3171 Lakeshore Road West

Stormwater Management Report

January 2023

Submitted by:

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SUBMISSION HISTORY

Submission	Date	In Support Of	Distributed To
1st	January 2022	Site Plan Approval	Town of Oakville
2nd	October 2022	Site Plan Approval	Town of Oakville
3rd	January 2023	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).

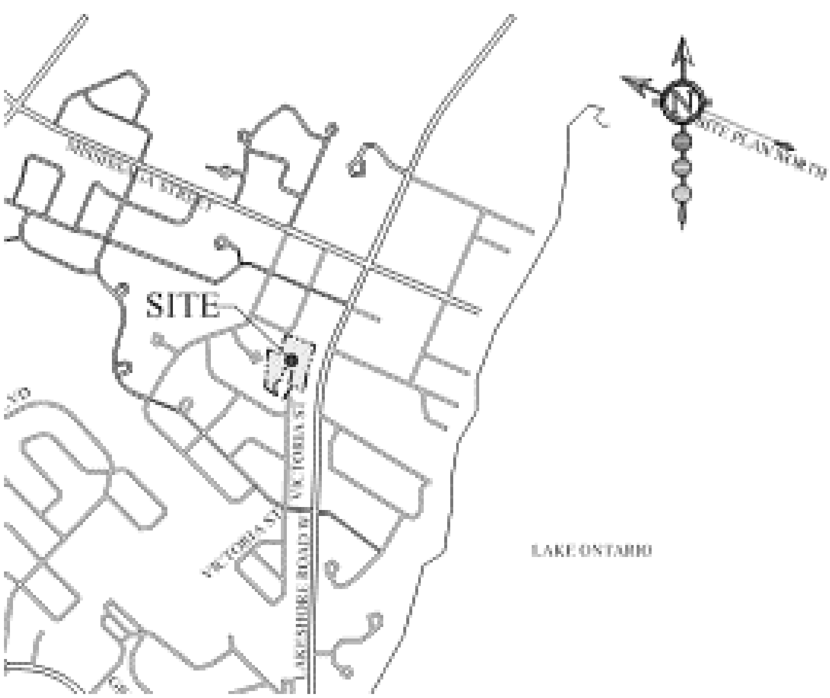

Figure 1: Site Location Plan

The proposed re-development is approximately 1.2 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;
- Town of Oakville Stormwater Management Master Plan, dated November 2019.
- Town of Oakville Development Engineering Procedures and Guidelines Manual, dated January 2011; and
- MECP SWM Planning and Design Manual, dated March 2003.

2.0 STORM SERVICING

2.1 Existing Storm Sewer System

As shown on **Figure 2**, the sizes and locations of the existing storm sewers surrounding the site are:

- A 300 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 of 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 (where necessary) and will outlet to the proposed storm sewer.

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. The catchments shown on **Figure 2** correspond to the catchment boundaries provided in the Town of Oakville SWM Master Plan, the existing drainage boundaries based on the topographic survey were delineated in the FSR prepared by SCS Consulting dated July 2019, relevant excerpts (Figure 2.1) are provided in **Appendix B**.

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.
Water Budget	Measures to minimize development impacts on the water balance to be incorporated into the development design (i.e. infiltration measures).

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
	Permeable Pavers
	Bioretention Facility
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 (0.24 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 (0.70 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. Permeable paver parking spots are proposed throughout the re-development to meet water budget criteria.

Major and minor system overland flow from Catchment 204 (0.03 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 southeastern corner 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 43.0 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 24.8 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 22.2 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**. A dual drainage hydrology (PCSWMM) model was prepared to determine potential impacts on the major and minor systems downstream of the proposed re-development. The results of the PCSWMM analysis are discussed in **Section 3.6**.

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 three sections with a total length of 112.0 m of 1200 mm diameter concrete superpipe beneath the private road. There will be 32.3 m of superpipe under Lane A and 79.7 m of superpipe under Lane B. The superpipe from Lane A connects with the two sections of superpipe on Lane B via a 1200 mm MH (MH4). At MH4, each section of superpipe will end at a bulkhead with 1 m sections of 450mm diameter concrete pipe connecting the bulkhead to MH4. The superpipe will release runoff from Catchment 203 to the existing Lakeshore Road West storm sewer. A terminal backwater valve is proposed downstream of the proposed OGS on the upstream side of MH2 to attenuate backwater effects from the existing storm sewer. The maximum release rate during the 100 year storm event from the superpipe will be limited to 128.1 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 will be released uncontrolled to Lakeshore Road West. It should be noted that runoff from Catchment 204 will be conveyed uncontrolled to Victoria St. (east) but will eventually be conveyed to the Lakeshore Road West major and minor system at the intersection of Lakeshore Road West and Mississauga St. Therefore, the proposed 100 year release rate to the Lakeshore Road West system will include runoff from Catchments 202, 203, and 204. Approximately 86.6 L/s will be released uncontrolled from Catchments 202 and 204 for a total proposed 100 year peak release rate of 214.7 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 200 mm diameter orifice tube located upstream of the proposed OGS unit. The location of the orifice is shown on **Figure 3** and on **Drawing S-1**. Orifice tube, superpipe parameters, and peak flow calculations are provided in **Appendix C**. The proposed release rates to Victoria St. (east) and Lakeshore Road West were examined as part of the PCSWMM analysis in **Section 3.6**.

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 rate to the Victoria St. (west) and Lakeshore Road West storm systems are 14.4 L/s and 127.3 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	14.4	0.0	26.8	14.4
	100 Year		24.8	22.2	47.0	47.0
Lakeshore Road West	5 Year	140.6	84.6	42.7	140.6	127.3
	100 Year		128.1	86.6	247.2	214.7

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	20.0	23.0
	100 Year	23.0	
Lakeshore Road West	5 Year	46.9	126.7
	100 Year	125.2	

*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 directing roof leaders to grass. The quality control provided by the 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 a Hydrodome HD 4 oil-grit separator (OGS). The OGS is sized to achieve 80% TSS Removal using a fine 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 2.0 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 1.2m x 0.6m 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. A PCSWMM analysis was prepared to confirm overland flow conveyance in the major systems downstream of the proposed re-development and is discussed further in **Section 3.6**.

3.5.5 Water Budget

Where feasible, measures to minimize impacts on the water budget will be incorporated into the development design. GeoBase Solutions has prepared water budget calculations for the proposed re-development to show that the water budget for the site will be maintained in the proposed condition, the water balance report is provided in **Appendix B**.

The existing infiltration and runoff volumes for the study area are approximately 1,440 m^3 and 3,820 m^3 respectively. Without mitigation, the proposed re-development infiltration and runoff volumes are approximately 830 m^3 and 5,820 m^3 respectively.

As outlined in **Section 3.5**, infiltration measures, such as permeable pavers will be implemented, to maintain existing infiltration rates to the extent feasible. It is anticipated that a proposed infiltration volume of approximately 1,010 m^3 and a runoff volume of approximately 5,640 m^3 can be achieved through the proposed mitigation measures. It should be noted that additional infiltration measures, such as rear yard infiltration trenches, cannot be incorporated into the re-development design since there will be insufficient space to meet the minimum foundation setback of 5.0 m.

3.5.6 Proposed Mitigation Measures – Permeable Pavers

Permeable pavers will capture 25 mm of runoff, from the parking areas only as shown on **Figure 3**. Four parking areas within private property will be composed of Unilock permeable pavers (or approved equivalent) overtop of 0.65 m of various sizes of crushed stone. The layers of crushed stone will be wrapped in Terrafix 270R geotextile (or approved equivalent). Drainage will sheet flow over the parking area where it will infiltrate through the pavers and into the underlying stone bedding. A 100 mm diameter PVC underdrain will be provided a minimum distance of 0.1 m above the bottom of the crushed stone base to convey excess runoff to the closest catchbasin. Permeable paver sizing calculations are included in **Appendix C** and details are shown on Drawing L3 prepared by MHBC provided in **Appendix F**.

3.6 SWM Master Plan PCSWMM Model Update

The proposed re-development was incorporated into the dual drainage (PCSWMM) model prepared by the Town in support of the Town of Oakville SWM Master Plan (November 2019) to determine the impact of the proposed re-development on the existing major and minor systems as well as any backwater effects on the proposed superpipe facility described in **Section 3.5.1**. A download link for the Town and proposed re-development model files is provided in **Appendix E**.

As described in **Section 3.1**, under existing conditions a portion of the site is conveyed to Sheldon Creek and the remainder is conveyed to Bronte Creek. The site area is correspondingly distributed between PCSWMM catchments S8_36 (Catchment 101 to Sheldon Creek) and S9_9 (Catchment 102 to Bronte Creek). An excerpt of the PCSWMM model schematic showing the location of the site within the Town model is provided in **Appendix E** for reference. The site area and associated impervious area was removed from the PCSWMM catchments noted above to determine the impact that development of that area would have on downstream conveyance systems. A summary of the catchment area and impervious area for the original PCSWMM catchments, the site catchments, and the modified catchments is provided in **Table 3.6** below. It should be noted that the impervious area of Catchment 102 was underestimated in the original S9-9 parameters resulting in an unrealistic imperviousness for the remainder of the catchment (97%), therefore the catchment imperviousness was maintained as 51.4%.

Table 3.6: Summary of Existing PCSWMM Model Areas

Parameter	Original S8_36	SCS Catchment 101	Modified S8_36	Original S9_9	SCS Catchment 102	Modified S9_9
Area (ha)	1.594	0.204	1.391	1.380	0.969	0.411
Imperv. Area (ha)	0.942	0.052	0.891	0.709	0.309	0.211
Imperv. (%)	59.1	25.3	64.1	51.4	31.9	51.4

As described in **Section 3.5**, under proposed conditions runoff continues to be conveyed to Sheldon Creek (Catchment 201) and Bronte Creek (Catchments 202-204). Catchments 203 and

204 are proposed to be uncontrolled. To best replicate the existing modelling of the re-development area, Catchment 203 has been combined with the associated PCSWMM catchment (S9_9). The percent routed has also been updated to account for the re-development catchment. A summary of the catchment S9_9 parameters is provided in **Table 3.7** below. Catchments 201, 203, and 204 have been added as separate PCSWMM catchments with Catchments 201 and 203 being routed through their respective proposed superpipe storage facilities before outletting to the existing minor system (Junction O_0160_6768 and Junction O_0160_400804 respectively) and Catchment 204 being conveyed to the existing major system node on Victoria St. (east) (Junction O_0160_6138-S). The laneway sections from the 100 year capture point in Catchment 203 to Lakeshore Road were also added to the model to allow for a spill condition and outlet to the Lakeshore Road West major system (Junction O_0160_400804-S). Similarly, a spill condition was provided for Catchment 201 using the right-of-way section attributed to Victoria St. (west) in the Town model. A summary of the PCSWMM catchments created or modified as part of the PCSWMM analysis are provided in **Appendix E**.

Table 3.7: Summary of Combined PCSWMM Model Areas

Parameter	Modified S9_9	SCS Catchment 202	Combined S9_9
Area (ha)	0.411	0.245	0.656
Imperv. Area (ha)	0.211	0.108	0.319
Imperv. (%)	51.4	44	49
Routed (%)	40	71	50

The 5 year and 100 year storm events were modelled using the SWM Master Plan and the updated PCSWMM model. Printouts of the major and minor system profiles immediately downstream of the proposed re-development are provided in **Appendix E** which show the depth and peak flows in the conveyance systems.

In general, the peak flows and depths in the Victoria St. (east) and Victoria St. (west) major and minor systems will be maintained in both the 5 year and 100 year storm events. The peak flows and depths will generally be maintained in the Lakeshore Road West minor system in the 5 year and 100 year storm events and the major system in the 5 year storm event. The peak flows in the Lakeshore Road West major system will be significantly reduced in the 100 year storm event. Therefore, the proposed uncontrolled and controlled release rates will not negatively impact the major and minor systems on Victoria St. (east), Victoria St. (west), and Lakeshore road downstream of the proposed re-development.

It should be noted that the proposed laneway superpipe is shown to reach maximum capacity for a limited time during the design storm event with some flows spilling out of the laneway entrance to the Lakeshore Road west right-of-way. However, given the results presented above this is acceptable because the additional major system flow is still significantly less than in the existing condition. Similarly the cul-de-sac superpipe is shown to fill completely and spill to Victoria St. (west) as intended. Therefore, the superpipe and orifice sizing conducted using the modified rational spreadsheet as outlined in **Section 3.5.1** is acceptable.

4.0 EROSION AND SEDIMENT CONTROL DURIING CONSTRUCTION

To ensure stormwater runoff during the construction phase does not transport sediment to the existing municipal infrastructure, catchbasin sediment control devices have been proposed on Lakeshore Road West along the frontage of the site, in addition to sediment control fence around the perimeter of the site and a mud mat at the construction entrance. The existing west asphalt driveway will be utilized as a mud mat to limit disturbance to the Lakeshore Road right-of-way. Tree preservation fence will be provided in accordance with the landscape drawings prepared by MHBC.

These measures are designed and constructed per the "Erosion and Sediment Control Guide for Urban Construction" document (TRCA, 2019). These measures, as well as any additional information pertaining to ESC Controls, can be found on **Drawing ESC-1**, **ESC-2**, and **ESC-3** provided in **Appendix F**. All reasonable measures will be taken to ensure sediment loading to the adjacent storm sewer systems is minimized both during and following construction.

The following monitoring and record keeping will be ensured during construction:

- All temporary erosion and sediment controls will be routinely inspected (at minimum once a week) and maintained in proper working order;
- All temporary erosion and sediment controls will be inspected after each rainfall event;
- All necessary repair works will be executed within a 48 hour period;
- No removal of temporary erosion and sediment controls prior to the stabilization of the area; and
- Minimize sediment transport during and following construction.

A 'weekly' monitoring report will be completed after every visit outlined above. The primary contact for this will be Pete Stelmach of SCS Consulting Group Ltd. He can be reached at 647-999-5189.

5.0 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 80% TSS removal with the fine particle size distribution.

Erosion Control

- The study area is too small to practically detain 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.

Water Budget:

- The proposed re-development will result in a net decrease in infiltration volume of 424 m^3/yr (total infiltration volume of 1,012 m^3/yr) and a net increase in runoff volume of 1,822 m^3/yr (total runoff volume of 5,638 m^3/yr).
- Best efforts to match existing infiltration volumes have been provided through permeable paver parking spots.

PCSWMM Analysis:

- The Town of Oakville PCSWMM model was updated to incorporate the proposed re-development.
- The results of the model show that the proposed re-development will not have a negative impact on downstream major and minor systems.

Erosion and Sediment Control

- Erosion and Sediment control measures to facilitate construction of the site are proposed including sediment control fence, access roads, check dams, etc.

Respectfully Submitted:

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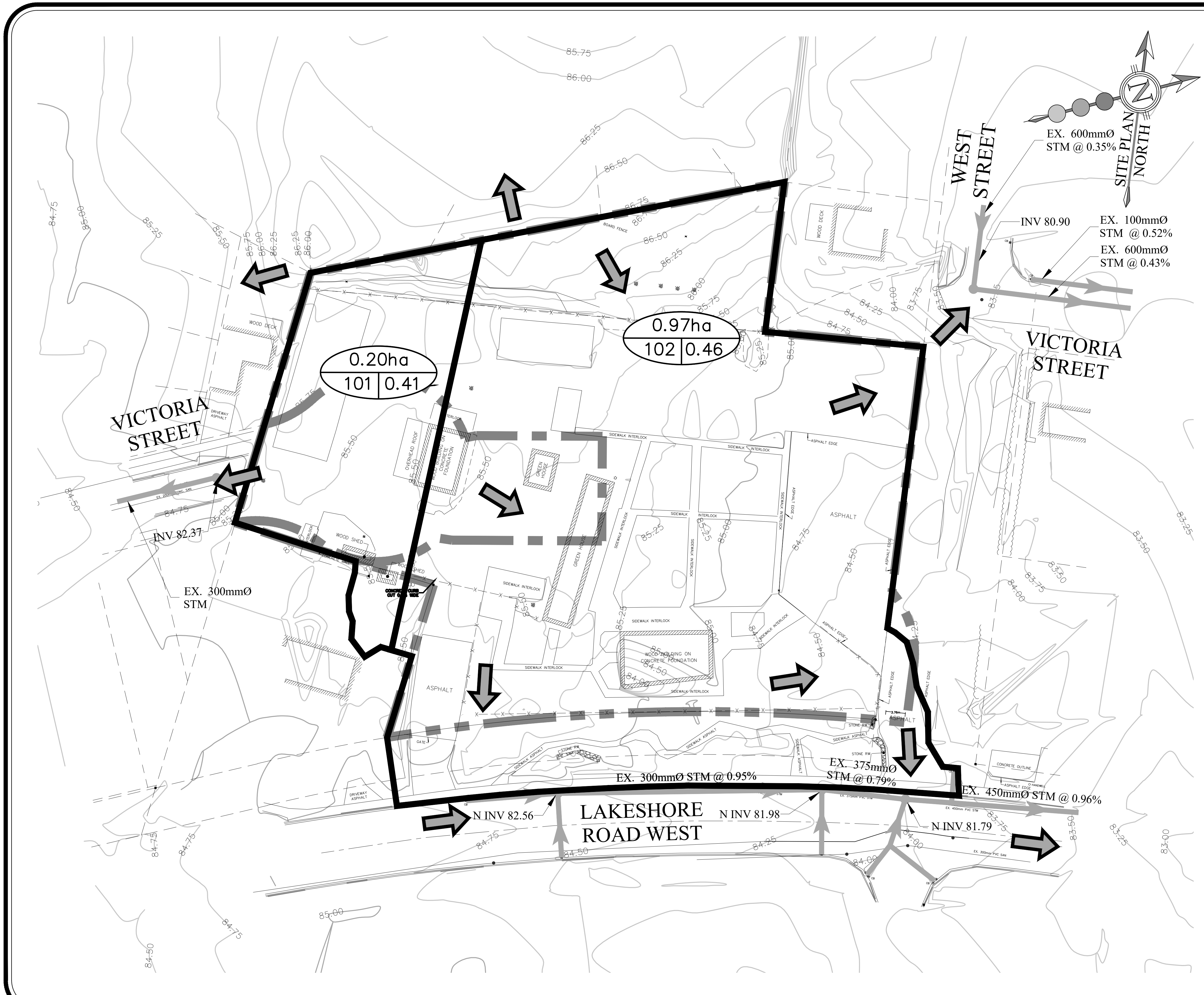

LEGEND:

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

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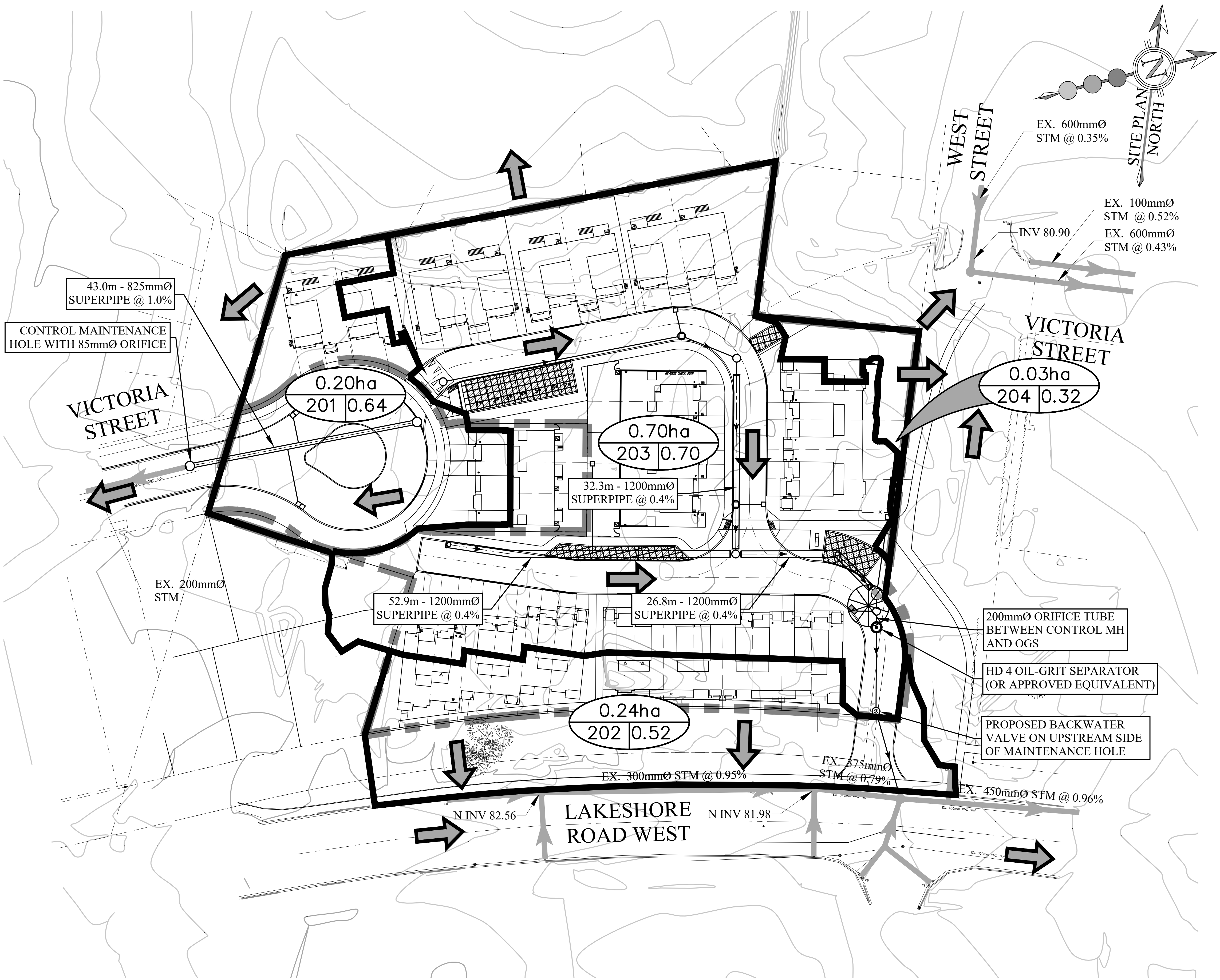
3171 LAKESHORE ROAD WEST, OAKVILLE

EXISTING STORM DRAINAGE PLAN

DESIGNED BY: N.D.M.	CHECKED BY: S.M.S.
SCALE: 1:750	DATE: JANUARY 2023
PROJECT No: 1930	FIGURE No: 2

File: P:\1930 3171 Lakeshore Road West, Oakville\Drawings\Phase 1\Swm\Report Figures\1930D-STRM-EXST-2.0.dwg - Revised by <GMURRIA> : Mon, Jan 16 2023 - 6:07pm



LEGEND:

- LIMIT OF DEVELOPMENT
- LIMIT OF SUBDIVISION
- MAJOR SYSTEM - OVERLAND FLOW
- PROPOSED STORM DRAINAGE BOUNDARY
- 0.67ha / 203 / 0.70 — DRAINAGE AREA (HECTARES); RUNOFF COEFFICIENT; CATCHMENT ID
- 255.50 — EXISTING CONTOURS
- EXISTING STORM SEWER AND MAINTENANCE HOLE
- PROPOSED STORM SEWER AND MAINTENANCE HOLE
- PROPOSED SUPERPIPE
- OIL-GRIT SEPARATOR MAINTENANCE HOLE
- 100 YEAR CAPTURE LOCATION
- PERMEABLE PAVERS
- MAINTENANCE HOLE WITH BACKWATER VALVE

SCS consulting group ltd

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

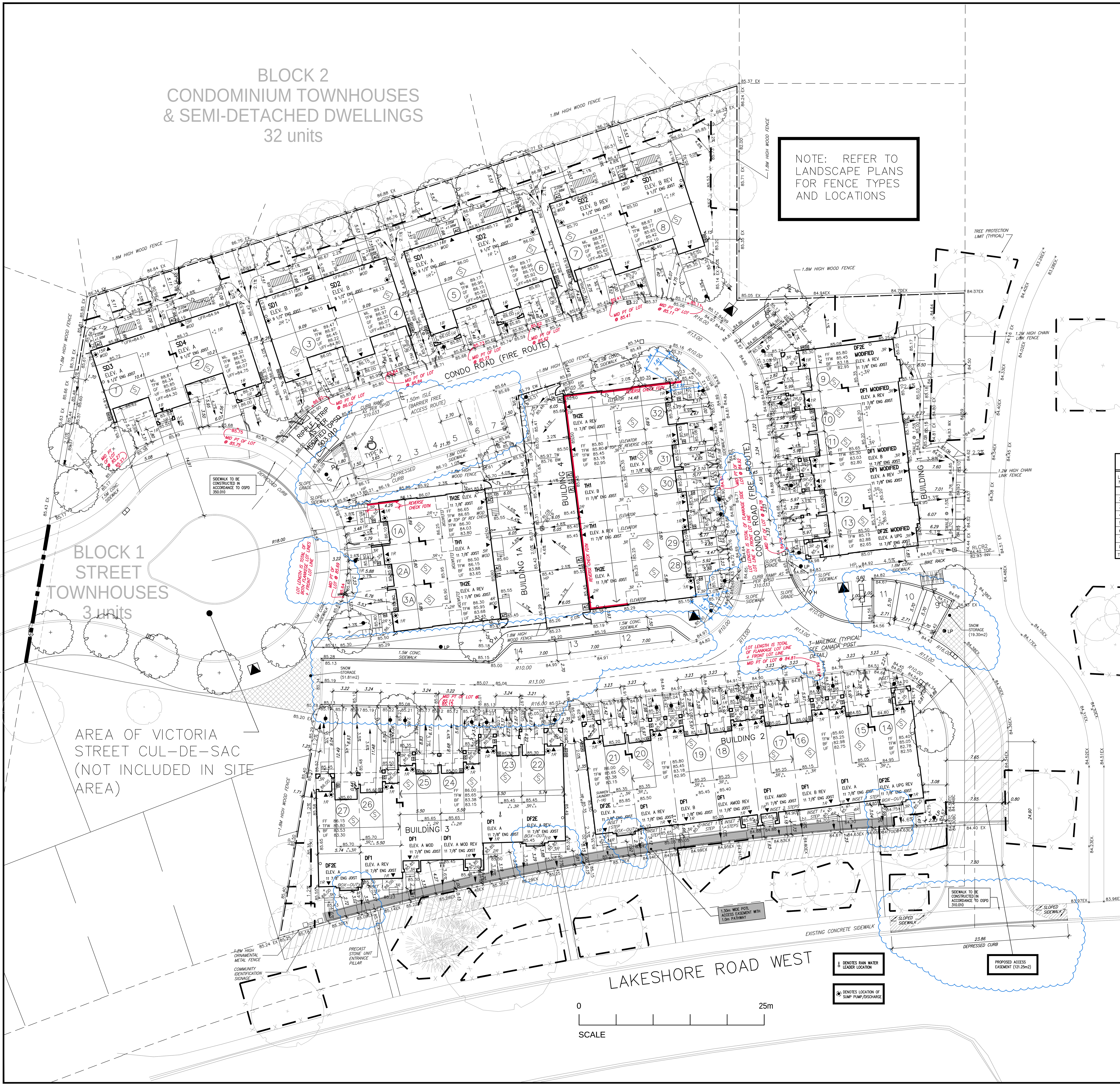
3171 LAKESHORE ROAD WEST, OAKVILLE

PROPOSED STORM DRAINAGE PLAN

DESIGNED BY: N.D.M.	CHECKED BY: S.M.S.
SCALE: 1:750	DATE: JANUARY 2023
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:	7,561.20m2 (92.28% OF SITE AREA)
TOTAL UNIT COVERAGE:	2,836.23m2 (34.62% OF SITE 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**

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-3A	256.70	74.10	114.86	346.44	33.15	31.79	199.79	57.67	18.72	24.28	10.44
2	SD-4A	252.30	88.10	117.38	286.37	40.99	40.00	128.99	45.04	12.94	23.29	10.41
3	SD-1B	250.00	102.99	110.71	242.74	45.61	29.89	102.14	42.08	10.46	22.94	10.31
4	SD-2B	248.30	104.92	110.21	236.65	46.57	29.23	97.21	41.08	10.35	22.94	10.36
5	SD-1A	244.80	103.44	111.06	236.654	46.93	29.54	96.05	40.59	10.35	22.94	10.29
6	SD-2A	247.80	104.71	110.06	236.65	46.51	29.21	97.38	41.15	10.35	22.94	10.44
7	SD-2B	248.30	104.29	110.21	238.09	46.29	29.25	98.63	41.43	10.37	22.94	10.32
8	SD-1B	250.00	58.54	110.71	427.04	25.92	40.51	275.82	64.59	14.69	22.94	10.44
TOTAL		1998.20	88.78	895.20	2250.63	39.78	259.42	1096.01	48.70			

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-2E (A)	87.20	183.40	47.55	17.47	78.73	42.93	7.20	25.57	
2A	TH-1 (A)	86.00	150.12	57.29	20.39	43.73	29.13	5.87	25.81	
3A	TH-2E (A)	87.20	204.92	42.55	25.01	92.71	45.24	7.82	28.62	
TOTAL		260.40	538.44	48.36	62.87	215.17	39.96			11.99

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-2E (A)	82.10	315.91	25.99	18.91	214.90	68.03	10.65	28.02	
10	DF-1 (A)	74.90	145.24	51.57	18.92	51.42	35.40	5.50	26.41	
11	DF-1 (B)	79.55	141.752	56.12	18.88	43.32	30.56	5.50	25.73	
12	DF-1 A)	74.90	137.80	54.35	18.81	44.09	32.00	5.50	25.06	
13	DF-2E (A UPG)	84.56	180.14	46.94	18.86	76.72	42.59	7.69	24.26	
TOTAL		396.01	920.84	43.01	94.38	430.45	46.75			11.76

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-2E (A UPG)	84.56	188.34	44.90	19.69	84.09	44.65	10.25	22.01	
15	DF-1 (A)	74.90	118.41	63.25	18.83	24.68	20.84	5.50	21.53	
16	DF-1 (B)	79.55	117.16	67.90	18.88	18.73	15.99	5.50	21.30	
17	DF-1 (AMOD)	75.09	116.35	64.54	18.88	22.38	19.24	5.50	21.15	
18	DF-1 (AMOD)	75.09	116.00	64.73	18.66	22.25	19.18	5.50	21.09	
19	DF-1 (B)	79.55	116.10	68.52	18.88	17.67	15.22	5.50	21.11	
20	DF-1 (A)	74.90	116.66	64.20	18.73	23.03	19.74	5.50	21.21	
21	DF-2E (A)	82.10	151.94	54.03	18.86	50.98	33.55	7.09	21.42	
TOTAL		468.74	772.36	60.69	151.41	152.21	19.71			11.96

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-2E (A)	82.10	172.97	47.46	18.93	71.94	41.59	7.41	21.88	
23	DF-1 (A)	74.90	127.79	58.61	19.07	33.82	26.47	5.51	23.03	
24	DF-1 (AMOD)	75.09	134.81	55.70	27.10	32.62	24.20	5.51	24.34	
25	DF-1 (AMOD)	75.09	142.30	52.77	27.63	39.58	27.81	5.51	25.75	
26	DF-1 (A)	74.90	150.28	49.84	36.75	38.63	25.71	5.51	27.25	
27	DF-2E (A)	82.10	241.39	34.01	39.87	119.42	49.47	6.68	29.74	
TOTAL		464.18	969.54	47.88	169.35	336.01	34.66			11.81

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-2E (A)	87.20	203.76	42.80	18.81	97.75	47.97	8.49	25.53	
29	TH-1 (A)	86.00	148.10	58.07	18.40	43.70	29.51	5.80	25.53	
30	TH-1 (B)	86.00	148.10	58.07	18.35	43.75	29.54	5.80	25.53	
31	TH-1 (A)	86.00	148.10	58.07	18.17	43.93	29.66	5.80	25.53	
32	TH-2E (A)	87.20	209.52	41.62	17.65	104.67	49.96	10.14	25.53	
TOTAL		432.40	857.58	50.42	91.38	333.80	38.92			11.87

KEY PLAN

SUBJECT PROPERTY

no.	description	date	by
20	.	.	.
19	.	.	.
18	.	.	.
17	.	.	.
16	ISSED FOR 3RD SPA	23-01-13	RC
15	REV AS PER SPA COMMENTS	22-12-05	RC
14	ISSUED FOR 2ND SPA	22-10-13	SS
13	ISSUED FOR SPA	22-01-19	RC
12	ADD LANDSCAPE INFO	22-01-19	RC
11	CHANGE MODEL FOR LOT 24/25 ADD GRADING	22-01-13	RC
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
255 Consumers Rd
Suite 120
Toronto ON M2J 1R4
t 416.630.2255
f 416.630.4782
va3design.com

The undersigned has reviewed and takes responsibility for this design and has the qualifications and meets the requirements set out in the Ontario Building Code to be a Designer.

qualification information
Richard Vink — name — signature — 24488 BCIN
registration information
VA3 Design Inc. — 42658

VOGUE WYCLIFFE (OAKVILLE) LTD.

project name: 3171 LAKESHORE ROAD WEST
municipality: OAKVILLE, ON
project no.: 17027
registered plan no.: –
lot/block no.: –
title: SITE PLAN
date: MAY 2016
scale: 1:250
drawn by: STEVE SOSTARIC
checked by: –
file name: 17027-SP
drawing no.: S1

RICHARD - H:\ARCHIVE\WORKING\2017\17027-WYC\SITE\17027-SP.dwg - Mon - Jan 23 2023 - 10:28 AM

APPENDIX B

RELEVANT EXCERPTS

Town of Oakville
Stormwater Management Master Plan

Project # TP115045 l Town of Oakville

Prepared for:

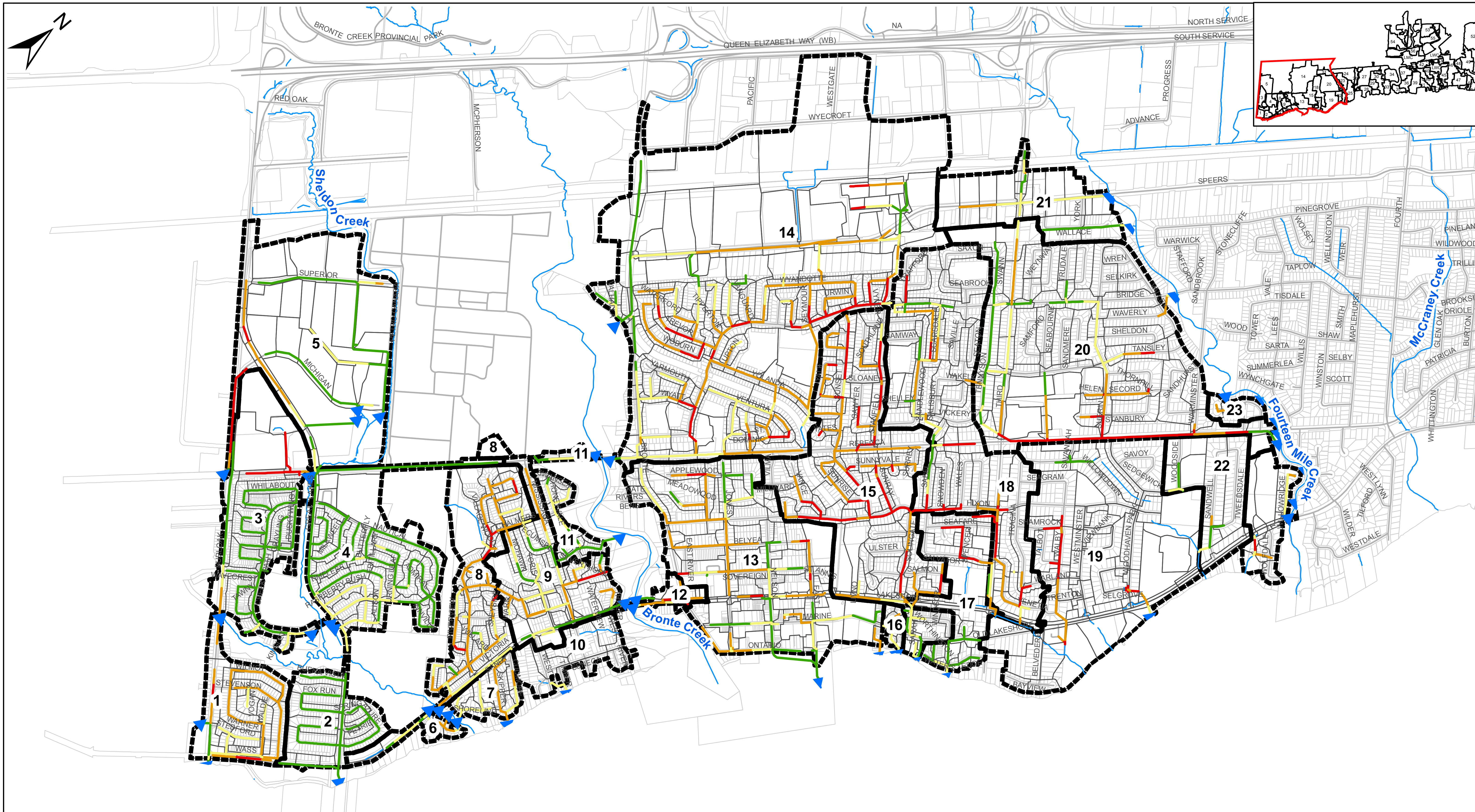
Town of Oakville

1225 Trafalgar Road, Oakville, Ontario L6H 0H3

November 13, 2019

Appendix F

Existing Conditions Capacity Assessment Results



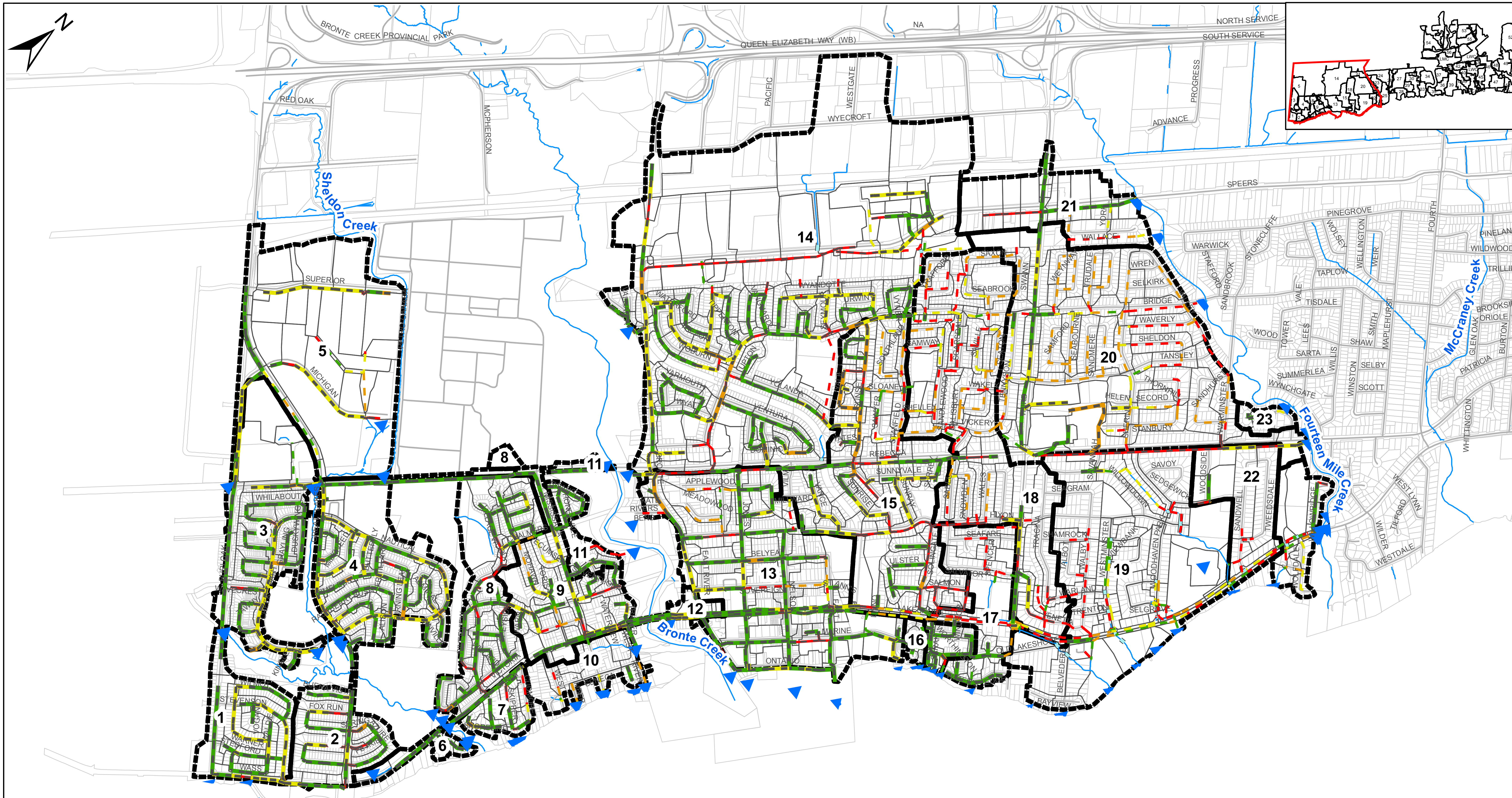
Legend

- 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)

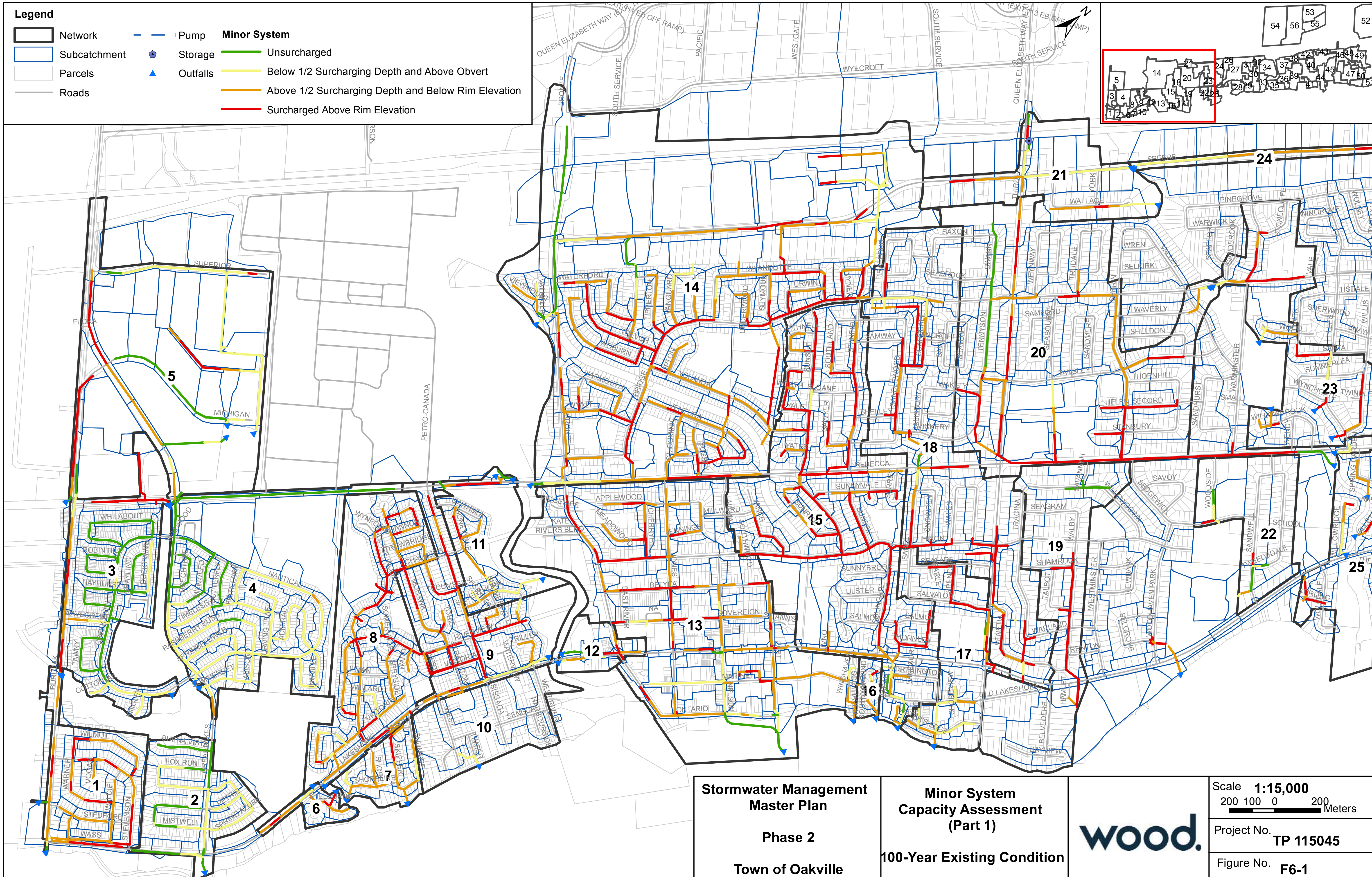
wood.

Scale **1:18,650**

0 100 200 400 600 800 Meters

Project No. **TP 115045**

Drawing No. **F4-1**



Stormwater Management Master Plan

Phase 2

Town of Oakville

Minor System Capacity Assessment (Part 1)

100-Year Existing Condition

Project No. TP 115045

Figure No. F6-1

Appendix H

Preferred Alternative Summary Drawings

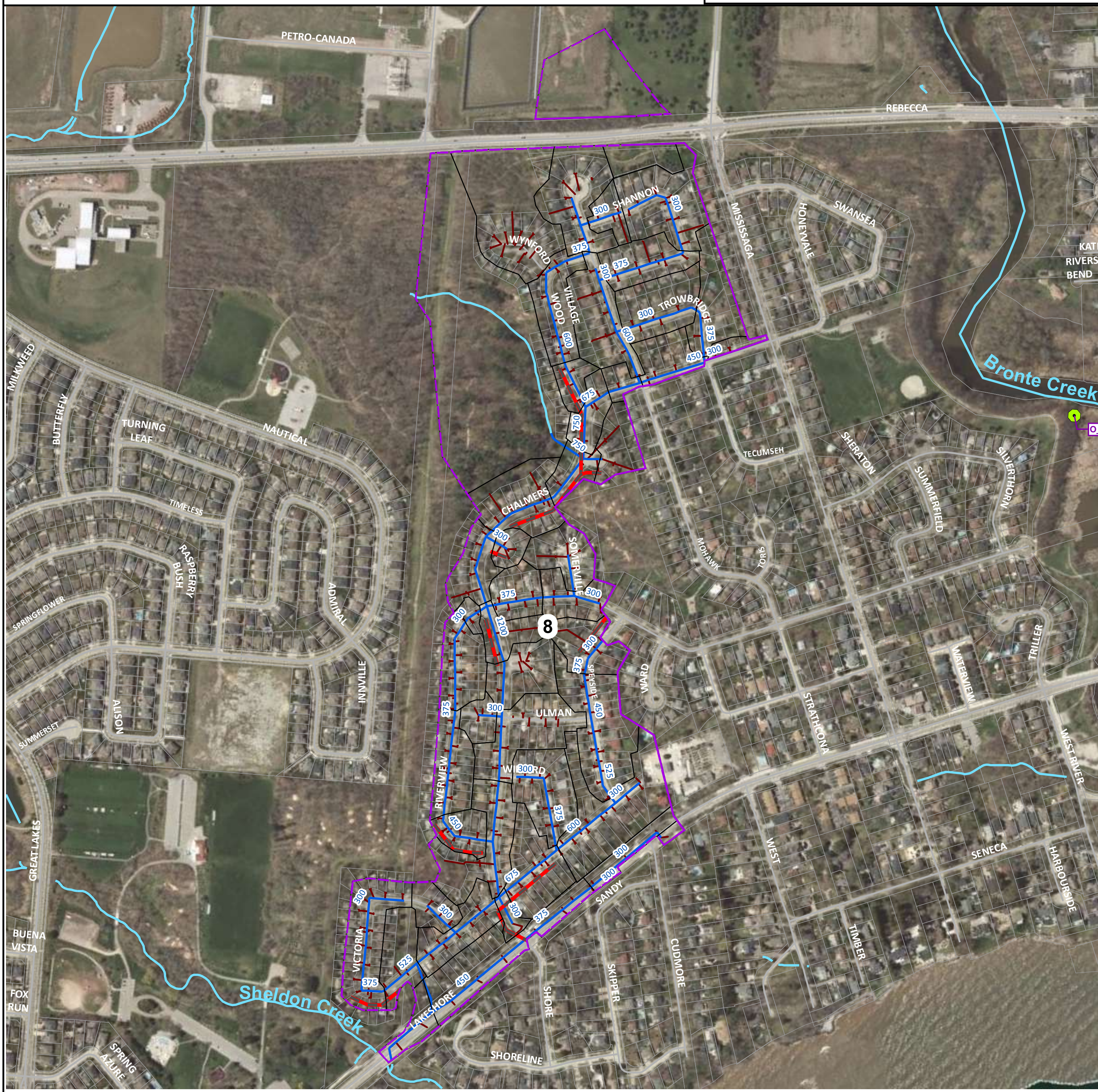
Legend

- 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)



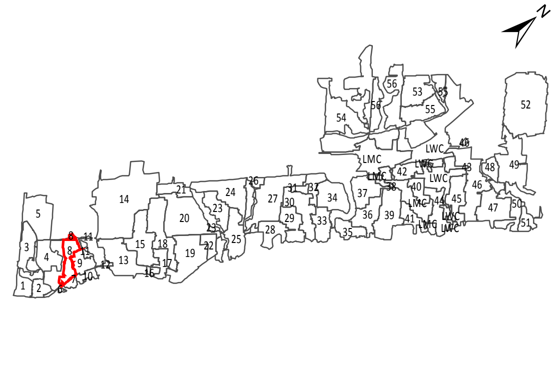
Stormwater Management Master Plan Phase 2 Town of Oakville	Recommended Works Sewershed 8	wood.	Not to Scale (NTS) Project No. TP 115045 Figure No. H8A

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.

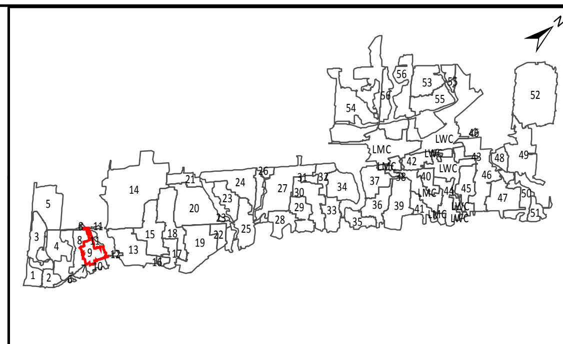
Legend

- 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)



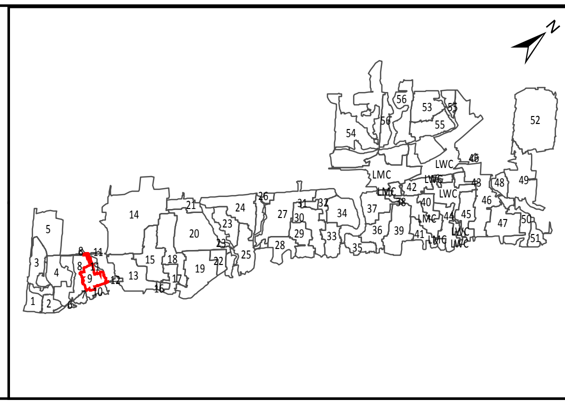
Stormwater Management Master Plan Phase 2 Town of Oakville	Recommended Works Sewershed 9	wood.	Not to Scale (NTS) Project No. **TP 115045** Figure No. H9A

Legend

- Network
- Subcatchments
- Parcel
- Roads
- Channels
- Remnant Channels
- Lateral
- 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 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

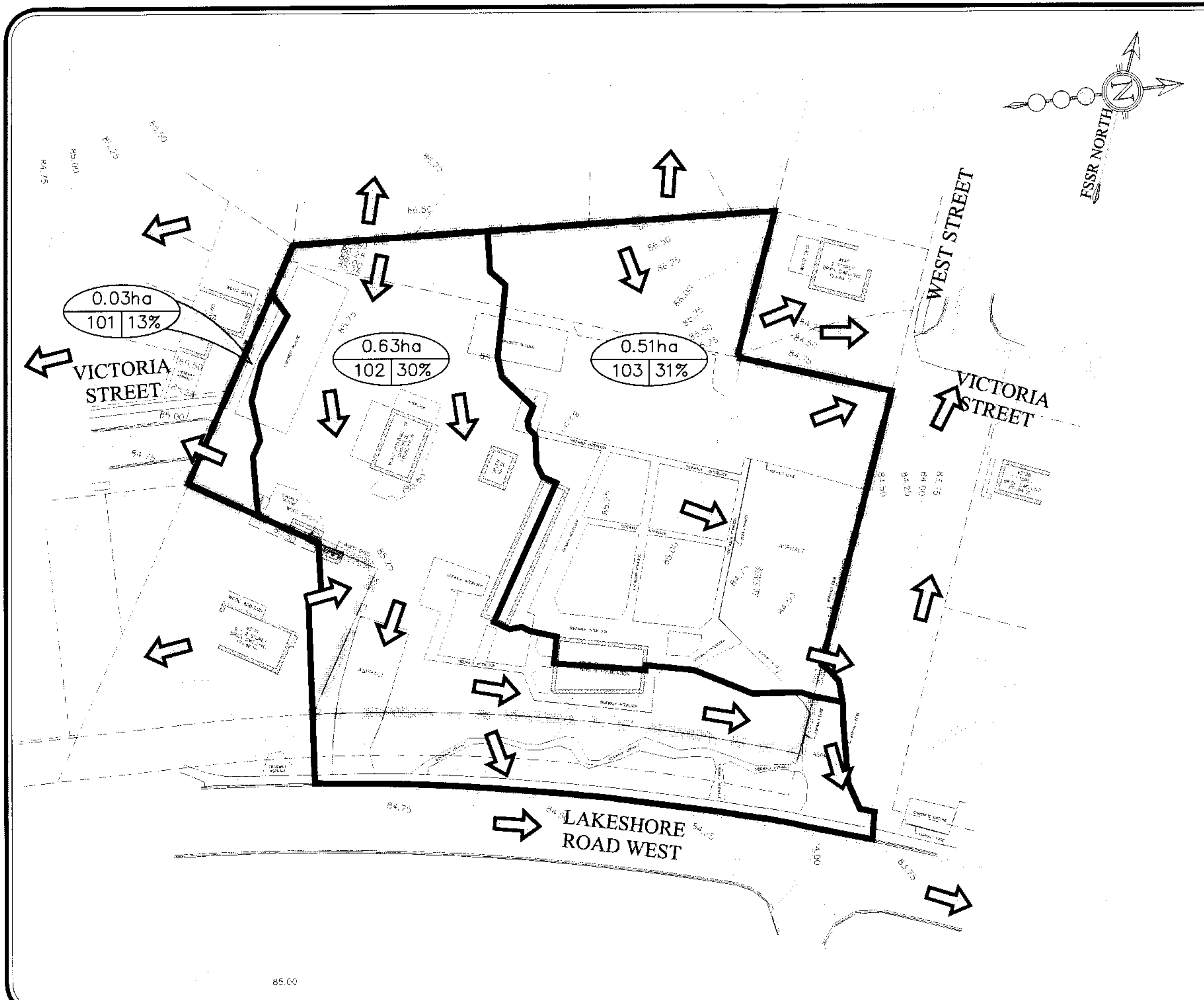
Rating	1 (Excellent)	2	3	4	5 (Poor)	Total
Total Length of Pipes (m)	2477	385	636	0	0	3498
Total Percentage of Pipes (%)	70.8	11	18.2	0	0	100

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.



LEGEND:

LIMIT OF PROPERTY

STORM DRAINAGE BOUNDARY

EXISTING STORM SEWER/MANHOLE

EXISTING CONTOUR

MAJOR SYSTEM - OVERLAND FLOW

DRAINAGE AREA (HECTARES)

PERCENT (%) IMPERVIOUS

CATCHMENT ID

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

3171 LAKESHORE ROAD WEST, OAKVILLE

EXISTING STORM DRAINAGE PLAN

DESIGNED BY: N.D.M.	CHECKED BY: S.M.S.
SCALE: 1:750	DATE: JULY 2019
PROJECT No: 1930	FIGURE No: 2.1

File: P:\1930 3171 Lakeshore Road West, Oakville\Drawings\FSP\Fig\Report Figures\1930P-PRED-2.1.dwg – Revised by <FBISDA> : Wed, Jul 03 2019 – 10 54am

Project: 22-004-100 **October 13, 2022**

SCS Consulting Group Ltd.
30 Centurian Drive, Suite 100
Markham, ON,
L3R 8B8

Attention: Mr. Nick McIntosh, M.A.Sc, P.Eng

via email: nmcintosh@scsconsultinggroup.com

Re: Site Water Balance Assessment - 3171 Lakeshore Rd. W. Oakville, Ontario

GeoBase Solutions Ltd. (GBS) was retained to complete a site water balance assessment for the proposed development located at 3171 Lakeshore Rd. W. in Oakville, Ontario (site). The site has a total area of about 11,700 m^2 and is currently developed as a garden center. The site is to be developed for residential purposes and will involve the construction of townhouses with landscaped yards, an internal road system and municipal services. This investigation is in support of the proposed draft site plan application for the City of Oakville, and to satisfy the requirements of the Conservation Halton (CH).

EXISTING CONDITIONS

The subject Site has a total area of about 11,700 m^2 and is currently developed as a garden center with pervious landscaped areas (8,100 m^2), impervious paved areas and hardscaping (3,100 m^2), and buildings/roof area (500 m^2). Surrounding land use mostly includes residential properties.

PROPOSED DEVELOPMENT

The subject property is to be developed for residential purposes and will involve the construction of townhouses with landscaped yards and an internal road system. For the site water balance calculations in this report, post development areas were estimated based on site plan designs provided to GBS. The total building area will occupy approximately 3,300 m^2. Ground level impervious areas (roads/walkway /parking areas) will occupy 3,700 m^2. The remainder of the site will be pervious landscaped area and will occupy approximately 4,700 m^2. **Appendix A** shows the post-development conceptual model considered for establishing post-hydrologic conditions.

THORNTHWAITE MONTHLY WATER BALANCE MODEL

The Thornthwaite water balance (Thornthwaite, 1948; Mather, 1978; 1979) is an accounting type method used to analyze the allocation of water among various components of the hydrologic cycle. Inputs to the model are monthly temperature, site latitude, precipitation and stormwater run-on. Outputs include monthly potential and actual evapotranspiration, evaporation, water surplus, total infiltration and total runoff. For ease of calculation, a spreadsheet model was used for the computation.

When precipitation (P) occurs, it can either runoff (R) through the surface water system, infiltrate (I) to the water table, or evaporate/evapotranspire (ET) from the earth's surface and vegetation. The sum of R and I is termed as the water surplus (S). When long-term averages of P, R, I and ET are used, there is no net change in groundwater storage (ST). Annually, however, there is a potential for small changes in ST.

The annual water budget can be stated as:

$$P = ET + R + I + ST$$

Based on the physiographic setting and proximity to climate stations, the Burlington TS Climate Station was chosen as the most representative database. The most recent 30-year normal (average weather data) available from Environment Canada covers the period from January 1981 to December 2010. Table A-1, Appendix A summarizes the monthly and annual averages for precipitation and daily temperature.

PRE-DEVELOPMENT WATER BALANCE

To predict outputs of the pre-development water balance, various inputs were entered into the Thornthwaite model including monthly precipitation and temperature, site latitude, water holding capacity values for native soils and factors of infiltration. Various inputs and outputs of the model are described in detail below. The detailed calculations are presented in Appendix A.

