SITE SERVICING & STORMWATER MANAGEMENT REPORT

BRONTE VILLAGE MALL REDEVELOPMENT
2441 LAKESHORE ROAD WEST

TOWN OF OAKVILLE
HALTON REGION

PREPARED FOR:

CROMBIE REIT

PREPARED BY:

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1.0 INTRODUCTION

C.F. Crozier & Associates Inc. (Crozier) was retained by Crombie REIT to prepare a Site Servicing and Stormwater Management Report in support of a Site Plan Application (SPA) for the property known as Bronte Village Mall, located at 2441 Lakeshore Road West in the Town of Oakville. This report demonstrates how the proposed development's servicing and stormwater management will integrate with the area's existing water, sanitary, and stormwater infrastructure.

The subject lands cover an area of approximately 2.30 ha, and currently consist of a commercial building with associated parking and landscaped areas. The property is bounded by Sovereign Street to the north, Jones Street to the east, Lakeshore Road West to the south, and Bronte Road to the west.

The proposed redevelopment on the west half of the site (West SPA lands) consists of the demolition of a portion of the existing commercial building and the construction of one 10-storey mixed-use residential building and one 14-storey mixed-use residential building, along with multi-storey underground parking. The proposed redevelopment on the east half of the site (East SPA lands) consists of a portion of the existing commercial building and surface parking to remain, and the construction of a new retail property. A portion of the existing property is to be dedicated to the Town of Oakville as parkland and is referred to as the 'Market Square' and 'Parkette' within this report.

2.0 WATER SERVICING

2.1 Existing Water Servicing

The Existing Site Services Plan completed by Cunningham McConnell Limited, dated January 8th, 2009, Town of Oakville Department of Public Works as-built on Jones Street (R-110-75-1), dated October 1975, Town of Oakville Department of Public Works as-built on Bronte Road (R-255-90-2), dated November, 1990, and Region of Halton Department of Public Works as-built on Sovereign Street (D0-0194), as well as the Site Plan drawing prepared by J.D. Hubbert & Associates Limited, dated October 30th, 1980, identify the following existing watermains in close proximity to the site:

- A 300 mm diameter watermain on Jones Street;
- A 150 mm diameter PVC watermain on Sovereign Street;
- A 300 mm diameter watermain on Lakeshore Road West which extends west from Jones Street for approximately 150 m and continues west as a 250 mm diameter watermain to Bronte Road;
- A 200 mm diameter watermain on Bronte Road that extends north from Lakeshore Road West to the existing 200 mm diameter service connection to the Site and continues north as a 150 mm diameter watermain to Sovereign Street;

- A 200 mm diameter internal watermain that extends through the site from the existing 300 mm diameter watermain on Bronte Road to the existing 200 mm diameter watermain on Bronte Road.

The location of the existing watermains is shown on **Drawing C01**.

As requested by Halton Region, hydrant flow tests were completed on November 13th, 2017 for the existing 200 mm diameter watermain on Bronte Road and the existing 150 mm diameter watermain on Sovereign Street, which are included in **Appendix A**. The projected fire flow available at a minimum of 20 psi for the Bronte Road and Sovereign Street watermains was calculated to be 366 L/s and 382 L/s, respectively, as shown in **Appendix A**.

2.2 Water Design Demand

The Halton Region Water and Wastewater Linear Design Manual (April 2015) was used to estimate the proposed water demands for domestic purposes. A summary of the results is presented in **Table 1**, with detailed calculations provided in **Appendix A**.

Table 1: Existing and Proposed Domestic Water Demand

	Average Daily Demand (L/s)	**Maximum Daily Demand** (L/s)	**Maximum Hourly Demand** (L/s)
Existing Water Demand	0.25	0.56	0.99
Proposed West SPA Water Demand	2.60	5.84	10.38
Proposed East SPA Water Demand	0.11	0.24	0.43
Proposed Total Site Water Demand	2.70	6.08	10.82
Increase in Water Demand	2.45	5.52	9.83

As shown in **Table 1**, the existing maximum hourly domestic water demand is 0.99 L/s. Following development, the maximum hourly domestic water demand will be 10.38 L/s for the West SPA (Site Plan Application) and 0.43 L/s for the East SPA, thus resulting in a water demand increase of 9.83 L/s for the entire property.

The Fire Underwriters Survey (FUS) method was used to complete the fire flow demand analysis for the individual buildings within the proposed development. Flow requirements were calculated based on the largest proposed floor footprint (West SPA includes Building A with Floors 3 & 4 = 2634 m^2 and Building B with Floors 3 & 4 = 2924 m^2, East SPA includes Existing and Proposed Retail Units = 3790 m^2) from Project Statistics, prepared by Quadrangle Architects Limited. Building A, Building B, and the existing and proposed retail units are assumed to be of ordinary construction material (Construction Coefficient = 1.0) and to have a complete automatic sprinkler system.

The proposed fire water service for the West SPA lands will be required to accommodate a fire flow of 250.0 L/s for a duration of 3.5 hours per the Fire Underwriters Survey calculation in **Appendix A**.

The proposed fire water service for the East SPA lands will be required to accommodate a fire flow of 200.0 L/s for a duration of 2.5 hours per the Fire Underwriters Survey calculation in **Appendix A**.

As noted in Section 2.1, the projected available fire flow from the Bronte Road and Sovereign Street watermains was calculated to be 366 L/s and 382 L/s, respectively.

Note that the Fire Underwriter's Survey value is a conservative estimate for comparison purposes only. The Mechanical Engineer for this development will complete the required analysis for fire protection, and the Architect will design fire separation methods per the determined fire flow rate in order to meet municipally available flows and pressures.

2.3 Proposed Water Servicing

The water servicing for the property has been designed to service the West SPA lands and East SPA lands separately, as there is a proposed parkland area to be dedicated to the Town of Oakville located between the West SPA lands and East SPA lands.

As shown on **Drawing C01**, an existing 200 mm diameter watermain extends through the Site connecting the existing 300 mm diameter watermain on Jones Street to the existing 200 mm diameter watermain on Bronte Road. This existing watermain is proposed to be removed from the extents of the proposed parkland area to be dedicated to the Town of Oakville.

The following paragraphs outline the proposed water servicing for the West SPA lands and the East SPA lands.

West SPA Lands
In order to provide water servicing to the West SPA lands, the existing 200 mm diameter watermain extending through the property is proposed to be terminated at the west property line. A new 200 mm diameter fire service is proposed to extend from the terminated existing watermain, complete with a property line valve and box. A proposed 150 mm diameter domestic service will connect to the existing 200 mm diameter watermain, complete with a property line valve and box. The proposed fire and domestic services will extend to the underground garage structure and connect inside the mechanical room of the building, per mechanical design and specifications. This connection will include a flow meter, check valves, and adhere to connection requirements according to Halton Region standards. Refer to **Drawing C02**.

East SPA Lands
In order to provide water servicing to the East SPA lands, the existing internal 200 mm diameter watermain and connection to the existing retail building is proposed to remain as the fire line, with the existing internal watermain to be terminated at the re-located fire hydrant, as shown in **Drawing C02**. A proposed 50 mm diameter domestic service will connect to the existing 200 mm diameter watermain at the property line, complete with a property line valve and box, and extend to the existing building. A domestic and fire line water service connection for the proposed retail space will be plumbed internally from the water connections in the existing retail building, per mechanical design and specifications.

There are three existing fire hydrants on Lakeshore Road West, two existing fire hydrants on Sovereign Street, and one existing fire hydrant on Bronte Road, as shown on **Drawing C01**. There are three internal fire hydrants which are to be removed or abandoned, as shown on

Drawing C01. There are two proposed internal fire hydrants, one of which is located in the West SPA lands and the other located in the East SPA lands, as shown on **Drawing C02**. Fire hydrants proposed within the footprint of the underground parking garage structure will connect to the internal water system through the underground parking garage structure, with connections to be designed by the Mechanical Engineer.

3.0 SANITARY SERVICING

3.1 Existing Sanitary Servicing

The Existing Site Services Plan completed by Cunningham McConnell Limited, dated January 8th, 2009, identifies the following existing sanitary sewers in close proximity to the subject site:

- A 200 mm diameter sanitary sewer on Sovereign Street, with wastewater flowing east and connecting to the existing 300 mm diameter sanitary sewer on Jones Street;
- A 300 mm diameter sanitary sewer on Jones Street, which extends south of Lakeshore Road West, with wastewater flowing south;
- A 200 mm diameter sanitary sewer on Lakeshore Road West, with wastewater flowing west along the frontage of the Site to the corner of Bronte Road and Lakeshore Road West;
- A 250 mm diameter sanitary sewer on Bronte Road, with wastewater flowing south and connecting to the existing 200 mm diameter sanitary sewer on Lakeshore Road West.

The location of the existing sanitary sewers is shown on **Drawing C01**.

3.2 Sanitary Design Flow

The Halton Region Water and Wastewater Linear Design Manual (April 2015) was used to estimate the proposed sanitary design flows generated from the West SPA lands, the East SPA lands, and the entire property. A summary of the results is presented in **Table 2**, with detailed calculations provided in **Appendix B**.

Table 2: Existing and Proposed Sanitary Design Flows

	Average Daily Flow (L/s)	**Peak Flow** (L/s)	**Infiltration Flow** (L/s)	**Total Peak Flow** (L/s)
Existing Sanitary Design Flow	0.25	0.85	0.66	1.50
Proposed West SPA Sanitary Flow	2.60	10.01	0.28	10.29
Proposed East SPA Sanitary Flow	0.11	0.38	0.31	0.69
Proposed Total Site Sanitary Flow	2.70	10.38	0.59	10.98
Increase in Sanitary Design Flow	2.45	9.53	-0.07	9.48

As shown in **Table 2**, the existing total peak sanitary flow is 1.50 L/s. Post-development, the total peak sanitary flow will be 10.29 L/s for the West SPA lands and 0.69 L/s for the East SPA lands, thus resulting in a sanitary design flow increase of 9.48 L/s for the entire property.

3.3 Proposed Sanitary Servicing

The sanitary servicing for the property has been designed to service the West SPA lands and East SPA lands separately, as there is a proposed parkland area to be dedicated to the Town of Oakville located between the West SPA lands and East SPA lands.

The following paragraphs outline the proposed sanitary servicing for the West SPA lands and the East SPA lands.

West SPA Lands
A sanitary sewer connection for the West SPA lands will be made to the existing sanitary manhole on Sovereign Street (refer to **Drawing C02**), north of the site. A 200 mm diameter PVC sanitary sewer at 2.0% will connect from the existing manhole to a proposed property line manhole. The sanitary sewer will enter through the wall of the underground parking garage structure and the internal sanitary sewer will be designed by the Mechanical Engineer to ensure the required connection for Building A and Building B.

East SPA Lands
There are two existing 200 mm diameter sanitary sewer connections to the existing retail building which outlet to the existing 200 mm diameter sanitary sewer on Sovereign Street. The two existing sanitary service connections are proposed to remain and provide service connections for the existing and proposed retail space in the East SPA lands.

3.4 External Sanitary Sewer Capacity Analysis

As requested by Halton Region, a sanitary capacity analysis was completed for the existing sanitary sewer network to determine available capacity for the proposed sanitary peak flows from the development.

As noted in Section 3.3, the sanitary flow from the West SPA lands and East SPA lands are proposed to discharge to the 200 mm diameter sanitary sewer on Sovereign Street, which flows east and discharges to the 300 mm diameter sanitary sewer flowing south on Jones Street. The Jones Street sewer outlets to the 600 mm diameter trunk sanitary sewer on Marine Drive, which discharges to the Marine Drive Pumping Station. A schematic sanitary sewer network sketch is provided in **Appendix E**.

The sanitary capacity analysis completed for this report includes the upstream sewage catchments, the proposed sanitary flows from the development, and the downstream sewage catchments which outlet to the 600 mm diameter trunk sanitary sewer on Marine Drive. A detailed description of the sewage catchments is provided below.

A large area of single family homes north of the subject property was identified as tributary to the 300 mm diameter Jones Street sanitary sewer and was delineated from Halton Region Sanitary Operating Maps. The area is approximately 41.9 ha and contributes a

peak sanitary flow of 37.91 L/s. This peak sanitary flow combines with the peak sanitary flow from the 200 mm diameter Sovereign Street sanitary sewer (including the peak sanitary flow from the West SPA lands and East SPA lands) at the corner of Sovereign Street and Jones Street for a combined peak sanitary flow of 48.89 L/s. The sanitary flows south in the Jones Street sanitary sewer, with several light commercial and residential sewage catchments also contributing sanitary flow. As noted in the detailed calculations and supporting figures in **Appendix E**, the existing sanitary sewer network from the corner of Sovereign Street & Jones Street to the trunk sewer has capacity to convey the existing sanitary flows and the proposed development's sanitary flows without surcharging.

A unit count was completed for the residential area north of the subject property, with 371 single family homes counted. Based on the Region's equivalent population density for single family homes (55 people/hectare), a population of 2303 persons was determined and used for the sanitary capacity analysis. Based on the equivalent population and unit count, a people per unit (ppu) density of 6.2 ppu was calculated. This ppu density is considered high for the Oakville area and is a conservative estimate for sanitary peak flow within the provided capacity analysis.

3.5 Marine Drive Pumping Station

As identified in Section 3.4, the property discharges wastewater to the 200 mm diameter sanitary sewer on Sovereign Street, which connects through a 600 mm diameter trunk sanitary sewer on Marine Drive to the Marine Drive Wastewater Pumping Station (WWPS). The Marine Drive WWPS services a sewer drainage area within the Oakville Southwest Wastewater Treatment Plant (SW WWTP) West Trunk Drainage Area (DA) and has a stated firm capacity of 108.0 L/s in the 'Sustainable Halton Water and Wastewater Master Plan' report (AECOM, 2011). The AECOM (2011) report states projected sewage inflows to the Marine Drive WWPS up to 2031, which are summarized in **Table 3**.

Table 3: Marine Drive WWPS Flows

	2010 Firm Capacity (L/s)	**2010 Inflow** (L/s)	**2016 Inflow** (L/s)	**2021 Inflow** (L/s)	**2026 Inflow** (L/s)	**2031 Inflow** (L/s)
Marine Drive WWPS	108.00	170.87	201.16	206.23	211.62	233.49

The subsequent 'Halton Region Pumping Station Master Plan' report (R.V. Anderson, June 2012) outlines future proposed upgrades to the Marine Drive WWPS. The long-term strategy as outlined by this report is to eliminate the Marine Drive WWPS through the installation of a new gravity trunk sanitary sewer from the existing location of the Marine Drive WWPS to the Oakville SW WWTP.

Through a review of available background information, it is the understanding of Crozier that as an intermediate solution the Marine Drive WWPS was upgraded in 2013 to a firm capacity of 240 L/s.

Based on the property's proposed increase in sanitary design flow (9.48 L/s) outlined in Section 3.2 and the projected Marine Drive WWPS sewage flows summarized in **Table 3**, the current capacity of the Marine Drive WWPS will be sufficient to convey the property's

sanitary flows beyond 2026. The long-term strategy of installing a new gravity trunk sanitary sewer will provide additional capacity once completed.

4.0 DRAINAGE CONDITIONS

4.1 Existing Drainage Conditions

Based on a review of the existing topographic survey prepared by J.D. Barnes Limited, dated May 27th, 2016, the development area currently consists of a retail building, with associated parking and landscaped areas. The pre-development drainage plan is shown in **Figure 1**.

Catchment 101 includes the existing retail building with several landscaped and parking areas. A small external catchment area (approximately 426 sq.m.) is captured by the site's stormwater system near the existing Hero Burger and is included within Catchment 101. Surface drainage from Catchment 101 is collected by several internal catch basins within the parking areas. According to the original site servicing design, prepared by J.D. Hubbert (1980), rooftop drainage from the retail building is collected and controlled to 13.25 L/s/ha by control flow roof drains prior to discharge to the 450 mm diameter internal storm sewer. A copy of the original site servicing design (Hubbert, 1980) is included in **Appendix D**. The 450 mm diameter internal storm sewer conveys the surface and roof drainage under the existing retail building to the 525 mm diameter storm sewer located on Sovereign Street. According to Region of Halton as-built no. D0-0194, the stormwater in the 525 mm diameter storm sewer on Sovereign Street flows east, combines with the stormwater flowing north in the 375 mm diameter storm sewer on Jones Street, and continues east on Sovereign Street in a 1350 mm diameter storm sewer.

According to the Hubbert site servicing design (1980), a peak flow rate of 0.187 m^3/s for the 5-year design storm event discharges to the storm sewer on Sovereign Street.

Catchment 102 includes a portion of the parking area, with surface drainage collected by two internal catch basins which outlet to the existing 375 mm diameter storm sewer on Jones Street. According to Town of Oakville as-built no. R-110-75-1, the stormwater in the 375 mm diameter storm sewer on Jones Street flows north, combines with the stormwater flowing east in the 525 mm diameter storm sewer on Sovereign Street, and continues east on Sovereign Street in a 1350 mm diameter storm sewer.

According to the Hubbert site servicing design (1980), a peak flow rate of 0.096 m^3/s for the 5-year design storm discharges to the storm sewer on Jones Street.

The stormwater discharging from the property to the Sovereign Street storm sewer and Jones Street storm sewer combine at the corner of Sovereign Street and Jones Street and are considered cumulative within the 1350 mm diameter storm sewer on Sovereign Street, east of Jones Street.

Catchment 103 includes a small portion of the parking lot and associated landscaped areas. The surface drainage is collected by two catch basins which connect to the 375 mm diameter storm sewer on Lakeshore Road West. According to Town of Oakville as-built no. R-255-90-2, the stormwater in the 375 mm diameter storm sewer on Lakeshore Road

West flows west, combines with the stormwater flowing south in the storm sewer on Bronte Road, and continues south in the Bronte Road storm sewer.

According to the Hubbert site servicing design (1980), a peak flow rate of 0.022 m^3/s for the 5-year design storm event discharges to the storm sewer on Lakeshore Road West. Subsequent to the Hubbert design and outlined in the Functional Servicing Report prepared by Trafalgar Engineering Ltd. (March 26, 2009), a portion of the adjacent property was added to the site and the parking lot expanded which resulted in a peak flow rate of 0.68 m^3/s to the 375 mm diameter storm sewer on Lakeshore Road West.

Table 4 provides a summary of pre-development site areas, associated runoff coefficients, and calculated peak flow rates, with detailed calculations provided in **Appendix C**. The calculated pre-development peak flow rates are based on currently delineated catchment areas and Town of Oakville IDF parameters.

Table 4: Pre-Development Land Areas, Runoff Coefficients, and Peak Flow Rates

Catchment No.	Outlet Location	Pervious Area (ha) (RC = 0.25)	Impervious Area (ha) (RC = 0.90)	Total Area (ha)	Weighted Runoff Coefficient (RC)	Design Storm Event	Peak Flow Rate[1] (L/s)
101	525 mm diameter storm sewer on Sovereign Street	0.03	1.61	1.64	0.89	2	167.6
						5	228.5
						10	267.6
						25	319.6
						50	357.4
						100	393.0
102	375 mm diameter storm sewer on Jones Street	0.00	0.48	0.48	0.90	2	99.4
						5	138.2
						10	163.0
						25	196.2
						50	220.2
						100	242.9
103	375 mm diameter storm sewer on Lakeshore Road West	0.01	0.20	0.22	0.86	2	42.8
						5	59.5
						10	70.2
						25	84.5
						50	94.9
						100	104.6
Entire Site	-	0.05	2.29	2.34	0.89	2	309.8
						5	426.1
						10	514.4
						25	600.2
						50	672.5
						100	740.5

Note 1: Pre-development peak flow rates consider reduced peak flow rates due to roof control drains from existing retail building.

4.2 Proposed Drainage Conditions

The proposed drainage plan for the property collects and discharges drainage within the West SPA lands and East SPA lands separately, as the proposed parkland area to be dedicated to the Town is located between the West SPA lands and East SPA lands. The

drainage from the West SPA lands is proposed to outlet to the Sovereign Street storm sewer, while the drainage from the East SPA lands is proposed to outlet to the Jones Street storm sewer. The drainage from the parkland area will also be collected separately and discharged to the Sovereign St. and Lakeshore Road West storm sewers through separate storm sewer connections to match pre-development conditions. The post-development drainage plan is shown in **Figure 2**.

According to the Hubbert site servicing design (1980), a portion of the property's drainage is conveyed to the Sovereign Street storm sewer by a 450 mm diameter storm sewer located beneath the existing retail building. Based on field observations, the existing pipe has an estimated 0.18% slope with a calculated capacity of 121 L/s which is not sufficient to convey the existing 5-year design storm event flows.

The existing 450 mm diameter storm sewer is located beneath the proposed new retail building and extends through the proposed parkland area to a manhole at the north property line (refer to **Drawing C01**). Maintaining the existing storm pipe within the proposed parklands would require a servicing agreement with the Town. As such, it is proposed to remove this storm sewer from the parkland area to the existing storm manhole at the north property line. The existing manhole will be removed and replaced, with new storm infrastructure extended to solely collect the parkland drainage. As the drainage from the West SPA lands (residential development) is conveyed through the existing 450 mm diameter storm sewer, this storm sewer will be maintained in the interim condition while the East SPA lands (retail development) is being constructed. Once the residential development proceeds, this sewer will be decommissioned and abandoned. The existing drainage formerly directed to this pipe will be directed to a new storm connection on Sovereign Street, with a portion of the existing drainage re-directed to the storm sewer connection on Jones Street (see **Figure 2**).

Due to the proposed increase in stormwater drainage to the Jones Street storm sewer, orifice controls and subsurface storage will be provided to meet the pre-development peak flow rate for each design storm event to the Jones Street sewer. All surface drainage will be treated with an oil-grit separator.

A detailed description of each post-development drainage catchment is included below.

Catchment 201 comprises the West SPA lands, including Building 'A', Building 'B', and several landscaped and impervious areas. The rooftop drainage from Building 'A' and Building 'B' will be collected by roof drains and controlled to 42 L/s/ha prior to discharging to the underground parking garage structure's internal stormwater conveyance system, which will be designed by the Mechanical Engineer. Surface drainage will be collected through an internal network of area drains which will be connected to the underground parking garage structure's internal stormwater conveyance system. For storm events exceeding the 100-year design storm event, an overland flow route will convey the stormwater along the proposed internal access road to Bronte Road and through the proposed parkland area ('Market Square') to Lakeshore Road West. Several small areas in Catchment 201 will drain uncontrolled to Sovereign Street, Bronte Road, and the proposed parkland area, as described in detail below.

Catchment 201A includes the landscaped and paved surface areas in Catchment 201 which are collected in area drains and conveyed to the underground parking garage structure's internal stormwater conveyance system. All surface drainage will be treated by an oil-grit separator, and then released by gravity flow into the storm sewer system on Sovereign Street.

Catchment 201B includes the landscaped and pedestrian walkway areas adjacent to Building 'B', fronting onto the proposed parkland area ('Parkette'). All surface runoff will drain uncontrolled to the proposed storm sewer system in the Parkette, which outlets to the storm sewer system on Sovereign Street. This runoff is considered clean as there are no parking or driving areas proposed in this sub-catchment.

Catchment 201C includes the landscaped and pedestrian walkway areas adjacent to Building 'B', fronting onto the proposed parkland area ('Market Square'). All surface runoff will drain uncontrolled to the proposed storm sewer system in the Market Square, which outlets to the storm sewer system on Lakeshore Road West. This runoff is considered clean as there are no parking or driving areas proposed in this sub-catchment.

Catchment 201D includes the landscaped and pedestrian walkway areas fronting Building 'A' onto Bronte Road. All surface runoff will drain uncontrolled to the storm sewer system on Bronte Road, which outlets to the storm sewer system on Lakeshore Road West, and is therefore included in the post-development flows to the Lakeshore Road West sewer. This runoff is considered clean as there are no parking or driving areas proposed in this sub-catchment.

Catchment 201E includes the landscaped and pedestrian walkway areas of Building 'A' fronting onto Sovereign Street. All surface runoff will drain uncontrolled to the storm sewer system on Sovereign Street. This runoff is considered clean as there are no parking or driving areas proposed in this sub-catchment.

Catchment 201F includes the rooftop area of Building 'A' and Building 'B'. The rooftop drainage will be collected by roof drains and controlled to 42 L/s/ha prior to discharging to the underground parking garage structure's internal stormwater conveyance system. As rooftop drainage is considered clean, it will be released downstream of the oil-grit separator to the storm sewer on Sovereign Street.

Catchment 202 comprises the East SPA lands, which includes the existing and proposed retail buildings, the existing parking lot, and several landscaped areas. Rooftop drainage from the existing retail building will be collected and released at 13.25 L/s/ha, as per the original site servicing design, prepared by J.D. Hubbert (1980). Rooftop drainage from the proposed retail building will be collected and released at 42 L/s/ha. Rooftop drainage from the existing and proposed retail buildings will be directed to the building's internal stormwater conveyance system, which will be designed by the Mechanical Engineer, and outlet to the proposed internal storm sewer connection, as shown in **Drawing C02**. Surface drainage will be collected by a proposed system of catch basins and conveyed to the proposed subsurface stormwater chamber, where the runoff will be controlled to below the pre-development peak flow rate for each storm event and then released by gravity flow into the storm sewer system on Jones Street. For storm events exceeding the 100-year design storm event, an overland flow route will convey the stormwater to Lakeshore Road

West. Two small areas in Catchment 202 will drain uncontrolled to the proposed parkland area, as described in detail below.

Catchment 202A includes the paved surface areas located in Catchment 202 which are collected in catch basins and conveyed to the proposed subsurface stormwater chamber. All surface drainage will be treated by an oil-grit separator, and then released by gravity flow into the storm sewer system on Jones Street.

Catchment 202B includes the pedestrian walkway area adjacent to the existing driveway access to Lakeshore Road West, fronting onto the proposed parkland area ('Market Square'). All surface runoff will drain uncontrolled to the proposed storm sewer system in the Market Square, which outlets to the proposed storm sewer system on Lakeshore Road West. This runoff is considered clean as there are no parking or driving areas proposed in this sub-catchment.

Catchment 202C includes the landscaped area adjacent to the proposed parkland area ('Parkette'). All surface runoff will drain uncontrolled to the proposed storm sewer system in the Parkette, which outlets to the storm sewer system on Sovereign Street. This runoff is considered clean as there are no parking or driving areas proposed in this sub-catchment.

Catchment 202D includes the rooftop area of the existing Sobey's building and the proposed Rexall building. Rooftop drainage from the existing and proposed retail buildings will be directed to the building's internal stormwater conveyance system, which will be designed by the Mechanical Engineer, and outlet to the proposed internal storm sewer connection.

Catchment 203A includes a portion of the proposed parkland area, known as the 'Market Square'. The Market square includes several landscape features and a pedestrian walking area which does not exceed 2% slope, as directed by Town of Oakville staff. Surface drainage will be collected by an internal catch basin and conveyed to the 375 mm diameter storm sewer on Lakeshore Road West to match pre-development conditions. This drainage is considered clean as there are no parking or driving areas proposed in this catchment.

Catchment 203B is an external drainage catchment which comprised a small portion of Catchment 101 in the pre-development condition and discharged to the Sovereign Street storm sewer. As the catch basin which previously conveyed the storm flows to Sovereign Street is proposed to be removed as part of the development of the West SPA lands (residential development), this area will be re-graded to sheet flow towards the storm sewer on Lakeshore Road West at that time.

Catchment 204 includes a portion of the proposed parkland area, known as the 'Parkette'. The Parkette includes several landscaped and pedestrian walkway areas adjacent to Sovereign Street. Surface drainage is proposed to be collected by a network of internal catch basins and conveyed to the 525 mm diameter storm sewer on Sovereign Street to match pre-development conditions. This drainage is considered clean as there are no parking or driving areas proposed in this catchment.

Table 5 provides a summary of the post-development site areas for the West SPA lands, East SPA lands, and the parkland areas (Market Square and Parkette), along with associated runoff coefficients, and calculated peak flow rates, which are based on currently delineated catchment areas and Town of Oakville IDF parameters. The post-development peak flows summarized in **Table 5** do not incorporate the reduced peak flow rates caused by roof drain or orifice controls. Post-development peak flow rates which are adjusted to incorporate reduced peak flow rates due to roof drains and/or orifice controls are included in **Table 6** and organized by stormwater discharge location (Sovereign Street, Jones Street, or Lakeshore Road West).

Table 5: Post-Development Land Areas, Runoff Coefficients, and Peak Flow Rates

Catchment No.	Catchment Area	Pervious Area (ha) (RC = 0.25)	Impervious Area (ha) (RC = 0.90)	Total Area (ha)	Weighted Runoff Coefficient (RC)	Design Storm Event	Peak Flow Rate (L/s)
201	West SPA lands	0.137	0.845	0.982	0.81	2	182.9
						5	254.2
						10	300.0
						25	360.9
						50	405.2
						100	446.9
202	East SPA lands	0.010	1.090	1.100	0.89	2	226.3
						5	314.5
						10	371.2
						25	446.6
						50	501.4
						100	553.0
203	Parkland – 'Market Square'	0.01	0.146	0.156	0.87	2	30.8
						5	42.8
						10	50.6
						25	60.8
						50	68.3
						100	75.3
204	Parkland – 'Parkette'	0.008	0.093	0.101	0.85	2	19.8
						5	27.5
						10	32.5
						25	39.1
						50	43.9
						100	48.4
Entire Site	-	0.165	2.175	2.340	0.85	2	459.8
						5	639.1
						10	754.2
						25	907.4
						50	1018.7
						100	1123.6

4.3 External Stormwater Conveyance Analysis – Sovereign Street

As requested by the Town of Oakville, an external stormwater conveyance analysis was completed to determine the conveyance of the major system within the Sovereign Street right-of-way limits. The analysis considered the existing cross-section of Sovereign Street which includes a berm in the south boulevard and the proposed cross-section of Sovereign Street which proposes removing the berm and re-grading the south boulevard to between

2% to 5% slope from back of curb. It is our understanding that the berm will remain in its present condition following the retail development (East SPA lands), with the exception of the proposed driveway access onto Sovereign Street which will cut through the berm. As requested by the Town, this driveway access was graded to ensure that major system drainage from the Sovereign Street right-of-way will not enter the subject lands. When the residential development (West SPA lands) proceeds, the berm will be removed and the south boulevard re-graded to between 2-5% slope from back of curb. This analysis will also confirm that major system drainage from the Sovereign Street right-of-way will not enter the subject lands in the proposed condition (berm removal). The north boulevard is not proposed to be altered in any form. The cross-fall on all proposed sidewalks within the south boulevard will be 2%.

As shown on the as-builts and drainage catchment sketches provided in **Appendix F**, a catchment area of approximately 2.35 ha drains to Sovereign Street. The 2.35 ha catchment area was split into two catchments, Catchment 1 and Catchment 2. This was completed because Catchment 2 encompasses the townhouse complex north of Sovereign Street where major system drainage is conveyed by the private condominium road to Sovereign Street, just west of Jones Street. Catchment 2 does discharge to Sovereign Street and has been included in a portion of this analysis to be conservative, however its discharge point is at the downstream end of this analysis.

Based on these catchment areas, the 5-year design storm event peak flows for Catchment 1 and 2 was calculated to be 309 L/s and 192 L/s, respectively. The 100-year design storm event peak flows for Catchments 1 & 2 were calculated to be 544 L/s and 337 L/s, respectively. Therefore, the expected major system overland peak flow was calculated to be 235 L/s (544 L/s – 309 L/s) for Catchment 1 and 145 L/s (337 L/s – 192 L/s) for Catchment 2.

As requested by the Town, additional topographic survey was completed for the Sovereign Street right-of-way in July 2018. The 'Existing Conditions' sketch shows the completed topographic survey which notes the existing centerline, bottom and top of curb, and property line grades at approximately 10 metre intervals. The 'Proposed Conditions' sketch shows the completed topographic survey and notes the existing centerline, bottom and top of curb for the north boulevard, bottom of curb for the south boulevard, and proposed top of curb and property line grades for the south boulevard based on a 0.15m curb and the berm removed and replaced with 2 to 5% boulevard slope from back of curb.
A total of 26 cross-sections of Sovereign Street was identified and used to complete the major system analysis for the existing 'berm' condition and the proposed 'berm removal' condition.

As shown in the 'Existing Condition' and 'Proposed Condition' tables, the 26 cross-sections for the existing and proposed conditions were compiled using Microsoft Excel. The conveyance channel for both conditions was approximated as a rectangular channel strictly within the roadway limits (8.60 m width) to remain conservative. An average channel bottom was approximated based on the centerline and bottom of curb grades. As shown on the figures created in Excel, Sovereign Street was approximated into three channel stretches.

Channel Stretch 1 had an average slope of 0.44% and conveyed Catchment 1 (235 L/s), which required a normal depth of 0.495m. Based on the average channel bottom elevation, the required normal depth, and the existing property line grades, a spill condition could be determined. This exercise was completed in a similar manner for Channel Stretch 2 (average slope = 0.17%, required normal depth = 0.066m) which was required to convey Catchment 1 and Channel Stretch 3 (average slope = 1.78%, required normal depth = 0.0324) which was required to convey Catchments 1 and 2.

As noted in the 'Existing Condition' table, a 'spill condition' is located at cross-section 3 (CS-3) in the south boulevard where the existing driveway access to Bronte Village Mall is located. This driveway entrance will be removed and replaced with a 0.15m curb in the proposed condition. A spill condition was also identified at CS-4, CS-7, CS-8, CS-9, CS-21, and CS-22 in the north boulevard. The spill condition at CS-4 is located at the intersection of Sovereign Street and East River Street and is not an actual spill condition. The spill condition at CS-7, CS-8, and CS-9 is located along private lots where typical grading away from the existing dwellings will likely contain this drainage and re-direct it back towards the Sovereign Street right-of-way. The spill conditions at CS-21 and CS-22 are located at the intersection of Sovereign Street and the townhouse complex road where drainage will be re-directed back towards Sovereign Street. These spill conditions are based on property line grades and are generally less than 0.05m.

As noted in the 'Proposed Condition' table, there are no spill conditions identified in the south boulevard when the berm is removed based on the proposed boulevard grading. The existing spill conditions at CS-4, CS-7, CS-8, CS-9, CS-21, and CS-22 in the north boulevard will be marginally improved by the increased cross-sectional area available for conveyance in the Sovereign Street right-of-way.

As noted in the 'Proposed Condition' table, a spill elevation in the location of the proposed south boulevard driveway access to the retail development ranges from 84.19 m asl to 83.85 m asl. The proposed property line grades range from 84.41 m asl to 83.99 m asl, therefore a spill condition does not exist at that location.

Therefore, as shown in this analysis, a spill condition does not exist in the south boulevard in the proposed condition (berm removal). In the existing condition, a spill condition does exist in the south boulevard at the location of the existing mall entrance near the corner of Sovereign Street and East River Street. This existing condition can be mitigated by a temporary berm or asphalt curb until the proposed condition is completed as part of the residential (West SPA lands) development. The north boulevard is not proposed to be altered and noted north boulevard spill conditions are expected to be marginally improved by the berm removal.

5.0 STORMWATER MANAGEMENT

The stormwater management for the site includes controlling the stormwater from the subject property in accordance with standards set by the Town of Oakville Development Engineering Procedures and Guidelines Manual (January, 2011).

5.1 Stormwater Management Criteria

A summary of the stormwater management controls to be provided are as follows:

- Quantity Control: The post-development stormwater peak flows from the property must be controlled to pre-development levels for all storms up to and including the 100-year design storm event.

- Quality Control: 80% Total Suspended Solids (TSS) removal on annual loading basis from all runoff leaving the development.

The Modified Rational Method (MRM) was used to determine the peak flow rates and requisite storage volumes using the Town of Oakville IDF values. Calculations are provided in **Appendix C**.

5.2 Stormwater Quantity Control

The Modified Rational Method was used to determine the pre-development and post-development peak flow rates for the Site using Town of Oakville IDF curves, individual catchment areas, and calculated runoff coefficients. The pre-development peak flow rates to each stormwater outlet (Sovereign Street storm sewer, Lakeshore Road West storm sewer, and Jones Street storm sewer) were defined as the maximum allowable post-development peak flow rate for the 2-year to 100-year design storms.

The following sections describe the stormwater management quantity control measures required to meet the post-development peak flow rate targets for each stormwater outlet.

Sovereign Street storm sewer:
The sub-catchments directed to the Sovereign Street storm sewer are Catchments 201A, 201B, 201E, 201F, 202C, and 204.

Catchment 201A collects surface drainage in area drains, with peak flow attenuation provided by improved surface treatment in the post-development condition.

Catchment 201B directs uncontrolled surface drainage to the 'Parkette' lands. The Parkette storm sewer collects the drainage in catch basins and conveys it to the storm sewer on Sovereign Street.

Catchment 201E directs uncontrolled surface drainage to the south boulevard of Sovereign Street, and eventually to the storm sewer on Sovereign Street, with peak flow attenuation provided by improved surface treatment.

Catchment 201F controls the rooftop drainage with rooftop control drains to 42 L/s/ha and outlets by gravity flow to the Sovereign Street storm sewer.

Catchment 202C directs uncontrolled surface drainage to the 'Parkette' lands, and eventually to the storm sewer on Sovereign Street, with peak flow attenuation provided by improved surface treatment.

Catchment 204 comprises the 'Parkette' lands and surface drainage will be collected in catch basins, with improved surface treatment providing peak flow attenuation.

Jones Street storm sewer:
The sub-catchments directed to the Jones Street storm sewer are Catchments 202A and 202D.

Catchment 202A collects surface drainage in an internal network of proposed and existing catch basins and conveys it to a proposed underground stormwater storage system, where drainage is orifice controlled, treated by an oil-grit separator, then released by gravity flow into the storm sewer system on Jones Street.

Catchment 202D controls the rooftop drainage from the new retail building with new rooftop control drains to 42 L/s/ha and the existing retail building with existing rooftop drains to 13.25 L/s/ha (per the original site servicing design, prepared by J.D. Hubbert). The rooftop drainage will be directed to the new retail building's internal stormwater conveyance system, which will be designed by the Mechanical Engineer, and outlet to the proposed internal storm sewer connection, as shown in **Drawing C02**.

Lakeshore Road West storm sewer:
The catchments directed to the Lakeshore Road West storm sewer are Catchments 201C, 201D, 202B, 203A, and 203B.

Catchment 201C directs uncontrolled surface drainage to the 'Market Square' lands. The Market Square storm sewer collects the drainage in a catch basin and conveys it to the storm sewer on Lakeshore Road West.

Catchment 201D directs uncontrolled surface drainage to the east boulevard of Bronte Road, and eventually to the storm sewer on Lakeshore Road West, with peak flow attenuation provided by improved surface treatment.

Catchment 202B directs uncontrolled surface drainage to the 'Market Square' lands. The Market Square storm sewer collects the drainage in a catch basin and conveys it to the storm sewer on Lakeshore Road West.

Catchment 203A comprises the 'Market Square' lands with surface drainage being collected in a new catch basin, with improved surface treatment providing peak flow attenuation.

Catchment 203B comprises the external lands which will be re-graded as part of the residential development (West SPA lands) with surface drainage directed to sheet flow towards the storm sewer on Lakeshore Road West.

Refer to **Table 6** for a summary of the post-development peak flow rates directed to each stormwater outlet, which incorporate the reduced peak flow rates caused by roof drain or orifice controls. Detailed calculations are included in **Appendix C**.

