3171 Lakeshore Road West

Stormwater Management Report

January 2022

Submitted by:

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SUBMISSION HISTORY

Submission	Date	In Support Of	Distributed To
1st	January 2022	Site Plan Approval	Town of Oakville

1.0 INTRODUCTION

SCS Consulting Group Ltd. has been retained by Vogue Wycliffe (Oakville) Limited to prepare this Stormwater Management (SWM) report in support of the submission for Plan of Subdivision and Site Plan Approval from the Town of Oakville for the proposed re-development of the 3171 Lakeshore Road West property, located in the Town of Oakville.

1.1 Study Area

The proposed re-development is comprised of the following land uses (refer to the Site Plan in **Appendix A**):

A Plan of Subdivision consisting of:

- 3 Freehold Townhouses; and
- A Municipal Right-of-Way.

A Site Plan consisting of:

- 27 Condominium Townhouses;
- 8 Condominium Semi-Detached Lots; and
- A private condominium laneway.

The site is located predominantly within the Bronte Creek watershed in the Town of Oakville. As shown on **Figure 1**, the site is bound by Lakeshore Road West to the south, unopened municipal right-of-way to the east, and existing residential to the north and west.

The site is currently operating as a garden centre and is zoned as Residential Low (RL3-0).

Figure 1: Site Location Plan

The proposed re-development is approximately 1.0 ha in size and consists of various types of condo townhouses and a proposed private road Access to the proposed re-development is off of Victoria Street (West of the proposed re-development) and Lakeshore Road West.

It should be noted that for the purposes of this report, south is defined as the direction of Lake Ontario per previous direction from the Town of Oakville. True north and the Site Plan north have been identified on all drawings and figures.

1.2 Purpose of the Report

This SWM report has been prepared in support of the Plan of Subdivision and Site Plan approval process. The detailed engineering design relating to site servicing and grading for the site will incorporate the concepts of the SWM measures outlined in this report.

The objectives of this report are to:

- Calculate the proposed stormwater runoff rate from the development; and,
- Determine suitable methods for attenuation and treatment of stormwater runoff.

1.3 Previous Documentation

The stormwater management strategy in this report was based on the following reports (relevant excerpts are included in **Appendix B**):

- Functional Servicing and Storm Water Management Report (FSSR), July 2019, prepared by SCS Consulting Group;
- MECP SWM Planning and Design Manual, dated March 2003; and
- Town of Oakville Stormwater Management Master Plan, dated November 2019.

2.0 STORM SERVICING

2.1 Existing Storm Sewer System

As shown on **Figure 2.0**, the sizes and locations of the existing storm sewers surrounding the site are:

- A 200 mm diameter storm sewer on Victoria St. (west of the proposed re-development) flowing west;
- A 600 mm diameter storm sewer and 100 mm diameter storm sewer on Victoria St. (east of the proposed re-development) flowing east; and
- Several lengths of storm sewer ranging in size from 300 - 450 mm diameter on Lakeshore Road West flowing east.

The Town Oakville issued a Stormwater Management (SWM) Master Plan in November 2019 which provides a detailed major and minor system analysis of the Town of Oakville, including the drainage from the proposed re-development. It should be noted that no storm sewer upgrade recommendations were proposed for Victoria St. or Lakeshore Road West as part of the SWM Master Plan analysis. Relevant excerpts are provided in **Appendix B**.

2.2 Proposed Storm Sewer System

The storm sewer system (minor system) within the proposed re-development (**Drawing S-1**) is designed for the 5 year return storm as per the Town of Oakville standards. The storm sewer system was designed in accordance with the Municipality, Ontario Building Code and MECP guidelines, including the following:

- Pipes to be sized to accommodate runoff from a 5 year storm event;
- Minimum Pipe Size: 300 mm diameter
- Maximum Flow Velocity: 4.0 m/s;
- Minimum Flow Velocity: 0.75 m/s; and
- Minimum Pipe Depth: 1.2 m, 1.5 m where sump pumps are required.

The storm sewer system will typically be designed with a slope of 0.5%. The storm sewer will be constructed at a minimum depth of 1.5 m where sump pumps are required. The storm sewer depth is limited by the invert elevation of the existing downstream sewer on Victoria St. (west) and Lakeshore Road West. Sump pumps will be provided on all lots and will outlet to the proposed storm sewer.

Two oversized storm sewers (Superpipes) are proposed in the municipal right-of-way and condo laneway as shown on **Drawing S-1** to achieve stormwater management criteria for the site. The Superpipe sizing and associated infrastructure are discussed further in **Section 3.5.1**.

3.0 STORMWATER MANAGEMENT

3.1 Existing Drainage

As shown on **Figure 2**, based on the existing topography runoff from the proposed re-development is conveyed to Victoria St. (west of the proposed re-development), Victoria St. (east of the proposed re-development), and Lakeshore Road West. External drainage is generally conveyed away from the proposed re-development except for a small area at the southwest corner.

Runoff conveyed to Victoria St. (west) is captured by an existing storm sewer or conveyed overland to Sheldon Creek. Runoff conveyed to Victoria St. (east)) and Lakeshore Road West is captured by an existing storm sewer or conveyed overland to Bronte Creek. The Victoria St. (east) major and minor system drainage combines with the Lakeshore Road West drainage just downstream of the proposed re-development at the intersection of Lakeshore Road West and Mississaga St.

There are no stormwater management controls on the existing site.

3.2 Allowable Release Rates

The catchments shown on **Figure 2** correspond to the catchment boundaries provided in the Town of Oakville SWM Master Plan. In the SWM Master Plan, Catchment 101 and 102 were modelled assuming the entire areas are conveyed to Victoria St. (west) and Lakeshore Road West respectively. The allowable release rates to the Victoria St. (west) and Lakeshore Road West major and minor systems are based on these drainage boundaries.

The allowable release rates for the proposed re-development are the SWM Master Plan peak runoff rates up to and including the 100 year storm event. For runoff conveyed directly to an existing storm sewer system, the allowable release rate is the respective SWM Master Plan 5 year peak runoff rate. The rational method was used to determine the target release rates from the site based on Intensity-Duration-Frequency (IDF) rainfall curves from the Town of Oakville SWM Master Plan. Supporting calculations are provided in **Appendix C**. **Table 3.1** summarizes the SWM Master Plan peak flows from the site to both the Victoria St. (west) and Lakeshore Road West outlets.

Table 3.1: Summary of Allowable Peak Flows

Return Period Storm	Victoria St. (West) (L/s)	Lakeshore Road West (L/s)
5 Year	26.8	140.6
100 Year	47.0	247.2

3.3 Stormwater Runoff Control Criteria

The following stormwater runoff control criteria have been established based on the Town of Oakville Stormwater Management Master Plan (2019) and the MECP Stormwater Management Planning and Design Manual (2003). The stormwater runoff criteria are summarized below in **Table 3.2**.

Table 3.2: Stormwater Runoff Control Criteria

Criteria	Control Measure
Quantity Control	Control proposed peak flows to SWM Master Plan peak flows for the 2 through 100 year storm events. Where runoff is conveyed to an existing storm sewer, limit the maximum peak flow to the SWM Master Plan 5 year storm event peak flow.
Quality Control	For site plan drainage, on-site quality control is required by an oil-grit separator before outletting to the municipal storm sewer.
Erosion Control	Detention of the 25 mm rainfall runoff for a minimum of 24 hours.

3.4 Stormwater Best Management Practices Selection

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

Table 3.3 below summarizes the recommended stormwater management Best Management Practices (BMPs) for the proposed re-development as outlined in the FSSR.

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

Stormwater Management Control	Recommended BMP
At-Source Controls	Increased Topsoil Depth
	Roof Overflow to Grassed Areas
End-Of-Pipe Controls	Underground Stormwater Detention System
	Oil-Grit Separator

3.5 Proposed Storm Drainage

The proposed major and minor system flow patterns and drainage areas are shown on **Figure 3**.

Major and minor system overland flow from Catchment 201 (0.20 ha) will be captured via proposed catchbasins, and conveyed via internal storm sewers, outletting to the existing Victoria St. (west) storm sewer. A superpipe attenuation facility under the municipal road will provide quantity control for Catchment 201 before the flow is released to the existing storm sewer on Victoria St. (west). During the 100 year storm event, some flows will be released to the Victoria St. (west) major system (via overland flow).

Major and minor system overland flow from Catchment 202 (0.25 ha) will be conveyed uncontrolled overland to Lakeshore Road West, which generally matches the existing drainage condition.

Major and minor system runoff from Catchment 203 (0.66 ha) will be captured via proposed catchbasins and conveyed via internal storm sewers, outletting to the existing Lakeshore Road West storm sewer. A superpipe attenuation facility under the private condominium road will provide quantity control for Catchment 203 before the flow is conveyed through an oil-grit separator (OGS) and released to the existing storm sewer on Lakeshore Road West.

Major and minor system overland flow from Catchment 204 (0.06 ha) will be conveyed uncontrolled overland to the unopened municipal right-of-way to the east of the proposed re-development which generally drains towards Victoria St. (east).

Runoff from the 100 year storm event will be captured in one location as shown on **Figure 3**. Runoff from the private condominium development (Catchment 203) will be captured in a low point in the entrance laneway at the southern edge of the proposed re-development. It should be noted that while the peak flow from 100 year storm event for Catchment 201 is not fully captured, the proposed catchbasins will have a sufficient inlet capacity to convey the peak flow. Inlet capacity is discussed further in **Section 3.5.4**.

3.5.1 Quantity Control

The proposed 100 year piped release rate from Catchment 201 will be controlled to the existing 5 year peak runoff rate to Victoria Street (west) via 42.9 m of 825 mm diameter concrete superpipe beneath the municipal road. The superpipe will release runoff from Catchment 201 to the existing Victoria St. (west) storm sewer, therefore the maximum release rate during the 100 year storm event from the superpipe will be limited to 23.2 L/s which is less than the allowable 5 year peak runoff rate entering the storm sewer from Catchment 101 (26.8 L/s). Some major system flow will be released uncontrolled to Victoria St. (west) during the 100 year storm event. Approximately 23.9 L/s will be released uncontrolled for a total proposed 100 year peak release rate of 47.0 L/s which is equal to the allowable 100 year peak runoff rate from Catchment 101 (47.0 L/s). Runoff entering the superpipe will be detained by an 85 mm diameter orifice plate on the downstream side of the control manhole (MH12) on Victoria St. (west). The location of the control manhole is shown on **Figure 3** and on **Drawing S-1**. Orifice plate, superpipe parameters, and peak flow calculations are provided in **Appendix C**.

The proposed 100 year piped release rate from Catchment 203 will be controlled to the existing 5 year peak runoff rate to Lakeshore Road West via 91.2 m of 1200 mm diameter concrete superpipe beneath the private road. The superpipe will release runoff from Catchment 203 to the existing Lakeshore Road West storm sewer, therefore the maximum release rate during the 100 year storm event from the superpipe will be limited to 135.7 L/s which is less than the allowable 5 year peak runoff rate entering the storm sewer from Catchment 102 (140.6 L/s).

Runoff from Catchment 202 is released uncontrolled to Lakeshore Road West. It should be noted that Catchment 204 is conveyed uncontrolled to Victoria St. (east) but is eventually conveyed to the Lakeshore Road West major and minor system at the intersection of Lakeshore Road West and Mississaga St. Therefore, the proposed 100 year release rate to the Lakeshore Road West system includes Catchments 202, 203, and 204. Approximately 106.0 L/s will be released uncontrolled from Catchments 202 and 204 for a total proposed 100 year peak release rate of 241.7 L/s which is less than the allowable 100 year peak runoff rate from Catchment 102 (247.2 L/s). Runoff entering the superpipe will be detained by a 225 mm diameter orifice plate on the upstream side of the superpipe end cap at MHTEE6. The location of the orifice is shown on **Figure 3** and on **Drawing S-1**. Orifice plate, superpipe parameters, and peak flow calculations are provided in **Appendix C**.

Additional peak runoff release rate calculations were prepared for the 5 year storm event to confirm that the combined flows are less than or equal to the 5 year allowable runoff rates. The proposed peak release rates to the Victoria St. (west) and Lakeshore Road West storm systems are 15.0 L/s and 135.9 L/s respectively which is less than the 5 year allowable runoff rates of 26.8 L/s and 140.6 L/s respectively.

Refer to the proposed servicing on **Drawing S-1** and orifice plate details on **Drawing D-1**. Calculations are provided in **Appendix C**. A summary of the quantity control provided is listed in **Table 3.4** and **Table 3.5**.

Table 3.4: Summary of Release Rates

Storm Outlet	Storm Event	Allowable Release Rate to Storm Sewer (L/s)	Controlled Site Release Rate (L/s)	Uncontrolled Site Release Rate (L/s)	Total Allowable Site Release Rate (L/s)	Total Proposed Site Release Rate (L/s)
Victoria St. (west)	5 Year	26.8	15.0	0.0	26.8	15.0
	100 Year		23.2	23.9	47.0	47.0
Lakeshore Road West	5 Year	140.6	83.3	52.6	140.6	135.9
	100 Year		135.7	106.0	247.2	241.7

Table 3.5: Summary of Superpipe Storage Volumes

Storm Outlet	Storm Event	Total Required Storage (m^3)	Underground Storage System Provided (m^3)
Victoria St. (west)	5 Year	20.5	22.9
	100 Year	22.4*	
Lakeshore Road West	5 Year	37.2	103.1
	100 Year	100.1	

*Note: the full storage volume will be utilized during the 100 year storm event as the pipe will fill completely before spilling uncontrolled to Victoria St. (west)

3.5.2 Quality Control

At-source quality control for all catchments will be provided by a treatment train of Best Management (BMP) techniques which will include additional topsoil depth on all grassed areas and directing roof leaders to grass. The quality control provided by the grassed areas and roof leaders to grass has not been quantified.

Runoff from Catchment 201 will not have quality control as it will be conveyed directly to the municipal storm sewer system where it will receive quality control from any existing devices operated by the Town of Oakville.

Runoff from Catchment 202 and 204 will be from roofs and yards which is generally considered to be "clean", therefore no quality control is proposed for these catchments.

Quality control for runoff from Catchment 203 will be provided by an EF06 (or approved equivalent) oil-grit separator (OGS). The OGS is sized to achieve 60% TSS Removal using the ETV particle size distribution. Sizing calculations, as well as operation and maintenance information are provided in **Appendix D**.

3.5.3 Erosion Control

The controlled areas of the proposed re-development (Catchment 201 and Catchment 203) are too small to practically detain the runoff volume from the 25 mm storm event over 24 hours, therefore it will not be possible to provide erosion control. It is typical that for relatively small sites of less than 2 ha, erosion control in the form of stormwater detention is not required.

3.5.4 Overland Flow Conveyance

Right-of-way capacity calculations were prepared for the proposed private laneway. The capacity provided by the private laneway will be sufficient to convey major system flows to the 100 year capture point at the laneway entrance to Lakeshore Road West. Two 1.2 m x 0.6 m catchbasins with Borden Grates are required at the 100 year capture point to convey the peak runoff rate into the proposed superpipe. The 100 year capture point was sized assuming 50% blockage. In an emergency event, runoff in excess of the capacity of the Superpipe and/or 100

year capture point will be conveyed to Lakeshore Road West. Calculations are provided in **Appendix C**. Refer to **Drawing GR-1** for grate elevation and ponding depth.

Right-of-way capacity calculations were not prepared for the municipal right-of-way as it is the most upstream end of Victoria St. (west). The two double catchbasins proposed at the low points of the cul-de-sac are sized to capture up to the 100 year peak flow assuming 50% blockage. Runoff in excess of the capacity of the Superpipe and/or 100 year capture point will be conveyed to Victoria St. (west). Calculations are provided in **Appendix C**. Refer to **Drawing GR-1** for grate elevation and ponding depth.

As shown in **Table 3.4** the 100 year peak release rates to Victoria St. (west) and Lakeshore Road West are less than the allowable runoff rates, therefore the major system flows on Victoria St. (west) and Lakeshore Road West will generally be maintained.

4.0 SUMMARY

This report describes a stormwater management plan that services the proposed 3171 Lakeshore Road West, Oakville re-development in support of the submission for Plan of Subdivision and Site Plan Approval from the Town of Oakville.

Quantity Control:

- Runoff from the proposed re-development to the Victoria St. (west) and Lakeshore Road West storm systems will be limited to the allowable release rates based on the Town of Oakville Stormwater Management Master Plan;
- Stormwater quantity control will be achieved through two orifice controls with stormwater storage provided by underground superpipes in the municipal right-of-way and the private laneway.

Quality Control

- The water quality objective is satisfied by reducing the TSS loading at source as many of the site modifications are land uses that do not require water quality treatment by inherently contributing clean runoff (roofs, lawns, gardens, additional topsoil depth).
- Additional quality control will be provided for the private laneway drainage by an oil-grit separator sized for 60% TSS removal with the ETV particle size distribution.

Erosion Control

- The study area is too small to practically detail the runoff volume from the 25 mm storm event over a minimum of 24 hours.

Storm Servicing

- Storm runoff will be conveyed by storm sewers designed in accordance with Municipality and MECP criteria;
- Storm sewers will generally be designed for the 5 year storm event where superpipe is not proposed; and
- Adequate 100 year overland flow routes and capture locations will be provided.

Respectfully Submitted:

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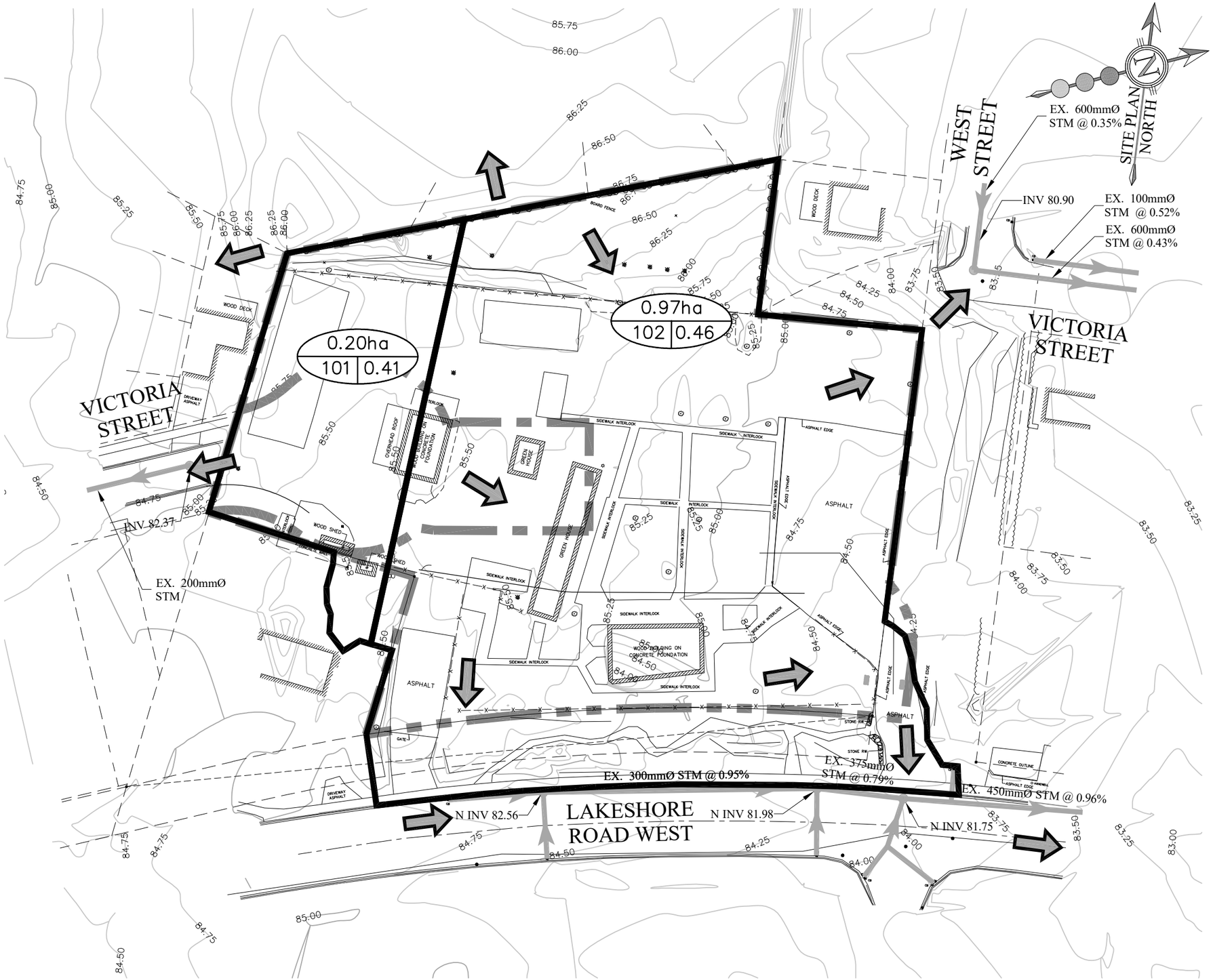

LEGEND:

- LIMIT OF DEVELOPMENT
- LIMIT OF SUBDIVISION
- MAJOR SYSTEM - OVERLAND FLOW
- STORM DRAINAGE BOUNDARY (PER TOWN OF OAKVILLE SWM MASTER PLAN, 2019)
- 0.35ha / 99 | 0.20 — DRAINAGE AREA (HECTARES); RUNOFF COEFFICIENT; CATCHMENT ID
- 255.50 — EXISTING CONTOURS
- EXISTING STORM SEWER AND MANHOLE

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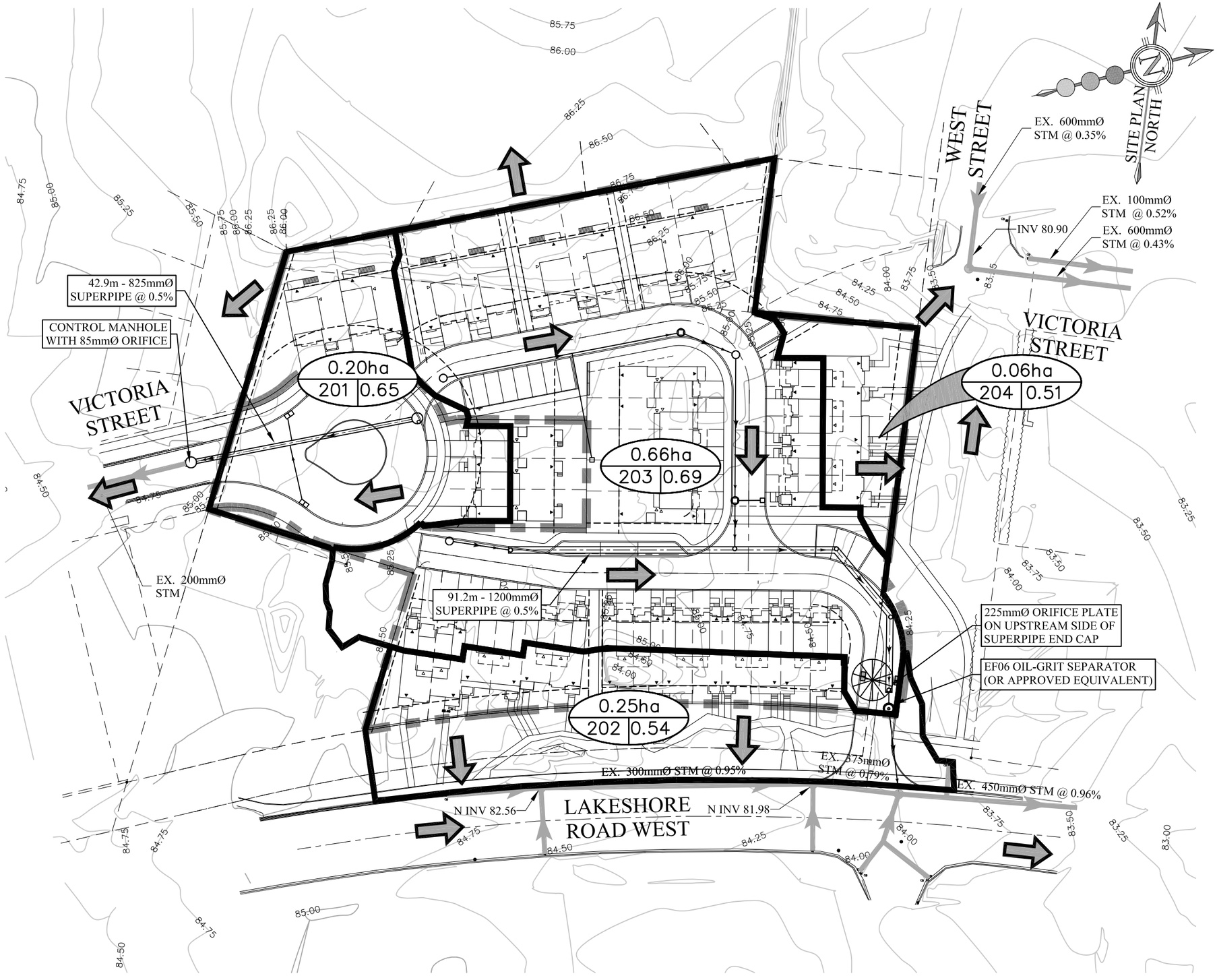
3171 LAKESHORE ROAD WEST, OAKVILLE