PRECIPITATION (P)

Based on the 30-year average for the Burlington TS Climate Station, the average precipitation for the area is about 863 mm/year. The monthly distribution of precipitation is presented in Table A-1, Appendix A.

STORAGE (ST)

Groundwater storage (ST) of native soils for the existing site was estimated using values of Water Holding Capacity (mm) of respective land use and soil types identified in Table 3.1 of the Storm Water Management (SWM) Planning & Design Manual (MOE, March 2003). The land uses, soil types and respective water holding capacities chosen to represent existing conditions at the site include cultivated, forested and shrub/pasture with a silt loam soil. Using the procedures outlined in the SWM Planning & Design Manual for the above land use and soil type, the annul change in storage is 0. The monthly distribution of ST for each of the land us/soil types is presented in Table A-2, Appendix A.

EVAPORATION / EVAPOTRANSPIRATION (ET)

In the pre-development scenario, there are existing impervious surfaces resulting in evaporation which is estimated as 15% of precipitation (129 mm/yr). As a result, evaporation volume for pre-development conditions was calculated at 466 m^3/yr.

Evapotranspiration in the pre-development scenario occurs over each pervious land use. Monthly Potential Evapotranspiration (PET) is estimated using monthly temperature data and is defined as a water loss from a homogeneous vegetation-covered area that never lacks water (Thornthwaite, 1948; Mather, 1978). Considering a total annual precipitation of 863 mm, adjusted Potential Evapotranspiration (PET) is estimated at 629.5 mm.

A comparison between PET and Precipitation (P) produces a soil moisture deficit which begins in June and is increases to a maximum of 153 mm in August. Actual Evapotranspiration (AET) is based on PET and changes in ST (Δ ST). Where there is not enough P to satisfy PET, a reduction in ST occurs. Estimated AET for landscaped areas was calculated at 541 mm/yr. The total annual volume of AET across the existing site is estimated at 4,379 m^3/yr. Detailed calculations and the monthly distribution of AET is presented in Table A-2, Appendix A.

INFILTRATION (I)

For pervious areas, precipitation surplus following AET has two components in the Thornthwaite model: a runoff component (overland flow that occurs when soil moisture capacity is exceeded) and an infiltration component. The accumulation of infiltration factors for topography, soil types and cover as prescribed in Table 3.1 of the SWM Planning & Design Manual give infiltration factors for existing conditions on the site as shown below in Section Table 1.

Table 1: Existing Conditions – Infiltration Factor

LAND USES / SOIL TYPES	TOPOGRAPHY	SOIL	COVER	TOTAL INFILTRATION FACTOR
Landscaped	0.30	0.20	0.05	0.55

Considering the above infiltration factors, the total depth of Infiltration (I) estimated for existing conditions is about 177 mm/yr, or a total volume of 1,436 m^3/yr. The more detailed calculations are presented in Table A-2, Appendix A.

RUNOFF (R)

The runoff component calculated in the pre-development model is the remaining volume of precipitation surplus for both pervious and impervious areas. Considering the precipitation surpluses and the total Infiltration and evaporation volume over the site, the total volume of runoff estimated for existing conditions is about 3,816 m^3/yr. The more detailed calculations are presented in Table A-2, Appendix A.

POST-DEVELOPMENT WATER BALANCE (NO MITIGATION)

To predict outputs of the post-development water balance, the same elements of the 30-year average weather data and site latitude inputs were used. Various inputs and outputs of the post-development model are described in detail below. The detailed calculations are presented in Table A-3 Appendix A.

PRECIPITATION (P)

Precipitation remains the same (ie. The 30-year climate normals (1981-2010) for the Burlington TS Climate Station).

STORAGE (ST)

Groundwater storage (ST) of native soils for the post-development site remains the same as predevelopment conditions since both in consider only landscaped pervious areas. A soil moisture holding capacity of 125 was selected for silt loam soils. Similar to pre-development conditions, using the procedures outlined in the SWM Planning & Design Manual for each land use, the annual change in storage is 0. The monthly distribution of ST for each of the land use/soil types is presented in Table A-3 Appendix A.

EVAPORATION / EVAPOTRANSPIRATION (ET)

In the post construction scenario, changes in land use result in an about 3,400 m^2 of additional impervious surfaces. For impervious areas it is assumed that evaporation will occur and will amount to approximately 15% of total precipitation. Considering a total annual precipitation of 863 mm, evaporation is estimated at 129 mm. As a result, a total annual volume of evaporation is estimated at 906 m^3/yr. The detailed calculations for evaporation are included in Table A-3 Appendix A.

For post-development pervious areas, monthly PET is estimated using the same inputs and calculations described in the pre-development model respective of land use and soil moisture holding capacity. In the post-development scenario, annual AET is 2,541 m^3/yr. The monthly distribution of Post-development AET and detailed calculations are presented in Table A-3, Appendix A.

INFILTRATION (I)

The same accumulation of infiltration factors for topography, soil types and cover as prescribed in Table 3.1 of the SWM Planning & Design Manual were used give infiltration factors for post-development conditions. Considering the infiltration factors used, the total volume of Infiltration (I) estimated for post-development conditions is about 833 m^3/yr. The more detailed calculations are presented in Table A-3, Appendix A.

RUNOFF (R)

The runoff component calculated in the post-development model is a combination of the remaining volume of precipitation surplus for both pervious and impervious areas. The total volume of runoff (R) estimated for post-development conditions is 5,817 m^3/yr. The more detailed calculations are presented in Table A-3, Appendix A.

POST-DEVELOPMENT WATER BALANCE (WITH MITIGATION)

Based on results of the pre-development and post-development water balance completed, the proposed development will produce a reduction in annual AET (1,838 m^3/yr), an increase in annual ET (440 m^3/yr), a reduction in annual infiltration (603 m^3/yr) and an increase in annual runoff (2001 m^3/yr), as shown in Table A-4, Appendix A. The effects are mainly the result of increased impervious area, replacing pervious areas of the site.

Best efforts have been made to remove the infiltration deficit through the use of Low Impact Development (LID) measures. A mitigation plan was provided by SCS Consulting Group ltd. (SCS) for incorporation into a mitigated post-development site water balance. The mitigation plan includes a design with permeable pavers totalling an area of 260 m^2. The location of the pavers are provided in the Proposed Storm Drainage Plan (figure 3) provided in the SWM Report completed by SCS. Using comparisons between total annual rainfall depth and daily rainfall depth provided by Wet Weather Flow Management Guidelines, City of Toronto, 2006, the pavers were provided with a 94% efficiency rating considering their design to infiltrate a 25 mm storm event.

Based on results of the post-development water balance with mitigation, the proposed development will produce a reduction in annual AET (1,838 m^3/yr), an increase in annual ET (440 m^3/yr), a reduction in annual infiltration (424 m^3/yr) and an increase in annual runoff (1,822 m^3/yr), as shown in Table A-4, Appendix A. The effects are mainly the result of increased impervious area, replacing pervious areas of the site.

The detailed calculations for the mitigated site water balance is summarized in **Table A-4, Appendix A**. The post-development with mitigation infiltration deficit of 424 m^3/yr is 29% of the pre-development infiltration volume.

We trust that the information contained in this report is satisfactory. Should you have any questions, please do not hesitate to contact this office.

GeoBase Solutions (GBS) Ltd.

Prepared By:	Reviewed By:
Scott Watson, B.A.T. Project Manager	Naeem Ehsan, M.Eng., P.Eng. Senior Engineer

Appendix A

TABLE A-1
CLIMATE NORMALS 1981-2010 (BURLINGTON TS CLIMATE STATION)
Water Balance - 3171 Lakeshore Rd. W., Oakville, Ontario

	Thornthwaite (1948)					
Month	**Mean Temperature (°C)**	**Heat Index**	**Unadjusted Potential Evapotranspiration (mm)**	**Daylight Correction Value**	**Adjusted Potential Evapotranspiration (mm)**	**Total Precipitation (mm)**
January	-4.4	0.0	0.0	0.78	0.0	66.0
February	-3.2	0.0	0.0	0.88	0.0	54.5
March	1.0	0.1	2.8	0.99	2.8	61.6
April	7.5	1.8	30.5	1.12	34.1	70.6
May	13.9	4.7	62.9	1.22	76.8	81.0
June	19.4	7.8	93.1	1.28	119.2	69.1
July	22.5	9.7	110.9	1.25	138.6	75.3
August	21.4	9.0	104.5	1.16	121.3	82.0
September	16.9	6.3	79.2	1.04	82.4	83.1
October	10.4	3.0	44.7	0.92	41.2	71.9
November	4.4	0.8	16.3	0.81	13.2	84.9
December	-1.0	0.0	0.0	0.75	0.0	63.0
TOTALS		**43.4**	**545.0**		**629.5**	**863.0**

Notes: Daylight Correction values obtained from Instruction and Tables For Computing Potential Evapotranspiration and The Water Balance (Thornthwaite & Mather, 1957)

TABLE A-2

Pre-development Water Balance

Water Balance - 3171 Lakeshore Rd. W., Oakville, Ontario

Catchments and Hydrologic Components			Month												Total
			March	April	May	June	July	August	September	October	November	December	January	February	
		PET - Adjusted Potential Evapotranspiration (mm)	2.82	34.11	76.78	119.23	138.62	121.27	82.36	41.16	13.18	0.00	0.00	0.00	**629.53**
		P - Total Precipitation (mm)	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		P-PET (mm)	58.78	36.49	4.22	-50.13	-63.32	-39.27	0.74	30.74	71.72	63.00	66.00	54.50	-
		Soil Moisture Deficit (mm)	0.00	0.00	0.00	-50.13	-113.45	-152.72	-151.98	-121.24	-49.52	0.00	0.00	0.00	-
Catchment 101	lanscaped	**Soil Moisture Storage (mm)**	125.00	125.00	125.00	74.87	11.55	0.00	0.74	31.48	103.20	125.00	125.00	125.00	-
		Actual Potential Evapotranspiration (mm)	2.82	34.11	76.78	109.18	97.19	83.81	82.36	41.16	13.18	0.00	0.00	0.00	**540.59**
		P-AET (mm)	58.78	36.49	4.22	-40.08	-21.89	-1.81	0.74	30.74	71.72	63.00	66.00	54.50	-
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-40.08	-61.97	-63.78	-63.04	-32.31	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	40.08	21.89	1.81	-0.74	-30.74	-32.31	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	58.78	36.49	4.22	0.00	0.00	0.00	0.00	0.00	39.42	63.00	66.00	54.50	**322.41**
		MOECC Infiltration Factor	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	-
		Run-Off Coefficient	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	-
		Infiltration (mm)	32.33	20.07	2.32	0.00	0.00	0.00	0.00	0.00	21.68	34.65	36.30	29.98	**177.33**
		Run-Off (mm)	26.45	16.42	1.90	0.00	0.00	0.00	0.00	0.00	17.74	28.35	29.70	24.53	**145.08**
		Catchment Area* (m^2) = 1500.00	**Monthly Volumes**												
	Total AET (m^3)		4.23	51.17	115.17	163.77	145.78	125.72	123.55	61.74	19.76	0.00	0.00	0.00	**810.89**
	Total Evaporation (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Infiltration (m^3)		48.49	30.10	3.48	0.00	0.00	0.00	0.00	0.00	32.52	51.98	54.45	44.96	**265.99**
	Total Runoff (m^3)		39.68	24.63	2.85	0.00	0.00	0.00	0.00	0.00	26.61	42.53	44.55	36.79	**217.63**
	Existing Paved Area	**Precipitation (mm)**	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
		Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
		Evaporation (mm)	9.24	10.59	12.15	10.37	11.30	12.30	12.47	10.79	12.74	9.45	9.90	8.18	**129.45**
		Run-Off (mm)	52.36	60.01	68.85	58.74	64.01	69.70	70.64	61.12	72.17	53.55	56.10	46.33	**733.55**
		Catchment Area (m^2) = 400.00	**Monthly Volumes**												
	Total AET (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Evaporation (m^3)		3.70	4.24	4.86	4.15	4.52	4.92	4.99	4.31	5.09	3.78	3.96	3.27	**51.78**
	Total Infiltration (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Runoff (m^3)		20.94	24.00	27.54	23.49	25.60	27.88	28.25	24.45	28.87	21.42	22.44	18.53	**293.42**
	Existing Roof Area	**Precipitation (mm)**	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
		Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
		Evaporation (mm)	9.24	10.59	12.15	10.37	11.30	12.30	12.47	10.79	12.74	9.45	9.90	8.18	**129.45**
		Run-Off (mm)	52.36	60.01	68.85	58.74	64.01	69.70	70.64	61.12	72.17	53.55	56.10	46.33	**733.55**
		Catchment Area (m^2) = 100.00	**Monthly Volumes**												
	Total AET (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Evaporation (m^3)		0.92	1.06	1.22	1.04	1.13	1.23	1.25	1.08	1.27	0.95	0.99	0.82	**12.95**
	Total Infiltration (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Runoff (m^3)		5.24	6.00	6.89	5.87	6.40	6.97	7.06	6.11	7.22	5.36	5.61	4.63	**73.36**
	Catchment 101 Total Monthly Volumes														
	Total AET (m^3)		4.23	51.17	115.17	163.77	145.78	125.72	123.55	61.74	19.76	0.00	0.00	0.00	**810.89**
	Total Evaporation (m^3)		4.62	5.30	6.08	5.18	5.65	6.15	6.23	5.39	6.37	4.73	4.95	4.09	**64.73**
	Total Infiltration (m^3)		48.49	30.10	3.48	0.00	0.00	0.00	0.00	0.00	32.52	51.98	54.45	44.96	**265.99**
	Total Runoff (m^3)		65.86	54.63	37.28	29.37	32.00	34.85	35.32	30.56	62.69	69.30	72.60	59.95	**584.40**

TABLE A-2

Pre-development Water Balance

Water Balance - 3171 Lakeshore Rd. W., Oakville, Ontario

Catchments and Hydrologic Components			March	April	May	June	July	August	September	October	November	December	January	February	Total
			Month												
		PET - Adjusted Potential Evapotranspiration (mm)	2.82	34.11	76.78	119.23	138.62	121.27	82.36	41.16	13.18	0.00	0.00	0.00	**629.53**
		P - Total Precipitation (mm)	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		P-PET (mm)	58.78	36.49	4.22	-50.13	-63.32	-39.27	0.74	30.74	71.72	63.00	66.00	54.50	-
		Soil Moisture Deficit (mm)	0.00	0.00	0.00	-50.13	-113.45	-152.72	-151.98	-121.24	-49.52	0.00	0.00	0.00	-
Catchment 102	lanscaped	Soil Moisture Storage (mm)	125.00	125.00	125.00	74.87	11.55	0.00	0.74	31.48	103.20	125.00	125.00	125.00	-
		Actual Potential Evapotranspiration (mm)	2.82	34.11	76.78	109.18	97.19	83.81	82.36	41.16	13.18	0.00	0.00	0.00	**540.59**
		P-AET (mm)	58.78	36.49	4.22	-40.08	-21.89	-1.81	0.74	30.74	71.72	63.00	66.00	54.50	-
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-40.08	-61.97	-63.78	-63.04	-32.31	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	40.08	21.89	1.81	-0.74	-30.74	-32.31	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	58.78	36.49	4.22	0.00	0.00	0.00	0.00	0.00	39.42	63.00	66.00	54.50	**322.41**
		MOECC Infiltration Factor	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	-
		Run-Off Coefficient	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	-
		Infiltration (mm)	32.33	20.07	2.32	0.00	0.00	0.00	0.00	0.00	21.68	34.65	36.30	29.98	**177.33**
		Run-Off (mm)	26.45	16.42	1.90	0.00	0.00	0.00	0.00	0.00	17.74	28.35	29.70	24.53	**145.08**
		Catchment Area* (m^2) = 6600.00		0.60				Monthly Volumes							
	Total AET (m^3)		18.60	225.15	506.73	720.58	641.44	553.18	543.60	271.66	86.96	0.00	0.00	0.00	**3567.90**
	Total Evaporation (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Infiltration (m^3)		213.38	132.45	15.33	0.00	0.00	0.00	0.00	0.00	143.09	228.69	239.58	197.84	**1170.35**
	Total Runoff (m^3)		174.58	108.37	12.54	0.00	0.00	0.00	0.00	0.00	117.07	187.11	196.02	161.87	**957.56**
	Existing Paved Area	Precipitation (mm)	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
		Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
		Evaporation (mm)	9.24	10.59	12.15	10.37	11.30	12.30	12.47	10.79	12.74	9.45	9.90	8.18	**129.45**
		Run-Off (mm)	52.36	60.01	68.85	58.74	64.01	69.70	70.64	61.12	72.17	53.55	56.10	46.33	**733.55**
		Catchment Area (m^2) = 2700.00						Monthly Volumes							
	Total AET (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Evaporation (m^3)		24.95	28.59	32.81	27.99	30.50	33.21	33.66	29.12	34.38	25.52	26.73	22.07	**349.52**
	Total Infiltration (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Runoff (m^3)		141.37	162.03	185.90	158.58	172.81	188.19	190.71	165.01	194.85	144.59	151.47	125.08	**1980.59**
	Existing Roof Area	Precipitation (mm)	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
		Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
		Evaporation (mm)	9.24	10.59	12.15	10.37	11.30	12.30	12.47	10.79	12.74	9.45	9.90	8.18	**129.45**
		Run-Off (mm)	52.36	60.01	68.85	58.74	64.01	69.70	70.64	61.12	72.17	53.55	56.10	46.33	**733.55**
		Catchment Area (m^2) = 400.00						Monthly Volumes							
	Total AET (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Evaporation (m^3)		3.70	4.24	4.86	4.15	4.52	4.92	4.99	4.31	5.09	3.78	3.96	3.27	**51.78**
	Total Infiltration (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Runoff (m^3)		20.94	24.00	27.54	23.49	25.60	27.88	28.25	24.45	28.87	21.42	22.44	18.53	**293.42**
	Catchment 102 Total Monthly Volumes														
	Total AET (m^3)		18.60	225.15	506.73	720.58	641.44	553.18	543.60	271.66	86.96	0.00	0.00	0.00	**3567.90**
	Total Evaporation (m^3)		28.64	32.83	37.67	32.13	35.01	38.13	38.64	33.43	39.48	29.30	30.69	25.34	**401.30**
	Total Infiltration (m^3)		213.38	132.45	15.33	0.00	0.00	0.00	0.00	0.00	143.09	228.69	239.58	197.84	**1170.35**
	Total Runoff (m^3)		336.90	294.40	225.98	182.08	198.42	216.07	218.97	189.46	340.79	353.12	369.93	305.47	**3231.56**

GBS

TABLE A-3

Post-development Water Balance

Water Balance - 3171 Lakeshore Rd. W., Oakville, Ontario

Catchments and Hydrologic Components			Month												Total
			March	April	May	June	July	August	September	October	November	December	January	February	
		PET - Adjusted Potential Evapotranspiration (mm)	2.82	34.11	76.78	119.23	138.62	121.27	82.36	41.16	13.18	0.00	0.00	0.00	**629.53**
		P - Total Precipitation (mm)	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		P-PET (mm)	58.78	36.49	4.22	-50.13	-63.32	-39.27	0.74	30.74	71.72	63.00	66.00	54.50	-
		Soil Moisture Deficit (mm)	0.00	0.00	0.00	-50.13	-113.45	-152.72	-151.98	-121.24	-49.52	0.00	0.00	0.00	-
Catchment 201	lanscaped	**Soil Moisture Storage (mm)**	125.00	125.00	125.00	74.87	11.55	0.00	0.74	31.48	103.20	125.00	125.00	125.00	-
		Actual Potential Evapotranspiration (mm)	2.82	34.11	76.78	109.18	97.19	83.81	82.36	41.16	13.18	0.00	0.00	0.00	**540.59**
		P-AET (mm)	58.78	36.49	4.22	-40.08	-21.89	-1.81	0.74	30.74	71.72	63.00	66.00	54.50	-
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-40.08	-61.97	-63.78	-63.04	-32.31	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	40.08	21.89	1.81	-0.74	-30.74	-32.31	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	58.78	36.49	4.22	0.00	0.00	0.00	0.00	0.00	39.42	63.00	66.00	54.50	**322.41**
		MOECC Infiltration Factor	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	-
		Run-Off Coefficient	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	-
		Infiltration (mm)	32.33	20.07	2.32	0.00	0.00	0.00	0.00	0.00	21.68	34.65	36.30	29.98	**177.33**
		Run-Off (mm)	26.45	16.42	1.90	0.00	0.00	0.00	0.00	0.00	17.74	28.35	29.70	24.53	**145.08**
		Catchment Area* (m^2) = 800.00	**Monthly Volumes**												
	Total AET (m^3)		2.26	27.29	61.42	87.34	77.75	67.05	65.89	32.93	10.54	0.00	0.00	0.00	**432.47**
	Total Evaporation (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Infiltration (m^3)		25.86	16.05	1.86	0.00	0.00	0.00	0.00	0.00	17.34	27.72	29.04	23.98	**141.86**
	Total Runoff (m^3)		21.16	13.14	1.52	0.00	0.00	0.00	0.00	0.00	14.19	22.68	23.76	19.62	**116.07**
	Proposed Paved Area	**Precipitation (mm)**	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
		Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
		Evaporation (mm)	9.24	10.59	12.15	10.37	11.30	12.30	12.47	10.79	12.74	9.45	9.90	8.18	**129.45**
		Run-Off (mm)	52.36	60.01	68.85	58.74	64.01	69.70	70.64	61.12	72.17	53.55	56.10	46.33	**733.55**
		Catchment Area (m^2) = 900.00	**Monthly Volumes**												
	Total AET (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Evaporation (m^3)		8.32	9.53	10.94	9.33	10.17	11.07	11.22	9.71	11.46	8.51	8.91	7.36	**116.51**
	Total Infiltration (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Runoff (m^3)		47.12	54.01	61.97	52.86	57.60	62.73	63.57	55.00	64.95	48.20	50.49	41.69	**660.20**
	Proposed Roof Area	**Precipitation (mm)**	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
		Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
		Evaporation (mm)	9.24	10.59	12.15	10.37	11.30	12.30	12.47	10.79	12.74	9.45	9.90	8.18	**129.45**
		Run-Off (mm)	52.36	60.01	68.85	58.74	64.01	69.70	70.64	61.12	72.17	53.55	56.10	46.33	**733.55**
		Catchment Area (m^2) = 300.00	**Monthly Volumes**												
	Total AET (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Evaporation (m^3)		2.77	3.18	3.65	3.11	3.39	3.69	3.74	3.24	3.82	2.84	2.97	2.45	**38.84**
	Total Infiltration (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Runoff (m^3)		15.71	18.00	20.66	17.62	19.20	20.91	21.19	18.33	21.65	16.07	16.83	13.90	**220.07**
	Catchment 201 Total Monthly Volumes														
	Total AET (m^3)		2.26	27.29	61.42	87.34	77.75	67.05	65.89	32.93	10.54	0.00	0.00	0.00	**432.47**
	Total Evaporation (m^3)		11.09	12.71	14.58	12.44	13.55	14.76	14.96	12.94	15.28	11.34	11.88	9.81	**155.34**
	Total Infiltration (m^3)		25.86	16.05	1.86	0.00	0.00	0.00	0.00	0.00	17.34	27.72	29.04	23.98	**141.86**
	Total Runoff (m^3)		83.99	85.15	84.14	70.48	76.81	83.64	84.76	73.34	100.79	86.94	91.08	75.21	**996.33**

GBS

TABLE A-3

Post-development Water Balance

Water Balance - 3171 Lakeshore Rd. W., Oakville, Ontario

Catchments and Hydrologic Components			Month												Total
			March	April	May	June	July	August	September	October	November	December	January	February	
		PET - Adjusted Potential Evapotranspiration (mm)	2.82	34.11	76.78	119.23	138.62	121.27	82.36	41.16	13.18	0.00	0.00	0.00	**629.53**
		P - Total Precipitation (mm)	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		P-PET (mm)	58.78	36.49	4.22	-50.13	-63.32	-39.27	0.74	30.74	71.72	63.00	66.00	54.50	-
		Soil Moisture Deficit (mm)	0.00	0.00	0.00	-50.13	-113.45	-152.72	-151.98	-121.24	-49.52	0.00	0.00	0.00	-
Catchment 202	lanscaped	**Soil Moisture Storage (mm)**	125.00	125.00	125.00	74.87	11.55	0.00	0.74	31.48	103.20	125.00	125.00	125.00	-
		Actual Potential Evapotranspiration (mm)	2.82	34.11	76.78	109.18	97.19	83.81	82.36	41.16	13.18	0.00	0.00	0.00	**540.59**
		P-AET (mm)	58.78	36.49	4.22	-40.08	-21.89	-1.81	0.74	30.74	71.72	63.00	66.00	54.50	-
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-40.08	-61.97	-63.78	-63.04	-32.31	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	40.08	21.89	1.81	-0.74	-30.74	-32.31	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	58.78	36.49	4.22	0.00	0.00	0.00	0.00	0.00	39.42	63.00	66.00	54.50	**322.41**
		MOECC Infiltration Factor	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	-
		Run-Off Coefficient	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	-
		Infiltration (mm)	32.33	20.07	2.32	0.00	0.00	0.00	0.00	0.00	21.68	34.65	36.30	29.98	**177.33**
		Run-Off (mm)	26.45	16.42	1.90	0.00	0.00	0.00	0.00	0.00	17.74	28.35	29.70	24.53	**145.08**
		Catchment Area* (m^2) = 1400.00	0.60					**Monthly Volumes**							
	Total AET (m^3)		3.95	47.76	107.49	152.85	136.06	117.34	115.31	57.62	18.45	0.00	0.00	0.00	**756.83**
	Total Evaporation (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Infiltration (m^3)		45.26	28.09	3.25	0.00	0.00	0.00	0.00	0.00	30.35	48.51	50.82	41.97	**248.26**
	Total Runoff (m^3)		37.03	22.99	2.66	0.00	0.00	0.00	0.00	0.00	24.83	39.69	41.58	34.34	**203.12**
	Proposed Paved Area	**Precipitation (mm)**	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
		Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
		Evaporation (mm)	9.24	10.59	12.15	10.37	11.30	12.30	12.47	10.79	12.74	9.45	9.90	8.18	**129.45**
		Run-Off (mm)	52.36	60.01	68.85	58.74	64.01	69.70	70.64	61.12	72.17	53.55	56.10	46.33	**733.55**
		Catchment Area (m^2) = 400.00						**Monthly Volumes**							
	Total AET (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Evaporation (m^3)		3.70	4.24	4.86	4.15	4.52	4.92	4.99	4.31	5.09	3.78	3.96	3.27	**51.78**
	Total Infiltration (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Runoff (m^3)		20.94	24.00	27.54	23.49	25.60	27.88	28.25	24.45	28.87	21.42	22.44	18.53	**293.42**
	Proposed Roof Area	**Precipitation (mm)**	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
		Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
		Evaporation (mm)	9.24	10.59	12.15	10.37	11.30	12.30	12.47	10.79	12.74	9.45	9.90	8.18	**129.45**
		Run-Off (mm)	52.36	60.01	68.85	58.74	64.01	69.70	70.64	61.12	72.17	53.55	56.10	46.33	**733.55**
		Catchment Area (m^2) = 600.00						**Monthly Volumes**							
	Total AET (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Evaporation (m^3)		5.54	6.35	7.29	6.22	6.78	7.38	7.48	6.47	7.64	5.67	5.94	4.91	**77.67**
	Total Infiltration (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Runoff (m^3)		31.42	36.01	41.31	35.24	38.40	41.82	42.38	36.67	43.30	32.13	33.66	27.80	**440.13**
	Catchment 202 Total Monthly Volumes														
	Total AET (m^3)		3.95	47.76	107.49	152.85	136.06	117.34	115.31	57.62	18.45	0.00	0.00	0.00	**756.83**
	Total Evaporation (m^3)		9.24	10.59	12.15	10.37	11.30	12.30	12.47	10.79	12.74	9.45	9.90	8.18	**129.45**
	Total Infiltration (m^3)		45.26	28.09	3.25	0.00	0.00	0.00	0.00	0.00	30.35	48.51	50.82	41.97	**248.26**
	Total Runoff (m^3)		89.39	83.00	71.51	58.74	64.01	69.70	70.64	61.12	97.00	93.24	97.68	80.66	**936.67**

GBS

TABLE A-3

Post-development Water Balance

Water Balance - 3171 Lakeshore Rd. W., Oakville, Ontario

Catchments and Hydrologic Components			Month												Total
			March	April	May	June	July	August	September	October	November	December	January	February	
		PET - Adjusted Potential Evapotranspiration (mm)	2.82	34.11	76.78	119.23	138.62	121.27	82.36	41.16	13.18	0.00	0.00	0.00	**629.53**
		P - Total Precipitation (mm)	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		P-PET (mm)	58.78	36.49	4.22	-50.13	-63.32	-39.27	0.74	30.74	71.72	63.00	66.00	54.50	-
		Soil Moisture Deficit (mm)	0.00	0.00	0.00	-50.13	-113.45	-152.72	-151.98	-121.24	-49.52	0.00	0.00	0.00	-
Catchment 203	lanscaped	**Soil Moisture Storage (mm)**	125.00	125.00	125.00	74.87	11.55	0.00	0.74	31.48	103.20	125.00	125.00	125.00	-
		Actual Potential Evapotranspiration (mm)	2.82	34.11	76.78	109.18	97.19	83.81	82.36	41.16	13.18	0.00	0.00	0.00	**540.59**
		P-AET (mm)	58.78	36.49	4.22	-40.08	-21.89	-1.81	0.74	30.74	71.72	63.00	66.00	54.50	-
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-40.08	-61.97	-63.78	-63.04	-32.31	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	40.08	21.89	1.81	-0.74	-30.74	-32.31	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	58.78	36.49	4.22	0.00	0.00	0.00	0.00	0.00	39.42	63.00	66.00	54.50	**322.41**
		MOECC Infiltration Factor	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	-
		Run-Off Coefficient	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	-
		Infiltration (mm)	32.33	20.07	2.32	0.00	0.00	0.00	0.00	0.00	21.68	34.65	36.30	29.98	**177.33**
		Run-Off (mm)	26.45	16.42	1.90	0.00	0.00	0.00	0.00	0.00	17.74	28.35	29.70	24.53	**145.08**
		Catchment Area* (m^2) = 2100.00	**Monthly Volumes**												
	Total AET (m^3)		5.92	71.64	161.23	229.27	204.09	176.01	172.96	86.44	27.67	0.00	0.00	0.00	**1135.24**
	Total Evaporation (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Infiltration (m^3)		67.89	42.14	4.88	0.00	0.00	0.00	0.00	0.00	45.53	72.77	76.23	62.95	**372.38**
	Total Runoff (m^3)		55.55	34.48	3.99	0.00	0.00	0.00	0.00	0.00	37.25	59.54	62.37	51.50	**304.68**
	Proposed Paved Area	**Precipitation (mm)**	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
		Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
		Evaporation (mm)	9.24	10.59	12.15	10.37	11.30	12.30	12.47	10.79	12.74	9.45	9.90	8.18	**129.45**
		Run-Off (mm)	52.36	60.01	68.85	58.74	64.01	69.70	70.64	61.12	72.17	53.55	56.10	46.33	**733.55**
		Catchment Area (m^2) = 2400.00	**Monthly Volumes**												
	Total AET (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Evaporation (m^3)		22.18	25.42	29.16	24.88	27.11	29.52	29.92	25.88	30.56	22.68	23.76	19.62	**310.68**
	Total Infiltration (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Runoff (m^3)		125.66	144.02	165.24	140.96	153.61	167.28	169.52	146.68	173.20	128.52	134.64	111.18	**1760.52**
	Proposed Roof Area	**Precipitation (mm)**	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
		Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
		Evaporation (mm)	9.24	10.59	12.15	10.37	11.30	12.30	12.47	10.79	12.74	9.45	9.90	8.18	**129.45**
		Run-Off (mm)	52.36	60.01	68.85	58.74	64.01	69.70	70.64	61.12	72.17	53.55	56.10	46.33	**733.55**
		Catchment Area (m^2) = 2200.00	**Monthly Volumes**												
	Total AET (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Evaporation (m^3)		20.33	23.30	26.73	22.80	24.85	27.06	27.42	23.73	28.02	20.79	21.78	17.99	**284.79**
	Total Infiltration (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Runoff (m^3)		115.19	132.02	151.47	129.22	140.81	153.34	155.40	134.45	158.76	117.81	123.42	101.92	**1613.81**
	Catchment 203 Total Monthly Volumes														
	Total AET (m^3)		5.92	71.64	161.23	229.27	204.09	176.01	172.96	86.44	27.67	0.00	0.00	0.00	**1135.24**
	Total Evaporation (m^3)		42.50	48.71	55.89	47.68	51.96	56.58	57.34	49.61	58.58	43.47	45.54	37.61	**595.47**
	Total Infiltration (m^3)		67.89	42.14	4.88	0.00	0.00	0.00	0.00	0.00	45.53	72.77	76.23	62.95	**372.38**
	Total Runoff (m^3)		296.40	310.53	320.70	270.18	294.42	320.62	324.92	281.13	369.21	305.87	320.43	264.60	**3679.01**

TABLE A-3

Post-development Water Balance

Water Balance - 3171 Lakeshore Rd. W., Oakville, Ontario

Catchments and Hydrologic Components			March	April	May	June	July	August	September	October	November	December	January	February	Total
			Month												
		PET - Adjusted Potential Evapotranspiration (mm)	2.82	34.11	76.78	119.23	138.62	121.27	82.36	41.16	13.18	0.00	0.00	0.00	**629.53**
		P - Total Precipitation (mm)	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		P-PET (mm)	58.78	36.49	4.22	-50.13	-63.32	-39.27	0.74	30.74	71.72	63.00	66.00	54.50	-
		Soil Moisture Deficit (mm)	0.00	0.00	0.00	-50.13	-113.45	-152.72	-151.98	-121.24	-49.52	0.00	0.00	0.00	-
Catchment 204	lanscaped	Soil Moisture Storage (mm)	125.00	125.00	125.00	74.87	11.55	0.00	0.74	31.48	103.20	125.00	125.00	125.00	-
Catchment 204	lanscaped	Actual Potential Evapotranspiration (mm)	2.82	34.11	76.78	109.18	97.19	83.81	82.36	41.16	13.18	0.00	0.00	0.00	**540.59**
Catchment 204	lanscaped	P-AET (mm)	58.78	36.49	4.22	-40.08	-21.89	-1.81	0.74	30.74	71.72	63.00	66.00	54.50	-
Catchment 204	lanscaped	Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-40.08	-61.97	-63.78	-63.04	-32.31	0.00	0.00	0.00	0.00	-
Catchment 204	lanscaped	Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	40.08	21.89	1.81	-0.74	-30.74	-32.31	0.00	0.00	0.00	-
Catchment 204	lanscaped	Precipitation Surplus (mm)	58.78	36.49	4.22	0.00	0.00	0.00	0.00	0.00	39.42	63.00	66.00	54.50	**322.41**
Catchment 204	lanscaped	MOECC Infiltration Factor	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	-
Catchment 204	lanscaped	Run-Off Coefficient	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	-
Catchment 204	lanscaped	Infiltration (mm)	32.33	20.07	2.32	0.00	0.00	0.00	0.00	0.00	21.68	34.65	36.30	29.98	**177.33**
Catchment 204	lanscaped	Run-Off (mm)	26.45	16.42	1.90	0.00	0.00	0.00	0.00	0.00	17.74	28.35	29.70	24.53	**145.08**
Catchment 204		Catchment Area* (m^2) = 400.00	**Monthly Volumes**												
Catchment 204	Total AET (m^3)		1.13	13.65	30.71	43.67	38.88	33.53	32.95	16.46	5.27	0.00	0.00	0.00	**216.24**
Catchment 204	Total Evaporation (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Catchment 204	Total Infiltration (m^3)		12.93	8.03	0.93	0.00	0.00	0.00	0.00	0.00	8.67	13.86	14.52	11.99	**70.93**
Catchment 204	Total Runoff (m^3)		10.58	6.57	0.76	0.00	0.00	0.00	0.00	0.00	7.10	11.34	11.88	9.81	**58.03**
Catchment 204	Proposed Paved Area	Precipitation (mm)	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
Catchment 204	Proposed Paved Area	Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
Catchment 204	Proposed Paved Area	Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
Catchment 204	Proposed Paved Area	Evaporation (mm)	9.24	10.59	12.15	10.37	11.30	12.30	12.47	10.79	12.74	9.45	9.90	8.18	**129.45**
Catchment 204	Proposed Paved Area	Run-Off (mm)	52.36	60.01	68.85	58.74	64.01	69.70	70.64	61.12	72.17	53.55	56.10	46.33	**733.55**
Catchment 204		Catchment Area (m^2) = 0.00	**Monthly Volumes**												
Catchment 204	Total AET (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Catchment 204	Total Evaporation (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Catchment 204	Total Infiltration (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Catchment 204	Total Runoff (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Catchment 204	Proposed Roof Area	Precipitation (mm)	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
Catchment 204	Proposed Roof Area	Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
Catchment 204	Proposed Roof Area	Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
Catchment 204	Proposed Roof Area	Evaporation (mm)	9.24	10.59	12.15	10.37	11.30	12.30	12.47	10.79	12.74	9.45	9.90	8.18	**129.45**
Catchment 204	Proposed Roof Area	Run-Off (mm)	52.36	60.01	68.85	58.74	64.01	69.70	70.64	61.12	72.17	53.55	56.10	46.33	**733.55**
Catchment 204		Catchment Area (m^2) = 200.00	**Monthly Volumes**												
Catchment 204	Total AET (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Catchment 204	Total Evaporation (m^3)		1.85	2.12	2.43	2.07	2.26	2.46	2.49	2.16	2.55	1.89	1.98	1.64	**25.89**
Catchment 204	Total Infiltration (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Catchment 204	Total Runoff (m^3)		10.47	12.00	13.77	11.75	12.80	13.94	14.13	12.22	14.43	10.71	11.22	9.27	**146.71**
Catchment 204	**Catchment 204 Total Monthly Volumes**														
Catchment 204	Total AET (m^3)		1.13	13.65	30.71	43.67	38.88	33.53	32.95	16.46	5.27	0.00	0.00	0.00	**216.24**
Catchment 204	Total Evaporation (m^3)		1.85	2.12	2.43	2.07	2.26	2.46	2.49	2.16	2.55	1.89	1.98	1.64	**25.89**
Catchment 204	Total Infiltration (m^3)		12.93	8.03	0.93	0.00	0.00	0.00	0.00	0.00	8.67	13.86	14.52	11.99	**70.93**
Catchment 204	Total Runoff (m^3)		21.05	18.57	14.53	11.75	12.80	13.94	14.13	12.22	21.53	22.05	23.10	19.08	**204.74**

GBS

TABLE A-4

Post-development Water Balance With Mitigation

Water Balance - 3171 Lakeshore Rd. W., Oakville, Ontario

Catchments and Hydrologic Components			Month												Total
			March	April	May	June	July	August	September	October	November	December	January	February	
		PET - Adjusted Potential Evapotranspiration (mm)	2.82	34.11	76.78	119.23	138.62	121.27	82.36	41.16	13.18	0.00	0.00	0.00	**629.53**
		P - Total Precipitation (mm)	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		P-PET (mm)	58.78	36.49	4.22	-50.13	-63.32	-39.27	0.74	30.74	71.72	63.00	66.00	54.50	-
		Soil Moisture Deficit (mm)	0.00	0.00	0.00	-50.13	-113.45	-152.72	-151.98	-121.24	-49.52	0.00	0.00	0.00	-
Catchment 201	lanscaped	Soil Moisture Storage (mm)	125.00	125.00	125.00	74.87	11.55	0.00	0.74	31.48	103.20	125.00	125.00	125.00	-
		Actual Potential Evapotranspiration (mm)	2.82	34.11	76.78	109.18	97.19	83.81	82.36	41.16	13.18	0.00	0.00	0.00	**540.59**
		P-AET (mm)	58.78	36.49	4.22	-40.08	-21.89	-1.81	0.74	30.74	71.72	63.00	66.00	54.50	-
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-40.08	-61.97	-63.78	-63.04	-32.31	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	40.08	21.89	1.81	-0.74	-30.74	-32.31	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	58.78	36.49	4.22	0.00	0.00	0.00	0.00	0.00	39.42	63.00	66.00	54.50	**322.41**
		MOECC Infiltration Factor	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	-
		Run-Off Coefficient	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	-
		Infiltration (mm)	32.33	20.07	2.32	0.00	0.00	0.00	0.00	0.00	21.68	34.65	36.30	29.98	**177.33**
		Run-Off (mm)	26.45	16.42	1.90	0.00	0.00	0.00	0.00	0.00	17.74	28.35	29.70	24.53	**145.08**
		Catchment Area* (m^2) = 800.00	**Monthly Volumes**												
	AET Volume (m^3)		2.26	27.29	61.42	87.34	77.75	67.05	65.89	32.93	10.54	0.00	0.00	0.00	**432.47**
	Total Evaporation (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Infiltration (m^3)		25.86	16.05	1.86	0.00	0.00	0.00	0.00	0.00	17.34	27.72	29.04	23.98	**141.86**
	Total Runoff (m^3)		21.16	13.14	1.52	0.00	0.00	0.00	0.00	0.00	14.19	22.68	23.76	19.62	**116.07**
	Proposed Paved Area	Precipitation (mm)	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
		Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
		Evaporation (mm)	9.24	10.59	12.15	10.37	11.30	12.30	12.47	10.79	12.74	9.45	9.90	8.18	**129.45**
		Run-Off (mm)	52.36	60.01	68.85	58.74	64.01	69.70	70.64	61.12	72.17	53.55	56.10	46.33	**733.55**
		Catchment Area (m^2) = 900.00	**Monthly Volumes**												
	Total AET (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Evaporation (m^3)		8.32	9.53	10.94	9.33	10.17	11.07	11.22	9.71	11.46	8.51	8.91	7.36	**116.51**
	Facility Infiltration (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Runoff (m^3)		47.12	54.01	61.97	52.86	57.60	62.73	63.57	55.00	64.95	48.20	50.49	41.69	**660.20**
	Proposed Roof Area	Precipitation (mm)	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
		Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
		Evaporation (mm)	9.24	10.59	12.15	10.37	11.30	12.30	12.47	10.79	12.74	9.45	9.90	8.18	**129.45**
		Run-Off (mm)	52.36	60.01	68.85	58.74	64.01	69.70	70.64	61.12	72.17	53.55	56.10	46.33	**733.55**
		Catchment Area (m^2) = 300.00	**Monthly Volumes**												
	Total AET (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Evaporation (m^3)		2.77	3.18	3.65	3.11	3.39	3.69	3.74	3.24	3.82	2.84	2.97	2.45	**38.84**
	Facility Infiltration (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Runoff (m^3)		15.71	18.00	20.66	17.62	19.20	20.91	21.19	18.33	21.65	16.07	16.83	13.90	**220.07**
	Catchment 201 Total Monthly Volumes														
	Total AET (m^3)		2.26	27.29	61.42	87.34	77.75	67.05	65.89	32.93	10.54	0.00	0.00	0.00	**432.47**
	Total Evaporation (m^3)		11.09	12.71	14.58	12.44	13.55	14.76	14.96	12.94	15.28	11.34	11.88	9.81	**155.34**
	Total Infiltration (m^3)		25.86	16.05	1.86	0.00	0.00	0.00	0.00	0.00	17.34	27.72	29.04	23.98	**141.86**
	Total Runoff (m^3)		83.99	85.15	84.14	70.48	76.81	83.64	84.76	73.34	100.79	86.94	91.08	75.21	**996.33**

GBS

TABLE A-4

Post-development Water Balance With Mitigation

Water Balance - 3171 Lakeshore Rd. W., Oakville, Ontario

Catchments and Hydrologic Components			Month												Total
			March	April	May	June	July	August	September	October	November	December	January	February	
		PET - Adjusted Potential Evapotranspiration (mm)	2.82	34.11	76.78	119.23	138.62	121.27	82.36	41.16	13.18	0.00	0.00	0.00	**629.53**
		P - Total Precipitation (mm)	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		P-PET (mm)	58.78	36.49	4.22	-50.13	-63.32	-39.27	0.74	30.74	71.72	63.00	66.00	54.50	-
		Soil Moisture Deficit (mm)	0.00	0.00	0.00	-50.13	-113.45	-152.72	-151.98	-121.24	-49.52	0.00	0.00	0.00	-
Catchment 202	lanscaped	Soil Moisture Storage (mm)	125.00	125.00	125.00	74.87	11.55	0.00	0.74	31.48	103.20	125.00	125.00	125.00	-
	lanscaped	Actual Potential Evapotranspiration (mm)	2.82	34.11	76.78	109.18	97.19	83.81	82.36	41.16	13.18	0.00	0.00	0.00	**540.59**
	lanscaped	P-AET (mm)	58.78	36.49	4.22	-40.08	-21.89	-1.81	0.74	30.74	71.72	63.00	66.00	54.50	-
	lanscaped	Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-40.08	-61.97	-63.78	-63.04	-32.31	0.00	0.00	0.00	0.00	-
	lanscaped	Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	40.08	21.89	1.81	-0.74	-30.74	-32.31	0.00	0.00	0.00	-
	lanscaped	Precipitation Surplus (mm)	58.78	36.49	4.22	0.00	0.00	0.00	0.00	0.00	39.42	63.00	66.00	54.50	**322.41**
	lanscaped	MOECC Infiltration Factor	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	-
	lanscaped	Run-Off Coefficient	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	-
	lanscaped	Infiltration (mm)	32.33	20.07	2.32	0.00	0.00	0.00	0.00	0.00	21.68	34.65	36.30	29.98	**177.33**
	lanscaped	Run-Off (mm)	26.45	16.42	1.90	0.00	0.00	0.00	0.00	0.00	17.74	28.35	29.70	24.53	**145.08**
		Catchment Area* (m^2) = 1400.00	**Monthly Volumes**												
	Total AET (m^3)		3.95	47.76	107.49	152.85	136.06	117.34	115.31	57.62	18.45	0.00	0.00	0.00	**756.83**
	Total Evaporation (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Infiltration (m^3)		45.26	28.09	3.25	0.00	0.00	0.00	0.00	0.00	30.35	48.51	50.82	41.97	**248.26**
	Total Runoff (m^3)		37.03	22.99	2.66	0.00	0.00	0.00	0.00	0.00	24.83	39.69	41.58	34.34	**203.12**
	Proposed Paved Area	Precipitation (mm)	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
	Proposed Paved Area	Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
	Proposed Paved Area	Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
	Proposed Paved Area	Evaporation (mm)	9.24	10.59	12.15	10.37	11.30	12.30	12.47	10.79	12.74	9.45	9.90	8.18	**129.45**
	Proposed Paved Area	Run-Off (mm)	52.36	60.01	68.85	58.74	64.01	69.70	70.64	61.12	72.17	53.55	56.10	46.33	**733.55**
		Catchment Area (m^2) = 400.00	**Monthly Volumes**												
	Total AET (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Evaporation (m^3)		3.70	4.24	4.86	4.15	4.52	4.92	4.99	4.31	5.09	3.78	3.96	3.27	**51.78**
	Total Infiltration (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Runoff (m^3)		20.94	24.00	27.54	23.49	25.60	27.88	28.25	24.45	28.87	21.42	22.44	18.53	**293.42**
	Proposed Roof Area	Precipitation (mm)	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
	Proposed Roof Area	Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
	Proposed Roof Area	Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
	Proposed Roof Area	Evaporation (mm)	9.24	10.59	12.15	10.37	11.30	12.30	12.47	10.79	12.74	9.45	9.90	8.18	**129.45**
	Proposed Roof Area	Run-Off (mm)	52.36	60.01	68.85	58.74	64.01	69.70	70.64	61.12	72.17	53.55	56.10	46.33	**733.55**
		Catchment Area (m^2) = 600.00	**Monthly Volumes**												
	Total AET (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Evaporation (m^3)		5.54	6.35	7.29	6.22	6.78	7.38	7.48	6.47	7.64	5.67	5.94	4.91	**77.67**
	Total Infiltration (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Runoff (m^3)		31.42	36.01	41.31	35.24	38.40	41.82	42.38	36.67	43.30	32.13	33.66	27.80	**440.13**
	Catchment 202 Total Monthly Volumes														
	Total AET (m^3)		3.95	47.76	107.49	152.85	136.06	117.34	115.31	57.62	18.45	0.00	0.00	0.00	**756.83**
	Total Evaporation (m^3)		9.24	10.59	12.15	10.37	11.30	12.30	12.47	10.79	12.74	9.45	9.90	8.18	**129.45**
	Total Infiltration (m^3)		45.26	28.09	3.25	0.00	0.00	0.00	0.00	0.00	30.35	48.51	50.82	41.97	**248.26**
	Total Runoff (m^3)		89.39	83.00	71.51	58.74	64.01	69.70	70.64	61.12	97.00	93.24	97.68	80.66	**936.67**

GBS

TABLE A-4

Post-development Water Balance With Mitigation

Water Balance - 3171 Lakeshore Rd. W., Oakville, Ontario

Catchments and Hydrologic Components			March	April	May	June	July	August	September	October	November	December	January	February	Total
			Month												
		PET - Adjusted Potential Evapotranspiration (mm)	2.82	34.11	76.78	119.23	138.62	121.27	82.36	41.16	13.18	0.00	0.00	0.00	**629.53**
		P - Total Precipitation (mm)	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		P-PET (mm)	58.78	36.49	4.22	-50.13	-63.32	-39.27	0.74	30.74	71.72	63.00	66.00	54.50	-
		Soil Moisture Deficit (mm)	0.00	0.00	0.00	-50.13	-113.45	-152.72	-151.98	-121.24	-49.52	0.00	0.00	0.00	-
Catchment 203	lanscaped	Soil Moisture Storage (mm)	125.00	125.00	125.00	74.87	11.55	0.00	0.74	31.48	103.20	125.00	125.00	125.00	-
		Actual Potential Evapotranspiration (mm)	2.82	34.11	76.78	109.18	97.19	83.81	82.36	41.16	13.18	0.00	0.00	0.00	**540.59**
		P-AET (mm)	58.78	36.49	4.22	-40.08	-21.89	-1.81	0.74	30.74	71.72	63.00	66.00	54.50	-
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-40.08	-61.97	-63.78	-63.04	-32.31	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	40.08	21.89	1.81	-0.74	-30.74	-32.31	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	58.78	36.49	4.22	0.00	0.00	0.00	0.00	0.00	39.42	63.00	66.00	54.50	**322.41**
		MOECC Infiltration Factor	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	-
		Run-Off Coefficient	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	-
		Infiltration (mm)	32.33	20.07	2.32	0.00	0.00	0.00	0.00	0.00	21.68	34.65	36.30	29.98	**177.33**
		Run-Off (mm)	26.45	16.42	1.90	0.00	0.00	0.00	0.00	0.00	17.74	28.35	29.70	24.53	**145.08**
		Catchment Area* (m^2) = 2100.00	Monthly Volumes												
	Total AET (m^3)		5.92	71.64	161.23	229.27	204.09	176.01	172.96	86.44	27.67	0.00	0.00	0.00	**1135.24**
	Total Evaporation (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Infiltration (m^3)		67.89	42.14	4.88	0.00	0.00	0.00	0.00	0.00	45.53	72.77	76.23	62.95	**372.38**
	Total Runoff (m^3)		55.55	34.48	3.99	0.00	0.00	0.00	0.00	0.00	37.25	59.54	62.37	51.50	**304.68**
	Proposed Paved Area	Precipitation (mm)	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
		Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
		Evaporation (mm)	9.24	10.59	12.15	10.37	11.30	12.30	12.47	10.79	12.74	9.45	9.90	8.18	**129.45**
		Run-Off (mm)	52.36	60.01	68.85	58.74	64.01	69.70	70.64	61.12	72.17	53.55	56.10	46.33	**733.55**
		Catchment Area (m^2) = 2140.00	Monthly Volumes												
	Total AET (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Evaporation (m^3)		19.77	22.66	26.00	22.18	24.17	26.32	26.68	23.08	27.25	20.22	21.19	17.49	**277.02**
	Total Infiltration (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Runoff (m^3)		112.05	128.42	147.34	125.69	136.97	149.16	151.16	130.79	154.43	114.60	120.05	99.14	**1569.80**
	Proposed Pervious Paved Area	Precipitation (mm)	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
		Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
		Evaporation (mm)	9.24	10.59	12.15	10.37	11.30	12.30	12.47	10.79	12.74	9.45	9.90	8.18	**129.45**
		Run-Off (mm)	52.36	60.01	68.85	58.74	64.01	69.70	70.64	61.12	72.17	53.55	56.10	46.33	**733.55**
		Catchment Area (m^2) = 260.00	Infiltration Efficiency 94.00%		Monthly Volumes										
	Total AET (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Evaporation (m^3)		2.40	2.75	3.16	2.69	2.94	3.20	3.24	2.80	3.31	2.46	2.57	2.13	**33.66**
	Total Infiltration (m^3)		12.80	14.67	16.83	14.35	15.64	17.03	17.26	14.94	17.64	13.09	13.71	11.32	**179.28**
	Total Runoff (m^3)		0.82	0.94	1.07	0.92	1.00	1.09	1.10	0.95	1.13	0.84	0.88	0.72	**11.44**
	Proposed Roof Area	Precipitation (mm)	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
		Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
		Evaporation (mm)	9.24	10.59	12.15	10.37	11.30	12.30	12.47	10.79	12.74	9.45	9.90	8.18	**129.45**
		Run-Off (mm)	52.36	60.01	68.85	58.74	64.01	69.70	70.64	61.12	72.17	53.55	56.10	46.33	**733.55**
		Catchment Area (m^2) = 2200.00	Monthly Volumes												
	Total AET (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Evaporation (m^3)		20.33	23.30	26.73	22.80	24.85	27.06	27.42	23.73	28.02	20.79	21.78	17.99	**284.79**
	Total Infiltration (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Runoff (m^3)		115.19	132.02	151.47	129.22	140.81	153.34	155.40	134.45	158.76	117.81	123.42	101.92	**1613.81**
	Catchment 203 Total Monthly Volumes														
	Total AET (m^3)		5.92	71.64	161.23	229.27	204.09	176.01	172.96	86.44	27.67	0.00	0.00	0.00	**1135.24**
	Total Evaporation (m^3)		42.50	48.71	55.89	47.68	51.96	56.58	57.34	49.61	58.58	43.47	45.54	37.61	**595.47**
	Total Infiltration (m^3)		80.69	56.81	21.70	14.35	15.64	17.03	17.26	14.94	63.17	85.85	89.94	74.27	**551.66**
	Total Runoff (m^3)		283.61	295.86	303.87	255.83	278.78	303.59	307.66	266.19	351.57	292.78	306.72	253.28	**3499.73**

TABLE A-4

Post-development Water Balance With Mitigation

Water Balance - 3171 Lakeshore Rd. W., Oakville, Ontario

Catchments and Hydrologic Components			Month												Total
			March	April	May	June	July	August	September	October	November	December	January	February	
		PET - Adjusted Potential Evapotranspiration (mm)	2.82	34.11	76.78	119.23	138.62	121.27	82.36	41.16	13.18	0.00	0.00	0.00	**629.53**
		P - Total Precipitation (mm)	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		P-PET (mm)	58.78	36.49	4.22	-50.13	-63.32	-39.27	0.74	30.74	71.72	63.00	66.00	54.50	-
		Soil Moisture Deficit (mm)	0.00	0.00	0.00	-50.13	-113.45	-152.72	-151.98	-121.24	-49.52	0.00	0.00	0.00	-
Catchment 204	lanscaped	Soil Moisture Storage (mm)	125.00	125.00	125.00	74.87	11.55	0.00	0.74	31.48	103.20	125.00	125.00	125.00	-
		Actual Potential Evapotranspiration (mm)	2.82	34.11	76.78	109.18	97.19	83.81	82.36	41.16	13.18	0.00	0.00	0.00	**540.59**
		P-AET (mm)	58.78	36.49	4.22	-40.08	-21.89	-1.81	0.74	30.74	71.72	63.00	66.00	54.50	-
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-40.08	-61.97	-63.78	-63.04	-32.31	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	40.08	21.89	1.81	-0.74	-30.74	-32.31	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	58.78	36.49	4.22	0.00	0.00	0.00	0.00	0.00	39.42	63.00	66.00	54.50	**322.41**
		MOECC Infiltration Factor	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	-
		Run-Off Coefficient	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	-
		Infiltration (mm)	32.33	20.07	2.32	0.00	0.00	0.00	0.00	0.00	21.68	34.65	36.30	29.98	**177.33**
		Run-Off (mm)	26.45	16.42	1.90	0.00	0.00	0.00	0.00	0.00	17.74	28.35	29.70	24.53	**145.08**
		Catchment Area* (m^2) = 400.00	Monthly Volumes												
	Total AET (m^3)		1.13	13.65	30.71	43.67	38.88	33.53	32.95	16.46	5.27	0.00	0.00	0.00	**216.24**
	Total Evaporation (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Infiltration (m^3)		12.93	8.03	0.93	0.00	0.00	0.00	0.00	0.00	8.67	13.86	14.52	11.99	**70.93**
	Total Runoff (m^3)		10.58	6.57	0.76	0.00	0.00	0.00	0.00	0.00	7.10	11.34	11.88	9.81	**58.03**
	Proposed Paved Area	Precipitation (mm)	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
		Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
		Evaporation (mm)	9.24	10.59	12.15	10.37	11.30	12.30	12.47	10.79	12.74	9.45	9.90	8.18	**129.45**
		Run-Off (mm)	52.36	60.01	68.85	58.74	64.01	69.70	70.64	61.12	72.17	53.55	56.10	46.33	**733.55**
		Catchment Area (m^2) = 0.00	Monthly Volumes												
	Total AET (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Evaporation (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Infiltration (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Runoff (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Proposed Roof Area	Precipitation (mm)	61.60	70.60	81.00	69.10	75.30	82.00	83.10	71.90	84.90	63.00	66.00	54.50	**863.00**
		Evaporation Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
		Run-Off Coefficient	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	-
		Evaporation (mm)	9.24	10.59	12.15	10.37	11.30	12.30	12.47	10.79	12.74	9.45	9.90	8.18	**129.45**
		Run-Off (mm)	52.36	60.01	68.85	58.74	64.01	69.70	70.64	61.12	72.17	53.55	56.10	46.33	**733.55**
		Catchment Area (m^2) = 200.00	Monthly Volumes												
	Total AET (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Evaporation (m^3)		1.85	2.12	2.43	2.07	2.26	2.46	2.49	2.16	2.55	1.89	1.98	1.64	**25.89**
	Total Infiltration (m^3)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Total Runoff (m^3)		10.47	12.00	13.77	11.75	12.80	13.94	14.13	12.22	14.43	10.71	11.22	9.27	**146.71**
	Catchment 204 Total Monthly Volumes														
	Total AET (m^3)		1.13	13.65	30.71	43.67	38.88	33.53	32.95	16.46	5.27	0.00	0.00	0.00	**216.24**
	Total Evaporation (m^3)		1.85	2.12	2.43	2.07	2.26	2.46	2.49	2.16	2.55	1.89	1.98	1.64	**25.89**
	Total Infiltration (m^3)		12.93	8.03	0.93	0.00	0.00	0.00	0.00	0.00	8.67	13.86	14.52	11.99	**70.93**
	Total Runoff (m^3)		21.05	18.57	14.53	11.75	12.80	13.94	14.13	12.22	21.53	22.05	23.10	19.08	**204.74**

GBS

TABLE A-5
Site Water Balance Summary
Water Balance - 3171 Lakeshore Rd. W., Oakville, Ontario

Total Site	Month												Total
	March	April	May	June	July	August	September	October	November	December	January	February	
Pre-Development													
Total AET (m^3)	23	276	622	884	787	679	667	333	107	0	0	0	**4379**
Total ET (m^3)	33	38	44	37	41	44	45	39	46	34	36	29	**466**
Total Infiltration (m^3)	262	163	19	0	0	0	0	0	176	281	294	243	**1436**
Total Runoff (m^3)	403	349	263	211	230	251	254	220	403	422	443	365	**3816**
Post-Development without Mitigation													
Total AET (m^3)	13	160	361	513	457	394	387	193	62	0	0	0	**2541**
Total ET (m^3)	65	74	85	73	79	86	87	75	89	66	69	57	**906**
Total Infiltration (m^3)	152	94	11	0	0	0	0	0	102	163	171	141	**833**
Total Runoff (m^3)	491	497	491	411	448	488	494	428	589	508	532	440	**5817**
Post-Development with Mitigation													
Total AET (m^3)	13	160	361	513	457	394	387	193	62	0	0	0	**2541**
Total ET (m^3)	65	74	85	73	79	86	87	75	89	66	69	57	**906**
Total Infiltration (m^3)	165	109	28	14	16	17	17	15	120	176	184	152	**1013**
Total Runoff (m^3)	478	483	474	397	432	471	477	413	571	495	519	428	**5637**
Post-Development Deficit with Mitigation (-ve value implies a net gain)													
Total AET (m^3)	10	116	261	371	330	285	280	140	45	0	0	0	**1838**
Total ET (m^3)	-31	-36	-41	-35	-38	-42	-42	-37	-43	-32	-34	-28	**-440**
Total Infiltration (m^3)	97	54	-9	-14	-16	-17	-17	-15	56	105	110	91	**424**
Total Runoff (m^3)	-75	-134	-211	-185	-202	-220	-223	-193	-167	-73	-76	-63	**-1822**

GBS

APPENDIX C

STORMWATER MANAGEMENT CALCULATIONS

SCS consulting group ltd

EXISTING WEIGHTED RUNOFF COEFFICIENT

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
Pervious Area	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
Pervious Area	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

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

Catchment 201 Outlets to: Victoria Street (West)

	Runoff Coefficient	Area (ha)	Weighted Runoff Coefficient	Weighted Runoff Coefficient (100 Year)
Ground Level Impervious	0.90	0.09	0.41	0.45
Rooftops	0.90	0.03	0.14	0.15
Grass	0.25	0.08	0.10	0.13
TOTAL		0.20	0.64	0.73

Catchment 202 Outlets to: Lakeshore Road West

	Runoff Coefficient	Area (ha)	Weighted Runoff Coefficient	Weighted Runoff Coefficient (100 Year)
Ground Level Impervious	0.90	0.04	0.15	0.17
Rooftops	0.90	0.06	0.23	0.25
Grass	0.25	0.14	0.15	0.18
TOTAL		0.24	0.52	0.60

Catchment 203 Outlets to: Lakeshore Road West

	Runoff Coefficient	Area (ha)	Weighted Runoff Coefficient	Weighted Runoff Coefficient (100 Year)
Ground Level Impervious	0.90	0.21	0.27	0.30
Rooftops	0.90	0.27	0.35	0.39
Grass	0.25	0.22	0.08	0.10
TOTAL		0.70	0.70	0.78

Catchment 204 Outlets to: Victoria Street (East)

	Runoff Coefficient	Area (ha)	Weighted Runoff Coefficient	Weighted Runoff Coefficient (100 Year)
Ground Level Impervious	0.90	0.00	0.00	0.00
Rooftops	0.90	0.003	0.09	0.10
Grass	0.25	0.027	0.23	0.28
TOTAL		0.03	0.32	0.38

PROPOSED WEIGHTED RUNOFF COEFFICIENT

Victoria Street (East) Total

Catchment	Runoff Coefficient	Area	Weighted Runoff Coefficient
204	0.32	0.03	0.32
TOTAL		0.03	0.32

Lakeshore Road West Total

Catchment	Runoff Coefficient	Area	Weighted Runoff Coefficient
202	0.52	0.24	0.13
203	0.70	0.70	0.52
TOTAL		0.94	0.65

Victoria Street (West) Total

Catchment	Runoff Coefficient	Area	Weighted Runoff Coefficient
201	0.64	0.20	0.64
TOTAL		0.20	0.64

Overall Total

Catchment	Runoff Coefficient	Area	Weighted Runoff Coefficient
201	0.64	0.20	0.64
202	0.52	0.24	0.63
203	0.70	0.70	2.44
204	0.32	0.03	0.05
TOTAL		1.17	3.75

3171 Lakeshore Road West
Project Number: 1930
Date: January 2023
Designer Initials: N.D.M.

SUMMARY

			100 Year									
Catchment ID	Runoff Coef.	Area (ha)	Release Rate (L/s) [1]	Storage Required (m^3) [1]	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	0.73	0.20	47.0	22.2	23.0	85	24.8		22.2	MH12	82.420	VERTICAL
202	0.60	0.24	80.2	0.0	0.0	uncontrolled	-	80.2		-	100.000	-
203	0.78	0.70	128.1	125.2	126.7	200	128.1			MHTEE1 End Cap	82.500	TUBE
204	0.38	0.03	6.4	0.0	0.0	uncontrolled	-	6.4		-	100.000	-
Total		1.17	261.7	147.4	149.7	-	-			-	-	-

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))	128.1	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	214.7	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))	24.8	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) [1]	Storage Required (m^3) [1]	Storage Available (m^3)	Orifice Size (mm) [2]	Orifice Release Rate (L/s)	Uncontrolled Release Rate (L/s)
201	0.64	0.20	14.4	20	23.0	85	14.4	0
202	0.52	0.24	39.7	0	0	uncontrolled	-	39.7
203	0.70	0.70	84.6	46.9	126.7	200	84.6	0
204	0.32	0.03	3.0	0	0	uncontrolled	-	3.0
Total		1.17	141.7	66.5	149.7			

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	127.3	L/s
Victoria Street (West) 5 year Allowable Release Rate	26.8	L/s
Victoria Street (West) Proposed Release Rate	14.4	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: January 2023
Designer Initials: N.D.M.