Table 6: Summary of Peak Flow Rates

Stormwater Outlet	Catchment Area	Catchment No.	Peak Flow Rates (L/s)					
			2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
525 mm diameter Sovereign Street storm sewer	West SPA lands	201	70.5	88.2	99.6	114.8	125.8	136.2
	Parkette	204	27.6	38.4	45.3	54.5	61.2	67.5
	TOTAL	-	98.1	126.6	144.9	169.3	187	203.7
375 mm diameter Jones Street storm sewer	East SPA lands	202	80.7	100.8	111.8	126.0	148.3	163.8
375 mm diameter Lakeshore Road West storm sewer	Market Square	203	40.7	56.5	66.7	80.2	90.1	99.3
TOTAL SITE:			219.4	283.9	323.4	375.6	425.5	466.9

A summary of the pre-development and post-development peak flow rates directed to each stormwater outlet for the subject property is provided in **Table 7**. As noted, the post-development peak flow rates for the 2-year to 100-year design storm events are maintained below the pre-development peak flow rates.

Table 7: Comparison of Pre to Post Development Peak Flow Rates

Stormwater Outlet	Development Condition	Peak Flow Rates (L/s)					
		2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
525 mm diameter Sovereign Street storm sewer	Pre-Development	167.6	228.5	267.6	319.6	357.4	393.0
	Post-development	98.1	126.6	144.9	169.3	187	203.7
375 mm diameter Jones Street storm sewer	Pre-Development	99.4	138.2	163.0	196.2	220.2	242.9
	Post-development	80.7	100.8	111.8	126.0	148.3	163.8
375 mm diameter Lakeshore Road West storm sewer	Pre-Development	42.8	59.5	70.2	84.5	94.9	104.6
	Post-development	40.7	56.5	66.7	80.2	90.1	99.3
Entire Property	Pre-Development	309.8	426.1	514.4	600.2	672.5	740.5
	Post-development	219.4	283.9	323.4	375.6	425.5	466.9

For storm events exceeding the 100-year design storm event, overland flow routes are provided for the West SPA lands, East SPA lands, Market Square, and Parkette.

West SPA lands contain an overland flow route west along the proposed internal roadway to Bronte Road and east to the Parkette, and eventually, the Market Square and Lakeshore Road West.

East SPA lands contain an overland flow route east through the existing parking and driveway area to Lakeshore Road West.

Parkette lands contain an overland flow route south through the Market Square to Lakeshore Road West.

Market Square lands contain an overland flow route south to Lakeshore Road West.

5.3 Stormwater Quality Control

The stormwater quality criteria refers to the MOECC Enhanced Level of Protection of 80% total suspended solids (TSS) removal from 90% of the runoff volume for the proposed development. The following sections describe the stormwater management quality control measures required to meet the MOECC stormwater quality criteria for each stormwater outlet.

Sovereign Street storm sewer:
The sub-catchments directed to the Sovereign Street storm sewer are Catchments 201A, 201B, 201E, 201F, 202C, and 204. All surface drainage from Catchment 201A will be treated by an oil-grit separator, which will provide 86% TSS removal for 98% of the runoff volume captured. A Stormceptor Model STC 750 (or approved equivalent) will provide an enhanced level of protection. **Appendix C** contains the OGS sizing calculations.

Catchments 201B, 201E, 202C, and 204 include landscaped and pedestrian walkway areas whose runoff is considered clean as there are no parking or driving areas proposed within these catchments. The rooftop drainage from Catchment 201F is considered clean and will be released downstream of the oil-grit separator to the storm sewer on Sovereign Street.

Jones Street storm sewer:
The sub-catchments directed to the Jones Street storm sewer are Catchments 202A and 202D. All surface drainage will be treated by an oil-grit separator, which will provide 81% TSS removal for 94% of the runoff volume captured. A Stormceptor Model STC 2000 (or approved equivalent) will provide an enhanced level of protection. **Appendix C** contains the OGS sizing calculations.

Lakeshore Road West storm sewer:
The sub-catchments directed to the Lakeshore Road West storm sewer are Catchments 201C, 201D, 202B, 203A, and 203B. Catchments 201C, 201D, 202B, and 203A include landscaped and pedestrian walkway areas whose runoff is considered clean as there are no proposed parking or driveway areas. Catchment 203B is an external drainage catchment.

As shown in **Table 8**, 80% TSS removal is achieved for all post-development stormwater catchments in the site.

Table 8: Summary of TSS Removal

Stormwater Outlet	Catchment No.	Area (m^2)	% of Total Area	TSS Removal (%)	Total TSS Removal (%)	TSS Removal Target (%)
525 mm diameter Sovereign Street storm sewer	201A	3,009	28.7%	86%	24.68%	80.0%
	201F	5,934	56.6%	100%	56.61%	
	201B, 201E, 202C, 204	1,540	14.7%	80%	11.75%	
	Total Catchment:	10,483	100.0%	-	**93.04%**	
375 mm diameter Jones Street storm sewer	202A	6,984	64.8%	81%	52.49%	80.0%
	202D	3,790	35.2%	100%	35.18%	
	Total Catchment:	10,774	100.0%	-	**87.67%**	
375 mm diameter Lakeshore Road West storm sewer	201C, 201D, 202B, 203	1,711	100.0%	80%	**80.00%**	80.0%

6.0 EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

Erosion and sediment controls will be installed prior to the commencement of any construction activities and will be maintained until the site is stabilized or as directed by the Site Engineer and/or the Town of Oakville. **Drawing C01** identifies the location of the recommended control features. Controls will be inspected after each significant rainfall event and maintained in proper working condition.

The following sediment and erosion controls will be included during construction on the site:

- Heavy Duty Silt Fencing

  A Heavy Duty Silt Fence will be installed on the site as indicated in **Drawing C01** to intercept sheet flow. Additional silt fences may be added based on field decisions by the Site Engineer and Owner, prior to, during, and following construction.

- Rock Mud Mat

  A rock mud mat will be installed at the entrance to the construction zone on Bronte Road and Lakeshore Road West in order to prevent mud tracking from the site onto the surrounding lands and perimeter roadway network. All construction traffic will be restricted to these accesses only.

- Silt sacks in Catch Basins

  A silt sack will be installed in the existing storm sewer catch basins located on Bronte Road, Sovereign Street, Jones Street, and Lakeshore Road West, during construction and on the top of new catch basins and area drains until the finished surfaces are stabilized.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the information contained in this report, we offer the following conclusions:

1. Water servicing for the West SPA lands will be met using a new 200 mm diameter PVC fire service connection and 150 mm diameter PVC domestic service connection to the existing 200 mm diameter watermain on Bronte Road.

   Water servicing for the East SPA lands will be met using the existing internal 200 mm diameter watermain and connection to the existing retail building as the fire line, with the existing internal watermain to be terminated at the re-located fire hydrant. A proposed 50 mm diameter domestic service will connect to the existing 200 mm diameter watermain at the property line, complete with a property line valve and box, and extend to the existing building. A domestic and fire line water service connection for the proposed retail space will be plumbed internally from the water connections in the existing retail building, per mechanical design and specifications.

2. Sanitary servicing for the West SPA lands will be met using a new 200 mm diameter PVC sanitary sewer service connection to the existing 200 mm diameter sanitary sewer on Sovereign Street.

   Sanitary servicing for the East SPA lands will be met using the two existing 200 mm diameter sanitary service connections from the existing retail building to the 200 mm diameter sanitary sewer on Sovereign Street.

3. The property's internal storm sewer system has been sized to convey the 5-year design storm event in accordance with Town of Oakville design requirements.

4. The stormwater management quantity controls will control the post-development peak flows from the property to pre-development levels for all storms up to and including the 100-year storm event.

5. Stormwater quality controls for the West SPA lands will be achieved through a combination of clean rooftop drainage and an oil-grit separator for surface drainage. Stormwater quality controls for the East SPA lands will be achieved through a combination of clean rooftop drainage and an oil-grit separator for surface drainage.

Based on the aforementioned conclusions and recommendations, we recommend the approval of the site plan application from the perspective of site servicing and stormwater management.

Respectfully submitted,

C.F. CROZIER & ASSOCIATES INC.

Benjamin Peachman, E.I.T.
Civil

C.F. CROZIER & ASSOCIATES INC.

Ashish Shukla, P.Eng.
Project Manager

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APPENDIX A

Water Demand Calculations

CROZIER & ASSOCIATES Consulting Engineers

Project: Bronte Village Mall
Project No.: 1348-4555

Date: 2017.06.21
Revised: 2018.01.17
Design: BP
Check: AS

Existing Population Estimate

	Commercial (ha)	Residential (ha)
Retail Area	0.864	0
TOTAL	0.864	0

Commercial Population:

Light Commercial:	90	persons/ha	Source: Halton Region Water and Wastewater Linear Design Manual, April 2015
Commercial Population:	**78**	persons	

Residential Population:

Apartment:	1.68	persons/unit	Source: Population density per email confirmation from Region of Halton, dated September 29, 2015
Residential Population:	**0**	persons	

TOTAL POPULATION	**78**	persons

CROZIER & ASSOCIATES Consulting Engineers

Project: Bronte Village Mall
Project No.: 1348-4555

Date: 2017.06.21
Revised: 2018.01.17
Design: BP
Check: AS

Proposed Population Estimate

		Commercial (m^2)	Residential (# of units)
			Apartment
WEST	Building A	0	242
	Building B	643	240
EAST	Remaining Retail	2,787	0
	Proposed Retail	1,003	0
TOTAL		4,433	482

Source: The estimated number of suites are from *Project Statistics* (Quandrangle Architects, August 1, 2017).

Floor	Units	
	Building A	Building B
G	23	7
2	15	16
3	27	61
4	27	
5	14	26
6	16	26
7	16	26
8	16	26
9	16	26
10	16	26
11	14	0
12	14	0
13	14	0
14	14	0
Total:	242	240

Commercial Population:

Light Commercial:	90	persons/ha
Commercial Population:	**40**	persons

Source: Halton Region Water and Wastewater Linear Design Manual, April 2015

Residential Population:

Apartment:	1.68	persons/unit
Residential Population:	**810**	persons

Source: Population density per email confirmation from Region of Halton, dated September 29, 2015

SPA WEST POPULATION:	**816**	persons
SPA EAST POPULATION:	**34**	persons
TOTAL POPULATION:	**850**	persons

CROZIER & ASSOCIATES Consulting Engineers

Project: Bronte Village Mall
Project No.: 1348-4555

Date: 2017.06.21
Revised: 2017.11.20
Design: BP
Check: AS

Existing Water Demand

Population Estimate:

Commercial:	78 persons
Residential:	0 persons
TOTAL POPULATION:	78 persons

Design Criteria:

Average Daily Demand:	0.275 m^3/cap.day	Source: Halton Region Water and Wastewater Linear Design Manual, April 2015
Maximum Daily Demand Peaking Factor:	2.25	
Maximum Hourly Demand Peaking Factor:	4.00	

Commercial Demand:

Average Day Demand:	21.38 m^3/day	
	0.25 L/s	
Maximum Day Demand:	48.11 m^3/day	
	0.56 L/s	
Maximum Hourly Demand:	85.54 m^3/day	
	0.99 L/s	

Residential Demand:

Average Day Demand:	0.00 m^3/day	
	0.00 L/s	
Maximum Day Demand:	0.00 m^3/day	
	0.00 L/s	
Maximum Hourly Demand:	0.00 m^3/day	
	0.00 L/s	

Total Maximum Day Demand:	**0.25** L/s
Total Maximum Day Demand:	**0.56** L/s
Total Maximum Hourly Demand:	**0.99** L/s

CROZIER & ASSOCIATES Consulting Engineers

Project: Bronte Village Mall
Project No.: 1348-4451

Date: 2017.06.21
Revised: 2018.01.17
Design: BP
Check: AS

Proposed Water Demand

Population Estimate:

Commercial:		40	persons
Residential:	Total	810	persons
	Building A	407	persons
	Building B	403	persons
TOTAL POPULATION:		850	persons

Design Criteria:

Average Daily Demand:	0.275	m^3/cap.day
Maximum Daily Demand Peaking Factor:	2.25	
Maximum Hourly Demand Peaking Factor:	4.00	

Source: Halton Region Water and Wastewater Linear Design Manual, April 2015

Commercial Water Demand:

		Commercial (L/s)		
		Average Daily Demand	**Maximum Daily Demand**	**Maximum Hourly Demand**
SPA WEST	Building A	0.00	0.00	0.00
	Building B	0.02	0.04	0.07
SPA EAST	Remaining Retail	0.08	0.18	0.32
	Proposed Retail	0.03	0.06	0.11
TOTAL		**0.13**	**0.29**	**0.51**

Residential Water Demand:

		Residential (L/s)		
		Average Daily Demand	**Maximum Daily Demand**	**Maximum Hourly Demand**
SPA WEST	Building A	1.29	2.91	5.18
	Building B	1.28	2.89	5.13
SPA EAST	Remaining Retail	0.00	0.00	0.00
	Proposed Retail	0.00	0.00	0.00
TOTAL		**2.58**	**5.80**	**10.31**

Total Water Demand:

		Average Daily Demand (L/s)	**Maximum Daily Demand (L/s)**	**Maximum Hourly Demand (L/s)**
SPA WEST	Building A	1.29	2.91	5.18
	Building B	1.30	2.93	5.21
SPA WEST TOTAL:		**2.60**	**5.84**	**10.38**
SPA EAST	Remaining Retail	0.08	0.18	0.32
	Proposed Retail	0.03	0.06	0.11
SPA EAST TOTAL:		**0.11**	**0.24**	**0.43**
TOTAL DEMAND:		**2.70**	**6.08**	**10.82**

Bronte Village Mall (WEST SPA - Building A)
Fire Protection Volume Calculation
CFCA File: 1348-4555

Date: 1/17/2018
Design: BP
Check: AS

Water Supply for Public Fire Protection - 1999
Fire Underwriters Survey

Part II - Guide for Determination of Required Fire Flow

1. An estimate of fire flow required for a given area may be determined by the formula:

$$F = 220 * C * \sqrt{A}$$

where

F = the required fire flow in litres per minute

C = coefficient related to the type of construction:

=	1.5	for wood frame construction (structure essentially all combustible)
=	1.0	for ordinary construction (brick or other masonry walls, combustible floor and interior)
=	0.8	for non-combustible construction (unprotected metal structural components)
=	0.6	for fire-resistive construction (fully protected frame, floors, roof)

A = The total floor area in square metres (including all storeys, but excluding basements at least 50 percent below grade) in the building considered.

Proposed Buildings

Building Area = 2634 sq.m
Total Floor Area (+ 50% of floor above) = 3951 sq.m

C = 1.0 Assume ordinary construction

Therefore F = 13,829 L/min

Fire flow determined above shall not exceed:
30,000 L/min for wood frame construction
30,000 L/min for ordinary construction
25,000 L/min for non-combustible construction
25,000 L/min for fire-resistive construction

2. Values obtained in No. 1 may be reduced by as much as 25% for occupancies having low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Non-Combustible	-25%	Free Burning	15%
Limited Combustible	-15%	Rapid Burning	25%
Combustible	0% (No Change)		

Combustible	0% reduction

0 L/min reduction
13,829 L/min

Note: Flow determined shall not be less than 2,000 L/min

3. Sprinklers - The value obtained in No. 2 above maybe reduced by up to 50% for complete automatic sprinkler protection. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards.

As part of this analysis, building is assumed to have sprinkler protection (50% reduction),

6,914 L/min reduction

Water Supply for Public Fire Protection - 1999
Fire Underwriters Survey

Part II - Guide for Determination of Required Fire Flow

4. Exposure - To the value obtained in No. 2, a percentage should be added for structures exposed within 45 metres by the fire area under consideration. The percentage shall depend upon the height, area, and construction of the building(s) being exposed, the separation, openings in the exposed building(s), the length and height of exposure, the provision of automatic sprinklers and/or outside sprinklers in the building(s) exposed, the occupancy of the exposed building(s) and the effect of hillside locations on the possible spread of fire.

Separation	Charge	Separation	Charge
0 to 3 m	25%	20.1 to 30 m	10%
3.1 to 10 m	20%	30.1 to 45 m	5%
10.1 to 20 m	15%		

Exposed buildings

Name		**Distance (m)**	**Charge (%)**	**Surcharge (L/s)**
North	Adjacent Dwelling	16.5	15%	2074.3
South	Adjacent Dwelling	6	20%	2765.7
East	Adjacent Dwelling	20	15%	2074.3
West	Adjacent Dwelling	20.2	10%	1382.9

8,297 L/min Surcharge

Determine Required Fire Flow

No.1	13,829			
No. 2	0	reduction		
No. 3	-6,914	reduction		
No. 4	8,297	surcharge		
Required Flow:	**15,211 L/min**			
Rounded to nearest 1000 L/min:	**15,000 L/min**		or	250.0 L/s
				3,963 USGPM

Required Duration of Fire Flow

Flow Required L/min	Duration (hours)
2,000 or less	1.0
3,000	1.25
4,000	1.5
5,000	1.75
6,000	2.0
8,000	2.0
10,000	2.0
12,000	2.5
14,000	**3.0**
16,000	**3.5**
18,000	4.0
20,000	4.5
22,000	5.0
24,000	5.5
26,000	6.0
28,000	6.5
30,000	7.0
32,000	7.5
34,000	8.0
36,000	8.5
38,000	9.0
40,000 and over	9.5

Bronte Village Mall (WEST SPA - Building B)
Fire Protection Volume Calculation
CFCA File: 1348-4555

Date: 1/17/2018
Design: BP
Check: AS

Water Supply for Public Fire Protection - 1999
Fire Underwriters Survey

Part II - Guide for Determination of Required Fire Flow

1. An estimate of fire flow required for a given area may be determined by the formula:

$$F = 220 * C * \sqrt{A}$$

where

F = the required fire flow in litres per minute

C = coefficient related to the type of construction:

=	1.5	for wood frame construction (structure essentially all combustible)
=	1.0	for ordinary construction (brick or other masonry walls, combustible floor and interior)
=	0.8	for non-combustible construction (unprotected metal structural components)
=	0.6	for fire-resistive construction (fully protected frame, floors, roof)

A = The total floor area in square metres (including all storeys, but excluding basements at least 50 percent below grade) in the building considered.

Proposed Buildings

Building Area = 2924 sq.m
Total Floor Area (+ 50% of floor above) = 4386 sq.m

C = 1.0 Assume ordinary construction

Therefore F = 14,570 L/min

Fire flow determined above shall not exceed:
30,000 L/min for wood frame construction
30,000 L/min for ordinary construction
25,000 L/min for non-combustible construction
25,000 L/min for fire-resistive construction

2. Values obtained in No. 1 may be reduced by as much as 25% for occupancies having low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Non-Combustible	-25%	Free Burning	15%
Limited Combustible	-15%	Rapid Burning	25%
Combustible	0% (No Change)		

Combustible	0% reduction

0 L/min reduction
14,570 L/min

Note: Flow determined shall not be less than 2,000 L/min

3. Sprinklers - The value obtained in No. 2 above maybe reduced by up to 50% for complete automatic sprinkler protection. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards.

As part of this analysis, building is assumed to have sprinkler protection (50% reduction),

7,285 L/min reduction

Water Supply for Public Fire Protection - 1999
Fire Underwriters Survey

Part II - Guide for Determination of Required Fire Flow

4. Exposure - To the value obtained in No. 2, a percentage should be added for structures exposed within 45 metres by the fire area under consideration. The percentage shall depend upon the height, area, and construction of the building(s) being exposed, the separation, openings in the exposed building(s), the length and height of exposure, the provision of automatic sprinklers and/or outside sprinklers in the building(s) exposed, the occupancy of the exposed building(s) and the effect of hillside locations on the possible spread of fire.

Separation	Charge	Separation	Charge
0 to 3 m	25%	20.1 to 30 m	10%
3.1 to 10 m	20%	30.1 to 45 m	5%
10.1 to 20 m	15%		

Exposed buildings

Name		**Distance (m)**	**Charge (%)**	**Surcharge (L/s)**
North	Adjacent Dwelling	25	10%	1457.0
South	Adjacent Dwelling	22	10%	1457.0
East	Adjacent Dwelling	15	15%	2185.5
West	Adjacent Dwelling	15	15%	2185.5

7,285 L/min Surcharge

Determine Required Fire Flow

No.1	14,570		
No. 2	0	reduction	
No. 3	-7,285	reduction	
No. 4	7,285	surcharge	
Required Flow:	**14,570 L/min**		
Rounded to nearest 1000 L/min:	**15,000 L/min**	or	250.0 L/s
			3,963 USGPM

Required Duration of Fire Flow

Flow Required L/min	Duration (hours)
2,000 or less	1.0
3,000	1.25
4,000	1.5
5,000	1.75
6,000	2.0
8,000	2.0
10,000	2.0
12,000	2.5
14,000	**3.0**
16,000	**3.5**
18,000	4.0
20,000	4.5
22,000	5.0
24,000	5.5
26,000	6.0
28,000	6.5
30,000	7.0
32,000	7.5
34,000	8.0
36,000	8.5
38,000	9.0
40,000 and over	9.5

CROZIER & ASSOCIATES Consulting Engineers

Bronte Village Mall (EAST SPA - Ex. & Prop. Retail Area) **Date:** 11/21/2017
Fire Protection Volume Calculation **Design:** TL
CFCA File: 1348-4555 **Check:** BP

Water Supply for Public Fire Protection - 1999
Fire Underwriters Survey

Part II - Guide for Determination of Required Fire Flow

1. An estimate of fire flow required for a given area may be determined by the formula:

$$F = 220 * C * \sqrt{A}$$

where

F = the required fire flow in litres per minute

C = coefficient related to the type of construction:

=	1.5	for wood frame construction (structure essentially all combustible)
=	1.0	for ordinary construction (brick or other masonry walls, combustible floor and interior)
=	0.8	for non-combustible construction (unprotected metal structural components)
=	0.6	for fire-resistive construction (fully protected frame, floors, roof)

A = The total floor area in square metres (including all storeys, but excluding basements at least 50 percent below grade) in the building considered.

Proposed Buildings

Building Area = 3790 sq.m
Total Floor Area (+ 50% of floor above) = 5685 sq.m

C = 1.0 Assume ordinary construction

Therefore F = 16,588 L/min

Fire flow determined above shall not exceed:
30,000 L/min for wood frame construction
30,000 L/min for ordinary construction
25,000 L/min for non-combustible construction
25,000 L/min for fire-resistive construction

2. Values obtained in No. 1 may be reduced by as much as 25% for occupancies having low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Non-Combustible	-25%	Free Burning	15%
Limited Combustible	-15%	Rapid Burning	25%
Combustible	0% (No Change)		

Combustible	0% reduction

0 L/min reduction
16,588 L/min

Note: Flow determined shall not be less than 2,000 L/min

3. Sprinklers - The value obtained in No. 2 above maybe reduced by up to 50% for complete automatic sprinkler protection. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards.

As part of this analysis, building is assumed to have sprinkler protection (50% reduction),

8,294 L/min reduction

Water Supply for Public Fire Protection - 1999
Fire Underwriters Survey

Part II - Guide for Determination of Required Fire Flow

4. Exposure - To the value obtained in No. 2, a percentage should be added for structures exposed within 45 metres by the fire area under consideration. The percentage shall depend upon the height, area, and construction of the building(s) being exposed, the separation, openings in the exposed building(s), the length and height of exposure, the provision of automatic sprinklers and/or outside sprinklers in the building(s) exposed, the occupancy of the exposed building(s) and the effect of hillside locations on the possible spread of fire.

Separation	Charge	Separation	Charge
0 to 3 m	25%	20.1 to 30 m	10%
3.1 to 10 m	20%	30.1 to 45 m	5%
10.1 to 20 m	15%		

Exposed buildings

Name		**Distance (m)**	**Charge (%)**	**Surcharge (L/s)**
North	Adjacent Dwelling	33	5%	829.4
South	Adjacent Dwelling	>45	0%	0.0
East	Adjacent Dwelling	>45	0%	0.0
West	Adjacent Dwelling	15	15%	2488.2

3,318 L/min Surcharge

Determine Required Fire Flow

No.1	16,588		
No. 2	0	reduction	
No. 3	-8,294	reduction	
No. 4	3,318	surcharge	
Required Flow:	**11,611 L/min**		
Rounded to nearest 1000 L/min:	**12,000 L/min**	or	200.0 L/s
			3,170 USGPM

Required Duration of Fire Flow

Flow Required L/min	Duration (hours)
2,000 or less	1.0
3,000	1.25
4,000	1.5
5,000	1.75
6,000	2.0
8,000	2.0
10,000	2.0
12,000	**2.5**
14,000	3.0
16,000	3.5
18,000	4.0
20,000	4.5
22,000	5.0
24,000	5.5
26,000	6.0
28,000	6.5
30,000	7.0
32,000	7.5
34,000	8.0
36,000	8.5
38,000	9.0
40,000 and over	9.5

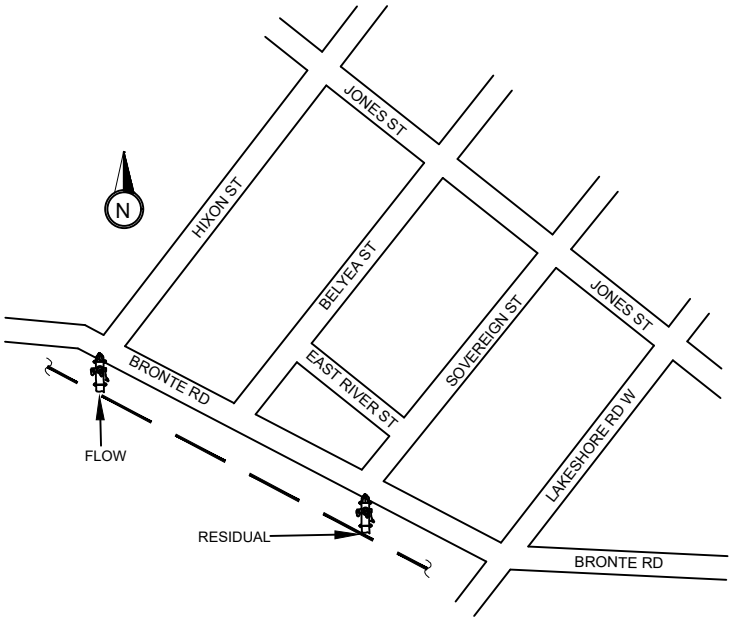
FIRST FOR FIRE PROTECTION
VIPOND INC
est. 1945

FLOW TEST RESULTS

DATE : NOVEMBER 13, 2017 TIME : 9:00 AM

LOCATION : 2441 LAKESHORE WEST (BRONTE RD)
OAKVILLE
ONTARIO

TEST BY : J.MABEN, D.MANZHAY & P.U.C



STATIC PRESSURE : 72 ---------- PSI

TEST NO.	NO. OF NOZZLES	NOZZLE DIAMETER (INCHES)	DISCHARGE CO-EFFICIENT	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	DISCHARGE (U.S.GPM)
1	1	1-3/4"	0.997	71	57	686
2	1	2-1/2"	0.9	70	47	1150
3	2	2-1/2"	0.9	68	21/22	1556

FIRST FOR FIRE PROTECTION
VIPOND INC
est. 1945

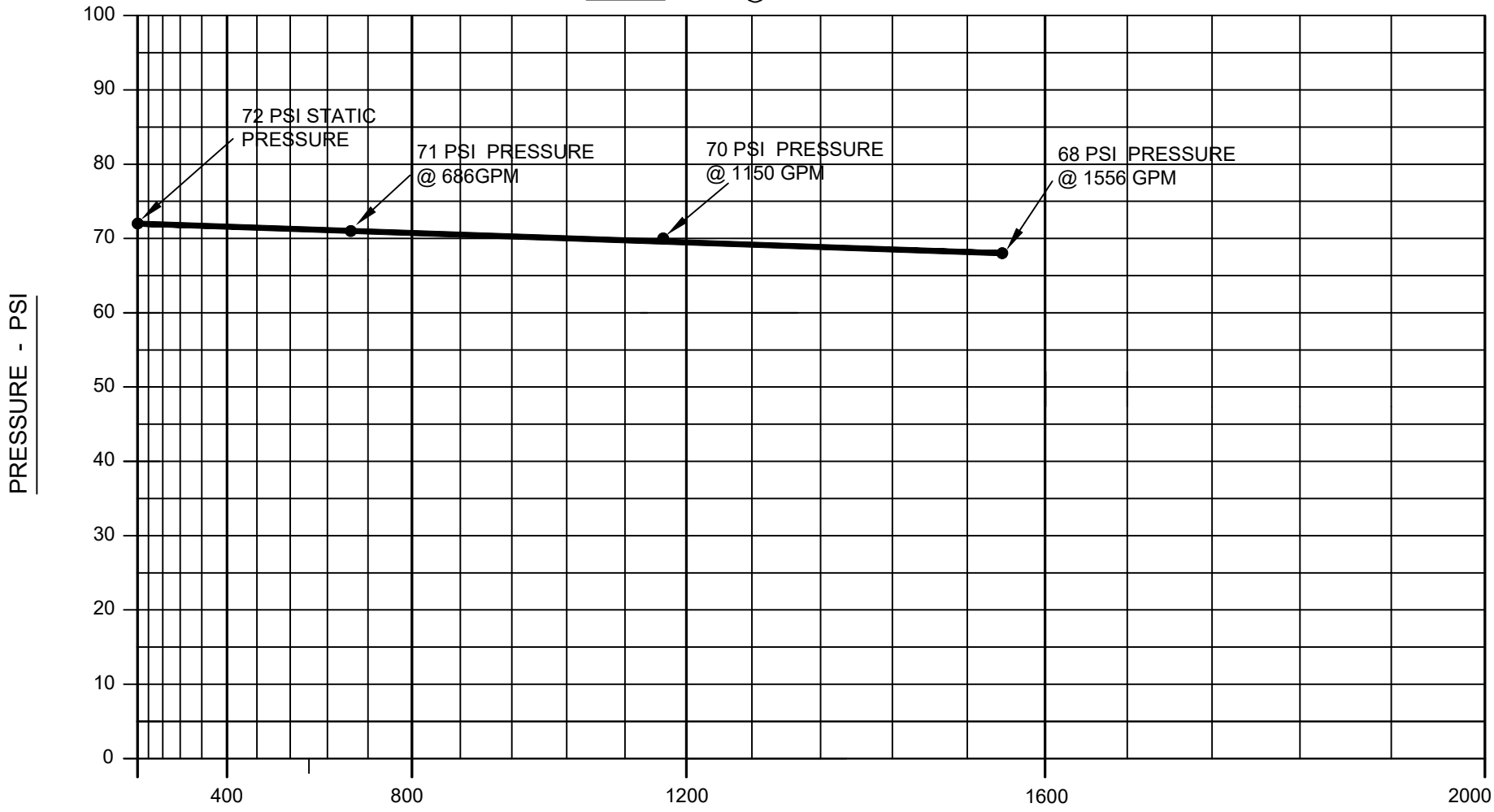
2441 LAKESHORE WEST (BRONTE RD)	TEST BY : VIPOND | FIRE PROTECTION
OAKVILLE	OFFICE : MISSISSAUGA
ONTARIO	BY : J.MABEN, D.MANZHAY & P.U.C
	DONE : NOV 13, 2017 AT 9:00 AM

STATIC : 72 PSI

71 PSI @ 686 GPM

70 PSI @ 1150 GPM

68 PSI @ 1556 GPM



VIP-DES-FO5-C

CROZIER & ASSOCIATES
Consulting Engineers

PROJECT: Bronte Village Mall
PROJECT No.: 1348-4555
FILE: Fire Flow Demand
DATE: 11/14/2017
UPDATE: 11/21/2017
DESIGN: TL
CHECK: BP

PROJECTED FIRE FLOW (Bronte Road)
Date of Flow Tests - November 13, 2017

Test	Hydrant Location / ID	Static Pressure	Residual Pressure during Test	Flow from Hydrant Test	Desired Residual Pressure	Projected Fire Flow Available at 20 psi
		Ps	Pt	Qt	Pr	Qr
		(psi)	(psi)	(USGPM)	(psi)	(USGPM)
1	2441 Lakeshore West (Bronte Road), Oakville	72	71	686	20	5,794
2			70	1150		6,680
3			68	1556		6,216

Available Hydrant Flow	L/s	L/min
	365.54	21,932

$Q_r = Q_t \times ((P_s - P_r)/(P_s - P_t))^{0.54}$ Formula to determine available flow as per AWWA M17 (1989)

$Q_r = Qr/15.85$ Covert flows at 20 psi from USGPM to L/s

NOTE: Projected fire flows are calculated on the basis of hydrant tests carried out by Vipond on November 13, 2017 at 9:00 AM.

FLOW TEST RESULTS

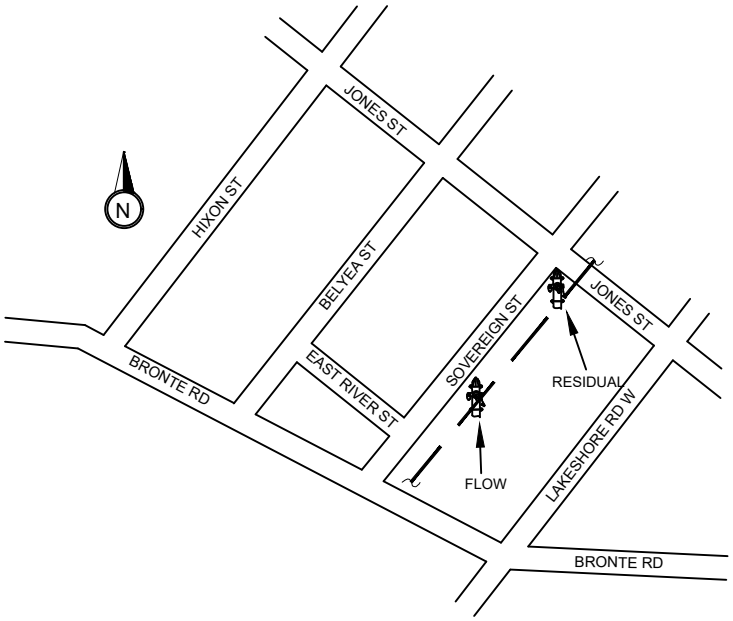
DATE : NOVEMBER 13, 2017 TIME : 9:30 AM

LOCATION : 2441 LAKESHORE WEST (JONES ST)

OAKVILLE

ONTARIO

TEST BY : J.MABEN, D.MANZHAY & P.U.C



STATIC PRESSURE : 72 ---------- PSI

TEST NO.	NO. OF NOZZLES	NOZZLE DIAMETER (INCHES)	DISCHARGE CO-EFFICIENT	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	DISCHARGE (U.S.GPM)
1	1	1-3/4"	0.997	71	58	716
2	1	2-1/2"	0.9	70	46	1138
3	2	2-1/2"	0.9	68	26/24	1678

FIRST FOR FIRE PROTECTION
VIPOND INC
est. 1945

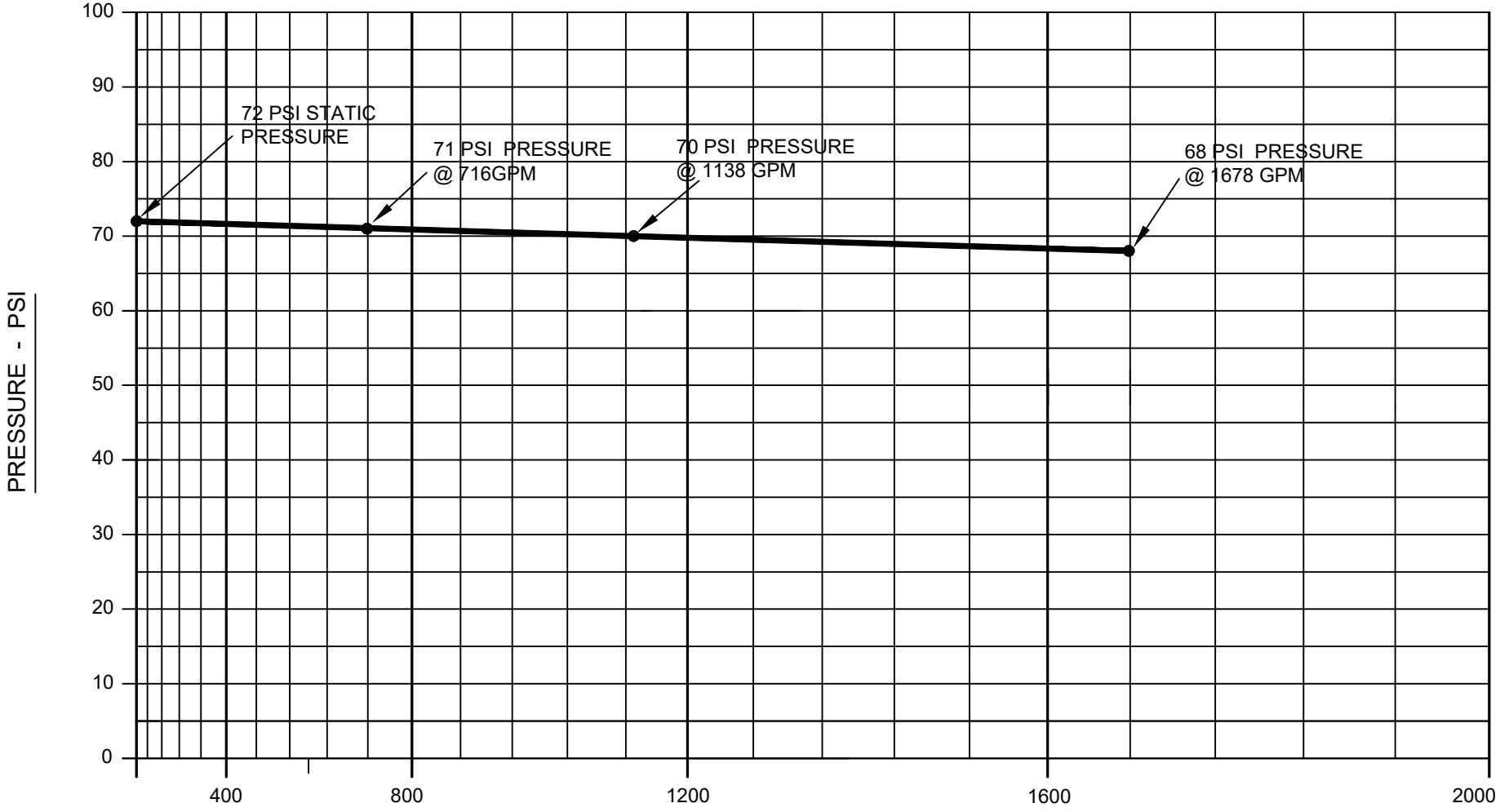
2441 LAKESHORE WEST (JONES ST)	TEST BY : VIPOND | FIRE PROTECTION
OAKVILLE	OFFICE : MISSISSAUGA
ONTARIO	BY : J.MABEN, D.MANZHAY & P.U.C
	DONE : NOV 13, 2017 AT 9:30 AM

STATIC : 72 PSI

71 PSI @ 716 GPM

70 PSI @ 1138 GPM

68 PSI @ 1678 GPM



VIP-DES-FO5-C

CROZIER & ASSOCIATES
Consulting Engineers

PROJECT: Bronte Village Mall
PROJECT No.: 1348-4555
FILE: Fire Flow Demand
DATE: 11/14/2017
UPDATE: 11/21/2017
DESIGN: TL
CHECK: BP

PROJECTED FIRE FLOW (Sovereign Street)
Date of Flow Tests - November 13, 2017

Test	Hydrant Location / ID	Static Pressure	Residual Pressure during Test	Flow from Hydrant Test	Desired Residual Pressure	Projected Fire Flow Available at 20 psi
		Ps	Pt	Qt	Pr	Qr
		(psi)	(psi)	(USGPM)	(psi)	(USGPM)
1	2441 Lakeshore West (Sovereign St.), Oakville	72	71	716	20	6,047
2			70	1138		6,610
3			68	1678		6,704

Available Hydrant Flow	L/s	L/min
	381.53	22,892

$Q_r = Q_t \times ((P_s - P_r)/(P_s - P_t))^{0.54}$ Formula to determine available flow as per AWWA M17 (1989)

$Q_r = Qr/15.85$ Covert flows at 20 psi from USGPM to L/s

NOTE: Projected fire flows are calculated on the basis of hydrant tests carried out by Vipond on November 13, 2017 at 9:30 AM.