EXISTING STORM DRAINAGE PLAN

DESIGNED BY: N.D.M.	CHECKED BY: S.M.S.
SCALE: 1:750	DATE: JANUARY 2022
PROJECT No: 1930	FIGURE No: 2



LEGEND:

- LIMIT OF DEVELOPMENT
- LIMIT OF SUBDIVISION
- MAJOR SYSTEM - OVERLAND FLOW
- PROPOSED STORM DRAINAGE BOUNDARY
- 0.35ha / 99 | 0.20 — DRAINAGE AREA (HECTARES); RUNOFF COEFFICIENT; CATCHMENT ID
- 255.50 — EXISTING CONTOURS
- EXISTING STORM SEWER AND MANHOLE
- PROPOSED STORM SEWER AND MANHOLE
- PROPOSED SUPERPIPE
- OIL-GRIT SEPARATOR MANHOLE
- 100 YEAR CAPTURE LOCATION

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3171 LAKESHORE ROAD WEST, OAKVILLE

PROPOSED STORM DRAINAGE PLAN

DESIGNED BY: N.D.M.	CHECKED BY: S.M.S.
SCALE: 1:750	DATE: JANUARY 2022
PROJECT No: 1930	FIGURE No: 3

APPENDIX A

SITE PLAN

SITE STATISTICS SUMMARY (WITH OVERALL LOT AREA

DRAFT PLAN OF SUBDIVISION PART OF LOT 32, CONCESSION 4, SOUTH OF DUNDAS STREET (GEOGRAPHIC TOWNSHIP OF TRAFALGAR) AND BLOCK 79, REGISTERED PLAN M-257 TOWN OF OAKVILLE REGIONAL MUNICIPALITY OF HALTON

ZONING :	RM1-XX
OVERALL LOT AREA: *(LOT AREA OWNED BY DEVELOPER)*	9,925.86m2 2.45 ACRES 1.00 Ha
SITE AREA: *(SITE AREA, NOT INCLUDING CUL-DE-SAC/STREET TOWNS)*	8,193.89m2 2.03 ACRES 0.82 Ha
O.B.C. BUILDING CLASSIFICATION	PART 9, GROUP C 3 STOREY BUILDINGS/SEMIS
GROSS FLOOR AREA:	N/A
AMENITY AREA	--
DENSITY 32 UNITS TOTAL *(NOT INCLUDING 3 STREET TOWNS)*	39.02 PER Ha 15.76 PER ACRES
PARKING :	*27 TOWN HOMES RESIDENCE PARKING PROVIDED (1 INTERNAL & 1 EXTERNAL) 54 SPACES TOTAL*
	8 SEMI-DETACHED HOMES RESIDENCE PARKING PROVIDED (2 INTERNAL & 2 EXTERNAL) 32 SPACES TOTAL
	VISITOR PARKING: .35 x 0.25 = 8.75 (9 VISITOR PARKING REQUIRED) 14 VISITOR PARKING PROVIDED (INCLUDES 1 ACCESSIBLE SPACE)

UNIT COUNT

10.35m SEMI DETACHED (INCLUDES 2-11.60m SEMI DETACHED)	8
5.50m DUAL FRONTAGE TOWN HOME	27
TOTAL	35 UNITS

PROPOSED VALVE
HYDRANT
WATER SERVICE
CATCH BASIN
CABLE TELEVISION PEDESTAL
LIGHT POLE
TRANSFORMER
DOUBLE STM./SAN. CONNECTION
SINGLE STM./SAN. CONNECTION
BELL PEDESTAL

FF FINISHED FLOOR ELEVATION
ML FINISHED MAIN LEVEL ELEVATION
UF UNDERSIDE FOOTING ELEVATION
BF FIN. BASEMENT FLOOR SLAB
TFW TOP OF FOUNDATION WALL
No. OF RISERS
UFR UNDERSIDE FOOTING AT REAR
UFF UNDERSIDE FOOTING AT FRONT
UFS UNDERSIDE FOOTING AT SIDE
W.O.D. WALK OUT DECK
W.O.B. WALK OUT BASEMENT
REV REVERSE PLAN

STREET SIGN
MAIL BOX
RETAINING WALL
CHAIN LINK FENCE (SEE LANDSCAPE PLAN)
ACOUSTICAL FENCE (SEE LANDSCAPE PLAN)
WOOD SCREEN FENCE (SEE LANDSCAPE PLAN)
HYDRO SERVICE LATERAL
HYDRO METER
GAS METER
SWALE DIRECTION
EMBANKMENT
PROVIDE 3/4" DIA. CLEAR STONE IN THIS AREA
THIS LOT CONTAINS ENGINEERED FILL
AIR CONDITIONER REQUIRED
SUMP PUMP DISCHARGE LOCATION (DISCHARGE ONTO SPLASHPAD)
SIDE WINDOW LOCATION
EXTERIOR DOOR LOCATION
EXTERIOR DOOR LOCATION
REDUCE SIDE YARD

north arrow

10.65m SEMI DETACHED

LOT No.	Model Type	G.F.A (sq.m.)	G.F.A. Per Lot (%)	Coverage (sq.m.)	Lot Area (sq.m.)	Coverage (%)	Driveway Area (m2)	Soft Landscape Area (m2)	Soft Landscape (%)	Lot Frontage (m)	Lot Depth (m)	Proposed Building Height (m)
1	SD-1	253.70	73.23	106.20	346.44	30.65	36.20	204.04	58.90	16.86	21.17	
2	SD-1	253.70	88.53	106.20	286.58	37.06	39.51	140.87	49.16	11.60	21.47	
3	SD-2	246.10	101.05	100.35	243.55	41.20	33.58	109.62	45.01	10.35	22.94	
4	SD-2	246.10	103.65	100.35	237.43	42.27	33.06	104.02	43.81	10.35	22.94	
5	SD-2	246.10	103.65	100.35	237.43	42.27	33.06	104.02	43.81	10.35	22.94	
6	SD-2	246.10	103.65	100.35	237.43	42.27	33.06	104.02	43.81	10.35	22.94	
7	SD-2	246.10	103.65	100.35	237.43	42.27	33.06	104.02	43.81	10.35	22.94	
8	SD-2	246.10	57.53	100.35	427.81	23.46	33.06	294.40	68.82	14.68	22.94	
TOTAL		1491.80	#####	613.80	1588.86	38.63	274.59	700.47	44.09			N/A

5.80m STANDARD TOWN BUILDING 1A (FREE HOLD)

LOT No.	Model Type	Coverage (sq.m.)	Lot Area (sq.m.)	Coverage (%)	Driveway Area (m2)	Soft Landscape Area (m2)	Soft Landscape (%)	Lot Frontage (m)	Lot Depth (m)	Proposed Building Height (m)
1A	TH-1 END	88.66	183.67	48.27	18.74	76.27	41.53	7.15	25.42	
2A	TH-1	89.66	149.92	59.81	20.43	39.83	26.57	5.80	25.42	
3A	TH-1 END	88.66	205.40	43.16	25.26	91.48	44.54	7.15	26.88	
TOTAL		266.98	538.99	49.53	64.43	207.58	38.51			N/A

5.40m DUAL FRONTAGE TOWN BUILDING 1 (CONDO)

LOT No.	Model Type	Coverage (sq.m.)	Lot Area (sq.m.)	Coverage (%)	Driveway Area (m2)	Soft Landscape Area (m2)	Soft Landscape (%)	Lot Frontage (m)	Lot Depth (m)	Proposed Building Height (m)
9	DF-1-END	80.45	319.77	25.16	17.80	221.62	69.27	10.83	26.92	
10	DF-1	77.88	145.42	53.56	17.40	50.14	34.48	5.50	26.10	
11	DF-1	77.88	141.70	54.96	17.40	46.42	32.76	5.50	25.43	
12	DF-1	77.88	137.99	56.44	17.40	42.71	30.95	5.50	24.75	
13	DF-1-END	80.45	180.61	44.54	17.28	82.88	45.89	7.45	24.75	
TOTAL		394.54	925.49	42.63	87.28	443.67	47.94			N/A

5.40m DUAL FRONTAGE TOWN BUILDING 2 (CONDO)

LOT No.	Model Type	Coverage (sq.m.)	Lot Area (sq.m.)	Coverage (%)	Driveway Area (m2)	Soft Landscape Area (m2)	Soft Landscape (%)	Lot Frontage (m)	Lot Depth (m)	Proposed Building Height (m)
14	DF-1-END	80.45	174.56	46.09	19.77	74.34	42.59	8.48	21.78	
15	DF-1	77.88	119.02	65.43	18.15	22.99	19.32	5.50	21.47	
16	DF-1	77.88	117.71	66.16	18.15	21.68	18.42	5.50	22.94	
17	DF-1	77.88	116.85	66.65	18.15	20.82	17.82	5.50	22.94	
18	DF-1	77.88	116.44	66.88	18.15	20.41	17.53	5.50	22.94	
19	DF-1	77.88	116.48	66.86	18.15	20.45	17.56	5.50	22.94	
20	DF-1	77.88	116.97	66.58	18.15	20.94	17.90	5.50	22.94	
21	DF-1-END	80.45	154.63	52.03	18.15	56.03	36.23	7.20	22.94	
TOTAL		469.85	761.09	61.74	146.82	144.39	18.97			N/A

5.40m DUAL FRONTAGE TOWN BUILDING 3 (CONDO)

LOT No.	Model Type	Coverage (sq.m.)	Lot Area (sq.m.)	Coverage (%)	Driveway Area (m2)	Soft Landscape Area (m2)	Soft Landscape (%)	Lot Frontage (m)	Lot Depth (m)	Proposed Building Height (m)
22	DF-1-END	80.45	184.72	43.55	19.77	84.50	45.74	7.74	22.58	
23	DF-1	77.88	127.60	61.03	18.15	31.57	24.74	5.50	23.85	
24	DF-1	77.88	134.84	57.76	18.15	38.81	28.78	5.50	25.24	
25	DF-1	77.88	142.86	54.51	18.15	46.83	32.78	5.50	26.72	
26	DF-1	77.88	151.43	51.43	18.15	55.40	36.58	5.50	28.29	
27	DF-1-END	80.45	239.84	33.54	18.15	141.24	58.89	6.74	28.29	
TOTAL		472.42	981.29	48.14	110.52	398.35	40.59			N/A

5.80m STANDARD TOWN BUILDING 4 (CONDO)

LOT No.	Model Type	Coverage (sq.m.)	Lot Area (sq.m.)	Coverage (%)	Driveway Area (m2)	Soft Landscape Area (m2)	Soft Landscape (%)	Lot Frontage (m)	Lot Depth (m)	Proposed Building Height (m)
28	TH-1-END	88.66	210.23	42.17	19.16	102.41	48.71	9.45	25.61	
29	TH-1	89.66	148.54	60.36	18.69	40.19	27.06	5.80	25.61	
30	TH-1	89.66	148.54	60.36	18.69	40.19	27.06	5.80	25.61	
31	TH-1	89.66	148.54	60.36	18.69	40.19	27.06	5.80	25.61	
32	TH-1-END	88.66	207.97	42.63	19.26	100.05	48.11	7.96	25.61	
TOTAL		446.30	863.82	51.67	94.49	323.03	37.40			N/A

no.	description	date	by
10	ADDED ISLAND AT CUL-DE-SAC	21-11-09	SS
9	RE. STATS AS PER CLIENT REQUEST	22-02-10	SS
8	ADDED INDIVIDUAL STATS	21-01-20	SS
7	REVISED BUILDING SETBACK FOR BUILDING 3	20-12-10	SS
6	ADDED ACCESS EASEMENT	20-12-03	SS
5	REVISED TRAIL AT LAKESHORE ROAD WEST	20-11-11	SS
4	REMOVED EMERGENCY ACCESS	20-11-04	SS
3	REVISED OVERALL SITE PLAN	20-01-31	SS
2	REVISED AS PER CITY COMMENTS	19-08-09	SS
1	ISSUED FOR CLIENT REVIEW	19-05-01	SS

Builder to verify location of all hydrants, street lights, transformers and other services. If minimum dimensions are not maintained, builder is to relocate at his own expense.

Builder to verify service connection elevations prior to constructing foundations.

VA3 DESIGN
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VOGUE/WYCLIFFE

project name: –
municipality: OAKVILLE, ON
registered plan no.: –
project no.: 17027
lot/block no.: –
title: SITE PLAN
date: MAY 2016
scale: 1:250
drawing no.: 1
drawn by: STEVE SOSTARIC
checked by: –
file name: 17027-SP

APPENDIX B

RELEVANT EXCERPTS

SCS consulting group ltd

Town of Oakville
Stormwater Management Master Plan

Project # TP115045 | Town of Oakville

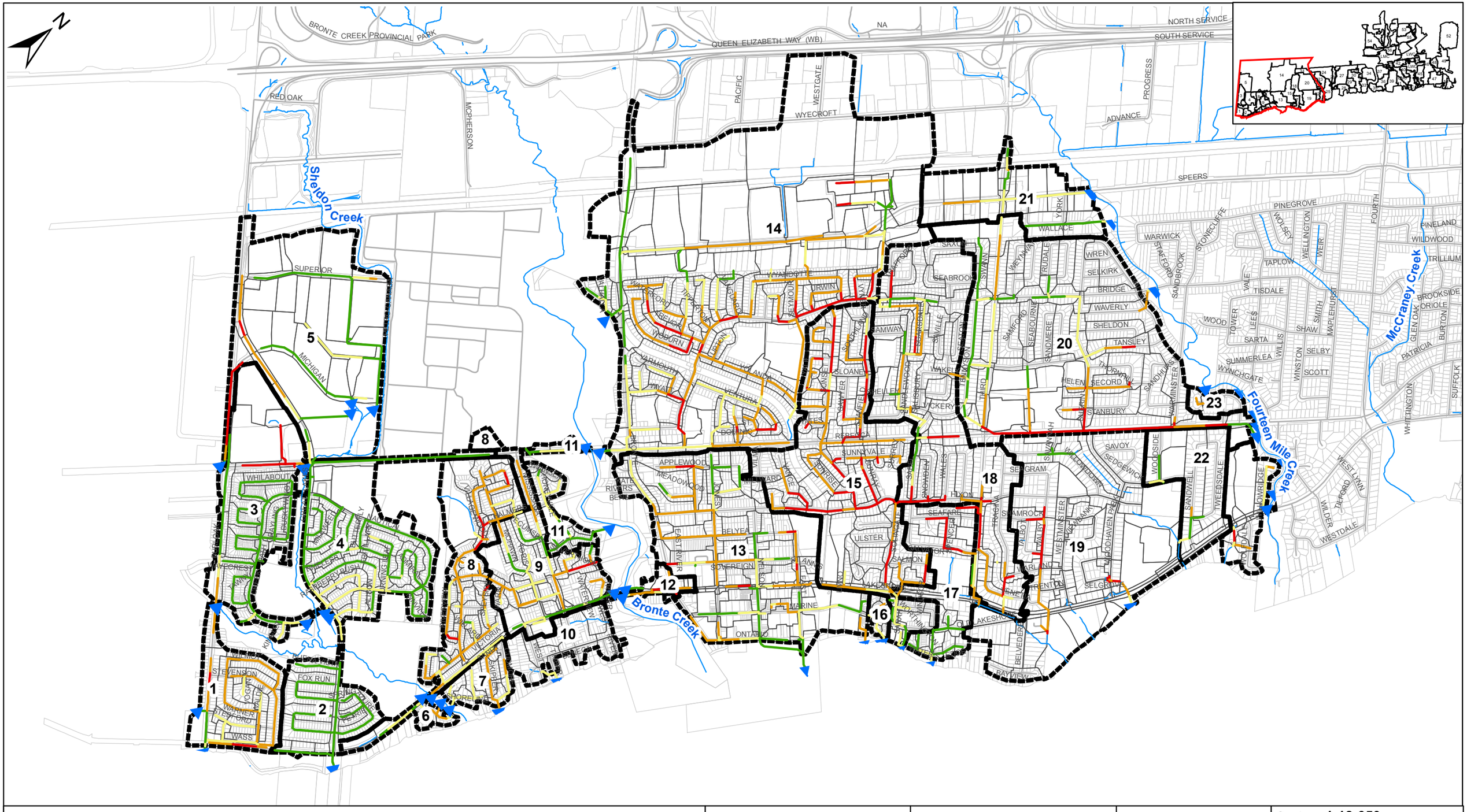
Prepared for:

Town of Oakville
1225 Trafalgar Road, Oakville, Ontario L6H 0H3

November 13, 2019

Appendix F

Existing Conditions Capacity Assessment Results



Legend

- Network
- Subcatchment
- Parcels
- Roads
- Streams
- Outfalls

Minor System Performance

- Unsurcharged
- Below 1/2 Surcharging Depth and Above Obvert
- Above 1/2 Surcharging Depth and Below Rim Elevation
- Surcharged Above Rim Elevation

Stormwater Management Master Plan

Phase 2

Town of Oakville

5 Year Minor System Performance Assessment - Existing Condition (Part 1)

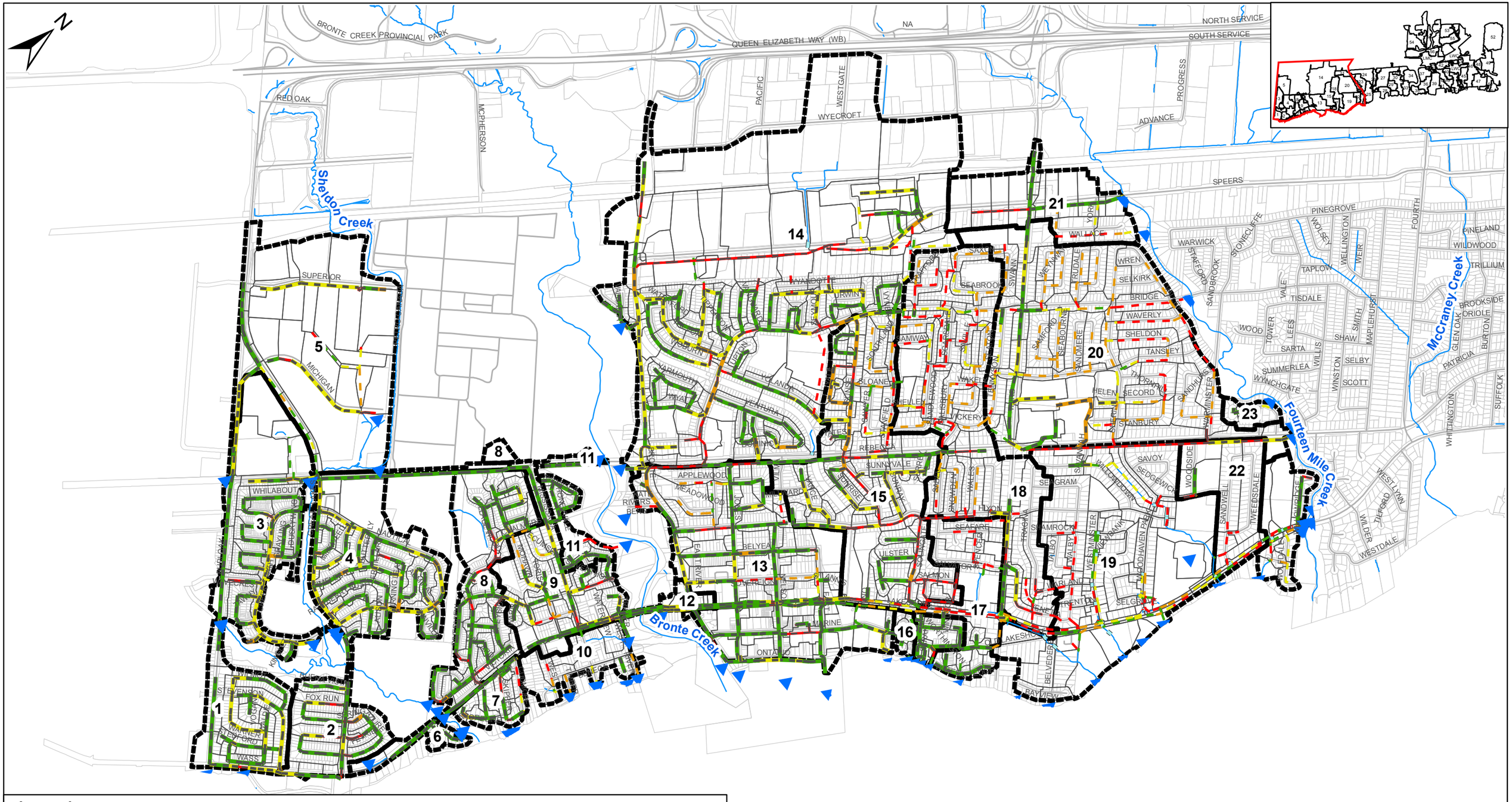
wood.

Scale **1:18,650**

0 100 200 400 600 800 Meters

Project No. **TP 115045**

Drawing No. **F1-1**



Legend

- Network
- Subcatchment
- Parcels
- Roads
- Streams
- Culverts
- Outfalls

Major System Performance

- Flow Contained Within Ditch
- Flow Contained Within Curb
- Flow Above Ditch But Contained Within ROW
- Flow Above Curb But Contained Within ROW
- Flow Beyond ROW (Less Than 50% to Building) - Ditches
- Flow Beyond ROW (Less Than 50% to Building) - Curbed
- Flow Beyond ROW (Greater Than 50% to Building) - Ditches
- Flow Beyond ROW (Greater Than 50% to Building) - Curbed

Stormwater Management Master Plan

Phase 2

Town of Oakville

100 Year Major System Performance Assessment - Existing Condition (Part 1)

wood.

