

Kindred Works

445 Anndale Rd, City of Waterloo

Functional Servicing and Stormwater Management Report (FSR/SWM)

September 19, 2025

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Contents

1	Introduction	1
1.1	Background	1
1.2	Existing Site Description	2
1.3	Site Proposal	2
1.4	Service Connections	2
2	Terms of Reference and Methodology	3
2.1	Terms of Reference	3
2.2	Methodology: Stormwater Management	3
2.3	Methodology: Sanitary Discharge	4
2.4	Methodology: Water Supply	4
3	Stormwater Management	5
3.1	Stormwater Quantity Control	5
3.2	Stormwater Quality Control	6
3.3	Water Balance	7
3.4	Stormwater Summary and Storm Service Connection	8
3.5	Grading	8
3.6	Emergency Overflow	8
4	Sanitary Drainage System	9
4.1	Pre-Development Conditions	9
4.2	Post-Development Conditions	9
4.3	Sanitary Service Connection	10
5	Water Supply System	10
5.1	Existing Water Infrastructure	10
5.2	Domestic Water Supply Demands	10
5.3	Fire Flow Analysis	11
5.4	Water Service Connection	11
5.5	Hydrant Coverage	11
6	Conclusions and Recommendations	12

Tables

Table 2.1	Sanitary Design Parameters	4
Table 2.2	Water Design Parameters	4
Table 3.1	Rainfall Depths.....	5
Table 3.2	Visual OTTHYMO Modelling Variables	5
Table 3.3	Peak Discharges	6
Table 3.4	Ponding Characteristics	6
Table 3.5	Site Water Balance	7
Table 3.6	Stormwater Management Summary	8
Table 3.7	Storm Service Performance	8
Table 4.1	Proposed Development Site Populations	9
Table 4.2	Sanitary Service Performance.....	10
Table 5.1	Domestic Water Demands	10

Figures

FIG 1	Aerial Plan	Appendix A
DAP-1	Pre-Development Storm Drainage Area	Appendix B
DAP-2	Post-Development Storm Drainage Area	Appendix B
SAN-1	Sanitary Drainage Area Plan	Appendix C

Appendices

Appendix A		Background Information
Appendix B		Stormwater Data Analysis
Appendix C		Sanitary Data Analysis
Appendix D		Water Data Analysis
Appendix E		Engineering Plans

1 Introduction

1.1 Background

Arcadis Professional Services (Canada) Inc. (Arcadis) has been retained by Kindred Works. ("Kindred" or the "Owner") to prepare a Functional Servicing and Stormwater Management Report to support the Zoning By-Law Amendment (ZBA) submission for a proposed townhouse development located at 445 Anndale Road (the "Subject Site"), in the City of Waterloo (the "City") and the Region of Waterloo (the "Region"). The purpose of this report is to develop a municipal site servicing strategy (stormwater, sanitary discharge, and water supply), and to identify any potential constraints within the existing municipal infrastructure.

More specifically, the report will present the following:

- Calculate allowable and proposed runoff rates for the development;
- Evaluate suitable methods for attenuation and treatment of stormwater runoff;
- Develop on-site control measures and examine theoretical performance to satisfy the City's stormwater management criteria;
- Evaluate groundwater quantity and quality parameters from the hydrogeological report and develop a strategy to manage groundwater under both short- and long-term conditions to comply with the Region of Peel's Discharge By-Law criteria;
- Develop a Stormwater Management (SWM) plan that complies with the City's stormwater management criteria;
- Identify sanitary servicing opportunities and constraints;
- Identify water servicing opportunities and constraints, calculate the proposed domestic water and firefighting supply needs; and evaluate the capacity of the municipal infrastructure.

The following documents have been obtained from various sources:

- City of Waterloo plan and profile drawings for Anndale Road, Davenport Road and Lexington Road;
- Christ Lutheran Church Stormwater Management Report, prepared by MTE Consultants, dated October 2000;
- Subsurface Utility Engineering Investigation (QL-B), prepared by multiVIEW, dated May 13th, 2025;
- Topographic Survey prepared by Speight, Van Nostrand & Gibson Ltd., dated August 29, 2022;
- Scoped Hydrogeological Investigation Report, prepared by HCS Inc., dated March 04, 2025.
- Geotechnical Investigation, prepared by CMT Engineering Inc., dated November 29th, 2024, and,
- Architectural plans and site statistics prepared by KPMB Architects Inc.

1.2 Existing Site Description

Located in the City of Waterloo and the Region of Waterloo at 445 Anndale Road, the 12,046 m² (1.20 ha) subject site is bounded by existing single-family homes to the north, Davenport Road to the west, Anndale Road to the east and Lexington Road to the south. Please see Figure 1 in **Appendix A** for an aerial view of the site.

The site currently hosts one church. The site slopes west to east with ground surface elevations ranging from 340.07 m to 336.57 m and is self-contained with no external drainage areas to consider.

1.3 Site Proposal

The development will consist of five townhouse blocks with a total of 57 residential units. The existing Christ Lutheran Church on site will be retained. The proposed grading and servicing design will account for and accommodate the existing Church structure. The proposed development will include one basement unit per townhouse block for mechanical and storage uses. Vehicular access will be provided off Anndale Road with parking at-grade. Architectural drawings can be found in **Appendix A** for reference.

1.4 Service Connections

A water service, storm service and sanitary service will be provided for the townhouse development off Anndale Road. A single individual sanitary and water service connection will be provided for each townhouse block which will be routed to the basement unit. No storm service will be provided to the individual townhouse blocks as roof leaders and foundation drains are proposed to discharge to grade.

Each townhouse block will come complete with a fire department connection, and a series of on-site hydrants will be installed to provide adequate fire hydrant coverage and maintain minimum clearances to all proposed fire department connections.

The existing Christ Lutheran Church will retain the existing sanitary and water service connections provided off Lexington Road.

2 Terms of Reference and Methodology

2.1 Terms of Reference

The terms of reference used for the scope of this report have been based on:

- City of Waterloo Engineering and Landscape Manual
- Region of Waterloo, Design Guidelines and Supplemental Specifications for Municipal Services, Dated February 2024
- Region of Waterloo Water and Wastewater Monitoring Report, Dated June 2020
- MECP Design Guidelines for Drinking Water Systems

2.2 Methodology: Stormwater Management

The stormwater management criteria for this development are based on the requirements of the City of Waterloo.

The requirements include:

- Stormwater quantity controls are required for the site to control the proposed conditions peak flows from the site to the existing conditions (pre-development) levels for 2, 5, and 100 year storm events;
- The 2 year storm volume is to be stored underground to minimize frequent nuisance flooding;
- Active infiltration of rooftop runoff should be provided if soil and groundwater conditions permit; and
- Stormwater quality controls are to be provided for the site.

2.3 Methodology: Sanitary Discharge

Pre- and post-development peak sewer flows will be calculated based on the following Region of Waterloo design guidelines and information within the Region of Waterloo Water and Wastewater Monitoring Report:

Table 2.1 Sanitary Design Parameters

Design Flows		Population Densities	
Residential Flow	275 L/c/day	Single Detached Semi Detached Townhouse Multiple Unit Types Unspecified Unit Types	
Industrial Flow	0.40 L/s/ha		
Commercial Flow	0.95 L/s/ha		3.25 people / unit
Institutional Flow	0.25 L/s/ha		3.25 people / unit
Infiltration Allowance	0.25 L/s/ha		2.44 people / unit
Harmon Peaking Factor			2.11 people / unit
Min. Peaking Factor	N/A		3.05 people / unit
Max. Peaking Factor	N/A		

Based on the calculated peak flows, the adequacy of the existing infrastructure to support the proposed development will be discussed.

2.4 Methodology: Water Supply

The domestic water usage will be calculated based on the following Region of Waterloo design guidelines (Section B.2.2.2) and the MECP Design Guidelines for Drinking Water Systems (Table 3-1: Peaking Factor) design criteria:

Table 2.2 Water Design Parameters

Average Daily Demand		Peaking Factors		
		Land Use	Peak Hour	Max Day
Residential	225 L/c/day	Residential	4.13	2.75

A fire flow analysis was also completed by C&H Fire Suppression Systems Inc. to determine the adequacy of the existing watermain to support the fire demands of the development in accordance with the requirements and guidelines of the National Fire Protection Association and the Ontario Building Code. This will be discussed in the subsequent sections.

3 Stormwater Management

3.1 Stormwater Quantity Control

Three-hour duration Chicago style storms derived from City of Waterloo IDF curves were used for the stormwater management modelling. The total depths of rainfall for the modelled storms are indicated in **Table 3.1**.

Table 3.1 Rainfall Depths

RETURN EVENT	STORM DURATION (hours)	RAINFALL DEPTH (mm)
2 Year	3	32.4
5 Year	3	47.5
100 Year	3	90.0

The 'pre-development' characteristics of the site are summarized in the document "Stormwater Management Report, Christ Lutheran Church, 445 Anndale Road, City of Waterloo" (MTE Consultants Inc., October 2000). The pre-development site included a building, parking areas, gravel areas, and landscaped areas with a total imperviousness of 14.2 percent.

The existing (pre-development) and proposed conditions have been modelled using Visual OTTHYMO, in accordance with City guidelines. Modelling variables are summarized in **Table 3.2**.

Table 3.2 Visual OTTHYMO Modelling Variables

CATCHMENT ID	DESCRIPTION	AREA (HA)	XIMP/TIM P (%)	SLOPE (%)	Tp (Hours)	PERVIOUS CN
A-1 PRE	Total Site	1.2046	0.142	2	-	75
Total		1.2046				
A-1 POST	Building/ Parking	1.1802	0.653	2	-	75
A-2 POST	Landscaped	0.0244	-	-	0.16	75
Total		1.2046				

Attenuation will be provided within underground storage tanks providing 327.8 m³ of storage, and within 600mm storm sewer pipes providing 46.5 m³ of storage, with a total storage volume of 374.4 m³. A 190mm orifice opening at the outlet pipe of MH2 providing control for minor flows, and a 325mm orifice opening at the outlet of MH11 providing control for major flows.

The total available storage within the underground storage system is 374 m³, which will provide the required storage for events up to the 100-year storm. The underground stage-storage-discharge calculations are included in **Appendix B**, and details are provided on the engineering drawings.

The existing and proposed peak flows from the site are summarized in **Table 3.3**, and the Visual OTTHYMO model output is included in **Appendix B**.

Table 3.3 Peak Discharges

RETURN EVENT	EXISTING CONDITIONS	PROPOSED CONDITIONS
	PEAK DISCHARGE (M ³ /S)	PEAK DISCHARGE (M ³ /S)
DRAINING TOWARD ANNDAL ROAD		
2 Year	0.051	0.046
5 Year	0.079	0.065
100 Year	0.260	0.240

As indicated in **Table 3.3**, the proposed design will result in a proposed flows controlled to pre-development levels for events up to the 100-year storm. As summarized in **Table 3.4**, events up to the 100-year storm volume (374 m³) will be stored underground to minimize nuisance flooding.

Table 3.4 Ponding Characteristics

RETURN EVENT	STORAGE VOLUME (M3)	PONDING DEPTH (M)*	PONDING ELEVATION (m)*
2 Year	134	0.38	335.38
5 Year	223	0.61	335.74
100 Year	372	1.72	336.85

* All storage will be provided underground, tank invert = 335.13m

3.2 Stormwater Quality Control

Stormwater quality control treatment must meet Enhanced (Level 1) Protection as defined by the Ministry of the Environment, Conservation and Parks (MECP) 2003 Stormwater Management Planning and Design (SWMPD) Manual.

A combination of infiltration and an oil/grit separator (OGS) units will be utilized to provide stormwater quality control. Runoff from catchment area A-1 includes parking lot areas, which will be routed through a stormwater tank at the north part of the site.

Prior to runoff entering the tank, 'Snout' OGS units will be installed in each CB and CBMH as shown on the engineering drawings to provide initial treatment of runoff. Details are provided on the engineering drawings.

A portion of the tank will include an open bottom to accommodate infiltration. The total drainage area to the gallery is 1.1802 ha (65.3 percent impervious level). Based on Table 3.2 of the MECP Stormwater Planning & Design Manual (2003), a total infiltration storage of 20 m³/ha is required to provide a Basic Protection Level of 60 percent TSS removal (based on 70 percent impervious level). The infiltration gallery therefore requires a total infiltration storage volume of 24 m³. The infiltration gallery will provide a total storage volume of 36 m³ to account for water balance retention (see below). The bottom elevation of the infiltration gallery (334.8m) will remain over 1m above the observed groundwater elevation, which was observed to range between 5.61m to 7.26m below existing grade.

A Stormceptor OGS unit (EFO5) will be installed at the outlet of the stormwater tank to provide additional stormwater quality control. Based on output from the Stormceptor Sizing Program included in **Appendix B**, the

EFO5 unit will provide a TSS removal efficiency of 53 percent for greater than 90 percent of annual flows generated by area A-1, based on the ETV particle size distribution.

The infiltration area and the OGS unit will provide an Enhanced Protection Level for suspended solids (80% TSS removal) using a treatment train approach. The following equation (based on the New Jersey SWM BMP Manual Chapter 4, 2004) has been utilized for calculating the total TSS removal efficiency for BMPs in series:

$$R = A + B - [(A \times B) / 100]$$

where:

- A is the TSS removal rate of the first BMP (infiltration, TSS removal efficiency of 60%);
- B is the TSS removal rate of the second BMP (OGS unit, TSS removal efficiency of 53%); and
- R is the Total TSS removal rate.

$$R = 60\% + 53\% - [(60\% \times 53\%) / 100] = 81.2\%$$

Therefore, the proposed treatment-train approach will provide a TSS removal efficiency in excess of 80%, meeting the Enhance Protection Level requirements.

3.3 Water Balance

The City of Waterloo requires that runoff be retained on site to meet the water balance requirements of the site. Based on the water balance calculations included in the Hydrogeological Investigation prepared by Hydrogeology Consulting Services Inc., there will be a 613.8 m³/year deficit.

The first 3.0mm of runoff from developing area A1-POST (1.802ha) will be retained. Based on Table 1b of the City of Toronto Wet Weather Flow Management Guidelines, November 2006 (Table included in Appendix B), retaining the first 3.0mm of runoff will account for 40 percent of annual precipitation. Based on the Hydrogeological Investigation, the total annual precipitation in the area is 851mm. Therefore, the following retention will be provided:

$$\begin{aligned} \text{Site Area (A1-POST)} &= 11,802 \text{ m}^2 \\ \text{Annual Retention Depth} &= 851 \text{ mm} \times 40\% = 340 \text{ mm} \\ \text{Annual Retention Volume} &= 11,802 \text{ m}^2 \times 0.340 \text{ m} = 4,013 \text{ m}^3 \end{aligned}$$

The stormwater tank adjacent to MH2 will include an additional storage depth with an open bottom to accommodate infiltration and provide retention from drainage within catchment A-1. Based on a drainage area of 11,802 m², a total of 35.4 m³ of retention storage is required to retain the first 3.0mm of runoff.

The tank will provide a total retention storage of 37.0 m³. **Table 3.5** summarizes the recharge volumes under proposed conditions and confirms that the proposed retention volume will meet the existing water balance deficit. Note that the uncontrolled landscaped area A2-POST will provide additional passive infiltration.

Table 3.5 Site Water Balance

Catchment	Required Retention	Provided Retention
Proposed Conditions		
A-1 Post Annual Retention Volume	613 m ³ /year	4,013 m ³ /year
A-1 Post Tank Volume for 3.0mm Retention	35 m ³	37 m ³

3.4 Stormwater Summary and Storm Service Connection

The results and findings of the above stormwater management analysis are summarized in **Table 3.6** below.

Table 3.678 Stormwater Management Summary

Parameter	Result
Allowable Release Rate – Anndale Road	0.260 m ³ /s
Uncontrolled Release Rate (100-yr)	0.004 m ³ /s
Controlled Release Rate (100-yr)	0.240 m ³ /s
Required Storage	372 m ³
Provided Storage	374 m ³
Flow Restrictor Type and Size	190mm orifice plate & 325mm orifice plate
Water Quality Control Devices	CB Snouts, Infiltration gallery, Stormceptor OGS unit

To support the above-noted stormwater management design a new 450 mm storm service at a 2.0% slope is proposed. This service is to be installed from a new control manhole at the property line to the existing 450 mm storm sewer within Anndale Road. The following table illustrates the peak flow and corresponding capacity of the service:

Table 3.7 910 Storm Service Performance

From	To	Pipe Size (mm)	Pipe Slope	Peak Flow (L/s)	Capacity (L/s)	Percent of Full Flow
Cntrl.MH	Storm Sewer	450	2.0%	240	403	60%

As shown above, the proposed storm service can easily convey the controlled discharge while operating at 60% of full flow capacity. Please refer to the detailed design calculations which can be found in **Appendix B** and refer to **Appendix E** for **Drawing SS-01**.

3.5 Grading

Under pre-development conditions, no external drainage enters the site and all drainage within the site is conveyed to the adjacent rights-of-way.

The proposed grades will match current drainage patterns wherever feasible. Grades will be maintained along property lines to the extent practical. Emergency overland flow route in excess of a 100-year storm event will continue to be directed to the adjacent rights-of-way.

3.6 Emergency Overflow

It is recommended that rooftop scuppers be installed to ensure emergency overflow from roof areas should rooftop drains become plugged. All areas at grade level have been designed with positive drainage (away from the building). Emergency overflow hatches as per OPSD 401.010 Type 'B' are to be provided on all storm manholes throughout the site. Maximum ponding within the development site shall not exceed City requirements of 0.30 m.

4 Sanitary Drainage System

4.1 Pre-Development Conditions

Local sewer infrastructure consists of a 250 mm sanitary sewer flowing south on Anndale Road, a 200mm sanitary sewer flowing east on Lexington Road, and a 200mm sanitary sewer flowing east through an existing easement along the north boundary of the development site.

Pre-Development Sanitary Flows – Lexington Road

The site hosts an existing Church, which discharges to Lexington Road via an existing sanitary service (to be retained). The existing peak sanitary flow to Lexington Road is calculated as follows:

$$Q_{\text{Pre-Dev. (Lexington Rd)}} = \left(1.2046 \text{ ha} \cdot 0.25 \frac{\text{L}}{\text{s}} / \text{ha} \right) + (0.25 \text{ L/s} \cdot \text{ha} \cdot 1.2046 \text{ ha}) = \mathbf{0.6 \text{ L/s}}$$

Pre-Development Sanitary Flows – Anndale Road

There are no existing sanitary flows to Anndale Road generated by the development site.

4.2 Post-Development Conditions

The post-development sanitary service connection for the proposed townhouse development is located on Anndale Road and the existing service connection for the Church to Lexington Road will be retained in the post-development condition.

Post-Development Sanitary Flows – Lexington Road

The site hosts an existing Church, which will be retained and will continue discharging to Lexington Road via an existing sanitary service. The peak sanitary flow to Lexington Road in the post-development condition is calculated as follows:

$$Q_{\text{Post-Dev. (Lexington Rd)}} = \left(0.4 \text{ ha} \cdot 0.25 \frac{\text{L}}{\text{s}} / \text{ha} \right) + (0.25 \text{ L/s} \cdot \text{ha} \cdot 0.4 \text{ ha}) = \mathbf{0.2 \text{ L/s}}$$

The existing 200mm sanitary sewer on Lexington Road will experience a decrease in flow of **0.4 L/s** as a result of the proposed development.

Post-Development Sanitary Flows – Anndale Road

The anticipated sanitary discharge flows for the proposed townhouse development were calculated based on the site statistics provided by KPMB Architects along with the design criteria outlined in **Section 2.3**. The proposed site statistics can be found in **Appendix A**. The population calculations are shown in **Table 4.1** below.

Table 4.1 Proposed Development Site Populations

	Units	Density	Population
Townhouses	57	2.44 pp/unit	139
Total Proposed Population			139

The corresponding post-development sanitary sewer flow is calculated as follows:

$$Q_{\text{Post-Dev.}} = \left(\frac{275 \text{ L/c} \cdot \text{d} \cdot 139 \text{ pp} \cdot 4.2}{86400 \text{ s / day}} \right) + (0.26 \text{ L/s} \cdot \text{ha} \cdot 0.8046 \text{ ha}) = \mathbf{2.1 \text{ L/s}}$$

The existing 250mm sanitary sewer on Anndale Road will experience an increase in flow of **2.1 L/s** as a result of the proposed development.

4.3 Sanitary Service Connection

It is proposed that a new 200mm diam. sanitary service at a 2.0% slope be installed from the new control manhole to the existing 250 mm sanitary sewer on Anndale. The following table summarizes the peak flow and corresponding capacity of the sanitary service connection:

Table 4.2 Sanitary Service Performance

From	To	Pipe Size (mm)	Pipe Slope	Peak Flow (L/s)	Capacity (L/s)	Percent of Full Flow
Cntrl.MH	Sanitary Sewer	200	2.0%	2.1	48.4	4.3%

As shown above, the sanitary service has ample capacity to convey the post-development peak sanitary flow while operating at 4.3% of full flow capacity. Please see the detailed design sheet which can be found in **Appendix C** and **Drawing SS-01** in **Appendix E**.

5 Water Supply System

5.1 Existing Water Infrastructure

Per the City's record information, local water infrastructure consists of an existing 300 mm watermain on Anndale Road, an existing 300 mm watermain on Lexington Road and an existing 300mm watermain on Davenport Road. The Christ Lutheran Church (to be retained) has an existing water service which connects to the 300mm watermain on Lexington Road. The size, depth, and other details of the existing Church service connection will be obtained via an SUE (QL-A) investigation as part of a future submission.

5.2 Domestic Water Supply Demands

Using the criteria set in **Section 2.4** and the site statistics provided by the architect, the Average Day Demand (ADD), Peak Hour Demand (PHD), and Max Day Demand (MDD) have been calculated, and are summarized as follows:

Table 5.112 Domestic Water Demands

Building	Population	ADD (L/s)	PHD (L/s)	MDD (L/s)
Townhouse	139	0.31	1.26	0.84
Total	139	0.31	1.26	0.84

5.3 Fire Flow Analysis

C&H Fire Suppression Systems Inc. conducted a fire hydrant test and completed a detailed fire flow analysis based on the proposed development details site statistics provided by KPMB Architects. The fire flow analysis indicates that the water flow supply available at the site meets the fire flow demand requirements. For additional detail refer to the detailed fire flow analysis and corresponding calculations attached in **Appendix D**.

5.4 Water Service Connection

To service the proposed development, a new 200 mm water service shall be connected to the proposed 300mm watermain within Anndale Road with a tapping sleeve and valve. A new valve and box shall be installed at the property line for the incoming service, and an inline flow water meter chamber will be installed within private property to meter the proposed development's water usage as per City of Waterloo standard CW-334. Each Townhouse block will come complete with its own individual private water service connection which will be sub metered within the Townhouse block itself. Individual block services will be sized at a later date when input from Mechanical Engineering is available.

The existing water service for the Christ Lutheran Church is located off Lexington Avenue and will be retained in the post-development condition. The size and depth of the existing water service connection for the Christ Lutheran Church will be verified through an SUE (QL-A) investigation in a future submission.

5.5 Hydrant Coverage

There are existing municipal hydrants located in close proximity to the development site at the intersection of Anndale Road/Lexington Road and at the intersection of Davenport Road/Lexington Road. In addition, private hydrants have been proposed within the site as per Region of Waterloo Standard E2-01 along with individual fire department connections for each proposed townhouse block. The proposed and existing hydrants will provide the required 45 m of coverage for all proposed fire department connections. Please see **Drawing SS-01** for the location of all existing and proposed water infrastructure, including fire hydrants and fire department connections.

6 Conclusions and Recommendations

Storm Sewer and Stormwater Management

The objectives of the City of Waterloo can be met by implementing on-site measures. Storm flows shall be attenuated on-site and released to the municipal storm sewer on Anndale Road at an appropriate discharge rate thus meeting the City's target for stormwater quantity control. Additionally, stormwater quality controls have been proposed to achieve minimum 80% TSS Removal for the subject site in the post-development condition. The first 5mm of runoff will be retained and infiltrated to meet the water balance requirements.

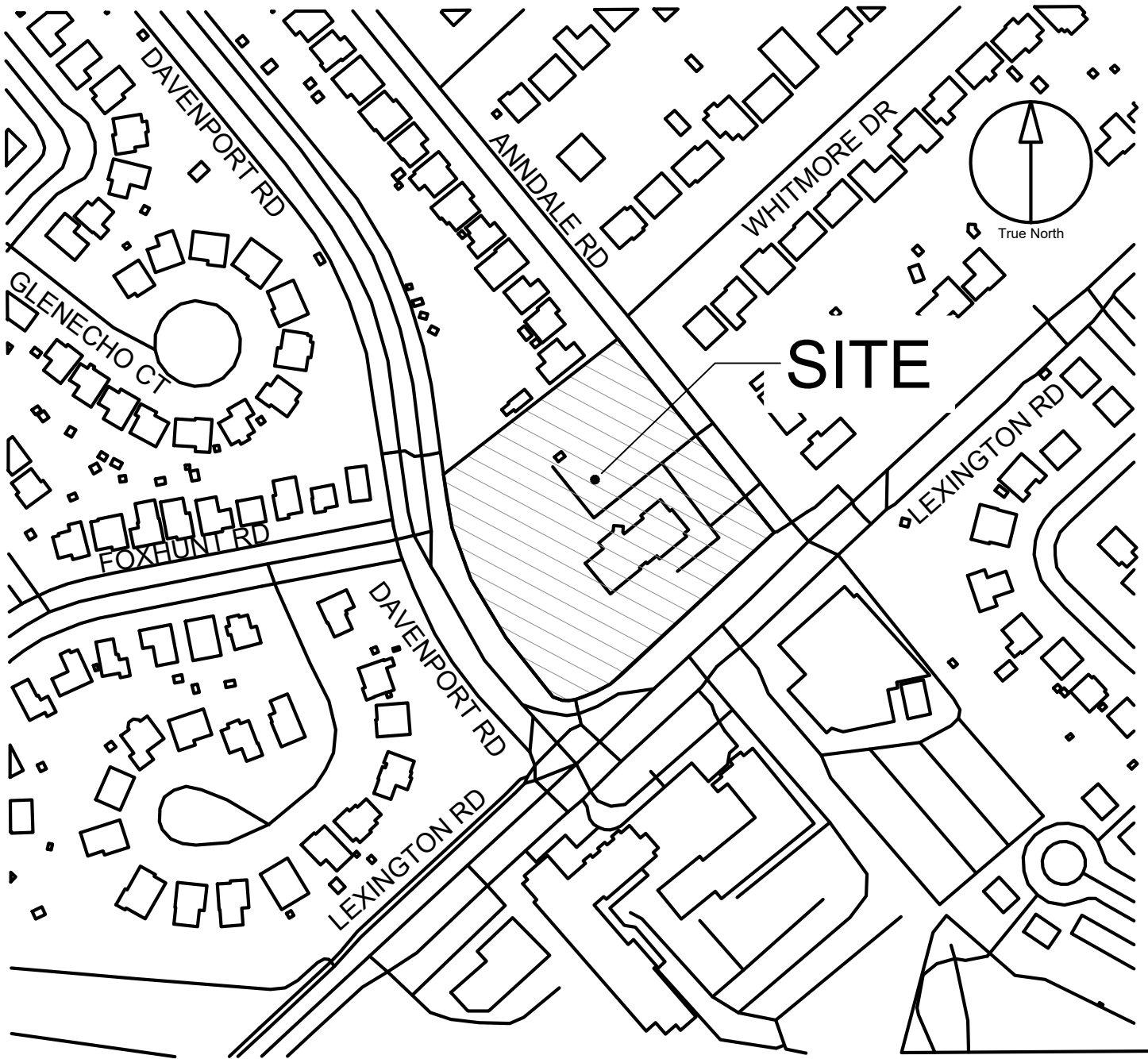
Sanitary Sewers

An appropriate sanitary service connection has been sized and provided to support the development proposal in accordance with City of Waterloo and Region of Waterloo design criteria. It is expected that the City of Waterloo and Region of Waterloo will review downstream sanitary sewer capacity for servicing allocation which will be confirmed at a later stage.

Water Supply

The existing 300 mm watermain within Anndale Road has sufficient pressure and flow to support the fire and domestic demands for the proposed development. Hydrant coverage and fire department connections are satisfied.

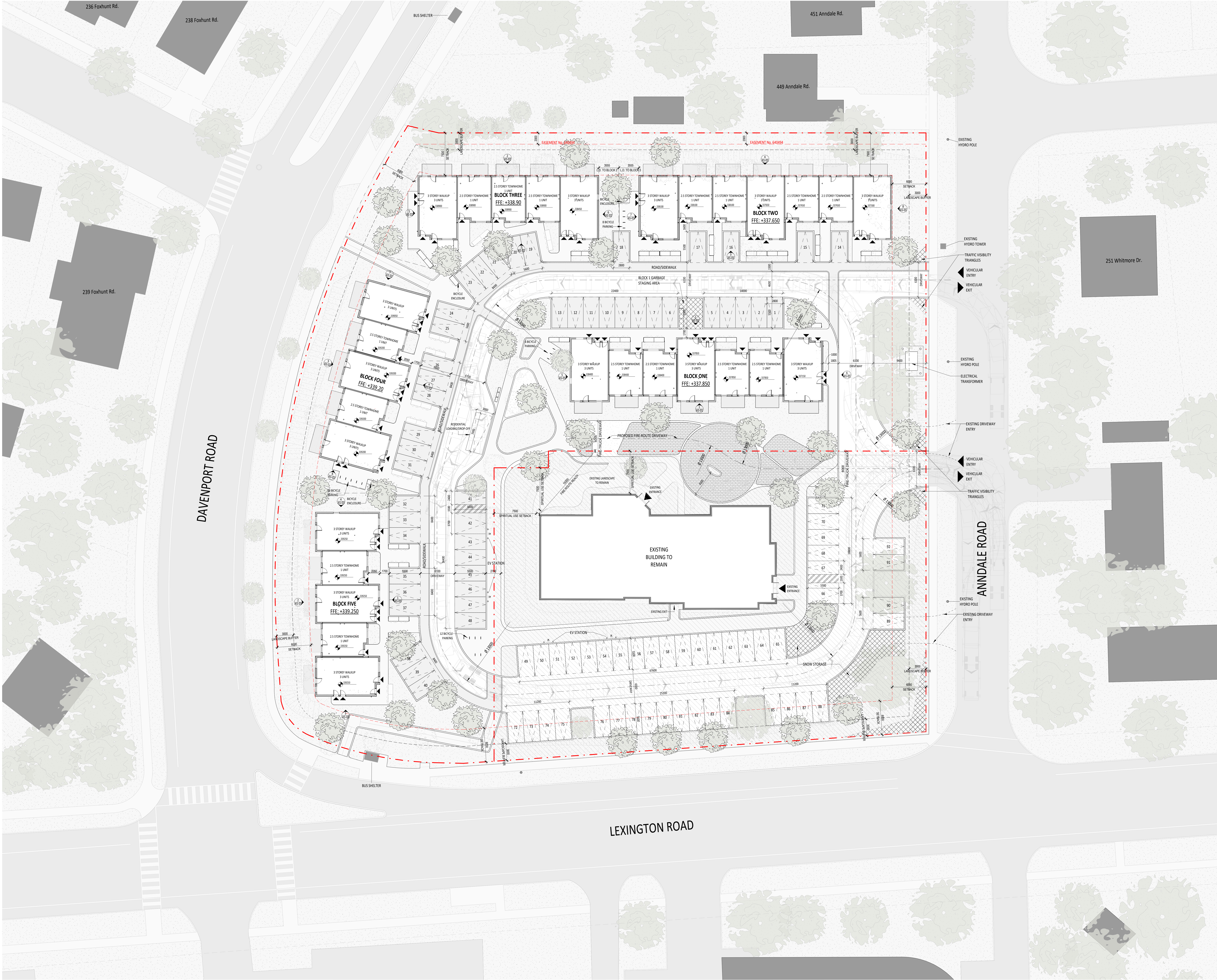
Figures



CLIENT KINDRED WORKS	PROJECT NAME 445 ANNDAL RD				FILE LOCATION Scale 10mm
	SCALE: NTS	DATE: 2025-09-15			
	PROJECT ENG: NS	DRAWN BY: RJ	FIGURE NAME AERIAL PLAN	FIGURE NO.	
	CHECKED BY: NS	APPROVED BY: NS		REVISION	
	PROJECT NO: 30290838			FIG.1	
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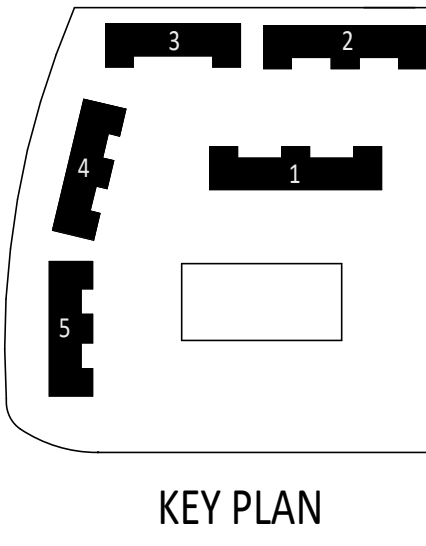
Appendix A

Background Information



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2. The Architect's drawings are to be read in conjunction with all other Contract Documents including the Project Manual and the General Conditions and Electrical Drawings. In case of difference between the Contract Documents, the General Conditions shall prevail.
3. The Architect is not responsible for the design of the building's mechanical, electrical, plumbing, and fire protection systems. The Contractor shall be responsible for the design of these systems and for obtaining all necessary permits and approvals from the appropriate authorities.
4. The Contractor shall be responsible for the design of the building's exterior finishes and for obtaining all necessary permits and approvals from the appropriate authorities.
5. The Contractor shall be responsible for the design of the building's interior finishes and for obtaining all necessary permits and approvals from the appropriate authorities.
6. The Contractor shall be responsible for the design of the building's landscape and for obtaining all necessary permits and approvals from the appropriate authorities.

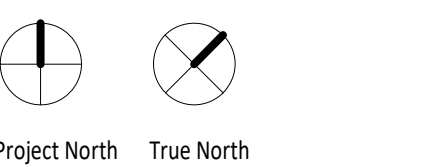


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SPA File:
File:
Legal Description:

Kindred Works
445 ANNDAL RD.
445 Anndale Rd., Waterloo, ON
N2K 2E3



Project No. 2102
Scale 1:200
Plot Date 2025.08.19

SITE PLAN

R8 Zone – Cluster Townhouse (3.C.10)

Regulation	Requirement	Provided
Lot Area (minimum)	None	
Lot Frontage (minimum)	None	
Common Element Road of Private Road Width	6.1m	6.1m
Common Element Road or Private Road Setback where driveway is proposed	6.0m	6.0m
Street Line Setback (minimum)	6.0m	6.0m
Interior Lot Line Setback (minimum)	7.5m	7.5m
Rear Yard Setback (minimum)	7.5m	7.5m
Building Separation (residential – minimum)	2.4m	3.36m+
Building Separation (non-residential – minimum)	6m	8.7m+
Building Height (maximum)	10m	12m
Density (maximum)	150 bedrooms per hectare	143 bedrooms per hectare
Lot Coverage (maximum)	45%	23%
Landscaped Open Space (minimum)	30%	47%

Parking Townhouse Parking Spaces (minimum) Visitor Parking Spaces (minimum)	1 per dwelling unit. Required: 15 0.33 per dwelling unit. Required: 5	57
Stacked Townhouse (Walk-Up) Parking Spaces (minimum) Visitor Parking Spaces (minimum) Total Residential Parking Required Total Visitor Parking Required	1 per dwelling unit. Required: 42 0.10 per dwelling unit. Required: 5 57 10	

Spiritual Use Parking Spaces (minimum)	8 per 100 sqm. Required: 58	35
--	-----------------------------	----

Accessible Parking Spaces Minimum parking spaces required (76-100)	2 Type A, 2 Type B	2 Type A, 2 Type B
--	--------------------	--------------------

Parking Space Dimensions 90 degrees 90 degrees when one side abuts a wall or column 90 degrees when both sides abut a wall or column Type A Accessible Parking Space Type B Accessible Parking Space Accessible Parking Access Aisle	Width: 2.8 m, Length: 5.5 m Width: 3.0 m, Length: 5.5 m Width: 3.2 m, Length: 5.5 m Width: 3.7 m, Length: 5.5 m Width: 2.4 m, Length: 5.5 m Width: 1.5 m, Length: 5.5 m	Width: 2.8 m, Length: 5.5 m N/A N/A Width: 3.7 m, Length: 5.5 m Width: 2.4 m, Length: 5.5 m Width: 1.5 m, Length: 5.5 m
---	--	--

445 Anndale Rd., Waterloo, ON			
1 Legal Address			
2 Municipal Address		445 Anndale Rd., Waterloo, ON	
3 Applicable Zoning By-Laws		Bylaw 2018-050	
4 Zoning Designation		Lowrise Residential R8	
5 Lot Area (m2)		12,046m²	
5a Severed Residential Lot Area (m2)		8,044m²	
5b Retained Church Lot Area (m2)		4,002m²	
6 Total Building GFA (m2)		5,995m²	
7 Coverage (Area at Grade, m2)		1,842m²	
8 Sustainability Target		n/a	
9 Established Grade (By-law 05-200 Section 3)		Geodetic el. m	
10 Total Area of Renovated Space		0	
Proposed Building Height		12.000m	
1 Building Height is measured from Established Grade as defined above			
2 Floor heights are measured from Established Grade at Geodetic el. xxx.xxxm to top of floor levels			

Project Area Breakdown (m2)					
Level	Gross Constructed Area (GCA)	Gross Floor Area (GFA) as per Zoning Bylaw No. 2018-050			
		Existing Heritage Church	New Community	New Residential	Total Per Level
BLOCK 1 - BASEMENT	411.92 m²	0.00 m²	0.00 m²	0.00 m²	0.00 m²
LEVEL 1	1841.87 m²	714.93 m²	0.00 m²	1841.87 m²	1841.87 m²
LEVEL 2	1881.63 m²	0.00 m²	0.00 m²	1881.63 m²	1881.63 m²
LEVEL 3	1859.42 m²	0.00 m²	0.00 m²	1562.54 m²	1562.54 m²
	5,995 m²	715 m²	0 m²	5,286 m²	5,286 m²

						FSI
						0.50

Residential Suite Mix				
Group Number	End Walkup	Standard Walkup	Townhouse	Total Unit Count
1	6	1	4	11
2	6	4	4	14
3	6	1	3	10
4	6	3	2	11
5	6	3	2	11
	30	12	15	57

Bedroom Mix				
Level	1BR	2BR	3BR	Total Count
BLOCK 1 - BASEMENT	0	0	0	0
LEVEL 1	14	0	15	29
LEVEL 2	0	14	0	14
LEVEL 3	0	14	0	14
	14	28	15	57

GFA Per Unit as per Zoning Bylaw No. 2018-050								
	WA - End Walkup Basement (x5)		WC - Standard Walkup (x4)		WE - Standard End Walkup (x5)		TA - Townhouse (x15)	
	m2	sqft	m2	sqft	m2	sqft	m2	sqft
Level 1	79.63	857.09	79.42	854.89	77.82	837.69	49.99	538.03
Level 2	80.91	870.92	76.11	819.21	79.49	855.61	51.14	550.44
Level 3	76.80	826.69	78.11	840.74	79.49	855.61	28.45	306.27
Total	237.34	2,554.69	233.64	2,514.83	236.80	2,548.91	129.58	1,394.74

Barrier Free Units					
	% of total units required	# of Units Required	% of total units provided	# of units provided	Comments
	20%	11.4	24%	14	

% Greenspace on Site per Zoning Bylaw No. 2018-050			
	% of greenspace on site required	% of greenspace on site provided	Comments
	30% minimum	47%	

Lot Coverage per Zoning Bylaw No. 2018-050			
	% of coverage on site required	% of coverage on site provided	Comments
	40% maximum	22.89%	

Car Parking as per Zoning Bylaw No. 2018-050					
Land Use	Units	Standard (spaces per unit)	Parking Required per By-Law	Parking Provided	
		Residential			Spaces Provided/Notes
2 Storey Town	15	1	15		For 85-119 parking spaces required, 3 Electric Vehicle Parking Spaces required per Zoning Bylaw No. 2018-050
3 Storey Walkups	42	1	42		
Sub-Total			57	57	
Effective Resident Ratio (Spaces per unit)			1.00	1.00	
		Non-Residential			
Spiritual Use	8 parking spaces per 100 sqm per Zoning Bylaw No. 2018-050		58	35	For 76-100 parking spaces, 2 Type A Accessible Parking Spaces and 2 Type B Accessible Parking Spaces required per Zoning Bylaw No. 2018-050
Residential Visitor	0.33 spaces per townhome / 0.1 spaces per stacked townhome		10		
Sub-Total			68	35	
Total			125	92	

1 Calculations which result in a fraction shall be rounded to the next highest whole number as per Zoning Bylaw No. 2018-050.