APPENDIX B

Sanitary Flow Calculations

Project: Bronte Village Mall
Project No.: 1348-4555

Date: 2017.06.21
Revised: 2017.11.20
Design: BP
Check: AS

Existing Sanitary Flow

Total Site Area:

22,970	m^2
2.30	ha

Population Estimates:

Commercial:	78	persons
Residential:	0	persons
TOTAL POPULATION:	78	persons

Design Criteria:

Unit Sewage Flow:	0.275	m^3/cap.day
Infiltration:	0.286	L/s/ha

Source: Halton Region Water and Wastewater Linear Design Manual, April 2015

Peaking Factor (Commercial Land Use): **Modified Harmon Formula**

$$M_e = 0.8 \cdot \left(1+\frac{14}{4+\sqrt{Pe}}\right)$$

Source: Halton Region Water and Wastewater Linear Design Manual, April 2015

Commercial Sanitary Flow:

Average Dry Weather Flow:	21.38	m^3/day
	0.25	L/s

Residential Sanitary Flow:

Average Dry Weather Flow:	0.00	m^3/day
	0.00	L/s

Total Dry Weather Sanitary Flow:	0.25	L/s
Peaking Factor:	3.42	
Total Peak Sanitary Flow:	0.85	L/s
Inflow/Infiltration Allowance:	0.66	L/s
Total Design Sanitary Flow:	**1.50**	L/s

CROZIER & ASSOCIATES Consulting Engineers

Project: Bronte Village Mall
Project No.: 1348-4555

Date: 2017.06.21
Revised: 2018.01.17
Design: BP
Check: AS

Proposed Sanitary Flow

Site Area:

SPA West:	0.98
SPA East:	1.09
Town dedicated lands:	0.23
Total Site:	2.30

Population Estimates:

SPA West:			SPA East:		
Commercial:	6	persons	Commercial:	34	persons
Residential:	810	persons	Residential:	0	persons
TOTAL POPULATION:	816	persons	TOTAL POPULATION:	34	persons

Design Criteria:

Unit Sewage Flow: 0.275 m^3/cap.day

Infiltration: 0.286 L/s/ha

Source: Halton Region Water and Wastewater Linear Design Manual, April 2015

Peaking Factor (Residential Land Use): **Harmon Formula**

$$M = 1+\frac{14}{4+\sqrt{P}}$$

Source: Halton Region Water and Wastewater Linear Design Manual, April 2015

Peaking Factor (Commercial Land Use): **Modified Harmon Formula**

$$M_e = 0.8 \cdot (1+\frac{14}{4+\sqrt{Pe}})$$

Sanitary Flow:

	Land Use	Total Population (persons)	Dry Weather Sanitary Flow (L/s)	Peaking Factor (Combined Land Use)	Peak Sanitary Flow (L/s)	Inflow/ Infiltration (L/s)	Total Design Sanitary Flow (L/s)
West SPA:	Residential	810	2.58	3.86	9.94	**0.28**	**10.29**
	Commercial	6	0.02	3.55	0.07		
	Total:	816	**2.60**	-	**10.01**		
East SPA:	Residential	0	0.00	4.50	0.00	**0.31**	**0.69**
	Commercial	34	0.11	3.48	0.38		
	Total:	34	**0.11**	-	**0.38**		
TOTAL SITE:		850	**2.70**	-	**10.38**	**0.59**	**10.98**

APPENDIX C

Stormwater Management Calculations

PROJECT: Bronte Village Mall **DESIGN:** TL **DATE:** 10/26/2017
PROJECT No.: 1348-4555 **CHECK:** BP **UPDATED:** 9/25/2018

PRE-DEVELOPMENT CONDITIONS

Address: 2441 Lakeshore Road West

Storm Data:Town of Oakville IDF Parameters

Time of Concentration: T_c= 10 min

Return Period	a	b	c	i mm/hr
2 yr	725	4.8	0.808	82.18
5 yr	1170	5.8	0.843	114.21
10 yr	1400	5.8	0.848	134.79
25 yr	1680	5.6	0.851	162.17
50 yr	1960	5.8	0.861	182.06
100 yr	2150	5.7	0.861	200.80

Equations:

Intensity

$$i_{(Td)} = a / (T_c + b)^{c}$$

Peak Flow

$$Q_{post} = 0.0028 \bullet C_{post} \bullet i_{(Td)} \bullet A$$

Catchment 101 (Sovereign St.):

Existing Weighted Runoff Coefficient

	C	Area (ha)	Weighted RC
Pervious	0.25	0.0336	0.01
Impervious (Site Drainage)	0.90	0.70210	0.81
Impervious (External Drainage)	0.90	0.0426	0.05
Total Surface		0.7783	0.87
Peak Flow rate		**Area**	**Total Flow Rate**
	(L/s/ha)	**(ha)**	**(m3/s)**
Roof Drains	13.249	0.864	0.0114
	Total:	**1.642**	

2 Year Storm

$Q_{pre\text{-}surface}$	0.1562 m^3/s	(Peak Flow)
$Q_{pre\text{-}roof}$	0.0114 m^3/s	(Peak Flow)
$Q_{pre\text{-}total}$	0.1676 m^3/s	(Peak Flow)

5 Year Storm

$Q_{pre\text{-}surface}$	0.2170 m^3/s	(Peak Flow)
$Q_{pre\text{-}roof}$	0.0114 m^3/s	(Peak Flow)
$Q_{pre\text{-}total}$	0.2285 m^3/s	(Peak Flow)

10 Year Storm

$Q_{pre\text{-}surface}$	0.2561 m^3/s	(Peak Flow)
$Q_{pre\text{-}roof}$	0.0114 m^3/s	(Peak Flow)
$Q_{pre\text{-}total}$	0.2676 m^3/s	(Peak Flow)

25 Year Storm

$Q_{pre\text{-}surface}$	0.3081 m^3/s	(Peak Flow)
$Q_{pre\text{-}roof}$	0.0114 m^3/s	(Peak Flow)
$Q_{pre\text{-}total}$	0.3196 m^3/s	(Peak Flow)

50 Year Storm

$Q_{pre\text{-}surface}$	0.3459 m^3/s	(Peak Flow)
$Q_{pre\text{-}roof}$	0.0114 m^3/s	(Peak Flow)
$Q_{pre\text{-}total}$	0.3574 m^3/s	(Peak Flow)

100 Year Storm

$Q_{pre\text{-}surface}$	0.3816 m^3/s	(Peak Flow)
$Q_{pre\text{-}roof}$	0.0114 m^3/s	(Peak Flow)
$Q_{pre\text{-}total}$	0.3930 m^3/s	(Peak Flow)

Catchment 102 (Jones St.):

Existing Weighted Runoff Coefficient

	C	Area (ha)	Weighted RC
Pervious	0.25	0.0000	0.00
Impervious	0.90	0.4800	0.90
Total		0.4800	0.90

2 Year Storm

Q_{pre}	0.0994 m^3/s	(Peak Flow)

5 Year Storm

Q_{pre}	0.1382 m^3/s	(Peak Flow)

10 Year Storm

Q_{pre}	0.1630 m^3/s	(Peak Flow)

25 Year Storm

Q_{pre}	0.1962 m^3/s	(Peak Flow)

50 Year Storm

Q_{pre}	0.2202 m^3/s	(Peak Flow)

100 Year Storm

Q_{pre}	0.2429 m^3/s	(Peak Flow)

PROJECT: Bronte Village Mall **DESIGN:** TL **DATE:** 10/26/2017
PROJECT No.: 1348-4555 **CHECK:** BP **UPDATED:** 9/25/2018

PRE-DEVELOPMENT CONDITIONS

Address: 2441 Lakeshore Road West

Storm Data:Town of Oakville IDF Parameters

Time of Concentration: T_c= 10 min

Return Period	a	b	c	i mm/hr
2 yr	725	4.8	0.808	82.18
5 yr	1170	5.8	0.843	114.21
10 yr	1400	5.8	0.848	134.79
25 yr	1680	5.6	0.851	162.17
50 yr	1960	5.8	0.861	182.06
100 yr	2150	5.7	0.861	200.80

Equations:

Intensity

$$i_{(Td)} = a / (T_c + b)^{c}$$

Peak Flow

$$Q_{post} = 0.0028 \bullet C_{post} \bullet i_{(Td)} \bullet A$$

Catchment 103 (Lakeshore Rd W.):

Existing Weighted Runoff Coefficient

	C	Area (ha)	Weighted RC
Pervious	0.25	0.0146	0.02
Impervious	0.90	0.2027	0.84
Total		0.2173	0.86

2 Year Storm

Q_{pre}	0.0428 m^3/s	(Peak Flow)

5 Year Storm

Q_{pre}	0.0595 m^3/s	(Peak Flow)

10 Year Storm

Q_{pre}	0.0702 m^3/s	(Peak Flow)

25 Year Storm

Q_{pre}	0.0845 m^3/s	(Peak Flow)

50 Year Storm

Q_{pre}	0.0949 m^3/s	(Peak Flow)

100 Year Storm

Q_{pre}	0.1046 m^3/s	(Peak Flow)

Entire Site:

Existing Weighted Runoff Coefficient

	C	Area (ha)	Weighted RC
Pervious	0.25	0.0482	0.01
Impervious	0.90	1.4274	0.87
Total Surface		1.4756	0.88
Peak Flow rate		**Area**	**Total Flow Rate**
	(L/s/ha)	**(ha)**	**(m3/s)**
Roof Drains	13.249	0.864	0.0114
	Total:	**2.33960**	

2 Year Storm

$Q_{pre\text{-}surface}$	0.2984 m^3/s	(Peak Flow)
$Q_{pre\text{-}roof}$	0.0114 m^3/s	(Peak Flow)
$Q_{pre\text{-}total}$	0.3098 m^3/s	(Peak Flow)

5 Year Storm

$Q_{pre\text{-}surface}$	0.4147 m^3/s	(Peak Flow)
$Q_{pre\text{-}roof}$	0.0114 m^3/s	(Peak Flow)
$Q_{pre\text{-}total}$	0.4261 m^3/s	(Peak Flow)

10 Year Storm

$Q_{pre\text{-}surface}$	0.5029 m^3/s	(Peak Flow)
$Q_{pre\text{-}roof}$	0.0114 m^3/s	(Peak Flow)
$Q_{pre\text{-}total}$	0.5144 m^3/s	(Peak Flow)

25 Year Storm

$Q_{pre\text{-}surface}$	0.5888 m^3/s	(Peak Flow)
$Q_{pre\text{-}roof}$	0.0114 m^3/s	(Peak Flow)
$Q_{pre\text{-}total}$	0.6002 m^3/s	(Peak Flow)

50 Year Storm

$Q_{pre\text{-}surface}$	0.6610 m^3/s	(Peak Flow)
$Q_{pre\text{-}roof}$	0.0114 m^3/s	(Peak Flow)
$Q_{pre\text{-}total}$	0.6725 m^3/s	(Peak Flow)

100 Year Storm

$Q_{pre\text{-}surface}$	0.7291 m^3/s	(Peak Flow)
$Q_{pre\text{-}roof}$	0.0114 m^3/s	(Peak Flow)
$Q_{pre\text{-}total}$	0.7405 m^3/s	(Peak Flow)

CROZIER & ASSOCIATES Consulting Engineers

PROJECT: Bronte Village Mall
PROJECT No.: 1348-4555
DESIGN: TL
CHECK: BP
DATE: 10/26/2017
UPDATED: 9/25/2018

POST-DEVELOPMENT CONDITIONS

Address: 2441 Lakeshore Road West

Storm Data:Town of Oakville IDF Parameters

Time of Concentration: T_c= 10 min

Return Period	a	b	c	i mm/hr
2 yr	725	4.8	0.808	82.18
5 yr	1170	5.8	0.843	114.21
10 yr	1400	5.8	0.848	134.79
25 yr	1680	5.6	0.851	162.17
50 yr	1960	5.8	0.861	182.06
100 yr	2150	5.7	0.861	200.80

Equations:

Intensity

$i_{(Td)} = a / (T_c + b)^c$

Peak Flow

$Q_{post} = 0.0028 \bullet C_{post} \bullet i_{(Td)} \bullet A$

WEST SPA - Outlet: Sovereign Street

Catchment 201

Post-dev Weighted Runoff Coefficient

	C	Area (ha)	Weighted RC
201A - Surface (Controlled)			
Pervious	0.25	0.1212	0.10
Impervious	0.90	0.1798	0.54
Total Surface		0.3009	0.64
201B - Surface (Uncontrolled to 204)			
Pervious	0.25	0.0000	0.00
Impervious	0.90	0.0305	0.90
Total Surface		0.0305	0.90
201C - Surface (Uncontrolled to 203)			
Pervious	0.25	0.0025	0.02
Impervious	0.90	0.0272	0.82
Total Surface		0.0297	0.85
201D - Surface (Uncontrolled to Lakeshore Rd W.)			
Pervious	0.25	0.0121	0.15
Impervious	0.90	0.0081	0.36
Total Surface		0.0202	0.51
201E - Surface (Uncontrolled to Sovereign St.)			
Pervious	0.25	0.0015	0.05
Impervious	0.90	0.0061	0.72
Total Surface		0.0076	0.77
TOTAL SURFACE		0.3890	-

201F - Rooftop (Roof drain control)	Peak Flow Rate (L/s/ha)	Area (ha)	Total Flow Rate (m3/s)
Ex. Roof	13.25	0.0000	0.000
Prop. Roof	42	0.5934	0.025
TOTAL ROOF	-	0.5934	0.025

2 Year Storm		
$Q_{post\text{-}from\ 201A}$	0.0442 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201E}$	0.0014 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201F}$	0.0249 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.0705 m^3/s**	**(Peak Flow)**
5 Year Storm		
$Q_{post\text{-}from\ 201A}$	0.0614 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201E}$	0.0019 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201F}$	0.0249 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.0882 m^3/s**	**(Peak Flow)**
10 Year Storm		
$Q_{post\text{-}from\ 201A}$	0.0725 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201E}$	0.0022 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201F}$	0.0249 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.0996 m^3/s**	**(Peak Flow)**
25 Year Storm		
$Q_{post\text{-}from\ 201A}$	0.0872 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201E}$	0.0027 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201F}$	0.0249 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.1148 m^3/s**	**(Peak Flow)**
50 Year Storm		
$Q_{post\text{-}from\ 201A}$	0.0979 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201E}$	0.0030 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201F}$	0.0249 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.1258 m^3/s**	**(Peak Flow)**
100 Year Storm		
$Q_{post\text{-}from\ 201A}$	0.1080 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201E}$	0.0033 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201F}$	0.0249 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.1362 m^3/s**	**(Peak Flow)**

EAST SPA - Outlet: Jones Street

Catchment 202

Post-dev Weighted Runoff Coefficient

	C	Area (ha)	Weighted RC
202A - Surface (Controlled)			
Pervious	0.25	0.0000	0.00
Impervious	0.90	0.6984	0.90
Total Surface		0.6984	0.90
202B - Surface (Uncontrolled to 203)			
Pervious	0.25	0.0000	0.00
Impervious	0.90	0.0081	0.90
Total Surface		0.0081	0.90
202C - Surface (Uncontrolled to 204)			
Pervious	0.25	0.0100	0.17
Impervious	0.90	0.0045	0.28
Total Surface		0.0145	0.45
TOTAL SURFACE		0.7210	-

202D - Rooftop (Roof drain control)	Peak Flow rate (L/s/ha)	Area (ha)	Total Flow Rate (m3/s)
Ex. Roof	13.25	0.2787	0.004
Prop. Roof	42	0.1003	0.004
TOTAL ROOF	-	0.3790	0.008

2 Year Storm		
$Q_{post\text{-}from\ 202A}$	0.0728 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 202D}$	0.0079 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.0807 m^3/s**	**(Peak Flow)**
5 Year Storm		
$Q_{post\text{-}from\ 202A}$	0.0929 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 202D}$	0.0079 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.1008 m^3/s**	**(Peak Flow)**
10 Year Storm		
$Q_{post\text{-}from\ 202A}$	0.1039 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 202D}$	0.0079 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.1118 m^3/s**	**(Peak Flow)**
25 Year Storm		
$Q_{post\text{-}from\ 202A}$	0.1181 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 202D}$	0.0079 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.1260 m^3/s**	**(Peak Flow)**
50 Year Storm		
$Q_{post\text{-}from\ 202A}$	0.1404 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 202D}$	0.0079 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.1483 m^3/s**	**(Peak Flow)**
100 Year Storm		
$Q_{post\text{-}from\ 202A}$	0.1559 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 202D}$	0.0079 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.1638 m^3/s**	**(Peak Flow)**

CROZIER & ASSOCIATES Consulting Engineers

PROJECT: Bronte Village Mall **DESIGN:** TL **DATE:** 10/26/2017
PROJECT No.: 1348-4555 **CHECK:** BP **DATED:** 4/6/2018

POST-DEVELOPMENT CONDITIONS

Address: 2441 Lakeshore Road West

Storm Data:Town of Oakville IDF Parameters

Time of Concentration: T_c= 10 min

Return Period	a	b	c	i mm/hr
2 yr	725	4.8	0.808	82.18
5 yr	1170	5.8	0.843	114.21
10 yr	1400	5.8	0.848	134.79
25 yr	1680	5.6	0.851	162.17
50 yr	1960	5.8	0.861	182.06
100 yr	2150	5.7	0.861	200.80

Equations:

Intensity

$i_{(Td)} = a / (T_c + b)^c$

Peak Flow

$Q_{post} = 0.0028 \bullet C_{post} \bullet i_{(Td)} \bullet A$

MARKET SQUARE - Outlet: Lakeshore Road West

Catchment 203

Post-dev Weighted Runoff Coefficient

	C	Area (ha)	Weighted RC
203A - Surface (Market Square)			
Pervious	0.25	0.0095	0.02
Impervious	0.90	0.1036	0.82
Total Surface		0.1131	0.85
203B - External Catchment			
Pervious	0.25	0.0000	0.00
Impervious	0.90	0.0426	0.90
Total Surface		0.0426	0.90
TOTAL SURFACE		0.1557	-

2 Year Storm		
$Q_{post\text{-}from\ 203A}$	0.0220 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 203B}$	0.0088 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201C}$	0.0058 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 202B}$	0.0017 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201D}$	0.0024 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.0407 m^3/s**	**(Peak Flow)**
5 Year Storm		
$Q_{post\text{-}from\ 203A}$	0.0306 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 203B}$	0.0123 m3/s	(Peak Flow)
$Q_{post\text{-}from\ 201C}$	0.0080 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201D}$	0.0033 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 202B}$	0.0023 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.0565 m^3/s**	**(Peak Flow)**
10 Year Storm		
$Q_{post\text{-}from\ 203A}$	0.0361 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 203B}$	0.0145 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201C}$	0.0095 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201D}$	0.0039 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 202B}$	0.0028 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.0667 m^3/s**	**(Peak Flow)**
25 Year Storm		
$Q_{post\text{-}from\ 203A}$	0.0434 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 203B}$	0.0174 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201C}$	0.0114 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201D}$	0.0047 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 202B}$	0.0033 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.0802 m^3/s**	**(Peak Flow)**
50 Year Storm		
$Q_{post\text{-}from\ 203A}$	0.0488 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 203B}$	0.0195 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201C}$	0.0128 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201D}$	0.0053 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 202B}$	0.0037 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.0901 m^3/s**	**(Peak Flow)**
100 Year Storm		
$Q_{post\text{-}from\ 203A}$	0.0538 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 203B}$	0.0216 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201C}$	0.0141 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201D}$	0.0058 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 202B}$	0.0041 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.0993 m^3/s**	**(Peak Flow)**

PARKETTE - Outlet: Sovereign Street

Catchment 204

Post-dev Weighted Runoff Coefficient

	C	Area (ha)	Weighted RC
Pervious	0.25	0.0080	0.02
Impervious	0.90	0.0934	0.83
Total Surface		0.1014	0.85
TOTAL SURFACE		0.1014	-

2 Year Storm		
$Q_{post\text{-}from\ 204}$	0.0198 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201B}$	0.0063 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 202C}$	0.0015 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.0276 m^3/s**	**(Peak Flow)**
5 Year Storm		
$Q_{post\text{-}from\ 204}$	0.0275 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201B}$	0.0088 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 202C}$	0.0021 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.0384 m^3/s**	**(Peak Flow)**
10 Year Storm		
$Q_{post\text{-}from\ 204}$	0.0325 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201B}$	0.0104 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 202C}$	0.0025 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.0453 m^3/s**	**(Peak Flow)**
25 Year Storm		
$Q_{post\text{-}from\ 204}$	0.0391 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201B}$	0.0125 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 202C}$	0.0030 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.0545 m^3/s**	**(Peak Flow)**
50 Year Storm		
$Q_{post\text{-}from\ 204}$	0.0439 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201B}$	0.0140 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 202C}$	0.0033 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.0612 m^3/s**	**(Peak Flow)**
100 Year Storm		
$Q_{post\text{-}from\ 204}$	0.0484 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 201B}$	0.0154 m^3/s	(Peak Flow)
$Q_{post\text{-}from\ 202C}$	0.0037 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.0675 m^3/s**	**(Peak Flow)**

ENTIRE PROPERTY

Entire Site:

Post-dev Weighted Runoff Coefficient

	C	Area (ha)	Weighted RC
Pervious	0.25	0.1648	0.03
Impervious	0.90	1.2023	0.79
TOTAL SURFACE		1.3671	0.82
	Peak Flow rate (L/s/ha)	Area (ha)	Total Flow Rate (m3/s)
Existing Roof	13.25	0.2787	0.004
Proposed Roof	42	0.6937	0.029
TOTAL ROOF	-	0.9724	0.033
TOTAL AREA		**2.340**	**ha**

2 Year Storm		
$Q_{post\text{-}surface}$	0.1866 m^3/s	(Peak Flow)
$Q_{post\text{-}rooftop}$	0.0328 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.2194 m^3/s**	**(Peak Flow)**
5 Year Storm		
$Q_{post\text{-}surface}$	0.2511 m^3/s	(Peak Flow)
$Q_{post\text{-}rooftop}$	0.0328 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.2839 m^3/s**	**(Peak Flow)**
10 Year Storm		
$Q_{post\text{-}surface}$	0.2906 m^3/s	(Peak Flow)
$Q_{post\text{-}rooftop}$	0.0328 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.3234 m^3/s**	**(Peak Flow)**
25 Year Storm		
$Q_{post\text{-}surface}$	0.3428 m^3/s	(Peak Flow)
$Q_{post\text{-}rooftop}$	0.0328 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.3756 m^3/s**	**(Peak Flow)**
50 Year Storm		
$Q_{post\text{-}surface}$	0.3926 m^3/s	(Peak Flow)
$Q_{post\text{-}rooftop}$	0.0328 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.4255 m^3/s**	**(Peak Flow)**
100 Year Storm		
$Q_{post\text{-}surface}$	0.4340 m^3/s	(Peak Flow)
$Q_{post\text{-}rooftop}$	0.0328 m^3/s	(Peak Flow)
$Q_{post\text{-}total}$	**0.4669 m^3/s**	**(Peak Flow)**

CROZIER & ASSOCIATES Consulting Engineers

PROJECT: Bronte Village Mall | **DESIGN:** TL | **DATE:** 10/26/2017
PROJECT No.: 1348-4555 | **CHECK:** BP | **UPDATED:** 4/6/2018

STORAGE VOLUME CALCULATION - 2-YEAR DESIGN STORM EVENT

Outlet: Jones Street

Criteria:

Control 2 yr post-development peak flow rate to the 2 yr pre-development peak flow rate

Allowable Release Rate: 0.0994 m^3/s (2-yr pre-development flow rate)
Actual Release Rate: 0.0807 m^3/s (From orifice discharge curve)

Post Development Condition:

Catchment 202:

-	0.0028	factor	(Metric conversion in equation)
C_{post}	0.90	-	(Runoff coefficient)
$Area_{Post}$	0.698	ha	(Drainage area)
T_c	10	min	
Td	600	sec	
i	82.18	mm/hr	
Q_{roof}	0.008	m^3/s	
Q_{post}	0.145	m^3/s	(Post-Development Peak Flow Rate)

2-Yr Post-Development Release Rate:

Catchment 202:	0.1446	m^3/s
Roof:	0.008	m^3/s
Total:	0.1525	m^3/s

Intensity

$i_{(Td)} = A/(Td+B)^{\wedge}C$

Peak Flow

$Q_{post} = 0.0028 \bullet C_{post} \bullet i_{(Td)} \bullet A$

Storage

$S_d = Q_{post} \bullet T_d - Q_{pre} (T_d + T_c) / 2$

Preliminary Storage Volume Determination

T_d	i_{YEAR} @T_d	T_d	Q_{post}	S_d
min	*mm/hr*	*sec*	*m3/s*	*m3*
10	**82.18**	600	*0.153*	**43.1**
11	**77.95**	660	*0.145*	**44.9**
12	**74.18**	720	*0.138*	**46.4**
13	**70.79**	780	*0.133*	**47.7**
14	**67.74**	840	*0.127*	**48.7**
15	**64.96**	900	*0.122*	**49.5**
16	**62.42**	960	*0.118*	**50.1**
17	**60.10**	1020	*0.114*	**50.6**
18	**57.96**	1080	*0.110*	**50.9**
19	**55.98**	1140	*0.106*	**51.1**
20	**54.15**	1200	*0.103*	**51.2**
21	**52.45**	1260	*0.100*	**51.2**
22	**50.86**	1320	*0.097*	**51.1**
23	**49.38**	1380	*0.095*	**51.0**
24	**47.99**	1440	*0.092*	**50.7**
25	**46.68**	1500	*0.090*	**50.4**
26	**45.46**	1560	*0.088*	**50.0**
27	**44.30**	1620	*0.086*	**49.5**
28	**43.20**	1680	*0.084*	**49.0**
29	**42.17**	1740	*0.082*	**48.5**
30	**41.19**	1800	*0.080*	**47.9**

TOTAL STORAGE VOLUME REQUIRED: **51.2** **m^3**

CROZIER & ASSOCIATES Consulting Engineers

PROJECT: Bronte Village Mall **DESIGN:** TL **DATE:** 10/26/2017
PROJECT No.: 1348-4555 **CHECK:** BP **UPDATED:** 4/6/2018

STORAGE VOLUME CALCULATION - 5-YEAR DESIGN STORM EVENT

Outlet: Jones Street

Criteria:

Control 5 yr post-development peak flow rate to the 5 yr pre-development peak flow rate

Allowable Release Rate: 0.1382 m^3/s (5-yr pre-development flow rate)
Actual Release Rate: 0.1008 m^3/s (From orifice discharge curve)

Post Development Condition:
Catchment 202:

-	0.0028 factor	(Metric conversion in equation)
C_{post}	0.90 -	(Runoff coefficient)
$Area_{Post}$	0.70 ha	(Drainage area)
T_c	10 min	
Td	600 sec	
i	114.21 mm/hr	
Q_{roof}	0.008 m3/s	
Q_{post}	0.201 m^3/s	(Post-Development Peak Flow Rate)

5-Yr Post-Development Release Rate:

Catchment 202: 0.2010 m^3/s
Roof: 0.008 m^3/s
Total: 0.2089 m^3/s

Intensity
i(Td) = A/(Td+B)^C

Peak Flow
Qpost = 0.0028 • Cpost • i(Td) • A

Storage
Sd = Qpost • Td - Qpre (Td + Tc) / 2

Preliminary Storage Volume Determination

Td	iYEAR @Td	Td	Qpost	Sd
min	*mm/hr*	*sec*	*m3/s*	*m3*
10	**114.21**	600	*0.209*	**64.9**
11	**108.46**	660	*0.199*	**67.7**
12	**103.30**	720	*0.190*	**70.1**
13	**98.64**	780	*0.182*	**72.0**
15	**90.59**	900	*0.167*	**75.0**
16	**87.07**	960	*0.161*	**76.1**
17	**83.84**	1020	*0.155*	**76.9**
18	**80.86**	1080	*0.150*	**77.6**
19	**78.10**	1140	*0.145*	**78.0**
20	**75.54**	1200	*0.141*	**78.3**
21	**73.16**	1260	*0.137*	**78.5**
22	**70.93**	1320	*0.133*	**78.5**
23	**68.85**	1380	*0.129*	**78.4**
24	**66.90**	1440	*0.126*	**78.1**
25	**65.06**	1500	*0.122*	**77.8**
26	**63.33**	1560	*0.119*	**77.4**
27	**61.70**	1620	*0.116*	**76.9**
28	**60.16**	1680	*0.114*	**76.3**
29	**58.70**	1740	*0.111*	**75.6**

TOTAL STORAGE VOLUME REQUIRED: 78.5 m^3

CROZIER & ASSOCIATES Consulting Engineers

PROJECT: Bronte Village Mall **DESIGN:** TL **DATE:** 10/26/2017
PROJECT No.: 1348-4555 **CHECK:** BP **UPDATED:** 4/6/2018

STORAGE VOLUME CALCULATION - 10-YEAR DESIGN STORM EVENT

Outlet: Jones Street

Criteria:

Control 10 yr post-development peak flow rate to the 10 yr pre-development peak flow rate

Allowable Release Rate: 0.1630 m^3/s (10-yr pre-development flow rate)
Actual Release Rate: 0.1118 m^3/s (From orifice discharge curve)

Post Development Condition:
Catchment 202:

-	0.0028	factor	(Metric conversion in equation)
C_{post}	0.90	-	(Runoff coefficient)
$Area_{Post}$	0.70	ha	(Drainage area)
T_c	10	min	
Td	600	sec	
i	134.79	mm/hr	
Q_{roof}	0.008	m3/s	
Q_{post}	0.237	m^3/s	(Post-Development Peak Flow Rate)

10-Yr Post-Development Release Rate:

Catchment 202: 0.2372 m^3/s
Roof: 0.008 m^3/s
Total: 0.2451 m^3/s

Intensity

$i_{(Td)} = A/(Td+B)^{\wedge}C$

Peak Flow

$Q_{post} = 0.0028 \bullet C_{post} \bullet i_{(Td)} \bullet A$

Storage

$$S_d = Q_{post} \bullet T_d - Q_{pre} (T_d + T_c) / 2$$

Preliminary Storage Volume Determination

T_d	i_{YEAR} @T_d	T_d	Q_{post}	S_d
min	*mm/hr*	*sec*	*m3/s*	*m3*
10	**134.79**	600	*0.245*	**80.0**
11	**127.96**	660	*0.233*	**83.4**
12	**121.83**	720	*0.222*	**86.3**
13	**116.32**	780	*0.213*	**88.7**
14	**111.32**	840	*0.204*	**90.7**
15	**106.76**	900	*0.196*	**92.4**
16	**102.59**	960	*0.188*	**93.7**
17	**98.76**	1020	*0.182*	**94.8**
18	**95.23**	1080	*0.176*	**95.6**
19	**91.97**	1140	*0.170*	**96.3**
20	**88.94**	1200	*0.164*	**96.7**
21	**86.11**	1260	*0.159*	**96.9**
22	**83.48**	1320	*0.155*	**97.0**
23	**81.01**	1380	*0.150*	**97.0**
24	**78.70**	1440	*0.146*	**96.8**
25	**76.53**	1500	*0.143*	**96.5**
28	**70.73**	1680	*0.132*	**95.0**

TOTAL STORAGE VOLUME REQUIRED: **97.0** **m^3**

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PROJECT: Bronte Village Mall **DESIGN:** TL **DATE:** 10/26/2017
PROJECT No.: 1348-4555 **CHECK:** BP **UPDATED:** 4/6/2018

STORAGE VOLUME CALCULATION - 25-YEAR DESIGN STORM EVENT

Outlet: Jones Street

Criteria:

Control 25 yr post-development peak flow rate to the 25 yr pre-development peak flow rate

Allowable Release Rate: 0.1962 m^3/s (25-yr pre-development flow rate)
Actual Release Rate: 0.1260 m^3/s (From orifice discharge curve)

Post Development Condition:
Catchment 202:

-	0.0028 factor	(Metric conversion in equation)
C_{post}	0.90 -	(Runoff coefficient)
$Area_{Post}$	0.70 ha	(Drainage area)
T_c	10 min	
Td	600 sec	
i	162.17 mm/hr	
Q_{roof}	0.008 m3/s	
Q_{post}	0.285 m^3/s	(Post-Development Peak Flow Rate)

25-Yr Post-Development Release Rate:

Catchment 202: 0.2854 m^3/s
Roof: 0.008 m^3/s
Total: 0.2933 m^3/s

Intensity

$i_{(Td)} = A/(Td+B)^{\wedge}C$

Peak Flow

$Q_{post} = 0.0028 \bullet C_{post} \bullet i_{(Td)} \bullet A$

Storage

$$S_d = Q_{post} \bullet T_d - Q_{pre} (T_d + T_c) / 2$$

Preliminary Storage Volume Determination

T_d	$i_{YEAR}@T_d$	T_d	Q_{post}	S_d
min	*mm/hr*	*sec*	*m3/s*	*m3*
10	**162.17**	600	*0.293*	**100.4**
11	**153.81**	660	*0.279*	**104.5**
12	**146.35**	720	*0.265*	**108.0**
13	**139.62**	780	*0.254*	**110.9**
14	**133.54**	840	*0.243*	**113.3**
15	**128.00**	900	*0.233*	**115.3**
16	**122.94**	960	*0.224*	**117.0**
17	**118.29**	1020	*0.216*	**118.3**
18	**114.01**	1080	*0.209*	**119.4**
19	**110.06**	1140	*0.202*	**120.2**
20	**106.39**	1200	*0.195*	**120.7**
21	**102.98**	1260	*0.189*	**121.1**
22	**99.79**	1320	*0.184*	**121.3**
23	**96.81**	1380	*0.178*	**121.3**
24	**94.02**	1440	*0.173*	**121.1**
25	**91.40**	1500	*0.169*	**120.8**
26	**88.94**	1560	*0.164*	**120.4**
27	**86.61**	1620	*0.160*	**119.8**
28	**84.41**	1680	*0.156*	**119.2**

TOTAL STORAGE VOLUME REQUIRED:	**121.3**	**m^3**

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PROJECT: Bronte Village Mall **DESIGN:** TL **DATE:** 10/26/2017
PROJECT No.: 1348-4555 **CHECK:** BP **UPDATED:** 4/6/2018

STORAGE VOLUME CALCULATION - 50-YEAR DESIGN STORM EVENT

Outlet: Jones Street

Criteria:

Control 50 yr post-development peak flow rate to the 50 yr pre-development peak flow rate

Allowable Release Rate: 0.2202 m^3/s (50-yr pre-development flow rate)
Actual Release Rate: 0.1483 m^3/s (From orifice discharge curve)

Post Development Condition:
Catchment 202:

-	0.0028	factor	(Metric conversion in equation)
C_{post}	0.90	-	(Runoff coefficient)
$Area_{Post}$	0.70	ha	(Drainage area)
T_c	10	min	
Td	600	sec	
i	182.06	mm/hr	
Q_{roof}	0.008	m3/s	
Q_{post}	0.320	m^3/s	(Post-Development Peak Flow Rate)

50-Yr Post-Development Release Rate:

Catchment 202: 0.3204 m^3/s
Roof: 0.008 m^3/s
Total: 0.3283 m^3/s

Intensity

$i_{(Td)} = A/(Td+B)^{\wedge}C$

Peak Flow

$Q_{post} = 0.0028 \bullet C_{post} \bullet i_{(Td)} \bullet A$

Storage

$S_d = Q_{post} \bullet T_d - Q_{pre} (T_d + T_c) / 2$

Preliminary Storage Volume Determination

T_d	i_{YEAR} @T_d	T_d	Q_{post}	S_d
min	*mm/hr*	*sec*	*m3/s*	*m3*
10	**182.06**	*600*	*0.328*	**108.0**
11	**172.69**	*660*	*0.312*	**112.4**
12	**164.30**	*720*	*0.297*	**116.0**
13	**156.75**	*780*	*0.284*	**119.0**
14	**149.91**	*840*	*0.272*	**121.5**
15	**143.68**	*900*	*0.261*	**123.4**
16	**137.99**	*960*	*0.251*	**125.0**
17	**132.76**	*1020*	*0.242*	**126.2**
18	**127.94**	*1080*	*0.233*	**127.1**
19	**123.49**	*1140*	*0.225*	**127.7**
20	**119.36**	*1200*	*0.218*	**128.1**
21	**115.51**	*1260*	*0.211*	**128.2**
22	**111.93**	*1320*	*0.205*	**128.1**
23	**108.57**	*1380*	*0.199*	**127.7**
24	**105.43**	*1440*	*0.193*	**127.3**
25	**102.47**	*1500*	*0.188*	**126.6**
26	**99.69**	*1560*	*0.183*	**125.8**
27	**97.07**	*1620*	*0.179*	**124.9**
28	**94.59**	*1680*	*0.174*	**123.9**

TOTAL STORAGE VOLUME REQUIRED: 128.2 m^3

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PROJECT No.: 1348-4555 **CHECK:** BP **UPDATED:** 4/6/2018

STORAGE VOLUME CALCULATION - 100-YEAR DESIGN STORM EVENT

Outlet: Jones Street

Criteria:

Control 100 yr post-development peak flow rate to the 100 yr pre-development peak flow rate

Allowable Release Rate: 0.2429 m^3/s (100-yr pre-development flow rate)
Actual Release Rate: 0.1638 m^3/s (From orifice discharge curve)

Post Development Condition:
Catchment 202:

-	0.0028	factor	(Metric conversion in equation)
C_{post}	0.90	-	(Runoff coefficient)
$Area_{Post}$	0.70	ha	(Drainage area)
T_c	10	min	
Td	600	sec	
i	200.80	mm/hr	
Q_{roof}	0.008	m3/s	
Q_{post}	0.353	m^3/s	(Post-Development Peak Flow Rate)

100-Yr Post-Development Release Rate:

