



1310 South Service Road

Functional Servicing and Stormwater Management Report

Project Location:

1310 South Service Road, Hamilton, Ontario

Prepared for:

Livwell Developments
499 Brant Street
Burlington, Ontario L7R 2G5

Prepared by:

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August 25, 2026

MTE File No.: 65075_001





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Notes and Details Plan	
MTE Drawing No. C2.3	Encl.
Notes and Details Plan	
MTE Drawing No. C2.4	Encl.

1.0 INTRODUCTION

MTE Consultants Inc. (MTE) was retained by Livwell Developments to complete a Functional Servicing and Stormwater Management Report for a new residential development to be constructed at 1310 South Service Road in the City of Hamilton (herein referred to as the Site) in support of the Site Plan Application.

The property is bounded to the north by South Service Road, to the east and south by existing commercial development and to the west by Vince Mazza Way. For the exact location of the Site refer to **Figure 1.1**.

The proposed development for the Site is the construction of two 9-storey residential buildings complete with surface (above grade) parking and entrances connecting to South Service Road and Vince Mazza Way. A new municipal concrete sidewalk will also be installed as part of the development within the Vince Mazza Way right-of-way.

The subject site is in the process of being severed. The southern property line shown on the civil drawings is contemplated. The undeveloped lands south of the south property line are contemplated to be sold to the commercial property owner and developed as a Costco parking lot expansion by others.



PROJECT		
1310 SOUTH SERVICE ROAD		
TITLE		
SITE LOCATION PLAN		
Drawn	Scale	Figure
MJR	N.T.S.	F1.1
Checked	Project No.	
AKS	65075 D01	
Date	Rev No.	
2026-08-19	0	

2.0 CRITERIA

2.1 Existing Topography

The Site encompasses an area of 1.47ha and currently comprises an asphalt parking lot and large pile of fill material. In the existing condition, surface runoff from the Site drains from south to north. The runoff is conveyed via ditches along the east property line and Vince Mazza Way and South Service right-of-ways to a culvert spanning under the QEW. There is an elevation difference of approximately 2.6m between the north and south property lines. There is currently an existing fill pile along the southeast property line approximately 2.64m in height. The Site is approximately 44% impervious in the existing conditions.

2.2 Existing Servicing

2.2.1 Water

There is an existing 300mm diameter municipal watermain along South Service Road and Vince Mazza Way. The two closest municipal fire hydrants are located north and northeast of the property along South Service Road.

2.2.2 Sanitary

There is a 375mm diameter municipal sanitary sewer along Vince Mazza Way which drains to the north into the 750mm diameter municipal sanitary sewer along South Service Road which drains toward the west. The closest manhole is located within South Service Road and is approximately 5.7m deep.

2.2.3 Storm

Surface runoff from a majority of the Site is conveyed overland to the northeast of the Site where it enters the 1830x1240 box culvert spanning below the QEW.

2.3 Existing Soils Information

A geotechnical investigation was completed for the Site by Blue Frog Environmental Consulting Inc., dated August 15 2022. A copy of this report can be found in Appendix G. Fourteen boreholes were advanced from March 30 to April 5 2022 to determine the underlying soil conditions of the Site. The investigation revealed the Site is generally comprised of topsoil, sand and gravel fill or asphalt overlying native silty clay glacial till. Weathered shale bedrock was encountered in eight of the boreholes. The on-site cohesive soils can generally be classified as stiff to very stiff and on-site cohesionless soils can generally be classified as compact to very dense. Monitoring wells were installed in seven of the fourteen boreholes to facilitate the measurement of groundwater elevations. Four monitoring wells were found at the Site that were installed by others. Groundwater measurements were taken every two weeks from April 11 to June 2, 2022. The design groundwater table at the Site was found to range from 0.5 to 2.0mbgs. For additional information, refer to the geotechnical report in **Appendix G**.

Given the properties of existing soils and high groundwater, this site is generally not suitable for infiltration.

2.4 Reviewing Agencies

Grading, servicing and stormwater management designs as well as this Functional Servicing Report will be required for submission to the City of Hamilton in support of the Zoning By-Law Amendment and Site Plan Applications. The City of Hamilton will also be responsible for the review and approval of site plans, site grading, servicing, stormwater management, lighting and landscape design and ultimately issuing building permits.

As the Site falls within MTO Regulation limit, it is anticipated that the City of Hamilton will forward the site engineering design to the MTO for their review and approval.

3.0 METHODOLOGY

Preliminary grading and servicing strategies for the proposed development have been developed based on the topographic survey, plan and profile information, and Conceptual Site Plan prepared by Patrick David Trottier Architect/BIM Studio, dated August 6, 2026.

3.1 Proposed Grading

The proposed development for the Site is the construction of two 9-storey residential buildings complete with surface (above grade) parking and entrances connecting to South Service Road and Vince Mazza Way. A new municipal concrete sidewalk will also be installed as part of the development within the Vince Mazza Way right-of-way. The proposed grading strategy will respect the existing grades along South Service Road, Vince Mazza Way and design grades along the southern property line. Re-grading along the east property line will be required for the proposed development to maintain positive drainage of storm runoff to the QEW culvert from south to north. Re-grading the Vince Mazza Way right-of-way will be required for the proposed development, including construction of the new municipal concrete sidewalk mentioned previously. It is noted that the potential future grades along the southern property line have been coordinated with adjacent property and have been shown on the MTE Drawing C2.1. These as-designed elevations along the south property line are subject to further coordination as the adjacent property progresses through their Site Plan Approval application.

3.2 Proposed Servicing

Individual services are brought into the property for Building A and Building B as the owner intends to further sever the property in half (roughly down the middle). Building A is intended to be developed first with sanitary and water coming in from the Vince Mazza Way. Storm for the west half of the Site will outlet to the ditch along the north side of the property. Building B is intended to be developed second with sanitary and water coming in from South Service Road. Storm for the east half of the Site will outlet to the ditch along the northeast side of the property. Easements for access and overland flow will be required.

3.2.1 Water

Two new connections to the 300mm diameter municipal watermain along South Service Road and Vince Mazza will be required in order to service each of the proposed buildings. The east and west buildings will be connected to the 300mm diameter watermain along South Service Road and Vince Mazza Way respectively. Both connections will consist installation of a 250mm diameter water service teed off the existing 300mm diameter watermain. Both services will be split at the property line into a dual 150mm diameter domestic service and 250mm diameter fire service. The 150mm diameter domestic service off South Service Road will extend into a waterproofed meter chamber with a water meter and another valve chamber with a double check

assembly valve and then continue to the east building. The chambers are proposed due to length of pipe from property line to building. The chambers are positioned outside the 14m MTO setback. The 150mm diameter domestic line off Vince Mazza Way will extend to the west building. No chamber is proposed for the east building due to the length of pipe from property line to building. The 250mm diameter fire service at the splits will continue to their respective buildings. A new hydrant will be required to service the proposed buildings. The fire service off Vince Mazza Way will split and be reduced to a 150mm diameter watermain to service the proposed the hydrant that will be accessible by both buildings fire department connections on the south building faces. Refer to Drawing C2.2 for more details.

The expected domestic water demand for the proposed buildings was calculated using OBC, MOE and City of Hamilton design criteria. Table 3.1 summarizes the domestic water demand requirements for the Average Day, Maximum Day and Peak Hour demand scenarios for each building and detailed calculations are provided in Appendix B. It should be noted that average day peak factor is 1.0, the max day peak factor is 1.9 and the peak hour factor is 3.0 in accordance with City of Hamilton standards. Population counts were extrapolated based on unit count and equivalent populations listed in MOE guidelines.

Table 3.1 – Domestic Water Demands

Building Demands (Each)		
Population	375 Residents (Each Building)	
Average Day Demand	360L/person/day x 375 people =	1.56L/s
Maximum Day Demand	1.9 x 0.479L/s =	2.95L/s
Peak Hour Demand	3.0 x 0.479L/s =	4.65L/s

Fire flow demands for the proposed Phase 2 Building were determined using the City of Hamilton fire flow requirement design guidelines policy and the OBC. The fire demands are summarized in **Table 3.2** and detailed calculations are provided in Appendix B.

Table 3.2 – Fire Flow Requirements

Building (Each)	Required Fire Flow Rate
9-Storey Apartment Building	150L/s (9,000L/min)

The site servicing information was reviewed using the hydrant flow testing data completed by Lithos on July 11, 2022. The maximum day domestic (of both buildings combined) and fire flow demand (156L/s) for each of the proposed buildings can be accommodated by the existing watermain with a residual pressure of 390kPa, which is greater than the minim allowable pressure of 140kPa per OBC 201. Refer to **Appendix B** for detailed calculations.

3.2.2 Sanitary

A sanitary flow design sheet has been prepared to determine the flows anticipated to be generated by the proposed development. With the proposed Buildings A and B having 124 and 125 units respectively (with an equivalent population of 375 people each based on MOE guidelines), and a flow rate of 360L/person/day, the anticipated average sanitary flow rate per building is 1.56L/S with a peak flow of 7.81L/s. Accounting for extraneous flows via infiltration on a site area of 1.47ha, the

resulting total combined peak flow from the Site is expected to be approximately 16.21L/s. Refer to **Appendix C** for sanitary flow calculations.

It is proposed that the east and west buildings will be serviced by a new 200mm diameter sanitary sewer respectively. The connection from the west building will be complete with new a manhole (equipped with an external drop structure) at the municipal sewer on Vince Mazza Way. The 200mm diameter sanitary sewer will enter the Site at the west property line. The connection from the east building will connect into the existing 1500mm diameter manhole on South Service Road complete with a new external drop structure. The 200mm diameter sanitary sewer for the west building will enter the Site at the north property line. The new 200mm sanitary sewers will have adequate capacity to service the proposed development. A downstream capacity assessment was previously completed by Lithos in their May 2023 FSSWM report based on an anticipated sanitary demand of 30.71L/s. The downstream capacity analysis concluded that the maximum sewer capacity is around 22.5%. Given that the revised development concept reduced anticipated sanitary demand to 16.09L/s, additional downstream capacity assessment is not anticipated. Refer to **Appendix C** for Lithos downstream capacity calculations.

3.2.3 Storm

A private storm sewer system will be installed on-site to collect rooftop runoff from the buildings, parking areas and landscaped area along the south property line. The runoff collected in the storm sewers will be directed to storage tanks and respective OGS units located in the north parking area before being directed to the ditch within the South Service Road right-of-way. Runoff from the west and north frontage of the property and will flow towards the ditch along Vince Mazza Way and South Service Road right-of-way respectively. Based on design grades received by MTE of the adjacent property to the south, the proposed swale along the east property line will convey the runoff from a portion of the landscaped area of the adjacent property in addition to the landscaped area along the east property line of the Site. This swale will direct storm runoff to the ditch along South Service Road. These as-designed elevations at the southeast property line are subject to further coordination as the adjacent property progresses through their Site Plan Approval application.

4.0 STORMWATER MANAGEMENT DESIGN

4.1 SWM Methodology

The Stormwater Management Terms of Reference used for the scope of this report were based on the City's Storm Drainage Policy dated May 2004, City of Hamilton Criteria and Guidelines for Stormwater Management Infrastructure, dated September 2007, Stoney Creek Urban Boundary Expansion Area (SCUBE) East Subwatershed Study, dated 2013, and Stormwater Management Brief at Winona Crossing prepared by A.J. Clarke and Associates Ltd., dated March 3, 2016.

Individual storm sewer networks and stormwater management infrastructure (OGS units, SWM tanks) are proposed to meet the SWM criteria so that each building can be developed and occupied independently. Given the proximity to MTO lands, all essential storm infrastructure is positioned outside the 14m MTO setback and quantity controls were selected based on MTO requirements (orifice pipes instead of plates, no flow control roof drains).

4.2 SWM Criteria

The subject property is located within the Stoney Creek Watercourse 10.1 as defined in the SCUBE East Subwatershed Study, conducted by Aquafor Beech Limited, dated 2013, on behalf

of the City of Hamilton. The receiving water body is Lake Ontario and the sub watershed area is within the jurisdiction of the Hamilton Conservation Authority. The proposed development will be designed to meet the City's Storm Drainage Policy, Stormwater Management Brief at Winona Crossing and the SCUBE East Subwatershed Study. The following design criteria will be reviewed:

The stormwater management design criteria for the Site, as established are as follows:

- i) Attenuation of the post-development peak flows for the 2-, 5-, 10-, 25-, 50- and 100-year storm event to 38L/s/ha (A.J. Clarke and Associates Ltd., 2016).
- ii) Implementation of Normal (Level 2) water quality controls.
- iii) Water Balance Analysis.
- iv) Implementation of Erosion and Sediment Control measures.

4.3 Water Quantity Control

To successfully complete the preliminary stormwater management design for the Site, the following specific tasks were undertaken:

- i) Determine the percent impervious of the Site and catchment parameters for inclusion in MIDUSSS modelling.
- ii) Calculate post-development runoff hydrographs using MIDUSS NET.

The following table summarizes the catchments used in modelling of the Site. The post-development condition was separated into three catchment areas; the two controlled areas and the uncontrolled area. **Figure 4.1** illustrates the limits of the post-development catchment areas.

Table 4.1 – Catchment Parameters

#	Catchment	Area (ha)	% Impervious	Pervious CN	Impervious CN	Slope (%)	Flow Length (m)
Post-Development Catchment Area							
201	Controlled Area West	0.70	87	84	98	2.0	15.0
202	Controlled Area East	0.67	87	84	98	2.8	15.0
203	Uncontrolled Area West	0.047	20	84	98	15.0	3.0
204	Uncontrolled Area East	0.054	6	84	98	15	3.0

As detailed previously, a geotechnical investigation was completed for the Site by BlueFrog Environmental Consulting Inc., dated August 15 2022. The investigation revealed the Site is generally comprised of topsoil, sand and gravel fill or asphalt overlying native silty clay glacial till. Weathered shale bedrock was encountered in eight of the boreholes. The on-site cohesive soils can generally be classified as stiff to very stiff and on-site cohesionless soils can generally be classified as compact to very dense. Therefore, a pervious CN of 84 for grassed areas is appropriate.

Refer to **Appendix G** for the historic geotechnical report.

LEGEND

- CATCHMENT 201
- CATCHMENT 202
- CATCHMENT 203
- CATCHMENT 204

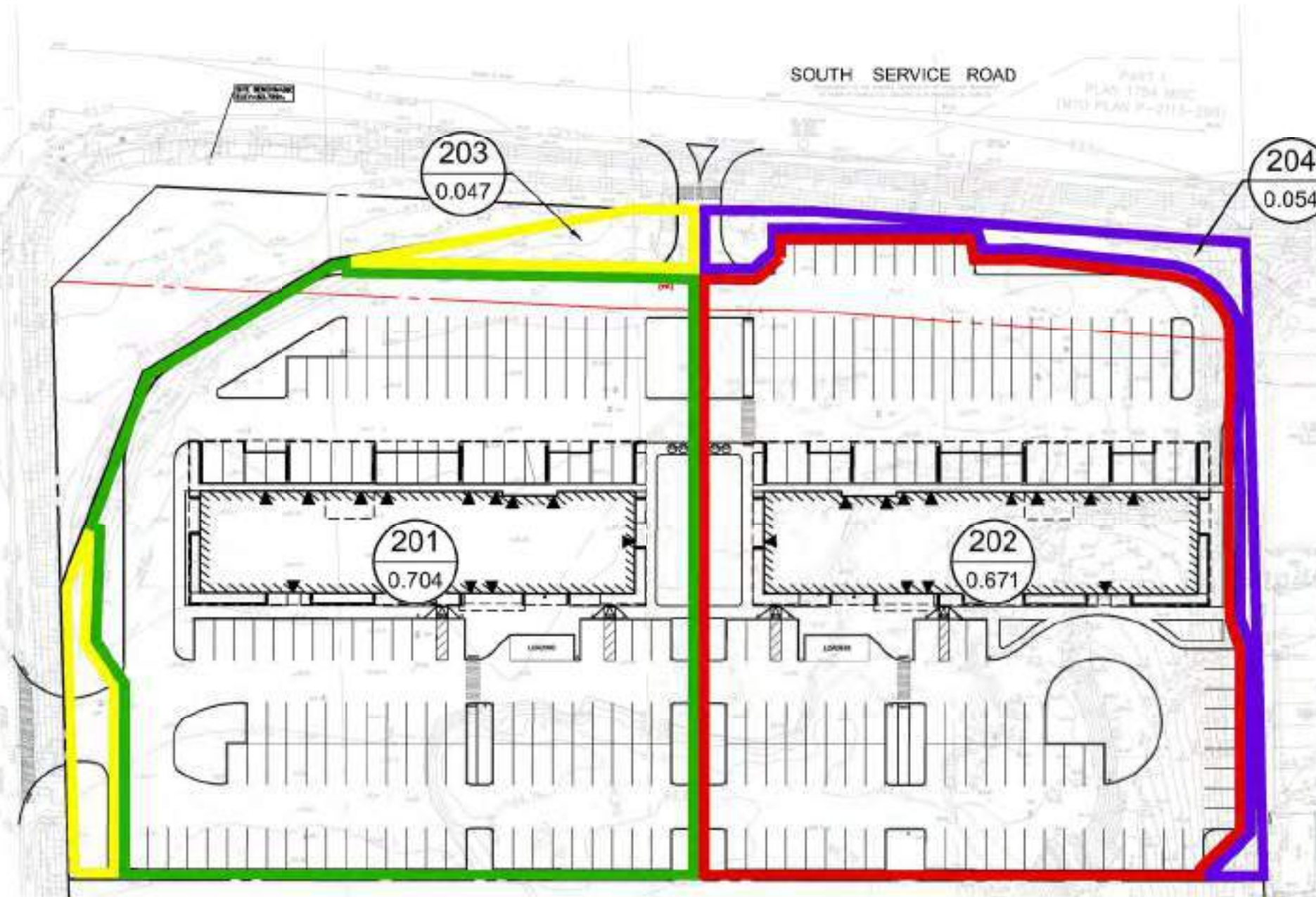
201
0.702

SUB-CATCHMENT
NUMBER

AREA (ha.)

VINCE MAZZA WAY

SOUTH SERVICE ROAD



0 7.5 15 22.5 30m



PROJECT			
1310 SOUTH SERVICE ROAD			
TITLE			
POST-DEVELOPMENT CATCHMENT AREA'S			
Drawn	MJR	Scale	1:750
Checked	LJF	Project No.	65075_001
Date	2026-08-19	Rev No.	0

F4.1

To achieve the stormwater management requirements for the Site, runoff generated from the buildings and parking areas will be controlled with underground storage complete with 50mm diameter orifice pipes split between the west and east areas of the property. The following tables summarize the expected flows that will be generated by the west and east areas of the Site. Please refer to **Appendix F** and MTE Drawing C2.2 for more details. The allowable flow rate of 56.2L/s for the entire property was calculated by prorating the allowable rate of 38L/s/ha to the site area of 1.479ha ($38\text{L/s/ha} \times 1.479\text{ha} = 56.2\text{L/s}$).

Table 4.2 – Summary of Flows – West Building

Modelling Condition	Allowable Flow Rate (m³/s)	Post-Development (Controlled Area) (m³/s)	Post-Development (Uncontrolled Area) (m³/s)	Post-Development (West Site) (m³/s)
2-Year Storm Event	0.028	0.004	0.04	0.006
5-Year Storm Event		0.008	0.007	0.010
10-Year Storm Event		0.008	0.010	0.013
25-Year Storm Event		0.009	0.013	0.017
50-Year Storm Event		0.009	0.015	0.019
100-Year Storm Event		0.009	0.017	0.022

Table 4.3 – Summary of Flows – East Building

Modelling Condition	Allowable Flow Rate (m³/s)	Post-Development (Controlled Area) (m³/s)	Post-Development (Uncontrolled Area) (m³/s)	Post-Development (East Site) (m³/s)
2-Year Storm Event	0.027	0.008	0.003	0.010
5-Year Storm Event		0.009	0.007	0.014
10-Year Storm Event		0.010	0.009	0.017
25-Year Storm Event		0.010	0.013	0.021
50-Year Storm Event		0.010	0.016	0.024
100-Year Storm Event		0.011	0.019	0.027

Table 4.4 – Summary of Flows – Total

Modelling Condition	Allowable Flow Rate (m³/s)	Total Flow West (m³/s)	Total Flow East (m³/s)	Combined (m³/s)
2-Year Storm Event	0.056	0.006	0.010	0.016
5-Year Storm Event		0.010	0.014	0.024
10-Year Storm Event		0.013	0.017	0.030
25-Year Storm Event		0.017	0.021	0.038
50-Year Storm Event		0.019	0.024	0.043
100-Year Storm Event		0.022	0.027	0.049

As summarized by **Tables 4.2, 4.3 and 4.4** above, the post-development flow rate for all storms including the 100-year is controlled to the prorated allowable release rate of 38L/s/ha established in the report by A.J. Clarke and Associates Ltd., dated March 2016. Please see **Appendix A** for more details. A stage storage analysis of the proposed stormwater management design indicates that all runoff will be captured within the parking area. Depth of ponding in the parking area does not exceed 0.25m and remains below the proposed weir elevation of 84.0m for all storms. See **Table 4.4** below for reference.

Table 4.5 – Summary of Ponding and Weiring Depths

Modelling Condition	Ponding Depth West (m)	Ponding Depth East (m)	Depth Over Weir (cm)
2-Year Storm Event	82.745	82.788	0.0
5-Year Storm Event	83.750	83.335	0.0
10-Year Storm Event	83.781	83.675	0.0
25-Year Storm Event	83.827	83.728	0.0
50-Year Storm Event	83.859	83.765	0.0
100-Year Storm Event	83.895	83.807	0.0

4.4 Water Quality Control

A Stormceptor Model EFO 12 and EFO 10 will be installed on the storm west and east sewer system respectively to provide water quality control for the Site. The chosen units are expected to provide 70% TSS load reduction for a CA ETV particle size distribution. (Refer to **Appendix E** for the sizing output from the Stormceptor Expert program). The Stormceptor will require regular annual maintenance to ensure it is operating properly. The owner may be required to enter into a maintenance agreement with a suitable contractor to complete this work.

4.5 Water Balance

According to the SCUBE East Water Subwatershed study, dated May 15, 2013, the first 3mm over the catchment area must be captured and infiltrated for silt/clay soils. It is noted that the target is 3mm infiltration and options are grey water reuse, parking lot storage and green roof planters. At this time, the owner is not contemplating grey water re-use nor green roofs. Infiltration on this site is not feasible due to soil and high groundwater conditions. Schematic shop drawings for storm tanks were prepared with 3mm of dead storage to meet these requirements, however it is our opinion that the tanks should not be equipped with dead storage for infiltration and instead be lined with an impervious liner due to high ground water concerns. Details of storm tanks will be refined (including implementing an impermeable liner) prior to construction based on City review of the historic Geotech report and groundwater monitoring results.

4.6 Erosion and Sediment Control

Precautions will need to be taken during construction to limit erosion and sedimentation. Typically, the following measures are recommended during construction for erosion and sedimentation control:

- i) Erosion and sedimentation facilities are to be installed prior to any area grading operations.
- ii) All erosion control measures are to be inspected and monitored by the contractor and repairs are to be completed as required.
- iii) All materials and equipment used for the purpose of site preparation and project completion should be operated and stored in a manner that prevents any deleterious substance from leaving the Site.
- iv) Stripping and strategic placement of topsoil stockpiles. Placement of sediment control fencing around all stockpile areas.
- v) To minimize the amount of mud being tracked onto the roadway, a mud mat should be installed at the primary construction entrance.

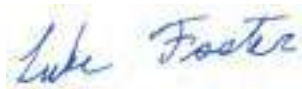
5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the foregoing analysis, it is concluded that:

- i) The proposed grading design will respect the natural topography of the Site to achieve a reasonable cut/fill balance where possible.
- ii) Existing municipal infrastructure for water, sanitary and storm is available along South Service Road and Vince Mazza Way.
- iii) The SWM criteria can be satisfied with the implementation of on-site controls for water quantity and water quality.
- iv) Additional grading, servicing and stormwater management details will be provided during detailed design.

All of which is respectfully submitted,

MTE Consultants Inc.



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https://mte85.sharepoint.com/sites/65075_001/Shared Documents/03- Reports/rpt_2026-08-25_FFSWM.docx

Appendix A

Historic SWM Brief



Updated: March 3, 2016

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The underground cisterns are to be designed such that the containment/separator rows do not allow for infiltration into the bedding below. However, the remainder of the system will have an open bottom to provide storage for infiltration purposes as required.

Low Impact Development (LID) features in the form of permeable pavers and bio-swales are also proposed at various locations within the Winona Crossing site.

SWM quantity control analyses for each of the outlets are presented below.

2.7.1 Outlet-10.1

Due to downstream storm sewer constraints, the 100 year maximum flow from the Winona Crossing site has been limited to 38 L/s/ha which is less than the 5 year predevelopment flows (51L/s/ha) to W.C 10.1 at Node QEW culvert. A detailed hydraulic grade line analysis of the downstream MTO culverts and the Watercourse 10.1 storm sewer system from the QEW to Lake Ontario was carried out to determine the storage volumes that would be necessary to achieve the following:

- Meet the conveyance and freeboard targets for the QEW as specified by MTO Directive B-100
- Confirmation that the frequency of surcharging within the downstream storm sewer system does not increase, and
- Confirmation that the frequency of surface flooding does not increase.

The detailed hydraulic grade line analysis is shown in Appendix C and as a result of this analysis, the post development runoff from Winona Crossing site that drains to Outlet 10.1 has been controlled to have an overall discharge of 38 L/s/ha. The Subcatchment areas to WC 10.1 are detailed under post-development conditions in Figure C2 in Appendix C.

The calculated storage requirements for the Outlet-10.1 swm infrastructure are outlined in Table 6:

Table 6: Outlet 10.1 Quantity Control Summary					
Description	Frequency (Years)				
	5 yr	10 yr	25 yr	50 yr	100 yr
Pre-development peak flow (Penady Lands) (m ³ /s) (L101)	0.700	0.965	1.320	1.595	1.876
Post development peak outflow (Penady Lands) (m ³ /s) (L120+L118)	0.426	0.496	0.529	0.551	0.571
Increase in peak flow from pre to post development (m ³ /s)	-0.274	-0.460	-0.791	-1.044	-1.305
Maximum system storage (m ³)	3,613	4,585	5,842	6,798	7,776

Storage for Erosion protection is not considered as necessary since the existing watercourse is proposed to be enclosed in a storm sewer that will outlet to the culvert below the QEW and its service roads. From the North Service Road, the storm drainage flows northerly for a short length before crossing



4.0 Recommendations and Conclusions

The recommendations and conclusions of this report concerning storm drainage, storm sewers, and stormwater management requirements for the proposed development are as follows:

1. Implement and conform to the requirements and criteria of the SCUBE East Subwatershed Study for SWM quantity and quality control;
2. Provide LID features as shown on the engineering drawings (servicing and site grading);
3. Provide underground cisterns sized to restrict the amount of flow from the site to less than the 5 year pre-development levels, in accordance with the Hydraulic Grade Line analysis presented;
4. Install Oil-grit Separators prior to storm flows from the parking lots entering the underground cisterns to provide Normal Level 2 quality control. Further, provide for containment/separator rows within the cisterns to allow for further removal of the soil particles;
5. Install clear stone bedding below the main portion of the cisterns to encourage capture and infiltration of at least the first 3mm of rainfall on the site;
6. Design the storm sewer system within the project site as a shallow storm sewer system with a minimum cover over the storm sewer of 1.2m (or provide adequate insulation);
7. Ensure Siltation and Erosion Control measures are implemented throughout the construction process.

We conclude that the subject property can be serviced for the proposed development in accordance with the requirements of the City of Hamilton for urban development.

All of which is respectfully submitted.


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Appendix B

Fire Flow Analysis Design Sheets





1310 South Service Road

FIRE FLOW ANALYSIS

Hamilton, Ontario

Project Number: 65075_100

Date: August 21, 2026

Design By: LJF

File: Q:\65075_001\Fire Flow\Fire Flow Analysis - LJF.xlsx

CALCULATION OF RESIDUAL PRESSURE AT ON-SITE HYDRANT

1. Boundary Conditions (Based on Fire Flow Test Results):

	Metric	Imperial	
P0 - Starting Pressure	45.01 m	64 psi	
P1 - Pressure at Q1	42.19 m	60 psi	
Q1 - From Fire Flow Test	6704 L/min	1771 U.S. gal/min	
Q2 - Required Flow	9356 L/min	2472 U.S. gal/min	From: Water Demand calculations by MTE
P-loss 1	2.81 m	4 psi	
P-loss 2	5.22 m	7 psi	
P2 - Residual Pressure	39.79 m	57 psi	Extrapolated from Fire Flow Test Results

ANALYSIS SUMMARY

Total Losses	0.000 m		
	0.00 kPa	0.0 psi	
Residual Pressure after Losses	39.79 m		
	390 kPa	56.6 psi	PASS
<i>Allowable Residual Pressure</i>	<i>140 kPa</i>	<i>20.3 psi</i>	



1310 South Service Road
FIRE FLOW DEMANDS

Hamilton, Ontario
Project #: 65075_100
Date: August 21, 2026
Date Printed: 8/21/2026
By: LJF

Development Information ¹								Fire Flow ²							Domestic Flow ^{3,4}				
								Ontario Building Code											
Node ID / Area ID / Building #	F.F.E. (m.a.s.l.)	Description	# of Units	Population	Bldg Area (1 st Floor) m ²	Total Bldg Area m ²	Building Volume m ³	K	V	S _{tot}	Q	F	F	Fire Flow (Max OBC)	MOE Guidelines	Average Day	Max Day	Peak Hour	Max Day + Fire Flow
				# of people				m ³	L	L/min	L/s	L/s	L/s	L/s	L/s	L/s	L/s		
1	84.25	West Apartment	124	375	1,217	10,953	36,211	10	36,211	1.20	434,532	9,000	150	150	1.56	1.56	2.97	4.69	156
2	84.25	East Apartment	125	375	1,217	10,953	36,211	10	36,211	1.20	434,532	9,000	150	150	1.56	1.56	2.97	4.69	156
TOTALS FOR SITE			249	750	2434	21906	72422	Max Fire Flow =					150	150	3.13	3.13	5.94	9.38	156
														156					

Assumptions:

- 1 All building areas and populations are based on the Site Plan by Patrick David Trottier Architect. Assumed population per "Design Guidelines for Drinking-Water Systems" (MOE, 2008)
- 2 All buildings are classified as occupancy group C (Residential Occupancy)
- 3 Average Daily Demands for each building are based on "City of Hamilton Water and Wastewater Master Plan Class Environmental Assessment Report" by KMK Consultants Ltd., Dated Novemeber 2006:

Residential = 360 L/cap/day
- 4 Peaking Factors based on "City of Hamilton Water and Wastewater Master Plan Class Environmental Assessment Report" by KMK Consultants Ltd., Dated Novemeber 2006

Average Day = 1

Maximum Day = 1.9

Peak Hour = 3

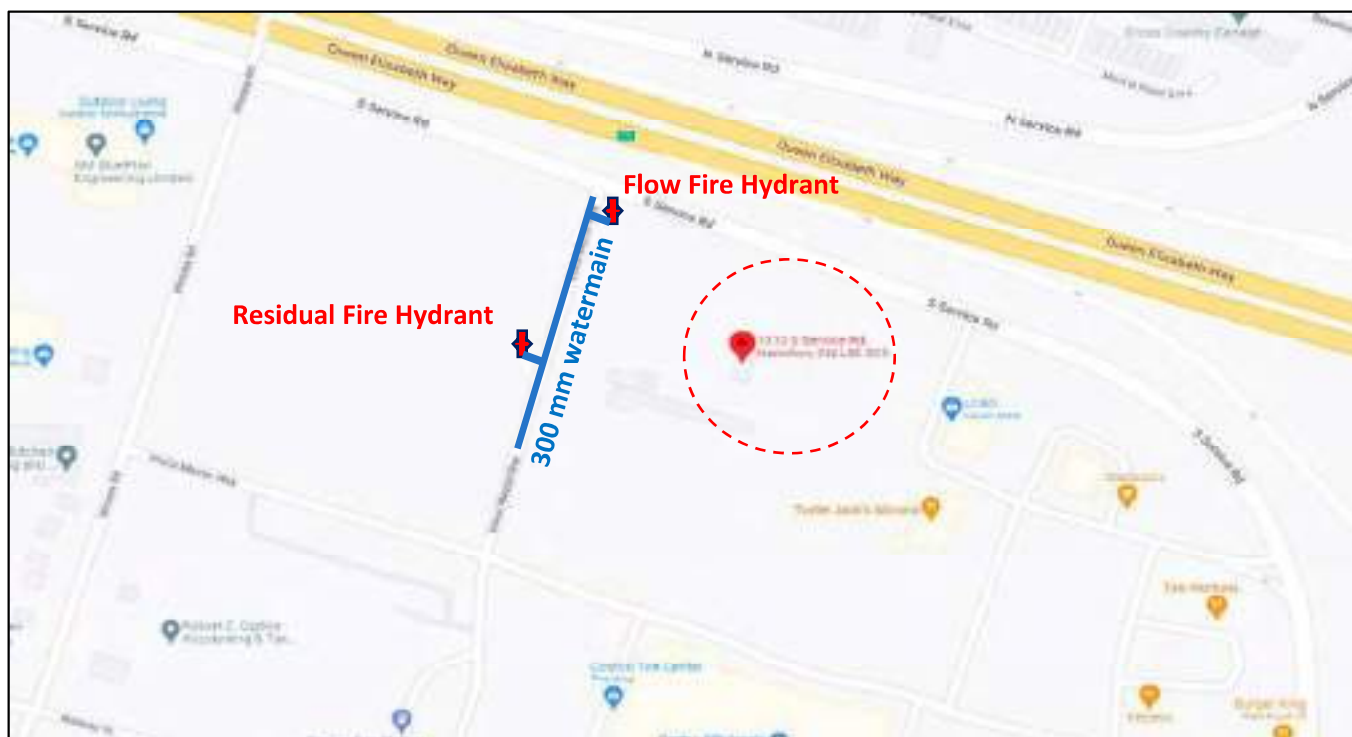
General Information

Report No. : **FHR-22-07-11-01** Date : **11-Jul-22**
 Project No. : **PUD22-019**
 Site Address/Location: **1310 South service Road**
 Region/Municipality: **City of Hamilton**
 Residual Fire Hydrant Location/description : **North-West of 1310 South service Rd, along South Service Rd (43°13'05.5"N 79°38'37.1"W)**
 Flow Fire Hydrant Location/description : **West of 1310 South Service Road along Vince Mazza Way (43°13'04.0"N 79°38'39.6"W)**
 Watermain Pipe Size (mm) : **300 mm**
 Test Equipment Orifice Size (in) : **2.5**
 Test Equipment Orifice coefficient : **0.9**
 Date of test: **11-Jul-22**
 Time of test: **11 am**
 Temperature: **26°C**
 Testing Method : **NFPA 291 (Recommended Practice for Fire Flow Testing and Marking of Hydrants)**

Attendants

	Name	Title	Contact Info.
Lithos Inspector	Pradeep	Construction inspector	(905)-609-3435
Lithos Inspector	Surabhi Suresh	Project Coordinator	(647)-394-1527
City/Town Rep.	Marty	Operator East	-

Site Plan/Sketch



Pressure Readings (PSIG)

Flow Hydrant's Outlet Condition	C-0 { Outlet #1 : Close Outlet #2 : Close	C-1 { Outlet #1 : Open Outlet #2 : Close	C-2 { Outlet #1 : Open Outlet #2 : Open
Residual Fire Hydrant	64	62	60
Flow Fire Hydrant	-	43	26

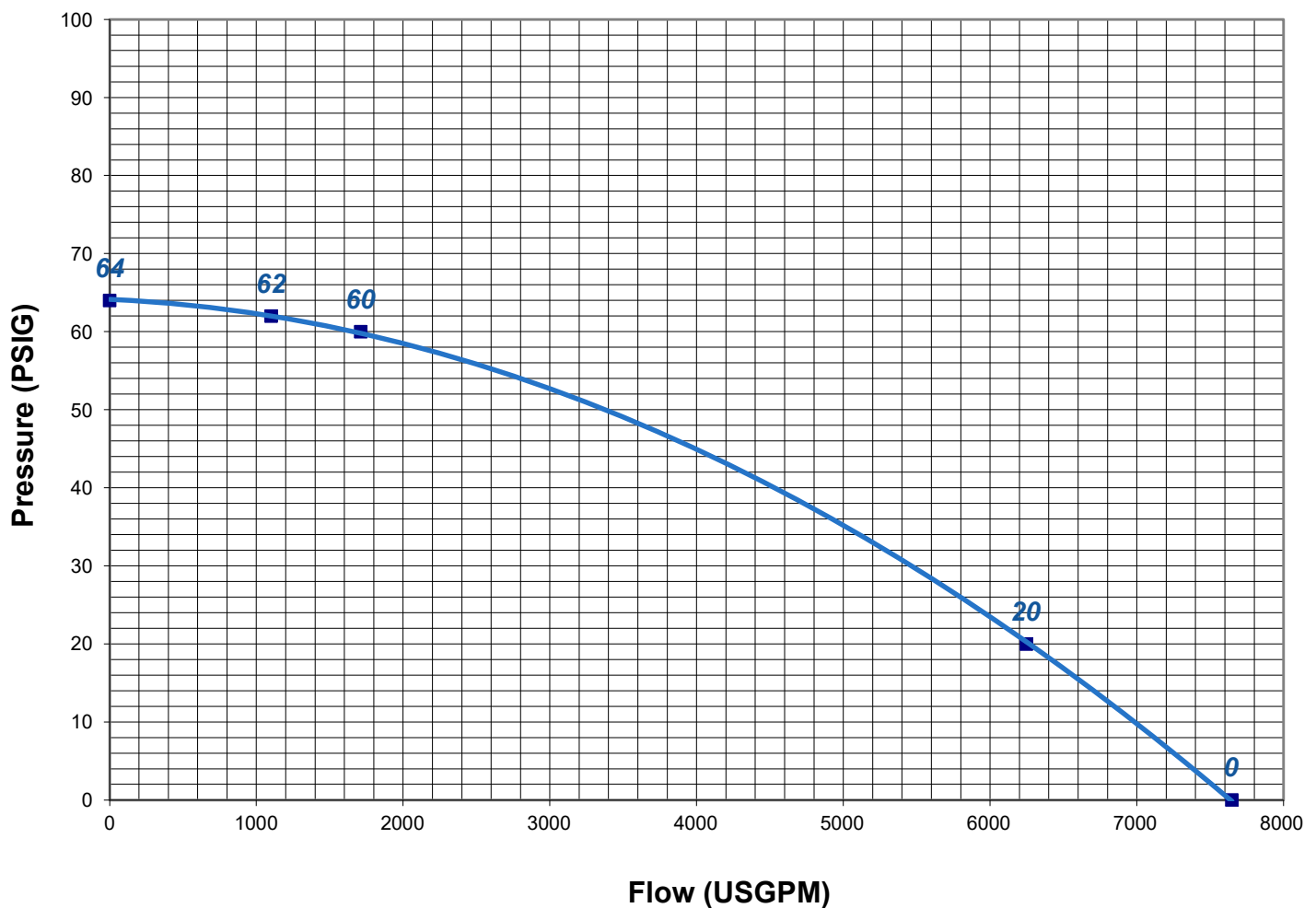
General Information

Report No. : **FHR-22-07-11-01** Date : **11-Jul-22**
 Project No. : **PUD22-019**
 Site Address/Location: **1310 South service Road**
 Region/Municipality: **City of Hamilton**

Pressure-Flow Table

Condition		C-0	C-1	C-2	C(20)	C(0)
Pressure (PSIG)		64	62	60	20	0
Flow	(USGPM)	0	1100.30	1711.17	6246.61	7647.46
	(L/S)	0.00	69.43	107.97	394.16	482.55

Pressure-Flow Graph



Result

Maximum available flow at 20PSI = 6246.61 USGPM or 394.16 L/s

Appendix C

Sanitary Sewer Design Sheet



1310 South Service Road

65075_100
Date: August 21, 2026
Design By: LJF

Manning's "n" 0.013



Velocity (m/s)
Minimum 0.6
Maximum 3.0

Sanitary Discharge Calculations

Location	Residential				Total Residential		Design				
	Units (ea.)	Population (persons)	Average Discharge (L/s)	Peak Flow (excluding infiltration) (L/s)	Total Sanitary Discharge + Infiltration (L/s)	Pipe Size (mm)	Length (m)	Slope (%)	Capacity (L/s)	Full Flow Velocity (m/s)	% Pipe Full (%)
West Building	124	375	1.563	7.81	8.1	200	48.2	2.0	46.36	1.48	17.5%
East Building	125	375	1.563	7.81	8.1	200	44.7	2.0	46.36	1.48	17.5%
Proposed Totals		750	3.125	15.63	16.21						

Sanitary Demand		
Residential Daily Discharge	360	L/ca/day
	0.0042	L/ca/sec
Babbitt Peaking Factor	5.00	
Site Area	1.47	ha
Infiltration Allowance	0.4	L/s/ha
	0.588	L/s

Note 1: Residential Demand based on City of Hamilton Design Guidelines Section E.1.4
Note 2 Babbitt Peaking Factor $PF = 5/P^{0.2} = 5/(750/1000)^{0.2} = 5.30$ (max 5.0) as per City of Hamilton Design Criteria.
Note 3: Infiltration allowance from City of Hamilton design criteria.



