	Bumper presoak			1	2	40	2	Cold or hot (softened)		√√	Requires two injectors (one for front and one for rear)
							93	Total soft water GPM			
	Reverse osmosis use										
	Rain bar 1			1	6	40	6	Cold (softened)			Can reduce to match production rate
	Mirror rinse			1	6	40	6	Cold (softened)			Can reduce to match production rate
							12	Total RO GPM usage			
							24	FW GPM to produce at 50%			Note this need to be soft water as well

Notes:

1. These values are worst case values and assumes cars are back to back which is possible on a busy day and all devices are on simutaneously.

410	**GPM**	**PEAK If 100% fresh water (see note 1)**
182	**GPM**	**Of possible reclaim**
228	**GPM**	**PEAK city water if all reclain used**
117	**Soft water (Chemicals and RO)**	

Calculations are based on "Water Supply for Public Fire Protection Guide" by Fire Underwriters Survey Dated 2020

Municipal Engineering Solutions

FUS CALCULATION

Project:	Bayfield Barrie	**Building Type/Block #**	547 Bayfield Building
Project Number:	17002-188	**Firewalls/Sprinkler:**	
Project Location:	Barrie	**Number of Units/Unit #'s**	
Date:	14-Jun-24		

1.0 FUS Formula

$$RFF = 220C\sqrt{A}$$

where: RFF = required fire flow in litres per minute;
C = the Coefficient related to the type of construction; and
A = the Total Effective Floor Area (m^2) excluding basements at least 50% below grade) [a]

NBC Occupancy	Group B
Type of Construction [b]	Non-combustible Construction Type II
Protection (for C below 1.0)	Unprotected Openings
Footprint area	966.2 sq. metres
Storeys	1
C =	0.8
A =	966.2 Total Effective Area [a]
F =	**5000 L/min** (rounded)

2.0 Occupancy Adjustment

Type of Occupancy [c]	Limited Combustible
Hazard Allowance	-0.15
	-750 L/min
Adjusted Fire Flow	**4250 L/min**

3.0 Sprinkler Adjustment

		Credit	Total
NFPA 13 sprinkler standard	NO	0%	0%
Standard Water Supply	NO	0%	
Fully Supervised system	NO	0%	

Sprinkler Credit **0 L/min**

4.0 Exposure Adjustment

Construction Type of the Exposed Building Face: Type I-II (unprotected)

North Side		Percent	Total*
Distance to Building (m)	20.1 to 30	4%	8%
Length (ft) by height in storeys	over 100		
South Side			
Distance to Building (m)	20.1 to 30	4%	
Length (ft) by height in storeys	over 100		
East Side			
Distance to Building (m)	over 30	0%	
Length (ft) by height in storeys	41 to 60		
West Side			
Distance to Building (m)	over 30	0%	
Length (ft) by height in storeys	41 to 60		

*max 75%

Exposures Surcharge **340 L/min**

Total Required Fire Flow (rounded)	**5000 L/min** **83 L/sec**

a) For buildings with a construction coefficient from 1.0 to 1.5, consider 100% of all floor areas. For buildings with a construction coefficient below 1.0 (vertical openings are inadequately protected), consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to a maximum of eight. If the vertical openings and exterior vertical communications are properly protected, consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors.
b) Wood Frame=1.5, Mass Timber= 0.8 to 1.5, Ordinary=1.0, Noncombustible=0.8, Fire-Resistive=0.6
c) Noncombustible=-25%, Limited Combustible=-15%, Combustible=0%, Free Burning=+15%, Rapid Burning=+25%

FUS CALCULATION

Project:	Bayfield Barrie	**Building Type/Block #**	545 Bayfield Building
Project Number:	17002-188	**Firewalls/Sprinkler:**	
Project Location:	Barrie	**Number of Units/Unit #'s**	
Date:	14-Jun-24		

1.0 FUS Formula

$$RFF = 220C\sqrt{A}$$

where: RFF = required fire flow in litres per minute;
C = the Coefficient related to the type of construction; and
A = the Total Effective Floor Area (m^2) excluding basements at least 50% below grade) [a]

NBC Occupancy	Group B
Type of Construction [b]	Non-combustible Construction Type II
Protection (for C below 1.0)	Unprotected Openings
Footprint area	977.0 sq. metres
Storeys	1
C =	0.8
A =	977.0 Total Effective Area [a]
F =	**6000 L/min** (rounded)

2.0 Occupancy Adjustment

Type of Occupancy [c]	Limited Combustible
Hazard Allowance	-0.15
	-900 L/min
Adjusted Fire Flow	**5100 L/min**

3.0 Sprinkler Adjustment

		Credit	Total
NFPA 13 sprinkler standard	NO	0%	0%
Standard Water Supply	NO	0%	
Fully Supervised system	NO	0%	

Sprinkler Credit **0 L/min**

4.0 Exposure Adjustment

Construction Type of the Exposed Building Face: Type I-II (unprotected)

North Side		Percent	Total*
Distance to Building (m)	20.1 to 30	4%	19%
Length (ft) by height in storeys	over 100		
South Side			
Distance to Building (m)	0 to 3	15%	
Length (ft) by height in storeys	over 100		
East Side			
Distance to Building (m)	over 30	0%	
Length (ft) by height in storeys	41 to 60		
West Side			
Distance to Building (m)	over 30	0%	
Length (ft) by height in storeys	41 to 60		

*max 75%

Exposures Surcharge **970 L/min**

Total Required Fire Flow (rounded)	**6000 L/min** **100 L/sec**

a) For buildings with a construction coefficient from 1.0 to 1.5, consider 100% of all floor areas. For buildings with a construction coefficient below 1.0 (vertical openings are inadequately protected), consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to a maximum of eight. If the vertical openings and exterior vertical communications are properly protected, consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors.

b) Wood Frame=1.5, Mass Timber= 0.8 to 1.5, Ordinary=1.0, Noncombustible=0.8, Fire-Resistive=0.6

c) Noncombustible=-25%, Limited Combustible=-15%, Combustible=0%, Free Burning=+15%, Rapid Burning=+25%

Appendix B

Boundary Information

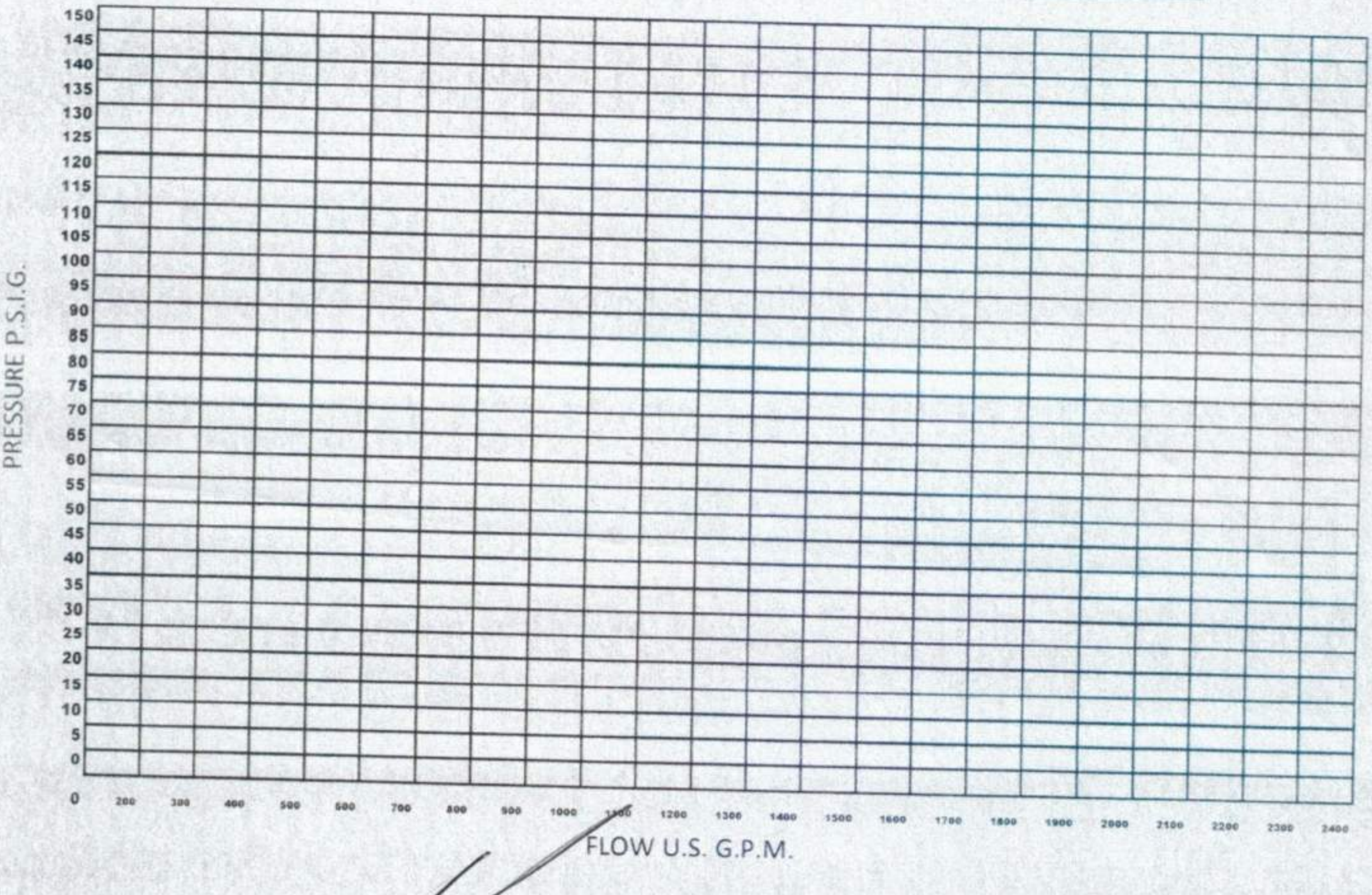
AquaOne Water Quality
9 Langstaff Road East
Thornhill, Ontario L3T 3P7
Office 416-930-3333 Fax 905-764-0399

TEST FLOW SHEET

DATE: June 11/24

PROJECT LOCATION: 580 Bayfield St.
JOB NUMBER: Hill Group
TEST DATA
Time of Test 10:00 AM ____ PM
Location of Test (Flow): 580 Bayfield street
Residual 550 Bayfield St.
Main Size: ____________
Static Pressure: 55PSI

NUMBER OF OUTLETS	PITO PRESSURE	FLOW (US G.P.M.)	RESIDUAL PRESSURE
1 Port	40 PSI	1060	45 PSI
2 Port	35 PSI	2000	40 PSI



AquaOne Signature ____________

AquaOne Employee ____________

AquaOne Water Quality

9 Langstaff Road East
Thornhill, Ontario L3T 3P7
Office 416-930-3333 Fax 905-764-0399

①

TEST FLOW SHEET

DATE: June 11/24

PROJECT LOCATION: 54 Bayfield st.

JOB NUMBER: Hill Group

TEST DATA

Time of Test 9:30 AM ____ PM

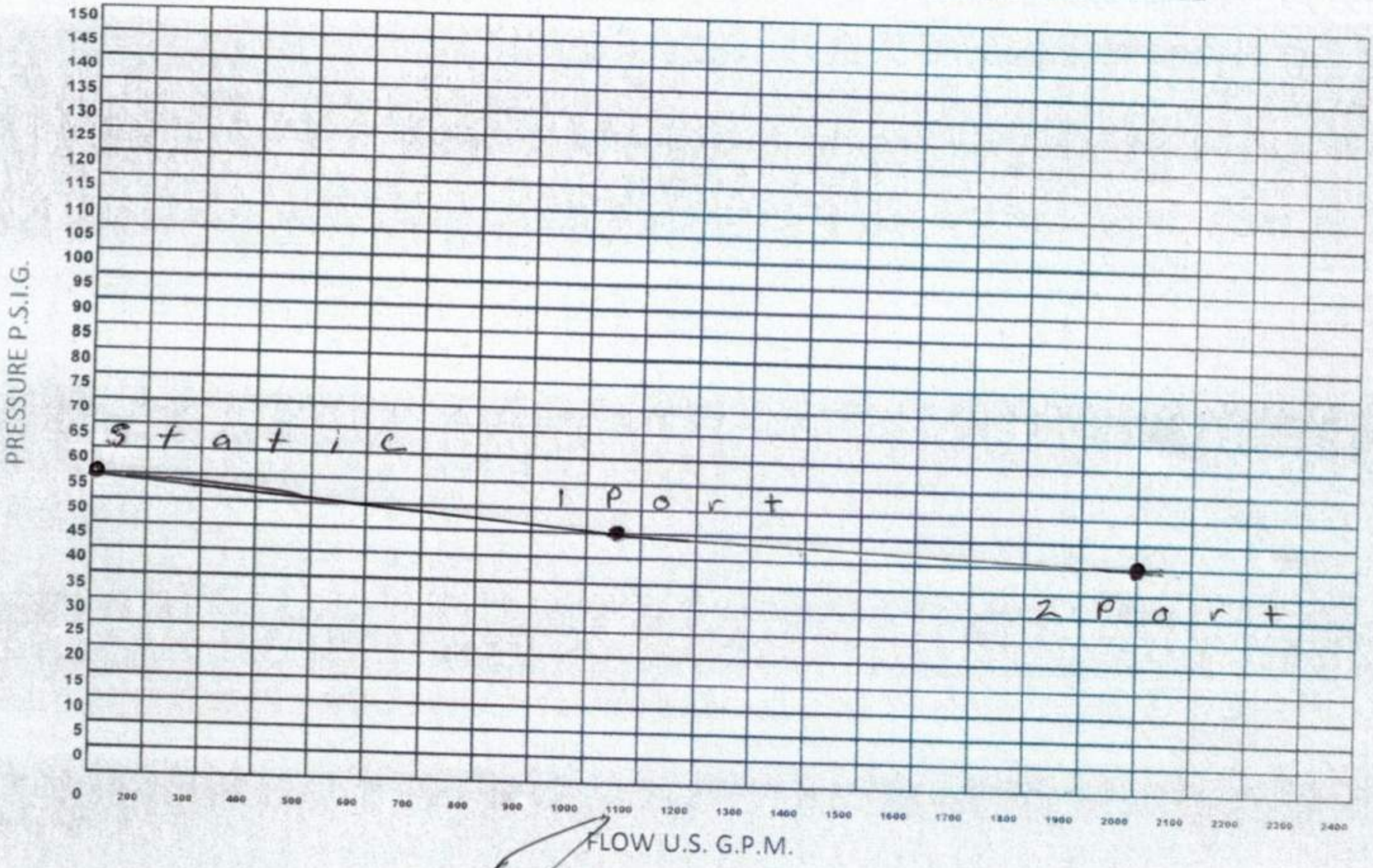
Location of Test (Flow): 54 Bayfield st.

Residual 550 Bayfield st.

Main Size: ____________

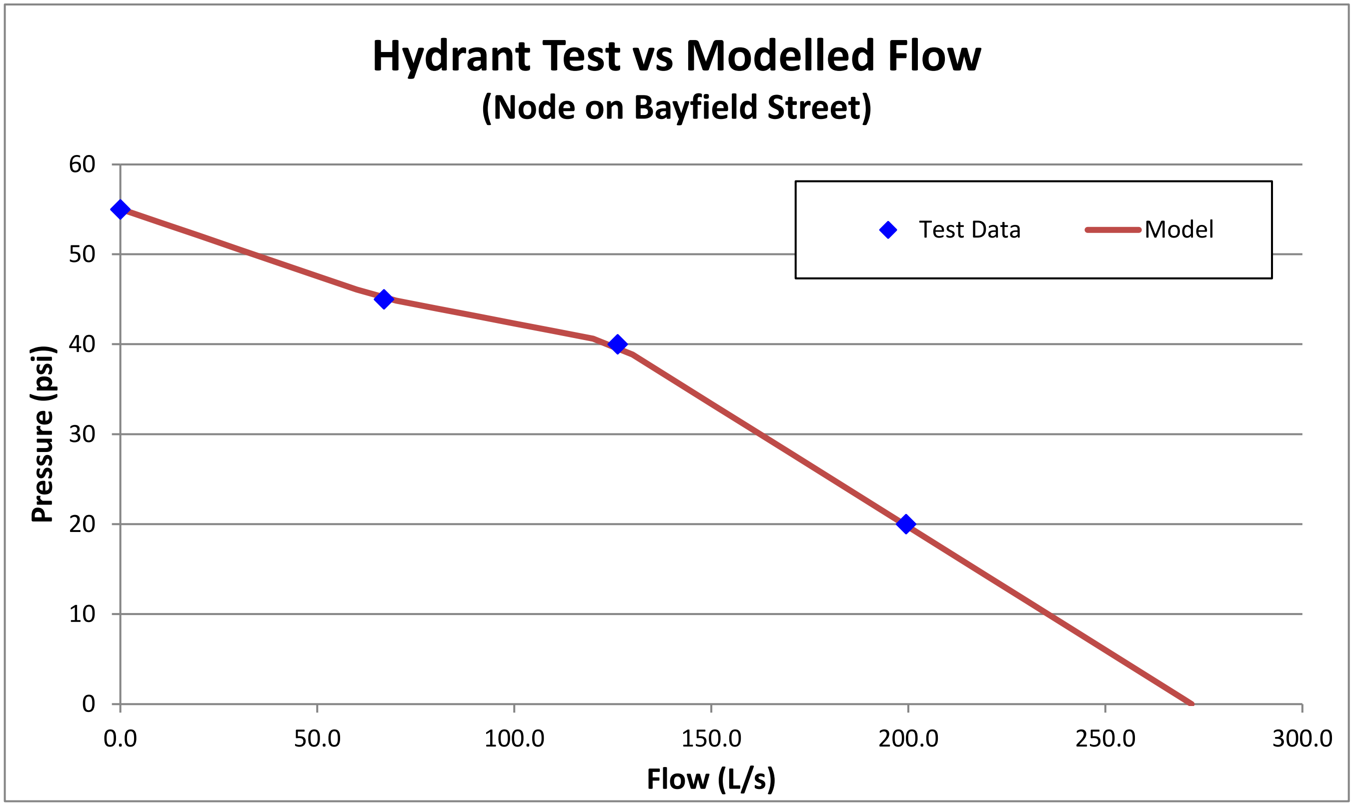
Static Pressure: 55PST

NUMBER OF OUTLETS	PITO PRESSURE	FLOW (US G.P.M.)	RESIDUAL PRESSURE
1Port	40PST	1060	45PST
2Port	35PST	2000	40PST



AquaOne Signature ____________

AquaOne Employee ____________

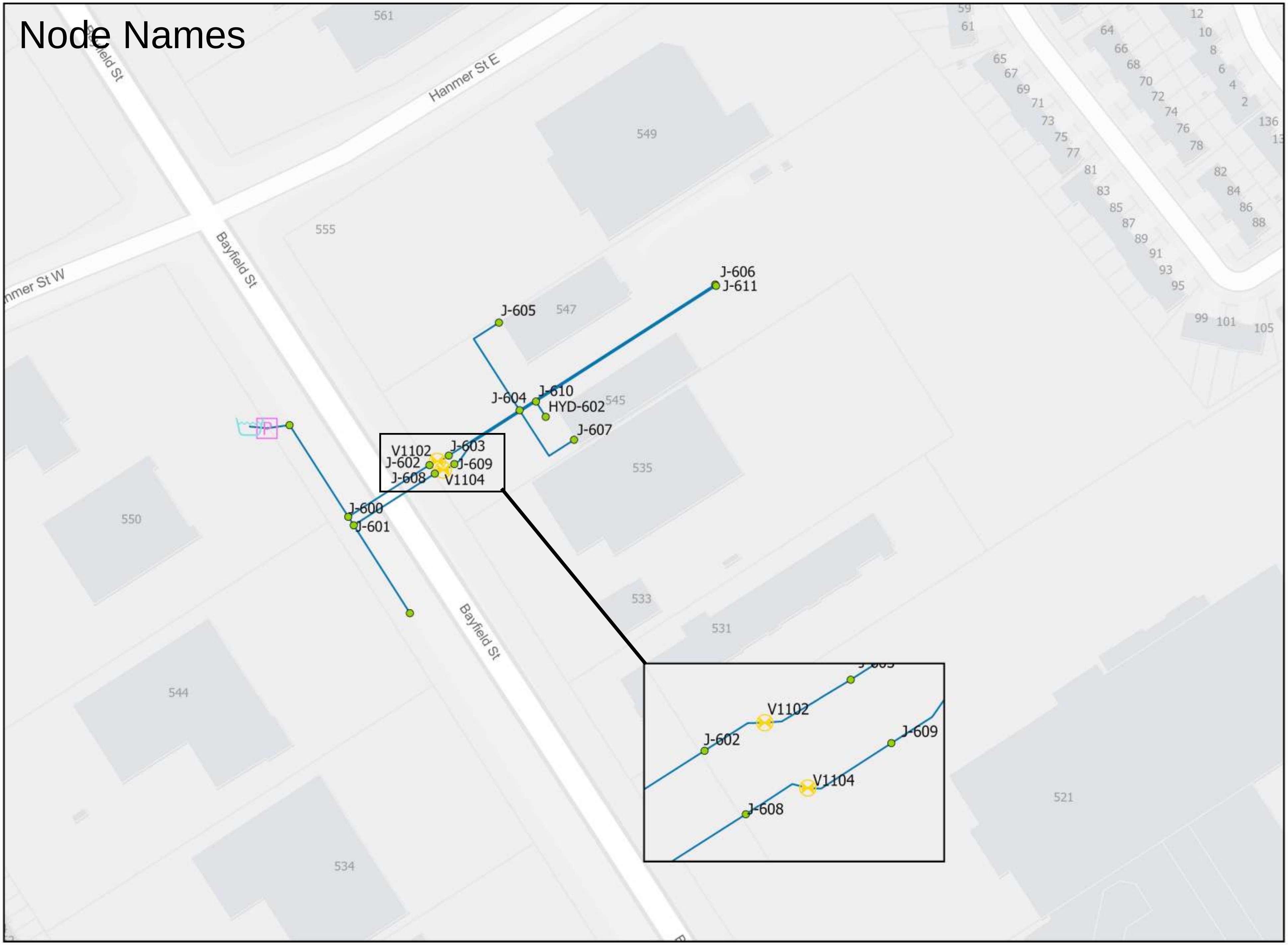


	Static Pressure (kPa)	Residual Pressure (psi)	Test Flow (L/s)	Theoretical Flow at 20 psi (140 kPa) (L/s)
Hydrant Test	55.0	40.0	126.2	199.4
Model	55.1	40.6	120.0	198.9

