December 2024

UD22-017

Functional Servicing & Stormwater Management Report



Project: 2083 Lakeshore Road

THE ROSSEAU GROUP INC.

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Principal

Identification	Date	Description of issued and/or revision
FSR/SWM Report	December 20th, 2024	Issued for Site Plan Application

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Executive Summary

Lithos Group Inc. (Lithos) was retained by THE ROSSEAU GROUP INC. (the "Owner") to prepare a Functional Servicing and Stormwater Management (FSR-SWM) Report in support of Zoning By-law Amendment for a proposed mixed-use development at 2083 Lakeshore Road Road (M1N 1V2), in the City of Burlington (the "City"). The following is a summary of our conclusions:

Storm Drainage

The property's existing drainage pattern is separated into two drainage areas (one flowing north towards Lakeshore Road and one flowing south towards Old Lakeshore Road). Following that fact, our analysis assumes that the drainage pattern is maintained under post-development conditions. Therefore, the site stormwater discharge will be controlled to the 2-year pre-development flows. The proposed storm lateral connection will be connected to the existing 450 mm diameter storm sewer on Old Lakeshore Road, through a 200mm diameter storm lateral connection, with a minimum grade of 2.0% (or equivalent size). In order to attain the target flows and meet the City's Wet Weather Flow Management Guidelines (WWFMG), quantity controls will be utilized and up to 42.3 m^3 of underground storage will be required for the subject site. The stormwater management (SWM) system will be designed to provide enhanced level (Level 1) protection as specified by the Ministry of the Environment, Conservation and Parks (MECP) in order to achieve a minimum total suspended solids (TSS) removal of 80%.

Sanitary Sewers

The development will be connected to the Old Lakeshore Road, through a 200mm diameter sanitary sewer lateral connection, with a minimum grade of 2.00% (or equivalent pipe design). During pre-development conditions, the site discharges 0.05 L/s into the City's sanitary sewer network. Under post-development conditions, the site discharges 4.99 L/s. Therefore, under post-development conditions the additional net discharge flow from the proposed development, is anticipated at approximately 4.94 L/s.

Water Supply

Water supply for the site will be from the existing 300 mm diameter watermain on Old Lakeshore Road. It is anticipated that a total design flow of 86.55 L/s will be required to support the proposed development. Upon receipt of the fire hydrant test results, an addendum to this report will be prepared and submitted to the City on the "Client's" behalf.

Site Grading

The proposed grades will improve the existing drainage conditions to meet the City's/Regional requirements. Grades will be maintained along the property line wherever feasible, and emergency overland flow will be gravity driven to the adjacent right-of-way's (ROW).

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1.0 Introduction

Lithos Group Inc. (Lithos) was retained by THE ROSSEAU GROUP INC. (the "Owner") to prepare a Functional Servicing and Stormwater Management (FSR-SWM) Report in support of Zoning By-law Amendment for a proposed mixed-use development at 2083 Lakeshore Road Road (M1N 1V2), in the City of Burlington (the "City").

The purpose of this report is to provide site-specific information for the City's review with respect to infrastructure required to support the proposed development regarding storm drainage, sanitary sewers and water supply.

We contacted the City's engineering department to obtain existing information in preparation of this report. The following documents were available for our review:

- Plan and Profile drawings of Old Lakeshore Road, drawing No. W-2295-06, dated January 2005;
- Plan and Profile drawings of Pearl Street, drawing No. B-5213, dated January 1984 and drawing No. N 38-9, dated November 1971;
- Plan and Profile drawings of Gore/Junction Street, drawing No. B-7327, dated June 1995 and drawing No. N 38-8, "as constructed" on October 1976;
- Plan and Profile drawings of Lakeshore Road, drawing No N 38-2, dated December 1971
- Plan and Profile drawings of Old Lakeshore Road, drawing No N 38-3, dated December 1971;
- Site Plan and Site Statistics prepared by Kirkor Architects and Planners, dated December 11, 2024;
- Topographical Survey prepared by KRCMAR Surveyors LTD, dated March 01, 2022;
- Hydrogeological Investigation by EXP Services Inc., dated June 07, 2022.

2.0 Site Description

The existing site is approximately 0.199 hectares and is currently occupied by outdoor parking area. The site area is bound by Old Lakeshore Road to the south, Lakeshore Road to the north and residential use developments to the west and the east side. Refer to **Figures 1** and **2** following this report and site photographs in **Appendix A** as well as to the topographic survey in **Appendix B**.

3.0 Site Proposal

The proposed development will be a 27-storey mixed-use building and it will be serviced by five (5) levels of underground parking space. The proposed development will be comprised of 196 residential units and 418.27 m^2 of retail space. The development will include 21,785.8 m^2 of Gross Floor Area (GFA). Please refer to **Appendix B** for the proposed site plan and building site statistics.

4.0 Terms of Reference and Methodology

4.1. Terms of Reference

The Terms of Reference used for the scope of this report was based on the Region of Halton Water and Wastewater Linear Design Manual (Halton Region, April 2019), the Ministry of Environment, Conversation and Parks (MECP) 2003, the TRCA /CVC Low Impact Development Stormwater Management Planning and Design Guide, City of Burlington Stormwater Management Design Guidelines, which were approved by City Council on June 22, 2020 and local engineering standards provided by the City of Burlington.

4.2. Methodology: Stormwater Drainage and Management

This report provides a detailed Stormwater Management (SWM) review of the pre-development and post-development conditions and comments on opportunities to reduce peak flows. This is illustrated on a proposed servicing connection plan. Other requirements set by the WWFMG will also be discussed.

The proposed development will be designed to meet the City's Design Criteria and the standards of the Province of Ontario as set out in the Ministry of Environment, Conservation and Parks (MECP) 2003 Stormwater Management Planning and Design Manual (SWMPD). The following design criteria will be reviewed:

- Post-development peak flows for the 100-year storm event for both drainage areas (towards Lakeshore Road and towards Old Lakeshore Road) should be controlled to the 2-year target flows. This criterion is consistent with the City of Burlington comments provided in the pre-consultation meeting held on January 16, 2019; and,
- A safe overland flow will be provided for all flows in excess of the 100-year storm event.

4.3. Methodology: Sanitary Discharge

The sanitary sewage discharge from the site will be determined using the guidelines as set out in Water and Wastewater Linear Design Manual by the Region of Halton. The calculated values provide peak sanitary flow discharge that considers infiltration.

The estimated sanitary discharge flows from the proposed site will be calculated based on the criteria shown in **Table 4.1** below.

Table 4.1 – Sanitary Flows

Usage	Design Flow	Units	Population Equivalent
Residential (Apartment over 6 stories)	285	persons/ ha	0.275 (m^3 per capita per day)
Commercial	90		27.750 (m^3 per hectare per day)

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

4.4. Methodology: Water Usage

The domestic water usage was calculated based on the City's design criteria outlined in **Table 4.2.**

Table 4.2 – Water Usage

Usage	Water Demand	Units
Apartments (over 6 stories high)	285	persons/ ha
Commercial	90	persons/ ha

Pressure and flow tests will be conducted on the existing hydrants located near the site along Old Lakeshore Road, to obtain existing flows, residual and static pressure. The results will be compared to the anticipated domestic and fire protection usage to determine if there is adequate capacity to support the development. Upon receipt of the test results, an addendum to this report will be prepared and submitted to the City on the "Client's" behalf.

5.0 Stormwater Management and Drainage

5.1. Existing Conditions

The subject lands are located in the Burlington's Urban Creeks drainage shed.

The existing site is approximately 0.199 hectares and is currently occupied by outdoor parking area. The site drains partially towards Old Lakeshore Road and partially towards Lakeshore Road.

According to available records, there are two (2) storm sewer abutting the subject property. More specifically:

- An existing 760mm diameter storm sewer on the north side of Lakeshore Road flowing north; and,
- An existing 450 mm diameter storm sewer on the north side of Old Lakeshore Road flowing east.

The existing site has two (2) internal drainage areas:

1. A1 Pre – Storm runoff from the outdoor parking areas and the driveway, being discharged into the City's storm network along Old Lakeshore Road; and
2. A2 – Pre – Storm runoff from the north portion of the site area, discharged into the City's storm network along Lakeshore Road.

The existing site is primarily covered by impermeable areas, thus, there is no significant infiltration onsite. Both corresponding run-off coefficients for the areas draining towards Old Lakeshore Road and Lakeshore Road are estimated at 0.95. The input parameters, summarized in **Table 5.1** below, are illustrated in the pre-development drainage area plan in **Figure DAP-1** in **Appendix C**.

Table 5.1 – Pre-development Input Parameters

Drainage Area	Drainage Area (ha)	Actual "C"	Design "C"	Tc (min.)
A1 Pre (Draining Towards Old Lakeshore Road)	0.190	0.95	0.50	10
A2 Pre (Draining Towards Lakeshore Road)	0.009	0.95	0.50	10

5.1.1. Total Storm Design Flow

Peak flows calculated for the existing conditions are shown in **Table 5.2** below.

Table 5.2 – Target Peak Flows

Catchment	Peak Flow Rational Method (L/s)					
	2-year	5-year	10-year	25-year	50-year	100-year
A1 Pre - Towards Old Lakeshore Road	20.7	26.7	30.7	39.3	47.3	53.8
A2 Pre – Towards Lakeshore Road	1.0	1.3	1.5	1.9	2.2	2.5

As shown in **Table 5.2**, the post-development will need to be controlled to the target flow of 20.7 L/s and 1.0 L/s for the areas draining towards Old Lakeshore Road and Lakeshore Road, respectively.

5.2. Stormwater Management

In order to meet the WWFMG criteria, the development flow rates for the areas draining towards Old Lakeshore Road and Lakeshore Road are to be controlled to the two (2) year target flows established in **Section 5.1.**

The site consists of five (3) internal drainage areas:

1. A1 Post – Storm runoff from rooftops, terraces and outdoor amenity space, controlled in the underground storage tank, located at P1 level;
2. A2 Post – Uncontrolled storm runoff from the site, draining towards Lakeshore Road;
3. A3 Post – Uncontrolled storm runoff from the site, draining towards Old Lakeshore Road.

The post-development drainage areas and runoff coefficients are indicated on **Figure DAP-2**, located in **Appendix C** and summarized in **Table 5.3** below.

Table 5.3 - Post-development Input Parameters

Drainage Area	Drainage Area (ha)	"C"	Antecedent "Ca"	Tc (min.)
A1 Post Rooftop/Terraces/Outdoor Amenity Area– Controlled in the Underground Storage Tank)	0.184	0.71	0.89	10
A2 Post (Uncontrolled Area Towards Lakeshore Road)	0.001	0.95	1.00	10
A3 Post (Uncontrolled Area Towards Old Lakeshore Road)	0.006	0.95	1.00	10

The coefficients "C" in Table 5.3 have been increased by the scaling factors according to City's Guidelines; therefore, for the worst case scenario of a 100-year event they have been amplified by the factor 1.25.

5.2.1. Quantity Controls

As mentioned in **Section 5.1** of this report, storm runoff from the existing property drains towards two (2) storm sewer networks. Therefore, a quantity control analysis has been prepared for each storm network adjacent to the site in order to assess the post-development peak flows for the 100-year storm event for both drainage areas (towards Lakeshore Road and towards Old Lakeshore Road) to be controlled to the 2-year target flows.

5.2.1.1 Post-development flows towards Old Lakeshore Road

Table 5.4 below. The detailed post-development quantity control calculations are provided in **Appendix C**.

Table 5.4 – Post-development Quantity Control as per City Requirements (towards Old Lakeshore Road)

Storm Evet	Target Flow (L/s)	Release Rate from Tank (L/s)	Uncontrolled Release Rate (L/s)	Groundwater Dewatering (L/s)	Required Storage Tank Volume (m^3)	Total Site Release Rate (L/s)
2-year	20.7	9.1	1.7	0.39	13.1	11.2
5-year		10.5	2.2	0.39	17.9	13.1
10-year		13.1	2.6	0.39	27.9	16.1
25-year		13.3	3.1	0.39	28.7	16.8
50-year		14.9	3.4	0.39	36.1	18.7
100-year		16.1	3.7	0.39	42.3	20.2

As shown in **Table 5.4** , in order to control post-development flows to 2-year pre-development conditions, a target flow of 20.7 L/s is to be satisfied. The required on-site storage is accommodated by the underground storage tank located at P1 Level.

The stormwater flow from the rooftops / terraces and the outdoor amenity space (**Drainage Area A1 Post**), will be gravity driven into the proposed underground storage tank. Furthermore, groundwater, after being collected by the building's sub-drain system, it will be treated and then will be pumped into the underground tank, with a peak flow rate of 0.39 L/s. Please Refer to **Section 6.0** for more details regrading groundwater flow.

Storm runoff from the underground storage tank will be directed with a maximum release rate of 20.2 L/s achieved, towards the existing 450 mm storm sewer on Old Lakeshore Road. Detailed calculations are provided in **Appendix C.**

Underground Storage Tank

An underground main storage tank is proposed to meet the quantity control requirements set forth by the City's WWFMG. Stormwater from rooftops / terraces and outdoor amenity space (**Drainage Area A1 Post**) will be gravity driven into the proposed underground storage tank.

The underground storage tank, located at P1 level (refer to engineering drawing "**SS-01"**, submitted separately), will have a maximum storage requirement of 42.3 m^3 with a maximum storage depth of 1.04 m, during the hundred-year storm event, and will outlet through a pump towards the City's infrastructure. Additional details will be provided at the Site Plan Application Stage.

5.2.1.2 Post-development flows towards Lakeshore Road

Under post-development conditions, storm runoff from the nothern portion of the property along with to the existing catch basin at the right-of-way and finally discharging to the existing 760mm storm sewer along Lakeshore Road. Using the City's intensity-duration-frequency (IDF) data, modified rational method calculations were undertaken to determine the maximum release rate under each storm event.

Table 5.5 – Post-development Quantity Control as per City Requirements (towards Lakeshore Road)

Storm Event	Target Flow (L/s)	Uncontrolled Release Rate(L/s)
2-year	1.0	0.2
5-year		0.3
10 year		0.3
25 year		0.4
50 year		0.4
100-year		0.5

As shown on **Table 5.5**, under post-development conditions, uncontrolled flow towards Lakeshore Road during a 100-year storm event is smaller than the two (2)-year pre-development target flow, therefore, no additional stormwater storage will be required as the proposed development will not exceed the capacity of the existing storm infrastructure on Lakeshore Road. In fact, the proposed development will have a significantly positive impact on the existing storm infrastructure.

5.3. Proposed Storm Connection

The proposed development will connect to the existing 450 mm diameter storm sewer on Old Lakeshore Road, via a 200 mm storm sewer service connection, with a minimum grade of 2.0% (or equivalent pipe design). Refer to engineering drawing "**SS-01**" (submitted separately) indicating the stormwater service connection.

6.0 Groundwater Flow

According to the "Hydrogeological Investigation" prepared by EXP Services Inc., dated June 07, 2022, the minimum groundwater level observed at 78.55 m above sea level (masl), while the highest groundwater level observed at 79.73 masl. In addition, the proposed development will be serviced by five(5) basement levels (with the lowest basement level at approximately 70.0 masl).

The results of groundwater sampling on site, reveal that groundwater should be treated before it can be discharged into the public storm sewer; however, it is within the City's limits for discharging into the sanitary sewer network. The results of the Hydrogeological Investigation can be found in **Appendix B**.

6.1.1. Short Term Discharged to Storm Sewer

According to the Hydrogeological Investigation prepared by EXP Services Inc., dated June 07, 2022, short term groundwater discharge is estimated at 193,000 L/day (including safety factor). Assuming that the temporary groundwater pump will run for approximately 8 hours per day, peak groundwater discharge

rate will be at 6.7 L/sec. After being treated, groundwater will be directed towards the City's storm sewer network.

6.1.2. Long Term Discharge to Storm Sewer

Given that the underground construction will be partially submerged into the existing groundwater table, long-term groundwater discharge, along with the installation of a permanent dewatering system, will be required.

According to the Hydrogeological Investigation prepared by EXP Services Inc., dated June 07, 2022, short-term groundwater discharge (during construction) is estimated at 34,000 L/day (included safety factor). Assuming that the groundwater pump will function for approximately 24 hours per day, the long-term groundwater rate is estimated at 0.39 L/sec (groundwater peak flow rate). More specifically, groundwater flow will be pumped into the proposed underground storm storage tank, before finally being conveyed into the City's 450mm diameter storm sewer along Old Lakeshore Road after being treated. Groundwater will have a sampling access point for the City's access and inspection. Details and section for the groundwater sampling access point will be provided during Site Plan Application Stage.

7.0 Sanitary Drainage System

7.1. Existing Sanitary Drainage System

According to available records, there are two (2) sanitary sewer, abutting the subject property. More specifically:

- A 450mm diameter sanitary sewer along Lakeshore Road flowing east; and
- A 200 mm diameter sanitary sewer on the north side of Old Lakeshore Road flowing east.

The sanitary flow generated by the proposed development at 2083 Old Lakeshore Road was compared to the existing flow in order to quantify the net increase in the sanitary sewer network.

7.2. Equivalent Population

As per City's design criteria the equivalent population for the proposed development was calculated. **Table 7.1** below shows the equivalent population, based on the unit count and retail area in the proposed development's statistics. Refer to **Appendix D** for detailed calculations.

Table 7.1 – Post Development Equivalent Population

Unit Type	Number of Units / Area	Design Guideline Population Multiplier	Population
1 Bedroom	40	1.4	56
2 Bedroom	96	2.1	201
3 Bedroom	60	3.1	186
Retail	418.27 (m^2)	1.1p/100m^2	5
Total	**-**	-	**448**

7.3. Existing and Proposed Sanitary Flows

Given that the subject site is currently occupied by outdoor parking area, the total discharge flow was compared to the existing flow to quantify the net increase in the combined sewer.

Using the design criteria outlined in **Section 4.3** and existing site information, the total discharge flow from parking area is estimated at 0.05 L/s.
Similarly, using the design criteria and the proposed development statistics, the new building will discharge a total flow 4.99 L/s (considering 240 L/c/d respectively for the residential population) into the City's infrastructure. For detailed calculations refer to the sanitary sewer design sheet in **Appendix D**.

7.4. Proposed Sanitary Connection

The proposed development will connect to the existing 200mm diameter sanitary sewer on Old Lakeshore Road, via a proposed 150mm diameter lateral at a minimum grade of 2.00% (or equivalent pipe design). Refer to engineering drawing "**SS-01**" (submitted separately) for details.

8.0 Water Supply System

8.1. Existing System

According to available records, there are two (2) watermains, abutting the subject property. More specifically:

- A 300mm diameter watermain along Lakeshore Road;
- A 150mm diameter watermain on the north side along Old Lakeshore Road; and,
- A 300mm diameter watermain on the south side along Old Lakeshore Road.

8.2. Proposed Water Supply Requirements

The estimated water consumption was calculated based on the occupancy rates shown on **Table 4.2**, according to the Region's watermain design criteria, revised in July 2017.

It is anticipated that an average consumption of approximately 1.43 L/s (123,552 L/day), a maximum daily consumption of 3.22 L/s (278,208 L/day), a peak hourly demand for residential use of 5.72 L/s (20,592 L/hr) and a peak hourly demand for commercial use of 3.22 L/s (11,592 L/hr) will be required to service this development with domestic water. Detailed calculations are found in **Appendix E**.

The fire flow requirements were estimated using the method prescribed by the Fire Underwriters Survey (FUS) be undertaken to assess the minimum requirement for fire suppression. The fire flow calculations are normally conducted for the largest storey, by area, and for the two immediately adjacent storeys.

As a result, to the above-mentioned method, we have selected Levels 1, 2 and 3 which result the maximum fire flow requirement for this development (worst case scenario).

Table 8.1 illustrates the input parameters used for the FUS calculations. According to our calculations, a minimum fire suppression flow of approximately 83.33 L/s (1,321 USGPM) will be required. Refer to detailed calculations found in **Appendix E**.

Table 8.1 – Fire Flow Input Parameters

Parameter	Frame used for Building	Combustibility of Contents	Presence of Sprinklers	Separation Distance			
				North	East	West	South
Value according to FUS options	Fire-Resistive Construction	Non-Combustible	Yes	>30m	0-3.0m	0-3.0m	20.1m-30m
Surcharge/reduction from base flow	0.6	25%	30%	0%	25%	25%	10%

In summary, the required design flow is the sum of 'the minimum fire suppression flow' and 'maximum daily demand' (83.33 + 3.22 = 86.55 L/s, 1372 USGPM).

8.3. Proposed Watermain Connections

The proposed development will be serviced by a 200mm diameter fire and a 150mm diameter domestic water. According to Region's standard drawing RH-409.01, the 200 mm water service will be split one and a half (1.5) meter from the property line and valve and boxes will be installed on each service at the property line.

The proposed water service will be connected to the existing 300 mm diameter watermain on Lakeshore Road. Refer to engineering drawing "**SS-01**" (submitted separately) indicating the water service connection.

9.0 Erosion Control during Construction

Erosion and sediment control measures will be designed and will include sediment fencing, a construction access driveway, check dams and temporary sediment control facilities where required. These measures will be designed and constructed as per the "Erosion and Sediment Control Guideline for Urban Construction" document (December 2006). The detailed erosion and sediment control plan will be approved by the City and Region prior to any site alteration being undertaken. All reasonable measures will be taken to ensure sediment loading to the adjacent properties and storm sewers is minimized both during and following construction.

10.0 Site Grading

10.1. Existing Grades

The existing site is approximately 0.199 hectares and is currently occupied by outdoor parking area. Moreover, it is located between Old Lakeshore Road and Lakeshore Road, in the City of Burlington. The site generally drains to the existing stormwater system inside the property and by overland towards the adjacent right of ways (ROW).

10.2. Proposed Grades

The proposed grades will improve the existing drainage conditions to meet the City's requirements. The existing grades will be maintained along the property line and emergency overland flow will be directed to adjacent right of ways.

11.0 Conclusions and Recommendations

Based on our investigations, we conclude the following:

Storm Drainage

The property's existing drainage pattern is separated into two drainage areas (one flowing north towards Lakeshore Road and one flowing south towards Old Lakeshore Road). Following that fact, our analysis assumes that the drainage pattern is maintained under post-development conditions. Therefore, the site stormwater discharge will be controlled to the 2-year pre-development flows. The proposed storm lateral connection will be connected to the existing 450 mm diameter storm sewer on Old Lakeshore Road, through a 200mm diameter storm lateral connection, with a minimum grade of 2.0% (or equivalent size). In order to attain the target flows and meet the City's Wet Weather Flow Management Guidelines (WWFMG), quantity controls will be utilized and up to 42.3 m^3 of underground storage will be required for the subject site. The stormwater management (SWM) system will be designed to provide enhanced level (Level 1) protection as specified by the Ministry of the Environment, Conservation and Parks (MECP) in order to achieve a minimum total suspended solids (TSS) removal of 80%.

Sanitary Sewers

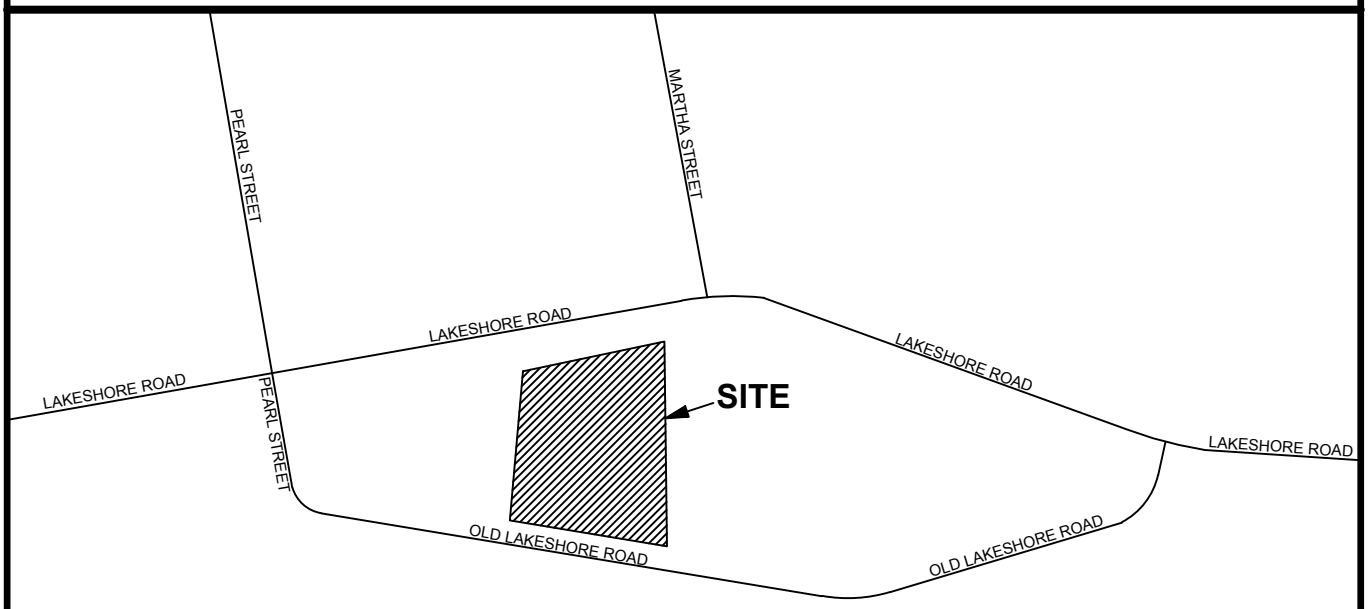
The development will be connected to the Old Lakeshore Road, through a 200mm diameter sanitary sewer lateral connection, with a minimum grade of 2.00% (or equivalent pipe design). During pre-development conditions, the site discharges 0.05 L/s into the City's sanitary sewer network. Under post-development conditions, the site discharges 4.99 L/s. Therefore, under post-development conditions the additional net discharge flow from the proposed development, is anticipated at approximately 4.94 L/s.

Water Supply

Water supply for the site will be from the existing 300 mm diameter watermain on Old Lakeshore Road. It is anticipated that a total design flow of 86.55 L/s will be required to support the proposed development. Upon receipt of the fire hydrant test results, an addendum to this report will be prepared and submitted to the City on the "Client's" behalf.

Site Grading

The proposed grades will improve the existing drainage conditions to meet the City's/Regional requirements. Grades will be maintained along the property line wherever feasible and emergency overland flow will be gravity driven to the adjacent right-of-way's (ROW).



Lithos

150 Bermondsey Road, Toronto, Ontario M4A 1Y1

LOCATION PLAN

MIXED USE DEVELOPMENT
2083 OLD LAKESHORE ROAD
BURLINGTON, ONTARIO

DATE:	DEC 2024	PROJECT No:	UD22-017
SCALE:	N.T.S.	FIGURE No:	FIG 1



Lithos

150 Bermondsey Road, Toronto, Ontario M4A 1Y1

AERIAL PLAN

MIXED USE DEVELOPMENT
2083 OLD LAKESHORE ROAD
BURLINGTON, ONTARIO

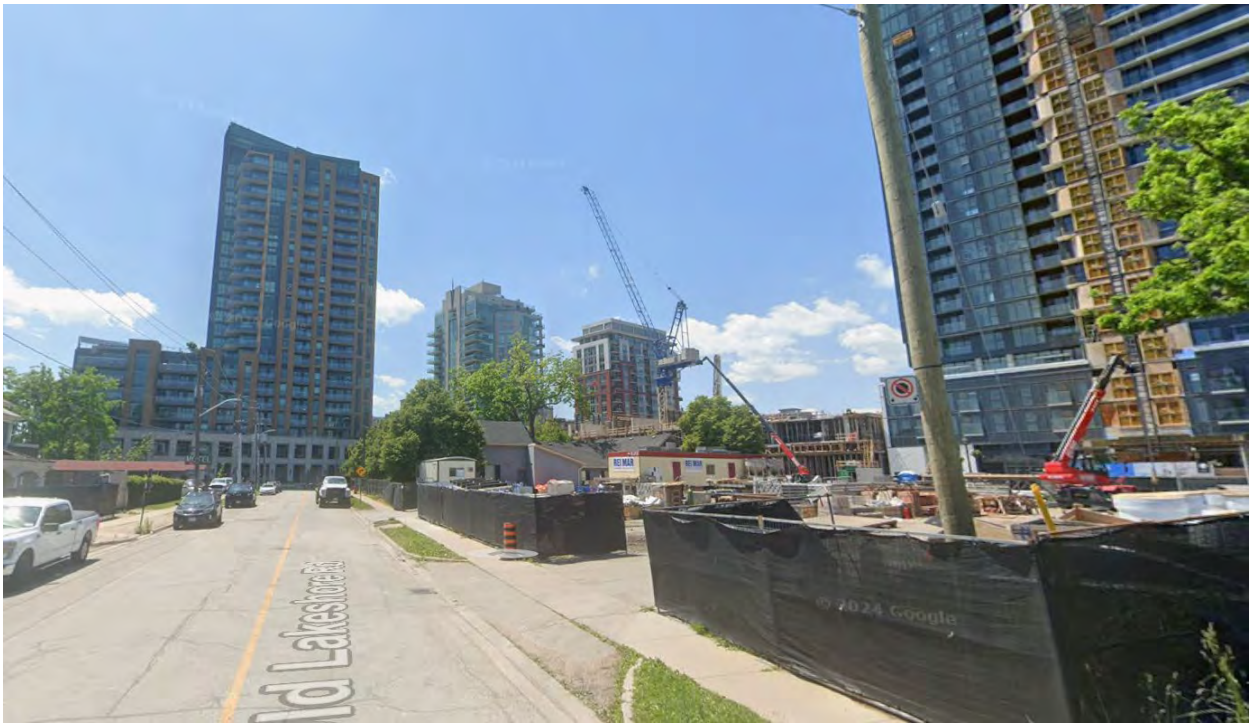
DATE:	DEC 2024	PROJECT No:	UD22-017
SCALE:	N.T.S.	FIGURE No:	FIG 2

Appendix A

Site Photographs



North-East corner of the property along Lakeshore Road facing South-West



South-East corner of the property along Old Lakeshore Road facing North-West



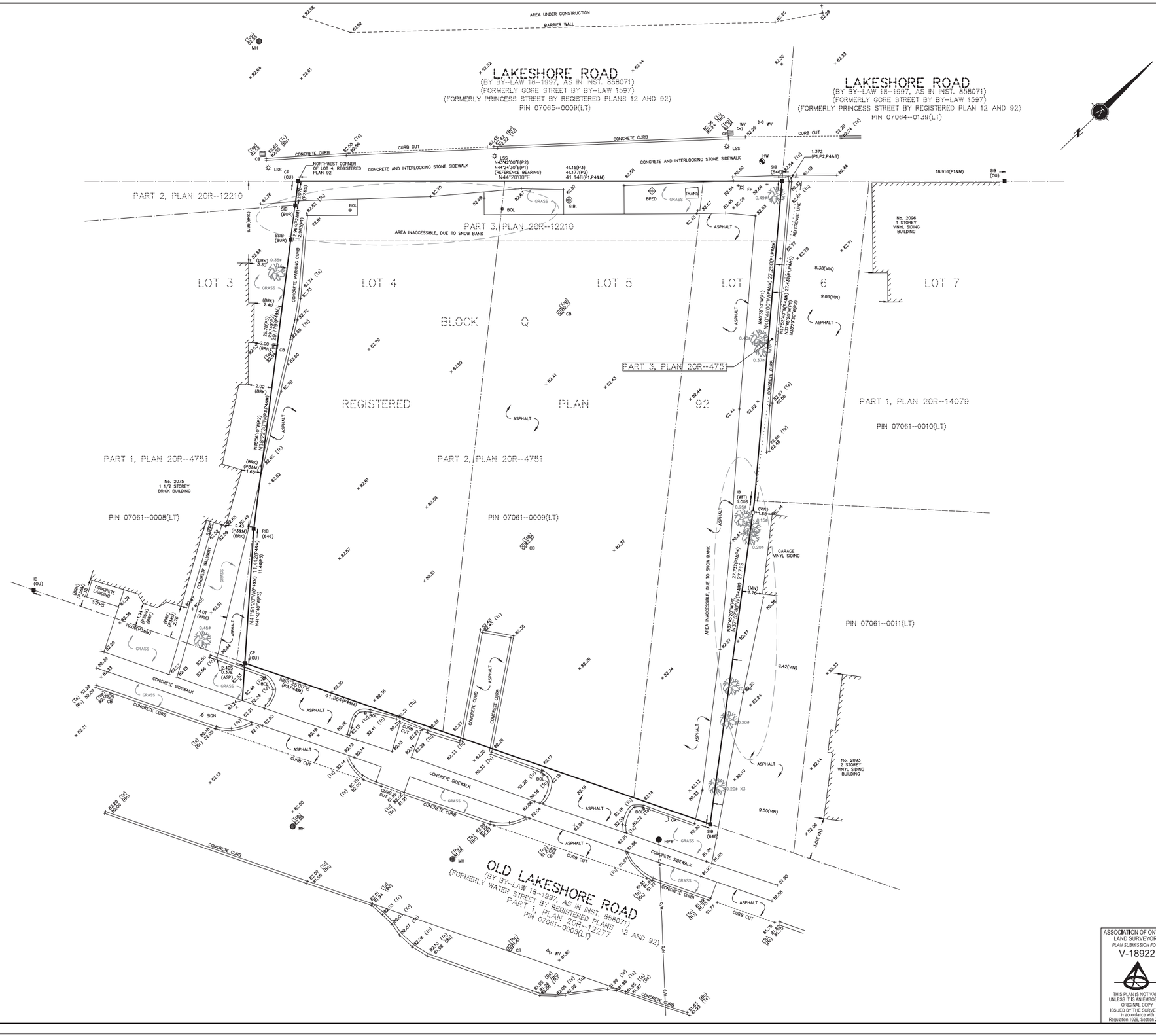
South-West corner of the property along Old Lakeshore Road facing North-East



North-West corner of the property along Lakeshore Road facing South-East

Appendix B

Background Information



PLAN OF SURVEY
SHOWING TOPOGRAPHICAL INFORMATION OF

LOT 5
AND PART OF LOTS 4 AND 6
BLOCK Q
REGISTERED PLAN 92
CITY OF BURLINGTON
(FORMERLY IN THE TOWNSHIP OF NELSON)
REGIONAL MUNICIPALITY OF HALTON

SCALE 1:150

3 0 3 6 9 12 15m

KRCMAR SURVEYORS LTD. 2022

METRIC: DISTANCES AND COORDINATES SHOWN HEREON ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

BEARING

BEARINGS SHOWN HEREON ARE ASTRONOMIC AND ARE REFERRED TO THE SOUTHERLY LIMIT OF LAKESHORE ROAD (FORMERLY GORE STREET) AS SHOWN ON REFERENCE PLAN 20R-4751 HAVING A BEARING OF N44°20'00"E.

ELEVATION

ELEVATIONS SHOWN HEREON ARE GEODETIC (CGVD28:78) AND ARE RELATED TO BENCH MARK No. 0011991U001 HAVING AN ELEVATION OF 78.331 METRES.