SANITARY SEWER DESIGN SHEET
1310 South Service Road
CITY OF HAMILTON

Based on Part 8 of the latest edition of the Code and Guide for Sewage Systems

LOCATION	SECTION AREA (ha.)	RESIDENTIAL								COMM. AREA (ha.)	FLOW								SEWER DESIGN										
		NUMBER OF UNITS						POPULATION			AVERAGE APARTMENTS FLOW @ 275 L/cd (L/s)	TOWNHOUSES FLOW @ 1100 L/cd (L/s)	HARMON PEAKING FACTOR	RES. PEAK FLOW (L/s)	AVERAGE COMMERCIAL FLOW @ 5L/m ² /d (L/s)	TOTAL ACCUM. AREA (ha.)	INFILT. @ 0.40 L/s/ha. (L/s)	TOTAL DESIGN FLOW (L/s)	PIPE LENGTH (m)	PIPE DIA. (mm)	SLOPE (%)	FULL FLOW CAPACITY n = 0.015 (L/sec)	FULL FLOW VELOCITY n = 0.015 (m/sec)	% of DESIGN CAPACITY (%)					
		Single Fam. Dwell. (ha)	Townhouse (ha)	Studio @ 2 ppu	1 Bed Apts. @ 2 ppu	2 Bed Apts. @ 4 ppu	3 Bed Apts. @ 6 ppu	Appart. Pop. (persons)	POP. (persons)																				
column number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
Existing Condition																													
Undeveloped area	2.363	0	0	0	0	0	0	0	0	0.000	0.00	0.00	2.0	0.00	0.000	2.363	0.945	0.95											
Proposed Condition																													
Mixed-use	2.363	0	32	0	422	166	85	2,018	2,018	0.143	6.42	0.4	4.3	29.68	0.083	2.363	0.945	30.71		300	2.0%	136.76	1.68	22.5%					
Residential Flow Rate - 275 litres/capita/day																													
Infiltration - 0.40 L/ha																													
Peaking Factor = 5*P ^{0.2} , P=Population in thousands																													
2 BDR Townhouses - 1100 litres/capita/day																													
Commercial flow Rate - 5L/m ² /day																													
																				min velocity = 0.75 m/s max velocity = 2.75 m/s Manning n = 0.015 dia < 600mm n = 0.013 dia ≥ 600mm									
										Prepared By: Eleni Karamanoli, P.E., M.A.Sc. Reviewed By: Anastasia Tzakopoulou, P.E., M.A.Sc. Date: May 2023										Project: 1310 South Service Road File No: UD22-019 City of Hamilton									
Sheet 1 OF 2																													



EXTERNAL SANITARY SEWER SEGMENTS
1310 South Service Road
City of Hamilton

5 L/m² /day- commercial for areas over 600m²
7.5 L/m² /day- commercial for areas 400- 600m²
275 L/c/day - residential
q = average daily per capita flow (c.m./day)
Q (p) = peak population flow (L/s)
Q (I) = peak extraneous flow (L/s)
Q (C) = peak flow from commercial area (L/s)
Q (d) = peak design flow (L/s)

M = Peaking Factor (residential) = 5P^{0.2} where P = population in 1000's
I = unit of peak extraneous flow
Q (Ind) = peak flow from industrial (L/s) Q (Ins) = peak flow from institutional (L/s)
Q(p) = PqM/86.4 (L/s)
Q(I) = IA (L/s) where I = 0.40 L/s/ha, and A = drainage area - commercial area (ha)
Q(C) = based on Y L/p/day - residential equivalent (see below)
Q(d) = Q(p) + Q(I) + Q(Ind) + Q(Ins) + Q(C)

LOCATION												F L O W S (CUMMULATIVE)											
DESCRIPTION	Sewer Segment	Drainage Area	Infiltration Area	Residential	Commercial	Future Development (Residential)	Future Development (Commercial)	TOTAL RESIDENTIAL	PEOPLE	Peak Factor	Drainage	Infiltration	RESIDENTIAL	INFILTRATION	COMMERCIAL	EXISTING PEAK FLOW	PROPOSED FLOW	TOTAL PEAK	GRADE	Max. Allowable	PIPE	Pre-development	Post-development
		(hectares)	Hectares	(persons)	(hectares)	(persons)	(hectares)	(cumulative)	(cumulative)	(dimensionless)	(hectares)	(hectares)	Q (p)	Q (I)	Q (C)	(L/s)	(L/s)	(L/s)	(%)	Flow	SIZE	% of DESIGN CAPACITY	% of DESIGN CAPACITY
column number	1	2	3	4	5	7	8	9	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Sewer Segment	#1	25.04	25.04	204	1.37	1362	0.190	1566	1566	4.57	25.04	25.04	22.78	10.02	0.90	33.71	30.71	64.42	1.00%	175.3	375	19.23%	36.74%
Sewer Segment	#2	39.09	39.09	0	6.41	465	29.60	2031	2031	4.34	39.09	39.09	28.05	25.65	32.16	85.87	30.71	116.58	0.24%	545.4	750	15.74%	21.37%
Sewer Segment	#3	0.30	0.30	0	0.00	0	0	2031	2031	4.34	0.30	0.30	28.05	25.77	32.16	85.99	30.71	116.70	0.24%	545.4	750	15.77%	21.40%
Sewer Segment	#4	0.29	0.29	0	0.00	0	0	2031	2031	4.34	0.29	0.29	28.05	25.89	32.16	86.11	30.71	116.82	0.24%	545.4	750	15.79%	21.42%
Sewer Segment	#5	0.55	0.55	0	0.00	0	0	2031	2031	4.34	0.55	0.55	28.05	26.11	32.16	86.33	30.71	117.04	0.24%	545.4	750	15.83%	21.46%
Sewer Segment	#6	0.17	0.17	0	0.00	0	0	2031	2031	4.34	0.17	0.17	28.05	26.18	32.16	86.39	30.71	117.10	0.24%	545.4	750	15.84%	21.47%
Trunk Sewer																							

- NOTES:
1. Calculated flows are estimated based on the existing developments within the drainage area.
 2. The post development flow can be supported by the existing sanitary network, thus the sewers can support the proposed development.
 3. Future Developments within our Drainage Area were included in our External Sanitary Analysis. Population assumed for 1290 South Service Road and the catchments east and west of Fifty Road (125 ppha).



Prepared By: Eleni Karamanolli, P.E., M.A.Sc.
Reviewed By: Anastasia Tzakopoulou, P.E., M.A.Sc.
Date: May 2023

Project: 1310 South Service Road
File No: UD22-019
City of Hamilton



**DOWNSTREAM SANITARY SEWER
SEGMENT INFORMATION**

SEWER SEGMENT	TYPE	SIZE (mm)	LENGTH (m)	SLOPE (%)
#1	CIRCULAR	375	120,20	1,00
#2	CIRCULAR	750	78,40	0,24
#3	CIRCULAR	750	87,60	0,24
#4	CIRCULAR	750	56,00	0,24
#5	CIRCULAR	750	110,80	0,24
#6	CIRCULAR	750	107,40	0,24



150 Bermondsey Road, Toronto, Ontario M4A 1Y1

LEGEND

- EXISTING MANHOLE
- EXISTING SANITARY TRUNK SEWER
- EXISTING SANITARY SEWER

- INFILTRATION AREA
- - - DRAINAGE AREA

1
NUMBERED SEGMENT
AS INDICATED IN "EXTERNAL
SANITARY SEWER SEGMENTS"
DESIGN SHEET

DOWNSTREAM SANITARY
NETWORK DRAINAGE AREA PLAN
MIXED-USE DEVELOPMENT
1310 SOUTH SERVICE ROAD
HAMILTON, ONTARIO

DATE: MAY 2023

PROJECT No: UD22-019

SCALE: N.T.S.

FIGURE No: DAP3

Appendix D

Storm Sewer Design Sheet



1310 South Service Road CITY OF HAMILTON				STORM SEWER DESIGN ENGINEERING SERVICES				Design Parameters												
								IDF Parameters				Pipe Design								
Project No.: 65075_100 Date: 24-Aug-26 Design By: LJF Checked By:				Drainage Area Plan No.:				Design Storm Frequency: 5 year a = 1049.5 b = 8.0 c = 0.803 Tc = 10 $i = \frac{A}{(T + B)^c}$				Max Velocity 3.65 m/s Min Velocity 0.8 m/s Manning's "n" 0.013								
LOCATION				STORM FLOW							DESIGN									
AREA No.	STREET NAME	FROM MH	TO MH	AREA A (ha.)	RUNOFF COEFF "C"	A x C	CUMMUL A x C	TIME OF CONCEN (min.)	RAIN INTENSITY (mm/hr)	PEAK FLOW "Q" (m³/sec)	PIPE SIZE (mm)	SLOPE (%)	LENGTH (m)	CAPACITY (m³/sec)	VELOCITY (m/sec)	TIME IN PIPE (min.)	% Pipe FULL	REMARKS		
		CB4	CBMH3	0.131	0.82	0.107	0.107	10.0000	103.0383	0.0307	250	0.5	22.1	0.0420	0.8566	0.42998	72.99			
		CBMH3	CBMH2	0.031	0.63	0.020	0.127	10.4300	101.1035	0.0356	300	0.5	16.2	0.0683	0.9673	0.27911	52.07			
		CBMH2	CBMH1	0.038	0.81	0.031	0.158	10.7091	99.8905	0.0438	300	0.5	17.4	0.0683	0.9673	0.29979	64.04			
		CBMH1	West Tank	0.024	0.73	0.017	0.175	11.0089	98.6235	0.0480	300	0.5	5.7	0.0683	0.9673	0.09821	70.22			
		CB7	CBMH6	0.07	0.84	0.062	0.062	10.0000	103.0383	0.0178	250	0.5	35.1	0.0420	0.8566	0.68291	42.39			
		CBMH6	CBMH5	0.11	0.82	0.092	0.154	10.6829	100.0029	0.0429	300	0.5	21.9	0.0683	0.9673	0.37732	62.80			
		CBMH5	West Tank	0.03	0.33	0.010	0.165	11.0602	98.4101	0.0451	300	0.5	18.9	0.0683	0.9673	0.32563	65.95			
		CB12	CBMH11	0.10	0.82	0.084	0.084	10.0000	103.0383	0.0239	250	0.5	34.1	0.0420	0.8566	0.66345	56.90			
		CBMH11	CBMH10	0.11	0.79	0.084	0.168	10.6634	100.0866	0.0467	300	0.5	25.0	0.0683	0.9673	0.43073	68.28			
		CBMH10	MH9	0.06	0.75	0.043	0.211	11.0942	98.2695	0.0575	300	0.5	11.4	0.0683	0.9673	0.19641	84.12			
		MH9	CBMH8	0.00		0.000	0.211	11.2906	97.4653	0.0570	300	0.5	35.4	0.0683	0.9673	0.60992	83.43			
		CBMH8	East Tank	0.03	0.71	0.020	0.230	11.9005	95.0593	0.0608	375	0.5	15.0	0.1239	1.1225	0.22272	49.04			

Appendix E

Stormceptor Output



Imbrium® Systems

ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

08/20/2026

Province:	Ontario	Project Name:	1310 South Service Road Phase 1
City:	Hamilton	Project Number:	65075_001
Nearest Rainfall Station:	HAMILTON RBG CS	Designer Name:	Luke Foster
Climate Station Id:	6153301	Designer Company:	MTE Consultants Inc.
Years of Rainfall Data:	20	Designer Email:	LFoster@mte85.com
		Designer Phone:	548-889-6412
Site Name:	1310 South Service Road	EOR Name:	
		EOR Company:	
Drainage Area (ha):	0.75	EOR Email:	
% Imperviousness:	95.00	EOR Phone:	
Runoff Coefficient 'c': 0.87			

Particle Size Distribution:	CA ETV
Target TSS Removal (%):	70.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	20.43
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	Yes
Upstream Orifice Control Flow Rate to Stormceptor (L/s):	13.00
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	711
Estimated Average Annual Sediment Volume (L/yr):	578

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	53
EFO5	57
EFO6	61
EFO8	65
EFO10	68
EFO12	70

Recommended Stormceptor EFO Model: **EFO12**
Estimated Net Annual Sediment (TSS) Load Reduction (%): **70**
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.

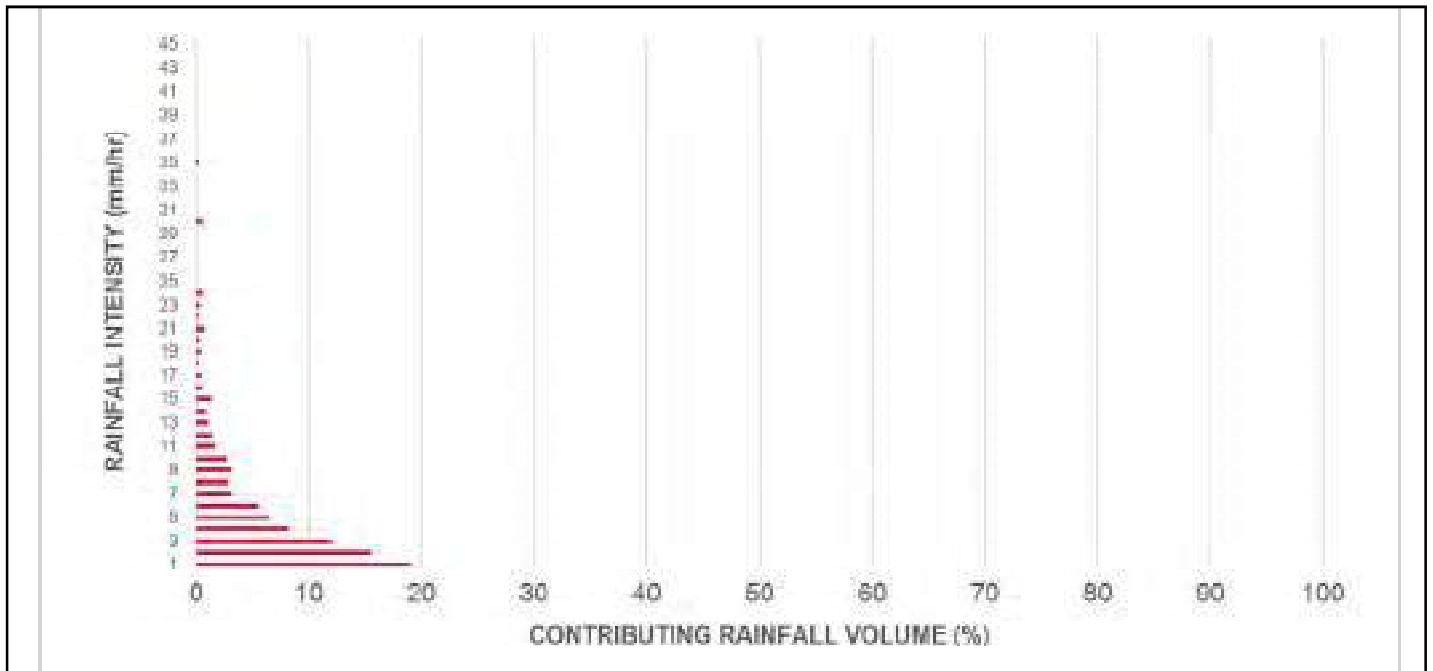
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Upstream Flow Controlled Results

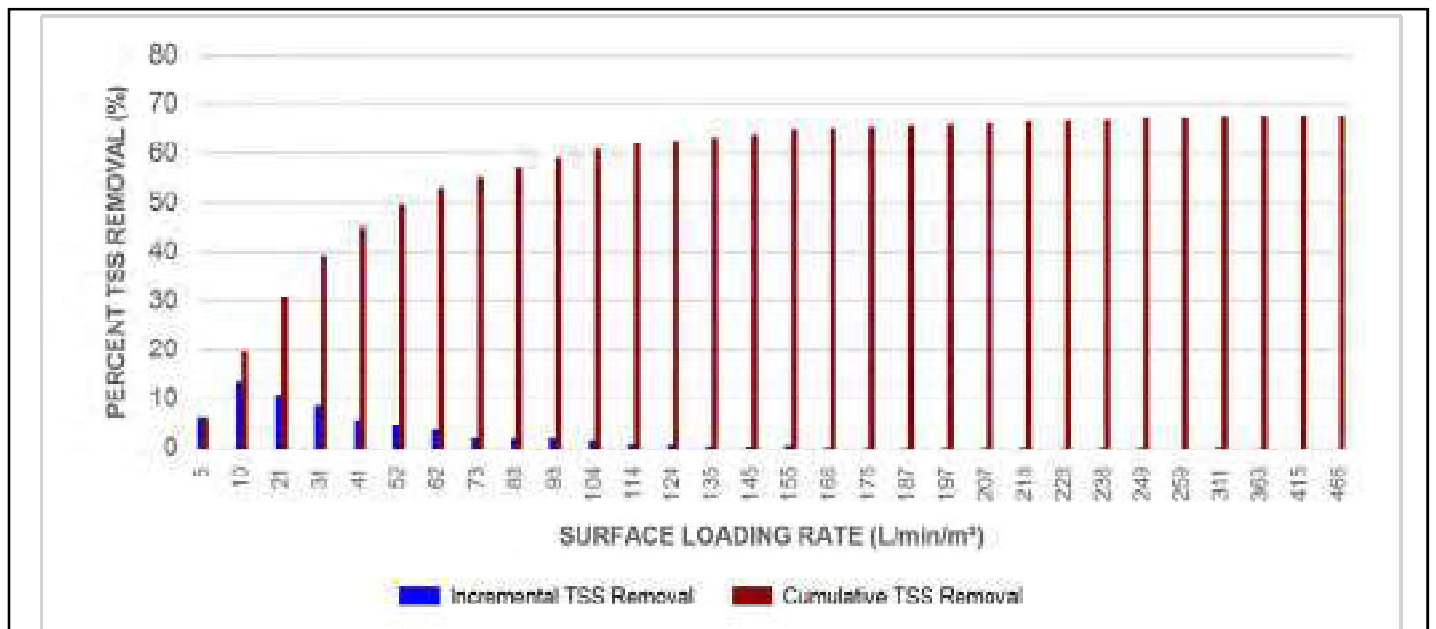
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	9.1	9.1	0.91	54.0	4.0	70	6.4	6.4
1.00	19.0	28.0	1.81	109.0	9.0	70	13.4	19.7
2.00	15.5	43.5	3.63	218.0	17.0	70	10.9	30.7
3.00	12.1	55.6	5.44	327.0	26.0	70	8.5	39.2
4.00	8.2	63.8	7.26	435.0	35.0	70	5.8	44.9
5.00	6.5	70.4	9.07	544.0	44.0	70	4.6	49.5
6.00	5.5	75.9	10.88	653.0	52.0	69	3.8	53.3
7.00	24.1	100.0	12.70	762.0	61.0	67	16.2	69.5
8.00	0.0	100.0	13.00	780.0	62.0	67	0.0	69.5
9.00	0.0	100.0	13.00	780.0	62.0	67	0.0	69.5
10.00	0.0	100.0	13.00	780.0	62.0	67	0.0	69.5
11.00	0.0	100.0	13.00	780.0	62.0	67	0.0	69.5
12.00	0.0	100.0	13.00	780.0	62.0	67	0.0	69.5
13.00	0.0	100.0	13.00	780.0	62.0	67	0.0	69.5
14.00	0.0	100.0	13.00	780.0	62.0	67	0.0	69.5
15.00	0.0	100.0	13.00	780.0	62.0	67	0.0	69.5
16.00	0.0	100.0	13.00	780.0	62.0	67	0.0	69.5
17.00	0.0	100.0	13.00	780.0	62.0	67	0.0	69.5
18.00	0.0	100.0	13.00	780.0	62.0	67	0.0	69.5
19.00	0.0	100.0	13.00	780.0	62.0	67	0.0	69.5
20.00	0.0	100.0	13.00	780.0	62.0	67	0.0	69.5
21.00	0.0	100.0	13.00	780.0	62.0	67	0.0	69.5
22.00	0.0	100.0	13.00	780.0	62.0	67	0.0	69.5
23.00	0.0	100.0	13.00	780.0	62.0	67	0.0	69.5
24.00	0.0	100.0	13.00	780.0	62.0	67	0.0	69.5
25.00	0.0	100.0	13.00	780.0	62.0	67	0.0	69.5
30.00	0.0	100.0	13.00	780.0	62.0	67	0.0	69.5
35.00	0.0	100.0	13.00	780.0	62.0	67	0.0	69.5
40.00	0.0	100.0	13.00	780.0	62.0	67	0.0	69.5
45.00	0.0	100.0	13.00	780.0	62.0	67	0.0	69.5
Estimated Net Annual Sediment (TSS) Load Reduction =								70 %

Climate Station ID: 6153301 Years of Rainfall Data: 20

RAINFALL DATA FROM HAMILTON RBG CS 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

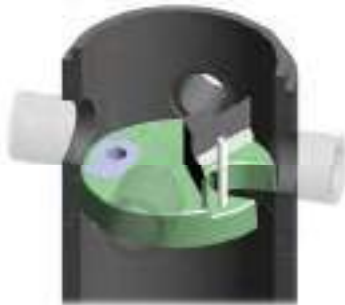
► Stormceptor® EF and EFO feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance 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.

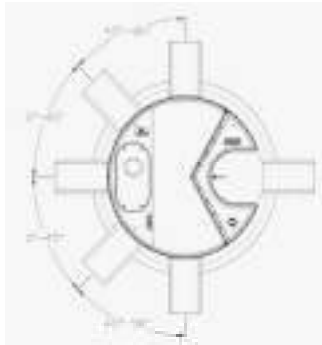
DESIGN FLEXIBILITY

► 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
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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

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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.

Imbrium® Systems

ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

08/20/2026

Province:	Ontario	Project Name:	1310 South Service Road Phase 2
City:	Hamilton	Project Number:	65075_001
Nearest Rainfall Station:	HAMILTON RBG CS	Designer Name:	Luke Foster
Climate Station Id:	6153301	Designer Company:	MTE Consultants Inc.
Years of Rainfall Data:	20	Designer Email:	LFoster@mte85.com
		Designer Phone:	548-889-6412
Site Name:	1310 South Service Road	EOR Name:	
		EOR Company:	
Drainage Area (ha):	0.67	EOR Email:	
% Imperviousness:	95.00	EOR Phone:	
Runoff Coefficient 'c': 0.87			

Particle Size Distribution:	CA ETV
Target TSS Removal (%):	70.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	18.25
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	Yes
Upstream Orifice Control Flow Rate to Stormceptor (L/s):	7.00
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	635
Estimated Average Annual Sediment Volume (L/yr):	516

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	56
EFO5	60
EFO6	64
EFO8	67
EFO10	70
EFO12	70

Recommended Stormceptor EFO Model: **EFO10**
Estimated Net Annual Sediment (TSS) Load Reduction (%): **70**
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.

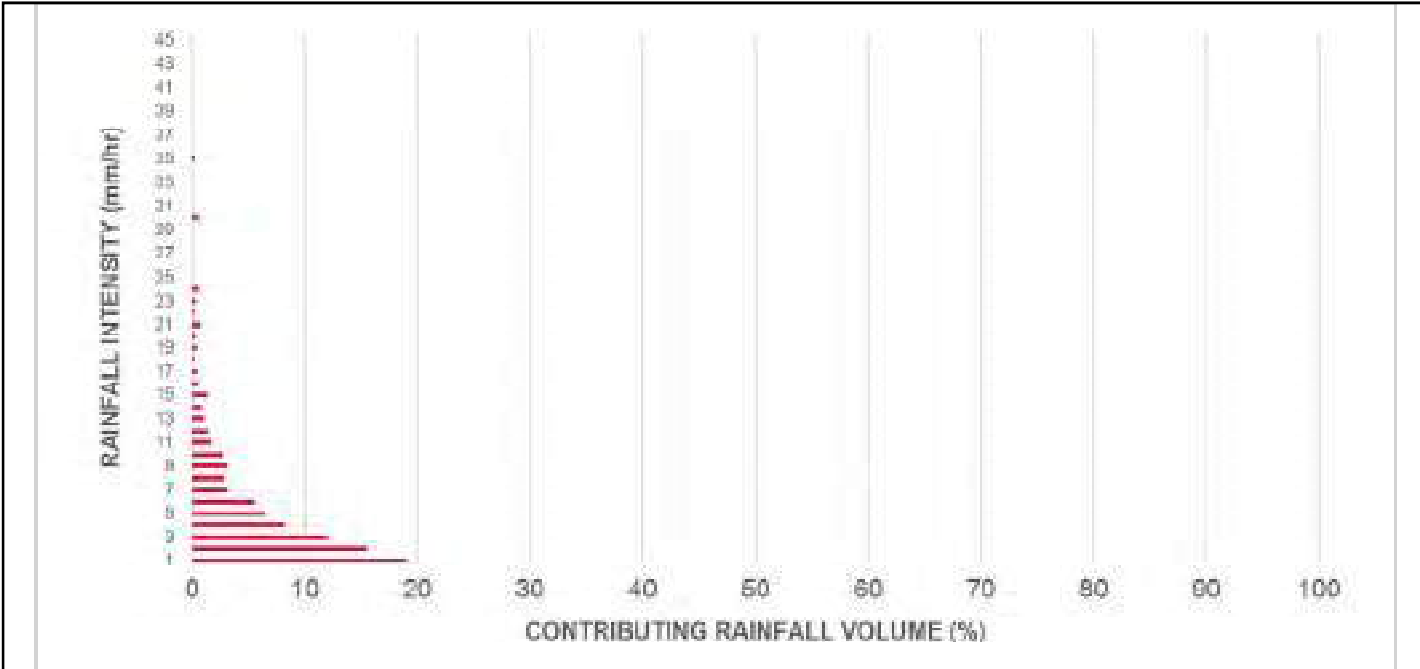
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Upstream Flow Controlled Results

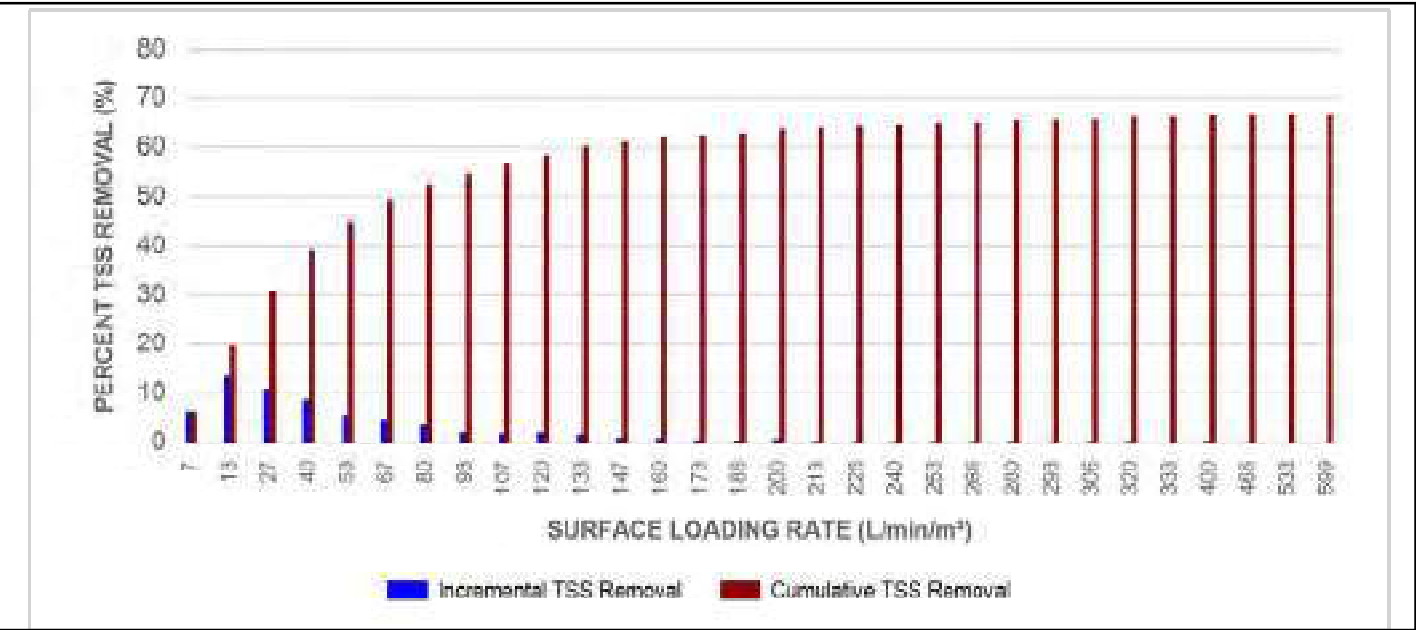
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	9.1	9.1	0.81	49.0	7.0	70	6.4	6.4
1.00	19.0	28.0	1.62	97.0	13.0	70	13.4	19.7
2.00	15.5	43.5	3.24	194.0	27.0	70	10.9	30.7
3.00	12.1	55.6	4.86	292.0	40.0	70	8.5	39.2
4.00	44.4	100.0	6.48	389.0	53.0	69	30.5	69.7
5.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
6.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
7.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
8.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
9.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
10.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
11.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
12.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
13.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
14.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
15.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
16.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
17.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
18.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
19.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
20.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
21.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
22.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
23.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
24.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
25.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
30.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
35.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
40.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
45.00	0.0	100.0	7.00	420.0	58.0	69	0.0	69.7
Estimated Net Annual Sediment (TSS) Load Reduction =								70 %

Climate Station ID: 6153301 Years of Rainfall Data: 20

RAINFALL DATA FROM HAMILTON RBG CS 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)
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SCOUR PREVENTION AND ONLINE CONFIGURATION

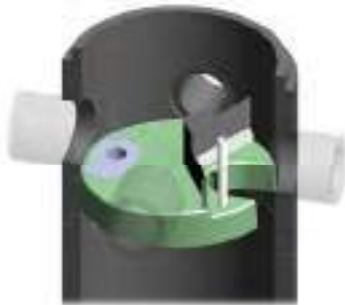
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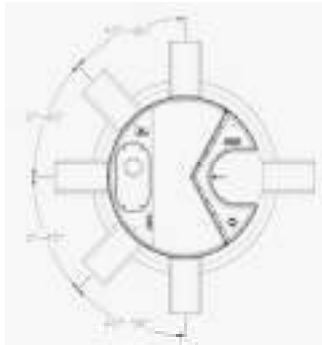
DESIGN FLEXIBILITY

► 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)
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EF5 / EFO5	1.5	5	1.62	5.3	420	111	305	10	2124	75	2612	5758
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EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
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** 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

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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.

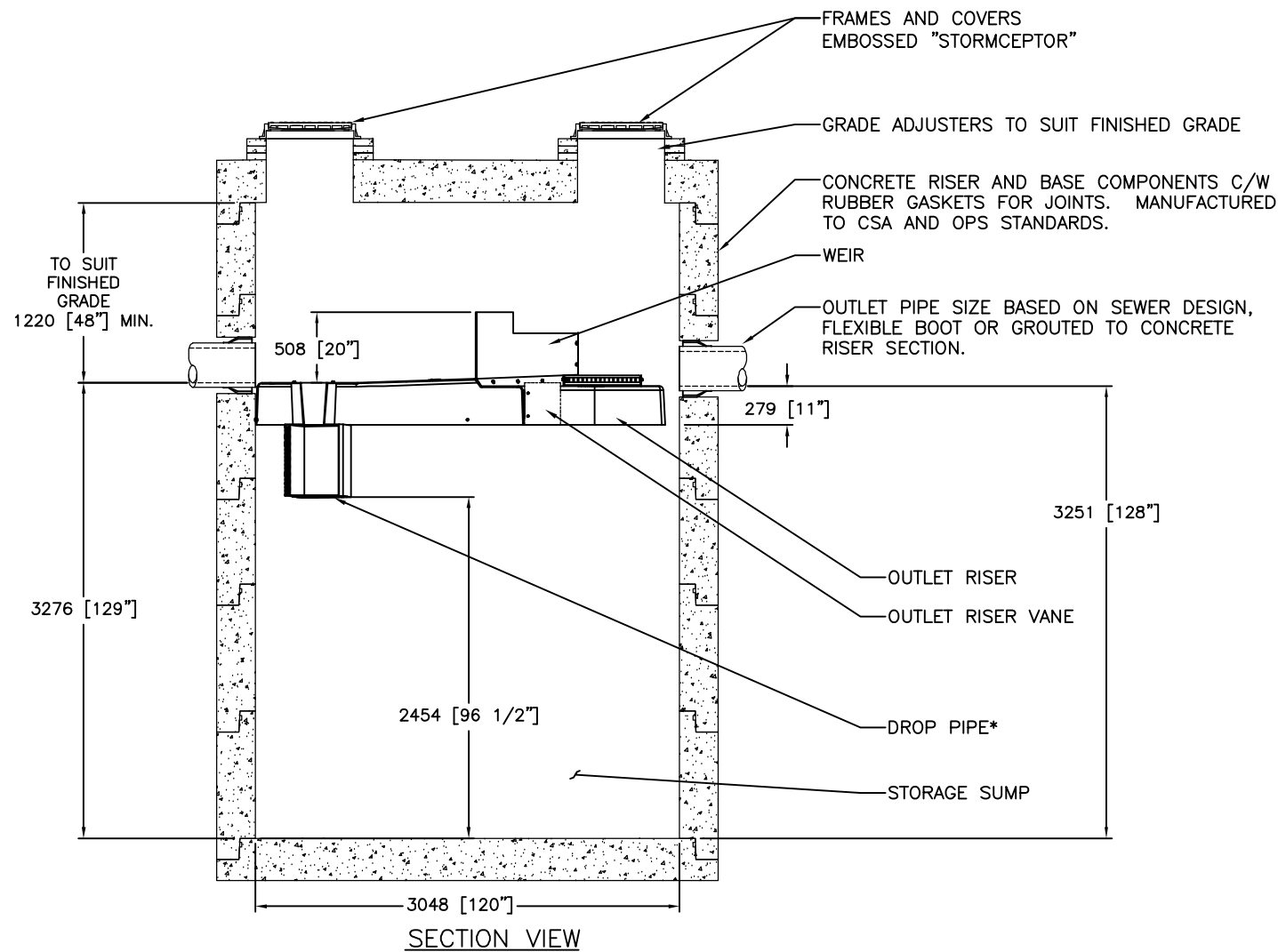
3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

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.

DRAWING NOT TO BE USED FOR CONSTRUCTION



GENERAL NOTES:

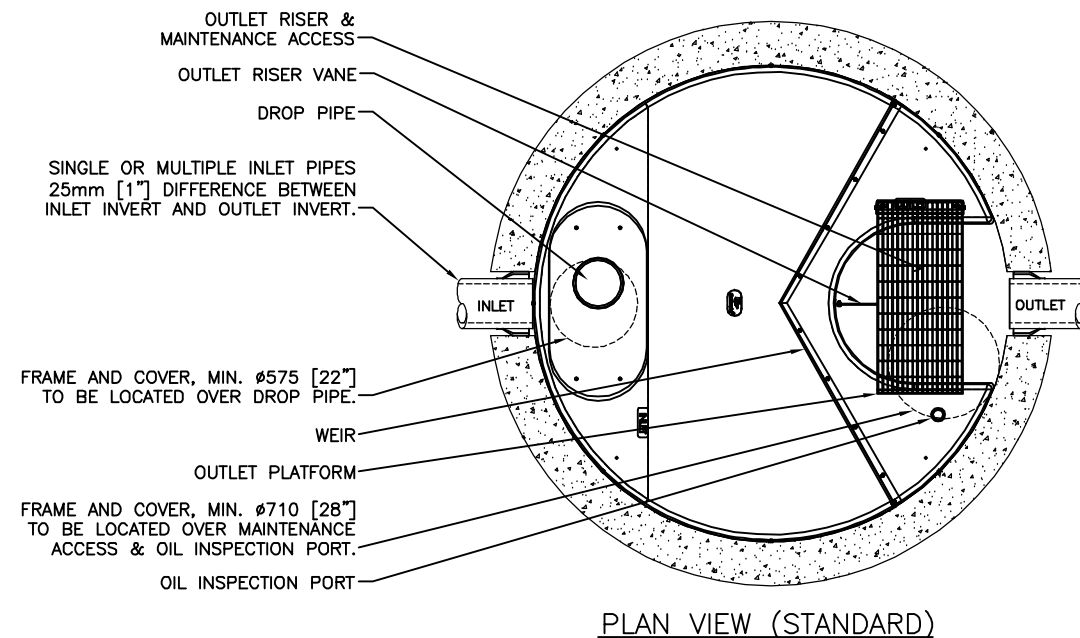
* MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m² (27.9 gpm/ft²) FOR STORMCEPTOR EF10 AND 535 L/min/m² (13.1 gpm/ft²) FOR STORMCEPTOR EFO10 (OIL CAPTURE CONFIGURATION).

1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
2. STORMCEPTOR STRUCTURE INLET AND OUTLET PIPE SIZE AND ORIENTATION SHOWN FOR INFORMATIONAL PURPOSES ONLY.
3. UNLESS OTHERWISE NOTED, BYPASS INFRASTRUCTURE, SUCH AS ALL UPSTREAM DIVERSION STRUCTURES, CONNECTING STRUCTURES, OR PIPE CONDUITS CONNECTING TO COMPLETE THE STORMCEPTOR SYSTEM SHALL BE PROVIDED AND ADDRESSED SEPARATELY.
4. DRAWING FOR INFORMATION PURPOSES ONLY. REFER TO ENGINEER'S SITE/UTILITY PLAN FOR STRUCTURE ORIENTATION.
5. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

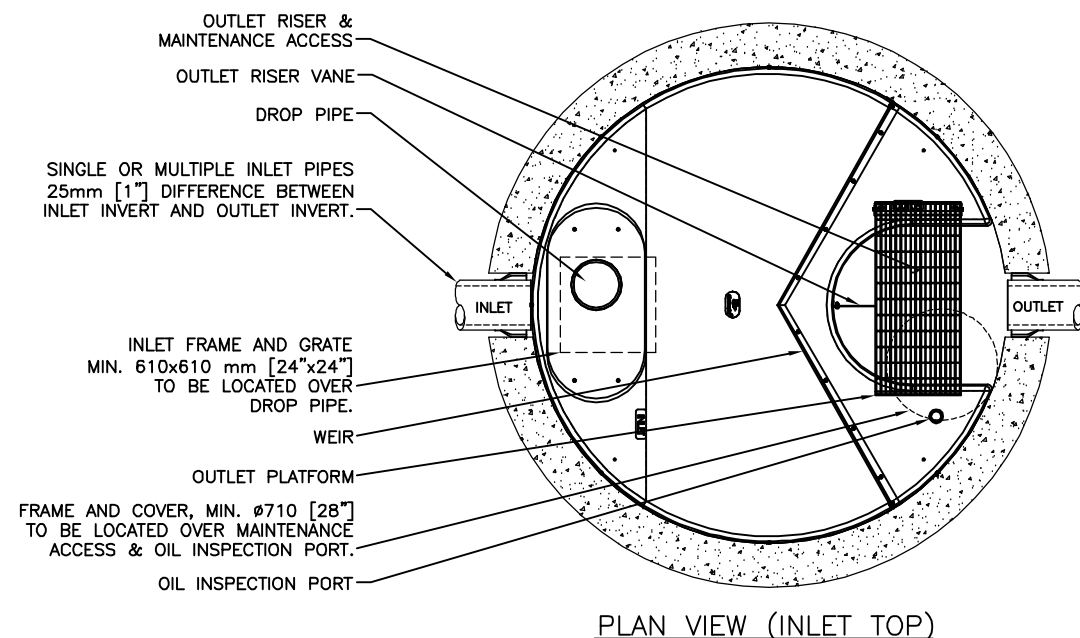
FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL STORMCEPTOR REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION REVISIONS. ELEVATIONS SHOULD BE MAINTAINED EXCEPT WHERE NOTED ON BYPASS STRUCTURE (IF REQUIRED).

INSTALLATION NOTES

- A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING CLUTCHES PROVIDED)
- C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
- D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT THE DEVICE FROM CONSTRUCTION-RELATED EROSION RUNOFF.
- E. DEVICE ACTIVATION, BY CONTRACTOR, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE STORMCEPTOR UNIT IS CLEAN AND FREE OF DEBRIS.