Appendix C

Model Results

Node Names


Bayfield St
Hanmer St E
Hanmer St W
561
549
555
547
545
535
533
531
521
550
544
534
J-606
J-611
J-605
J-604
J-610
HYD-602
J-607
V1102
J-603
J-602
J-609
J-608
V1104
J-600
J-601
V1102
J-602
J-609
V1104
J-608
59
61
65
67
69
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101
105

Pipe Names

Hanmer St E
Hanmer St W
Bayfield St
Bayfield St
Bayfield St
561
549
555
547
545
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P-605
P-610
P-611
P-612
P-613

Pipe Diameters

Existing Conditions
545-547 Bayfield, Barrie ON
June 18, 2024

Municipal Engineering Solutions

Average Day

Node Table

ID	Demand	Elevation	Head	Pressure
	(L/s)	*(m)*	*(m)*	*(psi)*
HYD-602	0.00	286.80	322.71	51.04
J-600	0.00	286.90	322.78	51.00
J-601	0.00	287.00	322.78	50.86
J-602	0.00	288.00	322.75	49.40
J-603	0.00	287.62	320.55	46.82
J-604	0.00	286.45	320.53	48.45
J-605	12.96	286.70	320.21	47.64
J-606	0.00	285.50	320.53	49.80
J-607	12.96	286.74	320.30	47.71
J-608	0.00	287.80	322.78	49.72
J-609	0.00	288.76	322.71	48.26
J-610	0.00	286.40	322.71	51.61
J-611	0.00	285.50	322.71	52.89

MIN		**285.50**		**46.82**
MAX		**288.76**		**52.89**

Pipe Table

ID	From Node	To Node	Length	Diameter	Roughness	Flow	Velocity
			(m)	*(mm)*	*(C)*	*(L/s)*	*(m/s)*
P-601	J-600	J-601	4.00	300	120	0.00	0.00
P-603	J-600	J-602	38.28	300	120	25.92	0.37
P-604	J-602	V1102	3.63	250	110	25.92	0.53
P-605	V1102	J-603	5.20	250	110	25.92	0.53
P-606	J-603	J-604	33.42	300	120	25.92	0.37
P-607	J-604	J-605	45.71	150	100	12.96	0.73
P-608	J-604	J-607	33.49	150	100	12.96	0.73
P-609	J-604	J-606	92.62	300	120	0.00	0.00
P-610	J-601	J-608	38.29	300	120	0.00	0.00
P-611	J-608	V1104	3.81	250	110	0.00	0.00
P-612	V1104	J-609	5.17	250	110	0.00	0.00
P-613	J-609	J-610	41.46	300	120	0.00	0.00
P-614	J-610	HYD-602	7.30	150	100	0.00	0.00
P-615	J-610	J-611	85.26	300	120	0.00	0.00

Maximum Day

Node Table

ID	Demand	Elevation	Head	Pressure
	(L/s)	*(m)*	*(m)*	*(psi)*
HYD-602	0.00	286.80	322.65	50.96
J-600	0.00	286.90	322.72	50.92
J-601	0.00	287.00	322.72	50.78
J-602	0.00	288.00	322.69	49.32
J-603	0.00	287.62	320.49	46.72
J-604	0.00	286.45	320.47	48.36
J-605	13.23	286.70	320.14	47.53
J-606	0.00	285.50	320.47	49.71
J-607	13.23	286.74	320.22	47.60
J-608	0.00	287.80	322.72	49.64
J-609	0.00	288.76	322.65	48.17
J-610	0.00	286.40	322.65	51.53
J-611	0.00	285.50	322.65	52.81

MIN		**285.50**		**46.72**
MAX		**288.76**		**52.81**

Pipe Table

ID	From Node	To Node	Length	Diameter	Roughness	Flow	Velocity
			(m)	*(mm)*	*(C)*	*(L/s)*	*(m/s)*
P-601	J-600	J-601	4.00	300	120	0.00	0.00
P-603	J-600	J-602	38.28	300	120	26.46	0.37
P-604	J-602	V1102	3.63	250	110	26.46	0.54
P-605	V1102	J-603	5.20	250	110	26.46	0.54
P-606	J-603	J-604	33.42	300	120	26.46	0.37
P-607	J-604	J-605	45.71	150	100	13.23	0.75
P-608	J-604	J-607	33.49	150	100	13.23	0.75
P-609	J-604	J-606	92.62	300	120	0.00	0.00
P-610	J-601	J-608	38.29	300	120	0.00	0.00
P-611	J-608	V1104	3.81	250	110	0.00	0.00
P-612	V1104	J-609	5.17	250	110	0.00	0.00
P-613	J-609	J-610	41.46	300	120	0.00	0.00
P-614	J-610	HYD-602	7.30	150	100	0.00	0.00
P-615	J-610	J-611	85.26	300	120	0.00	0.00

Peak Hour

Node Table

ID	Demand	Elevation	Head	Pressure
	(L/s)	*(m)*	*(m)*	*(psi)*
HYD-602	0.00	286.80	322.62	50.92
J-600	0.00	286.90	322.69	50.87
J-601	0.00	287.00	322.69	50.73
J-602	0.00	288.00	322.66	49.27
J-603	0.00	287.62	320.45	46.67
J-604	0.00	286.45	320.43	48.31
J-605	13.38	286.70	320.09	47.47
J-606	0.00	285.50	320.43	49.66
J-607	13.38	286.74	320.18	47.54
J-608	0.00	287.80	322.69	49.59
J-609	0.00	288.76	322.62	48.13
J-610	0.00	286.40	322.62	51.48
J-611	0.00	285.50	322.62	52.76

MIN		**285.50**		**46.67**
MAX		**288.76**		**52.76**

Pipe Table

ID	From Node	To Node	Length	Diameter	Roughness	Flow	Velocity
			(m)	*(mm)*	*(C)*	*(L/s)*	*(m/s)*
P-601	J-600	J-601	4.00	300	120	0.00	0.00
P-603	J-600	J-602	38.28	300	120	26.76	0.38
P-604	J-602	V1102	3.63	250	110	26.76	0.55
P-605	V1102	J-603	5.20	250	110	26.76	0.55
P-606	J-603	J-604	33.42	300	120	26.76	0.38
P-607	J-604	J-605	45.71	150	100	13.38	0.76
P-608	J-604	J-607	33.49	150	100	13.38	0.76
P-609	J-604	J-606	92.62	300	120	0.00	0.00
P-610	J-601	J-608	38.29	300	120	0.00	0.00
P-611	J-608	V1104	3.81	250	110	0.00	0.00
P-612	V1104	J-609	5.17	250	110	0.00	0.00
P-613	J-609	J-610	41.46	300	120	0.00	0.00
P-614	J-610	HYD-602	7.30	150	100	0.00	0.00
P-615	J-610	J-611	85.26	300	120	0.00	0.00

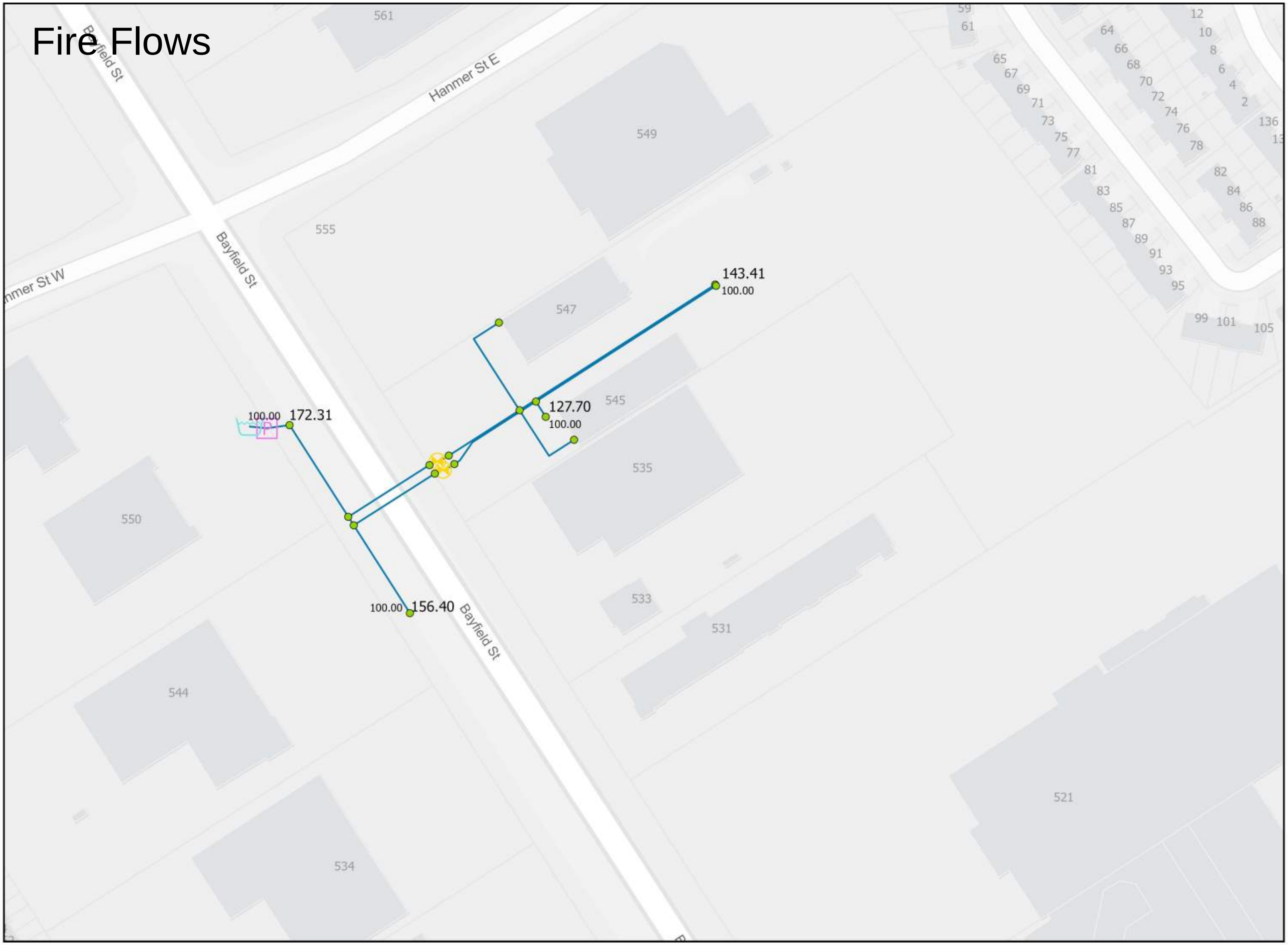
Fire Flow Table

ID	Total Demand	Available Flow	Fire Flow Met?
	(L/s)	*(L/s)*	
HYD-600	100.00	172.31	**TRUE**
HYD-601	100.00	156.40	**TRUE**
HYD-602	100.00	127.70	**TRUE**
J-611	100.00	143.41	**TRUE**

@20 psi (140 kPa)

MIN	**127.70**
MAX	**172.31**

Fire Flows


Bayfield St
Hanmer St E
Hanmer St W
Bayfield St
Bayfield St
561
549
555
547
545
535
533
531
521
550
544
534
59
61
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8
6
4
2
136
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143.41
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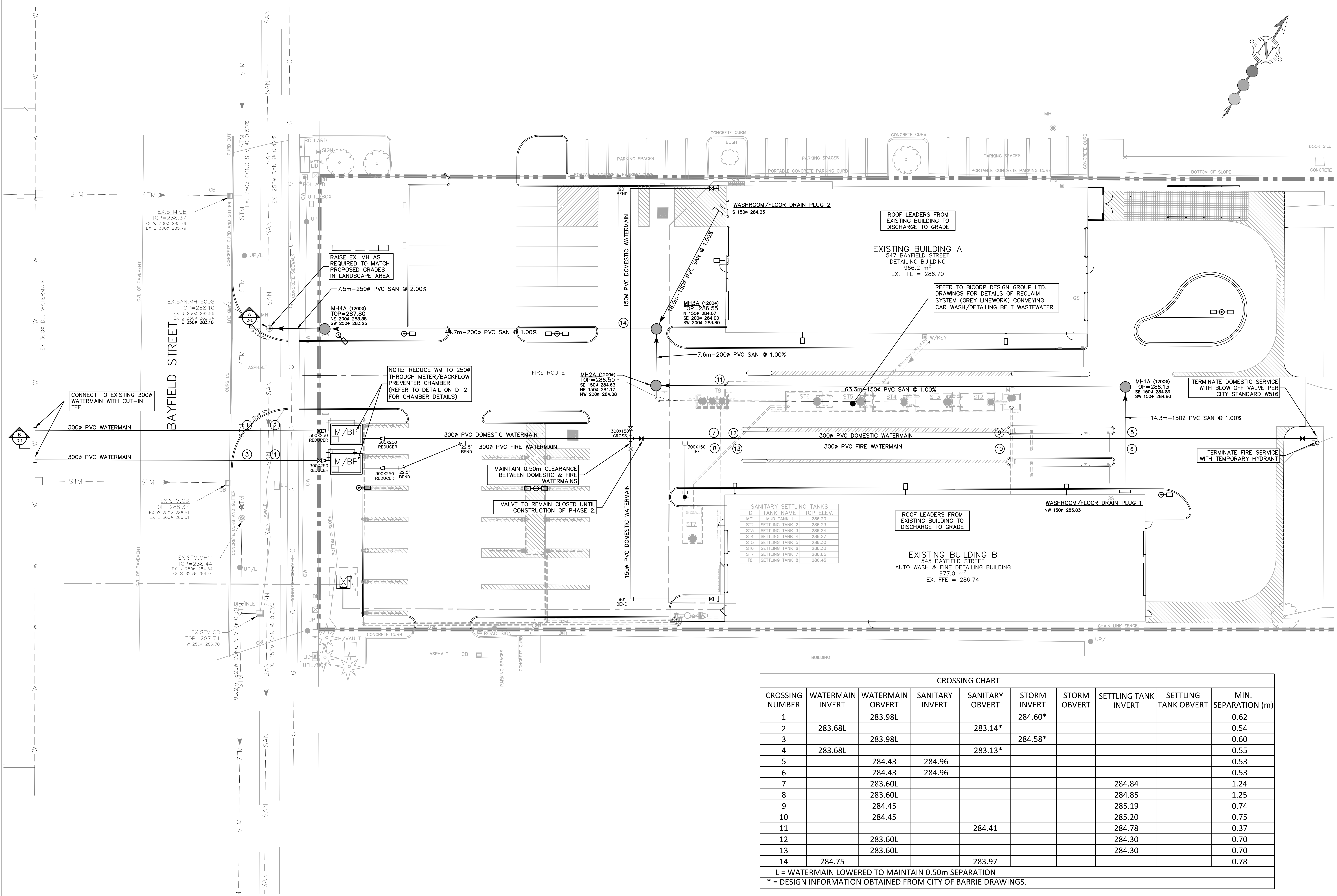
127.70
100.00
100.00
172.31
100.00
156.40

Appendix F Drawings



SANITARY SETTLING TANKS

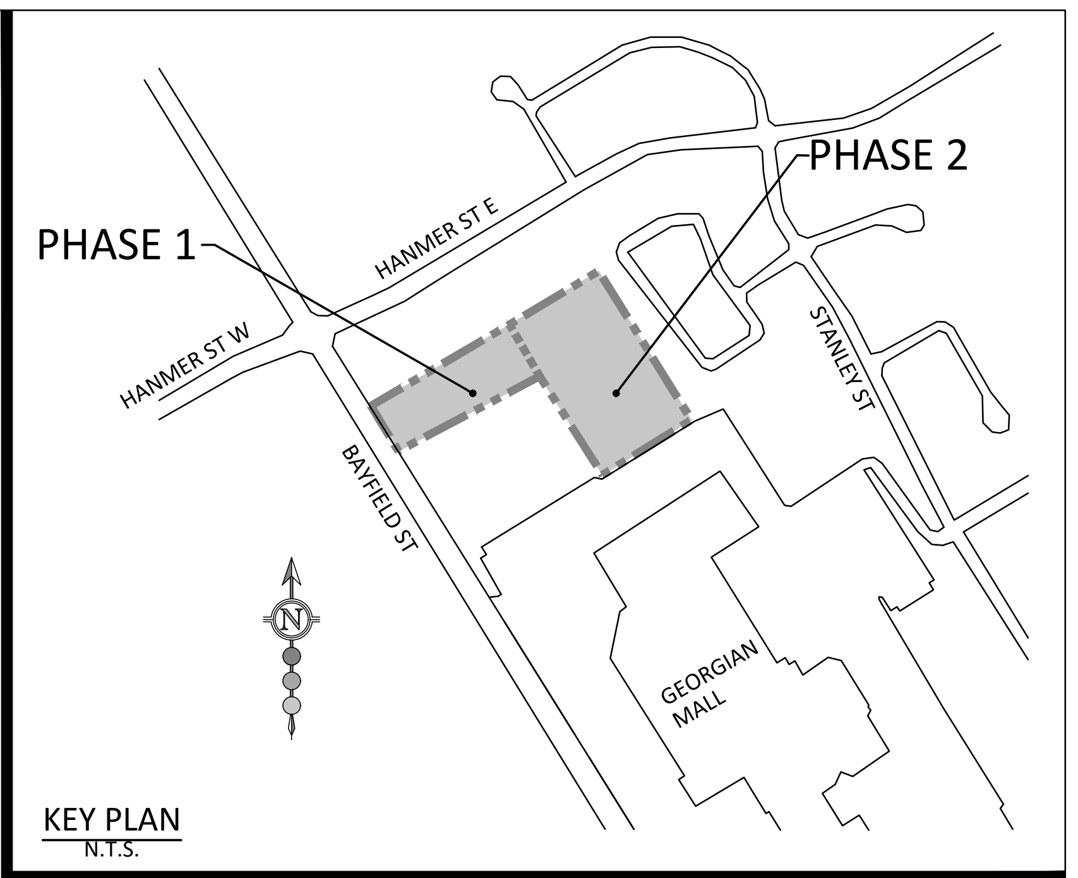
ID	TANK NAME	TOP ELEV.
MT1	MUD TANK 1	286.20
ST2	SETTLING TANK 2	286.23
ST3	SETTLING TANK 3	286.24
ST4	SETTLING TANK 4	286.27
ST5	SETTLING TANK 5	286.30
ST6	SETTLING TANK 6	286.33
ST7	SETTLING TANK 7	286.65
T8	SETTLING TANK 8	286.45

CROSSING CHART

CROSSING NUMBER	WATERMAIN INVERT	WATERMAIN OBVERT	SANITARY INVERT	SANITARY OBVERT	STORM INVERT	STORM OBVERT	SETTLING TANK INVERT	SETTLING TANK OBVERT	MIN. SEPARATION (m)
1		283.98L			284.60*				0.62
2	283.68L			283.14*					0.54
3		283.98L			284.58*				0.60
4	283.68L			283.13*					0.55
5		284.43	284.96						0.53
6		284.43	284.96						0.53
7		283.60L					284.84		1.24
8		283.60L					284.85		1.25
9		284.45					285.19		0.74
10		284.45					285.20		0.75
11				284.41			284.78		0.37
12		283.60L					284.30		0.70
13		283.60L					284.30		0.70
14	284.75			283.97					0.78

L = WATERMAIN LOWERED TO MAINTAIN 0.50m SEPARATION

* = DESIGN INFORMATION OBTAINED FROM CITY OF BARRIE DRAWINGS.