LEGEND

■	DENOTES SURVEY MONUMENT FOUND
□	DENOTES SURVEY MONUMENT PLANTED
SIB	DENOTES STANDARD IRON BAR
SSIB	DENOTES SHORT STANDARD IRON BAR
RIB	DENOTES ROUND IRON BAR
IB	DENOTES IRON BAR
CP	DENOTES CONCRETE PIN
(M)	DENOTES MEASURED
(S)	DENOTES SET
RP	DENOTES REGISTERED PLAN
(P1)	DENOTES PLAN 20-14079
(P2)	DENOTES PLAN 20-12210
(P3)	DENOTES PLAN OF SURVEY AND TOPOGRAPHY BY ROBERT T. FORCE, O.L.S., DATED OCTOBER 21, 1994
(P4)	DENOTES PLAN 20-4751
(BUR)	DENOTES CITY OF BURLINGTON ENGINEERING DEPARTMENT
(646)	DENOTES ROBERT GEORGE SEWELL, O.L.S.
(OU)	DENOTES ORIGIN UNKNOWN
(BRK)	DENOTES TIE TO BRICK
(ASP)	DENOTES TIE TO ASPHALT
(VIN)	DENOTES TIE TO VINYL SIDING
(WIT)	DENOTES WITNESS
(Tc)	DENOTES TOP OF CURB
(Bc)	DENOTES BOTTOM OF CURB
x82.45	DENOTES EXISTING GRADE ELEVATION
BPED	DENOTES BELL PEDESTAL
CB	DENOTES CATCH BASIN
0.1ø	DENOTES CONIFEROUS TREE WITH TRUNK DIAMETER
0.1ø	DENOTES DECIDUOUS TREE WITH TRUNK DIAMETER
	DENOTES DOWN GUY ANCHOR
FH	DENOTES FIRE HYDRANT
HW	DENOTES HYDRO HAND WELL
HPW	DENOTES HYDRO POLE – WOODEN
LSS	DENOTES LAMP STANDARD – STEEL
MH	DENOTES MANHOLE
SN	DENOTES SIGN
WV	DENOTES WATER VALVE
TRANS	DENOTES HYDRO TRANSFORMER
BOL	DENOTES BOLLARD
G.B.	DENOTES GARBAGE BIN
GA	DENOTES DOWN GUY ANCHOR
-OH-	DENOTES OVERHEAD HYDRO

SURVEY REPORT

1. THE RE-ESTABLISHMENT OF THE SUBJECT PROPERTY BOUNDARIES IS BASED ON INFORMATION CONTAINED IN THE RELEVANT TITLE DOCUMENTS, REGISTERED PLANS AND ON THE EVIDENCE OF PRIOR SURVEYS FOUND DURING THE COURSE OF PREPARING THE SUBJECT SURVEY.
2. THE TYPE AND LOCATION OF THE EXISTING BUILDINGS AND OTHER IMPROVEMENTS, FENCES ETC., ON OR NEAR THE SUBJECT PROPERTY ARE AS SHOWN ON THE SURVEY PLAN.
3. COMPLIANCE WITH MUNICIPAL ZONING REQUIREMENTS IS NOT CERTIFIED BY THIS REPORT.
4. NOTE THE MOST NORTH-EASTERLY ADJACENT PROPOERTY (PIN 07061-0010) CHANGED FROM FEE SIMPLE LT CONVERSION QUALIFIED TO FEE SIMPLE ABSOLUTE VIA INSTRUMENT No. HR50919 TO POSSESS ALL OF PART 1, PLAN 20R-14079 WHICH ALSO INCLUDES PART 3, PLAN 20R-4751, AND THEREFORE INCONSISTENT WITH THE LEGAL DESCRIPTION PRESENTED ON THE SUBJECT PROPERTY'S PIN; 07061-0009.

TOTAL SITE AREA = 1994.9m²

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE 28th DAY OF FEBRUARY, 2022.

DATE MARCH 01, 2022

SATESH A. LAKHAN
ONTARIO LAND SURVEYOR

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ASSOCIATION OF ONTARIO LAND SURVEYORS
PLAN SUBMISSION FORM
V-18922

THIS PLAN IS NOT VALID UNLESS IT IS AN EMBOSSED ORIGINAL COPY ISSUED BY THE SURVEYOR In accordance with Regulation 1026, Section 29(3).

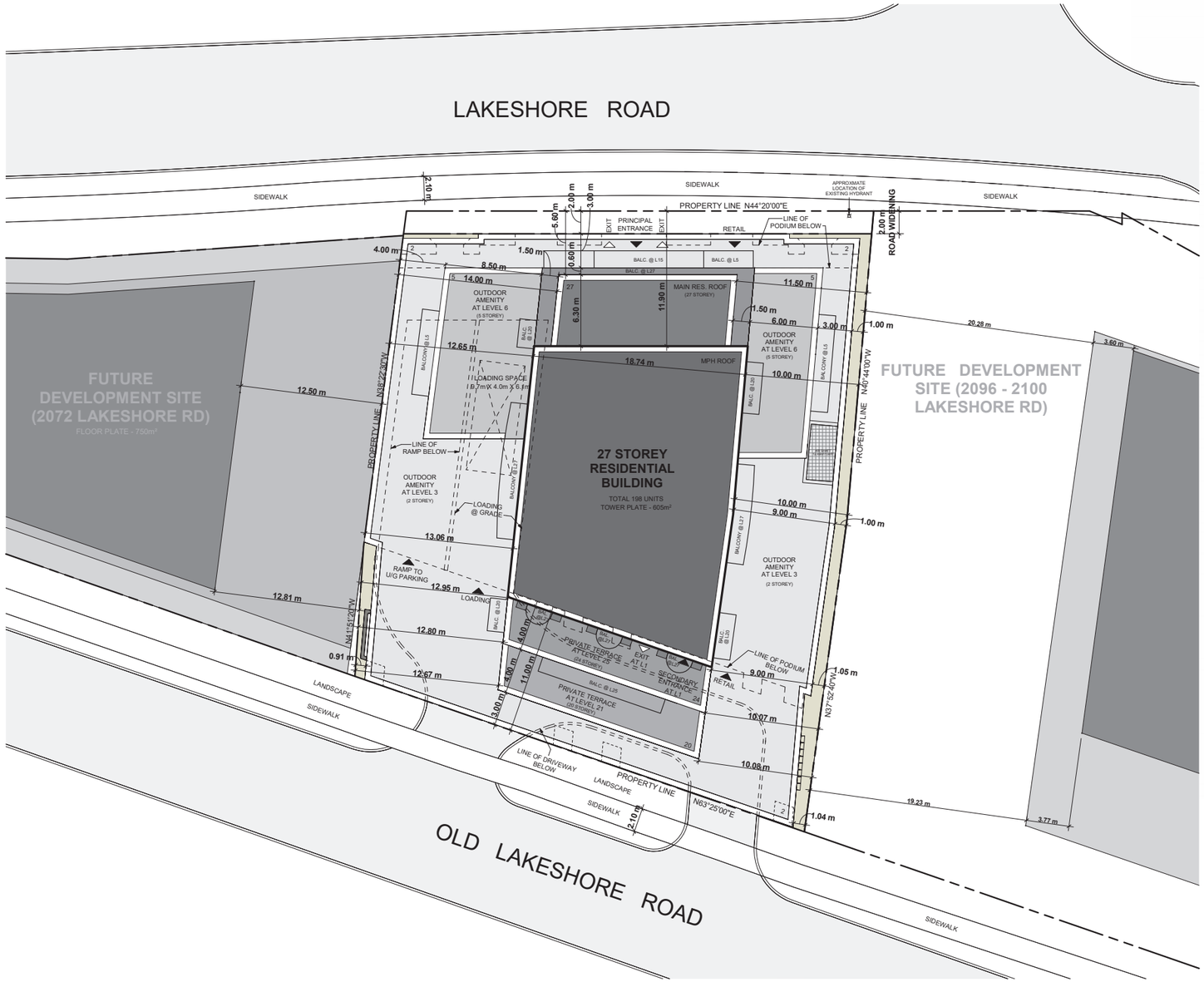
MUNICIPAL ADDRESS: No. 2075&2083 LAKESHORE ROAD

FIELD:	RK	DRAWN:	JY	CHECKED:	SAL	JOB NO:	22-027
DWG NAME:	22-027BT01	PLOT INFO:	00:00 16/Feb/2022			WORK ORDER NO:	36017

1137 Centre Street Thornhill ON L4J 3M6 905.738.0053 F 905.738.9221 www.krcmar.ca

PLAN AVAILABLE AT www.ProtectYourBoundaries.ca

KRCMAR



1 | Site Plan
Scale: 1 : 200

2083 OLD LAKESHORE ROAD
Burlington, Ontario
Proposed Residential Development

Project Statistics
December 11, 2024 — Project No.: 22-047.07

1.0 Site Area

Site Area	hectares	acres	sq.m.	sq.ft.
Total Site Area	0.1994	0.4927	1,994.02	21,463

2.0 Proposed Residential Gross Building Floor Area

Gross Building Floor Area — The total area of the floor measured to the outside of all outside walls, including a basement or cellar but excluding areas used for parking of motor vehicles or areas above an atrium.

2.1 Proposed Residential Gross Building Floor Area - 27 Storey Condominium

			floors	sq.m.	sq.m.	sq.ft.
Levels	P5	to P4	2 x	195.89	391.78	4,217
Levels	P3	to P2	2 x	190.97	381.94	4,918
Levels	P1		1 x	649.63	649.63	6,993
Levels	1		1 x	649.63	649.63	6,147
Levels	2		1 x	1,133.64	1,133.64	12,202
Levels	3		1 x	988.80	988.80	10,643
Levels	4	to 5	2 x	988.80	1,977.60	21,287
Levels	6		1 x	756.30	756.30	8,141
Levels	7	to 15	9 x	756.30	6,806.70	73,267
Levels	16	to 20	5 x	735.83	3,679.15	39,602
Levels	21	to 23	3 x	715.71	2,147.13	23,110
Levels	24		1 x	644.71	644.71	6,940
Levels	25		1 x	578.14	578.14	6,223
Levels	26	to 27	2 x	570.43	1,140.86	12,389
Total Residential Gross Building Floor Area					**21,387.53**	**229,998**

2.2 Proposed Retail Gross Building Floor Area

		sq.m.	sq.ft.
Level 1		418.27	4,502

2.3 Total Gross Building Floor Area

	sq.m.	sq.ft.
Total Residential Gross Building Floor Area	21,387.53	229,998
Proposed Retail Gross Building Floor Area	418.27	4,502
Total Gross Building Floor Area	**21,785.80**	**234,500**

3.0 Proposed Density - FAR

Floor Area Ratio — The mathematical relationship between building floor area and lot area, determined by dividing the gross building floor area of all buildings on a lot by the net area of that lot.

FAR	Total GBFA	Total Site Area	FAR
	21,785.80	÷ 1,994.02 sq.m.	**10.93**

4.0 Unit Count

Floor Levels	1 Bedroom	1 Bedroom+Den	2 Bedroom	Large 2 Bedroom	Total Units per floor	no. floors	Total units
Level 4 - 5	0	0	1	2	3	2	6
Level 6	0	0	1	2	3	1	3
Level 7-15	2	2	3	2	9	9	81
Level 16-20	2	2	3	2	9	5	45
Level 21-23	2	2	2	2	8	3	24
Level 24	0	0	2	4	6	1	6
Level 25	0	0	2	4	6	1	6
Level 26-27	0	0	2	4	6	2	12
Total Units	**80**	**78**	**80**	**80**			**198**
Percentage (%)	20.41%	19.37%	30.61%	30.61%			100.00%

5.0 Vehicular Parking

5.1 Parking Ratio Proposed

	Ratio
Residential - Owners	1.00 /unit
Residential - Visitors	0.07 /unit

5.2 Parking Required

	Units	Ratio	Parking Spaces
Residential - Owners	198	1.00 /unit	198
Residential - Visitors	198	0.07 /unit	14
Total Parking Required			**210**

5.3 Parking Provided

	Owners	Visitors	(Accessible)	Parking Spaces
Level P6	43	0	1	43
Level P4	43	0	1	43
Level P3	43	0	1	43
Level P2	43	0	1	43
Level P1	24	14	2	38
Total Parking Provided	**196**	**14**	**6**	**210**

6.0 Bicycle Parking

6.1 Bicycle Parking Ratio Required*

	Ratio
Retail - Short-Term	2 spaces + 1 spaces / 1000 m² GFA
Residential - Short-Term	0.05 /unit
Residential - Long-Term	0.50 /unit

** As per Burlington City-Wide Parking Standards Review(July 2017)*

6.2 Bicycle Parking Required

	sq.m.	Units	Ratio	Parking Spaces
Retail - Short-Term	418.27		2 spaces + 1 spaces / 1000 m² GFA	10
Residential - Short-Term		196	0.05 /unit	10
Residential - Long-Term		196	0.50 /unit	98
Total Bicycle Parking Required				**118**

6.3 Bicycle Parking Provided

	Long-Term	Short-Term	Parking Spaces
Level P3	50	0	50
Level P2	50	0	50
At Grade	0	12	12
Total Bicycle Parking Provided	**100**	**12**	**112**

7.0 Amenity Space

Amenity Area — The area situated within the boundaries of a project and intended for recreational purposes, which may include open spaces, patios, balconies, communal play areas, lounges, sundecks, and rooftiectcs, but shall not include the area occupied at grade by the buildings, service areas, parking, and driveways.

7.1 Zoning Regulations - Indoor & Outdoor Amenity Space

Minimum Amenity Area	Zoning Regulations: For apartment dwelling units and retirement homes: 20m² per unit

7.2 Amenity Space Required

	Units	Ratio	sq.m.	sq.ft.
Maximum Amenity Area per dwelling unit	198	20m²	3,920.00	42,199

7.3 Amenity Space Provided

	floors	Indoor Amenity	Outdoor Amenity	Private Terraces	Balconies	sq.m.	sq.ft.
Levels	1	1 x	0.00	0.00	0.00	0.00	0
Levels	2	1 x	0.00	0.00	0.00	0.00	0
Levels	3	1 x	894.55	748.58	0.00	1,643.13	17,687
Levels	4 to 5	2 x	0.00	0.00	91.00	182.00	1,959
Levels	6	1 x	341.51	202.73	0.00	544.25	5,858
Levels	7 to 15	9 x	0.00	0.00	69.41	624.69	6,724
Levels	16	1 x	0.00	0.00	88.11	88.11	948
Levels	17 to 20	4 x	0.00	0.00	75.39	301.55	3,246
Levels	21	1 x	0.00	0.00	88.11	48.07	136.18
Levels	22 to 23	2 x	0.00	0.00	0.00	75.96	151.92
Levels	24	1 x	0.00	0.00	0.00	85.36	919
Levels	25	1 x	0.00	0.00	75.03	76.31	151.94
Levels	26 to 27	2 x	0.00	0.00	0.00	72.51	145.03
Total Amenity Space Provided			**1,236.06**	**951.31**	**176.00**	**665.55**	**4,590.63**	**49,304**

2 | Project Statistics
NTS

Authorities Having Jurisdiction

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Date:

KIRKOR
ARCHITECTS AND PLANNERS
20 De Boers Drive Suite 400
Toronto ON M3J 0H1

Revisions:

No.:	Revision:	Date:

No.:	Issued For:	Date:

Client:
THE ROSSEAU GROUP

2083 Lakeshore Road, Burlington
Proposed Residential Development

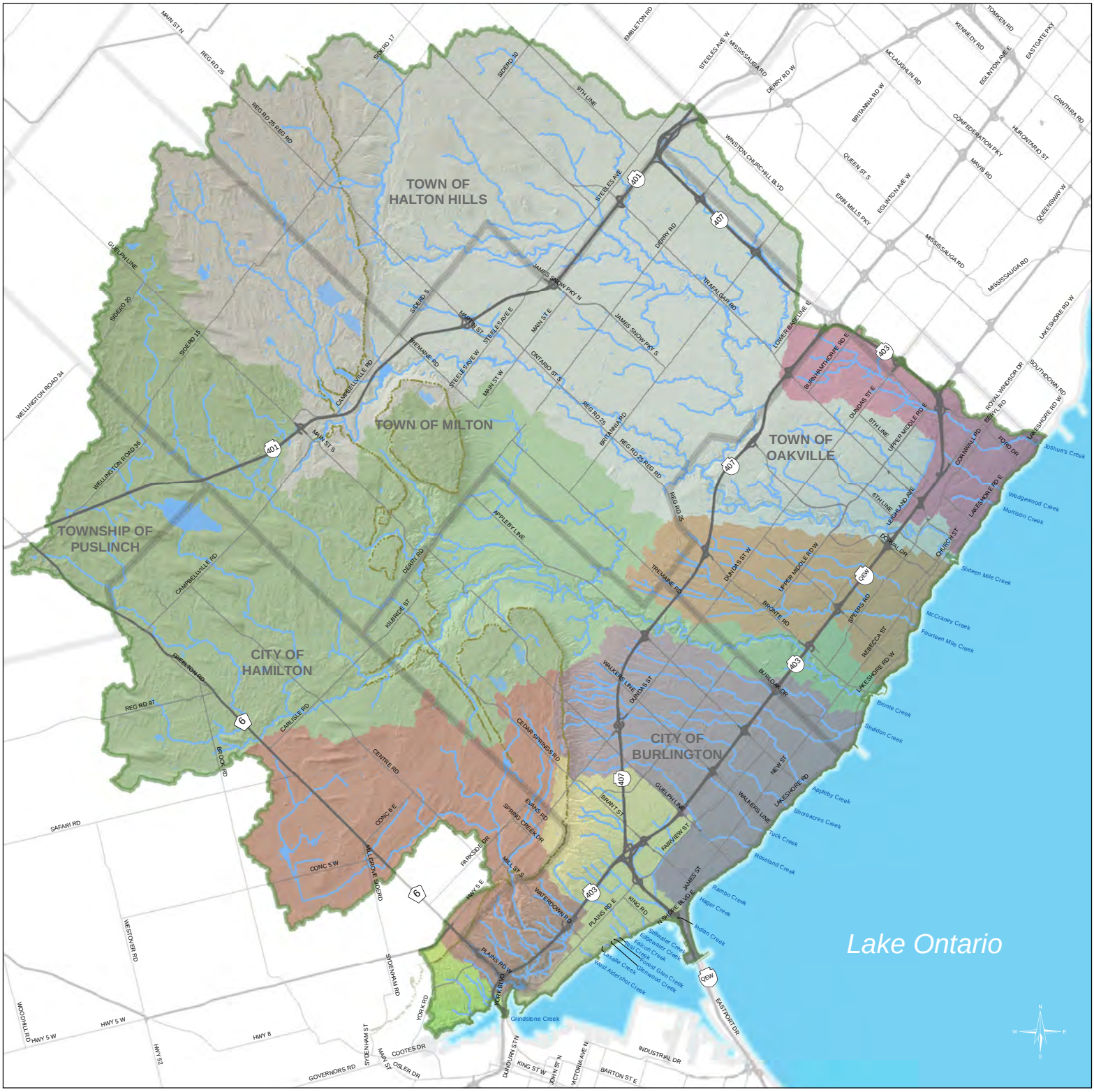
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Site Plan & Project Statistics

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Checked by: Checker
Project No.: 22-047
Date: Dec. 11 2024
Drawing No.:

dA1.3

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Conservation Halton Watersheds



Legend

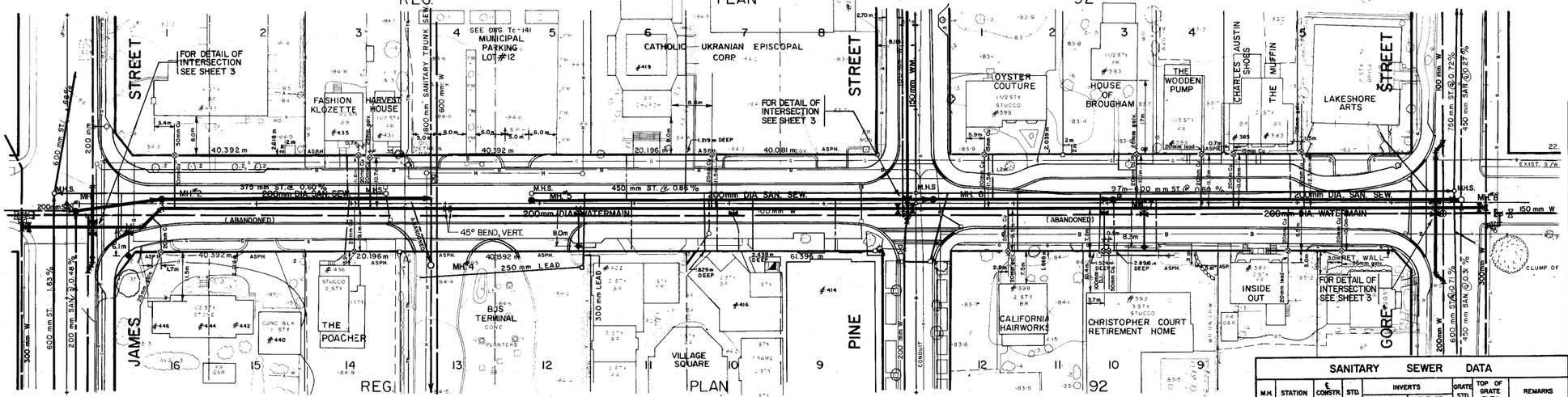
- Expressway / Highway
- Arterial Roads
- Creeks & Waterbodies
- Niagara Escarpment
- Municipal Boundaries

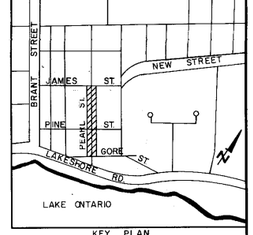
Watersheds

- Bronte Creek
- Burlington Urban Creeks
- Grindstone Creek
- North Cootes Paradise
- North Shore
- Oakville East Urban Creeks
- Oakville West Urban Creeks
- Sixteen Mile Creek

0 1 2 4 6 8 10 Kilometres

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KEY PLAN
SCALE · 1:12,500

1929 DATUM

GEOD. B.M. CITY HALL, AT SOUTHWEST SIDE OF BRANT STREET, 0.32 km NORTHWEST OF LAKESHORE RD., IMMEDIATELY NORTHWEST OF AND OPPOSITE JAMES STREET. TABLET IN NORTHWEST CONC. FOUNDATION WALL, 1.6 m NORTHEAST OF CURVED PORTION AT REAR OF BUILDING, 0.3048 m BELOW METAL SIDING. ELEV. 86.565

GEOD. B.M. B.M. SET ON HORIZONTAL GEODETIC CONTROL MONUMENT 650013 IN THE CITY OF BURLINGTON, LOCATED ON THE SIDE OF MARTHA STREET AT THE INTERSECTION OF MARTHA STREET AND NEW STREET. 4.328 m WEST OF FACE OF CURB. 5.15 m NORTH OF NEW STREET CENTRE LINE. ELEV. 84.989

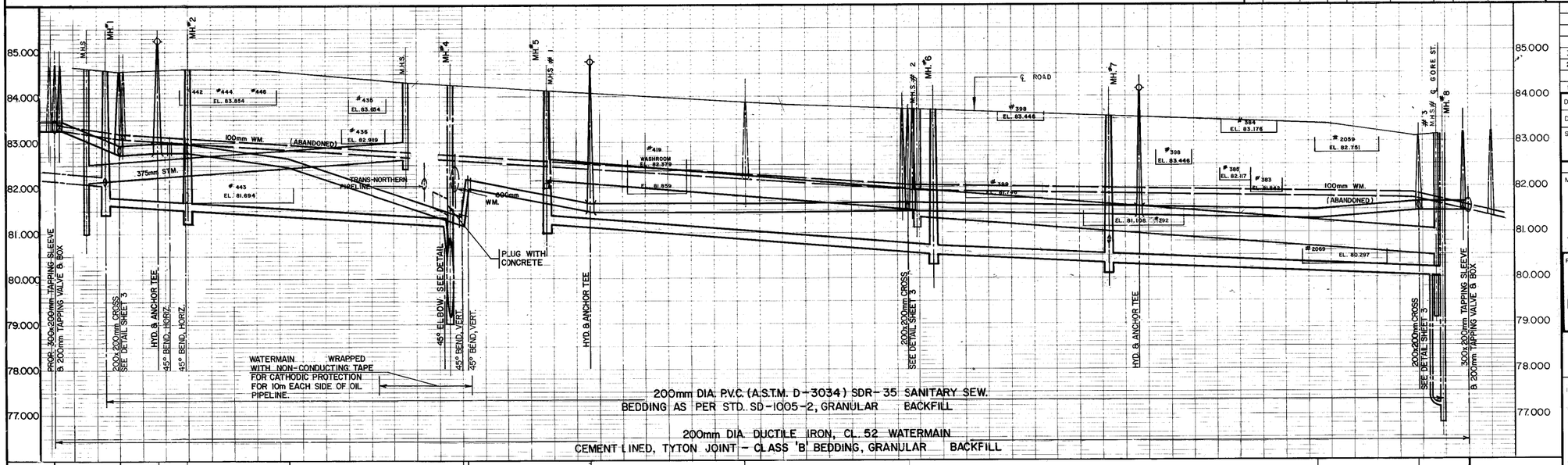
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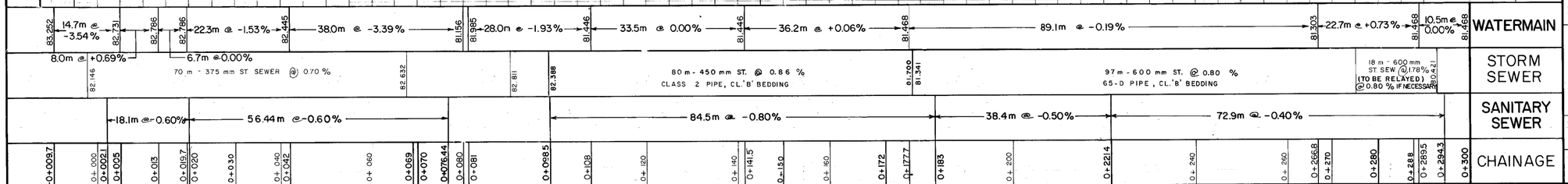
WATERMAIN DATA

ITEM	STATION	℄ CONSTR. OFFSET	STD.	INVERT ELEV.	REMARKS
300x200mm TAPPING SLEEVE & 200mm TAPPING VALVE & BOX	0+009.7	5.0m Rt.	405	83.252	
45° BEND, HORIZ & VERT.	0+004.0	14.4 m Rt.	421	83.666	
45° BEND, HORIZ. & VERT.	0+005.0	13.1 m Rt.	421	82.731	
200x100mm REDUCER	0+005.0	12.0 m Rt.	–	——	
200x200mm FL. CROSS & 2-200mm FL. G.V. & BOX	0+005.0	5.0m Rt.	405	82.731	
11¼° BEND, VERT.	0+005.0	4.0m Lt.	421	82.942	
HYD. & ANCHOR TEE	0+013.0	11.4m Rt.	441	82.786	WITH SEC. G.V. & BOX
45° BEND, HORIZ.	0+016	5.0m Rt.	421	82.786	
45° BEND, HORIZ.	0+019.7	1.0m Rt.	421	82.804	
45° BEND, VERT.	0+080	1.0m Rt.	421	81.156	
45° BEND, VERT.	0+081	1.0m Rt.	421	81.985	
HYD. & ANCHOR TEE	0+108	9.0m Rt.	441	81.446	WITH SEC. G.V. & BOX
200x200mm FL. CROSS & 2-200mm FL. G.V. & BOX	0+177.7	1.0m Rt.	405	81.468	
HYD. & ANCHOR TEE	0+228	9.3m Rt.	441		WITH SEC. G.V. & BOX
45° BEND, HORIZ. & VERT.	0+289.5	16.0 mRt.	421	—	
200x200mm FL. CROSS & 2-200mm FL. G.V. & BOX	0+289.5	1.0m Rt.	405	81.468	
200x100mm REDUCER	0+289.5	10.0 mLt.	—	—	
45° BEND, HORIZ. & VERT.	0+289.5	11.5 m Lt.	421	—	
45° BEND, HORIZ. & VERT.	0+291	15.5 m Rt.	421	81.767	
45° BEND, HORIZ. & VERT.	0+291	13.0m Lt.	421	81.888	
300x200mm TAPPING SLEEVE & 200mm TAPPING VALVE & BOX	0+300	1.0m Rt.	405	81.474	

SANITARY SEWER DATA

M.H.	STATION	℄ CONSTR. OFFSET	STD.	INVERTS INLET	INVERTS OUTLET	GRATE STD.	TOP OF GRATE ELEV.	REMARKS
1	0+002.1	1.5m Rt	322	EX.N. 82.025 EX.W. 82.041	S. 81.600	331	84.549	
2	0+020	1.0m Lt	322	N. 81.491	S. 81.419	331	84.601	
	0+076.44	1.0m Lt			SW. 81.080			45° ELBOW
EX.4	0+077.4	13.05mRt		EX.NE. 81.416 EX.E. 79.166	EX.W. 79.166		84.296	PLUG NE. INV.
5	0+098.5	1.0m Lt	322		S. 81.194	331	84.121	
6	0+183	1.0m Lt	322	N. 80.518	S. 80.518	331	83.685	
7	0+221.4	1.0m Lt	322	N. 80.326 EX.W. 80.754	S. 80.326	331	83.531	
EX.8	0+294.3	0.4m Lt		N. 80.034 EX.W. 76.923	EX.E. 76.911		83.161	DROP. 77.178 N.





Nº	DATE	BY	REVISIONS
3	JULY/86	M.P.S.	AS CONSTRUCTED - WATER
2	JUNE/84	D. MIS	EXIST. W/M TO BE REMOVED 3 m EITHER SIDE OF T.N.P.L.
1	MAY/84	D. MIS	SAN. SEWER RAISED FROM JAMES ST. TO 1800 mm SANITARY TRUNK SEWER.

DESIGN M.P.S. CHECKED
DRAWN M.P.S. CHECKED
DATE: JAN. 1984
SCALE 1:500 HORZ. 5m 0 5m 10m 15m; 0.5m 0 0.5m 1.0m 1.5m; 1:50 VERT.
REFERENCES S-04-20-C S-04-06-C

APPROVALS

Municipal

DIRECTOR OF PUBLIC WORKS

DATE

Regional

DIRECTOR OF PUBLIC WORKS

MANAGER OF DESIGN & CONSTRUCTION

86 06 17

FIELD NOTES

STAMP

CITY OF BURLINGTON

JOINT CONTRACT

REGIONAL MUNICIPALITY OF HALTON PUBLIC WORKS DEPARTMENT

200mm WM. & 200mm SAN. SEW.

PEARL STREET

CITY OF BURLINGTON

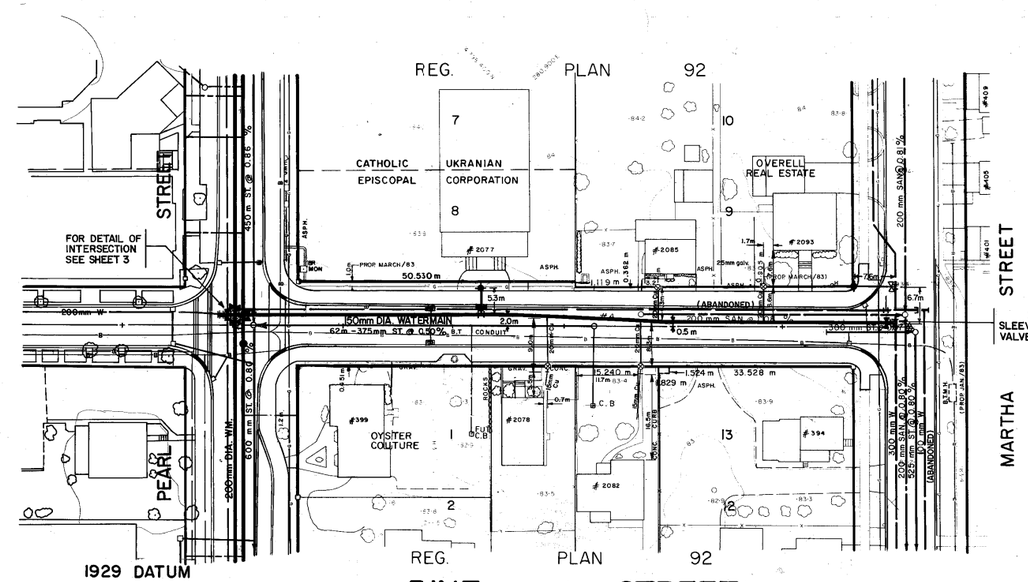
JAMES ST. TO GORE ST.

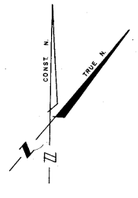
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REGIONAL DRAWING Nº B-5213

CONTRACT Nº 84-8 / PR-732

SHEET 1 OF 3





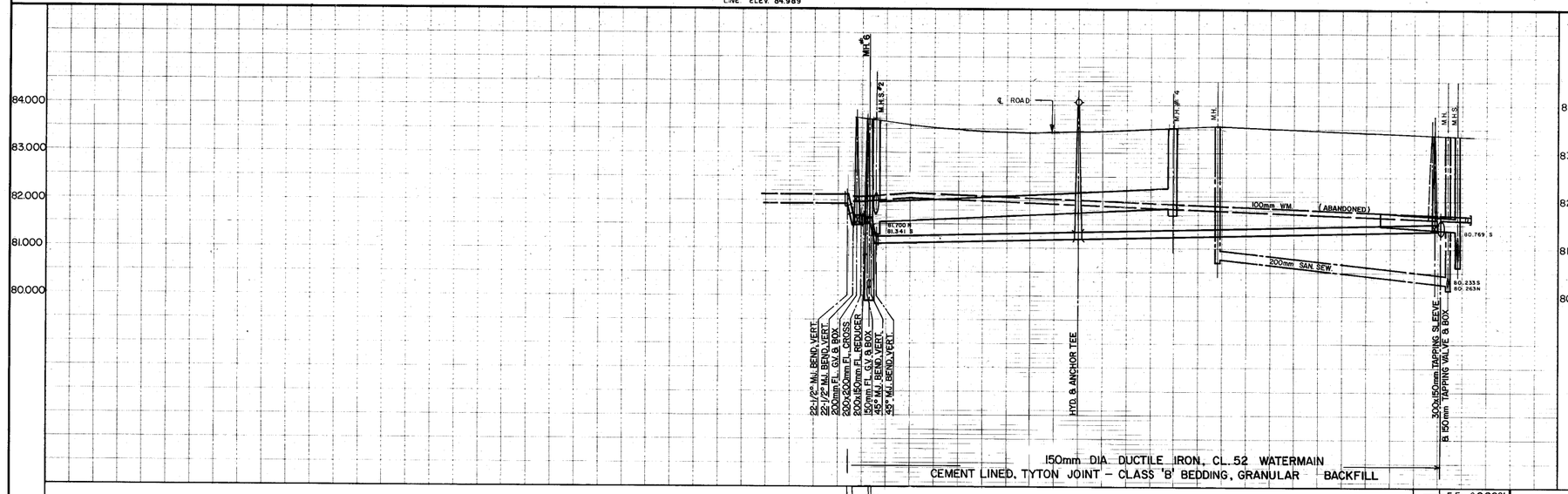
KEY PLAN
SCALE: 1:12,500

GEOD. B.M. CITY HALL, AT SOUTHWEST SIDE OF BRANT STREET, 0.32 km NORTHWEST OF LAKESHORE RD., IMMEDIATELY NORTHWEST OF AND OPPOSITE JAMES STREET. TABLET IN NORTHWEST CONC. FOUNDATION WALL, 1.6 m NORTHEAST OF CURVED PORTION AT REAR OF BUILDING, 0.3048 m BELOW METAL SIDING. ELEV. 86.565

GEOD. B.M. B.M. SET ON HORIZONTAL GEODETIC CONTROL MONUMENT 650013 IN THE CITY OF BURLINGTON, LOCATED ON THE SIDE OF MARTHA STREET AT THE INTERSECTION OF MARTHA STREET AND NEW STREET. 4.328 m WEST OF FACE OF CURB. 5.15 m NORTH OF NEW STREET CENTRE LINE. ELEV. 84.989

WATERMAIN DATA

ITEM	STATION	℄ CONSTR. OFFSET	STD.	INVERT ELEV.	REMARKS
22 1/2° BEND, VERT.	0+237.2	2.0m Lt.	421	81.958	
22 1/2° BEND, VERT.	0+238.2	2.0m Lt	421	81.468	
200mm FL. G.V. & BOX	0+239.7	2.0m Lt.	405	81.468	
200x200mm FL. CROSS	0+240.2	2.0m Lt.		81.468	
200x150mm FL. REDUCER	0+240.52	2.0m Lt.	—	——	
150mm FL. G.V. & BOX	0+240.79	2.0m Lt.	405	81.508	
45° BEND, VERT.	0+241.6	2.0m Lt.	421	81.508	
45° BEND, VERT.	0+242.1	2.0m Lt.	421	81.092	
HYD. & ANCHOR TEE	0+235	7.3m Lt.	441	81.191	WITH SEC. G.V. & BOX
HYDRANT	0+333	7.4m Lt.	441	——	
300x150mm TAPPING SLEEVE & 150mm TAPPING VALVE & BOX	0+360.5	0.5m Lt.	405	81.357	



NO	DATE	BY	REVISIONS
1	JULY/86	M.P.S.	AS CONSTRUCTED - WATER

DESIGN	M.P.S.	CHECKED	DATE
DRAWN	M.P.S.	CHECKED	JAN. 1984

SCALE 1:500 HORZ. (5m 0 5m 10m 15m) (0.5m 0 0.5m 1.0m 1.5m) 1:50 VERT

REFERENCES
20R-1910
20R-1185
20R-1365
10R-5273
20R-5482

FIELD NOTES
P-242
P-292

APPROVALS

Municipal

DIRECTOR OF PUBLIC WORKS

DATE

Regional

DIRECTOR OF PUBLIC WORKS

MANAGER OF DESIGN & CONSTRUCTION

STAMP

84 of 17

CITY OF BURLINGTON

JOINT CONTRACT

REGIONAL MUNICIPALITY OF HALTON PUBLIC WORKS DEPARTMENT

150mm DIA. WATERMAIN

PINE STREET

CITY OF BURLINGTON

PEARL ST. TO MARTHA ST.