Bicycle Parking as per Zoning Bylaw No. 2018-050					
	Units	Rate (per unit)	Spaces Required	Spaces Provided	Spaces Provided/Notes
Multiple Dwelling (Short Term)	57	0.3 Type A + 0.3 Type B	36 spaces 18 Type A + 18 Type B	40 spaces 18 Type A + 22 Type B	Bike Parking A means secure bike parking located indoors or within a bike locker.
Place of Worship (Short Term)	10% of required motor vehicle parking spaces		4 spaces	6 spaces Type B	
Total			40 spaces 18 Type A + 22 Type B	46 spaces 18 Type A + 28 Type B	Bike Parking B means any other bike parking.

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The Architect is not liable for any loss or deterioration of information resulting from subsequent reproduction of the original drawing.

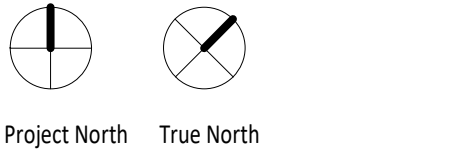
GENERAL NOTES:
1. Drawings are not to be scaled. Contractor will verify all existing conditions and dimensions required to prepare the bids and will report any discrepancies and/or omissions to the Architect immediately.
2. The Architect's Drawings are to be read in conjunction with all other Contract Documents including the Project Manual and the local, Mechanical and Electrical Codes. In case of differences between the Contract Documents with respect to the quality, value or scope of work, the greater shall apply.
3. Drawings are not to be scaled. Contractor will verify all existing conditions and dimensions required to prepare the bids and will report any discrepancies and/or omissions to the Architect immediately.
4. Drawings are not to be scaled. Contractor will verify all existing conditions and dimensions required to prepare the bids and will report any discrepancies and/or omissions to the Architect immediately.
5. The Architect is not responsible for means, methods and techniques of construction.
6. These drawings are not to be used for construction unless specifically noted for each purpose.

1	2025.08.19	021015 FOR SPA
Rev.	Date	Issued

KP MB
351 King St. E., Suite 1200
Toronto, ON, Canada M5A 0L6
416.977.5104

SPA File:
File:
Legal Description:

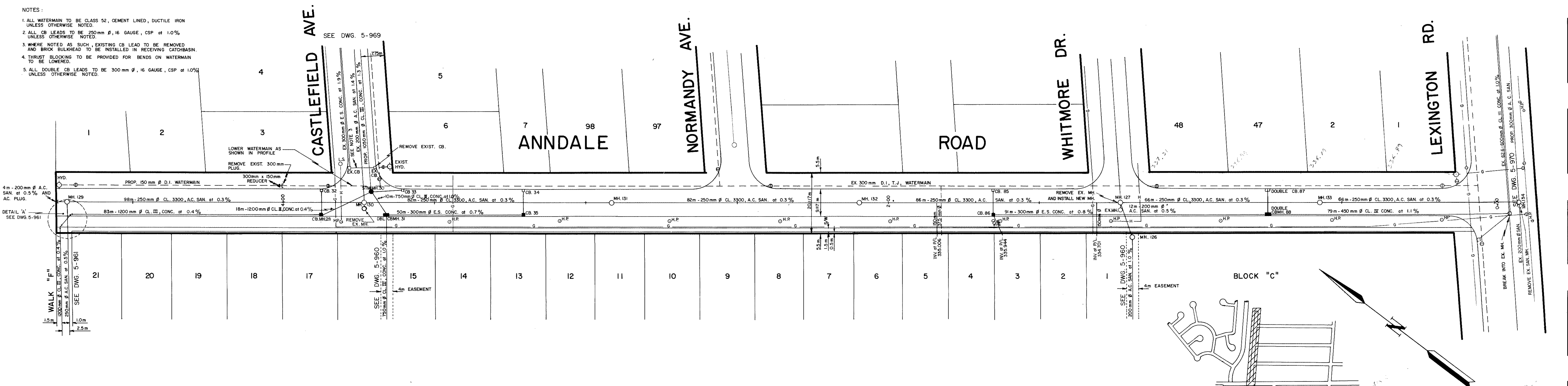
Kindred Works
445 ANNDALÉ RD.
445 Anndale Rd., Waterloo, ON
N2K 2E3



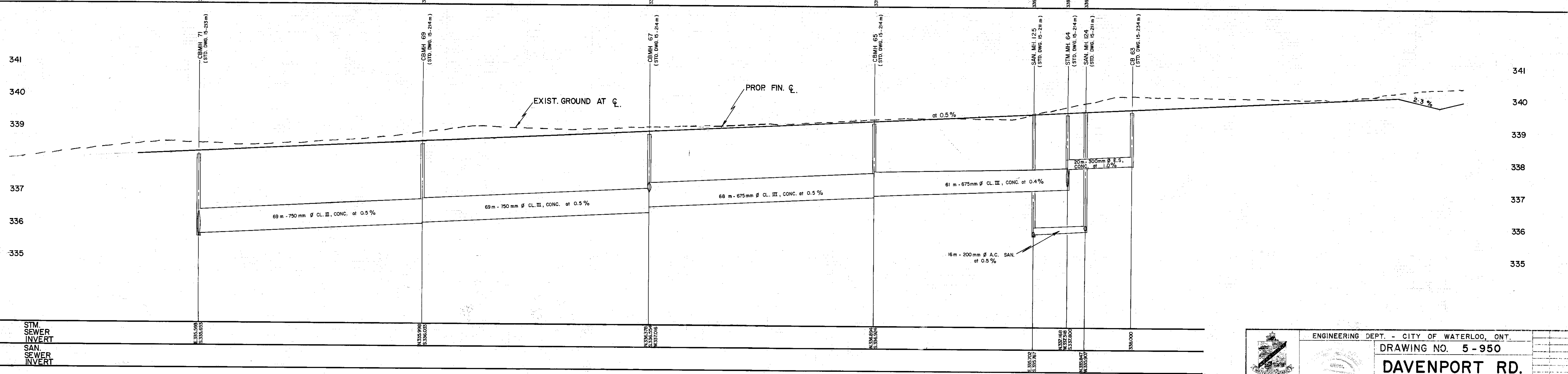
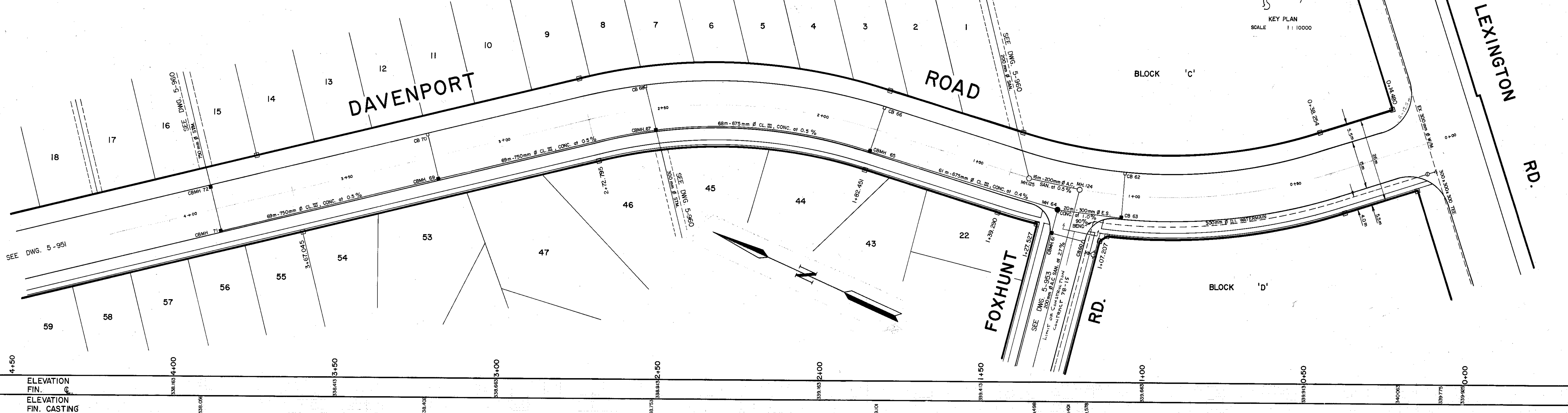
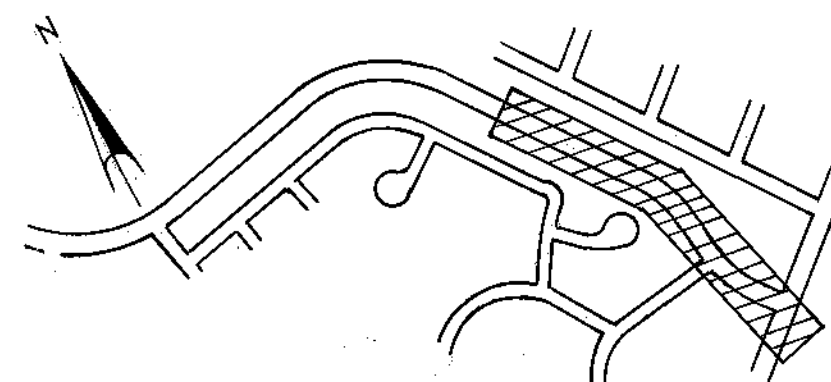
Project No. 2102
Scale 1:1
Plot Date 2025.08.19

STATISTICS

- NOTES:
1. ALL WATERMAIN TO BE CLASS 52, CEMENT LINED, DUCTILE IRON UNLESS OTHERWISE NOTED.
 2. ALL CB LEADS TO BE 250mm Ø, 16 GAUGE, CSP AT 1.0% UNLESS OTHERWISE NOTED.
 3. WHERE NOTED AS SUCH, EXISTING CB LEAD TO BE REMOVED AND BRICK BULKHEAD TO BE INSTALLED IN RECEIVING CATCHBASIN.
 4. THRUST BLOCKING TO BE PROVIDED FOR BENDS ON WATERMAIN TO BE LOWERED.
 5. ALL DOUBLE CB LEADS TO BE 300mm Ø, 16 GAUGE, CSP AT 1.0% UNLESS OTHERWISE NOTED.



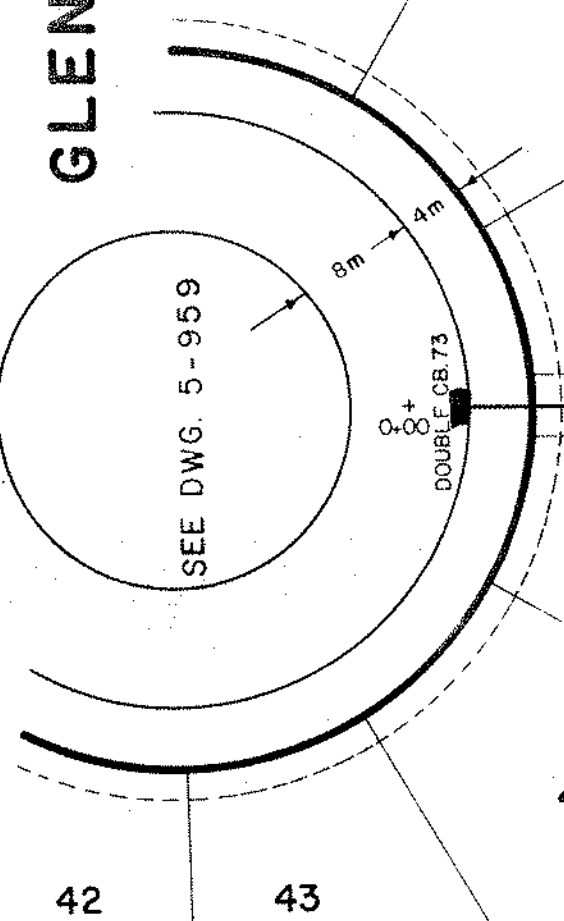
- NOTES:
1. ALL WATERMAIN TO BE CLASS 52 CEMENT LINED DUCTILE IRON UNLESS OTHERWISE NOTED.
 2. ALL MAIN SANITARY SEWER TO BE CLASS 2400 A.C. UNLESS OTHERWISE NOTED.
 3. ALL C.B. LEADS TO BE 250mm Ø 16 GAUGE C.S.P. AT 1.0% UNLESS OTHERWISE NOTED.
 4. CROSSFALL TO BE 2.0%



ENGINEERING DEPT. - CITY OF WATERLOO, ONT.	
DRAWING NO. 5-950	
DAVENPORT RD. LEXINGTON RD. TO STORM EASEMENT	
DRAWN BY: L.T.C.	DATE: MARCH 1978
SCALE: 1:500	HORIZ: 1:500 VERT: 1:50
APP'D BY: [Signature]	P. ENG. DESIGN BY: P. ALLEN CH'D BY: G. LEMON

- NOTES:
1. ALL WATERMAIN TO BE CLASS 52 CEMENT LINED DUCTILE IRON UNLESS OTHERWISE NOTED.
 2. ALL MAIN SANITARY SEWER TO BE CLASS 2400 A.C. UNLESS OTHERWISE NOTED.
 3. ALL C.B. LEADS TO BE 250mm Ø 16 GAUGE C.S.P. AT 10% UNLESS OTHERWISE NOTED.
 4. ALL DOUBLE C.B. LEADS TO BE 300mm Ø 16 GAUGE C.S.P. AT 10% UNLESS OTHERWISE NOTED.
 5. CONTRACTOR TO MATCH EX. GROUND ABUTTING EASEMENTS & FINAL GRADING TO BE PROVIDED BY THE BUILDER.

GLENECHO COURT



DAVENPORT ROAD

DAVENPORT RD.

DAVENPORT RD.

ANNDALE RD.

CASTLEFIELD AVE.

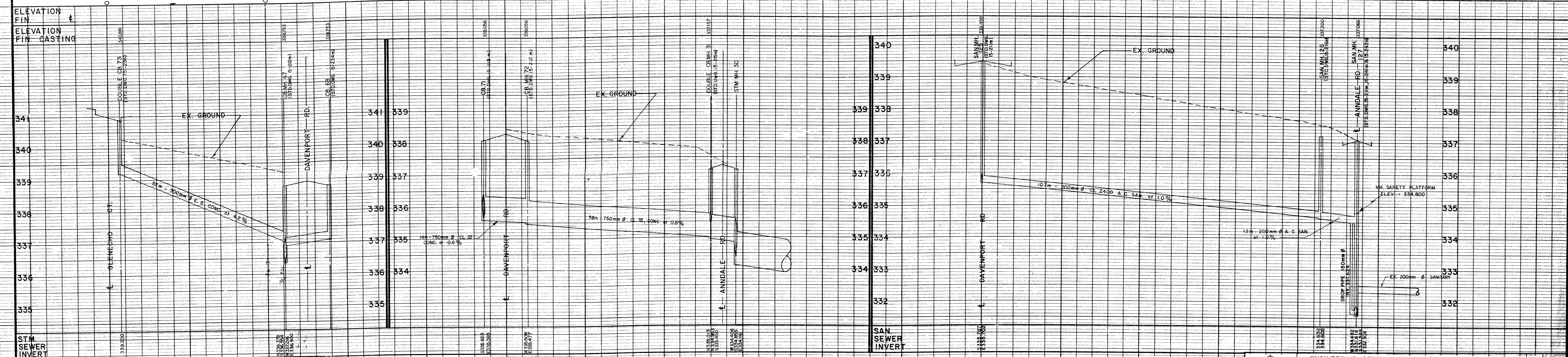
FOXHUNT RD.

DAVENPORT RD.

ANNDALE RD.

WHITMORE DR.

Note: THESE SERVICES WERE INSTALLED under Contract 79-6 on a Time and Materials basis.



ENGINEERING DEPT. - CITY OF WATERLOO, ONT.

AS BUILT

AS BUILT EASEMENTS

LINCOLN NORTH SUB'D

DRAWING NO. 5 - 960

DRAWN BY: L.T.C. DATE: APRIL 1978

SCALE: 1 : 500 HORIZ: 1 : 500 VERT: 1 : 50

FLD. BK/PAGE DATE APP'D BY: G.R.O. P. ENG. DESIGN BY: P. ALLEN CH'KD BY: G. LEMON



STORM WATER MANAGEMENT REPORT

**CHRIST LUTHERAN CHURCH
445 Anndale Road
CITY OF WATERLOO**

PREPARED FOR:

**Frey Building Contractors
Hawkesville, Ontario**

October 2000



CONSULTING
CIVIL
ENGINEERS

STORM WATER MANAGEMENT REPORT

CITY OF WATERLOO
Development Services

APPROVED

filed DA
CHRIST LUTHERAN CHURCH
445 Anndale Road
CITY OF WATERLOO

PER W. Collett
DATE Feb 21 2001

PREPARED FOR:

Frey Building Contractors
Hawkesville, Ontario

October 2000
MTE Project No. C 1758-300
M:\1758\1758-swm.wpd



TABLE OF CONTENTS

	Page
1.0 INTRODUCTION	1
2.0 CRITERIA	1
3.0 METHODOLOGY	1
4.0 STORM WATER MANAGEMENT	2
4.1 Catchment Parameters	2
4.2 Water Quantity - Modeling Results	2
4.3 Water Quality	4
4.4 Erosion & Sedimentation Control	5
5.0 CONCLUSIONS AND RECOMMENDATIONS	5

TABLES

- 4.1 Catchment Parameters
- 4.2 Stage-Storage-Discharge Information
- 4.3 Flows

FIGURES

- 1.01 Storm Drainage Areas

APPENDICES

APPENDIX "A" - Calculations

APPENDIX "B" - MIDUSS 98 Output

DRAWINGS

- Existing Conditions Plan
MTE Drawing No. 1758-801 Encl.
- Site Servicing, Site Grading and Storm Water Management Plan
MTE Drawing No. 1758-201 Encl.

1.0 INTRODUCTION

MTE Consultants Inc. was retained by Frey Building Contractors on behalf of their client, Christ Lutheran Church, to complete the storm water management design for the site improvements to be undertaken at 445 Anndale Road in the City of Waterloo.

The site is located on the south west corner of the intersection of Anndale Road and Lexington Road. The property fronts onto Anndale Road and is bounded to the east by Lexington Road and to the south by Davenport Road. For the exact location of the site refer to the key plan located on the enclosed engineering drawing.

The proposed site improvements include an addition to the existing building and construction of a new asphalt parking lot.

This report addresses the storm water management requirements set forth by the City of Waterloo and proposes a design which meets the requirements for the site. The site grading and storm water management details for the site are illustrated on the enclosed MTE engineering drawing, 1758-201.

2.0 CRITERIA

The storm water management design criteria for the subject site, as established by the City of Waterloo, is as follows:

- i) attenuation of the post development peak flows to the pre-development (existing) peak flows; and
- ii) water quality control.

3.0 METHODOLOGY

In order to successfully complete the storm water management design for this site, the following specific tasks were undertaken:

- i) calculated the allowable runoff rates using MIDUSS 98;
- ii) delineated site into catchment areas and determined catchment parameters for inclusion in MIDUSS modeling;
- iii) calculated post development runoff hydrographs using MIDUSS 98; and
- iv) revised the site grades as necessary to attain the required storage for runoff control.

4.0 STORM WATER MANAGEMENT

4.1 Catchment Parameters

The site was delineated into seven catchments. The following table provides a brief description of each catchment and also provides the parameters for each catchment used in the MIDUSS 98 modeling of the site. The catchments are illustrated on the enclosed MTE Drawing 1758-201.

Table 4.1 Catchment Parameters

Catchment	Description	Total Area (m ²)	% Impervious	Pervious CN	Flow Length (m)	Slope (%)
<i>Post Development</i>						
1	asphalt	592.8	100	98	12.5	2.36
2	building	330.4	100	98	10.5	1.0
3	grass	4,635.6	0	75	32.0	2.9
4	uncontrolled gravel	616.1	0	85	18.0	1.3
5	uncontrolled asphalt	1294.2	100	98	45.0	1.1
6	uncontrolled building	374.4	100	98	11.5	1.0
7	uncontrolled grass	4,297.7	0	75	30.0	1.6

4.2 Water Quantity - Modeling Results

In order to achieve the SWM requirements for the site, runoff generated from the controlled section of the property, as illustrated in Figure 1.0, will be controlled with the installation of a 50 mm diameter orifice plate. In order to achieve the required storage volume, parking lot storage to a maximum depth of 0.3 metres will be utilized. The enclosed engineering drawing provides an indepth description of this system. An overflow weir has been created at the juncture of the existing asphalt and the proposed asphalt to ensure the maximum ponding depth within the new parking lot does not exceed 0.3 metres. The flow equation for the orifice is included in Appendix A. The remaining areas of the site will remain uncontrolled. Refer to Appendix B for the MIDUSS 98 output.

The following table illustrates the stage-storage-discharge relationship of the storm system.

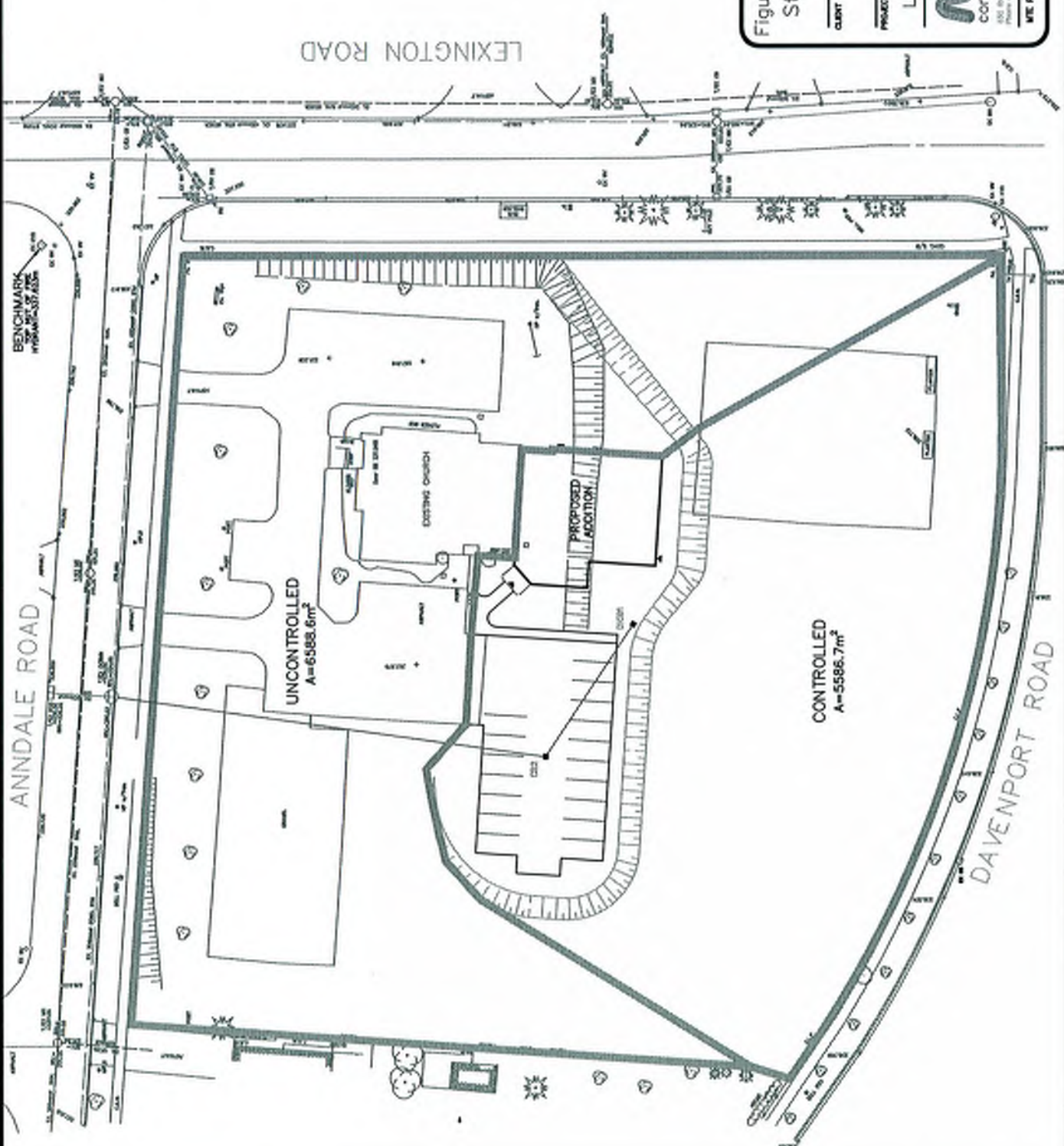


Figure 1.0

Storm Drainage Areas

CLIENT Frey Building
Contractors

PROJECT Christ
Lutheran Church

MTE CONSULTING
CIVIL
ENGINEERS
consultants inc.

400 Redwood Drive • Oakville • Ontario L6M 4G2
Phone (905) 231-0000 • Fax (905) 231-0001
MTE Project No. 1708-300 06/29/11

Table 4.2 Stage-Storage-Discharge Information

Elevation (m)	Head (m)	Orifice/Weir Flow (m ³ /s)	Volume (m ³)	Remarks
335.61	0	0	0	Orifice invert
337.24	1.63	0.00587	4.0	Top of grate of CB 2
337.29	1.68	0.00596	5.1	
337.34	1.73	0.00605	10.2	
337.39	1.78	0.00613	24.8	
337.44	1.83	0.00622	47.2	
337.49	1.88	0.00631	71.8	
337.54	1.93	0.00639	98.6	Overflow weir crest
337.59	1.98	0.2208	127.4	

With the addition of the 50 mm diameter orifice plate the post development runoff from the 5 year storm event is controlled to 0.006 m³/s and to 0.082 for the 100 year storm event. Including the uncontrolled drainage from the site, the 5 year storm event peak runoff is 0.056 m³/s and 0.175 m³/s for the 100 year storm event. The following table summarizes the flows generated by the entire site.

Table 4.3 Flows

Modeling Condition	5 year Storm Event (m ³ /s)	100 year Storm Event (m ³ /s)
Pre-development	0.056	0.220
Uncontrolled Post Development	0.121	0.336
Controlled Post Development	0.056	0.175

The maximum ponding elevation for the 100 year storm event within the parking area is 337.556 which amounts to 1.6 cm of storm water flowing over the weir.

4.3 Water Quality

In accordance with the criteria outlined previously, water quality control will be achieved with the installation of a Goss Trap in the proposed catchbasin (CB 2). A Goss Trap is designed to help prevent gas, oil, leaves, and other floating substances from entering the outlet pipe. A minimum sump of 500 mm for all proposed structures will also be implemented to help reduce the amount of sediment entering the storm system.

4.4 Erosion & Sedimentation Control

In order to minimize the effects of erosion during the grading of the site, sediment control fencing will be installed along the perimeter of the site as necessary and around all storm structures, as shown on the enclosed engineering drawing.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the foregoing analysis, it is concluded that:

- i) adequate storage and discharge control can be established on-site to reduce the 5 and 100 year storm event post development peak flows to the pre-development peak flows as determined using MIDUSS 98; and
- ii) upon completion of construction, the site will conform to the design criteria specified by the City of Waterloo upon completion of the report recommendations.

It is recommended that:

- i) the site grading be undertaken according to the proposed elevations, details and erosion control measures shown on the enclosed engineering drawings;
- ii) the storm water management facilities be installed as detailed on the enclosed engineering drawing; and
- iii) the storm water management facilities be inspected by MTE Consultants Inc. during construction and certified to the City of Waterloo upon completion.

All of which is respectfully submitted,

MTE CONSULTANTS INC.



Rebecca C. Kerr, EIT
Project Manager



Jeff Martens, P.Eng.
Director of Engineering

APPENDIX "A"

CALCULATIONS

CALCULATIONS

Orifice Equation (MIDUSS 98)

$$Q = C_c \pi/4 D^2 \text{sqrt}(2g(H-2/3D))$$

where	C_c	coefficient of contraction
	H	head relative to the invert of the orifice
	D	orifice diameter
	g	gravitational acceleration

Weir Equation (MIDUSS 98)

$$Q_{cr} = B \text{sqrt}(g) y_{cr}^{3/2} \quad \text{where } y_{cr} = 2/3 (H-Z)$$

where	B	weir breadth
	g	gravitational acceleration
	H	head relative to the invert of the weir
	Z	weir sill elevation

APPENDIX "B"

MIDUSS 98 OUTPUT

PRE-DEVELOPMENT

```

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* MIDUSS 98 created June 17, 2000*
* 10 Units used: ie METRIC*
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* Output filename: 1758-pre5.out*
* Licensee name: MTE Consultants Inc.*
* Company MTE Consultants Inc.*
* Date & Time last used: 10/05/2000 at 15:39:11*
* 31 TIME PARAMETERS*
* 5.000 Time Step*
* 180.000 Max. Storm length"
* 1500.000 Max. Hydrograph"
* 81 ADD COMMENT-----"
* 6 Lines of comment"
* *****
* CHRIST LUTHERAN CHURCH"
* 445 ANNDALE ROAD"
* "
* PRE-DEVELOPMENT CONDITION"
* *****
* 81 ADD COMMENT-----"
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* ++++++
* 5 YEAR STORM EVENT"
* ++++++
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* 12.347 Constant B"
* 0.895 Exponent C"
* 0.400 Fraction R"
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* 1.000 Overland Slope"
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* 0.100 Pervious Ia/S coefficient"
* 4.482 Pervious Initial abstraction"
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* Time to Centroid 109.439 88.050 109.439 minutes"
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```

```

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* Rainfall losses 26.486 5.756 26.486 mm"
* Runoff depth 21.063 41.793 21.063 mm"
* Runoff volume 13.06 0.00 13.06 c.m"
* Maximum flow 0.006 0.000 0.006 c.m/sec"
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* 15.000 Pervious length"
* 1.000 Pervious slope"
* 0.038 Impervious Area"
* 15.000 Impervious length"
* 1.000 Impervious slope"
* 0.250 Pervious Manning 'n'"

```

```

*      75.000 Pervious SCS Curve No."
*      0.260 Pervious Runoff coefficient"
*      0.100 Pervious Ia/S coefficient"
*      8.467 Pervious Initial abstraction"
*      0.015 Impervious Manning 'n'"
*      98.000 Impervious SCS Curve No."
*      0.891 Impervious Runoff coefficient"
*      0.100 Impervious Ia/S coefficient"
*      0.518 Impervious Initial abstraction"
*      0.012 0.040 0.000 0.000 c.m/sec"
*      Catchment 103 Pervious Impervious Total Area "
*      Surface Area 0.000 0.038 0.038 hectare"
*      Time of concentration 15.621 1.621 1.621 minutes"
*      Time to Centroid 116.961 88.048 88.048 minutes"
*      Rainfall depth 47.549 47.549 47.549 mm"
*      Rainfall volume 0.00 18.07 18.07 c.m"
*      Rainfall losses 35.232 5.754 5.754 mm"
*      Runoff depth 12.318 41.795 41.795 mm"
*      Runoff volume 0.00 15.88 15.88 c.m"
*      Maximum flow 0.000 0.012 0.012 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"      0.012 0.052 0.000 0.000"
" 81 ADD COMMENT=====
"      3 Lines of comment"
"      =====
"      CATCHMENT 4 - GRASS AREA"
"      =====
" 33 CATCHMENT 104"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      104 ID number"
"      0.000 % Impervious"
"      0.986 Total Area"
"      50.000 Flow length"
"      2.500 Overland Slope"
"      0.986 Pervious Area"
"      50.000 Pervious length"
"      2.500 Pervious slope"
"      0.000 Impervious Area"
"      50.000 Impervious length"
"      2.500 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      75.000 Pervious SCS Curve No."
"      0.260 Pervious Runoff coefficient"
"      0.100 Pervious Ia/S coefficient"
"      8.467 Pervious Initial abstraction"
"      0.015 Impervious Manning 'n'"
"      98.000 Impervious SCS Curve No."
"      0.891 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"      0.036 0.052 0.000 0.000 c.m/sec"
"      Catchment 104 Pervious Impervious Total Area "
"      Surface Area 0.986 0.000 0.986 hectare"
"      Time of concentration 24.438 2.536 2.536 minutes"
"      Time to Centroid 127.712 89.479 127.712 minutes"
"      Rainfall depth 47.549 47.549 47.549 mm"
"      Rainfall volume 468.83 0.00 468.83 c.m"
"      Rainfall losses 35.214 5.994 35.214 mm"
"      Runoff depth 12.335 41.555 41.555 mm"
"      Runoff volume 121.62 0.00 121.62 c.m"
"      Maximum flow 0.036 0.000 0.036 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"      0.036 0.056 0.000 0.000"
" 64 SHOW TABLE"
"      2 Flow hydrograph"
"      4 Inflow Hydrograph"
"      Maximum flow 0.056 c.m/sec"
"      Hydrograph volume 204.862 c.m"
"      6 005hyd Hydrograph extension used in this file"
" 19 EXIT"

```

```

" MIDUSS 98 Output----->"
" MIDUSS 98 version number 1.00"
" MIDUSS 98 created June 17, 2000"
" 10 Units used: ie METRIC"
" Project filename: Q:\1758\"
" Output filename: 1758-pre100.out"
" Licensee name: MTE Consultants Inc."
" Company MTE Consultants Inc."
" Date & Time last used: 10/05/2000 at 15:38:34"
" 31 TIME PARAMETERS"
" 5.000 Time Step"
" 180.000 Max. Storm length"
" 1500.000 Max. Hydrograph"
" 81 ADD COMMENT-----"
" 6 Lines of comment"
" *****"
" CHRIST LUTHERAN CHURCH"
" 445 ANNDALE ROAD"
" "
" PRE-DEVELOPMENT CONDITION"
" *****"
" 81 ADD COMMENT-----"
" 3 Lines of comment"
" +++++"
" 100 YEAR STORM EVENT"
" +++++"
" 32 STORM Chicago storm"
" 1 Chicago storm"
" 4692.000 Coefficient A"
" 17.437 Constant B"
" 0.956 Exponent C"
" 0.400 Fraction R"
" 180.000 Duration"
" 1.000 Time step multiplier"
" Maximum intensity 239.793 mm/hr"
" Total depth 89.960 mm"
" 6 005hyd Hydrograph extension used in this file"
" 81 ADD COMMENT-----"
" 3 Lines of comment"
" -----"
" CATCHMENT 1 - GRAVEL AREA"
" -----"
" 33 CATCHMENT 101"
" 1 Triangular SCS"
" 1 Equal length"
" 1 SCS method"
" 101 ID number"
" 0.000 % Impervious"
" 0.062 Total Area"
" 15.000 Flow length"
" 1.000 Overland Slope"
" 0.062 Pervious Area"
" 15.000 Pervious length"
" 1.000 Pervious slope"
" 0.000 Impervious Area"
" 15.000 Impervious length"
" 1.000 Impervious slope"
" 0.250 Pervious Manning 'n'"
" 85.000 Pervious SCS Curve No."
" 0.444 Pervious Runoff coefficient"
" 0.100 Pervious Ia/S coefficient"
" 4.482 Pervious Initial abstraction"
" 0.015 Impervious Manning 'n'"
" 98.000 Impervious SCS Curve No."
" 0.900 Impervious Runoff coefficient"
" 0.100 Impervious Ia/S coefficient"
" 0.520 Impervious Initial abstraction"
" 0.021 0.000 0.000 0.000 c.m/sec"
" Catchment 101 Pervious Impervious Total Area "
" Surface Area 0.062 0.000 0.062 hectare"
" Time of concentration 8.077 1.278 8.077 minutes"
" Time to Centroid 100.818 85.810 100.818 minutes"
" Rainfall depth 89.960 89.960 89.960 mm"

```

"	Rainfall volume	55.78	0.00	55.78	c.m"
"	Rainfall losses	34.062	6.970	34.062	mm"
"	Runoff depth	55.898	82.990	55.898	mm"
"	Runoff volume	34.66	0.00	34.66	c.m"
"	Maximum flow	0.021	0.000	0.021	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.021	0.021	0.000	0.000"
" 81	ADD COMMENT=====				
"	3 Lines of comment"				
"	-----"				
"	CATCHMENT 2 - ASPHALT AREA"				
"	-----"				
" 33	CATCHMENT 102"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	1 SCS method"				
"	102 ID number"				
"	100.000 % Impervious"				
"	0.130 Total Area"				
"	20.000 Flow length"				
"	1.000 Overland Slope"				
"	0.000 Pervious Area"				
"	20.000 Pervious length"				
"	1.000 Pervious slope"				
"	0.130 Impervious Area"				
"	20.000 Impervious length"				
"	1.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	75.000 Pervious SCS Curve No."				
"	0.260 Pervious Runoff coefficient"				
"	0.100 Pervious Ia/S coefficient"				
"	8.467 Pervious Initial abstraction"				
"	0.015 Impervious Manning 'n'"				
"	98.000 Impervious SCS Curve No."				
"	0.891 Impervious Runoff coefficient"				
"	0.100 Impervious Ia/S coefficient"				
"	0.518 Impervious Initial abstraction"				
"		0.074	0.021	0.000	0.000 c.m/sec"
"	Catchment 102 Pervious Impervious Total Area "				
"	Surface Area	0.000	0.130	0.130	hectare"
"	Time of concentration	11.276	1.519	1.519	minutes"
"	Time to Centroid	107.264	86.106	86.106	minutes"
"	Rainfall depth	89.960	89.960	89.960	mm"
"	Rainfall volume	0.00	116.95	116.95	c.m"
"	Rainfall losses	50.076	6.571	6.571	mm"
"	Runoff depth	39.884	83.389	83.389	mm"
"	Runoff volume	0.00	108.41	108.41	c.m"
"	Maximum flow	0.000	0.074	0.074	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.074	0.082	0.000	0.000"
" 81	ADD COMMENT=====				
"	3 Lines of comment"				
"	-----"				
"	CATCHMENT 3 - BUILDING AREA"				
"	-----"				
" 33	CATCHMENT 103"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	1 SCS method"				
"	103 ID number"				
"	100.000 % Impervious"				
"	0.038 Total Area"				
"	15.000 Flow length"				
"	1.000 Overland Slope"				
"	0.000 Pervious Area"				
"	15.000 Pervious length"				
"	1.000 Pervious slope"				
"	0.038 Impervious Area"				
"	15.000 Impervious length"				
"	1.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				