KEY PLAN
N.T.S.

BENCHMARK: 03120080033 ELEV. 277.889

ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE REFERRED TO ONTARIO MINISTRY OF NATURAL RESOURCES AND FORESTRY CONTROL No. 03120080033 HAVING A PUBLISHED ELEVATION OF 277.889 METRES (CGVD28: 78)

LEGEND:

▬ ▪ ▪ ▬	LIMIT OF PROPERTY
—●→	PROPOSED SANITARY SEWER AND MAINTENANCE HOLE
—⋈—	PROPOSED WATERMAIN & VALVE
✦	PROPOSED HYDRANT
— STM —→	EXISTING STORM SEWER
— SAN —→	EXISTING SANITARY SEWER
— W —	EXISTING WATERMAIN
— G —	EXISTING GAS MAIN
BB ☒	EXISTING BELL BOX
CB ▤	EXISTING CATCH BASIN
MH ◎	EXISTING MANHOLE
WV ◉	EXISTING WATER VALVE
GM ▣	EXISTING GAS METER
HM ▣	EXISTING HYDRO METER
W/KEY ▣	EXISTING WATER KEY
UP ●	EXISTING UTILITY POLE
FH	EXISTING FIRE HYDRANT
GUY —○	EXISTING GUY WIRE/POLE
✺	EXISTING DECIDUOUS TREE
✷	EXISTING CONIFEROUS TREE

TOPOGRAPHIC SURVEY PROVIDED BY SCHAEFFER DZALDOV PURCELL LTD., OCTOBER 2023

REVISIONS

No.	DESCRIPTION	DATE	BY	APPROVED
1.	ISSUED FOR SITE PLAN APPLICATION	JUN 21/24	P.C.	

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

CITY OF BARRIE
70 COLLIER STREET
BARRIE, ONTARIO L4M 4T5
TEL: (705) 726-4242
FAX: (705) 739-4237

547 BAYFIELD INC.

547 BAYFIELD STREET - KLASSIC CAR WASH & DETAILING CENTRE

SERVICING PLAN - PHASE 1

LICENSED PROFESSIONAL ENGINEER
K. CHEN
100136982
June 21, 2024
PROVINCE OF ONTARIO

DATE:	JUNE 2024	DESIGNED BY:	D.S.	CHECKED BY:	P.C.
SCALE:	1:250	DRAWN BY:	D.S.	CHECKED BY:	P.G.

1 0 5 10 15 20

PROJECT No: 2700

DRAWING No: S-1

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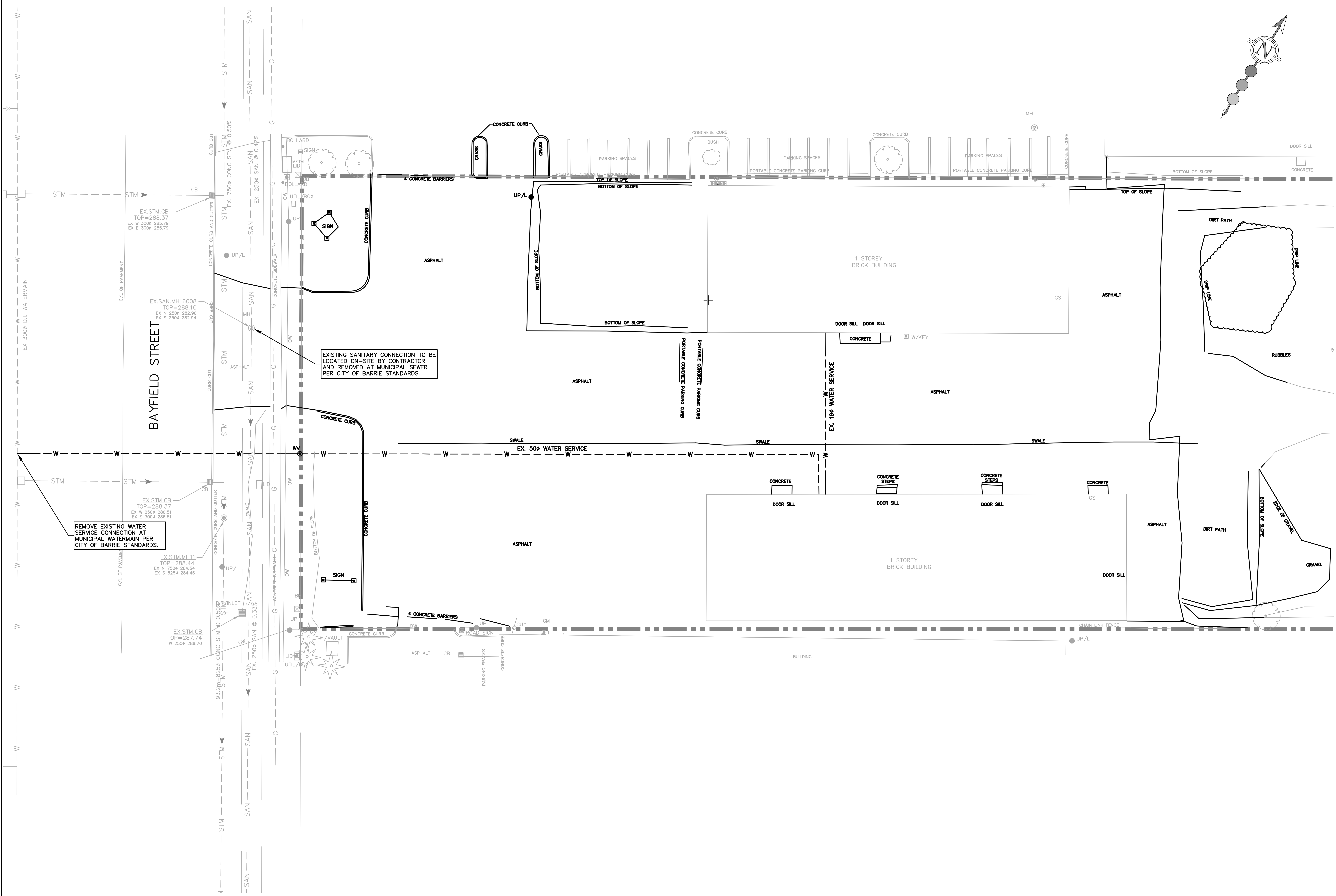
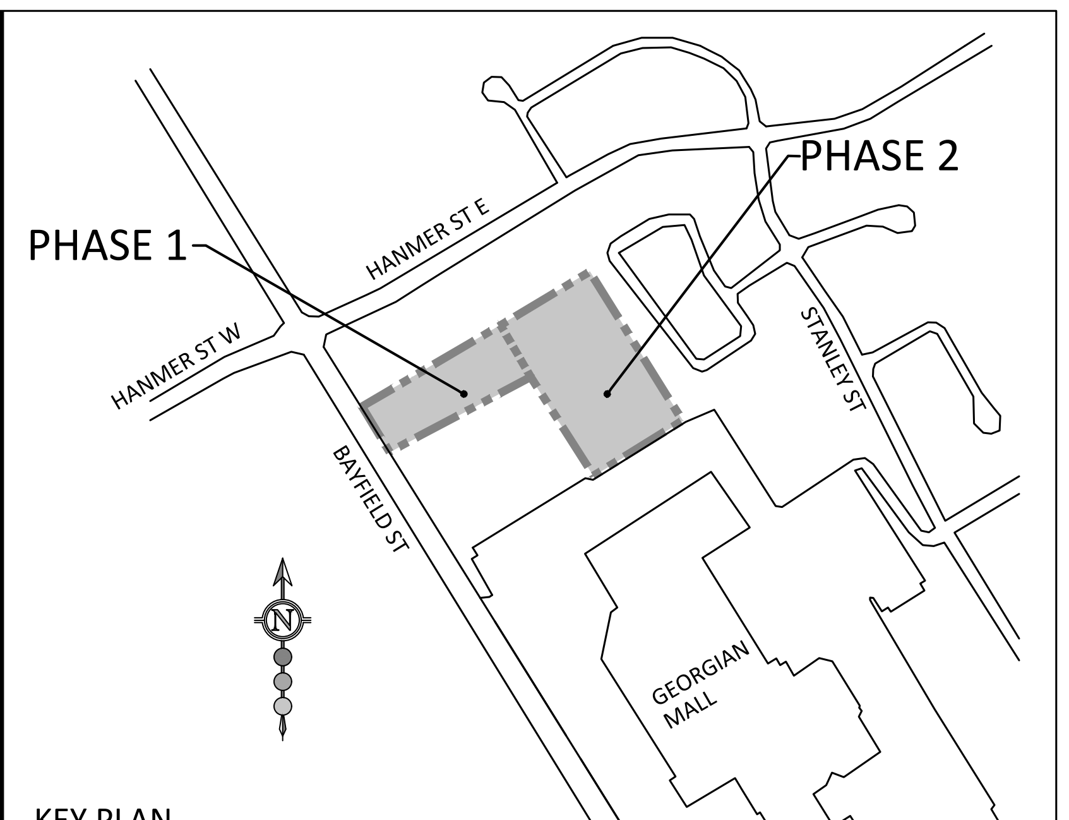


EXISTING SANITARY CONNECTION TO BE LOCATED ON-SITE BY CONTRACTOR AND REMOVED AT MUNICIPAL SEWER PER CITY OF BARRIE STANDARDS.

REMOVE EXISTING WATER SERVICE CONNECTION AT MUNICIPAL WATERMAIN PER CITY OF BARRIE STANDARDS.



KEY PLAN
N.T.S.

BENCHMARK: 03120080033 ELEV. 277.889

ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE REFERRED TO ONTARIO MINISTRY OF NATURAL RESOURCES AND FORESTRY CONTROL No. 03120080033 HAVING A PUBLISHED ELEVATION OF 277.889 METRES (CGVD28: 78)

LEGEND:

	▬ ▪ ▪ ▬	LIMIT OF PROPERTY
BB	☒	EXISTING BELL BOX
CB	▤	EXISTING CATCH BASIN
MH	◎	EXISTING MANHOLE
WV	⊙	EXISTING WATER VALVE
GM	▣	EXISTING GAS METER
HM	▣	EXISTING HYDRO METER
W/KEY	▣	EXISTING WATER KEY
UP	●	EXISTING UTILITY POLE
FH		EXISTING FIRE HYDRANT
GUY	—○	EXISTING GUY WIRE/POLE
		EXISTING DECIDUOUS TREE
	✵	EXISTING CONIFEROUS TREE

REMOVE ALL STRUCTURES, PAVEMENT, SERVICES, SIGNS, LIGHTING, FENCES AND LANDSCAPING FEATURES IDENTIFIED IN BOLD LINEWORK TO ENABLE CONSTRUCTION, UNLESS OTHERWISE NOTED.

TOPOGRAPHIC SURVEY PROVIDED BY SCHAEFFER DZALDOV PURCELL LTD., OCTOBER 2023

REVISIONS

No.	DESCRIPTION	DATE	BY	APPROVED
1.	ISSUED FOR SITE PLAN APPLICATION	JUN 21/24	P.C.	

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

CITY OF BARRIE
70 COLLIER STREET
BARRIE, ONTARIO L4M 4T5
TEL: (705) 726-4242
FAX: (705) 739-4237

547 BAYFIELD INC.

547 BAYFIELD STREET - KLASSIC CAR WASH & DETAILING CENTRE

REMOVALS PLAN - PHASE 1

LICENSED PROFESSIONAL ENGINEER
K. CHEN
100136982
June 21, 2024
PROVINCE OF ONTARIO

DATE:	JUNE 2024	DESIGNED BY:	D.S.	CHECKED BY:	P.C.
SCALE:	1:250	DRAWN BY:	D.S.	CHECKED BY:	P.G.

1 0 5 10 15 20

PROJECT No: 2700

DRAWING No: R-1

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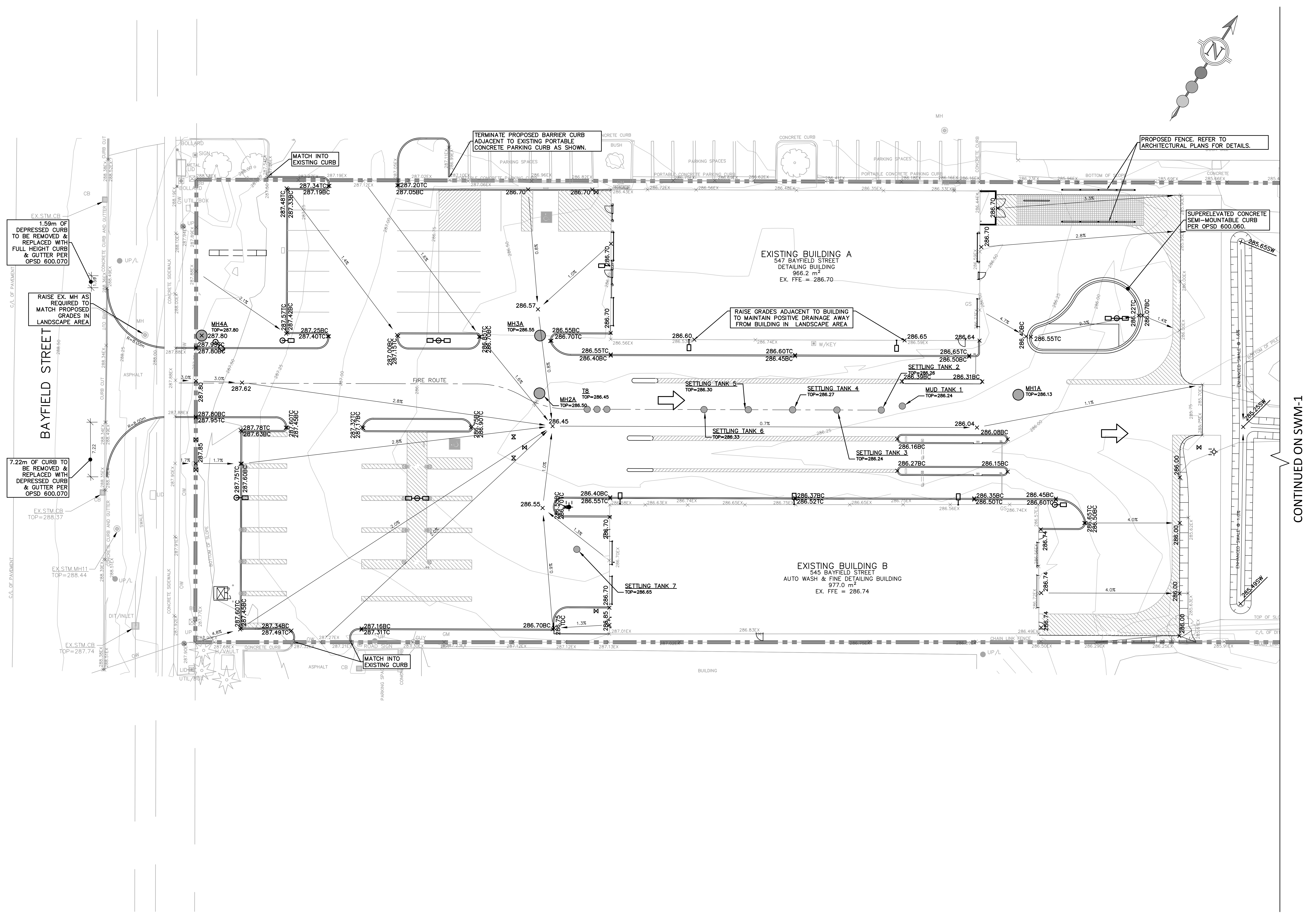

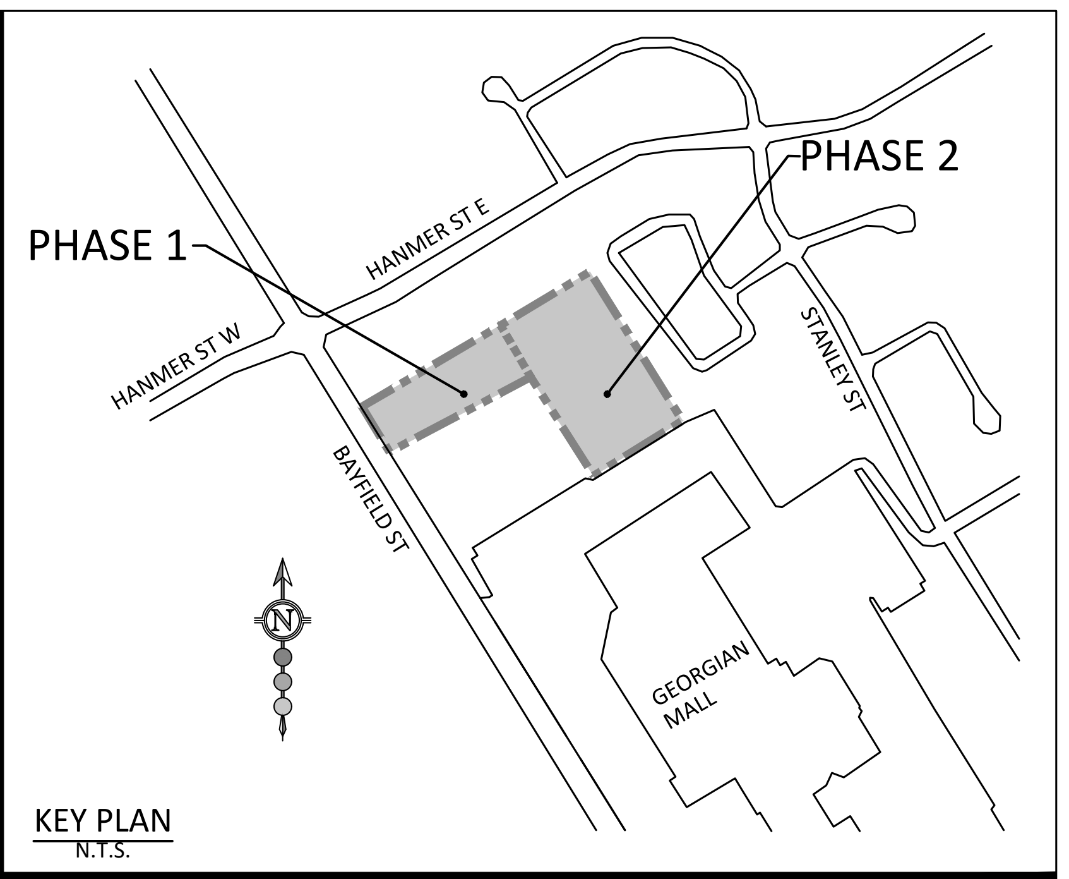

BENCHMARK: 03120080033 ELEV. 277.889

ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE REFERRED TO ONTARIO MINISTRY OF NATURAL RESOURCES AND FORESTRY CONTROL No. 03120080033 HAVING A PUBLISHED ELEVATION OF 277.889 METRES (CGVD28: 78)

LEGEND:

▬ ■ ■ ▬	LIMIT OF PROPERTY
×123.23	PROPOSED ELEVATION
×123.23EX	EXISTING ELEVATION
×123.23SW	SWALE ELEVATION
⇦	EMERGENCY OVERLAND FLOW ROUTE
270.25	EXISTING CONTOUR
●	PROPOSED SANITARY MAINTENANCE HOLE
⋈	PROPOSED WATER VALVE
✦	PROPOSED HYDRANT
BB ☒	EXISTING BELL BOX
CB ▤	EXISTING CATCH BASIN
MH ◎	EXISTING MANHOLE
WV ⊙	EXISTING WATER VALVE
GM ▣	EXISTING GAS METER
HM ▣	EXISTING HYDRO METER
W/KEY ▣	EXISTING WATER KEY
UP ●	EXISTING UTILITY POLE
FH	EXISTING FIRE HYDRANT
GUY —○	EXISTING GUY WIRE/POLE
✺	EXISTING DECIDUOUS TREE
✷	EXISTING CONIFEROUS TREE

TOPOGRAPHIC SURVEY PROVIDED BY SCHAEFFER DZALDOV PURCELL LTD., OCTOBER 2023

REVISIONS

No.	DESCRIPTION	DATE	BY	APPROVED
1.	ISSUED FOR SITE PLAN APPLICATION	JUN 21/24	P.C.	