MUNICIPAL DRAWING Nº MP-4 R

REGIONAL DRAWING Nº B-5214

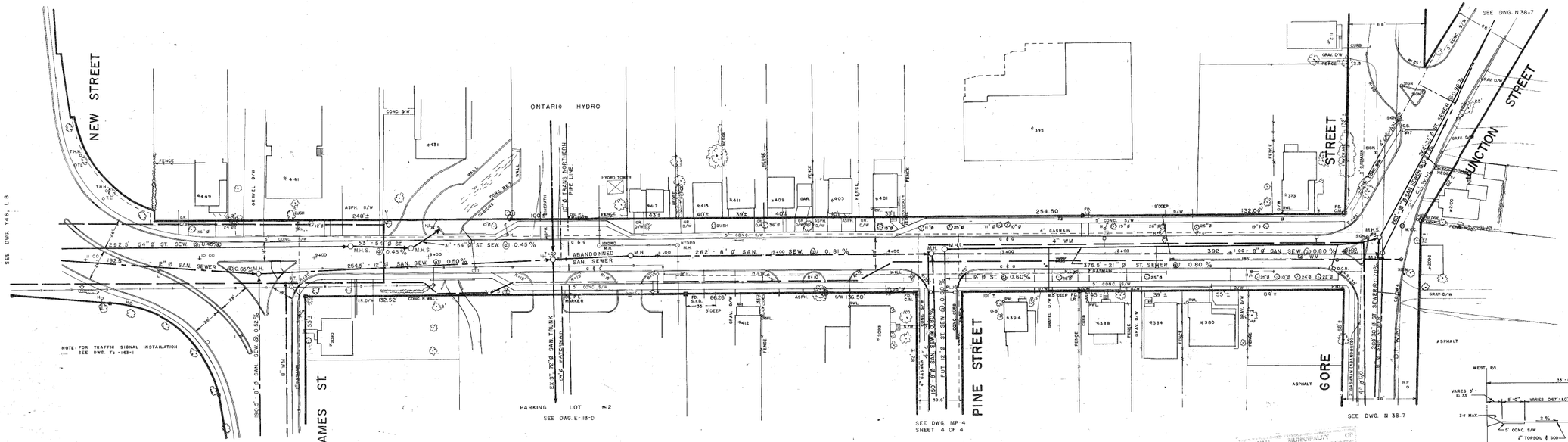
CONTRACT Nº 84-8 / PR-732

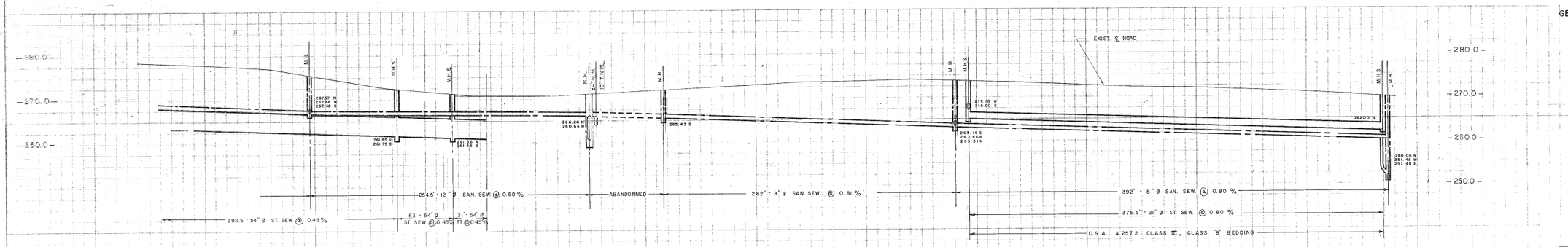
SHEET 2 OF 3

B-5214

PR-732 2 of 3

R 4 CM 1:50 1:1334-2





	11+00	10+50	10+00	9+50	9+44	9+00	8+75	8+59.42	8+50	8+25	8+00	7+75	7+59.56	7+50	7+25	7+00	6+50	6+00	5+50	5+00	4+70	4+50	4+20	4+10	4+00	3+70	3+50.3	3+50	3+00	2+50	2+00	1+50	1+00	0+50	0+20	0+00	-0+33
EXIST. ℄ ROAD					276.46	273.53	272.82	272.28	271.99	271.56	270.83	270.70	270.67	270.68	270.86	271.14	271.70	272.26	272.82	273.38	273.72	273.90	274.03	274.03	274.01	273.84	273.77	273.66	273.22	272.78	272.34	271.90	271.46	270.80	270.40		
ORIG. ℄ ROAD					275.86		272.29	271.48		271.05	270.81	270.73		270.66	270.62	270.73	271.08	271.97	272.85	273.52	273.82						273.95	273.76	273.33	272.83	272.35	271.93	271.54	270.81	270.40	270.12	269.75
CHAINAGES																																					

GEOD. B.M. CITY HALL, AT S/W SIDE OF BRANT ST., 0.2 MILES N/W OF LAKESHORE RD, IMMEDIATELY N/W AND OPPOSITE JAMES ST. TABLET IN N/W CONC. FOUNDATION WALL, 5.5' N/E OF CURVED PORTION AT REAR OF BLDG., 12" BELOW METAL SIDING. ELEV. 284.005

B.M. PLATE ON PUMP HOUSE, LOCATED JUST WEST OF RAMBO, BEING 0.2 MILES E OF BRANT ST. ON LAKESHORE RD. PLATE IS FIXED TO THE S. FACE OF BRICK BLDG. BEING 0.5' E. OF THE S/W CORNER AND 1.0' ABOVE EXISTING CONC. S/W. ELEV. 256.464

B-3666

REVISION Nº	DESCRIPTION	DATE	BY
2	TRANSFER TO OPERATING MAP	80-8-5	D.P.R.
1	"AS CONSTRUCTED" (CONTR. 78-10) (N-242)	OCT./79	D.M.

CITY OF BURLINGTON
DEPARTMENT OF PUBLIC WORKS

MARTHA STREET
GORE STREET — JAMES STREET

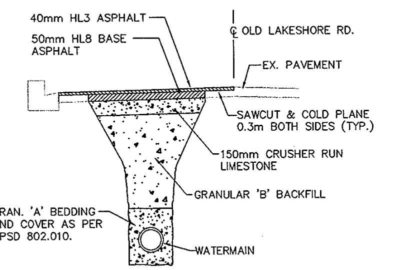
DESIGN BY	P.F.	CHK'D		FIELD NOTES	INDEX Nº
DRAWN BY	Z. PILLER	CHK'D		J-IC-1, M 102, P.194 M-15	
SCALE	HORZ. 1"=40' VERT 1"=10'	DATE	NOV, 1971	REFERENCES	
APPROVED	DIRECTOR OF PUBLIC WORKS	DATE		E 61-3, L 71-3, K 84, SUR. 8-6,	W 67

PR-326-78

B-3666

GENERAL NOTES

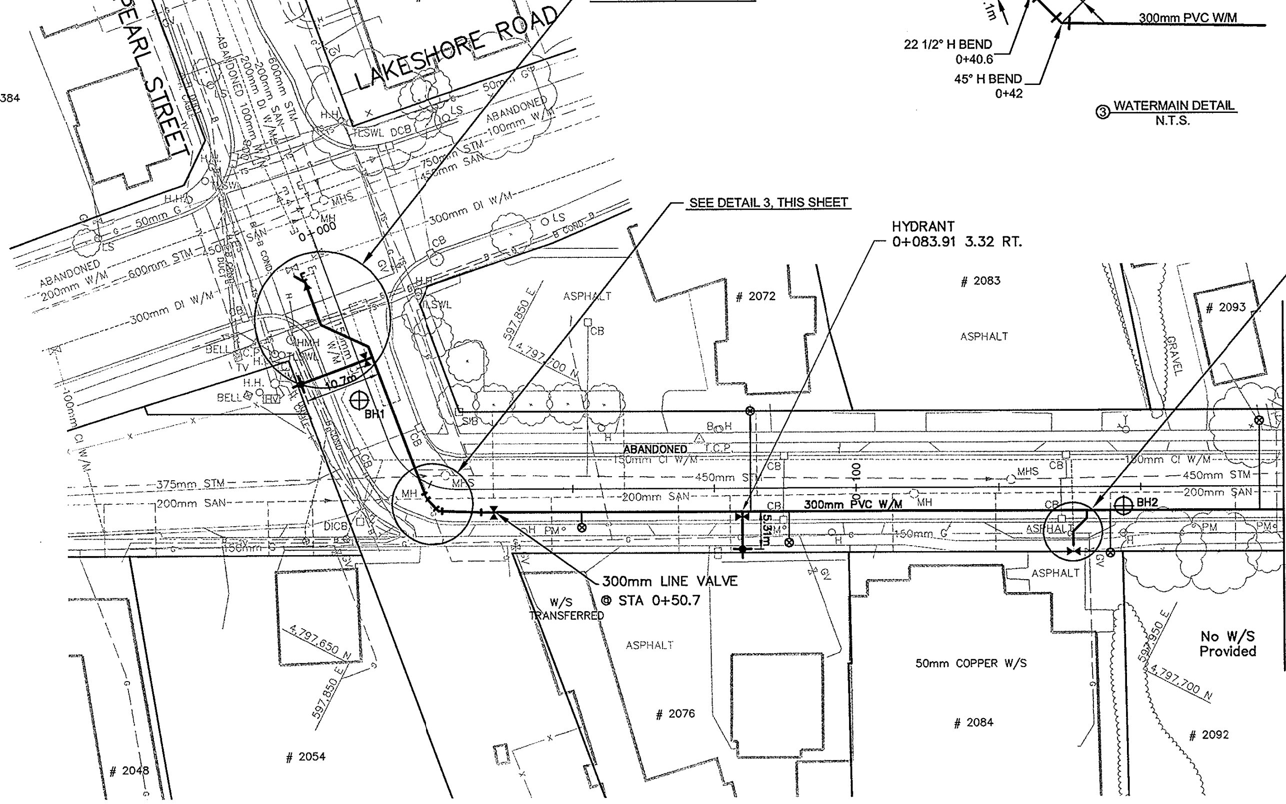
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SPECIFIED.
2. ALL WATERMAIN AND SANITARY SEWER INSTALLATION SHALL CONFORM TO THE LATEST REVISIONS OF THE ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD) AND SPECIFICATIONS (OPSS) AS AMENDED BY THE REGIONAL MUNICIPALITY OF HALTON.
3. THE LOCATION OF ALL EXISTING WATERMAIN, SANITARY SEWER, UTILITIES AND SERVICES ARE APPROXIMATE. THE CONTRACTOR MUST VERIFY THE LOCATION, VERIFY SIZE AND ELEVATION IN THE FIELD PRIOR TO CONSTRUCTION.
4. DRIVEWAY MATERIAL IS ASPHALT UNLESS OTHERWISE SPECIFIED.
5. WATERMAIN MATERIAL IS TO BE EITHER DUCTILE IRON PRESSURE CLASS 350 AS PER AWWA C-150 OR PVC SDR-18 CL-150 AS PER AWWA C-900.
6. UNLESS OTHERWISE NOTED, ALL EXISTING WATER SERVICES ARE TO BE REPLACED WITH A MIN. 19mm DIA. COPPER FOR RESIDENTIAL DWELLINGS AND 25mm DIA. COPPER FOR INDUSTRIAL AND COMMERCIAL PREMISES AS PER OPSD 1104.010. UNLESS OTHERWISE NOTED, SERVICES ARE TO BE REPLACED FROM THE MAIN TO THE PROPERTY LINE WITH A NEW CURB STOP AND SERVICE BOX AT THE PROPERTY LINE.
7. THE CONTRACTOR SHALL PROVIDE ALL TEMPORARY CAPS, PLUGS AND BLOW OFFS REQUIRED FOR TESTING THE NEW WATERMAIN.
8. MAXIMUM ALLOWABLE PIPE JOINT DEFLECTION OF THE WATERMAIN SHALL BE 70% OF THE MANUFACTURER'S SPECIFICATIONS. PIPE BARREL DEFLECTION IS STRICTLY PROHIBITED.
9. CORROSION PROTECTION IS REQUIRED FOR ALL METALLIC PIPE, VALVES, FITTINGS SERVICES AND HYDRANTS. CATHODIC PROTECTION (ZINC ANODE) AS PER THE DETAILS IN THE REGIONAL DESIGN SPECIFICATIONS OR 8 MIL MEDIUM DENSITY POLYETHYLENE ENCASEMENT AS PER AWWA C-105 SHALL BE USED.
10. AFTER REMOVING VALVE BOXES AND HYDRANTS, BACKFILL WITH COMPACTED GRANULAR 'A'. WHERE EXISTING VALVE CHAMBERS ARE TO BE ABANDONED, ALL VALVES WITHIN THE CHAMBER ARE TO BE LEFT IN PLACE AND THE CHAMBER IS TO BE BROKEN DOWN TO 1.0m BELOW FINAL GRADE AND BACKFILLED WITH NON-SHRINK BACKFILL TO SUBGRADE. THE AFFECTED AREA SHALL BE COMPLETELY RESTORED. ALL HYDRANTS SHOWN FOR REMOVAL SHALL BE RETURNED TO REGIONAL STORES AT 1179 BRONTE RD., OAKVILLE. UNLESS OTHERWISE NOTED, ALL VALVES WHICH ARE SHOWN FOR REMOVAL SHALL BE DISPOSED OF BY CONTRACTOR.
11. EXISTING WATERMAIN IS TO BE EITHER REMOVED OR PLUGGED AND ABANDONED AS REQUIRED.
12. HYDRANTS ARE TO BE INSTALLED SUCH THAT THE LOWER ROD/STEM LENGTH SHALL NOT EXCEED 1.7m MEASURED FROM THE BREAK-OFF FLANGE.
13. REGIONAL MUNICIPALITY OF HALTON APPROVED MECHANICAL RESTRAINTS ARE TO BE USED ON ALL STANDARD BENDS, VALVES, FITTINGS AND HYDRANTS. REFER TO TABLE.



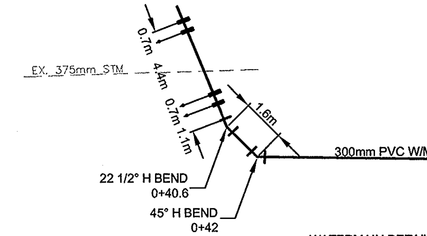
ROAD RESTORATION DETAIL

N.T.S.

NOTE: ASPHALT DRIVEWAY RESTORATION IS TO BE FULL WIDTH OF DRIVEWAY WITH 50mm HL3A.



OLD LAKESHORE ROAD

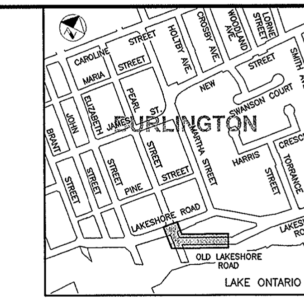


③ WATERMAIN DETAIL
N.T.S.

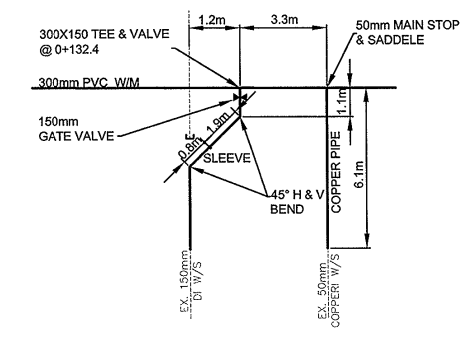
LEGEND

⊕ BH1	BOREHOLES– REFER TO PETO MACCULLUM LTD. GEO-TECHNICAL REPORT # 93HF095 REGION FILE: FS 364 (1993)
⊗	WATER BOXES
	EX. HYDRANT REMOVAL
	EX. VALVE BOX REMOVAL
	EX. WVC OR EX. MH REMOVAL
	PLUG

NOTE: USED 25mm COPPER PIPE FOR ALL NEW WATER SERVICES EXCEPLT # 2084 (USED 50mm COPPER PIPES)

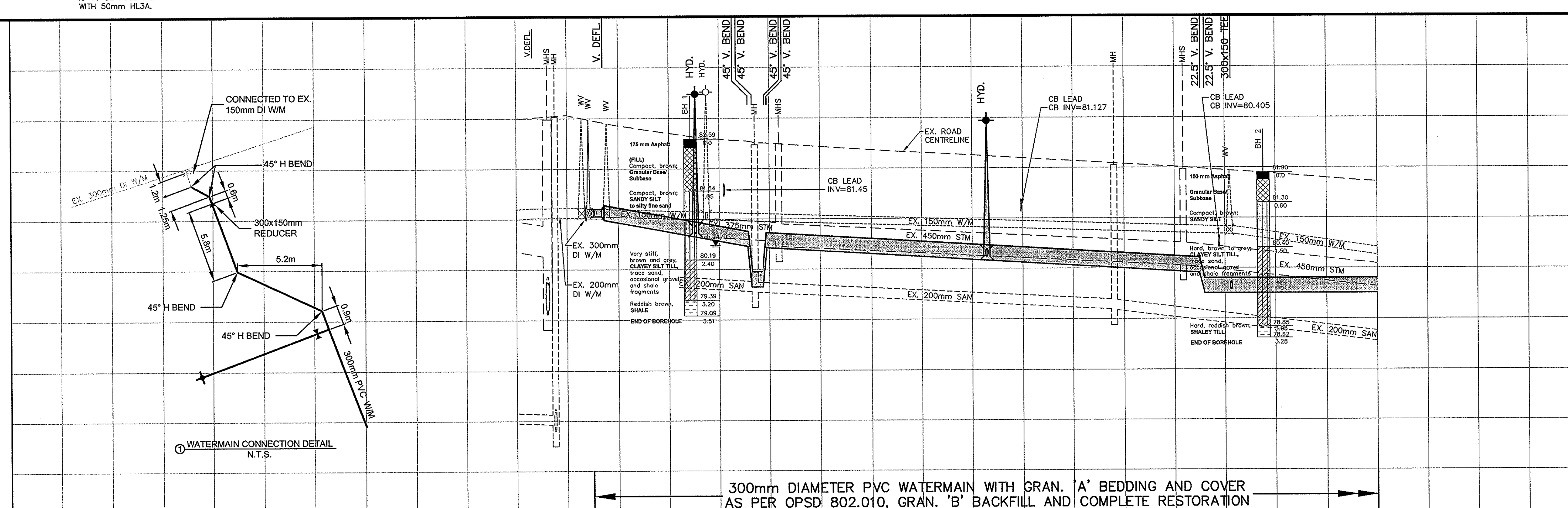


KEYPLAN
N.T.S.



② WATERSERVICE CONNECTION DETAIL
N.T.S.

REGIONAL MUNICIPALITY OF HALTON, ITS EMPLOYEES, OFFICERS AND AGENTS ARE NOT RESPONSIBLE FOR ANY ERRORS, OMISSIONS OR INACCURACIES, WHETHER DUE TO THEIR NEGLIGENCE OR OTHERWISE. ALL INFORMATION SHOULD BE VERIFIED



℄ ELEVATIONS	83.06, 82.85, 82.71, 82.59, 82.51, 82.43, 82.37, 82.31, 82.26, 82.20, 82.14, 82.08, 82.02, 81.95, 81.87, 81.79, 81.72
WATERMAIN ELEVATIONS	81.05±, 81.05±, 80.98± … 79.91, 79.50; 61.79m @ 0.00%
	0.70m @ 100%; 4.4m @ 0.00%; 0.70m @ 100%; 1.00m @ 41.42%
CHAINAGE	0+000, 0+005.26±, 0+020, 0+033.7, 0+034.4, 0+038.8, 0+039.5, 0+060, 0+080, 0+100, 0+120, 0+125.00, 0+126.00, 0+140, 0+160

NO	Date	By	REVISIONS	MANU	CAD
2	MAY 19	KDH	As Constructed		X
1	NOV 08	E.A.H.	As Constructed		X

Design	B.K.	Ch'kd	
Drawn	C.S.J.	Ch'kd	

Date: JANUARY 2005

Scale: Horiz. 1:500; Vert. 1:50

References

APPROVALS

Municipal

Regional

Director, Engineering Services

Manager, Design Services

Field Notes: REGION BOOK

Stamp

Halton

WATERMAIN REPLACEMENT ON
OLD LAKESHORE ROAD
FROM PEARL STREET TO
140m SOUTHWEST OF LAKESHORE ROAD
IN THE CITY OF BURLINGTON

Consultant File NO

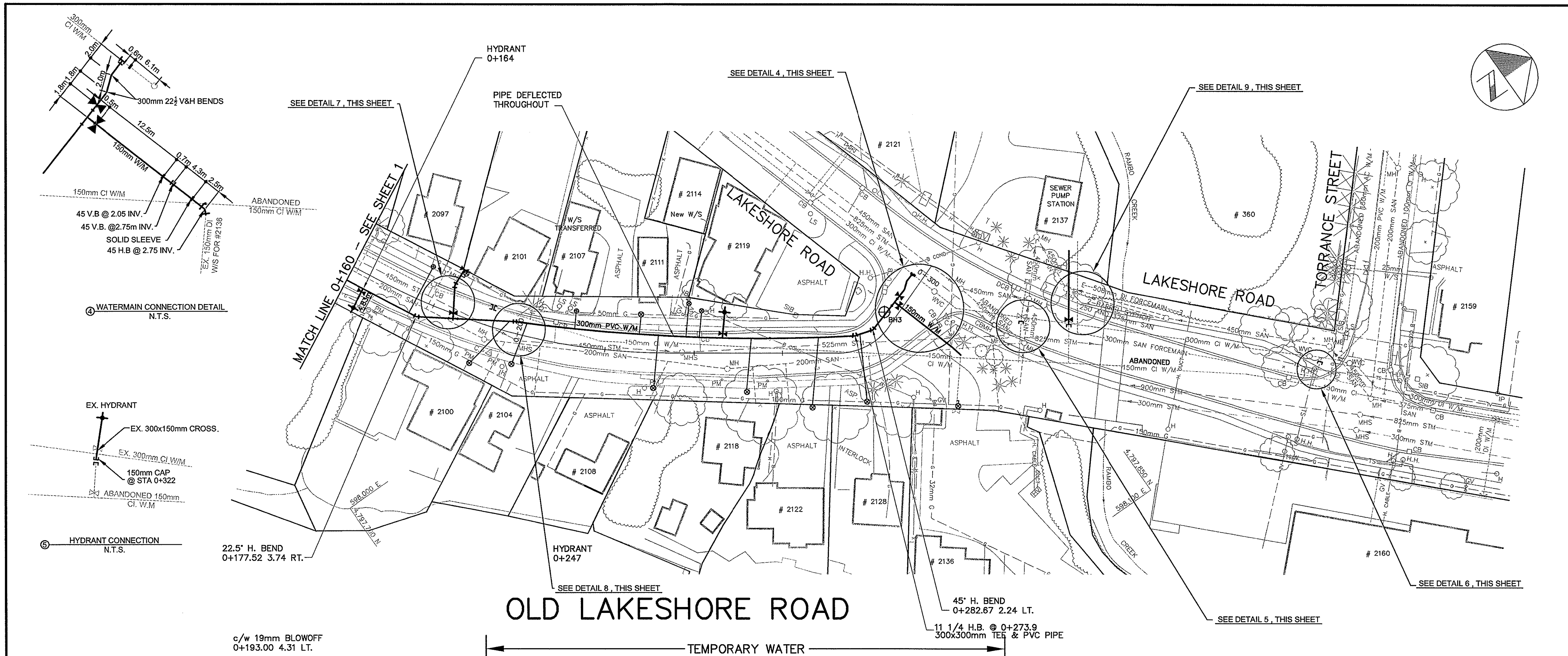
Ref B-12080

CONTRACT NO W-2295-06

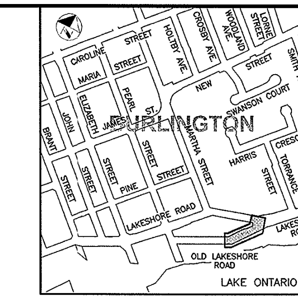
Drawing NO SHEET 1 OF 2

PR-2295-06 1 of 2

B-12080



OLD LAKESHORE ROAD

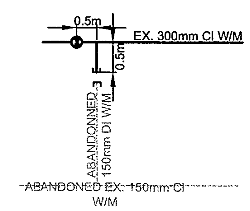


KEYPLAN
N.T.S.

LEGEND

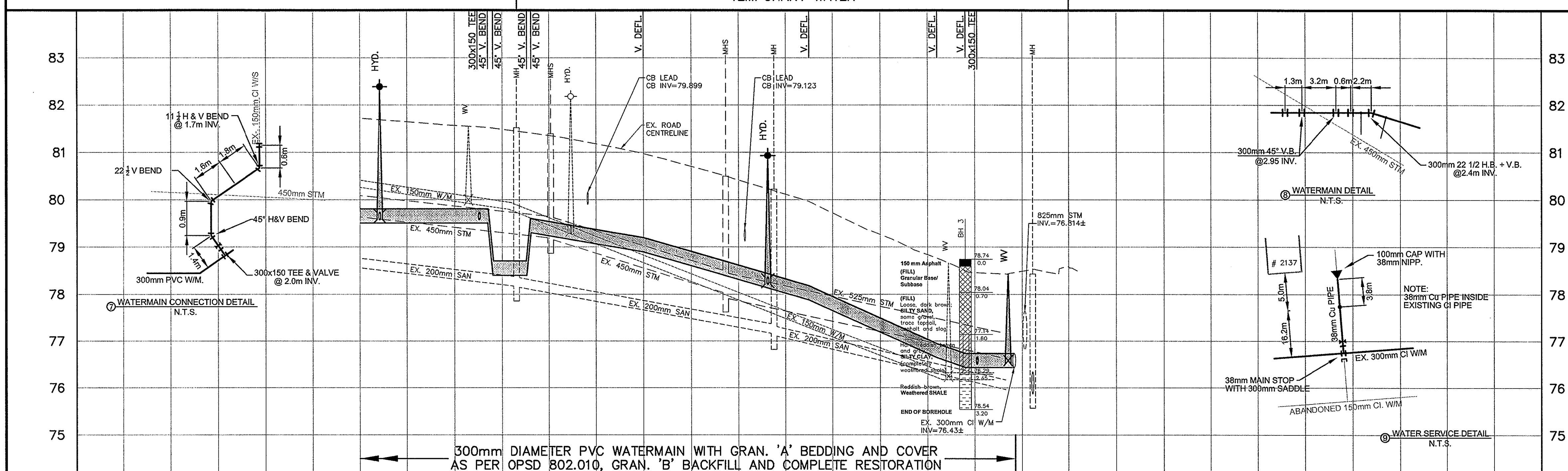
- ⊕ BH1
- WATER BOXES
- EX. HYDRANT REMOVAL
- EX. VALVE BOX REMOVAL
- EX. WVC OR EX. MH REMOVAL
- PLUG

NOTE: USED 25mm COPPER PIPE FOR ALL NEW WATER SERVICES



⑥ CUT AND CAPPED 150mm DI W/M
N.T.S.

REGIONAL MUNICIPALITY OF HALTON, ITS EMPLOYEES, OFFICERS AND AGENTS ARE NOT RESPONSIBLE FOR ANY ERRORS, OMISSIONS OR INACCURACIES, WHETHER DUE TO THEIR NEGLIGENCE OR OTHERWISE. ALL INFORMATION SHOULD BE VERIFIED



℄ ELEVATIONS	81.72, 81.64, 81.57, 81.48, 81.35, 81.18, 80.97, 80.70, 80.41, 80.11, 79.72, 79.26, 78.84, 78.46, 78.49, 78.58 / 78.49
WATERMAIN ELEVATIONS	61.79m @ 0.00%, 79.50, 78.40, 78.40, 79.30, 23.48m @ 1.75%, 78.89, 34.76m @ 2.90%, 77.88, 24.76m @ 5.00%, 76.64, 76.43±, 76.43±
	0.90m @ 100%, 7.44m @ 0.00%, 1.10m @ 100%, 10.60m @ 0.00%, 5.47m @ 3.85%
CHAINAGE	0+160, 0+180, 0+186.97, 0+188.03, 0+195.31, 0+196.20, 0+200, 0+220, 0+240, 0+255, 0+260, 0+280, 0+282, 0+288, 0+298.58±, 0+300, 0+311.80

Nº	Date	By	REVISIONS	MANU	CAD
2	MAY 19	KDH	As Constructed		X
1	NOV 08	E.A.H.	As Constructed		X

Design	B.K.	Ch'kd	
Drawn	C.S.J.	Ch'kd	

Date: JANUARY 2005

Scale: Horiz. 1:500; Vert. 1:50

References

APPROVALS

Municipal

Regional

Director, Engineering Services

Manager, Design Services

Field Notes: REGION BOOK

Stamp

Halton

WATERMAIN REPLACEMENT ON
OLD LAKESHORE ROAD
FROM 140m SOUTHWEST OF LAKESHORE ROAD TO LAKESHORE ROAD
IN THE CITY OF BURLINGTON

Consultant File Nº

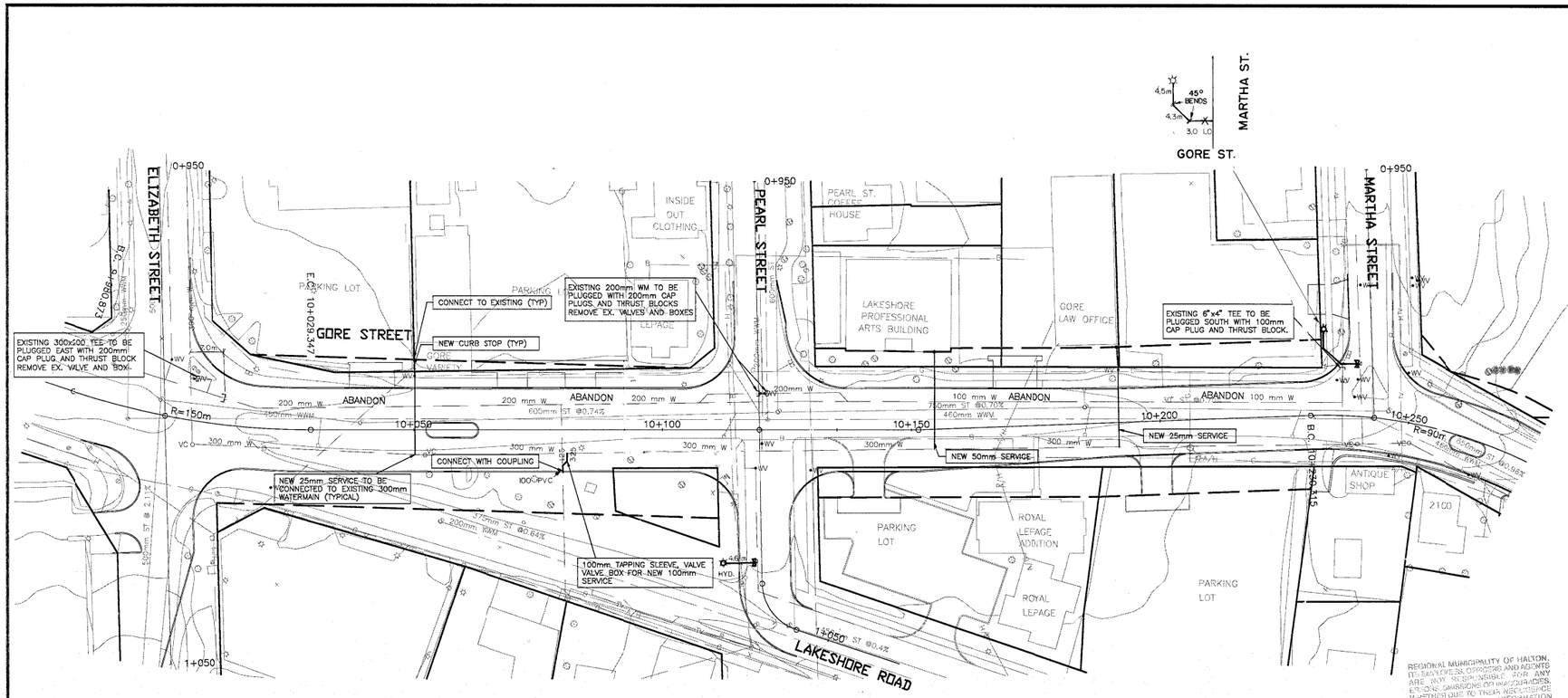
Reg B-12081

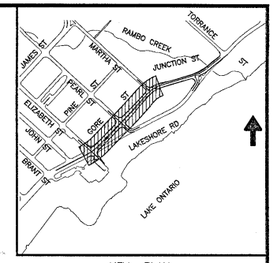
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Drawing Nº SHEET 2 OF 2

PR-2295-06 2 of 2

B-12081



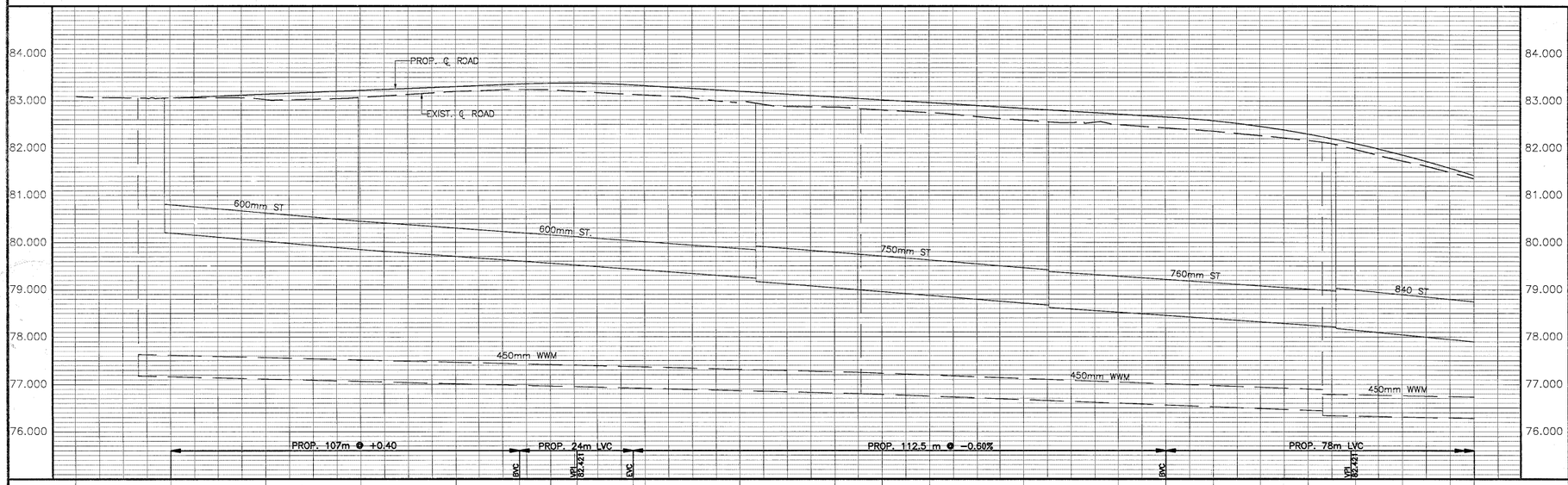


KEY PLAN

GENERAL NOTES

1. All Watermain and Sanitary sewer installation shall conform to the to the latest revisions of the Ontario Provincial Standard Drawings (OPSD) and Specifications (OPSS) as amended by the Regional Municipality of Halton.
2. The locations of all existing Watermain, Sanitary Sewer, Utilities and Service Laterals are approximate. The Contractor must verify the location, size and elevation in the field prior to construction.
3. All existing sanitary laterals shall be replaced with 125mm PVC SDR28 diameter Connections for single family and semi-detached dwellings and 150mm PVC SDR28 diameter connections for all others. The new lateral is to be placed from the sewer to the property line in accordance with OPSD 1006.02. The minimum and maximum cover at the property line shall be 2.15m and 2.75m respectively unless otherwise noted.
4. All existing water services to be replaced with 20mm diameter copper for residential dwellings and 25mm diameter copper for industrial and commercial premises as per OPSD 1104.01 unless otherwise noted. New services are to be replaced from the main to the property line with a new curb stop and service box at the property line, unless otherwise ncted.
5. The Contractor shall provide all temporary caps, plugs and blow offs required for testing the new watermain.
6. Maximum allowable pipe joint deflection of the watermain shall be 70% of the Manufacturer's specifications. Pipe Barrel bending is not permitted.
7. The proposed watermain is to be tested, flushed, chlorinated and accepted by the Region prior to being put into service.
8. Corrosion protection is required for all ductile iron valves and fittings. Use either cathodic protection (zinc anode) as per the details in the specification or 3 mil medium density Polyethylene encasement as per AWWA C105/A21.5-93.
9. All existing sanitary manholes to be either removed or broken down 1.0 metres below final grade and backfilled with Granular material and complete restoration unless otherwise ncted. Frames and covers are to be salvaged and returned to Regional stores at 2316 South Service Road, Oakville.
12. Existing valve boxes to be removed are to have granular backfill and complete restoration. Existing valves in valve chambers to be removed are to have the chamber broken down to 1.0 metres below final grade backfilled with granular to subgrade and complete restoration. All existing hydrants to be removed are to be returned to Regional Stores 2316 South Service Road, Oakville.
13. Regional Municipality of Halton Approved Mechanical Restraints shall be used on all standard bends, valves, fittings and hydrants. Refer to table below for length of pipe to be restrained on both sides of fittings.