```

"      75.000 Pervious SCS Curve No."
"      0.260 Pervious Runoff coefficient"
"      0.100 Pervious Ia/S coefficient"
"      8.467 Pervious Initial abstraction"
"      0.015 Impervious Manning 'n'"
"      98.000 Impervious SCS Curve No."
"      0.891 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"      0.022 0.082 0.000 0.000 c.m/sec"
"      Catchment 103 Pervious Impervious Total Area "
"      Surface Area 0.000 0.038 0.038 hectare"
"      Time of concentration 9.488 1.278 1.278 minutes"
"      Time to Centroid 105.051 85.809 85.809 minutes"
"      Rainfall depth 89.960 89.960 89.960 mm"
"      Rainfall volume 0.00 34.18 34.18 c.m"
"      Rainfall losses 50.193 6.968 6.968 mm"
"      Runoff depth 39.767 82.992 82.992 mm"
"      Runoff volume 0.00 31.54 31.54 c.m"
"      Maximum flow 0.000 0.022 0.022 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"      0.022 0.104 0.000 0.000"
" 81 ADD COMMENT=====
"      3 Lines of comment"
"      =====
"      CATCHMENT 4 - GRASS AREA"
"      =====
" 33 CATCHMENT 104"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      104 ID number"
"      0.000 % Impervious"
"      0.986 Total Area"
"      50.000 Flow length"
"      2.500 Overland Slope"
"      0.986 Pervious Area"
"      50.000 Pervious length"
"      2.500 Pervious slope"
"      0.000 Impervious Area"
"      50.000 Impervious length"
"      2.500 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      75.000 Pervious SCS Curve No."
"      0.260 Pervious Runoff coefficient"
"      0.100 Pervious Ia/S coefficient"
"      8.467 Pervious Initial abstraction"
"      0.015 Impervious Manning 'n'"
"      98.000 Impervious SCS Curve No."
"      0.891 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"      0.174 0.104 0.000 0.000 c.m/sec"
"      Catchment 104 Pervious Impervious Total Area "
"      Surface Area 0.986 0.000 0.986 hectare"
"      Time of concentration 14.844 1.999 14.844 minutes"
"      Time to Centroid 111.761 86.786 111.761 minutes"
"      Rainfall depth 89.960 89.960 89.960 mm"
"      Rainfall volume 887.01 0.00 887.01 c.m"
"      Rainfall losses 50.065 6.641 50.065 mm"
"      Runoff depth 39.895 83.319 39.896 mm"
"      Runoff volume 393.37 0.00 393.37 c.m"
"      Maximum flow 0.174 0.000 0.174 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"      0.174 0.220 0.000 0.000"
" 64 SHOW TABLE"
"      2 Flow hydrograph"
"      4 Inflow Hydrograph"
"      Maximum flow 0.220 c.m/sec"
"      Hydrograph volume 567.969 c.m"
"      6 005hyd Hydrograph extension used in this file"
" 19 EXIT"

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POST DEVELOPMENT

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"      MIDUSS 98 Output----->
"      MIDUSS 98 version number                      1.00
"      MIDUSS 98 created                          June 17, 2000
"      10 Units used:                          ie METRIC
"      Project filename:                          Q:\1758\
"      Output filename:                          alt1-post5.out
"      Licensee name:                          MTE Consultants Inc.
"      Company                          MTE Consultants Inc.
"      Date & Time last used:                    10/25/2000 at 15:12:28
" 31 TIME PARAMETERS
"      5.000 Time Step
"      180.000 Max. Storm length
"      1500.000 Max. Hydrograph
" 81 ADD COMMENT=====
"      6 Lines of comment
"      *****
"      CHRIST LUTHERAN CHURCH
"      445 ANNDALE ROAD
"      "
"      POST-DEVELOPMENT CONDITION
"      *****
" 81 ADD COMMENT=====
"      3 Lines of comment
"      *****
"      5 YEAR STORM EVENT
"      *****
" 32 STORM Chicago storm
"      1 Chicago storm
"      1755.000 Coefficient A
"      12.347 Constant B
"      0.895 Exponent C
"      0.400 Fraction R
"      180.000 Duration
"      1.000 Time step multiplier
"      Maximum intensity      136.512 mm/hr
"      Total depth      47.549 mm
"      6 005hyd Hydrograph extension used in this file
" 81 ADD COMMENT=====
"      3 Lines of comment
"      -----
"      CATCHMENT 1 - ASPHALT AREA
"      -----
" 33 CATCHMENT 1
"      1 Triangular SCS
"      1 Equal length
"      1 SCS method
"      1 ID number
"      100.000 % Impervious
"      0.059 Total Area
"      13.000 Flow length
"      1.500 Overland Slope
"      0.000 Pervious Area
"      13.000 Pervious length
"      1.500 Pervious slope
"      0.059 Impervious Area
"      13.000 Impervious length
"      1.500 Impervious slope
"      0.250 Pervious Manning 'n'
"      75.000 Pervious SCS Curve No.
"      0.260 Pervious Runoff coefficient
"      0.100 Pervious Ia/S coefficient
"      8.467 Pervious Initial abstraction
"      0.015 Impervious Manning 'n'
"      98.000 Impervious SCS Curve No.
"      0.891 Impervious Runoff coefficient
"      0.100 Impervious Ia/S coefficient
"      0.518 Impervious Initial abstraction
"      0.018 0.000 0.000 0.000 c.m/sec
"      Catchment 1 Pervious Impervious Total Area "
"      Surface Area 0.000 0.059 0.059 hectare
"      Time of concentration 12.694 1.317 1.317 minutes

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*      Time to Centroid      113.402      87.666      87.666      minutes"
*      Rainfall depth        47.549      47.549      47.549      mm"
*      Rainfall volume        0.00      28.05      28.05      c.m"
*      Rainfall losses        35.253      5.938      5.938      mm"
*      Runoff depth           12.296      41.611      41.611      mm"
*      Runoff volume           0.00      24.55      24.55      c.m"
*      Maximum flow           0.000      0.018      0.018      c.m/sec"
* 40      HYDROGRAPH Add Runoff "
*      4      Add Runoff "
*              0.018      0.018      0.000      0.000"
* 81      ADD COMMENT=====
*      3      Lines of comment"
*              -----
*      CATCHMENT 2 - BUILDING AREA"
*              -----
* 33      CATCHMENT 2"
*      1      Triangular SCS"
*      1      Equal length"
*      1      SCS method"
*      2      ID number"
*      100.000 % Impervious"
*      0.033 Total Area"
*      11.000 Flow length"
*      1.000 Overland Slope"
*      0.000 Pervious Area"
*      11.000 Pervious length"
*      1.000 Pervious slope"
*      0.033 Impervious Area"
*      11.000 Impervious length"
*      1.000 Impervious slope"
*      0.250 Pervious Manning 'n'"
*      75.000 Pervious SCS Curve No."
*      0.260 Pervious Runoff coefficient"
*      0.100 Pervious Ia/S coefficient"
*      8.467 Pervious Initial abstraction"
*      0.015 Impervious Manning 'n'"
*      98.000 Impervious SCS Curve No."
*      0.891 Impervious Runoff coefficient"
*      0.100 Impervious Ia/S coefficient"
*      0.518 Impervious Initial abstraction"
*              0.010      0.018      0.000      0.000 c.m/sec"
*      Catchment 2      Pervious      Impervious      Total Area "
*      Surface Area      0.000      0.033      0.033      hectare"
*      Time of concentration 12.969      1.346      1.346      minutes"
*      Time to Centroid  113.730      87.698      87.698      minutes"
*      Rainfall depth      47.549      47.549      47.549      mm"
*      Rainfall volume      0.00      15.69      15.69      c.m"
*      Rainfall losses      35.258      5.906      5.906      mm"
*      Runoff depth         12.291      41.643      41.643      mm"
*      Runoff volume         0.00      13.74      13.74      c.m"
*      Maximum flow         0.000      0.010      0.010      c.m/sec"
* 40      HYDROGRAPH Add Runoff "
*      4      Add Runoff "
*              0.010      0.029      0.000      0.000"
* 81      ADD COMMENT=====
*      3      Lines of comment"
*              -----
*      CATCHMENT 3 - GRASS AREA"
*              -----
* 33      CATCHMENT 3"
*      1      Triangular SCS"
*      1      Equal length"
*      1      SCS method"
*      3      ID number"
*      0.000 % Impervious"
*      0.464 Total Area"
*      40.000 Flow length"
*      2.500 Overland Slope"
*      0.464 Pervious Area"
*      40.000 Pervious length"
*      2.500 Pervious slope"

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"      0.000 Impervious Area"
"      40.000 Impervious length"
"      2.500 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      75.000 Pervious SCS Curve No."
"      0.260 Pervious Runoff coefficient"
"      0.100 Pervious Ia/S coefficient"
"      8.467 Pervious Initial abstraction"
"      0.015 Impervious Manning 'n'"
"      98.000 Impervious SCS Curve No."
"      0.891 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"      0.019      0.029      0.000      0.000 c.m/sec"
"      Catchment 3      Pervious      Impervious Total Area "
"      Surface Area      0.464      0.000      0.464      hectare"
"      Time of concentration      21.376      2.218      21.375      minutes"
"      Time to Centroid      123.966      88.947      123.966      minutes"
"      Rainfall depth      47.549      47.549      47.549      mm"
"      Rainfall volume      220.63      0.00      220.63      c.m"
"      Rainfall losses      35.217      5.845      35.217      mm"
"      Runoff depth      12.332      41.704      12.332      mm"
"      Runoff volume      57.22      0.00      57.22      c.m"
"      Maximum flow      0.019      0.000      0.019      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4      Add Runoff "
"      0.019      0.030      0.000      0.000"
" 54      POND DESIGN"
"      0.030      Current peak flow      c.m/sec"
"      96.0      Hydrograph volume      c.m/sec"
"      9.      Number of stages"
"      335.610      Minimum water level      c.m/sec"
"      337.590      Maximum water level      c.m/sec"
"      0      Keep Design Data: 1 = True; 0 = False"
"      Level Discharge      Volume"
"      335.610      0.000      0.0"
"      337.240      0.006      4.0"
"      337.290      0.006      5.1"
"      337.340      0.006      10.2"
"      337.390      0.006      24.8"
"      337.440      0.006      47.2"
"      337.490      0.006      71.8"
"      337.540      0.006      98.6"
"      337.590      0.221      127.4"
"      1.      WEIRS"
"      Crest      Weir      Crest      Left      Right"
"      elevation coeffie breadth sideslope sideslope"
"      337.540      0.900      12.500      0.000      0.000"
"      1.      ORIFICES"
"      Orifice      Orifice      Orifice Number of"
"      invert coeffie diameter orifices"
"      335.610      0.630      0.046      1.000"
"      Peak outflow      0.006      c.m/sec"
"      Maximum level      337.445      metre"
"      Maximum storage      49.785      c.m"
"      Centroidal lag      3.204      hours"
"      0.019      0.030      0.006      0.000 c.m/sec"
" 40      HYDROGRAPH Next link "
"      5      Next link "
"      0.019      0.006      0.006      0.000"
" 81      ADD COMMENT=====
"      3      Lines of comment"
"      -----
"      CATCHMENT 4 - Uncontrolled GRAVEL AREA"
"      -----
" 33      CATCHMENT 4"
"      1      Triangular SCS"
"      1      Equal length"
"      1      SCS method"
"      4      ID number"
"      0.000      % Impervious"

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"      0.062  Total Area"
"      20.000  Flow length"
"      1.100  Overland Slope"
"      0.062  Pervious Area"
"      20.000  Pervious length"
"      1.100  Pervious slope"
"      0.000  Impervious Area"
"      20.000  Impervious length"
"      1.100  Impervious slope"
"      0.250  Pervious Manning 'n'"
"      85.000  Pervious SCS Curve No."
"      0.444  Pervious Runoff coefficient"
"      0.100  Pervious Ia/S coefficient"
"      4.482  Pervious Initial abstraction"
"      0.015  Impervious Manning 'n'"
"      98.000  Impervious SCS Curve No."
"      0.900  Impervious Runoff coefficient"
"      0.100  Impervious Ia/S coefficient"
"      0.520  Impervious Initial abstraction"
"      0.006  0.006  0.006  0.000 c.m/sec"
"      Catchment 4      Pervious  Impervious Total Area "
"      Surface Area      0.062  0.000  0.062  hectare"
"      Time of concentration 13.725  1.872  13.725  minutes"
"      Time to Centroid 111.863  88.457  111.863  minutes"
"      Rainfall depth 47.549  47.549  47.549  mm"
"      Rainfall volume 29.48  0.00  29.48  c.m"
"      Rainfall losses 26.520  5.776  26.520  mm"
"      Runoff depth 21.029  41.773  21.029  mm"
"      Runoff volume 13.04  0.00  13.04  c.m"
"      Maximum flow 0.006  0.000  0.006  c.m/sec"
* 40  HYDROGRAPH Add Runoff "
*      4  Add Runoff "
*      0.006  0.012  0.006  0.000"
* 81  ADD COMMENT=====
*      3  Lines of comment"
*      -----
*      CATCHMENT 5 - Uncontrolled ASPHALT AREA"
*      -----
* 33  CATCHMENT 5"
"      1  Triangular SCS"
"      1  Equal length"
"      1  SCS method"
"      5  ID number"
"      100.000  % Impervious"
"      0.129  Total Area"
"      50.000  Flow length"
"      1.000  Overland Slope"
"      0.000  Pervious Area"
"      50.000  Pervious length"
"      1.000  Pervious slope"
"      0.129  Impervious Area"
"      50.000  Impervious length"
"      1.000  Impervious slope"
"      0.250  Pervious Manning 'n'"
"      75.000  Pervious SCS Curve No."
"      0.260  Pervious Runoff coefficient"
"      0.100  Pervious Ia/S coefficient"
"      8.467  Pervious Initial abstraction"
"      0.015  Impervious Manning 'n'"
"      98.000  Impervious SCS Curve No."
"      0.891  Impervious Runoff coefficient"
"      0.100  Impervious Ia/S coefficient"
"      0.518  Impervious Initial abstraction"
"      0.035  0.012  0.006  0.000 c.m/sec"
"      Catchment 5      Pervious  Impervious Total Area "
"      Surface Area      0.000  0.129  0.129  hectare"
"      Time of concentration 32.170  3.339  3.339  minutes"
"      Time to Centroid 137.151  90.690  90.690  minutes"
"      Rainfall depth 47.549  47.549  47.549  mm"
"      Rainfall volume 0.00  61.34  61.34  c.m"
"      Rainfall losses 35.220  5.988  5.988  mm"

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"      Runoff depth      12.329      41.561      41.561      mm"
"      Runoff volume      0.00      53.61      53.61      c.m"
"      Maximum flow      0.000      0.035      0.035      c.m/sec"
" 40  HYDROGRAPH Add Runoff "
"      4  Add Runoff "
"          0.035      0.045      0.006      0.000"
" 81  ADD COMMENT=====
"      3  Lines of comment"
"          -----
"          CATCHMENT 6 - Uncontrolled BUILDING AREA"
"          -----
" 33  CATCHMENT 6"
"      1  Triangular SCS"
"      1  Equal length"
"      1  SCS method"
"      6  ID number"
" 100.000 % Impervious"
"      0.037 Total Area"
"      15.000 Flow length"
"      1.000 Overland Slope"
"      0.000 Pervious Area"
"      15.000 Pervious length"
"      1.000 Pervious slope"
"      0.037 Impervious Area"
"      15.000 Impervious length"
"      1.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      75.000 Pervious SCS Curve No."
"      0.260 Pervious Runoff coefficient"
"      0.100 Pervious Ia/S coefficient"
"      8.467 Pervious Initial abstraction"
"      0.015 Impervious Manning 'n'"
"      98.000 Impervious SCS Curve No."
"      0.891 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"          0.011      0.045      0.006      0.000 c.m/sec"
"      Catchment 6      Pervious      Impervious Total Area "
"      Surface Area      0.000      0.037      0.037      hectare"
"      Time of concentration      15.621      1.621      1.621      minutes"
"      Time to Centroid      116.961      88.048      88.048      minutes"
"      Rainfall depth      47.549      47.549      47.549      mm"
"      Rainfall volume      0.00      17.59      17.59      c.m"
"      Rainfall losses      35.232      5.754      5.754      mm"
"      Runoff depth      12.318      41.795      41.795      mm"
"      Runoff volume      0.00      15.46      15.46      c.m"
"      Maximum flow      0.000      0.011      0.011      c.m/sec"
" 40  HYDROGRAPH Add Runoff "
"      4  Add Runoff "
"          0.011      0.053      0.006      0.000"
" 81  ADD COMMENT=====
"      3  Lines of comment"
"          -----
"          CATCHMENT 7 - Uncontrolled GRASS AREA"
"          -----
" 33  CATCHMENT 7"
"      1  Triangular SCS"
"      1  Equal length"
"      1  SCS method"
"      7  ID number"
"      0.000 % Impervious"
"      0.430 Total Area"
"      60.000 Flow length"
"      1.500 Overland Slope"
"      0.430 Pervious Area"
"      60.000 Pervious length"
"      1.500 Pervious slope"
"      0.000 Impervious Area"
"      60.000 Impervious length"
"      1.500 Impervious slope"
"      0.250 Pervious Manning 'n'"

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"      75.000  Pervious SCS Curve No."
"      0.260  Pervious Runoff coefficient"
"      0.100  Pervious Ia/S coefficient"
"      8.467  Pervious Initial abstraction"
"      0.015  Impervious Manning 'n'"
"      98.000  Impervious SCS Curve No."
"      0.891  Impervious Runoff coefficient"
"      0.100  Impervious Ia/S coefficient"
"      0.518  Impervious Initial abstraction"
"          0.013      0.053      0.006      0.000 c.m/sec"
"      Catchment 7      Pervious      Impervious      Total Area "
"      Surface Area      0.430      0.000      0.430      hectare"
"      Time of concentration      31.778      3.298      31.778      minutes"
"      Time to Centroid      136.674      90.624      136.674      minutes"
"      Rainfall depth      47.549      47.549      47.549      mm"
"      Rainfall volume      204.46      0.00      204.46      c.m"
"      Rainfall losses      35.220      5.978      35.220      mm"
"      Runoff depth      12.329      41.571      12.329      mm"
"      Runoff volume      53.01      0.00      53.01      c.m"
"      Maximum flow      0.013      0.000      0.013      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4      Add Runoff "
"          0.013      0.056      0.006      0.000"
"      6      00Shyd Hydrograph extension used in this file"
" 19      EXIT"

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"      MIDUSS 98 Output----->"
"      MIDUSS 98 version number                      1.00"
"      MIDUSS 98 created                          June 17, 2000"
"      10      Units used:                          ie METRIC"
"      Project filename:                          Q:\1758\"
"      Output filename:                          alt1-post100.out"
"      Licensee name:                          MTE Consultants Inc."
"      Company                          MTE Consultants Inc."
"      Date & Time last used:                    10/25/2000 at 15:15:08"
" 31      TIME PARAMETERS"
"      5.000      Time Step"
"      180.000      Max. Storm length"
"      1500.000      Max. Hydrograph"
" 81      ADD COMMENT-----"
"      6      Lines of comment"
"      *****"
"      CHRIST LUTHERAN CHURCH"
"      445 ANNDALE ROAD"
"      "
"      POST-DEVELOPMENT CONDITION"
"      *****"
" 81      ADD COMMENT-----"
"      3      Lines of comment"
"      *****"
"      100 YEAR STORM EVENT"
"      *****"
" 32      STORM Chicago storm"
"      1      Chicago storm"
"      4692.000      Coefficient A"
"      17.437      Constant B"
"      0.956      Exponent C"
"      0.400      Fraction R"
"      180.000      Duration"
"      1.000      Time step multiplier"
"      Maximum intensity          239.793      mm/hr"
"      Total depth          89.960      mm"
"      6      005hyd Hydrograph extension used in this file"
" 81      ADD COMMENT-----"
"      3      Lines of comment"
"      -----"
"      CATCHMENT 1 - ASPHALT AREA"
"      -----"
" 33      CATCHMENT 1"
"      1      Triangular SCS"
"      1      Equal length"
"      1      SCS method"
"      1      ID number"
"      100.000      % Impervious"
"      0.059      Total Area"
"      13.000      Flow length"
"      1.500      Overland Slope"
"      0.000      Pervious Area"
"      13.000      Pervious length"
"      1.500      Pervious slope"
"      0.059      Impervious Area"
"      13.000      Impervious length"
"      1.500      Impervious slope"
"      0.250      Pervious Manning 'n'"
"      75.000      Pervious SCS Curve No."
"      0.260      Pervious Runoff coefficient"
"      0.100      Pervious Ia/S coefficient"
"      8.467      Pervious Initial abstraction"
"      0.015      Impervious Manning 'n'"
"      98.000      Impervious SCS Curve No."
"      0.891      Impervious Runoff coefficient"
"      0.100      Impervious Ia/S coefficient"
"      0.518      Impervious Initial abstraction"
"      0.034      0.000      0.000      0.000 c.m/sec"
"      Catchment 1      Pervious      Impervious Total Area *
"      Surface Area      0.000      0.059      0.059      hectare"
"      Time of concentration      7.710      1.039      1.039      minutes"

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"      Time to Centroid      102.851      85.526      85.527      minutes"
"      Rainfall depth        89.960      89.960      89.960      mm"
"      Rainfall volume        0.00       53.08       53.08       c.m"
"      Rainfall losses        50.143      7.939       7.939       mm"
"      Runoff depth           39.817      82.021      82.021      mm"
"      Runoff volume           0.00       48.39       48.39       c.m"
"      Maximum flow           0.000      0.034       0.034       c.m/sec"
" 40  HYDROGRAPH Add Runoff "
"      4  Add Runoff "
"          0.034      0.034      0.000      0.000"
" 81  ADD COMMENT=====
"      3  Lines of comment"
"          -----
"          CATCHMENT 2 - BUILDING AREA"
"          -----
" 33  CATCHMENT 2"
"      1  Triangular SCS"
"      1  Equal length"
"      1  SCS method"
"      2  ID number"
" 100.000 % Impervious"
"      0.033 Total Area"
"      11.000 Flow length"
"      1.000 Overland Slope"
"      0.000 Pervious Area"
"      11.000 Pervious length"
"      1.000 Pervious slope"
"      0.033 Impervious Area"
"      11.000 Impervious length"
"      1.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
" 75.000 Pervious SCS Curve No."
"      0.260 Pervious Runoff coefficient"
"      0.100 Pervious Ia/S coefficient"
"      8.467 Pervious Initial abstraction"
"      0.015 Impervious Manning 'n'"
" 98.000 Impervious SCS Curve No."
"      0.891 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"          0.019      0.034      0.000      0.000 c.m/sec"
"      Catchment 2      Pervious      Impervious      Total Area "
"      Surface Area      0.000      0.033      0.033      hectare"
"      Time of concentration 7.877      1.061      1.061      minutes"
"      Time to Centroid    103.068      85.556      85.556      minutes"
"      Rainfall depth      89.960      89.960      89.960      mm"
"      Rainfall volume      0.00       29.69      29.69      c.m"
"      Rainfall losses      50.120      7.807      7.807      mm"
"      Runoff depth         39.840      82.153      82.153      mm"
"      Runoff volume         0.00       27.11      27.11      c.m"
"      Maximum flow         0.000      0.019      0.019      c.m/sec"
" 40  HYDROGRAPH Add Runoff "
"      4  Add Runoff "
"          0.019      0.053      0.000      0.000"
" 81  ADD COMMENT=====
"      3  Lines of comment"
"          -----
"          CATCHMENT 3 - GRASS AREA"
"          -----
" 33  CATCHMENT 3"
"      1  Triangular SCS"
"      1  Equal length"
"      1  SCS method"
"      3  ID number"
"      0.000 % Impervious"
"      0.464 Total Area"
"      40.000 Flow length"
"      2.500 Overland Slope"
"      0.464 Pervious Area"
"      40.000 Pervious length"
"      2.500 Pervious slope"

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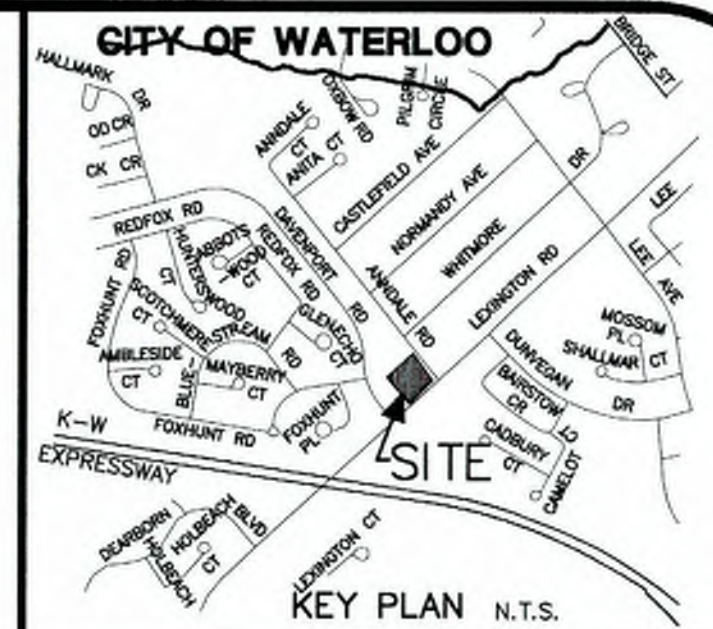
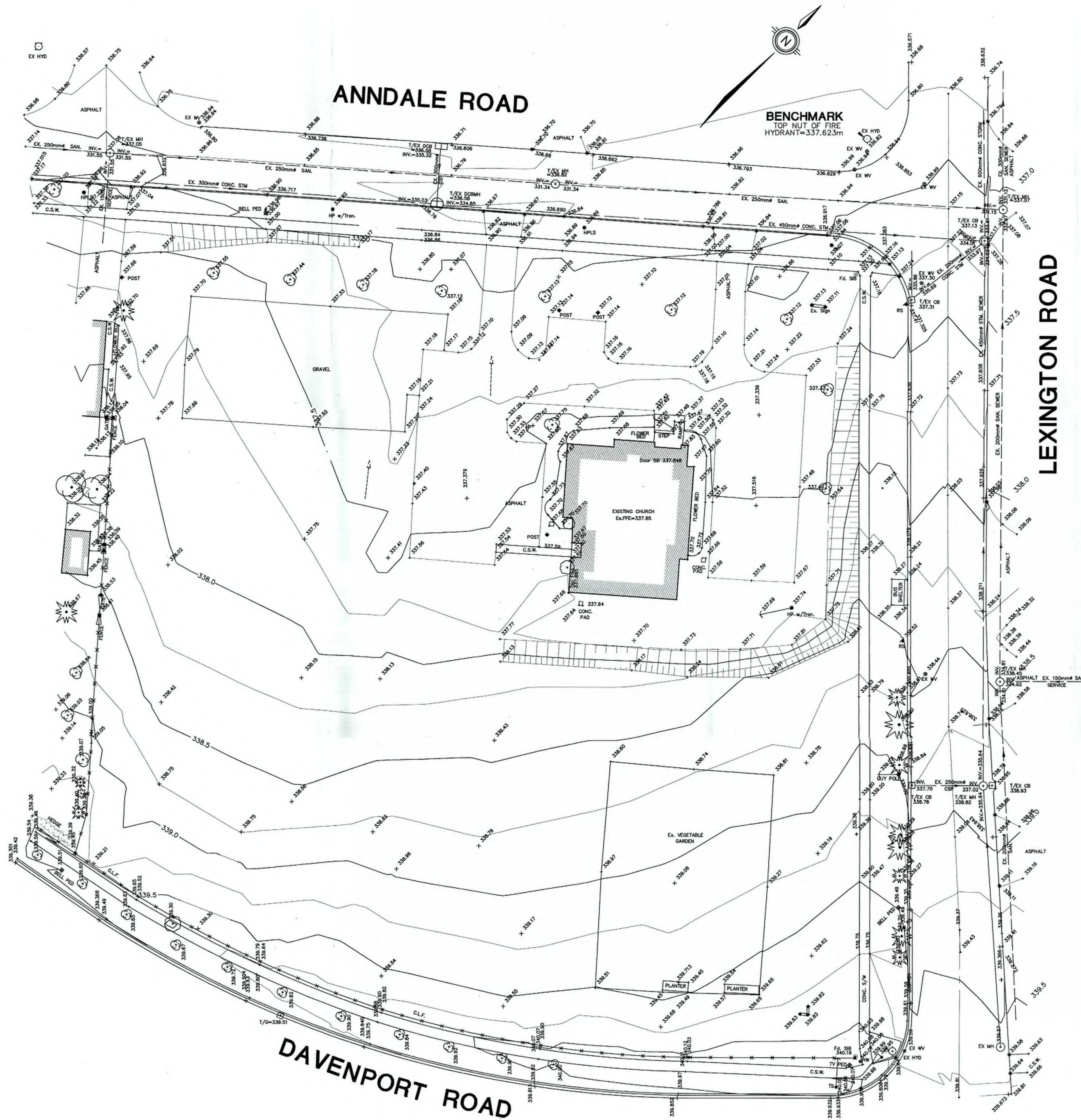
*      0.000 Impervious Area"
*      40.000 Impervious length"
*      2.500 Impervious slope"
*      0.250 Pervious Manning 'n'"
*      75.000 Pervious SCS Curve No."
*      0.260 Pervious Runoff coefficient"
*      0.100 Pervious Ia/S coefficient"
*      8.467 Pervious Initial abstraction"
*      0.015 Impervious Manning 'n'"
*      98.000 Impervious SCS Curve No."
*      0.891 Impervious Runoff coefficient"
*      0.100 Impervious Ia/S coefficient"
*      0.518 Impervious Initial abstraction"
*      0.084 0.053 0.000 0.000 c.m/sec"
*      Catchment 3 Pervious Impervious Total Area "
*      Surface Area 0.464 0.000 0.464 hectare"
*      Time of concentration 12.984 1.749 12.984 minutes"
*      Time to Centroid 109.436 86.436 109.436 minutes"
*      Rainfall depth 89.960 89.960 89.960 mm"
*      Rainfall volume 417.41 0.00 417.41 c.m"
*      Rainfall losses 50.134 6.495 50.134 mm"
*      Runoff depth 39.826 83.465 39.826 mm"
*      Runoff volume 184.79 0.00 184.79 c.m"
*      Maximum flow 0.084 0.000 0.084 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"      0.084 0.105 0.000 0.000"
" 54 POND DESIGN"
*      0.105 Current peak flow c.m/sec"
*      270.0 Hydrograph volume c.m/sec"
*      9. Number of stages"
*      335.610 Minimum water level c.n/sec"
*      337.590 Maximum water level c.n/sec"
*      0 Keep Design Data: 1 = True; 0 = False"
*      Level Discharge Volume"
*      335.610 0.000 0.0"
*      337.240 0.006 4.0"
*      337.290 0.006 5.1"
*      337.340 0.006 10.2"
*      337.390 0.006 24.8"
*      337.440 0.006 47.2"
*      337.490 0.006 71.8"
*      337.540 0.006 98.6"
*      337.590 0.221 127.4"
*      1. WEIRS"
*      Crest Weir Crest Left Right"
*      elevation coefficie breadth sideslope sideslope"
*      337.540 0.900 12.500 0.000 0.000"
*      1. ORIFICES"
*      Orifice Orifice Orifice Number of"
*      invert coefficie diameter orifices"
*      335.610 0.630 0.046 1.000"
*      Peak outflow 0.082 c.m/sec"
*      Maximum level 337.558 metre"
*      Maximum storage 108.787 c.m"
*      Centroidal lag 3.378 hours"
*      0.084 0.105 0.082 0.000 c.m/sec"
" 40 HYDROGRAPH Next link "
"      5 Next link "
"      0.084 0.082 0.082 0.000"
" 81 ADD COMMENT=====
"      3 Lines of comment"
"      -----
"      CATCHMENT 4 - Uncontrolled GRAVEL AREA"
"      -----
" 33 CATCHMENT 4"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      4 ID number"
"      0.000 % Impervious"

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*      75.000  Pervious SCS Curve No."
*      0.260  Pervious Runoff coefficient"
*      0.100  Pervious Ia/S coefficient"
*      8.467  Pervious Initial abstraction"
*      0.015  Impervious Manning 'n'"
*      98.000  Impervious SCS Curve No."
*      0.891  Impervious Runoff coefficient"
*      0.100  Impervious Ia/S coefficient"
*      0.518  Impervious Initial abstraction"
*      0.063    0.113    0.082    0.000 c.m/sec"
*      Catchment 7      Pervious  Impervious  Total Area  "
*      Surface Area      0.430      0.000      0.430      hectare"
*      Time of concentration 19.302      2.600      19.302      minutes"
*      Time to Centroid    117.332      87.695      117.332      minutes"
*      Rainfall depth      89.960      89.960      89.960      mm"
*      Rainfall volume     386.83      0.00      386.83      c.m"
*      Rainfall losses     50.086      7.089      50.086      mm"
*      Runoff depth        39.874      82.871      39.874      mm"
*      Runoff volume       171.46      0.00      171.46      c.m"
*      Maximum flow        0.063      0.000      0.063      c.m/sec"
" 40  HYDROGRAPH Add Runoff "
*      4  Add Runoff "
*      0.063    0.175    0.082    0.000"
*      6  005hyd  Hydrograph extension used in this file"
" 19  EXIT"

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NOTE TO CONTRACTOR :
DO NOT SCALE DRAWINGS.
CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.
ALL DRAWINGS REMAIN THE PROPERTY OF THE ENGINEER AND SHALL NOT BE REPRODUCED OR REUSED WITHOUT THE ENGINEER'S WRITTEN PERMISSION.
DO NOT USE THIS DRAWING FOR CONSTRUCTION UNLESS SIGNED AND DATED BY THE ENGINEER'S OFFICE.

DATE _____

THE OWNER/ARCHITECT/CONTRACTOR IS ADVISED THAT M.T.E. CONSULTANTS INC. CANNOT CERTIFY ANY COMPONENT OF THE SITE WORKS NOT INSPECTED DURING CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO NOTIFY M.T.E. CONSULTANTS INC. PRIOR TO COMMENCEMENT OF CONSTRUCTION TO ARRANGE FOR INSPECTION.

BENCHMARK ELEV. = 331.454
DESCRIPTION
GEODETIC BENCHMARK 030-99-0010
TABLET SET IN S/E CORNER OF CASSWELL AND DEARBORN PLACE IN LINCOLN SUBDIVISION

- LEGEND**
- SITE BOUNDARY
 - x 338.32 EXISTING SPOT ELEVATIONS
 - - - - - EXISTING CONTOURS
 - - - - - EXISTING DIRECTION OF DRAINAGE
 - - - - - STORM SEWERS (EX.)
 - - - - - SANITARY SEWERS (EX.)
 - - - - - EMBANKMENT - (EX.)

6.		
5.		
4.		
3.		
2.		
1.	RELEASED FOR APPROVAL	RCK 00/09/25
No.	REVISION	BY DATE

MTE CONSULTING
civil
engineers
consultants inc.