Catchment 202: 0.3534 m^3/s
Roof: 0.008 m^3/s
Total: 0.3613 m^3/s

Intensity

$i_{(Td)} = A/(Td+B)^{\wedge}C$

Peak Flow

$Q_{post} = 0.0028 \bullet C_{post} \bullet i_{(Td)} \bullet A$

Storage

$S_d = Q_{post} \bullet T_d - Q_{pre} (T_d + T_c) / 2$

Preliminary Storage Volume Determination

T_d	i_{YEAR} @T_d	T_d	Q_{post}	S_d
Preliminary Storage Volume Determination				
10	**200.80**	*600*	*0.361*	**118.5**
11	**190.41**	*660*	*0.343*	**123.2**
12	**181.11**	*720*	*0.327*	**127.1**
13	**172.74**	*780*	*0.312*	**130.3**
14	**165.16**	*840*	*0.299*	**132.9**
15	**158.27**	*900*	*0.286*	**135.0**
16	**151.97**	*960*	*0.275*	**136.6**
17	**146.18**	*1020*	*0.265*	**137.8**
18	**140.86**	*1080*	*0.256*	**138.7**
19	**135.93**	*1140*	*0.247*	**139.3**
20	**131.37**	*1200*	*0.239*	**139.5**
21	**127.12**	*1260*	*0.232*	**139.5**
22	**123.16**	*1320*	*0.225*	**139.3**
23	**119.45**	*1380*	*0.218*	**138.9**
24	**115.98**	*1440*	*0.212*	**138.3**
25	**112.72**	*1500*	*0.206*	**137.5**
26	**109.65**	*1560*	*0.201*	**136.5**
27	**106.76**	*1620*	*0.196*	**135.4**
28	**104.03**	*1680*	*0.191*	**134.2**

TOTAL STORAGE VOLUME REQUIRED: **139.5** **m^3**

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PROJECT No.: 1348-4555
DESIGN: TL
CHECK: BP
DATE: 10/27/2017
UPDATE: 4/6/2018

ORIFICE TUBE DESIGN SUMMARY

Address: 2441 Lakeshore Road West

Outlet: Jones Street Storm Sewer System

Orifice Type	=	Orifice Tube	
Invert Elevation	=	81.37	m
Diameter of Orifice	=	200	mm
Area of Orifice (A)	=	0.0314	sq.m
Orifice Coefficient (Cd)	=	0.82	
Centroid Elevation	=	81.47	m

Rating Table

ORIFICE INVERT	Elevation	Discharge	Required Storage Volume	Provided Storage Volume		
				Triton	Surface Ponding	Total Storage
	m	m^3/s	m^3	m^3	m^3	m^3
	81.37	0.0000	-	0	0	0
2-year	81.97	0.0807	51.2	52.6	0.0	52.6
5-year	82.25	0.1008	78.5	79.9	0.0	79.9
10-year	82.43	0.1118	97.0	97.4	0.0	97.4
25-year	82.69	0.1260	121.3	122.7	0.0	122.7
50-year	83.16	0.1483	128.2	128.6	0.0	128.6
100-year	83.53	0.1638	139.5	128.6	12.0	140.6

Triton S-29 Profile

Top of Grade:	83.39 m asl
Bottom Elevation of Pavement Structure:	82.80 m asl
Top Elevation of Embedment Stone:	82.75 m asl
Top Elevation - Storage Chamber:	82.31 m asl
Invert Elevation:	81.43 m asl
Bottom Elevation - Storage Chamber:	81.40 m asl
Bottom Elevation of Embedment Stone:	81.25 m asl

Note: Embedment stone assumed to have a void space of 0.4
Note: Impermeable liner installed at bottom elevation of embedment stone, complete with dual layer of geotextile

Construction Drawings
Prepared For:
CROZIER & ASSOCIATES

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OAKVILLE, ON

INDEX

SHEET	DESCRIPTION
1.	Title Sheet
2.	Typical Chamber Details
3.	Typical End Cap Details
4.	Product Specifications
5.	Site Servicing Plan
6.	General Plan View
7.	Section A-A
8.	Section B-B

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1	05/07/2018	REVISED LAYOUT AND DESIGN PER CROZIER	
2	05/08/2018	REVISED ELEVATIONS AS PER CROZIER	
3	05/22/2018	REVISED LAYOUT AS PER CROZIER	

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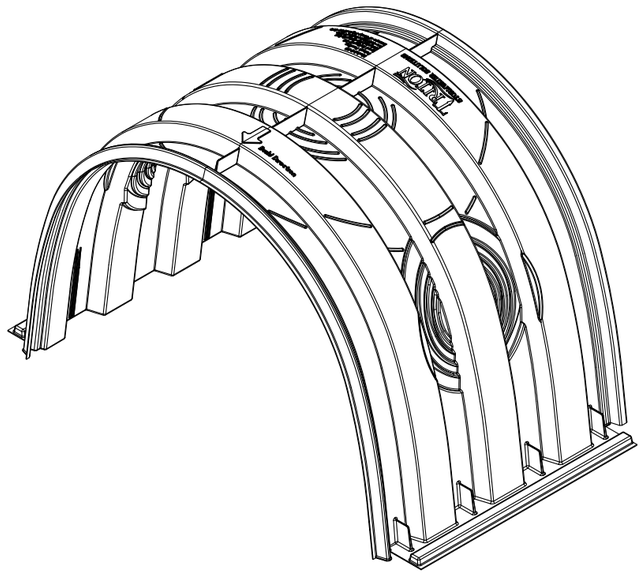
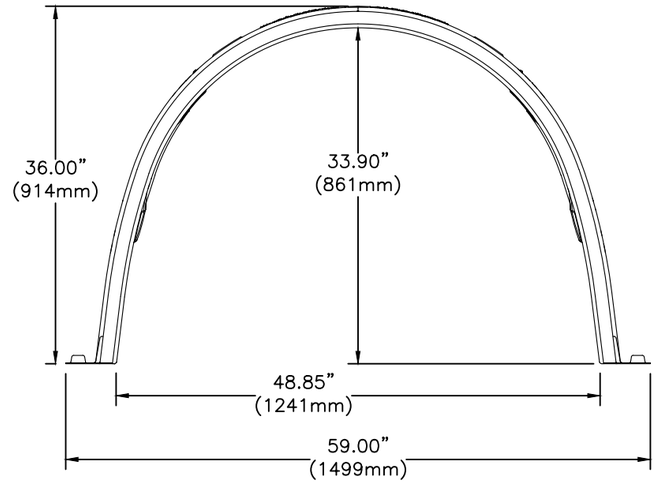
TITLE SHEET

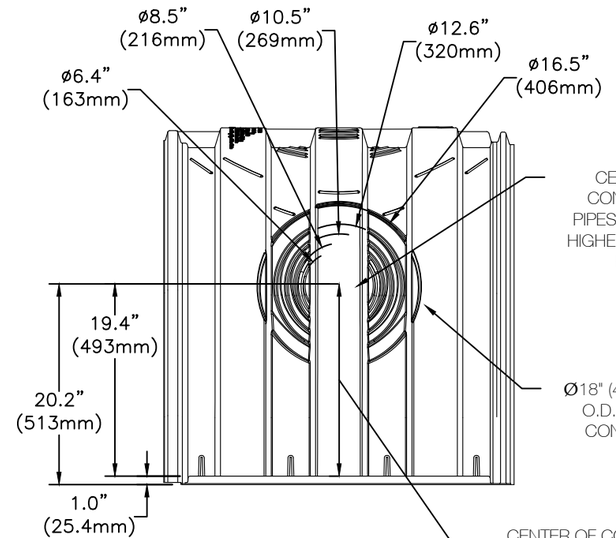
Sheet Number
1 OF 8

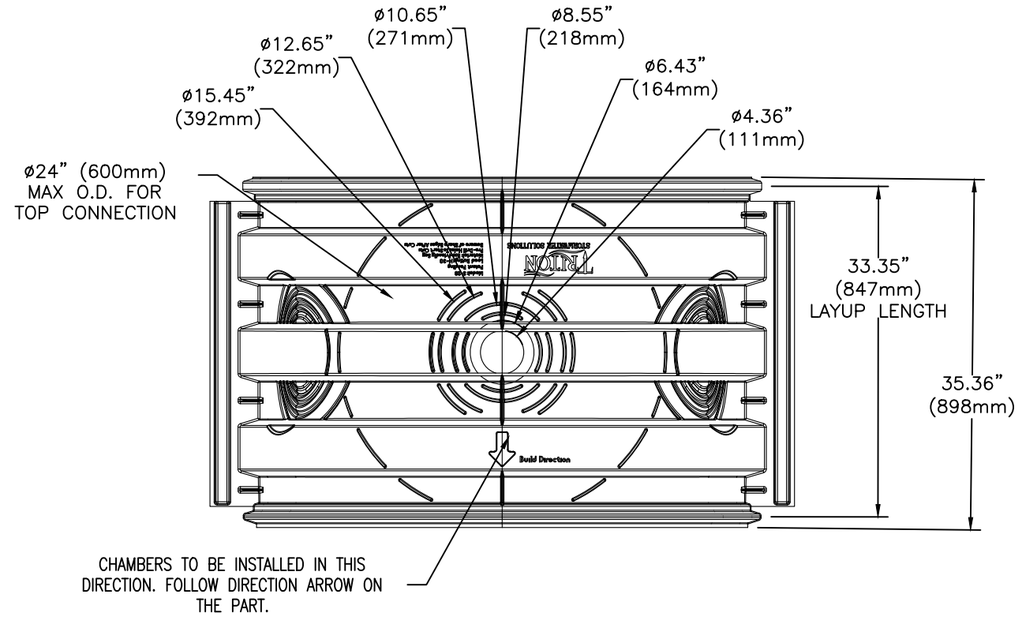


S-29 CHAMBER SPECS	
NOMINAL DIMENSIONS (LAYUP LENGTH X WIDTH X HEIGHT)	33.35" X 59.00" X 36.00" (847mm X 1499mm X 914mm)
BARE CHAMBER STORAGE	27.35 CUBIC FEET (0.774 CUBIC METERS)
*MIN INSTALLED STORAGE	41.05 CUBIC FEET (1.162 CUBIC METERS)
CHAMBER WEIGHT	32 lbs (14.515 kg)
STORAGE PER LINEAR UNIT WITHOUT STONE	9.84 FT^3/FT (0.914 M^3/M)
STORAGE PER LINEAR UNIT WITH STONE	14.77 FT^3/FT (1.372 M^3/M)
*ASSUMING A MIN OF 6" (152mm) STONE ABOVE AND BELOW AND 7.5" (191mm) BETWEEN ROWS WITH 40% STONE POROSITY (DOES NOT INCLUDE 12" (305mm) PERIMETER STONE VOLUME)	

NOTE: S-29 CHAMBER DETAILS TESTED AND RATED FOR H-30 LOAD CONDITIONS WITH 18" (457mm) OF COVER AND NO PAVEMENT .







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TYPICAL CHAMBER DETAIL

Sheet Number
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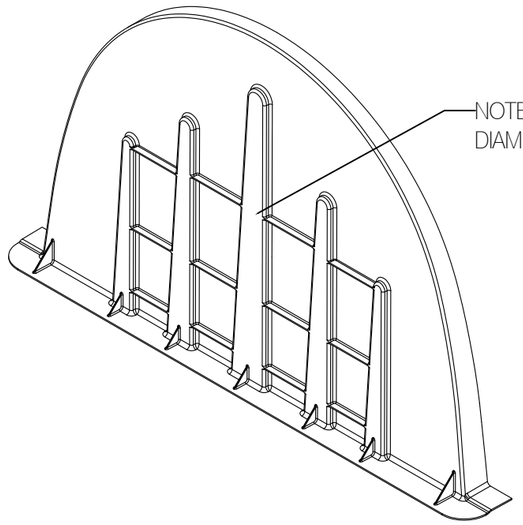
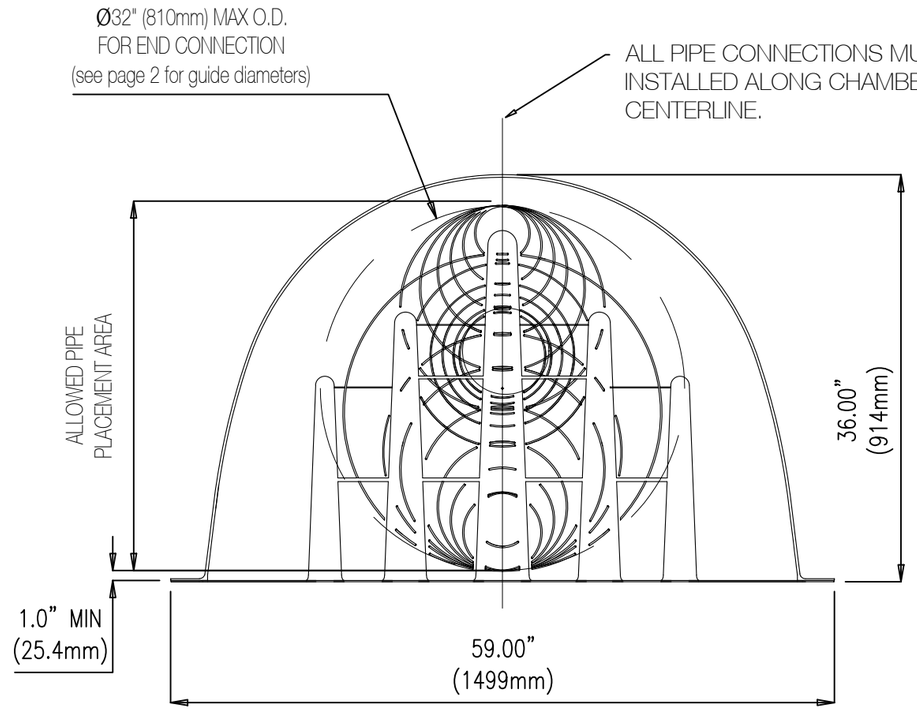
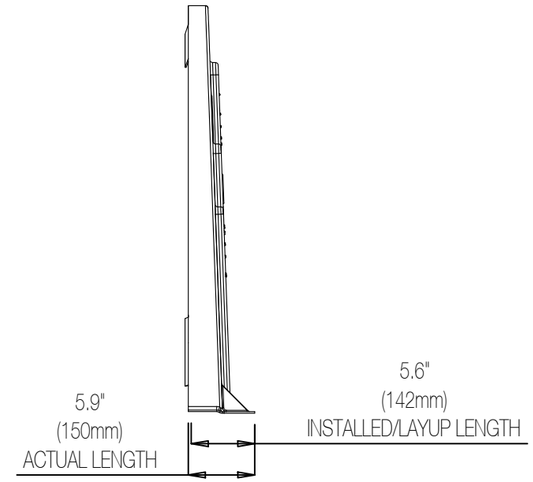


NOTE: REFER TO PAGE 2 FOR SIZES OF DIAMETER CUT GUIDES.

S-29 END CAP SPECS	
NOMINAL DIMENSIONS (LAYUP LENGTH X WIDTH X HEIGHT)	5.90" X 59.00" X 36.00" (150mm X 1499mm X 914mm)
BARE END CAP STORAGE	1.031 CUBIC FEET (0.029 CUBIC METERS)
*MIN INSTALLED STORAGE	4.98 CUBIC FEET (0.141 CUBIC METERS)
*ASSUMING A MIN OF 6" (152mm) STONE ABOVE AND BELOW AND 7.5" (191mm) BETWEEN ROWS WITH 40% STONE POROSITY (DOES NOT INCLUDE 12" (305mm) PERIMETER STONE VOLUME)	





THE END CAP FITS UP ON THE OUTSIDE OF THE S-29 CHAMBER. REFER TO INSTALLATION MANUAL FOR FURTHER DETAIL.

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TYPICAL END CAP DETAIL

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TRITON S-29 PRODUCT SPECIFICATIONS

1.0 General

1.1 Triton chambers are designed to control stormwater runoff. As a subsurface retention or detention system, Triton chambers retain and allow effective infiltration of water into the soil. As a subsurface detention system, Triton chambers detain and allow for the metered flow of water to an outfall.

2.0 Chamber Parameters

2.1 The chamber shall be injection compression molded of a structural grade 1010 green soy resin composite to be inherently resistant to environmental stress cracking (ESCR), creep, and to maintain proper stiffness through temperature ranges of -40 degrees Fahrenheit to 180 degrees Fahrenheit (-40 degrees Celsius to 82.2 degrees Celsius).

2.2 The material property for the chamber and end cap must meet or exceed the following:
Tensile Strength- Ultimate: 21,755 PSI (149.9 Mpa)
Tensile Strength-Yield: 17,404 PSI (119.9 Mpa)
Tensile Modulus: 1,750-2,240 PSI (12.0 Mpa - 15.4 Mpa)
Flex Modulus: 1,600 KSI (11,031.6 Mpa)
Flex Yield Strength: 33,100 PSI (228.2 Mpa)
Compressive Strength: 30,457,000 PSI (209,993.6 Mpa)
Shear Strength: 11,500 PSI (79.29 Mpa)

2.3 The nominal chamber dimensions of the Triton S-29 shall be 36.0 inches tall (914 millimeters), 59.0 inches wide (1499 millimeters) and 35.36 inches long (898 millimeters). Lay-up length is 33.35 inches (847 millimeters).

2.4 The chamber shall have an elliptical curved section profile.

2.5 The chamber shall be open-bottomed.

2.6 The chamber shall incorporate an overlapping corrugation joint system to allow chamber rows to be constructed.

2.7 The nominal storage volume of a Triton S-29 chamber shall be 41.05 cubic feet (1.162 cubic meters) per chamber when installed per Triton's typical details. This equates to 2.67 cubic feet (0.075 cubic meters) of storage per square foot of bed. This does not include perimeter stone.

2.8 The chamber shall have both of its ends open to allow for unimpeded hydraulic flows and visual inspections down a row's entire length.

2.9 The chamber shall have five corrugations to achieve strengths defined above.

2.10 The chamber shall have five circular and elliptical, indented and raised, surfaces on the top to the chamber for a maximum of 24 inch (610 millimeter) diameter optional top feed inlets, inspection ports and/or clean-out access ports.

2.11 The chamber shall have five elliptical, indented, surfaces on either side of the chamber for optional feed inlets, outlets. Capable of accepting pipe O.D. up to 18 inches (450 millimeters).

2.12 The chamber shall be analyzed, designed and field tested using AASHTO LRFD bridge design specifications 1. Design live load shall meet or exceed the AASHTO HS30 or a rear axle load of 48,000 pounds (21,772.4 kg). Design shall consider earth and live loads without pavement as appropriate for the minimum 18 inches (457 millimeters) of total cover to a maximum total cover of 50 feet (15.24 meters).

2.13 The chamber shall be manufactured in an ISO 9001:2008 certified facility

2.14 The service life of the product is over 60 years under a constant sustained load of 10,000 PSI (68.95 Mpa) which is equal to the H-20 loading condition. Under typical loading conditions the Chamber and End Cap has a useful life span of 120 years from date of when manufactured.

3.0 End Cap Parameters

3.1 The end cap shall be Injection Compression molded of 1010 green soy resin to be inherently resistant to environmental stress cracking (ESCR), creep and to maintain proper stiffness through temperature ranges of -40 degrees Fahrenheit to 180 degrees Fahrenheit (-40 degrees Celsius to 82.2 degrees Celsius).

3.2 The end cap shall be designed to fit over the last corrugation of a chamber, which allows: the capping of each end of the chamber row.

3.3 The end cap shall have six upper saw guides capable of accepting pipe O.D. up to 17.81 inches (452 millimeters), five middle saw guides capable of accepting pipe O.D. up to 15.99 inches (406mm) and eight lower saw guides capable of accepting pipe O.D. up to 27.92 inches (709 millimeters) to allow easy cutting for various diameters of pipe that may be used to inlet or outlet the system. See end cap detail for further details.

3.4 The end cap shall have excess structural adequacies to allow cutting an orifice of any size at any invert elevation.

3.5 The primary face of an end cap shall have five corrugations and be angled outward to resist horizontal loads generated near the edges of beds.

3.6 The end cap shall be manufactured in an ISO 9001:2008 certified facility.

3.7 The service life of the product to be over 60 years under a sustained load of 10,000 PSI (68.95 Mpa) which is equal to the H-20 loading condition.

3.8 The nominal storage volume of a Triton S-29 end cap shall be 4.98 cubic feet (0.141 cubic meters) per end cap when installed per triton's typical details. This equates to 1.83 cubic feet (0.052 cubic meters) of storage per square foot of bed.

4.0 Installation

4.1 Installation shall be in accordance with the latest Triton Installation manual that can be downloaded from the Triton website: www.tritonsws.com/support/downloads

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PRODUCT SPECIFICATIONS

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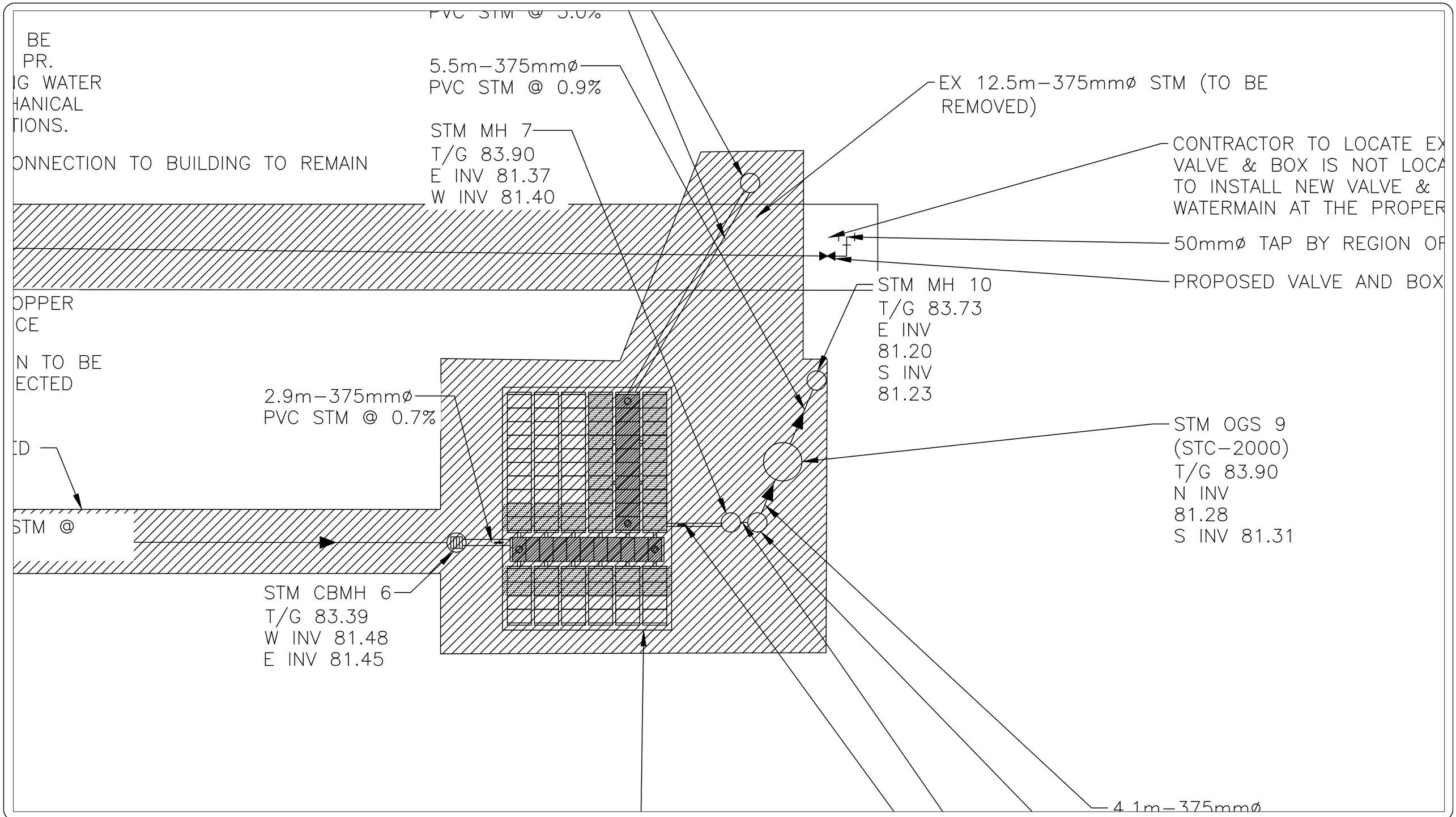

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2	05/08/2018	REVISED ELEVATIONS AS PER CROZIER
3	05/22/2018	REVISED LAYOUT AS PER CROZIER

Project Number

Date Drawn
04/26/2018

Scale
N.T.S.

Designed by

Drawn by

Checked by

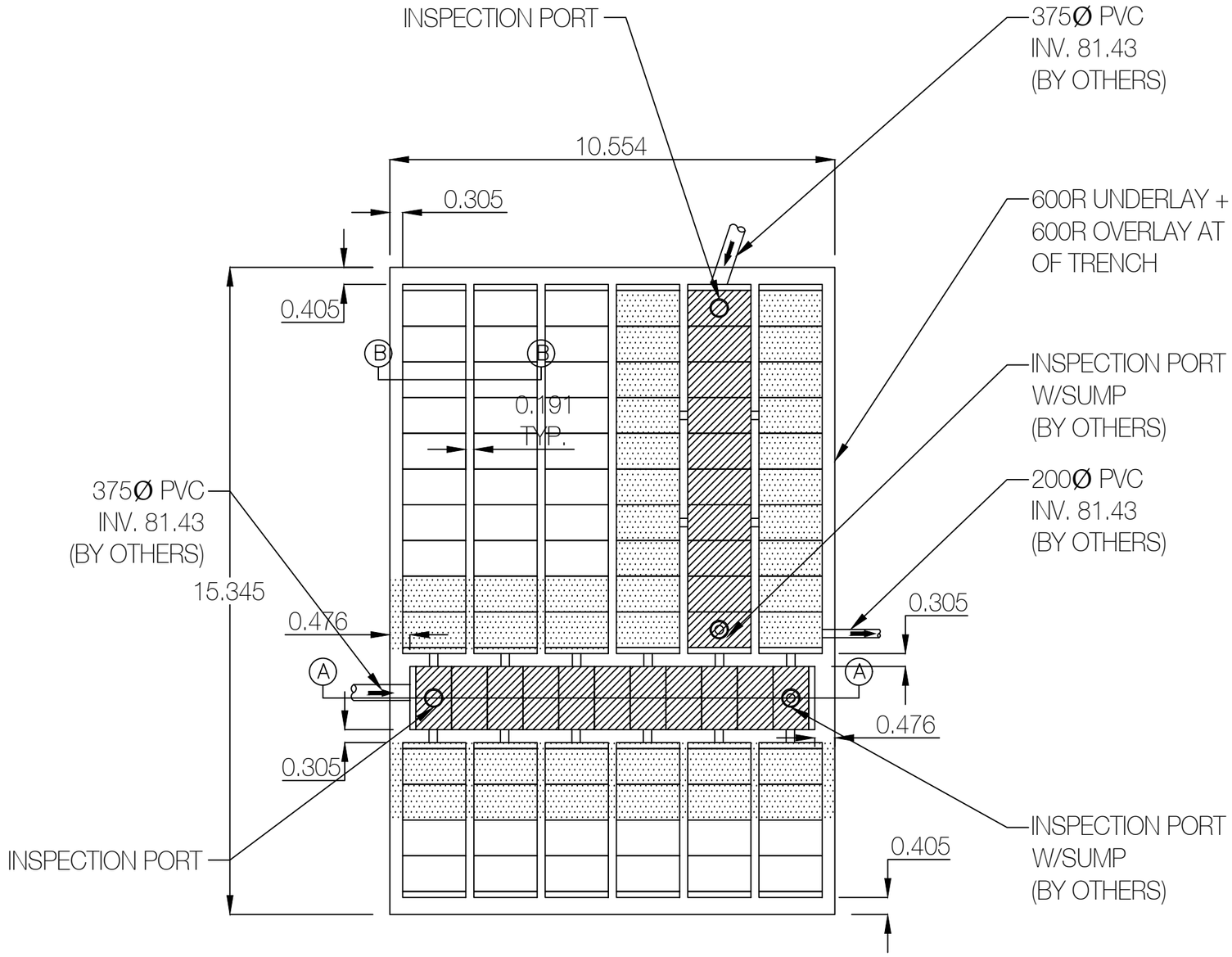
BRONTE VILLAGE
OAKVILLE, ON

SITE SERVICING PLAN

Sheet Number
5 OF 8

NOTES

1. ALL DIMENSIONS ARE IN METERS OR UNLESS OTHERWISE SHOWN.
2. NOT TO SCALE.
3. PLEASE REFER TO THE LATEST INSTALLATION GUIDELINES:
   http://www.tritonsws.com/support/downloads



LEGEND

- DISTRIBUTION CHAMBER WITH GEOGRID BELOW
- DISTRIBUTION CHAMBER
- HEADER ROW

BRONTE VILLAGE
OAKVILLE,ON

ITEM NUMBER	ITEM DESCRIPTION	QTY	UNITS
1	TRITON S-29 CHAMBER	95	EA
2	ENDCAP	26	EA
3	HEADER ROW FLOOR (HDPE LINER OVER 360R)	20	M
4	TERRAFIX 360R GEOTEXTILE (4.57mX91.44m PER ROLL)	1	EA
5	DISTRIBUTION PIPES (200mm Ø PVC X 4.27m)	4	EA
6	INSPECTION RISERS (250mm Ø PVC X 4.27m)	4	EA
7	GEOGRID PANELS (1.981m WIDE)	34	M
8	40 MIL HDPE LINER WITH 600R UNDERLAY AND OVERLAY	1	EA

terrafix
geosynthetics inc.

455 Horner Avenue
Toronto, Ontario
M8W 4W9
Tel:(416) 674-0363

REVISIONS \ ISSUE

1	05/07/2018	REVISED LAYOUT AND DESIGN PER CROZIER
2	05/08/2018	REVISED ELEVATIONS AS PER CROZIER
3	05/22/2018	REVISED LAYOUT AS PER CROZIER

Project Number

Date Drawn
04/26/2018

Scale
N.T.S.

Designed by

Drawn by

Checked by

BRONTE VILLAGE
OAKVILLE, ON

GENERAL PLAN VIEW

Sheet Number
6 OF 8

NOTES

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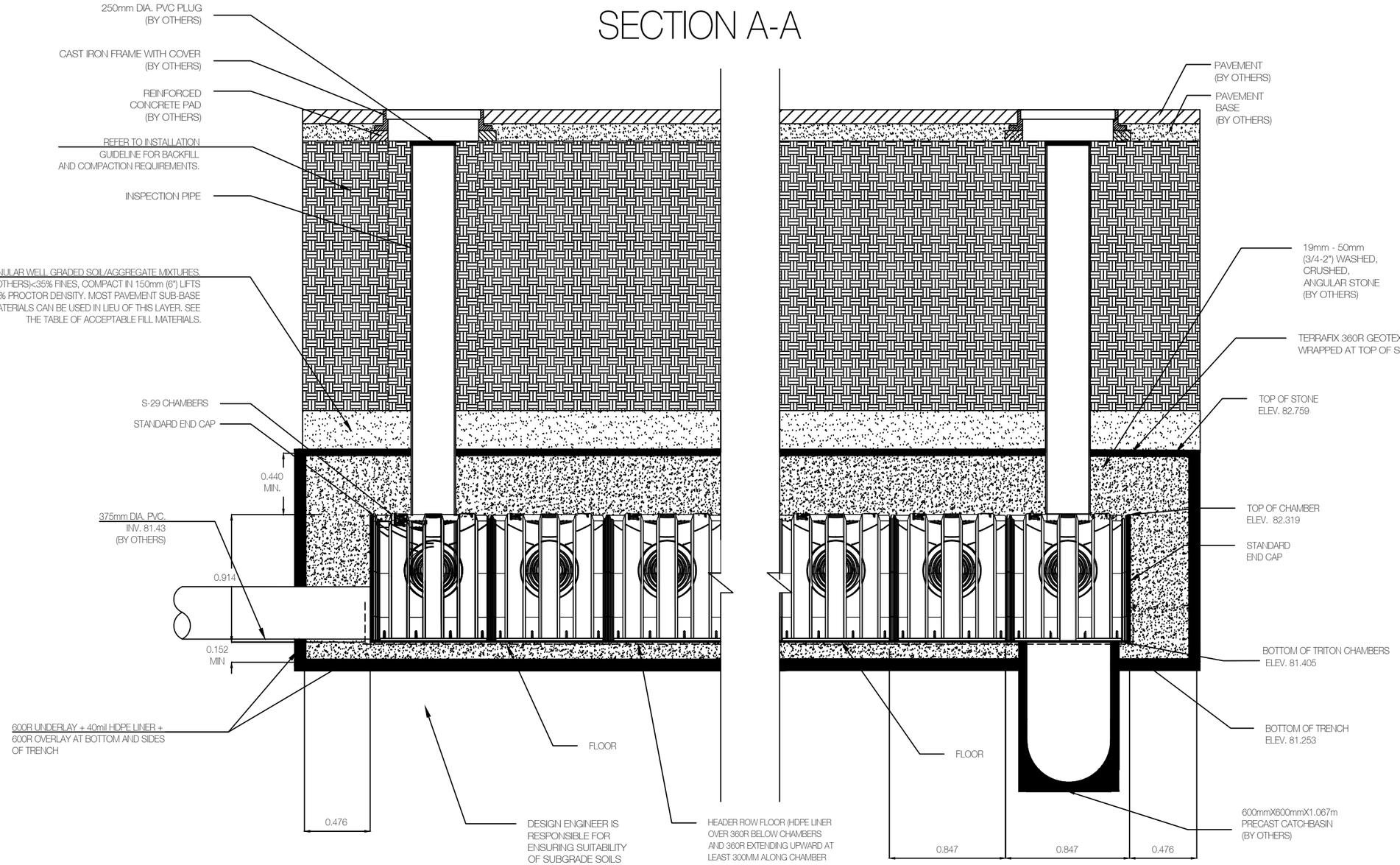
   http://www.tritonsws.com/support/downloads

SECTION A-A



*
FOR UNPAVED INSTALLATION WHERE
RUTTING FROM VEHICLES MAY OCCUR,
INCREASE COVER TO 24" (610mm)

NOTE:
ENGINEER TO CONFIRM SEASONALLY HIGH WATER TABLE ELEVATION IS BELOW BOTTOM OF TRENCH

terrafix
geosynthetics inc.

455 Horner Avenue
Toronto, Ontario
M8W 4W9
Tel:(416) 674-0363

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Project Number

Date Drawn
04/26/2018

Scale
N.T.S.

Designed by

Drawn by

Checked by

BRONTE VILLAGE

OAKVILLE, ON

SECTION A-A

Sheet Number
7 OF 8

NOTES

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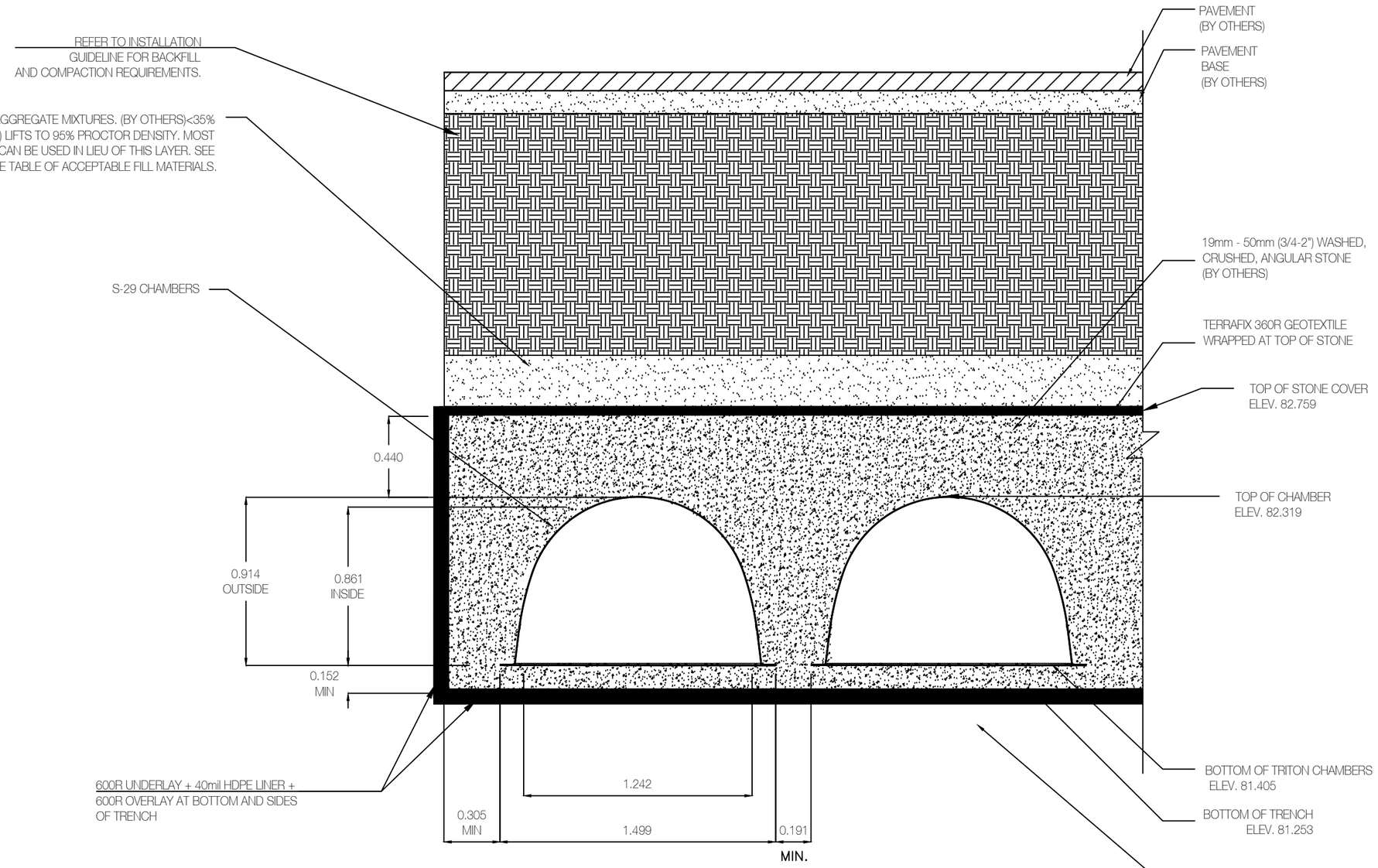
2. NOT TO SCALE.
3. PLEASE REFER TO THE LATEST INSTALLATION GUIDELINES:
   http://www.tritonsws.com/support/downloads

SECTION B-B



* FOR UNPAVED INSTALLATION WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (610mm)

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04/26/2018

Scale
N.T.S.

Designed by

Drawn by

Checked by

BRONTE VILLAGE
OAKVILLE, ON

SECTION B-B

Sheet Number
8 OF 8

Triton Storage Calculator

Non-Rectangular Footprint, Including Perimeter Stone

Units: Metric (user can change units in the "Reference" tab, below)

User Input:

Triton Chamber Model	S-29	
Number of Rows	13	
Number of Chambers	95	
Base of Stone Elevation	81.25	m
Depth of Stone Above Chambers	440.00	mm
Depth of Stone Below Chambers	152.0	mm
System Footprint	162.0	m^2
Voids in Stone (porosity)	40%	

System minimums are automatically populated by default. The defaults can be overwritten if desired. Red cells indicate that the minimums have not been met and must be revised, while green cells indicate values larger than the minimums.