Area ID: 201

Area = **0.200** ha
"C" = **0.73**
AC= **0.1450**
Tc = **10.0** min
Time Increment = **5.0** min
Release Rate = **47.00** l/s
Max.Storage = **22.2** 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	80.94	48.6	28.2	20.4	
15.0	158.3	63.80	57.4	35.3	22.2	<<<<
20.0	131.4	52.95	63.5	42.3	21.2	
25.0	112.7	45.44	68.2	49.4	18.8	
30.0	99.0	39.90	71.8	56.4	15.4	
35.0	88.4	35.64	74.9	63.5	11.4	
40.0	80.0	32.26	77.4	70.5	6.9	
45.0	73.2	29.50	79.7	77.6	2.1	
50.0	67.5	27.21	81.6	84.6	-3.0	
55.0	62.7	25.27	83.4	91.7	-8.3	
60.0	58.5	23.60	85.0	98.7	-13.7	
65.0	55.0	22.16	86.4	105.8	-19.3	
70.0	51.8	20.89	87.7	112.8	-25.1	
75.0	49.0	19.77	89.0	119.9	-30.9	
80.0	46.6	18.77	90.1	126.9	-36.8	
85.0	44.4	17.88	91.2	134.0	-42.8	
90.0	42.4	17.07	92.2	141.0	-48.8	
95.0	40.5	16.34	93.1	148.1	-54.9	
100.0	38.9	15.67	94.0	155.1	-61.1	
105.0	37.4	15.06	94.9	162.2	-67.3	
110.0	36.0	14.50	95.7	169.2	-73.5	
115.0	34.7	13.98	96.5	176.3	-79.8	
120.0	33.5	13.50	97.2	183.3	-86.1	
125.0	32.4	13.05	97.9	190.4	-92.4	

Area ID: 201

Area = **0.200** ha
"C" = **0.64**
AC= **0.1280**
Tc = **10.0** min
Time Increment = **5.0** min
Release Rate = **14.43** l/s
Max.Storage = **19.6** 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	40.64	24.4	8.7	15.7	
15.0	90.6	32.23	29.0	10.8	18.2	
20.0	75.5	26.88	32.3	13.0	19.3	
25.0	65.1	23.15	34.7	15.2	19.6	<<<<
30.0	57.3	20.39	36.7	17.3	19.4	
35.0	51.3	18.27	38.4	19.5	18.9	
40.0	46.6	16.57	39.8	21.6	18.1	
45.0	42.7	15.18	41.0	23.8	17.2	
50.0	39.4	14.03	42.1	26.0	16.1	
55.0	36.7	13.05	43.1	28.1	14.9	
60.0	34.3	12.21	44.0	30.3	13.6	
65.0	32.3	11.48	44.8	32.5	12.3	
70.0	30.5	10.84	45.5	34.6	10.9	
75.0	28.9	10.27	46.2	36.8	9.4	
80.0	27.4	9.76	46.9	39.0	7.9	
85.0	26.2	9.31	47.5	41.1	6.3	
90.0	25.0	8.90	48.0	43.3	4.7	
95.0	23.9	8.52	48.6	45.5	3.1	
100.0	23.0	8.18	49.1	47.6	1.5	
105.0	22.1	7.87	49.6	49.8	-0.2	
110.0	21.3	7.58	50.0	52.0	-1.9	
115.0	20.6	7.32	50.5	54.1	-3.6	
120.0	19.9	7.07	50.9	56.3	-5.4	
125.0	19.2	6.84	51.3	58.4	-7.1	

ON-SITE DETENTION AND ORIFICE DETAILS

Area ID 201

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

Type of Control: VERTICAL
Location: MH12

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

Pipe Storage

Diameter (mm)	Area (m^2)	Length (m)	Volume (m^3)
825	0.535	43.0	23.0
		Total Volume	**23.0**

	Stage (m)	Head (m)	Storage (m^3)	Discharge (m^3/s)
Invert E.L.	82.42	0.00	0.0	0.00
5 Year WL	83.32	0.86	19.6	0.014
100 Year WL (Surface spill elevation)	85.00	2.54	23.0	0.025

MODIFIED RATIONAL METHOD

3171 Lakeshore Road West
Project Number: 1930
Date: January 2023
Designer Initials: N.D.M.

Area ID: 203

Area =	**0.700** ha			
"C" =	**0.78**			
AC=	**0.5488**			
Tc =	**10.0** min			
Time Increment =	**5.0** min			
Release Rate =	**128.09** L/s		of Oakville	100 Year
Max.Storage =	**125.2** m^3		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	306.33	183.8	76.9	106.9	
15.0	158.3	241.44	217.3	96.1	121.2	
20.0	131.4	200.40	240.5	115.3	125.2	<<<<
25.0	112.7	171.96	257.9	134.5	123.5	
30.0	99.0	151.01	271.8	153.7	118.1	
35.0	88.4	134.90	283.3	172.9	110.4	
40.0	80.0	122.09	293.0	192.1	100.9	
45.0	73.2	111.65	301.4	211.3	90.1	
50.0	67.5	102.96	308.9	230.6	78.3	
55.0	62.7	95.62	315.5	249.8	65.8	
60.0	58.5	89.32	321.5	269.0	52.6	
65.0	55.0	83.85	327.0	288.2	38.8	
70.0	51.8	79.06	332.1	307.4	24.6	
75.0	49.0	74.82	336.7	326.6	10.1	
80.0	46.6	71.05	341.0	345.8	-4.8	
85.0	44.4	67.66	345.1	365.0	-20.0	
90.0	42.4	64.61	348.9	384.3	-35.4	
95.0	40.5	61.84	352.5	403.5	-51.0	
100.0	38.9	59.31	355.9	422.7	-66.8	
105.0	37.4	57.00	359.1	441.9	-82.8	
110.0	36.0	54.87	362.1	461.1	-99.0	
115.0	34.7	52.91	365.1	480.3	-115.3	
120.0	33.5	51.09	367.8	499.5	-131.7	
125.0	32.4	49.40	370.5	518.7	-148.2	

Area ID: 203

Area =	**0.700** ha			
"C" =	**0.70**			
AC=	**0.4870**			
Tc =	**10.0** min			
Time Increment =	**5.0** min			
Release Rate =	**84.62** L/s		of Oakville	5 Year
Max.Storage =	**46.9** m^3		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	154.63	92.8	50.8	42.0	
15.0	90.6	122.64	110.4	63.5	46.9	<<<<
20.0	75.5	102.27	122.7	76.2	46.6	
25.0	65.1	88.09	132.1	88.9	43.3	
30.0	57.3	77.60	139.7	101.5	38.1	
35.0	51.3	69.50	145.9	114.2	31.7	
40.0	46.6	63.04	151.3	126.9	24.4	
45.0	42.7	57.77	156.0	139.6	16.4	
50.0	39.4	53.38	160.1	152.3	7.8	
55.0	36.7	49.65	163.8	165.0	-1.2	
60.0	34.3	46.45	167.2	177.7	-10.5	
65.0	32.3	43.67	170.3	190.4	-20.1	
70.0	30.5	41.23	173.2	203.1	-29.9	
75.0	28.9	39.07	175.8	215.8	-40.0	
80.0	27.4	37.14	178.3	228.5	-50.2	
85.0	26.2	35.41	180.6	241.2	-60.6	
90.0	25.0	33.84	182.8	253.9	-71.1	
95.0	23.9	32.42	184.8	266.6	-81.8	
100.0	23.0	31.13	186.8	279.3	-92.5	
105.0	22.1	29.94	188.6	292.0	-103.3	
110.0	21.3	28.84	190.4	304.6	-114.3	
115.0	20.6	27.83	192.1	317.3	-125.3	
120.0	19.9	26.90	193.7	330.0	-136.4	
125.0	19.2	26.03	195.2	342.7	-147.5	

ON-SITE DETENTION AND ORIFICE DETAILS

Area ID 203

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

Type of Control: TUBE
Location: MHTEE1 End Cap

	200	mm
Area:	0.031	m^2
g =	9.81	m/sec^2
C_d =	0.82	

Pipe Storage

Diameter (mm)	Area (m^2)	Length (m)	Volume (m^3)
1200	1.131	112.0	126.7
		Total Volume	**126.7**

	Stage (m)	Head (m)	Storage (m^3)	Discharge (m^3/s)
Invert E.L.	82.50	0.00	0.0	0.00
5 Year WL	83.15	0.55	46.9	0.085
100 Year WL	83.86	1.26	125.2	0.128

Storage Summary

Lane B Superpipe 1 Parameters

Length =	26.8	m
Slope =	0.4	%
Diameter =	1200	mm
Area of Pipe =	1.1310	m^2
D/S Superpipe Invert =	82.50	m
Elevation Increment =	0.02	m
Total Storage Provided =	30.31	m^3
U/S Superpipe Invert =	82.61	m
U/S Superpipe Obvert =	83.81	m
D/S Superpipe Obvert =	83.70	m

Stage/Storage Table:

Stage (m)	Volume Pipe 1 (m3)
82.50	0.00
82.52	0.01
82.54	0.05
82.56	0.14
82.58	0.27
82.60	0.46
82.62	0.72
82.64	1.02
82.66	1.37
82.68	1.74
82.70	2.15
82.72	2.57
82.74	3.03
82.76	3.50
82.78	3.99
82.80	4.50
82.82	5.03
82.84	5.57
82.86	6.12
82.88	6.69
82.90	7.26
82.92	7.85
82.94	8.45
82.96	9.05
82.98	9.66
83.00	10.28
83.02	10.90
83.04	11.53
83.06	12.16
83.08	12.80
83.10	13.44
83.12	14.08
83.14	14.72
83.16	15.36
83.18	16.00
83.20	16.64
83.22	17.28
83.24	17.92
83.26	18.55
83.28	19.18
83.30	19.81
83.32	20.43
83.34	21.04
83.36	21.65
83.38	22.25
83.40	22.84
83.42	23.42
83.44	23.99
83.46	24.54
83.48	25.09
83.50	25.62
83.52	26.14
83.54	26.63
83.56	27.11
83.58	27.57
83.60	28.01
83.62	28.43
83.64	28.81
83.66	29.17
83.68	29.49
83.70	29.76
83.72	29.98
83.74	30.13
83.76	30.23
83.78	30.29
83.80	30.31
83.82	30.31
83.84	30.31
83.86	30.31
83.88	30.31
83.90	30.31
83.92	30.31
83.94	30.31
83.96	30.31
83.98	30.31
84.00	30.31
84.02	30.31
84.04	30.31
84.06	30.31

Lane B Superpipe 2 Parameters

Length =	52.9	m
Slope =	0.4	%
Diameter =	1200	mm
Area of Pipe =	1.1310	m^2
D/S Superpipe Invert =	82.64	m
Elevation Increment =	0.02	m
Total Storage Provided =	59.83	m^3
U/S Superpipe Invert =	82.85	m
U/S Superpipe Obvert =	84.05	m
D/S Superpipe Obvert =	83.84	m

Stage/Storage Table:

Stage (m)	Volume Pipe 2 (m3)
82.50	0.00
82.52	0.00
82.54	0.00
82.56	0.00
82.58	0.00
82.60	0.00
82.62	0.00
82.64	0.00
82.66	0.01
82.68	0.05
82.70	0.14
82.72	0.27
82.74	0.47
82.76	0.73
82.78	1.06
82.80	1.47
82.82	1.96
82.84	2.53
82.86	3.20
82.88	3.93
82.90	4.73
82.92	5.58
82.94	6.47
82.96	7.41
82.98	8.39
83.00	9.39
83.02	10.43
83.04	11.50
83.06	12.60
83.08	13.71
83.10	14.85
83.12	16.01
83.14	17.19
83.16	18.38
83.18	19.58
83.20	20.80
83.22	22.03
83.24	23.27
83.26	24.52
83.28	25.77
83.30	27.03
83.32	28.29
83.34	29.55
83.36	30.81
83.38	32.07
83.40	33.33
83.42	34.59
83.44	35.84
83.46	37.08
83.48	38.31
83.50	39.54
83.52	40.75
83.54	41.95
83.56	43.14
83.58	44.31
83.60	45.46
83.62	46.59
83.64	47.70
83.66	48.78
83.68	49.83
83.70	50.86
83.72	51.86
83.74	52.82
83.76	53.74
83.78	54.61
83.80	55.44
83.82	56.21
83.84	56.92
83.86	57.55
83.88	58.09
83.90	58.54
83.92	58.92
83.94	59.22
83.96	59.45
83.98	59.62
84.00	59.73
84.02	59.80
84.04	59.82
84.06	59.83

Lane A Superpipe Parameters

Length =	32.3	m
Slope =	0.4	%
Diameter =	1200	mm
Area of Pipe =	1.131	m^2
D/S Superpipe Invert =	82.70	m
Elevation Increment =	0.02	m
Total Storage Provided =	36.53	m^3
U/S Superpipe Invert =	82.83	m
U/S Superpipe Obvert =	84.03	m
D/S Superpipe Obvert =	83.90	m

Stage/Storage Table:

Stage (m)	Volume Pipe 3 (m3)
82.50	0.00
82.52	0.00
82.54	0.00
82.56	0.00
82.58	0.00
82.60	0.00
82.62	0.00
82.64	0.00
82.66	0.00
82.68	0.00
82.70	0.00
82.72	0.01
82.74	0.05
82.76	0.14
82.78	0.27
82.80	0.47
82.82	0.73
82.84	1.05
82.86	1.44
82.88	1.86
82.90	2.33
82.92	2.83
82.94	3.36
82.96	3.92
82.98	4.50
83.00	5.10
83.02	5.72
83.04	6.36
83.06	7.02
83.08	7.69
83.10	8.38
83.12	9.08
83.14	9.79
83.16	10.51
83.18	11.24
83.20	11.98
83.22	12.73
83.24	13.48
83.26	14.24
83.28	15.00
83.30	15.77
83.32	16.54
83.34	17.31
83.36	18.09
83.38	18.86
83.40	19.63
83.42	20.40
83.44	21.17
83.46	21.94
83.48	22.70
83.50	23.46
83.52	24.21
83.54	24.95
83.56	25.69
83.58	26.41
83.60	27.13
83.62	27.83
83.64	28.53
83.66	29.21
83.68	29.87
83.70	30.52
83.72	31.15
83.74	31.76
83.76	32.35
83.78	32.92
83.80	33.46
83.82	33.97
83.84	34.46
83.86	34.90
83.88	35.31
83.90	35.66
83.92	35.95
83.94	36.18
83.96	36.34
83.98	36.44
84.00	36.50
84.02	36.53
84.04	36.53
84.06	36.53

Cul-de-sac Parameters

Length =	43	m
Slope =	1	%
Diameter =	825	mm
Area of Pipe =	0.535	m^2
D/S Superpipe Invert =	82.42	m
Elevation Increment =	0.02	m
Total Storage Provided =	22.99	m^3
U/S Superpipe Invert =	82.85	m
U/S Superpipe Obvert =	83.68	m
D/S Superpipe Obvert =	83.25	m

Stage/Storage Table:

Stage (m)	Volume Pipe 4 (m3)
82.42	0.00
82.44	0.00
82.46	0.02
82.48	0.04
82.50	0.09
82.52	0.15
82.54	0.24
82.56	0.35
82.58	0.48
82.60	0.64
82.62	0.83
82.64	1.04
82.66	1.28
82.68	1.56
82.70	1.86
82.72	2.20
82.74	2.56
82.76	2.96
82.78	3.39
82.80	3.86
82.82	4.36
82.84	4.89
82.86	5.45
82.88	6.04
82.90	6.65
82.92	7.27
82.94	7.91
82.96	8.57
82.98	9.23
83.00	9.89
83.02	10.57
83.04	11.24
83.06	11.92
83.08	12.59
83.10	13.26
83.12	13.93
83.14	14.58
83.16	15.23
83.18	15.87
83.20	16.49
83.22	17.10
83.24	17.68
83.26	18.23
83.28	18.76
83.30	19.24
83.32	19.70
83.34	20.13
83.36	20.52
83.38	20.88
83.40	21.20
83.42	21.50
83.44	21.77
83.46	22.00
83.48	22.21
83.50	22.39
83.52	22.54
83.54	22.67
83.56	22.77
83.58	22.85
83.60	22.91
83.62	22.95
83.64	22.97
83.66	22.98
83.68	22.99
83.70	22.99
83.72	22.99
83.74	22.99
83.76	22.99
83.78	22.99
83.80	22.99
83.82	22.99
83.84	22.99
83.86	22.99
83.88	22.99
83.90	22.99
83.92	22.99
83.94	22.99
83.96	22.99
83.98	22.99

Required Laneway R.O.W. Capacity

Town of Oakville 5 Year (Rational Method)	
Area (ha) =	0.39
Runoff Coeff. =	0.70
T_c (min) =	10.00
a=	**1170**
b=	**5.80**
c=	**0.843**
Intensity (mm/hr) =	114.21
Runoff (m^3/s)=	**0.087**

Town of Oakville 100 Year (Rational Method)	
Area (ha) =	0.67
100 Year Return Period Factor[1] =	1.25
100 Year Runoff Coeff. =	0.88
T_c (min) =	10.00
a=	**2150**
b=	**5.70**
c=	**0.861**
Intensity (mm/hr) =	200.80
Runoff (m^3/s)=	**0.327**

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

Area (ha)[1]	Runoff Coefficient[1]	Weighted Runoff Coefficient
0.39	0.70	0.70
0.39		0.70

[1]Refer to Lane A Catchments on Drawing DR-1 in **Appendix F**

Catchment 203		
Area (ha)	**Runoff Coefficient[1]**	**Weighted Runoff Coefficient**
0.67	0.70	0.70
0.67		0.70

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

Major System Peak Flow:

$Q_{peak} = Q_{100yr} - Q_{5yr} =$ **0.240** m^3/s

Therefore, there is sufficient capacity in the Catchment 203 laneway and entrance laneway (capacity of 0.442 cu.m/s and 0.293 cu.m/s respectively per calculations in this Appendix) to convey the peak flow of 0.24 cu.m/s.

Cul-de-sac 100 Year Capture Calculation
Catchment 201

City of Oakville 100 Year (Rational Method)	
Area (ha) =	0.20
100 Year Return Period Factor[1] =	1.25
100 Year Runoff Coeff. =	0.80
T_c (min) =	10.00
a=	**2150**
b=	**5.70**
c=	**0.861**
Intensity (mm/hr) =	200.80
Runoff (m^3/s)=	**0.089**

[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	0.64	0.64
	0.20		0.64

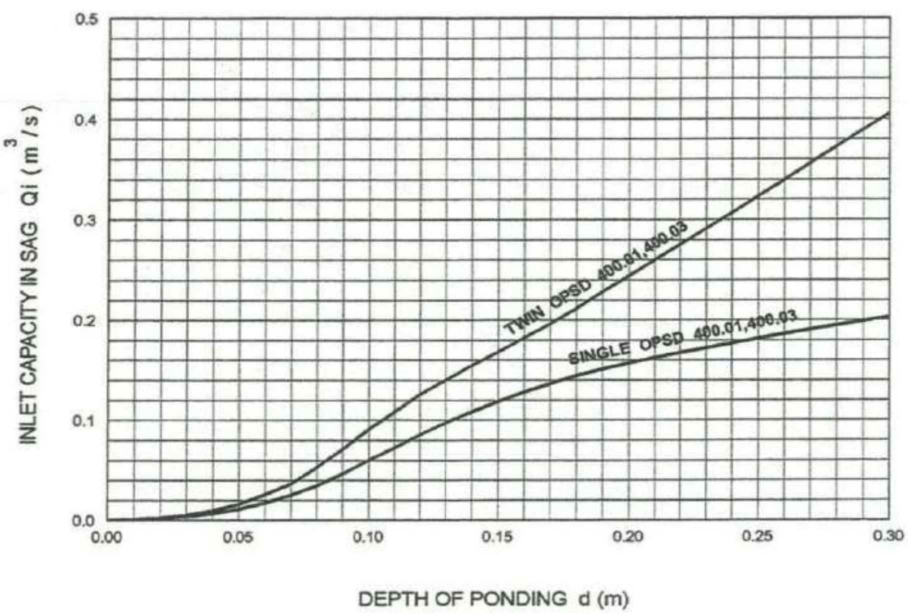
[1]Refer to weighted runoff coefficient calculations in this Appendix

100 Year Peak Flow:

$$Q_{100yr} = \quad 0.089 \ m^3/s$$

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	0.089 m^3/s	
Required Capture Capacity with 50% Blockage	0.178 m^3/s	
Type of Catch Basin	Twin	
Number of Catchbasins	2	
Required Capture Capacity Per Catchbasin	0.089 m^3/s	
Provided Capture Capacity per Catchbasin	0.103 m^3/s	
Ponding Depth Required	0.10 m	(85.04)
Ponding Depth Provided	0.11 m	(85.05-84.94)

Sizing CB Lead - Catchment 201			
Orifice Flow	Grate Elevation =	84.94	m
	Lead Invert =	83.26	m
	CB Lead Diameter =	0.300	m
	Required CB Lead Capacity =	0.089	m^3/s
	Orifice Coefficient =	0.82	
	Required Head Above CB Lead Centroid =	0.03	m
	Required Water Elevation =	83.44	m
Pipe Flow	CB Lead Slope =	1.0%	
	Provided CB Lead Pipe Full Flow Capacity =	0.097	m^3/s

Catchbasin Capacity (Borden Grate)			
Required depth above grate =	0.02	m	(84.36)
Provided depth above grate =	0.10	m	(84.44-84.34)
Area of Orifice =	0.0041	m^2	
Orifice Coefficient =	0.6		
Total Discharge, Q=	0.002	m^3/sec	
Discharge Vel., V=	0.410	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 =	0.120	m^3/sec
Number of Catchbasins =	2	
Catchbasin Capacity =	0.240	m^3/sec
Super CB Lead Diameter =	0.375	m
Super CB Grate Invert =	84.33	
Super CB Lead Invert =	83.27	
Head over Lead Invert =	0.87	m
Super CB Lead Capacity =	0.332	m^3/sec
Inlet Capacity (0.02m Ponding Depth) =	**0.240**	m^3/sec

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

Therefore, two 1.2mx0.6m Borden grate have sufficient capacity with 50% blockage to capture the 100 year flow of 0.240 m^3/s.

Entrance Laneway @ 2.08%

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	2.08 %
Normal Depth	0.093 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

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Discharge	0.293 m^3/s
Roughness Coefficient	0.016
Elevation Range	-0.108 to 0.000 m
Flow Area	0.3 m^2
Wetted Perimeter	9.261 m
Hydraulic Radius	0.033 m
Top Width	9.23 m
Normal Depth	0.093 m

Entrance Laneway @ 2.08%

Results

Critical Depth	0.107 m
Critical Slope	0.69 %
Velocity	0.95 m/s
Velocity Head	0.046 m
Specific Energy	0.14 m
Froude Number	1.660
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.000 m
Length	0.000 m
Number Of Steps	0

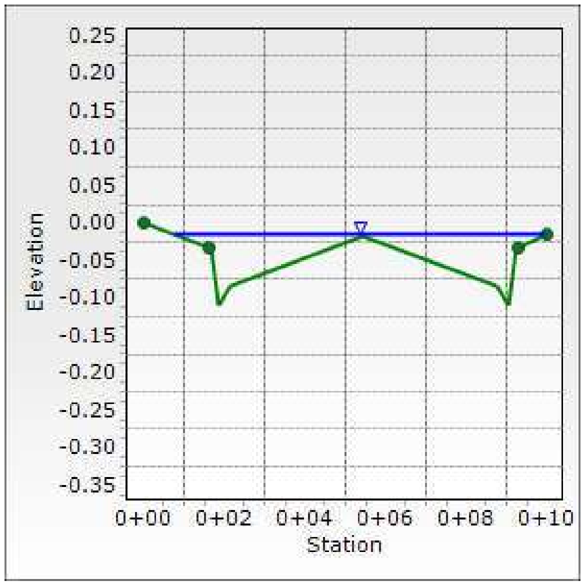
GVF Output Data

Upstream Depth	0.000 m
Profile Description	
Profile Headloss	0.00 ft
Downstream Velocity	Infinity m/s
Upstream Velocity	Infinity m/s
Normal Depth	0.093 m
Critical Depth	0.107 m
Channel Slope	2.08 %
Critical Slope	0.69 %

Entrance Laneway @ 2.08%

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Channel Slope	2.08 %
Normal Depth	0.093 m
Discharge	0.293 m³/s



Laneway @ 2.08%

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Channel Slope	2.08 %
Normal Depth	0.108 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

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Discharge	0.442 m³/s
Roughness Coefficient	0.018
Elevation Range	-0.108 to 0.000 m
Flow Area	0.4 m²
Wetted Perimeter	9.731 m
Hydraulic Radius	0.045 m
Top Width	9.70 m
Normal Depth	0.108 m

Laneway @ 2.08%

Results

Critical Depth	0.122 m
Critical Slope	0.81 %
Velocity	1.01 m/s
Velocity Head	0.052 m
Specific Energy	0.16 m
Froude Number	1.529
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.000 m
Length	0.000 m
Number Of Steps	0

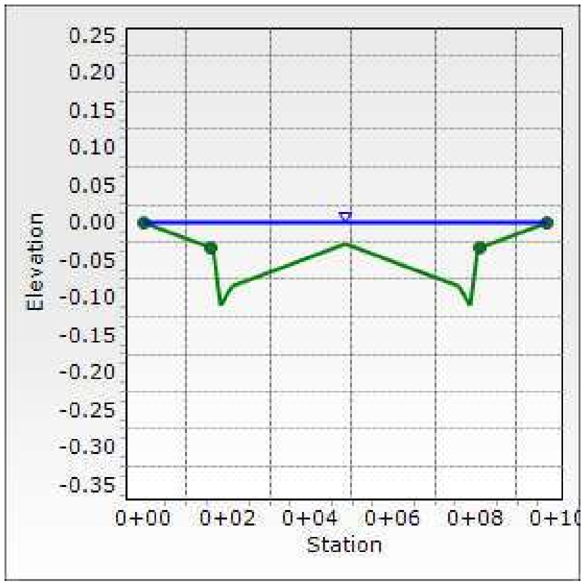
GVF Output Data

Upstream Depth	0.000 m
Profile Description	
Profile Headloss	0.00 ft
Downstream Velocity	Infinity m/s
Upstream Velocity	Infinity m/s
Normal Depth	0.108 m
Critical Depth	0.122 m
Channel Slope	2.08 %
Critical Slope	0.81 %

Laneway @ 2.08%

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Channel Slope	2.08 %
Normal Depth	0.108 m
Discharge	0.442 m³/s



Parking Areas
Permeable Paver Sizing

Water Balance Volume

Land Type	Area (ha)	Rainfall Depth (mm)	Rainfall Volume (m^3)	Initial Abstraction (mm)	Initial Abstraction Volume (m^3)	Runoff Volume (m^3)
	(1)	(2)	(3) = (2)x(1)x10 m3/ha-mm	(4)	(5) = (4)x(1)x10 m3/ha-mm	(6) = (3) - (5)
Permeable Paver Parking Area	0.026	25	6.4	1.0	0.3	6.1
Total	**0.026**	**25**	**6.4**	**1.0**	**0.3**	**6.1**

Minimum runoff storage volume to infiltrate the 25mm storm event= **6.1 m^3**

48 Hour Drawdown Calculation		
I - Infiltration Rate*	12.0	mm/h
n - Porosity	0.4	
t - Design Detention Time	48	h
SF - Safety Factor	2.5	
D - Maximum Depth of Infiltration Trench for 48 Hour Drawdown	0.6	m

$$D = \frac{I * t}{SF * n * 1000}$$

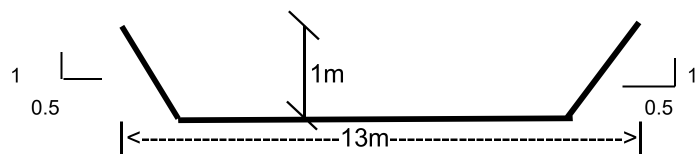
Permeable Paver Parking Storage Parameters		
Porosity Coefficient	0.4	
Minimum Depth	0.10	m
Area	255.4	m^2
Provided Runoff Storage Volume	**10.3**	**m^3**
Actual Drawdown Time	**8.3**	**h**

*Based on typical infiltration rate of silty clay soils

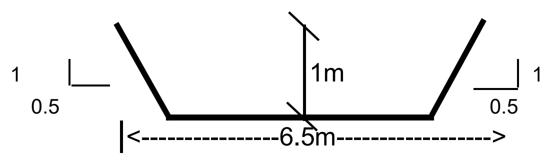
Therefore, the sizing for the Permeable Paver Parking Storage is approximately 0.1 m deep, with a surface area of 255.4 sq.m to provide a total 10.3 cu.m of runoff storage volume.

Excavated Sediment Trap in Ditch OPSD 219.220

Drainage Area:	0.58 ha			
Sediment Trap Volume=	0.58 ha	x	125	m^3/ha
=	73 m^3		(Required)	
Depth =	1.0 m			
Length =	13.0 m			
Width =	6.5 m			
Volume provided =	75.0 m^3		(Provided)	



Section B-B



Section A-A

APPENDIX D

OIL-GRIT SEPARATOR SIZING AND MAINTENANCE INFORMATION

Hydroworks Sizing Summary

3171 Lakeshore Rd
Oakville, Ontario

01-19-2023

Recommended Size: HydroDome HD 4

A HydroDome HD 4 is recommended to provide 80 % annual TSS removal based on a drainage area of .7 (ha) with an imperviousness of 69 % and Toronto Central, Ontario rainfall for the 20 um to 2000 um particle size distribution.

The recommended HydroDome HD 4 treats 100 % of the annual runoff and provides 87 % annual TSS removal for the Toronto Central rainfall records and 20 um to 2000 um particle size distribution.

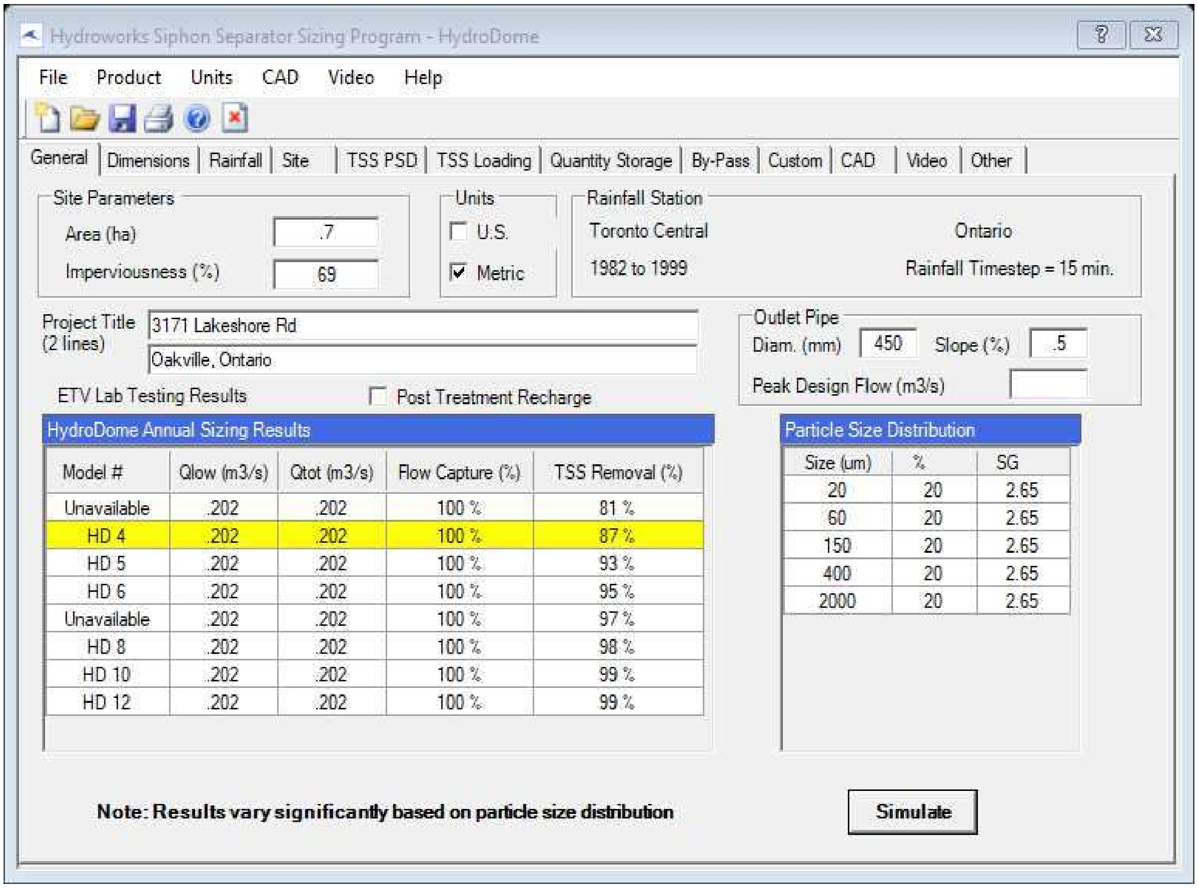
The HydroDome has a siphon which creates a discontinuity in headloss. Since a peak flow was not specified, headloss was calculated using the full pipe flow of .2 (m3/s) for the given 450 (mm) pipe diameter at .5% slope. The headloss was calculated to be 426 (mm) above the crown of the 450 (mm) outlet pipe.

This summary report provides the main parameters that were used for sizing. These parameters are shown on the summary tables and graphs provided in this report.

If you have any questions regarding this sizing summary please do not hesitate to contact Hydroworks at 888-290-7900 or email us at support@hydroworks.com.

The sizing program is for sizing purposes only and does not address any site specific parameters such as hydraulic gradeline, tailwater submergence, groundwater, soils bearing capacity, etc. Headloss calculations are not a hydraulic gradeline calculation since this requires a starting water level and an analysis of the entire system downstream of the HydroDome .

TSS Removal Sizing Summary



Hydroworks Siphon Separator Sizing Program - HydroDome

File Product Units CAD Video Help

General | Dimensions | Rainfall | Site | TSS PSD | TSS Loading | Quantity Storage | By-Pass | Custom | CAD | Video | Other

Site Parameters
Area (ha) .7
Imperviousness (%) 69

Units
U.S.
☑ Metric

Rainfall Station
Toronto Central Ontario
1982 to 1999 Rainfall Timestep = 15 min.

Project Title (2 lines) 3171 Lakeshore Rd
Oakville, Ontario

Outlet Pipe
Diam. (mm) 450 Slope (%) .5
Peak Design Flow (m3/s)

ETV Lab Testing Results
Post Treatment Recharge

HydroDome Annual Sizing Results

Model #	Qlow (m3/s)	Qtot (m3/s)	Flow Capture (%)	TSS Removal (%)
Unavailable	.202	.202	100 %	81 %
HD 4	.202	.202	100 %	87 %
HD 5	.202	.202	100 %	93 %
HD 6	.202	.202	100 %	95 %
Unavailable	.202	.202	100 %	97 %
HD 8	.202	.202	100 %	98 %
HD 10	.202	.202	100 %	99 %
HD 12	.202	.202	100 %	99 %

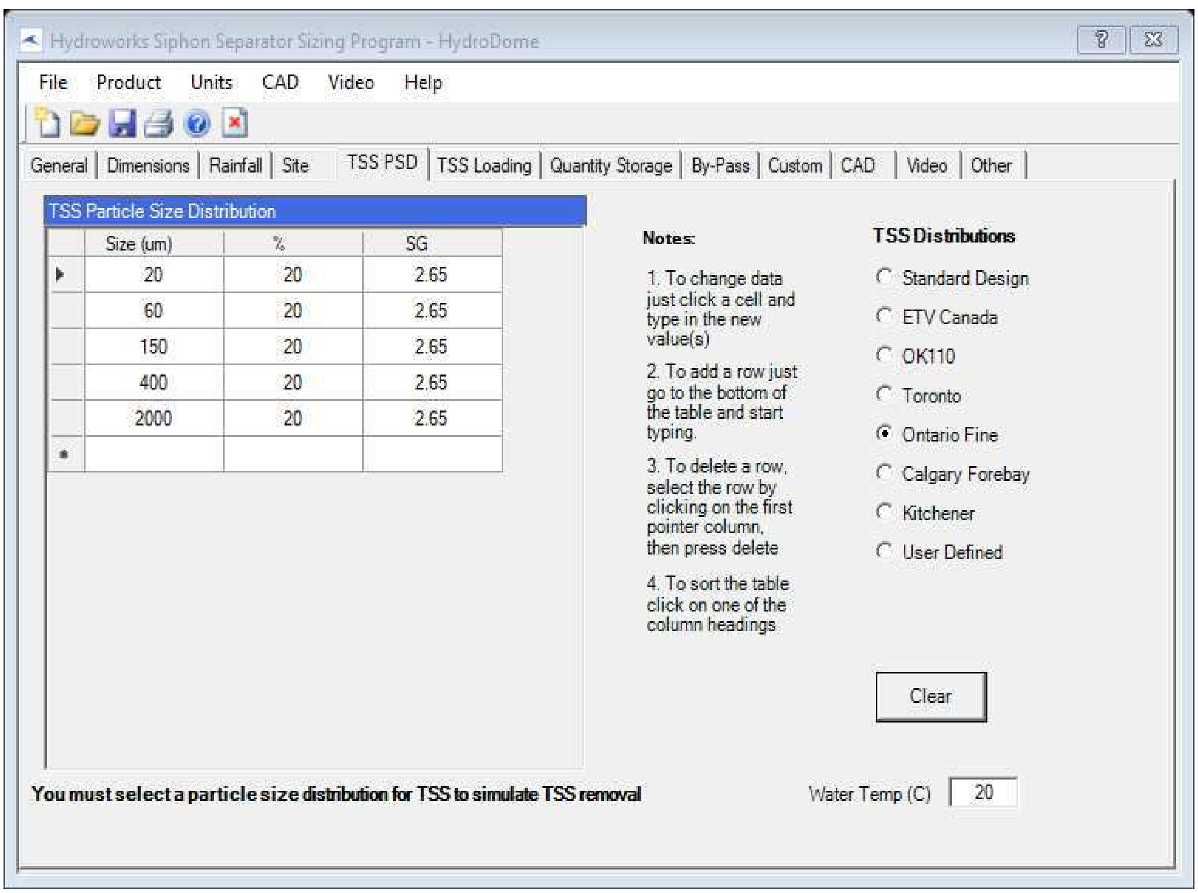
Particle Size Distribution

Size (um)	%	SG
20	20	2.65
60	20	2.65
150	20	2.65
400	20	2.65
2000	20	2.65

Note: Results vary significantly based on particle size distribution

Simulate

TSS Particle Size Distribution



Hydroworks Siphon Separator Sizing Program - HydroDome

File Product Units CAD Video Help

General | Dimensions | Rainfall | Site | TSS PSD | TSS Loading | Quantity Storage | By-Pass | Custom | CAD | Video | Other

TSS Particle Size Distribution

Size (um)	%	SG
20	20	2.65
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400	20	2.65
2000	20	2.65

Notes:

1. To change data just click a cell and type in the new value(s)
2. To add a row just go to the bottom of the table and start typing.
3. To delete a row, select the row by clicking on the first pointer column, then press delete
4. To sort the table click on one of the column headings

TSS Distributions

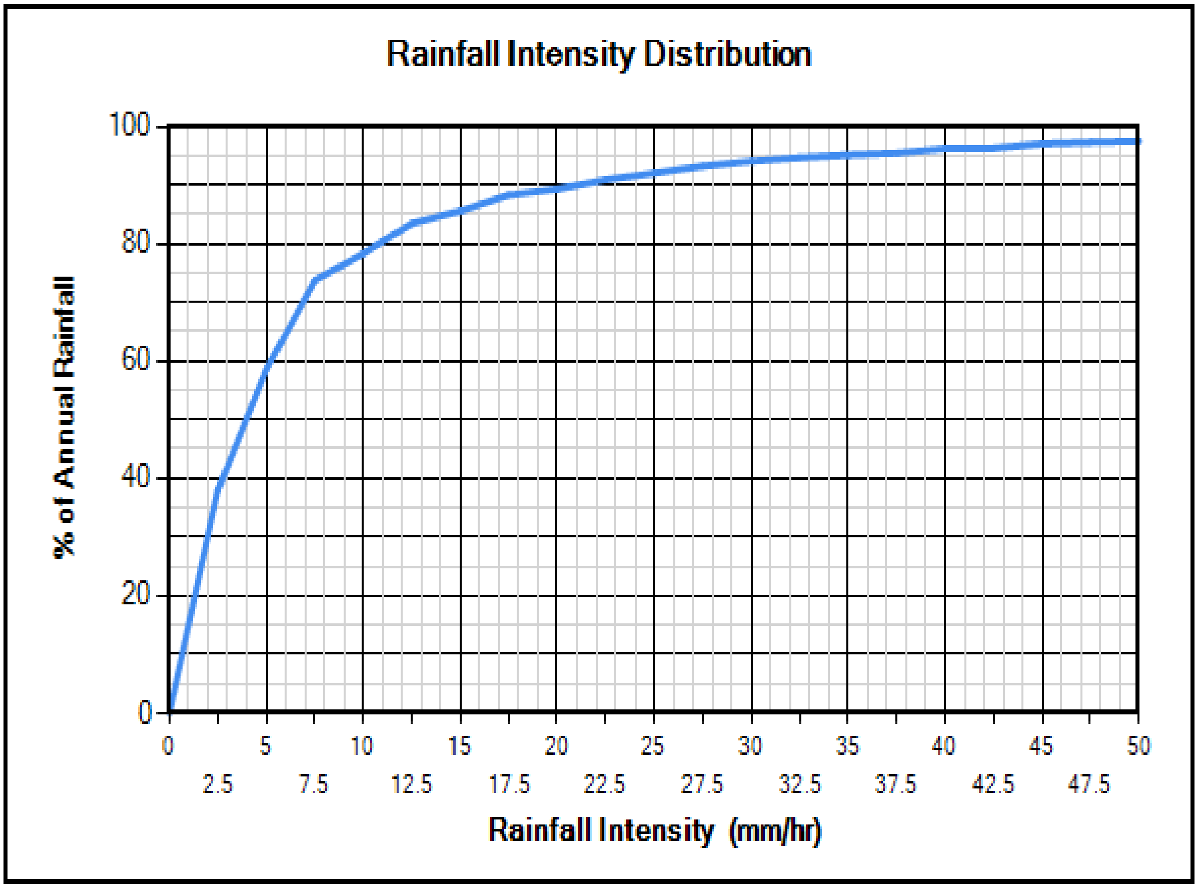
- Standard Design
- ETV Canada
- OK110
- Toronto
- (●) Ontario Fine
- Calgary Forebay
- Kitchener
- User Defined

Clear

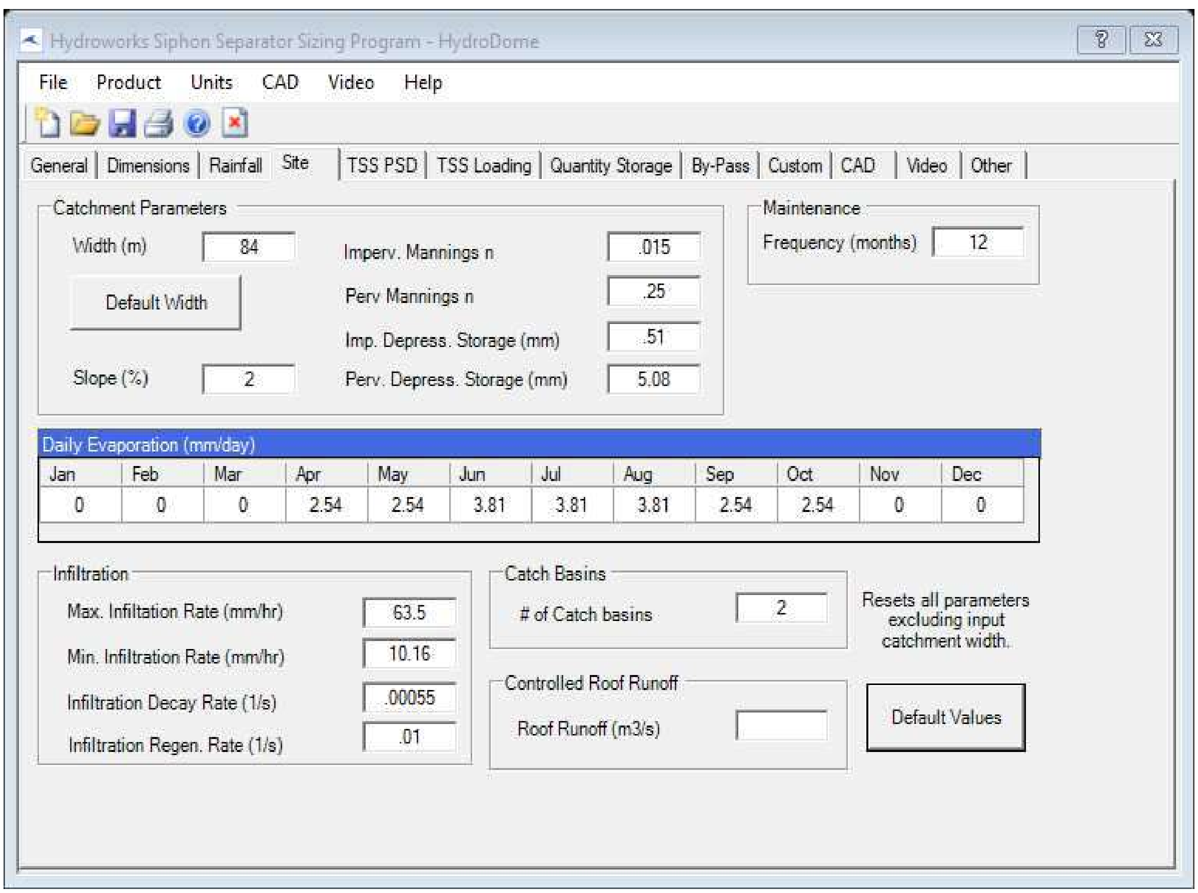
You must select a particle size distribution for TSS to simulate TSS removal

Water Temp (C) 20

Rainfall Station - Toronto Central, Ontario(1982 to 1999)



Site Physical Characteristics



Dimensions And Capacities

Hydroworks Siphon Separator Sizing Program - HydroDome

File Product Units CAD Video Help

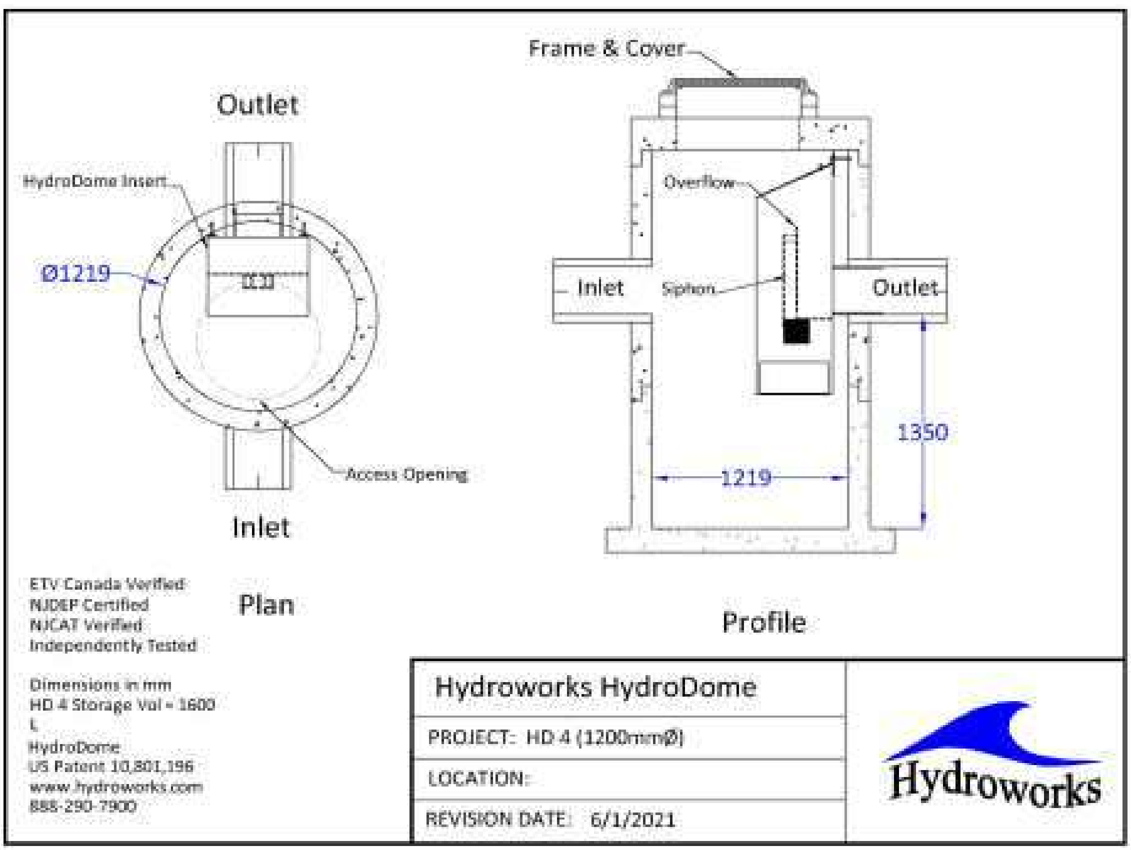
General | Dimensions | Rainfall | Site | TSS PSD | TSS Loading | Quantity Storage | By-Pass | Custom | CAD | Video | Other

Dimensions and Capacities

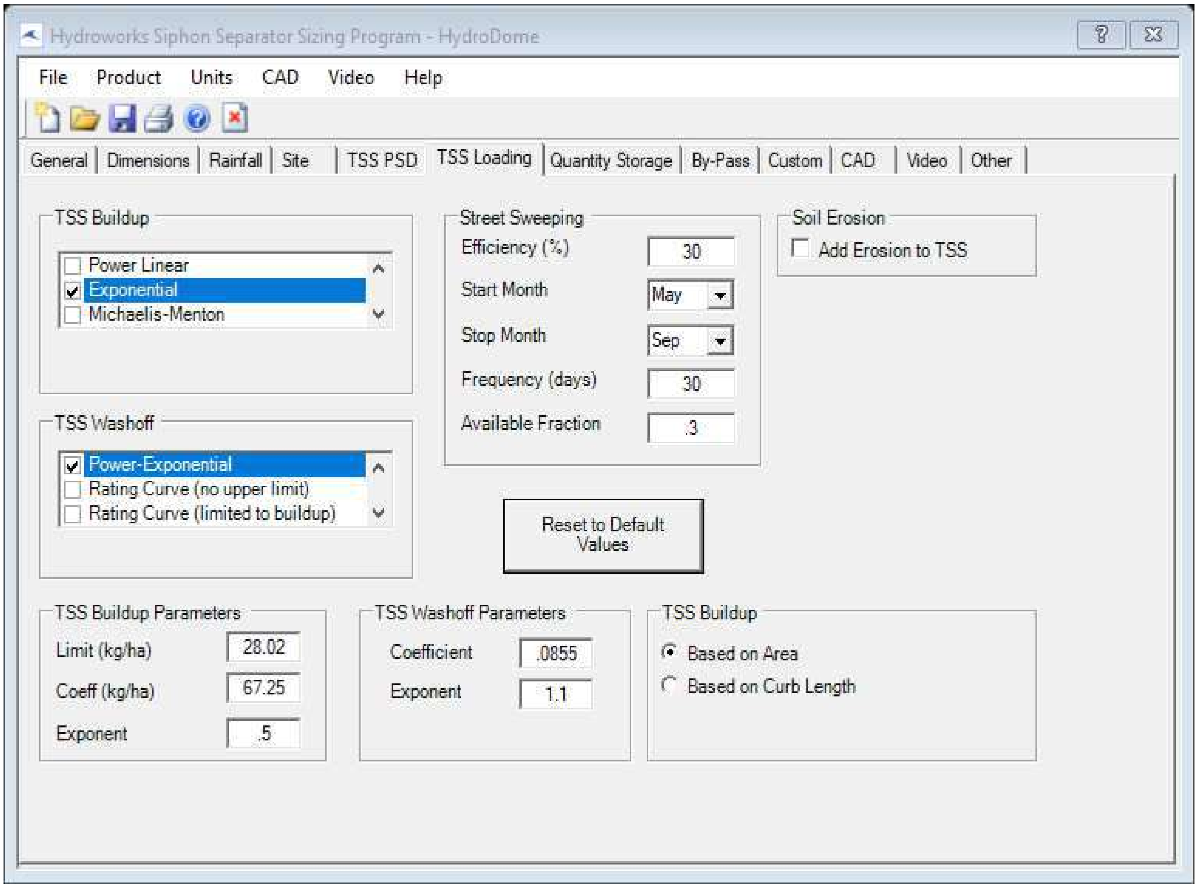
Model	Diam. (m)	Depth (m)	Float. Vol. (L)	Sediment Vol. (m3)	Total Vol. (m3)
HD 3	0.91	1.22	114	0.3	0.8
HD 4	1.22	1.37	243	0.6	1.6
HD 5	1.52	1.68	442	1.1	3.1
HD 6	1.83	1.98	728	1.9	5.2
HD 7	2.13	2.29	1114	3	8.2
HD 8	2.44	2.59	1698	4.3	12.1
HD 10	3.05	3.2	3284	8.2	23.3
HD 12	3.66	3.81	5639	13.9	40

Depth = Depth from outlet invert to inside bottom of tank

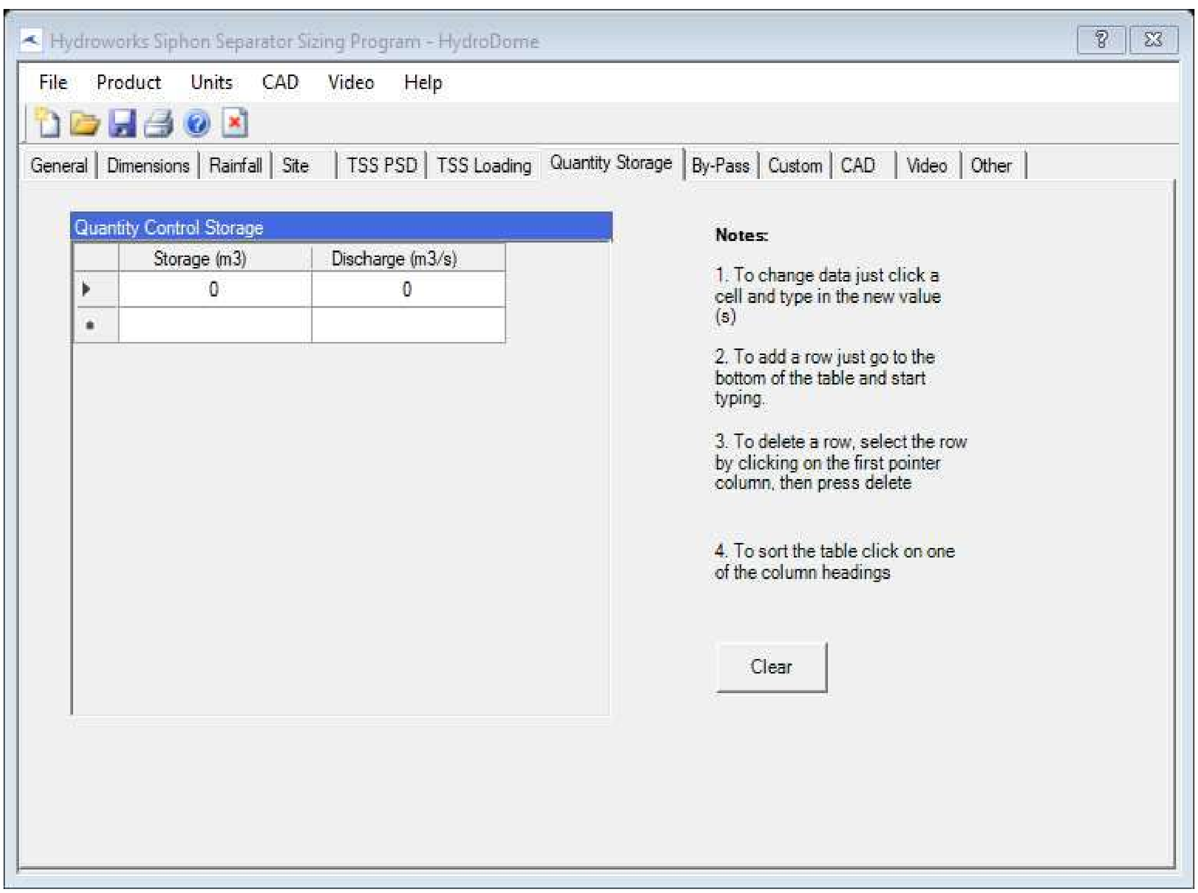
Generic HD 4 CAD Drawing



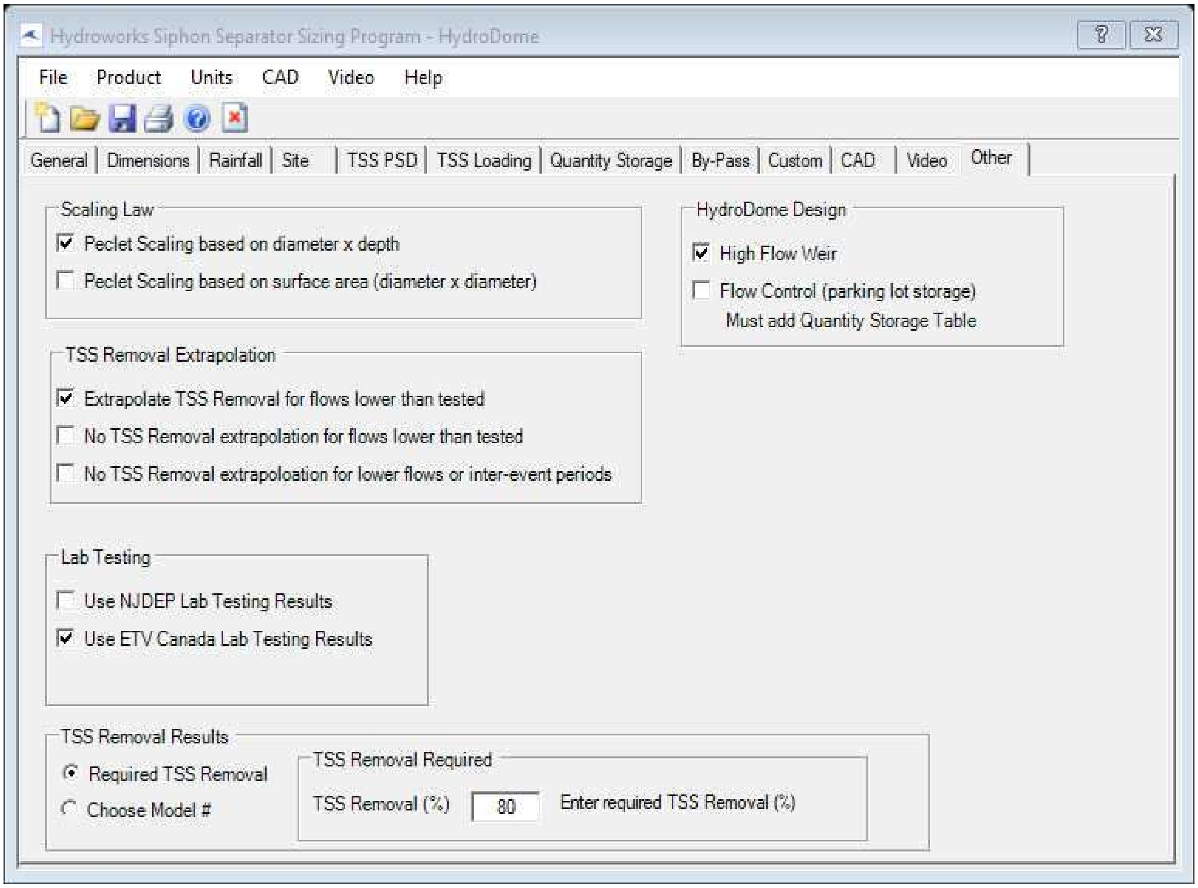
TSS Buildup And Washoff



Upstream Quantity Storage



Other Parameters



Hydroworks Sizing Program - Version 5.5

Hydroworks® HydroDome

Operations & Maintenance Manual

Version 1.0

Please call Hydroworks at 888-290-7900 or email us at support@hydroworks.com if you have any questions regarding the Inspection Checklist. Please email a copy of the completed checklist to Hydroworks at support@hydroworks.com for our records.