650 Riverbend Dr., Kitchener Ont., N2K 3S2
Phone (519) 743-6500 Fax (519) 743-6513

RECEIVED
NOV 06 2000
DEVELOPMENT SERVICES

MTE
OCT 16 2000
PRINTED

CLIENT
FREY BUILDING CONTRACTORS
HAWKESVILLE

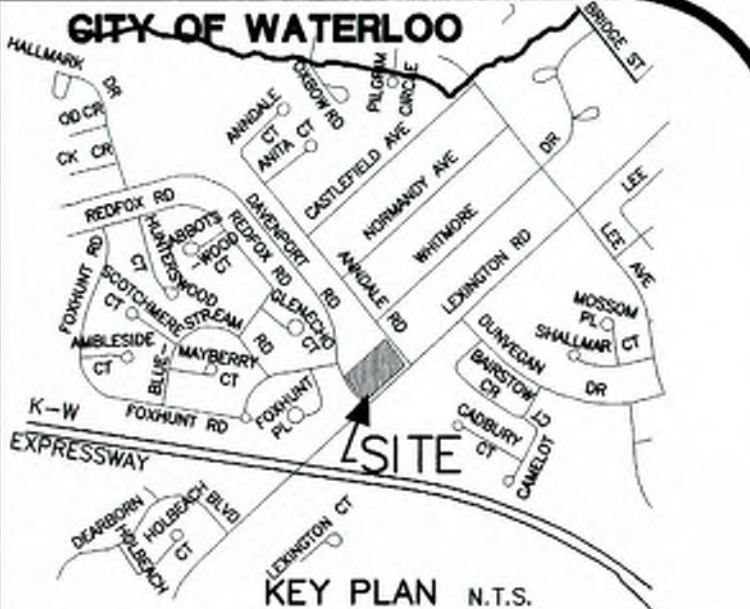
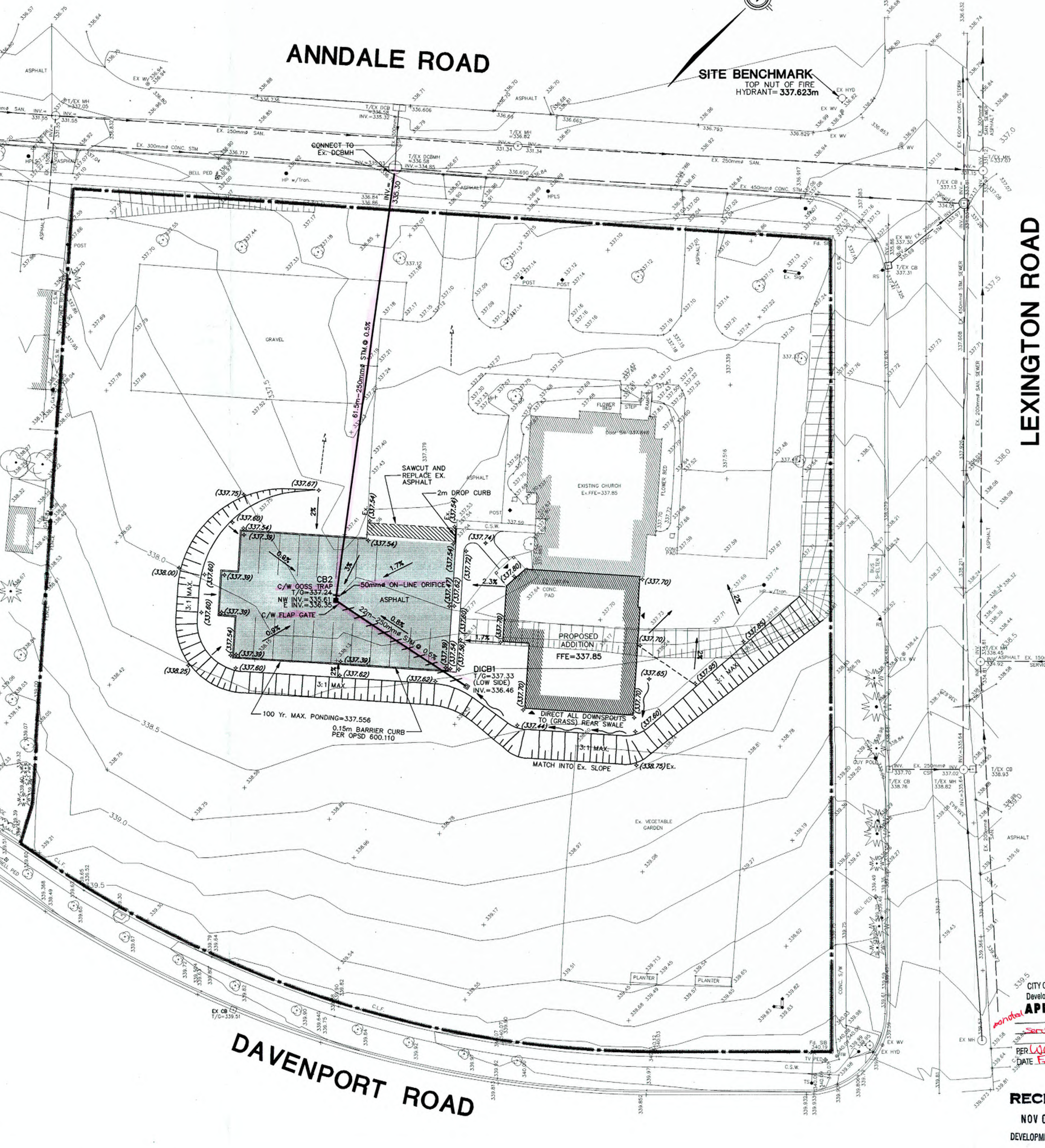
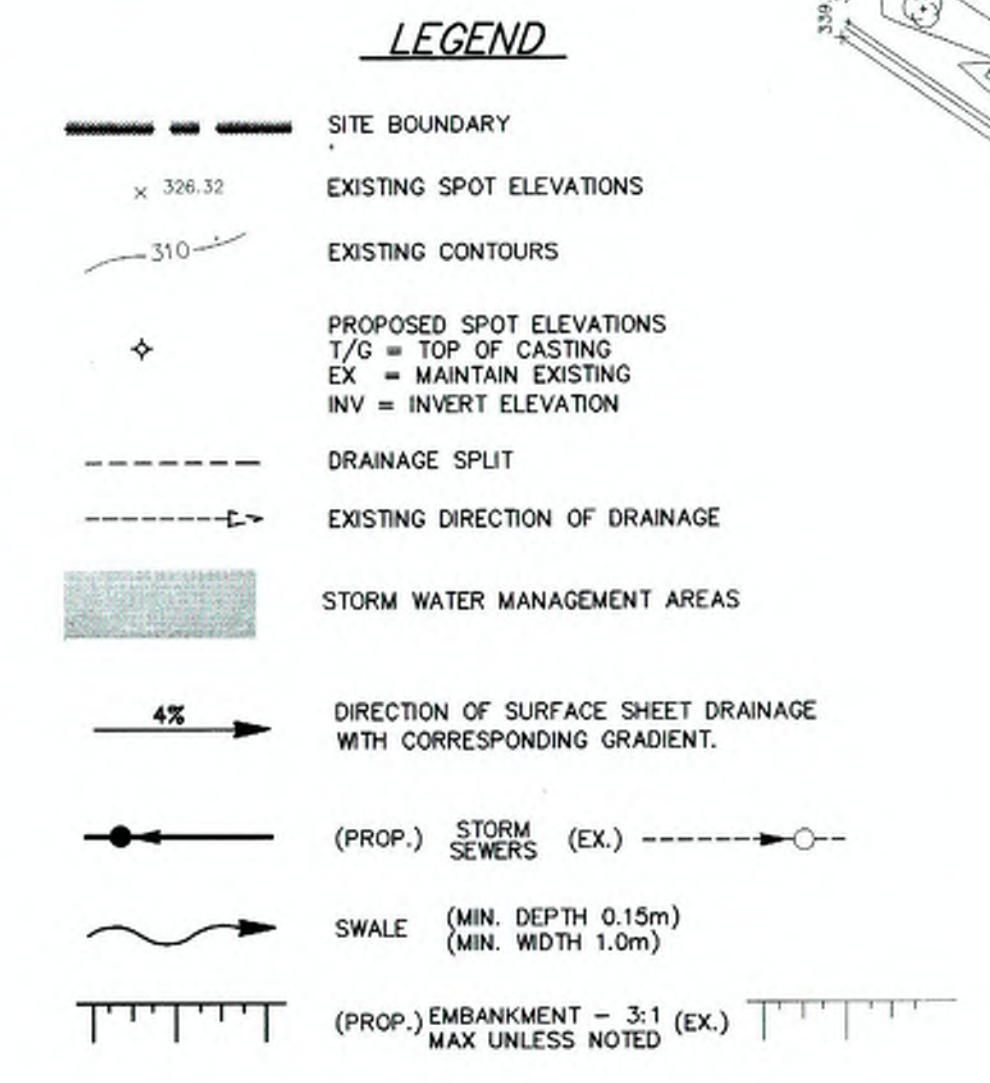
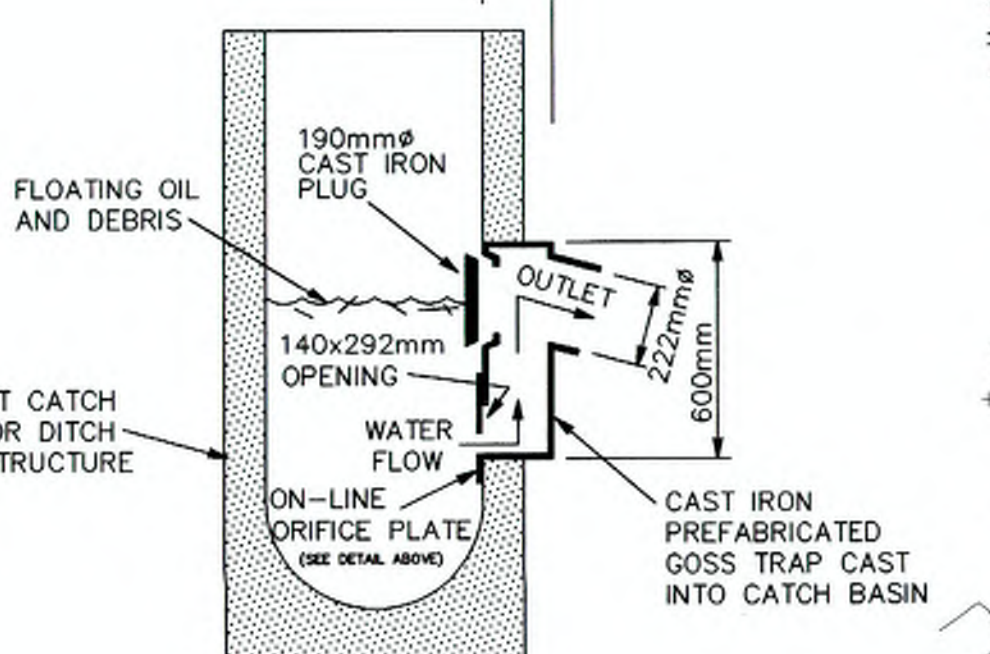
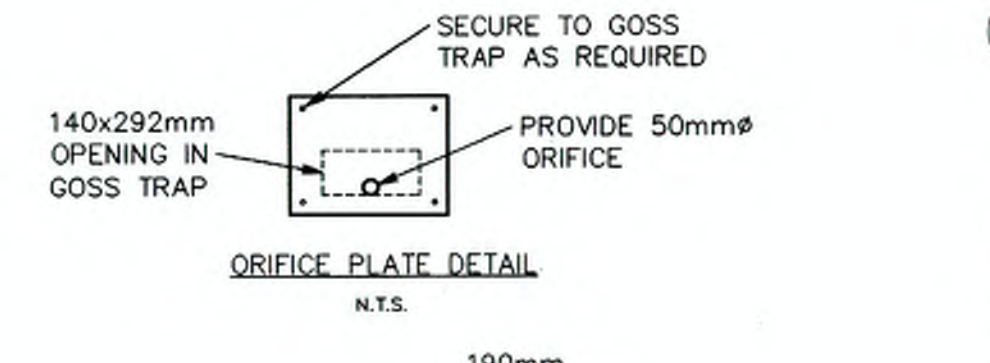
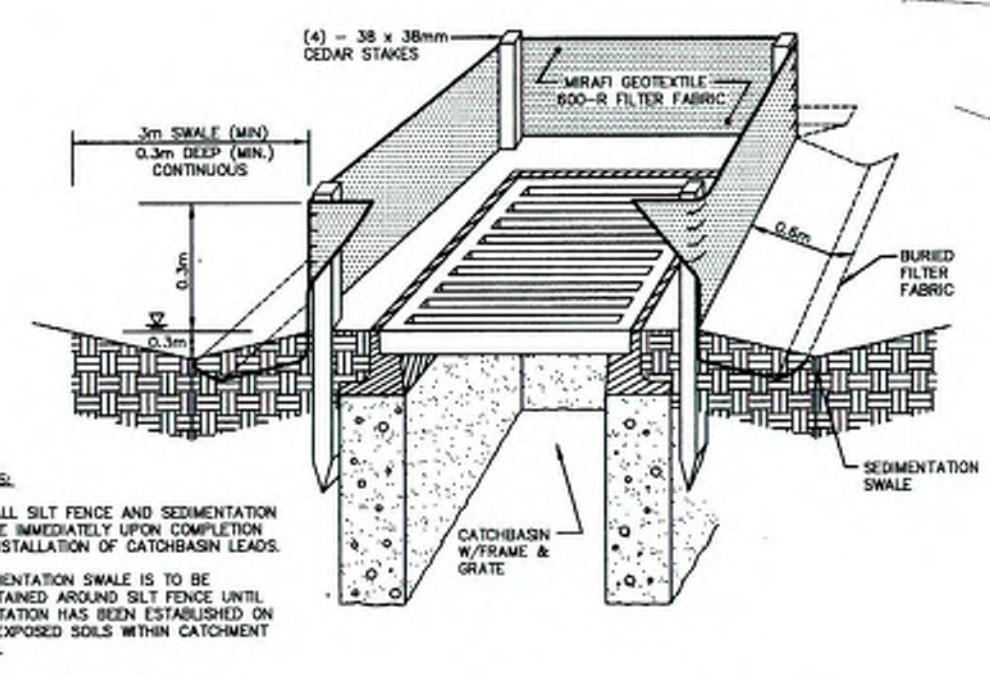
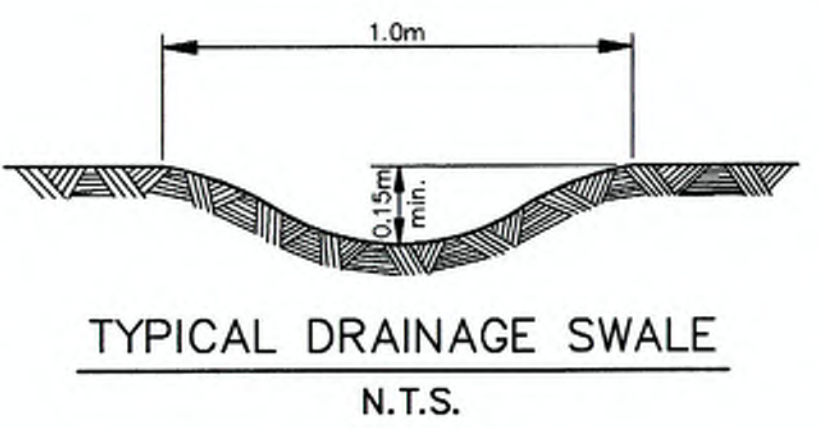
PROJECT
CHRIST LUTHERAN CHURCH
445 ANNDALE ROAD WATERLOO

DRAWING
EXISTING CONDITIONS PLAN

Design By	RCK	Drawn By	BDS
Checked By		Surveyed By	MTE
Date	SEPT 25/00	Drawing No.	1758-801
Job No.	1758-300	Scale	1:300
Scale	1:300	SHEET	1 of 1

CONSTRUCTION NOTES AND SPECIFICATIONS

- 1.0 GENERAL
- THIS PLAN NOT FOR CONSTRUCTION UNTIL SEALED BY ENGINEER AND APPROVED BY THE CITY OF WATERLOO.
 - THIS PLAN IS TO BE USED FOR SERVING AND GRADING ONLY; ANY OTHER INFORMATION SHOWN IS FOR ILLUSTRATION PURPOSES ONLY. THIS PLAN MUST NOT BE USED TO SITE THE PROPOSED BUILDING.
 - NO CHANGES ARE TO BE MADE WITHOUT THE APPROVAL OF THE ENGINEER.
 - THIS PLAN NOT TO BE REPRODUCED IN WHOLE OR IN PART WITHOUT THE PERMISSION OF MTE CONSULTANTS INC.
 - PRIOR TO CONSTRUCTION, THE CONTRACTOR MUST:
 - (1) CHECK AND VERIFY ALL EXISTING CONDITIONS, LOCATIONS AND ELEVATIONS WHICH INCLUDES BUT IS NOT LIMITED TO THE BENCHMARK ELEVATIONS, EXISTING SERVICE CONNECTIONS AND EXISTING INVERTS. REPORT ALL DISCREPANCIES TO THE ENGINEER PRIOR TO PROCEEDING.
 - (2) OBTAIN ALL UTILITY LOCATES AND REQUIRED PERMITS AND LICENSES.
 - (3) VERIFY THAT THE FINISHED FLOOR ELEVATIONS AND BASEMENT FLOOR ELEVATIONS (WHICH MAY APPEAR ON THIS PLAN) COMPLY WITH THE FINAL ARCHITECTURAL DRAWINGS.
 - (4) CONFIRM ALL DRAWINGS USED FOR CONSTRUCTION ARE OF THE MOST RECENT REVISION.
 - THE CONTRACTOR SHALL ASSUME ALL LIABILITY FOR ANY DAMAGE TO EXISTING WORKS.
 - ALL WORKS ON A MUNICIPAL RIGHT-OF-WAY WILL BE INSTALLED BY MUNICIPALITY UPON APPLICATION BY OWNER AT OWNER'S EXPENSE. THE CONTRACTOR IS TO MAKE CONNECTION TO THE SERVICES AND RESTORE ALL AFFECTED PROPERTY TO ORIGINAL CONDITION.
 - ALL UNDERGROUND SERVICES ARE TO BE CONSTRUCTED IN FULL COMPLIANCE WITH THE ONTARIO PROVINCIAL BUILDING CODE (PART 7, PLUMBING), THE ONTARIO PROVINCIAL STANDARD SPECIFICATIONS (OPSS) AND THE REQUIREMENTS OF THE CITY OF WATERLOO AND THE REGIONAL MUNICIPALITY OF WATERLOO, WHICH CODES AND REGULATIONS SHALL SUPERSEDE ALL OTHERS.
 - CONTRACTOR IS RESPONSIBLE FOR CONTACTING ENGINEER PRIOR TO COMMENCING WORK TO ARRANGE FOR INSPECTION, ENGINEER TO DETERMINE DEGREE OF INSPECTION AND TESTING REQUIRED FOR CERTIFICATION OF UNDERGROUND SERVICE INSTALLATION.
 - PLAN TO BE READ IN CONJUNCTION WITH SWM REPORT PREPARED BY MTE CONSULTANTS INC.
 - SITE PLAN INFORMATION TAKEN FROM PLAN PREPARED BY FREY BUILDING, CONTRACTORS DATED JULY 13/00.
 - LEGAL INFORMATION TAKEN FROM PLAN PREPARED BY QUENTER RUBE, DATED JAN. 3/00.
 - EXISTING TOPOGRAPHIC INFORMATION TAKEN FROM PLAN PREPARED BY MTE, DATED SEPT.25/00.
 - FILTER FABRIC TO BE TERRAFIX 200R OR APPROVED EQUIVALENT.
 - MAXIMUM GRASS SLOPE TO BE 3:1. SLOPES GREATER THAN 3:1 TO BE LANDSCAPED WITH LOW MAINTENANCE COVER.
 - THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TRAFFIC AND SAFETY MEASURES DURING THE CONSTRUCTION PERIOD INCLUDING THE SUPPLY, INSTALLATION AND REMOVAL OF ALL NECESSARY SIGNALS, DELINEATORS, MARKERS, AND BARRIERS. ALL SIGNS, ETC. SHALL CONFORM TO THE STANDARDS OF THE LOCAL MUNICIPALITY AND THE MTO MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES.
 - THE POSITION OF POLE LINES, CONDUITS, WATERMANS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.
 - 2.0 STORM SEWERS
 - PIPE BEDDING FOR RIGID PIPE TO BE CLASS "B" AS PER OPSD-802.030. PIPE BEDDING FOR FLEXIBLE PIPE TO BE AS PER OPSD-802.010. BEDDING MATERIAL AND COVER MATERIAL TO BE GRADE "A". TRENCH BACKFILL TO BE NATIVE MATERIAL REPLACED IN 300mm LIFTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY.
 - STORM SEWERS 200mm TO 375mm SHALL BE POLYVINYL CHLORIDE (PVC) PIPE (EX. ASTM D3034 OR REBID PVC SEWER PIPE CSA B182.4-90 ASTM F794 WITH INTEGRAL BELL AND SPIGOT UTILIZING FLEXIBLE ELASTOMERIC SEALS).
 - MANHOLES AND MANHOLE CATCHBASINS TO BE 1200mm DIAMETER PRECAST WITH ALUMINUM STEPS AT 300mm CENTRES AS PER OPSD-701.010.
 - CATCHBASINS TO BE 600mm SQUARE PRECAST AS PER OPSD-705.010.
 - DITCH INLET CATCHBASINS TO BE 600mm SQUARE AS PER OPSD 705.030, WITH 3:1 SLOPE ON GRATE UNLESS OTHERWISE SPECIFIED.
 - CATCHBASIN MANHOLES AND CATCHBASINS TO HAVE A MINIMUM 500mm DEEP SLUMP.
 - MANHOLE AND CATCHBASIN, FRAMES, GRATES, CASTINGS AND LIDS TO BE QUALITY GREY IRON ASTM A48 CLASS 30B.
 - STORM MANHOLE LIDS TO BE PER OPSD 401.01 - TYPE "B" CATCHBASIN GRATES TO BE PER OPSD 400.02.
 - CATCHBASIN GRATES IN LANDSCAPED AREAS TO BE PER OPSD 400.10 DITCH INLET CATCHBASIN GRATES TO BE PER OPSD 403.01.
 - STORM SEWERS AND SERVICES TO HAVE MINIMUM 1.2m COVER. WHERE COVER OVER SERVICES IS DEPENDENT, THE CONTRACTOR SHALL LONGITUUDINALLY CENTER OVER THE PIPE. PLASTICIAN P. D. BELOW GRADE RIGID INSULATION ON APPROVED EQUIVALENT, WITH OVERLAPPING JOINTS. INSULATION TO BE 150mm WIDE AND 75mm THICK.
 - UNDER NO CIRCUMSTANCES SHALL THE BUILDING FOUNDATION DRAINS BE CONNECTED DIRECTLY TO THE STORM SEWER SYSTEM.
 - ALL WEEPING TILE DRAINAGE TO BE PUMPED TO THE STORM SEWER SYSTEM.
 - 3.0 EROSION AND SEDIMENT CONTROL
 - CONTRACTOR TO INSTALL EROSION CONTROL MEASURES AS SHOWN PRIOR TO CONSTRUCTION AND MAINTAIN IN GOOD CONDITION UNTIL CONSTRUCTION IS COMPLETED AND VEGETATIVE COVER IS ESTABLISHED.
 - EROSION CONTROL FENCING TO BE INSTALLED AROUND BASE OF ALL SLOPES.
 - EROSION PROTECTION TO BE PROVIDED AROUND ALL STORM AND SANITARY MANS AND CIB.
 - ADDITIONAL EROSION CONTROL MEASURES MAY BE REQUIRED AS SITE DEVELOPMENT PROGRESSES. CONTRACTOR TO PROVIDE ALL ADDITIONAL EROSION CONTROL STRUCTURES.
 - EROSION CONTROL STRUCTURES TO REMAIN IN PLACE UNTIL ALL DISTURBED GROUND SURFACES HAVE BEEN RESTABILIZED.



NOTE TO CONTRACTOR :
DO NOT SCALE DRAWINGS.
CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.
ALL DRAWINGS REMAIN THE PROPERTY OF THE ENGINEER AND SHALL NOT BE REPRODUCED OR REUSED WITHOUT THE ENGINEER'S WRITTEN PERMISSION.
DO NOT USE THIS DRAWING FOR CONSTRUCTION UNLESS SIGNED AND DATED BY THE ENGINEER'S OFFICE.

DATE _____
THE OWNER/ARCHITECT/CONTRACTOR IS ADVISED THAT M.T.E. CONSULTANTS INC. CANNOT CERTIFY ANY COMPONENT OF THE SITE WORKS NOT INSPECTED DURING CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO NOTIFY M.T.E. CONSULTANTS INC. PRIOR TO COMMENCEMENT OF CONSTRUCTION TO ARRANGE FOR INSPECTION.

BENCHMARK ELEV. = 331.454
DESCRIPTION
GEODETIC BENCHMARK 030-99-0010
TABLET SET IN S/E CORNER OF CASWELL AND DEARBORN PLACE IN LINCOLN SUBDIVISION

NO.	REVISION	BY	DATE
6.			
5.			
4.			
3.			
2.			
1.	ISSUED FOR APPROVAL	RCK	00/10/26
No. REVISION			

MTE CONSULTING CIVIL ENGINEERS
consultants inc.
650 Riverbend Dr., Kitchener Ont., N2K 3S2
Phone (519) 743-6500 Fax (519) 743-6513

PROFESSIONAL ENGINEER
M.T.E. MARTENS
00/10/27
PROVINCE OF ONTARIO

MTE CONSULTANTS INC.
NOV 02 2000
PRINTED

CLIENT: FREY BUILDING CONTRACTORS
3435 BROADWAY STREET HAWKESVILLE

PROJECT: CHRIST LUTHERAN CHURCH
445 ANNDALE ROAD WATERLOO

DRAWING: SITE SERVICING, SWM AND GRADING PLAN

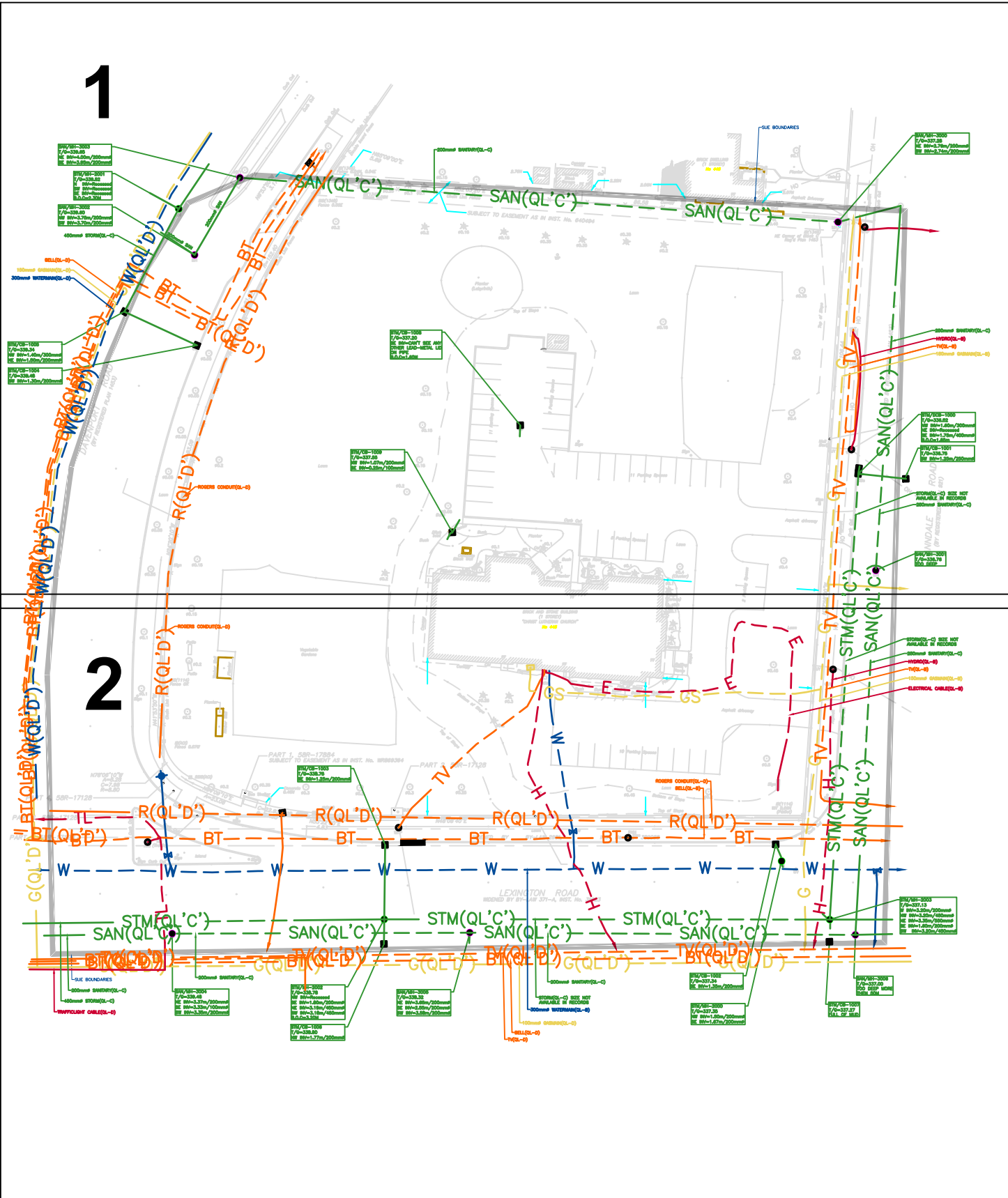
Design By: RCK Drawn By: WSS
Checked By: JEM Surveyed By: MTE
Date: SEPT 25/00 Drawing No.: 1758-201
Job No.: 1758-300
Scale: 1:300 SHEET 1 of 1

APPROVAL
CITY OF WATERLOO
Development Services
APPROVED
PER [Signature]
DATE Feb 2001

RECEIVED
NOV 06 2000
DEVELOPMENT SERVICES

SUE NOTES:

- 1. All inverts are in meters and are taken from the Top of Grate (T/G) or Rim Elevation reference.
- 2. The water and sewers records are old. No update as built drawings were received, and all depicted STM, SAN, and water mains are based on these old records. For this reason, it is highly recommended to perform sonding for the sewers in order to establish and /or confirm connections for mains and laterals.
- 3. No records of service lines were available nor collected. All the depicted service lines included in this composite drawing are based on the geophysical survey only.
- 4. Any data or information from records or outside of the project boundaries and scope of work is provided for information purposes only and has not been verified.
- 5. Overhead Utilities are not included within the scope of work of the SUE Investigation.
- 6. Records for the utility "Hydro" were requested but not received. All depicted hydro lines are based on geophysical survey only
- 7. The size and material descriptions on this drawing are based on record information provided by the utility owners. No testing has been conducted to verify these materials.
- 8. Please see some SUE Investigation challenges and the Technical limitations on sheet #2



KEY MAP

GLOSSARY	
CSE	- CONFINED SPACE ENTRY
SAN	- SANITARY
STM	- STORM
INV	- INVERT
OBV	- OBVERT
BOC	- BOTTOM OF CHAMBER
EORI	- END OF RECORD INFORMATION
AATUR	- UTILITY ABANDONED ACCORDING TO UTILITY RECORDS
EOI	- END OF SURFACE GEOPHYSICAL INFORMATION
TIG	- TOP OF GRATE ELEVATION
ROW	- RIGHT OF WAY
NPS	- NOMINAL PIPE SIZE

FOR: KINDRED WORKS

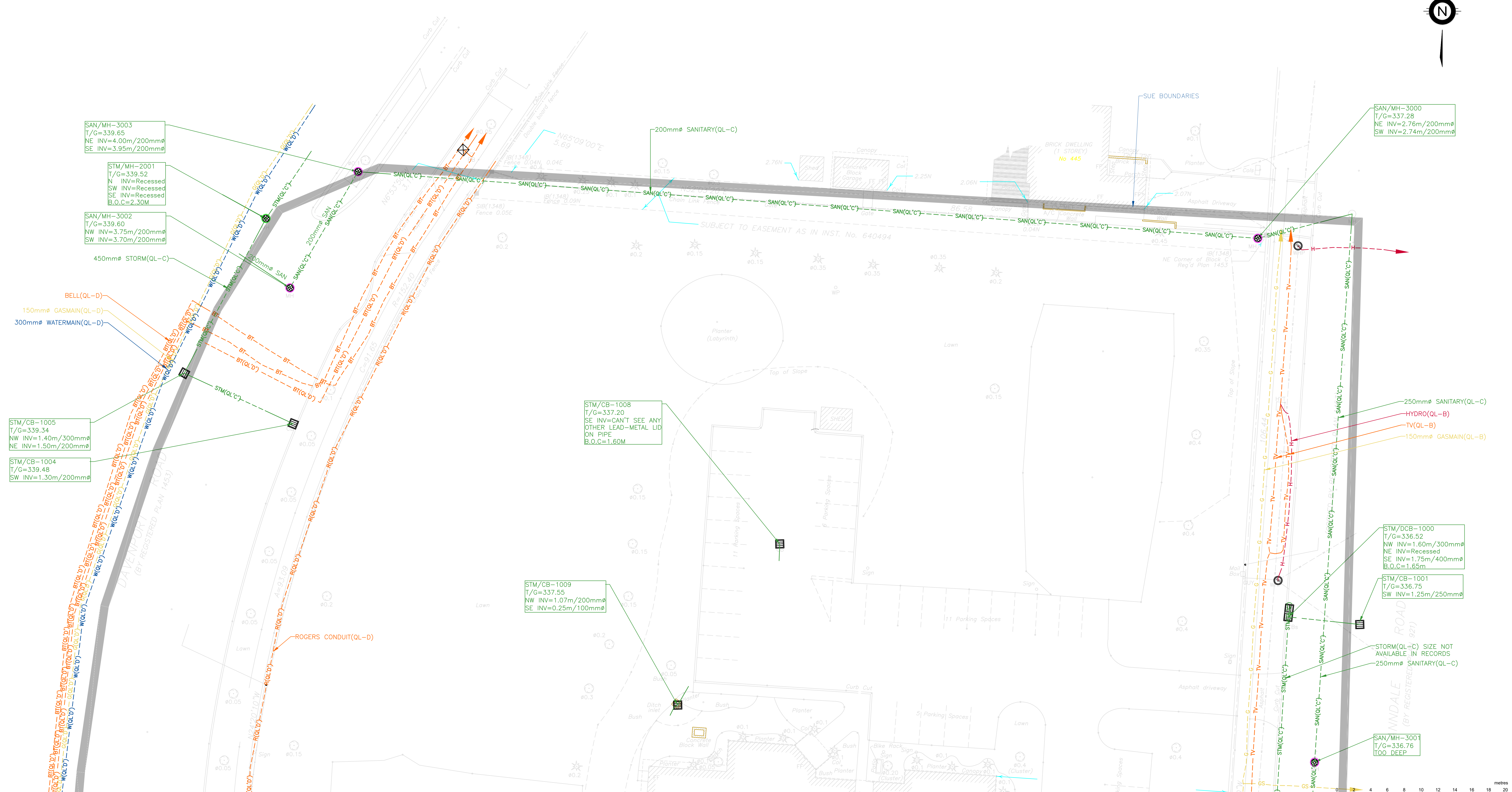
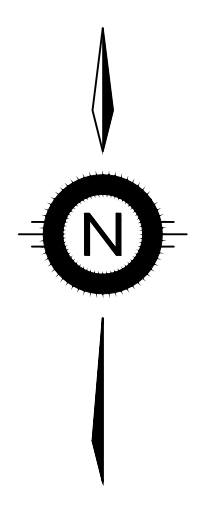
PROJECT NO: 63836

PROJECT NAME: 445 ANNDALE ROAD

DATE: 2025-05-13



Tel: 1-800-363-3116
Email: sales@multiview.ca
www.multiview.ca



Data presented herein is subject to multiVIEW's terms and conditions as listed on the final page of the contract drawings.



SUBSURFACE UTILITY ENGINEERING
HYDRO EXCAVATION & CCTV
CONCRETE SCANNING
UTILITY LOCATES
NEAR-SURFACE GEOPHYSICS

Tel: 1-800-363-3116
Fax: 1-866-571-5946
www.multiVIEW.ca
325 Matheson Blvd East
Mississauga, ON, L4Z1X8

Project No.: 63836
Date: 2025-05-13
Surveyed/Drawn By: FZ/FR
Checked: AD

For: KINDRED WORKS

Site: 445 ANNDAL RD, WATERLOO, ON

Subsurface Utility Engineering C/ASCE 38-02 Quality Levels

QL'A: Visual verification of utility location and depth using excavation methods. i.e. Hydrovac.

QL'B: Utility located using surface geophysical methods i.e. electronically applied or induced magnetic field using specific utility locate equipment or ground penetrating radar.

QL'C: Utility plotted using record information in conjunction with a visual field survey of utility furniture.

QL'D: Utility plotted using record information only. This can include oral recollection.

- GENERAL NOTES**
- This information is provided for design purposes only.
 - All inverts shown on this plan by multiVIEW Locates Inc. are in meters and were measured from the top of the manhole and/or catch basin lids.
 - Subsurface utility information shown on this drawing was obtained on a best effort, best practices basis, within the technical limitations of the instrumentation.
 - Utilities shown on this map by multiVIEW Locates Inc. were located using ASCE 38-02 Quality Level 'B' methods unless otherwise noted. All other information hereon has been supplied by others and is not certified.
 - Third party information provided on these drawings are for the convenience of use but do not constitute information obtained and delivered by multiVIEW Locates Inc. during the course of this project.
 - Elevations represented for this study were obtained by multiVIEW Locates Inc. utilizing datum derived by differential GPS observations and referred to the CAN-NET Reference Network.