PLAN VIEW (STANDARD)



PLAN VIEW (INLET TOP)

SITE SPECIFIC DATA REQUIREMENTS					
STORMCEPTOR MODEL			EFO10		
STRUCTURE ID					*
HYDROCARBON STORAGE REQ'D (L)					*
WATER QUALITY FLOW RATE (L/s)					
PEAK FLOW RATE (L/s)					*
RETURN PERIOD OF PEAK FLOW (yrs)					*
DRAINAGE AREA (HA)					*
DRAINAGE AREA IMPERVIOUSNESS (%)					*
PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*
* PER ENGINEER OF RECORD					

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MARK	DATE	REVISION DESCRIPTION	BY
1	6/8/18	OUTLET PLATFORM	JSK
0	5/26/17	INITIAL RELEASE	JSK
####	####	####	####
####	####	####	####
####	####	####	####
####	####	####	####

Stormceptor® EF

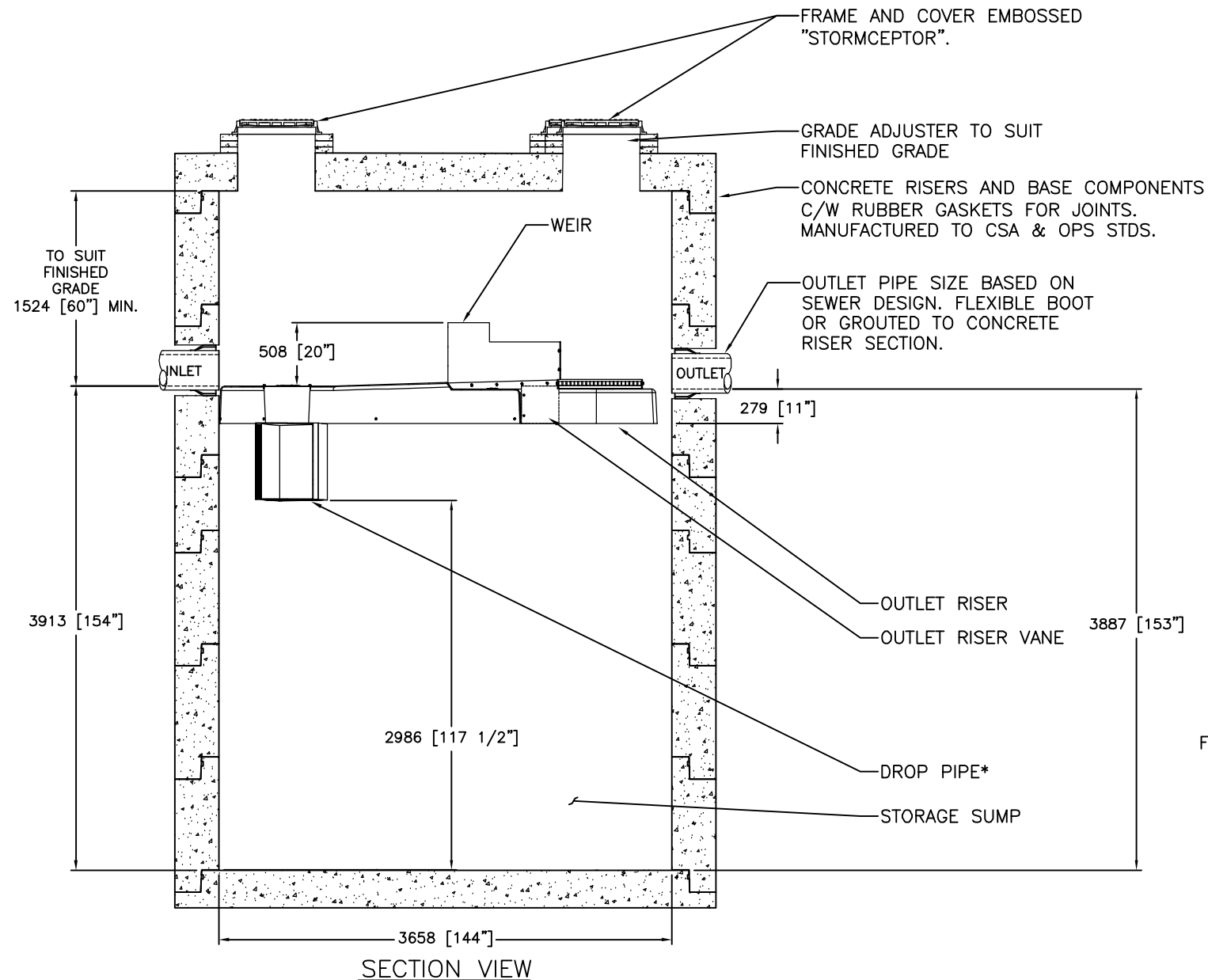
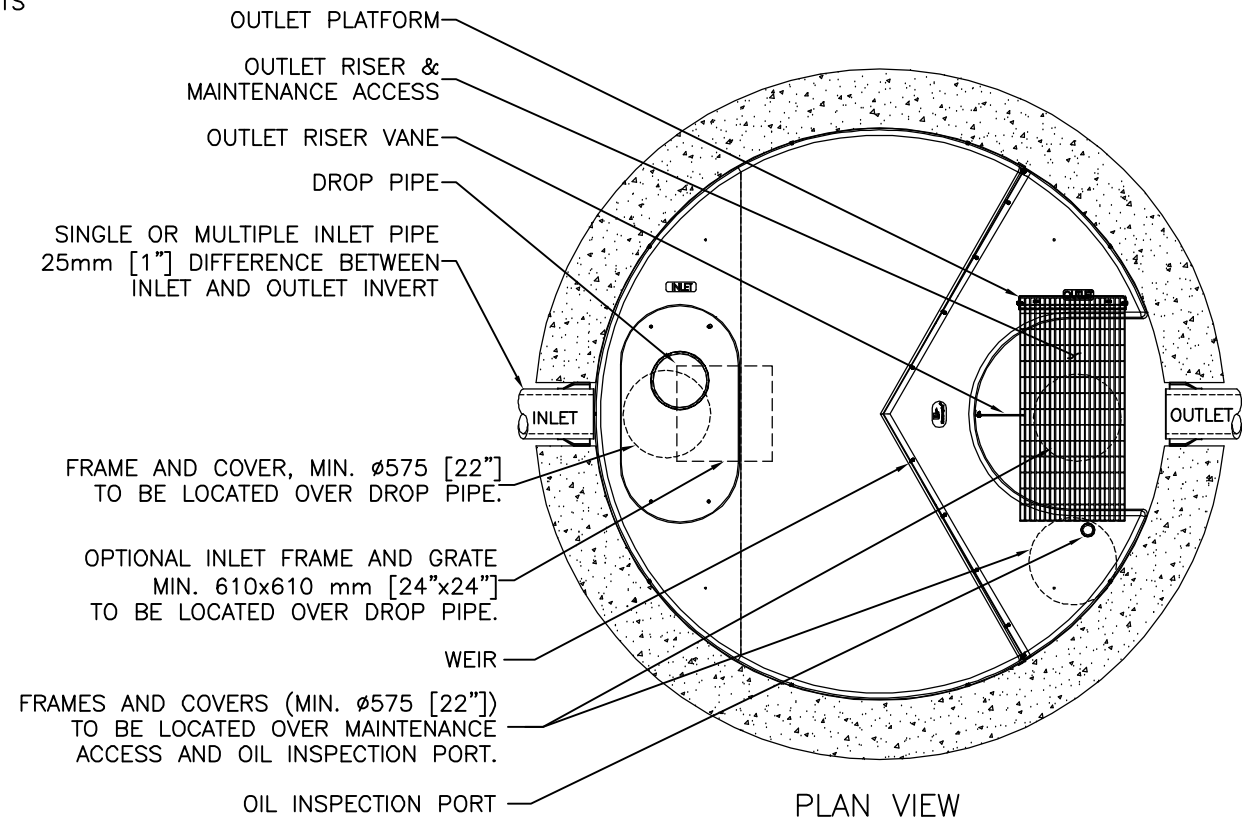
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[illegible]

DATE: 10/24/2017	
DESIGNED: JSK	DRAWN: JSK
CHECKED: BSF	APPROVED: SP
PROJECT No.: EFO10	SEQUENCE No.: *
SHEET: 1 OF 1	

STANDARD DETAIL
NOT FOR CONSTRUCTION

DRAWING NOT TO BE USED FOR CONSTRUCTION



GENERAL NOTES:

* MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m² (27.9 gpm/ft²) FOR STORMCEPTOR EF12 AND 535 L/min/m² (13.1 gpm/ft²) FOR STORMCEPTOR EFO12 (OIL CAPTURE CONFIGURATION).

1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
2. STORMCEPTOR STRUCTURE INLET AND OUTLET PIPE SIZE AND ORIENTATION SHOWN FOR INFORMATIONAL PURPOSES ONLY.
3. UNLESS OTHERWISE NOTED, BYPASS INFRASTRUCTURE, SUCH AS ALL UPSTREAM DIVERSION STRUCTURES, CONNECTING STRUCTURES, OR PIPE CONDUITS CONNECTING TO COMPLETE THE STORMCEPTOR SYSTEM SHALL BE PROVIDED AND ADDRESSED SEPARATELY.
4. DRAWING FOR INFORMATION PURPOSES ONLY. REFER TO ENGINEER'S SITE/UTILITY PLAN FOR STRUCTURE ORIENTATION.
5. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

INSTALLATION NOTES

- A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING CLUTCHES PROVIDED)
- C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
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STANDARD DETAIL
NOT FOR CONSTRUCTION

<u>SITE SPECIFIC DATA REQUIREMENTS</u>					
STORMCEPTOR MODEL			EFO12		
STRUCTURE ID					*
HYDROCARBON STORAGE REQ'D (L)					*
WATER QUALITY FLOW RATE (L/s)					*
PEAK FLOW RATE (L/s)					*
RETURN PERIOD OF PEAK FLOW (yrs)					*
DRAINAGE AREA (HA)					*
DRAINAGE AREA IMPERVIOUSNESS (%)					*
PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*
* PER ENGINEER OF RECORD					

[illegible]

Appendix F

MIDUSS Outputs

Post-Development



```

"      MIDUSS Output ----->"
"      MIDUSS version          Version 2.25 rev. 473"
"      MIDUSS created          Sunday, February 7, 2010"
"      10      Units used:      ie METRIC"
"      Job folder:              Q:\65075_001\MIDUSS"
"      Output filename:         65075_Post-Dev_2-Year_V3_EAST.out"
"      Licensee name:          A"
"      Company                  "
"      Date & Time last used:    8/23/2026 at 10:35:51 AM"
" 31      TIME PARAMETERS"
"      5.000 Time Step"
"      180.000 Max. Storm length"
"      1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"      1 Chicago storm"
"      646.000 Coefficient A"
"      6.000 Constant B"
"      0.781 Exponent C"
"      0.400 Fraction R"
"      180.000 Duration"
"      1.000 Time step multiplier"
"      Maximum intensity        99.290 mm/hr"
"      Total depth              32.724 mm"
"      6 002hyd Hydrograph extension used in this file"
" 33      CATCHMENT 202"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      201 Controlled"
"      87.000 % Impervious"
"      0.671 Total Area"
"      15.000 Flow length"
"      2.000 Overland Slope"
"      0.087 Pervious Area"
"      15.000 Pervious length"
"      2.000 Pervious slope"
"      0.584 Impervious Area"
"      15.000 Impervious length"
"      2.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      84.000 Pervious SCS Curve No."
"      0.310 Pervious Runoff coefficient"
"      0.100 Pervious Ia/S coefficient"
"      4.838 Pervious Initial abstraction"
"      0.015 Impervious Manning 'n'"
"      98.000 Impervious SCS Curve No."
"      0.835 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"      0.122 0.000 0.000 0.000 c.m/sec"
"      Catchment 202 Pervious Impervious Total Area "
"      Surface Area 0.087 0.584 0.671 hectare"
"      Time of concentration 13.074 1.519 2.126 minutes"
"      Time to Centroid 117.239 90.841 92.229 minutes"
"      Rainfall depth 32.724 32.724 32.724 mm"
"      Rainfall volume 28.55 191.03 219.58 c.m"
"      Rainfall losses 22.578 5.408 7.640 mm"
"      Runoff depth 10.146 27.316 25.084 mm"

```

```

"      Runoff volume 8.85 159.46 168.31 c.m"
"      Runoff coefficient 0.310 0.835 0.767 "
"      Maximum flow 0.003 0.121 0.122 c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"      0.122 0.122 0.000 0.000"
" 54      POND DESIGN"
"      0.122 Current peak flow c.m/sec"
"      0.027 Target outflow c.m/sec"
"      168.3 Hydrograph volume c.m"
"      14. Number of stages"
"      81.780 Minimum water level metre"
"      84.000 Maximum water level metre"
"      81.780 Starting water level metre"
"      0 Keep Design Data: 1 = True; 0 = False"
"      Level Discharge Volume"
"      81.780 0.000 0.000"
"      81.951 0.00402 4.522"
"      82.122 0.00499 27.134"
"      82.292 0.00579 49.746"
"      82.463 0.00650 72.357"
"      82.634 0.00713 94.969"
"      82.805 0.00772 117.580"
"      82.975 0.00826 140.192"
"      83.146 0.00877 162.804"
"      83.317 0.00925 185.415"
"      83.488 0.00971 217.750"
"      83.658 0.01015 217.800"
"      83.829 0.01057 445.275"
"      84.000 0.01097 596.925"
"      1. ORIFICES"
"      Orifice Orifice Orifice Number of"
"      invert coefficie diameter orifices"
"      81.600 0.820 0.0500 1.000"
"      Peak outflow 0.008 c.m/sec"
"      Maximum level 82.788 metre"
"      Maximum storage 115.360 c.m"
"      Centroidal lag 4.355 hours"
"      0.122 0.122 0.008 0.000 c.m/sec"
" 40      HYDROGRAPH Combine 1"
"      6 Combine "
"      1 Node #"
"      Total Flow from Site"
"      Maximum flow 0.008 c.m/sec"
"      Hydrograph volume 168.301 c.m"
"      0.122 0.122 0.008 0.008"
" 40      HYDROGRAPH Start - New Tributary"
"      2 Start - New Tributary"
"      0.122 0.000 0.008 0.008"
" 33      CATCHMENT 204"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      202 Uncontrolled"
"      6.000 % Impervious"
"      0.054 Total Area"
"      3.000 Flow length"
"      15.000 Overland Slope"

```

"	0.051	Pervious Area"			
"	3.000	Pervious length"			
"	15.000	Pervious slope"			
"	0.003	Impervious Area"			
"	3.000	Impervious length"			
"	15.000	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	84.000	Pervious SCS Curve No."			
"	0.306	Pervious Runoff coefficient"			
"	0.100	Pervious Ia/S coefficient"			
"	4.838	Pervious Initial abstraction"			
"	0.015	Impervious Manning 'n'"			
"	98.000	Impervious SCS Curve No."			
"	0.741	Impervious Runoff coefficient"			
"	0.100	Impervious Ia/S coefficient"			
"	0.518	Impervious Initial abstraction"			
"	0.003	0.000	0.008	0.008 c.m/sec"	
"	Catchment 204	Pervious	Impervious	Total Area	"
"	Surface Area	0.051	0.003	0.054	hectare"
"	Time of concentration	2.720	0.316	2.398	minutes"
"	Time to Centroid	103.638	89.282	101.719	minutes"
"	Rainfall depth	32.724	32.724	32.724	mm"
"	Rainfall volume	16.61	1.06	17.67	c.m"
"	Rainfall losses	22.699	8.487	21.846	mm"
"	Runoff depth	10.025	24.237	10.878	mm"
"	Runoff volume	5.09	0.79	5.87	c.m"
"	Runoff coefficient	0.306	0.741	0.332	"
"	Maximum flow	0.003	0.001	0.003	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.003	0.003	0.008	0.008"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.003	0.003	0.003	0.008"	
" 40	HYDROGRAPH Combine 1"				
"	6 Combine "				
"	1 Node #"				
"	Total Flow from Site"				
"	Maximum flow	0.010	c.m/sec"		
"	Hydrograph volume	174.175	c.m"		
"	0.003	0.003	0.003	0.010"	
" 40	HYDROGRAPH Confluence 1"				
"	7 Confluence "				
"	1 Node #"				
"	Total Flow from Site"				
"	Maximum flow	0.010	c.m/sec"		
"	Hydrograph volume	174.175	c.m"		
"	0.003	0.010	0.003	0.000"	

```

"          MIDUSS Output ----->"
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"          MIDUSS created          Sunday, February 7, 2010"
"          10 Units used:          ie METRIC"
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"          Output filename:        65075_Post-Dev_2-Year_V5_WEST.out"
"          Licensee name:          A"
"          Company                  "
"          Date & Time last used:   8/23/2026 at 10:58:20 AM"
" 31 TIME PARAMETERS"
"      5.000 Time Step"
"      180.000 Max. Storm length"
"      1500.000 Max. Hydrograph"
" 32 STORM Chicago storm"
"      1 Chicago storm"
"      646.000 Coefficient A"
"      6.000 Constant B"
"      0.781 Exponent C"
"      0.400 Fraction R"
"      180.000 Duration"
"      1.000 Time step multiplier"
"      Maximum intensity          99.290 mm/hr"
"      Total depth                 32.724 mm"
"      6 002hyd Hydrograph extension used in this file"
" 33 CATCHMENT 201"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      201 Controlled"
"      87.000 % Impervious"
"      0.704 Total Area"
"      15.000 Flow length"
"      2.000 Overland Slope"
"      0.092 Pervious Area"
"      15.000 Pervious length"
"      2.000 Pervious slope"
"      0.612 Impervious Area"
"      15.000 Impervious length"
"      2.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      84.000 Pervious SCS Curve No."
"      0.310 Pervious Runoff coefficient"
"      0.100 Pervious Ia/S coefficient"
"      4.838 Pervious Initial abstraction"
"      0.015 Impervious Manning 'n'"
"      98.000 Impervious SCS Curve No."
"      0.835 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"          0.128 0.000 0.000 0.000 c.m/sec"
"      Catchment 201 Pervious Impervious Total Area "
"      Surface Area 0.092 0.612 0.704 hectare"
"      Time of concentration 13.074 1.519 2.126 minutes"
"      Time to Centroid 117.239 90.841 92.229 minutes"
"      Rainfall depth 32.724 32.724 32.724 mm"
"      Rainfall volume 29.95 200.43 230.38 c.m"
"      Rainfall losses 22.578 5.408 7.640 mm"
"      Runoff depth 10.146 27.316 25.084 mm"

```

```

"          Runoff volume          9.29 167.30 176.59 c.m"
"          Runoff coefficient      0.310 0.835 0.767 "
"          Maximum flow            0.004 0.127 0.128 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"          0.128 0.128 0.000 0.000"
" 54 POND DESIGN"
"      0.128 Current peak flow c.m/sec"
"      0.028 Target outflow c.m/sec"
"      176.6 Hydrograph volume c.m"
"      18. Number of stages"
"      82.340 Minimum water level metre"
"      84.000 Maximum water level metre"
"      82.340 Starting water level metre"
"      0 Keep Design Data: 1 = True; 0 = False"
"          Level Discharge Volume"
"      82.340 0.000 0.000"
"      82.350 3.11E-05 3.633"
"      82.450 0.00197 39.958"
"      82.550 0.00300 76.284"
"      82.650 0.00375 112.610"
"      82.750 0.00438 148.936"
"      82.850 0.00492 185.262"
"      82.960 0.00546 225.220"
"      83.050 0.00587 225.320"
"      83.150 0.00629 225.420"
"      83.250 0.00668 225.520"
"      83.350 0.00705 225.620"
"      83.450 0.00740 225.720"
"      83.550 0.00774 225.820"
"      83.650 0.00806 225.920"
"      83.750 0.00837 226.020"
"      83.850 0.00867 389.270"
"      84.000 0.00910 634.145"
" 1. ORIFICES"
"      Orifice Orifice Orifice Number of"
"      invert coefficie diameter orifices"
"      82.340 0.820 0.0500 1.000"
"      Peak outflow 0.004 c.m/sec"
"      Maximum level 82.745 metre"
"      Maximum storage 147.295 c.m"
"      Centroidal lag 9.125 hours"
"          0.128 0.128 0.004 0.000 c.m/sec"
" 40 HYDROGRAPH Combine 1"
"      6 Combine "
"      1 Node #"
"          Total Flow from Site"
"      Maximum flow 0.004 c.m/sec"
"      Hydrograph volume 170.128 c.m"
"          0.128 0.128 0.004 0.004"
" 40 HYDROGRAPH Start - New Tributary"
"      2 Start - New Tributary"
"          0.128 0.000 0.004 0.004"
" 33 CATCHMENT 203"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      203 Uncontrolled.."

```

"	20.000	% Impervious"			
"	0.047	Total Area"			
"	3.000	Flow length"			
"	15.000	Overland Slope"			
"	0.038	Pervious Area"			
"	3.000	Pervious length"			
"	15.000	Pervious slope"			
"	0.009	Impervious Area"			
"	3.000	Impervious length"			
"	15.000	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	84.000	Pervious SCS Curve No."			
"	0.306	Pervious Runoff coefficient"			
"	0.100	Pervious Ia/S coefficient"			
"	4.838	Pervious Initial abstraction"			
"	0.015	Impervious Manning 'n'"			
"	98.000	Impervious SCS Curve No."			
"	0.741	Impervious Runoff coefficient"			
"	0.100	Impervious Ia/S coefficient"			
"	0.518	Impervious Initial abstraction"			
"	0.004	0.000	0.004	0.004 c.m/sec"	
"	Catchment 203	Pervious	Impervious	Total Area	"
"	Surface Area	0.038	0.009	0.047	hectare"
"	Time of concentration	2.720	0.316	1.814	minutes"
"	Time to Centroid	103.638	89.282	98.230	minutes"
"	Rainfall depth	32.724	32.724	32.724	mm"
"	Rainfall volume	12.30	3.08	15.38	c.m"
"	Rainfall losses	22.699	8.487	19.857	mm"
"	Runoff depth	10.025	24.237	12.867	mm"
"	Runoff volume	3.77	2.28	6.05	c.m"
"	Runoff coefficient	0.306	0.741	0.393	"
"	Maximum flow	0.002	0.002	0.004	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.004	0.004	0.004	0.004"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.004	0.004	0.004	0.004"	
" 40	HYDROGRAPH Combine 1"				
"	6 Combine "				
"	1 Node #"				
"	Total Flow from Site"				
"	Maximum flow	0.006		c.m/sec"	
"	Hydrograph volume	176.176		c.m"	
"	0.004	0.004	0.004	0.006"	
" 40	HYDROGRAPH Confluence 1"				
"	7 Confluence "				
"	1 Node #"				
"	Total Flow from Site"				
"	Maximum flow	0.006		c.m/sec"	
"	Hydrograph volume	176.176		c.m"	
"	0.004	0.006	0.004	0.000"	

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"          MIDUSS Output ----->"
"          MIDUSS version          Version 2.25 rev. 473"
"          MIDUSS created          Sunday, February 7, 2010"
"          10 Units used:          ie METRIC"
"          Job folder:              Q:\65075_001\MIDUSS"
"          Output filename:        65075_Post-Dev_5-Year_V2_EAST.out"
"          Licensee name:          A"
"          Company                  "
"          Date & Time last used:   8/23/2026 at 10:31:52 AM"
" 31 TIME PARAMETERS"
"      5.000 Time Step"
"      180.000 Max. Storm length"
"      1500.000 Max. Hydrograph"
" 32 STORM Chicago storm"
"      1 Chicago storm"
"      1049.500 Coefficient A"
"      8.000 Constant B"
"      0.803 Exponent C"
"      0.400 Fraction R"
"      180.000 Duration"
"      1.000 Time step multiplier"
"      Maximum intensity          133.809 mm/hr"
"      Total depth                46.985 mm"
"      6 005hyd Hydrograph extension used in this file"
" 33 CATCHMENT 202"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      201 Controlled"
"      87.000 % Impervious"
"      0.671 Total Area"
"      15.000 Flow length"
"      2.000 Overland Slope"
"      0.087 Pervious Area"
"      15.000 Pervious length"
"      2.000 Pervious slope"
"      0.584 Impervious Area"
"      15.000 Impervious length"
"      2.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      84.000 Pervious SCS Curve No."
"      0.416 Pervious Runoff coefficient"
"      0.100 Pervious Ia/S coefficient"
"      4.838 Pervious Initial abstraction"
"      0.015 Impervious Manning 'n'"
"      98.000 Impervious SCS Curve No."
"      0.873 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"          0.178 0.000 0.000 0.000 c.m/sec"
"      Catchment 202 Pervious Impervious Total Area "
"      Surface Area 0.087 0.584 0.671 hectare"
"      Time of concentration 10.025 1.328 1.905 minutes"
"      Time to Centroid 110.644 89.253 90.673 minutes"
"      Rainfall depth 46.985 46.985 46.985 mm"
"      Rainfall volume 40.98 274.28 315.27 c.m"
"      Rainfall losses 27.460 5.959 8.754 mm"
"      Runoff depth 19.525 41.025 38.230 mm"

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```

"          Runoff volume          17.03 239.49 256.53 c.m"
"          Runoff coefficient      0.416 0.873 0.814 "
"          Maximum flow            0.008 0.176 0.178 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"          0.178 0.178 0.000 0.000"
" 54 POND DESIGN"
"      0.178 Current peak flow c.m/sec"
"      0.027 Target outflow c.m/sec"
"      256.5 Hydrograph volume c.m"
"      14. Number of stages"
"      81.780 Minimum water level metre"
"      84.000 Maximum water level metre"
"      81.780 Starting water level metre"
"      0 Keep Design Data: 1 = True; 0 = False"
"          Level Discharge Volume"
"      81.780 0.000 0.000"
"      81.951 0.00402 4.522"
"      82.122 0.00499 27.134"
"      82.292 0.00579 49.746"
"      82.463 0.00650 72.357"
"      82.634 0.00713 94.969"
"      82.805 0.00772 117.580"
"      82.975 0.00826 140.192"
"      83.146 0.00877 162.804"
"      83.317 0.00925 185.415"
"      83.488 0.00971 217.750"
"      83.658 0.01015 217.800"
"      83.829 0.01057 445.275"
"      84.000 0.01097 596.925"
"      1. ORIFICES"
"          Orifice Orifice Orifice Number of"
"          invert coefficie diameter orifices"
"      81.600 0.820 0.0500 1.000"
"          Peak outflow 0.009 c.m/sec"
"          Maximum level 83.335 metre"
"          Maximum storage 188.785 c.m"
"          Centroidal lag 5.294 hours"
"          0.178 0.178 0.009 0.000 c.m/sec"
" 40 HYDROGRAPH Combine 1"
"      6 Combine "
"      1 Node #"
"          Total Flow from Site"
"          Maximum flow 0.009 c.m/sec"
"          Hydrograph volume 256.511 c.m"
"          0.178 0.178 0.009 0.009"
" 40 HYDROGRAPH Start - New Tributary"
"      2 Start - New Tributary"
"          0.178 0.000 0.009 0.009"
" 33 CATCHMENT 204"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      202 Uncontrolled"
"      6.000 % Impervious"
"      0.054 Total Area"
"      3.000 Flow length"
"      15.000 Overland Slope"

```

"	0.051	Pervious Area"			
"	3.000	Pervious length"			
"	15.000	Pervious slope"			
"	0.003	Impervious Area"			
"	3.000	Impervious length"			
"	15.000	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	84.000	Pervious SCS Curve No."			
"	0.411	Pervious Runoff coefficient"			
"	0.100	Pervious Ia/S coefficient"			
"	4.838	Pervious Initial abstraction"			
"	0.015	Impervious Manning 'n'"			
"	98.000	Impervious SCS Curve No."			
"	0.770	Impervious Runoff coefficient"			
"	0.100	Impervious Ia/S coefficient"			
"	0.518	Impervious Initial abstraction"			
"	0.007	0.000	0.009	0.009 c.m/sec"	
"	Catchment 204	Pervious	Impervious	Total Area	"
"	Surface Area	0.051	0.003	0.054	hectare"
"	Time of concentration	2.085	0.276	1.892	minutes"
"	Time to Centroid	99.891	87.651	98.582	minutes"
"	Rainfall depth	46.985	46.985	46.985	mm"
"	Rainfall volume	23.85	1.52	25.37	c.m"
"	Rainfall losses	27.697	10.793	26.683	mm"
"	Runoff depth	19.287	36.192	20.302	mm"
"	Runoff volume	9.79	1.17	10.96	c.m"
"	Runoff coefficient	0.411	0.770	0.432	"
"	Maximum flow	0.006	0.001	0.007	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.007	0.007	0.009	0.009"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.007	0.007	0.007	0.009"	
" 40	HYDROGRAPH Combine 1"				
"	6 Combine "				
"	1 Node #"				
"	Total Flow from Site"				
"	Maximum flow	0.014	c.m/sec"		
"	Hydrograph volume	267.474	c.m"		
"	0.007	0.007	0.007	0.014"	
" 40	HYDROGRAPH Confluence 1"				
"	7 Confluence "				
"	1 Node #"				
"	Total Flow from Site"				
"	Maximum flow	0.014	c.m/sec"		
"	Hydrograph volume	267.474	c.m"		
"	0.007	0.014	0.007	0.000"	

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"          MIDUSS Output ----->"
"          MIDUSS version              Version 2.25 rev. 473"
"          MIDUSS created              Sunday, February 7, 2010"
"          10 Units used:              ie METRIC"
"          Job folder:                 Q:\65075_001\MIDUSS"
"          Output filename:            65075_Post-Dev_5-Year_V3_WEST.out"
"          Licensee name:              A"
"          Company                     "
"          Date & Time last used:      8/23/2026 at 11:00:55 AM"
" 31 TIME PARAMETERS"
"      5.000 Time Step"
"      180.000 Max. Storm length"
"      1500.000 Max. Hydrograph"
" 32 STORM Chicago storm"
"      1 Chicago storm"
"      1049.500 Coefficient A"
"      8.000 Constant B"
"      0.803 Exponent C"
"      0.400 Fraction R"
"      180.000 Duration"
"      1.000 Time step multiplier"
"      Maximum intensity              133.809 mm/hr"
"      Total depth                    46.985 mm"
"      6 005hyd Hydrograph extension used in this file"
" 33 CATCHMENT 201"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      201 Controlled"
"      87.000 % Impervious"
"      0.704 Total Area"
"      15.000 Flow length"
"      2.000 Overland Slope"
"      0.092 Pervious Area"
"      15.000 Pervious length"
"      2.000 Pervious slope"
"      0.612 Impervious Area"
"      15.000 Impervious length"
"      2.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      84.000 Pervious SCS Curve No."
"      0.416 Pervious Runoff coefficient"
"      0.100 Pervious Ia/S coefficient"
"      4.838 Pervious Initial abstraction"
"      0.015 Impervious Manning 'n'"
"      98.000 Impervious SCS Curve No."
"      0.873 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"          0.187 0.000 0.000 0.000 c.m/sec"
"      Catchment 201 Pervious Impervious Total Area "
"      Surface Area 0.092 0.612 0.704 hectare"
"      Time of concentration 10.025 1.328 1.905 minutes"
"      Time to Centroid 110.644 89.253 90.673 minutes"
"      Rainfall depth 46.985 46.985 46.985 mm"
"      Rainfall volume 43.00 287.77 330.77 c.m"
"      Rainfall losses 27.460 5.959 8.754 mm"
"      Runoff depth 19.525 41.025 38.230 mm"

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```

"          Runoff volume              17.87 251.27 269.14 c.m"
"          Runoff coefficient          0.416 0.873 0.814 "
"          Maximum flow                0.008 0.185 0.187 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"          0.187 0.187 0.000 0.000"
" 54 POND DESIGN"
"      0.187 Current peak flow c.m/sec"
"      0.028 Target outflow c.m/sec"
"      269.1 Hydrograph volume c.m"
"      18. Number of stages"
"      82.340 Minimum water level metre"
"      84.000 Maximum water level metre"
"      82.340 Starting water level metre"
"      0 Keep Design Data: 1 = True; 0 = False"
"          Level Discharge Volume"
"      82.340 0.000 0.000"
"      82.350 3.11E-05 3.633"
"      82.450 0.00197 39.958"
"      82.550 0.00300 76.284"
"      82.650 0.00375 112.610"
"      82.750 0.00438 148.936"
"      82.850 0.00492 185.262"
"      82.960 0.00546 225.220"
"      83.050 0.00587 225.320"
"      83.150 0.00629 225.420"
"      83.250 0.00668 225.520"
"      83.350 0.00705 225.620"
"      83.450 0.00740 225.720"
"      83.550 0.00774 225.820"
"      83.650 0.00806 225.920"
"      83.750 0.00837 226.020"
"      83.850 0.00867 389.270"
"      84.000 0.00910 634.145"
" 1. ORIFICES"
"      Orifice Orifice Orifice Number of"
"      invert coefficie diameter orifices"
"      82.340 0.820 0.0500 1.000"
"      Peak outflow 0.008 c.m/sec"
"      Maximum level 83.750 metre"
"      Maximum storage 226.338 c.m"
"      Centroidal lag 9.963 hours"
"          0.187 0.187 0.008 0.000 c.m/sec"
" 40 HYDROGRAPH Combine 1"
"      6 Combine "
"      1 Node #"
"          Total Flow from Site"
"      Maximum flow 0.008 c.m/sec"
"      Hydrograph volume 258.220 c.m"
"          0.187 0.187 0.008 0.008"
" 40 HYDROGRAPH Start - New Tributary"
"      2 Start - New Tributary"
"          0.187 0.000 0.008 0.008"
" 33 CATCHMENT 203"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      202 Uncontrolled.."

```

"	20.000	% Impervious"			
"	0.047	Total Area"			
"	3.000	Flow length"			
"	15.000	Overland Slope"			
"	0.038	Pervious Area"			
"	3.000	Pervious length"			
"	15.000	Pervious slope"			
"	0.009	Impervious Area"			
"	3.000	Impervious length"			
"	15.000	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	84.000	Pervious SCS Curve No."			
"	0.411	Pervious Runoff coefficient"			
"	0.100	Pervious Ia/S coefficient"			
"	4.838	Pervious Initial abstraction"			
"	0.015	Impervious Manning 'n'"			
"	98.000	Impervious SCS Curve No."			
"	0.770	Impervious Runoff coefficient"			
"	0.100	Impervious Ia/S coefficient"			
"	0.518	Impervious Initial abstraction"			
"	0.007	0.000	0.008	0.008 c.m/sec"	
"	Catchment 203	Pervious	Impervious	Total Area	"
"	Surface Area	0.038	0.009	0.047	hectare"
"	Time of concentration	2.085	0.276	1.508	minutes"
"	Time to Centroid	99.891	87.651	95.983	minutes"
"	Rainfall depth	46.985	46.985	46.985	mm"
"	Rainfall volume	17.67	4.42	22.08	c.m"
"	Rainfall losses	27.697	10.793	24.316	mm"
"	Runoff depth	19.287	36.192	22.668	mm"
"	Runoff volume	7.25	3.40	10.65	c.m"
"	Runoff coefficient	0.411	0.770	0.482	"
"	Maximum flow	0.004	0.003	0.007	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.007	0.007	0.008	0.008"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.007	0.007	0.007	0.008"	
" 40	HYDROGRAPH Combine 1"				
"	6 Combine "				
"	1 Node #"				
"	Total Flow from Site"				
"	Maximum flow	0.010		c.m/sec"	
"	Hydrograph volume	268.874		c.m"	
"	0.007	0.007	0.007	0.010"	
" 40	HYDROGRAPH Confluence 1"				
"	7 Confluence "				
"	1 Node #"				
"	Total Flow from Site"				
"	Maximum flow	0.010		c.m/sec"	
"	Hydrograph volume	268.874		c.m"	
"	0.007	0.010	0.007	0.000"	

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"          MIDUSS Output ----->"
"          MIDUSS version          Version 2.25 rev. 473"
"          MIDUSS created          Sunday, February 7, 2010"
"          10 Units used:          ie METRIC"
"          Job folder:              Q:\65075_001\MIDUSS"
"          Output filename:         65075_Post-Dev_10-Year_V3_EAST.out"
"          Licensee name:          A"
"          Company                  "
"          Date & Time last used:    8/23/2026 at 10:30:48 AM"
" 31 TIME PARAMETERS"
"      5.000 Time Step"
"      180.000 Max. Storm length"
"      1500.000 Max. Hydrograph"
" 32 STORM Chicago storm"
"      1 Chicago storm"
"      1343.700 Coefficient A"
"      9.000 Constant B"
"      0.814 Exponent C"
"      0.400 Fraction R"
"      180.000 Duration"
"      1.000 Time step multiplier"
"      Maximum intensity          156.803 mm/hr"
"      Total depth                56.544 mm"
"      6 010hyd Hydrograph extension used in this file"
" 33 CATCHMENT 202"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      201 Controlled"
"      87.000 % Impervious"
"      0.671 Total Area"
"      15.000 Flow length"
"      2.000 Overland Slope"
"      0.087 Pervious Area"
"      15.000 Pervious length"
"      2.000 Pervious slope"
"      0.584 Impervious Area"
"      15.000 Impervious length"
"      2.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      84.000 Pervious SCS Curve No."
"      0.471 Pervious Runoff coefficient"
"      0.100 Pervious Ia/S coefficient"
"      4.838 Pervious Initial abstraction"
"      0.015 Impervious Manning 'n'"
"      98.000 Impervious SCS Curve No."
"      0.888 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"          0.216 0.000 0.000 0.000 c.m/sec"
"      Catchment 202 Pervious Impervious Total Area "
"      Surface Area 0.087 0.584 0.671 hectare"
"      Time of concentration 8.863 1.240 1.800 minutes"
"      Time to Centroid 107.857 88.515 89.935 minutes"
"      Rainfall depth 56.544 56.544 56.544 mm"
"      Rainfall volume 49.32 330.08 379.41 c.m"
"      Rainfall losses 29.917 6.341 9.406 mm"
"      Runoff depth 26.627 50.202 47.137 mm"

```

```

"          Runoff volume          23.23 293.07 316.29 c.m"
"          Runoff coefficient      0.471 0.888 0.834 "
"          Maximum flow            0.012 0.211 0.216 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"          0.216 0.216 0.000 0.000"
" 54 POND DESIGN"
"      0.216 Current peak flow c.m/sec"
"      0.027 Target outflow c.m/sec"
"      316.3 Hydrograph volume c.m"
"      14. Number of stages"
"      81.780 Minimum water level metre"
"      84.000 Maximum water level metre"
"      81.780 Starting water level metre"
"      0 Keep Design Data: 1 = True; 0 = False"
"          Level Discharge Volume"
"      81.780 0.000 0.000"
"      81.951 0.00402 4.522"
"      82.122 0.00499 27.134"
"      82.292 0.00579 49.746"
"      82.463 0.00650 72.357"
"      82.634 0.00713 94.969"
"      82.805 0.00772 117.580"
"      82.975 0.00826 140.192"
"      83.146 0.00877 162.804"
"      83.317 0.00925 185.415"
"      83.488 0.00971 217.750"
"      83.658 0.01015 217.800"
"      83.829 0.01057 445.275"
"      84.000 0.01097 596.925"
"      1. ORIFICES"
"          Orifice Orifice Orifice Number of"
"          invert coefficie diameter orifices"
"      81.600 0.820 0.0500 1.000"
"          Peak outflow 0.010 c.m/sec"
"          Maximum level 83.675 metre"
"          Maximum storage 240.282 c.m"
"          Centroidal lag 5.856 hours"
"          0.216 0.216 0.010 0.000 c.m/sec"
" 40 HYDROGRAPH Combine 1"
"      6 Combine "
"      1 Node #"
"          Total Flow from Site"
"          Maximum flow 0.010 c.m/sec"
"          Hydrograph volume 316.272 c.m"
"          0.216 0.216 0.010 0.010"
" 40 HYDROGRAPH Start - New Tributary"
"      2 Start - New Tributary"
"          0.216 0.000 0.010 0.010"
" 33 CATCHMENT 204"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      202 Uncontrolled"
"      6.000 % Impervious"
"      0.054 Total Area"
"      3.000 Flow length"
"      15.000 Overland Slope"

```

"	0.051	Pervious Area"			
"	3.000	Pervious length"			
"	15.000	Pervious slope"			
"	0.003	Impervious Area"			
"	3.000	Impervious length"			
"	15.000	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	84.000	Pervious SCS Curve No."			
"	0.466	Pervious Runoff coefficient"			
"	0.100	Pervious Ia/S coefficient"			
"	4.838	Pervious Initial abstraction"			
"	0.015	Impervious Manning 'n'"			
"	98.000	Impervious SCS Curve No."			
"	0.782	Impervious Runoff coefficient"			
"	0.100	Impervious Ia/S coefficient"			
"	0.518	Impervious Initial abstraction"			
"		0.009	0.000	0.010	0.010 c.m/sec"
"	Catchment 204	Pervious	Impervious	Total Area	"
"	Surface Area	0.051	0.003	0.054	hectare"
"	Time of concentration	1.844	0.258	1.690	minutes"
"	Time to Centroid	98.342	86.913	97.236	minutes"
"	Rainfall depth	56.544	56.544	56.544	mm"
"	Rainfall volume	28.70	1.83	30.53	c.m"
"	Rainfall losses	30.203	12.304	29.129	mm"
"	Runoff depth	26.341	44.239	27.415	mm"
"	Runoff volume	13.37	1.43	14.80	c.m"
"	Runoff coefficient	0.466	0.782	0.485	"
"	Maximum flow	0.008	0.001	0.009	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.009	0.009	0.010	0.010"
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"		0.009	0.009	0.009	0.010"
" 40	HYDROGRAPH Combine 1"				
"	6 Combine "				
"	1 Node #"				
"	Total Flow from Site"				
"	Maximum flow		0.017		c.m/sec"
"	Hydrograph volume		331.076		c.m"
"		0.009	0.009	0.009	0.017"
" 40	HYDROGRAPH Confluence 1"				
"	7 Confluence "				
"	1 Node #"				
"	Total Flow from Site"				
"	Maximum flow		0.017		c.m/sec"
"	Hydrograph volume		331.076		c.m"
"		0.009	0.017	0.009	0.000"

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"          MIDUSS Output ----->"
"          MIDUSS version          Version 2.25 rev. 473"
"          MIDUSS created          Sunday, February 7, 2010"
"          10 Units used:          ie METRIC"
"          Job folder:             Q:\65075_001\MIDUSS"
"          Output filename:        65075_Post-Dev_10-Year_V3_WEST.out"
"          Licensee name:          A"
"          Company                 "
"          Date & Time last used:   8/23/2026 at 11:02:20 AM"
" 31 TIME PARAMETERS"
"      5.000 Time Step"
"      180.000 Max. Storm length"
"      1500.000 Max. Hydrograph"
" 32 STORM Chicago storm"
"      1 Chicago storm"
"      1343.700 Coefficient A"
"      9.000 Constant B"
"      0.814 Exponent C"
"      0.400 Fraction R"
"      180.000 Duration"
"      1.000 Time step multiplier"
"      Maximum intensity          156.803 mm/hr"
"      Total depth                56.544 mm"
"      6 010hyd Hydrograph extension used in this file"
" 33 CATCHMENT 201"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      201 Controlled"
"      87.000 % Impervious"
"      0.704 Total Area"
"      15.000 Flow length"
"      2.000 Overland Slope"
"      0.092 Pervious Area"
"      15.000 Pervious length"
"      2.000 Pervious slope"
"      0.612 Impervious Area"
"      15.000 Impervious length"
"      2.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      84.000 Pervious SCS Curve No."
"      0.471 Pervious Runoff coefficient"
"      0.100 Pervious Ia/S coefficient"
"      4.838 Pervious Initial abstraction"
"      0.015 Impervious Manning 'n'"
"      98.000 Impervious SCS Curve No."
"      0.888 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"          0.226 0.000 0.000 0.000 c.m/sec"
"      Catchment 201 Pervious Impervious Total Area "
"      Surface Area 0.092 0.612 0.704 hectare"
"      Time of concentration 8.863 1.240 1.800 minutes"
"      Time to Centroid 107.857 88.515 89.935 minutes"
"      Rainfall depth 56.544 56.544 56.544 mm"
"      Rainfall volume 51.75 346.32 398.07 c.m"
"      Rainfall losses 29.917 6.341 9.406 mm"
"      Runoff depth 26.627 50.202 47.137 mm"

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```

"          Runoff volume          24.37 307.48 331.85 c.m"
"          Runoff coefficient      0.471 0.888 0.834 "
"          Maximum flow            0.012 0.222 0.226 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"          0.226 0.226 0.000 0.000"
" 54 POND DESIGN"
"      0.226 Current peak flow c.m/sec"
"      0.028 Target outflow c.m/sec"
"      331.8 Hydrograph volume c.m"
"      18. Number of stages"
"      82.340 Minimum water level metre"
"      84.000 Maximum water level metre"
"      82.340 Starting water level metre"
"      0 Keep Design Data: 1 = True; 0 = False"
"          Level Discharge Volume"
"      82.340 0.000 0.000"
"      82.350 3.11E-05 3.633"
"      82.450 0.00197 39.958"
"      82.550 0.00300 76.284"
"      82.650 0.00375 112.610"
"      82.750 0.00438 148.936"
"      82.850 0.00492 185.262"
"      82.960 0.00546 225.220"
"      83.050 0.00587 225.320"
"      83.150 0.00629 225.420"
"      83.250 0.00668 225.520"
"      83.350 0.00705 225.620"
"      83.450 0.00740 225.720"
"      83.550 0.00774 225.820"
"      83.650 0.00806 225.920"
"      83.750 0.00837 226.020"
"      83.850 0.00867 389.270"
"      84.000 0.00910 634.145"
" 1. ORIFICES"
"      Orifice Orifice Orifice Number of"
"      invert coefficie diameter orifices"
"      82.340 0.820 0.0500 1.000"
"      Peak outflow 0.008 c.m/sec"
"      Maximum level 83.781 metre"
"      Maximum storage 275.923 c.m"
"      Centroidal lag 9.842 hours"
"          0.226 0.226 0.008 0.000 c.m/sec"
" 40 HYDROGRAPH Combine 1"
"      6 Combine "
"      1 Node #"
"          Total Flow from Site"
"      Maximum flow 0.008 c.m/sec"
"      Hydrograph volume 317.819 c.m"
"          0.226 0.226 0.008 0.008"
" 40 HYDROGRAPH Start - New Tributary"
"      2 Start - New Tributary"
"          0.226 0.000 0.008 0.008"
" 33 CATCHMENT 203"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      202 Uncontrolled.."