Introduction

The HydroDome (Figure 1) is a state-of-the-art hydrodynamic separator. HydroDome can be used for water □uality and □uantity flow control if desired.

Hydrodynamic separators remove solids, debris and lighter than water (oil, trash, floating debris) pollutants from stormwater. Hydrodynamic separators and other water □uality measures are mandated by regulatory agencies (Town/City, State, Federal Government) to protect storm water □uality from pollution generated by urban development (traffic, people) as part of new development permitting re□uirements.

As storm water treatment structures fill up with pollutants they become less and less effective in removing new pollution. Therefore, it is important that storm water treatment structures be maintained on a regular basis to ensure that they are operating at optimum performance. The HydroDome is no different in this regard and this manual has been assembled to provide the owner/operator with the necessary information to inspect and coordinate maintenance of their HydroDome.

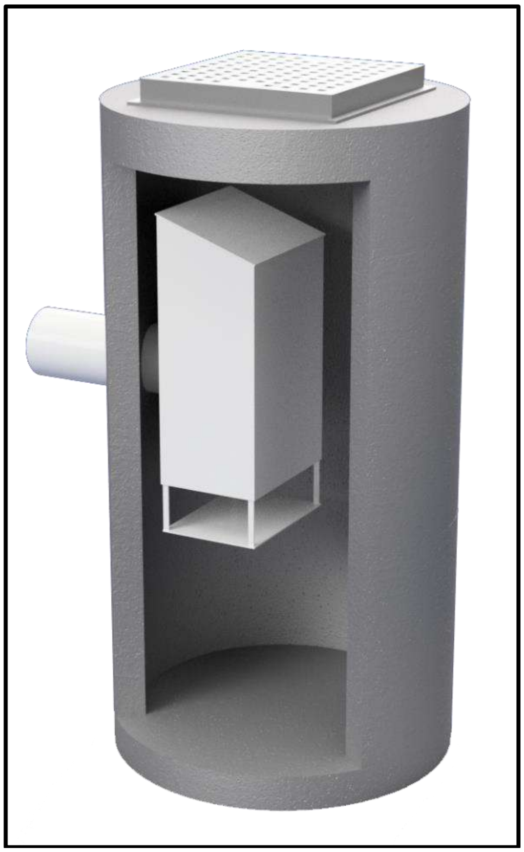


Figure 1□□ydroworks □ydro□ome

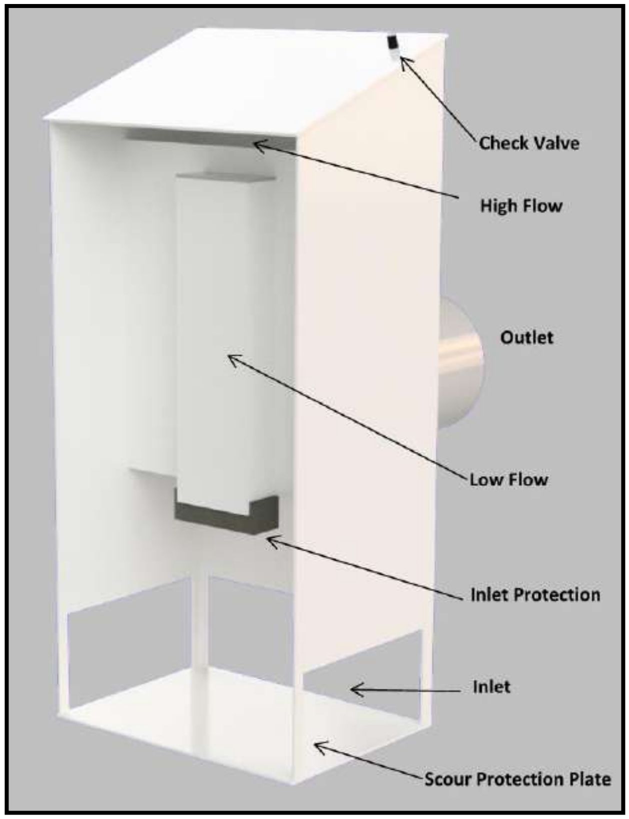


Figure 2 HydroDome Internal Components

Inspection

Procedure

Floatables

A visual inspection can be conducted for floatables by removing the cover/grate and looking down into the separator.

TSS/Sediment

Inspection for TSS build-up can be conducted using a Sludge Judge™, Core Pro™, AccuSludge™ or equivalent sampling device that allows the measurement of the depth of TSS/sediment in the unit. These devices typically have a ball valve at the bottom of the tube that allows water and TSS to flow into the tube when lowering the tube into the unit. Once the unit touches the bottom of the device, it is quickly pulled upward such that the water and TSS in the tube forces the ball valve closed allowing the user to see a full core of water/TSS in the unit. Several readings (2 or 3) should be made at different locations of the structure to ensure that an accurate TSS depth measurement is recorded.

Operation

The water level during periods without rain should be near the outlet invert of the structure. If the water level remains near the top of the HydroDome this may suggest that there is an obstruction downstream of the HydroDome or that the inlet protection at the HydroDome may need to be cleaned.

Frequency

Construction Period

The HydroDome separator should be inspected every four weeks and after every large storm (over 0.5" (12.5 mm) of rain) during the construction period.

Post-Construction Period

The Hydroworks HydroDome separator should be inspected during the first year of operation for normal stabilized sites (grassed or paved areas). If the unit is subject to oil spills or runoff from unstabilized areas (storage piles, exposed soils), the HydroDome separator should be inspected more frequently (4 times per year). The initial annual inspection will indicate the required frequency of inspection and maintenance if the unit was maintained after the construction period.

Reporting

Reports should be prepared as part of each inspection and include the following information:

1. Date of inspection
2. GPS coordinates of Hydroworks unit
3. Time since last rainfall
4. Date of last inspection
5. Installation deficiencies (missing parts, incorrect installation of parts)
6. Structural deficiencies (concrete cracks, broken parts)
7. Operational deficiencies (leaks, elevated water level)
8. Presence of oil sheen or depth of oil layer
9. Estimate of depth/volume of floatables (trash, leaves) captured
10. Sediment depth measured
11. Recommendations for any repairs and/or maintenance for the unit
12. Estimation of time before maintenance is required if not required at time of inspection

A sample inspection checklist is provided at the end of this manual.

Maintenance

Procedure

The Hydroworks HydroDome unit is typically maintained using a vacuum truck. There are numerous companies that can maintain the HydroDome separator. Maintenance with a vacuum truck involves removing all of the water and sediment together. The water is then separated from the sediment on the truck or at the disposal facility.

The area around the HydroDome provides clear access to the bottom of the structure (Figure 3). This is the area where a vacuum hose would be lowered to clean the unit.

In instances where a vacuum truck is not available other maintenance methods (i.e. clamshell bucket) can be used, but they will be less effective. If a clamshell bucket is used the water must be decanted prior to cleaning since the sediment is under water and typically fine in nature.

The local municipality should be consulted for the allowable disposal options for both water and sediments prior to any maintenance operation. Once the water is decanted the sediment can be removed with the clamshell bucket.

Maintenance of a Hydroworks HydroDome unit will typically take 1 to 2 hours depending on size of unit and using a vacuum truck. Cleaning may take longer for other cleaning methods (i.e. clamshell bucket).

Inlet protection (Figure 2) is located at the inlet to the low flow opening in the HydroDome to ensure the opening does not become clogged. Although it is not anticipated that the inlet protection will have to be replaced on a regular (i.e. annual) basis since the inlet protection is protected by the submerged entrance to the HydroDome , the inlet protection should be checked each time the HydroDome is inspected or maintained. The inlet protection is removable and should be rinsed with water to ensure any debris caught on the protection is discarded. Unless damaged, the inlet protection can be reinstalled. A replacement piece can be bought through Hydroworks and/or retail stores. Hydroworks can provide information on the inlet protection and where it can be bought. A sign that the inlet protection needs cleaning/replacement would be a water level near the crown of the outlet pipe in the structure during periods with no flow.

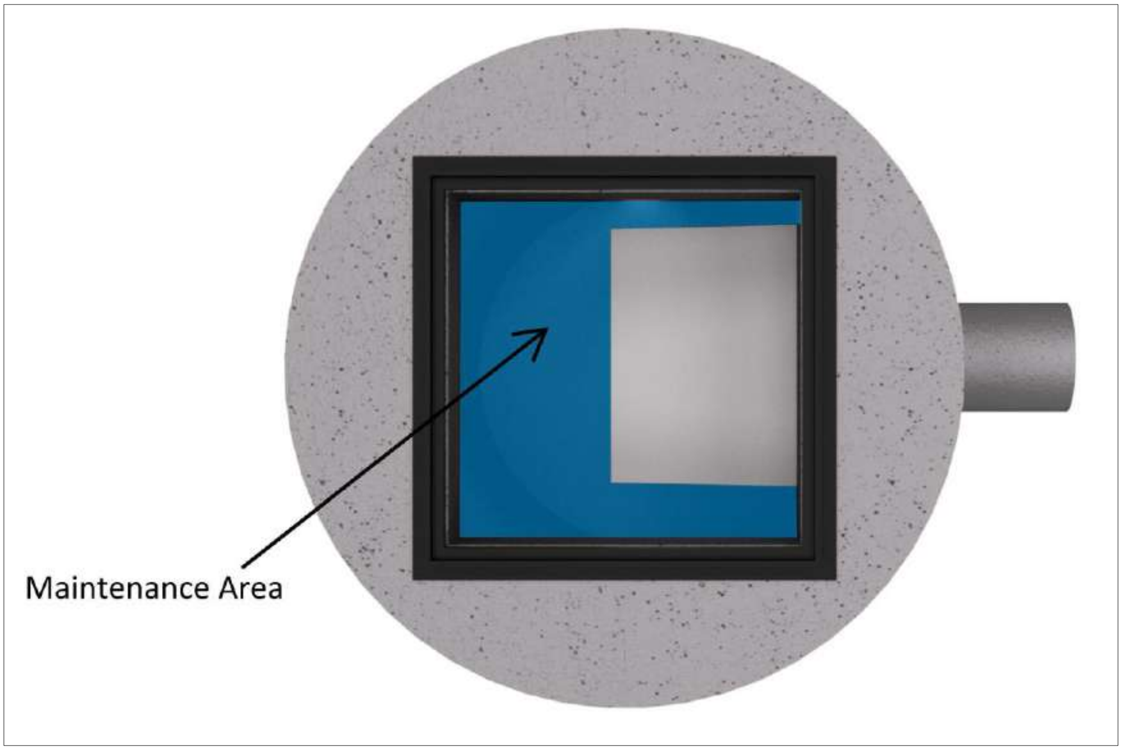


Figure 3 – HydroDome Maintenance Access

Frequency

<u>Construction Period</u>

A HydroDome separator can fill with construction sediment quickly during the construction period. The HydroDome must be maintained during the construction period when the depth of TSS/sediment reaches 24” (600 mm). It must also be maintained during the construction period if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 50% of the area of the separator

The HydroDome separator should be maintained at the end of the construction period, prior to operation for the post-construction period.

<u>Post-Construction Period</u>

The maintenance for sediment accumulation is required if the depth of sediment is 1 ft or greater in separators with standard water (sump) depths (Table 1).

There will be designs with increased sediment storage based on specifications or site-specific criteria. Please contact Hydroworks at 888-290-7900 to inquire whether your HydroDome was designed with extra sump depth to extend the frequency of maintenance.

The HydroDome separator must also be maintained if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 75% of the water surface of the separator.

Table 1 Standard Dimensions for Hydroworks HydroDome Models

Model	Diameter ft (mm)	Maintenance Sediment Depth in (mm)
HD 3	3 (900)	12 (300)
HD 4	4 (1200)	12 (300)
HD 5	5 (1500)	12 (300)
HD 6	6 (1800)	12 (300)
HD 7	7 (2100)	12 (300)
HD 8	8 (2400)	12 (300)
HD 10	10 (3000)	12 (300)
HD 12	12 (3600)	12 (300)

□Y□RO□OME I□SPECTIO□ S□EET

□ate ____________________________
□ate of Last Inspection ____________________________

Site ____________________________
City ____________________________
State ____________________________
Owner ____________________________

□PS Coordinates ____________________________

□ate of last rainfall ____________________________

Site Characteristics	**Yes**	**□o**
Soil erosion evident	☐	☐
Exposed material storage on site	☐	☐
Large exposure to leaf litter (lots of trees)	☐	☐
High traffic (vehicle) area	☐	☐

□ydro□ome	**Yes**	**□o**
Obstructions in the inlet	☐ □	☐
Damage to HydroDome (cracked, broken, loose pieces)	☐ □□	☐
Improperly installed outlet pipe	☐ □□□	☐
Internal component damage (cracked, broken, loose pieces)	☐ □□	☐
Floating debris in the separator (oil, leaves, trash)	☐	☐
Large debris visible in the separator	☐ □	☐
Concrete cracks/deficiencies	☐ □□□	☐
Exposed rebar	☐ □□	☐
Raised water level (water level close to top of HydroDome)	☐ □□□	☐
Water seepage (water level not at outlet pipe invert)	☐ □□□	☐
Water level depth below outlet pipe invert _______ "		

Routine Measurements				
Floating debris depth	**< 0.5" (13mm)**	☐	**>0.5" 13mm)**	☐ □
Floating debris coverage	**□75□ of surface area**	☐	**□75□ surface area**	☐ □
Sludge depth	**□12" (300mm)**	☐	**□12" (300mm)**	☐ □

□ Maintenance re□uired
□□ Repairs re□uired
□□□ Further investigation is re□uired

Note: Inspections should not be made within 24 hours of a storm to allow the water to drain from the structure to assess a raised water level or water level seepage

Hydroworks

Other Comments:

Hydroworks

Hydroworks□ HydroDome

One Year Limited Warranty

Hydroworks, LLC warrants, to the purchaser and subsequent owner(s) during the warranty period subject to the terms and conditions hereof, the Hydroworks HydroDome to be free from defects in material and workmanship under normal use and service, when properly installed, used, inspected and maintained in accordance with Hydroworks written instructions, for the period of the warranty. The standard warranty period is 1 year.

The warranty period begins once the separator has been manufactured and is available for delivery. Any components determined to be defective, either by failure or by inspection, in material and workmanship will be repaired, replaced or remanufactured at Hydroworks' option provided, however, that by doing so Hydroworks, LLC will not be obligated to replace an entire insert or concrete section, or the complete unit. This warranty does not cover shipping charges, damages, labor, any costs incurred to obtain access to the unit, any costs to repair/replace any surface treatment/cover after repair/replacement, or other charges that may occur due to product failure, repair or replacement.

This warranty does not apply to any material that has been disassembled or modified without prior approval of Hydroworks, LLC, that has been subjected to misuse, misapplication, neglect, alteration, accident or act of God, or that has not been installed, inspected, operated or maintained in accordance with Hydroworks, LLC instructions and is in lieu of all other warranties expressed or implied. Hydroworks, LLC does not authorize any representative or other person to expand or otherwise modify this limited warranty.

The owner shall provide Hydroworks, LLC with written notice of any alleged defect in material or workmanship including a detailed description of the alleged defect upon discovery of the defect. Hydroworks, LLC should be contacted at 136 Central Ave., Clark, NJ 07066 or any other address as supplied by Hydroworks, LLC. (888-290-7900).

This limited warranty is exclusive. There are no other warranties, express or implied, or merchantability or fitness for a particular purpose and none shall be created whether under the uniform commercial code, custom or usage in the industry or the course of dealings between the parties. Hydroworks, LLC will replace any goods that are defective under this warranty as the sole and exclusive remedy for breach of this warranty.

Subject to the foregoing, all conditions, warranties, terms, undertakings or liabilities (including liability as to negligence), expressed or implied, and howsoever arising, as to the condition, suitability, fitness, safety, or title to the Hydroworks HydroDome are hereby negated and excluded and Hydroworks, LLC gives and makes no such representation, warranty or undertaking except as expressly set forth herein. Under no circumstances shall Hydroworks, LLC be liable to the Purchaser or to any third party for product liability claims□claims arising from the design, shipment, or installation of the HydroDome, or the cost of other goods or services related to the purchase and installation of the HydroDome. For this Limited Warranty to apply, the HydroDome must be installed in accordance with all site conditions required by state and local codes; all other applicable laws; and Hydroworks' written installation instructions.

Hydroworks, LLC expressly disclaims liability for special, consequential or incidental damages (even if it has been advised of the possibility of the same) or breach of expressed or implied warranty. Hydroworks, LLC shall not be liable for penalties or liquidated damages, including loss of production and profits□labor and materials□overhead costs□or other loss or expense incurred by the purchaser or any third party. Specifically excluded from limited warranty coverage are damages to the HydroDome arising from ordinary wear and tear□alteration, accident, misuse, abuse or neglect□improper maintenance, failure of the product due to improper installation of the concrete sections or improper sizing□or any other event not caused by Hydroworks, LLC. This limited warranty represents Hydroworks' sole liability to the purchaser for claims related to the HydroDome, whether the claim is based upon contract, tort, or other legal basis.

APPENDIX E

PCSWMM ANALYSIS

DIGITAL REPORT AND MODELLING FILES

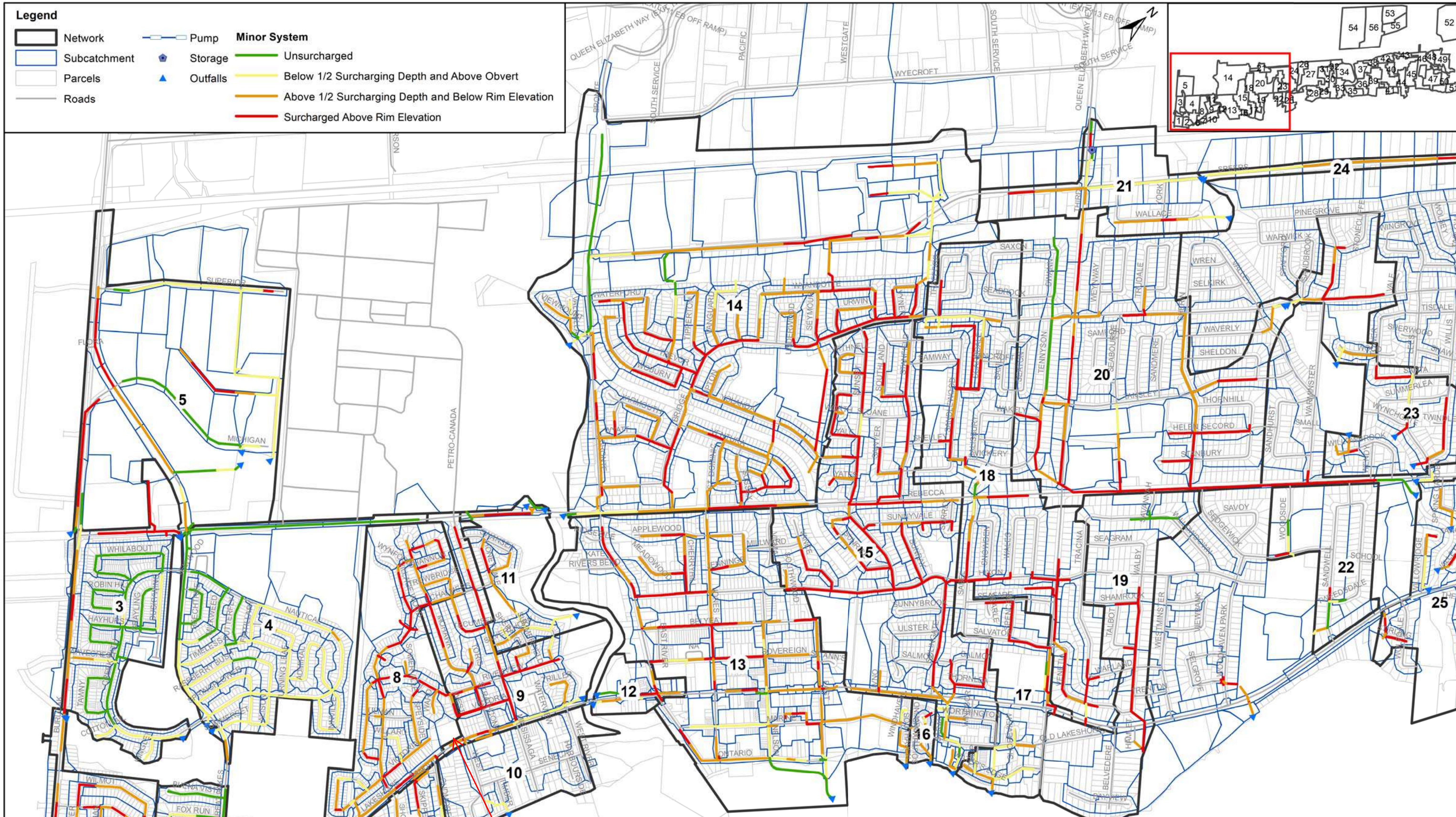
The following secure link is being provided by **SCS Consulting Group** to share 3171 Lakeshore Road West related digital data:

https://filesafecloud.scsconsultinggroup.com/url/7zksjijmyfuqmgtk

Please click on the link and download all files from this location.

- PCSWMM Modelling (Town and Site Plan Modified)

SCS consulting group ltd



Stormwater Management Master Plan

Phase 2

Town of Oakville

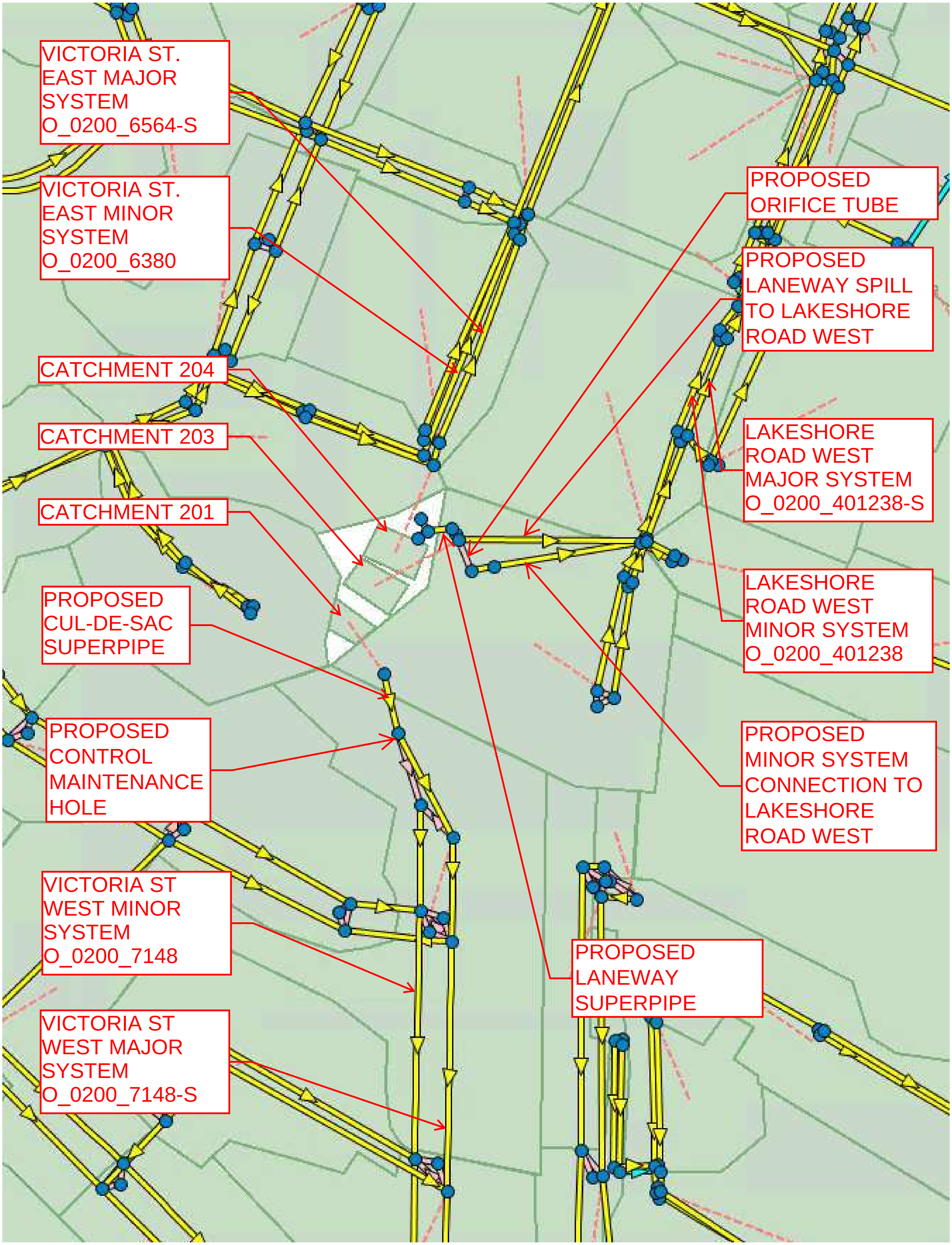
Minor System Capacity Assessment (Part 1)

100-Year Existing Condition

wood.

Project No. **TP 115045**

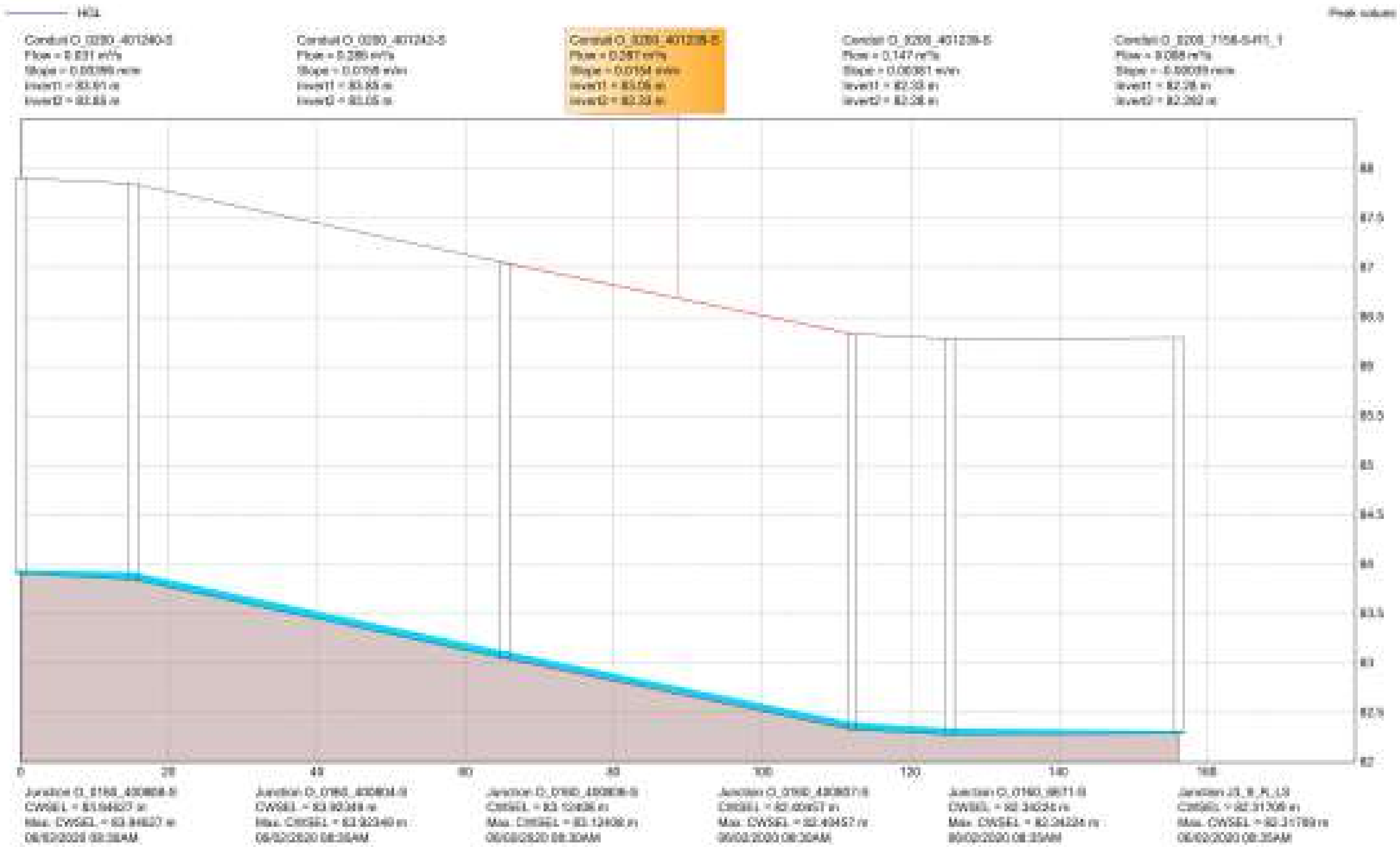
Figure No. **F6-1**



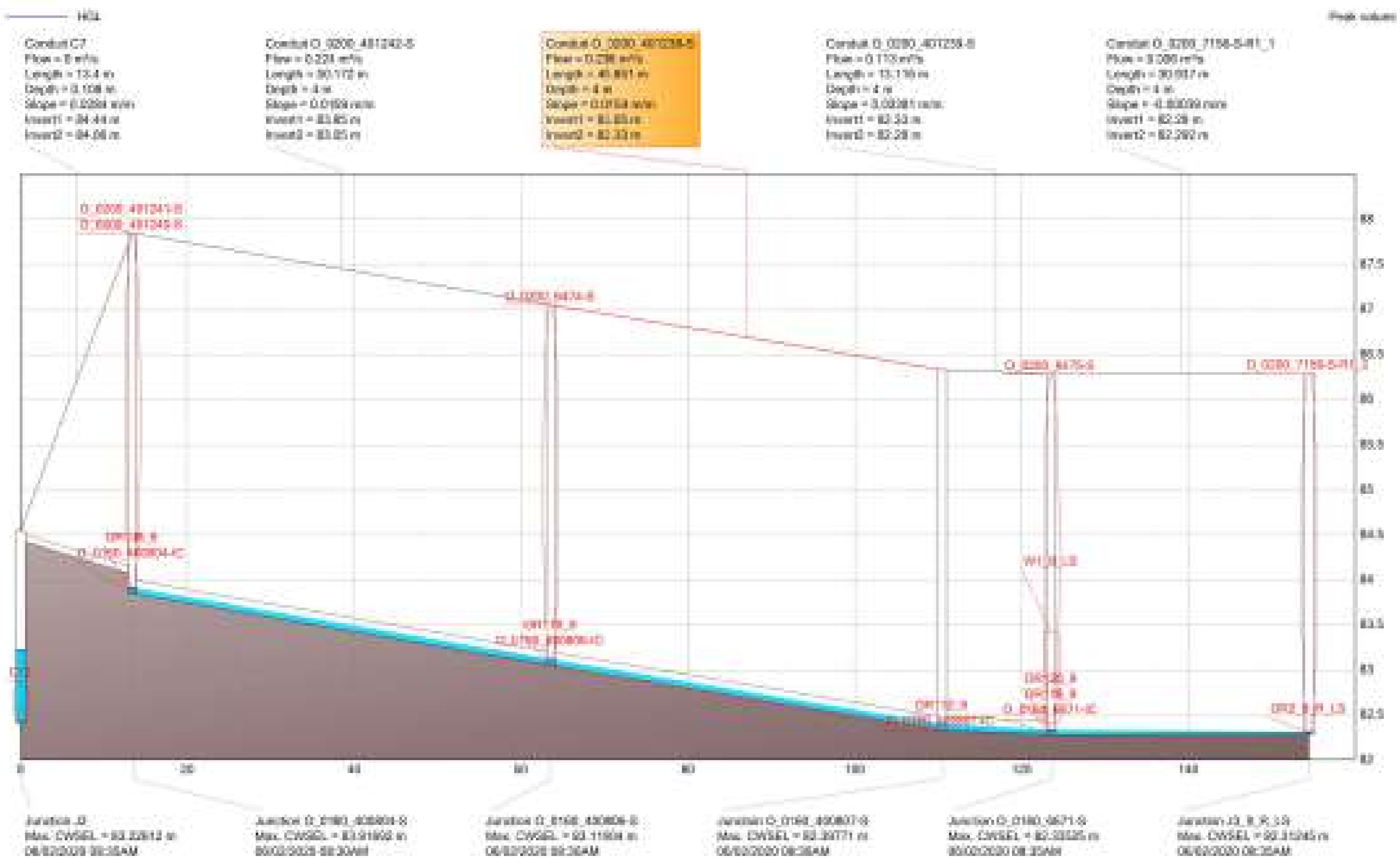
PCSWMM MODEL SCHEMATIC

Project ID	1930
Project Name	3171 Lakeshore Road West, Oakville
Date	January 2023
Description	Assess Impact on Adjacent Catchment Areas
Location	Town of Oakville

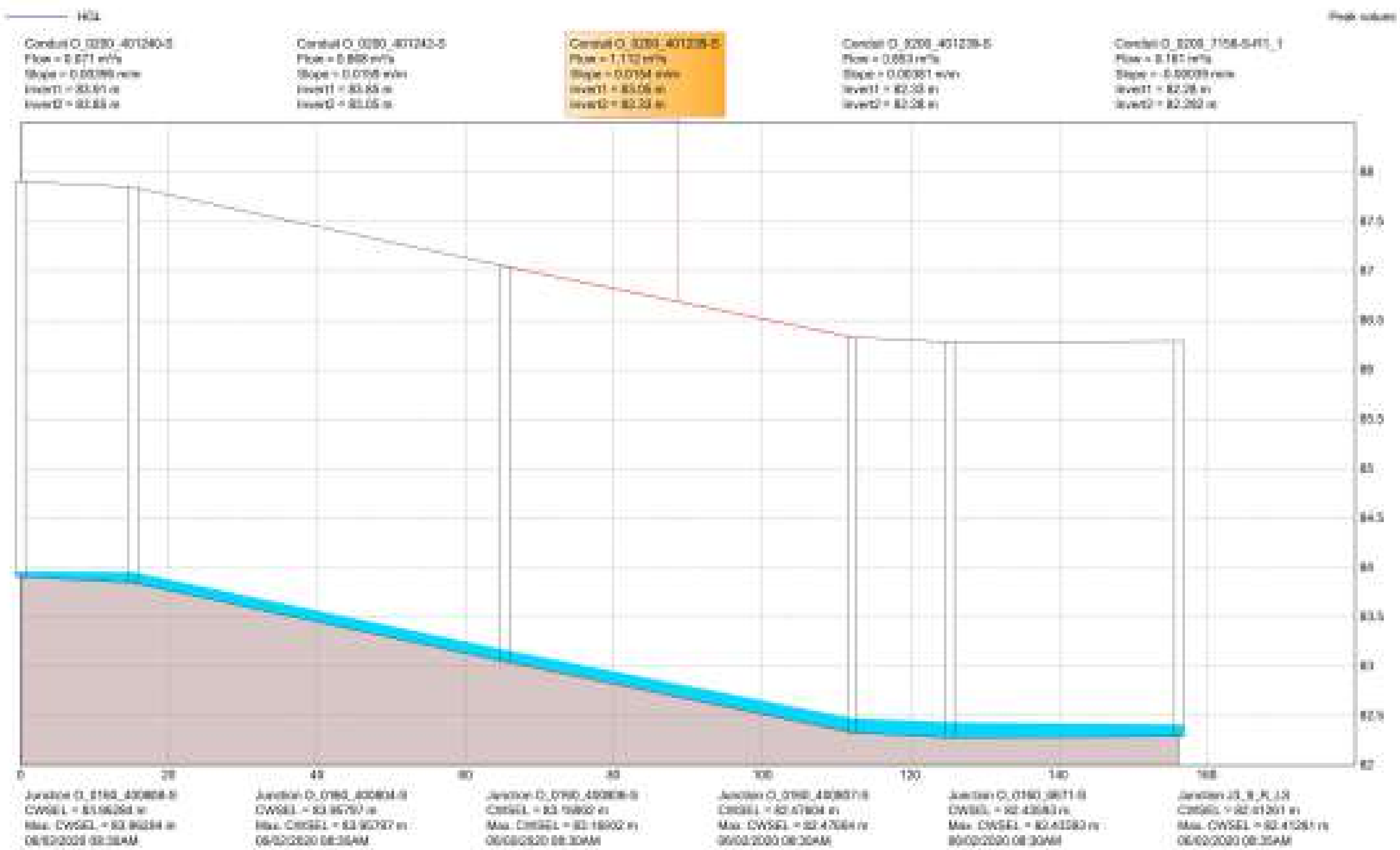
ATTRIBUTES					
Name	**201**	**203**	**204**	**S8_36 modified**	**S9_9 combined**
X-Coordinate				603838.08	603874.383
Y-Coordinate				4804491.167	4804615.887
Description					
Tag				8	8
Rain Gage	RG1	RG1	RG1	RG1	RG1
Outlet	J3	J1	O_0160_6138-S	O_0160_6768-S	O_0160_400803-S
Area (ha)	0.196	0.7	0.03	1.391	0.656
Width (m)	49	167.7	20	347	164
Flow Length (m)	40	40	15	40	40
Slope (%)	3	1	4	0.87	1
Imperv. (%)	61	69	10	64.1	48.6
N Imperv	0.013	0.013	0.013	0.013	0.013
N Perv	0.25	0.25	0.25	0.25	0.25
Dstore Imperv (mm)	1	1	1	1	1
Dstore Perv (mm)	5	5	5	5	5
Zero Imperv (%)	25	25	25	25	25
Subarea Routing	PERVIOUS	PERVIOUS	PERVIOUS	PERVIOUS	PERVIOUS
Percent Routed (%)	11	13	100	40	50



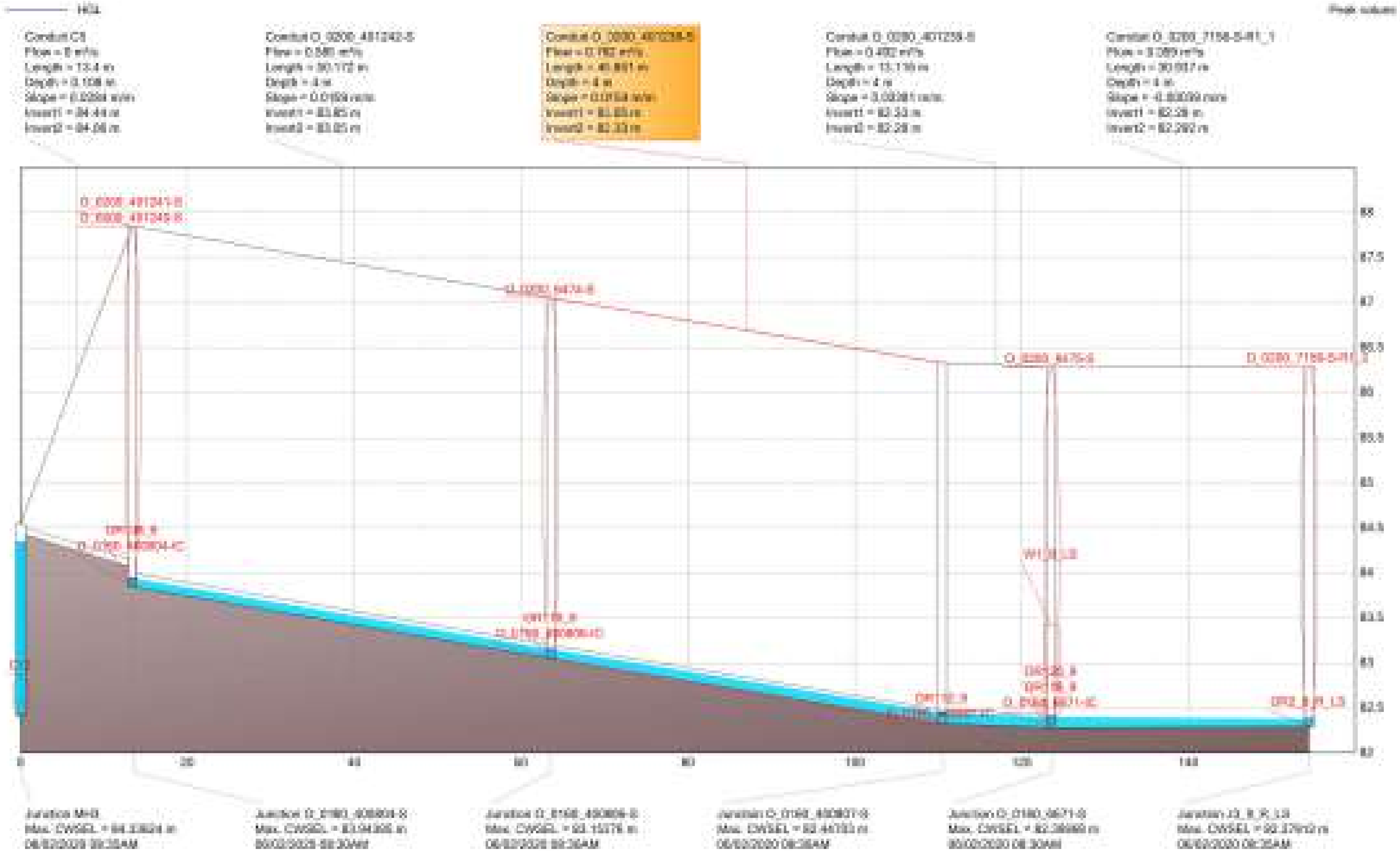
LAKESHORE ROAD WEST
MAJOR SYSTEM
5 YEAR
EXISTING



LAKESHORE ROAD WEST
MAJOR SYSTEM
5 YEAR
PROPOSED



LAKESHORE ROAD WEST
MAJOR SYSTEM
100 YEAR
EXISTING



LAKESHORE ROAD WEST
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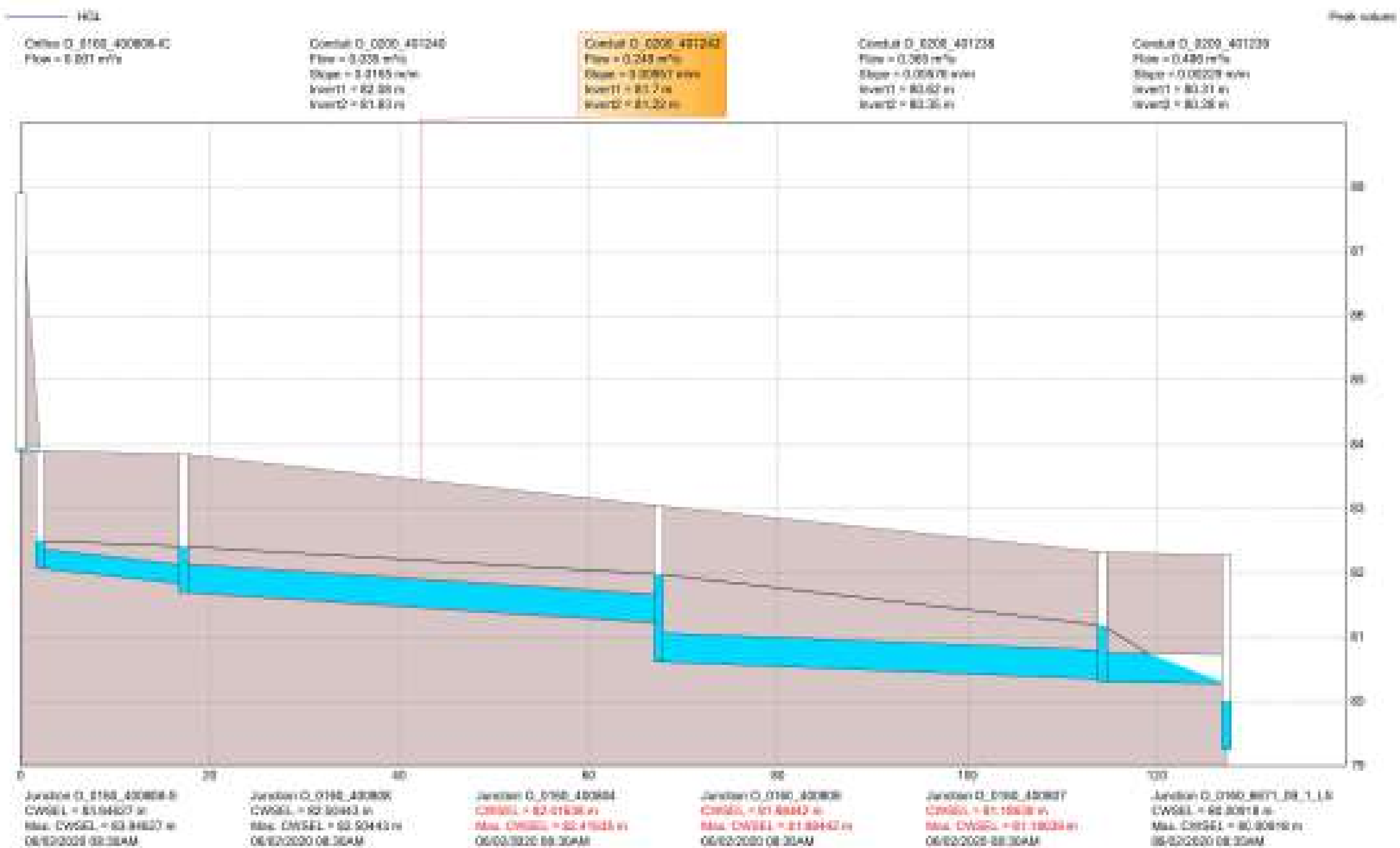
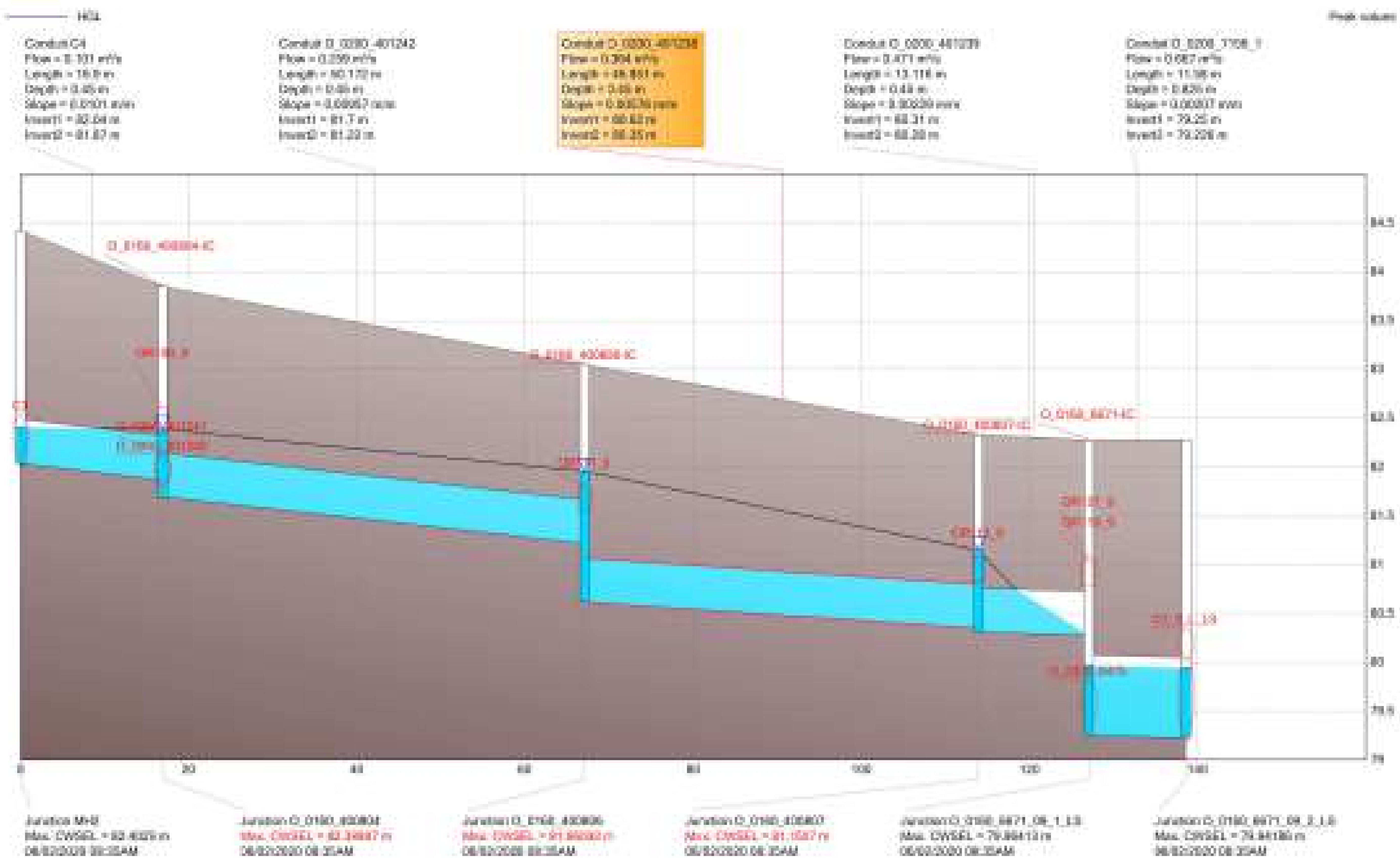