Calculated Values:

Number of End Caps	26	
System Depth	1.506	m
Volume of Stone Required	169.6	m^3
System Storage Volume	142.1	m^3

Constants:

Chamber Width at Legs	1499	mm
Chamber Height	914.0	mm
Chamber Length at Overlap	847.00	mm
End Cap Length at Overlap	142.00	mm
Min. Depth of Stone Above Chambers	3	mm
Min. Depth of Stone Below Chambers	3	mm
Min. End Stone	305	mm
Min. Side Stone	305	mm
Min. Distance Between Legs of Chambers	6.0	mm
Layup Chamber Volume	0.774	m^3
Layup End Cap Volume	0.029	m^3

Incremental Storage Output:

Height of System	Cumulative Chamber & End Cap Volume	Cumulative Stone Void Volume	Cumulative System Volume	Elevation		
(mm)	(m^3)	(m^3)	(m^3)	(m)		
0.0	0.0	0.0	0.0	81.25		
25.0	0.0	1.6	1.6	81.28		
50.0	0.0	3.2	3.2	81.30		
75.0	0.0	4.9	4.9	81.33		
100.0	0.0	6.5	6.5	81.35		
125.0	0.0	8.1	8.1	81.38		
150.0	0.0	9.7	9.7	81.40		
152.0	0.0	9.8	9.8	81.41		
177.0	2.7	10.4	13.1	81.43	storage above inlet of pipe =	129.1
202.0	2.7	12.0	14.7	81.46		
227.0	5.3	12.6	17.9	81.48		
252.0	8.0	13.1	21.1	81.51		
277.0	10.6	13.7	24.3	81.53		
302.0	13.2	14.3	27.5	81.56		
327.0	15.8	14.9	30.7	81.58		
352.0	18.4	15.4	33.8	81.61		
377.0	20.9	16.0	37.0	81.63		
402.0	23.5	16.6	40.1	81.66		
427.0	26.0	17.2	43.3	81.68		
452.0	28.6	17.9	46.4	81.71		
477.0	31.1	18.5	49.5	81.73		
502.0	33.5	19.1	52.6	81.76		
527.0	36.0	19.7	55.7	81.78		
552.0	38.4	20.4	58.8	81.81		
577.0	40.8	21.1	61.9	81.83		
602.0	44.3	21.3	65.6	81.86		
627.0	45.5	22.4	67.9	81.88		
652.0	47.8	23.1	70.9	81.91		
677.0	50.1	23.8	73.9	81.93		
702.0	52.3	24.6	76.8	81.96		
727.0	54.4	25.3	79.8	81.98		
752.0	56.6	26.1	82.7	82.01		
777.0	58.6	26.9	85.5	82.03		
802.0	60.6	27.7	88.3	82.06		
827.0	62.5	28.6	91.1	82.08		
852.0	64.4	29.4	93.8	82.11		
877.0	66.1	30.4	96.5	82.13		
902.0	67.8	31.3	99.1	82.16		
927.0	69.3	32.3	101.7	82.18		
952.0	70.8	33.4	104.1	82.21		
977.0	72.0	34.5	106.5	82.23		
1002.0	73.0	35.7	108.7	82.26		
1027.0	73.8	37.0	110.8	82.28		
1052.0	74.2	38.5	112.6	82.31		
1066.0	74.3	39.3	113.7	82.32		
1091.0	0.0	40.9	115.3	82.34		
1116.0	0.0	42.6	116.9	82.37		
1141.0	0.0	44.2	118.5	82.39		
1166.0	0.0	45.8	120.1	82.42		
1191.0	0.0	47.4	121.8	82.44		
1216.0	0.0	49.0	123.4	82.47		
1241.0	0.0	50.7	125.0	82.49		
1266.0	0.0	52.3	126.6	82.52		
1291.0	0.0	53.9	128.2	82.54		
1316.0	0.0	55.5	129.9	82.57		
1341.0	0.0	57.1	131.5	82.59		
1366.0	0.0	58.8	133.1	82.62		
1391.0	0.0	60.4	134.7	82.64		
1416.0	0.0	62.0	136.3	82.67		
1441.0	0.0	63.6	137.9	82.69		
1466.0	0.0	65.2	139.6	82.72		
1491.0	0.0	66.9	141.2	82.74		
1506.0	0.0	67.8	142.2	82.76		

Brief Stormceptor Sizing Report - 2441 Lakeshore Road West

Project Information & Location			
Project Name	Bronte Village Mall	**Project Number**	1348-4555
City	Oakville	**State/ Province**	Ontario
Country	Canada	**Date**	12/1/2017
Designer Information		**EOR Information (optional)**	
Name	wentao Liu	**Name**	Benjamin Peachman
Company	CF Crozier & Associates	**Company**	CF Crozier & Associates
Phone #	647-887-5656	**Phone #**	
Email	tliu@cfcrozier.ca	**Email**	bpeachman@cfcrozier.ca

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	2441 Lakeshore Road West
Target TSS Removal (%)	80
TSS Removal (%) Provided	86
Recommended Stormceptor Model	STC 750

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary		
Stormceptor Model	**% TSS Removal Provided**	**% Runoff Volume Captured Provided**
STC 300	78	95
STC 750	86	98
STC 1000	87	98
STC 1500	88	98
STC 2000	90	99
STC 3000	92	99
STC 4000	93	100
STC 5000	94	100
STC 6000	95	100
STC 9000	97	100
STC 10000	97	100
STC 14000	98	100
StormceptorMAX	Custom	Custom

Sizing Details

Drainage Area	
Total Area (ha)	0.301
Imperviousness %	59.7

Rainfall	
Station Name	TORONTO CENTRAL
State/Province	Ontario
Station ID #	0100
Years of Records	18
Latitude	45°30'N
Longitude	90°30'W

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	90.00
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	
Water Quality Flow Rate (L/s)	

Up Stream Storage	
Storage (ha-m)	Discharge (cms)
0.000	0.136

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cms)	

Particle Size Distribution (PSD)
The selected PSD defines TSS removal

City of Toronto PSD		
Particle Diameter (microns)	Distribution %	Specific Gravity
10.0	20.0	2.65
30.0	10.0	2.65
50.0	10.0	2.65
95.0	20.0	2.65
265.0	20.0	2.65
1000.0	20.0	2.65

Notes

• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
• Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
• For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications

Brief Stormceptor Sizing Report - Bronte Village Mall - East SPA

Project Information & Location			
Project Name	Bronte Village Mall - East SPA	**Project Number**	1348-4555
City	Oakville	**State/ Province**	Ontario
Country	Canada	**Date**	2/12/2018
Designer Information		**EOR Information (optional)**	
Name	Benjamin Peachman	**Name**	
Company	C.F. Crozier & Associates	**Company**	
Phone #	416-477-3392	**Phone #**	
Email	bpeachman@cfcrozier.ca	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	Bronte Village Mall - East SPA
Target TSS Removal (%)	80
TSS Removal (%) Provided	81
Recommended Stormceptor Model	STC 2000

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary		
Stormceptor Model	**% TSS Removal Provided**	**% Runoff Volume Captured Provided**
STC 300	65	80
STC 750	75	90
STC 1000	77	90
STC 1500	77	90
STC 2000	81	94
STC 3000	82	94
STC 4000	86	97
STC 5000	86	97
STC 6000	88	99
STC 9000	91	99
STC 10000	91	99
STC 14000	93	100
StormceptorMAX	Custom	Custom

Stormceptor®

FORTERRA

Sizing Details

Drainage Area	
Total Area (ha)	0.7
Imperviousness %	100.0

Rainfall	
Station Name	TORONTO CENTRAL
State/Province	Ontario
Station ID #	0100
Years of Records	18
Latitude	45°30'N
Longitude	90°30'W

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	90.00
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	
Water Quality Flow Rate (L/s)	

Up Stream Storage	
Storage (ha-m)	Discharge (cms)
0.014	0.169

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cms)	

Particle Size Distribution (PSD)
The selected PSD defines TSS removal

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Notes

• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
• Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
• For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications

APPENDIX D

External Reports

REGIONAL

DESIGN OF SANITARY SERVICES APPROVED
DETAIL CONSTRUCTION
NATION REQUIRED WITH
SPECIAL CONDITIONS AND
APPROVAL FROM [illegible]

REGION FILE N° [illegible]

SOVEREIGN STREET

EXIST. STORM MANHOLE

EXIST. 21'4 STORM SEWER

EXIST. SAN. MH
INVERT 266.74

EXIST. 8'4 SANITARY DRAIN

EXIST. 18'4 STORM DRAIN

EXIST. 6'4 WATERMAIN

EXISTING STORM MANHOLE
INVERT 265.60'

PROPOSED 8'4 SANITARY DRAIN @ 2.0%

NEW CATCHBASIN I ea.
TOP ELEVATION - 276.0'
INVERT APPROX. - 271.90

8'4 STORM DRAIN @ 1.6%

NEW STORM DRAIN CONN.
INVERT APPROX. - 269.00'

INVERT APPROX 268.00'

PROPOSED SANITARY MANHOLE
NEW CONNECTION INVERTS APPROX.
SOUTH - 267.50'
EAST - 267.80'

RELOCATED HISTORICAL HOUSE

RETAIL BLOCK 'A'
AREA 35,235.85 SQ. FT.
FIN. FLOOR ELEV. 276.5'

ENCLOSED MALL

RETAIL BLOCK 'B'
AREA 12,481.15 SQ. FT.
FIN. FLOOR ELEV. 276.5'

FOOD STORE
AREA 30,000 SQ FT
FIN. FLOOR ELEV. 276.5'

JONES STREET

2" WATERMETER LOCATION

NEW FIRE HYDRANT AND VALVE

2½"-2½"-6" SPRINKLER SIAMESE CONNECTION MIN 1'-0" & MAX 3'-0" ABOVE GRADE

6"x6" REDUCER

TAPPING SLEEVE AND VALVE

TAPPING ONLY BY REGION OF DEVELOPERS CHOICE

KEY VALVES

BRONTE ROAD

12'4 STORM DRAIN @ 0.55%

18'4 STORM DRAIN @ 0.55%

NEW STORM MANHOLE
TOP ELEVATION 275.50
INVERT APPROX. 270.88

NEW STORM MANHOLE
TOP ELEVATION 275.50
INVERT APPROX. 270.20'

NEW CATCH BASIN #5
TOP ELEVATION 275.00
INVERT APPROX. 270.11

NEW CATCH BASIN #4 (DOUBLE)
TOP ELEVATION - 275.50'
INVERT APPROX. - 271.21'

12'4 STORM @ 0.25%

MINIMUM 5'-6" COVER OVER WATERMAIN

NEW STORM MANHOLE
TOP ELEVATION - 276.50'
W. INVERT APPROX. 268.6'
S. INVERT APPROX. 268.7'
E. INVERT APPROX. 268.80

EXISTING 12'4 STORM CAPPED OFF (LOW)
INV. ELEV. 266.35'

NEW CATCH BASIN #2 (DOUBLE)
TOP ELEVATION - 274.00'
INVERT APPROX. - 270.40'

NEW CATCH BASIN #3 (DOUBLE)
TOP ELEVATION - 274.00'
INVERT APPROX. - 269.60'

12'4 STORM @ 1.0%

NEW CATCH BASIN
TOP ELEVATION 276.00'
INVERT APPROX 269.80'

8'4 STORM DRAIN @ 1.0%

8'4 TAPPING SLEEVE AND VALVE

EXISTING 8'4 WATERMAIN

EXISTING T.D. BANK

EXISTING GARAGE

EXISTING RESTAURANT

NEW CATCH BASIN #7
TOP ELEV. 272.00'
INV. APP. 267.80'

EXISTING STORM MANHOLE

EXISTING 18'4 STORM SEWER

EXIST. STORM MANHOLE

EXIST. STORM ELEV. 266.86 INVERT ELEV. 266.86 I/VERT NEW DRAIN

LAKESHORE ROAD WEST

Oct. 30/80. Discussion with Mr. Gowson of T.D. Hubbert - Mgrs. Re. Connection for internal storm into 18" conc. No fittings provided by INSTALLER.

825-0076
Hodge

STORM DRAINAGE CALCULATIONS PAVED AREA 0.90 SODDED AREA 0.35

AREA SERVED	PAVED AREA SQ. FT.	SODDED AREA SQ. FT.	C.F.S.	SIZE AND SLOPE OF DRAIN
CATCH BASIN #1	11,400	3,200	1.00	8'4 @ 1.00%
CATCH BASIN #2	23,225	-	2.4	12'4 @ 1.00% (EXIST 12'4 CONN.)
CATCH BASIN #3	23,225	-	2.4	12'4 @ 0.25%
CATCH BASIN #4	13,200	4,400	1.24	12'4 @ 0.25%
CATCH BASIN #5	13,320	-	1.45	15'4 @ 0.25%
ROOF DRAINAGE	15 ROOF HOPPERS @ 14 GPM.		0.67	6'4 @ 1.00%
CATCH BASIN #6	13,600	7,000	1.84	8'4 @ 1.00%
SOVEREIGN	STREET CONNECTION		6.80	18'4 @ 0.80% (0.197 m³/s)
CATCH BASIN #7	9,780	-	0.75	8'4 @ 1.00%

3.4 cfs = 0.096 m³/s

0.022 m³/s

2441 LAKESHORE ROAD W.

17 11

TRAFALGAR ENGINEERING LTD.

#1-481 Morden Road
Oakville, Ontario
L6K 3W6

FUNCTIONAL SERVICING REPORT

FOR

BRONTE VILLAGE MALL REDEVELOPMENT

PREPARED FOR
2143111 Ontario Inc.

PREPARED BY
TRAFALGAR ENGINEERING LTD.

Project No. 1369

March 26, 2009

Tel: (905) 338-3366 Fax: (905) 338-7734 Email: tel@trafalgareng.com

1.0 INTRODUCTION

The subject site is located at 2441 Lakeshore Road West in the Town of Oakville and is currently home of the Bronte Village Mall. The site is located at the north side of Lakeshore Road and is bordered by Jones Street on the east, Sovereign Street on the north and Bronte Road on the west. Adjacent to the south-west corner of the site is a small commercial building, gas station and a small park located at the Lakeshore Road/Bronte Road intersection.

The existing 8,640m^2 building is located on the 2.41ha site. The existing building is located on the northern half of the site with a large asphalt parking area situated between the building and Lakeshore Road.

The subject site is relatively flat, however, there are some significant grades where the site abuts the boundary roads. Along the south and east boundaries, the parking lot is approximately 0.5m above the adjacent grade of Lakeshore Road and Jones Street.

Along the north edge of the site Sovereign Street rises approximately 2m from the Jones Street intersection to the high point, approximately 40m west of Bronte Road. At this location Sovereign Street is approximately 0.8m above the subject site. Located along the south boulevard of Sovereign Street is an existing berm that varies from being 1.2m higher at Jones Street to 0.3m higher at the west end of the site. Adjacent to the site Bronte Road falls approximately 1.4m from Sovereign Street to the south limit of the site.

The proposed 750,000ft^2 development will contain a combination of retail, office and residential uses. The proposal is for 451 residential units, 81,200ft^2 of retail space and 72,400ft^2 of office space. The majority of the commercial space will be located along the southern part of the site adjacent to Lakeshore Road. The residential units will be located in three buildings on the north part of the site and separated from the commercial uses by the central driveway.

Located central to the Lakeshore Road frontage is an open space "Market Square". Running from Bronte Road to Jones Street through the centre of the site is the Central Driveway. This driveway will provide access to the underground parking area and loading access to the retail space. Under the entire site will be an underground garage to provide parking for both the residential and commercial uses.

The proposed development may be phased over a number of years with the earliest occupancy being late 2011.

2.0 WASTE WATER

Record drawings show that the site is surrounded by existing wastewater sewers. A 300mm diameter sewer is located on Jones Street, a 200mm diameter sewer is located on Sovereign Street, a 250mm diameter sewer is located on Bronte Road and a 200mm diameter sewer located on Lakeshore Road. The existing 8,640m^2 mall drains to the existing 200mm sewer on Sovereign Street.

The site is tributary to the existing Marine Drive Pumping Station located on East Street and Marine Drive.

The proposed development will generate an equivalent population of approximately 1179 people, and increase the existing sanitary design flows from the site by 12.4 l/s to a flow of 14.8 l/s.

The Region has indicated that there is limited capacity in the downstream sewage pumping station and the South-West Wastewater Treatment Plant. Halton Region Staff Report PPW51-08 indicates there is approximately 0.7 MLD of unused capacity at the plant or equivalent flow for approximately 1,900 people. The Region is currently looking to upgrade the facility to provide an additional 10MLD capacity. This work is proposed to be completed by late 2011. Based on this timing and the Bronte Village redevelopment schedule, the downstream works should be completed prior to the development being completed.

The Region of Halton is currently undertaking the study: "Capital Needs Assessment and Master Plan for the South Halton Sanitary Sewage Pump Stations" to provide a comprehensive review of all South Halton Sanitary Pump Stations in order to determine their existing condition and ability to accommodate the future flows generated from the proposed intensification of South Halton. Due to other development applications currently being processed in the Bronte area and tributary to the Marine Drive pumping station, the Region undertook a separate study and assessment of the Marine Drive Pumping Station to accelerate this process. In the spring of 2008, the Region had retained TSH as a consultant to review the station and prepare a report.

The Region is proposing to upgrade the Marine Drive pump station in two stages. The immediate stage would be to address the current capacity issues and include the development applications that have already been processed for this area. The additional capacity provided is for approximately 588 units. The second stage would include the ultimate design to accommodate the intensification of the area which would be sometime into the future.

The findings of the Consultant are summarized in the Technical Memorandum #1 prepared by AECOM, dated February 2, 2009. The report recommends installation of a third pump at the station and changes to the impeller to increase the station capacity from approximately 144l/s to 225l/s. This increase in pumping capacity will be to address the current wet weather flows and flows from an additional 588 units planned for the Bronte Area. Region of Halton staff have indicated that they don't have funds budgeted for the station upgrade and will not start the design process until a developer agrees to frontend the works and pay for all the development related upgrades.

The development of the Bronte Village Mall site will take place over a number of years and in the best case, occupancy of the initial phase of development will be late 2011. As a result there are a couple of different options to address the capacity issue at the Marine Drive Pumping Station.

- The development could be delayed and timed to coincide with the completion with the Regions next Master Plan and the ultimate upgrade with the pumping station.

- The development could be phased over a number of years to match the available capacity of the downstream system. The upgrades to the Marine Drive Pumping Station allowed for development of 588 residential/condominium units. However, our investigation notes that the number of the units allowed for at least one of the developments is overstated and the second development, the proposed seniors' complex on Lakeshore Road, is not actively advancing and may not proceed. This may free up 175 units of capacity. When combined with current allocated capacity for the existing commercial space, there would be sufficient capacity in the system to allow the initial phases of the development to proceed until such time as the Region is able to complete the required studies to upgrade the station to an ultimate capacity to support the intensification of the Bronte area.

- Request from the Region to increase the planned capacity of the pumping station to allow a portion of the proposed development to proceed immediately. This may require a front-ending of the additional cost by the developer.

- In the event that the development was to proceed prior to the ultimate pumping station upgrades being completed, and sufficient capacity was not found within the system, it would be possible for the development to proceed with the construction of an on-site sewage pumping station. A small below ground station could be located on the north side of the subject lands adjacent to Sovereign Street. A forcemain would be constructed along Sovereign Street easterly to East Street and south to connect to the existing gravity main located at East Street and Lakeshore Road West. The on-site sewer systems would convey the flow from all the buildings to the pumping station. The construction of an on-site pumping station would by-pass the Marine Drive station.

The preferred solution would be for the Region of Halton to undertake the necessary works to the Marine Drive station to address the additional capacity required for the development. In the

event that this is not possible, the development has the option of constructing a pumping station to service the proposed site and bypass the Marine Drive station.

3.0 WATER SUPPLY

The subject site is part of the Oakville Zone 1 water system. Surrounding the site are a 150mm main on Sovereign Street, a 300mm main on Jones Street, a 300mm main on Lakeshore and a 200mm main on Bronte Road, changing to a 150mm main mid-way to Sovereign Street.

Crossing through the existing site is a 200mm watermain connecting to Bronte Road and to Jones Street. The existing building and site hydrants are fed from this main.

Flow tests were taken by Jackson Waterworks from the existing hydrant at the north-east corner of the site off the existing 150mm main on Sovereign Street. This test indicated a static pressure of 70psi and a theoretical fire flow at 20psi of 4031 USGPM.

Based on the proposed use, the Calculated Average Daily Demand is $324m^3$/day with a Maximum Hourly Demand of $54m^3$/hr. The increase in flow is $50m^3$/hr over the existing land use.

In reviewing the flow tests undertaken by Jackson Waterworks, dated December 15, 2008, we note that very little pressure was lost between the static flow and the two measured flows. This indicates there is a good water distribution system to support the proposed development and the water system is relatively insensitive to a small increase in domestic flows.

The flow tests also indicate a good potential flow for fire fighting. The detailed design of the on-site fire system will be reviewed at the time of the detailed building design by an expert in the design of these facilities. However, based on our experience, we do not anticipate problems with water supply for fire fighting purposes.

4.0 STORM DRAINAGE

The existing site is part of two sewer drainage sheds. A small 0.397ha corner of the south-west corner of the site drains to the existing 375mm diameter sewer located along Lakeshore Road. This sewer drains to the west and outlets to Bronte Street at Lakeshore Road. The remaining part of the site drains to the existing 1350mm diameter sewer located on Sovereign Street, east of Jones Street. The majority of the site drains via the 525mm storm sewer on Sovereign Street with a small area draining to Jones Street.

The original site servicing design, as prepared by J. D. Hubbert, indicates that the site was designed with a flow of 0.187m^3/s to Sovereign Street of which 0.096m^3/s is conveyed to Jones Street, giving a total flow of 0.283m^3/s conveyed to Sovereign Street trunk sewer east of Jones Street. This drawing notes that the existing building was fitted with control flow roof drains to reduce the post-development flows.

The J. D. Hubbert drawing also shows a local connection to the Lakeshore Road sewer servicing the local driveway.

Subsequent to the J. D. Hubbert design, a part of an adjacent site was added to the Mall property and the Mall parking lot expanded onto this area. The sewer connection for this area is to the Lakeshore sewer. This added site has an area of 0.274ha with a composite runoff co-efficient of 0.83. The resulting flow is approximately 0.068m^3/s.

The design of the on-site storm water system will be designed to limit the flow to the existing quantity. Flows for the 5-year storm to the Sovereign Street trunk sewer will be limited to 0.283m^3/s. Flows to Lakeshore Road will be limited to 0.068m^3/s.

The proposed development will be divided into two drainage areas. The 0.269ha around the Market Square and the immediate area next to Lakeshore Road will drain directly to the Lakeshore Road sewer system. It is anticipated that approximately 15% of this area will be

landscaped resulting in a combined runoff co-efficient of C=0.82. The resulting runoff will be approximately 0.066m^3/s, less than the calculated pre-development rate of 0.068m^3/s.

The remaining 2.142ha of the site will drain to the existing Sovereign Street trunk sewer. At the re-zoning stage, it is difficult to predict the final site layout and the resulting site impervious ratio and corresponding runoff co-efficient. For the purposes of this report, we have assumed a site runoff co-efficient of C=0.90 for the main part of the site. We have also assumed there is no opportunity for surface storage or roof top storage and all storage will be provided in an underground storage tank. Based on these assumptions, the required volume of 197m^3 of underground storage is required.

One way of providing the required storage would be the construction of a "super pipe" along the north side of the proposed parking garage. 174m of a 1.2m diameter pipe would provide the appropriate storage. An orifice would be installed on the downstream of the tank to control the flow to the required level.

The site will require stormwater quality control. The area draining towards Lakeshore Road out lets to Bronte Road and will require an "Enhanced" level of control. An oil/grit separator such as a stormceptor STC750 would provide the appropriate control.

The area draining towards the Sovereign Street trunk sewer will require "Normal" level of control. An oil/grit separator such as an STC3000 would provide the appropriate level of control.

The details of the stormwater management facilities will be designed as part of the site plan submission once all the details of the site layout have been established.

5.0 SUMMARY

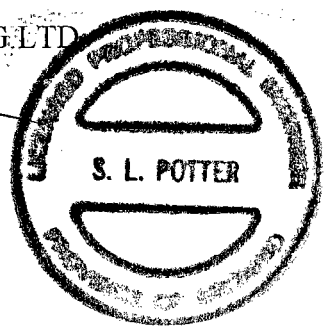
1. The rezoning of the subject lands will increase the wastewater flows beyond the capacity of the local pumping station. The Region is planning to upgrade this station in the future. If the proposed development proceeds prior to this station an on-site pumping station maybe required.

2. There is adequate local watermain infrastructure to support the re-zoning of the lands.

3. Re-development of the subject site will require on-site stormwater management controls to ensure there is no drainage impact on the surrounding levels as a result of the re-development.

Prepared by:
TRAFALGAR ENGINEERING LTD.

S. L. Potter, P. Eng.
Consulting Engineer
Principal



APPENDIX E

External Sanitary Capacity Analysis

CROZIER & ASSOCIATES Consulting Engineers

PROJECT: Bronte Village Mall Redevelopment
PROJECT NO.: 1348-4555
DESIGN: TL
CHECK: AS
DATE: 11/29/2017
UPDATE: 1/17/2018

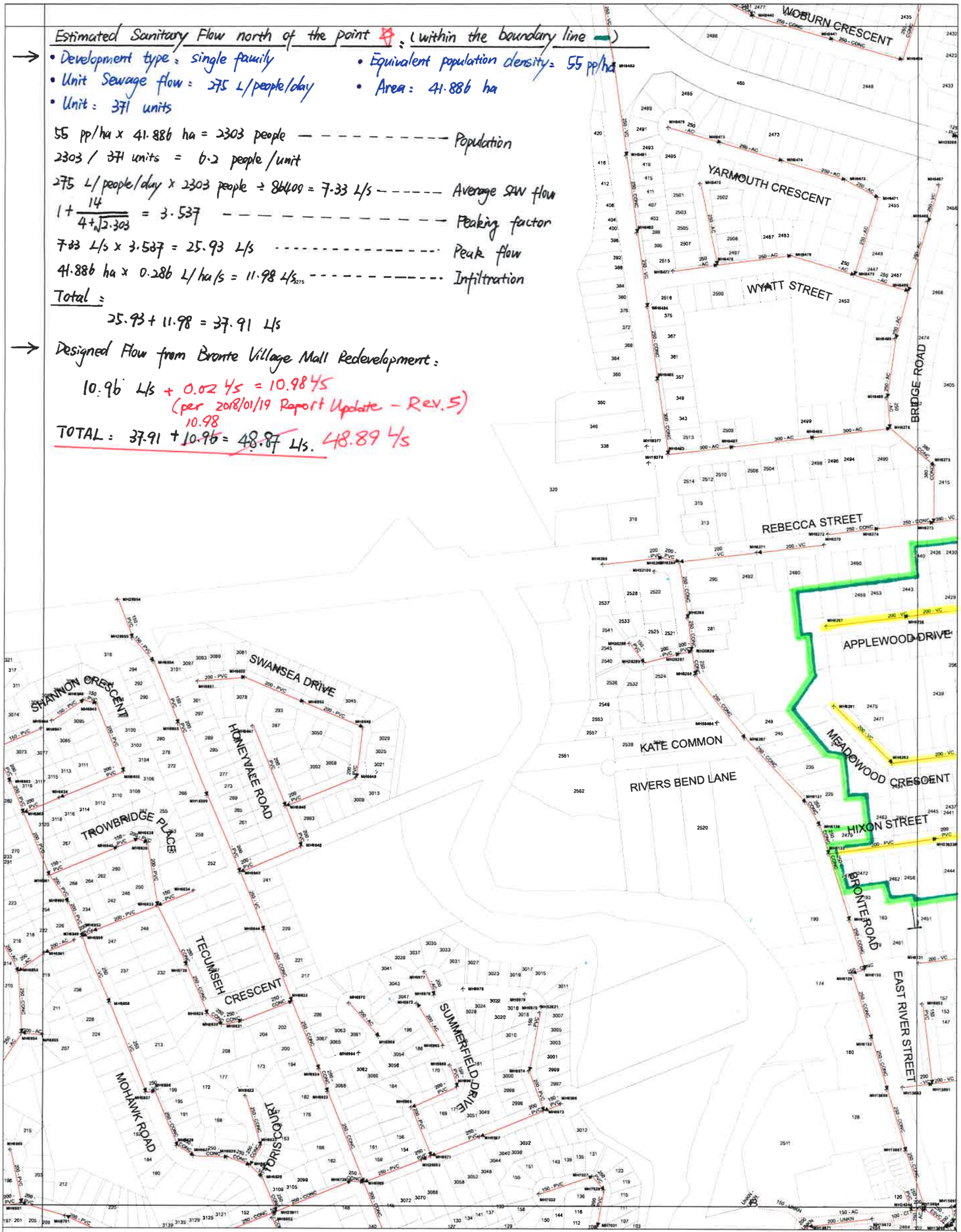
SANITARY CAPACITY ANALYSIS

Address: 2441 Lakeshore Road West

*The following design parameters are according to Region of Halton Water and Wastewater Linear Design Manual (April 2015).

	Townhouse		Light Commercial					
Equivalent Population Density=	135.00	pp/ha	90.00	pp/ha	N =	0.013	Min Velocity =	0.60 m/s at Actual Flow
Unit Sewage Flow=	275	l/c.d	24750	l/ha.d	Q infiltration =	0.286 L/ha.s	Max Velocity =	3.00 m/s at Full Flow
Peak Factor (M) =	1+(14/4+(P/1000)^0.5)		0.8*(1+(14/4+(P/1000)^0.5))					

Location	FROM MH	TO MH	Catchment ID	Length (m)	Total Area (Ha)	Equiv. Pop	Cumul. Area (Ha)	Cumul. trib pop	Pop. Flow Q(p) (l/s)	Peak Factor	Peak Design Flow (l/s)	Peak Infiltration Flow (l/s)	TOTAL Infilt.	Combined (l/s)	Pipe Diam (mm)	Upper Inv. El.	Lower Inv. El.	Slope (m/m)	Cap. (l/s)	Full Flow Vel. (m/s)	Q/Qfull (-)	Actual Vel. (m/s)
The total sanitary contribution north of the intersection of Sovereign Street and Jones Street, including the designed sanitary flow from the subject site =												48.89	L/s									
*The detailed calculation can be found in the following map.																						
From MHJ1 to MHJ3:																						
S1	MH J1	MH J2	S1	71.54	0.34	31	0.34	31	0.10	3.48	0.34	0.10	0.10	**49.32**	300	79.27	79.01	0.004	**58.42**	0.83	0.84	0.61
S2	MH J2	MH J3	S2	65.38	0.32	29	0.65	60	0.19	3.44	0.64	0.09	0.19	**49.72**	300	78.98	78.74	0.004	**58.42**	0.83	0.85	0.61
From MHL2 to MHJ3:																						
S4	MH L2	MH L1	S4	35.00	0.33	31	0.33	31	0.10	3.48	0.33	0.10	0.10	**49.32**	300	79.99	79.65	0.010	**96.70**	1.37	0.51	1.01
S3	MH L1	MH J3	S3	51.80	0.15	14	0.49	45	0.14	3.46	0.48	0.04	0.14	**49.51**	300	79.62	79.10	0.010	**96.70**	1.37	0.51	1.01
From MHJ3 to MHJ6:																						
S5	MH J3	MH J4	S5	10.68	0.02	2	1.16	107	0.33	3.39	1.13	0.01	0.33	**50.35**	300	78.74	78.68	0.005	**68.38**	0.97	0.74	0.72
S6	MH J4	MH J5	S6	62.89	0.68	62	1.84	169	0.53	3.34	1.76	0.19	0.53	**51.18**	300	78.68	78.37	0.005	**68.38**	0.97	0.75	0.72
S7	MH J4	MH J5	S7	58.93	0.44	40	2.28	209	0.65	3.31	2.17	0.13	0.65	**51.71**	300	78.37	78.17	0.004	**57.21**	0.81	0.90	0.60
S8			S8		0.12	16	2.40	225	0.05	4.39	0.22	0.03	0.69	**51.97**							0.91	
S9	MH J5	MH J6	S9	12.14	0.03	3	2.43	228	0.66	3.31	2.19	0.01	0.70	**52.00**	300	78.17	77.95	0.018	**130.10**	1.84	0.40	1.36



Estimated Sanitary Flow north of the point ✱ : (within the boundary line —)

- Development type : single family
- Equivalent population density : 55 pp/ha
- Unit Sewage flow : 275 L/people/day
- Area : 41.886 ha
- Unit : 371 units

55 pp/ha x 41.886 ha = 2303 people ---------- Population

2303 / 371 units = 6.2 people/unit

275 L/people/day x 2303 people ÷ 86400 = 7.33 L/s ------ Average SAN flow

$1 + \frac{14}{4+\sqrt{2.303}} = 3.537$ ---------- Peaking factor

7.33 L/s x 3.537 = 25.93 L/s ---------- Peak flow

41.886 ha x 0.286 L/ha/s = 11.98 L/s_{275} ---------- Infiltration

Total :

25.93 + 11.98 = 37.91 L/s

Designed Flow from Bronte Village Mall Redevelopment :

10.96 L/s + 0.02 L/s = 10.98 L/s
(per 2018/01/19 Report Update - Rev.5)

TOTAL : 37.91 + ~~10.96~~ 10.98 = ~~48.87~~ L/s. 48.89 L/s

Halton REGION

REGIONAL MUNICIPALITY OF HALTON
Department of Public Works

SANITARY OPERATING MAPS

TOWN OF OAKVILLE

Sewer Types
- Treated Discharge Sewer
- Untreated Discharge Sewer
- ForceMain
- Proposed ForceMain
- Gravity Sewer (In Service)
- Gravity Sewer (Out of Service)
- Proposed Gravity Sewer

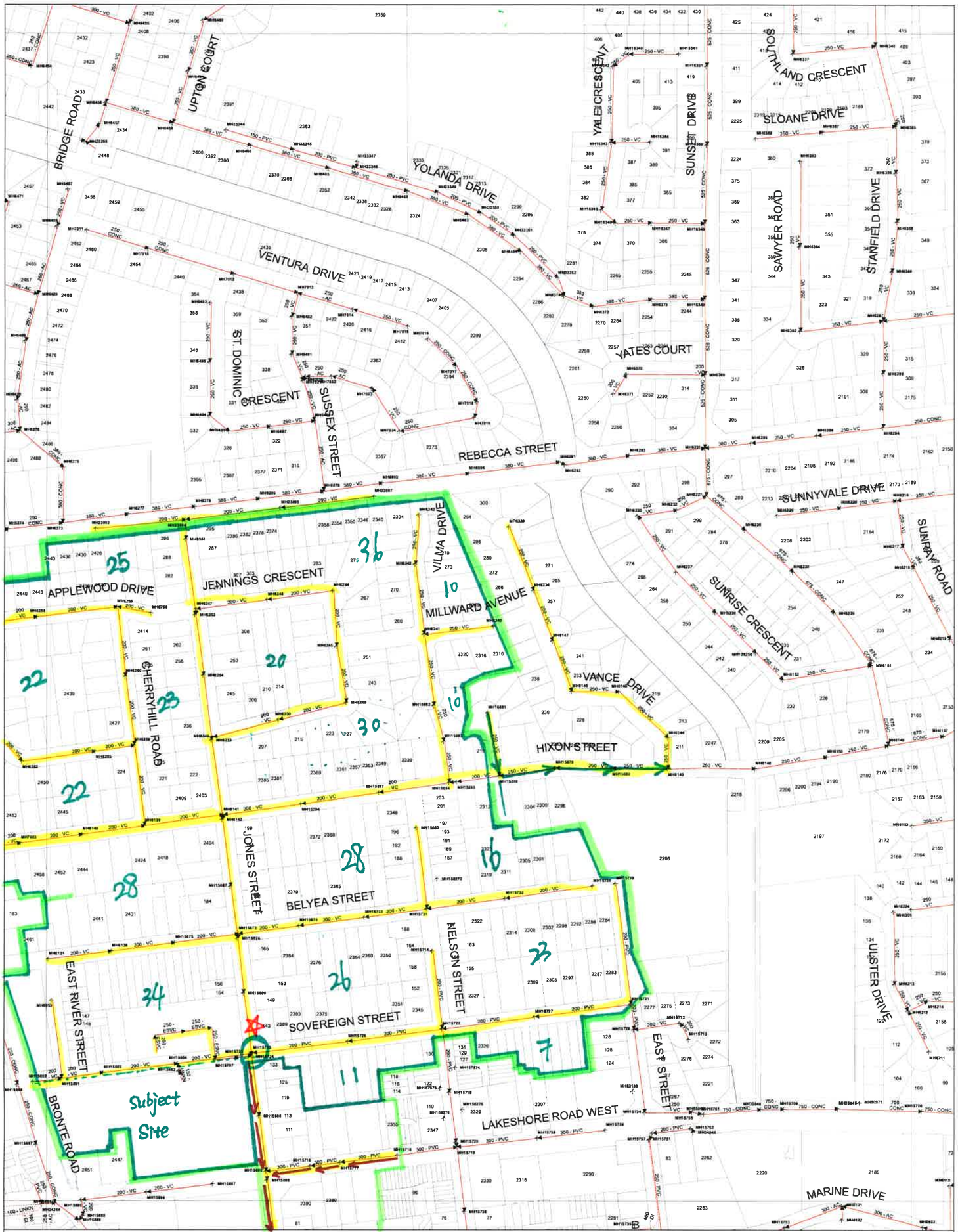
Maintenance Hole Types
- K Maintenance Hole
- J Chamber

Major System Facilities
- E Wastewater Storage Tank
- G Wastewater Treatment Plant
- B Pumping Station
- Municipal Boundary

0 25 50 100 150 200 Meters

Map Index

Grid Number: 208A
Print Date: Nov 1, 2017



Halton REGION

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SANITARY OPERATING MAPS

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Maintenance Hole Types

- K Maintenance Hole
- J Chamber

Major System Facilities

- E Wastewater Storage Tank
- G Wastewater Treatment Plant
- B Pumping Station
- Municipal Boundary

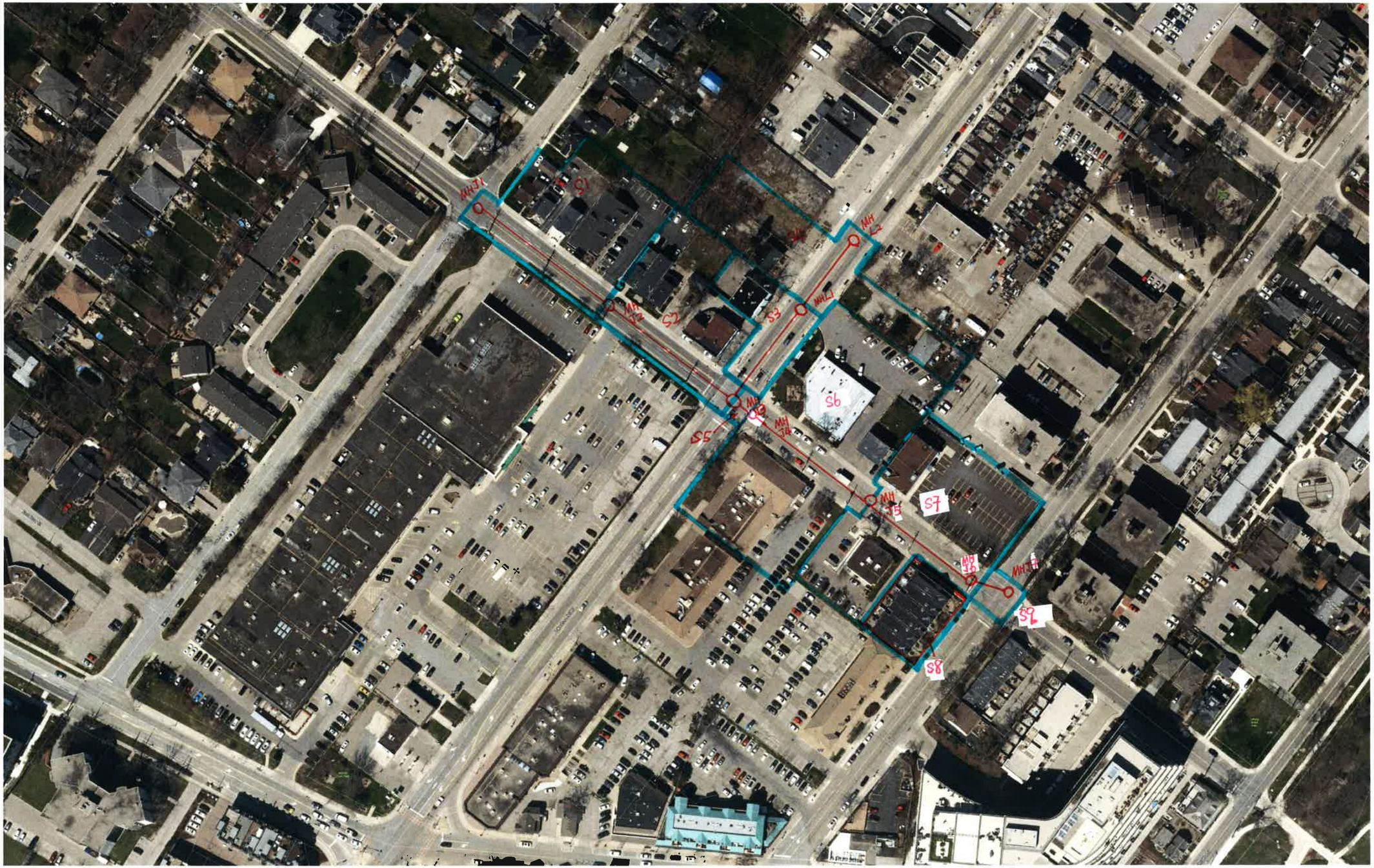
Meters
0 25 50 100 150 200

Map Index

Grid Number: 208B
Print Date: Nov 26, 2015

OAKVILLE

Town of Oakville



Legend

- Trails
- Cemeteries
- Parks
- Parcels

Catchment	Area (ha)	Type
S1	0.336	Commercial
S2	0.318	Commercial
S3	0.153	Commercial
S4	0.334	Commercial
S5	0.022	Commercial
S6	0.682	Commercial
S7	0.439	commercial
S8	0.117	Residential <Townhouse>
S9	0.031	Commercial

81.3 0 40.64 81.3 Meters

NAD_1983_UTM_Zone_17N

Disclaimer: THIS IS NOT A LEGAL PLAN OF SURVEY.