```

```

"      20.000 % Impervious"
"      0.047 Total Area"
"      3.000 Flow length"
"     15.000 Overland Slope"
"      0.038 Pervious Area"
"      3.000 Pervious length"
"     15.000 Pervious slope"
"      0.009 Impervious Area"
"      3.000 Impervious length"
"     15.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
"     84.000 Pervious SCS Curve No."
"      0.466 Pervious Runoff coefficient"
"      0.100 Pervious Ia/S coefficient"
"      4.838 Pervious Initial abstraction"
"      0.015 Impervious Manning 'n'"
"     98.000 Impervious SCS Curve No."
"      0.782 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"      0.010      0.000      0.008      0.008 c.m/sec"
"      Catchment 203      Pervious      Impervious      Total Area "
"      Surface Area      0.038      0.009      0.047      hectare"
"      Time of concentration      1.844      0.258      1.375      minutes"
"      Time to Centroid      98.342      86.913      94.963      minutes"
"      Rainfall depth      56.544      56.544      56.544      mm"
"      Rainfall volume      21.26      5.32      26.58      c.m"
"      Rainfall losses      30.203      12.304      26.623      mm"
"      Runoff depth      26.341      44.239      29.920      mm"
"      Runoff volume      9.90      4.16      14.06      c.m"
"      Runoff coefficient      0.466      0.782      0.529      "
"      Maximum flow      0.006      0.003      0.010      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4      Add Runoff "
"      0.010      0.010      0.008      0.008"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"      0.010      0.010      0.010      0.008"
" 40      HYDROGRAPH Combine 1"
"      6      Combine "
"      1      Node #"
"      Total Flow from Site"
"      Maximum flow      0.013      c.m/sec"
"      Hydrograph volume      331.882      c.m"
"      0.010      0.010      0.010      0.013"
" 40      HYDROGRAPH Confluence 1"
"      7      Confluence "
"      1      Node #"
"      Total Flow from Site"
"      Maximum flow      0.013      c.m/sec"
"      Hydrograph volume      331.882      c.m"
"      0.010      0.013      0.010      0.000"

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"          MIDUSS Output ----->"
"          MIDUSS version          Version 2.25 rev. 473"
"          MIDUSS created          Sunday, February 7, 2010"
"          10 Units used:          ie METRIC"
"          Job folder:             Q:\65075_001\MIDUSS"
"          Output filename:        65075_Post-Dev_25-Year_V3_EAST.out"
"          Licensee name:          A"
"          Company                 "
"          Date & Time last used:   8/23/2026 at 10:29:26 AM"
" 31      TIME PARAMETERS"
"          5.000 Time Step"
"          180.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"          1 Chicago storm"
"          1719.500 Coefficient A"
"          10.000 Constant B"
"          0.823 Exponent C"
"          0.400 Fraction R"
"          180.000 Duration"
"          1.000 Time step multiplier"
"          Maximum intensity        185.131 mm/hr"
"          Total depth              68.724 mm"
"          6 025hyd Hydrograph extension used in this file"
" 33      CATCHMENT 202"
"          1 Triangular SCS"
"          1 Equal length"
"          1 SCS method"
"          201 Controlled"
"          87.000 % Impervious"
"          0.671 Total Area"
"          15.000 Flow length"
"          2.000 Overland Slope"
"          0.087 Pervious Area"
"          15.000 Pervious length"
"          2.000 Pervious slope"
"          0.584 Impervious Area"
"          15.000 Impervious length"
"          2.000 Impervious slope"
"          0.250 Pervious Manning 'n'"
"          84.000 Pervious SCS Curve No."
"          0.527 Pervious Runoff coefficient"
"          0.100 Pervious Ia/S coefficient"
"          4.838 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"
"          0.518 Impervious Initial abstraction"
"          0.261 0.000 0.000 0.000 c.m/sec"
"          Catchment 202 Pervious Impervious Total Area "
"          Surface Area 0.087 0.584 0.671 hectare"
"          Time of concentration 7.856 1.156 1.694 minutes"
"          Time to Centroid 105.486 87.849 89.268 minutes"
"          Rainfall depth 68.724 68.724 68.724 mm"
"          Rainfall volume 59.95 401.19 461.14 c.m"
"          Rainfall losses 32.526 6.869 10.205 mm"
"          Runoff depth 36.199 61.855 58.520 mm"

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```

"          Runoff volume 31.58 361.09 392.67 c.m"
"          Runoff coefficient 0.527 0.900 0.852 "
"          Maximum flow 0.018 0.255 0.261 c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4 Add Runoff "
"          0.261 0.261 0.000 0.000"
" 54      POND DESIGN"
"          0.261 Current peak flow c.m/sec"
"          0.027 Target outflow c.m/sec"
"          392.7 Hydrograph volume c.m"
"          14. Number of stages"
"          81.780 Minimum water level metre"
"          84.000 Maximum water level metre"
"          81.780 Starting water level metre"
"          0 Keep Design Data: 1 = True; 0 = False"
"          Level Discharge Volume"
"          81.780 0.000 0.000"
"          81.951 0.00402 4.522"
"          82.122 0.00499 27.134"
"          82.292 0.00579 49.746"
"          82.463 0.00650 72.357"
"          82.634 0.00713 94.969"
"          82.805 0.00772 117.580"
"          82.975 0.00826 140.192"
"          83.146 0.00877 162.804"
"          83.317 0.00925 185.415"
"          83.488 0.00971 217.750"
"          83.658 0.01015 217.800"
"          83.829 0.01057 445.275"
"          84.000 0.01097 596.925"
"          1. ORIFICES"
"          Orifice Orifice Orifice Number of"
"          invert coefficie diameter orifices"
"          81.600 0.820 0.0500 1.000"
"          Peak outflow 0.010 c.m/sec"
"          Maximum level 83.728 metre"
"          Maximum storage 311.272 c.m"
"          Centroidal lag 6.693 hours"
"          0.261 0.261 0.010 0.000 c.m/sec"
" 40      HYDROGRAPH Combine 1"
"          6 Combine "
"          1 Node #"
"          Total Flow from Site"
"          Maximum flow 0.010 c.m/sec"
"          Hydrograph volume 392.597 c.m"
"          0.261 0.261 0.010 0.010"
" 40      HYDROGRAPH Start - New Tributary"
"          2 Start - New Tributary"
"          0.261 0.000 0.010 0.010"
" 33      CATCHMENT 204"
"          1 Triangular SCS"
"          1 Equal length"
"          1 SCS method"
"          202 Uncontrolled"
"          6.000 % Impervious"
"          0.054 Total Area"
"          3.000 Flow length"
"          15.000 Overland Slope"

```

"	0.051	Pervious Area"			
"	3.000	Pervious length"			
"	15.000	Pervious slope"			
"	0.003	Impervious Area"			
"	3.000	Impervious length"			
"	15.000	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	84.000	Pervious SCS Curve No."			
"	0.522	Pervious Runoff coefficient"			
"	0.100	Pervious Ia/S coefficient"			
"	4.838	Pervious Initial abstraction"			
"	0.015	Impervious Manning 'n'"			
"	98.000	Impervious SCS Curve No."			
"	0.794	Impervious Runoff coefficient"			
"	0.100	Impervious Ia/S coefficient"			
"	0.518	Impervious Initial abstraction"			
"	0.013	0.000	0.010	0.010 c.m/sec"	
"	Catchment 204	Pervious	Impervious	Total Area	"
"	Surface Area	0.051	0.003	0.054	hectare"
"	Time of concentration	1.634	0.240	1.511	minutes"
"	Time to Centroid	96.936	86.250	95.990	minutes"
"	Rainfall depth	68.724	68.724	68.724	mm"
"	Rainfall volume	34.88	2.23	37.11	c.m"
"	Rainfall losses	32.868	14.190	31.747	mm"
"	Runoff depth	35.856	54.534	36.977	mm"
"	Runoff volume	18.20	1.77	19.97	c.m"
"	Runoff coefficient	0.522	0.794	0.538	"
"	Maximum flow	0.012	0.001	0.013	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.013	0.013	0.010	0.010"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.013	0.013	0.013	0.010"	
" 40	HYDROGRAPH Combine 1"				
"	6 Combine "				
"	1 Node #"				
"	Total Flow from Site"				
"	Maximum flow	0.021	c.m/sec"		
"	Hydrograph volume	412.565	c.m"		
"	0.013	0.013	0.013	0.021"	
" 40	HYDROGRAPH Confluence 1"				
"	7 Confluence "				
"	1 Node #"				
"	Total Flow from Site"				
"	Maximum flow	0.021	c.m/sec"		
"	Hydrograph volume	412.565	c.m"		
"	0.013	0.021	0.013	0.000"	

```

"          MIDUSS Output ----->"
"          MIDUSS version              Version 2.25 rev. 473"
"          MIDUSS created              Sunday, February 7, 2010"
"          10 Units used:              ie METRIC"
"          Job folder:                 Q:\65075_001\MIDUSS"
"          Output filename:            65075_Post-Dev_25-Year_V3_WEST.out"
"          Licensee name:              A"
"          Company                     "
"          Date & Time last used:      8/23/2026 at 11:03:59 AM"
" 31 TIME PARAMETERS"
"      5.000 Time Step"
"      180.000 Max. Storm length"
"      1500.000 Max. Hydrograph"
" 32 STORM Chicago storm"
"      1 Chicago storm"
"      1719.500 Coefficient A"
"      10.000 Constant B"
"      0.823 Exponent C"
"      0.400 Fraction R"
"      180.000 Duration"
"      1.000 Time step multiplier"
"      Maximum intensity      185.131 mm/hr"
"      Total depth            68.724 mm"
"      6 025hyd Hydrograph extension used in this file"
" 33 CATCHMENT 201"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      201 Controlled"
"      87.000 % Impervious"
"      0.704 Total Area"
"      15.000 Flow length"
"      2.000 Overland Slope"
"      0.092 Pervious Area"
"      15.000 Pervious length"
"      2.000 Pervious slope"
"      0.612 Impervious Area"
"      15.000 Impervious length"
"      2.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      84.000 Pervious SCS Curve No."
"      0.527 Pervious Runoff coefficient"
"      0.100 Pervious Ia/S coefficient"
"      4.838 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"
"      0.518 Impervious Initial abstraction"
"          0.273      0.000      0.000      0.000 c.m/sec"
"      Catchment 201      Pervious      Impervious      Total Area "
"      Surface Area      0.092      0.612      0.704 hectare"
"      Time of concentration      7.856      1.156      1.694 minutes"
"      Time to Centroid      105.486      87.849      89.267 minutes"
"      Rainfall depth      68.724      68.724      68.724 mm"
"      Rainfall volume      62.90      420.92      483.82 c.m"
"      Rainfall losses      32.526      6.869      10.205 mm"
"      Runoff depth      36.199      61.855      58.520 mm"

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```

"          Runoff volume      33.13      378.85      411.98 c.m"
"          Runoff coefficient      0.527      0.900      0.852 "
"          Maximum flow      0.019      0.267      0.273 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"          0.273      0.273      0.000      0.000"
" 54 POND DESIGN"
"      0.273 Current peak flow c.m/sec"
"      0.028 Target outflow c.m/sec"
"      412.0 Hydrograph volume c.m"
"      18. Number of stages"
"      82.340 Minimum water level metre"
"      84.000 Maximum water level metre"
"      82.340 Starting water level metre"
"      0 Keep Design Data: 1 = True; 0 = False"
"          Level Discharge Volume"
"      82.340      0.000      0.000"
"      82.350      3.11E-05      3.633"
"      82.450      0.00197      39.958"
"      82.550      0.00300      76.284"
"      82.650      0.00375      112.610"
"      82.750      0.00438      148.936"
"      82.850      0.00492      185.262"
"      82.960      0.00546      225.220"
"      83.050      0.00587      225.320"
"      83.150      0.00629      225.420"
"      83.250      0.00668      225.520"
"      83.350      0.00705      225.620"
"      83.450      0.00740      225.720"
"      83.550      0.00774      225.820"
"      83.650      0.00806      225.920"
"      83.750      0.00837      226.020"
"      83.850      0.00867      389.270"
"      84.000      0.00910      634.145"
" 1. ORIFICES"
"      Orifice Orifice Orifice Number of"
"      invert coefficie diameter orifices"
"      82.340      0.820      0.0500      1.000"
"      Peak outflow      0.009 c.m/sec"
"      Maximum level      83.827 metre"
"      Maximum storage      351.888 c.m"
"      Centroidal lag      10.362 hours"
"          0.273      0.273      0.009      0.000 c.m/sec"
" 40 HYDROGRAPH Combine 1"
"      6 Combine "
"      1 Node #"
"          Total Flow from Site"
"      Maximum flow      0.009 c.m/sec"
"      Hydrograph volume      391.340 c.m"
"          0.273      0.273      0.009      0.009"
" 40 HYDROGRAPH Start - New Tributary"
"      2 Start - New Tributary"
"          0.273      0.000      0.009      0.009"
" 33 CATCHMENT 203"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      202 Uncontrolled.."

```

"	20.000	% Impervious"			
"	0.047	Total Area"			
"	3.000	Flow length"			
"	15.000	Overland Slope"			
"	0.038	Pervious Area"			
"	3.000	Pervious length"			
"	15.000	Pervious slope"			
"	0.009	Impervious Area"			
"	3.000	Impervious length"			
"	15.000	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	84.000	Pervious SCS Curve No."			
"	0.522	Pervious Runoff coefficient"			
"	0.100	Pervious Ia/S coefficient"			
"	4.838	Pervious Initial abstraction"			
"	0.015	Impervious Manning 'n'"			
"	98.000	Impervious SCS Curve No."			
"	0.794	Impervious Runoff coefficient"			
"	0.100	Impervious Ia/S coefficient"			
"	0.518	Impervious Initial abstraction"			
"	0.013	0.000	0.009	0.009 c.m/sec"	
"	Catchment 203	Pervious	Impervious	Total Area	"
"	Surface Area	0.038	0.009	0.047	hectare"
"	Time of concentration	1.634	0.240	1.250	minutes"
"	Time to Centroid	96.936	86.250	93.992	minutes"
"	Rainfall depth	68.724	68.724	68.724	mm"
"	Rainfall volume	25.84	6.46	32.30	c.m"
"	Rainfall losses	32.868	14.190	29.132	mm"
"	Runoff depth	35.856	54.534	39.592	mm"
"	Runoff volume	13.48	5.13	18.61	c.m"
"	Runoff coefficient	0.522	0.794	0.576	"
"	Maximum flow	0.009	0.004	0.013	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.013	0.013	0.009	0.009"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.013	0.013	0.013	0.009"	
" 40	HYDROGRAPH Combine 1"				
"	6 Combine "				
"	1 Node #"				
"	Total Flow from Site"				
"	Maximum flow	0.017		c.m/sec"	
"	Hydrograph volume	409.949		c.m"	
"	0.013	0.013	0.013	0.017"	
" 40	HYDROGRAPH Confluence 1"				
"	7 Confluence "				
"	1 Node #"				
"	Total Flow from Site"				
"	Maximum flow	0.017		c.m/sec"	
"	Hydrograph volume	409.949		c.m"	
"	0.013	0.017	0.013	0.000"	

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"          MIDUSS Output ----->"
"          MIDUSS version          Version 2.25 rev. 473"
"          MIDUSS created          Sunday, February 7, 2010"
"          10 Units used:          ie METRIC"
"          Job folder:             Q:\65075_001\MIDUSS"
"          Output filename:        65075_Post-Dev_50-Year_V3_EAST.out"
"          Licensee name:          A"
"          Company                 "
"          Date & Time last used:   8/23/2026 at 10:27:41 AM"
" 31 TIME PARAMETERS"
"      5.000 Time Step"
"      180.000 Max. Storm length"
"      1500.000 Max. Hydrograph"
" 32 STORM Chicago storm"
"      1 Chicago storm"
"      1954.800 Coefficient A"
"      10.000 Constant B"
"      0.826 Exponent C"
"      0.400 Fraction R"
"      180.000 Duration"
"      1.000 Time step multiplier"
"      Maximum intensity          208.762 mm/hr"
"      Total depth                 76.908 mm"
"      6 050hyd Hydrograph extension used in this file"
" 33 CATCHMENT 202"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      201 Controlled"
"      87.000 % Impervious"
"      0.671 Total Area"
"      15.000 Flow length"
"      2.000 Overland Slope"
"      0.087 Pervious Area"
"      15.000 Pervious length"
"      2.000 Pervious slope"
"      0.584 Impervious Area"
"      15.000 Impervious length"
"      2.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      84.000 Pervious SCS Curve No."
"      0.558 Pervious Runoff coefficient"
"      0.100 Pervious Ia/S coefficient"
"      4.838 Pervious Initial abstraction"
"      0.015 Impervious Manning 'n'"
"      98.000 Impervious SCS Curve No."
"      0.905 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"          0.298 0.000 0.000 0.000 c.m/sec"
"      Catchment 202 Pervious Impervious Total Area "
"      Surface Area 0.087 0.584 0.671 hectare"
"      Time of concentration 7.284 1.099 1.621 minutes"
"      Time to Centroid 104.079 87.435 88.839 minutes"
"      Rainfall depth 76.908 76.908 76.908 mm"
"      Rainfall volume 67.09 448.97 516.05 c.m"
"      Rainfall losses 34.004 7.293 10.766 mm"
"      Runoff depth 42.905 69.615 66.143 mm"

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```

"          Runoff volume          37.43 406.39 443.82 c.m"
"          Runoff coefficient      0.558 0.905 0.860 "
"          Maximum flow            0.022 0.289 0.298 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"          0.298 0.298 0.000 0.000"
" 54 POND DESIGN"
"      0.298 Current peak flow c.m/sec"
"      0.027 Target outflow c.m/sec"
"      443.8 Hydrograph volume c.m"
"      14. Number of stages"
"      81.780 Minimum water level metre"
"      84.000 Maximum water level metre"
"      81.780 Starting water level metre"
"      0 Keep Design Data: 1 = True; 0 = False"
"          Level Discharge Volume"
"      81.780 0.000 0.000"
"      81.951 0.00402 4.522"
"      82.122 0.00499 27.134"
"      82.292 0.00579 49.746"
"      82.463 0.00650 72.357"
"      82.634 0.00713 94.969"
"      82.805 0.00772 117.580"
"      82.975 0.00826 140.192"
"      83.146 0.00877 162.804"
"      83.317 0.00925 185.415"
"      83.488 0.00971 217.750"
"      83.658 0.01015 217.800"
"      83.829 0.01057 445.275"
"      84.000 0.01097 596.925"
"      1. ORIFICES"
"          Orifice Orifice Orifice Number of"
"          invert coefficie diameter orifices"
"      81.600 0.820 0.0500 1.000"
"          Peak outflow 0.010 c.m/sec"
"          Maximum level 83.765 metre"
"          Maximum storage 360.187 c.m"
"          Centroidal lag 7.277 hours"
"          0.298 0.298 0.010 0.000 c.m/sec"
" 40 HYDROGRAPH Combine 1"
"      6 Combine "
"      1 Node #"
"          Total Flow from Site"
"          Maximum flow 0.010 c.m/sec"
"          Hydrograph volume 443.763 c.m"
"          0.298 0.298 0.010 0.010"
" 40 HYDROGRAPH Start - New Tributary"
"      2 Start - New Tributary"
"          0.298 0.000 0.010 0.010"
" 33 CATCHMENT 204"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      202 Uncontrolled"
"      6.000 % Impervious"
"      0.054 Total Area"
"      3.000 Flow length"
"      15.000 Overland Slope"

```

"	0.051	Pervious Area"			
"	3.000	Pervious length"			
"	15.000	Pervious slope"			
"	0.003	Impervious Area"			
"	3.000	Impervious length"			
"	15.000	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	84.000	Pervious SCS Curve No."			
"	0.552	Pervious Runoff coefficient"			
"	0.100	Pervious Ia/S coefficient"			
"	4.838	Pervious Initial abstraction"			
"	0.015	Impervious Manning 'n'"			
"	98.000	Impervious SCS Curve No."			
"	0.799	Impervious Runoff coefficient"			
"	0.100	Impervious Ia/S coefficient"			
"	0.518	Impervious Initial abstraction"			
"		0.016	0.000	0.010	0.010 c.m/sec"
"	Catchment 204	Pervious	Impervious	Total Area	"
"	Surface Area	0.051	0.003	0.054	hectare"
"	Time of concentration	1.515	0.229	1.406	minutes"
"	Time to Centroid	96.064	85.838	95.199	minutes"
"	Rainfall depth	76.908	76.908	76.908	mm"
"	Rainfall volume	39.04	2.49	41.53	c.m"
"	Rainfall losses	34.454	15.427	33.312	mm"
"	Runoff depth	42.454	61.481	43.596	mm"
"	Runoff volume	21.55	1.99	23.54	c.m"
"	Runoff coefficient	0.552	0.799	0.567	"
"	Maximum flow	0.014	0.002	0.016	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.016	0.016	0.010	0.010"
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"		0.016	0.016	0.016	0.010"
" 40	HYDROGRAPH Combine 1"				
"	6 Combine "				
"	1 Node #"				
"	Total Flow from Site"				
"	Maximum flow		0.024		c.m/sec"
"	Hydrograph volume		467.305		c.m"
"		0.016	0.016	0.016	0.024"
" 40	HYDROGRAPH Confluence 1"				
"	7 Confluence "				
"	1 Node #"				
"	Total Flow from Site"				
"	Maximum flow		0.024		c.m/sec"
"	Hydrograph volume		467.305		c.m"
"		0.016	0.024	0.016	0.000"

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"          MIDUSS Output ----->"
"          MIDUSS version          Version 2.25 rev. 473"
"          MIDUSS created          Sunday, February 7, 2010"
"          10 Units used:          ie METRIC"
"          Job folder:             Q:\65075_001\MIDUSS"
"          Output filename:        65075_Post-Dev_50-Year_V3_WEST.out"
"          Licensee name:          A"
"          Company                 "
"          Date & Time last used:   8/23/2026 at 11:05:34 AM"
" 31 TIME PARAMETERS"
"      5.000 Time Step"
"      180.000 Max. Storm length"
"      1500.000 Max. Hydrograph"
" 32 STORM Chicago storm"
"      1 Chicago storm"
"      1954.800 Coefficient A"
"      10.000 Constant B"
"      0.826 Exponent C"
"      0.400 Fraction R"
"      180.000 Duration"
"      1.000 Time step multiplier"
"      Maximum intensity          208.762 mm/hr"
"      Total depth                76.908 mm"
"      6 050hyd Hydrograph extension used in this file"
" 33 CATCHMENT 201"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      201 Controlled"
"      87.000 % Impervious"
"      0.704 Total Area"
"      15.000 Flow length"
"      2.000 Overland Slope"
"      0.092 Pervious Area"
"      15.000 Pervious length"
"      2.000 Pervious slope"
"      0.612 Impervious Area"
"      15.000 Impervious length"
"      2.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      84.000 Pervious SCS Curve No."
"      0.558 Pervious Runoff coefficient"
"      0.100 Pervious Ia/S coefficient"
"      4.838 Pervious Initial abstraction"
"      0.015 Impervious Manning 'n'"
"      98.000 Impervious SCS Curve No."
"      0.905 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"          0.313 0.000 0.000 0.000 c.m/sec"
"      Catchment 201 Pervious Impervious Total Area "
"      Surface Area 0.092 0.612 0.704 hectare"
"      Time of concentration 7.284 1.099 1.621 minutes"
"      Time to Centroid 104.079 87.435 88.839 minutes"
"      Rainfall depth 76.908 76.908 76.908 mm"
"      Rainfall volume 70.39 471.05 541.43 c.m"
"      Rainfall losses 34.004 7.293 10.766 mm"
"      Runoff depth 42.905 69.615 66.143 mm"

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"          Runoff volume          39.27 426.38 465.64 c.m"
"          Runoff coefficient      0.558 0.905 0.860 "
"          Maximum flow            0.023 0.303 0.313 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"          0.313 0.313 0.000 0.000"
" 54 POND DESIGN"
"      0.313 Current peak flow c.m/sec"
"      0.028 Target outflow c.m/sec"
"      465.6 Hydrograph volume c.m"
"      18. Number of stages"
"      82.340 Minimum water level metre"
"      84.000 Maximum water level metre"
"      82.340 Starting water level metre"
"      0 Keep Design Data: 1 = True; 0 = False"
"          Level Discharge Volume"
"      82.340 0.000 0.000"
"      82.350 3.11E-05 3.633"
"      82.450 0.00197 39.958"
"      82.550 0.00300 76.284"
"      82.650 0.00375 112.610"
"      82.750 0.00438 148.936"
"      82.850 0.00492 185.262"
"      82.960 0.00546 225.220"
"      83.050 0.00587 225.320"
"      83.150 0.00629 225.420"
"      83.250 0.00668 225.520"
"      83.350 0.00705 225.620"
"      83.450 0.00740 225.720"
"      83.550 0.00774 225.820"
"      83.650 0.00806 225.920"
"      83.750 0.00837 226.020"
"      83.850 0.00867 389.270"
"      84.000 0.00910 634.145"
" 1. ORIFICES"
"      Orifice Orifice Orifice Number of"
"      invert coefficie diameter orifices"
"      82.340 0.820 0.0500 1.000"
"      Peak outflow 0.009 c.m/sec"
"      Maximum level 83.859 metre"
"      Maximum storage 403.745 c.m"
"      Centroidal lag 10.877 hours"
"          0.313 0.313 0.009 0.000 c.m/sec"
" 40 HYDROGRAPH Combine 1"
"      6 Combine "
"      1 Node #"
"          Total Flow from Site"
"      Maximum flow 0.009 c.m/sec"
"      Hydrograph volume 437.780 c.m"
"          0.313 0.313 0.009 0.009"
" 40 HYDROGRAPH Start - New Tributary"
"      2 Start - New Tributary"
"          0.313 0.000 0.009 0.009"
" 33 CATCHMENT 203"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      202 Uncontrolled.."

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"      20.000 % Impervious"
"      0.047 Total Area"
"      3.000 Flow length"
"     15.000 Overland Slope"
"      0.038 Pervious Area"
"      3.000 Pervious length"
"     15.000 Pervious slope"
"      0.009 Impervious Area"
"      3.000 Impervious length"
"     15.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
"     84.000 Pervious SCS Curve No."
"      0.552 Pervious Runoff coefficient"
"      0.100 Pervious Ia/S coefficient"
"      4.838 Pervious Initial abstraction"
"      0.015 Impervious Manning 'n'"
"     98.000 Impervious SCS Curve No."
"      0.799 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"      0.015      0.000      0.009      0.009 c.m/sec"
"      Catchment 203      Pervious      Impervious      Total Area "
"      Surface Area      0.038      0.009      0.047      hectare"
"      Time of concentration 1.515      0.229      1.173      minutes"
"      Time to Centroid 96.064      85.838      93.346      minutes"
"      Rainfall depth 76.908      76.908      76.908      mm"
"      Rainfall volume 28.92      7.23      36.15      c.m"
"      Rainfall losses 34.454      15.427      30.649      mm"
"      Runoff depth 42.454      61.481      46.260      mm"
"      Runoff volume 15.96      5.78      21.74      c.m"
"      Runoff coefficient 0.552      0.799      0.601      "
"      Maximum flow 0.010      0.005      0.015      c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"      0.015      0.015      0.009      0.009"
" 40 HYDROGRAPH Copy to Outflow"
"      8 Copy to Outflow"
"      0.015      0.015      0.015      0.009"
" 40 HYDROGRAPH Combine 1"
"      6 Combine "
"      1 Node #"
"      Total Flow from Site"
"      Maximum flow      0.019      c.m/sec"
"      Hydrograph volume 459.522      c.m"
"      0.015      0.015      0.015      0.019"
" 40 HYDROGRAPH Confluence 1"
"      7 Confluence "
"      1 Node #"
"      Total Flow from Site"
"      Maximum flow      0.019      c.m/sec"
"      Hydrograph volume 459.522      c.m"
"      0.015      0.019      0.015      0.000"

```

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"          MIDUSS Output ----->"
"          MIDUSS version          Version 2.25 rev. 473"
"          MIDUSS created          Sunday, February 7, 2010"
"          10 Units used:          ie METRIC"
"          Job folder:             Q:\65075_001\MIDUSS"
"          Output filename:        65075_Post-Dev_100-Year_V8_EAST.out"
"          Licensee name:         A"
"          Company                 "
"          Date & Time last used:   8/23/2026 at 10:25:11 AM"
" 31 TIME PARAMETERS"
"      5.000 Time Step"
"      180.000 Max. Storm length"
"      1500.000 Max. Hydrograph"
" 32 STORM Chicago storm"
"      1 Chicago storm"
"      2317.400 Coefficient A"
"      11.000 Constant B"
"      0.836 Exponent C"
"      0.400 Fraction R"
"      180.000 Duration"
"      1.000 Time step multiplier"
"      Maximum intensity          228.222 mm/hr"
"      Total depth                 86.135 mm"
"      6 100hyd Hydrograph extension used in this file"
" 33 CATCHMENT 202"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      201 Controlled"
"      87.000 % Impervious"
"      0.671 Total Area"
"      15.000 Flow length"
"      2.000 Overland Slope"
"      0.087 Pervious Area"
"      15.000 Pervious length"
"      2.000 Pervious slope"
"      0.584 Impervious Area"
"      15.000 Impervious length"
"      2.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      84.000 Pervious SCS Curve No."
"      0.586 Pervious Runoff coefficient"
"      0.100 Pervious Ia/S coefficient"
"      4.838 Pervious Initial abstraction"
"      0.015 Impervious Manning 'n'"
"      98.000 Impervious SCS Curve No."
"      0.910 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"          0.331 0.000 0.000 0.000 c.m/sec"
"      Catchment 202 Pervious Impervious Total Area "
"      Surface Area 0.087 0.584 0.671 hectare"
"      Time of concentration 6.855 1.059 1.568 minutes"
"      Time to Centroid 102.898 87.079 88.467 minutes"
"      Rainfall depth 86.135 86.135 86.135 mm"
"      Rainfall volume 75.14 502.83 577.96 c.m"
"      Rainfall losses 35.674 7.729 11.362 mm"
"      Runoff depth 50.460 78.406 74.773 mm"

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"          Runoff volume          44.02 457.71 501.72 c.m"
"          Runoff coefficient      0.586 0.910 0.868 "
"          Maximum flow            0.026 0.319 0.331 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"          0.331 0.331 0.000 0.000"
" 54 POND DESIGN"
"      0.331 Current peak flow c.m/sec"
"      0.027 Target outflow c.m/sec"
"      501.7 Hydrograph volume c.m"
"      14. Number of stages"
"      81.780 Minimum water level metre"
"      84.000 Maximum water level metre"
"      81.780 Starting water level metre"
"      0 Keep Design Data: 1 = True; 0 = False"
"          Level Discharge Volume"
"      81.780 0.000 0.000"
"      81.951 0.00402 4.522"
"      82.122 0.00499 27.134"
"      82.292 0.00579 49.746"
"      82.463 0.00650 72.357"
"      82.634 0.00713 94.969"
"      82.805 0.00772 117.580"
"      82.975 0.00826 140.192"
"      83.146 0.00877 162.804"
"      83.317 0.00925 185.415"
"      83.488 0.00971 217.750"
"      83.658 0.01015 217.800"
"      83.829 0.01057 445.275"
"      84.000 0.01097 596.925"
"      1. ORIFICES"
"          Orifice Orifice Orifice Number of"
"          invert coefficie diameter orifices"
"      81.600 0.820 0.0500 1.000"
"          Peak outflow 0.011 c.m/sec"
"          Maximum level 83.807 metre"
"          Maximum storage 416.110 c.m"
"          Centroidal lag 7.947 hours"
"          0.331 0.331 0.011 0.000 c.m/sec"
" 40 HYDROGRAPH Combine 1"
"      6 Combine "
"      1 Node #"
"          Total Flow from Site"
"          Maximum flow 0.011 c.m/sec"
"          Hydrograph volume 501.728 c.m"
"          0.331 0.331 0.011 0.011"
" 40 HYDROGRAPH Start - New Tributary"
"      2 Start - New Tributary"
"          0.331 0.000 0.011 0.011"
" 33 CATCHMENT 204"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      202 Uncontrolled"
"      6.000 % Impervious"
"      0.054 Total Area"
"      3.000 Flow length"
"      15.000 Overland Slope"

```

"	0.051	Pervious Area"			
"	3.000	Pervious length"			
"	15.000	Pervious slope"			
"	0.003	Impervious Area"			
"	3.000	Impervious length"			
"	15.000	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	84.000	Pervious SCS Curve No."			
"	0.582	Pervious Runoff coefficient"			
"	0.100	Pervious Ia/S coefficient"			
"	4.838	Pervious Initial abstraction"			
"	0.015	Impervious Manning 'n'"			
"	98.000	Impervious SCS Curve No."			
"	0.805	Impervious Runoff coefficient"			
"	0.100	Impervious Ia/S coefficient"			
"	0.518	Impervious Initial abstraction"			
"		0.019 0.000 0.011 0.011 c.m/sec"			
"	Catchment 204	Pervious	Impervious	Total Area	"
"	Surface Area	0.051	0.003	0.054	hectare"
"	Time of concentration	1.426	0.220	1.328	minutes"
"	Time to Centroid	95.254	85.477	94.461	minutes"
"	Rainfall depth	86.135	86.135	86.135	mm"
"	Rainfall volume	43.72	2.79	46.51	c.m"
"	Rainfall losses	36.001	16.813	34.849	mm"
"	Runoff depth	50.134	69.322	51.285	mm"
"	Runoff volume	25.45	2.25	27.69	c.m"
"	Runoff coefficient	0.582	0.805	0.595	"
"	Maximum flow	0.017	0.002	0.019	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.019 0.019 0.011 0.011"				
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.019 0.019 0.019 0.011"				
" 40	HYDROGRAPH Combine 1"				
"	6 Combine "				
"	1 Node #"				
"	Total Flow from Site"				
"	Maximum flow	0.027	c.m/sec"		
"	Hydrograph volume	529.422	c.m"		
"	0.019 0.019 0.019 0.027"				
" 40	HYDROGRAPH Confluence 1"				
"	7 Confluence "				
"	1 Node #"				
"	Total Flow from Site"				
"	Maximum flow	0.027	c.m/sec"		
"	Hydrograph volume	529.422	c.m"		
"	0.019 0.027 0.019 0.000"				

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"          MIDUSS Output ----->"
"          MIDUSS version          Version 2.25 rev. 473"
"          MIDUSS created          Sunday, February 7, 2010"
"          10 Units used:          ie METRIC"
"          Job folder:             Q:\65075_001\MIDUSS"
"          Output filename:        65075_Post-Dev_100-Year_V4_WEST.out"
"          Licensee name:         A"
"          Company                 "
"          Date & Time last used:   8/23/2026 at 10:51:19 AM"
" 31 TIME PARAMETERS"
"      5.000 Time Step"
"      180.000 Max. Storm length"
"      1500.000 Max. Hydrograph"
" 32 STORM Chicago storm"
"      1 Chicago storm"
"      2317.400 Coefficient A"
"      11.000 Constant B"
"      0.836 Exponent C"
"      0.400 Fraction R"
"      180.000 Duration"
"      1.000 Time step multiplier"
"      Maximum intensity          228.222 mm/hr"
"      Total depth                86.135 mm"
"      6 100hyd Hydrograph extension used in this file"
" 33 CATCHMENT 201"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      201 Controlled"
"      87.000 % Impervious"
"      0.704 Total Area"
"      15.000 Flow length"
"      2.000 Overland Slope"
"      0.092 Pervious Area"
"      15.000 Pervious length"
"      2.000 Pervious slope"
"      0.612 Impervious Area"
"      15.000 Impervious length"
"      2.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      84.000 Pervious SCS Curve No."
"      0.586 Pervious Runoff coefficient"
"      0.100 Pervious Ia/S coefficient"
"      4.838 Pervious Initial abstraction"
"      0.015 Impervious Manning 'n'"
"      98.000 Impervious SCS Curve No."
"      0.910 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"          0.347 0.000 0.000 0.000 c.m/sec"
"      Catchment 201 Pervious Impervious Total Area "
"      Surface Area 0.092 0.612 0.704 hectare"
"      Time of concentration 6.855 1.059 1.568 minutes"
"      Time to Centroid 102.898 87.079 88.467 minutes"
"      Rainfall depth 86.135 86.135 86.135 mm"
"      Rainfall volume 78.83 527.56 606.39 c.m"
"      Rainfall losses 35.674 7.729 11.362 mm"
"      Runoff depth 50.460 78.406 74.773 mm"

```

```

"          Runoff volume          46.18 480.22 526.40 c.m"
"          Runoff coefficient      0.586 0.910 0.868 "
"          Maximum flow            0.027 0.334 0.347 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"          0.347 0.347 0.000 0.000"
" 54 POND DESIGN"
"      0.347 Current peak flow c.m/sec"
"      0.028 Target outflow c.m/sec"
"      526.4 Hydrograph volume c.m"
"      18. Number of stages"
"      82.340 Minimum water level metre"
"      84.000 Maximum water level metre"
"      82.340 Starting water level metre"
"      0 Keep Design Data: 1 = True; 0 = False"
"          Level Discharge Volume"
"      82.340 0.000 0.000"
"      82.350 3.11E-05 3.633"
"      82.450 0.00197 39.958"
"      82.550 0.00300 76.284"
"      82.650 0.00375 112.610"
"      82.750 0.00438 148.936"
"      82.850 0.00492 185.262"
"      82.960 0.00546 225.220"
"      83.050 0.00587 225.320"
"      83.150 0.00629 225.420"
"      83.250 0.00668 225.520"
"      83.350 0.00705 225.620"
"      83.450 0.00740 225.720"
"      83.550 0.00774 225.820"
"      83.650 0.00806 225.920"
"      83.750 0.00837 226.020"
"      83.850 0.00867 389.270"
"      84.000 0.00910 634.145"
" 1. ORIFICES"
"      Orifice Orifice Orifice Number of"
"      invert coefficie diameter orifices"
"      82.340 0.820 0.0500 1.000"
"      Peak outflow 0.009 c.m/sec"
"      Maximum level 83.895 metre"
"      Maximum storage 462.708 c.m"
"      Centroidal lag 11.439 hours"
"          0.347 0.347 0.009 0.000 c.m/sec"
" 40 HYDROGRAPH Combine 1"
"      6 Combine "
"      1 Node #"
"          Total Flow from Site"
"      Maximum flow 0.009 c.m/sec"
"      Hydrograph volume 488.657 c.m"
"          0.347 0.347 0.009 0.009"
" 40 HYDROGRAPH Start - New Tributary"
"      2 Start - New Tributary"
"          0.347 0.000 0.009 0.009"
" 33 CATCHMENT 203"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      202 Uncontrolled.."