REGIONAL MUNICIPALITY OF HALTON, ITS EMPLOYEES, OFFICERS AND AGENTS ARE NOT RESPONSIBLE FOR ANY ERRORS, OMISSIONS OR INACCURACIES, EITHER DUE TO THIS REPRODUCTION OR OTHERWISE. ALL INFORMATION SHOULD BE VERIFIED.



℄ ELEV'S	83.090	83.060	83.140	83.220	83.300	83.354	83.372	83.330	83.060	83.195	83.075	83.015	82.955	82.835	82.715	82.655	82.575	82.455	82.295	82.095	81.852	81.569
CHAINAGE	0+090	10+000	10+020	10+040	10+060	10+073.50	10+080	10+085.50	10+097.50	10+160	10+120	10+140	10+150	10+160	10+180	10+200	10+210	10+220	10+230	10+233.5	10+240	10+243.9	10+249	10+250	10+260	10+270

2	03.09.97	JJA	AS CONSTRUCTED	
1	14/06/95	WWM	ISSUED FOR TENDER	
NO.	DATE	BY	REVISIONS	
DESIGN	R. KLEINE	CHECKED	R.D.K.	DATE
DRAWN	R. KLEINE	CHECKED	R.D.K.	JUNE 1995
SCALE HORZ. 0 10 20				REFERENCES:
VERT. 0 1.0 2.0				

APPROVALS

MUNICIPAL

DIRECTOR OF ENGINEERING

DATE

REGIONAL

COMMISSIONER OF PUBLIC WORKS

DIRECTOR OF DESIGN & CONSTRUCTION

95-06-19

FIELD NOTES:

STAMP: LICENSED PROFESSIONAL ENGINEER ROBERT D. KIVI 95/06/19 PROVINCE OF ONTARIO

CONSULTANT

Marshall Macklin Monaghan
CONSULTING ENGINEERS • SURVEYORS • PLANNERS

REGIONAL MUNICIPALITY OF Halton

CITY OF BURLINGTON

TITLE

GORE/JUNCTION STREET

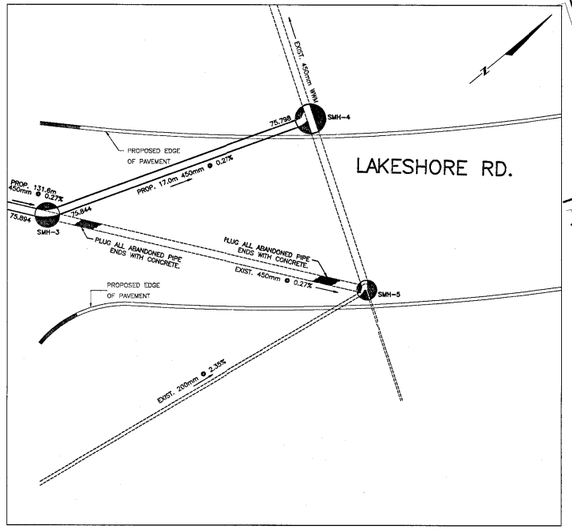
WATERMAIN ABANDONING
STA 9+975 TO STA 10+275

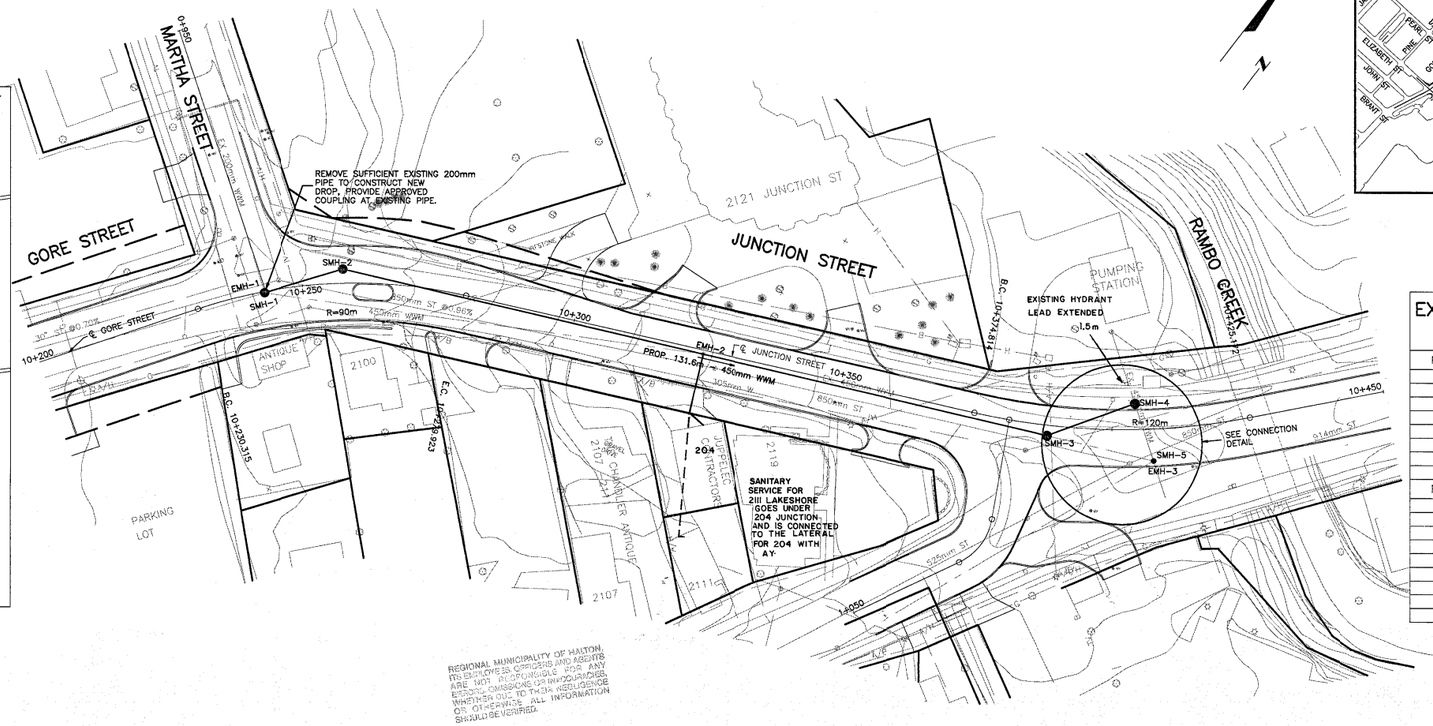
MUNICIPAL DRAWING NO.	REGIONAL DRAWING NO.
TL-22R	B - 7326
CONTRACT NO. PR-1603 95-10	SHEET 1 OF 5

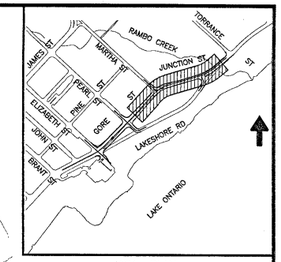
B - 7326

POSITION EDGE OF PRINT ON THIS LINE

DOWNSTREAM WASTEWATER MAIN CONNECTIONS







KEY PLAN

EXISTING SERVICE CONNECTIONS

(PER VIDEO SURVEY NOV 25, 1995)

FROM EMH-1 TO EMH-2

DISTANCE	LOCATION
11.8	12 O'clock
13.8	12 O'clock
26.8	12 O'clock
43.8	12 O'clock
56.8	12 O'clock
64.2	12 O'clock
68.7	12 O'clock

FROM EMH-2 TO EMH-3

DISTANCE	LOCATION
8.4	12 O'clock
8.9	12 O'clock
11.6	12 O'clock
18.4	12 O'clock
18.4	1 O'clock
41.8	12 O'clock
41.8	2 O'clock
43.5	12 O'clock

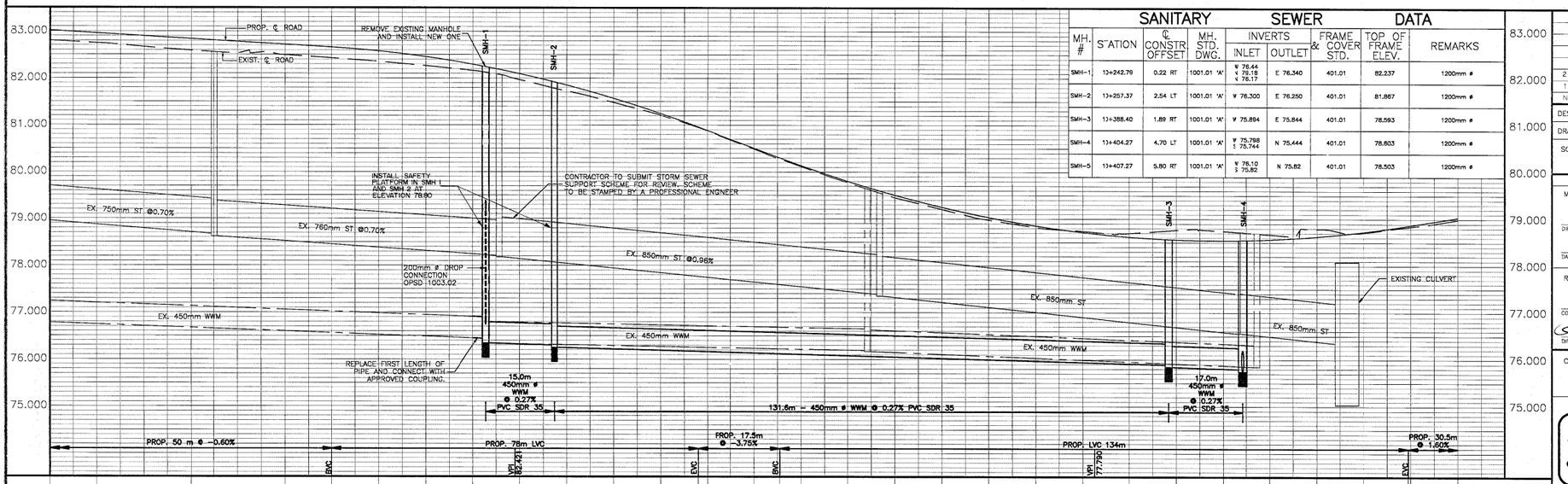
NOTES:

A. The existing sanitary sewer flows from buildings are to be mcintained at all times during construction. Pumping around the construction area will be permitted subject to review of the contractor's construcion plan.

B. All benching to be according to OPSD 1004.01.

C. Contractor to locate and confirm all active sewer leads and provide new connections from the proposed main to the property line including approved couping. Abandoned sewer leads shall not be reconstructed but are to be plugged with concrete at the edge of trench.

D. All excavations to be in vertical trench.



SANITARY SEWER DATA

MH. #	STATION	℄ CONSTR. OFFSET	MH. STD. DWG.	INVERTS INLET	INVERTS OUTLET	FRAME & COVER STD.	TOP OF FRAME ELEV.	REMARKS
SMH-1	1+242.79	0.22 RT	1001.01 'A'	W 76.44 N 79.18 N 76.17	E 76.340	401.01	82.237	1200mm ø
SMH-2	1+257.37	2.54 LT	1001.01 'A'	W 76.300	E 76.250	401.01	81.867	1200mm ø
SMH-3	1+388.40	1.89 RT	1001.01 'A'	W 75.894	E 75.844	401.01	78.593	1200mm ø
SMH-4	1+404.27	4.70 LT	1001.01 'A'	W 75.798 S 75.744	N 75.444	401.01	78.603	1200mm ø
SMH-5	1+407.27	5.80 RT	1001.01 'A'	W 76.10 S 75.82	N 75.82	401.01	78.503	1200mm ø

℄ ELEV'S	83.015	82.955	82.835	82.715	82.655	82.575	82.455	82.295	82.095	81.852	81.569	81.246	80.959	80.884	80.509	80.302	80.138	78.801	79.504	79.247	79.030	78.853	78.716	78.618	78.560	78.543	78.565	78.627	78.730	78.864	78.872	79.032
WASTEWATER MAIN																																
									W 76.44 N 79.18 N 76.74	E 76.340																W 75.894 E 75.844		W 75.798 S 75.744	N 75.744					
CHAINAGE	10+150	10+160	10+180	10+200	10+210	10+220	10+230	10+240	10+242.8	10+249	10+250	10+257.4	10+260	10+270	10+280	10+288	10+290	10+300	10+305.5	10+310	10+320	10+330	10+340	10+350	10+360	10+370	10+372.5	10+380	10+388.4	10+390	10+400	10+404.3	10+410	10+420	10+430	10+439.5	10+440	10+450

B - 7327

NO.	DATE	BY	REVISIONS
2	03 09 97	JJA	AS CONSTRUCTED
1	14/06/95	JMM	ISSUED FOR TENDER

DESIGN	R.KLEINE	CHECKED	R.D.K.	DATE
DRAWN	R.KLEINE	CHECKED	R.D.K.	JUNE 1995

SCALE HORZ. ℄ 10 20 VERT. ℄ 1.0 2.0

REFERENCES:

FIELD NOTES:

APPROVALS

MUNICIPAL

DIRECTOR OF ENGINEERING

DATE

REGIONAL

COMMISSIONER OF PUBLIC WORKS

DIRECTOR OF DESIGN & CONSTRUCTION

STAMP: LICENSED PROFESSIONAL ENGINEER ROBERT B. KIVI 21/06/95 PROVINCE OF ONTARIO

CONSULTANT

Marshall Macklin Monaghan
CONSULTING ENGINEERS • SURVEYORS • PLANNERS

REGIONAL MUNICIPALITY OF Halton

TO THE CORPORATION OF THE CITY OF BURLINGTON

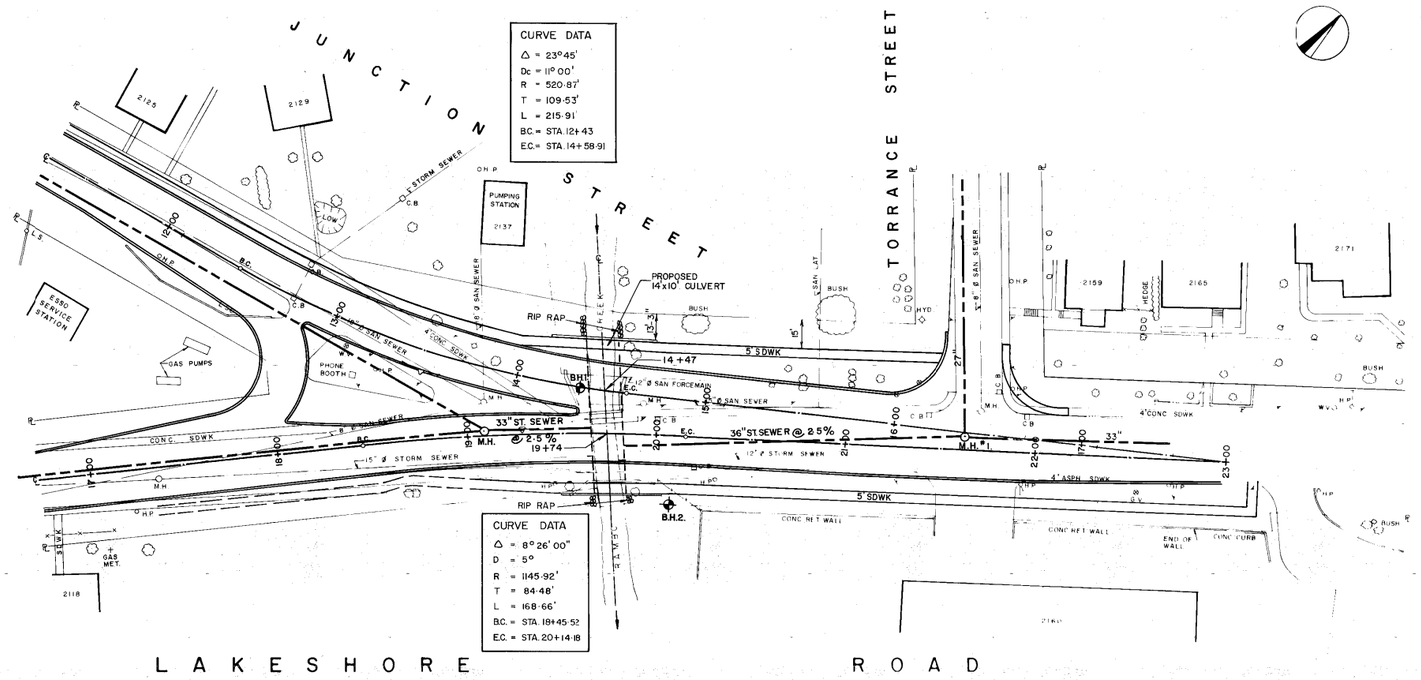
TITLE

GORE/JUNCTION STREET

WASTEWATER MAIN REPLACEMENT
STA 10+150 TO STA 10+450

MUNICIPAL DRAWING NO.	REGIONAL DRAWING NO.
TL-22R	B - 7327
CONTRACT NO. PR-1603 95-10	SHEET 2 OF 5

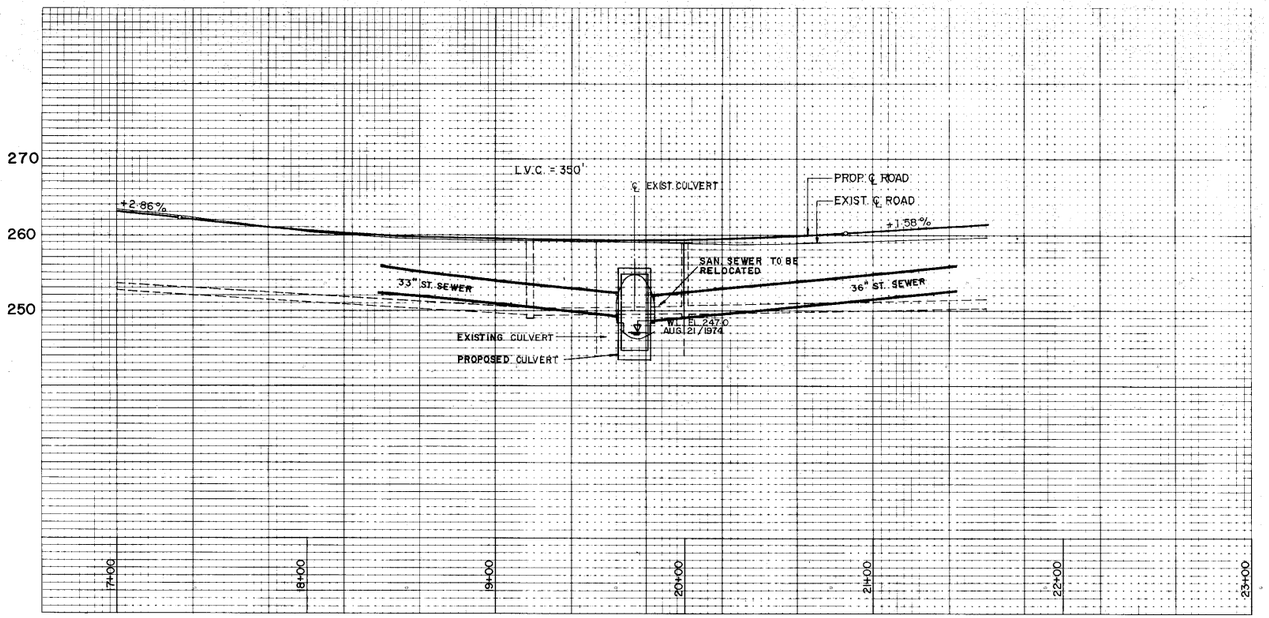
PR-1603 2/5



PLAN

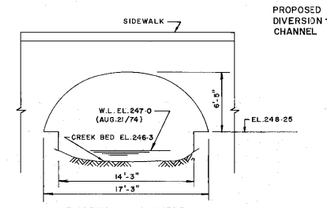
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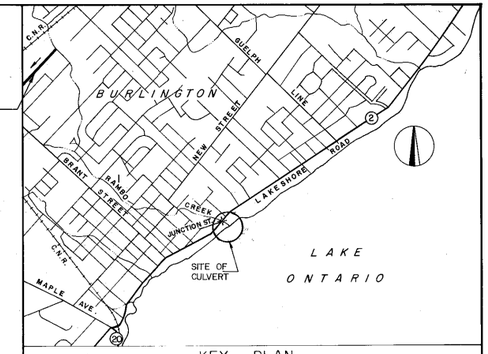
B.M. EL 259.95
NORTHEAST CORNER OF CONC. ABUTMENT
NORTH SIDE OF LAKESHORE ROAD
AT RAMBO CREEK BRIDGE



PROFILE

1" = 10'-0" VERT.
1" = 40'-0" HORIZ.





KEY PLAN

2·5"= 1 MILE

NOTES :

1. ELEVATION OF HWL BASED ON REGIONAL FLOOD ON REDUCED DRAINAGE AREA - ASSUMING FLOOD CONTROL CHANNEL IS CONSTRUCTED. IF FLOOD CONTROL CHANNEL IS NOT BUILD, NEW CULVERT WILL NOT ALTER THE REGIONAL FLOOD LINE OF 256 AS INDICATED IN THE MacLAREN REPORT (Oct. 1965)

SOILS INFORMATION

BOREHOLE NO. 1.

248.8	0.0	GROUND SURFACE
		VERY LOOSE BROWN SILTY SAND
247.8	1.0	VERY LOOSE BLACK ORGANIC SANDY SILT
246.8	2.0	
		SOFT TO FIRM RED BROWN CLAYEY SILT, SOME GRAVEL TRACE OF SAND (TILL)
243.8	5.0	WEATHERED RED BROWN SHALE BEDROCK
242.8	6.0	
		FAIRLY SOUND RED BROWN SHALE BEDROCK
240.8	8.0	END OF HOLE

PRACTICAL REFUSAL TO AUGERING

BOREHOLE NO.2.

259.9	0.0	GROUND SURFACE
		STIFF RED BROWN CLAYEY SILT, SOME GRAVEL, OCCASIONAL LIMESTONE AND SHALE FRAGMENTS (FILL)
247.9	12.0	
		STIFF MOTTLED BROWN CLAYEY SILT, TRACE OF SAND
244.9	15.0	
		VERY LOOSE BLACK ORGANIC SILT, TRACE OF GRAVEL OCCASIONAL SAND LAYERS 1/8"TH.
242.9	17.0	
		SOFT TO FIRM RED BROWN CLAYEY SILT SOME SAND AND GRAVEL (TILL)
241.4		
240.9	19.0	
		WEATHERED RED BROWN SHALE BEDROCK
		FAIRLY SOUND RED BROWN SHALE BEDROCK
237.9	22.0	END OF HOLE

PRACTICAL REFUSAL TO AUGERING

AS CONSTRUCTED

1. WATERSHED AREA 0.86 SQUARE MILES OR 4.9 SQUARE MILES (730 cfs.)
2. DESIGN FLOOD FREQUENCY REGIONAL FLOOD OR 8 YEAR FLOOD
3. SPECIAL FEATORES AT SITE (DAMS, ICE, SCOUR, DRIFT, SLIDING BANKS ETC.) CHANNEL DIVERSION PROJECT EXPECTED TO PROCEED BY CONSERVATION AUTHORITY IN 1975.
4. (A) EXISTING STRUCTURES AT SITE, UPSTREAM AND DOWNSTREAM (GIVE LOCATION, TOTAL SPAN, HEIGHT ABOVE NORMAL HIGH WATER, NET AREA FOR FLOW AT N.H.W., ESTIMATED AGE)
   - 1st. UP STREAM (HYDRO RIGHT-OF-WAY) SPAN 18' HEIGHT ABOVE N.H.W.L - 2 FEET (WORK WITH HEAD) NET AREA FOR FLOW AT HWL = 63 SQ. FEET. AGE APPROX. 20 YEARS.
   - 2nd UP STREAM ON MARTHA ST. SPAN 10' HEIGHT 8·8' ARCH. AGE APPROX. 25 YEARS.

   (B) REASON FOR CHANGE IN HEIGHT OR SPAN OF PROPOSED STRUCTURE FROM THAT OF EXISTING STRUCTURE NO SUBSTANTIAL CHANGE
5. INFORMATION ON EXTREME FLOODING AT SITE OBTAINED FROM JAMES F. MacLAREN LTD. FLOOD CONTROL REPORT AND REFLECTS HIGHEST WATER ELEVATION TO BE 253.7 SEE NOTE AND LOWEST WATER ELEVATION TO BE 247.0
6. IS IT LIKELY THAT STREAM BED WILL BE LOWERED NO
7. IS STRUCTURE ON A MUNICIPAL DRAIN NO
8. DESIGN LOADING H20 S16 PLUS NA INCHES ASPHALT
9. (A) NAVIGATION CLEARANCES REQUIRED, IF ANY NA

   (B) RAILWAY CLEARANCES REQUIRED, IF ANY NA

   (C) REQUIREMENTS OF OTHER AGENCIES HALTON REGION CONSERVATION AUTHORITY

FINAL SUBMISSION

10. HAS APPROVAL BEEN OBTAINED FROM FEDERAL MINISTRY OF TRANSPORT (N.W.P. ACT) NA CANADIAN TRANSPORT COMMISSION
    RAILWAY COMPANIES NA
11. APPROX VOLUME OF CONCRETE 272 CU. YD.
    WEIGHT OF REINFORCEMENT 20 TONS
    WEIGHT OF STRUCTURAL STEEL TONS
    LENGTH OF PRESTRESSED BEAMS LIN. FT.
    LENGTH OF PIPE CULVERT LIN. FT.

NO.	DATE	REVISION

RAMBO CREEK CULVERT
LAKESHORE ROAD

OWNER

CITY OF BURLINGTON

TWP. LOT CON.

CO. or REGION HALTON STRUCTURE SITE NO. MUN. DIST. 4

SITE PLAN

DESIGN ENGINEER D.J.S. TEFFT DATE NOVEMBER 1974

DESIGN G.T.
DRAWN E.U.
CHECK P.A.

74031B PROJECT NO.

DRAWING NO. 1

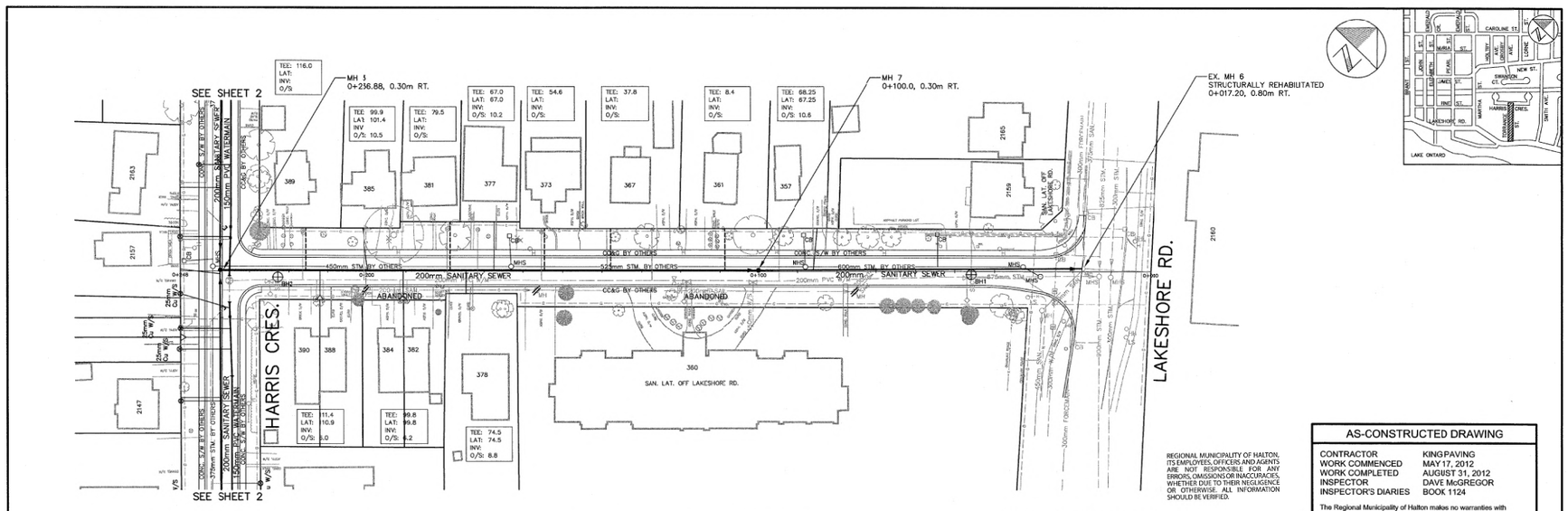
Philips Planning + Engineering Limited

REGISTERED PROFESSIONAL ENGINEER DONALD J.S. TEFFT PROVINCE OF ONTARIO

B-4413

B-4413

POSITION EDGE OF PRINT ON THIS LINE



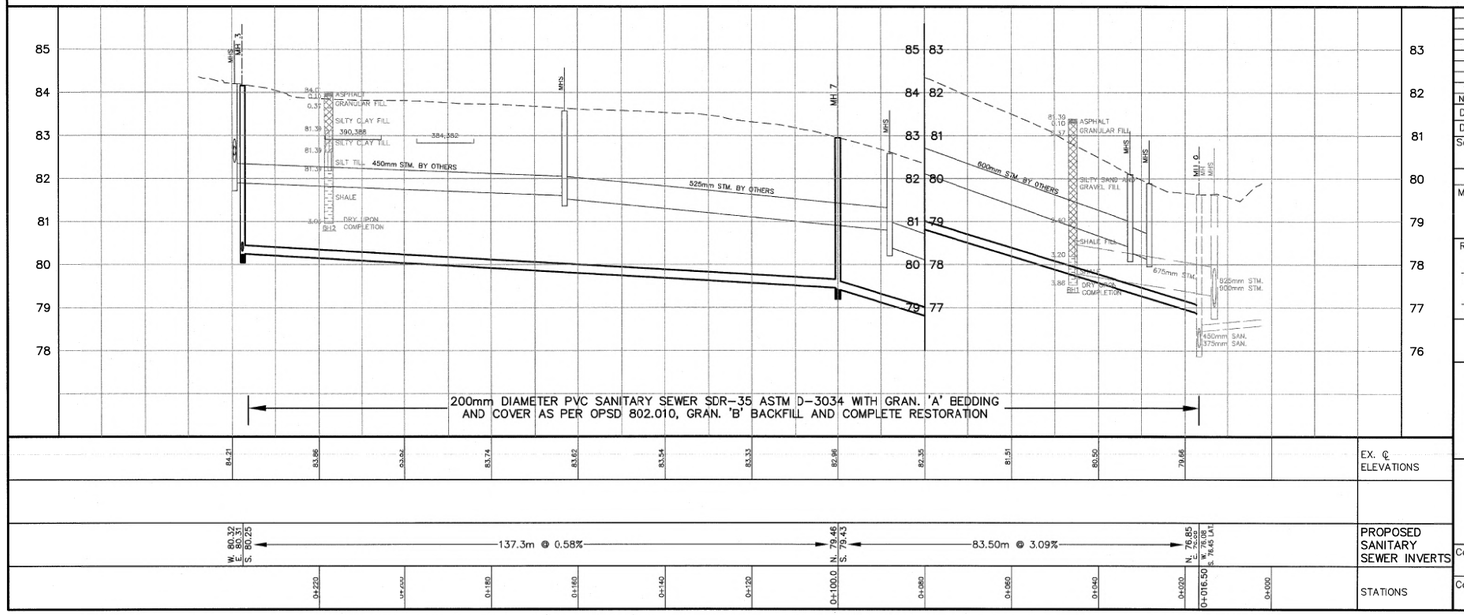
TORRANCE STREET

AS-CONSTRUCTED DRAWING

CONTRACTOR	KINGPAVING
WORK COMMENCED	MAY 17, 2012
WORK COMPLETED	AUGUST 31, 2012
INSPECTOR	DAVE McGREGOR
INSPECTOR'S DIARIES	BOOK 1124

The Regional Municipality of Halton makes no warranties with respect to the accuracy of this drawing and assumes no responsibility for its use. All information should be verified.

FOR GENERAL NOTES AND RESTORATION DETAIL SEE SHEET 1.



NO	Date	By	REVISION	Man.	CAD
1	JUNE 2014	E.W.S.	AS CONSTRUCTED		X

Design	S.J.S.	Ch'kd		Date MARCH 2012
Drawn	E.W.S.	Ch'kd		References
Scale 1:500 Horiz. 10 5 0 10; 1:50 Vert. 1 0.5 0 1				

APPROVALS

Municipal

Regional

Director, Wastewater Services

Manager, Wastewater Design & Construction

Field Notes

Stamp

Halton REGION — CITY OF BURLINGTON

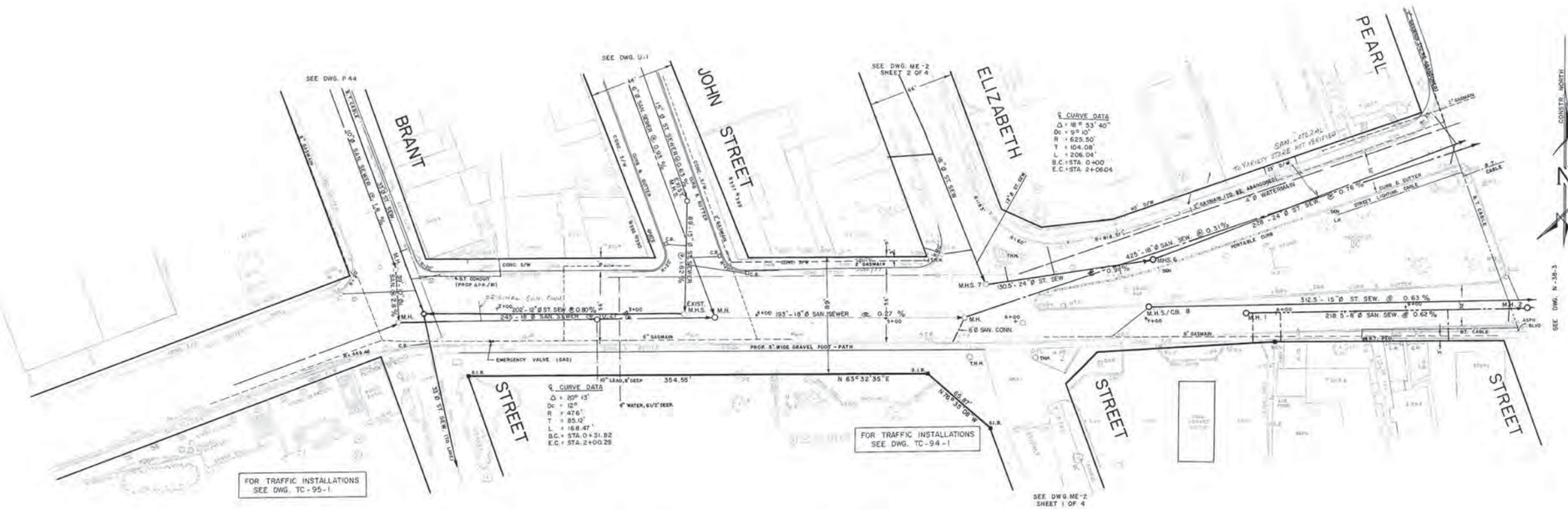
WATERMAIN AND SANITARY SEWER REPLACEMENT ON
TORRANCE STREET
IN THE CITY OF BURLINGTON
FROM LAKESHORE RD. E. HARRIS CRES.