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

CITY OF BARRIE
70 COLLIER STREET
BARRIE, ONTARIO L4M 4T5
TEL: (705) 726-4242
FAX: (705) 739-4237

547 BAYFIELD INC.

547 BAYFIELD STREET - KLASSIC CAR WASH & DETAILING CENTRE

GRADING PLAN - PHASE 1

LICENSED PROFESSIONAL ENGINEER
K. CHEN
100136982
June 21, 2024
PROVINCE OF ONTARIO

DATE:	JUNE 2024	DESIGNED BY:	D.S.	CHECKED BY:	P.C.
SCALE:	1:250	DRAWN BY:	D.S.	CHECKED BY:	P.G.

1 0 5 10 15 20

PROJECT No: 2700

DRAWING No: GR-1

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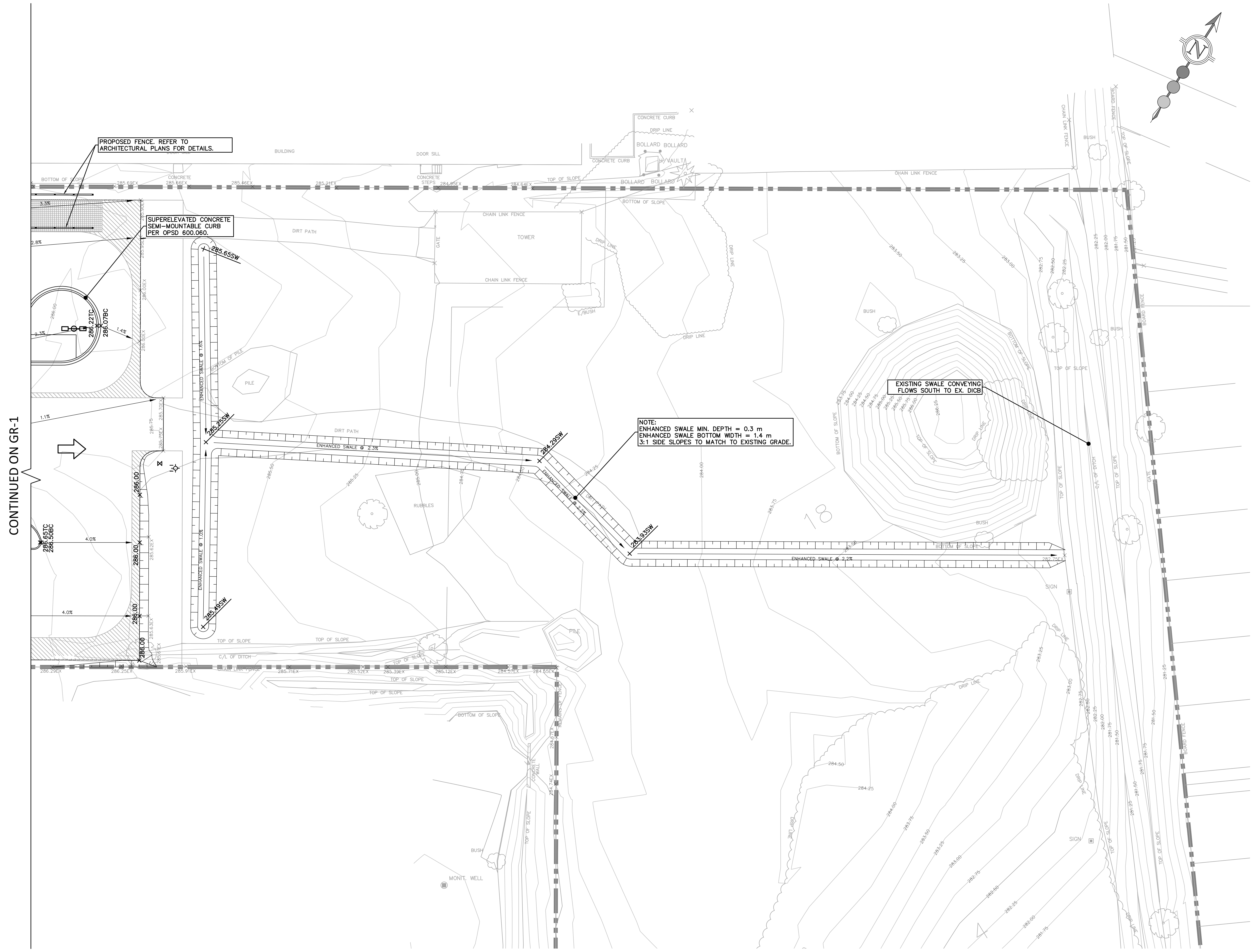
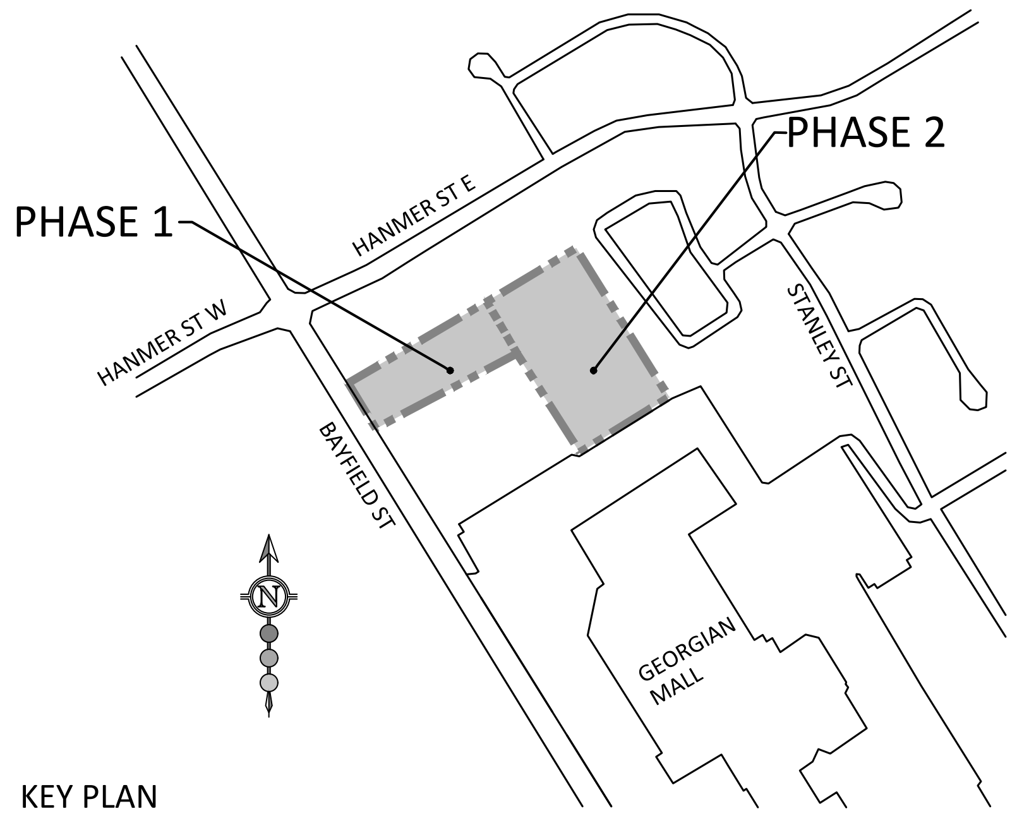


NOTE:
ENHANCED SWALE MIN. DEPTH = 0.3 m
ENHANCED SWALE BOTTOM WIDTH = 1.4 m
3:1 SIDE SLOPES TO MATCH TO EXISTING GRADE.



KEY PLAN
N.T.S.

BENCHMARK: 03120080033 ELEV. 277.889

ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE REFERRED TO ONTARIO MINISTRY OF NATURAL RESOURCES AND FORESTRY CONTROL No. 03120080033 HAVING A PUBLISHED ELEVATION OF 277.889 METRES (CGVD28: 78)

LEGEND:

▬ ▪ ▪ ▬	LIMIT OF PROPERTY
×123.23	PROPOSED ELEVATION
×123.23EX	EXISTING ELEVATION
×123.23SW	SWALE ELEVATION
⇦	EMERGENCY OVERLAND FLOW ROUTE
270.25	EXISTING CONTOUR
●	PROPOSED SANITARY MAINTENANCE HOLE
⋈	PROPOSED WATER VALVE
✦	PROPOSED HYDRANT
BB ☒	EXISTING BELL BOX
CB ▤	EXISTING CATCH BASIN
MH ◎	EXISTING MANHOLE
WV ◉	EXISTING WATER VALVE
GM ▣	EXISTING GAS METER
HM ▣	EXISTING HYDRO METER
W/KEY ▣	EXISTING WATER KEY
UP ●	EXISTING UTILITY POLE
FH	EXISTING FIRE HYDRANT
GUY —○	EXISTING GUY WIRE/POLE
✺	EXISTING DECIDUOUS TREE
✷	EXISTING CONIFEROUS TREE

TOPOGRAPHIC SURVEY PROVIDED BY SCHAEFFER DZALDOV PURCELL LTD., OCTOBER 2023

REVISIONS

No.	DESCRIPTION	DATE	BY	APPROVED
1.	ISSUED FOR SITE PLAN APPLICATION	JUN 21/24	P.C.	

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

CITY OF BARRIE
70 COLLIER STREET
BARRIE, ONTARIO L4M 4T5
TEL: (705) 726-4242
FAX: (705) 739-4237

547 BAYFIELD INC.

547 BAYFIELD STREET - KLASSIC CAR WASH & DETAILING CENTRE

STORMWATER MANAGEMENT PLAN - PHASE 1

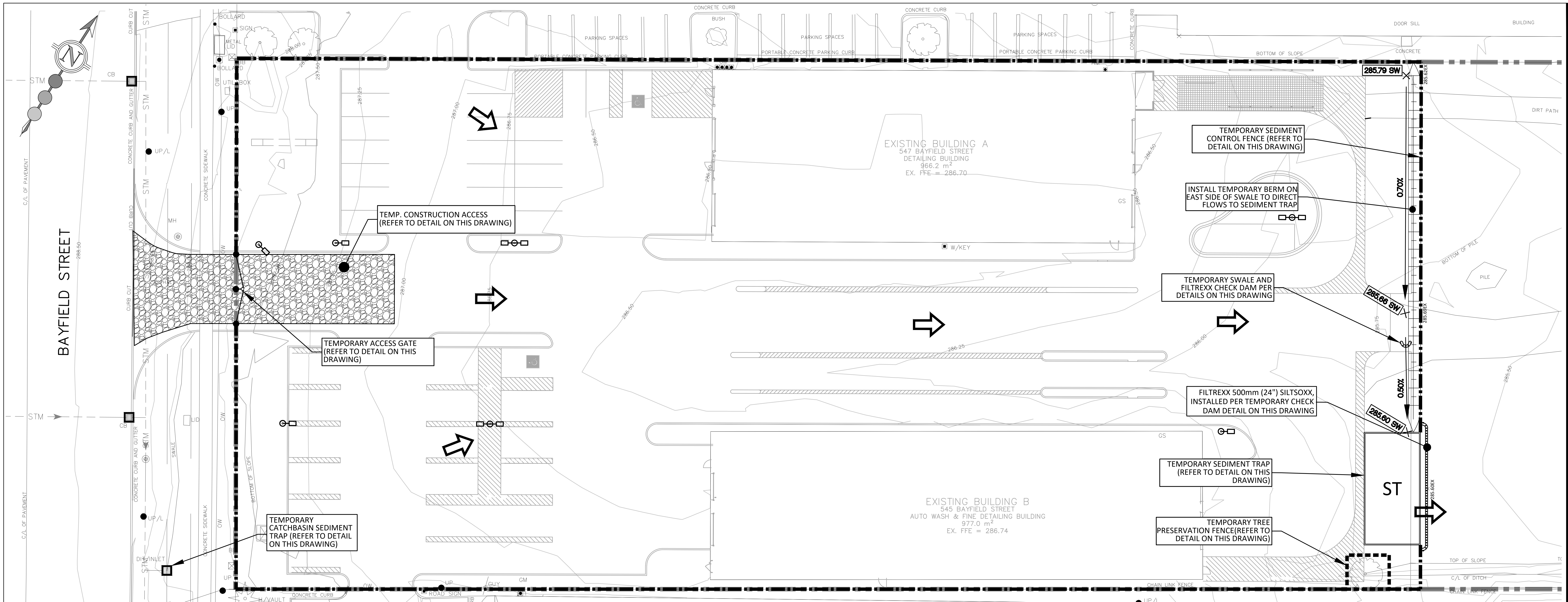
K. CHEN
100136982
June 21, 2024

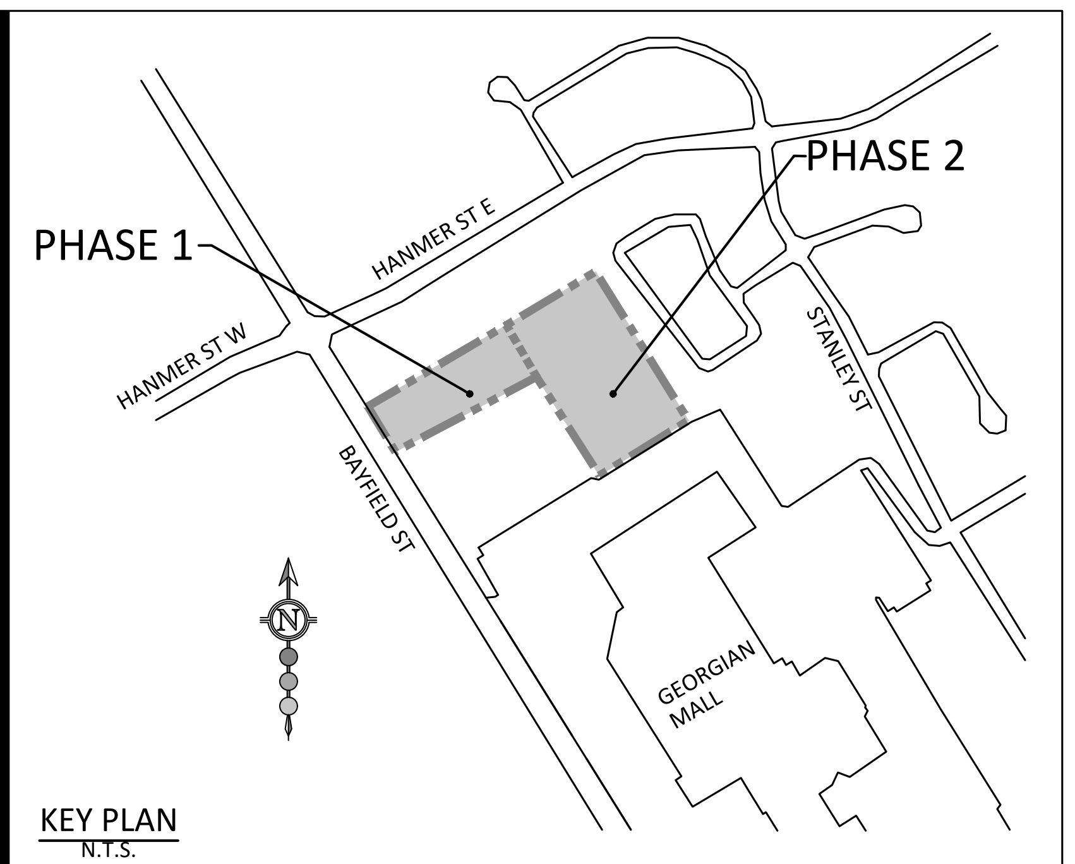
DATE:	JUNE 2024	DESIGNED BY:	D.S.	CHECKED BY:	P.C.
SCALE:	1:250	DRAWN BY:	D.S.	CHECKED BY:	P.G.

1 0 5 10 15 20

PROJECT No: 2700

DRAWING No: SWM-1





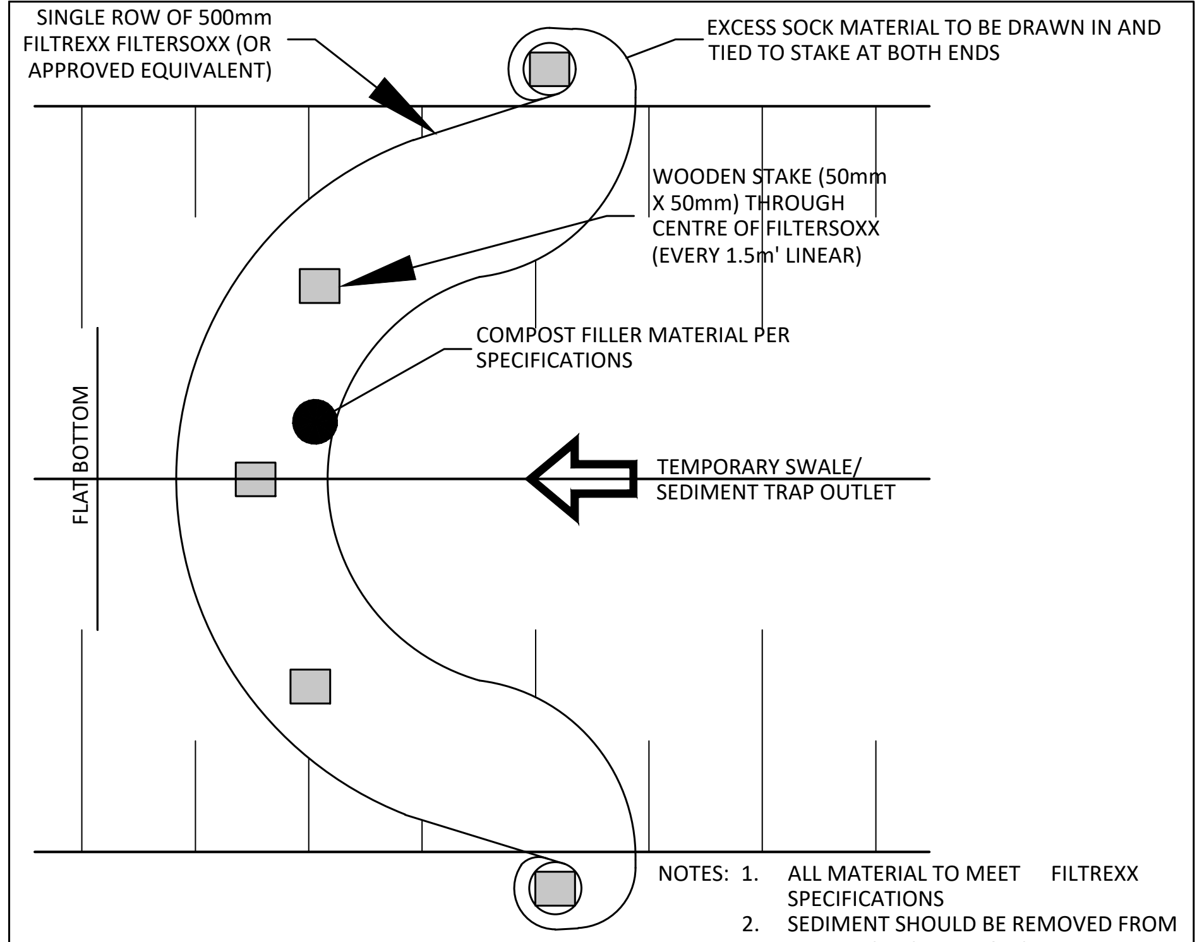
KEY PLAN
N.T.S.