LAKESHORE ROAD WEST
MINOR SYSTEM
5 YEAR
EXISTING



LAKESHORE ROAD WEST
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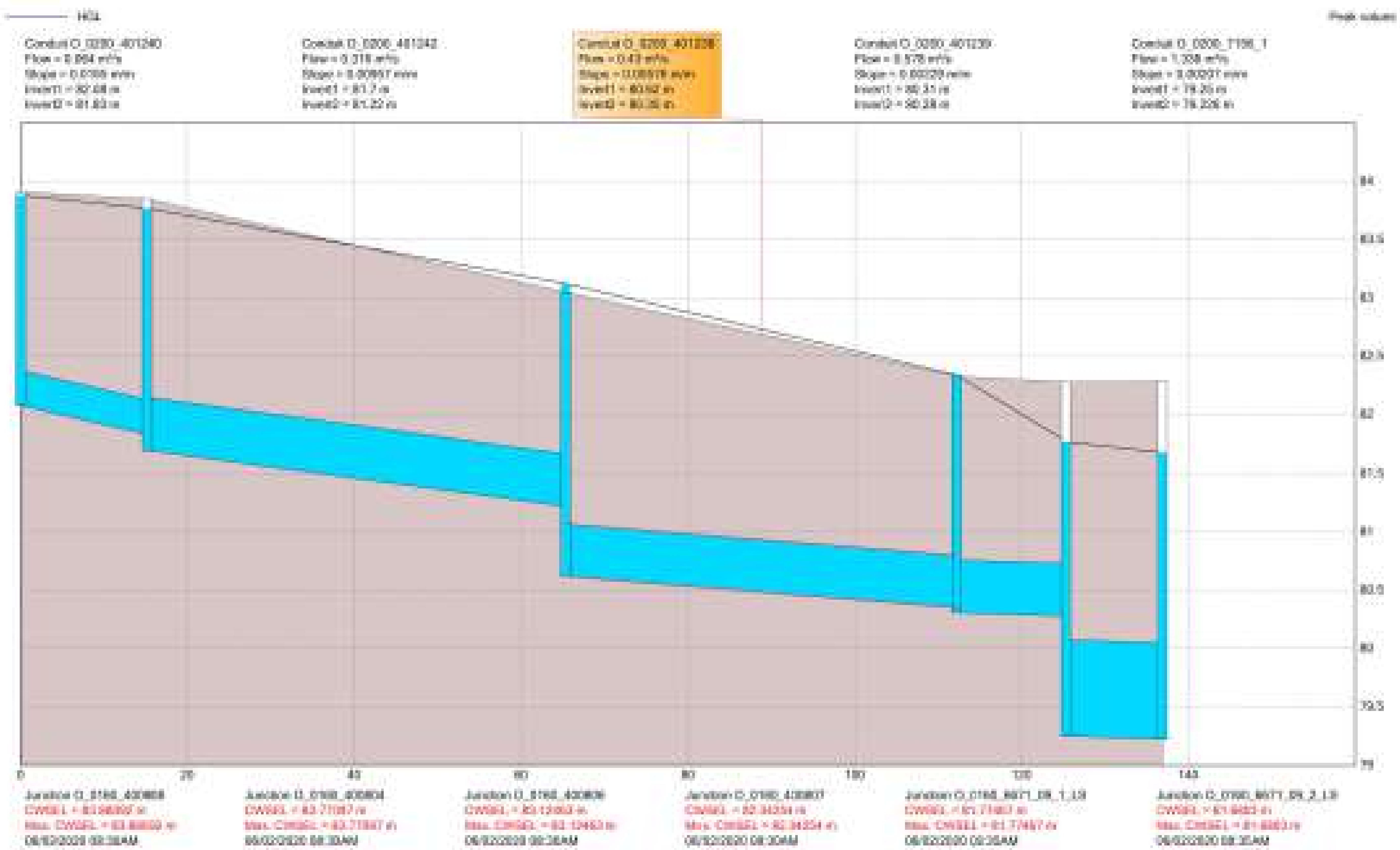
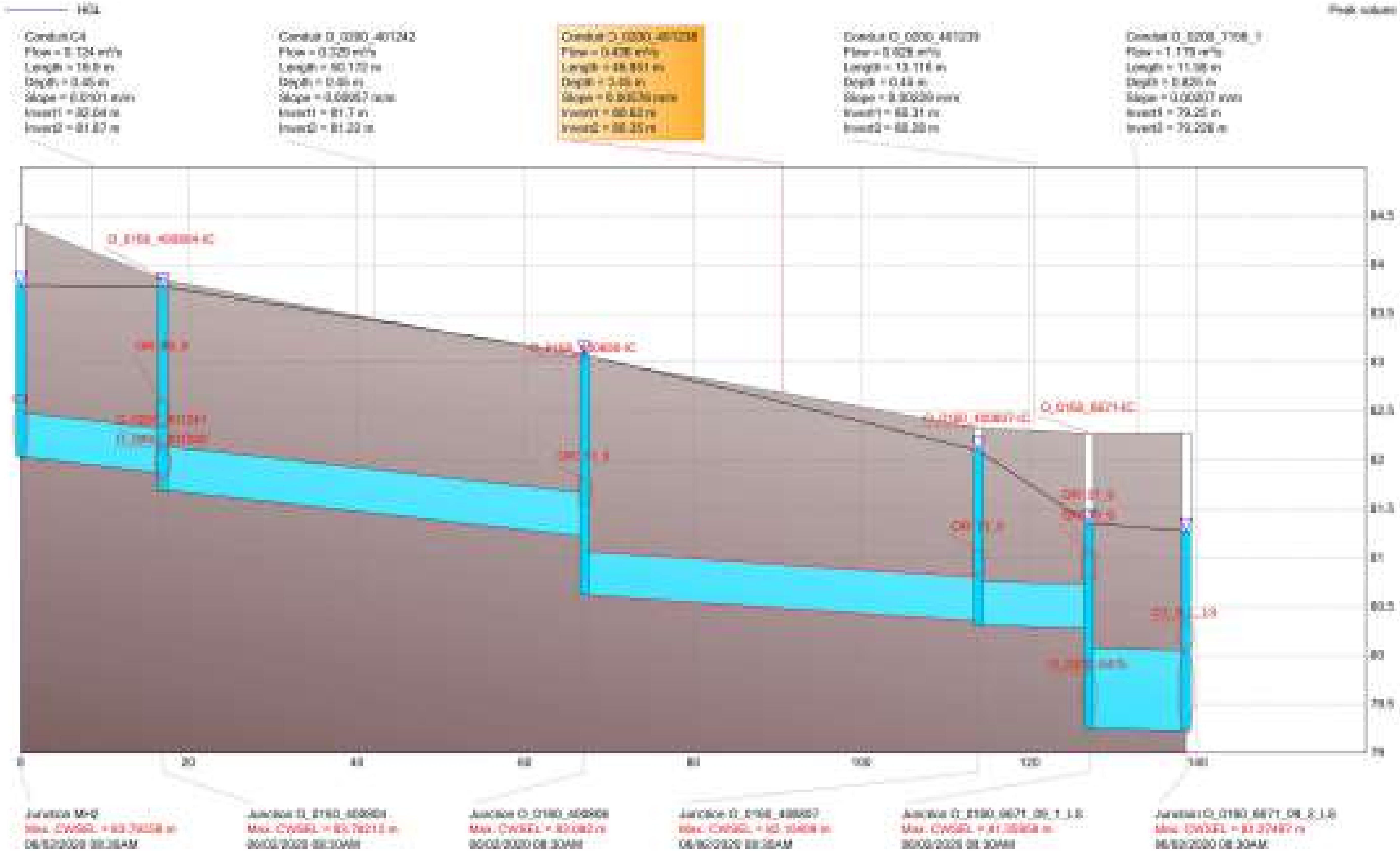
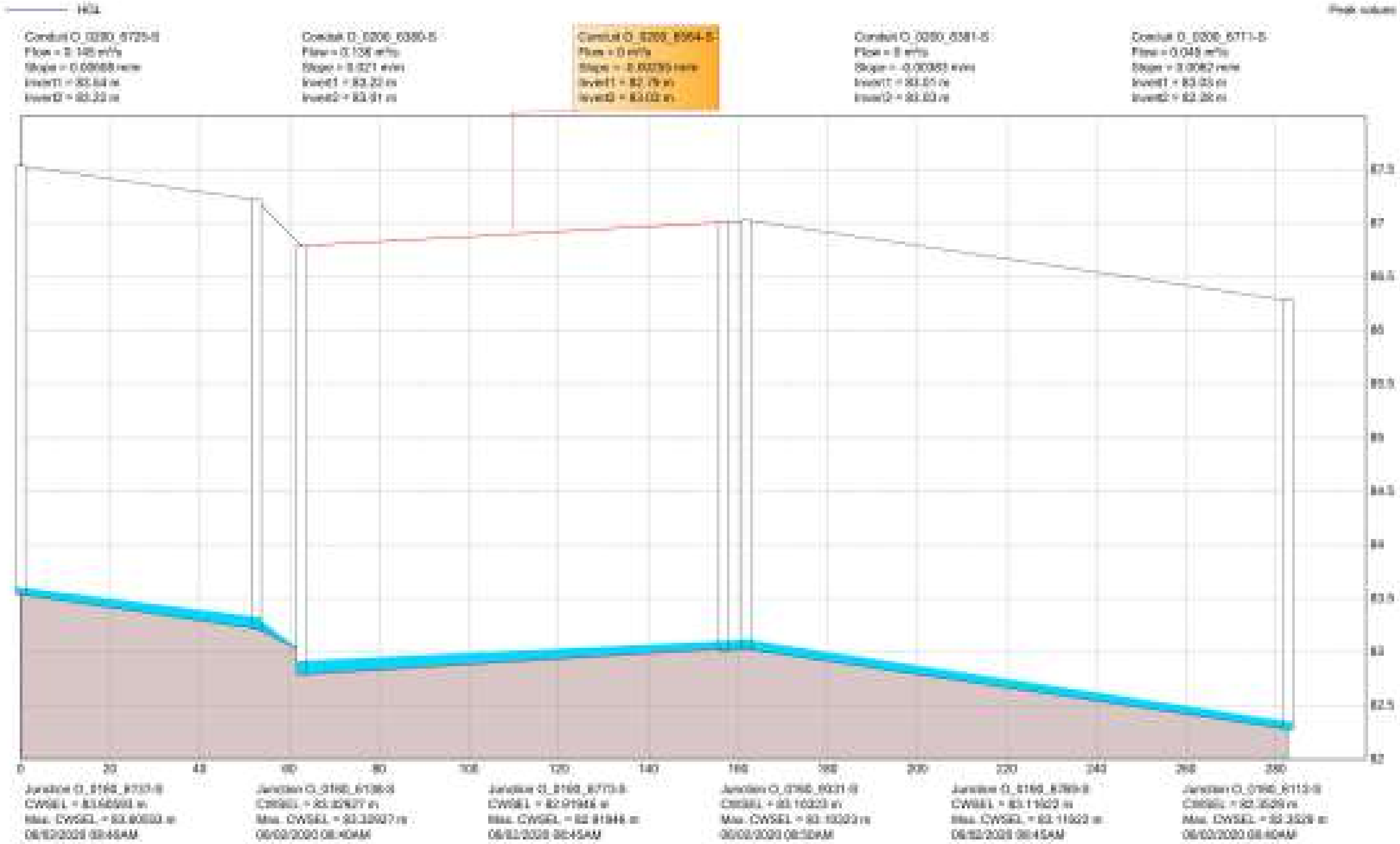
5 YEAR
PROPOSED



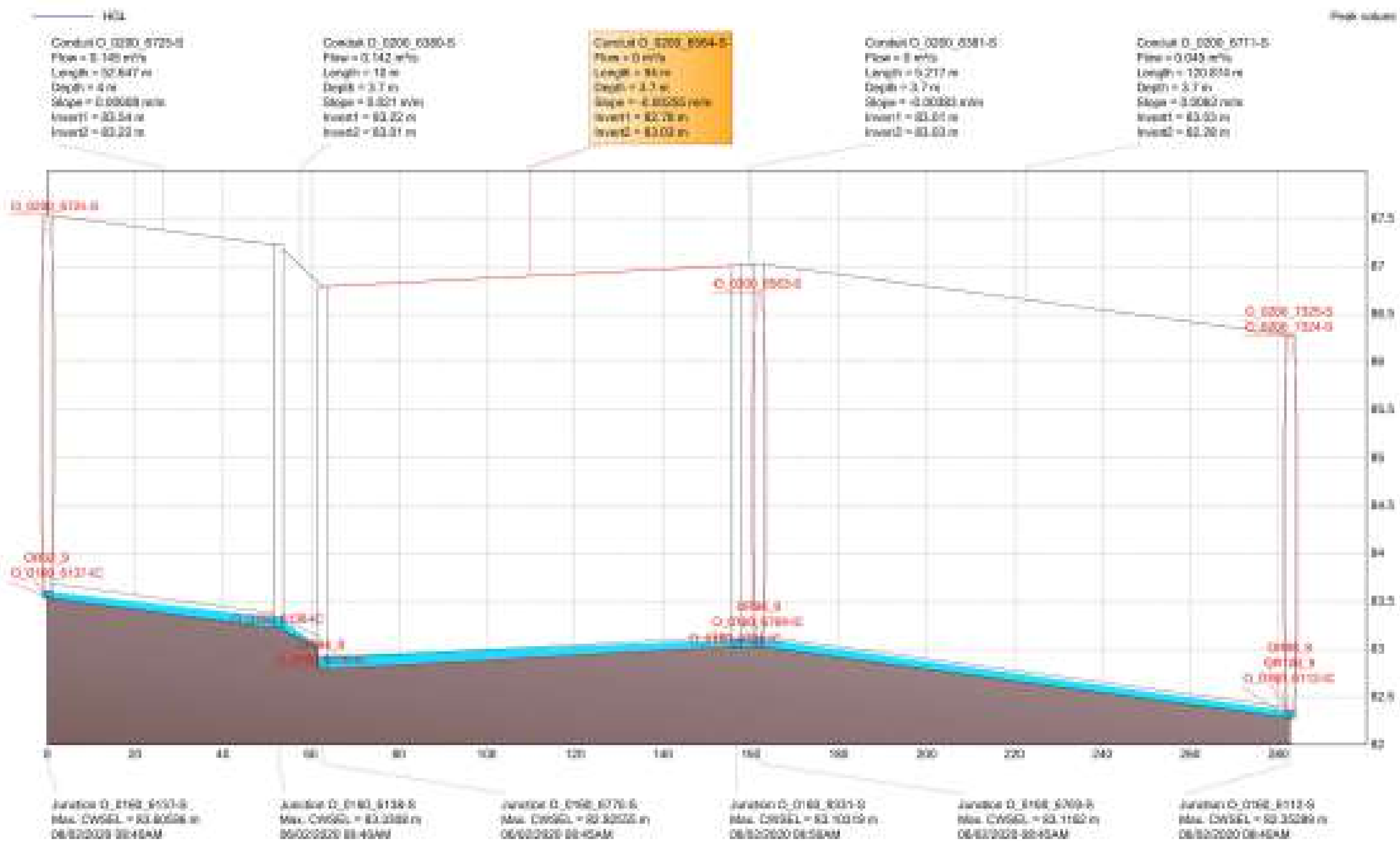
LAKESHORE ROAD WEST
MINOR SYSTEM
100 YEAR
EXISTING



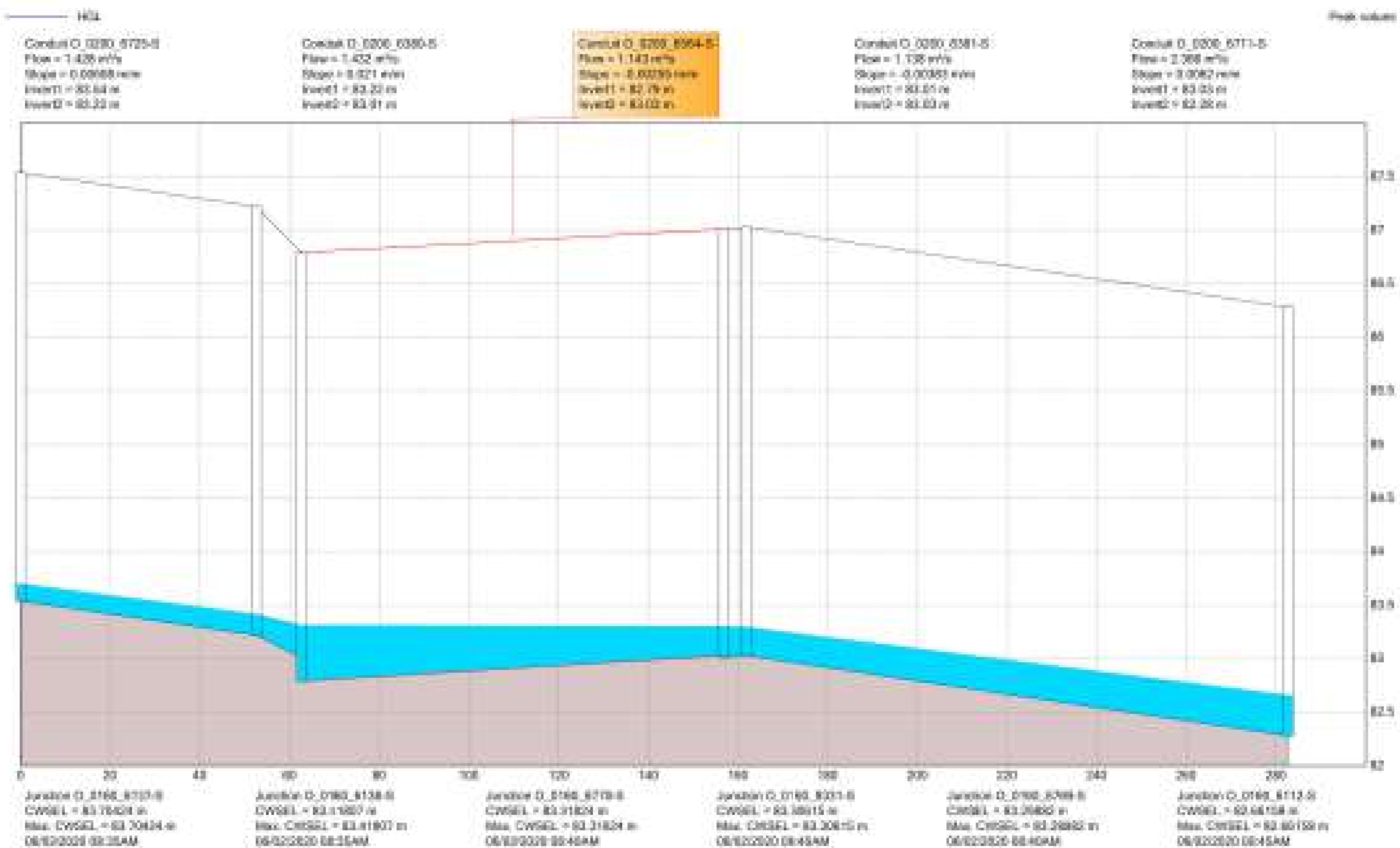
LAKESHORE ROAD WEST
MINOR SYSTEM
100 YEAR
PROPOSED



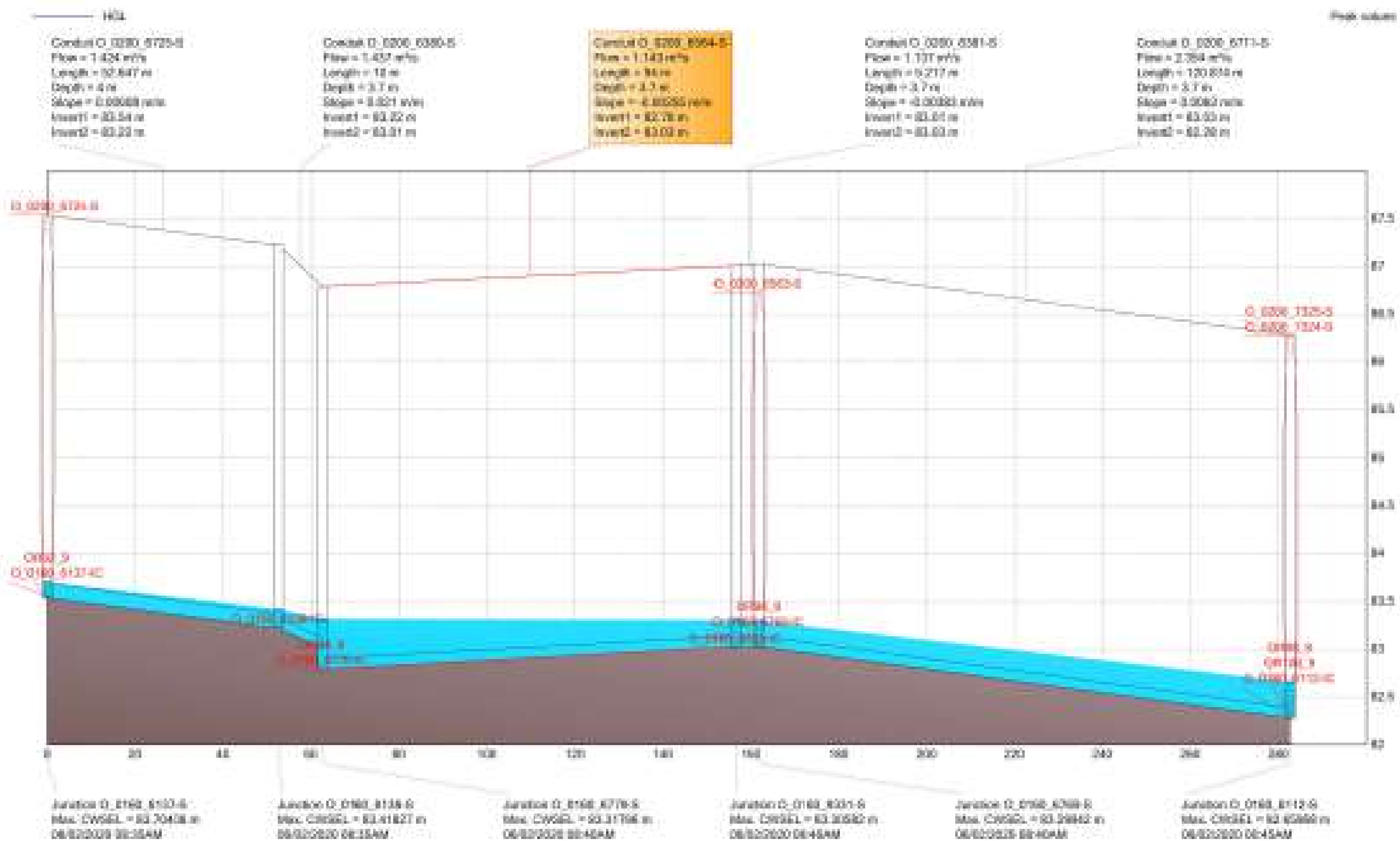
VICTORIA ST. EAST
MAJOR SYSTEM
5 YEAR
EXISTING



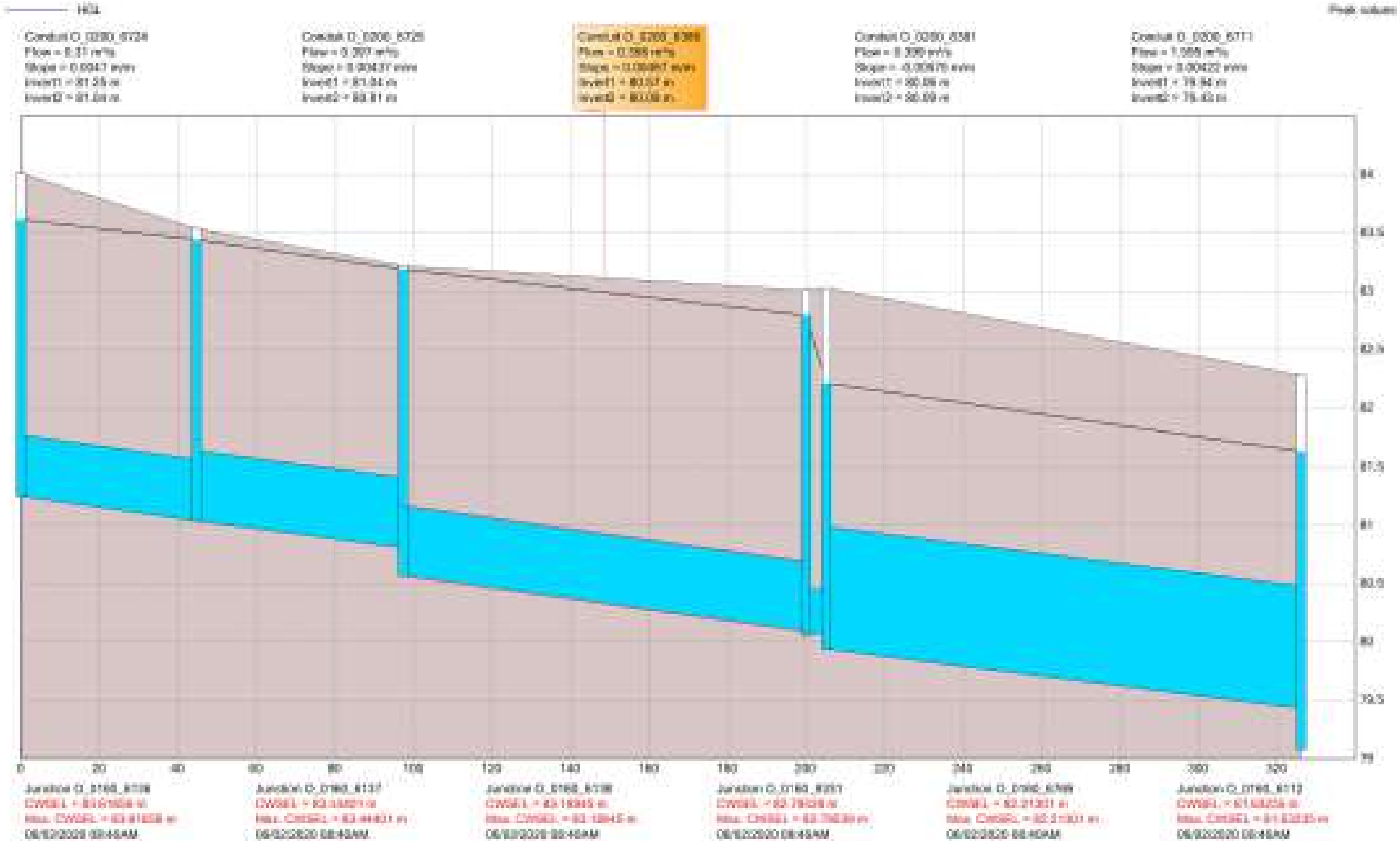
VICTORIA ST. EAST
MAJOR SYSTEM
5 YEAR
PROPOSED



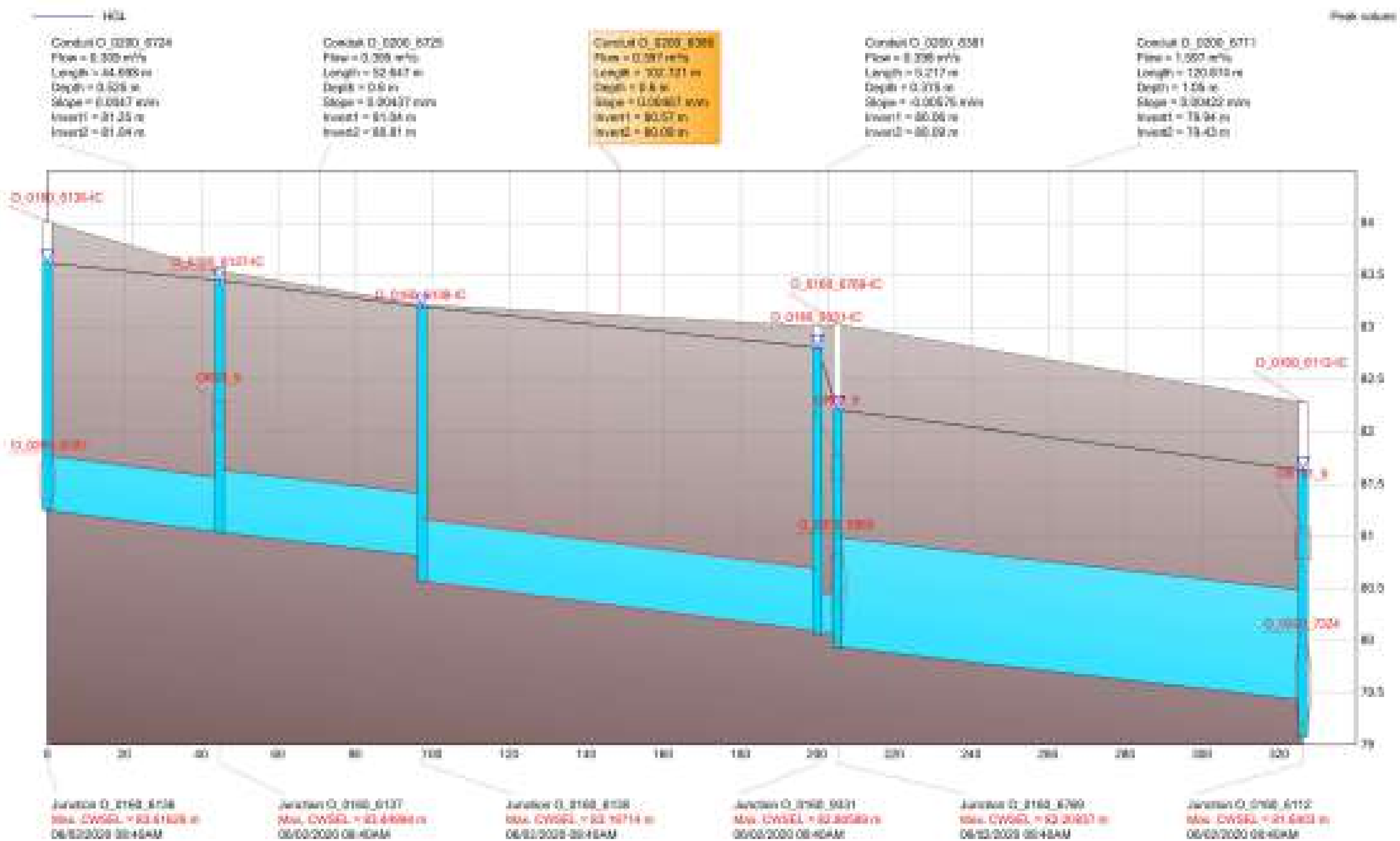
VICTORIA ST. EAST
MAJOR SYSTEM
100 YEAR
EXISTING



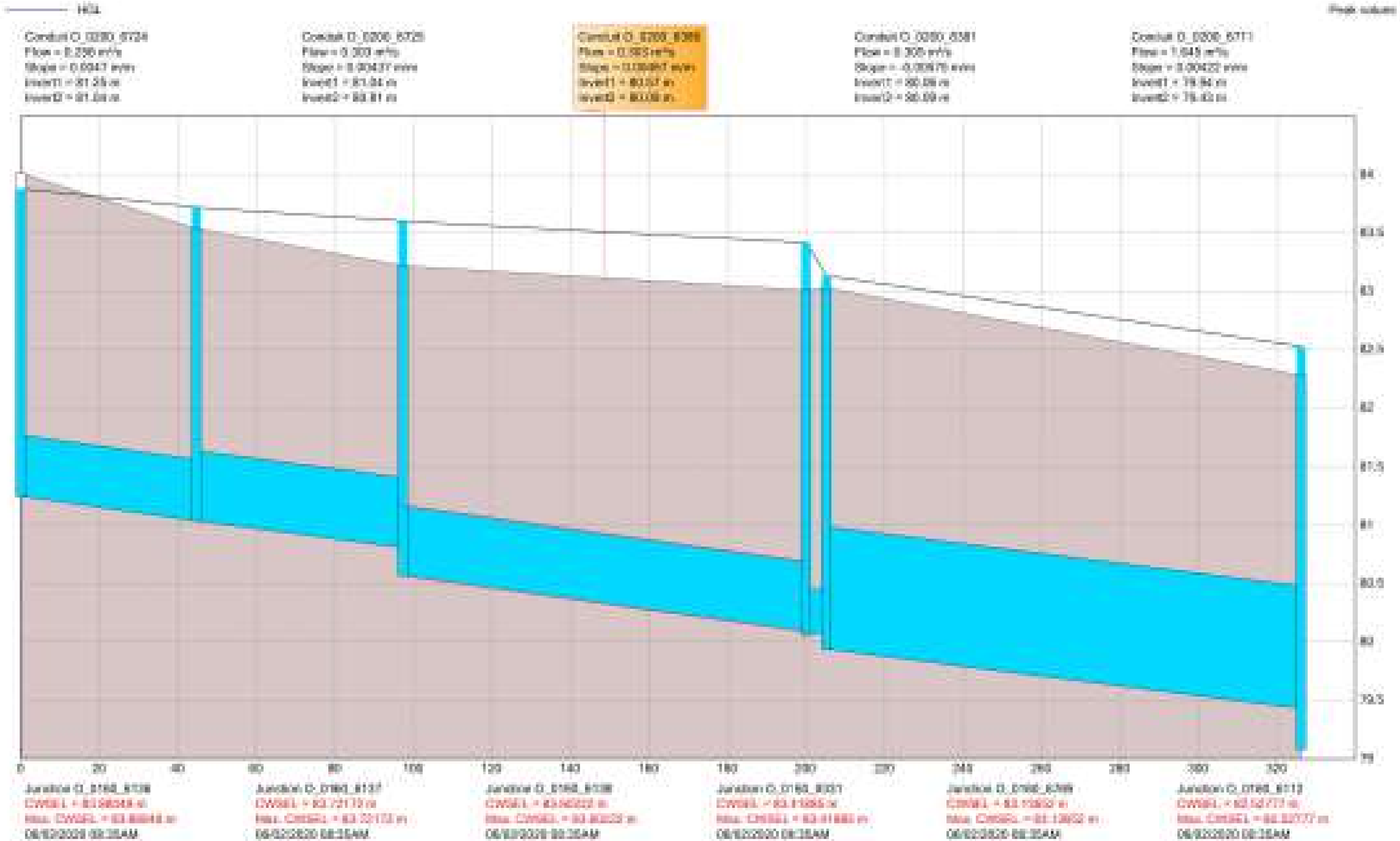
VICTORIA ST. EAST
MAJOR SYSTEM
100 YEAR
PROPOSED



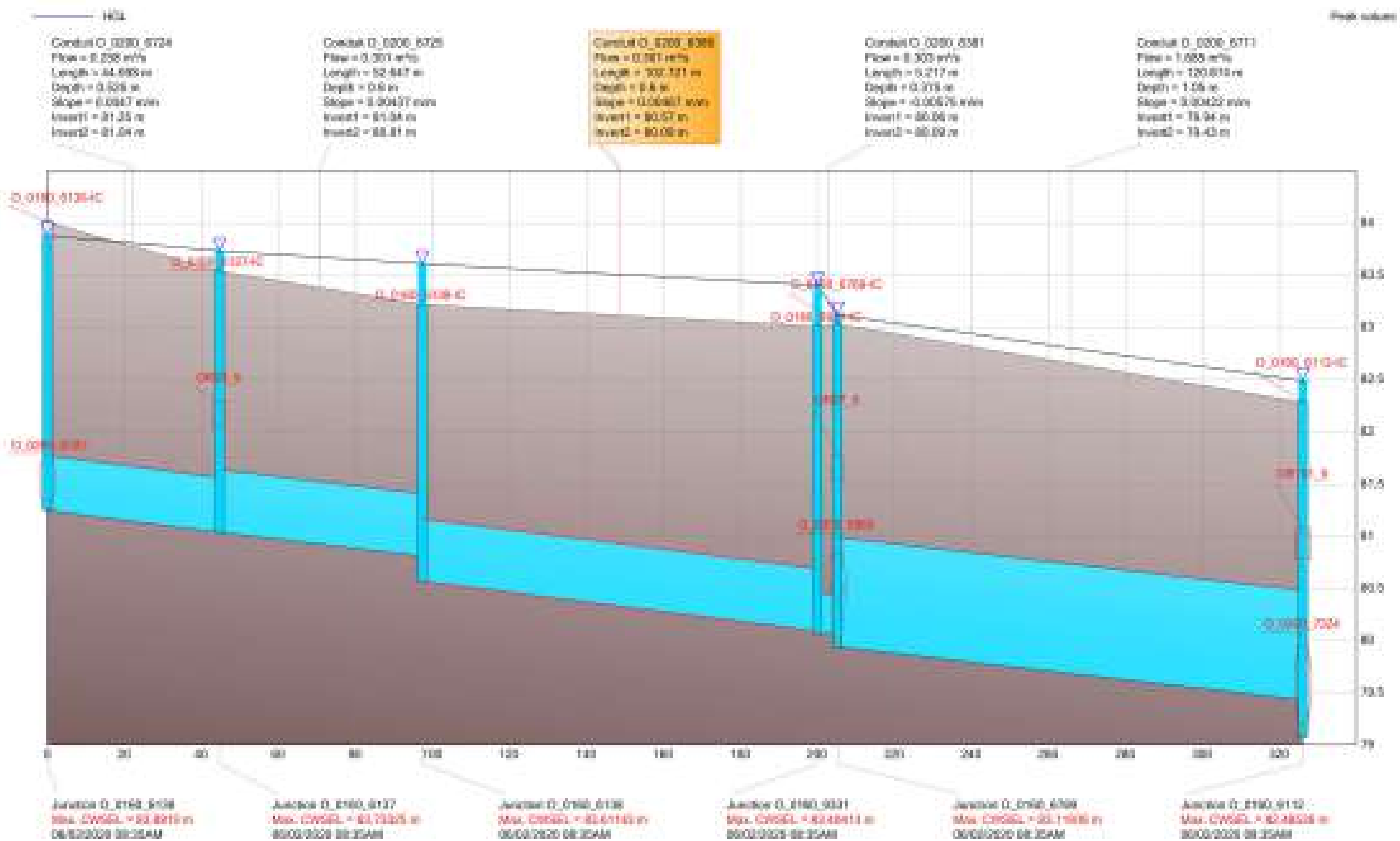
VICTORIA ST. EAST
MINOR
5 YEAR
EXISTING



VICTORIA ST. EAST
MINOR
5 YEAR
PROPOSED



VICTORIA ST. EAST
MINOR
100 YEAR
EXISTING



VICTORIA ST. EAST
MINOR
100 YEAR
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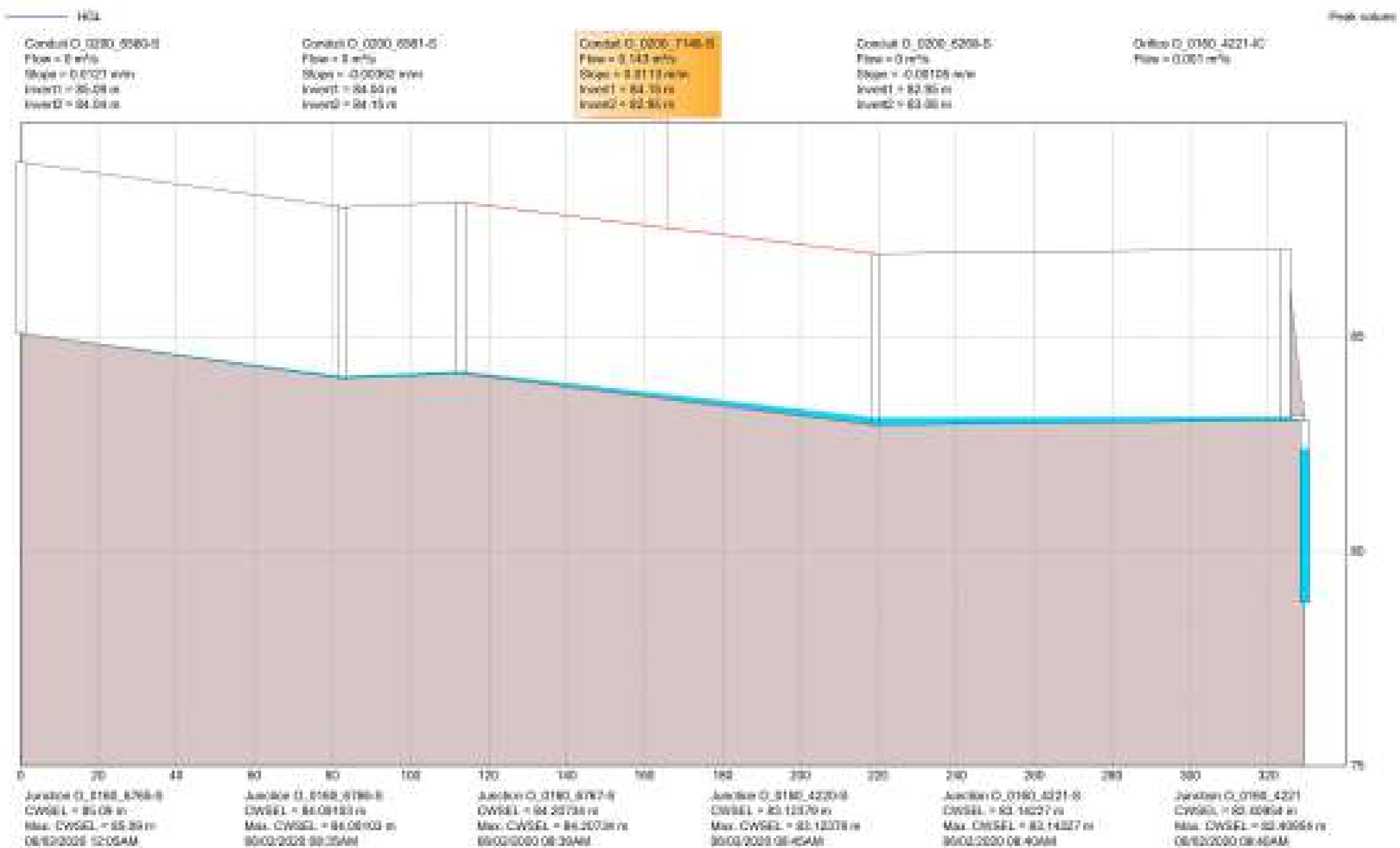
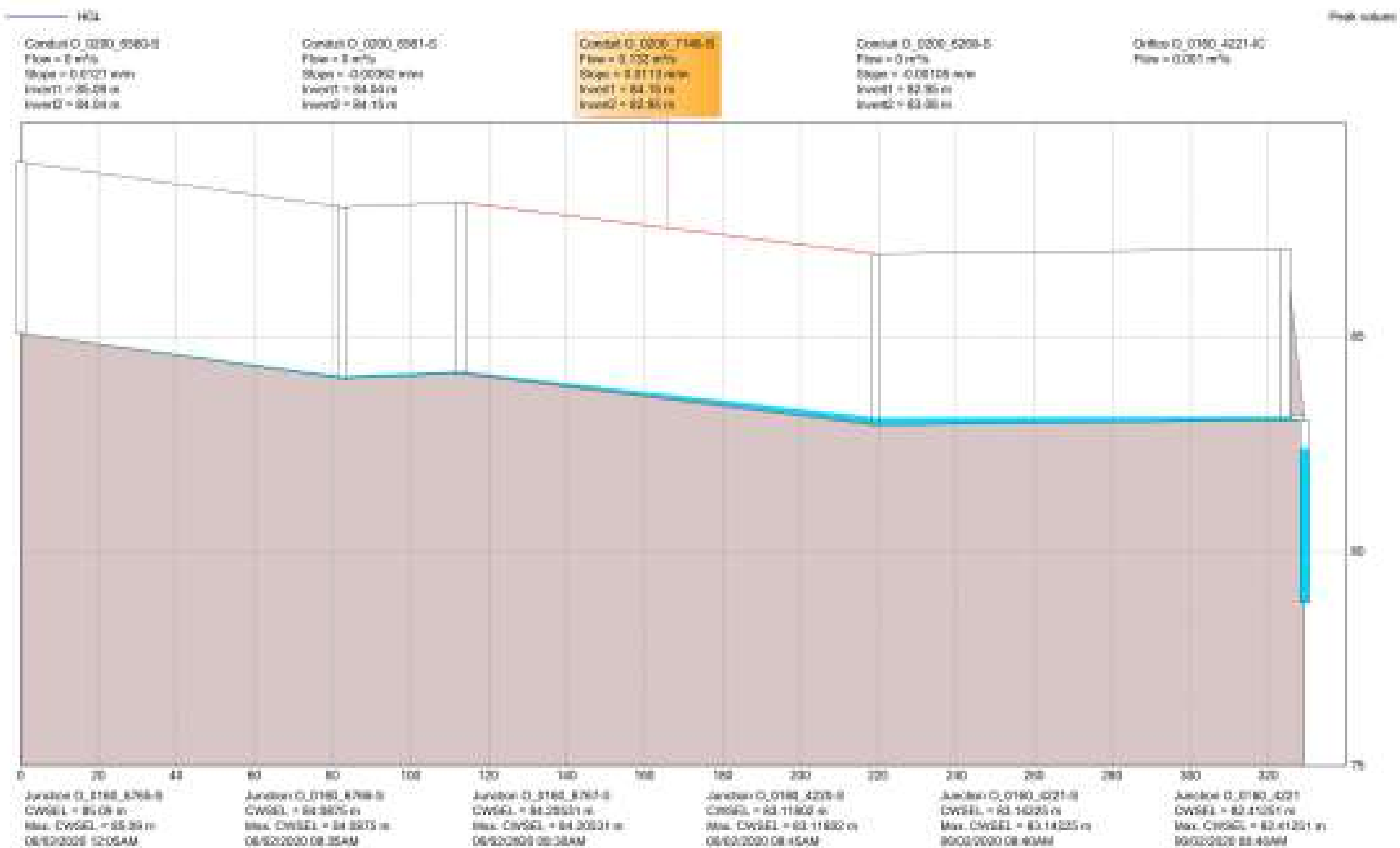


VICTORIA ST. WEST
MAJOR SYSTEM
5 YEAR
EXISTING



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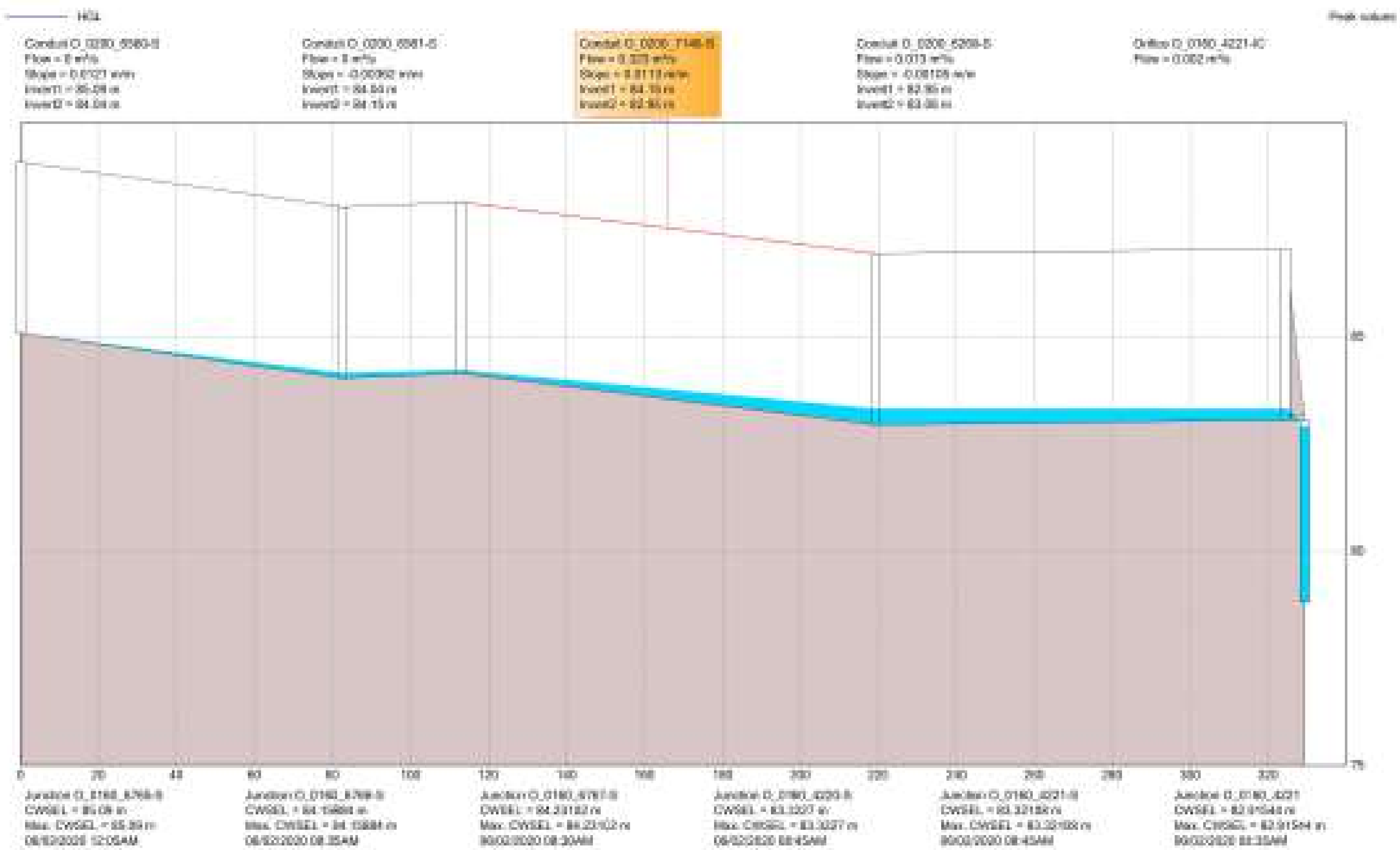
5 YEAR
PROPOSED



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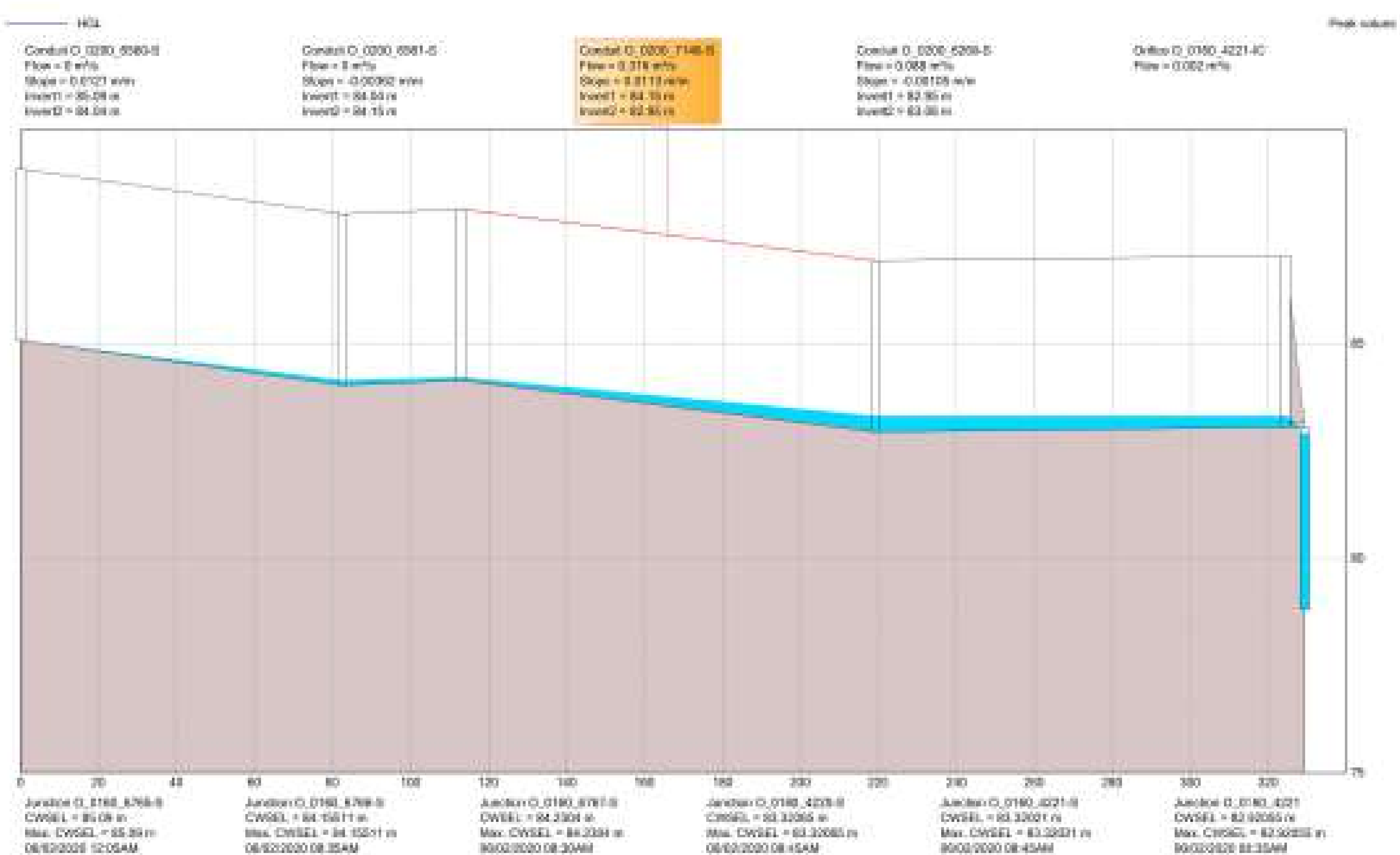
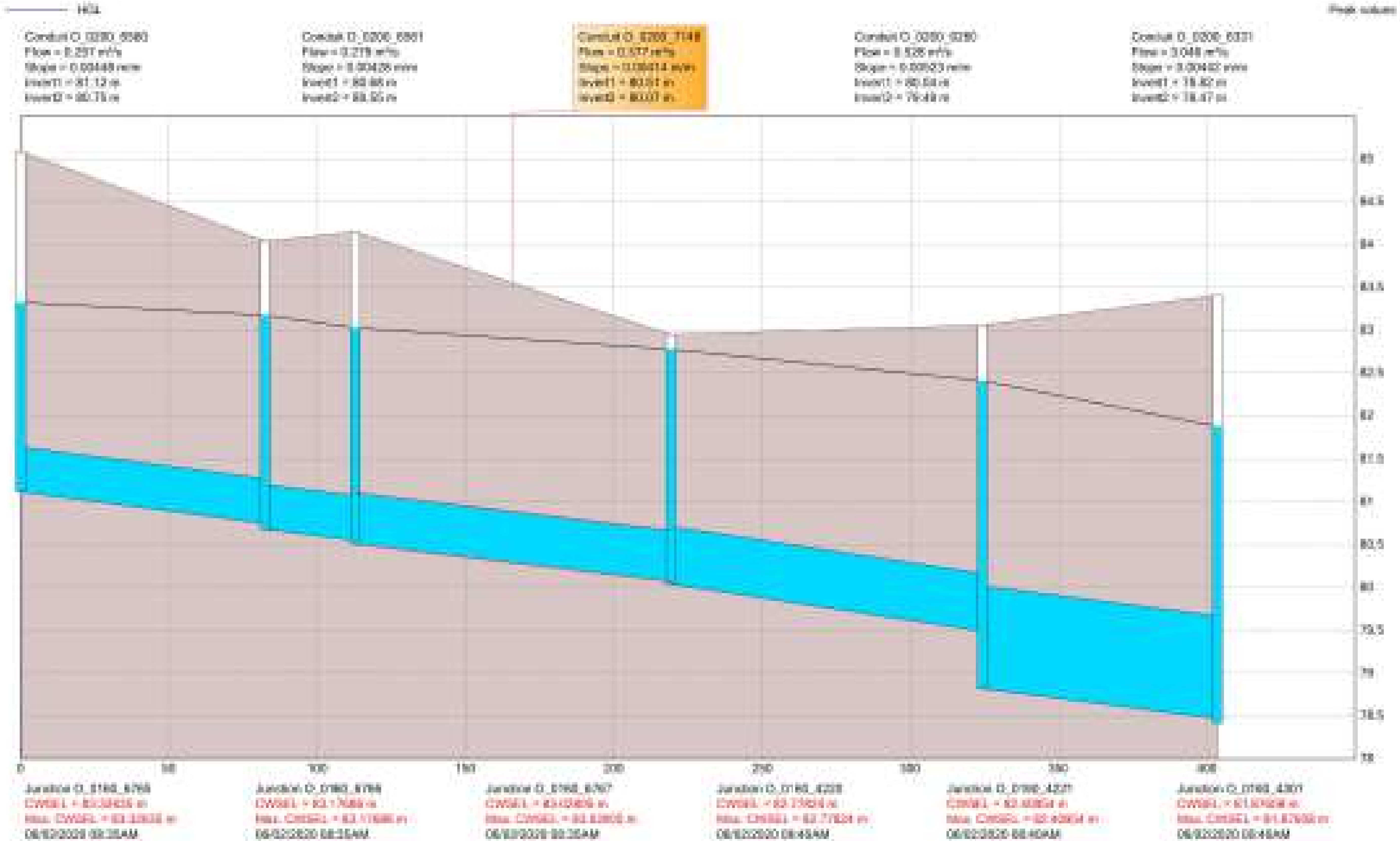
100 YEAR
EXISTING



VICTORIA ST. WEST
MAJOR SYSTEM
100 YEAR
PROPOSED



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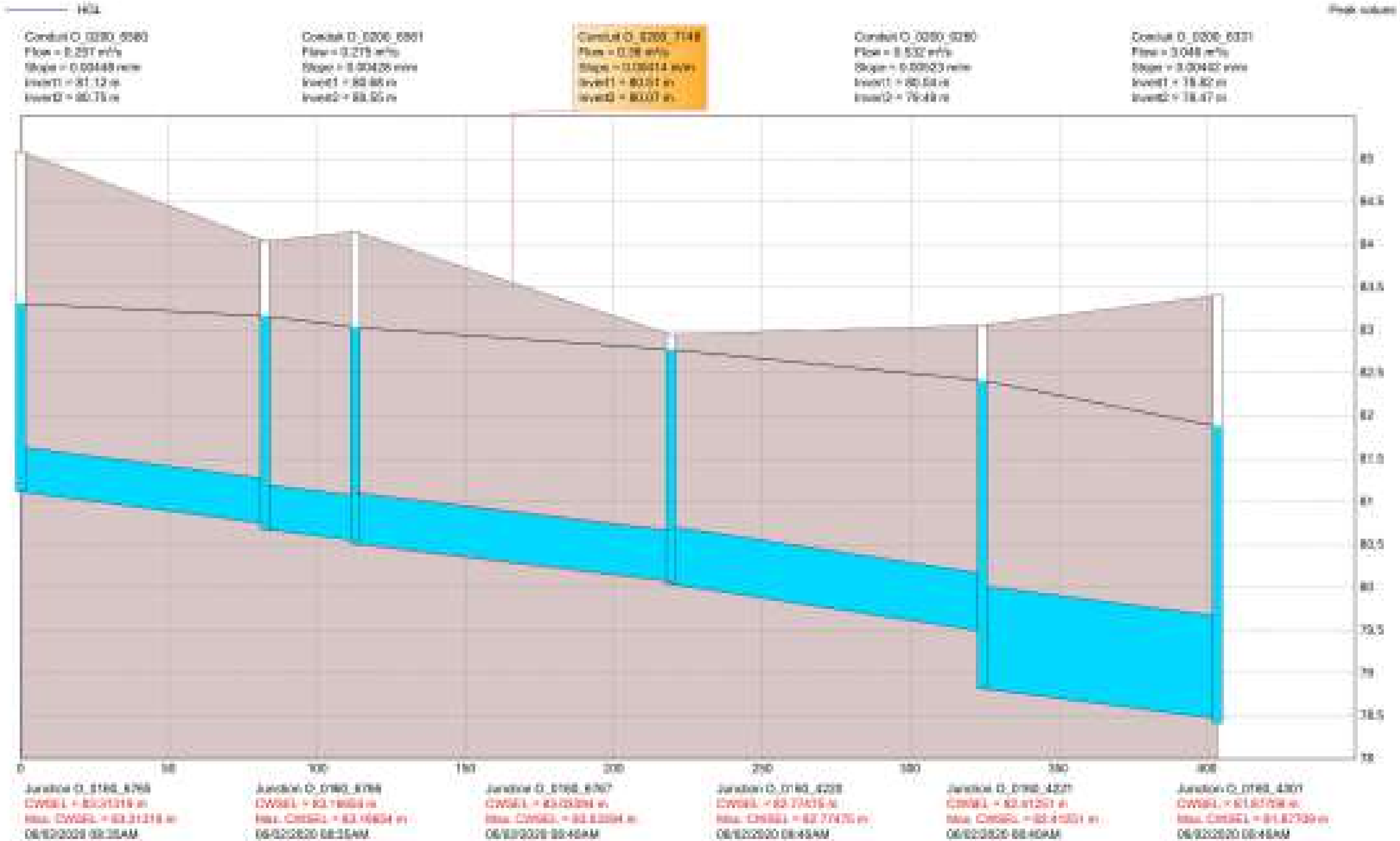
MINOR SYSTEM
5 YEAR
EXISTING



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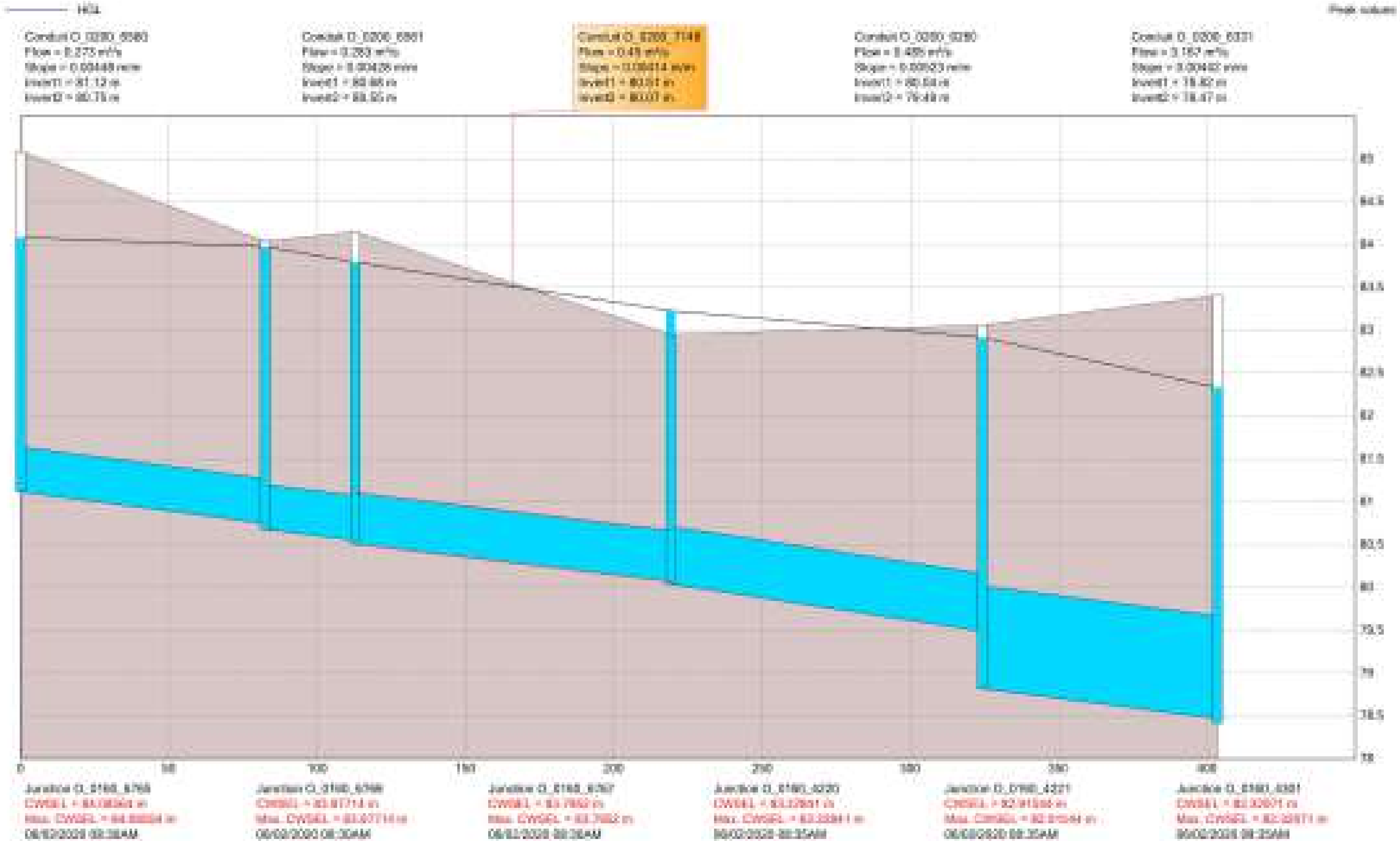
5 YEAR
PROPOSED