November 29, 2017

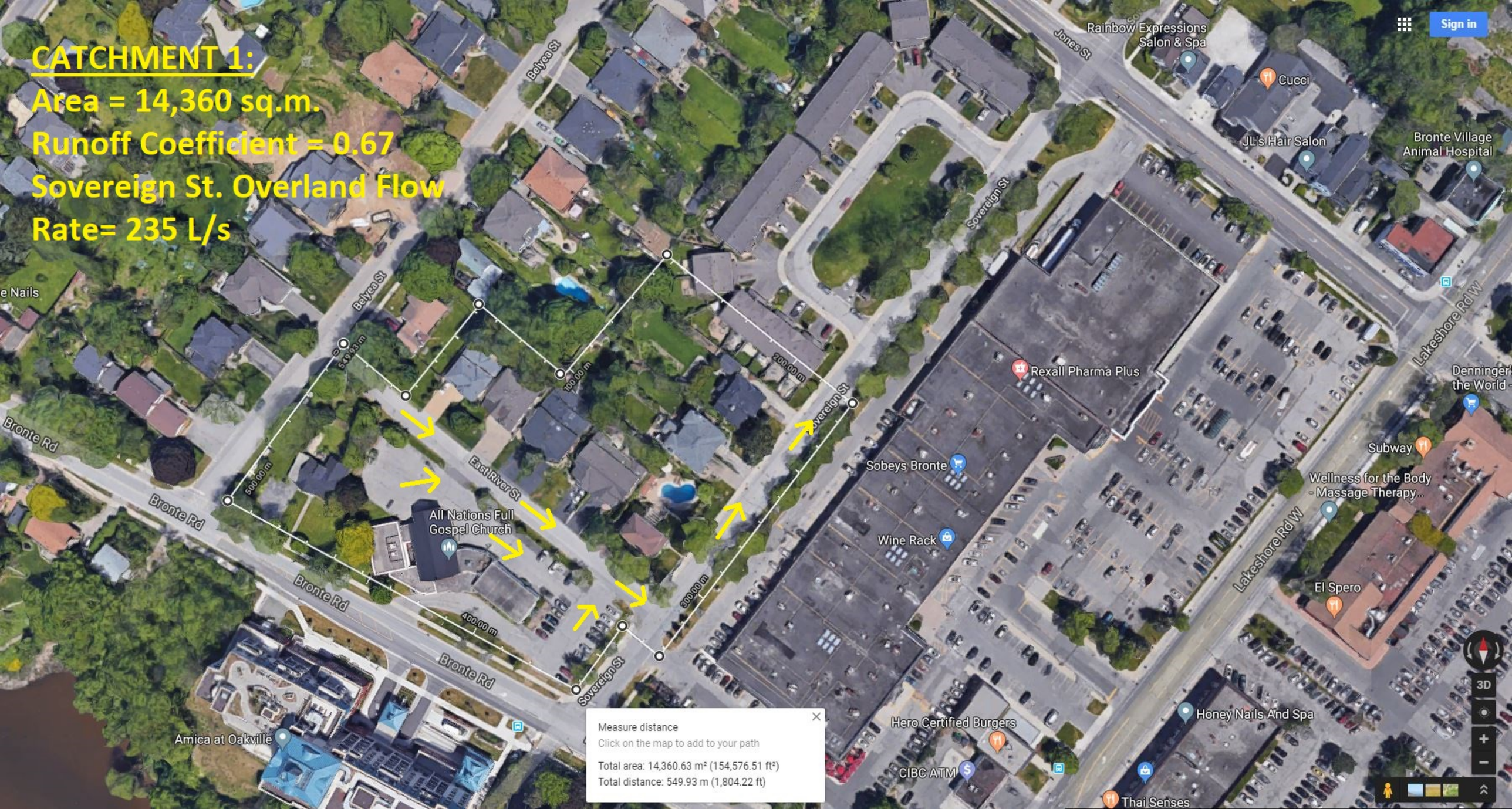
Scale:

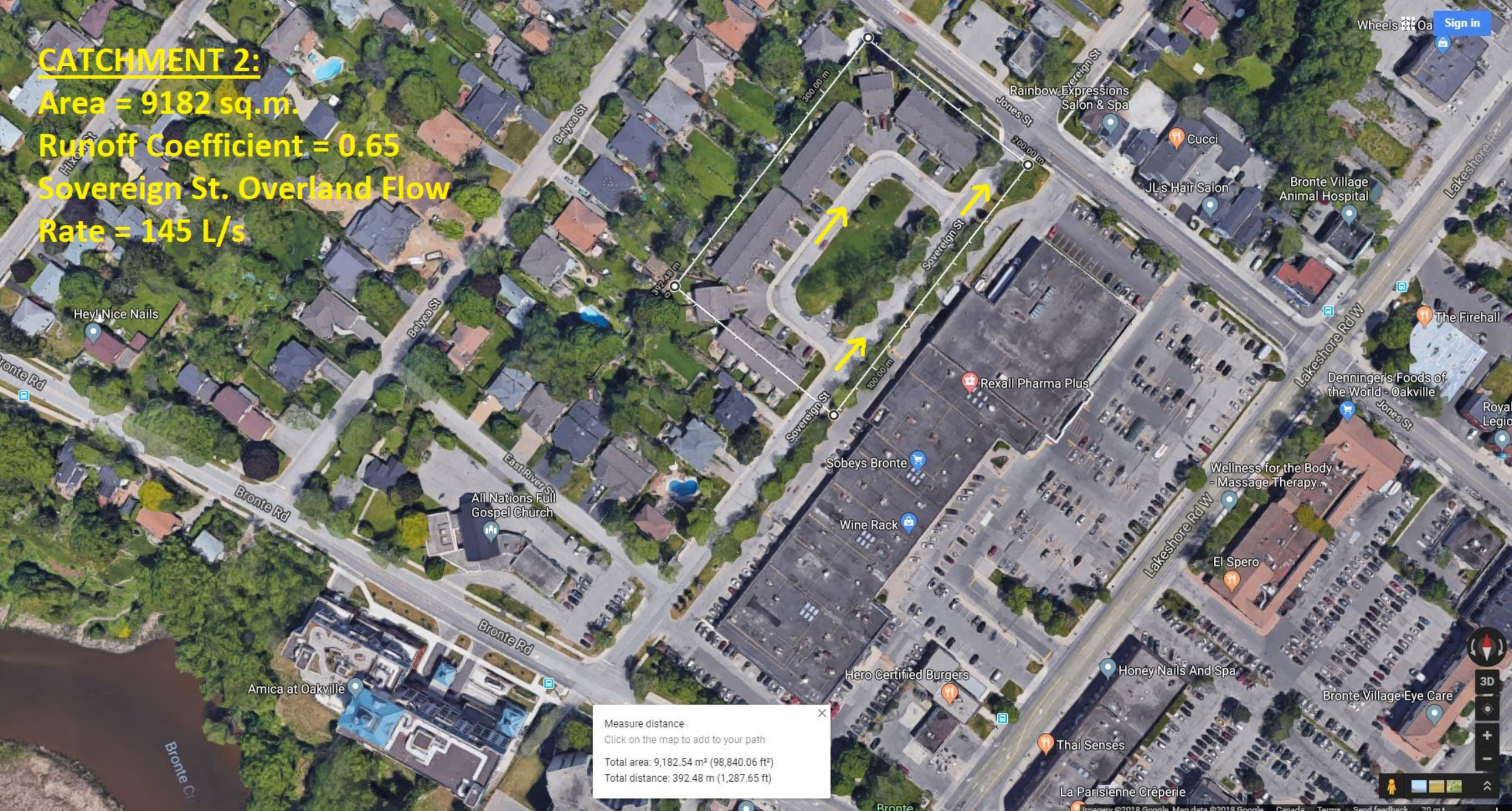
1: 1,600

Town of Oakville

APPENDIX F

External Stormwater Conveyance Analysis – Sovereign Street


CATCHMENT 1:
Area = 14,360 sq.m.
Runoff Coefficient = 0.67
Sovereign St. Overland Flow
Rate= 235 L/s
549.93 m
100.00 m
200.00 m
500.00 m
400.00 m
300.00 m
Measure distance
Click on the map to add to your path
Total area: 14,360.63 m² (154,576.51 ft²)
Total distance: 549.93 m (1,804.22 ft)
Belyea St
Jones St
Sovereign St
Lakeshore Rd W
Bronte Rd
East River St
Rainbow Expressions Salon & Spa
Cucci
JL's Hair Salon
Bronte Village Animal Hospital
Rexall Pharma Plus
Sobeys Bronte
Wine Rack
All Nations Full Gospel Church
Subway
Wellness for the Body - Massage Therapy...
El Spero
Hero Certified Burgers
CIBC ATM
Honey Nails And Spa
Thai Senses
Amica at Oakville
Sign in
3D


CATCHMENT 2:
Area = 9182 sq.m.
Runoff Coefficient = 0.65
Sovereign St. Overland Flow
Rate = 145 L/s
300.00 m
200.00 m
392.48 m
100.00 m
Sovereign St
Jones St
Belyea St
Bronte Rd
East River St
Lakeshore Rd W
Rainbow Expressions Salon & Spa
Cucci
JL's Hair Salon
Bronte Village Animal Hospital
The Firehall
Hey! Nice Nails
Rexall Pharma Plus
Denninger's Foods of the World - Oakville
Sobeys Bronte
Wine Rack
All Nations Full Gospel Church
Wellness for the Body - Massage Therapy...
El Spero
Amica at Oakville
Hero Certified Burgers
Honey Nails And Spa
Bronte Village Eye Care
Thai Senses
La Parisienne Crêperie
Measure distance
Click on the map to add to your path
Total area: 9,182.54 m² (98,840.06 ft²)
Total distance: 392.48 m (1,287.65 ft)
Sign in
3D

A. Estimated Major System Flow

Storm Data:Town of Oakville IDF Parameters

Time of Concentration: Tc= 10 min

Return Period	a	b	c	i mm/hr
2 yr	725	4.8	0.808	82.18
5 yr	1170	5.8	0.843	114.21
10 yr	1400	5.8	0.848	134.79
25 yr	1680	5.6	0.851	162.17
50 yr	1960	5.8	0.861	182.06
100 yr	2150	5.7	0.861	200.80

Equations:

Intensity
$i_{(Td)} = a / (T_c + b)^{c}$

Peak Flow
$Q_{post} = 0.0028 \bullet C_{post} \bullet i_{(Td)} \bullet A$

Catchment 1:

	RC	Area (ha)	Weighted RC
Building	0.90	0.48	0.30
Road	0.90	0.46	0.29
Grass	0.25	0.50	0.09
Total		1.44	0.67

Note: Catchment 1 & 2 are defined in the attached Figures.

Catchment 2:

	RC		Area (ha)	Weighted RC
Building	0.90		0.26	0.26
Road	0.90		0.31	0.30
Grass	0.25		0.35	0.10
Total			0.92	0.65

Note: Catchment 1 & 2 are defined in the attached Figures.

5 Year Storm

-	0.0028	factor	factor	(Metric conversion)
RC	0.67	-	-	(Runoff coefficient)
Area	1.44	ha	ha	(Drainage area)
Tc	10	min	min	
i	114.21	mm/hr	mm/hr	Town of Oakville
Q	**0.309**	**m3/s**	**m^3/s**	(Peak Flow)

5 Year Storm

-	0.0028	factor	factor	(Metric conversion)
RC	0.65	-	-	(Runoff coefficient)
Area	0.918	ha	ha	(Drainage area)
Tc	10	min	min	
i	114.21	mm/hr	mm/hr	Town of Oakville
Q	**0.1915**	**m3/s**	**m^3/s**	(Peak Flow)

100 Year Storm

-	0.0028	factor	factor	(Metric conversion)
RC	0.67	-	-	(Runoff coefficient)
Area	1.436	ha	ha	(Drainage area)
Tc	10	min	min	
i	200.80	mm/hr	mm/hr	Town of Oakville
Q	**0.5439**	**m3/s**	**m^3/s**	(Peak Flow)

100 Year Storm

-	0.0028	factor	factor	(Metric conversion)
RC	0.65	-	-	(Runoff coefficient)
Area	0.918	ha	ha	(Drainage area)
Tc	10	min	min	
i	200.80	mm/hr	mm/hr	Town of Oakville
Q	**0.3367**	**m3/s**	**m^3/s**	(Peak Flow)

Major System Overland Flow

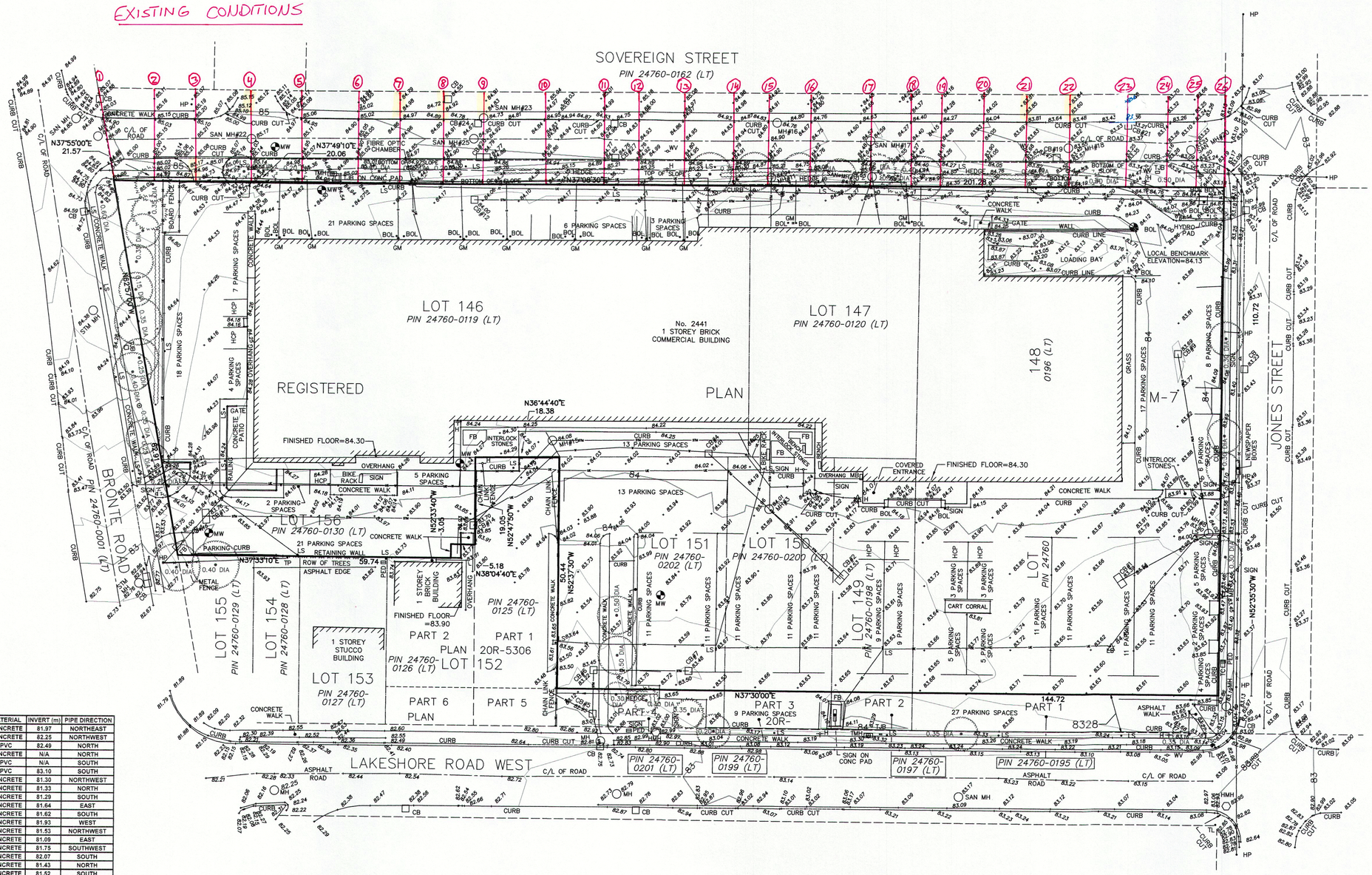
=	**0.5439**	**-**	**0.309**	**m^3/s**	
=	**0.2345**	**L/s**			

Major System Overland Flow

=	**0.3367**	**-**	**0.192**	**m^3/s**	
=	**0.1452**	**L/s**			

Note: The estimated overland flow for the major system will be the 100-yr peak flow minus the 5-yr peak flow (which is captured in the minor system).

EXISTING CONDITIONS



MH/CB No.	TYPE	DIAMETER (m)	MATERIAL	INVERT (m)	PIPE DIRECTION
CB#1	STORM	0.35	CONCRETE	81.97	NORTHEAST
CB#2	STORM	0.40	CONCRETE	82.25	NORTHWEST
		0.14	PVC	82.49	NORTH
MH#3	STORM	N/A	CONCRETE	N/A	NORTH
		N/A	PVC	N/A	SOUTH
CB#4	STORM	0.18	PVC	83.10	SOUTH
CB#5	STORM	0.26	CONCRETE	81.30	NORTHWEST
		0.24	CONCRETE	81.33	NORTH
		0.30	CONCRETE	81.29	SOUTH
CB#6	STORM	0.23	CONCRETE	81.64	EAST
		0.20	CONCRETE	81.62	SOUTH
CB#7	STORM	0.30	CONCRETE	81.93	WEST
MH#8	STORM	0.20	CONCRETE	81.53	NORTHWEST
		0.30	CONCRETE	81.09	EAST
		0.30	CONCRETE	81.75	SOUTHWEST
CB#9	STORM	0.30	CONCRETE	82.07	SOUTH
MH#10	SANITARY	0.24	CONCRETE	81.43	NORTH
		0.16	CONCRETE	81.52	SOUTH
		0.25	CONCRETE	81.55	SOUTHWEST
MH#11	STORM	0.52	CONCRETE	82.08	NORTH
		0.50	CONCRETE	82.13	SOUTH
CB#12	STORM	0.24	CONCRETE	82.85	EAST
CB#13	STORM	0.32	CONCRETE	82.65	EAST
CB#14	STORM	N/A	CONCRETE	N/A	NORTH
MH#15	STORM	N/A	N/A	N/A	EAST
		N/A	N/A	N/A	SOUTHWEST
MH#16	SANITARY	0.60	CONCRETE	81.61	NORTHEAST
		0.40	CONCRETE	81.84	SOUTHWEST
MH#17	SANITARY	0.30	PVC	81.45	NORTHEAST
		0.30	PVC	81.47	SOUTHWEST
		0.20	PVC	81.50	SOUTHEAST
MH#18	SANITARY	0.20	CONCRETE	79.97	NORTHWEST
		0.30	CONCRETE	79.87	NORTHEAST
CB#19	STORM	0.20	CONCRETE	82.60	NORTHWEST
MH#20	SANITARY	0.40	PVC	79.42	NORTHEAST
		0.40	PVC	79.62	SOUTHWEST
CB#21	STORM	0.20	PVC	79.75	NORTHEAST
		0.20	PVC	80.03	SOUTHWEST
MH#22	SANITARY	0.20	CONCRETE	82.59	NORTHEAST
		0.20	CONCRETE	82.61	SOUTHWEST
		0.20	CONCRETE	82.56	SOUTHEAST
MH#23	SANITARY	0.30	CONCRETE	82.05	NORTHEAST
		0.30	CONCRETE	82.07	SOUTHWEST
		0.30	CONCRETE	82.11	SOUTHEAST
CB#24	STORM	0.30	CONCRETE	83.13	NORTHEAST
MH#25	SANITARY	0.30	CONCRETE	82.37	NORTHEAST
		0.30	CONCRETE	82.39	SOUTHWEST
CB#26	STORM	0.30	CONCRETE	83.49	NORTHWEST
MH#27	STORM	0.30	PVC	83.96	NORTHWEST

TOPOGRPAHIC SURVEY OF
ALL OF LOTS 146, 147 AND 156 AND PART OF LOTS 148, 149, 150, AND 151 REGISTERED PLAN M-7
TOWN OF OAKVILLE
REGIONAL MUNICIPALITY OF HALTON
SCALE 1 : 500

10 0 10 20 30 metres

J.D. BARNES LIMITED

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

NOTES

BEARINGS ARE UTM GRID, DERIVED FROM REAL TIME NETWORK (RTN) OBSERVATIONS UTM ZONE 17, NAD83 (CSRS) (2010.0).

ELEVATION NOTE

ELEVATIONS SHOWN ON THIS PLAN ARE DERIVED FROM THE TOWN OF OAKVILLE BENCH MARKS:
No. 117
ELEVATION=83.984m
AND
No. 243
ELEVATION=88.331m

LOCAL BENCHMARK

CUT CROSS IN CURB LOCATED AT THE NORTHEASTERN END OF LOADING BAY, AS SHOWN ON FACE OF PLAN.
ELEVATION=84.13m

LEGEND

CB	DENOTES CATCHBASIN
TC	DENOTES TELEPHONE CHAMBER
GM	DENOTES GAS METER
HMH	DENOTES HYDRO MANHOLE
MH	DENOTES MANHOLE
TMH	DENOTES TELEPHONE MANHOLE
SAN MH	DENOTES SANITARY MANHOLE
STM MH	DENOTES STORM MANHOLE
BOL	DENOTES BOLLARD
HP	DENOTES HYDRO POLE
LS	DENOTES LIGHT STANDARD
MB	DENOTES MAIL BOX
MW	DENOTES MINTORING WELL
TP	DENOTES TELEPHONE POLE
TSC	DENOTES TRAFFIC SIGNAL CONTROL
TJB	DENOTES TELEPHONE JUNCTION BOX
PED	DENOTES TELEPHONE PEDESTAL
H	DENOTES FIRE HYDRANT
WV	DENOTES WATER VALVE
BM	DENOTES BENCH MARK
FB	DENOTES FLOWER BOX
GC	DENOTES GARBAGE CAN
HCP	DENOTES HANDICAP PARKING SPACE
E	DENOTES OVERHEAD HYDRO CABLE
T	DENOTES OVERHEAD TELEPHONE CABLE
OC	DENOTES OVERHEAD CABLE
G	DENOTES BURIED GAS PIPELINE
UE	DENOTES BURIED HYDRO CABLE
UC	DENOTES BURIED FIBRE OPTIC CABLE
W	DENOTES BURIED WATER LINE
SAN	DENOTES SANITARY SEWER LINE
STM	DENOTES STORM SEWER LINE
	DENOTES STORM SEWER LINE
	DENOTES CONIFEROUS TREE DIA=DIAMETER OF TRUNK IN METRES
	DENOTES DECIDUOUS TREE DIA=DIAMETER OF TRUNK IN METRES

BEFORE DIGGING, UNDERGROUND SERVICES SHOULD BE LOCATED ON SITE BY THE RESPECTIVE AGENCIES.

IT IS THE RESPONSIBILTITY OF THE CONTRACTOR TO VERIFY THAT LOCAL BENCHMARKS HAVE NOT BEEN ALTERED OR DISTURBED AND THAT THE RELATIVE ELEVATIONS AGREE WITH THE INFORMATION SHOWN ON THIS PLAN.

ALL CURB ELEVATIONS ARE TAKEN TO FACE OF CURB.

PRIMARY CONTOURS ARE AT 1.00m INTERVALS.
SECONDAY CONTOURS ARE AT 0.25m INTERVALS.

ADDITIONAL SURVEY COMPLETED ON THE 10th DAY OF JULY, 2018.
ADDITIONAL SURVEY COMPLETED ON THE 9th DAY OF MAY, 2018.
ORIGINAL SURVEY COMPLETED ON THE 19th DAY OF APRIL, 2016.

J.D.BARNES LIMITED
LAND INFORMATION SPECIALISTS
SURVEYING MAPPING GIS
401 WHEELABRATOR WAY, SUITE A, MILTON, ON L9T 3C1
T: (905) 875-9955 F: (905) 875-9956 www.jdbarnes.com

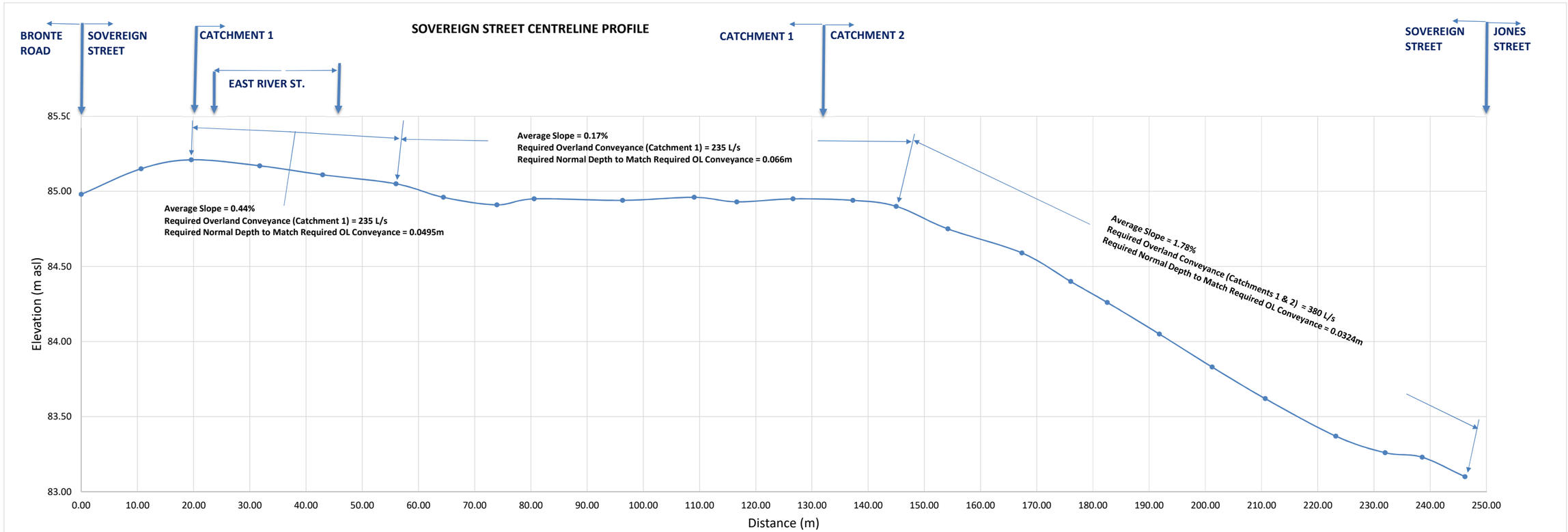
DRAWN BY:	CHECKED BY:	REFERENCE NO.:
AP/JW		16-30-895-00-TOPO

FILE: G:\16-30-895\00\Drawing\16-30-895-00-B_topo.dgn DATED: JULY 12th, 2018

B. Existing Conditions

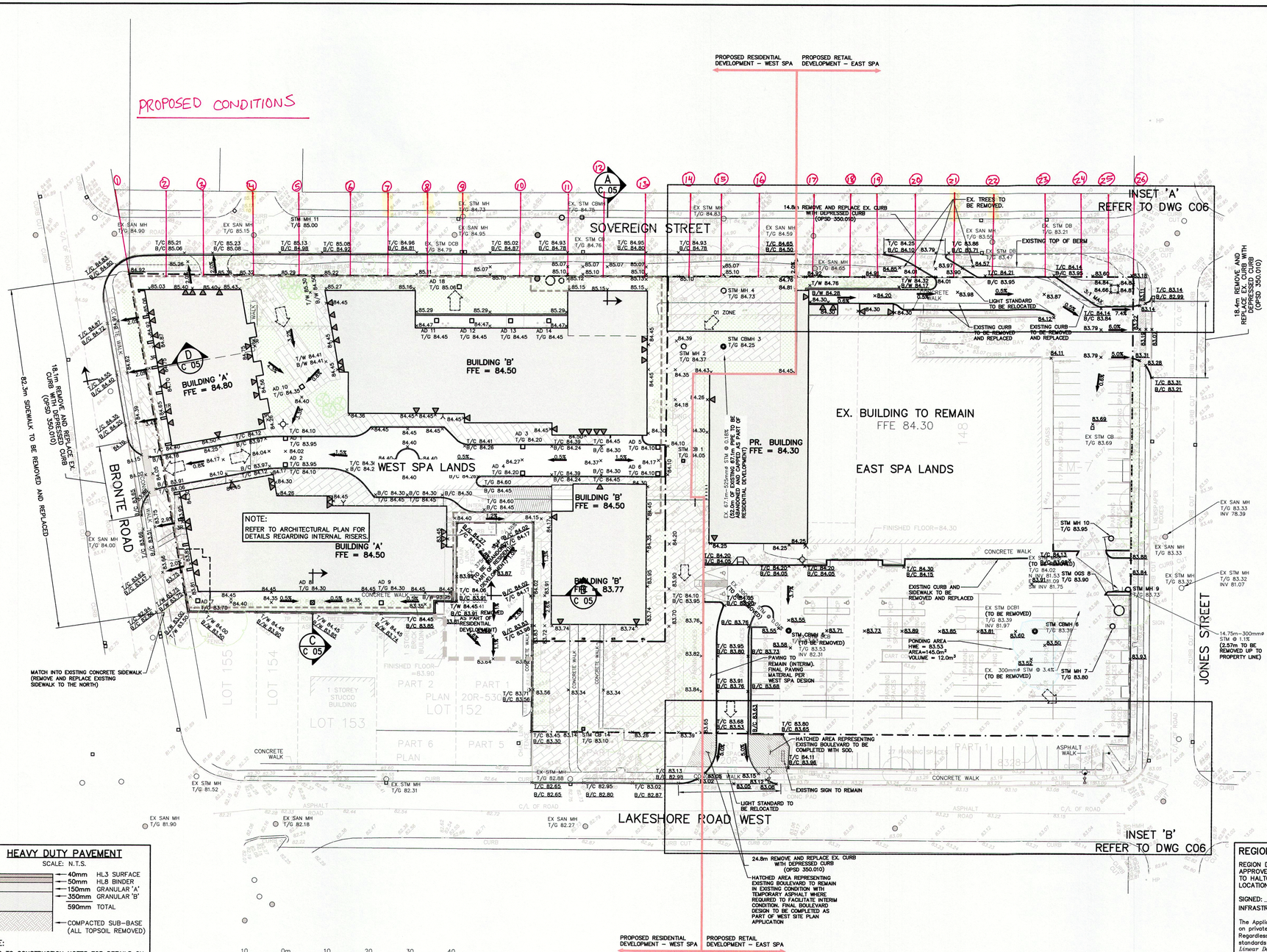
Cross-Section #	South Boulevard grade (m asl)				Centreline Elevation (m asl)	North Boulevard grade (m asl)			R.O.W. Conveyance Average Depth (m)	R.O.W. Conveyance Cross-Sectional Area (sq.m.)	Projected Conveyance Channel Grade (m asl) (Based on Average Slope in Sketch)	Projected Spill Elevation (m asl)	Incremental Distance (m)	Total Distance (m)
	Property Line	Top of Berm	Top of Curb	Bottom of Curb		Bottom of Curb	Top of Curb	Property Line						
1	84.92	84.96	84.92	84.85	84.98	84.90	85.02	85.07	-	-	-	-	0.00	0.00
2	84.99	85.02	85.13	85.00	85.15	85.03	85.15	85.11	-	-	-	-	10.62	10.62
3	84.73	84.96	**85.08**	85.08	85.21	85.10	85.20	85.07	0.025	0.215	85.13	**85.18**	8.95	19.57
4	84.54	85.51	85.14	85.03	85.17	85.12	**85.12**	85.12	0.027	0.236	85.08	**85.13**	12.17	31.74
5	84.95	85.36	85.07	84.95	85.11	84.95	85.06	85.17	0.110	0.946	85.03	85.08	11.20	42.94
6	84.51	85.34	85.02	84.90	85.05	84.90	85.02	84.94	0.060	0.516	84.95	85.00	13.07	56.00
7	84.44	85.30	84.97	84.85	84.96	84.86	**84.97**	84.79	0.058	0.495	84.94	**85.00**	8.43	64.43
8	84.42	85.30	84.90	84.79	84.91	84.78	**84.92**	84.72	0.067	0.580	84.92	**84.99**	9.50	73.93
9	84.34	85.26	84.88	84.77	84.95	84.73	84.83	**84.91**	0.080	0.688	84.91	**84.97**	6.63	80.56
10	84.33	85.15	84.96	84.86	84.94	84.84	84.95	85.04	0.095	0.817	84.88	84.95	15.74	96.30
11	84.36	85.21	84.92	84.77	84.96	84.83	84.99	85.01	0.105	0.903	84.86	84.93	12.76	109.06
12	84.35	85.25	84.92	84.76	84.93	84.83	84.96	85.18	0.193	1.656	84.85	84.91	7.58	116.64
13	84.35	85.23	84.95	84.80	84.95	84.86	84.97	85.08	0.125	1.075	84.83	84.90	10.00	126.64
14	84.42	85.30	84.91	84.79	84.94	84.83	84.98	84.98	0.085	0.731	84.81	84.88	10.64	137.27
15	84.39	85.21	84.90	84.77	84.90	84.80	84.91	84.92	0.068	0.581	84.82	84.89	7.72	144.99
16	84.40	85.08	84.76	84.62	84.75	84.67	84.76	84.75	0.058	0.495	84.66	84.69	9.20	154.19
17	84.33	85.05	84.64	84.48	84.59	84.50	84.63	84.48	0.070	0.602	84.43	84.46	13.15	167.34
18	84.38	84.94	84.42	84.27	84.40	84.27	84.40	84.24	0.065	0.559	84.27	84.30	8.68	176.02
19	84.35	84.85	84.26	84.16	84.26	84.15	84.27	84.16	0.057	0.494	84.15	84.19	6.53	182.55
20	84.30	84.76	84.05	83.90	84.05	83.93	84.04	83.96	0.065	0.559	83.99	84.02	9.26	191.81
21	84.26	84.60	83.82	83.68	83.83	83.69	83.81	**83.81**	0.063	0.538	83.82	**83.85**	9.40	201.21
22	84.19	84.53	83.57	83.45	83.62	83.48	83.60	**83.64**	0.087	0.752	83.65	**83.69**	9.44	210.65
23	84.14	84.47	83.35	83.25	83.37	83.21	83.36	83.68	0.225	1.935	83.43	83.46	12.56	223.21
24	84.76	84.76	83.28	83.16	83.26	83.14	83.26	83.70	0.275	2.365	83.27	83.31	8.78	231.99
25	84.84	83.35	83.24	83.20	83.23	83.10	83.26	83.66	0.100	0.860	83.16	83.19	6.58	238.57
26	84.87	84.83	83.18	83.08	83.10	83.01	83.09	83.15	0.053	0.452	83.02	83.05	7.61	246.18

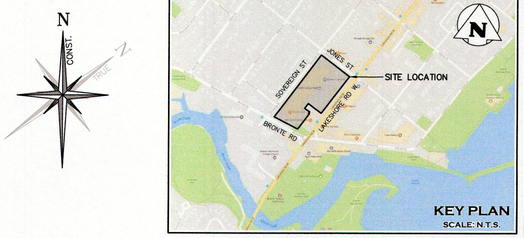
SPILL CONDITION Based on Projected Spill Elevation



Notes: Assume consistent road width of 8.60m
Assume consistent berm off-set in south boulevard of 2.85m from property line

PROPOSED CONDITIONS





LEGEND

- PROPERTY LINE
- EX. WATERMAIN & GATE VALVE
- EX. FIRE HYDRANT
- EX. STORM SEWER & MANHOLE
- EX. STORM CATCHBASIN
- EX. SANITARY SEWER & MANHOLE
- PROPOSED WATERMAIN & GATE VALVE
- PROPOSED FIRE HYDRANT & GATE VALVE
- PROPOSED STORM SEWER & MANHOLE
- PROPOSED SANITARY SEWER & MANHOLE
- ×84.50 EXISTING GRADE
- ×84.50 PROPOSED GRADE
- ×84.50 PROPOSED GRADE (TO MATCH EXISTING)
- 2.0% PROPOSED MINOR FLOW DIRECTION
- 2.0% PROPOSED GRASSED SWALE
- BUILDING ENTRANCE (PERSONNEL DOOR)
- BUILDING ENTRANCE (OVERHEAD DOOR)
- PROPOSED MAJOR OVERLAND FLOW DIRECTION
- EX. WATERMAIN & GATE VALVE
- EX. STORM SEWER & MANHOLE
- EX. SANITARY SEWER & MANHOLE
- WEST SITE PLAN APPLICATION LANDS
- PROPOSED PONDING AREA
- PROPOSED LIMIT OF DISTURBANCE FOR EAST LANDS
- PROPOSED SODDING AREA IN BOULEVARD

HEAVY DUTY PAVEMENT

SCALE: N.T.S.