```

```

"      20.000 % Impervious"
"      0.047 Total Area"
"      3.000 Flow length"
"     15.000 Overland Slope"
"      0.038 Pervious Area"
"      3.000 Pervious length"
"     15.000 Pervious slope"
"      0.009 Impervious Area"
"      3.000 Impervious length"
"     15.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
"     84.000 Pervious SCS Curve No."
"      0.582 Pervious Runoff coefficient"
"      0.100 Pervious Ia/S coefficient"
"      4.838 Pervious Initial abstraction"
"      0.015 Impervious Manning 'n'"
"     98.000 Impervious SCS Curve No."
"      0.805 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"      0.017      0.000      0.009      0.009 c.m/sec"
"      Catchment 203      Pervious      Impervious      Total Area "
"      Surface Area      0.038      0.009      0.047      hectare"
"      Time of concentration 1.426      0.220      1.116      minutes"
"      Time to Centroid      95.254      85.477      92.742      minutes"
"      Rainfall depth      86.135      86.135      86.135      mm"
"      Rainfall volume      32.39      8.10      40.48      c.m"
"      Rainfall losses      36.001      16.813      32.163      mm"
"      Runoff depth      50.134      69.322      53.972      mm"
"      Runoff volume      18.85      6.52      25.37      c.m"
"      Runoff coefficient      0.582      0.805      0.627      "
"      Maximum flow      0.012      0.005      0.017      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4      Add Runoff "
"      0.017      0.017      0.009      0.009"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"      0.017      0.017      0.017      0.009"
" 40      HYDROGRAPH Combine 1"
"      6      Combine "
"      1      Node #"
"      Total Flow from Site"
"      Maximum flow      0.022      c.m/sec"
"      Hydrograph volume      514.024      c.m"
"      0.017      0.017      0.017      0.022"
" 40      HYDROGRAPH Confluence 1"
"      7      Confluence "
"      1      Node #"
"      Total Flow from Site"
"      Maximum flow      0.022      c.m/sec"
"      Hydrograph volume      514.024      c.m"
"      0.017      0.022      0.017      0.000"

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Appendix G

Preliminary Geotechnical Investigation





GEOTECHNICAL ASSESSMENT

1310 South Service Road, Stoney Creek, Ontario

Project No. 0138-001.02

August 15, 2022

Prepared for:

Jennum Properties Inc.
3027 Harvester Road
Burlington, Ontario L7N 3G7

Prepared by:



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1.0 Introduction and Objectives

Jennum Properties Inc. retained BlueFrog Environmental Consulting Inc. (BlueFrog) to complete a Geotechnical Assessment of the subject property located at 1310 South Service Road, Stoney Creek, Ontario (hereinafter referred to as the Site). A site map is provided as **Figure 1**.

The purpose of the investigation was to obtain information about the subsurface conditions at the Site and based on our interpretation of the data obtained, provide recommendations on the geotechnical aspects of the proposed development.

The subject work was performed in accordance with the agreement between BlueFrog Environmental Consulting Inc. and Forum Properties. This report has been prepared based on fieldwork and/or review of information conducted by BlueFrog and others, for the sole benefit and use by Jennum Properties Inc. In performing the work, BlueFrog has relied in good faith on information provided by others and has assumed that the information provided is both complete and accurate. The work was performed to current industry practice for similar geotechnical work, within the same regulatory jurisdiction. The findings presented herein should be considered in the context of the scope of work; further, the findings are considered valid only at the time the report was produced. The information presented herein shall not be construed as legal advice.

The conclusions, recommendations, and/or opinions presented in this report are based upon engineering and/or geoscience judgement and experience within the context of Jennum Properties' objectives and the applicable guidelines, regulations, and legislation existing at the time the report was produced.

1.1 Background and Site Description

The Site plan showing the current Site configuration is presented as **Figure 2**. The Site is currently undeveloped with an asphalt pavement cover across the central portion of the Site. We understand that a former motel and restaurant structure were present at the southern portion of the Site, with a former retail fuel outlet located on the central and eastern portion of the property.

The following two environmental reports were made available during this investigation:

- Phase II Environmental Site Assessment, West Portion of 1310 South Service Road, Stoney Creek. By LRJ, File No. 200786, dated April 5, 2021.
- Phase Two Environmental Site Assessment, 1310 South Service Road, Stoney Creek, Ontario. By Terraprobe Inc., File No. 73-14-4006, dated May 23, 2014.

1.2 Proposed Redevelopment

We understand that the Site will be redeveloped to four mixed use commercial/residential apartment buildings ranging from 8 to 12 storeys high. Underground parking will consist of one level of underground parking, with floor slab about 3m below ground surface (bgs).

2.0 Scope of Work

The scope of the geotechnical work was to perform the following main activities:

- Obtain underground utility clearances prior to completing subsurface work.
- Advance fourteen boreholes on-Site to depths of 5.2 to 11.3mbgs.
 - Sample the soils at regular depth intervals in the boreholes. Samples were collected with a split spoon sampler used to obtain N-values.
 - Collect soil samples for geotechnical laboratory testing consisting of moisture contents and Atterberg Limits determinations.

- Install monitoring wells in seven boreholes.
- Measure the groundwater levels in the wells and conduct hydraulic conductivity testing.
- Obtain elevations of all boreholes and monitoring wells.

3.0 Methodology

3.1 Drilling

Public and private utility locates were completed prior to the initiation of the drilling program.

BlueFrog staff supervised the drilling of the boreholes. The assessment locations are presented on **Figure 2** and a summary of the 2022 drilling is provided in **Table i**.

Table i **Drilling Details**

Item	Comments
Drilling Dates	March 30 to April 5, 2022
Drilling Contractor	Profile Drilling
Drill Rig	Track mount drill rig equipped with hollow-stem augers and split spoon samplers
Assessment locations completed as boreholes	BH101, BH102, BH104, BH108 to 111, and MW103, MW105 to MW107 and MW112 to MW114
Assessment locations completed as monitoring wells	MW103, MW105 to MW107 and MW112 to MW114
Assessment depth	5.2 to 11.3 mbgs

Soil samples were obtained by employing the Standard Penetration Test, in accordance with ASTM D1586. The Standard Penetration Test consists of freely dropping a 63.5 kilogram hammer a vertical distance of 0.76 m to drive a 51 mm outside diameter split-barrel (split spoon) sampler into the ground. The number of blows of the hammer required to drive the sampler into the relatively undisturbed ground by a vertical distance of 0.30 m was recorded and is denoted as 'N'-values. These recorded 'N'-values give an indication of the consistency of cohesive soils or compactness of non-cohesive of the soils and are recorded on the Record of Borehole sheets in **Appendix A**.

Pocket penetrometer readings were carried out on representative cohesive soil samples to provide an indication of the undrained shear strength of the soil. The results are recorded on the Record of Borehole sheets in **Appendix A**.

Monitoring wells, consisting of a 51 mm diameter polyvinyl chloride (PVC) 10 slot screen, measuring 3.0 m in length, and an un-slotted riser, were installed in seven of the boreholes. Sand pack was placed in the annulus between the slotted PVC pipe and borehole walls to a maximum of 0.30 m above the well screen. Hydrated bentonite chips were placed in the annulus between the solid PVC pipe and borehole walls on top of the sand pack to approximately 0.2 to 0.3 m below ground surface. The monitoring wells were completed with a J-plug and above grade casing set in concrete grout to protect the well from damage. Details are presented on the Record of Borehole sheets in **Appendix A**.

3.2 Monitoring Well Development

After the monitoring wells were installed, they were developed to remove particulates or fluids that may have collected within the screen or sand pack during well installation. The monitoring wells were developed by purging at least ten casing volumes of water or until the well went dry three times using a dedicated inertial

pump and a non-dedicated surge block. The surge block was cleaned with a solution of phosphate-free detergent and water, then rinsed with distilled water, between monitoring wells.

3.3 Water Level Measurements

The depth to the water table in the monitoring wells were determined with a Solinst interface meter that was cleaned with a solution of phosphate-free detergent and water, then rinsed with distilled water, between monitoring wells.

3.4 Hydraulic Conductivity Testing

Hydraulic conductivity testing (rising head slug tests) was completed on May 19, 2022 in two of the monitoring wells. Initial water levels were measured using a Solinst interface meter. A slug of water was removed from the wells using a clean disposable bailer and the volume removed was recorded for each well. Water levels were measured throughout the rising head testing using a dedicated (one per monitoring well) Solinst Levelogger and manual measurements were also collected using the interface meter.

3.5 Geotechnical Laboratory Testing

The soil samples were stored in air tight containers to minimize moisture loss and transported to our office for further examination and classification. The samples were visually inspected and logged for classification purposes. A laboratory testing programme consisting of natural moisture content determinations and two Atterberg Limits determinations was performed on representative soil samples. The results of the laboratory testing are presented on the Record of Borehole sheet attached in **Appendix A** and in the laboratory test results in **Appendix B**.

3.6 Survey

All boreholes and wells were surveyed by BlueFrog staff. Each location was geo-referenced vertically to a local benchmark. The top of the fire hydrant at the southwest corner of South Service Road and Vince Mazza Way was used as a local benchmark, assigned an elevation of 100.00m. The well elevations are included in **Table 1**.

4.0 Subsurface Conditions

Descriptions of the sub-surface conditions encountered in the boreholes advanced in this investigation is presented on the Record of Borehole sheet in **Appendix A**. The following paragraphs are intended to supplement and complement this data.

4.1 Ground Cover and Fill

Topsoil was encountered at surface of BH104, MW105, MW106 and MW113. The topsoil ranges in thickness from 0.1 to 0.9m. One measured 'N'-value of 4 blows per 0.3m was obtained within the topsoil. A measured moisture content of 17% was obtained within the topsoil.

Concrete was encountered at surface of BH110, about 0.1m thick.

Asphalt was encountered at surface of BH102, MW103, BH111, MW112 and MW114, with a buried asphalt layer found in BH108. The asphalt thickness ranges from about 5 to 10cm.

Sand and gravel fills were encountered in the remaining boreholes at surface and below the asphalt and concrete to depths of about 0.3 to 0.9mbgs, except at MW112 where the gravelly sand fill was encountered to a depth of about 5.4mbgs. Measured 'N'-values range from 4 to 52 blows per 0.3m indicating a loose to very dense compactness. Measured moisture contents range from 5 to 21%.

4.2 Silty Fine Sand to Fine Sandy Silt

Underlying the topsoil in BH104 the native silty sand was encountered to a depth of about 1.2mbgs.

4.3 Silty Clay Glacial Till

Below the fill and silty fine sand to fine sandy silt soils a mottled brown to grey silty clay glacial till was encountered. The boreholes were either terminated within the glacial till at depth of 5.2 to 11.1mbgs, or the base of the glacial till was encountered at the bedrock surface at depths of 7.0 to 10.5mbgs.

The glacial till is a heterogeneous mixture of a silty clay matrix with varying amounts of sand and gravel. Cobbles and boulders are anticipated within the glacial till.

Measured 'N'-values range from 6 to greater than 50 blows per 0.3m within the glacial till, but typically ranging from 15 to 37 blows per 0.3m. Pocket penetrometer measurements indicate an undrained shear strength of 100 to greater than 225kPa (limit of penetrometer), but typically greater than 200kPa. These results indicate a firm to hard consistency, but typically very stiff to hard.

Measured moisture contents range from 8 to 22%. Two Atterberg Limits determinations were carried out on representative samples of the glacial till. The results are presented in **Appendix A** and **Appendix B** and summarized as follows: plastic limit of 15%, liquid limit of 27 and 28% and plasticity index of 12 and 13%.

From the Terraprobe report referenced in **Section 1.1**, three grain size distributions were presented of the glacial till deposit. The results are summarized below.

Table ii *Glacial Till Gradation*

Gravel	5 to 8%
Sand	17 to 20%
Silt	45 to 46%
Clay	26 to 31%

4.4 Bedrock

Reddish-brown, weathered shale bedrock as encountered in eight of the boreholes at depths of 7.0 to 10.5mbgs. The following table summarizes the approximate depth and elevation of the bedrock.

Table iii *Depth to Bedrock*

Borehole No.	Approximate Depth to Bedrock	Approximate Elevation of Bedrock Surface
BH101	9.5mbgs	90.4m
MW103	10.0mbgs	89.7m
BH104	10.5mbgs	89.2m
BH105	10.5mbgs	88.8m
MW106	8.5mbgs	90.7m
MW107	7.0mbgs	93.4m
BH108	7.0mbgs	93.3m
BH109	8.5mbgs	92.0m

These boreholes were terminated within the shale bedrock at depths of 10.8 to 11.3mbgs.

Measured 'N'-values were greater than 50 blows per 0.3m indicating a hard consistency. Measured moisture contents range from 4 to 16%, but typically 8 to 9%.

The shale bedrock is part of the Queenston Formation and is known to contain layers of limestone and sandstone. The rock has swelling properties and degrades quickly when exposed to wetting and drying conditions.

4.5 Site Hydrogeology

Seven (7) monitoring wells were installed at the Site during this investigation and four (4) monitoring wells were found at the Site that were installed by others (see **Section 1.1**). These eleven (11) monitoring wells have been monitored every two weeks with monitoring on-going. The monitoring results are presented in **Table 1** for the newly installed monitoring wells. Groundwater levels from all eleven (11) monitoring wells at the Site are summarized in the table below.

Table iv Summary of Groundwater Levels (April 11 to June 2, 2022)

	Monitoring Well	Depth to Groundwater Level	Potentiometric Elevation	Well Screen Stratigraphy
BlueFrog 2022	MW103	3.9 to 7.2mbgs	92.5 to 95.8m	Silty Clay Glacial Till
	MW105	Dry to 3.0mbgs	Dry to 96.4m	Silty Clay Glacial Till
	MW106	Dry to 5.5mbgs	Dry to 93.7m	Silty Clay Glacial Till
	MW107	0.6 to 0.7mbgs	99.6 to 99.8m	Silty Clay Glacial Till to Weathered Shale Bedrock
	MW112	0 to 0.2mbgs	99.1 to 99.3m	Gravelly Sand FILL
	MW113	0.4 to 2.9mbgs	96.5 to 99.1m	Silty Clay Glacial Till
	MW114	0 to 0.1mbgs	99.3 to 99.4m	Silty Clay Glacial Till
Existing Wells by others	MW21-8	1.4 to 1.7mbgs	-	Silty Clay Glacial Till
	BH201	1.3 to 2.0mbgs	-	-
	BH303	1.6 to 3.1mbgs	-	-
	BH401	1.2 to 1.8mbgs	97.5 to 98.1m	-

5.0 Discussion and Recommendations

These recommendations and comments are based on factual information and are intended only for use by the design engineers. The number of boreholes may not be sufficient to determine all the factors that may affect construction methods and costs. Subsurface soil, rock and groundwater conditions between and beyond the boreholes may differ from those encountered at the borehole location, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The anticipated construction conditions are also discussed, but only to the extent that they may influence design decisions. Construction methods discussed express our opinion only and are not intended to direct the contractors on how to carry out the construction. Contractors should also be aware that the data and their interpretation presented in this report may not be sufficient to assess all the factors that may have an effect upon the construction.

We understand that the proposed development will have one level of underground parking (assumed 3mbgs). We assume the underground parking will be across the Site as per the Feasibility Study (dated June 13, 2022).

5.1 Foundations

The subsurface conditions encountered at the Site consists of a discontinuous fill deposit and thin discontinuous native silty sand layer over a generally very stiff to hard silty clay glacial till to depths of about 7.0 to >11mbgs. Weathered shale bedrock was encountered in some boreholes below the glacial till. It should be noted that the former tank nest fill in the area of MW112 extends to a depth of about 5.4mbgs. The design long term groundwater table ranges across the site from about 0.5 to 2mbgs as groundwater drops in elevation towards the north, with groundwater mounding in the former tank nest fill deposit at MW112.

Shallow spread and strip footing foundations and raft foundation are feasible for the proposed structure on the undisturbed very stiff to hard silty clay glacial till deposits. **Table v** below provides the factored geotechnical resistance at Ultimate Limit State (ULS) and the geotechnical reaction at Serviceability Limit State (SLS) for foundations founded on the undisturbed native soils for the possible underground parking levels.

Table v Spread Footing Geotechnical Resistances and Reactions

Foundati on Depth	Foundation Type	Net Geotechnical Reaction at SLS (net)	Net Factored Geotechnical Resistance ULS (net)	Subgrade Reaction
3.9mbgs	Strip footing	400kPa	500kPa	20,000 kPa/m
3.9mbgs	Spread Footing 1.8m x 1.8m	400kPa	500kPa	20,000 kPa/m
	3m x 3m	300kPa	500kPa	13,000 kPa/m
3.9mbgs	Raft 130m x 130m	125kPa	500kPa	5,000 kPa/m

The above factored ULS values incorporate a geotechnical resistance of 0.5 and assumes a footing width of up to 2mm wide and footing embedment of 0.9m. The SLS values are based on total settlement of 25mm and differential up to 20mm.

Strip and spread foundations at MW112 will need to be stepped down to native soils at about 5.4mbgs. For a raft foundation the fill will need to be removed and replaced with engineered fill as noted in **Section 5.5**.

Where necessary, the stepping of the footings at different elevations should be carried out at an angle no steeper than 7V in 10H. No individual footing step should be greater than 0.6m in height.

The founding subgrade is prone to disturbance from construction foot traffic, therefore after evaluation by geotechnical personnel, a skim coat of concrete (minimum 50 mm thickness) should be placed on the native soils to ensure the soil maintains its integrity. If disturbed, the subgrade should be sub-excavated and replaced with lean concrete. All loosened, wet and deleterious subgrade should be removed prior to skim coat concrete.

Minimum footing sizes, thickness and other footing requirements should be designed in accordance to the latest sections of the Ontario Building Code.

An unfactored horizontal resistance against sliding between concrete and the undisturbed native soils can be calculated using a friction factor of 0.38. For ULS design a geotechnical resistance factor of 0.8 should be applied.

The footing subgrade should be inspected and evaluated by a Geotechnical Engineer prior to concreting to ensure that the footings are founded on competent undisturbed soil capable of supporting the recommended geotechnical resistances and reactions.

All exterior footings should have at least 1.2 m of earth cover or synthetic insulation for frost protection. Within the underground parking this depth can be reduced to 0.9 m due to partial ground heating.

5.2 Seismic Site Classifications

Based on the Ontario Building Code of 2012, the classification of soils for seismic design should be based on the average properties of the top 30 m of the subsurface profile. The boreholes were extended to a maximum depth of 11.3mbgs. The Site may be classified as Site Class 'C' under the site classification for seismic site response of OBC 2012.

5.3 Excavation

The proposed foundation constructions and site services will require excavation in the overburden soils. Excavations must be carried out as per the *Occupational Health and Safety Act and Regulations for Construction Projects*. Minimum support system requirements for steeper excavations are indicated in Sections 235 through 238 and 241 of the Act and Regulations. Based on the Act the soils can be classified as indicated in **Table vi**.

Table vi Soil Types for Excavations

Soil Type	Soil Description	Temporary Stable Excavation Slopes From the Base of Excavation
2	Very Stiff to Hard Silty Clay Glacial Till	Lower 1.2m vertical and 1H to 1V above vertical cut
3	FILL above groundwater table Silty Sand Stiff Silty Clay Glacial Till	1H to 1V
4	Gravelly Sand FILL below groundwater table (former tank nest in area of MW112)	3H to 1V

The groundwater table will encountered for the proposed underground structures and services.

The stable side slopes should be regularly inspected for instability and flattened if there are signs of erosion or instability. The founding subgrade must also be protected against frost during winter conditions.

Stockpiles of excavated materials should be kept at least 3 m from the edge of the excavation to avoid slope instability. Care should also be taken to avoid overloading of any underground services/structures by stockpiles.

Conventional excavation equipment will be suitable for excavation purposes. Cobbles and boulders should be anticipated. Excavation within the weathered shale bedrock is not anticipated.

For the proposed underground basement, temporary shoring is anticipated due to space limitations. Interlocking caisson wall or a soldier pile and lagging wall can be designed. For vertical shoring design, the following soil parameters can be used for preliminary design purposes.

Table vii Soil Parameters for Shoring Design

Soil Type	Bulk Unit Weight (kN/m ³)	Friction Angle	Undrained Shear Strength (kPa)	Lateral Earth Pressure Coefficients		
				Ka	Ko	Kp
Fill	20.0	30°	-	0.33	0.50	3.00
Silty Clay Glacial Till						
Stiff	20.0	-	100kPa	-	-	-
Very Stiff	21.0	-	175kPa	-	-	-
Hard	22.0	-	225kPa	-	-	-
Weathered Shale Bedrock	25.0	-	300kPa	-	-	-

For design purposes, apparent earth pressure diagrams in the latest edition of the Canadian Foundation Manual may be used. The long term groundwater table at the site varies as follows:

- 0.5mbgs for the proposed southern wall
- 2.0mbgs for the north, east and west walls