Consultant File NO. B13771

Contract NO. WS-2815-12 Drawing NO. SHEET 3 OF 3

PR-2815-12 3 of 3

Drawing: R:\DESIGN\PROJECTS\PR-2815 HARRIS TORRANCE AC.DWG
Layout: AS CONSTRUCTED
Date: 08/20/2014 Time: 03:32:34 PM



LAKESHORE ROAD

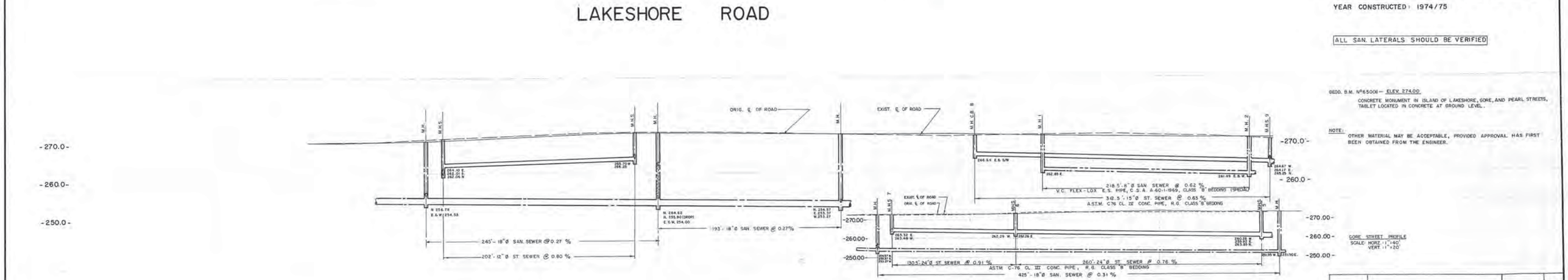
ORIGINAL ROAD BASE: CONCRETE (STA. 5+50 - 10+00)
EXISTING ROAD BASE:
15" GRAN. "B", 6" GRAN. "A", 4" H.M. 5, 1 1/2" H.M. 3.

YEAR CONSTRUCTED: 1974/75

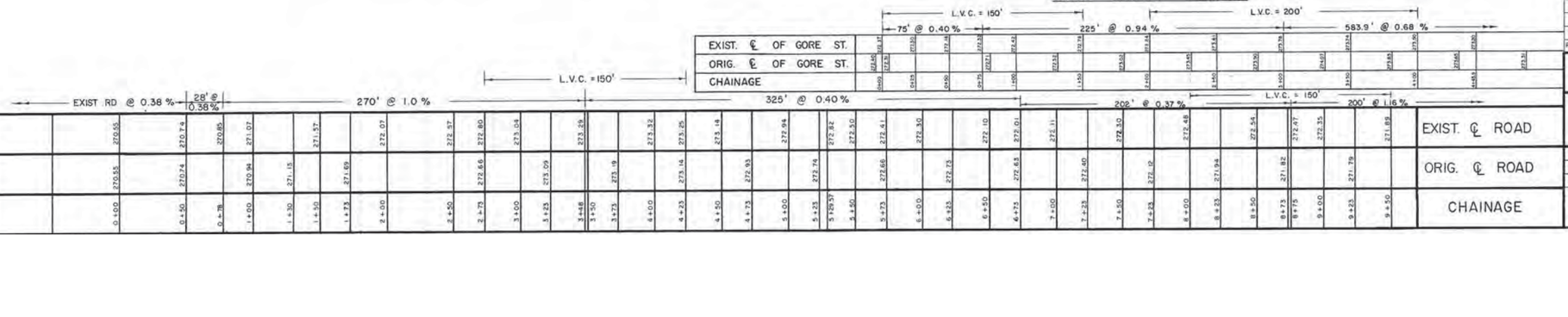
ALL SAN. LATERALS SHOULD BE VERIFIED

GEOD. B.M. Nº65001 — ELEV. 274.00
CONCRETE MONUMENT IN ISLAND OF LAKESHORE, GORE, AND PEARL STREETS, TABLET LOCATED IN CONCRETE AT GROUND LEVEL.

NOTE: OTHER MATERIAL MAY BE ACCEPTABLE, PROVIDED APPROVAL HAS FIRST BEEN OBTAINED FROM THE ENGINEER.



GORE STREET PROFILE

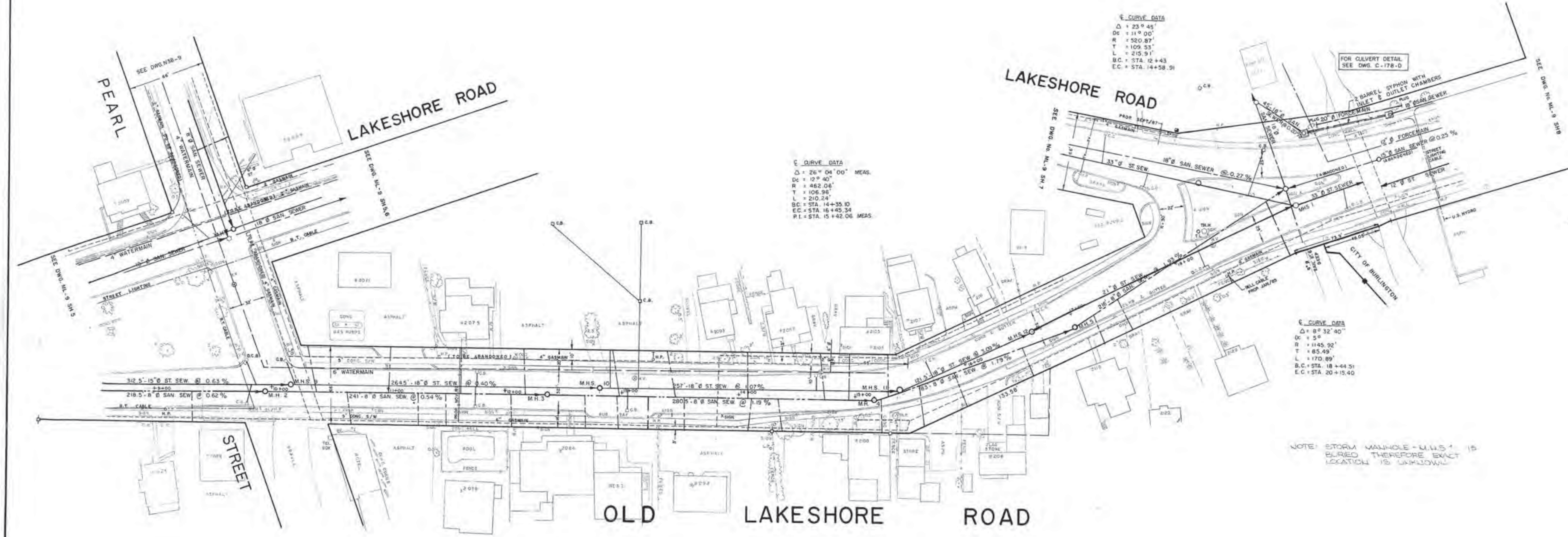


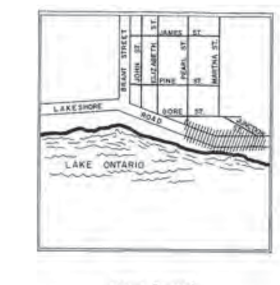
REVISION. Nº	DESCRIPTION	DATE	BY
1	"AS CONSTRUCTED" L-155, G-130, G-149	SEPT 21/76	L.A.

CITY OF BURLINGTON
ENGINEERING DEPARTMENT

LAKESHORE ROAD
300' W. OF BRANT ST. — 300' E. OF ELIZABETH ST.

DESIGN	S.S.M.	CHK'D		FIELD NOTES	INDEX Nº
DRAWN BY	Z. PILLER	CHK'D		L.71-98, L.71-91,	N 38-2
SCALE	HORZ. 1"=40' VERT. 1"=10'	DATE	DEC. 1971	REFERENCES	
APPROVED	DIRECTOR OF PUBLIC WORKS	DATE		20R-3295	



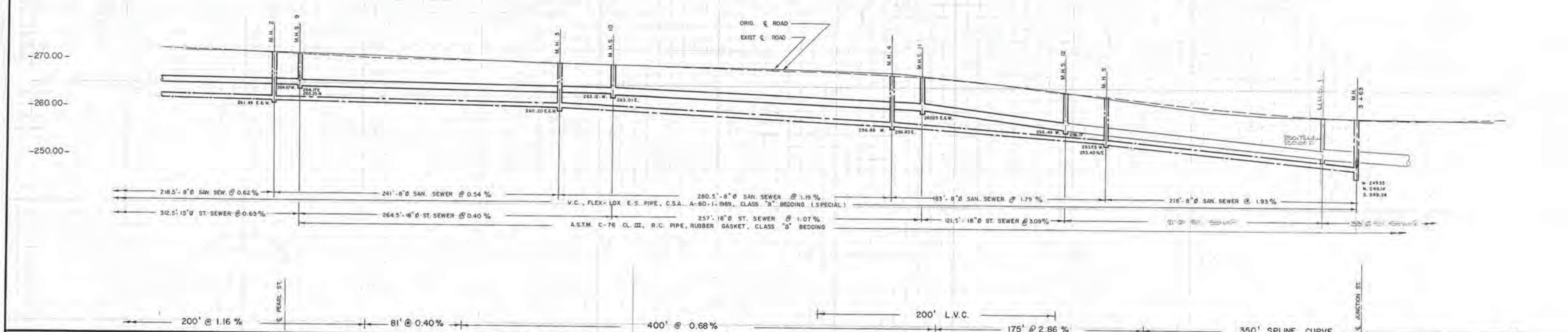


SCALE: 1" = 1000'

KEY - PLAN

ALL SAN. LATERALS SHOULD BE VERIFIED

ORIGINAL ROAD BASE: CONCRETE (STA. 10+00 - E'LY)
EXISTING ROAD BASE:
15" GRAN. "B", 6" GRAN. "A", 4" H.M. 5, 1 1/2" H.M. 3.
YEAR CONSTRUCTED: 1974 / 75



CHAINAGES	EXIST. ℄ ROAD	ORIG. ℄ ROAD
9+00	272.35	
9+23		271.79
9+50	271.89	
10+00		
10+06	271.24	
10+23	271.04	271.48
10+56	270.66	
10+75	270.44	271.00
11+06	270.32	
11+23	270.25	270.55
11+56	270.11	
11+73	270.05	270.05
12+06	269.83	
12+23	269.71	269.61
12+56	269.49	
12+73	269.37	269.42
13+06	269.15	
13+23	269.03	269.30
13+56	268.81	
13+73	268.69	268.99
14+06	268.47	
14+23	268.35	268.55
14+56	268.13	
14+74	267.99	268.29
15+06	267.65	
15+25	267.40	267.92
15+35	267.25	268.17
15+56	266.91	
16+02	265.97	266.37
16+06	265.88	
16+52	264.70	264.98
16+56	264.59	
17+02	263.27	263.29
17+06	263.16	
17+31	262.44	
17+56	261.87	261.78
18+06	260.52	260.32
18+56	259.56	259.54
19+06.5	259.08	259.30
19+56.5	258.86	259.21
20+00	259.00	
20+06	259.05	
20+10	259.08	258.91
20+36	259.34	258.88

B.M. 1
CONC. MON.-Nº 650011- IN ISLAND OF LAKESHORE RD, GORE ST, AND PEARL ST. TABLET IN CONC. AT GROUND LEVEL. ELEV. 274.00

B.M. 2
S/W CORNER OF S/W TOP OF CONC. STEP AT HOUSE Nº 2107 LAKESHORE RD. ELEV. 269.15

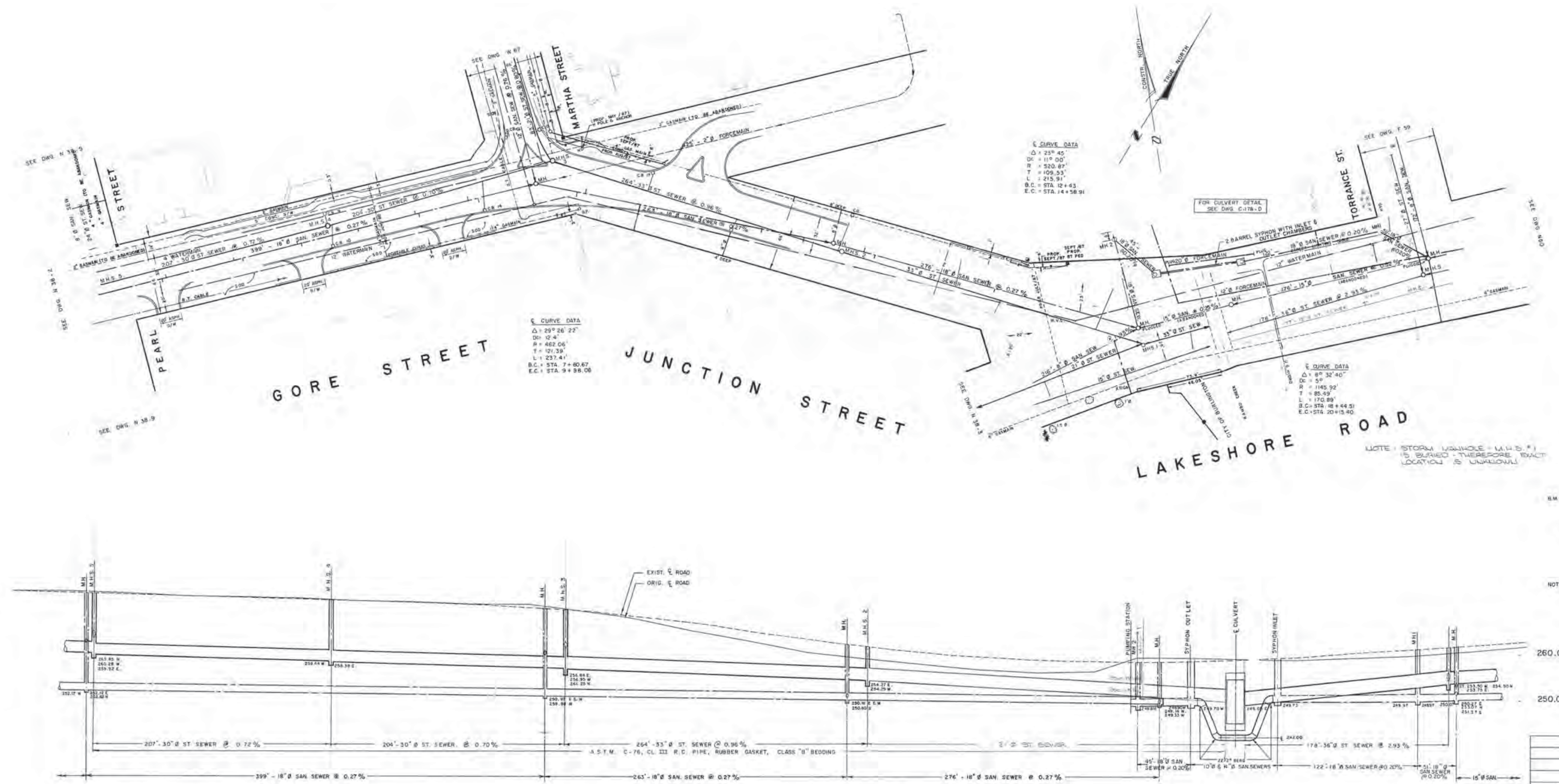
NOTE: OTHER MATERIALS MAY BE ACCEPTABLE, PROVIDED APPROVAL HAS FIRST BEEN OBTAINED FROM THE ENGINEER.

REVISION Nº	DESCRIPTION	DATE	BY
1	"AS CONSTRUCTED" L-155, G-130, G-149	OCT. 22 / 76	L.A.

CITY OF BURLINGTON
ENGINEERING DEPARTMENT

OLD LAKESHORE ROAD
PEARL STREET — LAKESHORE ROAD

DESIGN	S. S. M.	CHK'D		FIELD NOTES	INDEX Nº
DRAWN BY	Z. PILLER	CHK'D		L.71-VII, L.71,	N 38-3
SCALE	HORIZ. 1" = 40' VERT. 1" = 10'	DATE	DEC. 1971	REFERENCES	
APPROVED	DIRECTOR OF PUBLIC WORKS DATE			FOR-4649	





KEY PLAN
SCALE: 1" = 1000'

ALL SAN. LATERALS SHOULD BE VERIFIED

EXISTING ROAD BASE

15" GRAN. "B", 6" GRAN. "A", 4" H.M. 5, 1 1/2" H.M. 3.

YEAR CONSTRUCTED : 1974-75

B.M.
1. GEOD. B.M. Nº 650011 (ELEV. 274.01) CONC. MON. IN ISLAND FORMED BY INTERSECTION OF LAKESHORE RD., GORE ST. & PEARL ST. - 36' NORTH OF H.P. Nº P-52, 3' SOUTHEAST OF EDGE OF GORE ST., TABLET IN TOP OF CONC. AT GROUND ELEV.
2. TOPO. B.M. (ELEV. 260.33) NORTHEAST CORNER OF CONC. ABUTMENT NORTH SIDE OF LAKESHORE RD. AT RAMBO CREEK BRIDGE.

NOTES
1. OTHER MATERIALS MAY BE ACCEPTABLE PROVIDED APPROVAL HAS FIRST BEEN OBTAINED FROM THE ENGINEER.

CHAINAGE	EXIST. ℄ ROAD
4+40	273.20
4+90	272.86
5+40	272.52
5+90	272.18
6+40	271.84
6+90	271.50
7+40	271.16
7+90	270.68
8+40	269.93
8+80	269.16
8+90	268.82
9+40	267.62
9+90	266.05
10+20	264.97
10+40	264.23
10+90	262.51
11+40	261.08
11+90	259.95
12+40	259.11
12+65	258.80
12+90	258.56
13+40	258.32
13+90	258.37
14+25	258.72
14+40	259.36
14+90	260.15
15+40	260.94
15+90	261.65
16+33.96 / 0+00	261.69
0+50	262.72

ORIG. ℄ ROAD
273.73
273.31
272.59
272.45
272.17
271.64
271.44
270.87
270.84
269.48
268.31
267.69
265.03
262.89
260.47
259.08
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259.19
258.91
258.88
259.13
259.73
260.59

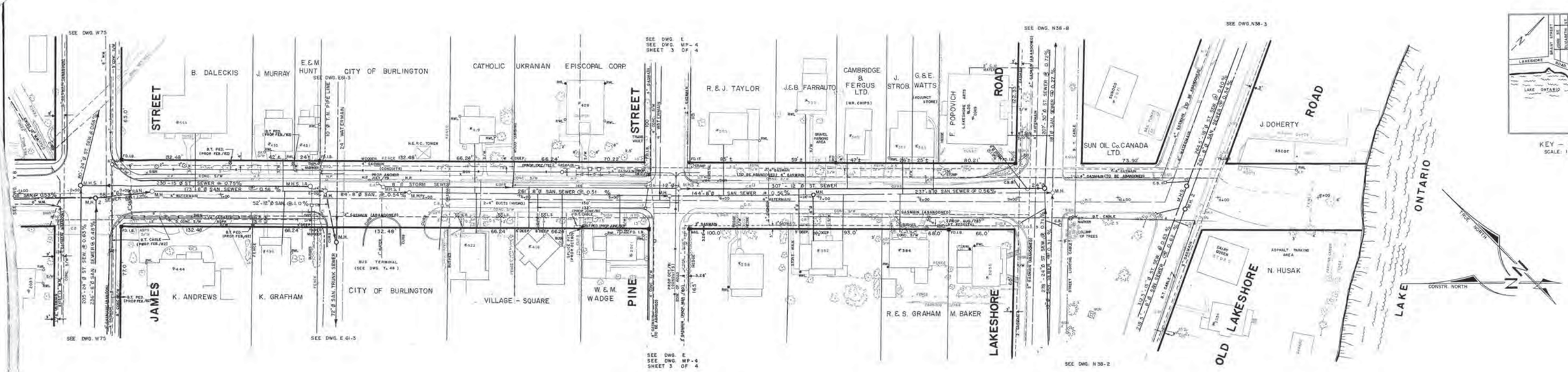
REVISION Nº	DESCRIPTION	DATE	BY
1	"AS CONSTRUCTED" L-155, G-130	OCT 26/76	L.A.

CITY OF BURLINGTON
ENGINEERING DEPARTMENT

~~LAKESHORE ROAD~~
GORE ST. & JUNCTION ST.
PEARL STREET - LAKESHORE ROAD

DESIGN	S.S.M.	CHK'D		FIELD NOTES	INDEX Nº
DRAWN BY	L.A.	CHK'D			N 38-8
SCALE	HORIZ. 1" = 40' VERT. 1" = 10'	DATE		REFERENCES	
APPROVED	DIRECTOR OF PUBLIC WORKS DATE				

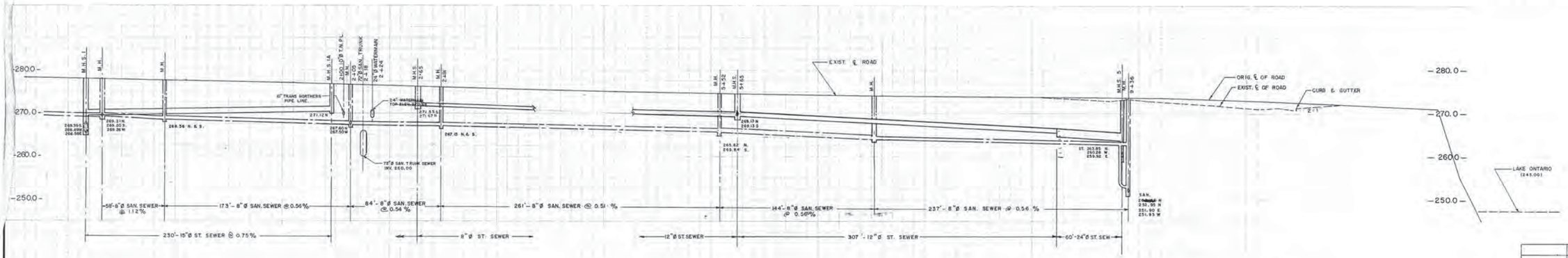
N 38-8

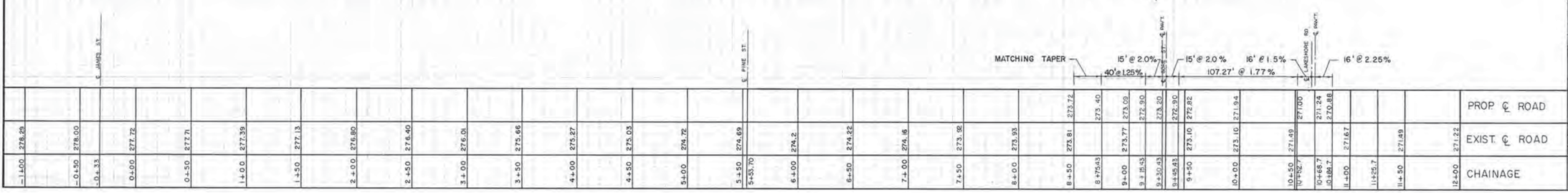


KEY — PLAN
SCALE: 1"=1000'

PEARL STREET

NOTE.
RWL ○ DENOTES RAIN WATER LEADER WITH OUTLET ABOVE GROUND.
RWL ● DENOTES RAIN WATER LEADER EXTENDED INTO GROUND.





REVISION N°	DESCRIPTION	DATE	BY
2	LAKESHORE RD. "AS CONSTRUCTED" L-155, G-130, G-149	OCT. 1/76	L.A.
1	"AS CONSTRUCTED" M.H.2 NOTES P-159	MAY 31,73	P.A.

CITY OF BURLINGTON
ENGINEERING DEPARTMENT

PEARL STREET
JAMES STREET — LAKE ONTARIO

DESIGN	P.F.	CHK'D		FIELD NOTES	INDEX NR
DRAWN BY	Z. PILLER	CHK'D		6-60, E30, J48 - [illegible]	N 38-9
SCALE	HORIZ: 1"=40' VERT: 1"=10'	DATE	NOV, 1971	REFERENCES	
APPROVED	DIRECTOR OF PUBLIC WORKS			C65, H36, L 71-3, E 19, E10, E 61-3, SUR. 8-4, SUR. 8-6, R 84, E60 7N	

2083 Old Lakeshore Road, Burlington, Ontario

L7R 1E3

Hydrogeological Investigation

Client:
Rosseau Development Corp
3190 Harvester Road, Suite 201 A
Burlington, ON L7N 3T1

Attention: Ms. Erica Forrest

Type of Document:
Final Technical Report.

Project Name:
2083 Old Lakeshore Road, Burlington, Ontario

Project Number:
GTR-22007301-A0

EXP Services Inc.
1595 Clark Boulevard
Brampton, ON, L6T 4V1
t: 905.793.9800
f: 905.793.0641

Date Submitted:
2022-06-07

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Figure 2 – Surficial Geology

Figure 3 – MECP Water Well Records Map

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3 Results

3.1 Monitoring Well Details

A total of four (4) monitoring wells were installed across the Site. The details of monitoring network are as follows:

- Three (3) shallow wells, including BH/MW 1, BH/MW 2, and BH/MW 4 were installed to an approximated depth range from 6.5 to 6.9 mbgs;
- One (1) deep well labeled as BH/MW 2 was installed to an approximate depth of 8.8 mbgs. Each monitoring well is equipped with a 50-mm (2-inch) diameter PVC casing and with a flush mount well protective casing. The well screen is three (3) meters long.

Borehole logs and monitoring well installation details are provided in Appendix B. The monitoring well locations are shown on Figure 4.

3.2 Water Level Monitoring

As part of the Hydrogeological Investigation, static water levels in all monitoring wells were recorded in two (2) monitoring events, May 5 and May 19, 2022. A summary of all static water level data as it relates to the elevation survey is Provided in Appendix C.

The groundwater elevations recorded for the shallow wells ranged from 78.55 masl (4.68 mbgs at BH/MW3 on May 5, 2022) to 79.73 masl (2.26 mbgs at BH/MW 4 on May 19, 2022).

One (1) map was created for the Site to show groundwater contours of the shallow water-bearing zone (Figures 6). Accordingly, the groundwater flow direction in the shallow zone is interpreted to be southwest of the Site, towards Lake Ontario.

Groundwater levels are expected to show seasonal fluctuations and vary in response to prevailing climate conditions. This may also affect the direction and rate of flow. It is recommended to conduct seasonal groundwater level measurements to provide more information on seasonal groundwater level fluctuations.

3.3 Hydraulic Conductivity Testing

Four (4) Single Well Response Tests (SWRT's) were completed on all monitoring wells on May 5, 2022. The tests were completed to estimate the saturated hydraulic conductivity (K) of the soils at the well screen depths.

The static water level within each monitoring well was measured prior to the start of testing. In advance of performing SWRTs, each monitoring well underwent development to remove fines introduced into the screens following construction. The development process involved purging of the monitoring wells to induce the flow of fresh formation water through the screen. Each monitoring well was permitted to fully recover prior to performing SWRTs.

Hydraulic conductivity values were calculated from the SWRT and constant rate test data as per Hvorslev's solution included in the Aqtesolv Pro. V.4.5 software package. The semi-log plots for normalized drawdown versus time are included in Appendix D. A summary of the hydraulic conductivities (K-values) estimated from the SWRTs are provided in Table 3-1.

Table 3-1: Summary of Hydraulic Conductivity Testing

Monitoring Well	Well Depth (mbgs)*	Screen Interval (mbgs)		Screened Lithology **	Estimated Hydraulic Conductivity (m/s)
		from	to		
BH/MW 1	6.76	3.76	6.76	Partial Silty Clay Till / Weathered Bedrock	1.8E-07
BH/MW 2	8.78	5.78	8.78	Sound Bedrock	1.1E-07
BH/MW 3	6.56	3.56	6.56	Weathered to Sound Bedrock	1.1E-06
BH/MW 4	6.94	3.94	6.94	Partial Silty Clay Till / Weathered Bedrock	5.4E-06
				Highest Estimated K Value	5.4E-06
				Arithmetic Mean of Estimated K Values	1.7E-06
				Geometric Mean of Estimated K Values	5.8E-07

Note:
mbgs: meter below ground surface
masl: meter above mean sea level
*measured in the field
**based on geotechnical borehole logs (EXP, 2022)

SWRTs provide K-estimates of the geological formation surrounding the well screens and may not be representative of bulk formation hydraulic conductivity. As shown in Table 3-1, the highest K-value of the tested water-bearing zone is 5.4E-6 m/s. The geometric and arithmetic means of the K-values are estimated 5.8E-7 m/s and 1.7E-6 m/s, respectively.

3.4 Groundwater Quality

To assess the suitability for discharging pumped groundwater into the sewers owned by either the Regional Municipality of Halton or the City of Burlington during dewatering activities, one (1) groundwater sample was collected from monitoring well BH/MW 4 on May 20, 022 using a peristaltic pump. Prior to collecting the noted water sample, approximately three (3) standing well volumes of groundwater were purged from the referred well. The samples were collected unfiltered and placed into pre-cleaned laboratory-supplied vials and/or bottles provided with analytical test group specific preservatives, as required. Dedicated nitrile gloves were used during sample handling. The groundwater samples were submitted for analysis to Bureau Veritas Laboratory, a CALA certified independent laboratory in Mississauga, Ontario. Analytical results are provided in Appendix E. Table 3-2 summarizes exceedance(s) of the Sanitary and Storm Sewer Use By-Law parameters.

When comparing the chemistry of the collected groundwater samples to the Regional Municipality of Halton Sanitary and Combined Sewer Discharge Criteria, there were no parameter exceedances to be reported.

When comparing the chemistry of the collected groundwater samples to the City of Burlington Storm Sewer Discharge Criteria, the concentrations of Total Suspended Solids (TSS), and Manganese (Mn) exceeded the applicable guidelines

For groundwater samples collected as part of this investigation, there were no exceedances of the Sewer Use By-Law parameters with respect to the laboratory reported detection limits (RDL)

Table 3-2: Summary of Analytical Results

Parameter	Units	The Regional Municipality of Halton Sanitary and Combined Sewer Discharge Limit	The City of Burlington Storm Sewer Discharge Limit	Concentration BH/MW 4 May 20, 2022
Total Suspended Solids (TSS)	mg/L	350	15	**46**
Total Manganese (Mn)	µg/L	5	0.05	**0.18**

Note:
Bold – Exceeds either the Regional Municipality of Halton or the City of Storm Sewer Discharge Limit.

Additionally, the laboratory results for the water samples collected for the Environmental Site Assessment (ESA) were compared to the sewer discharge criteria. The concentrations of tested parameters were below the applicable guidelines. The ESA water quality samples were collected in accordance with the MECP's guidelines.

For the short-term dewatering system (construction phase), it is anticipated that TSS levels and some other parameters (for example, Total Metals) in the pumped groundwater may become elevated and exceed both, Sanitary and Storm Sewer Use By-Law limits. To control the concentration of TSS and associated metals, it is recommended that a suitable treatment method be implemented (filtration or decantation facilities and/ or any other applicable treatment system) during construction dewatering activities to discharge to the applicable sewer system. The specifications of the treatment system will need to be adjusted to the reported water quality results by the treatment contractor/process engineer.

For the long-term dewatering discharge to the sanitary sewer system (post-development phase) and based on the water quality test results, the water is suitable to be discharged without a treatment system.

For the long-term dewatering discharge to the storm sewer system (post-development phase) and based on the water quality results, it is recommended to implement a suitable pre-treatment, as required.

The water quality results presented in this report may not be representative of the long-term condition of groundwater quality onsite. As such, regular water quality monitoring is recommended for the post-construction phase, as required by the Reginal Municipality of Halton or the City of Burlington.

An agreement to discharge into the sewers owned by either the Regional Municipality of Halton or the City of Burlington will be required prior to releasing dewatering effluent.

The Environmental Site Assessment Report(s) shall be reviewed for more information on the groundwater quality conditions at the Site.

4 Dewatering Assessment

The dimensions of the proposed structure to support the dewatering assessment are summarized in Table 4-1 below.

Table 4-1 Building Dimensions for Dewatering Assessment

Input Parameter	Assumption	Units	Notes
Number of Subgrade Levels	Two Levels	-	Based on the information provided by the client
Ground Elevation	82.24	masl	Ground elevation at BH 2
Top of Slab Elevation	76.74	masl	Assumed to be 1.5 m above the proposed foundation elevation.
Lowest Footing Elevation	75.24	masl	Based on the geotechnical report, it is anticipated to be seven (7) mbgs.
Excavation Area (Length x Width)	2,444 (57 x 42.8)	m^2 (m x m)	Approximate area (length x width) of Site for the proposed development.

4.1 Dewatering Flow Rate Estimate and Zone of Influence

The Dupuit-Forcheimer equation for radial flow to both sides of an excavation through an unconfined aquifer resting on a horizontal impervious surface was used to obtain a flow rate estimate. Dewatering flow rate is expressed as follows:

$$Q_w = \frac{\pi K(H^2 - h^2)}{Ln\left[\frac{R_o}{r_e}\right]}$$

$$r_e = \frac{a+b}{\pi} \qquad R_o = R_{cj} + r_e$$

Where:

Qw = Rate of pumping (m^3/s)
X = Length of excavation (m)
K = Hydraulic conductivity (m/s)
H = Hydraulic head beyond the influence of pumping (static groundwater elevation) (m)
h = Hydraulic head above the base of aquifer in an excavation (m)
R_0 = Radius of influence (m)
R_{cj} = Cooper-Jacob's radius of influence (m)
r_e = Equivalent perimeter (m)
a = Length of the excavation area (m)
b = Width of the excavation area (m)

It is expected that the initial dewatering rate will be higher to remove groundwater from within the overburden formation. The dewatering rates are expected to decrease once the target water level is achieved in the excavation footprint as groundwater will have been removed, primarily from storage, resulting in lower seepage rates into the excavation.

4.2 Cooper-Jacob's Radius of Influence

The radius of influence (Rcj) for the construction dewatering was calculated based on Cooper-Jacob's equation. This equation is used to predict the distance at which the drawdown resulting from pumping is negligible.

The estimated radius of influence due to pumping is based on Cooper-Jacob's formula as follows:

$$R_{cj} = \sqrt{2.25KDt/s}$$

Where:

Ro = Estimated radius of influence (m)
D = Aquifer thickness (original saturated thickness) (m)
K = Hydraulic conductivity (m/s)
S = Storage coefficient
t = Duration of pumping (s)

4.3 Stormwater

Additional pumping capacity may be required to maintain dry conditions within the excavation during and following significant precipitation events. Therefore, the dewatering rates at the Site should also include removing stormwater from the excavation.

A 15 mm precipitation event was utilized for estimating the stormwater volume. The calculation of the stormwater volume is included in Appendix F.

The estimate of the stormwater volume only accounts for direct precipitation into the excavation. The dimensions of the excavation are considered in the dewatering calculations. Runoff which originated outside of the excavation's footprint is excluded and it should be directed away from the excavation.

During precipitation events greater than 15 mm (ex: 100-year storm), measures should be taken by the contractor to retain stormwater onsite in a safe manner to not exceed the allowable water taking and discharge limits, as necessary. A two (2) and a one hundred (100) year storm event over a 24-hour period are 56.2 and 122.1 mm (refer to Appendix F).

4.4 Results of Dewatering Rate Estimates

4.4.1 Construction Dewatering Rate Estimate

For this assessment, it was assumed that the proposed construction plans include an excavation with shoring extending to the Site boundaries. EXP should be retained to review the assumptions outlined in this section, should the assumed shoring design change. Short-term (construction) dewatering calculations are presented in Appendix F.