40mm	HL3 SURFACE
50mm	HL8 BINDER
150mm	GRANULAR 'A'
350mm	GRANULAR 'B'
590mm	TOTAL
	COMPACTED SUB–BASE (ALL TOPSOIL REMOVED)

NOTE:
REFER TO CONSTRUCTION NOTES FOR DETAILS ON COMPACTION. PAVEMENT STRUCTURE IS BASED ON GEOTECHNICAL CONSULTANT'S RECOMMENDATIONS.

LIGHT DUTY PAVEMENT

SCALE: N.T.S.

40mm	HL3 SURFACE
50mm	HL8 BINDER
150mm	GRANULAR 'A'
300mm	GRANULAR 'B'
540mm	TOTAL
	COMPACTED SUB–BASE (ALL TOPSOIL REMOVED)

NOTE:
REFER TO CONSTRUCTION NOTES FOR DETAILS ON COMPACTION. PAVEMENT STRUCTURE IS BASED ON GEOTECHNICAL CONSULTANT'S RECOMMENDATIONS.

NOTE:
FUTURE LAKESHORE ROAD BOULEVARD TO BE DESIGNED IN COORDINATION WITH THE TOWN IN ACCORDANCE WITH THE ONGOING MUNICIPAL EA.

NOTE:
EXISTING SERVICING FROM TOWN OF OAKVILLE AS–BUILT DRAWING PROJECT No. 79–903, DRAWING No. M–1 (APRIL 10, 1980)

REGIONAL APPROVAL

REGION DESIGN OF WATER AND/OR WASTEWATER SERVICES APPROVED SUBJECT TO DETAIL CONSTRUCTION CONFORMING TO HALTON REGION STANDARDS, SPECIFICATIONS AND LOCATION APPROVAL FROM AREA MUNICIPALITY

SIGNED: _____ DATED: _____

INFRASTRUCTURE PLANING & POLICY.

The Applicant should be aware that the approval of water systems on private property is the responsibility of the Local Municipality. Regardless, the Applicant must ensure that the Region of Halton's standards and specifications are met *(The Water and Wastewater Linear Design Manual may be obtained thru the Data Management Group at 905–825–6032)* Furthermore, all water quality tests must be completed to the Region of Halton's satisfaction, before the water supply can be turned on.

SP 6903 | MUNICIPAL PLANNING # SP.1729.004/11

DRAWING NOTES:

THIS DRAWING IS THE EXCLUSIVE PROPERTY OF C.F. CROZIER & ASSOCIATES INC. AND THE REPRODUCTION OF ANY PART WITHOUT PRIOR WRITTEN CONSENT OF THIS OFFICE IS STRICTLY PROHIBITED.

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS, AND DATUMS ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO THIS OFFICE PRIOR TO CONSTRUCTION.

THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT. DO NOT SCALE THIS DRAWING.

ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

SURVEY NOTES:

SURVEY COMPLETED BY J.D. BARNES LIMITED ON THE 19th DAY OF APRIL, 2016. REFERENCE No. 16–30–895–00–TOPO (JULY 11th, 2018).

BEARINGS ARE UTM GRID, DERIVED FROM REAL TIME NETWORK (RTN) OBSERVATIONS, UTM ZONE 17, NAD83 (CSRS) (2010.0).

DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.9996781

SITE PLAN NOTES:

SITE PLAN PREPARED BY QUADRANGLE ARCHITECTS LIMITED.
DRAWING No.: 5 (2018/JUNE/29)
PROJECT No. 16083

ELEVATION NOTE:

ELEVATIONS SHOWN ON THIS PLAN ARE DERIVED FROM THE TOWN OF OAKVILLE BENCH MARKS:

No. 117 ELEVATION = 83.984m, No. 243 ELEVATION = 88.331m

LOCAL BENCHMARK:

CUT CROSS IN CURB LOCATED AT THE NORTHEASTERN END OF LOADING BAY, AS SHOWN ON FACE OF PLAN..

ELEVATION = 84.13m

No.	ISSUE / REVISION	YYYY/MMM/DD
13	ISSUED FOR SPA	2018/JUN/06
12	ISSUED FOR WEST LANDS SITE SERVICING PERMIT	2018/MAY/09
11	ISSUED FOR EAST LANDS SITE SERVICING PERMIT	2018/MAY/09
10	ISSUED FOR SPA	2018/APR/06
9	ISSUED FOR TENDER	2018/MAR/21

Stamp

Stamp

Project: BRONTE VILLAGE MALL REDEVELOPMENT
2441 LAKESHORE ROAD WEST, OAKVILLE
REGIONAL MUNICIPALITY OF HALTON

Drawing: SITE GRADING PLAN

CROZIER & ASSOCIATES Consulting Engineers
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON L9T 6P4
905 875-0026 T
905 875-4915 F
WWW.CFCROZIER.CA

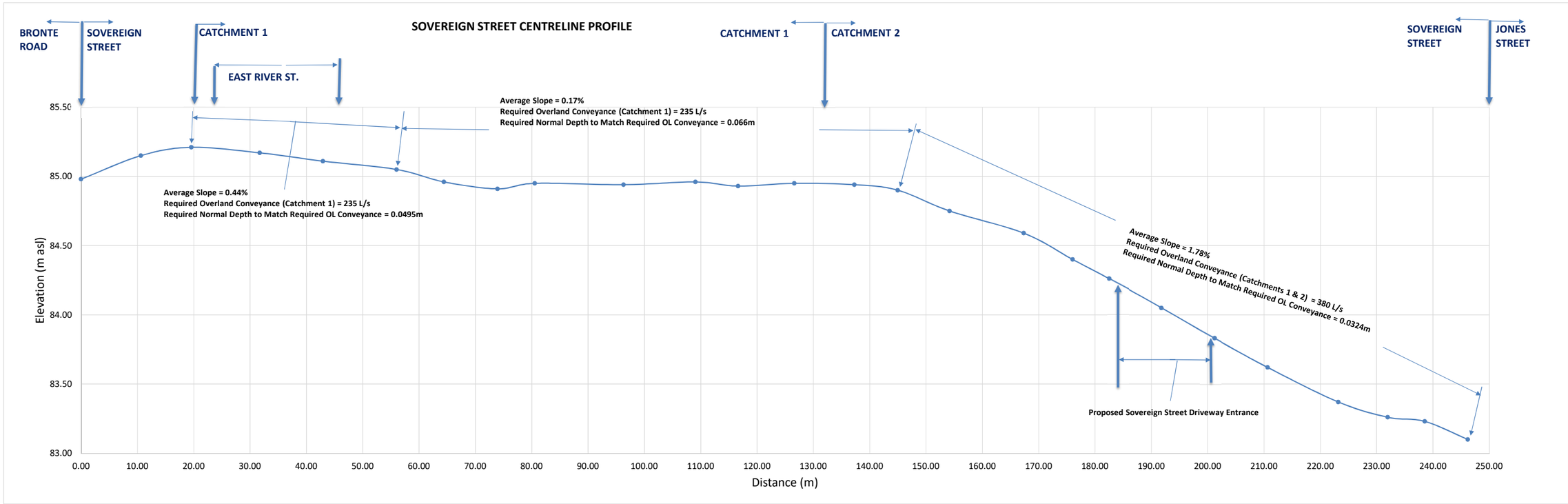
Drawn	Design	Project No.
S.T.T.	B.M.P.	1348–4555
Check	Check	Scale
B.M.P.	A.S.	1:500

Dwg. C 03

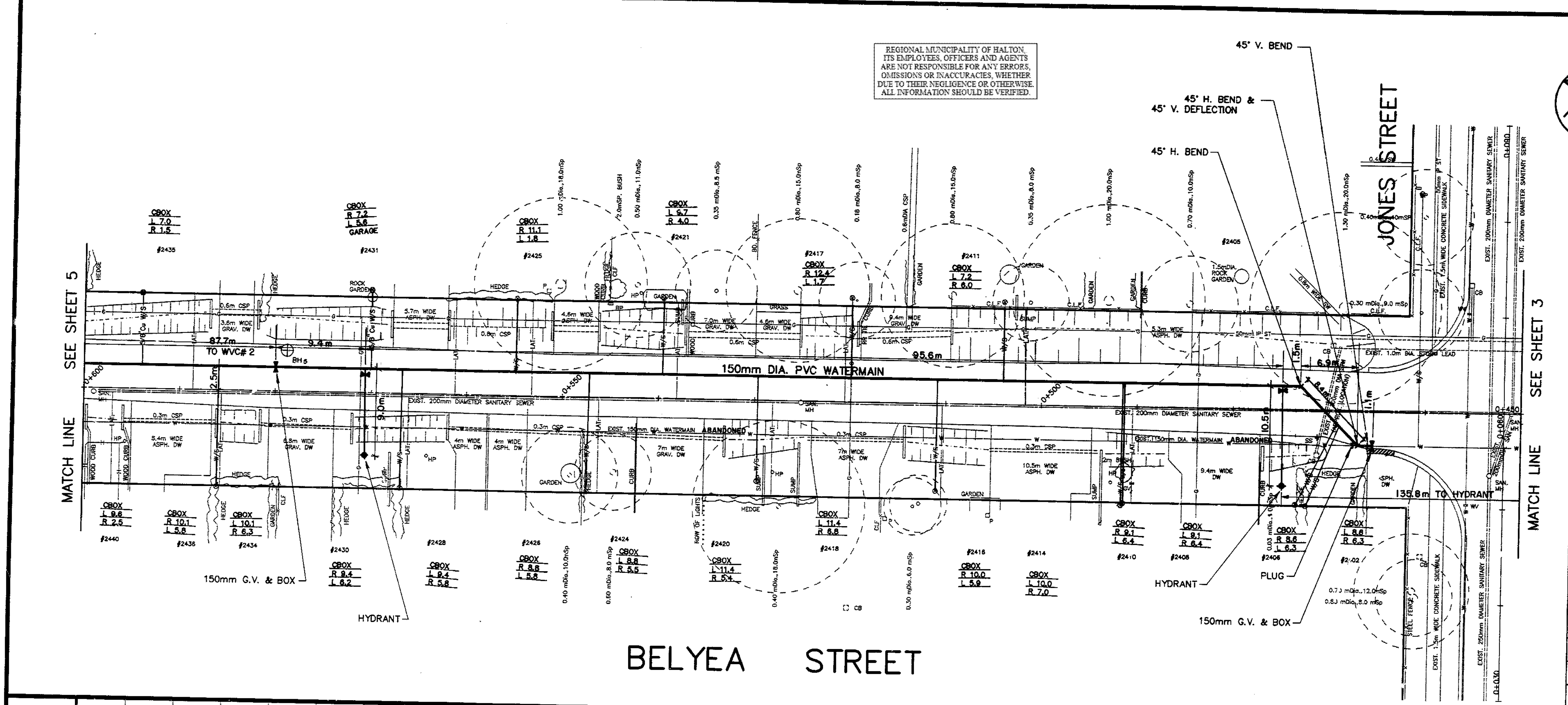
C. Proposed Conditions

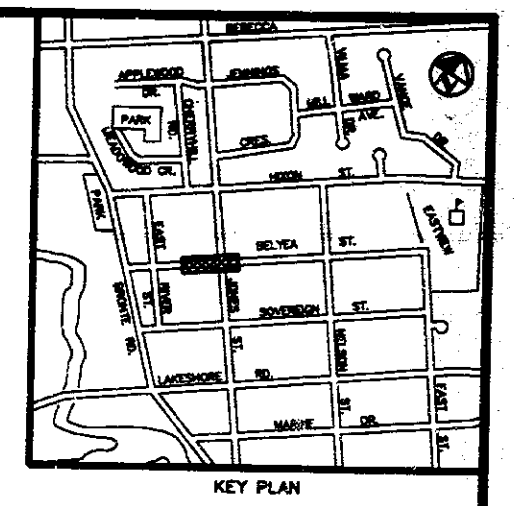
Cross-Section #	South Boulevard grade (m asl)			Centreline Elevation (m asl)	North Boulevard grade (m asl)			R.O.W. Conveyance Average Depth (m)	R.O.W. Conveyance Cross-Sectional Area (sq.m.)	Projected Conveyance Channel Grade (m asl) (Based on Average Slope in Sketch)	Projected Spill Elevation (m asl)	Incremental Distance (m)	Total Distance (m)
	Property Line	Top of Curb	Bottom of Curb		Bottom of Curb	Top of Curb	Property Line						
1	84.92	84.92	84.85	84.98	84.90	85.02	85.07	-	-	-	-	0.00	0.00
2	85.25	85.15	85.00	85.15	85.03	85.15	85.11	-	-	-	-	10.62	10.62
3	85.33	85.23	85.08	85.21	85.10	85.20	85.07	0.055	0.473	85.13	85.18	8.95	19.57
4	85.28	85.18	85.03	85.17	85.12	**85.12**	85.12	0.023	0.194	85.08	**85.13**	12.17	31.74
5	85.25	85.10	84.95	85.11	84.95	85.06	85.17	0.110	0.946	85.03	85.08	11.20	42.94
6	85.15	85.05	84.90	85.05	84.90	85.02	84.94	0.060	0.516	84.95	85.00	13.07	56.00
7	85.10	85.00	84.85	84.96	84.86	**84.97**	84.79	0.058	0.495	84.94	**85.00**	8.43	64.43
8	85.11	84.94	84.79	84.91	84.78	**84.92**	84.72	0.067	0.580	84.92	**84.99**	9.50	73.93
9	85.11	84.92	84.77	84.95	84.73	84.83	**84.91**	0.080	0.688	84.91	**84.97**	6.63	80.56
10	85.10	85.01	84.86	84.94	84.84	84.95	85.04	0.095	0.817	84.88	84.95	15.74	96.30
11	85.10	84.92	84.77	84.96	84.83	84.99	85.01	0.105	0.903	84.86	84.93	12.76	109.06
12	85.10	84.91	84.76	84.93	84.83	84.96	85.18	0.152	1.311	84.85	84.91	7.58	116.64
13	85.10	84.95	84.80	84.95	84.86	84.97	85.08	0.125	1.075	84.83	84.90	10.00	126.64
14	85.10	84.94	84.79	84.94	84.83	84.98	84.98	0.085	0.731	84.81	84.88	10.64	137.27
15	85.10	84.92	84.77	84.90	84.80	84.91	84.92	0.068	0.581	84.82	84.89	7.72	144.99
16	84.93	84.77	84.62	84.75	84.67	84.76	84.75	0.058	0.495	84.66	84.69	9.20	154.19
17	84.73	84.63	84.48	84.59	84.50	84.63	84.48	0.070	0.602	84.43	84.46	13.15	167.34
18	84.52	84.42	84.27	84.40	84.27	84.40	84.24	0.065	0.559	84.27	84.30	8.68	176.02
19	84.41	84.31	84.16	84.26	84.15	84.27	84.16	0.057	0.494	84.15	84.19	6.53	182.55
20	84.21	83.90	83.90	84.05	83.93	84.04	83.96	0.063	0.538	83.99	84.02	9.26	191.81
21	83.99	83.83	83.68	83.83	83.69	83.81	**83.81**	0.063	0.538	83.82	**83.85**	9.40	201.21
22	83.70	83.60	83.45	83.62	83.48	83.60	**83.64**	0.087	0.752	83.65	**83.69**	9.44	210.65
23	83.50	83.40	83.25	83.37	83.21	83.36	83.68	0.135	1.161	83.43	83.46	12.56	223.21
24	83.41	83.31	83.16	83.26	83.14	83.26	83.70	0.130	1.118	83.27	83.31	8.78	231.99
25	83.45	83.35	83.20	83.23	83.10	83.26	83.66	0.150	1.290	83.16	83.19	6.58	238.57
26	83.18	83.08	83.08	83.10	83.01	83.09	83.15	0.053	0.452	83.02	83.05	7.61	246.18

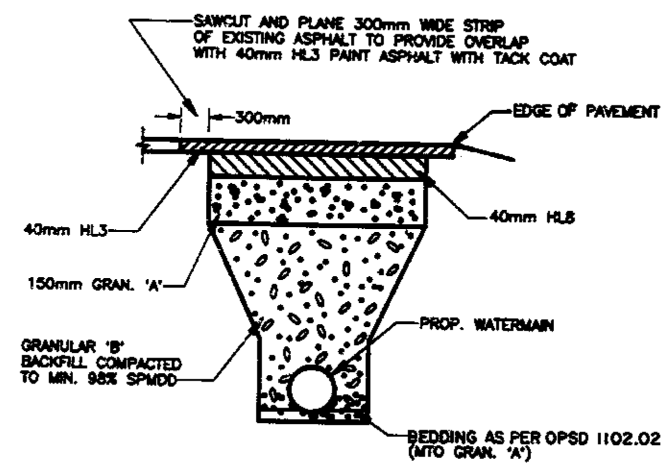
SPILL CONDITION Based on Projected Spill Elevation



Notes: Assume consistent road width of 8.60m
Assume consistent berm off-set in south boulevard of 2.85m from property line



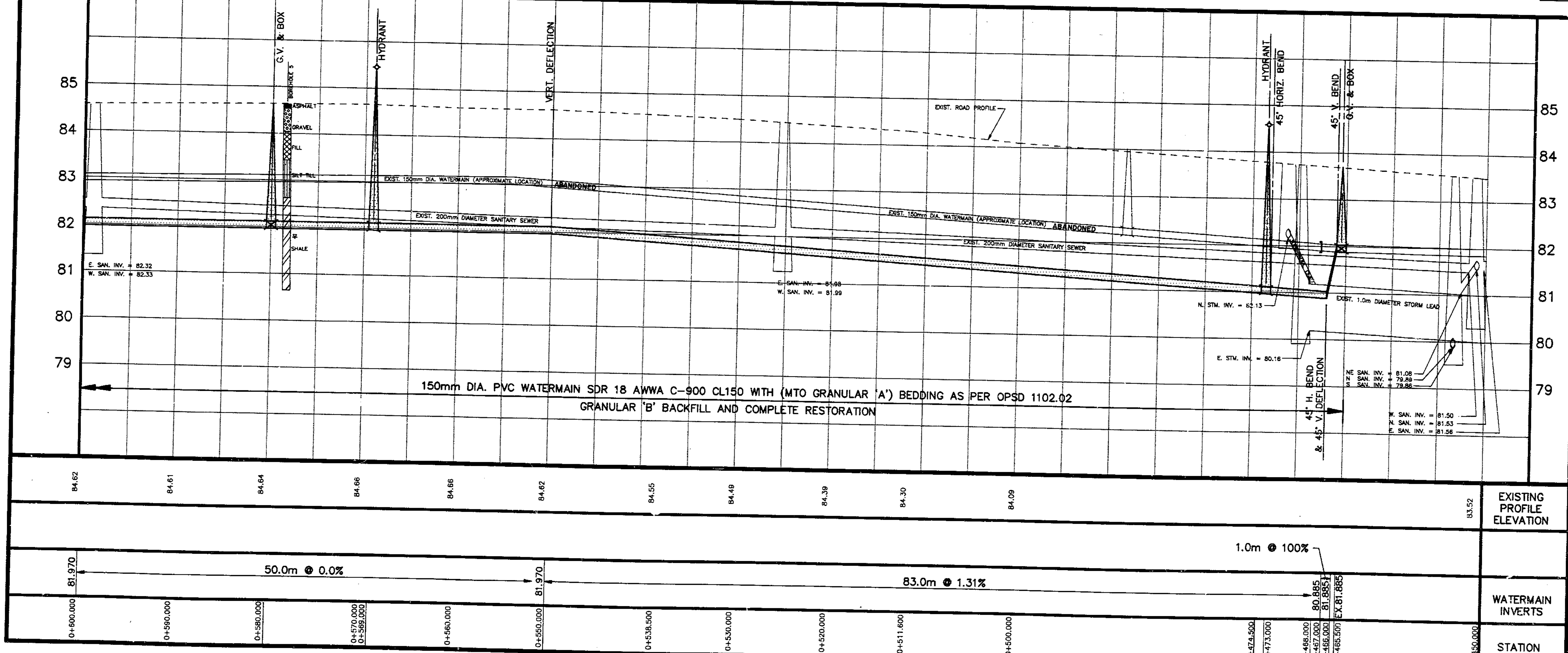




ROAD RESTORATION DETAIL FOR BELYEA STREET
n.t.s.

SEE SHEET 1 OF 8 FOR GENERAL NOTES

WATERMAIN DATA					
ITEM	STATION	℄ CONSTR. OFFSET	STD. DWG.	INVERT ELEV.	REMARKS
150mm G.V. & BOX	0+465.500	3.60m LT.	W3	EX.81.885	CUT INTO EX. W/M & CONNECT TO PROPOSED
45° V. BEND	0+466.000	3.60m LT.	1103.01	81.885	
45° H. BEND & 45° V. DEFLECTION	0+467.000	3.60m LT.	1103.01	80.885	
45° H. BEND	0+473.000	2.5m RT.	1103.01	80.963	
FIRE HYD.	0+474.500	2.5m RT.	1105.01	80.970	TOP OF BOTTOM FLANGE TO BE SET AT 100mm ABOVE EX. GROUND
FIRE HYD.	0+569.000	2.5m RT.	1105.01	81.970	TOP OF BOTTOM FLANGE TO BE SET AT 100mm ABOVE EX. GROUND
150mm G.V. & BOX	0+580.000	2.5m RT.	W3	81.970	



No.	Date	By	REVISIONS	MANU.	CAD
1	NOV/92	LC	AS CONSTRUCTED W/M (PLAN)	X	X

Design	T.L.	Ch'kd	Date: DEC. 1991
Drawn	L.C.	Ch'kd	References
Scale	Horiz. / Vert.		Field Notes

APPROVALS

Municipal

Regional

Commissioner of Public Works

Director of Design & Construction 92-01-17

Stamp: LICENSED PROFESSIONAL ENGINEER J. Y.-K. CHOI Jan 17/92 PROVINCE OF ONTARIO

Halton

TITLE

150mm DIA. WATERMAIN ON BELYEA STREET FROM JONES STREET TO 150m W.

Consultant File No.

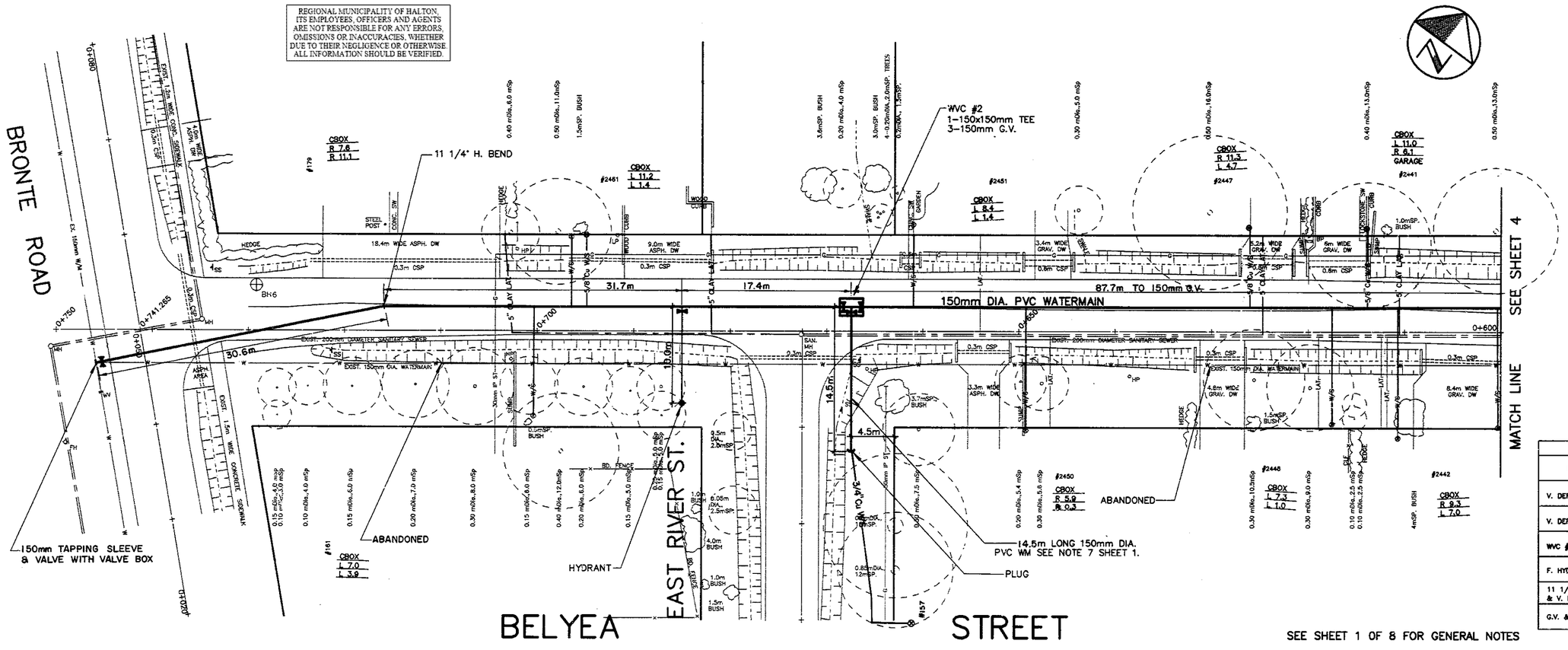
Regional Drawing No. 0-8320

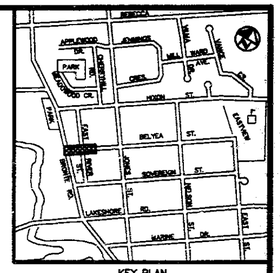
CONTRACT No. W-1340-92

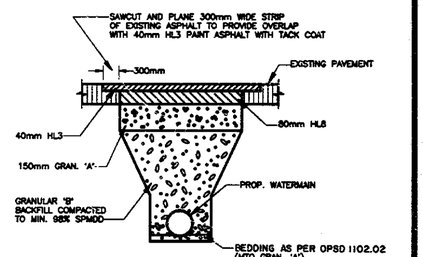
Drawing No.

SHEET 4 OF 8

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.



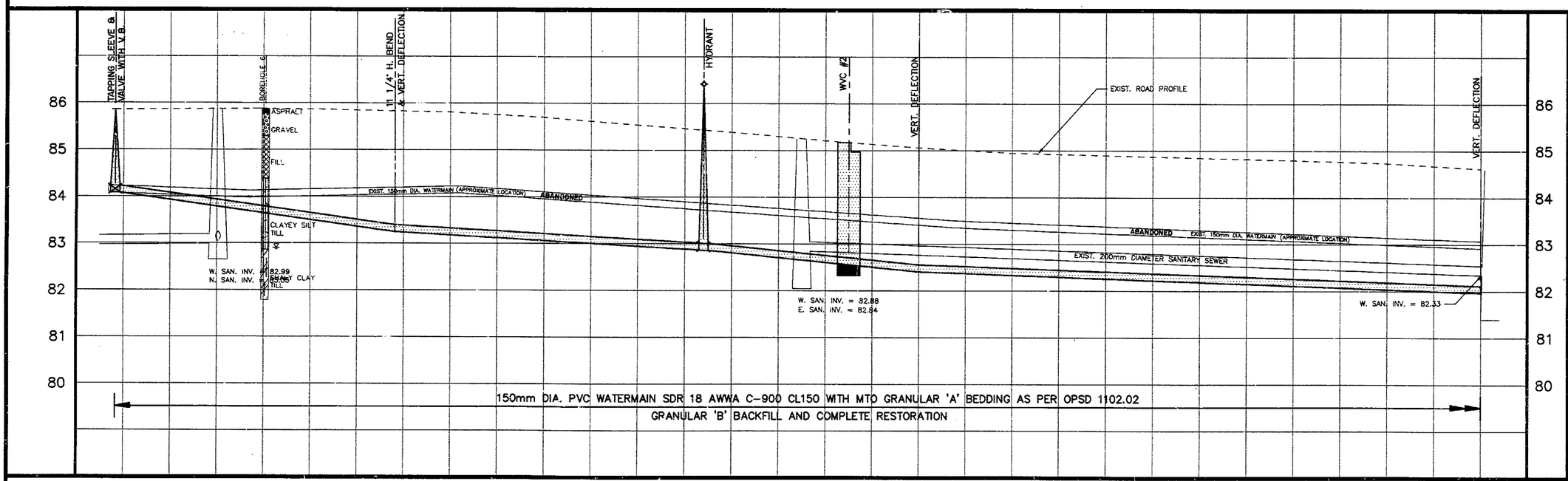




ROAD RESTORATION DETAIL ON BRONTE RD.
n.t.s.

WATERMAIN DATA					
ITEM	STATION	& CONSTR. OFFSET	STD. DWG.	INVERT ELEV.	REMARKS
V. DEFLECTION	0+800.000	2.5m RT.	1103.01	81.970	
V. DEFLECTION	0+660.000	2.5m RT.	1103.01	82.410	
WVC #2	0+667.500	2.5m RT.	W2	82.523	1-150x150mm TEE 3-150mm G.V.
F. HYDRANT	0+685.000	2.5m RT.	1105.01	82.868	TOP OF BOTTOM FLANGE TO BE SET AT 100mm ABOVE EX. GROUND
11 1/4° H. BEND & V. DEFLECTION	0+715.911	2.5m RT.	1103.01	83.250	
G.V. & BOX	0+745.870	3.5m LT.	W3	EX.84.082	DISCONNECT EX. WM AND CONNECT PROP. 150mm DIA WM TO EX. 150x150mm TEE

SEE SHEET 1 OF 8 FOR GENERAL NOTES



EXISTING PROFILE ELEVATION	85.68	85.65	85.61	85.70	85.54	85.39	85.21	85.06	84.95	84.90	84.85	84.80	84.74	84.62
WATERMAIN INVERTS	EX.84.082	30.31m @ 2.75%		83.250	55.91m @ 1.5%			82.410	60.0m @ 0.73%					81.970
STATION	0+746.217 0+745.870	0+730.000	0+720.000	0+715.911	0+710.000	0+700.000	0+690.000	0+683.000 0+680.000	0+670.003 0+667.500	0+660.000	0+650.000	0+640.000	0+630.000	0+620.000	0+610.000	0+600.000

1	NOV./92	LC	AS CONSTRUCTED W/M (PLAN)	X	X
NO	Date	By	REVISIONS	MANU	CAD

Design	T.L.	Ch'kd	Date: DEC. 1991
Drawn	L.C.	Ch'kd	
Scale: Horiz. 5 2.5 0 5; Vert. 1 0.5 0 1			References

APPROVALS

Municipal

Regional

Commissioner of Public Works

Director of Design & Construction

92 0117

Field Notes

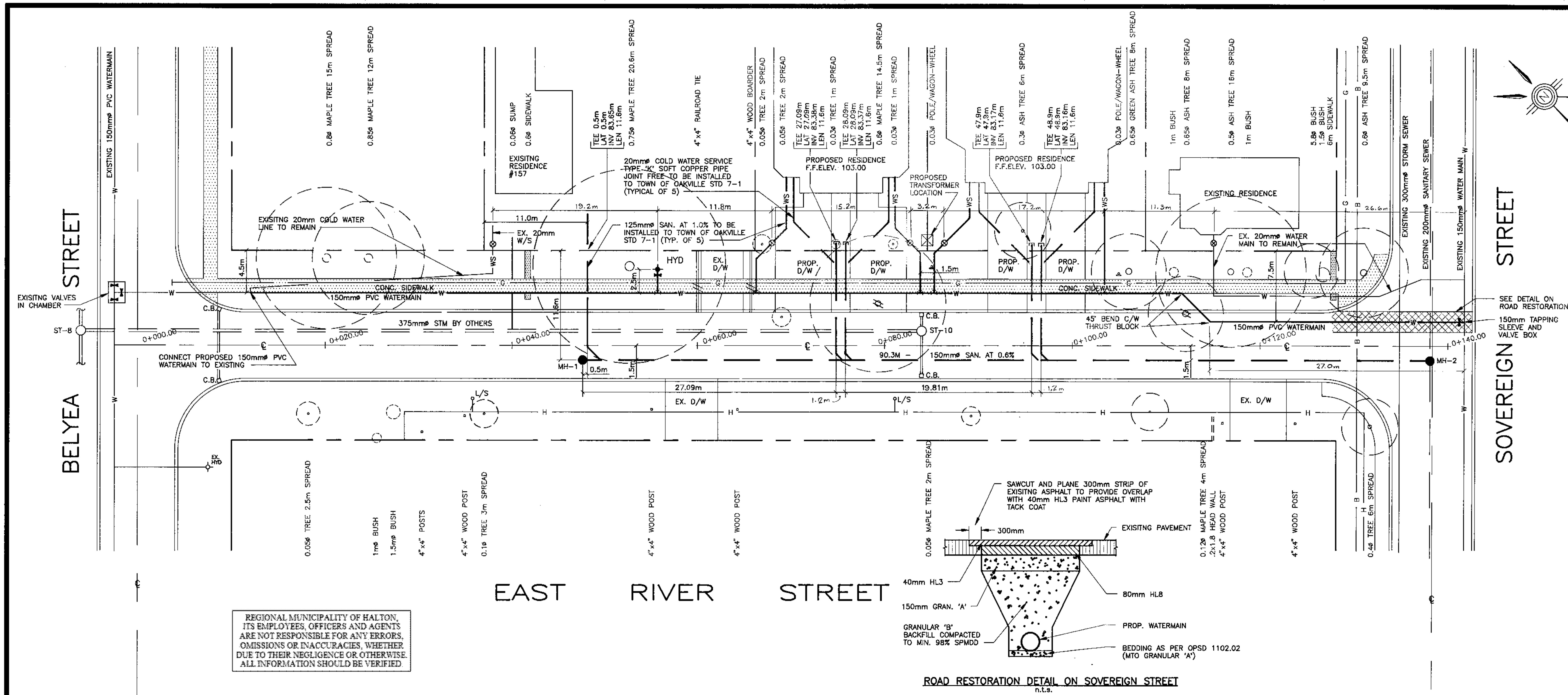
Stamp: LICENSED PROFESSIONAL ENGINEER J. Y-K. CHOI Jan 17, 92 PROVINCE OF ONTARIO

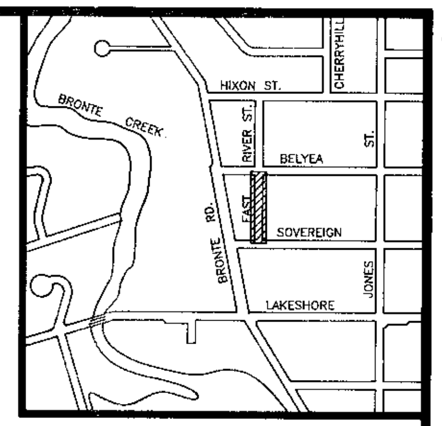
Halton

TITLE

150mm DIA. WATERMAIN
ON
BELYEA STREET
FROM 70m E. OF EAST RIVER ST. TO BRONTE RD.

Consultant File NO	Regional Drawing NO 0-8321
CONTRACT NO W-1340-92	Drawing NO SHEET 5 OF 8





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

SAWCUT AND PLANE 300mm STRIP OF EXISTING ASPHALT TO PROVIDE OVERLAP WITH 40mm HL3 PAINT ASPHALT WITH TACK COAT
300mm
EXISTING PAVEMENT
40mm HL3
80mm HL8
150mm GRAN. 'A'
GRANULAR 'B' BACKFILL COMPACTED TO MIN. 98% SPMDD
PROP. WATERMAIN
BEDDING AS PER OPSD 1102.02 (MTO GRANULAR 'A')

ROAD RESTORATION DETAIL ON SOVEREIGN STREET
n.t.s.

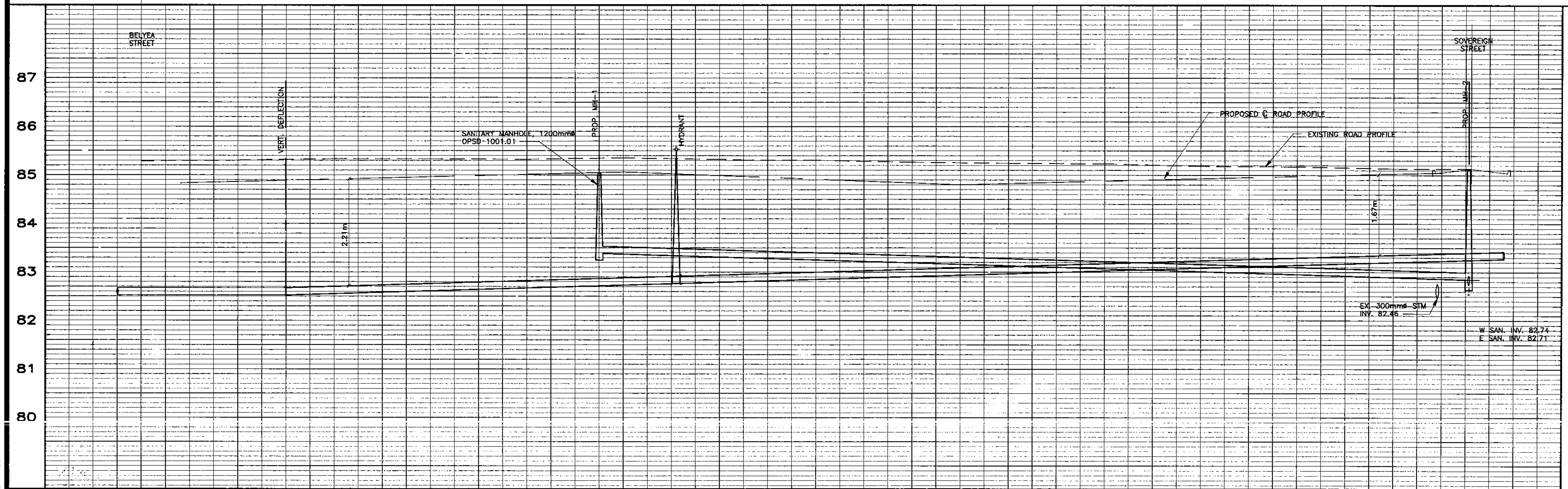
GENERAL NOTES

1. Sewers
   - Sanitary Pipes: VC CSA STD A60.1, BEDDING TYPE 'B'
   - Sanitary Manholes: 1200mmø OPSD-1001.01 Frame and Cover, OPSD 401.01, Steps OPSD 405.01
2. Watermains
   - PVC SDR 18, Class 150, AWWA C900 MIN, PVC Gasket Joint Fittings, Thrust Blocks as per OPSD-1003.01 & 1103.02,
   - Bedding: Class 'b' as per OPSD-1102.01
   - Cover: 1.7m Minimum Cover or below centerline of pavement as applicable or as per design
   - Valves: Gate Valves for WAtermains 300mmø and under, open left with 500mm Square STD. AWWA Operating Nut. Manufacturers as approved by the Region.
   - Valves & Boxes: As per W3 Region STD.
   - Hydrants: As per AWWA C502-73 with Steamer Parts and 150mmø secondary valve and box, OPSD 1105.01 as revised by Halton Region.
   - Crossings: At crossings over sewer trenches, watermain trench will be excavated to the top of sewer and backfill with compacted granular up to the spring line of watermain.
   - Services: All connections will be made only after testing and disinfection of new mains.
   - Inspection: All proposed watermians will be inspected and approved by the Region before backfilling.
   - Seperation: Min. 2.5m from other service laterals.
3. Block Connections
   - Sanitary: 150mmø PVC DR 35, CSA B182.1, ASTM D3034
   - Storm: 300mmø PVC DR 35, CSA B182.2, ASTM D3034
   - Bedding: Type 'B', As per OPSD 1102.01

Sewer Service Connection as per STD 4-3
Water Service Connection as per STD W-16

Construction Notes

1. Vertical trench construction with Granular 'C' backfill. Restore surface using:
   450 Granular 'B'
   150 Granular 'A'
   80mm HL-8 STD
   40mm HL-3A
2. Typical Trench Section as per STD 4-1.
3. Support all existing Hydro Poles/light poles during construction
4. Reconstruct disturbed boulevard with topsoil and sod to Town of Oakville specificatoin.
5. Restore damaged asphalt driveways, concrete curbs, concrete curb and gutter as a result of watermain construction to Town of Oakville specifications.