A minimum of 12 kPa surcharge should be used for construction equipment.

Prior to excavation in the area of the former tank nest for any foundations or site services, the saturated gravelly sand will need to be dewatered in advance of excavation.

Lateral movement of the shoring system must be restrained either by tiebacks, horizontal struts, or rakers. For preliminary tieback design the following unfactored anchor soil-grout bond strength can be used for tiebacks within the overburden soils.

Table viii Unfactored Soil-Grout Bond Strengths for Tieback Design

Stratigraphy	Unfactored Soil-Grout Bond Strength (Gravity Grouted)	Unfactored Soil-Grout Bond Strength (Pressure Grouted)
Silty Clay Glacial Till		
Stiff	125kPa/m	190kPa/m
Very Stiff	175kPa/m	260kPa/m
Hard	200kPa/m	300kPa/m
Weathered Shale Bedrock	1,000kPa/m	n/a

A monitoring program must be developed to monitor the shoring and adjacent ground movements due to the impact of the shoring excavation. Adjacent underground utilities and structures within 4m of the proposed temporary shoring (assuming a 4m deep shored excavation) should be evaluated.

Use of frost blankets on the walls of the shoring should be considered if adjacent structures or utilities are susceptible to frost action through the shoring walls.

5.4 Groundwater Control

We understand that excavations may be extended up to about 4mbgs. The design groundwater table at the Site ranges from 0.5 to 2.0mbgs, allowing for long term groundwater fluctuations. Dewatering using temporary sumps and pumps at the base of the excavations should suffice, except in the former tank nest area where the saturated gravelly sand fill should be dewatered prior to excavation by temporary sumps advanced deeper as the excavation proceeds. Details of the anticipated groundwater quantity and quality are included in the Hydrogeological Assessment Report.

5.5 Basement Design and Drainage

The lateral earth pressure for basement wall design should be calculated using soil parameters in **Table vii, Section 5.3**, using an at-rest lateral earth pressure of 0.45. The basement walls should be backfilled with imported granular material placed in 125 mm thick loose lifts that can be compacted with light equipment to avoid damaging the basement walls. Heavy compaction equipment should not be operated along basement walls, especially when the walls are unsupported at their top. The backfill should not be over-compacted to avoid damage to basement walls. Due to its high permeability, the granular material will permit quick drainage of water to perimeter drains, but in order to reduce the quantity of water percolating into the backfill, the uppermost 0.5 m of the backfill should consist of relatively impermeable clayey soils. The structure may be constructed as a water-tight structure or as a conventionally drained structure, however we understand that long term discharge to municipal sewers will not be allowed therefore a conventionally drained structure will not be allowed.

Water-tight Structure

To prevent subsurface water discharge to the municipal sewers, the walls and lower floor slab of the buildings must be water-proofed. The proposed building will be founded below the groundwater table, therefore uplift forces must be resisted by the weight of the structure, assuming a design groundwater table at 0.5mbgs, using a factor of safety of 1.1. The building and floor slab may also be structurally tied to the temporary shoring (ie. interlocking caisson wall) to add the weight of the shoring system to the building to resist the uplift forces.

The structure walls must be designed to resist hydrostatic groundwater pressures using a design groundwater table at 0.5mbgs as noted above.

The Site should be graded for drainage away from foundations. A minimum cross fall of three percent (3%) immediately adjacent to foundations is recommended to allow for some settlement and promote good surface drainage.

Basement Backfill

If the basement is constructed in open cut, then the backfill must be placed as engineered fill. The following placement procedure is recommended for engineered fill.

- i. The excavation base should be compacted to at least 95% Standard Proctor Maximum Dry Density (SPMDD) and the base should be inspected and approved by a geotechnical engineer. Any weak soil identified should be sub-excavated and re-compacted using on site soils, or imported Granular 'B' fill, to 95% SPMDD to establish stable and uniform conditions.
- ii. Backfill material should consist of imported Granular 'B' Type I or II fill. The material should be placed in maximum 125mm loose lifts adjacent to the basement walls, and maximum 200mm away from the

- basement walls. Oversize particles (cobbles and boulders) larger than 120 mm should be discarded, and each fill layer should be uniformly compacted to at least 95% of its SPMDD.
- iii. Depending on the construction season, the on-Site soils may require some reconditioning, wetting or drying.
 - iv. Full-time geotechnical inspection and quality control (by means of frequent field density and laboratory testing) are necessary for the construction of a certifiable engineered fill. Compaction procedures and efficiency should be monitored by a qualified geotechnical technician.
 - v. The re-compacted subgrade must not be frozen and should be placed at a moisture content within 2% of the optimum value for compaction. The soil should not be placed during winter months when freezing ambient temperatures occur persistently or intermittently. The following procedures are recommended for the placement of engineered or structural fill during cold weather conditions:
 - The fill placement must be inspected by qualified field personnel on a full-time basis under the supervision of a geotechnical engineer, with the authority to stop the fill operations at any time when conditions are considered to be unfavourable.
 - The intended area of fill must be clearly identified in the field prior to commencing the work.
 - Ramps for access must be constructed outside of the limits of intended fill.
 - The fill material must be comprised of imported OPSS Granular 'B' Type I or II, or other approved equivalent granular material when temperatures are below 0°C.
 - Imported fill containing ice, snow or any frozen material cannot be accepted for use and should be returned to the source.
 - Any frozen fill must be completely removed prior to placing subsequent lifts. Breaking the frost in situ will not be accepted. Consideration should be given to overnight placement of thermal blankets and/or sacrificial earth fill layers to limit frost penetration. Following removal of frozen material, the remaining exposed surface should be compacted to a minimum of 98% of SPMDD prior to placement of new fill.
 - During periods of cold where ambient temperatures are -5°C or less, placement of engineered fill shall stop and the existing fill materials must be protected from frost penetration.

It should be noted that the placement of engineered fill materials during cold weather conditions requires extra effort beyond that typical in better climatic conditions. At any time where conditions are deemed unfavourable, the engineered fill operation must be suspended.

5.6 Basement Floor Slab

A concrete slab-on-grade may be built on properly prepared and graded subgrade. Any disturbed or excessively wet zones should be sub-excavated and replaced with lean concrete to establish stable and uniform conditions. The subgrade should be inspected and approved by a geotechnical engineer. All new fill should be placed in maximum 200 mm loose lifts within $\pm 2\%$ of its optimum moisture content, and each lift compacted with suitable equipment to minimum 98% SPMDD, before placing the next lift.

Underneath the slab, a minimum 200 mm thick base course, consisting of 19 mm size clear should be placed to improve the support for the floor slab and function as drainage layer. This base course should be compacted with vibratory equipment to a uniform high density. If the subgrade is wet, the clear stone should be separated from the subgrade by an approved filter fabric (e.g. non-woven geotextile, with FOS of 75 - 150µm).

5.7 Backfilling and Suitability of On-Site Soils for Reuse

Based on visual and tactile examination of the soil samples and the results of the laboratory testing programme, the on-site excavated inorganic soils can be reused on site. Any weak or excessively wet zones identified

during compaction should be sub-excavated and replaced with compacted competent material (such as existing soils or imported Granular 'A') to establish stable and uniform conditions. For use as backfill, the clayey soils will have to be reduced to be smaller than 100 mm in size and placed in thin layers. The clayey soils will have to be compacted using heavy equipment suitable for these soils which may be difficult to operate in the narrow confines of trenches. Unless the clayey materials are properly reduced in sizes, all organics and debris removed, and compacted in sufficiently thin lifts, post-construction settlements could occur. The backfill should be placed in maximum 200 mm thick loose layers at or near (+ 2%) their optimum moisture content, and each layer should be compacted to at least 95% SPMDD. This value should be increased to at least 98% SPMDD within 0.6 m of the road subgrade surface.

The excavated soils may require reconditioning (e.g., wetting or drying) prior to reuse. The on-site excavated soils should not be used in confined areas (e.g., around catch-basins and laterals under roadways) where heavy compaction equipment cannot be operated. The use of granular backfill together with an appropriate frost taper would be preferable in confined areas. Unsuitable materials such as organic soils, boulders, cobbles, frozen material, etc., should not be used for backfilling. Clear stone and high performance bedding should not be used as backfill material.

5.8 Site Services

We assume underground services will not be more than 3 mbgs.

Trenching

Trench excavations should be carried out as per the Safety Regulations of the Province of Ontario. The soils are classified in **Section 5.3** in accordance with the Ontario Health and Safety Regulations. Groundwater seepage will be encountered and is discussed further in **Section 5.4**.

Stockpiles of excavated materials should be kept at least 3 m from the edge of the excavation to avoid slope instability. Care should also be taken to avoid overloading of any underground services/structures by stockpiles.

Normal excavation equipment will be suitable for making trenches within soils in which the proposed underground services will be installed. The terms describing the compactness (very loose, loose, compact, dense, very dense) and consistency (very soft, soft, firm, stiff, very stiff, hard) of soil strata give an indication of the effort needed for excavation.

Cobbles and boulders should be anticipated within the glacial till.

Bedding

The boreholes show that the service pipes may be laid predominantly within the native very stiff to hard silty clay glacial till. Granular bedding may be used as bedding material. The recommended minimum thickness of granular bedding for normal Class 'B' Type of bedding (i.e., compacted granular bedding material – OPSD-802) below the invert is 150 mm. The thickness of the bedding may, however, have to be increased depending on the pipe diameter or if wet or weak subgrade conditions are encountered. Clear stone and high-performance bedding should not be used as bedding material.

Backfill

Based on the visual and tactile examination of the soil samples, the inorganic on-Site excavated soils could be re-used as backfill in service trenches. The moisture contents at the time of construction should be at or near optimum. The backfill should be placed in maximum 200 mm thick loose layers at or near (+ 2%) their optimum moisture content, and each layer should be compacted to at least 95% SPMDD. This value should

be increased to at least 98 % SPMDD within 0.6 m of the road subgrade surface. Reuse of clayey soils are discussed in **Section 5.7**.

The excavated soils may require reconditioning (e.g., wetting or drying) prior to reuse. Unsuitable materials such as organic soils, boulders, cobbles, frozen soils and materials, etc., must not be used for backfilling. Clear stone and high-performance bedding should not be used as backfill material.

5.9 Construction Monitoring

It is recommended that a programme of geotechnical/material inspection and testing be carried out during the construction phase of the project to confirm that the conditions exposed in the excavations are consistent with those encountered in the boreholes, verify the design assumptions, and confirm that the various project specifications and materials requirements are being met.

6.0 Closure

We trust that the above information meets your present needs. Statement of qualifications for the undersigned are available on request. Please do not hesitate to contact us if you have any questions or comments.

Sincerely,

BlueFrog Environmental Consulting Inc.

Report prepared by:
Downunder Geotechnical Limited

Andrew Drevininkas, P.Eng.
Geotechnical Engineer



Report reviewed by:
Downunder Geotechnical Limited

A handwritten signature in black ink, appearing to read "Geoffrey Creer".

Geoffrey Creer, P.Eng.
Geotechnical Engineer

Report reviewed by:

A handwritten signature in black ink, appearing to read "O. Gharabegian".

Oshin Gharabegian, P.Geo.
Senior Project Manager

STATEMENT OF LIMITATIONS

This Report has been prepared by BlueFrog, based on fieldwork conducted by BlueFrog and others, for sole benefit and use by Jennum Properties Inc. In performing this Work, BlueFrog has relied in good faith on information provided by others, and has assumed that the information provided by those individuals is both complete and accurate. This Work was performed to current industry standard practice for similar geotechnical work, within the relevant jurisdiction and same locale. The findings presented herein should be considered within the context of the scope of work and project terms of reference; further, the findings are time sensitive and are considered valid only at the time the Report was produced. The conclusions and recommendations contained in this Report are based upon the applicable guidelines, regulations, and legislation existing at the time the Report was produced; any changes in the regulatory regime may alter the conclusions and/or recommendations.

The conclusions and recommendations given in this report are based on information determined at a specific testhole locations. Subsurface soil and groundwater conditions beyond the testholes may differ from those encountered at the testhole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. It is recommended practice that the Geotechnical Engineer be retained during the construction to confirm that the subsurface conditions across the site do not deviate materially from those encountered in the testholes.

The design recommendations in this report are applicable only to the project described in the text, and then only if constructed substantially in accordance with the details stated in this report. Since all details of the design may not be known, we recommend that we be retained during the final design stage to verify that the design is consistent with our recommendations, and that assumptions made in our analysis are valid.

The comments made in this report relating to potential construction problems and possible methods of construction are intended only for the guidance of the designers. The number of testholes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of fill may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices. No other warranty is expressed or implied.

TABLES

Table 1: Groundwater Monitoring Well Details and Results

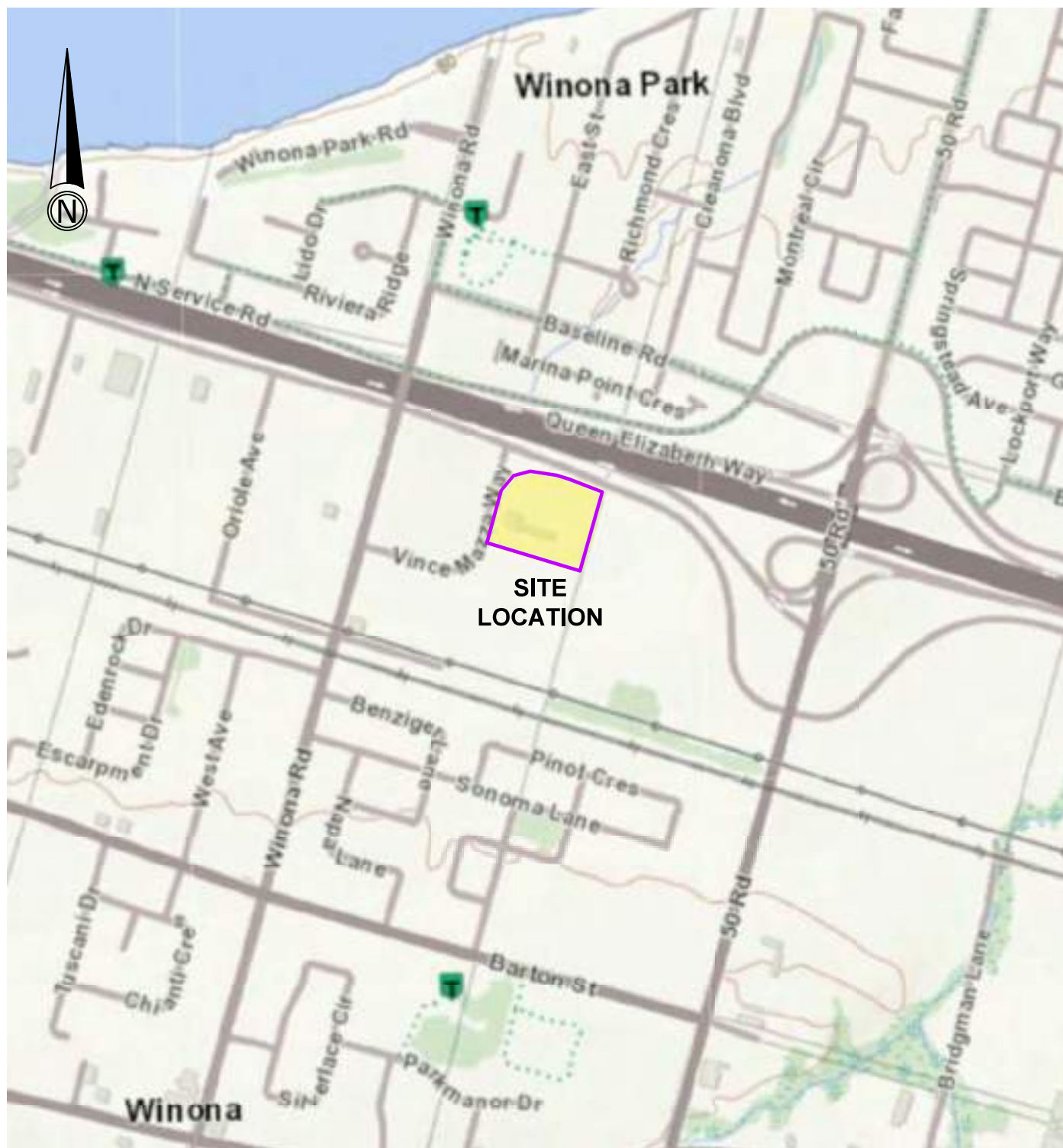
Assessment Location	Top of Pipe Elevation ¹ (m)	Ground Surface Elevation ¹ (m)	Screen Interval (mbgs)	Date (yyyy/mm/dd)	Subsurface Vapour Concentration ²		Free Product Thickness (mm)	Potentiometric Depth (mbgs)	Potentiometric Elevation ¹ (m)
					(CV)	(OV)			
MW103	100.60	99.67	4.6 - 7.6	4/11/22	200ppm	ND	ND	7.21	92.47
				4/22/22	NM	NM	ND	6.57	93.10
				5/06/22	0	1ppm	ND	5.64	94.03
				5/19/22	NM	NM	ND	4.95	94.73
				6/02/22	NM	NM	ND	3.89	95.79
MW105	100.34	99.40	1.5 - 4.6	4/11/22	29%LEL	2ppm	DRY	DRY	DRY
				4/22/22	NM	NM	ND	4.29	95.11
				5/06/22	0	3ppm	ND	3.55	95.84
				5/19/22	NM	NM	ND	3.74	95.66
				6/02/22	NM	NM	ND	3.00	96.40
MW106	100.10	99.23	4.6 - 7.6	4/11/22	2%LEL	ND	DRY	DRY	DRY
				4/22/22	NM	NM	ND	7.60	91.63
				5/06/22	0	2ppm	ND	7.00	92.23
				5/19/22	NM	NM	ND	6.14	93.09
				6/02/22	NM	NM	ND	5.51	93.71
MW107	101.20	100.37	4.6 - 7.6	4/11/22	10ppm	ND	ND	0.69	99.68 *
				4/22/22	NM	NM	ND	0.69	99.68 *
				5/06/22	0	2ppm	ND	0.74	99.63 *
				5/19/22	NM	NM	ND	0.60	99.77 *
				6/02/22	NM	NM	ND	0.71	99.66 *
MW112	100.21	99.31	1.5 - 4.6	4/11/22	1%LEL	ND	ND	0.05	99.26 *
				4/22/22	NM	NM	ND	0.07	99.24 *
				5/06/22	85ppm	0ppm	ND	0.00	99.31 *
				5/19/22	NM	NM	ND	0.11	99.20 *
				6/02/22	NM	NM	ND	0.18	99.13 *
MW113	100.41	99.48	1.5 - 4.6	4/11/22	2%LEL	3ppm	ND	2.94	96.54
				4/22/22	NM	NM	ND	1.13	98.36 *
				5/06/22	0	1ppm	ND	0.39	99.09 *
				5/19/22	NM	NM	ND	0.46	99.02 *
				6/02/22	NM	NM	ND	0.55	98.93 *

Assessment Location	Top of Pipe Elevation ¹ (m)	Ground Surface Elevation ¹ (m)	Screen Interval (mbgs)	Date (yyyy/mm/dd)	Subsurface Vapour Concentration ²		Free Product Thickness (mm)	Potentiometric Depth (mbgs)	Potentiometric Elevation ¹ (m)
					(CV)	(OV)			
MW114	100.25	99.35	1.5 - 4.6	4/11/22	ND	ND	ND	0.10	99.25 *
				4/22/22	NM	NM	ND	0.08	99.27 *
				5/06/22	0	0	ND	-0.04	99.39 *
				5/19/22	NM	NM	ND	0.02	99.33 *
				6/02/22	NM	NM	ND	0.05	99.31 *
MW21-8			1.5 - 4.5	4/11/22	NM	NM	ND	1.58	*
				4/22/22	NM	NM	ND	1.63	
				5/06/22	5ppm	0	ND	1.56	*
				5/19/22	NM	NM	ND	1.65	
				6/02/22	NM	NM	ND	1.42	*
BH201				4/11/22	2%LEL	280ppm	ND	1.35	
				4/22/22	NM	NM	ND	1.98	
				5/06/22	2% LEL	380ppm	ND	1.50	
				5/19/22	NM	NM	ND	1.39	
				6/02/22	NM	NM	ND	1.32	
BH401	100.149	99.268		4/11/22	ND	2ppm	ND	1.20	98.07
				4/22/22	NM	NM	ND	1.82	97.45
				5/06/22	0	0	ND	1.19	98.07
				5/19/22	NM	NM	ND	1.22	98.05
				6/02/22	NM	NM	ND	1.32	97.94
BH303				4/11/22	ND	ND	ND	1.56	
				4/22/22	NM	NM	ND	3.05	
				5/06/22	15ppm	24ppm	ND	2.49	
				5/19/22	NM	NM	ND	2.15	
				6/02/22	NM	NM	ND	1.88	

NOTES:

- * - Water level above top of screen
- CV - Combustible vapours
- mbgs- metres below ground surface
- ND - Not detected
- NM - Well not monitored
- 1 - Elevation data provided by others, relative to a geodetic benchmark or Elevation relative to a local benchmark of 100 m
- 2 - ppmv unless otherwise indicated

FIGURES



MAP REFERENCE: Ontario Ministry of Natural Resources and Forestry

0 100 200 400m
Scale 1 : 10 000



BlueFrog
Environmental Consulting Inc.

SITE LOCATION MAP

1310 SOUTH SERVICE ROAD,
STONEY CREEK, ONTARIO

0138-001.02

MAY 2022

FIGURE 1



0 5 10 20 30m
Scale 1 : 750

LEGEND

- SITE BOUNDARY
- PROPERTY BOUNDARY
- BUILDING FOOTPRINT
- FORMER BUILDING FOOTPRINT
- BOREHOLE
 - BH101, BH102, BH104 AND BH108 TO BH111 ADVANCED BY BLUEFROG (2022)
 - BH5 AND BH9 ADVANCED BY TERRAPROBE (2014)
- MONITORING WELL
 - MW103, MW105 TO MW107 AND MW112 TO MW114 INSTALLED BY BLUEFROG (2022)
 - MW21-1 AND MW21-6 TO MW21-8 INSTALLED BY TERRAPROBE (2021)
 - MW0, MW1, MW4 AND MW6 TO MW8 INSTALLED BE TERRAPROBE (2014)
 - BH201 TO BH204, BH302 TO BH306 AND BH401 INSTALLED BY OTHERS
- STOCKPILE
- OIL WATER SEPARATOR
- FIRE HYDRANT
- ASPHALT
- CONCRETE
- DIRT / GRAVEL
- GRASS / BUSH

NOTES:

LOCATIONS ARE APPROXIMATE.

PROPERTY BOUNDARIES: Ontario Ministry of Natural Resources and Forestry

DRAWING SHOULD BE PRINTED ON 11x17 PAPER FOR ACCURATE SCALING.



SITE PLAN		
1310 SOUTH SERVICE ROAD, STONEY CREEK, ONTARIO		
0138-001.02	MAY 2022	FIGURE 2

APPENDIX A
Record of Borehole Sheets

Explanation of Terms Used in the Record of Borehole Sheets

Classification of Soils

As per Unified Soil Classification System ASTM D2487

Consistency (Cohesive Soils)

Consistency	Undrained Shear Strength (kPa)	N-value
Very soft	<12	0-2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very stiff	100-200	15-30
hard	>200	>30

Compactness (Cohesionless Soils)

Compactness	N-value
Very loose	<4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

Sample Types

GS	Grab Sample
DP	Direct Push soil core sample
RC	Rock core
SS	Split Spoon sample
TW	Thin walled sample

Recovery



Sample recovery



No sample recovery

Soil Boundaries

The boundaries of the soil strata encountered are presented on the borehole logs as dashed and solid lines. Dashed lines represent an assumed boundary between soil strata, while a solid line represents an observed transition between soil strata within the recovered soil samples.

Cobbles and Boulders

Cobbles and boulders may be encountered within the soil deposits, which cannot be sampled in their boreholes. Glacial till is known to contain cobbles and boulders due to the nature of their formation/deposition and should be expected in any excavations within the soil.

Fill

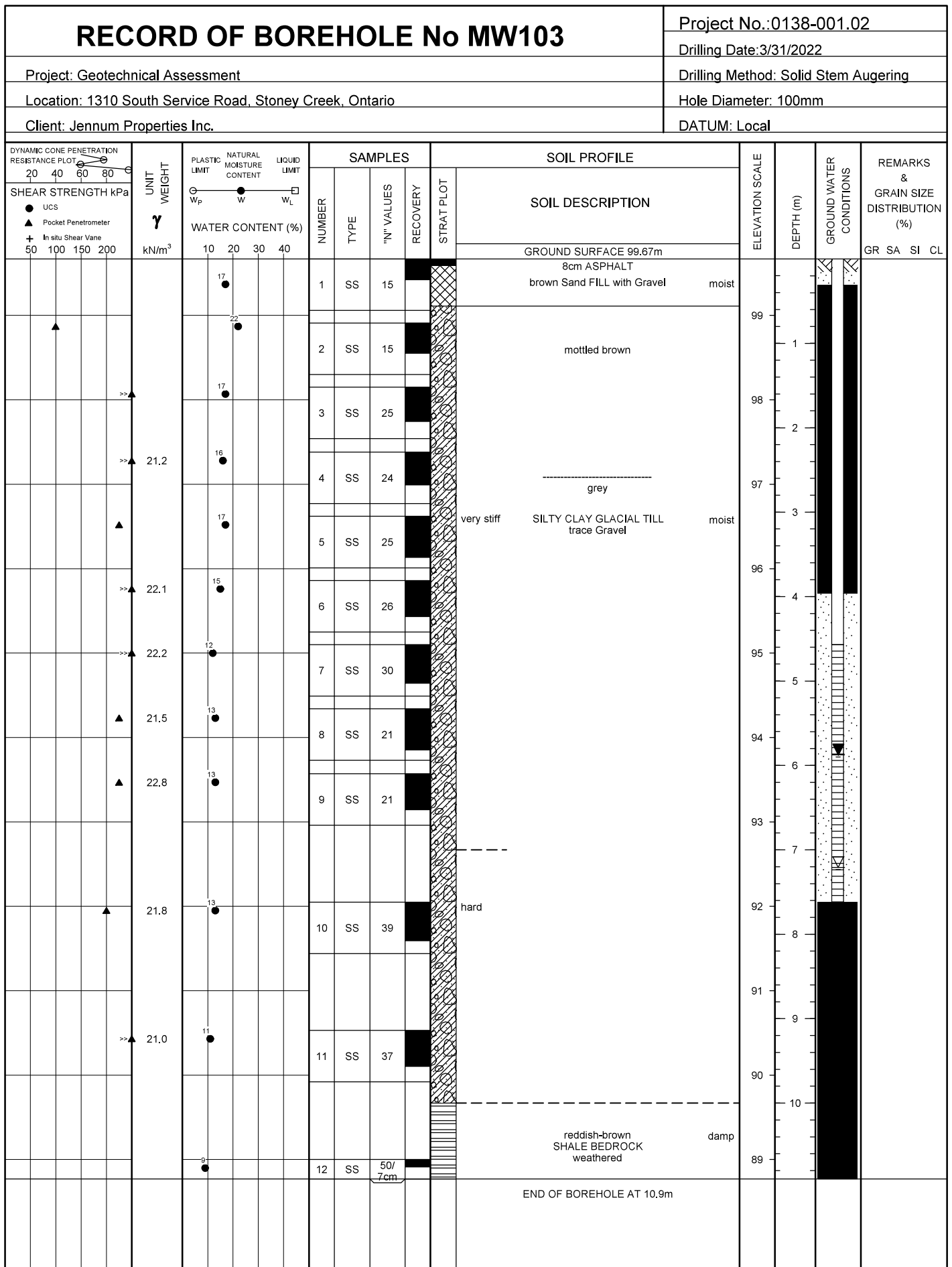
It should be noted that fill is heterogeneous in nature and has a variable compactness, consistency, or degree of compaction. The fill description is based solely on the soil sample retrieved and may not be representative of the entire layer. All fills should be expected to contain variable materials, including possible obstructions, such as wood, concrete, etc. which may not have been encountered within the boreholes. The depth of fill may also be variable and cannot be detected solely on the results of the boreholes. Testpits are recommended to confirm the variability of the material and depth of the fill.

RECORD OF BOREHOLE No BH101											Project No.:0138-001.02				
											Drilling Date:3/30/2022				
Project: Geotechnical Assessment											Drilling Method: Hollow Stem Augering				
Location: 1310 South Service Road, Stoney Creek, Ontario											Hole Diameter: 225mm				
Client: Jennum Properties Inc.											DATUM: Local				
DYNAMIC CONE PENETRATION RESISTANCE PLOT															
SHEAR STRENGTH kPa															
● UCS ▲ Pocket Penetrometer + In situ Shear Vane															
50 100 150 200															
UNIT WEIGHT γ kN/m³															
PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT Wp W WL WATER CONTENT (%) 10 20 30 40															
SAMPLES															
NUMBER TYPE "N" VALUES RECOVERY															
SOIL PROFILE															
SOIL DESCRIPTION															
GROUND SURFACE 99.90m															
ELEVATION SCALE															
DEPTH (m)															
GROUND WATER CONDITIONS															
REMARKS & GRAIN SIZE DISTRIBUTION (%)															
GR SA SI CL															
8cm brown Sand FILL some Gravel dense grey Silty Sand FILL moist															
mottled brown to brown															
very stiff SILTY CLAY GLACIAL TILL trace Gravel															
grey moist															
hard															
very stiff															
hard															
reddish-brown SHALE BEDROCK weathered damp															