Scale **1:18,650**

0 100 200 400 600 800 Meters

Project No. **TP 115045**

Drawing No. **F4-1**

Legend

- Network
- Subcatchment
- Parcels
- Roads
- Pump
- Storage
- Outfalls

Minor System

- Unsurcharged
- Below 1/2 Surcharging Depth and Above Obvert
- Above 1/2 Surcharging Depth and Below Rim Elevation
- Surcharged Above Rim Elevation

Stormwater Management Master Plan **Phase 2** **Town of Oakville**	**Minor System Capacity Assessment (Part 1)** **100-Year Existing Condition**	wood.	Scale **1:15,000** 200 100 0 200 Meters Project No. **TP 115045** Figure No. **F6-1**

Appendix H

Preferred Alternative Summary Drawings

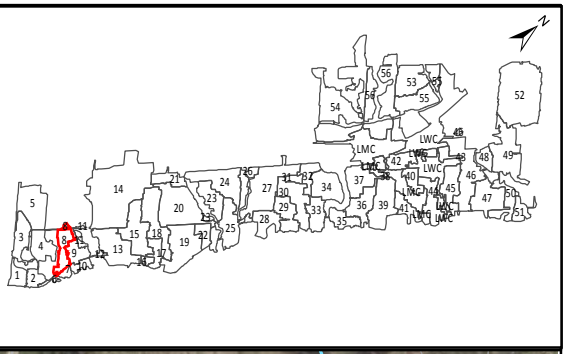
Legend

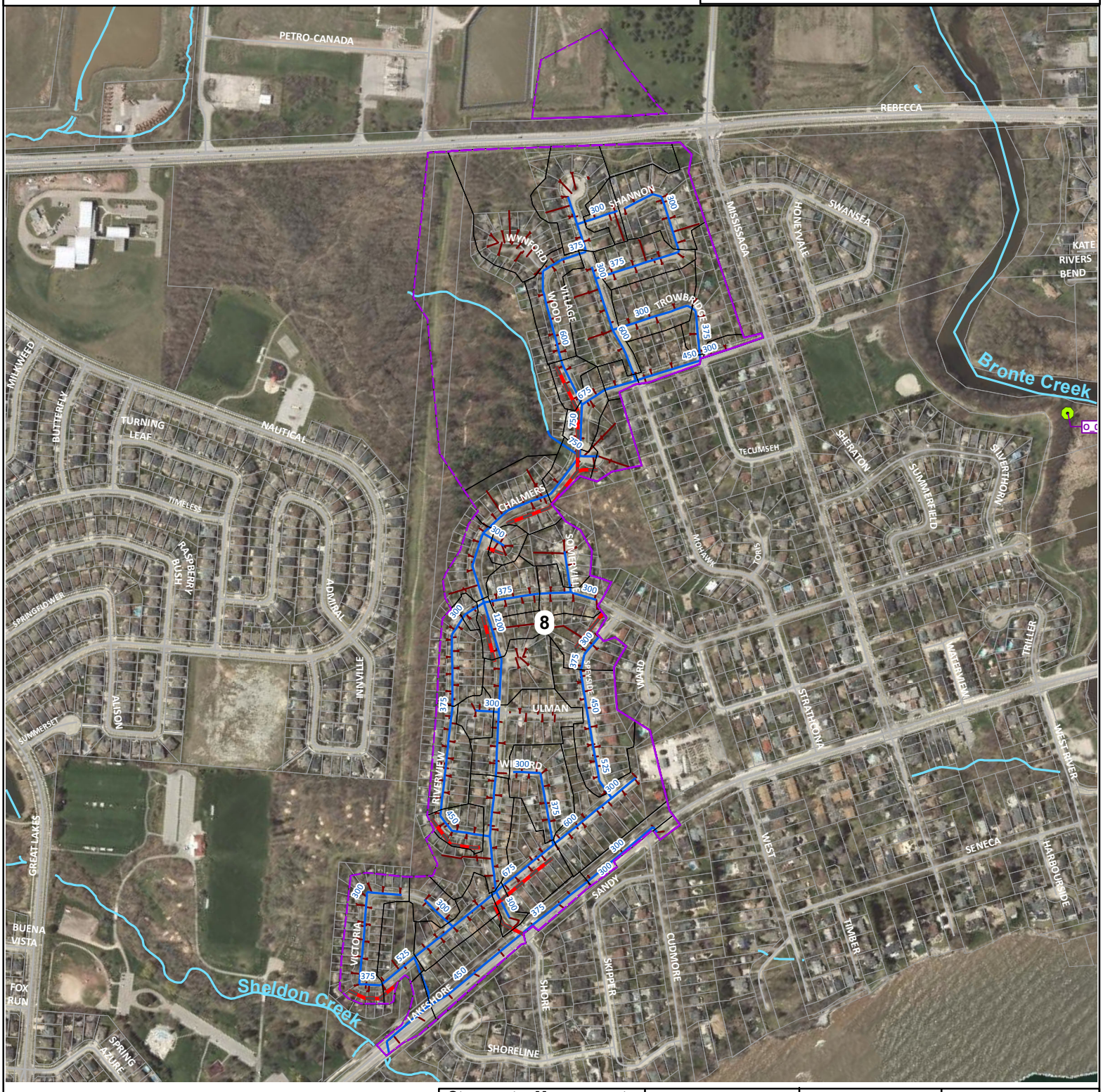
- Network
- Subcatchments
- Parcel
- Roads
- Channels
- Remnant Channels
- Basement Lateral Storm
- Existing Pipes
- Dry SWM Facility Retrofit
- Drainage Areas to Dry SWM Facility - Retrofit
- Outfalls
- Outfall Retrofit

Major System Improvement Locations

- Curbed
- Ditches

1500 - Existing Pipe Size (mm)





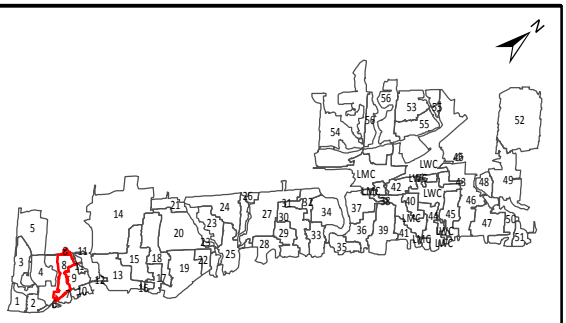
Stormwater Management Master Plan **Phase 2** **Town of Oakville**	**Recommended Works** **Sewershed 8**	wood.	Not to Scale (NTS) Project No. **TP 115045** Figure No. H8A

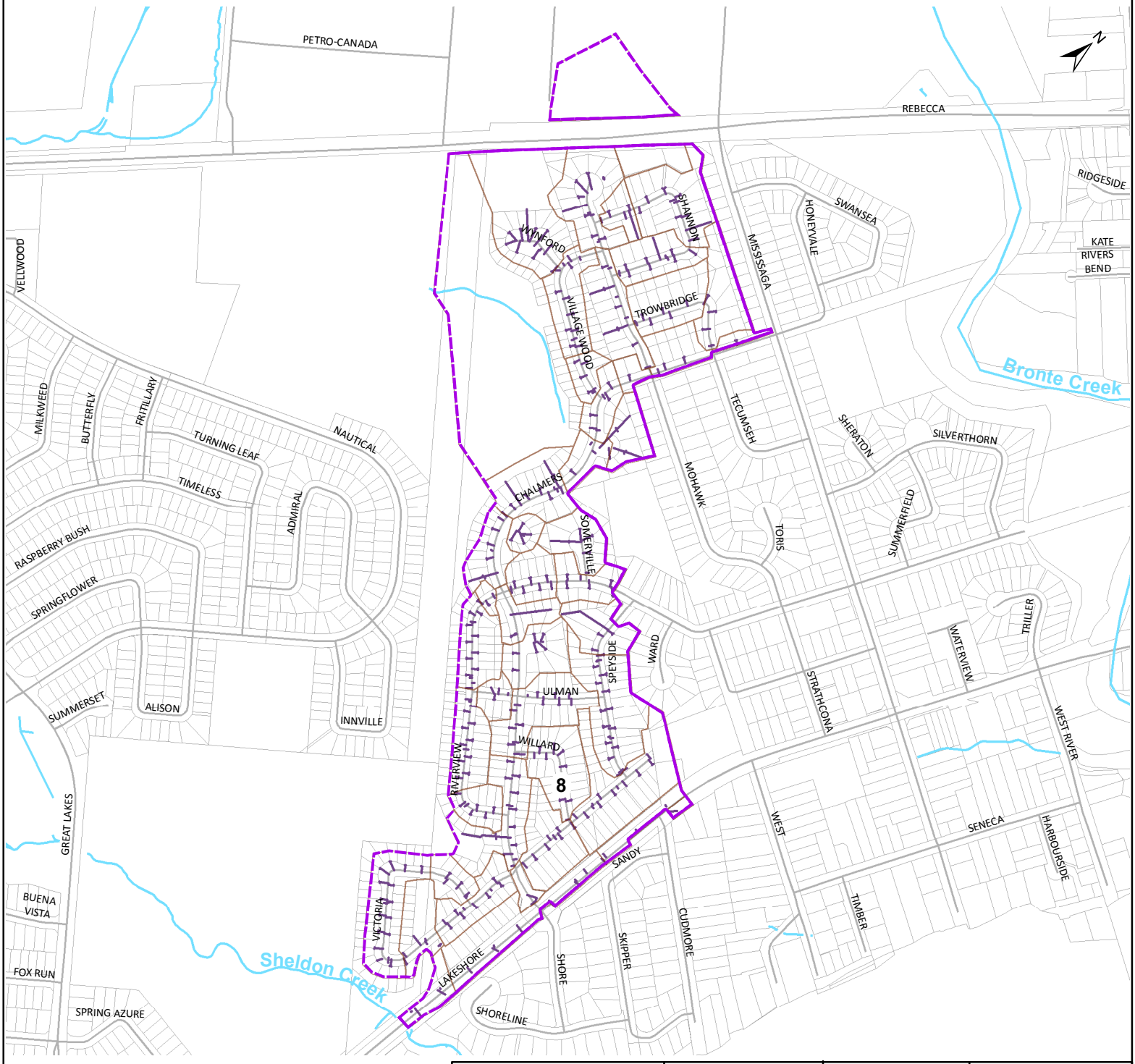
Legend

- Network
- Subcatchments
- Parcel
- Roads
- Channels
- Remnant Channels
- Lateral
- 1500 - Proposed Pipe Size (mm)
- Outfalls
- Proposed Subsurface Quantity Storage Unit
- Inlet Improvement Locations
- Potential Higher Capacity Catch Basins

Pipe Upgrade Recommandations

- 1 Up
- 2 Up
- 3 Up
- 4 Up
- >4 Up
- Diversion
- Install New Storm Sewers
- Replace with Like Sized Pipe





Stormwater Management Master Plan **Phase 2** **Town of Oakville**	**Recommended Works** **Sewershed 8**	wood.	Not to Scale (NTS) Project No. **TP 115045** Figure No. H8B

Network 8 Summary Sheet

Network Prioritization

Net Level of Service (LOS):	D	Weighted Net Score:	2.67
Minor System - Basement Connected LOS:	D	Minor System - Basement Not Connected LOS:	A
Major System LOS:	A	Future Study Recommended:	Confirmatory

Network Characteristics

Area (ha):	38.44	Existing Conditions Imperviousness (%):	50.46	Future Conditions Imperviousness (%):	52.24		
Land Use (ha):	Residential	28.93	Open Space	7.96	Commercial/Industrial	1.56	
Number of Private Properties:	480						

Infrastructure Characteristics

Modeled Sewer Length (m):	4,583	Basement Connected Sewer (m):	3,809	Not Connected (m):	774
Sewer Outfalls (#):	1	Modelled Sewer Manholes (#):	94	Catch Basins (#):	148
Existing ICD Implementation (%):	0	Existing SWM Facilities (#):	None	Existing SWM Storage (m^3):	N/A

Recommended Works

A. Quantity Control				
Minor System - Storm Sewers				
ICD Implementation	> 75 % of Inlets	148 # of CB	$	49,777
Replace with Like Sized Pipe		- m	$	-
Replace and Upgrade 1 Pipe Size		- m	$	-
Replace and Upgrade 2 Pipe Sizes		- m	$	-
Replace and Upgrade 3 Pipe Sizes		- m	$	-
Replace and Upgrade 4 Pipe Sizes		- m	$	-
Replace and Upgrade > 4 Pipe Sizes		- m	$	-
Diversion Sewers and New Sewers		- m	$	-
Online Storage		- m^3	$	-
Offline Storage		- m^3	$	-
Inlet Improvements				
Inlets Identified for Improvement:		- # of Inlets	$	-
CB Upgrades				
Higher Capacity Catch Basin Upgrades:		- # of CB	$	-
Minor System - Ditches				
Culvert Improvement		- m	$	-
Resectioning/Reditching		- m	$	-
Major System				
Replace Pipes		-		
Storage		-		
Urban Road LID Implementation		933 m	$	315,064
Resectioning/Reprofiling		845 m *		
Remnant Channels				
Remnant Channel I.D.		N/A		
Diversion		- m	$	-
Online Storage		-	$	-
Optimize Outlet		-		
Increase Pipe Size (Online)		-		
Reprofiling/Regrading		- m	$	-
B. Quality Control				
Proposed Stormwater Quality Outfall Retrofits:		- # of Facilities		
Impervious Area Treated to Enhanced Standard):		- ha	$	-
Stormwater Quality Retrofits to Existing Dry Facilities:		- # of Facilities		
Impervious Area Treated to Enhanced Standard:		- ha	$	-
Total Capital Works Costs			$	364,841
Preliminary and Detailed Design Future Studies (Schedule A/A+) Cost			$	4,978
Detailed Future Studies (Schedule B) Cost			$	-
Detailed Network Analysis Studies Cost			$	-
Total Capital Works and Future Studies Costs			$	369,819
Network Unitary Cost for All Recommended Works ($/Private Properties)			$	770

Storm Sewer Condition

Structural Grade						
Rating	1 (Excellent)	2	3	4	5 (Poor)	Total
Total Length of Pipes (m)	2573	1070	1025	108	39	4967
Total Percentage of Pipes (%)	51.8	21.5	20.6	2.2	0.8	97
O & M Rating						
Rating	1 (Excellent)	2	3	4	5 (Poor)	Total
Total Length of Pipes (m)	1071	2457	896	244	147	4967
Total Length of Pipes (%)	21.6	49.5	18	4.9	3	97

Notes: Significant mitigation efforts, other than ICDs, are not required.

* Major system reprofiling has been recommended for review in areas which lack a suitable alternative for mitigating poor surface drainage. Reprofiling should be considered at the time of roadway reconstruction.

Legend

- Network
- Subcatchments
- Parcel
- Roads
- Channels
- Remnant Channels
- Basement Lateral Storm
- Existing Pipes
- Dry SWM Facility Retrofit
- Drainage Areas to Dry SWM Facility - Retrofit
- Outfalls
- Outfall Retrofit

Major System Improvement Locations

- Curbed
- Ditches

1500 - Existing Pipe Size (mm)

Stormwater Management Master Plan **Phase 2** **Town of Oakville**	**Recommended Works** **Sewershed 9**	wood.	Not to Scale (NTS) Project No. **TP 115045** Figure No. H9A

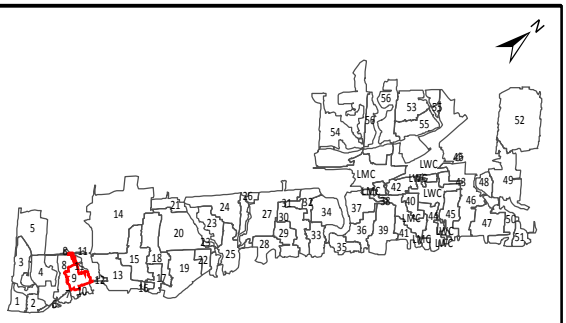
Legend

- Network
- Subcatchments
- Parcel
- Roads
- Channels
- Remnant Channels
- Lateral
- Outfalls
- Proposed Subsurface Quantity Storage Unit
- Inlet Improvement Locations
- Potential Higher Capacity Catch Basins

1500 - Proposed Pipe Size (mm)

Pipe Upgrade Recommandations

- 1 Up
- 2 Up
- 3 Up
- 4 Up
- >4 Up
- Diversion
- Install New Storm Sewers
- Replace with Like Sized Pipe



Stormwater Management Master Plan **Phase 2** **Town of Oakville**	**Recommended Works** **Sewershed 9**	wood.	Not to Scale (NTS) Project No. **TP 115045** Figure No. H9B

Network 9 Summary Sheet

Network Prioritization

Net Level of Service (LOS):	C	Weighted Net Score:	1.91
Minor System - Basement Connected LOS:	D	Minor System - Basement Not Connected LOS:	A
Major System LOS:	A	Future Study Recommended:	Further Assessment

Network Characteristics

Area (ha):	32.17	Existing Conditions Imperviousness (%):	51.24			Future Conditions Imperviousness (%):	57.36
Land Use (ha):	Residential	29.31	Open Space	2.14	Commercial/Industrial		0.71
Number of Private Properties:	298						

Infrastructure Characteristics

Modeled Sewer Length (m):	3,869	Basement Connected Sewer (m):	2,294	Not Connected (m):	1,575
Sewer Outfalls (#):	1	Modelled Sewer Manholes (#):	61	Catch Basins (#):	133
Existing ICD Implementation (%):	0	Existing SWM Facilities (#):	None	Existing SWM Storage (m^3):	N/A

Recommended Works

A. Quantity Control				
Minor System - Storm Sewers				
ICD Implementation	75 % of Inlets	100 # of CB	$	33,549
Replace with Like Sized Pipe		- m	$	-
Replace and Upgrade 1 Pipe Size		193 m	$	329,073
Replace and Upgrade 2 Pipe Sizes		177 m	$	301,351
Replace and Upgrade 3 Pipe Sizes		- m	$	-
Replace and Upgrade 4 Pipe Sizes		- m	$	-
Replace and Upgrade > 4 Pipe Sizes		- m	$	-
Diversion Sewers and New Sewers		- m	$	-
Online Storage		- m^3	$	-
Offline Storage		- m^3	$	-
Inlet Improvements				
Inlets Identified for Improvement:		- # of Inlets	$	-
CB Upgrades				
Higher Capacity Catch Basin Upgrades:		- # of CB	$	-
Minor System - Ditches				
Culvert Improvement		310 m	$	33,063
Resectioning/Reditching		310 m	$	30,972
Major System				
Replace Pipes		-		
Storage		-		
Urban Road LID Implementation		736 m	$	248,623
Resectioning/Reprofiling		347 m *		
Remnant Channels				
Remnant Channel I.D.		N/A		
Diversion		- m	$	-
Online Storage		-	$	-
Optimize Outlet		-		
Increase Pipe Size (Online)		-		
Reprofiling/Regrading		- m	$	-
B. Quality Control				
Proposed Stormwater Quality Outfall Retrofits:		- # of Facilities		
Impervious Area Treated to Enhanced Standard):		- ha	$	-
Stormwater Quality Retrofits to Existing Dry Facilities:		- # of Facilities		
Impervious Area Treated to Enhanced Standard:		- ha	$	-
Total Capital Works Costs			$	976,632
Preliminary and Detailed Design Future Studies (Schedule A/A+) Cost			$	66,397
Detailed Future Studies (Schedule B) Cost			$	3,097
Detailed Network Analysis Studies Cost			$	80,000
Total Capital Works and Future Studies Costs			$	1,126,126
Network Unitary Cost for All Recommended Works ($/Private Properties)			$	3,779

Storm Sewer Condition

Structural Grade						
Rating	1 (Excellent)	2	3	4	5 (Poor)	Total
Total Length of Pipes (m)	2477	385	636	0	0	3498
Total Percentage of Pipes (%)	70.8	11	18.2	0	0	100
O & M Rating						
Rating	1 (Excellent)	2	3	4	5 (Poor)	Total
Total Length of Pipes (m)	431	2087	838	74	68	3498
Total Length of Pipes (%)	12.3	59.7	24	2.1	1.9	100

Notes: Minor Pipe replacement upgrades are also recommended in addition to pipe upgrades as per the Lakeshore Road (Draft) Class EA. Instances of surcharge at isolated locations with basement connections or foundations drains should be considered for disconnection from the storm sewer system. Future study recommended with additional investigation to address residual data gaps and to validate alternatives.

* Major system reprofiling has been recommended for review in areas which lack a suitable alternative for mitigating poor surface drainage. Reprofiling should be considered at the time of roadway reconstruction.

APPENDIX C

STORMWATER MANAGEMENT CALCULATIONS

SCS consulting group ltd

EXISTING WEIGHTED RUNOFF COEFFICIENT

3171 Lakeshore Road West
Project Number: 1930
Date: December 2021
Designer Initials: M.M.H

Catchment 101 Outlets to: Victoria Street (West)

	Runoff Coefficient	Area (ha)	Weighted Runoff Coefficient
Asphalt	0.90	0.04	0.19
Rooftops	0.90	0.01	0.04
Grass	0.25	0.15	0.19
TOTAL		0.20	0.41

Catchment 102 Outlets to: Lakeshore Road West

	Runoff Coefficient	Area (ha)	Weighted Runoff Coefficient
Asphalt	0.90	0.27	0.25
Rooftops	0.90	0.04	0.04
Grass	0.25	0.66	0.17
TOTAL		0.97	0.46

Overall Total

Catchment	Runoff Coefficient	Area	Weighted Runoff Coefficient
101	0.41	0.20	0.07
102	0.46	0.97	0.38
TOTAL		1.17	0.45

ALLOWABLE RELEASE RATE

3171 Lakeshore Road West
Project Number: 1930
Date: December 2021
Designer Initials: M.M.H

5 Year storm

IDF Parameters*

a = 1170
t = 10 min
b = 5.8
c = 0.843

Allowable Release Rate Calculation				
Outlet	**Area**	**time**	**Intensity**	**Flow**
ID		**t**	**i=a/(t+b)^c**	**Q=CiA/360**
	ha	***min***	***mm/hr***	***l/s***
Lakeshore Road West	0.969	10.00	114.21	140.6
Victoria Street (West)	0.204	10.00	114.21	26.8

* a,b,c's per Town of Oakville

100 Year storm

IDF Parameters*

a = 2150
t = 10 min
b = 5.7
c = 0.861

Allowable Release Rate Calculation				
Outlet	**Area**	**time**	**Intensity**	**Flow**
ID		**t**	**i=a/(t+b)^c**	**Q=CiA/360**
	ha	***min***	***mm/hr***	***l/s***
Lakeshore Road West	0.969	10.00	200.80	247.2
Victoria Street (West)	0.204	10.00	200.80	47.0

* a,b,c's per Town of Oakville

PROPOSED WEIGHTED RUNOFF COEFFICIENT

3171 Lakeshore Road West
Project Number: 1930
Date: December 2021
Designer Initials: M.M.H

Catchment 201 Outlets to: Victoria Street (West)

	Runoff Coefficient	Area (ha)	Weighted Runoff Coefficient	Weighted Runoff Coefficient (100 Year)
Asphalt	0.90	0.10	0.42	0.47
Rooftops	0.90	0.03	0.14	0.15
Grass	0.25	0.08	0.10	0.12
TOTAL		0.20	0.65	0.74

Catchment 202 Outlets to: Lakeshore Road West

	Runoff Coefficient	Area (ha)	Weighted Runoff Coefficient	Weighted Runoff Coefficient (100 Year)
Asphalt	0.90	0.06	0.21	0.24
Rooftops	0.90	0.05	0.19	0.21
Grass	0.25	0.13	0.14	0.17
TOTAL		0.25	0.54	0.62

Catchment 203 Outlets to: Lakeshore Road West

	Runoff Coefficient	Area (ha)	Weighted Runoff Coefficient	Weighted Runoff Coefficient (100 Year)
Asphalt	0.90	0.27	0.37	0.41
Rooftops	0.90	0.18	0.24	0.27
Grass	0.25	0.21	0.08	0.10
TOTAL		0.66	0.69	0.78

Catchment 204 Outlets to: Victoria Street (East)

	Runoff Coefficient	Area (ha)	Weighted Runoff Coefficient	Weighted Runoff Coefficient (100 Year)
Asphalt	0.90	0.01	0.08	0.09
Rooftops	0.90	0.02	0.28	0.31
Grass	0.25	0.04	0.15	0.19
TOTAL		0.06	0.51	0.59