BENCHMARK: 03120080033 ELEV. 277.889

ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE REFERRED TO ONTARIO MINISTRY OF NATURAL RESOURCES AND FORESTRY CONTROL No. 03120080033 HAVING A PUBLISHED ELEVATION OF 277.889 METRES (CGVD28: 78)

LEGEND:

▬ ■ ■ ▬	LIMIT OF PROPERTY
270.25	EXISTING CONTOUR
▬ ▪ ▬ ▪ ▬	TEMPORARY EROSION SEDIMENTATION CONTROL SILT FENCE
■ ■ ■ ■ ■	TEMPORARY EROSION SEDIMENTATION CONTROL TREE PRESERVATION FENCE
⇨	EXISTING FLOW DIRECTION
ST	PROPOSED SEDIMENT TRAP
□	PROPOSED CATCHBASIN SEDIMENT TRAP
●—●	PROPOSED GATE
0.50% →	PROPOSED TEMPORARY SWALE
× 285.60 SW	PROPOSED TEMPORARY SWALE ELEVATION
× 285.60EX	EXISTING ELEVATION
⌓	PROPOSED FILTREXX CHECK DAM
BB ☒	EXISTING BELL BOX
CB ▤	EXISTING CATCH BASIN
MH ◎	EXISTING MANHOLE
WV ◉	EXISTING WATER VALVE
GM ▣	EXISTING GAS METER
HM ▣	EXISTING HYDRO METER
W/KEY ▣	EXISTING WATER KEY
UP ●	EXISTING UTILITY POLE
FH	EXISTING FIRE HYDRANT
GUY —○	EXISTING GUY WIRE/POLE
✿	EXISTING DECIDUOUS TREE
✶	EXISTING CONIFEROUS TREE



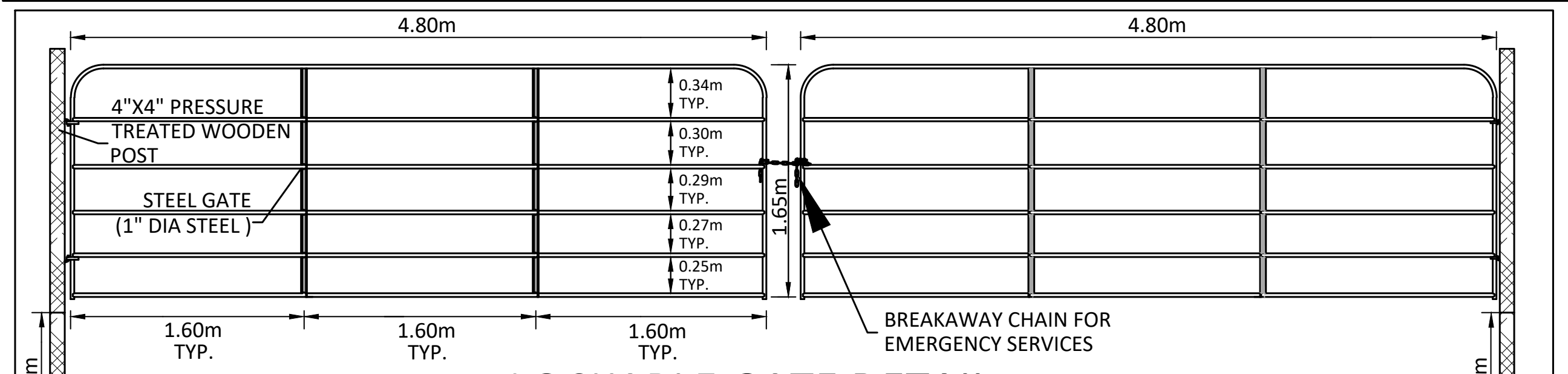
NOTES:
1. ALL MATERIAL TO MEET FILTREXX SPECIFICATIONS
2. SEDIMENT SHOULD BE REMOVED FROM BEHIND CHECKDAM ONCE THE ACCUMULATED HEIGHT HAS REACHED $\frac{1}{2}$ TOTAL HEIGHT OF THE CHECK DAM.

500mm FILTREXX (OR APPROVED EQUIVALENT) CHECK DAM

SCALE: N.T.S.

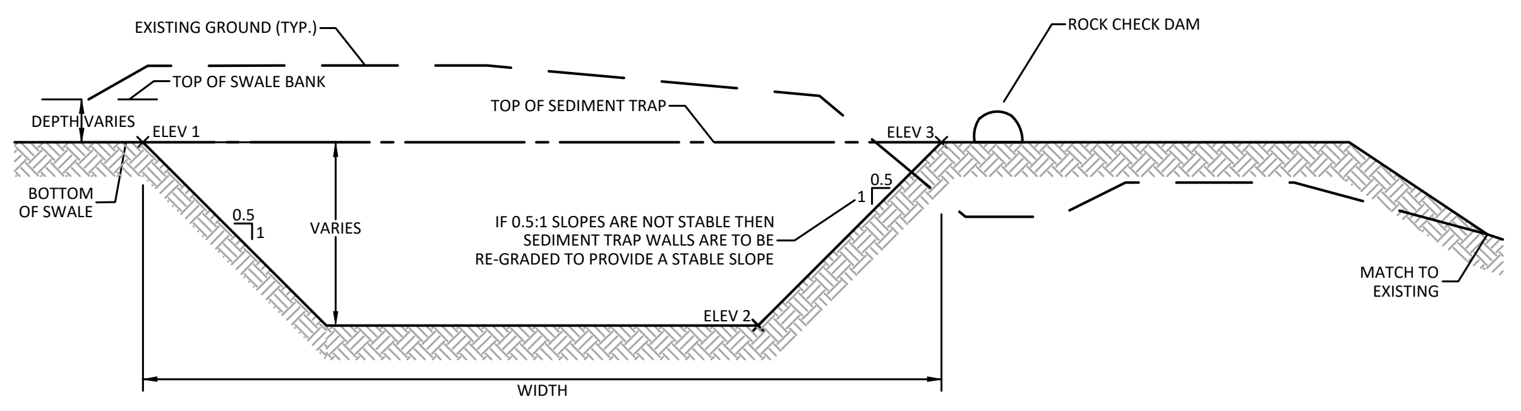
GENERAL

1. INSTALL TREE PRESERVATION FENCING AS PER THE APPROVED TREE PRESERVATION PLAN PRIOR TO COMMENCEMENT OF ANY SITEWORKS.
2. TREE REMOVALS TO BE COMPLETED IN ACCORDANCE WITH THE APPROVED ARBORIST REPORT OR LATEST AMENDMEND THEREOF.
3. INSTALL EROSION AND SEDIMENT CONTROLS (ESC) PRIOR TO COMMENCEMENT OF ANY SITE WORKS. ESC MEASURES TO BE INSPECTED BY THE ENGINEER, CONSERVATION AUTHORITY AND MUNICIPALITY PRIOR TO COMMENCEMENT OF ANY SITEWORKS.
4. INSTALL CONSTRUCTION ACCESS MUD MAT PRIOR TO COMMENCEMENT OF ANY SITE WORKS. CONSTRUCTION ACCESS SHALL CONFORM TO THE ONTARIO TRAFFIC MANUAL, BOOK 7 - TEMPORARY CONDITIONS. SITE MUST ONLY BE ACCESSED FROM THE APPROVED CONSTRUCTION ACCESS LOCATIONS.
5. INSPECT EROSION AND SEDIMENT CONTROL MEASURES REGULARLY AND AFTER WET WEATHER EVENTS. REPAIRS AND OR SEDIMENT REMOVAL MUST BE COMPLETED WITHIN 24 HOURS OF INSPECTION.
6. STRIPPED GROUND LEFT INACTIVE FOR OVER 30 DAYS SHALL BE VEGETATED BY HYDROSEEDING OR APPROVED EQUIVALENT.
7. INSTALL SEDIMENT CONTROL FENCE AROUND THE BASE OF EARTH STOCKPILES. MAXIMUM STOCKPILE SIDESLOPES TO BE 1.5 (H) TO 1.0 (V). MAXIMUM STOCKPILE HEIGHT NOT TO EXCEED 3.0 METRES.
8. IMPLEMENT DUST CONTROL MEASURES AT ALL TIMES.
9. CLEAN MUD TRACKING AND SWEEP PUBLIC ROADS ON A REGULAR BASIS.
10. INSTALL CATCHBASIN SEDIMENT CONTROL DEVICES IMMEDIATELY FOLLOWING INSTALLATION OF CATCHBASIN.
11. CLEAN CATCHBASINS AND STORM SEWERS UPON PLACEMENT OF BASE ASPHALT.



LOCKABLE GATE DETAIL (FOR MUD MAT - CONSTRUCTION ENTRANCE)

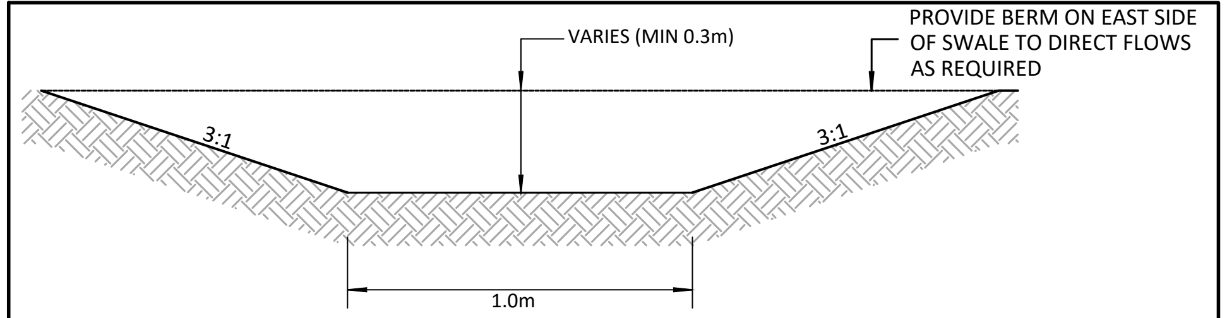
SCALE: N.T.S.



ELEVATION 1 INSERT SWALE INVERT (m)	ELEVATION 2 BOTTOM OF TRAP (m)	ELEVATION 3 TOP OF TRAP (m)	TRAP BASIN DEPTH (m)	TRAP LENGTH (m)	TRAP WIDTH (m)	REQUIRED TRAP VOLUME (m³)	PROVIDED TRAP VOLUME (m³)
285.60	284.10	285.60	1.5	13	6.5	100.0	105.7

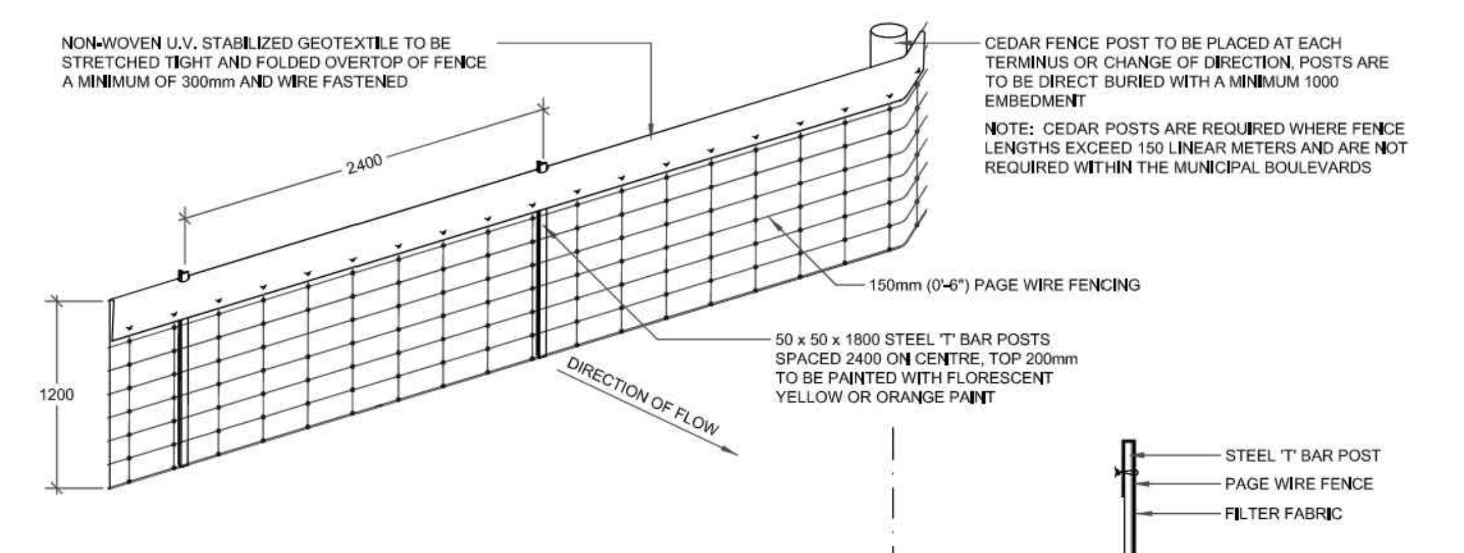
TEMPORARY SEDIMENT TRAP

SCALE: N.T.S.



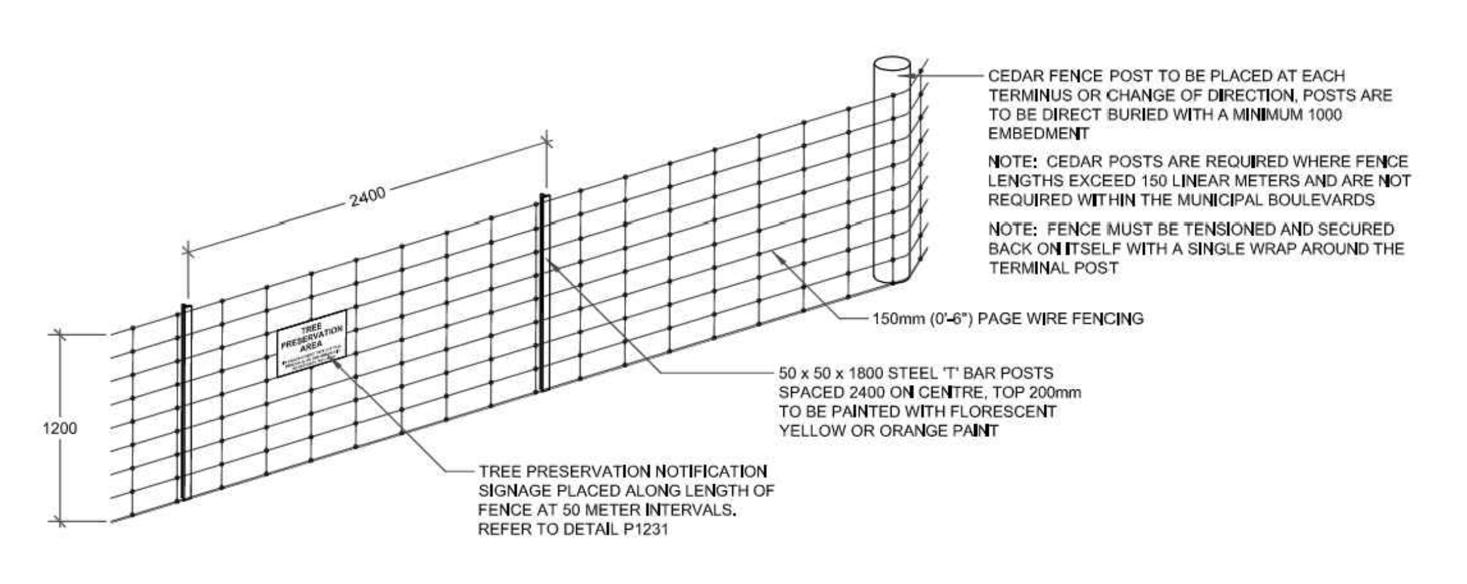
TEMPORARY SWALE

SCALE: N.T.S.



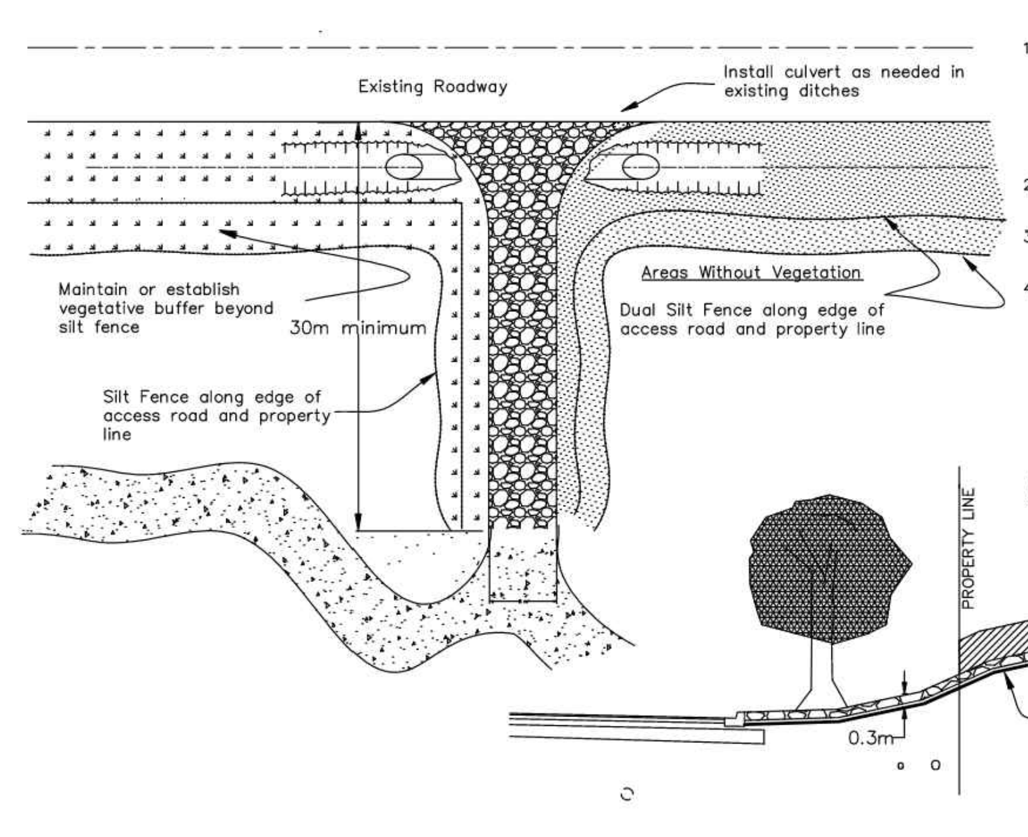
1. THIS STANDARD IS TO BE USED IN ACCORDANCE WITH THE SITE ALTERATION BY-LAW FOR THE DESIGN AND MAINTENANCE OF EROSION CONTROL MEASURES AND IS TO BE ADMINISTERED ACCORDINGLY
2. SILT / SEDIMENT CONTROL FENCE SHOULD BE ALIGNED WITH CONTOURS FOR SHEET OVERLAND FLOW
3. SILTATION CONTROL FENCE IS TO BE LOCATED IN AREAS OF LOW SEDIMENT YIELD ON SLOPES THAT CONFIRM TO M.T.O. DRAINAGE MANUAL VOLUME 2 "CHART F4-3C TOPOGRAPHIC FACTOR LS BASED ON SLOPE LENGTH AND GRADIENT"
4. SILTATION CONTROL FENCE SHALL BE INSTALLED WITH FILTER MEDIA FABRIC TOED INTO THE SOIL 300mm BE EITHER STATIC SLICING OR TRENCHING METHODS WITH COMPACTION OF TRENCH MATERIAL MEETING 95% S.P.D.
5. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN
6. SILT / SEDIMENT CONTROL FENCE MAY BE UTILIZED FOR TREE PRESERVATION AND IS TO BE USED IN CONJUNCTION WITH P1231, P1232 AND P1235

Barrie | FENCE SILTATION CONTROL | REV No. 3 | DATE: APR 2023 | SCALE: N.T.S. | P1233



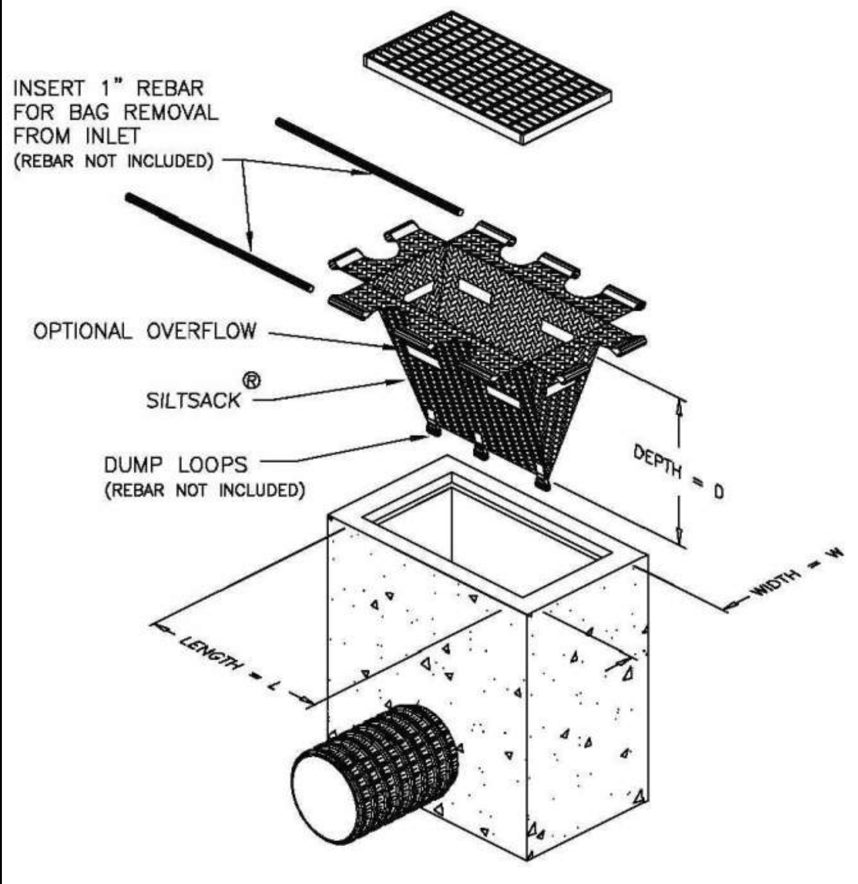
1. THIS DETAIL IS USED IN CONJUNCTION WITH P1233.
2. PAGE WIRE FENCE TO BE ATTACHED TO CEDAR RAIL POSTS WITH 'U' SHAPED GALVANIZED NAILS ON EACH HORIZONTAL STRAND.
3. USE A MINIMUM OF FOUR (4) 100MM, 16 GAUGE GALVANIZED T-POST CLIPS TO ATTACH PAGE WIRE FENCE TO EACH 'T' BAR POST.
4. 'T' BARS ARE TO BE DRIVEN INTO THE GROUND TO A MINIMUM DEPTH OF 600mm.
5. ALL MEASUREMENTS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
6. THIS DETAIL TO BE USED IN CONJUNCTION WITH P1230, P1231, P1234 AND P1235.