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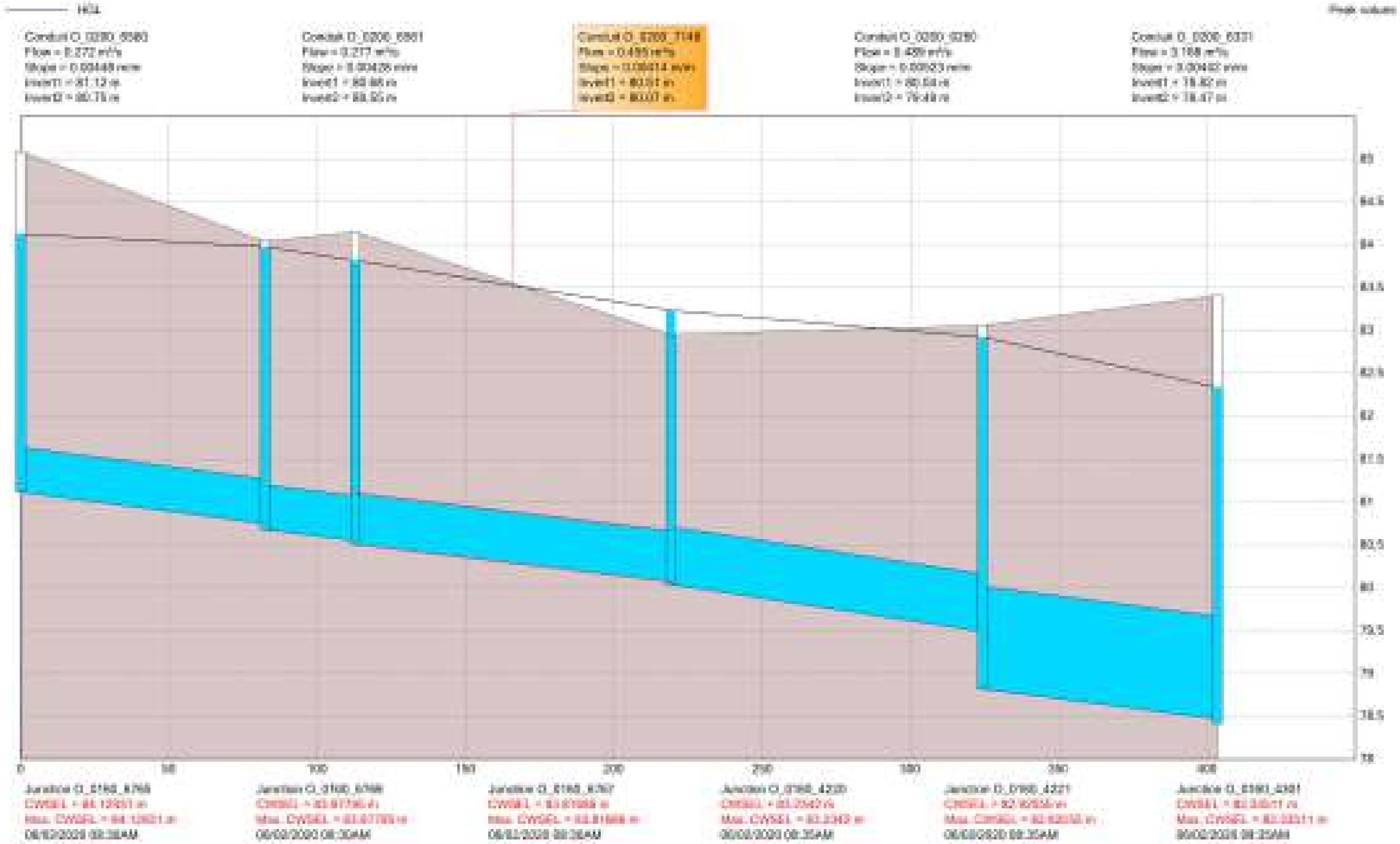
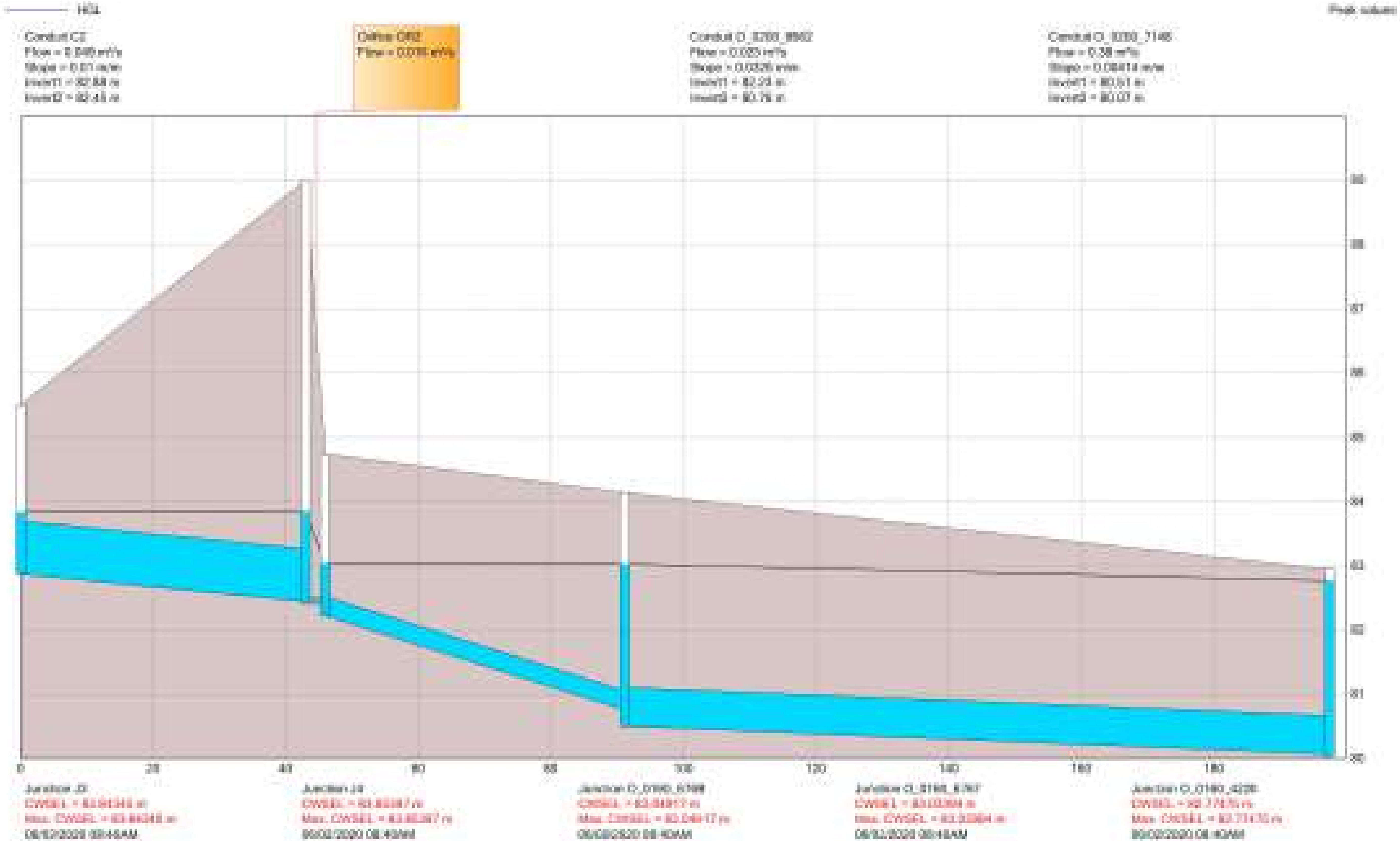
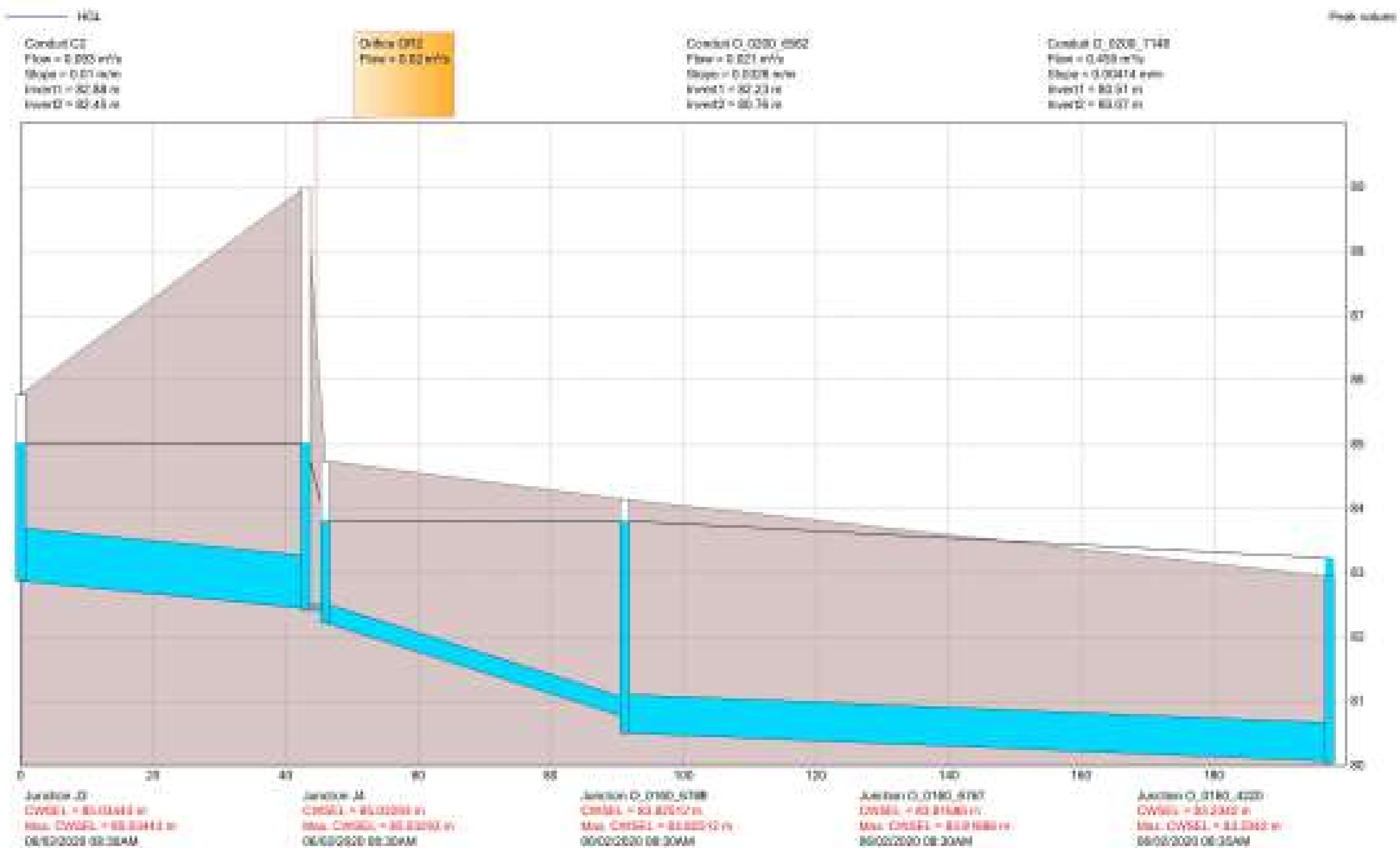
100 YEAR
EXISTING



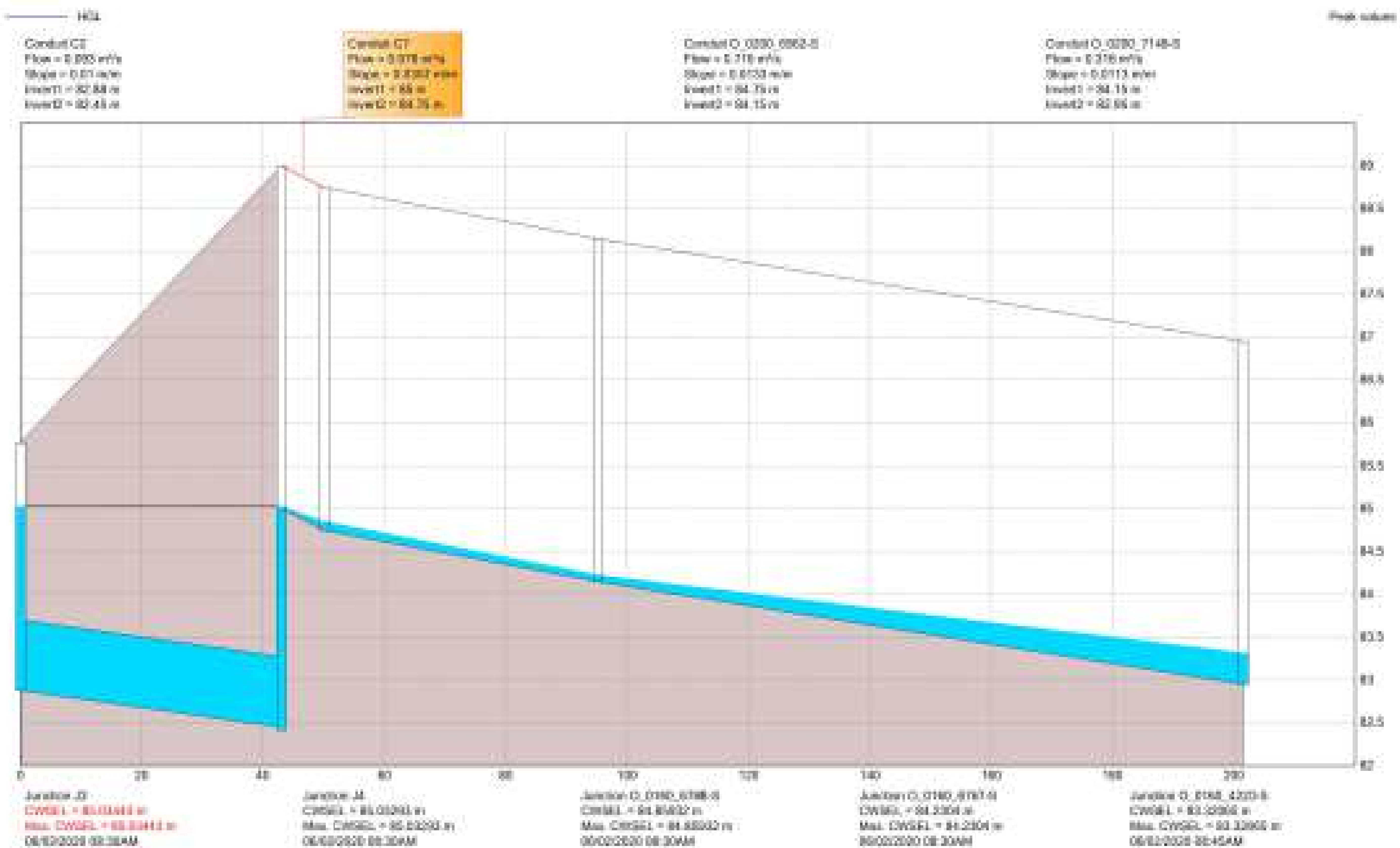
VICTORIA ST. WEST
MINOR SYSTEM
100 YEAR
PROPOSED



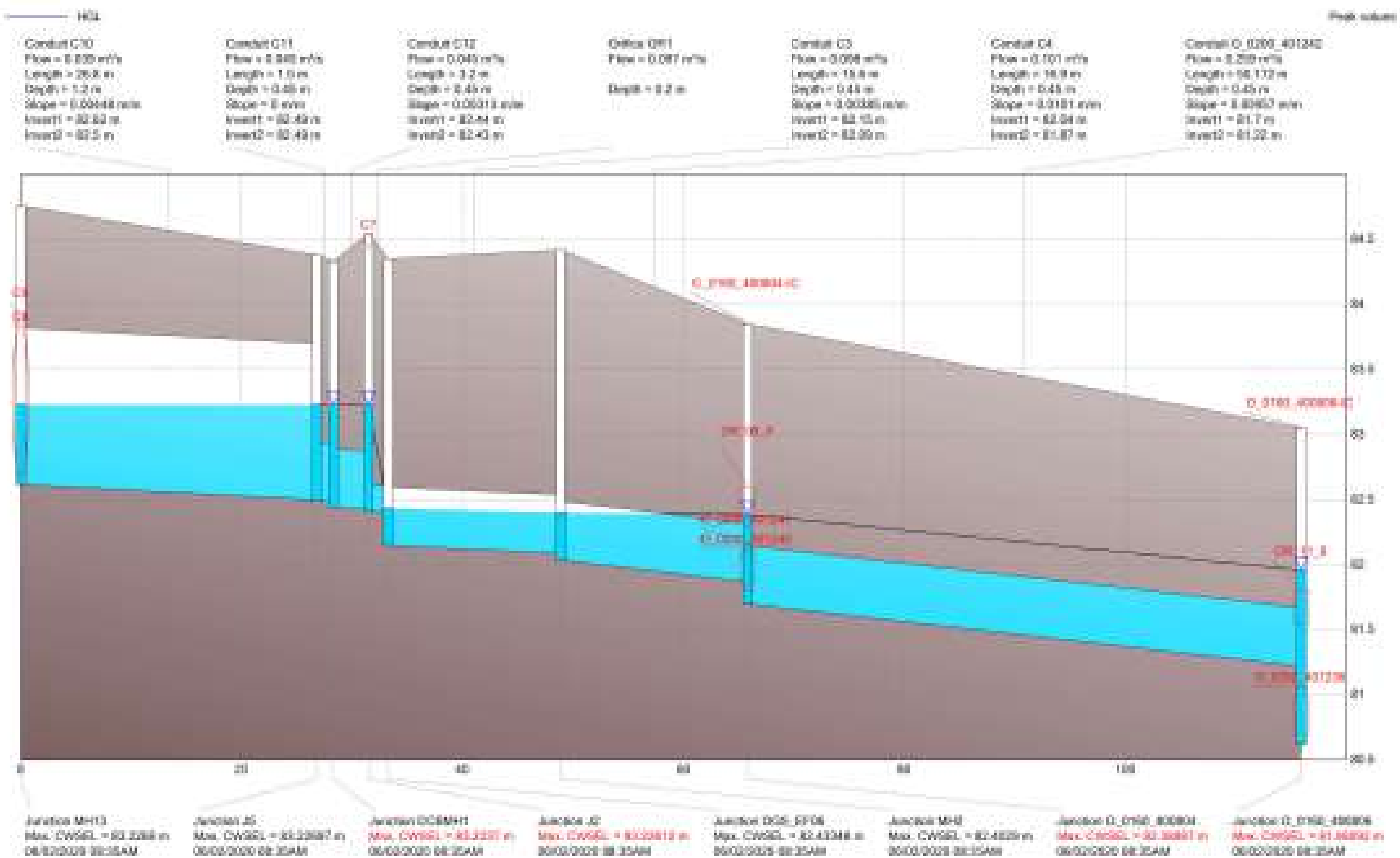
SITE (CUL-DE-SAC)
MINOR SYSTEM
5 YEAR



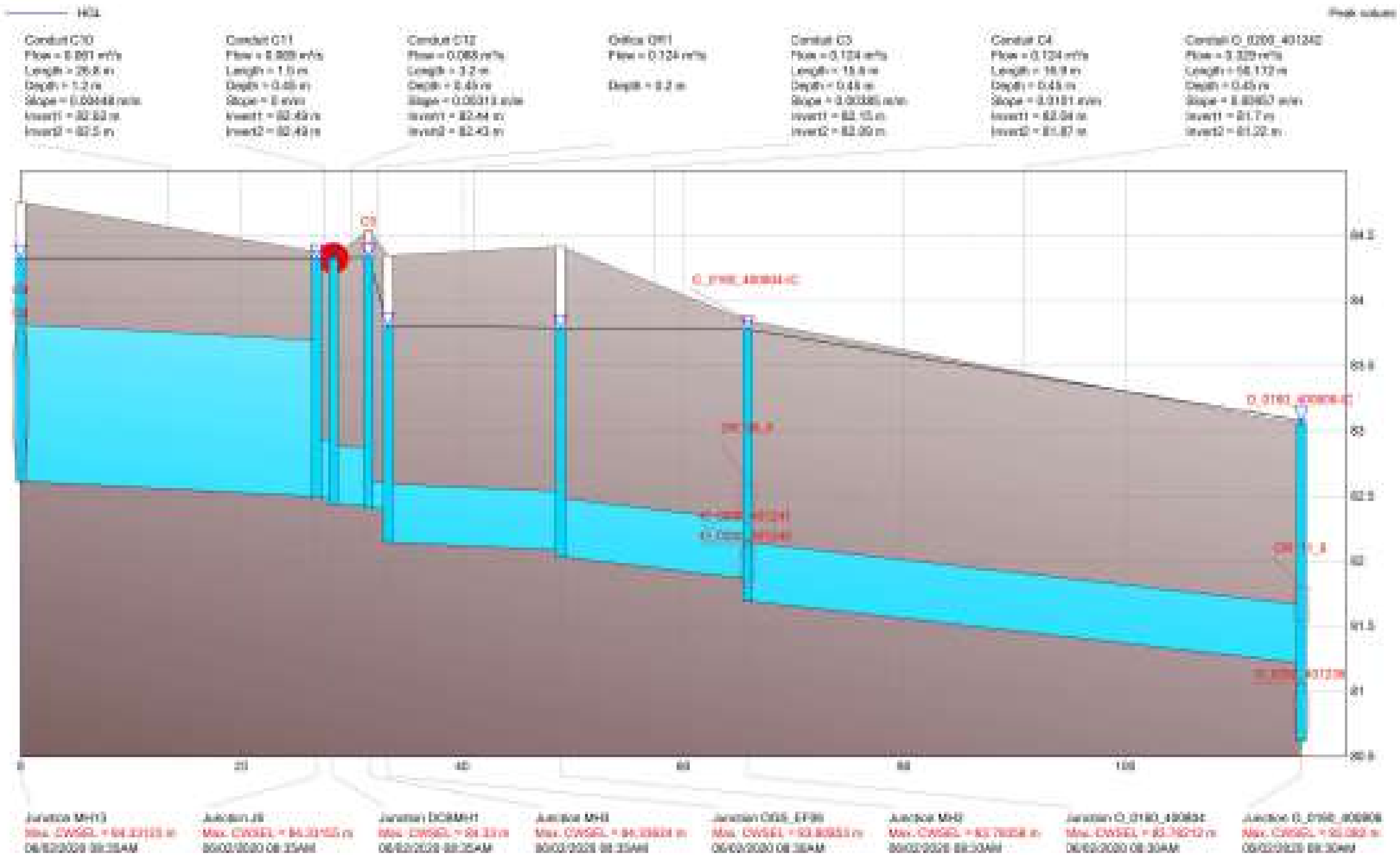
SITE (CUL-DE-SAC)
MINOR SYSTEM
100 YEAR



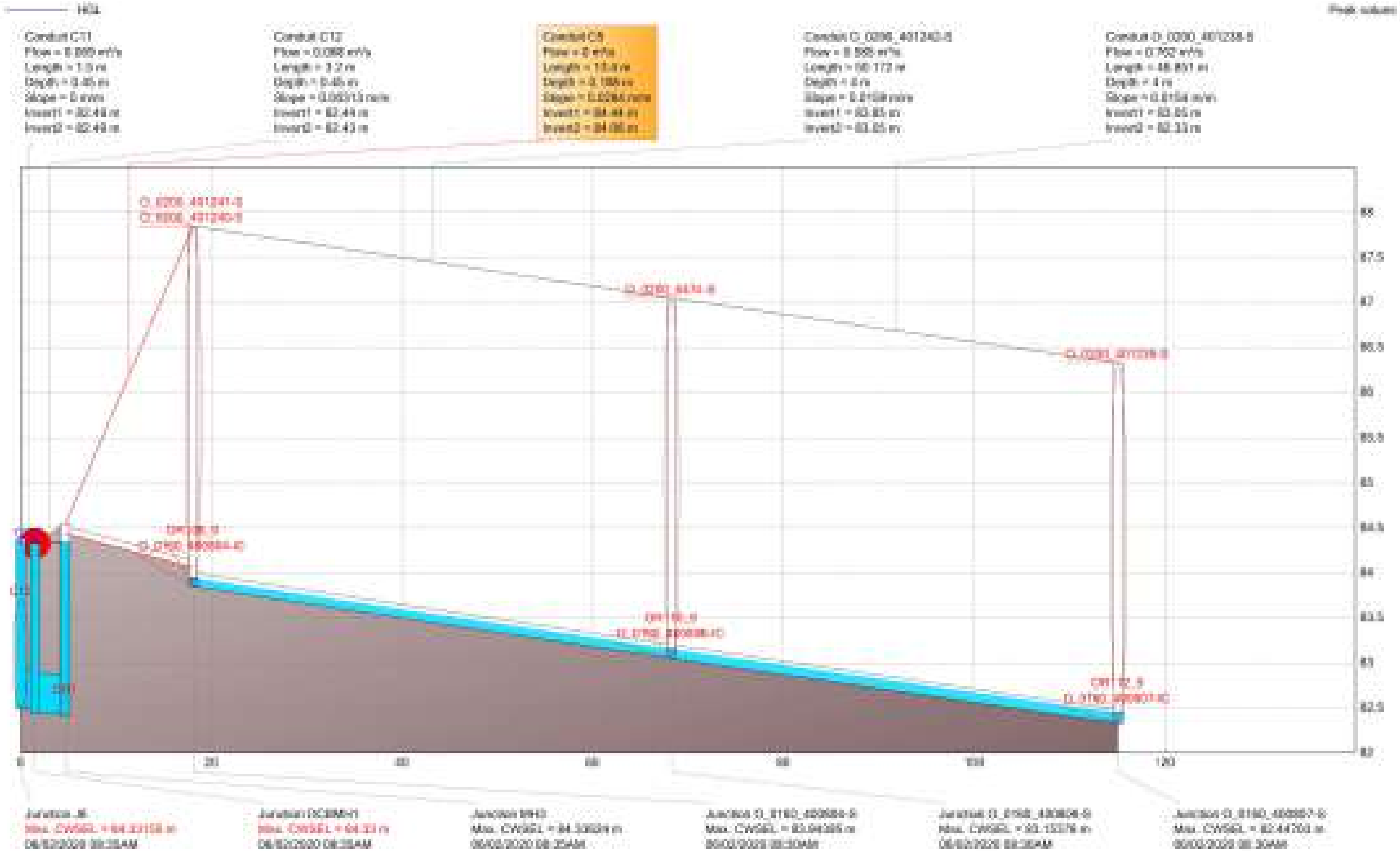
SITE (CUL-DE-SAC)
MAJOR SYSTEM
100 YEAR



SITE (LANEWAY)
MINOR SYSTEM
5 YEAR



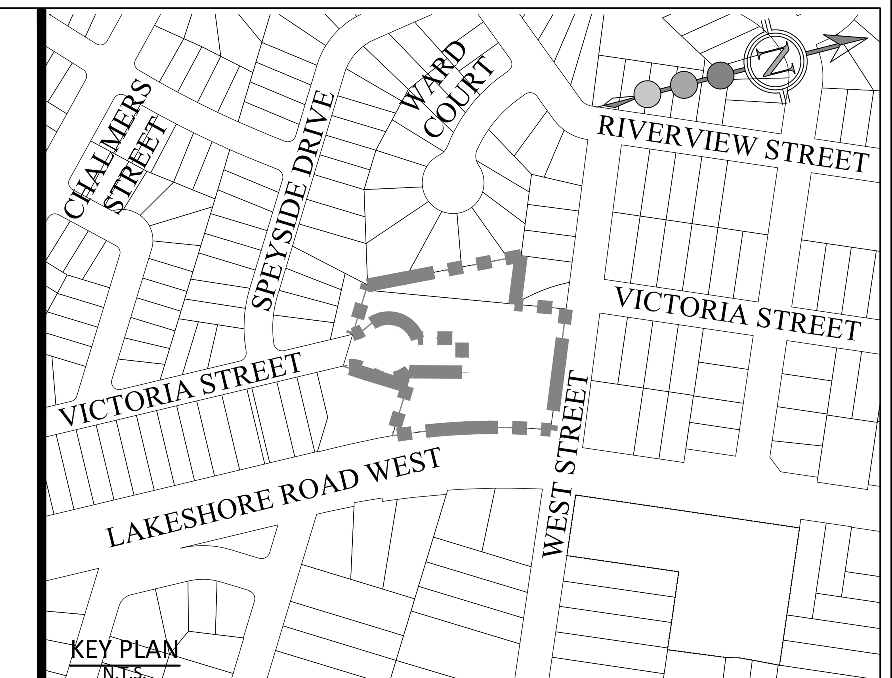
SITE (LANEWAY)
MINOR SYSTEM
100 YEAR



SITE (LANEWAY)
MAJOR SYSTEM
OVERFLOW
100 YEAR

APPENDIX F

DRAWINGS

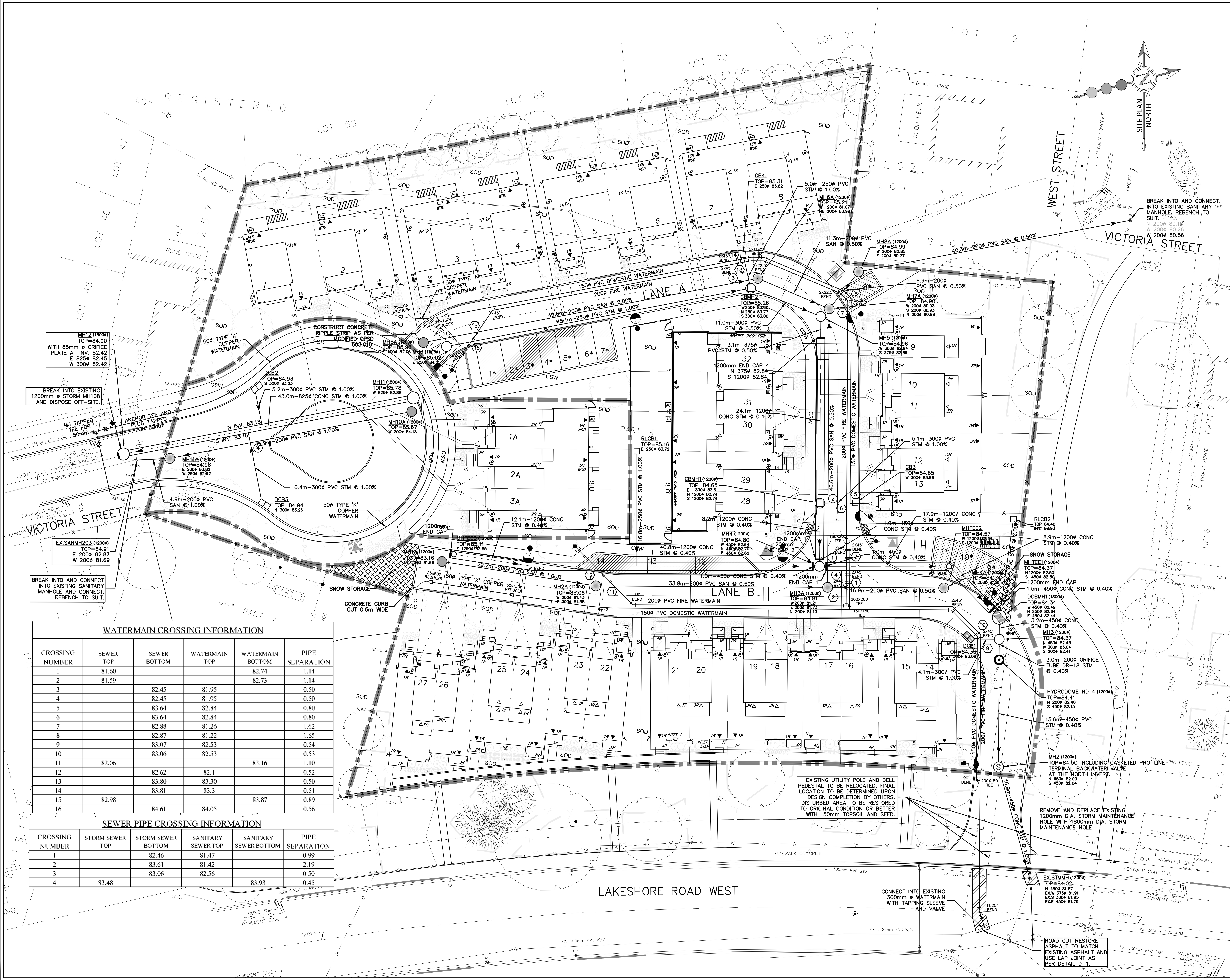


BENCHMARK: ELEV. 85.407

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 SINGLE CATCHBASIN / DOUBLE CATCHBASIN
- PROPOSED SINGLE /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 100mm PVC SDR-35 STORM LATERAL FOR SUMP PUMP DISCHARGE AS PER DETAIL ON DRAWING D-1. TO BE CONSTRUCTED UPON COMPLETION OF HOUSE FOUNDATION
- PROPOSED WATER SERVICE
- PROPOSED RAIN WATER LEADER
- 1 DENOTES WATERMAIN CROSSING
- 1 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
- PROPOSED LIGHT STANDARD
- 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 W EXISTING OVERHEAD WIRE
- EXISTING FENCE
- PERMEABLE UNIT PAVER AS PER DETAILS ON LANDSCAPE PLANS



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			82.73	1.14
3		82.45	81.95		0.50
4		82.45	81.95		0.50
5		83.64	82.84		0.80
6		83.64	82.84		0.80
7		82.88	81.26		1.62
8		82.87	81.22		1.65
9		83.07	82.53		0.54
10		83.06	82.53		0.53
11	82.06			83.16	1.10
12		82.62	82.1		0.52
13		83.80	83.30		0.50
14		83.81	83.3		0.51
15	82.98			83.87	0.89
16		84.61	84.05		0.56

SEWER PIPE CROSSING INFORMATION

CROSSING NUMBER	STORM SEWER TOP	STORM SEWER BOTTOM	SANITARY SEWER TOP	SANITARY SEWER BOTTOM	PIPE SEPARATION
1		82.46	81.47		0.99
2		83.61	81.42		2.19
3		83.06	82.56		0.50
4	83.48			83.93	0.45

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.	
2.	ISSUED FOR SITE PLAN APPLICATON - 2ND SUBMISSION	OCT 14/22	P.G.	
3.	ISSUED FOR SITE PLAN APPLICATON - 3RD SUBMISSION	JAN 20/23	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

SERVICING PLAN

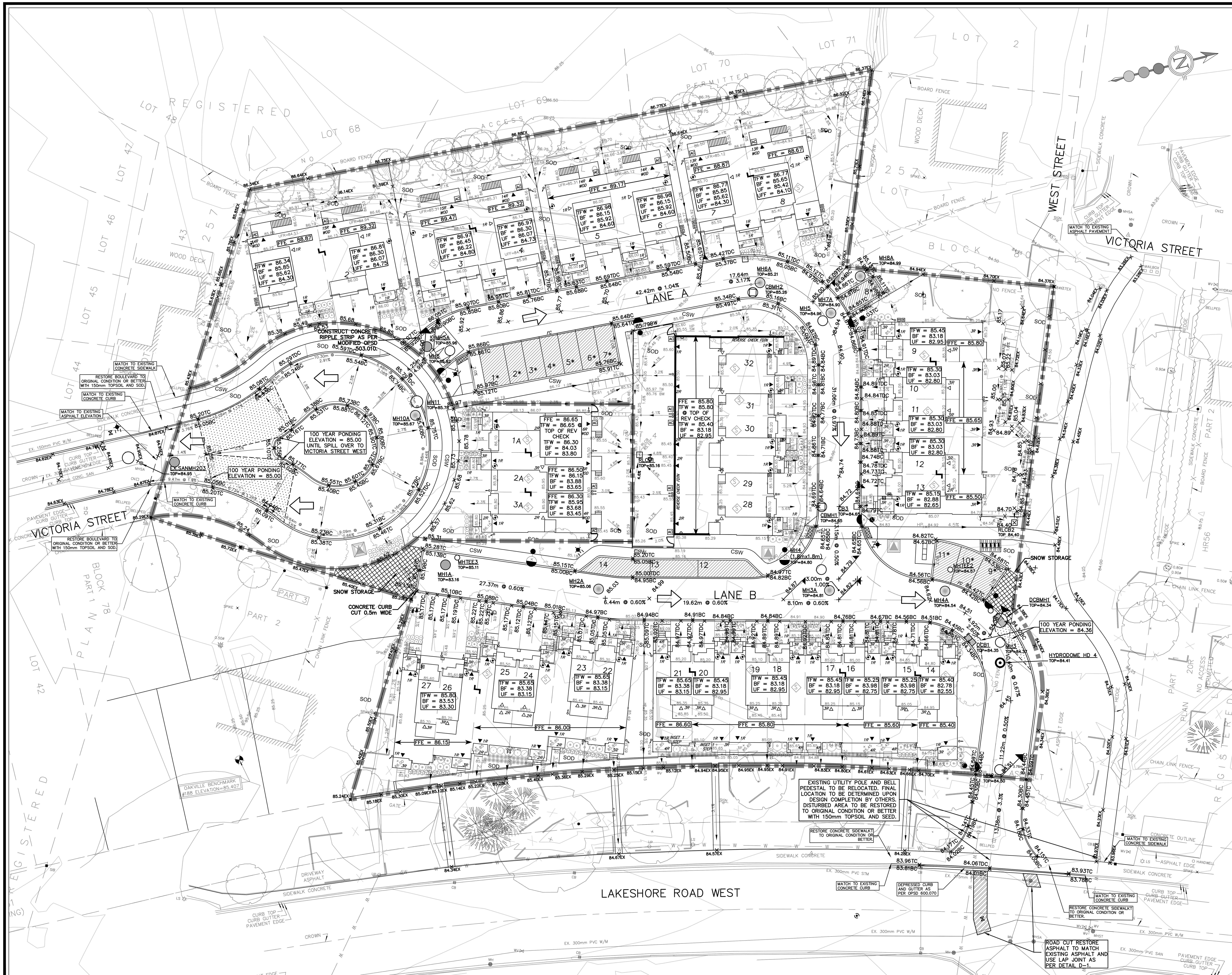
LICENSED PROFESSIONAL ENGINEER
K. CHEN
100136982
2023-01-20
PROVINCE OF ONTARIO

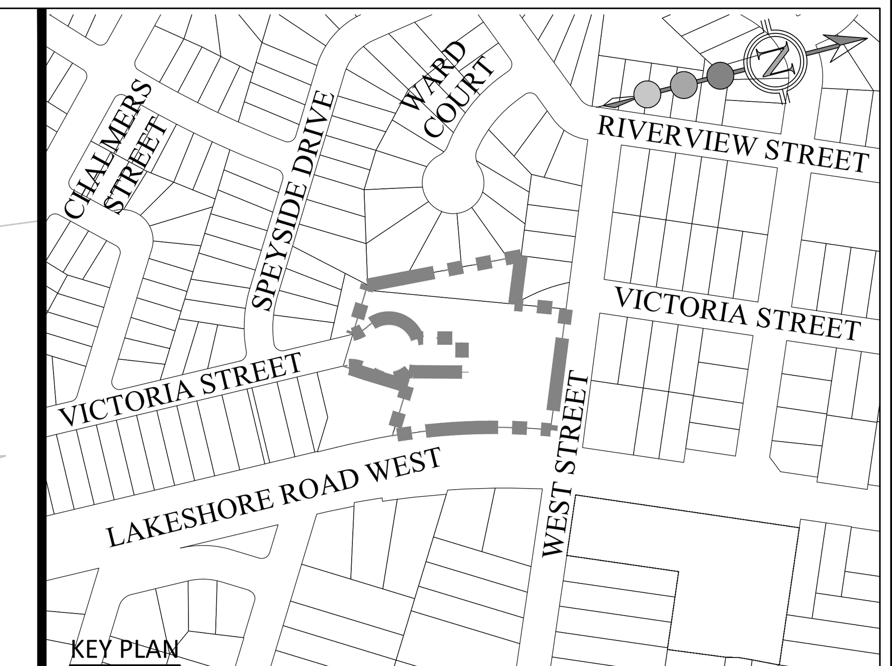
DATE:	JANUARY 2023	DESIGNED BY:	K.L.	CHECKED BY:	P.G
SCALE:	1:250	DRAWN BY:	K.L	CHECKED BY:	P.G

10 5 0 10 20 30 40 50 60 70 80

PROJECT No: 1930

DRAWING No: S-1





KEY PLAN
N.T.S.

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
	SINGLE CATCHBASIN
	DOUBLE CATCHBASIN
	HYDRANT
	VALVE AND BOX
	RAIN WATER LEADER
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 W	EXISTING OVERHEAD WIRE
	EXISTING FENCE
	DOUBLE CATCHBASIN WITH BORDEN GRATE (R/W-22-4)
	CATCHBASIN MANHOLE WITH BORDEN GRATE (R/W-22-4)
	PROPOSED UNITS WITH SUMP PUMP TO STORM LATERAL
	PERMEABLE UNIT PAVER AS PER DETAILS ON LANDSCAPE PLANS
	100 yr PONDING

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.	
2.	ISSUED FOR SITE PLAN APPLICATON - 2nd SUBMISSION	OCT 14/22	P.G.	
3.	ISSUED FOR SITE PLAN APPLICATON - 3rd SUBMISSION	JAN 20/23	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

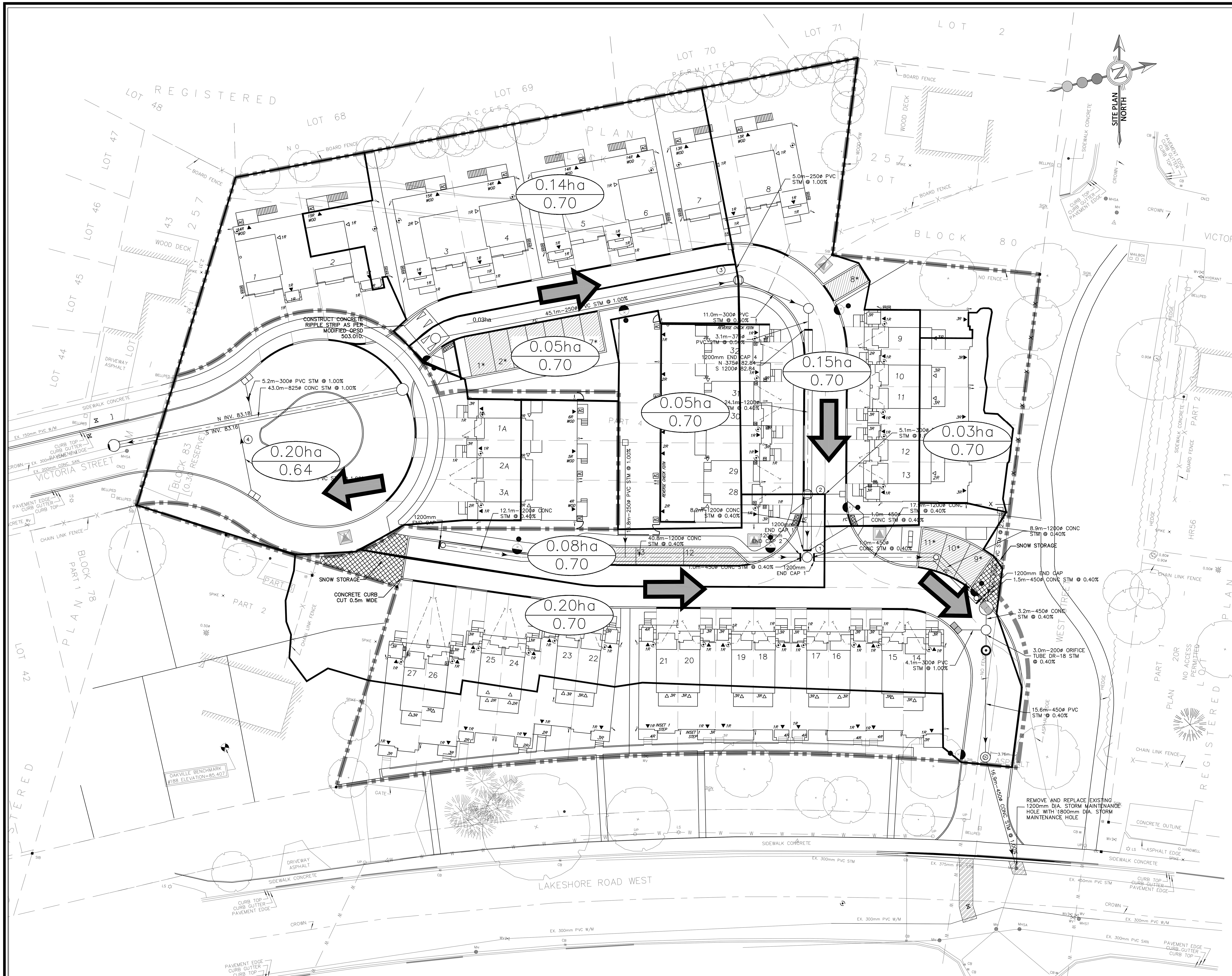
LICENSED PROFESSIONAL ENGINEER
K. CHEN
100136982
2023-01-20
PROVINCE OF ONTARIO

DATE:	JANUARY 2023	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

PROJECT No: 1930

DRAWING No: GR-1



KEY PLAN
N.T.S.

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
- MAJOR SYSTEM OVERLAND FLOW
- PROPOSED STORM DRAINAGE BOUNDARY
- 0.03ha / 0.70 — DRAINAGE AREA (HECTARES) / RUNOFF COEFFICIENT
- 270.25 EXISTING CONTOURS
- MH EXISTING STORM SEWER AND MANHOLE
- PROPOSED STORM SEWER AND MANHOLE
- PROPOSED SUPERPIPE
- PROPOSED OIL-GRIT SEPARATOR MANHOLE
- PROPOSED SUMP PUMP
- PROPOSED RAIN WATER LEADER

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.	
2.	ISSUED FOR SITE PLAN APPLICATION - 2nd SUBMISSION	OCT 14/22	P.G.	
3.	ISSUED FOR SITE PLAN APPLICATION - 3rd SUBMISSION	JAN 20/23	P.G.	

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
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OAKVILLE
1225 TRAFALGAR ROAD
OAKVILLE, ONTARIO L6H 0H3
TEL: (905) 845-6601

VOGUE WYCLIFFE (OAKVILLE) LIMITED

3171 LAKESHORE ROAD WEST, OAKVILLE

STORM DRAINAGE PLAN

LICENSED PROFESSIONAL ENGINEER
K. CHEN
100136982
2023-01-20
PROVINCE OF ONTARIO

DATE:	JANUARY 2023	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

PROJECT No: 1930

DRAWING No: DR-1

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

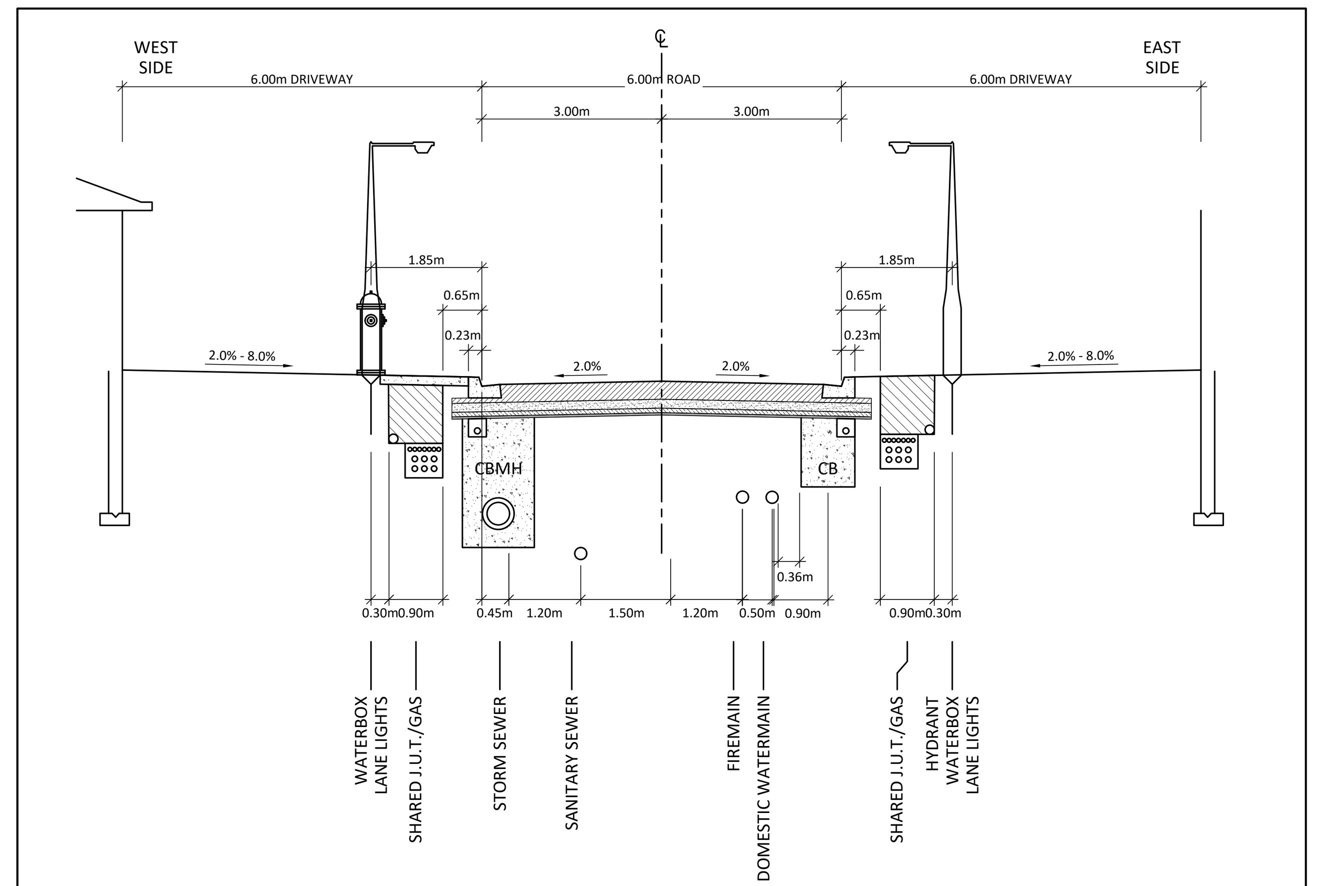
1. PIPE: POLYVINYL CHLORIDE (PVC) CLASS 150 DR-18 PIPE, AWWA C900 AND CSA B137.3, LATEST AMENDMENTS.
   TYPE K COPPER, ASTM B88.
2. EMBEDMENT AND TRENCH DETAIL: OPSD 802.010.
3. BEDDING MATERIAL: MUNICIPAL WATERMAIN BEDDING SHALL CONFORM TO MUNICIPAL STANDARDS. PRIVATE WATERMAIN BEDDING SHALL CONFORM 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

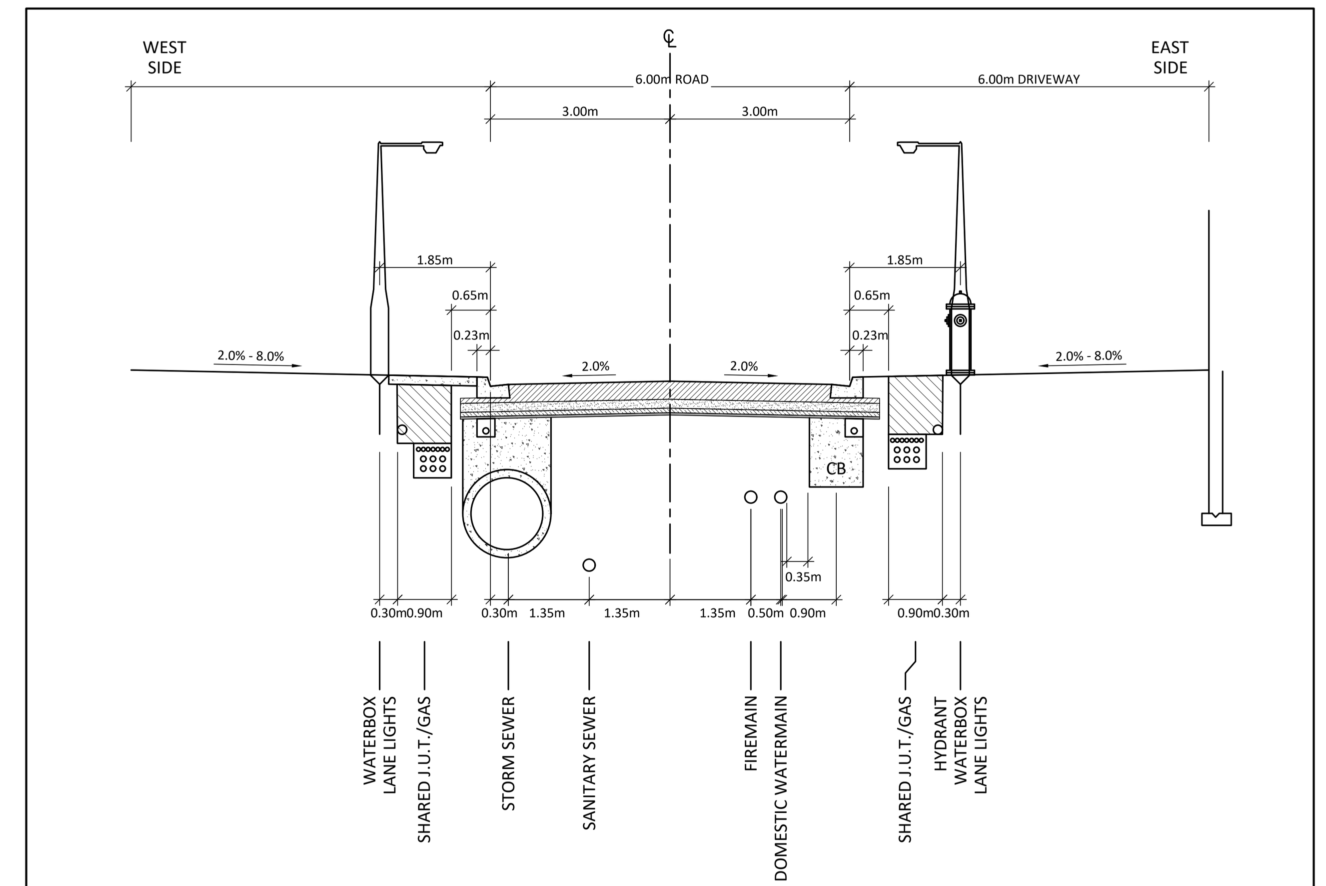
1. PIPE: POLYVINYL CHLORIDE (PVC) SEWER PIPES AND FITTINGS SHALL CONFORM TO CSA-B182.2.
2. PVC SEWERS (375 mm DIAMETER AND SMALLER): SDR-35, CSA B182.2-LATEST AMENDMENT, UNLESS OTHERWISE SPECIFIED.
3. CONCRETE SEWERS (450 mm DIAMETER AND LARGER): CONCRETE (CLASS 65-D), CSA A257.2 OR LATEST AMENDMENT, 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
SCALE: 1:100



B D-1 TYPICAL PRIVATE LANE B CROSS SECTION
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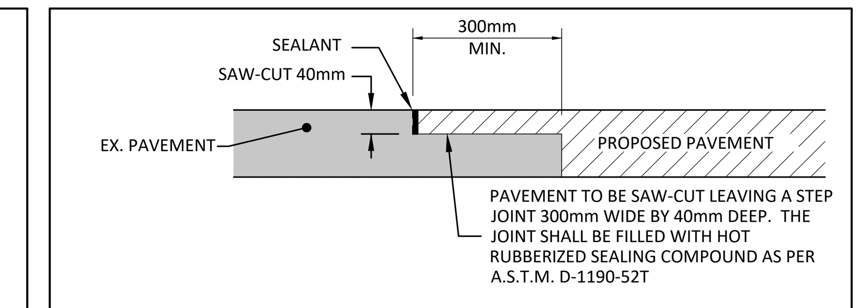
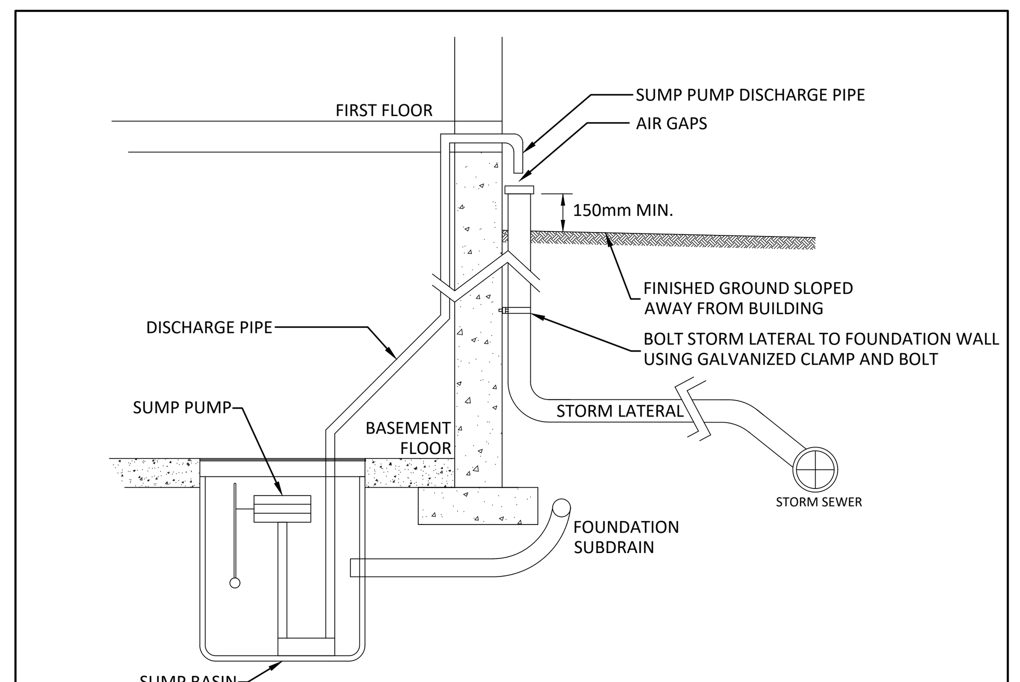
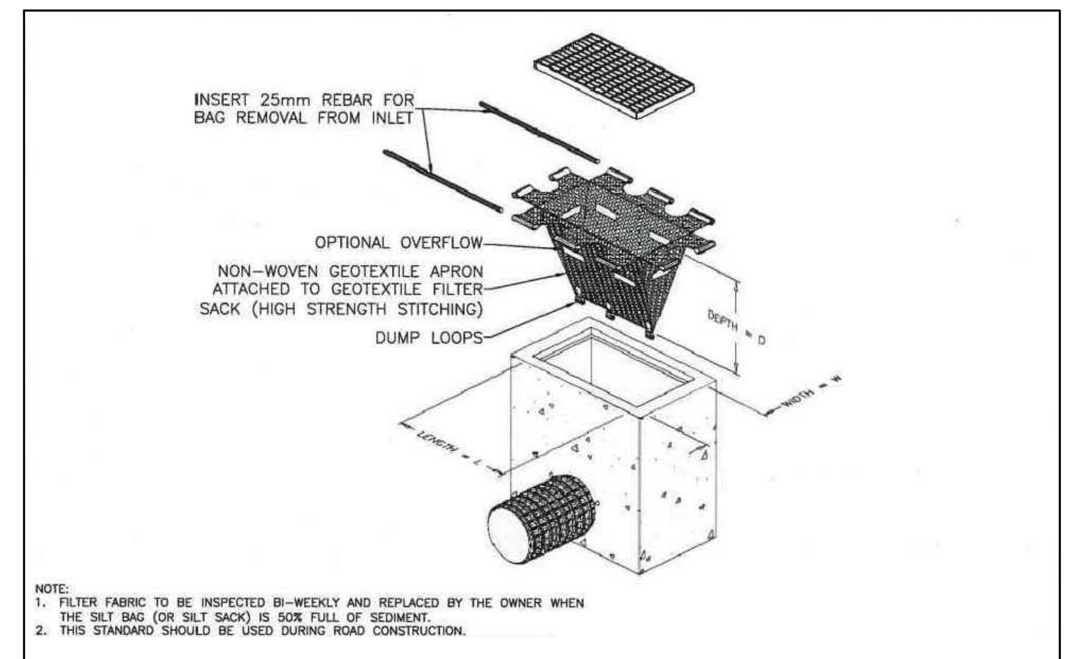


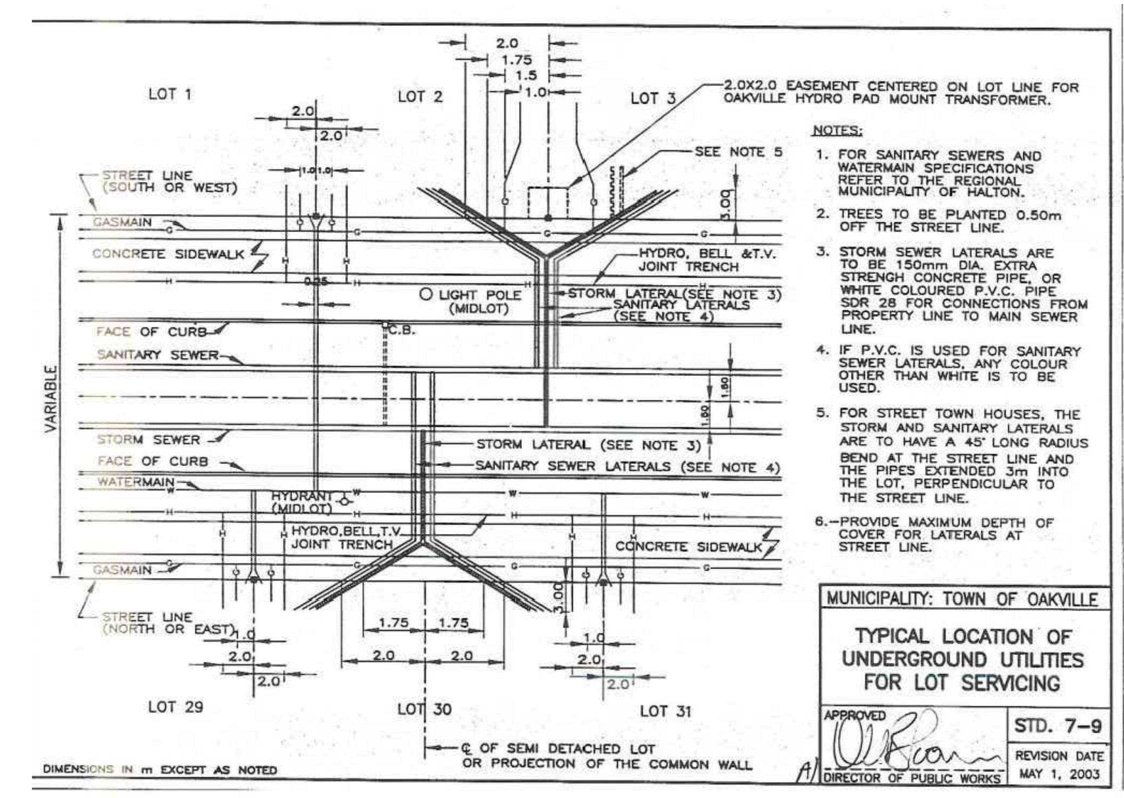
LAP JOINT DETAIL
N.T.S.