END OF BOREHOLE AT 11.3m															

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RECORD OF BOREHOLE No BH102														Project No.:0138-001.02																																																																																																																																																															
														Drilling Date:3/30/2022																																																																																																																																																															
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Client: Jennum Properties Inc.														DATUM: Local																																																																																																																																																															
<div><div><div>DYNAMIC CONE PENETRATION RESISTANCE PLOT</div><div><div>20 40 60 80</div><div>● UCS</div><div>▲ Pocket Penetrometer</div><div>+ In situ Shear Vane</div></div></div><div><div>SHEAR STRENGTH kPa</div><div>50 100 150 200</div></div></div> <div><div>UNIT WEIGHT</div><div>γ</div><div>kN/m³</div></div> <div><div>PLASTIC LIMIT</div><div>W_P</div><div>NATURAL MOISTURE CONTENT</div><div>W</div><div>LIQUID LIMIT</div><div>W_L</div></div> <div><div>WATER CONTENT (%)</div><div>10 20 30 40</div></div> <table><thead><tr><th colspan="4">SAMPLES</th><th colspan="2">SOIL PROFILE</th><th rowspan="2">ELEVATION SCALE</th><th rowspan="2">DEPTH (m)</th><th rowspan="2">GROUND WATER CONDITIONS</th><th rowspan="2">REMARKS & GRAIN SIZE DISTRIBUTION (%)</th></tr><tr><th>NUMBER</th><th>TYPE</th><th>"N" VALUES</th><th>RECOVERY</th><th>STRAT PLOT</th><th>SOIL DESCRIPTION</th></tr></thead><tbody><tr><td colspan="6"></td><td colspan="3">GROUND SURFACE 99.40m</td><td>GR SA SI CL</td></tr><tr><td>1</td><td>SS</td><td>6</td><td></td><td></td><td>loose</td><td>8cm ASPHALT grey Gravel FILL with Sand</td><td>wet</td><td></td><td></td></tr><tr><td>2</td><td>SS</td><td>20</td><td></td><td></td><td></td><td>mottled brown to brown</td><td></td><td></td><td></td></tr><tr><td>3</td><td>SS</td><td>22</td><td></td><td></td><td></td><td></td><td></td><td></td><td>SS3: sampler wet</td></tr><tr><td>4</td><td>SS</td><td>20</td><td></td><td></td><td></td><td>grey</td><td></td><td></td><td></td></tr><tr><td>5</td><td>SS</td><td>24</td><td></td><td></td><td>very stiff</td><td>SILTY CLAY GLACIAL TILL trace Gravel</td><td>moist</td><td></td><td></td></tr><tr><td>6</td><td>SS</td><td>29</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>7</td><td>SS</td><td>25</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>8</td><td>SS</td><td>22</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>9</td><td>SS</td><td>26</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>10</td><td>SS</td><td>21</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>11</td><td>SS</td><td>29</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>12</td><td>SS</td><td>64/ 23cm</td><td></td><td></td><td>hard</td><td></td><td></td><td></td><td></td></tr><tr><td colspan="6"></td><td colspan="3">END OF BOREHOLE AT 11.1m</td><td></td></tr></tbody></table>																		SAMPLES				SOIL PROFILE		ELEVATION SCALE	DEPTH (m)	GROUND WATER CONDITIONS	REMARKS & GRAIN SIZE DISTRIBUTION (%)	NUMBER	TYPE	"N" VALUES	RECOVERY	STRAT PLOT	SOIL DESCRIPTION							GROUND SURFACE 99.40m			GR SA SI CL	1	SS	6			loose	8cm ASPHALT grey Gravel FILL with Sand	wet			2	SS	20				mottled brown to brown				3	SS	22							SS3: sampler wet	4	SS	20				grey				5	SS	24			very stiff	SILTY CLAY GLACIAL TILL trace Gravel	moist			6	SS	29								7	SS	25								8	SS	22								9	SS	26								10	SS	21								11	SS	29								12	SS	64/ 23cm			hard											END OF BOREHOLE AT 11.1m			
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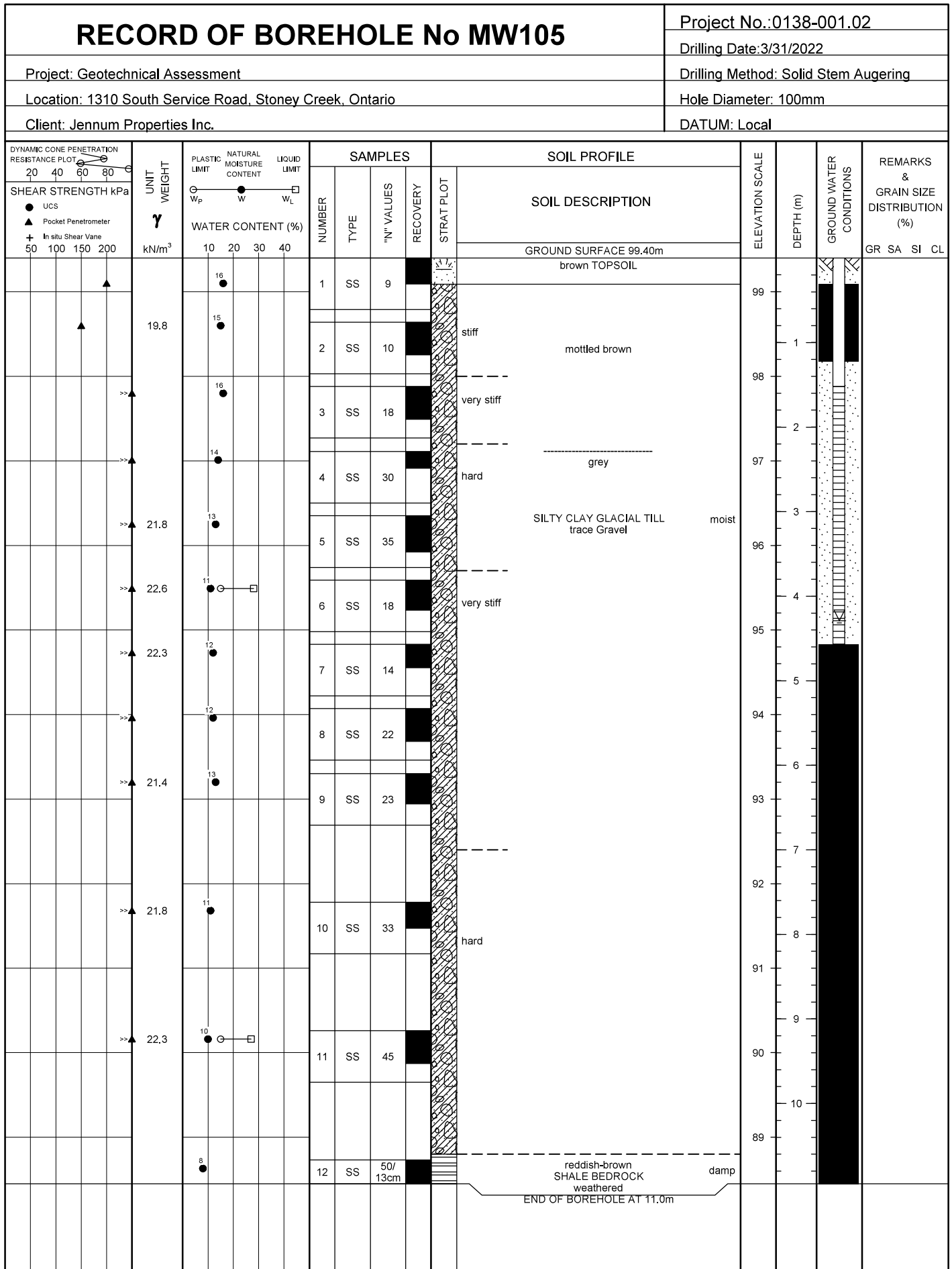
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RECORD OF BOREHOLE No BH104										Project No.:0138-001.02															
										Drilling Date:3/31/2022															
Project: Geotechnical Assessment										Drilling Method: Solid Stem Augering															
Location: 1310 South Service Road, Stoney Creek, Ontario										Hole Diameter: 100mm															
Client: Jennum Properties Inc.										DATUM: Local															
<div><div><div>DYNAMIC CONE PENETRATION RESISTANCE PLOT</div><div><div>20 40 60 80</div><div>● UCS</div><div>▲ Pocket Penetrometer</div><div>+ In situ Shear Vane</div></div><div>SHEAR STRENGTH kPa</div><div>50 100 150 200</div></div><div><div>UNIT WEIGHT</div><div>γ</div><div>kN/m³</div></div><div><div>PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT</div><div>W_P W W_L</div><div>WATER CONTENT (%)</div><div>10 20 30 40</div></div></div>														SAMPLES				SOIL PROFILE				ELEVATION SCALE	DEPTH (m)	GROUND WATER CONDITIONS	REMARKS & GRAIN SIZE DISTRIBUTION (%)
NUMBER	TYPE	"N" VALUES	RECOVERY	STRAT PLOT	SOIL DESCRIPTION																				
GROUND SURFACE 99.67m														GR	SA	SI	CL								
1	SS	4			firm	dark brown TOPSOIL	moist		99	1															
2	SS	15			compact	brown SILTY SAND	moist		98	2															
3	SS	27			very stiff	mottled brown to brown			97	3															
4	SS	23							96	4															
5	SS	27				grey	moist		95	5															
6	SS	33			hard	SILTY CLAY GLACIAL TILL trace Gravel			94	6															
7	SS	23			very stiff				93	7															
8	SS	25							92	8															
9	SS	27							91	9															
10	SS	26			hard				90	10															
11	SS	33							89	11															
12	SS	75				reddish-brown SHALE BEDROCK weathered	damp																		
END OF BOREHOLE AT 11.3m																									

LOGGED BY CFM



LOGGED BY CFM

Project No.:0138-001.02

Drilling Date:4/1/2022

Project: Geotechnical Assessment

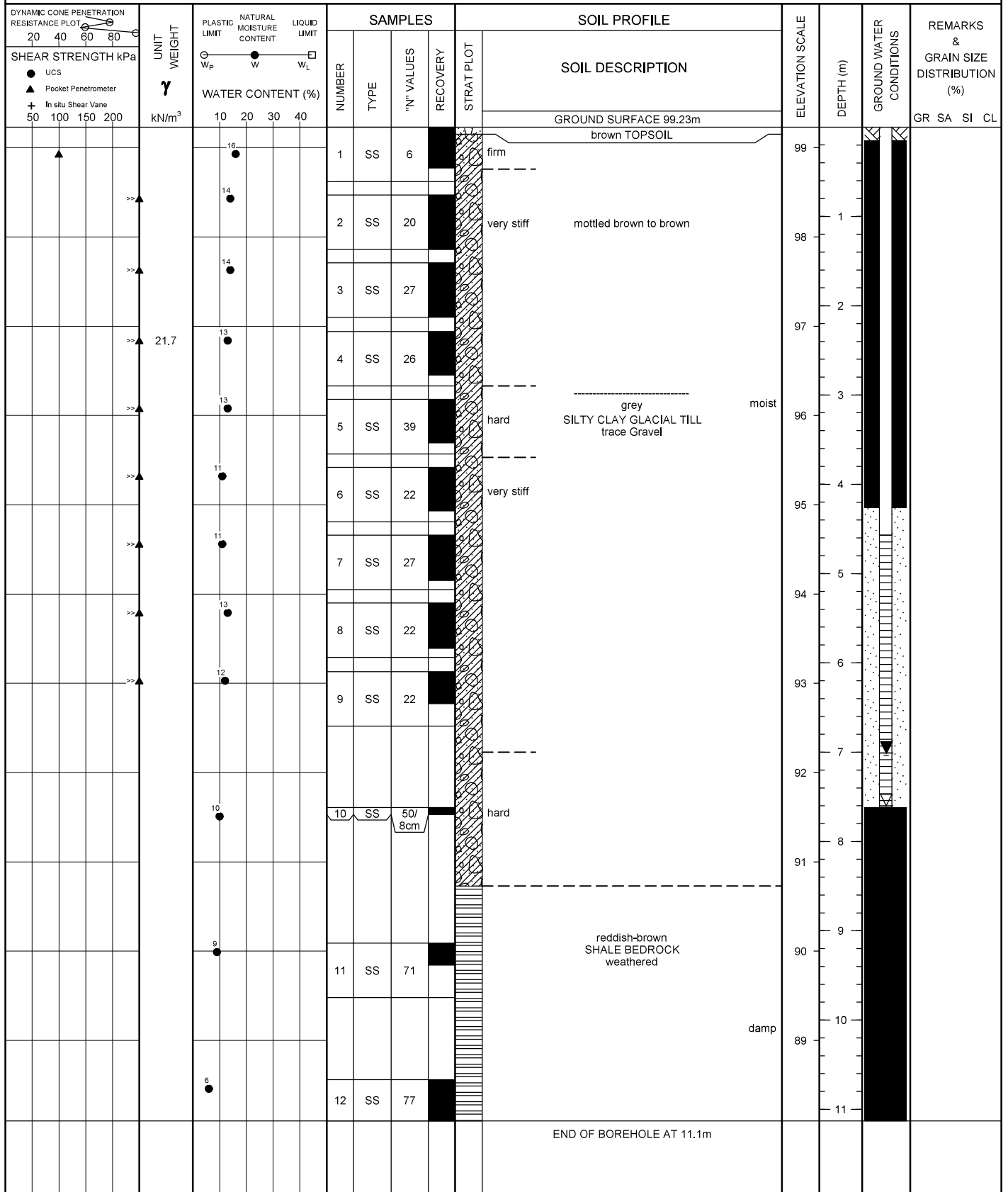
Drilling Method: Hollow Stem Augering

Location: 1310 South Service Road, Stoney Creek, Ontario

Hole Diameter: 200mm

Client: Jennum Properties Inc.

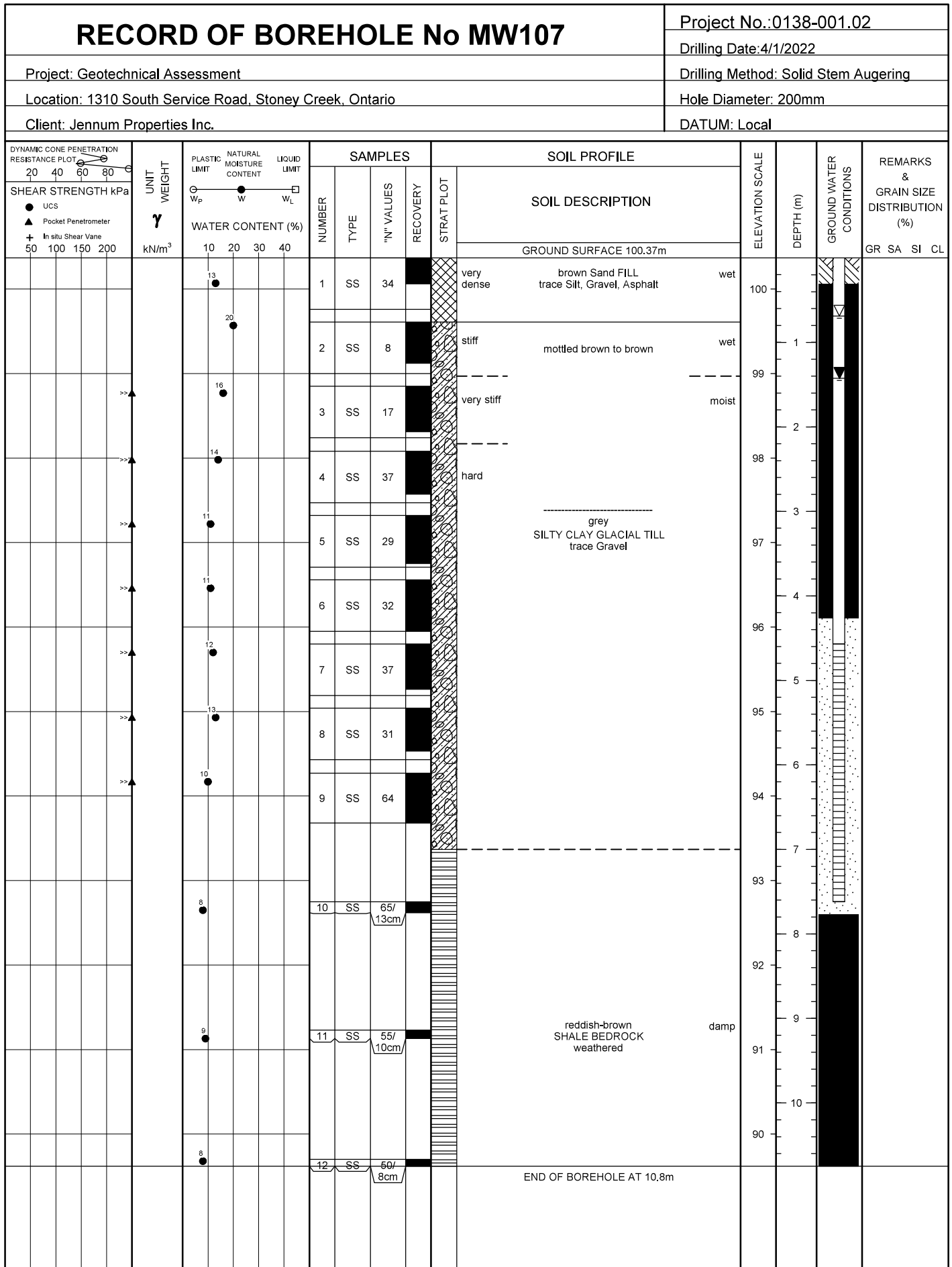
DATUM: Local



LOGGED BY KES

PAGE 1 OF 1





LOGGED BY CFM

Project No.:0138-001.02

Drilling Date:4/4/2022

Project: Geotechnical Assessment

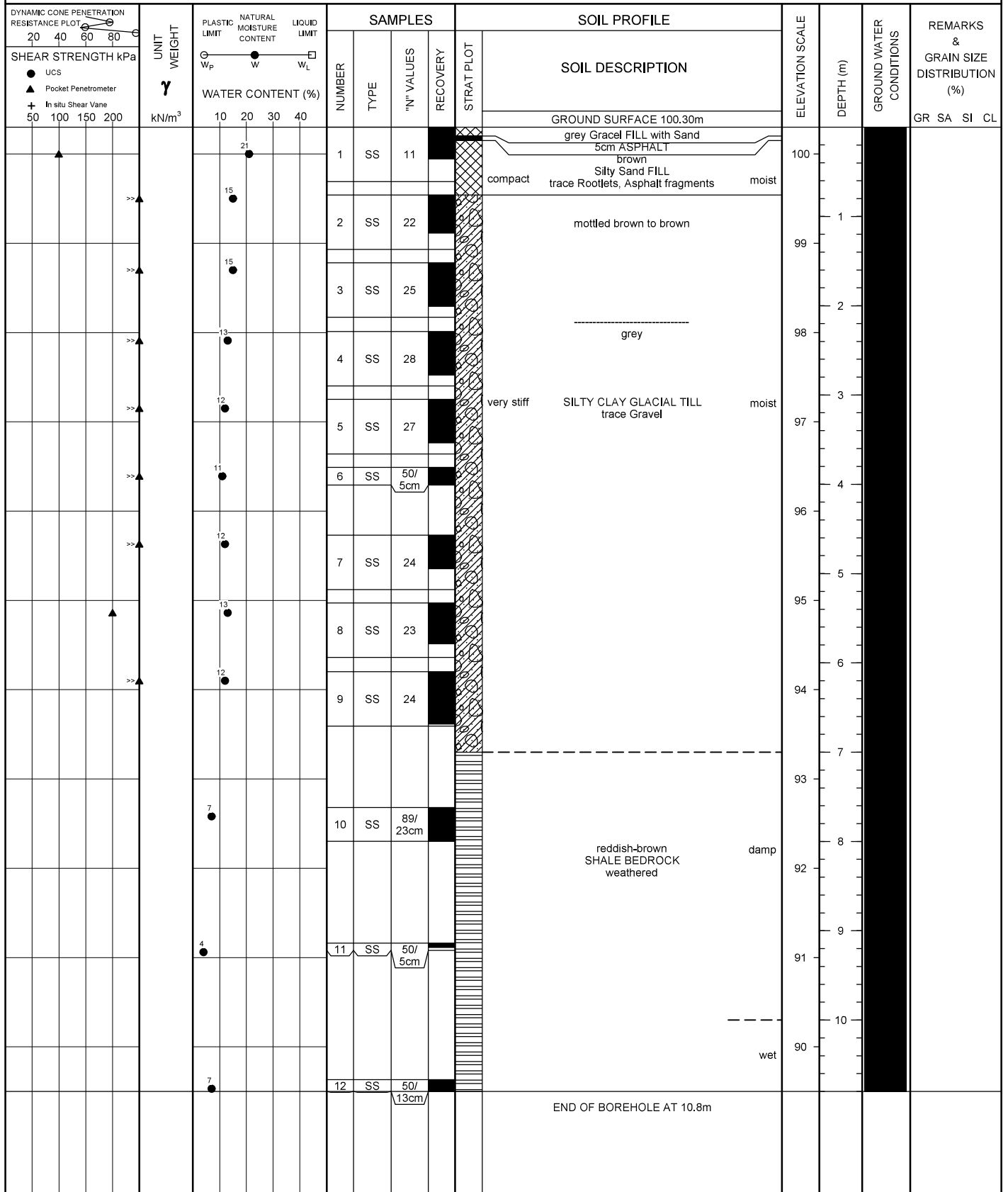
Drilling Method: Solid Stem Augering

Location: 1310 South Service Road, Stoney Creek, Ontario

Hole Diameter: 100mm

Client: Jennum Properties Inc.

DATUM: Local



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PAGE 1 OF 1



RECORD OF BOREHOLE No BH109										Project No.:0138-001.02					
Project: Geotechnical Assessment Location: 1310 South Service Road, Stoney Creek, Ontario Client: Jennum Properties Inc.										Drilling Date:4/4/2022					
										Drilling Method: Solid Stem Augering					
										Hole Diameter: 100mm					
										DATUM: Local					
DYNAMIC CONE PENETRATION RESISTANCE PLOT		UNIT WEIGHT γ kN/m ³	PLASTIC NATURAL MOISTURE LIQUID LIMIT LIMIT CONTENT LIMIT W _P W W _L			SAMPLES				SOIL PROFILE		ELEVATION SCALE	DEPTH (m)	GROUND WATER CONDITIONS	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
SHEAR STRENGTH kPa ● UCS ▲ Pocket Penetrometer + In situ Shear Vane			WATER CONTENT (%)			NUMBER	TYPE	"N" VALUES	RECOVERY	STRAT PLOT	SOIL DESCRIPTION				
20 40 60 80 50 100 150 200			10 20 30 40								GROUND SURFACE 100.46m				
						1	SS	21			compact brown Sandy Gravel FILL	moist	100		
						2	SS	11			compact brown Sandy Silt FILL (reworked native)	wet	1		
						3	SS	13			stiff mottled brown to brown		99		
						4	SS	30			SILTY CLAY GLACIAL TILL trace Gravel		2		
						5	SS	31			hard moist		3		
						6	SS	27			very stiff grey		4		
						7	SS	26					5		
						8	SS	23					6		
						9	SS	27					7		
						10	SS	67			hard		8		
						11	SS	50/3cm			reddish-brown SHALE BEDROCK weathered	moist	9		
						12	SS	60/8cm					10		
						12	SS	60/8cm			END OF BOREHOLE AT 10.8m				

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PAGE 1 OF 1

RECORD OF BOREHOLE No BH110												Project No.:0138-001.02			
												Drilling Date:4/4/2022			
Project: Geotechnical Assessment												Drilling Method: Solid Stem Augering			
Location: 1310 South Service Road, Stoney Creek, Ontario												Hole Diameter: 100mm			
Client: Jennum Properties Inc.												DATUM: Local			

DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	PLASTIC NATURAL MOISTURE LIQUID LIMIT LIMIT CONTENT LIMIT W _p W W _L				SAMPLES				SOIL PROFILE		ELEVATION SCALE	DEPTH (m)	GROUND WATER CONDITIONS	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
SHEAR STRENGTH kPa ● UCS ▲ Pocket Penetrometer + In situ Shear Vane 50 100 150 200					WATER CONTENT (%) 10 20 30 40				NUMBER	TYPE	"N" VALUES	RECOVERY	STRAT PLOT	SOIL DESCRIPTION				
														GROUND SURFACE 99.86m				
												CONCRETE						
												compact grey Sand FILL with Gravel black staining at 0.36m wet						
												stiff grey Silty Clay FILL trace Gravel black staining at 0.6m moist						
												brown						
												black staining at 1.8m						
												SILTY CLAY GLACIAL TILL trace Gravel						
												very stiff						
												moist						
												grey						
												END OF BOREHOLE AT 5.9m						

LOGGED BY CFM

Project No.:0138-001.02

Drilling Date:4/5/2022

Project: Geotechnical Assessment

Drilling Method: Solid Stem Augering

Location: 1310 South Service Road, Stoney Creek, Ontario

Hole Diameter: 100mm

Client: Jennum Properties Inc.

DATUM: Local

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RECORD OF BOREHOLE No MW112														Project No.:0138-001.02			
														Drilling Date:4/5/2022			
Project: Geotechnical Assessment														Drilling Method: Hollow Stem Augering			
Location: 1310 South Service Road, Stoney Creek, Ontario														Hole Diameter: 225mm			
Client: Jennum Properties Inc.														DATUM: Local			

DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	PLASTIC NATURAL MOISTURE LIQUID LIMIT LIMIT CONTENT LIMIT W _p W W _L				SAMPLES				SOIL PROFILE		ELEVATION SCALE	DEPTH (m)	GROUND WATER CONDITIONS	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL					
SHEAR STRENGTH kPa					WATER CONTENT (%)				NUMBER	TYPE	"N" VALUES	RECOVERY	STRAT PLOT	SOIL DESCRIPTION					moist wet				
● UCS ▲ Pocket Penetrometer + In situ Shear Vane					10 20 30 40									GROUND SURFACE 99.31m 8cm ASPHALT									
50 100 150 200				10 20 30 40										brown Gravelly Sand FILL									
								1	SS	18				compact									
								2	SS	32				dense									
								3	SS	52				very dense									
								4	SS	35				dense									
								5	SS	18				compact									
								6	SS	24													
								7	SS	12													
								8	SS	22				very stiff									
▲								grey SILTY CLAY GLACIAL TILL trace Gravel															
END OF BOREHOLE AT 5.9m																							

LOGGED BY CFM

RECORD OF BOREHOLE No MW113												Project No.:0138-001.02			
												Drilling Date:4/5/2022			
Project: Geotechnical Assessment												Drilling Method: Hollow Stem Augering			
Location: 1310 South Service Road, Stoney Creek, Ontario												Hole Diameter: 225mm			
Client: Jennum Properties Inc.												DATUM: Local			

DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT LIMIT				SAMPLES				SOIL PROFILE		ELEVATION SCALE	DEPTH (m)	GROUND WATER CONDITIONS	REMARKS & GRAIN SIZE DISTRIBUTION (%)																																	
SHEAR STRENGTH kPa					WATER CONTENT (%)				NUMBER	TYPE	"N" VALUES	RECOVERY	STRAT PLOT	SOIL DESCRIPTION																																					
● UCS ▲ Pocket Penetrometer + In situ Shear Vane				W _p W W _L																																															
20 40 60 80 50 100 150 200				10 20 30 40																																															
								<table border="1" style="width:100%; border-collapse: collapse;"> <tr><td>1</td><td>SS</td><td>4</td><td></td></tr> <tr><td>2</td><td>SS</td><td>10</td><td></td></tr> <tr><td>3</td><td>SS</td><td>26</td><td></td></tr> <tr><td>4</td><td>SS</td><td>17</td><td></td></tr> <tr><td>5</td><td>SS</td><td>17</td><td></td></tr> <tr><td>6</td><td>SS</td><td>17</td><td></td></tr> <tr><td>7</td><td>SS</td><td>18</td><td></td></tr> </table>				1	SS	4		2	SS	10		3	SS	26		4	SS	17		5	SS	17		6	SS	17		7	SS	18				GROUND SURFACE 99.48m brown TOPSOIL brown Sand FILL with Gravel brown Silt FILL with Gravel, trace Clay grey Gravel FILL trace Sand brown to mottled brown stiff very stiff grey SILTY CLAY GLACIAL TILL trace Gravel END OF BOREHOLE AT 5.2m									
1	SS	4																																																	
2	SS	10																																																	
3	SS	26																																																	
4	SS	17																																																	
5	SS	17																																																	
6	SS	17																																																	
7	SS	18																																																	

LOGGED BY CFM

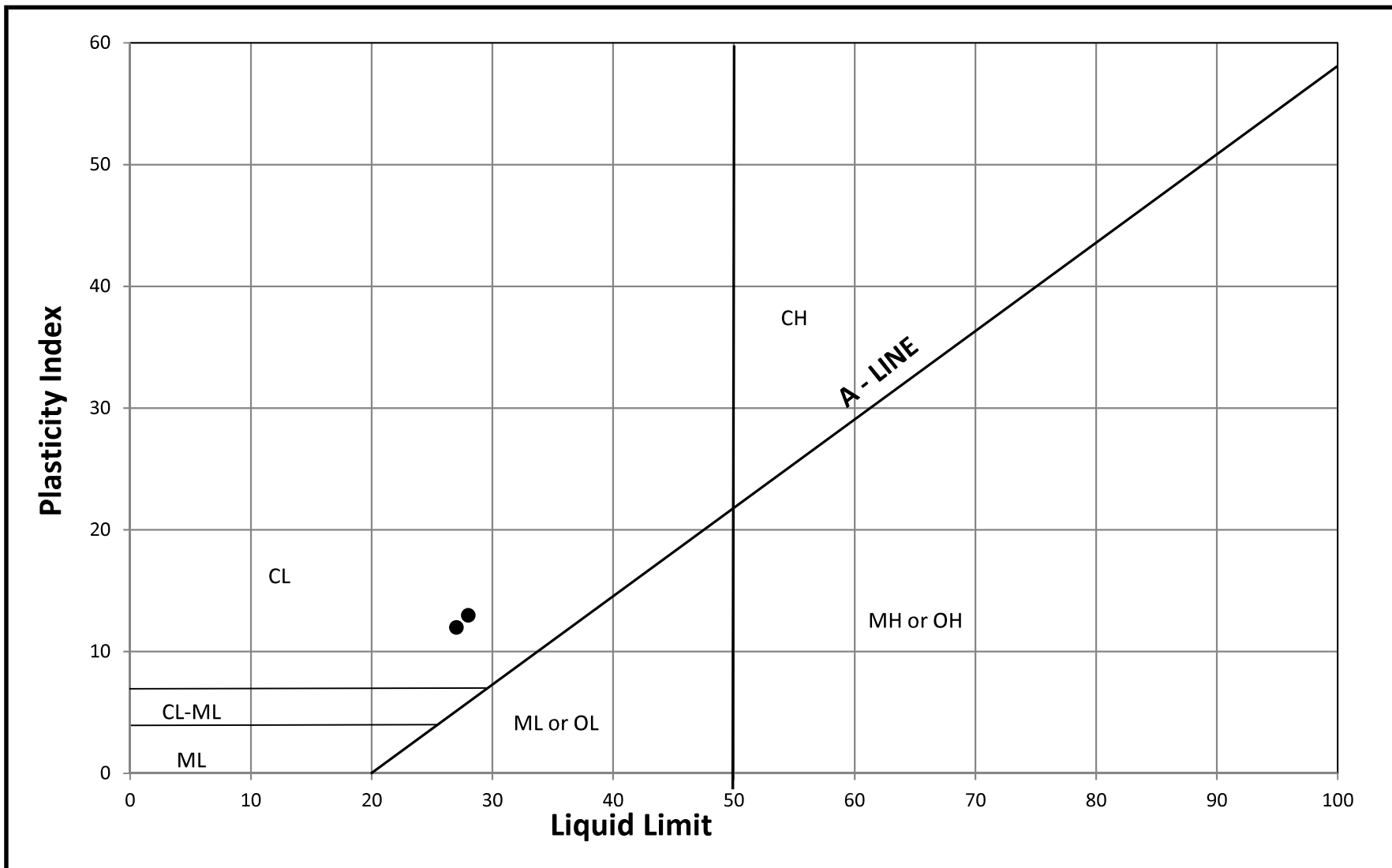
RECORD OF BOREHOLE No MW114														Project No.:0138-001.02			
														Drilling Date:4/5/2022			
Project: Geotechnical Assessment														Drilling Method: Hollow Stem Augering			
Location: 1310 South Service Road, Stoney Creek, Ontario														Hole Diameter: 225mm			
Client: Jennum Properties Inc.														DATUM: Local			

DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	PLASTIC NATURAL MOISTURE LIQUID LIMIT LIMIT CONTENT LIMIT W _p W W _L				SAMPLES				SOIL PROFILE		ELEVATION SCALE	DEPTH (m)	GROUND WATER CONDITIONS	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL							
SHEAR STRENGTH kPa ● UCS ▲ Pocket Penetrometer + In situ Shear Vane 50 100 150 200					WATER CONTENT (%) 10 20 30 40				NUMBER	TYPE	"N" VALUES	RECOVERY	STRAT PLOT	SOIL DESCRIPTION					moist						
GROUND SURFACE 99.35m																									
8cm ASPHALT																									
compact brown Gravel FILL with Sand																									
black staining at 0.8m brown to mottled brown																									
grey																									
SILTY CLAY GLACIAL TILL trace Gravel																									
very stiff																									
moist																									
END OF BOREHOLE AT 5.2m																									

LOGGED BY CFM

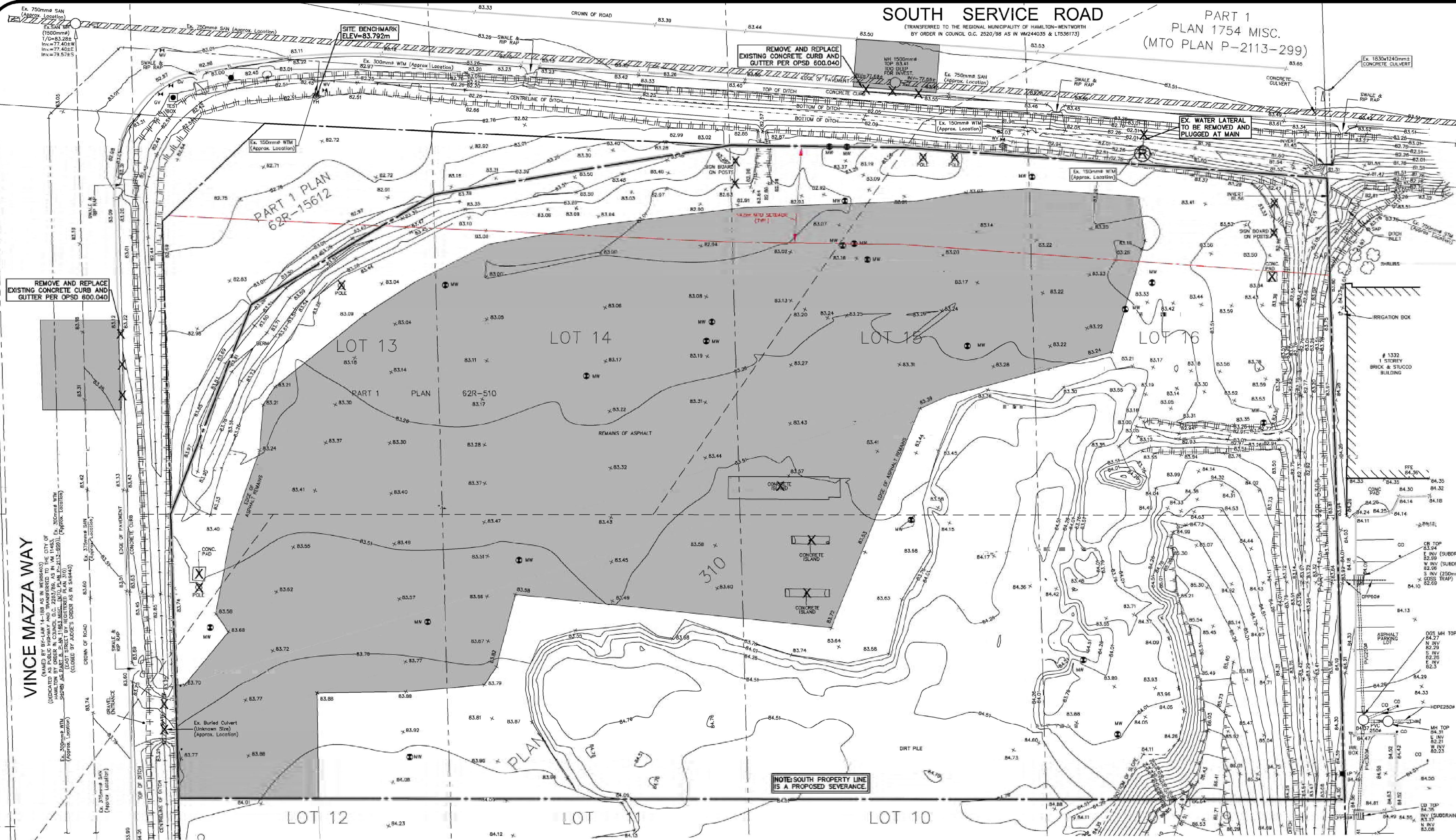
APPENDIX B

Geotechnical Laboratory Results



	PLASTICITY CHART	Project No: D22115
		Project:
Date: April 2022	SILTY CLAY GLACIAL TILL	1301 South Service Road Stoney Creek, Ontario
Checked: AD		

Engineering Drawings



GEODETIC BM	ELEV. =	m
REFER TO DRAWING CREATED BY SURVEYORS ON SITE INC. DATED FEBRUARY 3, 2026.		
SITE BENCHMARK	ELEV. =	m
REFER TO DRAWING CREATED BY SURVEYORS ON SITE INC. DATED FEBRUARY 3, 2026.		
0 4 8 12 16 20 24m		

NOTE TO CONTRACTOR:

DO NOT SCALE DRAWINGS.

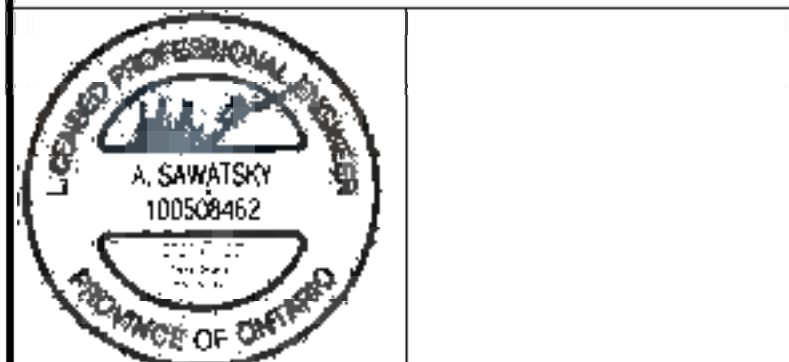
CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

ALL DRAWINGS REMAIN THE PROPERTY OF THE ENGINEER AND SHALL NOT BE REPRODUCED OR REUSED WITHOUT THE ENGINEER'S WRITTEN PERMISSION.

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.

- NOTE:**
1. PROPERTY LINE IS APPROXIMATE ONLY AND SHOULD NOT BE USED FOR DETERMINING SETBACKS OR LAYOUT.
 2. EXISTING TOPOGRAPHICAL INFORMATION PROVIDED BY SURVEYORS ON SITE INC., DATED FEBRUARY 11, 2026.
 3. THIS PLAN IS PART OF A SET OF PLANS WHICH COMPRISE OF C1.1, C1.2, C2.1, C2.2, C2.3 & C2.4.
 4. INVERTS ARE APPROXIMATE ONLY, CONTRACTOR TO FIELD VERIFY AND REPORT ANY DISCREPANCIES TO ENGINEER.

1. ISSUED FOR ZBA	AXS	2026-08-26
No.	REVISION-ISSUANCE	BY



CLIENT

LIVWELL DEVELOPMENTS

495 BRANT STREET EURLINGTON

PROJECT

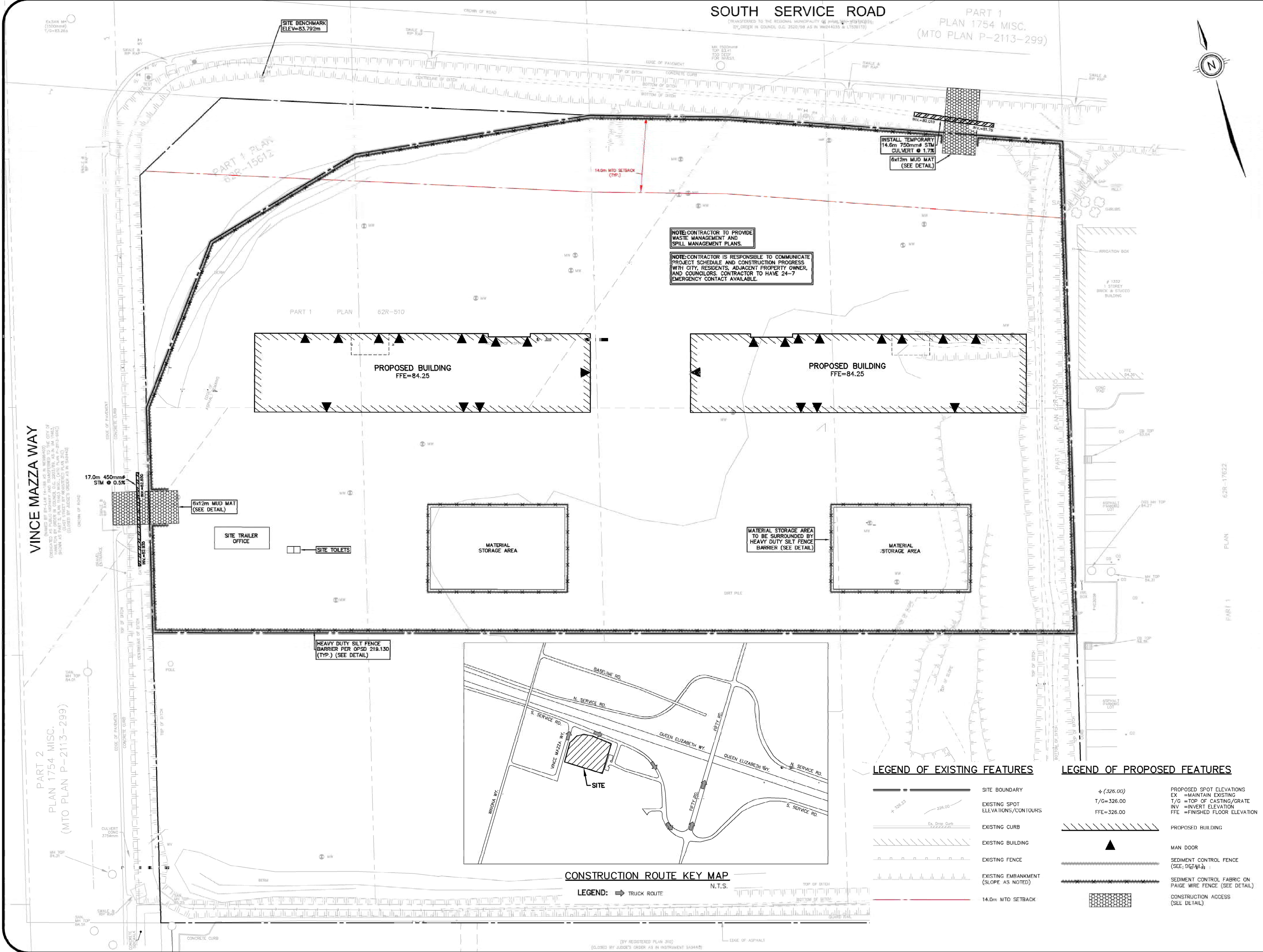
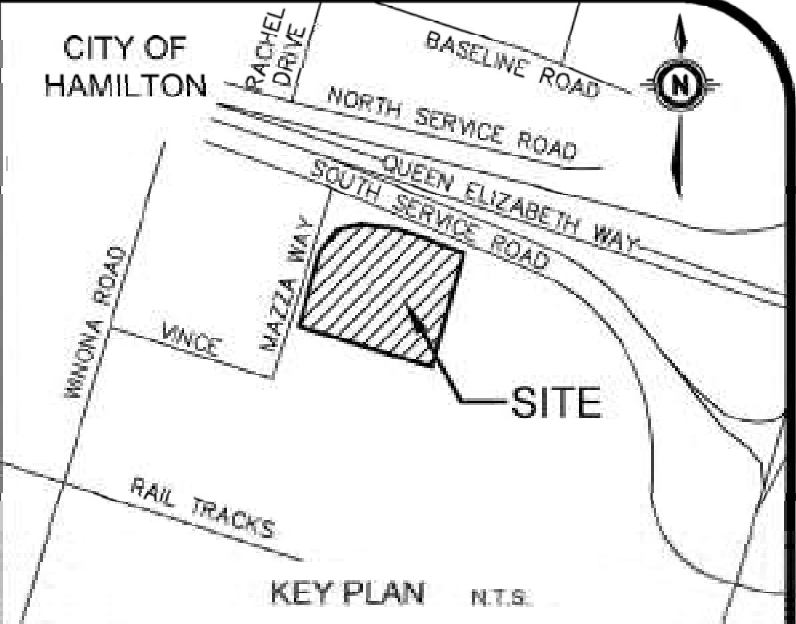
1310 SOUTH SERVICE ROAD

HAMILTON ONTARIO

EXISTING CONDITIONS AND REMOVALS PLAN	
Design By	LJF
Project Manager	A.SAWATSKY
Drawn By	GLC/GCC
Project No.	65075_001
Checked By	AXS
Drawing No.	
Date	2026-03-11
Scale	1:300
C1.1	
Sheet 1 of 6	

LEGEND OF EXISTING FEATURES

- SITE BOUNDARY
- EXISTING SPOT ELEVATIONS/CONTOURS
- EXISTING CURB
- EXISTING BUILDING
- EXISTING FENCE
- EXISTING EMBANKMENT (SLOPE AS NOTED)
- EXISTING SANITARY SEWER
- EXISTING WATERMAIN
- EXISTING STORM SEWER
- 14.0m MTO SETBACK
- REMOVALS
- HARD SURFACE REMOVALS



GEODETIC BM	ELEV. =	m
REFER TO DRAWING CREATED BY SURVEYORS ON SITE INC. DATED FEBRUARY 3, 2026.		
SITE BENCHMARK	ELEV. =	m
REFER TO DRAWING CREATED BY SURVEYORS ON SITE INC. DATED FEBRUARY 3, 2026.		
0 4 8 12 16 20 24m		

NOTE TO CONTRACTOR:

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- NOTE:**
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 2. EXISTING TOPOGRAPHICAL INFORMATION PROVIDED BY SURVEYORS ON SITE INC., DATED FEBRUARY 11, 2026.

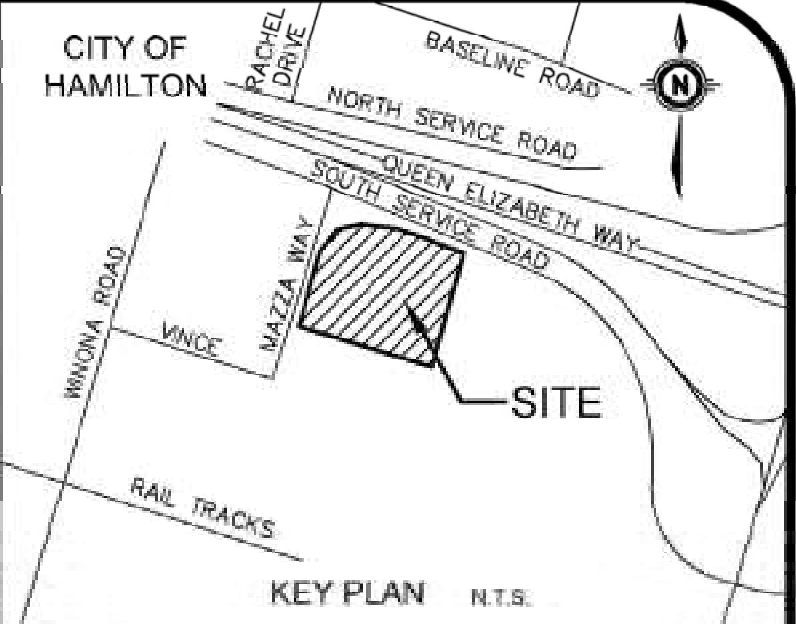
1.	ISSUED FOR ZBA	AXS	2026-08-20
No.	REVISION/ISSUANCE	BY	YYYY-MM-DD



CLIENT	
LIVWELL DEVELOPMENTS	
499 BRANT STREET	BURLINGTON
PROJECT	
1310 SOUTH SERVICE ROAD	
HAMILTON ONTARIO	
DRAWING	
CONSTRUCTION MANAGEMENT PLAN	
Design By	LJF
Project Manager	A. SAWATSKY
Drawn By	OLC/GGC
Project No.	65075_001
Checked By	AXS
Drawing No.	
Date	2026-08-24
Scale	1:300
C1.2	
Sheet 2 of 6	

SOUTH SERVICE ROAD

PART 1
PLAN 1754 MISC.
(MTO PLAN P-2113-299)



GEODETIC BM	ELEV. =	m
REFER TO DRAWING CREATED BY SURVEYORS ON SITE INC. DATED FEBRUARY 3, 2020.		
SITE BENCHMARK	ELEV. =	m
REFER TO DRAWING CREATED BY SURVEYORS ON SITE INC. DATED FEBRUARY 3, 2020.		
0 4 8 12 16 20 24m		

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 - EXISTING TOPOGRAPHICAL INFORMATION PROVIDED BY SURVEYORS ON SITE INC., DATED FEBRUARY 11, 2020.
 - THIS PLAN IS PART OF A SET OF PLANS WHICH COMPRISE OF C1.1, C1.2, C2.1, C2.2, C2.3 & C2.4.
 - INVERTS ARE APPROXIMATE ONLY, CONTRACTOR TO FIELD VERIFY AND REPORT ANY DISCREPANCIES TO ENGINEER.

1. ISSUED FOR ZBA	AVS	2020-08-20
No.	REVISION-ISSUANCE	BY

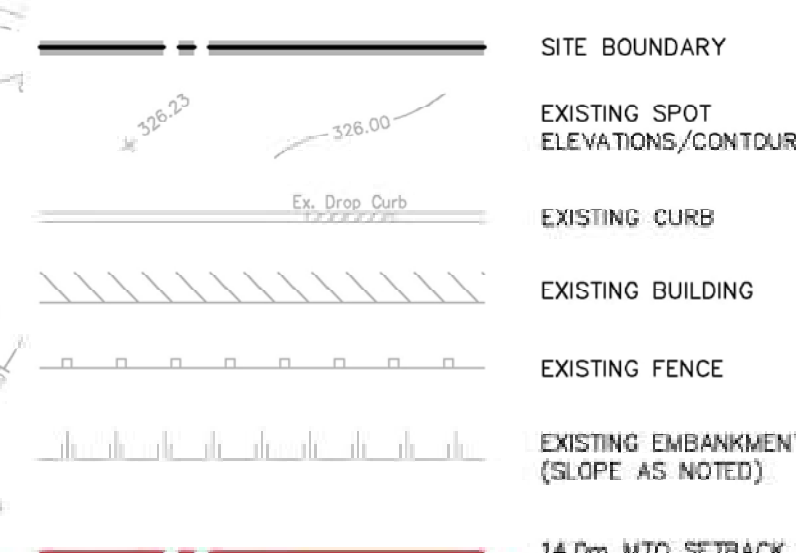


CLIENT
LIVWELL DEVELOPMENTS
499 BRANT STREET BURLINGTON
PROJECT
1310 SOUTH SERVICE ROAD
HAMILTON ONTARIO
DRAWING

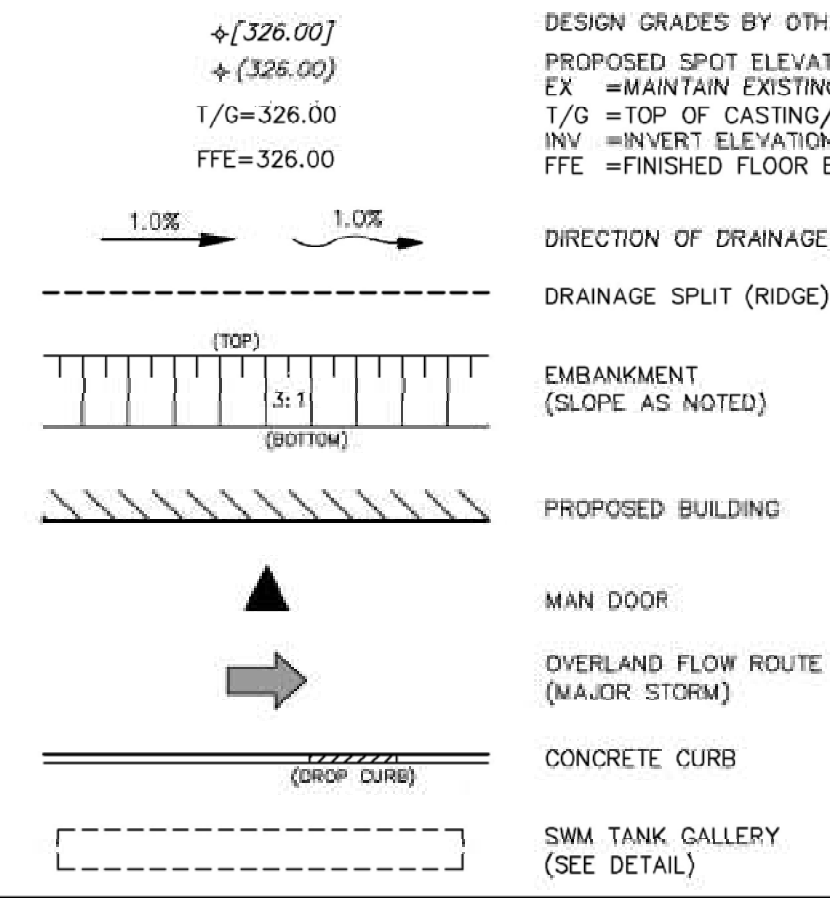
SITE GRADING PLAN

Design By	LJF	Project Manager	A.SAWATSKY
Drawn By	GLO/GGC	Project No.	65075_001
Checked By	AXS	Drawing No.	C2.1
Date	2020-05-15	Scale	1:300
		Sheet 3 of 6	

LEGEND OF EXISTING FEATURES

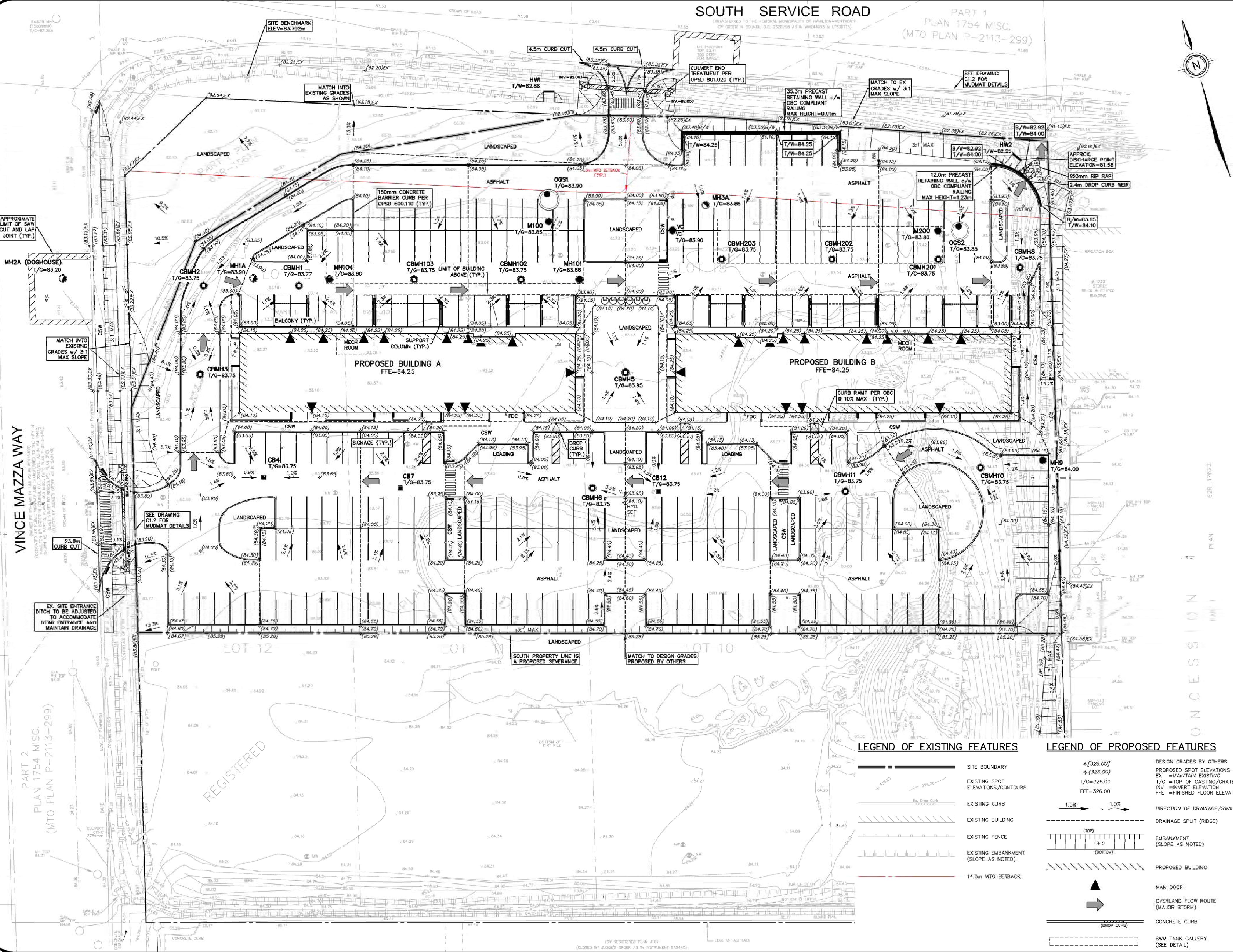


LEGEND OF PROPOSED FEATURES



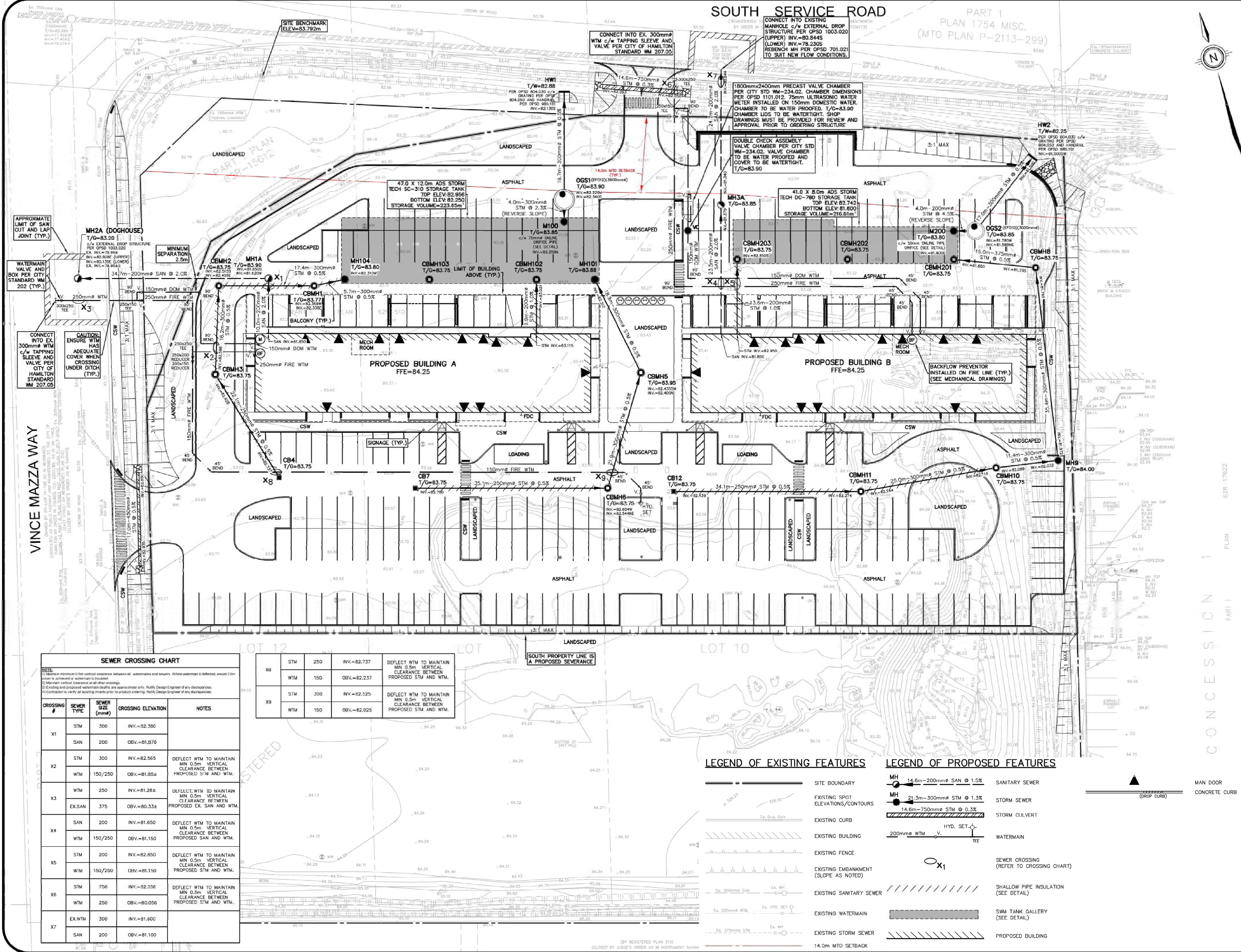
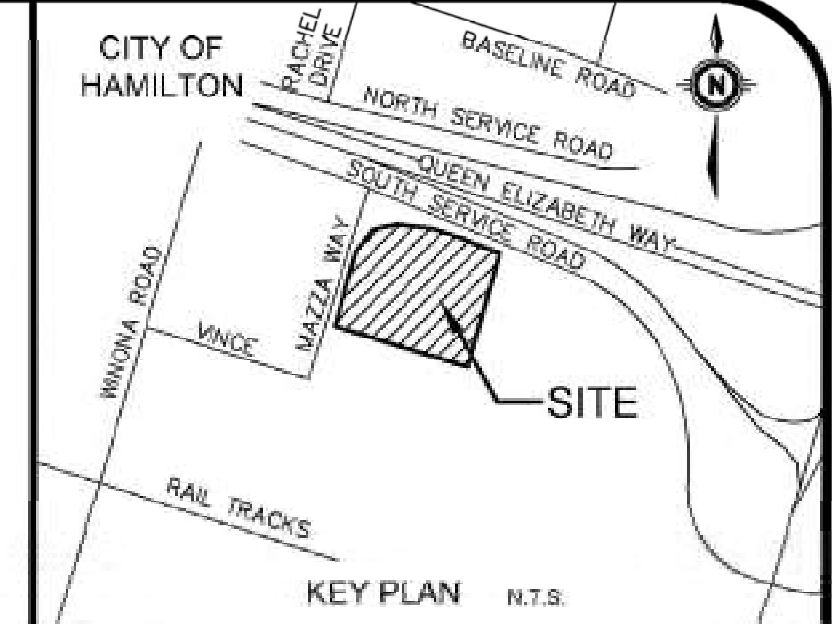
VINCE MAZZA WAY

PART 2
PLAN 1754 MISC.
(MTO PLAN P-2113-299)



MTE File Path: P:\65075_001\65075_001-C2

August 26, 2020 - 2:17:30 PM - Printed By: Matthew Russell



GEODETIC BM	ELEV. =	m
REFER TO DRAWING CREATED BY SURVEYORS ON SITE INC. DATED FEBRUARY 3, 2026.		
SITE BENCHMARK	ELEV. =	m
REFER TO DRAWING CREATED BY SURVEYORS ON SITE INC. DATED FEBRUARY 3, 2026.		
0 4 8 12 16 20 24m		

NOTE TO CONTRACTOR:

DO NOT SCALE DRAWINGS.

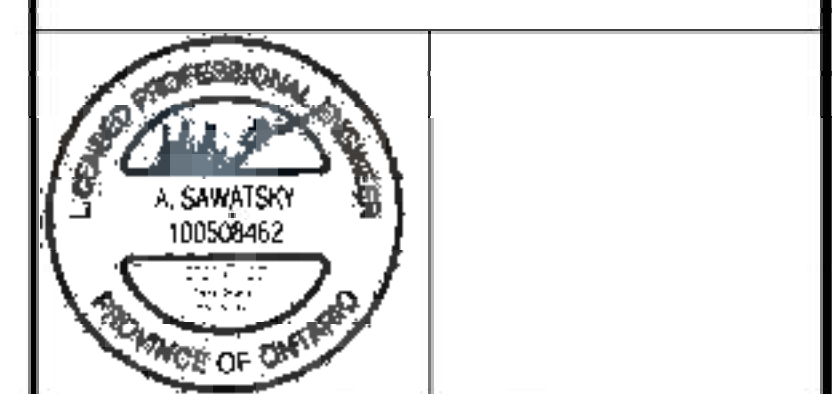
CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

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1.	ISSUED FOR ZBA	AVS	2026-08-26
No.	REVISION-ISSUANCE	BY	YYYY-MM-DD



LIVWELL DEVELOPMENTS

499 BRANT STREET BURLINGTON

PROJECT

1310 SOUTH SERVICE ROAD

HAMILTON ONTARIO

DRAWING

SITE SERVICING PLAN	
Design By	LJF
Project Manager	A.SAWATSKY
Drawn By	GLC/GGC
Project No.	65075_001
Checked By	AXS
Drawing No.	C2.2
Date (yyyy-mm-dd)	2026-05-15
Scale	1:300
Sheet 4 of 6	

SEWER CROSSING CHART				
CROSSING #	SEWER TYPE	SEWER SIZE (mm)	CROSSING ELEVATION	NOTES
X1	STM	300	INV.=82.380	
	SAN	200	OBV.=81.870	
X2	STM	300	INV.=82.565	DEFLECT WTM TO MAINTAIN MIN 0.5m VERTICAL CLEARANCE BETWEEN PROPOSED STM AND WTM.
	WTM	150/250	OBV.=81.85±	
X3	WTM	250	INV.=81.26±	DEFLECT WTM TO MAINTAIN MIN 0.5m VERTICAL CLEARANCE BETWEEN PROPOSED EX. SAN AND WTM.
	EX.SAN	375	OBV.=80.33±	
X4	SAN	200	INV.=81.650	DEFLECT WTM TO MAINTAIN MIN 0.5m VERTICAL CLEARANCE BETWEEN PROPOSED SAN AND WTM.
	WTM	150/250	OBV.=81.150	
X5	STM	200	INV.=82.850	DEFLECT WTM TO MAINTAIN MIN 0.5m VERTICAL CLEARANCE BETWEEN PROPOSED STM AND WTM.
	WTM	150/250	OBV.=81.150	
X6	STM	750	INV.=82.056	DEFLECT WTM TO MAINTAIN MIN 0.5m VERTICAL CLEARANCE BETWEEN PROPOSED STM AND WTM.
	WTM	250	OBV.=80.056	
X7	EX.WTM	300	INV.=81.600	
	SAN	200	OBV.=81.100	

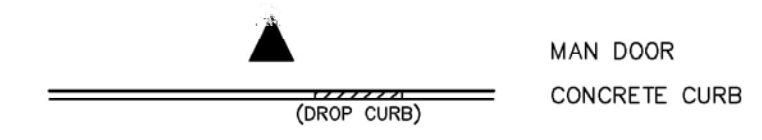
X8	STM	250	INV.=82.737	DEFLECT WTM TO MAINTAIN MIN 0.5m VERTICAL CLEARANCE BETWEEN PROPOSED STM AND WTM.
	WTM	150	OBV.=82.237	
X9	STM	300	INV.=82.525	DEFLECT WTM TO MAINTAIN MIN 0.5m VERTICAL CLEARANCE BETWEEN PROPOSED STM AND WTM.
	WTM	150	OBV.=82.025	

LEGEND OF EXISTING FEATURES

- SITE BOUNDARY
- EXISTING SPOT ELEVATIONS/CONTOURS
- EXISTING CURB
- EXISTING BUILDING
- EXISTING FENCE
- EXISTING EMBANKMENT (SLOPE AS NOTED)
- EXISTING SANITARY SEWER
- EXISTING WATERMAIN
- EXISTING STORM SEWER
- 14.0m MTO SETBACK

LEGEND OF PROPOSED FEATURES

- 14.6m-200mm SAN @ 1.5%
- 21.3m-300mm STM @ 1.3%
- 14.6m-750mm STM @ 0.3%
- HYD. SET
- TEE
- SEWER CROSSING (REFER TO CROSSING CHART)
- SHALLOW PIPE INSULATION (SEE DETAIL)
- SWM TANK GALLERY (SEE DETAIL)
- PROPOSED BUILDING



CONSTRUCTION NOTES AND SPECIFICATIONS

1. GENERAL

- 1.1. THESE PLANS ARE NOT FOR CONSTRUCTION UNTIL SIGNED AND SEALED BY ENGINEER AND APPROVED BY THE CITY OF HAMILTON.
- 1.2. THESE PLANS ARE TO BE USED FOR SERVING AND GRADING ONLY. ANY OTHER INFORMATION SHOWN IS FOR ILLUSTRATION PURPOSES ONLY. THESE PLANS MUST NOT BE USED TO SITE THE PROPOSED BUILDING.
- 1.3. NO CHANGES ARE TO BE MADE WITHOUT THE APPROVAL OF THE DESIGN ENGINEER.
- 1.4. THESE PLANS ARE NOT TO BE REPRODUCED IN WHOLE OR IN PART WITHOUT THE PERMISSION OF MTE CONSULTANTS INC.
- 1.5. THE APPROVAL OF THESE PLANS DO NOT EXEMPT THE OWNER'S BONDED CONTRACTOR FROM THE REQUIREMENTS TO OBTAIN THE VARIOUS PERMITS NORMALLY REQUIRED TO COMPLETE A CONSTRUCTION PROJECT, SUCH AS, BUT NOT LIMITED TO THE FOLLOWING:

- 1.5.1. ROAD OUT PERMIT
- 1.5.2. APPROACH APPROVAL PERMITS
- 1.5.3. COMMITTEE OF ADJUSTMENT
- 1.5.4. SEWER PERMITS
- 1.5.5. RELOCATION OF SERVICES
- 1.5.6. ENCROACHMENT AGREEMENTS

1.6. PRIOR TO CONSTRUCTION, THE CONTRACTOR MUST:

- 1.6.1. 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.
- 1.6.2. OBTAIN ALL UTILITY LOCATES AND REQUIRED PERMITS AND LICENCES.
- 1.6.3. VERIFY THAT THE FINISHED FLOOR ELEVATIONS AND BASEMENT FLOOR ELEVATIONS (WHICH MAY APPEAR ON HIS PLAN) COMPLY WITH THE FINAL ARCHITECTURAL DRAWINGS.
- 1.6.4. CONFIRM ALL DRAWINGS USED FOR CONSTRUCTION ARE OF THE MOST RECENT REVISION
- 1.7. THE CONTRACTOR SHALL ASSUME ALL LIABILITY FOR ANY DAMAGE TO EXISTING WORKS.

- 1.8. ALL WORKS ON A MUNICIPAL RIGHT-OF-WAY WILL BE INSTALLED BY THE OWNER'S BONDED CONTRACTOR UPON APPLICATION BY OWNER AT OWNER'S EXPENSE. UNDER THE ROAD CUT PERMIT, THE CONTRACTOR IS TO MAKE CONNECTION TO THE SERVICES AND MAKE AND MAINTAIN THE TEMPORARY REPAIR OVER THE CUT. WITH PERMANENT REPAIR BEING MADE BY THE CITY CONTRACTOR AT THE OWNER/OWNER'S CONTRACTOR COST. THE CONTRACTOR IS RESPONSIBLE FOR RESTORATION OF ALL BOULEVARD AREAS.

- 1.9. CONSTRUCTION OF SEWERS, WATERMAINS AND RELATED APPURTENANCES SHALL BE UNDERTAKEN IN ACCORDANCE WITH THE CITY OF HAMILTON CONSTRUCTION AND MATERIALS SPECIFICATIONS MANUAL (LATEST EDITION), THE ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD), AND MINISTRY OF THE ENVIRONMENT GUIDELINES (LATEST EDITION). THE CITY DRAWINGS SHALL TAKE PRECEDENT OVER THE OPSD DRAWINGS.