Pits (elevator, sump pits) are assumed to have the same excavation depth and dewatering target as the main excavation; deeper pits may require localized dewatering and revised dewatering estimates. Based on the assumptions provided in this report, the results of the dewatering rate estimate can be summarized as follows:

Table 4-2 Summary of Construction Dewatering Rate

Peak Dewatering Flow Rates	
Description	Two Levels of Underground Parking (L/day)
Total Volume of Short-Term Groundwater Discharge (Construction Dewatering) without Safety Factor (including precipitation)	115,000
Total Volume of Short-Term Groundwater Discharge (Construction Dewatering) with Safety Factor (including precipitation)	193,000
Total Volume of Short-Term Groundwater Discharge (Construction Dewatering) with Safety Factor (excluding Precipitation) for EASR and PTTW	156,000

The peak dewatering flow rates does not account for flow from utility beddings and variations in hydrogeological properties beyond those encountered during this investigation.

Local dewatering may be required for pits (elevator pits, sump pits, raft) and for localized areas with permeable, soft, or wet soil conditions. Local dewatering is not considered to be part of this assessment, but contractor should be ready to install additional system to manage such conditions. Dewatering estimates should be reviewed once the pit dimensions are available.

All grading around the perimeter of the excavation should be graded away from the shoring the systems and ramp/site access to redirect runoff away from excavation.

The dewatering assumptions are based on using shoring system without open cuts and sloped excavations.

The contractor is responsible for the design of the dewatering systems (depth of wells, screen length, number of wells, spacing sand pack around screens, prevent soil loss etc.) to ensure that dry conditions are always maintained within the excavation at all costs.

Dewatering should be monitored using dedicated monitoring wells within and around the perimeter of the excavation, and these wells should be monitored using manual measurements and with electronic data loggers; records should be maintained on site to track dewatering progress. Discharge rates should be monitored using calibrated flow meters and records of dewatering progress, and daily precipitation as per MECP requirements should be maintained.

4.4.2 Post-Construction Dewatering Rate Estimate

It is our understanding that the development plan includes a permanent foundation sub-drain system that will ultimately discharge to the municipal sewer system if conventional footings are installed. The long-term dewatering was based on the same equations as construction dewatering shown in Section 4.1.

The calculation for the estimated flow to the future sub-drain system (with no cutoff walls) is provided in Appendix F. The dewatering target for the foundation drainage system is taken at 0.5 m below the lowest slab elevation.

The foundation drain analysis provides a flow rate estimate. Once the foundation drain is built, actual flow rate measurements of the sump discharge will be required to confirm the estimated flow rate.

Based on the assumptions provided in this report, the estimated sub-drain discharge volumes are summarized in Appendix F. Seasonal and daily fluctuations are expected. These estimates may be affected by hydrogeological conditions beyond those encountered at this time, fluctuations in groundwater regimes, surrounding Site alterations, and existing and future infrastructures.

Table 4-3: Summary of Long-Term Dewatering Rate

Long-Term Dewatering Flow Rate	Two Levels of Underground Parking (L/day)
Total Volume of Long-Term Groundwater Drainage Rate *without* Safety Factor (from foundation drainage, weeping tiles, sub slab drainage)	23,000
Total Volume of Long-Term Groundwater Drainage Rate *with* Safety Factor (from foundation drainage, weeping tiles, sub slab drainage)	34,000

Intermittent cycling of sump pumps and seasonal fluctuation in groundwater regimes should be considered for pump specifications. A safety factor was applied to the flow rate to account for water level fluctuations due to seasonal changes.

These estimates assume that pits (elevator and/or sump pits) are made as watertight structures (without drainage), if their depths extend below the dewatering target, as previously stated. The dewatering assumptions are based on using shoring system without open cuts. Open cuts can act as preferential groundwater pathways in the long-term and cause foundation drainage volumes to increase.

The sub-drain rate estimate is based on the assumptions outlined in this report. Any variations in hydrogeological conditions beyond those encountered as part of this investigation may significantly influence the sub-drain discharge volumes.

4.5 MECP Water Taking Permits

4.5.1 Short-Term Discharge Rate (Construction Phase)

In accordance with the Ontario Water Resources Act, if the water taking for the construction dewatering is more than 50,000 L/day but less than 400,000 L/day, then an online registration in the Environmental Activity and Sector Registry (EASR) with the MECP will be required. If groundwater dewatering rates onsite exceed 400,000 L/day, a Category 3 Permit to Take Water (PTTW) will be required from the MECP.

As of July 1, 2021, an amendment of O. Reg. 63/16 has come into effect and replaced the former subsection 7 (5) such that the EASR water taking limit of 400,000 L/day would apply to groundwater takings of each dewatered work area only, excluding stormwater.

The dewatering estimate including a safety factor is greater than 50,000 L/day and less than 400, 000 L/day as shown in Table 4-2. The MECP construction dewatering rate excludes the precipitation amount and is the rate used for the permit application. Based on the MECP construction dewatering an EASR will be required to facilitate the construction dewatering program at the Site.

A Discharge Plan (dewatering sketch, sewer discharge agreement) must be developed and applied for any discharges from the Site. Monitoring of both water quantity and water quality must be carried out for the entire duration of the construction dewatering phase. During this phase, the Discharge Plan and the daily water taking records must be available onsite.

The EASR, Discharge Plan, hydrogeological investigation report, and geotechnical assessment of settlements must also be available at the construction Site during the entire construction dewatering. EXP should be notified immediately about any changes to the construction dewatering schedule or design, since the EASR will need to be updated to reflect these modifications. Altogether, the hydrogeological report, EASR, Discharge Plan and geotechnical assessment constitute the Water Taking Plan which needs to be available onsite during the construction dewatering.

4.5.2 Long-Term Discharge Rate (Post Construction Phase)

In accordance with the Ontario Water Resources Act, if the water taking for the construction dewatering is more than 50,000 L/day, then an application for a Category 3 Permit to Take Water (PTTW) will be required from the MECP.

Based on the dewatering estimate shown in Table 4-3 less than 50,000 L/day, a Category 3 Permit to Take Water (PTTW) will not be required to facilitate the post-development phase.

The safety factor for construction (short-term) dewatering is selected larger than for long-term to account for anticipated greater groundwater volumes during initial dewatering. The applied analytical formula is adequate for long-term (steady state) conditions as it omits specific yield and time dependency. When the formula is used for short-term conditions a larger safety factor is recommended to cover a larger initial dewatering rate, which is required to remove stored groundwater. Moreover, a large initial construction dewatering rate is favorable, as it supports reducing the time to reach the dewatering target elevation.

6 Conclusions and Recommendations

Based on the findings of the Hydrogeological Investigation, the following conclusions and recommendations are provided:

- When comparing the chemistry of the collected groundwater samples to the Regional Municipality of Halton Sanitary and Combined Sewer Discharge Criteria, there were no parameter exceedances to be reported.
- When comparing the chemistry of the collected groundwater samples to the City of Burlington Storm Sewer Discharge Criteria, the concentrations of Total Suspended Solids (TSS), and Manganese (Mn) exceeded the applicable guidelines.
- Based on the assumptions outlined in this report, the estimated peak dewatering rate for proposed construction activities is approximately 193,000 L/day. This is the rate which will be required to be discharged to the municipal sewer system.
- The estimated MECP dewatering rate for proposed construction activities is approximately 156,000 L/day. As the dewatering flow rate estimate is between 50,000 L/day and 400,000 L/day, an EASR will be required to facilitate the construction dewatering program for the Site.
- The long-term flow rate of the foundation sub-drain is estimated to be approximately 34,000 L/day. It is recommended that once the sub-drain system is in place, a flow meter be installed at the sump(s) to record daily discharge volumes during the commissioning stage of the system. Regular maintenance/cleaning of the sub-drain system is recommended to ensure its proper operation. A PTTW will not be required for long-term discharge.
- The construction dewatering and long-term estimate of sub-drain discharge volumes is based on the assumptions outlined in this report. Any variations in hydrogeological conditions beyond those encountered as part of this preliminary investigation may significantly influence the discharge volumes.
- For the short-term dewatering system (construction phase), it is anticipated that TSS levels and some other parameters (for example, Total Metals) in the pumped groundwater may become elevated and exceed both, Sanitary and Storm Sewer Use By-Law limits. To control the concentration of TSS and associated metals, it is recommended that a suitable treatment method be implemented (filtration or decantation facilities and/ or any other applicable treatment system) during construction dewatering activities to discharge to the applicable sewer system. The specifications of the treatment system will need to be adjusted to the reported water quality results by the treatment contractor/process engineer.
- For the long-term dewatering discharge to the sanitary sewer system (post-development phase) and based on the water quality test results, the water is suitable to discharge without a treatment system.
- For the long-term dewatering discharge to the storm sewer system (post-development phase) and based on the water quality results, it is recommended to implement a suitable pre-treatment as required.
- As per the MECP technical requirement for PTTW and EASRs, the geotechnical assessment of the stability of the soils due to water taking (ex: settlement, soil loss, subsidence etc.) is required. The water taking should not have unacceptable interference on soils and underground structures (foundations, utilities etc.). A letter related to geotechnical issues as it pertains to the Site is required to be completed under a separate cover.
- An agreement to discharge into the sewers owned by either the Regional Municipality of Halton or the City of Burlington will be required prior to releasing dewatering effluent.
- The EASR registration allows construction dewatering discharge of up to 400,000 L/day. A Discharge Plan (dewatering sketch, sewer discharge agreement) must be developed and applied for any discharges from the Site. The Discharge Plan and monitoring for both water quantity and water quality must be carried at the Site during the entire construction dewatering phase. The daily water taking records must be maintained onsite for the entire construction dewatering phase. The EASR, Discharge Plan, hydrogeological investigation report, and geotechnical assessment of settlements must always also be available at the construction Site for the entire construction dewatering. EXP should be notified immediately about any changes to the construction dewatering schedule or design, since EASR will need to be updated to

reflect these modifications. The hydrogeological report, EASR, Discharge Plan and geotechnical assessment constitutes the Water Taking Plan which needs to be available onsite for the duration of construction dewatering.

- In conformance with Regulation 903 of the Ontario Water Resources Act, the installation and eventual decommissioning of any dewatering system wells or monitoring wells must be completed by a licensed well contractor. This will be required for all wells that are no longer in use.

The conclusions and recommendations provided above should be reviewed in conjunction with the entirety of the report. They assume that the present design concept described throughout the report will proceed to construction. This report is solely intended for the construction and long-term dewatering assessments. Any changes to the design concept may result in a modification to the recommendations provided in this report.

7 Limitations

This report is based on a limited investigation designed to provide information to support an assessment of the current hydrogeological conditions within the study area. The conclusions and recommendations presented within this report reflect Site conditions existing at the time of the assessment. EXP must be contacted immediately, if any unforeseen Site conditions are experienced during construction activities. This will allow EXP to review the new findings and provide appropriate recommendations to allow the construction to proceed in a timely and cost-effective manner.

Our undertaking at EXP, therefore, is to perform our work within limits prescribed by our clients, with the usual thoroughness and competence of the geoscience/engineering profession. No other warranty or representation, either expressed or implied, is included or intended in this report.

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We trust that this information is satisfactory for your purposes. Should you have any questions or comments, please do not hesitate to contact this office.

Sincerely,

EXP Services Inc.





Peyman Sayyah, M.Sc., P.Geo
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Environmental Services

Appendix C – SWRT Procedures and Results

Appendix C: Groundwater Elevation Summary

2083 Old Lakeshore Road, Burlington, Ontario

BRM-2102012-C0

Monitoring Well ID	Ground Surface Elevation (masl)	Stick Up (m)	Approximate Full Well Depth (mbTOP)	Approximate Full Well Depth (mbgs)	Minimum GW Elevation (masl)	Maximum GW Elevation (masl)	Depth	5-May-22	19-May-22
BH/MW 1	82.56	0.00	6.76	6.76	79.43	79.44	mbTOP	3.14	3.13
							mbgs	3.14	3.13
							masl	79.43	79.44
BH/MW 2	82.24	0.00	8.78	8.78	77.66	77.78	mbTOP	4.59	4.47
							mbgs	4.59	4.47
							masl	**77.66**	**77.78**
BH/MW 3	83.22	0.00	6.56	6.56	78.55	78.76	mbTOP	4.68	4.46
							mbgs	4.68	4.46
							masl	**78.55**	78.76
BH/MW 4	81.98	0.00	6.94	6.94	79.61	79.73	mbTOP	2.37	2.26
							mbgs	2.37	2.26
							masl	79.61	**79.73**

Notes:

mbTOP - meters below top of the pipe

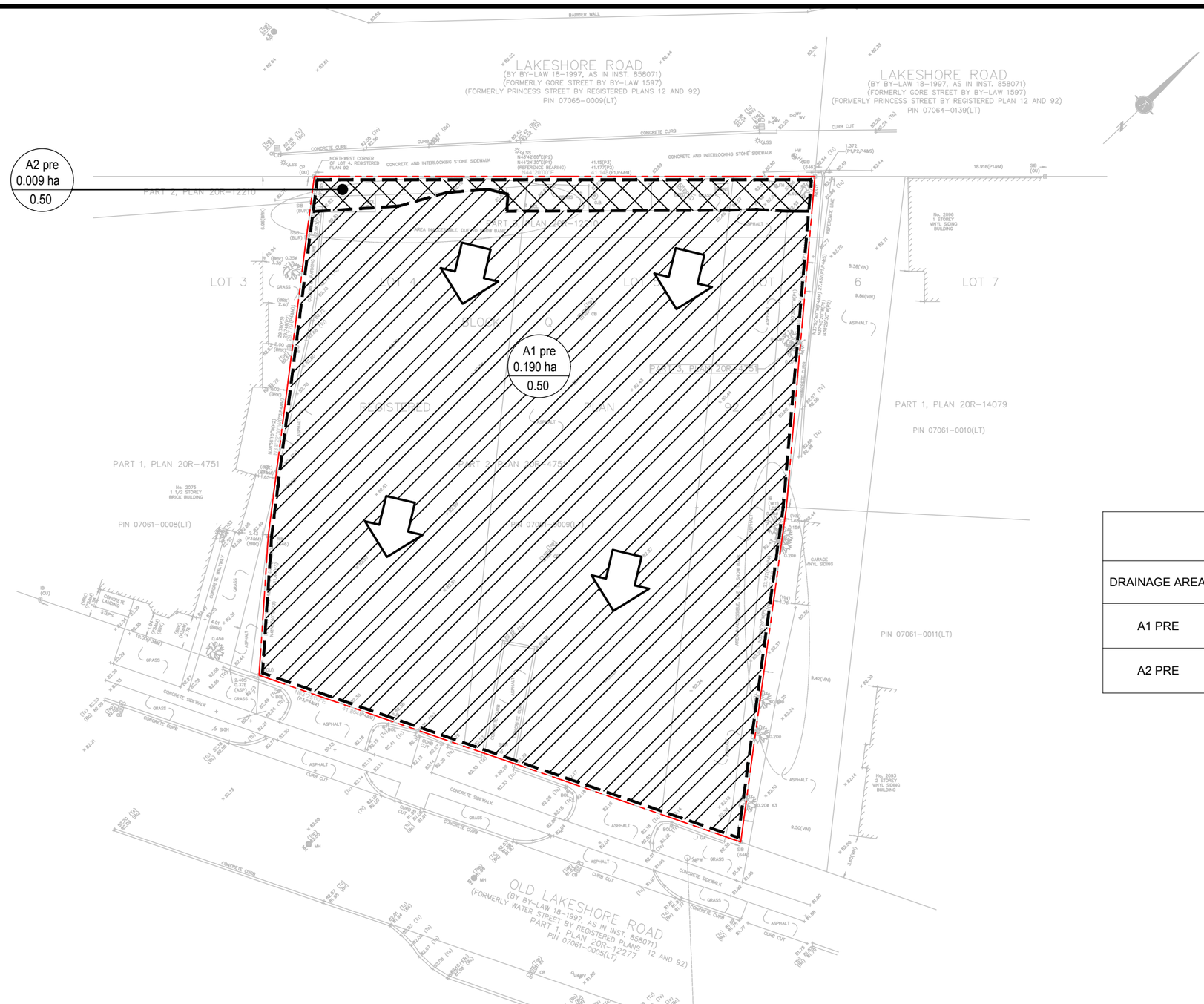
mbgs - meters below ground surface

masl - meters above mean sea level

	Min. GW Elev.	Max. Gw Elev.
Shallow Wells	**78.55**	**79.73**
Deep Well	**77.66**	**77.78**

Appendix C

Storm Analysis



RUN-OFF COEFFICIENTS				
DRAINAGE AREA	AREA (ha)	ACTUAL COEFFICIENT	DESIGN COEFFICIENT	LEGEND
A1 PRE	0.190	0.95	0.50	
A2 PRE	0.009	0.95	0.50	

LEGEND

A1 pre / 0.04 ha / 0.50

- STORM DRAINAGE AREA NUMBER
- DRAINAGE AREA (ha)
- COMPOSITE RUNOFF COEFFICIENT
- PRE-DEVELOPMENT STORM DRAINAGE AREA
- PROPERTY LINE

Lithos
150 Bermondsey Road, Toronto, Ontario M4A 1Y1

PRE-DEVELOPMENT
DRAINAGE AREA PLAN
MIXED USE DEVELOPMENT
2083 LAKESHORE ROAD
BURLINGTON, ONTARIO

DATE: DEC 2024 | PROJECT No: UD22-017
SCALE: N.T.S. | FIGURE No: DAP1

Lithos

Prepared By: Stergios Grigoriadis, P.E., M.A.Sc.
Reviewed by: Dimitra Frysali, P.E., M.A.Sc.

Rational Method
Pre-Development Flow Calculation
2083 Old Lakeshore Road and
File No. UD22-017
City of Burlington
Date: December 2024

Area Number	Surface	Area (ha)	Actual "C"	Design "C"
Pre Development (A1 Pre - Towards Old Lakeshore Road)	Hardscape	0.190	0.95	0.50
	Landscape	0.000	0.25	
Pre Development (A2 Pre - Towards Lakeshore Road)	Hardscape	0.009	0.95	
	Landscape	0.000	0.25	
Total Area		0.199	0.95	

Formula:	$I = A / (t + B)c$
A, B, C	Constants
t	time of duration
I	Rainfall intensity

Event 2-year
A = 681.52
B = 6
C = 0.78

IDF Data Set City of Burlington

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m^3/s)	Q (L/s)
Pre Development (A1 Pre - Towards Old Lakeshore Road)	0.190	0.50	0.10	10	78.4	0.021	20.7
Pre Development (A2 Pre - Towards Lakeshore Road)	0.009	0.50	0.00	10	78.4	0.001	1.0

Event 5-year
A = 802.04
B = 5
C = 0.764

IDF Data Set City of Burlington

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m^3/s)	Q (L/s)
Pre Development (A1 Pre - Towards Old Lakeshore Road)	0.190	0.50	0.10	10	101.3	0.027	26.7
Pre Development (A2 Pre - Towards Lakeshore Road)	0.009	0.50	0.00	10	101.3	0.001	1.3

Event 10-year
A = 918.28
B = 5
C = 0.763

IDF Data Set City of Burlington

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m^3/s)	Q (L/s)
Pre Development (A1 Pre - Towards Old Lakeshore Road)	0.190	0.50	0.10	10	116.3	0.031	30.7
Pre Development (A2 Pre - Towards Lakeshore Road)	0.009	0.50	0.00	10	116.3	0.001	1.5

Event 25-year
A= 1065.95
B= 5
C= 0.76

IDF Data Set City of Burlington

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m^3/s)	Q (L/s)
Pre Development (A1 Pre - Towards Old Lakeshore Road)	0.190	0.55	0.10	10	135.4	0.039	39.3
Pre Development (A2 Pre - Towards Lakeshore Road)	0.009	0.55	0.00	10	135.4	0.002	1.9

Event 50-year
A= 1172.34
B= 5
C= 0.761

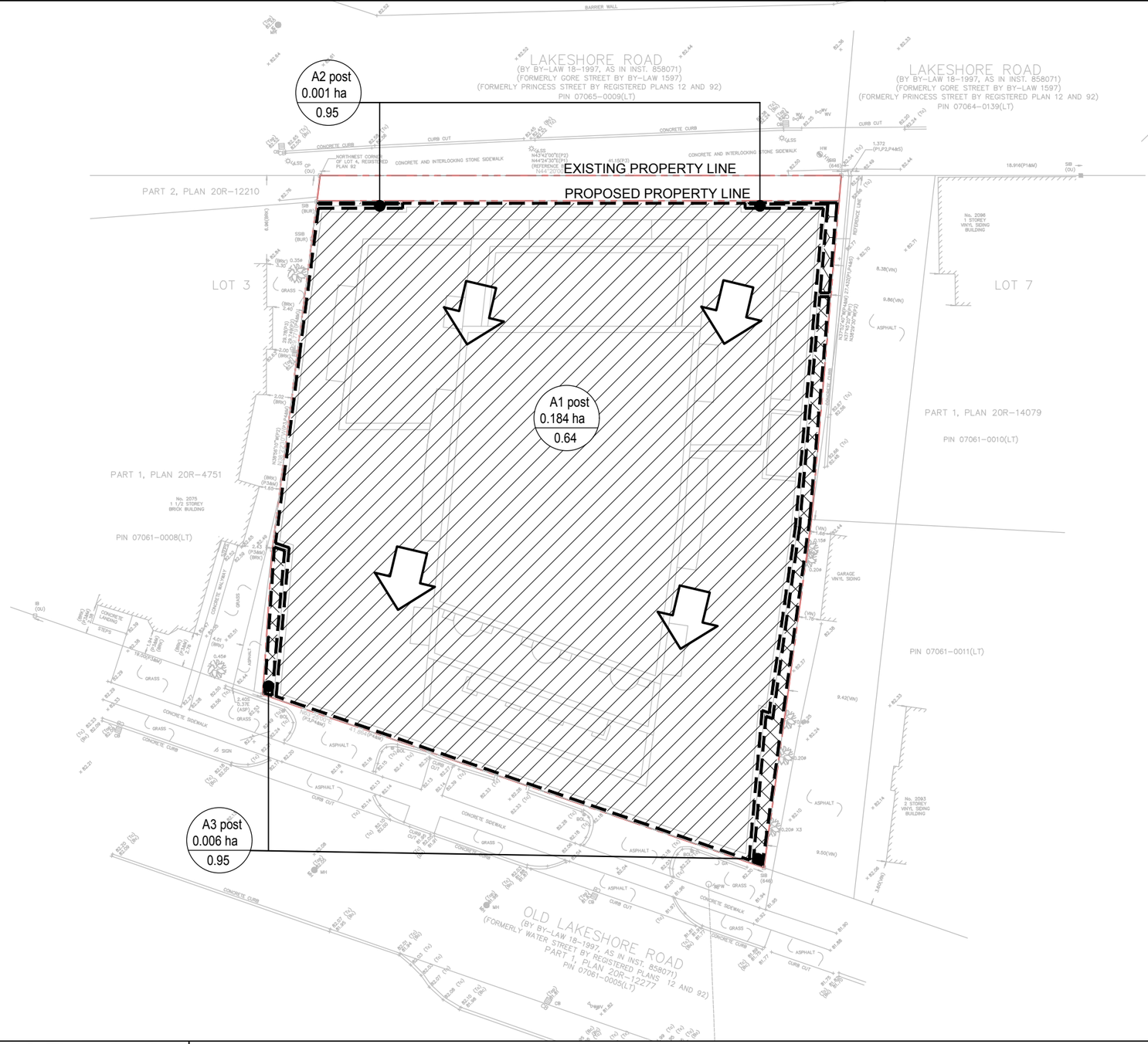
IDF Data Set City of Burlington

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m^3/s)	Q (L/s)
Pre Development (A1 Pre - Towards Old Lakeshore Road)	0.190	0.60	0.11	10	149.3	0.047	47.3
Pre Development (A2 Pre - Towards Lakeshore Road)	0.009	0.60	0.01	10	149.3	0.002	2.2

Event 100-year
A = 1281.34
B = 5
C = 0.761

IDF Data Set City of Burlington

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m^3/s)	Q (L/s)
Pre Development (A1 Pre - Towards Old Lakeshore Road)	0.190	0.63	0.12	10	163.2	0.054	53.8
Pre Development (A2 Pre - Towards Lakeshore Road)	0.009	0.63	0.01	10	163.2	0.003	2.5



RUN-OFF COEFFICIENTS

DRAINAGE AREA	LEGEND	LAND USE	AREA (ha)	INITIAL COEFFICIENT	COMPOSITE COEFFICIENT	TOTAL AREA (ha)
A1 POST - PROPOSED DEVELOPMENT (CONTROLLED)		LANDSCAPE	0.062	0.25	0.64	0.184
		HARDSCAPE	0.108	0.95		
A2 POST - PROPOSED DEVELOPMENT (UNCONTROLLED)		LANDSCAPE	0.000	0.25	0.95	0.001
		HARDSCAPE	0.001	0.95		
A3 POST - PROPOSED DEVELOPMENT (UNCONTROLLED)		LANDSCAPE	0.000	0.25	0.95	0.006
		HARDSCAPE	0.006	0.95		

Lithos

150 Bermondsey Road, Toronto, Ontario M4A 1Y1

LEGEND

A1 post / 0.04 ha / 0.50 — STORM DRAINAGE AREA NUMBER; DRAINAGE AREA (ha); COMPOSITE RUNOFF COEFFICIENT

PRE-DEVELOPMENT STORM DRAINAGE AREA

PROPERTY LINE

POST-DEVELOPMENT DRAINAGE AREA PLAN

MIXED USE DEVELOPMENT
2083 LAKESHORE ROAD
BURLINGTON, ONTARIO

DATE: DEC 2024	PROJECT No: UD22-017
SCALE: N.T.S.	FIGURE No: DAP2

Modified Rational Method - Two Year Storm
Site Flow and Storage Summary - towards Old Lakeshore Road
2083 Old Lakeshore Road

Drainage Area A1 Post

Rooftops / Terraces / Outdoor Amenity Area - Controlled In Tank

Area (A1) = **0.184** ha
"C" = **0.71**
AC1 = **0.13**
Tc = **10** min
Time Increment = **5.0** min

Max. Release Rate = **28.6** L/s

Drainage Area A3 Post

Uncontrolled Site Area towards Old Lakeshore Road

Area (A3) = **0.006** ha
"C" = **0.95**
AC3= **0.006**
Tc = **10.0** min
Time Increment = **5.0** min

Max. Release Rate = **1.7** L/s

Groundwater Dewatering

Pump Peak Flow Rate = **0.39** L/s

Total Site

Total Site = A1+A3+ Groundwater Dewatering

2-yr Pre-Development Site Release Rate = **20.7** L/s

Controlled Release Rate (85mm Orifice Plate)= **9.1** L/s

Uncontrolled Flow (A3) = **1.7** **L/s**

Groundwater Dewatering Flow Rate = **0.39** **L/s**

Total Site Release Rate Achieved = **11.2** L/s

Max. Storage Tank-1 Size = **13.1** m^3
Stor. Tank footpring Area = **40.6** m^2

2 Year Design Storm

a=	681.52
c=	0.780
B=	6
I=	a/((Tc+B)^c)

Area	Area(ha)	Coefficient
Landscape	0.062	0.25
Hardscape	0.122	0.95
Total	0.184	0.71

Area	Area(ha)	Coefficient
Landscape	0.000	0.25
Hardscape	0.006	0.95
Total	0.006	0.95

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Time	**Rainfall**	**Storm Runoff (A1 Post)**	**Runoff Volume (A1 Post)**	**Storm Runoff (A3 Post)**	**Runoff Volume (A3 Post)**	**Dewatering Volume**	**Total Storm Runoff Volume**	**Target Released Volume**	**Storage Volume**	**Storage Depth of Tank**
(min)	**(mm/hr)**	**(m^3/s)**	**(m^3)**	**(m^3/s)**	**(m^3)**	**(m3)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m)**
10.0	78.4	0.029	17.17	0.001	0.74	0.23	17.40	5.46	11.9	0.29
15.0	63.4	0.023	20.83	0.001	0.90	0.35	21.18	8.19	13.0	0.32
20.0	53.7	0.020	23.51	0.002	2.04	0.47	23.98	10.92	13.1	0.32
25.0	46.8	0.017	25.62	0.001	2.22	0.59	26.21	13.64	12.6	0.31
30.0	41.6	0.015	27.36	0.001	2.37	0.70	28.06	16.37	11.7	0.29
35.0	37.6	0.014	28.84	0.001	2.50	0.82	29.66	19.10	10.6	0.26
40.0	34.4	0.013	30.13	0.001	2.61	0.94	31.07	21.83	9.2	0.23
45.0	31.7	0.012	31.28	0.001	2.71	1.05	32.33	24.56	7.8	0.19
50.0	29.5	0.011	32.31	0.001	2.80	1.17	33.48	27.29	6.2	0.15
55.0	27.6	0.010	33.25	0.001	2.88	1.29	34.53	30.02	4.5	0.11
60.0	26.0	0.009	34.11	0.001	2.96	1.40	35.51	32.75	2.8	0.07
65.0	24.5	0.009	34.90	0.001	3.03	1.52	36.42	35.48	0.9	0.02
70.0	23.3	0.008	35.64	0.001	3.09	1.64	37.28	38.21	0.0	0.00
75.0	22.1	0.008	36.34	0.001	3.15	1.76	38.09	40.93	0.0	0.00
80.0	21.1	0.008	36.99	0.001	3.21	1.87	38.86	43.66	0.0	0.00
85.0	20.2	0.007	37.61	0.001	3.26	1.99	39.60	46.39	0.0	0.00
90.0	19.4	0.007	38.19	0.001	3.31	2.11	40.30	49.12	0.0	0.00
95.0	18.6	0.007	38.75	0.001	3.36	2.22	40.97	51.85	0.0	0.00
100.0	17.9	0.007	39.28	0.001	3.41	2.34	41.62	54.58	0.0	0.00
105.0	17.3	0.006	39.79	0.001	3.45	2.46	42.25	57.31	0.0	0.00
110.0	16.7	0.006	40.28	0.001	3.49	2.57	42.85	60.04	0.0	0.00
115.0	16.2	0.006	40.74	0.001	3.53	2.69	43.43	62.77	0.0	0.00
120.0	15.7	0.006	41.19	0.000	3.57	2.81	44.00	65.49	0.0	0.00
125.0	15.2	0.006	41.63	0.000	3.61	2.93	44.55	68.22	0.0	0.00
130.0	14.8	0.005	42.04	0.000	3.65	3.04	45.09	70.95	0.0	0.00
135.0	14.4	0.005	42.45	0.000	3.68	3.16	45.61	73.68	0.0	0.00
140.0	14.0	0.005	42.84	0.000	3.72	3.28	46.12	76.41	0.0	0.00
145.0	13.6	0.005	43.22	0.000	3.75	3.39	46.61	79.14	0.0	0.00
150.0	13.3	0.005	43.59	0.000	3.78	3.51	47.10	81.87	0.0	0.00
155.0	12.9	0.005	43.95	0.000	3.81	3.63	47.57	84.60	0.0	0.00
160.0	12.6	0.005	44.30	0.000	3.84	3.74	48.04	87.33	0.0	0.00
165.0	12.4	0.005	44.63	0.000	3.87	3.86	48.50	90.06	0.0	0.00
170.0	12.1	0.004	44.96	0.000	3.90	3.98	48.94	92.78	0.0	0.00
175.0	11.8	0.004	45.29	0.000	3.93	4.10	49.38	95.51	0.0	0.00
180.0	11.6	0.004	45.60	0.000	3.96	4.21	49.81	98.24	0.0	0.00
185.0	11.3	0.004	45.91	0.000	3.98	4.33	50.24	100.97	0.0	0.00
190.0	11.1	0.004	46.21	0.000	4.01	4.45	50.65	103.70	0.0	0.00
195.0	10.9	0.004	46.50	0.000	4.03	4.56	51.06	106.43	0.0	0.00
200.0	10.7	0.004	46.79	0.000	4.06	4.68	51.47	109.16	0.0	0.00
205.0	10.5	0.004	47.07	0.000	4.08	4.80	51.87	111.89	0.0	0.00
210.0	10.3	0.004	47.34	0.000	4.11	4.91	52.26	114.62	0.0	0.00
215.0	10.1	0.004	47.61	0.000	4.13	5.03	52.65	117.34	0.0	0.00
220.0	9.9	0.004	47.88	0.000	4.15	5.15	53.03	120.07	0.0	0.00
225.0	9.8	0.004	48.14	0.000	4.18	5.27	53.40	122.80	0.0	0.00
230.0	9.6	0.004	48.39	0.000	4.20	5.38	53.77	125.53	0.0	0.00
235.0	9.5	0.003	48.64	0.000	4.22	5.50	54.14	128.26	0.0	0.00
240.0	9.3	0.003	48.89	0.000	4.24	5.62	54.50	130.99	0.0	0.00
245.0	9.2	0.003	49.13	0.000	4.26	5.73	54.86	133.72	0.0	0.00
250.0	9.0	0.003	49.37	0.000	4.28	5.85	55.22	136.45	0.0	0.00
255.0	8.9	0.003	49.60	0.000	4.30	5.97	55.57	139.18	0.0	0.00
260.0	8.8	0.003	49.83	0.000	4.32	6.08	55.91	141.91	0.0	0.00
265.0	8.6	0.003	50.06	0.000	4.34	6.20	56.26	144.63	0.0	0.00
270.0	8.5	0.003	50.28	0.000	4.36	6.32	56.60	147.36	0.0	0.00

Modified Rational Method - Five Year Storm
Site Flow and Storage Summary - towards Old Lakeshore Road
2083 Old Lakeshore Road

Drainage Area A1 Post

Rooftops / Terraces / Outdoor Amenity Area - Controlled In Tank

Area (A1) = **0.184** ha
"C" = **0.71**
AC1 = **0.13**
Tc = **10** min
Time Increment = **5.0** min

Max. Release Rate = **37.0** L/s

Drainage Area A3 Post

Uncontrolled Site Area towards Old Lakeshore Road

Area (A3) = **0.006** ha
"C" = **0.95**
AC3= **0.006**
Tc = **10.0** min
Time Increment = **5.0** min

Max. Release Rate = **2.2** L/s

Groundwater Dewatering

Pump Peak Flow Rate = **0.39** L/s

Total Site

Total Site = A1+A3+ Groundwater Dewatering

2-yr Pre-Development Site Release Rate = **20.7** L/s

Controlled Release Rate (85mm Orifice Plate)= **10.5** L/s

Uncontrolled Flow (A3) = **2.2** **L/s**

Groundwater Dewatering Flow Rate = **0.39** **L/s**

Total Site Release Rate Achieved = **13.1** L/s

Max. Storage Tank-1 Size = **17.9** m^3
Stor. Tank footpring Area = **40.6** m^2

5 Year Design Storm

a=	802.04
c=	0.764
B=	5
I=	a/((Tc+B)^c)

Area	Area(ha)	Coefficient
Landscape	0.062	0.25
Hardscape	0.122	0.95
Total	0.184	0.71

Area	Area(ha)	Coefficient
Landscape	0.000	0.25
Hardscape	0.006	0.95
Total	0.006	0.95