PROPOSED WEIGHTED RUNOFF COEFFICIENT

3171 Lakeshore Road West
Project Number: 1930
Date: December 2021
Designer Initials: M.M.H

Victoria Street (East) Total

Catchment	Runoff Coefficient	Area	Weighted Runoff Coefficient
204	0.51	0.06	0.51
TOTAL		0.06	0.51

Lakeshore Road West Total

Catchment	Runoff Coefficient	Area	Weighted Runoff Coefficient
202	0.54	0.25	0.15
203	0.69	0.66	0.51
TOTAL		0.91	0.65

Victoria Street (West) Total

Catchment	Runoff Coefficient	Area	Weighted Runoff Coefficient
201	0.65	0.20	0.65
TOTAL		0.20	0.65

Overall Total

Catchment	Runoff Coefficient	Area	Weighted Runoff Coefficient
201	0.65	0.20	0.65
202	0.54	0.25	0.65
203	0.69	0.66	2.24
204	0.51	0.06	0.16
TOTAL		1.17	3.70

SUMMARY

3171 Lakeshore Road West
Project Number: 1930
Date: December 2021
Designer Initials: M.M.H

			100 Year										
Catchment ID	Runoff Coef.	Area (ha)	Release Rate (L/s) [1]	Storage Required (m^3) [1]	Ponding Depth (m)	Storage Available (m^3)	Orifice Size (mm) [2]	Orifice Release Rate (L/s)	Uncontrolled Release Rate (L/s)	Major (Overland) Flow (L/s)	Location of Orifice	Invert	VERTICAL/TUBE Control
201	0.74	0.20	47.0	22.4	0.00	22.9	85	23.2		23.9	MH12	82.850	VERTICAL
202	0.62	0.25	85.2	0.0	0.00	0.0	uncontrolled	-	85.2		-	100.000	-
203	0.78	0.66	135.7	100.1	0.00	103.1	225	135.7		0	MHTEE6 End Cap	82.090	VERTICAL
204	0.59	0.06	20.8	0.0	0.00	0.0	uncontrolled	-	20.8		-	100.000	-
Total		1.17	288.8	122.5	-	126.1	-	-			-	-	-

Lakeshore Road West Minor System Allowable Release Rate (Existing 5 Year)	140.6	L/s
Lakeshore Road West Minor System Proposed Release Rate (100 Year))	135.7	L/s
Lakeshore Road West and Victoria Street (East) 100 year Allowable Release Rate	247.2	L/s
Lakeshore Road West and Victoria Street (East) Proposed Release Rate	241.7	L/s
Victoria Street (West) Minor System Allowable Release Rate (Existing 5 Year)	26.8	L/s
Victoria Street (West) Minor System Proposed Release Rate (100 Year))	23.2	L/s
Victoria Street (West) 100 year Allowable Release Rate	47.0	L/s
Victoria Street (West) Proposed Release Rate	47.0	L/s

Notes:
[1] Per Modified Rational Calculations (attached)
[2] See attached for orifice details

			5 Year						
Catchment ID	Runoff Coef.	Area (ha)	Release Rate (L/s) [2]	Storage Required (m^3) [2]	Ponding Depth (m)	Storage Available (m^3) [3]	Orifice Size (mm) [4]	Orifice Release Rate (L/s)	Uncontrolled Release Rate (L/s)
201	0.65	0.20	15.0	20.5	0.00	22.9	85	15.0	0
202	0.54	0.25	42.3	0	0.00	0	uncontrolled	-	42.3
203	0.69	0.66	83.3	37.2	0.00	103.1	225	83.3	0
204	0.51	0.06	10.3	0	0.00	0	uncontrolled	-	10.3
Total		1.17	150.9	57.7	-	126.1			

Lakeshore Road West and Victoria Street (East) 5 year Allowable Release Rate	140.6	L/s
Lakeshore Road West and Victoria Street (East) Proposed Release Rate	135.9	L/s
Victoria Street (West) 5 year Allowable Release Rate	26.8	L/s
Victoria Street (West) Proposed Release Rate	15.0	L/s

Notes:
[1] Per Modified Rational Calculations (attached)
[2] See attached for orifice details

MODIFIED RATIONAL METHOD

3171 Lakeshore Road West
Project Number: 1930
Date: December 2021
Designer Initials: M.M.H

Area ID: 201

Area = **0.205** ha
"C" = **0.74**
AC= **0.1511**
Tc = **10.0** min
Time Increment = **15.0** min
Release Rate = **47.05** l/s
Max.Storage = **22.4** m^3

Town of Oakville 100 Year
a= 2150
b= 5.7
c= 0.861

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (l/s)	Runoff Volume (m^3)	Released Volume (m^3)	Storage Volume (m^3)	
10.0	200.8	84.35	50.6	28.2	22.4	<<<<
25.0	112.7	47.35	71.0	49.4	21.6	
40.0	80.0	33.62	80.7	70.6	10.1	
55.0	62.7	26.33	86.9	91.7	-4.9	
70.0	51.8	21.77	91.4	112.9	-21.5	
85.0	44.4	18.63	95.0	134.1	-39.1	
100.0	38.9	16.33	98.0	155.3	-57.3	
115.0	34.7	14.57	100.5	176.4	-75.9	
130.0	31.4	13.17	102.7	197.6	-94.9	
145.0	28.6	12.03	104.7	218.8	-114.1	
160.0	26.4	11.09	106.5	240.0	-133.5	
175.0	24.5	10.29	108.1	261.1	-153.1	
190.0	22.9	9.61	109.5	282.3	-172.7	
205.0	21.5	9.02	110.9	303.5	-192.6	
220.0	20.2	8.50	112.2	324.6	-212.5	
235.0	19.1	8.04	113.4	345.8	-232.4	
250.0	18.2	7.63	114.5	367.0	-252.5	
265.0	17.3	7.27	115.6	388.2	-272.6	
280.0	16.5	6.94	116.6	409.3	-292.8	
295.0	15.8	6.64	117.5	430.5	-313.0	
310.0	15.2	6.37	118.4	451.7	-333.3	
325.0	14.6	6.12	119.3	472.8	-353.6	
340.0	14.0	5.89	120.1	494.0	-373.9	
355.0	13.5	5.68	120.9	515.2	-394.3	

Area ID: 201

Area = **0.205** ha
"C" = **0.65**
AC= **0.1336**
Tc = **10.0** min
Time Increment = **15.0** min
Release Rate = **15.01** l/s
Max.Storage = **20.5** m^3

of Oakville 5 Year
a= 1170
b= 5.8
c= 0.843

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (l/s)	Runoff Volume (m^3)	Released Volume (m^3)	Storage Volume (m^3)	
10.0	114.2	42.41	25.4	9.0	16.4	
25.0	65.1	24.16	36.2	15.8	20.5	<<<<
40.0	46.6	17.29	41.5	22.5	19.0	
55.0	36.7	13.62	44.9	29.3	15.7	
70.0	30.5	11.31	47.5	36.0	11.5	
85.0	26.2	9.71	49.5	42.8	6.7	
100.0	23.0	8.54	51.2	49.5	1.7	
115.0	20.6	7.63	52.7	56.3	-3.6	
130.0	18.6	6.92	53.9	63.0	-9.1	
145.0	17.1	6.33	55.1	69.8	-14.7	
160.0	15.7	5.84	56.1	76.5	-20.4	
175.0	14.6	5.43	57.1	83.3	-26.2	
190.0	13.7	5.08	57.9	90.0	-32.1	
205.0	12.9	4.77	58.7	96.8	-38.1	
220.0	12.1	4.51	59.5	103.6	-44.1	
235.0	11.5	4.27	60.2	110.3	-50.1	
250.0	10.9	4.06	60.8	117.1	-56.2	
265.0	10.4	3.87	61.5	123.8	-62.4	
280.0	9.9	3.69	62.0	130.6	-68.5	
295.0	9.5	3.54	62.6	137.3	-74.7	
310.0	9.1	3.40	63.2	144.1	-80.9	
325.0	8.8	3.27	63.7	150.8	-87.2	
340.0	8.5	3.15	64.2	157.6	-93.4	
355.0	8.2	3.03	64.6	164.3	-99.7	

ON-SITE DETENTION AND ORIFICE DETAILS

3171 Lakeshore Road West
Project Number: 1930
Date: December 2021
Designer Initials: M.M.H

Area ID 201

Orifice Equation: $Q = C_d A(2gh)^{1/2}$

Orifice Diameter:	85	mm
Area:	0.006	m^2
g =	9.81	m/sec^2
C_d =	0.62	

Type of Control:	VERTICAL
Location:	MH12

Pipe Storage

Diameter (mm)	Area (m^2)	Length (m)	Volume (m^3)
825	0.535	42.9	22.9
		Total Volume	**22.9**

	Stage (m)	Head (m)	Storage (m^3)	Discharge (m^3/s)
Invert E.L.	82.85	0.00	0.0	0.00
5 Year WL	83.82	0.93	22.9	0.015
100 Year WL	85.10	2.21	22.9	0.023

MODIFIED RATIONAL METHOD

3171 Lakeshore Road West
Project Number: 1930
Date: December 2021
Designer Initials: M.M.H

Area ID: 203

Area = **0.660** ha
"C" = **0.78**
AC= **0.5160**
Tc = **10.0** min
Time Increment = **15.0** min
Release Rate = **135.66** l/s
Max.Storage = **100.1** m^3

of Oakville 100 Year
a= 2150
b= 5.7
c= 0.861

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (l/s)	Runoff Volume (m^3)	Released Volume (m^3)	Storage Volume (m^3)	
10.0	200.8	288.06	172.8	81.4	91.4	
25.0	112.7	161.71	242.6	142.4	100.1	<<<<
40.0	80.0	114.81	275.5	203.5	72.0	
55.0	62.7	89.91	296.7	264.5	32.2	
70.0	51.8	74.35	312.2	325.6	-13.3	
85.0	44.4	63.63	324.5	386.6	-62.1	
100.0	38.9	55.77	334.6	447.7	-113.0	
115.0	34.7	49.75	343.3	508.7	-165.4	
130.0	31.4	44.98	350.8	569.8	-218.9	
145.0	28.6	41.10	357.5	630.8	-273.3	
160.0	26.4	37.87	363.6	691.9	-328.3	
175.0	24.5	35.15	369.1	752.9	-383.8	
190.0	22.9	32.82	374.1	814.0	-439.8	
205.0	21.5	30.79	378.8	875.0	-496.2	
220.0	20.2	29.02	383.1	936.0	-552.9	
235.0	19.1	27.46	387.2	997.1	-609.9	
250.0	18.2	26.07	391.0	1058.1	-667.1	
265.0	17.3	24.82	394.6	1119.2	-724.6	
280.0	16.5	23.69	398.0	1180.2	-782.2	
295.0	15.8	22.67	401.3	1241.3	-840.0	
310.0	15.2	21.74	404.4	1302.3	-897.9	
325.0	14.6	20.89	407.3	1363.4	-956.0	
340.0	14.0	20.11	410.2	1424.4	-1014.3	
355.0	13.5	19.38	412.9	1485.5	-1072.6	

Area ID: 203

Area = **0.660** ha
"C" = **0.69**
AC= **0.4579**
Tc = **10.0** min
Time Increment = **15.0** min
Release Rate = **83.34** l/s
Max.Storage = **37.2** m^3

of Oakville 5 Year
a= 1170
b= 5.8
c= 0.843

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (l/s)	Runoff Volume (m^3)	Released Volume (m^3)	Storage Volume (m^3)	
10.0	114.2	145.38	87.2	50.0	37.2	<<<<
25.0	65.1	82.82	124.2	87.5	36.7	
40.0	46.6	59.27	142.3	125.0	17.2	
55.0	36.7	46.68	154.0	162.5	-8.5	
70.0	30.5	38.76	162.8	200.0	-37.2	
85.0	26.2	33.29	169.8	237.5	-67.7	
100.0	23.0	29.26	175.6	275.0	-99.4	
115.0	20.6	26.17	180.6	312.5	-132.0	
130.0	18.6	23.71	184.9	350.0	-165.1	
145.0	17.1	21.71	188.8	387.5	-198.7	
160.0	15.7	20.04	192.4	425.0	-232.7	
175.0	14.6	18.63	195.6	462.5	-266.9	
190.0	13.7	17.42	198.6	500.0	-301.5	
205.0	12.9	16.37	201.3	537.5	-336.2	
220.0	12.1	15.44	203.9	575.0	-371.2	
235.0	11.5	14.63	206.3	612.5	-406.3	
250.0	10.9	13.90	208.5	650.0	-441.5	
265.0	10.4	13.25	210.7	687.5	-476.9	
280.0	9.9	12.66	212.7	725.0	-512.3	
295.0	9.5	12.13	214.7	762.5	-547.9	
310.0	9.1	11.64	216.5	800.0	-583.5	
325.0	8.8	11.19	218.3	837.5	-619.3	
340.0	8.5	10.78	220.0	875.1	-655.1	
355.0	8.2	10.40	221.6	912.6	-691.0	

ON-SITE DETENTION AND ORIFICE DETAILS

3171 Lakeshore Road West
Project Number: 1930
Date: December 2021
Designer Initials: M.M.H

Area ID 203

Orifice Equation: $Q = C_d A(2gh)^{1/2}$

Orifice Diameter:	225	mm
Area:	0.040	m^2
g =	9.81	m/sec^2
C_d =	0.62	

Type of Control: VERTICAL
Location: MHTEE6 End Cap

Pipe Storage

Diameter (mm)	Area (m^2)	Length (m)	Volume (m^3)
1200	1.131	91.2	103.1
		Total Volume	**103.1**

	Stage (m)	Head (m)	Storage (m^3)	Discharge (m^3/s)
Invert E.L.	82.09	0.00	0.0	0.00
5 Year WL	82.79	0.58	103.1	0.083
100 Year WL	83.75	1.54	103.1	0.136

Required Laneway R.O.W. Capacity

3171 Lakeshore Road West, Oakville
Project Number: 1930
Date: December 2021
Designer Initials: C.M.D.

Town of Oakville 5 Year (Rational Method)	
Area (ha) =	0.38
Runoff Coeff. =	0.69
T_c (min) =	10.00
a=	**1170**
b=	**5.80**
c=	**0.843**
Intensity (mm/hr) =	114.21
Runoff (m^3/s)=	**0.083**

Town of Oakville 100 Year (Rational Method)	
Area (ha) =	0.66
100 Year Return Period Factor[1] =	1.25
100 Year Runoff Coeff. =	0.86
T_c (min) =	10.00
a=	**2150**
b=	**5.70**
c=	**0.861**
Intensity (mm/hr) =	200.80
Runoff (m^3/s)=	**0.318**

[1]100 year return period factor calculated as per MTO Design Chart 1.07

Area (ha)[1]	Runoff Coefficient[1]	Weighted Runoff Coefficient
0.38	0.69	0.69
0.38		0.69

[1]Refer to Drawing DR-1 in **Appendix E**

Catchment 203		
Area (ha)	Runoff Coefficient[1]	Weighted Runoff Coefficient
0.66	0.69	0.69
0.66		0.69

[1]Refer to weighted runoff coefficient calculations in this Appendix

Major System Peak Flow:

$Q_{peak} = Q_{100yr} - Q_{5yr}$ = 0.234 m^3/s

Therefore, there is sufficient capacity in the Catchment 203 laneway and entrance laneway (capacity of 0.375 cu.m/s and 0.253 cu.m/s respectively per calculations in this Appendix) to convey the peak flow of 0.234 cu.m/s.

Laneway @ 1.5%

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	1.50	%
Normal Depth	0.11	m

Section Definitions

Station (m)	Elevation (m)
0+00.000	0.000
0+01.625	-0.033
0+01.650	-0.033
0+01.850	-0.108
0+02.125	-0.083
0+04.850	-0.028
0+07.575	-0.083
0+07.850	-0.108
0+08.050	-0.033
0+08.075	-0.033
0+09.700	0.000

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.000, 0.000)	(0+01.625, -0.033)	0.025
(0+01.625, -0.033)	(0+08.075, -0.033)	0.013
(0+08.075, -0.033)	(0+09.700, 0.000)	0.025

Results

Discharge		0.375	m^3/s
Elevation Range	-0.1075 to 0.0000 m		
Flow Area		0.44	m^2
Wetted Perimeter		9.7312	m
Top Width		9.7000	m

Laneway @ 1.5%

Results

Normal Depth		0.11	m
Critical Depth		0.12	m
Critical Slope		0.00842	m/m
Velocity		0.86	m/s
Velocity Head		0.04	m
Specific Energy		0.15	m
Froude Number		1.30	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth		0.00	m
Length		0.0000	m
Number Of Steps		0	

GVF Output Data

Upstream Depth		0.00	m
Profile Description			
Profile Headloss		0.00	m
Downstream Velocity		Infinity	m/s
Upstream Velocity		Infinity	m/s
Normal Depth		0.11	m
Critical Depth		0.12	m
Channel Slope		0.01500	m/m
Critical Slope		0.00842	m/m

Laneway @ 1.5%

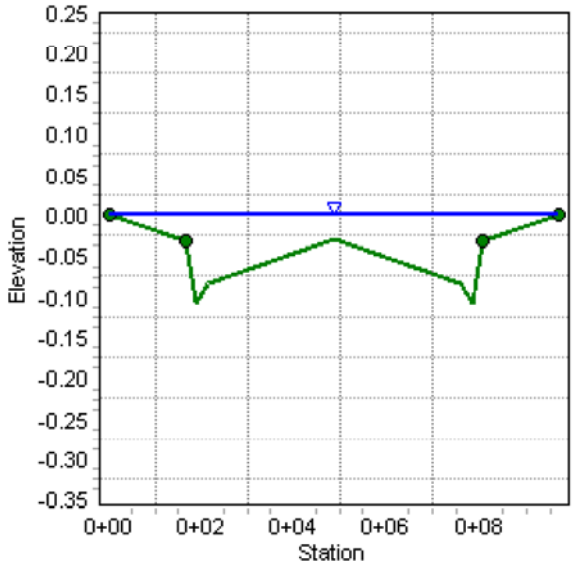
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	1.50	%
Normal Depth	0.11	m
Discharge	0.375	m³/s

Cross Section Image



Entrance Laneway @ 1.5%

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	1.50	%
Normal Depth	0.09	m

Section Definitions

Station (m)	Elevation (m)
0+00.000	0.000
0+01.625	-0.033
0+01.650	-0.033
0+01.850	-0.108
0+02.125	-0.083
0+05.450	-0.016
0+08.775	-0.083
0+09.050	-0.108
0+09.250	-0.033
0+09.275	-0.033
0+10.000	-0.015

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.000, 0.000)	(0+01.625, -0.033)	0.025
(0+01.625, -0.033)	(0+09.275, -0.033)	0.013
(0+09.275, -0.033)	(0+10.000, -0.015)	0.025

Results

Discharge		0.253	m^3/s
Elevation Range	-0.1075 to 0.0000 m		
Flow Area		0.31	m^2
Wetted Perimeter		9.3062	m
Top Width		9.2750	m

Entrance Laneway @ 1.5%

Results

Normal Depth		0.09	m
Critical Depth		0.10	m
Critical Slope		0.00711	m/m
Velocity		0.81	m/s
Velocity Head		0.03	m
Specific Energy		0.13	m
Froude Number		1.41	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth		0.00	m
Length		0.0000	m
Number Of Steps		0	

GVF Output Data

Upstream Depth		0.00	m
Profile Description			
Profile Headloss		0.00	m
Downstream Velocity		Infinity	m/s
Upstream Velocity		Infinity	m/s
Normal Depth		0.09	m
Critical Depth		0.10	m
Channel Slope		0.01500	m/m
Critical Slope		0.00711	m/m

Entrance Laneway @ 1.5%

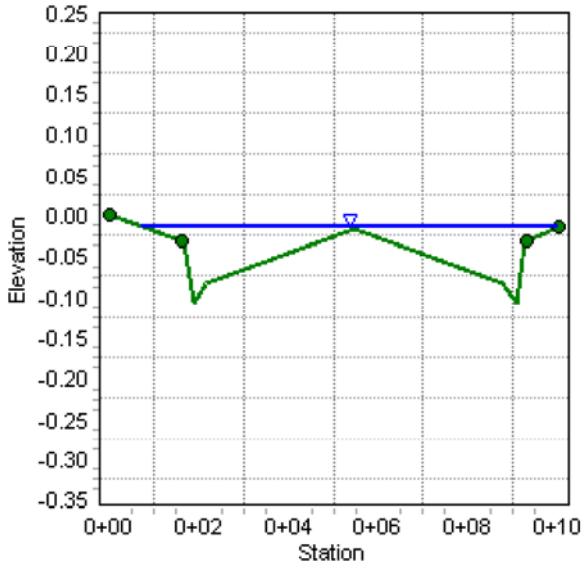
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	1.50	%
Normal Depth	0.09	m
Discharge	0.253	m³/s

Cross Section Image



Catchbasin Capacity (Borden Grate)			
Depth above grate =	0.09	m	(84.25-84.16)
Area of Orifice =	0.0041	m^2	
Orifice Coefficient =	0.6		
Total Discharge, Q=	0.003	m^3/sec	
Discharge Vel., V=	0.802	m/sec	

Honeycomb Grating

Grating Length =	1.2	m
Grating Width =	0.6	m

Catchbasin Opening

Length =	1.200	m
Width =	0.600	m
Area =	0.720	m^2
Area Lost to Grating/Opening =	0.00091	m^2
Orifice Opening Area =	0.0041	m^2
Effective number of Openings =	142	
Grating Open Area =	0.586	m^2
Assumed Blockage =	**50.0**	**%**
Effective Grating Open Area =	0.293	m^2
Effective flow Capacity =	0.235	m^3/sec
Number of Catchbasins =	2	
Catchbasin Capacity =	0.470	m^3/sec
Super CB Lead Diameter =	0.300	m
Super CB Grate Invert =	84.16	
Super CB Lead Invert =	82.66	
Head over Lead Invert =	1.35	m
Super CB Lead Capacity =	0.281	m^3/sec
Required Inlet Capacity[1] =	0.234	
Provided Inlet Capacity =	**0.470**	m^3/sec

[1] See Required Laneway ROW Capacity calculation in this Appendix.

Therefore, two 1.2mx0.6m Borden grates have sufficient capacity with 50% blockage (0.470 m^3/s) to capture the 100 year flow of 0.234 m^3/s.