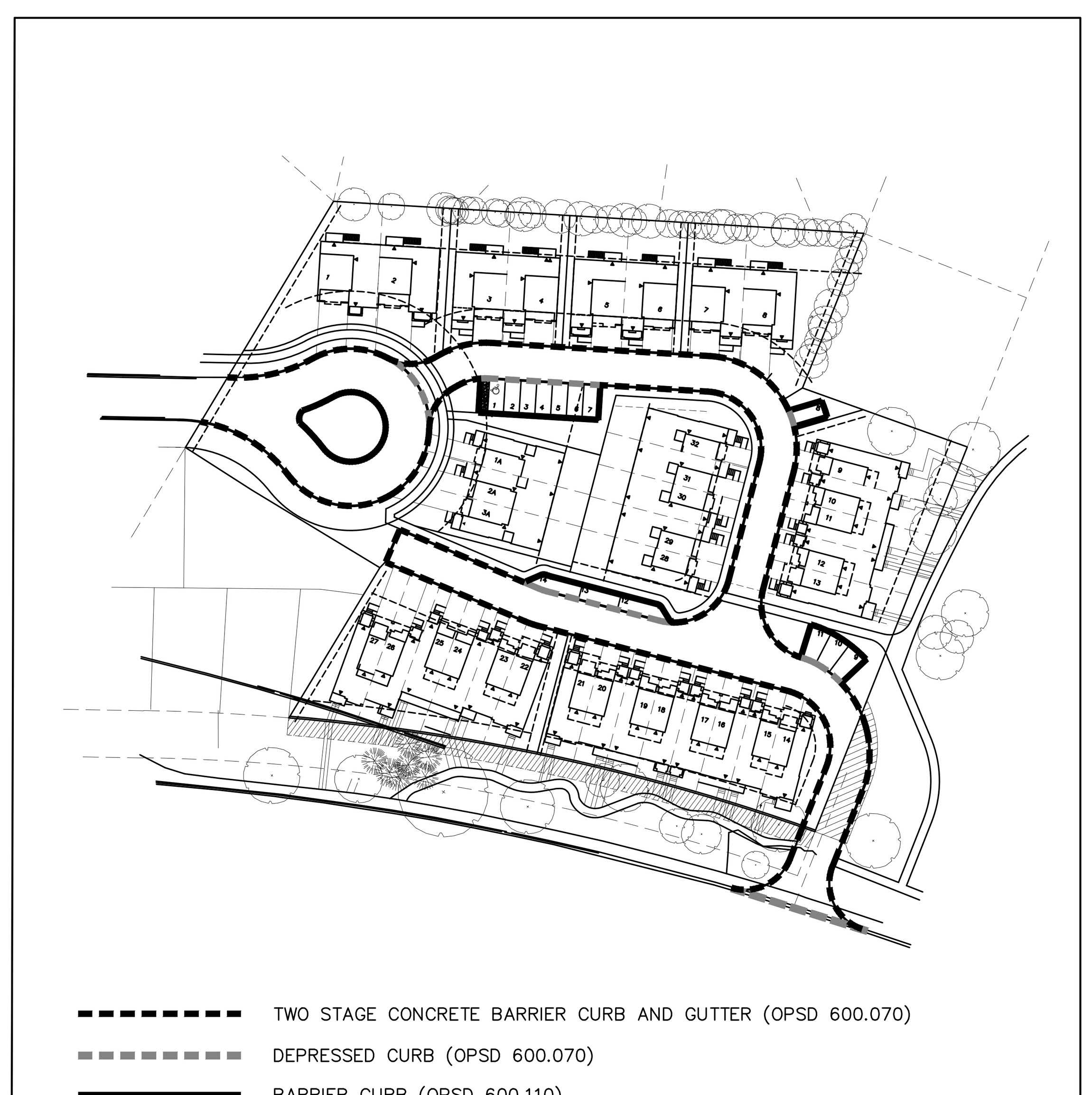


A D-1 SCHEMATIC SUMP PUMP DETAIL - DISCHARGE TO STORM SEWER
SCALE: N.T.S.

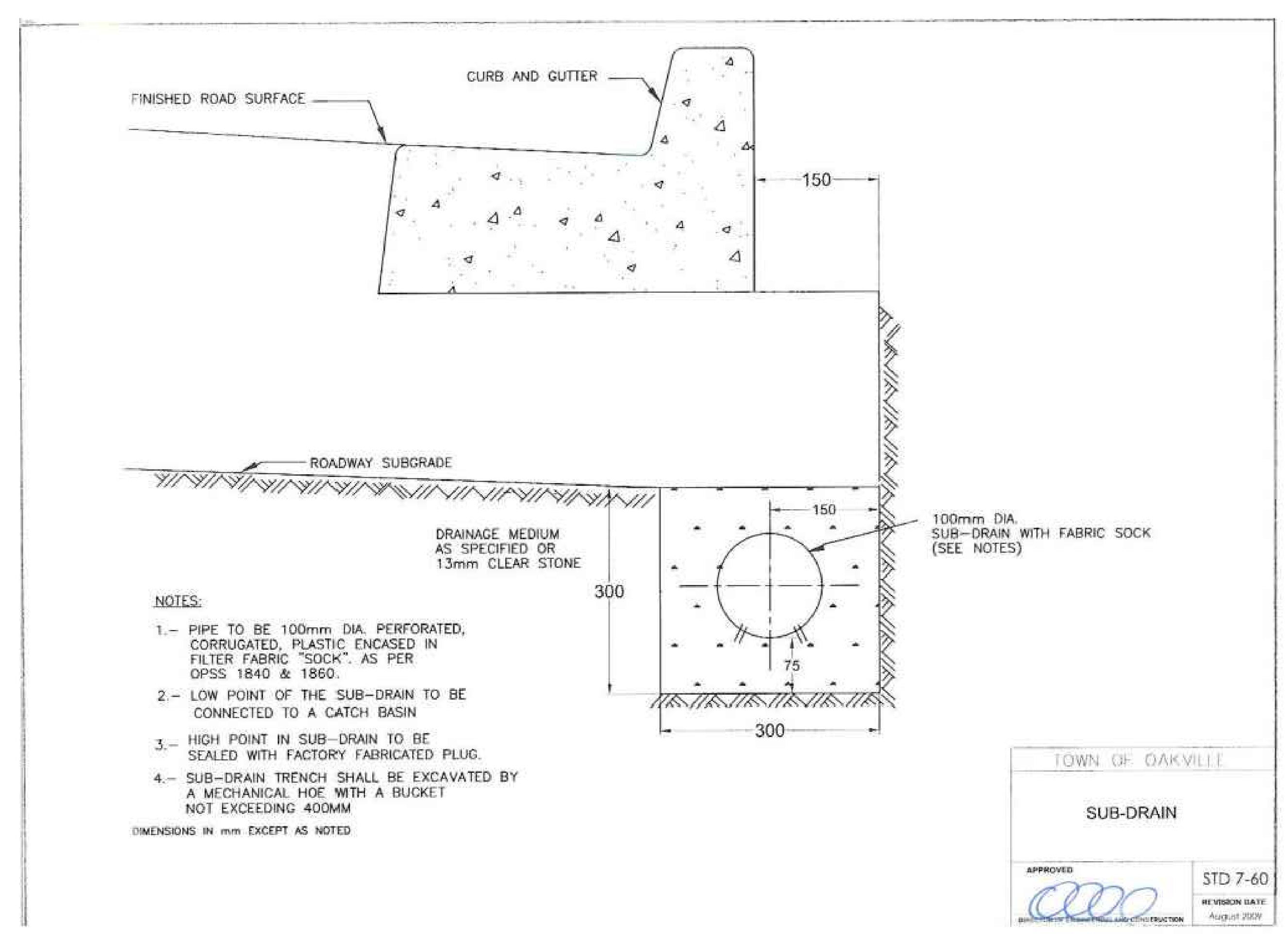


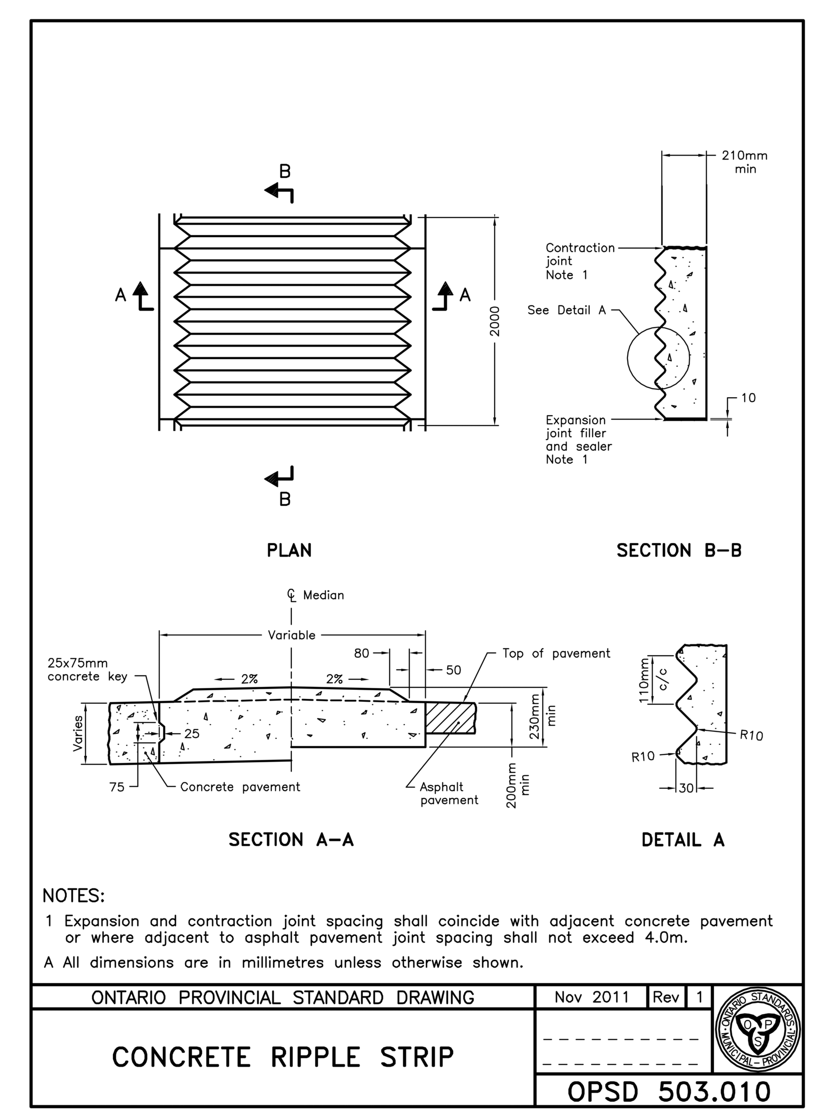
TEMPORARY CATCHBASIN SEDIMENT CONTROL DEVICE





CURB KEYPLAN
SCALE : N.T.S.





REVISIONS				
No.	DESCRIPTION	DATE	BY	APPROVED
1.	ISSUED FOR SITE PLAN APPLICATION	JAN 20/22	P.G.	
2.	ISSUED FOR SITE PLAN APPLICATION - 2nd SUBMISSION	OCT 14/22	P.G.	
3.	ISSUED FOR SITE PLAN APPLICATION - 3rd SUBMISSION	JAN 20/23	P.G.	

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3171 LAKESHORE ROAD WEST, OAKVILLE

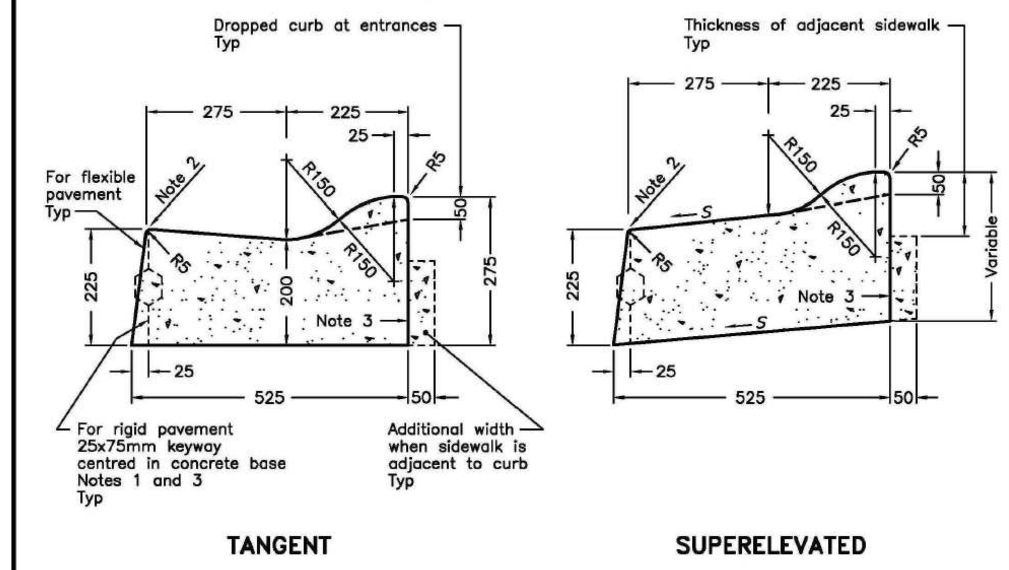
DETAILS PLAN

LICENSED PROFESSIONAL ENGINEER
K. CHEN
100136982
2023-01-20
PROVINCE OF ONTARIO

DATE:	JANUARY 2023	DESIGNED BY:	K.L.	CHECKED BY:	P.G.
SCALE:	N.T.S.	DRAWN BY:	K.L.	CHECKED BY:	P.G.

PROJECT No: 1930

DRAWING No: D-1



TANGENT

SUPERELEVATED

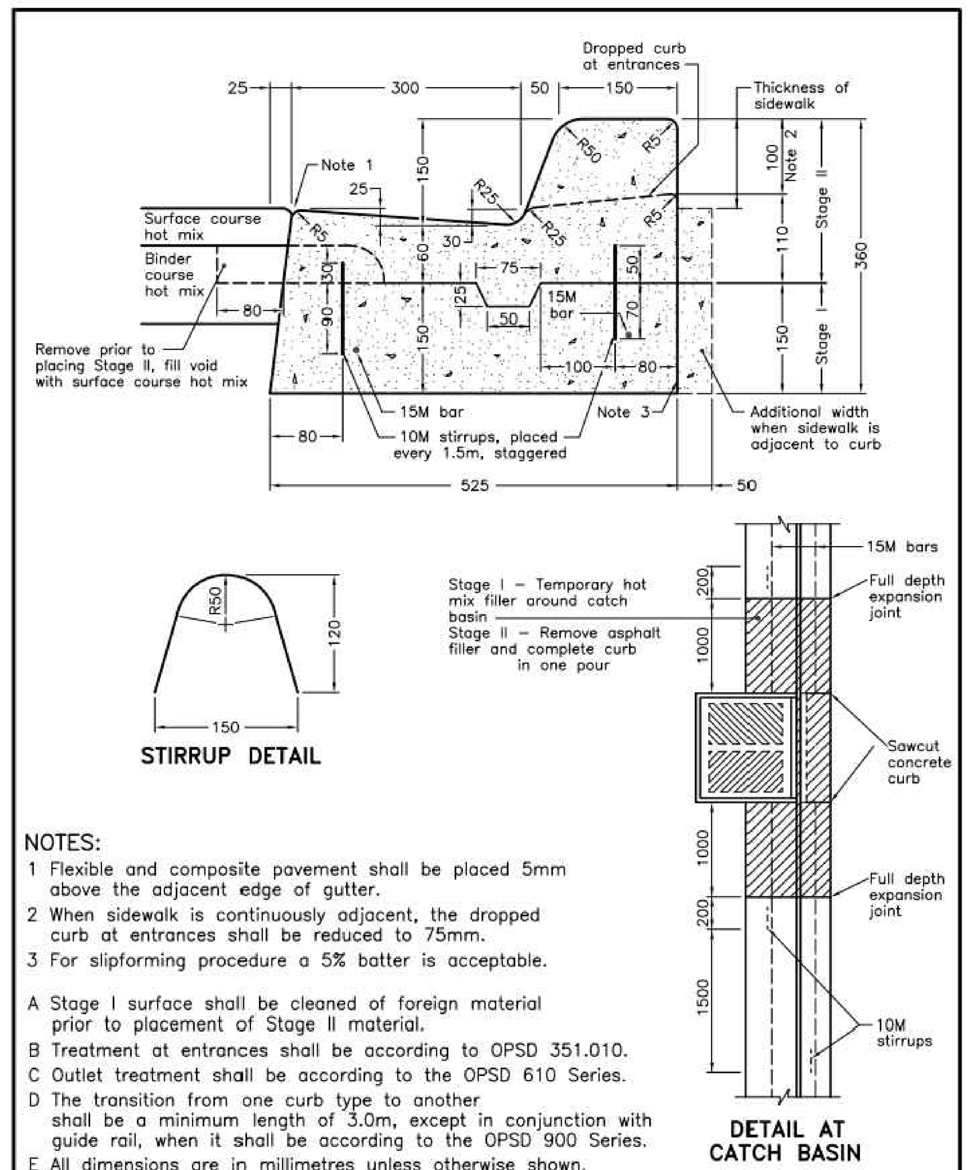
LEGEND:
S — Rate of pavement superelevation in percent, %.

NOTES:
1 When curb and gutter is adjacent to concrete pavement or base, this drawing shall be used in conjunction with OPSD 552.010 and 552.020.
2 Flexible and composite pavement shall be placed 5mm above the adjacent edge of gutter.
3 For slipforming procedure a 5% batter is acceptable.
A Treatment at entrances shall be according to OPSD 351.010.
B Outlet treatment shall be according to the OPSD 610 Series.
C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev 2

CONCRETE SEMI-MOUNTABLE CURB WITH STANDARD GUTTER

OPSD 600.060



STIRRUP DETAIL

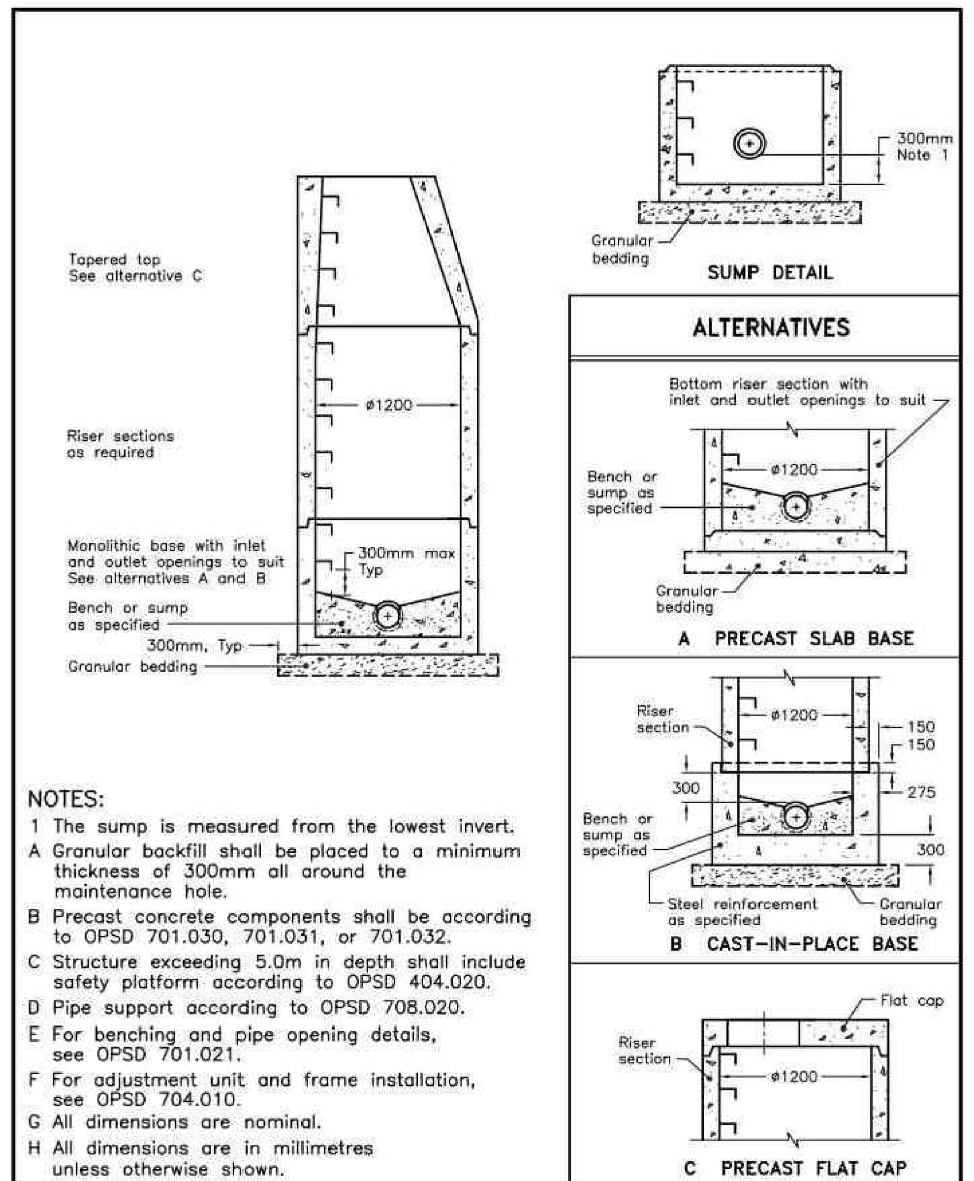
DETAIL AT CATCH BASIN

NOTES:
1 Flexible and composite pavement shall be placed 5mm above the adjacent edge of gutter.
2 When sidewalk is continuously adjacent, the dropped curb at entrances shall be reduced to 75mm.
3 For slipforming procedure a 5% batter is acceptable.
A Stage I surface shall be cleaned of foreign material prior to placement of Stage II material.
B Treatment at entrances shall be according to OPSD 351.010.
C Outlet treatment shall be according to the OPSD 610 Series.
D The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail, when it shall be according to the OPSD 900 Series.
E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev 2

CONCRETE BARRIER CURB WITH STANDARD GUTTER
TWO STAGE CONSTRUCTION

OPSD — 600.070



SUMP DETAIL

ALTERNATIVES

A PRECAST SLAB BASE

B CAST-IN-PLACE BASE

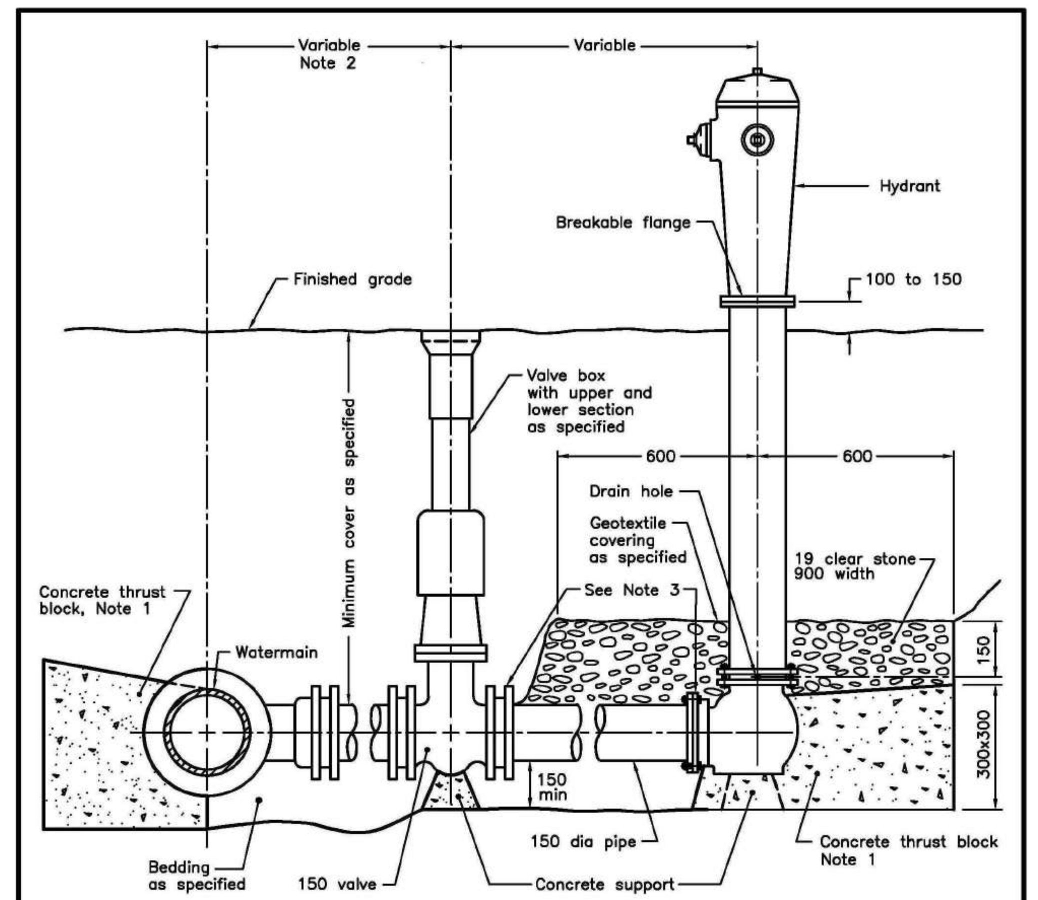
C PRECAST FLAT CAP

NOTES:
1 The sump is measured from the lowest invert.
A Granular backfill shall be placed to a minimum thickness of 300mm all around the maintenance hole.
B Precast concrete components shall be according to OPSD 701.030, 701.031, or 701.032.
C Structure exceeding 5.0m in depth shall include safety platform according to OPSD 404.020.
D Pipe support according to OPSD 708.020.
E For benching and pipe opening details, see OPSD 701.021.
F For adjustment unit and frame installation, see OPSD 704.010.
G All dimensions are nominal.
H All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev 5

PRECAST CONCRETE MAINTENANCE HOLE
1200mm DIAMETER

OPSD 701.010

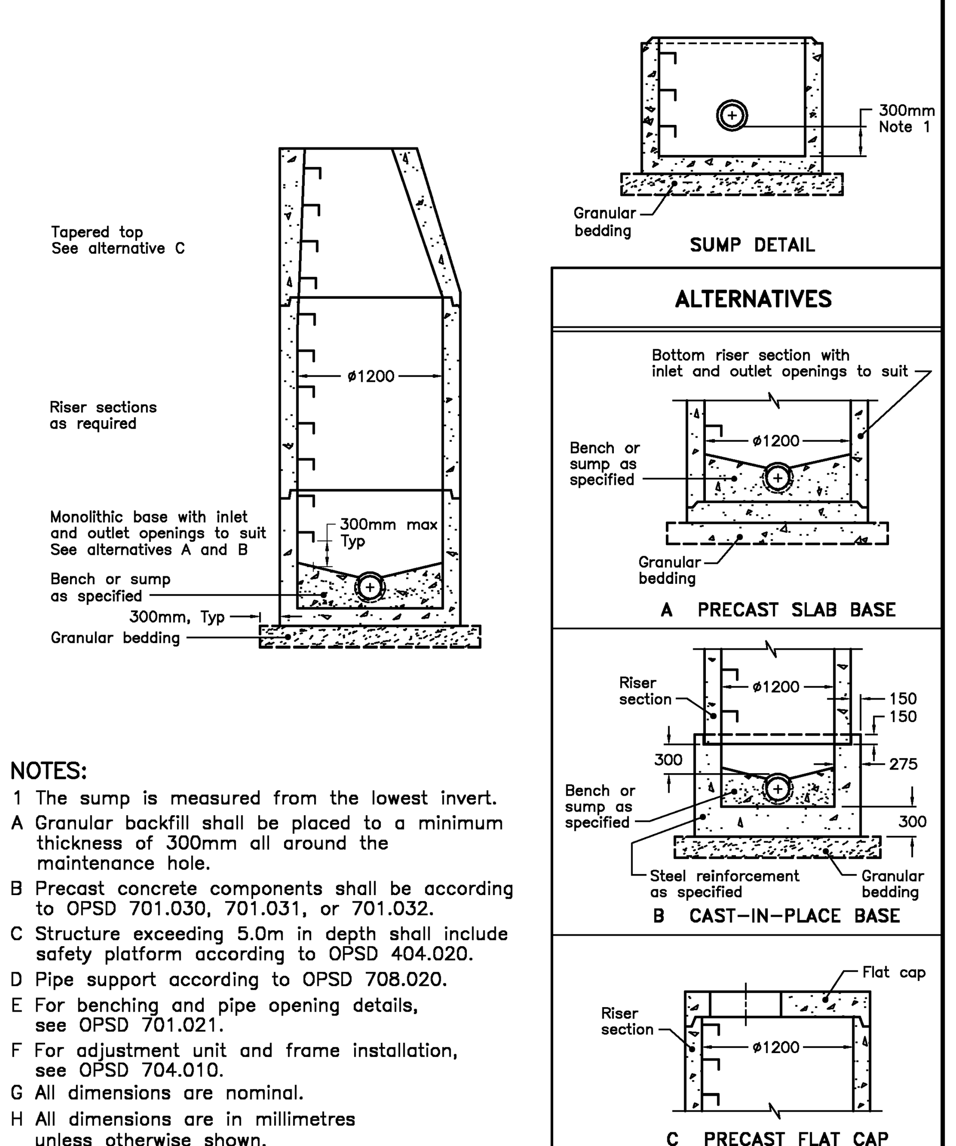


NOTES:
1 All concrete thrust blocks shall be poured against undisturbed ground.
2 When specified, for watermains 400mm and less, locate valve within 1.0m of centreline of watermain. Retaining and restraining devices shall be utilized. For watermains 600mm and over, bolt valve with flanged end directly to flanged tee.
3 Retaining and restraining devices shall be as specified.
A Bond breaker shall be used between the concrete and the fittings and appurtenances.
B Bolts and nuts for buried flange to flange connections shall be stainless steel.
C When required, flange of standpipe extensions shall not be in frost zone.
D This OPSD shall be read in conjunction with OPSD 1103.010 and 1103.020.
E Backfill material within 500mm of service box shall be native or imported, as specified.
F Tracer wire shall be installed as specified.
G All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2018 | Rev 3

HYDRANT INSTALLATION

OPSD 1105.010



SUMP DETAIL

ALTERNATIVES

A PRECAST SLAB BASE

B CAST-IN-PLACE BASE

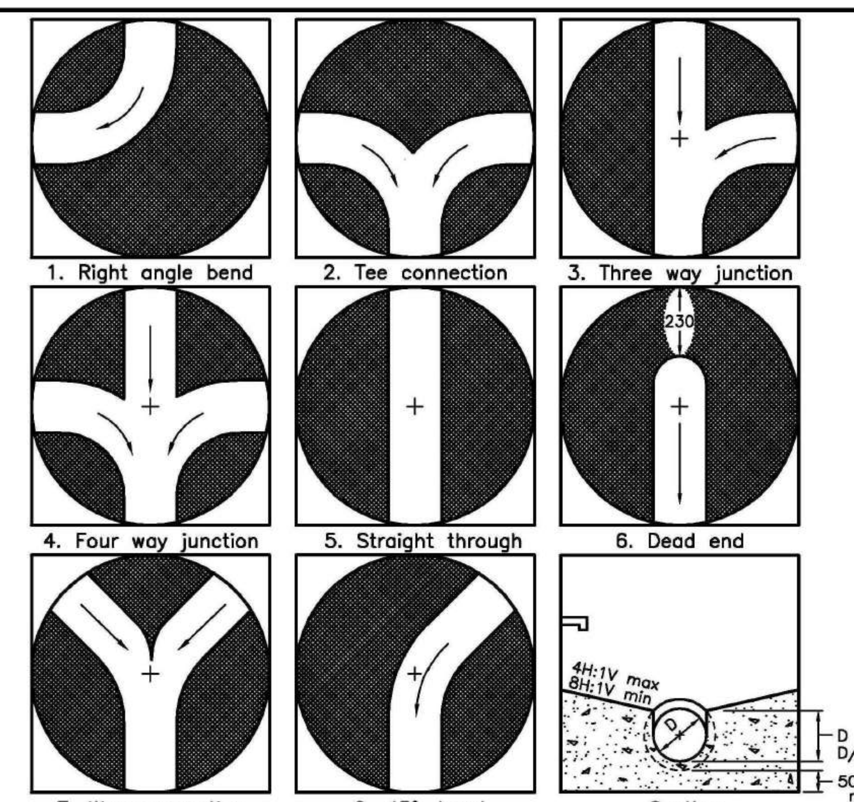
C PRECAST FLAT CAP

NOTES:
1 The sump is measured from the lowest invert.
A Granular backfill shall be placed to a minimum thickness of 300mm all around the maintenance hole.
B Precast concrete components shall be according to OPSD 701.030, 701.031, or 701.032.
C Structure exceeding 5.0m in depth shall include safety platform according to OPSD 404.020.
D Pipe support according to OPSD 708.020.
E For benching and pipe opening details, see OPSD 701.021.
F For adjustment unit and frame installation, see OPSD 704.010.
G All dimensions are nominal.
H All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev 5

PRECAST CONCRETE MAINTENANCE HOLE
1200mm DIAMETER

OPSD 701.010



1. Right angle bend
2. Tee connection
3. Three way junction
4. Four way junction
5. Straight through
6. Dead end
7. Wye connection
8. 45° bend
Section

MAXIMUM SIZE HOLE IN THE WALL IN PRECAST RISER SECTIONS

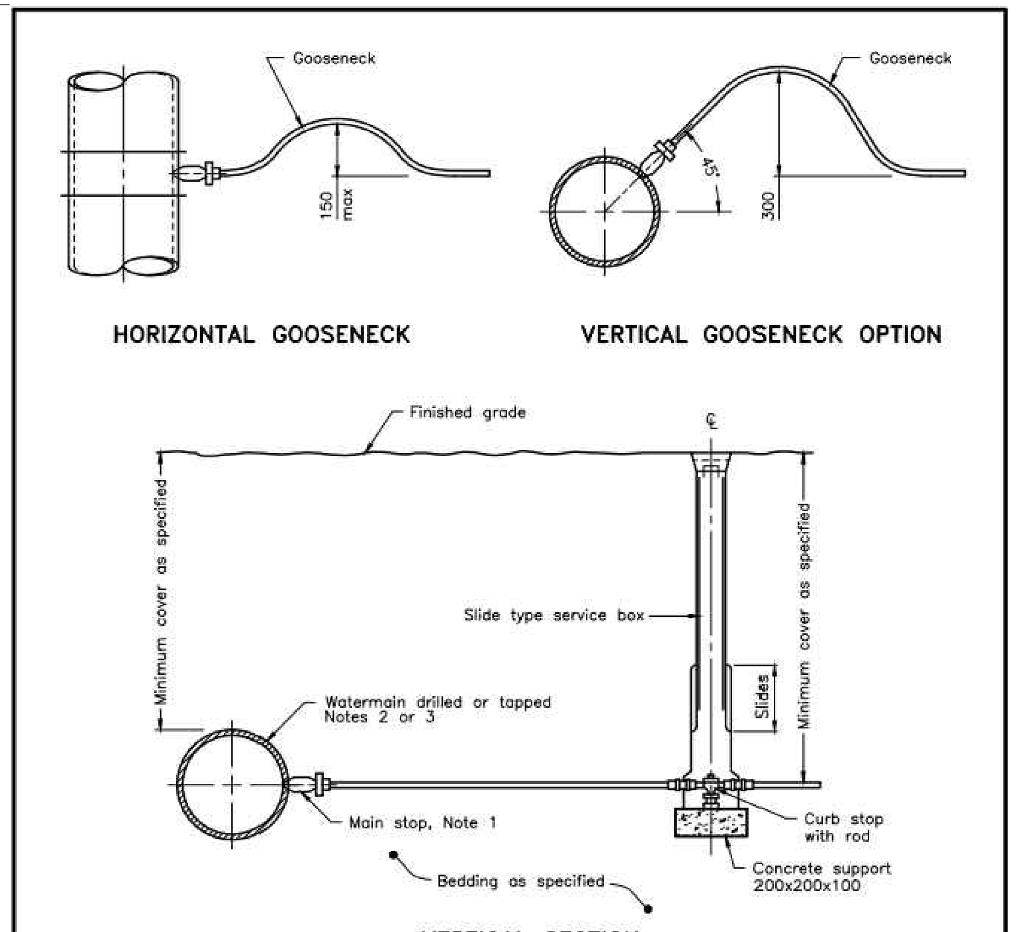
Maintenance Hole Diameter	No. 1–4	No. 5 and 6	No. 8	No. 7 Inlet Hole	No. 7 Outlet Hole
1200	700	860	780	700	860
1500	860	1220	960	860	1170
1800	1220	1485	1220	1220	1485
2400	1485	2020	1760	1485	2020
3000	1930	2450	2300	1930	2450
3600	2470	3085	2730	2470	3085

NOTES:
1 Slopes shall be maintained from the outlet hole opening for top of benching.
A Concrete for benching shall be 30MPa.
B When benching is hand-finished, it shall be given wood float finish, channel shall be given steel trowel finish.
C Benching slope and height shall be as specified.
D When specified, maintenance holes that are 1200mm in diameter with a uniform channel for 200 or 250mm pipe may be prebenched at the manufacturer with standardized benching slope and channel orientation.
E All dimensions are nominal.
F All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev 4

MAINTENANCE HOLE BENCHING AND PIPE OPENING ALTERNATIVES

OPSD 701.021



HORIZONTAL GOOSENECK

VERTICAL GOOSENECK OPTION

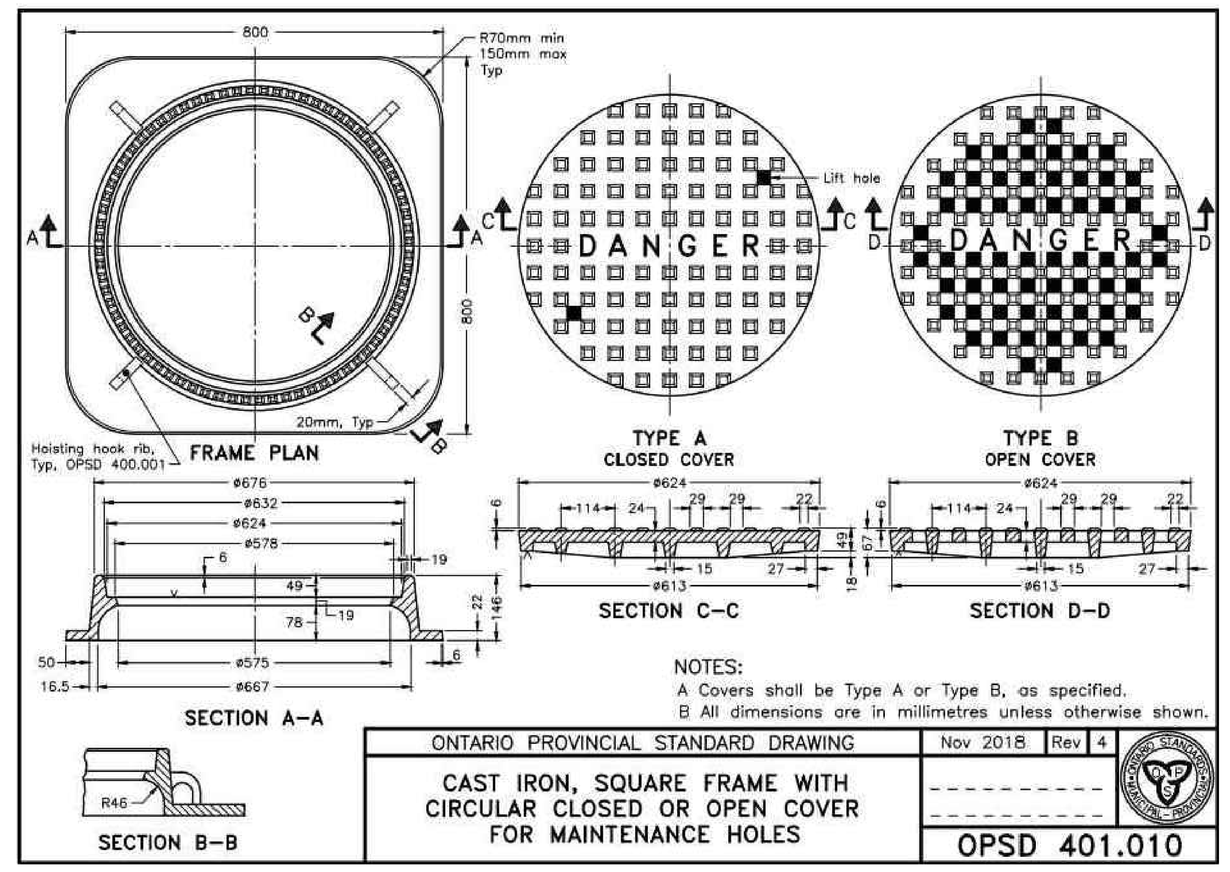
VERTICAL SECTION

NOTES:
1 For plastic service pipes, install main stop at 15° above horizontal with a minimum 1.2m long gooseneck.
2 Direct tap ductile iron pipe with approved tool with standard AWWA inlet thread.
3 Service connections to plastic watermains shall be made using service saddles or factory made tees.
A When specified, the vertical gooseneck option shall be used.
B Couplings shall not be permitted unless the service length exceeds 20m between the main stop and curb stop.
C All water services shall be installed 90° to the longitudinal axis of the watermain.
D Backfill material within 500mm of service box shall be native or imported, as specified.
E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2018 | Rev 4

WATER SERVICE CONNECTION
19 and 25mm DIAMETER SIZES

OPSD 1104.010



FRAME PLAN

TYPE A
CLOSED COVER

TYPE B
OPEN COVER

SECTION C–C

SECTION D–D

SECTION A–A

SECTION B–B

NOTES:
A Covers shall be Type A or Type B, as specified.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2018 | Rev 4

CAST IRON, SQUARE FRAME WITH CIRCULAR CLOSED OR OPEN COVER FOR MAINTENANCE HOLES

OPSD 401.010

REVISIONS

No.	DESCRIPTION	DATE	BY	APPROVED
1.	ISSUED FOR SITE PLAN APPLICATION	JAN 20/22	P.G.	
2.	ISSUED FOR SITE PLAN APPLICATION - 2nd SUBMISSION	OCT 14/22	P.G.	
3.	ISSUED FOR SITE PLAN APPLICATION - 3rd SUBMISSION	JAN 20/23	P.G.	

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3171 LAKESHORE ROAD WEST, OAKVILLE

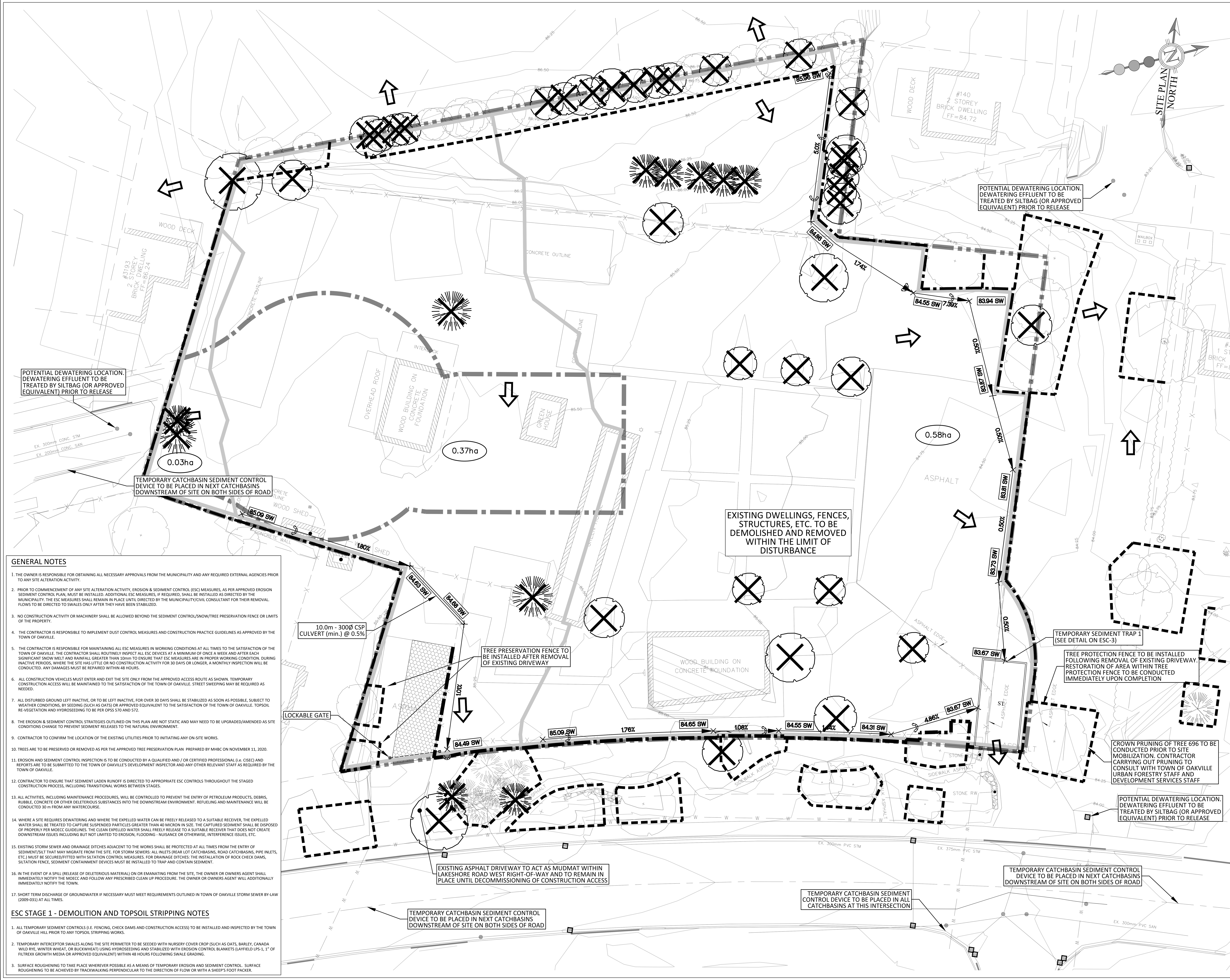
DETAILS PLAN

LICENSED PROFESSIONAL ENGINEER
K. CHEN
100136982
2023-01-20
PROVINCE OF ONTARIO

DATE:	JANUARY 2023	DESIGNED BY:	K.L.	CHECKED BY:	P.G.
SCALE:	N.T.S.	DRAWN BY:	K.L.	CHECKED BY:	P.G.

PROJECT No: 1930

DRAWING No: D-2

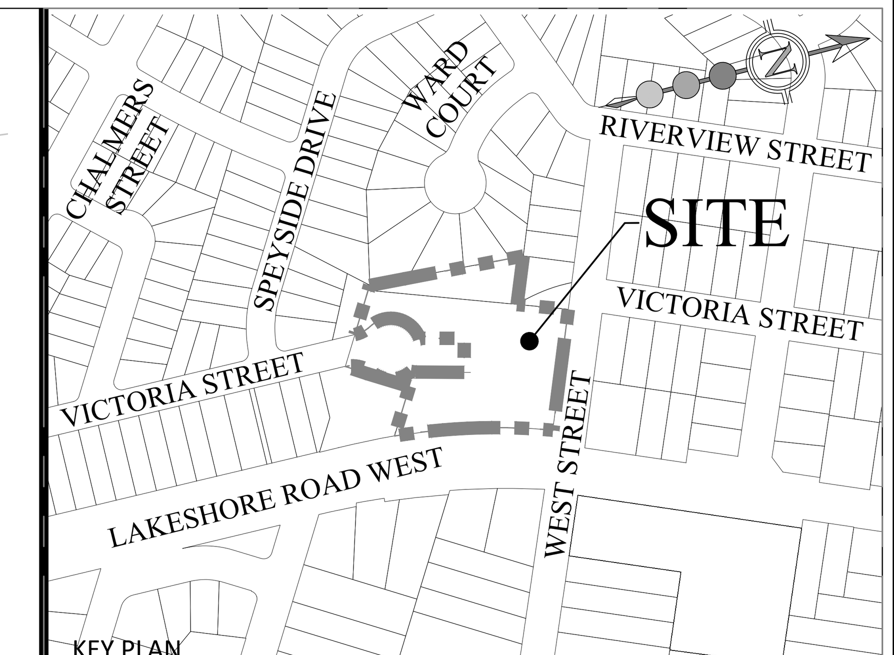


GENERAL NOTES

1. THE OWNER IS RESPONSIBLE FOR OBTAINING ALL NECESSARY APPROVALS FROM THE MUNICIPALITY AND ANY REQUIRED EXTERNAL AGENCIES PRIOR TO ANY SITE ALTERATION ACTIVITY.
2. PRIOR TO COMMENCEMENT OF ANY SITE ALTERATION ACTIVITY, EROSION & SEDIMENT CONTROL (ESC) MEASURES, AS PER APPROVED EROSION SEDIMENT CONTROL PLAN, MUST BE INSTALLED. ADDITIONAL ESC MEASURES, IF REQUIRED, SHALL BE INSTALLED AS DIRECTED BY THE MUNICIPALITY. THE ESC MEASURES SHALL REMAIN IN PLACE UNTIL DIRECTED BY THE MUNICIPALITY/CIVIL CONSULTANT FOR THEIR REMOVAL. FLOWS TO BE DIRECTED TO SWALES ONLY AFTER THEY HAVE BEEN STABILIZED.
3. NO CONSTRUCTION ACTIVITY OR MACHINERY SHALL BE ALLOWED BEYOND THE SEDIMENT CONTROL/SNOW/TREE PRESERVATION FENCE OR LIMITS OF THE PROPERTY.
4. THE CONTRACTOR IS RESPONSIBLE TO IMPLEMENT DUST CONTROL MEASURES AND CONSTRUCTION PRACTICE GUIDELINES AS APPROVED BY THE TOWN OF OAKVILLE.
5. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING ALL ESC MEASURES IN WORKING CONDITIONS AT ALL TIMES TO THE SATISFACTION OF THE TOWN OF OAKVILLE. THE CONTRACTOR SHALL ROUTINELY INSPECT ALL ESC DEVICES AT A MINIMUM OF ONCE A WEEK AND AFTER EACH SIGNIFICANT SNOW MELT AND RAINFALL GREATER THAN 10mm TO ENSURE THAT ESC MEASURES ARE IN PROPER WORKING CONDITION. DURING INACTIVE PERIODS, WHERE THE SITE HAS LITTLE OR NO CONSTRUCTION ACTIVITY FOR 30 DAYS OR LONGER, A MONTHLY INSPECTION WILL BE CONDUCTED. ANY DAMAGES MUST BE REPAIRED WITHIN 48 HOURS.
6. ALL CONSTRUCTION VEHICLES MUST ENTER AND EXIT THE SITE ONLY FROM THE APPROVED ACCESS ROUTE AS SHOWN. TEMPORARY CONSTRUCTION ACCESS WILL BE MAINTAINED TO THE SATISFACTION OF THE TOWN OF OAKVILLE. STREET SWEEPING MAY BE REQUIRED AS NEEDED.
7. ALL DISTURBED GROUND LEFT INACTIVE, OR TO BE LEFT INACTIVE, FOR OVER 30 DAYS SHALL BE STABILIZED AS SOON AS POSSIBLE, SUBJECT TO WEATHER CONDITIONS, BY SEEDING (SUCH AS OATS) OR APPROVED EQUIVALENT TO THE SATISFACTION OF THE TOWN OF OAKVILLE. TOPSOIL RE-VEGETATION AND HYDROSEEDING TO BE PER OPSS 570 AND 572.
8. THE EROSION & SEDIMENT CONTROL STRATEGIES OUTLINED ON THIS PLAN ARE NOT STATIC AND MAY NEED TO BE UPGRADED/AMENDED AS SITE CONDITIONS CHANGE TO PREVENT SEDIMENT RELEASES TO THE NATURAL ENVIRONMENT.
9. CONTRACTOR TO CONFIRM THE LOCATION OF THE EXISTING UTILITIES PRIOR TO INITIATING ANY ON-SITE WORKS.
10. TREES ARE TO BE PRESERVED OR REMOVED AS PER THE APPROVED TREE PRESERVATION PLAN PREPARED BY MHBC ON NOVEMBER 11, 2020.
11. EROSION AND SEDIMENT CONTROL INSPECTION IS TO BE CONDUCTED BY A QUALIFIED AND / OR CERTIFIED PROFESSIONAL (i.e. CISEC) AND REPORTS ARE TO BE SUBMITTED TO THE TOWN OF OAKVILLE'S DEVELOPMENT INSPECTOR AND ANY OTHER RELEVANT STAFF AS REQUIRED BY THE TOWN OF OAKVILLE.
12. CONTRACTOR TO ENSURE THAT SEDIMENT LADEN RUNOFF IS DIRECTED TO APPROPRIATE ESC CONTROLS THROUGHOUT THE STAGED CONSTRUCTION PROCESS, INCLUDING TRANSITIONAL WORKS BETWEEN STAGES.
13. ALL ACTIVITIES, INCLUDING MAINTENANCE PROCEDURES, WILL BE CONTROLLED TO PREVENT THE ENTRY OF PETROLEUM PRODUCTS, DEBRIS, RUBBLE, CONCRETE OR OTHER DELETERIOUS SUBSTANCES INTO THE DOWNSTREAM ENVIRONMENT. REFUELING AND MAINTENANCE WILL BE CONDUCTED 30 m FROM ANY WATERCOURSE.
14. WHERE A SITE REQUIRES DEWATERING AND WHERE THE EXPELLED WATER CAN BE FREELY RELEASED TO A SUITABLE RECEIVER, THE EXPELLED WATER SHALL BE TREATED TO CAPTURE SUSPENDED PARTICLES GREATER THAN 40 MICRON IN SIZE. THE CAPTURED SEDIMENT SHALL BE DISPOSED OF PROPERLY PER MOECC GUIDELINES. THE CLEAN EXPELLED WATER SHALL FREELY RELEASE TO A SUITABLE RECEIVER THAT DOES NOT CREATE DOWNSTREAM ISSUES INCLUDING BUT NOT LIMITED TO EROSION, FLOODING - NUISANCE OR OTHERWISE, INTERFERENCE ISSUES, ETC.
15. EXISTING STORM SEWER AND DRAINAGE DITCHES ADJACENT TO THE WORKS SHALL BE PROTECTED AT ALL TIMES FROM THE ENTRY OF SEDIMENT/SILT THAT MAY MIGRATE FROM THE SITE. FOR STORM SEWERS: ALL INLETS (REAR LOT CATCHBASINS, ROAD CATCHBASINS, PIPE INLETS, ETC.) MUST BE SECURED/FITTED WITH SILTATION CONTROL MEASURES. FOR DRAINAGE DITCHES: THE INSTALLATION OF ROCK CHECK DAMS, SILTATION FENCE, SEDIMENT CONTAINMENT DEVICES MUST BE INSTALLED TO TRAP AND CONTAIN SEDIMENT.
16. IN THE EVENT OF A SPILL (RELEASE OF DELETERIOUS MATERIAL) ON OR EMANATING FROM THE SITE, THE OWNER OR OWNERS AGENT SHALL IMMEDIATELY NOTIFY THE MOECC AND FOLLOW ANY PRESCRIBED CLEAN UP PROCEDURE. THE OWNER OR OWNERS AGENT WILL ADDITIONALLY IMMEDIATELY NOTIFY THE TOWN.
17. SHORT TERM DISCHARGE OF GROUNDWATER IF NECESSARY MUST MEET REQUIREMENTS OUTLINED IN TOWN OF OAKVILLE STORM SEWER BY-LAW (2009-031) AT ALL TIMES.