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Time	**Rainfall Intensity**	**Storm Runoff (A1 Post)**	**Runoff Volume (A1 Post)**	**Storm Runoff (A3 Post)**	**Runoff Volume (A3 Post)**	**Dewatering Volume**	**Total Storm Runoff Volume**	**Target Released Volume**	**Storage Volume**	**Storage Depth of Tank**
(min)	**(mm/hr)**	**(m^3/s)**	**(m^3)**	**(m^3/s)**	**(m^3)**	**(m3)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m)**
10.0	101.3	0.037	22.19	0.002	0.96	0.23	22.42	6.30	16.1	0.40
15.0	81.3	0.030	26.71	0.001	1.16	0.35	27.07	9.45	17.6	0.43
20.0	68.6	0.025	30.04	0.002	2.61	0.47	30.50	12.60	17.9	0.44
25.0	59.7	0.022	32.66	0.002	2.83	0.59	33.25	15.76	17.5	0.43
30.0	53.0	0.019	34.84	0.002	3.02	0.70	35.54	18.91	16.6	0.41
35.0	47.9	0.017	36.71	0.002	3.18	0.82	37.52	22.06	15.5	0.38
40.0	43.8	0.016	38.34	0.001	3.33	0.94	39.28	25.21	14.1	0.35
45.0	40.4	0.015	39.80	0.001	3.45	1.05	40.85	28.36	12.5	0.31
50.0	37.5	0.014	41.11	0.001	3.57	1.17	42.28	31.51	10.8	0.27
55.0	35.1	0.013	42.32	0.001	3.67	1.29	43.60	34.66	8.9	0.22
60.0	33.0	0.012	43.42	0.001	3.77	1.40	44.83	37.81	7.0	0.17
65.0	31.2	0.011	44.45	0.001	3.86	1.52	45.97	40.96	5.0	0.12
70.0	29.6	0.011	45.41	0.001	3.94	1.64	47.05	44.12	2.9	0.07
75.0	28.2	0.010	46.32	0.001	4.02	1.76	48.07	47.27	0.8	0.02
80.0	26.9	0.010	47.17	0.001	4.09	1.87	49.04	50.42	0.0	0.00
85.0	25.8	0.009	47.98	0.001	4.16	1.99	49.96	53.57	0.0	0.00
90.0	24.7	0.009	48.74	0.001	4.23	2.11	50.85	56.72	0.0	0.00
95.0	23.8	0.009	49.47	0.001	4.29	2.22	51.70	59.87	0.0	0.00
100.0	22.9	0.008	50.17	0.001	4.35	2.34	52.51	63.02	0.0	0.00
105.0	22.1	0.008	50.84	0.001	4.41	2.46	53.30	66.17	0.0	0.00
110.0	21.4	0.008	51.48	0.001	4.47	2.57	54.06	69.32	0.0	0.00
115.0	20.7	0.008	52.10	0.001	4.52	2.69	54.79	72.48	0.0	0.00
120.0	20.1	0.007	52.70	0.001	4.57	2.81	55.50	75.63	0.0	0.00
125.0	19.5	0.007	53.27	0.001	4.62	2.93	56.20	78.78	0.0	0.00
130.0	18.9	0.007	53.83	0.001	4.67	3.04	56.87	81.93	0.0	0.00
135.0	18.4	0.007	54.37	0.001	4.72	3.16	57.53	85.08	0.0	0.00
140.0	17.9	0.007	54.89	0.001	4.76	3.28	58.16	88.23	0.0	0.00
145.0	17.4	0.006	55.40	0.001	4.81	3.39	58.79	91.38	0.0	0.00
150.0	17.0	0.006	55.89	0.001	4.85	3.51	59.40	94.53	0.0	0.00
155.0	16.6	0.006	56.37	0.001	4.89	3.63	59.99	97.68	0.0	0.00
160.0	16.2	0.006	56.83	0.001	4.93	3.74	60.58	100.84	0.0	0.00
165.0	15.9	0.006	57.29	0.001	4.97	3.86	61.15	103.99	0.0	0.00
170.0	15.5	0.006	57.73	0.000	5.01	3.98	61.71	107.14	0.0	0.00
175.0	15.2	0.006	58.16	0.000	5.05	4.10	62.26	110.29	0.0	0.00
180.0	14.9	0.005	58.59	0.000	5.08	4.21	62.80	113.44	0.0	0.00
185.0	14.6	0.005	59.00	0.000	5.12	4.33	63.33	116.59	0.0	0.00
190.0	14.3	0.005	59.40	0.000	5.15	4.45	63.85	119.74	0.0	0.00
195.0	14.0	0.005	59.80	0.000	5.19	4.56	64.36	122.89	0.0	0.00
200.0	13.7	0.005	60.19	0.000	5.22	4.68	64.87	126.04	0.0	0.00
205.0	13.5	0.005	60.56	0.000	5.25	4.80	65.36	129.20	0.0	0.00
210.0	13.2	0.005	60.94	0.000	5.29	4.91	65.85	132.35	0.0	0.00
215.0	13.0	0.005	61.30	0.000	5.32	5.03	66.33	135.50	0.0	0.00
220.0	12.8	0.005	61.66	0.000	5.35	5.15	66.81	138.65	0.0	0.00
225.0	12.6	0.005	62.01	0.000	5.38	5.27	67.28	141.80	0.0	0.00
230.0	12.4	0.005	62.36	0.000	5.41	5.38	67.74	144.95	0.0	0.00
235.0	12.2	0.004	62.69	0.000	5.44	5.50	68.19	148.10	0.0	0.00
240.0	12.0	0.004	63.03	0.000	5.47	5.62	68.64	151.25	0.0	0.00
245.0	11.8	0.004	63.35	0.000	5.50	5.73	69.09	154.41	0.0	0.00
250.0	11.6	0.004	63.68	0.000	5.52	5.85	69.53	157.56	0.0	0.00
255.0	11.5	0.004	63.99	0.000	5.55	5.97	69.96	160.71	0.0	0.00
260.0	11.3	0.004	64.31	0.000	5.58	6.08	70.39	163.86	0.0	0.00
265.0	11.1	0.004	64.61	0.000	5.61	6.20	70.81	167.01	0.0	0.00
270.0	11.0	0.004	64.92	0.000	5.63	6.32	71.23	170.16	0.0	0.00

Modified Rational Method - Ten Year Storm
Site Flow and Storage Summary - towards Old Lakeshore Road
2083 Old Lakeshore Road

Drainage Area A1 Post

Rooftops / Terraces / Outdoor Amenity Area - Controlled In Tank

Area (A1) = **0.184** ha
"C" = **0.89**
AC1 = **0.16**
Tc = **10** min
Time Increment = **5.0** min

Max. Release Rate = **53.1** L/s

Drainage Area A3 Post

Uncontrolled Site Area towards Old Lakeshore Road

Area (A3) = **0.006** ha
"C" = **1.00**
AC3= **0.006**
Tc = **10.0** min
Time Increment = **5.0** min

Max. Release Rate = **2.6** L/s

Groundwater Dewatering

Pump Peak Flow Rate = **0.39** L/s

Total Site

Total Site = A1+A3+ Groundwater Dewatering

2-yr Pre-Development Site Release Rate = **20.7** L/s

Controlled Release Rate (85mm Orifice Plate) = **13.1** L/s

Uncontrolled Flow (A3) = **2.6** L/s

Groundwater Dewatering Flow Rate = **0.39** L/s

Total Site Release Rate Achieved = **16.1** L/s

Max. Storage Tank-1 Size = **27.9** m^3
Stor. Tank footpring Area = **40.6** m^2

10 Year Design Storm

a=	918.28
c=	0.763
B=	5
I=	a/((Tc+B)^c)

Area	Area(ha)	Coefficient
Landscape	0.062	0.25
Hardscape	0.122	0.95
Total	0.184	0.71

Area	Area(ha)	Coefficient
Landscape	0.000	0.25
Hardscape	0.006	0.95
Total	0.006	0.95

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Time	**Rainfall**	**Storm**	**Runoff**	**Storm**	**Runoff**	**Dewatering**	**Total Storm**	**Target Released**	**Storage**	**Storage**
	Intensity	**Runoff (A1 Post)**	**Volume (A1 Post)**	**Runoff (A3 Post)**	**Volume (A3 Post)**	**Volume**	**Runoff Volume**	**Volume**	**Volume**	**Depth of Tank**
(min)	**(mm/hr)**	**(m^3/s)**	**(m^3)**	**(m^3/s)**	**(m^3)**	**(m3)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m)**
10.0	116.3	0.053	31.84	0.002	1.16	0.23	32.07	7.86	24.2	0.60
15.0	93.4	0.043	38.35	0.002	1.40	0.35	38.70	11.80	26.9	0.66
20.0	78.8	0.036	43.13	0.003	3.15	0.47	43.59	15.73	27.9	0.69
25.0	68.5	0.031	46.91	0.002	3.43	0.59	47.49	19.66	27.8	0.69
30.0	60.9	0.028	50.04	0.002	3.66	0.70	50.74	23.59	27.2	0.67
35.0	55.0	0.025	52.73	0.002	3.85	0.82	53.55	27.52	26.0	0.64
40.0	50.3	0.023	55.08	0.002	4.02	0.94	56.02	31.45	24.6	0.60
45.0	46.4	0.021	57.18	0.002	4.18	1.05	58.23	35.39	22.8	0.56
50.0	43.2	0.020	59.07	0.001	4.32	1.17	60.24	39.32	20.9	0.52
55.0	40.4	0.018	60.81	0.001	4.44	1.29	62.10	43.25	18.8	0.46
60.0	38.0	0.017	62.41	0.001	4.56	1.40	63.81	47.18	16.6	0.41
65.0	35.9	0.016	63.89	0.001	4.67	1.52	65.41	51.11	14.3	0.35
70.0	34.1	0.016	65.28	0.001	4.77	1.64	66.91	55.04	11.9	0.29
75.0	32.4	0.015	66.58	0.001	4.86	1.76	68.33	58.98	9.4	0.23
80.0	31.0	0.014	67.81	0.001	4.95	1.87	69.68	62.91	6.8	0.17
85.0	29.6	0.014	68.97	0.001	5.04	1.99	70.96	66.84	4.1	0.10
90.0	28.4	0.013	70.08	0.001	5.12	2.11	72.18	70.77	1.4	0.03
95.0	27.4	0.012	71.13	0.001	5.20	2.22	73.35	74.70	0.0	0.00
100.0	26.4	0.012	72.14	0.001	5.27	2.34	74.48	78.63	0.0	0.00
105.0	25.4	0.012	73.10	0.001	5.34	2.46	75.56	82.57	0.0	0.00
110.0	24.6	0.011	74.03	0.001	5.41	2.57	76.60	86.50	0.0	0.00
115.0	23.8	0.011	74.92	0.001	5.47	2.69	77.61	90.43	0.0	0.00
120.0	23.1	0.011	75.78	0.001	5.54	2.81	78.59	94.36	0.0	0.00
125.0	22.4	0.010	76.61	0.001	5.60	2.93	79.54	98.29	0.0	0.00
130.0	21.8	0.010	77.42	0.001	5.66	3.04	80.46	102.23	0.0	0.00
135.0	21.2	0.010	78.19	0.001	5.71	3.16	81.35	106.16	0.0	0.00
140.0	20.6	0.009	78.95	0.001	5.77	3.28	82.22	110.09	0.0	0.00
145.0	20.1	0.009	79.68	0.001	5.82	3.39	83.07	114.02	0.0	0.00
150.0	19.6	0.009	80.39	0.001	5.87	3.51	83.90	117.95	0.0	0.00
155.0	19.1	0.009	81.08	0.001	5.92	3.63	84.71	121.88	0.0	0.00
160.0	18.7	0.009	81.75	0.001	5.97	3.74	85.50	125.82	0.0	0.00
165.0	18.2	0.008	82.41	0.001	6.02	3.86	86.27	129.75	0.0	0.00
170.0	17.8	0.008	83.05	0.001	6.07	3.98	87.03	133.68	0.0	0.00
175.0	17.5	0.008	83.67	0.001	6.11	4.10	87.77	137.61	0.0	0.00
180.0	17.1	0.008	84.28	0.001	6.16	4.21	88.50	141.54	0.0	0.00
185.0	16.8	0.008	84.88	0.001	6.20	4.33	89.21	145.47	0.0	0.00
190.0	16.4	0.007	85.46	0.001	6.24	4.45	89.91	149.41	0.0	0.00
195.0	16.1	0.007	86.04	0.001	6.29	4.56	90.60	153.34	0.0	0.00
200.0	15.8	0.007	86.59	0.001	6.33	4.68	91.27	157.27	0.0	0.00
205.0	15.5	0.007	87.14	0.001	6.37	4.80	91.94	161.20	0.0	0.00
210.0	15.3	0.007	87.68	0.001	6.41	4.91	92.59	165.13	0.0	0.00
215.0	15.0	0.007	88.21	0.000	6.44	5.03	93.24	169.06	0.0	0.00
220.0	14.7	0.007	88.72	0.000	6.48	5.15	93.87	173.00	0.0	0.00
225.0	14.5	0.007	89.23	0.000	6.52	5.27	94.50	176.93	0.0	0.00
230.0	14.3	0.007	89.73	0.000	6.56	5.38	95.11	180.86	0.0	0.00
235.0	14.0	0.006	90.22	0.000	6.59	5.50	95.72	184.79	0.0	0.00
240.0	13.8	0.006	90.70	0.000	6.63	5.62	96.32	188.72	0.0	0.00
245.0	13.6	0.006	91.17	0.000	6.66	5.73	96.91	192.66	0.0	0.00
250.0	13.4	0.006	91.64	0.000	6.70	5.85	97.49	196.59	0.0	0.00
255.0	13.2	0.006	92.10	0.000	6.73	5.97	98.06	200.52	0.0	0.00
260.0	13.0	0.006	92.55	0.000	6.76	6.08	98.63	204.45	0.0	0.00
265.0	12.8	0.006	92.99	0.000	6.79	6.20	99.19	208.38	0.0	0.00
270.0	12.6	0.006	93.43	0.000	6.83	6.32	99.75	212.31	0.0	0.00

Modified Rational Method - Twenty Five Year Storm
Site Flow and Storage Summary - towards Old Lakeshore Road
2083 Old Lakeshore Road

Drainage Area A1 Post

Rooftops / Terraces / Outdoor Amenity Area - Controlled In Tank

Area (A1) = **0.184** ha
"C" = **0.79**
AC1 = **0.14**
Tc = **10** min
Time Increment = **5.0** min

Max. Release Rate = **54.4** L/s

Drainage Area A3 Post

Uncontrolled Site Area towards Old Lakeshore Road

Area (A3) = **0.006** ha
"C" = **1.00**
AC3= **0.006**
Tc = **10.0** min
Time Increment = **5.0** min

Max. Release Rate = **3.1** L/s

Groundwater Dewatering

Pump Peak Flow Rate = **0.39** L/s

Total Site

Total Site = A1+A3+ Groundwater Dewatering

2-yr Pre-Development Site Release Rate = **20.7** L/s

Controlled Release Rate (85mm Orifice Plate) = **13.3** L/s

Uncontrolled Flow (A3) = **3.1** **L/s**

Groundwater Dewatering Flow Rate = **0.39** **L/s**

Total Site Release Rate Achieved = **16.8** L/s

Max. Storage Tank-1 Size = **28.7** m^3
Stor. Tank footpring Area = **40.6** m^2

25 Year Design Storm

a=	1065.95
c=	0.762
B=	5
I=	a/((Tc+B)^c)

Area	Area(ha)	Coefficient
Landscape	0.062	0.25
Hardscape	0.122	0.95
Total	0.184	0.71

Area	Area(ha)	Coefficient
Landscape	0.000	0.25
Hardscape	0.006	0.95
Total	0.006	0.95

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Time	**Rainfall Intensity**	**Storm Runoff (A1 Post)**	**Runoff Volume (A1 Post)**	**Storm Runoff (A3 Post)**	**Runoff Volume (A3 Post)**	**Dewatering Volume**	**Total Storm Runoff Volume**	**Target Released Volume**	**Storage Volume**	**Storage Depth of Tank**
(min)	**(mm/hr)**	**(m^3/s)**	**(m^3)**	**(m^3/s)**	**(m^3)**	**(m3)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m)**
10.0	135.4	0.054	32.61	0.002	1.35	0.23	32.85	8.01	24.8	0.61
15.0	108.7	0.044	39.29	0.002	1.63	0.35	39.64	12.01	27.6	0.68
20.0	91.7	0.037	44.20	0.003	3.67	0.47	44.66	16.01	28.7	0.71
25.0	79.8	0.032	48.08	0.003	3.99	0.59	48.66	20.01	28.6	0.71
30.0	71.0	0.028	51.30	0.002	4.26	0.70	52.00	24.02	28.0	0.69
35.0	64.1	0.026	54.06	0.002	4.49	0.82	54.88	28.02	26.9	0.66
40.0	58.6	0.024	56.48	0.002	4.69	0.94	57.41	32.02	25.4	0.63
45.0	54.1	0.022	58.64	0.002	4.87	1.05	59.69	36.03	23.7	0.58
50.0	50.3	0.020	60.59	0.002	5.03	1.17	61.76	40.03	21.7	0.54
55.0	47.1	0.019	62.37	0.002	5.18	1.29	63.66	44.03	19.6	0.48
60.0	44.3	0.018	64.02	0.001	5.31	1.40	65.42	48.03	17.4	0.43
65.0	41.9	0.017	65.54	0.001	5.44	1.52	67.06	52.04	15.0	0.37
70.0	39.7	0.016	66.97	0.001	5.56	1.64	68.61	56.04	12.6	0.31
75.0	37.8	0.015	68.31	0.001	5.67	1.76	70.06	60.04	10.0	0.25
80.0	36.1	0.014	69.57	0.001	5.78	1.87	71.45	64.05	7.4	0.18
85.0	34.6	0.014	70.77	0.001	5.88	1.99	72.76	68.05	4.7	0.12
90.0	33.2	0.013	71.91	0.001	5.97	2.11	74.02	72.05	2.0	0.05
95.0	31.9	0.013	73.00	0.001	6.06	2.22	75.22	76.05	0.0	0.00
100.0	30.7	0.012	74.03	0.001	6.15	2.34	76.37	80.06	0.0	0.00
105.0	29.7	0.012	75.03	0.001	6.23	2.46	77.48	84.06	0.0	0.00
110.0	28.7	0.012	75.98	0.001	6.31	2.57	78.56	88.06	0.0	0.00
115.0	27.8	0.011	76.90	0.001	6.38	2.69	79.59	92.07	0.0	0.00
120.0	26.9	0.011	77.79	0.001	6.46	2.81	80.60	96.07	0.0	0.00
125.0	26.1	0.010	78.64	0.001	6.53	2.93	81.57	100.07	0.0	0.00
130.0	25.4	0.010	79.47	0.001	6.60	3.04	82.51	104.07	0.0	0.00
135.0	24.7	0.010	80.27	0.001	6.66	3.16	83.43	108.08	0.0	0.00
140.0	24.0	0.010	81.05	0.001	6.73	3.28	84.32	112.08	0.0	0.00
145.0	23.4	0.009	81.80	0.001	6.79	3.39	85.19	116.08	0.0	0.00
150.0	22.8	0.009	82.53	0.001	6.85	3.51	86.04	120.09	0.0	0.00
155.0	22.3	0.009	83.25	0.001	6.91	3.63	86.87	124.09	0.0	0.00
160.0	21.8	0.009	83.94	0.001	6.97	3.74	87.68	128.09	0.0	0.00
165.0	21.3	0.009	84.62	0.001	7.03	3.86	88.48	132.09	0.0	0.00
170.0	20.8	0.008	85.28	0.001	7.08	3.98	89.25	136.10	0.0	0.00
175.0	20.4	0.008	85.92	0.001	7.13	4.10	90.01	140.10	0.0	0.00
180.0	20.0	0.008	86.55	0.001	7.19	4.21	90.76	144.10	0.0	0.00
185.0	19.6	0.008	87.16	0.001	7.24	4.33	91.49	148.11	0.0	0.00
190.0	19.2	0.008	87.76	0.001	7.29	4.45	92.21	152.11	0.0	0.00
195.0	18.8	0.008	88.35	0.001	7.34	4.56	92.92	156.11	0.0	0.00
200.0	18.5	0.007	88.93	0.001	7.38	4.68	93.61	160.11	0.0	0.00
205.0	18.1	0.007	89.49	0.001	7.43	4.80	94.29	164.12	0.0	0.00
210.0	17.8	0.007	90.05	0.001	7.48	4.91	94.96	168.12	0.0	0.00
215.0	17.5	0.007	90.59	0.001	7.52	5.03	95.62	172.12	0.0	0.00
220.0	17.2	0.007	91.12	0.001	7.57	5.15	96.27	176.12	0.0	0.00
225.0	16.9	0.007	91.65	0.001	7.61	5.27	96.91	180.13	0.0	0.00
230.0	16.6	0.007	92.16	0.001	7.65	5.38	97.54	184.13	0.0	0.00
235.0	16.4	0.007	92.67	0.001	7.69	5.50	98.17	188.13	0.0	0.00
240.0	16.1	0.006	93.16	0.001	7.73	5.62	98.78	192.14	0.0	0.00
245.0	15.9	0.006	93.65	0.001	7.78	5.73	99.38	196.14	0.0	0.00
250.0	15.6	0.006	94.13	0.001	7.81	5.85	99.98	200.14	0.0	0.00
255.0	15.4	0.006	94.60	0.001	7.85	5.97	100.57	204.14	0.0	0.00
260.0	15.2	0.006	95.07	0.001	7.89	6.08	101.15	208.15	0.0	0.00
265.0	15.0	0.006	95.53	0.000	7.93	6.20	101.73	212.15	0.0	0.00
270.0	14.8	0.006	95.98	0.000	7.97	6.32	102.29	216.15	0.0	0.00

Modified Rational Method - Fifty Year Storm
Site Flow and Storage Summary - towards Old Lakeshore Road
2083 Old Lakeshore Road

Drainage Area A1 Post

Rooftops / Terraces / Outdoor Amenity Area - Controlled In Tank

Area (A1) = **0.184** ha
"C" = **0.86**
AC1 = **0.16**
Tc = **10** min
Time Increment = **5.0** min

Max. Release Rate = **65.4** L/s

Drainage Area A3 Post

Uncontrolled Site Area towards Old Lakeshore Road

Area (A3) = **0.006** ha
"C" = **1.00**
AC3= **0.006**
Tc = **10.0** min
Time Increment = **5.0** min

Max. Release Rate = **3.4** L/s

Groundwater Dewatering

Pump Peak Flow Rate = **0.39** L/s

Total Site

Total Site = A1+A3+ Groundwater Dewatering

2-yr Pre-Development Site Release Rate = **20.7** L/s

Controlled Release Rate (85mm Orifice Plate) = **14.9** L/s

Uncontrolled Flow (A2) = **3.4** **L/s**

Groundwater Dewatering Flow Rate = **0.39** **L/s**

Total Site Release Rate Achieved = **18.7** L/s

Max. Storage Tank-1 Size = **36.1** m^3
Stor. Tank footpring Area = **40.6** m^2

50 Year Design Storm

a=	1172.34
c=	0.761
B=	5
I=	a/((Tc+B)^c)

Area	Area(ha)	Coefficient
Landscape	0.062	0.25
Hardscape	0.122	0.95
Total	0.184	0.71

Area	Area(ha)	Coefficient
Landscape	0.000	0.25
Hardscape	0.006	0.95
Total	0.006	0.95

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Time	**Rainfall**	**Storm Runoff (A1 Post)**	**Runoff Volume (A1 Post)**	**Storm Runoff (A3 Post)**	**Runoff Volume (A3 Post)**	**Dewatering Volume**	**Total Storm Runoff Volume**	**Target Released Volume**	**Storage Volume**	**Storage Depth of Tank**
(min)	**(mm/hr)**	**(m^3/s)**	**(m^3)**	**(m^3/s)**	**(m^3)**	**(m3)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m)**
10.0	149.3	0.065	39.23	0.002	1.49	0.23	39.47	8.96	30.5	0.75
15.0	119.9	0.053	47.28	0.002	1.80	0.35	47.63	13.44	34.2	0.84
20.0	101.2	0.044	53.20	0.003	4.05	0.47	53.66	17.93	35.7	0.88
25.0	88.1	0.039	57.88	0.003	4.40	0.59	58.47	22.41	36.1	0.89
30.0	78.3	0.034	61.77	0.003	4.70	0.70	62.47	26.89	35.6	0.88
35.0	70.8	0.031	65.10	0.002	4.95	0.82	65.92	31.37	34.5	0.85
40.0	64.7	0.028	68.02	0.002	5.18	0.94	68.96	35.85	33.1	0.82
45.0	59.7	0.026	70.63	0.002	5.38	1.05	71.68	40.33	31.3	0.77
50.0	55.5	0.024	72.98	0.002	5.55	1.17	74.15	44.82	29.3	0.72
55.0	52.0	0.023	75.14	0.002	5.72	1.29	76.43	49.30	27.1	0.67
60.0	48.9	0.021	77.13	0.002	5.87	1.40	78.53	53.78	24.8	0.61
65.0	46.2	0.020	78.97	0.002	6.01	1.52	80.49	58.26	22.2	0.55
70.0	43.9	0.019	80.70	0.001	6.14	1.64	82.33	62.74	19.6	0.48
75.0	41.8	0.018	82.32	0.001	6.26	1.76	84.07	67.22	16.8	0.41
80.0	39.9	0.017	83.85	0.001	6.38	1.87	85.72	71.71	14.0	0.35
85.0	38.2	0.017	85.29	0.001	6.49	1.99	87.28	76.19	11.1	0.27
90.0	36.6	0.016	86.67	0.001	6.60	2.11	88.78	80.67	8.1	0.20
95.0	35.2	0.015	87.98	0.001	6.70	2.22	90.21	85.15	5.1	0.12
100.0	34.0	0.015	89.24	0.001	6.79	2.34	91.58	89.63	1.9	0.05
105.0	32.8	0.014	90.44	0.001	6.88	2.46	92.90	94.11	0.0	0.00
110.0	31.7	0.014	91.60	0.001	6.97	2.57	94.17	98.60	0.0	0.00
115.0	30.7	0.013	92.71	0.001	7.06	2.69	95.40	103.08	0.0	0.00
120.0	29.7	0.013	93.78	0.001	7.14	2.81	96.59	107.56	0.0	0.00
125.0	28.9	0.013	94.82	0.001	7.22	2.93	97.74	112.04	0.0	0.00
130.0	28.0	0.012	95.82	0.001	7.29	3.04	98.86	116.52	0.0	0.00
135.0	27.3	0.012	96.79	0.001	7.37	3.16	99.94	121.00	0.0	0.00
140.0	26.6	0.012	97.73	0.001	7.44	3.28	101.00	125.49	0.0	0.00
145.0	25.9	0.011	98.64	0.001	7.51	3.39	102.03	129.97	0.0	0.00
150.0	25.2	0.011	99.52	0.001	7.57	3.51	103.03	134.45	0.0	0.00
155.0	24.6	0.011	100.39	0.001	7.64	3.63	104.01	138.93	0.0	0.00
160.0	24.1	0.011	101.23	0.001	7.70	3.74	104.97	143.41	0.0	0.00
165.0	23.5	0.010	102.04	0.001	7.77	3.86	105.91	147.89	0.0	0.00
170.0	23.0	0.010	102.84	0.001	7.83	3.98	106.82	152.37	0.0	0.00
175.0	22.5	0.010	103.62	0.001	7.89	4.10	107.72	156.86	0.0	0.00
180.0	22.1	0.010	104.38	0.001	7.94	4.21	108.60	161.34	0.0	0.00
185.0	21.6	0.009	105.13	0.001	8.00	4.33	109.46	165.82	0.0	0.00
190.0	21.2	0.009	105.86	0.001	8.06	4.45	110.30	170.30	0.0	0.00
195.0	20.8	0.009	106.57	0.001	8.11	4.56	111.13	174.78	0.0	0.00
200.0	20.4	0.009	107.27	0.001	8.16	4.68	111.95	179.26	0.0	0.00
205.0	20.0	0.009	107.95	0.001	8.22	4.80	112.75	183.75	0.0	0.00
210.0	19.7	0.009	108.62	0.001	8.27	4.91	113.53	188.23	0.0	0.00
215.0	19.3	0.008	109.28	0.001	8.32	5.03	114.31	192.71	0.0	0.00
220.0	19.0	0.008	109.92	0.001	8.37	5.15	115.07	197.19	0.0	0.00
225.0	18.7	0.008	110.56	0.001	8.41	5.27	115.82	201.67	0.0	0.00
230.0	18.4	0.008	111.18	0.001	8.46	5.38	116.56	206.15	0.0	0.00
235.0	18.1	0.008	111.79	0.001	8.51	5.50	117.29	210.64	0.0	0.00
240.0	17.8	0.008	112.39	0.001	8.55	5.62	118.01	215.12	0.0	0.00
245.0	17.5	0.008	112.98	0.001	8.60	5.73	118.72	219.60	0.0	0.00
250.0	17.3	0.008	113.56	0.001	8.64	5.85	119.41	224.08	0.0	0.00
255.0	17.0	0.007	114.14	0.001	8.69	5.97	120.10	228.56	0.0	0.00
260.0	16.8	0.007	114.70	0.001	8.73	6.08	120.78	233.04	0.0	0.00
265.0	16.5	0.007	115.25	0.001	8.77	6.20	121.46	237.53	0.0	0.00
270.0	16.3	0.007	115.80	0.001	8.81	6.32	122.12	242.01	0.0	0.00

Modified Rational Method - Hundred Year Storm
Site Flow and Storage Summary - towards Old Lakeshore Road
2083 Old Lakeshore Road

Drainage Area A1 Post

Rooftops / Terraces / Outdoor Amenity Area - Controlled In Tank

Area (A1) = **0.184** ha
"C" = **0.89**
AC1 = **0.16**
Tc = **10** min
Time Increment = **5.0** min

Max. Release Rate = **74.4** L/s

Drainage Area A3 Post

Uncontrolled Site Area towards Old Lakeshore Road

Area (A3) = **0.006** ha
"C" = **1.00**
AC3= **0.006**
Tc = **10.0** min
Time Increment = **5.0** min

Max. Release Rate = **3.7** L/s

Groundwater Dewatering

Pump Peak Flow Rate = **0.39** L/s

Total Site

Total Site = A1+A3+ Groundwater Dewatering

2-yr Pre-Development Site Release Rate = **20.7** L/s

Controlled Release Rate (85mm Orifice Plate) = **16.1** **L/s**

Uncontrolled Flow (A3) = **3.7** **L/s**

Groundwater Dewatering Flow Rate = **0.4** **L/s**

Total Site Release Rate Achieved = **20.2** L/s

Max. Storage Tank-1 Size = **42.3** m^3
Stor. Tank footpring Area = **40.6** m^2

100 Year Design Storm

a=	1281.34
c=	0.761
B=	5
I=	a/((Tc+B)^c)

Area	Area(ha)	Coefficient
Landscape	0.062	0.25
Hardscape	0.122	0.95
Total	0.184	0.71

Area	Area(ha)	Coefficient
Landscape	0.000	0.25
Hardscape	0.006	0.95
Total	0.006	0.95

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Time	**Rainfall**	**Storm Runoff (A1 Post)**	**Runoff Volume (A1 Post)**	**Storm Runoff (A3 Post)**	**Runoff Volume (A3 Post)**	**Dewatering Volume**	**Total Storm Runoff Volume**	**Target Released Volume**	**Storage Volume**	**Storage Depth of Tank**
(min)	**(mm/hr)**	**(m^3/s)**	**(m^3)**	**(m^3/s)**	**(m^3)**	**(m3)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m)**
10.0	163.2	0.074	44.67	0.003	1.63	0.23	44.90	9.69	35.2	0.87
15.0	131.1	0.060	53.83	0.002	1.97	0.35	54.18	14.53	39.6	0.98
20.0	110.6	0.050	60.56	0.004	4.42	0.47	61.03	19.38	41.7	1.03
25.0	96.3	0.044	65.90	0.003	4.81	0.59	66.48	24.22	42.3	1.04
30.0	85.6	0.039	70.32	0.003	5.14	0.70	71.03	29.07	42.0	1.03
35.0	77.4	0.035	74.12	0.003	5.41	0.82	74.94	33.91	41.0	1.01
40.0	70.7	0.032	77.44	0.002	5.66	0.94	78.38	38.76	39.6	0.98
45.0	65.3	0.030	80.41	0.002	5.87	1.05	81.46	43.60	37.9	0.93
50.0	60.7	0.028	83.09	0.002	6.07	1.17	84.26	48.45	35.8	0.88
55.0	56.8	0.026	85.55	0.002	6.25	1.29	86.83	53.29	33.5	0.83
60.0	53.5	0.024	87.81	0.002	6.42	1.40	89.21	58.13	31.1	0.77
65.0	50.5	0.023	89.91	0.002	6.57	1.52	91.43	62.98	28.5	0.70
70.0	47.9	0.022	91.87	0.002	6.71	1.64	93.51	67.82	25.7	0.63
75.0	45.6	0.021	93.72	0.002	6.85	1.76	95.47	72.67	22.8	0.56
80.0	43.6	0.020	95.46	0.001	6.97	1.87	97.33	77.51	19.8	0.49
85.0	41.7	0.019	97.11	0.001	7.09	1.99	99.10	82.36	16.7	0.41
90.0	40.1	0.018	98.68	0.001	7.21	2.11	100.78	87.20	13.6	0.33
95.0	38.5	0.018	100.17	0.001	7.32	2.22	102.39	92.05	10.3	0.25
100.0	37.1	0.017	101.60	0.001	7.42	2.34	103.94	96.89	7.0	0.17
105.0	35.8	0.016	102.97	0.001	7.52	2.46	105.43	101.74	3.7	0.09
110.0	34.6	0.016	104.28	0.001	7.62	2.57	106.86	106.58	0.3	0.01
115.0	33.5	0.015	105.55	0.001	7.71	2.69	108.24	111.43	0.0	0.00
120.0	32.5	0.015	106.77	0.001	7.80	2.81	109.58	116.27	0.0	0.00
125.0	31.5	0.014	107.95	0.001	7.89	2.93	110.87	121.11	0.0	0.00
130.0	30.7	0.014	109.09	0.001	7.97	3.04	112.13	125.96	0.0	0.00
135.0	29.8	0.014	110.19	0.001	8.05	3.16	113.35	130.80	0.0	0.00
140.0	29.0	0.013	111.26	0.001	8.13	3.28	114.54	135.65	0.0	0.00
145.0	28.3	0.013	112.30	0.001	8.20	3.39	115.69	140.49	0.0	0.00
150.0	27.6	0.013	113.31	0.001	8.28	3.51	116.82	145.34	0.0	0.00
155.0	26.9	0.012	114.29	0.001	8.35	3.63	117.92	150.18	0.0	0.00
160.0	26.3	0.012	115.25	0.001	8.42	3.74	118.99	155.03	0.0	0.00
165.0	25.7	0.012	116.18	0.001	8.49	3.86	120.04	159.87	0.0	0.00
170.0	25.2	0.011	117.09	0.001	8.55	3.98	121.07	164.72	0.0	0.00
175.0	24.6	0.011	117.98	0.001	8.62	4.10	122.07	169.56	0.0	0.00
180.0	24.1	0.011	118.84	0.001	8.68	4.21	123.05	174.40	0.0	0.00
185.0	23.6	0.011	119.69	0.001	8.74	4.33	124.02	179.25	0.0	0.00
190.0	23.2	0.011	120.52	0.001	8.81	4.45	124.97	184.09	0.0	0.00
195.0	22.7	0.010	121.33	0.001	8.86	4.56	125.89	188.94	0.0	0.00
200.0	22.3	0.010	122.12	0.001	8.92	4.68	126.80	193.78	0.0	0.00
205.0	21.9	0.010	122.90	0.001	8.98	4.80	127.70	198.63	0.0	0.00
210.0	21.5	0.010	123.67	0.001	9.03	4.91	128.58	203.47	0.0	0.00
215.0	21.1	0.010	124.42	0.001	9.09	5.03	129.45	208.32	0.0	0.00
220.0	20.8	0.009	125.15	0.001	9.14	5.15	130.30	213.16	0.0	0.00
225.0	20.4	0.009	125.87	0.001	9.20	5.27	131.14	218.01	0.0	0.00
230.0	20.1	0.009	126.58	0.001	9.25	5.38	131.96	222.85	0.0	0.00
235.0	19.8	0.009	127.28	0.001	9.30	5.50	132.77	227.70	0.0	0.00
240.0	19.5	0.009	127.96	0.001	9.35	5.62	133.58	232.54	0.0	0.00
245.0	19.2	0.009	128.63	0.001	9.40	5.73	134.37	237.38	0.0	0.00
250.0	18.9	0.009	129.29	0.001	9.45	5.85	135.14	242.23	0.0	0.00
255.0	18.6	0.008	129.95	0.001	9.49	5.97	135.91	247.07	0.0	0.00
260.0	18.3	0.008	130.59	0.001	9.54	6.08	136.67	251.92	0.0	0.00
265.0	18.1	0.008	131.22	0.001	9.59	6.20	137.42	256.76	0.0	0.00
270.0	17.8	0.008	131.84	0.001	9.63	6.32	138.16	261.61	0.0	0.00

Lithos

Orifice Plate Design

2083 Lakeshore Road

File No. UD22-017

Date: December 2024

Prepared By: Stergios Grigoriadis, P.E., M.A.Sc.

Reviewed by: Dimitra Frysali, P.E., M.A.Sc.