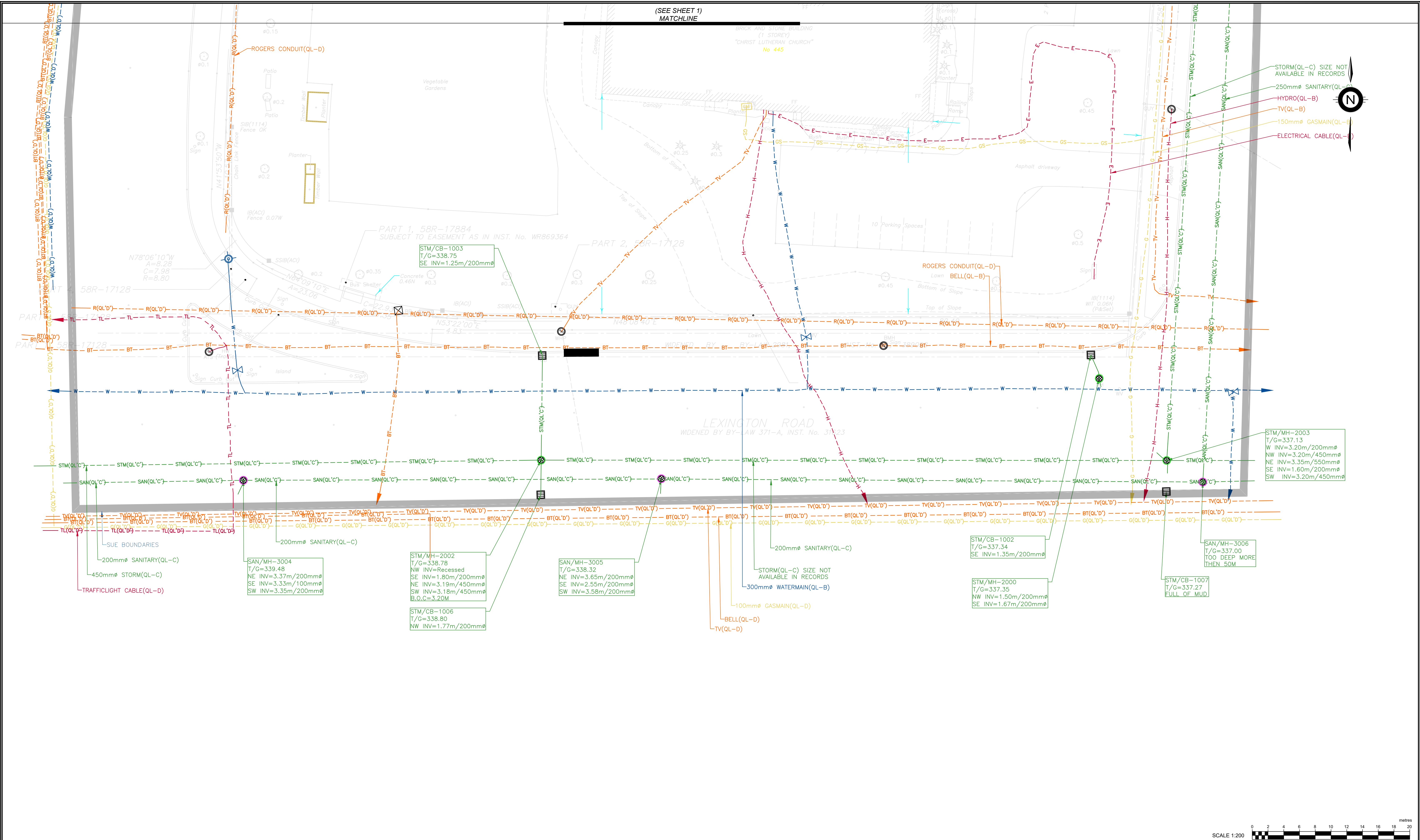
SUE UTILITY CODES & LEGEND

W	Watermain	Q (QL'D)	Gas (QL-D)
G	Gasmain	BT (QL'D)	Bell (QL-D)
BT	Bell	TV (QL'D)	TV (QL-D)
TV	TV Cable	W (QL'D)	Watermain (QL-D)
H	Hydro Cable	R (QL'D)	Rogers (QL-D)
E	Electrical Cable	STM (QL'C)	Storm (QL-C)
TL	Trafficlight Cable	SAN (QL'C)	Sanitary (QL-C)
	Project Boundaries	TL (QL'D)	Trafficlights (QL-D)

	Manhole		Streetlight Pole		Bell/Rogers Ped
	Storm Manhole		Transformer		Flush to Grade
	Sanitary Manhole		Hydro Pole		Water Valve Chamber
	Catch Basin		Trafficlight Pole		Fire Hydrant
	Double Catch Basin		Electrical Box		Water Valve
	Combined Manhole		Guy Pole		Bell Manhole
	Gas Valve		Handwell		
	Gas Meter		Catch Basin Manhole		

ALL UTILITIES DEPICTED ARE AT "QUALITY LEVEL B" UNLESS OTHERWISE NOTED

SHEET 1 of 3					Revision
Rev. No.	Drawn By	Checked By	Date		
01	AD	AD	2025-06-16		UPDATED NOTES.



Data presented herein is subject to multiVIEW's terms and conditions as listed on the final page of the contract drawings.

multi view Insight, not hindsight	THE LOCATION OF UNDERGROUND SERVICES SHOULD BE VERIFIED PRIOR TO EXCAVATION. UTILITY LOCATES ARE REQUIRED PRIOR TO ANY EXCAVATION ACTIVITY SUBSURFACE UTILITY ENGINEERING HYDRO EXCAVATION & CCTV CONCRETE SCANNING UTILITY LOCATES NEAR-SURFACE GEOPHYSICS Tel: 1-800-363-3116 Fax: 1-866-571-5946 www.multiVIEW.ca 325 Matheson Blvd East Mississauga, ON, L4Z1X8	Project No.:	Date:	Surveyed/Drawn By:	Checked:	SUBSURFACE UTILITY ENGINEERING C/ASCE 38-02 Quality Levels QL'A: Visual verification of utility location and depth using excavation methods. I.e. Hydrovac. QL'B: Utility located using surface geophysical methods i.e. electronically applied or induced magnetic field using specific utility locate equipment or ground penetrating radar. QL'C: Utility plotted using record information in conjunction with a visual field survey of utility furniture. QL'D: Utility plotted using record information only. This can include oral recollection.	GENERAL NOTES 1. This information is provided for design purposes only. 2. All inverts shown on this plan by multiVIEW Locates Inc. are in meters and were measured from the top of the manhole and/or catch basin lids. 3. Subsurface utility information shown on this drawing was obtained on a best effort, best practices basis, within the technical limitations of the instrumentation. 4. Utilities shown on this map by multiVIEW Locates Inc. were located using ASCE 38-02 Quality Level 'B' methods unless otherwise noted. All other information hereon has been supplied by others and is not certified. 5. Third party information provided on these drawings are for the convenience of use but do not constitute information obtained and delivered by multiVIEW Locates Inc. during the course of this project. 6. Elevations represented for this study were obtained by multiVIEW Locates Inc. utilizing datum derived by differential GPS observations and referred to the CAN-NET Reference Network.	SUE UTILITY CODES & LEGEND W Watermain G Gasmain BT Bell TV TV Cable H Hydro Cable E Electrical Cable TL Trafficlight Cable Project Boundaries Q(QL'D) Gas (QL-D) BT(QL'D) Bell (QL-D) TV(QL'D) TV (QL-D) W(QL'D) Watermain (QL-D) R(QL'D) Rogers (QL-D) STM(QL'C) Storm (QL-C) SAN(QL'C) Sanitary (QL-C) TL(QL'D) Trafficlights (QL-D) Manhole Storm Manhole Sanitary Manhole Catch Basin Double Catch Basin Combined Manhole Gas Valve Gas Meter Streetlight Pole Transformer Hydro Pole Trafficlight Pole Electrical Box Guy Pole Handwell Catch Basin Manhole Bell/Rogers Ped Flush to Grade Water Valve Chamber Fire Hydrant Water Valve Bell Manhole	SHEET 2 of 3 <table><tr><th>Rev. No.</th><th>Drawn By</th><th>Checked By</th><th>Date</th><th>Revision</th></tr><tr><td>01</td><td>AD</td><td>AD</td><td>2025-06-16</td><td>UPDATED NOTES.</td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table>	Rev. No.	Drawn By	Checked By	Date	Revision	01	AD	AD	2025-06-16	UPDATED NOTES.																				
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		01	AD	AD	2025-06-16					UPDATED NOTES.																													
For:		KINDRED WORKS																																					
Site:		445 ANNDAL RD, WATERLOO, ON																																					

Technical Limitations

- Throughout this schedule, "multiVIEW" is the corporate entity multiVIEW Locates Inc.
2. Pipe, cable, conduit, rebar, post-tension cables, anchors, containers, vaults, tanks and similar objects that are buried under the ground or embedded within a structure are referred to in multiVIEW's terms and conditions as Buried Assets
3. Subsurface conditions such as depth to bedrock, change in soil type, presence of karst, voids, contaminated soil or ground water, residual construction or industrial debris or buried waste are referred to in multiVIEW's terms and conditions as Buried Liabilities.
4. The Client acknowledges that the laws of fundamental physics apply and acknowledge that sensing instruments can not detect all Buried Assets and Buried Liabilities. Buried Assets and Buried Liabilities which are detectable by properly deployed and operated instruments are termed Locatable Buried Assets and Locatable Buried Liabilities. Buried Assets and Buried Liabilities which are not clearly detectable in an unambiguous manner due to the laws of fundamental physics are termed Unlocatable Buried Assets and Unlocatable Buried Liabilities. multiVIEW follows industry best-practice procedures but is not responsible for determining the presence and location of Unlocatable Buried Assets or Unlocatable Buried Liabilities.
5. Instruments to locate Buried Assets use a variety of approaches to detect and infer the location of the Buried Assets. Standard pipe and cable locating instruments detect the magnetic fields associated with electrical current flowing in the Buried Asset. GPR (Ground Penetrating radar) techniques depend on the transmission of radio waves into the host material and detection of waves reflected back from the Buried Assets. Sounding methods require insertion of a source of magnetic field into the pipe or conduit and detection of the magnetic field created by source at the surface of the Work Area to locate the sonde position. For the purposes of this estimate, Locatable Buried Assets are normally characterized as:
- a. metallic pipes, cables and conduits that are capable of carrying an electrical current and that can be physically accessed to allow an energizing current source to create an electrical current in the Buried Asset of sufficient magnitude as to be detectable by standard locating instruments;
 - b. metallic pipes, cables and conduits that actively carry an identifiable electric current that is sufficiently large and has suitable frequency as to be detectable by standard locating instruments;
 - c. metallic and non-metallic pipes, cables, conduits, rods, bars, wires, voids, and inclusions that represent a substantive electrical contrast to the host material and are embedded in a host material transparent to radio waves such that radio waves reflected from the feature are detectable by a GPR instrument;
 - d. non-metallic pipes, cables and conduits (i.e. composed of plastic, concrete, asbestos, clay, etc.) which have continuous associated tracer wire capable of carrying an electric current and that can be physically accessed to allow an energizing current source to create an electrical current in the tracer wire of sufficient magnitude as to be detectable by standard cable locating instruments;
 - e. non-metallic pipes, cables and conduits which have continuous associated tracer wire capable of carrying an electric current and that naturally carries an electrical current of sufficient magnitude and suitable frequency as to be detectable by standard cable locating instruments;
 - f. open pipe and conduits that can be accessed by a sonde and are sufficiently shallow to permit detectable magnetic fields to be sensed at the surface of the Work Area;
- Examples of Unlocatable Buried Assets include, but are not limited to, the following:
- g. pipes, cables and conduits whose depth of burial is too great to create and/or overlain by or in proximity to metallic material which results in signal distortion thus preventing physically measurable signals at the surface or where burial material interferes with current generation and signal emissions;
 - h. normally Locatable Buried Assets situated in, or emerging from, an area which is an Inaccessible Area;
 - i. normally Locatable Buried Assets with a break or breaks to the electrical continuity of any metallic pipe, cable or tracer wire (i.e. segmented lengths, corroded connections, sections of plastic repair, etc.);
 - j. non-metallic pipe, cable and conduits which do not have a continuous and/or accessible associated tracer wire;
 - k. the host material is opaque to radio waves;
 - l. Buried Assets that are normally characterized as Locatable become Unlocatable when either ambient interfering electromagnetic fields or the material surrounding and/or enclosing and/or above the Buried Asset disrupt the energizing current or the normal operation of the sensing instrument.
6. Instruments used to locate Buried Liabilities use a variety of approaches to detect and infer the location of the Buried Liability. Magnetometers detect the distortion in the local magnetic field induced by the presence of some types of Buried Liabilities. GPR (Ground Penetrating radar) techniques depend on the transmission of radio waves into the host material and detection of waves reflected back from the Buried Liability. In some cases the lack of reflected GPR signal can be a Buried Liability indicator. Electromagnetic induction methods use electromagnetic induction to induce current flow in the subsurface and detect the resulting magnetic fields that are associated with these induced currents to identify Buried Liabilities. Electrical resistivity measurements use direct connect to pass current through host material and map out distortions in the current flow to indicate changes in the subsurface that may indicate the presence of Buried Liabilities. For the purposes of this estimate, Locatable Buried Liabilities are normally characterized as those features that will create a discernable change to the response of the measuring instrument and which differ in character from the background surrounding environment (that is, the features create an Anomalous Response) when industry best practices are followed.
7. The Client acknowledges that the laws of fundamental physics apply and that equipment is subject to measurement distortions that are site specific resulting in limited precision when determining positional coordinates. multiVIEW will use best-practice procedures but is not responsible for determining the location of Buried Assets or Buried Liabilities to an accuracy better than what is typical of normal locate instruments.
8. Determination of type composition, depth or size of the Buried Assets or Buried Liabilities is not possible and does not constitute part of this service. Identification of the type (i.e. gas, electric, communications, etc) of a specific Buried Asset is not technically possible except by visual surface appurtenance or excavation and visual exposure of the Buried Asset. Inferences that may be drawn by correlation with records and as-built drawings may be offered but such inferences are provided on a best effort basis with no guarantee of correctness.
9. Client acknowledges the critical nature of having access to energize Buried Assets to enable locating and assumes full responsibility for identifying and providing access (including provision of licensed plumbing, electrical or confined space entry personnel if required and which adhere to multiVIEW health and safety procedures) to any and all points necessary for the energization of the Buried Assets. multiVIEW accepts no responsibility for locating any Buried Asset for which access and/or appropriate workplace safety measures are not provided.
10. Individual Locatable Buried Assets are deemed Unlocatable Buried Assets where there are numerous Buried Assets clustered together either vertically and/or horizontally ("Clustered Utilities") making identification of individual elements physically impossible. multiVIEW is not responsible for identifying the individual Buried Assets in such situations.
11. Non-metallic pipe and cable (i.e. fibre-optic systems, etc.) are Unlocatable Buried Assets for standard cable locating instruments unless either an unbroken tracer wire or continuous metallic sheathing surrounding such buried plant is easily accessible from the surface. The Client must provide direct and simple access to every traceable wire or continuous metallic sheathing. Otherwise, multiVIEW accepts neither liability nor responsibility for locating such features since they are deemed Unlocatable
12. Non-metallic pipe and conduits (i.e. plastic, concrete, asbestos, clay, etc.) under pressure (i.e. water, gas, forcemain systems, etc.) are Unlocatable Buried Assets for standard cable locating instruments unless an unbroken tracer wire is attached to the pipe and this tracer wire is easily accessible from the surface. The Client must provide direct and simple access to every traceable wire.
13. Non-pressurized, non-metallic (i.e. plastic, concrete, asbestos, clay, etc.) conduits or pipe (i.e. sewers, drains, empty ducts, etc.) are Unlocatable Buried Assets unless a transmitting sonde can be inserted throughout the full length of the pipe or conduit. It is the responsibility of the Client to identify and provide direct access (including provision of licensed plumbing, electrical or confined space entry personnel if required) to any and all access points for such lines. multiVIEW accepts no responsibility for locating such lines where the Client does not provide access and/or appropriate workplace safety measures.
14. Any Buried Asset incapable of generating a reflected radar wave detectable by a GPR instrument is an Unlocatable Buried Assets.
15. All or part of a Work Area is defined as an Inaccessible Area when inaccessible for surveying Inaccessible Areas include the following: those covered by a structure or object (i.e. buildings, vehicles, debris, stockpiled snow, building materials, etc.); those covered by open water; those covered by woods, vegetation, or snow too thick to permit easy walking; those where the surface terrain slopes steeper than 1:2; those covered by snow; and, those where the safety of the operator is jeopardized (i.e. unstable footing, environmental hazards, uncontrolled roads, etc.). The final decision for defining an area as an Inaccessible Area rests with the multiVIEW Health & Safety Officer.
16. Utility data depicted on QL-D CAD lines are derived via utility owners record data and shown only for reference.

Liability Limitations

1. Location and mapping services, marks, reports and results provided by multiVIEW cannot substitute as a legally defined Buried Asset location in jurisdiction where government regulation dictates that the Buried Asset owner is solely responsible for identifying and locating their own Buried Assets. In cases where multiVIEW is legally authorized to act on behalf of the Buried Asset owner to locate the owner's Buried Assets, any results provided by multiVIEW will clearly identify that the Buried Asset location is legally authorized on all records, documents, and reports.
2. multiVIEW's markings of Buried Asset or Buried Liability locations are provided as information to be input into the Client's decision making process and the provision of this information does not relieve the Client, or any other person, party, or corporation, from liability for damages for personal injury including death, or for property damage or liability caused to or from any Buried Asset or Buried Liability, within the Work Area.
3. Cables carrying DC voltages and/or small diameter cables (i.e. fire alarm or security systems, remote signal cables, inaccessible tracer wire, perfectly balanced AC cables, etc.) can only be detected by methods which create electrical currents and signals in the cables. Where a sensitive or dangerous connection is involved, the Client must provide qualified personnel to isolate and enable direct access to these systems. The Client is responsible for defining the impact of locating signals on sensitive electronics. multiVIEW accepts no responsibility for any damage to plant, or any third party, caused by locating signals. Technical information about locating signals is available from multiVIEW upon request.
4. multiVIEW is not liable for damages resulting from physical exposure of any Buried Assets or Buried Liability by the Client, its representatives, their sub-contractors or any other person or corporation.
5. multiVIEW will not accept any liability regarding inaccurate estimates of utility depth secured only by electronic means since multiVIEW recommends exposure of any such issues by vacuum excavating if any such depth information is critical to the design, engineering or construction of subsequent infrastructure.
6. multiVIEW accepts no responsibility and is not liable for damages suffered by any third party as a result of decisions or actions based on the performance of the statement of work by multiVIEW.
7. multiVIEW accepts no responsibility and is not liable for conduit blockage, or restoration of the site to pre-survey conditions, as a result of survey practices needed to fulfill the objectives of the Service provided.
8. The completeness of work carried out by multiVIEW is based on information provided by the Client at or prior to the earlier of the time of issuance of this Estimate. If the scope work or size and/or extent of the Work Area changes, a signed Change Order must be issued so that scope of work can be adjusted to address Client requirement changes. Documents and maps provided by multiVIEW are the definitive means legally defining the extent of the Work Area investigated.
9. multiVIEW accepts no responsibility for locating Buried Assets or Buried Liabilities outside the limit of the Work Area or in the Inaccessible Areas.
10. Except as written in this contract, multiVIEW disclaims any and all promises, representations, warranties and covenants, express, implied, statutory or otherwise.
11. multiVIEW shall not be liable for any amount in excess of the fees paid by the Client to multiVIEW for the work described in this estimate on account of any loss, injury, death, or damage whether resulting directly or indirectly to a person or property irrespective of the cause or origin of such loss, injury, death or damage including, without limitation, loss, injury, death or damage attributable to the negligence of multiVIEW, its employees and agents in the performance or non-performance of the Service.
12. In any action, claim, loss or damage arising out of the work for which this estimate is provided, the Client agrees that multiVIEW Locates Inc.'s liability will be 'several' and not 'joint and several' and the Client may only claim payment from multiVIEW Locates Inc or multiVIEW Locates Inc.'s proportionate share of the total liability based on degree of fault. Any action against multiVIEW Locates Inc must be commenced on or before the date which is the earlier of: i) eighteen months from the date on which the work in this estimate is completed and, ii) the date by which an action must be commenced under any applicable legislation other than limitation legislation. In no event shall multiVIEW Locates Inc be liable to the Client whether the claim be in tort, contract or otherwise, for an amount in excess of the fees paid by the Company for the services work provided. In no event shall multiVIEW Locates Inc be liable to the Client, whether a claim be in tort, contract or otherwise for any consequential, indirect, lost profit or similar damages, or failure to realize expected savings. multiVIEW Locates Inc will use all reasonable efforts to complete within any agreed upon timeframe the performance of the services described herein; however, multiVIEW Locates Inc shall not be liable for failures or delays in performance that arise from causes beyond its control, including the untimely performance or non-performance by the Client of its obligations.

multi view Insight, not hindsight	THE LOCATION OF UNDERGROUND SERVICES SHOULD BE VERIFIED PRIOR TO EXCAVATION. UTILITY LOCATES ARE REQUIRED PRIOR TO ANY EXCAVATION ACTIVITY	Project No.: 63836	Date: 2025-05-13	Surveyed/Drawn By: FZ/FR	Checked: AD																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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PLAN OF SURVEY WITH TOPOGRAPHY OF
PART OF BLOCK C
REGISTERED PLAN 1453
CITY OF WATERLOO
REGIONAL MUNICIPALITY OF WATERLOO
SCALE 1 : 300

SPEIGHT, VAN NOSTRAND & GIBSON LIMITED
ONTARIO LAND SURVEYORS
2022

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METRIC

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

ELEVATION NOTE

ELEVATIONS ARE GEODETIC AND ARE DERIVED FROM THE CITY OF
WATERLOO BENCHMARK No. 6701078.

LOCATION :

SOUTHEAST CORNER OF MARKDALE AVENUE AND GLEN CEDAR ROAD.
PLATE ON SOUTHWEST CORNER OF BUILDING.
CORNER AND 0.40 METRES ABOVE GRADE.

ELEVATION:

PUBLISHED ELEVATION = 335.311 metres.

BEARING NOTE

BEARINGS SHOWN HEREON ARE ASTRONOMIC AND ARE REFERRED TO THE
EASTERLY LIMIT OF BLOCK C, REGISTERED PLAN 1453,
HAVING A BEARING OF N37°58'00"W.

LEGEND

DENOTES	
■	SURVEY MONUMENT FOUND
WIT	SURVEY MONUMENT PLANTED
SSIB	WITNESS MONUMENT
IB	STANDARD IRON BAR
CC	SHORT STANDARD IRON BAR
N.S.E.W	IRON BAR
OU	CUT CROSS
ACI	NORTH, SOUTH, EAST, WEST
1114	ORIGIN UNKNOWN
1348	ANSLEY, CAMPBELL AND IMA, O.L.S.
P	J. METZ, O.L.S.
	WAYNE D. TURPEL, O.L.S.
	PLAN OF SURVEY BY WAYNE D. TURPEL SURVEYING LIMITED
	DATED 27 JUNE 2013
MH	MANHOLE
A/C	AIR CONDITIONING
ATS	AUTOMATIC TRAFFIC SIGNAL
METER	METER
FF	FLOOR FINISH
HYT	HYDRO TRANSFORMER
BWH	BELL MANHOLE
CB	CATCH BASIN
FH	FIRE HYDRANT
WV	WATER VALVE
COL	COLUMN
HW	HAND WELL
GUY	GUY WIRE / POLE
WHP	WOODEN HYDRO POLE
O/H	OVERHEAD
BB	BELL BOX
BSH	BUS SHELTER
WP	WOODEN POLE
DT	DECIDUOUS TREE
CT	CONIFEROUS TREE
CON	CONCRETE
BRK	BRICK
GRV	GRAVEL
MET	METAL
WOD	WOODEN

SURVEYOR'S CERTIFICATE

I CERTIFY THAT :

- THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT,
THE SURVEYORS ACT AND THE REGULATIONS MADE UNDER THEM.
- THE SURVEY WAS COMPLETED ON AUGUST 19, 2022

DATE : AUGUST 29, 2022

LES RUONICKI
ONTARIO LAND SURVEYOR

SPEIGHT, VAN NOSTRAND & GIBSON LIMITED
ONTARIO LAND SURVEYORS
750 OAKDALE ROAD, Units 65 & 66
TORONTO, ONTARIO M3N 2Z4
TEL. 416 749-SVNG(7864) FAX 416 749-7866
E-MAIL: toronto@svng-on.ca

ASSOCIATION OF ONTARIO
LAND SURVEYORS
PLAN SUBMISSION FORM
2197929

DRAWN :	M.M.	FILE NAME :	A2200143.DWG
CHECKED :	L.R.	PLOT SCALE :	MET. 1=0.30
JOB No. :	220-0143	PLOTTED :	
REF. No. :		UPDATED :	

THIS PLAN IS NOT VALID
UNLESS IT IS AN EMBOSSED
ORIGINAL COPY
ISSUED BY THE SURVEYOR
in accordance with
Regulation 1026, Section 28(3)

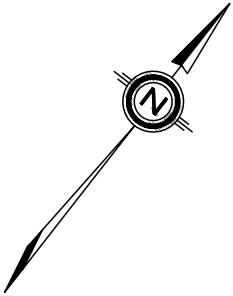
Appendix B

Stormwater Data Analysis

DAVENPORT ROAD

ANNDALE ROAD

LEXINGTON ROAD



A1 PRE
5587 m2
CONTROLLED

STORM FLOWS FROM A1 PRE HAVE BEEN
CONTROLLED IN A 100-YR STORM EVENT
PER MTE CONSULTING'S SWM REPORT
DATED FEB 21, 2001.

A2 PRE
6459 m2
UNCONTROLLED

A2 PRE BREAKDOWN
ROOFTOPS = 420 m2
LANDSCAPE = 4263 m2
PAVEMENT = 1776 m2

LEGEND

- PROPERTY LINE
- DRAINAGE BOUNDARY
- OVERLAND FLOW DIRECTION
- AREA ID
- DRAINAGE AREA

- CONVENTIONAL ROOF
- LANDSCAPING
- PAVEMENT

KPMB ARCHITECTS

351 KING ST E
TORONTO, ON M5A 0L6

PROJECT NAME
445 ANNDALE ROAD

SCALE: NTS
PROJECT ENG: ND
CHECKED BY: ND
PROJECT NO: 30290838

DATE: JULY 2025
DRAWN BY: RJ
APPROVED BY: ND



FIGURE NAME
PRE-DEVELOPMENT
STORM DRAINAGE AREA
PLAN

FIGURE NO.
DAP-1

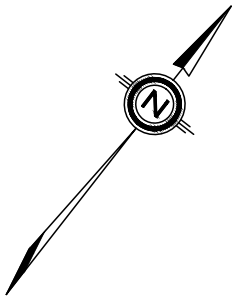
REVISION
01

LAND TYPE	AREA
IMPERVIOUS (ROOFTOPS AND PAVEMENT)	2196 m2
PERMOUS (LANDSCAPE)	4263 m2

DAVENPORT ROAD

ANNDALE ROAD

LEXINGTON ROAD



A2 POST
244 m2
UNCONTROLLED

A2 POST BREAKDOWN
LANDSCAPE = 244 m²

A1 POST
11,802 m2
CONTROLLED

A1 POST BREAKDOWN
ROOFTOPS = 2560 m²
IMPERVIOUS PAVEMENT = 3850 m²
PERMEABLE PAVEMENT = 1291 m²
LANDSCAPE = 4101 m²

LAND TYPE	AREA
IMPERVIOUS (ROOFTOPS & PAVEMENT)	6410m2
PERMOUS (LANDSCAPE & PERMEABLE PAVEMENT)	5636m2

LEGEND

- PROPERTY LINE
- DRAINAGE BOUNDARY
- OVERLAND FLOW DIRECTION

AREA ID
DRAINAGE AREA



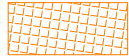
PERMEABLE PAVEMENT



CONVENTIONAL ROOF



LANDSCAPING



PAVEMENT/ROADWAY

KPMB ARCHITECTS

351 KING ST E
TORONTO, ON M5A 0L6

PROJECT NAME
445 ANNDALE ROAD

SCALE:
NTS
PROJECT ENG:
ND
CHECKED BY:
ND
PROJECT NO:
30290838

DATE:
JULY 2025
DRAWN BY:
RJ
APPROVED BY:
ND



FIGURE NAME
POST-DEVELOPMENT
STORM DRAINAGE AREA
PLAN

FIGURE NO.
DAP-2
REVISION
01

30290838 - 445 Anndale Road, City of Waterloo
Parking Area A01-POST - Underground Stage-Storage-Discharge Relationship

Orifice # 1

Orifice Invert = 335.03 m @ outlet MH2
 Orifice Radius = 0.0950 m
 Orifice Diameter = 190 mm
 Orifice Centreline = 335.125 m
 Orifice Coefficient = 0.6
 Orifice Area = 0.02835 m²

Tank Section 1

Tank Length = 53.02 m
 Tank Width = 3.66 m
 Tank Height = 0.91 m²
 Voids = 0.97 m
 Tank Storage = 188.2 m³/m
 Total Tank Storage = 171.3 m³

Pipe Storage

Diameter = 0.600 mm
 Total Length = 164.29 mm
 Pipe Storage = 0.283 m³/m
Total Pipe Storage = 46.5 m³

Orifice # 2

Orifice Invert = 334.93 m @ outlet MH11
 Orifice Radius = 0.1625 m
 Orifice Diameter = 325 mm
 Orifice Centreline = 335.093 m
 Orifice Coefficient = 0.6
 Orifice Area = 0.08296 m²

Tank Section 2

Tank Length = 43.89 m
 Tank Width = 3.66 m
 Tank Height = 0.91 m²
 Voids = 0.97 m
 Tank Storage = 155.8 m³/m
 Total Tank Storage = 141.8 m³

Tank Section 3

Tank Length = 3.66 m
 Tank Width = 4.57 m
 Tank Height = 0.91 m²
 Voids = 0.97 m
 Tank Storage = 16.2 m³/m
 Total Tank Storage = 14.8 m³

Total Tank Storage = 327.8 m³

Depth (m)	Elevation (m)	Description	Orifice # 1 Flow (m ³ /s)	Orifice # 2 Flow (m ³ /s)	Total Flow (m ³ /s)	Tank Storage (m ³)	Pipe Storage (m ³)	Total Storage (m ³)
0.00	335.13	Tank Invert	0.00000	0.00000	0.00000	0.0	0.0	0.0
0.20	335.33		0.03411	0.00000	0.03411	65.6	7.8	73.3
0.40	335.53		0.04794	0.00000	0.04794	131.1	15.5	146.6
0.60	335.73	Orifice #2 Operates	0.05860	0.00000	0.05860	196.7	23.3	220.0
0.80	335.93		0.00000	0.20172	0.20172	262.3	31.0	293.3
1.10	336.23	Tank Obvert	0.00000	0.23509	0.23509	327.8	38.8	366.6
1.37	336.50	Pipe Obvert	0.00000	0.26151	0.26151	327.8	46.5	374.3
1.72	336.85	Top of Grate CB1	0.00000	0.29222	0.29222	327.8	46.6	374.4

Orifice equation: $Q = C_o \times A \times (2 \times g \times h)^{0.5}$

where:

A = orifice area (m²)

g = 9.806 m/s²

h = head above c/l of orifice (m)



Imbrium[®] Systems

ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

09/15/2025

Province:	Ontario	Project Name:	445 Anndale Road
City:	Waterloo	Project Number:	30290838
Nearest Rainfall Station:	WATERLOO WELLINGTON AP	Designer Name:	Andy Kroess
Climate Station Id:	6149387	Designer Company:	IBI Group
Years of Rainfall Data:	34	Designer Email:	andy.kroess@ibigroup.com
		Designer Phone:	519-585-2255
Site Name:	Area Post	EOR Name:	
		EOR Company:	
Drainage Area (ha):	1.180	EOR Email:	
% Imperviousness:	65.30	EOR Phone:	
Runoff Coefficient 'c': 0.69			

Particle Size Distribution:	CA ETV
Target TSS Removal (%):	50.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	30.93
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	Yes
Upstream Orifice Control Flow Rate to Stormceptor (L/s):	150.00
Peak Conveyance (maximum) Flow Rate (L/s):	250.00
Influent TSS Concentration (mg/L):	100
Estimated Average Annual Sediment Load (kg/yr):	286
Estimated Average Annual Sediment Volume (L/yr):	232

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	48
EFO5	53
EFO6	56
EFO8	61
EFO10	64
EFO12	67

Recommended Stormceptor EFO Model: **EFO5**
Estimated Net Annual Sediment (TSS) Load Reduction (%): **53**
Water Quality Runoff Volume Capture (%): **> 90**





THIRD-PARTY TESTING AND VERIFICATION

► **Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

► **Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

► The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5



Stormceptor[®] EF Sizing Report



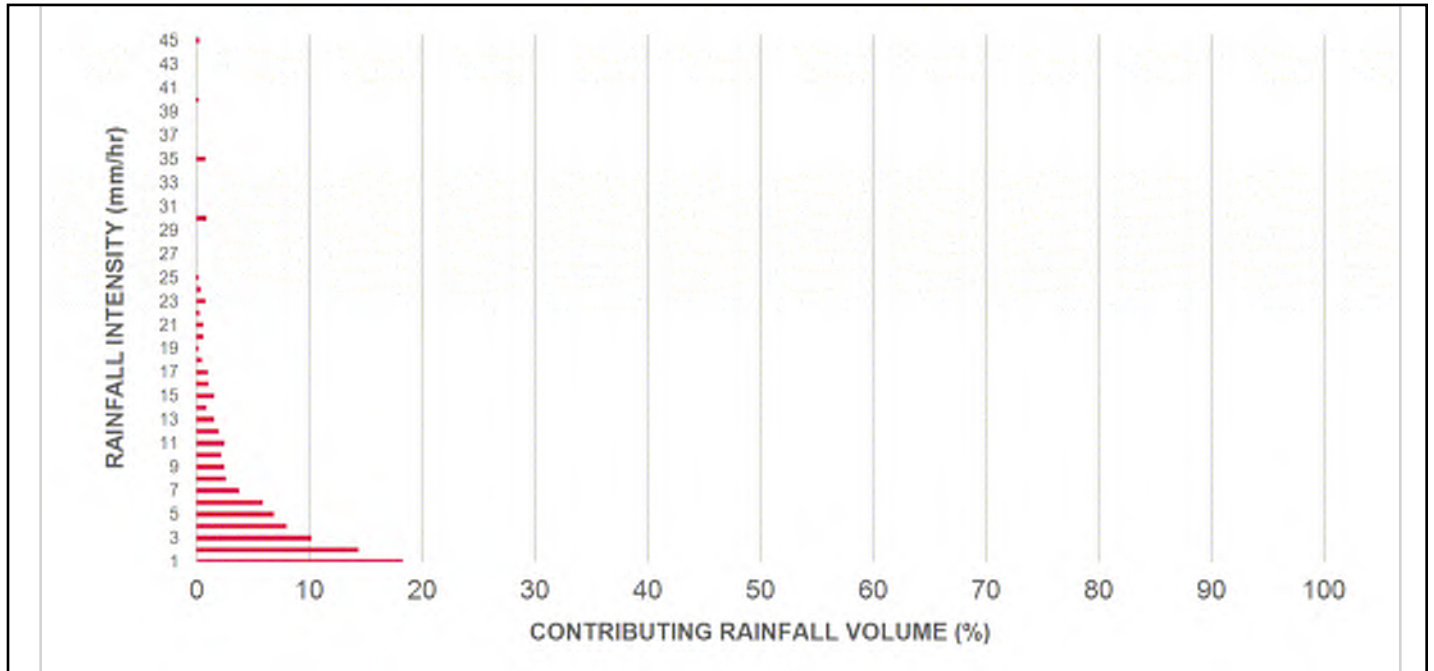
Upstream Flow Controlled Results

Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m ²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.5	8.5	1.13	68.0	37.0	70	6.0	6.0
1.00	18.3	26.8	2.27	136.0	75.0	66	12.0	18.0
2.00	14.4	41.3	4.54	272.0	150.0	58	8.4	26.4
3.00	10.2	51.5	6.81	408.0	224.0	53	5.5	31.9
4.00	8.0	59.5	9.08	545.0	299.0	51	4.1	35.9
5.00	6.9	66.4	11.35	681.0	374.0	49	3.4	39.3
6.00	5.9	72.3	13.62	817.0	449.0	47	2.8	42.1
7.00	3.8	76.1	15.89	953.0	524.0	44	1.7	43.8
8.00	2.6	78.7	18.16	1089.0	599.0	42	1.1	44.9
9.00	2.5	81.1	20.42	1225.0	673.0	42	1.0	45.9
10.00	2.2	83.3	22.69	1362.0	748.0	41	0.9	46.8
11.00	2.5	85.8	24.96	1498.0	823.0	41	1.0	47.8
12.00	2.0	87.8	27.23	1634.0	898.0	41	0.8	48.6
13.00	1.6	89.4	29.50	1770.0	973.0	40	0.6	49.3
14.00	0.9	90.4	31.77	1906.0	1047.0	39	0.4	49.6
15.00	1.6	91.9	34.04	2042.0	1122.0	38	0.6	50.2
16.00	1.1	93.0	36.31	2179.0	1197.0	37	0.4	50.6
17.00	1.0	94.0	38.58	2315.0	1272.0	36	0.4	51.0
18.00	0.5	94.6	40.85	2451.0	1347.0	35	0.2	51.2
19.00	0.2	94.8	43.12	2587.0	1421.0	34	0.1	51.3
20.00	0.6	95.4	45.39	2723.0	1496.0	32	0.2	51.5
21.00	0.6	96.1	47.66	2859.0	1571.0	30	0.2	51.7
22.00	0.3	96.4	49.93	2996.0	1646.0	29	0.1	51.7
23.00	0.8	97.2	52.20	3132.0	1721.0	28	0.2	52.0
24.00	0.4	97.6	54.47	3268.0	1796.0	27	0.1	52.1
25.00	0.2	97.8	56.73	3404.0	1870.0	25	0.0	52.1
30.00	0.9	98.7	68.08	4085.0	2244.0	21	0.2	52.3
35.00	0.8	99.5	79.43	4766.0	2619.0	18	0.2	52.5
40.00	0.2	99.7	90.78	5447.0	2993.0	16	0.0	52.5
45.00	0.3	100.0	102.12	6127.0	3367.0	14	0.0	52.6
Estimated Net Annual Sediment (TSS) Load Reduction =								53 %

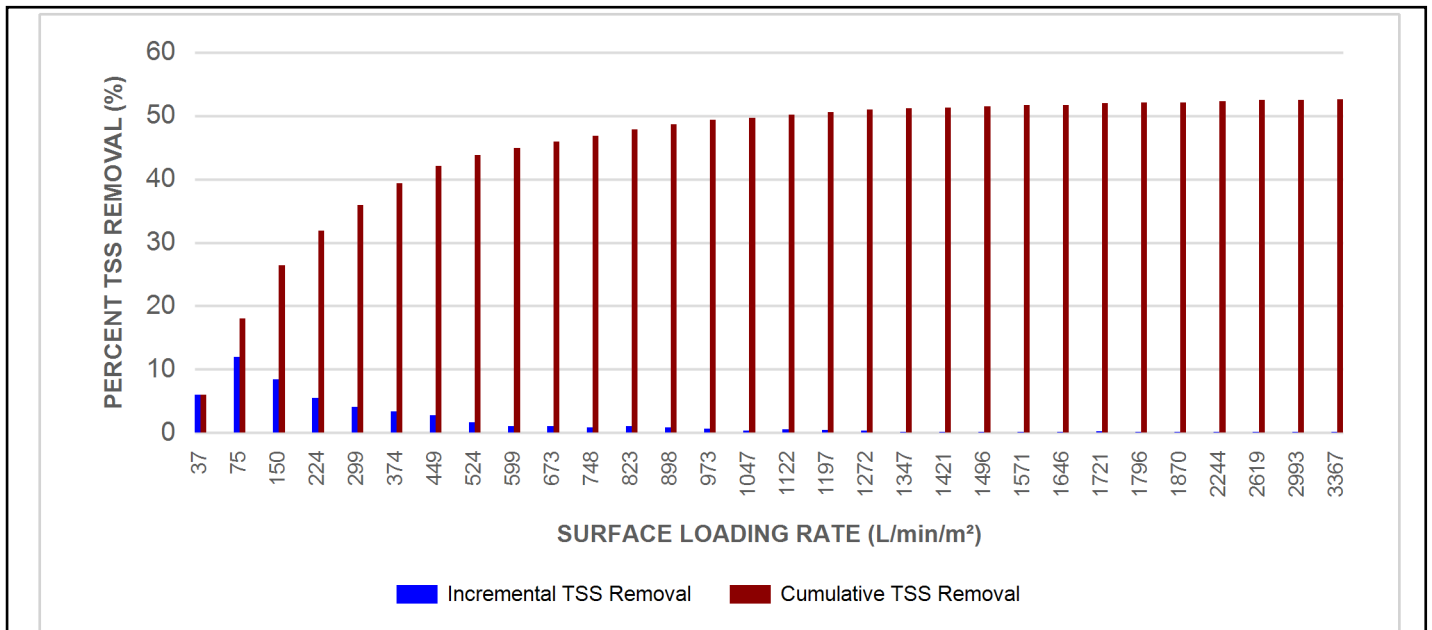
Climate Station ID: 6149387 Years of Rainfall Data: 34



RAINFALL DATA FROM WATERLOO WELLINGTON AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR[®] MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF5 / EFO5	1.5	5	90	762	30	762	30	710	25
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

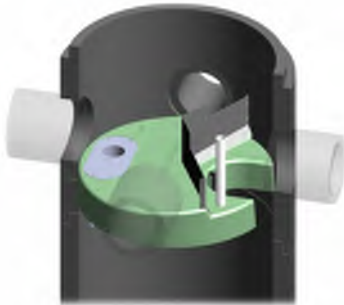
► **Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

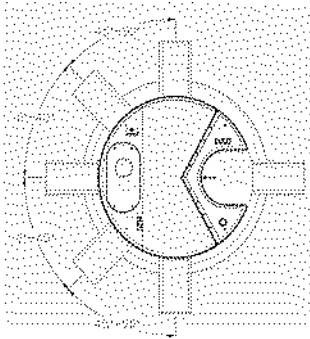
DESIGN FLEXIBILITY

► **Stormceptor® EF and EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

► While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.





INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF5 / EFO5	1.5	5	1.62	5.3	420	111	305	10	2124	75	2612	5758
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft³)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit <http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef>

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit <http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef>



Table of TSS Removal vs Surface Loading Rate Based on Third-Party Test Results
Stormceptor® EFO

SLR (L/min/m ²)	TSS % REMOVAL	SLR (L/min/m ²)	TSS % REMOVAL	SLR (L/min/m ²)	TSS % REMOVAL	SLR (L/min/m ²)	TSS % REMOVAL
1	70	660	42	1320	35	1980	24
30	70	690	42	1350	35	2010	24
60	67	720	41	1380	34	2040	23
90	63	750	41	1410	34	2070	23
120	61	780	41	1440	33	2100	23
150	58	810	41	1470	32	2130	22
180	56	840	41	1500	32	2160	22
210	54	870	41	1530	31	2190	22
240	53	900	41	1560	31	2220	21
270	52	930	40	1590	30	2250	21
300	51	960	40	1620	29	2280	21
330	50	990	40	1650	29	2310	21
360	49	1020	40	1680	28	2340	20
390	48	1050	39	1710	28	2370	20
420	47	1080	39	1740	27	2400	20
450	47	1110	38	1770	27	2430	20
480	46	1140	38	1800	26	2460	19
510	45	1170	37	1830	26	2490	19
540	44	1200	37	1860	26	2520	19
570	43	1230	37	1890	25	2550	19
600	42	1260	36	1920	25	2580	18
630	42	1290	36	1950	24	2600	26



STANDARD PERFORMANCE SPECIFICATION FOR “OIL GRIT SEPARATOR” (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m ³ sediment / 265 L oil
	5 ft (1524 mm) Diameter OGS Units:	1.95 m ³ sediment / 420 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m ³ sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m ³ sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m ³ sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m ³ sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL





The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m² to 1400 L/min/m², and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m² and 1400 L/min/m² shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m² shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m². No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m².

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m² shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m², and shall be calculated using a simple proportioning formula, with 1400 L/min/m² in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m².

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**.

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m².

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators**, with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-

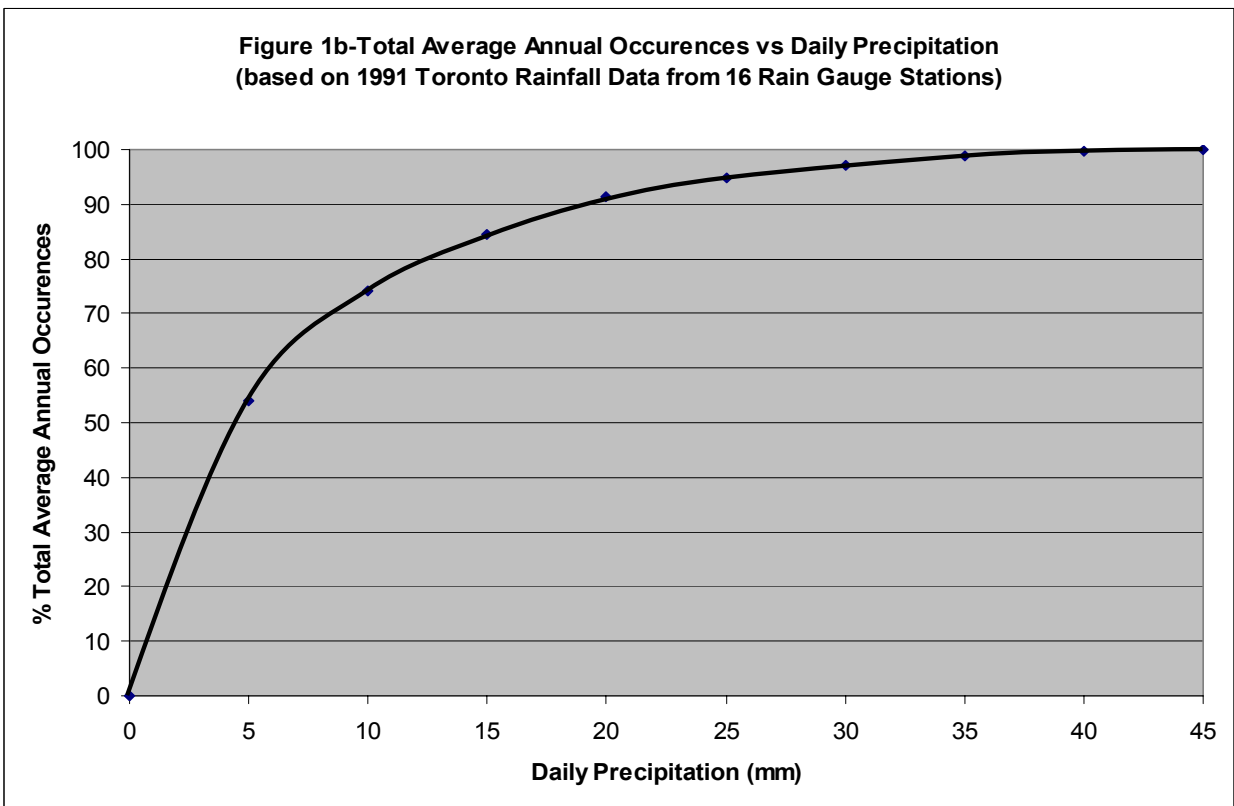
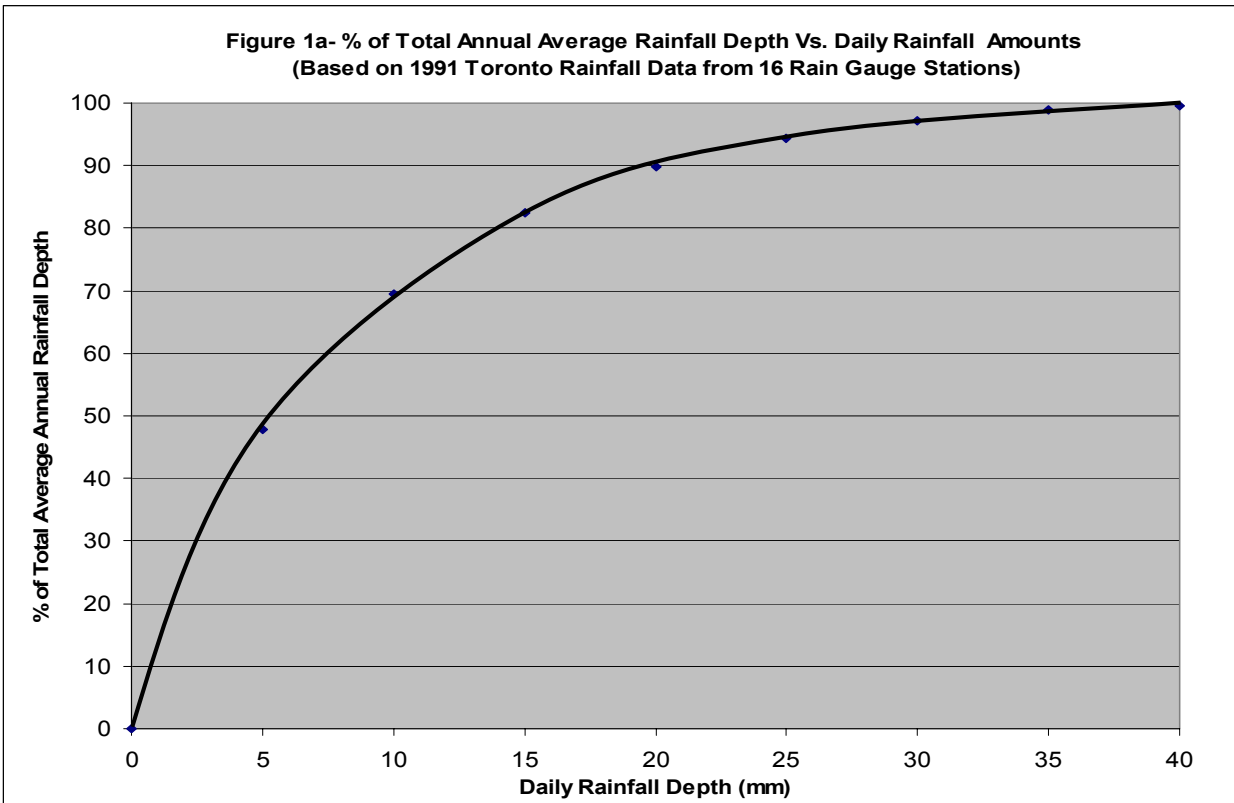




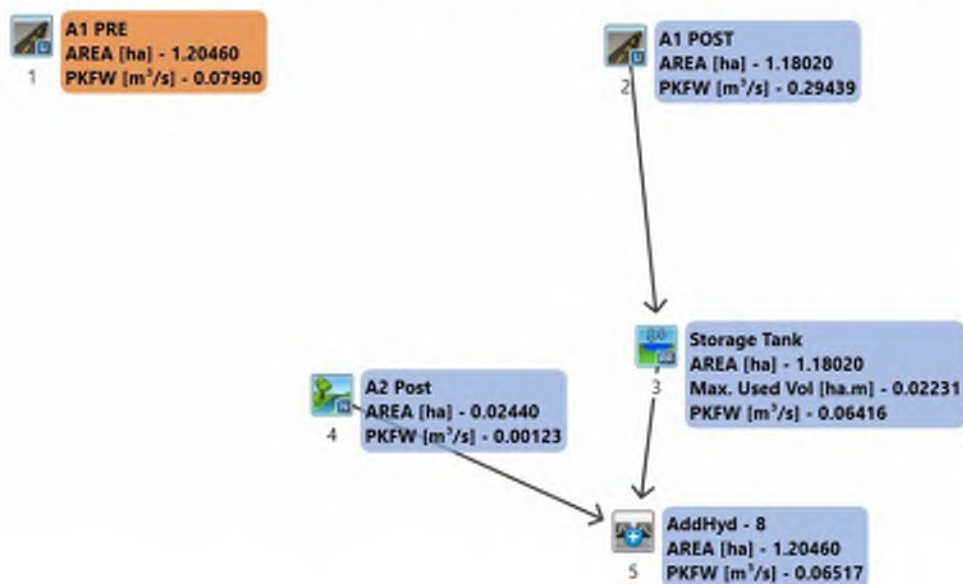
entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m² to 2600 L/min/m²) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**. However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.





30290838 - 445 Anndale Road, City of Waterloo - VO Model Schematic



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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\V02\voin.dat

Output filename:

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Summary filename:

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DATE: 09/15/2025

TIME: 03:40:55

USER:

COMMENTS: _____

** SIMULATION : 2 Year Waterloo **

| CHICAGO STORM | IDF curve parameters: A=1101.000
| Ptotal= 32.39 mm | B= 9.258
C= 0.882

used in: $INTENSITY = A / (t + B)^C$

Duration of storm = 3.00 hrs

Storm time step = 5.00 min

Time to peak ratio = 0.40

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	1.97	0.75	7.99	1.50	9.38	2.25	2.81
0.08	2.15	0.83	11.43	1.58	7.56	2.33	2.60
0.17	2.37	0.92	18.89	1.67	6.30	2.42	2.41
0.25	2.65	1.00	42.64	1.75	5.38	2.50	2.26
0.33	2.99	1.08	105.66	1.83	4.68	2.58	2.12
0.42	3.44	1.17	49.25	1.92	4.14	2.67	1.99
0.50	4.03	1.25	26.13	2.00	3.70	2.75	1.88
0.58	4.85	1.33	16.91	2.08	3.35	2.83	1.79
0.67	6.06	1.42	12.18	2.17	3.06	2.92	1.70

```

-----
| CALIB |
| STANDHYD ( 0001) |
| ID= 1 DT= 5.0 min |
-----

```

Area (ha)= 1.20
Total Imp(%)= 14.20 Dir. Conn.(%)= 14.20

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.17	1.03	
Dep. Storage (mm)=	1.00	1.50	
Average Slope (%)=	1.00	2.00	
Length (m)=	89.61	50.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	105.66	14.27	
over (min)	5.00	20.00	
Storage Coeff. (min)=	2.34 (ii)	19.92 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.30	0.06	
			TOTALS
PEAK FLOW (cms)=	0.05	0.02	0.052 (iii)
TIME TO PEAK (hrs)=	1.17	1.50	1.17
RUNOFF VOLUME (mm)=	31.39	8.26	11.53
TOTAL RAINFALL (mm)=	32.39	32.39	32.39
RUNOFF COEFFICIENT =	0.97	0.25	0.36

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.0 Ia = Dep. Storage (Above)

- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB                               |
| NASHYD ( 0004) | Area (ha)= 0.02   Curve Number (CN)= 75.0
| ID= 1 DT= 5.0 min | Ia (mm)= 8.00   # of Linear Res.(N)= 3.00
-----
|                               |
|                               | U.H. Tp(hrs)= 0.16

```

Unit Hyd Qpeak (cms)= 0.006

PEAK FLOW (cms)= 0.001 (i)
 TIME TO PEAK (hrs)= 1.333
 RUNOFF VOLUME (mm)= 5.399
 TOTAL RAINFALL (mm)= 32.391
 RUNOFF COEFFICIENT = 0.167

- (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB                               |
| STANDHYD ( 0002) | Area (ha)= 1.18
| ID= 1 DT= 5.0 min | Total Imp(%)= 65.30   Dir. Conn.(%)= 65.30
-----

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.77	0.41
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	88.70	40.00
Mannings n	=	0.013	0.250

Max.Eff.Inten.(mm/hr)=	105.66	16.84
over (min)	5.00	20.00
Storage Coeff. (min)=	2.33 (ii)	16.72 (ii)
Unit Hyd. Tpeak (min)=	5.00	20.00
Unit Hyd. peak (cms)=	0.30	0.06

TOTALS

PEAK FLOW (cms)=	0.21	0.01	0.212 (iii)
TIME TO PEAK (hrs)=	1.17	1.50	1.17
RUNOFF VOLUME (mm)=	31.39	8.26	23.35
TOTAL RAINFALL (mm)=	32.39	32.39	32.39
RUNOFF COEFFICIENT =	0.97	0.25	0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 75.0 Ia = Dep. Storage (Above)

- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0003)		OVERFLOW IS OFF			
IN= 2---> OUT= 1					
DT= 5.0 min					
		OUTFLOW	STORAGE	OUTFLOW	STORAGE
		(cms)	(ha.m.)	(cms)	(ha.m.)
		0.0000	0.0000	0.2017	0.0293
		0.0341	0.0073	0.2351	0.0367
		0.0479	0.0147	0.2615	0.0374
		0.0586	0.0220	0.2922	0.0374
		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0002)		1.180	0.212	1.17	23.35
OUTFLOW: ID= 1 (0003)		1.180	0.045	1.42	23.31
PEAK FLOW REDUCTION [Qout/Qin](%)= 21.37					
TIME SHIFT OF PEAK FLOW (min)= 15.00					
MAXIMUM STORAGE USED (ha.m.)= 0.0134					

ADD HYD (0005)					
1 + 2 = 3					
		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0003):		1.18	0.045	1.42	23.31
+ ID2= 2 (0004):		0.02	0.001	1.33	5.40
=====					
ID = 3 (0005):		1.20	0.046	1.42	22.95

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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DATE: 09/15/2025

TIME: 03:40:55

USER:

COMMENTS: _____

** SIMULATION : 5 Year Waterloo **

| CHICAGO STORM |
Ptotal= 47.53 mm

IDF curve parameters: A=1755.000
B= 12.347
C= 0.895

used in: $INTENSITY = A / (t + B)^C$

Duration of storm = 3.00 hrs

Storm time step = 5.00 min

Time to peak ratio = 0.40

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	2.93	0.75	12.74	1.50	14.99	2.25	4.29
0.08	3.23	0.83	18.26	1.58	12.05	2.33	3.94
0.17	3.58	0.92	29.81	1.67	9.99	2.42	3.65
0.25	4.03	1.00	62.98	1.75	8.49	2.50	3.40
0.33	4.58	1.08	136.51	1.83	7.35	2.58	3.17
0.42	5.31	1.17	71.84	1.92	6.46	2.67	2.98
0.50	6.27	1.25	40.53	2.00	5.75	2.75	2.80
0.58	7.62	1.33	26.82	2.08	5.17	2.83	2.65
0.67	9.60	1.42	19.46	2.17	4.69	2.92	2.51

```

-----
| CALIB |
| STANDHYD ( 0001) |
| ID= 1 DT= 5.0 min |
-----

```

Area (ha)= 1.20
Total Imp(%)= 14.20 Dir. Conn.(%)= 14.20

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.17	1.03	
Dep. Storage (mm)=	1.00	1.50	
Average Slope (%)=	1.00	2.00	
Length (m)=	89.61	50.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	136.51	31.29	
over (min)	5.00	15.00	
Storage Coeff. (min)=	2.11 (ii)	14.95 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.31	0.08	
			TOTALS
PEAK FLOW (cms)=	0.06	0.06	0.080 (iii)
TIME TO PEAK (hrs)=	1.17	1.42	1.17
RUNOFF VOLUME (mm)=	46.53	16.21	20.51
TOTAL RAINFALL (mm)=	47.53	47.53	47.53
RUNOFF COEFFICIENT =	0.98	0.34	0.43

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.0 Ia = Dep. Storage (Above)

- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB                               |
| NASHYD ( 0004) | Area (ha)= 0.02   Curve Number (CN)= 75.0
| ID= 1 DT= 5.0 min | Ia (mm)= 8.00   # of Linear Res.(N)= 3.00
-----
|                               |
|                               | U.H. Tp(hrs)= 0.16
|                               |

```

Unit Hyd Qpeak (cms)= 0.006

PEAK FLOW (cms)= 0.001 (i)
 TIME TO PEAK (hrs)= 1.333
 RUNOFF VOLUME (mm)= 12.497
 TOTAL RAINFALL (mm)= 47.534
 RUNOFF COEFFICIENT = 0.263

- (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB                               |
| STANDHYD ( 0002) | Area (ha)= 1.18
| ID= 1 DT= 5.0 min | Total Imp(%)= 65.30   Dir. Conn.(%)= 65.30
-----

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.77	0.41
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	88.70	40.00
Mannings n	=	0.013	0.250

Max.Eff.Inten.(mm/hr)=	136.51	37.38
over (min)	5.00	10.00
Storage Coeff. (min)=	2.10 (ii)	6.94 (ii)
Unit Hyd. Tpeak (min)=	5.00	10.00
Unit Hyd. peak (cms)=	0.31	0.14

TOTALS

PEAK FLOW (cms)=	0.28	0.03	0.294 (iii)
TIME TO PEAK (hrs)=	1.17	1.25	1.17
RUNOFF VOLUME (mm)=	46.53	16.21	36.01
TOTAL RAINFALL (mm)=	47.53	47.53	47.53
RUNOFF COEFFICIENT =	0.98	0.34	0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 75.0 Ia = Dep. Storage (Above)

- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0003)		OVERFLOW IS OFF			
IN= 2---> OUT= 1					
DT= 5.0 min					
		OUTFLOW	STORAGE	OUTFLOW	STORAGE
		(cms)	(ha.m.)	(cms)	(ha.m.)
		0.0000	0.0000	0.2017	0.0293
		0.0341	0.0073	0.2351	0.0367
		0.0479	0.0147	0.2615	0.0374
		0.0586	0.0220	0.2922	0.0374
		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0002)		1.180	0.294	1.17	36.01
OUTFLOW: ID= 1 (0003)		1.180	0.064	1.50	35.97
PEAK FLOW REDUCTION [Qout/Qin](%)= 21.80					
TIME SHIFT OF PEAK FLOW (min)= 20.00					
MAXIMUM STORAGE USED (ha.m.)= 0.0223					

ADD HYD (0005)					
1 + 2 = 3					
		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0003):		1.18	0.064	1.50	35.97
+ ID2= 2 (0004):		0.02	0.001	1.33	12.50
=====					
ID = 3 (0005):		1.20	0.065	1.50	35.49

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

=====

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

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DATE: 09/15/2025

TIME: 03:40:55

USER:

COMMENTS: _____

** SIMULATION : 100 Year Waterloo **

| CHICAGO STORM |
Ptotal= 89.93 mm

IDF curve parameters: A=4692.000
B= 17.437
C= 0.956

used in: $INTENSITY = A / (t + B)^C$

Duration of storm = 3.00 hrs

Storm time step = 5.00 min

Time to peak ratio = 0.40

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	4.53	0.75	25.42	1.50	30.32	2.25	7.23
0.08	5.11	0.83	37.36	1.58	23.93	2.33	6.54
0.17	5.82	0.92	61.48	1.67	19.44	2.42	5.95
0.25	6.71	1.00	123.92	1.75	16.17	2.50	5.44
0.33	7.85	1.08	239.79	1.83	13.70	2.58	5.00
0.42	9.35	1.17	139.80	1.92	11.79	2.67	4.62
0.50	11.40	1.25	82.91	2.00	10.28	2.75	4.28
0.58	14.29	1.33	55.40	2.08	9.06	2.83	3.99
0.67	18.59	1.42	39.93	2.17	8.06	2.92	3.72

```
-----
| CALIB                                     |
| STANDHYD ( 0001) | Area (ha)= 1.20      |
| ID= 1 DT= 5.0 min | Total Imp(%)= 14.20   Dir. Conn.(%)= 14.20 |
-----
```

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.17	1.03	
Dep. Storage (mm)=	1.00	1.50	
Average Slope (%)=	1.00	2.00	
Length (m)=	89.61	50.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	239.79	103.61	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.69 (ii)	9.64 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.32	0.11	
			TOTALS
PEAK FLOW (cms)=	0.11	0.20	0.260 (iii)
TIME TO PEAK (hrs)=	1.17	1.33	1.25
RUNOFF VOLUME (mm)=	88.93	45.18	51.39
TOTAL RAINFALL (mm)=	89.93	89.93	89.93
RUNOFF COEFFICIENT =	0.99	0.50	0.57

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.0 Ia = Dep. Storage (Above)

- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB                               |
| NASHYD ( 0004) | Area (ha)= 0.02   Curve Number (CN)= 75.0
| ID= 1 DT= 5.0 min | Ia (mm)= 8.00   # of Linear Res.(N)= 3.00
-----
|                               |
|                               | U.H. Tp(hrs)= 0.16
|                               |

```

Unit Hyd Qpeak (cms)= 0.006

PEAK FLOW (cms)= 0.004 (i)
 TIME TO PEAK (hrs)= 1.333
 RUNOFF VOLUME (mm)= 40.089
 TOTAL RAINFALL (mm)= 89.932
 RUNOFF COEFFICIENT = 0.446

- (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB                               |
| STANDHYD ( 0002) | Area (ha)= 1.18
| ID= 1 DT= 5.0 min | Total Imp(%)= 65.30   Dir. Conn.(%)= 65.30
-----

```

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.77	0.41
Dep. Storage (mm)=	1.00	1.50
Average Slope (%)=	1.00	2.00
Length (m)=	88.70	40.00
Mannings n =	0.013	0.250

Max.Eff.Inten.(mm/hr)=	239.79	103.61
over (min)	5.00	10.00
Storage Coeff. (min)=	1.68 (ii)	5.54 (ii)
Unit Hyd. Tpeak (min)=	5.00	10.00
Unit Hyd. peak (cms)=	0.32	0.16

TOTALS

PEAK FLOW (cms)=	0.50	0.10	0.559 (iii)
TIME TO PEAK (hrs)=	1.17	1.25	1.17
RUNOFF VOLUME (mm)=	88.93	45.18	73.75
TOTAL RAINFALL (mm)=	89.93	89.93	89.93
RUNOFF COEFFICIENT =	0.99	0.50	0.82

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 75.0 Ia = Dep. Storage (Above)

- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| RESERVOIR( 0003)| OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min      |
-----

```

	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.2017	0.0293
	0.0341	0.0073	0.2351	0.0367
	0.0479	0.0147	0.2615	0.0374
	0.0586	0.0220	0.2922	0.0374

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0002)	1.180	0.559	1.17	73.75
OUTFLOW: ID= 1 (0003)	1.180	0.236	1.33	73.70

PEAK FLOW REDUCTION [Qout/Qin](%)= 42.13
 TIME SHIFT OF PEAK FLOW (min)= 10.00
 MAXIMUM STORAGE USED (ha.m.)= 0.0372

```

-----
| ADD HYD ( 0005)|
| 1 + 2 = 3      |
-----

```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0003):	1.18	0.236	1.33	73.70
+ ID2= 2 (0004):	0.02	0.004	1.33	40.09
=====				
ID = 3 (0005):	1.20	0.240	1.33	73.02

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