Cul-de-sac 100 Year Capture Calculation
Catchment 201

3171 Lakeshore Road West, Oakville
Project Number: 1930
Date: December 2021
Designer Initials: C.M.D.

City of Oakville 100 Year (Rational Method)	
Area (ha) =	0.20
100 Year Return Period Factor[1] =	1.25
100 Year Runoff Coeff. =	0.81
T_c (min) =	10.00
a=	**2150**
b=	**5.70**
c=	**0.861**
Intensity (mm/hr) =	200.80
Runoff (m^3/s)=	**0.091**

[1]100 year return period factor calculated as per MTO Design Chart 1.07

Catchment 201			
Land Use	**Area (ha)**	**Runoff Coefficient[1]**	**Weighted Runoff Coefficient**
-	0.20	0.65	0.65
	0.20		0.65

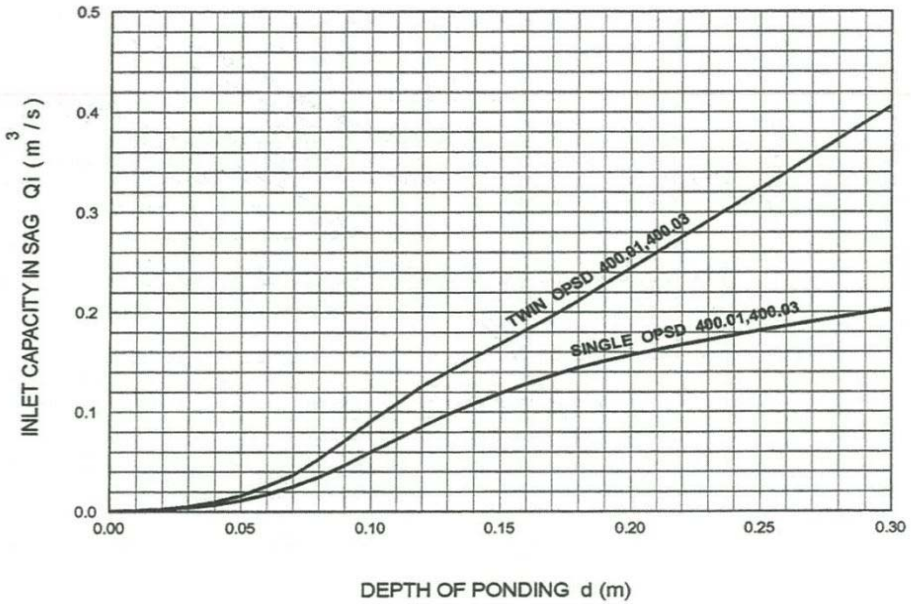
[1]Refer to weighted runoff coefficient calculations in this Appendix

100 Year Peak Flow:

$$Q_{100yr} = 0.091\ m^3/s$$

Design Charts

Design Chart 4.19: Inlet Capacity at Road Sag



*Per Ministry of Transportation Ontario Drainage Manual

100 Year Capture Capacity for OPSD 400.01 & 400.03 - Catchment 201			
Required Capture Capacity	0.091	m^3/s	
Required Capture Capacity with 50% Blockage	0.181	m^3/s	
Type of Catch Basin	Twin		
Number of Catchbasins	2		
Required Capture Capacity Per Catchbasin	0.091	m^3/s	
Provided Capture Capacity per Catchbasin	0.120	m^3/s	
Ponding Depth Required	0.10	m	
Ponding Depth Provided	0.12	m	(85.12-85.00)

Sizing CB Lead - Catchment 201			
Orifice Flow	Grate Elevation =	85.00	m
	Lead Invert =	83.50	m
	CB Lead Diameter =	0.300	m
	Required CB Lead Capacity =	0.091	m^3/s
	Orifice Coefficient =	0.82	
	Required Head Above CB Lead Centroid =	0.03	m
	Required Water Elevation =	83.68	m
Pipe Flow	CB Lead Slope =	2.0%	
	Provided CB Lead Pipe Full Flow Capacity =	0.137	m^3/s

APPENDIX D

OIL-GRIT SEPARATOR SIZING AND MAINTENANCE INFORMATION

Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

Province:	Ontario
City:	Oakville
Nearest Rainfall Station:	HAMILTON RBG CS
Climate Station Id:	6153301
Years of Rainfall Data:	20

Site Name:	3171 Lakeshore Rd. W

Drainage Area (ha):	0.66
Runoff Coefficient 'c':	0.69

Particle Size Distribution:	CA ETV
Target TSS Removal (%):	60.0
Required Water Quality Runoff Volume Capture (%):	90.0

Estimated Water Quality Flow Rate (L/s):	15.04
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	

Project Name:	3171 Lakeshore Rd. W
Project Number:	-
Designer Name:	Brandon O'Leary
Designer Company:	Forterra
Designer Email:	brandon.oleary@forterrabp.com
Designer Phone:	905-630-0359
EOR Name:	Melanie Hehn
EOR Company:	SCS Consulting Group Ltd.
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	54
EFO6	61
EFO8	65
EFO10	67
EFO12	69

Recommended Stormceptor EFO Model: EFO6

Estimated Net Annual Sediment (TSS) Load Reduction (%): 61

Water Quality Runoff Volume Capture (%): > 90

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THIRD-PARTY TESTING AND VERIFICATION

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

PERFORMANCE

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

PARTICLE SIZE DISTRIBUTION (PSD)

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

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

Stormceptor® EF Sizing Report

Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
1	20.9	20.9	1.27	76.0	29.0	70	14.7	14.7
2	17.0	37.9	2.53	152.0	58.0	69	11.7	26.4
3	13.3	51.2	3.80	228.0	87.0	64	8.5	34.9
4	9.0	60.2	5.06	304.0	116.0	62	5.5	40.5
5	7.2	67.4	6.33	380.0	144.0	59	4.2	44.7
6	6.0	73.5	7.60	456.0	173.0	57	3.4	48.1
7	3.5	76.9	8.86	532.0	202.0	54	1.9	50.0
8	3.2	80.1	10.13	608.0	231.0	53	1.7	51.7
9	3.5	83.7	11.39	684.0	260.0	52	1.9	53.6
10	3.0	86.7	12.66	760.0	289.0	52	1.5	55.1
11	1.9	88.6	13.93	836.0	318.0	51	1.0	56.1
12	1.6	90.2	15.19	912.0	347.0	50	0.8	56.9
13	1.2	91.4	16.46	987.0	375.0	49	0.6	57.5
14	1.0	92.4	17.72	1063.0	404.0	48	0.5	57.9
15	1.5	93.9	18.99	1139.0	433.0	47	0.7	58.7
16	0.7	94.6	20.26	1215.0	462.0	46	0.3	59.0
17	0.5	95.1	21.52	1291.0	491.0	45	0.2	59.2
18	0.4	95.5	22.79	1367.0	520.0	44	0.2	59.4
19	0.6	96.1	24.05	1443.0	549.0	44	0.3	59.6
20	0.4	96.5	25.32	1519.0	578.0	43	0.2	59.8
21	0.9	97.4	26.59	1595.0	607.0	42	0.4	60.2
22	0.2	97.6	27.85	1671.0	635.0	42	0.1	60.3
23	0.5	98.1	29.12	1747.0	664.0	42	0.2	60.5
24	0.7	98.8	30.38	1823.0	693.0	42	0.3	60.8
25	0.0	98.8	31.65	1899.0	722.0	41	0.0	60.8
30	0.8	99.6	37.98	2279.0	866.0	41	0.3	61.1
35	0.4	100.0	44.31	2659.0	1011.0	40	0.1	61.3
40	0.0	100.0	50.64	3038.0	1155.0	38	0.0	61.3
45	0.0	100.0	56.97	3418.0	1300.0	36	0.0	61.3
50	0.0	100.0	63.30	3798.0	1444.0	33	0.0	61.3
						Estimated Net Annual Sediment (TSS) Load Reduction =		**61 %**

Climate Station ID□□□□□□□□ Years of Rainfall Data□□□

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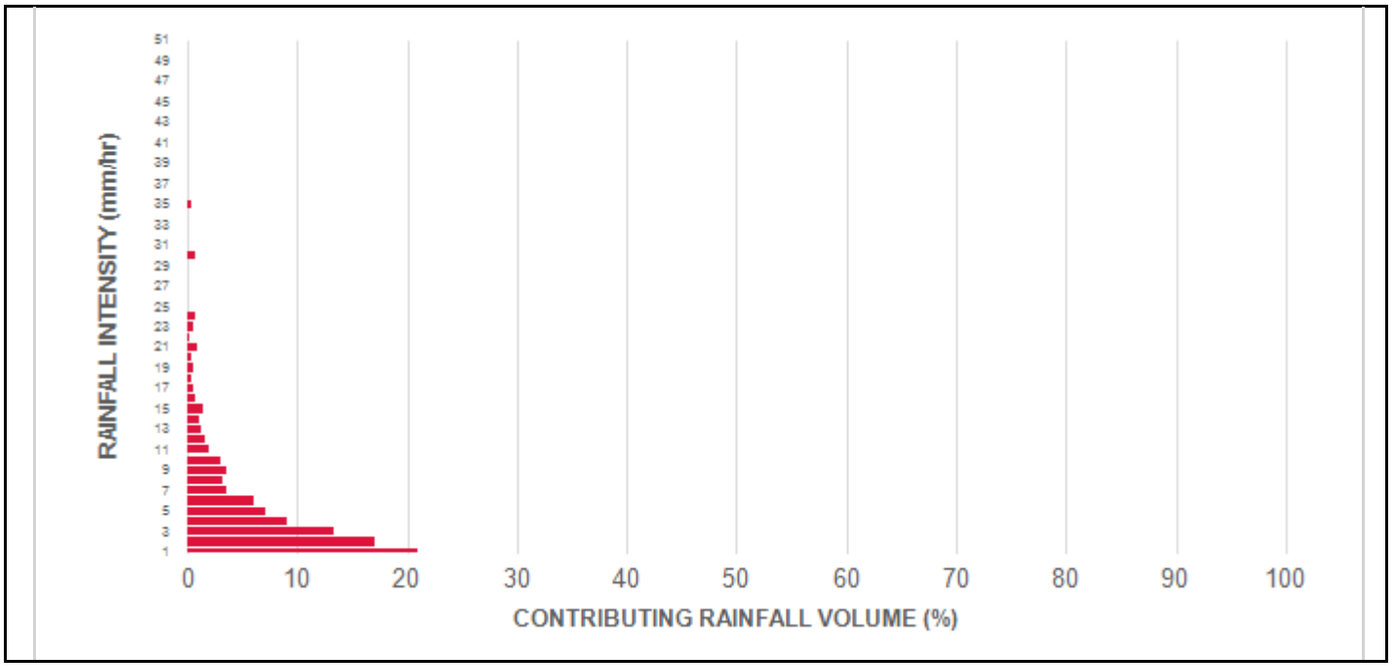
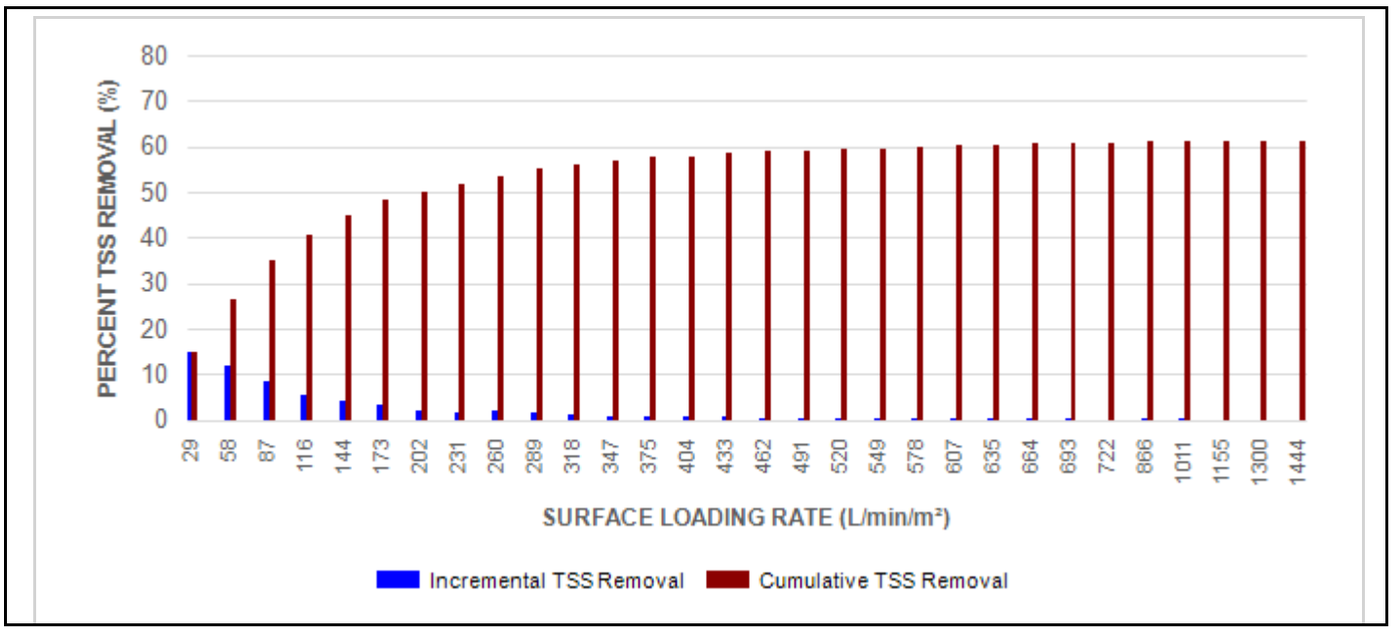
RAINFALL DATA FROM HAMILTON RBG CS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL
FOR THE RECOMMENDED STORMCEPTOR® MODEL



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Maximum Pipe Diameter / Peak Conveyance

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

SCOUR PREVENTION AND ONLINE CONFIGURATION

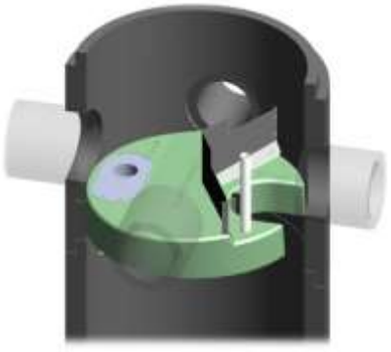
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

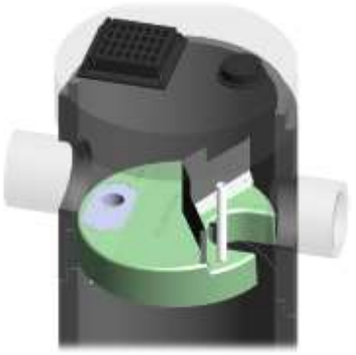
DESIGN FLEXIBILITY

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

OIL CAPTURE AND RETENTION

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





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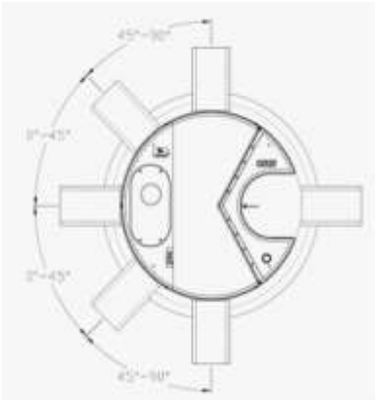

INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

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

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

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

SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL
1	70	660	46	1320	48	1980	35
30	70	690	46	1350	48	2010	34
60	67	720	45	1380	49	2040	34
90	63	750	45	1410	49	2070	33
120	61	780	45	1440	48	2100	33
150	58	810	45	1470	47	2130	32
180	56	840	45	1500	46	2160	32
210	54	870	45	1530	45	2190	31
240	53	900	45	1560	44	2220	31
270	52	930	44	1590	43	2250	30
300	51	960	44	1620	42	2280	30
330	50	990	44	1650	42	2310	30
360	49	1020	44	1680	41	2340	29
390	48	1050	45	1710	40	2370	29
420	48	1080	45	1740	39	2400	29
450	48	1110	45	1770	39	2430	28
480	47	1140	46	1800	38	2460	28
510	47	1170	46	1830	37	2490	28
540	47	1200	47	1860	37	2520	27
570	46	1230	47	1890	36	2550	27
600	46	1260	47	1920	36	2580	27
630	46	1290	48	1950	35		

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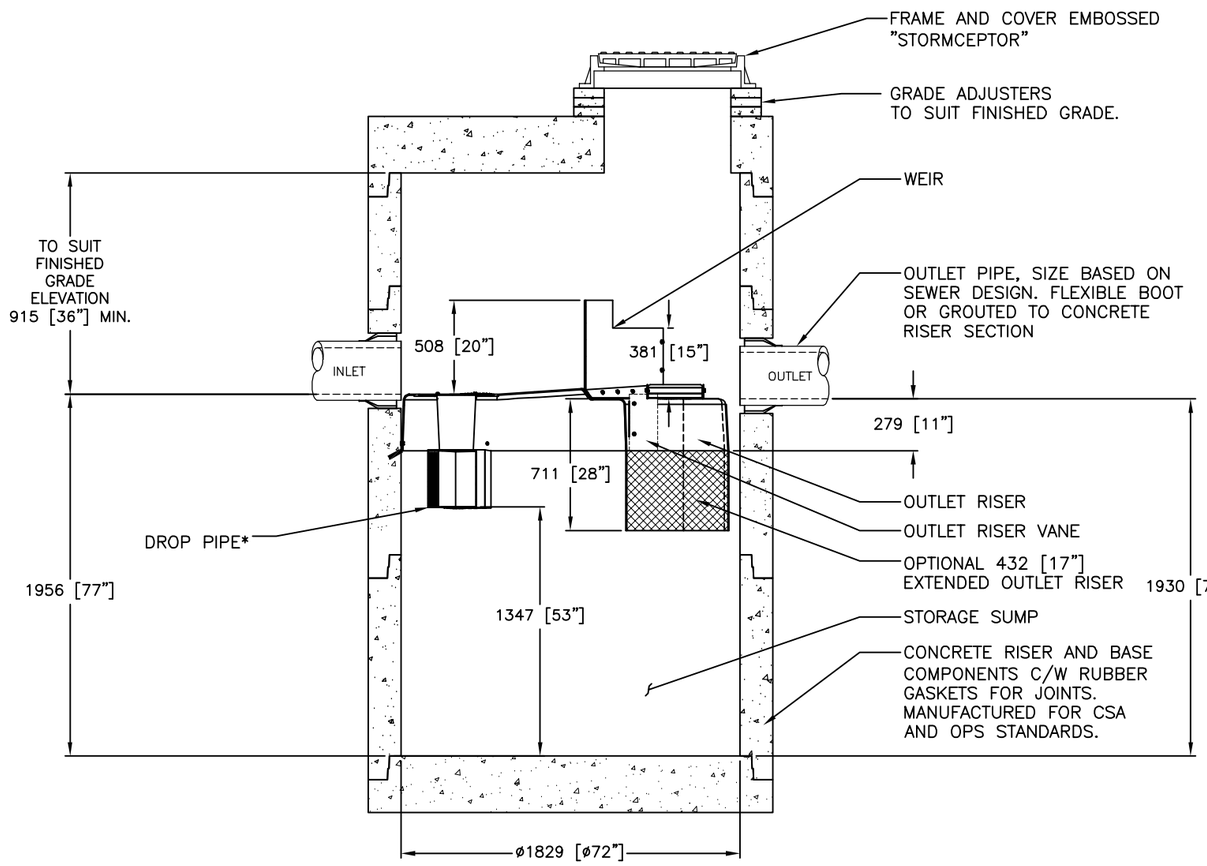
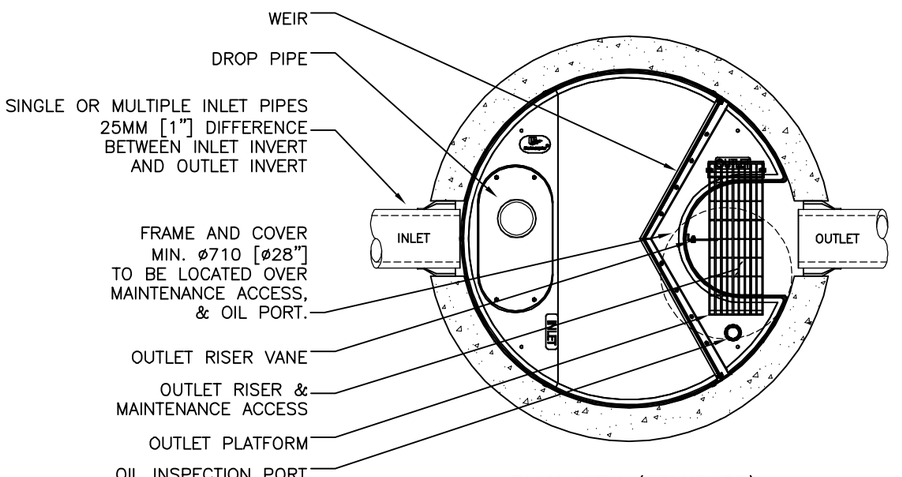
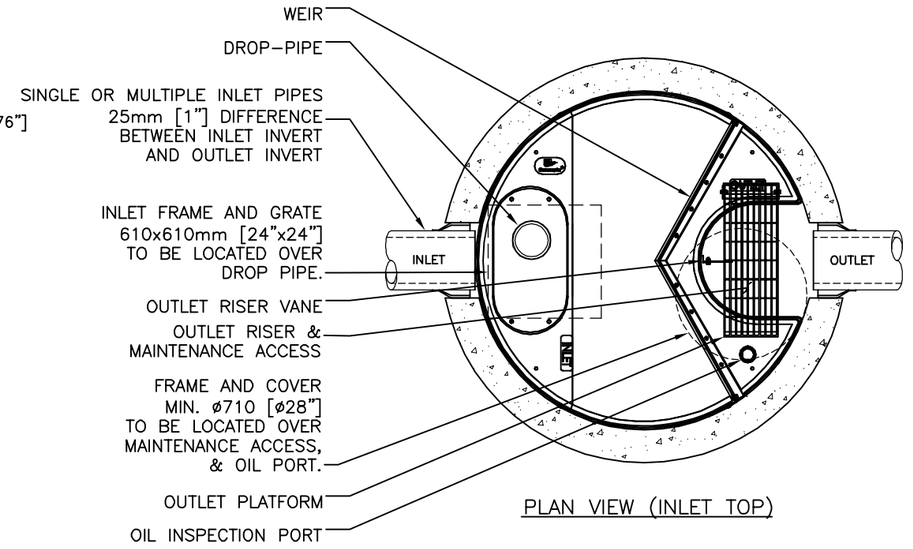
□□□□□ □or an □□S device to be an acce□table □torm□ater treatment device on a □ite □here vehicular tra□□ic occur□and the □otential □or an oil or □uel □□ill e□i□t□□the □□S device mu□t have re□orted veri□ied □er□ormance re□ult□o□greater than □□□ cumulative retention o□□□□□E □la□tic bead□ □or the □ive □□eci□ied □ur□ace loading rate□ □ranging □□□ □□min□m□to □□□□ □□min□m□□in accordance □ith the □ight □i□uid Re□entrainment Simulation □e□ting within the Canadian ETV Program's □r□□□d□r□□□r□□□□r□□r□□□□□□□□□□□□ □□□r□□□□□□r□□r□□□o□ever□an □□S device □hall not be allo□ed i□the □ight □i□uid Re□entrainment Simulation □e□ting □a□ □er□ormed □ith □creening com□onent□ □ithin the □□S device that are e□□ective at retaining the □□□E □la□tic bead□□but □ould not be e□□ected to retain light li□uid□ □uch a□oil and □uel□



SECTION VIEW



PLAN VIEW (STANDARD)



PLAN VIEW (INLET TOP)

MARK	DATE	REVISION DESCRIPTION	BY
		RELEASE	
		ADDENDUM	
		ISSUED FOR	

Stormceptor® EF

SIZE

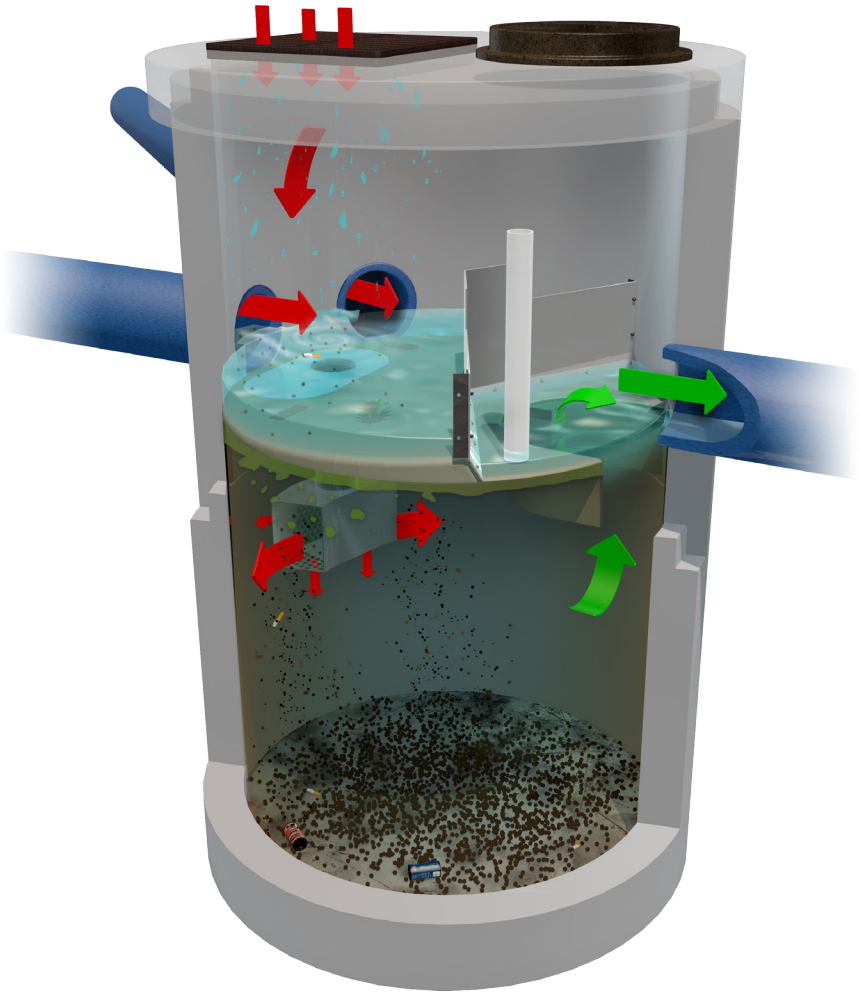
imbrium®
7037 RIDGE ROAD, SUITE 360, HANOVER, MD 21076
USA 1-866-279-8626 CA 800-565-4501 INTL +1-416-960-9900

DESIGNED	SIZE
DRAWN	APPROVED
CHECKED	SHEET

SHEET

Stormceptor® EF

Owner's Manual



imbrium®

STORMCEPTOR® EF IS PATENT-PENDING.