Orifice Equation for 85 mm Plate

$$Q = C \times A \times \sqrt{2 \times g \times h}$$

100 yr event

d=	85	mm
C=	0.63	
A=	0.006	m^2
g=	9.81	m/s^2
h=	1.04	m
Q=	**16.1**	**L/s**

50 yr event

d=	85	mm
C=	0.63	
A=	0.006	m^2
g=	9.81	m/s^2
h=	0.89	m
Q=	**14.9**	**L/s**

25 yr event

d=	85	mm
C=	0.63	
A=	0.006	m^2
g=	9.81	m/s^2
h=	0.71	m
Q=	**13.3**	**L/s**

10 yr event

d=	85	mm
C=	0.63	
A=	0.006	m^2
g=	9.81	m/s^2
h=	0.69	m
Q=	**13.1**	**L/s**

5 yr event

d=	85	mm
C=	0.63	
A=	0.006	m^2
g=	9.81	m/s^2
h=	0.44	m
Q=	**10.5**	**L/s**

2 yr event

d=	85	mm
C=	0.63	
A=	0.006	m^2
g=	9.81	m/s^2
h=	0.33	m
Q=	**9.1**	**L/s**

Lithos

Modified Rational Method - Two Year Storm
Site Flow and Storage Summary - towards Lakeshore Road
2083 Old Lakeshore Road
File No. UD22-017

Drainage Area A2 Post

Uncontrolled Site Area towards Lakeshore Road

Area (A2) =	**0.001**	ha
"C" =	**0.95**	
AC2=	**0.00**	
Tc =	**10.0**	min
Time Increment =	**5.0**	min
Max. Release Rate =	**0.2**	L/s

Total Site

Total Site = A2

2-yr Pre-Development Site Release Rate =	**1.0**	L/s
Controlled Release Rate =	**0.0**	L/s
Uncontrolled Flow (A2) =	0.2	L/s
Total Site Release Rate Achieved =	**0.2**	L/s

2 Year Design Storm

a=	681.52
c=	0.780
B=	6
I=	a/((Tc+B)^c)

Area	Area(ha)	Coefficient
Landscape	0.000	0.25
Hardscape	0.001	0.95
Total	0.001	0.95

(1)	(2)	(3)	(4)	(5)	(6)
Time (min)	**Rainfall Intensity** (mm/hr)	**Storm Runoff (A2 Post)** (m^3/s)	**Runoff Volume (A2 Post)** (m^3)	**Total Storm Runoff Volume** (m^3)	**Target Released Volume** (m^3)
10.0	78.4	0.000	0.12	0.12	0.00
15.0	63.4	0.000	0.15	0.15	0.00
20.0	53.7	0.000	0.17	0.17	0.00
25.0	46.8	0.000	0.19	0.19	0.00
30.0	41.6	0.000	0.20	0.20	0.00
35.0	37.6	0.000	0.21	0.21	0.00
40.0	34.4	0.000	0.22	0.22	0.00
45.0	31.7	0.000	0.23	0.23	0.00
50.0	29.5	0.000	0.23	0.23	0.00
55.0	27.6	0.000	0.24	0.24	0.00
60.0	26.0	0.000	0.25	0.25	0.00
65.0	24.5	0.000	0.25	0.25	0.00
70.0	23.3	0.000	0.26	0.26	0.00
75.0	22.1	0.000	0.26	0.26	0.00
80.0	21.1	0.000	0.27	0.27	0.00
85.0	20.2	0.000	0.27	0.27	0.00
90.0	19.4	0.000	0.28	0.28	0.00
95.0	18.6	0.000	0.28	0.28	0.00
100.0	17.9	0.000	0.28	0.28	0.00
105.0	17.3	0.000	0.29	0.29	0.00
110.0	16.7	0.000	0.29	0.29	0.00
115.0	16.2	0.000	0.29	0.29	0.00
120.0	15.7	0.000	0.30	0.30	0.00
125.0	15.2	0.000	0.30	0.30	0.00
130.0	14.8	0.000	0.30	0.30	0.00
135.0	14.4	0.000	0.31	0.31	0.00
140.0	14.0	0.000	0.31	0.31	0.00
145.0	13.6	0.000	0.31	0.31	0.00
150.0	13.3	0.000	0.32	0.32	0.00
155.0	12.9	0.000	0.32	0.32	0.00
160.0	12.6	0.000	0.32	0.32	0.00
165.0	12.4	0.000	0.32	0.32	0.00
170.0	12.1	0.000	0.33	0.33	0.00
175.0	11.8	0.000	0.33	0.33	0.00
180.0	11.6	0.000	0.33	0.33	0.00
185.0	11.3	0.000	0.33	0.33	0.00
190.0	11.1	0.000	0.33	0.33	0.00
195.0	10.9	0.000	0.34	0.34	0.00
200.0	10.7	0.000	0.34	0.34	0.00
205.0	10.5	0.000	0.34	0.34	0.00
210.0	10.3	0.000	0.34	0.34	0.00
215.0	10.1	0.000	0.34	0.34	0.00
220.0	9.9	0.000	0.35	0.35	0.00
225.0	9.8	0.000	0.35	0.35	0.00
230.0	9.6	0.000	0.35	0.35	0.00
235.0	9.5	0.000	0.35	0.35	0.00
240.0	9.3	0.000	0.35	0.35	0.00
245.0	9.2	0.000	0.36	0.36	0.00
250.0	9.0	0.000	0.36	0.36	0.00
255.0	8.9	0.000	0.36	0.36	0.00
260.0	8.8	0.000	0.36	0.36	0.00
265.0	8.6	0.000	0.36	0.36	0.00
270.0	8.5	0.000	0.36	0.36	0.00

Lithos

Modified Rational Method -Five Year Storm
Site Flow and Storage Summary - towards Lakeshore Road
2083 Old Lakeshore Road
File No. UD22-017

Drainage Area A2 Post

Uncontrolled Site Area towards Lakeshore Road

Area (A2) =	**0.001**	ha
"C" =	**0.95**	
AC2=	**0.00**	
Tc =	**10.0**	min
Time Increment =	**5.0**	min
Max. Release Rate =	**0.3**	L/s

Total Site

Total Site = A2

2-yr Pre-Development Site Release Rate =	**1.0**	L/s
Controlled Release Rate =	**0.0**	L/s
Uncontrolled Flow (A2) =	0.3	L/s
Total Site Release Rate Achieved =	**0.3**	L/s

5 Year Design Storm

a=	802.04
c=	0.764
B=	5
I=	a/((Tc+B)^c)

Area	Area(ha)	Coefficient
Landscape	0.000	0.25
Hardscape	0.001	0.95
Total	0.001	0.95

(1)	(2)	(3)	(4)	(5)	(6)
Time (min)	**Rainfall Intensity** (mm/hr)	**Storm Runoff (A2 Post)** (m^3/s)	**Runoff Volume (A2 Post)** (m^3)	**Total Storm Runoff Volume** (m^3)	**Target Released Volume** (m^3)
10.0	101.3	0.000	0.16	0.16	0.00
15.0	81.3	0.000	0.19	0.19	0.00
20.0	68.6	0.000	0.22	0.22	0.00
25.0	59.7	0.000	0.24	0.24	0.00
30.0	53.0	0.000	0.25	0.25	0.00
35.0	47.9	0.000	0.27	0.27	0.00
40.0	43.8	0.000	0.28	0.28	0.00
45.0	40.4	0.000	0.29	0.29	0.00
50.0	37.5	0.000	0.30	0.30	0.00
55.0	35.1	0.000	0.31	0.31	0.00
60.0	33.0	0.000	0.31	0.31	0.00
65.0	31.2	0.000	0.32	0.32	0.00
70.0	29.6	0.000	0.33	0.33	0.00
75.0	28.2	0.000	0.33	0.33	0.00
80.0	26.9	0.000	0.34	0.34	0.00
85.0	25.8	0.000	0.35	0.35	0.00
90.0	24.7	0.000	0.35	0.35	0.00
95.0	23.8	0.000	0.36	0.36	0.00
100.0	22.9	0.000	0.36	0.36	0.00
105.0	22.1	0.000	0.37	0.37	0.00
110.0	21.4	0.000	0.37	0.37	0.00
115.0	20.7	0.000	0.38	0.38	0.00
120.0	20.1	0.000	0.38	0.38	0.00
125.0	19.5	0.000	0.39	0.39	0.00
130.0	18.9	0.000	0.39	0.39	0.00
135.0	18.4	0.000	0.39	0.39	0.00
140.0	17.9	0.000	0.40	0.40	0.00
145.0	17.4	0.000	0.40	0.40	0.00
150.0	17.0	0.000	0.40	0.40	0.00
155.0	16.6	0.000	0.41	0.41	0.00
160.0	16.2	0.000	0.41	0.41	0.00
165.0	15.9	0.000	0.41	0.41	0.00
170.0	15.5	0.000	0.42	0.42	0.00
175.0	15.2	0.000	0.42	0.42	0.00
180.0	14.9	0.000	0.42	0.42	0.00
185.0	14.6	0.000	0.43	0.43	0.00
190.0	14.3	0.000	0.43	0.43	0.00
195.0	14.0	0.000	0.43	0.43	0.00
200.0	13.7	0.000	0.44	0.44	0.00
205.0	13.5	0.000	0.44	0.44	0.00
210.0	13.2	0.000	0.44	0.44	0.00
215.0	13.0	0.000	0.44	0.44	0.00
220.0	12.8	0.000	0.45	0.45	0.00
225.0	12.6	0.000	0.45	0.45	0.00
230.0	12.4	0.000	0.45	0.45	0.00
235.0	12.2	0.000	0.45	0.45	0.00
240.0	12.0	0.000	0.46	0.46	0.00
245.0	11.8	0.000	0.46	0.46	0.00
250.0	11.6	0.000	0.46	0.46	0.00
255.0	11.5	0.000	0.46	0.46	0.00
260.0	11.3	0.000	0.46	0.46	0.00
265.0	11.1	0.000	0.47	0.47	0.00
270.0	11.0	0.000	0.47	0.47	0.00

Lithos

Modified Rational Method - Ten Year Storm
Site Flow and Storage Summary - towards Lakeshore Road
2083 Old Lakeshore Road
File No. UD22-017

Drainage Area A2 Post

Uncontrolled Site Area towards Lakeshore Road

Area (A2) =	**0.001**	ha
"C" =	**0.95**	
AC2=	**0.00**	
Tc =	**10.0**	min
Time Increment =	**5.0**	min
Max. Release Rate =	**0.3**	L/s

Total Site

Total Site = A2

2-yr Pre-Development Site Release Rate =	**1.0**	L/s
Controlled Release Rate =	**0.0**	L/s
Uncontrolled Flow (A2) =	0.3	L/s
Total Site Release Rate Achieved =	**0.3**	L/s

10 Year Design Storm

a=	918.28
c=	0.763
B=	5
I=	a/((Tc+B)^c)

Area	Area(ha)	Coefficient
Landscape	0.000	0.25
Hardscape	0.001	0.95
Total	0.001	0.95

(1)	(2)	(3)	(4)	(5)	(6)
Time	**Rainfall Intensity**	**Storm Runoff (A2 Post)**	**Runoff Volume (A2 Post)**	**Total Storm Runoff Volume**	**Target Released Volume**
(min)	**(mm/hr)**	**(m^3/s)**	**(m^3)**	**(m^3)**	**(m^3)**
10.0	116.3	0.000	0.18	0.18	0.00
15.0	93.4	0.000	0.22	0.22	0.00
20.0	78.8	0.000	0.25	0.25	0.00
25.0	68.5	0.000	0.27	0.27	0.00
30.0	60.9	0.000	0.29	0.29	0.00
35.0	55.0	0.000	0.30	0.30	0.00
40.0	50.3	0.000	0.32	0.32	0.00
45.0	46.4	0.000	0.33	0.33	0.00
50.0	43.2	0.000	0.34	0.34	0.00
55.0	40.4	0.000	0.35	0.35	0.00
60.0	38.0	0.000	0.36	0.36	0.00
65.0	35.9	0.000	0.37	0.37	0.00
70.0	34.1	0.000	0.38	0.38	0.00
75.0	32.4	0.000	0.39	0.39	0.00
80.0	31.0	0.000	0.39	0.39	0.00
85.0	29.6	0.000	0.40	0.40	0.00
90.0	28.4	0.000	0.41	0.41	0.00
95.0	27.4	0.000	0.41	0.41	0.00
100.0	26.4	0.000	0.42	0.42	0.00
105.0	25.4	0.000	0.42	0.42	0.00
110.0	24.6	0.000	0.43	0.43	0.00
115.0	23.8	0.000	0.43	0.43	0.00
120.0	23.1	0.000	0.44	0.44	0.00
125.0	22.4	0.000	0.44	0.44	0.00
130.0	21.8	0.000	0.45	0.45	0.00
135.0	21.2	0.000	0.45	0.45	0.00
140.0	20.6	0.000	0.46	0.46	0.00
145.0	20.1	0.000	0.46	0.46	0.00
150.0	19.6	0.000	0.46	0.46	0.00
155.0	19.1	0.000	0.47	0.47	0.00
160.0	18.7	0.000	0.47	0.47	0.00
165.0	18.2	0.000	0.48	0.48	0.00
170.0	17.8	0.000	0.48	0.48	0.00
175.0	17.5	0.000	0.48	0.48	0.00
180.0	17.1	0.000	0.49	0.49	0.00
185.0	16.8	0.000	0.49	0.49	0.00
190.0	16.4	0.000	0.49	0.49	0.00
195.0	16.1	0.000	0.50	0.50	0.00
200.0	15.8	0.000	0.50	0.50	0.00
205.0	15.5	0.000	0.50	0.50	0.00
210.0	15.3	0.000	0.51	0.51	0.00
215.0	15.0	0.000	0.51	0.51	0.00
220.0	14.7	0.000	0.51	0.51	0.00
225.0	14.5	0.000	0.52	0.52	0.00
230.0	14.3	0.000	0.52	0.52	0.00
235.0	14.0	0.000	0.52	0.52	0.00
240.0	13.8	0.000	0.52	0.52	0.00
245.0	13.6	0.000	0.53	0.53	0.00
250.0	13.4	0.000	0.53	0.53	0.00
255.0	13.2	0.000	0.53	0.53	0.00
260.0	13.0	0.000	0.54	0.54	0.00
265.0	12.8	0.000	0.54	0.54	0.00
270.0	12.6	0.000	0.54	0.54	0.00

Lithos

Modified Rational Method - Twenty Five Year Storm
Site Flow and Storage Summary - towards Lakeshore Road
2083 Old Lakeshore Road
File No. UD22-017

Drainage Area A2 Post

Uncontrolled Site Area towards Lakeshore Road

Area (A2) =	**0.001**	ha
"C" =	**1.00**	
AC2=	**0.00**	
Tc =	**10.0**	min
Time Increment =	**5.0**	min
Max. Release Rate =	**0.4**	L/s

Total Site

Total Site = A2

2-yr Pre-Development Site Release Rate =	**1.0**	L/s
Controlled Release Rate =	**0.0**	L/s
Uncontrolled Flow (A2) =	0.4	L/s
Total Site Release Rate Achieved =	**0.4**	L/s

25 Year Design Storm

a=	1065.95
c=	0.762
B=	5
I=	a/((Tc+B)^c)

Area	Area(ha)	Coefficient
Landscape	0.000	0.25
Hardscape	0.001	0.95
Total	0.001	0.95

(1)	(2)	(3)	(4)	(5)	(6)
Time (min)	**Rainfall Intensity** (mm/hr)	**Storm Runoff (A2 Post)** (m^3/s)	**Runoff Volume (A2 Post)** (m^3)	**Total Storm Runoff Volume** (m^3)	**Target Released Volume** (m^3)
10.0	135.4	0.000	0.23	0.23	0.00
15.0	108.7	0.000	0.27	0.27	0.00
20.0	91.7	0.000	0.31	0.31	0.00
25.0	79.8	0.000	0.33	0.33	0.00
30.0	71.0	0.000	0.35	0.35	0.00
35.0	64.1	0.000	0.37	0.37	0.00
40.0	58.6	0.000	0.39	0.39	0.00
45.0	54.1	0.000	0.41	0.41	0.00
50.0	50.3	0.000	0.42	0.42	0.00
55.0	47.1	0.000	0.43	0.43	0.00
60.0	44.3	0.000	0.44	0.44	0.00
65.0	41.9	0.000	0.45	0.45	0.00
70.0	39.7	0.000	0.46	0.46	0.00
75.0	37.8	0.000	0.47	0.47	0.00
80.0	36.1	0.000	0.48	0.48	0.00
85.0	34.6	0.000	0.49	0.49	0.00
90.0	33.2	0.000	0.50	0.50	0.00
95.0	31.9	0.000	0.51	0.51	0.00
100.0	30.7	0.000	0.51	0.51	0.00
105.0	29.7	0.000	0.52	0.52	0.00
110.0	28.7	0.000	0.53	0.53	0.00
115.0	27.8	0.000	0.53	0.53	0.00
120.0	26.9	0.000	0.54	0.54	0.00
125.0	26.1	0.000	0.54	0.54	0.00
130.0	25.4	0.000	0.55	0.55	0.00
135.0	24.7	0.000	0.56	0.56	0.00
140.0	24.0	0.000	0.56	0.56	0.00
145.0	23.4	0.000	0.57	0.57	0.00
150.0	22.8	0.000	0.57	0.57	0.00
155.0	22.3	0.000	0.58	0.58	0.00
160.0	21.8	0.000	0.58	0.58	0.00
165.0	21.3	0.000	0.59	0.59	0.00
170.0	20.8	0.000	0.59	0.59	0.00
175.0	20.4	0.000	0.59	0.59	0.00
180.0	20.0	0.000	0.60	0.60	0.00
185.0	19.6	0.000	0.60	0.60	0.00
190.0	19.2	0.000	0.61	0.61	0.00
195.0	18.8	0.000	0.61	0.61	0.00
200.0	18.5	0.000	0.62	0.62	0.00
205.0	18.1	0.000	0.62	0.62	0.00
210.0	17.8	0.000	0.62	0.62	0.00
215.0	17.5	0.000	0.63	0.63	0.00
220.0	17.2	0.000	0.63	0.63	0.00
225.0	16.9	0.000	0.63	0.63	0.00
230.0	16.6	0.000	0.64	0.64	0.00
235.0	16.4	0.000	0.64	0.64	0.00
240.0	16.1	0.000	0.64	0.64	0.00
245.0	15.9	0.000	0.65	0.65	0.00
250.0	15.6	0.000	0.65	0.65	0.00
255.0	15.4	0.000	0.65	0.65	0.00
260.0	15.2	0.000	0.66	0.66	0.00
265.0	15.0	0.000	0.66	0.66	0.00
270.0	14.8	0.000	0.66	0.66	0.00

Lithos

Modified Rational Method - Fifty Year Storm
Site Flow and Storage Summary - towards Lakeshore Road
2083 Old Lakeshore Road
File No. UD22-017

Drainage Area A2 Post

Uncontrolled Site Area towards Lakeshore Road

Area (A2) =	**0.001**	ha
"C" =	**1.00**	
AC2=	**0.00**	
Tc =	**10.0**	min
Time Increment =	**5.0**	min
Max. Release Rate =	**0.4**	L/s

Total Site

Total Site = A2

2-yr Pre-Development Site Release Rate =	**1.0**	L/s
Controlled Release Rate =	**0.0**	L/s
Uncontrolled Flow (A2) =	0.4	L/s
Total Site Release Rate Achieved =	**0.4**	L/s

50 Year Design Storm

a=	1172.34
c=	0.761
B=	5
I=	a/((Tc+B)^c)

Area	Area(ha)	Coefficient
Landscape	0.000	0.25
Hardscape	0.001	0.95
Total	0.001	0.95

(1)	(2)	(3)	(4)	(5)	(6)
Time (min)	**Rainfall Intensity** (mm/hr)	**Storm Runoff (A2 Post)** (m^3/s)	**Runoff Volume (A2 Post)** (m^3)	**Total Storm Runoff Volume** (m^3)	**Target Released Volume** (m^3)
10.0	149.3	0.000	0.25	0.25	0.00
15.0	119.9	0.000	0.30	0.30	0.00
20.0	101.2	0.000	0.34	0.34	0.00
25.0	88.1	0.000	0.37	0.37	0.00
30.0	78.3	0.000	0.39	0.39	0.00
35.0	70.8	0.000	0.41	0.41	0.00
40.0	64.7	0.000	0.43	0.43	0.00
45.0	59.7	0.000	0.45	0.45	0.00
50.0	55.5	0.000	0.46	0.46	0.00
55.0	52.0	0.000	0.48	0.48	0.00
60.0	48.9	0.000	0.49	0.49	0.00
65.0	46.2	0.000	0.50	0.50	0.00
70.0	43.9	0.000	0.51	0.51	0.00
75.0	41.8	0.000	0.52	0.52	0.00
80.0	39.9	0.000	0.53	0.53	0.00
85.0	38.2	0.000	0.54	0.54	0.00
90.0	36.6	0.000	0.55	0.55	0.00
95.0	35.2	0.000	0.56	0.56	0.00
100.0	34.0	0.000	0.57	0.57	0.00
105.0	32.8	0.000	0.57	0.57	0.00
110.0	31.7	0.000	0.58	0.58	0.00
115.0	30.7	0.000	0.59	0.59	0.00
120.0	29.7	0.000	0.59	0.59	0.00
125.0	28.9	0.000	0.60	0.60	0.00
130.0	28.0	0.000	0.61	0.61	0.00
135.0	27.3	0.000	0.61	0.61	0.00
140.0	26.6	0.000	0.62	0.62	0.00
145.0	25.9	0.000	0.63	0.63	0.00
150.0	25.2	0.000	0.63	0.63	0.00
155.0	24.6	0.000	0.64	0.64	0.00
160.0	24.1	0.000	0.64	0.64	0.00
165.0	23.5	0.000	0.65	0.65	0.00
170.0	23.0	0.000	0.65	0.65	0.00
175.0	22.5	0.000	0.66	0.66	0.00
180.0	22.1	0.000	0.66	0.66	0.00
185.0	21.6	0.000	0.67	0.67	0.00
190.0	21.2	0.000	0.67	0.67	0.00
195.0	20.8	0.000	0.68	0.68	0.00
200.0	20.4	0.000	0.68	0.68	0.00
205.0	20.0	0.000	0.68	0.68	0.00
210.0	19.7	0.000	0.69	0.69	0.00
215.0	19.3	0.000	0.69	0.69	0.00
220.0	19.0	0.000	0.70	0.70	0.00
225.0	18.7	0.000	0.70	0.70	0.00
230.0	18.4	0.000	0.71	0.71	0.00
235.0	18.1	0.000	0.71	0.71	0.00
240.0	17.8	0.000	0.71	0.71	0.00
245.0	17.5	0.000	0.72	0.72	0.00
250.0	17.3	0.000	0.72	0.72	0.00
255.0	17.0	0.000	0.72	0.72	0.00
260.0	16.8	0.000	0.73	0.73	0.00
265.0	16.5	0.000	0.73	0.73	0.00
270.0	16.3	0.000	0.73	0.73	0.00

Lithos

Modified Rational Method - Hundred Year Storm
Site Flow and Storage Summary - towards Lakeshore Road
2083 Old Lakeshore Road
File No. UD22-017

Drainage Area A2 Post

Uncontrolled Site Area towards Lakeshore Road

Area (A2) =	**0.001**	ha
"C" =	**1.00**	
AC2=	**0.00**	
Tc =	**10.0**	min
Time Increment =	**5.0**	min
Max. Release Rate =	**0.5**	L/s

Total Site

Total Site = A2

2-yr Pre-Development Site Release Rate =	**1.0**	L/s
Controlled Release Rate =	**0.0**	L/s
Uncontrolled Flow (A2) =	0.5	L/s
Total Site Release Rate Achieved =	**0.5**	L/s

100 Year Design Storm

a=	1281.34
c=	0.761
B=	5
I=	a/((Tc+B)^c)

Area	Area(ha)	Coefficient
Landscape	0.000	0.25
Hardscape	0.001	0.95
Total	0.001	0.95

(1)	(2)	(3)	(4)	(5)	(6)
Time (min)	**Rainfall Intensity** (mm/hr)	**Storm Runoff (A2 Post)** (m^3/s)	**Runoff Volume (A2 Post)** (m^3)	**Total Storm Runoff Volume** (m^3)	**Target Released Volume** (m^3)
10.0	163.2	0.000	0.27	0.27	0.00
15.0	131.1	0.000	0.33	0.33	0.00
20.0	110.6	0.000	0.37	0.37	0.00
25.0	96.3	0.000	0.40	0.40	0.00
30.0	85.6	0.000	0.43	0.43	0.00
35.0	77.4	0.000	0.45	0.45	0.00
40.0	70.7	0.000	0.47	0.47	0.00
45.0	65.3	0.000	0.49	0.49	0.00
50.0	60.7	0.000	0.51	0.51	0.00
55.0	56.8	0.000	0.52	0.52	0.00
60.0	53.5	0.000	0.53	0.53	0.00
65.0	50.5	0.000	0.55	0.55	0.00
70.0	47.9	0.000	0.56	0.56	0.00
75.0	45.6	0.000	0.57	0.57	0.00
80.0	43.6	0.000	0.58	0.58	0.00
85.0	41.7	0.000	0.59	0.59	0.00
90.0	40.1	0.000	0.60	0.60	0.00
95.0	38.5	0.000	0.61	0.61	0.00
100.0	37.1	0.000	0.62	0.62	0.00
105.0	35.8	0.000	0.63	0.63	0.00
110.0	34.6	0.000	0.63	0.63	0.00
115.0	33.5	0.000	0.64	0.64	0.00
120.0	32.5	0.000	0.65	0.65	0.00
125.0	31.5	0.000	0.66	0.66	0.00
130.0	30.7	0.000	0.66	0.66	0.00
135.0	29.8	0.000	0.67	0.67	0.00
140.0	29.0	0.000	0.68	0.68	0.00
145.0	28.3	0.000	0.68	0.68	0.00
150.0	27.6	0.000	0.69	0.69	0.00
155.0	26.9	0.000	0.70	0.70	0.00
160.0	26.3	0.000	0.70	0.70	0.00
165.0	25.7	0.000	0.71	0.71	0.00
170.0	25.2	0.000	0.71	0.71	0.00
175.0	24.6	0.000	0.72	0.72	0.00
180.0	24.1	0.000	0.72	0.72	0.00
185.0	23.6	0.000	0.73	0.73	0.00
190.0	23.2	0.000	0.73	0.73	0.00
195.0	22.7	0.000	0.74	0.74	0.00
200.0	22.3	0.000	0.74	0.74	0.00
205.0	21.9	0.000	0.75	0.75	0.00
210.0	21.5	0.000	0.75	0.75	0.00
215.0	21.1	0.000	0.76	0.76	0.00
220.0	20.8	0.000	0.76	0.76	0.00
225.0	20.4	0.000	0.77	0.77	0.00
230.0	20.1	0.000	0.77	0.77	0.00
235.0	19.8	0.000	0.77	0.77	0.00
240.0	19.5	0.000	0.78	0.78	0.00
245.0	19.2	0.000	0.78	0.78	0.00
250.0	18.9	0.000	0.79	0.79	0.00
255.0	18.6	0.000	0.79	0.79	0.00
260.0	18.3	0.000	0.80	0.80	0.00
265.0	18.1	0.000	0.80	0.80	0.00
270.0	17.8	0.000	0.80	0.80	0.00

Appendix D

Sanitary Data Analysis

SANITARY SEWER DESIGN SHEET

2083 Old Lakeshore Road

CITY OF BURLINGTON

LOCATION	RESIDENTIAL								COMMERCIAL		FLOW								SEWER DESIGN				
	SECTION AREA	NUMBER OF UNITS						SECTION POP.	COMM AREA	SECTION POP. @ 110 ppha	TOTAL ACCUM. POP.	AVERAGE RESIDENTIAL FLOW '@' 240 L/c/d	HARMON PEAKING FACTOR	RES. PEAK FLOW	AVERAGE COMMERCIAL FLOW @ 250 L/c/d	TOTAL ACCUM. AREA	INFILT. @ 0.26 L/s/ha.	TOTAL DESIGN FLOW	PIPE LENGTH	PIPE DIA.	SLOPE	FULL FLOW CAPACITY n = 0.013	% of DESIG CAPACITY
		Single Fam. Dwell.	Townhouse	Studio	1 Bed Apts.	2 Bed Apts.	3 Bed Apts.																
	(ha.)	@ 3.5 ppu	@ 2.7	@ 1.4 ppu	@ 1.4 ppu	@ 2.1 ppu	@ 3.1 ppu	(persons)	(ha.)	(persons)	(persons)	(L/s)		(L/s)	(L/s)	(ha.)	(L/s)	(L/s)	(m)	(mm)	(%)	(L/sec)	(%)
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
Existing Condition																							
Parking	0.199	0	0	0	0	0	0	0	0.000	0	0	0.00	4.50	0.00	0.000	0.199	0.052	**0.05**					
Proposed Condition																							
Mixed-Use Development	0.191	0	0	0	40	96	60	444	0.042	5	448	1.23	4.00	4.93	0.013	0.191	0.050	**4.99**		150	2.0%	21.54	23%
																Total Net Flow		4.94					

Residential Flow Rate - 240 litres/capita/day
Retail Flow Rate - 250 litres/capita/day
Infiltration - 0.26 L/ha
Peaking Factor = $1 + [14 / (4 + P^{0.5})]$, P=Population in thousands
Site Area: 0.191 Ha

Prepared by: Stergios Grigoriadis P.E., M.A.Sc.
Reviewed by: Dimitra Frysali, P.Eng., M.A.Sc.
Date: December 2024

Project: 2083 Old Lakeshore Road
Project: UD22-017
City of Burlington

Sheet 1 OF 1

Appendix E

Water Data Analysis

WATER DEMAND

2083 Old Lakeshore Road

File No: UD22-017
Date: December 2024
Prepared by: Stergios Grigoriadis P.Eng., M.A.Sc.
Reviewed By: Dimitra Frysali, P.Eng., M.A.Sc.

Fire Flow Calculation

1 $F = 220\ C\ (A)^{1/2}$

Where F= Fire flow in Lpm
C= construction type coefficient
= 0.6 fire resistive construction
A = total floor area in sq.m. excluding basements, includes garage*

		Area Applied
Level 1=	1268.1 m^2	25%
Level 2=	1133.6 m^2	100%
Level 3=	988.8 m^2	25%
=	1,698 sq.m.	

Note 1: The levels indicated, reference the floors with the largest areas (refer to building stats).

F = 5,439.08 L/min *F(No.1) = 220C √A*

F = 5,000 L/min *F(No.1) Round to nearest 1000 l/min*

2 Occupancy Reduction
25% reduction for non-combustible occupancy
F = 3750 L/min *F(No.2) = F(No.1) x occupancy reduction/charge(%)*

3 Sprinkler Reduction
30% Reduction for NFPA Sprinkler System
F = 2625 l/min *F(No.3) = F(No.2) x sprinkler reduction(%)*

4 Separation Charge

25%	East	0 to 3m
0%	North	Greater than 30m
10%	South	20.1m to 30m
25%	West	0 to 3m
60%	Total Separation Charge	

F = 2250 L/min *F (No.4) = F(No.2) x separation charge(%)*

F = 4,875.00 L/min *F (tot) = F(No.3) + F(No.4)*

F = 5,000 L/min *F(tot) Round to nearest 1000 l/min*
83.33 L/s
F = 1321 US GPM

Domestic Flow Calculations

Residential Population = 444 from Sanitary Design Sheet
Commercial Population= 5 from Sanitary Design Sheet
Average Day Demand = 275 L/cap/day 1 US Gallon=3.785 L

= 1.43 L/s
= 23 US GPM 1 US GPM=15.852L/s

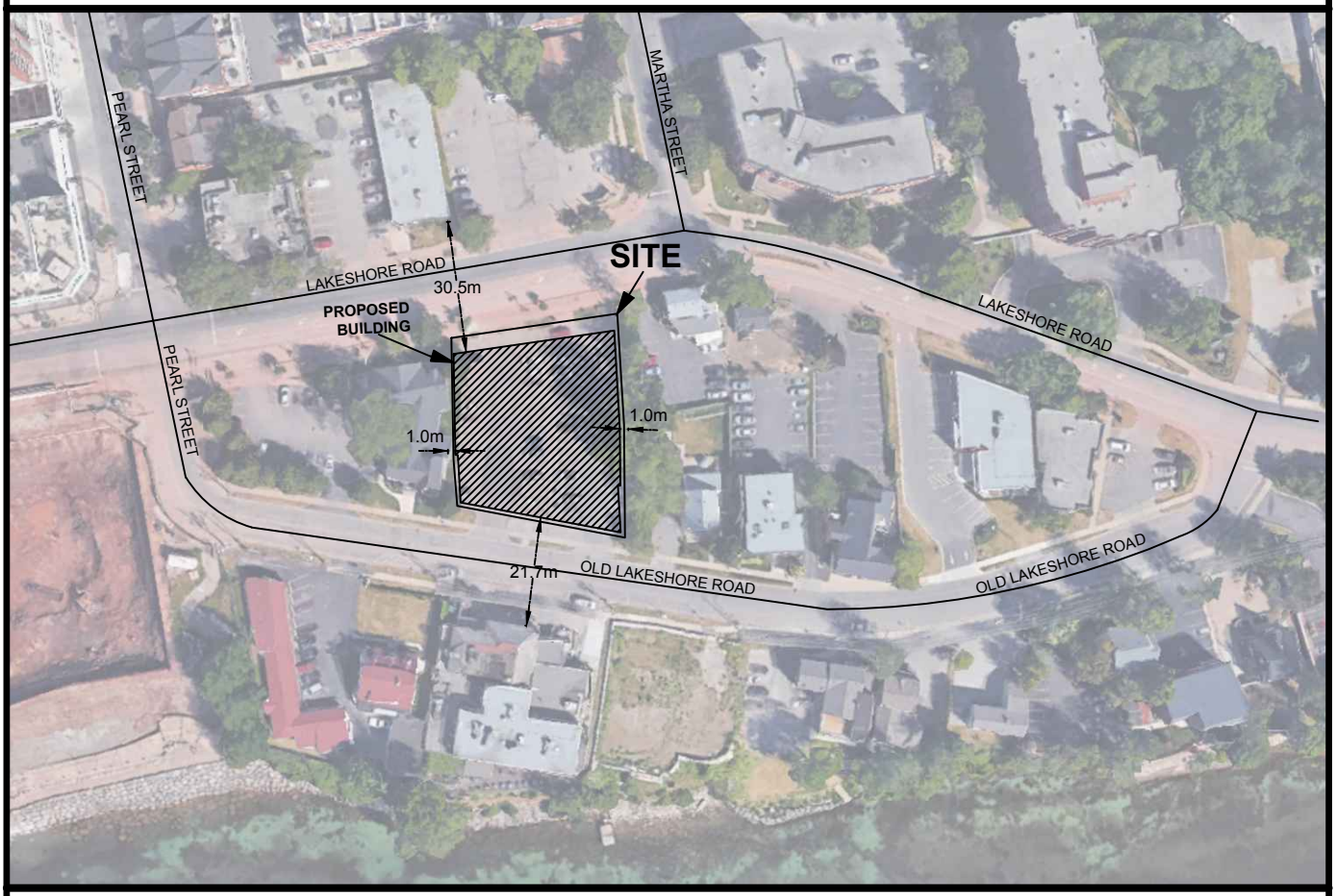
Max. Daily Demand Peaking Factor = 2.25
Max. Daily Demand = 3.22 L/s = 51 US GPM
or
Residential Max. Hourly Demand Peaking Factor = 4.00
Max. Hourly Demand = 5.72 L/s = 91 US GPM

Commercial Max. Hourly Demand Peaking Factor = 2.25
Max. Hourly Demand = 3.22 L/s

Max Daily Demand = 3.22 L/s
Fire Flow = 83.33 L/s

Required 'Design' Flow = 86.55 L/s
1372 US GPM

Note: Required 'Design' Flow is the maximum of either:
1) Fire Flow + Maximum Daily Demand
2) Maximum Hourly Demand



Lithos

150 Bermondsey Road, Toronto, Ontario M4A 1Y1

SEPARATION DISTANCES

MIXED USE DEVELOPMENT
2083 OLD LAKESHORE ROAD
BURLINGTON, ONTARIO

DATE:	DEC 2024	PROJECT No:	UD22-017
SCALE:	N.T.S.	FIGURE No:	FIG 4