```

=====
=====

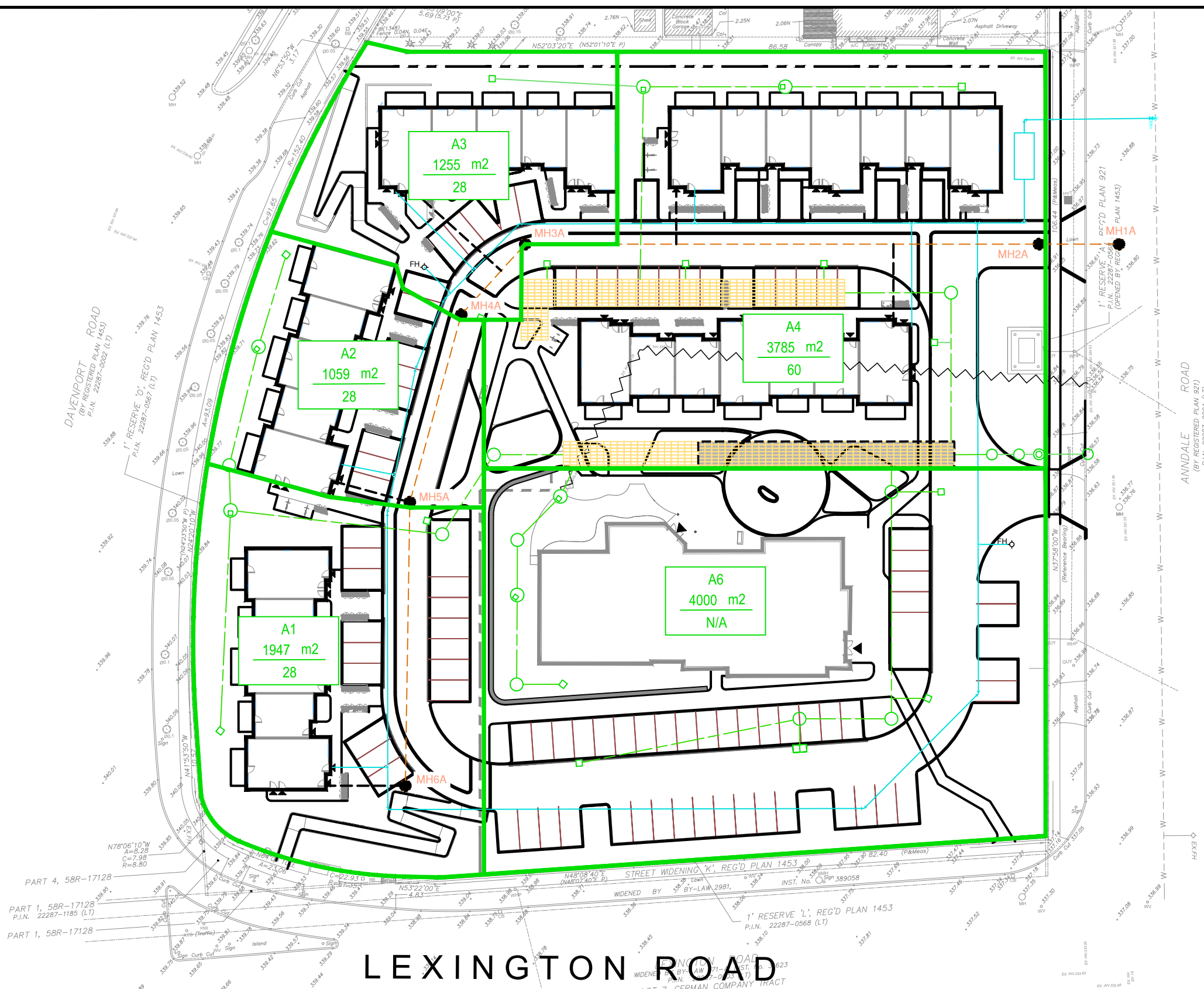
```

Appendix C

Sanitary Data Analysis

DAVENPORT ROAD

ANNDALE ROAD



LEGEND

- PROPERTY LINE
- DRAINAGE BOUNDARY

A1 POST	AREA ID
2630 m2	DRAINAGE AREA
105	POPULATION

KPMB ARCHITECTS

351 KING ST E
TORONTO, ON M5A 0L6

PROJECT NAME
445 ANNDALE ROAD

SCALE: NTS	DATE: JULY 2025
PROJECT ENG: ND	DRAWN BY: RJ
CHECKED BY: ND	APPROVED BY: ND
PROJECT NO: 30290838	



FIGURE NAME SANITARY DRAINAGE AREA PLAN	FIGURE NO. SAN-1	REVISION 01
---	---------------------	----------------

445 Anndale Road

Residential development



NOTES:

Post-development residential sewage flow based upon a unit flow of 275.0 Lpcd.

Post-development institutional sewage flow based upon a unit flow of 0.25 L/s/ha

Maximum flow velocity for pipe flowing full = 3.0 m/s.

Minimum flow velocity for pipe flowing partially full (actual flow) = 0.6 m/s.

Infiltration= 0.25 L/s/ha

Mannings= 0.013

Sanitary Service Connection Sizing

Project Name: 445 Anndale Road

Project Number: 30290838

Date: 15-Sep-25

Designed By: Nicolas Di Stefano

	From	To	DESIGN FLOW CALCULATIONS												SEWER DESIGN & ANALYSIS							Notes
			Area (ha)	Townhouse Units	Residential Population	ICI Population	Cumulative Area (ha)	Cumm. Residential Population	Peaking Factor	Res. Sewage Flow (L/s) (1)	ICI. Sewage Flow (L/s)	Infiltration Flow (L/s) (2)	Ground Water (L/s) (3)	Total Flow, Qd (L/s) (1)+(2)+(3)+(4)	Nominal Diameter (mm)	Pipe Slope (%)	Pipe Length (m)	Full Flow Capacity, Qf (L/s)	Full Flow Velocity (m/s)	Actual Velocity V (m/s)	Percent of Full Flow (%)	

Pre-Development Sanitary Flow (to Lexington Road)																						
Ex. Sanitary Flows	Church	Lexington Rd	1.2046	0	0	0	1.2046	0.0000	4.50	0.00	0.30	0.30	0.0	0.6	Ex. Service size, depth, slope etc., unknown. To be verified in future submission.							
Post-Development Sanitary Service Design (to Anndale Road)																						
Sanitary Flows	MH6A	MH5A	0.1947	11	27	0	0.1947	27	4.36	0.37	0.00	0.05	0.0	0.4	200	2.0%	38.5	48.4	1.49	0.46	0.9%	
	MH5A	MH4A	0.1059	11	27	0	0.3006	54	4.31	0.74	0.00	0.08	0.0	0.8	200	2.0%	26.4	48.4	1.49	0.56	1.7%	
	MH4A	MH3A	0.1255	11	27	0	0.4261	81	4.27	1.09	0.00	0.11	0.0	1.2	200	2.0%	12.9	48.4	1.49	0.63	2.5%	
	MH3A	MH2A	0.3785	24	59	0	0.8046	139	4.20	1.86	0.00	0.20	0.0	2.1	200	2.0%	69.7	48.4	1.49	0.74	4.3%	
	MH2A	MH1A	0.0000	0	0	0	0.8046	139	4.20	1.86	0.00	0.20	0.0	2.1	200	2.0%	10.8	48.4	1.49	0.74	4.3%	
Post-Development Church Flow (to Lexington Road)																						
Sanitary Flows	Church	Lexington Rd	0.4000	0	0	0	0.4000	0.0000	4.50	0.00	0.10	0.10	0.0	0.2	Ex. Service size, depth, slope etc., unknown. To be verified in future submission.							

Post-Development (Residential)			
	Units / Area	Density	Population
Single Family Homes	0	3.3 ppl/unit	0
Semi-Detached	0	3.3 ppl/unit	0
Townhouse	57	2.4 ppl/unit	139
Multiple Unit Types	0	2.1 ppl/unit	0
Unspecified Unit Types	0	3.1 ppl/unit	0
Total Units =		57	139

Post-Development (Non Residential)			
Institutional	4000 m2	0.25 L/s/ha	0.10
Total Post-Dev. Flow =		0.10	

Appendix D

Water Data Analysis

445 Anndale Road

Townhouse



DOMESTIC WATER DEMAND CALCULATIONS

Project Name: 445 Anndale Road

Project Number: 30290838

Date: 15-Sep-25

Designed By: Nicolas Di Stefano, P.Eng.

- 1. Based on the City of Waterloo and Region of Waterloo Standards
- 2. MECP Design Guidelines for Drinking Water Systems
- 3. ADD = 225 L/cap/day for residential uses

Peaking Factors		
Land Use	Peak Hour	Maximum Day
Residential	4.13	2.75
Commercial	4.13	2.75

	Units	Density	Population	ADD (L/s)	(ADDxP.F.) PHD (L/s)	(ADDxP.F.) MDD (L/s)
Townhouse	57 units	2.4 pp/unit	139	0.31	1.26	0.84
Totals =	57 units		139	0.31	1.26	0.84

Population	ADD (L/s)	PHD (L/s)	MDD (L/s)
139	0.31	1.26	0.84

July 23/25

Arcadis Professional Services Inc.
8133 Warden Ave., Unit 300
Markham, Ontario
L6G 1B3

Attn: Nicolas Di Stefano

Re: Fire Flow Analysis for proposed 445 Anndale Rd., Waterloo Ontario

Dear Nicolas,

The fire flow analysis is representative of Group C residential property
The analysis has been completed according to the requirements and guidelines of the National Fire Protection Association and the Ontario Building Code.

The water flow supply available at the site meets the fire flow demand requirements as per attached hydrant flow test data and graph.

Sincerely,

Per

Steve Brockwell L.E.L., G.S.C.



Professional Engineers
Ontario *July 23/25*
Limited Engineering Licensee
Name: S. H. BROCKWELL
Number: 100516597
Limitations: Design, supervision and evaluation of water-based fire protection systems per NFPA13, NFPA14, NFPA20, NFPA24, OBC and OFC, NFPA30 flammable liquids and NFPA33 spray applications using flammable or combustible materials.
Association of Professional Engineers of Ontario





#103 - 274 Shirley Avenue
Kitchener, Ontario, N2B 2E1
☎ (519) 742-6030
FAX (519) 742-0266
chfire@chfireinc.com

July 23rd, 2025

Fire Flow Analysis

Location: 445 Anndale Road, Waterloo, Ontario

Building Classification: Class C – Residential

Combustible Construction

$$Q = K * V * STOT$$

$$K = 18$$

$$V = 4465 \text{ cubic meters}$$

$$STOT = 1 + 0.25 + 0.4 = 1.65$$

$$\begin{aligned} \text{Therefore } Q &= 18 * 4465 * 1.65 \\ Q &= 132,610 \text{ Litres} \end{aligned}$$

Therefore, as per Table 2, if $Q > 135,000$ Litres and $\leq 162,000$ Litres

Fire flow demand = 4500 Litres/minute @ 140Kpa

Hydrant Flow Test :
445 Annedale Road, Waterloo

WO 13139

Static Hydrant: See map
Flowing Hydrant: See map
Flowing Hydrant: See map

Static Pressure	50 PSI
Residual Pressure (1)	47 PSI
Residual Pressure (2)	45 PSI
Residual Pressure (3)	44 PSI

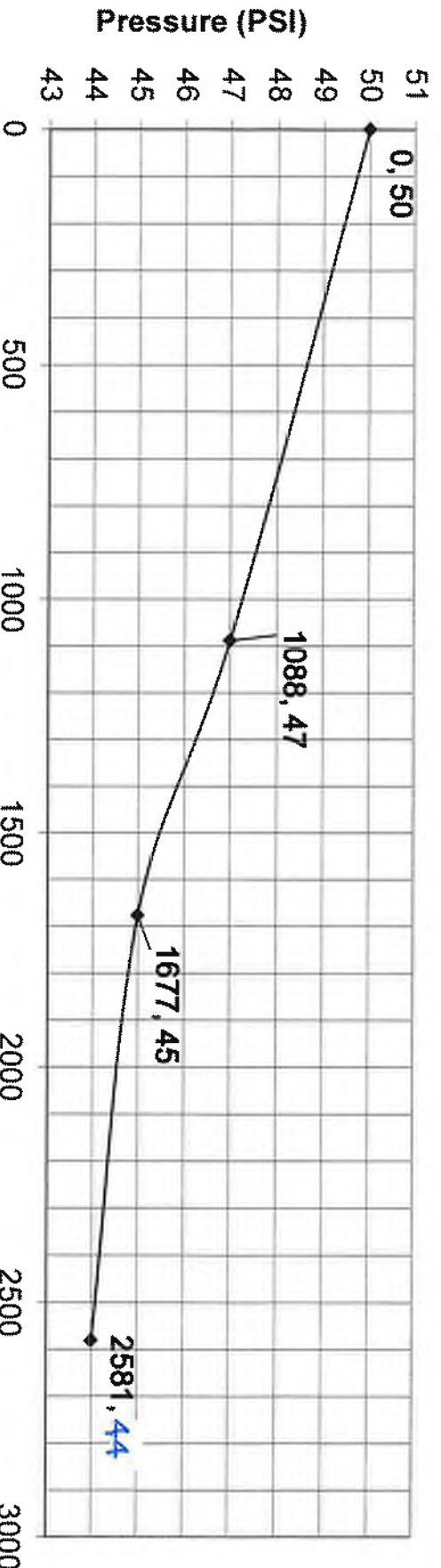
Co efficient value	0.9
--------------------	-----

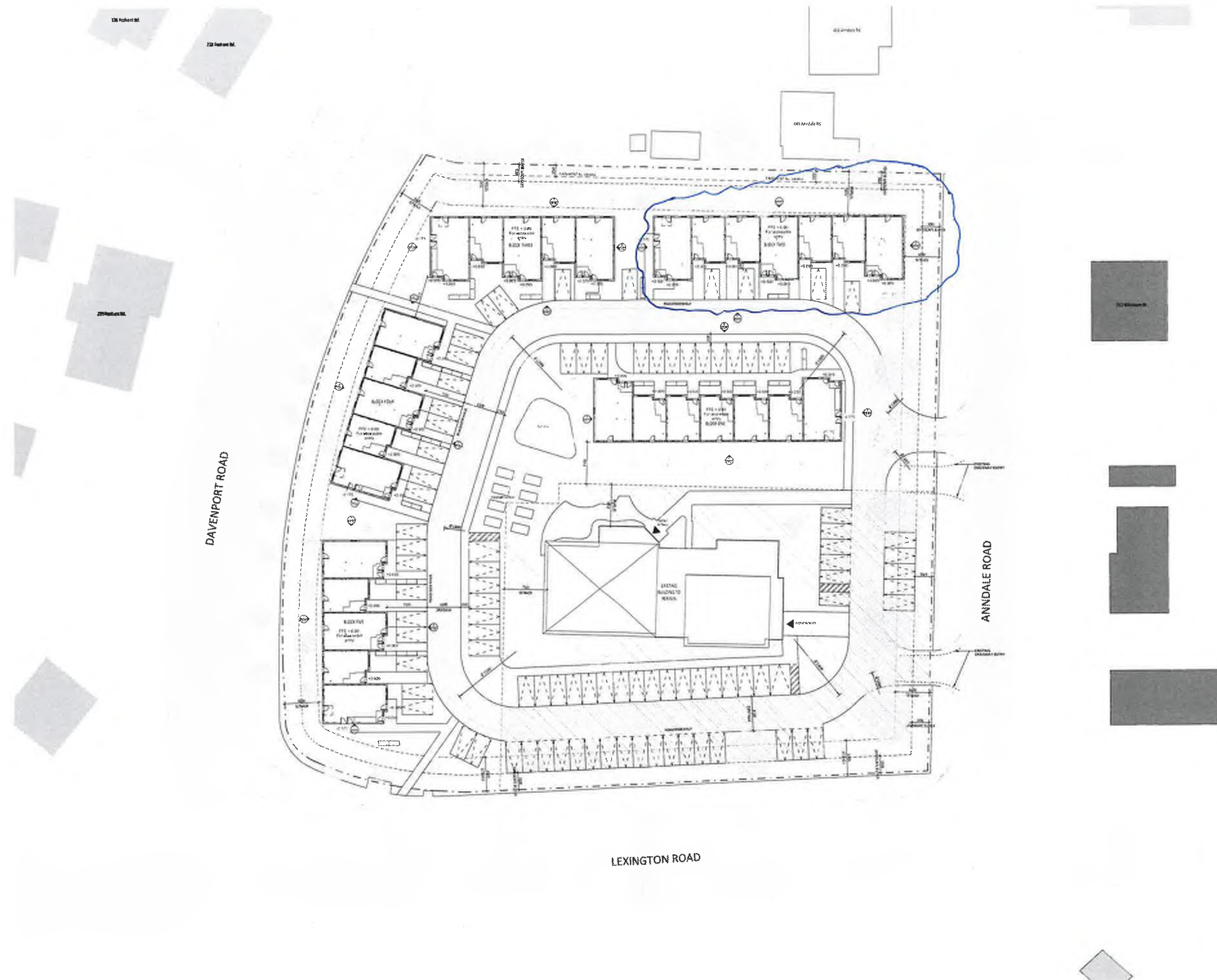
Pitot Reading (1)	42 PSI
Outlet Size (1)	2.5 inches
Pitot Reading (2)	27 PSI
Outlet Size (2)	2.5 inches
Pitot Reading (3)	40 PSI
Outlet Size (3)	2.5 inches
Flow 1 Calculated	1088 USGPM
Flow 2 Calculated	1677 USGPM
Flow 3 Calculated	2581 USGPM

# of Outlets Flowed (1)	1
# of Outlets Flowed (2)	2
# of Outlets Flowed (3)	3
Graph Data:	
Pressure Values (y-axis)	Flow Values (x-axis)
50	0
47	1088
45	1677
44 PSI	2581
Time of Test :	10:00 AM
21-Jul-24	
Performed by:	Josh Green + 1

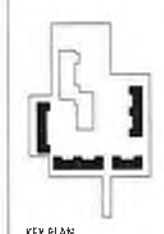


Water Graph





1. The site is located at the intersection of Davenport Road and Lexington Road, south of Ann Dale Road. The site is bounded by Davenport Road to the west, Lexington Road to the south, and Ann Dale Road to the east. The site is currently vacant and is being proposed for residential development. The proposed development consists of a central building to be demolished and replaced with a new building, and several rows of smaller residential units. The site is shown on the attached site plan.



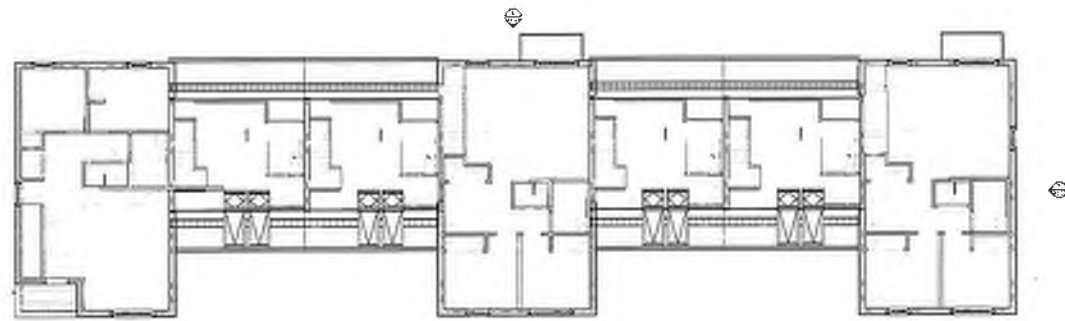
KEY PLAN

KP MB
25th King St W, Suite 2000
Toronto, ON, Canada M5H 2B6
416-877-2344
6th Flr
File
Legal Description

Project Name
445 ANNDALE RD.
445 Ann Dale Rd., Willowdale, ON
M2H 3E3



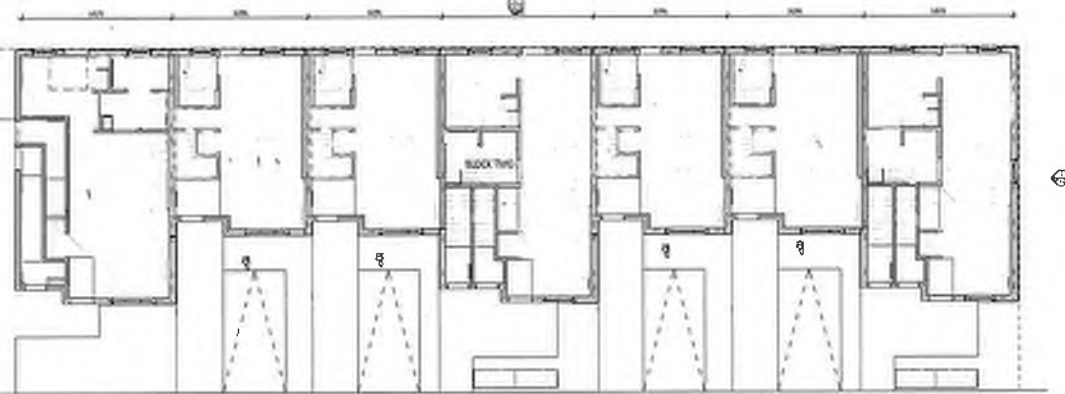
Project No. 12
Date 1.12.2021
SHEET 1 OF 1
SITE PLAN



8 BLOCK 2 - LEVEL 3
1:50



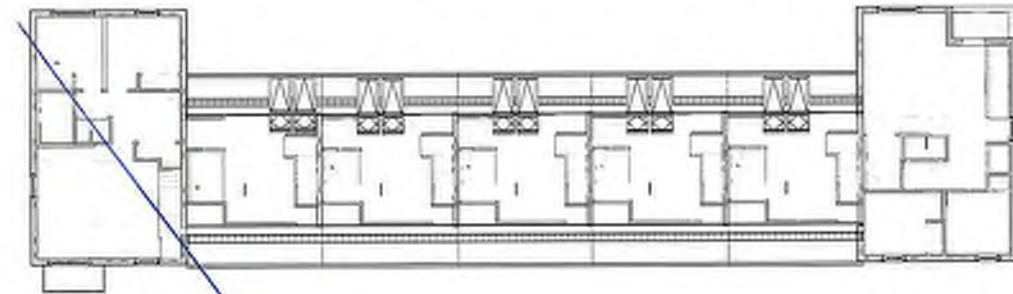
7 BLOCK 2 - LEVEL 2
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6 BLOCK 2 - GROUND LEVEL
1:50



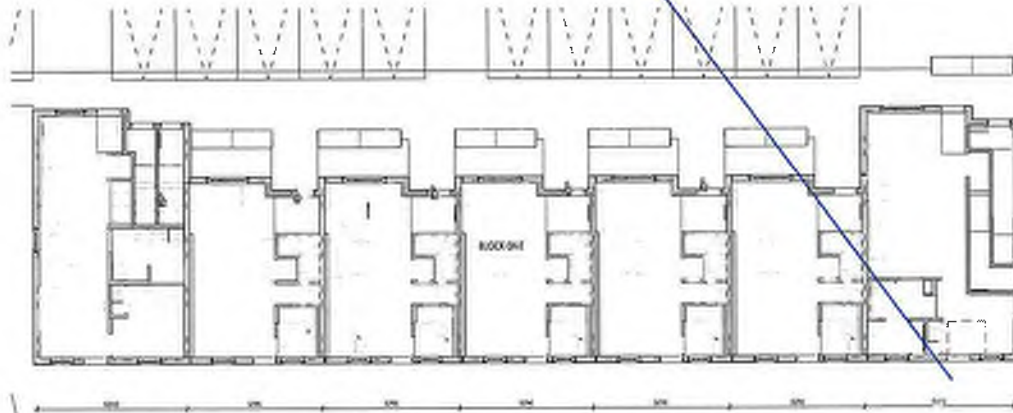
5 BLOCK 2 - BASEMENT
1:50



4 BLOCK 1 - LEVEL 3
1:50



3 BLOCK 1 - LEVEL 2
1:50



2 BLOCK 1 - GROUND LEVEL
1:50



1 BLOCK 1 - BASEMENT
1:50



KEY PLAN

KP
MB

30 King St. E. Suite 1000
Toronto, ON M5E 1A5
416-593-1111

CPA Inc.

Legal Development

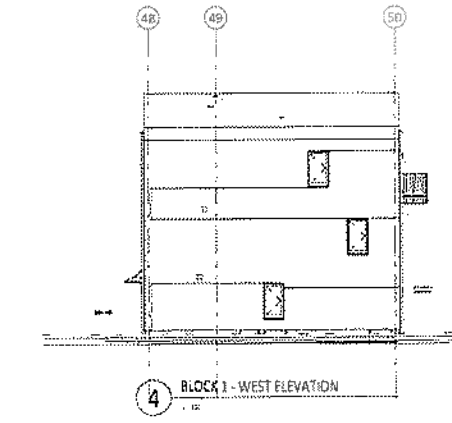
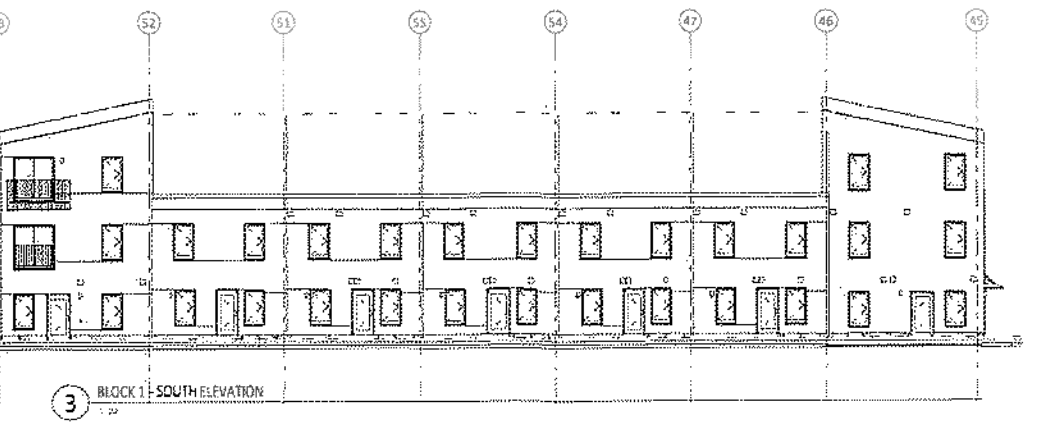
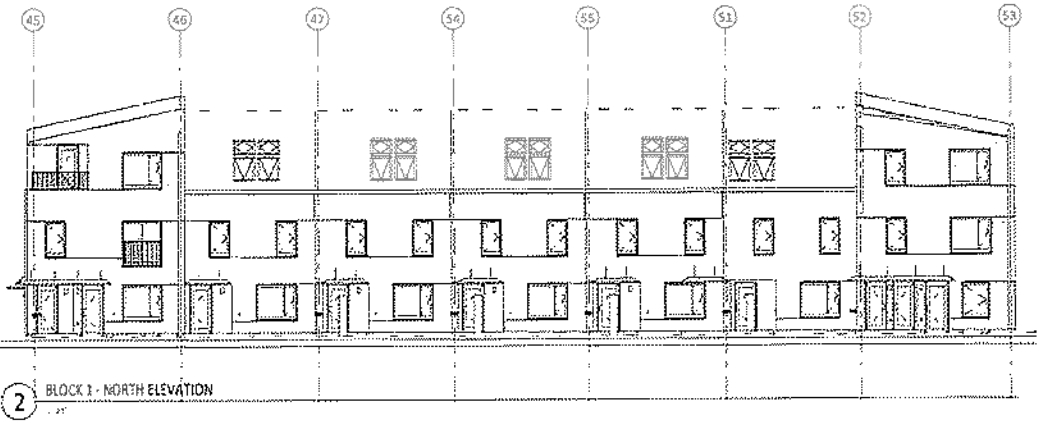
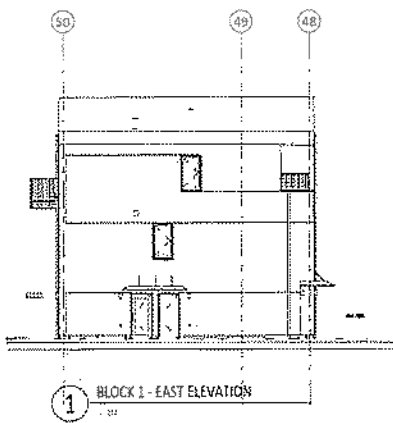
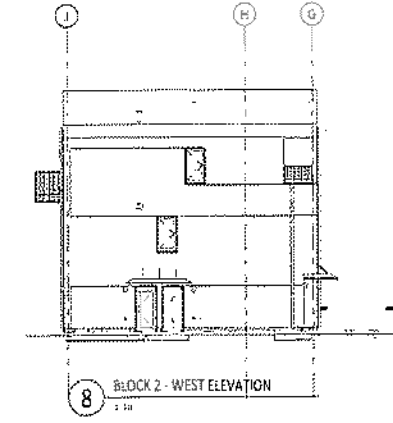
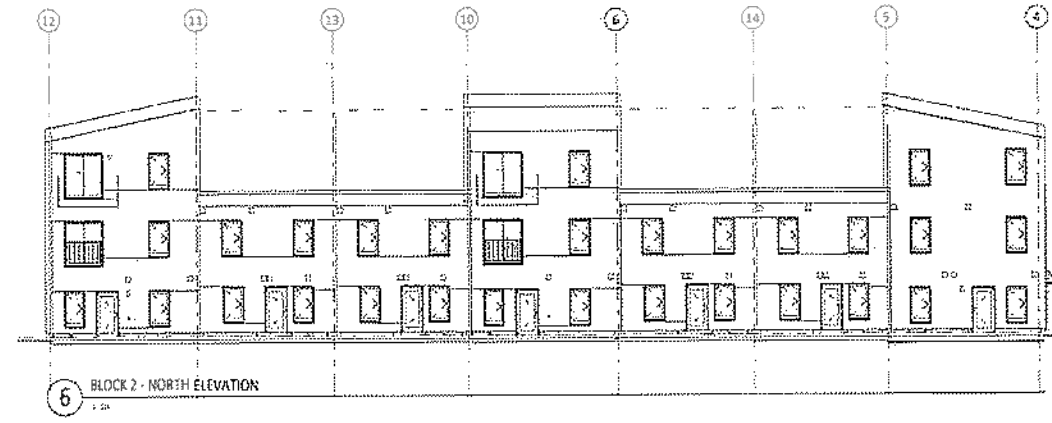
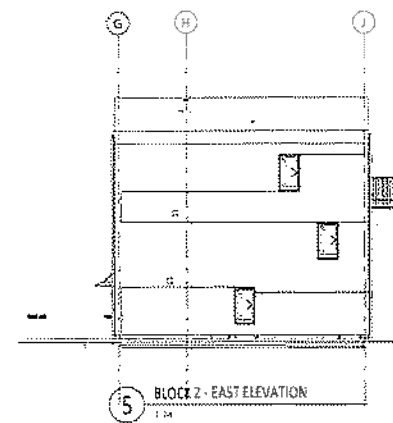
445 ANNDALE RD.

445 Annandale Rd., Toronto, ON
M2N 2E3



Scale: 1:50

Block 1 & 2 - Block Plans



**KPMB
ARCHITECTS**
35104 S.E. 2nd Ave. Suite 1200
Seattle, WA 98148-3450
206.467.1200

Kindergarten Works
445 ANNDALE RD.

M/S Atanah Reg. Victoria
ON
MAY 20

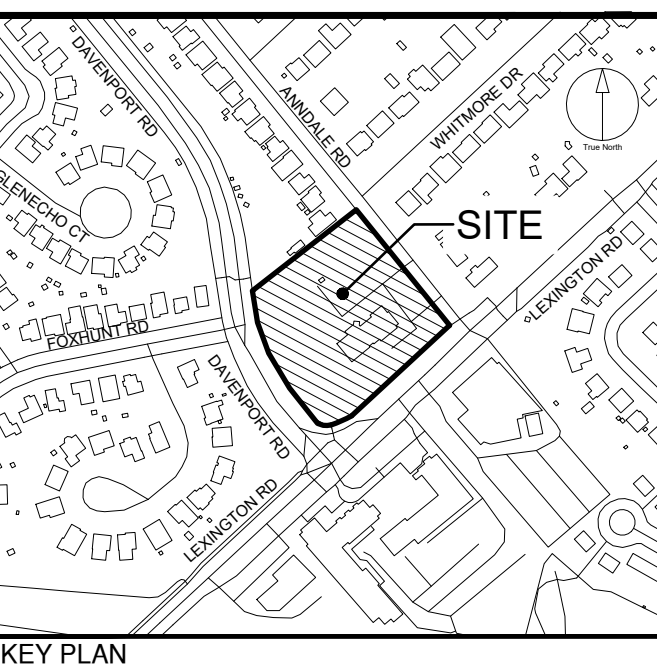
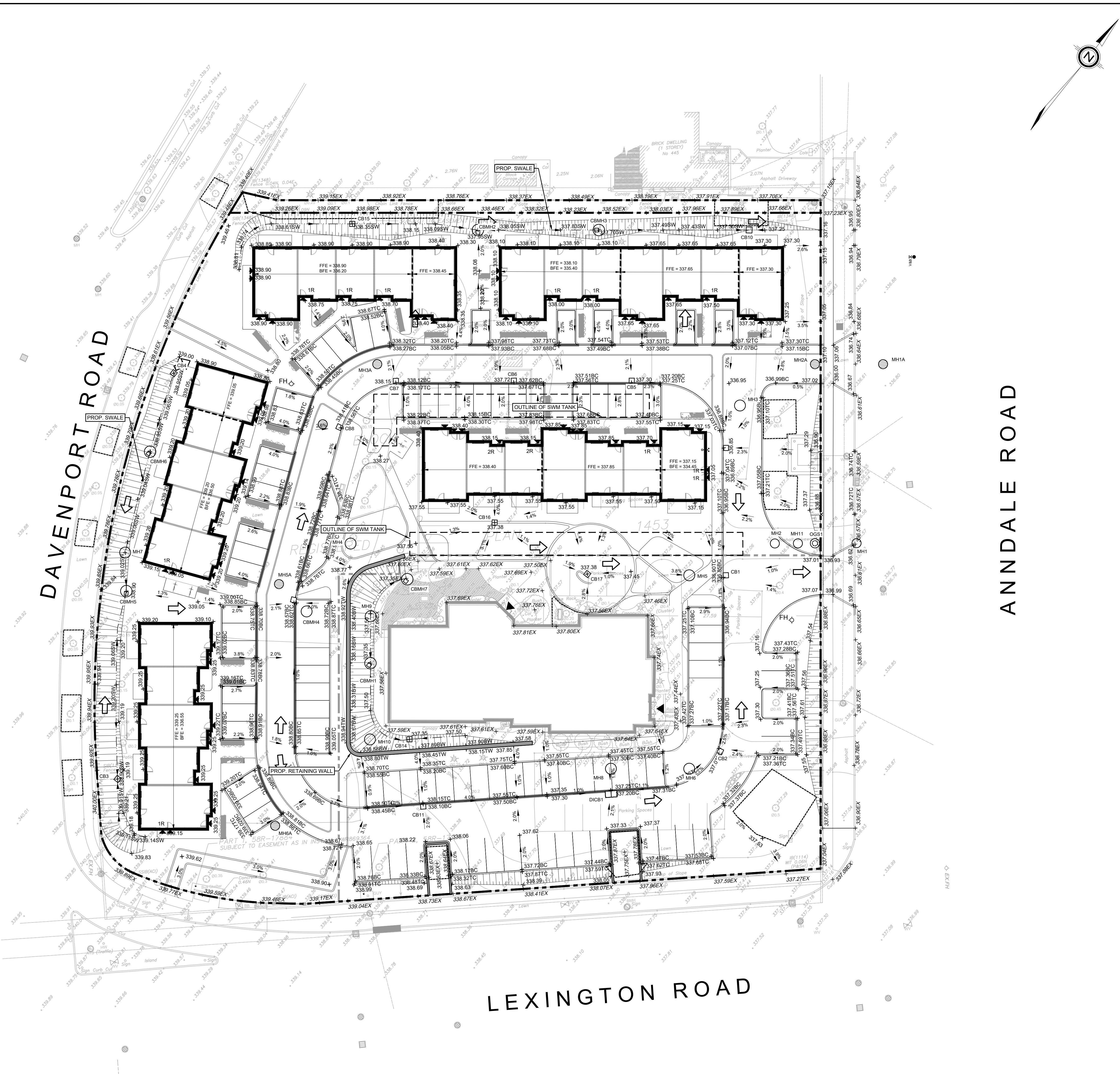


Project #	2000
Year	1999
File Name	20000101

**ELEVATIONS -
GROUP 1 & 2**

Appendix E

Engineering Plans



ISSUES	DESCRIPTION	DATE
No.		
1	ISSUED FOR ZBA SUBMISSION	SEP 19, 2025

LEGEND	
PROPERTY LINE	---
OUTLINE OF BUILDING AT GROUND LEVEL	---
OUTLINE OF ABOVEGROUND LEVEL	---
OUTLINE OF LEVEL BELOW	---
PROPOSED DOOR / OVERHEAD DOOR	---
PROPOSED GRADE (TOP OF CURB)	x 149.50
PROPOSED GRADE (BOTTOM OF CURB)	x 149.33EX
PROPOSED GRADE (TOP OF WALL)	x 149.50BC
PROPOSED GRADE (SWALE)	x 149.65TW
PROPOSED STORM MAINTENANCE HOLE	x 149.65SW
PROPOSED STORM CATCHBASIN MANHOLE	○
PROPOSED SANITARY MAINTENANCE HOLE	○
PROPOSED CATCHBASIN	○
PROPOSED VALVE AND BOX	○
EMERGENCY OVERLAND FLOW ROUTE	---

SEAL

PROJECT

PROJECT NO: 30290838
DRAWN BY: RJ
PROJECT MGR: NS

LIST OF DRAWINGS
SG-01 - SITE GRADING PLAN
SS-01 - SITE SERVICING PLAN
DD-01 - GENERAL NOTES
DD-02 - DETAILS

SITE PLAN INFORMATION
KPMB ARCHITECTS
351 KING STREET EAST
SUITE 1200
TORONTO, ON M5A 0L6
PHONE: (416) 977-5104
EMAIL: www.toronto.svng.on.ca

CLIENT
KINDRED WORKS

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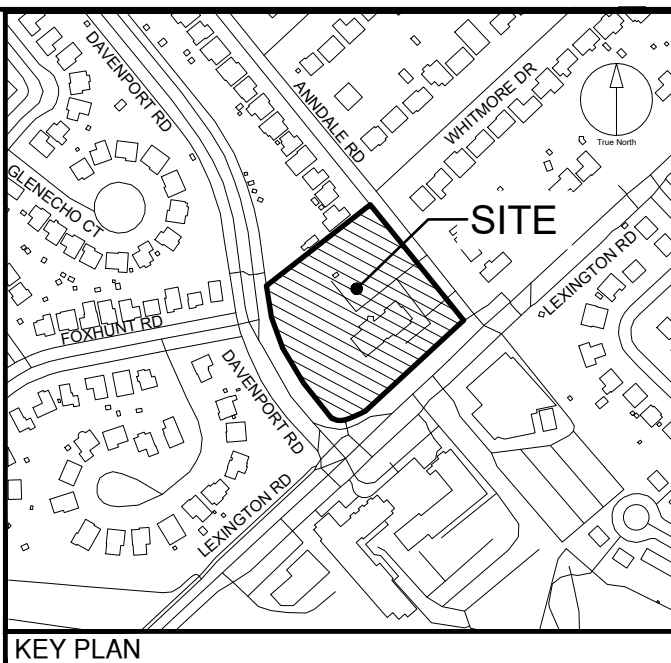
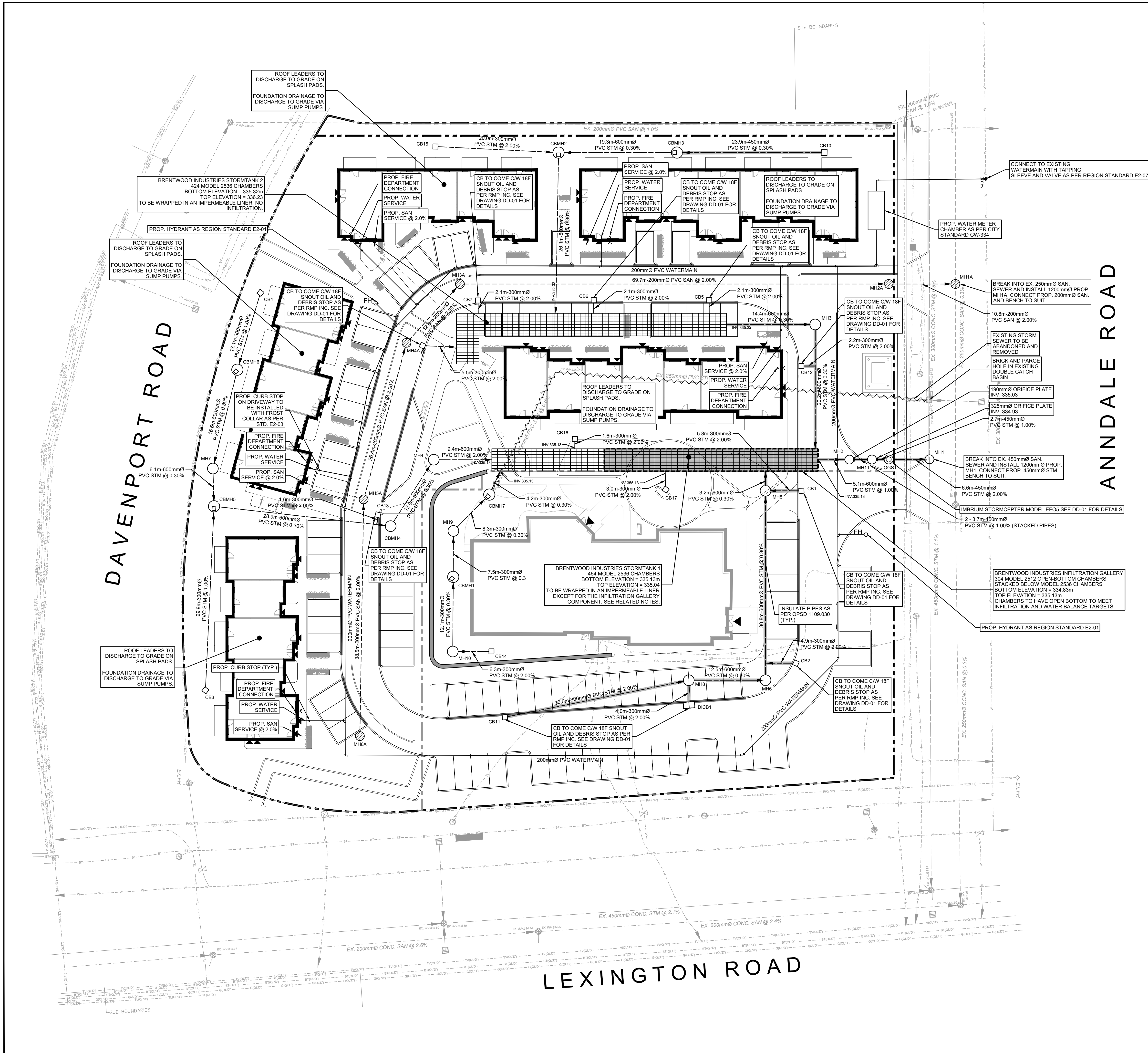
SEAL

PROJECT
445 ANNDAL RD.
WATERLOO, ON. N2K 2E3

PROJECT NO: 30290838
DRAWN BY: RJ
PROJECT MGR: NS

SHEET TITLE
SITE GRADING PLAN
SHEET NUMBER
SG-01
ISSUE
01

SCALE: 1:300
0 5.0m 10.0m



CLIENT

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ISSUES

No.	DESCRIPTION	DATE
1	ISSUED FOR ZBA SUBMISSION	SEP 19, 2025

LEGEND

PROPERTY LINE
OUTLINE OF BUILDING AT GROUND LEVEL
OUTLINE OF ABOVEGROUND LEVEL
PROP. DEPRESSED CURB
PROP. DOOR / OVERHEAD DOOR
PROP. STORM SEWER
PROP. SANITARY SEWER
PROP. STORM MAINTENANCE HOLE
PROP. STORM CATCHBASIN MANHOLE
PROP. STORM OIL-GRIT SEPARATOR
PROP. SANITARY MAINTENANCE HOLE
PROP. AREA DRAIN
PROP. VALVE AND BOX
PROP. WATERMAIN
PROP. WATER SERVICE

SANITARY SEWER
STRUCTURE INVENTORY

MH #	MH DIAMETER	MH OPSD	COVER OPSD	TOP ELEV.	INVERTS
MH1A	1200mmØ	701.010	401.010	336.80	SW 331.59 (200mmØ) NE 331.81 (200mmØ)
MH2A	1200mmØ	701.010	401.010	337.07	SW 332.08 (200mmØ) NE 331.81 (200mmØ)
MH3A	1200mmØ	701.010	401.010	338.26	S 333.53 (200mmØ) NE 333.47 (200mmØ)
MH4A	1200mmØ	701.010	401.010	338.48	SE 333.85 (200mmØ) N 333.79 (200mmØ)
MH5A	1200mmØ	701.010	401.010	338.66	SE 334.44 (200mmØ) NW 334.38 (200mmØ)
MH6A	1200mmØ	701.010	401.010	338.92	NW 335.21 (200mmØ)

STORM SEWER
STRUCTURE INVENTORY

MH #	MH DIAMETER	MH OPSD	COVER OPSD	TOP ELEV.	INVERTS
CBMH1	1500mmØ	701.011	400.020	337.35	SE 335.34 (300mmØ) NW 335.31 (300mmØ)
CBMH2	1500mmØ	701.011	400.020	337.95	SW 335.49 (300mmØ) NE 335.49 (600mmØ) SE 335.40 (600mmØ)
CBMH3	1500mmØ	701.011	400.020	337.70	NE 335.58 (450mmØ) SW 335.55 (600mmØ)
CBMH4	1500mmØ	701.011	400.020	338.66	SW 335.42 (600mmØ) N 335.36 (600mmØ)
CBMH5	1500mmØ	701.011	400.020	338.90	NW 335.80 (600mmØ) SE 335.60 (300mmØ) NE 335.51 (600mmØ)
CBMH6	1500mmØ	701.011	400.020	338.95	N 335.76 (300mmØ) SE 335.73 (600mmØ)
CBMH7	1500mmØ	701.011	400.020	337.36	S 335.20 (300mmØ) N 335.14 (300mmØ)
MH1	1200mmØ	701.010	401.010	336.58	SW 334.75 (450mmØ)
MH2	1200mmØ	701.010	401.010	337.02	SW 335.08 (600mmØ) NE 335.03 (450mmØ) NE 335.73 (450mmØ)
MH3	1500mmØ	701.011	401.010	336.92	SW 335.28 (600mmØ) SE 335.19 (600mmØ)
MH4	1500mmØ	701.011	401.010	338.77	S 335.32 (600mmØ) NE 335.32 (600mmØ)
MH5	1500mmØ	701.011	401.010	337.10	SE 335.17 (600mmØ) NE 335.23 (300mmØ) NW 335.14 (600mmØ)
MH6	1500mmØ	701.011	401.010	337.27	SW 335.35 (600mmØ) NW 335.26 (600mmØ)
MH7	1500mmØ	701.011	401.010	339.02	NW 335.68 (600mmØ) SE 335.62 (600mmØ)
MH8	1500mmØ	701.011	401.010	337.29	SW 335.45 (300mmØ) SE 335.48 (300mmØ) NE 335.39 (600mmØ)
MH9	1500mmØ	701.011	401.010	337.50	SE 335.29 (300mmØ) N 335.23 (300mmØ)
MH10	1500mmØ	701.011	401.010	337.97	NE 335.47 (300mmØ) NW 335.38 (300mmØ)
MH11	1200mmØ	701.010	401.010	337.04	SW 334.99 (450mmØ) SW 335.69 (450mmØ) NE 334.93 (450mmØ)
OGS1	1200mmØ	AS PER MANUFACTURER'S DETAIL		337.09	SW 334.90 (450mmØ) NE 334.88 (450mmØ)

SEAL

ARCADIS

8133 Warden Avenue - Unit 300
Markham ON L3R 9B3 Canada
tel 905 783 2322
www.arcadis.com

PROJECT

445 ANNDAL RD.

WATERLOO, ON. N2K 2E3

PROJECT NO:

30290838

DRAWN BY:

RJ

CHECKED BY:

NS

PROJECT MGR:

NS

APPROVED BY:

NS

SHEET TITLE

SITE SERVICING PLAN

SHEET NUMBER

SS-01

ISSUE

01

LIST OF DRAWINGS

SG-01 - SITE GRADING PLAN
SG-01 - SITE SERVICING PLAN
DD-01 - GENERAL NOTES
DD-02 - DETAILS

SITE PLAN INFORMATION

KPMB ARCHITECTS
395 KING STREET EAST
SUITE 1200
TORONTO, ON M5A 0L6
PHONE: (416) 749-7864
FAX: (416) 749-7865
E-MAIL: www.toronto.avrg.on.ca

SURVEYOR INFORMATION

SVNG LIMITED
750 OAKDALE ROAD,
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TORONTO, ON M3N 2Z4
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BENCHMARK INFORMATION:

ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE RELATED TO THE CITY OF WATERLOO BENCHMARK No. 0701078, HAVING AN ELEVATION OF 335.311 METRES.

SCALE: 1:300

File Location: C:\Users\jmmenzr\1918\DWG\CAD\Drawings\445 Anndale Rd\Project Files\10_WP04_Civil\AutoCAD\Drawings\30290838-SHT-SERV-01.dwg Last Saved: September 19, 2025, by jmmenzr\1918 Plotted: October 15, 2025 11:57:01 AM by jmmenzr, Raphael

GENERAL NOTES:

1. CONTRACTOR IS REQUIRED TO REFER THE APPROVED VEGETATION MANAGEMENT PLAN WITH RESPECT TO THE INFORMATION FOR TREE REMOVAL / TREE PROTECTION.