TABLE OF CONTENTS

OVERVIEW

The **Stormceptor® EF** is a continuation and evolution of the most globally recognized oil-grit separator (OGS) stormwater treatment technology - ***Stormceptor®***. Also known as a hydrodynamic separator, the enhanced flow Stormceptor EF is a high performing oil-grit separator that effectively removes a wide variety of pollutants from stormwater and snowmelt runoff at higher flow rates as compared to the original Stormceptor. Stormceptor EF captures and retains sediment (TSS), free oils, gross pollutants and other pollutants that attach to particles, such as nutrients and metals. Stormceptor EF's patent-pending treatment and scour prevention technology and internal bypass ensures sediment is retained during all rainfall events..

Stormceptor EF offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe, multiple inlet pipes, and/or from the surface through an inlet grate. Stormceptor EF can also serve as a junction structure, accommodate a 90-degree inlet to outlet bend angle, and be modified to ensure performance in submerged conditions. With its scour prevention technology and internal bypass, Stormceptor EF can be installed online, eliminating the need for costly additional bypass structures.

OPERATION

- Stormwater enters the Stormceptor upper chamber through the inlet pipe(s) or a surface inlet grate. A specially designed insert reduces the influent velocity by creating a pond upstream of the insert's weir. Sediment particles immediately begin to settle. Swirling flow sweeps water, sediment, and floatables across the sloped surface of the insert to the inlet opening of the drop pipe, where a strong vortex draws water, sediment, oil, and debris down the drop pipe cone.
- Influent exits the cone into the drop pipe duct. The duct has two large rectangular outlet openings as well as perforations in the backside and floor of the duct. Influent is diffused through these various opening in multiple directions and at low velocity into the lower chamber.
- Free oils and floatables rise up and are trapped beneath the insert, while sediment settles to the sump. Pollutants are retained for later removal during maintenance cleaning.
- Treated effluent enters the outlet riser, moves upward, and discharges to the top side of the insert downstream of the weir, where it flows out the outlet pipe.
- During intense storm events with very high influent flow rates, the pond height on the upstream side of the weir may exceed the height of the weir, and the excess flow passes over the top of the weir to the downstream side of the insert, and exits through the outlet pipe. This internal bypass feature allows for online installation, avoiding the cost of additional bypass structures. During bypass, the pond separates sediment from all incoming flows, while full treatment in the lower chamber continues at the maximum flow rate.
- Stormceptor EF's patent-pending enhanced flow and scour prevention technology ensures pollutants are captured and retained, allowing excess flows to bypass during infrequent, high intensity storms.

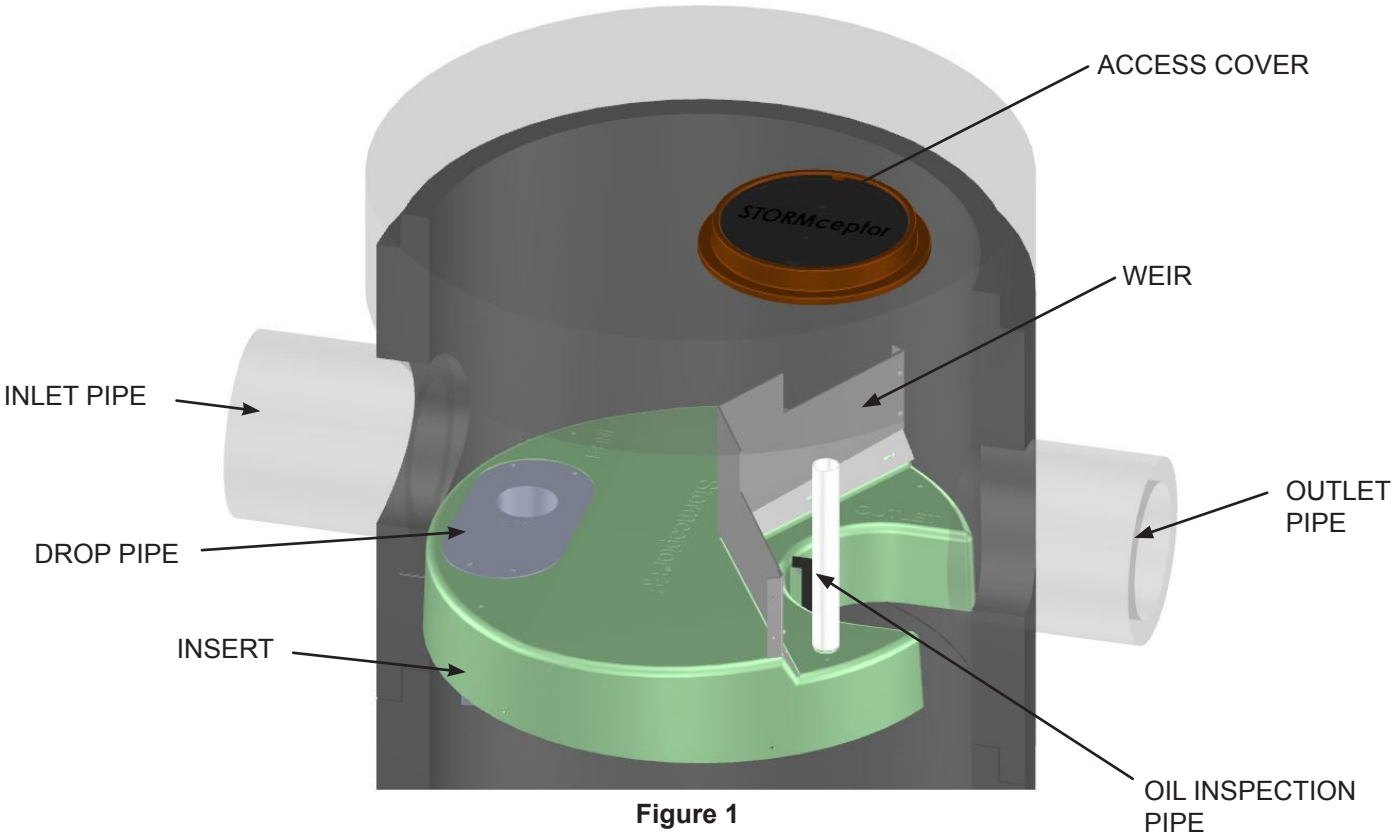


Figure 1

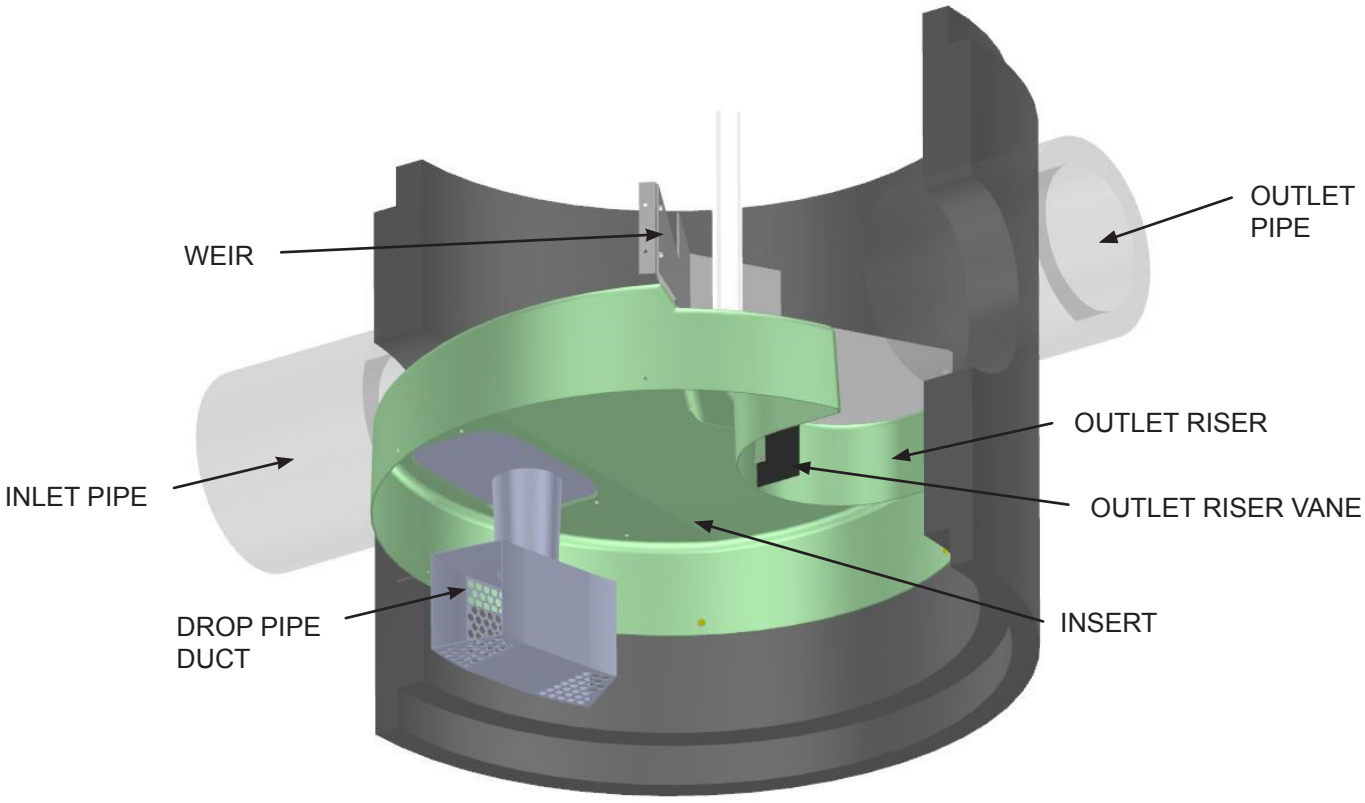


Figure 2

- Insert – separates vessel into upper and lower chambers, and provides double-wall containment of hydrocarbons
- Weir – creates stormwater ponding and driving head on top side of insert
- Drop pipe – conveys stormwater and pollutants into the lower chamber
- Outlet riser – conveys treated stormwater from the lower chamber to the outlet pipe, and provides primary inspection and maintenance access into the lower chamber
- Outlet riser vane – prevents formation of a vortex in the outlet riser during high flow rate conditions
- Oil inspection pipe – primary access for measuring oil depth, and oil removal

IDENTIFICATION

Each Stormceptor EF/EFO unit is easily identifiable by the trade name ***Stormceptor®*** embossed on the access cover at grade as shown in **Figure 3**. The tradename ***Stormceptor®*** is also embossed on the top of the insert upstream of the weir as shown in **Figure 3**.

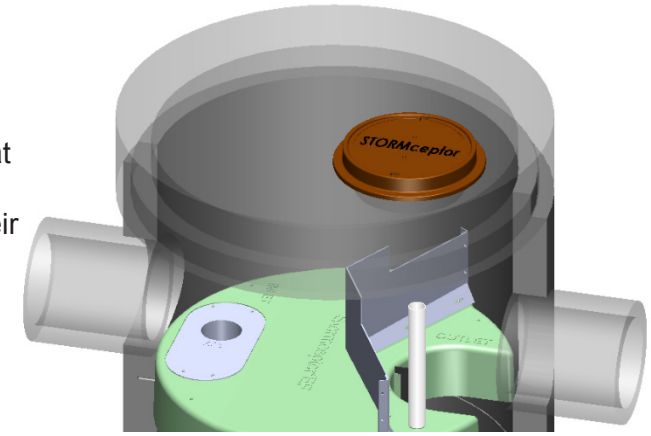


Figure 3

The unit serial number is identified on the top of the insert upstream of the weir as shown in **Figure 4**.

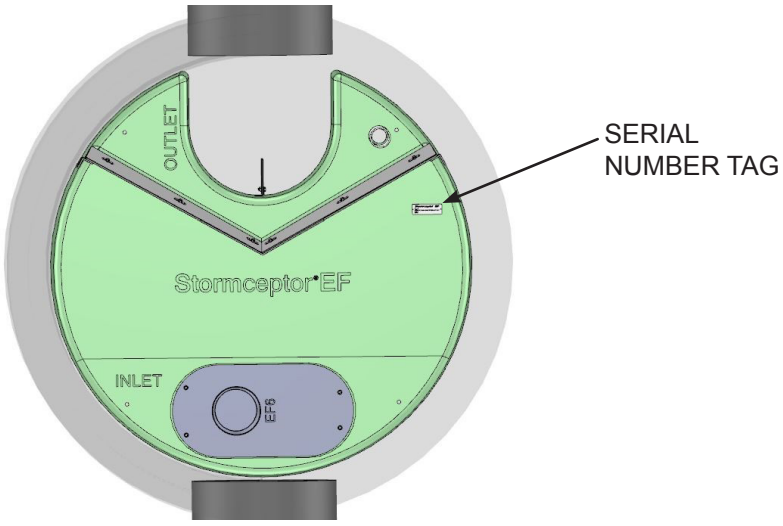


Figure 4

MODEL DETAILS

TABLE 1. METRIC DIMENSIONS AND CAPACITIES								
Stormceptor Model	Inside Diameter	Minimum Surface to Outlet Invert Depth	Depth Below Outlet Pipe Invert	Wet Volume	Sediment Capacity[1]	Hydrocarbon Storage Capacity[2]	Maximum Flow Rate into Lower Chamber[3]	Peak Conveyance Flow Rate[4]
	(m)	(mm)	(mm)	(L)	(m^3)	(L)	(L/s)	(L/s)
EF4 / EFO4	1.22	915	1524	1780	1.19	265	22.1 / 10.4	425
EF6 / EFO6	1.83	915	1930	5070	3.47	610	49.6 / 23.4	990
EF8 / EFO8	2.44	1219	2591	12090	8.78	1070	88.3 / 41.6	1700
EF10 / EFO10	3.05	1219	3251	23700	17.79	1670	138 / 65	2830
EF12 / EFO12	3.66	1524	3886	40800	31.22	2475	198.7 / 93.7	2830

TABLE 2. U.S. DIMENSIONS AND CAPACITIES								
Stormceptor Model	Inside Diameter	Minimum Surface to Outlet Invert Depth	Depth Below Outlet Pipe Invert	Wet Volume	Sediment Capacity[1]	Hydrocarbon Storage Capacity[2]	Maximum Flow Rate into Lower Chamber[3]	Peak Conveyance Flow Rate[4]
	(ft)	(in)	(in)	(gal)	(ft^3)	(gal)	(cfs)	(cfs)
EF4 / EFO4	4	36	60	471	42	70	0.78 / 0.37	15
EF6 / EFO6	6	36	76	1339	123	160	1.75 / 0.83	35
EF8 / EFO8	8	48	102	3194	310	280	3.12 / 1.47	60
EF10 / EFO10	10	48	128	6261	628	440	4.87 / 2.30	100
EF12 / EFO12	12	60	153	10779	1103	655	7.02 / 3.31	100

1. Sediment Capacity is measured from the floor to the bottom of the drop pipe cone. Sediment Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.
2. Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert. Hydrocarbon Storage Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.
3. EF Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 1135 L/min/m^2 (27.9 gpm/ft^2). EFO Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 535 L/min/m^2 (13.1 gpm/ft^2).
4. Peak Conveyance Flow Rate is limited by a maximum velocity of 1. m/s (5 fps).

INSPECTION AND MAINTENANCE

It is important to perform regular inspection and maintenance. Regular inspection and maintenance ensures maximum operation efficiency, keeps maintenance costs low, and provides continued protection of natural waterways.

Quick Reference

- Typical inspection and maintenance is performed from grade
- Remove manhole cover(s) or inlet grate to access insert and lower chamber
  NOTE: If an inlet grate is present, EF4/EFO4 requires the removal of a flow deflector beneath inlet grate
- Use Sludge Judge® or similar sediment probe to check sediment depth through the outlet riser
- Oil dipstick can be inserted through the oil inspection pipe
- Visually inspect the insert for debris, remove debris if present
- Visually inspect the drop pipe opening for blockage, remove blockage if present
- Visually inspect insert and weir for damage, schedule repair if needed
- Insert vacuum hose and jetting wand through the outlet riser and extract sediment and floatables
- Replace flow deflector (EF4/EFO4), inlet grate, and cover(s)

When is inspection needed?

- Post-construction inspection is required prior to putting the Stormceptor into service.
- Routine inspections are recommended during the first year of operation to accurately assess pollutant accumulation.
- Inspection frequency in subsequent years is based on the maintenance plan developed in the first year.
- Inspections should also be performed immediately after oil, fuel, or other chemical spills.

What equipment is typically required for inspection?

- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

When is maintenance cleaning needed?

- If the post-construction inspection indicates presence of construction sediment of a depth greater than a few inches, maintenance is recommended at that time. For optimum performance and normal operation the unit should be cleaned out once the sediment depth reaches the recommended maintenance sediment depth, see **Table 3**.
- Maintain immediately after an oil, fuel, or other chemical spill.

TABLE 3
RECOMMENDED SEDIMENT DEPTHS FOR MAINTENANCE SERVICE*

MODEL	Sediment Depth	
	in	mm
EF4 / EFO4	8	203
EF6 / EFO6	12	305
EF8 / EFO8	24	610
EF10 / EFO10	24	610
EF12 / EFO12	24	610

* Based on a minimum distance of 40 inches (1,016 mm) from bottom of outlet riser to top of sediment bed

The frequency of inspection and maintenance may need to be adjusted based on site conditions to ensure the unit is operating and performing as intended. Maintenance costs will vary based on the size of the unit, site conditions, local requirements, disposal costs, and transportation distance.

What equipment is typically required for maintenance?

- Vacuum truck equipped with water hose and jet nozzle
- Small pump and tubing for oil removal
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Gas analyzer, respiratory gear, and safety harness for specially trained personnel if confined space entry is required (adhere to all OSHA / CCOSH standards)

What conditions can compromise Stormceptor performance?

- Presence of construction sediment and debris in the unit prior to activation
- Excessive sediment depth beyond the recommended maintenance depth
- Oil spill in excess of the oil storage capacity
- Clogging or restriction of the drop pipe inlet opening with debris
- Downstream blockage that results in a backwater condition

MAINTENANCE PROCEDURES

- Maintenance should be conducted during dry weather conditions when no flow is entering the unit.
- Stormceptor is maintained from grade through a standard surface manhole access cover or inlet grate.
- In the case of submerged or tailwater conditions, extra measures are likely required, such as plugging the inlet and outlet pipes prior to conducting maintenance.
- Inspection and maintenance of upstream catch basins and other stormwater conveyance structures is also recommended to extend the time between future maintenance cycles.
- Sediment depth inspections are performed through the **Outlet Riser** and oil presence can be determined through the **Oil Inspection Pipe** (**see Figures 6 and 7**).
- Oil presence and sediment depth are determined by inserting a Sludge Judge® or measuring stick to quantify the pollutant depths.
- Visually inspect the insert, weir, and drop pipe inlet opening to ensure there is no damage or blockage.

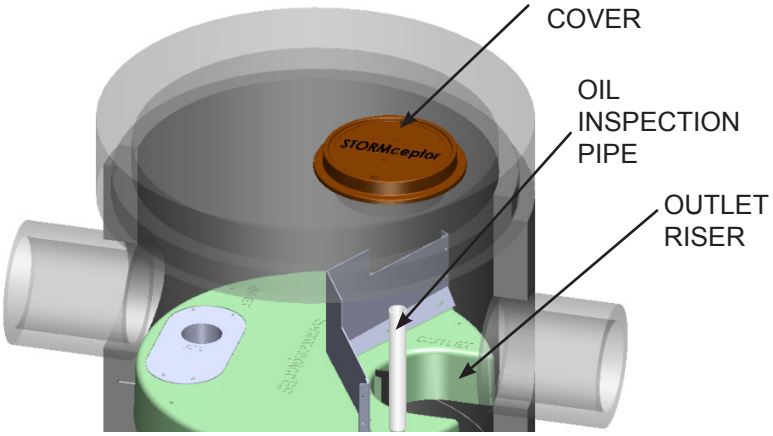


Figure 5

Figure 6

- When maintenance is required, a standard vacuum truck is used to remove the pollutants from the lower chamber of the unit through the **Outlet Riser** (**see Figure 7**).

Figure 7

- The Outlet Riser Vane is durable and flexible and designed to allow maintenance activities with minimal, if any, interference (**see Figure 8**).

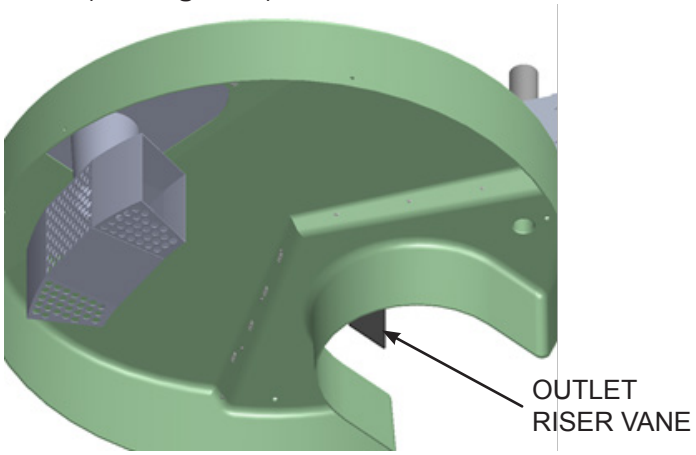


Figure 8

REMOVABLE FLOW DEFLECTOR

- Grated inlets for the Stormceptor EF4/EFO4 model requires a removable flow deflector staged underneath a 24-inch x 24-inch (600 mm x 600 mm) square inlet grate to direct flow towards the inlet side of the insert, and avoid flow and pollutants from entering the outlet side of the insert from grade **(See Figure 9).** The EF6/EFO6 and larger models do not require the flow deflector.