Barrie | FENCE TREE PRESERVATION | REV No. 2 | DATE: APR 2023 | SCALE: N.T.S. | P1232



NOTES:
1. THIS STANDARD IS TO BE IN ACCORDANCE WITH SCHEDULE "B" OF THE SITE ALTERATION BY-LAW, 'CODE FOR THE DESIGN AND MAINTENANCE OF EROSION AND SEDIMENTATION CONTROL MEASURES' AND IS TO BE ADMINISTERED ACCORDINGLY.
2. Purpose of Construction Mat is to minimize transportation of sediment onto roadways.
3. Construction mat is to be installed as the first step in the site alteration process.
4. Construction mats are required where paved roads are within 300m of the site.

Barrie | Construction Entrance | REV No. 2 | DATE: APR 2023 | SCALE: N.T.S | D710



TERRAFIX SILTSACK - TYPE B

SCALE: N.T.S.

TOPOGRAPHIC SURVEY PROVIDED BY SCHAEFFER DZALDOV PURCELL LTD., OCTOBER 2023

REVISIONS

No.	DESCRIPTION	DATE	BY	APPROVED
1.	ISSUED FOR SITE PLAN APPLICATION	JUN 21/24	P.C.	

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

CITY OF BARRIE
70 COLLIER STREET
BARRIE, ONTARIO L4M 4T5
TEL: (705) 726-4242
FAX: (705) 739-4237

547 BAYFIELD INC.

547 BAYFIELD STREET - KLASSIC CAR WASH & DETAILING CENTRE

EROSION & SEDIMENT CONTROL PLAN - PHASE 1

LICENSED PROFESSIONAL ENGINEER
K. CHEN
100136982
June 21, 2024
PROVINCE OF ONTARIO

DATE:	JUNE 2024	DESIGNED BY:	D.S.	CHECKED BY:	P.C.
SCALE:	1:250	DRAWN BY:	D.S.	CHECKED BY:	P.G.

1 0 5 10 15 20

PROJECT No: 2700

DRAWING No: ESC-1

GENERAL

1. PRIOR TO STARTING ANY WORKS, THE CONTRACTOR MUST ENSURE THAT ALL NECESSARY APPROVALS ARE IN PLACE FROM THE MUNICIPALITY AND OTHER EXTERNAL AGENCIES, AS REQUIRED.
2. WORK SHALL BE CARRIED OUT IN COMPLIANCE WITH THE APPLICABLE HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS.
3. WORKS AND MATERIALS SHALL CONFORM TO CURRENT MINISTRY OF THE ENVIRONMENT, CONSERVATION AND PARKS, MUNICIPAL, REGIONAL, ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS. FOR ALL WORK WITHIN PRIVATE PROPERTY, WORKS AND MATERIALS SHALL CONFORM TO THE ONTARIO BUILDING CODE, OR THE ABOVE-NOTED STANDARDS, WHICHEVER IS MORE STRINGENT.
4. WORKS BY OTHERS (EITHER ON-SITE OR OFF-SITE) MAY BE ON-GOING DURING THE PERIOD OF THIS CONTRACT. COORDINATE CONSTRUCTION ACTIVITIES WITH ALL OTHER CONTRACTORS TO PREVENT CONSTRUCTION CONFLICTS.
5. VERIFY THE LOCATION, DIMENSIONS AND ELEVATION OF EXISTING SERVICES AND UTILITIES PRIOR TO CONSTRUCTION. EXISTING INFRASTRUCTURE TO BE PROTECTED AND/OR SUPPORTED DURING CONSTRUCTION. DISCREPANCIES BETWEEN THE DRAWINGS AND FIELD CONDITIONS TO BE IMMEDIATELY REPORTED TO THE ENGINEER.
6. REFER TO THE ARCHITECTURAL SITE PLAN FOR DIMENSIONS AND LAYOUT INFORMATION.

GRADING

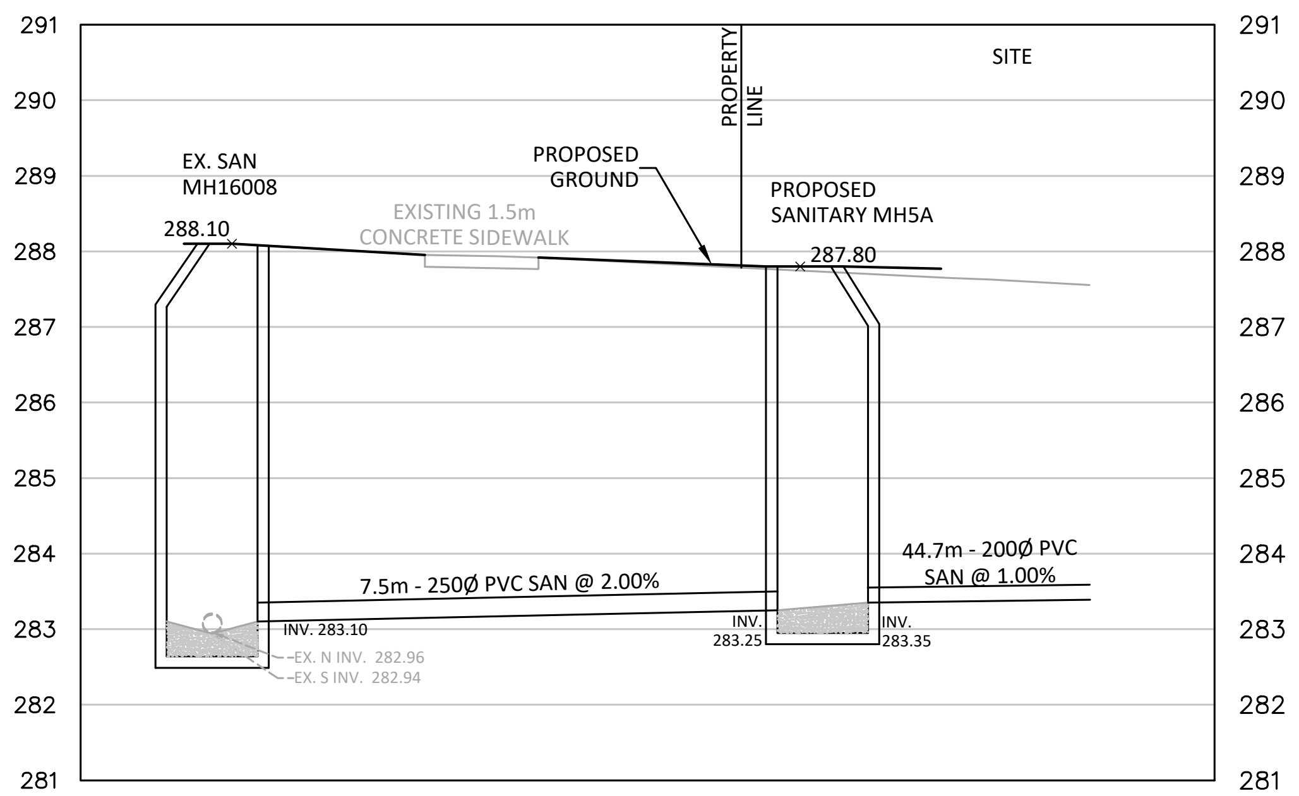
1. PRIOR TO COMMENCEMENT OF EARTHWORKS, SITE ALTERATION PLANS MUST BE APPROVED AND ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED AND OPERATIONAL. THE CONTRACTOR SHALL MAINTAIN ALL WORKS UNTIL CONSTRUCTION IS COMPLETED TO THE SATISFACTION OF THE ENGINEER.
2. ENGINEERED FILL SHALL CONFORM TO THE SPECIFICATIONS PROVIDED IN THE GEOTECHNICAL REPORT, OR LATEST AMENDMENT THEREOF.
3. ENGINEERED FILL SHALL BE INSPECTED AND TESTED BY THE GEOTECHNICAL CONSULTANT. PROOF ROLLING OF SUBGRADE WILL BE REQUIRED PRIOR TO PLACEMENT OF GRANULAR MATERIALS. COORDINATE INSPECTIONS WITH GEOTECHNICAL CONSULTANT.
4. GRANULAR COMPACTION: PER THE SPECIFICATIONS PROVIDED IN THE GEOTECHNICAL REPORT, OR LATEST AMENDMENT THEREOF.
5. LIGHT DUTY PARKING PAVEMENT STRUCTURE (PER GEOTECHNICAL REPORT):
   40 mm HL3 TOP COURSE ASPHALT
   50 mm HL8 BASE COURSE ASPHALT
   150 mm GRANULAR 'A'
   300 mm GRANULAR 'B'
6. HEAVY DUTY/FIRE ROUTE PAVEMENT STRUCTURE (PER GEOTECHNICAL REPORT):
   40 mm HL3 TOP COURSE ASPHALT
   70 mm HL8 BASE COURSE ASPHALT
   150 mm GRANULAR 'A'
   450 mm GRANULAR 'B'
7. ASPHALT COMPACTION: PER THE SPECIFICATIONS PROVIDED IN THE GEOTECHNICAL REPORT, OR LATEST AMENDMENT THEREOF.
8. BARRIER CURB: OPSD 600.110.
   MOUNTABLE CURB: OPSD 600.100.
   SEMI-MOUNTABLE CURB: OPSD 600.090.
9. CONCRETE SIDEWALK: 125mm DEEP WITH 125mm GRANULAR 'A' BASE.
   CONCRETE SIDEWALK ACROSS RESIDENTIAL DRIVEWAY: 175mm DEEP WITH 125mm GRANULAR 'A' BASE.CONCRETE SIDEWALK ACROSS LANEWAYS, ROADS, COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL DRIVEWAYS: 200mm DEEP WITH 125mm GRANULAR 'A' BASE.
10. LAP JOINTS SHALL BE USED WHERE PROPOSED ASPHALT MEETS EXISTING ASPHALT AS PER DETAIL ON THIS DRAWING.
11. PAVEMENT MARKINGS SHALL BE PLACED AS SHOWN ON THE ARCHITECTURAL SITE PLAN WITH A MINIMUM OF TWO COATS OF ORGANIC SOLVENT BASED PAINT AS PER OPSS 1712.
12. INSTALL SIGNAGE AS PER THE ARCHITECTURAL SITE PLAN.
13. ALL EXCESS EXCAVATED MATERIAL SHALL BE REMOVED OFFSITE TO THE CONTRACTOR'S APPROVED DISPOSAL SITE.
14. EMBANKMENTS SHALL BE SLOPED AT A MAXIMUM OF 3H:1V, UNLESS OTHERWISE SPECIFIED.
15. DISTURBED AREAS SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER. THE RELOCATION OR REMOVAL OF TREES AND SHRUBS SHALL BE SUBJECT TO APPROVAL BY THE ARBORIST.
16. PLACE 200mm THICK TOPSOIL IN ALL PLANTING AND SOD AREAS.
17. REFER TO LANDSCAPE/ARCHITECTURAL DRAWINGS FOR LOCATION AND TYPE OF ALL HARD LANDSCAPE SURFACES.
18. THE CONTRACTOR SHALL PROVIDE TO THE ENGINEER AN AS-CONSTRUCTED GRADING DRAWING.

WATERMAINS

1. PIPE: POLYVINYL CHLORIDE (PVC) CLASS 150 DR-18 PIPE, AWWA C900 AND CSA B137.3, LATEST AMENDMENTS.
   TYPE K COPPER, ASTM B88.
2. EMBEDMENT AND TRENCH DETAIL: OPSD 802.010.
3. BEDDING MATERIAL: MUNICIPAL WATERMAIN BEDDING SHALL CONFORM TO MUNICIPAL STANDARDS. PRIVATE WATERMAIN BEDDING SHALL CONFORM TO GEOTECHNICAL RECOMMENDATION.
4. MINIMUM COVER: 1.7 m FROM PROPOSED FINISHED GRADES IN URBANIZED AREAS. ON OPEN DITCH OR UNIMPROVED ROADS, AN INCREASED COVER OF MINIMUM 2.3 m SHALL BE PROVIDED TO ALLOW FOR FUTURE ROAD IMPROVEMENTS OR LOWERING OF THE ROAD PROFILE WHEN URBANIZATION OCCURS.
5. INSULATION: TO BE PROVIDED IF COVER TO OBVERT IS LESS THAN 1.70 METRES. 50mm THICK HIGH LOAD 60. WIDTH AS NOTED ON DRAWING.
6. MINIMUM CURVATURE OF PIPE DEFLECTION (IF REQUIRED) SHALL BE AS PER THE FOLLOWING GUIDELINES: 100mm - R=30.0m; 150mm - R=43.0m; 200mm - R=57.0m; 300mm - R=83.0m; 400mm - R=100.0m.
7. HORIZONTAL SEPARATION: MINIMUM 2.5 METRES FROM SEWERS AND SEWER MAINTENANCE HOLES, MEASURED FROM THE NEAREST EDGES.
8. VERTICAL SEPARATION: MINIMUM 0.5 METRES. IF WATERMAIN MUST CROSS BELOW A SEWER, THE WATERMAIN SHALL BE INSTALLED WITH JOINTS LOCATED A MINIMUM OF 2.5 METRES FROM THE POINT OF CROSSING.
9. MECHANICAL RESTRAINTS: REQUIRED AT ALL CHANGES IN PIPE DIRECTION AND AT REDUCERS AND CAPS. RESTRAIN PIPE 12.2 METRES BACK FROM STUBS AND 6.1 METRES ON EITHER SIDE OF VALVES 100mm OR LARGER. RESTRAIN ALL JOINTS WITHIN ENGINEERED FILL AREAS. RESTRAINT RODS AND INSTALLATION SHALL CONFORM TO NFPA 24 (STANDARD FOR THE INSTALLATION OF PRIVATE FIRE SERVICE MAINS AND THEIR APPURTENANCES).
10. THRUST BLOCKING: REQUIRED FOR ALL TEES, PLUGS AND HORIZONTAL BENDS PER OPSD 1103.010 AND ONTARIO BUILDING CODE S.7.3.4.9.
11. HYDRANTS: SHALL CONFORM TO MUNICIPAL SPECIFICATIONS AND STANDARDS. STORZ NOZZLE TO BE ORIENTED PERPENDICULAR TO THE FIRE ROUTE. HYDRANT FLANGE ELEVATION TO BE 0.15m ABOVE PROPOSED FINISHED GRADE AT THE HYDRANT. HYDRANT TO BE PAINTED PER FIRE DEPARTMENT SPECIFICATIONS.
12. HYDRANT ANCHOR TEES: ATTACH HYDRANT VALVE TO THE ANCHOR TEE, PROVIDED THAT THE MAXIMUM DISTANCE FROM HYDRANT TO VALVE DOES NOT EXCEED 6.1 METRES. ENSURE VALVE BOX DOES NOT CONFLICT WITH CURBS.
13. HYDRANT FLOW TEST: TO BE COMPLETED BY CONTRACTOR PER NFPA 291 AND RESULTS PROVIDED TO THE ENGINEER.
14. PIPE FITTINGS: CAST IRON, CEMENT LINED, MECHANICAL JOINT, SHORT BODY CONFORMING TO ANSI/AWWA C110/A21.10. JOINTS: RUBBER GASKET CONFORMING TO ANSI/AWWA C111/A21.11.
15. VALVE BOXES: 100mm SLIDING TYPE BOX COMPLETE WITH GUIDE PLATE. INSTALL EXTENSION STEM AS REQUIRED TO MAINTAIN A MAXIMUM DISTANCE OF 1.8m FROM TOP OF OPERATING NUT TO FINISHED GRADE.
16. VALVE CHAMBERS SHALL BE DRAINED TO STORM SEWER WHERE POSSIBLE. IF ONSITE SWM RESULTS IN SURCHARGING OF CHAMBER, EITHER SPECIFY A BACKWATER VALVE OR DELETE THIS NOTE.
17. TRACER WIRE: #12 AWG SOLID COPPER SUITABLE FOR DIRECT BURIAL.
18. CATHODIC PROTECTION: OPSD 1109.011 AND OPSS 702. DUCTILE IRON FITTINGS: 5.4 kg ZINC ANODE. HYDRANTS, VALVES AND TEES: 10.8 kg ZINC ANODE. WHERE NEW WATERMAIN IS CONNECTED TO EXISTING CAST IRON OR DUCTILE IRON WATERMAIN, ONE 14.5 kg MAGNESIUM ANODE SHALL BE PLACED ON EACH SIDE OF THE CONNECTION.
19. TERMINATE SERVICES 1.0 METRE FROM THE OUTSIDE FACE OF BUILDING, UNLESS OTHERWISE NOTED ON DRAWING. TERMINATE STUBS WITH A PLUG AND 50 mm BLOW OFF.
20. ISOLATE NEW WATERMAIN FROM EXISTING LINES IN ORDER TO ALLOW INDEPENDENT PRESSURE TESTING AND CHLORINATION.
21. PRESSURE AND BACTERIOLOGICAL TESTING: AS PER MUNICIPAL STANDARD SPECIFICATIONS; ONTARIO BUILDING CODE AND MINISTRY OF THE ENVIRONMENT. TREAT CHLORINATED WATER TO ACCEPTABLE LEVELS PRIOR TO DISCHARGE.
22. WATER METER: OBTAIN FROM CITY OF BARRIE. INSTALL PER CITY OF BARRIE STANDARD W533.