2. CONTRACTOR TO INFORM CITY'S PWS INSPECTOR PRIOR OF ALL SERVICE DISCONNECTIONS. CITY'S INSPECTOR TO BE ON SITE DURING SERVICE DISCONNECTIONS.
3. EXISTING WATER SERVICE TO BE REMOVED AND AT MAIN. DISCONNECTED PIPE MUST BE CAPPED OR BULK HEADED.
4. LEAD TEE JOINTS DRAINED, SUPER FLUSHED AND CHLORINATED WITH POSSIBLE MAIN SHUT DOWN.
5. EXISTING SANITARY SERVICE TO BE REMOVED AND CAPPED AT PROPERTY LINE.
6. IF EXISTING SANITARY SERVICE PIPE CONSIST OF BITUMINOUS FIBER PIPE, THE FULL SERVICE TO BE REMOVED AND CAPPED AT THE MAIN.
7. EXISTING VEGETATION NOT TO BE REMOVED UNTIL A BUILDING PERMIT HAS BEEN ISSUED OR UNTIL CONTROL MEASURES HAVE BEEN INSTALLED AND ACCEPTED BY CITY LANDSCAPE TECHNOLOGIST.
8. EXISTING CONCRETE SIDEWALK TO REMAIN UNTIL ALL CONSTRUCTION WORKS HAVE FINISHED.
9. CONCRETE WORKS (CURB AND GUTTER, SIDEWALKS) OF PAVING WILL NOT BE PERMITTED AFTER NOVEMBER 30th OF EACH YEAR UNLESS SPECIFICALLY APPROVED IN WRITING BY THE DIRECTOR OF ENGINEERING SERVICES.
10. ALL MUNICIPAL DRAIN INLETS, ON SITE CB AND MH's (UPON COMPLETION OF SERVICING), OR ANY OTHER CB INLETS IN THE AREA OF THE SITE AND ON HAUL ROUTES MUST BE PROTECTED WITH FILTER FABRIC, OR EQUIVALENT BARRIERS MEETING CRITERIA, STANDARDS AND SPECIFICATIONS ACCEPTABLE BY THE ENGINEERING AND CONSTRUCTION DIVISION.
11. EROSION AND SEDIMENT CONTROL AND CONCEPTUAL WORKSPACE MANAGEMENT PLAN MUST BE REVIEWED JOINTLY BY THE CONSULTANT, CONTRACTOR, SUPERINTENDENT AND THE CITY STAFF PRIOR TO COMMENCEMENT OF CONSTRUCTION, AND REVISIONS TO THE PLANS RESUBMITTED TO THE ENGINEERING AND CONSTRUCTION DIVISION, AS NECESSARY.
12. NO CONSTRUCTION WORK ON TO BE UNDERTAKEN ON THE SUBJECT PROPERTY WITHOUT FINAL ENGINEERING ACCEPTANCE AND A BUILDING PERMIT ISSUED BY THE CITY.
13. ALL WORK TO BE DONE IN ACCORDANCE WITH STANDARDS AND SPECIFICATION OF THE REGION OF WATERLOO (DGSSMS), CITY OF WATERLOO AND OPSD EXCEPT WHICHEVER ARE MORE STRINGENT. NEW CURBS AND SOD TO BE REINSTATED AS REQUIRED. ANY AREAS IN RIGHT OF WAY DISTURBED THROUGH CONSTRUCTION TO BE REPLACED AT THE DEVELOPERS COST.
15. EXISTING CONC. SIDEWALK TO BE REMOVED AND REPLACED AT NEW ENTRANCE AS PER CITY STANDARD DWG. W-230. NEW SIDEWALK TO BE REPLACED AT THE DEVELOPERS' COST.
16. ALL SERVICE CONNECTIONS TO THE PROPERTY LINE MUST BE INSTALLED TO THE CITY'S SATISFACTION PRIOR TO ANY INTERNAL SERVICING WORKS AS PER CITY BY-LAW.
17. CITY OF WATERLOO, ENGINEERING SERVICES DEPARTMENT MUST BE NOTIFIED OF ANY SIGNIFICANT CHANGES TO THE APPROVED DESIGN THAT MAY OCCUR DURING CONSTRUCTION.
18. CONTRACTOR IS RESPONSIBLE FOR RESTORING ALL AFFECTED PROPERTY TO ORIGINAL CONDITION, AT THE OWNERS EXPENSE.
19. CONTRACTOR TO REFER TO BY-LAW 08-077 'THE CITY OF WATERLOO TRAFFIC AND PARKING BY-LAW'.
20. CONTRACTOR TO REFER TO BY-LAW 10-066 'THE CITY OF WATERLOO SITE ALTERATION BY-LAW'.
21. CONTRACTOR TO REFER TO BY-LAW 09-111 'THE CITY OF WATERLOO WORK PERMIT BY-LAW'.
22. THE ENGINEERING ACCEPTANCE OF THIS PLAN DOES NOT EXEMPT THE OWNER'S BONDED CONTRACTOR FROM THE REQUIREMENTS TO OBTAIN THE VARIOUS PERMITS AND ADDITIONAL APPROVALS REQUIRED TO COMPLETE CONSTRUCTION PROJECT.
23. ALL SERVICE CONNECTIONS TO THE PROPERTY LINE MUST BE INSTALLED TO THE CITY'S SATISFACTION PRIOR TO ANY INTERNAL SERVICING WORKS AS PER CITY BY-LAW.
24. WATER SYSTEMS 100mm Ø AND LARGER TO BE ISOLATED FROM THE MUNICIPAL WATER SUPPLY WITH THE CERTIFIED BACKFLOW PREVENTION DEVICE DURING CONSTRUCTION.
25. WATER SERVICE TESTING AND COMMISSIONING TO COMPLY WITH DGSSMS SECTION D.28 'COMMISSIONING'.
26. #8 GAUGE TWU SOLID COPPER PLASTIC COATED TRACER WIRE TO BE ATTACHED TO EVERY NONMETALLIC SERVICE TO INSIDE THE BUILDING AND ON FIRE SERVICE LEAD TO ENABLE THE PIPE TO BE LOCATED.
27. ANODES CONNECTED TO EACH METALLIC FITTINGS USING BRASS GROUNDING CLAMPS, SHALL NOT BE ATTACHED TO TRACER WIRES, AND TRACER WIRE SHALL NOT BE CONNECTED TO WATERMAIN FITTINGS.
28. ALL METALLIC WATERMAIN FITTINGS AND APPURTENANCES ARE TO BE WRAPPED WITH AN APPROVED PETROLATUM SYSTEM.
29. ALL NEW MANHOLES MUST BE FITTED WITH SELF-ADJUSTING MANHOLE FRAMES AND COVERS FROM EAST JORDAN IRON WORKS (PRODUCT NO. 00302201) OR BIBBY-STE-CROIX (AUTOSTABLE C-50M-ONT).
30. ENGINEERING ACCEPTANCE OF THIS PLAN DOES NOT EXEMPT THE OWNERS BONDED CONTRACTOR FROM THE REQUIREMENT TO OBTAIN THE VARIOUS PERMITS AND ADDITIONAL APPROVALS REQUIRED TO COMPLETE A CONSTRUCTION PROJECT

BEFORE STARTING WORK:

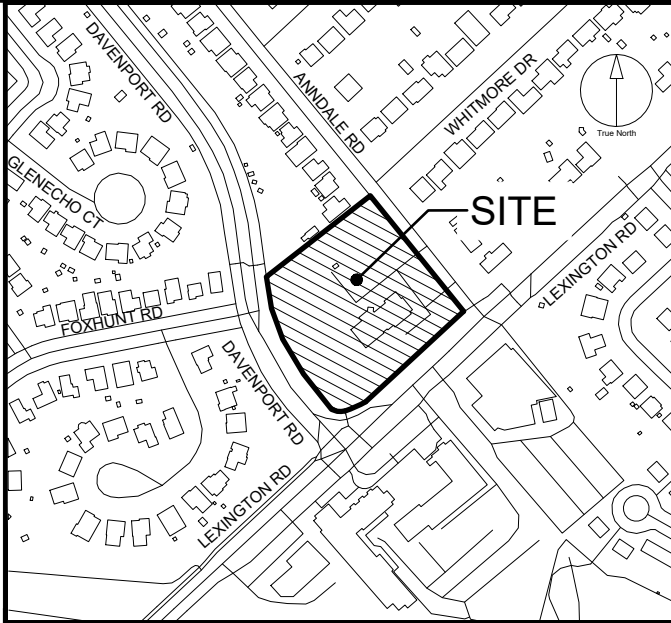
1. ANY CONSTRUCTION WORK WITHIN THE TRAVELED PORTION OF A ROADWAY IS PROHIBITED UNTIL FORMAL WRITTEN AUTHORIZATION FROM THE CITY'S PWS TRANSPORTATION DIVISION IS OBTAINED. A TRAFFIC CONTROL PLAN (INCLUDING SIGNAGE CONSIDERATIONS) WILL REQUIRE APPROVAL BY PWS STAFF. MAKE APPLICABLE TRAFFIC CONTROL ARRANGEMENTS WITH HELGA BOWMAN AT (519-886-2310 EXT:30270)
2. PER CITY BY-LAW 10-066 NO WORK SHALL BE COMPLETED ON THE SUBJECT PROPERTY WITHOUT A BUILDING PERMIT, INCLUDING PRE-GRADING OR TREE REMOVAL. SHOULD THE DEVELOPER OR CONTRACTOR WISH TO PREPARE THE SITE FOR CONSTRUCTION PRIOR TO ENGINEERING ACCEPTANCE OR ISSUANCE OF THE BUILDING PERMIT, AN APPLICATION FOR A SITE ALTERATION PERMIT SHALL BE SUBMITTED TO THE ENGINEERING AND CONSTRUCTION DIVISION FOR REVIEW AND APPROVAL. PLEASE REFER TO CITY BY-LAW 10-066 FOR ALL REQUIREMENTS OF THE PERMIT.
3. CONTRACTOR MUST HAVE THE SEDIMENT AND EROSION CONTROLS IN PLACE AND INSPECTION BY CITY FORCES PRIOR TO ANY WORK COMPLETED ON SITE.
4. THE CONTRACTOR SHALL NOTIFY THE CITY OF WATERLOO AND ARCADIS AT LEAST 48 HOURS PRIOR TO COMMENCING CONSTRUCTION.
5. THE POSITION OF THE POLE LINES, CONDUITS, WATERMANS, SEWERS, AND OTHER UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED.
6. PRIOR TO THE COMMENCEMENT OF CONSTRUCTION, ALL BENCHMARKS, ELEVATIONS, DIMENSIONS, AND GRADES MUST BE CHECKED BY THE CONTRACTOR AND ANY DISCREPANCIES REPORTED TO THE ENGINEER.
7. ALL EXISTING UNDERGROUND UTILITIES WITHIN THE LIMITS OF CONSTRUCTION SHALL BE LOCATED, MARKED AND PROTECTED. ANY UTILITIES DAMAGED OR DISTURBED DURING CONSTRUCTION SHALL BE REPAIRED OR REPLACED TO THE SATISFACTION OF THE ENGINEER, AT THE CONTRACTOR'S EXPENSE.
8. ALL WORK WITHIN CITY RIGHT-OF-WAY TO BE DONE BY CITY FORCES OR APPROVED CONTRACTOR TO CITY/REGIONAL STANDARDS AT THE EXPENSE OF THE OWNER.
9. ALL MUDTRACING/SEDIMENT LEAVING SITE IS THE RESPONSIBILITY OF THE CONTRACTOR AND SHALL BE CLEARED DAILY.
10. CONTRACTOR/OWNER IS RESPONSIBLE TO RESTORE ANY DOWNSTREAM STORMWATER DAMAGE CAUSED BY CONSTRUCTION AND/OR DISTURBED PROPERTY WITHIN THE MUNICIPAL RIGHT-OF-WAY TO REGION OF WATERLOO AND THE CITY OF WATERLOO STANDARDS.
11. PRIOR OF CONSTRUCTION OWNER OF THE SITE TO INSTALL A PROJECT SIGN CLEARLY VISIBLE TO THE PUBLIC INDICATING:
 - a. THE NAME OF THE REGISTERED OWNER OR DEVELOPER;
 - b. THE NAME OF THE CONSULTING ENGINEER
 - c. THE NAME OF THE GENERAL CONTRACTORA TELEPHONE CONTACT NUMBER FOR EACH OF THE ABOVE TO BE CLEARLY MARKED ON THE SIGN. AT LEAST ONE OF THE TELEPHONE NUMBERS TO BE DESIGNATED AS A 24 HOUR EMERGENCY CONTACT NUMBER. SIGN TO BE MAINTAINED IN GOOD ORDER UNTIL PROJECT IS COMPLETED
12. ALL HEALTH AND SAFETY RELATED SIGNAGE MUST BE POSTED AT THE SITE REQUIRED BY THE APPLICABLE LAW AND BEST MANAGEMENT PRACTICES.
13. CONTRACTOR TO ENSURE ALL CATCHBASINS ALONG ROADS BORDERING AND DOWNSTREAM OF CONSTRUCTION MUST BE PROTECTED WITH FILTER FABRIC.
14. EXISTING PROPERTY LINE MUST BE SURVEYED AND IDENTIFIED PRIOR TO CONSTRUCTION AND ALL FENCING MUST BE PLACED INSIDE THE PROPERTY LINE.
15. CONTRACTOR IS REQUIRED TO INSTALL FULL BOARD HOARDING BETWEEN CONSTRUCTION AND PUBLIC WALKWAYS WITHIN HIGH PEDESTRIAN TRAFFIC.
16. CONTRACTOR MUST NOTIFY ALL NEIGHBORING RESIDENCE PRIOR OF PROPOSED WORKS ON THE ROAD RIGHT-OF-WAY. CLEAR ACCESS TO ADJACENT PROPERTIES MUST BE MAINTAINED AT ALL TIMES.
17. CONTRACTOR TO PROVIDE LOCATION OF EMERGENCY ACCESS TO THE CITY FOR APPROVAL PRIOR OF CONSTRUCTION. EMERGENCY ENTRANCE TO HAVE CLEAR ACCESS AT ALL TIME FOR EMERGENCY.
18. GENERAL CONTRACTOR IS RESPONSIBLE TO SCHEDULE PRE-CONSTRUCTION MEETING WITH THE CITY OF WATERLOO ENGINEERING SERVICE REPRESENTATIVE AND ARCADIS PRIOR OF CONSTRUCTION.
19. THE DEVELOPER'S CONSULTING ENGINEER SHALL NOTIFY THE CITY'S ENGINEERING AND CONSTRUCTION PROJECT MANAGER AT LEAST ONE WEEK IN ADVANCE OF ALL PRE-CONSTRUCTION AND SITE MEETINGS. CONSTRUCTION CAN NOT PROCEED UNTIL A PRE-CONSTRUCTION MEETING INCLUDING THE DEVELOPER'S REPRESENTATIVE, THE CONTRACTOR AND ENGINEERING AND CONSTRUCTION STAFF HAS BEEN HELD.
20. TRAFFIC PLAN BASED ON ONTARIO TRAFFIC MANUAL (OTM) BOOK 7 IS REQUIRED AND MUST BE APPROVED BY THE CITY OF WATERLOO. CONTRACTOR TO PROVIDE THE TRAFFIC PLAN TO THE CITY PRIOR OF CONSTRUCTION. COPY OF TRAFFIC PLAN TO BE ON THE SITE AT ALL TIMES.
21. TRAFFIC CONTROL PLAN MUST BE BASED ON ONTARIO TRAFFIC MANUAL (OTM) BOOK 7.
22. CONTRACTOR TO INFORM PUBLIC WORKS SERVICES STAFF OF ALL DISCONNECTIONS. PWS STAFF TO COMPLETE AN INSPECTION DURING EXISTING SERVICE DISCONNECTIONS.
23. REPLACEMENT OF FULL SIDEWALK FRONTING PROPERTY IS REQUIRED AT A COST TO THE DEVELOPER.

EROSION CONTROL NOTES:

1. NO ALTERNATIVE METHODS OF EROSION CONTROL PROTECTION SHALL BE PERMITTED UNLESS APPROVED BY IBI GROUP AND THE CITY OF WATERLOO'S INTEGRATED PLANNING AND PUBLIC WORKS - ENGINEERING SERVICES.
2. SILT FENCING TO BE PER OPSD 219.110 AND REQUIRED TO BE INSTALLED AROUND FULL CONSTRUCTION AREA.
3. ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES MUST BE PUT INTO PLACE AT THE CITY'S REQUEST.
4. STOCKPILE LOCATIONS TO BE MINIMUM 2.50m FROM PROPERTY LINE. ADDITIONAL EROSION CONTROL MEASURES MAY BE REQUIRED AS SITE DEVELOPMENT PROGRESSES.
5. CONTRACTOR TO PROVIDE ALL ADDITIONAL EROSION CONTROL FEATURES TO PREVENT SEDIMENT FROM LEAVING THE SITE.
6. SEDIMENTS TO BE REMOVED WHEN ACCUMULATIONS REACH A MAXIMUM OF 1/3 THE HEIGHT OF THE STRUCTURE.
7. CONTRACTOR IS RESPONSIBLE FOR REMOVING SEDIMENTS FROM THE MUNICIPAL ROADWAY AND SIDEWALKS AT THE END OF EACH WORK DAY.
8. ALL EROSION CONTROL STRUCTURES TO REMAIN IN PLACE UNTIL ALL DISTURBED GROUND SURFACES HAVE BEEN RE-STABILIZED EITHER BY PAVING OR RESTORATION OF VEGETATIVE GROUND COVER.
9. CONTRACTOR TO MONITOR THE SITE DEVELOPMENT TO ENSURE ALL EROSION CONTROLS ARE INSTALLED AND MAINTAINED TO CITY REQUIREMENTS AND ANY DAMAGE REPAIRED IMMEDIATELY.
10. CONTRACTOR TO COMPLY WITH THE ENGINEER'S INSTRUCTIONS TO INSTALL, MODIFY OR MAINTAIN EROSION CONTROL WORKS.
11. MUNICIPAL ROAD RIGHT-OF-WAY TO BE MAINTAINED FREE OF DEBRIS THROUGHOUT CONSTRUCTION. STREET SWEEPING AND DUST CONTROL SHALL BE COMPLETED DAILY, IF APPLICABLE.

GENERAL SERVICING NOTES:

1. SANITARY SEWER SYSTEM:
 - A. PVC PIPE SDR 28 - BACK FILLED WITH APPROVED MATERIAL (95% SPD MIN.) OR EQUIVALENT. PER OPSD 802.010
 - B. CLASS "B" BEDDING
 - C. MINIMUM PIPE COVER 2.0m.
 - D. NOR-A-SEAL BOOT OR APPROVED EQUAL IS REQUIRED WHERE PIPE PASS THROUGH MANHOLE WALLS. BENCHING IS REQUIRED INSIDE THE MANHOLE PER OPSD 701.021.
 - E. MANHOLES - OPSD 701.010. BACKFILLED WITH GRAN. 'B' (100% SPD MIN.)
 - F. 2.0m MINIMUM COVER.
 - G. SERVICES:
 - G.1. 150mmDIA. PVC SDR 28
 - G.2. SERVICE MARKER PAINTED RED
2. STORM SEWER SYSTEM:
 - A. PVC PIPE SDR 28 - BACK FILLED WITH APPROVED MATERIAL (95% SPD MIN.) OR EQUIVALENT. PER OPSD 802.010
 - B. CLASS "B" BEDDING.
 - C. 1.5m MINIMUM COVER.
 - D. CB FRAME AND GRATE PER OPSD 400.100.
 - E. SINGLE CATCH BASINS - OPSD 705.010.
 - F. STORM PIPE PVC SDR 35
 - G. MANHOLE - 701.010.
 - H. SERVICE MARKER PAINTED GREEN
3. WATERMAIN SYSTEM:
 - A. PVC PIPE SDR 28 - BACK FILLED WITH APPROVED MATERIAL (95% SPD MIN.) OR EQUIVALENT. PER OPSD 802.010
 - B. CLASS "B" BEDDING.
 - C. 150mmØ (IPEX-BLUE BRUTE B1373) DR18 PVC PIPE
 - D. 2.0m MINIMUM COVER.
 - E. MIN. VERTICAL CLEARANCE BETWEEN WATER MAIN AND OTHER SERVICES = 0.5m
 - F. MIN. HORIZ. CLEARANCE BETWEEN WATER MAIN AND OTHER SERVICES = 2.5m.
 - G. HYDRANTS ON WATER MAINS LESS THAN 300mm, 2-65mm NOZZLES, 150mm MECHANICAL JOINT INLET.
 - H. FIRE HYDRANTS SHALL BE INSTALLED IN ACCORDANCE WITH OPSD 1105.010
 - H.1. <300mm DIAMETER, HYDRANT SHALL HAVE 1-100M DIAMETER NOZZLE WITH STORZ CONNECTION, 2-65mm DIAMETER NOZZLES, AND 150mm MECHANICAL JOINT OUTLET
 - H.2. DRAIN PLUGS SHALL BE UNPLUGGED.
 - I. SERVICE MARKER PAINTED BLUE
 - J. 8 GAUGE TRACER WIRE TO BE INSTALLED ALONG THE LENGTH OF THE WATER SERVICE
 - K. ALL NEW PRIVATE FIRE SERVICE MAINS TO BE TESTED HYDROSTATICALLY AT NOT LESS THAN 200psi PRESSURE FOR TWO HOURS PER BUILDING CODE.
 - L. CONCRETE THRUST BLOCK TO BE INSTALLED ON ALL BENDS.
 - M. EXISTING SERVICES TO BE REMOVED AND CAPPED AT MAIN.



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KINDRED WORKS

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1	ISSUED FOR ZBA SUBMISSION	SEP 19, 2025

LEGEND

SEAL



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PROJECT
445 ANNDAL RD.

WATERLOO, ON. N2K 2E3

LIST OF DRAWINGS
SG-01 - SITE GRADING PLAN
SS-01 - SITE SERVICING PLAN
DD-01 - GENERAL NOTES
DD-02 - DETAILS

SITE PLAN INFORMATION

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BENCHMARK INFORMATION:
ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE RELATED TO THE CITY OF WATERLOO BENCHMARK No. 6701075, HAVING AN ELEVATION OF 335.311 METRES.

SCALE: 1:300



PROJECT NO:
30290838

DRAWN BY:
RJ

CHECKED BY:
NS

PROJECT MGR:
NS

APPROVED BY:
NS

SHEET TITLE

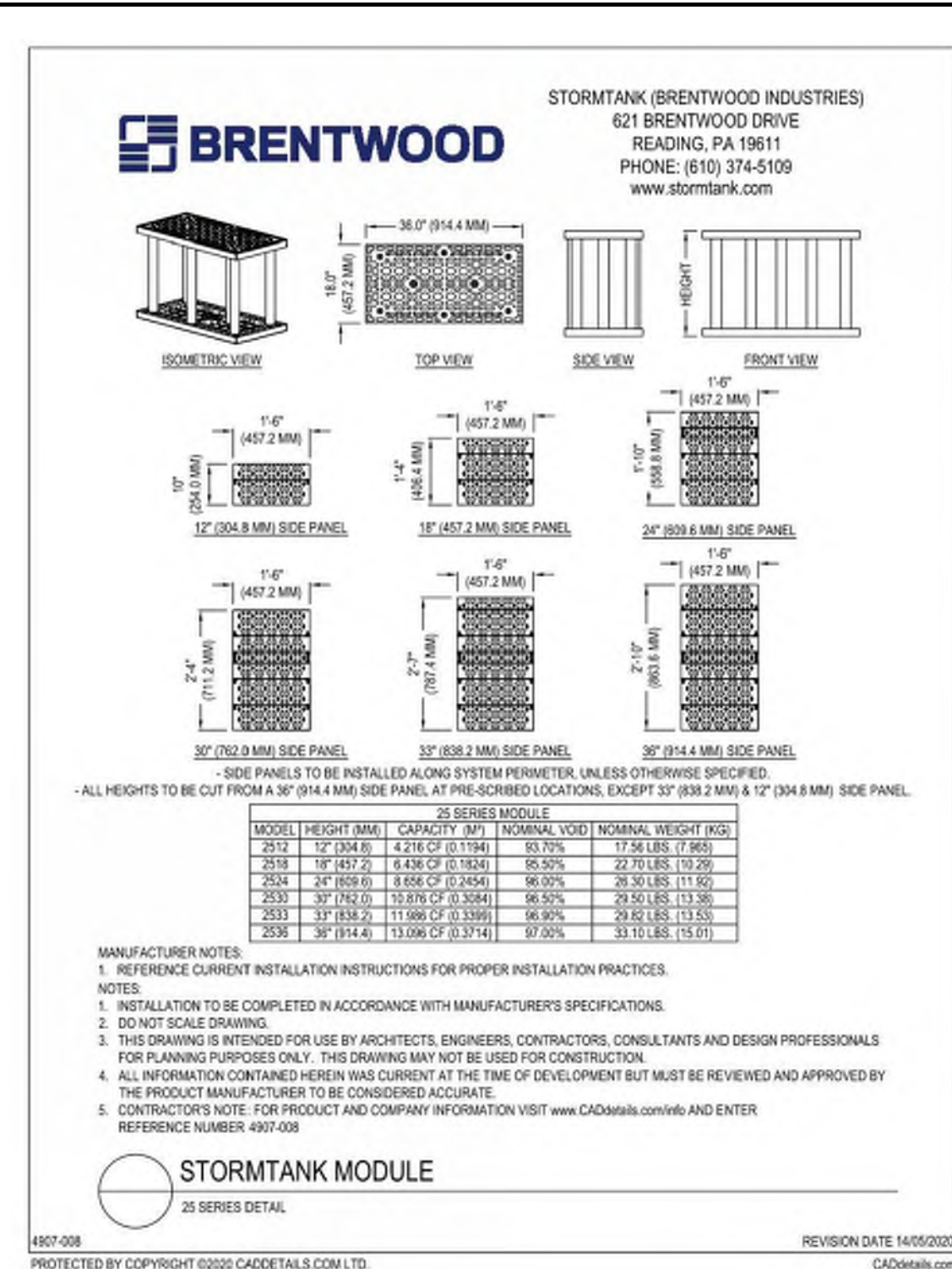
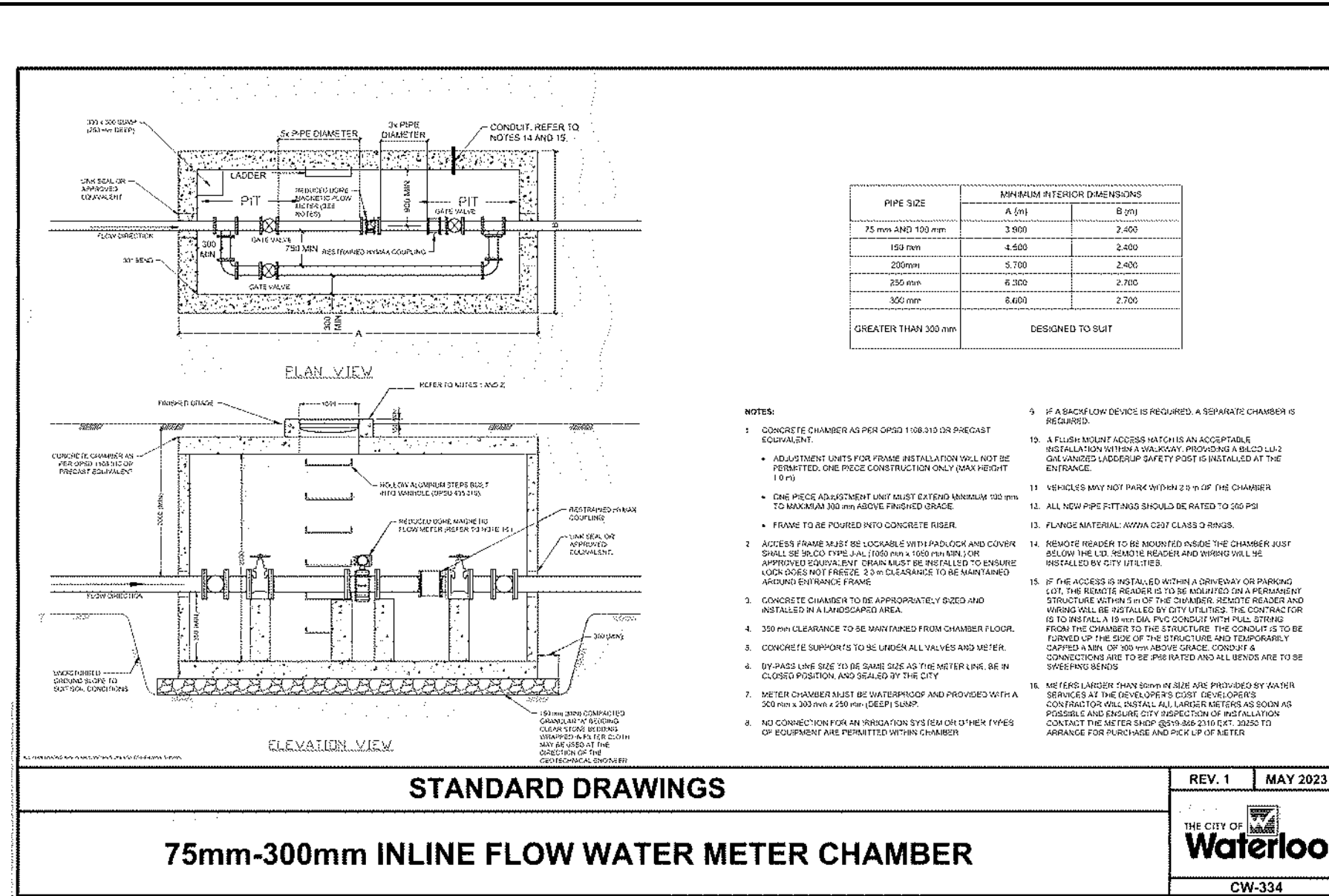
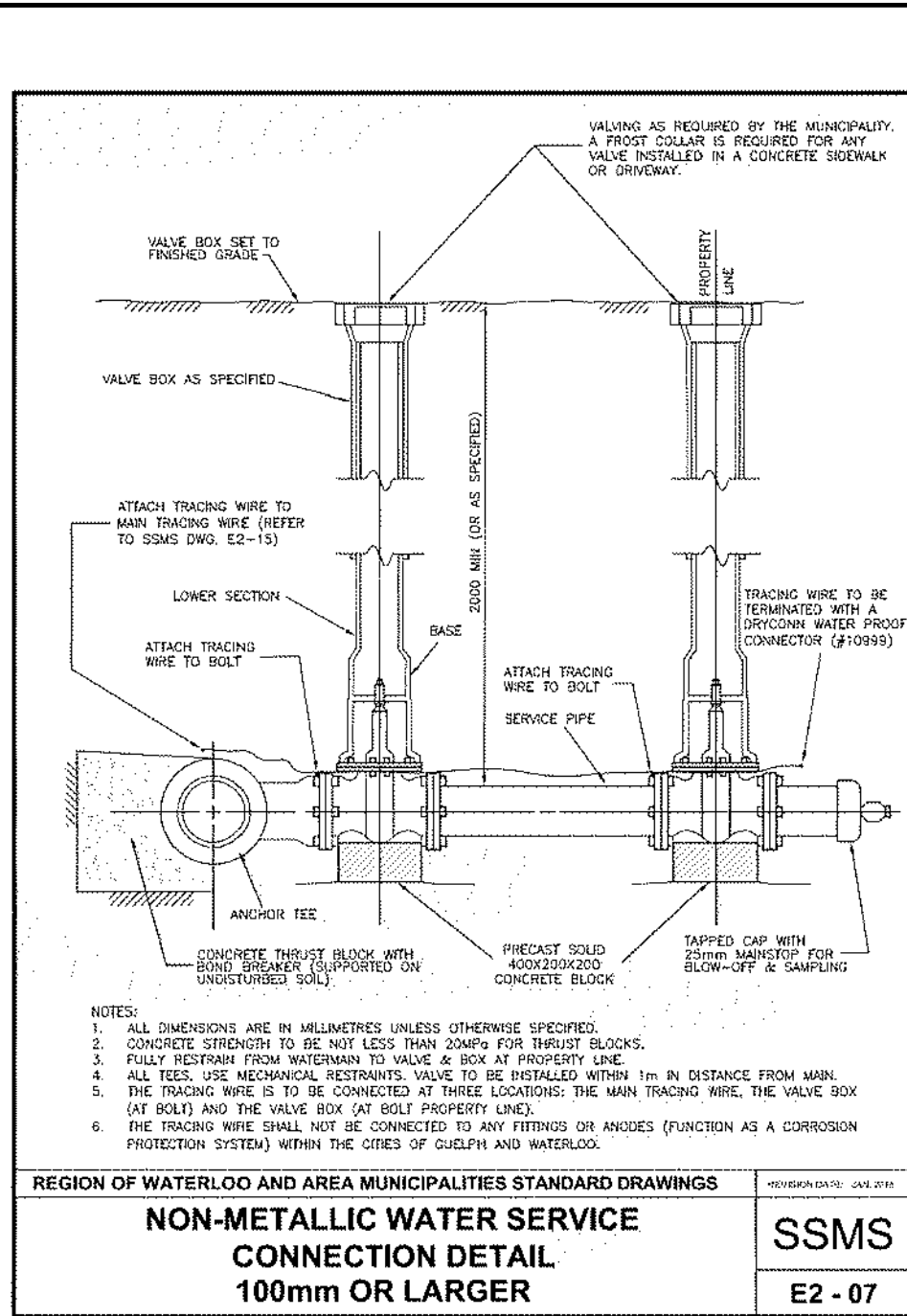
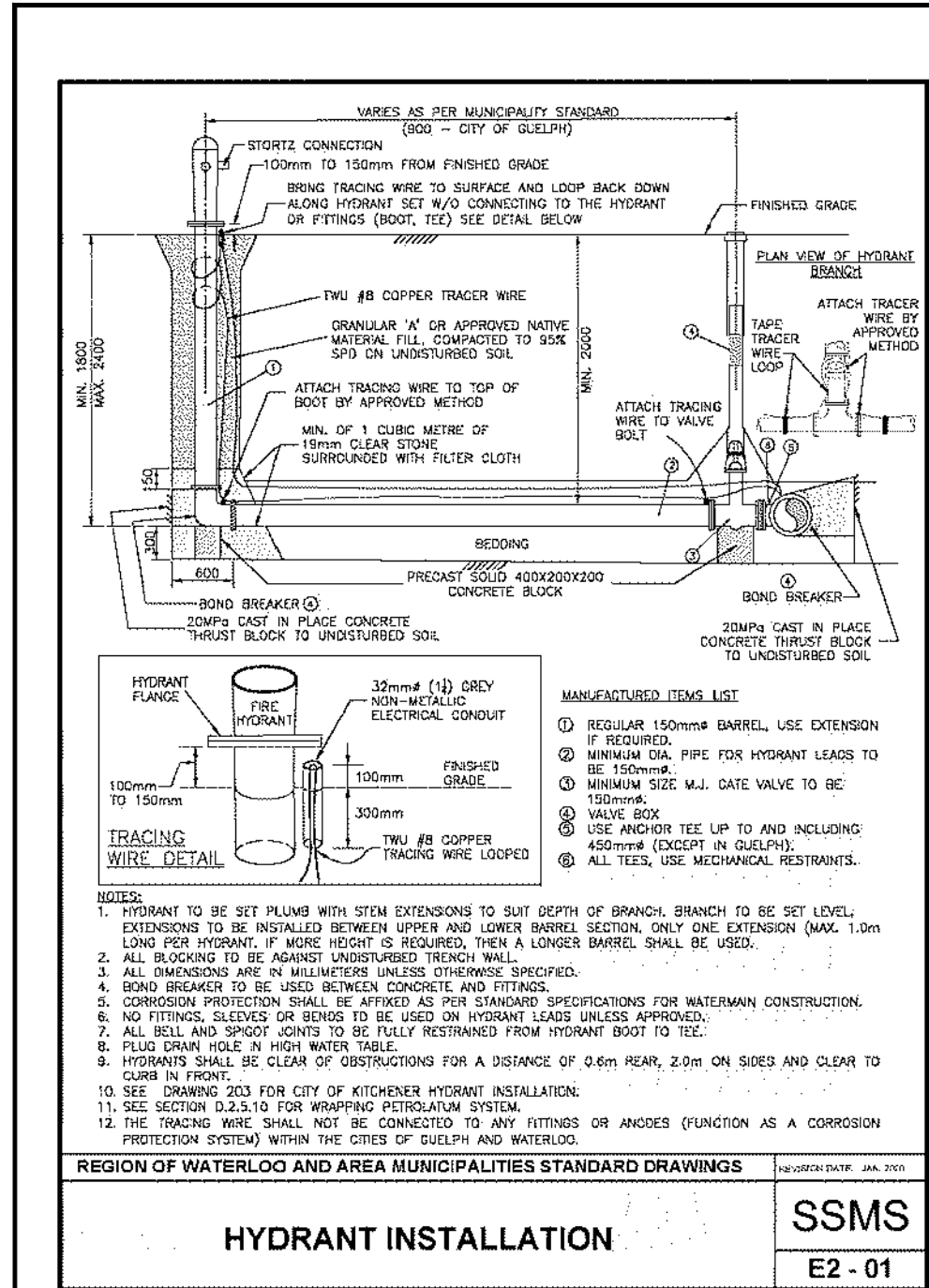
**GENERAL NOTES AND
DETAILS**

SHEET NUMBER

DD-01

ISSUE

01



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