SANITARY INVERTS: 83.38 — 90.3M OF 150mmø V.C. CSA STD A60.1 SANITARY SEWER AT 0.6% — 82.84

WATERMAIN INVERTS: EX.82.52 — EX.82.52 — 126.60M OF 150mmø PVC WATERMAIN AT 0.59% — 82.93 — SD R18 AWWA C 900 — EX.83.27

PROPOSED ℄ ELEVATIONS: 84.834 — 85.063 — 84.809 — 85.055

EXISITNG ℄ ELEVATIONS: 85.28 — 85.30 — 85.33 — 85.33 — 85.32 — 85.35 — 85.32 — 85.31 — 85.30 — 85.26 — 85.26 — 85.24 — 85.23 — 85.18 — 85.17 / 85.17 — 85.13 — 85.13

STATION: 0+000.00 — 0+000.00 — 0+004.20 — 0+010.00 / 0+010.80 — 0+020.00 — 0+030.00 — 0+040.00 — 0+050.00 — 0+059.80 — 0+062.25 — 0+070.00 — 0+080.00 — 0+085.00 — 0+090.00 — 0+100.00 — 0+110.00 — 0+119.30 / 0+120.00 — 0+130.00 — 0+138.08

Nº	Date	By	Revisions
1	9/29/93	T.N.T.	AS BUILT DRAWING

Design. — Chk'd. D.M. — Date.
Drawn T.N.T. — Chk'd.
Scale. Horiz. 5 2.5 0 5 — Vert. 1 .5 0 1
References.

Approvals

Municipal.
COMMISSIONER OF PUBLIC WORKS
DIRECTOR OF DESIGN & CONSTRUCTION

Field Notes. Bell ☐ Hydro ☐ Gas ☐ Cable ☐

Stamp. REGISTERED PROFESSIONAL ENGINEER — W. A. E. FROST — PROVINCE OF ONTARIO

Regional.
DESIGN OF SANITARY AND WATER SERVICES APPROVED SUBJECT TO DETAIL CONSTRUCTION CONFORMING TO HALTON REGION STANDARDS AND SPECIFICATIONS AND LOCATION APPROVAL FROM AREA MUNICIPALITIES.
SIGNED_____ DATE_____
COMM. OF PUBLIC WORKS-HALTON REGION

Consultant.
TOTAL DESIGN CONSULTANTS LTD.

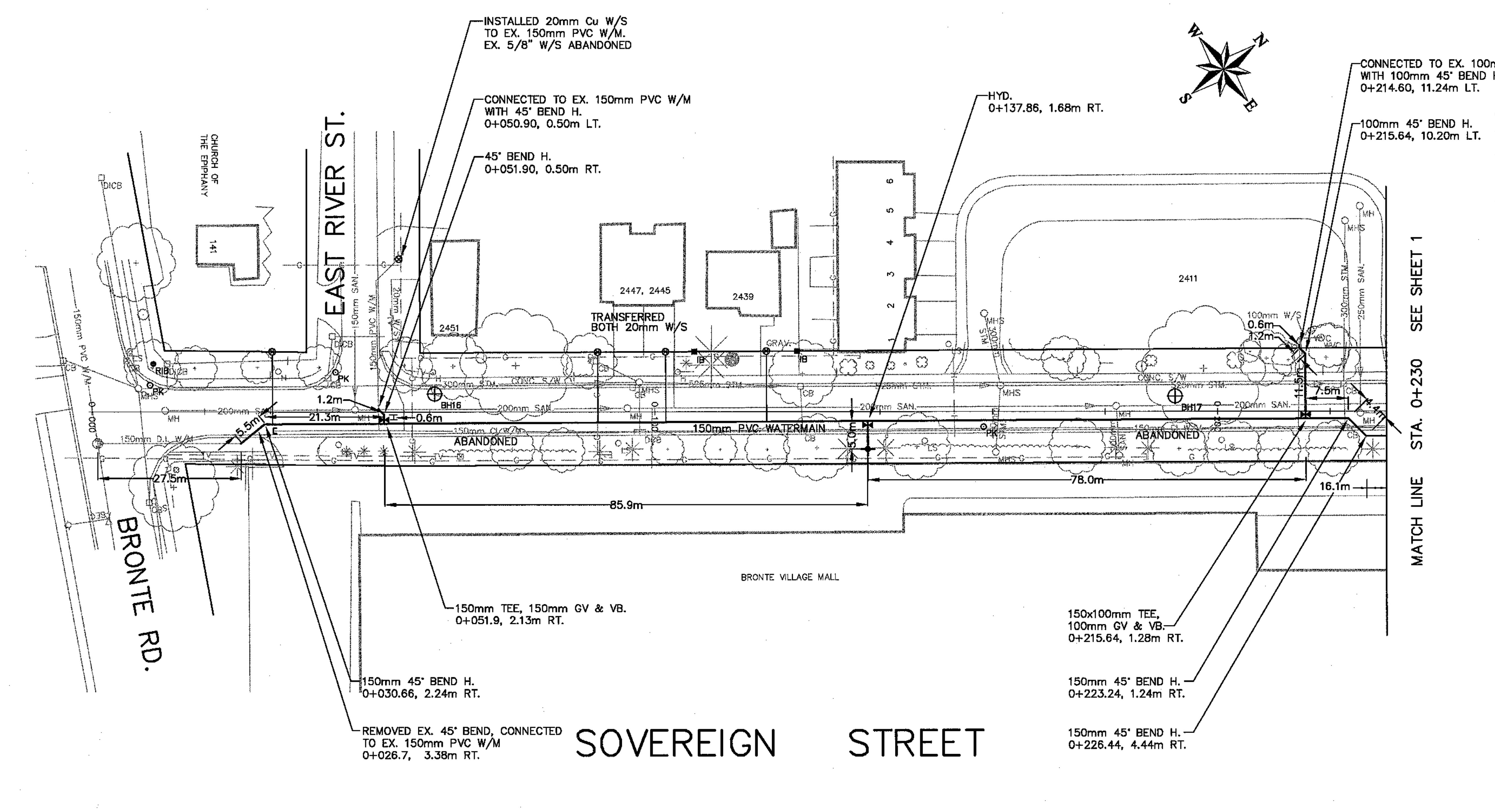
Municipality.
Halton

Title.
PROPOSED SANITARY SEWER AND WATERMAIN ON EAST RIVER STREET IN THE TOWN OF OAKVILLE
LAND DIVISION #B92/084/0

Municipal Dwg. Nº. 0-8705 — Regional Dwg. Nº. DO-407
Contract Nº.
Sheet 1 of 1

metric
Dimensions in millimetres unless otherwise noted.

File name: EX1313.DWG Last edited: 93/09/29 @ 11:50
0-8504 0-8705



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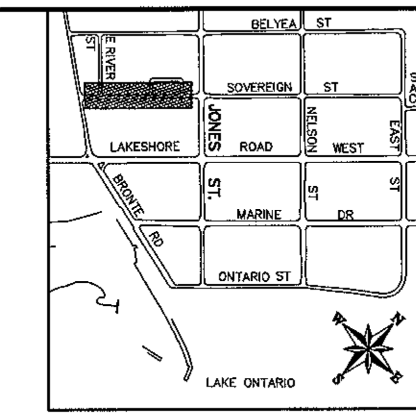


GENERAL NOTES

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, SIZE AND ELEVATION IN THE FIELD PRIOR TO CONSTRUCTION.
4. DRIVEWAY MATERIAL IS ASPHALT UNLESS OTHERWISE SPECIFIED.
5. UNLESS OTHERWISE NOTED, ALL NEW SANITARY SEWERS ARE TO BE PVC SDR 35 ASTM D3034 WITH GRANULAR 'A' BEDDING AND COVER AS PER OPSD 802.010 WITH GRANULAR 'B' BACKFILL.
6. UNLESS OTHERWISE NOTED, ALL EXISTING SANITARY LATERALS ARE TO BE REPLACED WITH PVC SDR28, 125mm DIA. CONNECTIONS FOR SINGLE FAMILY AND SEMI-DETACHED DWELLINGS AND 150mm DIA. CONNECTIONS FOR ALL OTHERS, AND ARE TO BE REPLACED FROM THE NEW SEWER MAIN TO EXISTING LATERALS AT THE PROPERTY LINE.
7. UNLESS OTHERWISE NOTED, ALL THE EXISTING SANITARY MANHOLES ARE TO BE EITHER REMOVED OR BROKEN DOWN 1.0m BELOW ROAD GRADE AND BACKFILLED WITH GRANULAR 'B' WITH COMPLETE RESTORATION. FRAMES AND COVERS ARE TO BE SALVAGED AND RETURNED TO THE REGIONAL STORES, 2316 SOUTH SERVICE ROAD, OAKVILLE.
8. UNLESS OTHERWISE NOTED, ALL EXISTING WATER SERVICES ARE TO BE REPLACED WITH 20mm DIA. COPPER FOR RESIDENTIAL DWELLINGS AND 25mm DIA. COPPER FOR INDUSTRIAL AND COMMERCIAL PREMISES AS PER OPSD 802.010 . 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.
9. THE CONTRACTOR SHALL PROVIDE ALL TEMPORARY CAPS, PLUGS AND BLOW OFFS REQUIRED FOR TESTING THE NEW WATERMAIN.
10. MAXIMUM ALLOWABLE PIPE JOINT DEFLECTION OF THE WATERMAIN SHALL BE 70% OF THE MANUFACTURER'S SPECIFICATIONS. PIPE BARREL DEFLECTION IS STRICTLY PROHIBITED.
11. 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 IS TO BE USED.
12. 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 2316 SOUTH SERVICE ROAD, OAKVILLE. UNLESS OTHERWISE NOTED, ALL VALVES WHICH ARE SHOWN FOR REMOVAL SHALL BE DISPOSED OF BY CONTRACTOR.
13. EXISTING WATERMAIN IS TO BE EITHER REMOVED OR PLUGGED AND ABANDONED AS REQUIRED.
14. IF HYDRANT BARREL DEPTH EXCEEDS 1.7m, A HYDRANT THAT CAN BE RAISED FROM THE BOTTOM WITHOUT INCREASING ROD LENGTH IS TO BE USED.
15. REGIONAL MUNICIPALITY OF HALTON APPROVED MECHANICAL RESTRAINTS ARE TO BE USED ON ALL STANDARD BENDS, VALVES, FITTINGS AND HYDRANTS. REFER TO TABLE.

AS-BUILT DRAWINGS

CONTRACTOR	DAIMERSON CONST. CO. LTD.
WORK COMMENCED	JULY 7, 1999
WORK COMPLETED	DECEMBER 17, 1999
INSPECTOR	SEAN FERRIS
INSPECTOR'S DIARIES	BOOKS 691 & 711

RESTRAINED LENGTHS FOR PVC WATERMAIN

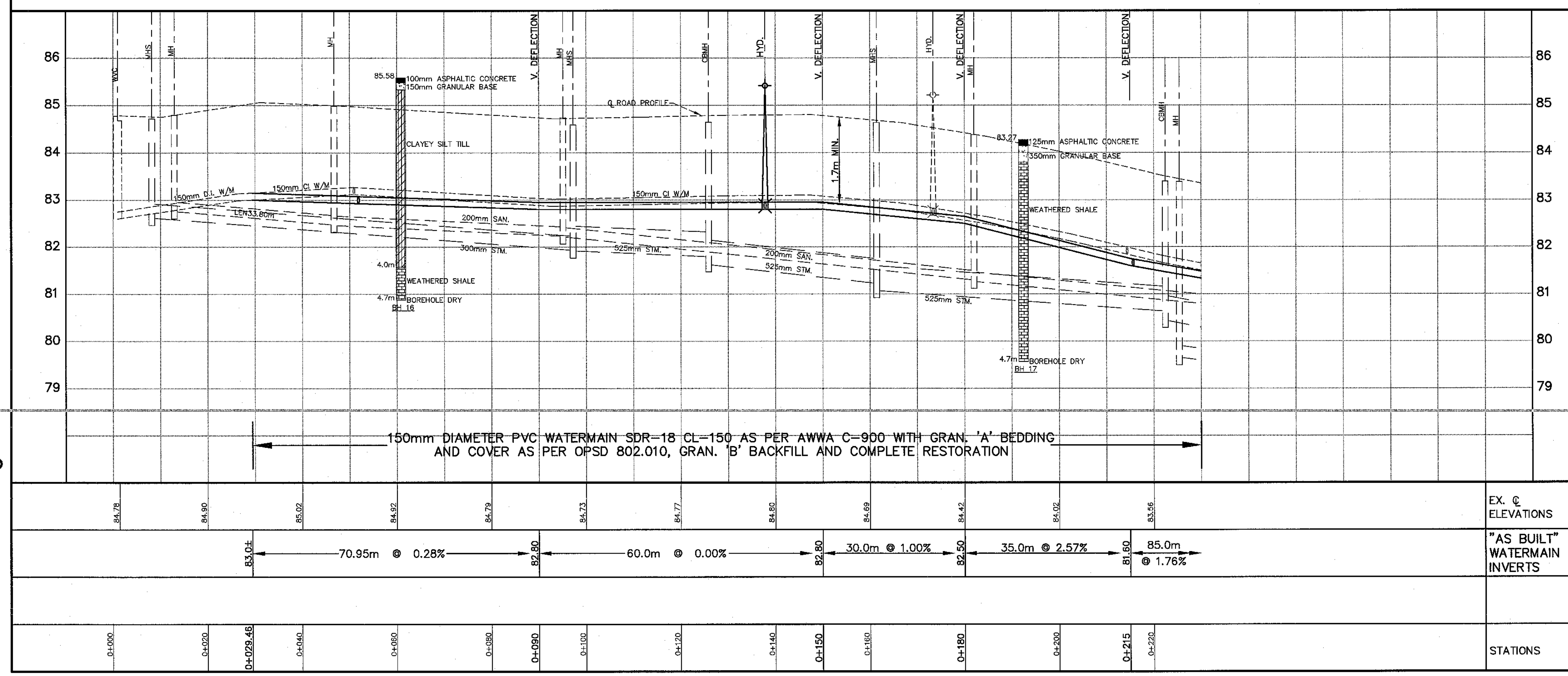
PIPE SIZE	11 1/4° V. OFFSET	45° V. OFFSET	45° H. BEND	STRAIGHT TEE	VALVE, HYDRANT, DEAD END
150mm	–	1.1m / 0.4m	1.6m	7.0m/1.4m	10.7m
200mm	–	–	2.1m	–	14.0m
300mm	8.3m/2.8m	–	2.9m	–	20.1m

200x150mm REDUCING TEE: 5.8m/BR.
150x100mm REDUCING TEE: 2.1m/BR.

LEGEND

- BH1 — BOREHOLES–REFER TO SOIL-MAT ENGINEERS AND CONSULTANTS Ltd. GEOTECHNICAL INVESTIGATION, REPORT No. SM 98222–G.
- WATER BOXES
- EX. HYDRANT REMOVAL
- EX. G.V. & BOX REMOVAL
- EX. WVC OR EX. MH REMOVAL
- PLUG

FOR ROAD RESTORATION DETAILS SEE SHEET 2.



1	JAN. '01	REJ	AS CONSTRUCTED		X
Nº	Date	By	REVISIONS	MANU	CAD

Design	M.B.	Ch'kd	Date: DECEMBER 1998
Drawn	E.W.S.	Ch'kd	
Scale	1:500 Horiz. 1:50 Vert.		References

APPROVALS

Municipal

Regional

Director, Engineering Services

Manager, Design Services

Field Notes

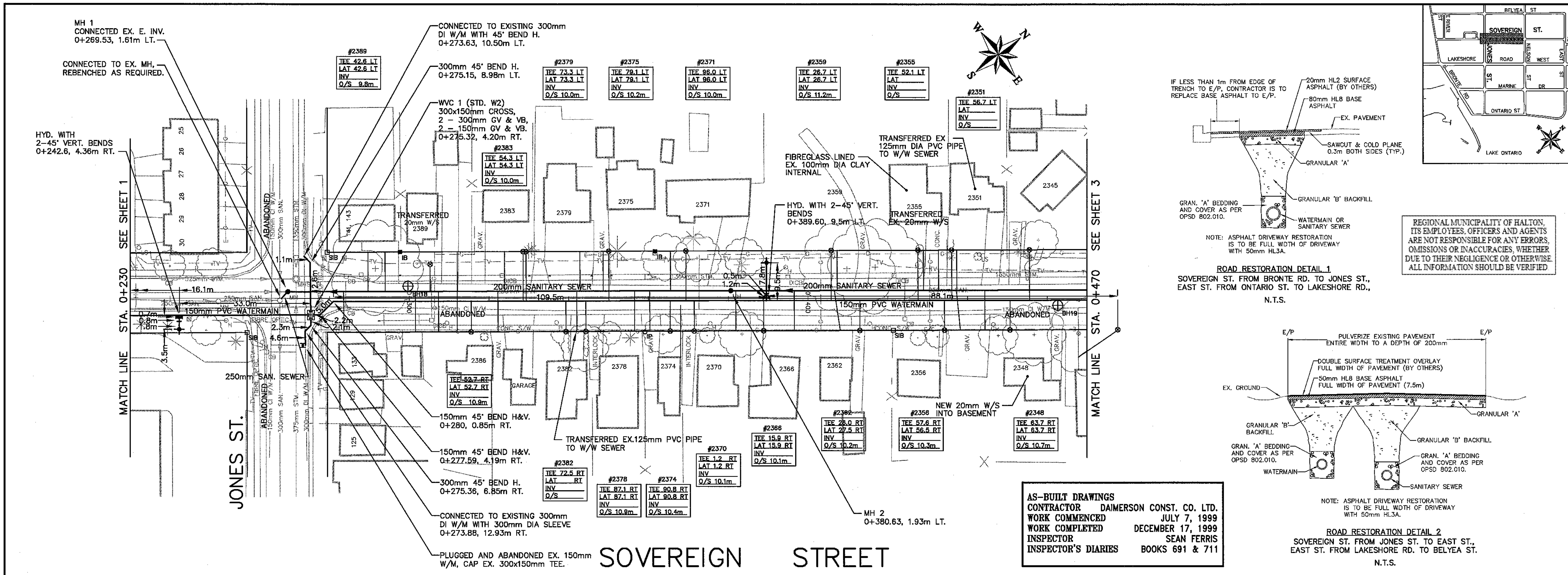
Stamp

Halton

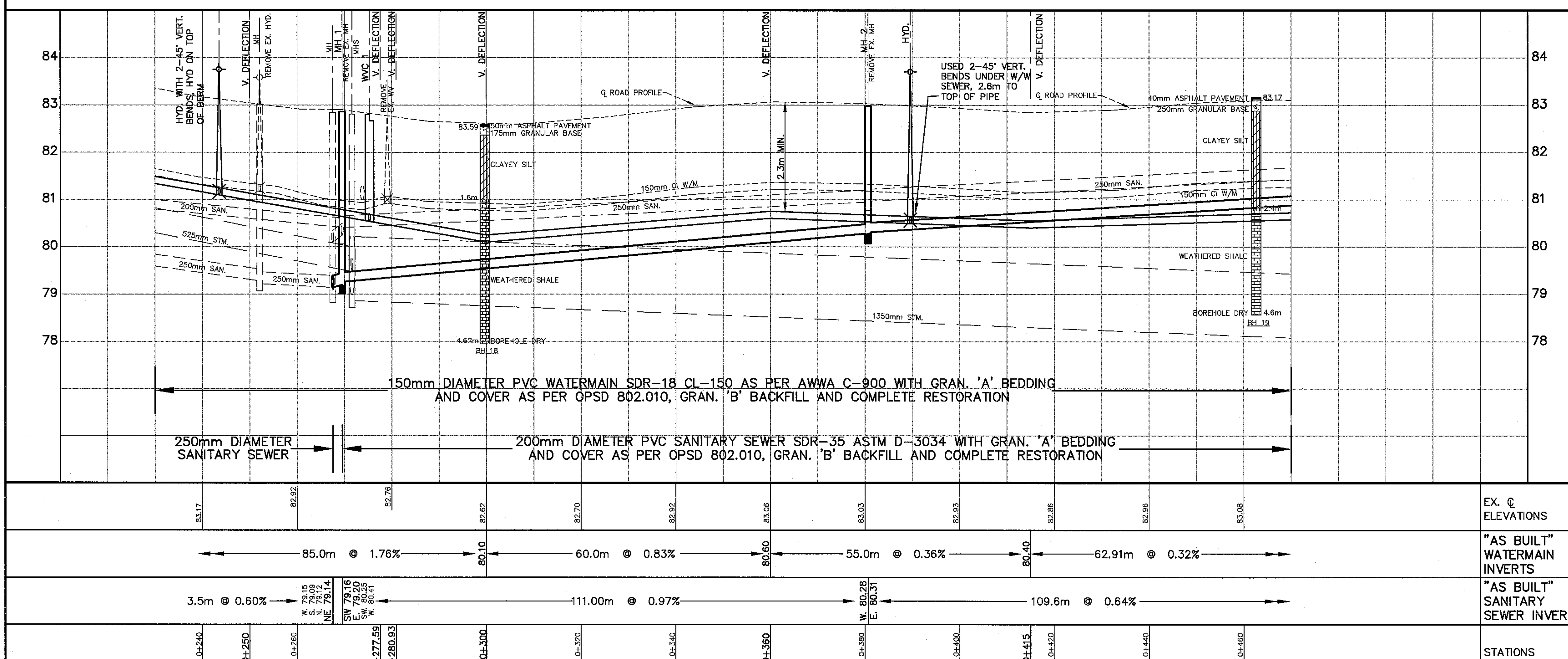
WATERMAIN REPLACEMENT ON
SOVEREIGN STREET
IN THE TOWN OF OAKVILLE
FROM BRONTE RD. TO 40m WEST OF JONES ST.

Consultant File Nº	Regional Drawing Nº O - 10864
CONTRACT Nº WS-1708-99	Drawing Nº SHEET 1 OF 7

PR-1708-99 1 of 7
O - 10864



FOR GENERAL NOTES SEE SHEET 1.



Nº	Date	By	Revisions	MANU	CAD
1	JAN. '01	REJ	AS CONSTRUCTED		X

Design M.B. Ch'kd
Drawn E.W.S. Ch'kd
Date DECEMBER 1998
Scale 1:500 Horiz. 1:50 Vert.
References
Field Notes
APPROVALS
Municipal
Regional
Director, Engineering Services
Manager, Design Services
Stamp

Halton

WATERMAIN AND SANITARY SEWER REPLACEMENT ON
SOVEREIGN STREET
IN THE TOWN OF OAKVILLE
FROM 40m WEST OF JONES ST. TO 20m WEST OF NELSON ST.

Consultant File Nº
Regional Drawing Nº O- 10865
CONTRACT Nº WS–1708–99
Drawing Nº SHEET 2 OF 7

PR-1708-99 2 of 7
O - 10865

CONSTRUCTION RECORD DRAWING

CONTRACTOR: Mardave Construction LTD

WORK COMMENCED: SEPTEMBER, 2001

WORK COMPLETED: NOVEMBER, 2001

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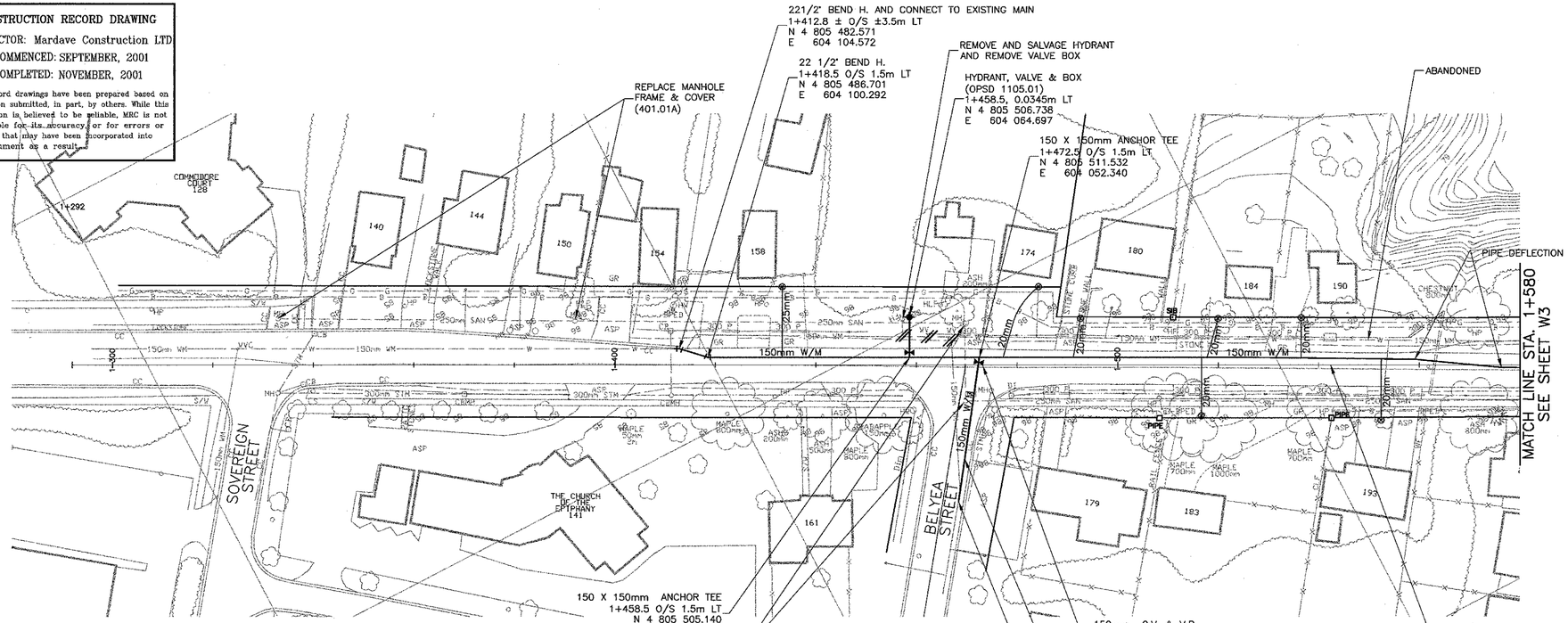
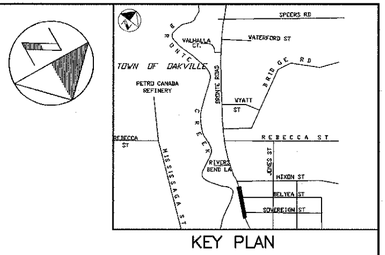


BRONTE ROAD



KEY PLAN

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NOTE :

NEW FRAME AND GRATES FOR SANITARY SEWERS TO BE SUPPLIED BY REGION. REPLACE ALL MODULOC.

THE LOCATION OF UTILITIES IS APPROXIMATE ONLY AND THE EXACT LOCATION SHOULD BE DETERMINED BY CONSULTING THE MUNICIPAL AUTHORITIES AND UTILITY COMPANIES CONCERNED. THE CONTRACTOR SHALL PROVE THE LOCATION OF UTILITIES AND SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION FROM DAMAGE.

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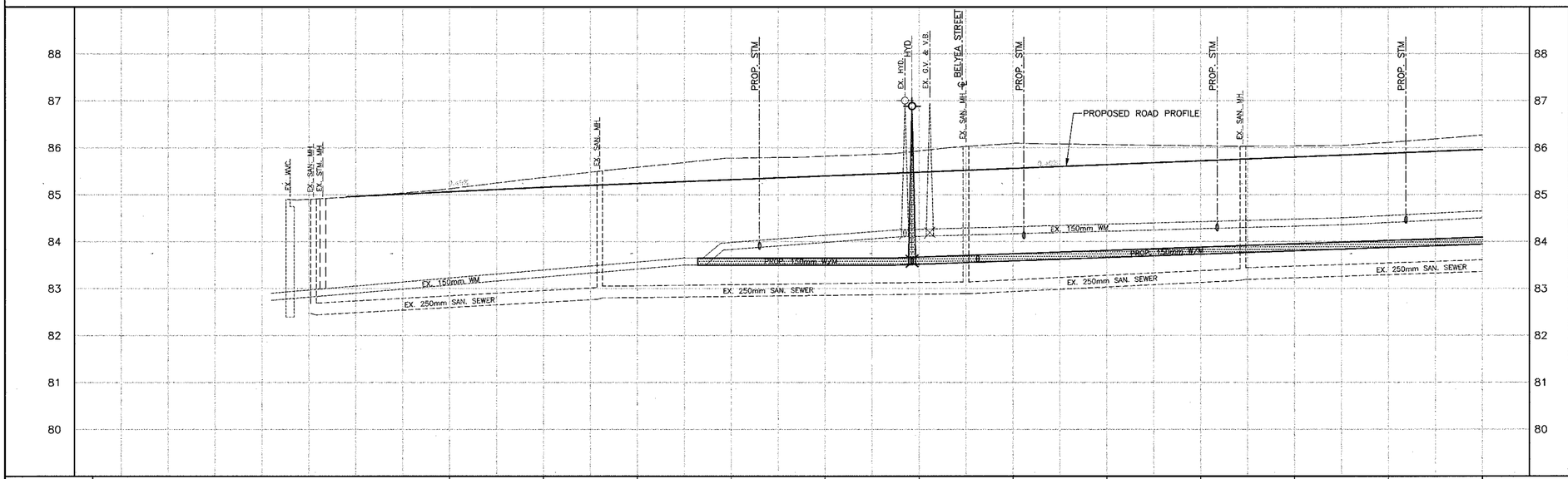

PROPOSED CENTRELINE ELEVATIONS	85.057	85.155	85.235	85.315	85.395	85.475	85.555	85.635	85.715	85.795	85.875	85.955
WATERMAIN INVERTS				83.44	83.67	83.50			83.74			
WATERMAIN BEDDING & DETAILS				150mm DIA. PVC WATERMAIN WITH GRANULAR "A" BEDDING AND COVER AS PER OPSD 802.010, 802.030 AND 802.031 AND GRANULAR "B" BACKFILL								
CHAINAGE	1+340	1+360	1+380	1+400	1+412.8	1+418.5 1+420	1+440	1+455	1+460	1+480	1+500	1+520 1+525	1+540	1+560	1+580

NO	Date	By	REVISIONS	MANU CAD

Design	R.I.R.	Ch'kd		Date MARCH, 2000
Drawn	G.H.B.	Ch'kd		References
Scale	Horiz. 10 5 0 10			
	Vert. 1.0 0.5 0 1.0			

APPROVALS

Municipal

Regional

Director, Engineering Services

Manager, Design Services

Field Notes

Stamp: REGISTERED PROFESSIONAL ENGINEER R.I.ROOK PROVINCE OF ONTARIO

MRC McCORMICK RANKIN CORPORATION

Halton

TITLE

WATERMAIN REPLACEMENT ON
BRONTE ROAD
IN THE TOWN OF OAKVILLE
FROM 40m SOUTH OF BELYEA STREET
TO 30m SOUTH OF HIXON STREET

Consultant File NO

Region D- 11917

CONTRACT NO W-1956-2000

Drawing NO SHEET W2 OF W7

D- 11917

FILE LOCATION: S:\4125\RECORD DRAWINGS\
DRAWING NAME: M4125A01.DWG
DRAWN BY: G.H.B.
MODIFIED: 02/07/05 08:30:11
DATE PLOTTED: 00/04/10 11:30:06

CONSTRUCTION RECORD DRAWING

CONTRACTOR: Mardave Construction LTD

WORK COMMENCED: SEPTEMBER, 2001

WORK COMPLETED: NOVEMBER, 2001

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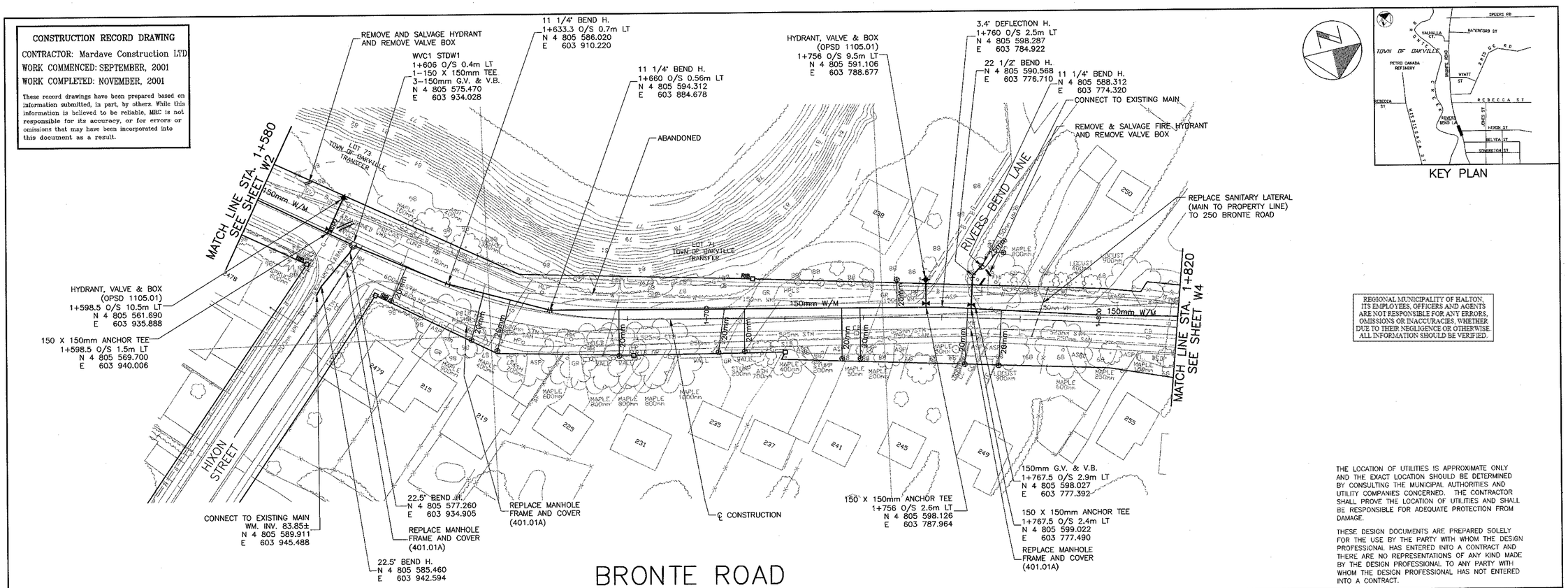

KEY PLAN

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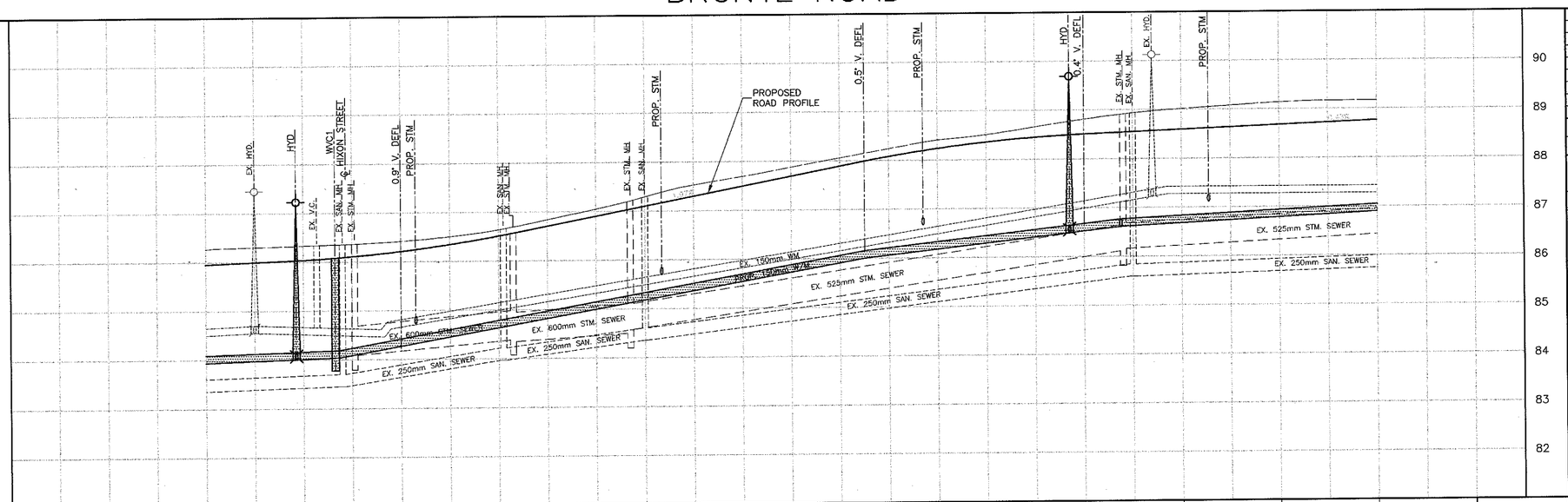
BRONTE ROAD



PROPOSED CENTRELINE ELEVATIONS	85.955	86.037	86.206	86.508	86.901	87.295	87.690	88.076	88.356	88.503	88.589	88.675	88.761
WATERMAIN INVERTS		84.042					85.68			86.61			
WATERMAIN BEDDING & DETAILS	150mm DIA. PVC WATERMAIN WITH GRANULAR "A" BEDDING AND COVER AS PER OPSD 802.010, 802.030 AND 802.031 AND GRANULAR "B" BACKFILL												
CHAINAGE	1+580	1+600	1+620	1+640	1+660	1+680	1+700	1+715	1+720	1+740	1+760	1+767.5	1+780	1+800	1+820

NO	Date	By	REVISIONS	MANU CAD
Design	R.I.R.		Ch'kd	Date MARCH, 2000
Drawn	G.H.B.		Ch'kd	
Scale Horiz. 10 5 0 10				References
Vert. 1.0 0.5 0 1.0				

APPROVALS

Municipal

Regional

Director, Engineering Services

Manager, Design Services

Field Notes

Stamp: REGISTERED PROFESSIONAL ENGINEER R.I.ROOK PROVINCE OF ONTARIO

MRC McCORMICK RANKIN CORPORATION

Halton

TITLE: WATERMAIN REPLACEMENT ON BRONTE ROAD IN THE TOWN OF OAKVILLE FROM 30m SOUTH OF HIXON STREET TO 170m SOUTH OF REBECCA STREET

Consultant File NO

Regional Drawing NO D- 11918

CONTRACT NO W-1956-2000

Drawing NO SHEET W3 OF W7

DATE PLOTTED:

MODIFIED: 02/07/04 16:36:23

FILE LOCATION=S:\4125\RECORD DRAWINGS\
DRAWING NAME: 3412SA02.DWG
DRAWN BY: G.H.B.

D- 11918

DRAWINGS

FIGURES