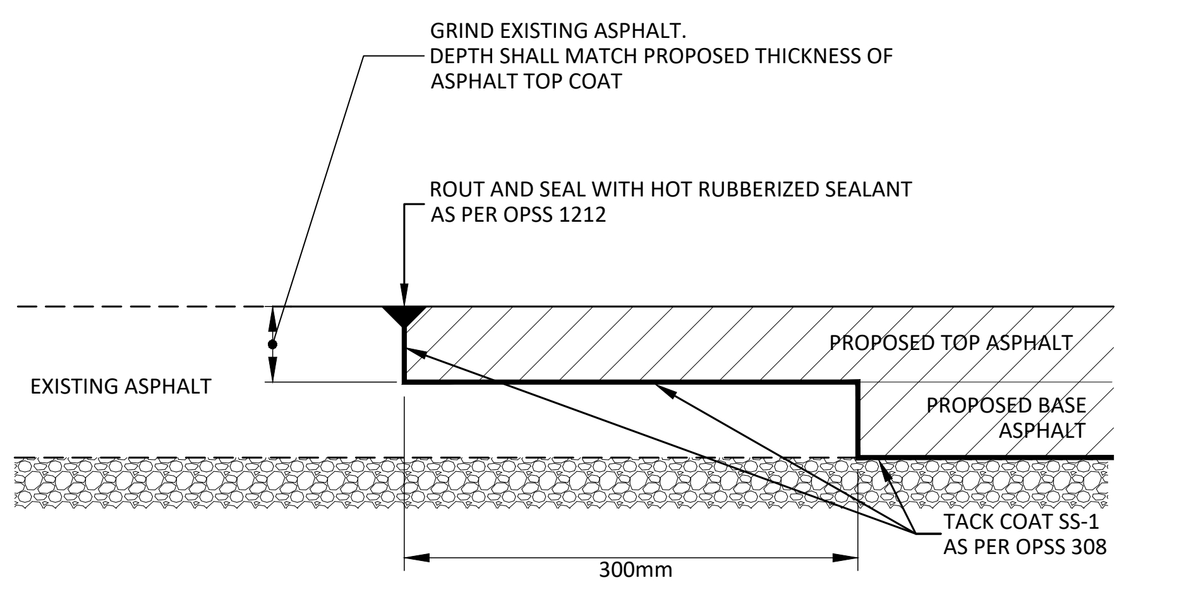
STORM AND SANITARY SEWERS

1. PIPE: POLYVINYL CHLORIDE (PVC) SEWER PIPES AND FITTINGS SHALL CONFORM TO CSA-B182.2. HIGH DENSITY POLYETHYLENE (HDPE) PIPES AND FITTINGS SHALL CONFORM TO CSA-B182.6.
2. PVC SEWERS (375 mm DIAMETER AND SMALLER): SDR-35, CSA B182.2-LATEST AMENDMENT, UNLESS OTHERWISE SPECIFIED.
3. CONCRETE SEWERS (450 mm DIAMETER AND LARGER): CONCRETE (CLASS 65-D), CSA A257.2 OR LATEST AMENDMENT, UNLESS OTHERWISE SPECIFIED.
4. PVC PIPE SEWER BEDDING: OPSD 802.010.
5. CONCRETE PIPE SEWER BEDDING: OPSD 802.030 CLASS 'B' FOR TYPE 1 AND 2 SOILS. OPSD 802.031 FOR TYPE 3 SOILS. SOIL TYPE TO BE CONFIRMED BY THE GEOTECHNICAL CONSULTANT DURING EXCAVATION.
6. TRENCH BACKFILL: PER THE SPECIFICATIONS PROVIDED IN THE GEOTECHNICAL REPORT, OR LATEST AMENDMENT THEREOF.
7. INSULATION: TO BE PROVIDED IF COVER TO OBVERT IS LESS THAN 1.20 METRES. 50mm THICK HIGH LOAD 60. WIDTH AS NOTED ON DRAWING.
8. MAINTENANCE HOLES: OPSD 701.010 TO 701.015 AND CSA A257.4.
9. CLEANOUTS: ZURN Z1474 OR APPROVED EQUIVALENT.
10. SAFETY PLATFORM: OPSD 404.020 TO OPSD 404.022. INSTALL SAFETY PLATFORM WHERE MAINTENANCE HOLE DEPTH EXCEEDS 5.0m.
11. MAINTENANCE HOLE FRAMES AND COVERS: OPSD 401.010 - TYPE 'A'
12. JOINTS-PIPE AND MAINTENANCE HOLE: CSA A257.3.
13. BACKFILL: ALL MAINTENANCE HOLE AND CATCHBASIN EXCAVATIONS SHALL BE BACKFILLED WITH GRANULAR 'B'.
14. MAINTENANCE HOLE BENCHING: OPSD 701.021. CATCHBASIN MAINTENANCE HOLES TO BE BENCHED.
15. DROP STRUCTURES: OPSD 1003.020-(EXTERNAL DROP IF DROP IS MIN 1.2m). OPSD 1003.030-(INTERNAL DROP FOR EXISTING 1500 OR LARGER MAINTENANCE HOLES) OPSD 1003.031-(INTERNAL DROP FOR NEW MAINTENANCE HOLES) OR TOWN STANDARD XXX.
16. DURING CONSTRUCTION ALL CATCHBASINS SHALL BE EQUIPPED WITH TEMPORARY SEDIMENT CONTROL DEVICE. REFER TO DETAILS ON DRAWING ESC-1.
17. CONCRETE ADJUSTMENT UNITS FOR MAINTENANCE HOLES AND CATCHBASINS: OPSD 704.010, OPSS 407 AND CSA A257.4. MAXIMUM HEIGHT OF ADJUSTMENT UNITS SHALL BE 300mm.
18. EXTERNAL RAINWATER LEADERS TO DRAIN TO SURFACE.
19. LASER ALIGNMENT AND ELEVATION CONTROL TO BE UTILIZED FOR SEWER INSTALLATIONS.
20. TERMINATE SEWERS 1.0 METRE FROM THE OUTSIDE FACE OF BUILDING, UNLESS OTHERWISE NOTED ON DRAWING.
21. FLUSH AND INSPECT SEWERS VIA CCTV CAMERA. SUBMIT ONE WRITTEN REPORT AND TWO DIGITAL VIDEOS IN AN ACCEPTABLE FORMAT TO THE ENGINEER FOR REVIEW.
22. THE CONTRACTOR SHALL PROVIDE TO THE ENGINEER AN AS-CONSTRUCTED SERVICING DRAWING.



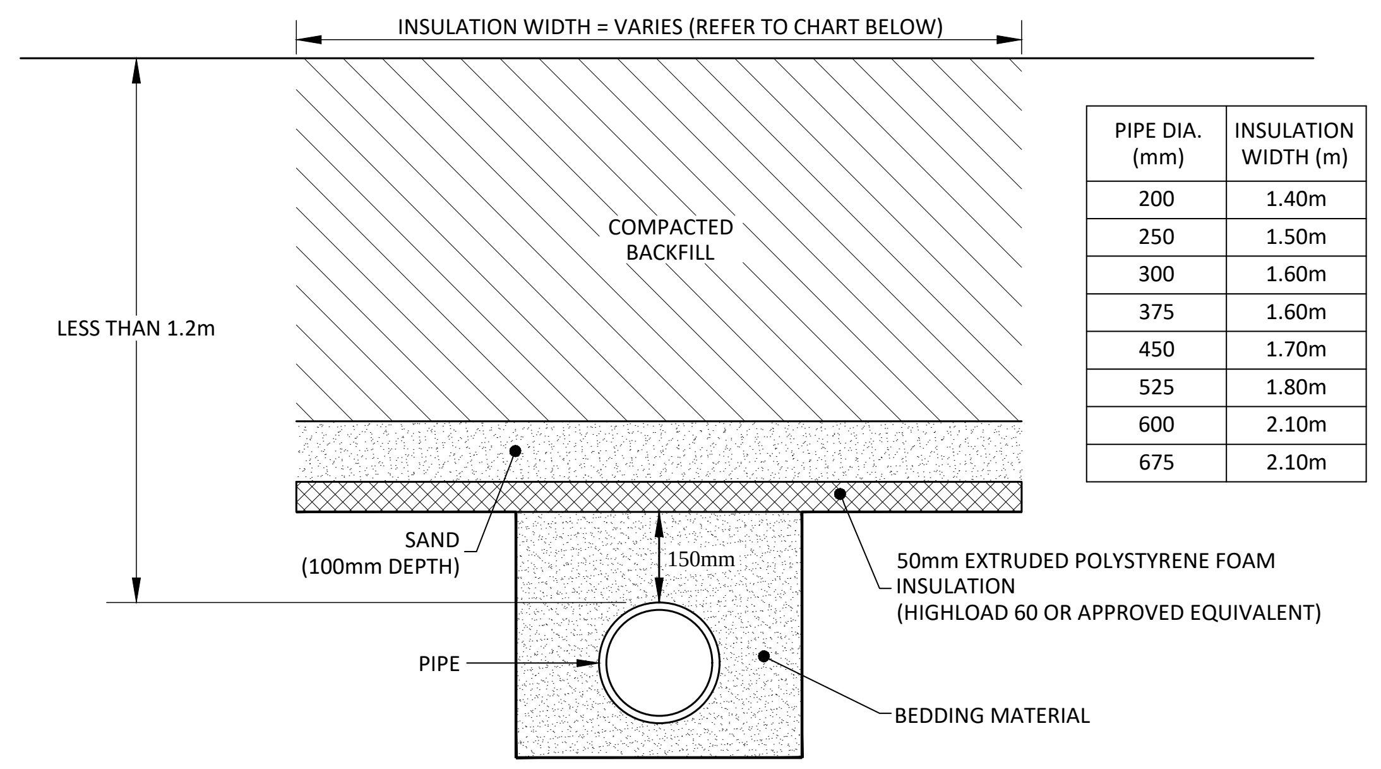
A / D-1 SANITARY SERVICE CONNECTION

SCALE 1:100



LAP JOINT DETAIL

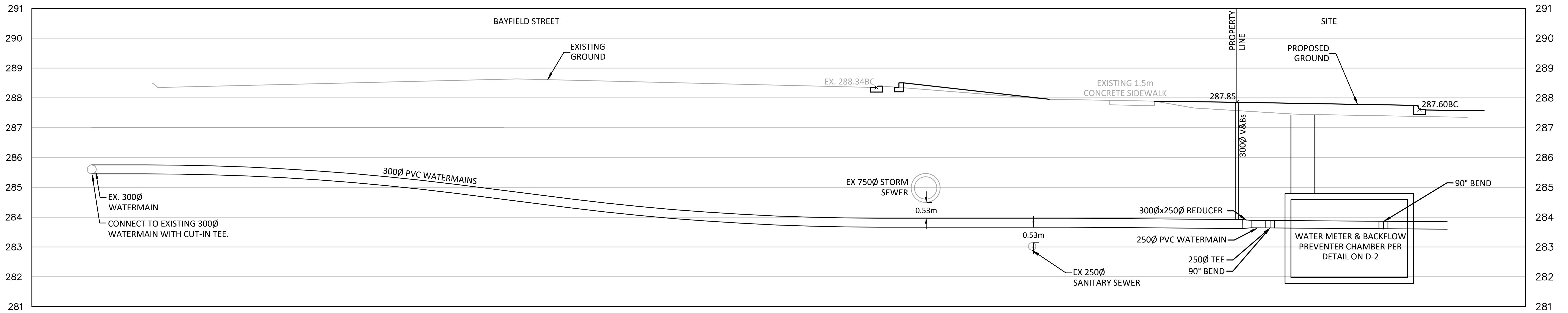
SCALE: N.T.S.



PIPE DIA. (mm)	INSULATION WIDTH (m)
200	1.40m
250	1.50m
300	1.60m
375	1.60m
450	1.70m
525	1.80m
600	2.10m
675	2.10m

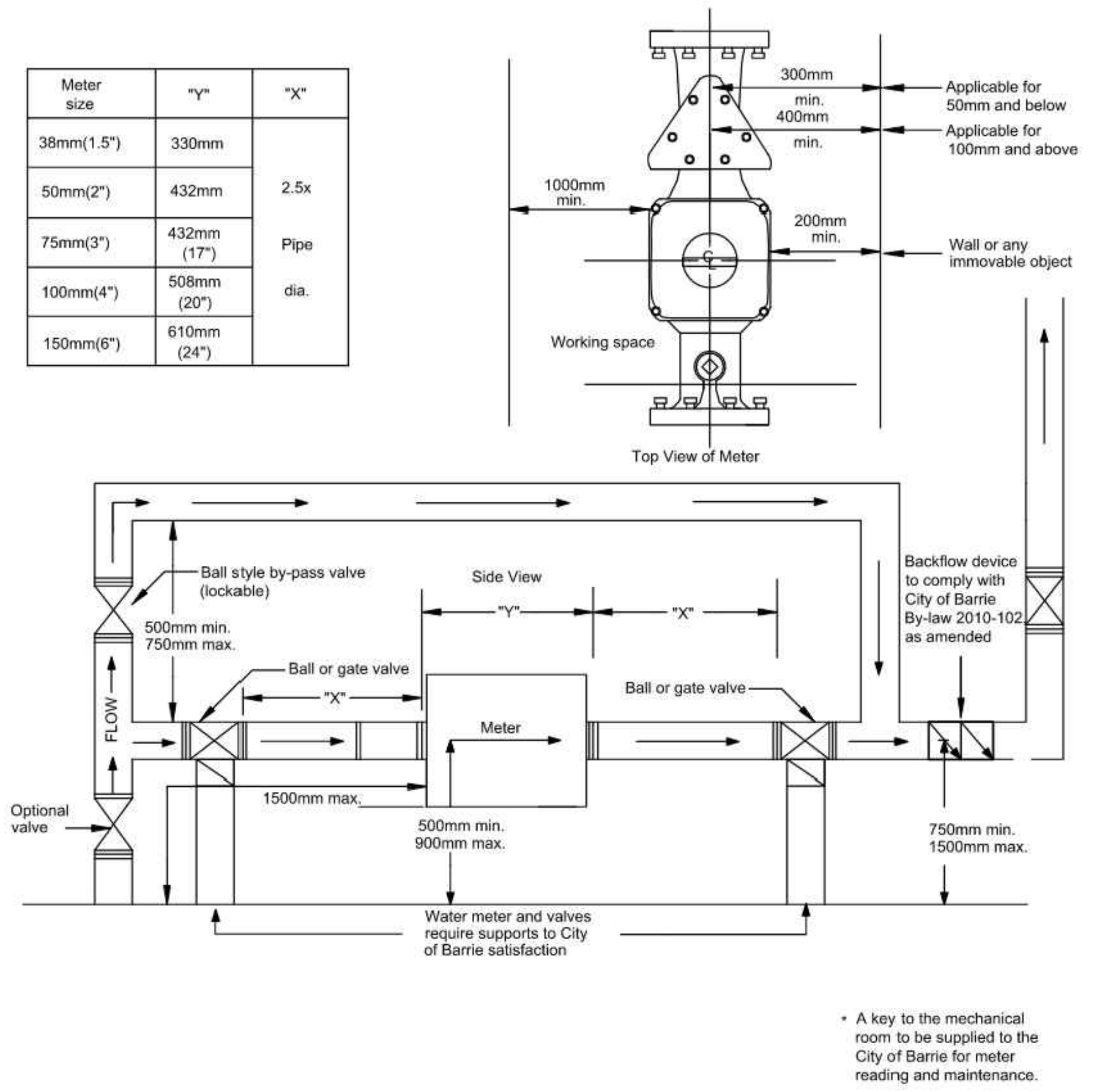
TYPICAL PIPE INSULATION

SCALE: N.T.S.



B / D-1 WATER SERVICE CONNECTION

SCALE 1:100



Meter size	"Y"	"X"
38mm(1.5")	330mm	2.5x Pipe dia.
50mm(2")	432mm	
75mm(3")	432mm (17")	
100mm(4")	508mm (20")	
150mm(6")	610mm (24")	

- A key to the mechanical room to be supplied to the City of Barrie for meter reading and maintenance.

NOTES:

1. The diameter of the by-pass line shall match the diameter of the internal plumbing.
2. All materials to be supplied by the contractor except water meters. All meters larger than 50mm are to be supplied and installed by the contractor.
3. Butterfly valves or globe valves shall not be used.
4. All piping between water service entering the building and backflow device must be labeled 'No connection permitted'.
5. Backflow device must be installed within a maximum of 3 meters downstream of the water meter.
6. Meter wire, installed in conduit, to be run from meter location to outside of building at the direction of the Barrie Water Operations representative. Meter wire (22 gauge, 2 conductor, metgray, UV rated) supplied by the City of Barrie.
7. All dimension are in millimeters unless otherwise shown.
8. Contractor to provide flat secure (vertical) surface for the smart point to be mounted on.

Barrie

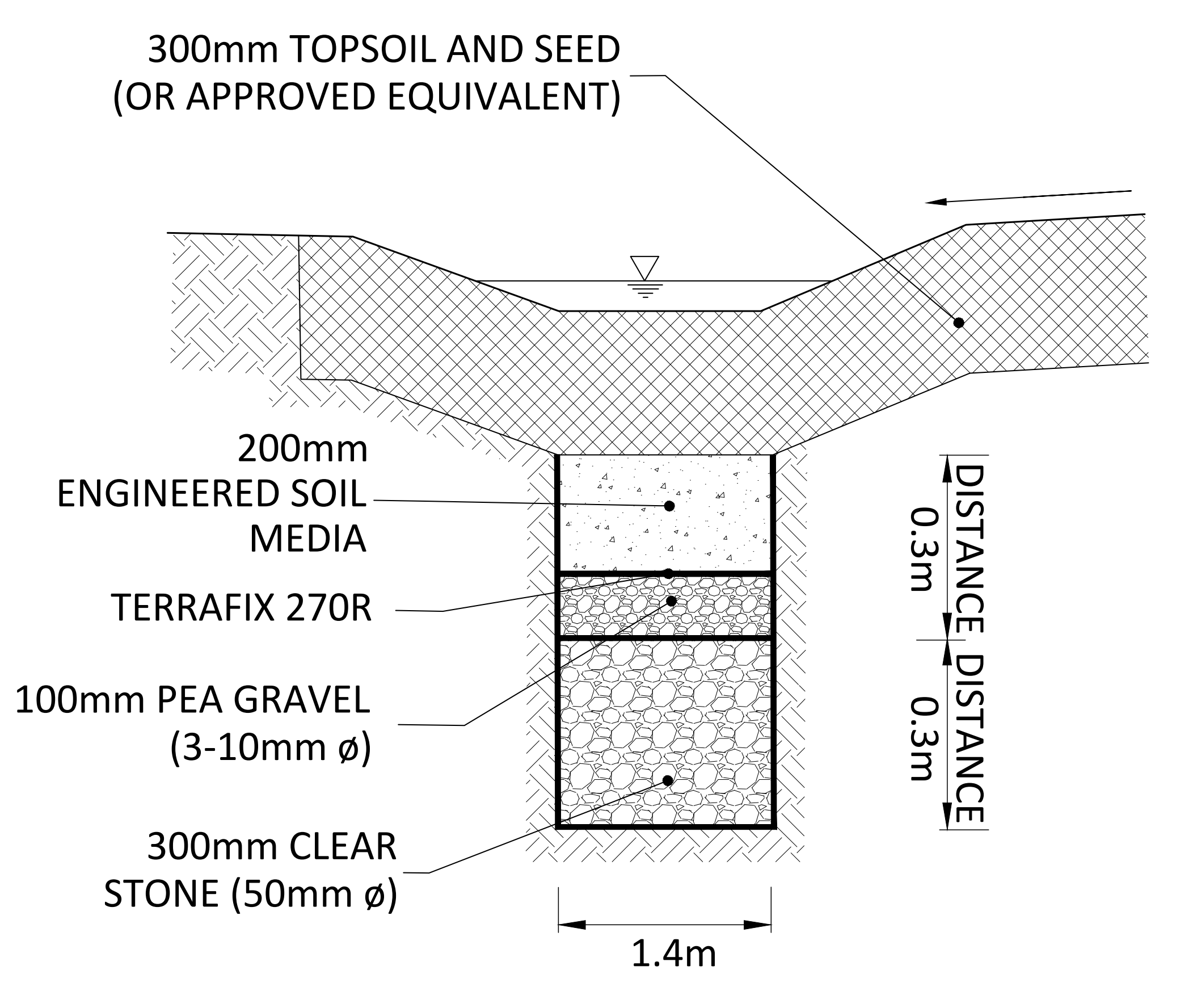
Water Meter Installation
with By-Pass Assembly

REV No. 4

DATE: APR 2023

SCALE: N.T.S

W533



ENHANCED GRASSED SWALE
WITH INFILTRATION COMPONENT

SCALE: N.T.S.