ESC STAGE 1 - DEMOLITION AND TOPSOIL STRIPPING NOTES

1. ALL TEMPORARY SEDIMENT CONTROLS (I.E. FENCING, CHECK DAMS AND CONSTRUCTION ACCESS) TO BE INSTALLED AND INSPECTED BY THE TOWN OF OAKVILLE HILL PRIOR TO ANY TOPSOIL STRIPPING WORKS.
2. TEMPORARY INTERCEPTOR SWALES ALONG THE SITE PERIMETER TO BE SEEDED WITH NURSERY COVER CROP (SUCH AS OATS, BARLEY, CANADA WILD RYE, WINTER WHEAT, OR BUCKWHEAT) USING HYDROSEEDING AND STABILIZED WITH EROSION CONTROL BLANKETS (LAYFIELD LPS-1, 1" OF FILTREXX GROWTH MEDIA OR APPROVED EQUIVALENT) WITHIN 48 HOURS FOLLOWING SWALE GRADING.
3. SURFACE ROUGHENING TO TAKE PLACE WHEREVER POSSIBLE AS A MEANS OF TEMPORARY EROSION AND SEDIMENT CONTROL. SURFACE ROUGHENING TO BE ACHIEVED BY TRACKWALKING PERPENDICULAR TO THE DIRECTION OF FLOW OR WITH A SHEEP'S FOOT PACKER.



KEY PLAN
N.T.S.

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 DEVELOPMENT
- LIMIT OF SUBDIVISION
- EROSION SEDIMENTATION CONTROL SILT FENCE (SEE DETAIL ON DRAWING ESC-3)
- TREE PRESERVATION FENCE (SEE DETAIL ON DRAWING ESC-3)
- 84.50 — EXISTING CONTOUR AND ELEVATION
- EXISTING STORM DRAINAGE BOUNDARY
- 84.55 SW — SWALE ELEVATION
- 0.50% — SWALE (SEE DETAIL ON DRAWING ESC-3)
- TEMPORARY CONSTRUCTION ACCESS (SEE DETAIL ON DRAWING ESC-3)
- EXISTING FLOW DIRECTION
- 0.60ha — DRAINAGE AREA (ha)
- TEMPORARY STREET CATCHBASIN SEDIMENT CONTROL DEVICE (SEE DETAIL ON DRAWING ESC-3)
- TEMPORARY FILTREX CHECK DAM (SEE DETAIL ON DRAWING ESC-3)
- LOCKABLE GATE (SEE DETAIL ON DRAWING ESC-3)
- EXISTING TREE TO BE REMOVED (REFER TO DRAWING TI-1 PREPARED BY MHBC)
- ST — TEMPORARY SEDIMENT TRAP (SEE DRAWING ESC-3)

NOTE

- TREE REMOVAL AND TREE TRIMMING SHOULD OCCUR OUTSIDE THE MIGRATORY BREEDING BIRD WINDOW APRIL 1- AUGUST 31

TOPOGRAPHIC SURVEY PROVIDED BY RPE SURVEYING LTD, MAY 2017

REVISIONS

No.	DESCRIPTION	DATE	BY	APPROVED
1.	ISSUED FOR SITE PLAN APPLICATION - 2ND SUBMISSION	OCT 14/22	P.G.	

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
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3171 LAKESHORE ROAD WEST, OAKVILLE

EROSION AND SEDIMENT CONTROL - STAGE 1 DEMOLITION AND TOPSOIL STRIPPING

LICENSED PROFESSIONAL ENGINEER
N. D. MCINTOSH
100230564
JAN 23, 2023
PROVINCE OF ONTARIO

DATE:	JANUARY 2023	DESIGNED BY:	N.D.M.	CHECKED BY:	P.G.
SCALE:	1:250	DRAWN BY:	S.T.	CHECKED BY:	P.G.

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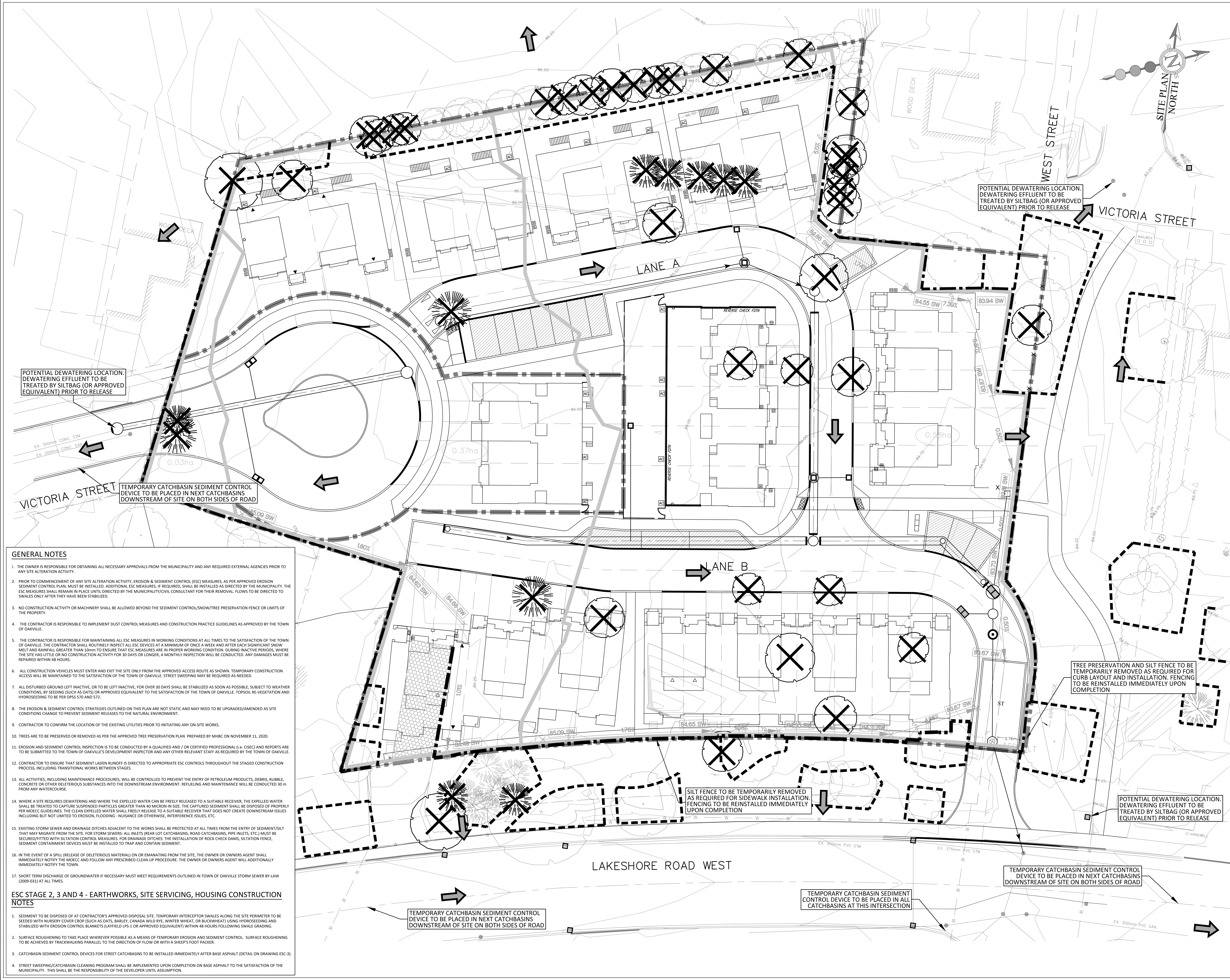
PROJECT No: 1930

DRAWING No: ESC-1

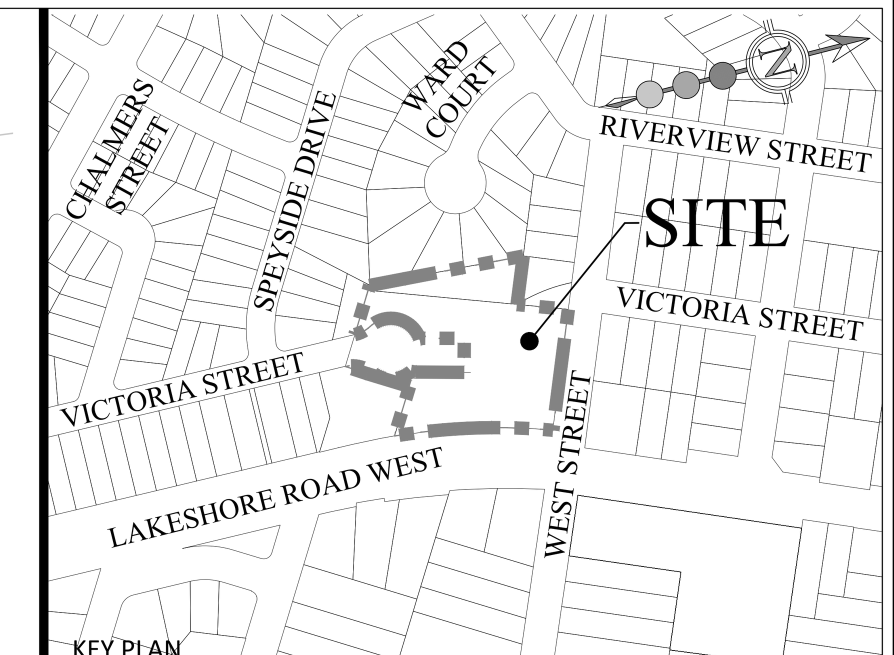


GENERAL NOTES

1. THE OWNER IS RESPONSIBLE FOR OBTAINING ALL NECESSARY APPROVALS FROM THE MUNICIPALITY AND ANY REQUIRED EXTERNAL AGENCIES PRIOR TO ANY SITE ALTERATION ACTIVITY.
2. PRIOR TO COMMENCEMENT OF ANY SITE ALTERATION ACTIVITY, EROSION & SEDIMENT CONTROL (ESC) MEASURES, AS PER APPROVED EROSION SEDIMENT CONTROL PLAN, MUST BE INSTALLED. ADDITIONAL ESC MEASURES, IF REQUIRED, SHALL BE INSTALLED AS DIRECTED BY THE MUNICIPALITY. THE ESC MEASURES SHALL REMAIN IN PLACE UNTIL DIRECTED BY THE MUNICIPALITY/CIVIL CONSULTANT FOR THEIR REMOVAL. FLOWS TO BE DIRECTED TO SWALES ONLY AFTER THEY HAVE BEEN STABILIZED.
3. NO CONSTRUCTION ACTIVITY OR MACHINERY SHALL BE ALLOWED BEYOND THE SEDIMENT CONTROL/SNOW/TREE PRESERVATION FENCE OR LIMITS OF THE PROPERTY.
4. THE CONTRACTOR IS RESPONSIBLE TO IMPLEMENT DUST CONTROL MEASURES AND CONSTRUCTION PRACTICE GUIDELINES AS APPROVED BY THE TOWN OF OAKVILLE.
5. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING ALL ESC MEASURES IN WORKING CONDITIONS AT ALL TIMES TO THE SATISFACTION OF THE TOWN OF OAKVILLE. THE CONTRACTOR SHALL ROUTINELY INSPECT ALL ESC DEVICES AT A MINIMUM OF ONCE A WEEK AND AFTER EACH SIGNIFICANT SNOW MELT AND RAINFALL GREATER THAN 10mm TO ENSURE THAT ESC MEASURES ARE IN PROPER WORKING CONDITION. DURING INACTIVE PERIODS, WHERE THE SITE HAS LITTLE OR NO CONSTRUCTION ACTIVITY FOR 30 DAYS OR LONGER, A MONTHLY INSPECTION WILL BE CONDUCTED. ANY DAMAGES MUST BE REPAIRED WITHIN 48 HOURS.
6. ALL CONSTRUCTION VEHICLES MUST ENTER AND EXIT THE SITE ONLY FROM THE APPROVED ACCESS ROUTE AS SHOWN. TEMPORARY CONSTRUCTION ACCESS WILL BE MAINTAINED TO THE SATISFACTION OF THE TOWN OF OAKVILLE. STREET SWEEPING MAY BE REQUIRED AS NEEDED.
7. ALL DISTURBED GROUND LEFT INACTIVE, OR TO BE LEFT INACTIVE, FOR OVER 30 DAYS SHALL BE STABILIZED AS SOON AS POSSIBLE, SUBJECT TO WEATHER CONDITIONS, BY SEEDING (SUCH AS OATS) OR APPROVED EQUIVALENT TO THE SATISFACTION OF THE TOWN OF OAKVILLE. TOPSOIL RE-VEGETATION AND HYDROSEEDING TO BE PER OPSS 570 AND 572.
8. THE EROSION & SEDIMENT CONTROL STRATEGIES OUTLINED ON THIS PLAN ARE NOT STATIC AND MAY NEED TO BE UPGRADED/AMENDED AS SITE CONDITIONS CHANGE TO PREVENT SEDIMENT RELEASES TO THE NATURAL ENVIRONMENT.
9. CONTRACTOR TO CONFIRM THE LOCATION OF THE EXISTING UTILITIES PRIOR TO INITIATING ANY ON-SITE WORKS.
10. TREES ARE TO BE PRESERVED OR REMOVED AS PER THE APPROVED TREE PRESERVATION PLAN PREPARED BY MHBC ON NOVEMBER 11, 2020.
11. EROSION AND SEDIMENT CONTROL INSPECTION IS TO BE CONDUCTED BY A QUALIFIED AND / OR CERTIFIED PROFESSIONAL (i.e. CISEC) AND REPORTS ARE TO BE SUBMITTED TO THE TOWN OF OAKVILLE'S DEVELOPMENT INSPECTOR AND ANY OTHER RELEVANT STAFF AS REQUIRED BY THE TOWN OF OAKVILLE.
12. CONTRACTOR TO ENSURE THAT SEDIMENT LADEN RUNOFF IS DIRECTED TO APPROPRIATE ESC CONTROLS THROUGHOUT THE STAGED CONSTRUCTION PROCESS, INCLUDING TRANSITIONAL WORKS BETWEEN STAGES.
13. ALL ACTIVITIES, INCLUDING MAINTENANCE PROCEDURES, WILL BE CONTROLLED TO PREVENT THE ENTRY OF PETROLEUM PRODUCTS, DEBRIS, RUBBLE, CONCRETE OR OTHER DELETERIOUS SUBSTANCES INTO THE DOWNSTREAM ENVIRONMENT. REFUELING AND MAINTENANCE WILL BE CONDUCTED 30 m FROM ANY WATERCOURSE.
14. WHERE A SITE REQUIRES DEWATERING AND WHERE THE EXPELLED WATER CAN BE FREELY RELEASED TO A SUITABLE RECEIVER, THE EXPELLED WATER SHALL BE TREATED TO CAPTURE SUSPENDED PARTICLES GREATER THAN 40 MICRON IN SIZE. THE CAPTURED SEDIMENT SHALL BE DISPOSED OF PROPERLY PER MOECC GUIDELINES. THE CLEAN EXPELLED WATER SHALL FREELY RELEASE TO A SUITABLE RECEIVER THAT DOES NOT CREATE DOWNSTREAM ISSUES INCLUDING BUT NOT LIMITED TO EROSION, FLOODING - NUISANCE OR OTHERWISE, INTERFERENCE ISSUES, ETC.
15. EXISTING STORM SEWER AND DRAINAGE DITCHES ADJACENT TO THE WORKS SHALL BE PROTECTED AT ALL TIMES FROM THE ENTRY OF SEDIMENT/SILT THAT MAY MIGRATE FROM THE SITE. FOR STORM SEWERS: ALL INLETS (REAR LOT CATCHBASINS, ROAD CATCHBASINS, PIPE INLETS, ETC.) MUST BE SECURED/FITTED WITH SILTATION CONTROL MEASURES. FOR DRAINAGE DITCHES: THE INSTALLATION OF ROCK CHECK DAMS, SILTATION FENCE, SEDIMENT CONTAINMENT DEVICES MUST BE INSTALLED TO TRAP AND CONTAIN SEDIMENT.
16. IN THE EVENT OF A SPILL (RELEASE OF DELETERIOUS MATERIAL) ON OR EMANATING FROM THE SITE, THE OWNER OR OWNERS AGENT SHALL IMMEDIATELY NOTIFY THE MOECC AND FOLLOW ANY PRESCRIBED CLEAN UP PROCEDURE. THE OWNER OR OWNERS AGENT WILL ADDITIONALLY IMMEDIATELY NOTIFY THE TOWN.
17. SHORT TERM DISCHARGE OF GROUNDWATER IF NECESSARY MUST MEET REQUIREMENTS OUTLINED IN TOWN OF OAKVILLE STORM SEWER BY-LAW (2009-031) AT ALL TIMES.

ESC STAGE 2, 3 AND 4 - EARTHWORKS, SITE SERVICING, HOUSING CONSTRUCTION NOTES

1. SEDIMENT TO BE DISPOSED OF AT CONTRACTOR'S APPROVED DISPOSAL SITE. TEMPORARY INTERCEPTOR SWALES ALONG THE SITE PERIMETER TO BE SEEDED WITH NURSERY COVER CROP (SUCH AS OATS, BARLEY, CANADA WILD RYE, WINTER WHEAT, OR BUCKWHEAT) USING HYDROSEEDING AND STABILIZED WITH EROSION CONTROL BLANKETS (LAYFIELD LPS-1 OR APPROVED EQUIVALENT) WITHIN 48 HOURS FOLLOWING SWALE GRADING.
2. SURFACE ROUGHENING TO TAKE PLACE WHEREVER POSSIBLE AS A MEANS OF TEMPORARY EROSION AND SEDIMENT CONTROL. SURFACE ROUGHENING TO BE ACHIEVED BY TRACKWALKING PARALLEL TO THE DIRECTION OF FLOW OR WITH A SHEEP'S FOOT PACKER.
3. CATCHBASIN SEDIMENT CONTROL DEVICES FOR STREET CATCHBASINS TO BE INSTALLED IMMEDIATELY AFTER BASE ASPHALT (DETAIL ON DRAWING ESC-3).
4. STREET SWEEPING/CATCHBASIN CLEANING PROGRAM SHALL BE IMPLEMENTED UPON COMPLETION ON BASE ASPHALT TO THE SATISFACTION OF THE MUNICIPALITY. THIS SHALL BE THE RESPONSIBILITY OF THE DEVELOPER UNTIL ASSUMPTION.



KEY PLAN
N.T.S.

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:

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- LIMIT OF SUBDIVISION
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- TREE PRESERVATION FENCE (SEE DETAIL ON DRAWING ESC-3)
- 84.50 — EXISTING CONTOUR AND ELEVATION
- EXISTING STORM DRAINAGE BOUNDARY
- 84.55 SW — SWALE ELEVATION
- 0.50% — SWALE (SEE DETAIL ON DRAWING ESC-3)
- TEMPORARY CONSTRUCTION ACCESS
- 0.60ha — DRAINAGE AREA (ha)
- PROPOSED FLOW DIRECTION
- TEMPORARY STREET CATCHBASIN SEDIMENT CONTROL DEVICE (SEE DETAIL ON DRAWING ESC-3)
- TEMPORARY FILTREX CHECK DAM (SEE DETAIL ON DRAWING ESC-3)
- LOCKABLE GATE (SEE DETAIL ON DRAWING ESC-3)
- PROPOSED STORM SEWER AND MANHOLE
- PROPOSED SUPERPIPE
- EXISTING TREE TO BE REMOVED (REFER TO DRAWING TI-1 PREPARED BY MHBC)
- ST — TEMPORARY SEDIMENT TRAP (SEE DRAWING ESC-3)

TOPOGRAPHIC SURVEY PROVIDED BY RPE SURVEYING LTD, MAY 2017

REVISIONS

No.	DESCRIPTION	DATE	BY	APPROVED
1.	ISSUED FOR SITE PLAN APPLICATION - 2ND SUBMISSION	OCT 14/22	P.G.	

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3171 LAKESHORE ROAD WEST, OAKVILLE

EROSION AND SEDIMENT CONTROL - STAGE 2, 3 AND 4 EARTHWORKS, SITE SERVICING, AND HOUSING CONSTRUCTION

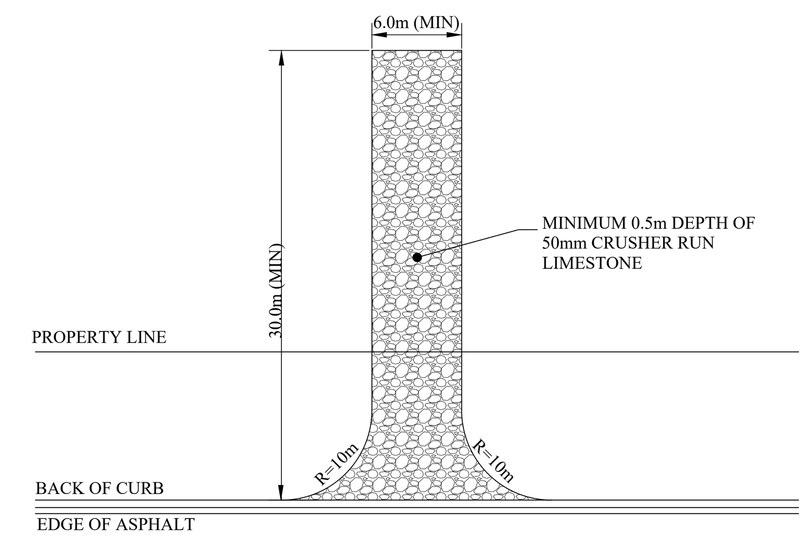
LICENSED PROFESSIONAL ENGINEER
N. D. MCINTOSH
100230564
JAN 23, 2023
PROVINCE OF ONTARIO

DATE:	JANUARY 2023	DESIGNED BY:	N.D.M.	CHECKED BY:	P.G.
SCALE:	1:250	DRAWN BY:	S.T.	CHECKED BY:	P.G.

1 0 5 10 15 20

PROJECT No: 1930

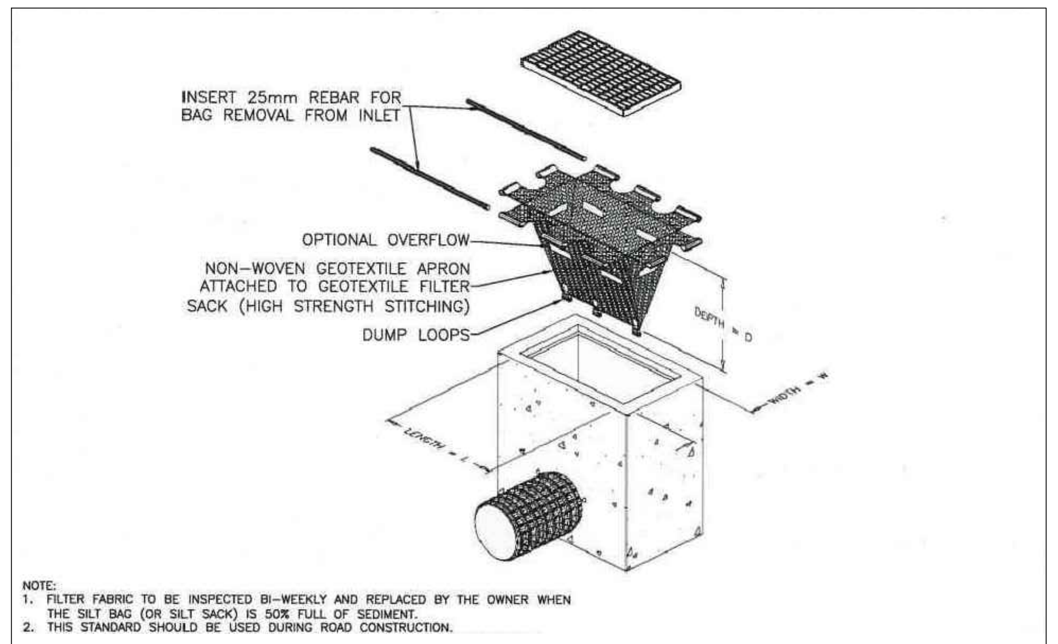
DRAWING No: ESC-2



NOTES:
1. UPON REMOVAL OF TEMPORARY CONSTRUCTION ACCESS, ALL DISTURBED AREAS SHALL BE RESTORED TO ORIGINAL OR BETTER CONDITION.

MUD MAT FOR TEMPORARY CONSTRUCTION ACCESS

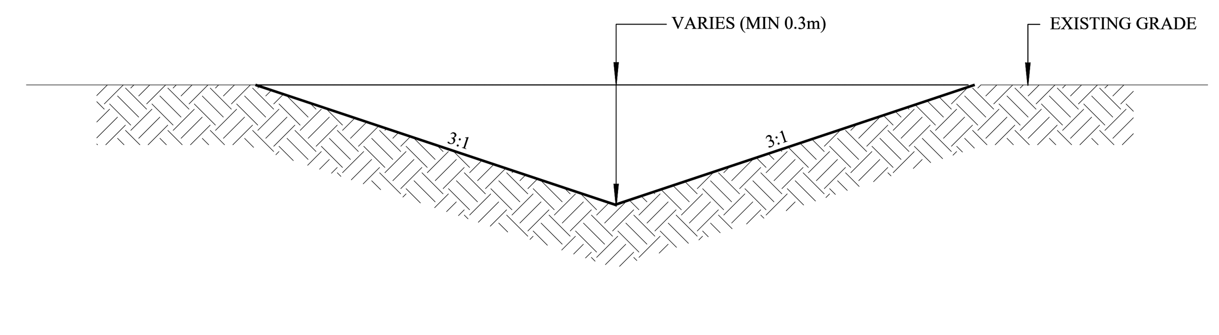
SCALE: N.T.S.



NOTE:
1. FILTER FABRIC TO BE INSPECTED BI-WEEKLY AND REPLACED BY THE OWNER WHEN THE SILT BAG (OR SILT SACK) IS 50% FULL OF SEDIMENT.
2. THIS STANDARD SHOULD BE USED DURING ROAD CONSTRUCTION.

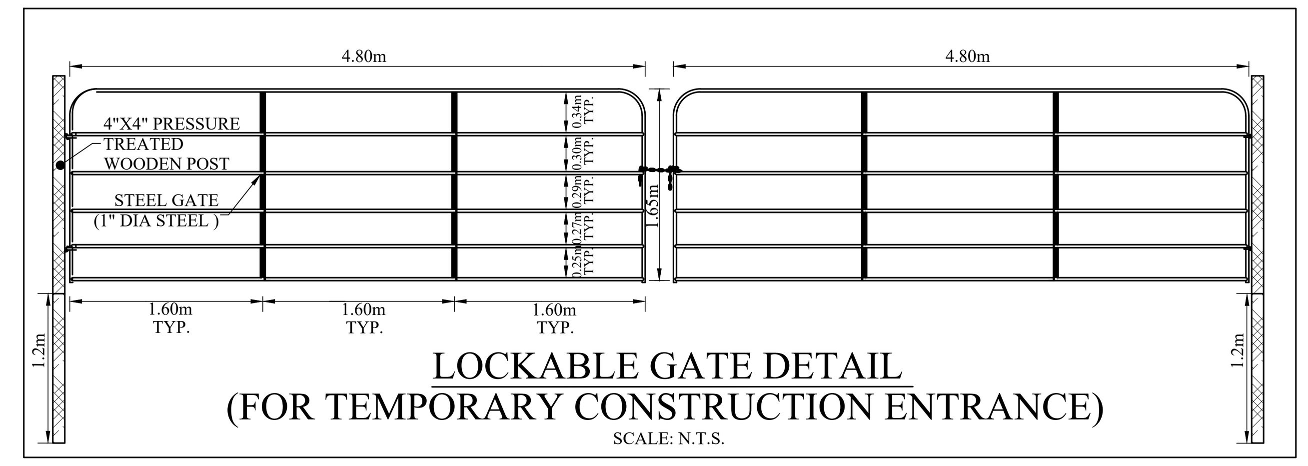
TEMPORARY CATCHBASIN SEDIMENT CONTROL DEVICE

SCALE: N.T.S.



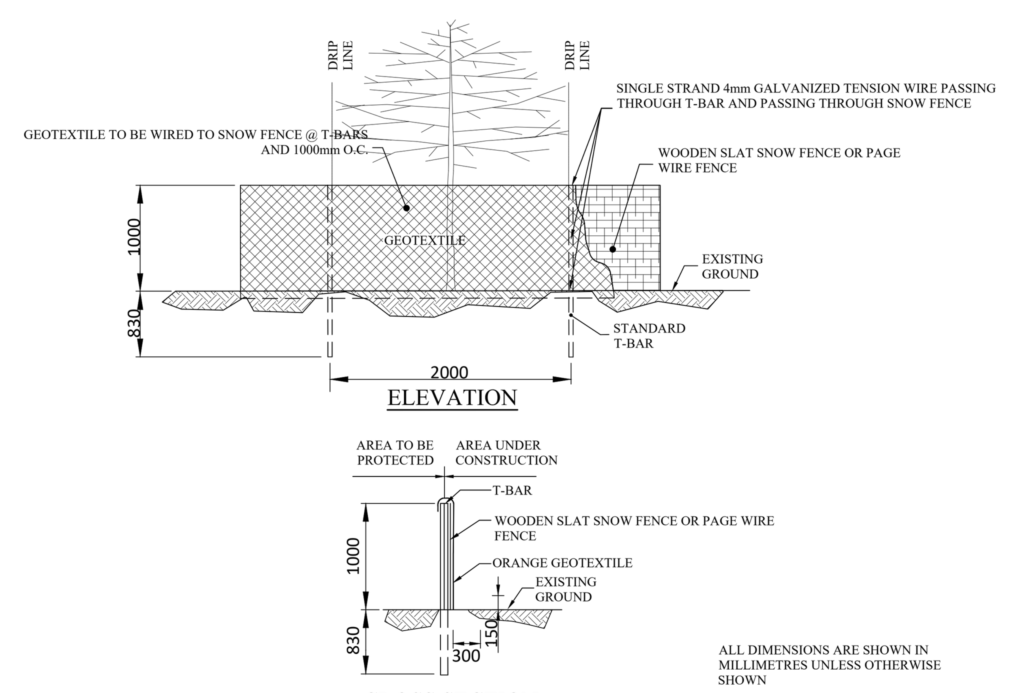
TEMPORARY SWALE

SCALE: N.T.S.



LOCKABLE GATE DETAIL (FOR TEMPORARY CONSTRUCTION ENTRANCE)

SCALE: N.T.S.



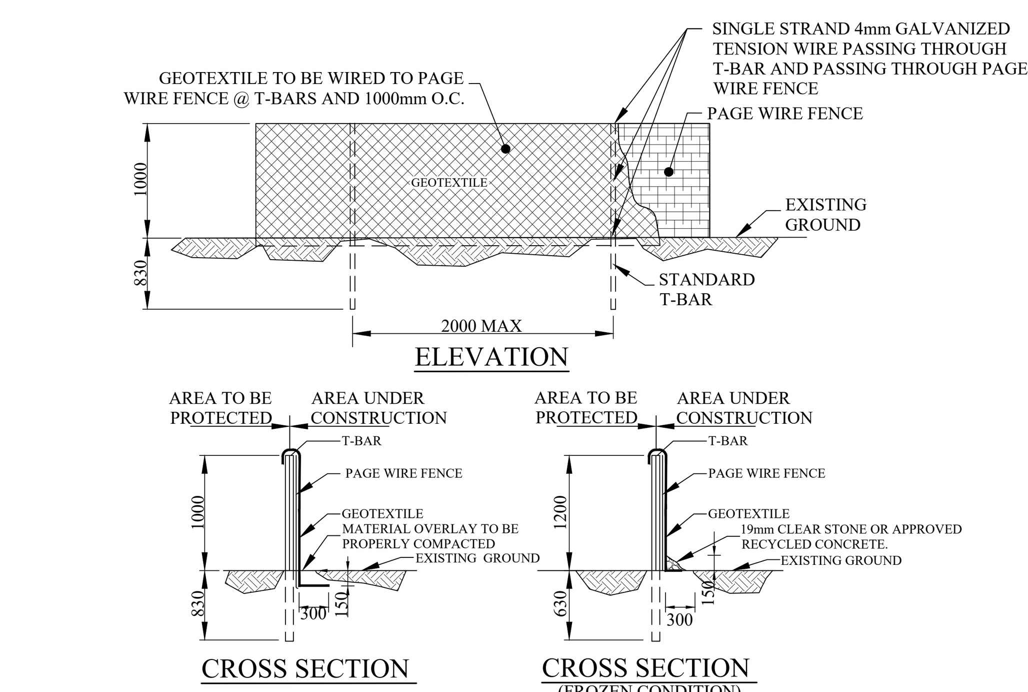
ALL DIMENSIONS ARE SHOWN IN MILLIMETRES UNLESS OTHERWISE SHOWN

NOTES:

1. ORANGE GEOTEXTILE TO HAVE A HORIZONTAL OVERLAY OF 1000mm AT JOINTS.
2. SNOW FENCE TO BE WOODEN.
3. ALL EXISTING TREES WHICH ARE TO REMAIN, SHALL BE FULLY PROTECTED WITH THE FENCING BEYOND THEIR "DRIP-LINE", TO THE SATISFACTION OF THE TOWN'S LANDSCAPE ARCHITECT. GROUPS OF TREES AND OTHER EXISTING PLANTINGS TO BE PROTECTED, SHALL BE DONE IN A LIKE MANNER WITH FENCING AROUND THE ENTIRE GROUPINGS.
4. THE AREA WITHIN THE PROTECTIVE FENCING SHALL REMAIN UNDISTURBED AND SURPLUS SOIL, EQUIPMENT, DEBRIS OR BUILDING MATERIALS SHALL NOT BE PLACED OVER ROOT SYSTEMS OF THE TREES WITHIN THE PROTECTIVE FENCING. NO CONTAMINENTS WILL BE DUMPED OR FLUSHED WHERE FEEDER ROOTS OF TREES EXIST.
5. THE DEVELOPER OR HIS AGENTS SHALL TAKE EVERY PRECAUTION NECESSARY TO PREVENT DAMAGE TO TREES OR SHRUBS TO BE RETAINED. NO RIGGING CABLES SHALL BE WRAPPED AROUND OR INSTALLED IN TREES.
6. WHERE ROOT SYSTEMS OF PROTECTED TREES ARE EXPOSED DIRECTLY ADJACENT TO, OR DAMAGED BY CONSTRUCTION WORK, THEY SHALL BE TRIMMED NEATLY AND THE AREA BACK-FILLED WITH APPROPRIATE MATERIAL TO PREVENT DESICCATION.
7. WHERE LIMBS OR PORTIONS OF TREES ARE REMOVED TO ACCOMMODATE CONSTRUCTION WORK, THEY SHALL BE REMOVED CAREFULLY. EXPOSED WOOD OVER 25mm TO BE TREATED WITH AN APPROVED TREE WOUND DRESSING.
8. WHERE NECESSARY, THE TREES SHALL BE GIVEN AN OVERALL PRUNING TO RESTORE THE BALANCE BETWEEN ROOTS AND TOP GROWTH, OR TO RESTORE THE APPEARANCE OF THE TREE. PRUNE BRANCHES BY $\frac{1}{3}$ IF REQUIRED TO REMOVE DAMAGED OR OBJECTIONABLE BRANCHES. DO NOT PRUNE LEADERS.
9. TREES THAT HAVE DIED OR HAVE BEEN DAMAGED BEYOND REPAIR SHALL BE REPLACED BY THE DEVELOPER AT HIS OWN EXPENSE WITH TREES OF A SIZE AND SPECIES AS APPROVED BY THE TOWN'S LANDSCAPE ARCHITECT.
10. IF GRADES AROUND TREES TO BE PROTECTED ARE LIKELY TO CHANGE THE DEVELOPER SHALL BE REQUIRED TO TAKE SUCH PRECAUTIONS AS FRYWELLING AND ROOT-FEEDING TO THE SATISFACTION OF THE TOWN'S LANDSCAPE ARCHITECT.

TREE PRESERVATION FENCE

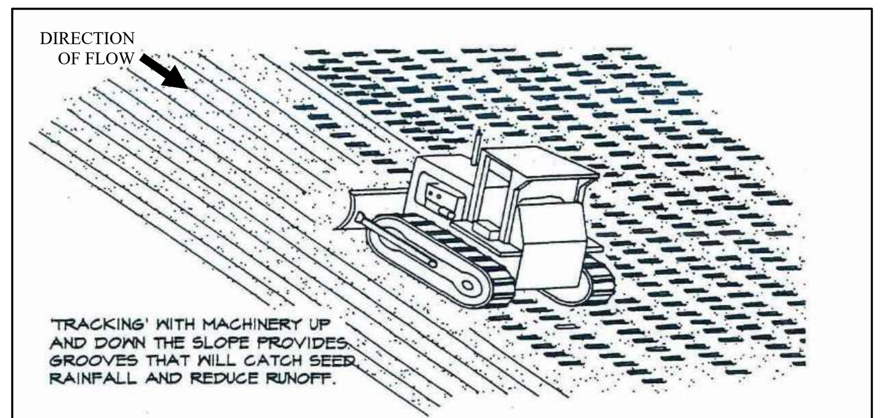
SCALE: N.T.S.



NOTES:
1. GEOTEXTILE TO HAVE A MINIMUM TEAR RESISTANCE OF 210 N (TERRAFIX 270R, LAYFIELD LP4, OR APPROVED EQUIVALENT).
2. GEOTEXTILE TO HAVE A HORIZONTAL OVERLAY OF 1000mm AT JOINTS.
3. PAGE WIRE FENCE OR APPROVED EQUIVALENT.

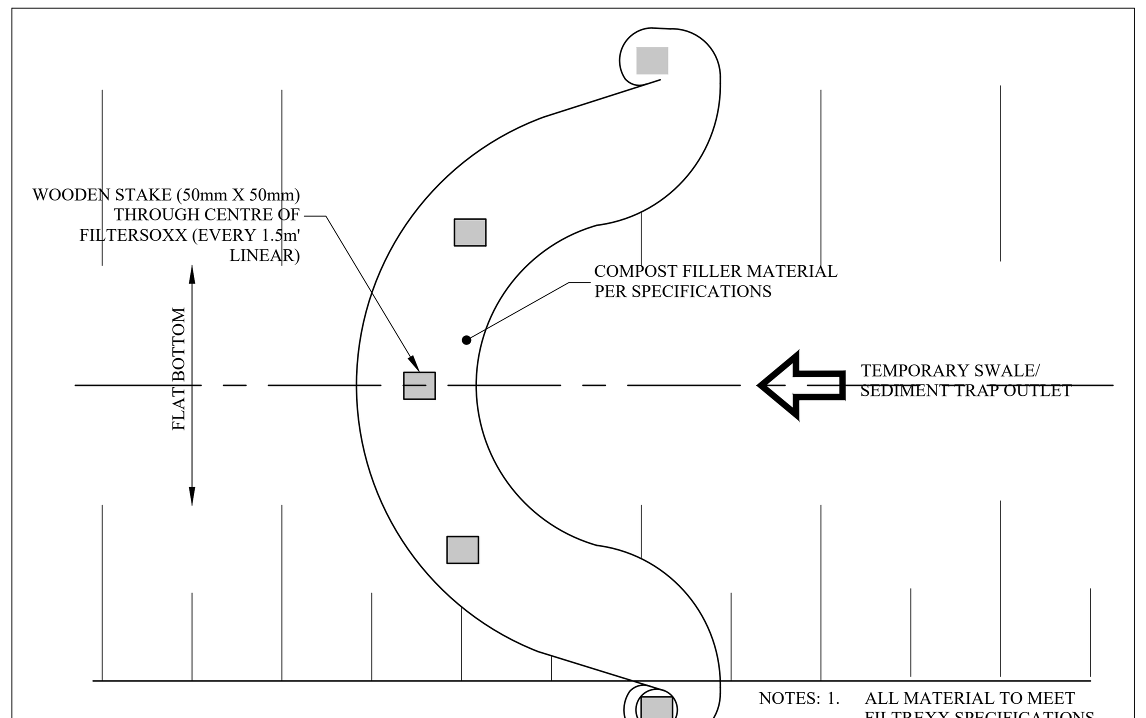
TEMPORARY SINGLE ROW SEDIMENT CONTROL FENCE

SCALE: N.T.S.



TRACK WALKING DETAIL

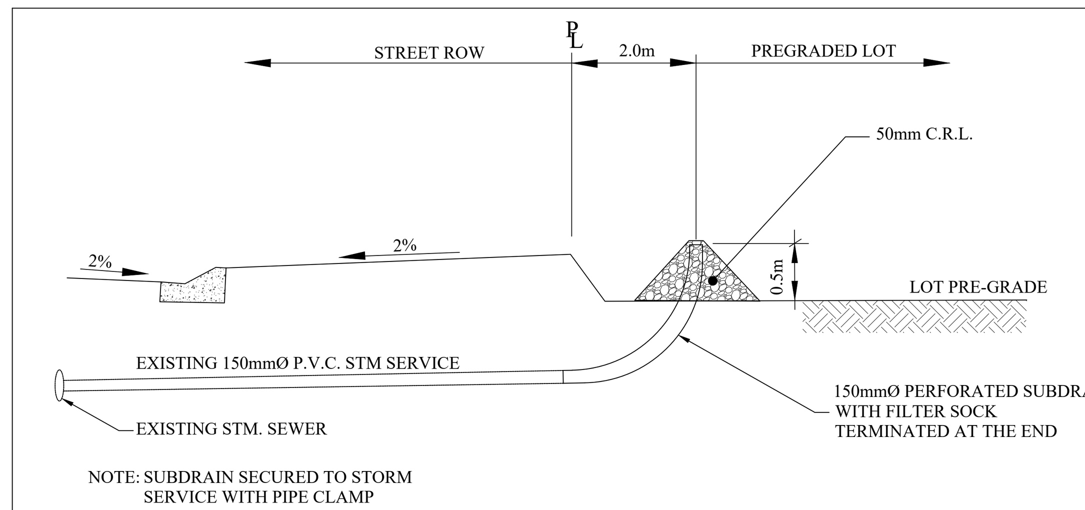
SCALE: N.T.S.



NOTES:
1. ALL MATERIAL TO MEET FILTREXX SPECIFICATIONS
2. SEDIMENT SHOULD BE REMOVED FROM BEHIND CHECKDAM ONCE THE ACCUMULATED HEIGHT HAS REACHED $\frac{1}{2}$ TOTAL HEIGHT OF THE CHECK DAM.

FILTREXX (OR APPROVED EQUIVALENT) CHECK DAM

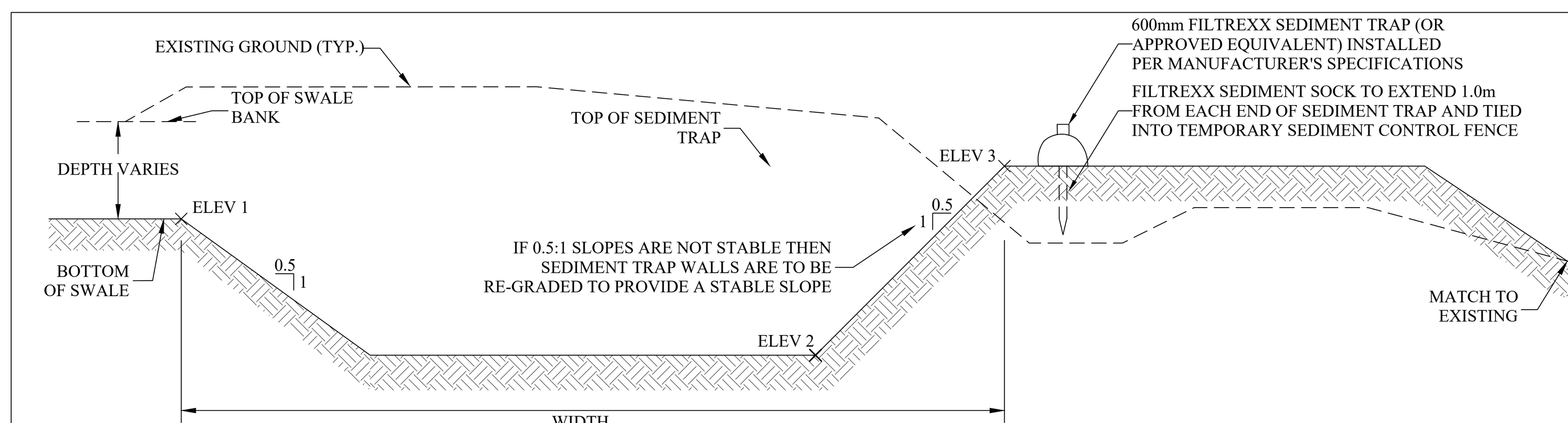
SCALE: N.T.S.



NOTE: SUBDRAIN SECURED TO STORM SERVICE WITH PIPE CLAMP

TEMPORARY LOT RISER DRAIN WITH FILTER SOCK

SCALE: N.T.S.



SEDIMENT TRAP	**ELEVATION 1** INSERT SWALE INVERT (m)	**ELEVATION 2** BOTTOM OF TRAP (m)	**ELEVATION 3** TOP OF TRAP (m)	TRAP BASIN DEPTH (m)	TRAP LENGTH (m)	TRAP WIDTH (m)	REQUIRED TRAP VOLUME (m^3)	PROVIDED TRAP VOLUME (m^3)
1	83.67	83.26	84.26	1.0	13.0	6.5	73.0	75.0

TEMPORARY SEDIMENT TRAP

SCALE: N.T.S.

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3171 LAKESHORE ROAD WEST, OAKVILLE

EROSION AND SEDIMENT CONTROL DETAILS PLAN 1

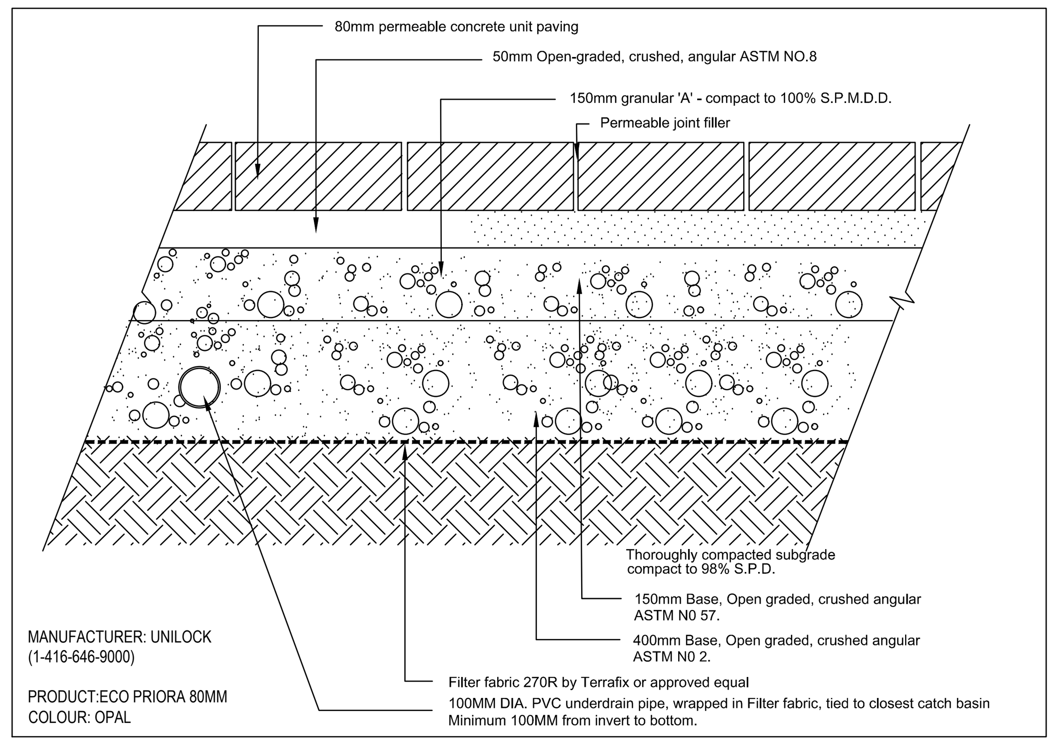
LICENSED PROFESSIONAL ENGINEER
N. D. MCINTOSH
100230564
JAN 20, 2023
PROVINCE OF ONTARIO

DATE:	JANUARY 2023	DESIGNED BY:	N.D.M.	CHECKED BY:	P.G.
SCALE:	N.T.S.	DRAWN BY:	S.T.	CHECKED BY:	P.G.

PROJECT No: 1930

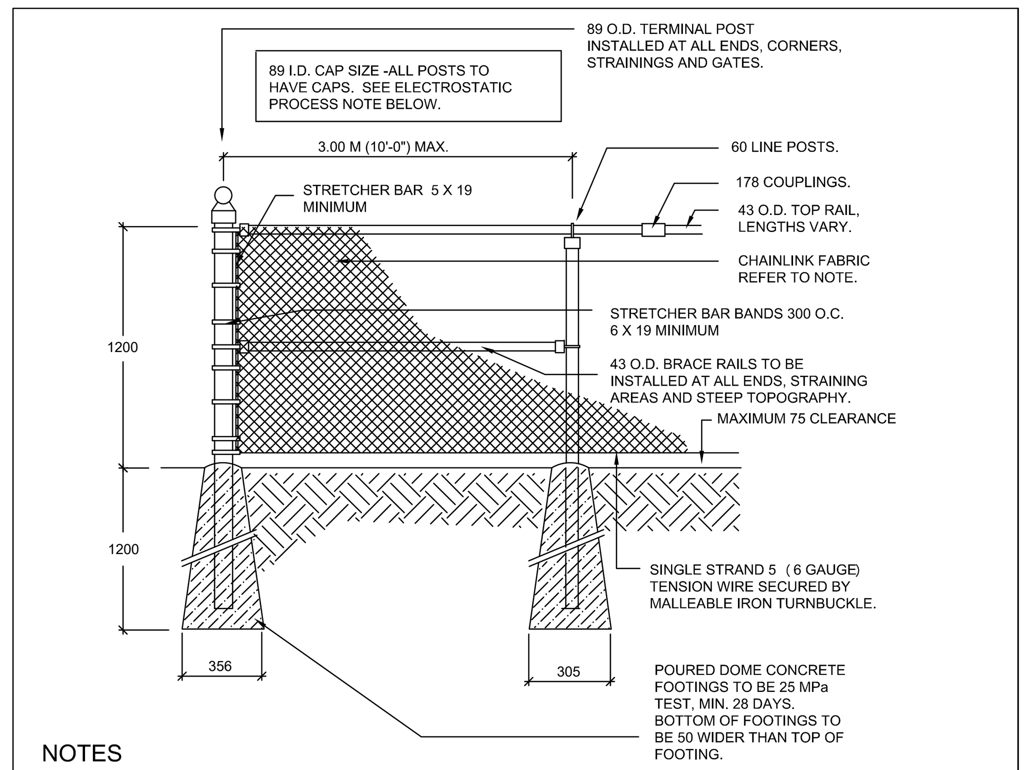
DRAWING No: ESC-3

File: P:\1930 3171 Lakeshore Road West, Oakville\Drawings\Phase 1\Esc\1930D-EROS-ESC-3.dwg - Revised by <CMAIER-DOWNING> : Fri, Oct 14 2022 - 9:39am



1 L-3 **Permeable Unit Paver**

n.t.s.

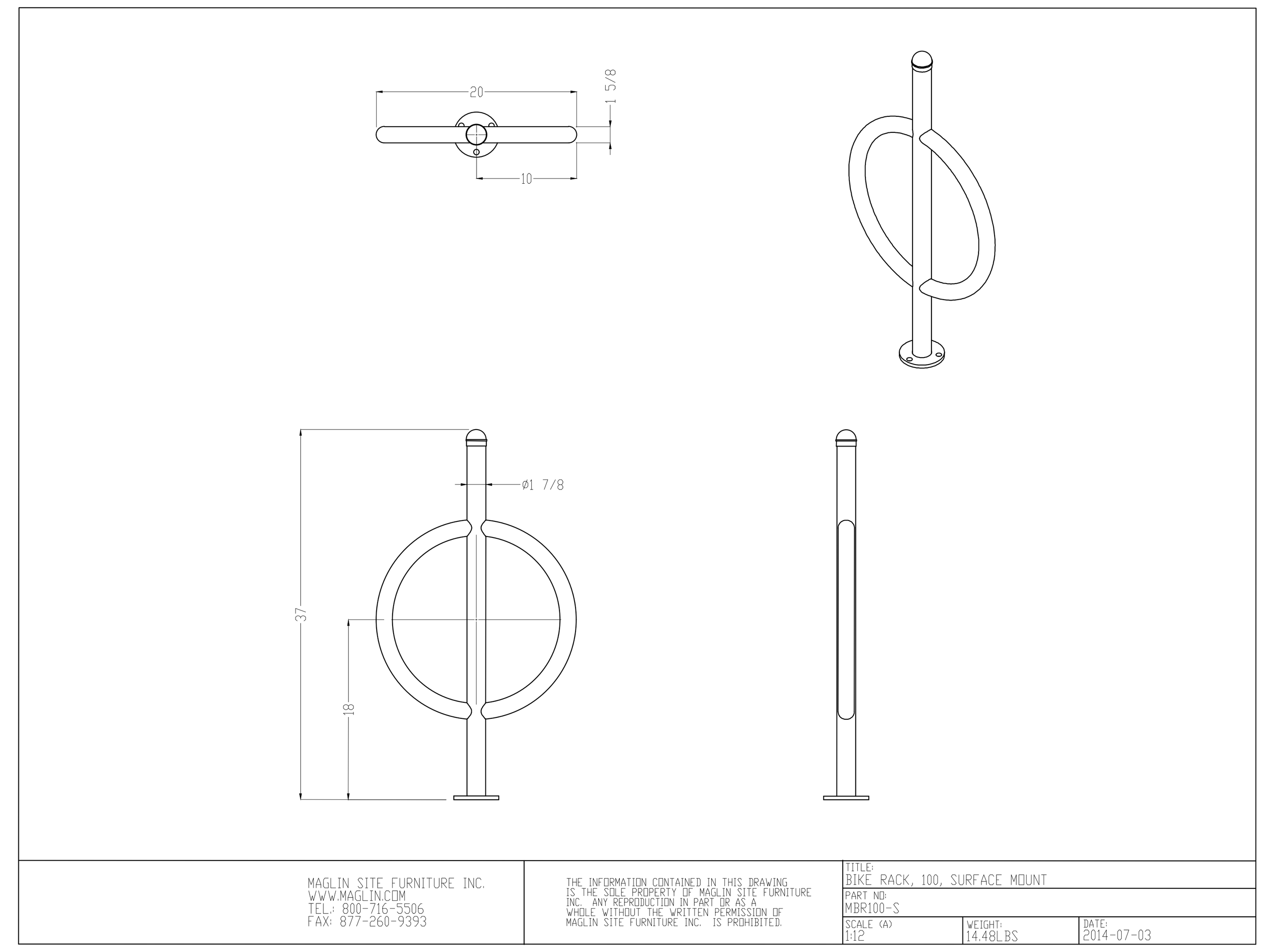


NOTES

1. CHAINLINK FABRIC TO BE BLACK VINYL COATED, WOVEN MESH SIZE 38mm, FABRIC HEIGHT 1.2M, CONSTRUCTED WITH 3.5 (9 GAUGE) GALVANIZED WIRE COATED WITH BLACK VINYL. FASTENED TO TOP RAIL, BRACE RAIL, LINE POST, STRETCHER BAR AND TENSION WIRE WITH 3.5 (9 GAUGE) GALVANIZED (AND PAINTED BLACK) WIRE 450 (18") O.C.
2. ALL FENCE COMPONENTS OTHER THAN VINYL COATED CHAINLINK FABRIC SHALL BE PAINT TREATED WITH ONE COAT STERLING RED PRIMER #1734, FOLLOWED BY ONE COAT STERLING SEMI-GLOSS BLACK ENAMEL #3813, BY ELECTROSTATIC PROCESS.
3. ALL DIMENSIONS ARE IN METRES AND MILLIMETRES.

2 L-3 **1.2m Chain Link Fence**

n.t.s.



3 L-3 **Maglin BR100 Bike Rack**

n.t.s.

GENERAL NOTES

1. Do not scale the drawings. All dimensions are in millimetres unless noted otherwise.
2. This drawing is to be read in conjunction with the overall master plan and engineering drawings prepared by the project engineer and site plans prepared by the project architect.
3. The contractor shall check and verify all existing and proposed grading and conditions on the project and immediately report any discrepancies to the consultant before proceeding with any work.
4. The contractor is to be aware of all existing and proposed services and utilities. The contractor is responsible for having all underground services and utility lines staked by each agency having jurisdiction prior to commencing work.
5. This drawing is to be used for development approval only. For layout of all work refer to construction drawings.
6. Plant quantities indicated on the plan supercede the quantities from the plant list (report any discrepancies to the landscape architect).
7. Do not leave any holes open overnight.
8. Keep area outside construction zone clean and useable by others at all times. Contractor shall throughly clean areas surrounding the construction zone at the end of each work day.
9. Contractor to make good any and all damages outside of the development area that may occur as a result of construction at no extra cost.
10. This drawing is Copyright MHBC 2022

REVISION NO.	DATE	ISSUED / REVISION	BY
7.	JANUARY 20, 2023	ISSUED FOR SPA	CC
6.	OCTOBER 14, 2022	ISSUED FOR SPA	CC
5.	JANUARY 17, 2022	ISSUED FOR SPA	CC
4.	JANUARY 12, 2021	ISSUED FOR SPA	CC
3.	NOVEMBER 11, 2020	ISSUED FOR SPA	CC
2.	AUGUST 13, 2019	ISSUED FOR SPA	CC

PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE

MHBC

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ONTARIO ASSOCIATION OF LANDSCAPE ARCHITECTS
NICOLA A. MIELE
OALA
MEMBER

ISSUED FOR SPA ONLY
NOT FOR CONSTRUCTION

DATE	JANUARY 2023
DRAWN BY	CC
PLAN SCALE	1:250
FILE NO.	11161E
CHECKED BY	N.M.
OTHER	

PROJECT

3171 LAKESHORE ROAD WEST
OAKVILLE, ON

FILE NAME

LANDSCAPE DETAILS

DWG NO.

L3

SOURCE

N:\11161\E – Cudmore's Nursery\2023\January\11161E – Landscape Plan – 01–20–2023.dwg

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