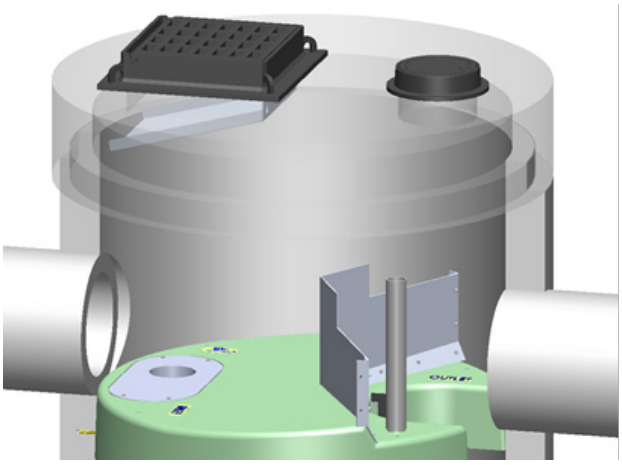
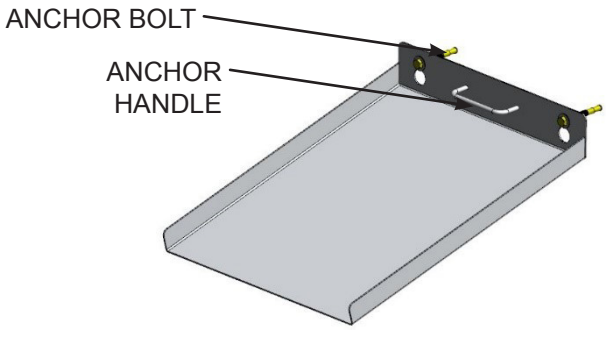


Figure 9



Removable Flow Detector

HYDROCARBON SPILLS

Stormceptor is often installed on high pollutant load hotspot sites with vehicular traffic where hydrocarbon spill potential exists. Should a spill occur, or presence of oil be identified within a Stormceptor EF/EFO, the unit should be cleaned immediately by a licensed liquid waste hauler.

Disposal

Maintenance providers are to follow all federal, state/ provincial, and local requirements for disposal of material.

Oil Sheens

When oil is present in stormwater runoff, a sheen may be noticeable at the Stormceptor outlet. An oil rainbow or sheen can be noticeable at very low oil concentrations (< 10 mg/L). Despite the appearance of a sheen, Stormceptor EF/EFO may still be functioning as intended.

Oil Level Alarm

To mitigate spill liability with 24/7 detection, an electronic Oil Level Alarm monitoring system can be employed to trigger a visual and audible alarm when a pre-set level of oil is captured within the lower chamber or when an oil spill occurs. The oil level alarm is available as an optional feature to include with Stormceptor EF/EFO as shown in **Figure 10**.

For additional details about the Oil Level Alarm, please visit www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-systems.

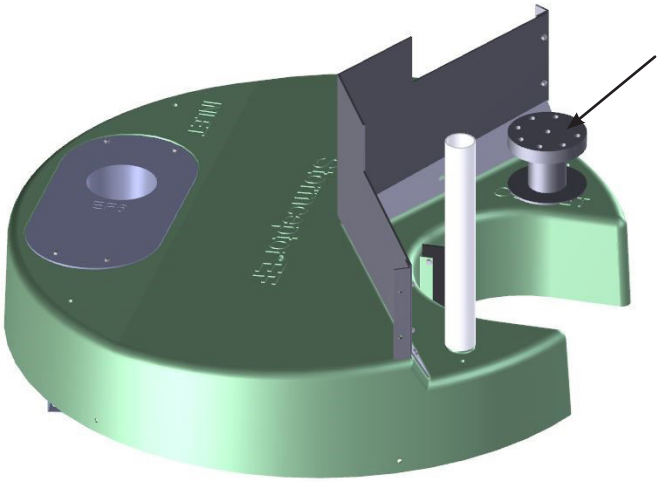


Figure 10

Optional Oil Alarm

REPLACEMENT PARTS

Stormceptor has no moving parts. Therefore, inspection and maintenance activities are generally focused on pollutant removal. Since there are no moving parts during operation in a Stormceptor, broken, damaged, or worn parts are not typically encountered. However, if replacement parts are necessary, they may be purchased by contacting your local Stormceptor representative.

STORMCEPTOR INSPECTION AND MAINTENANCE LOG

Stormceptor Model No: _____

Serial Number: _____

Installation Date: _____

Location Description of Unit: _____

Recommended Sediment Maintenance Depth: _____

DATE	SEDIMENT DEPTH	OIL DEPTH (inches or mm)	SERVICE REQUIRED (Y/N)	MAINTENANCE PERFORMED	MAINTENANCE PROVIDER	COMMENTS

Other Comments: _____

CONTACT INFORMATION

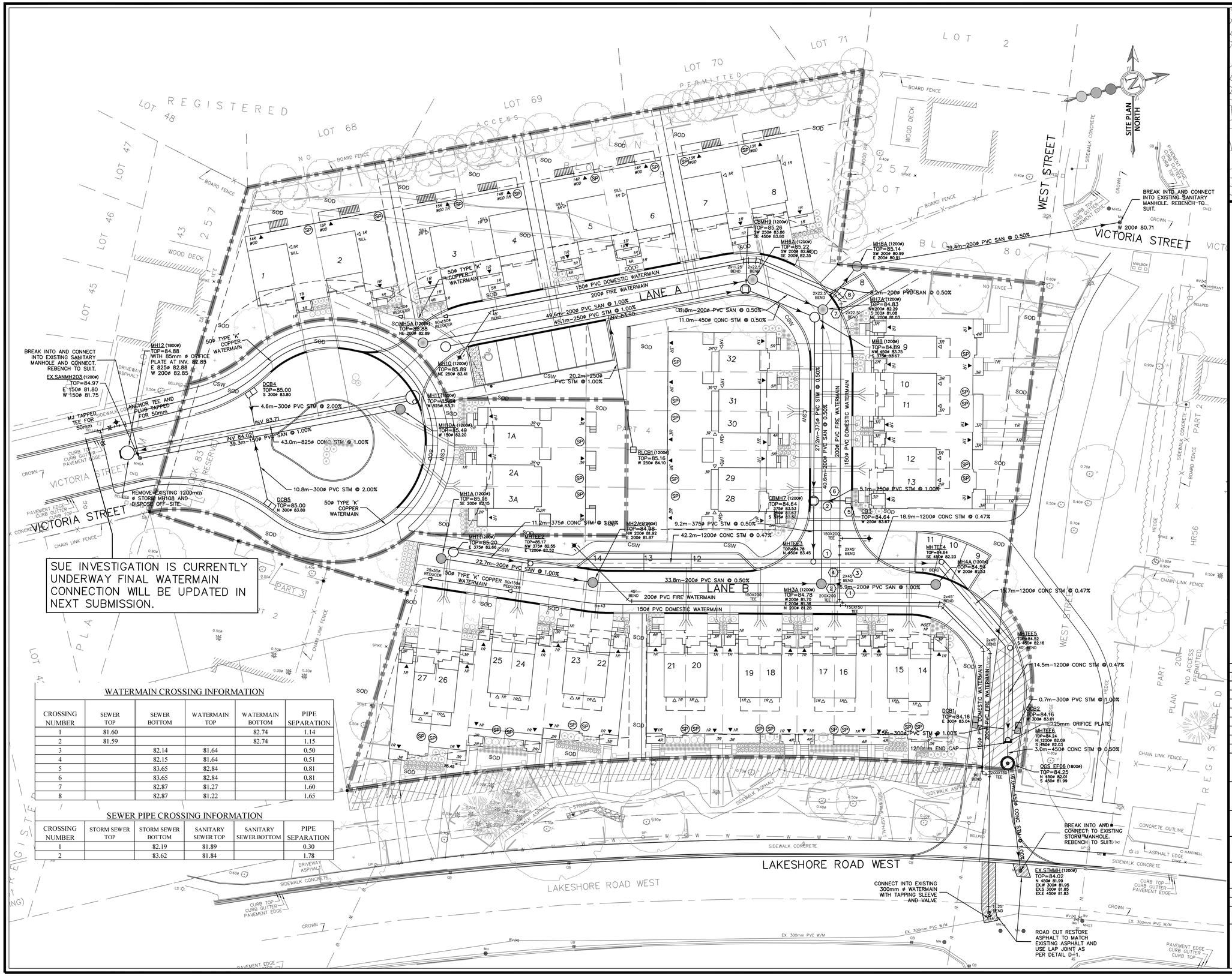
Questions regarding Stormceptor EF/EFO can be addressed by contacting your local Stormceptor representative.

Imbrium Systems Inc.
1-416-960-9900 / 1-800-565-4801 / 888-279-8826

www.imbriumsystems.com
www.stormceptor.com
info@imbriumsystems.com

APPENDIX E

DRAWINGS

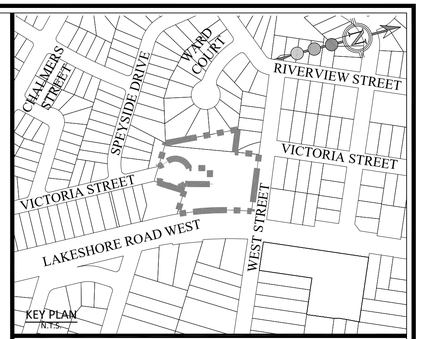


WATERMAIN CROSSING INFORMATION

CROSSING NUMBER	SEWER TOP	SEWER BOTTOM	WATERMAIN TOP	WATERMAIN BOTTOM	PIPE SEPARATION
1	81.60			82.74	1.14
2	81.59			82.74	1.15
3		82.14	81.64		0.50
4		82.15	81.64		0.51
5		83.65	82.84		0.81
6		83.65	82.84		0.81
7		82.87	81.27		1.60
8		82.87	81.22		1.65

SEWER PIPE CROSSING INFORMATION

CROSSING NUMBER	STORM SEWER TOP	STORM SEWER BOTTOM	SANITARY SEWER TOP	SANITARY SEWER BOTTOM	PIPE SEPARATION
1		82.19	81.89		0.30
2		83.62	81.84		1.78



BENCHMARK: ELEV. 85.407

ELEVATIONS ARE GEODETIC AND ARE REFERRED TO TOWN OF OAKVILLE VERTICAL BENCH MARK NUMBER 188 HAVING AN ORTHOMETRIC ELEVATION OF 85.407 METERS. ELEVATIONS ARE REFERENCED TO THE CANADIAN GEODETIC VERTICAL DATUM OF 1925, PRE-1978 ADJUSTMENT (CGVD-1928:PRE-1978 ADJ.).

LEGEND:

- LIMIT OF PROPERTY
- LIMIT OF MUNICIPAL PROPERTY
- PROPOSED SANITARY SEWER AND MANHOLE
- PROPOSED STORM SEWER AND MANHOLE
- PROPOSED SUPERPIPE
- PROPOSED OIL GRIT SEPARATOR
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN / DOUBLE CATCHBASIN
- PROPOSED DOUBLE CATCHBASIN WITH BORDEN TYPE GALVANIZED GRATING (R/W-22-4) OR APPROVED EQUIVALENT
- PROPOSED UNITS WITH SUMP PUMP TO STORM LATERAL REFER TO DETAIL ON DRAWING D-1.
- PROPOSED WATERMAIN
- PROPOSED HYDRANT
- PROPOSED VALVE AND BOX
- PROPOSED DUAL SERVICE CONNECTION
- PROPOSED SINGLE SERVICE CONNECTION
- PROPOSED WATER SERVICE
- DENOTES WATERMAIN CROSSING
- DENOTES SEWER PIPE CROSSING
- PROPOSED TREE PROTECTION FENCE AS PER DETAILS ON LANDSCAPE PLANS
- PROPOSED 1.8m HIGH WOOD FENCE AS PER DETAILS ON LANDSCAPE PLANS
- EXISTING MANHOLE
- EXISTING CATCHBASIN
- EXISTING WATERMAIN VALVE AND BOX
- EXISTING TREE
- EXISTING UTILITY POLE
- EXISTING LIGHT STANDARD
- EXISTING BELL PEDISTAL
- EXISTING OVERHEAD WIRE
- EXISTING FENCE

TOPOGRAPHIC SURVEY PROVIDED BY RPE SURVEYING LTD, MAY 2017

REVISIONS

No.	DESCRIPTION	DATE	BY	APPROVED
1.	ISSUED FOR SITE PLAN APPLICATON	JAN 20/22	P.G.	

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

OAKVILLE
1225 TRAFALGAR ROAD
OAKVILLE, ONTARIO L6H 0H3
TEL: (905) 845-6601

THE VOGUE DEVELOPMENT GROUP INC.

3171 LAKESHORE ROAD WEST, OAKVILLE

SERVICING PLAN

LICENSED PROFESSIONAL ENGINEER — K. CHEN 100136982 — 2022-01-20 — PROVINCE OF ONTARIO

DATE:	JANUARY 2022	DESIGNED BY:	K.L.	CHECKED BY:	P.G
SCALE:	1:250	DRAWN BY:	K.L	CHECKED BY:	P.G

10 5 0 10 20 30 40 50 60 70 80

PROJECT No: 1930

DRAWING No: S-1

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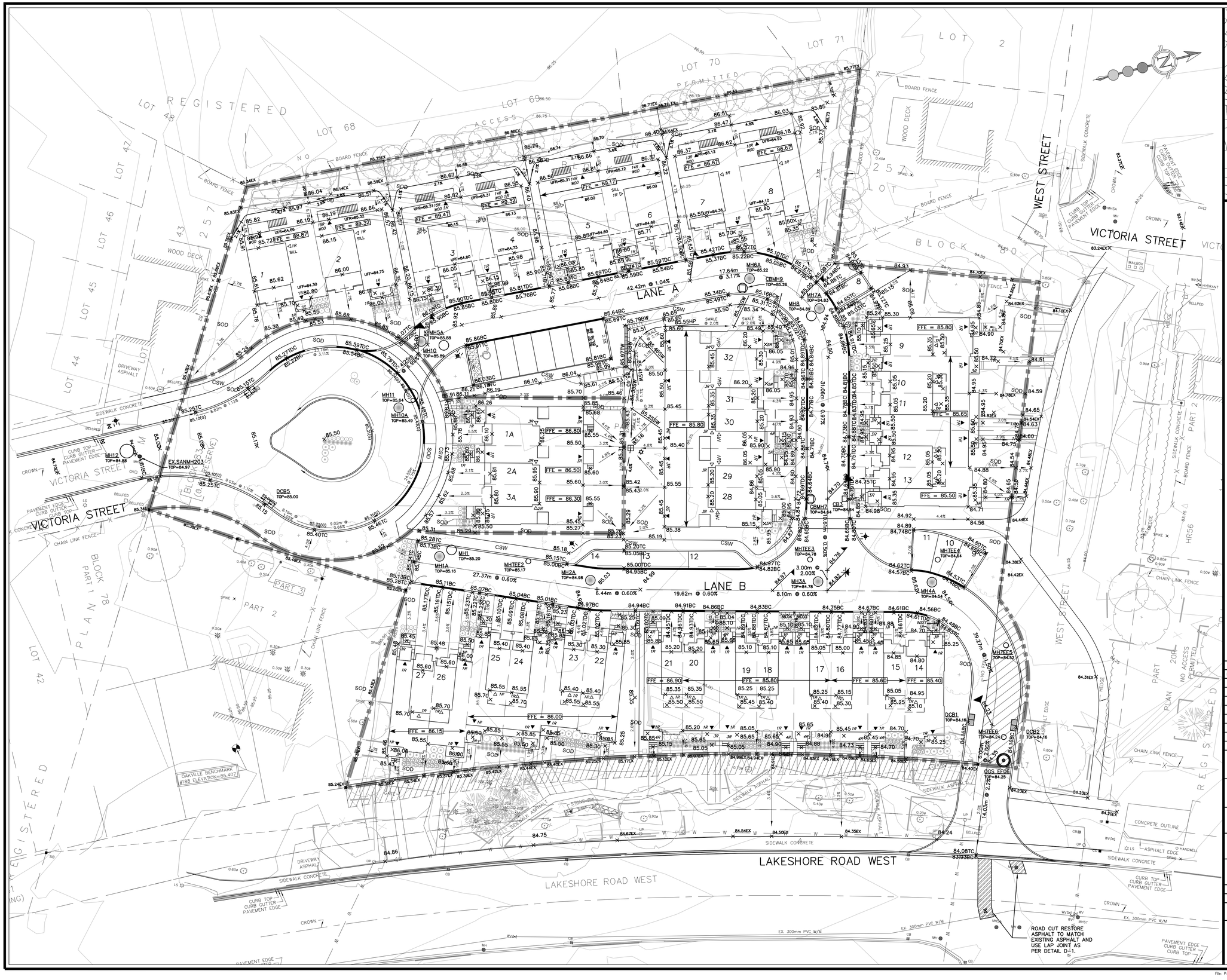
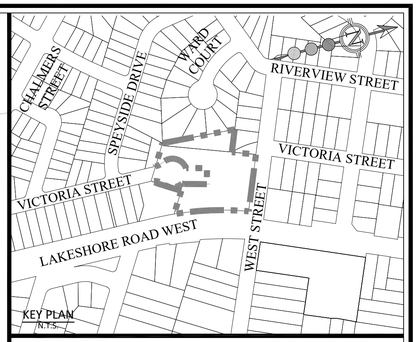




BENCHMARK: ELEV. 85.407

ELEVATIONS ARE GEODETIC AND ARE REFERRED TO TOWN OF OAKVILLE VERTICAL BENCH MARK NUMBER 188 HAVING AN ORTHOMETRIC ELEVATION OF 85.407 METERS. ELEVATIONS ARE REFERENCED TO THE CANADIAN GEODETIC VERTICAL DATUM OF 1925, PRE-1978 ADJUSTMENT (CGVD-1928:PRE-1978 ADJ.).

LEGEND:

- LIMIT OF PROPERTY
- SANITARY MANHOLE
- STORM MANHOLE
- OIL GRIT SEPARATOR
- CATCHBASIN MANHOLE
- CATCHBASIN
- HYDRANT
- VALVE AND BOX
- 270.25 — EXISTING CONTOUR AND ELEVATION
- ×123.23EX — EXISTING ELEVATION
- ×123.23 — PROPOSED ELEVATION
- 123.23 — PROPOSED CENTRELINE ELEVATION
- ×123.23TC — PROPOSED TOP OF CURB ELEVATION
- ×123.23BC — PROPOSED BOTTOM OF CURB ELEVATION
- PROPOSED EMERGENCY OVERLAND FLOW DIRECTION
- PROPOSED TREE PROTECTION FENCE AS PER DETAILS ON LANDSCAPE PLANS
- PROPOSED TREE PROTECTION FENCE AS PER DETAILS ON LANDSCAPE PLANS
- MH — EXISTING MANHOLE
- EXISTING CATCHBASIN
- WV — EXISTING WATERMAIN VALVE AND BOX
- 0.30ø 0.90ø — EXISTING TREE
- EXISTING UTILITY POLE
- LS — EXISTING LIGHT STANDARD
- BELLPED — EXISTING BELL PEDISTAL
- W — EXISTING OVERHEAD WIRE
- EXISTING FENCE

TOPOGRAPHIC SURVEY PROVIDED BY RPE SURVEYING LTD, MAY 2017

REVISIONS

No.	DESCRIPTION	DATE	BY	APPROVED
1.	ISSUED FOR SITE PLAN APPLICATON	JAN 20/22	P.G.	

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

OAKVILLE
1225 TRAFALGAR ROAD
OAKVILLE, ONTARIO L6H 0H3
TEL: (905) 845-6601

VOGUE WYCLIFFE (OAKVILLE) LIMITED

3171 LAKESHORE ROAD WEST, OAKVILLE

GRADING PLAN

LICENSED PROFESSIONAL ENGINEER — K. CHEN 100136982 — 2022-01-20 — PROVINCE OF ONTARIO

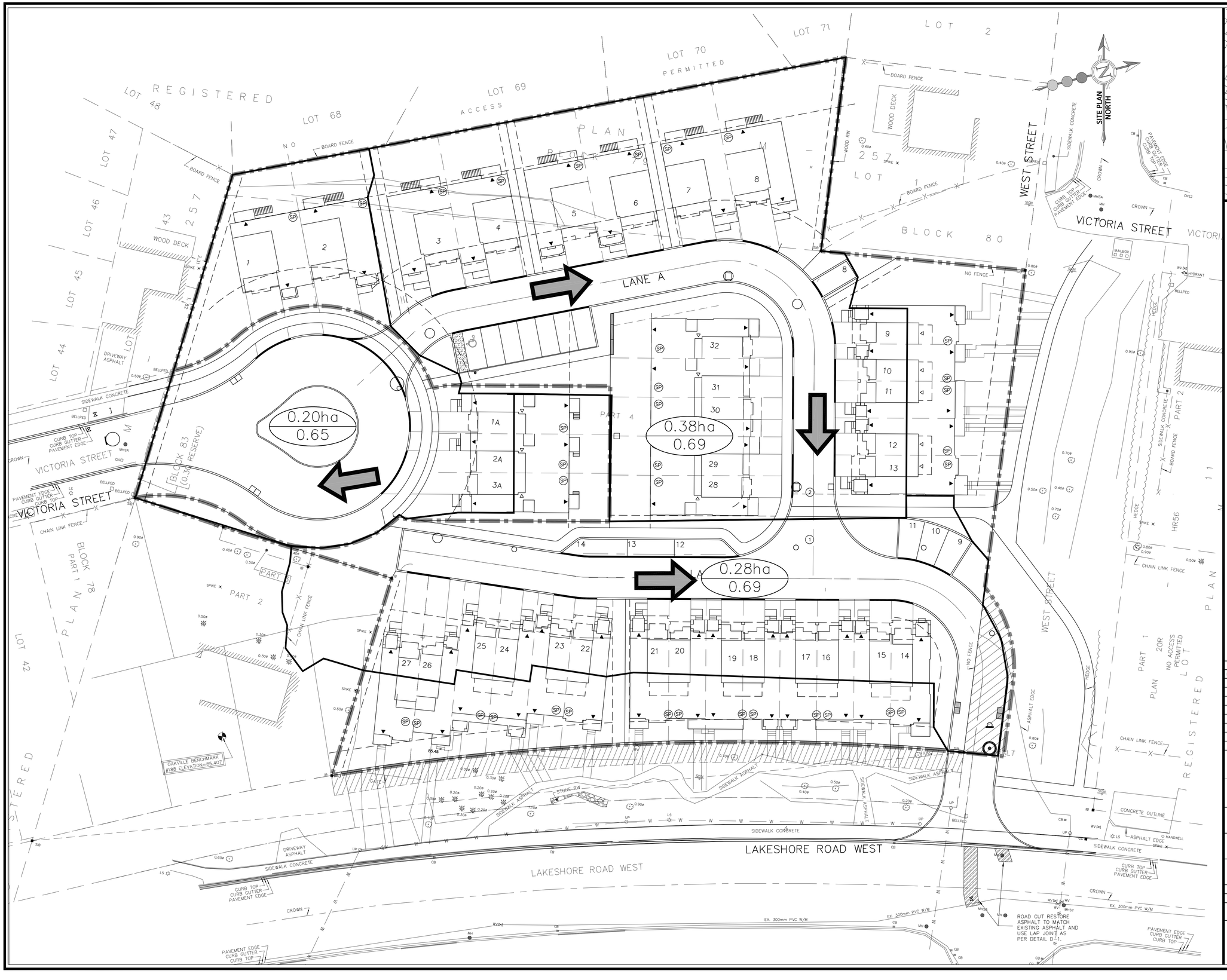
DATE: JANUARY 2022	DESIGNED BY: K.L.	CHECKED BY:	P.G.
SCALE: 1:250	DRAWN BY: K.L.	CHECKED BY:	P.G.