REVISIONS

No.	DESCRIPTION	DATE	BY	APPROVED
1.	ISSUED FOR SITE PLAN APPLICATION	JUN 21/24	P.C.	

SCS consulting group ltd

30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

CITY OF BARRIE

70 COLLIER STREET
BARRIE, ONTARIO L4M 4T5
TEL: (705) 726-4242
FAX: (705) 739-4237

547 BAYFIELD INC.

547 BAYFIELD STREET - KLASSIC
CAR WASH & DETAILING CENTRE

DETAILS PLAN - PHASE 1

K. CHEN
100136982
June 21, 2024

DATE:	JUNE 2024	DESIGNED BY:	D.S.	CHECKED BY:	P.C.
SCALE:	AS SHOWN	DRAWN BY:	D.S.	CHECKED BY:	P.G.

PROJECT No: 2700

DRAWING No: D-1

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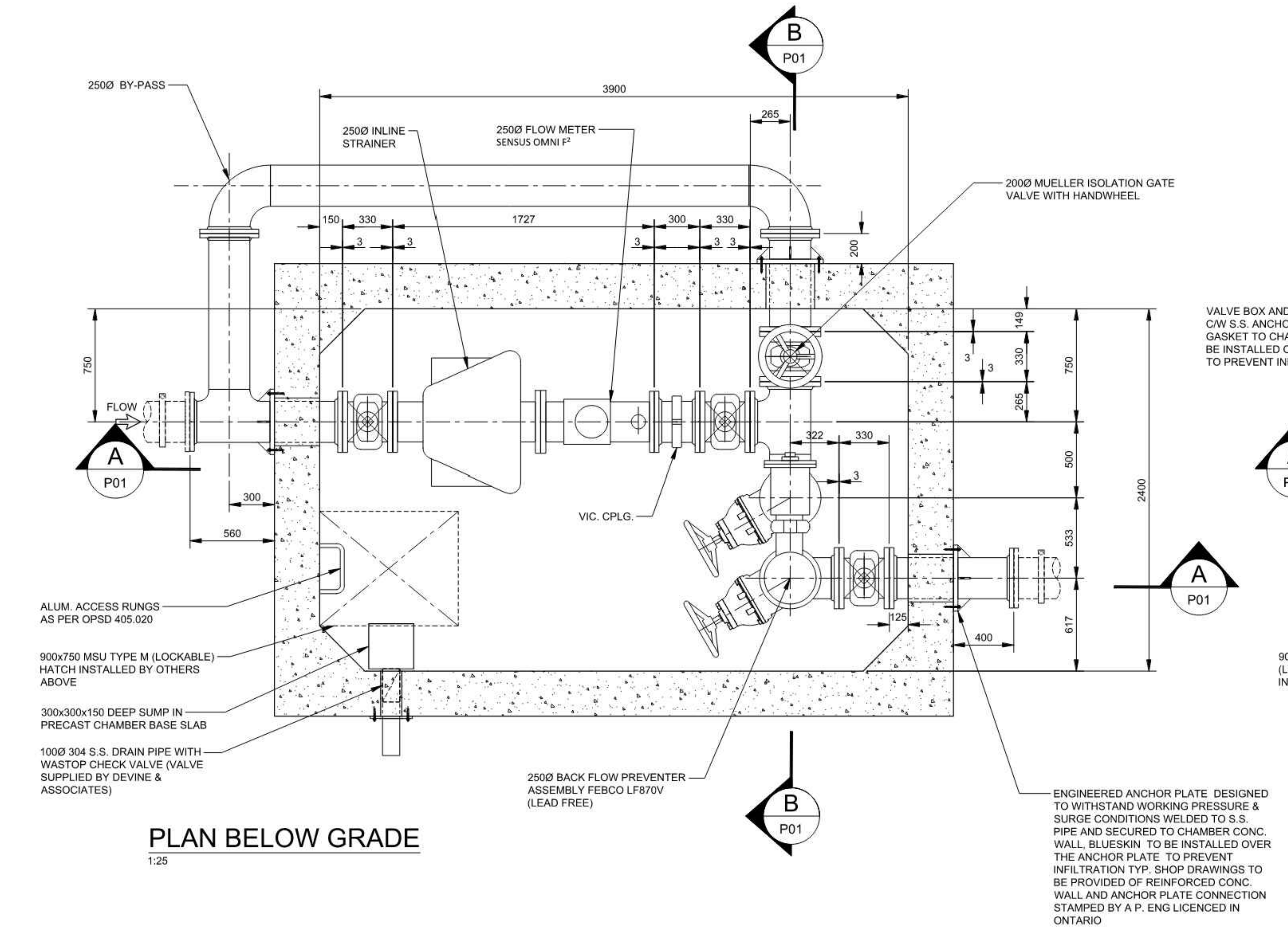
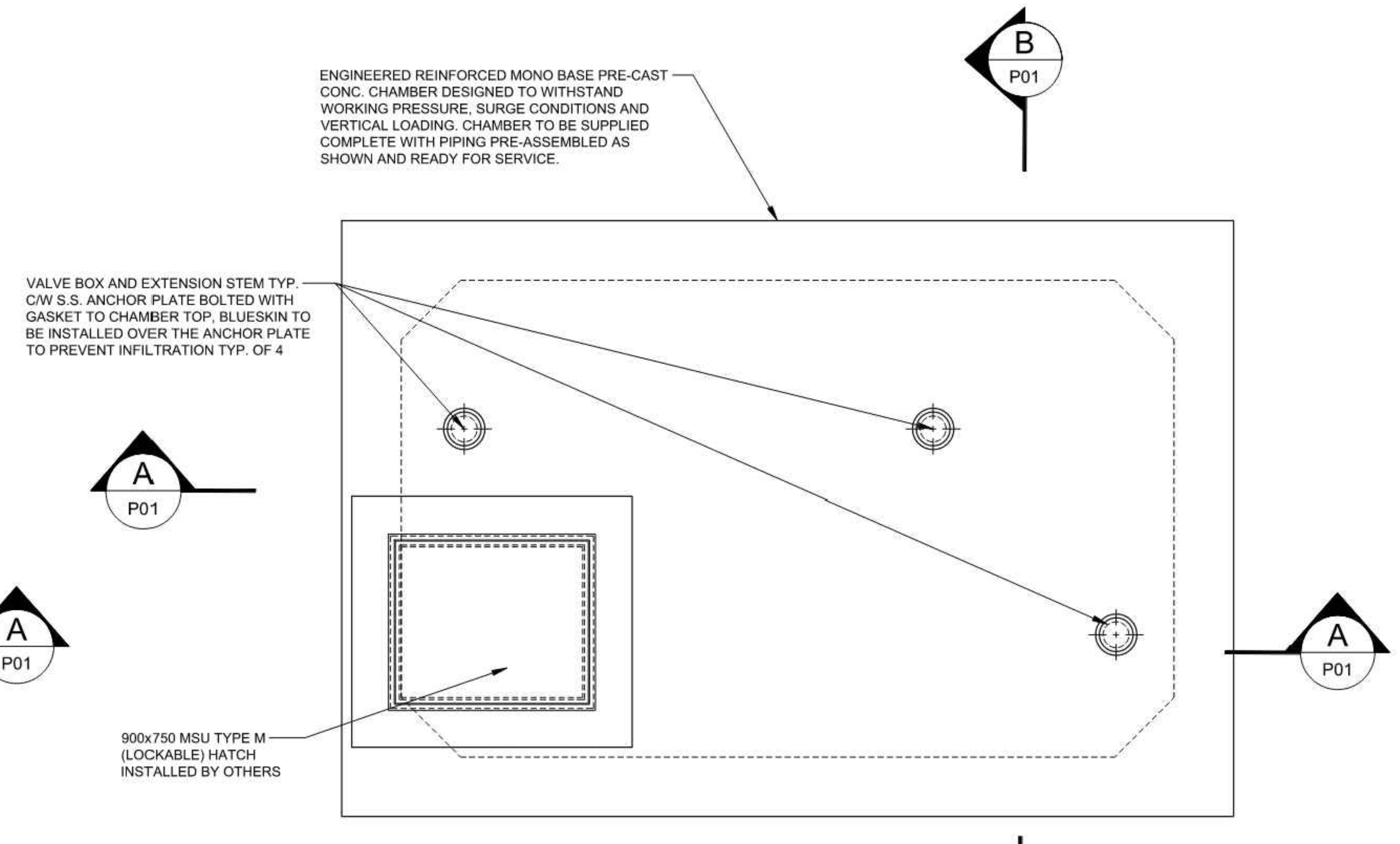


PLAN BELOW GRADE

1:25

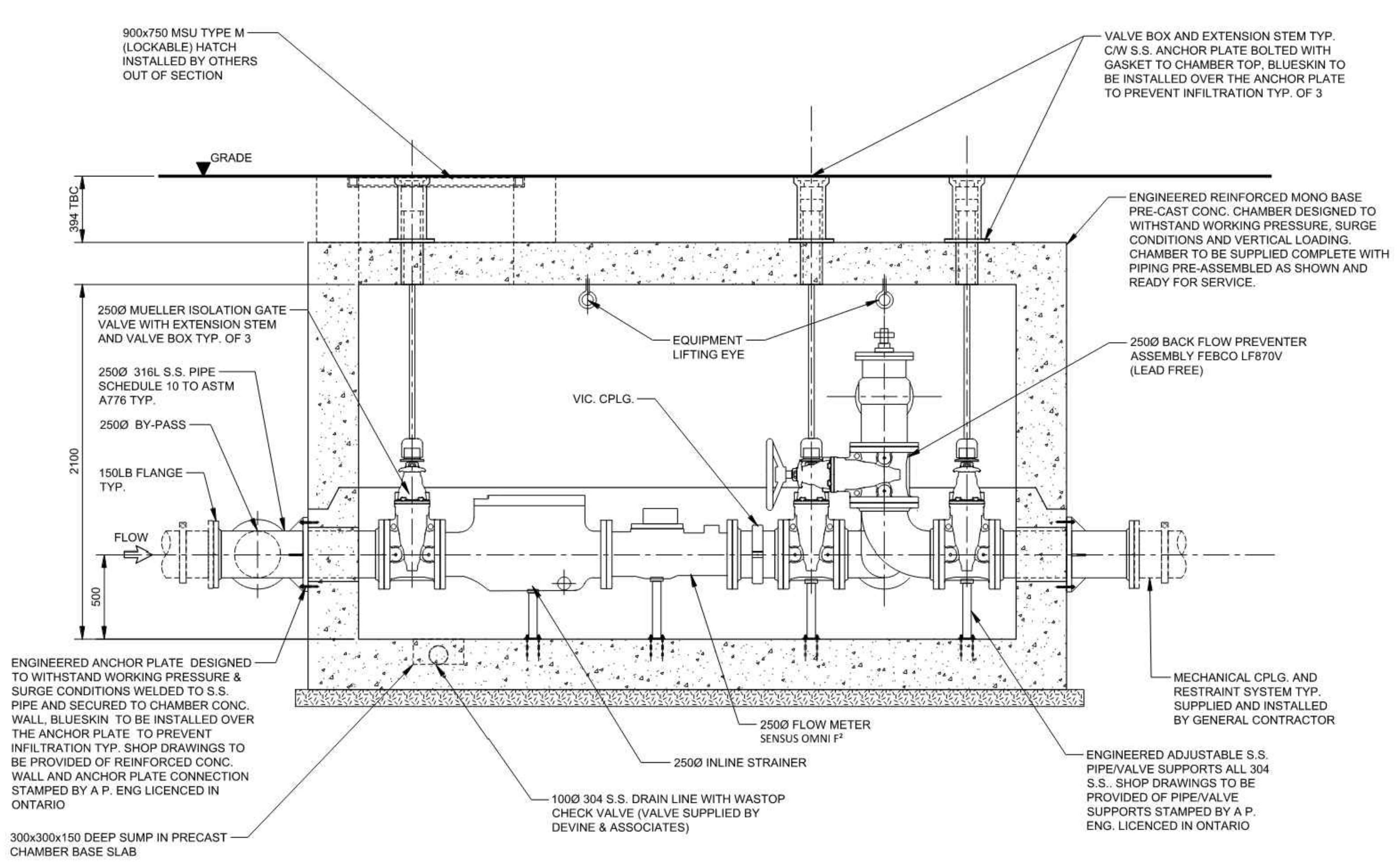


PLAN AT GRADE

1:25

NOTE:

1. WHEN CHAMBER IS INSTALLED ON SITE CONTRACTOR IS TO APPLY BLUESKIN WATERPROOFING TO THE EXTERIOR OF THE CHAMBER AND THEN APPLY INSULATION TO THE TOP AND SIDES OF THE CHAMBER (TO SIDES AT LEAST 1.8 METERS BELOW GRADE) IF REQUIRED.
2. CHAMBER CEILING TO BE CORED WHERE REQUIRED TO SUIT VALVE EXTENSION STEMS. VALVE BOXES TO BE SUPPLIED AND INSTALLED SUCH THAT THEY PREVENT GROUND WATER INFILTRATION AND ARE ADJUSTABLE TO SUIT FINISHED GRADE. ASSEMBLY TO INCLUDE S.S. FLANGED SPOOL, WITH GASKET, BOLTED TO CHAMBER ROOF AND THEN BLUESKINNED. FERNCO COUPLER TO CONNECT TO ABOVE S.S. SPOOL AND TO VALVE BOX. HOSE CLAMPS ON FERNCO TO SECURE ITEMS IN POSITION.
3. FLOW METER: SENSUS OMNI F2 WATER METER WITH STRAINER. UL/FM APPROVED. PER CITY OF BARRIE STANDARDS.
4. BACKFLOW PREVENTER: WATTS, FEBCO LF870V N-PATTERN DOUBLE CHECK VALVE ASSEMBLY. EPOXY COATED DUCTILE IRON BODY, OSY RESILIENT WEDGE GATE VALVES.
5. GATE VALVES - MUELLER A-2362 RESILIENT WEDGE GATE VALVES. ANSI B16.1 CLASS 125 FLANGED ENDS, DUCTILE IRON BODY, FUSION BOND EPOXY COATED IN/OUT. AWWA C509 COMPLIANT.
6. EXTENSION STEMS TO BE WELDED CONSTRUCTION AND INCLUDE 50mm MALE & FEMALE OPERATING NUTS AND 38mm SOLID ROUND BAR. ALL COMPONENTS TO BE MANUFACTURED FROM 304 S.S.
7. ALL BOLTS AND NUTS TO BE 304 S.S. NC HEX HEAD.
8. PRE-ASSEMBLED CHAMBER SUPPLIER TO BE RESPONSIBLE FOR FUNCTIONAL PERFORMANCE OF ALL ITEMS WITHIN THE CHAMBER. SUPPLIER TO HAVE SUPPLIED MINIMUM OF FIVE (5) PRE-ASSEMBLED VALVE CHAMBERS IN ONTARIO.
9. PRE-ASSEMBLED VALVE CHAMBER TO BE SUPPLIED BY DEVINE & ASSOCIATES LIMITED OR APPROVED EQUIVALENT.
10. CONTRACTOR TO PROVIDE SHOP DRAWINGS FOR APPROVAL PRIOR TO CONSTRUCTION.
11. EXTERNAL COUPLINGS AND RESTRAINTS SUPPLIED AND INSTALLED GENERAL CONTRACTOR



SECTION A

1:25

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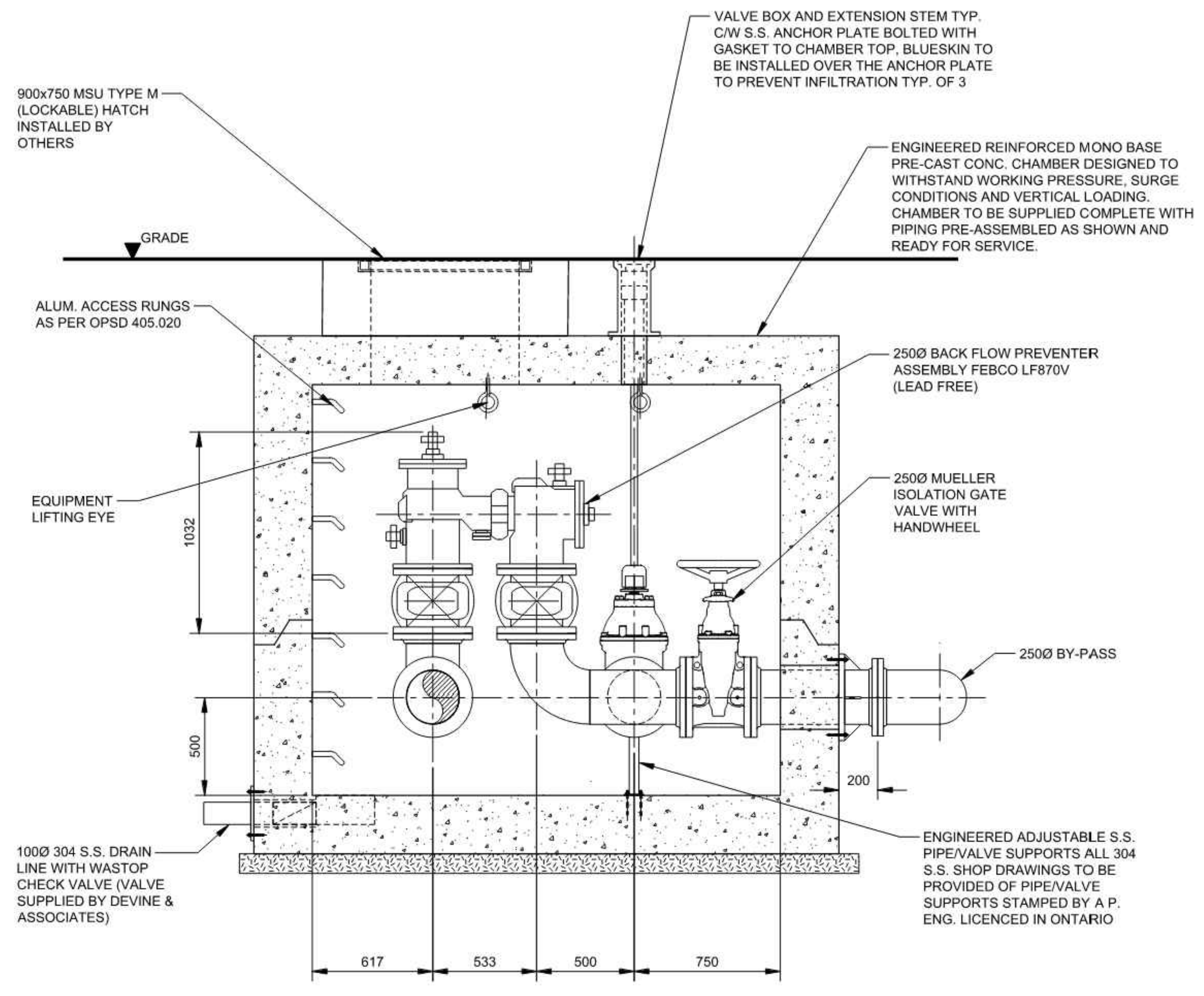

SECTION B

1:25

-

REVISIONS

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30 CENTURIAN DRIVE, SUITE 100
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DETAILS PLAN - PHASE 1

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DATE:	JUNE 2024	DESIGNED BY:	D.S.	CHECKED BY:	P.C.
SCALE:	AS SHOWN	DRAWN BY:	D.S.	CHECKED BY:	P.G.

PROJECT No: 2700

DRAWING No: D-2

SHEET TITLE
250Ø FLOW METER / BACKFLOW PREVENTER CHAMBER 2.4x3.9m

DEVINE & Associates
Flow Solutions
www.devineassoc.com

1 VALLEYWOOD DR.
SUITE 101, MARKHAM,
ONTARIO L3R 5L9
PHONE: 905.479.2130
FAX: 905.479.9870
www.devineassoc.com

ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN MILLIMETRES OR DECIMAL METRES UNLESS NOTED OTHERWISE.

File: P:\2700 547 Bayfield Street, Barrie\Drawings\Phase 1\Det\2700D-DETL.dwg - Revised by <DSHORE> : Mon, Mar 11 2024 - 11:45am

SCS Consulting Group Ltd
30 Centurian Drive, Suite 100
Markham, ON, L3R 8B8
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