- 1.10. ALL SEWERS ARE TO BE INSTALLED WITH A MINIMUM COVER OF 2.20m AT THE PROPERTY LINE BELOW THE FINAL ROAD GRADE OR AT SUCH HIGHER ELEVATION ONLY AS MAY BE NECESSITATED BY THE ELEVATIONS OF PRIVATE PROPERTY OR PRIVATE PROPERTY THE MINIMUM COVER IS TO BE NO LESS THAN 1.2m.

- 1.11. FLEXIBLE SANITARY AND STORM SEWERS SHALL BE CONNECTED TO MANHOLES USING HOT-W-SEA BOOTHS OR APPROVED EQUIVALENT. RIGID SANITARY AND STORM SEWER CONNECTIONS TO MANHOLES SHALL BE GROUDED IN PLACE. ALL CONNECTIONS TO MANHOLES SHALL BE IN ACCORDANCE WITH OPSD 701.010. ANY CONNECTIONS TO CATCHBASINS SHALL BE GROUDED IN PLACE.

- 1.12. INFORMATION REGARDING ANY EXISTING SERVICES AND/OR UTILITIES SHOWN ON THE APPROVED SET OF CONSTRUCTION DRAWINGS, IS FURNISHED AS THE BEST AVAILABLE INFORMATION. THE CONTRACTOR SHALL INTERPRET THIS INFORMATION AS HE SEES FIT WITH THE UNDERSTANDING THAT THE OWNER AND HIS AGENTS DISCLAIM ALL RESPONSIBILITY FOR ITS ACCURACY AND/OR SUFFICIENCY.

- 1.13. NO BLASTING WILL BE PERMITTED.

- 1.14. ALTERNATIVE MATERIALS WILL NOT BE ALLOWED UNLESS FIRST APPROVED IN WRITING BY THE CONSULTANT AND THE CITY OF HAMILTON.

- 1.15. APPROVED FILL, FREE OF DELETERIOUS AND ORGANIC MATERIAL AND Boulders SHALL BE COMPACTED TO A DRY DENSITY NOT LESS THAN 95% OF THE STANDARD PROCTOR DENSITY. AFTER COMPACTION, SOIL DENSITY TESTS SHALL BE CONDUCTED TO ENSURE ADEQUATE COMPACTION AND STABILITY OF THE FILL AND TEST RESULTS SHALL BE SUBMITTED TO THE ENGINEER.

- 1.16. CONTRACTOR IS RESPONSIBLE FOR CONTACTING ENGINEER 48 HRS PRIOR TO COMMENCING WORK TO ARRANGE FOR INSPECTION. ENGINEER TO DETERMINE DEGREE OF INSPECTION AND TESTING REQUIRED. FOR CERTIFICATION OF UNDERGROUND SERVICE INSTALLATION AS MANDATED BY ONTARIO BUILDING CODE DIVISION C, PART 1, SECTION 1.2.2, GENERAL REVIEW. FAILURE TO NOTIFY ENGINEER WILL RESULT IN EXTENSIVE POST CONSTRUCTION INSPECTION AT CONTRACTORS EXPENSE.

- 1.17. PLAN TO BE READ IN CONJUNCTION WITH MTE DRAWING C1.1, C1.2, C2.1, C2.2, C2.3 AND C2.4.

- 1.18. PLAN TO BE READ IN CONJUNCTION WITH SWM REPORT PREPARED BY MTE CONSULTANTS INC.
- 1.19. SITE PLAN INFORMATION TAKEN FROM PLAN PREPARED BY PATRICK DAVID TROTTER ARCHITECT, DATED AUGUST 06, 2026.

- 1.20. EXISTING TOPOGRAPHIC AND LEGAL INFORMATION TAKEN FROM PLAN PREPARED BY SURVEYORS ON SITE INC. DATED FEBRUARY 18, 2026. MTE ASSUMES THAT ALL TOPOGRAPHICAL INFORMATION IS AN ACCURATE REPRESENTATION OF CURRENT CONDITIONS.

- 1.21. RETAINING WALLS TO BE DESIGNED BY OTHERS. FOR WALLS EXCEEDING 1.0m IN HEIGHT, SHOP DRAWINGS MUST BE SUBMITTED FOR REVIEW AND APPROVAL AND BUILDING PERMIT MUST BE OBTAINED. 0.6m IN HEIGHT OR LESS REQUIRE GUARDS. HIGH SIDE OF RETAINING WALLS TO BE BACKFILLED WITH FREE DRAINING MATERIAL.

- 1.22. SITE SERVING CONTRACTOR TO TERMINATE ALL SERVICES 1.0 METRES FROM FOUNDATION WALL.

- 1.23. FILTER FABRIC TO BE TERRAFIX 270R OR APPROVED EQUIVALENT.

- 1.24. 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, DELINEATOR MARKERS, CONE BARRIERS, ALL SIGNS, ETC. SHALL CONFORM TO THE STANDARDS OF THE CITY OF CAMBRIDGE AND THE MTO MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES.

- 1.25. THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, 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 QUANTIFIED. 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.

- 1.26. CONTRACTOR TO MAINTAIN A "CONFINED TRENCH CONDITION" IN ALL SEWER AND SERVICE TRENCHES.

- 1.27. FOLLOWING COMPLETION OF PROPOSED WORKS AND PRIOR TO OCCUPANCY INSPECTION, ALL STORM AND SANITARY SEWERS ARE TO BE FLUSHED, AND ALL CATCHBASIN AND CATCHBASIN MANHOLE SUMPS ARE TO BE CLEANED OF DEBRIS AND SILT.

- 1.28. CONTRACTOR TO COMPLY WITH OREG. 406/19 FOR MANAGEMENT OF EXCESS SOILS AS APPLICABLE.

- 1.29. APPROVAL OF THIS DRAWING IS FOR MATERIAL ACCEPTABILITY AND COMPLIANCE WITH MUNICIPAL AND PROVINCIAL SPECIFICATIONS AND STANDARDS ONLY. APPROVAL AND INSPECTION BY THE CITY OF THE WORKS DOES NOT CERTIFY THE LINE AND GRADE OF THE WORKS AND IT IS THE OWNER'S RESPONSIBILITY TO HAVE THEIR ENGINEER CERTIFY THIS ACCORDINGLY.

2. STORM SEWERS

- 2.1. 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 GRAN. "A". TRENCH BACKFILL TO BE NATIVE MATERIAL REPLACED IN 300mm LIFTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY.
- 2.2. STORM SEWERS 200mm TO 375mm SHALL BE POLYVINYL CHLORIDE (PVC) PIPE SDR35 ASTM-D3034 WITH INTEGRAL BELL AND SPIGOT UTILIZING FLEXIBLE ELASTOMERIC SEALS.

- 2.3. STORM SEWERS, 450mm AND LARGER, SHALL BE POLYVINYL CHLORIDE (PVC) PIPE SDR35 ASTM-D3034 WITH INTEGRAL BELL AND SPIGOT UTILIZING FLEXIBLE ELASTOMERIC SEALS OR CONCRETE PIPE, CSA-A257.2 65-0 WITH RUBBER GASKET JOINT WITH INTEGRAL BELL AND SPIGOT UTILIZING FLEXIBLE ELASTOMERIC SEALS.

- 2.4. FACTORY FABRICATED TEES SHALL BE USED FOR ALL STORM SERVICE CONNECTIONS.

- 2.5. MANHOLES AND MANHOLE CATCHBASINS TO BE 1200mm DIAMETER PRECAST WITH ALUMINUM STEPS AT 300mm CENTRES AS PER OPSD 701.010 UNLESS OTHERWISE SPECIFIED. (NO SUMPS)

- 2.6. CATCHBASINS TO BE 600mm SQUARE PRECAST AS PER OPSD 705.010, MODIFIED WITH A GOSS TRAP AS PER SEW-304. (GOSS TRAPS ARE NOT REQUIRED ON C/S WITHIN GRASSED AREAS).

- 2.7. ALL STORM STRUCTURES TO HAVE A MINIMUM 600mm DEEP SUMP.

- 2.8. MANHOLE AND CATCHBASIN, FRAMES, GRATES, CASTINGS AND LIDS TO BE QUALITY GREY IRON ASTM A48 CLASS 30B.

- 2.9. STORM MANHOLE LIDS TO BE PER OPSD 401.010 - TYPE 'A' CATCHBASIN AND CATCHBASIN MANHOLE GRATES TO BE PER OPSD 400.100. DITCH INLET CATCHBASIN GRATES TO BE PER OPSD 403.010.

- 2.10. ADJUSTMENT UNITS FOR STORM STRUCTURES TO BE IN ACCORDANCE WITH OPSD 704.010 OR 704.011.

- 2.11. STORM SEWERS AND SERVICES TO HAVE MINIMUM 1.2m COVER WHERE COVER OVER SERVICES IS DEFICIENT. THE CONTRACTOR SHALL LONGITUUDINALLY CENTER OVER THE PIPE. PLASTISPAN H.D. BELOW GRADE RIGID INSULATION OR APPROVED EQUIVALENT, WITH OVERLAPPING JOINTS. INSULATION TO BE 1950mm WIDE AND 75mm THICK.

- 2.12. CONTRACTOR RESPONSIBLE FOR TESTING OF STORM SEWERS IN ACCORDANCE WITH OPS5 410.

- 2.13. CULVERTS SHALL BE MINIMUM 14 GAGE INSTALLED AS PER OPS5 421 AND OPSD 802.010 (TYPE 2, USING GRAN 'A' FOR COVER AND BEDDING MATERIAL).

- 2.14. STORMCEPTOR MANUFACTURER TO PROVIDE WRITTEN CERTIFICATION OF THE INSTALLATION TO THE ENGINEER AND THE CITY.

- 2.15. UNDER NO CIRCUMSTANCES SHALL THE BUILDING FOUNDATION DRAINS BE CONNECTED DIRECTLY TO THE STORM SEWER SYSTEM.

- 2.16. ALL WEEPING TILE DRAINAGE TO BE PUMPED TO THE STORM SEWER SYSTEM.

3. SANITARY SEWERS

- 3.1. 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 GRAN. "A". TRENCH BACKFILL TO BE NATIVE MATERIAL REPLACED IN 300mm LIFTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY.

- 3.2. SANITARY SEWERS 150mm AND SMALLER SHALL BE POLYVINYL CHLORIDE (PVC) PIPE SDR28 ASTM-D3034 WITH INTEGRAL BELL AND SPIGOT UTILIZING FLEXIBLE ELASTOMERIC SEALS.

- 3.3. SANITARY SEWERS GREATER THAN 150mm SHALL BE POLYVINYL CHLORIDE (PVC) PIPE DR35 ASTM-D3034 WITH INTEGRAL BELL AND SPIGOT UTILIZING FLEXIBLE ELASTOMERIC SEALS.

- 3.4. MANHOLES TO BE 1200mm DIAMETER PRECAST WITH ALUMINUM STEPS AT 300mm CENTRES AS PER OPSD 701.010.

- 3.5. MANHOLES TO BE BENCHED PER OPSD 701.021.

- 3.7. SANITARY MANHOLE LIDS TO BE PER OPSD 401.010 - TYPE 'A'. SANITARY MANHOLE LIDS TO BE WATER TIGHT PER OPSD 401.030 WHEN LOCATED IN SIM PONDING AREA.

- 3.8. MANHOLE FRAMES, CASTINGS AND LIDS TO BE QUALITY GREY IRON ASTM A48 CLASS 30B.

- 3.9. ADJUSTMENT UNITS FOR SANITARY STRUCTURES TO BE IN ACCORDANCE WITH OPSD 704.010 OR 704.011.

- 3.10. FACTORY FABRICATED WYES SHALL BE USED FOR ALL SANITARY SERVICE CONNECTIONS.

- 3.11. SANITARY SEWERS AND SERVICES TO HAVE MINIMUM 1.2m COVER. WHERE COVER OVER SERVICES IS DEFICIENT, THE CONTRACTOR SHALL LONGITUUDINALLY CENTER OVER THE PIPE. PLASTISPAN H.D. BELOW GRADE RIGID INSULATION OR APPROVED EQUIVALENT, WITH OVERLAPPING JOINTS. INSULATION TO BE 1950mm WIDE AND 75mm THICK.

- 3.12. CONTRACTOR RESPONSIBLE FOR TESTING OF SANITARY SEWERS IN ACCORDANCE WITH OPS5 409.

4. WATERMAINS

- 4.1. PIPE BEDDING AND COVER MATERIAL FOR WATERMAINS AND SERVICES TO BE INSTALLED AS PER CITY OF HAMILTON STANDARD DRAWING No. WM-200.01 (CONCRETE AND PVC), AND WM-200.02 (DUCTILE IRON). BOTH BEDDING AND COVER MATERIAL TO BE GRANULAR "A" BEDDING. FOR WATERMAINS GREATER THAN 50mm AND GRANULAR "D" FOR SERVICES 50mm AND SMALLER. TRENCH BACKFILL TO BE NATIVE MATERIAL REPLACED IN 300mm LIFTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY.

- 4.2. ALL MATERIALS AND CONSTRUCTION METHODS MUST CORRESPOND TO THE CURRENT CITY OF HAMILTON STANDARDS.

- 4.3. FOR SERVICES GREATER THAN 50mm, THE PROPOSED WATER SERVICE BOTH WITHIN THE ROAD ALLOWANCE AND ON PRIVATE PROPERTY MAY EITHER BE DUCTILE IRON (CLASS 52), COPPER, OR PVC RATED AT MINIMUM WORKING PRESSURE OF 150 PSI (DR18). SERVICES 50mm AND LESS MUST BE COPPER WITHIN THE ROAD ALLOWANCE. HOWEVER, PVC OR AN ALTERNATE MATERIAL APPROVED FOR USE UNDER THE ONTARIO BUILDING CODE MAY BE USED ON PRIVATE PROPERTY.

- 4.4. PVC WATER MAIN/SERVICE MATERIAL, CATHODIC PROTECTION, TRACER WIRE ETC. MUST BE AS PER FORM 400.

- 4.5. MAIN STOPS, CURB STOPS AND COUPLINGS SHALL BE AWWA C-800 COPPER TO COPPER FLANGED OR COMPRESSION CONNECTION OR APPROVED EQUIVALENT.

- 4.6. A MINIMUM HORIZONTAL SEPARATION OF 2.5m IS TO BE MAINTAINED BETWEEN SEWERS AND WATERMAIN, WHERE THE WATERMAIN CROSSES OVER THE SEWER, 0.25m MINIMUM VERTICAL SEPARATION IS TO BE MAINTAINED PER CITY OF HAMILTON STANDARDS.

- 4.7. ALL WATERMAINS AND SERVICES TO HAVE MINIMUM 1.6m COVER TO TOP OF PIPE. WHERE COVER OVER SERVICES IS DEFICIENT, THE CONTRACTOR SHALL LONGITUUDINALLY CENTER OVER THE PIPE. PLASTISPAN H.D. BELOW GRADE RIGID INSULATION OR APPROVED EQUIVALENT, WITH OVERLAPPING JOINTS. INSULATION TO BE 1950mm WIDE AND 75mm THICK.

- 4.8. CITY OF HAMILTON TO SUPPLY AND INSTALL WATER METER BY APPOINTMENT UNDER THE WATER METER PERMIT. CONTRACTOR TO INSTALL METER SPACER (OBTAINED FROM CITY). ALL VALVES, PIPING AND REMOTE METER READOUT AT LOCATION ON BUILDING EXTERIOR ACCEPTABLE TO MUNICIPALITY. INTERNAL METERS TO BE INSTALLED AT FLOOR GRADE AS PER WM-210.

- 4.9. AS A FIRE SERVICE IS PROPOSED TO THE BUILDING, A BACKFLOW PREVENTOR MAY BE REQUIRED IN ACCORDANCE WITH THE ONTARIO BUILDING CODE. A BACKFLOW PREVENTOR IS REQUIRED IT MUST BE LOCATED AT THE SERVICE POINT OF ENTRY TO THE BUILDING.

- 4.10. ALL WATERMAIN TO BE PRESSURE TESTED IN ACCORDANCE WITH OPS5 441, AND HAMILTON FORM 400.10.06. ALL TESTING AND DISINFECTION TO BE COMPLETED UNDER THE SUPERVISION OF THE ENGINEER. CONTRACTOR TO SUBMIT WATER COMMISSIONING PLAN IN ACCORDANCE WITH CITY OF HAMILTON SPECIFICATIONS. THIS PLAN MUST BE APPROVED BY THE CITY OF HAMILTON PRIOR TO ANY WATERMAIN WORK.

- 4.11. ALL PROPOSED WATER PIPING MUST BE ISOLATED FROM EXISTING LINES IN ORDER TO ALLOW INDEPENDENT PRESSURE TESTING AND CHLORINATING FROM EXISTING SYSTEM.

4.11.1. WATERMAIN SHUTDOWN

- 4.11.2. MAXIMUM 4 HOUR SHUTDOWN OF EXISTING MAIN AT A TIME CONVENIENT TO THE CITY OF HAMILTON AND ABUTTING USERS.

- 4.11.3. CONTRACTOR TO GIVE 48 HOUR PRIOR NOTIFICATION USING THE "CITY OF HAMILTON NOTICE OF SHUTDOWN" FOR ALL AFFECTED AREAS.

- 4.11.4. IN THE EVENT A SCHEDULED SHUTDOWN IS CANCELLED BY THE CITY OF HAMILTON, THE CONTRACTOR SHALL HAVE NO CLAIMS AGAINST THE CITY.

- 4.12. ANCHOR OR THRUST BLOCKS ARE TO BE INSTALLED AT ALL WATER SERVICE ELBOWS, TEES, PLUGS ETC. FOR 300mm DIAMETER WATER SERVICES AND SMALLER, ANCHOR BLOCKS ARE TO BE AS PER WM-204.01. FOR WATER SERVICES GREATER THAN 300mm, ANCHOR BLOCKS ARE TO BE AS PER WM-204.02 TO WM-204.13 AS APPLICABLE.

- 4.13. PVC WATERMAIN SHALL HAVE TWO STRANDED COPPER, AWG# TRACER WIRE STRAPPED TO TOP AT 5 METRE INTERVALS. TRACER WIRE SHALL BE BROUGHT TO THE SURFACE AT ALL HYDRANTS AND CAD WEPED TO THE LOWER FLANGE OF THE HYDRANT. CATHODIC PROTECTION TO BE PROVIDED FOR ALL PVC WATER SERVICE AND MAIN INSTALLATION IN ACCORDANCE WITH CITY OF HAMILTON STANDARD FORM 400.

- 4.14. ALL HYDRANTS ARE TO BE INSTALLED AS PER WM-203.01 AND ARE TO BE COMPLETE WITH A SECONDARY VALVE. SECONDARY VALVES ARE TO BE CLOSE COUPLED TO THE HYDRANT IN ALL CASES, AND ARE TO OPEN RIGHT IN THE ORIGINAL CITY OF HAMILTON (PRIOR TO AMALGAMATION), AND LEFT IN THE OTHER FIVE. THE MAIN HYDRANT VALVE IS TO BE OPEN LEFT, WITH CLEAR MARKINGS CAST IN THE BONNET SHOWING AN OPEN LEFT DIRECTIONAL INDICATOR ARROW. A BLACK LETTER 'L' MUST ALSO BE TO MARKED ON THE BONNET INDICATING THE MAIN HYDRANT VALVE IS TO BE OPEN LEFT. HYDRANTS ARE TO BE EQUIPPED WITH 100mm (4 INCH) STORZ PUMPER NOZZLES, BLACK IN COLOUR.

- 4.15. SERVICE BOXES TO BE MUELLER H-10300 SERIES, CLOW "D" SERIES COMPLETE WITH ROD AND PLUG OR EQUIVALENT AS PER THE APPROVED WATERMAIN PRODUCTS LIST, CITY OF HAMILTON CONSTRUCTION AND MATERIAL SPECIFICATIONS MANUAL.

- 4.16. ALL CHECK VALVES TO BE GRANE SERIES 125, Model No. 373 (DIRECT BURY TYPE) OR APPROVED EQUIVALENT.

- 4.17. ALL UNUSED WATER SERVICES ARE TO BE PROPERLY ABANDONED.

- 4.18. ALL BACKFLOW PREVENTION DEVICES MUST BE SELECTED, INSTALLED & MAINTAINED IN ACCORDANCE WITH THE CITY OF HAMILTON'S BACKFLOW PREVENTION BY-LAW #10-103, INCLUDING THE MANUFACTURER'S SPECIFICATIONS FOR INSTALLATION ETC., AND GUIDELINES SET OUT IN THE MOST RECENT VERSIONS OF THE "AWWA CANADIAN CROSS CONNECTION CONTROL MANUAL" AND THE "CSA B64.10 / 07 / B64.10.1-07 STANDARDS". IN SELECTING A BACKFLOW DEVICE FOR A PROPERTY, THE CONTRACTOR MUST BE AWARE OF THE POSSIBLE USES OF THE SITE WHICH COULD RESULT IN A HIGHER RISK TO THE MUNICIPAL DRINKING WATER SYSTEM, THIS MAKING THE DEVICE CHOICE CRITICAL. THE CONTRACTOR MUST BE AWARE OF THE REQUIREMENT FOR FUTURE CHANGE OUT AT THE OWNER'S EXPENSE.

5. GRADING NOTES

- 5.1. ANY CHANGES IN GRADES AND CATCH BASINS REQUIRE THE APPROVAL OF THE DIRECTOR OF DEVELOPMENT ENGINEERING, PLANNING AND ECONOMIC DEVELOPMENT DEPARTMENT.

- 5.2. FILTER FABRIC TO BE TERRAFIX 270R OR APPROVED EQUAL.

- 5.3. MINIMUM GRASSED SLOPE TO BE 3:1. SLOPES GREATER THAN 3:1 TO BE LANDSCAPED WITH LOW MAINTENANCE GROUND COVER.

- 5.4. MINIMUM ASPHALT GRADE TO BE 1.0%, MINIMUM GUTTERLINE GRADE TO BE 0.5%.

- 5.5. CONTRACTOR TO MATCH EXISTING GRADES AT PROPERTY LINE UNLESS OTHERWISE NOTED.

- 5.6. ALL DRIVEWAYS FROM PROPERTY LINES FOR THE FIRST 7.5m SHALL BE WITHIN 5% MAX. GRADE, THEREAFTER, ALL DRIVEWAYS SHALL BE WITHIN 10% MAXIMUM GRADES.

- 5.7. PRIOR TO REMOVING ANY EXCESS SOILS FROM THE SITE, CONTRACTOR TO CONTACT THE ARCHITECT FOR DIRECTION ON CREATING EARTHEN BERMS ON-SITE.

- 5.8. ALL LANDSCAPED AREAS ARE TO HAVE A MINIMUM 2.0% SLOPE.

6. RESTORATIONS

- 6.1. ALL RESTORATIONS TO CONFORM TO HAMILTON FORM 300.30.

- 6.2. RESTORATIONS OF ROAD OVER UTILITY CUTS IN HAMILTON TO BE AS PER STANDARD DRAWINGS R0-100.01 AND R0-100.02, WITH GRANULAR "A" BEDDING. THE CONTRACTOR MUST BE BONDED WITH THE CITY OF HAMILTON AND MAKE AND MAINTAIN THE TEMPORARY ROAD REPAIR OVER THE CUT, WITH PERMANENT REPAIR BEING MADE BY THE CITY CONTRACTOR AT THE OWNER/OWNER'S CONTRACTOR COST.

- 6.3. ALL BOULEVARDS TO BE RESTORED WITH #1 NURSERY SOD ON A MINIMUM 100mm OF SELECT TOPSOIL.

- 6.4. CONTRACTOR SHALL CO-ORDINATE THE REMOVAL AND RESTORATION OF EXISTING PARKING METERS AND STREET SIGNS WITH THE CITY OF HAMILTON TRAFFIC DEPARTMENT.

- 6.5. ALL FENCES AFFECTED BY CONSTRUCTION SHALL BE REMOVED, TEMPORARILY RELOCATED AND/OR STOCKPILED IF APPROVED BY THE ENGINEER, AND REINSTATED UPON COMPLETION OF CONSTRUCTION.

7. SEWER ABANDONMENT NOTES

- 7.1. ALL EXISTING UNUSED SEWERS MUST BE PROPERLY ABANDONED, BY EITHER COMPLETELY REMOVING THOSE SEWERS OR BY GROUTING EITHER END OF THE SEWER WITH A MINIMUM 300mm THICK CONCRETE PLUG.

- 7.2. UNUSED MAINTENANCE HOLES AND CATCH BASINS MUST BE COMPLETELY REMOVED.

- 7.3. OPENING IN MAINTENANCE HOLES WHERE SERVICES WERE REMOVED MUST BE BRICKED AND PARGED.

8. EROSION AND SEDIMENT CONTROL

- 8.1. 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. BUT PRIOR TO FENCE BECOMING OVERGROWN. ENGINEER'S REPRESENTATIVE TO DETERMINE IF VEGETATION HAS REACHED THE CRITICAL POINT AND WILL THEN INSTRUCT CONTRACTOR TO REMOVE FENCE.

- 8.2. ALL EROSION AND SEDIMENT CONTROL MEASURES (TEMPORARY SEDIMENT CONTROL FENCES, STORM SEWER BULKHEADS, ROCK CHECK DAMS, WORK LIMIT FENCES, SEDIMENT BASINS, ETC.) MUST BE INSTALLED PRIOR TO COMMENCEMENT OF CONSTRUCTION.

- 8.3. TEMPORARY VEHICLE TRACKING CONTROLS TO BE CONSTRUCTED AS PER REQUIREMENTS IN "EROSION & SEDIMENT CONTROL GUIDELINE FOR URBAN CONSTRUCTION" DATED DECEMBER 2006, AT ALL ACCESS POINTS. CONTRACTOR SHALL MAINTAIN THESE AS REQUIRED AND AS DIRECTED BY THE CITY ENGINEER.

- 8.4. OVERLAND SHEET FLOW EROSION PROTECTION SHALL BE AS PER OPSD 219.130. IF EXCESSIVE SETBACK BUILDUP/BLUCKAGE OCCURS (VISUAL INSPECTION) THEN REPLACEMENT OF THE FILTER CLOTH IS REQUIRED.

- 8.5. CATCH BASIN SEDIMENT CONTROL DEVICE, I.E. "SILTSACK" BY ACF ENVIRONMENT OR APPROVED EQUIVALENT, TO BE PLACED AS PER MANUFACTURER'S RECOMMENDATIONS (SEE DETAIL). IF MAINTENANCE IS REQUIRED ("SILTSACK" SUMPS AND SEDIMENT TRAPS ARE TO BE INSPECTED FOR SEDIMENT ACCUMULATION AND FILTER CLOTH BLOCKAGE ON A WEEKLY BASIS). THESE SEDIMENT TRAPS ARE NOT TO BE REMOVED UNTIL THE CURBS AND THE BOULEVARDS SODDED. SEDIMENT TRAPS SHALL ALSO BE PLACED AS PER DETAIL AT ALL CATCH BASINS LOCATIONS IN AREAS TO BE VEGETATED AND MAINTAINED UNTIL GROUND COVER IS ESTABLISHED.

- 8.6. ALL SILT FENCING TO BE INSTALLED PRIOR TO ANY AREA GRADING, EXCAVATING OR DEMOLITION COMMENCING.

- 8.7. EROSION CONTROL FENCING TO BE INSTALLED AROUND BASE OF ALL STOCKPILES.

- 8.8. MUD MATS TO BE PROVIDED ON-SITE AT ALL LOCATIONS WHERE CONSTRUCTION VEHICLES EXIT THE SITE. MUD MATS SHALL BE A MINIMUM OF 3.0m WIDE, 15.0m LONG (LENGTH MAY VARY DEPENDING ON SITE LAYOUT) AND 0.3m DEEP AND SHALL CONSIST OF 200mm CLEAR STONE MATERIAL OR APPROVED EQUIVALENT. PROPOSED EROSION PROTECTION TO BE INTO MUD MAT. CONTRACTOR TO ENSURE ALL VEHICLES LEAVE THE SITE VIA THE MUD MAT AND THAT THE MAT IS MAINTAINED IN A MANNER TO MAXIMIZE EFFECTIVENESS AT ALL TIMES.

- 8.9. TOPSOIL PILES SHALL BE TEMPORARILY SEEDDED TO PREVENT EROSION. PLACEMENT OF VEGETATION SHALL BE IN ACCORDANCE WITH OPS5.572 WHERE REQUIRED. EROSION CONTROL BLANKETS SHALL BE PLACED AS PER OPS5.572, AT THE DIRECTION OF THE CITY ENGINEER.

- 8.10. 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.

- 8.11. NO ALTERNATE METHODS OF EROSION PROTECTION SHALL BE PERMITTED UNLESS APPROVED BY THE ENGINEER AND THE CITY OF HAMILTON DEPARTMENT OF PUBLIC WORKS.

- 8.12. CONTRACTOR TO CLEAN ROADWAY AND SIDEWALKS OF SEDIMENTS RESULTING FROM CONSTRUCTION TRAFFIC FROM THE SITE EACH DAY.

- 8.13. ALL DISTURBED AREAS NOT SCHEDULED FOR FURTHER CONSTRUCTION WITHIN 45 DAYS WILL BE PROVIDED WITH A SUITABLE TEMPORARY MULCH AND SEED COVER WITHIN 7 DAYS OF THE COMPLETION OF THAT PARTICULAR PHASE OF CONSTRUCTION.

- 8.14. ALL DISTURBED EXTERNAL AREAS SHALL BE REVEGETATED WITH PERMANENT COVER (AS DETAILED) WITHIN 7 DAYS OF THE COMPLETION OF THAT PARTICULAR PHASE OF CONSTRUCTION.

- 8.15. ADDITIONAL EROSION AND SEDIMENT CONTROL LOCATIONS/ MEASURES MAY BE REQUIRED AS DETERMINED BY THE CITY/CONSERVATION AUTHORITY.

9. MAINTENANCE RECOMMENDATIONS

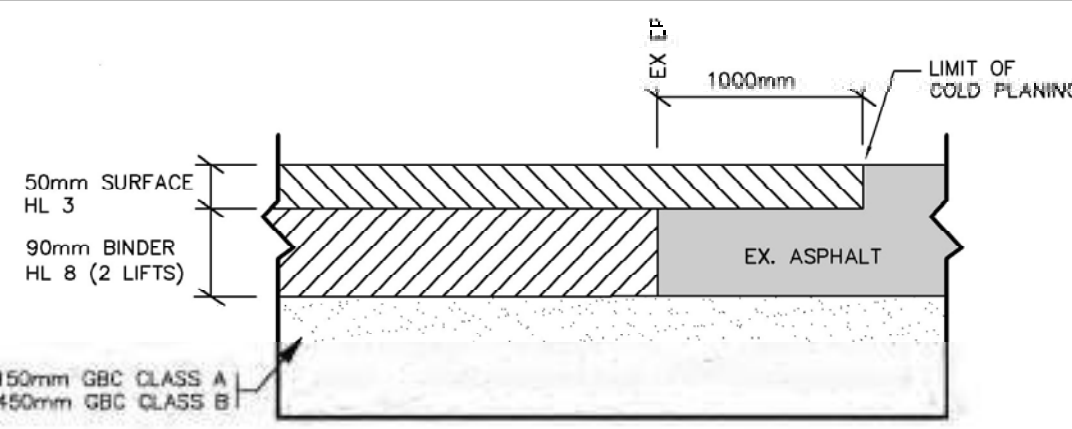
- 9.1. DURING THE COURSE OF CONSTRUCTION CONTRACTOR TO REMOVE SEDIMENT AND CONTAMINANTS FROM STORMWATER MANAGEMENT FACILITIES MONTHLY. FOLLOWING CONSTRUCTION CONTRACT COMPLETION, OWNER TO HIRE QUALIFIED CONTRACTOR TO REMOVE SEDIMENT AND CONTAMINANTS ANNUALLY AND REINSTATE STORMWATER MANAGEMENT FACILITIES ACCORDING TO THE DESIGN OUTLINED ON THIS PLAN, AS REQUIRED.

- 9.2. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE VISUALLY INSPECTED AFTER EACH WORKING DAY, AND MAINTAINED WHEN REQUIRED AS DIRECTED BY THE CONSULTANT AND TO THE SATISFACTION OF THE CITY/CONSERVATION AUTHORITY. THE CONSULTANT SHALL KEEP A DAILY RECORD OF INSPECTION, MAINTENANCE, ETC. AND PRESENT THE CITY WITH A COPY OF REPORT ON A MONTHLY BASIS.

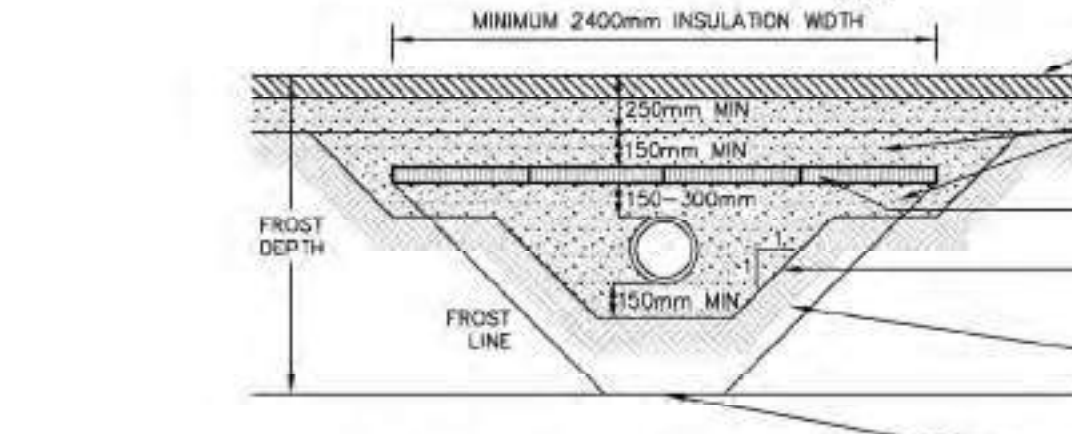
- 9.3. OWNER'S REPRESENTATIVE TO MONITOR EROSION CONTROL STRUCTURES TO ENSURE FENCING IS INSTALLED AND MAINTENANCE IS PERFORMED TO CITY REQUIREMENTS.

- 9.4. THE PROPOSED STORMCEPTOR(OCs) WILL REQUIRE REGULAR ANNUAL MAINTENANCE. OWNER TO ENTER INTO A MAINTENANCE AGREEMENT WITH A SUITABLE CONTRACTOR TO COMPLETE THIS WORK.

- 9.5. REGULAR MAINTENANCE FOR ALL CATCH BASINS (ON THE PUBLIC ROADWAY AND ON PRIVATE PROPERTY) AND INLET CHAMBERS IS REQUIRED (SEDIMENT TRAPS AND SUMPS SHALL BE INSPECTED FOR SEDIMENT ACCUMULATION, TRASH BUILDUP AND FILTER CLOTH BLOCKAGE ON A WEEKLY BASIS AND AFTER ANY MAJOR RAINFALL EVENT). ACCUMULATED SEDIMENT SHALL BE REMOVED BY MECHANICAL MEANS. FLUSHING OF SEDIMENT INTO THE STORMWATER SEWER SYSTEM IS PROHIBITED. THE SEDIMENT REMAINS IN THE CATCH BASIN 24 HOURS (MINIMUM) AFTER A STORM THEN CLEANING OR REPLACEMENT CLOTH IS REQUIRED.



ASPHALT JOINT DETAIL N.T.S.



SEWER PIPE INSULATION DETAIL N.T.S.

DESIGNATED ACCESS FOR ALL CONSTRUCTION TRAFFIC. INSTALL 'MUD MAT' AS PER DETAIL BELOW PRIOR TO ANY OTHER CONSTRUCTION. MAT TO BE MAINTAINED IN GOOD WORKING ORDER UNTIL GRADING WORKS ARE COMPLETED AND ROAD BASE HAS BEEN CONSTRUCTED.



CONSTRUCTION ACCESS DETAIL N.T.S.

PAVEMENT STRUCTURE (ASPHALT AND/OR GRANULAR), OR SELECT NATIVE MATERIAL AND TOPSOIL, AS SPECIFIED ON DRAWINGS.

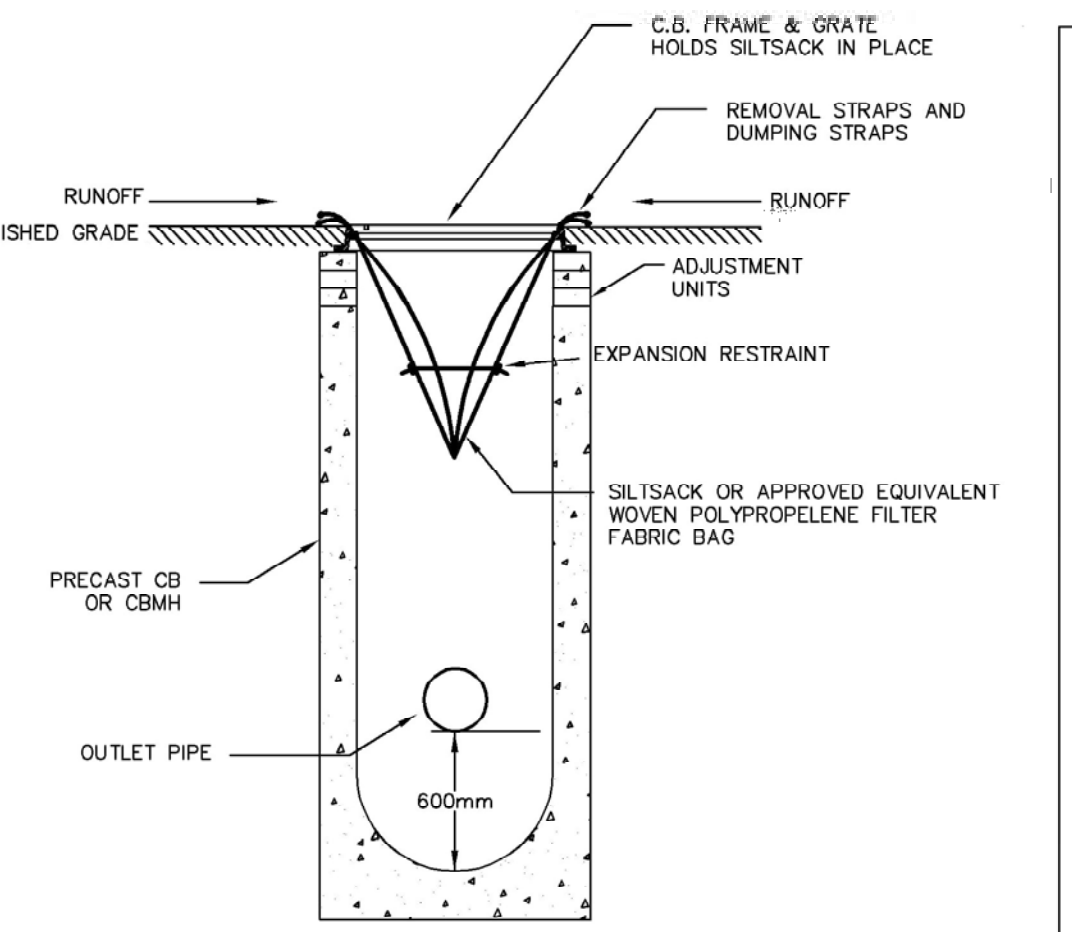
GRANULAR 'A' BEDDING & BACK FILL BELOW AND ABOVE PIPE AND INSULATION BOARD, COMPACTED TO MINIMUM 95% SPMD.

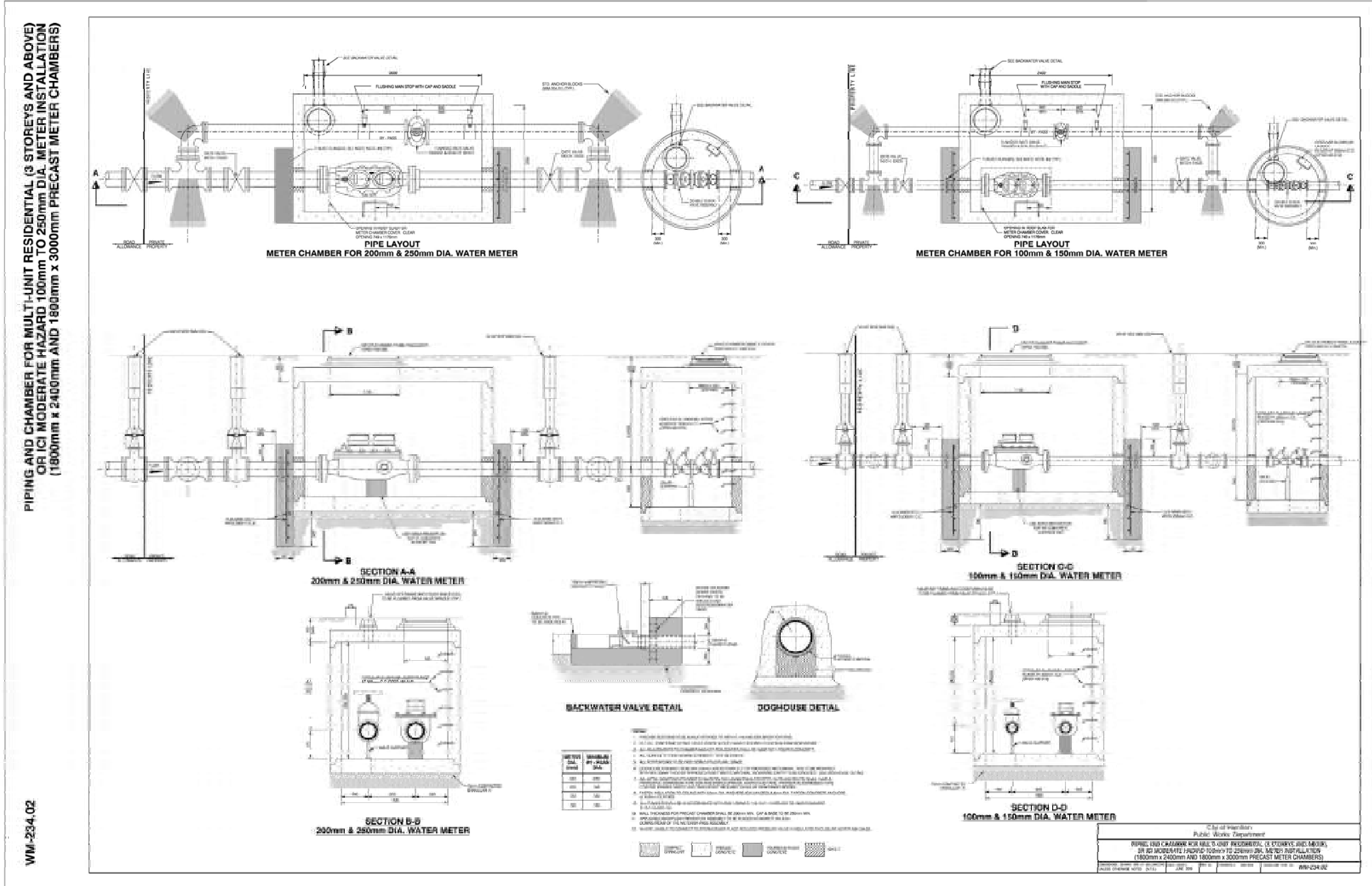
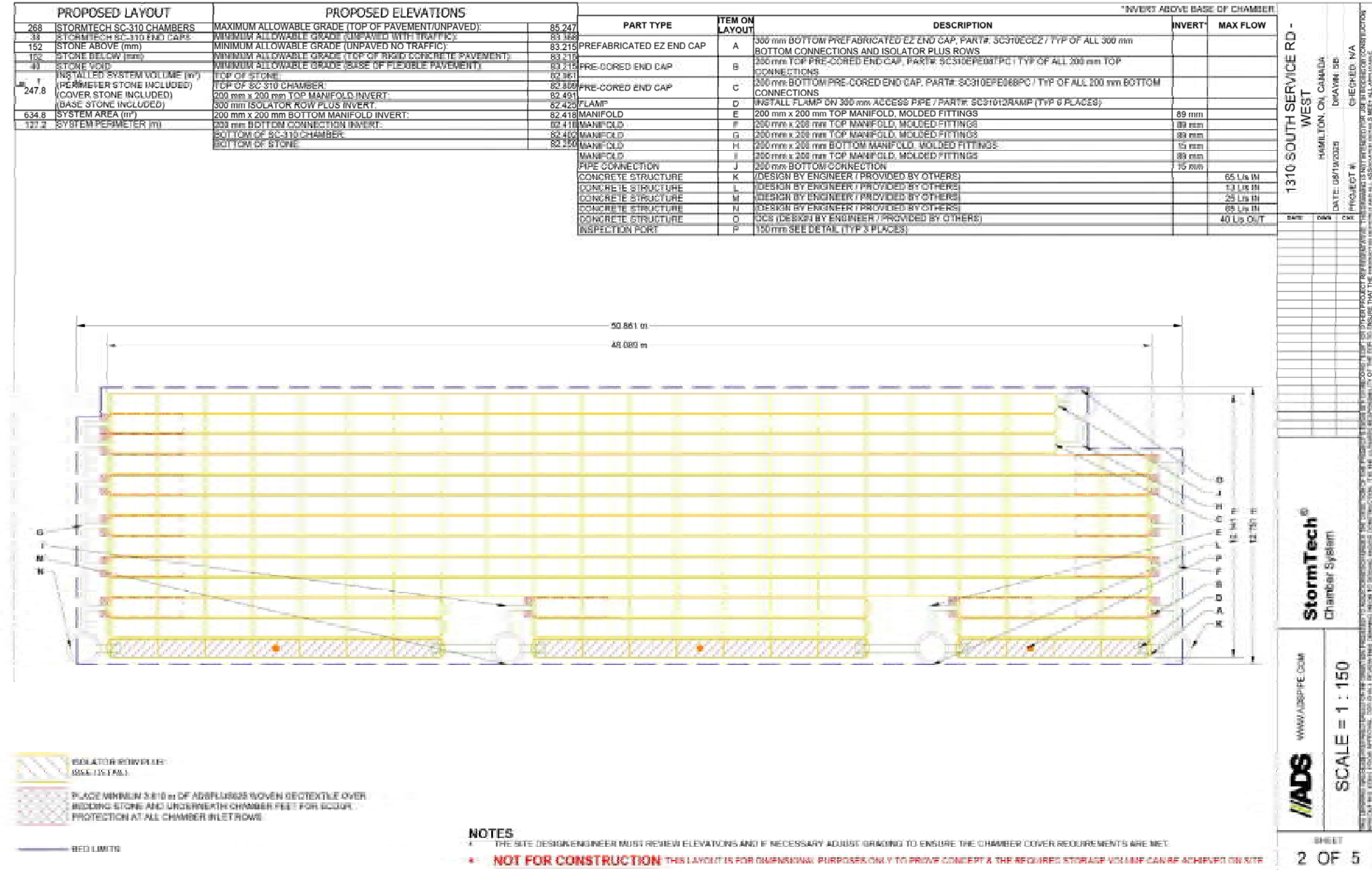
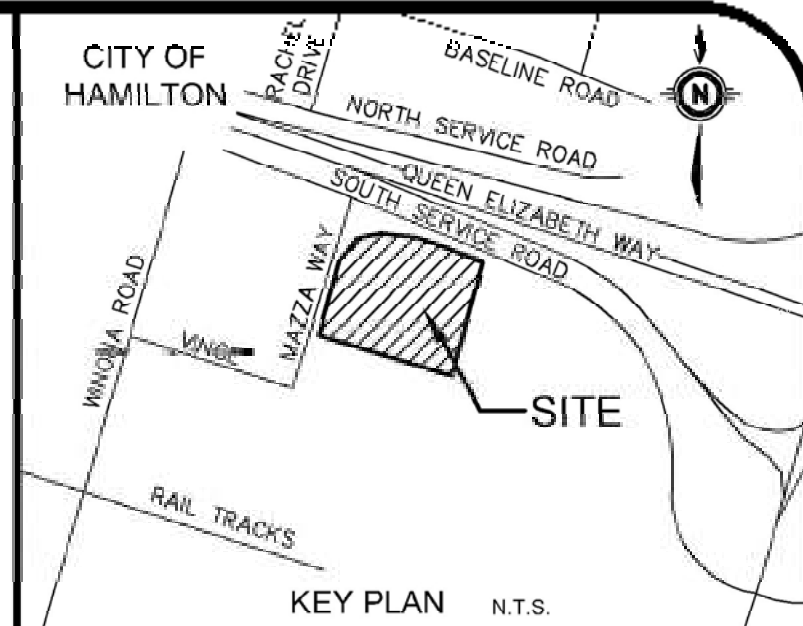
RIGID EPS-INSULATION BOARD PER SPECIFICATION NOTES (MINIMUM R10-THICKNESS, TYPICALLY 50-65mm).

NOTE: TRENCH SIDE-SLOPES IN AREAS OF PIPE INSULATION TO BE MAXIMUM 1:1 SLOPE. NO TIEBACK SECTIONS ALLOWED UNLESS INDICATED IN DETAIL.

NATIVE SOILS - WHERE NATIVE SOIL IS SOFT AND/OR OF ORGANIC CONTENT, REMOVE TO DEPTH OF 150mm MIN. (TYPICALLY 50-65mm) AND REPLACE WITH GRANULAR-B2 MATERIAL COMPACTED TO 95% SPMD, OR CONSTRUCT IN ACCORDANCE WITH WRITTEN DIRECTION FROM GEOTECHNICAL CONSULTANT.

FROST DEPTH - PROTECT SOIL ZONE UNDER PIPE FROM FREEZING. REFER TO OPSD 3400.011 FOR SPECIFIC LOCAL FROST DEPTH.



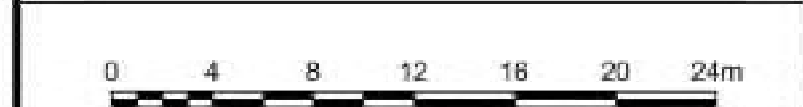


GEODETIC BM ELEV. = 171.00

REFER TO DRAWING CREATED BY SURVEYORS ON SITE INC. DATED FEBRUARY 3, 2026.

SITE BENCHMARK ELEV. = 171.00

REFER TO DRAWING CREATED BY SURVEYORS ON SITE INC. DATED FEBRUARY 3, 2026.



NOTE TO CONTRACTOR:

DO NOT SCALE DRAWINGS.

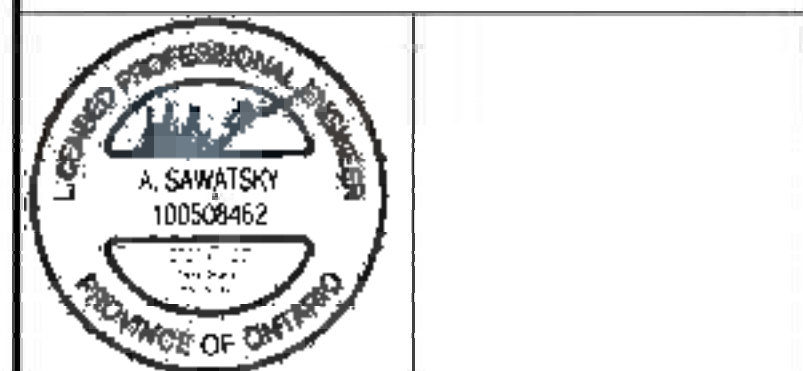
CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

ALL DRAWINGS REMAIN THE PROPERTY OF THE ENGINEER AND SHALL NOT BE REPRODUCED OR REUSED WITHOUT THE ENGINEER'S WRITTEN PERMISSION.

THE OWNER/RIGHTS/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.

- NOTE:
1. PROPERTY LINE IS APPROXIMATE ONLY AND SHOULD NOT BE USED FOR DETERMINING SETBACKS OR LAYOUT.
 2. EXISTING TOPOGRAPHICAL INFORMATION PROVIDED BY SURVEYORS ON SITE INC., DATED FEBRUARY 11, 2026.
 3. THIS PLAN IS PART OF A SET OF PLANS WHICH COMPRISE OF C1.1, C1.2, C2.1, C2.2, C2.3 & C2.4.
 4. INVERTS ARE APPROXIMATE ONLY, CONTRACTOR TO FIELD VERIFY AND REPORT ANY DISCREPANCIES TO ENGINEER.

1.	ISSUED FOR ZDA	AXS	2026-08-26
No.	REVISION - ISSUANCE	BY	YTY-MMD



CLIENT

LIVWELL DEVELOPMENTS

499 BRANT STREET BURLINGTON

PROJECT

1310 SOUTH SERVICE ROAD

HAMILTON ONTARIO

DRAWING

Design By	LJF	Project Manager	A. SAWATSKY
Drawn By	GLO/GGC	Project No.	65075_001
Checked By	AXS	Drawing No.	C2.4
Date	2026-05-15		
Scale	1:300	Sheet	6 of 6