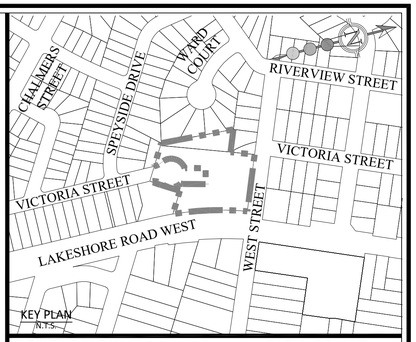
5 0 10 20 30 40

Accepted to be in accordance with the City of Markham Standards. This acceptance is not to be construed as verification of engineering content.
Review Staff: _____
Signature: _____ Date
XXX, P. Eng.
Manager, Development Engineering

PROJECT No: 1930

DRAWING No: GR-1





BENCHMARK: ELEV. 85.407

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LEGEND:

- LIMIT OF PROPERTY
- LIMIT OF MUNICIPAL PROPERTY
- MAJOR SYSTEM OVERLAND FLOW
- PROPOSED STORM DRAINAGE BOUNDARY
- 0.50 / 0.70 — DRAINAGE AREA (HECTARES) / RUNOFF COEFFICIENT
- 270.25 — EXISTING CONTOURS
- EXISTING STORM SEWER AND MANHOLE
- PROPOSED STORM SEWER AND MANHOLE
- PROPOSED SUPERPIPE
- PROPOSED OIL-GRIT SEPARATOR MANHOLE
- (SP) PROPOSED SUMP PUMP

TOPOGRAPHIC SURVEY PROVIDED BY RPE SURVEYING LTD, MAY 2017

REVISIONS

No.	DESCRIPTION	DATE	BY	APPROVED
1.	ISSUED FOR SITE PLAN APPLICATION	JAN 20/22	P.G.	

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
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OAKVILLE
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VOGUE WYCLIFFE (OAKVILLE) LIMITED

3171 LAKESHORE ROAD WEST, OAKVILLE

STORM DRAINAGE PLAN

LICENSED PROFESSIONAL ENGINEER
K. CHEN
100136982
2022-01-20
PROVINCE OF ONTARIO

DATE: JANUARY 2022	DESIGNED BY: K.L.	CHECKED BY:	P.G.
SCALE: 1:500	DRAWN BY: K.L.	CHECKED BY:	P.G.

10 5 0 10 20 30 40 50 60 70 80

APPROVED AS TO FORM IN RELIANCE UPON THE PROFESSIONAL SKILL AND ABILITY OF SCS CONSULTING GROUP LTD. CONSULTING ENGINEERS AS TO DESIGN AND SPECIFICATION.

PROJECT No: 1930

DRAWING No: DR-1

??????????????, Director Of Engineering Date

GENERAL

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

WATERMAINS

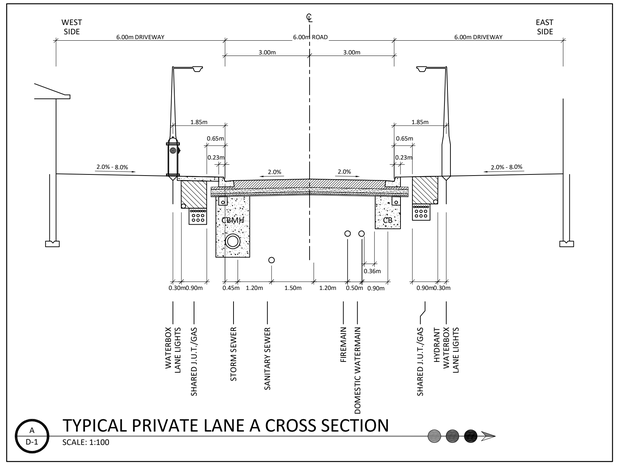
1. PIPE: POLYVINYL CHLORIDE (PVC) CLASS 150 DR-18 PIPE, AWWA C900 AND CSA B137.3, LATEST AMENDMENTS.
   TYPE K COPPER, ASTM B88.
2. EMBEDMENT AND TRENCH DETAIL: OPSD 802.010.
3. BEDDING MATERIAL: MUNICIPAL WATERMAIN BEDDING SHALL CONFORM TO MUNICIPAL STANDARDS. PRIVATE WATERMAIN BEDDING SHALL CONFORM TO GEOTECHNICAL RECOMMENDATION.
4. MINIMUM COVER: 1.80 m FROM PROPOSED FINISHED GRADES.
5. INSULATION: TO BE PROVIDED IF COVER TO OBVERT IS LESS THAN 1.20 METRES. 50mm THICK HIGH LOAD 60. WIDTH AS NOTED ON DRAWING.
6. MINIMUM CURVATURE OF PIPE DEFLECTION (IF REQUIRED) SHALL BE AS PER THE FOLLOWING GUIDELINES: 100mm - R=30.0m; 150mm - R=43.0m; 200mm - R=57.0m; 300mm - R=83.0m; 400mm - R=100.0m.
7. HORIZONTAL SEPARATION: MINIMUM 2.5 METRES FROM SEWERS AND SEWER MANHOLES, MEASURED FROM THE NEAREST EDGES.
8. VERTICAL SEPARATION: MINIMUM 0.5 METRES. IF WATERMAIN MUST CROSS BELOW A SEWER, THE WATERMAIN SHALL BE INSTALLED WITH JOINTS LOCATED A MINIMUM OF 2.5 METRES FROM THE POINT OF CROSSING.
9. MECHANICAL RESTRAINTS: REQUIRED AT ALL CHANGES IN PIPE DIRECTION AND AT REDUCERS. RESTRAIN PIPE 12.2 METRES BACK FROM STUBS AND 6.1 METRES ON EITHER SIDE OF VALVES 100mm OR LARGER. RESTRAIN ALL JOINTS WITHIN ENGINEERED FILL AREAS. RESTRAINT RODS AND INSTALLATION SHALL CONFORM TO NFPA 24 (STANDARD FOR THE INSTALLATION OF PRIVATE FIRE SERVICE MAINS AND THEIR APPURTENANCES).
10. THRUST BLOCKING: REQUIRED FOR ALL TEES, PLUGS AND HORIZONTAL BENDS PER OPSD 1103.010 AND ONTARIO BUILDING CODE S.7.3.4.9.
11. HYDRANTS: SHALL CONFORM TO MUNICIPAL SPECIFICATIONS AND STANDARDS. STORZ NOZZLE TO BE ORIENTED PERPENDICULAR TO THE FIRE ROUTE. HYDRANT FLANGE ELEVATION TO BE 0.15m ABOVE PROPOSED FINISHED GRADE AT THE HYDRANT. HYDRANT TO BE PAINTED PER FIRE DEPARTMENT SPECIFICATIONS.
12. HYDRANT ANCHOR TEES: ATTACH HYDRANT VALVE TO THE ANCHOR TEE, PROVIDED THAT THE MAXIMUM DISTANCE FROM HYDRANT TO VALVE DOES NOT EXCEED 6.1 METRES. ENSURE VALVE BOX DOES NOT CONFLICT WITH CURBS.
13. HYDRANT FLOW TEST: TO BE COMPLETED BY CONTRACTOR PER NFPA AND RESULTS PROVIDED TO THE ENGINEER.
14. PIPE FITTINGS: CAST IRON, CEMENT LINED, MECHANICAL JOINT, SHORT BODY CONFORMING TO ANSI/AWWA C110/A21.10. JOINTS: RUBBER GASKET CONFORMING TO ANSI/AWWA C111/A21.11.
15. VALVE BOXES: 100mm SLIDING TYPE BOX COMPLETE WITH GUIDE PLATE. INSTALL EXTENSION STEM AS REQUIRED TO MAINTAIN A MAXIMUM DISTANCE OF 1.8m FROM TOP OF OPERATING NUT TO FINISHED GRADE.
16. TRACER WIRE: #12 AWG SOLID COPPER SUITABLE FOR DIRECT BURIAL.
17. CATHODIC PROTECTION: OPSD 1109.011 AND OPSS 702. DUCTILE IRON FITTINGS: 5.4 kg ZINC ANODE. HYDRANTS, VALVES AND TEES: 10.8 kg ZINC ANODE. WHERE NEW WATERMAIN IS CONNECTED TO EXISTING CAST IRON OR DUCTILE IRON WATERMAIN, ONE 14.5 kg MAGNESIUM ANODE SHALL BE PLACED ON EACH SIDE OF THE CONNECTION.
18. TERMINATE SERVICES 1.0 METRE FROM THE OUTSIDE FACE OF BUILDING, UNLESS OTHERWISE NOTED ON DRAWING. TERMINATE STUBS WITH A PLUG AND 50 mm BLOW OFF.
19. ISOLATE NEW WATERMAIN FROM EXISTING LINES IN ORDER TO ALLOW INDEPENDENT PRESSURE TESTING AND CHLORINATION.
20. PRESSURE AND BACTERIOLOGICAL TESTING: AS PER MUNICIPAL STANDARD SPECIFICATIONS; ONTARIO BUILDING CODE AND MINISTRY OF THE ENVIRONMENT. TREAT CHLORINATED WATER TO ACCEPTABLE LEVELS PRIOR TO DISCHARGE.
21. SUMP PUMPS: TO BE PROVIDED FOR ALL UNITS (BY BUILDER) AND DISCHARGE TO GRADE OR TO STORM SEWER LATERAL WITH GOOSNECK PER DETAIL ON THIS DRAWING.

STORM AND SANITARY SEWERS

1. PIPE: POLYVINYL CHLORIDE (PVC) SEWER PIPES AND FITTINGS SHALL CONFORM TO CSA-B182.2.
2. PVC SEWERS (375 mm DIAMETER AND SMALLER): SDR-35, CSA B182.2-LATEST AMENDMENT, UNLESS OTHERWISE SPECIFIED.
3. CONCRETE SEWERS (450 mm DIAMETER AND LARGER): CONCRETE (CLASS 65-D), CSA A257.2 OR LATEST AMENDMENT, UNLESS OTHERWISE SPECIFIED.
4. PVC PIPE SEWER BEDDING: OPSD 802.010.
5. CONCRETE PIPE SEWER BEDDING: OPSD 802.030 CLASS 'B' FOR TYPE 1 AND 2 SOILS. OPSD 802.031 FOR TYPE 3 SOILS. SOIL TYPE TO BE CONFIRMED BY THE GEOTECHNICAL CONSULTANT DURING EXCAVATION.
6. TRENCH BACKFILL: PER THE SPECIFICATIONS PROVIDED IN THE GEOTECHNICAL REPORT, OR LATEST AMENDMENT THEREOF.
7. INSULATION: TO BE PROVIDED IF COVER TO OBVERT IS LESS THAN 1.20 METRES. 50mm THICK HIGH LOAD 60. WIDTH AS NOTED ON DRAWING.
8. MANHOLES: OPSD 701.010 TO 701.015 AND CSA A257.4.
9. CLEANOUTS: ZURN Z1474 OR APPROVED EQUIVALENT.
10. SAFETY PLATFORM: OPSD 404.020 TO OPSD 404.022. INSTALL SAFETY PLATFORM WHERE MANHOLE DEPTH EXCEEDS 5.0m.
11. MANHOLE FRAMES AND COVERS: OPSD 401.010 - TYPE 'A'
12. JOINTS-PIPE AND MANHOLE: CSA A257.3.
13. BACKFILL: ALL MANHOLE AND CATCHBASIN EXCAVATIONS SHALL BE BACKFILLED WITH GRANULAR 'B'.
14. MANHOLE BENCHING: OPSD 701.021. CATCHBASIN MANHOLES TO BE BENCHED.
15. CATCHBASINS: SINGLE: OPSD 705.010 AND CSA A257.4; DOUBLE: OPSD 705.030 AND CSA A257.4. DITCH INLET CATCHBASINS: OPSD 705.030.
16. CATCHBASIN FRAMES AND COVERS: OPSD 400.020.
17. CATCHBASIN LEADS AND SERVICE LATERALS ON PRIVATE PROPERTY SHALL BE CONNECTED TO MAINLINE SEWER WITH WYE FITTING.
18. DURING CONSTRUCTION ALL CATCHBASINS SHALL BE EQUIPPED WITH TEMPORARY SEDIMENT CONTROL DEVICE. REFER TO DETAILS ON THIS DRAWING.
19. CONCRETE ADJUSTMENT UNITS FOR MANHOLES AND CATCHBASINS: OPSD 704.010, OPSS 407 AND CSA A257.4. MAXIMUM HEIGHT OF ADJUSTMENT UNITS SHALL BE 300mm.
20. PERFORATED SUB-DRAINS SHALL BE CONNECTED TO ALL CATCHBASINS AND CATCHBASIN MANHOLES AS PER DETAIL ON THIS DRAWING. PERFORATED SUB-DRAINS SHALL BE PLACED UNDER ALL CURB.
21. LASER ALIGNMENT AND ELEVATION CONTROL TO BE UTILIZED FOR SEWER INSTALLATIONS.
22. FLUSH AND INSPECT SEWERS VIA CCTV CAMERA. SUBMIT ONE WRITTEN REPORT AND TWO DIGITAL VIDEOS IN AN MPEG FORMAT TO THE ENGINEER FOR REVIEW.
23. LATERAL SEWER PIPES: SINGLE: 125mm PVC (SDR-28) CSA B181.2; DUAL: 150mm PVC (SDR-28).
24. THE CONTRACTOR SHALL PROVIDE TO THE ENGINEER AN AS-CONSTRUCTED SERVICING DRAWING.

GRADING NOTES

1. PRIOR TO COMMENCEMENT OF EARTHWORKS, SITE ALTERATION PLANS MUST BE APPROVED AND ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED AND OPERATIONAL. THE CONTRACTOR SHALL MAINTAIN ALL WORKS UNTIL CONSTRUCTION IS COMPLETED TO THE SATISFACTION OF THE ENGINEER.
2. ENGINEERED FILL SHALL CONFORM TO THE SPECIFICATIONS PROVIDED IN THE GEOTECHNICAL REPORT, OR LATEST AMENDMENT THEREOF.
3. ENGINEERED FILL SHALL BE INSPECTED AND TESTED BY THE GEOTECHNICAL CONSULTANT. PROOF ROLLING OF SUBGRADE WILL BE REQUIRED PRIOR TO PLACEMENT OF GRANULAR MATERIALS. COORDINATE INSPECTIONS WITH GEOTECHNICAL CONSULTANT.
4. GRANULAR COMPACTION: PER THE SPECIFICATIONS PROVIDED IN THE GEOTECHNICAL REPORT, OR LATEST AMENDMENT THEREOF.
5. PAVEMENT STRUCTURE:
   40 mm HL3 TOP COURSE ASPHALT
   60 mm HL8 BASE COURSE ASPHALT
   150 mm GRANULAR 'A'
   350 mm GRANULAR 'B'
6. ASPHALT COMPACTION: PER THE SPECIFICATIONS PROVIDED IN THE GEOTECHNICAL REPORT, OR LATEST AMENDMENT THEREOF.
7. BARRIER CURB: OPSD 600.110.
   CONCRETE BARRIER CURB AND GUTTER (TWO STAGE CONSTRUCTION) : OPSD 600.070
8. CONCRETE SIDEWALK: 125mm DEEP WITH 125mm GRANULAR 'A' BASE.CONCRETE SIDEWALK ACROSS RESIDENTIAL DRIVEWAY: 175mm DEEP. CONCRETE SIDEWALK ACROSS LANEWAYS, ROADS, COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL DRIVEWAYS: 200mm DEEP.
9. LAP JOINTS SHALL BE USED WHERE PROPOSED ASPHALT MEETS EXISTING ASPHALT AS PER DETAIL ON THIS DRAWING.
10. PAVEMENT MARKINGS SHALL BE PLACED AS SHOWN ON THE ARCHITECTURAL SITE PLAN WITH A MINIMUM OF TWO COATS OF ORGANIC SOLVENT BASED PAINT AS PER OPSS 1712.
11. INSTALL SIGNAGE AS PER THE ARCHITECTURAL SITE PLAN.
12. ALL EXCESS EXCAVATED MATERIAL SHALL BE REMOVED OFFSITE TO THE CONTRACTOR'S APPROVED DISPOSAL SITE.
13. EMBANKMENTS SHALL BE SLOPED AT A MAXIMUM OF 3H:1V, UNLESS OTHERWISE SPECIFIED.
14. DISTURBED AREAS SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER. THE RELOCATION OR REMOVAL OF TREES AND SHRUBS SHALL BE SUBJECT TO APPROVAL BY THE ARBORIST.
15. REFER TO LANDSCAPE DRAWINGS FOR LOCATION AND TYPE OF ALL HARD LANDSCAPE SURFACES.
16. THE CONTRACTOR SHALL PROVIDE TO THE ENGINEER AN AS-CONSTRUCTED GRADING DRAWING.



A D-1 TYPICAL PRIVATE LANE A CROSS SECTION
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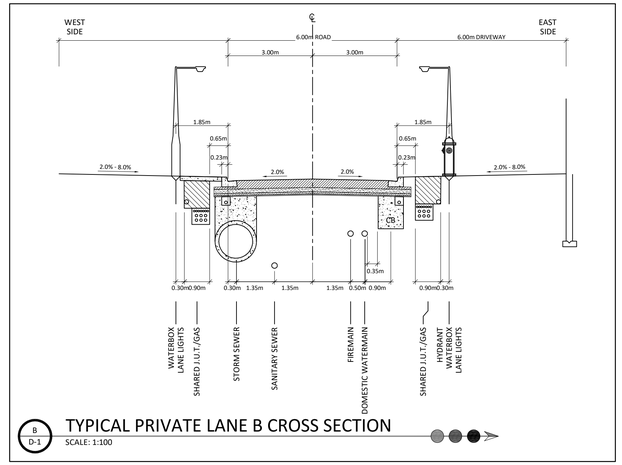

B D-1 TYPICAL PRIVATE LANE B CROSS SECTION
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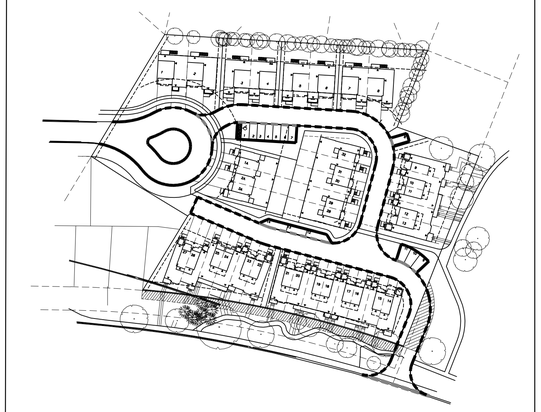

CURB KEYPLAN
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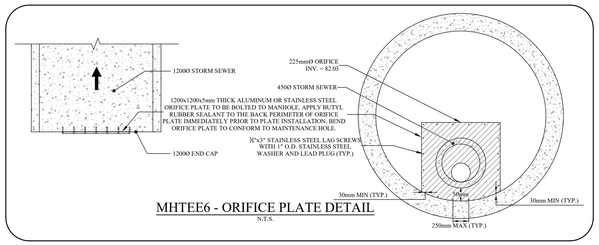

MHTEE6 - ORIFICE PLATE DETAIL
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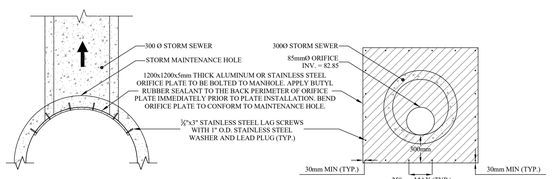

STM MH12 - ORIFICE PLATE DETAIL
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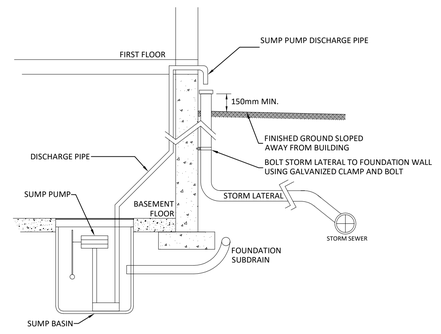

A D-1 SCHEMATIC SUMP PUMP DETAIL - DISCHARGE TO STORM SEWER
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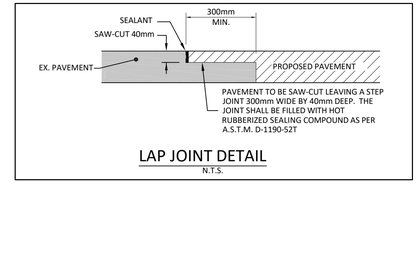

LAP JOINT DETAIL
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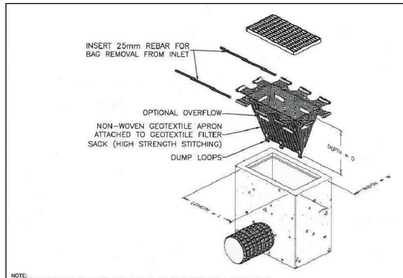

TEMPORARY CATCHBASIN SEDIMENT CONTROL DEVICE

REVISIONS

No.	DESCRIPTION	DATE	BY	APPROVED
1.	ISSUED FOR SITE PLAN APPLICATION	JAN 20/22	P.G.	

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
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TEL: (905) 845-6601

VOGUE WYCLIFFE (OAKVILLE) LIMITED

3171 LAKESHORE ROAD WEST, OAKVILLE

DETAILS PLAN

LICENSED PROFESSIONAL ENGINEER
K. CHEN
100136982
2022-01-20
PROVINCE OF ONTARIO

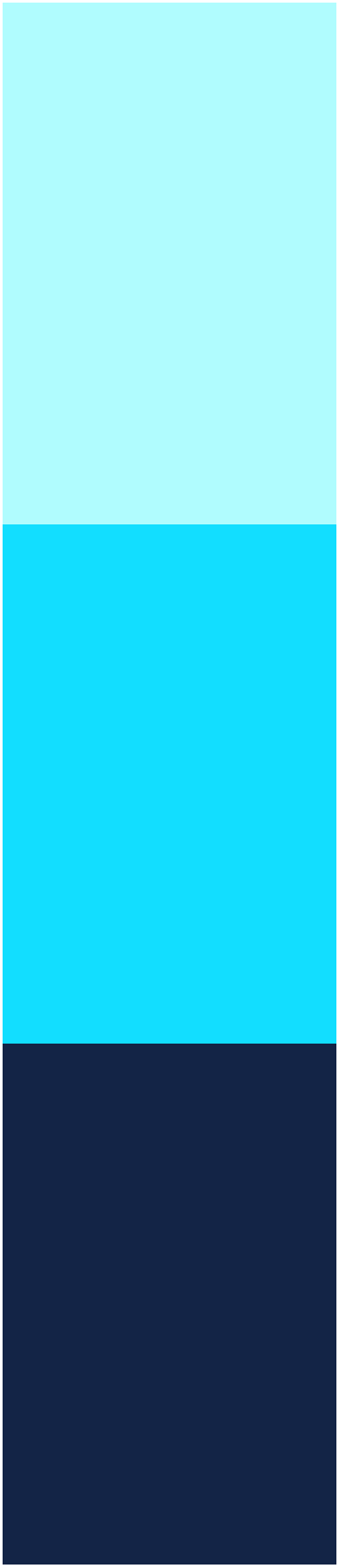
DATE: JANUARY 2022	DESIGNED BY: K.L.	CHECKED BY: P.G.
SCALE: N.T.S.	DRAWN BY: K.L.	CHECKED BY: P.G.

APPROVED AS TO FORM IN RELIANCE UPON THE PROFESSIONAL SKILL AND ABILITY OF SCS CONSULTING GROUP LTD. CONSULTING ENGINEERS AS TO DESIGN AND SPECIFICATION.

DARNELL LAMBERT, P.ENG, DIRECTOR OF ENGINEERING — Date

PROJECT No: 1930

DRAWING No: D-1



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